

# GREAT LAKES WATER LEVELS AND BASIN CONDITIONS

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U.S. ARMY



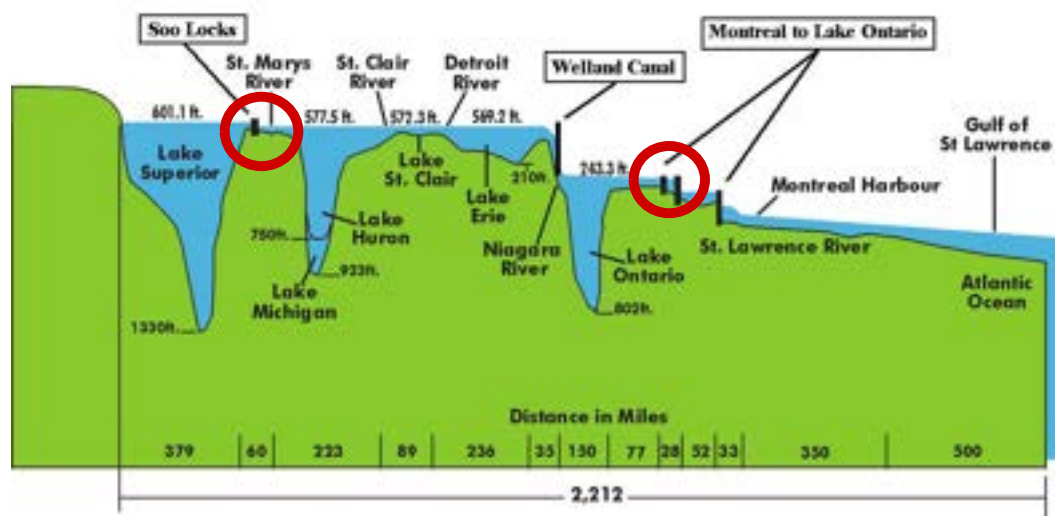
US Army Corps  
of Engineers



# MONITORING GREAT LAKES WATER LEVELS

***The Great Lakes Basin***

- 14,000 miles of shoreline
- 95,000 square miles of water
- 200,000 square miles of land
- 8 States & 2 Provinces



○ Outflow regulation





# MONITORING GREAT LAKES WATER LEVELS



## Daily Average Water Levels Based on Lake-Wide Average Network

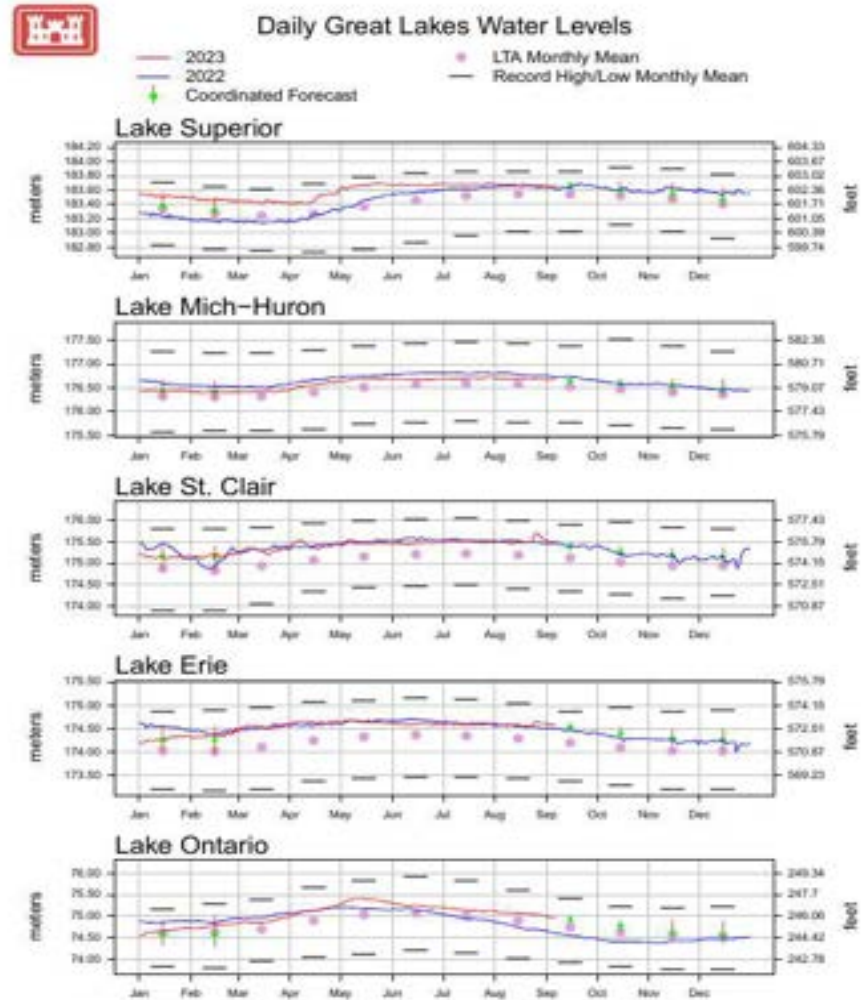
- **Lake Superior:** Duluth, Marquette, Pt. Iroquois, Thunder Bay, Michipicoten
- **Lakes Michigan-Huron:** Harbor Beach, Ludington, Mackinaw City, Milwaukee, Tobermory, Thessalon
- **Lake St. Clair:** St. Clair Shores, Belle River
- **Lake Erie:** Toledo, Cleveland, Port Stanley, Port Colborne
- **Lake Ontario:** Oswego, Rochester, Toronto, Kingston, Port Weller, Cobourg



