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Testing the waters

Ohio EPA gets back in the business of monitoring inland lakes

By **Spencer Hunt**
 THE COLUMBUS DISPATCH

The deepest spot in Griggs Reservoir is just north of the dam that turned a 6-mile stretch of the Scioto River into a long, narrow lake.

It's there, where the muddy bottom is 21 feet from the surface, that many of the lake's secrets will be revealed with the help of discs, dredges, probes and tubes lowered into the green water.

Ohio Environmental Protection Agency researchers use these tools to measure, among other things, sediment, algae, metals and toxins, in an effort to grade Griggs' water quality.

Each test the agency performs will help set standards for 447 lakes that dot Ohio, many of which provide drinking water for residents.

"Lakes are now the final piece in a total understanding of water quality in Ohio," said Linda Merchant-Masonbrink, the EPA's inland lake program manager.

The Ohio EPA halted lake testing in 1995 after federal funding was cut. At the time, officials believed measuring pollution in streams that feed and drain lakes would provide a general picture of water quality in Ohio lakes.

Anthony Sasson of the Ohio Nature Conservancy said lakes are different because they store pollutants that streams flush away.

"It's been a gap over the last decade," Sasson said. "I hope the new attention (on lakes) will help close that gap."

Columbus Public Utilities officials test lake water from Griggs, two other large reservoirs, and the streams that feed into them, once a week for pollutants that can threaten drinking water.

The tests "give us an opportunity to adjust our treatment and be prepared," said Lynn Kelly, the city's water treatment coordinator.

One of the top concerns is atrazine, a popular weed killer that runs off of farmland and can pose a health risk in drinking water.

Tests at Griggs in July showed an unhealthy level. Kelly said carbon filters at the Dublin Road water plant reduced atrazine to a safe level.

But drinking water tests don't provide a full picture. The state wants to know if lakes are safe for wildlife as well as people, Masonbrink said.

For example, many cities don't measure algae unless it causes a taste or odor problem. But algae can cause problems. Big problems.

The state got back into testing in 2007 when the U.S. EPA sent a \$170,000 grant to test 20 lakes in a national lake survey.

Test results from Grand Lake St. Marys revealed huge quantities of microcystin, a toxin created by blue-green algae. It can sicken people and animals.

Subsequent Ohio EPA tests done in May showed the toxin was at levels two to four times higher than World Health Organization safety standards.

Tests at Buckeye Lake in June and July also found microcystin, but at safer levels. Finding the algae helped convince the Ohio EPA to renew lake testing.

"It's important to know what you're swimming in," Masonbrink said.

Ohio EPA experts visited eight lakes in 2008. They plan to visit 15 this year.

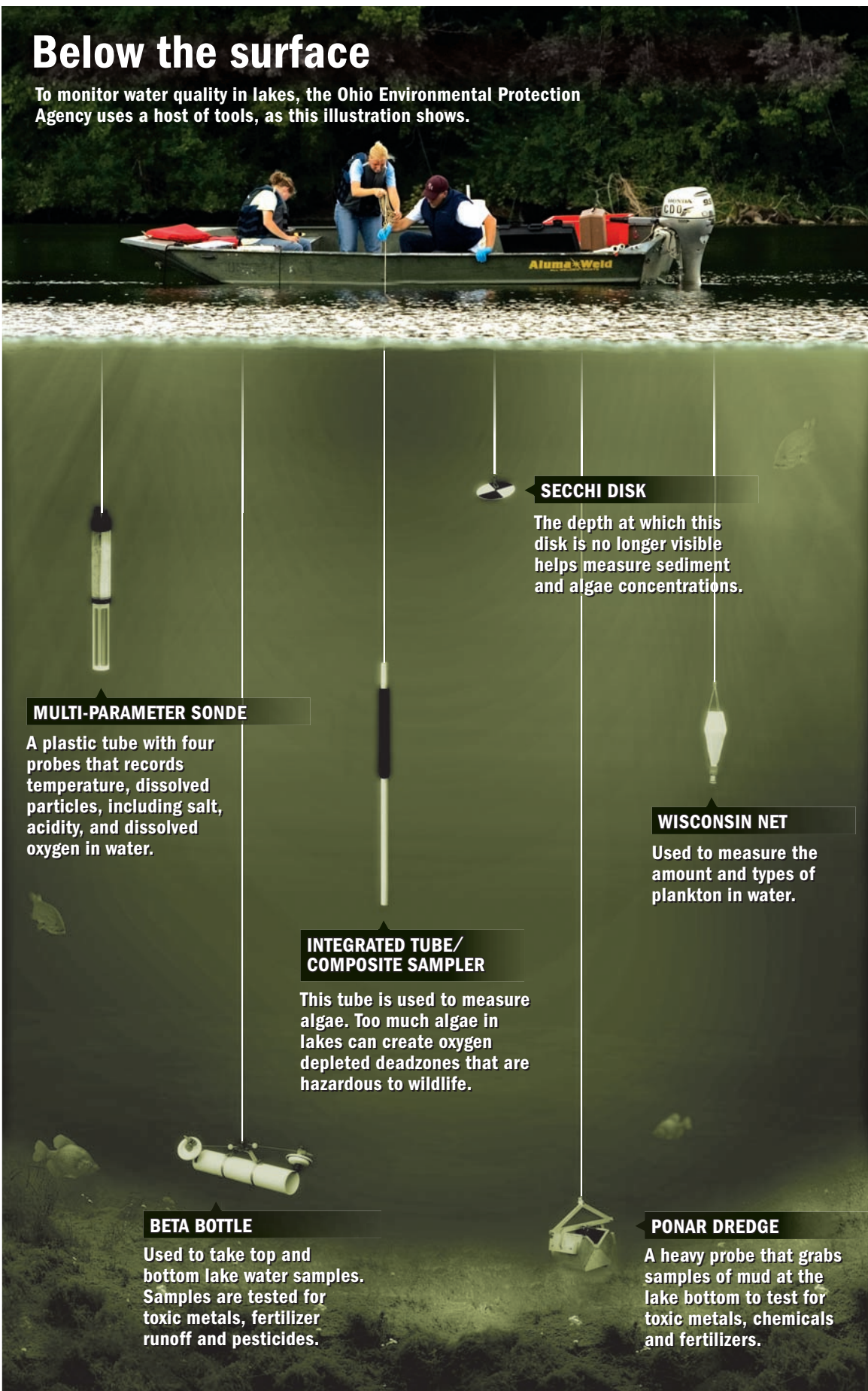
The findings also will help define pollution threats posed by farms, where rain washes pesticides, herbicides, fertilizers and manure to streams and lakes.

