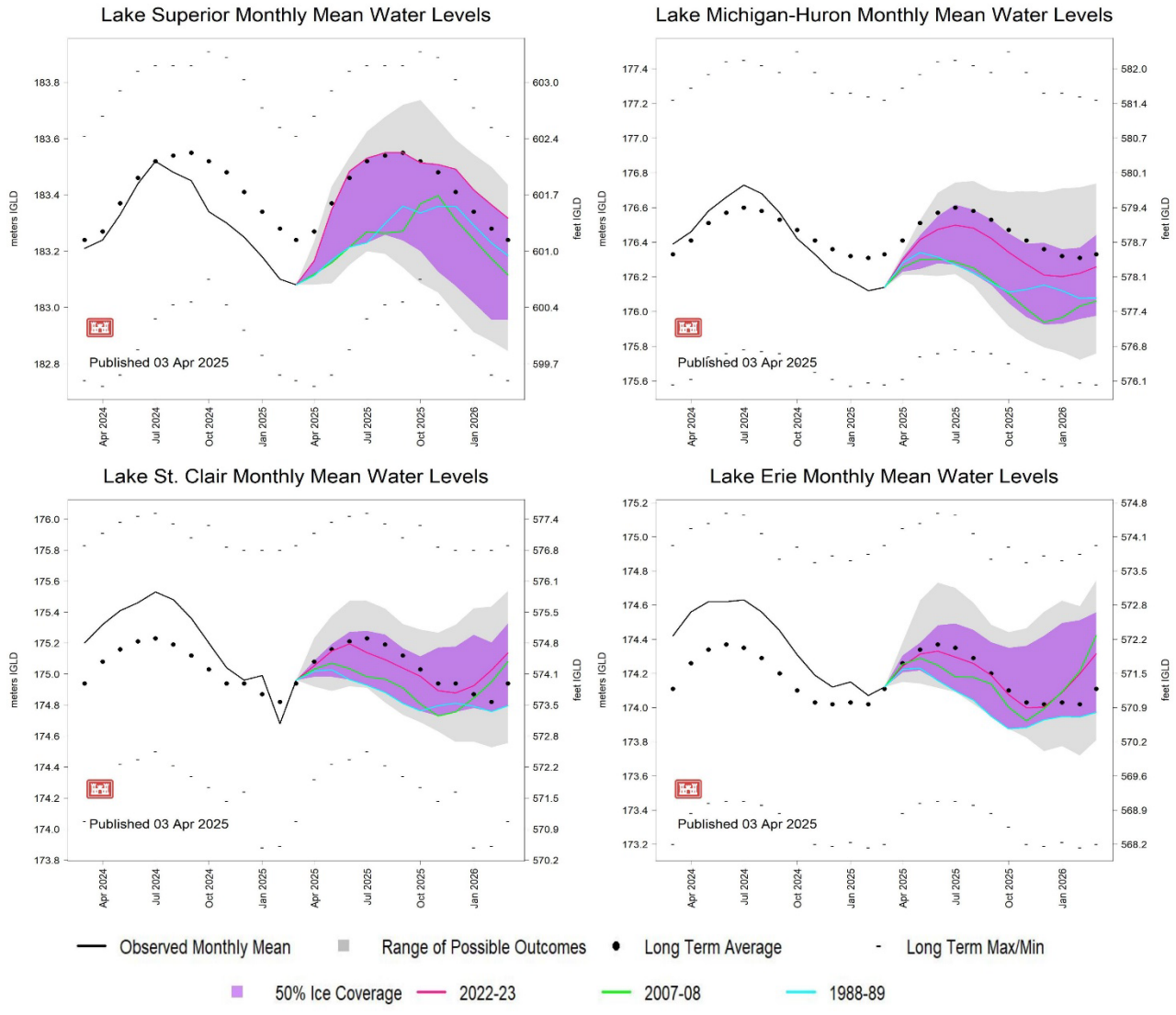
US Army Corps of Engineers ®
Detroit District

Great Lakes Water Level Future Scenarios

Volume 39 April 2025: Average Ice and Cooling Waters



*At this time, water level outlooks for Lake Ontario are still under development due to complexities of its weekly regulation process. An experimental version is shown later in this report. For the official 6-month forecast of all lakes, including Lake Ontario, see the Monthly Bulletin of Great Lakes Water Levels.