# MONITORING GREAT LAKES WATER LEVELS

Great Lakes Water Levels

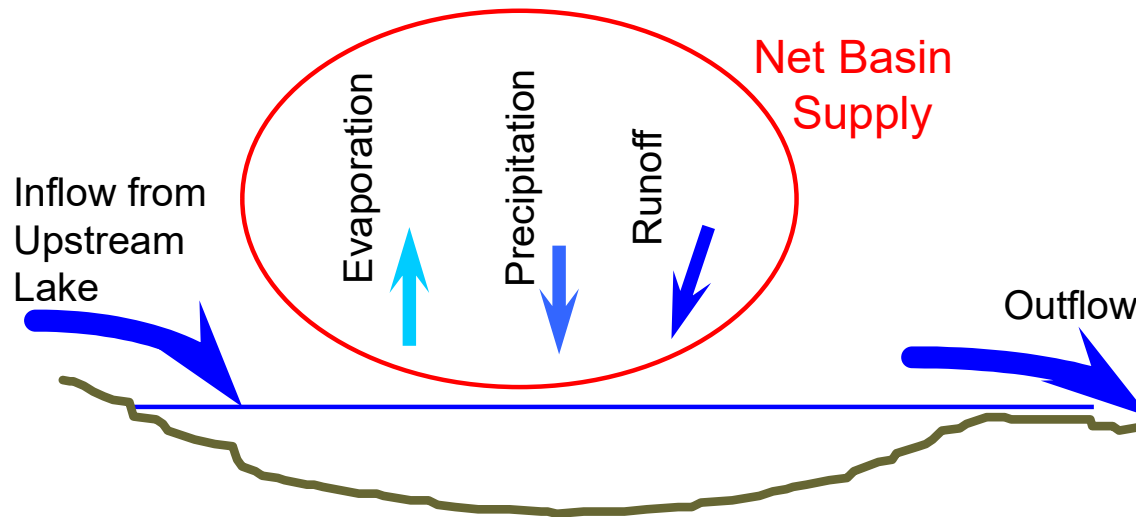
Date	Superior	Mich-Huron	St. Clair	Erie	Ontario
2023-09-01	602.49	579.66	575.85	572.87	246.00
2023-09-02	602.53	579.66	575.79	572.80	246.00
2023-09-03	602.53	579.66	575.72	572.77	245.96
2023-09-04	602.53	579.66	575.66	572.80	245.93
2023-09-05	602.49	579.66	575.66	572.77	245.93
2023-09-06	602.59	579.66	575.58	572.77	245.93
MEAN	602.53	579.66	575.72	572.80	245.96
LTA	602.17	579.17	574.54	571.52	245.21
MAX	603.22(2019)	581.96(1996)	577.03(2020)	573.72(2019)	247.41(1947)
MIN	600.46(2007)	576.64(1964)	571.98(1934)	568.83(1934)	242.49(1934)



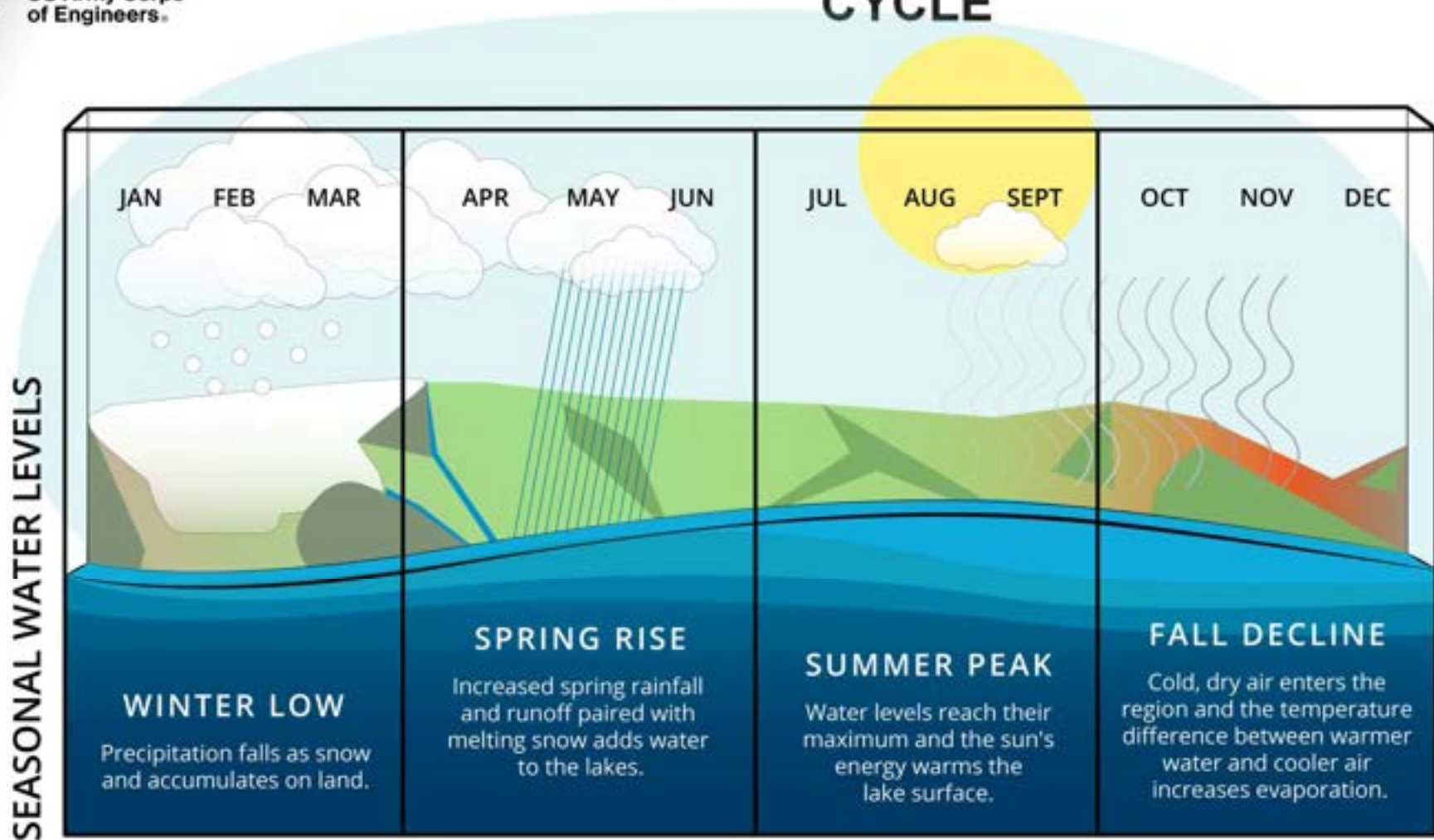
Lake-wide average levels are based on a network of water level gages located around the lakes. LTA and record levels are computed from a period of record of 1918 to 2022. Elevations are referenced to the International Great Lakes Datum (1985). Updated 2023-09-07

<https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Information-2/Water-Level-Data/>

