GREAT LAKES WATER LEVELS

Lauren Fry, PhD
Office of Great Lakes Hydraulics and Hydrology
USACE Detroit District
26 February 2020

“The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation.”
GREAT LAKES WATER LEVELS

1. Introduction to the Great Lakes
2. Where are water levels now, and how do water levels compare with historical levels?
3. What causes water levels to change, and why are water levels so high?
4. What can we expect over the next 6-12 months?
GREAT LAKES WATER LEVELS

1. Introduction to the Great Lakes
2. Where are water levels now, and how do water levels compare with historical levels?
3. What causes water levels to change, and why are water levels so high?
4. What can we expect over the next 6-12 months?
Great Lakes coastal watershed counties are home to the third largest number of U.S. residents when compared to other coasts.

Alaska (1 million people)

West Coast (40 million people)

Great Lakes (27 million people)

East Coast (70 million people)

Hawaii & U.S. Pacific Remote Islands (2 million people)

Gulf Coast (21 million people)

Puerto Rico & U.S. Virgin Islands (4 million people)

Based on American Community Survey 5-Year Estimates for watershed counties (via NOAA NOS Office of Coastal Management), and 2010 U.S. Census data for some island areas. Rounded to the nearest million.
GREAT LAKES WATER LEVELS

1. Introduction to the Great Lakes
2. Where are water levels now, and how do water levels compare with historical levels?
3. What causes water levels to change, and why are water levels so high?
4. What can we expect over the next 6-12 months?
Great Lakes Water Levels (1918–2020)

Lake Superior

Lake Michigan–Huron

Lake St. Clair

Lake Erie

Lake Ontario

The monthly average levels are based on a network of water level gages located around the lakes. Elevations are referenced to the International Great Lakes Datum (1985). Water levels have been coordinated through 2019. Values highlighted in gray are provisional.
Decade plus of low water with record lows.
Decade plus of low water with record lows

Record rise and record highs

The monthly average levels are based on a network of water level gauges located around the lakes. Elevations are referenced to the International Great Lakes Datum (1985). Water levels have been coordinated through 2019. Values highlighted in gray are provisional.
Photo courtesy of the Port Director of the Port of Monroe
GREAT LAKES WATER LEVELS

1. Introduction to the Great Lakes
2. Where are water levels now, and how do water levels compare with historical levels?
3. What causes water levels to change, and why are water levels so high?
4. What can we expect over the next 6-12 months?
FACTORS IMPACTING WATER LEVELS
FACTORS IMPACTING WATER LEVELS

WINTER
- Snow accumulation

SPRING
- Snow melt, rainfall, increased runoff

SUMMER
- Increased sunshine warms lake water

FALL
- Increased evaporation
FACTORS IMPACTING WATER LEVELS

Evaporation → Precipitation → Runoff

Net Basin Supply
FACTORS IMPACTING WATER LEVELS

Inflow from Upstream Lake

Evaporation

Precipitation

Runoff

Net Basin Supply

Outflow
## Precipitation Ranks for Great Lakes Basin

Wettest 12, 24, 48 and 60 month periods in 120 plus years for the Great Lakes

[Map of Great Lakes Basin]

### NOAA National Centers for Environmental Information, Climate at a Glance

<table>
<thead>
<tr>
<th>Period</th>
<th>12-Month Rank</th>
<th>24-Month Rank</th>
<th>48-Month Rank</th>
<th>60-Month Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan–Dec 2019</td>
<td>125th Driest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
</tr>
<tr>
<td>12-Month</td>
<td>42.40&quot; (1,076.96mm)</td>
<td>32.78&quot; (832.61mm)</td>
<td>9.62&quot; (244.35mm)</td>
<td>1930</td>
</tr>
<tr>
<td>Jan 2018–Dec 2019</td>
<td>124th Driest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
</tr>
<tr>
<td>24-Month</td>
<td>80.82&quot; (2,052.83mm)</td>
<td>65.54&quot; (1,664.72mm)</td>
<td>15.28&quot; (388.11mm)</td>
<td>1963</td>
</tr>
<tr>
<td>Jan 2016–Dec 2019</td>
<td>122nd Driest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
</tr>
<tr>
<td>48-Month</td>
<td>157.75&quot; (4,006.85mm)</td>
<td>131.06&quot; (3,328.92mm)</td>
<td>26.69&quot; (677.93mm)</td>
<td>1936</td>
</tr>
<tr>
<td>Jan 2015–Dec 2019</td>
<td>121st Driest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
<td>1st Wittest</td>
</tr>
<tr>
<td>60-Month</td>
<td>192.42&quot; (4,887.47mm)</td>
<td>163.83&quot; (4,161.28mm)</td>
<td>28.59&quot; (726.19mm)</td>
<td>1934</td>
</tr>
</tbody>
</table>

Wettest to Date
GREAT LAKES WATER LEVELS

1. Introduction to the Great Lakes
2. Where are water levels now, and how do water levels compare with historical levels?
3. What causes water levels to change, and why are water levels so high?
4. What can we expect over the next 6-12 months?
MONTHLY FORECAST

Done at the beginning of each month
Forecasts out 6 months
6-MONTH WATER LEVEL FORECAST

6-MONTH WATER LEVEL FORECAST

Projected levels (dashed green line):

- In period of seasonal decline until March, then seasonal rise
- At or within a couple of inches of record highs
- January level was 4 inches above January 2019 level

6-MONTH WATER LEVEL FORECAST

Projected levels (dashed green line):

- No further seasonal decline is projected.
- 4 to 7 inches above record highs
- January level was 17 inches above January 2019 level.

6-MONTH WATER LEVEL FORECAST

Projected levels (dashed green line):

• In period of seasonal rise until May

• 5 inches above record high to 4 inches below record high

• January level was 7 inches above January 2019 level

6-MONTH WATER LEVEL FORECAST

Projected levels (dashed green line):

- In period of seasonal rise until April
- 13 to 23 inches above long term average
- January level was 9 inches above January 2020 level

https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Leve...
OFFICE OF GREAT LAKES HYDRAULICS AND HYDROLOGY

John Allis, Chief
john.t.allis@usace.army.mil
(313) 226-2137

Lauren Fry
lauren.m.fry@usace.army.mil
(313) 226-3020

Deanna Apps
deanna.apps@usace.army.mil
(313) 226-2979