Overview

The April 2025 Water Level Future Scenario Product explores years following winters that experienced a peak ice cover of around 50% and quickly cooling surface water temperatures. Figure 1 shows the maximum ice coverage of the Great Lakes basin and can be accessed at the following link: NOAA GLERL Ice Conditions. Conditions during winter 2024-25 experienced just below average ice cover across all lakes but peaked to 52% in mid-February (near the long term average), however the coverage shifted back to below average after this peak. In addition, 2025 also experienced a surface water temperature drop of about 5 degrees Celsius in two months when temperatures were averaged across Lakes Superior and Michigan-Huron compared to a typical decrease of 3 degrees Celsius.

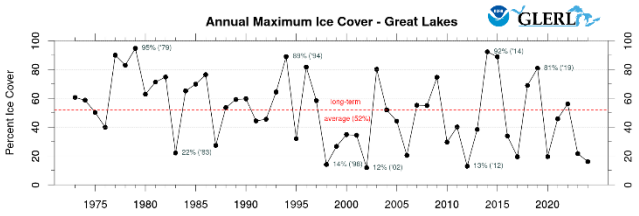


Figure 1: Maximum ice cover for the Great Lakes from 1973-2024 from NOAA GLERL

This edition of the Water Level Future Scenarios incorporates the projection of water levels if Net Basin Supply (NBS) values are similar to other years when ice coverage peaked around 50%. Three prior years considered for this analysis that experienced quickly cooling water temperatures and 50% ice cover were 1988, 2007, and 2022. Warm water temperatures with cool air above initiates evaporation across the lakes. As the water temperature drop, and ice form, evaporation is slowed for the season. The lake graphics on Page 1 were generated using NBS sequences from April to March 1988-89 (blue line), 2007-08 (green line), and 2022-23 (pink line). Each of these lines on the graphics represent projected water levels for April 2025 through March 2026 if the water supply conditions followed the other 50% peak ice coverage years. The purple plume represents 12 NBS sequences for years that contained peak ice coverage around 50%.

The gray shaded region of the plot represents the full range of possible outcomes using historical NBS sequences from 1900 to 2024. This analysis also includes an experimental version of Lake Ontario (Figure 2). Scenario for 2022-23 is not included in the Lake Ontario graphic due to historical NBS data only being used through 2019.

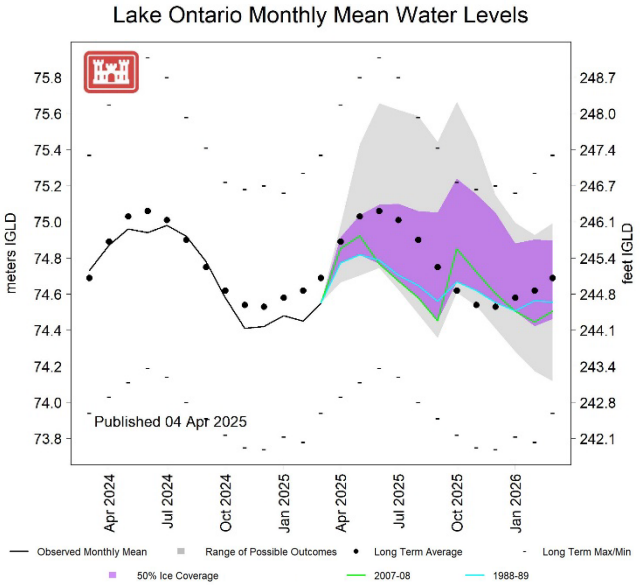


Figure 2: An experimental version Lake Ontario graphic with the new future scenario reflected.

