

Local Climate and Weather Impacts

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Building a Weather-Ready Nation

MISSION

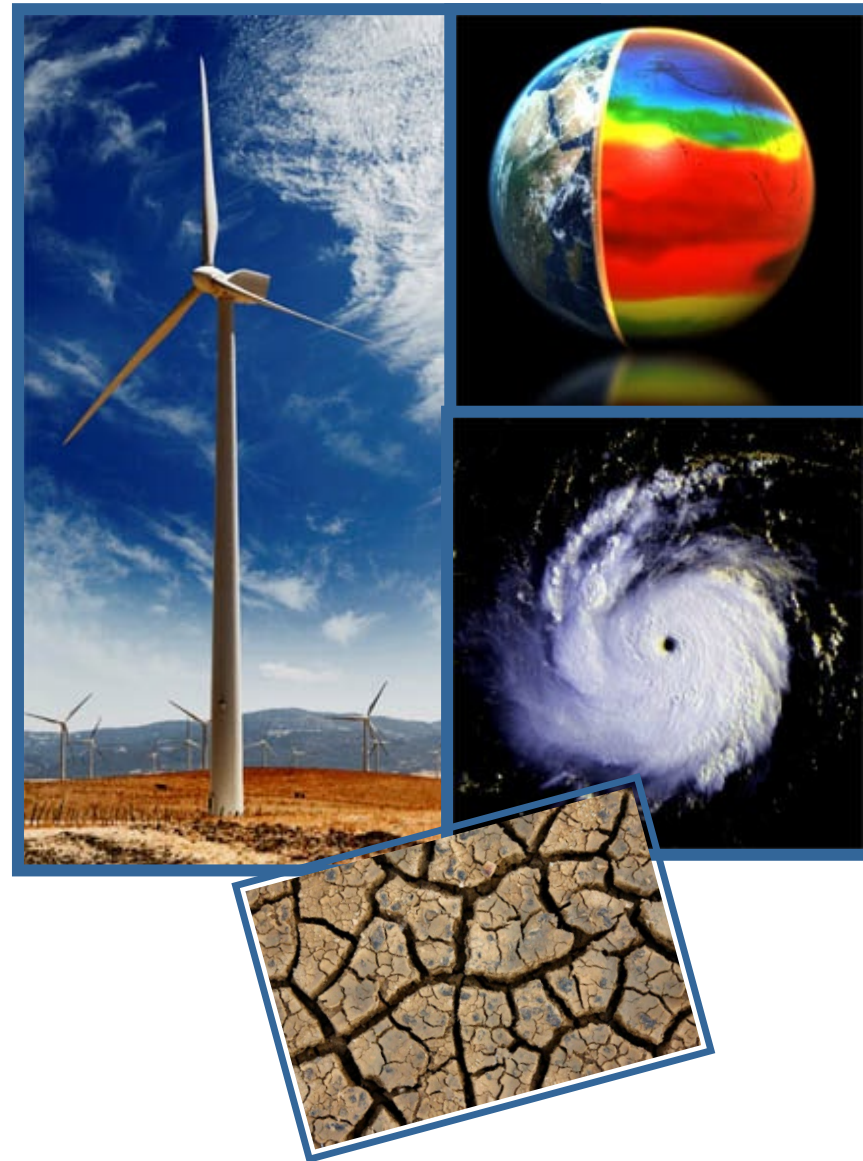
Provide weather, water, and climate data, forecasts and warnings

