

WATER QUALITY



Experts say soluble phosphorus runoff from farms is one of several contributors to the harmful algal blooms plaguing Lake Erie and other bodies of water in recent years. Researchers at The Ohio State University are working to solve this problem and improve Ohio's water quality by helping farmers continue to achieve high levels of productivity while reducing input usage and cost. The key is to keep more fertilizer in the soil where crops can use it and to apply only what is needed for growing crops.

HIGHER YIELDS, LESS FERTILIZER, IMPROVED WATER QUALITY

Since September 2014, Ohio State University Extension has trained more than 12,600 Ohio farmers on best practices to apply fertilizer for optimum crop yield, reduce the risk of nutrient runoff and improve water quality throughout the state.

Known as Fertilizer Applicator Certification Training (FACT), this program allows farmers and commercial fertilizer applicators to meet the educational requirements of Ohio's agricultural fertilization law, which requires those who apply fertilizer to more than 50 acres to become certified by September 30, 2017.

FACT was developed by College of Food, Agricultural, and Environmental Sciences researchers and educators and is offered in partnership with the Ohio Department of Agriculture. The training provides research-based tactics to keep nutrients in the field and available to crops while increasing stewardship of nearby and downstream water resources.

According to 2015 U.S. Department of Agriculture statistics, the average Ohio farm is 188 acres. Using this figure, the 12,600 farmers trained so far by FACT represent more than 2.3 million acres of farmland impacted.

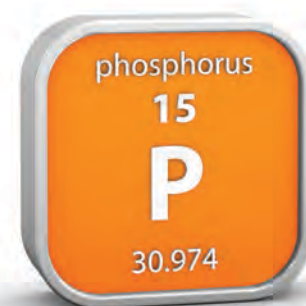
FACT helps farmers and applicators better understand the issue of water pollution and see the connections between production practices and environmental stewardship.

More: nutrienteducation.osu.edu

PHOSPHORUS LEVELS ARE DECREASING IN OHIO SOIL

Agricultural soil phosphorus levels held steady or trended downward in at least 80 percent of Ohio counties from 1993 through 2015, according to Ohio State researchers.

The findings, which are based on data from more than 2 million phosphorus soil tests from 1993 to 2015, represent good news for Ohioans concerned about protecting surface water quality while maintaining agricultural production. Soil



phosphorus levels are strongly related to the concentration of phosphorus in runoff water; less phosphorus in the soil should result in reduced phosphorus runoff risk.

Phosphorus soil testing is an important tool farmers use to determine if phosphorus fertilizer is needed for crop growth; and if so, how much. In Ohio, crop-specific phosphorus fertilizer recommendations come from the Tri-State Fertility Guidelines.

Farmers are being asked to avoid applying phosphorus fertilizer beyond crop needs. Maintaining soil phosphorus levels within the appropriate agronomic range minimizes phosphorus runoff risk, while providing sufficient crop nutrition.



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COLLEGE OF FOOD, AGRICULTURAL,
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In 2015, the median soil phosphorus level was within the appropriate agronomic range in 87 of 88 Ohio counties, assuming nutrition needs for a typical Ohio crop rotation.

Ohio State researchers are also working to evaluate and revise the Ohio Phosphorus Risk Index so it accurately reflects runoff risk of phosphorus. The index is a U.S. Department of Agriculture Natural Resources Conservation Service tool used by farmers to assess their risk of phosphorus moving off farm fields. The revisions include adding more management options into the index to reduce runoff risk with a goal of broad implementation of revised and more specific phosphorus recommendations to improve Ohio water quality.

FIELD TO FAUCET: PARTNERSHIPS TO RID OHIO WATERS OF HARMFUL ALGAL BLOOMS

In the two years since a harmful algal bloom shut down the drinking water for two days in Toledo, Ohio, 23 research projects aimed at ensuring safe drinking water while keeping Ohio farms productive and profitable are now up and running thanks to the ongoing Field to Faucet water quality program. The program was created in September 2014 after harmful algal blooms

created the water quality crisis in Lake Erie that suspended access to clean, safe water to the northern Ohio city of Toledo.

Field to Faucet involves researchers from multiple Ohio State colleges, other regional universities, and several agricultural organizations and government agencies. A full listing of partner schools and organizations can be found at field2faucet.osu.edu. Ongoing projects include a one-stop shop for farmland data, new field sensors to quickly scan for multiple algal toxins in water and food, a new app to help farmers manage farm nutrients, research to rid livestock manure of phosphorus and nitrogen, and the use of unmanned aerial vehicles (drones) to provide real-time concentrations of microcystin in Lake Erie's waters. Microcystin is a toxin made by certain harmful algal blooms.

More: field2faucet.osu.edu

ARE FISH SAFE TO EAT DURING ALGAL BLOOMS?

Harmful algal blooms can produce toxic microcystin, and severe blooms in Lake Erie have caused worries that sport fish might be contaminated.

To see if that is the case, Ohio Agricultural Research and Development Center-funded scientists tested microcystin concentrations in three Lake Erie fish — walleye, yellow perch and white perch — collected in

summer 2013. They found significant differences among them, but say none of the samples posed a health risk to people who follow state guidelines for safe fish consumption.

But there are caveats. The study used safe-eating thresholds for healthy adults; children and the immune-compromised might be susceptible to lower doses. There's also evidence that microcystin accumulates in white perch and walleye, and that levels in white perch vary with bloom conditions.

For those reasons, the scientists strongly recommend that, during algal blooms, microcystin should be monitored not just in water but also in fish. They say the monitoring would lead to a better understanding of the microcystin levels and their risks. Benefits would also include protection for Ohio's \$2 billion-a-year sport fishing industry and the 1.3 million Ohioans who fish and eat what they catch.

A NEW, FAST, CHEAPER TEST FOR ALGAL BLOOM TOXIN

Harmful algal blooms are a growing health and environmental concern, not just in Ohio but also around the world, partly because some of the blooms produce toxic microcystin. Unsafe microcystin levels in western Lake Erie, for instance, were behind the two-day shutdown of Toledo's drinking water supply in 2014. A new test developed by OARDC-funded scientists detects microcystin in water samples quickly and at a low cost.

Based on technology called enzyme-linked immunosorbent assay, or ELISA, the new test is simple to use, fast — less than 3 hours from preparing the test kit to detection — and more than 10 times less expensive than the current ELISA test — less than \$1 per sample instead of \$10. The scientists say their new test can be used on a wide variety of samples, from drinking water sources to bloom samples to municipal water treatment plants and more. An end result will be better protection of people's health, including the 3 million Ohioans (and 11 million people total) who rely on Lake Erie for their drinking water.



Lake Erie algal bloom