GLERL
Great Lakes Environmental Research Laboratory

Great Lakes ice cover varies dramatically year to year. GLERL ice research informs commercial shipping as well as ice breaking operations in the Great Lakes.

Ice Cover

Understanding the causes of fluctuations in the extent and duration of ice cover on the Great Lakes is crucial to the regional economy. The amount of ice cover, as well as how long it remains on the lakes, varies greatly from year to year and can have both positive and negative impacts on a range of water dependent industries—from hydropower, to the fishing industry, to commercial shipping.

NOAA's Great Lakes Environmental Research Laboratory (GLERL) explores the relationships between ice cover, lake temperatures, and regional climate through models based on observations of variables, such as ice cover and surface water temperature. Studying, monitoring, and predicting ice cover on the Great Lakes enhances the ability to predict lake water levels, water movement patterns, water temperature structure, lake-effect snow events, and spring plankton blooms—important for navigation, weather forecasting, fisheries management, adapting to lake level changes, and recreational safety and rescue efforts.

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NOAA GLERL improves ice forecasting capability through:

Observing current ice cover conditions

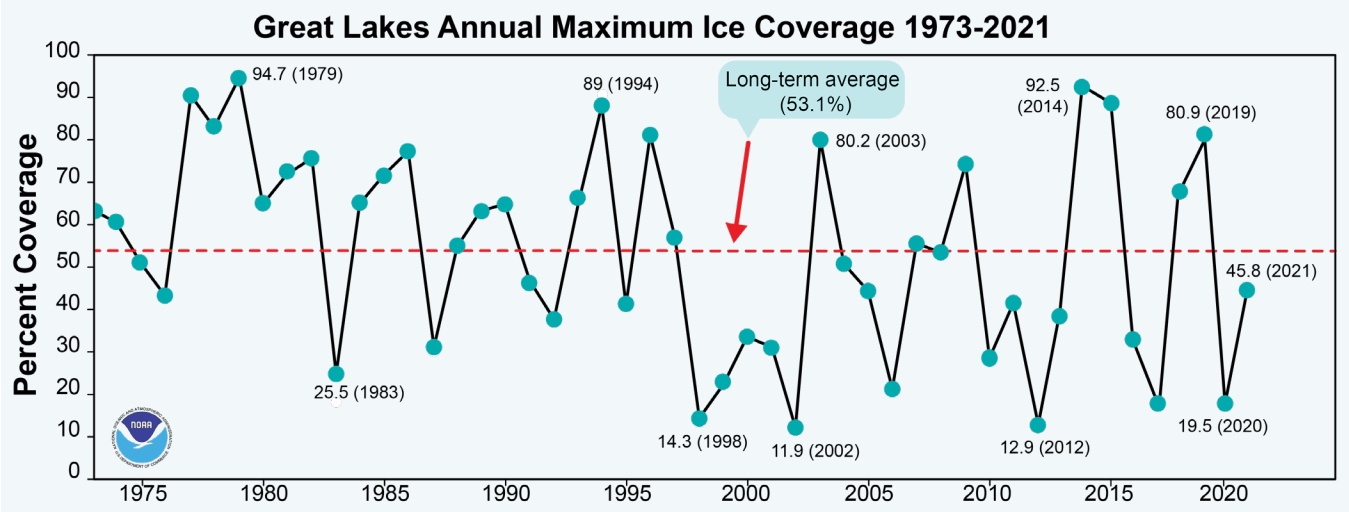
NOAA GLERL obtains and produces data aimed toward understanding the processes important to ice formation/melting, heat exchange between the lakes and atmosphere, and the water balance of the Great Lakes. Specifically, this observational data supports research and understanding of the Great Lakes water balance, and improvement of lake-effect snow forecasts. The NOAA Great Lakes Coastwatch program provides public access to global and regional satellite data products for use in understanding, managing, and protecting coastal resources. Products like the daily map of synthesized observations of the Great Lakes surface water temperature and ice cover—known as the Great Lakes Surface Environmental Analysis (GLSEA)—help to improve predictive models and support water-dependent industries such as hydropower, fishing, commercial shipping, and search and rescue operations.

Analyzing and hosting historical ice cover data

NOAA GLERL has been exploring the relationships between ice cover, lake thermal structure, and regional climate for over 30 years through development, maintenance, and analysis of historical model simulations and observations of ice cover, surface water temperature, and other variables. The NOAA Great Lakes Ice Atlas (1973-2002) provides information about ice cover variation on the Great Lakes during the last quarter of the 20th century and early years of the 21st Century. The recent Great Lakes Ice Cover Database (2003-present) webpage extends the with annual updates. For the entire period of record, data is available as gridded ASCII data, geo-referenced shapefiles and lake-wide average time series. This historical data is critical to predictive modeling efforts and establishes a foundation for understanding the influence of ice on the regional economy and environment.

Modeling and forecasting

NOAA GLERL conducts research on short-term ice forecasting as part of the Great Lakes Operational Forecast System (GLOFS)—a model used to predict Great Lakes physical conditions, such as lake circulation, temperature, and water level fluctuations. Researchers are working to upgrade GLOFS to provide the first-ever ice forecasts of extent/concentration, thickness, and velocity for the Great Lakes. These forecast model advancements further improve predictions of water temperature, water level, and water currents during winter and early spring months. NOAA GLERL research on seasonal ice forecasting has found that global-scale air masses, or teleconnection patterns, impact regional climate and variability of ice cover in the Great Lakes. GLERL produces an annual experimental projection for maximum seasonal Great Lakes ice cover using a statistical regression model based on these teleconnection patterns and seasonal air temperature data. Continuously improved models and forecasts provide vital information for a variety of stakeholders, such as emergency responders, shipping industries, and fishermen.



The data in the graph above originates from the Canadian Ice Service (1973-1988) and U.S. National Ice Center (1989 - present).

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