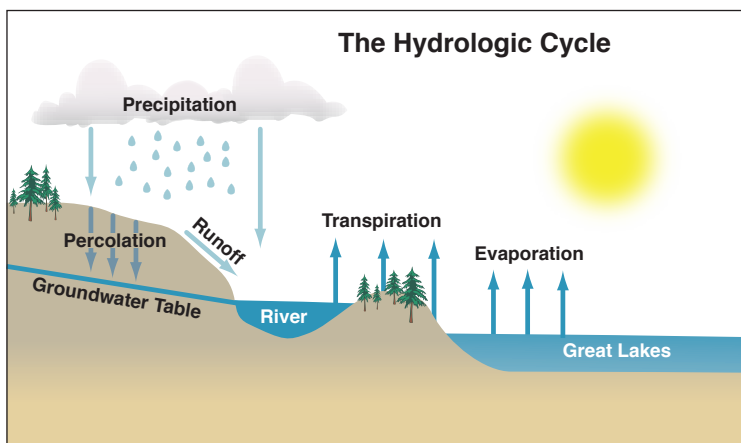


# Water Levels of the Great Lakes

2011 Update



Water levels have fluctuated throughout the history of the Great Lakes. Research has indicated that several thousand years ago, water levels became so low that the lakes were no longer interconnected as they are currently. More recently, record low levels coincided with the dust bowl years of the 1930s and a severe drought in 1964. The lakes experienced extremely high levels in 1986, and since that time, levels have generally been declining. This decline has been a concern because lower water levels are consistent with most global climate change forecasts.



## Why Do Lake Levels Fluctuate?

Great Lakes water levels respond to changes in water supplies, including precipitation, runoff from tributaries, and evaporation from the lakes' surfaces. The primary driving forces are precipitation and evaporation. Lower precipitation leads to lower runoff from the basin, and higher evaporation draws water from the lakes causing levels to decline.

## What are the Present Conditions?

Water levels in Superior, Michigan-Huron, and Erie dropped sharply from 1997-1999 and have remained at relatively low levels since that sudden decline. Following slight increases in 2008 and 2009, levels in all these lakes dropped again in 2010. Levels as of February 2011 are below those of February 2010; Superior is approximately 0.3 meters lower, Michigan-Huron approximately 0.5 meters lower, and Erie approximately 0.2 meters lower. Lake Ontario is tightly regulated and remains at levels similar to those of 2010.

The four graphs on the next page show yearly-averaged water levels; they are updated through 2010.

For more information:

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NOAA Great Lakes Environmental Research Laboratory



Low lake levels at Old Mission Point lighthouse, Grand Traverse Bay, Lake Michigan in July 2010. Photo: NOAA.