# FACTORS IMPACTING WATER LEVELS



# ANNUAL WATER LEVELS AND THE HYDROLOGIC CYCLE



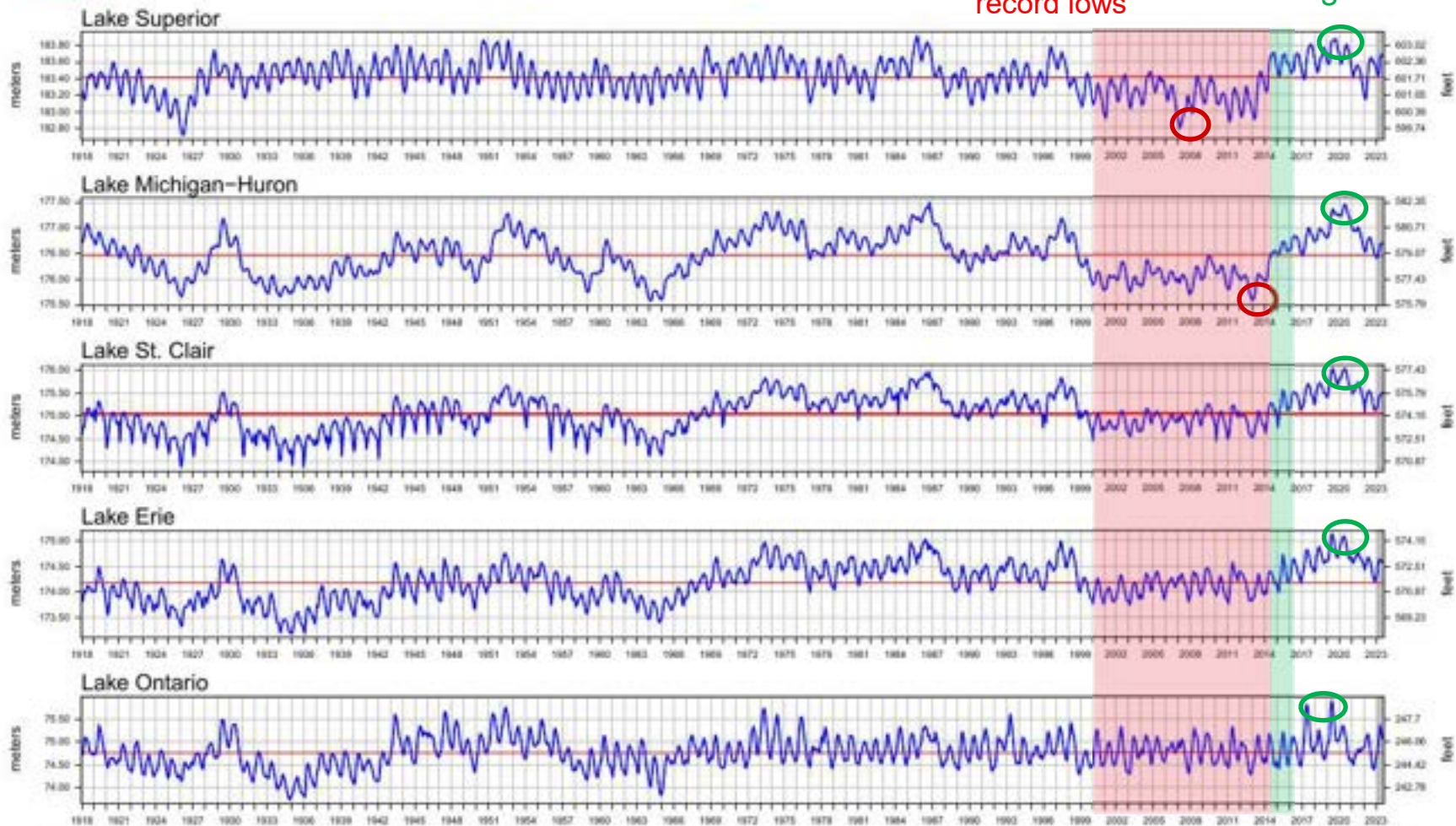


### Great Lakes Water Levels (1918-2023)

— Monthly Mean Level — Long Term Average Annual

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 gages located around the lakes. Elevations are referenced to the International Great Lakes Datum (1985).

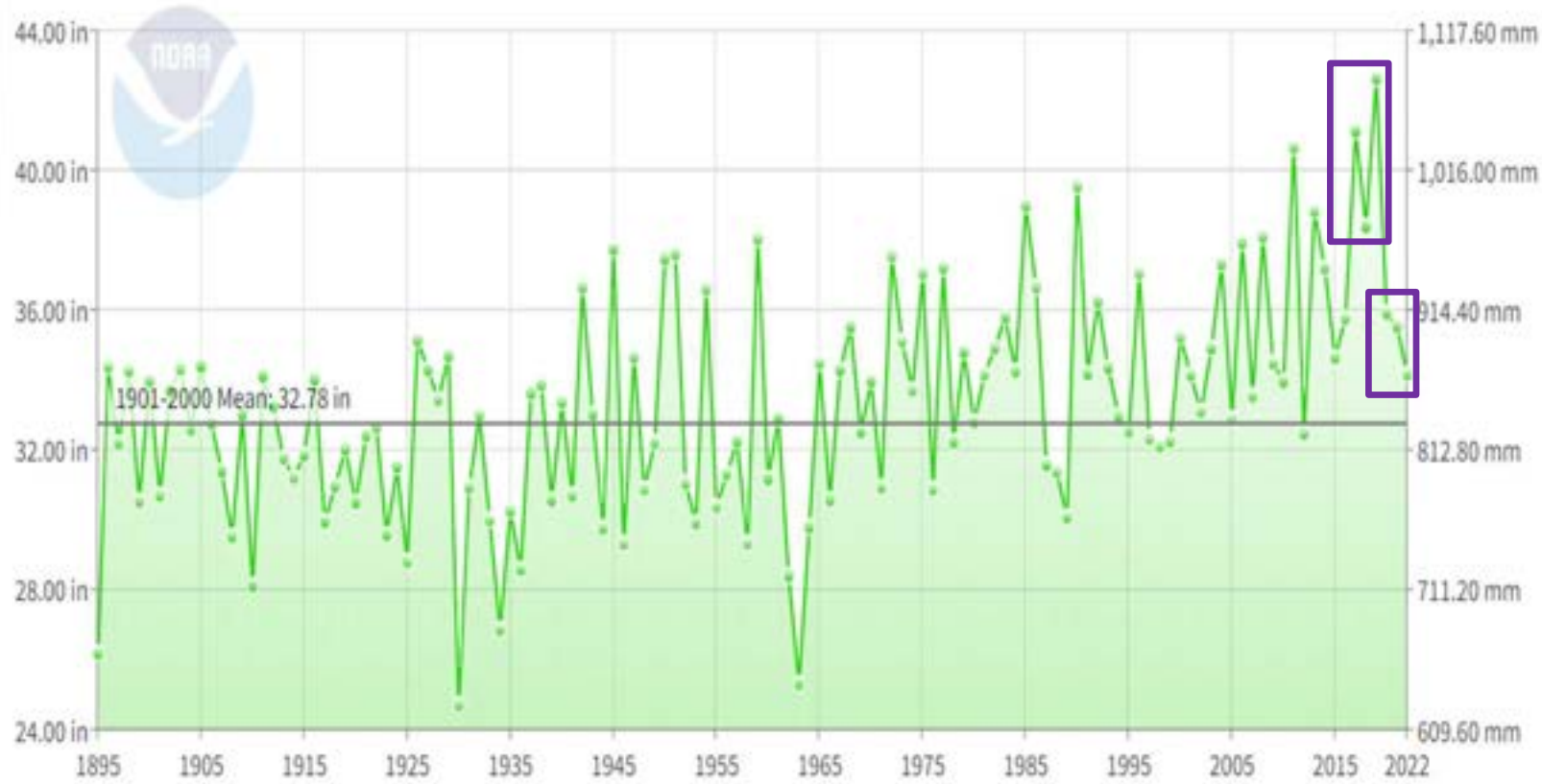
Water levels have been coordinated through 2022. Values highlighted in gray are provisional.



