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THE MICHIGAN RIPARIAN

www.mi-riparian.org

DEVOTED TO THE MANAGEMENT AND WISE USE OF MICHIGAN'S LAKES AND STREAMS

Published Quarterly – February, May, August and November

AERIAL VIEW OF THE SOO LOCKS

These locks between Michigan and Canada handle more freight than any other set of locks in the world. Iron ore is the leading commodity, but large amounts of grain, coal, salt and limestone pass through the locks annually. The Poe lock can handle ships 105 feet wide and 1,000 feet long. Freighters are raised 21 feet to get from Lake Huron to Lake Superior.

MICHIGAN SUPREME COURT REFUSES TO HEAR APPEAL OF HIGGINS LAKE POA v GERRISH TWP CASE

By Clifford H. Bloom – Law, Weathers & Richardson, P.C.

This past January, the Michigan Court of Appeals' decision in *Higgins Lake Property Owners Ass'n v Gerrish Twp*, 255 Mich App 83 (2003), upheld and confirmed its earlier opinion in the case of *Jacobs v Lyon Twp*, 199 Mich App 667 (1993). Both *Higgins Lake Property Owners Ass'n* and *Jacobs* stand for the proposition that public road ends at lakes are for travel and access purposes only and cannot be used for activities such as permanent boat mooring, extensive dockage, shorestations, sunbathing, lounging, picnicking, and similar activities. One modest dock can usually be installed by either a governmental unit or a member of the public, but once installed, it becomes public. Only temporary boat mooring is allowed as an incident to access and navigability.

Unfortunately, some backlot owners, particularly in the Higgins Lake area, had refused to comply with the mandates of the 1993 *Jacobs* decision, and continued to improperly maintain extensive private dockage, shorestations, permanent boat moorage, and similar prohibited activities at some road ends. Given such widespread disregard of *Jacobs*, riparian property owners and a lake association instituted the *Higgins Lake Property Owners Ass'n* litigation, which resulted in the Court of Appeals' decisive decision in that case earlier this year which confirmed *Jacobs*. The backlot defendants in *Higgins Lake Property Owners Ass'n* case did not like the Court of Appeals' decision and asked the Michigan Supreme

(Continued on page 21)

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In This Issue

Cover: Aerial view of the Soo Locks, 1970.

8 WATERSHED MONITORING GOES GLOBAL

10 THE ATTORNEY WRITES—Clifford Bloom

11 MICHIGAN SEA GRANT STUDY

14 CLMP PROGRAM 2002

17 MANAGEMENT OF EURASIAN WATER-MILFOIL IN HOUGHTON LAKE

The Michigan Riparian magazine adds Contributing Editors to its staff. The new editors and their areas of expertise are listed below:

Dr. Lois Wolfson, Institute of Water Research, Michigan State University. Area of expertise—Aquatic Plants.

Anthony Groves, Progressive AE of Grand Rapids. Tony's area of expertise is Land Use and Water Quality.

Dr. Don Garling, Department of Fisheries and Wildlife, Michigan State University. Area of expertise is Fisheries Management.

Bob Weir, Writer and Communications Consultant, Port Huron, Michigan. Areas of expertise include land use, water resources, and stewardship of those resources.

WATERSHED MONITORING GOES GLOBAL

By Randy Cook, Science Teacher, Tri-County High School, Howard City, MI

The school lake project has expanded once again, this time on an international level. On June 5, 2003, project director Randy Cook headed to Loma Alta, Ecuador to train students from four different villages how to use the graphing calculator, Calculator Based Laboratory and probes to perform water quality testing.

Randy teamed up with Claude Nathan, the president of People Allied for Nature (PAN), who has been working in the community of Loma Alta for almost 10 years. PAN's work was instrumental in the setting aside of a 1,500 acre reserve protecting the "fog" forest owned by the community. In the nearly 10 years of working with PAN, the community voted in 2000 to increase the reserve size to 4,500 acres and then agreed in 2003 to expand it to an impressive 7,500 acre protected forest.

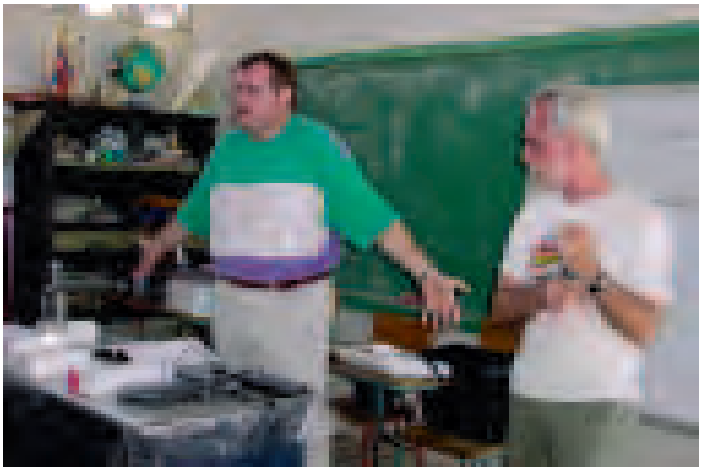
One of PAN's goals was the environmental education of the children within the community. Not only did PAN secure the funding for eight full-time school teachers through grants and donations, they wanted to educate the children there on the importance of water, its conservation, protection of watersheds, and how it affects their lives. Then entered Randy into the picture.

Randy authored an elementary water curriculum that was translated into Spanish by Miriam Lewis and Claude Nathan. After completing the elementary curriculum, the high school text used by the lake/school project was revised into a more translation friendly version and then translated into Spanish as well.

A grant from Irwin Andrew Porter foundation paid for the equipment necessary for the testing of the river Valdivia, which starts high in the mountains of the forest and runs through the villages on its way to the Pacific Ocean. Vernier Software and Technology, as well as Tri County Area Schools, helped pay some of the expenses for Randy to go.

To represent the four villages that make up the community, students participated in concentrated training activities, with Randy instructing in English and Claude interpreting in Spanish. Each student participating in the training did so on their own time and was given a surprise performance exam with the top scoring candidates being chosen to be part of the group.

One of the goals in the selection of sites on the Valdivia was to show the students how human activity affects water quality. A water sample was taken from the river high into the forest before it passed through any of the village settlements. Another sample was taken between the first settlement of El Suspiro and the main settlement of Loma Alta, a sample taken between El Suspiro and Loma Alta, with the final sample being collected in the river down stream from the settlement of Loma Alta. The results of the testing showed increased amounts of the ions being tested, the more human contact there was with the river. A sample of the cistern that



Randy & Claude teaching the use of the calculator, CBL and probes for water quality testing.

One of the groups of La Ponga in training.

One of the groups at Loma Alta in training.

holds the community water source was also tested. An additional test for coliform and for E. coli was also performed using 3M Petrifilm.

With the four teams being established, the high school students are partnering with the village/community leadership in Loma Alta to perform water quality testing. The work performed by these students will be placed on our web site with the other participants of the project.

While there, Randy had the opportunity to not only train the students to perform the water quality testing, but he was able to take the 18 km hike up to the "fog" forest and spend an evening at a camp at the top of "heart break" ridge. ✦

You will be able to find details and pictures of his trip on the web at www.mlswa.org and click on the school/lake project. Look for Loma Alta School's link.

The group of El Suspiro in training.

The River Valdivia near its source.

