



**US Army Corps  
of Engineers  
Detroit District**



# Great Lakes Update

## Great Lakes Winter and Spring Summary January – June 2012

The US Army Corps of Engineers (USACE) Detroit District monitors hydraulic and hydrologic conditions of the Great Lakes. This update article provides a summary of the Great Lakes water levels and basin conditions for January 2012 through June 2012. The report will also address some of the most recent frequently asked questions to our Hydraulics and Hydrology Office.

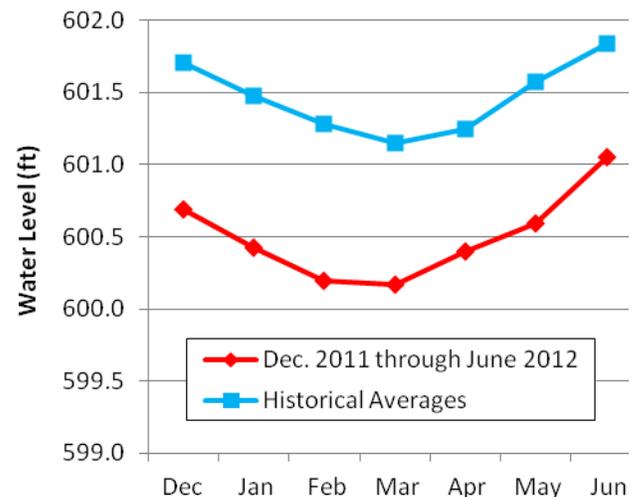
All of the Great Lakes are currently below their long-term average (LTA) water levels due to the recent dry conditions around the basin. With the exception of Lake Superior, all of the Great Lakes are also below their levels of one year ago. More detailed information for each lake's water level follows below.

All water levels mentioned in this article are monthly mean surface elevations in feet on the International Great Lakes Datum of 1985 (IGLD 85). All values shall be considered preliminary until final levels are coordinated between U.S. and Canadian agencies, sometime in early 2013. The official period of record for Great Lakes water levels is 1918 – 2011. Official water level statistics and historical water levels are located on the internet at the following address.

<http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/historicdata/>

### Lake Superior

Lake Superior's water level is currently 2 inches higher than one year ago but 9 inches below its LTA as of the end of June. As shown in Figure 1, the water level has followed the typical pattern of falling through the winter months until March and has risen steadily since then. From December 2011, the water level has risen 4 inches in 2012, compared to a typical rise of 2 inches.



**Figure 1: 2012 Lake Superior Water Levels**

The greater than average water level rise for Lake Superior in 2012 has been caused by wetter than average basin conditions, especially for May and June. Figure 2 shows the monthly totals of precipitation for the Lake Superior basin. Lake Superior has received a total of 15.2 inches of

over-basin precipitation in 2012, compared to a historical average of 13.2 inches.

Portions of the Lake Superior basin were inundated by very heavy rain during the month of June. In a period of just over 3 days, locations in and around Duluth, MN received in excess of 10 inches of rainfall. This rain caused significant flooding and extremely high flows in the St. Louis River, which feeds Lake Superior. The combination of the heavy rain and increased runoff caused Lake Superior to rise 4 inches from June 18<sup>th</sup> to the 21<sup>st</sup>.

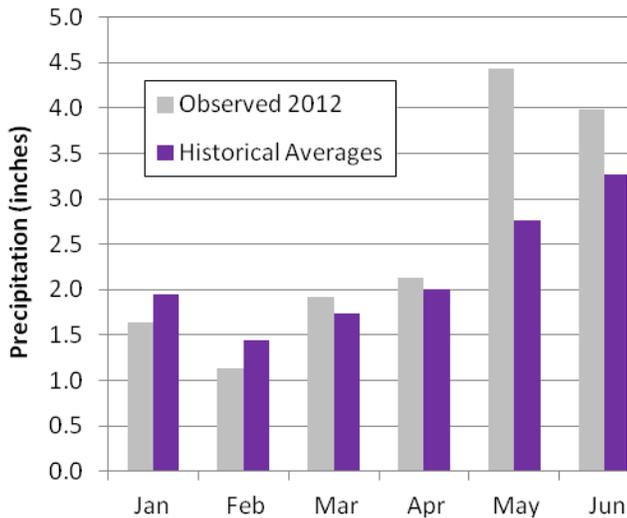


Figure 2: Lake Superior 2012 Monthly Precipitation

Another factor which has contributed to Lake Superior’s greater than average water level rise is the below average outflow through the St. Marys River. The regulated flow, internationally coordinated by the Lake Superior Board of Control according to Regulation Plan 1977-A, has been below average as shown in Figure 3.

