

Local Climate and Weather Impacts

Judy Levan
Meteorologist In Charge, NWS Buffalo

National Weather Service - Buffalo NY – www.weather.gov/buf

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Building a Weather-Ready Nation

MISSION

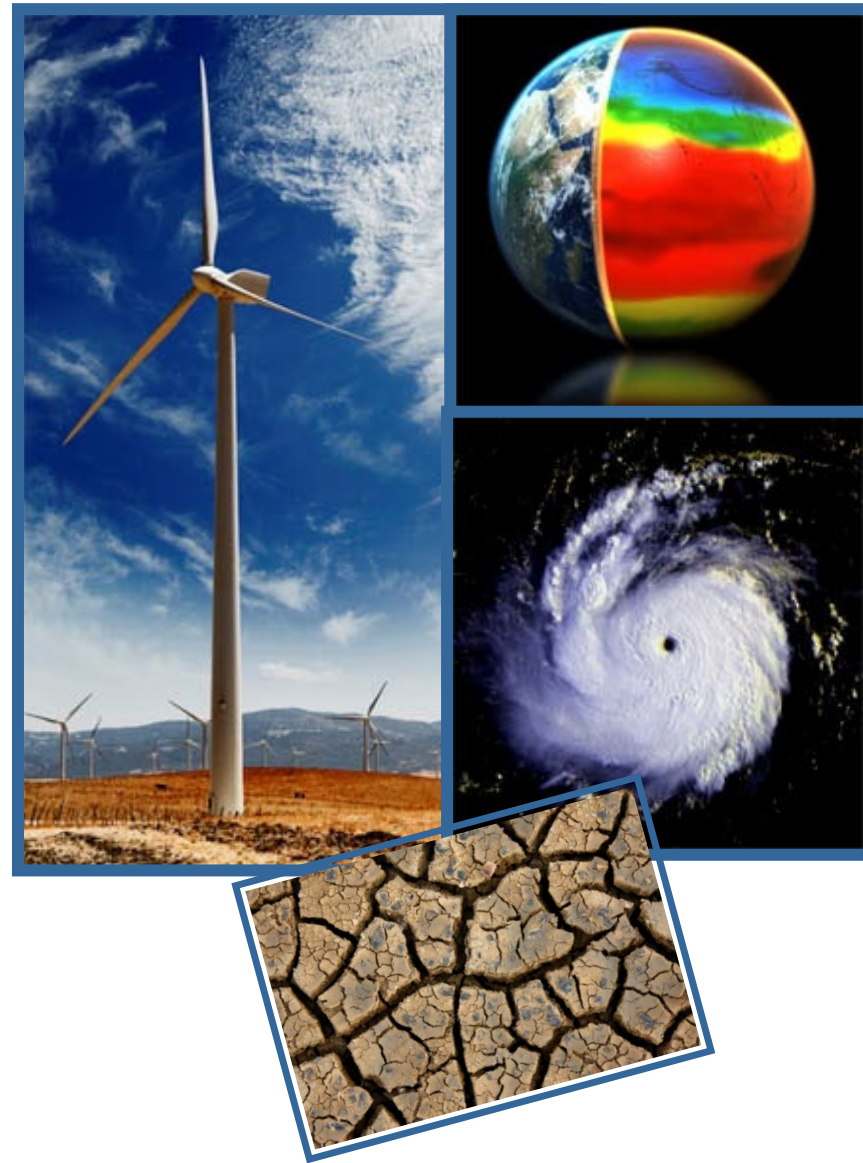
Provide weather, water, and climate data, forecasts and warnings

Protect life and property

Enhance national economy

VISION

**A Weather-Ready Nation:
Society is Prepared for and
Responds to Weather-
Dependent Events**





Seasonal Conditions

Finger Lakes Region

Winter

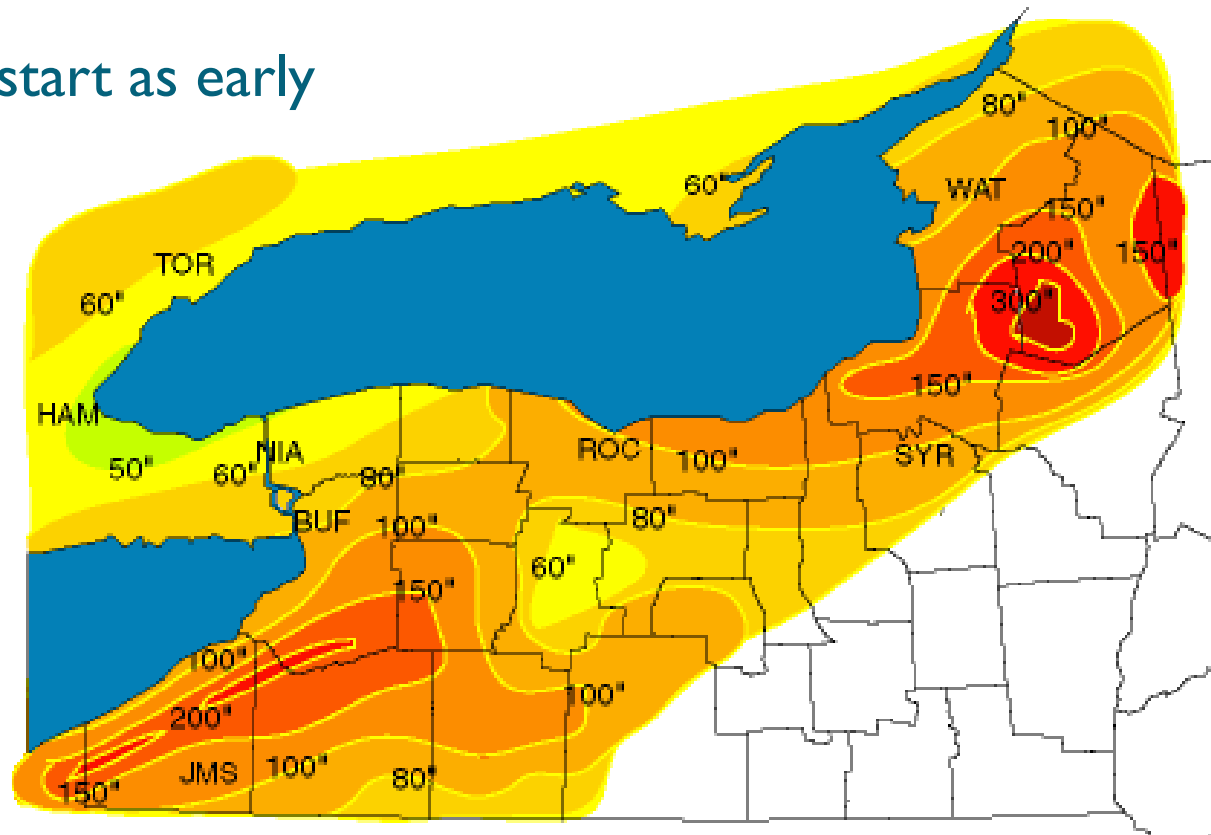
- ▶ Generally cloudy, cold and snowy
 - ▶ May include frequent thaws and rains
 - ▶ Snow mainly covers the ground from Christmas through early March however periods of bare ground are not uncommon
 - ▶ Lake Ontario modifies extreme cold temperatures
 - ▶ On average about six nights below zero



