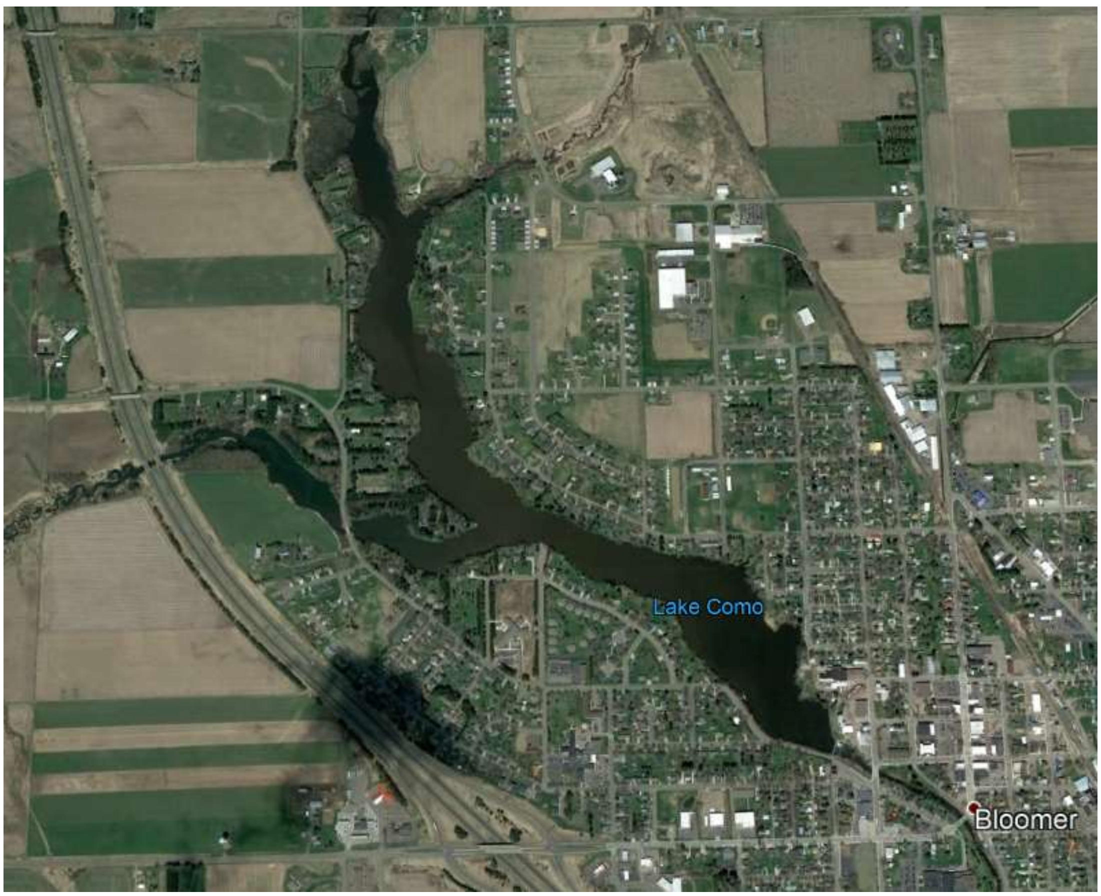
LAKE EDUCATION AND PLANNING SERVICES, LLC
302 21 ¼ STREET
CHETEK, WISCONSIN 54728

LAKE COMO, CHIPPEWA COUNTY

2020-2024 AQUATIC PLANT MANAGEMENT PLAN
WDNR WBIC: 2152100



Prepared by: Dave Blumer, Lake Educator

August 28, 2019

BLOOMER COMMUNITY LAKE ASSOCIATION
BLOOMER, WI 54724

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PREPARED FOR THE BLOOMER COMMUNITY LAKE ASSOCIATION

INTRODUCTION

Lake Como is a 98 acre impoundment of Duncan Creek located within the City of Bloomer in western Chippewa County. The first Lake Como dam was installed around 1860 to power the local saw mill. Over the years, the dam was rebuilt and modified for to meet various needs throughout the first half of the 20th century until the City of Bloomer took ownership later in the 1900s. In 1989, the US Army Corps of Engineers determined that the dam was structurally unsound and in the 1992 inspection report, the WDNR ordered the city of Bloomer to either remove or repair the dam within ten years due to the hazards associated. In 1999, the city conducted a survey to determine constituent preference for removal or repair and a special referendum was passed to approve funding for dam repairs.

In addition to dam repairs the Bloomer Community Lake Association (BCLA) and the City of Bloomer wanted to make an effort to address other community concerns including sedimentation, poor water quality, excessive plant and algal growth, and declining fisheries. To do this the BCLA and the city applied for and received several WDNR grants to develop a comprehensive management plan. After conducting numerous studies, the dam was repaired and a significant portion of the lake bottom was dredged in 2003-2004. These efforts dramatically altered the lake including increasing the depth from a maximum of 6-ft reported in 1992 to 11-ft currently. In 2018, concerns about increasing levels of aquatic plants in Lake Como prompted the BCLA to initiate steps to develop a WDNR approvable Aquatic Plant Management Plan (APMP) that will outline strategies to control nuisance vegetation that dominate the lake's spring and summer littoral zone.

PUBLIC PARTICIPATION AND STAKEHOLDER INPUT

Initial contact with the BCLA came in March 2018 when John Nielsen, a past president and current board member of the BCLA contacted LEAPS with questions related to the development of an aquatic plant management plan (APMP) for Lake Como to deal with an increased concern about nuisance vegetation in the lake. A proposal was drawn up by LEAPS to develop an APMP based on past data and a new whole-lake aquatic plant survey completed by Endangered Resource Services in 2018. This survey work was paid for directly by the BCLA.

Several correspondences were had between LEAPS and the BCLA from June 2018 to March 2019 related to the development of this plan, but it was in April 2019 at a monthly meeting of the BCLA board where more information was gathered as to the purpose and results of this project. LEAPS were invited to this meeting by the current president of the BCLA to discuss progress made in developing the new APMP.

Also present at the April 2019 meeting were members of the BCL and representatives from Cason and Associates and Lake Restoration Inc. Lake Restoration Inc. was there to discuss the possibility of a small chemical treatment to control nuisance vegetation. Cason and Associates was there to discuss a lake water quality management planning project for Lake Como that they had put together at the request of John Nielsen.

LEAPS assembled various handouts to show the results of the 2018 aquatic plant survey, and to lay out what was likely to be included in the APMP for the approval of the board.

The BCLA is strong and well-funded when it needs to be. During the lake restoration project of the early 2000's, the BCLA was successful in securing several grants for lake restoration including dam repair and large-scale dredging to restore depth and contour and to create better habitat; fish stocking after dredging, and improving the City of Bloomer boat landing, and installation of fishing piers.

Lake Como is an important part of the community that is Bloomer. When the lake and beach are in good condition it is used frequently including for teaching swimming lessons to local youth. After the restoration project was completed circa 2004, Lake Como was again a body of water the Community was proud of. Unfortunately, in the past few years, many of the issues of concern that led to the restoration project have returned. At the present time, the most visual issues are those related to nuisance aquatic plant growth. As a result the BCLA was brought back to the forefront to lead the process of restoring the lake once again. The first part of this process is the development of an APMP.

A Community meeting was held in February 2018 and another in May 2019 to update the community on what the BCLA has been doing in the last two years since they "came out of hibernation." The Bloomer Telephone Cooperative has a link for Lake Como related news at http://lakecomo.bloomertel.net/ that has been used in the past to post project updates and documents related to management of Lake Como. There is currently a Lake Como project page available at https://leapsllc.com/index.php/lake-como/ where current management planning and aquatic plant survey documents are posted.

OVERALL MANAGEMENT GOAL

The overall aquatic plant management goal for Lake Como is to increase lake usability through aquatic plant management actions that will reduce nuisance aquatic vegetation issues without negatively impacting the health of the aquatic plant community in Lake Como or suffer other desirable aspects of the lake.

IMPLEMENTATION GOALS

This Aquatic Plant Management Plan lays out six goals along with multiple objectives and the actions necessary to meet those objectives. The goals, objectives, and actions in this plan will help improve conditions in Lake Como helping to make it the community resource it should be for the City of Bloomer, its community members, lake residents, lake users, and visitors. The goals included in this document are as follows:

- Goal 1: Support and implement aquatic plant management actions that minimize negative impacts on the native aquatic plant diversity or water quality.
- Goal 2: Implement and maintain AIS education and prevention efforts.
- Goal 3: Promote and support nearshore, riparian, community, municipal, and watershed best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Como.
- Goal 4: Engage lake residents, community members, lake users, and visitors in being active lake stewards.
- Goal 5: Develop a more comprehensive water quality management plan for Lake Como.
- Goal 6: Implement the Lake Como Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

If the objectives associated with these goals are met by successfully implementing the related actions, Lake Como will be a better lake in five years than it is now.

WISCONSIN'S AQUATIC PLANT MANAGEMENT STRATEGY

The waters of Wisconsin belong to all people. Their management becomes a balancing act between the rights and demands of the public and those who own property on the water's edge. This legal tradition called the Public Trust Doctrine dates back hundreds of years in North America and thousands of years in Europe. Its basic philosophy with respect to the ownership of waters was adopted by the American colonies. The US Supreme Court has found that the people of each state hold the right to all their navigable waters for their common use, such as fishing, hunting, boating and the enjoyment of natural scenic beauty.

The Public Trust Doctrine is the driving force behind all management in Wisconsin lakes. Protecting and maintaining that resource for all of Wisconsin's people is at the top of the list in determining what is done and where. In addition to the Public Trust Doctrine, two other forces have converged that reflect Wisconsin's changing attitudes toward aquatic plants. One is a growing realization of the importance of a strong, diverse community of aquatic plants in a healthy lake ecosystem. The other is a growing concern over the spread of Aquatic Invasive Species (AIS), such as Eurasian water milfoil (EWM). These two forces have been behind more recent changes in Wisconsin's aquatic plant management laws and the evolution of stronger support for the control of invasive plants.

To some, these two issues may seem in opposition, but on closer examination they actually strengthen the case for developing an Aquatic Plant Management Plans (APMPs) as part of a total lake management picture. Planning is a lot of work, but a sound plan can have long-term benefits for a lake and the community living on and using the lake.

The impacts of humans on Wisconsin's waters over the past five decades have caused public resource professionals in Wisconsin to evolve a certain philosophy toward aquatic plant management. This philosophy stems from the recognition that aquatic plants have value in the ecosystem, as well as from the awareness that, sometimes, excessive growth of aquatic plants can lessen our recreational opportunities and our aesthetic enjoyment of lakes. In balancing these, sometimes competing objectives, the Public Trust Doctrine requires that the State's public resource professionals be responsible for the management of fish and wildlife resources and their sustainable use to benefit all Wisconsin citizens. Aquatic plants are recognized as a natural resource to protect, manage, and use wisely.

Aquatic plant protection begins with human beings. We need to work to maintain good water quality and healthy native aquatic plant communities. The first step is to limit the amount of nutrients and sediment that enter the lake. There are other important ways to safeguard a lake's native aquatic plant community. They may include developing motor boat ordinances that prevent the destruction of native plant beds, limiting aquatic plant removal activities, designating certain plant beds as critical habitat sites and preventing the spread of non-native, invasive plants, such as EWM.

If plant management is needed, it is usually in lakes that humans have significantly altered. If we discover how to live on lakes in harmony with natural environments and how to use aquatic plant management techniques that blend with natural processes rather than resist them, the forecast for healthy lake ecosystems looks bright. To assure no harm is done to the lake ecology, it is important that plant management is undertaken as part of a long range and holistic plan.

In many cases, the development of long-term, integrated aquatic plant management strategies to identify important plant communities and manage nuisance aquatic plants in lakes, ponds or rivers is required by the State of Wisconsin. To promote the long-term sustainability of our lakes, the State of Wisconsin endorses the development of APMPs and supports that work through various grant programs.

There are many techniques for the management of aquatic plants in Wisconsin. Often management may mean protecting desirable aquatic plants by selectively hand pulling the undesirable ones. Sometimes more intensive management may be needed such as using harvesting equipment, herbicides or biological control agents. These methods require permits and extensive planning.

While limited management on individual properties is generally permitted, it is widely accepted that a lake will be much better off if plants are considered on a whole lake scale. This is routinely accomplished by lake organizations or units of government charged with the stewardship of individual lakes.

LAKE CHARACTERISTICS

In order to make recommendations for aquatic plant and lake management, basic information about the water body of concern is necessary. A basic understanding of physical characteristics including size and depth, critical habitat, water quality, water level, fisheries and wildlife, wetlands and soils is needed to make appropriate recommendations for improvement

PHYSICAL CHARACTERISTICS

Lake Como is a 92 acre drainage lake in western Chippewa County located in the City of Bloomer. Depth readings taken at Lake Como's 352 survey points revealed the majority of the shoreline dropped off sharply into >6ft of water. In the southern basin, the flat surrounding the city beach was the only significant area under 5ft. Upstream of the HWY Q Bridge, the Como Creek Inlet was never more than 4ft deep. Downstream from the bridge, depths slowly increased from 3ft to 6ft before dropping into the main basin. In the northern lobe, depth increased rapidly from 4ft at the Duncan Creek Inlet to >6ft just south of the North City Park (Figure 1). Bottom substrate is variable with primarily sand (48.6%) and organic and sandy muck (45.7%) with some patches of rocky bottom (5.7%) mixed in. Most of the main basin was sand and sandy muck, while areas with more nutrient-rich organic muck were largely confined to a few side bays and the Como Creek Inlet. Surveyors also noted that almost all rocky and gravel areas occurred along the main channel or on exposed points around the main basin (Figure 1)

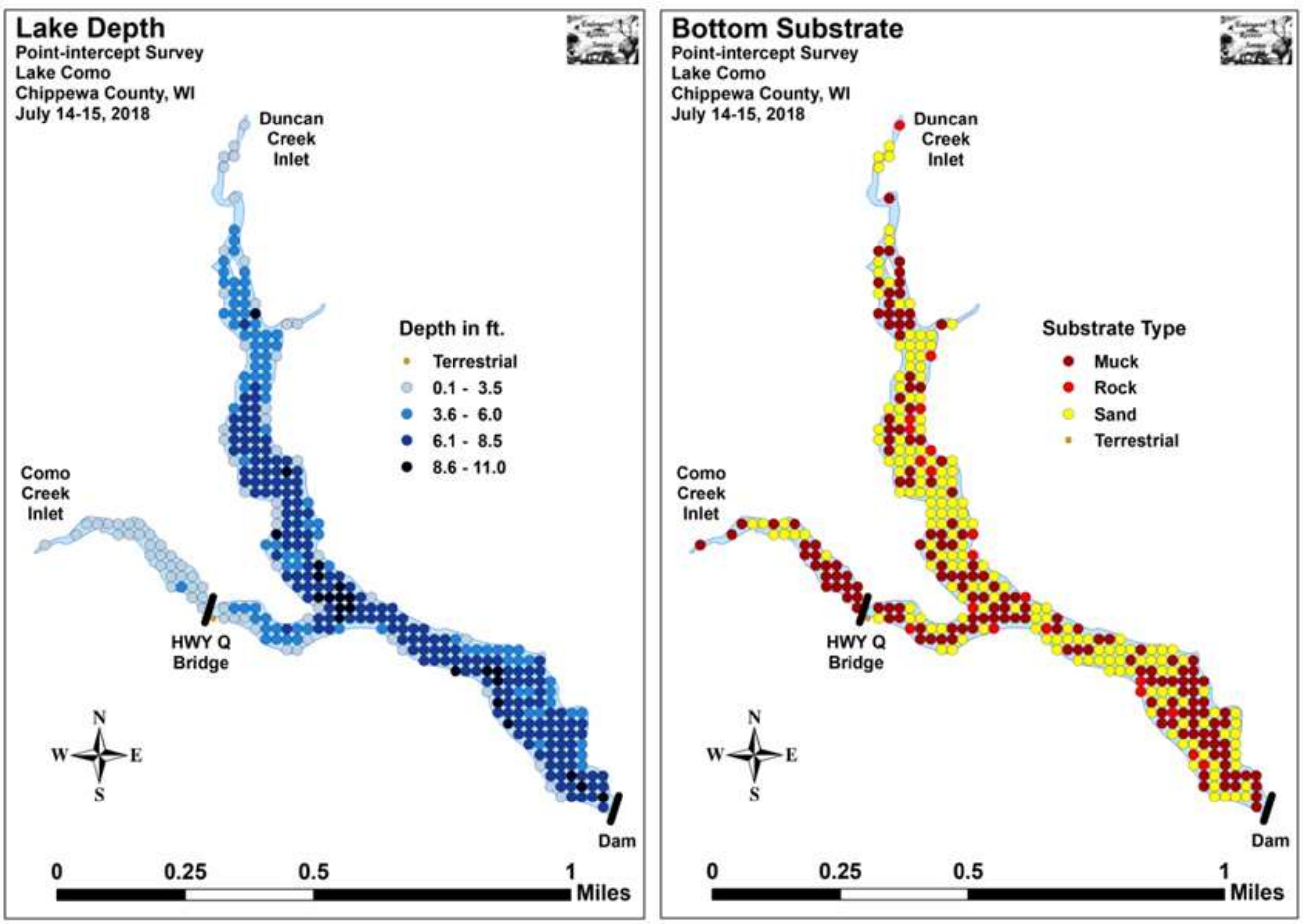


Figure 1: Lake depth (left) and bottom substrate material (right)

WATER QUALITY

Water clarity and water chemistry are important indicators of water quality. Secchi disk readings of water clarity have been collected by Wisconsin Citizen Lake Monitoring Network (CLMN), formerly the Self-help Lake Monitoring Program, volunteers albeit very sporadically. Prior to 2018, the most recent water quality data was collected in 2006. This makes it impossible to determine any sort of water quality trend. While there is no way to determine a trend, the data from 2018 can still be used to get a base line on the conditions present within the lake.

WATER CLARITY

Water clarity is a measurement of how deep sunlight can penetrate into the waters of a lake. It can be measured in a number of ways, the most common being an 8" disk divided into four sections, two black and two white, lowered into the lake water from the surface by a rope marked in measurable increments (Figure 2). The water clarity reading is the point at which the Secchi disk when lowered into the water can no longer be seen from the surface of the lake. Water color (like dark water stained by tannins from nearby bogs and wetlands), particles suspended in the water column (like sediment or algae), and weather conditions (cloudy, windy, or sunlight) can impact how far a Secchi disk can be seen down in the water. Some lakes have Secchi disk readings of water clarity of just a few inches, while other lakes have conditions that allow the Secchi disk to be seen for dozens of feet before it disappears from view.

Figure 2: Black and white Secchi disk

In 2018, the average summer (June-Aug) Secchi disk reading for Lake Como at the Deepest Point was 3.69 feet. The average for the Northwest Georegion was 9 feet putting Lake Como well below average for the area.

TROPHIC STATE INDEX

One of the most commonly used metrics of water quality is the trophic state of a lake. The trophic state is defined as the total load of biomass in a waterbody at any given time (Carlson & Simpson, 1996). To determine the trophic state of any given lake, the Tropic State Index (TSI) is generally used. This index uses the three main variables of Secchi depth, total phosphorus, and chlorophyll concentration. TSI values are technically limitless, but when applied, they almost always fall between 0 and 100. To make sense of these values, they are broken into different trophic states. The four main trophic states are oligotrophic (TSI<40), mesotrophic (TSI 40-50), eutrophic (TSI 50-70), and hypereutrophic (TSI>70) (Figure 3). Oligotrophic lakes are usually very clear, clean lakes with low nutrient levels. Mesotrophic lakes are moderately clear with some nutrients and more plants present within the system. Eutrophic lakes have excess nutrients that support a great deal of algae growth, and may have a large aquatic plant community. Hypereutrophic lakes are typically very green with dense algae and limited plant growth.

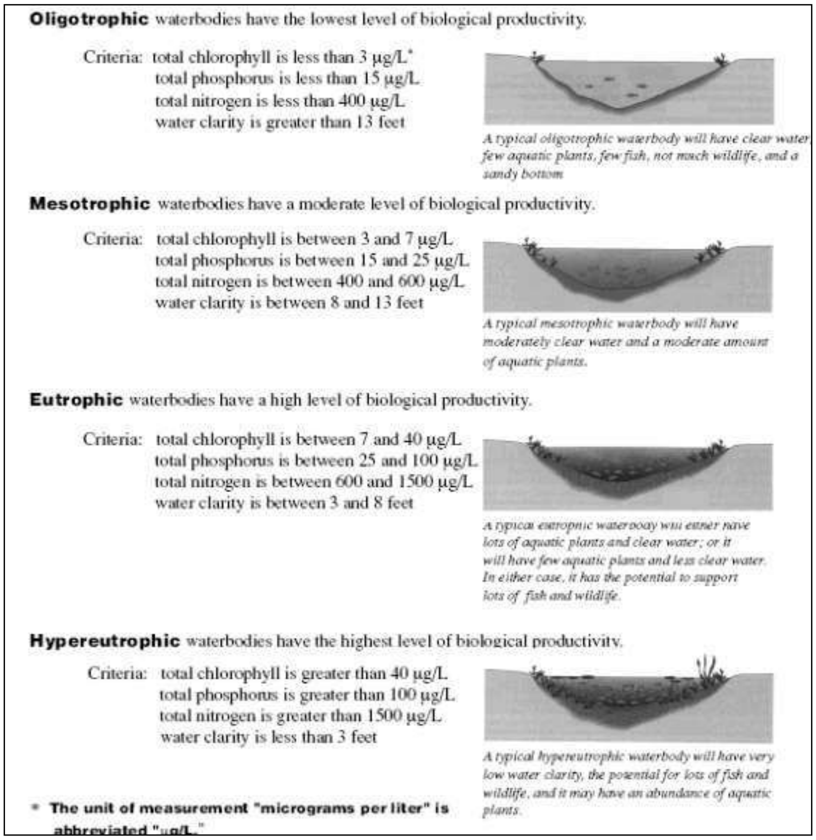


Figure 3: Trophic status in lakes

In 2018, all of the Secchi data collected suggested that Lake Como was a eutrophic lake nearing hypereutrophic. The 2018 average for Secchi TSI depth was 63 which suggest the system is very eutrophic.

Chemical variables, most commonly total phosphorus and chlorophyll-concentrations, are considered more accurate representations of the trophic state of a lake. In 2018, this data showed higher TSI values than the Secchi data alone. The 2018 average for total phosphorus concentration was 70.3 with a high of 73 in September and a low of 68 in August. This suggests Lake Como is on the border between a eutrophic system and a hyper eutrophic one. Chlorophyll values are generally considered the most accurate representation of a lake's trophic state because this is an indirect measurement of how much algae is present within the lake. In Lake Como, the chlorophyll- a TSI values fell somewhere between the total phosphorus values and the Secchi values in 2018. The average 2018 TSI for chlorophyll-a was 61 with a high of 65 in July and a low of 56 in August. This means Lake Como is a very eutrophic lake that contains nutrient levels that are likely to be in excess of the levels found in a healthy system.

TEMPERATURE AND DISSOLVED OXYGEN

Temperature and dissolved oxygen are important factors that influence aquatic organisms and nutrient availability in lakes. As temperature increases during the summer in deeper lakes, the colder water sinks to the bottom and the lake develops three distinct layers as shown in Figure 4. This process, called stratification, prevents mixing between the layers due to density differences which limits the transport of nutrients and dissolved oxygen between the upper and lower layers. In most lakes in Wisconsin that undergo stratification, the whole lake mixes in the spring and fall when the water temperature is between 53 and 66°F, a process called overturn. Overturn begins when the surface water temperatures become colder and therefore denser causing that water to sink or fall through the water column. Below about 39°F, colder water becomes less dense and begins to rise through the water column. Water at the freezing point is the least dense which is why ice floats and warmer water is near the bottom (called inverse stratification) throughout the winter.

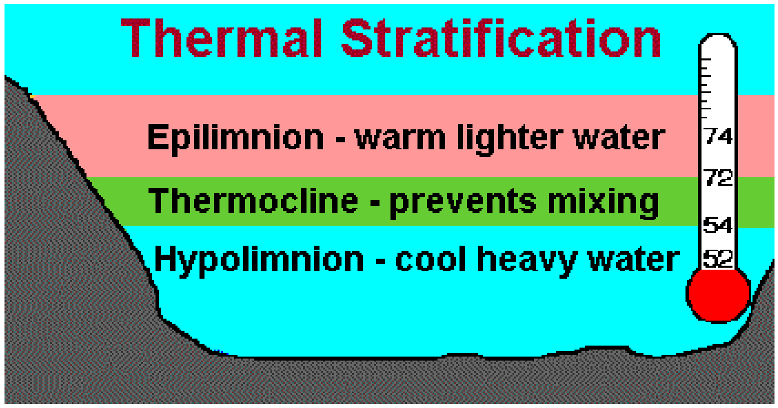


Figure 4: Summer thermal stratification

During the summer months, the upper warm layer, called the epilimnion, remains well oxygenated due to wind and wave action and photosynthesis. The middle layer, called the metalimnion or thermocline, is where changes in temperature and dissolved oxygen are greatest. This middle layer acts as a barrier that prevents warmer, oxygen rich waters in the upper layer from mixing with colder, deeper waters It is common for dissolved oxygen levels to be depleted in the lower layer, called the hypolimnion, as there is no source of new oxygen and the decomposition of organic matter consumes oxygen.

A dissolved oxygen level of 2mg/l or less, called hypoxia is an important criterion of sediment phosphorus release. When near-bottom dissolved oxygen is at 2mg/l or less, the sediment-water interface is likely anoxic (no oxygen) and therefore releasing phosphorus. If the phosphorus released from sediments reaches the upper part of the lake through spring or fall overturn or when natural or human induced wave action mixes the lake, it can provide a significant internal source of phosphorus to fuel algae blooms.

In 2018, Lake Como appears to have somewhat stratified and established a thermocline between two and three meters deep at the deepest point within the lake in September. This thermocline was likely short lived because of the shallow nature of Lake Como, but there is no data to confirm or reject that assumption.

