

## **Toxins blooming in lakes**

High levels of dangerous algae growing worse in Ohio, threaten drinking water, recreation areas

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The high-altitude photos of western Lake Erie last summer showed it increasingly covered by what looks like a slick of opaque, bright green paint, stretching from Toledo and the Maumee Bay east to the Lake Erie islands.

At ground level, the scene was equally unnerving.

The water was an unworldly, surreal, disgusting green. It looked like a painting, not something produced by Mother Nature.

The water can be as thick as pea soup or covered with scummy, foul-smelling mats.

The culprit: algal blooms from planktonic bacteria that can produce toxins dangerous to fish, animals and humans.

The number of blooms producing scary toxins or poisons is growing in frequency and duration in Lake Erie and many inland lakes and waterways in Ohio and elsewhere.

The threat is gaining attention as new testing shows the toxin microcystin from the planktonic bacteria is

present in popular recreational lakes and city water supplies, including Akron's.

Last year, signs were posted on Ohio's largest inland body of water, Grand Lake St. Mary's between

Wapakoneta and the Indiana border, when the water turned green and toxin levels rose high enough to threaten

bathers at a state park beach and the city of Celina's drinking water.

"It is a growing problem that is not going away and is likely to get worse . . .," said scientist Julie Weatherington-Rice of Columbus. "Something is out of kilter in our lakes, and it's a very serious problem. And

it's something we're all contributing to."

She chaired an Ohio Academy of Science symposium on the problem on April 9-10. She also serves on a state

panel on phosphorus going into Lake Erie and teaches at Ohio State University.

Asked whether the lake problems can be fixed, Weatherington-Rice replied: "It's big, really big. I don't know if

it's fixable. It won't be easy."

### **Prehistoric threat**

The life forms responsible for producing the toxins are some of the oldest on Earth.

The toxins themselves rank among the most dangerous, naturally occurring poisons on the planet, according to

the federal Centers for Disease Control and Prevention.

It's the growing frequency of algal blooms and recent detection of toxins in Lake Erie and inland lakes that are

catching attention.

"It is an emerging story, a fascinating scientific story, a very scary story and an incredibly complicated issue,"

said Weatherington-Rice.

The blooms — commonly found across the United States in warm, nutrient-rich waters — can cause taste and

odor problems in drinking water, foul beaches with offensive scum and odors, reduce oxygen levels for fish and

cause processing problems for operators of drinking-water treatment plants.

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Because of the yuck factor, few people are likely to drink or swim in the disgustingly green water. Nonetheless,

the toxins sometimes produced by those waters have killed fish and birds. They can irritate, sicken or even kill

livestock, pets and humans by attacking the liver and nervous system.

While no one has died in Ohio, 75 deaths at a Brazilian kidney dialysis center in 1996 were linked to toxincontaminated

water.

If the growth of recent years continues, it could affect Ohio's \$2.5 billion Lake Erie tourist industry, damage

lakeside property values and affect the state's \$800 million Lake Erie fishery.

Nationally, such toxic algal blooms cost an estimated \$82 million annually, according to the National Oceanic

and Atmospheric Administration.

"This is not a trivial organism," said Joe Logan of the Ohio Environmental Council, a statewide eco-group. "It's

not just a nuisance algae. It's a serious toxin and we're on a very alarming and worrisome path. . . . What's

happening is very alarming."

Ohio does not have a toxic algae tracking or reporting program, but the knowledge that microcystin was a

problem in other states resulted in the creation of the Harmful Algal Bloom Initiative in 2008.

The initiative

consists of several universities and state and federal agencies and is headed by Linda Merchant-Masonbrink of

the Ohio Environmental Protection Agency.

Problems in Ohio were confirmed when federal data became available for the first time last year, Merchant-

Masonbrink said.

U.S. EPA testing in 2007 found detectable levels of microcystin — a toxin that attacks the nervous system — in

seven of 19 Ohio lakes tested, or 37 percent. The national average is 25 percent.

"Our response was, 'Uh, oh, it looks like we have a problem,' " she said.

Through additional testing, the state has found harmful algal blooms — the ones producing toxins — in the

Ohio River and other inland lakes.

But Ohio's testing and search for lakes with toxins is limited by budgetary constraints, she said. At present, there are no federal or state limits, although some predict the federal EPA could impose such a limit in the next few years.

The federal EPA says toxic algae pose "a significant hazard to human health and ecosystem viability."

### **Tests reveal toxins**

Microcystis, sometimes referred to as blue-green algae, is the only toxic algae for which there is sufficient

information to produce general guidelines. The World Health Organization says treated drinking water should

contain no more than 1 part per billion of microcystin. The risk for recreational use is considered low at below

10 parts per billion, and rises to moderate between 10 and 20 parts per billion.

Last year, the level at Grand Lake St. Mary's was as high as 82 parts per billion.

The next highest level last year was 10 at Buckeye Lake east of Columbus.

Lake Erie's levels in Maumee Bay ran as high as 8 parts per billion, according to federal data.

