Water Levels of the Great Lakes

September 2014

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.

Remarkable Recovery for Lakes Michigan and Huron Water Levels

- Lake Superior was above its monthly average levels this entire spring and summer for the first time since 1998.
- 2014 saw the 2nd straight above-average seasonal rise on both Lake Superior and Lake Michigan-Huron.
- All of the Great Lakes have had above-average net basin supplies (precipitation + runoff – evaporation) for the past 18 months.
- Lake Michigan-Huron reached its highest level (578.99 ft., IGLD85, August 2014) since 1998 but was still 3 inches below the average for that month.
- All of the lakes except for Lake Ontario were above their 2013 levels this summer.

If you live or play near the shores of Lake Michigan or Lake Huron, you've noticed quite a change in your beach in the past 18 months. The high point in August 2014 (578.99 ft., IGLD85) was 16 inches higher than the 2013 peak, and nearly 3 feet above the record low water levels of January 2013.

Freighter entering the Soo Locks, June 2014. Credit: NOAA.

Why did the water levels recover so quickly?

The past year and a half has been a period of above average net basin supplies to the lakes. Net basin supply is the 'net' amount of water entering a lake's basin through a combination of precipitation over the lake, evaporation from the lake surface, and runoff entering it. Precipitation has been above average for most lake basins every month of 2014. The seasonal rise was above average for the upper lakes (Superior, Michigan, and Huron) in both 2013 and 2014. Lake Superior levels have been above their monthly means since April 2014 (first time since 1998). Although the August 2014 peak for Lake Michigan-Huron is the highest those lakes have been since 1998, it was still 3 inches below its monthly average for August. Fall is traditionally the season when evaporation from the lakes is highest, driven by a large temperature difference between the air and water. Scientists are anxious to see whether the effects of the severe winter of 2014 will impact this fall's evaporation rates. Another year of below-average autumn water level decline would contribute to even higher lake levels for 2015.

How are water levels predicted?

Forecasts of Great Lakes monthly-average water levels are typically based on computer simulation models. One example is the Great Lakes Advanced Hydrologic Prediction System (AHPS), developed 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 ("net" supply of water to the basin) is routed through the lakes and connecting channels using models that reflect flow patterns and regulation rules in order to produce a band of probability-based future water levels.

