

THE MICHIGAN
RIPARIAN



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

Published Quarterly – February, May, August and November



MC Scows Approach the Starting Line For A Sailing Race At Diamond Lake, Cass County

In this issue:

More Than A Century of Sailing At Diamond Lake

Problems With Geese? The DNR Has A Control Program

Effects of Residential Development on Water Quality at Higgins Lake

Bacteria Found That Is Lethal to Zebra Mussels, Harmless to Fish

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In This Issue

- Cover** *MC Scows Approach the Starting Line For A Sailing Race at Diamond Lake*
Photo by Julie Howe
- 6** *Letter to the Editor: Big Mansions Are Spoiling Our Beautiful Shores*
By Charles Breed
- 7** *More than A Century of Sailing At Diamond Lake*
- 8** *Michigan Waterfront Alliance Legislative Update*
By Christian Kindsvatter
- 8** *Public Hearings On Proposed New Rules For DEQ Permits Delayed*
- 9** *Our Attorney Writes on Zoning Tools That Would Benefit Riparians*
By Clifford H. Bloom
- 11** *Problems With Geese? The DNR Has A Control Program and Some Advice*
- 13** *Michigan Lake & Stream Associations News*
- 14** *Effects of Residential Development On the Water Quality of Higgins Lake*
By Russel J. Minnerick, U.S. Geol. Survey
- 19** *Surface Water Quality Monitoring Program Tests Lakes & Streams in Kalamazoo County*
By Shelly Weldy
- 20** *Would You Believe There Are 263 Mud Lakes in Michigan?*
- 21** *Publication of Three More Lake History Books Reported*
- 22** *Researcher Finds Soil Bacteria Lethal To Zebra Mussels, Harmless to Fish*

The Michigan Riparian welcomes letters to the editor, articles for publication, photos, suggestions, and article ideas. Please contact the editor at 269-244-5477.

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for design assistance on this issue.**

Letters to the Editor

Big Mansions Are Spoiling Our Beautiful Shores

To the Editor:

What is to be the future of Michigan's prized and much loved riparian properties? Can we preserve what is left of the natural beauty of our lake and stream shorelines? Or are we going to continue to turn our waterfronts into conspicuous consumption subdivisions with noisy jet ski amusement parks for front yards?

As recently as fifty years ago the inland lakes of Michigan were a place to escape the stress, heat, noise and demands of civilization. A lake was a serene and restful place to relax, swim, fish, watch the sunset and the moon rise, and perhaps listen to the loons. Lake lots were reasonably priced and many small summer cottages were built that generally preserved the trees and native habitat. Why mow a lawn on vacation?

Today, many of these old, intimate, small summer cottages are being bulldozed and replaced by huge, year-round homes squeezed into the former cottage's space or on lots too small for such extreme size.

With lake lots now selling for a half to one million dollars, buyers seem to feel justified in reshaping the land to build large-scale mansions with 30-foot cathedral ceilings, 20-foot pillared entrances, three and four car garages, multiple roof gables, large manicured and chemically treated lawns, illuminated docks, multiple boats and hoists, and several jet skis.

We need to heed the advice of architect Sarah Susanka, who argues in her recent book *The Not So Big House*, that a home can be much smaller than we thought was needed and that added size will not secure the happiness we seek. She points out that most folks do not gravitate to the cathedral-ceilinged spaces, or the rooms with the most acreage, but to "the more intimate places proportioned to our human scale." The book stresses that "right-sizing" can make us feel more fulfilled and can achieve a more sustainable use of earth's resources.

Unfortunately, zoning alone cannot stop the proliferation of these new mansion homes that are spoiling our shorelines. Clearly, the time has come to create a culture where excessive size is not the measure of success or happiness. We must conserve and preserve our natural beauty and resources so that future generations may also enjoy our wonderful Michigan shorelines.

-- Charles Breed, Long Lake,
Grand Traverse County

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More Than A Century of Sailing at Diamond Lake

Sailors have been competing in races at Diamond Lake near Cassopolis, as shown on the cover and this page, for more than a century. Probably the first organized race was on the 4th of July in 1895, with three boats entered. According to Lois Webster Welch, author of *A Diamond Sparkles*, (a history from which some of this article is taken) the first record of sailing craft on Diamond Lake was in the summer of 1873. The first two sailboats were those made available to guests of a resort that year operated by Moon and Lindsay. Five years later they bought another "sailing yacht." In 1886, Barak L. Rudd became the owner of a sailboat, but there was no further mention of sailing in the local newspaper until 1895.

By that time, several resorts were operating at Diamond Lake and there were an unreported number of sailboats "providing pleasure, sport, and competition." In that first race on the 4th of July, 1895, the champion's flag was awarded to a 25-ft yacht named "Marguerite". Her owner, a retired Navy captain named Charles Shillaber, then excluded his boat from further competition and offered the flag as a challenge prize for other races that summer. Whatever boat won it would have to defend it "against all comers" in succeeding races with the winner of the September 14 race keeping the flag.

In the opening race of the 1896 season, "Marguerite" was soundly and fairly beaten by a new 18-ft yacht named "Priscilla". Captain Shillaber, who also owned a resort hotel at Diamond Lake, called for a meeting on June 27, 1896 to organize the Diamond Lake Yacht Club. Elected as its first chairman, he presented a silver cup to be offered as a prize according to rules made by the club. He said his

boat would not compete for it and provided for a champion's flag to be awarded as in the previous year.

On the 5th of July, 1897, six sailboats were entered in the first of a series of 15 races, five to be sailed each year through 1899. One of the boats was "Lillian", owned by J.M. Studebaker of South Bend, but she, along with one other, did not finish that race.

Interest in sailing at Diamond Lake dwindled sometime before the First World War and did not pick up again until the mid 1930's. In the spring of 1938, the second Diamond Lake Yacht Club was organized "to promote and conduct racing" under specific rules and handicaps and to "foster good fellowship among its members." The first year the club had 48 members with 20 sailboats listed on the roster. The fleet included nine Gaff C's, three Snipes, three Cat Boats, two National Ones, a Cape Ann, a Cape Cod, and a Comet. Ten races were held the first summer, including an Invitational Regatta on August 14 and a three-day Labor Day Regatta.

By 1940 there were enough Snipes to organize a fleet, which grew to 15 boats by 1944. By 1953 it had more than doubled to 34 boats and was recognized as the largest Snipe fleet in the world.