What's happening on Lake Erie and Ohio's inland lakes is "the tip of the iceberg . . . and an issue that has

scientists really concerned," said Gary Winston, director of Heidelberg University's National Center for Water

Quality Research.

Microcystin also was found at low levels in three samples from LaDue Reservoir, one of Akron's drinkingwater

lakes in Geauga County.

A test revealed levels of 3.5 parts per billion in 2007. But in two tests in 2009, the level dropped to below 1 part

per billion.

Testing of water before and after treatment showed no sign of the toxin at Lake Rockwell, Akron's main

reservoir in Portage County.

Akron is aware of the problem but not overly concerned because of the low levels, said Michael McGlinchy,

head of Akron's Public Utilities Bureau.

Like many communities, Akron relies on carbon filters in treating its drinking water and that removes the algal

toxins.

No toxins were found in Mogadore Reservoir. They were found at low levels in Michael J. Kerwin Reservoir

(West Branch State Park) and Aurora Pond.

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### **Complicated life form**

There are at least 40 freshwater species that are known to produce cyanotoxins under the right conditions.

The most common toxic algae are microcystis (pronounced micro-sis-tis) and the stringy bottom-growing

lyngbya wollei (pronounced ling-bia wall-eye) that forms small balls as it rises and gathers in thick mats on the surface. The latter is common in Florida and North Carolina and was first found in Lake Erie in 2006.

Green and black are the dominant Ohio colors, but others can look blue-green, purple, red, white or brown.

Ohio has at least seven major organisms that can trigger harmful algal blooms. They are native and common to Ohio's lakes.

The presence of such blue-green algae does not necessarily mean that toxins are being produced. Not all

microcystis blooms are toxic. The toxicity depends on the strains present and environmental conditions, which tend to become more favorable when human-induced.

High levels of microcystin are known to affect the liver. At low, prolonged doses, they promote liver tumors.

Exposure to the toxins can also cause gastrointestinal and nervous system problems. The threat to animals and

humans can vary, depending on age, sex and sensitivity to exposure.

Scientists are unsure why the algae will produce toxins during one bloom but perhaps not during the next.

Levels change daily.

Contributing factors are farm fertilizers, animal manure, aging septic systems and lawn chemicals.

Killing the algae with chemicals will stop production, but the toxin, if already produced, will remain in the water.

The shallow western end of Lake Erie and Grand Lake St. Mary's have the most toxic algal problems.

The major culprit on Lake Erie's Maumee Bay near Toledo is microcystis, which had been found in low levels

in the lake for more than 100 years but did not become a problem until the mid-'90s.

Blooms were common in the shallow western end in the 1970s and 1980s before the United States and Canada

agreed to lower the use of phosphorus, which is common in detergents and fertilizers and a key nutrient in the

development of such phytoplankton.

In 1995, the free-floating microcystis was detected again by researcher John Hageman of Ohio State

University's Stone Laboratory. The lake was blanketed that September with what looked like a thick slick of

grass-green paint.

The 1995 discovery surprised scientists, largely because zebra and quagga mussels had invaded Lake Erie,

starting in 1986. The thumbnail-size mussels filter lake water and Lake Erie is significantly clearer as a result.

But research showed that the mussels expel the microcystis as unpalatable food. The result is that the mussels eat other algae and provide an advantage to the microcystis. It has become the dominant species in western Lake Erie.

Since then, the microcystis blooms have recurred every summer except 2002, a dry summer. The blooms were extensive in 2003, 2007, 2008 and 2009.

The blooms also aggravate the so-called dead zone in Lake Erie. The dead algae sink to the bottom in the lake's

Central Basin and use up oxygen needed by fish and insects.

Scientists suspect that the Maumee River that empties into Lake Erie at Toledo may be a major contributor to

the toxic algae. The river flows through farmland in Northwest Ohio and Northeast Indiana and annually dumps

5 million tons of sediment into Lake Erie. Included are large amounts of fertilizer and animal manure washed off the farms.

Similar toxic algal problems have been found in Michigan's Saginaw Bay on Lake Huron.

Researchers are exploring whether moving lake-bottom sediment may boost growth of toxic algae and whether

weed killers used by farmers could be a factor.

In Grand Lake St. Mary's, the dominant organism is plankto-thrix (pronounced plank-toe-thrix).

Its colonies of

planktonic filaments are distributed throughout the water, producing an overall greenish tint.

The federal tests from 2007 showed high microcystin levels in the 12,700-acre lake: 78 parts per billion.

The U.S. EPA released the 2007 test results to the state on April 27, 2009. The state posted warning signs at the

state park beach and by the water on the Friday before Memorial Day. Swimming and water skiing were not

banned, but people were advised of the threat.

Ohio tested for microcystin weekly from mid-June to September. Those tests ranged between 48 and 82 parts

per billion.

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On April 5, the Ohio Department of Health, EPA and Department of Natural Resources lifted the advisory

because recent levels have remained below 10 parts per billion.

Tests last year of treated water from Grand Lake St. Mary's showed that no microcystin had passed from the

lake through the Celina Water Treatment Plant.

