WORKING WETLANDS

WETLANDS

Wetlands provide wildlife habitat, flood storage, and recreational opportunities, but also are essential for removing nutrients in our waterways.

PHOSPHORUS

An essential nutrient that can move off the land and overwhelm our freshwater systems, resulting in algal blooms.

LAKE ERIE ALGAL BLOOMS INCREASING

20 years Phosphorus loading has been increasing

90% wetlands lost due to development & farming

Scientists and lawmakers agree we need to **REDUCE CURRENT LOADING BY 40%** to stop these blooms.

So, how well can wetlands reduce phosphorus?

LOW FLOW
LOW NUTRIENT LOAD

wetland filters well = less P enters Lake Erie

HIGH FLOW
HIGH NUTRIENT LOAD

wetland is overloaded = more P enters Lake Erie

WHAT CAN WE DO FOR OUR WETLANDS?

SUPPORT
Donate and advocate for the protection, enhancement, & creation of wetlands.

MANAGE
Evaluate your wetland's nutrient reduction performance & adapt management to enhance its role in helping Lake Erie.

FUND
Support projects that increase wetland monitoring and restoration.

RESEARCH
Increase understanding of which wetlands best retain phosphorus (plants, natural vs. constructed).

FOR A DEEPER LOOK, GO ONLINE TO

www.nerrssciencecollaborative.org/working-wetlands

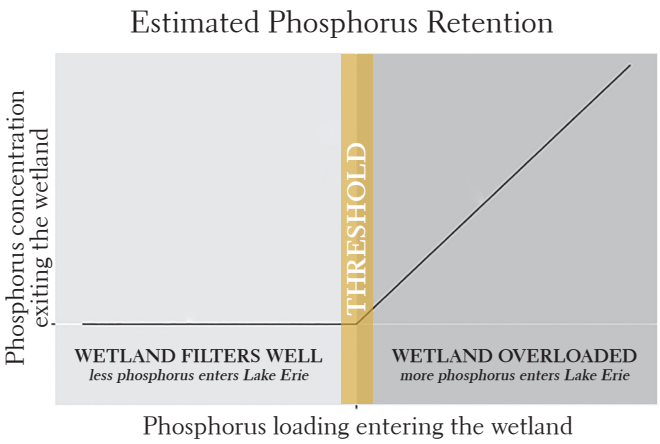
OLD WOMAN CREEK NATIONAL ESTUARINE RESEARCH RESERVE

OHIO DEPARTMENT OF NATURAL RESOURCES

National Estuarine Research Reserve System Science Collaborative

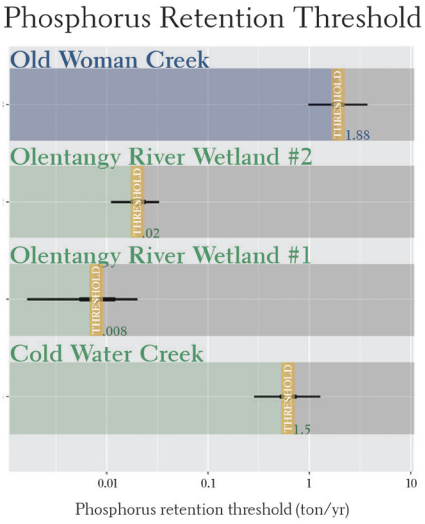
HOW MUCH PHOSPHORUS CAN WETLANDS CONTAIN OVER TIME?

Over long periods of time, wetlands retain phosphorus through the building up of sediment. This long-term storage determines **a wetland's phosphorus retention capacity**. If a wetland becomes overloaded, the excess phosphorus flows through it and into the receiving water body, which can result in harmful algal blooms. **The point at which a wetland becomes overloaded and can no longer retain additional phosphorus is called the wetland's phosphorus retention threshold.** Understanding a wetland's threshold for retaining phosphorus is an essential step for managing water quality.



A statistical method, called a Bayesian changepoint model, was used to estimate the phosphorus retention capacity of different wetlands. The model compares phosphorus loading (concentration over time) into the wetland with phosphorus concentration leaving the wetland. **At low levels of loading, the wetland retains most of the phosphorus; at high levels of phosphorus loading, phosphorus concentrations leaving the wetland are higher and less predictable.** The model uses this information to estimate the point at which loading becomes too high, which is the phosphorus retention threshold.

This modeling approach estimated phosphorus retention thresholds for three wetlands: the Old Woman Creek, an open coastal wetland; the Coldwater Creek treatment wetland; and Olentangy River experimental treatment wetlands. The model does not work well for diked wetlands that have a single opening through which water flows both into and out of the wetland. The **thresholds differed among these wetlands, due to their different type, size, and hydrology, reflected in the graphs to the right.** Differences are due to the rate at which sediment builds up and how much sediment can be stored. Smaller wetlands (e.g., the Olentangy River wetlands) have a lower retention threshold than larger ones, because they store less sediment.



This study is a starting point for anticipating how the protection, restoration, and management of wetlands can help reduce phosphorus loading to Lake Erie. Additional water quality data is still needed to better predict individual phosphorus retention capacities of various wetland types. **Monitoring instructions and a web-based tool are available at the link below to assist wetland managers with data collection and model application. Managers can use these individual threshold estimates to determine if phosphorus loading to a wetland is typically too high or if it is usually below the wetlands' retention capacity.**

Model results allow us to estimate the long-term capacity for phosphorus retention only; they do not account for short-term phosphorus use and release by plants and micro-organisms. Additional research is needed to understand how different wetland characteristics affect retention capacities, such as the types of plants or how quickly water moves through the wetland. **Answering these questions will allow managers to make more informed decisions about what type of activities and areas are most beneficial for nutrient retention.**

Old Woman Creek National Estuarine Research Reserve is managed as a cooperative partnership between the Ohio Department of Natural Resources and the National Oceanic and Atmospheric Administration. This work was sponsored by the National Estuarine Research Reserve System Science Collaborative, which supports collaborative research that addresses coastal management problems important to the reserves. The Science Collaborative is funded by the National Oceanic and Atmospheric Administration and managed by the University of Michigan Water Center (NAI4NOS4190145).

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