The H2Ohio Wetland Monitoring Program

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

March 2024

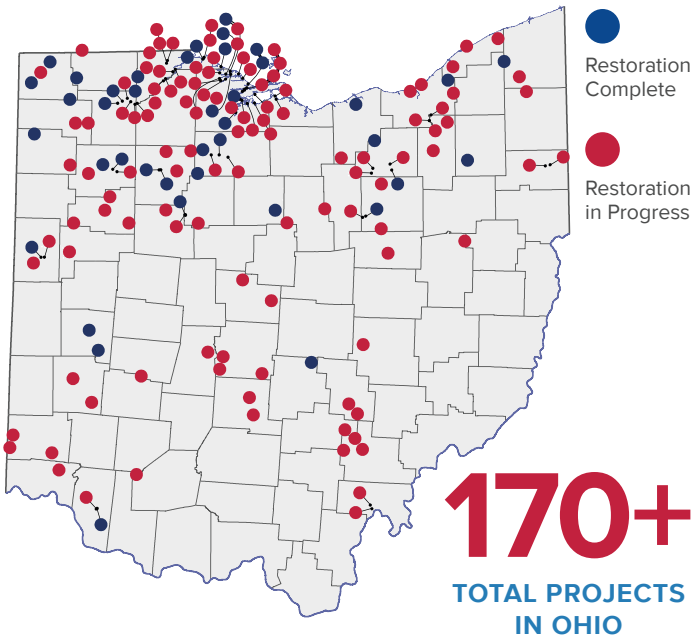
ABOUT THE PROGRAM

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



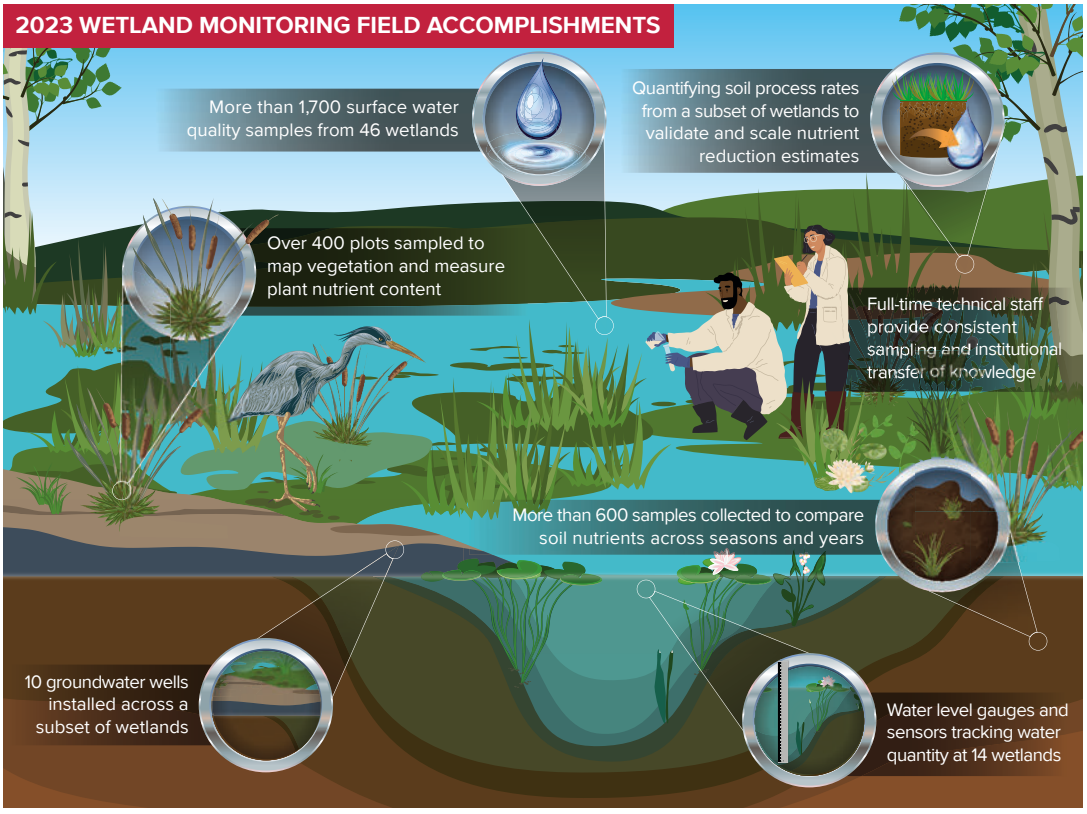
170+

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

Magee Marsh/Turtle Creek Bay Wetland Reconnection

Magee Marsh/Turtle Creek Bay Wetland Reconnection (also known as the Magee Marsh Project) is a 148-acre Lake Erie coastal wetland in Ottawa County near the mouth of Turtle Creek. The Ohio Department of Natural Resources (ODNR) Division of Wildlife owns and manages the wetland primarily for wildlife habitat. The Magee Marsh Project and other coastal wetlands are large in area (>100 acres), shallow in water depth (<2 feet), and confined by dikes or berms.

