

AMENDMENT 2
Aquatic Plant Management Plan, Lake Wingra, Lower Rock River Basin, Dane County
Wisconsin

**Approved by the Dane County Lakes and Watershed Commission on December 21, 2017 and
by the Wisconsin Department of Natural Resources on April 13, 2018.**

Prepared by Dane County Land and Water Resources Department (LWRD) staff Sue Jones, Pete Jopke, Andrew Karleigh, John Reimer, and Michelle Richardson, with assistance from Susan Sandford.

Plant surveys were conducted by Wisconsin Department of Natural Resources (DNR) researchers Alison Mikulyuk and Kevin Olson in 2017. The Wisconsin Department of Natural Resources provided funding to LWRD to support this plan amendment.

Introduction

This is a second amendment to the Aquatic Plant Management Plan, Lake Wingra, Lower Rock River Basin, Dane County Wisconsin, published in January 2007 by the Dane County Office of Lakes and Watersheds. The 2007 plan was approved by the Wisconsin Department of Natural Resources on March 17, 2007 and by the Dane County Lakes and Watershed Commission on April 12, 2007. The first amendment to the 2007 plan was approved by the Wisconsin Department of Natural Resources on March 27, 2014 and Dane County Lakes and Watershed Commission on April 14, 2014. Aquatic Plant Management Plans are required under NR 109.04(d), Wisconsin Administrative Code, to guide mechanical harvesting activities and the effective management of aquatic plants in water bodies.

Vilas Lagoon, although hydraulically connected to Lake Wingra, is not included in this plan amendment. Vilas Lagoon was included in a separate plan (2007, amended in 2013) with Jenni and Kyle Preserve Ponds, Tenney Park Lagoon, Warner Park Lagoon, and Verona Quarry because they are all shallow, highly disturbed systems with limited plant diversity. Vilas Lagoon and these other ponds meet the conditions for a waiver of plan and permit requirements under NR 109.06 Wisconsin Administrative Code, and therefore Dane County will not update the 2007 and 2013 documents.

This plan is prepared in support of Dane County's permit for its mechanical aquatic plant harvesting program, operated in accordance with NR 109 Wisconsin Administrative Code. Individuals and groups that propose herbicide treatments of aquatic plants in Dane County waters would need to go through a separate planning and permitting process with the Wisconsin Department of Natural Resources.

While this aquatic plant management plan focuses on one particular aspect of lake management, aquatic plants, implementation of this plan occurs in the context of significant involvement by Lake Wingra watershed residents in lake and watershed restoration. Since the

Lake Wingra plan was completed in 2007, watershed residents have increasingly demonstrated their care for Lake Wingra’s health by involvement in lake and watershed restoration projects. The Friends of Lake Wingra play a central role in bringing together people and groups that have a role or interest in the protection and management of Lake Wingra and its watershed.

Recent Plant Survey Methods and Results

Staff from the DNR Research Bureau conducted plant surveys on August 14-16, 2017 using Wisconsin DNR approved protocols and the point intercept method. The maps found in the appendices reflect the 2017 data.

