Upper Turtle Lake Aquatic Plant Management Plan

Turtle Lakes Lake Protection Project

Barron County, Wisconsin

SEH No. TULMD 110870

September 27, 2011

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RE: Turtle Lakes Lake Protection Project
Upper Turtle Lake Aquatic Plant Management Plan
Barron County, Wisconsin
SEH No. TULMD 110870

Mr. Mark Koegel
Upper Turtle Lake Association
1462 3-3/8 Street
Turtle Lake, WI 54889

Dear Mark:

The following document is a final version of the 5-year Aquatic Plant Management (APM) Plan for Upper Turtle Lake in Barron County. Enclosed are two copies of the APM Plan. Two additional copies have been sent to Pamela Toshner, Lakes Grant Coordinator with the Wisconsin Department of Natural Resources (WDNR) in Spooner, WI. Should the WDNR approve this APM Plan, you should be eligible for Aquatic Invasive Species Established Population Control Grant funding in February of 2012.

Sincerely,

Dave Blumer
Lake Scientist

dlb/jam
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Upper Turtle Lake Aquatic Plant Management Plan

Turtle Lakes Lake Protection Project
Barron County, Wisconsin

Prepared for:
Upper Turtle Lake Association
Town of Almena, WI

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Date

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Date

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2	Pamela Toshner Wisconsin Department of Natural Resources 810 W. Maple Street Spooner, WI 54801

Executive Summary

Upper Turtle Lake is a 443-acre lake located in west-central Barron County, Wisconsin. The health and quality of the native plant community is above average, with a floristic quality that ranks in the upper quartile on a statewide and regional basis. Curly-leaf pondweed (CLP), an aquatic invasive species, is known to be in the lake and reed canary grass, an established exotic species, is also present around the lake. Currently, CLP seldom occurs as monotypic beds and appears to be enhancing early season habitat in the lake by providing fish forage and cover areas. In recent years, plant management activity in the lake has been limited to lake property owners removing and chemically treating nuisance plants at a very small scale. The Upper Turtle Lake Association recognized the need for a coordinated strategy to manage aquatic invasive species and to prevent the introduction of new invasive species. This Aquatic Plant Management Plan was developed to fulfill that need by setting forth goals and aquatic plant management activities for the next five years. The UTLA is requesting WDNR approval for the activities included within this plan which is anticipated to begin in 2011.

The goals of the Upper Turtle Lake Aquatic Plant Management Plan are to:

1. Protect and enhance the native species community;
2. Monitor and control the aquatic invasive species in Upper Turtle Lake;
3. Prevent the introduction of new aquatic invasive species and prevent the spread of invasive species from Upper Turtle Lake to other lakes;
4. Reduce nutrient and pollutant loading to the lake and monitor lake water quality;
5. Evaluate aquatic plant management on an annual basis and revise the APM Plan as necessary.

An outline of the aquatic plant management goals and activities can be found in Appendix D and a five-year timeline for completion of the activities is included in Appendix E. This five-year plan is intended to be a living document which can be modified from time to time to ensure goals are being met. Minor changes and adaptations are expected and may be made annually, but any major change in activities or management philosophy will be presented to the UTLA and the WDNR for approval.

Curly-leaf pondweed management will include annual spring bed mapping and fall turion density sampling to help determine the CLP management activities that most benefit the native plant community and the water quality of Upper Turtle Lake. Early-season (late spring through early summer) manual removal is the preferred method of CLP control at this time. If the existing density or distribution of CLP changes substantially (for example, reduces the native plant species diversity), chemical application may be used for control. Native plant control will be limited to access lanes for individual lake property owners which will be maintained via boat traffic and manual removal unless severely impaired navigation or nuisance conditions are documented.

All permits applications and necessary record keeping will be completed by the UTLA, their consultant, and their commercial chemical applicator. Annual summaries and evaluations of the activities undertaken will be completed by the UTLA and their consultant and submitted to the necessary partners for review. A final project summary will be completed by the UTLA and their consultant in the final year of this project which will include a whole-lake aquatic plant survey to determine the overall impact of this 5-year plan.

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Upper Turtle Lake Aquatic Plant Management Plan

Turtle Lakes Lake Protection Project

Prepared for Upper Turtle Lake Association

1.0 Introduction

Upper Turtle Lake is located in west-central Barron County in the Township of Almena. The lake provides many recreational opportunities through a popular public access site on U.S. Highway 8. Two aquatic invasive species are known to inhabit Upper Turtle Lake: the Chinese mystery snail (*Cipangopaludina chinensis*) and curly-leaf pondweed (*Potamogeton crispus*). The Chinese mystery snail was first documented in 2009 and curly-leaf pondweed (CLP) was first documented in the early 2000s. Reed canary grass (*Phalaris arundinacea*) is an established exotic species that is present along the shoreline and within wetlands throughout the watershed.

The Upper Turtle Lake Association (UTLA) has been monitoring the water quality of Upper Turtle Lake for the past 15 years. During this time, there has been no substantial change to the lake's condition; however, there has been a slight increase in the total phosphorus concentration since 2002. Currently, Upper Turtle Lake does not experience severe algal blooms throughout the summer season, but if phosphorous levels continue to increase it is possible for degraded water quality, including reduced water clarity and increased chlorophyll *a* concentrations, to become more of an issue to lake users. High concentrations of phosphorous in the lake can fuel algae growth which in turn would limit beneficial plant growth. This may cause a shift from a plant-dominated system to an algae-dominated system during the summer months.

This Aquatic Plant Management Plan is the first coordinated effort towards managing aquatic plants in Upper Turtle Lake. It provides direction for protecting the native plant community of Upper Turtle Lake and for monitoring the impacts of the aquatic invasive species curly-leaf pondweed. The goal of this plan is to investigate the history and current situation of aquatic plants in the lake, provide possible management alternatives, recommend the preferred management options, form an implementation plan, and develop a mechanism to monitor and modify the management plan.

1.1 Public Participation

The UTLA has been actively working to improve water quality conditions in the lake since the 1990s. A comprehensive lake management plan study was completed in 2003 for Upper Turtle Lake by Blue Water Science. The goals of the project were to examine existing lake conditions and to develop a lake management plan that protects, maintains, and enhances Upper Turtle Lake water quality. Members of the UTLA contributed to this comprehensive study by monitoring water quality, performing inventories of the shoreline, wildlife, and aquatic vegetation, and by completing questionnaires and fishery related work. The 2003

Upper Turtle Lake Management Plan provided recommendations for future work including watershed-wide projects, on-site wastewater treatment maintenance, shoreland landscaping projects, aquatic plant monitoring, an on-going education program, watershed and lake monitoring, and optional fish management.

The Lower Turtle Lake Management District (LTLMD) completed comprehensive lake management planning in 2009 and applied to the WDNR for lake protection grant funding to address agricultural and nearshore area contributions of phosphorous to the lake. Since Upper Turtle Lake is a part of the larger Turtle Lakes watershed, the LTLMD reached out to include the UTLA in a five-year lake protection project. Developing APM plans for both Upper and Lower Turtle Lake is a part of this project. The UTLA eagerly joined other partners in this project and have been working cooperatively with the LTLMD to complete their responsibilities in the overall project. Project partners include the UTLA, LTLMD, the Lower Turtle Lake Association, Barron County, local farmers and the Town of Almena. Representatives from each group form a Stakeholders Board that meets once every two months to update the project and discuss current and future activities.

2.0 Documentation of Plant Problems and Need for Management

The aquatic invasive species CLP was first officially documented in the lake in 2001 during a WDNR Sensitive Areas survey. The presence of CLP in Upper Turtle Lake appears to be having little effect on the plant community at this time and may be providing valuable fish habitat in the early part of the growing season. An aquatic plant survey completed in 2010 found a diverse native plant community distributed throughout the lake. Although there have been no issues with CLP to date, it should be monitored yearly to track for changes in its distribution that have a negative effect on the native plant community (e.g. significant decrase in the floristic quality of the lake) or lake uses (e.g. inhibit recreational activities). The UTLA needs an Aquatic Plant Management Plan in place should CLP become problematic.

Efforts should be made to protect existing native plants. A questionnaire sent to lake property owners in 2002 found that the most critical issue on the lake is “weeds” (McComas, 2003). Many of the “weeds” are native plants that provide a diverse habitat and utilize nutrients that would otherwise fuel algae growth while anchoring sediments and buffer against shoreline erosion. The native species with the largest populations in Upper Turtle Lake are coontail, flat-stem pondweed, and Fries’ pondweed. Lake residents and users should be educated on the importance of native aquatic plants to the lake ecosystem and water quality. While excessive growth of native plants can be a nuisance to lake users, the removal of native plants should be limited to protect the high floristic, and implicitly, natural quality of the lake.

Restoring and enhancing native plant communities could improve habitat and water quality conditions. A shoreland survey performed in 2002 found that 30% of the 214 developed lots around the lake had lawns going down to the lakeshore. It would be beneficial to the water quality and ecosystem to encourage those homeowners to install lakeshore vegetative buffers. Restoring rushes, arrowhead, pickerel weed, and similar plants along shoreland currently devoid of any emergent vegetation could reduce erosion and help to hold sediment in place.

There remains a threat of non-native invasive species being introduced (for example, Eurasian watermilfoil) or of CLP becoming more dominant in the lake. Water craft inspection should be continued, as should in-lake and shoreline invasive species monitoring to prevent the introduction of new AIS and prevent the export of CLP to surrounding lakes

2.1 Historic Plant Management Activities

The UTLA has not completed any major aquatic plant control in the lake. Individual land owners have participated in aquatic plant control, mostly by physical removal, with some individual chemical treatments. A search of WDNR permit records found that chemical treatments have been done at various times from 1996 through 2007, primarily along the southwestern shore for navigation relief and algae control.

3.0 Lake Inventory

Identifying appropriate aquatic plant management recommendations for Upper Turtle Lake requires a basic understanding of its physical characteristics, including size, depth, critical habitat, and the fishery, as well as the factors influencing water quality, such as soils and land use. Aquatic plant management will impact certain aspects of a lake including water quality, fish and wildlife habitat, and both target and non-target aquatic plants. Water quality and plant survey data have been and are currently being collected within Upper Turtle Lake and throughout its watershed. These data allow for an evaluation of the effects of aquatic plant management and other management activities on the lake and its ecosystem.

3.1 Physical Characteristics

Upper Turtle Lake (WBIC 2079800) is a drainage lake in west-central Barron County, Wisconsin about 2.5 miles east of the Village of Turtle Lake (Figure 1). According to the Wisconsin Lakes bulletin, the lake covers 438 acres, has a maximum depth of 25 feet and an average depth of 14 feet (WDNR, 2005). A LiDAR survey of Barron County completed in May 2005 indicates the lake covers 443 acres. Physical characteristics of the lake are provided in Table 1. Turtle Creek, which flows from Upper Turtle Lake, is the main tributary to Lower Turtle Lake. The lake is fed by intermittent streams and groundwater and is the headwaters of Turtle Creek which begins at the southern end of the lake.

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 boundary for Upper Turtle Lake was delineated by the Barron County Soil and Water Conservation Department and adjusted using 2-foot contour lines obtained from the Barron County LiDAR survey. The Upper Turtle Lake watershed is 2,117 acres including the lake area.

Land cover and land use management practices within a watershed have a strong influence on water quality. 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 can lead to an increase in the amount of rainfall runoff that flows directly into Upper Turtle Lake and its tributary streams. The removal of riparian, i.e., nearshore, vegetation causes an increase in the amount of nutrient-rich soil particles transported directly to the lake during rain events.

The land use in the Upper Turtle Lake watershed is primarily classified as agricultural (row crops, pasture, etc.) and a mix of forests, wetlands, and barrens (Figure 1). Agricultural land use covers nearly 50% of the watershed and consists primarily of large-scale row cropping. Residential areas make up a relatively small portion of the land use; however, the majority of residential areas are concentrated around the lakes in the watershed leading to more immediate and likely greater impacts to water quality than areas located further away from the lakes.

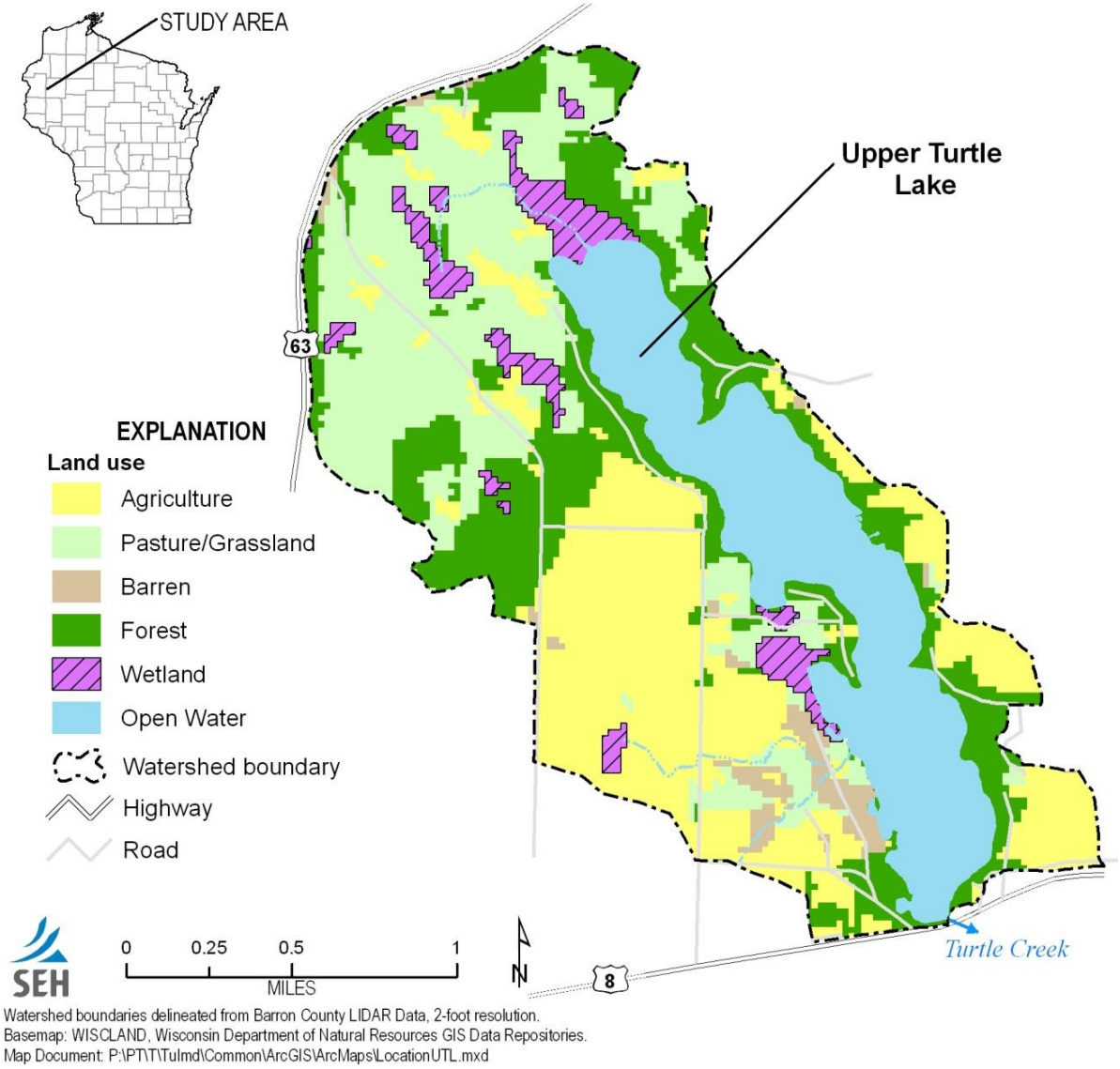

Figure 1 – Location of Upper Turtle Lake and Its Watershed

Table 1
Physical Characteristics of Upper Turtle Lake

Lake Area (acres)	443
Watershed Area (acres)	2,117
Watershed to Lake Ratio	4:1
Maximum Depth (feet)	25
Mean Depth (feet)	13.7
Volume (acre-feet)	6053.8
Elevation (feet AMSL)	1,162
Maximum Fetch (miles)	1.9
Miles of Shoreline	7.37
Lake Type	Drainage

3.2 Lake Water Quality

Citizen Lake Monitoring Network (CLMN) volunteers have collected water quality data from the Upper Turtle Lake Deep Hole site since 1994. Volunteers measured quantitative parameters such as temperature, dissolved oxygen, and Secchi depth, and collected water samples which were sent to the Wisconsin State Lab of Hygiene for analysis of total phosphorus, chlorophyll *a*, nitrogen, and other constituent concentrations. Qualitative observations such as lake level, color, and user perception of water quality were also recorded.