A lake's Trophic Status Index (TSI) is determined by correlating three water quality parameters: total phosphorus, chlorophyll-*a* (a measure of algae in the water) and water clarity (Secchi disk readings). The TSI for Lake Como indicates it is highly eutrophic. This means the lake is characterized by high nutrient concentrations, high levels of primary productivity, and poor water clarity. The TSI plot exhibits a discrepancy between total phosphorus and the other water quality parameters, suggesting that chlorophyll-a and Secchi depth values should be higher based on the phosphorus values. This discrepancy is likely due to the short water retention time in the impoundment (about 24 hours) that prevents excessive algal blooms.

FISHERIES

Lake Como is considered a northern pike, largemouth bass, and panfish fishery. WDNR Fish Managers report that the largemouth bass is the most abundant gamefish in Lake Como with fish ranging in size from 4 inches to 19 inches and averaging just over 11 inches in the 2011 fisheries survey. Northern pike were the second most common game fish ranging in size from just over 10 inches to almost 40 inches in length and averaging 23 inches.

Panfish are abundant with yellow perch being the most commonly found species followed by black crappie and bluegills. Pumpkinseed are present but in very low numbers. Perch ranged in size from 3 inches up to 11.5 inches, but on average are fairly small with the mean size being 5.5 inches. Crappies ranged from 3 to 10 inches, but on average, were on the higher end of that range with an overall mean of 8 inches. Similarly, bluegills ranged from 3 inches to just under 9 inches, but had an average of 6.4 inches overall.

In addition to the gamefish and panfish populations, the 2011 survey also noted the collection of black and yellow bullheads, white suckers, and native minnow species. Historical records indicate there was a brook trout population within Duncan Creek that was also found within Lake Como, but there is no mention of trout in the 2011 survey. There are no records of walleye or carp ever being found within Lake Como. Lake Como is on an eight year rotation, so the next fisheries assessment is scheduled to occur in the spring of 2019.

WATERSHED CHARACTERISTICS

The Lake Como Watershed is one of several smaller watersheds which make up the larger Duncan Creek Watershed. The Duncan Creek Watershed covers 191- mi^2 (122,240 acres) through central Chippewa County with small portions extending into southern Barron County and Northern Eau Claire County (Figure 5). It consists of 270 miles of streams and rivers, 185 acres of lakes and 6,972 acres of wetlands. The watershed is dominated by agriculture, forest and grassland (22%). Duncan Creek flows into the Chippewa River in Chippewa Falls just below the hydroelectric dam within the city. Streams in this watershed are impacted by agricultural land uses and may respond to nonpoint source pollution controls.

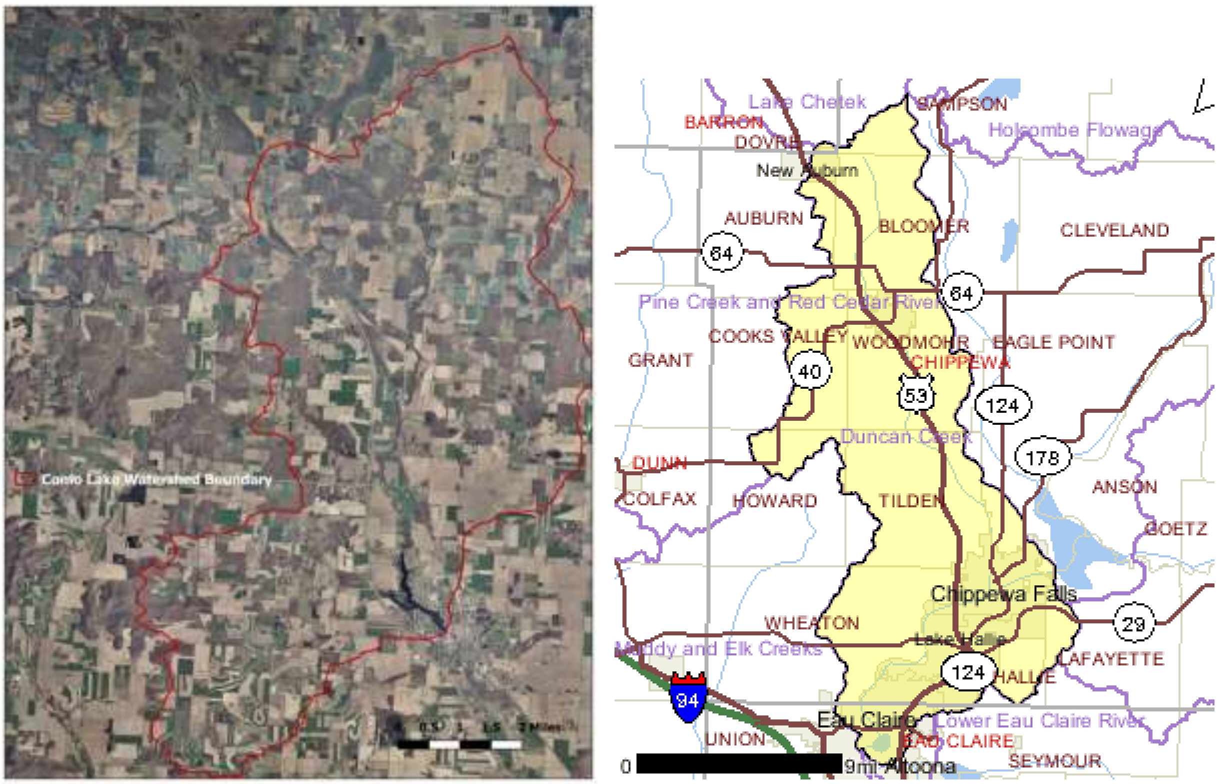


Figure 5: Lake Como Watershed (left) and Duncan Creek Watershed (right)

The Lake Como Watershed covers 46.37 square miles which accounts for approximately 25% of the entire Duncan Creek Watershed. Like the rest of the overall Duncan Creek Watershed, the Lake Como Watershed is comprised of agricultural land cover (63.8%) and forest land (20.5%). The rest of the watershed is a mix of several other cover types shown in Table 1. Most of the development within the watershed is confined to the City of Bloomer, Village of New Auburn, and US-53 while agriculture, primarily row crops, and forest land are spread throughout the watershed (Figure 6).

Table 1: Breakdown of land cover in the Lake Como Watershed

Cover Type	Area (Acres)	Percentage of Watershed
Open Water	112.8	0.4%
Wetlands	1566.2	5.2%
Forest	6132.1	20.5%
Scrub/ Grassland	675.7	2.3%
Pasture	3108.8	10.4%
Crops	15990.2	53.4%
Light Development	2245.2	7.5%
Heavy Development	98.8	0.3%

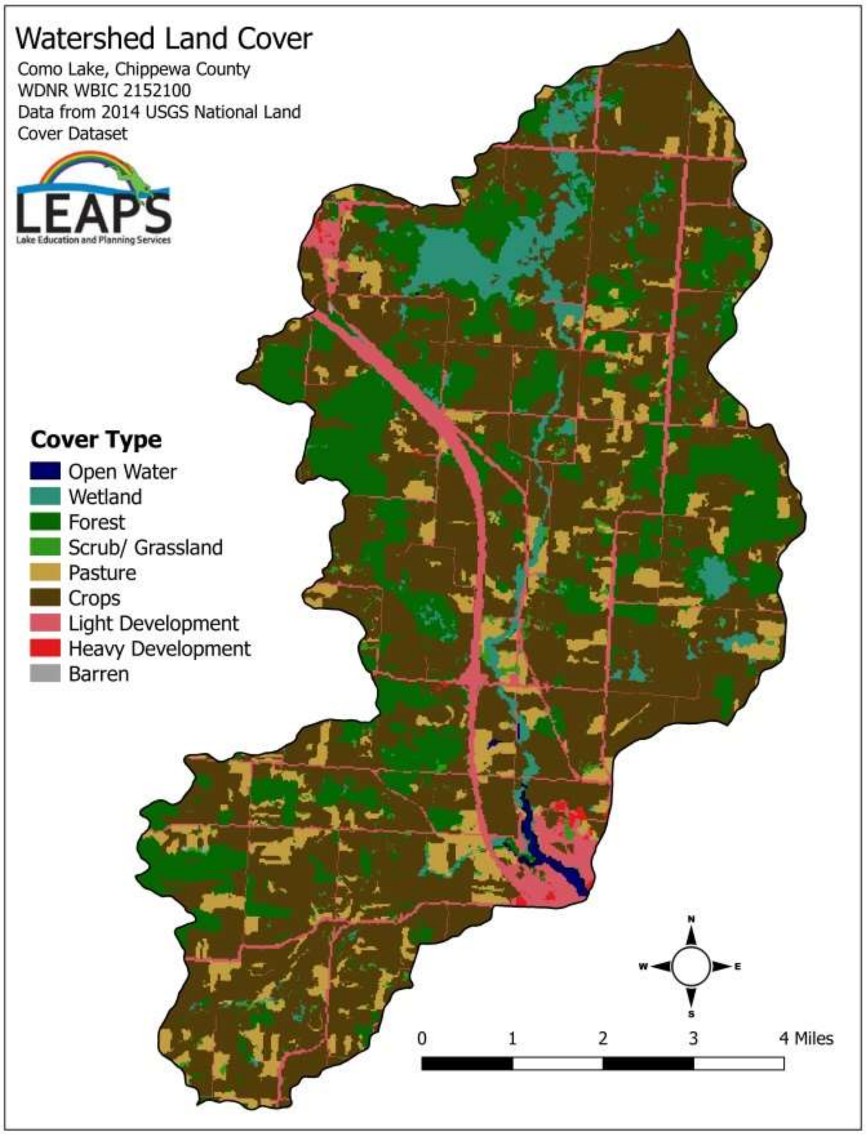


Figure 6: Land use in the Lake Como Watershed

SOILS

Soils are classified into four main hydrologic soil groups (A, B, C, and D) to indicate their potential for producing runoff. Group A soils have a high infiltration rate which makes the potential amount of runoff very low. These soils are, generally very sandy and allow water to pass through unimpeded. Conversely, group D soils have a very low infiltration rate making their runoff potential fairly high. Group D soils are generally very dense with high amounts of organic material. This causes water to move slowly through group D soils often resulting in standing water on flat surfaces and flowing water over sloped surfaces. Group D soils are usually contained to wetland areas.

There are also three sub groups (A/D, B/D, and C/D) these indicated the infiltration rate of the soils with respect to the water table. If the water table is high and blocking infiltration, these soils are considered to have a high runoff potential and placed into group D, but when the water table is lower, these soils are similar to the first grouping. The majority (53.9%) of the Lake Como watershed soils fall into Group C and C/D. The remaining areas consist of 0.4% open water, 19.6% Groups A and A/D, 20.7% Groups B and B/D, and 5.4% Group D soils (Table 2, Figure 7). Group C soils usually have a fairly high amount of organic material which makes it easy for plant growth. However these soils also have a slow infiltration rate which makes for a high runoff potential when there is no buffer around the lake.

Table 2: Hydrologic Soil Profile of the Lake Como Watershed

Hydrologic Soil Group	Area (Acres)	Percentage of Watershed
A	4,166.9	14.0%
B	3,246.8	10.9%
C	6,282.3	21.0%
D	1,619.9	5.4%
A/D	1,677.1	5.6%
B/D	2,918.6	9.8%
C/D	9,819.3	32.9%
Open Water	125.8	0.4%
Total	29,856.7	100.0%

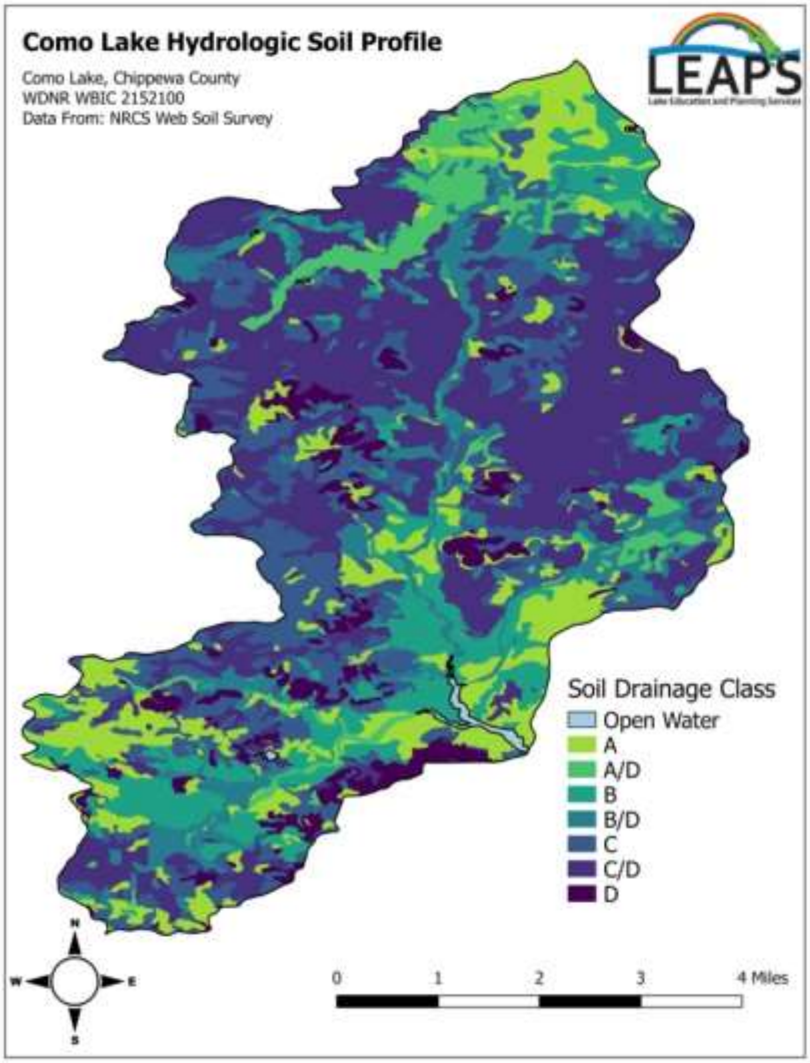


Figure 7: Hydrologic Soil Profile for Lake Como Watershed

WETLANDS

A wetland is 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. Wetlands have many functions which benefit the ecosystem surrounding Lake Como. Wetlands with a higher floral diversity of native species support a greater 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.

Wetlands also provide flood protection within the landscape. Due to the dense vegetation and location within the landscape, wetlands are important for retaining stormwater from rain and melting snow moving towards surface waters and retaining 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 to Lake Como by acting as buffers between land and water. They protect against erosion by absorbing the force of waves and currents and by anchoring sediments. This shoreline protection is important in waterways where boat traffic, water current, and wave action cause substantial damage to the shore. Wetlands also 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.

The Lake Como Watershed contains almost 1,600 acres of wetland areas (Figure 8). The largest of these wetland areas is a large wetland complex in the far northern part of the watershed, but this area is where the largest tributary for Lake Como (Duncan Creek) begins. This stream is lined by wetland areas most of the way before it enters Lake Como. The smaller tributary, Como Creek, also has segments that are bordered by wetlands before it enters the lake. While these areas are not able to filter out all of the potential sources of nutrients and pollutants, they should not be disturbed as they do help filter out many of the nutrients and pollutants that would otherwise flow unimpeded into the streams and lake.

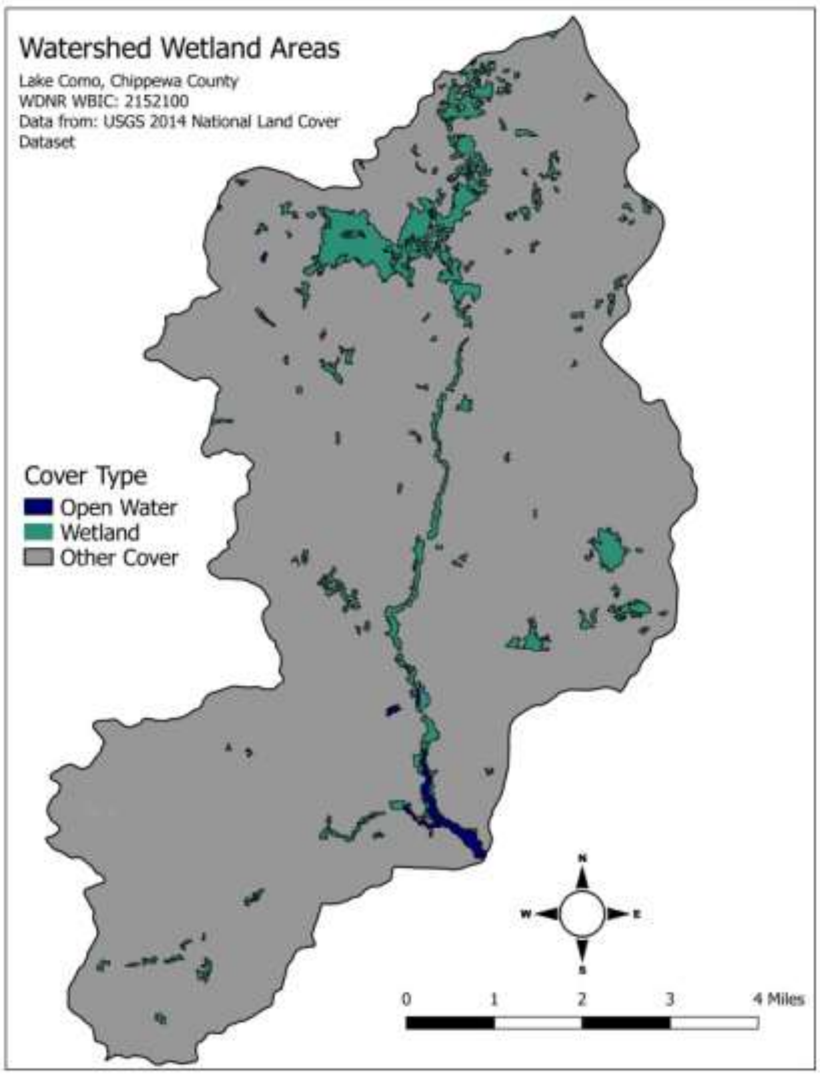


Figure 8: Wetlands within the Lake Como Watershed

COARSE WOODY HABITAT (Wolter, 2012)

Coarse woody habitat (CWH) in lakes is classified as trees, limbs, branches, roots, and wood fragments at least 4 inches in diameter that enter a lake by natural (beaver activity, toppling from ice, wind, or wave scouring) or human means (logging, intentional habitat improvement, flooding following dam construction). CWH in the littoral or near-shore zone serves many functions within a lake ecosystem including erosion control, as a carbon source, and as a surface for algal growth which is an important food base for aquatic macro invertebrates. Presence of CWH has also been shown to prevent suspension of sediments, thereby improving water clarity. CWH serves as important refuge, foraging, and spawning habitat for fish, aquatic invertebrates, turtles, birds, and other animals. The amount of littoral CWH occurring naturally in lakes is related to characteristics of riparian forests and likelihood of toppling. However, humans have also had a large impact on amounts of littoral CWH present in lakes through time. During the 1800's the amount of CWH in northern lakes was increased beyond natural levels as a result of logging practices. But time changes in the logging industry and forest composition along with increasing shoreline development have led to reductions in CWH present in many northern Wisconsin lakes.

CWH is often removed by shoreline residents to improve aesthetics or select recreational opportunities (swimming and boating). Jennings et al. (2003) found a negative relationship between lakeshore development and the amount of CWH in northern Wisconsin lakes. Similarly, Christensen et al. (1996) found a negative correlation between density of cabins and CWH present in Wisconsin and Michigan lakes. While it is difficult to make precise determinations of natural densities of CWH in lakes it is believed that the value is likely on the scale of hundreds of logs per mile. The positive impact of CWH on fish communities have been well documented by researchers, making the loss of these habitats a critical concern.

Fortunately, remediation of this habitat type is attainable on many waterbodies, particularly where private landowners and lake associations are willing to partner with county, state, and federal agencies. Large-scale CWH projects are currently being conducted by lake associations and local governments with assistance from the WDNR where hundreds of whole trees are added to the near-shore areas of lakes. For more information on this process visit: https://healthylakeswi.com/best-practices/#fish (last accessed on 2-25-2019). These types of projects are more formally called "tree drops" but are popularly are called "fish sticks" (Figure 9).

Figure 9: Coarse woody habitat-Fishsticks projects

The coarse woody habitat within Lake Como has not been quantified, but property owners interested in installing fishsticks projects are still eligible for WDNR funding through the Healthy Lakes Initiative.

SHORELANDS

How the shoreline of a lake is managed can have big impacts on the water quality and health of that lake. Natural shorelines prevent polluted runoff from entering lakes, help control flooding and erosion, provide fish and wildlife habitat, may make it harder for aquatic invasive species to establish themselves, muffle noise from watercraft, and preserve privacy and natural scenic beauty. Many of the values lake front property owners appreciate and enjoy about their properties - natural scenic beauty, tranquility, privacy, relaxation - are enhanced and preserved with good shoreland management. And healthy lakes with good water quality translate into healthy lake front property values.

Shorelands may look peaceful, but they are actually the hotbed of activity on a lake. 90% of all living things found in lakes - from fish, to frogs, turtles, insects, birds, and other wildlife - are found along the shallow margins and shores. Many species rely on shorelands for all or part of their life cycles as a source for food, a place to sleep, cover from predators, and to raise their young. Shorelands and shallows are the spawning grounds for fish, nesting sites for birds, and where turtles lay their eggs. There can be as much as 500% more species diversity at the water's edge compared to adjoining uplands.

Lakes are buffered by shorelands that extend into and away from the lake. These shoreland buffers include shallow waters with submerged plants (like coontail and pondweeds), the water's edge where fallen trees and emergent plants like rushes might be found, and upward onto the land where different layers of plants (low ground cover, shrubs, trees) may lead to the lake. A lake's littoral zone is a term used to describe the shallow water area where aquatic plants can grow because sunlight can penetrate to the lake bottom. Shallow lakes might be composed entirely of a littoral zone. In deeper lakes, plants are limited where they can grow by how deeply light can penetrate the water.

Shorelands are critical to a lake's health. Activities such replacing natural vegetation with lawns, clearing brush and trees, importing sand to make artificial beaches, and installing structures such as piers, can cause water quality decline and change what species can survive in the lake.

PROTECTING WATER QUALITY

Shoreland buffers slow down rain and snow melt (runoff). Runoff can add nutrients, sediments, and other pollutants into lakes, causing water quality declines. Slowing down runoff will help water soak (infiltrate) into the ground. Water that soaks into the ground is less likely to damage lake quality and recharges groundwater that supplies water to many of Wisconsin's lakes. Slowing down runoff water also reduces flooding, and stabilizes stream flows and lake levels.

Shoreland wetlands act like natural sponges trapping nutrients where nutrient-rich wetland sediments and soils support insects, frogs, and other small animals eaten by fish and wildlife.

Shoreland forests act as filters, retainers, and suppliers of nutrients and organic material to lakes. The tree canopy, young trees, shrubs, and forest understory all intercept precipitation, slowing runoff, and contributing to water infiltration by keeping the soil's organic surface layer well-aerated and moist. Forests also slow down water flowing overland, often capturing its sediment load before it can enter a lake or stream. In watersheds with a significant proportion of forest cover, the erosive force of spring snow melts is reduced as snow in forests melts later than snow on open land, and melt water flowing into streams is more evenly distributed. Shoreland trees grow, mature, and eventually fall into lakes where they protect shorelines from erosion, and are an important source of nutrients, minerals and wildlife habitat.

NATURAL SHORELANDS ROLE IN PREVENTING AQUATIC INVASIVE SPECIES

In addition to removing essential habitat for fish and wildlife, clearing native plants from shorelines and shallow waters can open up opportunities for invasive species to take over. Like tilling a home garden to prepare it for seeding, clearing shoreland plants exposes bare earth and removes the existing competition (the cleared shoreland plants) from the area. Nature fills a vacuum. While the same native shoreland plants may recover and reclaim their old space, many invasive species possess "weedy" traits that enable them to quickly take advantage of new territory and out-compete natives.

The act of weeding creates continual disturbance, which in turn benefits plants that behave like weeds. The modern day practice of mowing lawns is an example of keeping an ecosystem in a constant state of disturbance to the benefit of invasive species like turf grass, dandelions, and clover, all native to Europe. Keeping shoreline intact is a good way to minimize disturbance and minimize opportunities for invasive species to gain a foothold.

THREATS TO SHORELANDS

When a landowner develops a waterfront lot, many changes may take place including the addition of impervious surfaces like driveways, houses, decks, garages, sheds, piers, rafts and other structures; wells and septic systems; lawns; sandy beaches; and more. Many of these changes result in the compaction of soil and the removal of trees and native plants, as well as the addition of impervious (hard) surfaces, all of which alter the path that precipitation takes to the water.

Building too close to the water, removing shoreland plants, and covering too much of a lake shore lot with hard surfaces (such as roofs and driveways) can harm important habitat for fish and wildlife, send more nutrient and sediment runoff into the lake, and cause water quality decline.

Changing one waterfront lot in this fashion may not result in a measurable change in the quality of the lake or stream. But cumulative effects when several or many lots are developed in a similar way can be enormous. A lake's response to stress depends on what condition the system is in to begin with, but bit by bit, the cumulative effects of tens of thousands of waterfront property owners "cleaning up" their shorelines, are destroying the shorelands that protect their lakes. Increasing shoreline development and development throughout the lake's watershed can have undesired cumulative effects.

