Kirby Lake Aquatic Plant Management Plan

AIS Education, Prevention and Planning

Barron County, Wisconsin

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May 28, 2013

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Barron County, Wisconsin

Prepared for:
Kirby Lake Management District
Cumberland, Wisconsin

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Executive Summary

Kirby Lake is in north-western Barron County, Wisconsin. The Lake covers approximately 92 acres with an average depth of 8-ft. and a maximum depth of 19-ft. Kirby Lake has exceptional aquatic plant diversity and distribution, and at the present time, no non-native, invasive aquatic plant species other than reed canary grass. The aquatic plant diversity in the lake which includes 49 different species including 17 species with coefficients of conservatism of 9 or 10 and two Species of Special Concern in WI, Robbins Spikerush and Snail-seed pondweed, makes Kirby Lake one of the most "sensitive" lakes to date that have been surveyed by ERS. The density of native aquatic plant growth; however, does create nuisance level conditions preventing lake access and use issues for many property owners and lake users. As such, management of native aquatic plants to provide open water access and improved navigation is necessary. An integrated management approach that relies on a combination of manual and mechanical control methods and techniques is recommended for Kirby Lake. No wild rice was identified in Kirby Lake.

Kirby Lake is a moderately nutrient rich system, or mesotrophic, with relatively stable water quality since continuous monitoring began in the early 1990s. Summer water clarity in Kirby Lake averages about 6.5 ft. as measured by a Secchi disk. Total phosphorus averages 25 ug/L, and Chlorophyll-a averages 12.5 ug/L. Kirby Lake is dimictic, meaning that at least twice a year (spring and fall) stratification is replaced by a mixing event called "overturn" or "turnover" whereby all waters in the lake (top and bottom) naturally mix recharging levels of dissolved oxygen and distributing necessary nutrients throughout the water in the lake. Smaller and often limited "mixing" events can occur in the summer months due to large storm events or heavy use by humans (like the 4th of July Weekend).

The overall goal of aquatic plant management in the Kirby Lake is to protect this outstanding resource from degradation by maximizing prevention of new invasions and by completing only a minimal amount of native plant management to provide nuisance and navigation relief for lake users. The primary objectives of this aquatic plant management plan are monitor for the introduction of new aquatic invasive species (early detection and rapid response) and to open less than 5% of the littoral zone for navigational purposes.

The following actions will be implemented by the Kirby Lake Management District to help meet the objectives of this plan:

- **Objective 1: Preservation and Restoration**. Protect and restore the native plant species community in and around the lakes to decrease susceptibility to the introduction of new aquatic invasive species.
  Action: Provide shoreland restoration materials (online, newsletter).
  Action: Conduct a baseline shoreland evaluation (by boat).
  Action: Host shoreland restoration training event/professional site planning event
  Action: Provide riparian owner recognition for shoreland improvement projects
  Action: Complete a habitat evaluation/sensitive areas survey of the lake.
  Action: Promote limited disruptions to native plant community on shore and in water.
- **Objective 2: Prevention**. Prevent the introduction and establishment of new aquatic invasive species through early detection and rapid response
  Action: In-lake and shoreline aquatic invasive species monitoring.
  Action: Promote riparian property owner monitoring of shoreline, open water; training as necessary.
  Action: Watercraft inspection at the public access point; participate in 4th of July Landing Blitz.
  Action: Update contact information on AIS Rapid Response Plan annually and as needed.
- **Objective 3: Management**. Maintain common navigation channels and individual riparian access lanes in areas of nuisance native plant and reed canary grass growth via mechanical and manual control.

Action: Annual planning for native plant management.
Action: Manual/Physical (hand, rake, and diver) removal around docks and in shallow water to provide nuisance level relief from vegetation.
Action: Mechanical harvesting to open and maintain common use navigation channels and riparian access lanes.
Action: Normal boat use to maintain access lanes.
Action: Establish at least one off-loading site and long-term storage site for harvested vegetation.
Action: Daily tracking of harvesting operations: amount of vegetation, type of vegetation, where harvesting occurred.

- **Objective 4: Education and Awareness**. Continue public outreach and education programs on aquatic invasive species.
  Action: Summarize Aquatic Plant Management Plan for wider distribution.
  Action: Distribute aquatic invasive species educational materials.
  Action: Facilitate aquatic invasive species public education opportunity.
  Action: Maintain webpage/newsletter.
  Action: Maintain, update, and improve aquatic invasive species signage a public access point.
  Action: Present summary of water quality information during public event(s).
  Action: Provide education opportunities and information on wildlife and wildlife monitoring programs.
- **Objective 5: Research and Monitoring**. Develop a better understanding of the lake and the factors affecting lake water quality through continued and expanded monitoring efforts.
  Action: Conduct CLMN Expanded water quality monitoring on the lake.
  Action: Conduct dissolved oxygen monitoring on the lake.
  Action: Conduct water quantity monitoring (lake stage and precipitation).
  Action: Develop a comprehensive lake management plan.
- **Objective 6: Adaptive Management**. Follow an adaptive management approach that measures and analyzes the effectiveness of control activities and modify the management plan as necessary to meet goals and objectives
  Action: Draft annual reports summarizing events and activities, and presenting strategy revisions and future management activities.
  Action: Draft end of project report reviewing success and failures after 5-year implementation of this plan.
  Action: Complete whole-lake point intercept aquatic plant survey every 5 years.

The implementation of aquatic plant management actions to improve Kirby Lake is supported by two Kirby Lake Management District (KLMD) goals taken from the Watershed Inventory Report completed by Aron and Associates in 1994: to protect and maintain public health, and promote public comfort, convenience, necessity and welfare, in concert with the natural resource, through the environmentally sound management of the vegetation, fishery and wildlife populations in and around Kirby Lake; and to manage the lakes in an environmentally sound manner, pursuant to the standards and requirements set forth in Administrative Codes NR 103, *Water Quality Standards for Wetlands*, and NR 107, *Aquatic Plant Management*, to preserve and enhance its water quality and biotic communities, their habitats, and essential structure and function in the waterbody and adjacent areas.

A five-year implementation plan can be found in the Appendix J. Primary activities in this plan are related to the early detection and rapid response of new aquatic invasive species introductions, minimal native plant management for nuisance and navigational purposes, community outreach and education, and continued monitoring and data collection. Physical removal (hand-pulling, raking, and diver removal) and mechanical

harvesting are the preferred methods of aquatic plant control. Herbicides will only be used if a new AIS is discovered. Implementation of this plan will follow an adaptive management approach; the plan may be modified by evaluating results and adjusting actions on the basis of what has been learned.

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Kirby Lake Aquatic Plant Management Plan

AIS Education, Prevention and Planning

Prepared for the Kirby Lake Management District

1.0 Introduction

Kirby Lake (WBIC 1858200) is a shallow perched seepage lake located near the City of Cumberland in northwest Barron County, Wisconsin (Figure 1). The lake has a surface area of approximately 92 acres, a maximum depth of 19 feet and an average depth of 8 feet. Aquatic vegetation is abundant, supporting a warm water fishery of northern pike, bass, and panfish. Much of the upland surrounding the lake is hardwood forest with a fair amount of developed shore. A large wetland complex encompasses the southeastern portion of the lake. There are two miles of shoreline on the west side that is owned by Barron County which also maintains a primitive campground. The portion of Kirby Lake that is under public ownership encompasses nearly 50% of the total shoreland.

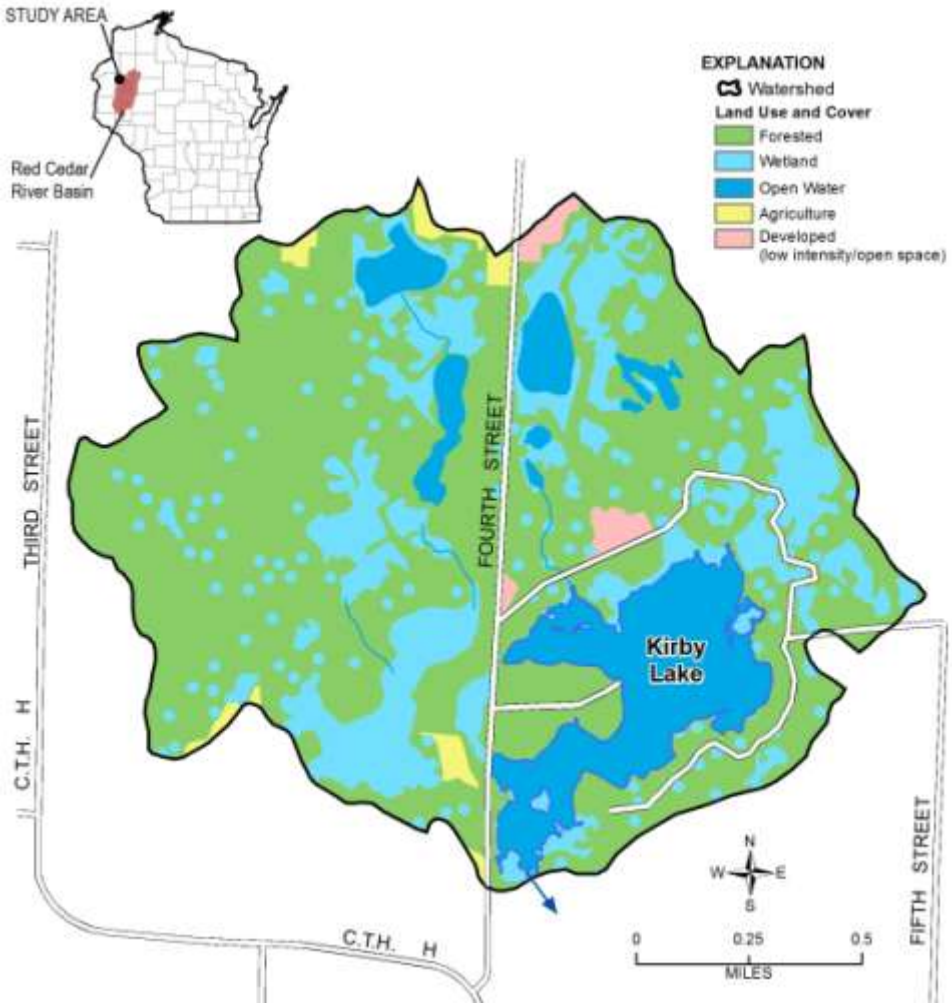


Figure 1 – Location of Kirby Lake, Barron County, Wisconsin

In the summer of 1991, the Kirby Lake Association, which formed in 1983, and the Town of Maple Plain formed the Kirby Lake Management District (KLMD). The following lake use and management goals and objectives were developed by the KLMD in consultation with the Town of Maple Plain.

- to protect and maintain public health, and promote public comfort, convenience, necessity and welfare, in concert with the natural resource, through the environmentally sound management of the vegetation, fishery and wildlife populations in and around Kirby Lake;
- to promote a quality, water-based experience for residents and visitors to Kirby Lake consistent with the policies and objectives of the Wisconsin Department of Natural Resources;
- to manage the lake in an environmentally sound manner, pursuant to the standards and requirements set forth in Administrative Codes NR 103, *Water Quality Standards for Wetlands*, and NR 107, *Aquatic Plant Management*, to preserve and enhance its water quality and biotic communities, their habitats, and essential structure and function in the waterbody and adjacent areas; and,
- to effectively control water quality in the Kirby Lake basin to better facilitate the conduct of water-related recreation, improve the aesthetic value of the resource to the community, and enhance the resource value of the waterbody.

Since the time these goals and objectives were formed, the KLMD has been involved in a number of projects to maintain, protect and improve the quality of the lake and its watershed. This Aquatic Plant Management Plan is the latest in a long list of projects and activities (lake and watershed studies, water quality monitoring, fish stocking, habitat improvement projects, and neighborhood watches) sponsored by the KLMD to achieve these goals. A winter aerator has been installed in Kirby Lake for many years, funded in part by the WDNR and the KLMD. The KLMD has been and remains very active in educating its members about the potential perils of Eurasian watermilfoil and other AIS.

This plan is intended to establish long-term and realistic objectives for managing native species and maintaining their important habitat functions. Detailed aquatic plant surveys were conducted, possible management alternatives were evaluated to determine preferred management options, and an implementation plan was developed which includes a mechanism to monitor and modify this management plan as needed.

Protecting Kirby Lake requires a number of activities, some of which are new, and others which are already being done. This plan supports sustainable practices to protect, maintain and improve the native aquatic plant community, the fishery, and the recreational and aesthetic values of the lake. This plan also lays out a strategy to prevent the introduction of new AIS not currently found in the lake, notably Eurasian watermilfoil (EWM) and curly-leaf pondweed (CLP), including a monitoring program to aid in early detection of any new AIS. Although this plan sets forth a five-year implementation schedule, it is not intended to be a static document; rather, it is a living document which will be evaluated annually to determine if it is meeting stated goals and community expectations and can be revised if necessary.

The KLMD sponsored the development of this APM Plan, funded through a WDNR Aquatic Invasive Species Education, Prevention, and Planning Grant and in-kind donations by KLMD volunteers.

2.0 Aquatic Plant Management Strategy

To date, purple loosestrife, curly-leaf pondweed, and Eurasian watermilfoil have not been found in Kirby Lake. The focus of this plan is an aquatic invasive species early detection and rapid response program and the management of nuisance native aquatic plant growth and reed canary grass. Aside from mechanical harvesting in 2011, previous plant management in the lake consisted of individual property owner control using chemical herbicides until the mid 2000s, and manual removal methods.

APM plans developed for northern Wisconsin lakes are evaluated according to Northern Region APM Strategy goals developed by the WDNR that went into effect in 2007 (Appendix A). All existing and new APM Plans and the associated management permits (chemical or harvesting) are reviewed by the WDNR. Additional review may be completed by the Voigt Intertribal Task Force (VITF) in cooperation with the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). WDNR aquatic plant management planning guidelines, the Northern Region Aquatic Plant Management Strategy, and the goals of the KLMD formed the framework for the development of this APM plan.

2.1 Shallow Lake Management Considerations

Lake management requires consideration of the differences between deep and shallow lakes. Kirby Lake is considered a shallow lake. Shallow lakes are those lakes with a maximum depth of less than 20 feet or with an average depth of less than 10 feet (1). In shallow lakes, much of the lake bed is littoral zone, that is, able to support aquatic plant growth. Shallow lakes generally exist in one of two alternative states: the algae-dominated turbid water state and the plant-dominated clear water state (Figure 2). The turbid water state is characterized by dense algae (phytoplankton) populations, an undesirable bottom feeding fish community, and few aquatic plants whereas the clear water state is characterized by abundant aquatic plant growth, a greater number of zooplankton, and a diverse and productive gamefish community (2). When asked during a public presentation on aquatic plants, attendees at the 2012 KLMD Annual Picnic indicated they prefer a plant-dominated system over an algae-dominated system.

Aquatic plants are the key to clear water in shallow lakes. A shallow lake that is free of both aquatic plants and algae is uncommon and it is unrealistic to expect such a lake to occur without a large investment in money and energy (1). The chance of macrophyte (plant)-free clear water is much higher with deep lakes. Shallow lakes are more susceptible to internal nutrient loading (e.g. lake sediment phosphorus release) and biomanipulation (additions or removals of fish that affect the entire aquatic food web) than deep lakes, which are more responsive to changes in the external nutrient load from the watershed (1).

The addition or removal of nutrients can change the composition of an aquatic plant community, but can't displace aquatic plants altogether. The mechanism that displaces the plants and allows for algae to take over is called a forward switch. Forward switches include the direct loss of plants through harvesting or herbicide use, repeated boat passage damaging the plants beyond recovery, runoff of herbicides from the surrounding watershed, static water levels, the introduction of carp, and a fish community that favors small fish that eat zooplankton (tiny critters) that would normally be present to eat phytoplankton (tiny plants or algae).

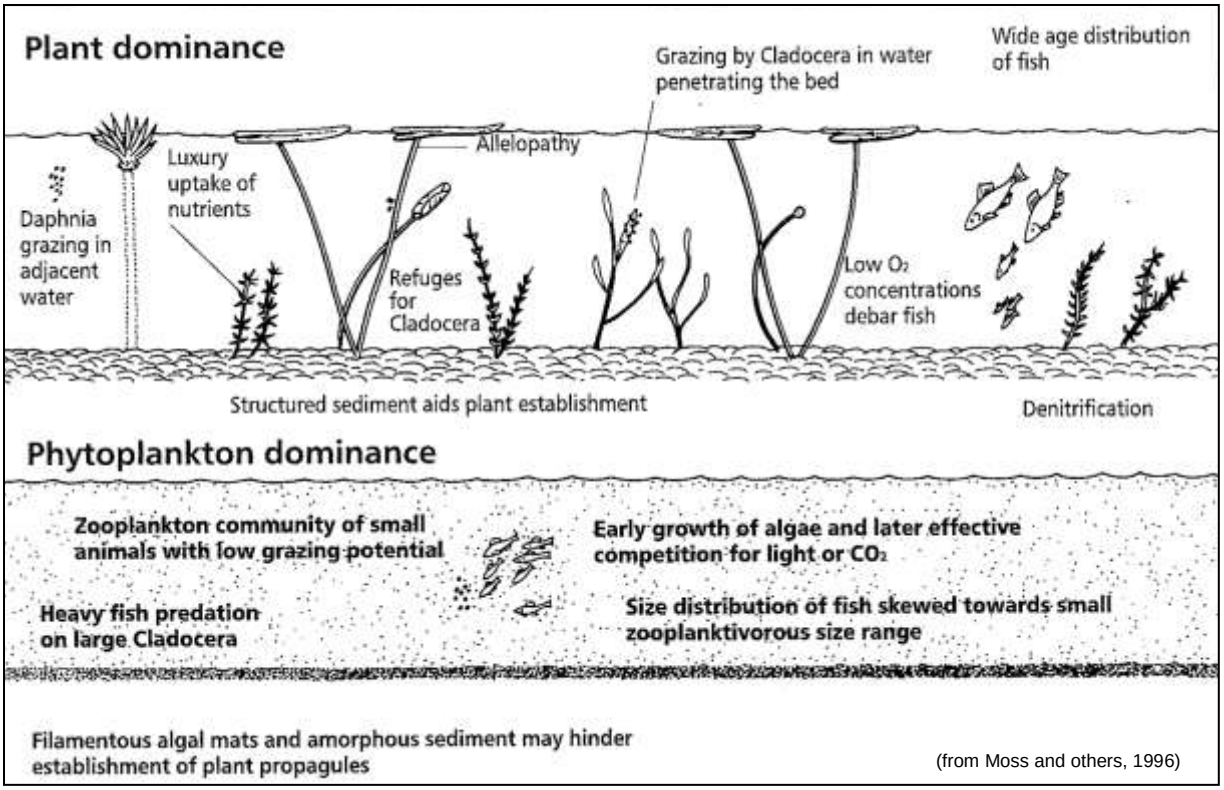


Figure 2 – Shallow Lake Alternative States and Stabilizing Mechanisms

A reverse switch is a process or management option that restores and stabilizes the plant community by overcoming the buffers stabilizing the algae. The most common techniques are biomanipulation, which is a manipulation of the fish community to reduce the number of zooplanktivores (often by adding piscivorous fish), and by re-establishing plants under conditions in which they can thrive. An important aspect of plant restoration is the re-establishment of wetland fringes (cattails, rushes, water lilies) that utilize nutrients, buffer wave action, provide refuge for Daphnia and other algae grazers, and add to the lake's aesthetic appeal.

Each alternative state can persist over a wide range of nutrient concentrations. Aquatic plants can dominate without threat at total phosphorus concentrations below about 25 to 50µg/L (or total nitrogen below about 250 to 500 mg/L). At total phosphorus levels greater than about 50 µg/L, either plant- or algae-dominated systems can exist, though at these higher nutrient levels there is a greater risk of the system switching from plant to algae dominance. Kirby Lake has total phosphorus levels that approach 50 µg/L. The lake is near the margin between moderately nutrient enriched (mesotrophic) and heavily nutrient enriched (eutrophic) (3). Plant diversity also decreases at higher nutrient levels and filamentous algae can be common. Native plants can become a nuisance at high nutrient concentrations as highly competitive species such as coontail and water lilies become dominant.

Shallow lake restoration follows a series of graded steps (2):

1. Forward switch detection and removal
2. External and internal nutrient control
3. Restructuring the ecosystem by a reverse switch (biomanipulation)
4. Plant establishment, including wetland fringe
5. Stabilizing and managing the restored system

Fortunately, Kirby Lake is in the plant-dominated, clear water state and in-lake restoration is not needed. It is, however, important to identify any switch mechanisms currently in operation and remove them. External and internal nutrient sources should be reduced as much as possible (preferably to < 50 µg/L) to buffer against a forward switch, the fisheries management strategy should be evaluated, and plant management will be undertaken only at levels necessary to maintain lake uses. A well established plant community, such as found in Kirby Lake, can withstand moderate impacts without further active management; however, the lakes and watershed should be monitored for changes and activities that might destabilize the system.

3.0 Public Participation and Input

The KLMD provided input, support, and review of draft and final documents during the development of this APM plan. The KLMD has been and remains very active in the stewardship of Kirby Lake. The KLMD has been sharing information and providing education to its members and to the local community for many years. This is accomplished through district meetings and a picnic held each summer. Developing an Aquatic Plant Management (APM) Plan for Kirby Lake was recommended by the WDNR as a result of a one-time harvesting event of reed canary grass in 2011. Since this time, the KLMD has been discussing possible aquatic plant management actions in the lake, and with full support hired a consulting agency to prepare a grant on behalf of the KLMD its constituency to help off- set the expected costs of developing an APM Plan, and to develop that plan. This grant was awarded by the WDNR and implemented by the KLMD beginning April 1, 2012.

3.1 2012 Annual Meeting and Picnic

Representatives from SEH and Endangered Resource Services, LLC (ERS) were on hand during the 2012 Annual Meeting and Picnic held June 30, 2012. Management concepts for shallow lakes and the value of aquatic plants to the lake ecosystem were discussed with the roughly 30 attendees during a PowerPoint presentation by SEH. A copy of the agenda for this meeting and of the presentation that was given by SEH is included in Appendix B. A large map of the lake was posted and residents were encouraged to mark areas of the lake where they feel aquatic plants are: ecologically valuable and need to be preserved; impede boat navigation in the spring and/or summer; and make it difficult to swim. Results of this activity are shown in Figure 3. The most commonly cited nuisance plants in these areas were watershield and water lilies.

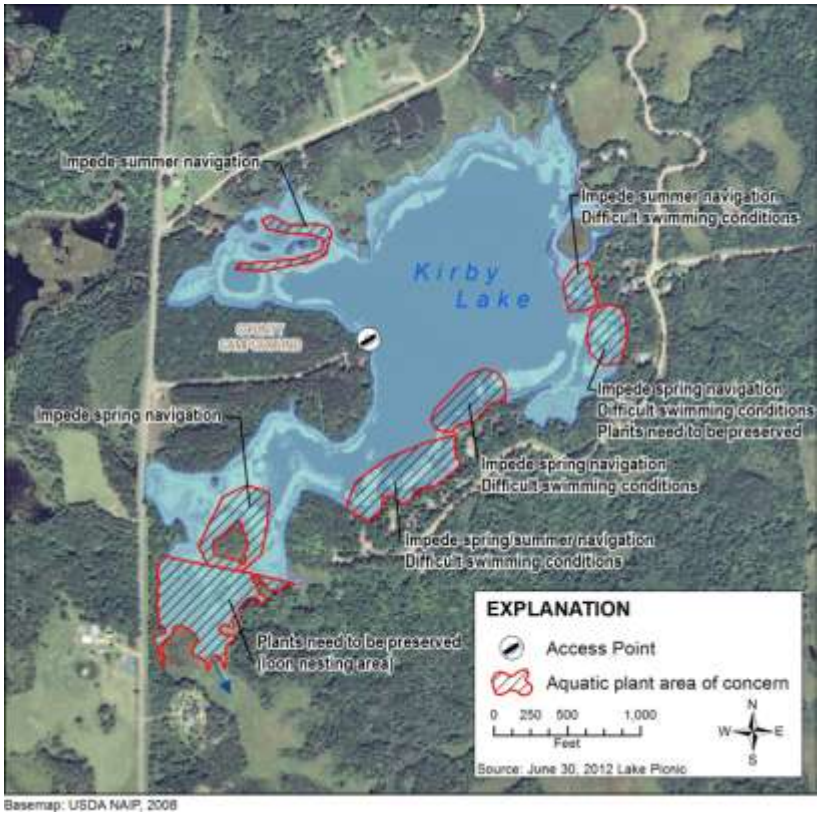


Figure 3 – Community Identification of Macrophyte Protection and Problem Areas

ERS displayed examples of some of the more common and rarer plants found in the lake and answered questions from picnic attendees.

3.2 September 2012 Vegetation Tour and KLMD Review of the APM Plan

On September 8th, 2012 prior to the regularly scheduled KLMD board meeting, representatives from the KLMD, WDNR, and SEH met on the lake for a tour of the aquatic vegetation. At this time it was suggested that harvesting may be the best management alternative for the KLMD to pursue. The WDNR felt that this had the most chance of being approved as a management action, since what is proposed is native plant control, not invasive species control. As a general rule the WDNR is not supporting the use of chemical herbicides to control native plants.

During the Sept. 8th KLMD Board Meeting (meeting minutes included in Appendix B) SEH and the WDNR met with the KLMD constituency to discuss where the Aquatic Plant Management Plan was headed for the lake. Discussion was had related to the use of herbicides as opposed to harvesting. A new committee, Aquatic Plant Research Committee, was formed by the KLMD with two individuals sharing the duties: Bob Busby and Katie Cook. These two individual were charged with researching greater information about the possibility of harvesting. They were also planning to have direct conversations with property owners about the idea of harvesting instead of herbicides. To date a formal report of what the committee found has not been presented to the KLMD Board or SEH

3.3 December 2012 Presentation of Draft APM Plan and January 2012 Newsletter

A draft of the Kirby Lake Aquatic Plant Management Plan and the suggested management recommendations and actions was submitted to the KLMD Board on December 8, 2012. During this meeting discussion with the Board indicated some concern over the use of harvesting. The Board wanted more information about the expected costs of either contracting services or buying their own harvester. They also wanted to send a newsletter out to their constituency with more information. It was decided that a newsletter article should be written briefly explaining the choice of harvesting as the most appropriate management action, and a brief survey conducted. Another meeting of the Board was set up for January 12, 2013 to finalize the newsletter and survey. A presentation of the APM Plan was set up for March 2, 2013.

A newsletter article was written by SEH and submitted to the KLMD Board for review. The newsletter and the brief survey focused on determining whether or not the constituency would support harvesting on the lake, and if they did what would be the preferred method to implement it: contracted harvesting services or purchasing their own harvester. The article and survey (Appendix B) included two questions: 1) Would you support aquatic plant harvesting as a means to provide better access and navigation through nuisance growth vegetation?; and 2), If you support harvesting or just need more information, which means of implementation would you most likely support? Only eight responses were generated by the newsletter, but all eight supported harvesting as the chosen management action. Four of the eight supported KLMD purchase of a harvester, two supported contracted services, and two wanted more information.

At this time, the idea of contracting services in 2013 was brought up as it was expected that buying a harvester with or without grant support would take the majority of the 2013 season with delivery of the harvester in the spring of 2014. The Board also wanted to know if purchase of a harvester could be supported by a WDNR Recreational Facilities grant.

3.4 March 2013 Presentation of the APM Plan and SEH Project Web link

As planned, a presentation of the APM Plan with revisions made from comments received from the survey and through phone and email was delivered on March 2nd. Unfortunately, only the KLMD Board Members were present. No property owners attended this meeting. Neither did members of the Aquatic Plant Research Committee. The PowerPoint presentation that was given at this time laid out the management actions and recommendations and the justification for them and is included in Appendix B. Because no property owners attended, it was decided that the presentation should be given again on Memorial Day Weekend. Also, SEH offered to set up a project link on the SEH website where management documents, a draft APM Plan, and other pertinent data could be posted for public access and comment. On March 4th, 2013 in response to comments made during the March 2 presentation, a project link for Kirby Lake was set up on the SEH webpage at http://www.sehinc.com/online/kirby-lake . All management documents and presentations have been uploaded to this site for review by anyone who wishes to do so. Since the establishment of the SEH project link, 23 different people have visited the site 59 times.

During the March Board meeting more discussion was held related to hiring contracted harvesting services as opposed to KLMD purchase of equipment. The Board decided to pursue contracted harvesting services in 2013for approximately 3.5 acres in Kirby Lake to be completed in late June. It was felt that going through this process now, would be a good indicator as to how effectively and efficiently contract harvesting services could be obtained. Additional research was conducted to identify possible contractors to provide harvesting in 2013.

If the KLMD chooses to purchase their equipment, it should be eligible for Recreational Facilities grant funding. Eligibility however, does not assure award. This grant program is competitive. The grant can be applied for at any time, but requires several time consuming actions including meeting with a grant board to pitch the idea. The process should be entered into as early in 2013 as possible to make it possible to have a harvester built and delivered before the start of the 2014 season.

3.5 Memorial Day 2013 Presentation of the APM Plan

While the KLMD Board has already endorsed the current draft of the APM Plan, final presentation of the plan to the constituency of the KLMD will be on Memorial Day Weekend 2013. Nearly 25 constituents were present at the 2013 Memorial Day Weekend meeting. The primary action, to complete mechanical harvesting of aquatic vegetation to open and maintain common use navigation channels around the lake and riparian access lanes to open water or common use navigation lanes, was been approved at this meeting, and is supported by the constituency of the Kirby Lake Management District. The majority of discussion during the meeting was related to how to implement the recommended aquatic plant management actions that were incorporated in the APM Plan. A representative from the Dummy Lakes Management District attended the Memorial Weekend presentation to Kirby Lake. Her input into actions that have been implemented on the Dummy Lakes was valuable, as was her added information about harvesting and the process of applying for Recreational Facilities grant funding from the state.

There was some concern expressed as to the cost of purchasing a harvester and what additional burdens would be placed on Lake District constituents. Concerns were also expressed related to spending money that had been collected for the express purpose of dealing with a new AIS in the lake like EWM. Questions were also asked about using the

harvester for control of a new AIS if one was introduced. The harvester could still be used, but would likely not be used as the only alternative. Further discussion was had related to the possibility of creating a coop with the Dummy Lakes Management District to purchase a harvester together.

3.6 Public Input Participants

The following folks commented on the development of the APM Plan prior to its being presented to the Kirby Lake Management District on May 25, 2013.

Stu Ketz	Bob Lissick
Dan Boxrud	Bill Lechner
Gloria & Joel Meyer	Ron Stewart
Michael Boland	John Schultz
David McNelly	Thelma Johnson
Steve Rubenzer	Bob Busby
Colleen Doolittle	Katie Cook

3.7 Primary Human Use Areas

Kirby Lake is used for a wide range of activities including fishing, swimming, boating, and viewing wildlife. There is one public boat landing on the lake which is adjacent to a Barron County-owned primitive campground (Figure 3). The majority of the area along the western shore is also owned by Barron County; public shoreline comprises 46% of the total shoreline.

4.0 Documentation of Problems and Need for Management

As a shallow perched seepage lake, Kirby Lake is subject to wide fluctuation in water level (3). Prior to 2011, a number of years of drought reduced the level of Kirby Lake by several feet, exposing shoreline that was then taken over by reed canary grass, a nearly ubiquitous invasive species. When water levels began to return in 2011, the dense reed canary grass beds became submerged and began to decay. The KLMD voiced concern over the potential negative impact the decaying vegetation may have on the water quality of the lake and the WDNR allowed large-scale mechanical harvesting of the plant detritus provided that the district develop an Aquatic Plant Management Plan for the lake to address future control activities.

