# Wolverine Lake

## Lake Management Plan Update

## 2012

Prepared by:

PLM Lake & Land Management
P.O. Box 132
Caledonia, MI 49316

# Wolverine Lake Management Plan Update, 2012

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# Wolverine Lake Management Plan Update, 2012

## Introduction

### *Purpose of the Update*

This management plan updates and documents management activities during 2012, examines current conditions in the lake, and provides management recommendations for 2013.

### *Characteristics of the Lake*

Wolverine Lake is a 270-acre lake located in Commerce Township, Oakland County, Michigan. Public access to the lake is provided by a public boat launch, located on the north shore of the lake. Most of the shoreline has been developed, with the exception of a sizeable wetland at the western end of the lake. The lake has a history of aquatic plant and water quality problems. Observations made while working on the lake indicate that the lake is used for fishing, water skiing, jet-skiing, boating (power and non-power), and swimming.

### *Management Goals for Wolverine Lake*

- The primary goal of aquatic plant management in Wolverine Lake is to control exotic aquatic plants so as to allow recreational use of the lake, protect native vegetation and promote a healthy fishery. The exotic plant species, Eurasian watermilfoil, Curly leaf pondweed and Starry stonewort, should be controlled throughout Wolverine Lake to the maximum extent possible.
- Species diversity and sufficient cover of native plants to provide fish habitat shall be maintained in the lake. Native plants should be managed to encourage the growth of plants that support the Wolverine Lake fishery (by creating structure and habitat) provided that they do not excessively interfere with recreational uses of the lake (e.g., swimming, water skiing, boating, and sailing) in high-use areas. Where they must be managed, management techniques that reduce the stature of plants without killing them (e.g., harvesting, contact herbicides) should be used whenever possible. Specific areas should be set aside where native plants will not be managed, to ensure adequate habitat for fish and other aquatic organisms. Muskgrass (Chara) should be allowed to grow throughout the lake, except where it grows so tall as to interfere with boating and swimming.
- The species Starry stonewort should be actively controlled and managed. Starry stonewort is in the same family as Muskgrass (Chara) but is considered to be an exotic invasive species. Starry stonewort, which looks very similar to the beneficial species Chara, is appearing in more and more lakes. Chara is a highly desired plant because it is typically low growing, keeps the water clear and can slow down the invasion of exotic weed species. Starry stonewort also forms dense mats, but unlike chara, it can grow from 5 to 7 feet tall. Starry stonewort can be very detrimental to a lake's ecosystem and has the ability to kill off native plants and have a negative impact on a lake's fisheries.
- The invasive terrestrial plants, Purple loosestrife and Phragmities should be controlled along the shoreline and adjacent wetlands where present. Both species are exotic and have the ability to displace beneficial native vegetation. Purple loosestrife grows 2 -4 feet tall and is a vibrant magenta color. It is very aggressive and can quickly become the dominant wetland vegetaion. Phragmites (common reed) is a wetland grass that ranges in height from 6 to 15 feet tall. "Phrag" quickly becomes the dominant feature in aquatic ecosystems, aggressively invading shorelines, wetlands, and ditches. This plant creates dense "strands" - walls of weeds crowding out beneficial native wetland vegetation and indigenous waterfowl habitats. Spreading by fragmentation and an extensive root system, Phragmites ultimately out-competes native plant life for sun, water and nutrients.

Phragmites

- Conditions in Wolverine Lake should not be allowed to deteriorate below present levels and lake and land management efforts should continue in an effort to improve the overall health of the lake. Also, an annual record of vegetation, water quality and management should be maintained.

# Lake Management Activities Conducted in 2012

## Planning/Evaluation

Complete surveys of the aquatic vegetation of the lake were conducted on April 27 and August 31, 2012. Vegetation checks were conducted on June 7, July 13, and August 17, 2012 to determine Eurasian Watermilfoil and Starry stonewort treatment areas, along with any areas that require harvesting.

## Water Quality

Water quality in the lake was evaluated on April 27 and August 31, 2012. Water samples were collected from three locations in Wolverine Lake (see attached map). On each occasion, Secchi disk depth, temperature and dissolved oxygen were measured and surface water quality samples were collected from the deep part of the lake and from the south and east arms of the lake for LakeCheck™ analysis. A depth profile of temperature and dissolved oxygen was also measured at one-meter (approximately three foot) intervals in the deepest part of the lake. LakeCheck samples were analyzed for conductivity, total dissolved solids, pH, alkalinity, total phosphorus and nitrates.

