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US Army Corps of Engineers
Detroit District

Great Lakes Update

Current Water Level Conditions on the Great Lakes

With summer in full swing, the Great Lakes become a hotbed for a multitude of recreational activities. This article will provide a synopsis of current Great Lakes water levels as well as a look forward to the next 6 months.

Lake Superior

Extremely dry conditions in the Lake Superior basin have led to an extended period of below average water levels. Since June 1998 Lake Superior has been below its long-term average and is currently in the longest period of below average water levels in it history. From August 2006 (summer peak) through March 2007 (winter low), Lake Superior's water level fell twenty inches. An average decline during this time of year is twelve inches.

To date, no new record low water level has been set, but with the July forecast, the probability a new record low water level will be reached within the next six months has increased.

Low water levels on Lake Superior are attributable to many factors. An important note is that natural factors like changing weather patterns have a much larger impact on water levels than anthropogenic factors like regulation strategies.

Several months of below average precipitation, lead to the development of drought conditions across the western basin (Figures 1 & 2). Total precipitation in 2006 was 6 inches below average.

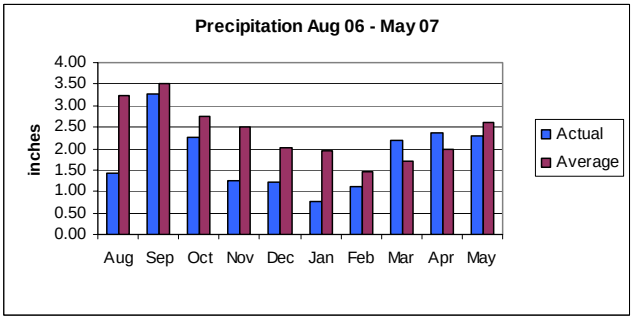

Figure 1: August 2006 – May 2007 Lake Superior Basin precipitation

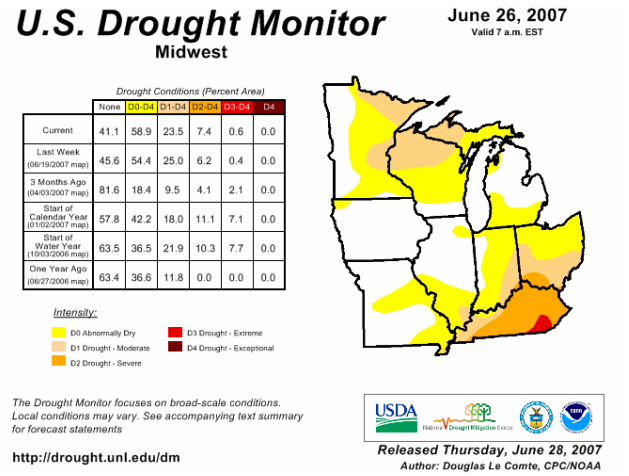

Figure 2: US Drought Monitor showing drought across the western Lake Superior basin.

A relatively warm start to the 2006/2007 winter season left Lake Superior largely ice free when arctic conditions set in across the region. Frigid air temperatures combined with the still warmer and ice free lake, led to significantly above average evaporation rates (Figure 3). February evaporation alone was over two inches higher than average. Lake Superior has seen above average evaporation in eleven out of the last seventeen months.

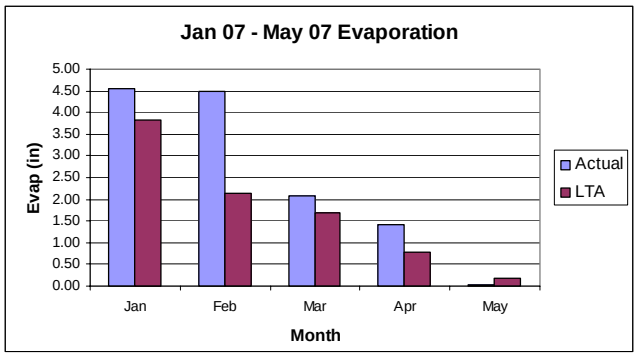

Figure 3: Evaporation from Lake Superior, January 2007 – April 2007

The amount of water available from winter snow pack was significantly below average in spring 2007 (Figure 4). Large amounts of lake effect snow did occur during the winter and early spring, but this type of snow can result in a loss of water from the lake. Beneficial snow fall comes from storm systems that originate outside of the Great Lakes basin.

