Climate Change in the Great Lakes

Photo: Dan Brown
NOAA Regional Integrated Sciences and Assessments (RISA)

Regional teams that help the nation to prepare for and adapt to climate variability and change.
GLISA’s Approach

- Interpret *existing* information and data for stakeholders
- Provide *locally* relevant climate synthesis:
  - What has happened?
  - What could happen?
  - What are the impacts?
There are multiple ways of looking at climate change:
- Global
- Regional
- Local

Local factors can drastically alter the magnitude of climate change impacts, but can also be adapted to more readily.
Rising Temperatures

Observed

2.3°F Warmer
1951-2017

Future

3 to 6°F Warmer
2040-2059

Source: GLISA and Univ. of Wisc. Nelson Institute
Winters are Warming Faster

2.3°F increase averaged over the entire year

2.8°F increase during winter (December - February)

Source: GLISA & National Centers for Environmental Information
Warming Winters

Lakes are warming faster than the air

Longer ice-free periods
A Longer Freeze-free Season

Observed changes due mostly to earlier last winter freeze

Future

- 16 Days Longer 1951-2017
- 35 to 54 Days Longer 2070-2099

Source: GLISA and Univ. of Wisc. Nelson Institute
Extreme Heat and Humidity

By mid-century, models project Michigan could see:

- 90°F Days: 8 to 25 more days per year
- 100°F Days: 2 to 11 more days per year*

But, it is unclear if there has been a significant observed change in hot days.

Source: GLISA and Univ. of Wisc. Nelson Institute
More Precipitation

Total annual precipitation in NE Illinois has increased by:

14%

Uneven changes across the GL Region:
SE MI (+17%)
Western UP (-1%)

Percent change are calculated relative to the period of 1951-1980 historical reference period.
Source: National Centers for Environmental Information
1.25-inch Precipitation Days: 

35%

Nuisance flooding and minor damages are reported more frequently after these events.

Changes are calculated from linear best fits of annual totals from 1951-2017. 
Source: National Centers for Environmental Information
Change in Snowfall

Snowfall has increased in lake-effect areas.

Snowfall has remained stable or decreased throughout southern parts of the region.
Impacts
Algal Blooms and Water Quality

More/Stronger Storms → More Runoff from Agriculture → Greater Nutrient Loading → Algal Blooms → Dead Zones

Warmer Lake Temperatures → Changed Lake Dynamics → Algal Blooms → Dead Zones
Stormwater Impacts

With increased extreme precipitation events, intense, flashy runoff amplify flooding risks.

Ontario
Spring 17’ Flood

U.S. Army National Guard
Lake Levels

• Declined since record highs in the 1980s and increased again recently (2015)
• While most models project continued declines in long-term lake levels, there remains significant uncertainty.
• Short-term variability and periods of high lake levels are still anticipated.
Impacts of Lake Levels

- Boating and recreation
- Shipping and navigation
- Property
- Fisheries and wetlands

Photos: Kim Channell
• **Fishing Industry:** Ice cover protects whitefish spawning areas. Great Lakes commercial fishing is $4 billion industry.

• **Coastal Zone:** In nearshore areas, ice provides stable platform for recreation and protects wetland areas from erosion.

• **Water Levels and Navigation:** Heavy ice cover can reduce evaporation and contribute to higher water levels in the following seasons—good news for shipping.
Potential Impacts on Shipping

Every lost inch of water depth:

- Reduces cargo capacity 50-270 tons
- Costs $10k-30k per transit.

...but less lake ice cover allows for a longer shipping season
Plants and Wildlife

- Forest ecosystems forced northward
  - Maple-Beech-Birch forest displaced
- Amplified stressors on biodiversity
  - Declining Coldwater fish populations, species migrating northward
- Agriculture
  - Longer growing season
  - Water availability, warm spells, spring freezes, flooding, and drought will reduce crop yields
For More Information

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