LEVELnews

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2022 begins with high water levels on Lakes Michigan/Huron, Erie, and Ontario

During December, the Great Lakes Basin experienced the following:

- Well above average water supply conditions across the basin;
- Lakes Superior declined much less than average, while Lake Michigan-Huron had a typical December decline, and Lakes Erie and Ontario rose more than average;
- Lake Superior's mean monthly level was below average, while Lakes Michigan-Huron, Erie, and Ontario were above or well above average. This was Lake Erie's seventh largest December level as well as Lake Ontario's tenth highest level; and
- The Great Lakes Basin had a notable 2021 with all the lakes starting the year above or well above average water levels, but only Lake Superior ended the year below average, while Lakes Michigan-Huron and Erie remained well above average throughout the year. Lake Ontario dropped below average for much of the year and rose above again in the fall. (See the full summary of the annual lake levels near the end of this newsletter.)

Relative to their beginning-of-January levels and with average water supplies for this time of year, some lakes are expected to continue their seasonal decline while others may hold steady or begin their seasonal rise in the coming months. Lake Superior water levels are expected to remain below average under typical water supply conditions. Wetter than average conditions could result in Lake Superior levels increasing above average, and drier than typical conditions may result in levels moving further below average. The water levels of Lakes Michigan-Huron and Erie are expected to remain above average under any water supply scenario. Lake Ontario levels are above average and are expected to remain so under average conditions. In the event of wetter than average conditions, Lake Ontario

Great Lakes Water Level Information

Lake	December 2021 Monthly Mean Level		Beginning-of-January 2022 Level	
	Compared to Monthly Average (1918–2020)	Compared to December 2020	Compared to Beginning-of-Month Average (1918–2020)	Compared to January 2021
Superior	10 cm below	32 cm below	7 cm below	28 cm below
Michigan–Huron	33 cm above	45 cm below	34 cm above	45 cm below
St. Clair	49 cm above	21 cm below	54 cm above	18 cm below
Erie	57 cm above	7 cm below	61 cm above	6 cm below
Ontario	34 cm above	25 cm above	33 cm above	22 cm above

could rise well above average by mid-winter, whereas drier than average conditions could result in lower than average levels.

With water levels remaining above average on some lakes and the possibility of large storms and winds during the fall and winter months, low-lying areas are at risk for accelerated coastline erosion and flooding. For current information and forecasts, please refer to the sources listed below.

December Precipitation over the Great Lakes[1,2]

Great Lakes Basin	**97%**	**Erie (including Lake St. Clair)**	**104%**
Superior	**125%**		
Michigan–Huron	**87%**	**Ontario**	**81%**

December Outflows from the Great Lakes[1]

Superior	**83%**	**Erie**	**122%**
Michigan–Huron	**114%**	**Ontario**	**127%**

[1] As a percentage of the long-term average.

[2] US Army Corps of Engineers (https://lre-wm.usace.army.mil/reports/GreatLakes/GLP-LastMonth.pdf).

NOTE: The figures contained in this report are provisional and are subject to change. Data are calculated from the best available observations at the time of posting.

December monthly levels

Lake Superior's monthly mean level was 183.31 m (IGLD85[1]), 10 cm below long-term average (1918-2020) and 32 cm lower than this time last year.

Lake Michigan-Huron's monthly mean level in December was 176.69 m (IGLD85). This was 33 cm above its December monthly mean water level and 45 cm lower than last year.

Lake Erie had an average monthly water level of 174.58 m (IGLD85), 57 cm above average and 7 cm below last year's level. This is Lake Erie's seventh highest December water level on record.

Lake Ontario's December monthly mean level was 74.87 m (IGLD85), 34 cm above average and 25 cm higher than the level from a year ago. This is Lake Ontario's tenth highest water level during the period of record (1918-2020) for December.

Lake level changes

Lake Superior declined by 2 cm in December, a quarter of its typical December decline of 8 cm. This is the second smallest December water level decline.

Lake Michigan-Huron declined by 5 cm, its typical December monthly decline.

Lake Erie rose by 4 cm, during a month when it typically doesn't change.

Lake Ontario's level increased by 2 cm in December, not far off its typical rise of 1 cm.

(Note: lake level changes are based on the levels at the beginning of the month and not the monthly average levels.)

Beginning-of-January lake levels

Lake Superior's beginning-of-January level was 7 cm below average, which is 28 cm lower than last year.

