The H2Ohio Wetland Monitoring Program

Managed by the Lake Erie and Aquatic Research Network (LEARN) and the Ohio Department of Natural Resources (ODNR)

December 2023

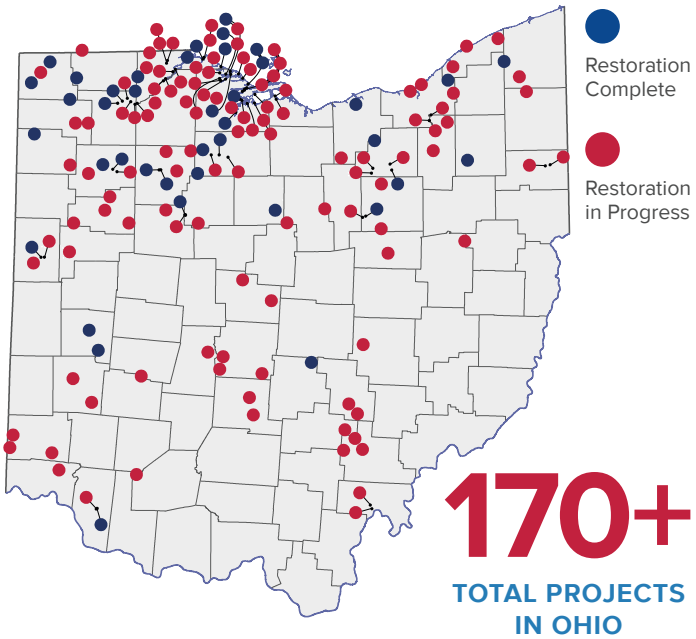
ABOUT THE PROGRAM

The H2Ohio Wetland Monitoring Program, managed by LEARN, is assessing the role wetland restoration projects play in curbing phosphorus and nitrogen losses from the landscape as part of the statewide H2Ohio Initiative to improve water quality and reduce harmful algal blooms. The ODNR-implemented wetland projects represent a wide range of wetland types, restoration and construction approaches, and complexity.

Wetlands can stop nutrients such as phosphorus and nitrogen, which can cause harmful algal blooms, from running off the landscape and flowing downstream through biological and geochemical processes in soils, water, and vegetation. To improve future wetland design and management, it's necessary to not only determine whether a project is effective, but also how these dynamic, newly restored ecosystems work.

Wetland Monitoring Program scientists have developed monitoring plans to evaluate representative H2Ohio wetland projects for years into the future. Data will inform management decisions, improve efforts to maximize nutrient retention, and indicate the cost-effectiveness of mitigating nutrient runoff to water bodies like Lake Erie.