Winter

- ▶ Snowfall averages vary by location
 - ▶ Over half of the annual snowfall comes from “lake effect” processes
 - ▶ Lake effect snow can start as early as October, usually peaks in late December and January

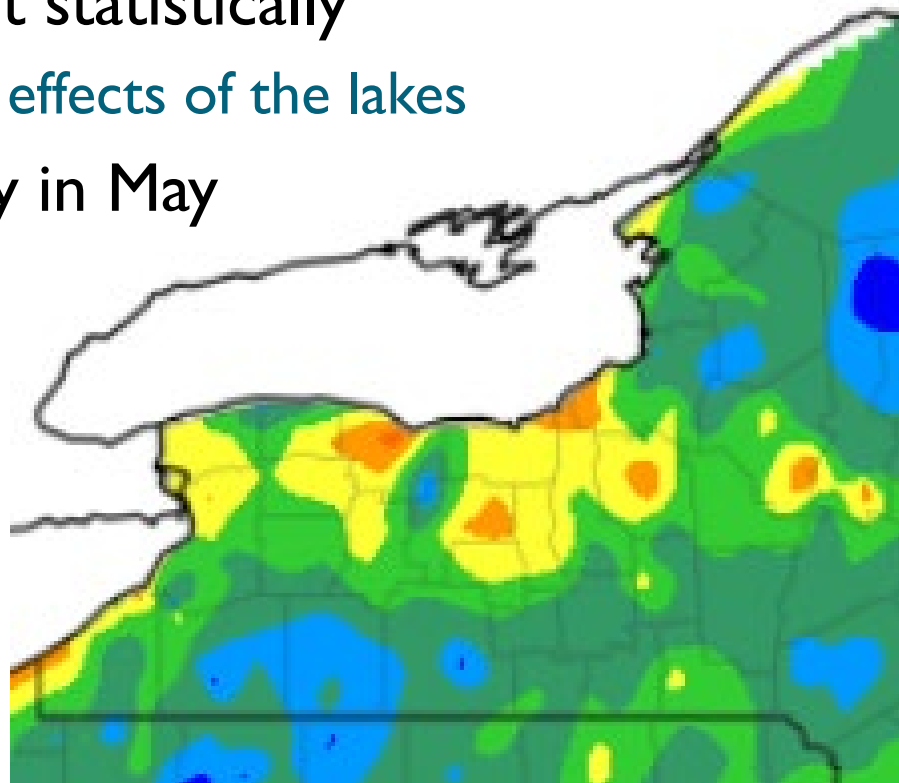
Average Annual
Seasonal Snowfall



Spring

- ▶ Spring comes slowly to the region
- ▶ Last frost usually occurs mid to late April
- ▶ Spring months are the driest statistically
 - ▶ Due in part to the stabilizing effects of the lakes
- ▶ Sunshine increases markedly in May