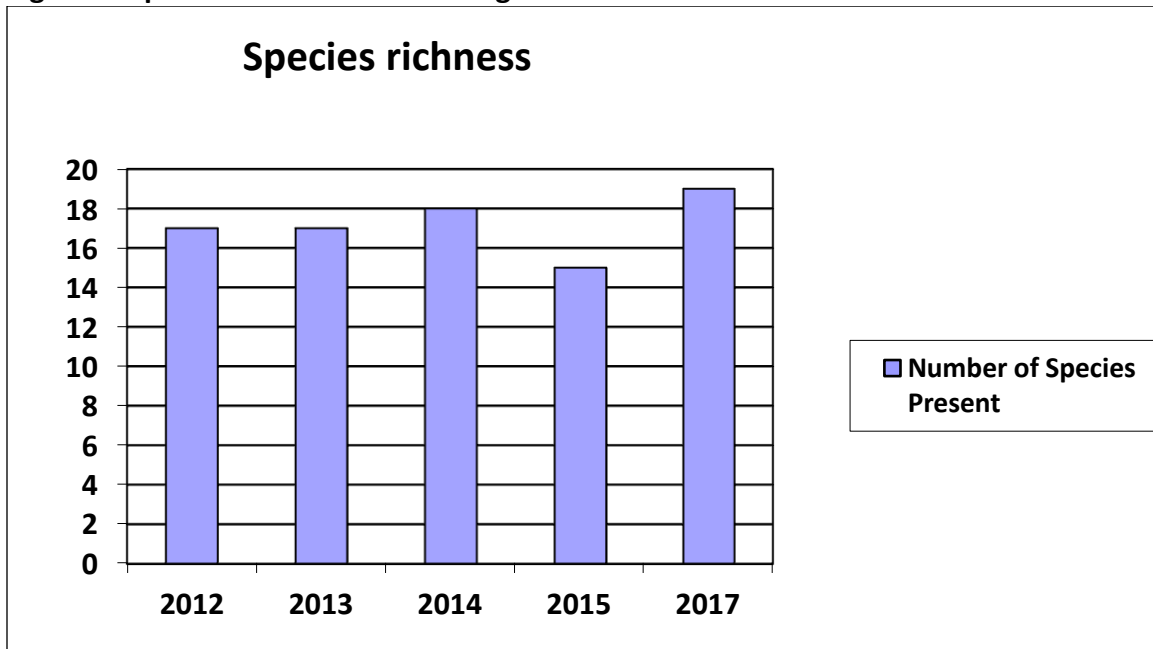
Table 1 below shows species present during the 2017 survey. Table 2 shows species richness from 2012-2017. Species richness is a count of the total number of different plant species found in a lake. Generally, the better the water quality the higher the species richness count.

Appendix A includes Lake Wingra summary statistics from the 2017 DNR survey and historical data. Appendix C includes mapped plant distributions for Lake Wingra.

Table 1. Species present during 2017 aquatic plant survey – Lake Wingra

Genus	Species	Common Name	Category
<i>Algae</i>	<i>sp.</i>	Filamentous algae	Submersed
<i>Ceratophyllum</i>	<i>demersum</i>	Coontail	Submersed
<i>Chara</i>	<i>sp.</i>	Muskgrass	Submersed
<i>Elodea</i>	<i>canadensis</i>	Common waterweed	Submersed
<i>Heteranthera</i>	<i>dubia</i>	Water star-grass	Submersed
<i>Lemna</i>	<i>minor</i>	Small duckweed	Free floating
<i>Myriophyllum</i>	<i>spicatum</i>	Eurasian water-milfoil	Submersed - Invasive
<i>Najas</i>	<i>flexilis</i>	Slender Naiad	Submersed
<i>Nelumbo</i>	<i>lutea</i>	American lotus	Emergent
<i>Nymphaea</i>	<i>odorata</i>	White water lily	Floating-leaf
<i>Potamogeton</i>	<i>friesii</i>	Fries pondweed	Submersed
<i>Potamogeton</i>	<i>illinoensis</i>	Illinois pondweed	Submersed
<i>Potamogeton</i>	<i>praelongus</i>	White-stem pondweed	Submersed
<i>Potamogeton</i>	<i>richardsonii</i>	Clasping-leaf pondweed	Submersed
<i>Potamogeton</i>	<i>zosteriformis</i>	Flat-stem pondweed	Submersed
<i>Spirodela</i>	<i>polyrhiza</i>	Large duckweed	Free floating
<i>Stuckenia</i>	<i>pectinata</i>	Sago pondweed	Submersed
<i>Vallisneria</i>	<i>americana</i>	Wild celery	Submersed
<i>Utricularia</i>	<i>vulgaris</i>	Common bladderwort	Submersed
<i>Wolffia</i>	<i>columbiana</i>	Common watermeal	Free floating

Figure 1. Species richness – Lake Wingra 2012-2017



Discussion of historical plant community changes

Definition of terms used in this section

Maximum depth of plant growth is the deepest depth at which plants were found in the lake. This is a function of water clarity. The clearer the water, the better the light penetration and presumably the deeper plants are able to grow. Not all plants grow in deep water some may prefer the shallower parts of the lake, but with clearer water the opportunity to grow deeper is available. Oligotrophic lakes (very clear water lakes) will have some plants growing in waters deeper than 20 feet. Hypereutrophic lakes (the opposite of oligotrophic) are characterized by excessive algal blooms and turbid poor water quality and clarity. Rooted plants are few and restricted to either unusual weather conditions or very shallow water where light can penetrate. Plant diversity is usually restricted to species that can tolerate poor water clarities.

