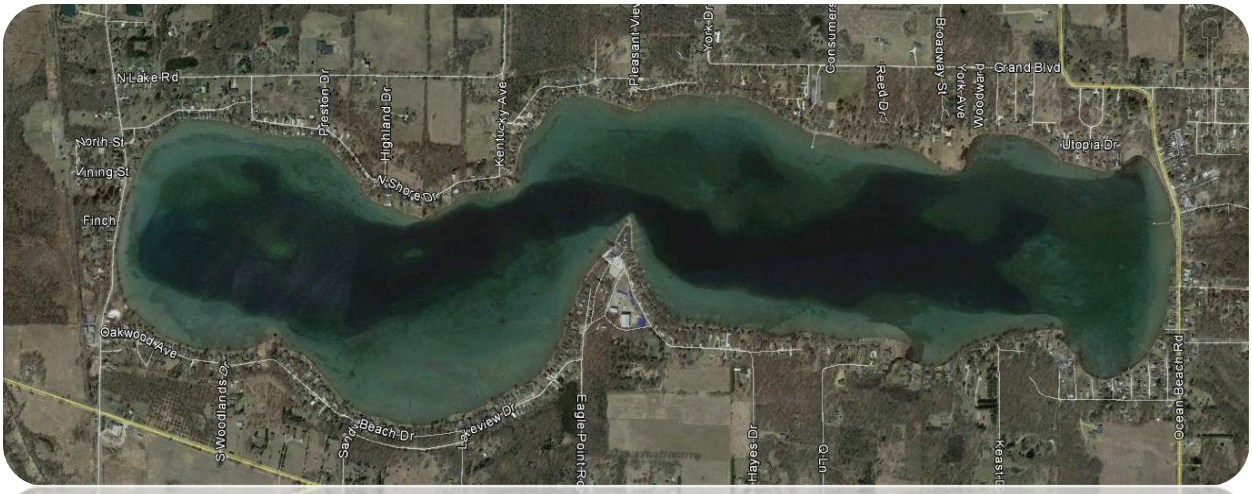

Clark Lake

Lake Management Plan Update 2020

Submitted By:

Steve Hanson, MS Fisheries Biologist

PLM Lake & Land Management Corp.

10785 Bennett Drive, Morrice MI 48857
phone 616.891.1294 · fax 616.891.0371
www.plmcorp.net

Lake Management Plan Update

Introduction

Purpose of the Update

This management plan updates and documents management activities during 2020, examines current conditions in the lake, and provides management recommendations for 2021. 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

Clark Lake is a 577-acre lake located in Columbia Township, Jackson County, Michigan. Public boat access to the lake is provided by a Columbia Township owned boat launch, located at the west end of the lake. Much of the shoreline has been developed for single family seasonal and year-round homes. The lake drains into Goose Creek at the east end of the lake. Goose Creek flows into the River Raisin and ultimately empties into Lake Erie.

Rooted vegetation is sparse in a majority of the shoreline areas although some pockets of near shore vegetation exist. The majority of the aquatic vegetation is located along drop off areas and shallow flats. The lake has a relatively short history of aquatic plant problems. The introduction of the exotic invasive species, Eurasian watermilfoil, most likely went unnoticed for several years. The majority of the Eurasian water milfoil is located in deeper (8-12 feet) with very few pockets in near shore areas. The first formal lake vegetation survey was conducted by PLM during the fall of 2014. This survey found that Eurasian water milfoil was in approximately 32% of the 63 sites surveyed. In addition, genetic testing of the milfoil plants by Grand Valley State University found that many of the samples collected were of a hybrid milfoil, a cross between native milfoil and the exotic Eurasian watermilfoil. Hybrid milfoils tend to be more difficult to control and grow back rapidly following control efforts. Management efforts to date have focused on controlling this hybrid milfoil in Clark Lake.

Management Goals for Clark Lake

- The primary goal of aquatic plant management in Clark Lake is the control of exotic aquatic plants. The exotic plant species, Eurasian watermilfoil and Starry stonewort, should be controlled throughout Clark Lake. 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 Clark Lake 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, recently found in Clark Lake, should be actively controlled and managed. Starry stonewort is a macro-algae and is in the same family as Muskgrass (Chara), but is considered to be an exotic invasive species.

Starry stonewort

Chara is a highly desired species 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.

- Conditions in Clark Lake 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 nutrient enrichment should be identified and implemented.

Lake Management Activities Conducted in 2020

Water Quality

Water quality in the lake was evaluated in the spring and fall of 2020. 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.

Planning/Evaluation

A complete survey of the aquatic vegetation of the lake was conducted in September, 2020. Brief checks of the lake were made throughout the 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 second survey is conducted in late summer or fall and is used to determine management success.