This plan addresses several concerns the KLMD has regarding native plant management and AIS early detection and rapid response activities. Kirby Lake users experience nuisance native aquatic plant growth throughout the open water season. This plan covers management recommendations for nuisance aquatic plant growth (native macrophytes and reed canary grass), an AIS monitoring and prevention strategy, preservation of the diverse native plant community, and educating riparians and lake users about AIS and the importance of native plants to the aquatic ecosystem. Continued monitoring and assessment are critical components in an effort to mitigate the problems that already exist and to help reduce the risk of the introduction of AIS to the lake from the surrounding area.

The possibility of the introduction of Eurasian watermilfoil into the lake is a primary concern of the KLMD. Eurasian watermilfoil is present in a number of nearby lakes including Sand Lake, Beaver Dam Lake, Kidney Lake, Duck Lake, Echo Lake, Horseshoe Lake, and Lower Vermillion Lake in Barron County and Shallow Lake in Washburn County. This proximity makes the lake a candidate for the introduction of EWM via boat traffic. Eurasian watermilfoil has the potential to thrive in Kirby Lake; northern watermilfoil (*Myriophyllum sibiricum*), a native macrophyte and close relative to Eurasian watermilfoil, is fairly common with a 21% frequency of occurrence in the littoral zone. Curly-leaf pondweed, another non-native plant that is often invasive in shallow, nutrient rich waterbodies like Kirby Lake, is also present in many surrounding lakes and waterways and poses a threat. Purple loosestrife, a highly invasive plant found growing along the fringes of wetlands, waterways, and lakes, is present throughout Barron County, notably in nearby Sand Lake and Beaver Dam Lake and could also pose a threat to Kirby Lake.

Watercraft inspection and in-lake monitoring is necessary to prevent the introduction of EWM and other new aquatic invasive species to Kirby Lake. Watercraft inspection activities at the boat landing should be implemented and maintained throughout the time period covered by this plan and beyond. Monitoring activities for aquatic invasive species not currently present in the lake should continue adjacent to the boat landing and in the lake as a whole. Aquatic plant management actions whether for non native invasive species or for nuisance growth of native species risk opening up areas devoid of vegetation which can provide a starting point for new AIS, and as such these actions should be implemented in a way that meets the needs of the lake community but also protects against overuse.

Shoreland restoration is also included in this plan. Managing shorelands to remove reed canary grass and replace it with more desirable native species is the only way to control this destructive plant species long-term. Natural shorelands with established native plants also maintain or improve water quality and habitat and will help to preserve aquatic plant diversity which in turn will also help to prevent highly competitive native aquatic plants (such as coontail and common waterweed) from becoming a problem and buffer against a forward switch to an algae-dominated system.

5.0 Lake Information

Identifying appropriate aquatic plant management recommendations for Kirby Lake requires a basic understanding of its physical characteristics, including its morphology (size, structure, and depth), critical habitat, and the fishery, as well as factors influencing water quality, such as soils and land use. All of these factors have the potential to influence aquatic plant growth. Aquatic plant management activities can impact the water quality, fish and wildlife habitat, and both target and non-target aquatic plants. Aquatic plant survey data including distribution, density and diversity was collected in 2012 and used to develop this plan. Bathymetric (lake depth) and bottom substrate data was collected at the same time. Water quality data collected by KLMD volunteers through 2012 was also used to develop this plan. These data along with data collection recommendations made in this plan will provide the information necessary to evaluate the effects of aquatic plant management and other management activities on the lake and its ecosystem.

The KLMD has sponsored a number of studies to evaluate the water quality and watershed of the lake. A watershed inventory was completed in 1994 by International Environmental Management Services, Ltd (4) and a water and nutrient budget was developed in 1998 by the U.S. Geological Survey(3). The lake inventory information that follows has been summarized from these and other previous studies and some of the information has been updated with more recent data. Many of the figures show the lake boundary from the Barron County LiDAR which was collected in 2005 (a climatologically near-normal year preceded by near-normal conditions).

5.1 Physical Characteristics

The morphology of Kirby Lake is summarized in Table 1 and shown in Figure 4. Because of the varying nature of the lake level, and subsequently the lake morphology, values from the WDNR lake map (created in 1968, a year of and preceded by near-normal climate conditions) are shown.

Depth soundings taken at 315 survey points included in the 2012 aquatic plant survey work revealed a varied underwater topography. The bays on the shoreline side of the lake's two islands were never deeper than 4ft while the lake's numerous shallow side bays generally dropped-off gradually into 5ft+ of water before joining the main basin. The exception to this was the western finger bay which contained two small potholes about 10 feet deep. The main basin also contained two separate holes that bottomed out at over 15 feet. Other notable features included a rocky 8ft saddle that ran from the boat landing due north to the point, and a small rock bar midlake at the pinch point entrance to the southwest bay (Figure 5).The lake bed is primarily sand and gravel out to depths of 3 to 5 feet and muck elsewhere (Figure 5).

During wet years, water enters Kirby Lake from precipitation and numerous small, intermittently flowing tributaries. During normal or below normal precipitation years total water entering Kirby Lake is probably less than what is lost primarily through outflow to ground water, surface water outflow through the outlet which is considered an intermittent stream, or through evaporation (3). Groundwater flow into the lake is likely limited to small areas of sub-surface flow separate from the established groundwater table, as data from the 1998 USGS Report indicates that Kirby Lake is "perched" above the local water table. The lake is situated in a hydro geologically-complex area with groundwater likely flowing westward toward Sand Creek (4).

Table 1
Physical Characteristics of Kirby Lake.

Lake	Area (acres)	Volume (acre-feet)	Shoreline[1] (miles)	Maximum depth (feet)	Average depth[2] (ft)
Kirby Lake	91.7	720.1	3.23	19	7.9

[1] Including islands; [2] computed, volume divided by area;

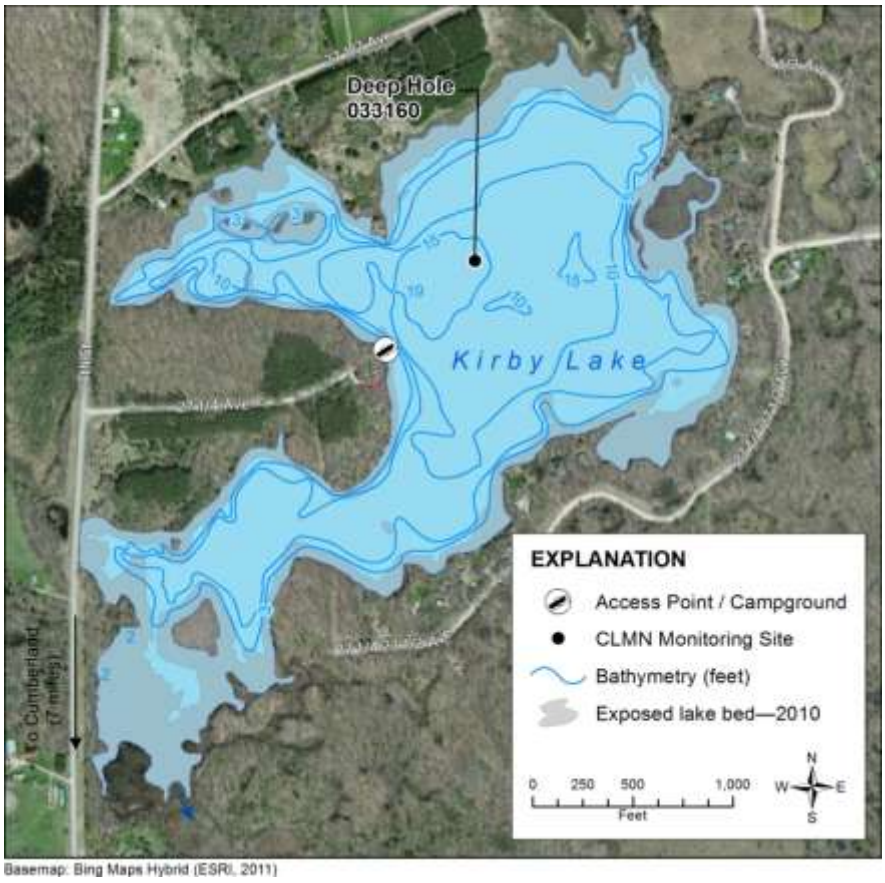


Figure 4 – Map of Kirby Lake, Barron County, Wisconsin

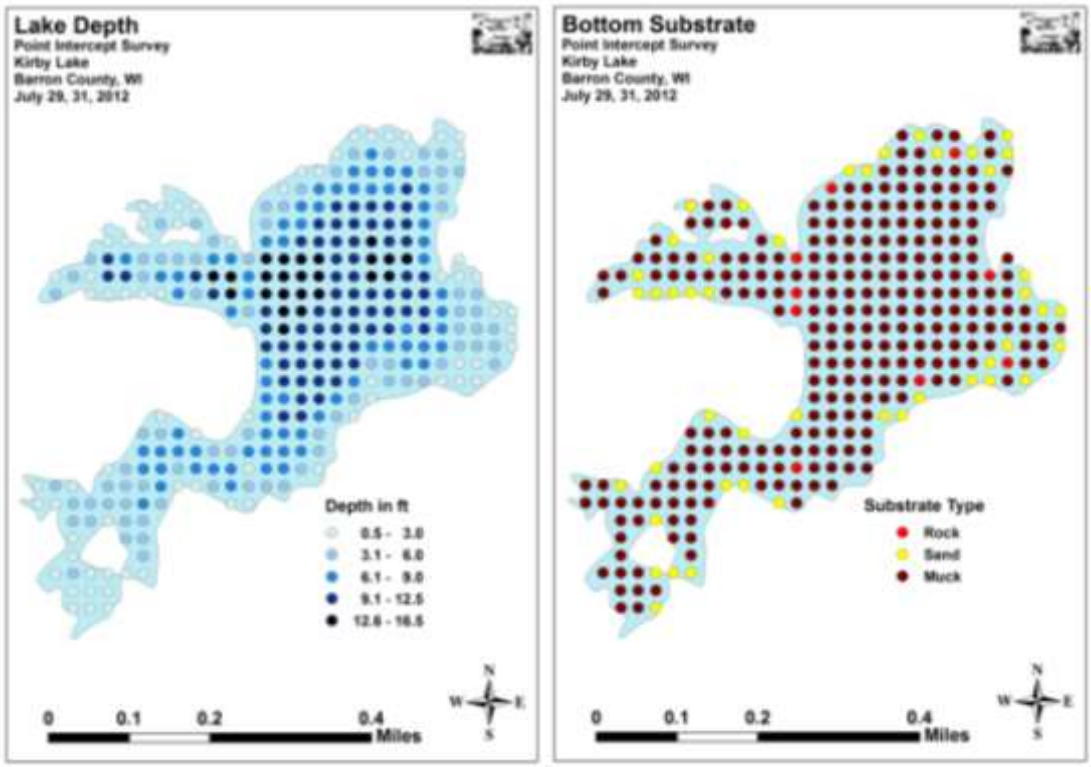


Figure 5 – 2012 Lake Depth and Bottom Substrate

5.2 Watershed

A watershed is an area of land from which water drains to a common surface water feature, such as a stream, lake, or wetland. The watershed of Kirby Lake, delineated by the USGS, has a total area of 1070 acres. Land cover is primarily forested (about 60%) with wetlands, small lakes, agricultural land and development (residential and roads) making up the remainder (Figure 1) (3). The hummocky, glacially derived landscape of the watershed has many areas of internal drainage, where surface runoff drains to closed depressions with no outlet for overflow. The direct tributary drainage area—the area which drains directly into Kirby Lake without first passing through other waterbodies—is 449 acres (4). Land use and land cover in the direct drainage area is shown in Table 2.

Table 2
Land Use and Land Cover in the Kirby Lake Direct Drainage Area, 1990

Land use	Acres	Percent of total
Residential	13	2.9
Roads/utilities	5	1.1
Recreation	2	.5
Forested/wetland	337	75.0
Water	92	20.5
Total	**449**	**100.0**
Source: Watershed Inventory Findings Report, 1994		

Land cover and land use management practices within a watershed have a strong influence on water quality and water quantity. Increases in impervious surfaces, such as roads, rooftops and compacted soils associated with residential and agricultural land uses, can reduce or prevent the infiltration of runoff. This leads to an increase in the volume and rate of stormwater runoff and pollutant loading to the lakes and their tributary streams. The removal of near-shore vegetation causes an increase in the amount of nutrient-rich soil particles transported directly to a waterbody during rain events. It is important to protect and restore the naturally occurring features of the direct drainage area (for example, the wetland fringe and native plant cover) to maintain and improve water quality.

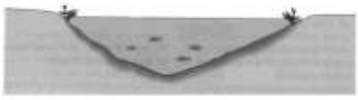
Agriculture is limited in the watershed, but like shoreland improvement planning, there are agricultural best management practices that can be incorporated to lessen agricultural inputs to the lake. Conservation tillage, grassed waterways, field borders, and feed lot improvements are just a few examples.

5.3 Water Quality

The water quality of a lake influences the aquatic plant community, which in turn can influence the chemistry of a lake. Water clarity, total phosphorus and chlorophyll *a* are measures of water quality that can be used to determine the productivity or trophic status of a lake. The Carlson trophic state index (TSI) is a frequently used biomass-related index. The trophic state of a lake is defined as the total weight of living biological material (or biomass) in a lake at a specific location and time. Eutrophication is the movement of a lake's trophic state in the direction of more plant biomass. Eutrophic lakes tend to have abundant aquatic plant growth, high nutrient concentrations, and low water clarity due to algae blooms (Figure 6). Oligotrophic lakes, on the other end of the spectrum, are nutrient poor and have little plant and algae growth (Figure 6). Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms (Figure 6).

Oligotrophic waterbodies have the lowest level of biological productivity.

Criteria: total chlorophyll is less than 3 µg/L*
total phosphorus is less than 15 µg/L
total nitrogen is less than 400 µg/L
water clarity is greater than 13 feet



A typical oligotrophic waterbody will have clear water, few aquatic plants, few fish, not much wildlife, and a sandy bottom

Mesotrophic waterbodies have a moderate level of biological productivity.

Criteria: total chlorophyll is between 3 and 7 µg/L
total phosphorus is between 15 and 25 µg/L
total nitrogen is between 400 and 600 µg/L
water clarity is between 8 and 13 feet

A typical mesotrophic waterbody will have moderately clear water and a moderate amount of aquatic plants.

Eutrophic waterbodies have a high level of biological productivity.

Criteria: total chlorophyll is between 7 and 40 µg/L
total phosphorus is between 25 and 100 µg/L
total nitrogen is between 600 and 1500 µg/L
water clarity is between 3 and 8 feet

A typical eutrophic waterbody will either have lots of aquatic plants and clear water; or it will have few aquatic plants and less clear water. In either case, it has the potential to support lots of fish and wildlife.

Hypereutrophic waterbodies have the highest level of biological productivity.

Criteria: total chlorophyll is greater than 40 µg/L
total phosphorus is greater than 100 µg/L
total nitrogen is greater than 1500 µg/L
water clarity is less than 3 feet

A typical hypereutrophic waterbody will have very low water clarity, the potential for lots of fish and wildlife, and it may have an abundance of aquatic plants.

* **The unit of measurement "micrograms per liter" is abbreviated "µg/L."**

Figure 6 – Trophic Status in Lakes

Water quality data are available online in the WDNR Surface Water Integrated Monitoring System (SWIMS) database. Data are available for Kirby Lake beginning in 1992. Measurements and sample collection were done at the Deep Hole monitoring site (Figure 4). Parameters that have been collected include temperature and dissolved oxygen profiles, nutrient concentrations, and Secchi depths.

5.3.1 Temperature and Dissolved Oxygen

Dissolved oxygen is essential for survival of most aquatic animals, just like atmospheric oxygen is essential for most terrestrial animals. Surface waters (also called the epilimnion) exchange oxygen with the atmosphere and are usually oxygen rich. In deeper lakes, or smaller lakes that are generally sheltered from prevailing winds, the water in the lake stratifies (or separates) into three distinct zones during the summer months, impacting water quality.

The epilimnion (zone one) includes the surface waters and are oxygen rich; below that (how far varies with a given lake) is the metalimnion (zone two), more commonly known as the thermocline; and below that the hypolimnion (zone three). The thermocline, when in place acts as a barrier preventing warmer, oxygen rich waters in the epilimnion from mixing with colder, deeper waters of the hypolimnion (Figure 7). As a result, the deeper waters of the

hypolimnion have limited amounts of dissolved oxygen available to support aquatic life. The dissolved oxygen that is available in the hypolimnion is used by microbes that decompose organic material in the bottom of the lake including dead plants and animals. The amount of oxygen used by these microbes is proportional to the amount of organic material that is present. As long as the waters of a given lake stay stratified, available oxygen in the hypolimnion (deep water) can be used up, often leading to very low, or even non-existent levels (anoxic) of dissolved oxygen in the lower portions of, or all of the waters in the hypolimnion.

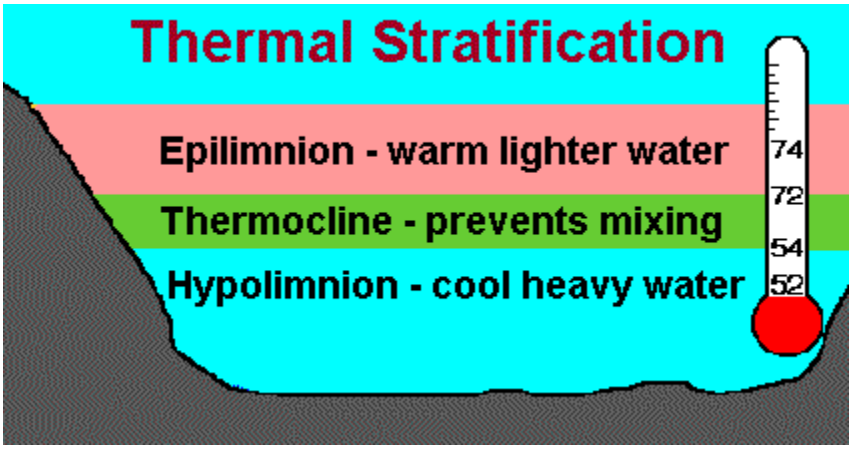


Figure 7 – Summer Thermal Stratification

Under anoxic conditions, aquatic life (like fish) is not supported, and chemical reactions occur that release phosphorus previously locked up in the bottom sediments of a lake into the water, a process called "internal loading". While considered a natural occurrence, accelerated depletion of dissolved oxygen and internal loading can be caused by human disturbances including plant management. Aquatic plants killed by herbicides are not removed from the system, like they are if hand-harvested or mechanically removed, and therefore increase the level of organic material present in the bottom of the lake. If chemical management is completed, it is better to complete it very early in the growth cycle of the target plant to minimize the plant material killed and left to decay at the bottom of the lake.

In most cases a lake does not remain in a stratified state year round. Citizen Lake Monitoring data indicates that Kirby Lake is dimictic, meaning that at least twice a year (spring and fall) stratification is replaced by a mixing event called "overturn" or "turnover" whereby all waters in the lake (top and bottom) naturally mix recharging levels of dissolved oxygen and distributing necessary nutrients throughout the water in the lake. Smaller and often limited "mixing" events can occur in the summer months due to large storm events or heavy use by humans (like the 4th of July Weekend).

Citizen Lake Monitoring data for Kirby Lake indicates that hypoxia (low oxygen) occurred at depths below 9 feet during July 2010 and June 2011 indicating that Kirby Lake, though considered to be a shallow lake does stratify, and when it does, suffers hypoxia in the hypolimnion. Under winter ice, dissolved oxygen is also limited, and can be used up when excessive aquatic plant death and decay add more organic matter to the sediment (1). In 1995, dissolved oxygen monitoring under the ice indicated that levels of dissolved oxygen started out high under early ice, but by late winter had decreased to hypoxic conditions (3). Data

suggest that healthy fish populations require 2-5 mg/l for moderately tolerant warm-water species and 5-9 mg/l for cold-water species (5).

Winter hypoxic conditions have historically caused winterkill in Kirby Lake. To avoid winterkill, a compressed air system was installed in 1989 by Barron County with technical and financial assistance from WDNR (6). The Lake District and Barron County are charged with maintenance of the system. Since installation, winterkill has been minimal (6).

5.3.2 Water Clarity

Water clarity is how deep sunlight can penetrate into the waters of a lake. It can be measured in a number of ways, the most common being an 8" disk divided into four sections, two black and two white, lowered into the lake water from the surface by a rope marked in measurable increments (Figure 8). The water clarity reading is the point at which the Secchi disk lowered into the water can no longer be seen from the surface of the lake. Water color (like dark water stained by tannins from nearby bogs and wetlands), particles suspended in the water column (like sediment or algae), and weather conditions (cloudy or sunlight) can impact how far a Secchi disk can be seen down in the water. Some lakes have Secchi disk readings of water clarity or just a few inches, while other lakes have conditions that allow the Secchi disk to be seen for dozens of feet before it disappears from view.

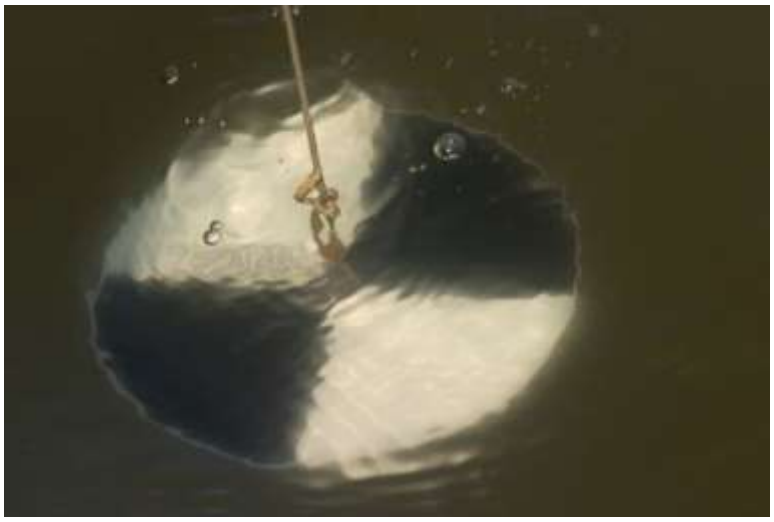


Figure 8 – Black and White Secchi Disk For Measuring Water Clarity

Secchi data for the Deep Hole site in Kirby Lake is available from 1992 to 2011 but no data is available from 2002-2004. Secchi depths ranged from 4 feet to 12 feet with an overall average of 6.5 feet. The average summer (June-August) Secchi depth between 1992 and 2011 ranged from 4 feet to 7.7 feet. The overall summer average was 6.2 feet (Figure 9), which classifies Kirby Lake as a mesotrophic system. However, mean summer values range from mesotrophic to eutrophic conditions. There is no significant trend in the water clarity over this time.

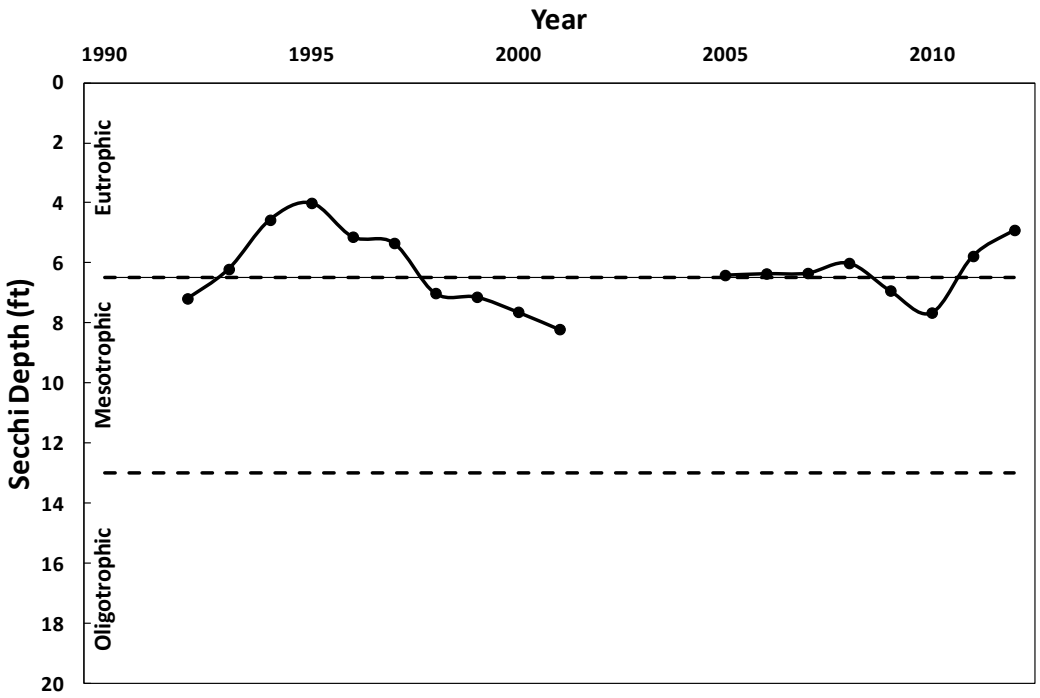


Figure 9 – Mean Summer Water Clarity in Kirby Lake, Barron County

5.3.3 Phosphorus

Phosphorus is an important nutrient for plant growth and is commonly the nutrient limiting plant production in Wisconsin lakes. Nitrogen is another chemical important to plant growth that can also be a limiting nutrient. Both phosphorus and nitrogen are normally in short supply in natural environments but are typically made much more available by human impacts including agriculture and lakeshore development. In either case, when the concentrations of these chemicals increase, they are taken up in large amounts and generally increase plant and algae productivity (7). Whether phosphorus or nitrogen is the limiting nutrient in Kirby Lake is not known at this time, though in many Wisconsin lakes, excess phosphorus is the culprit. Determining the limiting nutrient in Kirby Lake could be done by completing comprehensive lake management planning focused on protecting the water quality in Kirby Lake. Maintaining a total phosphorus concentration below 20 µg/L is necessary to prevent nuisance algal blooms in most lakes (8).

Total phosphorus data is available from 1993 through 2001 and 2010-2011. Total phosphorus measurements ranged from 14 µg/L to 50 µg/L. The overall summer average of 25 µg/L classifies Kirby Lake as a borderline mesotrophic/eutrophic lake (Figure 10). The total phosphorus input from precipitation and surface water inflow was estimated to be approximately 51 pounds during a 12-month study (3). Inflowing intermittent streams contributed 88% of the total phosphorus. Of those inflowing streams, one site on the southwest shore of the lake contributed 46% of the phosphorus load. This site drains nearly the entire watershed area of Kirby Lake that is west of Fourth Street. During periods of high water flow, phosphorus brought into the lake from this site will impact the entire lake. Phosphorus attached to sediment particles will enter the lake and settle to the bottom and build up in the sediment and is used up by rooted plants. Dissolved phosphorus in the inflow enters the lake and is immediately available for use by non-rooted plants and algae. Not all of the phosphorus that enters the lake stays in the lake. Approximately 35% of the total

phosphorus load was exported via surface outflow while the rest remained in the lake basin or was discharged with groundwater outflow (3).

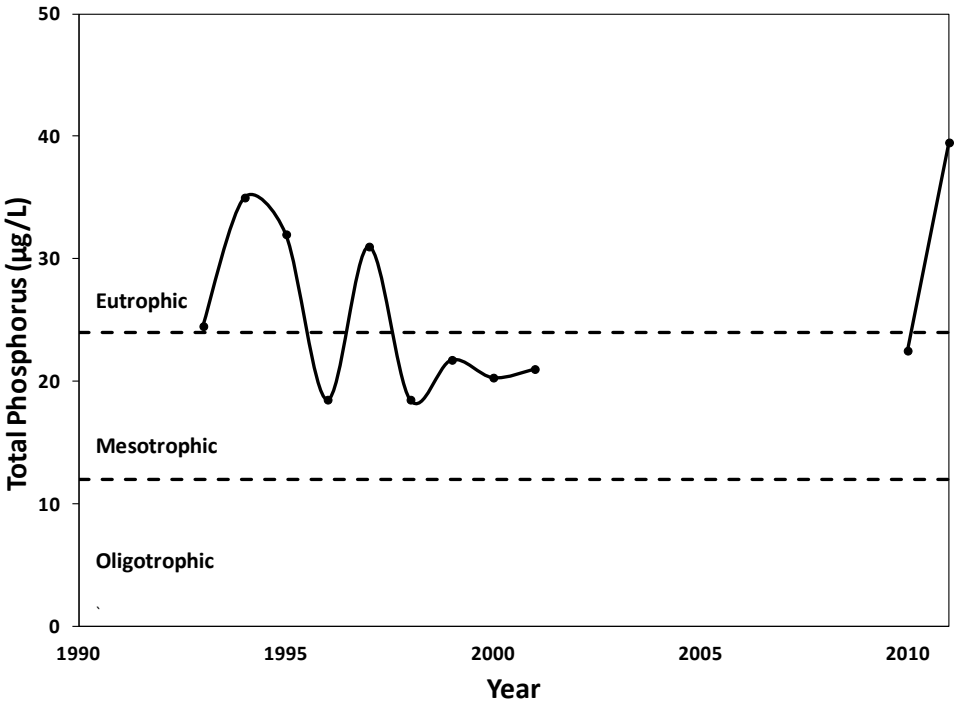


Figure 10 – Mean Summer Total Phosphorus in Kirby Lake, Barron County

5.3.4 Chlorophyll *a*

Chlorophyll-*a* is the green pigment found in plants and algae. The chlorophyll-*a* concentration is used as a measure of the algal population in a lake. Values greater than 10 µg/L are considered indicative of eutrophic conditions and concentrations 20 µg/L or higher are associated with algal blooms. Preference is given to the chlorophyll-*a* trophic state index for classification because it is the most accurate at predicting algal biomass.

Chlorophyll *a* has been measured from 1993 through 2001 and 2010-2011 (Figure 11). Chlorophyll *a* measurements ranged from 1.4 to 83.6 µg/L (trophic state values 37-68) during the summer months of those years. The overall summer average was 12.5 µg/L (trophic state value 54), which classifies Kirby Lake as a eutrophic lake. In 2011, summer Chlorophyll *a* measurements ranged from 14.1 to 15.2 µg/L (the trophic state value for both measurements is 55).

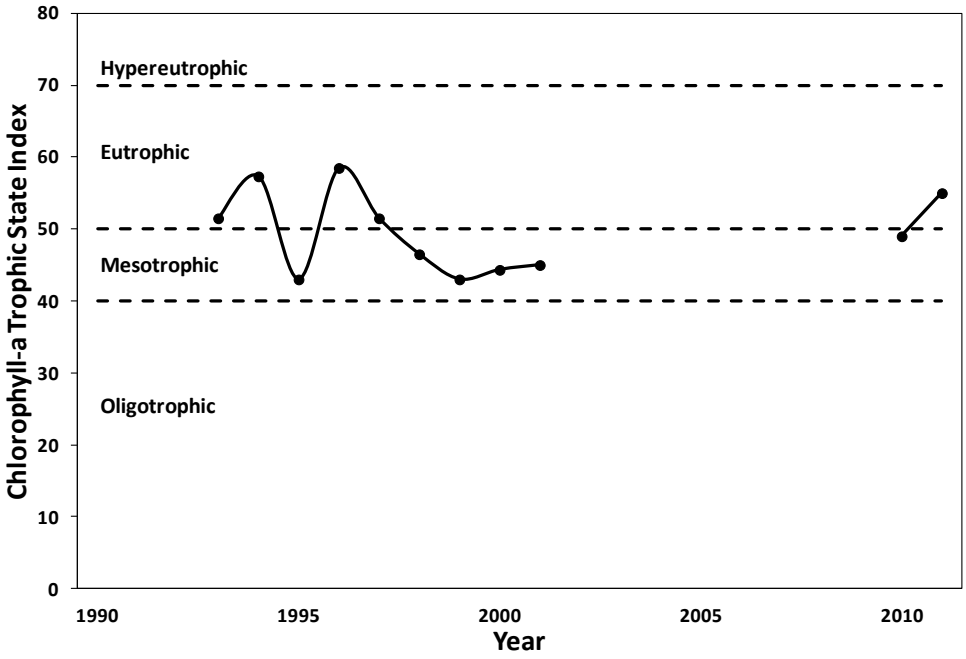


Figure 11 – Mean Summer Chlorophyll-a Trophic State Index for Kirby Lake, Barron County

5.4 Aquatic Ecosystems

Aquatic plants are a natural part of most lake communities and provide many benefits to fish, wildlife, and people. Native macrophytes have many important functions and values to a lake ecosystem. They are the primary producers in the aquatic food chain, converting the basic chemical nutrients in the water and soil into plant matter, which becomes food for all other life.