# RECENT BASIN CONDITIONS - PRECIPITATION

## Great Lakes Basin Precipitation

January-December



- 2017-19 precipitation very high
- Last 3 years, 2020-22 has been drier

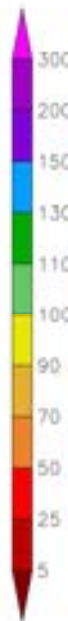
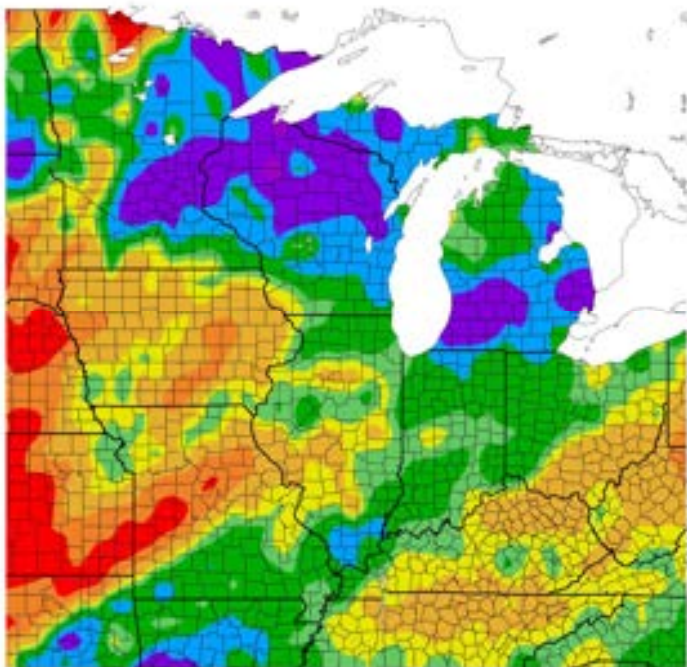


# RECENT BASIN CONDITIONS - PRECIPITATION

Change in conditions throughout the Year

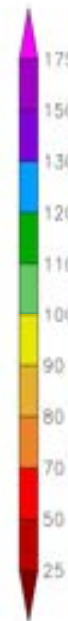
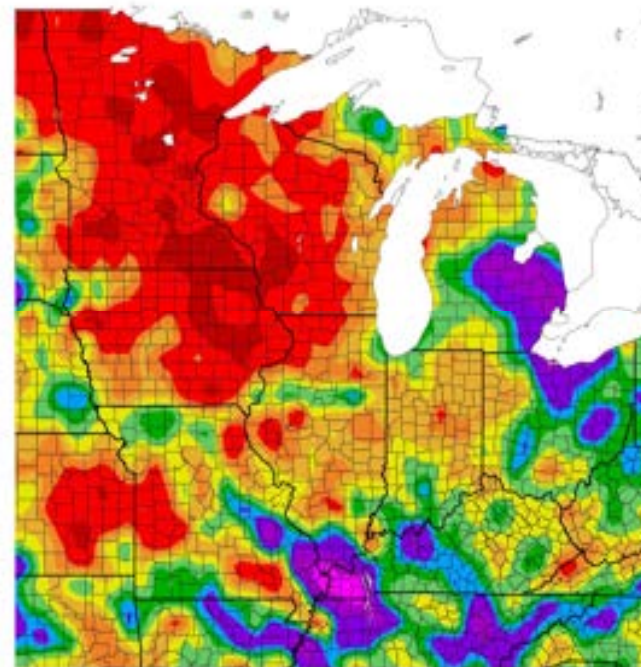
Feb. through April

Percent of Normal Precipitation (%)  
2/1/2023 - 4/30/2023



June through August

Percent of Normal Precipitation (%)  
6/1/2023 - 8/31/2023

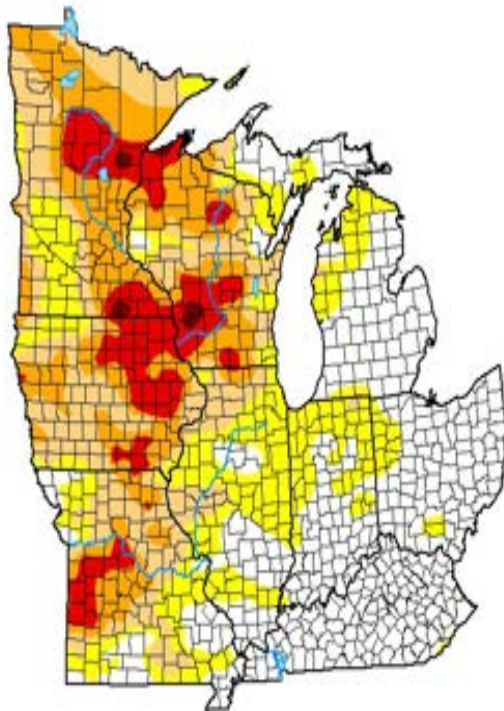




# RECENT BASIN CONDITIONS

## U.S. Drought Monitor Midwest

September 5, 2023  
(Released Thursday, Sep. 7, 2023)  
Valid 8 a.m. EDT



- Intensity:**
- None
  - D0 Abnormally Dry
  - D1 Moderate Drought
  - D2 Severe Drought
  - D3 Extreme Drought
  - D4 Exceptional Drought

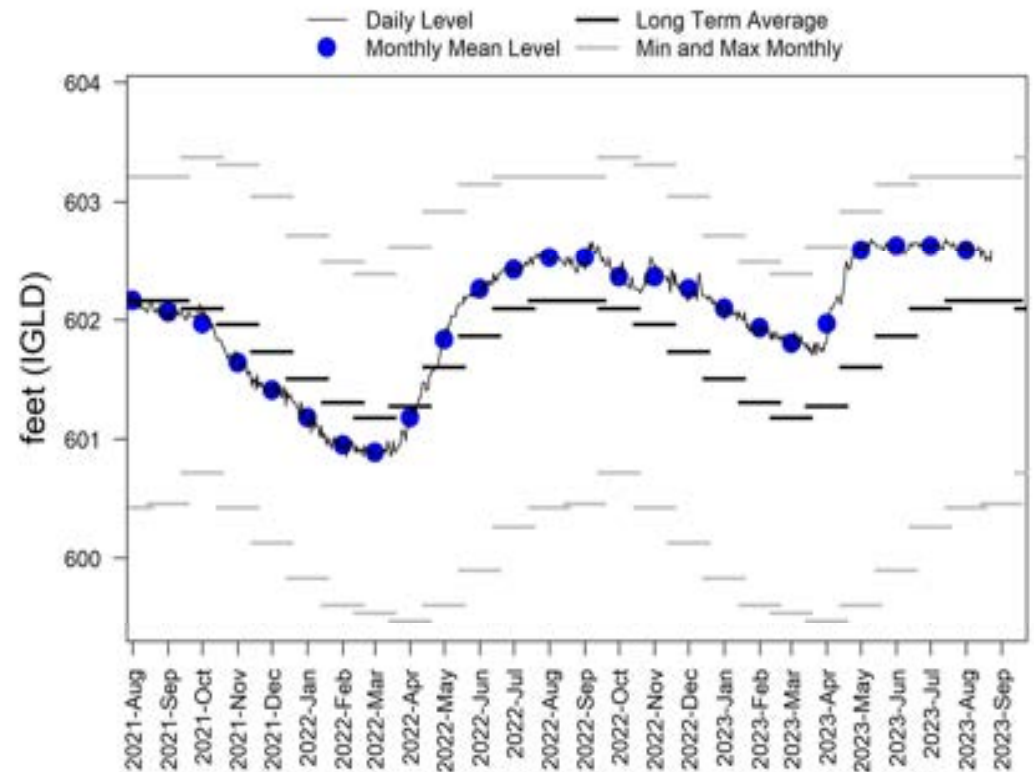
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