Frequency of occurrence is calculated by taking the total number of times a species is sampled divided by the total number of points at which depth was less than or equal to the maximum depth of plant growth.

The photic zone is the area where light penetrates enough to support plant growth.

The Floristic Quality Index (FQI) is a metric that evaluates the closeness of the flora in a lake to that of an undisturbed condition. The higher a FQI value, the closer that plant community is to an undisturbed ecosystem. Just for reference, compare a lake's numbers to the statewide average (24) or ecoregion average (20) (lakes also within the Southeast Glacial Plains ecoregion -

see map here http://dnr.wi.gov/topic/landscapes/documents/StateMaps/Map_S1_ELs.pdf), calculated from a subset of approximately 250 lakes across Wisconsin.

Coefficients of conservatism (C) range from 0 to 10 and represent an estimated probability that a plant is likely to occur in a landscape relatively unaltered from what is believed to be a pre-settlement condition (see the end of Table 2 in Appendix A). The lower numbers indicate more of a disturbed ecosystem, while the higher numbers indicate a community more like one that would have been found before human settlement.

Prior survey results

Lake Wingra plant community's littoral percentage frequency of occurrence (% FOO) of EWM has steadily increased since 2007, likely because of the carp removal project and subsequent increase in water clarity and maximum rooting depth (MDC) of aquatic plants. The maximum depth of plant growth has increased from 8.5 ft. to 13 ft. from 2005-2012. With the increase in clarity, EWM was able to take advantage of newly available lake habitat and expand out to deeper areas of the lake. The frequency of occurrence of plants less than the MDC has also increased from 52% to 81%, indicating more vegetation overall. Species richness within the lake has stayed stable throughout the past few years, with approximately 20 species found during the annual survey. Simpson's diversity index has slightly decreased over time, likely due to many areas in the middle of the lake that have only one species (EWM) present, which is driving down the lakewide diversity (nearshore diversity is still very much intact).

The nearshore areas (<6 feet) contain a very diverse and healthy native plant community, while the areas of the lake 6-10 feet are almost an exclusive monoculture of dense EWM.