The water level of Lake Superior will continue its seasonal rise until September and then begin its seasonal decline. The lake is forecasted to stay 1 to 4 inches above last year’s level over the remainder of 2012 and is expected to stay around 9 inches below the LTA.

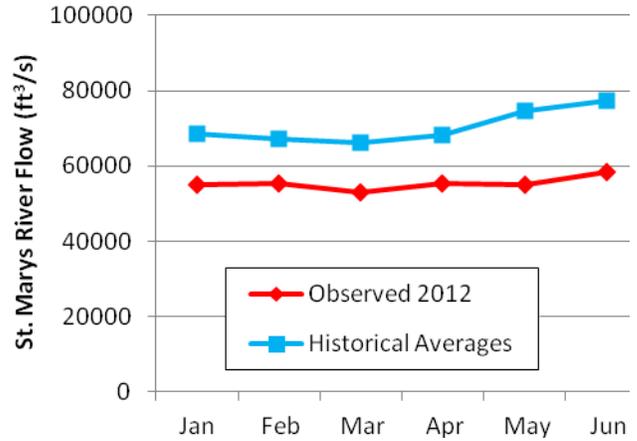


Figure 3: Lake Superior 2012 Outflow through the St. Marys River

Lake Michigan-Huron

Lake Michigan and Lake Huron are treated as one lake because they maintain the same water level due to the hydraulic connection at the Straits of Mackinac. June’s monthly mean water level for Lake Michigan-Huron was 19 inches below the long-term average and 6 inches below the level of one year ago. The Lake Michigan-Huron water levels of 2012 are shown in Figure 4. Typically, the lake level rises 9 inches from December’s monthly mean water level to June’s mean level, but in 2012 the water level has only risen 1 inch from December 2011.

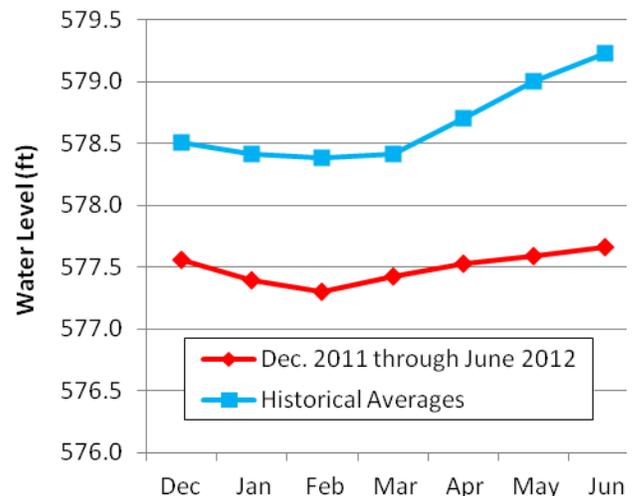
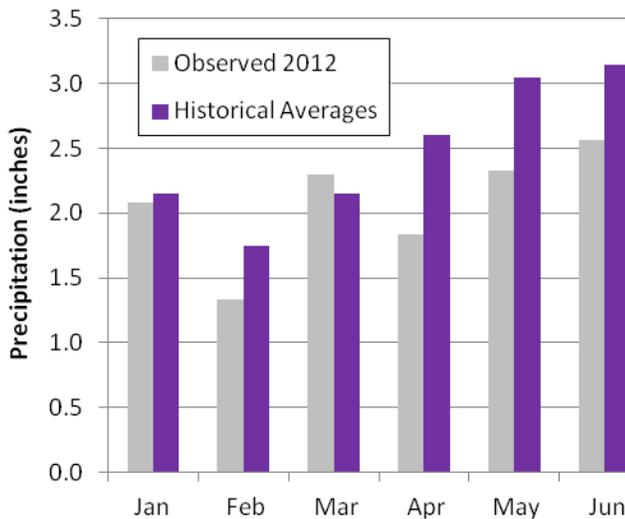


