

Developing Scalable HAB Prevention Technologies in the Ohio Region

USACE Harmful Algal Bloom Research & Development Initiative



Delivering scalable freshwater HAB prevention, detection, and management technologies through collaboration, partnership, and cutting-edge science.

Lead: Michael Brooker, The Ohio State University

Problem

Harmful algal blooms (HABs) have become more frequent and severe across the United States. Agriculture contributes a major portion of nutrients, like phosphorus, that feed these blooms and best management practices (BMPs) are needed to reduce nutrient loads. An accurate estimation of BMP performance quantified through monitoring of field-scale BMPs is needed so that the optimal solutions can be identified for management at watershed and regional scale.

Objective

Farmers will be recruited to adopt BMPs and allow edge-of-field monitoring on their agricultural lands. Novel BMPs and designs will be identified and applied in construction on the recruited farmers' properties. The impacts of these BMPs will be assessed through water quality monitoring. The results from this will be used to assess the management needs at the regional scale required to mitigate future HABs.

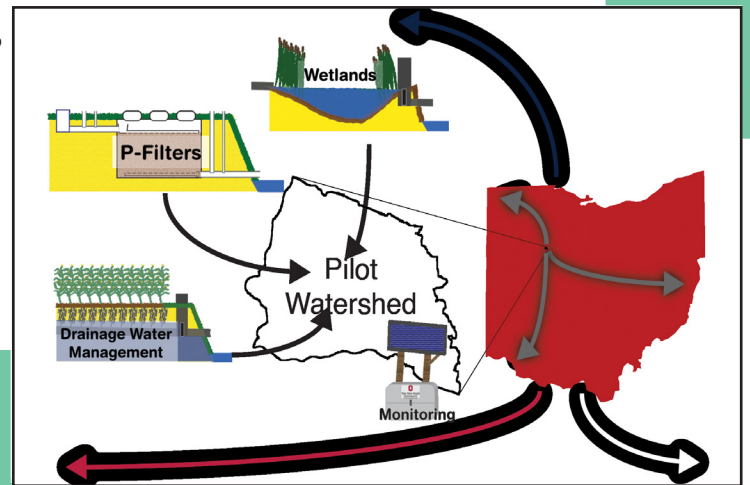


Figure 1. Conceptual diagram

Approach

Through existing partnerships and efforts, farmers will be recruited to adopt BMPs. This study will focus on identifying fields with greater risk of nutrient loss. Upon finding cooperative farmers, BMPs featuring novel designs will be constructed and instrumented with automated water sampling equipment. Samples from these fields will be analyzed to assess the impact of the BMPs on nutrient losses. Data from this study will be used to inform how these practices are represented within watershed models.

Major Milestones

Deliverable	Description
Publications	<p>Journal Article: Scott et al. 2023. "Techno-Economic Analysis of Phosphorus Removal Structures." <i>Environmental Science & Technology</i> 57 (34): 12858. https://doi.org/10.1021/acs.est.3c02696.</p> <p>Journal Article: Brooker et al. In review. "Quantifying Phosphorus Loads from Legacy-Phosphorus Fields." <i>Journal of Environmental Quality</i>.</p> <p>Undergraduate Thesis: M. Kacica. 2023. "Estimating the Benefits of Legacy Phosphorus Fields for Targeted Best Management Practices." The Ohio State University. https://kb.osu.edu/handle/1811/102733.</p> <p>Undergraduate Thesis: E. Ebersbach. 2023. "Impact of Soil Texture on Phosphorus Loss from Legacy-P Fields." The Ohio State University. https://kb.osu.edu/handle/1811/102810.</p>

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Major Milestones (cont.)

Deliverable	Description
Outreach	<p>Presentations:</p> <ul style="list-style-type: none"> S. Francis. 2023. “Combating Legacy Phosphorus: Phosphorus Removal Structures for Subsurface-Drained Agricultural Fields.” Presented at the International Association for Great Lakes Research, May 11, Toronto, Ontario, Canada. J. Martin. 2023. “Targeting Phosphorus Removal Structures to Legacy Phosphorus Sources.” presented at the American Ecological Engineering Society, June 6, Tampa, FL. M. Brooker. 2023. “Do Legacy-P Agricultural Fields Discharge Greater Nutrient Loads?” Presented at the American Ecological Engineering Society, June 6, Tampa, FL. M. Brooker. 2023. “Do Legacy-P Agricultural Fields Discharge Greater Nutrient Loads?” Presented at Lake Erie Public Webinar, hosted by the Environmental Climate Change Canada, June 20, (virtual). J. Martin. 2023. “Assessing the Value of a Public-Private Partnership to Target Best Management Practices to Legacy-Phosphorus Fields.” Presented at the SWCS Conference, August 8, Des Moines, IA. J. Martin. 2023. “Working with the Agricultural Community to Focus Practices for Watershed Phosphorus Reductions.” Presented at the SWCS Conference, August 8, Des Moines, IA. <p>Posters (presented at the OSU Denman Forum and 2023 AEES Meeting):</p> <ul style="list-style-type: none"> M. Kacica. 2023. “Approaching Phosphorus Reduction Targets by Managing Legacy Phosphorus Fields.” E. Ebersbach. 2023. “Impact of Soil Texture on Phosphorus Loss from Legacy-P Fields.” <p>Field Days:</p> <ul style="list-style-type: none"> J. Martin. “Water Quality Research.” Presented at the Field to Table Field Day Event hosted by A. Dean, Bryan, OH.
Field Sites	<p>A wetland-phosphorus filter system was constructed and instrumented with water quality monitoring equipment in Montpelier, Ohio. https://h2.ohio.gov/project/montpelier-wetland-restoration.</p>

Partnership/Leveraging Opportunities

This work will support and leverage coinciding research projects like (1) the “Developing Public-Private Partnerships (PPPs) to Target Legacy Phosphorus Fields to Increase Water Quality and Availability” research funded by the USDA-NIFA AFRI program; (2) the “Pilot Watershed: Shallow Run, Hardin County Ohio” project funded by the USDA-NRCS RCPP program; and (3) the “Beneficial Implementation of Byproducts to Reduce P Loss from Agricultural Land” project funded by the ODHE HABRI program.



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