H2Ohio restorations to this pre-existing diked wetland include improved water control structures between the Magee Marsh wetland pool ("wetland") and Turtle Creek ("creek"), which are used by managers to maintain desired water levels for habitat and allow the wetland to be filled from the creek and retain nutrients that would otherwise flow directly into Lake Erie. In 2023, water control structures were set to prevent inflow from the creek to the wetland due to a construction project, and consequently, no nutrients from the creek's watershed were retained in the wetland that year. Water level, nutrient concentration, and plant biomass data collected by the H2Ohio Wetland Monitoring Program were used to estimate potential nutrient reduction by this wetland should it be connected to the creek in coming years.

Magee Marsh Project Collaborators

ODNR Division of Wildlife

Erie Soil and Water Conservation District

A view of the Magee Marsh Project. Water and soil sampling are led by a crew from The University of Toledo. Vegetation sampling is led by a crew from Bowling Green State University.
Photo Credit: Helen Michaels

The Magee Marsh/ Turtle Creek Bay Wetland Reconnection is a 148-acre Lake Erie coastal wetland in Ottawa County near the mouth of Turtle Creek.

MONITORING APPROACH

At the Magee Marsh Project, researchers monitor water levels and nutrient concentrations of the wetland and creek, and wetland vegetation cover. Surface water flow of water into or out of the wetland based on water control actions are reported by wetland managers. Precipitation and surface water level are measured continuously using an on-site weather station and sensors.

If receiving water from Turtle Creek, Magee Marsh Project could retain 85 pounds of total phosphorus.*

**There are multiple potential water level management scenarios. Researchers calculated the effect of filling the wetland with high-nutrient Turtle Creek water and allowing the water to stay in the wetland for nutrient processing, and then releasing the same volume of water back into the Creek. If the wetland can remove all the nutrients from the water, researchers estimate that 85 pounds of total phosphorus can be retained from one "filling and discharge" cycle.*

Aerial view of the Magee Marsh Project showing sampling sites, water control structures, and the Turtle Creek flow path to Lake Erie.

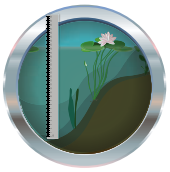
Magee Marsh Wetland Reconnection

H2OHIO WETLAND MONITORING PROGRAM March 2024

Volume (L) x Concentration (mg/L) = Load (mg)

To calculate nutrient load, researchers measure water QUANTITY (volume) and QUALITY (nutrient concentration).

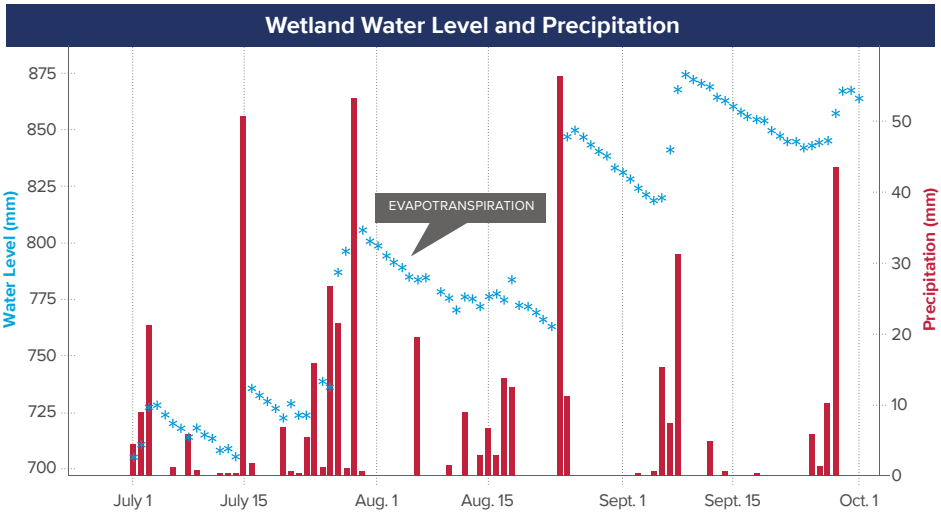
To calculate the potential nutrient removal, researchers estimated the load that would have been if the Magee Marsh wetland was filled to its maximum volume (~2 million liters or ~50,000 gallons) with creek water when phosphorus concentrations in Turtle Creek were highest.