TEST RESULTS

SPECIFIC TEST	WATER IN CISTERN AT LOMA ALTA	RIVER VALDIVIA IN SUSPIRO	RIVER VALDIVIA BETWEEN SUSPIRO & LOMA ALTA	RIVER VALDIVIA BELOW LOMA ALTA
Conductivity	1019.00	797.00	993.00	1064.00
pH	6.95	7.04	7.94	6.97
Turbidity	5.00 NTU	21.00 NTU	4.00 NTU	4.00 NTU
Nitrate Ions	0.30 mg/1	0.49 mg/1	0.12 mg/1	0.42 mg/1
Chloride Ions	86.16 mg/1	33.98 mg/1	22.84 mg/1	35.63 mg/1
Calcium Ions	17.35 mg/1	16.90 mg/1	23.39 mg/1	16.14 mg/1
Ammonium Ions	0.18 mg/1	0.24 mg/1	0.98 mg/1	0.53 mg/1

Attorney Writes

By Clifford H. Bloom
Law, Weathers & Richardson, P.C.
Bridgewater Place, 333 Bridge Street, N.W., Suite 800, Grand Rapids, Michigan 49504-5360

THE TOP ELEVEN THREATS TO RIPARIANS

The following are, in my opinion, the top eleven threats which will face riparians in Michigan as a group over the next decade:

11. The "Every New Toy" Effect. Overcrowding on lakes and excessive powerboat usage are becoming big problems for many lake communities. While it is difficult to argue that one lake activity is "better" or should have priority over others, it is a physical fact that activities associated with power boats (including personal watercraft), water-skiing and high speed boating tend to "crowd out" all other lake activities on a large portion of a lake—fishing, canoeing, kayaking, sail boating, and swimming out away from shore. This problem has been exacerbated by the advent of smaller, more affordable (and more easily launched) high speed watercraft such as personal watercraft and smaller molded speed boats. As technology progresses, new motor powered "toys" (such as hydrofoils) will become more common. One can only imagine what new generation of speed boats, air cushion vehicles and jet boats will appear in the future!

10. Water Diversion. This will be an increasing headache for riparians in the future, whether the diversions are from a particular lake (or watershed) or pursuant to a Nestlé/Perrier-type groundwater diversion. Local governments can adopt ordinances and regulations for local water diversions from lakes and watersheds covering areas such as non-farm irrigation. Perrier-type water diversions will probably require state-wide legislation. It is a sad commentary that even though many legislators from both parties and both gubernatorial candidates in the last election all ran on platforms which were opposed to water diversion, special interests appear to have effectively killed any meaningful legislation to regulate Perrier-type groundwater diversions, at least for now.

9. Improper Storm Water Runoff and Failing Septic Systems. These problems are pretty much self-explanatory. Although there are many potential solutions to these problems, riparians must become actively involved at both the local and county level to effectuate such solutions.

8. Failing to Elect Local Government Officials Who are "Pro-Lake." Never underestimate how effective a local municipality (a township, city, or village) can be in protecting its lakes if progressive people are elected to the governing body. The impact on lakes (whether positive or negative) can be dramatic. Local governments can pursue pro-lake policies through a progressive zoning ordinance and master plan, stormwater runoff ordinance, dock and boat launching ordinance, environmental committees, and conservation policies. Unfortunately, in some townships with lakes, it is difficult to elect pro-lake officials since the majority of riparian property owners are not residents (and hence, are not local registered voters) and nonriparians on the township board are not particularly sympathetic to lake issues. In other townships, riparians have no such excuse—in many townships, there are sufficient riparian voters to be able to elect township boards comprised entirely of pro-lake people, but that does not occur due to apathy among riparians.

7. Lack of Effective Local Zoning Regulations. Many townships still do not have anti-funneling regulations in their local zoning ordinances, or even any zoning at all. Proper zoning and planning policies and regulations are essential for the protection of lakes and watersheds. Seeing to it that the local municipality has the tools necessary to reasonably regulate development should be a high priority for lake associations.

6. Cluttered Public Road Ends. Michigan case law makes it clear that backlot property owners and members of the public can use public roads which end at lakes for travel and access purposes only—extensive dockage, permanent boat moorage, shorestations, sunbathing, lounging, and similar activities are unlawful. Public road ends exist at many lakes around the state. Furthermore, an increasing number of illegal floating marinas are popping up at road ends on lakes throughout Michigan. Legislation is currently before the Michigan Legislature (Senate Bill No. 481 and House Bill No. 4141) which would resolve this problem by permitting local police officials to issue tickets to violators. However, this common sense legislation is facing bitter opposition by certain backlotter groups.

5. Invasive and Alien Species. Zebra mussels, Chinese carp, purple loosestrife, lamprey eels, Eurasian millfoil and the insect attacking Michigan's ash trees—these are just a few of the alien species which have found their way to Michigan through ballast water in ships, landscaping shipments and other means of travel. To date, federal and state efforts to eradicate these invasive species and prevent future introduction of others into Michigan's environment have been tepid at best.

4. Urban Sprawl. Many of Michigan's lakes are located in rural or semi-rural areas. Urban sprawl not only hastens the over-development of lakes, but also causes severe overcrowding in the areas and watersheds around lakes. Unlike many other populous or industrialized states, Michigan has very few development controls in place at the state level and is considered quite "developmental friendly." In order to effectively combat (or at least get a handle on) uncontrolled sprawl and the alarming loss of farmland and open space, the Michigan Legislature will have to enact effective sprawl-busting tools such as laws authorizing impact fees (requiring developers to pay for their infrastructure needs and to minimize problems which their developments cause), transfer of development rights (also known as "TDRs," a market-based approach), full funding for purchase of development rights programs ("PDRs") and eliminating property taxation on true agricultural lands. For years, many developmental and real estate interests have vigorously fought such proposals and have effectively blocked any state-wide legislation to implement these tools. Unfortunately, the Michigan Land Use Council appointed by Governor Granholm failed to forcefully advocate the adoption of these needed tools, but instead concentrated on consensus-building "soft" approaches which will likely have limited impacts on sprawl. Worse yet, if only portions of the Council's recommendations are adopted into law (such as the loss of local control and taking away the ability of local municipalities to require large minimum lot size requirements) without forcing corresponding concessions from the development community (such as the authorization of TDRs and impact fees), the rate and intensity of urban sprawl could actually be increased.

3. Preemption/Loss of Local Control. Although state politicians often sing the praises of local control, it is amazing how many of them frequently vote to take away local control by legislation which "preempts" or precludes regulation and solutions at the local government level. Unfortunately, when the state takes away local authority in certain areas, there is frequently very little if any oversight of the area involved by state officials or agencies. Local control has been taken away (or severely restricted) in many areas which directly affect lakes including wetlands protection, oil and gas wells, huge industrial livestock operations, public schools in the vicinity of lakes, and

(continued on page 22)

MICHIGAN SEA GRANT STUDY SHOWS SERIOUS COASTAL GROWTH PRESSURE AND PLANNING GAPS

Michigan State University Extension News, College of Agriculture and Natural Resources, ANR Communication Services, 8/22/03

Significant improvements in land use planning along Michigan's shorelines have occurred over the past several years, but serious gaps remain, according to a Michigan Sea Grant study.

Suburban sprawl and most other issues identified in the Michigan Land Use Leadership Council's final report, released August 18, are even worse for coastal communities.

"What happens on the land is a major factor in determining whether individual components of this complex system [the Great Lakes] will remain healthy," the council's report states.

The Sea Grant report, *Status of Planning and Zoning in Michigan's Great Lakes Shoreline Communities*, revealed the following problems:

• Great Lakes shoreline properties continue to receive a disproportionate amount of development pressure compared with inland real estate.

• Michigan is following a low-density coastal land development pattern, with people moving out of cities and small towns to develop rural greenfields.

• Sprawling development is causing fragmentation of coastal habitat, especially wetlands and dunes.

• Development threatens public access to coastal areas and the seclusion found in large, undeveloped tracts.

A 2002 Sea Grant survey of all 338 political divisions identified several reasons for the problems:

• Land use planning is not coordinated across coastal regions or ecosystems, and planning remains fragmented.

• Nearly two out of three coastal communities do not have professional planners on staff.

• Local regulations that define coastal-dependent economic uses and protect coastal natural resources such as dunes, wetlands and high-risk erosion areas are uncommon.

"If these trends continue, unplanned development will cause long-term cumulative problems for coastal ecosystems and regional economies," says Mike Klepinger, Extension specialist for sustainable coastal community development and author of the Sea Grant report. "In the long run, coastal development will not be sustainable unless land use planning is improved in and between Michigan's coastal communities."

