



# Lake Orion

## Lake Management Plan Update 2024

Submitted By:

Steve Hanson, MS Fisheries Biologist

### PLM Lake & Land Management Corp.

PO Box 132 · Caledonia, Michigan 49316  
phone 616.891.1294 · fax 616.891.0371  
[www.plmcorp.net](http://www.plmcorp.net)



## Lake Management Plan Update

### Introduction

#### Purpose of the Update

This management plan updates and documents management activities during 2024, examines current conditions in the lake, and provides management recommendations for 2025. The plan will detail an integrated approach to lake management including but not limited to exotic weed control, water quality monitoring and aquatic vegetation surveying.

#### Characteristics of the lake

Lake Orion is an 470-acre lake located in Orion Township, Oakland County, Michigan. There is a Public Access Site located off Indianwood Road near the northeast corner of the lake. Much of the shoreline has been developed for single family, seasonal and year-round homes.

Rooted vegetation is moderate in a majority of the shoreline areas although some pockets of dense near shore vegetation exist. The majority of the aquatic vegetation is located along drop off areas and shallow flats. The lake has a history of aquatic plant problems, especially since the introduction of the exotic invasive species, Eurasian watermilfoil, curly leaf pondweed and Starry stonewort.

#### Management Goals for Lake Orion

- The primary goal of aquatic plant management in Lake Orion is the control of exotic aquatic plants. The exotic plant species, Eurasian watermilfoil, curly leaf pondweed and starry stonewort, should be controlled throughout Lake Orion. The abundance of these species should be reduced to the maximum extent possible, and efforts should be made to reduce their recovery after treatment.
- Aquatic plant management should preserve species diversity and cover of native plants sufficient to provide habitat for fish and other aquatic organisms. Native plants should be managed to encourage the growth of plants that support the Lake Orion fishery (by creating structure and habitat) provided that they do not excessively interfere with recreational uses of the lake (e.g., swimming and fishing) in high-use areas. Where they must be managed, management techniques that reduce the stature of native 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 provide habitat for fish and other aquatic organisms. Muskgrass (*Chara*) should be allowed to grow throughout the lake, except in where it grows so tall as to interfere with boating and swimming.
- The species Starry stonewort should be aggressively 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.



Starry stonewort

- The invasive terrestrial plants, Purple loosestrife and Phragmites 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 vegetation. 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 Lake Orion should not be allowed to deteriorate below present levels. Expansion of aquatic plant problems should trigger an adjustment in the aquatic vegetation management strategy. To support such responses, an annual record of vegetation and management should be maintained.
- Preventative measures that protect the lake from further nutrient enrichment should be identified and implemented.

## Lake Management Activities Conducted in 2024

### Water Quality

Water quality in the lake was evaluated in the spring and fall of 2024. On each occasion, a depth profile of water temperature and dissolved oxygen concentrations was measured at one-meter (approximately three foot) intervals and the Secchi disk depth was measured in the deepest part of the lake (Deep Hole Site). LakeCheck™ analysis was collected from the deep part of the lake. LakeCheck measures conductivity, total dissolved solids, pH, alkalinity, total phosphorus, soluble reactive phosphorus, nitrates and ammonia. A complete water quality report will be attached.

### Planning/Evaluation

A complete survey of the aquatic vegetation of the lake was conducted in September, 2024. Brief checks of the lake were made throughout the spring and summer months.

Vegetation surveys determine the locations of target and non-target plant species. The results of the surveys are used to determine the most appropriate management strategy. The vegetation surveys also document the success of the prescribed management program. An AVAS survey is the State of Michigan’s method for conducting a complete aquatic vegetation survey. The Aquatic Vegetation Assessment Site (AVAS) survey divides the parts of the lake capable of growing plants (littoral zone) into subareas and records the cover of each aquatic plant found in each “site”. This method of surveying takes into account not only the types of plant species present in the lake but also the densities of those species. AVAS surveys are also an excellent way to track plant species trends over time. A goal of invasive plant management is to have native plants increase while exotic plants decrease over time. The success of this goal can be illustrated through the use of the AVAS data collected over several years.

Since different native plants grow at varying times throughout the season it is important to evaluate the lake multiple times to account for *all* species in the lake. The first evaluation is conducted in the spring and is used to determine areas that will require treatment or management. The final survey is conducted in late summer or fall and is used to determine management success.

*Table 1: Common Submerged Plant Species Found in Lake Orion – September 2024*

Plant Name	Cover
Eurasian watermilfoil	<b>5.4</b>
Curly leaf Pondweed	<b>0.34</b>
Chara	7.08
Thinleaf Pondweed	2.08
Illinois pondweed	4.10
Large leaf pondweed	5.55
Wild celery	14.42
Northern watermilfoil	1.69
Coontail	0.76
Bladderwort	0.37
Starry Stonewort	<b>5.10</b>

## Current Conditions in the Lake

### Aquatic Vegetation

Lake Orion supports a relatively high diversity of native aquatic plants. Fourteen native species of aquatic plants were encountered in the September 2024 survey of the lake (Table 1). Rooted plant growth is moderate in most shoreline areas as the survey results show.

All of the plants listed in Table 1 are native North American species, except Eurasian watermilfoil, Curlyleaf pondweed and Starry stonewort. Eurasian watermilfoil was found at a low to medium density in some shoreline areas during the September survey. Starry stonewort density is continuing to decrease from highs during the 2015 season.

The native plant species in Lake Orion 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. Three native species commonly found in higher densities on Lake Orion are Chara, Illinois pondweed and Wild celery.