Lake Michigan–Huron's level was 34 cm above average at the beginning of January and 45 cm lower than this time last year.

Lake Erie was 61 cm above average at the beginning of January and 6 cm lower than last year at this time. This is the sixth highest beginning of January level on record.

Lake Ontario's level at the start of January was 33 cm above average and 22 cm higher than this time last year. This is the tenth highest beginning of January level on record.

At the beginning of January, all of the Great Lakes were at least 10 cm above their chart datum level. Chart datum is a reference elevation for each lake that provides more information on the depth of water for safe boat navigation on the lakes. For more information, please visit http://www.greatlakescc.org/wp36/home-2/international-great-lakes-datum-update/low-water-datum/

[1]Water levels are referenced to International Great Lakes (Vertical) Datum 1985 (IGLD85). For more information, please visit http://www.greatlakescc.org/wp36/home-2/international-great-lakes-datum-update/.

Water levels forecast

Relative to their beginning-of-January levels and with average water supplies for this time of year, some of the lakes are expected to continue their seasonal decline while others may hold steady or begin their seasonal rise in the coming months.

Lake Superior is currently below its average level and is expected to remain so under average conditions. Drier than average conditions could result in lake levels dropping further below average in the coming months, while wetter than average conditions may result in lake levels moving just above average.

The level of Lake Michigan-Huron is currently above average and expected to remain so under average and wetter than average water supply conditions. In the event of drier than average conditions, lake levels could approach average.

Lake Erie levels are currently well above average and are expected to remain high under average and wetter than average water supply conditions. In the event of dry conditions, lake levels could approach average in the next six months.

Lake Ontario levels are above average and are expected to remain so under typical water supply conditions. Drier than average conditions could result in Lake Ontario levels falling below average, while wetter than average conditions may result in lake levels rising well above average throughout the winter and spring months.

For more information on the probable range of water levels, consult https://www.canada.ca/en/environment-climate-change/services/water-overview/quantity/great-lakes-levels-related-data/levelnews-great-lakes-st-lawrence.html#projection.

For a graphical representation of recent and forecasted water levels on the Great Lakes, refer to the Canadian Hydrographic Service's Monthly Water Levels Bulletin at: https://waterlevels.gc.ca/C&A/bulletin-eng.html

Review of 2021 Great Lakes water levels

2021 was a noteworthy year for the Great Lakes, with all lake levels starting the year above average. Lake Superior started the year above average, its water levels decreased to below average values by late summer, making it the only lake to finish the year with below average levels. Lakes Michigan-Huron and Erie remained above average for the entire year. Lake Ontario dipped below average water levels early in the year and remained below average for about six months and then uncharacteristically rose through the late summer and fall ending the year well above average.

The year started out dry throughout the Great Lakes Basin, with the north becoming wetter than average in April. This resulted in a below average snowpack that had melted by early spring. The northern portion of the basin saw below average precipitation for the remainder of the year, except for August and December which were wetter than average. The southern portion of the basin was wetter than average throughout the summer, although August was drier than average. Southern Ontario had above average water supply conditions in the fall, however, December was well above average.

Lake Superior started 2021 with above average levels, which persisted until August, when water levels reached average values for the first time since March 2014. Lake Superior levels continued to decline throughout the fall and early winter, due to the dry conditions in the basin. The lake experienced atypical seasonal behaviour with the peak occurring in July