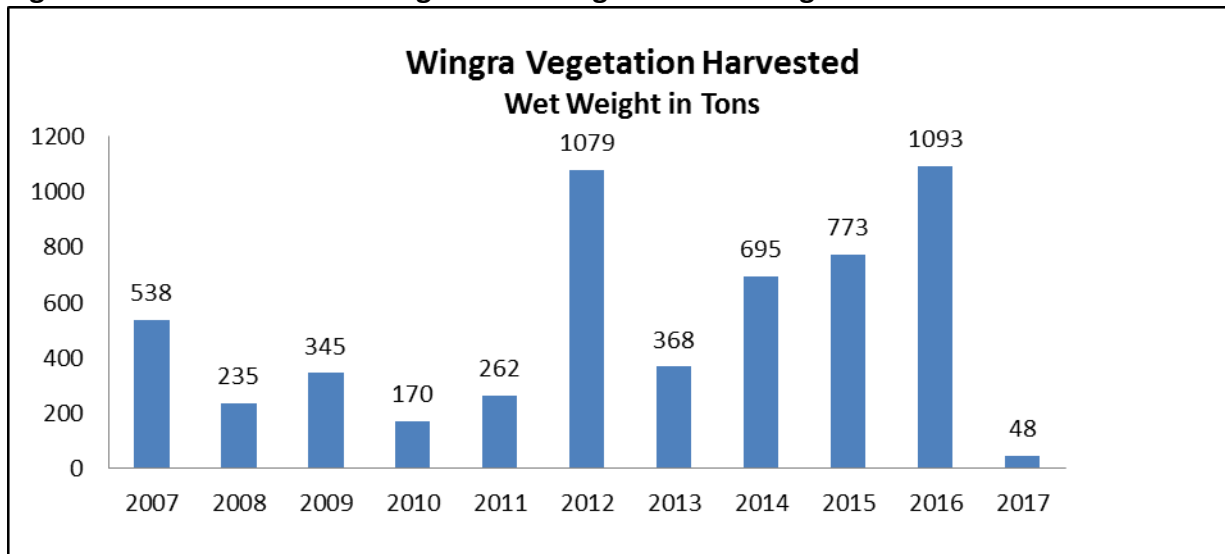
2017 survey results

In 2017 the number of species present increased to 21. The frequency of occurrence in photic zone sites was 72.96% with an FQI of 24.78 and an average C of 5.68. The frequency of occurrence of Eurasian water-milfoil decreased to 39.17% from 73.1% in 2012. The frequency of coontail increased to 67% from 34.7% in 2012.

Harvesting Aquatic Plant Management Records

Figure 2 summarizes Dane County's mechanical harvesting operations in Lake Wingra since 2007.

Figure 2: Mechanical Harvesting in Lake Wingra and Vilas Lagoons



Prior to 2017 the Lake Wingra vegetation harvest data was combined with Vilas Lagoons. In 2017 the data is for only the vegetation harvested in Lake Wingra proper.

Public input opportunities

Dane County Land and Water Resources Department (LWRD) staff developed an aquatic plant management online survey hosted on the Office of Lakes and Watersheds web page from May through August 2017. Staff promoted the survey via email, press release, social media, and through business –card-sized prompts handed out by harvester operators, Clean Boats Clean Waters staff, and other LWRD staff over the summer.

There were 165 responses to the online survey, and almost 80% of the respondents did not recommend any changes to the harvesting program priority goals and maps for each waterbody. More than 50% of the respondents reported areas that are difficult to navigate through related to aquatic plant growth, and identified specific locations where these difficulties have occurred from time to time.

Dane County Land and Water Resources Department staff held two public information meetings on October 2 (held at Dane County offices in southeast Madison) and 9 (held in Middleton), 2017. Although these meetings were well publicized through press releases, email, and social media, and were promoted by one television station, only a few people attended.

The complete draft plans were posted on the Office of Lakes and Watersheds web page in mid-November, with public comment solicited until December 8. Responding to public input, LWRD staff recommend adding an oval harvesting area to the Lake Wingra harvesting priority map to provide for additional recreational use. LWRD staff have also made several clarifications to plan text based on DNR comments.

Aquatic Plant Management in Dane County

The overall goal of Dane County's mechanical harvesting program is to cut and harvest Eurasian water-milfoil and other nuisance vegetation to help provide for reasonable use of the lakes for boating, fishing and swimming, while preserving the health and balance of the lake ecosystem. During periods of high water, harvesting of plants in the Yahara River between lakes Waubesa and Kegonsa becomes the highest priority.

Aquatic plant growth varies from lake to lake and year to year. Dane County employs a Plant Scout to evaluate plant growth conditions and recommend appropriate harvesting in response, within the limits of the plan harvesting priority areas and DNR permit. In times of heavy plant growth, local residents often advocate for additional harvesting in their areas, harvesting longer into the season (into the fall), or dedicating a harvester for a particular waterbody. County managers balance staff and harvesting equipment resources and priorities with needs and ecological conditions countywide. Local groups or individuals have the option of contracting with the county for additional harvesting and special event harvesting, within the boundaries of the permit and pending staff and equipment availability. Additional information about contract harvesting is available here: <https://wred-lwrd.countyofdane.com/documents/APM/Dane%20County%20Aquatic%20Plant%20Harvest%20Contract%20.pdf>

Dane County holds annual training sessions for new and returning harvester operators before the harvesting season begins. In that training, permanent and seasonal staff receive instruction on many topics including aquatic invasive species prevention protocols, plant identification, and communications. The Lakes Management Supervisor directs the day-to-day operations of the staff, guided by the Stormwater Engineer who is informed of plant conditions and harvesting needs by the Plant Scout. Particular concerns with a water body; deep versus shallow harvesting; collection of plant fragments from harvesters, plant self-fragmentation, and boat propellers etc. are all addressed in the supervision.