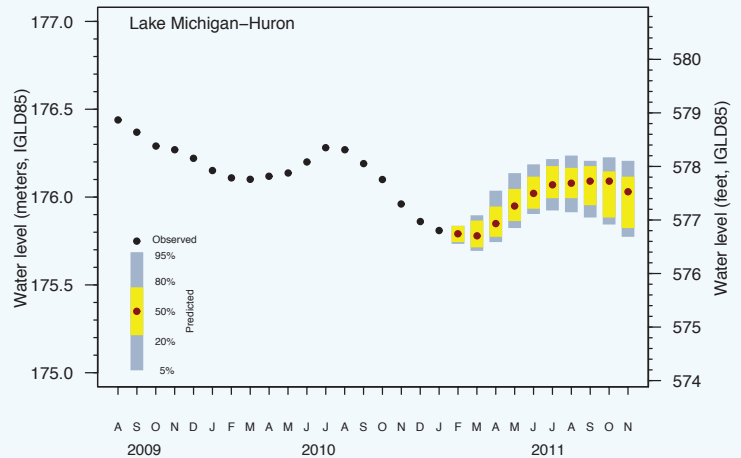
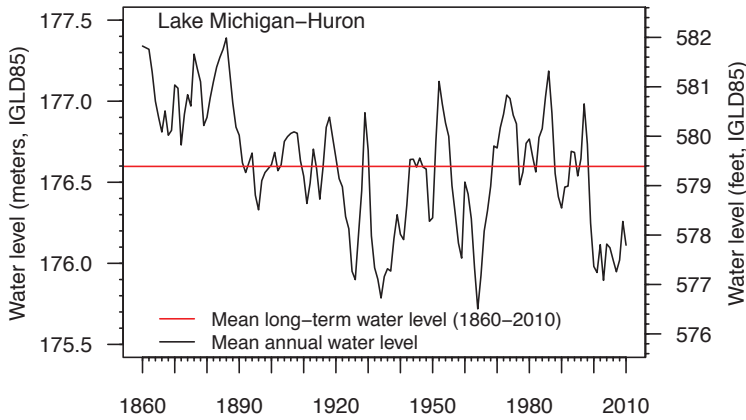
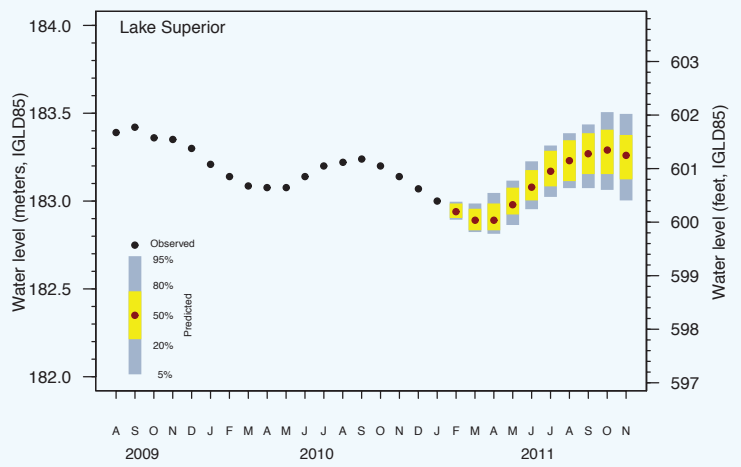
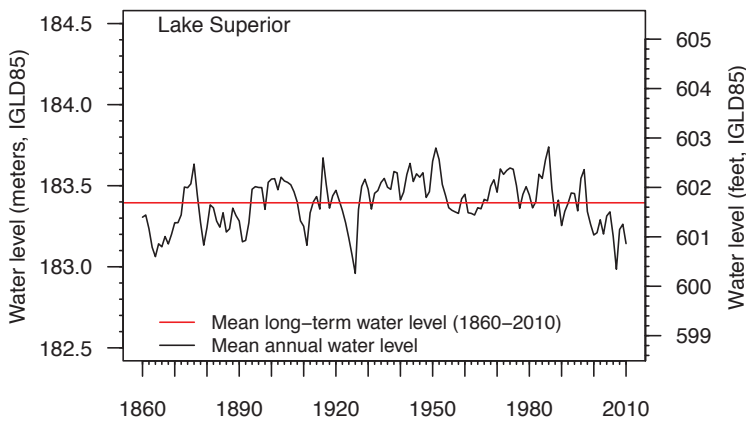
## Who is Affected by Changing Lake Levels?

Record high water levels of 1986 affected many residents and businesses located along the rivers that provide water to the lakes and along the shoreline of the lakes themselves. In 1986, the Tittabawassee River basin, which eventually empties into Lake Huron, endured an extraordinary amount of rainfall in a short period of time (up to 14 inches in 12 hours) resulting in flooding. Heavy river flooding not only causes property damage to businesses and residents, but water that runs off the land carries pesticides and nutrients with it. Water quality of the runoff water may affect the riverine and lakeshore ecosystems.

Water levels during the recent low episode (1997–2007) affected many interests, including commercial navigation, recreational boating, marinas, beaches, fishing, cottage and homeowners, and the aquatic ecosystem. For example, in the year 2000 the Lake Carriers that transport iron ore, coal, grain, and other raw cargoes were forced into “light-loading,” carrying 5-8 percent less goods, sending prices higher. Additionally, marinas spent millions to dredge boat slips, channels, and harbors along Great Lakes coasts. Nuclear and hydropower plants that use Great Lakes water for cooling and energy generation, respectively, either spent millions of dollars to relocate their cooling pipes or didn't generate enough power to meet customers demands.