The current Diamond Lake Yacht Club, now in its 64th year, was initially organized for sailing but broad-



ened its purpose many years ago to include youth development, social activities, water safety, and lake preservation. It has offered swimming instruction for kids for more than 50 years and has an active program of sailing instruction for juniors in Sunfish and Butterflies. Social activities include many members who don't own sailboats but enjoy the barbecues, brunches, dinner dances and other events that the club sponsors. The club has donated an ambulance and other rescue equipment to the Cass County Sheriff's Marine Patrol and has actively supported water safety, sewer construction, and wetland protection.

The club schedules about 18 races for its 15-boat MC fleet each summer from mid-June through Labor Day. Two thirds of them are on Sundays at 11 a.m. and the others are on Saturdays at the same time. Junior races are held on weekdays and Saturdays. The club has hosted the Michigan MC Championships regatta every summer for the past 18 years. The regatta, which normally attracts about 40 boats was held this year on July 26-28.

The Diamond Lake Yacht Club currently has a membership of about 150. Its first clubhouse in 1947 was a former marina showroom. Its current building was built in 1971. Membership is open to Diamond Lake property owners and interested persons in the surrounding area, especially sailors in the M C, Butterfly, and Sunfish classes. Annual dues are \$150 per family, plus \$35 per boat raced. -W.H.



Clubhouse of the Diamond Lake Yacht Club

Michigan Waterfront Alliance Legislative Update

By Christian Kindsvatter, MWA Lobbyist

Legislature in Summer Session. The Michigan House and Senate both remain in session if only to vote on legislation one day a week. For the first time in 25 years both houses will be meeting during the summer to complete the state annual budget process. Lake associations have an issue that has passed both the House and Senate, but as of early July, obtaining the Governor's signature is in question. SB 1106, the DNR Budget, has a one-time appropriation for \$35,000 for funds to match private contributions to develop a new process to measure boat noise to enforce the state's boat noise law. This provision is in question due to the state's revenue shortfall to cover expenses. The Governor could veto this line item; however, MWA continues to work with the Governor to gain acceptance of this DNR budget provision.

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Public Hearings Delayed on Proposed New Rules For Permits for Shoreline Structures, Activities

Public hearings on proposed revisions and additions to administrative rules used to enforce Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994, (PA 451, as amended) have been delayed for further discussion with some of the interest groups affected. According to Martin Jannereth, Chief of the Great Lakes Shorelands Section of the Michigan Department of Environmental Quality, the hearings will probably be scheduled in November or December. When determined, the dates, times and places of these hearings will be posted on the state's web site at www.michigan.gov/orr. The final draft of the rules will also be posted there. If available in time, the hearings will also be listed in the November issue of *The Michigan Riparian*, along with an extensive article originally scheduled for this issue.

The proposed rules involve identifying what kinds of structures and activities along the shorelines of inland lakes and rivers require permits from the DEQ, along with procedures for obtaining them. They apply to docks, marinas, dredging and filling, and the maintenance and repair of certain structures and erosion control systems. The rules also define structures and activities that are exempt from needing permits.

A working group of representatives from interests affected by the rules has worked for more than a year on the revisions. Riparians were represented by three officers of the Michigan Waterfront Alliance.

The final draft provides an exemption for a single-family-owned seasonal riparian dock up to 4 ft wide, with no roof and up to five watercraft, (which may be on lifts with covers).

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OUR 25th YEAR

Our Attorney Writes On Riparian Rights and other legal matters of concern

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Zoning Tools That Would Benefit Riparians If Supported or Authorized in Michigan

The single best tool available to protect inland lakes, streams, rivers, and watersheds in Michigan, in my humble opinion, is local municipal zoning. I have discussed lake access (i.e., anti-funneling/keyhole) zoning regulations in *The Riparian* and at various ML&SA meetings so often that I fear that many of you are probably overdosed on the subject! However, in addition to water access regulations, there are numerous other zoning techniques which can help protect our water resources.

Unfortunately, Michigan is light years behind most other industrialized states at the state level when it comes to many zoning issues and lacks many of the statutes found in other states regarding environmental protection. Therefore, most innovative planning in Michigan is occurring at the local municipal level. I realize that asking riparians to learn more about zoning issues is a little like asking someone who is not very fond of broccoli to eat it. Nevertheless, zoning has huge implications for lakes and watersheds, and riparians who ignore becoming involved in local zoning decisions do so at their own risk.

Following are brief descriptions of some of the innovative and beneficial techniques available in many other states which the Michigan Legislature has either failed to authorize or support financially to the extent needed to be truly beneficial.

Purchase of Development Rights

Basically, purchase of development rights (PDR) is a technique to preserve farmland and open space whereby the government buys development rights, thus precluding future development. Using this technique, the government purchases development rights on certain rural properties, and as part of such a sale, a permanent deed restriction (or conservation easement) is placed on the property which prohibits future residential and other development.

Michigan's PDR program is very limited, both in scope and the availability of funding. While a few other states have authorized hundreds of millions of dollars per year to protect vast tracts of farmland and open space, Michigan has provided only a small fraction of that amount per year, which has had little or no impact upon preservation of farmland and open space.

An exception to this is the innovative program being employed by a township government on the peninsula near Traverse City where local tax dollars are being utilized in a local PDR program which has been quite successful. However, until and unless Michigan provides a permanent, dedicated funding mechanism (such as an additional one percent sales tax, additional property transfer tax or other source of state revenue), it is unlikely that any statewide PDR program will have other than a token impact.

Transfer of Development Rights

This could very well be the single best approach for preventing unreasonable sprawl, regenerating urban areas, preserving open space and farmland and protecting the environment. This is a market-based approach which permits owners of agricultural and other lands to share in the profits of development, while keeping their land in farming or open space. Best of all, it is not primarily funded by the government, but rather by the developers and ultimate buyers or users of the new lots, houses or other developments created.

What is this "transfer of development rights" (TDR) approach utilized by several other states? It is a process whereby governments designate areas for development that are within or adjacent to urban areas instead of permitting extensive development in outlying rural areas.

Such areas planned for development already have streets, public water and sewer and other improvements or the improvements are such that they can be extended a short distance without excessive cost. These areas planned for development adjacent to or near urban communities are frequently designated as the "receiving areas (or zones)." In order to develop properties in a "receiving area," a developer must not only buy (or own) the property to be developed, but also purchase a certain number of development rights from the owners of rural properties further out.

