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**Long Lake**  
Grand Traverse County

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*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.

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# STURGEON FOR TOMORROW

by Brenda Archambo, President  
Sturgeon For Tomorrow  
[www.sturgeonfortomorrow.org](http://www.sturgeonfortomorrow.org)

## 2003 Field Season Review

There were two spawning runs observed during the 2003 field season. Spawning Run One: 4/29/03 - 5/4/03 and Spawning Run Two: 5/17/03 - 5/19/03. One hundred twenty-four sturgeon were captured; 80 from the first spawning run and 44 from the second. Female sturgeon that spawned during the first run were larger on average for each of the three size parameters (weight, total length, and girth) than females that spawned during the second.

Drift net larval sampling was conducted on the Upper Black River to quantify out-migrating larval sturgeon. Larval drift were detected 18 days post-spawn. Two distinct pulses of larval sturgeon drift were observed. The two pulses overlapped for several evenings but were easily distinguished by differences in the body size of the individuals in drift (i.e., much smaller individuals in pulse 2). Similar to previous seasons, we observed a discernible peak in the numbers of drifting larvae within a particular sampling evening (11:00p.m. - 1:00a.m.).

A total of 16,417 lake sturgeon larvae were collected. 431 larvae from group one and 15,986 from group two. Larval sampling was generally conducted during a 5-hour period, beginning at dusk and ending in the early morning (2:00 a.m. to 3:00 a.m.). All sturgeon larvae were immediately placed in a separate container and transported to the flow-through tanks located at the nearby field station. All larvae were transported from the field station to Wolf Lake Fish Hatchery for rearing.

On October 23, 5,605 five to seven inch fall fingerlings were reintroduced to three Cheboygan County rivers; 1,300 went into the Sturgeon River (Burt Lake), 1,300 went into the Pigeon River (Mullett Lake) and 3,005 returned home to the Upper Black River (Black Lake) at Red Bridge.

This exclusive, one-of-a-kind venture is the outcome of the cooperative efforts of Sturgeon For Tomorrow, the Michigan Department of Natural Resources and Michigan State University.

The "Head Start Program" is the first in the world to collect larval lake sturgeon, transfer them to a hatchery for



*Kregg Smith with sturgeon in Upper Black River*

nuturing and reintroduced to area streams. The reintroduction of these young-of-the year lake sturgeon in an ongoing effort to rehabilitate the lake sturgeon populations of Black, Burt and Mullett Lake.

Thirty fingerlings remain at Wolf Lake Hatchery with the intentions of conducting telemetry studies in field season 2004.

## **Bank Stabilization Projects Proposed to Protect Sturgeon Spawning Habitat**

A task group has been organized to determine if there is sufficient local interest and support to construct erosion control and public access projects on the Upper Black River. The projects are needed to control soil erosion into the water, provide public access while protecting sturgeon spawning habitat. The project sites were previously identified in the Black Lake Watershed Stewardship Initiative, Non-point Source Pollution Management Plan (June 2002). The proposed projects are in proximity to some of the last remaining sturgeon spawning habitat in northern Michigan.

Several grant proposals have been submitted with hopes of funding beginning in 2004-2005. SFT has pledged hands on - in kind support for these projects as we recognize the enormous benefits to lake sturgeon rehabilitation and recovery.

From: **BLACK LAKE BUZZ**, March 2004  
Bill Shull, President



# COMMON AQUATIC PLANTS IN MICHIGAN PLANT REFERENCE CHART



## CURLYLEAF PONDWEED

(*Potamogeton crispus*)

This undesirable exotic, also known as Crisp pondweed, bears a waxy cuticle on its upper leaves making them stiff and somewhat brittle. The leaves have been described as resembling lasagna noodles, but upon close inspection a row of "teeth" can be seen to line the margins. Growing in dense mats near the water's surface, it outcompetes native plants for sun and space very early in spring. By midsummer, massive natural die-offs can dramatically lower oxygen levels triggering fish kills.



## LARGELEAF PONDWEED

(*Potamogeton amplifolius*)

Thick, large stems and broad leaves aid in identification of Largeleaf pondweed. The submerged leaves appear waxy and taper toward the stem. Floating leaves are egg shaped. Rarely is this pondweed found branching.

## FLOATINGLEAF PONDWEED

(*Potamogeton natans*)

This pondweed can be distinguished from others by the shape of its two different types of leaves. The floating leaves are slightly heart shaped while leaves below the water are very long and narrow, if present at all. Many species of fish use this plant for cover in slow moving streams, lakes and ponds.



## CLASPIINGLEAF PONDWEED

(*Potamogeton richardsonii*)

Appearing extremely leafy at the tip due to frequent branching, Claspingleaf can be easily confused with Curlyleaf pondweed. Both bear waxy, submerged leaves, but Curlyleaf pondweed's leaves are serrated along the edges. Claspingleaf has leaves with smooth edges and a wide base that wraps around the stem nearly completely.



## WILD CELERY

(*Vallisneria americana*)

Also known commonly as Eelgrass or Tapegrass, this submersed plant can form thick beds and dominate an area. The grass like leaves have a distinctive vein pattern used to identify the plant. Flaccid when out of the water, the foliage occurs in tufts, much like turf grass. Soft muck bottoms are its preferred substrate.



THIS CHART IS A SAMPLING OF AQUATIC PLANTS COMMON TO THE MIDWEST AND IS NOT FOR USE AS A POSITIVE IDENTIFICATION KEY.

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(Continued on next page)



## EURASIAN WATERMILFOIL

(*Myriophyllum spicatum*)

An aggressive plant, this exotic milfoil can grow nearly 10 feet in length forming dense mats at the water's surface. Known to grow in muck, sand or rock, it has become a nuisance plant in many lakes and ponds. Identifying features include a pattern of 4 leaves whorled around a hollow stem. Feathery in appearance, each leaf consists of 10 to 21 pairs of closely packed leaflets (see cross section). Out of the water the leaves become limp, compressing against the stem.



## MUSKGRASS

(*Chara*)

Chara, or Stonewort as it is sometimes called, is typically found growing in clear, hard water. Lacking true stems and leaves, Muskgrass is actually a form of algae. Its "stems" are hollow with leaf-like structures in a whorled pattern. It may be found growing with tiny, orange fruiting bodies on the branches. Thick masses of Chara can form in some areas. Often confused with Coontail or Milfoils, it can be identified by a gritty texture and musky odor when crushed between the fingers.