SHORELAND PRESERVATION AND RESTORATION

If a native buffer of shoreland plants exists on a given property, it can be preserved and care taken to minimize impacts when future lake property projects are contemplated. If a shoreline has been altered, it can be restored. Shoreline restoration involves recreating buffer zones of natural plants and trees. Not only do quality wild shorelines create higher property values, but they bring many other values too. Some of these are aesthetic in nature, while others are essential to a healthy ecosystem. Healthy shorelines mean healthy fish populations, varied plant life, and the existence of the insects, invertebrates and amphibians which feed fish, birds and other creatures. Figure 10 shows the difference between a natural and unnatural shoreline adjacent to a lake home. More information about healthy shorelines can be found at the following website: https://healthylakeswi.com/

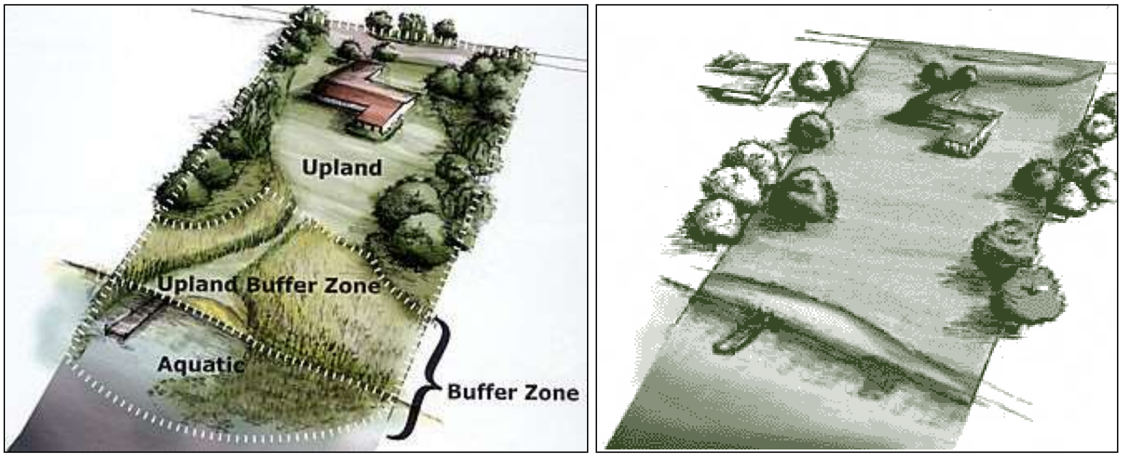


Figure 10: Healthy, AIS Resistant Shoreland (left) vs. Shoreland in Poor Condition

URBAN STORMWATER RUNOFF

Stormwater runoff is water from rain storms or snow melt that flows over the land rather than evaporating or soaking into the ground. Urban areas generate more stormwater runoff than rural areas because buildings and pavement cover much of the land and prevent water from soaking into the ground (Table 3). To prevent street and basement flooding, extensive drainage systems carry "excess" water to nearby waterways. In these lakes and streams, urban stormwater creates a variety of problems including: increased storm flows and decreased base flow; eroding channels and wider flood plain; poor water quality; and loss of habitat and recreational use (Prey, 1994). In addition to buildings, pavement and other hard surfaces, mowed lawns contribute a greater amount of stormwater runoff than do natural areas. Urban stormwater runoff entering a waterbody carries nutrients that may stimulate aquatic plant and algae growth in the water and sediment that contributes to the "filling in" of the waterbody. The concentrations of both sediment and phosphorus (a nutrient normally in limited supply in a natural setting, but essential for plant growth) in urban runoff are generally lower than rural runoff, but because more water runs off of the impervious surfaces the total load from urban areas is comparable, with actual loads per acre of urban land use often much higher than what comes off of an acre of rural land.

Other pollutants including oil, grease, and toxic chemicals from motor vehicles; pesticides and nutrients from lawns and gardens; viruses, bacteria, and nutrients from pet waste and failing septic systems; road salts; heavy metals from roof shingles, motor vehicles, and other sources; and thermal pollution (unnaturally warm water) from dark impervious surfaces such as streets and rooftops are also carried in. These pollutants can harm fish and wildlife populations, alter native vegetation, foul drinking water supplies, and make recreational areas unsafe and unpleasant (EPA, 2003).

Table 3: Typical Impervious Area Percentages (Brach, 1989)

Land Use	Percent Impervious Surface
Business/Shopping District	95-100
High Density Residential	45-60
Medium Density Residential	35-45
Low Density Residential	20-40
Open/Grass Areas	0-10

Lake Como is an urban lake, meaning nearly all of its shoreline is within the area of development associated with the City of Bloomer. As an urban lake, much of the shoreline around the lake is developed, with much of that being mowed lawn or other impervious surfaces right down to the edge of the water. More than 50% of the immediate shoreland adjacent to Lake Como can be considered "altered" from a more natural state by development (Figure 11). The amount of sediment and nutrients entering the lake via stormwater runoff from rural lands upstream and the developed urban area around the main body of the lake needs to be reduced as a means to also reduce unwanted aquatic vegetation and unsightly and potentially harmful algae blooms. To accomplish this, the amount of shoreline returned to a more natural state, or improved/restored needs to be increased. There are many simple and inexpensive shoreland best management practices that could be implemented along the shores of Lake Como, including "no mow" areas, native plantings, rain gardens, runoff diversions, and infiltration basins. All of these activities are supported by the WDNR Healthy Lakes Initiative and the grants that are available to make shoreland improvements.

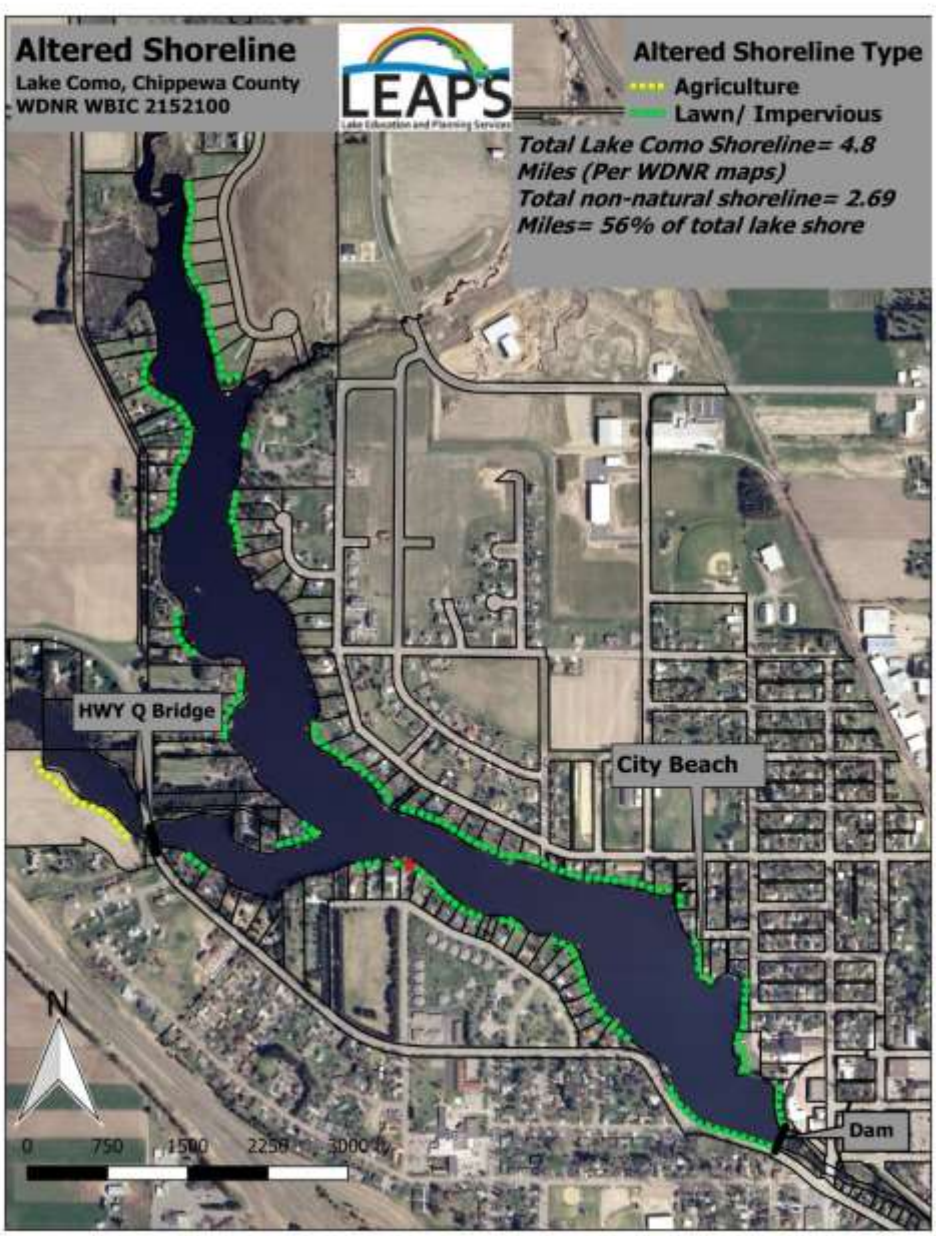


Figure 11: Lake Como Altered Shoreline

AQUATIC PLANT SURVEYS

Aquatic plants form the foundation of healthy and flourishing lake ecosystems - both within lakes and rivers and on the shores around them. They not only protect water quality, but they also produce life-giving oxygen. Aquatic plants are a lake's own filtering system, helping to clarify the water by absorbing nutrients like phosphorus and nitrogen that could stimulate algal blooms. Plant beds stabilize soft lake and river bottoms and reduce shoreline erosion by reducing the effect of waves and current. Healthy native aquatic plant communities help prevent the establishment of invasive non-native plants like Eurasian water-milfoil, purple loosestrife, or phragmites.

In addition, the best fishing spots are typically near aquatic plant beds. Aquatic plants provide important reproductive, food, and cover habitat for fish, invertebrates, and wildlife. It is aquatic plants that fashion a nursery for all sorts of creatures ranging from birds to beaver to bass to bugs. In order to maintain healthy lakes and rivers, healthy native aquatic plant communities must be maintained.

AQUATIC PLANTS IN 1991

In 1991, an aquatic plant survey in Lake Como identified 10 different aquatic plant species (Table 4). Frequency of occurrence, which is a value of abundance of each different plant in the lake are shown in Table 5.

Table 4: Aquatic plants found in Lake Como in 1991 ***(Dearlove, Christianson, & and Johnson, 2002)***

Scientific Name	Common Name	Plant Type
Ceratophyllum demersum	Coontail	Submergent
Elodea canadensis	Common waterweed	Submergent
Lemna minor	Small duckweed	Floating-leaf
Nitella sp.	Nitella	Submergent
Phalaris arundinacea	Reed canary grass	Emergent
Potamogeton nodosus	Longleaf pondweed	Submergent
Potamogeton pusillus	Small pondweed	Submergent
Sparganium androcladum	Burreed	Emergent
Scirpus validus	Softstem bulrush	Emergent
Typha latifolia	Broadleaf cattail	Emergent

Table 5: 1991 Frequency of Occurrence of aquatic plants in Lake Como *(Dearlove, Christianson, & and Johnson, 2002)*

	Frequency of Occurrence (%)			
Species	All Sites	0-1.5' Sites	1.5-5' Sites	5-10' Sites
Coontail	38.71	38.46	46.15	20.00
Common waterweed	74.19	69.23	92.31	40.00
Small duckweed	93.55	100.00	92.31	80.00
Nitella	9.68	0.00	15.38	20.00
Reed canary grass	9.68	23.08	0.00	0.00
Longleaf pondweed	25.81	30.77	30.77	0.00
Small pondweed	9.68	7.69	15.38	0.00
Burreed	3.23	7.69	0.00	0.00
Broadleaf cattail	6.45	15.38	0.00	0.00

All of the aquatic plant species in the 1991 survey are tolerant of eutrophic, light limiting conditions, and high siltation rates. During this survey aquatic plants were found at 93.5% of all sampling sites in the lake. Duckweed, which is a free-floating, very small aquatic plant which tends to float on the surface, can create large dense, piled-on mats that reduce navigation, limit light penetration, and reduce the aesthetic appearance of the water body. Such was the case in 1991 with duckweed mats covering 93.6% of all sampling sites and greater than 50% of the total lake surface (Dearlove, Christianson, & and Johnson, 2002).The two most abundant rooted aquatic plants, common waterweed and coontail are shade tolerant and do well in degraded water quality conditions. The three most common aquatic plant species in 1991 (duckweed, common waterweed, and coontail) also had the highest density ratings during the survey, meaning not only were they widespread (abundant) but where located they often created nuisance and navigation conditions (Dearlove, Christianson, & and Johnson, 2002).

In 2003 and 2004, the City of Bloomer, Bloomer Community Lake Association, and other partners completed a large dredging project in Lake Como. One of the expected outcomes of the dredging project was an improvement in the existing aquatic plant community. While this may have been one of the desired outcomes, it appears that no additional aquatic plant survey was completed after the dredging project. So there is no documentation of any "new" or more desirable aquatic vegetation between 2004 and 2018. A whole-lake, summer point-intercept survey was completed in 2018 in response to increasing aquatic plant growth and the nuisance conditions that it created.

AQUATIC PLANTS IN 2018

Using a standard formula that takes into account the shoreline shape and distance, islands, water clarity, depth and total acreage, WDNR biologists generated a 353 point sampling grid for Lake Como prior to the plant surveys that were conducted in 2018. Using this grid, Endangered Resource Services, LLC (ERS) conducted a warm water point-intercept survey, and bed mapping and point intercept surveys of curly-leaf pondweed (CLP) in 2018. During these surveys, ERS measured the number and distribution of the plant species present as well as the density of these populations. To measure the density, surveyors assigned each species found at a point a rake fullness value of 1-3 (Figure 12). The diversity of the plant community is measured in several different metrics, each explained in the following sections.

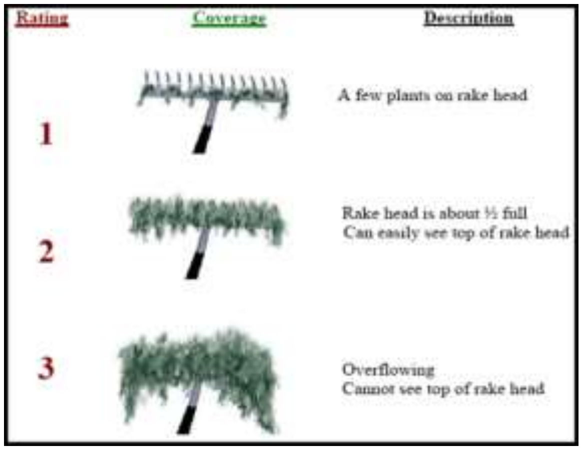


Figure 12: Rake fullness ratings

WARM-WATER FULL POINT-INTERCEPT (PI) AQUATIC PLANT SURVEY

ERS surveyed 352 of the 353 (one point was on land, so was not surveyed) points on July 14 and 15, 2018. Table 4 provides a brief summary of this survey.

Table 6: Summary of 2018 warm water PI survey

Summary Statistics:	
Total number of points sampled	352
Total number of sites with vegetation	268
Total number of sites shallower than the maximum depth of plants	346
Frequency of occurrence at sites shallower than maximum depth of plants	77.46
Simpson Diversity Index	0.76
Maximum depth of plants (ft)	9.5
Mean depth of plants (ft)	5.2
Median depth of plants (ft)	5.5
Average number of all species per site (shallower than max depth)	2.21
Average number of all species per site (veg. sites only)	2.85
Average number of native species per site (shallower than max depth)	2.19
Average number of native species per site (sites with native veg. only)	2.82
Species richness	12
Species richness (including visuals)	12
Species richness (including visuals and boat survey)	18
Mean total rake fullness (veg. sites only)	1.93

Plants were found growing as deep as 9.5-ft, but surveyors noted that there was very few if any plants at points with a depth greater than 7-ft. Collectively, overall plant colonization was slightly skewed to shallow water as the mean depth of 5.2-ft was lower than the median depth of 5.5-ft.

Plant richness was very low in Lake Como with only 12 species being found on the rake. This total increases to 18 when including plants seen from the boat but absent from the rake during sampling. Despite this low overall richness, mean native species at sites with native vegetation was a moderate 2.82/site although much of this total could be attributed to duckweeds which were nearly ubiquitous (Figure 13). Mean total rake fullness, a commonly used density metric, was also moderate at 1.93. Visual analysis of the map showed that almost all points in less than 6-ft of water had thick vegetation, but density generally declined rapidly with increased depth (Figure 13).

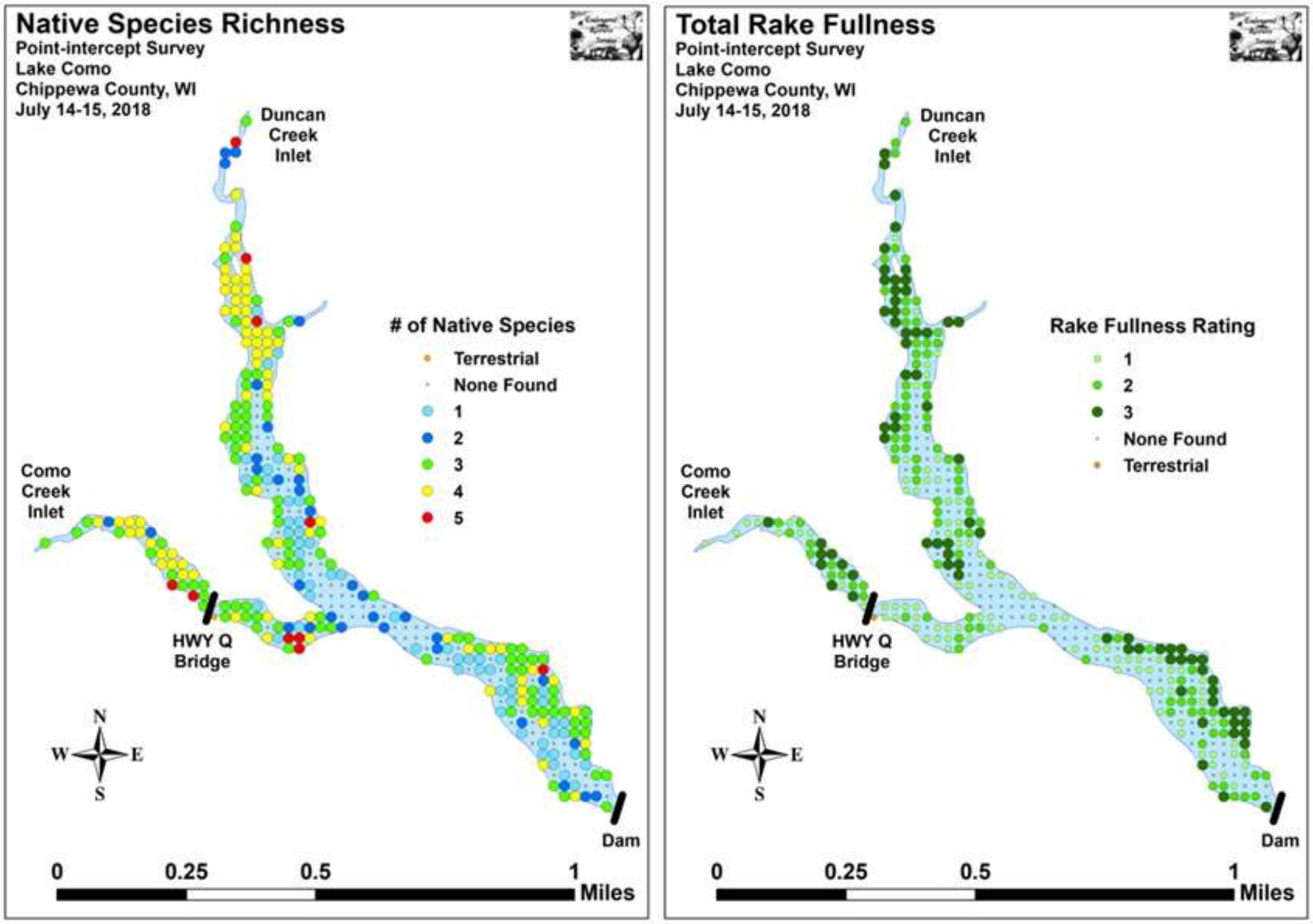


Figure 13: Native species richness (left) and total rake fullness (right)

Common waterweed, Small duckweed, Common watermeal, and Coontail were the most widely distributed species, found at 93.28%, 66.42%, 64.93%, of 45.90% of the sites where vegetation was found. Three of these four species were also the most abundant in 1991 prior to the 2003-04 dredging project. The fourth species, common watermeal, may have been present during the 1991 survey, but was not accounted for as it is a very small (smaller than duckweed) free-floating aquatic plant often found in the same areas as duckweed. These four plants accounted for an exceptionally high 95.02% of the total relative frequency. The relative frequency value shows a species' frequency relative to all other species. It is expressed as a percentage, and the total of all species' relative frequencies will add up to 100%. The incredibly high relative frequency of the top four species suggests there was little room for different plant species within the Lake Como plant community, also similar to what was documented in 1991.

SIMPSON'S DIVERSITY INDEX

A diversity index allows the entire plant community at one location to be compared to the entire plant community at another location. It also allows the plant community at a single location to be compared over time thus allowing a measure of community degradation or restoration at that site. With Simpson's Diversity Index, the index value represents the probability that two individual plants (randomly selected) will be different species. The index values range from 0-1 where 0 indicates that all the plants sampled are the same species to 1 where none of the plants sampled are the same species. The greater the index value, the higher the diversity in a given location. Although many natural variables like lake size, depth, dissolved minerals, water clarity, mean temperature, etc. can affect diversity, in general, a more diverse lake indicates a healthier ecosystem. Perhaps most importantly, plant communities with high diversity also tend to be more resistant to invasion by exotic species. In Lake Como, diversity was moderate in 2018 with a Simpson Index value of 0.76.

FLORISTIC QUALITY INDEX (FQI)

This index measures the impact of human development on a lake's aquatic plants. The 124 species in the index are assigned a Coefficient of Conservatism (C) which ranges from 1-10. The higher the value assigned, the more likely the plant is to be negatively impacted by human activities relating to water quality or habitat modifications. Plants with low values are tolerant of human habitat modifications, and they often exploit these changes to the point where they may crowd out other species. The FQI is calculated by averaging the conservatism value for each native index species found in the lake during the point-intercept survey, and multiplying it by the square root of the total number of plant species (N) in the lake. Statistically speaking, the higher the index value, the healthier the lake's aquatic plant community is assumed to be. Nichols (1999) identified four eco-regions in Wisconsin: Northern Lakes and Forests, North Central Hardwood Forests, Driftless Area and Southeastern Wisconsin Till Plain. He recommended making comparisons of lakes within ecoregions to determine the target lake's relative diversity and health. Lake Como is in the Northern Central Hardwood Forests Region.

In 2018, a total of 10 native index species were identified in the rake during the point-intercept survey. They produced a mean C of 5.3 and a FQI of 16.8 (Berg, Curly-leaf pondweed (Potamogeton crispus) Point-intercept and Bed Mapping Surveys, and Warm-water Macrophyte Point-intercept Survey Lake Como - WBIC 2152100 Chippewa County, Wisconsin, 2018). Nichols (1999) reported an average mean C for the North Central Hardwood Forests Region of 5.6 putting Lake Como below average, for this part of the state in 2018. Similarly, the FQI of 16.8 was well below the mean FQI of 20.9 for the North Central Hardwood Forests Region (Nichols, 1999). Both of these values suggest that Lake Como is negatively impacted by human development.

CURLY-LEAF PONDWEED POINT-INTERCEPT AND BED MAPPING SURVEYS

Curly-leaf pondweed (CLP) is a non-native, aquatic invasive species that has been present in many WI lakes for a long time. It is an early season plant that completes the majority of its plant life cycle in cold water. In WI, that means growth in the fall, under the ice, and through the spring into early summer. By early July, the life cycle of CLP is usually complete with new distribution of seeds (turions) for future growth, and decay of deceased vegetation.

In 2018, two surveys were conducted for CLP in Lake Como. The first was an early season point-intercept survey conducted on May 28th. The second survey was a bed mapping survey conducted on June 14th. During the early season point-intercept survey, surveyors found CLP growing over sand and muck in water from 2.5-7.0-ft deep with a mean depth of 4.7-ft. CLP was present in the rake sample at seven points with nine additional visual sightings. Of these, no points had a rake fullness rating of 3, one rated a 2, and the remaining six were a 1 for a mean rake fullness of 1.14. This extrapolated to 2.0% of the entire lake having CLP, and just 0.3% having a significant infestation (rake fullness 2 and 3). The CLP that was found was almost entirely restricted to the Como Creek Inlet upstream from the HWY Q Bridge and the Duncan Creek Inlet upstream from the North City Park. Most CLP in these areas occurred in water from 2-5-ft deep in the outwash near the channel where the bottom was disturbed and had at least some organic muck (Figure 14).

During the bed mapping survey on June 14th, ERS found very little CLP outside of what was found during the point-intercept survey earlier in the season. Despite searching the entire lake, the only significant CLP occurred in a single 1.64 acre high density area near the Duncan Creek Inlet (Figure 14). Although the CLP in this area was canopied, it wasn't a true bed as the area was dominated by Common waterweed and Coontail with the CLP occurring as scattered patches that never had a rake fullness of more than 2. There are few residences in this area, and flowing water created a natural navigation channel. ERS reported that the natural channel suggests this particular area is only a minor navigational impairment at worst. It was noted that large mats of filamentous algae covering all of the other plants presented a bigger challenge for the surveyors than any of the plants themselves.

CLP was not documented in the 1991 aquatic plant survey.