(Continued on Page 10)

These rural areas from which development rights can be purchased are often referred to as “sending areas (or zones).” The farmer or rural property owner would normally be allocated a certain number of development rights to sell based on the number of residential lots or other development potentials which could be developed on the rural property. These rural “development rights” are then transferred to the urban area where the developer desires to develop/redevelop property.

Once a property owner in a rural area sells development rights for use in an urban or suburban setting, a permanent deed restriction (or conservation easement) is placed on the rural property to forever prevent development. The property can still be used for nondevelopment uses such as farming, hunting, etc.

As with a PDR, the process for TDRs is purely voluntary for the rural property owner, who is free to negotiate prices with the developer regarding the development rights.

The TDR technique is being used successfully in other states, including Pennsylvania and New Jersey. Michigan Representative Patricia Birkholz (R., Saugatuck) has introduced legislation in the Michigan House of Representatives to authorize TDRs in Michigan, but to date, that legislation has gone nowhere.

Mandatory Offsite Improvements

In many other states, a developer is required under certain circumstances to make improvements outside of the boundaries of a proposed development. For instance, if a new development would overburden an existing public road, the developer would have to pay to have that existing road upgraded. In Michigan, municipalities generally cannot require off-site improvements by the developer.

Exaction/Impact Fees

In many states, developers are required to pay local governmental units fees based on negative impacts from the development or out of fairness. For example, in some other states, a developer might have to pay the local school district a certain amount of money for each new residential lot. This is based on the reasoning that prior homeowners had to pay local school millages for many years to build the physical school plants and the new development would place a strain on the existing facilities (and perhaps require expansion of school facilities), such that it would not be fair for a developer to create new residential lots without making a capital contribution to the schools. Again, Michigan municipalities generally cannot charge such impact/exaction fees.

Extension of Public Water and Sewer

In some states, developers are required to extend public water and sewer at their cost for significant distances before development can occur. In Michigan, if the proposed development is not located fairly close to existing public sewer and water facilities, a developer is not required to extend such facilities significant distances and in most cases, can utilize individual wells and septic tanks.

Why Is This Important to Riparians?

There are three general reasons why riparians should care about all of this. First, given the relative backwardness of Michigan at the state level regarding planning, environmental protection and agricultural and open space preservation, it is important that local municipalities step up to the plate and attempt to do their part by strong and prudent local zoning and planning.

Second, it can be argued that Michigan’s lack of offsite improvement requirements, exaction/impact fees, and mandatory extension by developers of public water and sewer for all significant developments leads to greater sprawl and causes unfair subsidization of private development by the taxpayers.

Finally, good local zoning regulations (or the lack thereof) can have huge impacts on lakes, even apart from lake access regulations. For example, permitting large and dense residential developments (whether conventional, multi-family or mobile home parks) near lakes can degrade lake quality and greatly increase boat traffic on the lake, even if the development involved is not actually on the lake itself. Open space and buffer zoning can help push developmental pressures away from lakes to more appropriate locations. Utilizing zoning to keep industrial and commercial uses away from lakes can lessen negative impacts on lakes. These are just a few examples of why good zoning can be used to protect lakes, while bad zoning (or the lack of zoning at all) can create severe problems for lake communities.

What can be done?

If you feel strongly about these issues, you should get involved in your local government’s zoning and planning activities. Furthermore, you can also let your state senator and representative know how you feel regarding Michigan’s falling behind in the areas of PDRs, TDRs, impact/exaction fees and environmental enforcement.

Problems with Geese?



The DNR Has a Goose Control Program and Some Advice On What You Can Do

Ed. Note: This article is condensed in part from the Michigan Department of Natural Resources brochure "Goose-Human Conflicts and Control Techniques" and from Canada Goose Management Guidelines of the Wildlife Division, Southwestern Management Unit. For copies and more details, contact your district DNR office.

The population of the once nearly extinct giant Canada goose (*Branta canadensis maxima*) has exploded in areas throughout North America. This is due in part to the success of wildlife management programs and the adaptability of these magnificent birds. In Michigan, the number of giant Canada geese counted each spring increased from 9,000 in 1970 to over 300,000 today. Giant Canada geese nest in every Michigan county but are most common (80 per cent of the population) in the southern third of the state. Of all the waterfowl, geese are particularly opportunistic and can easily become accustomed to people. Flocks of local Canada geese have become established throughout Michigan and other Midwestern states. They thrive on inland lake shores and in suburban areas where lawns, parks, and golf courses provide expanses of short grass for food, a lack of natural predators, an absence of hunting, and hand-feeding by some residents.

Although most people find a few geese acceptable, problems quickly develop when numbers increase when adults and their young return to their nesting areas year after year. This frequently results in overgrazed suburban lawns, undesirable accumulations of droppings and feathers, and the

fouling of swimming facilities, beaches, lawns, and golf courses. Geese can also damage agricultural crops by consumption or trampling.

Canada geese, like all native waterfowl, are protected by the Migratory Bird Treaty Act. Under this law, it is illegal to hunt, kill, sell, purchase, or possess migratory birds, or their feathers, nests, eggs, etc except as permitted by regulations of the U.S. Fish and Wildlife Service and the state of Michigan. They are also protected indirectly by various township and municipal

DNR Guide Lines for Goose Control

- **Encourage Hunting**
- **Enforce No Feeding**
- **Modify Habitats By:**
 - Changing Lawn Maintenance Practices**
 - Chemical Repellants**
 - Landscape Plantings**
 - Land Use Regulation**
 - Installing Barriers**
 - Using Reflecting Tape, Scarecrows, Balloons**
- **Harrass Geese By:**
 - Firing Shell Crackers**
 - Automatic Exploders**
- **Egg Removal (SE Mich.)**
- **Remove, Relocate Geese (A Last Resort)**

ordinances that prohibit the discharge of firearms within a certain distance of a dwelling.

The Wildlife Divisions of the various MDNR districts have developed suggestions for reducing the problems caused by geese. These are presented in summarized form in this article. The

DNR can also provide lists of where some of the products and devices mentioned can be purchased.

Encourage Hunting

The DNR considers hunting to be the most effective tool for controlling local goose populations and is the department's first priority for solving nuisance problems. It urges citizens to encourage and support goose hunting during both the regular October-November goose season and in two special early and late seasons -- one in early September and the other in January.

To make hunting more effective property owners and local governments must consider opening non-traditional areas, such as parks, estates, and golf courses to controlled hunting. In some cases, exemptions from local ordinances are needed to permit hunting in these areas.