Manure and fertilizers release phosphorus and nitrogen, which help create huge algae blooms that form oxygen-starved dead zones that threaten wildlife in lakes.

Tests taken last year at Buckeye Lake, for example, showed algae concentrations eight times higher than what researchers consider typical for a healthy lake.

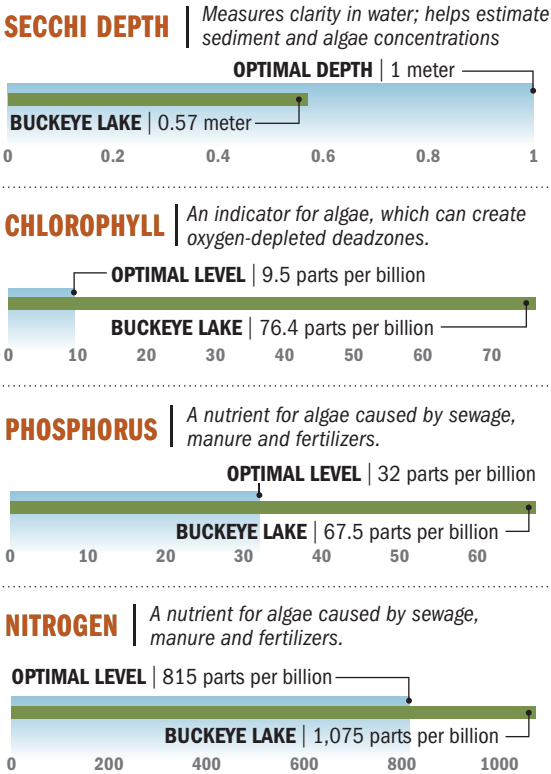
Masonbrink said 10 tests are performed at each lake over summer months.

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What's in Buckeye Lake

Ohio EPA researchers test for more than 30 indicators in inland lakes. Here are some of the results from a 2008-09 survey of central Ohio's Buckeye Lake that concerned scientists.