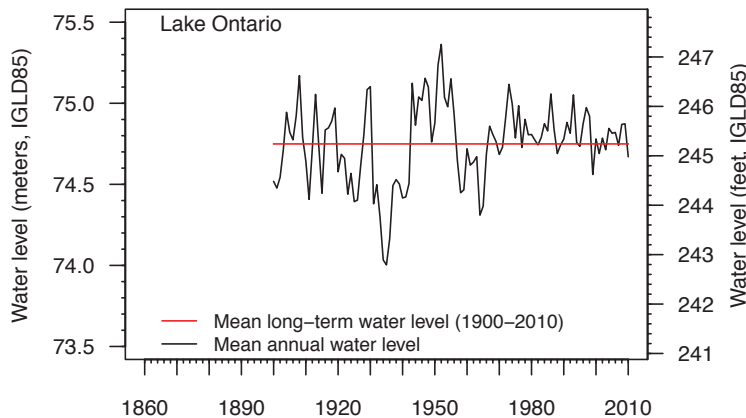
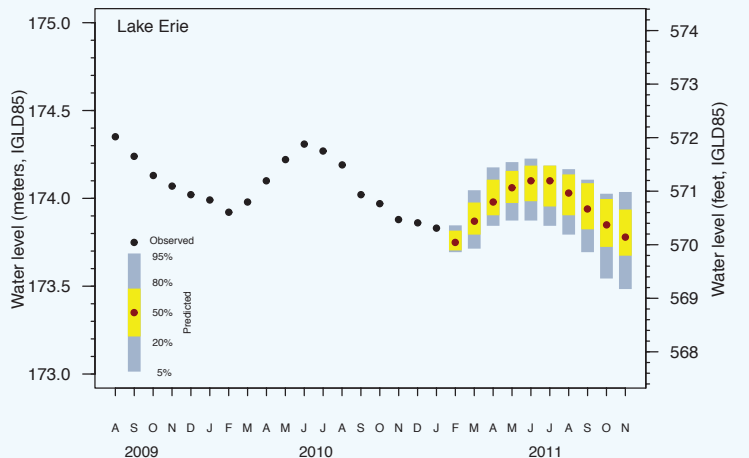
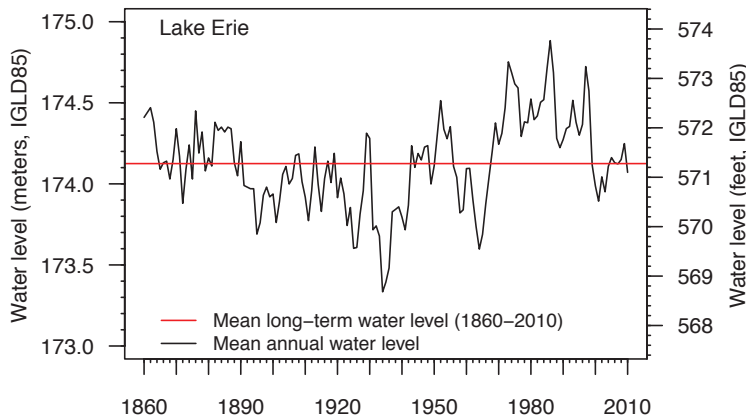


High lake levels on Lake Michigan in 1986 caused severe erosion. Photo: NOAA



**What is IGLD85?** Great Lakes water levels are measured from an elevation reference point referred to as the International Great Lakes Datum (1985). This datum is referenced to sea level as measured at Rimouski, Quebec, near the mouth of the St. Lawrence River. Every 25-30 years, the IGLD is changed to account for crustal movement—the ‘bouncing back’ of the earth’s crust from the weight of the glaciers.

## What is the Outlook for 2011?



NOAA Great Lakes Environmental Research Laboratory’s Advanced Hydrologic Prediction System (AHPS) produces probabilistic lake level forecasts 1-10 months into the future based on present conditions combined with climatic outlooks generated by NOAA and Environment Canada. These forecasts are updated regularly to reflect changing conditions and outlooks. The outlook as of February 2011 indicates that water levels in Lakes Michigan-Huron and Erie will likely be lower than those of 2010 for the next 6 months, while Superior will likely experience levels slightly lower than or similar to those of 2010 into the early summer.