Working closely with the Wisconsin Department of Natural Resources, the Dane County Land and Water Resources Department has developed harvesting priority maps that are included in many of the aquatic plant management plans and referred to in DNR harvesting permits issued to Dane County. Not every area that is identified for potential harvesting on the map will be harvested in any given harvesting season if there is little to no plant growth, because attention to higher priority areas does not permit it, or due to budget constraints. Harvester operators are instructed not to cut and remove plants outside of harvesting priority areas identified on these maps, unless authorized by their Supervisor in consultation with the Wisconsin Department of Natural Resources.

Harvesting machines are designed to cut, collect and remove plant fragments. Machine operators do not cut and harvest aquatic plants in water less than three feet in depth except where it's permitted by the Wisconsin Department of Natural Resources in the Yahara River.

Limits of the equipment, staff, and budget mean that plant harvesting for aesthetics, collection of wind-blown plant fragments due to boat propeller action, and the removal of plants that release from the sediment and float free in the fall cannot generally be accomplished. However, Dane County helps clean up plant materials at beaches and other public access points, even when the plant material is not associated with harvesting operations. Program managers also do their best to accommodate special requests for collection of naturally-occurring windblown and boat motor chopped plant fragments near private shorelines, as time and budget permit, and in consultation with Wisconsin DNR. Occasionally this collection of plant fragments occurs in waters less than three feet deep. The Dane County Lake Management Operations Manual provides instructions to harvesting machine operators about plant fragment collection.

There is a common misperception that excessive external nutrients carried into lakes in runoff from the watershed causes macrophyte (large aquatic plant) problems. In fact, external nutrient loading usually produces algal blooms that shade and reduce macrophyte biomass. Attempts to control biomass by controlling nutrients in the water column are unproductive, according to G. Dennis Cooke and others in the third edition of *Restoration and Management of Lakes and Reservoirs* (2005). This is because rooted macrophytes, such as the nuisance Eurasian water-milfoil, usually get their phosphorus and nitrogen directly from sediments. In the short-term, reduced phosphorus in the water column resulting from watershed controls may actually result in more macrophyte growth, because clearer water permits more light penetration that fosters plant growth.

It could take many years to reduce the historical nutrient additions to lake sediments, especially in agricultural areas outside of the Wingra watershed. Much important work is underway in Dane County to reduce watershed phosphorus loadings. In the long-term, scientists and managers hope that community efforts can reduce sediment phosphorus, thereby more directly affecting plant growth.

In shallow water, nutrient-rich lakes like Wingra, there is also another influence on plant growth, which Richard Lathrop and others describe in their 2013 paper "Carp Removal to Increase Water Clarity in Shallow Eutrophic Lake Wingra" published in *LakeLine* and available on the Dane County Lakes and Watersheds website (http://danewaters.com/pdf/research/Lake_Wingra_carp_removal_2013.pdf). In these lakes, there are alternate stable states where, at different times, a lake is dominated by algae or macrophytes, regardless of the phosphorus levels in the lake."

Fisheries

Anglers sometimes raise concerns over harvesting vegetation in late spring and early summer during the fish spawning period. Harvesting aquatic vegetation during this critical time impacts

a small fraction of the available spawning habitat for any given species and we continue to monitor the fish populations closely for any impacts aquatic plant harvesting may have. Dane County works closely with WDNR Fisheries and there appears to be no negative impact on the fishery as a whole. The Yahara Chain of Lakes continue to provide excellent fishing opportunities of all sorts including panfish, walleye, northern pike, largemouth bass, and musky.

Invasive Species

Much of the focus of Dane County's mechanical harvesting program is to cut and harvest Eurasian water-milfoil and other invasive and nuisance plants to help provide for reasonable use of the lakes for boating, fishing and swimming.

Dane County staff will continue to take steps to ensure that its plant harvesting equipment is cleaned and disinfected before moving it to other waterbodies, and follow all other Wisconsin invasive species laws (see Appendix B) to prevent transport of invasive plants to other waterbodies.