## COONTAIL

(*Ceratophyllum demersum*)

Supporting waterfowl, fish and insects, Coontail can be a desirable aquatic plant. However, thick growths around shore can be problematic. Lacking true roots, it commonly floats near the surface later in summer. Stiff leaves are whorled around a hollow stem in groups of five to twelve. Coontail can be differentiated from milfoils by forked, not feathery leaves. Leaf spacing is highly variable, but the ends are often bushy, like a racoon's tail.

## COMMON NAIAD

(*Najas flexilis*)

Leaves of the Common Naiad may occur in pseudo-whorls or oppositely positioned pairs (whorls tend to occur at the end of stems). The ribbonlike leaves are submersed with variable spacing between nodes. The edges may or may not appear spiny and the leaf tips taper to a fine point. Naiads are annual plants, growing from seed each year, and can form dense, bushy masses by midsummer.



## SOUTHERN NAIAD

(*Najas guadalupensis*)

Closely resembling Slender Naiads, Southern Naiads tend to be leafier with reddish brown stems. Leaves appear spiny along the margins. Sheaths at the base of leaves surround the stem and may conceal seeds.



ALL AQUATIC PLANTS, NATIVE OR EXOTIC, CAN REACH NUISANCE LEVELS AND REQUIRE MANAGEMENT

FOR MORE INFORMATION CONTACT: MIDWEST AQUATIC PLANT MANAGEMENT SOCIETY, P.O. BOX 100, SEYMOUR, INDIANA 47274



# Attorney Writes

By Clifford H. Bloom

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## CURRENT TOPICS OF INTEREST

It has now been confirmed that municipalities can regulate (and potentially even ban) the landings, docking, and takeoffs of seaplanes on inland lakes in Michigan. The validity of such local ordinances has a rather tortured legal history.

The City of Lake Angelus in Michigan long ago banned seaplanes on Lake Angelus by local ordinance. Mr. Robert Gustafson challenged the ability of a Michigan municipality to ban seaplanes on inland lakes by bringing a federal lawsuit. In *Gustafson v City of Lake Angelus*, 76 F3d 778 (CA 6, 1996), the United States Court of Appeals for the Sixth Circuit held that federal law does not preempt or preclude municipalities from regulating seaplanes on inland lakes.

Despite the federal Court of Appeals decision upholding the City of Lake Angelus ordinance, proponents of seaplanes “would not take no for an answer.” Rather, they approached the Michigan Aeronautics Commission (“MAC”) and requested that the MAC take action to invalidate any local ordinance which regulated or banned seaplanes on inland lakes. The MAC did take action and adopted a formal regulation which purported to preclude or severely limit the ability of Michigan municipalities to regulate seaplane landings and takeoffs on inland lakes. In *City of Lake Angelus v Michigan Aeronautics Comm’n* \_\_\_ Mich App \_\_\_ (2004), the Michigan Court of Appeals held that the MAC has no legal authority to preempt or preclude local ordinance regulations of seaplanes regarding inland lakes. It remains to be seen whether or not seaplane proponents will attempt to push legislation through the Michigan Legislature in their continuing attempt to take away local control from townships, cities and villages to reasonably regulate seaplane landings and takeoffs on urban or crowded lakes.

\* \* \*

In a past issue of the *Riparian*, I reported on the Michigan Court of Appeals’ decision in *Dyball v Lennox* from last November. The *Dyball* decision was very “pro-riparian,” in that it strictly and narrowly construed a lake access easement to prohibit dockage, permanent boat moorage, sunbathing, lounging and similar activities—the Court of Appeals clearly held that the easement could be used for simple ingress and egress only. That holding was particularly powerful since it appears that a dock and a boat may have been utilized by a backlotter on the easement for many years, and perhaps even before the easement was created.

Initially, the *Dyball* opinion was “unpublished,” which meant that although trial courts around Michigan could consider

the opinion if they chose to do so, it was not technically binding precedent. However, pursuant to a request to the Court of Appeals by the riparian property owner in the *Dyball* case (as assisted by the Michigan Lake & Stream Associations, Inc.), the Court of Appeals on February 24, 2004, decided to publish the *Dyball* opinion. Accordingly, that opinion is now binding precedent throughout the state of Michigan. A key provision of the opinion states as follows:

We find that the plain and unambiguous language of the easement in question does not grant defendant riparian rights and, as such, does not grant defendant the rights enjoyed by riparian owners. Defendant’s argument that the language ‘to the water’s edge of Lake Fenton’ raises a question of fact as to whether riparian rights were granted is misguided. The plain language of the easement does not suggest that the right to maintain a dock is within the scope of the easement. See *Thom, supra* at 512. The terms ingress and egress to the water’s edge do not evidence an intent to grant a right to construct and maintain a dock, a right typically reserved to riparian owners. See *Thies, supra* at 294. Defendant’s allowed use of the land, pursuant to the easement, is clearly defined by the terms of the easement and must be confined to the plain and unambiguous terms of said easement. The plain and unambiguous terms of the easement do not grant the dominant estate the right to maintain a dock or permanently moor a boat. The trial court, in coming to its determination, took into account the circumstances existing at the time of the grant and, therefore, erred. See *Id.* Even if the trial court was only interpreting the language of the easement, its findings were clearly erroneous because nothing in the plain and unambiguous language of the easement permits or grants defendant the right to erect and maintain a dock or to permanently moor a boat at the end of the easement. See *Little I, supra* at 507. The easement was created for access or ingress and egress to the lake and cannot be expanded. Consequently, the trial court erred in granting summary disposition to the defendant and denying plaintiffs’ motion to have the subject to the easement declared for access, and ingress and egress only (footnotes omitted).

*Dyball*, Slip Opinion at 6.

\* \* \*

There have been other recent Michigan appellate court decisions which should also be of interest to riparians. In *Kleiner*

(continued on page 20)



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Donald E. Winne, Executive Director

## BECOMING AN ML&SA STEWARD TO HELP SAVE MICHIGAN'S LAKES AND STREAMS

For over forty years MLSA has been working to protect Michigan's lakes and streams by empowering associations and riparians. Much has been accomplished, but to expand upon past successes, MLSA must prepare for the future. We need your help. MLSA has begun a campaign entitled "*not waiting for the future.*" Including an effort to identify "One Thousand Stewards," individuals who respect Michigan's water resources and believe in MLSA's cause and who are willing to financially contribute to MLSA at some level above the "individual membership" rate of \$35.

Please take a moment and consider joining the One Thousand Stewards. Complete the form below and mail it with your donation to MLSA, P.O. Box 303, Long Lake, MI 48743-0303.

