Report shows how to say goodbye to harmful algal blooms

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Jay Martin, an ecological engineer with The Ohio State University, poses next to the Maumee River in Toledo, Ohio, in this 2015 photo. Credit: Ken Chamberlain, CFAES.

Harmful algal blooms dangerous to human health and the Lake Erie ecosystem—such as the one that shut down Toledo's water supply for

two days in 2014—could become a problem of the past.

A new report shows that if farmers apply agricultural best management practices (BMPs) on half the cropland in the Maumee River watershed, the amount of total phosphorus and dissolved reactive phosphorus leaving the watershed would drop by 40 percent in an average rainfall year—the amount agreed to in the 2012 Great Lakes Water Quality Agreement between the U.S. and Canada.

Scientists believe that a drop of this magnitude would keep algal blooms at safe levels for people and the lake.

"With aggressive adoption of best management practices, it is possible to reduce harmful algal blooms to safe levels while maintaining agricultural productivity," said Jay Martin, ecological engineer in The Ohio State University's College of Food, Agricultural, and Environmental Sciences and co-author of the study.

The study, "Informing Lake Erie Agriculture Nutrient Management Via Scenario Evaluation," was a collaborative effort between the University of Michigan as the lead, The Nature Conservancy, Heidelberg University, LimnoTech, Texas A&M and Ohio State.

It reviewed 12 approaches to reducing total and dissolved reactive phosphorus and concluded that two of them would result in a 40 percent reduction on average.

"All 12 of the modeled scenarios produced results beneficial to phosphorus reduction," said Don Scavia, lead author of the study, environmental engineer and director of the University of Michigan's Graham Sustainability Institute.

Of the scenarios that reached the 40 percent threshold, one was an

extreme approach unlikely to be implemented, Scavia said. That extreme approach showed that 1.5 million crop acres would need to be converted into grassland to meet the targets, if no additional BMPs were employed on agricultural lands.

On the other hand, "the most promising scenarios included widespread use of in-field and edge-of-field nutrient management practices, especially subsurface application of phosphorus fertilizers, expansion of cover crops and creation of buffer strips," he said.

The BMPs are practices farmers have successfully used for decades, said Martin, who also leads Ohio State's Field to Faucet water quality initiative. They include subsurface fertilizer application, cover crops, fertilizing according to soil tests and installing buffer strips to intercept runoff.

Solutions must be good for both water, farmers

"The BMP scenarios are more sustainable because they can sustain agricultural productivity while improving water quality," Martin said. "To move forward, it is most important to find solutions that both improve water quality and maintain economic returns for farmers."

In the most promising BMP scenario, about 1 percent of the land in the watershed, or about 30,000 acres, would need to be converted to buffer strips, and about half the farm acreage would need to have cover crops and subsurface phosphorus applications. Farmers in the watershed are already implementing some of these BMPs, and so are on the way to reaching the 50 percent adoption level that would be necessary, Scavia said. A scenario that included enhanced nutrient management on all the cropland was also effective in reaching this goal.

While the BMPs are familiar to farmers, "It's clear that broadening their

use as much as needed will be a big lift," Martin said. "What will help is the additional $41 million that USDA announced it would invest in the Western Lake Erie Basin. This represents a significant investment that would help reach the 40 percent goal."

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) announced theinvestment March 28 at Maumee Bay State Park near Toledo. The dollars will be used to support farmer implementation of conservation practices.

Funding will help implement best practices

"This, along with other innovative efforts like water trusts, cost shares, drain fee incentives, and public-private partnerships that are already underway within the Lake Erie Basin and other parts of the Great Lakes, provide examples of how to make this happen," Martin said.

"The challenge is how to integrate and scale up these and other parts of the solution to treat the number of acres needed to see measureable improvements in water quality," he said.

The researchers chose the Maumee watershed because it has the most impact on the Western Lake Erie Basin, where most of the dangerous algal blooms occur. Information from the study could likely be applied to other agriculturally dominated watersheds with similar slopes, soil types, crop rotations and drainage, Scavia said, but current BMP use would need to be determined.

"The study's models provided the best available advice on both the scale and direction of change needed to meet the new load targets, and they suggested multiple pathways for it. But, as with all modeling of this sort, they may have under- or overestimated what is needed," Scavia said.

"The real test is to begin implementing the change, tracking implementation progress, measuring environmental outcomes, and adjusting both the models and the actions if needed," he said.

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