

By now Three Mile Lake's cottagers are more than a little tired of cracks about *Creature from the Black Lagoon* and *The Blob*. But last September, when

Marilyn Horner leaned closer to inspect the verdant scum oozing across the Muskoka lake, she couldn't help but think of a B-grade horror flick.

"I had my cellphone in my pocket and when I bent over, it fell in," she recalls. "I thought, 'Oh my God, what am I going to do? I don't want to put my arm in that to pull it out.' I didn't know whether I'd have an arm left."

It's some solace for cottagers that blue-green algae, or cyanobacteria, won't sever arms or pull hapless onlookers into the water. But given the right conditions, this usually inconsequential organism undergoes explosive growth — it "blooms," cloning itself to emerge as a real-life water-quality ogre. While other freshwater algae cause a nuisance by making the water murky, cyanobacteria can poison people and animals, making lakes temporarily off-limits for most human activities and menacing property values.

Three Mile Lake made the news last fall as the most recent example of what happens when cyanobacteria go on a bender. As the lake's water turned emerald green, health unit staff (later assisted by township firefighters) went door to door distributing notices advising cottagers against "swimming and other water sport activities" and using lake water for drinking, showers, laundry, dishwashing — virtually everything but flushing the toilet. The advisory stayed in place from late September until December, when tests found the water was safe.

Beyond the health threat, the stuff is repulsive. The hardest hit end of Three Mile Lake "looked like pea soup, with bits of algae floating in the water, sort of like chunks washing up on shore," says Township of Muskoka Lakes mayor Susan Pryke. At times, the scum was accompanied by a stench like "garbage that had been left sitting out too long."

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Dogs and cattle have died after drinking fouled water in Canada. Swimmers have developed everything from mild allergy-like reactions to skin rashes, aching joints, cramps, vomiting, diarrhea, and respiratory problems. And while human deaths are extremely rare, they have happened in other countries.

The maddening thing is it's hard to predict which blooms are toxic, and which are just ugly. "If I knew the answer to that, I'd be retired now," says Lee Jackson, a University of Calgary biology professor who studies blue-green algae in food webs and is a long-time cottager on Lake Huron. Because cottage water-treatment systems can't remove all the toxins (and some might make the situation worse), when a cyanobacterial bloom appears, "you don't want to be cavalier about it," Jackson advises. "If you see a



Last summer's blue-green algae bloom on Three Mile Lake (above and on pp. 68-69) led to a health warning (top, p. 72). The lake's association has been revived and, with local and provincial governments, has formed a working group to fight the menace.

That's the fear not just of Horner but of others around the lake: Is there a sequel in the works for Three Mile Lake, a *Son of Scum* slated for next season?

The answer lies in the skies. Last year's bloom was driven by searing temperatures, including above-normal September temperatures across the province. That's not likely to occur two years in a row, but with the trend to warmer weather, who wants to lay odds? With enough nutrients to feed the algae, the next hot summer could trigger a repeat performance.

CYANOBACTERIA DIDN'T JUST CRAWL OUT of the primordial ooze — it is the primor-

dial ooze. For almost two billion years it was among earth's dominant life forms, helping produce the oxygen-rich atmosphere we breathe today. Technically, although cyanobacteria is not a true algae, it shares the attributes of both bacteria and algae. The organism is found in environments as different as stagnant farm ponds and Antarctic waters. It's probably present in small numbers in most Ontario lakes.