### Membership in the One Thousand Stewards

Individual	\$35 _____	Investor	\$60 _____
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## LAKE SOMERSET PROPERTY OWNERS ASSOCIATION BOARD VOTES TO LIMIT PHOSPHORUS INPUT

On September 20, 2003, the Lake Somerset Board voted to limit phosphates from entering Somerset Lake. Beginning with January 2004, fertilizers containing phosphates will be prohibited on all lots within the LSPOA subdivisions. Also, no fertilizer will be permitted in buffer zones within 10 feet of the lake and within 20 feet of the entrance to any drain entering the lake.

Lake Somerset is a 220 acre lake with a maximum depth of 26 feet and an average depth of 16 feet. The lake has a shoreline length of 5 miles, and is surrounded by four subdivisions with approximately 1,200 lot owners on the 1,000 acres of land that surrounds the lake. The lake is located in Somerset Township in the Northeast corner of Hillsdale County.

Mr. Ferris, a local farmer and Association member has voluntarily pursued actions that will improve Lake Somerset's water quality by:

- Installing special grass filter strips bounding his fields to reduce agricultural runoff from his croplands.
- Employing low phosphate cattle feed to reduce the concentration of phosphates in the waste that is disposed on his fields.
- Using zero phosphate fertilizers, and
- Matching fertilizers composition, soil tests and plant requirements to reduce over-fertilization.

Limnologists have estimated that each pound of phosphorus added to a lake will generate 500 pounds of aquatic plants. Phosphates are known to be the primary factor leading to poor surface water quality as evidenced by reduced water clarity, and excessive growth of algae and lake bottom rooted aquatic plants.

Some local stores have agreed to carry phosphorus free fertilizers if there is sufficient interest. Check with Howard's Feed store in Jackson, and D&C Hardware.

*Article submitted by Al Hoffmanner*

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## BOATING DEATHS DOWN IN STATE

"Boating fatalities in 2003 in Michigan fell by nearly one-fourth from the year before, and officials credit better and more safety education as a major reason for the decline.

Out of the 220 boating accidents during the year – down from 228 the year before – there were 29 deaths compared to 38 in 2002. The number of fatalities is the lowest since 1999.

During 2003, the state had the smallest number of boats registered in six years, down 4.7 percent from the roughly 1 million registered in 2002 to 957,454."

*Christian H. Kindsvatter, Kindsvatter & Associates, Inc.*

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## MICHIGAN SUPREME COURT REVERSES APPEALS COURT DECISION IN HIGGINS LAKE CASE

Ken Dennings, President of Higgins Lake Property Owners Association (HLPOA) reports in Water Lines (Winter 2004) that the Michigan Supreme Court has vacated an Appeals Court decision, and ruled that 'keyholing' violated the single family zoning ordinance in Gerrish Township. HLPOA supported the lawsuit which challenged actions by a group of non-riparians. A report on the Shadyview Decision by attorney William Carey follows:

### Shadyview

This lawsuit involves a challenge to the activities of 20 families who purchased a single lakefront lot in Woodlawn Subdivision (Gerrish Township). The 20 families (who purchased the lot via a non-profit corporation known as Shadyview, Inc.) set up a multiple slip marina. Lot owners on either side of the Shadyview parcel filed suit in Roscommon County Circuit Court seeking to enjoin the multiple family use. The lawsuit challenged the multi-family use because the lot was zoned as single family residential. The lawsuit further challenged the activities as a private nuisance.

When this matter went to trial, Judge Baumgartner ruled that the marina dock could moor no more than 5 boats. Judge Baumgartner further ruled that no more than 2 families could use the lot at any one time. The case was then appealed to the Michigan Court of Appeals. On January 14, 2003, the Court of Appeals heard oral argument in the case. On March 3, 2003, the Court of Appeals issued its opinion reversing Judge Baumgartner.

In essence, the Court of Appeals found that the activities undertaken by the 20 family corporation did not constitute a violation of the Gerrish Township Zoning Ordinance and did not create a nuisance for the families living next door. A motion for the Court of Appeals to reconsider its decision was filed on March 6, 2003. The motion for reconsideration was denied.

A timely application to the Michigan Supreme Court challenging the Court of Appeals decision was filed. The Supreme Court in a very rare procedural move, denied plaintiff's request for Supreme Court review, but reversed the Michigan Court of Appeals. The Michigan Supreme Court has ordered that the Shadyview property may not be used for communal park or marina activities.

The court has ruled that the lot in question may only be used as a single family residential lot and that Shadyview may not maintain a dock or any number of boat slips on the riparian parcel. The decision made by the Supreme Court is stronger and more protective of the lake interest than even the original trial court decision.

The Supreme Court decision is final and not subject to further challenge. The decision represents the most significant victory against funneling/keyholing in the common law history of Michigan.



# LONG LAKE, GRAND TRAVERSE COUNTY

The picture of Long Lake on the front cover of this issue of *The Michigan Riparian* magazine was donated by Robert Smith, President and owner of Aerial Graphics in Grand Rapids. Mr. Smith has taken aerial pictures of nearly 1,000 inland lakes of Michigan and has made them available for the Riparian to use when desired.

There are 90 long lakes in Michigan, and this one in Grand Traverse County is one of the largest and deepest. This Long Lake has a surface area of 2,860 acres and a maximum depth of 88 feet. The average depth is 25.9 feet. The average elevation of the lake is 847 feet above sea level—267 feet above the average level of Lake Michigan at 580 feet above sea level.

The Long Lake Association was first organized in 1920 and has been very active in promoting good water quality for more than 50 years. Other associations have been established to look after the lake, such as the Long Lake Peninsula Association.

Long Lake Association joined Michigan Lake & Stream Associations in 1971 and has continued to support ML&SA for the past 25 years. The Association has prospered under the leadership of such people as Donald Hall, Robert Warner, Julius Martinek, Ruth Hunter, Robert Doerr, William Kidd, Art Larson, Bob Flannery and many others.

A study of phosphorus and dissolved oxygen in 1987-88 by the Great Lakes Water Quality Laboratory reported that, "The overall quality of Long Lake, from a laboratory analysis standpoint, appears to be good and healthy for a lake its size."



*Editor's Note: Lake Michigan is 6 3/4 inches above it's level of February 2003, but is 6 inches below it's level of February 2002.*

## LAKE TURNOVER—what is it?

*By Don Winne*

Lake turnover is also called lake stratification. Shallow lakes—less than 30 feet maximum depth—generally do not stratify. Lakes in Michigan—from 42 degrees north latitude (Detroit) to 46 degrees north latitude (Sault St. Marie) that have a depth of 30 feet or more usually stratify.

Lakes that stratify develop a warmer layer of water 20 to 30 feet in thickness called the EPILIMNION, and this layer is separated by a middle layer called the thermocline from the bottom layer called the HYPOLIMNION.

