

## Seawalls and Your Lake

An eroding shoreline can be a big headache for lakeshore homeowners. After all, you've spent a premium for your lakefront property and you'd like to keep it in place. What can you do? More importantly, what can you do without adversely affecting your lake and your property value?

The objective of lake shoreline protection techniques is to stabilize and protect these land forms against scour and erosion from forces such as wave action, ice action, seepage, and runoff from upland areas. Shoreline stabilization methods fall into two broad areas:

1. nonstructural (vegetation)
2. structural
  - a. flexible (rip-rap, glacial stone)
  - b. rigid (seawalls)

### Vegetation

Vegetation effectively controls runoff erosion on slopes or banks leading down to the water; however, it is less effective against direct wave action or seepage-caused bank slumping. Grasses are effective on slopes flatter than 3:1 (three feet horizontal run for each one foot vertical rise). On steeper slopes, deep-rooted grasses, woody shrubs, or trees are more effective. Bioengineered materials (erosion control mats, biologs, etc.) may be used to stabilize slopes while the vegetation is becoming established.

Benefits of a vegetated shoreline are numerous and include:

- Great habitat for aquatic organisms that live on the edge
- A barrier to Canada geese (they won't walk through tall grass, shrubs, or other dense vegetation)
- Shade, which discourages dense growth of aquatic plants (such as Eurasian watermilfoil) along the lakeshore.

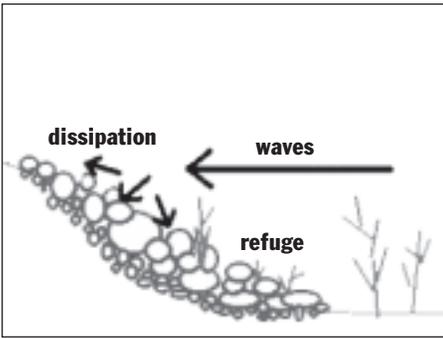


*Natural vegetation can protect even steep lakeshore slopes.*

### Flexible Structures

Rip-rap (preferably with natural, glacial stone), *when properly installed*, provides effective, long-term shoreline protection from waves, ice action, and bank slumping caused by seepage. Unfortunately, such structures are seldom installed properly but we'll address this in a future issue of *WaterColumn*. A glacial stone revetment is "flexible" because waves move the stones slightly

and flow over and into spaces between the stones, which dissipate the erosive energy of the waves. An additional ecological advantage of glacial stone is that aquatic insects (food for young fish) find shelter between the stones and rooted plants can grow within the stones, providing a more natural appearance.



*Glacial stone rip-rap dissipates wave energy and is habitat for many aquatic organisms.*

**Seawalls**

Seawalls are rigid structures that do not move when waves strike them. Wave energy instead is reflected back into the lake and down along the shore. They are used where steep banks prohibit the forms of protection suitable on shallow slopes. The seawall is placed vertically in soils and forms a barrier between the land surface and the water. The seawall itself can be constructed of sheet pile, wood, or concrete. Proper seawall construction requires: (a) anchoring either by driving the pile deep into the ground or the placement of “deadman” anchors and (b) protecting the “toe” of the seawall with large stones to prevent undercutting. Seawalls not properly constructed may quickly begin leaning toward the water due to back-pressure.

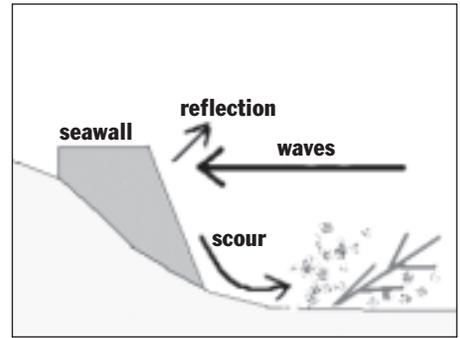
While many lakeshore homeowners apparently appreciate the looks of seawalls, they pose

many ecological problems for lakes.