3.2.1 Water Clarity

The depth to which light can penetrate a lake is a factor that limits aquatic macrophyte growth. Water clarity was measured by CLMN volunteers using a Secchi disk. The Secchi disk measurement is the average of the depth that when lowered the disk just disappears from sight and the depth that when raised the disk is just visible. Because light penetration is usually associated with algae growth, a lake is considered eutrophic when Secchi depths are less than 6.5 feet. Secchi depths vary throughout the year, with shallower readings in summer when algae become dense and limit light penetration and deeper readings in spring and late fall.

From 1994 through 2008, the average summer (July through August) Secchi depth in Upper Turtle Lake was 6.1feet, with depths varying as much as 16.25 feet in a single year (Figure 2). The trend line in Figure 2 shows that although annual variation exists there has been no appreciable change in the water clarity of the lake over time. This trend line is disregarding the 2009 summer, during which only a single Secchi measurement (13 feet) was taken.

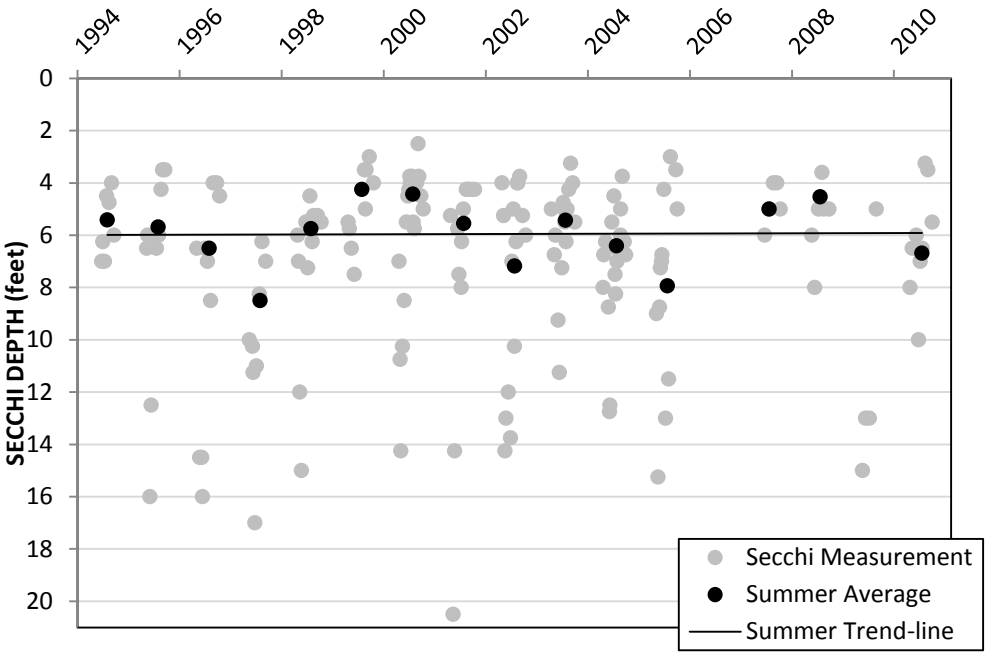

Figure 2 – Secchi Readings from 1994 through 2008 shown with Summer Average Trend.

3.2.2 Chlorophyll *a*

Chlorophyll *a* is a measurement of algae in the water. The concentration varies throughout the year, generally peaking in lake summer. The mean summer chlorophyll *a* concentration from 1999 through 2010 was 16.5 micrograms per liter (µg/L). This is slightly higher than the mean for northwest Wisconsin Lakes of 12.4 µg/L identified by Lillie and Mason (1983).

The preferred method of determining how productive a lake is, or its trophic status, is by converting the chlorophyll *a* concentration to a Wisconsin-specific Trophic Status Index (WTSI). Upper Turtle Lake is becoming eutrophic based on an average summer $WTSI_{CHL}$ of 54, which has remained fairly steady since the early 2000s. As with other lakes in this category, Upper Turtle Lake has decreased water clarity and oxygen depleted bottom waters during the summer (Table 2).

Table 2
The Wisconsin Trophic State Index and Description of Conditions for Upper Turtle Lake

TSI	Description of Associated Conditions
< 30	Classical oligotrophy: clear water, many algal species, oxygen throughout the year in bottom water, cold water, oxygen-sensitive fish species in deep lakes. Excellent water quality.
30 - 40	Deeper lakes still oligotrophic, but bottom water of some shallower lakes will become oxygen-depleted during the summer.
40 - 50	Water moderately clear, but increasing chance of low dissolved oxygen in deep water during the summer.
50 - 60	Lakes becoming eutrophic: decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.
60 - 70	Blue-green algae become dominant and algal scums are possible, extensive plant overgrowth problems possible.
70 - 80	Becoming very eutrophic. Heavy algal blooms possible throughout summer, dense plant beds, but extent limited by light penetration (blue-green algae block sunlight).
> 80	Algal scums, summer fishkills, few plants, rough fish dominant. Very poor water quality.

Upper Turtle Lake
$WTSI_{CHL}$ = 54

3.2.3 Phosphorus

Phosphorus is an important nutrient for plant growth and is commonly the nutrient limiting plant production in Wisconsin lakes. When phosphorus is limiting production, small additions of the nutrient to a lake can cause dramatic increases in plant and algae growth. The summer mean total phosphorus in Upper Turtle Lake from 1999 through 2010 (32.5 µg/L) is similar to the mean reported for northwest Wisconsin lakes (28.0 µg/L) by Lillie and Mason (1983). Average summer (July through August) phosphorus has been variable, but a slight increasing trend is present from 2002 to present (Figure 3).

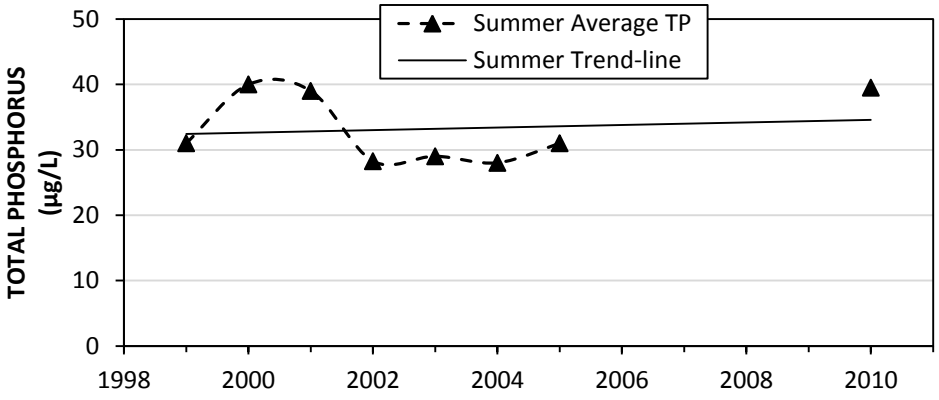

Figure 3 – Summer Average Total Phosphorus from 1999 through 2010

3.2.4 Nitrogen to Phosphorus Ratio

The ratio of the total nitrogen to total phosphorus (N:P) is used to determine the nutrient that likely limits aquatic plant growth in a lake. When N:P is greater than 16:1, phosphorus is interpreted as the limiting nutrient and when the ratio is less the 10:1, nitrogen is likely the limiting nutrient. In 2010, the N:P ratio averaged 21:1 in Upper Turtle Lake, which suggests phosphorus is likely limiting plant growth in the lake. This is also evident in a positive correlation between phosphorus and chlorophyll *a* concentrations in the lake; additional phosphorus equals more algae. With phosphorus as the likely limiting nutrient in the lake, one pound of phosphorus can grow up to 500 pounds of algae (Wetzel, 2001).

3.3 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. Such areas can be mapped by the WDNR and designated as Critical Habitat. Areas are designated as Critical Habitat when they include important fish and wildlife habitat, natural shorelines, physical features important for water quality (e.g., springs) and navigation thoroughfares. These areas, which can be located within or adjacent to the waterbody, are particularly valuable to the ecosystem or would be significantly impacted by most disturbances or development. Critical Habitat areas include both Sensitive Areas and Public Rights Features. Sensitive Areas offer critical or unique fish and wildlife habitat, including those area important for seasonal or life-stage requirements, or offer water quality or erosion control benefits.

A Sensitive Areas survey was conducted by the WDNR in August 1993 and re-evaluated in August 2001. The full WDNR report can be found in Appendix A. Three areas of the lake were identified as Sensitive Areas because they provide important habitat and offer shoreline stabilization (Figure 4). The WDNR report notes the presence of curly-leaf pondweed (CLP) in areas A and C. The 2010 aquatic plant survey identified CLP in all of the Sensitive Areas and dense, monotypic CLP beds were found in Sensitive Areas A and B. A competitive advantage CLP has over native plants is its ability to grow rapidly shortly after ice-out. This rapid growth leads to the development of dense, monotypic stands which provide a much less diverse habitat.

The WDNR strongly discourages chemical treatments and mechanical harvesting within the Sensitive Areas. The Upper Turtle Lake Sensitive Areas report states that historical chemical treatments and mechanical harvesting should be limited to navigational channels only and all

other interests in chemical treatments and mechanical harvesting should be scrutinized. Any plant removal done for navigation purposes should be limited to the minimum amount practical. Although restrictions are in place to protect these areas during plant management operations, short-term disruptions to habitat during the removal of aquatic invasive species such as CLP may lead to positive long-term improvements to the habitat of the lake.

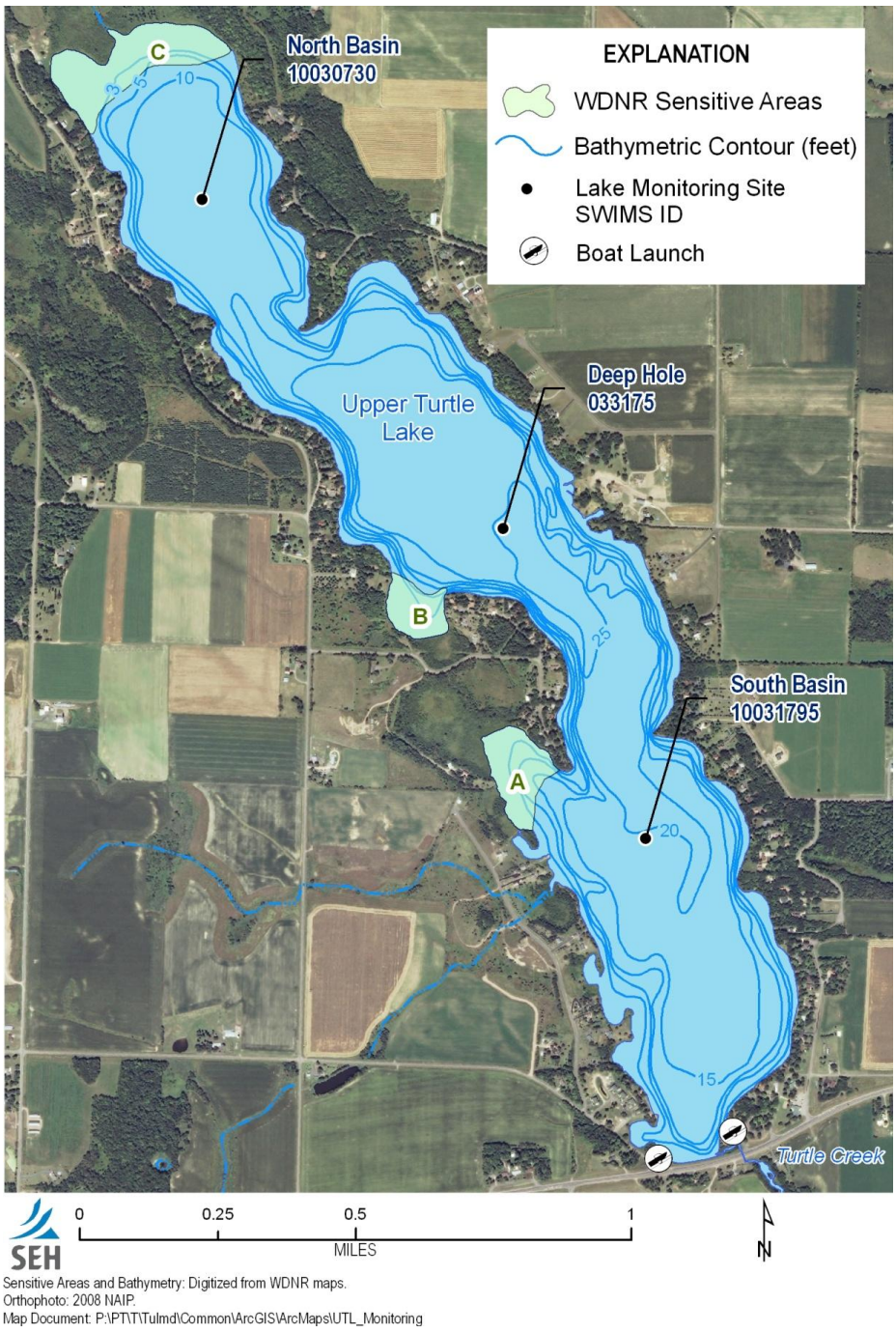

Figure 4 – WDNR Sensitive Area Designation and Lake Bathymetry

3.4 Fishery and Wildlife

Upper Turtle Lake has a diverse fishery that includes walleye (*Sander vitreus*), northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), pumpkinseed (*Lepomis gibbosus*), yellow perch (*Perca flavescens*), common carp (*Cyprinus carpio*), and bullheads (*Ameiurus* spp.). Walleye stocking has occurred sporadically from 1975 to 1992. About 20,000 small walleye fingerling have been stocked each even-numbered year from 2000 through 2008 (data for 2010 was not available when writing this report). Walleye spawning areas, identified in 2003 based on water depth and substrate (lakebed material), abound in Upper Turtle Lake. The timing and method of aquatic plant control should be carefully considered in spawning areas.