Average Date of Last Spring Freeze
1991-2020 Average



Summer

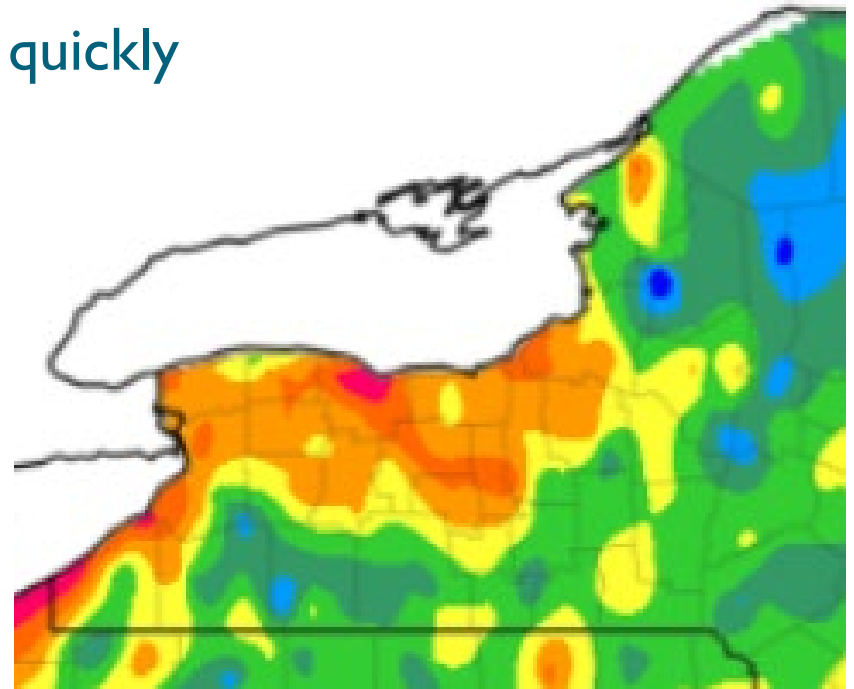
- ▶ Summers are beautiful!
 - ▶ Warm and sunny across the region
 - ▶ Average temperature in the 70 to 73 degree range
 - ▶ There usually are several periods of uncomfortably warm and muggy weather
 - ▶ About five days reach the 90 degree mark
- ▶ Rain can be expected every third or fourth day
 - ▶ Mainly in the form of showers and thunderstorms
 - ▶ More common inland than along the lakeshore
 - ▶ As the lakes warm, nighttime thunderstorms are often a feature of late summer
- ▶ Completely overcast days are rare



Autumn

- ▶ Pleasant, mild and dry through October
- ▶ Colder air masses across the Lakes brings a dramatic increase in cloud cover and first lake effect snows by mid-November
 - ▶ Early snows generally melt off quickly

Average Date of First Fall Freeze
1991-2020 Average



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Severe Weather

Finger Lakes Region

Summer Convective Weather

- ▶ Thunderstorm Winds – damage producing or ≥ 50 knots
 - ▶ 10 to 15 days per year
 - ▶ Estimated \$700,000 damage each year
 - ▶ Last 20 Years:
 - ▶ 2 deaths (June 2014 Phelps) and 7 injuries
- ▶ Hail
 - ▶ 3 to 5 events per year
 - ▶ Largest Hail reported in last ten years
 - ▶ 2.00" – Livingston Co – August 2020
 - ▶ 2.00" – Ontario Co – May 2013
 - ▶ 2.00" – Tompkins Co – May 2012
- ▶ Lightning
 - ▶ Last 20 years:
 - ▶ 1 Death / 12 Injuries
 - ▶ There have been several lightning-sparked fires



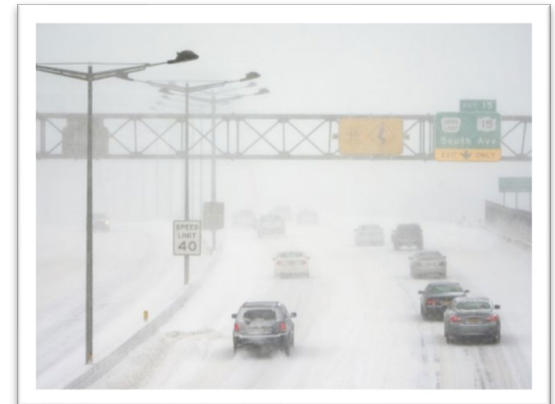
Summer Convective Weather

- ▶ Derechos
 - ▶ Long lived high wind event
 - ▶ Occurs about once every 10 to 20 years
 - ▶ “Labor Day Derecho” 1998
- ▶ Tornados – 47 since 1950
 - ▶ Most recent:
 - ▶ 2021 – Tompkins and Livingston Cos.
 - ▶ 2020 – Monroe Co
 - ▶ 2018 – Yates Co



Winter Weather

- ▶ Winter Weather
 - ▶ Snow Storms – about three times per year
 - ▶ Blizzards
 - ▶ About once every 10-15 years
 - Most Recent:
 - March 2014
 - ▶ Ice Storms
 - ▶ About once every 5 to 10 years
 - Most recent:
 - April 2018
 - December 2013
 - March 2008
 - January 2007
 - Mostly costly: March 1991



Photos credit: Rochester D&C



Flooding

- ▶ Floods/Flash Floods
 - ▶ Five to ten events per year
 - ▶ Floods can occur any time of year
 - ▶ Winter/Spring – ice jams, snowmelt and/or heavy rain with large storm systems
 - ▶ Spring/Summer - slow moving thunderstorms
 - ▶ Summer/Fall - Tropical Storms





