Lake-Effect Snow & Ice Forecasting

Winter weather brings challenges for commerce, risks for human safety, and opportunities for recreation to the Great Lakes region. Accurate forecasts of lake-effect snow and lake ice conditions are important for community preparedness and industry decision-making, but have been difficult to develop.

With our partners including the NOAA Great Lakes Environmental Research Laboratory and National Weather Service, CIGLR is developing models to improve lake-effect snow forecasts, ice predictions, and visibility forecasts. We engage with Great Lakes mariners to help us co-design the products that they need for safe commerce, transportation, and search-and-rescue efforts.

Research Impacts
Since 2008

$85M+ invested in Great Lakes Health & Safety

225+ Great Lakes Careers Supported

550+ people Trained for STEM Careers

$44M+ committed to Clean Drinking Water

University of Michigan

Cooperative Institute for Great Lakes Research
CIGLR
Great Lakes Science for Society
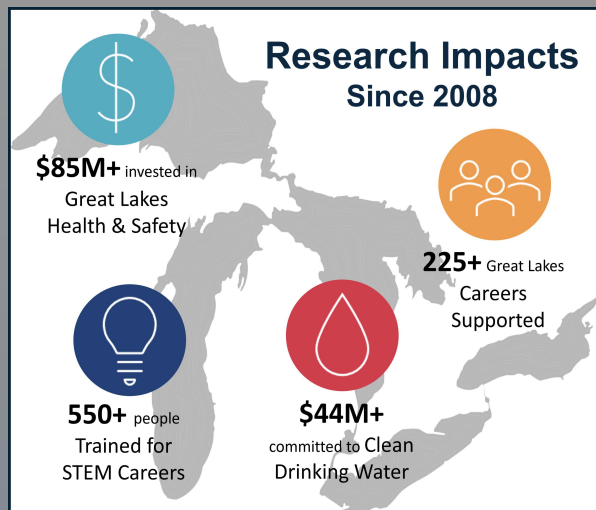
Hosted by the University of Michigan, CIGLR is a partnership between the National Oceanic and Atmospheric Administration (NOAA), universities, NGOs, and businesses.

With support from:

NOAA · NATIONAL WEATHER SERVICE

Quick Facts

- The Great Lakes store and move huge amounts of heat and water, making the weather and regional climate unique and hard to predict.
- Lake-effect snow is one of the most hazardous weather events in the region, putting safety at risk and impacting commerce.
- Certainty is often low in the location, duration, and severity of lake-effect snow forecasts.
- Ice cover in the Great Lakes is highly variable from year-to-year and is influenced by annual and longer-term trends.
- Understanding and predicting ice cover is important for navigation, weather forecasting, fisheries management, recreational safety, and search-and-rescue efforts.

A devastating lake-effect snow storm was responsible for at least 13 fatalities in Buffalo, NY, in 2014. The National Weather Service successfully predicted the storm, though forecast models were unable to fully capture its extreme intensity and precise location, highlighting the need for further advancements in forecasting technology. This unprecedented event dropped 7 feet of snow in 72 hours, costing state and local governments $46 million.

Photo by Major Mark Frank, New York Army National Guard

Current Research & Outcomes
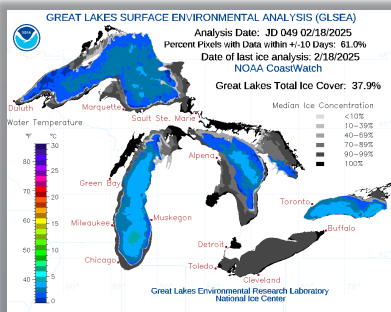
The Great Lakes Surface Environmental Analysis (GLSEA) provides key data for the Great Lakes Coastal Forecast System (GLCFS), which includes a 5-day forecast of ice concentration. With partners at the NOAA Great Lakes Environmental Research Laboratory, ice forecast products under development include ice thickness, ice movement, and vessel deicing.

- New models are enabling the first-ever ice forecast prediction tool for the NOAA Great Lakes Operational Forecast System.
- Advancements in forecast models are providing the National Weather Service with improved lake-effect snow, precipitation, visibility, and ice forecasts, leading to more accurate predictions.
- A monitoring network on Great Lakes lighthouses gathers heat and water vapor data used to improve lake-effect snow forecasts.
- NOAA CoastWatch produces daily maps of Great Lakes surface water temperature and ice cover.
- Analysis of historical ice cover is informing models of lake thermal structure, ecosystem forecasting, and trends over time.

Research & Management Needs

- Refined and extended coverage over small bays and connecting waterways in ice prediction models to support navigation.
- Research to improve predictions of snow depth on the ice and the interactions between ice and waves.
- Development of easy-to-interpret communication about ice and snow forecast uncertainties in collaboration with forecast users.
- Evaluation of social and economic impacts of Great Lakes ice decline, such as those on shipping, tourism, and winter recreation.
- Federal investment to increase ice breaking capacity in the Great Lakes in support of winter season commercial shipping.

Research teams are engaging the shipping industry and US Coast Guard to identify their ice information needs and develop decision-support products to address them. These new tools will support greater efficiency in winter commerce and promote public safety.

Photo by NOAA Great Lakes Environmental Research Laboratory

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