The invasive Chinese mystery snail (*Cipangopaludina chinens*) was first found in Upper Turtle Lake in 2009. The Chinese mystery snail reached Wisconsin 50 years ago and has become well established in many northern Wisconsin lakes. Not much is known about this species; however, they appear to have a negative effect on native snail populations by out-competing the native species for food and habitat. Chinese mystery snails can serve as vectors for the transmission of parasites and diseases. Some of the parasites and diseases that the Chinese mystery snail has been known to host can also infect humans. Biological control is most commonly supported method because it usually causes the least amount of damage to other aquatic organisms. Introducing fish or turtles that eat snails and maintaining their habitat may lower the mystery snail population.

The Natural Heritage Inventory (NHI) database contains recent and historic observations of rare species and plant communities. These observations are current as of October 6, 2009. Each species has a state status including Special Concern (SC), Threatened (THR) or Endangered (END). There are three plant species (Robbins' spikerush, *Eleocharis robbinsii*, SC; spotted pondweed, *Potamogeton pulcher*, END; Torrey's bulrush, *Scirpus torreyi*, SC), one bird species (bald eagle, *Haliaeetus leucocephalus*, SC) and four northern communities (dry-mesic forest, mesic forest, sedge medow, an wet forest) that have been documented in or near the Upper Turtle Lake watershed.

3.5 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 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).

Wetlands serve many functions that benefit the ecosystem surrounding Upper Turtle 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 by providing the habitat for many unique animals including natural enemies of mosquitoes. Natural enemies of mosquitoes (dragonflies, damselflies, backswimmers, and predacious diving beetles) need proper habitat, that is, healthy wetlands, to survive.

According to the National Wetland Inventory, emergent, forested and aquatic bed (lake and freshwater pond) wetlands are present in the Upper Turtle Lake watershed. The majority of the wetlands are located near or adjacent to the lake (Figure 1). Upper Turtle Lake has emergent and forested/shrub wetlands adjacent to the northern and the west-central shores that cover 35 acres and 20 acres, respectively. These shoreland wetlands are associated with the Sensitive Areas in Upper Turtle Lake.

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 wetlands are wetlands dominated by mature conifers and lowland hardwood trees. Forested wetlands 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 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 water quality protection because wetland plants and soils have the capacity to store and filter 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 which is important in waterways where boat traffic and water currents and wave action may cause substantial damage to the shore.

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. Aesthetics, recreation, education and science are also all services wetlands provide. Wetlands contain a unique combination of terrestrial and aquatic life and physical and chemical processes.

Although some small (two acres or less) 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.

3.6 Soils

The soil in the Upper Turtle Lake watershed consists primarily of sandy loams in the northern half of the watershed and silt loams in the southern half. Soils in the nearshore area of Upper Turtle Lake consist primarily of the Chetek-Rosholt complex and the Chetek sandy loam with steep slopes generally ranging from 12 to 25 percent. Soils are classified into hydrologic soil groups to indicate their potential for producing runoff. Much of the soil in the watershed area is classified as group B. Group B soils have moderately low runoff potential when thoroughly wet and water movement through the soil is unimpeded.

Although much of the soils in the watershed produce relatively little runoff, the Barron County Soil and Water Conservation Department has identified areas where the establishment of grassed waterways, an agricultural Best Management Practice (BMP), would likely be beneficial to the water quality in the lake. The implementation of these BMPs is a part of the large-scale Turtle Lakes Protection Project.

4.0 Aquatic Plant Surveys

Two comprehensive aquatic plant surveys have been completed in Upper Turtle Lake. In 2002, Blue Water Science surveyed the aquatic plant community (McComas, 2003) following a transect survey method and in 2010 Endangered Resource Services performed a point intercept survey (Berg, 2010). The 2002 survey was done in September and documented plant occurrences and densities at three depths along 20 transects for a total of 60 sample points. Aquatic plants were documented and identified to at least the taxonomic level genus and often to the species level.

The 2010 survey included an early season CLP density and bed mapping survey to evaluate the coverage of CLP in the lake and a whole-lake point intercept survey to document the current aquatic plant community in the lake. The whole-lake survey was completed following WDNR protocol and a total of 595 points were sampled. Summary statistics from the point intercept survey are presented in Table 3. The survey completed in 2010 provides the basis for aquatic plant management decisions in this document. The WDNR recommends that aquatic plant management plans extend no more than five years beyond the last plant survey; therefore, the plan presented in this document is for a five-year period.

Table 3
2010 Aquatic Plant Survey Summary Statistics

Statistic	Value
Total number of sites visited	595
Total number of sites with vegetation	166
Total number of sites shallower than maximum depth of plants	266
Frequency of occurrence at sites shallower than maximum depth of plants	62.41
Simpson Diversity Index	0.89
Maximum depth of plants (feet)	13.50
Number of sites sampled using rake on Rope (R)	0
Number of sites sampled using rake on Pole (P)	298
Average number of all species per site (shallower than max depth)	1.92
Average number of all species per site (veg. sites only)	3.07
Average number of native species per site (shallower than max depth)	1.86
Average number of native species per site (veg. sites only)	3.01
Species Richness	32
Species Richness (including visuals)	36

An informal aquatic plant survey was completed by the Beaver Creek Reserve in July and August 2009 as part of a multi-county AIS investigation (Mares and others, 2009). Although not a whole-lake survey, all aquatic plant species observed were documented. This survey was done following a transect method where 25 transects were placed around the lake at 1,500-ft intervals.

Drawing conclusions from the differences between the plant surveys should be done with extreme caution due to the different timing, purpose, and method of each survey. For example, the maximum depth of plant growth was found to be 15 feet in 2002 and 13.5 feet in 2010. This difference may be due to seasonal variation (the 2002 survey was completed

later in the summer) or due to annual variation of plant growth limiting factors (such as water clarity, temperature, or nutrient concentrations). The 2002 and 2009 surveys identified 16 and 22 aquatic plants to at least the genus level, respectively, compared to the 36 plant species identified during the 2010 point intercept survey. These differences are most likely a reflection of survey methods and not due to changes in the plant community. The most common aquatic plant species found during the 2010 survey were coontail (*Ceratophyllum demersum*), flat-stem pondweed (*Potamogeton zosteriformis*) and Fries' pondweed (*P. friesii*). Coontail was also the most common plant found during the 2002 survey (McComas, 2003).

A Floristic Quality Assessment was performed using the data from the 2010 aquatic plant survey. This assessment replaces a subjective measure of quality, such as "high" or "low" with more quantitative measures that allow for comparison of the floristic quality among many sites and for tracking changes over time. A Floristic Quality Assessment is based on calculating an average coefficient of conservatism (mean C) and a floristic quality index (FQI) for a lake. Higher mean C and FQI numbers indicate higher floristic quality and biological integrity and a lower level of disturbance impacts. Non-native plants were not part of the pre-settlement flora, so no coefficient is assigned to them and they are not considered in the calculation of mean C or FQI.

The coefficient of conservatism (C) is the basis of the FQI calculation. Each native species is assigned a value from zero to 10, which represents the probability that a plant species is likely to occur in a lake relatively unaltered from what is believed to be a pre-settlement condition. A C value of zero indicates the probability is almost zero, while a C of 10 indicates the plant is almost certain to be found only in an un-degraded natural community. For example, a C value of 0 is given to plants that may be found almost anywhere. The mean C value in 2010 for Upper Turtle Lake was 5.9, which is above the North Central Hardwood Forests median mean C of 5.6.

The FQI is calculated by multiplying the mean C by the square root of the total number of native species inventoried, thereby combining the conservatism of the species present with a measure of the species richness. The FQI is commonly used to express the quality of a natural area; a higher FQI indicates a healthier aquatic plant community. Nichols (1999) reported a range of FQI values from 3.0 to 44.6 in Wisconsin Lakes. The FQI of Upper Turtle Lake is 31.8. This value is higher than both the statewide median of 22.2 and the North Central Hardwood Forests ecoregion median of 20.9 (Nichols, 1999).The mean C and FQI values for Upper Turtle Lake suggest that the health and quality of the native plant community is above average. The floristic quality of Upper Turtle Lake ranks in the upper quartile on a statewide and regional basis. The Floristic Quality Assessment also indicates that the lake is somewhat susceptible to degradation and disturbances.

5.0 Wild Rice (*Zizania palustris*)

According to the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), Upper Turtle Lake is not a wild rice water. Additionally, wild rice was not found during the aquatic plant surveys of 2002, 2009, and 2010 or during the sensitive areas survey. Although wild rice is not present in Upper Turtle Lake, it warrants attention due to its ecologic and cultural significance and its abundance in nearby lakes and streams (for example, the Joel Flowage, Poskin Lake, and the Apple River). 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 Department of Natural Resources during their review of lake management documents. When present in a lake, wild rice is afforded numerous protections due to its ecological and cultural significance and management is therefore focused on harvest goals and protection rather than removal.

Wild rice is an annual aquatic grass that produces seed that is a nutritious source of food for wildlife and people (Figure 5). 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 species. Renewed interest in the wild rice community has led to large-scale restoration efforts to reintroduce wild rice in Wisconsin's landscape. There is the potential for planting wild rice at shoreline restoration and rehabilitation sites in Upper Turtle Lake. Extensive information is available on wild rice from GLIFWC and the WDNR.

Figure 5 – Wild Rice

6.0 Non-native Aquatic Invasive Species

The only non-native aquatic invasive plant species documented in Upper Turtle Lake is curly-leaf pondweed. The non-native Chinese mystery snail is known to be present in the lake; however, curly-leaf pondweed is the more problematic of these two aquatic invasive species. Not much is known about the environmental impacts of Chinese mystery snails other than periodic die offs that can be very aesthetically displeasing. The UTLA is currently involved in aquatic invasive species monitoring and water craft inspection in cooperation with WDNR and UW-Extension Lakes programs. These programs will continue into the foreseeable future.

6.1 Curly-leaf Pondweed (*Potamogeton crispus*)

Curly-leaf pondweed (CLP) is an invasive 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 has been documented throughout the U.S. The leaves are reddish-green, oblong, and about 3 inches long, with distinct wavy edges that are finely toothed (Figure 6). The stem of the plant is flat, reddish-brown and grows from 1 to 3 feet long. CLP is commonly found in alkaline and high nutrient waters, preferring soft substrate and shallow water depths. It tolerates low light and low water temperatures.

CLP spreads through burr-like winter buds called turions (Figure 6). 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 CLP one of the first nuisance aquatic plants to emerge in the spring. Early summer senescence usually results in CLP dropping from the water column by early July.

Figure 6 – Curly-Leaf Pondweed and Turions

Curly-leaf pondweed becomes invasive in some areas because of its tolerance for low light conditions and low water temperatures. These tolerances allow it to get a head start on and out-compete native plants in the spring. This fast, early growth of CLP can form dense surface mats that interfere with aquatic recreation. In mid-summer, when most aquatic plants are growing, CLP plants are dying off. The decaying CLP can increase nutrients which contribute to algal blooms as well as create unpleasant conditions on shorelines and beaches. As dense mats of CLP decay, dissolved oxygen may be depleted. Because decay primarily occurs in waters that receive oxygen recharge via wave action and plant respiration, the loss of dissolved oxygen is generally unsubstantial and only occurs near the deep-water edges of the littoral zone.

CLP was documented in Upper Turtle Lake during all three aquatic plant surveys even though the 2002 and 2009 surveys were completed after CLP generally senesces and drops out of the water column. The 2009 survey found CLP in 16 of the 25 (64%) transects surveyed (Figure 7) and the 2002 survey found CLP in 1 of the 60 (1.7%) sample points. The CLP-specific 2010 early season point intercept survey found CLP at 52 survey points, or approximately 8.7% of the lake (Figure 8). Based on rake fullness ratings, the 2010 survey determined that 5.9% of Upper Turtle Lake has a significant CLP infestation. Bed mapping found a total of 7.83 acres of canopied CLP stands, which equates to approximately 1.8 % of the total lake area (Figure 8).

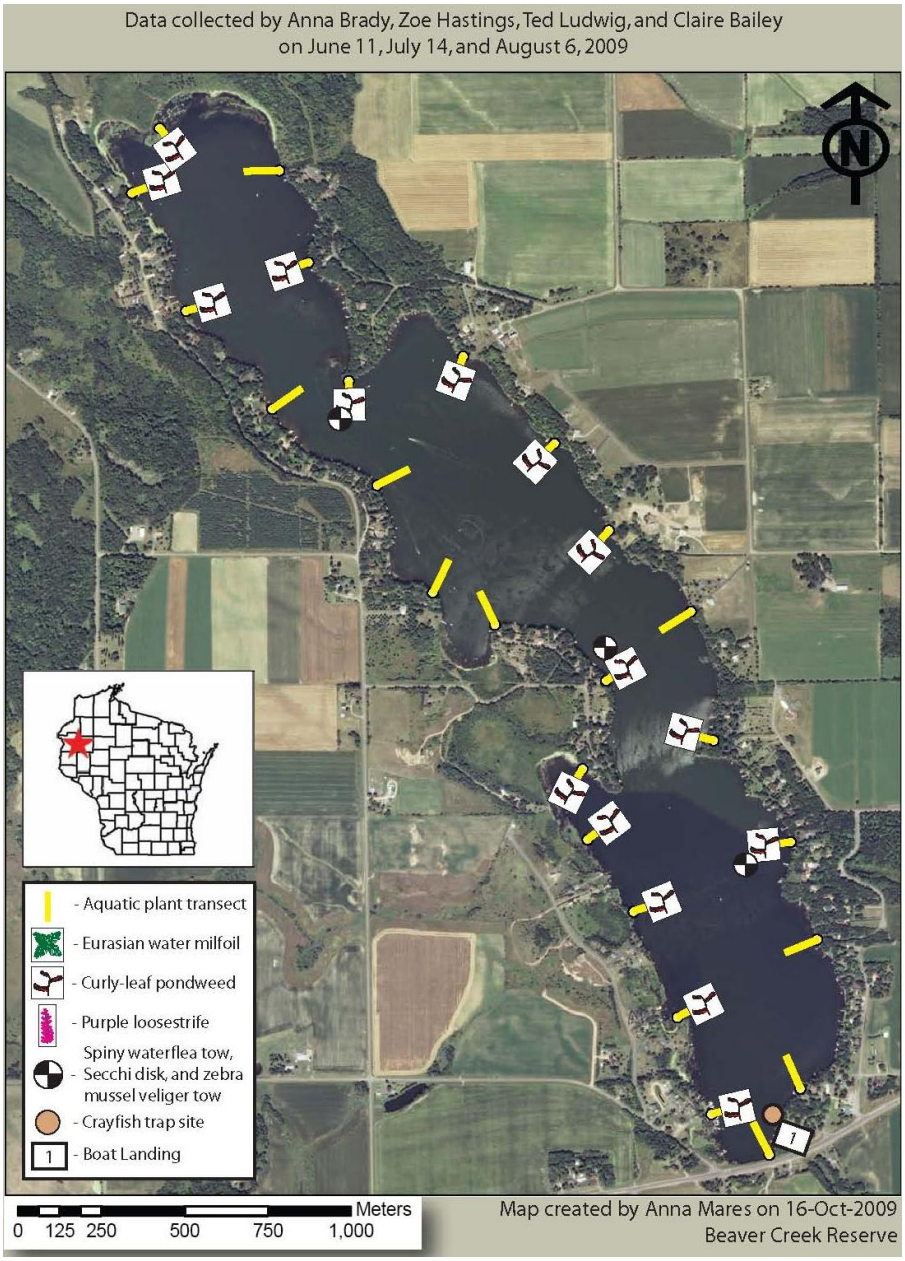

Figure 7 – Curly-Leaf Pondweed Identified during 2009 Beaver Creek Reserve Survey