Aquatic plants provide valuable fish and wildlife habitat. More food for fish is produced in areas of aquatic vegetation than in areas where there are no plants. Insect larvae, snails, and freshwater shrimp thrive in plant beds. Panfish eat aquatic plants in addition to aquatic insects and crustaceans. Plants also provide shelter for young fish. Northern pike spawn in marshy and flooded areas in early spring and bass, sunfish, and yellow perch usually nest in areas where vegetation is growing.

Many submerged plants produce seeds and tubers (roots) which are eaten by waterfowl. Bulrushes, sago pondweed, wild celery, and wild rice are especially important duck foods. Submerged plants also provide habitat to a number of insect species and other invertebrates that are, in turn, important foods for brooding hens and migrating waterfowl.

The lake aesthetic valued by so many is enhanced by the aquatic plant community. The visual appeal of a lakeshore often includes aquatic plants, which are a natural, critical part of a lake community. Plants such as water lilies, arrowhead, and pickerelweed have flowers or leaves that many people enjoy.

Aquatic plants improve water clarity and water quality. Certain plants, like bulrushes, can absorb and break down polluting chemicals. Nutrients used by aquatic plants for growth are not available to algae, thus reducing algae abundance and improving water clarity. Algae, which thrive on dissolved nutrients, can become a nuisance when too many submerged water plants are destroyed. Aquatic plants also maintain water clarity by preventing the re-

suspension of bottom sediments. Aquatic plants, especially rushes and cattails, dampen the force of waves and help prevent shoreline erosion. Submerged aquatic plants also weaken wave action and help stabilize bottom sediment.

Native aquatic plant communities also offer protection from non-native aquatic invasive species. Current scientific literature accepts the concept that invasions of exotic plants are encouraged, and in some cases induced, by the disruption of natural plant communities. Most aquatic invasive plant species are opportunistic; much like lawn and agricultural weeds that germinate in newly disturbed soil, aquatic invasive plant species are more likely to invade areas in which the native plant community has been disturbed or removed. Removing the natural competition from native plants may also open up the door to new invasive species and less desirable plant communities.

As a natural component of lakes, aquatic plants support the economic value of all lake activities. Wisconsin's $13 billion tourism industry is anchored by 15,081 lakes and 12,600 rivers and streams which draw residents and tourists to hunt, fish, camp, and watch wildlife. According to the WDNR, the world class fishery lures more than 1.4 million licensed anglers each year, supports more than 30,000 jobs, generates a $2.75 billion annual economic impact, and $200 million in tax revenues for state and local governments.

5.4.1 Wetlands

In Wisconsin, a wetland is defined as an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which has soils indicative of wet conditions (Wisconsin Statue 23.32(1)). Wetlands contain a unique combination of terrestrial and aquatic life and physical and chemical processes. Wetlands are protected under the Clean Water Act and state law and in some places by local regulations or ordinances. Landowners and developers are required to avoid wetlands with their projects whenever possible; if the wetlands can't be avoided, they must seek the appropriate permits to allow them to impact wetlands (for example, fill, drain or disturb soils).

About half of the wetlands in the watershed border the lake and tributary streams or have a direct hydrologic connection to the lake (Figure 1). According to the National Wetland Inventory, emergent, forested/shrub and aquatic bed (lake and freshwater pond) wetlands are present in the Kirby Lake watershed. Emergent wetlands are wetlands with saturated soil and are dominated by grasses such as redtop and reed canary grass, and by forbs such as giant goldenrod. Forested/shrub wetlands are wetlands dominated by mature conifers and lowland hardwood trees. Forested/shrub wetlands are the dominant form of wetlands in the watershed and are important for stormwater and floodwater retention and provide habitat for various wildlife. Aquatic bed wetlands are wetlands characterized by plants growing entirely on or within a water body that is no more than six feet deep.

Wetlands serve many functions that benefit the ecosystem surrounding the Kirby Lake. Wetlands support a great variety of native plants and are more likely to support regionally scarce plants and plant communities. Wetlands provide fish and wildlife habitat for feeding, breeding, resting, nesting, escape cover, travel corridors, spawning grounds for fish, and nurseries for mammals and waterfowl. Contrary to popular belief, healthy wetlands reduce mosquito populations; natural enemies of mosquitoes (dragonflies, damselflies, backswimmers, and predacious diving beetles) need proper habitat (that is, healthy wetlands) to survive.

Wetlands provide flood protection within the landscape by retaining stormwater from rain and melting snow and capturing floodwater from rising streams. This flood protection minimizes impacts to downstream areas. Wetlands provide groundwater recharge and discharge by allowing the surface water to move into and out of the groundwater system. The filtering capacity of wetland plants and substrates help protect groundwater quality. Wetlands can also stabilize and maintain stream flows, especially during dry months.

Wetland plants and soils provide water quality protection by storing and filtering pollutants ranging from pesticides to animal wastes. Wetlands also provide shoreline protection by acting as buffers between the land and water. Wetland plants protect against erosion by absorbing the force of waves and currents and by anchoring sediments. This is important in waterways where high boat traffic, water currents, and wave action may cause substantial damage to the shore.

There is a relatively large number of small (two acres or less) wetlands scattered throughout the watershed. Although these wetlands may not appear to provide significant functional values when assessed individually, they may be very important components of a larger natural system. Not only do small wetlands provide habitat functions, they also store phosphorus and nitrogen and trap pollutants such as heavy metals and pesticides. Draining these small wetlands, which often do not appear on maps, not only requires the proper permits, but can also release the once-stored pollutants and nutrients into lakes and streams.

5.4.2 Critical Habitat

Every body of water has areas of aquatic vegetation or other features that offer critical or unique aquatic plant, fish and wildlife habitat. Critical Habitat areas include important fish and wildlife habitat, natural shorelines, physical features important for water quality (for example, springs), areas of natural scenic beauty, and navigation thoroughfares. These areas, which can be located within or adjacent to the lake, are selected because they are particularly valuable to the ecosystem or would be significantly and negatively impacted by most human induced disturbances or development. Critical Habitat areas include both Sensitive Areas and Public Rights Features. Sensitive Areas offer critical or unique fish and wildlife habitat, are important for seasonal or life-stage requirements of various animals, or offer water quality or erosion control benefits. Public rights features include: physical features of waterbodies that ensure protection of water quality, reaches of bank, shore or bed that are mostly natural in appearance (not man-made or artificial) or that screen man-made or artificial features, navigation thoroughfares or areas traditionally used for navigation during normal recreational activities such as boating, angling, hunting, or enjoyment of natural scenic beauty.

Critical Habitat Areas on Kirby Lake have not been officially identified or mapped, however, areas of ecological importance have been identified via citizen monitoring efforts (loon nesting sites), plant surveying (high value aquatic plants) and fishery assessments (spawning habitat). Management activities targeting native plants should be limited to the amount necessary to maintain use in these ecologically sensitive areas; however, disruptions may be warranted when responding to the discovery of a new invasive species.

It is particularly important to maintain vegetated shoreland buffers in the ecologically significant areas. Also, stumps and woody habitat, which provide fish cover, should not be removed from the near-shore area. In the event of a treefall into the lake, unless it is causing a navigational impairment it should be left in the lake. It may take decades or longer for woody debris to decay in a lake, thus having limited impacts on water quality, but tremendous impact on creating desirable habitat. Because much of Kirby Lake contains such features, the

WDNR document *Guidelines for Protecting, Maintaining, and Understanding Lake Sensitive Areas*, which provides excellent guidance on how to approach management activities in ecologically sensitive areas, is included as Appendix C of this plan. Many of the management guidelines in the document are also in line with KLMD goals.

5.4.3 Rare and Endangered Species and Habitat

The Wisconsin Natural Heritage Inventory (NHI) program is part of an international network of programs that focus on rare plants and animals, natural communities, and other rare elements of nature. It is important for lake managers to consider impacts to these valuable species and communities, nearly all of which can be directly affected by aquatic plant management. Choosing the proper management techniques and the proper timing of management activities can greatly reduce or prevent negative impacts. Each species has a state status including Special Concern, Threatened, or Endangered. Species are listed by township: Kirby Lake and its watershed are in the Town of Maple Plain (T36N, R14W).

Three Special Concern species (the least darter fish, *Etheostoma microperca*; the gray wolf, *Canis lupus*; and bald eagle, *Haliaeetus leucocephalus*) are listed for the Town of Maple Plain (data current as of November 2011). Descriptions of these species can be found at: http://dnr.wi.gov/topic/EndangeredResources/biodiversity.html/ (last accessed 2012-11-16).

Two aquatic plant species listed as Species of Special Concern in Wisconsin, Robbins spikerush and Snail-seed pondweed, were identified during the 2012 warm-water aquatic plant survey for Kirby Lake by ERS. Species of Special Concern are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose for classifying plants in this category is to focus attention on them before they become threatened or endangered. Both of these species have Coefficients of Conservatism, a measure of plant sensitivity to human disturbances, of 10 on a 1-10 scale where the highest values represent those plants most sensitive to human disturbances. Seventeen aquatic plant species, greater than 30% of all the plants identified in Kirby Lake in 2012, have coefficients of conservatism of 9 or 10 making Kirby Lake one of the most "sensitive" lakes to date that have been surveyed by ERS (9).

The NHI program tracks examples of all types of Wisconsin's natural communities that are deemed significant because of their undisturbed condition, size, what occurs around them, or for other reasons. Natural communities listed for the Town of Maple Plain include: emergent marsh; lake—shallow soft seepage; and stream—fast, soft, warm. Full descriptions of these communities including current threats can be found on the WDNR website at: http://dnr.wi.gov/topic/endangeredresources/communities.asp (last accessed 2012-11-16).

5.4.4 Wildlife

Citizen monitoring of loons was done in 2009 and 2011 revealing loon arrival on Kirby Lake in mid-April and departure in mid-September. In 2009, one loon pair resided on Kirby Lake and successfully produced two loon chicks. In 2011, one loon pair resided on Kirby Lake and was unsuccessful in producing chicks due to eagle predation. During both years, the loons established nests on islands.

5.4.5 Fishery

The Kirby Lake sport fishery is highly valued by lake residents. The fishery consists primarily of panfish, largemouth bass, and northern pike (10). Fish stocking, primarily northern pike, has been done in the lake since 1984 (Table 3). A 1995 fisheries survey found

good populations of largemouth bass and northern pike and bluegill and crappie populations with excellent size distributions (6).

Table 3
Kirby Lake Fish Stocking Records

Year	Species	Age Class	Average Fish Length (in)
2011	Northern Pike	Large Fingerling	6.40
2011	Largemouth Bass	Large Fingerling	2.60
2010	Northern Pike	Large Fingerling	8.60
1999	Northern Pike	Fry	0.30
1998	Northern Pike	Fry	0.50
1996	Northern Pike	Fry	0.40
1994	Northern Pike	Fry	1.00
1992	Northern Pike	Fry	1.00
1991	Northern Pike	Fry	1.00
1990	Northern Pike	Fry	1.00
1989	Northern Pike	Fry	3.00
1988	Northern Pike	Fry	1.00
1988	Largemouth Bass	Fingerling	1.00
1986	Northern Pike	Fry	1.00
1985	Northern Pike	Fry	1.00
1984	Northern Pike	Fry	1.00

6.0 Aquatic Plant Communities

Aquatic plants play an important role in lakes. They anchor sediments, buffer wave action, oxygenate water, and provide valuable habitat for aquatic animals. The amount and type of plants in a lake can greatly affect nutrient cycling, water clarity, and food web interactions. Furthermore, plants are very important for fish reproduction, survival, and growth, and can greatly impact the type and size of fish in a lake.

Unfortunately, healthy aquatic plant communities are often degraded by poor water clarity, excessive plant control activities, and the invasion on non-native nuisance plants (11). These disruptive forces alter the diversity and abundance of aquatic plants in lakes and can lead to undesirable changes in many other aspects of a lake's ecology (Figure 12). Consequently, it is very important that lake managers find a balance between controlling nuisance plant growth and maintaining a healthy, diverse plant community.

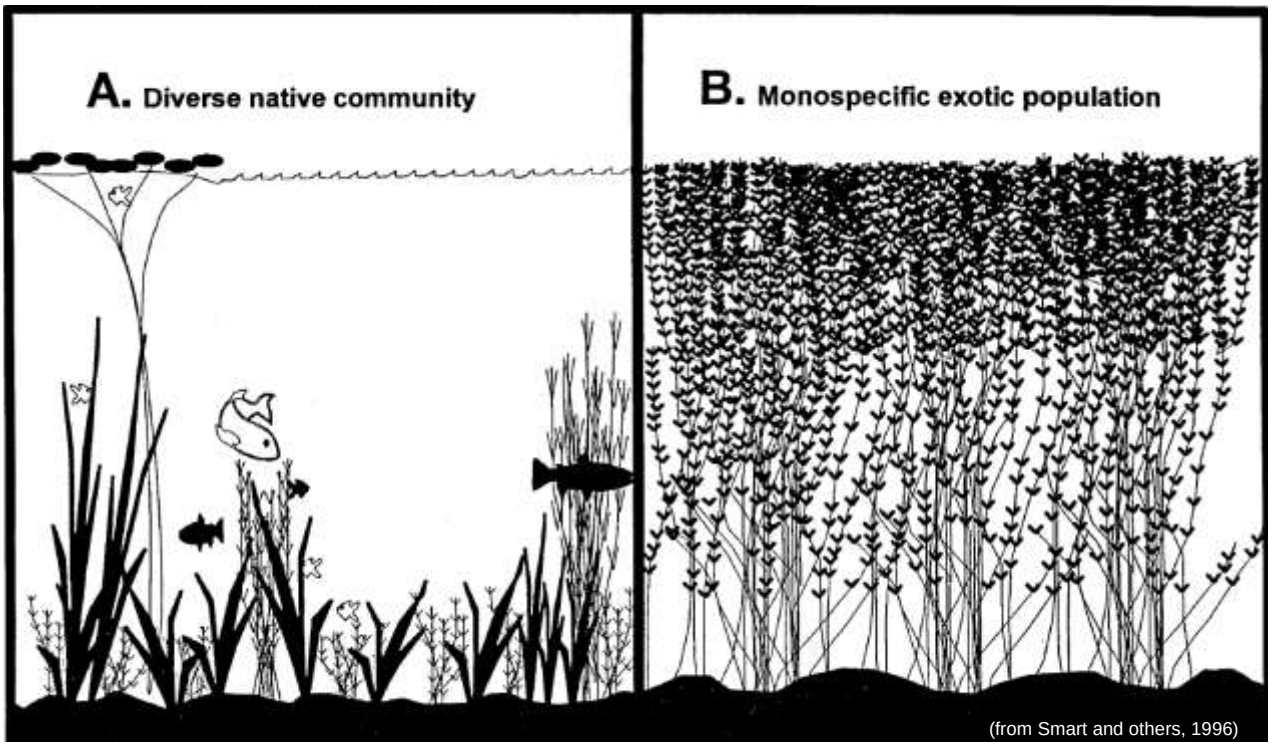


Figure 12 – Submersed Aquatic Plant Communities

6.1 Aquatic Plant Surveys in Kirby Lake

Extensive surveys of the plant communities in Kirby Lake were completed on three different occasions. The first survey was done in July 2006 by the WDNR because of the proximity of Kirby Lake to several other lakes with aquatic invasive species. The second survey was completed by the Beaver Creek Reserve in late July through early August 2009 as part of a multi-county aquatic invasive species mapping program. The third and most recent survey was completed in late July 2012 by Endangered Resources Services, LLC (ERS) (St. Croix Falls, Wis.). The 2012 survey also included a late spring aquatic invasive species survey focusing on curly-leaf pondweed, of which none was found.

The 2006 and 2012 surveys followed the WDNR point intercept whole-lake survey protocol and a comparison between the two surveys is included in this report. The 2009 survey was

completed using a transect method and was not considered a full aquatic plant survey. As such, data from this survey is not included in this document. The 2006 and 2012 surveys provide information on the diversity, distribution and density of the aquatic plant community in Kirby Lake. Detailed statistical assessments provided by the 2006 and 2012 surveys establish baseline conditions for evaluating any changes in the plant community over the coming years which will help guide responsible aquatic plant management planning. Generally, aquatic plant management plans can be developed using data from a plant survey up to 5 years old. The 2012 survey was requested by the WDNR for the development of this plan for several reasons, including the recent low water levels and harvesting of reed canary grass.

6.2 Comparison of 2006 and 2012 Plant Surveys

Aquatic plant data from the 2006 WDNR survey conducted on July 26th was compared to the data from the 2012 ERS survey conducted on July 29 and 31 by ERS using WDNR Pre/Post Survey protocol to determine if there were any significant changes in the lake's vegetation. In 2006, WDNR surveyors were unable to access very shallow water and consequently did not survey 65 of the 315 points. As a result, ERS only used the number of points with vegetation (162 in 2006 and 184 in 2012) as the comparative values. Comparing the two surveys found highly significant increases in Watershield, Creeping bladderwort, Aquatic moss, White water lily, Flat-leaf bladderwort, Creeping spikerush, and Reed canary grass; moderately significant increases in Northern manna-grass and Small bladderwort; and significant increases in Threeway sedge, Robbins' spikerush, Variable pondweed, and Branched bur-reed. It is believed that the majority of these differences are simply explained by the previous survey not accessing shallow water (Berg 2012).

Some other changes are less easy to explain. There is a highly significant decline/complete disappearance of Common waterweed; moderately significant declines in Sponges and Arrowheads; and significant declines in Small pondweed, Large-leaf pondweed, and Spatterdock. It is speculated by ERS that extended drought conditions may have changed the lake's water chemistry enough to make growing conditions less favorable for these species. More information about the comparison is available in the 2012 Cold Water Curly-leaf Pondweed and Full Warm Water Point-Intercept Aquatic Macrophyte Surveys Report for Kirby Lake (Berg, 2012). Statistics from the two plant surveys are compared in Table ##.

Table 4
Aquatic Macrophyte P/I Survey Summary Statistics, Kirby Lake, Barron County (July 26, 2006 and July 29, 31, 2012)

Summary Statistics:	2006	2012
Total number of points sampled	208	315
Total number of sites with vegetation	162	184
Total number of sites shallower than the maximum depth of plants	196	252
Frequency of occurrence at sites shallower than maximum depth of plants	82.65	73.02
Simpson Diversity Index	0.87	0.90
Maximum depth of plants (ft)	11.0	10.0
Mean depth of plants (ft)	5.6	4.2
Median depth of plants (ft)	5.8	4.0
Average number of all species per site (shallower than max depth)	2.48	2.88
Average number of all species per site (veg. sites only)	3.01	3.94
Average number of native species per site (shallower than max depth)	2.48	2.81
Average number of native species per site (veg. sites only)	3.01	3.87
Species richness	22	35
Species richness (including visuals)	26	38
Species richness (including visuals and boat survey)	30	49
Mean total rake fullness (veg. sites only)	Not measured	2.65

6.3 2012 Aquatic Plant Survey

A total of 49 species of aquatic plants were identified in Kirby Lake during the 2012 survey work. Watershield, Large purple bladderwort, Small pondweed, and Creeping bladderwort were the most common vascular plant species found at 62.50%, 62.50%, 50.54%, and 40.76% of survey points with vegetation respectively. Collectively, they accounted for 54.90% of the total relative frequency in 2012. White water lily (9.93), Flat-leaf bladderwort (7.45), Common bladderwort (6.90), and Farwell's water milfoil (4.41) were the only other species that had relative frequencies over 3%. Aquatic moss, a non-vascular plant, was actually the most common macrophyte being found at 66.30% of vegetative sites, but because it is non-vascular, WDNR plant survey protocol excludes Aquatic moss from all statistical calculations including species richness, relative frequency, and establishment of the lake's littoral zone (Berg, 2012). The 2012 survey reported 49 species of aquatic plants, the 2006 survey reported 30 species, and 2009 survey reported 20 species. The variations in the number of species recorded during the three surveys most likely reflect between-year variability and differences in sampling technique.

At the time of the 2012 survey, Secchi disc readings of water clarity were in the 6.5ft range producing a littoral zone that extended to 10.0ft (Figure 13). Plants were somewhat patchy in distribution as only 58.4% of the total lake bottom and 73.0% of the littoral zone were colonized. Diversity was very high with a Simpson Index Value of 0.90. Species richness was also moderately high for such a small lake with 35 species found in the rake. When including plants that were visuals and those found during the boat survey, this total jumped to 49 species as already mentioned. Both of these values were up from the 2006 survey that produced a Simpson Index Value of 0.87 and found 30 species in and adjacent to the lake.

Figure 13 – Kirby Lake Littoral Zone

Lakeside, 100 of the 184 sites with vegetation had four or more native species present in the rake (Figure 14) suggesting a very healthy diversity. The average for all sites with vegetation was 3.87 native species. Overall plant density was very high with a mean rake fullness of 2.65 at all sites with vegetation (Figure 14).

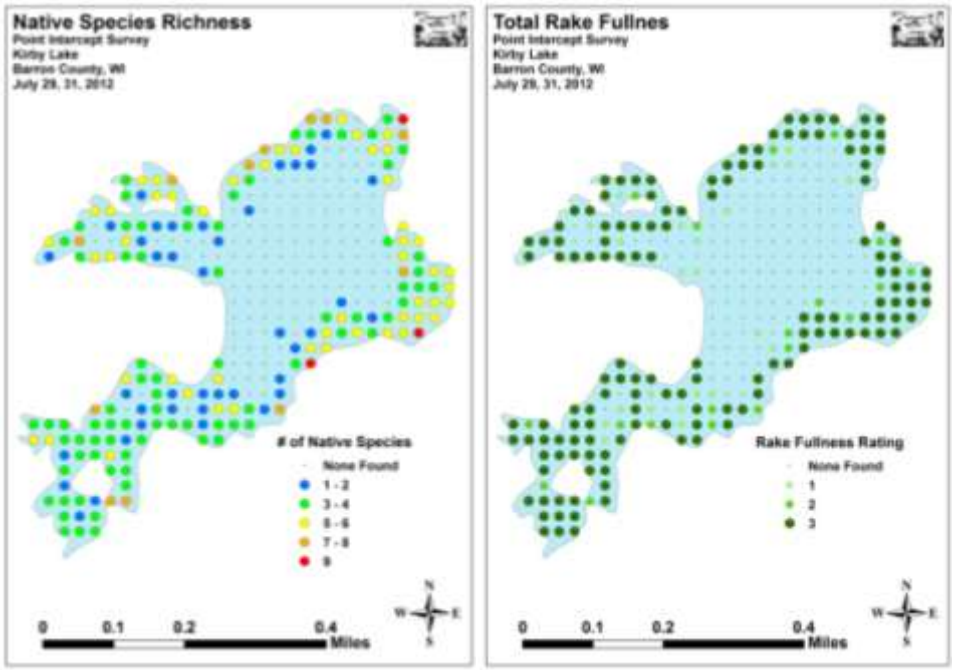


Figure 14 – Native Species Richness and Total Rake Fullness Rating

Aquatic plant density ratings documented by the 2012 survey support the claim that abundant vegetation in the lake interferes with open water access for riparian owners and general lake navigation (Figure 15). In areas of dense growth aquatic vegetation, Watershield, Farwell's water milfoil, White water lily, Small pondweed, and four species of bladderwort (Creeping, Large purple, Common, and Flat-leaf) are the most problematic. Kirby Lake's soft acidic water and shallow depths provide ideal growing conditions for these species, and as the lake's bays have grown shallower over time, they have been able to expand their range on the lake to the point where they now dominate most areas in less than five feet of water.

Figure 15 – Main Body of Kirby Lake (top), Riparian Property (left), Southwest Bay (right) (Berg, 2012)

A total of 31 native index species were identified during the summer point intercept survey. They produced a mean Coefficient of Conservatism (C) of 7.5 and a Floristic Quality Index (FQI) of 41.8. The average Mean C for the Northern Central Hardwood Forests Region is 5.6 putting Kirby Lake well above average for this part of the state. The FQI was exactly double the median FQI of 20.9 for the Northern Central Hardwood Forests Region (12). While aquatic plant management to provide relief from native aquatic plant growth is justifiable, great care should be taken to maintain the extremely diverse and healthy aquatic plant community that currently exists.

7.0 Wild Rice

Wild rice (Figure 16) was not found in Kirby Lake during any of the aquatic plant surveys nor is the lake listed as a rice water. When present in a lake, wild rice is afforded numerous protections due to its ecological and cultural significance. Management is therefore focused on harvest goals and protection of the resource rather than removal. According to the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), there have been no reported wild rice harvests from Kirby Lake. Any activity included in a comprehensive lake or aquatic plant management plan that could potentially impact the growth of wild rice in any body of water that has in the past, currently has, or potentially could have wild rice in the future requires consultation with the Tribal Nations. This consultation is usually completed by the WDNR in cooperation with GLIFWC during their review of lake management documents.

Wild rice is an annual aquatic grass that produces seed that is a nutritious source of food for wildlife and people. As a native food crop, it has a tremendous amount of cultural significance to the Wisconsin and Minnesota Native American Nations. Wild rice pulls large amounts of nutrients from the sediment in a single year and the stalks provide a place for filamentous algae and other small macrophytes to attach and grow. These small macrophytes pull phosphorous in its dissolved state directly from the water. Wild rice can benefit water quality, provide habitat for wildlife, and help minimize substrate re-suspension and shoreland erosion.

In Wisconsin, wild rice has historically ranged throughout the state. Declines in historic wild rice beds have occurred statewide due to many factors, including dams, pollution, large boat wakes, and invasive plant and animal species. Renewed interest in the wild rice community has led to large-scale restoration efforts to reintroduce wild rice in Wisconsin's landscape. Extensive information is available on wild rice from GLIFWC and the WDNR.

Figure 16 – Wild Rice (*Zizania palustris*)

8.0 Non-native Aquatic Invasive Species Present in Kirby Lake

The only non-native aquatic invasive species known to be present in Kirby Lake is reed canary grass. Reed canary grass, which has been labeled perhaps the worst invasive species in Wisconsin to date, is nearly ubiquitous in the Kirby Lake watershed. It can be found along the lake shore, in ditches and wetlands, and in open forest areas along streams. Reed canary grass forms dense, nearly monotypic stands that displace all other species, constricts waterways, and limits tree regeneration in riparian areas by shading out seedlings.

Figure 17 – Dense Reed Canary Grass Growth on Corbett Lake in Ladysmith, Wisconsin

It is reed canary grass that formed the impetus to complete this Aquatic Plant Management Plan, as it was the plant the KLMD removed from the lake when returning water levels caused it to die and then decay, increasing dead organic matter in the lake. More about management of reed canary grass is included in a later section.

8.1 AIS Monitoring Efforts

Kirby Lake was monitored for 11 aquatic invasive species between 2008 and 2010 by the WDNR (Table 5). All survey results were negative for detection of aquatic invasive species. The KLMD is currently involved in aquatic invasive species monitoring and is implementing a water craft inspection program aimed at preventing the introduction of other AIS in cooperation with WDNR and UW-Extension Lakes programs. These programs will continue into the foreseeable future.

Table 5
Aquatic Invasive Species Monitoring Efforts in Kirby Lake.

Aquatic Invasive Species	Year(s) surveyed
Curly-leaf pondweed	2008-2010
Purple Loosestrife	2008-2010
Eurasian water-milfoil	2008-2010
Freshwater jellyfish	2009
Zebra mussels	2008-2010
Hydrilla	2008-2009
Fishhook water flea	2008-2009
Spiny water flea	2009
Banded mystery snail	2009
Chinese mystery snail	2009
Rusty Crayfish	2009

9.0 Non-Native Aquatic Invasive Species Threats to Kirby Lake

Introduction of new AIS to a lake system is a constant threat to lakes and rivers. The non-native species of most concern are Eurasian watermilfoil, curly-leaf pondweed, purple loosestrife, zebra and quagga mussels, spiny water flea, giant reed grass, New Zealand mudsnails, and hydrilla. Aquatic invasive species monitoring recommended in this plan and supported by the KLMD will be watching for these and other AIS in hopes of early detection and rapid response.

9.1 Eurasian Watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil is a submerged aquatic plant native to Europe, Asia, and northern Africa (Figure 18). Although Eurasian watermilfoil was not found in Kirby Lake during extensive surveying, its introduction remains a concern. The close proximity of Kirby Lake to other lakes infested with the plant makes it is a prime candidate for the introduction of Eurasian watermilfoil via boat traffic.

Figure 18 – Eurasian Watermilfoil

Eurasian watermilfoil first arrived in Wisconsin during the 1960s and is the only non-native milfoil in the state. During the 1980s it began to move from several counties in southern Wisconsin to lakes and waterways in the northern half of the state. Eurasian watermilfoil grows best in alkaline systems with a high concentration of dissolved inorganic carbon and fertile, fine-textured, inorganic sediments. In less productive lakes it is restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lake beds, lakes receiving nutrient-laden runoff, and heavy-use lakes.

Unlike many other plants, Eurasian watermilfoil is not dependant on seed for reproduction. In fact, its seeds germinate poorly under natural conditions. Eurasian watermilfoil reproduces by fragmentation, allowing it to disperse over long distances by currents and inadvertently by boats, motors, and trailers. The fragments, which are produced after the plant fruits once or twice during the summer and by destruction of the plant (for example by propellers), can stay alive for weeks if kept moist.

Once established in an aquatic community, Eurasian watermilfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). Stolons, lower stems, and roots persist over winter and store the carbohydrates that help Eurasian watermilfoil claim the water column early in spring. The rapid growth can form a dense leaf canopy that shades out native aquatic plants. Its ability to spread rapidly by fragmentation and effectively block the sunlight needed for native plant growth often results in monotypic stands.

Monotypic stands of Eurasian watermilfoil provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways. For example, dense stands disrupt predator-prey relationships by fencing out larger fish and reduce the number of nutrient-rich native plants available for waterfowl. Dense stands of Eurasian watermilfoil also inhibit recreational uses like swimming, boating, and fishing. Some stands have been dense enough to obstruct industrial and power generation water intakes. The visual impact that greets the lake user on EWM-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". The cycling of nutrients from sediments to the water column by Eurasian watermilfoil may lead to deteriorating water quality and algae blooms in infested lakes.

The well distributed, healthy native plant community in Kirby Lake is helps protect the lake from the introduction and subsequent establishment of Eurasian watermilfoil. Research has shown that the abundance of Eurasian watermilfoil in a lake is inversely related to cumulative native plant cover (13). For this reason it is important to maintain healthy and diverse native stands of vegetation (14).

9.2 Curly-leaf Pondweed (*Potamogeton crispus*)

Curly-leaf pondweed is a submerged aquatic perennial that is native to Eurasia, Africa, and Australia. It was introduced to United States waters in the mid-1880s by hobbyists who used it as an aquarium plant and was planted in Michigan lakes as a food source for ducks. Curly-leaf pondweed has been documented throughout the U.S. In some lakes, curly-leaf pondweed coexists with native plants and does not cause significant problems; in other lakes, it becomes the dominant plant and causes significant problems (15). Dense growth can interfere with late spring and early summer recreation and the release of nutrients into the water column from the decaying curly-leaf during the height of the growing season can fuel algal blooms. Phosphorus release rates from the senescence of monotypic curly-leaf beds have been reported as high as nearly 10 pounds per acre and averages about 5 pounds per acre (16) (17) (18).

The leaves of curly-leaf pondweed are reddish-green, oblong, and about 3 inches long, with distinct wavy edges that are finely toothed (Figure 19). The stem of the plant is flat, reddish-brown and grows from 1 to 3 feet long. Curly-leaf is commonly found in alkaline and high nutrient waters, preferring soft substrate and shallow water depths. It tolerates low light and low water temperatures.