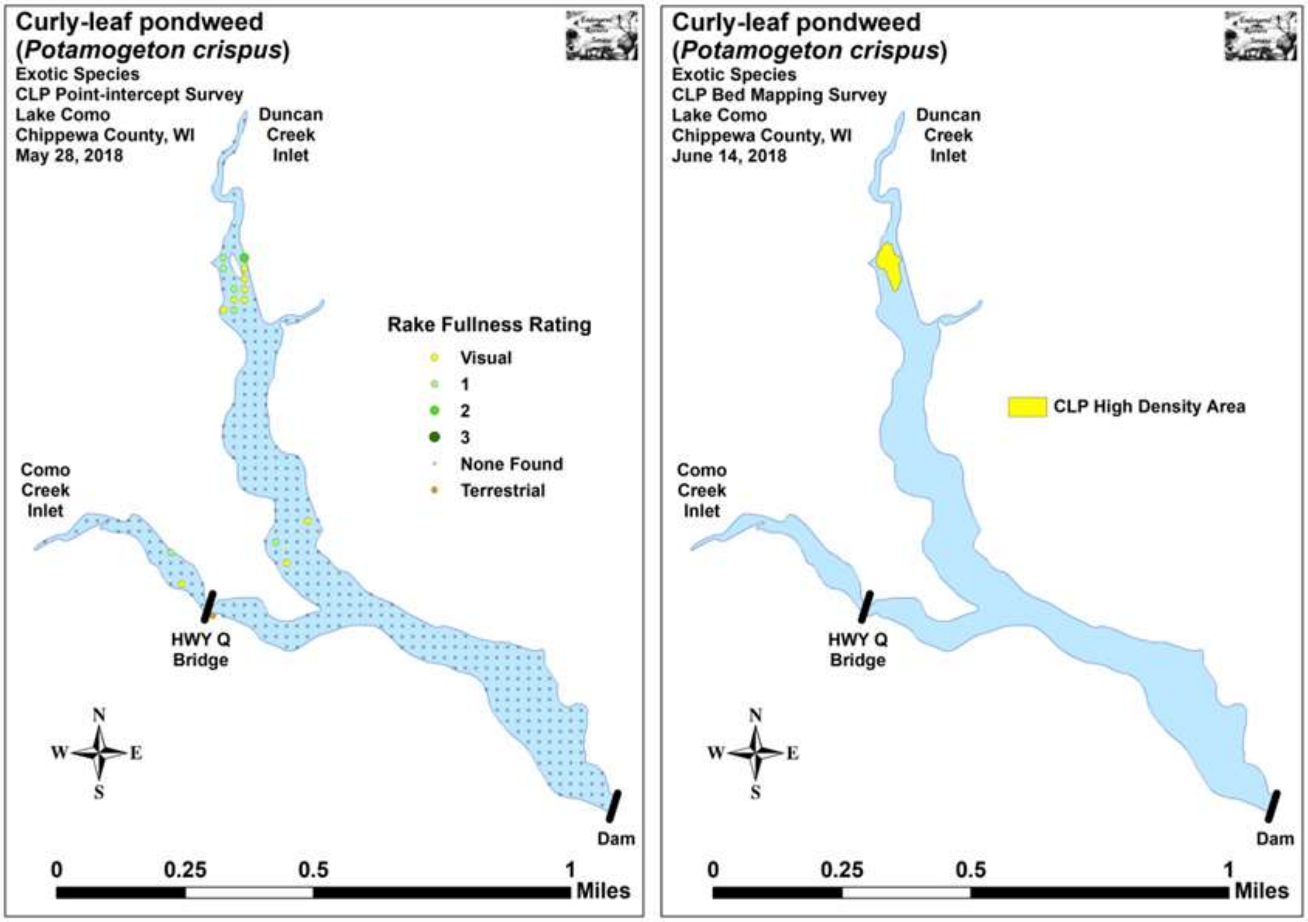


Figure 14: 2018 CLP point-intercept and bed mapping surveys

2018 AQUATIC PLANT SURVEY CONCLUSIONS

In a section of the 2018 Aquatic Plant Survey Report (Berg, 2018), the surveyor, Matt Berg made the following comments related to the aquatic plant community of Lake Como. These comments are similar to what was stated in the 2002 Condition Assessment Report prepared by Ramaker & Associates (Dearlove, Christianson, & and Johnson, 2002).

"Lake Como has an abundant native plant community that is dominated by just a few lower conservatism value species which can tolerate the lake's poor to very poor water clarity and high nutrient load. These plants are currently so abundant that they are significantly impacting both lake access and recreational activities. Because of this, some type of active management is likely in the future. Regardless of what, if any, management occurs, it is important to remember that these plants are supremely important to the lake as they are the basis of the aquatic ecosystem. They capture the sun's energy and turn it into usable food, "clean" the water of excess nutrients, and provide habitat for other organisms like aquatic invertebrates and the lake's fish populations. Because of this, ***maintaining some level of plants*** *in the lake is critical to maintaining the lake's overall health."*

He goes on to say that:

"Common waterweed and Coontail do not have roots and can rapidly reproduce vegetatively in nutrient-rich waters. Because of this ability, these native species can act like exotics and quickly become invasive. This seems to be the case in Lake Como where dense "haystacks" of vegetation dominated by these species and filamentous algae fill the entire water column in most areas on the lake that are less than 6ft deep.

Although the band of canopied plants that borders the shoreline can be quite narrow where the lake drops off rapidly, in many areas, like on the east side of the south basin, it is so wide that plants are severely restricting both lake access and general navigation."

WILD RICE

Wild rice is an aquatic grass which grows in shallow water in lakes and slow flowing streams. This grass produces a seed which is a nutritious source of food for wildlife and people. The seed matures in August and September with the ripe seed dropping into the sediment, unless harvested by wildlife or people. It is a highly protected and valued natural resource in Wisconsin. Only Wisconsin residents may harvest wild rice in the state. According to the WDNR Surface Water Data Viewer, Lake Como is not wild rice water. This was reaffirmed by the aquatic plant surveys conducted in 2018, during which no wild rice was found.

PAST MANAGEMENT

Lake Como is a 98-acre impoundment of Duncan Creek located in the City of Bloomer, Chippewa County, Wisconsin. The dam that creates the impoundment was estimated to have been first installed around 1860. Then around 1909 with the official construction of the Bloomer Millpond Dam. In the early 2000's it was completely upgraded by order of the WDNR.

Lake Como is a mostly urbanized, shallow and fertile body of water situated in a large and agriculturally dominated watershed. The lake is recognized as an important natural resource for the community, and is considered a regional asset of environmental, recreational and economic significance. Lake Como is known and used primarily for fishing, peaceful relaxation, wildlife and scenic enjoyment, and limited boating opportunities. In its 140 years of existence, limited management actions have been taken. The most substantial project was undertaken in the early 2000's when the Bloomer Mill Dam was repaired and a whole-lake restoration project completed.

LAKE COMO HABITAT ENHANCEMENT PROJECT

The dam impounding 98-acre Lake Como was repaired in 2002. While the lake was drained to facilitate these repairs, Vierbicher Associates, Inc. was hired by the City of Bloomer to complete a rehabilitation plan for the lake. All work necessary in the drained lake bed had to be completed before the lake could be refilled.

The rehabilitation project included dredging of more than 300,000 cubic yards of accumulated foreign material to restore the lake bottom to its original contours; installation of two sediment retention basins to hold future sedimentation brought into the lake; repair of 15 storm sewer outfalls; rebuilding the City Beach and Public Boat Launch; installation of fish cribs; restoration of the fishery; and habitat improvement projects. This project was completed and the lake refilled in the spring of 2004.

REMOVAL OF FLOATING VEGETATION AND DEBRIS

More recently the BCLA and the City of Bloomer have cooperated to install and maintain a "weed curtain" upstream of the Hwy Q Bridge to collect free-floating duckweed and other material which is removed at least a couple times a year by BCLA volunteers and the City Maintenance crew using the City's sewer vacuum (Figure 15).

Figure 15: Removal of duckweed and other floating debris from upstream of the Hwy Q Bridge in Lake Como (Photos Courtesy of the BCLA)

OTHER PAST MANAGEMENT RECOMMENDATIONS

A study completed by Ramaker & Associates, Inc. in 2002 identified the following list of past management recommendations made for Lake Como. Not all of these recommendations have been implemented. Any future aquatic plant and/or water quality management planning for Lake Como should start with these lists to determine what has and has not been done for the lake.

FISHERIES MANAGEMENT

- Stock and manage Lake Como as a largemouth bass and panfish fishery.
- Remove northern pike and white suckers during drawdown.
- Conduct occasional one-foot drawdown to strand and desiccate northern pike eggs after spawning.
- Discontinue the stocking of northern pike to prevent predation on trout and younger year classes of largemouth bass.
- Lower water temperature before it is released downstream to restore cold-water trout fishery.
- Restore near-shore habitat such as emergent vegetation, brush, trees and submerged logs to provide fish spawning, feeding and refuge sites.
- Dredge the lake bottom if it would create a more diverse depth profile to maximize habitat diversity.
- Conduct regular fishery surveys, especially after any major stocking or management efforts.
- Impose angling restrictions for 3-5 years following any stocking effort.

AQUATIC PLANT AND ALGAE MANAGEMENT

- Protect existing aquatic and wetland plant diversity.
- Consider harvesting, use of sea curtains, seining, sediment screens, drawdowns and dredging as aquatic plant management options.
- Make any decisions about aquatic plant management in the context of lake usage and the functional values of the aquatic plants for fish, wildlife and water quality.
- Harvest channels or use sediment screens to create openings within dense stands of common waterweed.
- While the aquatic plant community does offer fish habitat, some beds of common waterweed are too dense to allow passage of larger fish.
- Reduce nutrient loading to the lake to control duckweed.
- Establish a long-term goal of nutrient-reduction as a more permanent solution.

NONPOINT SOURCE POLLUTION MANAGEMENT

- Stabilize eroding stream banks and eliminate streamside cattle grazing.
- Purchase or acquire conservation easements to protect vegetative buffers in riparian zones.
- Develop and implement a construction site erosion control ordinance for the Bloomer urban area that includes activities not currently regulated.
- Develop and implement a stormwater management plan for the Bloomer urban area with special provisions designed to address control of water temperature in Duncan Creek.
- Control upland soil erosion and leave grassed waterways vegetated.
- Do not alter, drain, or fill existing wetlands or ditch streams.

AQUATIC INVASIVE SPECIES

Curly-leaf pondweed, an exotic aquatic plant species, was found and vouchered in Lake Como in 2008. CLP is the only known aquatic invasive plant species in the lake. Reed canary grass and yellow iris can be found in some areas around Lake Como. Rusty crayfish were discovered within Lake Como in 2008, and in 2015, Chinese mystery snails were verified as present within the lake. In addition to the species already present within Lake Como, there are many others that could be introduced. Most of these species are considered aquatic, although some are also considered shoreland or wetland type invasive species. More information is given for each non-native species in the following sections.

NON-NATIVE, AQUATIC INVASIVE PLANT SPECIES

CURLY-LEAF PONDWEED

Curly-leaf pondweed (CLP) is an invasive aquatic perennial that is native to Eurasia, Africa, and Australia (Figure 16). It was accidentally introduced to United States waters in the mid-1880s by hobbyists who used it as an aquarium plant. The leaves are reddish-green, oblong, and about 3 inches long, with distinct wavy edges that are finely toothed. The stem of the plant is flat, reddish-brown and grows from 1 to 3 feet long. The plant usually drops to the lake bottom by early July. 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. It has been reported in all states but Maine.

CLP spreads through burr-like winter buds called turions, which are moved among waterways. 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. It becomes invasive in some areas because of its early growth in low water temperatures. This allows it to get a head start on and outcompete native plants in the spring. Dense growth of CLP can form surface mats that interfere with aquatic recreation and the shade out light preventing native plant growth. In mid-summer, when most native aquatic plants are growing, CLP plants are dying off. Plant die-offs may result in a loss of dissolved oxygen and decaying plants can increase nutrients which contribute to algal blooms, as well as create unpleasant aesthetic conditions.

CLP is present in Lake Como, but its distribution and density is not extensive.

Figure 16: CLP Plants and Turions

REED CANARY GRASS

Reed canary grass (Figure 17) is a large, coarse grass that reaches 2 to 9 feet in height. It has an erect, hairless stem with gradually tapering leaf blades 3 1/2 to 10 inches long and 1/4 to 3/4 inch in width. Blades are flat and have a rough texture on both surfaces. The lead ligule is membranous and long. The compact panicles are erect or slightly spreading (depending on the plant's reproductive stage), and range from 3 to 16 inches long with branches 2 to 12 inches in length. Single flowers occur in dense clusters in May to mid-June. They are green to purple at first and change to beige over time. This grass is one of the first to sprout in spring, and forms a thick rhizome system that dominates the subsurface soil. Seeds are shiny brown in color.

Both Eurasian and native ecotypes of reed canary grass are thought to exist in the U.S. The Eurasian variety is considered more aggressive, but no reliable method exists to tell the ecotypes apart. It is believed that the vast majority of our reed canary grass is derived from the Eurasian ecotype. Agricultural cultivars of the grass are widely planted.

Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. It has become naturalized in much of the northern half of the U.S., and is still being planted on steep slopes and banks of ponds and created wetlands.

Reed canary grass can grow on dry soils in upland habitats and in the partial shade of oak woodlands, but does best on fertile, moist organic soils in full sun. This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, stream banks, and seasonally wet areas; it also grows in disturbed areas such as bergs and spoil piles.

Reed canary grass reproduces by seed or creeping rhizomes. It spreads aggressively. The plant produces leaves and flower stalks for 5 to 7 weeks after germination in early spring and then spreads laterally. Growth peaks in mid-June and declines in mid-August. A second growth spurt occurs in the fall. The shoots collapse in mid to late summer, forming a dense, impenetrable mat of stems and leaves. The seeds ripen in late June and shatter when ripe. Seeds may be dispersed from one wetland to another by waterways, animals, humans, or machines.

This species prefers disturbed areas, but can easily move into native wetlands. Reed canary grass can invade a disturbed wetland in just a few years. Invasion is associated with disturbances including ditching of wetlands, stream channelization, and deforestation of swamp forests, sedimentation, and intentional planting. The difficulty of selective control makes reed canary grass invasion of particular concern. Over time, it forms large, monotypic stands that harbor few other plant species and are subsequently of little use to wildlife. Once established, reed canary grass dominates an area by building up a tremendous seed bank that can eventually erupt, germinate, and recolonize treated sites.

Reed canary grass is located in a few locations along the shoreland of Lake Como, but these have not become monotypic stands that impair the normal function of wetlands. While this should be monitored with other AIS, this is not considered an issue at this time.

Figure 17: Reed Canary Grass (not from Lake Como)

YELLOW IRIS

Yellow iris (Figure 18) is a showy perennial plant that can grow in a range of conditions from drier upland sites, to wetlands, to floating aquatic mats. A native plant of Eurasia, it can be an invasive garden escapee in Wisconsin's natural environments. The leaves are broad and pointed at the tip. These are rather rigid and grow upright from the stem. The entire plant can grow 3-4 feet tall and boasts bright yellow flowers. Each flower can produce several hundred seeds which contain a small air pocket within the hard external coat of the seed which allows them to float very easily. Yellow iris is able to spread easily around aquatic environments because of the broad habitat requirements coupled with these floating seeds. While the seeds are an effective way for this plant to spread, like many other invasive wetland plants, it also utilizes rhizomes to spread through vegetative growth.

Yellow iris presents a unique threat to wetlands because of its ability to colonize areas that have not been disturbed. This issue is magnified by all parts of the plant being toxic to wildlife, so there are no natural controls in place to slow the expansion of yellow iris once it has become established. As with any invasive species, prevention is the best for of control. If yellow iris is found, physical removal can work to eradicate or control it if the entire plant, including the roots and rhizomes, is removed and properly disposed of. Due to the toxic nature of this plant, some people exhibit a sensitivity to yellow iris sap and tissues, so skin should be covered to prevent exposure. There are some chemical control methods that work to control yellow iris with aquatic herbicide. Chemical control often requires permits, and is more expensive than manual removal, so unless there is a large established population, hand removal is usually the best method to control yellow iris.

Yellow iris has been found on at least one shoreline property on Lake Como. This plant should be removed by the property owner, and shoreland monitoring efforts should watch for this plant around the lake.

Figure 18: Yellow Iris

PURPLE LOOSESTRIFE

Purple loosestrife (Figure 19) is a perennial herb 3-7 feet tall with a dense bushy growth of 1-50 stems. The stems, which range from green to purple, die back each year. Showy flowers that vary from purple to magenta possess 5-6 petals aggregated into numerous long spikes, and bloom from August to September. Leaves are opposite, nearly linear, and attached to four-sided stems without stalks. It has a large, woody taproot with fibrous rhizomes that form a dense mat. By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars.

Purple loosestrife is a wetland herb that was introduced as a garden perennial from Europe during the 1800's. It is still promoted by some horticulturists for its beauty as a landscape plant, and by beekeepers for its nectar-producing capability. Currently, more than 20 states, including Wisconsin have laws prohibiting its importation or distribution because of its aggressively invasive characteristics. It has since extended its range to include most temperate parts of the United States and Canada. The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators, like European species of herbivorous beetles that feed on the plant's roots and leaves, also contributes to its proliferation in North America.

Purple loosestrife was first detected in Wisconsin in the early 1930's, but remained uncommon until the 1970's. It is now widely dispersed in the state, and has been recorded in 70 of Wisconsin's 72 counties. Low densities in most areas of the state suggest that the plant is still in the pioneering stage of establishment. Areas of heaviest infestation are sections of the Wisconsin River, the extreme southeastern part of the state, and the Wolf and Fox River drainage systems.

This plant's optimal habitat includes marshes, stream margins, alluvial flood plains, sedge meadows, and wet prairies. It is tolerant of moist soil and shallow water sites such as pastures and meadows, although established plants can tolerate drier conditions. Purple loosestrife has also been planted in lawns and gardens, which is often how it has been introduced to many of our wetlands, lakes, and rivers.

Purple loosestrife can germinate successfully on substrates with a wide range of pH. Optimum substrates for growth are moist soils of neutral to slightly acidic pH, but it can exist in a wide range of soil types. Most seedling establishment occurs in late spring and early summer when temperatures are high.

Purple loosestrife spreads mainly by seed, but it can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%, resulting in an extensive seed bank. Mature plants with up to 50 shoots grow over 2 meters high and produce more than two million seeds a year. Germination is restricted to open, wet soils and requires high temperatures, but seeds remain viable in the soil for many years. Even seeds submerged in water can live for approximately 20 months. Most of the seeds fall near the parent plant, but water, animals, boats, and humans can transport the seeds long distances. Vegetative spread through local perturbation is also characteristic of loosestrife; clipped, trampled, or buried stems of established plants may produce shoots and roots. Plants may be quite large and several years old before they begin flowering. It is often very difficult to locate non-flowering plants, so monitoring for new invasions should be done at the beginning of the flowering period in mid-summer.

Any sunny or partly shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. Invasion usually begins with a few pioneering plants that build up a large seed bank in the soil for several years. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland. The plant can also make morphological adjustments to accommodate changes in the immediate environment; for example, a decrease in light level will trigger a change in leaf morphology. The plant's ability to adjust to a wide range of environmental conditions gives it a competitive advantage; coupled with its reproductive strategy, purple loosestrife tends to create monotypic stands that reduce biotic diversity.

Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Eventually, purple loosestrife can overrun wetlands thousands of acres in size, and almost entirely eliminate the open water habitat. The plant can also be detrimental to recreation by choking waterways.

Purple loosestrife has not been found around Lake Como, but it has been found in several nearby wetlands including those surrounding Lake Wissota and the Holcombe Flowage. AIS monitoring should include surveying for purple loosestrife annually.

Figure 19: Purple Loosestrife

EURASIAN WATERMILFOIL

EWM (Figure 20) is a submersed aquatic plant native to Europe, Asia, and northern Africa. It is the only non-native milfoil in Wisconsin. Like the native milfoils, the Eurasian variety has slender stems whorled by submersed feathery leaves and tiny flowers produced above the water surface. The flowers are located in the axils of the floral bracts, and are either four-petaled or without petals. The leaves are threadlike, typically uniform in diameter, and aggregated into a submersed terminal spike. The stem thickens below the inflorescence and doubles its width further down, often curving to lie parallel with the water surface. The fruits are four-jointed nut-like bodies. Without flowers or fruits, EWM is difficult to distinguish from Northern water milfoil. EWM has 9-21 pairs of leaflets per leaf, while Northern milfoil typically has 7-11 pairs of leaflets. Coontail is often mistaken for the milfoils, but does not have individual leaflets.

EWM grows best in fertile, fine-textured, inorganic sediments. In less productive lakes, it is restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lake beds, lakes receiving nitrogen and phosphorous-laden runoff, and heavily used lakes. Optimal growth occurs in alkaline systems with a high concentration of dissolved inorganic carbon. High water temperatures promote multiple periods of flowering and fragmentation.

Unlike many other plants, EWM does not rely on seed for reproduction. Its seeds germinate poorly under natural conditions. It reproduces by fragmentation, allowing it to disperse over long distances. The plant produces fragments after fruiting once or twice during the summer. These shoots may then be carried downstream by water currents or inadvertently picked up by boaters. EWM is readily dispersed by boats, motors, trailers, bilges, live wells, and bait buckets; and can stay alive for weeks if kept moist.

Once established in an aquatic community, milfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). As an opportunistic species, EWM is adapted for rapid growth early in spring. Stolons, lower stems, and roots persist over winter and store the carbohydrates that help milfoil claim the water column early in spring, photosynthesize, divide, and form a dense leaf canopy that shades out native aquatic plants. Its ability to spread rapidly by fragmentation and effectively block out 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 reducing 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 milfoil-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". Cycling of nutrients from sediments to the water column by EWM may lead to deteriorating water quality and algae blooms in infested lakes.

Figure 20: EWM fragment with adventitious roots and EWM in a bed

EWM has not been found within Lake Como, but volunteers should still be on the lookout for this plant. EWM is established in several nearby lakes including Lake Wissota and the majority of the Chippewa River. Early detection would be important if EWM ends up within Lake Como.

NON-NATIVE AQUATIC INVASIVE ANIMAL SPECIES

Currently, there are two non-native animal species documented in Lake Como, Chinese mystery snails and rusty crayfish. There are several other non-native, aquatic invasive animal species that could be introduced to Lake Como, most notably, zebra mussels. It is important for lake property owners and users to be knowledgeable of these species in order to identify them if and when they show up in Lake Como.

CHINESE MYSTERY SNAILS

Chinese mystery snails were found in Lake Como in 2015.

The Chinese mystery snails and the banded mystery snails (Figure 21) are non-native snails that have been found in a number of Wisconsin lakes. There is not a lot yet known about these species, however, it appears that they have a negative effect on native snail populations. The mystery snail's large size and hard operculum (a trap door cover which protects the soft flesh inside), and their thick hard shell make them less edible by predators such as rusty crayfish.

The female mystery snail gives birth to live young. This may be an important factor in their spread as it only takes one impregnated snail to start a new population. Mystery snails thrive in silt and mud areas although they can be found in lesser numbers in areas with sand or rock substrates. They are found in lakes, ponds, irrigation ditches, and slower portions of streams and rivers. They are tolerant of pollution and often thrive in stagnant water areas. Mystery snails can be found in water depths of 0.5 to 5 meters (1.5 to 15 feet). They tend to reach their maximum population densities around 1-2 meters (3-6 feet) of water depth. Mystery snails do not eat plants. Instead, they feed on detritus and in lesser amounts algae and phytoplankton. Thus removal of plants in shoreline area will not reduce the abundance of mystery snails.

Lakes with high densities of mystery snails often see large die-offs of the snails. These die-offs are related to the lake's warming coupled with low oxygen (related to algal blooms). Mystery snails cannot tolerate low oxygen levels. High temperatures by themselves seem insufficient to kill the snails as the snails could move into deeper water.

Many lake residents are worried about mystery snails being carriers of the swimmer's itch parasite. In theory they are potential carriers, however, because they are an introduced species and did not evolve as part of the lake ecosystem, they are less likely to harbor the swimmer's itch parasites.

Figure 21: Chinese Mystery Snails (not from Lake Como)

RUSTY CRAYFISH

Rusty crayfish were discovered, and confirmed to be in Lake Como in 2008.

Rusty crayfish (Figure 22) live in lakes, ponds and streams, preferring areas with rocks, logs and other debris in water bodies with clay, silt, sand or rocky bottoms. They typically inhabit permanent pools and fast moving streams of fresh, nutrient-rich water. Adults reach a maximum length of 4 inches. Males are larger than females upon maturity and both sexes have larger, heartier, claws than most native crayfish. Dark "rusty" spots are usually apparent on either side of the carapace, but are not always present in all populations. Claws are generally smooth, with grayish-green to reddish-brown coloration. Adults are opportunistic feeders, feeding upon aquatic plants, benthic invertebrates, detritus, juvenile fish and fish eggs.

The native range of the rusty crayfish includes Ohio, Tennessee, Kentucky, Indiana, Illinois and the entire Ohio River basin. However, this species may now be found in Michigan, Massachusetts, Missouri, Iowa, Minnesota, New York, New Jersey, Pennsylvania, Wisconsin, New Mexico and the entire New England state area (except Rhode Island). The Rusty crayfish has been a reported invader since at least the 1930's. Its further spread is of great concern since the prior areas of invasion have led to severe impacts on native flora and fauna. It is thought to have spread by means of released game fish bait and/or from aquarium release. Rusty crayfish are also raised for commercial and biological harvest.

Rusty crayfish reduce the amount and types of aquatic plants, invertebrate populations, and some fish populations--especially bluegill, smallmouth and largemouth bass, lake trout and walleye. They deprive native fish of their prey and cover and out-compete native crayfish. Rusty crayfish will also attack the feet of swimmers. On the positive side, rusty crayfish can be a food source for larger game fish and are commercially harvested for human consumption.

Rusty crayfish may be controlled by restoring predators like bass and sunfish populations. Preventing further introduction is important and may be accomplished by educating anglers, trappers, bait dealers and science teachers of their hazards. Use of chemical pesticides is an option, but does not target this species and will kill other aquatic organisms.

It is illegal to possess both live crayfish and angling equipment simultaneously on any inland Wisconsin water (except the Mississippi River). It is also illegal to release crayfish into a water of the state without a permit.

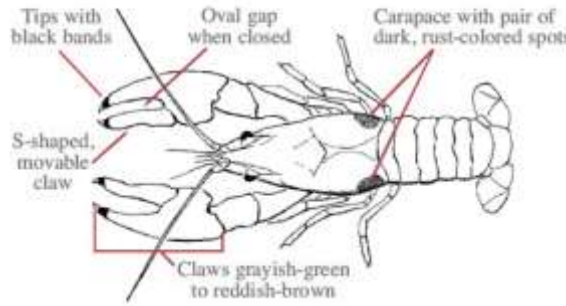


Figure 22: Rusty Crayfish and identifying characteristics

ZEBRA MUSSELS

Zebra mussels have not been identified in Lake Como.

Zebra mussels (Figure 23) are an invasive species that have inhabited Wisconsin waters and are displacing native species, disrupting ecosystems, and affecting citizens' livelihoods and quality of life. They hamper boating, swimming, fishing, hunting, hiking, and other recreation, and take an economic toll on commercial, agricultural, forestry, and aquacultural resources. The zebra mussel is a tiny (1/8-inch to 2-inch) bottom-dwelling clam native to Europe and Asia. Zebra mussels were introduced into the Great Lakes in the mid 1980's, and have been spreading throughout them since that time. They were most likely brought to North America as larvae in ballast water of ships that traveled from fresh-water Eurasian ports to the Great Lakes. Zebra mussels look like small clams with a yellowish or brownish D-shaped shell, usually with alternating dark- and light-colored stripes. They can be up to two inches long, but most are under an inch. Zebra mussels usually grow in clusters containing numerous individuals.