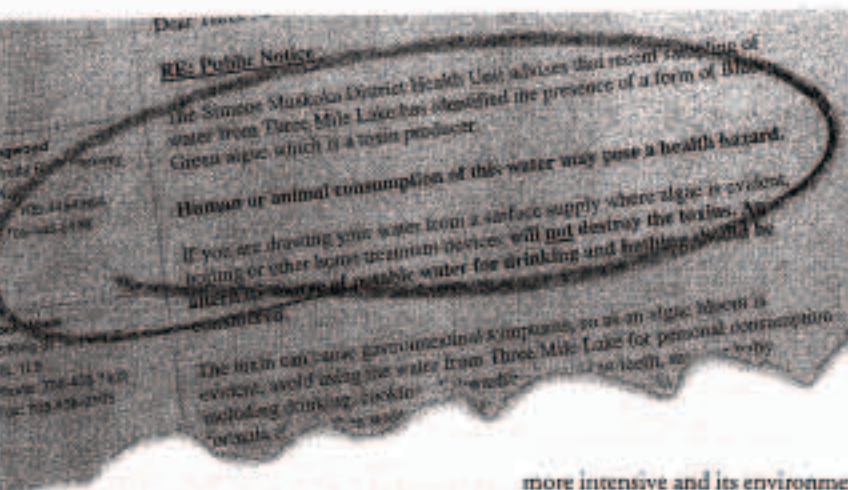
But given the right circumstances — often shallow, soft-bottomed lakes with limited water movement and balmy weather — cyanobacteria are primed for rapid growth. Their only additional need

is phosphorus, and humans do a good job of supplying it. Phosphorus comes from animal and human waste, lawn fertilizers, and whatever ends up in septic systems, including automatic dishwasher detergents and household cleaners. We also help the nutrient get to the lake by clearing land and replacing the tangle of shoreline vegetation with lawns and imported beaches.

The Three Mile Lake bloom is the first confirmed cyanobacterial scum in Muskoka (for blooms in other areas, see "Not the First Time," below), and it illustrates the link between development, phosphorus, and algae. Before the first wave of settlers carved farms out of the bush, the lake's shallow main basin probably held 8.49 parts per billion of phosphorus (as determined by computer models). That's not very much — one part per billion is the equivalent of one second in 32 years. Phosphorus and nitrogen are naturally occurring, but lakes on the Canadian Shield are typically low in these nutrients and can be more sensitive to their increase.

Today there are more than 550 cottages and homes on the shore. Farming is probably less active than in previous decades, but there are still about 200 head of cattle, horses, and other farm animals around the lake. Add the nearby golf course, and the main basin of Three Mile Lake is estimated to serve up 24.21 parts per billion of phosphorus.

"You can be fairly certain that increased human activities and more people in the watershed with the same level of control on waste" — including septic systems and livestock manure — "is going to produce more cyanobacteria,"



says Ellie Prepas, the Canada research chair in sustainable water management at Thunder Bay's Lakehead University. Prepas favours the zero-discharge approach Europeans have taken, removing phosphorus from watersheds by replacing septic systems with holding tanks whose contents are shipped to centralized sewage treatment facilities.

Cutting phosphorus is "the only handle we have on cyanobacteria," says Murray Charlton, research scientist with Environment Canada's National Water Research Institute. As aquatic organisms go, cyanobacteria are remarkably self-sufficient. Many take the nitrogen they need to grow from the atmosphere. Some dive and ascend like submarines, going down for more nutrients and up to capture more sunlight while shading out their competitors.

When it comes to fending off a cyanobacterial bloom, cottagers can't change the weather or stop the sun from shining. The best defence is to put sludge-producers on a low-phosphorus diet. Getting a handle on phosphorus means cottagers must come to grips with the trends making cottage use

more intensive and its environmental impact more extensive. As modest summer places are winterized or turned into full-time homes, cottagers spend more time at the lake. That means more trips to the loo, more household cleaners down the drain, more phosphorus in septic systems and tile beds — and, ultimately, more nutrients in the watershed.

At the same time, new cottages tend to be bigger, with larger septic systems, more extensive clearings, and landscaping that's more suburbia than wilderness. "Now what we seem to be getting on the lake is homes," says long-time Three Mile Lake cottager Victor Kulish. "The first thing the owners do is cut down the trees and plant a lawn from the water to the cottage and build these three- to six-thousand-square-foot structures."

The results shouldn't be a surprise. For years now, governments, conservation authorities, cottage lake associations, and *Cottage Life* have been harping on the need to ease the pressure on cottage lakes. But is the message getting through?

During the bloom, "I had a call from somebody on the lake who was

What is that STUFF?