Figure 19 – Curly-leaf Pondweed

Curly-leaf pondweed spreads through burr-like winter buds called turions (Figure 16). These plants can also reproduce by seed, but this plays a relatively small role compared to the vegetative reproduction through turions. New plants form under the ice in winter, making curly-leaf one of the first nuisance aquatic plants to emerge in the spring, often starting to grow late in the fall and staying green under the ice. Growth is accelerated in spring when light and temperature conditions are best suited for growth. Turions begin to grow in June and by late June and early July, the warm water conditions cause curl-leaf to senesce, dropping turions to the sediment while the rest of the plant decays (Figure 16).

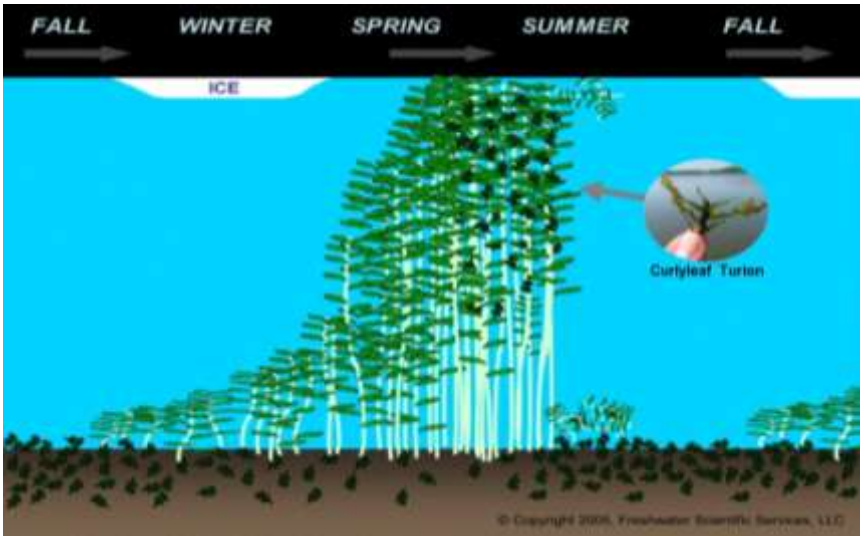


Figure 20 – Curly-leaf Life Cycle

9.3 Habitat Suitable for EWM and CLP Growth

Both CLP and EWM can establish themselves in a wide array of habitats, but like most species there appears to be a niche where both do exceptionally well. Both plants seem to do best in relatively alkaline, phosphorus rich lakes, and nuisance growth is generally restricted to moderately fertile lakes or fertile locations in less fertile lakes. EWM will grow in low alkaline lakes but not generally as vigorously (19). EWM grows best on fine-textured, inorganic sediments with an intermediate density. It grows relatively poorly on highly organic sediments which intrinsically have a low sediment density and on coarse substrates like sand and gravel which have a high sediment density (19). Both plants begin their growth early in the season when water temperatures may be too cold to support other plant growth. While CLP usually completes its life stages by early summer, EWM persists and actually does better under higher temperatures during the summer.

With a pH around 5 to 6, a primarily sand and gravel substrate in shallow water, and highly organic sediment in deeper water, conditions in Kirby Lake may be less than ideal for abundant growth of CLP and EWM. However, vigilance should be maintained to keep these species from being introduced into the lake via boat traffic, and in-lake monitoring should continue to look for these species, so if introduced they can be managed or removed as early as possible.

9.4 Purple Loosestrife (*Lythrum salicaria*)

Purple loosestrife is a perennial herb 3 to 7 feet tall with a dense bushy growth of 1 to 50 stems. The stems, which range from green to purple, die back each year. Showy flowers vary

from purple to magenta; possess 5 to 6 petals aggregated into numerous long spikes, and bloom from July to September. It is easiest to distinguish in late July and August as it has a very distinctive flowering head. Leaves are opposite, nearly linear, and attached to four-sided stems without stalks. It has a large, woody taproot with fibrous rhizomes that form a dense mat (Figure 21).

Figure 21 – Purple Loosestrife

The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators, like European species of herbivorous beetles that feed on the plant's roots and leaves, also contributes to its proliferation in North America. This plant's optimal habitat includes marshes, stream margins, alluvial flood plains, sedge meadows, and wet prairies. It is tolerant of moist soil and shallow water sites such as pastures and meadows, although established plants can tolerate drier conditions.

Purple loosestrife has also been planted in lawns and gardens, which is often how it has been introduced to many wetlands, lakes, and rivers. By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars.

9.5 Rusty Crayfish and Chinese Mystery Snail

Rusty crayfish are omnivores, meaning they forage on both plant and animal material. Originally from parts of the United States south of Indiana, they are larger and more aggressive than species of crayfish native to Wisconsin (Figure 22). Rusty crayfish prefer hard bottoms and tend to avoid soft sediment or mucky areas of lakes. When introduced they tend to replace native populations of crayfish, and then multiply rapidly. As omnivores they eat many things, including plant material, fish eggs, minnows, invertebrates and other crustaceans. In some lakes, they have devastated the aquatic plant community. Often, after reaching large populations, the number of rusty crayfish in the system declines rapidly. Some research suggests that this is because of a parasite infecting the crayfish. Management of this invasive species is limited, focusing on trapping or removal by residents.

Little is known about the ecological impact of Chinese mystery snails (Figure 22) and banded mystery snails, except that large die-offs are particularly offensive to the nose and impair lake

aesthetics. Management is limited and basically consists of landowner removal and disposal of snails and empty shells washed up on shore.

Figure 22 – Rusty Crayfish (left) and Chinese Mystery Snail (right)

10.0 Aquatic Plant Management Alternatives

Nuisance aquatic plants can be managed a variety of ways in Wisconsin. The best management strategy varies between lakes and depends on which nuisance species needs to be controlled, how widespread the problem is and the other plants and wildlife in the lake. In many cases, an integrated approach to aquatic plant management that utilizes a number of control methods is necessary.

Control methods for nuisance aquatic plants can be grouped into four broad categories:

- manual and mechanical control, which include harvesting, hand-pulling, and raking plants;
- biological control, which includes the use of organisms such as herbivorous insects, parasitic organisms, and planting aquatic plants;
- physical habitat alteration, which includes dredging, drawdown, lake bottom covers, and non-point source nutrient controls; and
- chemical control, which involves the use of herbicides.

Each of the above control categories are regulated by the WDNR and most activities require a permit from the State. Most control methods are regulated under Chapter NR 109 (Appendix D) except for chemical control which is regulated under Chapter NR 107. Installing lake bottom covers, which is not a commonly accepted practice, also requires a Chapter 30 permit.

Regardless of the target plant species, native or non-native, sometimes no active management of the aquatic plant community is the best option. Plant management activities can be disruptive to native plant species their ecological functions, and may open up areas for new invasive species to colonize. Other benefits of no management include no financial cost, no system disturbance, and no unintended effects of chemicals. Not managing AIS, however, may allow small populations of a plant to become larger and more difficult to control.

The benefits and limitations of a number of management techniques are described below. Although many of the available control methods are currently not applicable for Kirby Lake, informed decision-making on aquatic plant management options requires an understanding of plant management alternatives and how appropriate and acceptable each alternative is for a given lake.

10.1 No Manipulation

No manipulation of the aquatic plant community is often the easiest, cheapest, and in some cases most effective aquatic plant management alternative, even for non-native invasive species like curly-leaf pondweed. Not actively managing aquatic plants in Kirby Lake is a viable alternative, particularly in areas where excess aquatic plant growth does not impact lake uses, where the benefit of management is far out-weighed by the cost of management, where water quality or other lake characteristics limit nuisance growth conditions, and where highly valued native plants or habitat would be negatively impacted (for example, within ecologically significant areas such as the loon nesting site).

10.2 Manual and Mechanical Controls

Except for wild rice, manual removal of aquatic plants by means of a hand-held rake or by pulling the plants from the lake bottom by hand is allowed within a 30-foot-wide corridor along a 100-foot length of shoreline without a permit, provided the plant material is removed from the lake (Figure 23). Plant fragments can be composted or added directly to a garden.

Although up to 30 feet of shoreland vegetation can be removed, removal should only be done to the extent necessary. Clearing large swaths of macrophytes not only disrupts lake habits, it also creates open areas for non-native species to establish. If an aquatic invasive species such as curly-leaf pondweed is the target species, then removal by this means is unrestricted as long as native plants are not damaged or eliminated.

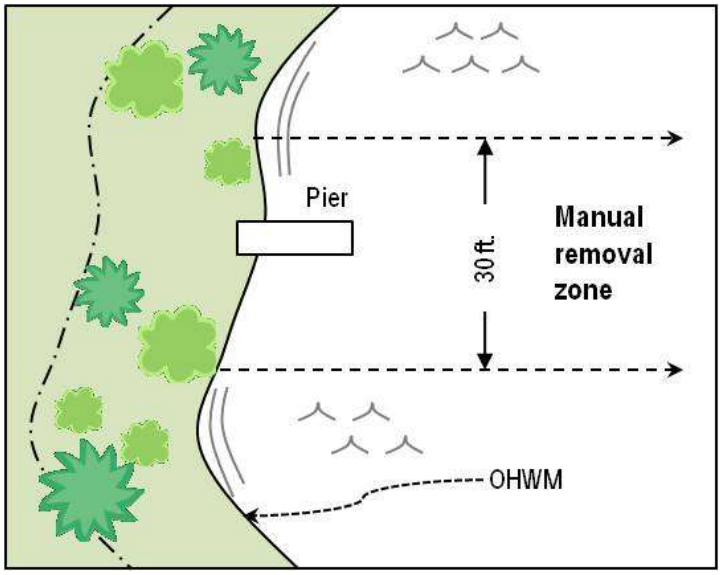


Figure 23 – Aquatic Vegetation Manual Removal Zone

Manual removal can be effective at controlling individual plants or small areas of plant growth. It limits disturbance to the lake bottom, is inexpensive, and can be practiced by many lake residents. Manual removal is most effective in shallow, hard bottom areas of a lake. It is appropriate for areas important for fish spawning. Pulling aquatic invasive species while snorkeling or scuba diving in deeper water can be done without a permit and can be effective at slowing the spread of a new aquatic invasive species infestation within a lake when done properly. When harvesting aquatic invasive species such as curly-leaf pondweed or Eurasian watermilfoil it is important that all material is removed as free-floating fragments can remain viable for a long period of time.

10.2.1 Large-scale Manual Removal

Larger hand-pulling or diver removal efforts are typically used to control aquatic invasive plant species when the population exists as single plants or isolated beds, as in new infestations. Large-scale projects have also successfully reduced or controlled established aquatic invasive species populations. One such effort for Eurasian watermilfoil control used diver hand harvesting of the entire littoral zone of the lake at least twice each summer for three years followed by three years of maintenance control to successfully reduced the overall distribution of EWM in the lake from 16% of the littoral zone to 3%. Overall costs ranged

from a high of $796 per hectare (approximately $320.00 per acre) of EWM removed during the three years of intensive management effort, to about $300 per hectare ($120 per acre) during the three year maintenance period (20).

Several local lake groups have and continue to use large-scale manual removal to manage Eurasian watermilfoil. Horseshoe Lake in Barron County uses diver removal on small or isolated areas of EWM, and uses chemical herbicides on larger, more expansive sites. Early in the management phase, Sand Lake in Barron County participated in diver removal, but stopped using divers as the EWM expanded too rapidly for the divers to keep up with. For several years the St Croix Flowage in Douglas County attempted to control the spread of EWM by diver removal. While successful in the first couple of years, the use of small-scale herbicide application has been added to the control regime.

In 2011, the Red Cedar Lakes Association performed diver removal on a dense, isolated one acre bed of curly-leaf pondweed in Red Cedar Lake. This large-scale effort was conducted by a group of local high school students (members of the Conservation Club) and a lake association representative. Water depths and inexperience made removal difficult; however, the effort was fairly successful and the divers were able to remove a large boat load of curly-leaf pondweed. In 2012 during early summer curly-leaf bed mapping, a determination was made on whether a bed could be hand harvested based on the previous years experience. In mid-summer, volunteers re-visited sites and removed on average 83% of the curly-leaf in 14 different beds.

10.2.2 Mechanical Control

Mechanical control methods use motorized accessories to assist in vegetation removal. Mechanical control can be used for both small- and large-scale control efforts and require WDNR permits regardless of the size of the area to be managed. As with manual control, plant fragments must be removed from the water to the extent practical.

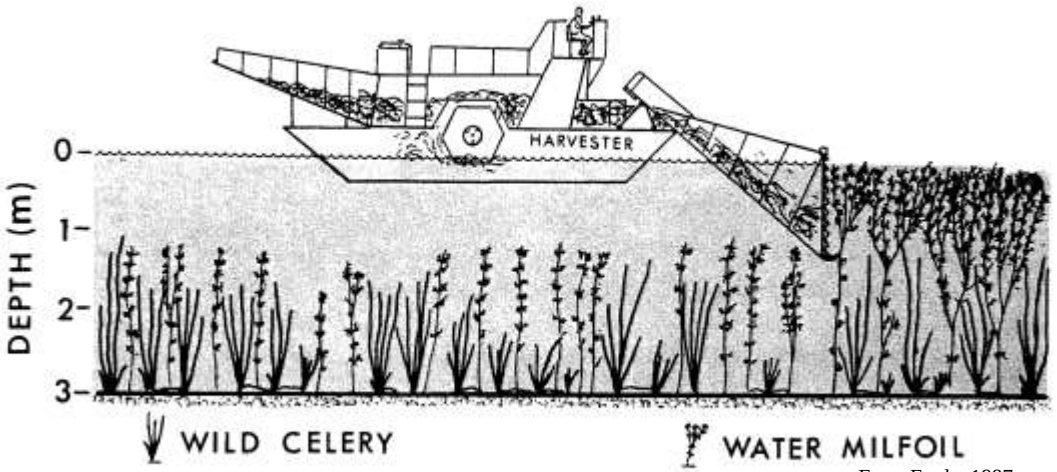
10.2.2.1 Large-scale Mechanical Harvesting

The most common form of mechanical control is the use of large-scale mechanical harvesters on the lake. The harvesters are generally driven by modified paddle wheels and include a cutter that can be raised and lowered to different depths, a conveyor system to capture and store the cut plants, and the ability to off-load the cut plants. Harvesters operate a depths ranging from skimming the surface (for example, to remove floating plant fragments) to as much as five feet deep.

Large-scale plant harvesting in a lake is similar to mowing the lawn. Plants are cut at a designated depth, but the root of the plant is often not disturbed. Plant composition can be modified by cutting away dense cover which may increase sunlight penetration enough to stimulate growth of underlying species (Figure 24) (21). Cut plants will usually grow back after time, just like the lawn grass. Re-cutting during the growing season is often required to provide adequate annual control (22). Harvesting activities in shallow water can re-suspend bottom sediments into the water column releasing nutrients and other accumulated compounds (22). Some research indicates that after cutting, reduction in available plant cover causes declines in fish growth and zooplankton densities. Other research finds that creating deep lake channels by harvesting increases the growth rates of some age classes of bluegill and largemouth bass (23).

Harvesters can remove thousands of pounds of vegetation in a relatively short period of time. By removing the plant biomass, harvesting also removes nutrients from a lake. Everything in

the path of the harvester will be removed including the target species, other plants, macro-invertebrates, semi-aquatic vertebrates, forage fishes, young-of-the-year fishes, and even adult game fish found in the littoral zone (24). An advantage of mechanical aquatic plant harvesting is that the harvester typically leaves enough plant material in the lake to provide shelter for fish and other aquatic organisms, and to stabilize the lake bottom sediments (21).



From Engle, 1987

Figure 24 – Harvesting Surface Foliage to Maintain Habitat and Stimulate Basal Plant Growth

Recent cost per acre for contracting harvesting services average $410 per acre whereas costs for purchasing, operating, and maintaining a harvester average $567 per acre (25). In general, the cost of harvesting decreased with increasing total acreage harvested, from about $500 per acre at 40 acre sites to about 250 per acre at 160 acre sites (25) [28]. The Rice Lake Protection and Rehabilitation District in Barron County, Wisconsin owns and operates three harvesters at a cost of approximately $420 per acre harvesting approximately 220 acres annually. The costs to support a harvesting program may be reduced by purchasing smaller or used equipment, determining a local, low cost disposal site, increasing the amount of acreage harvested, and through other cost analyses. Additional information on the advantages and disadvantages of mechanical harvesting is provided in Appendix E.

10.2.2.2 Small-scale Mechanical Harvesting

There are a wide range of small-scale mechanical management techniques, most of which involve the use of boat mounted rakes, scythes, and electric cutters. As with large-scale mechanical harvesting, removing the cut plants is required and often accomplished with a rake. Commercial rakes and cutters range in prices from $100 for rakes and cutters that can be thrown from the shore or attached to a boat to around $3000 for electric cutters with a wide range of sizes and capacities.

One of the best ways for riparian property owners to gain navigation relief near their docks is to actively use their watercraft to create open channels. Although not truly considered mechanical management, plant disruption by normal boat traffic is a legal method of management. Most macrophytes do not grow well in an area actively used for boating and swimming. It should be noted that purposefully navigating a boat in circles to clear large areas is not only potentially illegal, but it can also re-suspend sediments, clear paths for aquatic invasive species growth and cause ecological disruptions.

Mechanical harvesting is a viable plant management option for Kirby Lake, given the nature of the species composition and lake bed sediments in the areas where nuisance native plant growth impedes navigation and lake use. Harvesting is appropriate to open common use navigation channels and individual riparian access lanes.

10.2.3 Suction Dredging

Suction dredging is a form of mechanical harvesting where diver-operated suction tubes connected to barge- or pontoon-mounted pumps and strainer devices are used to vacuum plants uprooted by hand. This management technique is considered harvesting and not dredging because sediments are not removed from the system. Suction dredging is mostly used for control of isolated, new infestations of aquatic invasive species, and therefore not recommended for use in Kirby Lake.

10.2.4 Other Mechanical Management

The mechanical aquatic plant control methods described below are not recommended for use on Kirby Lake because they are often extremely disruptive to aquatic ecosystems. These methods are, however, used in other states or inappropriately employed in Wisconsin and are therefore discussed.

Cutting without plant removal, grinding and returning the vegetation to the water body, and rotovating (tilling) are also methods employed to control nuisance plant growth in some lakes. Cutting is just like harvesting except the plants are left in the lake. Grinding incorporates cutting and then grinding to minimize the biomass returned to the lake. Smaller particles disperse quicker and decay more rapidly. Rotovating works up bottom sediments dislodging and destroying plant root crowns and bottom growth.

Bottom rollers and surface sweepers are devices usually attached to the end of a dock or pier and sweep through an area adjacent to the dock. Continued disruption of the bottom area causes plants to disappear and light sediments to be swept out. The use of rollers may disturb bottom dwelling organisms and spawning fish. Plant fragmentation of nuisance weeds may also occur. In soft bottom areas, sediment disturbance can be significant. These devices are generally not permitted in Wisconsin. A permit under Section 30.12(3) is required which governs the placement of structures in navigable waters.

Another common method for removing aquatic plants from a beach or dock area is for riparian owners to hook a bed spring, sickle mower blade, or other contraption to the back of a boat, lawn mower, or ATV and drag it back and forth across the bottom. This type of management is considered mechanical and is generally not permitted by the WDNR.

10.3 Biological Controls

Biological control for aquatic plant management involves using animals, fungi, insects, or pathogens as a means to control nuisance plants. The goal of bio-control is to develop a predator-prey relationship where the growth of nuisance plants is reduced, but not eliminated. A special permit is required in Wisconsin before any biological control measure can be introduced into a new area. Biological controls are generally used for the control of aquatic invasive species.

Specific biological controls of curly-leaf pondweed are not known at this time. Ongoing research on naturalized and native herbivores and pathogens that impact nuisance aquatic and wetland plants is increasing the number of potential biological control agents that could be incorporated into invasive plant management programs (26).

The grass carp (*Ctenopharyngodon idella*), which feeds on aquatic plants and has been used as a biological tool to control nuisance aquatic plant growth in other states, is not permitted in Wisconsin. These fish can severely disrupt the aquatic ecosystem and have been known to nearly wipe out all aquatic vegetation in the lakes they inhabit. In a shallow lake system like Kirby Lake, this can cause a flip from a clear water plant-dominated system to an algae-dominated system.

There are several insects that have been studied and approved for biological control purposes of purple loosestrife. One species of insect has been proven to be extremely effective for control of purple loosestrife, the *Galerucella* beetles (*G. calmariensis* and *G. pusilla*). These beetles have been used extensively across North America to manage purple loosestrife, including in Wisconsin.

The milfoil weevil (*Euhrychiopsis lecontei*) is a native aquatic weevil that feeds on aquatic milfoils. Their host plant is typically northern watermilfoil, but they prefer Eurasian watermilfoil when it is available. Studies of utilizing the milfoil weevil for Eurasian watermilfoil control have resulted in variable levels of control, with little control being achieved on lakes with extensive motorized boat traffic.

EnviroScience, Inc has taken a patent on rearing and distributing the milfoil weevil. Recent information indicates they have successfully introduced weevils to more than 100 lakes in the United States and Canada in the last ten years. Costs for using the EnviroScience program run about $1.50 per weevil purchased, but includes the costs of mapping, stocking, and monitoring of effects. Researchers in Wisconsin have been developing a protocol for layperson rearing of the milfoil weevil. This process involves setting up large tanks with Eurasian watermilfoil and purchasing starter weevils from EnviroScience. With proper care and management, it is anticipated that this rearing method may be able to produce a 10 to 100 fold increase in weevils to be released into an affected area.

Plant fungi and pathogens are currently still in the research phase. Certain species for control of hydrilla and Eurasian watermilfoil have shown promise, but only laboratory tests in aquariums and small ponds have been conducted. Methods are not available for widespread application. Whether these agents will be successful in flowing waters or large-scale applications remains to be tested (27).

Selectively planting native aquatic plants to encourage or stimulate growth of desired plant species is another form of biological control. Introducing native plants is uncommon as it is often difficult and costly and requires a fairly large source of new plants and substantial short-term labor for collecting, planting, and maintaining the stock. Maintenance of plantings may require protection from fish and birds and temporary stabilization and protection of sediment in the planting area from wind and waves. Allowing the natural re-growth of native plants in cleared areas can prevent non-native invasive plant species from establishing in those sites.

10.4 Physical Habitat Alteration

Reducing nutrient loading from the watershed (for example, reducing fertilizer use or controlling construction erosion) provides fewer nutrients available for plant growth. Runoff from development in the nearshore area and from other parts of the watershed can increase the amount of phosphorus available for plant and algae growth. The limited light penetration due to increased algae in the water will be beneficial for plants adapted to low light conditions, such as curly-leaf pondweed. Higher nutrient concentrations also favor other non-

native plants such as Eurasian watermilfoil and native plants that tend to be nuisance such as coontail.

Research has shown that as shoreline development increases, the amount of aquatic plant growth near that lake shore decreases. In a Minnesota study of 44 lakes with varying amounts of developed shoreline, the average loss of aquatic plants in developed areas was 66% (28). On a lake wide basis, this loss of aquatic plant growth can lead to higher levels of phosphorus and an increase in the growth of algae, including filamentous algae that may attach to structures within the littoral zone or form surface mats. Reducing nutrient loading from the watershed (for example, via shoreland restoration and buffers) is a viable option in Kirby Lake.

Dredging is usually not performed solely for aquatic plant management but to restore lakes that have been filled in with sediments, have excess nutrients, have inadequate pelagic and hypolimnetic zones, need deepening for navigation, or require removal of toxic substances. A WDNR permit is required to perform any dredging in a waterbody or wetland. This method can be detrimental to desired plants, as all macrophytes would be prevented from growing for many years. This high level of disturbance may also create favorable conditions for the invasion of other invasive species. Dredging not recommended for aquatic plant management in Kirby Lake.

Benthic barriers or other bottom-covering approaches are another physical management technique that has been in use for many years. The basic idea is that the plants are covered over with a layer of a growth-inhibiting substance. Many materials have been used, including sheets or screens of organic, inorganic and synthetic materials, sediments such as dredge sediment, sand, silt or clay, fly ash, and combinations of the above. WDNR approval is required and screens must be removed each fall and reinstalled in the spring to be effective over the long term.

Dropping the lake level to allow for the desiccation, aeration, and freezing of lake sediments has been shown to be an effective aquatic plant management technique. Repeated drawdown lasting 4 to 6 months that include a freezing period are the most effective. Control of aquatic plants in these cases can last a number of years. The low lake levels may negatively affect native plants, provides an opportunity for adventitious species such as annuals, often reduces the recreational value of a waterbody, and can impact the fishery if spawning areas are affected. The cost of a drawdown is dependent on the outlet of the lake; if no control structure is present, such as in Kirby Lake, pumping of the lake can be cost prohibitive whereas costs can be minimal if the lake can be lowered by opening a gate. Raising water levels to flood out aquatic plants is uncommon and has a number of negative effects including the potential for shoreland flooding, shoreland erosion, and nutrient loading.

10.5 Chemical Control

Aquatic herbicides are granules or liquid chemicals specifically formulated for use in water to kill plants or cease plant growth. Herbicides approved for aquatic use by the U.S. Environmental Protection Agency are considered compatible with the aquatic environment when used according to label directions. Some individual states, including Wisconsin, also impose additional constraints on herbicide use. There are a number of aquatic herbicides registered for use in Wisconsin. Factsheets for each can be found on the WDNR website at http://dnr.wi.gov/lakes/plants/factsheets/ (last accessed October 2012).

A WDNR permit is required to use chemical herbicides in aquatic environments and a certified pesticide applicator is required for application on most lakes. The WDNR requires aquatic plant surveys before and after chemical application when introducing new treatments to lakes where the treatment size is greater than 10 acres or greater than 10% of the lake littoral area and more than 150 feet from shore. The pre- and post-treatment survey protocol can be found at: http://www4.uwsp.edu/cnr/uwexlakes/ecology/APM/Appendix-D.pdf (last accessed October 2012).

The advantages of using chemical herbicides for control of aquatic plant growth are the speed, ease and convenience of application, the relatively low cost, and the ability to somewhat selectively control particular plant types with certain herbicides. Disadvantages of using chemical herbicides include possible toxicity to aquatic animals or humans, oxygen depletion after plants die and decompose which can cause fishkills, a risk of increased algal blooms as nutrients in released into the water by the decaying plants, adverse effects on desirable aquatic plants, loss of fish habitat and food sources, water use restrictions, and a need to repeat treatments due to existing seed/turion banks and plant fragments. Chemical herbicide use can also create conditions favorable for non-native aquatic invasive species to outcompete native plants (for example, areas of stressed native plants or devoid of plants).

When properly applied, the possible negative impacts of chemical herbicide use can be minimized. For control of aquatic invasive species, early spring to early summer applications are preferred because exotic species are actively growing and many native plants are dormant, thus limiting the loss of desirable plant species; plant biomass is relatively low minimizing the impacts of deoxygenation and contribution of organic matter to the sediments; fish spawning has ceased; and recreational use is generally low limiting human contact. The concentration and amount of herbicides can be reduced because colder water temperatures enhance the herbicidal effects.

The selectivity of herbicides can be increased with careful selection of application rates and seasonal timing (29). Lake hydrodynamics must also be considered; steep drop-offs, inflowing waters, lake currents and wind can dilute chemical herbicides or increase herbicide drift and off-target injury. This is an especially important consideration when using herbicides near environmentally sensitive areas or where there may be conflicts with various water users in the treatment vicinity.

The WDNR, under Northern Region aquatic plant management guidelines does not readily support the use of chemical herbicides to provide native plant control. The use of chemical herbicides in Kirby Lake is not recommended for long-term control of native plants. Aquatic plant harvesting is a better alternative as it removes the nuisance portion of dense aquatic plant growth without eliminating the entire plant. It also provides greater plant management flexibility on an annual basis and can be implemented on very short notice. Herbicides will be considered as part of an integrated management approach for control of any new infestations of aquatic invasive species such as Eurasian watermilfoil should it become necessary. Because there are no significant, recurring algal blooms in Kirby Lake, the use of chemical algicides is not warranted.

11.0 Aquatic Plant Management Discussion

Preserving native aquatic plants in the shallow waters adjacent to the shore and native shoreland plant communities will aid in fending off the invasion of non-native plant species, protect and improve native fish and wildlife habitat, improve water quality, buffer against shoreland erosion, reduce shoreland runoff, and compliment the lake aesthetic. Eighty percent of the plants and animals on the Wisconsin endangered and threatened species list spend all or part of their life cycle within the near shore zone and as many as ninety percent of the living things in lakes and rivers are found along the shallow margins and shores. Activities along a lakeshore and in the immediate shoreland area can have major impacts on overall lake quality.

Kirby Lake has exceptional aquatic plant diversity and distribution, and at the present time, no non-native, invasive aquatic plant species except for reed canary grass. The density of aquatic plant growth, however, does create lake access and use issues for many property owners and lake users. As such, management of native aquatic plants to provide open water access and improved navigation is necessary. An integrated management approach that relies on a combination of manual and mechanical control methods and techniques is recommended for Kirby Lake. Manual removal can be used at any time and in most places where the density of aquatic plant growth is causing problems.

Mechanical harvesting, whether by equipment owned by the KLMD or through contract services outside the KLMD, is the preferred management alternative for Kirby Lake when nuisance native plant growth conditions are beyond the limits of reasonable manual removal. Mechanical harvesting provides the greatest flexibility in providing immediate and long-term relief in areas where native aquatic plant growth causes nuisance, navigation, and access issues. Mechanical harvesting removes only that portion of aquatic plant growth directly impacting access and navigation. As such, relief is achieved while still protecting the growing plant. Mechanical harvesting can reduce the level of nutrients in the water by removing vegetation that may otherwise die and decay in the lake.

Chemical herbicides should only be used for the control of new aquatic invasive species infestations. Herbicides should not be considered for native plant control and are not recommended for reed canary grass control at this time unless it is a part of an officially recognized shoreland restoration plan.

11.1.1 Reed Canary Grass

Reed canary grass is largely disregarded as a threat by many, perhaps because historically it was purposefully planted as a forage crop. Control of reed canary grass is difficult because of its persistent and tenacious growth. A reed canary grass management guide was developed by the Wisconsin Reed Canary Grass Management Working group and is available online as a downloadable PDF at: ftp://ftpfc.sc.egov.usda.gov/WA/Tech/RCG_management_0509.pdf.

Raising water levels is an effective reed canary grass control method, as was evident with the large die off of the plant when water levels returned in Kirby Lake. It is recommended that plant matter be harvested following die offs as previously completed to remove the biomass and nutrient source from the lake. During low water periods, cutting/mowing before seed heads appear is appropriate in areas of monotypic growth on the exposed lake bed where sensitive native plants are not found. Once cut, plant material should be removed from the lake bed by raking, or, in exposed areas solid enough to support the equipment used, “baling” could be done. Shoreland restoration should be completed in infested areas above the

ordinary high water mark to reduce the seed bed around the lake. Care should be taken at sites with disturbed soils to prevent new beds of reed canary grass from establishing.

The use of herbicides to kill reed canary grass in exposed lake bed areas below the high water mark is not recommended as dead plant biomass would still impact the lake, and the herbicide may kill other desirable plant species. Herbicide use to aid in shoreland restoration projects is acceptable.

11.1.2 Aquatic Plant Management in 2013

It is acknowledged that it will take the KLMD some time to set up an appropriate aquatic plant harvesting program, either by purchasing their own harvesting equipment or arranging contracted harvesting services. It is recommended that the KLMD pursue the purchase of a small harvester in 2013 with the expectation that it would be ready for use in 2014. By owning their own equipment, the KLMD would have greater flexibility in completing aquatic plant management needs. Recreational Boating Facilities grant funding may be available from the WDNR to aid in the purchase of a mechanical harvester for management purposes.

