

Great Lakes – St. Lawrence River Water Levels

Lakes Superior and Ontario end the year near average

In December, the Great Lakes Basin experienced the following:

- The mean monthly water level of Lake Superior was below average, while lakes Michigan-Huron and Erie remained above average, and Lake Ontario’s water level remained below average.
- All the Great Lakes experienced wet or very wet water supply conditions (a combination of the precipitation, evaporation, and runoff).
- December precipitation amounts were less than average for lakes Superior, Michigan-Huron, and Erie, while Lake Ontario received average precipitation amounts.
- Lake Superior experienced its tenth smallest December decline on record, and Lake Michigan-Huron experienced a smaller than average decline. Conversely, Lake Erie experienced a greater than average rise, while Lake Ontario experienced a much larger than average rise.

| Great Lakes water level information: December 2023 monthly mean levels | | | | | |
|---|--------------------|--|---------------------------|-------------------------------------|-------|
| Lake | Level ^a | Compared to December monthly average (1918–2022) | Compared to December 2022 | Compared to record high (1918-2022) | Notes |
| Superior | 183.37 m | 4 cm below | 20 cm below | 44 cm below | - |
| Michigan–Huron | 176.44 m | 8 cm above | 2 cm below | 82 cm below | - |
| St. Clair | 175.13 m | 19 cm above | 1 cm above | 67 cm below | - |
| Erie | 174.26 m | 24 cm above | 6 cm above | 63 cm below | - |
| Ontario | 74.49 m | 4 cm below | 2 cm above | 71 cm below | - |

^aWater 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 at <https://www.greatlakescc.org/en/international-great-lakes-datum-update/>



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Upon examination of the other water balance components, it was determined that the high water supplies were a result of low over-lake evaporation for the month of December. Over-lake evaporation at this time of year is generally seen as lake effect snow events, these events need both relatively warm lake water temperatures and cold air to pass over the warm water (see a description of one of these event in the December 2022 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/december-2022.html>). However, this past December there was a lack of cold air outbreaks that resulted in very few lake effect snow events and thus lower over-lake evaporation.

This is the time of year when both Lakes Erie and Ontario have reached their lowest water levels of the season. From this point on, they are expected to hold steady and then start to rise over the next few months. Typically, Lakes Superior and Michigan/Huron should continue their seasonal decline for a few more months before starting to rise again.

| Great Lakes water level information: | | | | |
|--|----------------------------|---|---|----------------------------------|
| December lake level changes ^a | | | | |
| Lake | December lake level change | December monthly average change (1918-2022) | Compared to average December change (1918-2022) | Notes |
| Superior | 4 cm decline | 8 cm decline | less than average decline | tenth smallest decline on record |
| Michigan–Huron | 2 cm decline | 5 cm decline | less than average decline | - |
| St. Clair | 10 cm rise | 3 cm rise | greater than average rise | - |
| Erie | 6 cm rise | 2 cm rise | greater than average rise | - |
| Ontario | 11 cm rise | 2 cm rise | much greater than average rise | - |

^a Lake level changes are based on the differences in levels at the beginning of the months and not the monthly average levels.

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

With 2023 in the books, we can look at the Great Lakes levels throughout the year. Read more about it below.

| Great Lakes water level information: Beginning-of-January level ^a | | | | | |
|---|----------------------|--|--------------------------|-------------------------------------|-------|
| Lake | Level ^{a,b} | Compared to January beginning-of-month average (1918–2022) | Compared to January 2023 | Compared to record high (1918–2022) | Notes |
| Superior | 183.36 m | 1 cm below | 18 cm below | 40 cm below | - |
| Michigan–Huron | 176.44 m | 11 cm above | 1 cm above | 82 cm below | - |
| St. Clair | 175.20 m | 28 cm above | 8 cm below | 67 cm below | - |
| Erie | 174.30 m | 27 cm above | 12 cm above | 59 cm below | - |
| Ontario | 74.54 m | 2 cm below | 1 cm above | 65 cm below | - |

^a At the beginning of January, all of the Great Lakes were at least 16 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 Low Water Datum – Great Lakes Coordinating Committee at <https://www.greatlakescc.org/en/international-great-lakes-datum-update/low-water-datum/>

^b 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 at <https://www.greatlakescc.org/en/international-great-lakes-datum-update/>

Water levels forecast

Lake Superior ended the month just below its average level and is expected to remain near average under typical water supply conditions. If there are very wet water supply conditions, lake levels could move above average, while very dry conditions could result in lake levels moving further below average.

Lake Michigan-Huron is expected to remain above average under either above average or average water supply conditions. Drier than average conditions could result in lake levels falling below average by early spring.

Lake Erie is also expected to stay above average under most water supply scenarios, although very dry water supply conditions could result in lake levels falling below average by early spring.

Lake Ontario water levels are just below average and are expected to remain near average under typical water supply conditions. Wetter than average water supply conditions may result in the level moving above average, while drier than average water supply conditions would result in the level moving further below average.

| December basin statistics | | | |
|---------------------------------|--|---|---|
| Lake | Precipitation (percentage of LTA) ^{a,b} | Net basin supply (probability of exceedance) ^{c,d} | Outflows (percentage of LTA) ^a |
| Superior | 71% | 5% (very wet) | 104% |
| Michigan-Huron | 63% | 16% (very wet) | 110% |
| Erie (including Lake St. Clair) | 87% | 34% (wet) | 106% |
| Ontario | 100% | 10% (very wet) | 108% |

^a As a percentage of the long-term average (LTA).
^b Environment and Climate Change Canada – Canadian Precipitation Analysis System
^c <5% extremely wet; <25% very wet; <45% wet; 45-55% average; >55% dry; >75% very dry; >95% extremely dry.
^d Please refer to the LEVELnews “What is net basin supply” (<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 description of net basin supply.
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.

