

The Manistee Lake Improvement Program – A Successful Collaboration

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One of the major challenges in lake management is finding a way to get everyone on the same page and moving in the right direction. Another consideration is determining what entity will take the lead in advancing a project. At the urging of the Manistee Lake Association, a statutory lake improvement board was established for Manistee Lake in 2005 to develop and implement a lake improvement plan. The lake improvement board provided a single point of responsibility and helped to foster the collaboration that was essential to the success of this project.

The Manistee Lake Improvement Board includes a Kalkaska County Commissioner, the Kalkaska County Drain Commissioner, the supervisors of both Coldsprings Township and Excelsior Township, and a riparian property owner. The riparian representative on the lake board also sits on the board of directors of the Manistee Lake Association and acts as a liaison between the lake improvement board and the lake association board. This article describes the current state of the lake, ongoing management initiatives, and how various entities are collaborating to manage the lake.

Manistee Lake and its Watershed

Manistee Lake is a relatively large shallow lake located in northern Kalkaska County. A summary of the physical characteristics of Manistee Lake and its watershed are included in Table 1.

Table 1 – Manistee Lake and Watershed Characteristics

Lake Surface Area	876 Acres
Maximum Depth	18 Feet
Mean Depth	7 Feet
Lake Volume	6,132 Acre-Feet
Shoreline Length	7.6 Miles
Shoreline Development Factor	1.8
Lake Elevation	812.5 Feet
Watershed Area	6,600 Acres
Ratio of Lake Area to Watershed Area	1:7.5

With a surface area of 876 acres, Manistee Lake is a relatively large lake. However, despite its size, the lake is shallow with a maximum depth of 18 feet, and a mean or average depth of about 7 feet (Figure 1). Much of the lake is shallow enough to support aquatic plant growth. The shoreline of Manistee Lake is over 7 miles long.

The Manistee Lake watershed is approximately 6,600 acres in area, a land area about 7.5 times larger than the lake itself. Much of the watershed is forest or wetland. However, most of the land

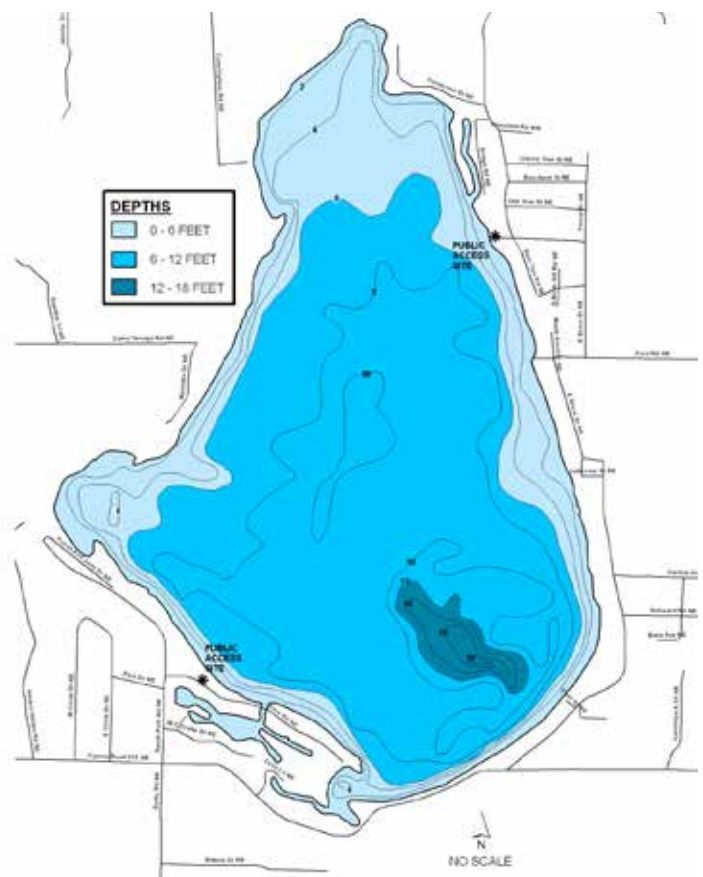


Figure 1 - Manistee Lake Depth Contour Map

immediately adjacent to the lake has been developed (Figure 2). Currently, over 300 homes and cottages border the lake.

Manistee Lake forms the headwaters of the North Branch of the Manistee River. Water flows from the outlet at the south end of the lake in a southwest direction into the main branch of the Manistee River and on to Lake Michigan at the city of Manistee. The elevation of Manistee Lake is over 600 feet higher than Lake Michigan.