The study noted progress in the following areas:

• Eighty percent of coastal jurisdictions now have a master plan to guide development.

• Jurisdictions with master plans were four times more likely to have one of three coastal protection laws in place than those with no master plans.

• Those responsible for planning and zoning are increasingly using sophisticated planning tools—particularly geographic information systems —in their work.

Klepinger is pleased that the Michigan Land Use Leadership Council is recommending support for planning and zoning educational programs.

"Local commissioners are trustees of Michigan's Great Lakes coastal environment; they need these programs and tools to do their jobs well," he says. "It's encouraging that the council is suggesting that the state provide incentives for participating in educational programs."

The Sea Grant report, including analyses for five coastal regions, is available online at www.michiganland use.org/ resourcescoastal_pz_status_ 20021.pdf. To obtain a printed copy, request MICHU #03-600 from Michigan Sea Grant Publications at (734) 764-1118 or msgpub/s@umich.edu.

Michigan Sea Grant is a collaborative effort of Michigan State University and the University of Michigan in Great Lakes research, education and outreach. It is one of 30 Sea Grant programs in coastal states, supported by the National Sea Grant College Program of the National Oceanic and Atmospheric Administration (NOAA). For additional information about Michigan Sea Grant, visit www.miseagrant.umich.edu. ✦

ML&SA NEWS

MICHIGAN LAKE & STREAM ASSOCIATIONS, INC.
P.O. Box 249, Three Rivers, Michigan 49093
Ph 269-273-8200 Fax 269-273-2919
Email info@mlswa.org dwinne@mlswa.org
Web sites www.mlswa.org. www.mi-water-cmp.org

Michigan Lake and Stream Association Receives Grant from Toshiba America Foundation

Long Lake, MI – September 26, 2003 – Michigan Lake and Stream Association received a Science and Math Improvement Grant from the Toshiba America Foundation in New York City in the amount of $4,500 for a project titled – "MLSWA State Stream Monitoring Project." The project was created by Mr. Jeff Kalember, a science teacher at Gaylord High School.

The grant money will enable 250 students from eight schools to perform their own data collection and conduct water quality studies on rivers, streams and ponds in their local communities. Students will create a report of water quality health and share it with citizens and the Department of Environmental Quality in Michigan.

The mission of the Toshiba America Foundation is to contribute to the quality of science and mathematics education in U.S. communities by investing in projects designed by classroom teachers to improve science and math education for students in grades K-12. Teachers from around the country compete for funding in order to enhance their classrooms with innovative project-based learning.

Toshiba America Foundation is a private, endowed, not-for-profit grant making organization dedicated to supporting education programs in the United States. Toshiba America Foundation was established in 1990 and endowed by Toshiba America, Inc. (TAI) and its U.S. Subsidiaries. TAI is a subsidiary of Toshiba Corporation, a world leader in high technology. For more information about Toshiba America Foundation, visit its website at http://www.taf.toshiba.com or call 212/596-0620.

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ANNUAL CONFERENCE 2004

Plan now to attend the 43rd Annual Conference of Michigan Lake & Stream Associations

April 23-25, 2004

Boyne Mountain Resort
Boyne Falls, Michigan.

LAKES AND STREAMS LEADERSHIP INSTITUTE - PLANNED FOR YEAR 2004

ARE YOU A RIPARIAN? AN ELECTED OFFICIAL AT THE LOCAL OR COUNTY LEVEL? A STATE EMPLOYEE? A CITIZEN INTERESTED IN PROTECTING MICHIGAN WATER RESOURCES? Plan now to register for the LSLI for 2004.

The purpose of the Institute is to provide information and training for individuals interested in taking an active role in protecting lakes and streams in their residential area. The seven sessions have been scheduled as follows:

DATE	LOCATION
May 1, 2004	RAM Center, Higgins Lake
May 15, 2004	RAM Center, Higgins Lake
May 21, 2004	Bengel Center, Bath
June 4, 2004	RAM Center, Higgins Lake
June 25 & 26, 2004	Kellogg Bio Station, Gull Lake

The cost of the Institute is $195.00, and $100.00 for High School and College Students.

The sessions have been planned under the following topics:

Leadership and Administration
Local Government
State Government
Watershed Management
Lake & Stream Ecology
Project Presentation and Graduation

For more information contact:

Howard Wandell
Department of Fisheries and Wildlife
Michigan State University
East Lansing, MI 48824-1222
Phone: 517-432-1491
Fax: 517-432-1699
Email: wandellh@msu.edu

Or you may visit the MLSWA website at: www.mlswa.org

HIGH SCHOOLS AND MLSA LAKE ASSOCIATIONS BEGIN THIRD YEAR OF WATER QUALITY MONITORING

Schools new to the Lake Monitoring program are: Sutton Bay, Dowagiac, and John Glenn. Program director for the Lake projects is Randy Cook, High School Science Teacher at Tri-County High School. The chart below identifies all schools, Science Teachers, MLSA member associations, and representatives in the project.

LAKE PROJECT	STREAM PROJECT	SCIENCE TEACHER	ASSOCIATION SPONSOR	ASSOCIATION REP.
	Hillman HS	Mike Wojda	Lake Avalon	Cecile Kortier
John Glenn HS	John Glenn HS	Kathy Bach	KawKawlin Watershed Asn	Robert Navrovick
Bear Lake HS		Sharon Reinhardt	Bear Lake Asn	Jerry Mathieu
Inland Lake HS	Inland Lake HS	Todd Warn	Burt Lake Asn	John Hutto, MD
	Onaway HS	Christine Steensma	Black Lake Asn	Jack Jackson
Gaylord HS		Jeff Kalember	Otsego Lake Asn	Don Johnson
Gladwin Area HS	Gladwin Area HS	Chad Donahue	McGilvery Lake Asn	Bob Emmert
Evart HS		Cheryl Travis	Hicks Lake Asn	Nancy Beckwith
	Marion HS	Jason Keeler	Hicks Lake Asn	Nancy Beckwith
Tri Co HS	Tri Co HS	Randy Cook	Indian Lake Asn	Shirley Westveer
	Oscoda HS	Michael Berenkowski	Pine R./VanEttan Lk Asn	Rick Myrick
	Johann/Lewiston HS	Kevin Kennedy	Twin Lakes Asn	Leo Schuster
Hale HS		Steve Keys	Long Lake Asn	Wayne Magnan
	Hale HS	Steve Keys	Chain Lakes Asn	Jean Roth
Norway HS	Norway HS	Tony Zygiel	Hamilton Chain of Lk Asn	Barb VanDenEeden
Interlocken HS		Jack Randall	Crystal Lake Asn	Stacey Daniels
Edwardsburg HS		Kevin Bartz	Painter-Juno-Christiana Asn	Nancy Bowman
Central Montcalm HS		Cheryl Stacer-McVey	Clifford Lake Asn	Clare Morrow
	Glen Arbor HS	Karen Richard	Glen Lake Asn	Ernest (Mike) Litch
Watervliet HS		Phyllis Moore	Paw Paw Lake Asn	Delavan Sipes
White Cloud HS		Edward Canning	Robinson Lake Asn	Jerrylyn Miller
Dowagiac Union HS		Paul Harsig	Magician Lake Impr Asn	Dick Morey
Suttons Bay HS		Jeff Trophy	Lake Leelanau Asn	Becky Darga
	Marenisco HS	Bob Mlklesk	Lake Gogebic Imp Asn	Carol D'Alberto
	West Iron Co HS	Joel Van Lanen	Iron River Asn	Pat Swanson
	Munising HS	Ted Williams	Deer Lake Asn	Char McDonnell
	Bangor HS	Joe Daily	Great Bear Lake Asn	Jim Cecott