It is not likely that the KLMD could complete the purchase of an aquatic plant harvester for use in the 2013 season. As a result, there are three potential management scenarios for 2013: 1) do not do any aquatic plant management in 2013; 2) contract harvesting services in 2013; and 3) evaluate the very limited use of aquatic herbicides. The first two scenarios are recommended. The third is not.

12.0 Aquatic Plant Management Goals, Objectives, and Actions

Kirby Lake supports an aquatic plant community with a number of uncommon species and a quality fishery valued by the lake community. The lake currently has only one known invasive species, reed canary grass. Nuisance conditions and navigation impairment caused by dense native plant growth occur throughout the open water season. This Aquatic Plant Management Plan established the following goals for aquatic plant management in Kirby Lake:

1. **Preservation, Protection, and Restoration**. Preserve, protect, and restore the native plant species community in and around the lake to decrease susceptibility to the introduction of new aquatic invasive species
2. **Prevention**. Prevent the introduction and establishment of new aquatic invasive species through early detection and rapid response.
3. **Management**. Maintain common navigation channels and individual riparian access lanes in areas of nuisance native plant and reed canary grass growth via mechanical and manual control.
4. **Education and Awareness**. Continue public outreach and education programs on aquatic invasive species.
5. **Research and Monitoring**. Develop a better understanding of the lake and the factors affecting lake water quality through continued and expanded monitoring efforts.
6. **Adaptive Management**. Follow an adaptive management approach that measures and analyzes the effectiveness of control activities and modify the management plan as necessary to meet goals and objectives

12.1 Preservation and Restoration

To maintain the quality and diversity of the lake ecosystem, the KLMD will provide riparian owners with educational materials on shoreland improvement and encourage participation by its constituency in shoreland restoration training events. Not knowing where to begin with a shoreland restoration is often the main hurdle preventing implementation. General information on shoreland restoration will be provided to all members in a newsletter and during public events. The cost of shoreland restoration and/or improvement projects is dependent on the size and type of restoration done, but can range in price from no cost for establishing no mow sites, to a couple hundred dollars for small restoration projects, to several thousands of dollars for larger more comprehensive full shore restoration projects. There are many free, down-loadable on-line resources, and both free and low cost paper resources including guides, pamphlets, and brochures available to help the average person work toward making improvements on their own properties. UW-Extension has offices in nearly every county in WI, Barron County included, and offer these materials for free or at very low prices. They also sponsor local workshops and/or training sessions, or can direct people to others who do. Local greenhouses and landscaping companies often have shoreland restoration packages for specific project types available to the public.

An alternative or addition to providing educational and informational materials is for the KLMD to sponsor individual property owner shoreline evaluations performed by resource professionals or trained KLMD volunteers. Recent research has revealed that riparian property owners evaluate their own shorelines significantly more natural than biologists' evaluations (30). A quick, inexpensive walk-through of a property by a shoreland restoration specialist can often identify areas in need of improvement and provide basic consulting for how to make those improvements. Shoreland restoration consultants generally charge $30-50

for first time site visits. Information collected in this manner would provide baseline data on the status of the shoreline around Kirby Lake and would allow for focused education and outreach efforts.

The KLMD will further encourage riparian property owners to diversify the shoreland environment by recognizing riparian owners who implement shoreland restoration and habitat improvement projects. Recognition can be in a number of ways, for example, by displaying a special sign on the shoreline or posting a notice in the annual newsletter.

12.2 Prevention

Aquatic invasive species can be transported via a number of vectors, but most invasions are associated with human activity. To minimize this risk, the KLMD will monitor the public boat launch on Kirby Lake with volunteer and/or paid inspectors following WDNR/UW-Extension Clean Boats, Clean Waters guidelines. Any watercraft inspection data collected as a part of a formally recognized Clean Boats Clean Waters program will be submitted to the WDNR SWIMS database. It is recommended that the KLMD participate in the Fourth of July Landing Blitz, a state-wide outreach effort to warn boaters of the dangers of transporting invasive species that takes place on the Fourth of July, a high-boat traffic day. Since watercraft inspection cannot be supported round-the-clock, the KLMD will continue to maintain and update signage at the boat launch kiosk as necessary.

Early detection and rapid response efforts increase the likelihood that a new aquatic invasive species will be addressed successfully while the population is still localized and levels are not beyond that which can be contained and eradicated. Once an aquatic invasive species becomes widely established in a lake, all that might be possible is the partial control of negative impacts. The costs of early detection and rapid response efforts are typically far less than those of long-term invasive species management programs.

To support early detection and response, the KLMD will continue to implement a proactive and consistent aquatic invasive species monitoring program. At least three times during the open water season of a given year, trained volunteers will patrol the shoreline and littoral zone looking for curly-leaf pondweed, Eurasian watermilfoil, purple loosestrife, Japanese knotweed, giant reed grass, zebra mussels, and other invasive species. Free support for this kind of monitoring program is provided as a part of the UW-Extension Lakes/WDNR Citizen Lake Monitoring Network (CLMN) AIS Monitoring Program. Any monitoring data collected as a part of a formal AIS monitoring program will be recorded annually and submitted to the WDNR SWIMS database.

The KLMD will encourage all property owners to monitor their shoreline and open water areas for new growths of aquatic invasive species. Table 6 shows the life stage of some invasive plant and animal species and the best times of the open water season to monitor for them (31). If a suspect AIS is found, or even suspected, it will be reported to the KLMD, County, and WDNR resource personnel.

Preventing the introduction of invasive species is the first line of defense against invasions, but even the best prevention efforts will not stop all invasive species introductions. A Eurasian Watermilfoil/Curly-leaf Pondweed Rapid Response Plan has been created for Kirby Lake and is included as Appendix F of this plan. The Rapid Response Plan contains information on what to do if a potential aquatic invasive species is found including contacts for authoritative verification and what should be done if a positive identification is made.

Table 6
Aquatic Invasive Species Monitoring Timetable.

	April	May	June	July	August	September
Eurasian watermilfoil						
Sprout						
Growth						
Bloom						
Die Back						
Curly-leaf pondweed						
Sprout	→					
Growth	→					
Bloom						
Die Back						
Purple Loosestrife						
Sprout						
Growth						
Bloom						
Die Back						
Zebra mussel						
Rusty crayfish						
Spiny water flea						

12.3 Management

Management of native aquatic plants to provide open water access and improved navigation is necessary in Kirby Lake. The best alternatives for completing this management are manual removal and mechanical harvesting. Mechanical harvesting can be implemented via the purchase and operation of the necessary equipment or by contracting harvesting services.

12.3.1 Manual Removal

Manual or physical removal is the most appropriate management method to control aquatic plant growth around docks and in areas where the water depth is shallower than 3 feet. To aide in physical removal of aquatic plants in small, shallow lake areas adjacent to shore, at least one plant removal rakes and/or razors will be purchased by the KLMD and made available for riparian property owners to use. As mentioned in a previous section, physical removal of aquatic plants is allowable without a permit within an area up to 30 feet wide near a dock or along a shoreline used for recreational activities, provided the parts of the plant cut or pulled are removed completely from the water and disposed of properly. By its very nature, physical removal is often a difficult and daunting task, thus minimizing how much plant material is actually removed. Native plant removal will be limited only to the amount needed to access open water areas or provide navigation and access lanes. Coarse woody habitat (tree falls, logs, etc.) will be left in the water as it is a critical feature of lakes influencing fish behavior, spawning, predator-prey interactions, growth, and species diversity. Research has shown that the growth of largemouth bass and bluegill are positively correlated with coarse woody habitat in lakes and a whole lake removal of coarse woody habitat led to the collapse of a yellow perch population (32).

12.3.2 Mechanical Harvesting

In deeper water and in larger areas where relief from nuisance aquatic plant growth for navigation purposes is needed, a harvesting plan will be created annually and will be used as the basis for completing an Aquatic Plant Harvesting Permit Application required by the WDNR (Appendix G). Harvesting plans will be designed to enhance both the ecological balance and recreational uses of the lake by establishing **common use navigation channels** and **individual riparian access lanes**. A common use navigation channel is a common navigation route for the general lake user. It is off shore and connects areas that boaters commonly would navigate to or across, and is for public benefit. An individual riparian access lane is an access lane to shore that normally is used by an individual riparian shore owner. Navigation channels will be limited to 20-ft wide and individual riparian access lanes will be limited to 10-ft wide and both must be in water at a depth of 3-ft or greater. Once harvested, these areas should be kept open and even expanded through regular use of watercraft. If the navigation channels or access lanes fill in again, they can be re-cut under the same harvesting permit that allowed their initial cutting.

Mechanical harvesting of aquatic plants can only be completed in water 3-ft or greater in depth. Harvesting in waters shallower than this can greatly disturb bottom sediments causing them to be re-suspended in the water column decreasing water quality. Bottom dwelling biota critical to the health of the lake can also be negatively impacted. Damage to the harvester may also occur. In waters at or deeper than 3-ft, aquatic plants can be cut to two-thirds of the water column or to the maximum depth of the harvester, whichever is less. At off-loading sites, the operator will attempt to return game fish, turtles, and other wildlife back to the water. Plant survey work in 2012 identified approximately 78 acres of the total 98 acres as a littoral or plant growing zone. In an effort to protect the existing health of the lake, harvesting of navigation channels and riparian access lanes in any one season will not exceed 5% of the established littoral zone, or approximately 3.9 acres total. This acreage does not include harvested reed canary grass or areas where aquatic vegetation is managed by physical means.

It is recommended that GPS units capable of tracking the movements of the harvester be installed on or, at a minimum, carried with the operator whenever harvesting is occurring and must be turned on. At the end of each day, a tracking log should be downloaded from the GPS unit and stored in digital form either on a computer or data disk. Regardless of GPS tracking, daily log sheets that include the following harvesting information: estimated total daily tonnage, number of loads, surface acres covered, plant ID list, percentage of each plant species removed, and plant bed density information, will be kept of all harvesting actions.

Clear-cutting of aquatic vegetation adjacent to riparian shoreline for the purpose of creating weed free areas for swimming or other recreational purposes is not an acceptable use of the mechanical harvester and is not recommended action in this plan. Landowners, however, are not prohibited from physically removing aquatic vegetation in these areas and will be encouraged to do so provided guidelines presented in NR 109 are followed.

The harvesting plan will be assessed annually to determine if changes should be made. Areas designated for harvesting in a given year, can be repeatedly harvested as needed in that year to maintain their function without the need for additional WDNR permitting or fees. An example harvesting plan for the first year of active management is included in Appendix H. Changes in the harvesting plan can be requested by property owners, and will be evaluated on an individual case basis as they come up. Appendix I provides guidelines for evaluating land owner requests and documenting the need to pursue management. Larger changes in the

harvesting plan may be necessary due to variability in water levels, changes in lake use patterns, or with the introduction of a new aquatic invasive species.

12.3.2.1 Acquisition of the Mechanical Harvester

It is recommended that the KLMD purchase and operate their own small aquatic plant harvester, as this would give them the greatest flexibility in managing aquatic vegetation in the lake. A new harvester able to cut a 5-ft swath has an expected price range of $45,000 to $65,000 depending on the type, construction, and features. Several companies in WI build small harvesters specifically for the type of aquatic plant management being recommended in this APM Plan. The Recreational Boating Facilities grant program supported by the WDNR can be used to help offset up to 50% of the costs of purchasing an aquatic plant harvester. There is no official grant deadline for application, but it should be done early in the year as it typically takes 6-9 months for the approval process.

Contracted harvesting is a viable option, with costs per acre averaging between $400 and $700. Contracted harvesting has several issues. Availability of contracted services is limited, with only a small handful of companies offering such services. Transportation of the equipment, keeping it clean so as not to infest a new lake with cuttings from a previous water body, arranging for off-loading and transportation of harvested materials, licensing requirements from state to state, and timing are all critical issues that must be addressed. Owning and operating a harvester also has issues including maintenance, storage, and possibly transportation. Insurance coverage may be necessary. Finding, training, and paying an operator will be necessary. Initial investments to purchase the equipment can be expensive, but it can be expected that the machinery used will be functional for a decade or more if properly maintained.

Unloading, hauling, and disposal of harvested aquatic vegetation adds to the cost of a harvesting program, particularly if additional equipment like a conveyor system and/or trailer are needed to move harvested material around, and if additional transport is needed to dispose of harvested material. Negotiations have been started with Barron County to see how use of County Land adjacent to the lake as an off-loading site and as a temporary or possibly permanent storage site for harvested plant material may reduce costs. It is recommended that the KLMD continue this discussion with Barron County. When reed canary grass was harvested from the lake in 2010, it was disposed of on local property a short distance from the lake.

Based on harvesting reports from Rice Lake in Barron County (Trigg, 2011 & 12), opening and maintaining 60 acres of navigation channels in Rice Lake from July – September produced about 5 tons of wet plant biomass per acre. Almost 95% of aquatic plant biomass when first harvested is water (AERF, 2009). It is expected that 2-4 acres of navigation and access corridors will be harvested annually from Kirby Lake, producing 10-20 tons of wet plant biomass annually. Once draining and drying has occurred only 1000-2000 lbs of plant material will remain. The numbers referred to here are for the entire season. It is expected that no one harvesting event would produce numbers even close to these annual numbers.

12.4 Education and Awareness

Providing education and outreach opportunities and materials to the lake community will improve the general knowledge base and likely increase participation in lake protection and restoration activities. The KLMD will continue to cultivate within their lake community, an awareness of the problems associated with aquatic invasive species and enough community

knowledge about certain species to aid in detection, planning, and implementation of management alternatives. The KLMD will continue to strive for greater understanding and appreciation of the entire aquatic ecosystem including the important role plants, animals and people play in that system, and how their activities impact the aquatic plants and water quality of the lakes in its constituency. To accomplish this, the KLMD will distribute or re-distribute informational materials and provide educational opportunities on aquatic invasive species and other factors that affect Kirby Lake. At least one annual activity (picnic at the lake, public workshop, mailing, guest speakers, etc.) will be sponsored and promoted by the KLMD that is focused on aquatic invasive species. Maintaining signs, continuing aquatic invasive species monitoring, and active inspections of watercraft at the public launch will be done to educate lake users about what they can do to prevent the spread of aquatic invasive species. Results of water quality and other monitoring efforts will be shared with the lake community at the annual meeting or another event to promote a greater understanding of the lake ecosystem and potentially increase participation in planning and management.

TO encourage greater appreciation of wildlife and wildlife monitoring programs, the KLMD will provide education and informational materials related to these programs during public events and meetings and in newsletters. Volunteers are currently participating in the Loon Watch program sponsored by the Sigurd Olson Institute. The KLMD will encourage participation in other programs sponsored by the Citizen-based Monitoring Network of Wisconsin (http://wiatri.net/cbm/) and help facilitate training opportunities for these and other wildlife monitoring and appreciation events if asked to do so and if the designated event is supported by its constituency.

12.5 Research and Monitoring

The KLMD will continue to participate in the CLMN Water Quality Monitoring Program. CLMN expanded monitoring parameters (Secchi, temperature, dissolved oxygen, total phosphorus, and chlorophyll a) will be continued at the Deep Hole Site. The intensity of water quality monitoring efforts should be evaluated at least every three years and not only consider cost, but also their contribution to the creation of knowledge and formulation of an effective lake management program. Long-term data can be used to identify the factors leading to changes to water quality such as aquatic plant management activities, changes in the watershed land use, and the response of the lakes to environmental changes. The background information and trends provided by these data can prove invaluable for comprehensive lake management planning.

Lake level monitoring will be added to long-term trend monitoring already completed by the KLMD. An official staff gage will be installed on a permanent structure in the lake or placed in reference to a permanent and unchanging structure on the shore. To facilitate daily readings, the staff gauge should be installed at the property of a volunteer who is a permanent resident on the lake. Lake levels will be recorded by reading the staff gauge on a daily or weekly basis.

It is recommended that the KLMD install at least one rain gage on the lake and document precipitation as it occurs. Support for this management recommendation can be accessed by KLMD participation in the Community Collaborative Rain, Hail and Snow (CoCoRaHs) Network. CoCoRaHS is a unique, non-profit, community-based network of volunteers of all ages and backgrounds working together to measure and map precipitation (rain, hail and snow). By using low-cost measurement tools, stressing training and education, and utilizing

an interactive Web-site (www.cocorahs.org), their aim is to provide the highest quality data for natural resource, education and research applications.

It is recommended that the KLMD pursue comprehensive lake management planning sometime in the next five years. Comprehensive Lake Management planning typically addresses five key components: water quality, aquatic plants, fisheries, the watershed, and public involvement. A Comprehensive Plan will help the KLMD work towards long-term lake goals like sustained water quality, a better understanding of the complex lake ecosystem, and increased lake protection.

12.6 Adaptive Management

This Aquatic Plant Management Plan is a working document guiding management actions on Kirby Lake over the next five years. This plan will follow an adaptive management approach by evaluating results and adjusting actions on the basis of what has been learned. This plan is therefore a living document, successively evolving and improving to meet environmental, social, and economic goals, to increase scientific knowledge, and to reduce tensions among stakeholders. Annual and end of project assessment reports are necessary to monitor progress and justify changes to the management strategy. Project reporting will meet the requirements of all stakeholders, gain proper approval, allow for timely reimbursement of expenses, and provide the appropriate data for continued management success. Success will be measured by the efficiency and ease in which these actions are completed

The KLMD and their retainers will compile, analyze, and summarize management operations, public education efforts, and other pertinent data into an annual report each year. The information will be presented to members of the KLMD, Barron County and the WDNR and made available in hardcopy and digital format on the internet. These reports will serve as a vehicle to propose future management recommendations and will therefore be completed prior to implementing following year management actions (approximately March 31st annually). At the end of this five year project, all management efforts (including successes and failures) and related activities will be summarized in a report to be used for revising the Aquatic Plant Management Plan.

It is recommended that whole-lake point intercept aquatic plant surveys be completed at three- to five-year intervals. At a minimum, a survey should be completed in 2017 and the results compared to the 2012 survey to determine the impacts of management activities on both target and non-target aquatic plants.

13.0 Timeline of Activities

The activities in this APM Plan are designed to be implemented over a 5-year period beginning in 2013. Appendix J is a timeline for implementation of activities. The plan is intended to be flexible to accommodate future changes in the needs of the lake and its watershed, and those of the KLMD. Some activities in the timeline are eligible for grant support to complete.

14.0 Works Cited

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Appendix A

2007 WDNR Northern Region Aquatic Plant Management Strategy

AQUATIC PLANT MANAGEMENT STRATEGY

Northern Region WDNR
Summer, 2007

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

ISSUES

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

BACKGROUND

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

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

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

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

GOALS OF STRATEGY:

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

BASIS OF STRATEGY IN STATE STATUTE AND ADMINISTRATIVE CODE

State Statute 23.24 (2)(c) states:

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

1. The **quantity** of aquatic plants that may be managed under an aquatic plant management permit.
2. The **species** of aquatic plants that may be managed under an aquatic plant management permit.
3. The **areas** in which aquatic plants may be managed under an aquatic plant management permit.
4. The **methods** that may be used to manage aquatic plants under an aquatic plant management permit.
5. The **times** during which aquatic plants may be managed under an aquatic plant management permit.
6. The **allowable methods** for disposing or using aquatic

plants that are removed or controlled under an aquatic plant management permit.

7. The requirements for plans that the department may require under sub. (3) (b). “

State Statute 23.24(3)(b) states:
“The department may require that an application for an aquatic plant management permit contain a plan for the department’s approval as to how the aquatic plants will be introduced, removed, or controlled.“

Wisconsin Administrative Code NR 109.04(3)(a) states:
“The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long-term sustainability of beneficial water use activities.”

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

APPROACH

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

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

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

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

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

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

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DOCUMENTATION OF IMPAIRED NAVIGATION AND/OR NUISANCE CONDITIONS

Navigation channels can be of two types:

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

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

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

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

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

Documentation of the *nuisance* must include:

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

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DEFINITIONS

Manual removal:	Removal by hand or hand-held devices without the use or aid of external or auxiliary power. Manual removal cannot exceed 30 ft. in width and can only be done where the shore is being used for a dock or swim raft. The 30 ft. wide removal zone cannot be moved, relocated, or expanded with the intent to gradually increase the area of plants removed. Wild rice may not be removed under this waiver.
Native aquatic plants:	Aquatic plants that are indigenous to the waters of this state.
Invasive aquatic plants:	Non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
Sensitive area:	Defined under s. NR 107.05(3)(i) (sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water).
Rapid Response protocol:	This is an internal WDNR document designed to provide guidance for grants awarded under NR 198.30 (Early Detection and Rapid Response Projects). These projects are intended to control pioneer infestations of aquatic invasive species before they become established.

Appendix B

Public Input Record

Appendix B – Public Input Records

KIRBY LAKE MANAGEMENT DISTRICT
P.O. BOX 603, CUMBERLAND, WI 54829

AGENDA FOR SPECIAL COMMISSIONERS MEETING
June 30, 2012, 12:00 pm, at Maple Plain Town Hall

I. CALL TO ORDER:
II. COMMISSIONERS PRESENT:
III. COMMISSIONERS ABSENT:
IV. GUESTS:
V. ELECT OFFICERS FOR FY 2012/2013
VI. APPROVE MINUTES:
- **A. May 26, 2012**

VII. COMMITTEE REPORTS:
- **A. None**

VIII. CHAIR REPORTS:
IX. TREASURER'S REPORT:
X. OLD BUSINESS:
- **A. Aquatic Plant Management Plan**
  - **1. Approve contract with ERS for completion of Point/Intercept Aquatic Plant Survey and documentation in the amount of $2,250**
  - **2. Approve contract with SEH for completion of Aquatic Plant Management Plan in the amount of $2,368**

XI. NEW BUSINESS:
- **A. Set future meeting schedule**
- **B. Other**

XII. ADJOURN

Kirby Lake Management District

2012 Annual Meeting

June 30, 2012

KIRBY LAKE MANAGEMENT DISTRICT
P.O. BOX 603, CUMBERLAND, WI 54829

MINUTES FOR QUARTERLY COMMISSIONERS MEETING
September 8, 2012, 10:00 am, at Maple Plain Town Hall

I. CALL TO ORDER: By Ketz at 10:00

II. COMMISSIONERS PRESENT: Ketz, Meyer, Stewart, Johnson

III. COMMISSIONERS ABSENT: Boxrud, Schultz, Horstman

A. In Boxrud's absence, Meyer agreed to take minutes

IV. GUESTS: Bob Busby, Kathy Cook; and Dave Blumer from SEH

A. The order of the agenda was adjusted to accommodate Dave Blumer's schedule.

V. AQUATIC PLANT MANAGEMENT PLAN STATUS

A. Mark Sundeen (DNR), David Blumer (Short Elliott Hendrickson) and Bob Busby (Lake District Owner) toured the lake from 8 to 10 AM this morning to review navigation problems due to excessive vegetation.

B. Dave Blumer provided an update. There are two phases to the plan process:

1. Gathering of pertinent and still current background data, information and history about the lake, including existing vegetation conditions; and education of the lake users.

2. Aquatic Plant Management Planning - allows KLMD to deal with the aquatic plants. District members and DNR will need to approve the plan to deal with vegetation on the lake.

C. The May Curly Leaf Pondweed survey and the July plant density survey have been completed. SEH is waiting for the final report from the Aquatic Plant Specialist, Endangered Resources Services. Hopefully the plan will be completed by year end.

D. Based on information to date including the field trip this morning, there seem to be two options to consider presenting in the plan.

1. **Acquire Harvester**
   - **a.** Advantages: small new one with 5 to 6 foot width range costs $30K to $50K. Considering the size of the lake, a used harvester would suffice. Portable, more flexibility, allows you to open navigation to narrow channels; submit one plan to cover all 26 Lake District owners, docks & channels. Grant money might be available
   - **b.** Disadvantages: maintenance, needs a driver, place to dispose of weeds harvested, place to store harvester; file harvesting plan each year before DNR will issue permit

KIRBY LAKE MANAGEMENT DISTRICT
P.O. BOX 603, CUMBERLAND, WI 54829

AGENDA FOR QUARTERLY COMMISSIONERS MEETING
December 8, 2012, 10:00 am, at Maple Plain Town Hall

I. CALL TO ORDER:
II. COMMISSIONERS PRESENT:
III. COMMISSIONERS ABSENT:
IV. GUESTS:
V. PUBLIC COMMENTS:
VI. APPROVE MINUTES:
- **A. September 8, 2012 meeting**

VII. COMMITTEE REPORTS:
- **A. County Highway H clean up**
- **B. Aquatic Plant Research Committee**
- **C. AIS monitoring**

VIII. CHAIR REPORTS:
IX. TREASURER'S REPORT:
- **A. Bills paid since last report**
- **B. Bills to be paid**
- **C. Status of investments**
- **D. Status of funds**

X. OLD BUSINESS:
- **A. Records Retention Policy – vote to approve**
- **B. Aquatic Plant Management Plan status update**
- **C. Dock out day report**

XI. NEW BUSINESS:
- **A. Township news**
- **B. County news**
- **C. Summary of DNR's three year fish stocking program**
- **D. Aerator barricade condition status**
- **E. Set following two quarterly meetings**
- **F. Set Annual Meeting date – July 6?**
- **G. Wisconsin Lakes Convention attendance**
- **H. Review draft annual newsletter**
- **I. Other**

XII. ADJOURN

2. **Herbicides**
    a. Disadvantages: requires state approval year to year with a plan that would be reviewed before permit issued. Limited area covered; debris stays in the lake and can contaminate the water quality. No grant money available.
    b. Advantages: Considering a harvesting permit was issued in 2011, the need for weed removal may be deemed more acceptable for approval now.

E. Dave Blumer provided copies of:
1. Total Rake Fullness Point Intercept Survey dated July 29, 31, 2012 by ERS.
2. 'Kirby Lake Report', background information completed by Sara Hatleli from Aquatic Plant & Habitat Services LLC as a subconsultant to SEH, providing info on:
    a. Waterbody & Watershed Characteristics
    b. 1990 Land Use
    c. Loons & Fish
    d. Aquatic Invasive Species
    e. Water Quality & clarity
    f. Phosphorus & Chlorophyll-a

F. New Committee Formed:
To coordinate discussions between the DNR and SEH and individual District Owners, the Aquatic Plant Research Committee was formed with the objective of seeking information to educate lake owners. Meyer made a motion to appoint Katy Cook and Bob Busby to the committee and to have direct conversations seeking information on behalf of KLMD. Other members may be added. Motion 2nd by Ketz. All ayes.

VI. APPROVE MINUTES:
A. For June 30th, 2012, Meyer moved approval and Johnson seconded. All ayes

VII. COMMITTEE REPORTS
A. None

VIII. TREASURER'S REPORT
A. Meyer distributed the Treasurer's Report addressing items B and D.
B. Bills paid since report.
C. Bills to be paid:
1. Cumberland Advocate $19
2. G Meyer reimbursement for postage spent the past 18 months $29
3. SEH $1,008

D. Status of Investments and Funds:
One CD matures on Sept 12th. Meyer made a proposal to renew for another 12 months and to transfer funds exceeding $4K from the checking into the new CD. Johnson made the motion to accept and Stewart 2nd. All ayes.

E. Johnson mentioned that due to tightening of bank regulations, early withdrawal of money held in a CD without a penalty is no longer valid for another non- profit organization that she represents.

F. Three separate motions were made by Johnson and 2nd by Stewart to accept the Treasurer's Report; approval to pay the 3 items; and to

renew CD & add funds transferred from checking. All ayes on all three votes.

IX. OLD BUSINESS

A. Records Retention Policy: Motion made by Meyer and 2nd by Johnson to delay until the next Board Meeting to allow time to compare to another Tax Retention Policy presented by Stu Ketz.

X. NEW BUSINESS

A. Township news: one mile of 6th street from 26 1/2 Ave will be blacktop.

B. County News: The distressed tree near the bottom of the boat landing on the right is of concern. It was brought to the county's attention a year ago. No response. The tree is about to fall. Injury and liability concerns. Johnson will contact the County.

C. Bob Busby was authorized to purchase six 2X4s to replace damaged buoy posts and new chains to support the buoys.

D. Meyer indicated that it would be wise to have a 2nd individual authorized to conduct banking business at Cumberland Federal Bank. In the event something occurred to the exiting Treasurer the bank account would be frozen. Stu Ketz is the 2nd authorized signature on file with the bank.

E. Received notification from Bliss McKnight that Wisconsin statutes regarding '*Uninsured Motorist, Underinsured Motorist and Auto Medical Payments Coverage'* provision of the Liability Insurance policy changed. The company will offer renewal at the new statutory minimum limits which is:

A. Uninsured: $25K per person and $50 per accident
B. Underinsured: Only upon completion and receipt of written form
C. Medical Coverage: $1,000 per person

F. Next Quarterly Board Meeting is scheduled for December 8, 2012. Future meetings to be scheduled at that time.

G. The annual meeting date was tentatively scheduled for Saturday July 6, 2013. A comment was made to consider scheduling KLMD meetings on a non holiday weekend when the likelihood of a district owner having out of town guests would be less. Will be taken under advisement when more members are present, or in the event a "special" meeting is called to discuss Aquatic Plant Management.

H. Concern was expressed at Don Horstman's absences. Stu to discuss with Boxrud.

XI. ADJOURN:

Moved by Stewart, seconded by Johnson to adjourn at 11:35. All ayes.

KIRBY LAKE MANAGEMENT DISTRICT
P.O. BOX 603, CUMBERLAND, WI 54829

DRAFT MINUTES FOR QUARTERLY COMMISSIONERS MEETING
December 8, 2012, 10:00 am, at Maple Plain Town Hall

I. CALL TO ORDER: By Ketz at 10:00

II. COMMISSIONERS PRESENT: Ketz, Meyer, Boxrud, Johnson, Horstman

III. COMMISSIONERS ABSENT: Stewart, Schultz

IV. GUESTS: Bob Busby; and Dave Blumer from SEH (10:40)

V. PUBLIC COMMENTS None

VI. APPROVE MINUTES:

A. For September 8, 2012, Meyer moved approval and Ketz seconded. Three ayes, Boxrud and Horstman abstained (not present September 8)

VII. COMMITTEE REPORTS

A. County Highway H clean up
   1. Schultz, committee chair, was absent. No report.

B. Aquatic Plant Research Committee
   1. Busby indicated Katie Cook had requested information from Clam Lake on their harvester program. No answer to date.

C. AIS Monitoring

Boxrud indicated May through September had been monitored as planned. Credit against the District's share of the Aquatic Plant Management Plan cost should be about $912. The monitoring information will be posted shortly.

VIII. CHAIR REPORTS Nothing not already on the agenda.

IX. TREASURER'S REPORT

A. Meyer distributed the Treasurer's Report addressing items B and D.

B. Bills paid since last report - $3,355.88. The $975 officer's insurance bill has been submitted to Barron County for reimbursement.

C. Bills to be paid:
   1. Cumberland Advocate $19
   2. Boxrud reimbursement for postage $50
   3. SEH $600
   4. Busby $88 for barrier and aerator marker buoy repair materials

D. Status of Investments and Funds:
   1. One CD matured on Sept 12th. Meyer renewed for another 12 months at 0.55% interest.
   2. Meyer did not transfer funds exceeding $4K from checking into the new CD as discussed at the last meeting. This is because the final invoices from the consultants working on the APM were expected to be due before March when other CDs matured. At only 0.55% interest, the Board agreed it was prudent to keep the money available to make payments.

E. It was moved and seconded to approve the Treasurer's report. All ayes.

X. OLD BUSINESS

A. Records Retention Policy: The policy Meyer had developed was compared to the resource Ketz had. After a few informal revisions to Meyer's version, it was decided to have Boxrud review the District files to see what documents would be discarded under the proposed policy before acting on the policy.