1. Reflected wave energy scours the lakebed along the seawall, and with it, scours rooted plants important as habitat for fish, aquatic insects (fish food), and amphibians.
2. Wave scouring also resuspends sediments, increasing turbidity in the lake.
3. Wave scouring stirs up sediment phosphorus, increasing algae growth.
4. Seawalls are a barrier for frogs leaving the water after breeding. They can't get out and may actually drown.

To prove the ecological value of glacial stone vs. seawalls, 17 cooperative lakefront landowners on Lake Wawasee refaced 1,000 feet of seawalls with glacial stone. One-year results showed fish diversity increased by 36%, rooted plants present at 81% of the sites, and aquatic insect diversity and abundance were doubled at the refaced sites.

Economic values also become important when considering shoreline management. People are willing to pay a premium price for lakefront property because of the benefits of living on the lake. These benefits include the scenic beauty, peacefulness, swimming, fishing, watching birds, and others. But installing seawalls is an action of lakefront homeowners that actually degrades the very qualities



*Seawalls reflect waves, which scours out the lake sediments.*

that drew them to the water in the first place. This is seen in declining property values. For example, a study in Maine has shown that a *three-foot decrease* in Secchi disk transparency (water clarity) dropped the average selling price of homes by \$7,500 - \$14,000 *per 100 feet* of lakefront property. A 2002 study in Minnesota came to similar conclusions. A *three-foot decrease* in water clarity on Leech Lake dropped property values by \$594 *per foot* of frontage. A *three-foot improvement* in clarity increased property values by \$423 *per foot* of frontage. Therefore, building a seawall may *not* be the best way to maintain your property's value.

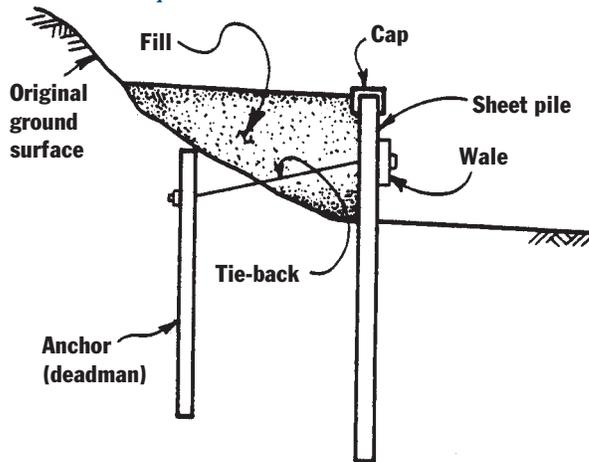
**What Does This Mean for Lakeshore Homeowners?**

You've paid a premium price for your lakefront property. If your shoreline is eroding, of course you need to fix it. However, before you do anything, you should first have

*Concrete seawall*



*Proper construction of a seawall*



*Wooden seawall*



a comprehensive evaluation of the *cause* of the problem. Once the cause is determined, work with your lake management professional to select the best corrective action for the problem . . . one that also has the minimum impact on the lake. Seawalls should only be used when the eroding lakeshore is steep, with high banks, and high wave energy. You don't need a seawall to repair minor erosion or in low wave energy situations and, in fact, you may actually do more damage to your lake than good.

For more information, contact your county Natural Resources Conservation Service, an agency within the U.S. Department of Agriculture. They have technical manuals and expertise to advise you on proper lakeshore erosion control. You may also contact the Indiana DNR, Division of Soil Conservation; Web site: <http://www.ai.org/dnr/soilcons/>.

#### **Sources of Information Used in this Article**

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IDNR. 1997. Lakeshore Protection in Indiana. Lake and River Enhancement Program, Division of Soil Conservation, Indianapolis. Available online at: <http://www.ai.org/dnr/soilcons/pdfs/seawall.pdf>.

## **State Issues 2003 Indiana Fish Consumption Advisory**

The Indiana State Department of Health has issued the 2003 Indiana Fish Consumption Advisory—both in print and on its Web site. In addition to fish consumption advisories for Indiana waters, the Fish Consumption Advisory

includes information on the health risks and health benefits of eating fish and the proper cleaning and preparation of fish. This publication is available annually through cooperative efforts between the Indiana State Department of Health, the Indiana Department of Environmental Management, the Department of Natural Resources, and Purdue University.