NUMBER OF LAKES IN THE CLMP PROGRAM — YEAR 2002

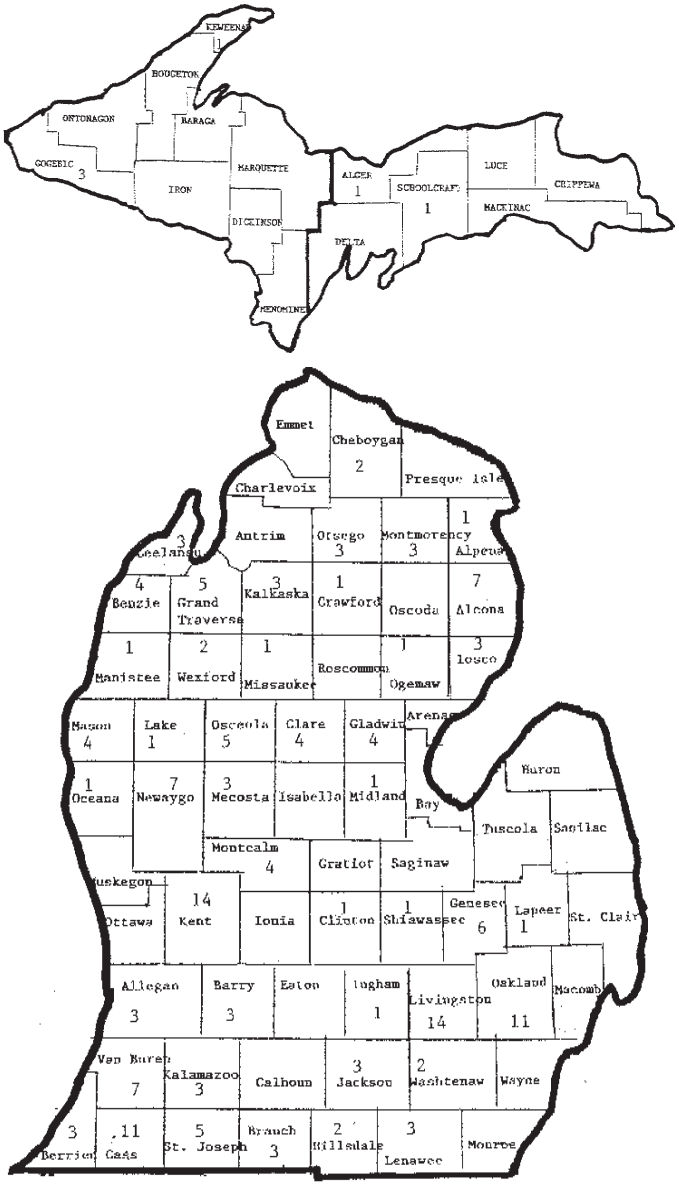
WATER TRANSPARENCY

Secchi depth is probably the most frequently used parameter in limnology. The Secchi Disk offered by ML&SA to lake associations is an 8 inch diameter metal disk painted into alternately painted black and white quadrants.

The disk is lowered into the water, and the observer reads the depth from the surface of the lake at which it can no longer be seen. This depth is recorded and referred to as the Secchi depth. The depth of light penetration in most lakes is twice the Secchi depth.

Secchi disk depth increases when the following occur:

1. Nutrient input decreases.
2. Zooplankton increase their grazing of algae.
3. Erosion into the lake from storm runoff from crop land and development sites is stopped.
4. Seasonal algae succession changes.

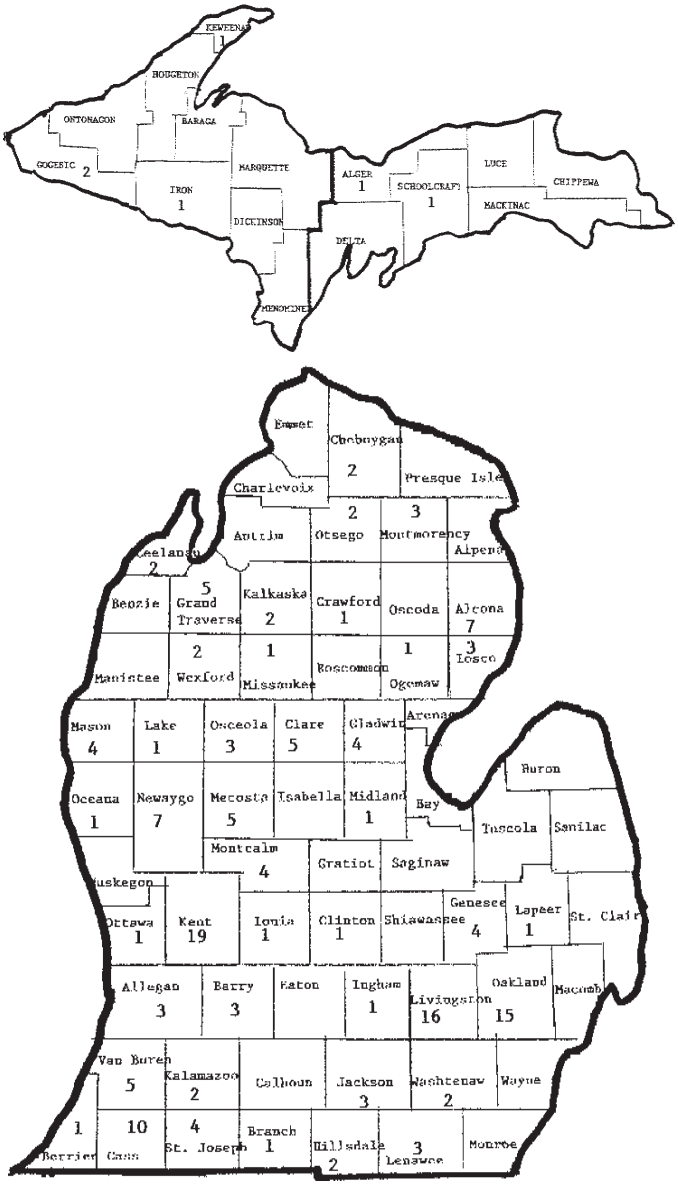


SPRING & SUMMER PHOSPHORUS

For most lakes in Michigan, phosphorus is the most important nutrient for algae growth.

The CLMP volunteers monitor for total phosphorus during spring overturn, when the lake is generally well mixed from top to bottom, and during late summer when the lake is at maximum temperature stratification from the surface to the bottom.

Spring overturn of a lake, one to two weeks after ice is out, is an opportune time to get a representative sample of phosphorus at the surface since the amount of phosphorus is uniform throughout the water column. The spring overturn total phosphorus data, collected year after year, are useful for evaluating nutrient enrichment in the lake. 2002 spring overturn results ranged from 5 to 92 parts per billion, with a mean average of 15 ppb.