**Author:**  
Richard Tinker  
CPC/NOAA/NWS/NCEP



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

## Lake Superior Water Levels

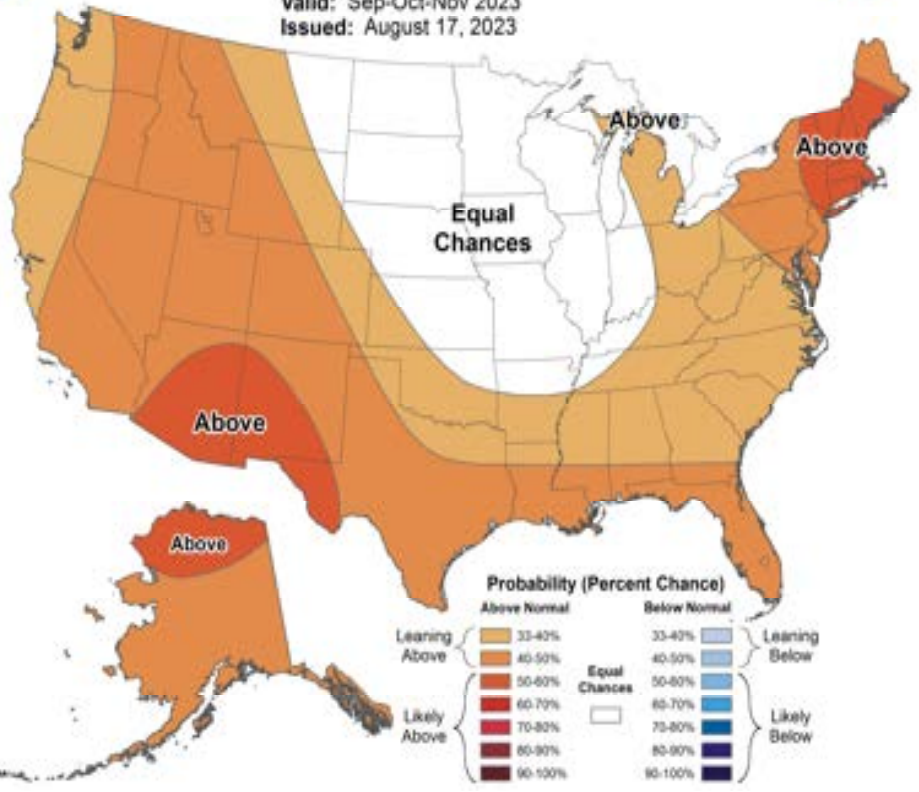




# SEASONAL FORECAST FOR 3-MONTH PERIOD (SEPT., OCT., NOV.)

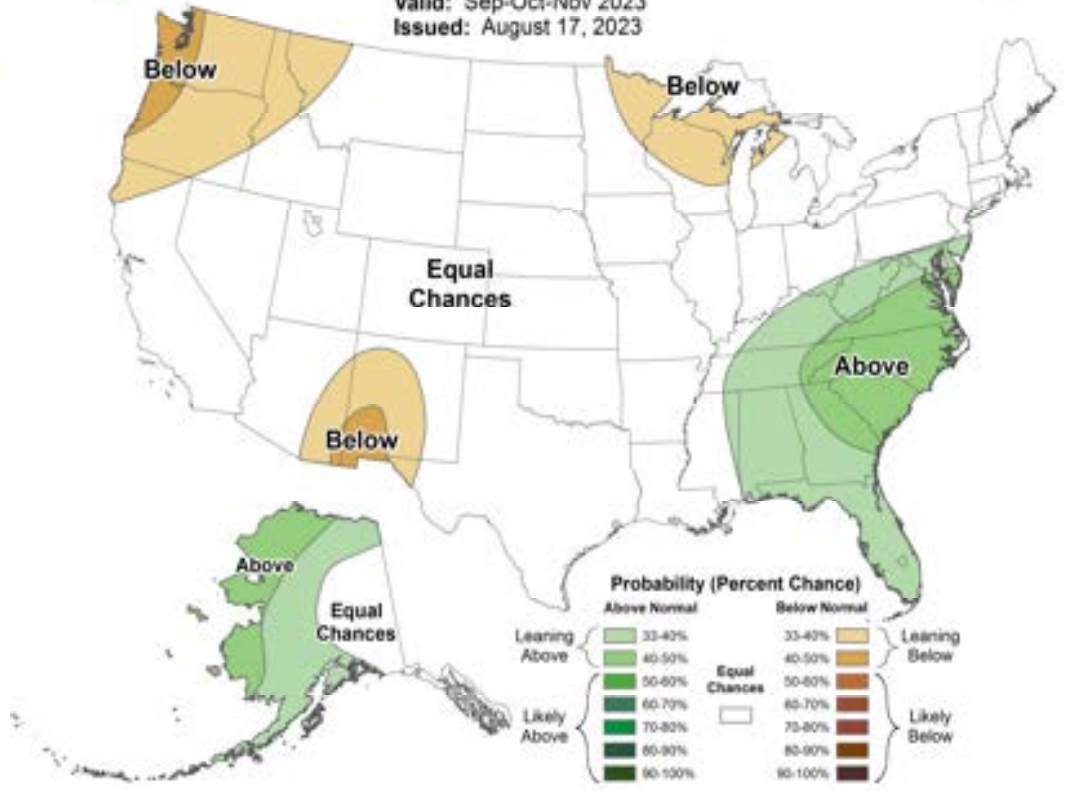
**Seasonal Temperature Outlook**

Valid: Sep-Oct-Nov 2023  
Issued: August 17, 2023



**Seasonal Precipitation Outlook**

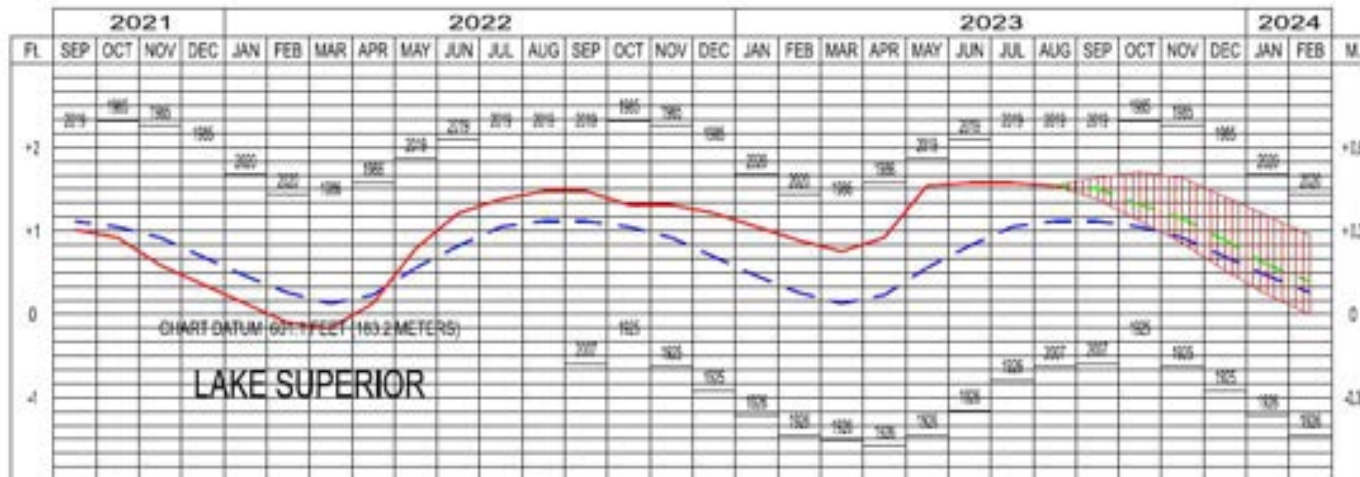
Valid: Sep-Oct-Nov 2023  
Issued: August 17, 2023





# 6-MONTH FORECAST (SEPTEMBER-FEBRUARY)

LAKE SUPERIOR WATER LEVELS - SEPTEMBER 2023