The invasive species below are more recent arrivals to Dane County waters. Dane County staff, along with recreational users, following cleaning and disinfecting protocols will help prevent the spread of these and other invasive plants and animals. Although the invasive species described below have not yet been found in Lake Wingra, their presence nearby underscores the importance of following the Appendix B steps to prevent transport of these invasive animals to Lake Wingra.

Spiny Waterfleas

In 2009 populations of spiny waterfleas (SWF) were verified by the Wisconsin DNR to be present in the Yahara chain of lakes. Spiny waterfleas are zooplankton that are native to Europe and Asia. Introduction of SWF into the Great Lakes by ballast water discharged from ocean going ships most likely occurred in the 1980's, and since then the spread to inland waters has continued.

The most likely method of introduction of SWF into the Yahara chain of lakes was by a boat, bilge water, or live well that had not be decontaminated. Research suggests that the SWF were introduced into Lake Mendota in the mid 1990's based upon sediment core samples where spines are present. By 2009 SWF were found in Lake Mendota at densities that are higher than any other waterbody in its native or invaded range. (Walsh 2016)

The SWF are carnivorous predators eating native herbivorous zooplankton. This loss of native zooplankton can have negative impacts on the lake ecology, impacting the zooplankton structure and distribution. This loss of native zooplankton can also affect fish populations that rely on the zooplankton as a food source. Small fish try to prey upon SWF but their spines make them difficult to swallow. The loss of zooplankton can also increase the amount of

phytoplankton, leading to greater turbidity, degraded plant health and reduced maximum depth where plants grow. As a result we see greater algal blooms and more impacts on people using the water.

One of the impacts to anglers is that SWF clog fishing rod eyelets and accumulate on fishing lines.

Zebra Mussels

In 2015 in Lake Mendota a population of zebra mussels was found by the UW Center for Limnology and verified by the Wisconsin DNR. Additionally in 2016 a population of zebra mussels was verified by the Wisconsin DNR in Lake Monona. Zebra mussels are native to Europe and Asia. The zebra mussel is a small bottom dwelling clam that spread through microscopic larvae called veligers. The zebra mussels were introduced into the Great Lakes in the 1980's most likely through the ballast water from ocean going ships, and since then zebra mussels have been spread to other inland waters.

The most likely method of introduction of zebra mussels into the Yahara chain of lakes was by a boat, bilge water, or live well that had not been decontaminated. The first observation of zebra mussels in the Yahara was in Lake Monona in 2001 when a few adult specimens were found.

The zebra mussels are the only freshwater mollusk that can attach themselves to solid objects. They become prolific in many lakes altering the food web. There may be increased plant abundance, as well as bluegreen algae blooms. Zebra mussels affect shoreline residents, boat owners and swimmers when their shells accumulate on hard surfaces making them a hazard to grab or stand on. They also encrust piers and boats, potentially damaging boat motors unless people take preventative steps. Adult females can produce one million eggs per year.

Chinese Mystery Snails

In 2012 these invasive snails were found in Lake Waubesa, in 2015 they were found in Stewart Lake, and in 2017 they were found in Lake Monona. These snails are native to eastern Asia and have been transported to the area for aquarium trade and possibly by in mud on boats or trailers. With a hard operculum (trap door that seals the shell) these snails can survive out of water for four weeks (*Unstad, K.M. and others. Management of Biological Invasions (2013) Volume 4, Issue 2: 123–127*), making their transport to a new waterbody likely. The impacts of these snails are not very well-studied.

Recommended management

Based on staff review of the plant survey data and public input, Dane County recommends the updated management elements found in this section. Dane County staff believe that additional harvesting in deeper waters and away from the shallow nearshore native communities would be beneficial for EWM navigation/nuisance control without having any direct impacts on native

plants. The amount of harvesting that Dane County can provide will be determined by budget and harvesting priorities for other county waters.