Getting rid of the problem at Grand Lake St. Mary's will be a "long, long process," said Merchant-Masonbrink.

On April 7, U.S. Sen. Sherrod Brown, D-Ohio, and Gov. Ted Strickland announced a \$1 million federal grant to

begin cleaning up the Grand Lake St. Mary's watershed. Meanwhile, the state is monitoring other lakes with similar conditions and where there are state-operated beaches. There were low levels of toxins at Buckeye Lake and Indian Lake; no toxins were found at Lake Loramie in Shelby County. Ohio also found no microcystin in Piedmont Lake in Belmont County or in drinking-water reservoirs for the cities of Fostoria and Clyde. In the future, Ohio may want to start a microcystin surveillance program to check inland lakes regularly, said the EPA's Merchant-Masonbrink. "Harmful algal blooms are a bit of nightmare . . . and will be a problem for a long, long time," she said. " . . . There are no easy answers." Bob Downing can be reached at 330-996-3745 or [bdowning@thebeaconjournal.com](mailto:bdowning@thebeaconjournal.com).  
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## How to protect yourself from cyanobacteria

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Cyanobacteria and algae are among the oldest forms of life. Under the right conditions — usually involving sunlight, warmth, high levels of phosphorus (from fertilizers and human and animal waste) — they can grow at a rapid rate, producing algal blooms. Like plants and algae, cyanobacteria contain chlorophyll, which captures sunlight to create sugars for energy. Unlike most plants and algae, many cyanobacteria are able to pull nitrogen from the air with special cells. The cyanobacteria may be distributed throughout the water or may form floating scum atop the water. The blooms may appear as a thick paint on the surface of the water in such colors as green, blue-green, brown and red. The largest danger to humans and animals occurs when the blooms produce toxins, among them microcystin, considered to be among the most powerful naturally occurring poisons. More than 40 freshwater cyanobacteria are capable of producing the toxins, which can remain after the blooms are gone and attack the nervous system and the liver; there are no known antidotes.

### How to stay safe

Rinse off family members and pets after swimming in natural waters. The waters may contain toxins that cannot be seen, smelled or tasted.

Avoid contact with waters that have algal blooms or where the water is pea green, has a floating green scum or is generally discolored. When in doubt, stay out!

If anyone becomes ill after swimming, seek medical attention immediately. Seek veterinary assistance if a pet appears ill.

Know signs of algal bloom poisoning: numbness of lips, tingling in fingers and toes, dizziness, headache, rash or skin irritation, abdominal pain, diarrhea and vomiting. For pets: weakness, staggering, convulsions, difficulty breathing and vomiting.

Do not allow family members or pets to drink lake or river water.

It is not advisable to use natural water as a residential water source.

Never cook with water thought to contain harmful algae. Boiling will not eliminate algal toxins. Consider minimal consumption of fish from bodies of water with harmful algal blooms. Toxins are greatest in

internal organs but can also be found in filets. At a minimum, remove the skin from the filet and wash

thoroughly before cooking. Be sure not to use natural water as the cleaning source.

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### **Prevention**

Use lawn and plant fertilizers sparingly. Do not overfertilize or overwater after applying, If possible, use a phosphorus-free fertilizer.

Regularly check and maintain home septic systems.

Limit runoff from farms and livestock areas.

Do not allow large concentrations of Canada geese to set up residence. Their droppings can taint water.

Maintain native plants along lakes and streams.

Do not treat algae blooms with algaecides, like copper sulfate, because the toxins might be released from dying cells.

In small lakes and ponds, install a bottom aeration system to control phosphorus and limit algae.

### **Who is monitoring for Ohio?**

Ohio in 2008 formed a Harmful Algal Bloom Initiative led by Linda Merchant-Masonbrink of the Ohio

Environmental Protection Agency. Other members are the Ohio Department of Health, the Ohio Department of

Natural Resources, the Ohio Sea Grant Program, the Ohio State University Extension, the U.S. Geological

Survey, the U.S. Army Corps of Engineers, the National Oceanic and Atmospheric Administration, the Ohio

Lake Management Society and researchers from Ohio State, Bowling Green, Heidelberg and Wright State universities.

**How to report blooms**

Contact the Ohio Department of Health at <http://www.odh.ohio.gov>; the Ohio Environmental Protection

Agency at 614-644-2001 or <http://www.epa.ohio.gov/dsw>; or <http://ohiowatersheds.osu.edu/groups>.

**For more information**

Check the Ohio EPA's Inland Lakes program at [http://www.epa.state.oh.us/dsw/inland\\_lakes/index.aspx](http://www.epa.state.oh.us/dsw/inland_lakes/index.aspx).

The Ohio Sea Grant office has published a color, four-page fact sheet. It is available at <http://www.ohioseagrant.osu.edu/news/?article=205>.

Information about harmful cyanobacteria is available at <http://www.cdc.gov/hab/cyanobacteria/facts.htm>.

Sources: Ohio Sea Grant fact sheet; Centers for Disease Control and Prevention