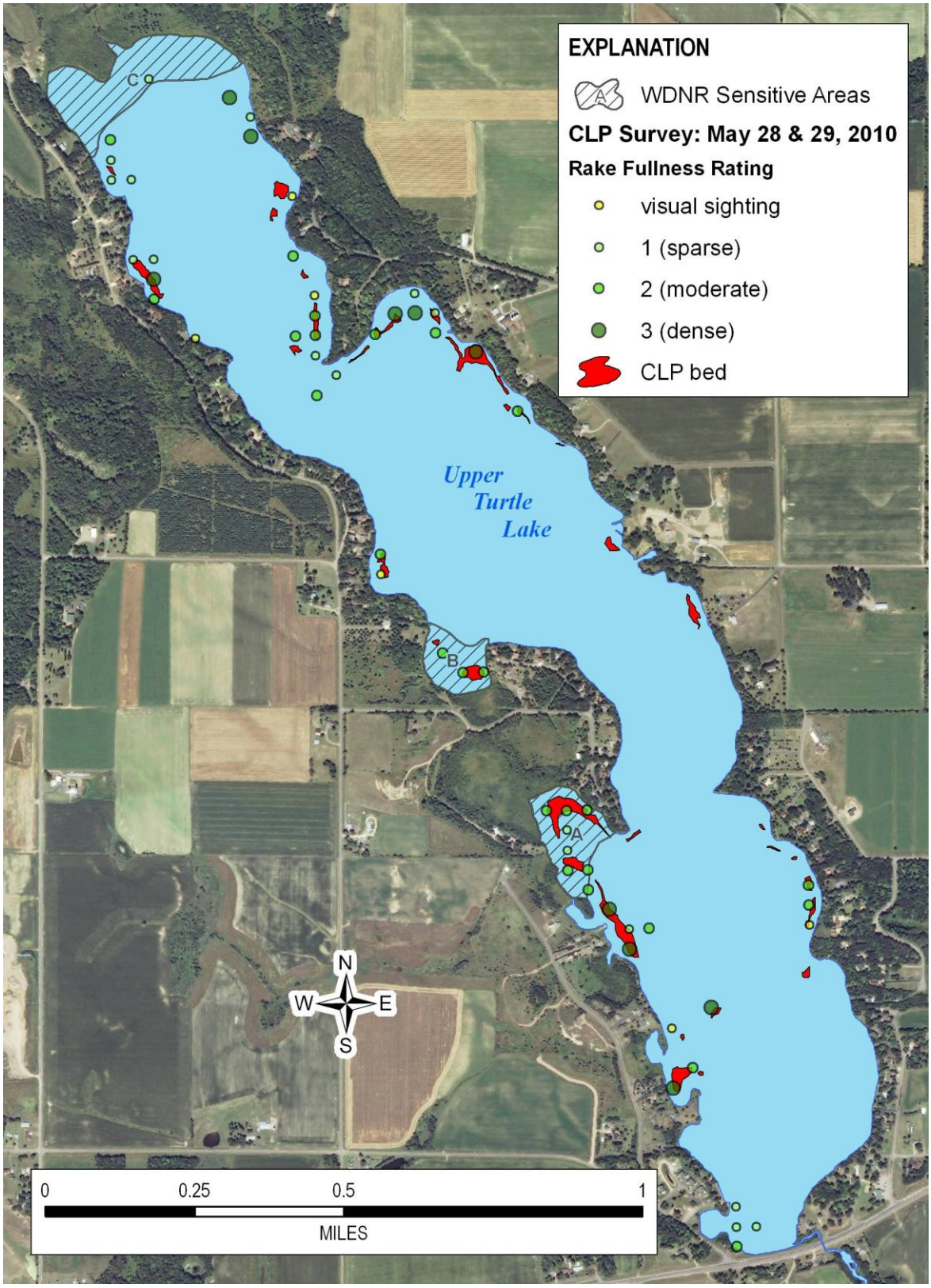

Figure 8 – 2010 Curly-Leaf Pondweed Distribution and Bed Locations

An internal source of phosphorus, the nutrient likely limiting plant growth in Upper Turtle Lake, is the decay of CLP and of other vegetation. The phosphorus load from CLP is more significant because it occurs during the middle of summer when algae are able to readily use the nutrient. The phosphorous content of CLP varies and is likely dependent on individual lake conditions. Roesler (2008) found the phosphorous content of the CLP in nearby Big Chetac Lake to be 0.26% of the plant biomass. Assuming that the biomass of CLP in Upper Turtle Lake is similar (245 g/m²), the potential phosphorus released by the 26 acres infested in Upper Turtle Lake (identified during the 2010 early season survey) is approximately 148 pounds. Because some of the phosphorus released by decaying CLP is captured by sediment or utilized by filamentous algae and other plants, it is likely that only 50% of this phosphorus (74 pounds) makes it into the water column where it can be immediately utilized by algae. These 74 pounds of phosphorus have to potential to grow up to 18.5 tons of algae.

6.2 Eurasian Watermilfoil (*Myriophyllum spicatum*)

Eurasian watermilfoil (EWM) is a submergent aquatic plant native to Europe, Asia, and northern Africa (Figure 9). Although EWM was not found in Upper Turtle Lake, it remains a concern because of its presence in nearby Barron County lakes including Lower Vermillion Lake, Echo Lake, Horseshoe Lake, Shallow Lake, Beaver Dam Lake, and Duck Lake. The proximity of these lakes makes Upper Turtle Lake a candidate for the introduction of EWM via boat traffic.

Figure 9 – 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. EWM grows best in alkaline systems with a high concentration of dissolved inorganic carbon and fertile, fine-textured, inorganic sediments. In less productive lakes EWM 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, EWM is not dependant on seed for reproduction. In fact, its seeds germinate poorly under natural conditions. EWM 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, EWM 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 EWM 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 EWM 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 EWM 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 EWM may lead to deteriorating water quality and algae blooms in infested lakes (WDNR, 2010).

6.3 Other Aquatic Invasive Species (AIS)

At the present time, CLP and the Chinese mystery snail are the only known AIS in Upper Turtle Lake. The 2009 Beaver Creek Reserve lake survey found no spiny waterflea or zebra mussel veligers (planktonic larvae) during the three summer samplings, nor was rusty crayfish or any native crayfish species detected during July 29, 2009 sampling. The 2009 survey did document the presence of Chinese mystery snails in Upper Turtle Lake. Purple loosestrife, rusty crayfish, zebra mussels, giant reed grass, spiny waterflea, hydrilla, and others could threaten the lake in the future. Continued AIS monitoring in and around the lake along with watercraft inspection at the public boat launch should continue.

7.0 WDNR Northern Region Aquatic Plant Management Strategy

All existing Aquatic Plant Management (APM) Plans and the associated management permits (chemical or harvesting) are reviewed by the WDNR. It is important for APM Plans to include yearly monitoring and assessment to document impacts on water quality, fish and wildlife, native plants, and control results for the targeted species. It is equally important for APM Plans to evaluate the potential for restoring the natural plant community within a lake. If needed, shifting the plant community toward more native species through a reduction of targeted aquatic invasive species can prevent plant management from becoming endless, routine maintenance.

The WDNR has a Northern Region Aquatic Plant Management Strategy (Appendix B) that went into effect in 2007. All aquatic plant management plans developed for northern Wisconsin lakes are evaluated according to the following goals:

- Preserve native species diversity which, in turn, fosters natural habitat for fish and other aquatic species, from frogs to birds;
- Prevent openings for invasive species to become established in the absence of the native species;
- 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;
- 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. The WDNR discourages applications for removal of this ecologically and culturally important native plant.

- To be consistent with 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.

8.0 Aquatic Plant Management Alternatives

Problematic aquatic plants in a lake can be managed in a variety of ways. The eradication of non-native aquatic invasive plant species such as CLP is generally not feasible, but preventing them from becoming a more significant problem is an attainable goal. Aquatic invasive species can negatively impact the native plant species that are beneficial to the lake ecosystem. Targeted early- and mid-season removal or treatment can minimize some of these impacts by preventing the AIS from becoming the dominant plant species in the lake which allows for the growth of more desirable native aquatic plants.

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

- Manual and mechanical removal
- Chemical application
- Biological control
- Physical habitat alteration

Manual and mechanical removal methods include pulling, cutting, raking, harvesting and other means of removing the plants from the water. Chemical application is typified by the use of herbicides. Biological control methods include organisms that use the plants for a food source or parasitic organisms that use the plants as hosts. Biological control may also include the use of species that compete successfully with the nuisance species for resources. Physical habitat alteration includes dredging, flooding, and drawdown. In many cases, an integrated approach to aquatic plant management that utilizes a number of control methods is necessary.

Regardless of the target plant species, native or non-native, sometimes no manipulation of the aquatic plant community is the best management option. Plant management activities can be disruptive to areas identified as critical habitat for fish and wildlife and should not be done unless it can occur without ecological impacts.

Not all plant management alternatives can be used in a particular lake. What other states accept for aquatic plant management may not be acceptable in Wisconsin. What is acceptable and appropriate in southern Wisconsin lakes may not be acceptable and appropriate in northern Wisconsin lakes. 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. Possible aquatic plant management alternatives are described below, beginning with the most appropriate options for Upper Turtle Lake.

8.1 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. No manipulation should be considered a viable alternative in areas where 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 would be negatively impacted by treatment.

There should be no manipulation of the aquatic plant community within the Sensitive Areas of Upper Turtle Lake except for the removal of CLP for individual access lanes or if there is a substantial change in the native species richness due to the expansion of curly-leaf pondweed.

8.2 Manual Removal

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 by the WDNR without a permit per NR109 (Appendix C). The zone of manual removal cannot exceed 30 shoreland feet and all raked or pulled plant material must be taken completely out of the lake and removed from the shoreline (Figure 10). 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. If an aquatic invasive species such as CLP is the target species, then removal by this means is unrestricted as long as native plants are not damaged or eliminated.

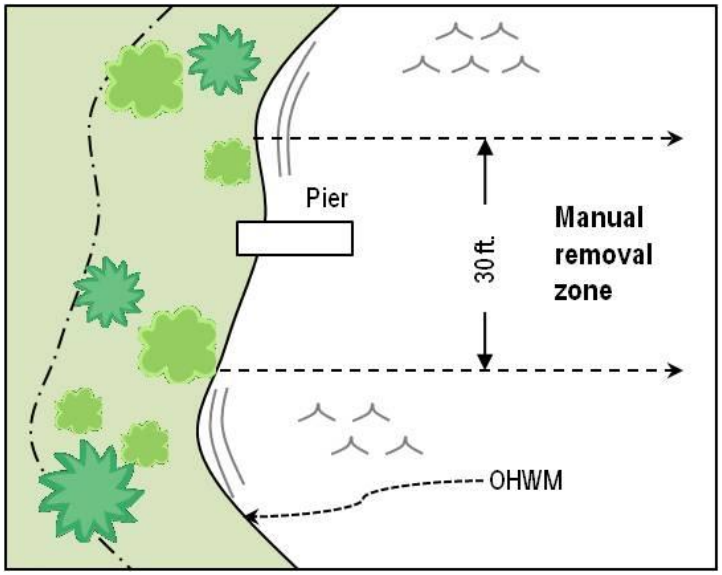

Figure 10 – Aquatic Vegetation Manual Removal Zone

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. In shallow, hard bottom areas of a lake, or where impacts to fish spawning habitat need to be minimized, this is the best form of control. Pulling aquatic invasive species while snorkeling or scuba diving in deeper water is also allowable without a permit and can be effective at slowing the spread of a new aquatic invasive species infestation within a lake when done properly.

Manual removal should be used by individual riparian property owners for access lanes and swimming areas. Efforts should be made to target CLP and avoid the removal of native vegetation. Manual removal can also be used to selectively manage the small curly-leaf pondweed beds located throughout Upper Turtle Lake. Curly-leaf pondweed can spread from plant fragments, so it is important to collect all plant fragments.

8.3 Native Plant Restoration and Enhancement

Native plant restoration, in particular shoreland restoration, is used on many lakes to reduce erosion, increase and improve native habitat, and improve water quality. Restoration not only improves the lake aesthetic enjoyed by so many, it also keeps invasive species ay bay. A study performed in west-central Wisconsin found the mean occurrence of non-native aquatic invasive species to be significantly greater at disturbed shoreline sites than at natural shorelines (Konkel and Evens, 2006). The study also found that the occurrence of non-native species and filamentous algae increased with the amount of disturbed shoreline on a lake.

Native plant restoration along the Upper Turtle Lake shoreline should be pursued. Native emergent plant species should be planted along with shoreland buffers. Due to the diversity of native species within the lake, native aquatic plant reintroduction or expansion is not necessary except possibly in areas where the removal of dense curly-leaf pondweed beds leaves the littoral area devoid of vegetation.

8.4 Mechanical Control

Mechanical removal of aquatic plants involves the use of motorized accessories to assist in vegetation removal. This is a common form of control when large-scale efforts are required but small scale forms of mechanical control also exist. WDNR permits are required regardless of the size of the area to be managed with mechanical control.

8.4.1 Suction Dredging

A form of mechanical harvesting is using diver operated suction harvesting to remove aquatic plants. Diver-operated suction harvesting entails the use of barge- or pontoon-mounted pumps and strainer devices with hoses used by divers to vacuum plants uprooted by hand. This management technique is called harvesting because even though a specialized small-scale dredge is used, sediments are not removed from the system. Sediments can be re-suspended during the operation but use of a sediment curtain would mitigates these effects. Plants are removed directly from the sediments by divers operating this device.

Suction harvesting is a viable management option in Upper Turtle Lake and could be used in conjunction with manual removal methods.

