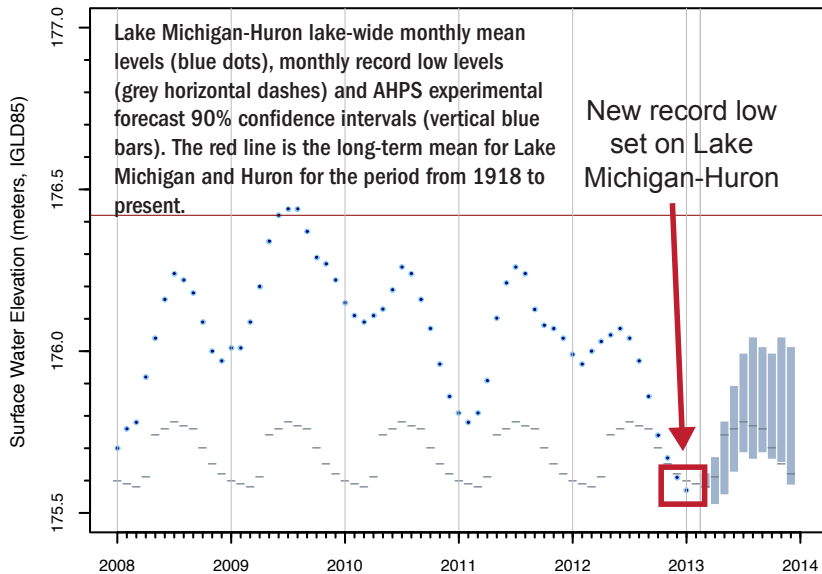




Water Levels of the Great Lakes

March 2013

The Great Lakes, their connecting waterways, and their watersheds, comprise the largest surface freshwater system on the planet. The monthly, seasonal, and annual surface water elevations of the lakes fluctuate in response to a variety of factors. This brochure provides a brief overview of historical Great Lakes water level patterns and current water levels, as well as the research NOAA conducts through its Great Lakes Environmental Research Laboratory (GLERL) on seasonal water level forecasts.



Record Low Levels for Lakes Michigan and Huron

In December 2012 and January 2013, the monthly average water level on Lake Michigan-Huron dropped below the previously recorded (1964) low for the period of record beginning in 1860. Seasonal outlooks indicate that water levels may continue to set new record lows (see figure at left adapted from NOAA-GLERL's Great Lakes Water Level Dashboard). The current record-setting low water levels on Lake Michigan and Huron are a result of many factors, including the large decrease in water levels that took place on the upper lakes in the late 1990's, and recent increases in overlake evaporation. NOAA-GLERL and its partners in NOAA's National Ocean Service are also investigating potential relationships between the rate of change on Lakes Michigan-Huron and Lake Erie.



Low water levels in Grand Traverse Bay, Lake Michigan, July 2010. Credit: NOAA.

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-GLERL, which combines historical meteorological data with a series of mathematical models and climate forecasts from NOAA's Climate Prediction Center 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 that reflect flow patterns in those channels and the regulation rules that guide operation of water level control infrastructure.