Purple Plume

The purple plume represents what the water levels on each lake would be if NBS conditions were similar to years where peak ice coverage was about 50%. Across all lakes, the purple plume tends to range between middle and lower sections of the gray band. In addition, the plume indicates near to below long-term average water level conditions for Lakes Superior and Michigan-Huron. Lakes St. Clair and Erie lean towards below average water levels for the first 6 months before transitioning to above average levels in the latter 6 months. For Lake Ontario, the purple plume is leaning below average for the first third of the scenario, above average for the second third before coming back to average toward the end of the scenario.

1988-89 Scenario

The 1988-89 NBS scenario is shown on the plots by the blue line. The blue line represents the water levels that could occur if similar NBS conditions are experienced in 2025-26 as were experienced in 1988-89. This scenario is called out as it represents a time when maximum ice coverage was 51% and water temperatures, averaged across Lakes Superior and Michigan Huron dropped 4.6 degrees Celsius from January 1, 1988, to March 1, 1988.

The ice coverage in 1988 overall was near the long-term average (LTA) ice cover. However, ice started in January, a month and a half after the typical starting time and grew rapidly. NBS was generally at or below average for the first 6 months after April, primarily driven by low precipitation and runoff. Evaporation for this year spanned above and below average, though followed the typical seasonal pattern.

If NBS patterns for this upcoming 12-months followed the same pattern as the 1988-89 scenario, Lake Superior's water level would start well below average, and end just below average. Lake Michigan-Huron could remain well below average for much of the 12 months, though could experience an unusual rise in water levels in the late fall 2025. Both Lakes St. Clair and Erie would remail below average for much of the 12 months, finishing near average. However, these two lakes would be experiencing some of the lowest NBS patterns in the period of record. Lake Ontario would experience below average water levels through the summer before rising somewhat unexpectedly in September. However, these levels would dip back to below average in January and remain below average for the rest of the scenario.

2007-08 Scenario

The 2007-08 NBS scenario is shown on the plots by the green line. The green line represents the water levels that could occur if similar NBS conditions are experienced in 2025-26 as were experienced in 2007-08. This scenario is called out as it represents a time when maximum ice coverage was 52% and water temperatures, averaged across Lakes Superior and Michigan-Huron dropped 4.8 degrees Celsius from January 1, 2007, to March 1, 2007.

Ice coverage in 2006 once again started later in the season, however, it remained below average for most of the season, and only spiked twice to above average (and the maximum) in mid-February and early March. NBS was generally below average for Lakes Superior, Michigan-Huron, Erie, and Ontario through December. Lake St. Clair had near average NBS. NBS rose to above average in the first few months of 2008. Runoff during this spring and summer were generally near average, though precipitation was especially low, for all but Lake Superior. Evaporation was above average in the first few months after April, however, it approached near normal towards the end of the calendar year.

If 2025-26 had a similar NBS pattern to 2007-08, Lakes Superior and Michigan-Huron would remain below LTA water levels for the entire 12 months. Both would end near the same level as the 1988-89 scenario. On Lake St. Clair, water levels would remain below average until the turn of the year in January 2026 when they would rise earlier and faster than normal, reaching water levels above LTA in February. Lake Erie would experience something similar, but the first 6 months would be near average before transitioning to above average levels in January 2026. Lake Ontario water levels would follow a similar pattern as the 1988-89 scenario, except the peaks and valleys are more pronounced at the end of the scenario, the water level would be below average.

2022-23 Scenario

The 2022-23 NBS scenario is shown on the plots by the pink line. The pink line represents the water levels that could occur if similar NBS conditions are experienced in 2025-26 as were experienced in 2022-23. This scenario is called out as it represents a time when maximum ice coverage was 53% and water temperatures, averaged across Lakes

Superior and Michigan-Huron dropped 5.3 degrees Celsius from January 1, 2022, to March 1, 2022.

In 2022, ice formation also started slightly late and below average, however, it remained near average throughout the season. This year experienced many peaks and valleys with ice coverage, but generally followed the LTA ice pattern. Generally, NBS was around average for the first 9 months of this scenario. Precipitation and runoff were near average or just below average for most of the year. Evaporation tended to also be near average, with some months and lakes wavering slightly above or below.