8.4.2 Mechanical Harvesting

The most common form of mechanical control is the use of large-scale mechanical weed harvesters on the lake. The harvesters are generally driven by modified paddle wheels and include a cutter that can be raised and lowered, a conveyor system to capture and store the cut plants, and the ability to off-load the cut plants. The depth at which these harvesters cut generally ranges from skimming the surface to as much as five-feet deep.

Harvesters can remove thousands of pounds of vegetation in a relatively short time period. They are not, however, species specific. 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 (Booms, 1999).

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. Cut plants will usually grow back after time, just like the lawn grass. Re-cutting several times a season is often required to provide adequate annual control (Madsen, 2000). Harvesting activities in shallow water can re-suspend bottom sediments into the water column releasing nutrients and other accumulated

compounds (Madsen, 2000). 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 (Greenfield et al., 2004).

One benefit of large-scale aquatic plant harvesting is the removal of large amounts of plant biomass from a water body. Plants use up nutrients including phosphorous in the water and sediment. However, they often re-deposit that phosphorous back into the lake water and sediment when they die. Early season or cool water plants like curly-leaf pondweed that complete their life cycle, die, and senesce (decay) in early summer can be a source of significant phosphorous loading and may negatively affect dissolved oxygen levels if not removed.

Harvesting is currently not recommended for Upper Turtle Lake, but may be re-evaluated at a later date should conditions dictate.

8.4.3 Small-scale Mechanical Management

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 waterbody. 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. Cutting, grinding, and rotovating have major drawbacks and will not be used on Upper Turtle Lake.

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. Plant disruption by normal boat traffic, however, is not considered illegal.

Small-scale mechanical aquatic plant management is not recommended for use on Upper Turtle Lake. One of the best ways for riparian property owners to gain navigation relief near their docks is to use their watercraft on a regular basis.

8.5 Chemical Control and Management

Herbicides are chemicals that adversely affect the physiological activity and development of plants, and are used to control vegetation by causing death or suppressing growth. Currently a product can only be labeled for aquatic use if it poses no more than a one in a million chance of causing significant damage to human health, the environment, or wildlife resources, and it cannot show evidence of biomagnification, bioavailability, or persistence in the environment (Madsen, 2000). Chemical control of aquatic plants has the advantage of

being selective to target species and. It is an appropriate alternative where monotypic stands of nuisance vegetation exist and where large infestations are present.

Herbicides affect plants through either systemic or contact action. Systemic herbicides are absorbed and transported throughout the plant, thereby killing the entire plant including the roots. Contact herbicides kill only the tissues that are contacted by the chemical and can leave live roots capable of re-growth. Herbicides can also be classified as broad-spectrum (kill or injure a wide variety of plant species) or selective (effective on only certain species). The selectivity can be influenced by the method, timing, formulation, and dosage. In order to select the most appropriate herbicide and dosage, the target and non-target plant species in the treatment area must be properly identified. Applying some systemic and contact herbicides together has a synergistic effect leading to increase selectivity and control (Skogerboe and Getsinger, 2006). Single applications of the two could result in reduced environmental loading of herbicides and monetary savings via a reduction in the overall amount of herbicide used and of the manpower required for application.

When properly applied, herbicides can control aquatic vegetation without harming fish and other wildlife. A WDNR permit is required for the use of aquatic herbicides and a certified pesticide applicator is required for application on most Wisconsin lakes. Full-season control is often achieved with herbicide application and control may extend into the following year. Because the plants remain in the lake and decay, treating too much plant matter can lead to a depletion of dissolved oxygen. Also, algal blooms may occur as nutrients are released into the water by the decaying plants. Spring and early summer are preferred for application because exotic species such as CLP and EWM are actively growing, whereas many native plants are not, and recreational use is generally low.

Chemical residual testing is often done in conjunction with treatment to track the fate of the chemical herbicide used in a particular lake. Residual testing is completed to determine if target concentrations are met, to see if the chemical moved outside its expected zone, and to determine if the chemical breaks down in the system as expected. Water samples are collected prior to treatment and for a period of days following chemical application (for example, 1, 4, 7, 14, 21, and 28 days after application). Monitoring sites are located both within and outside of the treatment area, particularly in areas that may be sensitive to the herbicide used, where chemical drift may have adverse impacts, where movement of water or some other characteristic may impact the effect of the chemical, and where there may be impacts to drinking and irrigation water.

The use of aquatic herbicides on Upper Turtle Lake should be restricted to the control of non-native plant species and only when expansion of existing beds or the introduction of a new non-native invasive species warrants their use.

8.5.1 EPA-approved Aquatic Herbicides in Wisconsin

There are currently six herbicides with aquatic labels registered for use in Wisconsin. A brief summary of each is presented below.

8.5.1.1 Endothall

Endothall is a broad-spectrum contact herbicide most commonly used to kill pondweeds. Trade names include Aquathol K or Super K, and Hydrothol 191. This chemical has been used on Upper Turtle Lake to control aquatic plants. Eurasian watermilfoil and pondweeds such as curly-leaf pondweed, Illinois pondweed, southern naiad, and sago pondweed are very sensitive to endothall, whereas plants such as common elodea, wild celery, water stargrass,

and many floating-leaf and emergent species are more tolerant. Endothall, therefore, has the potential to selectively control Eurasian watermilfoil and curly-leaf pondweed in sites where pondweeds do not dominate the plant community (Skogerboe and Getsinger, 2006).

8.5.1.2 Diquat

Diquat is a non-selective, contact herbicide used to control a wide variety of plants including certain types of filamentous algae. Its common trade name is Reward. This chemical has been used on Upper Turtle Lake to control aquatic plants. Diquat is strongly attacted to clay particles in the water and thus is not effective in lakes or ponds with muddy water or plants covered with silt. For this reason, care must be taken to not disturb bottom sediments during application.

8.5.1.3 Fluridone

Fluridone is a non-selective systemic herbicide. It requires very long exposure times, often three months or more, but may be effective at very low concentrations. Fluridone is sold under the common trade name SONAR. It was just recently approved for use in Wisconsin lakes for the control of Eurasian watermilfoil. It works best where the entire lake or flowage system can be managed, but not in spot treatments or high water exchange areas.

8.5.1.4 2,4-D

2-4,D is one of the most common systemic herbicides in use today. It is a relatively selective herbicide commonly used for treatment of EWM. A few of its most common trade names for use in an aquatic environment are Aqua-kleen, Aquacide, and Navigate. In its liquid form it is known as Weedar 64 and DMA 4 IVM. This chemical has been used on Upper Turtle Lake to control aquatic plants in both its liquid and granular form. 2,4-D effectively controls broadleaf plants (dicots) like EWM, coontail, and northern watermilfoil with a relatively short contact time, but does not generally harm monocots such as pondweeds (including CLP) or water celery. It is not effective against elodea or hydrilla. 2, 4-D can impact early season wild rice growth so should not be used in areas where the target species and wild rice cohabitate.

8.5.1.5 Glyphosate

Glyphosate is a systemic herbicide not effective on submersed plants. It is used for control of emergent or floating leaf plants like purple loosestrife, cattails, phragmites, and lily pads. Glysophate is the herbicide found in Round-Up (trade name) that is available over the counter for terrestrial weed control. A water-safe version of it called Rodeo is commercially available, but not from the average retail store. The Rodeo form of glysophate must be used when on or near water. It is not legal to use Round-Up on or near water. A surfactant and dye are usually added to it to make it stick to the target vegetation better and to make it more visible after application. Glysophate can be applied in a foliar spray or painted or dabbed onto cut stems. It is a systemic herbicide drawn into the plant and to the roots, so it will kill all parts of the target plant if applied correctly.

8.5.1.6 Copper Complexes

Copper sulfate and chelated coppers have been widely used as non-selective, fast-acting, contact herbicides or algaecides. These chemicals have been used on Upper Turtle Lake to control aquatic plants and algae, often in conjunction with endothall and diquat. Copper compounds are primarily used for algae control but can be effective against certain submerged plant species. Copper can build up in sediments, can be toxic to fish and invertebrates, and certain species of algae can build up a resistance (Charudattan 2001). The

use of copper compounds to control algae was once widely accepted in Wisconsin, but in recent years it has not been supported as a viable control method because of the potential negative impacts inherent in its use.

The use of copper solutions it is not recommended as a management option for Upper Turtle Lake due to the potential long-lasting negative effects on aquatic habitat.

8.5.1.7 Triclopyr

Triclopyr, a systemic herbicide similar to 2,4-D, is used for control of aquatic dicots. Its common trade names are Renovate 3 and Garlon 3A. To date, Triclopyr has not been approved for general use in Wisconsin but is undergoing testing for aquatic applications. Triclopyr degrades quickly in an aquatic environment making its use most effective in systems with low water-exchange where contact with target plants can be maintained for longer periods of time, though not as long as fluridone. Low concentrations of this herbicide can be effective for EWM control when exposure time reaches 48 to 72 hours (Netherland and Getsinger, 1992). It does not appear to significantly affect pondweeds and coontail (Clayton & Clayton, 2001).

8.5.2 Small-Scale Herbicide Application

Small-scale herbicide application involves treating small areas less than 10 acres combined on a given body of water. Small-scale chemical application is usually completed in the early season (April through May). It is also used as a follow up treatment to retreat areas missed or not impacted by large-scale applications. Testing for herbicide residuals is not required by the WDNR in order to complete small-scale treatments, but is recommended to gain an understanding of the fate of the chemical used.

Should the coverage of CLP significantly expand or cause a substantial change in the native species richness from 2010 levels, small-scale herbicide application is recommended for CLP control on Upper Turtle Lake. Surveys should be completed of the aquatic plant community in the areas to be treated before and after application to gauge the effectiveness and impact of the treatment on target and non-target plants.

8.5.3 Large-Scale Herbicide Application

Large-scale herbicide application involves chemical treatment of more than 10 acres combined on a given body of water. Like small-scale applications, this is usually completed in the early-season (April through May) for control of non-native invasive species like EWM and CLP while minimizing impacts on native species. If used, residual testing is recommended, as is pre and post treatment aquatic plant surveying to determine the impacts.

Large-scale chemical application is recommended for Upper Turtle Lake if manual methods and small-scale herbicide application prove to be inadequate to control CLP.

8.6 Biological Control and Management

Biological control for aquatic plant management involves using animals, fungi, insects, or pathogens as a means to control nuisance plants. The goal of biocontrol is to weaken, reduce the spread, or eliminate the unwanted population so that native or more desirable populations can make a comeback. A special permit is required in Wisconsin before any biocontrol measure can be introduced into a new area.

Biological control of nuisance plants in aquatic systems has both positive and negative attributes. One positive is that control agents are often host specific, so effects to non-target

species may be reduced. Control agents can also reproduce in response to increases in nuisance species density often without reapplication of the agent. Development and registration (where necessary) of biological control agents is generally less expensive than chemical agents.

Bio-control can have many potential disadvantages. A substantial risk is involved when new species are introduced as bio-control agents. To be considered successful, these species are expected to persist indefinitely in the environment where they are used, and may spread to new locations. Therefore, if there are any adverse effects resulting from the bio-control agent, these effects may be difficult or impossible to control. Other drawbacks include unpredictable success and rates of control that are slower than with chemical methods. Resistance in host species is unlikely to develop but can occur. Finally, agents that work in one area may not be suitable in all ecosystems. Climate, interference from herbicidal application, hydrological conditions, and eutrophication of the system can influence the effectiveness of bio-control agents. The growth of nuisance weeds can be suppressed with the use of bio-control agents, but not fully eliminated (Greenfield et al., 2004).

8.6.1 Biological Controls in Wisconsin

There are currently no biological controls for CLP but research to identify and establish biological controls is on-going. Studying naturalized and native herbivores and pathogens that impact nuisance aquatic and wetland plants increases the number of potential biological control agents that could be incorporated into invasive plant management programs. The groundwork has been laid for conducting future biological control research and experimentation. Although not all of the native and naturalized organisms researched can be successful, the information and expertise is now available for potential insects and pathogens to be collected, analyzed, and studied. A continuation of the work that has been started is needed to make available for the future more successful native bio-control agents (Freedman et al., 2007).

Many herbivorous insects have been and continue to be studied for their impacts on unwanted aquatic plant species. An herbivorous aquatic moth (Acentria ephemerella), two native herbivorous weevils (Euhrychiopsis lecontei and Phytobius spp.), and a midge species (Cricotopus spp.) have been associated with the decline of EWM in lakes. Several species of insect are being used to control purple loosestrife infestations very effectively. Two Galerucella spp. are easy to rear, can be extremely effective at reducing large populations of purple loosestrife, and after nearly 20 years of use appear to have no negative effect on the areas in which they are introduced.

There are several forms of biological control that have been used in other states, but are generally not approved for use in Wisconsin. The grass carp, also known as the white amur (Ctenopharyngodon idella), feeds on aquatic plants and has been used as a biological tool to control nuisance aquatic plant growth in other states. In addition to grass carp, common carp and tilapia (a fish species) have been added to ecosystems to reduce aquatic vegetation. Wisconsin does not permit the use of these fish for aquatic plant control.

Plant fungi and pathogens are currently still in the research phase. Certain species for control of hydrilla and EWM 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 (Greenfield et al., 2004).

8.6.2 Barley Straw

Organic materials, such as peat and barley straw, have been used for control of rooted aquatic plants and algae. There are several theories for why barley straw may work. One theory suggests that decomposing straw uses up nutrients in the water so they are not available for algae growth. Another suggests that decomposing straw gives off compounds toxic to algae (Scheffer, 1998). Although mixed results have been reported, it is known that the decomposition of the straw requires oxygen, and the application of excessive amounts of straw could reduce the oxygen content of the water to levels that stress or kill fish.

Questions still remain as to whether barley straw should be considered an algicidal (kills existing algae) or an algistatic (prevents new algae growth). This designation is an important one for if it is considered an algicidal agent then it is also considered a pesticide. The EPA requires rigorous testing and a registration before being a pesticide can be approved for use in a public water body. Because barley straw is not a registered pesticide, it cannot be sold as a pesticide or recommended for algae control; this would be the same as distributing an unregistered pesticide (Lembi, 2002). Although there is little evidence that barley acts like typical clarifiers such as alum (which causes the precipitation of phosphorus or removes particles from the water), this is one way in which the direct claim or implication of "algae control" can be avoided (Lembi, 2002).

More research is required before any recommendations regarding barley straw can be made. Placement of any barley straw in waters of Wisconsin may require a permit from the WDNR.

8.7 Aquatic Plant Habitat Disruption

Aquatic plant habitat disruption involves management activities that alter the environment in which aquatic plants are growing. Several techniques are commonly used: drawdown or flooding, dredging, benthic barriers, shading or light attenuation, and nutrient inactivation. While not prohibited in Wisconsin, these plant management alternatives will undergo much greater scrutiny by the WDNR, and in most cases will not be permitted. It is unlikely that any of these management alternatives will be completed in Upper Turtle Lake.

8.7.1 Dredging

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. In deep water, the plants do not receive enough light to survive. 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 is not a suitable aquatic plant management option in Upper Turtle Lake due to the cost, environmental impacts, and the problem of disposal of dredge material.

8.7.2 Benthic Barriers and Light Reduction

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.