This stratification process is driven by changes in the water surface temperature. The two turnover or mixing periods occur in the spring and fall of each year. As the ice melts and the surface water reaches 39 degrees fahrenheit—this is when water is most dense and heaviest—it sinks to the bottom and moves the warmer and less dense water to the surface until it becomes uniform in temperature from top to bottom.

This same process occurs in the fall when the air temperature cools the surface water to 39 degrees. This process begins around the middle of October in the upper part of the lower peninsula and the UP. This process occurs in early November in lakes below Lansing.

Factors that affect the turnover time for a specific lake include the lake size, maximum depth, whether the lake is exposed to the prevailing winds or sequestered by steep wooded hills that rise abruptly from its shores. Water clarity as revealed by Secchi depth measurements may also be a factor. Free floating algae and dissolved solids will increase the absorption of solar energy and thereby accelerate the turnover time.

Lakes in Michigan that stratify do so by early June. As a result of the failure of the EPILIMNION waters to mix with the HYPOLIMNION waters, the amount of dissolved oxygen in the hypolimnion decreases until the water just above the sediment will drop to zero dissolved oxygen. This condition will not change until the fall overturn occurs.

### LITERATURE REFERENCED:

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Department of Zoology, Arizona State University

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Bishop Professor of Biology, Department of Biology,  
University of Alabama, Tuscaloosa, Alabama, and  
Gene E. Likens, Director of Ecosystem Studies, The  
New York Botanical Gardens, Cary Arboretum,  
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# NEW SEPTIC SYSTEMS APPROVED FOR LAKE FRONT PROPERTY

(Part one of a three part series by Doug Coates, P.E. with Gosling Czubak Engineering Sciences, Inc., Traverse City, Michigan.)

## INTRODUCTION

Benzie and Leelanau counties have recently adopted new standards allowing septic systems for lots that previously would not “perc.” The new standards require sewage treatment using “innovative or advanced” treatment technologies. These technologies provide a higher degree of treatment to protect the water quality of lakes and groundwater.

## BACKGROUND

Officials in Benzie and Leelanau county were aware of worsening wastewater disposal problems in the late 1990s. The problem centered on disposal of holding tank waste. Hundreds of holding tanks had been constructed throughout Leelanau, Benzie and Grand Traverse counties in areas where poor soils or high groundwater conditions prohibited construction of conventional septic systems. Because holding tanks do not have an outlet, a septic tank pumper would periodically remove wastewater from the tank and haul it to a disposal area. Depending upon the number of people in the home, some holding tanks had to be pumped as often as two or more times monthly.

Holding tank waste disposal is done by spreading the waste on vacant land or agricultural land under license from the Michigan Department of Environmental Quality. These licenses require the septic tank service companies to plow the waste into the soil within one day of application or otherwise stabilize the waste. Obviously, plowing the waste into the soil is not possible in winter months. While it may be possible to delay cleaning sludge from a septic tank with a tile field until warm weather, the holding tank waste must be hauled away from the home throughout the winter.

## TASK FORCE ESTABLISHED

In May 2001, officials in Leelanau County established a task force to resolve this problem. The original task force had nine members including: the District Environmental Health Director, Bill Crawford; two Leelanau County Commissioners, Robert Pisor and Melinda Lautner; Walter Nielsen; Donald Matschke; Wayne Wunderlich; Steve Mattson; Alan Wrisley; and Doug Coates, P.E., Director of the Civil Engineering Department of Gosling Czubak Engineering Sciences, Inc. Many of the task force members had strong technical and scientific backgrounds in addition to their personal knowledge of the area and desire to protect the environment.

## TASK FORCE GOALS

The task force goals included:

- Develop methods to reduce the number of holding

tanks and associated disposal problems in the County.

- Develop stringent sewage treatment standards for property that cannot meet the “conventional” septic system standards.
- Update the Health Code to allow the Health Department options to approve alternative septic systems for challenging sites.
- Develop options for homeowners to avoid expensive “hold and pump” systems.

The task force divided into three committees. The subcommittees were charged with: drafting ordinance revisions; developing holding tank, treatment and disposal options; and evaluating alternative on-site sewage treatment systems. Over the next six or seven months the subcommittees met and developed a revised ordinance and construction standards for alternative systems. The Leelanau County Board of Trustees adopted this ordinance in January 2002 and Benzie County adopted it in May 2002.

## SUMMARY OF NEW ORDINANCES

The new ordinances specify where these alternative systems can be used. They are intended for single family residential sites only. The criteria includes:

- Existing holding tank replacement.
- Areas of high groundwater (groundwater within 4 feet from the bottom of a septic system disposal tile field).
- Lake properties with limited available area for disposal fields.
- Replacement of existing systems that failed.

Each of the alternative systems must be custom designed for each site. There is no “one size fits all” design for these systems.

The ordinance does not specify a particular type of equipment or equipment manufacturer. Rather it specifies performance criteria. The criteria includes:

- 1 Biological oxygen demand (BODs).
- 2 Total suspended solids (TSS) removal to levels less than 30.
- 3 Total inorganic nitrogen (TIN) removal to levels less than 25 mg/1 or 10 mg/1 if the system is within 500 feet of a lake or river.
- 4 Total phosphorus (TP) removal to levels less than 2 mg/1 if within 500 feet of a lake or river.
- 5 Disinfection to remove bacteria if the depth to groundwater is less than 24 inches.

The criteria also requires a site evaluation and design by a registered professional engineer.

# COMMUNITY DNA TESTING: SOURCE DETERMINATION OF FECAL POLLUTION — BEACHES—LAKES—POTABLE WATER

By Nancy Ritchie Posavatz, M.S. and Richard M. Raetz, P.E.  
Global Remediation Technologies, Inc., Traverse City, MI

## Introduction

Beaches and waterways around the State of Michigan are being tested for *Escherichia coli* (*E. coli*), an indicator of fecal pollution. *E. coli* are present in the digestive tract of all warm blooded animals and humans. Waterfowl, pets, and humans all can contribute to high *E. coli* counts. DNA testing allows us to determine the source of the fecal pollution, an important step in solving the problem.

This article briefly describes a culture independent method to determine if the source of fecal pollution in water is of human origin or not. We test for a strain of bacteria that are only found in humans (*Bacteroides* spp.). These bacteria cannot tolerate oxygen and will not survive in the environment for very long, unlike *E. coli*, which have been known to persist for thirty days or longer in cooler waters. Therefore, this test is a good indicator of a recent pollution event. This group of bacteria, *Bacteroides*, are used as a fecal indicator because of their high abundance in feces. The average concentration of *Bacteroides* in feces is 100 billion cells per gram.