## Projected Levels (dashed green line):

- Heading into fall decline
- August 2023 level was 1 inch above the August 2022 level and 5 inches above the long-term average level.
- Forecast to remain 2 to 5 inches above long-term average levels over next 6 months.

**LEGEND**

LAKE LEVELS

RECORDED

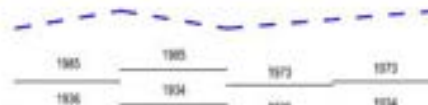
PROJECTED



AVERAGE \*\*

MAXIMUM \*\*

MINIMUM \*\*

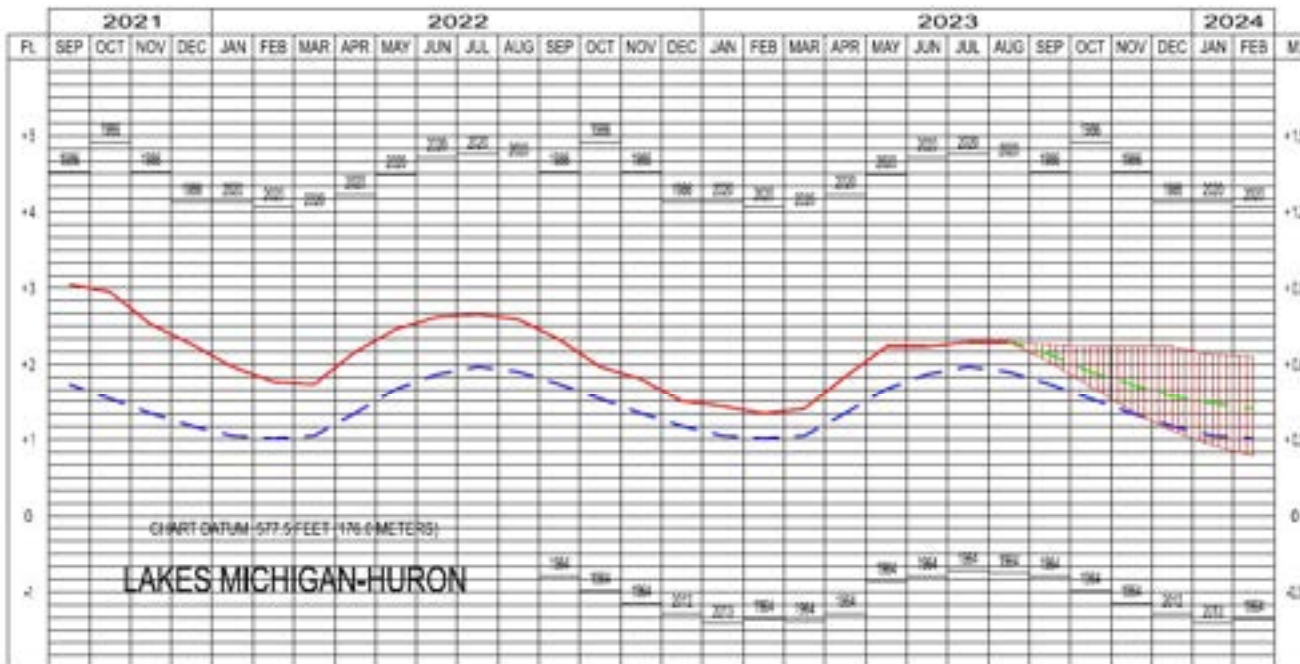


\*\* Average, Maximum and Minimum for period 1914-2022



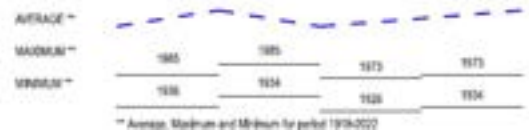
# 6-MONTH FORECAST (SEPTEMBER-FEBRUARY)