(Continued on page 24)

The Manistee Lake Improvement

(Continued from page 23)



Figure 2 – Manistee Lake Watershed Land Cover Map

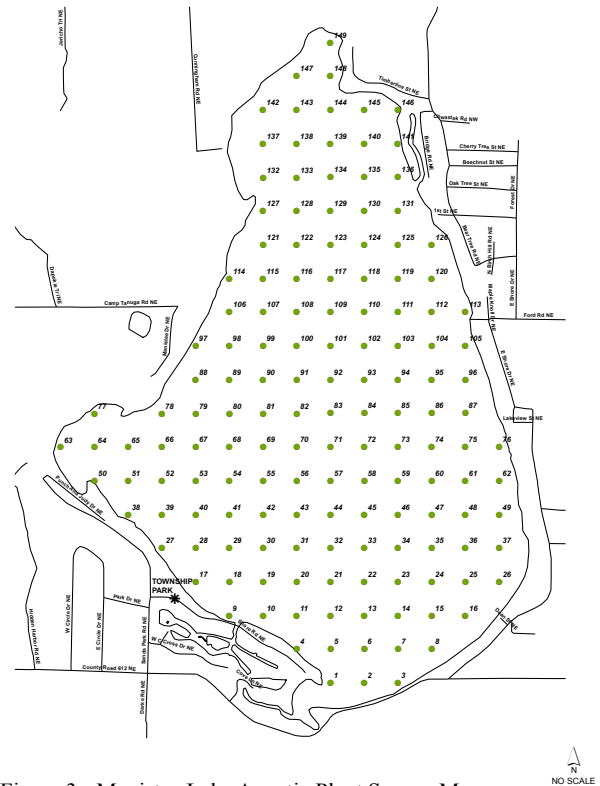


Figure 3 - Manistee Lake Aquatic Plant Survey Map

The Plan

In order to address both short- and long-term management issues in Manistee Lake, a multi-faceted improvement plan was developed. Key components of the plan include aquatic vegetation monitoring, aquatic plant control, water quality monitoring, watershed management, and fisheries management.

In 2007, public hearings were held and a three-year improvement project was approved for the years 2008 through 2010. In 2011, another public hearing was held and it was agreed that surplus funds accrued in the initial three-year project could be used to extend the project for two years, without having to collect additional assessments. In 2012, additional public hearings were conducted and there was broad support to extend the term of the project five years (2013 – 2017).

Aquatic Plant Monitoring

Each year, aquatic plants are surveyed in Manistee to evaluate the relative abundance of all plant species in the lake and to detect infestations of invasive species. With each survey, plants are collected at 149 locations identified with a global positioning system (Figure 3). At each sampling location, a double-sided thatch rake attached to a line is used to collect plant samples. A total of sixteen plant species have been identified in

Manistee Lake. The most common species are broadleaf plants including large-leaf, whitestem, and Richardson's pondweed. These types of plants provide excellent fish cover and habitat. Eurasian milfoil (*Myriophyllum spicatum*) has been the only exotic species observed in Manistee Lake. In addition to vegetation monitoring, lake level is recorded each year to evaluate seasonal and year-to-year variation in lake level, and the impact fluctuating water levels may have on plant growth in the lake.

Aquatic Plant Control

In order to control the spread of Eurasian milfoil, milfoil weevils (*Eurhychiopsis lecontei*) have been stocked in Manistee Lake on a periodic basis since 1999 (Table 2, Figure 4). In total, 138,000 weevils have been stocked and additional stocking is planned. The weevils feed exclusively on milfoil species, especially Eurasian milfoil. Researchers have documented declines in Eurasian milfoil in some lakes as the result of weevil feeding. These declines have been attributed largely to the burrowing and tunneling action of weevil larvae that cause the milfoil plant to lose buoyancy and fall from the water column. It is hoped that continued stocking in Manistee Lake will result in a sustained weevil population sufficient to provide long-term milfoil control. The annual vegetation monitoring surveys are being used to evaluate the efficacy of the weevils in controlling milfoil.

(Continued on page 25)

The Manistee Lake Improvement

(Continued from page 24)

Table 2 - Manistee Lake Weevil Stocking History

1999	10,000
2000	30,000
2001	10,500
2007	20,000
2010	20,000
2011	18,000
2012	30,000
Total	138,500



Figure 4 - The Milfoil Weevil (*Euhrychiopsis lecontei*)

Milfoil weevil photography courtesy of Tom Alwin and Michigan State University Department of Fisheries and Wildlife.