Protect life and property

Enhance national economy

VISION

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



Seasonal Conditions

Eastern Lake Ontario Region

Winter

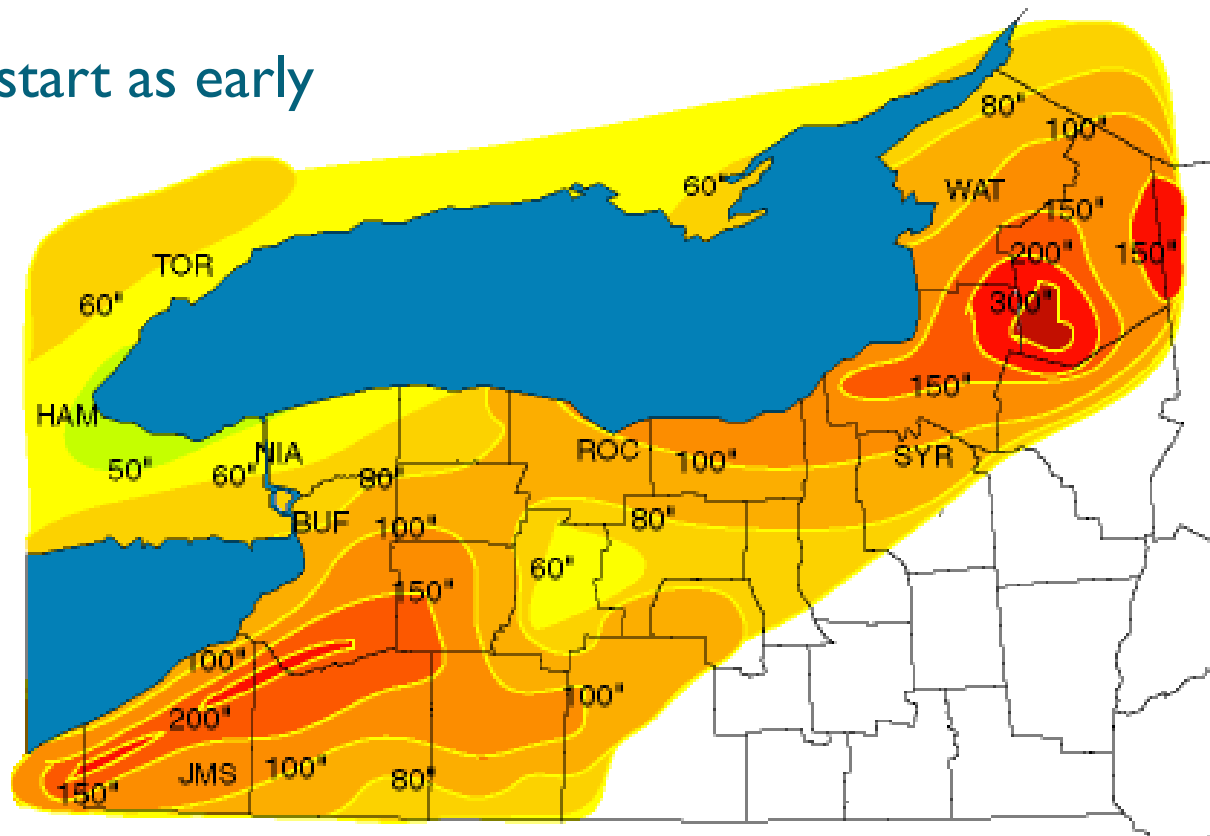
- ▶ Generally cloudy, cold and snowy
 - ▶ May include frequent thaws and rains
 - ▶ Snow mainly covers the ground from Christmas through early March however periods of bare ground are not uncommon
 - ▶ Lake Ontario modifies extreme cold temperatures
 - ▶ On average about ten nights below zero



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 January / early February

Average Annual
Seasonal Snowfall



Spring

- ▶ Spring comes slowly to the region
- ▶ Last frost usually occurs early May
- ▶ 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

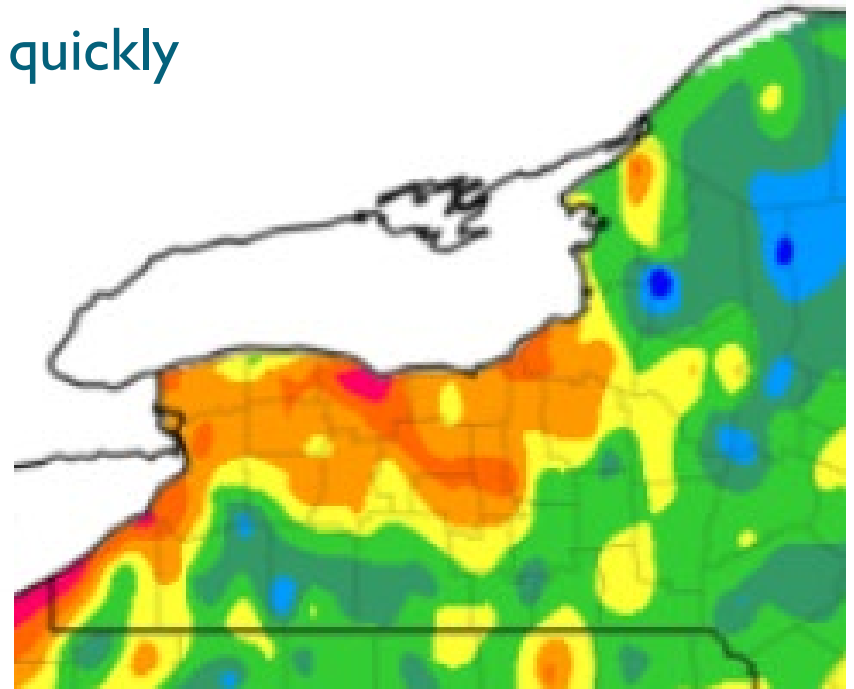
- ▶ Summers are beautiful!
 - ▶ Warm and sunny across the region
 - ▶ Average temperature in the 70 to 75 degree range
 - ▶ There usually are several periods of uncomfortably warm and muggy weather
 - ▶ About five days reach the 90 degree mark
- ▶ Rain can be expected every third or fourth day
 - ▶ Mainly in the form of showers and thunderstorms
 - ▶ More common inland than along the lakeshore
- ▶ 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