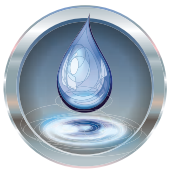


WATER LEVEL

From July to October in 2023, water levels in Magee Marsh were influenced primarily by inputs from precipitation increasing water levels and losses through evapotranspiration decreasing water levels. The H2Ohio Wetland Monitoring Program researchers use water level measurements to monitor wetland water volume for calculating nutrient loads. In future years, water levels may also be driven by Turtle Creek when water level control structures allow for water flow between the creek and wetland.

Daily average water level (blue stars) and daily accumulated precipitation (red bars) measured by continuously logging sensors deployed in Magee Marsh in 2023.





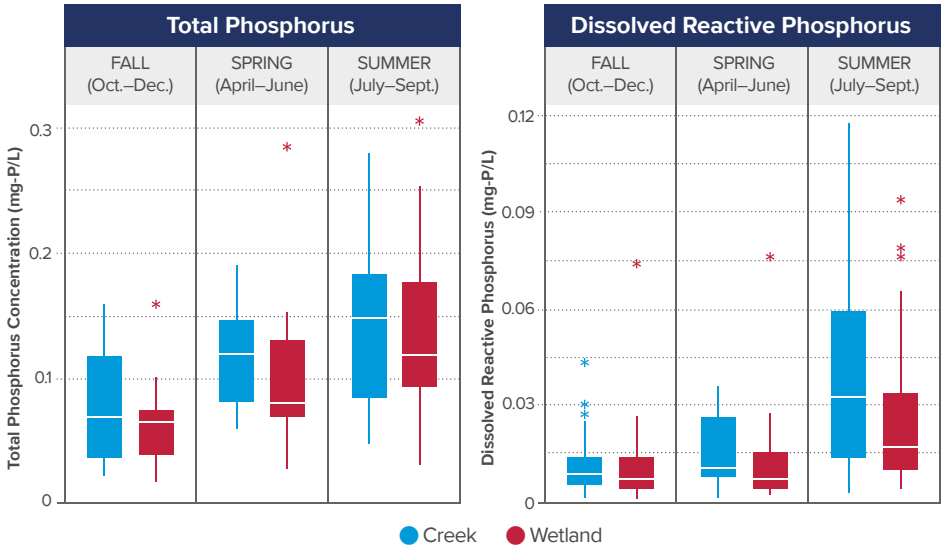
PHOSPHORUS CONCENTRATIONS

In 2023, nutrient concentrations were similar in the wetland and creek. Seasonal variability highlights the importance of year-long monitoring.

Note for the graphs: *The middle line is the median (middle) concentration of all the samples from that season. The boxes include 50% of the data points and the lines indicate the spread of most of the remaining 50% of data points. The stars represent outlier data which are very far from the median and other values.*

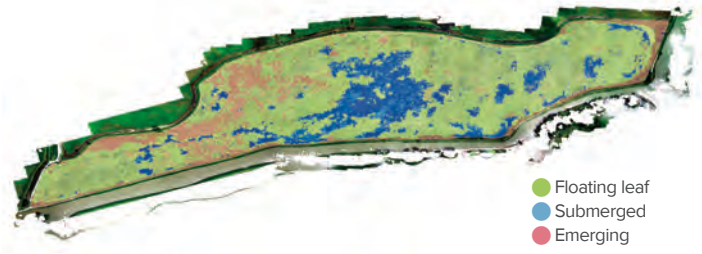
Sampling

Researchers sampled across three locations in the creek and five locations in the wetland. In total, the creek was sampled six times in Fall 2022; four times in Spring 2023; and 11 times in Summer 2023, while the wetland samples were pulled five, three, and nine times during those same seasons.



VEGETATION

Distinct vegetation zones in Magee Marsh Project have different nutrient uptake capacities, with a combined storage of up to 10 tons of phosphorus in plant biomass throughout the system. Much of this biomass stock existed before the wetland reconnection. Continued monitoring of how the vegetation stock of phosphorus shrinks or expands each year will help determine the continued impact of vegetation on nutrient retention.



Researchers use drone imagery to classify zones with distinct vegetation types in the Magee Marsh Project.

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

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