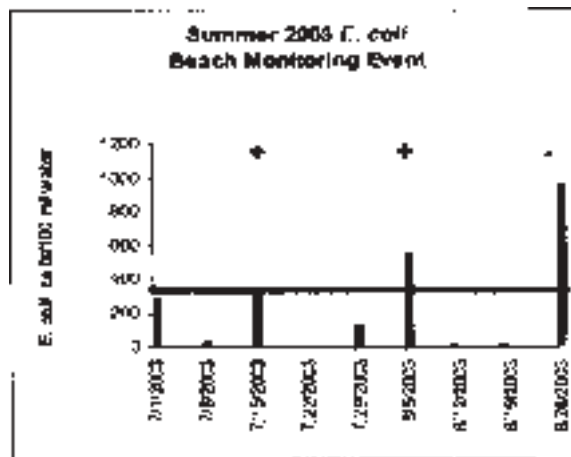
In this test, we use a molecular biology technique called the polymerase chain reaction (PCR) to test for the presence of a specific bacterial gene. It is a presence/absence based test that is scored either positive or negative based on the presence/absence of the gene of interest.

As discussed above, these bacteria and thus these bacterial genes are only found in humans. Studies have shown that over 80% of humans carry these bacteria and that 0% were found in other animals tested (dogs, cats, seagulls, ducks, and cows).

## Michigan Case Study

A community in northern Michigan participated in DEQ sponsored *E. coli* beach monitoring events in 2002. On more than one occasion, *E. coli* counts exceeded the acceptable recreation contact threshold level during the summer sampling events.

Community leaders were concerned about the *E. coli* counts but were aware that the source of the *E. coli* could be from waterfowl or from some other non-human source. The community was debating the need for a centralized wastewater treatment facility and felt that DNA testing results may aid in their determination of the need for a wastewater system.



This figure shows the result of the *E. coli* and DNA testing of the beach monitoring events. The red line denotes the acceptable recreation threshold value. The three sampling dates subjected to DNA testing are scored positive or negative with red plus or negative signs, respectively.

The community decided to collect samples for DNA testing in addition to their *E. coli* samples during the 2003 summer beach monitoring event. Samples (Replicates of three) were collected from a beach located in the community once a week during the months of July and August. *E. coli* counts exceeded the acceptable recreation contact threshold level three times. Samples collected on these three dates were subjected to DNA testing.

Based on the PCR-based test, DNA testing samples were scored positive or negative for human fecal pollution for the three sampling dates tested. Two of the three sampling dates had positive test results for human fecal pollution. The data were presented to the community leaders. They now have evidence of human fecal pollution to present to their community to aid in their decisions about the need for wastewater treatment.

*Nancy Ritchie Posavatz, M.S., is a research microbiologist and laboratory director for Global Remediation Technologies, Inc. (www.grtusa.com) in Traverse City, MI. She can be reached at 800-899-3703.*

# NEWS FROM LAKES AROUND THE STATE

## LAKE MARGRETHE—Crawford County

**Joe Porter, President**

### LOONS

We thank the new contributors to the Lake Margrethe Foundation, Loon Fund, P.O. Box 583, Grayling, MI 49738 including Drs. Kevin Sloan and Tammy Trullard, Dave Carlson, Marjorie Messiter, Paul and Donna Tomson, Joe and Arlene Caon, Hal and Jackie Helterhoff and Skip and Sherry Hanson. The Loon Fund now totals \$540.00.

The Loon Ranger, Denise McEvers, is working with John Hunt, Environmental Manager, Camp Grayling, Elaine Carlson, DNR Wildlife Biologist and the Michigan Loonwatch to determine the proper place to locate a Loon Nesting Island on Lake Margrethe. Last year, we had at least three adult Loons on the lake. We have not seen any chicks. We hope the nesting island will allow Loon to nest, rear their chicks and make our lake their home. We are very fortunate that Camp Grayling has a natural shoreline and is environmentally concerned about our area.

If you see Loon, observe them from a distance and avoid nesting areas. If a Loon acts disturbed – calling and splashing – it is trying to tell you to move out of its territory. Please do so. Never leave fishing lines unattended and stop fishing if the loons are feeding in the area. Never throw tangled line into the lake. Let's avoid Loons (and other wildlife) getting tangled in our fishing line.

## LAKE OF THE WOODS LAKE

### ASSOCIATION—Van Buren County

**Bill Kiss, President**

### DRY HYDRANTS

Fire Chief Barney Ives reported that they have one dry hydrant ready to go and one of the department volunteers has volunteered to use his equipment to install it. Tentative plans are to place it between two homes on the large channel; the homeowners have already given their ok.

If you're picturing a regular fire hydrant, let's change that picture a little. A dry hydrant is a pipe that goes down into the ground, makes an L underground, and runs into the lake. When the fire department needs to fill their pumper truck, they run a hose into the pipe and pump water into the trucks holding tank, which means they don't have to waste

time breaking through the ice or driving all the way back to town.

The Fire Department is still looking for spots on the east and south sides of the lake. If you'd like to see your insurance rates go down and have water readily available for the pumper trucks in case there's a fire in your neighborhood, why not contact one of the Association officers. Some place on Lake Drive and on 86th Avenue would be an excellent location; the lakefront isn't too far from the road so the fire department could use their hose from the truck to the hydrant. This installation will not be unsightly nor will it detract from your lakefront. One will more than likely go in at the public access and on the north side on the fire departments right-of-way at the end of 47th Street.

If you want to be the lucky property owner to get a hydrant installed, let us know. This is one way you can support your Association, and the only work involved for you is picking up your phone and calling one of the Association Officers to let them know you have a place for the hydrant.

**Our new web site** — [www.lakeofthewoodsmi.org](http://www.lakeofthewoodsmi.org)

## GULL LAKE QUALITY ORGANIZATION, INC.

**Dr. John Luchinger, President**

### WINTER AIN'T WHAT IT USED TO BE

There is no serious scientific doubt that global warming is a reality and that a major cause for this warming is human inputs of greenhouse gases to the atmosphere (for a nice summary of the facts, check out the EPA public website: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html>). However, our ability to predict just how hot it will get this century or how the local weather in each geographic region on the planet will change is still fairly uncertain. Most projections for Michigan suggest that it will get hotter, obviously, but also more precipitation (i.e., mosquito weather). So, while the winters may get shorter and less severe, we could still be in for a lot of snowfall.

The record of ice cover on Gull Lake nicely illustrates how this global climate change is affecting us locally. It also shows how difficult it is to detect changes without a long-term record; weather is extremely variable from one year to the next.

