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LEVELnews

Great Lakes — St. Lawrence River Water Levels

Dry conditions in January resulted in falling water levels throughout most of the Great Lake Basin

Lower than average precipitation amounts and high outflows from some of the Great Lakes contributed to greater than average declines in most of the lake levels throughout January. Despite these declines, water levels remain well above average in all lakes apart from Lake Ontario.

With the exception of Lake Erie, all the other lakes experienced more than their average decline, with Lake Michigan-Huron experiencing its record greatest January decline. Water levels on all the Great Lakes remain above average with the exception of Lake Ontario's beginning-of-February levels that were 2 cm below the long-term average (1918-2019).

Lake Superior's average level was 21 cm above its January average but 17 cm below last year's level and Lake Michigan-Huron experienced its fourth highest January level but was 19 cm below last year. Lake Erie experienced its fourth highest level for the month of January; 11 cm lower than last year. Lake Ontario was 5 cm above its average value for the month of January and 43 cm lower than last year.

Great Lakes Water Level Information

Lake	January 2021 Monthly Mean Level		Beginning-of-February 2021 Level	
	Compared to Monthly Average (1918–2018)	Compared to One Year Ago	Compared to Beginning-of-Month Average (1918–2018)	Compared to One Year Ago
Superior	21 cm above	17 cm below	18 cm above	20 cm below
Michigan–Huron	77 cm above	19 cm below	71 cm above	28 cm below
St. Clair	77 cm above	18 cm below	88 cm above	18 cm below
Erie	68 cm above	11 cm below	68 cm above	21 cm below
Ontario	5 cm above	43 cm below	2 cm below	57 cm below

Canada

At this time of year, Lake Ontario levels are generally holding steady at their seasonal low; however, a further decrease in Lake Ontario levels was observed throughout the month of January owing to drier and milder climatic conditions and increased outflows. Lakes Superior and Michigan-Huron are approaching their seasonal lows, while Lake Erie remains at seasonal low levels.

With water levels continuing to remain very high on some of the lakes and the possibility of large storms and winds during winter months, there is high risk for accelerated coastline erosion and flooding to occur in low lying areas. For current information and forecasts, please refer to local sources of information listed below.

January monthly levels

Lake Superior had a monthly average of 183.54 m (IGLD85[1]) for January. This was 21 cm above its January monthly-mean water level and 17 cm lower than its level last year, which was the highest in the period of record.

Lake Michigan–Huron's monthly-mean level in January was 177.07 m (IGLD85), 77 cm above average and 19 cm below last January's record level. This was the fourth highest January level on record.

Lake Erie's monthly-mean level was 174.69 m (IGLD85), 68 cm above average and 11 cm below its January 2020 level. This was the third highest January lake level on record, 17 cm below the record high in 1987.

Lake Ontario's January monthly-mean level was 74.62 m (IGLD85), 5 cm above average, 43 cm lower than the level from a year ago, and 54 cm below the record high in 1946.

Lake level changes

The level of Lake Superior went down by 10 cm during the month of January, more than its typical decline of 7 cm, this was the sixth largest fall on record.

Lake Michigan/Huron dropped by 11 cm during the month, more than its average 2 cm decline and the record largest January decline.

The level of Lake Erie did not change, although, it typically declines by 1 cm.

January Precipitation over the Great Lakes[1,2]

Great Lakes Basin	**37%**	**Lake Erie (including Lake St. Clair)**	**49%**
Lake Superior	**29%**		
Lake Michigan–Huron	**33%**	**Lake Ontario**	**50%**

January Outflows from the Great Lakes[1]

Lake Superior	**112%**	**Lake Erie**	**129%**
Lake Michigan–Huron	**145%**	**Lake Ontario**	**140%**

[1] As a percentage of the long-term average.
[2] US Army Corps of Engineers
NOTE: These figures are preliminary.

Lake Ontario decreased by 8 cm in January; however, it typically increases in the month of January by 5 cm on average.

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

Beginning-of-February lake levels

Lake Superior's beginning-of-February level was 18 cm above average, which is 20 cm lower than last year.

Lake Michigan–Huron's beginning-of-February level was 71 cm above average and 28 cm lower than it was last year. This is the fourth highest in the period of record, with a level that is 28 cm lower than the previous beginning-of-month record for February, set in 2020.