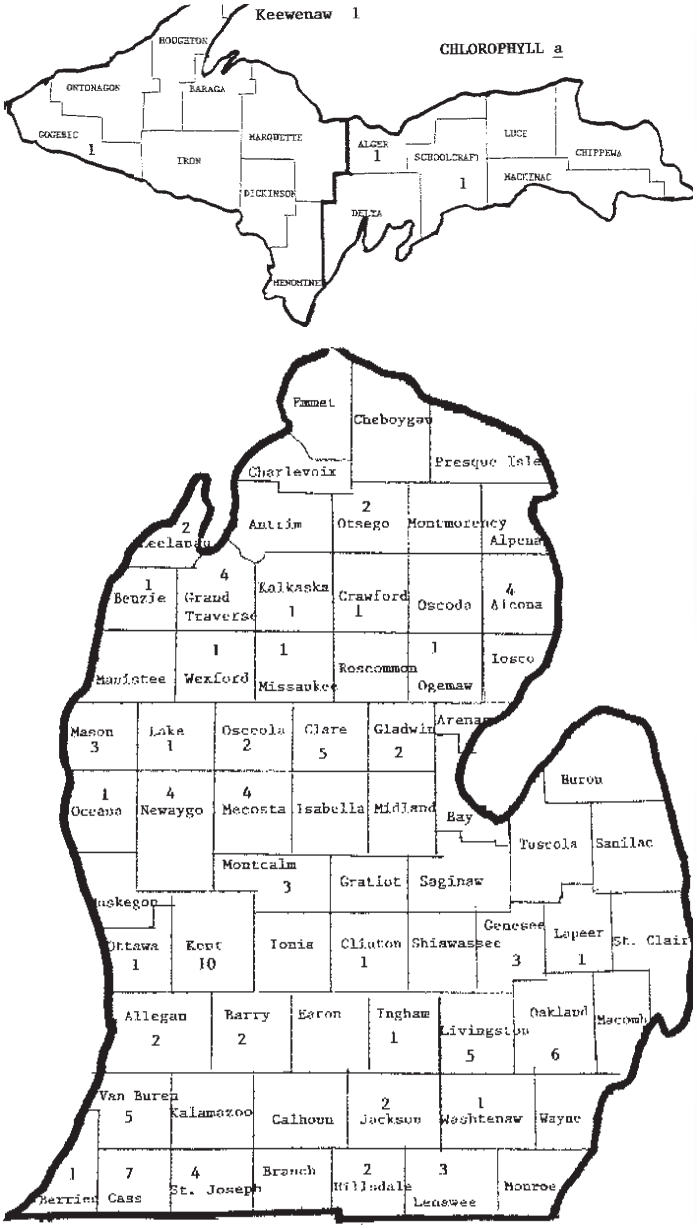


Chlorophyll *a*

Chlorophyll is the green photosynthetic pigment in the cells of plants. The amount of algae in a lake can be estimated by measuring the chlorophyll *a* concentration in the water. As an algal productivity indicator, chlorophyll *a* is often used to determine the trophic status of a lake.

Chlorophyll monitoring was added to the CLMP in 1998. Chlorophyll samples were collected on 104 lakes in 2002. For each lake, the volunteers were asked to collect and process five sets of chlorophyll *a* samples, one set per month from May through September.

The numbers on each county are the number of lakes that participated in Chlorophyll *a* testing for lakes that are members of Michigan Lake and Stream Associations in the year 2002. ❖



MANAGEMENT OF EURASIAN WATERMILFOIL IN HOUGHTON LAKE, MICHIGAN

Mark A. Heilman, SePRO Corporation, Carmel, IN
Kurt D. Getsinger, U.S. Army Engineer Research and Development Center, Vicksburg, MS
Anthony F. Groves, Progressive AE, Grand Rapids, MI

BACKGROUND

At 20,044 surface acres, Houghton Lake represents the largest inland lake in the state of Michigan. As a shallow lake (mean depth = 9 feet) with a large littoral area (~ 80% of lake surface area), Houghton Lake is a mesotrophic system with historically abundant populations of emergent and submersed aquatic vegetation. Stocked with walleye, smallmouth bass, northern pike, yellow perch, and bluegill, the lake is one of the best fishing resources in Michigan. The lake also is a major resource for waterfowl, including migratory ducks and coots. Good fishing, hunting, and other recreational opportunities make Houghton Lake a major tourist destination for state and regional residents, and tourism is a major resource for the local economy.

While the exact timeframe for the introduction of the invasive weed, Eurasian watermilfoil (*Myriophyllum spicatum*), hereafter called EWM, into Houghton Lake remains unknown, Bonnette (1996) noted that EWM was the second most abundant aquatic plant species. Surveys in 1999 and 2000 (Pullman 2000, Heilman and Pullman 2002) confirmed that EWM was by that time the most abundant plant species and found in over 10,000 acres of the system. Several thousand acres of the lake were covered with dense near-surface or topped-out EWM (Fig. 1A - October 2000 satellite image). These surface stands greatly interfered with navigation and were the source of massive quantities of plant fragments that washed ashore inundating shorelines. Although no formal studies have yet documented the impact of the EWM infestation on the local economy, the conclusion of the Houghton Lake Improvement Board (HLIB) and the lake community was that the infestation had reduced tourism and property values, and greatly increased costs of shoreline maintenance.

MANAGEMENT PLANNING

In 2001, the Houghton Lake Improvement Board (HLIB), seeking solutions to the EWM problem, began an intensive investigation of options for EWM control. On May 17, 2001, the US Army Engineer, Detroit District and the HLIB sponsored a technical workshop involving researchers from the US Army Corps of Engineers Aquatic Plant Control Research Program, Michigan Department of Natural Resources (MDNR), Michigan Department of Environmental Quality (MDEQ), and various aquatic plant management experts. The most current research information on EWM control options was presented, discussed, and documented (Getsinger et al. 2002a). Later in 2001, the HLIB hired a technical team to survey the lake and formally recommend management options. In its final report to the HLIB entitled the Houghton Lake Management Feasibility Study (Smith et al., 2002), the group presented survey results, a literature review of scientific information on Houghton Lake and EWM biology, and a summary of potential EWM management options, including review of benefits, drawbacks, and estimated cost of each option. An electronic Adobe Acrobat version of this report is available (Doug Henderson, ReMetrix LLC, 317-580-8135, doug@remetrix.com).

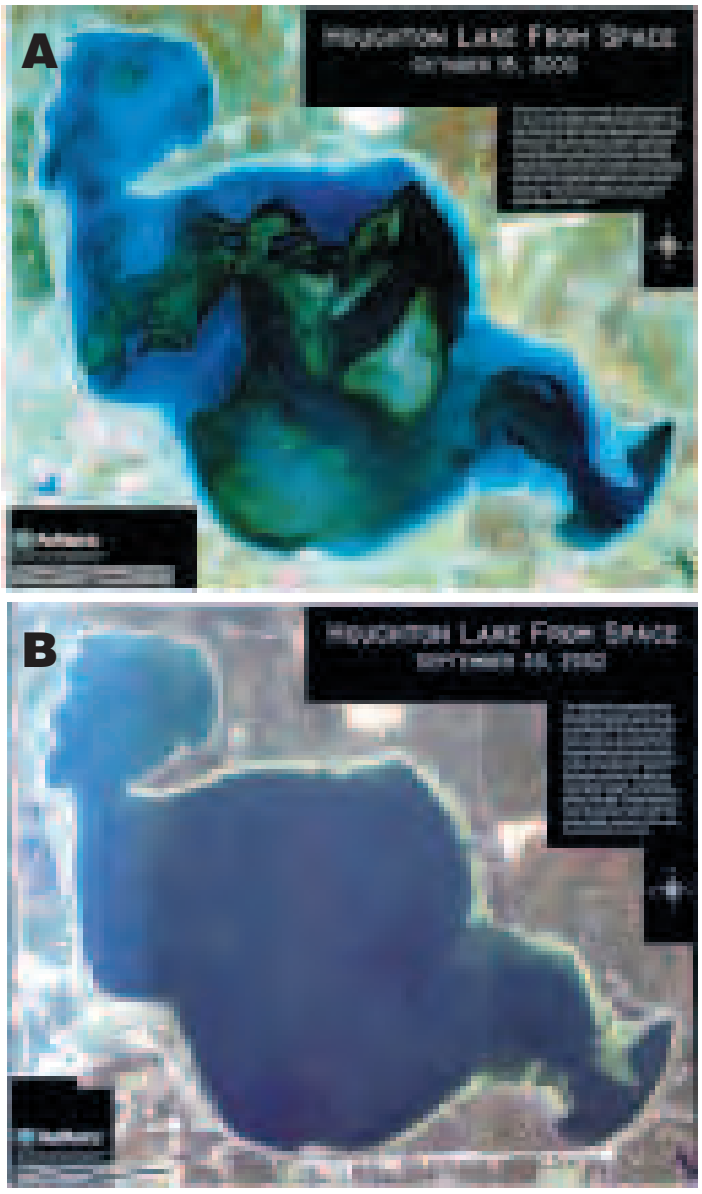


Figure 1. A) False color composite image of Houghton Lake, MI taken from IKONOS Satellite (Spacing Imaging LLC) on October 18, 2000. Contrast enhancement shows extensive beds of aquatic vegetation dominated by Eurasian watermilfoil. B) Natural color composite image of Houghton Lake, MI taken from IKONOS Satellite on September 30, 2002. No aquatic vegetation (Eurasian watermilfoil) was detected at or near the surface in this image. (Courtesy of ReMetrix LLC)

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After careful review of the scientific and economic merits of various management options, the HLIB selected a sequential integrated management plan that involved whole-lake treatment with the herbicide fluridone in the first year (2002) followed by possible introduction of *Euhrychiopsis lecontei*, a milfoil biocontrol agent, to control any new or recovering EWM populations detected by careful monitoring in subsequent years. The HLIB extended a detailed competitive bid for the fluridone treatment work that was awarded to a team of application specialists headed by SePRO Corporation, the manufacturer of the fluridone aquatic herbicide Sonar®.