LAKES MICHIGAN-HURON WATER LEVELS - SEPTEMBER 2023



## Projected Levels (dashed green line):

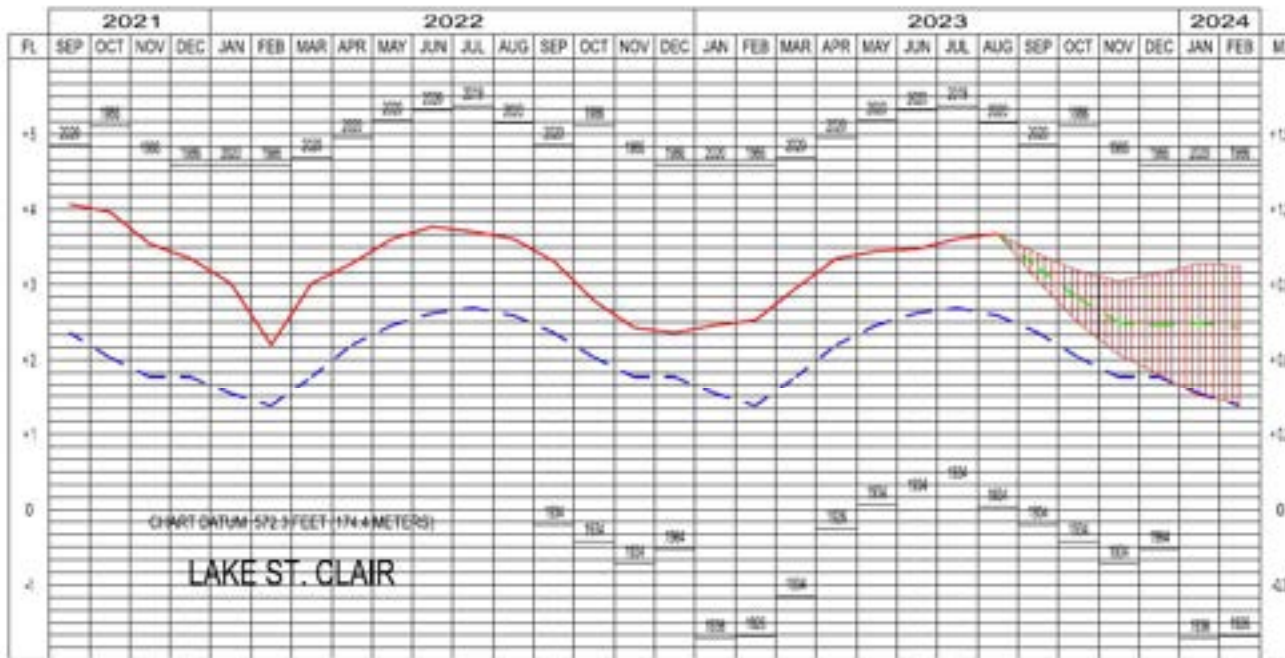
- Heading into fall decline
- August 2023 level was 4 inches below the August 2022 level and 5 inches above long-term average level.
- Forecast to be 4 to 5 inches above long-term average levels over the next 6 months.





# 6-MONTH FORECAST (SEPTEMBER-FEBRUARY)

LAKE ST. CLAIR WATER LEVELS - SEPTEMBER 2023



## Projected Levels (dashed green line):

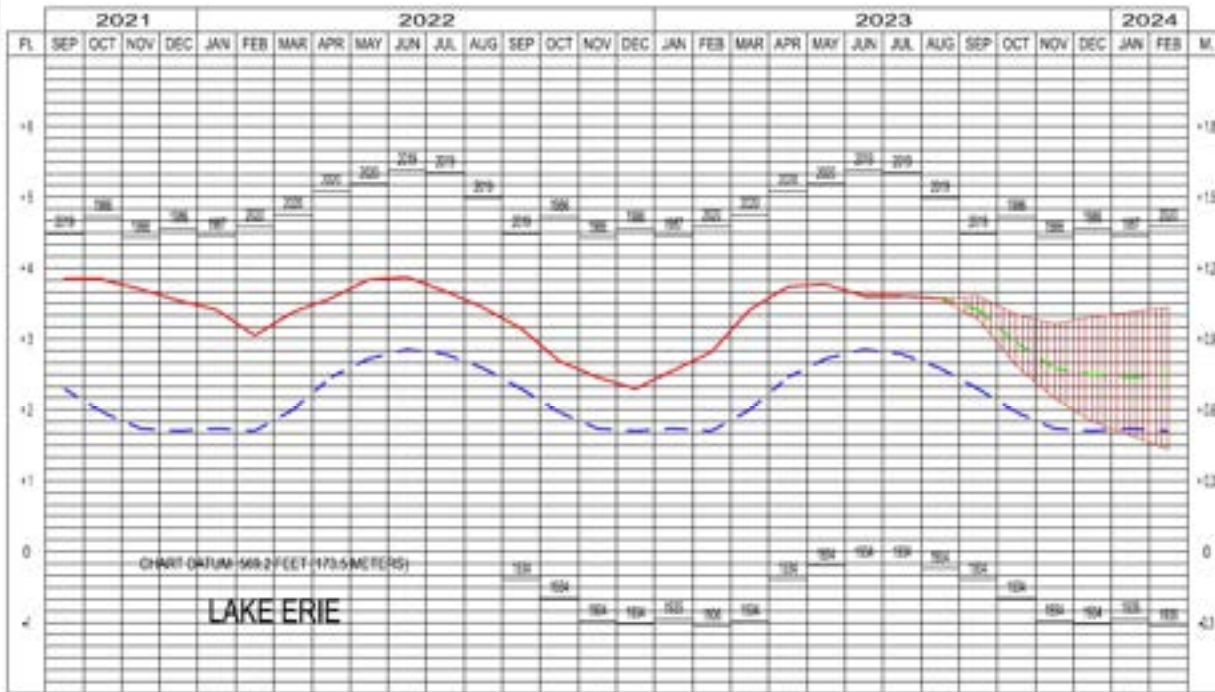
- Heading into fall decline
- August 2023 level was 1 inch above the August 2022 level and 13 inches above long-term average level.
- Forecast to be 8 to 13 inches above long-term average levels over the next 6 months.





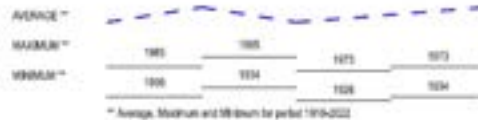
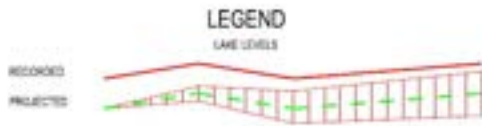
# 6-MONTH FORECAST (SEPTEMBER-FEBRUARY)

