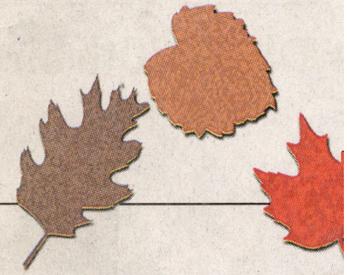


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WSSO FILLS PROGRAM WITH BOY GENIUSES **edge 1H**

DANGER *that floats*



Toxic blue-green algae from Muskegon Lake is shown floating in a jar.

Toxic algae blooming in area lakes; scientists blame zebra mussels

By Jeff Alexander
CHRONICLE STAFF WRITER

For years, scientists have pondered the worst-case scenario that could result from zebra mussels infesting the Great Lakes and scores of inland waters.

That picture is becoming increasingly, and alarmingly, clear.

A potent group of toxic compounds has been discovered in a common algae found in Muskegon Lake and the poisons may be present in other Michigan lakes. What makes this environmental horror story so unusual and troubling is that the toxins, called microcystins, were not dumped into Muskegon Lake by a renegade industry.

The culprits in this case: Zebra mussels.

What's worse, the only obvious solution would be killing all the zebra mussels in lakes, which isn't possible at this point.

Imported to the Great Lakes in the 1980s by trans-oceanic freighters, the mollusks have increased water clarity in lakes by eating algae as they filter huge volumes of water through their tiny bodies. The down side is that zebra mussels eat only nutritious algae — they spit out algae containing toxic compounds.

The result: Blue-green algal blooms, which can contain microcystins, are proliferating in relatively clean lakes across Michigan and other states, including Muskegon and White lakes, Lake Leelanau in northern Michigan and Lake Champlain in Vermont. The blooms create a blue-green layer of scum on the water's surface that looks like floating paint.

Scientists who recently tested algae scum on Muskegon Lake found elevated concentrations of microcystins. When ingested via drinking tainted water, the naturally occurring poisons can cause vomiting, diarrhea, fever, rashes, throat irritation and, in extreme cases, liver damage and cancer.

"I don't want to scare people, but the levels of microcystins we found are significant. These are very high concentrations and are on the same



Chronicle photos • Dave Carlson

Gary Fahnenstiel, director of the National Oceanic and Atmospheric Administration's Lake Michigan Field Station, collects a sample of blue-green algae near the Muskegon channel. Fahnenstiel says toxic algae will be a major issue in coming years.



Scientists who recently tested algae scum on Muskegon Lake found elevated concentrations of microcystins.

Fahnenstiel says to avoid going in water where blue-green algae is present. Wind and waves will disperse the surface scum, but the algae usually slips below the surface and returns when the water is calm.

Toxic algae 101

■ **The problem:** Microcystis, also known as blue-green algae, can produce a group of toxic chemicals known as microcystins. Not all blue-green algae produce the toxins.

■ **The cause:** Lakes with elevated concentrations of phosphorous produce blue-green algae. Zebra mussels are suspected of contributing to an increase in blue-green algal blooms in clean lakes. The mussels eat the good algae and spit out the bad, microcystis, which allows blue-green algae to proliferate.

■ **Where it's found:** Blue-green algal blooms are common in the southern United States, Europe and Africa. In Michigan, blue-green algal blooms occur on Spring Lake, Mona Lake, Muskegon Lake and White Lake and some very clean Michigan lakes, such as Lake Leelanau.

■ **Why it matters:** Microcystins are extremely toxic. Ingesting water containing microcystins can cause stomach cramps, vomiting, diarrhea, fever, headache, muscle and joint pain and weakness, as well as skin, eye and throat irritation and, in extreme cases, liver damage and cancer.

■ **Protect yourself:** Blue-green algae floats, creating a layer of bluish-green scum on the water surface that looks like paint. If you see it, stay out of the water or at least avoid areas where the scum is present.

Please see **ALGAE 4A** ►

▶ ALGAE from 1A

order of magnitude as the highest concentrations of microcystins ever reported," said Gary Fahnenstiel, director of the National Oceanic and Atmospheric Administration's Lake Michigan Field Station NOAA's in Muskegon.

Fahnenstiel, one of the world's leading experts on algae, said people should avoid swimming, wading, windsurfing, canoeing or water-skiing in areas of lakes with blue-green algal blooms. Dogs also should avoid those waters.

Although full-blown algal blooms are easy to spot on the water's surface, those blooms are hard to spot while forming or after being dispersed by waves. Here's a hint for next summer: In its diffuse stage, blue-green algae resembles a cloud of pollen in the water.