Climate Change

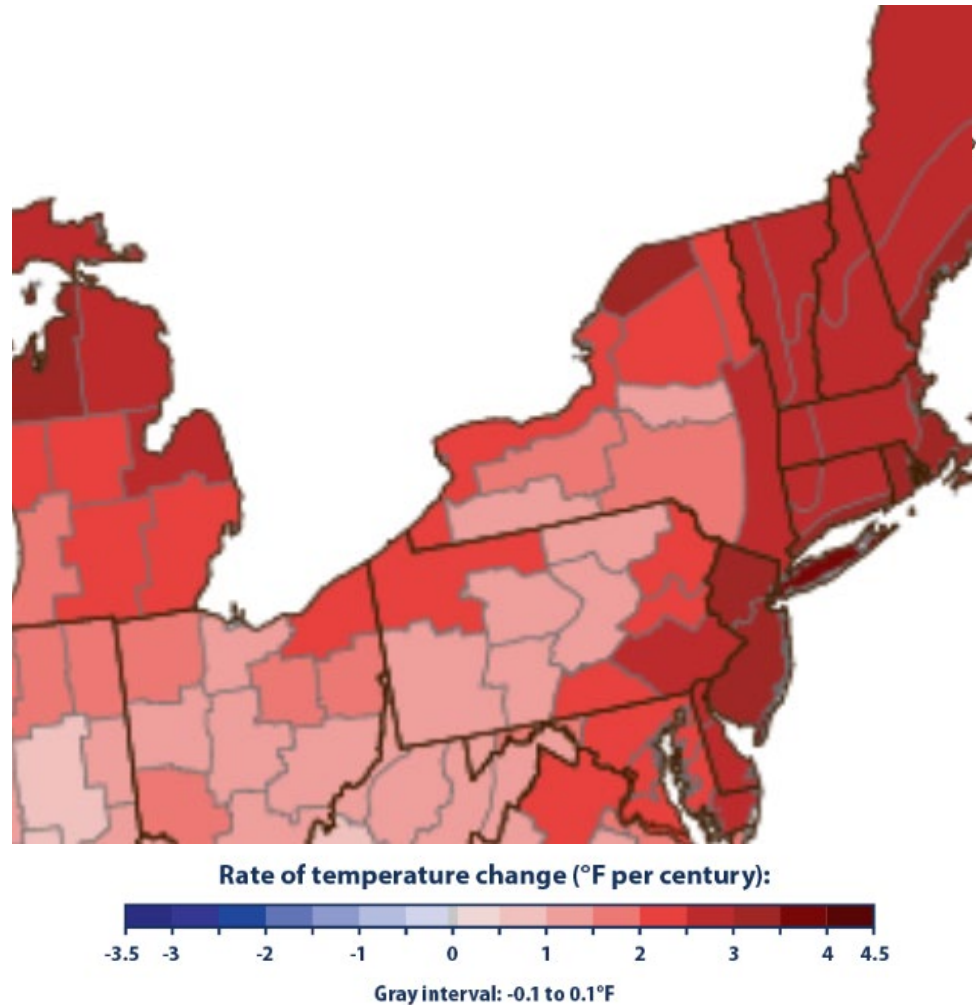
Global Warming vs. Climate Change

- ▶ The term **Global Warming** refers to the observation that the atmosphere near the Earth's surface is warming, without any implications for the cause or magnitude.
- ▶ **Climate change** is the departure from the expected average weather for a given place and time of year.



Climate Changes Are Already Occurring

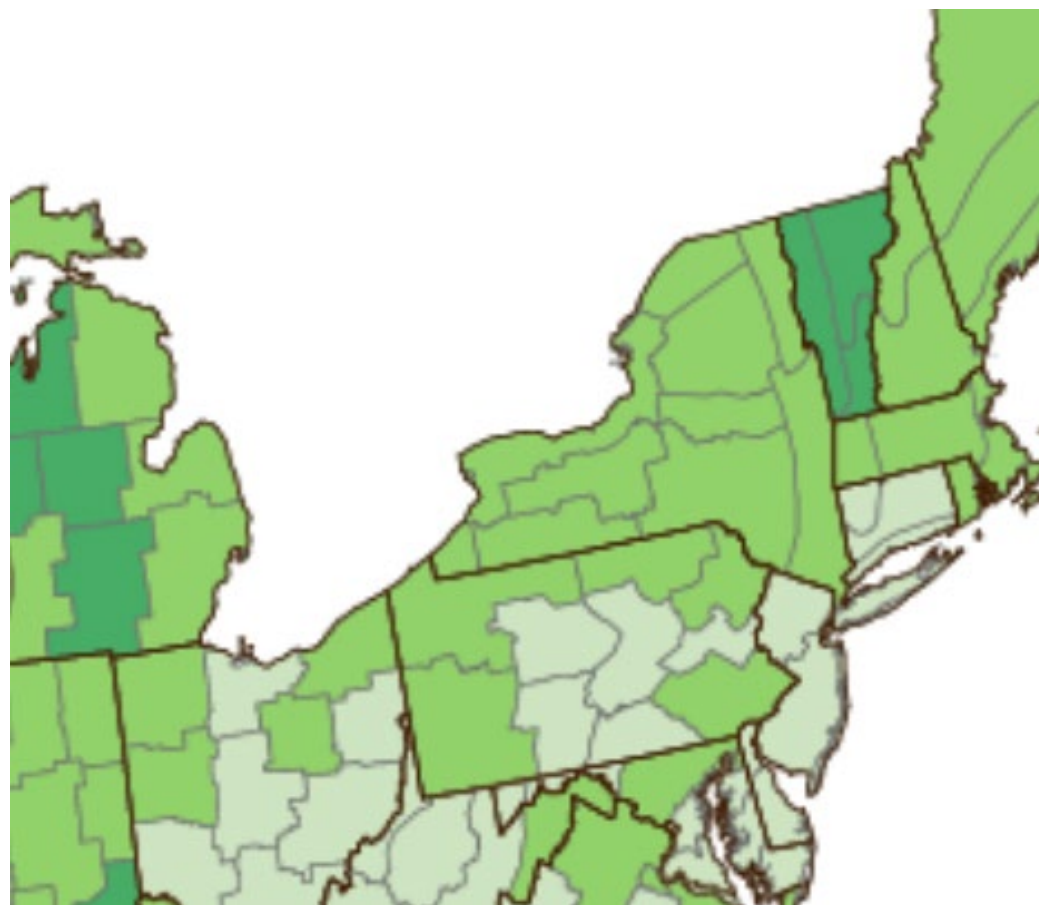
- ▶ **Temperatures:**
 - ▶ Winter – warmer and fewer cold days and nights
 - ▶ Summer – hotter and more frequent hot days/nights and heat waves



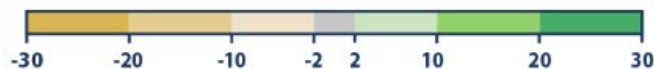
Climate Changes Are Already Occurring

► Precipitation:

- Regions that already experience long-duration droughts (such as the Southwestern U.S.) will likely see the area affected increase.