Lake Wingra Goals

The goals for managing aquatic plants in Lake Wingra are to: (1) protect high value species [NR 107.08(4)] found in the lake, and to (2) periodically control Eurasian water-milfoil when growths undermine lake access or interfere with special events. High value species found in Lake Wingra are: Illinois pondweed (*Potamogeton illinoensis*), clasping-leaf pondweed (*P. richardsonii*), white stem pondweed (*P. praelongis*), sago pondweed (*Struckenia pectinatus*), and wild celery (*Vallisneria Americana*). Other important native plants in Lake Wingra that require protection include floating-leaf pondweed (*P. natans*), variable pondweed (*P. gramineus*), flat-stem pondweed (*P. zosteriformis*), variable-leaf pondweed (*P. gramineus*), muskgrass (*Chara*), water stargrass (*Heteranthera dubia*), slender naiad (*Najas flexilis*), bladderwort (*Utricularia vulgaris*), spatterdock (*Nuphar variegata*), and white water lily (*Nymphaea tuberosa*).

These overarching aquatic plant management goals are coupled with the more specific goals of Dane County's mechanical harvesting program: to cut and harvest Eurasian water-milfoil and other nuisance vegetation to help provide for reasonable use of the lakes for boating, fishing and swimming, while preserving the health and balance of the lake ecosystem.

This plan amendment, consistent with the 2007 aquatic plant management plans for Lake Wingra and Vilas Lagoon (Vilas Lagoon is included in a plan with other shallow lagoons and ponds that have similar management issues) includes a goal of protection of white water lily and other native plants habitat.

Lake Wingra Recommendations

1. Mechanical harvesting should focus on Eurasian water-milfoil control, in areas where this exotic plant impedes lake access or if open water is needed for special events such as competition rowing or swimming.
2. Mechanical harvesting should avoid nearshore areas to protect the diverse plant community with the following exceptions: the area around the Wingra Park boat launch, fishing access points along Vilas Park Road, and the Vilas Beach area. The purpose of this nearshore harvesting is to increase shoreline use recreation and lake access.
3. As needed, provide deep mechanical harvesting in an open water channel between Vilas Beach and the Wingra Park boat landing, in order to improve recreational access.
4. Chemical treatments are not recommended and may undermine the ecologically diverse plant community in the lake.