Figure 5 - Manistee Lake Guidebook for Homeowners

Water Quality Monitoring

Each year, samples are collected from multiple locations in Manistee Lake to gauge the overall health of the lake. A summary of the data collected to date is provided in Table 3.

Historical and recent water quality data indicate that Manistee Lake maintains good water quality. Total phosphorus and chlorophyll-a levels are relatively low and algae growth in the open waters of the lake is minimal. The Secchi transparency in Manistee Lake appears to be influenced more by natural tannins (which impart a tea-colored appearance to the water) than algae growth in the water column. Continued water quality monitoring will provide a benchmark from which to gauge future changes in water quality.

Table 3 – Manistee Lake Water Quality Summary Statistics (2008 – 2012)

	Total Phosphorus (µg/L)	Secchi Transparency (feet)	Chlorophyll-a (µg/L)
Average	13	7.7	2
Standard deviation	10	2.4	2
Median	9	7.0	2
Minimum	2	4.0	0
Maximum	42	11.0	6
Number of samples	74	13	32

Watershed Management

Watershed management will be essential to preserving the water quality of Manistee Lake over the long term. Fortunately, much of the Manistee Lake watershed is forest or wetland, and pollution from these areas is minimal. However, as with most lakes, much of the shoreline bordering the lake is developed. If not properly managed, these developed shoreland areas have the potential to contribute fertilizer, oil and gas residues, septic effluent and other pollutants to the lake. To help address this potential, a guidebook for homeowners was created that contained information on lake water quality, ongoing monitoring programs, the lake fishery and recommendations and guidance for septic system maintenance,

lakeside lawn care, fertilizer use, greenbelts, rain gardens and other practices to protect the lake (Figure 5). Copies of the guidebook were mailed twice to all property owners around the lake.

Fisheries Management

Manistee Lake supports a healthy warm- and cool-water fishery. However, the lake is too shallow to support cold-water fish species like trout. In a 2004 survey of the lake by the Department of Natural Resources (DNR), 21 different fish species were found in the lake. Game fish in the lake include walleye, largemouth bass, smallmouth bass, bluegill, black crappie, pumpkinseed sunfish, northern pike, and yellow perch.

Fishing is a popular pastime in Manistee Lake and walleye are one of the most sought-after game fish. Manistee Lake has been stocked with walleye on a periodic basis since the early 1900's, with the most extensive stocking occurring since the early 1980's. In addition to stocking, some natural reproduction of walleye occurs in Manistee Lake. However, stocking is required to sustain the walleye fishery.

Recent DNR survey results indicate that about 50% of the total fish biomass in Manistee Lake is white suckers. White suckers often compete with perch and other fish for food. In an attempt to reduce the number of white suckers, the Manistee Lake Improvement Board and the Manistee Lake Association worked with the DNR to obtain permits to conduct a white sucker netting program. Beginning in the spring of 2007 and continuing each spring from 2010 to 2012, several thousand white suckers were netted and removed from the lake as they moved into the shallows to spawn (Figure 6). Captured suckers were distributed to the public free of charge. The DNR is planning additional surveys of Manistee Lake to evaluate the overall health of the fishery and the effects of the white sucker removal program. As this project moves forward, the Manistee Lake Improvement Board and the Manistee Lake Association are planning to continue periodic spring sucker netting and are exploring methods to enhance natural walleye reproduction in the lake, perhaps through the construction of artificial spawning reefs.

(Continued on page 26)

The Manistee Lake Improvement

(Continued from page 25)



Figure 6 – Manistee Lake Sucker Removal

Conclusion

All lake improvement projects have their own challenges. On Manistee Lake, a statutory lake improvement board proved the ideal vehicle to move the project forward. This was especially true because Manistee Lake is located in two separate townships; trying to coordinate activities between two townships, while not impossible, would have been an administrative challenge.

A major challenge in any lake improvement project is finding a way to equitably finance the project. The annual budget for the Manistee Lake project is \$39,000. The project is being financed through a special assessment district that includes all waterfront properties and back lots with deeded or dedicated lake access. When this cost is spread to properties within the special assessment district, the annual assessment for a typical waterfront property is \$130 and back lot properties are assessed \$65. All things considered, these costs were considered reasonable.

Another consideration in the implementation of a lake improvement plan is the need for a study to determine the scope and cost of management options. The study is an important first step in that it provides a basis for future discussion and decision-making.

This project demonstrates effective collaboration in which several partners came together and worked to improve conditions in Manistee Lake. To find out more about the project, visit www.manisteelake.org.



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