Enforce No Feeding

Feeding of all wild and domestic waterfowl on both public and private property in urban or suburban areas should be prohibited by local ordinance as an important first step in controlling Canada goose problems. A public education program should accompany the enactment of such an anti-feeding ordinance. Such an ordinance must be enforced and should have a penalty sufficient to deter disregard and violation of the ordinance.

Modify Habitats

Canada geese need upland and aquatic habitats for resting, feeding, and breeding. Modifying the habitats make an area less suitable to geese and limit the number that can use it.

(Continued on Page 12)

Lawn Maintenance Methods

Limit the size of your mowed lawn. An unmowed 6-foot wide shoreline buffer of tall native grasses or a hedgerow 20 to 30 inches tall can discourage geese from visiting your lawn. Canada geese are reluctant to walk through high vegetation. Letting the lawn grow longer and not fertilizing or watering it will make it less attractive to geese. When establishing a new lawn, consider planting fescues instead of Kentucky blue grass, which are less attractive to geese.

Chemical Repellants

Grass turf can also be treated with bird chemical repellants registered for this purpose with the U.S.E.P.A. Two such products are RE-JEX-IT and GooseChase.

Landscape Plantings

Replace grasses with plants that are not palatable to geese and do not provide feeding or nesting habitat. Such plants that can be used along the water's edge include pachysandra, periwinkle, and euonymus.

Use Regulation

Planning Commissions and other regulatory authorities should work with developers and property owners to avoid creating landscapes that geese like for nesting, such as islands and peninsulas in ponds. Where these features already exist, they should be removed or made unavailable to geese.

Install Barriers

Geese prefer to land on water and walk up onto adjacent grassy areas to feed and rest. Fences can be effective during the summer flightless period. Fences need to extend only 18 to 24 inches above the ground, but should completely enclose the site with no breaks for geese to sneak through. Two-inch mesh chicken wire is durable and will last for years. New types of strong, lightweight, and nearly invisible plastic or nylon fencing is available. Some homeowners have found two parallel monofilament fish lines (20 lb test) strung 6 and 12 inches

above the ground, well secured by stakes 6 feet apart to be quite successful in excluding geese.

Grids of single strand 14 gauge wire or 80-100 lb test monofilament line arranged in squares 10 to 15 feet on a side and suspended 12 to 18 inches above the water surface will deny geese access to lakes and ponds. This does not work for ducks.

Scaring Techniques

A thin mylar tape that flashes reflected sunlight and hums in the breeze strung along the water's edge can repel geese. Scarecrows can also be used. They don't need to resemble humans, but some part should move. Plastic streamers or flags that move in the breeze may also discourage geese. Large helium filled balloons 30" in diameter, tethered on 10 to 30 ft monofilament lines (50-70lb test) will keep geese from feeding and resting on lawns, since they don't like to linger under objects hovering above them.

Harrassing Techniques

It is permissible to harrass Canada geese without a Federal or State permit so long as the geese are not touched or handled, either by a person or a trained dog. However, it is not permissible to chase geese with motorized vehicles, either on land or water. Shellcrackers and other pyrotechnics can also be used, but a permit may be needed from the county or local government. Automatic exploders, using timers to ignite propane or acetylene gas, can be used but also may need a local permit.

Egg Removal

Since 1998, the DNR has been operating a program in Oakland County to slow goose population growth by collecting eggs during the spring nesting season. Through 2001, more than 11,000 eggs and 2,300 nests were removed. This year, the program was expanded to include Macomb and Wayne Counties. Volunteers from lake associations, golf courses, local governments and businesses are issued

permits and receive special training for this program. Applications for permits are due at the District DNR office by April 1 of each year. Collectors try to remove eggs after females have been sitting on them long enough to use up their fat. If this is done, the birds will not nest again.

Removing Geese

The DNR considers this the control method of last resort and will not consider it unless all the previous methods (except egg removal) have been properly tried but failed. There are a number of other strictly applied guidelines that must be met before a removal permit will be approved. These include:

- 1) Public approval. Requester must provide either a petition signed by 70 per cent of the lakeshore property owners, countersigned by the local unit of government, or a written request for the removal from a local unit of government. The petition or request must state that it is understood that the geese captured may be humanely killed as a means of disposal.
- 2) Requesting organizations must provide manpower to capture geese under DNR supervision or pay a private animal control firm to do it.
- 3) Geese will only be removed during the summer flightless period (about June 20 - July 10) and only if there are more than 25 geese.
- 4) No banded birds will be removed except for those in excess of 10 per cent of the total. Further, up to 10 per cent of geese captured may be banded and released on the site if the DNR deems it necessary for monitoring purposes.

Although the DNR officially discourages capture and removal as a control measure, petitions and requests to do so may be submitted to the District DNR Wildlife Division office not later than June 1 of each year. --W.H.

See also "Michigan's Exploding Goose Population" by Jack W. Boss in the Nov. 1994 Riparian.



ML&SA NEWS

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NEW ML&SA MEMBER ASSOCIATION

Houghton Lake Improvement Board – Roscommon County
James Desmond, Chairman

Westlake Woods Lake Association – Calhoun County
R. Sackett, President

SCHOOL PROJECTS EXPANDING

Four more schools will be chosen for the SCHOOLS/LAKE ASSOCIATION Science Project in addition to the nine high schools that participated in the program this past school year. The School/Lake project is directed by Randy Cook, chemistry teacher at Tri-County High School near Howard City in Montcalm County. Funds were received from the Porter Foundation, Wege Foundation and RGK Foundation to purchase equipment, supplies and other needs.

A new pilot program for monitoring streams is under the direction of Jeff Kalember, science teacher at Gaylord High School. The goal of this stream project is to build working relationships between high schools and lake, stream and watershed associations. The project will educate associations on what is happening in the streams that flow into and out of their lake. If you would like more information about the stream monitoring project, please call Pearl Bonnell at Long Lake, Michigan. Her phone number is 989-257-3583, and her e-mail is pbonnell@mlswa.org. Both projects are sponsored by ML&SA and supervised by Pearl Bonnell, Director of Operations of ML&SA.