SELECTIVE EWM CONTROL WITH SONAR HERBICIDE

Since the mid 1990's, laboratory and field research studies have documented the selective properties of low-dose (<10 parts per billion _ ppb or μg L^{-1}) applications of fluridone for the control of EWM (Netherland et al. 1997; Getsinger et al. 2002b; Getsinger et al. 2002c; Madsen et al. 2002). As the active ingredient in Sonar® aquatic herbicide, fluridone acts systemically and kills the entire plant (shoot and roots). Fluridone prevents photosynthesis, and thus plants cannot produce food for continued growth. Affected plants show pale or bleached new growth and slowly die over the course of 45-90 days provided a phytotoxic dose of fluridone is maintained over this period. The slow mode-of-action of fluridone allows it to be used for EWM control in entire lake systems with minimal risks of oxygen depletion and other water quality issues. EWM is more sensitive to fluridone exposure than most native aquatic plant species. Therefore, with low-dose protocols plus detailed residue monitoring and management, Sonar® has been used operationally to selectively control EWM throughout many areas of the northern United States. With a focus on selective control, MDEQ permits for spring treatments require a 6 ppb fluridone treatment to the top 10 feet of the water column (assumed littoral zone) followed by second 'booster' or 'bump' treatment at 14-21 days after the initial application. The second bump application brings the dose back up to 6 ppb and increases exposure period out to the 60-90 days needed for control in most cases.

MANAGEMENT FUNDING

Funding of the Houghton Lake Management Plan is being obtained via special assessment of benefiting properties and local units of government abutting Houghton Lake. Under provisions of Part 309 (Inland Lake Improvements) of the Michigan Natural Resources and Environmental Protection Act, PA 451 of 1994, formal public hearings were held in the fall of 2001 and a special assessment district was established to finance the project. Assessments are being collected on an annual basis over a five-year period (2002 to 2006). The project is being coordinated under the direction of the HLIB. In accordance with Part 309, the HLIB is composed of a riparian representative, a representative of each township bordering Houghton Lake, the county drain commissioner, a county commissioner, and a representative of the MDEQ.

PERMITTING, IMPLEMENTATION, AND MONITORING

In order to meet MDEQ permit requirements for the 2002 Sonar® treatment of Houghton Lake, detailed vegetation and bathymetric data from 2000 & 2001 surveys of the lake were used to produce a comprehensive management and application plan that was submitted to the MDEQ in February 2002. EWM distribution maps from 2000 and 2001 were submitted showing presence and estimated density of EWM based on results of the point-intercept survey of 912 sites in the lake on a 300-meter (984-foot) grid (Fig. 2 - 2001 EWM map). Using MDEQ recommended methods, littoral coverage of 22 different submersed plant species was documented. Using Geographic Information Systems (GIS), EWM was selectively removed from 2001 survey results to develop the required post-treatment vegetation goal map. The 2001 bathymetric survey results were modeled to produce an updated bathymetric map of the lake and detailed 1-foot resolution volumetric data to determine proper dose to the top 10 feet of the lake's water column.

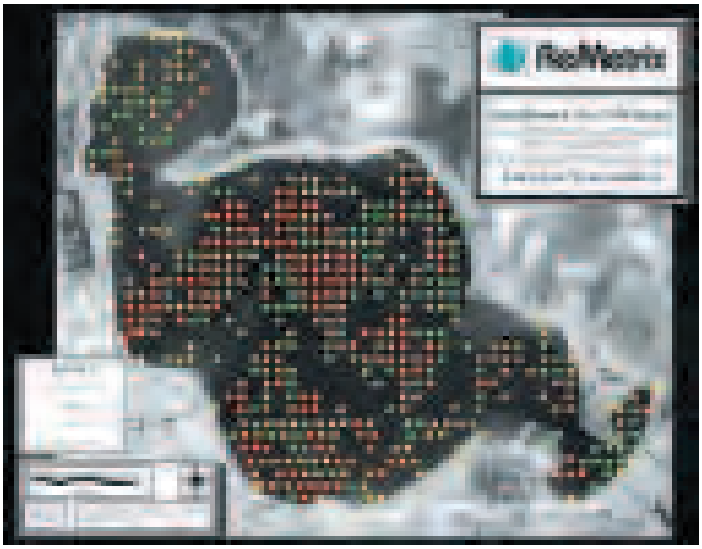

Figure 2. Eurasian watermilfoil distribution and estimated cover at 912 sites from July 24-August 1, 2001 point-intercept aquatic vegetation survey of Houghton Lake, MI. Red and orange sites indicate 80% and 40% mean cover of milfoil respectively. (Courtesy of ReMetrix LLC)

A detailed application plan was submitted that proposed the use of herbicide application systems linked to Global Positioning Systems (GPS) and a field computer for variable-rate precision injection of Sonar®. Using digital versions of updated lake bathymetric maps, these variable rate systems are designed to automatically adjust herbicide application rate based on boat speed and water depth at the precise location of the application vessel. Real-time application rate is also digitally recorded at one-second intervals for use in the development of as-applied maps for treatment documentation. Through GIS, over 130 application transects at 330-foot intervals were mapped and modeled to calculate exact volume of Sonar® that would be applied along each

transect to achieve target level of 6 ppb fluridone in the water. This GPS-GIS application approach is designed to provide even application of herbicides throughout the lake or treatment site. Since the canals of the lake were also heavily infested with EWM, their treatment was also part of the submitted plan, and digital aerial photography of the lake was used to map and calculate exact treatment area for combination of fluridone and diquat treatments.

The 2001 survey results were also used to select 36 different sites for plant and water sampling around the lake. Laboratory susceptibility testing (PlanTEST™) of EWM from these sites would be used to confirm phytotoxic response of Houghton's EWM population to the 6 ppb – bump 6 ppb fluridone protocol. Herbicide residues would be monitored throughout the 90-day Sonar® treatment using an enzyme-linked immunoassay (ELISA) test (FasTEST™). Along with water residues, biochemical response of sampled EWM to fluridone would be quantified throughout the treatment using laboratory testing (EffecTEST™)
(™ trademarks of SePRO Corporation).

The 2002 Sonar® treatment of Houghton Lake was permitted by MDEQ on April 23, 2002. Using fresh field samples from 25 of 36 sites, late April PlanTEST™ pretreatment plant analysis confirmed an acceptable phytotoxic response by EWM to 6 ppb bump 6 ppb protocol. After proper notification of lake residents through mailings and posting, SePRO made the first application of 660 gallons of Sonar® A.S. formulation (4 lbs fluridone per gallon) on May 15, 2002 to the top 10 feet of the lake (52,571 million gallons of water). FasTEST™ residue data (Fig. 3) show at 48 hours, lake-wide fluridone concentration was 7.0 ppb and fell to 5.2 ppb 5 days later as the lake fully mixed and residue dissipation began. By 14 days after initial treatment, residues had dropped to 3.2 ppb indicating the need for a second application of 2.8 ppb (308 gallons Sonar® A.S.). At 48 hours after the second application, lake-wide concentration was 6.15 ppb. Residue monitoring documented a 120-day exposure to greater than 2 ppb fluridone for the lake's EWM and non-target plant communities. Throughout the treatment period, EffecTEST™ biochemical response testing showed changes in EWM concentration of photosynthetic pigments indicative of exposure to phytotoxic dose of fluridone (Fig. 4 - Houghton EWM ß-carotene levels).