Current Conditions in the Lake

Aquatic Vegetation

Clark Lake supports a diverse community of aquatic plants. Ten native species of aquatic plants were encountered in the September 2020 survey of the lake (Table 1). Rooted plant growth is low in most shoreline areas as the survey results show.

During the September survey, only two of the sixty-five survey sites contained Eurasian watermilfoil. Both sites are in the northeast corner of the lake, adjacent to the County Park. Although the plants were clearly impacted by treatment, it appears as though some of the plants may survive. This particular area

has contained a persistent milfoil that has been difficult to control with previous management efforts as well.

The species Starry stonewort was also found in Clark Lake during the 2020 season. It was first identified in the northeast corner of the lake where it was treated with copper sulfate on August 8th. The September vegetation survey also located it at the boat launch and around the peninsula on Eagle Point. In total, Starry stonewort was found in four of the sixty-five survey sites.

Table 1. Common Aquatic Plants in Clark Lake, September 2020

Species#	Common Plant Name	Lake-wide Cover
1	Eurasian watermilfoil	0.34
3	Chara	4.58
10	Illinois pondweed	4.92
13	Floating leaf pondweed	0.15
15	Wild celery	1.92
17	Northern watermilfoil	0.8
22	Bladderwort	0.52
27	Sago Pondweed	3.49
29	Starry Stonewort	0
30	Water Lily	0.51
37	Pickerelweed	.02
40	Bulrush	0.15

All of the plants listed in Table 1 are native North American species except for Eurasian watermilfoil. These exotic plants cause considerably more problems than most native species. Eurasian watermilfoil can attain nuisance levels of growth at almost any time of year. Although Starry stonewort was not found during the September survey, it is known to be present in the lake. Both species are notorious for displacing native plant species and altering aquatic habitats.

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

Chara

Illinois pondweed

Wild celery

Aquatic Plant Control

The 2020 management program focused on control of hybrid milfoil & Starry stonewort. On July 29th, a 2.5 acre area was treated at the east end of the lake for hybrid milfoil using ProcellaCOR. In addition, 2 acres of starry stonewort were treated using copper sulfate.

Water Quality Monitoring

Water quality monitoring is a critical part of lake management. Water quality monitoring provides an ongoing record of conditions in a waterbody. 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. A full water quality report is attached.

Temperature and Dissolved Oxygen Profiles

Depth profiles of temperature and dissolved oxygen indicate that on April 27 the lake was not yet thermally stratified. The lake was well oxygenated, with an oxygen concentration in the Deep Hole Site of 11.5 mg/L (101% saturation) at the surface and 10.4 mg/L (89% saturation at 10 meters).

On September 30th, the lake was not thermally stratified. Dissolved oxygen was plentiful from the surface to 10 meters. September dissolved oxygen concentrations at the surface were 8.7 mg/L (90 % saturation), and the concentration at 10 meters depth was only 7.5 mg/L (71 % 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 Clark Lake 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 6.0 meters. The September Secchi disk depth was less at 3.5 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 13 μg P/L. By September, concentrations were somewhat less than to those found in April. The deep hole had a concentration of <10 μg P/L.

The concentration of phosphorus encountered in Clark Lake during 2020 indicates low to moderate phosphorus concentration of the lake. Overall, the phosphorus concentrations observed during the 2020 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, nitrate concentrations in the deep hole site was <230 μg N/L at the surface. By September, nitrate concentrations remained the same at <230 μg N/L. Nitrates values observed during the 2020 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 30 and 33 (see Table 2). These values overall rate Clark Lake as meso-oligotrophic to mesotrophic.

Table 2. Trophic State Index (TSI) Values

Site: Deep Hole	TSI from Secchi Disk	TSI from Total Phosphorus	TSI from Chlorophyll
April	34	37	NA
September	42	33	NA

Management Recommendations for 2021

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

Herbicide treatments

The 2021 aquatic plant management program should detect and treat any areas where Eurasian watermilfoil and Starry stonewort are found. Native plants should not be managed as they are not posing an ecological or recreational problem on the lake.

Areas of Eurasian watermilfoil that persist from the 2020 treatment program should be spot treated with the herbicide ProcellaCOR. The area targeted with ProcellaCOR during the 2020 season will be monitored for duration of effects. A final treatment plan for ProcellaCOR will be established after the spring 2021 vegetation survey.

Monitoring for Starry stonewort should take place through the spring and early summer months. Any areas that it is found should be treated promptly to help prevent the spread of this species.

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 2021:

- A spring vegetation survey (to evaluate conditions in the lake and direct management efforts)
- Water quality monitoring should continue
- Early summer herbicide treatment (to control any Eurasian watermilfoil and/or Starry stonewort areas that are found)
- Mid summer herbicide treatment, if required
- Mid-summer water quality sampling
- Late summer herbicide treatment, if required
- A fall vegetation survey
- Fall water quality sampling