B. Aquatic Plant Management Plan status update

1. Dave Blumer noted that he still needed the final plant report from ERS to complete the APM. The timing of completion of the plan is not so critical as far as grant applications for weed control or equipment purchase goes. There are few of these available. A recreational facilities grant may cover part of the purchase cost of a harvester.
2. He is satisfied that we will be able to propose recurrent weed harvesting to provide for traffic lanes and property access. This is now the preferred alternative for weed control.
3. Limited herbicide treatments may be allowed on a permit by permit basis.
4. Dave clarified for us that Reed Canary Grass is a non-native invasive species. It is so ubiquitous that we think of it as native. To fully control it we would need to apply herbicide and replant the areas with native plants.
5. Dave had tried to get some pricing information from weed harvesting contractors. Most are tied to specific lakes. One contractor in Minnesota is willing to travel and incorporates their travel cost into their on-lake hourly rate of $180/hour. Cutting the traffic lanes and access lanes may take 10 hours, so the cost potentially is $1,800 per trip. If we need it three times a summer, we would be looking at less than $6,000 per year. On the face of it, this would appear to be more cost effective than buying a harvester for $40,000, running it and maintaining it. Dave will do some more checking.
6. We noted that we hadn't been doing boat inspections as planned in the grant application as credit against our share of the APM cost. The grant period ends on June 30, 2013, so Dave suggested we get our 80 volunteer hours of CBCW (boat inspections) done from opening weekend through Memorial weekend. Busby said the CBCW kit is at Andreasen's.
7. The Board and Dave worked out a schedule for completion of the plan. Dave can develop a final draft by early January, the Board can review it on January 12, then ask for member comments at a March 2 Board meeting under Public Comments. To get the membership ready to comment on March 2, the newsletter will be sent out right after the January 12 meeting. The newsletter will include an update on the general plan content and ask for feedback by the middle of February. Dave can take those comments and incorporate any unaddressed ideas into the final plan to be submitted to the Board in late February. After the Public Comment period on March 2, the Board can approve the plan if no changes are felt to be necessary.

C. Dock Out Day report

1. Busby said it went well.

XI. NEW BUSINESS

A. Township news

1. Johnson indicated that the township had authorized money for a new heavy truck and a pickup.

B. County News

1. Horstman described the arduous review process undertaken in southern Barron county during approval of a frac sand mining operation. The Townships involved get 5 to 6 cents per ton extracted. The DNR handles the complete environmental review process. Any sand suitable for frac sand in the Kirby Lake area is believed to be too deep to be feasible.
2. Horstman said the county tax levy will be about the same as this year.
3. The distressed tree near the bottom of the boat landing was brought up again by Busby. Both he and Horstman had inquired with county staff about taking it out before it fell on a person or vehicle at the landing. Horstman will again ask for its removal.

C. Summary of DNR's three year fish stocking program

1. Boxrud noted that the information he got from the DNR was contained in the draft newsletter the Board had for review today.

D. Aerator Barricade Condition status

1. Busby fixed the barrier posts and the buoy chains. The signs should be replaced.

E. Set following two quarterly meetings

1. As agreed during the APM discussion, two meetings will be held in the first quarter, on January 12 and March 2 at 10:00 am.
2. The last quarterly meeting was scheduled for May 25 at 10:00 am.

F. Set Annual Meeting date – July 6?

1. July 6 at 10:00 was confirmed as the date and time.

G. Wisconsin Lakes Convention attendance

1. Boxrud noted we had a budget for two people to attend. The convention is April 9 through 11. The online registration will begin in January. The final registration fee is not known at this time.
2. It was decided to discuss again on January 12 since that date is soon enough.

H. Review draft annual newsletter

1. The Board thought the draft was good. However, sending it out will need to wait for the questionnaire Dave Blumer agreed to develop to be part of the newsletter. The newsletter will be finalized at the January 12 meeting and sent out by Johnson who volunteered for this duty. Boxrud will have envelopes prepared ahead of time.

I. Other None

XI. ADJOURN:

Moved by Meyer, seconded by Johnson to adjourn at 12:30. All ayes.

KIRBY LAKE MANAGEMENT DISTRICT

P.O. Box 603, Cumberland, WI 54829

2013 NEWSLETTER

The Board of Commissioners wishes the residents of Kirby Lake all the best in 2013!

Kirby Lake District Officers

Mr. Stu Ketz
Chair

Ms. Gloria Meyer
Treasurer

Mr. Dan Boxrud
Secretary

Mr. Ron Stewart
At Large

Mr. John Schultz
At Large

Ms. Thelma Johnson
Maple Plain

Mr. Don Horstman
Barron County

IMPORTANT UPCOMING DATES FOR 2013

Board Meeting	January 12 at 10:00 AM at Maple Plain Town Hall
Board Meeting	March 2 at 10:00 AM at Maple Plain Town Hall **(see note)**
Dock & Boat-In Day	April 20 at 10:00 AM at the Landing
Board Meeting	May 25 at 10:00 AM at Maple Plain Town Hall
Annual Meeting	July 6 at 10:00 AM at Maple Plain Town Hall
Special Board Meeting	After Annual Meeting, elect officers, set next meeting date
Annual Picnic	July 6 at 1:00 at **[volunteer host needed]**
Boat Parade	September 1 at 1:00 PM
Dock & Boat-Out Day	October 5 at 10:00 AM at the Landing

During 2012, several new activities were initiated to improve Kirby Lake. Development of an Aquatic Plant Management (APM) Plan for Kirby Lake was started and will soon be complete. The APM Plan will provide necessary documentation of nuisance aquatic plant growth and appropriate recommendations for management that will facilitate access to open water and general navigation without compromising lake and water quality. The APM Plan will also provide recommendations for protecting valuable aquatic plant, fish, and wildlife habitat in the lake, and support aquatic invasive species (AIS) prevention and education efforts. At the present time, the only confirmed AIS in the lake is a shoreland plant called reed canary grass, which has been around this region for so long it seems native. It is this plant that harvesting operations removed in 2011.

Kirby Lake continues to have a large quantity of native aquatic vegetation, which helps absorb nutrients to keep our water clearer but is also increasingly making boat travel and general enjoyment of the lake more difficult. Management recommendations focused on mechanical harvesting are being proposed by our consultant. Aquatic herbicides are not being recommended at this time except to possibly facilitate interim plant management in 2013 while final harvesting plans are being completed. Of course, should these management recommendations be approved by you and the WDNR, the District will face harvesting costs, either through contracting harvesting services, or buying and operating a harvester of our own. Recommended plant management plans and any such proposal to harvest vegetation or purchase a harvester will be discussed fully with the district membership before proceeding. **A presentation on aquatic plant management recommendations by our consultant is planned for March 2, 2013. You are invited to attend this meeting to provide your input to the Board. However, prior to that meeting we would appreciate your response to the attached survey. Please send your responses or other comments to APM Plan author Dave Blumer by February 19 at dblumer@sehinc.com, or call him at 715 236 4000, or mail your response to Dave Blumer, SEH, 1701 W Knapp St, Suite B, Rice Lake, WI, 54868.**

In September the Board established an Aquatic Plant Research Committee (Bob Busby and Katie Cook) to function as communicators with district property owners and the WDNR. If you have concerns, preferences or opinions, they may be able to get responses for you.

This past summer we got our third fish stocking in as many years. Overall, the WDNR has provided 460 9" Northern Pike, 524 6 ½ inch Northern Pike, 2300 3" Bass, and 200 8" Northerns. It is hoped that the Northerns will eat small Sunfish which can become stunted and a nuisance. You can do your part to improve fishing in Kirby Lake by keeping small Sunfish when you catch them and releasing Northerns and Bass when possible. Releasing these predators will improve the game fish stock while also ridding the lake of stunted fish.

We continued lake monitoring activities to look out for the future of Kirby Lake. The Andreasen's have again been collecting water quality samples under a project for the DNR, using specialized equipment funded largely through the WDNR. The project is very involved and throughout the summer they took dozens of lake observations and samples. When compared to previous years, the water clarity was the same as 2011 and about the same as our long term average. The vibrant aquatic vegetation community has, so far, absorbed most of the increased nutrient loading to avoid algae blooms. The lake monitoring data can be seen at DNR.WI.GOV/LAKES/CLMN, searching under Barron County, then Kirby Lake. The Board would like to thank the Andreasen's for all their hard work.

Aquatic Invasive Species, in particular Eurasian Water Milfoil and Curly Leaf Pondweed, were monitored again with these invasive species not seen so far. Thanks to all of last year's monitors who all returned to the job from 2011: Andreasen, Stewart, Rubenzer, Schmidt-Dannert, Meyer, and Boxrud. The aquatic vegetation consultant working on our APM Plan also found no invasive species. The time spent by our volunteers will partially offset our financial obligation toward the APM Plan cost, the bulk of which is being covered by WDNR grant monies awarded in early 2012. Looking forward, we always need more people looking for invasive species. If you would like to officially become part of the Kirby Lake AIS monitoring team, attending the excellent WDNR seminar in Spooner is well worth the investment of a Saturday morning. An hour or two each summer month slowly scanning and sampling a small part of the lake is all it takes after the training. If you'd like to join the team, please contact Dan Boxrud at dnboxrud@aol.com.

In addition, we will be recruiting inspectors to check incoming boats at the landing in May. Look for another volunteer opportunity.

In honor of George Moore, long time Town of Maple Plain representative on our Board who passed away more than a year ago, the Board "adopted" County Highway H from the Town Hall northerly past the Moore farm to the county line. The Moore family has expressed their thanks for recognizing George in this way. If you could assist with roadside cleanup three times this summer, please contact John Schultz at 651-770-2826. Although it's a long stretch, it's a fairly "clean" section of roadway and doesn't take long to complete.

Along the same line, the Board instituted a recognition program for those who give "above and beyond" to the benefit of the District. Although there will likely be one or maybe no recipient in any given year, three people were recognized in 2012. Bill Bay was recognized as the driving force in converting the Kirby Lake Association into the more formal Kirby Lake Management District. Mike Boland was recognized for his many years of service as an officer plus spearheading several efforts with the WDNR and other agencies. Bob Busby was recognized for his many years of diligent service, particularly in installation and operation of the aerator.

Have a safe and enjoyable summer at Kirby Lake!

Dear Kirby Lake Management District Member,

The Aquatic Plant Management (APM) Plan for Kirby Lake is near completion. It takes into account that the majority of property owners on the lake believe that the level of aquatic plant growth in the system has and still is increasing in distribution and density. Fortunately this increase in vegetation is not driven by the introduction of a non-native, invasive plant species like Eurasian water milfoil or curly-leaf pondweed. Unfortunately, this makes management to provide relief more difficult, as in general, large-scale management of native plants is not something the WDNR readily supports. Aquatic plants play an important role in lakes. They anchor sediments, buffer wave action, oxygenate water, use up available nutrients before algae can, and provide valuable habitat for fish and aquatic animals. They also help buffer the system from invasion by non-native aquatic invasive plant species. For these reasons and more, managing aquatic plants to provide nuisance and navigation relief, without causing undesirable changes is the main goal of management in Kirby Lake.

Aquatic plants can be managed by physical removal, application of herbicides, mechanical cutting or harvesting, and by manipulating the biological make up of the system. With physical removal aquatic plants are either raked or pulled from the lake by people power. Under certain guidelines this type of plant management does not require a WDNR permit or have high implementation costs, and is most protective of the existing lake conditions. Mechanical harvesting is often completed by a large floating weed cutting and removal machine. It is more large-scale than physical removal and very flexible, providing immediate and targeted relief with limited impacts to the existing lake conditions. It requires a WDNR permit and implementation costs run about $400-600 per acre for contracted services. To purchase a new harvester, the costs may range from $45,000 to $65,000.

Chemical herbicides are also effective at managing aquatic plants, but their use incurs greater scrutiny by the WDNR (particularly when chemically treating native plants), is not as immediate or flexible, requires pre and post treatment follow-up, a WDNR permit, and is just as expensive to implement as mechanical harvesting. Biological manipulation requires changing the existing makeup of the natural environment by adding something new, and is most commonly used to manage invasive species in lakes. Current conditions in Kirby Lake do not warrant its consideration.

The APM Plan recommends that the Kirby Lake Management District implement aquatic plant harvesting either by purchasing (with WDNR grant support) and operating its own equipment or by contracting harvesting services. Herbicide application as a long-term management strategy is not being recommended. It may however, be possible to complete an interim herbicide application in 2013, while harvesting details are being completed. Please answer the following questions related to the aquatic plant harvesting recommendation. Your input is wanted.

1) Would you support aquatic plant harvesting as a means to provide better access and navigation through nuisance growth vegetation?

___Yes ___No ___I need more information

2) If you support harvesting or just need more information, which means of implementation would you most likely support?

___Purchase and operation of harvesting equipment ___Contracting harvesting services

KIRBY LAKE MANAGEMENT DISTRICT
P.O. BOX 603, CUMBERLAND, WI 54829

DRAFT MINUTES FOR QUARTERLY COMMISSIONERS MEETING
March 2, 2013, 10:00 am, at Maple Plain Town Hall

I. CALL TO ORDER: at 10:02 by Ketz

II. COMMISSIONERS PRESENT: Ketz, Horstman, Meyer, Johnson, Boxrud

III. COMMISSIONERS ABSENT: Stewart, Schultz

IV. GUESTS: Dave Blumer, SEH

V. PUBLIC COMMENTS:

A. Aquatic Plant Management Plan input

1. Presentation by Dave Blumer on content of Plan: Dave Blumer updated the Board, using a Power Point presentation, on the final edits to the plan which has also been submitted to the WDNR for review. Much discussion, particularly on how to approach harvesting nuisance native plants. Owning a harvester allows for great flexibility on when we could harvest plants. On the other hand, the capital cost of buying ($45,000 to $65,000), maintaining and operating a harvester is quite high compared to the cost of annually hiring a contractor to harvest 20' wide navigation channels and 10' wide dock access lanes in late June ($2,000 to $3,000). Dave Blumer suggested that a Board member contact Alex Smith at the WDNR to make any inquiries as to plan approval status and timing. Boxrud agreed to contact Alex about: the concern around the many commitments in the 5 year plan, likelihood of approval of a recreation grant for a harvester, whether we can harvest to a 2' water depth, any concerns Alex may have about the plan, and the likely approval schedule. Blumer will develop budget costs for the items listed in the 5 year plan.

2. Input solicited from membership: No members in attendance. Blumer indicated he had 6 responses all supporting harvesting, split between purchase of a harvester and contracting. It was decided to again solicit input at the May 25 meeting when more owners will be at the lake. The meeting was moved to 1:00 to accommodate Blumer's schedule. Boxrud will send out another newsletter about the APM Plan. Blumer will provide a less cluttered map of the proposed harvesting plan for inclusion with the newsletter. Blumer provided a data stick with his Power Point presentation and a PDF version of same. Blumer will also post the plan document on SEH's client access site (like a web site) so anybody can access the full document.

B. Other: No members in attendance.

VI. APPROVE MINUTES:

A. December 8, 2012 meeting: Meyer moved approval as is, Johnson seconded. All ayes.

B. January 12, 2013 meeting: _____moved approval as is, _____seconded. Meyer and Boxrud abstained in that they were not in attendance, the remainder all voted aye.

VII. COMMITTEE REPORTS:

A. Aquatic Plant Research Committee: Not in attendance.

VIII. CHAIR REPORTS: Ketz noted his intent to offer a moment of silence at the annual meeting in recognition of those who have passed away this past year.

IX. TREASURER'S REPORT: Meyer presented a report covering all of the following. Report approved as presented.

A. Bills paid since last report

B. Bills to be paid: Advocate and Barron Electric.

C. Status of investments

D. Status of funds

X. OLD BUSINESS:

A. Records Retention Policy

1. Review records which could be destroyed if adopted: Boxrud reported that one box of records going back to the Association days could be discarded regardless of policy, and that the volume of other records is not overwhelming, so adopting the policy, or not, based on storage requirements is not significant. Considering possible legal ramifications, it was agreed a policy should be adopted and old records discarded per the policy.

2. Vote to approve policy: Meyer said she had the original document and would be willing to make changes per adoption. Several amendments were offered. With those amendments, Johnson moved, Meyer seconded, approval of the policy. All ayes. Meyer will forward a clean copy with the amendments for our files. Boxrud and Meyer will then screen files for extraneous information and discard.

B. Aquatic Plant Management Plan approval: Boxrud moved approval of the plan with a change in allowing harvesting of access lanes in waters as shallow as 2'. Johnson seconded. All ayes. Boxrud will convey this approval to Alex Smith at the WDNR. If this change is not allowed, the Board will need to reconsider.

C. CBCW volunteer coordinator needed: Meyer volunteered. Boxrud reminded her that we had committed 80 hours to this effort and that 9 weekend days in May at 8 hours per day plus 8 hours of coordinator time will satisfy the APM Plan grant requirements.

D. Wisconsin Lakes Partnership Convention attendance volunteer: Boxrud indicated the convention is April 9-11, with the instructional session for lake districts on April 9. Early bird discount registration ends March 19. There are no volunteers.

XI. NEW BUSINESS:

A. Township news: New pickup.

B. County news: Nothing notable.

C. Volunteer(s) for nominating committee: The seats held by Ketz and Stewart are up. Meyer indicated that Joel Meyer may be willing to volunteer.

D. Other: Meyer indicated that she has gotten inquiries on an updated membership information binder. She found the original documents and would be willing to make any updates. Boxrud will send corrections he has noted during mailings.

XII. ADJOURN

Aquatic Plant Management for Kirby Lake, Barron County

Background, Goals, Objectives, and Recommendations

March 2, 2013

Aquatic Plant Management Planning Project

In 2011, the Kirby Lake Management District requested a permit to harvest a non-native invasive shoreland plant called reed canary grass from the shallow water adjacent to much of the shoreline. This plant had overtaken much of the lake bed exposed during low water. When the lake level came back up, much of this plant material died and remained in the shallow water causing navigation issues and adding a tremendous amount of decaying plant material to the lake. The purpose for harvesting the dead and submerged reed canary grass was to help protect the lake from possible negative changes to water quality. The WDNR awarded the permit, under the condition that the Kirby Lake Management District pursue the development of an official Aquatic Plant Management Plan to guide aquatic plant management over five years beginning in 2013. This project is the result of that condition.

Kirby Lake has exceptional aquatic plant diversity and distribution, and at the present time, no non-native, invasive aquatic plant species other than reed canary grass. The density of native aquatic plant growth; however, does create nuisance level conditions preventing lake access and causing use issues for many property owners and lake users. As such, management of native aquatic plants to provide open water access and improved navigation is necessary.

The overall goal of aquatic plant management in the Kirby Lake is to protect this outstanding resource from degradation by protecting what is already there, maximizing prevention efforts for new invasions like curly-leaf pondweed and Eurasian watermilfoil through watercraft inspection and lake monitoring efforts, and limited management to improve lake use and access issues.

Individual goals associated with the Kirby Lake Aquatic Plant Management Plan include:

1. **Preservation, Protection, and Restoration.** Protect and restore the native plant species community in and around the lake to decrease susceptibility to the introduction of new aquatic invasive species
2. **Prevention.** Prevent the introduction and establishment of new aquatic invasive species through early detection and rapid response.
3. **Management.** Maintain common navigation channels and individual riparian access lanes in areas of nuisance native plant and reed canary grass growth via mechanical and manual control.
4. **Education and Awareness.** Continue public outreach and education programs on aquatic invasive species.
5. **Research and Monitoring.** Develop a better understanding of the lake and the factors affecting lake water quality through continued and expanded monitoring efforts.
6. **Adaptive Management.** Follow an adaptive management approach that measures and analyzes the effectiveness of control activities and modify the management plan as necessary to meet goals and objectives

Each of these goals has several objectives and recommendations to follow through with over the course of the five year plan.

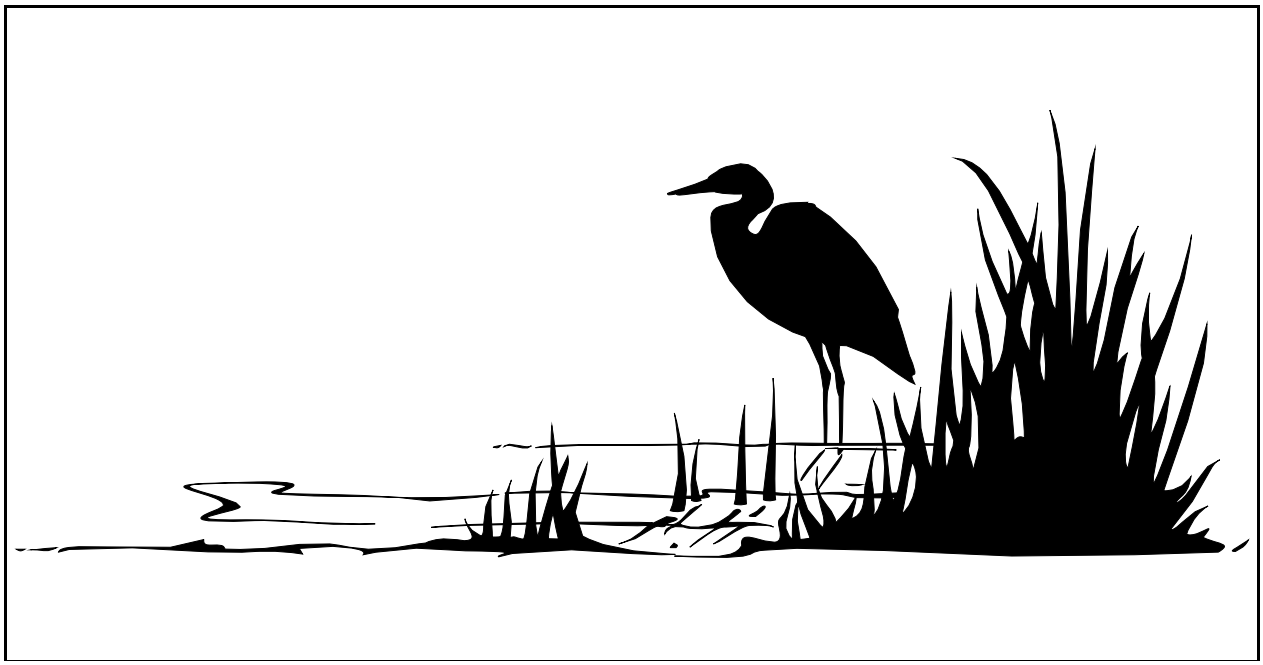
Public Project Documents:

- Draft Aquatic Plant Management Plan — 2.37 MB
- Kirby Lake Report — 681.9 KB
- Kirby Lake Management District 2013 Newsletter — 89.73 KB
- Cold Water Curly-leaf Pondweed and Full Warm Water Point-Intercept Aquatic Macrophyte Surveys — 3.78 MB
- Map — 4.59 MB
- Public Information and Survey — 42.27 KB
- Advantages and Disadvantages of Mechanical Harvesting of Aquatic Plants — 89.56 KB
- Aquatic Plant Management for Kirby Lake, Barron County - Background, Goals, Objectives and Recommendations - Presentation — 1.82 MB
- Kirby Lake Management District - 2012 Annual Meeting - Presentation — 1.75 MB

Appendix C

Guidelines for Protecting Sensitive Areas

GUIDELINES FOR PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSITIVE AREAS AND CRITICAL HABITAT



A companion document to help understand lake sensitive area and critical habitat reports

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GUIDELINES FOR PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSITIVE AREAS AND CRITICAL HABITAT

A companion document to help understand lake sensitive area and critical habitat reports

James M. Cahow
Water Resources Biologist
DNR, Northern Region, Barron

Richard R. Cornelius
Fisheries Biologist
DNR, Northern Region, Barron

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INTRODUCTION TO PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSTIVE AREAS AND CRITICAL HABITAT AREAS

This document was originally designed to be used in conjunction with specific lake sensitive area survey reports; **but it can also be useful to other parties interested in protecting lakes by helping them understand important factors which affect water quality and lake ecosystem health**. This document will concentrate on several main areas within the lake and its' shoreline areas that can be protected or restored to maintain water quality and lake ecosystem health. These main areas include aquatic plant sensitive areas, shoreline land use and lakeshore buffers, gravel and coarse rock rubble habitat, large woody debris, and various water regulations and zoning concerns.

This document will not attempt to deal with land use problems that do not fall within the immediate shoreline areas; although it should be recognized that lakes may have problems that occur in these outlying areas of their watershed resulting in significant nutrient and sediments additions that threaten the overall health of the lake ecosystem and should be dealt with through land acquisition and subsequent deed restrictions and implementation of non-point source control best management practices.

UNDERSTANDING AQUATIC PLANT SENSITIVE AREAS

The importance of aquatic plant communities is frequently underappreciated and their importance to a lake's ecosystem health misunderstood. This is often evident by the way people refer to aquatic plant habitat as problem weeds or weed beds. A weed by definition is a plant that is out of place or a plant of no value. The vast majority of native aquatic plants grow where they should be growing based on available light (water clarity & light penetration), water depth, and bottom substrate or soils and are not out of place and as previously stated are extremely important for the proper functioning of a healthy lake ecosystem and are an integral part of the biotic integrity.

Aquatic plants (macrophytes & algae) are the primary energy source upon which the rest of the lakes food chain is based and dependent upon. Fisheries are dependent upon them for cover, spawning habitat, important habitat and cover for fingerlings and young of the year, critical habitat for aquatic insects and other important food or forage species (minnows). They also serve an important function in reducing the shoreline erosion associated with

wave action while stabilizing sediments in place, and aquatic plants lock up available phosphorus which would otherwise be available to drive undesirable algae blooms.

Aquatic plants also provide many important functional values for wildlife: Loons require aquatic vegetation for their nests, and waterfowl and furbearers require aquatic vegetation for food and cover. Songbirds, shoreline water-birds, frogs and other amphibians, reptiles, and a host of other wildlife require aquatic vegetation for some critical need throughout different life cycles.

Use of Aquatic Herbicides

Because the potential ecological risks associated with aquatic herbicide applications are so high, most aquatic herbicide applications must be approved through the DNR permitting system and the application must be completed by a DATCP certified aquatic herbicide applicator. Those herbicides that don't require a DNR permit are often inappropriate for the existing site conditions or species present resulting in potential impacts without real nuisance relief.

The herbicides that don't require a permit are restricted to granular or pelletized forms and usually will only work in a narrow set of environmental conditions. If the site conditions include much of any fine flocculent sediments effectiveness can be dramatically reduced or eliminated. Many of these herbicides will work on only a limited number of species which may not even occur on the site increasing the importance of having a qualified applicator capable of identifying the species present and the site conditions which can limit herbicide effectiveness. In the long run most people would be far better off trying to limit vegetation by hand pulling or raking and if these are not feasible contacting a DATCP certified aquatic herbicide applicator to have them assess the different control methods suitable for the site.

In most cases aquatic herbicide applications should be discouraged because:

I. Less invasive or less destructive methods of control are feasible for the site and may include one or more of the following: mechanical harvesting, hand pulling, hand raking, hand cutting, and nutrient controls within the watershed. All too often herbicide treatments are conducted adjacent to private docks in situations where hand pulling or raking were easily a viable option and should have been the only allowable practice.

Before taking action, a careful assessment of existing conditions should be conducted and should include: importance of existing habitat areas, actual needs for clearing of aquatic plant habitat (navigational access does not require removal of all vegetation; only a reduction in density), and consideration of the cumulative impacts of removing aquatic plant habitat or treating it and the organisms living in it or around it with herbicides.

II. Can result in an overall reduction or fragmentation of important native aquatic plant habitat.

III. Creates openings in areas that should be colonized by native aquatic plant species. These openings provide increased opportunities for exotic species to become established in the lake and once established provide opportunities for their expansion.

IV. Results in direct and indirect mortality of sensitive or intolerant immobile species such mussels and other invertebrates. Some treatments can also result in the gradual build up of copper in the lake bed sediments to the point of being toxic to aquatic organisms. Several lakes in Northwestern Wisconsin have already reached or are approaching copper concentrations or levels that would be toxic or considered a lethal dose to 50% (LD50) of selected aquatic organisms exposed to similar concentrations under laboratory conditions. A serious problem that needs to be carefully considered is that copper does not break down, and it continues to build in concentration in the lake bed sediments with each subsequent treatment containing copper.

If people are going to treat aquatic plants they must understand that the available phosphorus will be expressed in larger plants or algae. Any attempts to suppress the expression of the available phosphorus will usually be very short term (7 days). It is difficult to justify adding toxic chemicals which do not break down and continue to build up towards toxic levels with each subsequent treatment. For this reason, aquatic herbicide treatments containing copper should be restricted to exceptional circumstances and not used on a regularly reoccurring basis.

V. If the average landowner width is l00’ or less and the minimum effective herbicide treatment width of 30’ is applied by most shoreline property owners around a lake, the cumulative impacts of the treatment could eliminate or seriously impact greater than 30% of the available habitat. This reduction in available habitat can result in an even greater percentage reduction in the overall fish populations for the lake. Elimination of habitat in even a small percentage of a lake, especially in critical habitat areas, can cause the collapse of a fishery.

VI. Aquatic plants lock up available phosphorus which would otherwise be available to drive undesirable algae blooms.

VII. Aquatic plants serve an important function in reducing the shoreline erosion associated with wave action while stabilizing sediments in place.

VIII. Aquatic plant management staff routinely hears complaints from shoreline property owners who expected their contracted aquatic herbicide application to eliminate all of the vegetation from the treatment area for a significant portion of the summer period. Most aquatic herbicides are effective on only a portion of the total aquatic plant community at a given site (species selective).

Free-floating species such as coon tail (*Ceratophyllum* sp.) and duckweed (*Lemna* sp.) also often drift back into treated areas with the next pervasive wind, eliminating the benefits they had expected from the chemical treatment. Other species such as Elodea, curly-leaf pondweed, milfoil, and other species easily fragment at times of the year and also drift into treatment areas eliminating or reducing the benefits of the previous treatment.

Hand raking or pulling near docks and in front of private developed properties eliminates the guess work out of what will be removed or eliminated when compared to expensive herbicide treatments with health concerns, use restrictions, and limited effectiveness.

Recent changes affecting mechanical removal and hand pulling of aquatic vegetation

Prior to the passing of Senate Bill 55 in September 2001, mechanical removal of aquatic plants was unregulated provided the lake bottom was not disturbed, the cut plants were removed from the lake and not allowed to drift free, and the plants cut and removed did not include rice or those that are a part of a floating bog mat.

As exotic species, such as Eurasian Watermilfoil, expand their distribution within the state, more opportunities for spreading these exotics will occur. The risk of an exotic becoming established in a new lake is dramatically increased if the native species of aquatic plants that normally occupy a specific habitat type have been eliminated or reduced. When exotics are introduced into an area they have to find a suitable location to become established. If all the suitable growing sites are occupied by native species the exotic will have a much more difficult time establishing a reproducing population.

The Department has recently developed the necessary administrative rules within NR 109 to comply with the legislative mandates of SB 55. These focus on protecting native aquatic plant habitat to reduce the risk of exotic species invasions, while also recognizing the importance of protecting and maintaining the native aquatic plant habitat and the functions it performs in maintaining overall lake health. These rules limit shoreline removals of aquatic plant habitat without a permit to less than a 30' width; with the restrictions that this 30' width also include docks and other human activity areas that result in the loss or degradation of aquatic plant habitat.

If individual shoreline owners would like to consider removing vegetation by hand pulling or raking in widths greater than 30' they must apply for an aquatic plant management permit with their local DNR aquatic plant management specialist. It is unlikely that the Department will approve many alterations beyond the standard 30' width because of the concerns related to: creating more areas devoid of native vegetation which increases opportunities for possible colonization sites for exotics, cumulative losses of overall habitat, and the fragmentation and degradation that impairs the remaining habitat.

Summary of management recommendations for the protection and restoration of aquatic plant communities

The following management recommendations provide some basic concepts that can be used or implemented to insure the long term health of aquatic plant communities and the overall health of lakes ecosystems.