In order to re-confirm assay results and as part of a comprehensive study of the Houghton Lake treatment, the Environmental Laboratory of the U.S. Army Engineer Research and Development Center (ERDC) also conducted fluridone residue measurements using high performance liquid chromatography (HPLC) and additional biochemical plant response testing. These results showed similar fluridone residue levels and plant response as indicated by SePRO testing. The complete report from the ERDC summarizing results from the pre- and post-treatment studies of Houghton Lake should be available to the public in 2004.

Treatment impacts on EWM, non-target plant species, and lake water quality were quantified through 1) annual August point-intercept surveys (2002 - year of treatment, 2003 - one-year post-treatment), 2) annual late July hydroacoustic surveys of plant bottom coverage and biovolume using ERDC-developed hydroacoustic technology (SAVEWS – Submersed Aquatic Vegetation Early Warning System), 3) high-resolution satellite image analysis, and 4) fortnightly water quality monitoring coordinated with the Michigan Water Research Center at Central Michigan University. Results of point-intercept surveys, satellite image analysis, and water quality monitoring are discussed briefly here.

Point-intercept data from vegetation surveys shows that in 2001, the year prior to treatment, EWM was present at 490 (54%) of the 912 surveyed sites. In 2002, the year of treatment (3 months following initial application), EWM was found at only 45 sites (<5%), indicating 91% control of EWM by 90 days after initial treatment. In August 2003 (15 months after initial treatment), EWM was not found at any of the 912 survey sites, indicating complete control of that target invasive species in the main body of the lake. The initial 2001 survey documented the presence of 22 aquatic plant species, including EWM. By August 2002, number of species found decreased to 21, and by August 2003, the number decreased to 19. Of the non-target species not present in the 2003 survey, all were known to have moderate to high susceptibility to fluridone, and significant impacts on these species were not unexpected. In 2001, the year prior to treatment, some level of vegetation was found at 705 (77%) of 912 survey sites. In 2002, the year of treatment (3 months following initial application), sites with vegetation decreased to 680 (74.6%). In 2003, sites with vegetation decreased to 496, still above half (54%) of all sites surveyed. Of those 496 sites, 226 (24.8% of 912 total) had only *Chara* spp. (muskgrass), while the remaining 270 (30% of 912 total) had additional macrophyte species present.

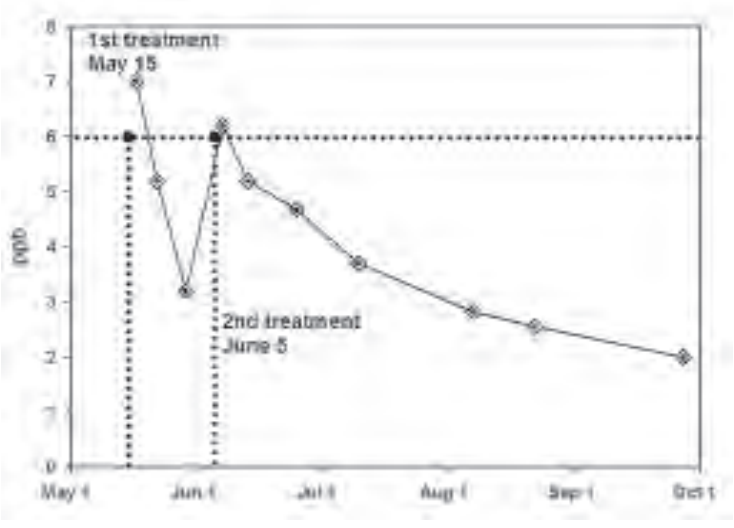

Figure 3. Enzyme-linked immunoassay (ELISA) measurements (FasTEST™) of fluridone residues in Houghton Lake during 2002 Sonar® treatment. Results are the mean of samples from 36 sites around the lake.

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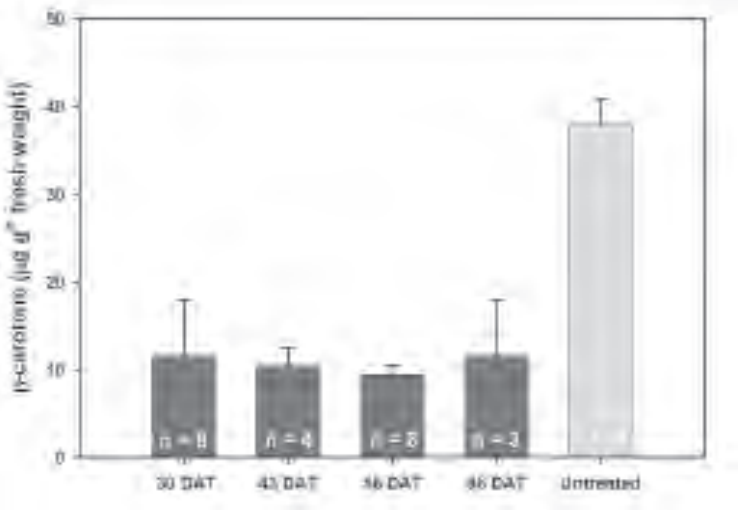

Figure 4. ß-carotene content of Eurasian watermilfoil (EWM) sampled at various sites in Houghton Lake, MI during the 2002 Sonar® treatment. Number of sample sites noted within each graph bar. This data shows that the herbicide is affecting the EWM, compared to untreated plants.

Starting in October 2000, high resolution IKONOS satellite imagery (©Space Imaging LLC) has been annually acquired and analyzed using digital analysis software to calculate the acreage of detectable near-surface and topped-out submersed vegetation on Houghton Lake. On October 18, 2000, after a banner-year for EWM growth, over 7,600 acres of submersed vegetation was detected via satellite (Fig. 1A). Field surveys that fall confirmed that almost all detected vegetation was EWM. On September 30, 2001, only 3,176 acres could be detected. However, as 2001 point-intercept survey data show, EWM continued to dominate the lake despite annual variability in total biomass. Analysis of a third IKONOS image taken on September 30, 2002, 138 days after the initial Sonar® treatment, did not detect any topped out or near-surface growth of submersed vegetation Fig. 1B), indicating the excellent control of EWM achieved by the treatment program.

Potential negative impact on water quality was a prominent concern of Houghton Lake stakeholders during management plan development. It was feared that dramatic reductions in the coverage of EWM after a Sonar® treatment might significantly decrease water clarity through either increased nutrient availability and enhanced algal growth, or through destabilization of sediments producing re-suspension and greater water turbidity (cloudy or muddy water). Another concern in year of treatment was the potential for reduced dissolved oxygen in the lake due to plant die-back, which can consume oxygen during organic matter decomposition.

In September 2001(pretreatment), total phosphorus measurements for various sites within the lake were nearly all less than 10 ppb, values typically indicative of an oligotrophic system. Chlorophyll *a*, a general indicator of algal abundance, ranged from 2-10 ppb at most sites, and Secchi disk transparencies ranged from 5.9 – 9.8 feet around the lake. These Chl *a* and Secchi values would indicate that Houghton Lake is a mesotrophic lake system. Dissolved oxygen values at almost all sites and depths were well above 5 parts per million (ppm).