Light manipulation techniques, although practical for small-scale applications (for example, to improve swimming areas), are not recommended for use in Upper Turtle Lake.

8.7.3 Water Level Manipulation

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 drawdowns 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, 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.

Drawdown and flooding are not recommended for aquatic plant control on Upper Turtle Lake. The lack of an outlet structure and the presence of a diverse aquatic plant community make water level manipulation impractical.

9.0 Aquatic Plant Management Discussion

Upper Turtle Lake is a eutrophic lake with a high quality aquatic plant community. Curly-leaf pondweed and reed canary grass are the only exotic aquatic plant species found in the lake at this time. Native plants found in the lake are somewhat susceptible to degradation and disturbances. Disturbances can occur in different ways. Indirect disturbances consist of degraded water quality and algal growth, biological disturbances include invasive plant species and the grazing and destruction of plants by carp, and direct disturbances include boat traffic, plant harvesting, chemical treatments, and the construction of docks and other structures. Disturbances along the shore and in wetlands open up areas for invasive species such as reed canary grass and purple loosestrife to populate. An appropriate preventative measure is to reseed any bare spots with native plants adapted to the site.

Promoting native plant growth is an important management goal, and is tied to improving water quality and clarity by reducing phosphorous and chlorophyll *a* concentrations in the lake. There are several significant non-point sources of nutrients to the system including agricultural runoff from the watershed, near shore runoff and septic system drainage from riparian properties, and the internal cycling of nutrients already present in the system through sediment release and mid-season CLP senescence.

Protecting native plants should be a primary focus of plant management in Upper Turtle Lake. In the 2002 Upper Turtle Lake property owner survey, respondents ranked the aesthetics or viewing the lake as the number one activity they enjoy most with fishing in a close second. The benefits offered by native plants include fish and wildlife habitat, keeping aquatic invasive plant species at bay, maintaining water quality, protecting the shoreline from erosion, and increasing land owner privacy. These benefits together create the lake aesthetic enjoyed by so many and are directly related to a healthy native aquatic plant community.

Under this APM Plan, plant removal by individual land owners will comply with the WDNR Northern Region (NOR) Plant Management Strategy (Appendix B). Riparian access lanes (lanes from the shore that are normally used by an individual shore owner) will be first maintained by normal boat traffic and manual removal before citing impaired navigation and engaging in other control methods such as chemical treatment. Severe impairment or nuisance means the plants are growing thickly and forms mats on the surface of the lake. The UTLA will assist to determine if navigation is impaired and removal may be allowed, but will defer a permit decision to the WDNR.

9.1 Curly-Leaf Pondweed

Curly-leaf pondweed is well-established in Upper Turtle Lake. Although widely distributed throughout the lake in the spring, CLP is generally present in fragmented groups interspersed with native plant species. A few monotypic beds of CLP are currently present in the lake that may be interfering with navigation in spring and early summer. The presence of CLP in the spring appears to provide important habitat for fish, offering spawning locations, forage and cover. By mid-summer, most of the CLP has senesced and valuable native plants, such as white-stem pondweed and Illinois pondweed, populate the areas vacated and provide habitat. Because of its apparent habitat value, management of CLP should first focus on monitoring and manual removal and any active management should be approached with caution.

The goals of plant management at this time are to maintain and improve the distribution and diversity of native species and improve water quality. To reach these goals, management activities need to be in place that monitor CLP and prevent the expansion of large monotypic CLP beds and prevent new monotypic beds from establishing. Although CLP is not currently at nuisance levels in much of the lake, an expanded infestation will likely have a negative impact to both the lake ecosystem and lake users in a number of ways. For example, the release of nutrients in mid-summer can fuel algae blooms and the growth of dense, canopied CLP beds can interfere with boat traffic.

Physical removal by land owners is the best management alternative for CLP control and problematic plant growth in the lake. To have the maximum benefit control efforts should be undertaken in the spring or early summer. Care should be taken to prevent negative impacts to the fishery, which utilizes the CLP at this time. Raking and hand cutting remove plants at the sediment surface, and there is some evidence that early season cutting of curly-leaf pondweed can prevent turion production. Curly-leaf pondweed can spread from plant fragments, so it is important to collect all fragments and clean all vegetation off boats and equipment.

Establishing an annual spring CLP bed mapping and turion density sampling program will help determine whether CLP beds remain in check or if additional management measures may be necessary. Monitoring the distribution and extent of monotypic CLP beds and evaluating them for potential control measures is of particular importance. Initially, this program will be completed primarily by resource professionals, but over time may be completed by trained volunteers. The data will provide more information on baseline conditions and trends, which are vital for developing an extensive CLP control program. The information can be used for guiding decisions on the level of management required, prioritizing areas of the lake for treatments, and selecting the specific tools and strategies to be implemented.

As mentioned above, chemical control of aquatic plants should only be allowed when severe impairment or nuisance conditions are documented, if CLP should expand to levels that

negatively impact native plants or if a new aquatic invasive species such as Eurasian watermilfoil is discovered in the lake. Chemical control of CLP in Upper Turtle Lake would likely be most effective through an early season application of the chemical endothall. Typical herbicide application costs range from $400-700 per acre of treated area with the majority of these costs associated with the raw materials. Prices vary depending on the chemical brand and form (liquid or granular), required dose rate, applicator fees, frequency of application, and the amount of pre- and post-treatment monitoring and assessment that is done. Pre- and post-treatment surveys of the aquatic plant community should be done coincident with any chemical treatments.

The initial aquatic plant management recommendations for Upper Turtle Lake are summarized in Figure 11. Over the course of the next several years, as CLP management progresses, new information is gathered, and lake conditions change, aquatic plant management and control methods will likely change.

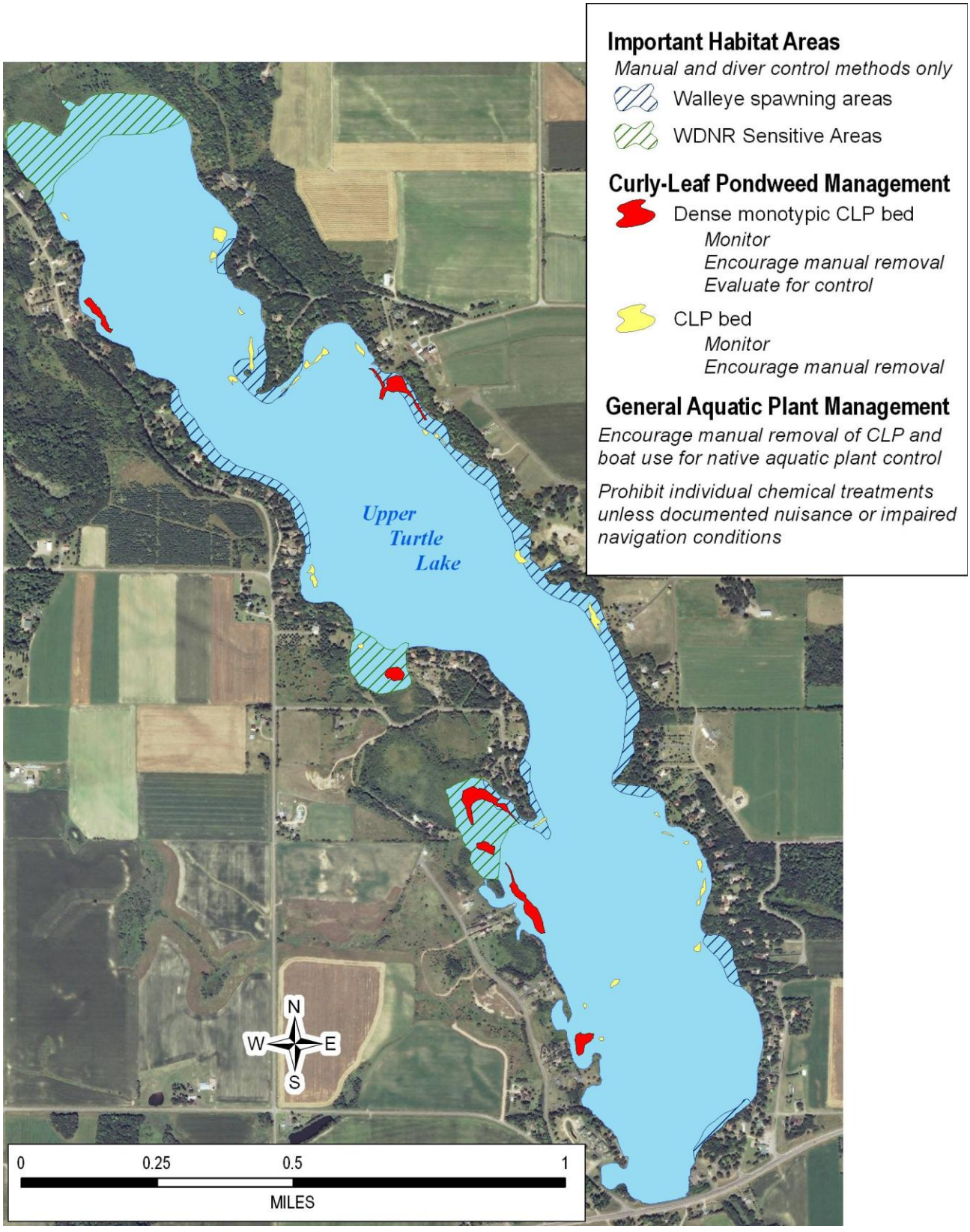

Figure 11 – Summary of Initial Aquatic Plant Management Recommendations

9.2 Agricultural and Shoreland Runoff

Agricultural land use makes up the majority of the land cover in the Upper Turtle Lake watershed. Non-point runoff from agricultural lands and from developed shoreland areas is a major source of nutrients to the lake. During the 2010 plant survey, a pasture was noted adjacent to the lake that may be providing excessive sediment and nutrients to the lake, a disturbance which is likely impacting native plant species and providing an advantage for CLP to dominate the area. Also noted during the 2010 survey was a greater abundance of filamentous algae in front of shorelines made up of mowed grass compared to those with at least some conservation practices in place.

Efforts to make changes to agricultural practices in the watershed and to make changes along the shoreline of the lake are underway through a five-year lake protection project. Because phosphorus is the nutrient that limits plant growth in the lake, the reduction of phosphorus loading to the lake will likely reduce the frequency and magnitude of algal blooms. Educating lake residents and riparian property owners about reducing their phosphorus footprint through best management practices should be an on-going activity practiced by the UTLA.

9.3 Re-establishing Native Plant Communities by Planting and Restoration

Native plant restoration will be beneficial to Upper Turtle Lake. 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. Allowing the re-growth of native plants in cleared areas can prevent CLP from establishing in those sites. One of the goals of the partner project with Lower Turtle Lake is to reduce the amount of phosphorous loading from the watershed. With a decrease in phosphorous, water clarity may improve in both lakes and allow for the re-establishment of some species of native plants, particularly in Lower Turtle Lake.

Aquatic plants can be classified into three general categories: submergent, emergent, and floating. Submergent plants are usually, but not always, rooted to the bottom of a lake and completely under water except for certain parts, like flowers, at certain times during the year. Emergent plants include bulrush, cattail, grasses (wild rice, for example), and sedges. Floating leaf plants include water lilies, floating leaf pondweeds, and common elodea. These plants generally grow in shallow water down to about 15 feet. Floating leaf plants also include free-floating species such as duckweeds that are not rooted in the sediment.

A diverse plant community will prevent certain native plants from becoming a nuisance. For example, submersed aquatic plants like coontail, northern watermilfoil, and common elodea may be beneficial native plants, but may become a nuisance if they are the dominant species in a lake. These plants do well in the presence of man-made disturbances, often increasing when other plants more sensitive to human disturbances are disappearing. Management efforts to improve water quality in the lake will help increase both aquatic plant diversity and quality.

Emergent plants may also be considered a nuisance by some riparian owners, but in general are extremely beneficial to a lake and their removal is discouraged unless a need for removal is shown following the problem documentation guidelines in the NOR Aquatic Plant Management Strategy followed by the WDNR (Appendix B).

In areas where dense growth of invasive species exists, native plants may re-establish naturally once the invasive species are removed if seeds and other propagules are still present. Artificially reintroducing native plants 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 (Figure 12).

Figure 12 – Protecting Native Plantings using the Buffer Blocker System

If desirable native plants to not come back by themselves, it may be possible to collect plant stock from other areas of the lake. It may be necessary to collect plants from other lakes or to purchase then from commercial vendors. Collecting plants from the same or other water bodies may require a permit. If commercial plants are purchased, care should be taken to not introduce unwanted vegetation at the same time. Because many submergent and floating leaf plants are susceptible to failure during restoration, a good rule of thumb to follow is to plant as many as possible. Emergent plant species are not as susceptible to failure (Moss and others, 1996).

There are many sources for more information regarding native aquatic plant restoration. Smart and others (1998) discuss numerous techniques for establishing native aquatic plants in reservoirs with an absence of vegetation or low species diversity. The Langlade County, Wisconsin Land Records and Regulations Department has a Shoreland Restoration Web Site which provides a great deal of information for re-establishing native plants (http://lrrd.co.langlade.wi.us/shoreland/index.asp, last accessed: May 2011). A complete review of these techniques and others should be completed before undertaking a planting project.

Planting projects on Upper Turtle Lake should start small. Begin by working with a few willing land owners to restore emergent plant species. If proven successful, restoration projects can be expanded. Improving water clarity over the next few years should also enhance the growth of more desirable aquatic plants that will keep other native plants from becoming a nuisance.

10.0 Aquatic Plant Management Goals, Objectives, and Actions

There are five broad goals, each with a number of objectives and actions, which will guide plant management efforts on Upper Turtle Lake over the course of the next five years. Appendix D is an outline of the aquatic plant management goals and activities, and Appendix E is a five-year timeline for completion of the activities included in this APM Plan. This five-year plan is not intended to be a static document; rather, it is a living document which can be revised to ensure goals are being met. Minor changes and adaptations are expected and may be made annually, but any major change in activities or management philosophy will be presented to the UTLA and the WDNR for approval. The five goals for this plan are as follows:

1. Protect and enhance the native species community
2. Monitor and control the aquatic invasive species in Upper Turtle Lake;
3. Prevent the introduction of new aquatic invasive species and prevent the spread of invasive species from Upper Turtle Lake to other lakes;
4. Reduce nutrient and pollutant loading to the lake and monitor lake water quality;
5. Evaluate aquatic plant management on an annual basis and revise the APM Plan as necessary.

This APM Plan will be implemented by the Upper Turtle Lake Association, their consultants, and through partnerships formed with the WDNR, the Barron County Soil and Water Conservation Department, and other local clubs and organizations.

10.1 Protect and enhance the native species community

It is important to promote the protection and expansion of native plants and animals in and around Upper Turtle Lake. The UTLA will promote the value of the native plants and other wildlife that are found in and around the lake through its educational and informational activities. Land owners and lake users will be encouraged to become involved in monitoring programs such as LoonWatch (http://www.loonwatch.org). The UTLA should consider working with the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) to evaluate if wild rice could be introduced in the lake during restoration activities.