Percent change in precipitation:



Climate Changes Are Already Occurring

- ▶ Precipitation:
 - ▶ Extreme rainfall events in the Great Lakes have increased over the last century and these trends are expected to continue.
 - ▶ Increased precipitation will continue to lead to flooding, erosion, declining water quality
 - ▶ Which could also lead to injuries, drownings and other flooding related effects on health



Climate Changes Are Already Occurring

- ▶ **Hurricanes:** More intense hurricanes
- ▶ Observations indicate an increase in hurricane intensity in the Atlantic and West Pacific



What about regional temperatures changes?

(Rochester Airport Climate Normals)

| MAX | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|-------------|------------------|------|------|------|------|------|------|------|------|------|------|------|------|---------------|
| | 1981-2010 | 31.7 | 34.1 | 42.8 | 56.0 | 67.6 | 76.6 | 81.0 | 79.1 | 71.6 | 59.6 | 48.0 | 36.5 | 57.2 |
| | 1991-2020 | 33.4 | 35.2 | 43.6 | 56.6 | 69.4 | 77.9 | 82.5 | 80.5 | 73.6 | 61.2 | 49.1 | 38.5 | 58.4 |
| | | 1.7 | 1.1 | 0.8 | 0.6 | 1.8 | 1.3 | 1.5 | 1.4 | 2.0 | 1.6 | 1.1 | 2.0 | 1.2 |
| | | | | | | | | | | | | | | |
| MIN | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| | 1981-2010 | 17.6 | 18.6 | 25.8 | 36.6 | 46.3 | 55.9 | 60.7 | 59.5 | 52.0 | 41.5 | 33.0 | 23.5 | 39.3 |
| | 1991-2020 | 19.0 | 19.6 | 26.8 | 37.1 | 48.2 | 57.4 | 62.2 | 61.0 | 53.6 | 43.3 | 34.0 | 25.4 | 40.6 |
| | | 1.4 | 1.0 | 1.0 | 0.5 | 1.9 | 1.5 | 1.5 | 1.5 | 1.6 | 1.8 | 1.0 | 1.9 | 1.3 |
| | | | | | | | | | | | | | | |
| Mean | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| | 1981-2010 | 24.7 | 26.4 | 34.3 | 46.3 | 57.0 | 66.2 | 70.8 | 69.3 | 61.8 | 50.6 | 40.5 | 30.0 | 48.2 |
| | 1991-2020 | 26.2 | 27.4 | 35.2 | 46.8 | 58.8 | 67.6 | 72.3 | 70.7 | 63.6 | 52.2 | 41.5 | 32.0 | 49.5 |
| | | 1.5 | 1.0 | 0.9 | 0.5 | 1.8 | 1.4 | 1.5 | 1.4 | 1.8 | 1.6 | 1.0 | 2.0 | 1.3 |

Positive Change

Negative Change

No Change



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What about regional precipitation changes?

(Rochester Airport Climate Normals)

| Precipitation | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---------------|------------------|------|------|-------|------|-------|------|------|-------|-------|------|-------|------|--------------|
| | 1981-2010 | 2.41 | 1.95 | 2.50 | 2.73 | 2.87 | 3.34 | 3.33 | 3.47 | 3.38 | 2.72 | 2.94 | 2.63 | 34.27 |
| | 1991-2020 | 2.55 | 2.13 | 2.49 | 2.99 | 2.86 | 3.37 | 3.56 | 3.31 | 3.18 | 3.22 | 2.76 | 2.67 | 35.09 |
| | | 0.14 | 0.18 | -0.01 | 0.26 | -0.01 | 0.03 | 0.23 | -0.16 | -0.20 | 0.50 | -0.18 | 0.04 | 0.82 |
| | | | | | | | | | | | | | | |
| Snow | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| | 1981-2010 | 28.2 | 21.5 | 16.3 | 3.9 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 7.3 | 21.8 | 99.5 |
| | 1991-2020 | 27.4 | 23.1 | 17.9 | 3.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 8.1 | 22.3 | 102.0 |
| | | -0.8 | 1.6 | 1.6 | -0.9 | -0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.5 | 2.5 |