FOR MORE INFORMATION

drew.gronewold@noaa.gov craig.stow@noaa.gov

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

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

GLERL Water Levels
<http://www.glerl.noaa.gov/data/now/wlevels/levels.html>

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

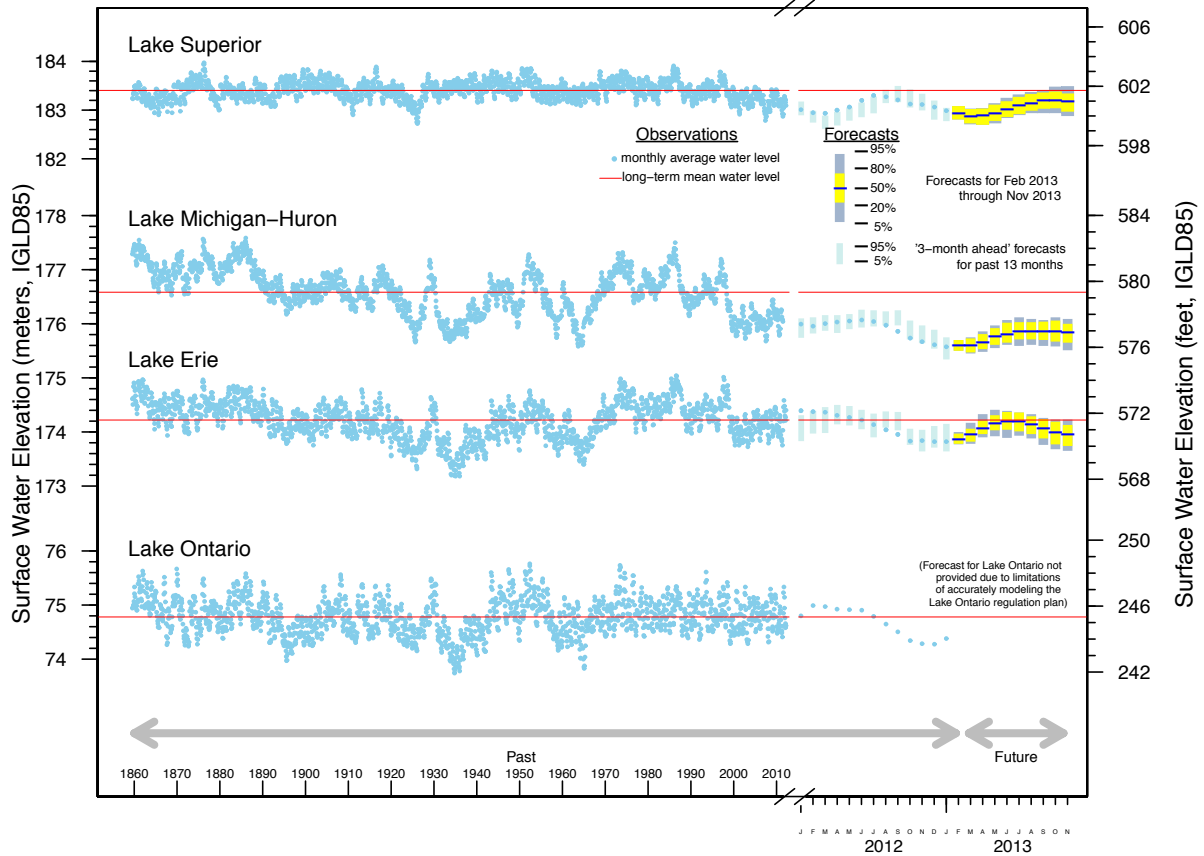
Great Lakes Coastal Forecasting
<http://www.glerl.noaa.gov/res/glcfs>



NOAA, Great Lakes Environmental Research Laboratory
4840 S. State Road, Ann Arbor, MI 48108, 734-741-2235

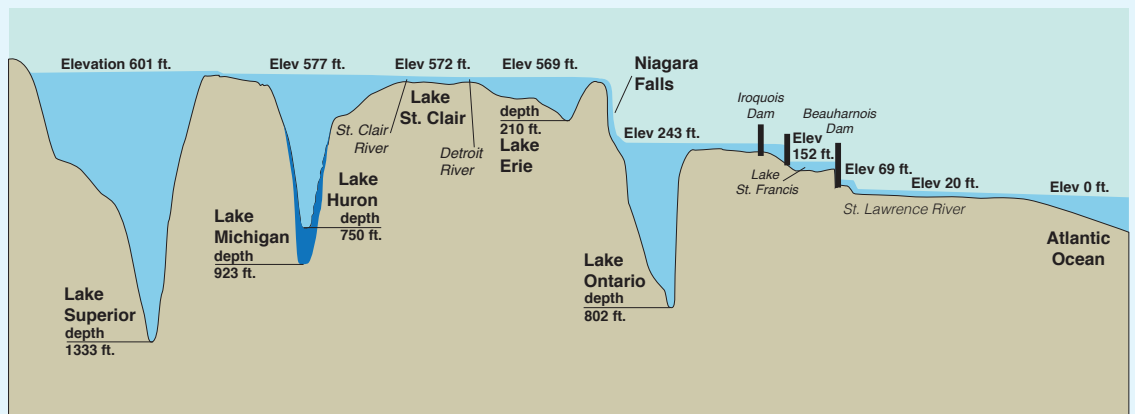
The Current Outlook for Great Lakes levels

The research-oriented outlook generated by NOAA-GLERL's AHPS on February 14, 2013 indicates that Lake Superior will likely remain below its long-term mean, and Lake Michigan and Huron may continue to set new record low levels. Lake Erie is a half-meter below its level of a year ago but is expected to reach long-term mean levels by summer. The uncertainty expressed in the forecasts 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 are expected to contain the observed water level 90% of the time. The NOAA-GLERL AHPS forecasts are used by the U.S. Army Corps of Engineers and Environment Canada as part of their operational water level forecasting systems (<http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/waterlevelforecasts/monthlybulletinofgreatlakeswaterlevels>).



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 1992. IGLD requires updating about every 30 years 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).