Mapping the Great Lakes

The Great Lakes basin is the largest freshwater ecosystem in the world, and home to approximately 34 million people. It supplies drinking water to 40 million people and boasts a $6 trillion economy consisting of diverse industries including shipping, angling, and recreation. The basin is an essential asset for federal infrastructure and national security. Despite the far-reaching social, environmental, and economic significance of the Great Lakes, we lack a thorough understanding of the underwater environment.

The Great Lakes: Unexplored and undervalued

Over 85% of the Great Lakes remain unexplored in detail. Until now, there has never been a concerted effort to fully explore these magnificent bodies of water from coast to coast and surface to lakebed. Current observations resemble a patch-work quilt, with only small areas surveyed to provide insights into their depths. There are thousands of discoveries waiting, and an entire economy to be developed around this effort.

Fully exploring the Great Lakes promises to deepen our understanding of fragile ecosystems and coastline changes impacting homes and businesses, uncover underwater discoveries like shipwrecks and ancient civilizations, and protect critical infrastructure. This understanding is essential to develop and sustain a regional blue economy and support this multi-year effort.

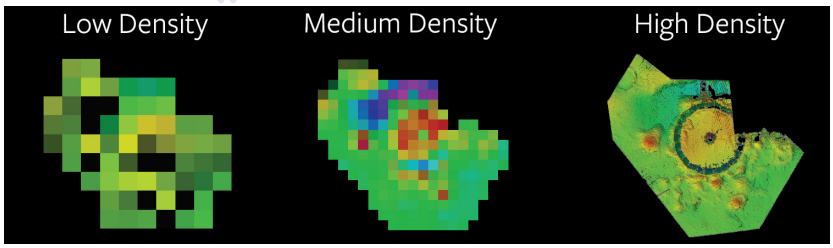
The Great Lakes hold 21% of the world's freshwater yet have never been fully explored.

Mapping the Great Lakes: Strategies for Economic and Environmental Sustainability

The economic impact of the Great Lakes is significant. The lakes sustain the commercial fishery, drinking water, and recreation, as well as transportation, shipping, and heavy industry, supporting jobs and economic growth. The Great Lakes have a fragile ecology that is threatened by invasive species, a changing climate and human impacts. This baseline mapping is crucial to ensure sustainable management and conservation of this vital freshwater resource.

Modern, high-density data provide an extremely detailed map. This is critical for discoveries of shipwrecks, resource management and research, especially under mounting climate change impacts and a growing blue economy.

There is currently no strategic plan or funding to fully explore the lakefloor of the Great Lakes. Revealing the shape and characterization of the lakefloor will yield a diverse array of economic and scientific benefits. Job creation is integral to supporting and maintaining Great Lakes mapping. This exploration will also increase understanding of the lakes' response to a changing climate, enable discoveries, both human and natural, and improve models of coastline erosion and insights into lakefloor biology and habitat.



Only a small percentage of the Great Lakes have been surveyed in high density data. (ex. water intake crib)

Underwater Exploration Technologies

Emerging technologies in this field continue to improve our ability to explore the Great Lakes in high density. These can be combined to optimize efficiency and improve the quality of the data.

Measuring and modeling the depths of the lakefloor is called **bathymetry**, and is considered a foundational dataset for a wide range of decision making, modeling and discovering artifacts and features.

The most common approach to this type of mapping is using **Sound Navigation and Ranging (SONAR)** instruments mounted on surface vessels, both crewed and uncrewed, to collect depth data. These, plus underwater robots can provide detailed 3D models of underwater features, including canyons, shipwrecks, ancient civilizations, pipelines & cables, and benthic habitat.

Remote sensing using airborne **Light Detection and Ranging, or LiDAR**, uses laser light technology to capture shallow depths along the coastline. The US Army Corps of Engineers has been successfully surveying US coastlines, including the Great Lakes, using LiDAR, for decades.

Leveraging the community, through vessels of opportunity with low density and low cost 'fish-finders' can help augment data collection efforts. However, this concept of **crowdsourced bathymetry** is not sufficient for comprehensive, high resolution mapping efforts.

Image: XOCEAN

The development of cost, hazard, and time-saving uncrewed surface vessels (USVs) and autonomous underwater vehicles (AUVs) is well underway.

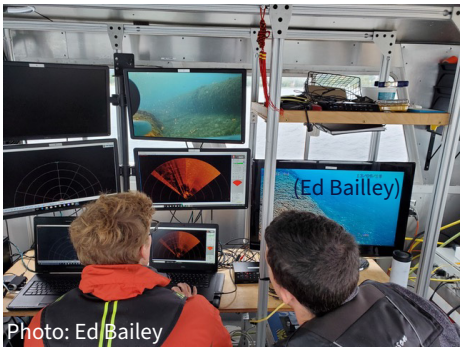


Photo: Ed Bailey

New technologies and citizen science efforts will help scientists better understand the Great Lakes' ecosystems, including changes caused by climate change.

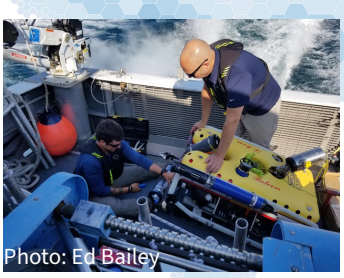


Photo: Ed Bailey

Researchers at Northwestern Michigan College prepare an ROV for underwater exploration.

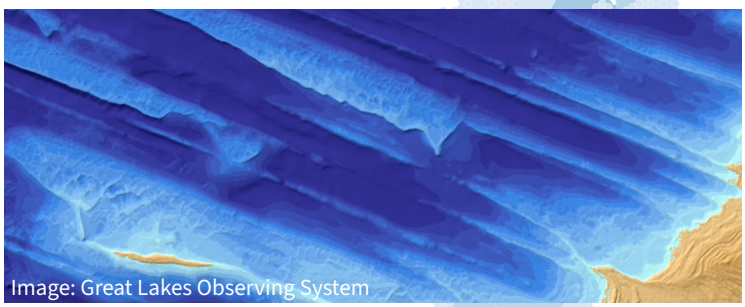


Image: Great Lakes Observing System

A high density image of the lakefloor. Understanding these features helps manage coastline erosion from wave and water levels.

Lakebed 2030

In 2019, a group of researchers, educators, technology innovators, policy makers and industry recognized this gap in national knowledge. Lakebed 2030 was formed to draw attention to this critical need, stimulate innovation for Great Lakes exploration and seek funding avenues to plan, execute and support bathymetric surveying on a scale this large. The goal of Lakebed 2030 is to collect depth data and make it publicly available via a comprehensive and high density dataset.

The Lakebed 2030 initiative has grown from a grassroots effort to a network of organizations, multi-jurisdictional agencies and individuals who recognize the importance to the economy and environment by having the remaining 85% of the Great Lakes lakefloor fully explored to modern standards and in high density.

Investing in the complete exploration of the Great Lakes not only benefits the economy and people of the region today, but lays the foundation for continued discoveries, understanding and protection of the Great Lakes far into the future.

Mapping the Great Lakes

great lakes observing system

To get involved and/or learn more:
underwater@glos.org
lakebed2030.org

glos.org
@RealGLOS
@GreatLakesObservingSystem