The Houghton Lake Management Plan

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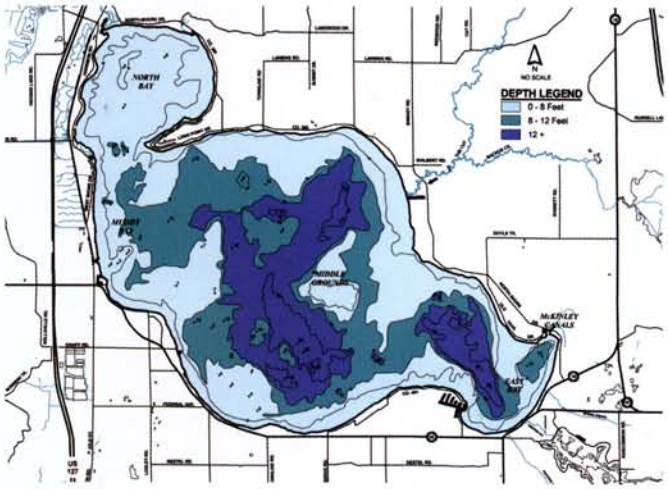
Introduction

With a surface area of 20,044 acres, Houghton Lake is Michigan's largest inland lake. It covers about one-quarter of Lake Township and sizable portions of Denton, Markey, and Roscommon Townships in Roscommon County. However, despite its vast area, the lake is relatively shallow. Houghton Lake has a maximum depth of 21 feet and an average depth of less than nine feet. Thus, Houghton Lake contains extensive shallow waters suitable for rooted plant growth.

How do other lakes compare?

Lake	County	Acres
Torch Lake	Antrim	18,770
Mullett Lake	Cheboygan	17,360
Lake Charlevoix	Charlevoix	17,260
Burt Lake	Cheboygan	17,120
Lake Gogebic	Ontonagon and Gogebic	12,800
Manistique Lake	Mackinac and Luce	10,130
Crystal Lake	Benzie	9,711
Higgins Lake	Roscommon	9,600
Hubbard Lake	Alcona	8,850
Hamlin Lake	Mason	4,990
Glen Lake	Leelenau	4,865
Walloon Lake	Charlevoix and Emmet	4,320
Lake Mitchell	Wexford	2,580
Lake St. Helen	Roscommon	2,390
Lake Missaukee	Missaukee	1,880

In recent years, whole-lake surveys have been conducted to determine the type and distribution of plants in Houghton Lake. **Of special concern is a plant called Eurasian milfoil** (*Myriophyllum spicatum*). Eurasian milfoil is an invasive aquatic plant that was first introduced to the United States in the 1940's. Although it is an exotic species, it is currently widespread in the state. Eurasian milfoil is problematic in that it often establishes early in the growing season and



can grow at greater depths than most plants. Eurasian milfoil can proliferate and spread via vegetative propagation, in which small pieces break off, take root, and grow. It often forms a thick canopy at the lake surface that can seriously hinder recreational activity. Eurasian milfoil generally provides poor fish habitat when compared to native plant species. **Once introduced into a lake, Eurasian milfoil may out-compete and displace more desirable plants and become the dominant species.** During the 1990s, Eurasian milfoil spread throughout much of Houghton Lake. By 2001, Eurasian milfoil infested nearly 11,000 acres of the lake and was common to dense in approximately 5,300 acres of the lake.

Recognizing the need to effectively manage Houghton Lake, the Houghton Lake Improvement Board was established in 2000 under provisions of Michigan's Natural Resources and Environmental Protection Act. In accordance with state law, the lake board is composed of a representative of each of the four townships that border the lake, a county commissioner, the county drain commissioner, and a lakefront property owner. Several members of the Houghton Lake Improvement Board are lake residents. The Lake Board has made the coordinated management of Houghton Lake possible.

In 2001, the Houghton Lake Management Feasibility Study was prepared for the lake board (Smith et al. 2001). The study included a description of the physical characteristics of Houghton Lake and its watershed, an evaluation of water quality conditions, a discussion of the fishery in Houghton Lake, and detailed mapping of aquatic vegetation. Various alternatives were identified to control the spread of Eurasian milfoil in Houghton Lake. Study findings were the basis for the Houghton Lake Management Plan. **Key components of the plan include invasive species control, aquatic plant surveys, information and education, water quality monitoring, watershed management, and fisheries management.**

After many public meetings and hearings to obtain input from residents, the lake board approved the plan and established a special assessment district to fund the project. The special assessment district includes all property bordering the lake and businesses located near the lake, over 5,000 properties total. The first phase of the management plan began in 2002 with a whole-lake treatment for milfoil control.