Zebra mussels feed by drawing water into their bodies and filtering out most of the suspended microscopic plants, animals and debris for food. This process can lead to increased water clarity and a depleted food supply for other aquatic organisms, including fish. The higher light penetration fosters growth of rooted aquatic plants which, although creating more habitat for small fish, may inhibit the larger, predatory fish from finding their food. This thicker plant growth can also interfere with boaters, anglers and swimmers. Zebra mussel infestations may also promote the growth of blue-green algae, since they avoid consuming this type of algae but not others.

Zebra mussels attach to the shells of native mussels in great masses, effectively smothering them. A survey by the Army Corps of Engineers in the East Channel of the Mississippi River at Prairie du Chien revealed a substantial reduction in the diversity and density of native mussels due to Zebra Mussel infestations. The East Channel provides habitat for one of the best mussel beds in the Upper Mississippi River. Future efforts are being considered to relocate such native mussel beds to waters that are less likely to be impacted by zebra mussels.

Once zebra mussels are established in a water body, very little can be done to control them. It is therefore crucial to take all possible measures to prevent their introduction in the first place. Some of the preventative and physical control measures include physical removal, industrial vacuums, and back flushing.

Chemical applications include solutions of chlorine, bromine, potassium permanganate and even oxygen deprivation. An ozonation process is under investigation (patented by Bollyky Associates Inc.) which involves the pumping of high concentrations of dissolved ozone into the intake of raw water pipes. This method only works in controlling veligers, and supposedly has little negative impacts on the ecosystem. Further research on effective industrial control measures that minimize negative impacts on ecosystem health is needed.

Figure 23: Zebra Mussels

While zebra mussels have not been identified in Lake Como, they were found in western Washburn County in 2016. This was the first time that zebra mussels had been found in Northwestern Wisconsin. Monitoring and prevention efforts should remain a top priority for the continued protection of Lake Como.

AIS PREVENTION STRATEGY

While there are already several established AIS in Lake Como, there are many more that could be introduced to the lake. The BCLA or other entities should implement a watercraft inspection and AIS Signage program at the public access points on the lake. Information should be shared with lake residents and users in an effort to expand the watercraft inspection message. In addition to the watercraft inspection program, an in-lake and shoreland AIS monitoring program should be implemented. Both of these programs should follow UW-Extension Lakes and WDNR protocol through the Clean Boats, Clean Waters program and the Citizen Lake Monitoring Network Aquatic Invasive Species Monitoring program.

Having an educated and informed lake constituency is the best way to keep non-native aquatic invasive species at bay in Lake Como. To foster this, the BCLA or other entities should host and/or sponsor lake community events including AIS identification and management workshops; distribute education and information materials to lake property owners and lake users through the newsletter, webpage, general mailings, and at the public access points.

MANAGEMENT ALTERNATIVES

Nuisance aquatic plants can be managed a variety of ways in Wisconsin. The best management strategy will be different for each lake and depends on which nuisance species needs to be controlled, how widespread the problem is, and the other plants and wildlife in the lake. In many cases, an integrated approach to aquatic plant management that utilizes a number of control methods is necessary. The eradication of non-native aquatic invasive plant species such as CLP or EWM is generally not feasible, but preventing them from becoming a more significant problem is an attainable goal. It is important to remember however, that regardless of the plant species targeted for control, sometimes no manipulation of the aquatic plant community is the best management option. Plant management activities can be disruptive to a lake ecosystem and should not be done unless it can be shown they will be beneficial and occur with minimal negative ecological impacts.

Management alternatives for nuisance aquatic plants can be grouped into four broad categories: manual and mechanical removal, chemical application, biological control, and physical habitat alteration. Manual and mechanical removal methods include pulling, cutting, raking, harvesting, suction harvesting, and other means of removing the physical plant from the water. Chemical application is typified by the use of herbicides that kill or impede the growth of the aquatic plant. Biological control methods include organisms that use the plant for a food source or parasitic organisms that use the plant as a host, killing or weakening it. Biological control may also include the use of species that compete successfully with the nuisance species for resources. Physical habitat alteration includes dredging, installing lake-bottom covers, manipulating light penetration, flooding, and drawdown. It may also include making changes to or in the watershed of a body of water to reduce nutrients going in.

Each of the above control categories are regulated by the WDNR and most activities require a permit from the WDNR to implement. Mechanical harvesting of aquatic plants and under certain circumstances, physical removal of aquatic plants, is regulated under Wisconsin Administrative Rule NR 109. The use of chemicals and biological controls are regulated under Administrative Rule NR 107. Certain habitat altering techniques like the installation of bottom covers and dredging require a Chapter 30/31 waterway protection permit. In addition, anytime wild rice is involved one or more of these permits will be required.

Informed decision-making on aquatic plant management implementation requires an understanding of plant management alternatives and how appropriate and acceptable each alternative is for a given lake. The following sections list scientifically recognized and approved alternatives for controlling aquatic vegetation.

NO MANAGEMENT

When evaluating the various management techniques, the assumption is erroneously made that doing nothing is environmentally neutral. In dealing with nonnative species like EWM, the environmental consequences of doing nothing may be high, possibly even higher than any of the effects of management techniques. Unmanaged, these species can have severe negative effects on water quality, native plant distribution, abundance and diversity, and the abundance and diversity of aquatic insects and fish (Madsen, 1997). Nonindigenous aquatic plants are the problem, and the management techniques are the collective solution. Nonnative plants are a biological pollutant that increases geometrically, a pollutant with a very long residence time and the potential to "biomagnify" in lakes, rivers, and wetlands (Madsen, 2000).

Foregoing any management in Lake Como is not a recommended option. Nuisance aquatic vegetation, whether it is a non-native, invasive species like CLP or native vegetation that reaches nuisance level conditions, some management is warranted using an integrated approach to management that could include but not necessarily limited to physical removal, harvesting, the use of herbicides, and nutrient reduction.

HAND-PULLING/MANUAL REMOVAL

Manual or physical removal of aquatic plants by means of a hand-held rake or cutting implement; or by pulling the plants from the lake bottom by hand is allowed by the WDNR without a permit per NR 109.06 Waivers under the following conditions:

- 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, swim rafts 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 (Figure 24)
- Removal of nonnative or invasive aquatic plants as designated under s. NR 109.07 is performed in a manner that does not harm the native aquatic plant community
- Removal of dislodged aquatic plants that drift on-shore and accumulate along the waterfront is completed.
- The area of removal 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
- Removal does not interfere with the rights of other riparian owners
- If wild rice is involved, the procedures of s. NR 19.09 (1) are followed.

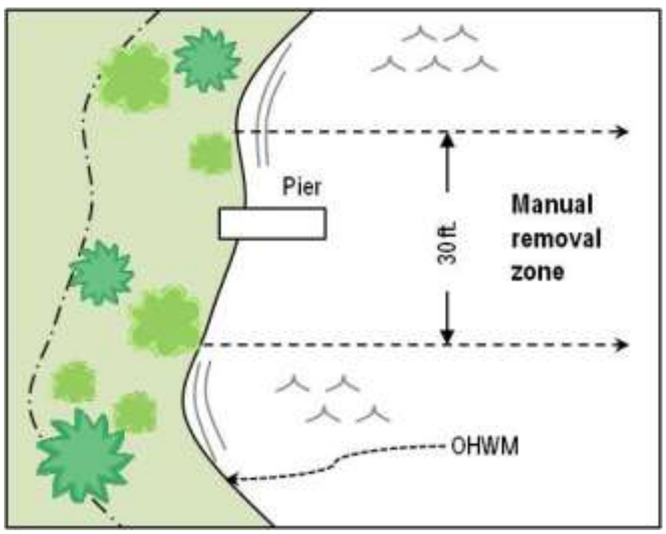


Figure 24: Aquatic vegetation manual removal zone

Although up to 30 feet of aquatic vegetation can be removed, removal should only be done to the extent necessary. There is no limit as to how far out into the lake the 30-ft zone can extend, however clearing large swaths of aquatic plants not only disrupts lake habits, it also creates open areas for non-native species to establish. Physical removal of aquatic plants requires a permit if the removal area is located in a "sensitive" or critical habitat area previously designated by the WDNR. Manual or physical 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. If water clarity in a body of water is such that aquatic plants can be seen in deeper water, pulling aquatic invasive species while snorkeling or scuba diving is also allowable without a permit according to the conditions in NR 106.06(2) and can be effective at slowing the spread of a new aquatic invasive species infestation within a lake when done properly.

Larger scale hand or diver removal projects have had positive impacts in temporarily reducing or controlling aquatic invasive species. Typically hand or diver removal is used when AIS has been newly identified and still exists as single plants or isolated small beds, but at least in one lake in New York State, it was used as a means to control a large-scale infestation of EWM. Kelting and Laxson (2010) reported that from 2004 to 2006 an "intensive management effort" which involved "the selective removal of Eurasian water milfoil using diver hand harvesting of the entire littoral zone of the lake at least twice each summer for three years" followed by three years of maintenance management successfully reduced the overall distribution of EWM in the lake.

In Lake Como, physical removal of aquatic vegetation by property owners is acceptable and encouraged particularly in small areas near docks to provide better conditions for swimming and other lake uses. CLP could be removed in this fashion without penalty, but would likely be difficult to accomplish.

DIVER ASSISTED SUCTION HARVESTING

Diver assisted suction harvesting or DASH, as it is often called, is a fairly recent aquatic plant removal technique. It is called "harvesting" rather than "dredging" because, although a specialized small-scale dredge is used, bottom sediment is not removed from the system. The operation involves hand-pulling of weeds from the lake bed and inserting them into an underwater vacuum system that sucks up plants and their root systems taking them to the surface. It requires water pumps on the surface (generally on a pontoon system) to move a large volume of water to maintain adequate suction of materials that the divers are processing (Figure 25). Only clean water goes through the pump. The material placed by the divers into the suction hose along with the water is deposited into mesh bags on the surface with the water leaving through the holes in the bag. The bags have a large enough 'mesh' size so that silts, clay, leaves and other plant material being collected do not immediately clog them and block water movement. If a fish or other living marine life is sucked into the suction hose it comes out the discharge unharmed and is returned to the body of water. It can have some negative impacts to other nearby non-target plants if not done carefully, particularly those plants that are perennials and expand their populations by sub-sediment runners (Eichler, Bombard, Sutherland, & Boylen, 1993).

A version of this is already done on Lake Como with BCLA and City of Bloomer officials using sewer vacuum equipment to suck up duckweed and other debris floating on the surface of the lake. This procedure is not however, used in deeper waters of the lake. Continuing these current efforts in Lake Como is recommended, but DASH in its truest sense is not.

Figure 25: DASH - Diver Assisted Suction Harvesting (Chuck Druckery, 2016 Wisconsin Lakes Convention Presentation)

MECHANICAL REMOVAL

Mechanical management involves the use of devices not solely powered by human means to aid removal. This includes gas and electric motors, ATV's, boats, tractors, etc. Using these instruments to pull, cut, grind, or rotovate aquatic plants is illegal in Wisconsin without a permit. DASH is also considered mechanical removal. To implement mechanical removal of aquatic plants a Mechanical/Manual Aquatic Plant Control Application is required annually. The application is reviewed by the WDNR and other entities and a permit awarded if required criteria are met. Using repeated mechanical disturbance such as bottom rollers or sweepers can be effective at control in small areas, but in Wisconsin these devices are illegal and generally not permitted.

LARGE-SCALE MECHANICAL HARVESTING

Large-scale mechanical harvesting has traditionally been used for control of CLP, but can be an effective way to reduce overall plant biomass in a water body. It is typically used to open up channels through existing beds of vegetation to improve access for both human related activities like boating, and natural activities like fish distribution and mobility.

Mechanical harvesters are large machines which both cut and collect aquatic plants (Figure 26). Cut plants are removed from the water by a conveyor belt system and stored on the harvester until disposal. A barge may be stationed near the harvesting site for temporary plant storage or the harvester carries the cut weeds to shore where shore station equipment lifts the cut plants into a dump truck or wagon. Harvested weeds are disposed of in landfills or other approved dumping sites, used as compost, or even used in reclaiming spent gravel pits or similar sites.

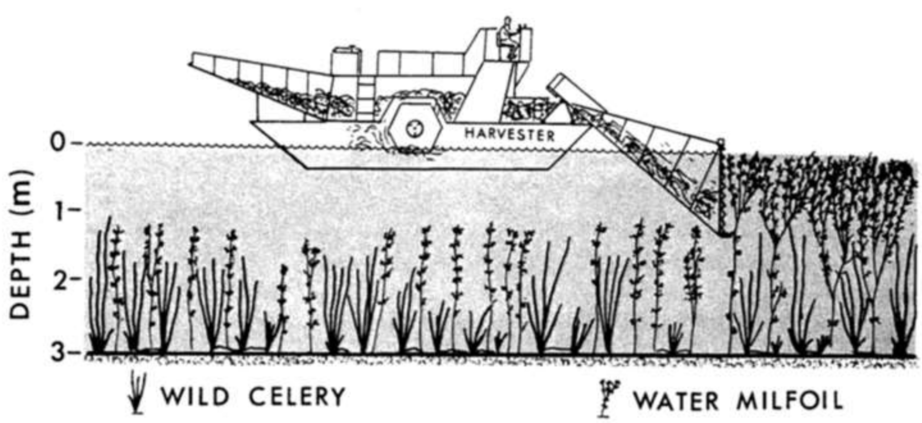


Figure 26: How a Harvester Works (Engle, 1987)

Harvesting is usually performed in late spring (for CLP), or in the summer when aquatic plants have reached or are close to the water's surface. WDNR permits for harvesting are typically good for a whole season meaning designated areas can be harvested as often as necessary to keep nuisance vegetation under control. Harvesters can cut and collect up to several acres per day depending on weed type, plant density, and storage capacity of the equipment. Depending on the equipment used, the plants are cut from three to five feet below the water's surface in a swath 4 to 20 feet wide. Harvesting can remove matted surface vegetation that is free-floating or rooted (if in an area designated in a permit) Harvesting can be an excellent way to create open areas of water for recreation and fishing access.

Timing is also important. The ideal time to harvest, in order to maximize the efficiency of the harvester, is just before the aquatic plants break the surface of the lake. If the harvesting work is contracted, the equipment should be inspected before and after it enters the lake. Since these machines travel from lake to lake, they may carry plant fragments with them, and facilitate the spread of AIS from one body of water to another.

Mechanical harvesting of aquatic plants has advantages and disadvantages (Madsen, 2000):

Advantages

- Harvesting results in immediate open areas of water.
- Removing plants from the water removes the plant nutrients, such as nitrogen and phosphorus, from the system. (Harvesting aquatic plants is not an effective tool for reducing nutrient loads in a lake and it is unlikely that any operational harvesting program will significantly impact the internal nutrient balance of the system).
- Harvesting as aquatic plants are dying back for the winter can remove organic material and help slow the sedimentation rate in a waterbody.
- Since the lower part of the plant remains after harvest, habitat for fish and other organisms is not eliminated.
- Harvesting can be targeted to specific locations, protecting designated conservancy areas from treatment.
- Opening of navigation and fishing lanes can improve fish habitat allowing for larger fish to cruise the edges of weed beds in areas where they may otherwise not be able to go.

Disadvantages

- Harvesting is similar to mowing a lawn; the plant grows back and may need to be harvested several times during the growing season.
- There is little or no reduction in plant density with mechanical harvesting.
- Off-loading sites and disposal areas for cut plants must be available. On heavily developed shorelines, suitable off-loading sites may be few and require long trips by the harvester.
- Some large harvesters are not easily maneuverable in shallow water or around docks or other obstructions.
- Significant numbers of small fish, invertebrates, and amphibians are often collected and killed by the harvester.
- Harvesting creates plant fragments which may increase the spread of certain invasive plant species throughout the waterbody.
- Although harvesters collect plants as they are cut, not all plant fragments or plants may be picked up. These may accumulate and decompose on shore.
- Harvesters are expensive and require routine maintenance.
- Harvesting may not be suitable for lakes with many bottom obstructions (stumps, logs) or for very shallow lakes (3-5 feet of water) with loose organic sediments.
- Harvesters brought into the waterbody from other locations need to be thoroughly cleaned and inspected before being allowed to launch. Otherwise new exotic species could be introduced to the waterbody.

Mechanical Harvesting – Surface Skimming

For the purpose of this document, surface skimming is defined as harvesting or by some other means, removing filamentous algae, duckweed, watermeal, or floating mats of plant debris from no more than 12-18 inches of depth below the surface of the waterbody. Mechanical harvesters can cut plants within a typical depth range of just a few inches to 5 or more feet of water. How low the cutting head and conveyor are lowered into the water typically determines how much vegetation is harvested. In WI, most harvesting permits limit harvesting to areas with at least 3-ft of water or more. Skimming would be lowering the cutting blade and conveyor in the water column just enough to get under thick mats of undesirable vegetation allowing for their removal. This type of harvesting does not hamper aquatic plants already rooted to the bottom, other than to cut off the top of the plant similar to mowing the grass. It would be expected that additional growth would occur on plants already present in the water column, and by reducing conditions that limit light penetration, more growth with other plants would occur.

Another form of surface skimming is already implemented by the BCLA in cooperation with the City of Bloomer. A curtain is installed in the west bay where Como Creek enters the lake. This curtain gathers duckweed and other floating vegetation and two to three times during the summer season, the City of Bloomer brings in its large street/sewer vacuum and essentially "vacuums" off the vegetative material, which is then disposed of at the local dump and made available for locals to use for fertilizer.

Another method of providing surface skimming would be to install a small skimming apparatus such as what is offered by Canadian Pond. Called a Proskim Surface Skimmer by Canadian Pond, the device swirls water and the duckweed and other plant material floating on the surface into a pump-like device that then takes it onto land, removing the duckweed and returning the water to the lake (Figure 27). These devices are not designed to manage surface materials from large areas, and are most often used in wastewater treatment ponds, but might work in smaller, select areas of Lake Como.

Figure 27: Proskim Surface Skimmer (Canadian Pond, 2019)

Given that one of the largest concerns of the community around Lake Como is the aesthetic appearance of the lake, surface skimming could be a valuable tool in reducing nuisance conditions, without causing unintentional harm to the majority of the aquatic plant community. This plan recommends that current practices in cooperation with the City of Bloomer be continued, and that larger surface water skimming be considered in other areas of the lake.

Disposal Sites and Harvesting Costs

Disposal sites are a key component when considering the mechanical harvesting of aquatic plants. The sites must be on shore and upland to make sure the plants and their reproductive structures don't make their way back into the lake or to other lakes. The number of available disposal sites and their distance from the targeted harvesting areas will determine the efficiency of the operation, in terms of time as well as cost.

Costs per acre vary with numbers of acres harvested, accessibility of disposal sites to the harvested areas, density and species of the harvested plants, and whether a private contractor or public entity does the work. Harvesting costs have been reported as low as $250 per acre. Private contractors generally charge $500 to $800 per acre. The purchase price of harvesters ranges from $45,000 to $250,000, with purchase of used harvesters slightly less. There are several harvester manufacturers in the United States (including at least two in Wisconsin) and some lake groups may choose to operate and purchase their own machinery rather than contracting for these services.

Prior to 2017, contracted harvesting services were not readily available in northwest Wisconsin. While there are many companies offering contracted services in Minnesota, most will not contract across the border into WI. There is at least one company out of northern Illinois that would consider offering services in northwest Wisconsin, but this has not happened yet. In 2017, a new company out of Chippewa Falls, WI began offering contracted harvesting services. The company owns two 5-ft Harvesters each with a capacity to hold about 220 cubic feet or 6,500 lbs. of cut vegetation on board.

Using mechanical harvesting to manage the aquatic plants in Lake Como is recommended to provide greater access for fishing and boating, improve fish habitat, and to reduce or slow the build-up of organic materials in the lake. Contracted harvesting or a BCLA run harvesting operation are both viable options for the BCLA to choose from.

SMALL-SCALE MECHANICAL HARVESTING

There are a wide range of small-scale mechanical harvesting techniques, most of which involve the use of boat mounted rakes, scythes, and electric cutters (Figure 28). As with all mechanical harvesting, removing the cut plants is required. Commercial rakes and cutters range in prices from $200 for rakes to around $3000 for electric cutters with a wide range of sizes and capacities. Using a weed rake or cutter that is run by human power is allowed without a permit, but the use of any device that includes a motor, gas or electric, would require a permit. Dragging a bed spring or bar behind a boat, tractor or any other motorized vehicle to remove vegetation is also illegal without a permit. Although not truly considered mechanical management, incidental plant disruption by normal boat traffic is a legal method of management. Active use of an area is often one of the best ways for riparian owners to gain navigation relief near their docks. Most aquatic plants won't grow well in an area actively used for boating and swimming. It should be noted that purposefully navigating a boat to clear large areas is not only potentially illegal it can also re-suspend sediments, encourage aquatic invasive species growth, and cause ecological disruptions.

Figure 28: Aquatic Mower & Weedshear Weed Cutter (weedersdigest.com)

Small-scale harvesting could be used in place of a large-scale harvester, but any harvested material would still need to be removed and disposed of. This method could also be used in Lake Como, but there is no way to contract this out. As the name suggests, this would also have a smaller impact than large-scale harvesting, and would limit the amount of vegetation that could be removed. Small-scale mechanical harvesting could be considered for Lake Como either with or instead of large-scale harvesting, however it does limit the amount of material that can be removed.

BOTTOM BARRIERS AND SHADING

Physical barriers, fabric or other, placed on the bottom of the lake to reduce aquatic plant growth is another form of management. However, its implementation may have other detrimental effects like inhibiting fish spawning, affecting benthic invertebrates (the small critters present in the sediments at the bottom of the lake), and could cause anaerobic conditions which may release excess nutrients from the sediment. Gas build-up beneath these barriers can cause them to dislodge from the bottom and sediment can build up on them allowing vegetation to re-establish. Bottom barriers are typically used for very small areas and provide only limited relief. Currently the WDNR does not readily permit this type of control.

Creating conditions in a lake that may serve to shade out aquatic plant growth has also been tried with mixed success. The general intention is to reduce light penetration in the water which in turns limits the depth at which plants can grow. Typically dyes have been added to a small water body to darken the water. Bottom barriers and attempts to further reduce light penetration in Lake Como are not recommended.

AUTOMATED SURFACE RAKES, BOTTOM ROLLERS, AND WATER JETS

Popular in some states as a means to clear beach and nearshore areas adjacent to developed properties of muck and vegetation, automated devices that rake, roll, or blow out vegetation, sediment, and other debris (Figure 29) are regulated under Chapter 30 of Wisconsin Statutes. These devices are considered "miscellaneous structures" and their placement in navigable waters of WI requires a permit from the WDNR. In general, the WDNR does not support the use of these devices for beach and nearshore maintenance and will seldom issue such a permit. These devices disrupt the natural makeup of a shoreland and the shallow water habitat it provides for a host of aquatic creatures. Depending on when they are used, they can also impact fish spawning activities. The material they dislodge is not removed, but rather moved to other places, often to adjacent properties or out into the main body of the lake. These devices are not recommended for use in Lake Como.

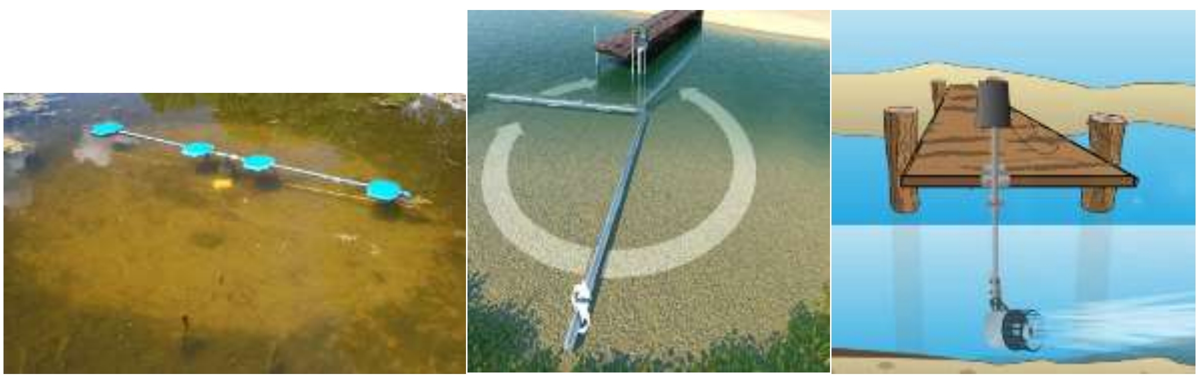


Figure 29: Lakemaid (lakerestoration.com), Lake Groomer/Weed Roller (weedersdigest.com), and AquaThruster (weedersdigest.com)

DREDGING

Dredging is the removal of bottom sediment from a lake. Its success is based on altering the target plant's environment. It is not usually performed solely for aquatic plant management but rather to restore lakes that have been filled in with sediment, have excess nutrients, inadequate pelagic and hypolimnetic zones, need deepening, or require removal of toxic substances (Peterson, 1982). In shallow lakes with excess plant growth, dredging can make areas of the lake too deep for plant growth. It can also remove significant plant root structures, seeds turions, rhizomes, tubers, etc. In Collins Lake, New York the biomass of curly-leaf pondweed remained significantly lower than pre-dredging levels 10-yrs after dredging (Tobiessen, Swart, & Benjamin, 1992). Dredging is very expensive, requires disposal of sediments, and has major environmental impacts. It is not a selective procedure so it can't be used to target any one particular species with great success except under extenuating circumstances. Dredging at any level must be permitted by the WDNR. It should not be performed for aquatic plant management alone. It is best used as a multipurpose lake remediation technique (Madsen, 2000).