10.2 Monitor and control the aquatic invasive species in Upper Turtle Lake

The expected outcome of CLP management is to prevent an increase in the distribution and density of CLP beds and reduce turion density in areas of targeted control. Curly-leaf pondweed control will initially consist of manual removal and, if available, diver removal methods. Shoreland property owners will be taught to distinguish curly-leaf pondweed from other beneficial native plants and encouraged to remove as much as they can via manual methods. Curly-leaf pondweed bed mapping and turion density monitoring will be done on an annually basis. Early season (late spring to early summer) CLP bed mapping will be done throughout the lake and fall turion density will be measured in areas of concern and in areas where concerted control efforts, including chemical treatments, occur to help determine the effectiveness of the control regime.

The dense and monotypic beds identified in 2010 will be closely monitored for expansion and evaluated for targeted control efforts. Should conditions and social acceptance dictate, small-scale chemical control methods may be initiated to control CLP. Any chemical treatment of CLP will be supported by early season bed mapping, fall turion density monitoring, pre- and

post-treatment aquatic plant surveys, and residual monitoring. Large-scale management may be completed on the lake if necessary but is not required at this time.

10.3 Prevent the introduction of new aquatic invasive species and prevent the spread of invasive species from Upper Turtle Lake to other lakes

Volunteers will continue watercraft inspection at the eastern public access site on Upper Turtle Lake following guidelines established by the UW-Extension Lakes Clean Boats-Clean Waters program. The majority of this monitoring will occur on holidays and weekends during the fishing season. At least one volunteer will attend Clean Boats-Clean Waters training in order to be eligible to train other watercraft inspectors.

An early detection and rapid response program can detect and eradicate budding populations of invasive species before they have a chance to become widely established, thus eliminating the need for costly and resource-intensive control programs. Early detection can be achieved through in-lake AIS monitoring, which will be completed by volunteers throughout the lake at least once a month from April through October. Volunteers will be trained according to CLMN AIS monitoring guidelines. AIS monitoring volunteers may be expected to monitor certain portions of the lake and (or) may be expected to monitor for a predetermined amount of time.

Properly identifying suspect species and knowing the appropriate contacts to initiate control measures is necessary for a coordinated and rapid response against new AIS. Appendix E contains a rapid response plan to follow should Eurasian watermilfoil (EWM) be discovered in Upper Turtle Lake. It includes guidelines for collecting samples, proper vouchering, informational signage, more complete monitoring, and possible treatment, if a suspect plant is found. The EWM rapid response is also applicable for other AIS.

The UTLA will promote AIS education and distribute information to lake property owners and lake users through its newsletter, webpage, and public meetings. The UTLA will sponsor or participate in an annual Lake Fair which will address pertinent lake issues. The Lake Fair could be held during another regularly scheduled event (e.g., the annual meeting or annual picnic), held with another entity such as a neighboring lake, or as a part of a larger public event.

10.4 Reduce nutrient and pollutant loading to the lake and monitor lake water quality

Much of the shoreland on Upper Turtle Lake is developed to some extent. The promotion and implementation of shoreland best management practices (BMPs) is currently underway as part of the Lake Protection Project. New and existing property owners will be encouraged to implement BMPs to help improve the aesthetic and ecologic quality of the lake. Educational and informational materials will be provided to property owners via newsletters and workshops by the UTLA and its partners including the WDNR and the Barron County Soil and Water Conservation Department.

Curly-leaf pondweed management and comprehensive management activities will have an effect on water quality conditions in the lake. Water quality monitoring through the Citizen Lake Monitoring Network (CLMN) and expanded parameters (that is, more frequent sampling of a larger number of water quality parameters) will help characterize current conditions which can then be compared to future conditions to determine the affects of management activities on the lake. Expanded water quality monitoring is currently being completed periodically during the open water season and once during the winter as part of the

partner project with Lower Turtle Lake. Upon completion of that project, data needs will be evaluated and water quality monitoring will continue.

10.5 Evaluate aquatic plant management on an annual basis and revise the APM Plan as necessary

Annual summaries and evaluations of all activities undertaken and a final project summary will be completed by the UTLA and their consultant. Reports will be made available to the public and interested parties including, but not limited to, the Lower Turtle Lake Management District and the WDNR. During the final year of this APM Plan, a whole-lake point intercept aquatic plant survey and assessment will be performed by a resource professional. This survey will identify any changes that may have occurred to the aquatic plant community during the course of this APM Plan and will guide future management effort.

11.0 Five-Year Timeline of Activities

The activities in this APM Plan are designed to be implemented over a 5-year period beginning in 2011. Appendix E provides a timeline for implementation of activities. As mentioned above, the plan is intended to be flexible to accommodate future changes in the needs of the lake and its watershed, and those of the UTLA. Many activities in the timeline will require grant support to complete. If grant support is not acquired, then some activities will be modified or eliminated until more revenue can be arranged through the UTLA or state grant funding.

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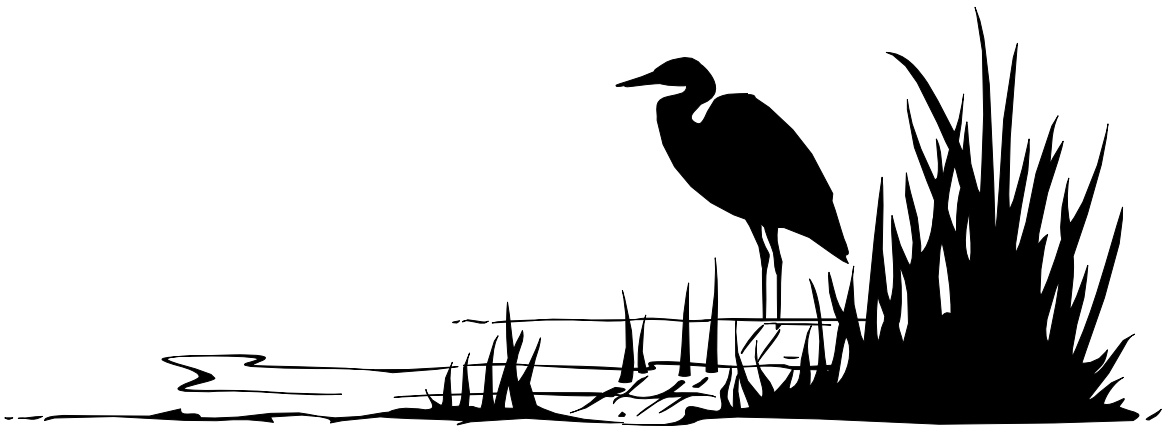
Appendix A

Upper Turtle Lake Sensitive Area Survey Report and Management Guidelines

UPPER TURTLE LAKE
SENSITIVE AREA SURVEY REPORT
AND MANAGEMENT GUIDELINES



This document is to be used
with its companion document
"Guidelines for protecting, maintaining,
and understanding lake sensitive areas"

Upper Turtle Lake (Barron Co.)
Integrated Sensitive Area Survey Report

Date of Survey: 12 August 1993 Number of Sensitive Areas: 3
Site Revisited: 20 August 2001

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Lake Sensitive Area Survey results identified three areas that merit special protection of the aquatic habitat. These areas of aquatic vegetation on Upper Turtle Lake offer critical or unique fish and wildlife habitat. These habitats provide the necessary seasonal or life stage requirements of the associated fisheries, and the aquatic vegetation offers water quality or erosion control benefits to the body of water.

During this survey there were no documented occurrences of Purple Loosestrife. However, the threat of Purple Loosestrife is always a concern and should be dealt with immediately. Methods for control are to remove the entire plant before it produces seeds or by cutting the flower head and spraying with and approved herbicide. You should contact the Department before any of these methods are implemented.

The reader should consider that any buffer that does not extend back from the waters edge at least 35' is not providing adequate protection for water quality and should be expanded to at least 35'. Local zoning ordinances and lakes classification systems have tried to provide better guidelines pertaining to buffer widths and set backs based on lake type. Landowners are encouraged to go beyond the minimum requirements laid out by zoning and consider extending buffer widths to beyond 35' and integrating other innovative ways to capture and reduce the runoff flowing off from their property while improving critical shoreline habitat. Berms and low head retention areas can greatly increase the effective capture rate from developed portions in addition to that portion captured within the buffer.

Site conditions may dictate that a buffer has to be much wider than 35' to be effective at capturing the sediments and nutrients running off the developed portions of the shoreline. If the shoreline is steeply sloped (>7%slope) greater widths should definitely be used.

No mowing should take place within the buffer area (with the exception of a narrow access trail and small picnic area), and trees and shrubs should not be cut down even when they become old and die; because they provide important woody debris habitat within the buffer zone as well as aquatic habitat when they fall into the lake.

The following is a brief summary of the Upper Turtle Lake sensitive area sites and the management guidelines. Also, the "Guidelines for Protecting, Maintaining, and Understanding Sensitive Areas" provides management guidelines and considerations for different lake sensitive areas (Attached).

I. Aquatic Plant Sensitive Areas

Sensitive areas A, B and C contain aquatic plant communities, which provide important fish and wildlife habitat as well as important shoreline stabilization functional values. Sensitive areas provide important enough habitat for the Upper Turtle Lake ecosystem that conservation easements, deed restrictions, or zoning should be used to protect them. Management guidelines for aquatic plant sensitive areas are (unless otherwise specifically stated):

1. Limit aquatic vegetation removal to navigational channels no greater than 25 feet wide where necessary, the narrower the better. These channels should be kept as short in length as possible and it is recommended that people do not completely eliminate aquatic vegetation within the navigation channel; but instead only remove what is necessary to prevent fouling of propellers to provide access to open water areas. Chemical treatments should be discouraged and if a navigational channel must be cleared, pulling by hand is preferable over mechanical harvesters where practical.
2. Prohibit littoral zone alterations covered by Wisconsin Statutes Chapter 30, unless there is clear evidence that such alterations

would benefit the lake's ecosystem. Rock riprap permits should not be approved for areas that already have a healthy native plant community stabilizing the shoreline and property owners should not view riprap as an acceptable alternative in these situations.

3. Leave large woody debris, logs, trees, and stumps, in the littoral zone to provide habitat for fish, wildlife, and other aquatic organisms.
4. Leave an adequate shoreline buffer of un-mowed natural vegetative cover and keep access corridors as narrow as possible (preferable less than 30 feet or 30% of any developed lot which ever is less).
5. Prevent erosion, especially at construction sites. Support the development of effective county erosion control ordinances. The proper use of Best Management Practices (BMP's) will greatly reduce the potential of foreign materials entering the waterway (i.e. silt, nutrients).
6. Strictly enforce zoning ordinances and support development of new zoning regulations where needed.
7. Eliminate nutrient inputs to the lake caused by lawn fertilizers, failing septic systems, and other sources.
8. Control exotic species such as purple loosestrife.

Resource Value of Site A

Sensitive area A consists of a small, shallow bay located on the southwestern shore of Upper Turtle Lake.

This area provides important habitat for centrarchid (bass and panfish) and esocid (northern pike) spawning and nursery areas. This area also provides important habitat for forage species. Wildlife also are reliant upon this area for habitat. Eagles, loons, herons, waterfowl, songbirds, furbearers, turtles, and amphibians benefit from this valuable habitat.

The emergent, floating, and submergent plant community structure of Sensitive area A includes: **Emergents;** broad-leafed cattail (*Typha latifolia*), water willow (*Decodon verticillatus*), and common bur-reed (*Sparganium eurycarpum*). **Floating leafed**; spatterdock (*Nuphar variegata*), white water lily (*Nymphaea odorata),* and duckweed (*Lemna sp.*). **Submergents;** wild

celery/eel-grass (*Vallisneria americana*), flat stem pondweed (*Potamogeton zosteriformis*), sago pondweed (*P. pectinatus*), curly leaf pondweed (*P. crispus*), clasping leaf pondweed (*P. richardsonii*), bushy pondweed (*Najas flexis*), illinois pondweed (*P. illinoensis),* coontail (*Ceratophyllum demersum*), northern milfoil (*Myriophyllum sibiricum)*, muskgrass (*Chara sp.*), and elodea.

Chemical treatments and/or mechanical harvesting are strongly discouraged. Historical chemical treatments and mechanical harvesting should be limited to navigational channels only. All other interests in chemical treatments and mechanical harvesting should be scrutinized.

Resource Value of Site B

Sensitive area B consists of a small bay located at the west side of Upper Turtle Lake.

This area provides important habitat for centrarchid (bass and panfish) and esocid (northern pike) spawning and nursery areas. This area also provides important habitat for forage species. Wildlife also are reliant upon this area for habitat. Eagles, loons, herons, waterfowl, songbirds, furbearers, turtles, and amphibians benefit from this valuable habitat.

The emergent, floating and submergent plant community structure of Sensitive area B includes: **Emergents;** common bur-reed (*Sparganium eurycarpum*), soft stem bulrush (*Scripus validus*), arrowhead (*Sagittaria sp.*), and broad-leafed cattail (*Typha latifolia*). **Floating leafed** duckweed (*Lemna sp.*) and white water lily (*Nymphaea odorata*). **Submergents;** wild celery/eel grass (*Vallisneria americana*), flat stem pondweed (*Potamogeton zosteriformis*), bushy pondweed (*Najas flexis*), clasping leaf pondweed (*P. richardsonii*), sago pondweed (*P. pectinatus*), northern milfoil (*Myriophyllum sibiricum*), coontail (*Ceratophyllum demersum*), muskgrass (*Chara sp.*), and elodea.

Chemical treatments and/or mechanical harvesting are strongly discouraged. Historical chemical treatments and mechanical harvesting should be limited to navigational channels only. All other interests in chemical treatments and mechanical harvesting should be scrutinized.