EURASIAN WATER MILFOIL—A SPREADING PROBLEM

We have information from MDEQ that over 400 applications were received in the year 2001 for permits to treat Eurasian Water Milfoil in lakes, ponds and marinas. If you have a Eurasian Milfoil problem on your lake, ML&SA would like to hear from you. Is it a minor, or major problem? Please send your reply to the main office at Three Rivers as shown above, or fax it to the Three Rivers office at 269-273-2919. Information requested:

Name of Lake _____

Lake Location: Township _____ County _____

Years infested _____

Eurasian verified by _____

Control attempted: Year(s) _____ Method _____

Control success: Meager _____ Excellent _____

Person reporting _____ Phone _____
(Optional)

Higgins Lake Water Quality

Five-year Study Finds Residential Development Adversely Affects Both Lake and Ground Water

Editor's Note: The following article by Russel J. Minnerick is reprinted with permission of the author and *Higgins Lake Foundation News*, where it previously appeared. The article is excerpted from the U.S. Geological Survey final report. The study found greater concentrations of nitrogen and phosphorus in near-shore waters than in deep basins. The complete 28-page report can be downloaded from **USGS WEB SITE** at <http://mi.water.usgs.gov>. Go to the Table of Contents to find List of Publications (by author), and scroll down to Minnerick.

Effects of Residential Development on the Water Quality of Higgins Lake Michigan 1995-1999

By Russel J. Minnerick
U.S. Geological Survey Water-Resources Investigations
Report 01-4055 Lansing, Michigan 2001

Abstract

Higgins Lake, a popular recreation area in the north-central Lower Peninsula of Michigan, drains an area of 58 square miles and is composed of two deep basins separated by a narrow channel between Flag Point and Point Detroit. The North and South Basins have a maximum depth of about 141 and 100 feet respectively. Ground-water inflow is the major source of the lake's water supply, with precipitation and inflow from two small tributaries providing the remaining water.

The quality of the lake water near shore has been affected by residential development. The concentration of chloride and turbidity in the lake water near the shore increases with increases in building and road density. Nitrogen concentration in lake water near shore also has increased the most in areas where buildings exceed a density of 0.50 building per acre. Ground water beneath the lake showed higher concentrations of phosphorus, nitrogen, chloride, and boron than the lake-water samples.

Escherichia Coliform (E. coli) bacteria was found in ground water at sites where building density exceeded 0.40 building per acre, indicating that water from septic systems, is leaching to the ground water that flows to the lake. Phosphorus concentration in lake and ground water appears to be more affected by site-specific conditions, such as soil type and distance of sampling sites from individual septic systems, than by building density alone.

Introduction

Higgins Lake (fig. 1 on Page 17) lies in the north-central Lower Peninsula of Michigan. Rapid population growth and increased residential development around Higgins Lake and the vicinity around Higgins Lake has created concern for lake water quality during the past 30 years. Gerrish and Lyon Townships in and around Higgins Lake also have undergone rapid growth. Between 1970 and 1990, the population of Gerrish Township grew by 246 percent, whereas Lyon Township grew by 185

percent (Robert Smith, Roscommon County Clerk, written commun., 1999). Summer cottages, condominiums and permanent homes, as well as State and municipal parks surround Higgins Lake. With the increased development around the lake, much of the native vegetation has been replaced by lawns and roads. Each household around the lake has its own septic-tank system with drain field or drywell. The condition of these individual systems vary with age and prevailing building codes at the time of installation.

Local government and concerned citizen groups believe that any degradation of lake water quality is a result of increased nutrient loading from septic systems, fertilization of lawns, and runoff from roads. In 1995, the U.S. Geological Survey (USGS), in cooperation with Gerrish and Lyon Townships, Roscommon County, Higgins Lake Property Owners Association and Higgins Lake Foundation began a sampling program to monitor changes in water quality that may have been a result of increased development around the lake.

Purpose and scope

This report summarizes the results of a sampling program conducted over five years (1995-99) and describes the effects of residential development associated land use on lake water quality. Also, water quality of surface-water inflow to the lake, shallow ground water, water in the North and South Basins of Higgins Lake, and near shore lake water is discussed. The trophic status of each deep basin was determined, compared and evaluated over time. This study provides a tool for community leaders in making decisions as to the best way to protect the water quality of Higgins Lake.

Description of the study area

Higgins Lake is approximately 9,900 acres in size, was formed during the last glacial period (Wisconsinan) (Miller and Thompson, 1970). The lake consists of two deep basins separated by a narrow channel between Flag Point and Point Detroit (fig. 1). Higgins Lake watershed is predominately sandy soils and glacial outwash forming rolling moraines. Except those areas with residential development and the small area of wetlands to the west, vegetative cover mostly is mixed northern hardwoods and pine.

Big Creek and Little Creek are two sources of sustained surface-water inflow into Higgins Lake (fig. 1). These two tributaries are predominantly ground-water fed and the tributaries flow from the west into Higgins Lake. Big Creek receives discharge from numerous piped flowing wells near its mouth, which dramatically increases the flow before the creek discharges to the lake. Their headwaters originate in low forested wetlands with organic soils. The watershed upstream from U.S. Highway 27 drains lowlands vegetated predominately with tag alder (*Alnus rugosa*), white birch (*Betula papyrifera*), and bigtooth aspen (*Populus grandidentata*). The tributaries pass through a heavily developed shoreline area of Higgins Lake before draining into the lake.

Higgins Lake's only outlet, referred to as "The Cut," flows into Houghton Lake (fig. 1). Lake-water elevations and flow of water from the lake into The Cut are controlled by a low-head dam with removable boards. Manipulation of the boards in the dam is controlled by the Roscommon County Board of Commissioners. The USGS operated a gaging station (USGS station 04120500) on The Cut from 1942 to 1950. During this period, The Cut had an average flow of 44.2ft³/s (U.S. Geological Survey, 1958).

The geology and topography in the Higgins lake region enables high recharge of the aquifer and provides Higgins Lake with a constant supply of ground water. Ground-water inflow and the precipitation in the form of rain and snow that falls directly onto the lake surface makes up the major source of the lake's water supply. Because it contains only one outlet and limited sources of water supply, Higgins Lake has a long hydrologic retention time, estimated at 12.4 years (Limno-Tech Incorporated, 1982).

The land use, topographic gradient, soil type, depth to the water table, quantity and quality of surface-water inflow into the lake, and quality of ground water all affect lake water quality. As the topographic gradient increases, the land surface is more easily eroded. Soil characteristics (such as permeability, porosity, and adsorptive capacity) and depth to the water table affect the rate that nutrients will reach the water table. A 1971-72 study of nutrient movement from septic tanks around Houghton Lake (Ellis and Childs, 1973) found that

sandy soils absorb small quantities of phosphorus, whereas clay or silt absorb large quantities of phosphorus. Sandy soils, such as those surrounding Houghton and Higgins Lake, were ineffective in absorbing phosphorus. Ground-water flow rate determines the retention time of water in the aquifer and, thus, the amount of time available for microbes to transform the nutrients.