In the early 2000's, Lake Como was dredged to remove large amounts of sediment that had built up within the lake. At the time the maximum depth of the lake was around 6-ft. Dredging returned the maximum depth to more than 11-ft and created several "sediment retention areas" within the lake to capture future sediment loading to the lake. Dredging also removed much of the sediment and organic material that had supported abundant/nuisance aquatic plant growth. In the last few years, aquatic plant growth has once again reached a level considered to be a nuisance by the community. Based on 2018 aquatic plant survey work, the maximum depth of the lake remains similar to what it was after the earlier dredging project. While it may be beneficial to once again consider dredging, particularly in the retention basins created during the last project, dredging is not recommended for the sole purpose of aquatic plant management in this plan.

DRAWDOWN

Drawdown, like dredging, alters the plant environment by removing all water in a water body to a certain depth, exposing bottom sediments to seasonal changes including temperature and precipitation. A winter drawdown is a low cost and effective management tool for the long-term control of certain susceptible species of nuisance aquatic plants. Winter drawdown has been shown to be an effective control measure for EWM, but typically only provides 2-3 years of relief before EWM levels return to pre-drawdown levels. A winter drawdown controls susceptible aquatic plants by dewatering a portion of the lake bottom over the winter, and subsequently exposing vascular plants to the combined effect of freezing and desiccation (drying). The effectiveness of drawdown to control plants hinges on the combined effect of the freezing and drying. If freezing and dry conditions are not sustained for 4-6 weeks, the effectiveness of the drawdown may be reduced.

A recent review of the impacts of winter water level drawdowns on the littoral or plant growing portion of a lake (Carmignani & Roy, 2017) identified certain species of plants and aquatic organisms that either flourished or suffered because of a winter drawdown. In particular, common waterweed (*Elodea canadensis*), a plant of significant abundance in Lake Como that contributes greatly to the nuisance level aquatic plant conditions, is considered a species tolerant of winter drawdowns, meaning it is likely to be less impacted if one is implemented. Other species that generally do well are those that propagate by seeds, grow fast, or have multiple means of reproduction/propagation. Curly-leaf pondweed fits into these categories as do duckweeds and watermeal, suggesting that a winter drawdown would do little to help with those plant species considered most problematic in Lake Como. As such, winter drawdowns are not recommended on Lake Como to control aquatic vegetation.

BIOLOGICAL CONTROL

Biological control involves using one plant, animal, or pathogen as a means to control a target species in the same environment. The goal of biological control is to weaken, reduce the spread, or eliminate the unwanted population so that native or more desirable populations can make a comeback. Care must be taken however, to insure that the control species does not become as big a problem as the one that is being controlled. A special permit is required in Wisconsin before any biological control measure can be introduced into a new area. EWM weevils are used to reduce EAM populations on some lakes and Galerucella beetles can be used for purple loosestrife control, but neither of these plants were found in or around Lake Como in the 2018 plant surveys. There are other forms of biological control being used or researched. It was thought at one time that the introduction of plant eating carp could be successful. It has since been shown that these carp have a preference list for certain aquatic plants. EWM is very low on this preference list (Pine & Anderson, 1991). Use of "grass carp" as they are referred to in Wisconsin is illegal as there are many other environmental concerns including what happens once the target species is destroyed, removal of the carp from the system, impacts to other fish and aquatic plants, and preventing escapees into other lakes and rivers. Currently, there are no biological controls that have been approved for control of native aquatic plants or CLP, so this is not a recommended management action for Lake Como.

CHEMICAL CONTROL

Aquatic herbicides are granules or liquid chemicals specifically formulated for use in water to kill plants or cease plant growth. Herbicides approved for aquatic use by the U.S. Environmental Protection Agency (EPA) are considered compatible with the aquatic environment when used according to label directions. Some individual states, including Wisconsin, also impose additional constraints on herbicide use.

The WDNR evaluates the benefits of using a particular chemical at a specific site vs. the risk to non-target organisms, including threatened or endangered species, and may stop or limit treatments to protect them. The WDNR frequently places conditions on a permit to require that a minimal amount of herbicide is needed and to reduce potential non-target effects, in accordance with best management practices for the species being controlled. For example, certain herbicide treatments are required by permit conditions to be in spring because they are more effective, require less herbicide and reduce harm to native plant species. Spring treatments also means that, in most cases, the herbicide will be degraded by the time peak recreation on the water starts.

The WDNR encourages minimal herbicide use by requiring a strategic Aquatic Plant Management Plan for management projects over 10 acres or 10% of the water body or any projects receiving state grants. The WDNR also requires consideration of alternative management strategies and integrated management strategies on permit applications and in developing an APM Plan, when funding invasive species prevention efforts, and by encouraging the use of best management practices when issuing a permit. The WDNR also supervises treatments, requires that adjacent landowners are notified of a treatment and are given an opportunity to request a public meeting if they want, requires that the water body is posted to notify the public of treatment and usage restrictions, and requires reporting after treatment occurs.

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

When properly applied, the possible negative impacts of chemical herbicide use can be minimized. Early spring to early summer applications are preferred because exotic species are actively growing and many native plants are dormant, thus limiting the loss of desirable plant species; plant biomass is relatively low minimizing the impacts of de-oxygenation and contribution of organic matter to the sediments; fish spawning has ceased; and recreational use is generally low limiting human contact. The concentration and amount of herbicides can be reduced because colder water temperatures enhance the herbicidal effects. Selectivity of herbicides can be increased with careful selection of application rates and seasonal timing. Lake hydrodynamics must also be considered; steep drop-offs, inflowing waters, lake currents and wind can dilute chemical herbicides or increase herbicide drift and off-target injury.

HOW CHEMICAL CONTROL WORKS

Aquatic herbicides are sprayed directly onto floating or emergent aquatic plants or are applied to the water in either a liquid or granular form. Herbicides affect plants through either systemic or direct contact action. Systemic herbicides are capable of killing the entire plant. Contact herbicides cause the parts of the plant in contact with the herbicide to die back, leaving the roots alive and able to re-grow.

Herbicides can be classified as broad-spectrum (kill or injure a wide variety of plant species) or selective (effective on only certain species). Non-selective, broad spectrum herbicides will generally affect all plants that they come in contact with. Selective herbicides will affect only some plants. The selectivity of a particular herbicide can be influenced by the method, timing, formulation, and concentration used.

Endothall is considered primarily a contact herbicide. Its common trade name is Aquathol K® (liquid) or Super K® (granular). Endothall is a broad spectrum herbicide most commonly used to kill pondweeds like curly-leaf. Because CLP is an annual plant not dependent on existing root structure to grow, a contact herbicide like endothall can be very effective. It is not effective on roots, rhizomes, or tubers. Endothall has been described as a broad spectrum contact-type, membrane-active herbicide. Native aquatic plant sensitivity varies greatly among species. EWM and pondweeds such as CLP, Illinois pondweed, southern naiad, and sago pondweed are very sensitive to endothall, while coontail is only moderately sensitive. Other plants such as common waterweed, wild celery, water stargrass, and many floating-leaf and emergent species are more tolerant of endothall. Endothall, therefore, has the potential to selectively control CLP and/or EWM in sites where native pondweeds do not dominate the plant community (Skogerboe & Getsinger, 2006).

Diquat is a non-selective, contact herbicide that will kill or injure a wide variety of plants by damaging cell tissues when absorbed by the foliage. It will not kill parts of the plant it does not come into direct contact with. Its common trade name is Reward® or Tribune®. Diquat is not effective in lakes or ponds with muddy water or plants covered with silt because it is strongly attracted to clay particles in the water. Bottom sediments must not be disturbed when this herbicide is used. At approved application rates Diquat does not appear to have any long or short term effects on most aquatic organisms.

Copper has been used as an aquatic herbicide and algaecide since 1950. Copper compounds for aquatic use are manufactured either as copper sulfate, or as a copper chelate. Both forms contain metallic copper as the active ingredient, but in the chelated forms the copper is combined with other compounds to keep the copper in solution and active in the water longer. Chelated copper is also less toxic to non-target organisms. Copper products are primarily used to treat algae but certain formulations will affect some plants, as well. The target species vary by product, so it is important to confirm that the intended target is listed on the label of the product being used. Copper products will treat green (free-floating) algae and filamentous (mat-forming) algae as well as larger algae species that look like plants, such as Chara spp. and Nitella spp. Copper sulfate is rarely used in Wisconsin, in part due to its high toxicity to invertebrates (water fleas, crustaceans, mollusks, mayflies, snails, and crayfish) and multiple species of fish (trout, bluegill and minnow) at typical application concentrations. The chelated forms of copper have different toxicology profiles from each other and from copper sulfate. The chelated copper products can also be toxic to fish at certain application rates, particularly to trout and bluegill in soft water. Applications to harder water provide a greater margin of safety to fish. Many of the chelated copper products are also toxic to invertebrates that live on the lake bottom even at approved application rates. These invertebrates are an important source of fish food (WDNR, 2012).

Sonar® whose active ingredient is fluridone, is a broad spectrum herbicide that interferes with the necessary processes in a plant that create the chlorophyll needed to turn sunlight into plant food through a process called photo-synthesis. Rodeo® whose active ingredient is glyphosate is another broad spectrum herbicide that prevents an aquatic plant from making the protein it needs to grow. As a result the treated plant stops growing and eventually dies.

2,4-D and triclopyr are active ingredients in several selective herbicides including Sculpin G®, Shredder Amine 4®, Navigate®, DMA 4®, and Renovate®. These herbicides stimulate plant cell growth causing them to rupture, but primarily in plants that are dicots like Eurasian watermilfoil, coontail, water lilies, and northern watermilfoil. These herbicides are considered selective as they have little to no effect on monocots (curly-leaf pondweed, native pondweeds) in treated areas. Fluridone, glyphosate, 2,4-D, and triclopyr are all considered systemic. When applied to the treatment area, plants in the treatment area draw the herbicide in through the leaves, stems, and roots killing all of the plant, not just the part that comes in contact with the herbicide.

ProcellaCOR® is a new herbicide that acts similar to both 2,4-D and triclopyr, with less contact time needed. The active ingredient in ProcellaCOR® is an organic compound which mimics the plant hormone auxin. The auxins that are produced naturally within plants stimulate stem elongation while suppressing bud growth. However when auxin concentrations within plant tissues reach a certain threshold, the growth response is completely reversed. The plant begins to, essentially, prepare for a dormant period by stopping growth altogether and abscising leaves. At this point, additional auxins (or their mimics) will become toxic to the plant and result in cell death. This herbicide has just recently been approved for use in Wisconsin, but it is currently still considered to be in a testing phase. This herbicide is intended for use on EWM, so it should not be used on Lake Como.

Endothall and diquat are considered broad spectrum contact herbicides. They destroy the outer cell membrane of the material they come in contact with and therefore kill a plant very quickly. Neither of these is considered selective and has the potential to kill all of the plant material that they come in contact with regardless of the species. As such, great care should be taken when using these products. Certain plant species like CLP begin growing very early in the spring, even under the ice, and are often the only growing plant present at that time. This is a good time to use a contact herbicide like Aquathol, as few other plants would be impacted. Using these products later in the season, will kill all vegetation in contact with the herbicide and can provide substantial nuisance relief from a variety of aquatic plants.

It is possible to apply more than one herbicide at a time when trying to establish control of unwanted aquatic vegetation. An example would be controlling EWM and CLP at the same time with an early season application, and controlling aquatic plants and algae at the same time during a mid-season nuisance relief application. Applying systemic and contact herbicides together has a synergistic effect leading to increased selectivity and control. 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 and number of application periods required to complete the treatment.

EFFICACY OF AQUATIC HERBICIDES

The efficacy of aquatic herbicides is dependent on both application concentration and exposure time, and these factors are influenced by two separate but interconnected processes - dissipation and degradation. Dissipation is the physical movement of the active herbicide within the water column both vertically and horizontally. Dissipation rates are affected by wind, water flow, treatment area relative to untreated area, and water depths. Degradation is the physical breakdown of the herbicide into inert components. Depending on the herbicide utilized, degradation occurs over time either through microbial or photolytic (chemical reactions caused by sunlight exposure) processes.

MICRO AND SMALL-SCALE HERBICIDE APPLICATION

The determining factor in designating chemical treatments as micro or small-scale is the size of the area being treated. Small-scale herbicide application involves treating areas less than 10 acres in size. The dividing line between small-scale and micro treatments is not clearly defined, but is generally considered to be less than an acre. Small-scale chemical application is usually completed in the early season (April through May). Micro treatments are as well, but may be used as follow-up spot treatments after an early season application, or in instances where a new infestation has been identified in a lake with EWM already or a in a completely new lake. Recent research related to micro and small-scale herbicide application generally shows that these types of treatment are less effective than larger scale treatments due to rapid dilution and dispersion of the herbicide applied. Some suggested ways to increase the effectiveness is to increase the concentration of herbicide used, use a contact herbicide like diquat that does not require as long a contact time to be effective, or in some manner contain the herbicide in the treated area by artificial means. An example of this would be installing a curtain around a treatment area that would hold the herbicide in place longer. If combined micro or small-scale treatments exceed 10 acres or 10% of the littoral zone of a lake it is considered a large-scale treatment.

LARGE-SCALE HERBICIDE APPLICATION

Large-scale herbicide application involves treating areas more than 10 acres in size. 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. It is generally accepted that lower concentration of herbicide can be used in large-scale applications as the likelihood of the herbicide staying in contact with the target plant for a longer time is greater. If the volume of water treated is more than 10% of the volume of the lake, or the treatment area is ≥160 acres, or 50% of the lakes littoral zone, effects can be expected at a whole-lake scale. Large-scale herbicide application can be extended in some lakes to include whole bay or even whole lake treatments. The bigger the treatment area, the more contained the treatment area, and the depth of the water in the treatment area, are factors that impact how whole bay or whole lake treatments are implemented.

Pre- and post-treatment aquatic plant surveying and having an approved Aquatic Plant Management Plan are required by the WDNR when completing large-scale chemical treatments.

PRE AND POST TREATMENT AQUATIC PLANT SURVEYING

When introducing new chemical treatments to lakes where the treatment size is greater than ten acres or greater than 10% of the lake littoral area and more than 150-ft from shore, the WDNR requires pre and post chemical application aquatic plant surveying. The protocol for pre and post treatment survey is applicable for chemical treatment of CLP and EWM.

The WDNR protocol assumes that an Aquatic Plant Management Plan has identified specific goals for non-native invasive species and native plants species. Such goals could include reducing coverage by a certain percent, reducing treatments to below large-scale application designations, and/or reducing density from one level to a lower level. A native plant goal might be to see no significant negative change in native plant diversity, distribution, or density. Results from pre and post treatment surveying are used to improve consistency in analysis and reporting, and in making the next season's management recommendations.

The number of pre and post treatment sampling points required is based on the size of the treatment area. Ten to twenty acres generally requires at least 100 sample points. Thirty to forty acres requires at least 120 to 160 sampling points. Areas larger than 40 acres may require as many as 200 to 400 sampling points. Regardless of the number of points, each designated point is sampled by rake, recording depth, substrate type, and the identity and density of each plant pulled out, native or invasive.

In the year prior to an actual treatment, the area to be treated must have a mid-season/summer/warm water point intercept survey completed that identifies the target plant and other plant species that are present. A pre-treatment aquatic plant survey is done in the year the herbicide is to be applied, prior to application to confirm the presence and level of growth of the target species. A post-treatment survey should be scheduled when native plants are well established, generally mid-July through mid-August. For the post-treatment survey, repeat the PI for all species in the treatment polygons, as was done the previous summer. For whole-lake scale treatments, a full lake-wide PI survey should be conducted.

CHEMICAL CONCENTRATION TESTING

Chemical concentration testing is often done in conjunction with treatment to track the fate of the chemical herbicide used. 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. 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. Water samples are collected prior to treatment and for a period of hours and/or days following chemical application.

Pre- and post-treatment aquatic plant surveys and testing for herbicide residuals are not required by the WDNR for small-scale treatments. Nor is an approved Aquatic Plant Management Plan if the organization sponsoring the application is not using grant funding to help defer the costs. Even though not required by the WDNR, participating in these activities is recommended as it helps to gain a better understanding of the impact and fate of the chemical used.

HERBICIDE USE IN LAKE COMO

Chemical treatment as a means of controlling native aquatic plants is legal in Wisconsin, but not generally permitted by the WDNR except under special circumstances. In Lake Como, the only justification that can be made for chemically treating native aquatic plants would be to keep the beach and city front area open and free of vegetation. However, if the offending vegetation is free-floating like duckweed, common waterweed, or coontail, the use of herbicides may not be as effective, or would potentially need to be used more than once during the season. Furthermore, aquatic plant growth at or near the beach is for the most part, outside of the swimming buoys where water depth is 6-8 feet. Sand placed on the beach and in the lake pretty much prevents significant aquatic plant growth within the swimming buoys.

Currently, most of the CLP within Lake Como is found in the extreme north end by the inlet of Duncan Creek. This is an area with few residences that also has enough flowing water to maintain a natural navigation channel. During the 2018 aquatic plant survey, CLP in the area was described at worst as a minor navigational impairment. Additionally, the moving water and small area would likely limit the effectiveness of any herbicide applied. At this time, chemical treatment is not a recommended management action for control of CLP or native aquatic vegetation in Lake Como.

NUTRIENT REDUCTION

Filamentous algae and common waterweed make up the largest part of the aquatic vegetation that presents itself in nuisance conditions that reduce the usability of Lake Como by property owners and the larger community of Bloomer. Floating mats of common waterweed that are covered with filamentous algae and several species of duckweed interfere with recreational activities including swimming (at the City Beach and at private residences), fishing, and pleasure boating. These same mats of floating vegetation are aesthetically displeasing, often masking the decent lake and water quality that is underneath (Figure 30).

Figure 30: Floating mats of duckweed, common waterweed, and filamentous algae at the City Beach, July 2019

The largest portion of biomass in these floating mats of vegetation is common waterweed (Figure 31). Common waterweed grows in a variety of lake and pond habitats but prefers to grow in fine sediments at the bottom of cool, spring-fed ponds. While Lake Como is not necessarily a spring-fed pond, its main source of water is from a cool water stream in Duncan Creek. Common waterweed is one of the few plants that stay green all winter long providing habitat and the producing oxygen under the ice. Common waterweed also provides excellent cover for aquatic insects and fish and serves as a source of food for lake wildlife. However, large mats of common waterweed that often form during the summer months can increase water temperature, and as they decay, can use up available oxygen. Common waterweed is commonly found growing near the bottom of a lake or pond, but is not rooted to the bottom so it can and does break free and float to the surface in large mats. This is what happens on Lake Como. Fragments of common waterweed grow new plants or rather continue growth from the existing fragment.

Figure 31: Common waterweed *(Elodea canadensis)*

Overabundant growth of common waterweed (and duckweed and filamentous algae) is a symptom of excessive nutrients (phosphorus and nitrogen) in the water. These nutrients can come from barnyards and crop fields, but are also associated with urban development including things like runoff from lawns and impervious (hard) surfaces, storm sewer systems, septic systems, and golf courses.

Control of overabundant aquatic plants is best accomplished by reducing or redirecting nutrient sources away from the waterbody. This can be accomplished through a host of best management practices for farming, private property owners, and municipalities. Some examples include no till planting, reducing fertilizer applications, maintaining septic systems properly, redirecting nutrient rich runoff away from the waterbody, and maintaining vegetative buffer strips around the waterbody and the streams that feed it.

If the underlying nutrient causes of aquatic plant growth are not addressed, management actions simply address the symptoms, not the problem.

A Comprehensive Lake Management Plan that addresses sources of nutrients and how to reduce what they contribute is needed for Lake Como. An Aquatic Plant Management Plan (this document) is just one part of a larger plan that should look at the watershed feeding Lake Como, nearshore development around the lake, internal sources of nutrients in the lake, and then identifies actions that can be taken to reduce nutrient loading. Without this, there will probably be a perpetual need to control overabundant plant growth.

AQUATIC PLANT HARVESTING AND SURFACE SKIMMING

The development of a Comprehensive Lake Management Plan that focuses on improving water quality and reducing nuisance aquatic plant growth can take several years to develop, and many more years to actually implement actions and see results. As such, certain management actions can be implemented to address certain issues now. Back in the early 2000's dredging was one such management action that provided some level of improvement to Lake Como. Management of aquatic plants in the system now is another such action. Large-scale aquatic plant harvesting in Lake Como can remove much of the undesirable aquatic plant growth and is recommended in this plan.

Through contracting of aquatic plant harvesting services, or the purchase of their own harvesting and support equipment, the BCLA and the City of Bloomer can improve conditions in Lake Como. Harvesting operations that extend several feet into the water column can reduce nuisance vegetation and improve navigation and lake access. This action would take place in a much smaller area with the intent of keeping navigation lanes open for easier lake access, boat use, and fishing. On a larger scale, surface skimming can be used to remove large mats of accumulated common waterweed, duckweed, filamentous algae, and other debris. Surface skimming would still be accomplished through the use of an aquatic plant harvester, but the intent would only be to remove surface matting in the top 12-18 inches that interferes with recreation, native aquatic plant growth, and the aesthetics of the lake.

Efforts to retain, collect, and remove duckweed in the area of Como Creek upstream of the Hwy Q bridge should be continued as it reduces the amount of floating duckweed that disperses through the entire system.

INSTALLATION OF AN AQUATIC PLANT DEFLECTOR CURTAIN ADJACENT TO THE CITY BEACH

One site of particular interest to the BCLA and the City of Bloomer is the city beach. The city beach is open to the public and staffed with life guards through most of the summer season. In late June and early July, swimming lessons are offered at the city beach. Sand is brought in to maintain the beach for the enjoyment of the community. Unfortunately, floating mats of vegetation build up along the buoy line and adjacent to the three swimming docks that are installed there each year. While the beach does sometime suffer from increased levels of E.coli bacteria in the water, most of the time it is the presence of the nuisance vegetation that limits its use. For the most part, the water quality in Lake Como and at the beach is pretty decent. The water is dark-stained from tannins that are carried into the lake from Duncan Creek and the other inlets, but seldom does it have algae blooms or bluegreen algae blooms.

E.coli levels are monitored by the City and the beach is closed if the values get too high. However, when floating mats of vegetation foul the beach area, the beach may as well be closed as few community members use it.

Several things can be done to reduce the amount of floating vegetation that fouls the beach. Aquatic plant harvesting and surface skimming outside of the beach area will help reduce the amount of floating vegetation, but this plan also recommends the installation of an aquatic plant curtain to further deflect mats of vegetation that drift into the beach area. The function of this curtain would be to encircle the beach area and extend up to 12" from the surface water into the lake (Figure 32). If strung from the extended point that makes up the beach, out past the normal swim area buoys and buoy rope, and across the entire length of the beach, prevailing winds and water current may slide vegetated mats past the beach, rather than them getting hung up on the beach.

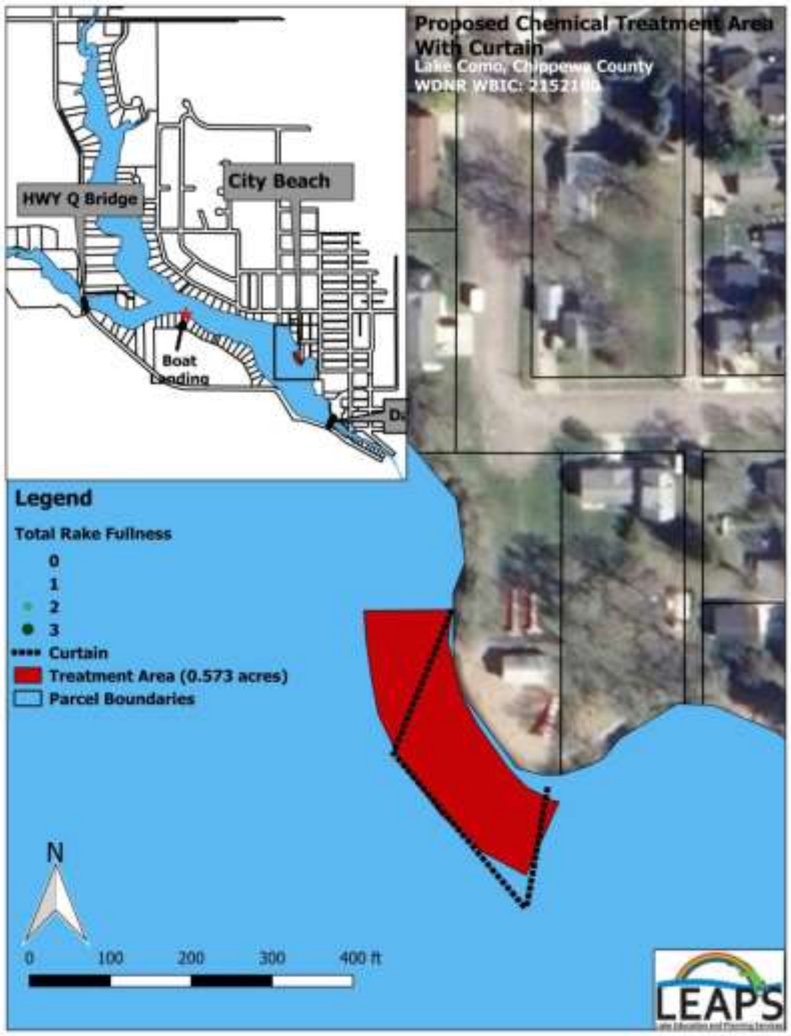


Figure 32: Potential herbicide application area and floating plant deflector curtain

There is precedence for the use of deflector curtains and they have proven to be effective in some areas. Figure 33 shows deflector curtains installed on a couple of beaches in the City of Madison, WI between 2010 and 2012. The curtains were installed on several Madison area beaches as a part of a pilot study to see if they could improve the aesthetics and safety of the beaches. The results of that study were published in a summary report written by a WDNR researcher (Lathrop, Reimer, Sorsa, Steinhorst, & Wu, 2013). During a conversation with the lead researcher, it was confirmed that the installation of a curtain to deflect floating debris is still implemented on at least one of the beaches in the study (D. Lathrop, personal communication August 2019). In the same conversation, the lead researcher was willing to share what was learned in greater detail if it would aid the BCLA and City of Bloomer in installing a test curtain.

If the City of Bloomer and the BCLA want to install such a curtain, however, they will have to apply for a Chapter 30 waterways permit for the placement of a miscellaneous structure in navigable water.