H2OHIO WETLAND PROJECTS



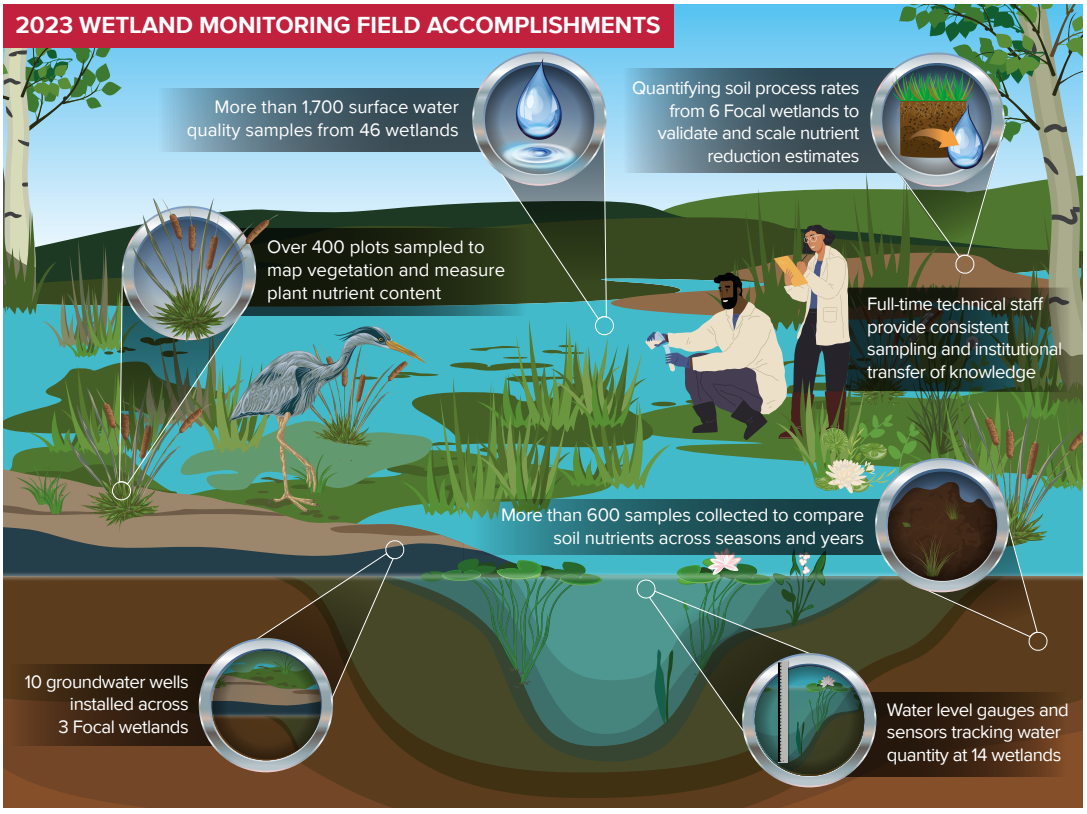
170+

TOTAL PROJECTS IN OHIO

GOAL OF THE PROGRAM

The ultimate goal of the H2Ohio Wetland Monitoring Program is to assess nutrient removal of wetland restoration projects to improve future restoration and management.

2023 WETLAND MONITORING FIELD ACCOMPLISHMENTS



Program Collaborators

Bowling Green State University

Heidelberg University National Center for Water Quality Research

Kent State University

Lake Erie and Aquatic Research Network

Ohio Department of Natural Resources

Ohio Sea Grant and Stone Laboratory

Old Woman Creek National Estuarine Research Reserve

The Ohio State University College of Food, Agricultural, and Environmental Sciences

The University of Toledo

Wright State University

CASE STUDY

Burntwood-Langenkamp Wetland Conservation Area

The Burntwood-Langenkamp Wetland Conservation Area is one of the recent efforts to restore habitat in the Grand Lake St. Marys watershed. Located at the confluence of Burntwood and Coldwater Creeks in Mercer County, the former corn/soybean field is now a restored wetland consisting of 45 wetland acres, 35 prairie acres, and 10 acres of forest.

Water enters the wetland from Burntwood Creek via a pump or via an inlet overflow, then flows through a series of settling ponds and vegetated flats, trapping and filtering out phosphorus and nitrogen before they can run into the lake. Since its construction, the new wetland has been able to contribute to the nutrient reduction goals in the watershed, with 2023 data suggesting a 70% reduction of nitrogen and a 15% reduction of phosphorus in the surface water between the wetland inflow and outflow. Wetland function will likely change as the wetland evolves, and long-term monitoring is needed to accurately evaluate success.

A view of the Burntwood-Langenkamp Wetland looking toward the outflow. Initial conversations about restoration began with the landowners in 2019. The water and soil sampling efforts at Burntwood-Langenkamp have been led by Wright State University.

Burntwood-Langenkamp Wetland Collaborators

- Access Engineering Solutions
- Clean Ohio Program
- Grand Lake St. Marys Lake Restoration Commission
- Grand Lake St. Marys Community
- Lake Improvement Association
- Langenkamp Family
- MAD Scientist Associates
- Mercer County Community and Economic Development Office
- VTF Excavation

The wetland area is in the Grand Lake St. Marys watershed. At 13,500 acres, the lake is Ohio's largest inland lake.

WATER FLOW AND SAMPLING SITES

As water flows into and out of the wetland, the research team continuously measures the water depth to calculate discharge, and some days the wetland captures 100% of Burntwood Creek's water flow. Preliminary estimates suggest the wetland holds the water for 3-5 days before flowing out to Coldwater Creek, processing more than 63 million gallons in just the first 6 months of 2023.

The wetland area is only 0.75% of the watershed area yet in its first year intercepted

4-5%

of the water flow from Burntwood Creek

Blue circles indicate water sampling sites with the dotted line showing the primary water pathway.

Burntwood-Langenkamp Wetland Conservation Area

H2OHIO WETLAND MONITORING PROGRAM December 2023

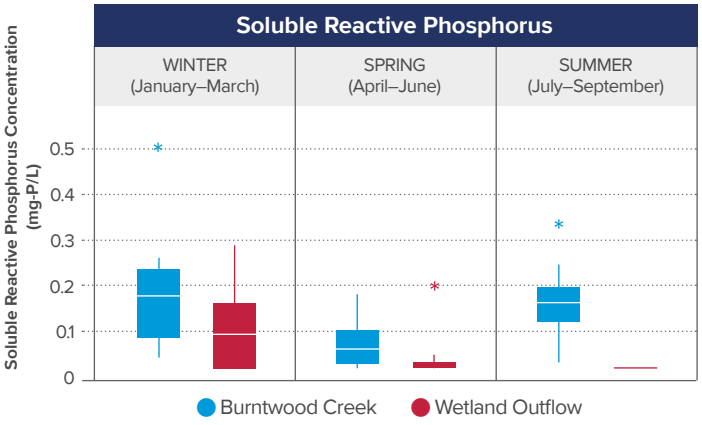
NUTRIENT CONCENTRATIONS

On average, declining concentrations and flow rates between wetland inflows and outflows indicate that the Burntwood-Langenkamp Wetland Conservation Area removed nutrients during most of our monitoring period.