Other pollutants

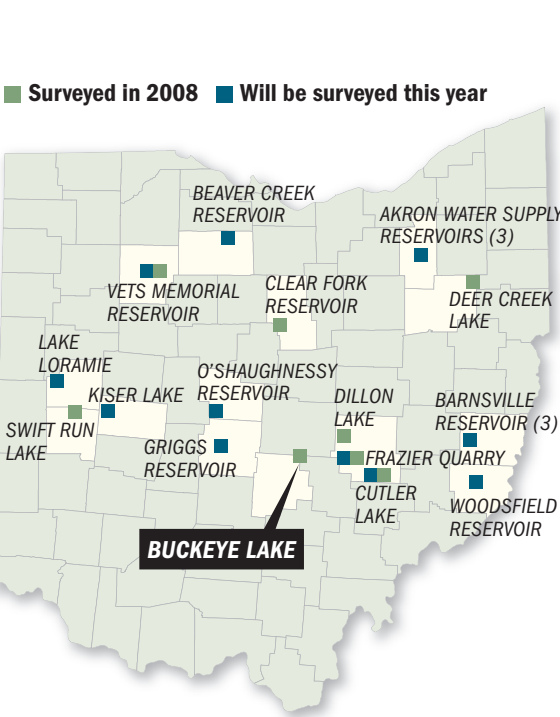
The EPA found these metals and compounds in Buckeye Lake. The agency says the low concentrations are not a health threat.

METAL/COMPOUND	HEALTH EFFECTS
Arsenic	Nausea, low blood cell production and damage to blood vessels
Cadmium	Nausea, diarrhea and kidney disease
Chromium	Skin rashes, linked to stomach ulcers in animals
Copper	Stomach distress, long term exposure can cause liver and kidney damage
Lead	Nervous system, kidney damage
Nickel	Nausea, vomiting, headaches and weakness
Selenium	Nausea, vomiting and diarrhea
Aluminum	Long term exposure may lead to Alzheimer's disease
Barium	Nausea, diarrhea and muscle weakness

Source: Ohio Environmental Protection Agency

Tested lakes

A funding cut put a halt to the Ohio EPA's lake-monitoring program in 1995. The agency restarted the program in 2008. There are 447 lakes on the state's survey list.



METAL/COMPOUND	HEALTH EFFECTS
Manganese	Nervous system damage from long term exposure
Sodium	A laxative in high concentrations.
Strontium	Impaired bone growth at high levels
Zinc	Fever, nausea, stomach cramps and diarrhea
Mercury	Brain and kidney damage, birth defects
Orthophosphate	Bone decalcification at high levels
E. coli bacteria	Nausea, vomiting and diarrhea
Microcystin	Nausea, rashes, liver and nerve damage
Atrazine	Cardiovascular and reproductive problems
Metolachlor	Stomach cramps, nausea, nervous system depression and liver damage

ARCHAEOLOGY

Man and maps go way back

Maps are visual representations of the landscape that we use to help us find our way. New evidence suggests that humans have relied on maps for more than 16,000 years.



BRADLEY T. LEPPER
 Spanish archaeologist Pilar Utrilla and a team of researchers from the University of Zaragoza recovered an engraved stone from Abauntz Cave in

northern Spain that might be the oldest known map in Western Europe.

The engravings include a few images of animals and numerous abstract designs. After 15 years of careful analysis, Utrilla's team convincingly argues that the entire composition is a stunningly accurate sketch of the geography around the cave. The group's conclusions are presented in the current issue of the *Journal of Human Evolution*.

According to Utrilla and her colleagues, the map includes a mountain that can be seen from the mouth of Abauntz Cave and the river flowing in the valley below.

Ibex are depicted on the flanks of the mountains, while the animals depicted in the valley are plains-dwelling species, such as aurochs, reindeer and a horse. Some of the animal engravings are smaller than others, suggesting that the artist was "seeking to show the depth in the composition."

The emphasis on game animals in their proper ecological zones suggests to the team that the engraving might represent "the plan for a hunt yet to happen" or "the narrative story of a hunt that already occurred."

According to independent researcher Michael Clauss, Ohio has its own Stone Age maps. In an article published in July in the online journal of the *American Society for Amateur Archaeology*, Clauss argues that many of the state's prehistoric petroglyphs are ancient maps.

Much of Clauss' argument depends upon the rather dubious assumption that early American Indians could envision the shapes of large topographic features as if seen from high above.

For example, he interprets an image from Jackson County's Leo Petroglyph site of a human head with antlers and bird's feet as an accurate rendering of a series of topographic features that are visible in modern aerial photographs.

More plausibly, Clauss links the sinuous curves of a serpent carved on the Independence Slab in Cuyahoga County with the strikingly similar winding course of the Huron River.

The idea that some Ohio petroglyphs might incorporate geographic information is an intriguing hypothesis. But a persuasive argument for any interpretation must be based on an intensive analysis of the particular panel of petroglyphs and its cultural context.

Not every Paleolithic engraving is a map, nor will all Ohio petroglyphs be explained by any single interpretation. Some appear to have a spiritual or religious focus. Others might be idiosyncratic with a meaning that is essentially unrecoverable.

The late Bruce Trigger once described archaeology as "the only discipline that seeks to study human behavior and thought without having any direct contact with either." The challenge archaeologists face is how to recover reliable knowledge about the past based on the indirect evidence available to us.

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