## Aquatic Plant/Weed Control

Herbicide treatments were performed on May 15, June 13, July 25 and August 29, 2012 on areas of Eurasian watermilfoil and Starry stonewort. The first herbicide treatment addressed approximately 70 acres of Eurasian watermilfoil and 70 acres of Starry Stonewort. The June 13 treatment addresses approximately 28 acres of EWM 70 acres Starry stonewort. The third treatment addressed 30 acres of Eurasian watermilfoil and 55 acres of Starry stonewort. The fourth treatment addressed 57 acres of Eurasian watermilfoil and 44 acres of Starry stonewort.

The late season planktonic algae blooms that occurred during the 2008 and 2009 seasons did not appear during the 2010, 2011 or 2012 seasons. We suspect the increased effort of starry stonewort control had a positive affect on the control of the planktonic algae. Although the previous year's blooms were very unsightly, they did not pose a direct risk to humans, fish or waterfowl. The water samples collected during the blooms did not indicate elevated levels of nutrients that may be expected with such a bloom. We will continue to monitor for planktonic algae and explore causes and possible solutions to this phenomenon.

Treatments of the planktonic algae may only provide limited, short-term relief in shoreline areas once a bloom has occurred. Preventative treatments may not be practical given nearly the whole waterbody would need to be treated regularly with copper products. This presents permitting, financial, and possibly non desirable non-target impacts.

**Table 1. Plant Species Found In Wolverine Lake, 2012**

| Common Name | Scientific Name |
|---|---|
| **Submersed Plants** | |
| Eurasian watermilfoil | *Myriophyllum spicatum* |
| Curly leaf pondweed | *Potamogeton crispus* |
| Starry stonewort | *Nitellopsis obtusa* |
| Illinois pondweed | *P. illinoensis* |
| Thinleaf pondweed | *Potamogeton spp.* |
| Largeleaf pondweed | P. amplifolius |
| Bladderwort | *Utricularia* spp. |
| Naiad | *Najas* spp. |
| Wild celery | *Vallisneria americana* |
| Muskgrass | *Chara* sp |
| American pondweed | *P. nodosus* |
| Coontail | *Ceratophyllum demersum* |
| **Floating-Leaved Plants** | |
| Water lily | *Nymphaea tuberosa* |
| Spatterdock | *Nuphar luteum* |
| Duckweed | *Lemna Minor* |
| **Emergent Plants** | |
| Cattail | *Typha latifolia* |
| Phragmites | *Phragmites australis* |

# Current Conditions in the Lake

## Aquatic Vegetation

Plant species found in the lake during 2012 are listed in Table 1. Eurasian watermilfoil was sparse throughout the lake with some of the densest areas in the Penny Lake Arm.

A few areas of the lake had abundant native plant growth, particularly the channel systems, but in general the diversity is rather low, most likely a result of the increasing density and coverage of the starry stonewort. Starry stonewort was found throughout the lake and has had a significant affect on the diversity and density of native and exotic plant species.

The spring survey conducted in late April showed moderate growth in the lake compared to previous years. This was a common occurrence throughout the state this season. Also, the fall survey indicates that the Starry stonewort is still the dominant plant species in the lake and is inhibiting the growth of native plants.

The native plant species in Wolverine Lake benefit the lake, performing such functions as stabilizing sediments and providing habitat for fish and other aquatic organisms. In general, native species cause few problems, compared with those caused by exotic plants. During 2012, the Starry stonewort became sufficiently dense to cause problems throughout the lake. The problem areas of Starry stonewort were "managed" through the use of mechanical harvesting and increased copper sulfate treatments. Additional treatments will most likely be needed in 2013 to effectively control the Starry stonewort growth.

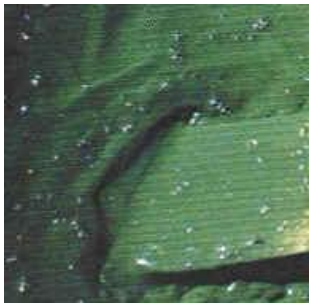
### *Starry stonewort*

Starry stonewort is in the same family as chara but is considered to be an exotic invasive species. Starry stonewort, which looks very similar to the beneficial species Chara, is appearing in more and more lakes. Chara is a highly desired plant because it is typically low growing, keeps the water clear and can slow down the invasion of exotic weed species. Starry stonewort also forms dense mats, but unlike chara, it can grow from 5 to 7 feet tall as evident on Wolverine Lake. Starry stonewort was first found in Lake St. Clair in the mid 1980's and has been moving west across the state. The plant is still considered "new" to Michigan and the State has not yet put it on the list of Noxious Invasive Species. Starry stonewort can be very detrimental to a lake's ecosystem and has the ability to kill off native plants and have a negative impact on the Wolverine Lake fisheries. It has been noted that in some lakes the bass have actually held their eggs and not released them due to inadequate spawning grounds. Positively identifying the chara as Starry stonewort does not change the management plan for the lake. The best management tool to control this species is a combination of Copper sulfate treatments and harvesting.