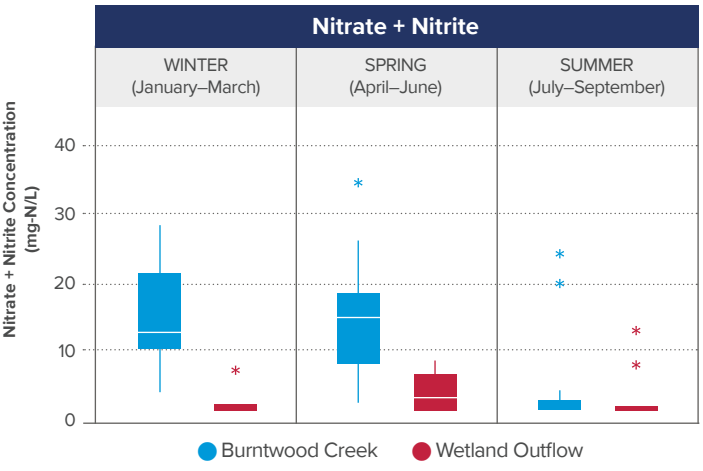
Note for the graphs below: *The middle line is the median (middle) concentration of all the samples from that season. The boxes indicate where 50% of the concentrations are. The lines indicate how spread out the data are outside that 50% of the data points. The stars represent outliers which are very far from the median and other values.*

Sampling

Winter: n = 9 samples, Spring: n = 14 samples, Summer: n = 13 samples, Samples were taken approximately weekly.



Soluble reactive phosphorus concentrations between inflow and outflow were greatly reduced in the summer with average concentration reductions near 98% and yearly average reductions around 75%.



Dissolved nitrogen concentrations between inflow and outflow were greatly reduced in the winter with average concentration reductions near 93% and yearly average reductions at 82%.

LOAD REDUCTION

Incorporating both flow volume and nutrient concentrations allows scientists to calculate load. The load removed by the wetland in this case study represents the total mass of nutrients held back from moving downstream and into Grand Lake St. Marys.

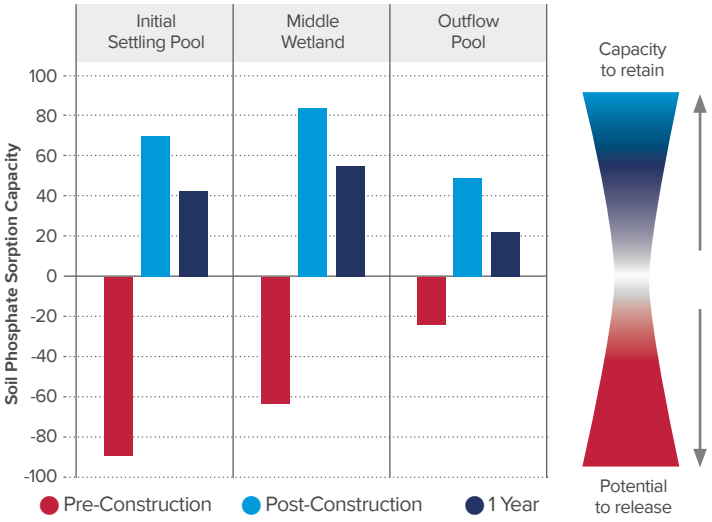
	Nutrient Load Reduced (kg)			
	Soluble Reactive Phosphorus	Total Phosphorus	Nitrate + Nitrite	Total Nitrogen
WINTER	3.47	13.06	1303	1300
SPRING	3.23	-3.09*	854	801
SUMMER	2.32	4.71	352	579
OVERALL	9.02	14.69	2509	2680

During the monitoring period (January–September 2023), total phosphorus loads in Burntwood Creek have decreased by 15 kilograms (33 pounds) and total nitrogen loads have been reduced by 2,680 kilograms (5,908 pounds). Samples were collected approximately weekly and load reduction was calculated based on surface water samples by Wright State University researchers.

**Negative values indicate net export*

SOIL PHOSPHATE SORPTION CAPACITY

The Soil Phosphate Sorption Capacity (SPSC) indicates the ability of soil to retain or release phosphorus. Calculated from a combination of soil phosphorus as well as iron and aluminum, this metric shows a range of soil values from positive (indicates a likely sink for nutrients) to negative (indicates a likely source of nutrients).



Values represent the average of generally three surface soil samples within approximately 3-square-meter area. Soil samples before the wetland's construction show that the land could be a source of phosphate. After earth moving and wetland construction, iron and aluminum in the soils had high capacity to store phosphate. One year after construction, soils still can retain phosphate, but at a lower capacity.

LEARN LAKE ERIE & AQUATIC RESEARCH NETWORK

Ohio Department of NATURAL RESOURCES

H2Ohio

For more information, visit
lakeerieandaquaticresearch.org
h2.ohio.gov/natural-resources

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