Severe Weather

Eastern Lake Ontario Region

Summer Convective Weather

- ▶ Thunderstorm Winds – damage producing or ≥ 50 knots
 - ▶ About 5 to 10 events per year
 - ▶ Estimated \$200,000-\$300,000 damage each year
- ▶ Hail
 - ▶ about 2 events per year
 - ▶ Largest Hail reported (since 1950) – 2.5”
 - ▶ Oswego Co – May 2017
- ▶ Lightning
 - ▶ Last 20 years:
 - ▶ 1 Injury / No deaths
 - Alexandria Bay - Aug 2016
 - ▶ There have been several lightning-sparked fires



Summer Convective Weather

- ▶ Derechos
 - ▶ Long lived high wind event
 - ▶ Occurs about once every 10 to 20 years

- ▶ Tornadoes – Eighteen since 1950
 - ▶ About once every 5 years
 - ▶ Most recent
 - ▶ 8/16/2016 Constableville
 - ▶ 7/8/2014 West Lowville
 - ▶ 6/28/2010 Palermo



Winter Weather

▶ Winter Weather

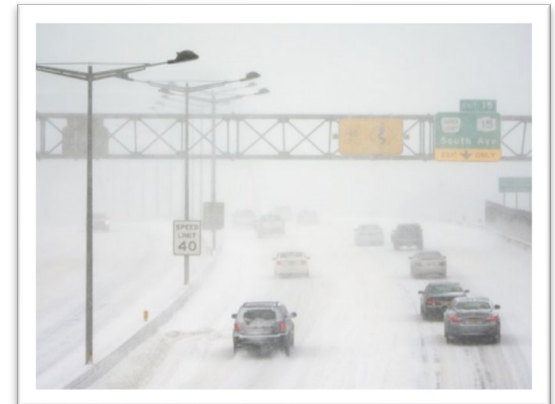
- ▶ Snow Storms – about five to ten times per year

▶ Blizzards

- ▶ About once every 5-10 years
- ▶ In the past 20 years:
 - ❑ Oswego Co – 2018
 - ❑ Jefferson/Lewis Cos – 2013
 - ❑ Jefferson/Lewis/Oswego Cos -2003

▶ Ice Storms

- ▶ About once every 5 to 10 years
 - ❑ In the past 20 years:
 - ❑ December 1997, April 2003, March 2014



Photos credit: Rochester D&C



Flooding

- ▶ Floods/Flash Floods
 - ▶ Three to four 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