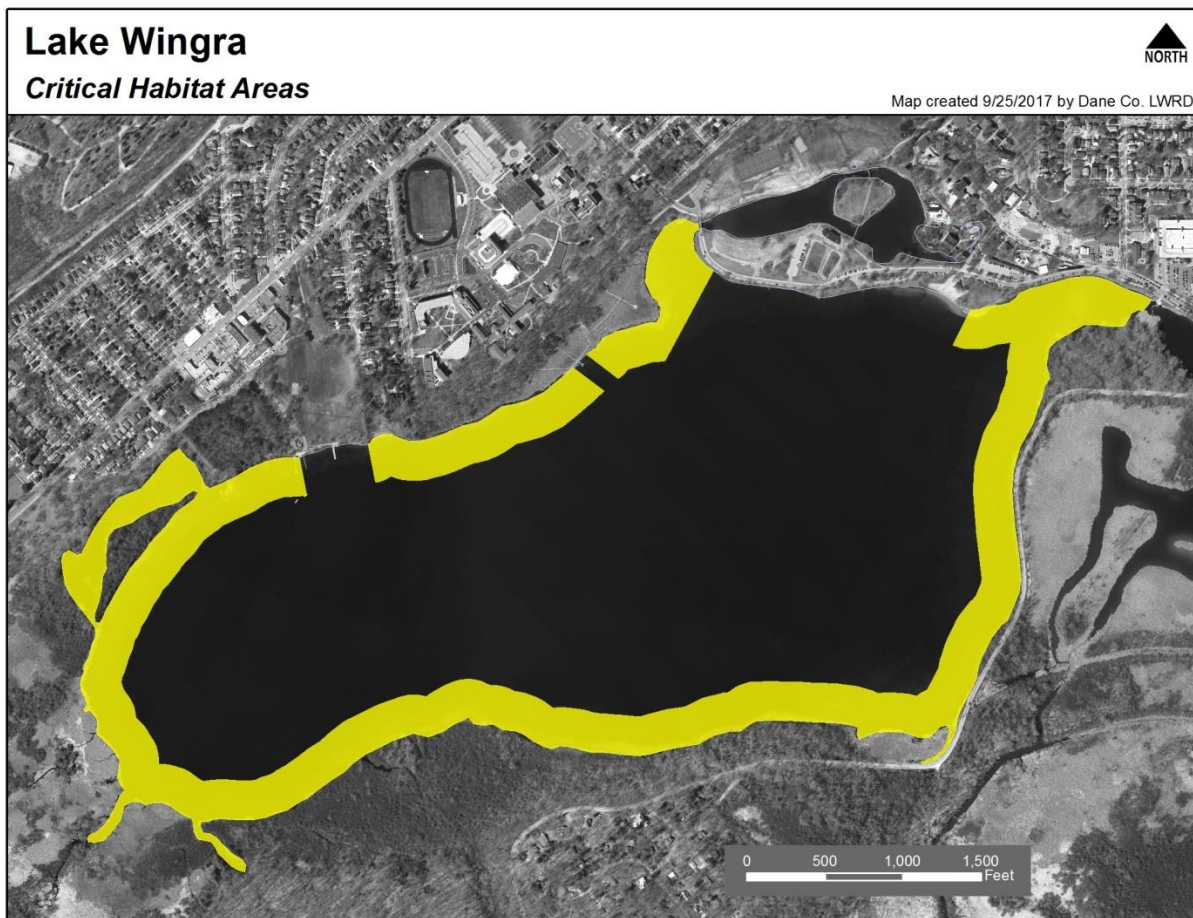
5. Ecologically acceptable methods to remove carp from Lake Wingra were completed with great success in 2007. Both water clarity and native plant distributions have improved since that intervention. Monitoring the carp population is important to maintain diverse plant growth, and may require additional work to keep the carp in check.
6. Consider sampling nearshore nongame fish populations to assess the ecological health of Lake Wingra.
7. Publicly owned shorelines should be designated as Critical Habitat Areas due to the presence of high value native species identified under NR 107.08(4). Aquatic plant management activities within the Critical Habitat Areas would be restricted to protect the important habitat functions. The public beach and boat ramp would not be included in the proposed Critical Habitat Areas. (Designation of Critical Habitat Areas is a Wisconsin Department of Natural Resources decision.)
8. The Dane County Plant Scout should document occurrences of high value native plants in regular scouting reports, including shoreline reference and GPS location. Dane County staff should make an annual summary report of these occurrences available to the public.
9. Dane County mechanical harvesting crews should continue to take steps to prevent the spread of exotic invaders across Dane County lakes and streams. These steps include removing any visible plants, mud, debris, water, fish or animals from the machinery and thoroughly washing the equipment (see Appendix B).

Proposed Critical Habitat Areas

Wisconsin DNR's website describes the importance of the DNR's designation of Critical Habitat Areas as follows: "Every waterbody has critical habitat - those areas that are most important to the overall health of the aquatic plants and animals. Remarkably, eighty percent of the plants and animals on the state's endangered and threatened species list spend all or part of their life cycle within the near shore zone.Wisconsin law mandates special protections for these critical habitats. Critical Habitat Designation is a program that recognizes those areas and maps them so that everyone knows which areas are most vulnerable to impacts from human activity. A critical habitat designation assists waterfront owners by identifying these areas up front, so they can design their waterfront projects to protect habitat and ensure the long-term health of the lake they where they live."

The Proposed Lake Wingra Critical Habitat Areas (Figure 3) are unchanged from the 2013 plan amendment.

Figure 3. Proposed Lake Wingra Critical Habitat Areas



Lake Wingra Harvesting Priorities

The harvesting priorities map below for Lake Wingra shows areas that may be harvested. Additional background on harvesting priorities is found in the Lake Management Operations Manual and posted on the Office of Lakes and Watersheds website (www.danewaters.com). Annual training and daily supervision of harvester operators reinforce that plants should be harvested only from these planned areas, unless a variance from the plan has been approved by Wisconsin DNR. Actual effort is dictated based on plant conditions, as evaluated and reported by Dane County's Plant Scout.

In response to public input during the 2017 update, Dane County proposed changes to the Lake Wingra Harvesting Priorities (Figure 4) adds an oval recreational path.

Figure 4. Lake Wingra Harvesting Priorities

