Water Levels of the Great Lakes

February 2012

Monthly average water levels of the North American Laurentian Great Lakes fluctuate in response to a variety of factors. This brochure provides a brief overview of current water level conditions, how those levels are measured, and the approach used by NOAA's Great Lakes Environmental Research Laboratory (GLERL) to predict monthly water levels.

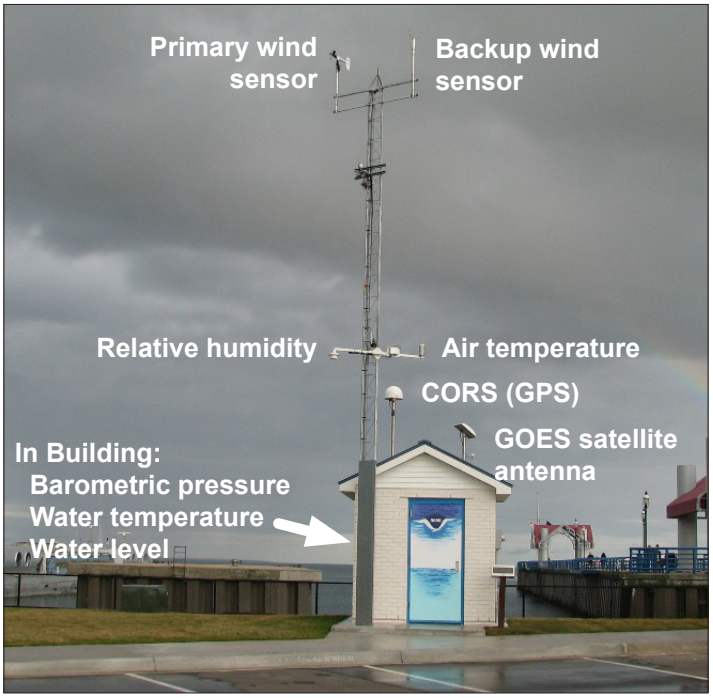
How are water levels predicted?

Forecasts of Great Lakes water levels are typically based on computer simulation models. One example is the Great Lakes Advanced Hydrologic Prediction System (AHPS), run by NOAA's Great Lakes Environmental Research Laboratory (GLERL), which combines historical meteorological data with a series of mathematical models and climate forecasts from NOAA's Climate Prediction Center (CPC) to simulate multiple variables. The most important variables are overlake precipitation, overlake evaporation, and rainfall-induced runoff. The sum of these variables (also referred to as the "net" supply of water to the basin) is routed through the lakes and their interconnecting channels using models which reflect flow patterns in those channels and the regulation rules which guide operation of water level control infrastructure.

How are water levels measured?

The Center for Operational Oceanographic Products and Services (CO-OPS), part of NOAA's National Ocean Service (NOS), operates water level and meteorological monitoring stations for the ocean and Great Lakes coasts. Historic records for some of these stations date back to 1860, providing over 150 years of continuous data. The Canadian Hydrographic Service also maintains water level monitoring stations on the Great Lakes and St. Lawrence River. This water level and meteorological information network is used by a diverse group including recreational boaters, the commercial shipping industry, hydropower companies, and government agencies.

Old Mission Point Lighthouse, Grand Traverse Bay, Lake Michigan in July 2010. Photo: NOAA.



Mackinaw City, MI water level station. Typical water, meteorological, and GPS sensor configuration. Photo: Jeff Oyler, NOS.

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GLERL Homepage
http://www.glerl.noaa.gov/