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 <https://www.tides.gc.ca/en/monthly-water-level-bulletin-great-lakes-and-montreal-harbour>.

Review of 2023 Great Lakes water levels

2023 saw the Great Lake levels returning closer to average for lakes Superior and Ontario, with lakes Michigan-Huron and Erie remaining above average throughout the year.

The year started out with average net basin supplies throughout the Great Lakes Basin, but wet conditions were predominant throughout February and March, except for the Michigan-Huron Basin, which experienced dry conditions for the same months. Net basin supply in May for the Lake Superior Basin was the third highest on record, with Lake Michigan-Huron and Lake Ontario basin also experiencing wet conditions. The summer months brought dry conditions throughout the Great Lakes Basin, with the exception of lakes Erie and Ontario which experienced very wet net basin supply conditions in August. The fall months from September to the beginning of December were characterized by very dry conditions throughout the Great Lakes Basin.

Lake Superior started 2023 with well above average levels, which persisted until April. Lake Superior levels peaked in June, earlier than the typical peak in August or September. Levels remained high throughout the summer but then, as a result of very dry water supply conditions in the fall season, dropped to close to average levels in October and remained there for the rest of the year. The water level drop from September to December was the fourth largest decline on record.

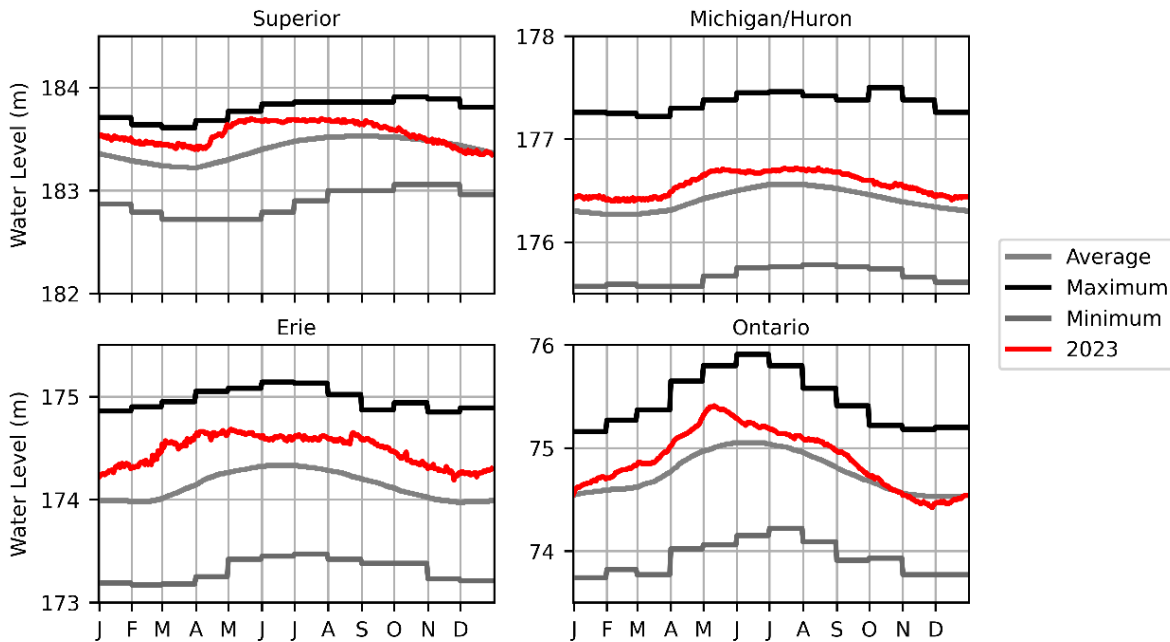
Lake Michigan-Huron experienced higher than average water levels for all of 2023. Levels followed a typical seasonal pattern for the year, experiencing its yearly peak in July.

Lake Erie experienced much higher than average water levels throughout 2023. Levels followed a relatively typical seasonal pattern for the year; however, it reached an early peak in May when it

typically peaks in June. Lake levels remained high throughout the fall even though the lake experienced its fifth largest fall (September to December) decline on record.

Lake Ontario started the year with close to average levels, but its water levels increased until it reached an early peak in May (a month earlier than usual), at a level well above average. Its level then decreased for the remaining of the year, reaching average levels by November, as a result of very dry water supply conditions throughout the fall season. The water level decline was the third largest for the fall season.

The 2023 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 (1918-2022).



Flood information

With water levels remaining high on some lakes, there is a high risk of flooding. Great Lakes water levels are difficult to predict weeks in advance due to natural variations in weather. To stay informed about 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 <https://www.ijc.org/en/labc>, and <https://ijc.org/en/loslrb>.

Information on current water levels and marine forecasts

Monthly levels: A monthly water level bulletin, produced by Fisheries and Oceans Canada is available at <https://www.tides.gc.ca/en/monthly-water-level-bulletin-great-lakes-and-montreal-harbour> and click on the link “Full Monthly Water Level Bulletin for the Great Lakes and Montréal Harbour (PDF)”. This publication is intended to complement the information provided by LEVELnews on a monthly basis.

Daily levels: Current daily lake-wide average levels of all the Great Lakes are available at <https://lre-wm.usace.army.mil/reports/greatLakes/greatLakesLevelsThisMonth/greatLakesLevelsThisMonth.html>. 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 <https://canada-preview.adobecqms.net/en/environment-climate-change/services/water-overview/quantity/great-lakes-levels-related-data.html>. 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 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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