Lake Erie was 68 cm above average at the beginning of February and 21 cm lower than the

[1]Water levels are referenced to International Great Lakes (Vertical) Datum 1985 (IGLD85). For more information, please visit International Great Lakes Datum Update – Great Lakes Coordinating Committee (greatlakescc.org).

record high last year at this time. This level is the fifth highest on record.

Lake Ontario's level at the start of February was 2 cm below average and 57 cm lower than the water level from last year. Lake Ontario has not been below average beginning-of-month levels since the beginning of October 2018.

At the beginning of February, all of the Great Lakes were at least 28 cm above their chart datum level (chart datum is a reference elevation for each lake in order to provide more information on the depth of water for safe boat navigation on the lakes. For more information, please visit Low Water Datum – Great Lakes Coordinating Committee website at http://www.greatlakescc.org/wp36/home/international-great-lakes-datum-update/low-water-datum/.

Water levels forecast

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

The level of Lake Superior is expected to continue its seasonal decline, but stay above average if it receives average water supplies throughout the winter.

Lake Michigan-Huron will likely remain below record levels with average water supplies, but still much higher than average in the coming months. However, above average water supplies could bring the level above record levels in the spring.

With average conditions, Lake Erie would stay well above average throughout the winter, while very wet conditions could result in the levels surpassing record levels in late winter.

Lake Ontario began its seasonal rise in December, however, lake levels decreased throughout January. Even with above average water supplies, Lake Ontario is not expected to reach records high levels.

For more information on the probable range of water levels consult the July 2018 edition of LEVELnews at https://www.canada.ca/en/environment-climate-change/services/water-overview/quantity/great-lakes-levels-related-data/levelnews-great-lakes-st-lawrence/july-2018.html

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

International Great Lakes Datum (IGLD) 1985 Update

Did you know that the land beneath our feet might not be as stable as you think? A 1 km thick ice sheet covered the Great Lakes 10,000 years ago pushing the land surface down. Although the ice sheet melted a long time ago, the land surface is still rebounding even though the weight of the ice is gone. In some places in the basin, the ground is rising more than 5 cm every decade, while in other areas it is lowering by 1 cm a decade. As a result, an update to the reference system used to define the levels of the Great Lakes is required approximately every 25-30 years to compensate for differential movement of the earth's crust in the Great Lakes region.

The elevation reference system for the Great Lakes is called the International Great Lakes Datum or IGLD. The current IGLD (called IGLD 1985) was implemented in February 1992 and replaced the previous system, IGLD 1955. IGLD 1955 was the first common datum between the United States and Canada. It was established by geodetic levelling, which is a precise form of land surveying. This was carried out from the Atlantic Ocean, inland up the St. Lawrence River, and then to each of the Great Lakes and connecting channels. The current datum (IGLD 1985) relies on a zero reference point representing local mean sea level, which is located at Pointe-au-Père, Quebec near the mouth of the St. Lawrence River. Numerous benchmarks (fixed land points or monuments) were established with very accurate elevations using geodetic levelling and then used to determine the elevation of

water level gauges for the lakes and connecting channels relative to the zero reference point.

Efforts are underway by the U.S. and Canada for the next coordinated update to the IGLD. With the current timeline, the new reference datum will be implemented in the next few years. The updated datum will forego geodetic levelling in lieu of using a geoid as a reference datum. Geoid referencing is more compatible with modern Global Navigation Satellite System (GNSS), which is more cost efficient and accurate. To see a presentation with more details about the IGLD and the plans for the next update see International Great Lakes Datum Update – Great Lakes Coordinating Committee website at http://www.greatlakescc.org/wp36/home/international-great-lakes-datum-update/ or visit IGLD - NOAA Tides & Currents at https://tidesandcurrents.noaa.gov/datum-updates/igld/.

Information on flooding

With water levels so high, the risk of flooding is also high. Great Lakes water levels are hard 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 web site at https://www.ontario.ca/page/floods.

Additional information can also be found at the International Lake Superior Board of Control web site, https://www.ijc.org/en/lsbc, and the International Lake Ontario–St. Lawrence River Board web site, 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 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 change when it is changing relatively rapidly due to the high precipitation recently experienced.

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 web page 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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