Starry stonewort

### *Planktonic Algae:*

Planktonic algae are a natural part of lakes and ponds and are the base of the aquatic food web. However, the composition of the algal community (blue green vs. green) and the density of the algae within the water body can vary greatly depending upon environmental conditions. Some factors that can influence planktonic algae blooms are available nutrient levels, adequate light penetration, competition from other algae and plants, and predation, or lack there of. Usually a significant algae bloom like the ones experienced previously on Wolverine Lake indicates an imbalance in one of the natural processes that take place within the lake. Although the lake has not experienced localized algae blooms in the past few years, determining the factors that contributed to the algae blooms will be crucial in attempting to avert a reoccurrence of such blooms in the future.



## *Water Quality*

(Detailed water quality results are attached.)

### *Temperature and Dissolved Oxygen Profiles*

Depth profiles of temperature and dissolved oxygen (attached) indicate that on April 27, the lake was not thermally stratified and was well oxygenated from the surface down to 10 meters. Dissolved oxygen concentrations were 11.12 to 10.44 mg/L at the surface and declined with increasing depth. On August 31, the lake was still thermally stratified, with a thermocline at approximately 7 meters. The epilimnion (i.e., water above the thermocline) was well oxygenated, with oxygen concentrations above 60 percent saturation. Conditions in the hypolimnion (i.e., water below the thermocline) were anoxic (i.e. devoid of dissolved oxygen) or nearly so. August dissolved oxygen concentrations were 7.9 to 9.3 mg/L at the surface, and only 1.8 mg/L at 10 meters of depth. The temperature and oxygen profiles observed during 2012 are fairly typical of a productive shallow lake. Substantial oxygen demand leads to rapid deoxygenation of the hypolimnion upon thermal stratification in the spring and oxygen concentrations are frequently low in bottom waters during the summer. Depletion of oxygen beneath the thermocline during the summer is a common symptom of eutrophication, and often leads to elevated internal nutrient loading as the result of the release of phosphorus from hypolimnetic sediments.

### *Conductivity Total Dissolved Solids, pH and Alkalinity*

Conductivity and Total Dissolved Solids (TDS) measure the total concentration of dissolved salts in the water. Values for Wolverine Lake indicate a high concentration of dissolved materials. Alkalinity and pH measure the amount of dissolved bases and the balance of acids and bases in the water. Alkalinity and pH values were within normal ranges for a hard water lake.

### *Secchi Disk Depths*

The Secchi disk depth is a measure of water clarity, determined by measuring the depth to which a black and white disk can be seen from the surface. (Larger numbers represent greater water clarity.) In May, the Secchi disk depth was 2.5 meters at the Deep Hole and South Arm. However, the East Arm had lower water clarity at 1.5 meters. In August, Secchi disk depths readings were 1.9 meters at all three sites.

### *Total Phosphorus*

Total phosphorus measures the total amount of phosphorus in the water. Phosphorus is an important plant nutrient (i.e., fertilizer) and the nutrient most likely to limit algal growth. Elevated phosphorus inputs to lakes caused by human activities are a major cause of cultural eutrophication. Total phosphorus concentrations in April ranged from 5 to 24 μg P/L in the main body and east arm of the lake with the highest value being in the South Arm (24 μg P/L). Phosphorus concentrations remained relatively stable into August with the Deep Hole recording 12 μg, the South Arm recording 23 μg P/L, while the East Arm site was 10 μg P/L. The range of phosphorus concentrations encountered in Wolverine Lake during 2012 indicates moderate to low phosphorus enrichment of the lake.

### *Nitrates*

Nitrates measure the total amount of in-organic nitrogen in the water. Nitrogen is an important plant nutrient (i.e., fertilizer) and the nutrient most likely to limit the growth of rooted plants. Overall, nitrate concentrations in the lake were low this season. Nitrate concentrations in the lake remained the same throughout the season at 300-330 μg N/L. Nitrate concentrations were well within the range expected for a developed, urban lake.

### *Evaluation of Trophic Status*

Carlson's Trophic State Index (TSI) calculated from Secchi disk depth and total phosphorus measurements yielded

**Table 2. Trophic State Index (TSI) Values**

| Site | Range of TSI values from Secchi Disk Depth | Range of TSI values from Total Phosphorus |
|---|---|---|
| Deep Hole | 42-44 | 23-36 |
| East Arm | 39-44 | 33-46 |
| South Arm | 48-51 | 40-45 |

values between 23 and 45 (see Table 2). Overall, these values rate Wolverine Lake as moderately eutrophic - eutrophic.

