Quarterly Climate Impacts and Outlook

Great Lakes Region

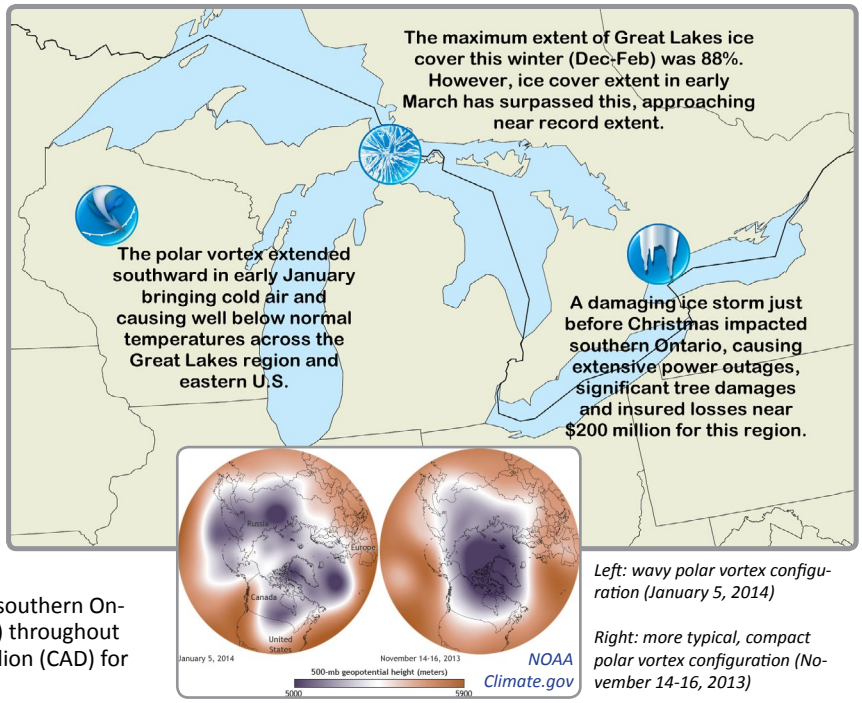
March 2014

Great Lakes Significant Events - *for December 2013 - February 2014*

Winter 2013-2014 was unusually cold for the Great Lakes basin, especially when compared to recent years. An arctic blast in early January blanketed the Great Lakes region and sent sub-freezing temperatures as far south as Florida. These freezing temperatures were the result of a southward dip of the polar vortex. The polar vortex is a permanent fixture of the atmospheric circulation at the poles, but in early January 2014 the polar vortex weakened, allowing fragments of cold air to surge into the middle latitudes (see bottom right graphic). This surge of cold air via the polar vortex occurred on a number of other occasions this winter as well. Since the polar vortex is permanent in the atmosphere, there will always be a chance for this cold variability.

A season of unusually cold weather in the Great Lakes basin is not a sign that the century long trend of rising temperatures has reversed. In fact, while Canada and the eastern U.S. froze at times this winter, many locations including Alaska and Europe, were experiencing unseasonably warm temperatures.

On December 20th-23rd, a damaging ice storm affected southern Ontario, with ice buildup ranging from 15-30 mm (0.6-1.2 in) throughout the region. Total insured losses are estimated at $200 million (CAD) for this region, according to the Insurance Bureau of Canada.



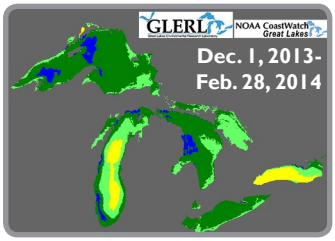
Left: wavy polar vortex configuration (January 5, 2014)

Right: more typical, compact polar vortex configuration (November 14-16, 2013)

Regional Climate Overview - *for December 2013 - February 2014*

Great Lakes Ice Cover

As of February 28th, the maximum extent of ice cover on the Great Lakes this winter was 88.4%, making it the 4th highest since 1973. The record ice cover of 94.7% occurred in 1979. Ice cover usually begins in mid-December, but this winter season it was reported by the end of November. Three of the Great Lakes (Superior, Huron, and Erie) became 90% or more ice covered by the end of winter, which usually does not occur.



Ice cover: Difference from Avg. (%)

−90 −75 −60 −45 −30 −15 0 15 30 45 60

Long-term average based on 1973-2013.

Great Lakes Water Levels

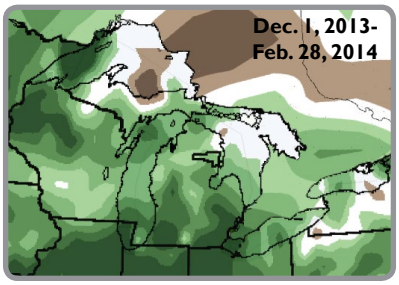
Levels of all the Great Lakes remain above last year's levels at the beginning of March. Snowy, cold weather and significant ice cover contributed to Lake Superior finishing the quarter near the long-term average, 32 cm (12.6 in) above last year's level and the highest at this time of year since 2005. The other lakes received near-normal water supplies. At the end of February, Lake Michigan-Huron was 32 cm (12.6 in) below average, but 33 cm (13 in) higher than at this time last year. Lake Erie and Lake Ontario remained near average throughout the quarter and were within 5 cm (~ 2 in) of their average levels to start March.

Water level statistics based on 1918-2013.

Snowfall

Most of the region saw above normal snowfall during winter, with departures from 100% to 200% of normal. However, generally areas northeast and on the southern side of Lake Superior only received 50% to 75% of normal winter snowfall.

Snowfall normals based on 1981-2010.