Figure 4: 2012 Lake Michigan-Huron Water Levels

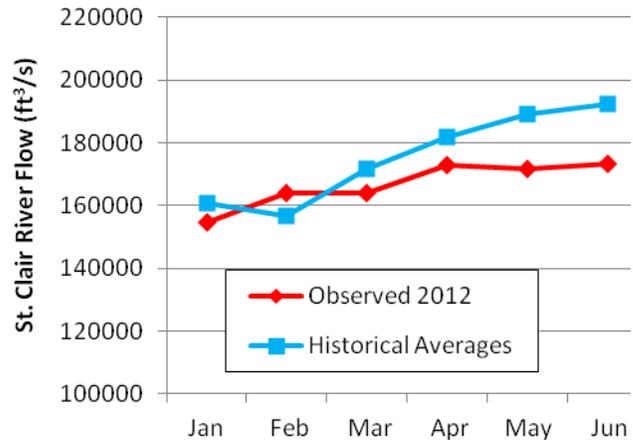
The below average rise of the water level has been caused by dryer than average basin conditions so far in 2012. Figure 5 shows the monthly precipitation totals for Lake Michigan-Huron. The basin typically receives 14.8 inches of precipitation during the first six months of the year, but has only received 12.4 inches in 2012.



**Figure 5: Lake Michigan-Huron 2012 Monthly Precipitation**

The water level of Lake Michigan-Huron is also influenced by the inflow through the St. Marys River (see Figure 3) and the outflow through the St. Clair River. Figure 6 shows that the outflow from Lake Huron through the St. Clair River has been below average in 2012, with the exception of February where the outflow was slightly above average. Therefore, the recent lower water levels on Lake Michigan-Huron are primarily due to dry basin conditions.

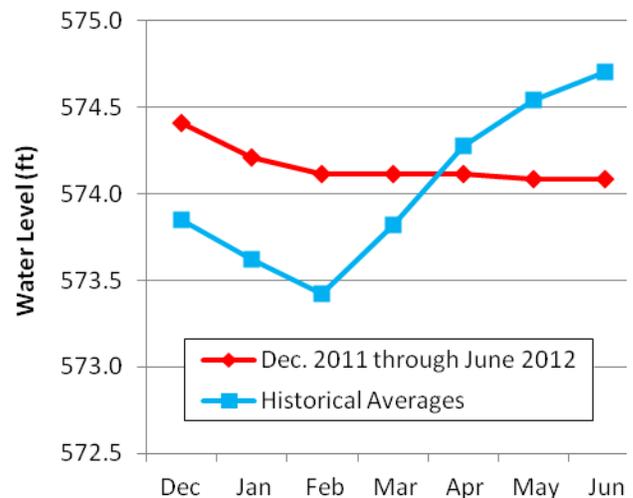
Low water levels are expected to continue for Lake Michigan-Huron through the remainder of 2012. As is typical, the levels are forecasted to continue a seasonal decline over the next six months. The latest forecast shows the lake remaining 21 to 22 inches below the LTA and 7 to 10 inches below 2011 levels.



**Figure 6: Lake Michigan-Huron Outflow through the St. Clair River**

**Lake St. Clair**

The water level of Lake St. Clair is currently 9 inches below the level of one year ago and 7 inches below the LTA. Figure 7 shows the Lake St. Clair water levels thus far in 2012 compared to average. The lake usually rises 10 inches from December to June, but the June 2012 mean level is actually 4 inches below December 2011's mean level.



**Figure 7: 2012 Lake St. Clair Water Levels**

Similar to the Michigan-Huron basin, the St. Clair basin has been experiencing dryer than average conditions. Figure 8 shows the 2012 precipitation

for the Lake St. Clair basin compared to average. Historically, Lake St. Clair has received an average of 16 inches of precipitation from January through June, but the 2012 total precipitation is 14 inches.