Increase

Decrease

No Change



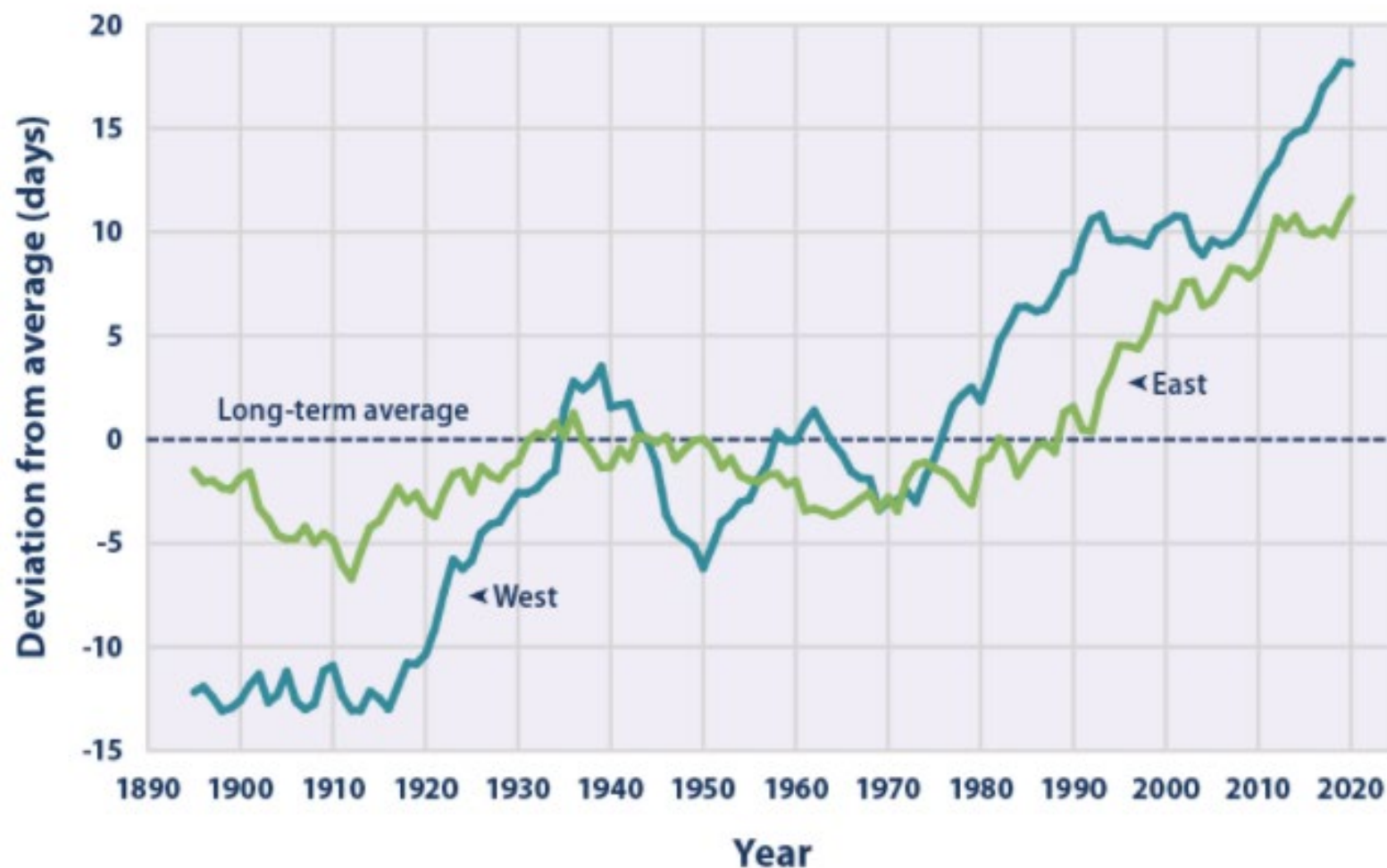
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Length of the Growing Season



<https://www.epa.gov/climate-indicators/climate-change-indicators-length-growing-season>



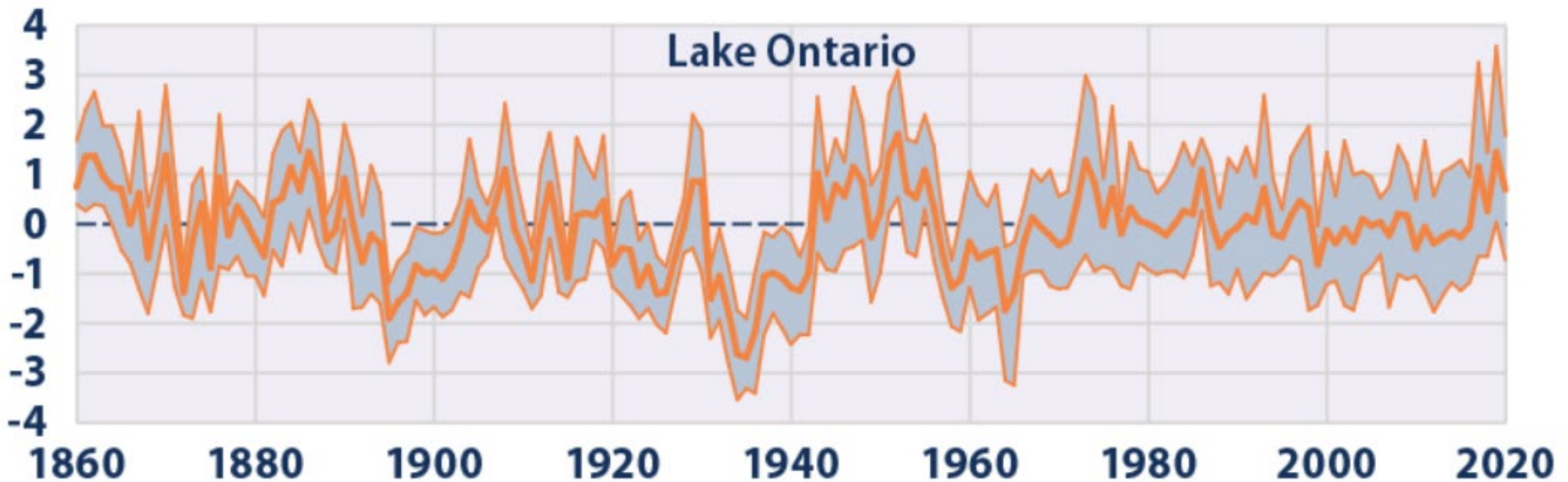
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Lake Ontario – Water Levels



