Freshwater Acidification Research at Thunder Bay

NOAA scientist aboard R.V. 3011 collects water samples from the GLERL metocean data buoy, Lake Huron Station 45162. Photo: TBNMS.

Exciting Science at TBNMS!

Working in partnership with NOAA's Ocean Acidification Program (OAP) and the Great Lakes Environmental Research Lab (GLERL), Thunder Bay National Marine Sanctuary (TBNMS) has started a long-term freshwater acidification monitoring project.

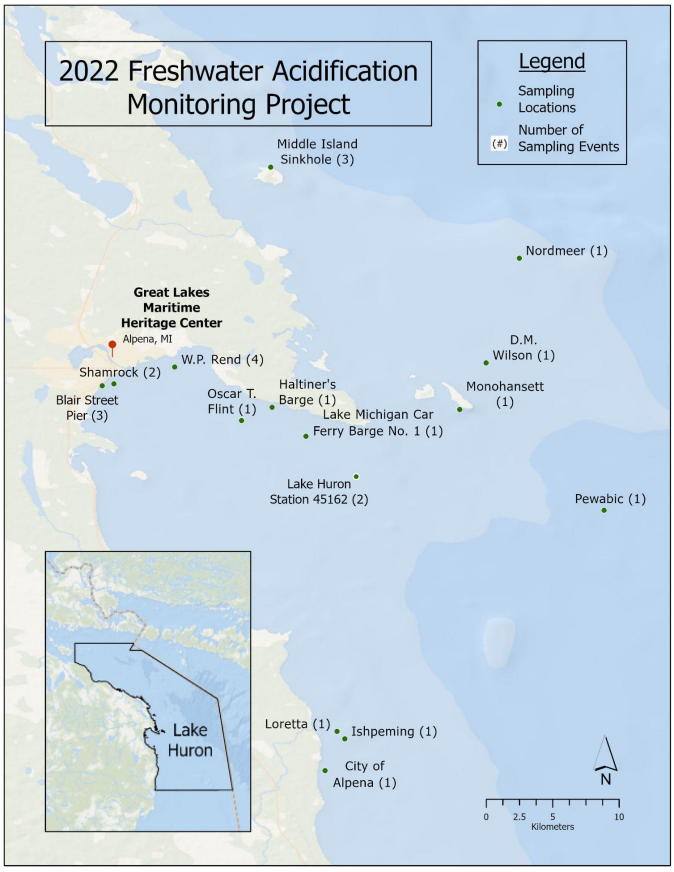
This summer, NOAA released its new 10-year acidification research roadmap to help the nation's scientists, resource managers, and coastal communities address acidification of the open oceans, coasts, and Great Lakes. Much like the ocean, the Great Lakes are expected to experience significant increases in acidification.

This important research initiative will result in the first baseline study specific to freshwater acidification in Lake Huron. It will improve our understanding of lake acidification and its potential impacts to natural and maritime heritage resources within the sanctuary and could be a model for management-focused monitoring for acidification throughout the Great Lakes.

What is freshwater acidification?

Ocean, coastal, and Great lakes acidification results from changes in the water chemistry caused by rising water temperatures. Carbon dioxide (CO_2) is released into the atmosphere through human activity such as the burning of fossil fuels and is absorbed by lake and ocean waters, causing a decline in potential hydrogen (pH) levels. This leads to the waters becoming more acidic.

Lake acidification differs from ocean acidification as the chemistry of lake water is largely determined by the chemical conditions of the watershed that supplies the lake with water. Lake Huron is projected to increase in acidity by as much as 40% by 2100.



Map showing locations sampled during 2022. Credit: TBNMS.

Why should we care about freshwater acidification?

Rising acidification levels have the potential to severely impact the Great Lakes environment. Changes in water chemistry can negatively impact some fish feeding behaviors and reproductive abilities, ultimately reducing fish populations. Increasing acidity in the water can decrease the availability of calcium carbonate, making it difficult for some shellfish organisms, like mussels and clams, to form and maintain their shells and skeletons.

Acidification can also influence the overgrowth of harmful algal blooms on the water's surface which can disturb lower levels of the food web and animals below because there is less sunlight and oxygen reaching depth. These algal blooms can even be toxic to humans because they have the potential to contaminate drinking water.

In addition to biological impacts, increasing water acidification may accelerate the deterioration of submerged cultural resources such as shipwrecks. Metals, particularly copper, are especially vulnerable to accelerated oxidation under increasingly acidic conditions. Higher corrosion rates may weaken the structural integrity of shipwrecks, leaving the archaeological sites more vulnerable to damage from natural phenomena such as waves and currents.

How is acidification research conducted?

During this two-year project, TBNMS researchers are conducting targeted water sampling from a number of predetermined locations within the sanctuary. After collection, the samples and associated water condition data are sent to GLERL in Ann Arbor, Michigan to undergo acidification analysis including measurements for pH, total alkalinity, total carbon content, and dissolved oxygen content. These important water chemistry indicators will give us insight into how freshwater acidification is impacting the Great Lakes.

Community Science!

TBNMS volunteers are adding to the research effort by collecting additional water samples, and learning and sharing about the importance of acidification monitoring. Local students and teachers are also contributing by collecting water samples during visits to the sanctuary's visitor center and cruises in sanctuary waters. The samples will be used in the analysis of Lake Huron's acidification study.

By actively working with students, teachers, and community volunteers, the sanctuary hopes to enhance understanding of the causes and impacts of climate change.

Sanctuary staff demonstrate a freshwater acidification research sample collection protocol to l teachers at the Blair Street Pier in Alpena, MI. Photo: TBNMS.

Freshwater acidification public presentation at the Great Lakes Maritime Heritage Center. Photo: TBNMS.

School students learn how to calibrate a water conductivity sensor to collect water samples while on a classroom cruise in TBNMS Photo: TBNMS.