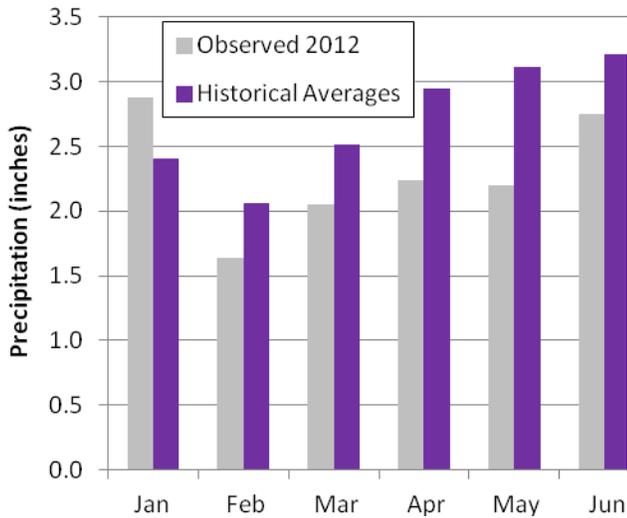


Figure 8: Lake St. Clair 2012 Monthly Precipitation

The level of Lake St. Clair is also affected by the outflow from the lake through the Detroit River. The 2012 monthly average flows through the Detroit River are shown in Figure 9. With the exception of February, the monthly mean flows through the Detroit River have been below average. Therefore, the recent lower water levels are caused by the basin’s dry weather.

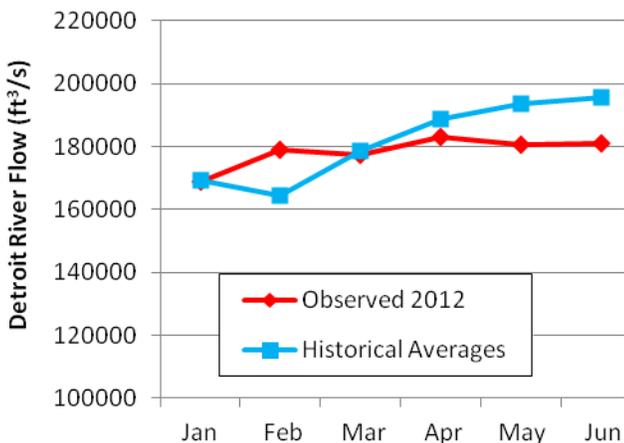


Figure 9: Lake St. Clair Outflow through the Detroit River

Lake St. Clair is also expected to follow the typical seasonal decline for the remainder of 2012. From July’s mean water level to December, the lake is predicted to fall 13 inches. The water levels are forecasted to stay 12 to 13 inches below the LTA through December and 13 to 19 inches below last year.

Lake Erie

Lake Erie’s water level is currently 14 inches below the level of one year ago and 4 inches below the LTA. As shown in Figure 10, the water level of Lake Erie has not followed the usual pattern over the last 7 months. Typically, Lake Erie rises 13 inches over the first half of the year, but the level has dropped 7 inches over the first half of 2012.

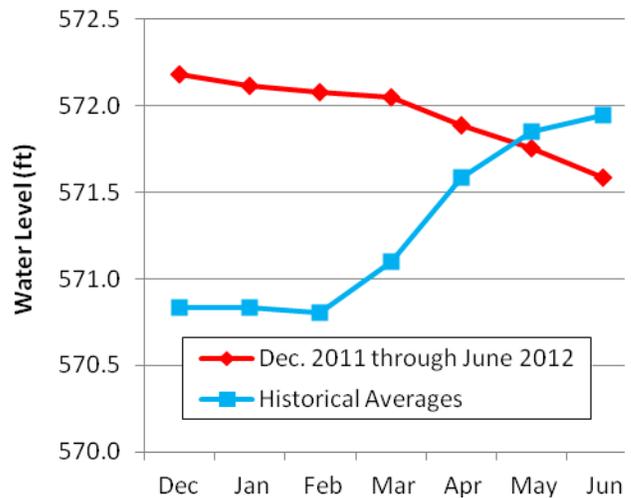


Figure 10: 2012 Lake Erie Water Levels

A large deficit of precipitation has been occurring in the Lake Erie basin in recent months. As seen in Figure 11, May precipitation was less than half of the historical average, with April and June also being very dry months. Usually Lake Erie receives 10 inches of precipitation during April, May, and June, but in 2012 it has only received 5 inches during those three months.