<https://www.epa.gov/climate-indicators/great-lakes>



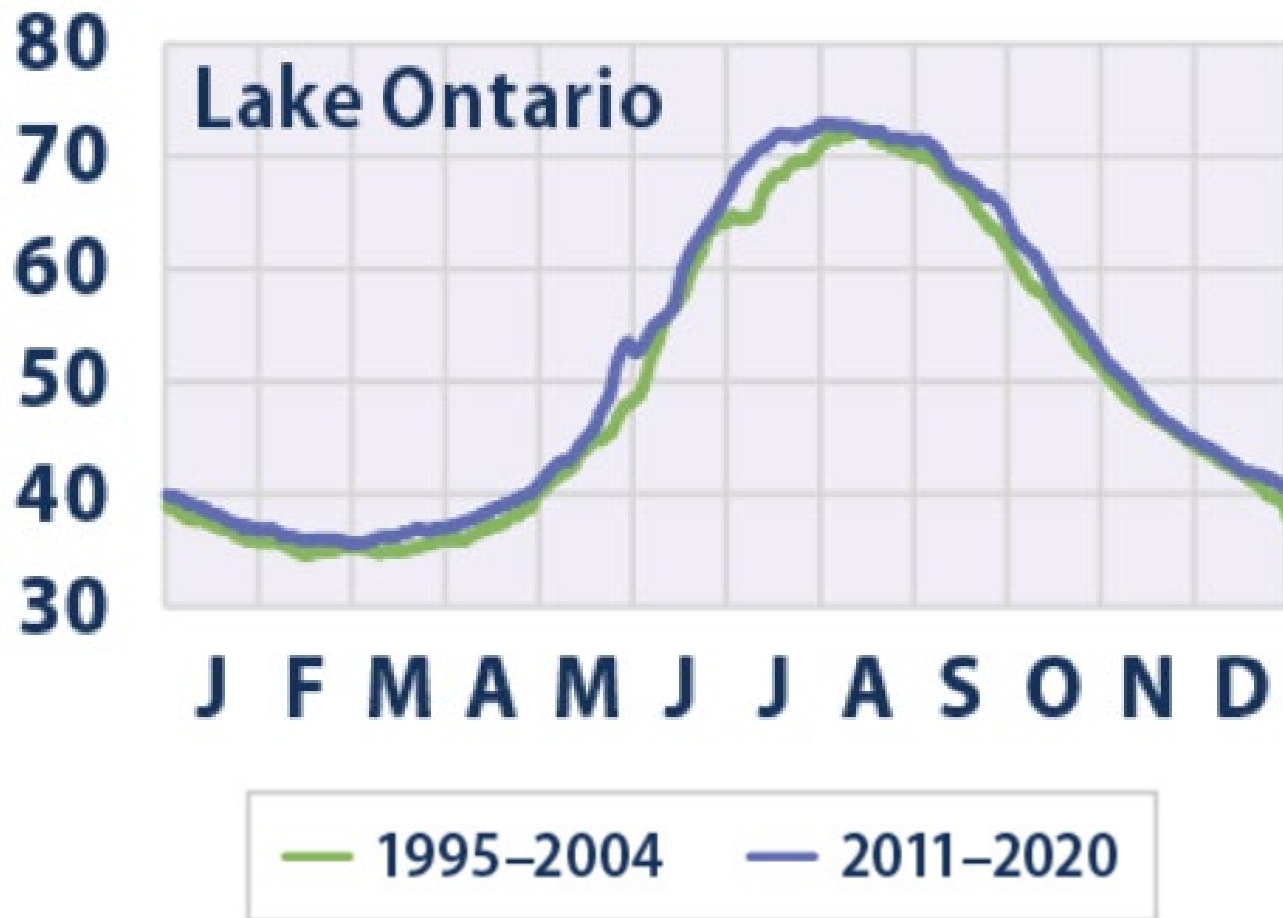
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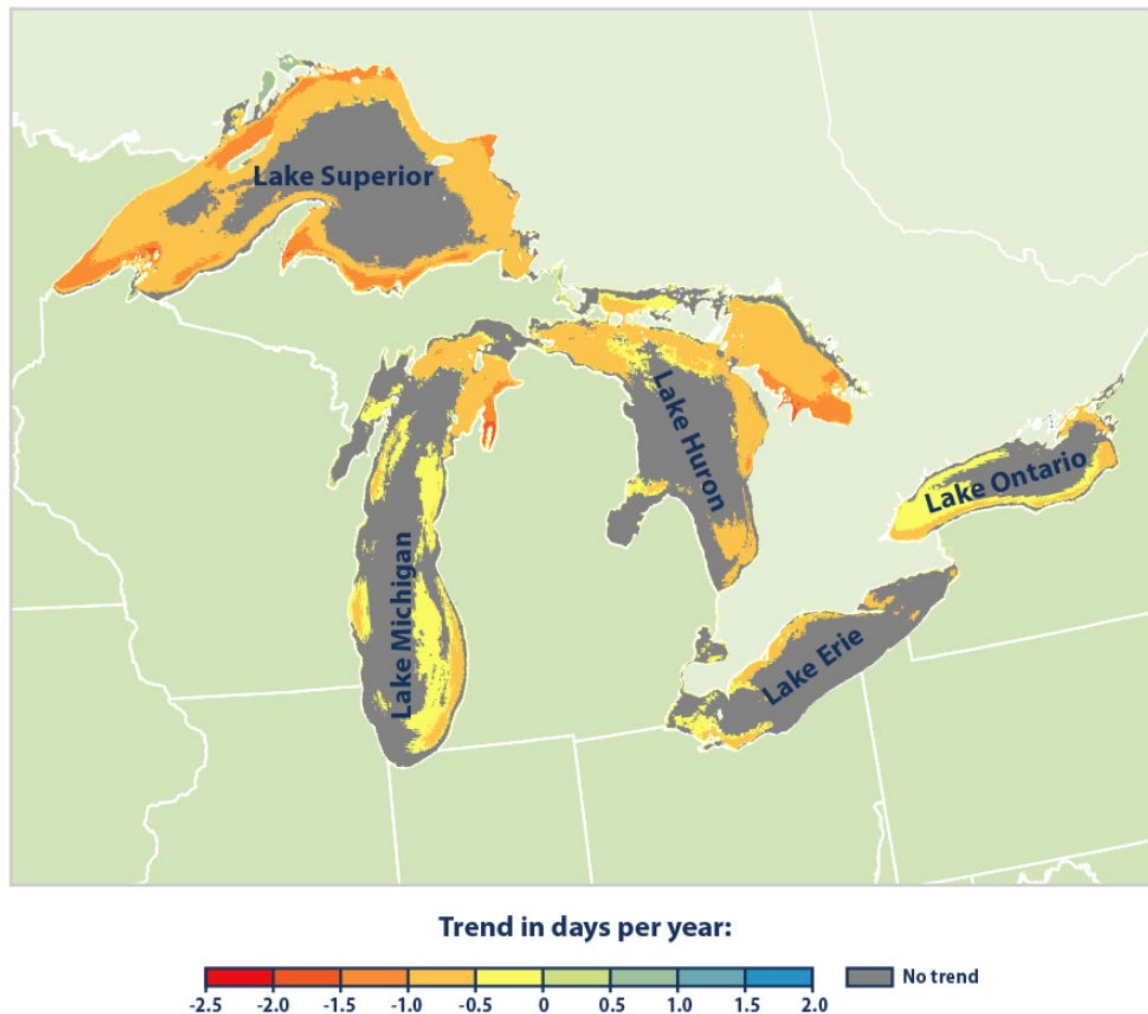
Lake Ontario Temperatures