Because a substantial proportion of the water supply to Higgins Lake originates as ground water entering the lake directly or by the way of its tributaries, the protection of local ground-water sources is critical to ensuring good lake water quality.

Study design

Phosphorus and nitrogen are the critical nutrients that stimulate aquatic growth of plants and algae in a lake. These nutrients are present naturally in the environment, but elevated concentrations above background levels may come from anthropogenic sources including septic systems and lawn fertilization. The nutrient in the shortest supply will tend to be the limiting control on production of phytoplankton and other algae (Hem, 1985). In lakes, a concentration of 0.10 mg/L of total phosphorus generally is considered the threshold where accelerated eutrophication will result (U.S. Environmental Protection Agency, 1986). The U.S. Environmental Protection Agency (USEPA) also has established a recommended limit of 0.05 mg/L for total phosphates in streams that enter lakes. Increased phosphorus and nitrogen concentration together also may have a greater combined effect on stimulation of aquatic growth than either element (Goldman and others, 1990). Limiting the input of phosphorus and nutrients into a lake is essential to controlling the rate of eutrophication.

To understand the relation of residential development and the water quality of Higgins Lake, water-quality characteristics of the ground water and near-shore lake water were compared to the building and road density around the lake. The primary tributary to Higgins Lake, Big Creek, was sampled at two sites. The upstream site was above all residential development and the downstream site was near the mouth below residential development. The concentrations of selected constituents and instantaneous loading at the two sites on Big Creek were compared. The North and South Basins were sampled at their deepest points to determine the

trophic status of each basin and monitor any changing water-quality trends within the basins.

Data collection for this study focused on four general components where their effect on lake water quality could be evaluated:

1. Ground water: Inflow from ground water makes up a substantial portion of the water supply to Higgins Lake. Therefore, ground-water quality should heavily affect Higgins Lake water quality.
2. Near shore: Inspection of aerial photographs and field surveys showed that approximately 19 percent of the lake surface area contains water that is about 4 ft or less in depth. The lake-bottom gradient near the shoreline is gentle until it reaches the deep basins. Water in this shallow zone is slow to mix with water from the deeper part of the lake because of the shallow zones large area. Closer to shoreline, mixing by wind is restricted by trees, buildings, and topography. It is in this shallow zone that changes in water quality resulting from land-use activities first would be expected.
3. Inlets: Two small tributaries are the only continuous sources of surface water to Higgins Lake. They contribute a small portion of the water inflow but drain a part of the watershed with one of the highest home densities.
4. Deep basins: The deepest water column in each basin was treated as separate sample sites to document any physical and chemical variation between basins. Samples were collected before and after the lake became thermally stratified. The thermally stratified zones in each water column were treated as separate sample sets because of the unique chemical and biological activities that can occur in each zone.

In this study, total phosphorus, $\text{NO}_2 + \text{NO}_3$ as nitrogen, chloride, boron, pH, dissolved oxygen concentration; physical characteristics such as turbidity, specific conductance, water temperature, secchi depth observations; and the biological indicator chlorophyll a were measured. Bacterial examinations for *E. coli* were made to help determine the possible sources of nutrient input into the lake. Because *E. coli* is a group of bacteria found only in the gastrointestinal tract of warmblooded animals, its presence could suggest effects of septic systems (American Public Health Association and others, 1998).



The sandy soils around the lake provide rapid recharge to the ground water that supplies most of the water to Higgins Lake. The lake has two spring-fed tributaries Big Creek and Little Creek, flowing from the west. The summer base flow from these tributaries determined from discharge measurements was estimated to be about 2ft³/s. This flow is less than 5 percent of the historical daily outflow through Higgins Lake's only outlet, The Cut. Except for direct precipitation falling on the lake's surface, the remainder of the water supply to Higgins Lake originates as ground water; protecting this resource is critical to ensuring good water quality in the lake.

About 19 percent of the near-shore surface area of the lake is less than 4 ft in depth. It is in this shallow zone that subtle changes in water quality are starting to occur. The concentration of most measured constituents in lake and ground water near shore increased with the increase of residential development. The dissolved chloride and turbidity in the lake water increase as building

Summary and Conclusions

Higgins Lake is in the north-central Lower Peninsula of Michigan. Gerrish and Lyon Townships in and around Higgins Lake increased in population by as much as 246 percent during 1970-90. This rapid population growth created a concern that with increased residential development of the shoreline around Higgins Lake, changes in water quality may occur, resulting from the effects of septic systems, fertilization of lawns, and runoff from roads. In 1995 the USGS in cooperation with Gerrish and Lyon Townships, Higgins Lake Property Owners Association and Higgins Lake Foundation began a sampling program to monitor changes in water quality that may have been a result of increased development around the lake.

Higgins Lake consists of two basins, North and South; the North Basin has the greater depth, about 141 ft and the South Basin is about 100 ft in depth.

density becomes greater than 0.50 building per acre. The phosphorus concentration in near-shore lake water averaged about 1.5 times the concentration found in the deep basins. Nitrogen concentration in lake water off shore from areas where the building density was about 0.50 building per acre or greater was about twice as high as in water in the deep basins. Concentrations of most constituents in near-shore lake water at site 20, with no residential development, generally was lower than at other near-shore sites with residential development.

The quality of ground water varied around Higgins Lake. At five locations, ground-water samples exceeded 0.10 mg/L total phosphorus, the level that USEPA recognizes as a threshold where accelerated eutrophication may result. Nitrogen concentrations at sites 3 and 28 exceeded 7.0 mg/L, approaching the established 10 mg/L guideline

where nitrogen in drinking water becomes a health concern. *E. coli*, a bacterial indicator of fecal contamination, increased in concentration in ground water as building density exceeded 0.40 buildings per acre. Septic systems are the most likely source of increases in phosphorus and nitrogen in lake and ground water near shore, because presence of *E. coli* bacteria in ground water indicates that septic systems are leaching effluent to the water table. High-building-density areas in sandy soils where septic systems are close to the water table are most likely to contribute excess nutrients to the lake.