Different from the other scenarios, if the 2025-26 NBS pattern followed 2022-23, water levels would be on the higher side of the purple plume. Lake Superior would experience water levels near average until going to slightly above average in November 2025. Lake Michigan-Huron will be slightly below average for the entirely of the 12 months. Lakes St. Clair and Erie have a similar pattern, with water levels being near LTA for the first part of the outlook, before rising to above average at the start of 2026. This scenario is not included in the Lake Ontario graphic as historical NBS data past 2019 is not available.

Summary & Climatic Outlook

Overall, if any of these three NBS scenarios highlighted occurred, near or below average water levels would occur for all the lakes for the first 6 months of the outlook. For the second half, some lakes could see and early rise in water levels, resulting in above LTA levels. The impact of NBS on the Great Lakes is complex, such that a single event of cooling water temperatures or ice cover cannot determine long-term trends of water levels. Evaluating isolated climate scenarios does not result in conclusive predictions of water levels. However, water levels are not expected to reach record highs or lows within the next 12 months when using a historical NBS approach of possible scenarios (the grey plume).

The Climate Prediction Center's April, May, and June outlook (Figure 3) indicates that in the eastern portion of the basin, temperatures are forecast to be above normal, while for the rest of the basin equal chances of above, below, or near normal temperatures are forecast. The seasonal precipitation forecast indicates a likelihood towards above normal precipitation for a portion of Michigan, Ohio, and Indiana. The rest of the basin has equal chances for above or below normal precipitation (Figure 3).

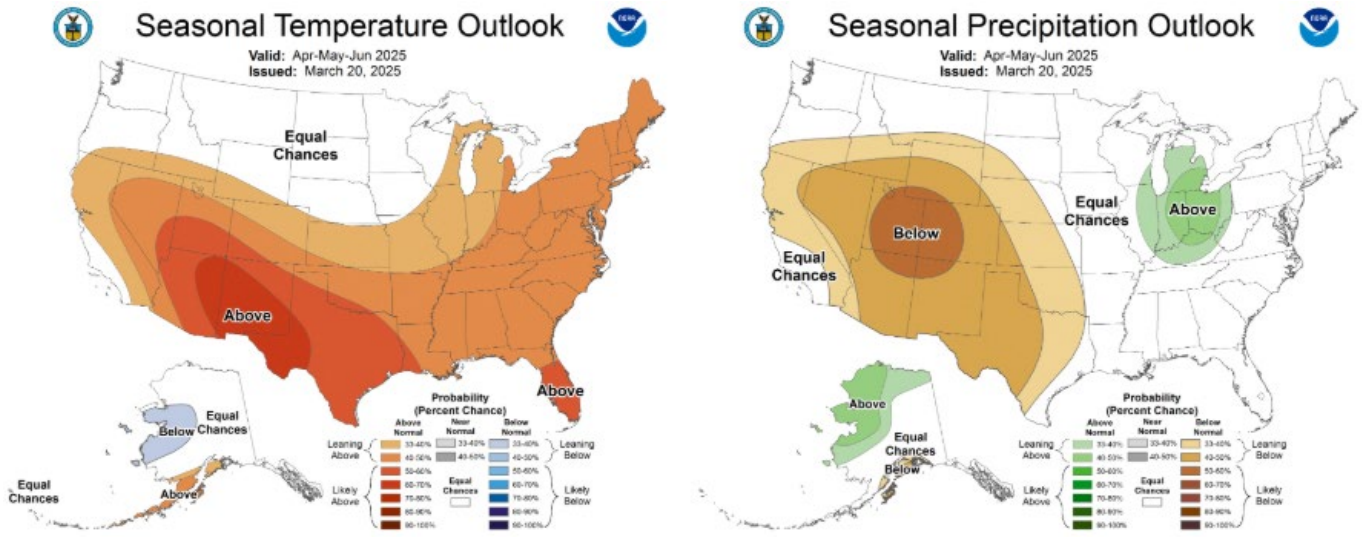


Figure 3. Climate Prediction Center's Seasonal Outlook maps for Temperature and Precipitation for April, May, and June 2025