1. Prohibit chemical treatment of aquatic plants accept under extenuating circumstances such as:
    A. The habitat to be treated is a dominant feature in the lake and the cumulative treatment of small areas will not reduce the overall percentage of coverage from historic coverages.
    B. There is no other management alternative that will work to clear necessary navigational access channels identified in a Department approved management plan (post 2000)
    C. Treatment will not result in a loss of critical habitat
    D. It can be shown that chemical treatment will result in an improvement to the overall health of the ecosystem.
    E. A serious use problem clearly exists
2. Discourage mechanical harvesting of aquatic plants in most circumstances. Clear only Department approved NR 109 permitted navigational channels 20'-30' wide. If small areas adjacent to docks are to be cleared of vegetation hand raking or pulling should be used if at all possible. Please consider the cumulative impacts if everyone was to duplicate the actions you take on your property around the rest of the lake.
3. Educate lake users about the value and importance of native aquatic plant habitats. Lake districts and associations should try to educate new property owners as soon as possible about the value of critical habitat and the laws associated with protecting lakes and lake front property.
4. Apply aggressive erosion control measures to all bare soil areas
5. **Protect** existing natural plant cover in upland areas within at least a 50'-60' corridor of the water's edge and **reestablish** an **effective buffer** of natural plant cover where it has been eliminated. This corridor or buffer is an important component in protecting water quality and habitat against eutrophication and sedimentation and provides critical habitat for our shoreline species of wildlife. Lake districts and associations should try to educate new property owners as soon as possible about the value of **shoreline buffers** and the laws associated with protecting lakes and lake front property.

6. Encourage the strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
7. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
8. Encourage the requirement of mandatory erosion control plans for all building permits that require ground breaking
9. Filling, dredging, or other shoreline or littoral zone alterations covered by chapter 30, Wisconsin Statutes, should be prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem.
10. Lake districts should carefully consider the value of purchasing shallow water bays with extensive aquatic plant communities to insure that future development does not result in an impact or a loss of this valuable habitat.

SHORELINE LANDUSE AND LAKESHORE BUFFERS

The impacts that can result from shoreline development can be greatly reduced if done carefully with respect to the many important functional values that must exist to maintain a healthy lakes ecosystem. Natural shoreline vegetation provides important protection for lake water quality as well as ecosystem health and should be maintained for at least a 50-60' buffer strip adjacent to any waterbody. If shorelines have a steeper gradient than 10-15% the buffer strip width should be increased. Access corridors through this buffer zone are restricted by most county zoning regulations. Restrictions usually prevent the clearing of woody vegetation and mowing to no more than a 30' width of the shoreline. Property owners that care about the health of their lake's ecosystem can go a step further by reducing the clearing of vegetation to a narrow foot path. The best design for a foot path is an irregular trail that does not go in a direct line to the lake but has irregular meanders much like a stream with small berms and humps to prevent runoff from flowing directly down the path and preventing the path from become an area of concentrated flow for the direct delivery of sediments and nutrients.

The importance of maintaining the zone of no disturbance of the natural vegetation along the lake shoreline is important for several reasons. As land is cleared and developed irregular surface areas are lost, leveled, and filled in by earth moving equipment, reducing infiltration and increasing runoff. The natural spongy layer of decaying leaves and plant matter is also

removed further reducing infiltration and increasing runoff. Soil porosity is also decreased, decreasing infiltration and increasing runoff. As we lose or simplify the layers present (trees, shrubs, and unmowed herbaceous ground cover) in the shoreline areas we decrease the layers present for the interception of rainfall; each layer present reduces the energy and volume of rainfall striking the grounds surface thereby reducing what is available for the mobilization and transport of sediments and nutrients from the ground's surface to the lake. The greater the volume of runoff the more energy available for the transport of nutrients and sediments from surrounding land uses into the lake to drive algae blooms and bury important shoreline habitats.

Shoreline buffers also increase the buildup of leaf litter forming a spongy layer to absorb more precipitation and runoff reducing the amount of sediment and nutrients reaching the lake and negatively impacting water quality and habitat. The denser unmowed vegetation also filters sediments and nutrients from runoff.

Each of these three layers (trees, shrubs, and herbaceous ground cover) provides different important habitat components for different life cycle requirements of various wildlife. If any one layer is missing the ability of certain wildlife species to survive may be compromised. Leaving wider areas of uncut vegetation (Buffer Zones) increases the likelihood that adequate habitat will exist for many species of songbirds, which are at risk from the loss of this valuable lake shoreline habitat. Furbearers, raptors, frogs, deer, and other wildlife also benefit from these wider natural areas.

The aesthetic perspective also needs to be evaluated. Everyone likes to look out and see the lake, but very few people like to look at an intensively developed shoreline that reminds them of the urban yards and hectic pace they were trying to get away from. Maintaining the natural wild character of a lake should be the highest priority guiding any development activities. Both man and wildlife will lose if the natural character is allowed to be manipulated to the point our lakeshores begin to resemble urban yards and lawns. This emphasizes the importance of insuring that development is done carefully to maintain as many of the important functional values that the natural undeveloped shoreline had.

The restoration of a naturally vegetated buffer for at least 50'-60' from water's edge should be a very high priority for properties that have been cleared or converted. As previously stated a healthy buffer includes the native trees, shrubs, and herbaceous ground cover that would naturally have

existed on a given site or location. The native species can usually be identified by looking at undeveloped shoreline areas.

Summary of management recommendations for the protection and restoration of natural vegetative shoreline buffers

1. Educate landowners about the importance of a healthy lakeshore buffer
2. Encourage the strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
3. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
4. Encourage the requirement of mandatory erosion control plans for all building permits that require ground breaking
5. Provide direct oversight of all building crews and insure that as little as possible of the natural plant cover is disturbed during the construction phases.
6. Utilize only the native indigenous species for shoreline buffer restoration efforts and carefully consider site limitations (soil type, soil moisture regime, and shade preferences of plantings) when selecting appropriate species. Restoration efforts should follow a least disturbance scenario; by first halting mowing within at least the shoreline buffer zone (35' back from the water's edge and with no more than 30' width of the shoreline cleared for access purposes; landowners that care about the health of their lake ecosystem are encouraged to go beyond the minimum requirements of the law and increase buffer width and decrease the length of shoreline cleared of vegetation for access). It is important to remember that any ground breaking activities increases the opportunity for transport of sediments and nutrients into the lake; especially within the lakeshore buffer zone.

   Landowners should expect that initial recovery of the natural vegetation within the ground cover layer may take one or two full growing seasons, after halting mowing activities. Vegetation can usually re-establish itself from the natural seed bank available within the existing soils and from the seeds and rootstalks of adjacent plant communities. Plug plantings of the native herbaceous groundcover species can be used to achieve adequate density and diversity if recovery appears to be sparse in successive years. Supplemental

plantings to establish adequate densities for the tree and shrub layer will have to be used in most situations.

The native species that should be used to restore the lakeshore buffer in order to provide the proper habitat and water quality protection functions necessary to insure a healthy Northern Wisconsin lake ecosystem are available through County Land and Water Resources District Conservation staff; please refer to the list of contact names and numbers at the end of this document.

ZONING AND REGULATION CONSIDERATIONS FOR LAKE PROTECTION

Filling, dredging, or other shoreline or littoral zone alterations covered by chapter 30, Wisconsin Statutes, should be prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem. Sea-walls should not be used and sand blankets should not be allowed in almost all situations. Rock rip-rap should be used only when anchoring difficult shorelines with problematic erosion which cannot be handled with just restoration of the native vegetation. If questions arise or problem areas exist, lakeshore property owners should call their local DNR Water Regs Staff for assistance or to report a problem area which may be negatively impacting lake water quality or habitat. A list of locally available technical assistance contact names and phone numbers is provided at the end of this document for easy reference.

County shoreland and wetland zoning regulations apply to the areas within 1000 feet of lakes, ponds, and flowages and within 300 feet of rivers, streams, and creeks. The intent of zoning regulations is to promote wise land use planning while allowing careful development around our precious surface water resources. Most of the counties in northwestern Wisconsin now have lakes classifications which require or prescribe certain setbacks for all structures and the maintenance or re-establishment of shoreline buffers to protect water quality and habitat needs. Most of them **as a minimum** allow for reasonable use of shoreline areas by allowing a 30' wide access/viewing corridor through the buffer. The remainder of the lot from the water's edge back 35'should be restored to a natural condition with trees, shrubs, and unmowed herbaceous ground cover including various grasses, sedges, forbs, and wildflowers.

On more sensitive lakes, county classifications may require or prescribe a wider buffer width and lakeshore property owners are encouraged to contact

their **local county conservationist** and determine what the specific requirements are for shoreline buffers on their lake. A list of locally available technical assistance contact names and phone numbers is provided at the end of this document for easy reference.

In all cases during development, the maintenance of a naturally vegetated buffer zone is critical to preserve a healthy lake ecosystem. In situations where the vegetation has been removed or altered landowners are encouraged to reestablish a buffer zone composed of the natural plant communities that belong there. For technical assistance in restoring your shoreline buffer please contact your local county conservationist or county shoreline BPM technician using the names and numbers provided at the end of this document. This ensures that you not only get water quality protection, but you also get the important functional values that the native plants provide for food and cover for shoreline species of wildlife dependent upon them.

EROSION CONTROL DURING LOT DEVELOPMENT

This is one area that can have a dramatic effect on water quality and habitat if it is not done correctly. The volume of sediments and nutrients that can be transported to a lake during the construction phase can equal the amount that would normally have only come off from the same parcel of land over a period of hundreds of years. The compounding effect of this nutrient load can have a dramatic effect on long term lake water quality. By following some basic rules during the construction phase we can keep most of these sediments and nutrients in place and prevent them from becoming a part of the lakes internal nutrient cycle that could cause a shift from a clear lake to one that has ample nutrients to drive extensive algae blooms each year.

Adequate soil erosion control measures and their proper maintenance during construction are very important and should become a very high priority for individual property owners. Lake association members could play an active part in reaching property owners before the damage is done or minimizing impacts by identifying active sites that need erosion control measures and contacting property owners to encourage proper implementation of erosion control measures. County zoning staff and officials need public support to get more effective zoning regulations on the books. Public support needs to be expressed if adequate county staff are to be hired to meet the increasing demands that are being placed on them by expanding development. As is most counties suffer from inadequate staff to deal with existing work demands. Mandatory erosion control plans should be a requirement for all

building permits that will involve ground breaking. This needs to be coupled with adequate staff to insure that erosion control plans are being followed and properly implemented and that erosion control measures are properly maintained. More recently county governments have begun to deal with these difficult issues.

Until county wide erosion control ordinances can be established it is strongly recommended that individuals require contractors to develop erosion control plans prior to the initiation of any construction, then the landowner should ensure that it is adequate. Aggressive follow through after construction has begun is also important to insure erosion control practices are properly implemented and maintained.

By giving erosion control careful consideration prior to construction serious impacts to our lakes and streams can be minimized or avoided entirely. Yards can be designed with subtle berms to divert runoff into internally drained areas or into constructed depressions to allow sediments and nutrients to settle out and be trapped before reaching our streams and lakes. Silt screen fences, properly installed during construction can protect against "sheet" runoff. Other erosion control methods are required on steep slopes or difficult sites. Your county land conservation staff or DNR technical support can provide expert advice about erosion control.

Protect all top soil piles by properly locating them away from drainage ways and as far away from the lake as possible. Surround them with a ring of silt screen fence while also seeding them down with an annual rye grass to provide additional stabilization until they are needed.

Never divert rainfall runoff from driveways, roofs, or access roads directly to the lake through drain tiles, culverts, or waterways. Instead, divert runoff into internally drained areas, constructed depressions to allow for settling of sediments and nutrients, or at least into a thickly vegetated site that will provide some degree of filtration and infiltration of runoff.

Management recommendations for constructions site erosion control

1. Minimize disturbance of natural plant communities within shoreline areas (50'-60' from water's edge) so they can continue to act as a buffer protecting lake water quality by filtering runoff and providing for infiltration before it reaches the lake.
2. Provide direct oversight of the construction crew during development. Insure that clearing of vegetation is kept to the minimum needed to accomplish the desired construction and avoid any disturbances within at least 50'-60' of any shoreline
    A. Insure that silt screen fences are installed and maintained.
    B. Apply mulch to all bare soil areas that may be exposed to precipitation during none work hours, and especially make sure mulch is applied before weekends. Purchase and use excelsior erosion control mats and other products where necessary.
    C. Provide coarse gravel and crushed rock cover for all areas that have regular heavy equipment traffic, i.e. driveways. Keep all vehicle traffic confined to these protected road surfaces.
    D. Include landscape designs for the protection of water quality i.e., such as holding ponds and depressions which provide for the opportunity to capture and hold runoff while maximizing infiltration and allowing sediments and nutrients to settle out.
    E. Try to eliminate or minimize areas of concentrated flow by reducing the surface area draining through a single path or channel and encouraging flow over multiple paths into depressional areas through the use of berms and other best management practices (BMPs).
3. Report serious erosion control problems that aren't being dealt with in a timely manner; before, they can result in significant impacts to water quality and habitat.

PROTECTION OF GRAVEL AND COARSE ROCK RUBBLE HABITAT

Gravel and coarse rock rubble free of silt and sediments are critical to the successful reproduction of some walleye stocks. Gravel and coarse rock rubble free of silt and sediments are also critical to the survival of different components of the aquatic food chain that supports a healthy lake ecosystem, including aquatic insects, crayfish, and other forage or food species. The greatest threat to these critical habitats is shoreline development that is not accomplished in a manner that maintains an adequate buffer of undisturbed land and does not implement and maintain proper erosion control measures. This buffer is particularly important during ground breaking and construction of lake shoreline areas, because it traps sediments and nutrients within the vegetation and irregular surface areas and small depressions preventing them from reaching the lake and driving algae blooms or burying important habitat.

Summary of management recommendations for the protection of rock rubble *walleye spawning* habitat

1. Educate landowners about the importance of a healthy lakeshore buffer (filter out sediments)
2. Encourage the strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
3. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
4. Encourage the requirement of a mandatory erosion control plan for all building permits that require ground breaking
5. Provide direct oversight of all building crews and insure that as little as possible of the natural plant cover is disturbed during the construction phases.
6. Do not use sand blankets to convert natural bottom types to sterile beach sand.
7. Filling, dredging, or other shoreline or littoral zone alterations covered by chapter 30, Wisconsin Statutes, should be prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem.

MAINTENANCE OF LARGE WOODY DEBRIS

Large woody debris or trees should be left in the lake as they naturally collapse and fall into the lake. Large woody debris is often overlooked for its importance in providing critical fish habitat. Species such as largemouth bass require some sort of cover to successfully nest and rear offspring. Bluegills and other species also benefit from the presence of large woody debris. The conversion or removal of natural plant cover within a 50'-60' corridor of the lake reduces or eliminates completely the opportunity for the replacement of large woody debris as well as other important functional areas important the any lake's ecosystem health and should be discouraged. The way we look at large woody debris should in the context of its importance to the health of the lake ecosystem. Pre-formulated perceptions drawn from urban experiences or practices used in urban areas can be very destructive to the way natural environments function in a complex interconnected fashion. A shoreline ringed with fallen trees should not be looked at as untidy or unkempt but one that is providing important habitat for fish and wildlife. Fishermen have recognized for decades that fallen trees are often some of the best habitat to fish for bass and panfish. This emphasizes the need to re-assess our value system and begin leaving them for important habitat. Fisheries managers in recent years have begun to increase their educational efforts in this particular area but still have a majority of the public to reach with this important message.

Management recommendations for woody debris

1. Educate lake shore owners about the value of allowing trees to fall into the lake naturally in order to provide valuable habitat for fish and wildlife.
2. Encourage lake shore property owners to become involved in the long term planning for woody debris on their property. Plant young trees for the replacement of older trees.

USE OF FERTILIZERS ON LAKE SIDE LAWNS

From a water quality standpoint lawn fertilizers are a recognizable source of nutrients that property owners can eliminate or control through proper application. More is not better. Landowners are also encouraged to strongly consider the consequences of having a large lawn that extends into the recommended buffer area (within 50'- 60' of the lakeshore). By reducing your lawn size you not only reduce the amount of sediments and nutrients entering the lake you also provide important habitat necessary to support Wisconsin's wildlife species dependent upon this important shoreline habitat that is quickly disappearing in the face of increasing development pressures. Another benefit to decreasing lawn size is the reduction in work load necessary to maintain it; hence you can spend more time relaxing and enjoying your property.

If you feel the need to fertilize your lawn have your soil tested for phosphorus and potassium levels. When applying fertilizers consider the need to have soil phosphorus levels at the maximum recommended level. By applying fertilizers at a lesser rate you can still enhance your lawn without the increased risk of having excess drain into the lake to drive undesirable algae blooms. Remember that fertilizer suppliers are in the business to sell chemicals. The recommended bag application rates are often too high. Get advice from your county or university extension offices and remind them that you are applying the fertilizers to a lakeshore lawn and do not want to over-apply.

Never burn brush or leaves, especially along the lakeshore, in road ditches, or in drainage ways that drain into the lake. The ashes are very high in phosphorus and nitrogen and are soluble in rainwater. The best way to deal with leaves is to compost them. Spreading them in a wooded area that does not drain to the lake is also a good way to deal leave disposal. If neither of these is an option, bag your leaves and take them to a yard waste collection site for proper disposal.

Do not remove grass clippings from lawns. They contain all the nitrogen and phosphorus your lawn needs which you will not have to replace with annual fertilizer applications. Use a mulching lawnmower it recycles the clippings into your lawn more efficiently. Never spread wood stove ashes in areas draining to the lake; instead dispose of them with your household garbage during normal refuse pickup times.

Management recommendations for fertilizer use

1. Apply fertilizers only if a soils test has determined that it is nutrient deficient and add less than the maximum recommended.
2. The use of a low phosphorus content fertilizers or no-phosphorus fertilizers is strongly recommended if the fertilizer is to be applied on lakeshore property.

SEPTIC SYSTEM MAINTENANCE AND NECESSARY REPLACEMENT OF OLD FAILING SYSTEMS

Failing septic systems can pose a significant threat to water quality, especially when large portions of shoreline are developed and when the overall percentage of a lakes watershed is dominated by lakeshore properties. Septic systems that are older than 20 years should be looked at to insure that the filtration field is properly functioning and that waste is not perching above the drain field and entering the lake directly without adequate filtration of nutrients and other components. There is no specific rule that septic systems have to be evaluated to determine if they are functioning properly, unless there is a complaint filed.

It is generally recommended that you have your septic system pumped of the normal sludge buildup every two to three years. This sludge removal is essential for maintaining the absorptive capacity of your drain field.

Inspect your system regularly for surfacing effluent around the drain field. Are there wet areas or strong odors? Do the drains in your home seem to work properly or are they sluggish? Do they make noisy gurgling sounds? If your septic system has any of these systems you should have it inspected by a licensed installer.

Never make any changes to your sanitary system or wastewater piping. This work must be done by a licensed installer. It is not only dangerous to health and human safety, as well as water quality, it is also illegal and can result in fines or penalties.

Avoid using a garbage disposal with private septic systems. Put kitchen scraps in a compost pile if at all possible; otherwise, as a last resort put them in with your household garbage. Limit the use washing machines, if possible. Laundry wash water is high in lint, synthetic fibers, and pet hair all of which can cause premature failure of your drain field. Use a commercial laundry if possible or if you are a weekend resident with a lakeshore septic

system wait until you return to your midweek residence with public water and sewer.

A septic system is only intended to break down organic wastes. Never put solvents, furniture stripping solutions, degreasers, petroleum compounds, oil based paints and stains, or other chemicals into your sanitary system.

Diverting sink and shower drains (so called gray water) to lawns and other properties adjacent to the lake will not only impact lake water quality it is also illegal. Gray water must be run through your septic system to allow for the proper filtration of pollutants. There are no exceptions to this without first obtaining necessary permits.

Appendix D

NR 109

Chapter NR 109

AQUATIC PLANTS: INTRODUCTION, MANUAL REMOVAL AND MECHANICAL CONTROL REGULATIONS

NR 109.01 Purpose. The purpose of this chapter is to establish procedures and requirements for the protection and regulation of aquatic plants pursuant to ss. 23.24 and 30.07, Stats. Diverse and stable communities of native aquatic plants are recognized to be a vital and necessary component of a healthy aquatic ecosystem. This chapter establishes procedures and requirements for issuing aquatic plant management permits for introduction of aquatic plants or control of aquatic plants by manual removal, burning, use of mechanical means or plant inhibitors. This chapter identifies other permits issued by the department for aquatic plant management that contain the appropriate conditions as required under this chapter for aquatic plant management, and for which no separate permit is required under this chapter. Introduction and control of aquatic plants shall be allowed in a manner consistent with sound ecosystem management, shall consider cumulative impacts, and shall minimize the loss of ecological values in the body of water. The purpose of this chapter is also to prevent the spread of invasive and non−native aquatic organisms by prohibiting the launching of watercraft or equipment that has any aquatic plants or zebra mussels attached.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03; **correction made under s. 13.92 (4) (b) 7., Stats., Register March 2011 No. 663.**

NR 109.02 Applicability. A person sponsoring or conducting manual removal, burning or using mechanical means or aquatic plant inhibitors to control aquatic plants in navigable waters, or introducing non−native aquatic plants to waters of this state shall obtain an aquatic plant management permit from the department under this chapter.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.03 Definitions. In this chapter:

(1) "Aquatic community" means lake or river biological resources.

(2) "Beneficial water use activities" mean angling, boating, swimming or other navigational or recreational water use activity.

(3) "Body of water" means any lake, river or wetland that is a water of this state.

(4) "Complete application" means a completed and signed application form, the information specified in s. NR 109.04 and any other information which may reasonably be required from an applicant and which the department needs to make a decision under applicable provisions of law.

(5) "Department" means the Wisconsin department of natural resources.

(6) "Manual removal" means the control of aquatic plants by hand or hand−held devices without the use or aid of external or auxiliary power.

(7) "Navigable waters" means those waters defined as navigable under s. 30.10, Stats.

(8) "Permit" means aquatic plant management permit.

(9) "Plan" means aquatic plant management plan.

(10) "Wetlands" means an area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.04 Application requirements and fees. **(1)** Permit applications shall be made on forms provided by the department and shall be submitted to the regional director or designee for the region in which the project is located. Permit applications for licensed aquatic nursery growers may be submitted to the department of agriculture, trade and consumer protection.

Note: Applications may be obtained from the department's regional headquarters or service centers. DATCP has agreed to send application forms and instructions provided by the department to aquatic nursery growers along with license renewal forms. DATCP will forward all applications to the department for processing.

(2) The application shall be accompanied by all of the following unless the application is made by licensed aquatic nursery growers for selective harvesting of aquatic plants for nursery stock. Applications made by licensed aquatic nursery growers for harvest of nursery stock do not have to include the information required by par. (d), (e), (h), (i) or (j).

(a) A nonrefundable application fee. The application fee for an aquatic plant management permit is:

1. $30 for a proposed project to manage aquatic plants on less than one acre.

2. $30 per acre to a maximum of $300 for a proposed project to manage aquatic plants on one acre or larger. Partial acres shall be rounded up to the next full acre for fee determination. An annual renewal of this permit may be requested with an additional application fee of one−half the original application fee, but not less than $30.

(b) A legal description of the body of water including township, range and section number.

(c) One copy of a detailed map of the body of water with the proposed introduction or control area dimensions clearly shown. Private individuals doing plant introduction or control shall provide the name of the owner riparian to the management area, which includes the street address or block, lot and fire number where available and local telephone number or other pertinent information necessary to locate the property.

(d) One copy of any existing aquatic management plan for the body of water, or detailed reference to the plan, citing the plan references to the proposed introduction or control area, and a description of how the proposed introduction or control of aquatic plants is compatible with any existing plan.

(e) A description of the impairments to water use caused by the aquatic plants to be managed.

(f) A description of the aquatic plants to be controlled or removed.

(g) The type of equipment and methods to be used for introduction, control or removal.

(h) A description of other introduction or control methods considered and the justification for the method selected.

(i) A description of any other method being used or intended for use for plant management by the applicant or on the area abutting the proposed management area.

(j) The area used for removal, reuse or disposal of aquatic plants.

(k) The name of any person or commercial provider of control or removal services.

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

(b) Within 30 days of receipt of the plan, the department shall notify the applicant of any additional information or modifications to the plan that are required. If the applicant does not submit the additional information or modify the plan as requested by the department, the department may dismiss the aquatic plant management permit application.

(c) The department shall approve the aquatic plant management plan before an application may be considered complete.

(4) The permit sponsor may request an annual renewal in writing from the department under s. NR 109.05 if there is no change proposed in the conditions of the original permit issued.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.05 Permit issuance. (1) The department shall issue or deny issuance of the requested permit within 15 working days after receipt of a completed application and approved plan as required under s. NR 109.04 (3).

(2) The department may specify any of the following as conditions of the permit:

(a) The quantity of aquatic plants that may be introduced or controlled.

(b) The species of aquatic plants that may be introduced or controlled.

(c) The areas in which aquatic plants may be introduced or controlled.

(d) The methods that may be used to introduce or control aquatic plants.

(e) The times during which aquatic plants may be introduced or controlled.

(f) The allowable methods used for disposing of or using aquatic plants that are removed or controlled.

(g) Annual or other reporting requirements to the department that may include information related to pars. (a) to (f).

(3) The department may deny issuance of the requested permit if the department determines any of the following:

(a) Aquatic plants are not causing significant impairment of beneficial water use activities.

(b) The proposed introduction or control will not remedy the water use impairments caused by aquatic plants as identified as a part of the application in s. NR 109.04 (2) (e).

(c) The proposed introduction or control will result in a hazard to humans.

(d) The proposed introduction or control will cause significant adverse impacts to threatened or endangered resources.

(e) The proposed introduction or control will result in a significant adverse effect on water quality, aquatic habitat or the aquatic community including the native aquatic plant community.

(f) The proposed introduction or control is in locations identified by the department as sensitive areas, under s. NR 107.05 (3) (i) 1., except when the applicant demonstrates to the satisfaction of the department that the project can be conducted in a manner that will not alter the ecological character or reduce the ecological value of the area.

(g) The proposed management will result in significant adverse long−term or permanent changes to a plant community or a high value species in a specific aquatic ecosystem. High value species are individual species of aquatic plants known to offer important values in specific aquatic ecosystems, including Potamogeton amplifolius, Potamogeton Richardsonii, Potamogeton praelongus, Stuckenia pectinata (Potamogeton pectinatus), Potamogeton illinoensis, Potamogeton robbinsii, Eleocharis spp., Scirpus spp., Valisneria spp., Zizania spp., Zannichellia palustris and Brasenia schreberi.

(h) If wild rice is involved, the stipulations incorporated by *Lac Courte Oreilles v. Wisconsin*, 775 F. Supp. 321 (W.D. Wis. 1991) shall be complied with.

(i) The proposed introduction or control will interfere with the rights of riparian owners.

(j) The proposed management is inconsistent with a department approved aquatic plant management plan for the body of water.

(4) The department may approve the application in whole or in part consistent with the provisions of sub. (3). A denial shall be in writing stating the reasons for the denial.

(5) (a) The department may issue an aquatic plant management permit on less than one acre in a single riparian area for a 3−year term.

(b) The department may issue an aquatic plant management permit for a one−year term for more than one acre or more than one riparian area. The permit may be renewed annually for up to a total of 3 years in succession at the written request of the permit holder, provided no modifications or changes are made from the original permit.

(c) The department may issue an aquatic plant management permit containing a department−approved plan for a 3 to 5 year term.

(d) The department may issue an aquatic plant management permit to a licensed nursery grower for a 3−year term for the harvesting of aquatic plants from a publicly owned lake bed or for a 5−year term for harvesting of aquatic plants from privately owned beds with the permission of the property owner.

(6) The approval of an aquatic plant management permit does not represent an endorsement of the permitted activity, but represents that the applicant has complied with all criteria of this chapter.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03; reprinted to restore dropped language from rule order, Register October 2003 No. 574.

NR 109.06 Waivers. The department waives the permit requirements under this chapter for any of the following:

(1) Manual removal or use of mechanical devices to control or remove aquatic plants from a body of water 10 acres or less that is entirely confined on the property of one person with the permission of that property owner.

Note: A person who introduces native aquatic plants or removes aquatic plants by manual or mechanical means in the course of operating an aquatic nursery as authorized under s. 94.10, Stats., on privately owned non−navigable waters of the state is not required to obtain a permit for the activities.

(2) A riparian owner who manually removes aquatic plants from a body of water or uses mechanical devices designed for cutting or mowing vegetation to control plants on an exposed lake bed that abuts the owner's property provided that the removal meets all of the following:

(a) 1. Removal of native plants is limited to a single area with a maximum width of no more than 30 feet measured along the shoreline provided that any piers, boatlifts, swimrafts and other recreational and water use devices are located within that 30−foot wide zone and may not be in a new area or additional to an area where plants are controlled by another method; or

2. Removal of nonnative or invasive aquatic plants as designated under s. NR 109.07 when performed in a manner that does not harm the native aquatic plant community; or

3. Removal of dislodged aquatic plants that drift on−shore and accumulate along the waterfront.

(b) Is not located in a sensitive area as defined by the department under s. NR 107.05 (3) (i) 1., or in an area known to contain threatened or endangered resources or floating bogs.

(c) Does not interfere with the rights of other riparian owners.

(d) If wild rice is involved, the procedures of s. NR 19.09 (1) shall be followed.

(4) Control of purple loosestrife by manual removal or use of mechanical devices when performed in a manner that does not harm the native aquatic plant community or result in or encourage re−growth of purple loosestrife or other nonnative vegetation.

(5) Any aquatic plant management activity that is conducted by the department and is consistent with the purposes of this chapter.

(6) Manual removal and collection of native aquatic plants for lake study or scientific research when performed in a manner that does not harm the native aquatic plant community.

Note: Scientific collectors permit requirements are still applicable.

(7) Incidental cutting, removal or destroying of aquatic plants when engaged in beneficial water use activities.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.07 Invasive and nonnative aquatic plants. (1) The department may designate any aquatic plant as an invasive aquatic plant for a water body or a group of water bodies if it has the ability to cause significant adverse change to desirable aquatic habitat, to significantly displace desirable aquatic vegetation, or to reduce the yield of products produced by aquaculture.

(2) The following aquatic plants are designated as invasive aquatic plants statewide: Eurasian water milfoil, curly leaf pondweed and purple loosestrife.

(3) Native and nonnative aquatic plants of Wisconsin shall be determined by using scientifically valid publications and findings by the department.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.08 Prohibitions. (1) No person may distribute an invasive aquatic plant, under s. NR 109.07.

(2) No person may intentionally introduce Eurasian water milfoil, curly leaf pondweed or purple loosestrife into waters of this state without the permission of the department.

(3) No person may intentionally cut aquatic plants in public/navigable waters without removing cut vegetation from the body of water.

(4) (a) No person may place equipment used in aquatic plant management in a navigable water if the person has reason to believe that the equipment has any aquatic plants or zebra mussels attached.

(b) This subsection does not apply to equipment used in aquatic plant management when re−launched on the same body of water without having visited different waters, provided the re−launching will not introduce or encourage the spread of existing aquatic species within that body of water.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.09 Plan specifications and approval. (1) Applicants required to submit an aquatic plant management plan, under s. NR 109.04 (3), shall develop and submit the plan in a format specified by the department.

(2) The plan shall present and discuss each of the following items:

(a) The goals and objectives of the aquatic plant management and protection activities.

(b) A physical, chemical and biological description of the waterbody.

(c) The intensity of water use.

(d) The location of aquatic plant management activities.

(e) An evaluation of chemical, mechanical, biological and physical aquatic plant control methods.

(f) Recommendations for an integrated aquatic plant management strategy utilizing some or all of the methods evaluated in par. (e).

(g) An education and information strategy.

(h) A strategy for evaluating the efficacy and environmental impacts of the aquatic plant management activities.

(i) The involvement of local units of government and any lake organizations in the development of the plan.

(3) The approval of an aquatic plant management plan does not represent an endorsement for plant management, but represents that adequate considerations in planning the actions have been made.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.10 Other permits. Permits issued under s. 30.12, 30.20, 31.02 or 281.36, Stats., or under ch. NR 107 may contain provisions which provide for aquatic plant management. If a permit issued under one of these authorities contains the appropriate conditions as required under this chapter for aquatic plant management, a separate permit is not required under this chapter. The permit shall explicitly state that it is intended to comply with the substantive requirements of this chapter.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

NR 109.11 Enforcement. (1) Violations of this chapter may be prosecuted by the department under chs. 23, 30 and 31, Stats.