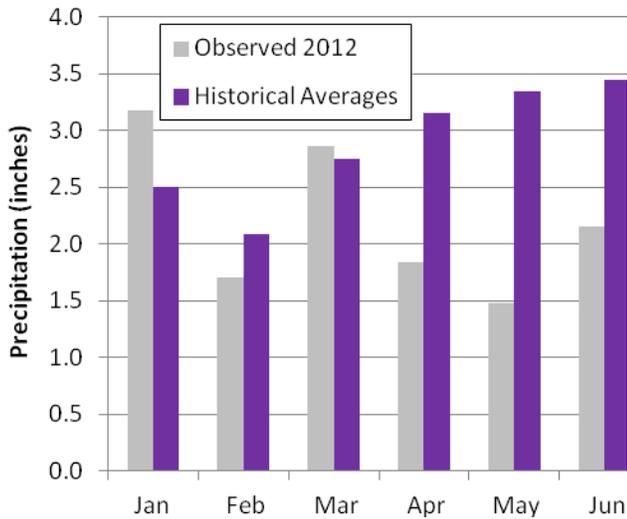


Figure 11: Lake Erie 2012 Monthly Precipitation

Similar to the unusual water level decline for Lake Erie, there has also been a drop in the Lake Erie outflow. As shown in Figure 12, the Lake Erie outflow was above average in early 2012, but since then the flow has fallen below average. The combination of above average outflow in early 2012 with very dry basin conditions in recent months have caused Lake Erie’s water level to decline.

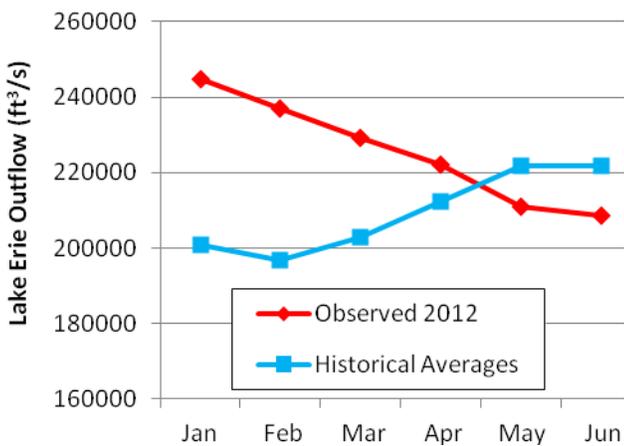


Figure 12: Lake Erie Outflow

The latest six month forecast shows Lake Erie’s water level falling 15 inches from July to December, when typically the lake falls 13

inches. By December, the water level of Lake Erie is forecasted to be 25 inches below its December 2011 level. Although the lake has dropped a large amount from 2011 levels, it is expected to remain 8 to 9 inches below the LTA for the rest of the year.

**Lake Ontario**

The water level of Lake Ontario is 17 inches below the level of one year ago and 6 inches below the LTA. Lake Ontario started 2012 above the LTA, as seen in Figure 13. From December’s monthly mean level to February, Lake Ontario rose 15 inches. Since then it has dropped 4 inches. Typically, Lake Ontario rises 20 inches from December to June, but from December 2011 it has only risen 11 inches in 2012.

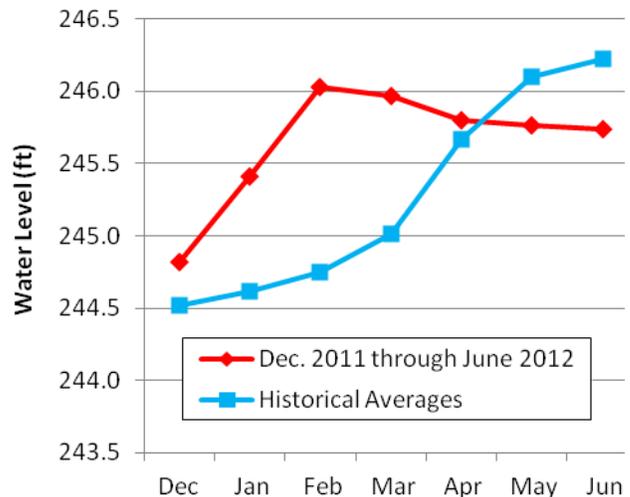


Figure 13: 2012 Lake Ontario Water Levels

Lake Ontario has also experienced a dry year, especially during the February through May period. Figure 14 shows that the precipitation totals during these months were well below average. Typically, the January through June total precipitation for Lake Ontario is 17 inches. In 2012, the total precipitation has been only 13 inches. The huge lack of precipitation caused a

direct impact to the water level of Lake Ontario, as can be seen by comparing Figures 13 and 14.