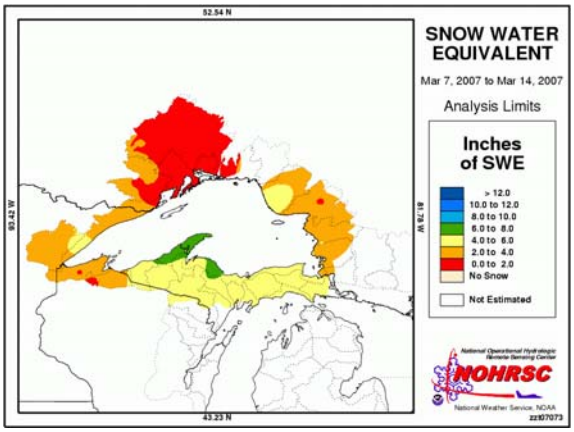

Figure 4: 2007 Snow Water Equivalent in the Lake Superior basin was 60% below average.

Taking the above factors into account, the latest six-month forecast for Lake Superior predicts that its water level will fall below the record low in September. Note, that this is just the record low for September. Lake Superior's all time record low occurred in April of 1926 at 599.5 feet IGLD 1985. Water levels on the lake will remain significantly below average through December.

Lake Superior Regulation

Lake Superior's natural outlet is through the St. Marys River into Lake Huron. In the vicinity of the cities of Sault Ste. Marie, Michigan and Ontario the river drops about twenty feet in less than a mile, known as the St. Marys Rapids. Although the rapids represent a hindrance to navigation, the twenty foot drop also represents a source of potential energy. During the past 200 years, the St. Marys River has undergone many physical changes harness its energy. A combination of these changes made it possible to control the flow in the river and thus the outflow from Lake Superior (Figure 5).

Figure 5: St. Marys River at Sault Ste. Marie MI and Ontario, CA

The Boundary Waters Treaty of 1909 was signed to help prevent and resolve any disputes over shared boundary waters. The International Joint Commission (IJC) has jurisdiction governing regulation strategies for the outflows from Lake Superior and issued its original Order of Approval in 1914. The U.S. Army Corps of Engineers in close coordination with

Environment Canada makes regulation recommendations on regulation to the IJC's International Lake Superior Board of Control on a monthly basis.

The current plan for the regulation of Lake Superior is called Plan 1977-A. Central to the plan is a relationship which determines the monthly Lake Superior outflow necessary to balance the water levels of Lake Superior and Lakes Michigan-Huron, relative to their long-term averages. The plan takes into consideration their historic range of fluctuation and the differing sizes of the lakes and drainage basins. If the water level of Lake Superior at the beginning of the month is higher relative to its long-term average than Lake Michigan-Huron, the regulation plan will call for a greater than average outflow. Conversely, if the Lake Michigan-Huron is in a relatively higher position that that of Lake Superior, the resulting outflow will be lower than average. Regulation of Lake Superior's outflow has an effect on water levels but to lesser a much extent than natural factors.

With the current low water levels on Lake Superior, the plan calls for outflows through the St. Marys River equal to the approximate flows which would have existed prior to any man made changes in the river.

Lake Michigan-Huron

Lake Michigan-Huron is also experiencing an extended period of below average water levels due to similar meteorological and hydrological conditions. Scientists consider Lakes Michigan and Huron one lake as they rise and fall together hydraulically due to their connection at the Straits of Mackinac.

Precipitation over the Lake Michigan-Huron basin from January through May 2007 is close to two inches below average (Figure 6). In May alone, precipitation was over an inch below average. During the same timeframe, evaporation was above average.