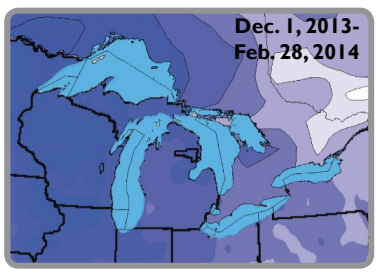
Snowfall: Percent of Normal (%)

25 50 75 90 110 125 150 175 200

Temperature

The winter season was the coldest in 20 years for the Great Lakes region. The coldest areas surrounded the western half of Lake Superior, where departures were greater than -5°C (-9°F). Areas surrounding the eastern half of Lake Ontario had the lowest departures, from -0.5°C to -2°C (-0.9°F to -3.6°F).

Temperature normals based on 1981-2010.



Temperature: Dep. from Normal (°)

°C -5 -4 -3 -2 -1 -.5 .5 1 2 3 4 5

°F -9 -7.2 -5.4 -3.6 -1.8 -0.9 0.9 1.8 3.6 5.4 7.2 9

Regional Impacts - *for December 2013 - February 2014*

Impacts of Unseasonably Cold Temperatures and Significant Ice Cover

The Maumee River in Maumee, OH in mid-January; Photo: Lucas County EMA

Ice shoves from lakes Ontario and Erie caused localized flooding in some areas in January and February. Ice shoves result from strong winds pushing lake ice sheets into adjacent embayments and downstream. Flood-impacted areas included along the Niagara River, Rocky and Maumee rivers in Ohio, and North Sandy Pond in New York.

Early onset and extensive ice cover has made this winter the most challenging for the shipping industry in about 24 years, according to the president of the Canadian Shipowners' Association. This not only impacts the freight community, but also the industries that use the cargo they are carrying.

During the December ice storm, Toronto suffered extensive and long-term losses to their urban tree canopy as a result of ice buildup ranging between 15-30 mm (0.6-1.2 in). Estimates say that 20% tree canopy has been lost city wide, with up to 50-80% on some streets. Other impacts during this storm include prolonged power outages that affected 600,000 households for 3-10 days. There were also two fatalities due to carbon monoxide poisoning.

Post-ice storm damage in Toronto; Photo: Alexander Adams (via Flickr)

Due to the blockage of water intakes on some of the Great Lakes from ice, officials in water utility departments along the lakes could not pump water into their plants for several hours in early January.

The cold temperatures produced sufficient ice on Lake Superior to allow over 85,000 visitors to trudge over the lake to explore the amazing ice cave formations on the Apostle Islands, giving this region an estimated economic boost of $10 million (USD) according to the Bayfield Chamber of Commerce and Visitor Bureau. This is the first time in 5 years the ice has been firm enough to allow passage. Agriculture may also benefit since cold temperatures make pests like the emerald ash borer easier to manage and slow the migration of invasive species.

Lake Superior ice cave; Photo: Bayfield Chamber of Commerce

The ice cover on the Great Lakes this winter may help raise persistent low water levels on the upper Great Lakes. In addition, lake whitefish abundance is positively related to ice cover over near shore spawning grounds, as ice helps to reduce the potential for dislodging of eggs from turbulent waves. An ice bridge formed between Isle Royale (MI) and the mainlands, allowing for the passage of species, particularly wolves and the potential diversification of the gene pool on the island.

Regional Outlook - *for April - June 2014*

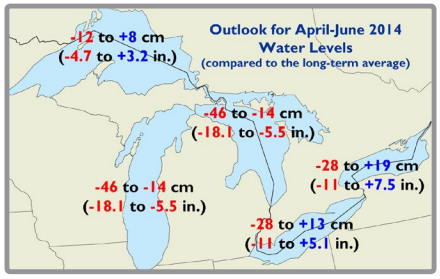
Ice Outlook

Lake Michigan from Sheboygan, WI in Feb. 2014; WI Sea Grant

Ice cover on the Great Lakes is naturally variable from year to year. Typically, maximum ice occurs on lakes Michigan, Huron, Ontario, and Erie in mid-February and in early March on Lake Superior. However, the cold temperatures and extensive ice cover this winter may delay start of ice breakup by two or three weeks. In addition, fog may be an issue in the coming months in the Great Lakes region as it is going to take longer than normal for the ice to melt. The significant ice cover this winter increases the risk for break-up ice jamming in adjacent embayments and tributaries, increasing the risk for flooding in these areas. However, the risk is reduced if the ice thaws gradually.

Lake Level Outlook

Current projections for April-June indicate that levels on lakes Superior, Erie and Ontario will remain near average unless exceedingly wet or dry water supply conditions are experienced. On the other hand, even the wettest scenarios suggest levels on Lake Michigan-Huron will remain below average, but levels are expected to remain higher than they were last spring. The range of probable levels on each lake are shown on the Outlook map below.



Outlook from the US Army Corps of Engineers and Environment Canada (Apr-June 2014)

Temperature & Precipitation Outlook

The NOAA Climate Prediction Center is forecasting for April through June 2014 that there are greater chances for below normal temperatures in the U.S. Great Lakes basin and equal chances for either below, near, or above normal precipitation.

Environment Canada is forecasting equal chances for either below, near, or above normal temperature and precipitation in the Canadian Great Lakes basin for April through June 2014.

Great Lakes Region Partners

Environment Canada
www.ec.gc.ca
Agriculture and Agri-Food Canada
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  www.cpc.noaa.gov

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National Integrated Drought Information System
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Great Lakes Water Level Dashboard
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National Park Service
www.nps.gov

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ISSN 2292-5120