FOR MORE INFORMATION

http://www.glerl.noaa.gov/data/now/wlevels/levels.html

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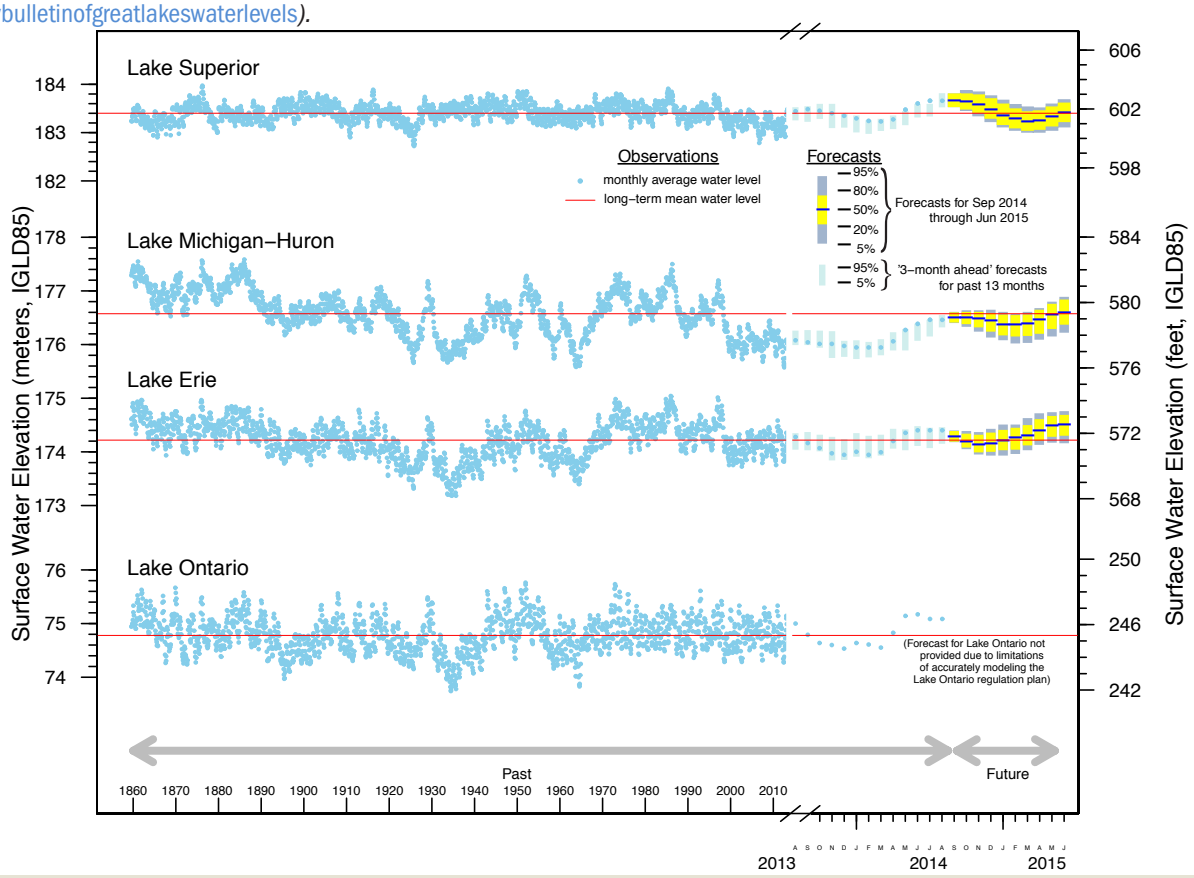
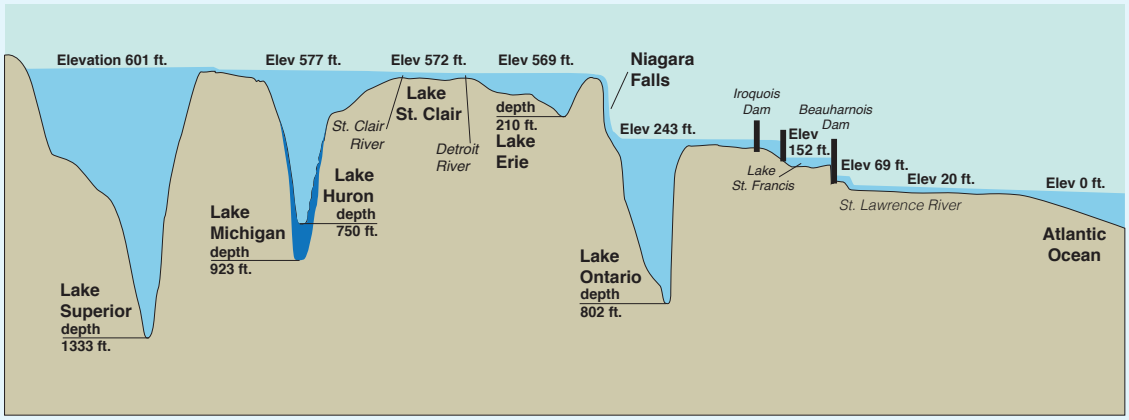
The Current Outlook for Great Lakes levels

*The research-oriented forecast generated by NOAA-GLERL's AHPS on September 13, 2014 indicates that the water levels of Lake Michigan and Huron may continue to increase in the summer of 2015 as compared with 2014; with a good chance to reach its monthly average level by June 2015. The outlook shows that Lake Superior levels may be slightly lower in summer 2015 than the peak of 2014. Lake Erie water levels will be similar to 2014 or slightly higher. The uncertainty expressed in the forecast 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).