



# THE LANTERN

## ARTIFICIAL FLOATING ISLANDS WILL HELP SAFETY OF WATER FOR OHIOANS

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Research conducted at the Milliron Research Wetlands at Ohio State Mansfield is testing the effectiveness of artificial floating islands, or AFIs, at removing nutrients from the water. Credit: Courtesy of Zhaozhe Chen

Floating objects covered with plants sit atop a quiet, scenic wetland at Ohio State's Mansfield campus, but they're not just for decoration — these structures could promise safer water for Ohioans and the survival of Ohio's aquatic life in the future.

Zhaozhe Chen, a graduate student in earth sciences who completed the research for his master's thesis, said he constructed and tested artificial floating islands for their ability to remove excess nutrients from wetlands such as marshes and swamps. Nutrient pollution is one of the most pervasive and costly environmental problems in the U.S., according to the Environmental Protection Agency website.

Ozeas Costa Jr., an associate professor of earth sciences and Chen's thesis adviser, said nutrient pollution causes the overgrowth of algae. The overgrowths, called algae blooms, release toxins that can cause health issues, lower water quality, harm food resources and significantly pollute water. The blooms also cause a decrease in oxygen in the water that leads to the illness and death of many fish and aquatic life.

Initially planned to be conducted at Ohio State's main campus in Mirror Lake, the research was approved to take place at the Milliron Research Wetlands after COVID-19 limited Columbus campus research activity, Costa said.

The experiment consists of three cells that each contain six individual floating islands and are placed in the wetland, Chen said. The floating islands are made with PVC pipes to provide buoyancy and have plant shoots growing above the water and plant roots underwater.

Along with the natural experiment, Chen said they are running an additional control experiment with more artificial floating islands in controlled settings to test exactly how much and what types of nutrients the islands remove from the water.

"For Lake Erie or Maumee Bay, where the nutrient pollution is very, very extensive in those regions, apparently, the plants themselves are not enough," Chen said. "So, [artificial floating islands] can provide extra help to that process."

Chen said the islands remove nutrients from the water using the plants atop them: The plants absorb nutrients for their own growth while the underwater root systems trap suspended solids to remove nutrients. Bacteria can also form on the plants and floating structures that remove nutrients through chemical processes.

Costa said the use of artificial floating islands and plants as a natural way to eliminate waste water began about 40 years ago in North America and is currently a popular practice in Asia.

"Plants, naturally, they filter out metals, nutrients, pathogens and other types of contaminants that are in water," Costa said. "That's why wetlands are so good at cleaning up wastewater."

Chen said if the research proves successful at removing excess nutrients, it could be upscaled and serve as a cheap solution to clean nutrient-polluted water bodies such as lakes and rivers.

"We do not have to invest billions of dollars to build new wastewater treatment facilities. It is a natural way of solving the problem because it uses the things that plants already do," Costa said. "They are low cost, environmentally friendly and highly effective ways of dealing with nutrient pollution."

Through replicating experiments in Asia, Chen said he adapted the research to fit the conditions and species found in Ohio's wetlands by using aquatic plant species native to Ohio and accounting for the region's climate. Costa said testing began in April and the artificial floating islands were installed in May. From there, they collected samples until they removed the islands near the end of October.

The research had to be conducted from April to September, Costa said, because when temperatures are too low, the plants start decaying. "When that happens, not only do they stop doing what we want them to do, but they also start putting nutrients back in the water," Costa said.

Chen said he is currently analyzing data from the experiment's weekly samples to discern the effectiveness of the floating islands at nutrient removal and the contribution of each type of removal process at extracting nutrients from the water. Until that data is analyzed, results are tentative, but initial observations look promising.

Chen said the research will continue following his master's thesis in the spring. The research was funded by grants from the Ohio State Sustainability Institute and the School of Earth Sciences' Friends of Orton Hall.