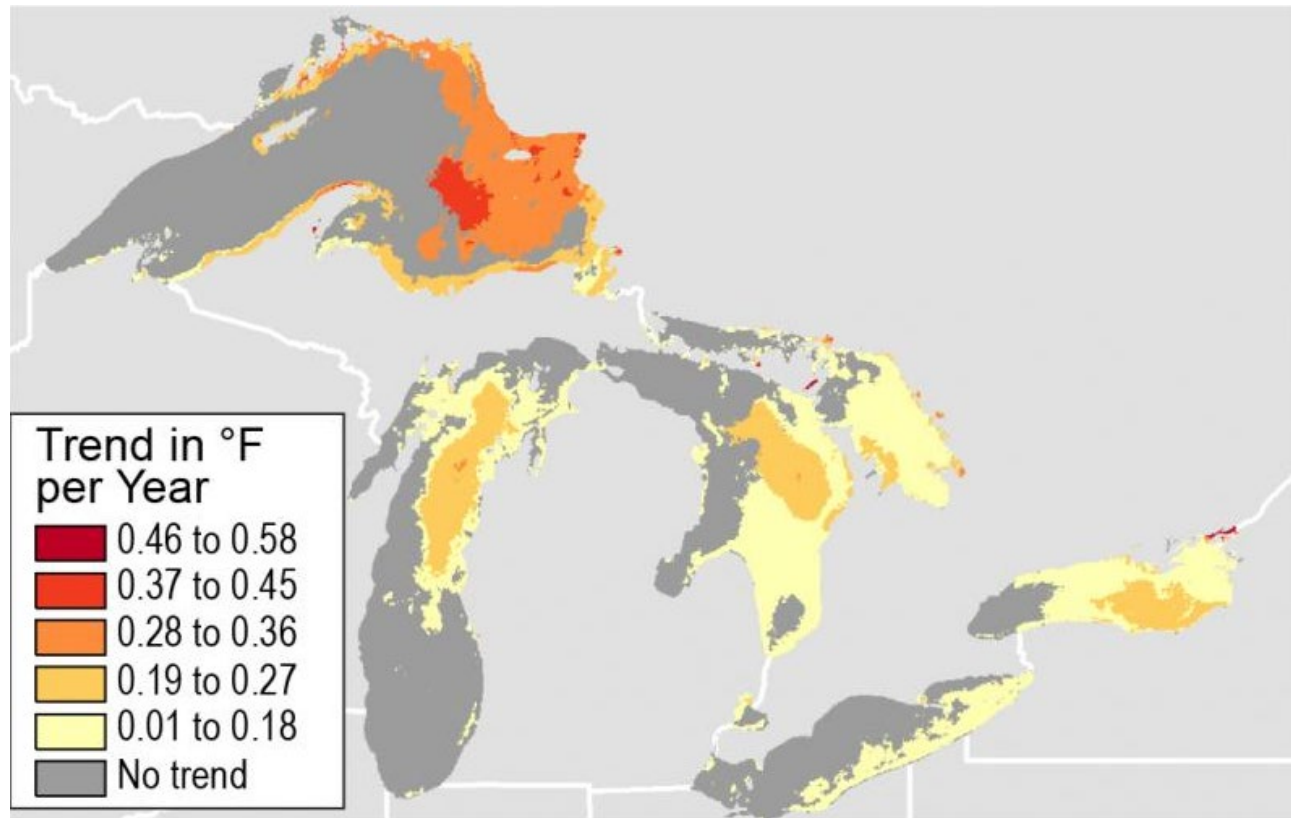
Lake Ontario Ice Cover



Changes in Ice Cover Duration 1973-2019



Changes in Summer Surface Water Temperature 1994-2013



Regional Climate Changes in the Great Lakes and Northeast: Summary



- More heat waves
- More frequent severe flooding
- Increase in amount of lake effect snow
- Air quality worsens
- Crop, livestock, forest and floodplain management practices must adapt



QUESTIONS?



Contact Info:

Judith Levan
Meteorologist In Charge
National Weather Service Buffalo
587 Aero Drive
Cheektowaga, NY 14225
716-565-0204 x222
judith.levan@noaa.gov

Reference websites:

- ▶ climate.gov
- ▶ heat.gov
- ▶ drought.gov
- ▶ toolkit.climate.gov
- ▶ epa.gov/climate-indicators