Figure 33: Deflector curtains installed on several beach areas in the City of Madison, WI

Limited/Selective Use of Aquatic Herbicides

As previously mentioned, the use of aquatic herbicides to control CLP is not recommended. There simply isn't enough CLP in areas that impact lake use to warrant the use of herbicides. However, there may be some benefit to implementing a very small-scale, selective herbicide application adjacent to the city beach and/or along the shores of the park on the north side of the city. Common waterweed, which is the main aquatic plant impacting the lake, can be effectively controlled through the use of aquatic herbicides. A chemical treatment along the deepest portion of the beach could reduce the amount of common waterweed near the bottom of the lake. When walking out to deep water from the beach, common waterweed becomes abundant at the bottom in about 5-ft of water. A mid-summer treatment in a narrow band of 5 to 8 feet of water around the beach could prolong the use of the beach and might increase the effectiveness of the harvesting and skimming program (Figure 34). The use of herbicides in a narrow band along the shores of North City Park could open up places to fish from shore or launch and land kayaks and other small watercraft.

If all these actions are implemented as a part of an integrated management plan, it is possible for the City of Bloomer and the BCLA to keep these public areas and Lake Como as a whole a more usable body of water and a better reflection on the community throughout the season.

AQUATIC PLANT SURVEYING

Lake Como has a limited native aquatic plant community. It also has CLP, a potentially problematic non-native aquatic invasive species. Both native and non-native aquatic plant species need to be monitored to determine the desired and undesired impacts of management implementation. There are at least three levels of aquatic plant surveying that help better assess and understand how management actions affect the lake and the aquatic plants within it.

MEANDERING SURVEYS

Meandering surveys of the littoral zone (plant-growing zone) looking for a specific plant species like CLP are important as they generally are the first indicator that there is something that does not belong. Meandering surveys help find target plant species, document the location where target plants are found using GPS technology or general mapping, and provides an opportunity to physically remove the target plant or make it a part of another management action. Annual bed mapping of CLP is considered a meandering survey and serves to identify areas of concern for management in the following spring. The BCLA should conduct annual meandering surveys to map out CLP beds and to survey the lake for any new AIS that may be introduced.

PRE AND POST-TREATMENT POINT-INTERCEPT SURVEYS

Pre and post-treatment, point-intercept surveys are more quantifiable and document short-term changes in those areas under management. They consist of a set of points that can be surveyed at multiple times, usually before and after a chemical treatment. Statistical information can be gathered from the data collected during one of these surveys. The WDNR only requires pre and post-treatment, point-intercept aquatic plant surveying when greater than 10 acres of the littoral zone are proposed for treatment, or if a chemical treatment is grant funded. Currently, it is unlikely that chemical treatments in Lake Como will exceed 1 acre and as a result, pre and post-treatment surveys will not need to be completed. Unless a single proposed treatment area exceeds 1.5 acres or is funded by a grant, pre and post-treatment surveys will not be completed. Should the size of a proposed chemical treatment reach or exceed 1.5 acres in a single treated area, the BCLA will complete pre and post-treatment survey work.

WHOLE-LAKE, POINT-INTERCEPT, AQUATIC PLANT SURVEYS

Whole-lake, point-intercept surveys are intended to track changes to the aquatic plant community over time. Typically in a lake where management of aquatic plants (non-native or native) takes place, whole-lake surveys are recommended at least every five years using the same set of pre-designated points each time. The first time a whole-lake point-intercept survey is completed, the results serve as a baseline for future comparisons. After the first survey, the results from any future surveys can be compared to the first survey for changes. If any changes are identified, it is then possible to analyze what might have caused the changes. While changes naturally occur in most lakes from one year to another, management actions including management of CLP can also be a reason for change.

The most recent whole-lake, point-intercept survey of Lake Como was completed in 2018. The next whole-lake point-intercept survey will need to be completed in 2023 at the end of this current plan.

AIS AND WATER QUALITY EDUCATION, MONITORING AND MANAGEMENT

In addition to monitoring the CLP within Lake Como the BCLA should participate in Citizen Lake Monitoring Network programs for water quality and aquatic invasive species monitoring annually. Monitoring of water quality can track changes in water clarity, phosphorus levels, and algae levels. Monitoring for AIS can help identify threats early enabling potentially more effective management if something is found. Watercraft inspection at the main public access point through the Clean Boats Clean Waters program can reduce the likelihood that a new AIS gets introduced into Lake Como, and provide another avenue to educate lake users. Additional AIS signage, or utilizing more fully, existing signage at the public access points can further that education and help protect the lake from future threats (Figure 34).

Figure 34: Main Access Kiosk (left) and Walk-in Access (right) on Lake Como

HEALTHY LAKES SHORELAND IMPROVEMENT PROJECTS

Although the total contribution of runoff laden with nutrients, sediment, and other contaminants hasn't been quantified, the sheer amount of developed shoreland with rip-rapped shorelines, lawns, and impervious surfaces to the edge of the lake is high on Lake Como. The lake and aquatic plant community would benefit from runoff reductions from the nearshore area around the lake. Property owners along the lake, and even property owners within the broader city limits, could implement best management practices including but not limited to rain barrels, curb cuts, native plantings, rain gardens, runoff diversions, and infiltration trenches to reduce runoff into Lake Como. Installation of many of these practices can be supported by WDNR grant funding through the Healthy Lakes Initiative and Healthy Lakes grant program. These grants can be applied for by the BCLA and are intended to fund small projects with up to $1,000.00 per practice installed.

COARSE WOODY HABITAT

Coarse woody habitat has never been formally quantified within Como Lake, but property owners around the lake could install "fishsticks" projects with funding support through the Healthy Lakes Initiative and Healthy Lakes grant program. These installations are a great way to improve fish and wildlife habitat and help reduce shoreline erosion.

AQUATIC PLANT MANAGEMENT GOALS, OBJECTIVES, AND ACTIONS

Goal 1: Support and implement aquatic plant management actions that minimize negative impacts on the native aquatic plant diversity or water quality.

Two years ago the Bloomer Community Lake Association (BCLA) was brought out of hibernation because of aquatic plant concerns in Lake Como. The BCLA was tasked with determining what could be done to manage nuisance vegetation in the lake. Dense beds of common waterweed, duckweed, and coontail covered with filamentous algae were fouling areas of the shore, public places along the lake, and limiting lake usability by mid to late June. Curly-leaf pondweed, a non-native, invasive, aquatic plant species is present in the lake but is not causing the majority of the issues. Excessive native aquatic plant beds and filamentous algae fueled by excess nutrients that create areas of nuisance, mostly free-floating, surface matted vegetation in the lake is the main source of issues. Nuisance aquatic vegetation is described as rooted beds or floating mats of vegetation > than an acre, in water at least 3-ft deep, with a rakehead density of 2 or greater that interfere with lake use and aesthetic appeal.

Because the majority of aquatic plant issues are related to dense growth native vegetation, the sole use of herbicides to reduce issues is not appropriate. This goal will be met by using an integrated approach to aquatic plant management that involves harvesting, physical removal, and limited use of herbicides in the short-term and nutrient reduction management in the long-term.

Objective 1: Implement an aquatic plant harvesting and surface skimming management plan.

Action Item: Purchase, operate, and maintain an aquatic plant harvester to support nuisance aquatic plant management on Lake Como.

Action Item: Develop partnerships with the City of Bloomer and other entities to support a harvesting program for Lake Como.

Objective 2: Maintain the current CLP population at less than 3.0 acres of continuous coverage with a rake density of <2.0.

Action Item: Complete annual CLP bed mapping surveys for area and density.

Action Item: If growth of CLP reaches or exceeds 3.0 acres of continuous coverage with a rakehead density ≥2, consider development of management actions likely to be focused on harvesting to control it.

Objective 3: Implement a native plant management plan to increase usability and aesthetic appeal of the lake while minimizing damage to the native ecosystem.

Action Item: Encourage lake property owners to complete physical removal of nuisance aquatic vegetation from around their docks and boat lifts following guidelines in NR 109.07.

Action Item: Implement an annual native plant harvesting program to maintain 10-ft navigation and fish passage lanes through areas of nuisance aquatic plant growth.

Note: Aquatic plants in navigation and fish passage lanes will be harvested to a depth no deeper than 2/3 of the water column in waters ≥3-ft in areas with an average rakehead density ≥2.

Action Item: Implement a large-scale surface skimming project.

Note: Skimming of surface mats of vegetation will be completed no deeper than 18-inches below the lake surface, and in water ≥3-ft in depth.

Action Item: Chemically treat designated areas along the City Beach and North City Park

Note: Chemical treatment at the City Beach consists of a narrow band in 5-7 feet of water that follows the contour of beach sand placed in the water.

Note: Chemical treatment adjacent to North City Park consists of a narrow band along the shoreline to allow fishing, wading, and use of small watercraft.

Note: Herbicide application would be completed only one time between the first of June and the end of July using a contact herbicide at appropriate label rates.

Objective 4: Continue surface collection and removal of duckweed, watermeal, and other floating debris upstream of the Hwy Q Bridge

Action Item: Surface collection and removal done in cooperation with the City of Bloomer and BCLA

Objective 5: Install an aquatic plant deflector curtain adjacent to the City Beach

Action Item: Apply for a Chapter 30 permit for a miscellaneous structure placed in navigable water.

Action Item: Research availability of and installation of an aquatic plant deflector curtain adjacent to the City Beach

Action Item: Annually install and remove an aquatic plant deflector curtain adjacent to the City Beach.

Objective 6: Maintain or improve native plant community measurements of FQI, SDI, and species richness as determined in the 2018 whole-lake, point-intercept, aquatic plant survey.

Action Item: Continue regular whole-lake warm-water point-intercept aquatic plant surveys at least every five years

Objective 7: Implement an annual, monthly volunteer monitoring program to track any changes in the water quality of Lake Como.

Action Item: Collect Temperature and Dissolved Oxygen profiles, total phosphorus, chlorophyll-a, and Secchi disk data monthly and in accordance with the CLMN protocol.

Note: Collection completed May through August every year with collection added in September and October if working off of grant funding.

Goal 2: Implement and maintain AIS education and prevention efforts

Lake Como is at risk of new AIS, particularly EWM, being introduced in the lake. The BCLA will begin to implement a watercraft inspection program according to WDNR/UW-Extension Lakes protocol. This program will either be volunteer-based, or paid for by the BCLA through a small-scale CBCW grant. Watercraft inspection data will be entered into the WDNR SWIMS database annually.

Appropriate AIS signage will be maintained at the public accesses on Lake Como to improve the AIS awareness of lake users and community members.

AIS monitoring will be completed to monitor for possible new AIS following WDNR/UW-Extension Lakes protocol through the Citizen Lake Monitoring Network (CLMN) AIS Monitoring Program. Purple loosestrife, Eurasian watermilfoil, zebra mussels, and other species will be watched for and survey data entered into the WDNR SWIMS database annually.

AIS education and information events and materials will be scheduled and/or distributed in various means to BCLA constituents, lake users, and community members.

Objective 1: Prevent new AIS from entering and becoming established in Lake Como

Action Item: Implement a Clean Boat Clean Waters watercraft inspection at the main public access point.

Action Item: Plan, place, and maintain materials on the kiosk at the main access point.

Action Item: Install AIS signs at the secondary walk-in landing on the east side of Lake Como.

Objective 2: Implement and maintain an AIS education and information program

Action Item: Create and distribute annual newsletters updating AIS and other BCLA activities

Action Item: Host events to promote public awareness, identification, knowledge, and involvement in lake and AIS education activities.

Action Item: Create and maintain a BCLA webpage and/or Facebook page.

Action Item: Continue holding regular public meetings of the BCLA to encourage constituent involvement and facilitate communication between the BCLA and other stakeholders.

Objective 3: Implement and maintain an AIS monitoring program

Action Item: Establish and maintain an in-lake and shoreline AIS monitoring program following CLMN guidelines

Action Item: Create an AIS Response Plan for any AIS that could be introduced into Lake Como

Goal 3: Promote and support nearshore, riparian, community, municipal, and watershed best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Como.

An important part of controlling undesirable aquatic plant growth and the production of algae is reducing the amount of nutrients (mainly phosphorus) that enter the lake. The BCLA will promote and encourage the implementation of simple and generally inexpensive best management practices including but not limited to shoreland buffers and the installation of rain gardens to reduce nutrient loading from the nearshore area.

Trees and other vegetation that naturally fall into a lake or that is intentionally placed in the lake by permit, is known as coarse woody habitat (CWH). CWH provides many benefits to fish and wildlife. Like aquatic vegetation, CWH is essential to the overall health of a lake and should be protected and enhanced, not eliminated. The BCLA will provide information about and encourage property owner participation in protecting and/or enhancing CWH.

Objective 1: Officially adopt the Wisconsin Healthy Lakes Initiative

Action Item: Provide information and education related to habitat improvement and runoff reduction projects that can be funded with Healthy Lake grants

Action Item: Offer at least one workshop annually focused on simple projects through the Healthy Lake Initiative that will improve habitat and reduce runoff.

Objective 2: Install three or more habitat improvement and/or runoff reduction projects annually.

Action Item: Identify property owners and community members interested in implementing projects that will improve habitat and reduce runoff.

Action Item: Work with the City of Bloomer to identify municipal projects that will improve habitat and reduce runoff.

Action Item: Apply for Healthy Lakes grant funding to support projects that improve shoreland habitat and reduce runoff.

Objective 3: Increase the amount of coarse woody habitat in Lake Como.

Action Item: Provide educational and informational materials to lake property owners that promote the benefits of coarse woody habitat in a lake.

Action Item: Encourage property owners not to remove woody debris that falls naturally into the lake from their shoreline unless it presents a dangerous and/or undesirable condition.

Action Item: Install a demonstration Fishsticks project somewhere on Lake Como.

Goal 4: Engage lake residents, community members, lake users, and visitors in being active lake stewards.

The success of any management plan be it for aquatic vegetation, water quality, or other aspect of lake health is dependent on the amount of support and understanding there is in the community. Education is key to developing that support and understanding.

Objective 1: Encourage behavior changes in residents in the following areas: shoreland development, landscaping to reduce runoff, AIS, water quality, aquatic vegetation, recreational practices, and responsibility for the lake.

Action Item: Help lake residents to understand AIS concerns, identify and monitor for AIS within the lake, and report and/or remove what they find.

Action Item: Encourage boaters to implement appropriate AIS prevention strategies on their watercraft.

Action Item: Distribute educational and informational material related to being good lake stewards.

Objective 2: Encourage and support BCLA constituent participation in annual lake and AIS conferences in WI and MN.

Action Item: Research and share dates and times for various lake and AIS conferences in MN and WI.

Goal 5: Develop a more comprehensive water quality management plan for Lake Como.

Lake Como's aquatic plant issues are driven by the amount of nutrients entering the system. Aquatic plant management without also reducing nutrient loading to the system will only treat symptoms without addressing the larger problem.

Objective 1: Request funding through the WDNR lake management planning grant program to develop a comprehensive water quality management plan.

Action Item: Apply for lake management planning grant funding to support review of existing data, collection of new data, and development of a more comprehensive water quality management plan for Lake Como.

Note: Grant eligibility is determined by the WDNR.

Goal 6: Implement the Lake Como Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

This APM Plan is not intended to be a static document, but rather a plan that makes room for management changes that still fall under the guise of the stated goals, but that may make attaining those goals easier and more efficient.

Management actions implemented in each year of this plan will be evaluated for how well they helped meet stated goals and objectives. Small changes will be made automatically if it is determined they will improve outcomes. Larger management changes will be presented to the BCLA, WDNR, and other Stakeholders for approval before implementation.

An end of project report summarizing the success and failures after five years of management will be completed. This report will be completed by the BCLA and its retainers and shared with property owners, lake users, WDNR, and other Stakeholders. A whole-lake, summer, PI, aquatic plant survey will be completed following the last year included in this plan (2023) following the same procedures that were used in the past PI survey. Results from all PI surveys will be compared to each other with the results leading to development of the next five years of aquatic plant management in Lake Como.

Objective 1: Apply for grant funding to support the implementation of actions in the Lake Como APM Plan.

Action Item: Apply for AIS Education, Prevention, and Planning and/or CBCW grants to support AIS management planning, summary reporting, plant surveys, watercraft inspections, AIS monitoring, and AIS education efforts.

Note: Grant eligibility is determined by the WDNR

Objective 2: Complete annual project activity and assessment reports

Action Item: Use reports to make recommendations for annual revisions and updates to the APM Plan and to develop next season management actions.

Objective 3: Complete an End-of-project Summary Report

Action Item: Complete an overall review of project successes and failures after five years of implementation.

Action Item: Review the goals, objectives, and actions in the 2020-2024 APM Plan for successful implementation.

Action Item: Revise or rewrite APM Plan after five years of implementation.

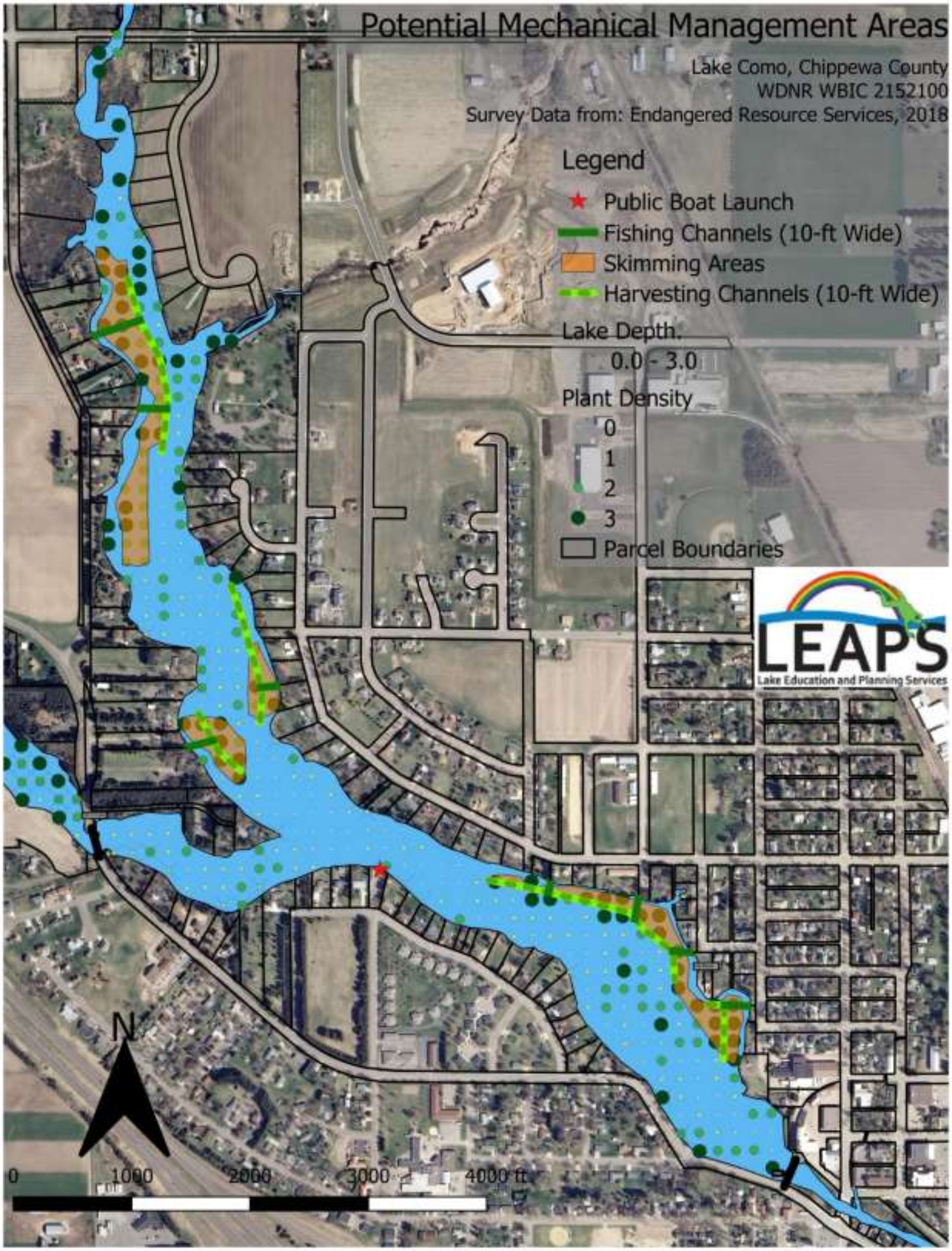
Objective 4: Build and support partnerships to support management implementation

Action Item: Communicate with local, county, and state entities; schools and local business; clubs and organizations, etc. to generate support for management actions.

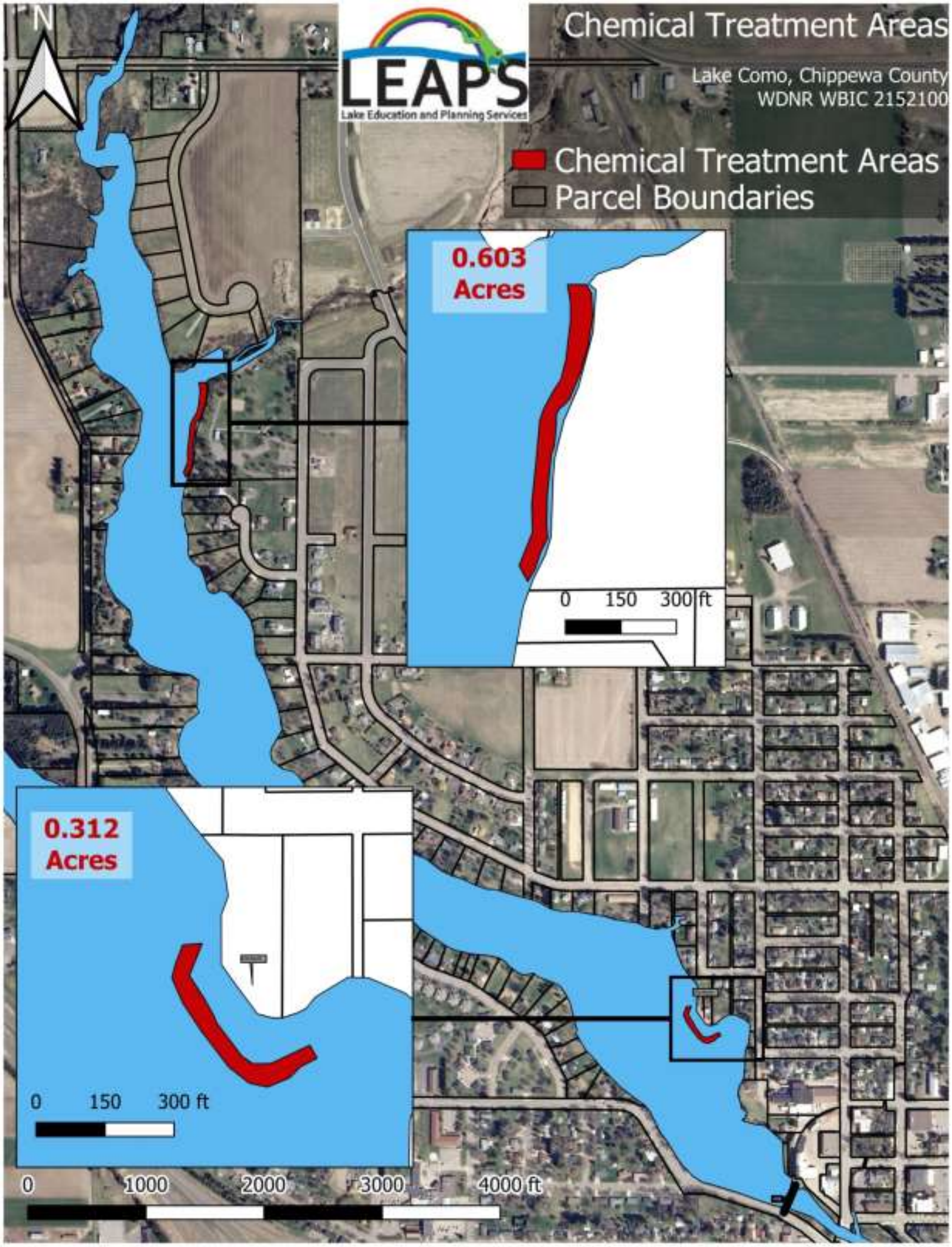
Action Item: Share results with constituents and partners from Action 1

The following three maps represent suggested management actions and can be used to guide implementation.