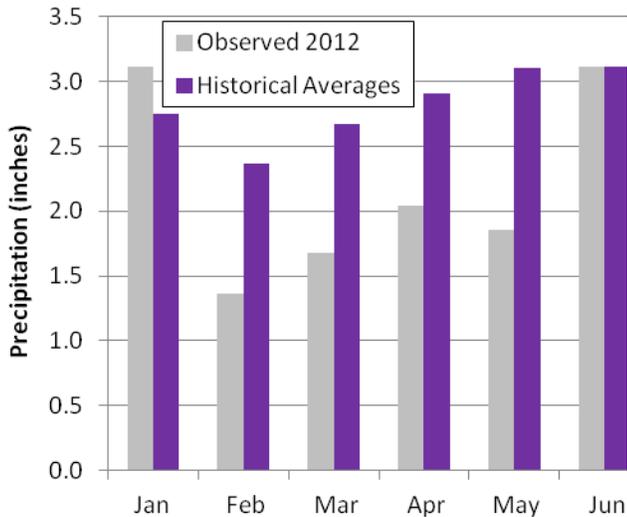


Figure 14: Lake Ontario 2012 Monthly Precipitation

Outflow through the St. Lawrence River is regulated by the International St. Lawrence River Board of Control. As seen in Figure 15, the outflow from Lake Ontario through the St. Lawrence River during the first four months of 2012 was above average and has been below average since then.

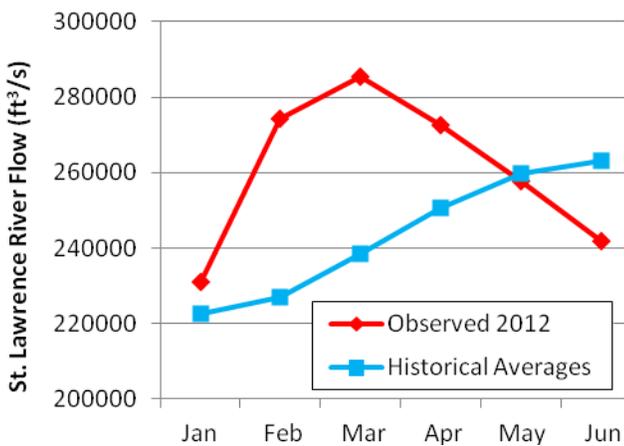


Figure 15: Lake Ontario Outflow through the St. Lawrence River

Lake Ontario typically falls 18 inches from July to December, but is only expected to fall 15 inches during the same time frame this year. This

would move Lake Ontario from 8 inches below to 4 inches below the LTA. The level of the lake is expected to remain 6 to 14 inches below 2011 levels.

**FREQUENTLY ASKED QUESTION:  
How will the warm air temperatures affect the lake levels?**

Sustained warm air temperatures increase the water temperatures of the Great Lakes, especially at the water surface. Currently, the surface temperatures of each of the Great Lakes are above average for this time of year. Figures 16 through 20 below are from the Great Lakes Coastwatch website provided by NOAA (<http://coastwatch.glerl.noaa.gov/>) and compare the surface water temperatures of 2012 to the available period of record averages.