In 2002, a variety of water quality studies including measurements of temperature, light, turbidity, dissolved oxygen, chlorophyll, and total phosphorus and total nitrogen were conducted on a biweekly basis from May through September to monitor treatment impacts. Results indicate that water quality remained similar to the 2001 pretreatment conditions. The lake remained well-mixed throughout the treatment period except for temporary slight stratification in late June. Light penetration was good with Secchi transparencies between 3.3 and 8.2 feet, which in shallow areas, was often equal to the water depth. Turbidity levels were very low, indicating minimal resuspension of sediments during the treatment. Except for a few isolated lower readings, dissolved O_2 remained above 5 ppm at both the surface and bottom throughout the study period. Chlorophyll values were low to moderate, with only an occasional peak above 30 ppb. Highest values occurred in May and July, periods that also showed peaks in total P, which remained very low for most of the treatment. Comparison of total P and N (nitrogen) ratios indicated that the lake was generally P-limited in terms of algal growth. A comprehensive review of Houghton 2002 water quality data will be available in the final ERDC report.

LONG-TERM MANAGEMENT STRATEGY AND CONCLUSIONS

In discussions of management designs for Houghton Lake, the HLIB, regulators, researchers, and consultants identified 4 major goals for the lake's long-term restoration: 1) reduce impacts of EWM on the lake ecosystem and its users, 2) encourage adequate levels of native plant diversity and abundance, 3) protect lake water quality, and 4) protect the lake's fishery. A sequential, integrated plant management/ restoration program was selected by the HLIB to meet these goals. Whole-lake treatment with Sonar® herbicide was the first step in this program, and has clearly met goal #1 by providing effective control of EWM through two growing seasons. While there have been impacts on native plant populations in the 15 months since the treatment was initiated, some level of impact was expected based on the presence of several fluridone-sensitive non-target species in the lake. Nineteen different species are still present in the lake and recovering. The lake's management plan also calls for potential work to re-vegetate the lake with certain species impacted by the treatment, such as *Elodea canadensis*, as early as 2004. Surveys have also documented the reappearance of *Zizania aquatica* (wild rice) in isolated locations within the lake, and efforts to restore this valuable native species in areas with suitable habitat could be assisted by EWM removal. Limnological studies have documented no significant changes in water quality within the lake as a result of the 2002 Sonar® treatment. Sufficient native plant growth remained to stabilize sediments and allow for proper nutrient cycling

within the system. Finally, while there is no scientific documentation of direct effects of Sonar® treatment on the lake's fishery, anecdotal information from property owners and regular users of the lake suggests that fishing is as good or better than in the years prior to treatment.

Overall, a comprehensive management plan to control EWM and provide a long-term strategy to maintain a healthy and diverse aquatic plant community has been implemented on Houghton Lake. The first stage of this plan—whole-lake control of Eurasian watermilfoil—has been successfully completed. Homeowners and lake users have been provided relief from the problems and issues associated with a widespread EWM infestation. Vigilance against re-infestation by EWM is critical, and an intensive monitoring program is in place to provide for rapid response to further problems with the invasive species. Efforts to reintroduce or expand the current populations of certain desirable native plants will be investigated to promote increased aquatic plant diversity. The focus of all efforts is the long-term health and economic value of the Houghton Lake ecosystem, a priceless freshwater resource for the state of Michigan and the Great Lakes region.

Acknowledgements

We would like to thank the Houghton Lake Improvement Board, Dr. Craig Smith, ERDC scientists, SePRO personnel, Progressive AE scientists, ReMetrix LLC, Central Michigan University, Professional LakeManagement, Aquatic Control, Inc., and all others involved with the Houghton Lake project. Permission was granted by the Chief of Engineers to publish this information.

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MICHIGAN SUPREME COURT. . .

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Court to review the case and take a further appeal of it. Recently, the Michigan Supreme Court refused to hear the appeal, such that the Court of Appeals' decisions in *Higgins Lake Property Owners Ass'n* and *Jacobs* are now final and binding precedent. This decision is a victory not only for riparian property owners around the state, but also members of the public who have been unable to use many of the cluttered-up public road ends for proper purposes due to the effective seizure of these public properties by some backlot property owners.

There is one disappointing aspect of the *Higgins Lake Property Owners Ass'n* decision. At first glance, the Court of Appeals' opinion in that case appears to set the bar rather high in order to obtain injunctive relief (i.e., a court order) ordering violators to comply with *Jacobs* and *Higgins Lake Property Owners Ass'n*. A superficial reading of that opinion would seem to indicate that even though someone could have filed a lawsuit and prevailed in court pursuant to a finding that the road end was being improperly used, the trial court could still refuse to grant injunctive relief—that is, even though a legal wrong has occurred, the victim or prevailing party could still be without a remedy even though the activities being complained about have been deemed illegal by the court. Happily, a close reading of the Court of Appeals' opinion seems to indicate that injunctive relief will be appropriate in many (if not most) cases after the date of the court's January opinion. One can reach that conclusion based on two factors. First, the Court of Appeals seemed to believe that the proof of violations in that case were not compelling. Accordingly, the justification for injunctive relief in future cases could be based upon more significant testimony, pictures and videotapes showing specific and concrete violations. Second, the decision appears to be a "shot across the bow" for anyone improperly using a public road end. The Court of Appeals seemed to indicate that to the extent that backlotters did not really understand *Jacobs* before, they might have been given a "pass"—but after the decision in the current *Higgins Lake Property Owners Ass'n* case, violating backlotters should not be shown lenience by the courts. ✦

ATTORNEY WRITES

(continued from page 10)

mobile home parks at or near lakes. A recent bill introduced in the Michigan House would probably take away most local authority over lake access regulations. This atrocious piece of proposed legislation would, if enacted in its present or similar form, likely invalidate hundreds of local government ordinance provisions around Michigan which regulate docks, boat moorage, "funneling" and similar lakefront activities and structures.

2. Lobbying/Lack of Clout. Developers, marina operators, boat manufacturers and others who would potentially overdevelop and exploit our lakes in Michigan are very well organized, at both the local government level and in Lansing. Backlotters are becoming more organized and will undoubtedly further hone their lobbying skills in the future. Unfortunately, riparians as a group have been somewhat politically apathetic in the past. This is changing through the efforts of organizations like the Michigan Waterfront Alliance ("MWA"), but much more needs to be done.

1. Apathy. Few people would probably disagree that this will be the biggest problem which will face riparians over the next decade. In the past, riparians have been somewhat of a "sleeping giant" in Michigan. While a few riparians have been actively involved in lake stewardship (both at their local community level and state wide), the overwhelming majority of lakefront property owners in our state have been apathetic and uninvolved. In order to protect our lakes over time, that must change. ✦

STATE FILES LAWSUIT

The Associated Press

Sept. 19, 2003 — Bean Creek, Lenawee County

A lawsuit filed by the state Department of Environmental Quality accuses two large dairy farms in Hudson of illegally discharging animal waste into a nearby waterway, the DEQ said Tuesday.

The lawsuit filed in Ingham County Circuit Court charges that two farms owned by Vreba-Hoff Dairy LLC allowed cattle manure and silage waste to get into Bean Creek, which leads to the Tiffin River. The DEQ said discharge from the farms also entered Lime Lake and Fischer Lake through smaller bodies of water.

The discharge contains high levels of phosphorus and ammonia in violation of state water quality standards, the DEQ said.

The waste got into nearby waterways because of inappropriate land application and poorly designed storm water retention structures, the DEQ said.

"Operations such as these that flout the law and pose an environmental threat to the waters of this state give all of agriculture a black eye," DEQ director Steven Chester said in a news release.

A representative of the Vreba-Hoff Dairy operations in Hudson did not immediately return a telephone call seeking comment Tuesday. The Vreba-Hoff dairy farms are a subsidiary of the Wauseon, Ohio-based Vreba-Hoff Dairy Development, LLC.

The DEQ wants the court to require Vreba-Hoff to examine the design and management of its operations and make the changes necessary to eliminate illegal discharges.

Together, Vreba-Hoff's dairy farms have about 6,000 dairy cows and generate about 12,000 gallons of cattle manure every day, the DEQ said. The department also said the company doesn't have the appropriate groundwater discharge permits required for farms that have more than 5,000 head of cattle. ✦