LAKE ERIE WATER LEVELS - SEPTEMBER 2023



## Projected Levels (dashed green line):

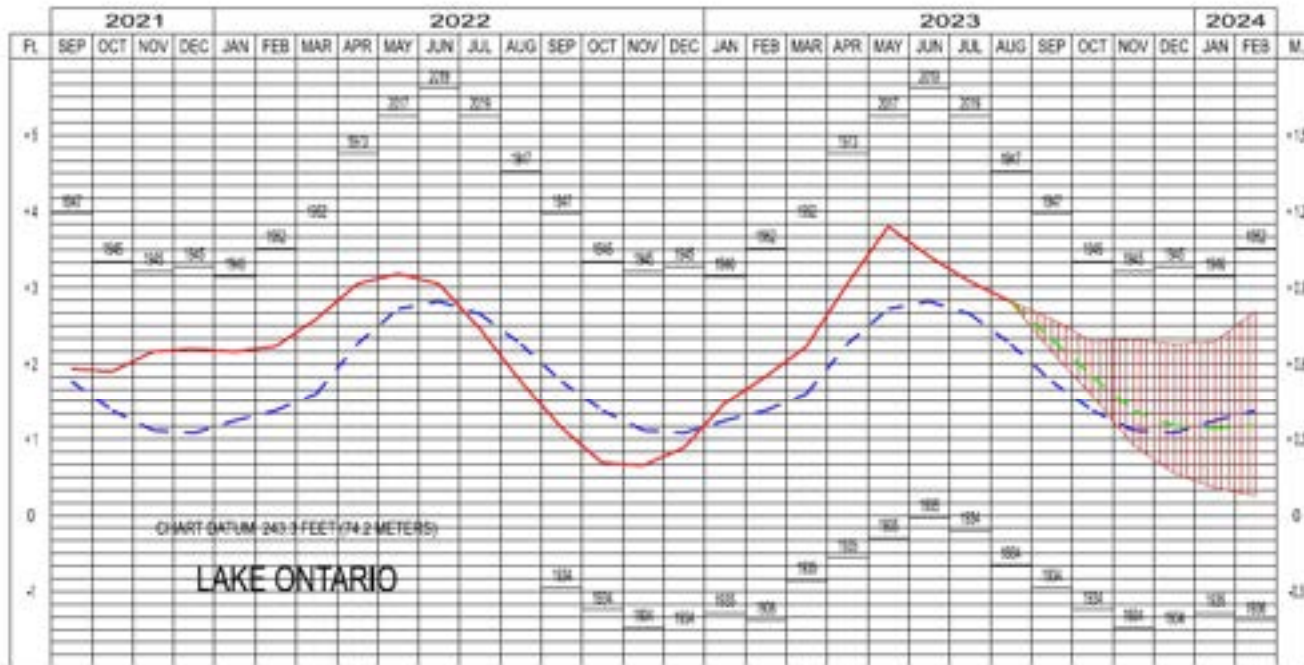
- In period of seasonal decline
- August 2023 level was 2 inches above its August 2022 level and 12 inches above long-term average level.
- Forecast to be 9 to 13 inches above long-term average levels over the next 6 months.





# 6-MONTH FORECAST (SEPTEMBER-FEBRUARY)

LAKE ONTARIO WATER LEVELS - SEPTEMBER 2023



## Projected Levels (dashed green line):

- In period of seasonal decline
- August 2023 level was 13 inches above the August 2022 level and 7 inches above long-term average level.
- Forecast to remain 1 to 7 inches above average levels through December and 1 to 2 inches below average levels in January and February.

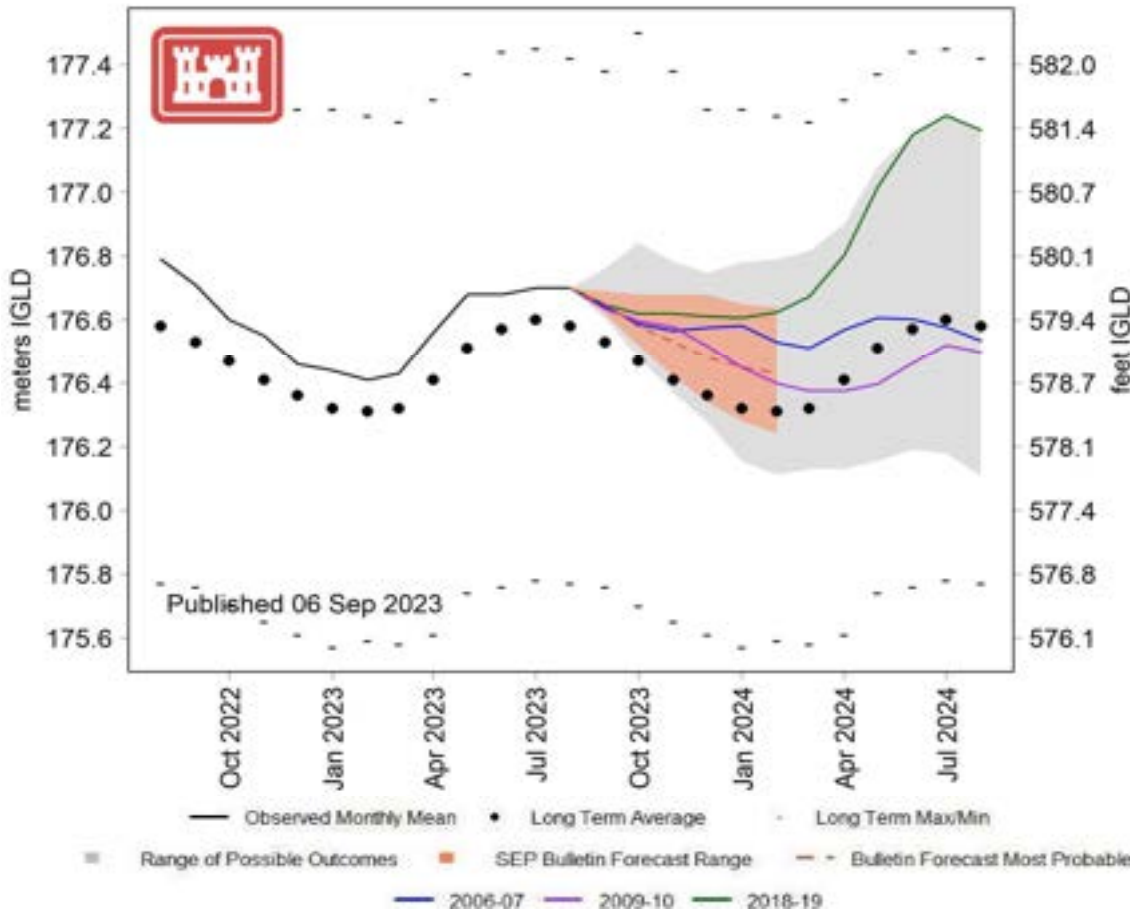






# WATER LEVEL FUTURE SCENARIOS

Lake Michigan-Huron Monthly Mean Water Levels



- Answers the question, What if.....
- Not a forecast
- Scenario driven based on historical supplies

Orange Plume – 6-Month Forecast

2006-07, 2009-10, 2018-19:  
Three years called out based on a direct transition from La Nina to El Nino

\*Note: Graphics updated monthly, scenarios updated every three months (Jan, Apr., Jul. Oct.)

<https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Level-Future-Scenarios/>

## KEY POINTS

- Water level fluctuations are primarily driven by weather and hydrologic conditions.
- Water levels are above average on all lakes but are forecast to remain below record high levels over the next 6 months.
- Regulation of outflows (St. Marys and St. Lawrence) cannot prevent extreme high or low water levels nor fully control water levels.
- For the Great Lakes, changes in climate impact the components of the water supply (precipitation, evaporation, and runoff) in complex and sometimes counteracting ways, making direct attribution of water level changes to climate change more challenging.
- Resilience to a wide range of water levels remains important.