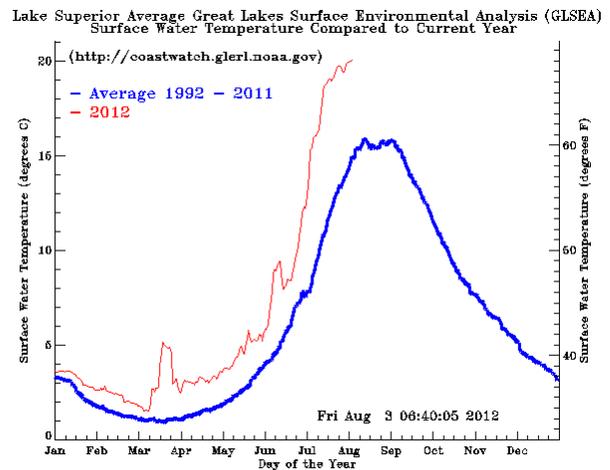


Figure 16: Lake Superior Surface Temperatures

Lake Michigan Average Great Lakes Surface Environmental Analysis (GLSEA)  
Surface Water Temperature Compared to Current Year

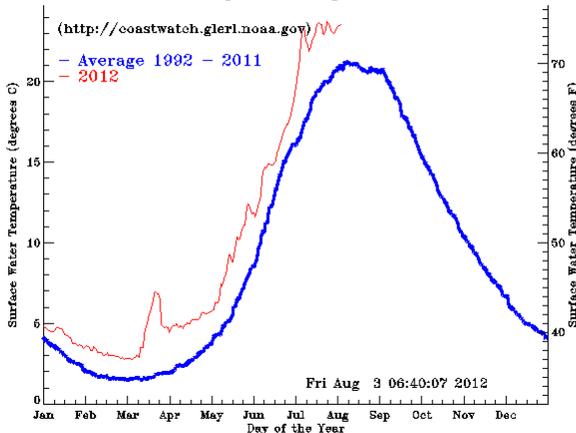


Figure 17: Lake Michigan Surface Temperatures

Lake Ontario Average Great Lakes Surface Environmental Analysis (GLSEA)  
Surface Water Temperature Compared to Current Year

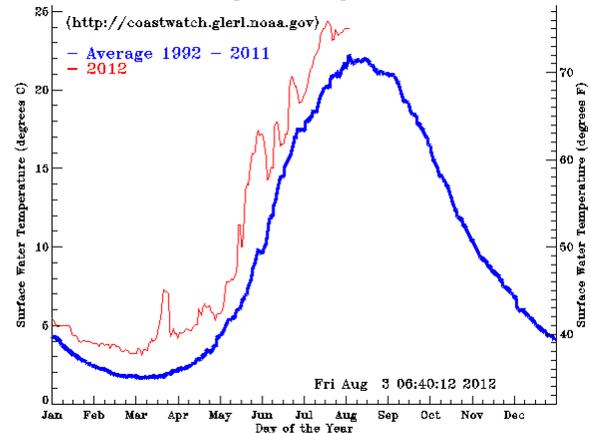


Figure 20: Lake Ontario Surface Temperatures

Lake Huron Average Great Lakes Surface Environmental Analysis (GLSEA)  
Surface Water Temperature Compared to Current Year

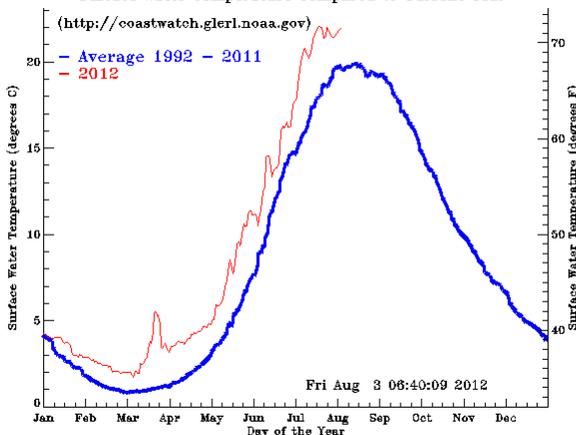


Figure 18: Lake Huron Surface Temperatures

Lake Erie Average Great Lakes Surface Environmental Analysis (GLSEA)  
Surface Water Temperature Compared to Current Year

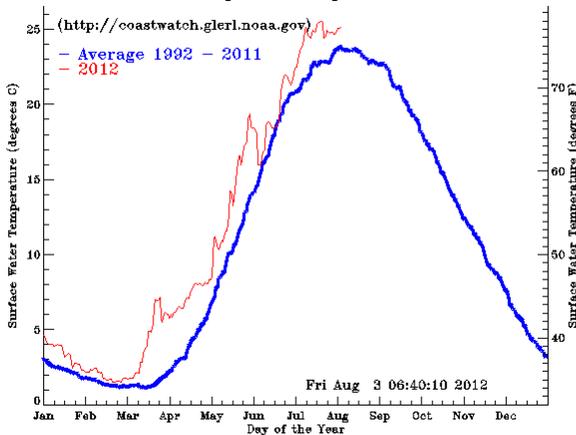


Figure 19: Lake Erie Surface Temperatures

The very warm temperatures experienced this summer have been the result of persistent high pressure systems sitting over the eastern U.S. These high pressure systems allowed temperatures to soar into the 90s and 100s. Locations as far north as Marquette, Michigan recorded daytime high temperatures well into the 90s this summer.