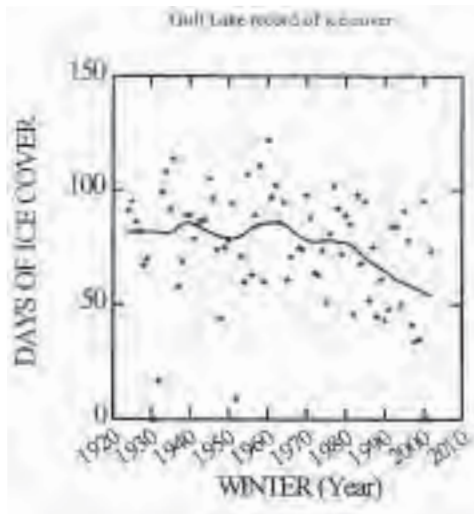
On the graph that follows, each star shows the total number of days for each winter that Gull Lake had ice cover

*(Continued on page 18)*

# NEWS FROM LAKES AROUND THE STATE

(Continued from page 17)

over the central basin of the lake. The line represents a smoothing (averaging across years) and shows a clear decline in average length of winter beginning in the 1970's. Average winter length during the past decade, as measured by ice cover, is about 20 days shorter than prior to the 1970's. In essence, our winters are about 25% shorter compared with the first half of the last century.



The two sequential years of no ice cover in 1930-31 reflect a climatic anomaly that began a decade known in the Midwest as the dust bowl. The winter of 2001-02 was the only other record of no ice cover (a scary indication of times to come).

## PENTWATER LAKE

### ASSOCIATION—Oceana County

**Ron Steiner, President**

### 2003 LAKE WATER TEST RESULTS

*Frode Maaseidvaag, Chair, Water Quality Committee*

Volunteers sampled Pentwater Lake and the North and South Branches of the Pentwater River four times during the summer. The sampling stations were the same as in 2002. Chlorophyll measurements were also made by the volunteers.

The Pentwater Township Board generously provided funds to purchase a used YSI Dissolved Oxygen measuring system and a water sampling bottle that greatly added to our efforts. The Township owns these devices but the PLA will maintain them. The Bass Lake Water Quality group will also use this equipment, and we have already started this cooperation.

The laboratory analyses were made by Dr. Rick Rediske of the Annis Water Institute, Grand Valley State University, Muskegon, who also provided valuable guidance. The good news is that the water testing in 2003 indicates that the water quality of the lake is still high. The lake is considered to be relatively healthy and stable.

Again this year we noted higher than normal readings of nitrate and phosphate, and this will be closely monitored in 2004. Namely, we found a high phosphate reading (0.034mg/L) in the North Branch of the Pentwater River in August and a high nitrate reading (1.10mg/L) in the South Branch of the Pentwater River in July. If these high readings occur again, we will try to discover their origins.

Several key measures help track the quality of the lake water:

**Ammonia nitrogen** *Ammonia is a natural nutrient found in many surface and ground water supplies and its excess presence can be an indication of sanitary pollution. Ammonia nitrogen is a product of microbiological activity and any sudden change in its concentration indicates a potential problem. The measured data should be in the range of the detectable level.*

The measurement detection level is 0.01 mg/L. The measured levels were generally within normal range with two exceptions: the South Branch of the river showed consistently higher levels and the September data for the whole lake were higher, indicating a higher than normal microbiological activity such as pollution from various sources.

**Dissolved oxygen (DO)** *Oxygen is vital to living forms and is soluble in water in direct proportion to its partial pressure in the atmosphere. In addition, oxygen is produced by the photosynthesis of aquatic plants and algae. If there is an excess amount of plants or algae during the natural cycle of respiration and decomposition, the DO levels can decrease and cause fish kills. DO levels should be above 4-5mg/L.*

All the surface readings, at 1 m depth, showed healthy readings of 7-15 mg/L while lake bottom readings were very low which is not unusual.

**Nitrate** *Nitrate is an essential nutrient for the overall health of a body of water. Nitrates, in conjunction with phosphates, stimulate the growth of algae and the problems associated with algae blooms. Readings above 1 mg/L are cause for concern.*

The concentrations measured were in the range of 0.31-1.20 mg/L. Again this year the high readings were from the South Branch of the Pentwater River. The nitrate levels have remained stable over the last few years.

# NEWS FROM LAKES AROUND THE STATE

**Phosphorus/phosphate** *Phosphorus is essential to promote the health and viability of the organisms that live in a fresh water lake. The amount of phosphate is generally not more than 0.01 mg/L unless the water is polluted from wastewater, sewage and drainage. When a level in excess of 0.03 mg/L is reached, an environment exists that is hostile to fish but favorable for growth of nuisance weeds and algae blooms.*

The readings were in the range of 0.02-0.039 mg/L. The only high readings of 0.030-0.060 were measured in August and September in the lake. **These high readings will be discussed with Dr. Rediske to determine any potential impact to the lake.**

## **PJC (Painter, Juno & Christiana)**

### **LAKES ASSOCIATION—Cass County**

**Gerald Marchetti, President**

## **WASTEWATER INFORMATION**

Construction is scheduled to begin this June and will include 278 homes in Ontwa and Mason Township. Tom Deneau of Wightman & Associates will coordinate this project and will update all members at our June 19 annual meeting.

## **DREDGING**

The dredging of the channel under the Christiana Drive bridge was delayed due to sediment testing. The permit has been approved and the work will be completed in April. The channel is currently only 1 1/2 feet deep. This is unhealthy with the stagnant water and floating weeds that currently exist. The dredged channel will be 8 to 10 feet deep, which will allow water to flow between Juno and Christiana Lake.

## **PORTAGE, BASE & WHITEWOOD**

### **LAKES ASSOCIATION—Livingston &**

#### **Washtenaw Counties**

**Dave Spielman, President**

## **FERTILIZERS CLEAN AND GREEN**

New soybean based organic fertilizer shows great promise for use around lakes. If you are an environmentally-

correct lake property owner you have refrained from using chemical fertilizer but a lot of us haven't done so. The problem with the Nitrogen/Phosphorus based chemical fertilizer is that it runs off of lawns and into the lakes before getting into soil.

Well, there seems to be hope for us. This new soybean-based fertilizer works differently. To release its nitrogen, it has to come in contact with the good earth. You can throw it directly in the water and it won't do anything harmful.

"Practical Soy," a Manchester, Michigan based company, calls the product Clean Green 7-0-0. This company was created to distribute an environmentally friendly, farmer-orientated organic fertilizer for use on lawns and gardens. Clean Green is made from processed soybeans which produce a fertilizer that is 7% Nitrogen, 0% Phosphate and 0% Potash. When this soy based fertilizer comes in contact with the soil it is transformed by organisms and its nutrients are released, feeding that lawn or plants at a steady pace throughout the growing season.