In its early stages, only a specialist with a microscope can sort out what's what, so when an algal bloom turns the water green and cloudy the safest approach is to stay out of the lake (and keep your pets away, too). Here are some tips to help you tell what is — and what isn't — cyanobacterial.

A CYANOBACTERIAL BLOOM IS

- ✓ Most notable for the way it covers the water with a fluorescent blue-green paint-like scum.
- ✓ Often redolent of fresh grass clippings, must, mould, or decaying vegetation.
- ✓ Usually blue-green (almost a bright emerald or teal, not kelly or forest green) but may have brown or reddish tinges.
- ✓ Often likened to pea soup.
- ✓ Most likely to occur in mid-to-late summer (July, August, and September).
- ✓ Made up of small colonies (the size of a pinhead or smaller) that are hard to pick up and hold on a stick.

A CYANOBACTERIAL BLOOM IS NOT

- X A subsurface cloud that's bright green (this is likely green algae) or brown (likely chrysophytes or diatoms, both other types of algae).
- X Yellow, powdery stuff floating on the lake. (This is tree pollen.)
- X Anything with root-like or leaf-like structures. (Duckweed is a small floating plant sometimes mistaken for blue-green algae.)
- X Guilty of releasing a sickly sweet odour. (Blame chrysophytes for that.)
- X Long and stringy when you pick it up with a stick. (These are usually colonies of green filamentous algae.)

Finally, when you see algae in the lake, it's best to err on the side of caution. Even if the bloom doesn't look blue-green, that doesn't mean there aren't blue-greens around.

THREE MILE LAKE
Continued from page 72

very concerned," says Bracebridge-based lake planner Randy French. "His statement was 'I wish I had known I wasn't supposed to put fertilizer on my lawn.'"

Promoting lake-friendly cottaging is one of the things French says lake associations do best. "You need to generate awareness on the lake so you can get ahead of these issues," he says. "With stewardship, it's an issue of what cottagers can do for themselves. The best way to get the word out is door to door, face to face."

If there is a benefit to cyanobacteria, it's that it is hard to ignore. When the scum appeared in Three Mile Lake, it spurred action. On Thanksgiving Day, cottagers and lakeside residents jammed the old red brick Raymond Community Hall to talk about the bloom. "It was standing room only and people standing outside," recalls Cindy Watson, president of the newly revitalized Three Mile Lake Association. Emotions were driven by a near-visceral reaction to the scum, the fear of its impact on people and property. Speakers blamed septic systems, farms, even the release of turbid water from a waterfowl nesting area.

Yet as cottagers talked it out, Watson says the meeting became "surprisingly productive." Three Mile Lake's association had once been active in stewardship and social events, but had fallen into dormancy during the '90s. Now cottagers voted to revive the association and use it to launch a cleanup effort. "Mostly, people wanted to know what's going on, and to make sure it doesn't happen again," Watson says.

A few days later, representatives from the lake association joined the newly formed Three Mile Lake Working Group, which also includes the Township of Muskoka Lakes, the District of Muskoka, and the provincial Environment and Natural Resources ministries. With Mayor Pryke chairing the session, the group agreed to fight cyanobacteria by cutting phosphorus in half. "No one wants to live on a lake that's the poster child for not managing your phosphorus well," says Pryke, who can see the lake from atop a rock behind her house. "The township has always worked on water quality, so to have Three Mile

Lake turn green on us like this was a real black mark."

The effort to erase the stain includes:

- More restrictive zoning on the lake ("WR4" in planning lingo, signifying the lake is "over threshold"). Rezoning could take at least a year, but would prevent new lots, boost setback for new construction from 20 to 30 metres, and implement site-plan controls to protect shoreline vegetation. Existing vacant lots will only be okayed for building if they have 60 metres or more of frontage and are at least an acre.
- A septic inspection for all systems on the lake, combined with an education program to help owners maintain them.
- Encouragement for local farmers who haven't already enrolled in the voluntary Canada-Ontario Environmental Farm Plan to sign up. The plan offers financial help for measures such as improving manure storage, fencing cattle away from water, and creating buffer strips along creeks.
- An education campaign by the Three Mile Lake Association and the Muskoka Watershed Council to explain the link between phosphorus and cyanobacteria. The association will track phosphorus levels and water clarity with the Ministry of the Environment's Lake Partner Program and help produce a more accurate map of the shoreline and its alterations.