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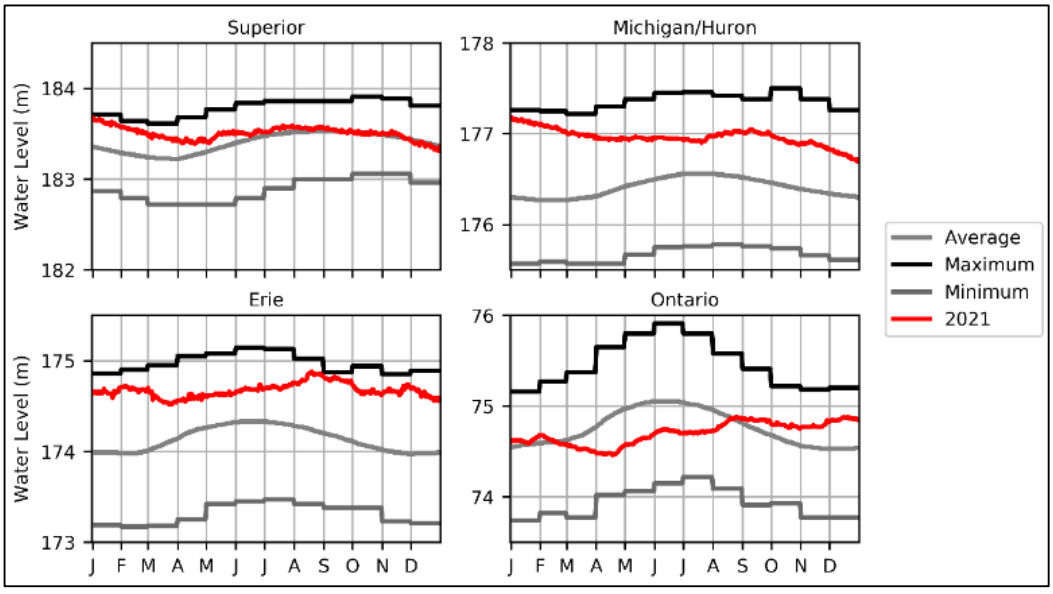
(typically August) and minimum in December (typically March).

Lake Michigan-Huron had an uncommon first half of 2021 with water levels decreasing at a time when they generally increase, partly due to the below average snow pack. This continued until June, at which time, the lake level went up for a few months before starting its seasonal decline. Even with this much larger than average decline throughout the year, as the lake started the year close to record high levels, it still finished 2021 with above average water levels. Lake Michigan-Huron experienced its peak in January, which has only occurred three other times in 1931, 1958, and 1987.

Lake Erie started out the year at well above average levels. The lake had atypical seasonal behaviour from January to March, again possibly owing to dry conditions and below average snowfall in the region. Lake levels continued with relatively typical behaviour for the remainder of the year, experiencing peak levels in July, a little later than typical, and a small unseasonal rise in October, before starting its season decline.

Lake Ontario experienced uncharacteristic yearly behaviour with levels progressively decreasing throughout the winter and moved below average in February for the first time since December 2016. Levels remained below average through the spring and early summer, but steadily increased for the remainder of the year, going above average in September. The lake experienced its yearly peak in December, when it generally occurs in May or June. The only other time Lake Ontario experienced a December peak was in 1926.

The 2021 levels for all lakes can be seen in the graph below, along with the average and the maximum and minimum levels during the period of record (1918-2020).



Information on flooding

With water levels remaining high on some of the lakes, the risk of flooding is also high. Great Lakes water levels are difficult to predict weeks in advance due to natural variations in weather. To stay informed on Great Lakes water levels and flooding, visit the Ontario flood forecasting and warning program website at https://www.ontario.ca/flooding.

Additional information can also be found at the International Lake Superior Board of Control website, https://www.ijc.org/en/lsbc, and the International Lake Ontario–St. Lawrence River Board website, https://ijc.org/en/loslrb.

Information on current water levels and marine forecasts

Daily levels: Current daily lake-wide average levels of all the Great Lakes are available on the Great Lakes water levels and related data webpage at https://www.canada.ca/en/environment-climate-change/services/water-overview/quantity/great-lakes-levels-related-data.html and by clicking on "Daily water levels for the current month". The daily average water level is an average taken from a number of gauges across each lake and is a good indicator of the overall lake level when it is changing relatively rapidly due to recent high precipitation.

Hourly levels: Hourly lake levels from individual gauge sites can be found at the Government of

Canada Great Lakes Water Level Gauging Stations website at http://tides.gc.ca/eng/find/region/6. These levels are useful for determining real-time water levels at a given site, however, it should be noted that they are subject to local, temporary effects on water levels such as wind and waves.

Marine forecasts: A link to current Government of Canada marine forecasts for wave heights for each of the Great Lakes can be found on the Great Lakes water level and related data webpage at https://www.canada.ca/en/environment-climate-change/services/water-overview/quantity/great-lakes-levels-related-data.html under the "Wave and wind data heading". Current marine forecasts for Lakes Superior, Huron, Erie and Ontario are available by clicking on the link of the lake in which you are interested. To view a text bulletin of recent wave height forecasts for all of the Great Lakes, click on the "Text bulletin wave height forecasts for the Great Lakes and St. Lawrence River" link.

FOR MORE INFORMATION:

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