The company recommends that you apply this product at a rate of 35 lbs per 1000 sq. feet. A 50 lb bag will cover approximately 1500 sq. feet. They recommend an early spring application and again in the early fall. Clean Green was tested by Michigan State University and showed equal results or better than chemical fertilizers. Clean Green costs \$15.50/bag and is available at local lawn supply dealers. Dexter Mill in Dexter has it in stock. Their phone number is (734) 426-4621.

## **THREE LAKES ASSOCIATION**

### **(Bellaire, Clam, & Torch)—Antrim County**

**Dick Garcia, President**

## **EXECUTIVE DIRECTOR'S CORNER**

### **SUMMER INTERN PROGRAM**

Plans are being made to work with 4-6 high school students conducting a shoreline Cladophora and Eurasian water milfoil survey for Torch, Clam, and Bellaire Lakes. Cladophora is green algae that grows on rocks and indicates high levels of the nutrient phosphorus. Eurasian water milfoil is an invasive aquatic nuisance species. Flotillas of canoes, kayaks, rowing shells, and fishing boats will be traveling around the lakeshores identifying areas of concern. The last survey was done in 1990 and located many 'areas of concern.'

*(Continued on page 20)*

# NEWS FROM LAKES AROUND THE STATE

(Continued from page 19)

Data from this project will be used by the Water Quality Committee to contact property owners about possible nutrient sources (seepage, fertilizer runoff, etc.). This program will require much preparation and many volunteers to supervise the students. We expect the program will run six hours each week for 10 weeks. If you know of anyone interested in paddling around the lakes with a fine bunch of kids looking for green slime and/or have extra kayaks and canoes for the TLA Armada, please call Tim Hannert at 533-6550.

## WALLOON LAKE ASSOCIATION—

### Charlevoix County

**Charles Hyatt, President**

### 3rd ANNUAL RESTORE THE

### SHORE CONTEST

Yes, we're serious about this contest and plan to keep it going for years to come. So get on board and send Walloon Lake Association's Water Quality Committee a photo of your shoreline this year. Entries will be accepted from May 1st to September 1st.

A reminder of this important event will follow in the May and June *Wallooners* so you can't miss out.

If you'd like to get an early jump on things with ideas on how to improve your shoreline, call the Walloon Lake Association office for a free rental video called The Living Shore. It's only 16 minutes long and it's superb!

## FISH FOR STOCKING

- Giant Hybrid Bluegills – Up to 8 inches
- Walleye – Up to 8 inches
- Largemouth Bass – Up to 8 inches
- Rainbow Trout – Fingerlings to Adult
- Smallmouth Bass – Fingerlings
- Channel Catfish – Fingerlings to Adult
- Yellow Perch – Up to 8 inches
- Northern Pike – Fingerlings
- Fathead Minnows

— Our delivery or your pickup —

### LAGGIS FISH FARM INC.

08988 35th Street  
Gobles, Michigan 49055

— In business since 1979 —

Work Phone - Daytime  
269-628-2056

Residence Phone - Evenings  
269-624-6215

## ATTORNEY WRITES

(continued from page 11)

*v Wachowicz, et al* (unpublished, Case No. 244053, decided on February 12, 2004), the Michigan Court of Appeals (for what seems like the thousandth time!) reaffirmed its decisions in *Jacobs v Lyon Township*, 199 Mich App 667 (1993) and *Higgins Lake Property Owners Assn v Gerrish Twp*, 255 Mich App 83 (2003) and again held that public road ends at lakes cannot be used for permanent boat moorage, sunbathing lounging, etc.

*Coyne v Daneluk* (unpublished, Case No. 242875, decided on February 24, 2004) dealt with a legal issue which real estate experts have long puzzled over. That case involved a platted subdivision along Lake Huron. The first tier of lots, while seemingly riparian, clearly did not quite touch the waters of Lake Huron on the plat map. In other words, there was a thin strip of land which ran along the shoreline, between Lake Huron and the first tier of lots. Although there were clearly-marked private roads within the plat which were created by the plat dedication, the plat dedication never mentioned the strip of land along the water. Nor was there any label on the strip of land on the plat map. The owners of the first tier of lots argued that their lots are riparian and that their lots should be deemed to implicitly extend to the waters of Lake Huron unencumbered. The owners of the backlots disagreed and took the position that the strip of land was created pursuant to an implicit dedication and was akin to a park for use by all lot owners within the plat. The Court of Appeals played King Solomon and "split the baby in half." Analogizing to the cases where a road runs parallel along the shoreline of a lake, the Court held that the first tier of lots was indeed riparian, with their property lines implicitly extending to the edge of Lake Huron through or under the land strip. However, the Court also held that the land strip effectively constituted a usage easement for the benefit of all lot owners within the plat. Therefore, the riparian property owners' respective boundary lines do extend to Lake Huron, but they are subject to a usage easement co-extensive with the land strip as shown on the plat map. The case was remanded back to the trial court for a determination of how the owners of the backlots could utilize the land strip/easement.

A decade ago, at the urging of developers, the Michigan Legislature took away almost all authority of cities, villages and townships to regulate wetlands in Michigan (often called "preemption"). The zoning ordinance for Meridian Charter Township did not directly address the issue of altering, destroying, or filling wetlands, but it did implicitly take the presence of wetlands into account for purposes of setbacks. Pursuant to a proposed development, the landowner claimed that the Township was without authority to take wetlands into consideration whatsoever in its zoning regulations. In *Forsberg Family, LLC v Charter Twp of Meridian* (unpublished, Case No. 245413, decided on February 24, 2004), the Michigan Court of Appeals disagreed and held that the state preemption of local control regarding wetlands did not extend to regulations which utilized wetlands as benchmarks for purposes of setbacks. ♣

## Fisheries



White Lake has a proud fisheries heritage that is a major tourism attraction to the community and has an active sport fishing and charter boat industry. White Lake supports a variety of sport fish including walleye, yellow perch, small and large mouth bass, northern pike, bluegill, black crappie, and white sucker as well as migratory salmon and trout from Lake Michigan to the White River. The fish community of White Lake has slowly changed throughout the years with the loss of the native Great Lakes spotted muskellunge, over 60 years ago, to a well established exotic chinook salmon run in the White River in 1970. The walleye population is strong, yet population production continues to be supported by a Michigan Dept. Natural Resources fish culture program. The fishery within White Lake is one of the most important resources that continues to remain in relatively good condition. However, it must also be shared as a resource for recreation, tourism, and for aesthetics which continue to change. White Lake's fisheries priority lies in the continued effort to remove fish consumption advisories and eliminate population declines. Loss of the sport fishing would lead to a substantial economic loss for the entire White Lake community and a reduced "quality of life" to residents.