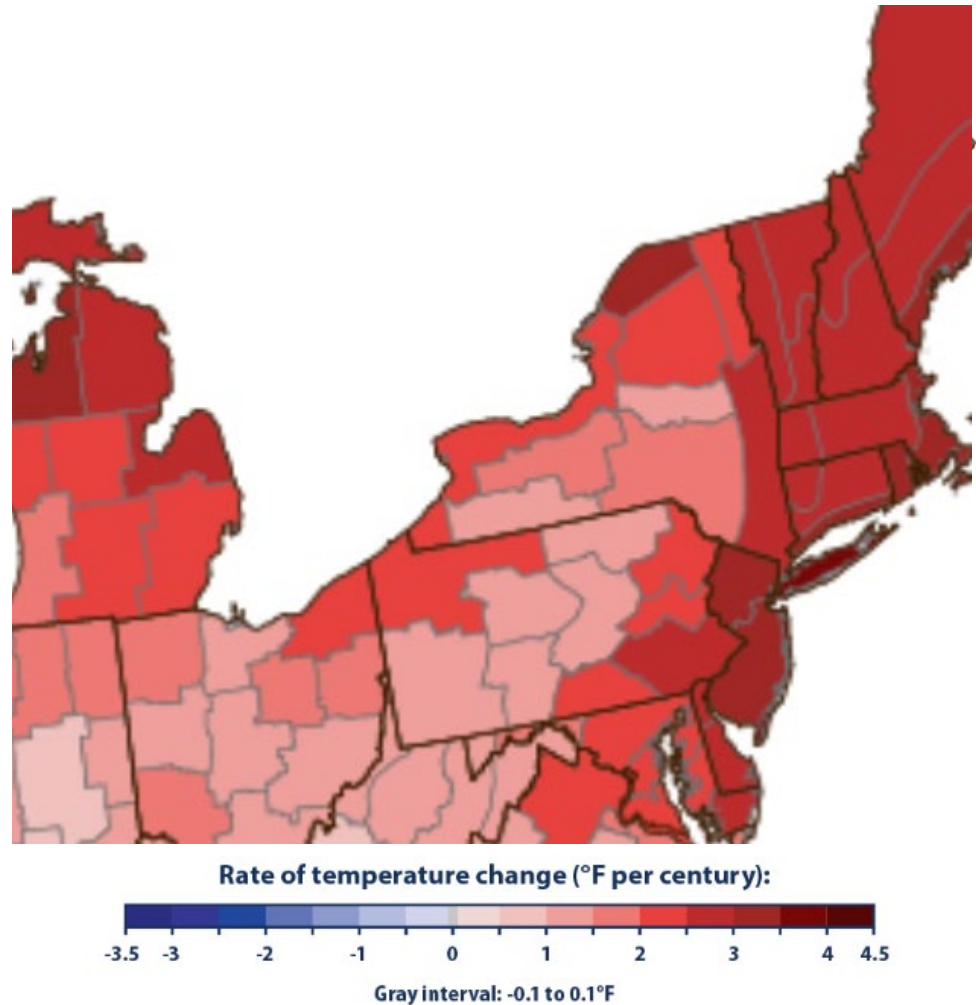
Global Warming vs. Climate Change

- ▶ 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

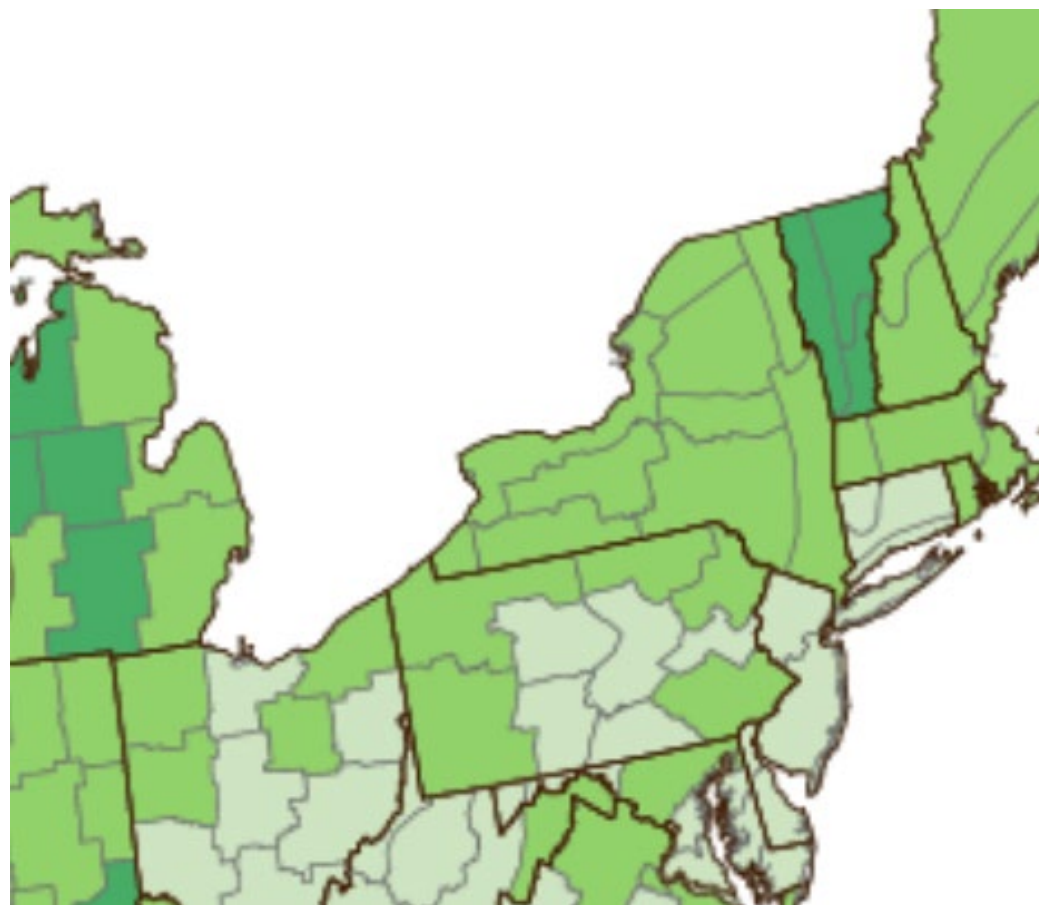
- ▶ **Temperatures:**
 - ▶ Winter – warmer and fewer cold days and nights
 - ▶ Summer – hotter and more frequent hot days/nights and heat waves