Blue-green algal blooms have long been common in lakes with high levels of phosphorous, such as Spring Lake. Zebra mussels are now causing the blooms in lakes with low phosphorous levels, according to scientific studies.

Although blue-green algae has poisoned drinking water supplies in other countries, Fahnenstiel said it is unlikely microcystins will foul Lake Michigan, a source of drinking water for much of Muskegon, Ottawa and Kent counties. Wave action in the lake is usually too intense to allow blue-green algal blooms to form, and the local drinking water intakes are deep enough to avoid the harmful algae, which floats to the water's surface.

The Muskegon Lake samples represented the "worst-case scenario," Fahnenstiel said, because they were taken from algae scum floating on the lake. But the Bear Lake sample was taken in an area with no scum on the water — the blue-green algae looked more like pollen in the water.

Although few people are out on area lakes now, Fahnenstiel said it would be wise in the future to avoid going in water where blue-green algae is present. Wind and waves will disperse the surface scum, but the algae usually slips below the surface and returns when the water is calm.

is calm.

"As a scientist and boater who spends time on Muskegon Lake — my kids swim and tube in the lake — I would not go in the water when these blooms are present," Fahnenstiel said.

Rick Rediske, a professor of water resources at Grand Valley State University and chairman of the Muskegon Lake Public Advisory Council, said he would limit activities in any lake with a blue-green algal bloom: "I would boat in it but I wouldn't swim in it," he said.

A Michigan State University study published earlier this year concluded that blue-green algal blooms could occur in any lake where zebra mussels are present. More than 100 Michigan lakes are infested with zebra mussels, according to state data.

"These algae blooms are not likely to go away," Fahnenstiel said. "Our experience in the Great Lakes has been that once these blooms appear, they occur every year. If you have zebra mussels in your lake, you'd better be looking out for these algal blooms."

Sarah Holden, a Michigan Department of Environmental Quality aquatic biologist, said the state has not been monitoring for microcystins in lakes.

"I think it is a relatively uncommon thing that is starting to become more frequent," Holden said. "We're trying to get a handle on it, figure out the best way to find lakes with problems, figure out what the health concerns are for people and how to get the word out."

A 2000 study performed by NOAA scientists in Saginaw Bay and Lake Erie warned that microcystins, which don't break down quickly in the environment, could move up the food chain, from invertebrates to fish and, ultimately, to people who eat the tainted fish.

The levels of microcystins in Muskegon Lake exceeded those found in Lake Erie.

There is no evidence that microcystins have affected fish or humans here, but no studies have been conducted.

Microcystin contamination has never been documented in area lakes until now because no one ever tested for the toxins. Although blue-green algae has

Gary Fahnenstiel, NOAA scientist, said the microcystins were significant. The concentrations are the same order of magnitude as the highest concentrations ever reported.



Chronicle map • Staff

■ Elevated concentrations of microcystins, naturally occurring but toxic compounds, were found in blue-green algae at these sites in Muskegon and Bear lakes. Levels above 20 parts per billion pose health hazards to humans who come in contact with the toxic algae. (Figures are parts per billion):

1. Boat basin near the Lake Michigan channel: 96.
2. Near Harbour Towne beach: 41.
3. Middle of Muskegon Lake: 238.
4. Middle of Bear Lake: 20.

Source: NOAA Lake Michigan Field Station

been a problem in other parts of the world for more than a century, it has only emerged as an issue in the United States in recent years, according to several scientists.

"There could be lakes out there, such as Spring Lake, that could be very high (for microcystins). We just haven't sampled them," Fahnenstiel said.

Spring Lake, one of West Michigan's most popular and intensely studied lakes, is notorious for massive blue-green algal blooms. Scientists from Grand Valley State University have thoroughly studied these

algal blooms. Scientists from Grand Valley State University have thoroughly studied those blooms and phosphorous pollution in Spring Lake, but did not test for toxic microcystins in the algae, said Alan Steinman, director of GVSU's Annis Water Resources Institute. He said the test is difficult and costly to perform.

"I've always been told that blue-green algae is not a harmful thing," said John Nash, chairman of the Spring Lake Lake Board.

When informed that some blue-green algae contains toxins, Nash said, "That concerns me."

Rediske said he has seen people swim, water ski and ride tubes in blue-green algal blooms on Spring Lake. "People seem to go out in Spring Lake in all conditions. This is something that really needs to be looked at," he said.