“We have tried to include everything a person might want to know about eating sport-caught fish in Indiana,” said LaNetta Alexander, environmental epidemiologist at the Indiana State Department of Health. “The advisory is designed to provide people with guidelines on how much and how often they should eat the fish,” Alexander said. “By following the advisory and eating fish in moderation, you help avoid the risk of accumulating contaminants in your body over time and gain the benefits of a protein source that's low in saturated fats.”

The advisory is not meant to discourage fishing, but rather to maximize the benefits and minimize the risk of eating Indiana fish, she said. The fish advisories are based on fish tissue sampled by the Department of Environmental Management; the agency gathers data on fish during its annual watershed assessment sampling. Mercury and polychlorinated biphenyls (PCBs) are the major contaminants that can be present in the tissues of Indiana fish, although pesticides and heavy metals can also be present.

“The Fish Consumption Advisory is a tool everyone who eats fish caught from Indiana waters should familiarize themselves with,” said Department of Environmental Management Commissioner Lori F. Kaplan. “By putting this critical information in the hands of Hoosier fisherman and fish consumers, these agencies are helping them make important decisions about their health and the health of their families.”

It is important to note that a fish advisory on a body of water does not necessarily mean that the water is unsafe for other recreational activities. If the water posed a hazard to human health, there would be a separate advisory issued for recreational activities like swimming or skiing. Requests for a free copy of the 2003 Indiana Fish Consumption Advisory and questions about eating sport-caught fish can be directed to the Indiana State Department of Health, at (317) 233-7055.

Information from the 2003 Fish Consumption Advisory is available on the Web in two ways: by body of water and by county (from a Web site prepared by Purdue University). Both versions are available at <http://www.IN.gov/isdh> (click on “Data and Statistics”). Other available Web resources include:

- mercury information, at <http://www.in.gov/idem/mercury/>
- a mercury fact sheet, at <http://www.in.gov/idem/mercury/prevention/mercfact.pdf>
- a polychlorinated biphenyls (PCBs) fact sheet, at <http://www.in.gov/idem/macsfactsheets/media/pcbs.html>

### **WATER COLUMN**

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# Coroner Cites Algae in Teen's Death . . .

## Experts are Uncertain About Toxin's Role

After a yearlong investigation, the Dane County, WI coroner has concluded that the mysterious death of a Cottage Grove teenager last summer likely was the first in the nation caused by exposure to a toxin released by algae.

Two days after swallowing water while splashing and diving in a scum-covered pond at a Dane County golf facility in July 2002, Dane Rogers went into shock and suffered a seizure before his heart failed, according to Coroner John Stanley's report.

Another teen, unnamed in the report, also was in the pond with Rogers and later became sick, complaining of severe diarrhea and abdominal pain. He survived. Tests of blood and stool samples from both boys found the common blue-green algae, known as *Anabaena flos-aquae*, and its toxin, Anatoxin-a. "Never in a million years did we think something like this could happen," said his father, Mike Rogers.

Kim Rogers, his mother, still recalls the evening of July 14 last year. "It was 97 degrees that day," she said. "It was just getting dark, and they decided to cool off in there. I can just picture them jumping in the water. Our one wish is that golf courses would be required to put a sign up at ponds, warning of toxins in the water," she said.

Dane Rogers was 17 at the time and looking forward to his senior year at Monona Grove High School. He was captain of the school's soccer team and honored as an all-conference goalie, and a member of both the National Honor Society and French Honor Society. "He was an all-around good kid," said his mother.

### Public Awareness

Coroner Stanley said he decided to release the report to make the public aware of the potential dangers of algal toxins in small ponds anywhere, whether at golf courses, farms, or parks.

"There are a lot of ponds out there with a lot more algae than was in this one," he said. "We wanted the public to know that you should not go swimming in algae-covered ponds. Parents should even be cautious not to let children collect golf balls from golf course ponds."