Milfoil Control

Houghton Lake contains abundant aquatic vegetation. Over 25 different plant species have been observed in the lake and about half of the lake contains plant growth (Progressive AE 2009). Aquatic plants are important in the lake in that they help to stabilize bottom sediments, produce oxygen, and

Eurasian milfoil
Myriophyllum spicatum

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provide valuable fish habitat and cover. The objective of the plant control effort in Houghton Lake was to selectively control the nuisance plant Eurasian milfoil without significantly impacting beneficial plant species. **Because of its ability to spread by fragmentation, mechanical harvesting is generally not recommended to control Eurasian milfoil.** Most often, Eurasian milfoil is controlled via the application of a systemic herbicide. Systemic herbicides kill the entire plant, unlike contact herbicides that leave the roots intact. In 2002, Houghton Lake was treated with a systemic herbicide called fluridone (trade name Sonar®) to control Eurasian milfoil.

Houghton Lake in 2000 before Sonar®AS treatment. Source: ReMetrix, LLC

Houghton Lake in 2002 after Sonar®AS treatment. Source: ReMetrix, LLC

The treatment was conducted using Michigan's "6-bump-6" protocol. With this approach, Sonar is applied at an initial concentration of 6 parts per billion. The dose is calculated based on the volume of the upper 10-foot strata of water in the lake. About two weeks after the initial treatment, the concentration of Sonar in the lake is measured and the lake is treated again to bring the concentration back up to 6 parts per billion. This approach provides selective control of Eurasian milfoil without significantly impacting most other plant species. **Eurasian milfoil declined from more than 11,000 acres before the Sonar treatment to 32 acres one-year post treatment.** Extensive sampling of Houghton Lake was conducted under the direction of U.S. Army Corps of Engineers to monitor treatment impacts. The results of sampling in 2002 indicate that water quality in Houghton Lake remained similar to the 2001 pretreatment condition (Heilman et al. 2003). No algae blooms or dissolved oxygen depletion occurred in Houghton Lake.

Since the Sonar treatment was completed in 2002, vegetation surveys of the entire lake have been conducted each year to evaluate plant species composition and to identify the location of Eurasian milfoil beds (Progressive AE 2009, Remetrix, LLC 2008). Spot-treatments with herbicides have been performed annually to prevent Eurasian milfoil from regaining dominance in the lake. Since the Sonar treatment, measures to control Eurasian milfoil have been limited to relatively small portions of the lake. **In 2009, seven years after the Sonar treatment, less than 9% of Houghton Lake required treatment.**

Information and Education

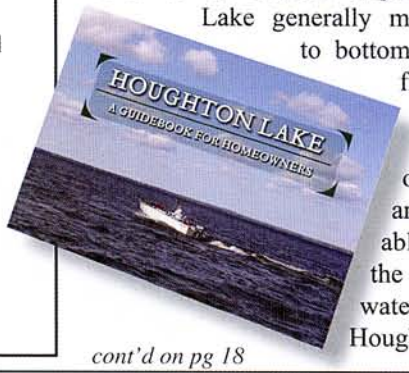
Information dissemination has been an important component of the management plan. Each year, all property owners in the district receive a newsletter that describes current project issues and activities. The lake board meets monthly during the summer months and all lake residents are notified regarding meeting dates and locations. The lake board provides regular project updates via e-mail to over 600 interested parties.

The lake board has posted large signs at public launch facilities around the lake with guidance on how to prevent the spread of invasive species in Houghton Lake.

In 2006, The Houghton Lake Improvement Board produced a publication entitled Houghton Lake – A Guidebook for Homeowners. The guidebook contained information on the ecology of Houghton Lake and its watershed, and provided lake protection guidelines to all homeowners in the special assessment district. **The Houghton Lake Improvement Board has developed a web site with a wealth of information about Houghton Lake (houghtonlakeboard.org).**

Water Quality

For the past several years, samples have been collected from Houghton Lake on an annual basis to evaluate baseline water quality conditions (Progressive AE 2009). Due to its shallow depth, Houghton Lake generally mixes surface to bottom during ice-free periods. Thus, the lake is well-oxygenated and fish are able to inhabit the entire water column. Houghton Lake



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HOUGHTON LAKE AQUATIC PLANTS

Arrowhead	Large-leaf pondweed	Two-leaf milfoil
Bladderwort	Nitella	Variable pondweed
Bulrush	Richardson's pondweed	Variable-leaf pondweed
Chara	Robbins pondweed	Water marigold
Coontail	Sago pondweed	Water stargrass
Curly-leaf pondweed	Slender-leaf naiad	Whitestem pondweed
Elodea	Small pondweed	Wild celery
Eurasian milfoil	Southern naiad	Wild rice
Flat-stem pondweed	Starry stonewort	
Illinois pondweed	Thin-leaf pondweed	