Microcystin contamination has been a problem for more than 100 years in other countries. There have been numerous cases of people, dogs and livestock becoming ill after drinking or wading in water laced with microcystins.

In Brazil, more than 60 kidney patients died after drinking water laced with microcystins passed through their dialysis machines.

People have become ill and some dogs have died recently in Vermont after falling into blue-green algae on picturesque Lake Champlain. Soldiers in Great Britain were sickened after canoeing through a blue-green algal bloom, and a Wisconsin boy died last year after falling into an agricultural pond contaminated with microcystins, Fahnenstiel said.

The problem is a relatively new one in the Great Lakes region. That's because zebra mussels are increasing the number of lakes experiencing blue-green algal blooms.

The concentration of microcystins in algae scum floating in the middle of Muskegon Lake was four times higher than the highest levels found in Lake Erie in 2000.

The 238 parts per billion of microcystins found in the Muskegon Lake algae bloom "does represent a health risk — mostly to accidental ingestion by pets or swimmers," said Wayne Carmichael, a professor of biological sciences at Wright State University. Carmichael is one of the world's leading experts on microcystins.

The World Health Organization's maximum exposure guideline for microcystins in recreational waters is 20 parts per billion, Carmichael said.

The other samples taken here found: 96 parts per billion of microcystins in a boat basin at the Lake Michigan Field Station, near the Muskegon Lake channel; 41 ppb near the Harbour Towne beach; and 20 ppb in the middle of Bear Lake.

Algae blooms cost billions in damages

By Jeff Alexander

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Nutrient pollution that causes noxious algae blooms to blanket lakes is more than an environmental nightmare — the problem also reduces lakefront property values and causes billions of dollars in other economic losses, according to a new study.



“These kinds of studies hopefully help our elected officials, decision makers, and stakeholders to appreciate that nature has both intrinsic and extrinsic values.”

Alan Steinman, director of Grand Valley State University's Annis Water Resources Institute

now don't think in those terms,” Steinman said. “These kinds of studies hopefully help our elected officials, decision makers and stakeholders to appreciate that nature has both intrinsic and extrinsic values.”

Nutrient pollution caused by livestock manure and phosphorus-based fertilizers draining off farm fields and residential lawns has been linked to nuisance and toxic algae blooms in several lakes in the Great Lakes region.

Some counties in the region, including Muskegon and Ottawa, have banned the sale of lawn fertilizers containing phosphorus in an effort to reduce elevated phosphorus concentrations in area lakes.

According to the study, lakefront property values drop by 15 percent every time water clarity is reduced by one meter. Algae blooms can reduce water clarity to

near zero; that phenomenon is common on Mona and Bear lakes during the hottest periods of summer.

Brenda Moore, director of the Mona Lake Watershed Council, said destructive land-use practices and the excessive use of phosphorus and nitrogen on lawns, golf courses and farms is a serious environmental and economic problem in West Michigan.

Scientists at the University of Kansas concluded that algae blooms fueled by excessive concentrations of phosphorus and nitrogen in surface waters across the United States cause at least \$4 billion damage annually. Most of the damage comes in the form of reduced lakefront property values, degraded fisheries and other recreational activities and the loss of biological diversity.

This is the first time scientists have put a price tag on the damage caused nationally by nutrient pollution in surface waters and the resulting algae blooms. The study, published in the journal *Environmental Science & Technology*, is significant locally because algae blooms have plagued several West Michigan lakes in recent years, including Muskegon, Mona, Bear and Spring lakes.

Alan Steinman, director of Grand Valley State University's Annis Water Resources Institute, said the study illustrated the high cost of pollution problems caused by excessive amounts of phosphorus and other nutrients in lakes.

“The greatest value is to let people know that there is a true cost to these impairments and losses, irrespective of what that (damage) number is, because many people right

“It is very difficult to put a price on the fact that Black Creek is a trout stream in Newaygo County, yet by the time it reaches Mona Lake it is impaired, has a hard time sustaining life, and it loads pollutants into Mona Lake for blue-green algae feeding frenzies,” Moore said.

Blue-green algae blooms, which have become common in recent years on Great

Lakes bays and numerous inland lakes, can release toxic chemicals capable of sickening fish, wildlife and humans.

Steinman said the Great Lakes are particularly vulnerable to nutrient pollution and the resulting algae blooms because water remains in the lakes for so long before flowing into the St. Lawrence River and, ultimately, the Atlantic Ocean.



Chronicle photo • Jeff Alexander

Don Fischer of Norton Shores runs his hands through the bluish-green slime in Mona Lake last summer.