The warmer than average water temperatures may lead to increased evaporation rates this fall and winter, when air temperatures are often colder than the water temperatures.

**FREQUENTLY ASKED QUESTION:**  
**Why are the lake levels currently low?**

There are a variety of factors which cause the lake levels to fluctuate. Primarily, they are influenced by precipitation on the lake, runoff into the lake from precipitation falling on the lake's watershed, and evaporation from the lake surface.

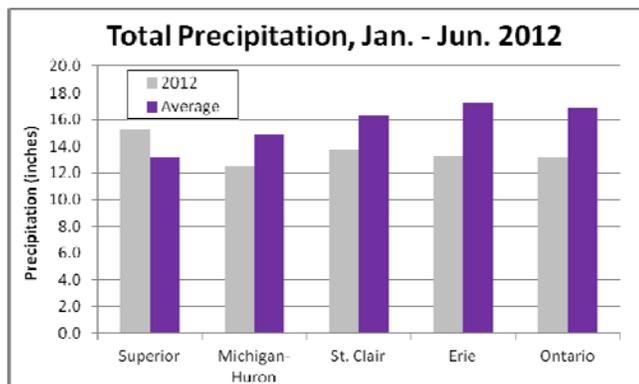
The lack of snowfall this winter played a major role in reducing the amount of spring runoff to all of the Great Lakes. Table 1 below lists the estimated runoff totals, as a percent of average, for the first six months of 2012 according to the

Great Lakes Advanced Hydrologic Prediction System (AHPS) model developed by NOAA Great Lakes Environmental Research Laboratory.

**Table 1: Runoff Totals Jan. – June 2012 as % of Average (AHPS model)**

Superior	Mich-Hur	St. Clair	Erie	Ontario
85%	71%	77%	60%	55%

By looking at precipitation totals shown in Figure 21 below, you will see that only Lake Superior has received above average precipitation in 2012. Lake Superior is also the only Great Lake with higher water levels than a year ago. This lack of precipitation on all of the other lake basins has been a major contributor to low lake levels.



**Figure 21: Total 2012 Precipitation Through June, Compared to Average**

#### **FREQUENTLY ASKED QUESTION:**

**Has the Chicago diversion lowered the levels of the Great Lakes?**

The Chicago Diversion diverts water from Lake Michigan into the Mississippi River watershed. In 1967, the US Supreme Court decreed that a total of 3,200 cubic feet per second was allowed to flow through the Chicago Diversion. This flow is audited by the USACE Chicago District, the US Geologic Survey, the Illinois Department of Transportation, and the Metropolitan Water Reclamation District of Chicago. In comparison, the allowed flow through the diversion is 1.7% of

the water flowing out of Lake Michigan-Huron through the St. Clair River.

There is also a diversion of water into the Great Lakes through the Long Lac and Ogoki diversions. The amount of water diverted into Lake Superior averages 5,000 cubic feet per second, or almost 2,000 cubic feet per second greater than the amount of water allowed out through the Chicago Diversion. The net total of the inter-basin diversions in the Great Lakes shows more water diverted into the lakes than out.

#### **More Information**

In addition to the *Monthly Bulletin*, the Detroit District issues the *Weekly Great Lakes Water Level Update* and the *Weekly Great Lakes Connecting Channels Water Levels and Depths*. Both products are updated each Thursday and can be located here:

<http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/waterlevelforecasts/>

The Detroit District welcomes comments on all of our forecast products. Please email questions and comments to [hhpm@usace.army.mil](mailto:hhpm@usace.army.mil). To contact the District by phone call toll free 1-888-694-8313 and select option 1.

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