Tributary inflow minimally affects nutrient loading to Higgins Lake. Most measured constituents were found in higher concentrations upstream from residential development than at the mouth of Big Creek, the inlet to the lake. It is assumed that approximately 98 percent of the summer base flow of Big Creek originates from a part of the shallow aquifer and/or possibly deeper aquifers that is not affected by residential development near Higgins Lake.

The Carlson Trophic-State Index classifies Higgins Lake as an oligotrophic lake, low in algal productivity. Occasional variations in phosphorus concentration, notably in the North Basin, indicates a slight tendency toward eutrophication. The median concentration of nitrogen also indicated little variation between basins. The median concentration of chloride in the two basins ranged from 7.0 to 7.5 mg/L. Boron concentrations generally were at or near the detection limit (16 ug/L). Anoxic conditions never were documented in either of the basins during this study. A minimum of 1.4 mg/L dissolved oxygen was recorded during this period. Water-quality-depth profiles indicated a progressive oxygen depletion in the hypolimnion as summer progressed.

The time period that the data cover in this study was too short to determine how fast and to what extent water quality is changing in the center of the lake as a result of increased residential development around the lake. Variations in the Trophic-State Index might be attributed to seasonal and climatological differences from year to year combined with sampling and analytical error rather than a change in trophic classification.

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NEWS FROM THE UPPER PENINSULA'S LARGEST LAKE – GOGEBIC

— From the Desk of your President — Joe Slazyk

After the devastating floods that were brought upon Gogebic County from the sudden thaw and rains this spring, businesses and residences have cleaned up and things are seemingly back to normal around the lake. People pooled their efforts to keep damage down to homes as well as places of business. The washed out section of the East Shore Road will in time be permanently repaired. At this writing a temporary road and bridge has been constructed to the west of the existing road and is operable.

We are seeking permission to cut trees in close proximity to the new boat ramp on the East Shore to further our efforts to continue the fish shelter program for the East Shore.

The walleye season opened with a bang with limits being taken around the lake, and the fish caught were of good size. You didn't need a boat to hang one of these lunkers on the wall, as was proven by one gentleman from the West Shore. He bagged a 31 incher from his dock. Looks like we're going to have another good year.

New Surface Water Monitoring Program Tests Lakes & Streams Throughout Kalamazoo County for Bacterial Concentrations

By Shelly Weldy

The second season for the Kalamazoo County Surface Water Quality Monitoring Program began in early May and is helping citizens have peace of mind when they travel to nearby public beaches for summer recreation. Riparian owners on all lakes and major rivers and streams in Kalamazoo County also benefit from the program, which tests water from 80 sites throughout the county.

“Parents want to know their children are swimming in safe beaches,” said Jeff Reicherts, surface water specialist. “This is a valuable program to keep bathing beaches safe and free of high levels of bacteria.”

This new program was established in 2001 and focuses on monitoring bacteriological levels in Kalamazoo County beaches, drains, creeks and streams. Sites tested include eight public bathing beaches in the county, which are monitored once per week and more frequently if problem levels are detected. In addition, 72 other sites are being regularly tested, including 22 other lakes, eight sites on the Kalamazoo River, and five on the Portage River. Monitoring starts in late April and ends in late September.

All water samples are sent to the Kalamazoo County Human Services Department Laboratory to be analyzed. If levels exceed standards, signs are posted at the bathing beaches notifying the public that water quality is not safe.

Sign posted at beaches to warn the public.



Kalamazoo County Beaches Monitored for Bacteria

Blue Lake

Cold Brook County Park

Campbell Lake

Robt. Morris Township Park

Eagle Lake

Ft Custer Recreation Area

Gull Lake

Ross Township Park

Hogsett Lake

Prairie View County Park

Long Lake

Ramona Park

Swimmer's Lake

Markin Glen County Park

Woods Lake

Woods Lake City Park

As a result of the monitoring, the public beach at Cold Brook County Park on Blue Lake in Charleston Township was closed twice last summer --once for five days and once for one day. The public beach at Woods Lake in Kalamazoo was closed once for one day.

The surface water-monitoring program concentrates mainly on finding high levels of *Escherichia coli* (*E. coli*) that most often occur after a rainfall and overland runoff. Also sources of animal waste may impact the quality of water and raise *E. coli* levels. *E. coli* are fecal coliform bacteria found in all warm-blooded animals including humans. When levels exceed Michigan's water quality standards, which are 300 *E. coli* colonies per 100 milliliters, as a geometric mean of all samples collected at a beach during one sampling event and 130 *E. coli* colonies per 100 milliliters, as a geometric mean of all samples collected over a 30-day period, the risk of illnesses increase. Some symptoms are abdominal pain, fever, diarrhea and vomiting. “Children, the elderly, and individuals with a weakened immune system are most at risk,” said Reicherts.

The Kalamazoo County Surface Water Monitoring Program is funded

through the county's general fund with additional monies from state and local grants. Its current annual budget is about \$110,000. A similar program existed during the late 1970's and 1980's, but was discontinued in 1985 because of lack of funding and personnel.

During the summer of 2000, citizens in Pavilion and Brady Townships had concerns about the water quality in the Portage River and Dorrance Creek, both of which run into Indian Lake. The suspected contamination came from agricultural runoff from a nearby dairy farm. Investigations by Michigan's Departments of Agriculture and Environmental Quality, the U.S. Environmental Protection Agency, and Kalamazoo County's Environmental Health and Laboratory Services Bureau concluded that the surface water did have high levels of *E. coli*.

Responding to such concerns, the Kalamazoo County Board of Commissioners created a countywide surface water-monitoring program. A Surface Water Quality Specialist was hired in January 2001. Responsibilities of this staff member include creating a monitoring strategy, implementing a surface water monitoring program for Kalamazoo County, maintaining a water quality data base, and overseeing the program through the sampling season. Priority for monitoring and sampling is given to locations where full body contact with water (swimming and wading) produces greater health risks.

“We are very pleased that the County is monitoring the water that enters our lake,” said Joe Briggs, President of the Indian Lake Association, near Vickburg, “especially after the major threat we had from *E. coli* from the animal facility upstream.”

Shelly Weldy is a senior at Western Michigan University majoring in journalism.

Would You Believe There are 263 Mud Lakes In the State of Michigan?