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File photos • Chronicle

Excessive phosphorus is one of the primary causes of toxic algae blooms that have fouled parts of Mona Lake in recent years, turning the water lime green and making some beaches unsafe for swimming.

Mending Mona Lake

Group pushing \$500,000 improvement in water quality

By Jeff Alexander

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The ghost of pollution past will soon return to Muskegon County — this time to deliver a gift of environmental restoration, instead of abuse, to area surface waters.

The Michigan Department of Environmental Quality is poised to dole out \$500,000 that was collected from the former owners of a defunct Egelston Township chemical manufacturing plant. The state collected that money as part of a pollution clean-up at the facility, which operated from 1961 to 2000 as Lakeway Chemical, Bofors-Nobel and Lomac LLC.

Decades of careless and illegal waste disposal practices at the defunct facility caused massive soil and groundwater contamination at the site and polluted Black Creek, which flows into Mona Lake. A groundwater cleanup has been ongoing at the site for more than a decade; that project will cost the government and former owners of the facility about \$90 million.

Officials at the Mona Lake Watershed Council hope to tap into the \$500,000 environmental restoration fund to improve water quality in the popular but troubled lake, which was affected by pollution at the Bofors-Nobel facility.

“If we get all of these projects funded, we could see a significant turnaround in water quality in Mona Lake in a decade or less,” said Brenda Moore, executive director of the watershed council. “These projects would really turn around the health of the entire watershed, especially Mona Lake.”

Mona Lake has long been

plagued by pollutants — including phosphorus, toxic chemicals and pathogens — that drain off the landscape and accumulate in the lake. Excessive phosphorus in the lake is one of the primary causes of toxic algae blooms that have fouled parts of the lake in recent years, turning the water lime green and making some beaches unsafe for swimming.

The Mona Lake Watershed Council is seeking funding for four projects designed to reduce the volume of phosphorus and other pollutants flowing into Mona Lake from Black Creek. A fifth project would increase public awareness of problems facing the lake and potential remedies.

Included in the council’s proposal are projects to restore wetlands along Cranberry Creek in Moorland Township and plant vegetation on 98 acres of land near the U.S. 31—I-96 interchange, along Black Creek, known as the Celery Flats. Those projects would reduce the volume of phosphorus flowing into Black Creek and Mona Lake, where it fuels excessive algae growth.

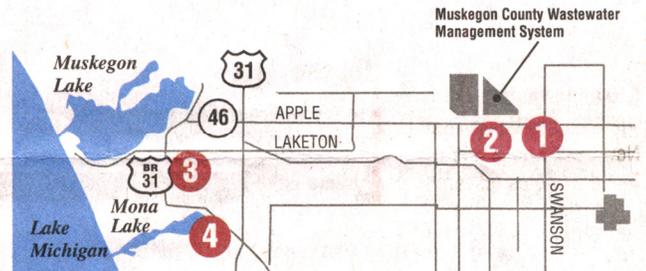
The Muskegon Lake Watershed Partnership also has applied for money from the Bofors-Nobel environmental restoration fund. That group proposes to use money from the fund to help support an ongoing \$3.4 million project to restore miles of Muskegon Lake shoreline to a more natural condition. Other government funds are supporting the Muskegon Lake shoreline restoration effort.

Judie Gapp, an enforcement specialist for the Michigan DEQ,

“These projects would really turn around the health of the entire watershed, especially Mona Lake.”

Brenda Moore, executive director of the Mona Lake Watershed Council

Mona Lake watershed projects



Chronicle map • Staff

- 1** Restore 30 acres of wetlands along Cranberry Creek in Moorland Township. The effort would be part of a Pheasants Forever project to restore 348 acres of wildlife habitat at the site.
- 2** Establish a conservation easement to prohibit future development along both sides of a 100-foot section of Black Creek; reduce streambank erosion and provide public access to a 40-acre parcel of public land.
- 3** Restore two large wetlands near Mona Lake and create gardens in Muskegon Heights.
- 4** Plant vegetation on 98 acres of land in the Celery Flats to absorb phosphorus in an area north of Black Creek; purchase 85 acres of land in the Celery Flats on the south side of the creek.



A sign cautions visitors about the water quality of Black Creek as it passes under Summit Avenue at Johnny O. Harris Memorial Park. The creek drains into Mona Lake. The Mona Lake Watershed Council is seeking funding for four projects to reduce the volume of phosphorus and other pollutants flowing from the creek into the lake.

Please see **MONA 10A** ►