(2) Failure to comply with the conditions of a permit issued under or in accordance with this chapter may result in cancellation of the permit and loss of permit privileges for the subsequent year. Notice of cancellation or loss of permit privileges shall be provided by the department to the permit holder.

History: CR 02−061: cr. Register May 2003 No. 569, eff. 6−1−03.

Appendix E

Advantages and Disadvantages of Mechanical Harvesting

Advantages and Disadvantages of Mechanical Harvesting of Aquatic Plants (AERF, 2009)

Advantages

Water can be used immediately following treatment. Some aquatic herbicides have restrictions on use of treated water for drinking, swimming and irrigation. Also, plants are removed during mechanical harvesting and do not decompose slowly in the water column as they do after herbicide application. In addition, oxygen content of the water is generally not affected by mechanical harvesting, although turbidity and water quality may be affected in the short term. Nutrient removal is usually insignificant because only small areas of lakes (1 to 2%) are typically harvested; however, some nutrients are removed with the harvested vegetation. It has been estimated that aquatic plants contain less than 30% of the annual nutrient loading that occurs in lakes.

The habitat remains intact because most harvesters do not remove submersed plants all the way to the lake bottom. Like mowing a lawn, clipped plants remain rooted in the sediment and regrowth begins soon after the harvesting operation.

Mechanical harvesting is site-specific because plants are removed only where the harvester operates. If a neighbor wants vegetation to remain along his or her lakefront, there is no movement of herbicides out of the intended treatment area to damage the neighbor's site.

Herbicide concerns remain widespread despite extensive research and much-improved application and despite use and registration requirements enforced by local regulatory agencies. Mechanical harvesting, despite some environmental concerns (as outlined below), is perceived to be environmentally neutral by the public.

Utilization of harvested biomass is thought by many to be a means of offsetting the relatively high costs and energy requirements associated with mechanical harvesting. Unfortunately, no cost-effective uses of harvested vegetation have been developed, despite much research examining the utility of harvested plant material as a biofuel, cattle feed, soil amendment, mulch or even as a papermaking substrate. As much as 95% of the biomass of aquatic plants is water, so 5 tons of Eurasian watermilfoil yields only 500 pounds of dry matter. In addition, cut plants in northern lakes are only available for 3 to 4 months of the year.

Disadvantages

The demand for aquatic weed harvesters is very small, so the equipment associated with these operations is often custom-made and expensive.

The area that can be harvested in a day depends on the size of the harvester, transport time, distance to the disposal site and density of the weeds being harvested. These factors can result in a wide range of costs. The cost of harvesting is site-specific, but mechanical harvesting is generally more expensive than other weed control methods due to the variables noted above and

the generally high capital outlay required to purchase equipment that may only be used for 3 or 4 months per year.

Mechanical harvesters are not selective and remove native vegetation along with target weeds. By-catch, or the harvesting of non-target organisms such as fish, crayfish, snails and frogs along with weeds, may be a concern. Research on fish catch during mechanical harvesting of submersed vegetation has shown that 15 to 30% of some species of fish can be removed with cut vegetation during a single harvest. If the total area of a lake that is harvested is 1, 5 or 10% of the lake's area, this will likely be of little consequence. However, if the management plan for a 10-acre pond calls for complete harvests 3 times per year, then the issue of by-catch of fish deserves more consideration.

Regrowth of cut vegetation can occur quickly. For example, if hydrilla can grow 1" per day as reported, a harvest that cuts 5 feet deep could result in plants reaching the water surface again only two months after harvesting. Speed of regrowth depends on the target weed, time of year harvested, water clarity, water temperature and other factors.

Floating plant fragments produced during mechanical harvesting can be a concern because most aquatic weeds can regrow vegetatively from even small pieces of vegetation. If an initial infestation of aquatic weeds is located at a boat ramp, care should be taken to minimize the spread of fragments to uninfested areas of the lake by maintaining a containment barrier around the area where mechanical harvesting will take place. On the other hand, if a lake is already heavily infested with a weed, it is unlikely that additional fragments will spread the weeds further. However, homeowners downwind of the harvesting site may not appreciate having to regularly rake weeds and floating fragments off their beaches.

Disposal of harvested vegetation can be an expensive and difficult problem after mechanical harvesting. Research during a project in the 1970s on Orange Lake in Florida compared the costs of in-lake disposal to the transport, off-loading and disposal of cut material at an upland site. As water levels on Orange Lake decreased during a drought period, the mechanical harvester was allowed to off-load cut vegetation along the shoreline among emergent vegetation instead of transporting harvested plants to the shore for disposal. The cost of in-lake disposal reduced the per-acre cost by about half when compared to transporting the vegetation to shore, loading it into a truck and disposing of the plant material in an old farm field.

Some lakes or rivers may not be suitable for mechanical harvesting. If there is only one public boat ramp on a lake and it is not close to the area to be harvested, the costs of moving the cut vegetation from the harvester to shore will add significantly to the cost of the operation Harvesters are not high-speed machines and move at 3 to 4 mph, so if a river flows at 2 mph and the harvester has to travel upstream to the off-loading site, well, do the math! Off-loading sites usually must have paved or concrete surfaces because the weeds are wet and an unpaved off-loading site can quickly become a quagmire.

Appendix F

AIS Rapid Response Plan

AIS Rapid Response Plan for Kirby Lake, Barron County, Wisconsin

Monitoring

Continuous monitoring of the lake and the public access for the presence of EWM and CLP will be completed by trained Kirby Lake Management District (KLMD) volunteers, Citizen Lake Monitoring Network (CLMN) volunteers, watercraft inspectors, and others. KLMD volunteers will patrol the shoreline of Kirby Lake at least three times annually from May through October. In-lake inspection at the boat access site will be completed at least once a month from May through October by KLMD, CLMN, and other lake volunteers. Volunteers completing any monitoring will collect suspicious plants and document where they were found. Suspicious plants will be submitted to designated KLMD personnel, this consultant, Barron County AIS representatives, or the WDNR for vouchering.

Specimen Vouchering

Volunteers are asked to collect at least two samples of the suspicious plant including roots if possible and place them in a zip-lock bag marked with the date, time, and location in the lake where it was found. The samples should be kept refrigerated until they can be submitted to one of the following appropriate personnel:

Kirby Lake Management District	
Stuart Ketz, Chairman	612-280-4229
Dan Boxrud, Secretary	763-755-9097
Bob Busby, Aquatic Plant Research Committee	715-822-3668
SEH	
Dave Blumer, Lake Scientist	715.861.4925
Jake Macholl, Lake Scientist	715.861.1944
Barron County Soil and Water Conservation Department	
Tyler Gruetzmacher, County Conservationist	715.537.6315
Wisconsin Department of Natural Resources	
Kris Larsen, AIS Specialist - Spooner	715.635.4072
Alex Smith, Lakes Coordinator - Spooner	715.635.4124

Positive Identification

If EWM or CLP is positively identified in Kirby Lake, the WDNR and KLMD volunteers will install AIS warning signs at all private and public access points. Aquatic plant management, if any is occurring in the area where EWM or CLP was identified, will immediately cease until arrangements can be made for the completion of an intensive search for the suspected AIS in the immediate and nearby area in which it was found. If a sizable area of EWM or CLP is identified, marker buoys will be placed in the lake to keep boaters out of the infested area until management can be undertaken.

APM Plan Modification

If EWM or CLP is identified in the lake, the existing plant management plan will need to be modified to include the treatment of the new AIS. An evaluation will be completed to determine and implement the most effective short-term management option. If necessary, a WDNR AIS Early Detection and Response grant will be applied for to help implement recommendations made in the modified plan. Either in the same year or the year immediately following the new identification, a whole-lake plant survey will be completed to again look for the new AIS. A complete AIS control plan will be added to the next revision of the existing APM Plan.

AIS Activity Funding

The KLMD collects an annual tax from its members. If these monies are not enough to cover the cost of an AIS treatment program, the KLMD will seek donations from its constituency and benefactors, undertake fundraisers and apply for an AIS Rapid Response and Early Detection grant to obtain appropriate funds. AIS Rapid Response and Early Detection grants can be applied for at any time as they are not subject to pre-determined application dates. Up to $20,000.00 is available for management implementation and planning activities.

Appendix G

WDNR Annual Harvesting Permit Application

State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921

Mechanical / Manual Aquatic Plant Control Application

Form 3200-113 (R 3/04)

FOR DNR USE ONLY	
Date Received	ID Number
Fee Received	County Code
Exp. Date	WBIC

Notice: Information requested on this form is required to permit mechanical and/or manual aquatic plant control application, per s. 23.24, Wis. Stats. The Department will not issue a permit unless you complete and submit this application. Personally identifiable information collected will be used for program administration and will be available to requesters under Wisconsin's Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Section I: Applicant Data

Permit Applicant Name

Applicant Mailing Address

City | State | ZIP Code

Telephone Number | E-Mail Address

Applicant is

☐ Private Individual ☐ Contractor

☐ Lake Organization (Specify) _____

Lake Property Address, City, State, ZIP (if different)

Telephone Number | E-Mail Address

Individuals and organizations (e.g., Lake District, Lake Association, Property Owners Association, County Department of Recreation), sponsoring removal. Attach additional sheets if necessary.

	Name	Address	Phone	E-mail Address
A.				
B.				
C.				
D.				

Has a Lake Management plan been provided to the DNR? ☐ Yes ☐ No

If Yes, date approved of most current copy

Location of Applicant file copy

Does the proposed plant removal agree with the approved plan? ☐ Yes ☐ No
If NO, explain. Attach additional sheets if necessary.

Is this area within or adjacent to a Sensitive Area designated by the Wisconsin Department of Natural Resources?

☐ Yes ☐ No ☐ Don't Know If yes, list sites _____

Section II: Location of Aquatic Plant Removal and Disposal

Waterbody of proposed plant removal | Lake Surface Area (acres) | County | Town _____ Range _____ Section _____

Name of Firm (if sub-contracted) | Telephone Number

Street Address | City, State and ZIP

	¼ / ¼	¼	Section	Township N	Range E / W	County
Name of 1st Plant Disposal Site (if applicable)						
Name of 2nd Plant Disposal Site (if applicable)						

Area(s) Proposed for Plant Removal (Note details in permit cover letter for final permitted sizes). Please see attached sample drawing for guidance

1. Length from shore _____ ft. x Shoreline or area width _____ ft. / 43,560 ft. = _____ Estimated Acreage Avg. Depth _____ft.
2. Length from shore _____ ft. x Shoreline or area width _____ ft. / 43,560 ft. = _____ Estimated Acreage Avg. Depth _____ft.
3. Length from shore _____ ft. x Shoreline or area width _____ ft. / 43,560 ft. = _____ Estimated Acreage Avg. Depth _____ft.
4. Offshore Control Site Length _____ ft. x Shoreline or area width _____ ft. / 43,560 ft. = _____ Estimated Acreage Avg. Depth _____ft.
5. Offshore Control Site Length _____ ft. x Shoreline or area width _____ ft. / 43,560 ft. = _____ Estimated Acreage Avg. Depth _____ft.

TOTAL ESTIMATED ACREAGE _____

Section II: Location of Aquatic Plant Removal (cont.)

What type of aquatic plants below the Ordinary High Water Mark are proposed to be removed? (check all that apply)

☐ Emergent (above water level) ☐ Submergent (below water level) ☐ Floating Leaf (at the surface i.e. lilly pads)

Section III: Map & Property Ownership

Attach a copy of a lake map that includes the property(s) to be harvested. If no printed map is available, provide a sketch of the site at the bottom of this page. On the map, identify the following required information.

- Area and dimensions of each proposed plant removal area.
- Location of all riparian neighbors (property owners riparian to and adjacent to the proposed removal area) including project participants and non-participants. Consecutively number each riparian neighbor (both project participants and non-participants). In the space below:
- Name all riparian owners, including project participants & non-participants. The number should correspond with the numbered properties on the map. Attach additional sheets if necessary.
- Check Yes box to indicate project participants and No box for non-participants.

No.	Name of Riparian Neighbor	Project Participant	Control dimensions (calculated acreage)
1.	_____	☐ Yes ☐ No	_____
2.	_____	☐ Yes ☐ No	_____
3.	_____	☐ Yes ☐ No	_____
4.	_____	☐ Yes ☐ No	_____
5.	_____	☐ Yes ☐ No	_____
6.	_____	☐ Yes ☐ No	_____

☐ Check here if separate sheets are attached identifying additional neighbor riparian owners. Indicate project participants and/or non-participants.

☐ Check here if printed map attached. If no printed map, use this space to sketch the site and provide required information.

Map

Section IV: Methods

What mechanical or manual methods to remove plants are proposed? (check all that apply)

☐ Mechanical harvesting ☐ Raking Other _____

☐ Hand Pulling ☐ Cutting _____

Please explain why you selected the proposed method(s).

Note: Other control methods (i.e. bottom barriers, weed rollers, herbicides) also need DNR permits. Contact this office for more details.

Section V: Fees

Fees are not refundable and are calculated as follows:

Check box for type of project:

1. ☐ single riparian area, one property owner, less than one acre **$30.00**
2. ☐ multiple riparian areas, offshore control areas, multiple riparian properties, one acre or greater $30.00/acre (round up to the nearest whole acre) If proposed removal is greater than 10 acres fee caps at $300.00

_____ acres x $30.00 per acre = $ _____

Total non-refundable fee enclosed (max $300.00) . . . . . $_____

Section VI: Reasons for Aquatic Plant Removal

Purpose of Aquatic Plant Removal

☐ Maintain navigational channel for common use

☐ Maintain private access for boating

☐ Maintain private access for fishing

☐ Improve swimming

☐ Other _____

Nuisance Caused By

☐ Emergent water plants

☐ Submergent water plants

☐ Floating water plants

☐ Other _____

Name of plants, if known

Section VII: Alternatives Considered

	A. Previously Done?		B. Presently Proposed?	
1. Chemical	☐ Yes	☐ No	☐ Yes	☐ No
2. Sediment screens	☐ Yes	☐ No	☐ Yes	☐ No
3. Dredging	☐ Yes	☐ No	☐ Yes	☐ No
4. Drawdown	☐ Yes	☐ No	☐ Yes	☐ No
5. Nutrient controls in watershed	☐ Yes	☐ No	☐ Yes	☐ No
6. Nutrient controls on property	☐ Yes	☐ No	☐ Yes	☐ No
7. Other	☐ Yes	☐ No	☐ Yes	☐ No

NOTE: Consider feasibility of alternatives for each control site. This information not only helps the department make a decision on this application but also helps you evaluate your investment in aquatic plant management.

Describe the level of success for alternative methods previously used:

1. Chemical _____
2. Sediment screens _____
3. Dredging _____
4. Drawdown _____
5. Nutrient controls in watershed _____
6. Nutrient controls on property _____
7. Other _____

Section VIII: Applicants Responsibilities

1. The applicant has prepared a detailed map, which shows the length, width and average depth of each area proposed for the control of rooted vegetation.

2. The applicant understands that the Department of Natural Resources may require supervision of any aquatic plant management project involving removal. Supervision may include inspection of the proposed treatment area and/or equipment, before, during, or after removal. The applicant is required to notify the regional office 4 working days in advance of each anticipated date of plant removal with the date, time, location and size of plant removal unless the Department waives this requirement. The advance notification may be specified in your permit.

3. The applicant agrees to inform all operators of harvesting equipment of the conditions and terms of this permit and to insure that all operators understand and abide by those terms and conditions.

4. The applicant agrees to comply with all terms and conditions of this permit, if used, as well as applicable Wisconsin Administrative Rules. The required fee is attached.

I hereby certify that the above information is true and correct and that copies of the application have been provided to the appropriate parties name in Section II and that the conditions of the permit will be adhered to. All portions of this permit, map and accompanying cover letter must be in possession of the applicant or their agent at time of plant removal. During plant removal activities, all provisions of applicable Wisconsin Administrative Rules must be complied with, as well as the specific conditions contained in the permit cover letter.

Applicant's Signature _____ Date Signed _____

DNR Use Only

Review Notes:

☐ Natural Heritage Inventory Review

Section IX: Permit to Carry Out Mechanical or Manual Removal of Aquatic Plants

The foregoing application is approved. Permission is hereby granted to the applicant to mechanically or manually remove aquatic plants described in the application during the season. The approval of an aquatic plant management permit may not represent an endorsement of the permitted activity, but represents that the applicant has complied with Wisconsin Administrative Rules.

Season Year 20____

Application fee if received? ☐ Yes ☐ No

State of Wisconsin
Department of Natural Resources For the Secretary

By_____
Regional Director or Designee

Date Signed _____ Date Mailed _____

If you believe that you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

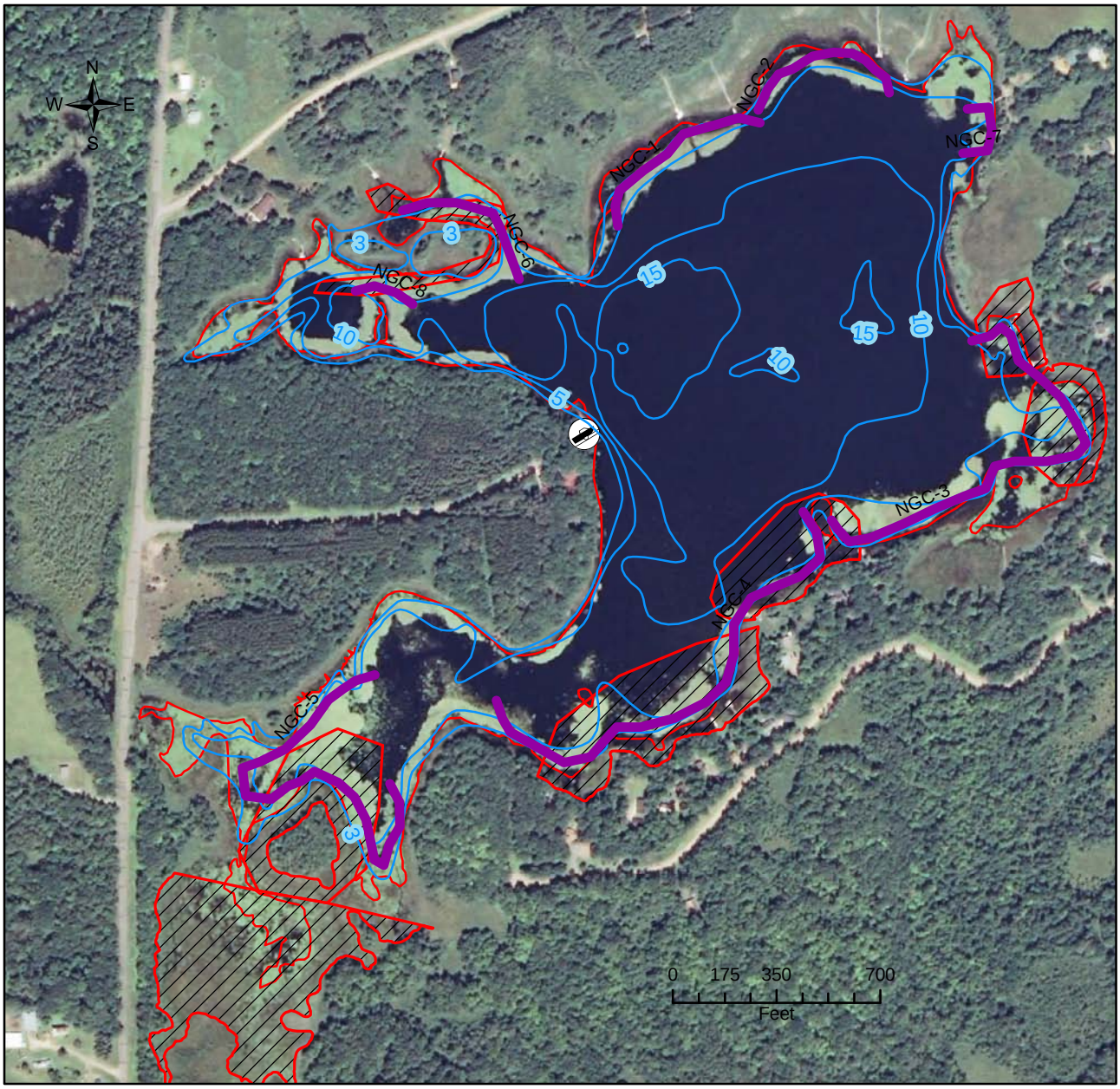
For Judicial review of a decision pursuant to ss. 227.52 and 227.53, Wis. Stats., you have 30 days after the decision is mailed or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for review shall name the Department of Natural Resources as the respondent.

To request a contested case hearing pursuant to s. 227.42, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the 30-day period for filing a petition for judicial review.

This notice is provided pursuant to s. 227.48(2), Wis. Stats.

Appendix H

Example First Year Harvesting Plan



Basemap: USDA NAIP, 2008

Legend

proposed_harvesting_blumer

Bathymetry (feet)

Aquatic plant area of concern

Areas of Concern defined by Participants of the Summer 2012 Lake Fair

Approximate Length of Channels - 7,316 ft

Approximate Area of Channels at 20-ft Wide - 3.4 acres

Appendix I

Native Plant Management Guidelines

Nuisance and Navigation Guidelines for Native Plant Management

1) **Common Navigation Areas of Concern**
   a) Current navigation areas of concern are shown in Appendix #.
   b) New areas will be identified in the following manner:
      i) Residents will notify a designee of the KLMD about an area of potential concern prior to June 30 each year
      ii) Area of concern is inspected by the KLMD or its retainer
      iii) If navigation impairment is confirmed, it will be documented as described below.
2) **Documenting Navigation Impairment**
   a) Provide examples of specific impairment of navigation caused by the presence of aquatic plants
   b) Indicate when plants cause problems and how long problems persist
   c) List the species of plants causing the nuisance
   d) List adaptations or alternatives considered/used to lessen problem (some examples include)
      i) Physical or hand removal
      ii) Increasing general use by watercraft
      iii) Mechanical removal
      iv) Altering the chosen navigation route
   e) Locate suggested navigation routes with GPS coordinates
   f) Provide dimensions (length, width, and depth)
      i) Mechanical harvesting is limited to waters at least 3-ft deep
   g) Include photos of navigation impairments
   h) Provide a record of historical management at the site if it has been managed previously
3) **Documenting Nuisance Conditions**
   a) Provide examples of specific activities that are limited because of presence of nuisance aquatic plants
   b) Indicate when plants cause problems and how long problems persist
   c) List the species of plants causing the nuisance
   d) List adaptations or alternatives consider/used to lessen problem (some examples include)
      i) Physical or hand removal
      ii) Increasing general use
      iii) Extending the dock to a greater depth or moving the dock
      iv) Altering the route to and from the dock
   e) Provide dimensions (length, width, and depth)
      i) Mechanical harvesting is limited to waters at least 3-ft deep
   f) Include photos of navigation impairments
   g) Provide a record of historical management at the site if it has been managed previously
4) **Management Actions**
   a) If navigation impairment or nuisance condition is confirmed, a management action consistent with other management actions already occurring on the lake will be recommended and added to the permit application
5) **Selecting Appropriate Control Method**
   a) Physical or hand removal will be the first choice for management
   b) Mechanical harvesting will be the alternative management action

Appendix J

Five Year Timeline of Actions

5-year Timeline of Recommended Actions in the K

Goals/Objectives/Activities	Grant Eligible	Grant Type	Facilitator
Native Species Preservation, Protection, and Restoration			
1 - Promote Shoreland Restoration and Improvement Projects			
Provide education and information material	yes	LPL	KLMD
Provide for professional site planning services	yes	LPL, LPT	KLMD, RP
Sponsor training sessions	yes	LPL, LPT	KLMD, RP, BarC, UWEX
Implement shoreland improvement projects	yes	LPT	KLMD, Rip, RP
Provide riparian owner recognition	no	NA	KLMD
2 - Protect Native Habitat			
Complete a habitat evaluation/sensitive area survey	yes	LPL	KLMD, WDNR
Support plant management that minimizes disturbance to native aquatic plant beds	no	NA	KLMD, RP
Prevention			
1 - Prevent AIS transfer in or out of the lake			
Implement and maintain a watercraft inspection program (CBCW)	yes	AIS	KLMD, WDNR, UWEX
2 - AIS Monitoring			
Implement and maintain an in-lake and shoreline AIS monitoring program (CLMN)	yes	AIS	KLMD, WDNR, UWEX
Follow the established AIS Rapid Response Plan if a suspect plant is found (Appendix E)	yes	AIS	KLMD, RP, WDNR, UWEX
Train landowners to monitor their own lake front for AIS	yes	AIS	KLMD, UWEX, CoAIS
3 - Data Recording			
Submit CBCW and CLMN data to SWIMS	yes	AIS	KLMD, WDNR, UWEX
Management of Native Plants			
1 - Annual Aquatic Plant Mangement Planning			
Contract with Resource Professional for planning annual services	no	NA	KLMD, RP
2 - Manual/Physical Removal of Native Aquatic Plants			
Encourage land owner manual removal where possible	no	NA	KLMD, RP
Provide weed rakes or razors for use by landowners	no	NA	KLMD
Evaluate larger manual removal project for harvesting applicability	no	NA	KLMD, RP
3a -Mechanical Harvesting of Aquatic Plants - Contracted			
Establish and maintain common use navigation channels and riparian access lanes	no	NA	KLMD, Cont.
3b -Mechanical Harvesting of Aquatic Plants - Purchased			
Apply for Recreational Facilities Grant/Grant Preparation	no	NA	KLMD, RP
Purchase a mechanical harvester	yes	RFG	KLMD, WDNR
Annual operation, maintenance,and storage of harvester	no	NA	KLMD, Cont.
4 -Mechanical Harvesting of Aquatic Plants - Tracking (if purchased)			
Purchase of GPS for Track daily tracking of harvesting operations	yes	LPL	KLMD
Daily tracking of harvesting operations	no	NA	KLMD
Prepare daily harvesting log sheets	no	NA	KLMD
5 -Mechanical Harvesting of Aquatic Plants - Disposal			
Establish at least one off-loading site for harvested vegetation	no	NA	KLMD, BarC, RP
Establish a long-term storage site for harvested vegetation	no	NA	KLMD, BarC, RP
Education and Awareness			
1 -Public Participation and Communication			
Publish a newsletter at least once annually	no	NA	KLMD
Annual public event planning and implementation	yes	LPL, AIS	KLMD, UWEX, WDNR, BarC, RP
2 -Promote Participation in Wildlife Monitoring Programs			
Provide information and education materials	yes	CBE, LPL	KLMD, WDNR, UWEX, CBS, RP
Research and Monitoring			
1 -Promote Riparian BMP's for Water Quality			
Provide education and information material	yes	LPL	KLMD, BarC, WDNR, RP
Implement Riparian BMP's	yes	LPL,LPT	KLMD, Rip, RP
2 -CLMN Water Quality Monitoring			
Complete October sampling for TP and CHL	yes	LPL	KLMD, RP, WDNR
Complete DO and temperature profiling year round	yes	LPL	KLMD, RP, WDNR
3 -Water Quantity Monitoring			
Install a surface water staff guage on the lake	yes	LPL	KLMD, RP
Record lake level data weekly	yes	LPL	KLMD
Install at least one rain gage on the lake	yes	LPL	KLMD, CoCoRaHs
Participate in the CoCoRaHs precipitation monitoring program	yes	LPL	KLMD, CoCoRaHs
4 -Comprehensive Lake Management Planning			
Contract with a Resource Professional to develop plan	yes	LPL	KLMD, RP, WDNR
Adaptive Management			
1 -Annual Project Updates and Assessments			
Complete annual plant mangement planning	no	NA	KLMD, RP
Provide for document sharing	yes	LPL	KLMD, RP
2 -End of Project Summary/APMP Revision			
Overall review of project successes and failures	yes	AIS/LPL	KLMD, RP
Revise/rewrite APM Plan	yes	AIS	KLMD, RP
Whole-lake point intercept plant survey	yes	AIS	KLMD, RP
Provide for document sharing	yes	AIS/LPL	KLMD, RP

Grant Abbreviations: LPL-Lake Management Planning Grants; LPT-Lake Protections Grants; AIS-Aquatic Invasive Species Grants (1-yr Watercraft Inspection, Rapid Response, Education); RFG=Recreational Facilities Grant; Citizen-ba

Facilitator Abbreviations: KLMD-Kirby Lake Management District; RP-Resource Professional/Consultant; BarC-Barron County; UWEX=University of Wisconsin Extension; WDNR-Wisconsin Department of Natural Resources; CoAIS

Available Resources: Same as Facilitator Abbreviations; INT-internet resources; as text describes

***Costs estimates based on Consultant past experience, so are not intended to be final**

Kirby Lake Aquatic Plant Management Plan

Estimated* Monetary Costs (Annual)	Available Resources	2013	2014	2015	2016	2017
$0.00-$50	WDNR, UW-Ext, BarC, INT	x	x	x	x	x
$50-$200	Local Landscapers, Nurseries, Greenhouses, Shoreland Restoration Consultants	?	x	?	x	?
$100-$300	Local Landscapers, Nurseries, Greenhouses, Shoreland Restoration Consultants	?	x	?	x	?
$0.00-$1000			?	?	?	?
no costs		?	x	x	x	x
no costs	WDNR	x	x			
costs associated with annual planning support		x	x	x	x	x
$25-$50	WDNR, UWEX, CoAIS	x	x	x	x	x
$50-$100	WDNR, UWEX, CoAIS, INT	x	x	x	x	x
no costs	KLMD	?	?	?	?	?
$25-$100	WDNR, UWEX, CoAIS	x	x	x	x	x
no costs	WDNR, UWEX, INT	x	x	x	x	x
$1500 - $2500		x	x	x	x	x
no costs	KLMD, Consultant	x	x	x	x	x
$250-$500 (one time)	INT	x	x	x	x	x
costs associated with annual planning support		x	x	x	x	x
$1800-$3000 (one harvesting); $3600-$6000 (two harvestings)	Harvesting Contractor	x	x	x	x	x
$2500-$3500 (one time)	WDNR, RP	x				
$15K - $20K (w/RFG) - $40K - $60K w/out RFG (one time)	WDNR, RP		x			
$2000-$4000		x	x	x	x	x
$300-$500 (one time)	INT, local distributor	x	x			
costs associated with operation and maintananc costs		x	x	x	x	x
costs associated with operation and maintananc costs		x	x	x	x	x
no costs	local property owner, BarC	x	x	x	x	x
$0.00-$500	local property owner, BarC	x	x	x	x	x
$50-$100	KLMD	x	x	x	x	x
$150-$250	UWEX, WDNR, CoAIS,RP	x	x	x	x	x
no costs	UWEX, CBS, BarC	x	x	x	x	x
$0.00-$50.00	BarC, WDNR, UWEX, INT	x	x	x	x	x
$0.00-$500	Local Landscapers, Nurseries, Greenhouses, Shoreland Restoration Consultants	?	?	?	?	?
$150-$250	RP, WDNR	x	x	x	x	x
no costs	RP, WDNR	x	x	x	x	x
$25-$50 (one time)	RP, INT	x	x			
no costs		x	x	x	x	x
$25-$50 (one time)	CoCoRaHs, RP, INT	x	x			
no costs	CoCoRaHs	x	x	x	x	x
$6000-$8000 (one time)	WDNR, RP		?	?	?	?
$1200-$2400	RP	x	x	x	x	x
no costs	RP	x	x	x	x	x
costs included in rewriting of the APM Plan	RP					x
$2500-$5000 (one time)	RP					x
$1500-$2500 (one time)	RP					x
no costs	RP					x

ased Education and Monitoring Grants; NA-not applicable

-County AIS Coordinator; CBE-Citizen-Based Science Network; CoCoRaHs-Community Collaborative Rain, Hail and Snow Network; Rip-Riparian Property Owners on the Lake