Resource Value of Site C

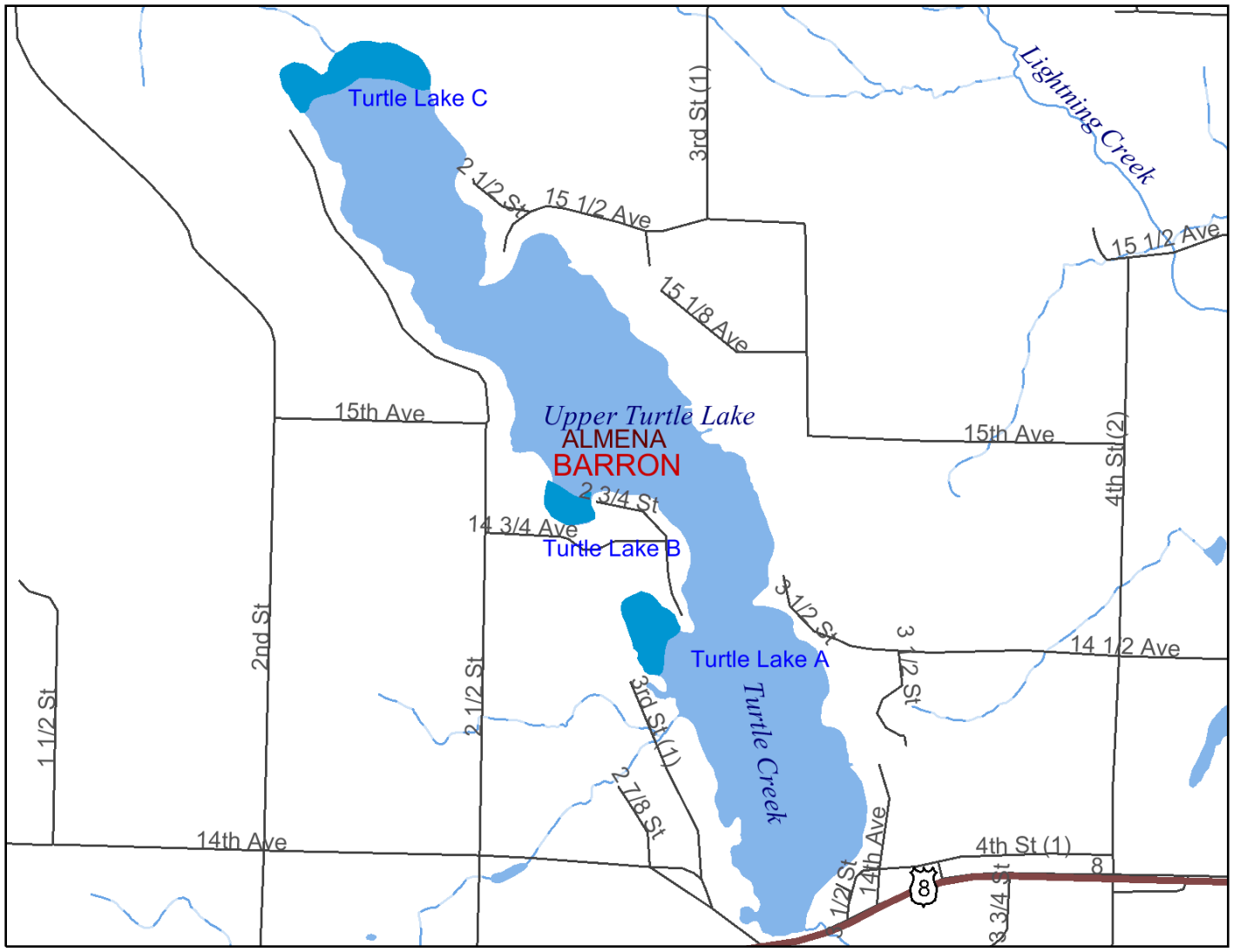
Sensitive area C is located in the northern bay on the end of Upper Turtle Lake.

This area provides important habitat for centrarchid (bass and panfish) and esocid (northern pike) spawning and nursery areas. This area also provides important habitat for forage species. Wildlife also are reliant upon this area for habitat. Eagles, loons, herons, waterfowl, songbirds, furbearers, turtles, and amphibians benefit from this valuable habitat.

The emergent, floating and submergent plant community structure of Sensitive area C includes: **Emergents;** soft stem bulrush (*Scirpus validus*) and broad leaf cattail (*Typha latifolia*). **Floating leafed**; spatterdock (*Nuphar variegata*), duckweed (*Lemna sp.*) and white water lily (*Nymphaea odorata*). **Submergents;** flat stem pondweed (*Potamogeton zosteriformis*), curly leaf pondweed (*P. crispus*), variable pondweed (*P. gramineus*), coontail (*Ceratophyllum demersum)*, illinois pondweed (*P. illinoensis*), northern milfoil (*Myriophyllum sibiricum),* and elodea.

Chemical treatments and/or mechanical harvesting are strongly discouraged. Historical chemical treatments and mechanical harvesting should be limited to navigational channels only. All other interests in chemical treatments and mechanical harvesting should be scrutinized.

Upper Turtle Lake Sensitive Areas



Legend

Major Highways
- Interstate
- State Highway
- U.S. Highways

County Roads

Local Roads

24K County Boundaries

Civil Towns
- Civil Town

Critical Habitat Areas
- Sensitive Area Designation
- Other Public Rights Feature

24K Open Water

24K Rivers and Shorelines
- Intermittent
- Fluctuating
- Perennial

Cities and Villages
- Village
- City

0 2400 4800 7200 ft.

N

Scale: 1:24,540

Appendix B

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 C

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 D

Upper Turtle Lake Aquatic Plant Management Goals, Objectives, and Actions

Upper Turtle Lake Aquatic Plant Management Goals, Objectives, and Actions

1. Goal One: Native Species Preservation, Protection, and Enhancement
    a. Objective One: Promote Shoreland Restoration and Best Management Practices
        i. Action 1: Complete up to three small-scale native plant re-establishment projects annually
            1. Work with land owners and resource professionals to identify areas of Upper Turtle Lake that may benefit from native plant restoration
            2. Focus on small-scale Emergent Species re-introduction as a means to reduce shoreline erosion
    b. Objective Two: Promote riparian owners and lake users appreciation of wildlife including, but not limited to, loons, bald eagles, fur-bearers, and amphibians
        i. Action1: Provide education and informational materials related to wild life during the lake fair, in newsletters, on the webpage, and during public meetings
        ii. Action 2: Encourage lake property owner involvement in loon monitoring, amphibian monitoring, and other monitoring activities
    c. Objective Three: Promote knowledge and appreciation of wild rice among riparian owners and lake users
        i. Action 1: Partner with GLIFWC
            1. Provide educational materials related to wild rice
2. Goal Two: AIS Monitoring and Management
    a. Objective One: Monitor the distribution of CLP in Upper Turtle Lake annually
        i. Action 1: Complete Spring Bed Mapping of CLP
        ii. Action 2: Fall Turion Density Monitoring
            1. Establish 10 sampling points
                a. within the littoral zone w/CLP growth
                b. annual fall sampling at these points
                c. Completed by consultant/resource professional
    b. Objective Two: Small-scale CLP bed management and/or removal
        i. Action 1: Land owner manual removal of CLP
            1. Near shore areas in 3-5 ft of water
            2. Any other area, provided it is hand pulled or pulled by divers
        ii. Action 2: Chemical treatment if determined necessary in any given year of this APM Plan
            1. Conditions that warrant chemical treatment
                a. Documented severe navigation impairment or nuisance conditions
                b. Expansion of CLP to levels that negatively impact native species richness
                c. Discovery of a new AIS, such as EWM, in the lake
            2. Treatment Stipulations
                a. Base treatments on previous year CLP mapping & fall turion density monitoring or most recent mapping of new AIS
                b. For CLP, apply granular Endothall at no more than 0.5-1.5 mg/l (parts per million)
                c. Complete pre post treatment aquatic plant surveying

d. Herbicide applied by a licensed commercial applicator

c. Objective Three: Protect Upper Turtle Lake from other AIS
    i. Action 1: Maintain an in-lake and shoreline AIS Monitoring Program
        1. Follow Citizen Lake Monitoring Network Guidelines
    ii. Action 2: Follow established EWM early detection and response plan
        1. See EWM Rapid Response Plan (Appendix F)
    iii. Action 3: Reduce or nullify negative impacts caused by other AIS
        1. Work with consultant and other resource professionals to determine if management is necessary and how best to complete it

3. Goal Three: AIS Education and Prevention
    a. Objective One: Work to prevent new AIS from entering and leaving Upper Turtle Lake
        i. Action 1: Maintain a watercraft inspection program at the two public accesses
            1. Follow UW-Extension Clean Boats Clean Waters (CBCW) Guidelines
    b. Objective Two: Set up and maintain a public participation and communication program and an AIS education and information program
        i. Action 1: Develop and distribute at least two newsletters updating AIS and other UTLA activities
        ii. Action 2: Host at least one annual meeting and maintain open UTLA Board meetings
        iii. Action 3: Host an Annual Lake Fair to promote public involvement in lake activities
            1. Can be combined with the Annual Picnic or other planned event, or with another entity
        iv. Action 4: Maintain an Upper Turtle Lake Association webpage
4. Goal Four: Pollution Control and Water Quality Monitoring
    a. Objective One: Promote land owner participation in best management practices (BMPs) that reduce phosphorous, sediment and other pollutant inputs to the lake
    b. Objective Two: Continue to participate in the CLMN Water Quality Monitoring Program
        i. Action 1: Complete Secchi, Temperature (Temp), Dissolved Oxygen (DO), Total Phosphorous (TP), and Chlorophyll a (CHL) sampling in the North, Central (Deep Hole) and South Basins
            1. Follow CLMN Expanded water quality monitoring protocol
    c. Objective Three: Complete supplementary water quality monitoring at all lake monitoring sites
        i. Action 1: Complete TP in April, September, and October
            1. Surface water only
        ii. Action 2: Complete CHL in September and October
    d. Objective Four: Complete storm water event sampling on three tributaries
        i. Action 1: Sample for TP, Ortho-phosphates, Total Suspended Solids (TSS), Total Kjeldahl Nitrogen (TN), Nitrites/nitrates, and Ammonia
            1. Up to three events per year
        ii. Action 2: Complete base flow and stage monitoring on two tributaries
    e. Objective Five: Complete routine sampling at the Turtle Creek Outlet
        i. Action 1: Sample for TP, Ortho-phosphates, TSS, TKN, Nitrites/nitrates, and Ammonia
            1. Complete once in each month April-October

ii. Action 2: Establish base flow conditions and stage
    1. Base flow monitoring at established sites

5. Goal Five: Assessment and Evaluation
    a. Objective One: Complete annual project activity and assessment reports
        i. Action 1: Use reports to make recommendation for annual revisions and updates to the APM Plan
    b. Objective Two: Complete an End-of-project Summary Report
        i. Action 1: Overall review of project successes and failures
        ii. Action 2: Revise/rewrite APM Plan
        iii. Action 3: Early- and mid-season whole-lake point intercept survey of all plants

Appendix E

Five-Year Timeline of Activities

5-year Timeline of Recommended Activities in the Upper Turtle Lake Aquatic Plant Management Plan									
Goal	Objective	Action	AIS Grant Eligible	Facilitator	Year				
					2011	2012	2013	2014	2015
Native Species Preservation, Protection, and Enhancement	3 native plant re-establishment projects	Work with the resource professionals	yes	UTLA/Consultant/WDNR	x	x			
	Wild rice education	Promote knowledge and appreciation of wild rice	yes	UTLA/Consultant/GLIFWC	x	x	x	x	x
	Promote knowledge and appreciation of wildlife	Education and informational materials	yes	UTLA	x	x	x	x	x
		Encourage involvement in wildlife monitoring	yes	UTLA, Wildlife Organizations	x	x	x	x	x
AIS Monitoring and Management	Monitor CLP distribution	Spring Bed Mapping of CLP	yes	Consultant/Contractor	x	x	x	x	x
		Complete Fall Turion Density Monitoring	yes	Consultant/Contractor	x	x	x	x	x
	Small-scale CLP management	Land owner manual removal	yes	UTLA	x	x	x	x	x
		Small-scale, early season endothall application	yes	UTLA/Consultant/Contractor	?	?	?	?	?
	Protect Upper Turtle from other AIS	In-lake CLMN AIS monitoring program	yes	UTLA/UW-Extension Lakes	x	x	x	x	x
		Follow EWM rapid response protocol	yes	UTLA	?	?	?	?	?
		Reduce or nullify negative impacts of AIS	yes	UTLA/Consultant	?	?	?	?	?
AIS Education and Prevention	Prevent AIS transport in/out	Watercraft inspection program	yes	UTLA/UW-Extension Lakes	x	x	x	x	x
	Public involvement/AIS education	Distribute at least 2 newsletters	yes	UTLA/Consultant	x	x	x	x	x
		Host annual public meeting	yes	UTLA	x	x	x	x	x
		Annual Lake Fair	yes	UTLA/Consultant	x	x	x	x	x
		Maintain UTLA webpage	yes	UTLA	x	x	x	x	x
Pollution Control and Water Quality Monitoring	Continue CLMN monitoring	Temp, DO, TP, CHL at 3 in-lake sites	no	UTLA/Consultant/WDNR	x	x	x	x	x
	Expanded water quality monitoring, all sites	TP: April, September, October	yes	UTLA/Consultant	x	x	x	x	x
		CHL: September, October	yes	UTLA/Consultant	x	x	x	x	x
	Tributary runoff event sampling	Nutrient and sediment sampling during 3 events	yes	UTLA/Consultant	x	x	?	?	x
	Turtle Creek Water Quality	Growing season nutrient and sediment sampling	yes	UTLA/Consultant	x	x	?	?	x
		Develop stage-streamflow relationships	yes	UTLA/Consultant	x	x	x	x	x
	Land owner participation in BMPs	Provide educational materials	yes	UTLA	x	x	x	x	x
		Support implementation of land owner BMPs	conditional	UTLA	x	x	x	x	x
Assessment and Evaluation	Annual Project Activity and Assessment Reports	Plan revisions	yes	Consultant/UTLA	x	x	x	x	x
	End-of-project Summary Report	Overall review of project successes and failures	yes	Consultant					x
		Revise/rewrite APM Plan	yes	Consultant					x
		Whole-lake point intercept plant survey	yes	Consultant/UTLA					x
	Project deliverables (digital and paper)	Copies to WDNR, UTLA, and Barron County	yes	Consultant/UTLA	x	x	x	x	x

Appendix F

Eurasian Watermilfoil (EWM) Rapid Response Plan

EWM Rapid Response Plan for Upper Turtle Lake, Barron County, Wisconsin

Monitoring

Continuous monitoring of the lake and the public access points for the presence of EWM will be completed by trained Upper Turtle Lake Association (UTLA) volunteers, Citizen Lake Monitoring Network (CLMN) volunteers, watercraft inspectors, and others. UTLA volunteers will patrol the shoreline of Upper Turtle Lake at least once a month from May through October. In-lake inspection at both boat access sites will be completed at least twice a month from May through October by UTLA, 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 UTLA personnel, this consultant, Barron County, 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:

Upper Turtle Lake Association	
Mark Koegel	715.357.3633
Earl Hoscheit	715.986.4414
Kathy Zalusky	715.986.2484
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	
Jim Cahow, Water Resources Biologist - Barron	715.637.6863
Kris Larsen, AIS Specialist - Spooner	715.635.4072
Pamela Toshner, Lakes Coordinator - Spooner	715.635.4073
Alex Smith, Critical Habitat Coordinator - Spooner	715.635.4124

Positive Identification

If EWM is positively identified in Upper Turtle Lake, the WDNR and UTLA volunteers will install EWM warning signs at all access points. Aquatic plant management, if any is occurring in the area where EWM was identified, will immediately cease until arrangements can be made for the completion of an intensive search for EWM in the immediate and nearby area in which it was found. If a sizable area of EWM is identified, EWM buoy markers will be placed in the lake to keep boaters out of the infested area until management can be undertaken.

APM Plan Modification

The existing plant management plan will need to be modified to include the treatment of EWM. 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 look for EWM. A complete EWM control plan will be added to the next revision of the existing APM Plan.

AIS Activity Funding

The UTLA collects annual dues from its members. If these monies are not enough to cover the cost of an EWM treatment program, the UTLA 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.