## Management Recommendations for 2013

The 2013 aquatic plant management program should detect and treat any areas where Eurasian watermilfoil is present and control the Starry stonewort as effectively as possible. Attempts to control planktonic algae will be considered anticipating a reoccurrence of 2008 and 2009 densities. In addition, the recently found area of Phragmites should be controlled to reduce its opportunity to spread to other areas.

Any areas of Eurasian watermilfoil should be promptly treated using herbicides. For the 2013 season we are recommending the use of systemic herbicides for the control of the Eurasian watermilfoil based on the unsatisfactory results with recent contact herbicide treatments. Treatments with the systemic herbicides, such as Triclopyr and 2,4-D should be conducted. The herbicides Triclopyr and 2,4-D, control Eurasian watermilfoil with little or no impact on most native plant species. Since they are systemic herbicides, they can actually kill Eurasian watermilfoil plants. Under ideal conditions, several consecutive annual applications of Renovate (triclopyr) or 2,4-D can reduce Eurasian watermilfoil to a maintenance (low) abundance. Recent Michigan regulation restricting 2,4-D use in the vicinity of drinking water wells may result in the inability to apply 2,4-D near the shoreline of the lake. Accurate well data must be obtained in areas that are being proposed for treatments. Any well that is found to be less than 30 feet deep, the treatment must take place at least 250 feet from the well head. Wells greater than 30 feet deep, a 75-foot isolation distance must be maintained. The Oakland County Health Department is a good resource to determine well depths and possible locations.

Triclopyr (Renovate) is a systemic herbicide with selectivity very similar to 2,4-D. Triclopyr is not subject to the well setback restrictions that currently affect 2,4-D. Therefore, triclopyr can be used to control Eurasian watermilfoil in near shore areas if necessary. A new granular formulation of Renovate was introduced in 2007. Renovate OTF is a granular herbicide that does not have well setback restrictions. PLM Lake & Land Management used the product on several lakes and has had good results. Renovate OTF is a possible solution to the on-going EWM problem near the Greenaway Drain.

Short-term control of curly leaf pondweed is easily achieved using low dose rates of a number of aquatic herbicides, including fluridone (Sonar), endothall (Aquathol-K, Hydrothol 191) and diquat (Reward). In the absence of long-term control techniques these contact herbicides should be used to control curly leaf pondweed in areas where it causes problems. Herbicide dose rates used to control curly leaf pondweed should be kept sufficiently low to minimize the impact on native plants.

Areas of Starry stonewort growth can be controlled using copper-based algaecides. Treatments should be confined to shallow areas where the Starry stonewort is present and interfering with recreation. Starry stonewort treatments should be performed at the beginning of the season and should be continually performed approximately every 3 - 4 weeks throughout the summer. This more aggressive approach will keep the Starry stonewort from reaching the nuisance levels that it has in past summers.

Mechanical harvesting of the Starry stonewort was implemented during the 2012 season. There were still areas of the lake that needed improvements but the Starry stonewort is fast growing and keeping up with continued growth is difficult. PLM will continue to note dense mats of nuisance Starry stonewort on survey maps and these locations will be priority areas for the harvesting operators for that month. Harvesting will not take place in areas that have been treated for Eurasian watermilfoil control for 10 days post treatment.

Planktonic algae treatments using copper based products may be suggested in an attempt to head off a lake wide bloom as seen in 2008 and 2009. Once a lake wide bloom has occurred, it may take several large scale treatments to reduce the density to manageable levels. More intensive and thorough biological assessment of the conditions contributing to the algae blooms is recommended and needed to establish a long term plan to address this issue.

Given ongoing water quality issues in the lake, water quality monitoring should continue in 2013. Frequent testing of waters entering the lake should be sampled for fecal bacteria. When concentrations

reach levels that are deemed unsafe for swimming by the state, the waters near the site should be closed for recreation until further testing can be done.

The recommended management program for 2013 consists of:

- A spring vegetation survey (to evaluate conditions in the lake and direct management efforts).
- Early summer herbicide treatment (to control any Eurasian watermilfoil and/or curly leaf pondweed areas that are found).
- Starry stonewort treatments (near shore), approximately every 3 - 4 weeks, or as needed.
- Continued harvesting of the Starry stonewort throughout the season.
- Mid summer herbicide treatment/Planktonic algae (to control any Eurasian watermilfoil areas that are found).
- Late summer herbicide treatment/Planktonic algae (to control any Eurasian watermilfoil areas that are found).
- Late summer Phragmites treatment.
- Water quality evaluation should continue.
- A fall vegetation survey.