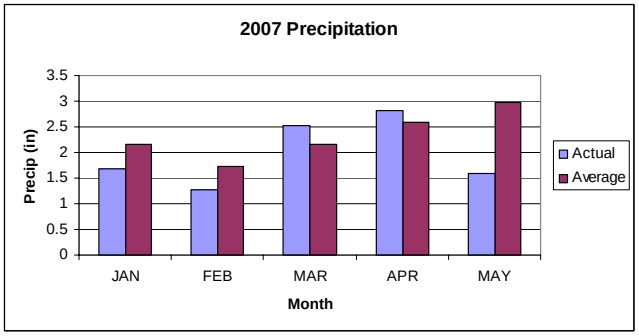

Figure 6: Lake Michigan-Huron Precipitation

The latest six month forecast for Lake Michigan-Huron calls for a water level of 577.6 by the end of July. This level would translate to a seasonal rise from February to July 2007 of seven inches. Lake Michigan-Huron's average seasonal rise from February through July is eleven inches. The lake is expected to remain below average and below 2006 conditions through November.

Lake St. Clair and Lake Erie

Lake St. Clair and Lake Erie began 2007 with above average water levels. Both lakes rose during the month of January, which is usually a time of decline. In fact Lake Erie rose steadily from October '06 through January '07 due to very wet conditions.

Lake St. Clair is currently below its long term average, while Lake Erie is near its average. The latest forecast calls for below average water level conditions on both lakes, through December.

Lake Ontario

Lake Ontario's water level is regulated under the auspices of the International Joint Commission's International St. Lawrence River Board of Control. The U.S. Army Corps of Engineers in Buffalo, NY along with Environment Canada make regulation strategy recommendations to the Board of Control on a weekly basis.

Currently, Lake Ontario's water level is below its long term average. The latest 6-month forecast calls for below average water level conditions.

Diversions

The major diversions in the Great Lakes basin are: (1) diversions into Lake Superior at Long Lac and Ogoki in Ontario, Canada; (2) a diversion out of Lake Michigan at Chicago; (3) a diversion between lakes Erie and Ontario through the Welland Canal; and (4) the New York State Barge Canal diversion (Figure 7).

These diversions have a minor effect on water levels compared to natural factors and regulation of lakes Superior and Ontario. The present flow rates into Lake Superior from the Long Lac and Ogoki diversions average 5,300 cubic feet per second (cfs). The flow through the Lake Michigan diversion at Chicago is 3,200 cfs and the flow from Lake Erie to Lake Ontario through the Welland Canal is 7,800 cfs. This compares to the average outflow of 78,000 cfs from Lake Superior and 247,000 cfs from Lake Ontario.

The combined effect of these three diversions has been to permanently raise Lake Superior by an average of 0.8 inch, lower lakes Michigan-Huron by 0.2 inches, lower Lake Erie by 4 inches and raise Lake Ontario by 1 inch.

Figure 7: Great Lakes Basin Diversions

Public Meetings

The International Lake Superior Board of Control will hold a meeting with the public on Tuesday, September 4th, 2007 at 7:00 PM. The meeting will be held at the Cisler Center on the campus of Lake Superior State University in Sault Ste. Marie, MI. For more information please contact Mr. John Kangas at (312) 353-4333 or Mr. David Fay at (613) 938-5725.

The International Niagara River Board of Control will hold a meeting with the public on Wednesday, September 12, 2007 at 7:30 PM. The meeting will be held at the Old Stone Inn, 5425 Robinson Street in Niagara Falls, Ontario. For more information please contact Mr. John Kangas at (312) 353-4333 or Mr. Len Falkiner at (905) 336-4947.

The International St. Lawrence River Board of Control will hold a multi-city teleconference during the evening of September 18. In-person sites in Oswego, NY and Cornwall, Ontario have yet to be determined. For more information please contact Mr. John Kangas at (312) 353-4333 or Mr. David Fay at (613) 938-5725.