### Aquatic Plant Control

Eurasian watermilfoil, Curly leaf pondweed and Starry stonewort were found in medium to high densities in the shoreline areas during the spring and early season surveys. These areas were treated on May 20th,

2024. A total of 124 acres of Eurasian watermilfoil/curly leaf pondweed were treated using Diquat. In addition, 70 acres of Starry stonewort was treated in shoreline areas.

Follow up surveys indicated delayed growth of Curlyleaf pondweed and Eurasian watermilfoil was establishing in other shoreline areas. These areas were treated on June 17th (64.5 acres) along with 33.3 acres of shoreline algae & Starry stonewort.

On July 15th, 43.5 acres of EWM were treated using Diquat. In addition, 72 acres were treated for shoreline Starry stonewort and 3.75 acres of mixed exotics were treated with flumioxazin.

On August 12<sup>th</sup>, treatment consisted of 75 acres for Eurasian watermilfoil and Starry stonewort in shoreline areas.

## Water Quality Monitoring

Water quality monitoring is a critical part of lake management. Water quality monitoring provides an ongoing record of conditions in a water body. Changes in water quality can indicate threats from sources such as failed or inadequate septic systems, agricultural and lawn runoff, burgeoning development and erosion from construction site. Prompt identification of threats to water quality makes it possible to remedy them before irreversible harm has been done. Riparian's enjoyment of the water resource and the value of their property depend on maintaining water quality.

(Detailed water quality results are attached.)

## Temperature and Dissolved Oxygen Profiles

Depth profiles of temperature and dissolved oxygen indicate that on April 16, the lake was not thermally stratified. The lake was well oxygenated, with an oxygen concentration in the Deep Hole Site of 11.2 mg/L (105% saturation) at the surface and 11.5 mg/L (100% saturation at 10 meters).

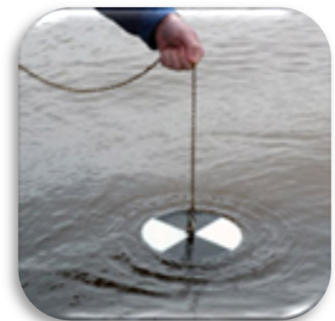
On September 5th, the lake was not thermally stratified. Dissolved oxygen was adequate from the surface to 10 meters. September dissolved oxygen concentrations at the surface were 10.0 mg/L (120% saturation), and the concentration at 10 meters depth was 3.3 mg/L (38 % saturation).

## 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 Lake Orion indicate low concentrations 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 soft 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 April, the Secchi disk depth was 3.3 meters. The September Secchi disk depth was more at 4.8 meters.



## 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. The total phosphorus concentration at the surface in the Deep Hole in April was <math><10\ \mu\text{g P/L}</math>. In September, the lake was not thermally stratified and the deep hole had a concentration of <math><10\ \mu\text{g P/L}</math>.

The concentration of phosphorus encountered in Lake Orion during 2024 indicates low to moderate phosphorus concentration of the lake. Overall, the phosphorus concentrations observed during the 2024 season are similar to other lakes in the area with similar physical characteristics.

## 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 moderate to low. In April & September, nitrate concentrations in the deep hole site was <230 µg N/L. Nitrates values observed during the 2024 season continue to indicate low to moderate levels in the lake.

## Evaluation of Trophic Status

Carlson’s Trophic State Index (TSI) calculated from Secchi disk depth total phosphorus and chlorophyll measurements made in April and September yielded values between 43 and 33 (see Table 2). These values overall rate Lake Orion as meso-oligotrophic to mesotrophic.

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

<b>Site: Deep Hole</b>	TSI from Secchi Disk	TSI from Total Phosphorus	TSI from Chlorophyll
<b>April</b>	43	33	NA
<b>September</b>	38	33	NA

## Management Recommendations for 2025

Management options are dependent on many factors, including but not limited too, species abundance (density), species richness, species location and many lake characteristics. Whenever an exotic species is found within an aquatic environment, action needs to be taken to prevent long term ecological damage as well as recreational and aesthetic loss that will take place.

## Submersed Aquatic Plants

### Conventional Herbicide treatments

The 2025 aquatic plant management program should detect and treat any areas where Eurasian watermilfoil or Starry stoneworts are detected. In addition, spring growth of Curlyleaf pondweed should be treated where it has the potential to cause recreational problems. If native plants become sufficiently dense to interfere with recreation, harvesting or chemical treatments may be recommended.

Areas of Eurasian watermilfoil should be promptly treated using herbicides. Depending upon the location and timing either systemic or contact herbicides should be applied.

Starry stonewort is best controlled with copper-based products or Flumioxazin. Typically, several treatments during the season are required to keep areas of Starry stonewort under control and reduce the chance of spreading to other parts of the lake.

Nuisance native plant management can also be incorporated into a lake management program with conventional herbicide treatments or mechanical harvesting if needed. Native plant treatments are completed using only contact herbicides in shoreline residential areas.

## Monitoring

Aquatic vegetation and water quality will be monitored to document the condition of the lake and to provide warning of any changes in the condition of the lake that need to be addressed by additional lake management activities.

## The Recommended Management Schedule for 2025:

- A spring vegetation survey (to evaluate conditions in the lake and direct management efforts)
- Water quality evaluation should continue
- Early summer herbicide treatment (to control any Eurasian watermilfoil, Curly leaf pondweed and Starry stonewort)
- 3-4 week starry stonewort treatments if required
- Mid-summer herbicide treatments
- Mid-summer water quality sampling
- Late summer herbicide treatment, if required
- A fall vegetation survey
- Fall water quality sampling