Building a better weapon against harmful algal blooms

December 17 2018

Predicting and pinpointing which farming practices are most likely to protect against environmental harm is a complex proposition, and researchers at The Ohio State University are working to fine-tune the tools that could help farmers and others prevent harmful algal blooms.

This week at the American Geophysical Union (AGU) fall meeting in Washington, D.C, a team of scientists from The Ohio State University shared early results from a trio of studies that aim to improve models designed to guide agricultural practices for reducing the risk of nitrogen and phosphorous farm runoff. Such runoff leads to the growth of toxic algae in waterways.

Basic models for predicting the consequences of various decisions, such as when to apply fertilizer, are available but they must be refined in order to ensure reliability and gain the trust of interested parties, including farmers and environmental protection organizations, said Jay Martin, a professor of ecological engineering at Ohio State.

Asmita Murumkar, a postdoctoral researcher at Ohio State, said her work is beginning to illuminate how the timing of fertilizer application intersects with heavy rains to contribute to nutrient runoff. She's working with the Ohio Applicator Forecast, a tool that uses National Weather Service data to assign risk estimates to applying fertilizer at various times.

Murumkar is hopeful that her research will help quantify what impact the tool would have on the environment under different scenarios- say if a quarter of farmers in the Maumee River watershed used it, or half.

"We want to better understand how much phosphorous runoff it would reduce in the region," Martin said, adding that there's plenty of evidence that individual farm practices impact runoff from those farms, but less evidence in terms of larger-scale estimates.

"We know from our previous work that fertilizer timing is important, but we want to be able to look across the whole Lake Erie Basin and know best-case and worst-case scenarios and this modeling will help address that," he said.

Margaret Kalcic, assistant professor in Ohio State's Food, Agricultural and Biological Engineering Department, said farmers are encouraged to follow the "Four Rs" for right time, source, amount and place when applying fertilizer.

"But 'right' is not clearly defined, and our team is working to provide our partners in Ohio, including farmers, advocates and policymakers, with better answers," Kalcic said.

Added Martin, "There's more subtlety here than just watching the weather and the ground moisture and we're trying to determine the best solutions that support agricultural production and environmental protection."

Grey Evenson, a postdoctoral researcher at Ohio State, will present initial findings on his work to identify the best data to use in modeling, so that it offers a more accurate picture of what is happening in fields and adjacent waterways.

"We don't want to underestimate—or overestimate—the value of these best management practices. For instance, some practices may produce greater benefits than we give them credit for in the model—such as improving soil health, which leads to better water retention," Evenson said.

Added Kalcic, "A lot of this work is about tuning existing models. By improving the quality of information we put into them we have greater confidence in the information that comes out of them." She said that there are many questions about the larger environmental impacts of practices such as no-till farming, which is generally thought of as environmentally friendly.

"We know that no-till is good for preventing soil erosion, but there are still uncertainties about its effects on water quality in the region," Kalcic said.

Graduate student Anna Apostel discussed a third project, in which she's manipulating various parameters in one model to try to determine how reliable—or not—the model is. The long-term goal is to move toward more-robust estimates of how practices contribute to water quality.

Martin said adjusting parameters so that magnitudes of processes better match reality and data from observations in the field is a critical part of improving model performance.

"We want to adjust our equations to better represent reality," Apostel said.

The overarching goal of all the work, the researchers said, is to have models that better align with what the researchers have observed in field experiments but that can look at the issues on a broad, regional level.

"We know that if you build a bad model it's not going to help anybody make any decisions," Kalcic said.

"We really want to build trust in truly useful models that will help policymakers, farmers and others. The worst thing would be that people trust models that are telling them the entirely wrong message," she said.

Provided by The Ohio State University

Citation: Building a better weapon against harmful algal blooms (2018, December 17) retrieved 22 June 2024 from https://phys.org/news/2018-12-weapon-algal-blooms.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.