Still, there is no reason for the public to panic about the presence of the toxins, according to Stanley and other investigators. While blue-green algae are common in surface water, toxins are released only after thick blooms occur in summer. The toxins are diluted significantly in lakes, rivers, and reservoirs and can be removed by conventional drinking water treatment plants.

One international algal toxin expert who participated in the investigation is not 100% convinced that Anatoxin-a caused Rogers' death. Wayne Carmichael, a professor of toxicology at Wright State University in Dayton, Ohio, has studied toxins released in algal blooms throughout the world. His laboratory received tissue, blood, and other fluid samples from the two boys, which were tested for several algal toxins.

Based on animal studies, Carmichael said the amount of Anatoxin-a found in the samples could have caused the diarrhea and seizure followed by rapid death. There are no other cases of human deaths caused by Anatoxin-a for comparison, however, he said.

The reason that Carmichael doubts this explanation is the length of time that elapsed—48 hours—between the boys frolicking in the pond and Rogers' sudden death.

"We're confident the toxin was present, but the time of death does not fit into what we know about

this toxin from animal studies," he said in an interview. "If it had been Anatoxin-a poisoning, he would have experienced those symptoms within a few hours. In animals, you see the effects within minutes to an hour or two."

"Otherwise, the evidence points to anatoxin," Carmichael said. "It's still puzzling to me."

Stanley, the coroner, defended his conclusion. "The only thing that didn't fit was the timeframe, but these kids may have had a stomachache or diarrhea before they told their parents," Stanley said. "Anatoxin is the most reasonable cause of his death with the available information."

### Confounded Investigators

At the time, Rogers' sudden death confounded medical investigators. An autopsy by Robert Huntington III of the University of Wisconsin-Madison Medical School offered no explanation. "This young person crashed and died after onset of nausea and vomiting," Huntington said in a report. "We see acute heart damage."

Huntington's conclusion: "This is a sad and vexing case." A series of laboratory tests for pesticides, parasites and other illness-causing organisms found no clues. Analyses of brain tissue ruled out meningitis and encephalitis.

Subsequent interviews with the teenager's friends and fellow soccer teammates revealed that Rogers and four of his buddies—about 48 hours before his death—had jumped a fence at Vitense Golf and Country Club on the Beltline Highway in Madison so that they could cool off in the pond.

"They were in there horsing around," Stanley said. "Pushing each other around and wrestling in the water." While wrestling and diving, Rogers and one of the other boys had their heads underwater for varying lengths of time, according to statements made by the teens. "They both got a mouthful of water," Stanley said.

The other boy who had been fully submerged became ill with the same symptoms of acute diarrhea and abdominal pain, the coroner said. The remaining three developed only minor symptoms. The four survivors described the small pond to investigators as “dirty” and “scummy.”

It was nearly two weeks after Rogers’ death before researchers became aware of the pond as a potential source of a toxin or other cause of diarrhea. Water samples were collected on July 26 that year, but studies were inconclusive. The samples were tested by the State Laboratory of Hygiene in Madison and the Madison Department of Public Health. The city laboratory found no illness-causing bacteria. The state laboratory found no algal toxins.

Nonetheless, Stanley concluded that the evidence linked *Anabaena* and anatoxin to Rogers’ death.

Diarrhea resulted from “incidental ingestion of the water from the pond,” he says in an addendum to his original coroner’s report.

*Source:* Sept. 6, 2003 editions of the *Milwaukee Journal Sentinel*

## **EPA Considers Barley Straw a Pesticide, Cracks Down on Distribution**

Barley straw has been endorsed by environmentally conscious managers as a remedy for controlling nuisance algae in ponds. Now the EPA is cracking down on companies trying to sell barley straw, claiming it is an unregistered pesticide.