Now recovered from the shock of the scum (and the loss of her cellphone), Horner is forging ahead with her husband on plans for a modest cottage. "We have to follow through because we love the property so much."

The future of Three Mile Lake demands this kind of commitment. Putting a lake on a low-phosphorus diet requires major changes from cottagers, and it's not a quick fix. It took decades for phosphorus levels to build up, and may take years for them to decline. The good news is cottagers aren't helpless victims in this movie, they're also shaping the plot. Now they have the opportunity to write a happy ending.

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Continued from page 172

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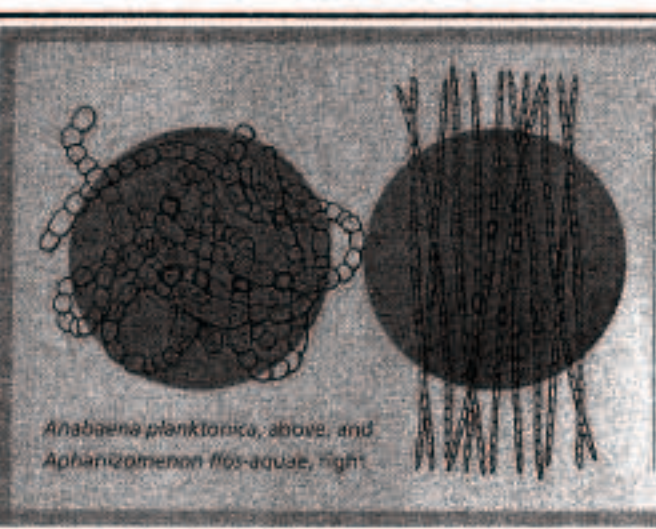
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Ray Ford wrote about algal blooms in *Lake of the Woods* in the Apr./May '04 issue of *Cottage Life*.

With enough nutrients in the lake, the next hot summer could trigger another cyanobacterial bloom



NOT THE FIRST TIME
Other lakes have been hit by cyanobacteria

Three Mile Lake isn't alone in the campaign against cyanobacteria. Scum has fouled the water in Lake Erie's western basin, as well as such classic

cottage locales as Lake Champlain and Lake of the Woods. Lake Winnipeg, home to more than 10,000 cottages, saw blooms blanketing 8,000 sq. km in 2003 and 13,000 sq. km last year. In 2003, blooms appeared on Sturgeon and Cameron lakes in the Kawartha, prompting the same sort of health unit advisories issued last fall for Three Mile Lake.

The Three Mile Lake experience will also sound familiar to cottagers on Sturgeon Bay, in the Pointe au Baril area. The bay has suffered from cyanobacterial blooms since 2002, inspiring cottagers, residents, and the Township of the Archipelago to fight back by naturalizing shorelines, inspecting septic systems, and banning lawn fertilizer.

Their next step may be an artificial water-circulation system to break a vicious cycle of algal blooms, oxygen depletion, and phosphorus releases. As decaying algae sink to the bottom they use up the oxygen in the deepest part of the bay or lake, setting the stage for a chemical reaction that releases phosphorus from the sediment.

This "internal loading" of phosphorus fuels the cycle by driving more algal growth. To put the brakes on the problem, Sturgeon Bay's water-quality team is investigating whether a mechanical system that works like a floating, solar-powered blender will mix oxygen through the water, keeping phosphorus locked up and algae under control.

"We're going to find a solution," says Township of the Archipelago councillor and Sturgeon Bay resident John Cochrane. "We look at Sturgeon Bay as the canary not just for Georgian Bay but for a lot of other places. If we can deal with the problem in Sturgeon Bay, it will be a blueprint for action in other areas."