

# Recent Lake Levels and Precipitation in Historical Perspective

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**This project was completed in 2004**

## Overview



Analysis of the impact of climatic episodes on lake levels will contribute to improved understanding and models of lake levels variation. Between 1997 and 2000 a major climatic episode resulted in a major decline of Great lakes water levels. This decline was notable for both the extent and the rapidity of which it occurred. During the spring of 2001 the levels of Lakes Michigan-Huron were the lowest since 1965 and the Lake Superior levels were the lowest since 1926. The start of the episode was the 1997-98 El Niño which resulted in very low snow cover in the upper parts of the Great Lakes basin. The situation was made worse by extremely warm air temperatures, which greatly reduced runoff and increased evaporation from the lake surface. The drop in levels has adversely impacted commercial navigation, recreational boating, and hydropower. The decreased levels have resulted in the best beaches in the last 35 years.

## Accomplishments

In 2004, reviewer comments and concerns were addressed in a revised manuscript, Hydro-Climatic factors of the recent record drop in Laurentian Great Lakes water levels, which was subsequently published.

The recent low water level regime was analyzed in terms of the water balance of the Great Lakes. The major water level lowering episodes occurred in the 1930s, 1980s, and 1997-2000. The monthly chronology of water level declines during these three episodes from previous maximum levels were compared. The relationship between lake levels and hydro-climatic variables was discussed in the context of the Net Basin Supply,  $NBS = P + R - E$  (precipitation + runoff - evaporation). The 1997-2000 episode was unusual compared to the record low water episode of the mid-1960s in that the primary hydro-climatic driver was high air temperatures and not extremely low precipitation. A comparison of the NBS and its components for Lake Michigan - Huron for the previous low water regimes provided a case study of how past variation in lake

levels in conjunction with NBS components affect lake levels in low water episodes. The 1997-2000 episode resulted in loss of cargo transport capacity in commercial ships, loss of hydropower generating capacity for power plants in the connecting channels of the Great Lakes, and economic losses related to the need to dredge navigation channels and the reduction of recreational boating activity. However, it was beneficial in that Great Lakes beaches were increased and the threat of shore erosion to beachfront property was reduced. Study results were presented at a scientific meeting and a manuscript was prepared for journal publication.

## **2002 Accomplishments**

Data sets needed for the low lake level analysis have been gathered and analysis of these data has started. Analysis of the low water levels has been completed. Preliminary results were presented at a scientific meeting and published in the proceedings of that meeting, (Quinn et al 2002).

## **Products**

Water Levels of the Great Lakes Brochure

Great Lakes Daily Water Level Plots

Assel, R. A., Quinn, F. H. and Sellinger C. E. 2004. Hydro-Climatic factors in the Recent Record Drop in Laurentian Great Lakes Water Levels. *Bull. Amer. Metero. Soc.* 85(8): 1143-1151.

Quinn, F., Assel, R., and Sellinger, C. 2002. Hydro-climatic factors and socioeconomic impacts of the recent record drop in Laurentian Great Lakes water levels. *Preprints of the 13th Symposium on Global Change and Climatic Variations, 82nd Annual Meeting of the American Meteorological Society.*