### *Associated Problems*

**Continued Threats from Exotic / Invasive Species:** Exotic species have had drastic impacts on White Lake fisheries with alewife, white perch, and round goby becoming firmly established in White Lake since 2000. These new species have led to a complicated change in the fishery by changing the food web structure, and outcompeting natives for food and habitat. In the early 1890's, the smallmouth bass population increased relative to the largemouth bass because of the increased water clarity caused by the exotic zebra mussel. Since then, the smallmouth bass declined slightly as the largemouth bass utilized the increase in aquatic vegetation provided by the exotic Eurasian watermilfoil. The watermilfoil was also taking advantage of the conditions created by the zebra mussel. The back and forth change of the bass populations took place simultaneously around the lake as exotics changed habitat structure. During this same period the round goby, another exotic species invaded and became a very competitive, predacious feeder. Presently, adult bass are targeting the goby as food, but the rapid goby population expansion may impact the eggs and fry of both species of bass.

**Decreased Health from Contaminants:** A sustainable fishery in White Lake has become an issue of increased importance. Consumption advisories continue for certain species due to chemical contamination and elevated levels of specific chemicals. Chlordane and PCBs in carp have led to state and federal fish consumption advisories for White Lake. Contaminant levels in fish for White Lake are a function of many things including: 1) the concentration of the contaminant in the water, 2) the concentration in the fish's primary food supply, 3) the size and age of the fish (older and larger fish generally have higher levels), 4) the fish's habitat (sedentary, bottom-dwelling species are more likely to concentrate toxics from contaminated sediments), and 5) the level in the food web (top-level predators often show higher contaminant levels).

### **Overall Fisheries Goal**

*Existing fisheries protected and native fisheries restored using quality management practices.  
No fish consumption advisories.*

**Increased Habitat Loss:** Another element greatly impacting fisheries is the alteration of habitat used for breeding, or to provide habitat for aquatic insects necessary for certain stages in the life cycle. Habitat alteration can be from competition for space with exotics or through human impacts like dredging, aquatic plant removal, and structural alteration. Other changes in habitat can be attributed to decreased water quality, including sedimentation and impacts from herbicide applications throughout White Lake. Similar lakes have experienced drastic increases in development and the destruction of aquatic habitat has eliminated many native fish species, and increased less desirable species.

Other habitat losses are from depleted oxygen concentrations in the water at lower depths during the summer from the excessive growth of algae. Overall, the loss of habitat may have the greatest impact on sustaining fish populations in White Lake negating the benefits of the sediment restoration projects. If White Lake, as a viable resource, continues to be under appreciated and alterations continue in food web structure then conditions may eventually lead to a collapse in the fishery.



# COOKING AND CLEANING FISH

## Important reminders.



**Trim & Cook Fish Properly to Reduce Health Risks.** Proper preparation reduces the concentration of organic chemicals, like PCB, even further. By trimming fatty areas before cooking and by cooking in ways that allow fat to drip away, more than 50 percent of the contaminants in fish can be eliminated. Methyl mercury is stored in fish flesh. Special trimming and cooking methods do not remove it.

Information provided by Michigan Department of Community Health 2002 Michigan Fish Advisory

## Michigan Consumption Advisory for White Lake

	General Population	Women & Children
Carp (PCB's, Chlordane)	<b>DO NOT EAT!</b>	<b>DO NOT EAT!</b>
Smallmouth Bass (Mercury, PCB's)	14-30in. one meal per week	14-30 in. one meal per month
Walleye (Mercury, PCB's)	14-26in. unlimited consumption 26in + one meal per week	14-18 in. one meal per week 18in + one meal per month

General Mercury Advisory for ALL inland lakes in Michigan:  
No one should eat more than one meal a week of rock bass, yellow perch, or crappie over nine inches in length and bass, walleye, northern pike or muskellunge of any size. Women of childbearing age and children under 15 should not eat more than one meal per month of these fish.

### Additional Resources

White Lake Fish and Waterfowl Aquatic Habitat Assessment - 2000,  
Thomas E. Hamilton

White Lake Aquatic Plant Assessment - 1995,  
Mark Lufferton

Michigan Department of Natural Resources  
[www.michigan.gov/dnr](http://www.michigan.gov/dnr)

Great Lakes Sport Fishing Council - Michigan  
[http://www.great-lakes.org/fish\\_mi.html](http://www.great-lakes.org/fish_mi.html)

Michigan Department of Community Health  
[www.michigan.gov/mdch](http://www.michigan.gov/mdch)

## SOLUTIONS FOR THE PUBLIC

- 1. Support a Sustainable Fishery** - Follow fishing regulations concerning possession (species taken) and become educated about fish advisories for White Lake and surrounding waters. Practice catch-and-release.
- 2. Protect Fisheries Habitat**-Protect habitat by not destroying aquatic plant beds or dredging in shallow areas. Leave near shore buffers.
- 3. Do the Right Thing** Do not dump refuse, liquids, or other illegal or harmful materials into the water.
- 4. Report Useful Data** - Report fish with tumors or growths, fainting of taste/smell, or any other abnormalities to the Michigan Dept. of Natural Resources.
- 5. Slow the Spread of Exotics** - Learn to identify local exotic species and never release exotics into the lake (including species used as bait).

## SOLUTIONS FOR MUNICIPALITIES AND GOVERNMENTAL AGENCIES

- 1. Determine Public Concern** - Survey local fishermen and sport fishing organizations to determine extent of fainting, and population estimates.
- 2. Health Concerns** - Provide research funding or utilize Michigan Dept. Natural Resources fish contaminant monitoring and update Michigan Dept. Public Health consumption advisories. Assess extent & species that are contaminated and determine where/how contaminants are entering aquatic food web.
- 3. Provide a Solution** - Develop aquatic plant habitat plan to protect, preserve, and restore fish habitat for various fishes and stages for certain life cycles (including breeding/spawning habitat for walleye). Implement a nutrient / buffer management plan.
- 4. Set Harvest Limits** - Set localized harvest limits for species of concern.
- 5. Map What's Important** - Provide aquatic zoning ordinances and map extent of critical areas.
- 6. Increase Your Stock** - Support cooperation / funding with local sport fishing organizations to work with Michigan Dept. Natural Resources to implement stocking native fish of importance to White Lake (including White bass, Great Lake Spotted Muskellunge, Sturgeon, and Walleye).