Real-time Weather Data
http://www.glerl.noaa.gov/metdata/

Great Lakes Web Cams
http://www.glerl.noaa.gov/webcams/

CoastWatch Satellite Data
http://coastwatch.glerl.noaa.gov/

Great Lakes Coastal Forecasting
http://www.glerl.noaa.gov/res/glcfs/

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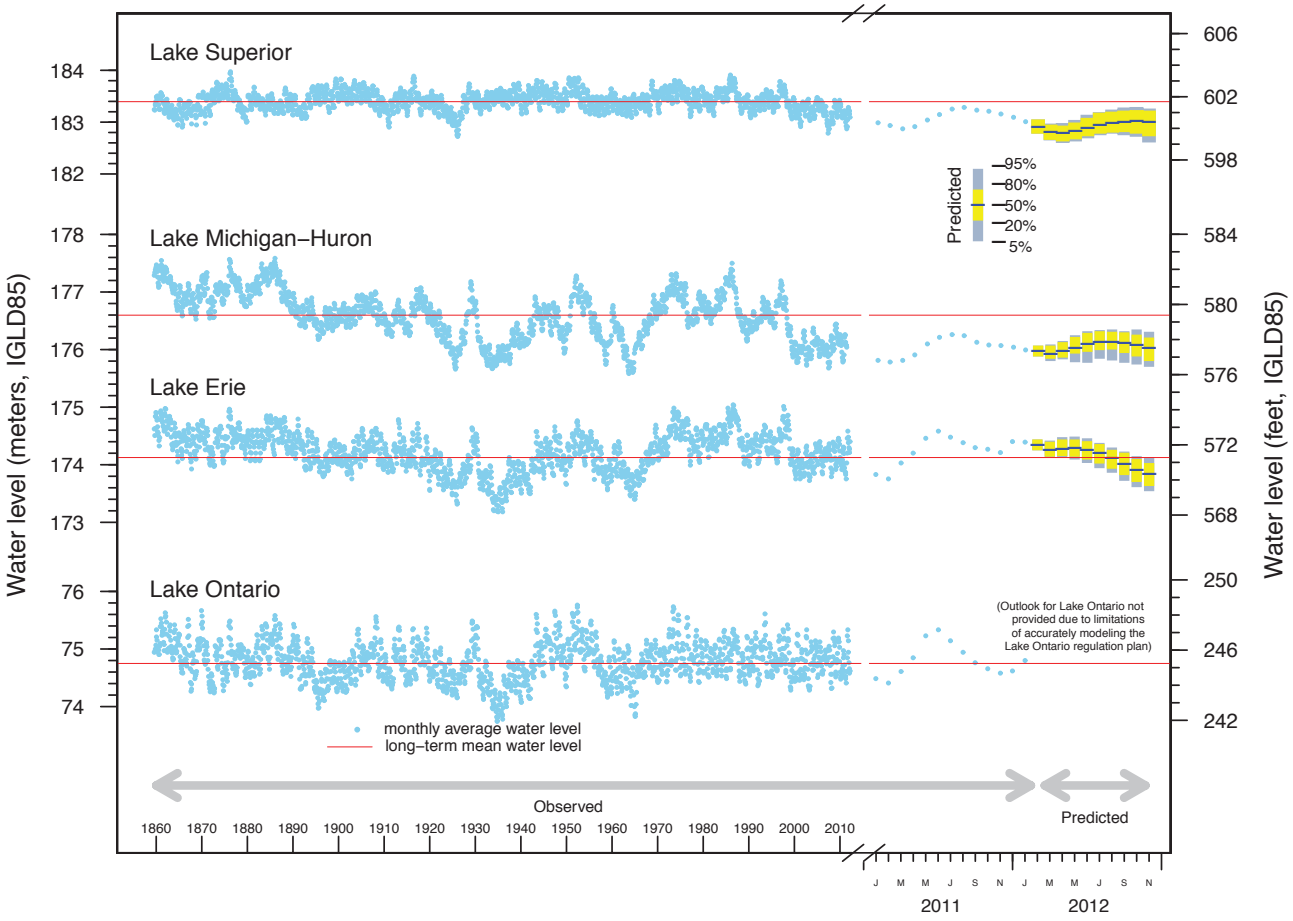
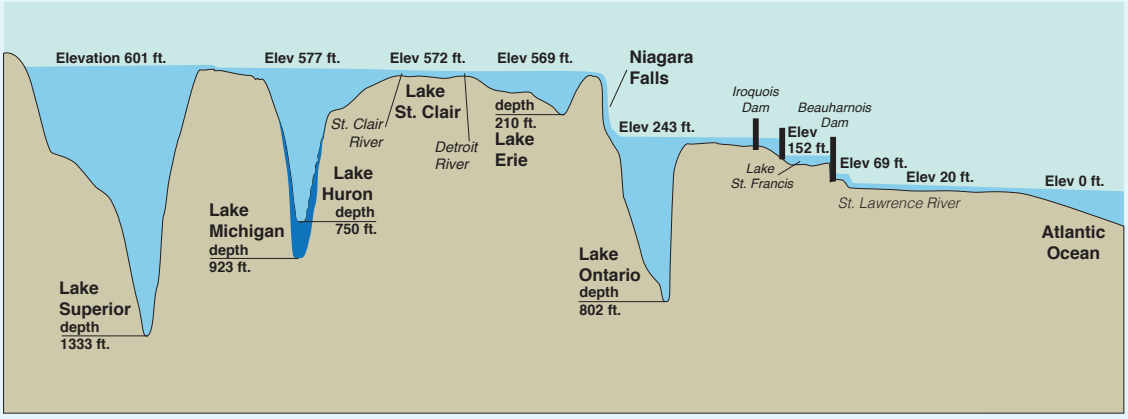
The Current Outlook for Great Lakes levels

The outlook generated by GLERL's AHPS on February 21st indicates that Lakes Superior and Michigan-Huron are expected to remain below the long-term mean. Although Lake Erie is much higher than it was a year ago at this time, AHPS predicts a steady decline over the summer back to below mean levels. The probability information shown here is based on observed weather patterns and Great Lakes water levels from 1948 to present, along with NOAA Climate Prediction Center's regional forecasts. The 5 and 95% bands, for example, are expected to contain the observed water level 90% of the time (http://www.glerl.noaa.gov/wr/ahps/curfcst/curfcst.html).



GREAT LAKES SYSTEM PROFILE

The Great Lakes, their respective watersheds and waterways, and the ocean are all connected. Within the Great Lakes system, water flows from Lake Superior via the St. Marys River into Lake Huron. Lakes Michigan and Huron are joined at the Straits of Mackinac, which allows these two lakes to act as one hydrologic system. The upper lakes meet the lower lakes at the Huron-Erie corridor, which is comprised of the St. Clair River, Lake St. Clair, and the Detroit River. Lake Erie flows over Niagara Falls and into Lake Ontario before flowing through the St. Lawrence River into the Atlantic Ocean.



What is IGLD85?

IGLD85 refers to the International Great Lakes Datum, an elevation benchmark (reference point) against which all water level gauging stations in the Great Lakes are compared. This reference point was last established in 1985. It is important because the land surface around the Great Lakes is constantly changing in elevation due to the 'bounce back' of the earth's crust following the retreat of the glaciers during the last ice age (also referred to as isostatic rebound).