Bales of barley straw have been used to inhibit algal growth in small ponds. In the US, the results have been mixed, with most official studies showing no beneficial reduction in the algae population. However, word-of-

mouth reports tell otherwise, and many homeowners are eager to try this inexpensive, chemical-free algae remedy. The EPA has recently begun enforcing rules that prohibit commercial vendors from selling barley straw specifically for algae control. The EPA defines a pesticide as “any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.” If a claim is made that barley “controls” algae (a pest), it is legally considered to be a pesticide. However, no company has ever registered barley straw for use as a pesticide. Therefore, barley straw cannot be sold as a pesticide to control algae. This means that commercial applicators (individuals who have been state certified to apply aquatic pesticides for hire) and lake management specialists cannot recommend or apply barley for algae control; this application would be the same as distributing an unregistered pesticide.

Similarly, garden centers and Internet companies cannot market barley straw as an algae control product. They can, however, sell barley straw for non-pesticide usage, such as for water clarification. Individual homeowners may apply so-called “home remedies” such as barley straw to any water garden or pond that is on their property since privately owned water bodies do not fall under EPA jurisdiction. Private landowners may not apply barley straw to any public lake or pond. These waters fall under state regulations. For more information on the EPA’s stance on aquatic pesticides, visit <http://www.epa.gov/compliance/resources/newsletters/civil/enfalert/registration.pdf>.

If one chooses to try barley straw as an algae control on their own private lake or pond, they should take into consideration that even the strongest proponents of the remedy do not claim that barley straw inhibits all types of algae. Also, the use of barley straw

can increase the growth of rooted aquatic plants, and may induce fish kills if decomposition of the barley straw reduces the dissolved oxygen levels in the pond. Proper dosage is critical.

*Source:* FX Browne, Inc. *Lake and Watershed News*

## **Meetings**

**October 20-23, 2003.** *3rd National Conference: Nonpoint Source Pollution Information & Education Programs*, Congress Plaza Hotel, Chicago, Illinois. Cosponsored by: Chicago Botanic Garden and U.S. Environmental Protection Agency. Contact: Bob Kirschner; e-mail: [bkirschn@chicagobotanic.org](mailto:bkirschn@chicagobotanic.org); Web site: <http://www.chicagobotanic.org/research/conference/nonpoint>.

**November 2-4, 2003.** *American Water Resources Association Annual Conference*, Hilton San Diego Resort, San Diego, CA. Web page: [www.awra.org](http://www.awra.org)

**November 4-8, 2003.** *NALMS 2003: 23rd International Symposium of the North American Lake Management Society*, Foxwoods Resort, Mashantucket, CT. Contact: Phone: (608) 233-2836; Fax: (608) 233-3186; e-mail: [nalms@nalms.org](mailto:nalms@nalms.org).

**Got a question about your lake? Or lakes in general? Or about something you’ve read? Write to us at the Water Column and we will do our best to answer it.**

## 2003 NALMS Symposium to be Held in Connecticut

The New England Chapter of the North American Lake Management Society is pleased to be hosting the society's international symposium November 4-8, 2003 at Foxwoods Resort in Mashantucket, CT. Designed for lake and watershed professionals and citizen stewards alike, this event features diverse pre- and post-symposium workshops (open to non-symposium participants) and technical sessions covering all aspects of lake and watershed assessment and management.

Supported by the New England Chapter, a limited number of Lake and Watershed Steward registration packages are available to assist citizen stewards interested in attending Friday's technical sessions and a workshop on Saturday.

Full and half-day workshops include:

- Aquatic Ecosystem Restoration
- GIS for Conservation Planning
- Fish Assemblage Status & Identification in Northeastern US Aquatic Habitats
- Internal Phosphorus Loading
- Low-Impact Development & Ecosystem Restoration
- Alum for Phosphorus Inactivation & Interception
- Taxonomy & Identification of Algae
- TMDL Modeling

- Aquatic Plants—An Identification Workshop
- Basics in Limnology
- Conservation Marketing for the 21st Century
- Ecology & Control of Nuisance Algae
- Education & Outreach Strategies
- Touring Your Watershed Using GIS

Please see the NALMS Web site (<http://www.nalms.org>) for more information, for a complete list of technical sessions, and to register.

## Perspectives

"Autumn is a second spring when every leaf is a flower"

—Albert Camus

### WATER COLUMN

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