Reporter Also Finds 34 Lost Lakes

In a feature article in *The Detroit Free Press* last spring, Staff Writer Joel Thurtell reported that of the 8,632 lakes in Michigan that have names, 263 are named Mud! In Oakland County alone, there are 14 Mud Lakes! (And at one time there were 16, before two were changed.) The next most used names in the state are not surprisingly Long (77 lakes), Bass (69 lakes) and Twin (62 twins, or 124 lakes, if you prefer to count them as two, as Mr. Thurtell does.) There are 58 Round lakes. The Top Ten most used lake names in Michigan are listed in the adjacent box. The article also mentioned that a Michigan Inland Lake Inventory completed in 1965 by Clifford Humphries and Joyce Colby of Michigan State University, the principal source for the lake names, found that the state has more than 35,000 lakes.

Despite so much duplication, the writer found that there was less confusion among emergency services, such as police, fire, and ambulance, than expected. (Ed. Note: Probably because of the state-wide standardized 5-digit rural street address system.) He reported that it is often developers and real estate agents who want to change a Mud

Lake into, say Fox Lake, as happened not long ago near West Bloomfield. Another Mud Lake in Oakland County's Holly Township was renamed Lake Mauna Loa, because a motel operator wanted a Hawaiian theme for his establishment.

Nationwide, the U.S. Board of Geographic Names receives from 200 to 300 requests a year to change the names of lakes and other natural features, Thurtell reported. "In Michigan, the average is about four," he wrote. A federal official reported that in the past eight years, 34 names of lakes, streams, hills, and valleys in Michigan have been changed.

Top Ten Michigan Lake Names

1. Mud	263
2. Long	77
3. Bass	69
4. Twin	62*
5. Round	58
6. Grass	46
7. Cranberry	44
8. Lost	34
9. Horseshoe	32
10. Bear	30
10. Crooked	30
* 124 lakes	



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Publication of Three More Lake Histories Reported

Since reporting in the May issue on several lake history books and projects to prepare them, *The Riparian* has learned of three more books that have been published. As such publications are reported to us, we will continue to publish short reports on them.

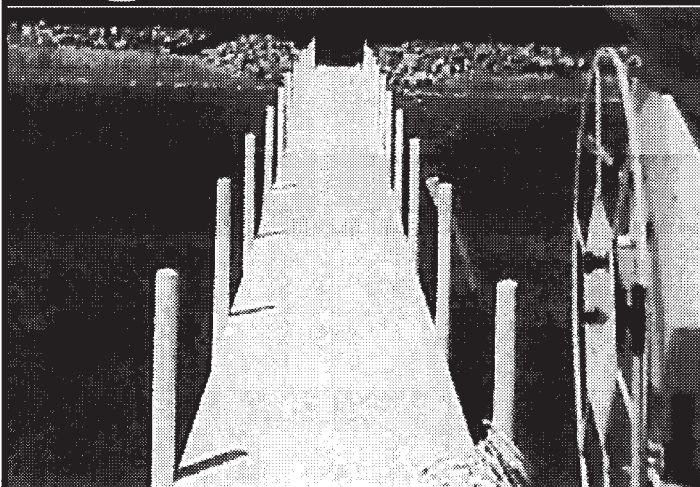
In 1999, *Reflections of Eagle Lake* was published by the Eagle Lake Improvement Association near Edwardsburg. Compiled by Lenore Cassady, Melva Freeman, and Norma Lu Meehan, it is a 60-page booklet containing historical narratives, personal recollections, and numerous old photographs. Copies may be purchased by sending \$10 plus \$2 for postage and handling to Eagle Lake Historical Society, P.O. Box 323, Edwardsburg, MI, 49112-0323.

The Baldwin Lake Association has published *The Windsong of Baldwin Prairie*. Written by Charlotte Fletcher, it is the history of the Baldwin Lake area just east of Union, Michigan. The 190-page book covers the history of Baldwin Lake, the village of Union, and also has information on adjoining Long, Coverdale, and Indiana Lakes. The book, which first appeared in December 2000, has more than 100 photos, maps, and charts. Of 500 copies printed, only a few remain unsold. They are available for \$26.50 at the Elkhart County Historical Society in Bristol, Indiana, or through the author Charlotte Fletcher, 13255 Pleasant Drive, Union, MI 49130-9720. Her telephone is 269-641-7207.

Hooked on Corey Lake, an historical book on Corey Lake five miles west of Three Rivers, has just been published. It was assembled by Lynn Minzey Cassady, a summer resident at the lake since her childhood. Its 107 pages contain recollections of various families' histories and special memories either written by them or by Mrs. Cassady based on taped interviews. It is illustrated with dozens of old photographs, some from the 1890's. The book also has histories of the two summer camps still operating on the lake as well as several resorts that no longer exist. It is available for \$15 a copy from Lynn Cassady, 10804 Corey Lake Road, Three Rivers, MI 49093.

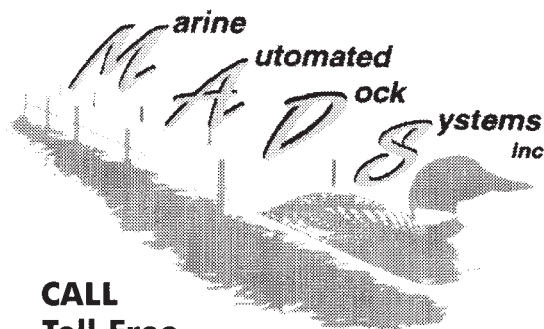
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Researcher Finds Soil Bacteria Lethal To Zebra Mussels, Harmless to Fish

Daniel Molloy, a researcher at the New York State Museum, has found a common soil bacteria that effectively kills zebra mussels without harming some native fish and wildlife species, according to an account published by *The Chicago Tribune* on June 16, 2002.

"In small trials, 95 percent of the zebra mussels clogging pipes at a hydropower facility died after exposure to the bacteria, *Pseudomonas fluorescens*," Tribune Reporter Kathy Paur, wrote. Preliminary tests indicated that the bacteria do not harm fish other species of mussels, or humans.

"Molloy tested hundreds of bacteria before finding the soil bacterium that kills zebra mussels and has yet to harm another water animal," Paur reported. "Because both live and dead bacteria kill zebra mussels, Molloy suspects that the bacterial cells contain a toxin lethal to zebra mussels," Paur wrote. "He plans to use dead bacteria

or the isolated toxin in any commercial mussel-killing ventures. The alleged toxin kills the mussels by destroying their digestive glands," she wrote. Molloy has patented the bacterium's use against zebra mussels, but extensive safety testing must be done and methods found to produce it in commercial quantities.

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