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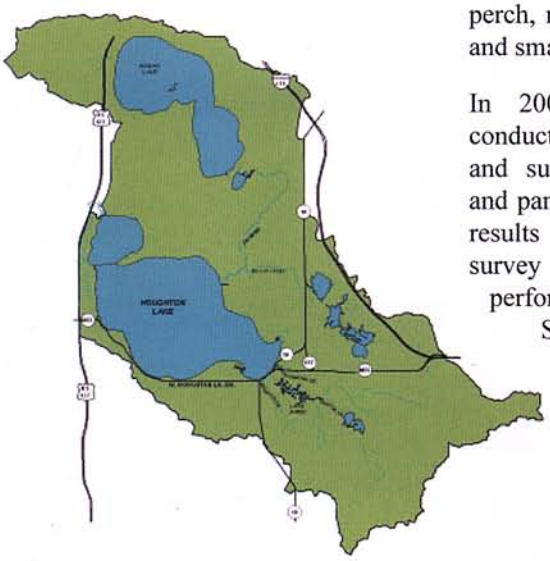
has an exceptional warm-water fishery. However, the lake is too warm during the summer months to sustain cold-water fish such as trout. Phosphorus levels in the lake often exceed the eutrophic threshold concentration of 20 parts per billion, but algae growth in the open waters of the lake is generally moderate. As a result of wind-induced turbidity and natural tannins in the water, water transparency in Houghton Lake is generally less than ten feet.

Watershed Management

The land area surrounding a lake that drains to the lake is called its watershed or drainage basin. The Houghton Lake watershed is 172 square miles in area, a land area over five times greater than the lake itself. Houghton Lake receives drainage from Higgins Lake via the Cut River and four major tributaries: Knappen Creek, Denton Creek, Spring Brook, and Backus Creek. The Houghton Lake watershed encompasses all or part of 13 townships.

Over the long term, Houghton Lake's water quality will be influenced by land use activities in its watershed. Fortunately, much of the watershed is state-owned land and consists of forested areas or wetlands. By filtering runoff, forests and wetlands in the watershed help to preserve water quality. With the construction of a sanitary sewer system around Houghton Lake in the 1970's, a primary source of pollution input to the lake was eliminated. However, much of the land adjacent to the lake has been urbanized and stormwater and fertilizer runoff are a concern.



To address this concern, watershed management efforts focused on the following:

- The watershed was mapped in detail to identify land use, soil types and drainage characteristics.
- The shoreline was surveyed and all stormwater outfalls to the lake were identified and mapped.
- Watershed management guidelines for lakeside landscaping, fertilizer use, and stormwater management were provided to all area homeowners.
- An ordinance that restricted the use of phosphorus fertilizers was drafted by the lake board and adopted by Roscommon County and all four townships bordering Houghton Lake.
- Watershed management information is disseminated annually to all lake residents.
- Roscommon County is working on developing county-wide stormwater guidelines.

Fisheries

Houghton Lake has a prized fishery. Since the 1930's, the Department of Natural Resources has identified 39 different species of fish in Houghton Lake including sunfish, perch, northern pike, walleye, largemouth and smallmouth bass.

In 2007, MDNR Fisheries Division conducted fish surveys during the spring and summer to evaluate both predator and panfish populations in the lake. These results were compared to historical fish survey results including a fish survey performed in 2001, the year before the Sonar® treatment. Based on the 2007 survey results, MDNR Fisheries Division concluded:

> Bluegill sizes and growth rates ranged from Satisfactory to Superior in all years between 1972 and 2007. Catch rates in trap nets have increased steadily since 1983. This is inconsistent with angler reports of poor bluegill catches during recent years. Other panfish also appear to have good size structure and large mean sizes. The panfish populations appear in good condition with no substantial changes since 1972.
>
> Overall, the fisheries of Houghton Lake are dominated by panfish, walleye, and northern pike. The 2007 survey indicates stable or increasing abundance of these species. Substantial changes in growth rates and sizes were not evident.

Community

By the late 1990's, the growth of Eurasian milfoil had reached a level that seriously impacted the Houghton Lake community including residents, businesses, boaters, and anglers. Vast beds of milfoil fouled propellers and impeded navigation, while floating mats of milfoil along the shoreline further impaired use of the lake. Since implementation of the Houghton Lake Management Plan, conditions in the lake have improved dramatically. Eurasian milfoil growth is largely controlled, a wealth of data has been collected on Houghton Lake and its watershed, and long-term management strategies are being implemented. **The lake board made it possible for lake residents and all local governmental units to work together to successfully manage Houghton Lake.**

References

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