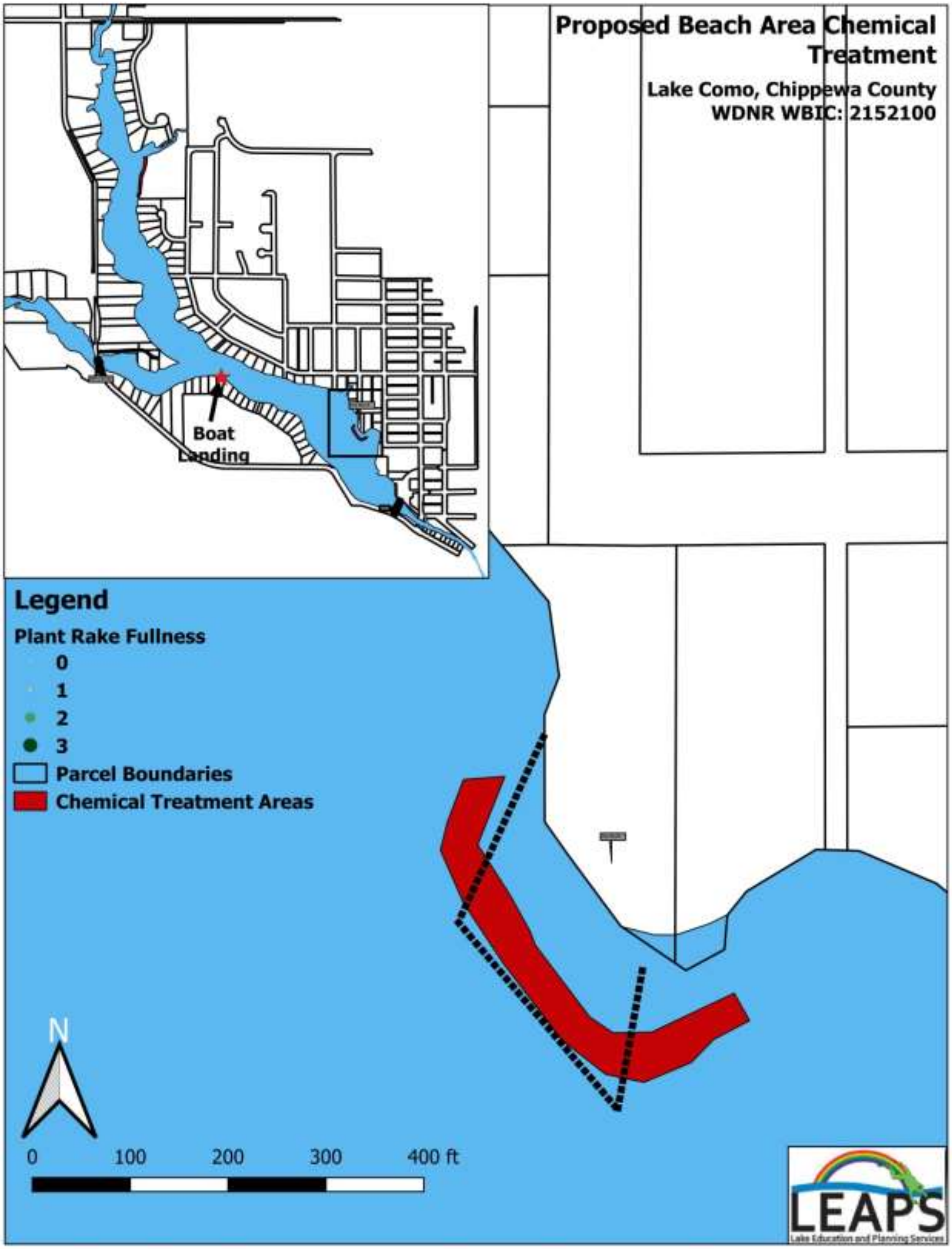
Map 1 – Harvesting of Navigation and Fish Passage Lanes and Skimming Areas



Map 2 – Potential Chemical Management Areas



Map 3 – Suggested Placement of and Aquatic Plant Deflector Curtain



IMPLEMENTATION AND EVALUATION

This plan is intended to be a tool for use by the BCLA to move forward with aquatic plant management actions that will maintain the health and diversity of Lake Como and its aquatic plant community. This plan is not intended to be a static document, but rather a living document that will be evaluated on an annual basis and updated as necessary to ensure goals and community expectations are being met. This plan is also not intended to be put up on a shelf and ignored. Implementation of the actions in this plan through funding obtained from the WDNR and/or BCLA funds is highly recommended. A separate version of the goals, objectives, and actions are included Appendix A. An Implementation and Funding Matrix is provided as Appendix B. A calendar that shows when certain management actions should occur is included as Appendix C.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES GRANT PROGRAMS

There are several different WDNR grant programs that may be applicable to and/or support the goals, objectives, and actions in this Aquatic Plant Management Plan.

AQUATIC INVASIVE SPECIES GRANTS

Aquatic Invasive Species grants can be used to support education, prevention, and planning projects, Clean Boats, Clean Waters programs, aquatic plant survey costs, plant management permitting costs, and many other actions. In some cased they can be used to support management implementation as well. Currently these grants require that 25% of a total projects cost be covered by the sponsor through volunteer time, donated services and/or equipment, and/or cash. Application due dates are December 10 and February 1.

LAKE MANAGEMENT PLANNING GRANTS

Lake management planning grants are intended to provide financial assistance to eligible applicants for the collection, analysis, and communication of information needed to conduct studies and develop management plans to protect and restore lakes and their watersheds. Projects funded under this subprogram often become the basis for implementation projects funded with Lake Protection grants. There are two categories of lake management planning grants: small-scale and large-scale.

SMALL SCALE LAKE MANAGEMENT PROJECTS

Small-scale projects are intended to address the planning needs of lakes where education, enhancing lake organizational capacity, and obtaining information on specific lake conditions are the primary project objectives. These grants are well suited for beginning the planning process, conducting minor plan updates, or developing plans and specification for implementing a management recommendation.

LARGE SCALE LAKE MANAGEMENT PROJECTS

Large-scale projects are intended to address the needs of larger lakes and lakes with complex and technical planning challenges. The result will be a lake management plan; more than one grant may be needed to complete the plan.

Currently these grants require that 33% of a total projects cost be covered by the sponsor through volunteer time, donated services and/or equipment, and/or cash. The application due date is December 10.

LAKE PROTECTION GRANTS

Lake protection and classification grants assist eligible applicants with implementation of lake protection and restoration projects that protect or improve water quality, habitat or the elements of lake ecosystems. There are four basic Lake Protection subprograms: a) Fee simple or Easement Land Acquisition b) Wetland and Shoreline Habitat Restoration c) Lake Management Plan Implementation d) Healthy Lakes Projects.

HEALTHY LAKES PROJECTS

The Healthy Lakes grants are a sub-set of Plan Implementation Grants intended as a way to fund increased installation of select best management practices (BMPs) on waterfront properties without the burden of developing a complex lake management plan. Details on the select best practices can be found in the Wisconsin Healthy Lakes Implementation Plan and in best practices fact sheets available through the Healthy Lakes Initiative.

Eligible best practices with pre-set funding limits are defined in the Wisconsin Healthy Lakes Implementation Plan, which local sponsors can adopt by resolution and/or integrate into their own local planning efforts. By adopting the

Wisconsin Healthy Lakes Implementation Plan, a lake organization is immediately eligible to implement the specified best practices. The intent of the Healthy Lakes grants is to fund shovel-ready projects that are relatively inexpensive and straight-forward. The Healthy Lakes grant category is not intended for large, complex projects, particularly those that may require engineering design. All Healthy Lake grants require a 25% sponsor match and have a standard 2-year timeline. Applications are due on February 1 each year.

For more information about these or any other lake related WDNR grant, visit the WDNR's Surface Water Grants page at https://dnr.wi.gov/aid/surfacewater.html.

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Appendix A

Lake Como APM Plan Goals, Objectives, and Actions

Appendix A - Lake Como Aquatic Plant Management (APM) Plan: Goals, Objectives, and Actions

Goal 1: Support and implement aquatic plant management actions that minimize negative impacts on the native aquatic plant diversity or water quality.

1. Objective 1: Implement an aquatic plant harvesting and surface skimming management plan.
    a. Action 1: Purchase, operate, and maintain an aquatic plant harvester to support nuisance aquatic plant management on Lake Como.
    b. Action 2: Develop partnerships with the City of Bloomer and other entities to support a harvesting program for Lake Como.
2. Objective 2: Maintain the current CLP population at less than 3.0 acres of continuous coverage with a rake density of <2.0.
    a. Action 1: Complete annual CLP bed mapping surveys for area and density.
        i. Survey work can be contracted out or completed by trained BCLA volunteers.
    b. Action 2: If growth of CLP reaches or exceeds 3.0 acres of continuous coverage with a rakehead density ≥ 2, consider development of management actions likely to be focused on harvesting to control it.
3. Objective 3: Implement a native plant management plan to increase usability and aesthetic appeal of the lake while minimizing damage to the native ecosystem.
    a. Action 1: Encourage lake property owners to complete physical removal of nuisance aquatic vegetation from around their docks and boat lifts following guidelines in NR 109.07.
    b. Action 2: Implement an annual native plant harvesting program to maintain 10-ft navigation and fish passage lanes through areas of nuisance aquatic plant growth.
        i. Aquatic plants in navigation and fish passage lanes will be harvested to a depth no deeper than 2/3 of the water column in waters $\geq$3-ft in areas with an average rakehead density ≥ 2.

            ii. Dump sites for harvested plants must be identified and approved by the WDNR before any harvesting can be completed.
    c. Action 3: Implement a large-scale surface skimming project.
        i. Skimming of surface mats of vegetation will be completed no deeper than 18-inches below the lake surface, and in water ≥3-ft in depth.
        ii. Dump sites for harvested plants must be identified and approved by the WDNR before any harvesting can be completed.
    d. Action 4: Chemically treat designated areas along the City Beach and North City Park.
        i. Chemical treatment at the City Beach consists of a narrow band in 5-7 feet of water that follows the contour of beach sand placed in the water.
        ii. Chemical treatment adjacent to North City Park consists of a narrow band along the shoreline to allow fishing, wading, and use of small watercraft.
        iii. Herbicide application would be completed only one time between the first of June and the end of July using a contact herbicide at appropriate label rates.
4. Objective 4: Continue surface collection and removal of duckweed and watermeal upstream of the Hwy Q Bridge.
    a. Action 1: Surface collection and removal done in cooperation with the City of Bloomer and BCLA.
        i. Dump sites for harvested plants must be identified and approved by the WDNR before any harvesting can be completed.
5. Objective 5: Install an aquatic plant deflector curtain adjacent to the City Beach to reduce undesirable floating vegetation and debris fouling the beach area.
    a. Action 1: Apply for a Chapter 30 permit for a miscellaneous structure placed in navigable water.
    b. Action 2: Research availability of and installation of an aquatic plant deflector curtain adjacent to the City Beach.

    c. Action 3: Annually install and remove an aquatic plant deflector curtain adjacent to the City Beach.

6. Objective 6: Maintain or improve native plant community measurements of FQI, SDI, and species richness as determined in the 2018 whole-lake, point-intercept, aquatic plant survey.
    a. Action 1: Continue regular whole-lake warm-water point-intercept aquatic plant surveys at least every five years.
7. Objective 7: Implement an annual, monthly volunteer monitoring program to track any changes in the water quality of Lake Como.
    a. Action 1: Collect Temperature and Dissolved Oxygen profiles, total phosphorus, chlorophyll-a, and Secchi disk data monthly and in accordance with the CLMN protocol.
        i. Collection completed May through August every year with collection added in September and October if working off of grant funding.

Goal 2: Implement and maintain AIS education and prevention efforts.

1. Objective 1: Prevent new AIS from entering and becoming established in Lake Como.
    a. Action 1: Implement a Clean Boat Clean Waters watercraft inspection program at the main public access point.
        i. 100-200 hours annually with grant funding
        ii. Volunteer hours only without grant funding
    b. Action 2: Plan, place, and maintain materials on the kiosk at the main access point on Lake Como.
    c. Action 3: Install AIS signs at the secondary walk-in landing on the east side of Lake Como.
        i. AIS signs are available from the WDNR at no cost
2. Objective 2: Implement and maintain an AIS education and information program.
    a. Action 1: Create and distribute annual newsletters updating AIS and other BCLA activities.
    b. Action 2: Host events to promote public awareness, identification, knowledge, and involvement in lake and AIS activities.
        i. Plan individual events or coordinate with other entities like Chippewa County, Clubs, and Organizations
    c. Action 3: Create and maintain an Bloomer Community Lake Association webpage and/or Facebook page.
    d. Action 4: Continue holding regular public meetings of the BCLA to encourage constituent involvement and facilitate communication between the BCLA and other stakeholders.
        i. Increase awareness of the BCLA and what they do by being part of area events including the County Fair, festivals, etc.
        ii. Present goals and objectives for Lake Como at local government and civic organization meetings
3. Objective 3: Implement and maintain an AIS monitoring program.
    a. Action 1: Establish and maintain an in-lake and shoreline AIS monitoring program following CLMN guidelines.
        i. AIS monitoring should occur at least once a month June-September

b. Action 2: Create an AIS Response Plan for any AIS that could be introduced into Lake Como.
    i. An AIS Response Plan identifies procedures to follow and people to contact if a new AIS is discovered in a lake

Goal 3: Promote and support nearshore, riparian, community, municipal, and watershed best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Como.

1. Objective 1: Officially adopt the Wisconsin Healthy Lakes Initiative for Lake Como.
    a. Action 1: Provide information and education related to habitat improvement and runoff reduction projects that can be funded with Healthy Lake grants.
    b. Action 2: Offer at least one workshop annually focused on simple projects through the Healthy Lake Initiative that will improve habitat and reduce runoff.
2. Objective 2: Install three or more Healthy Lakes habitat improvement and/or runoff reduction projects annually.
    a. Action 1: Identify property owners and community members interested in implementing Heathy Lakes projects that will improve habitat and reduce runoff.
    b. Action 2: Work with the City of Bloomer to identify municipal projects that will improve habitat and reduce runoff.
    c. Action 3: Apply for Healthy Lakes grant funding to support projects that improve shoreland habitat and reduce runoff.
3. Objective 3: Increase the amount of coarse woody habitat in Lake Como.
    a. Action 1: Provide educational and informational materials to lake property owners that promote the benefits of coarse woody habitat in a lake.
    b. Action 2: Encourage property owners not to remove woody debris that falls naturally into the lake from their shoreline unless it presents a dangerous and/or undesirable condition.
    c. Action 3: Install a demonstration Fishsticks project somewhere on Lake Como.

Goal 4: Engage lake residents, community members, lake users, and visitors in being active lake stewards.

1. Objective 1: Encourage behavior changes in residents in the following areas: shoreland development, landscaping to reduce runoff, AIS, water quality, aquatic vegetation, recreational practices, and responsibility for the lake.

    a. Action 1: Help lake residents to understand AIS concerns, identify and monitor for AIS within the lake, and report and/or remove what they find.
    b. Action 2: Encourage boaters to implement appropriate AIS prevention strategies on their watercraft.
    c. Action 3: Distribute educational and informational material related to being good lake stewards.
        i. Create and distribute welcome packets, newsletters, information/educational displays, Facebook and/or webpage, BCLA meetings, and other resources to increase the level of public awareness and interest in the lake.
2. Objective 2: Encourage and support BCLA constituent participation in annual lake and AIS conferences in WI and MN.
    a. Action 1: Research and share dates and times for various lake and AIS conferences in MN and WI.

Goal 5: Develop a more comprehensive water quality management plan for Lake Como.

1. Objective 1: Request funding through the WDNR surface water grants to develop a comprehensive water quality management plan.
    a. Action 1: Apply for lake management planning grant funding to support review of existing data, collection of new data, and development of a more comprehensive water quality management plan for Lake Como.
        i. Grant eligibility is determined by the WDNR
        ii. Lake Management Planning grants can be used to develop a more comprehensive water quality management plan for Lake Como
        iii. Included in such a grant could be tributary loading, watershed analysis, land use analysis, identification of outfalls into Lake Como

Goal 6: Implement the Lake Como Aquatic Plant Management Plan effectively and efficiently with a focus on community and constituent education, information, and involvement.

1. Objective 1: Request grant funding through the WDNR surface water grants program to support the implementation of actions in the Lake Como APM Plan.
    a. Action 1: Apply for AIS Education, Prevention, and Planning and/or CBCW grants to support AIS management planning, summary reporting, plant surveys, watercraft inspections, AIS monitoring, and AIS education efforts.
        i. Grant eligibility is determined by the WDNR
2. Objective 2: Complete annual project activity and assessment reports.
    a. Action 1: Use reports to make recommendation for annual revisions and updates to the APM Plan.
3. Objective 3: Complete an End-of-project Summary Report.
    a. Action 1: Overall review of project successes and failures.
    b. Action 2: Review the goals, objectives, and actions in the 2020-2024 APM Plan for successful implementation.
    c. Action 3: Revise or rewrite the Lake Como APM Plan in five years.
4. Objective 4: Build and support partnerships to support management planning and implementation.
    a. Action 1: Communicate with local, county, and state entities; schools and local business; clubs and organizations, etc. to generate support for management actions.
    b. Action 2: Share results from Action 1 with constituents and partners.

Appendix B

Implementation and Funding Matrix

Appendix B - Recommended Implementation and Funding Plan for the Lake Como Aquatic Plant Management Plan

	Goals/Objectives/Actions	Healthy Lakes Grant	CBCW Grant	AIS Education Grant	AIS Control Grant	LPL Grant	Implementers	2020	2021	2022	2023	2024
1.Support and implement aquatic plant management actions that minimize negative impacts on the native aquatic plant diversity or water quality.												
1.1 Implement an aquatic plant harvesting and surface skimming management plan.												
1	Purchase, operate, and maintain an aquatic plant harvester to support nuisance aquatic plant management on Lake Como.			x			BCLA, RP, CofB, CS	x	x	x	x	x
2	Develop partnerships with the City of Bloomer and other entities to support a harvesting program for Lake Como.			x			BCLA, RP, CofB, CS	x	x	x	x	x
1.2 Maintain the current CLP population at less than 3.0 acres of continuous coverage with a rake density of <2.0.												
1	Complete annual CLP bed mapping surveys for area and density.			x			BCLA, RP	x	x	x	x	x
2	If growth of CLP reaches or exceeds 3.0 acres of continuous coverage with a rakehead density ≥2, consider development of management actions likely to be focused on harvesting to control it.						RP	x	x	x	x	x
1.3 Implement a native plant management plan to increase usability and aesthetic appeal of the lake while minimizing damage to the native ecosystem.												
1	Encourage lake property owners to complete physical removal of nuisance aquatic vegetation from around their docks and boat lifts following guidelines in NR 109.07.			x			BCLA, RP, CofB	x	x	x	x	x
2	Implement an annual native plant harvesting program to maintain 10-ft navigation and fish passage lanes through areas of nuisance aquatic plant growth.			x			BCLA, RP, CofB	x	x	x	x	x
3	Implement a large-scale surface skimming project.			x			BCLA, RP, CofB	x	x	x	x	x
4	Chemically treat designated areas along the City Beach and North City Park.			x			BCLA, RP, CofB	x	x	x	x	x
1.4 Continue surface collection and removal of duckweed and watermeal upstream of the Hwy Q Bridge.												
1	Surface collection completed in cooperation with the City of Bloomer and the BCLA.			x			BCLA, RP, CofB	x	x	x	x	x
1.5 Install an aquatic plant deflector curtain adjacent to the City Beach to reduce undesirable floating vegetation and debris fouling the beach												
1	Apply for a Chapter 30 permit for a miscellaneous structure placed in navigable water.			x			BCLA, CofB	x	x	x	x	x
2	Research availability of and installation of an aquatic plant deflector curtain adjacent to the City Beach.			x			BCLA, CofB	x	x	x	x	x
3	Annually install and remove an aquatic plant deflector curtain adjacent to the City Beach.											
1.6 Maintain or improve native plant community measurements of FQI, SDI, and species richness as determined in the 2018 whole-lake, point-intercept, aquatic plant survey.												
1	Continue regular whole-lake warm-water point-intercept aquatic plant surveys at least every five years.			x			BCLA, RP				x	
1.7 Implement an annual, monthly volunteer monitoring program to track any changes in the water quality of Lake Como.												
1	Collect Temperature and Dissolved Oxygen profiles, total phosphorus, chlorophyll-a, and Secchi disk data monthly and in accordance with the CLMN protocol.			x		x	BCLA, WDNR	x	x	x	x	x
2. Implement and maintain implement AIS education and prevention efforts												
2.1 Prevent new AIS from entering and becoming established in Lake Como												
1	Implement a Clean Boat Clean Waters watercraft inspection program at the main public access point.		x	x			BCLA, CofB, CS	x	x	x	x	x
2	Plan, place, and maintain materials in and on the kiosk at the main access		x	x			BCLA, CofB	x	x	x	x	x
3	Install AIS signage at the east side walk-in public access.		x	x			BCLA, CofB	x		x		x
2.2 Implement and maintain an AIS education and information program												
1	Create and distribute annual newsletters updating AIS and other BCLA activities			x			BCLA	x	x	x	x	x
2	Host events to promote public awareness, identification, knowledge, and involvement in lake and AIS activities			x			BCLA	x	x	x	x	x
3	Create and/or maintain a Lake Como webpage or Facebook page.			x			BCLA, CS	x	x	x	x	x
4	Continue holding regular public meetings of the BCLA to encourage constituent involvement and facilitate communication between the BCLA and other stakeholders.			x			BCLA	x	x	x	x	x
2.3 Implement and maintain AIS monitoring efforts												
1	Establish and maintain an in-lake and shoreline AIS monitoring program following CLMN guidelines.			x		x	BCLA	x	x	x	x	x
2	Establish and maintain an AIS rapid response plan in the event a new AIS is discovered in the lake.			x		x	BCLA, RP	x				
3.Promote and support nearshore, riparian, community, municipal, and watershed best management practices that will improve fish and wildlife habitat, reduce runoff, and minimize nutrient loading into Lake Como.												
3.1 Officially adopt the Wisconsin Healthy Lakes Inititive for Lake Como												
1	Provide information and education related to habitat improvement and runoff reduction projects that can be funded with Healthy Lake grants						BCLA	x	x	x	x	x
2	Offer at least one workshop annually focused on simple projects through the Healthy Lake Initiative that will improve habitat and reduce runoff.						BCLA	x	x	x	x	x
3.2 Install three or more Healthy Lake Initiative projects on Lake Como annually												
1	Identify property owners and community members interested in implementing Heathy Lakes projects that will improve habitat and reduce runoff.						BCLA, CS	x	x	x	x	x
2	Work with the City of Bloomer to identify municipal projects that will improve habitat and reduce runoff.						BCLA, CofB	x	x	x	x	x
3	Apply for Healthy Lakes grant funding to support projects that improve shoreland habitat and reduce runoff.	x					BCLA	x		x		x
3.3 Increase the amount of coarse woody habitat present along the shoreline												
1	Provide educational and informational materials to lake property owners that promote the benefits of coarse woody habitat in a lake.	x		x			BCLA, RP	x	x	x	x	x
2	Encourage property owners not to remove woody debris that falls naturally into the lake from their shoreline unless it presents a dangerous and/or undesirable condition.			x			BCLA	x	x	x	x	x
3	Work with the WDNR and other resource professionals to install at least one Fishsticks demonstration project possibly through a Healthy Lake Initiative project.	x					BCLA, WDNR, RP	x	x	x	x	x
4. Engage lake residents and visitors in being active lake stewards												
4.1 Encourage behavior changes in residents and uses in the following areas - shoreland development, AIS, aquatic vegetation, recreational practices, and responsibility for care of the lake												
1	Help lake residents to understand AIS concerns, identify and monitor for AIS within the lake, and report and/or remove what they find.			x			BCLA, RP	x	x	x	x	x
2	Encourage boaters to implement appropriate AIS prevention strategies on their watercraft.			x			BCLA, RP	x	x	x	x	x
3	Distribute educational and informational material related to being good lake stewards.			x		x	BCLA, RP	x	x	x	x	x
4.2 Encourage and support constituent participation in annual lake and AIS conferences												
1	Research and share dates and times for various lake and AIS conferences in MN and WI.						BCLA, CS	x	x	x	x	x
5. Develop a more comprehensive water quality management plan for Lake Como												
5.1 Request funding through the WDNR surface water grants to develop a comprehensive water quality management plan.												
1	Apply for lake management planning grant funding to support review of existing data, collection of new data, and development of a more comprehensive water quality management plan for Lake Como.			x			BCLA, RP	x	x			
6. Implement the Lake Como APM Plan effectively and efficiently												
6.1 Request grant funding through the WDNR surface water grants program to support the implementation of actions in the Lake Como APM Plan												
1	Apply for AIS Education, Prevention, and Planning and/or CBCW grants to support AIS management planning, summary reporting, plant surveys, watercraft inspections, AIS monitoring, and AI			x			BCLA, RP	x			x	
6.2 Complete annual project activity and assessment reports												
1	Use reports to make recommendations for annual revisions and updates to the APM Plan.			x			BCLA, RP	x	x	x	x	x
6.3 Complete End-of-project Summary Reporting												
1	Review overall project successes and failures and determine why certain results happened.			x			RP	x	x	x	x	x
2	Review goals, objectives, and actions from the 2020-2024 APM Plan for successful implementation.			x			BCLA, RP	x	x	x	x	x
3	Revise or rewrite the APM Plan on a five year basis.			x		x	RP					x
6.4 Build and supprt partnerships to support management planning and implementation												
1	Communicate with local, county, and state entities; schools and local business; clubs and organizations, etc. to generate support for management actions.			x			BCLA, CS	x	x	x	x	x
2	Share results from Action 1 with constituents and partners.			x			BCLA, RP	x	x	x	x	x

Implementers: BCLA, Bloomer Community Lake Association; CofB, City of Bloomer; CS, Community Stakeholders; RP, resource professionals/consultant; WDNR, Wisconsin Department of Natural Resources; CLMN, Citizen Lake Monitoring Network; AIS, aquatic invasive species; CBCW, Clean Boats, Clean Waters; EWM, Eurasian watermilfoil; APM, Aquatic Plant Management; PI, point intercept; AEPP, AIS Education Prevention and Planning grant

Appendix C

Calendar of Events

Appendix C - Lake Como Aquatic Plant Management Plan - Calendar of Actions

Action	January	February	March	April	May	June	July	August	September	October	November	December
Aquatic Plant Management Planning and Implementation												
Preliminary Aquatic Plant Management Planning												
Final Aquatic Plant Management Planning												
Chemical Application Permit Preparation												
Harvesting Application Permit Preparation												
Spring CLP Chemical Treatment												
Summer nuisance Chemical Treatment												
Harvesting of CLP												
Harvesting of Native Aquatic Plants												
Physical Removal of Aquatic Plants												
Prior Year End of Season Management Summary Report												
AIS Education and Prevention												
Inspect/repair/replace AIS Signage												
CBCW Time at the Landing												
AIS Education Events												
Wisconsin Lakes Conference (Steven's Point, WI)												
NW Lakes Conference (Spooner, WI)												
Newsletters												
Bloomer Community Lake Association Meetings												
Grant Preparation/Application												
CBCW Grant Preparation (annually)												
CBCW Grant Application Due Date												10-Dec
AIS Education Grant Application Preparation												
AIS Education Grant Application Due Date												10-Dec
AIS Control Grant Application Preparation												
AIS Control Grant Application Due Date		1-Feb										
Lake Management Planning Grant Preparation												
Lake Management Planning Grant Due Date												10-Dec
Identify Healthy Lakes Grant Projects (annually)												
Healthy Lakes Grant Application Preparation												
Healthy Lakes Grant Application Due Date		1-Feb										
Aquatic Plant Surveying												
CLP Bed Mapping												
Pre-Treatment PI Surveys												
Post-Treatment PI Surveys												
Monitoring and Surveys												
Complete CLMN AIS Lake Survey												
CLMN Water Quality Monitoring												
PI Surveys												
Other Project Preparation, Planning, and Implementation												
Fishsticks Installation												
Install Healthy Lakes Projects												