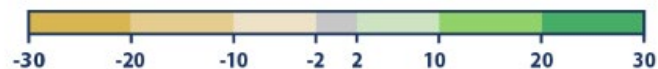
Climate Changes Are Already Occurring

► 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?

(Syracuse Airport Climate Normals)

MAX		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	1981-2010	31.5	34.2	43.2	57.2	68.8	77.5	81.6	80.0	72.2	60.0	48.4	36.4	57.6
	1991-2020	31.7	33.6	42.4	56.4	69.2	77.3	81.7	80.3	73.1	60.1	48.3	37.1	57.6
		0.2	-0.6	-0.8	-0.8	0.4	0.2	0.1	0.3	0.9	0.1	-0.1	0.7	0.0
MIN		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	1981-2010	15.7	17.6	25.1	36.6	46.4	56.0	61.0	59.6	51.9	41.2	32.8	22.4	38.9
	1991-2020	16.5	17.5	25.2	36.2	47.3	56.7	62.0	60.4	52.7	42.4	32.7	23.7	39.4
		0.8	-0.1	0.1	-0.4	0.9	0.7	1.0	0.8	0.8	1.2	-0.1	1.3	0.5
Mean		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	1981-2010	23.6	25.9	34.2	46.9	57.6	66.7	71.3	69.8	62.0	50.6	40.6	29.4	48.2
	1991-2020	24.1	25.5	33.8	46.3	58.2	67.0	71.8	70.4	62.9	51.3	40.5	30.4	48.5
		0.5	-0.4	-0.4	-0.6	0.6	0.3	0.5	0.6	0.9	0.7	-0.1	1.0	0.3

Positive Change

Negative Change

No Change



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What about regional precipitation changes?

(Syracuse Airport Climate Normals)

Precipitation		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	1981-2010	2.50	2.07	2.95	3.19	3.22	3.31	3.78	3.57	3.69	3.44	3.53	3.22	38.47
	1991-2020	2.58	2.46	3.04	3.48	3.42	3.56	3.86	3.70	3.38	3.89	3.23	3.28	39.88
		0.08	0.39	0.09	0.29	0.20	0.25	0.08	0.13	-0.31	0.45	-0.30	0.06	1.41
Snow		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	1981-2010	34.0	25.3	18.0	3.8	0.1	0.0	0.0	0.0	0.0	0.4	9.5	32.7	123.8
	1991-2020	34.0	30.3	19.8	3.0	0.1	0.0	0.0	0.0	0.0	0.2	9.8	30.6	127.8
		0.0	5.0	1.8	-0.8	0.0	0.0	0.0	0.0	0.0	-0.2	0.3	-1.1	4.0

Increase

Decrease

No Change



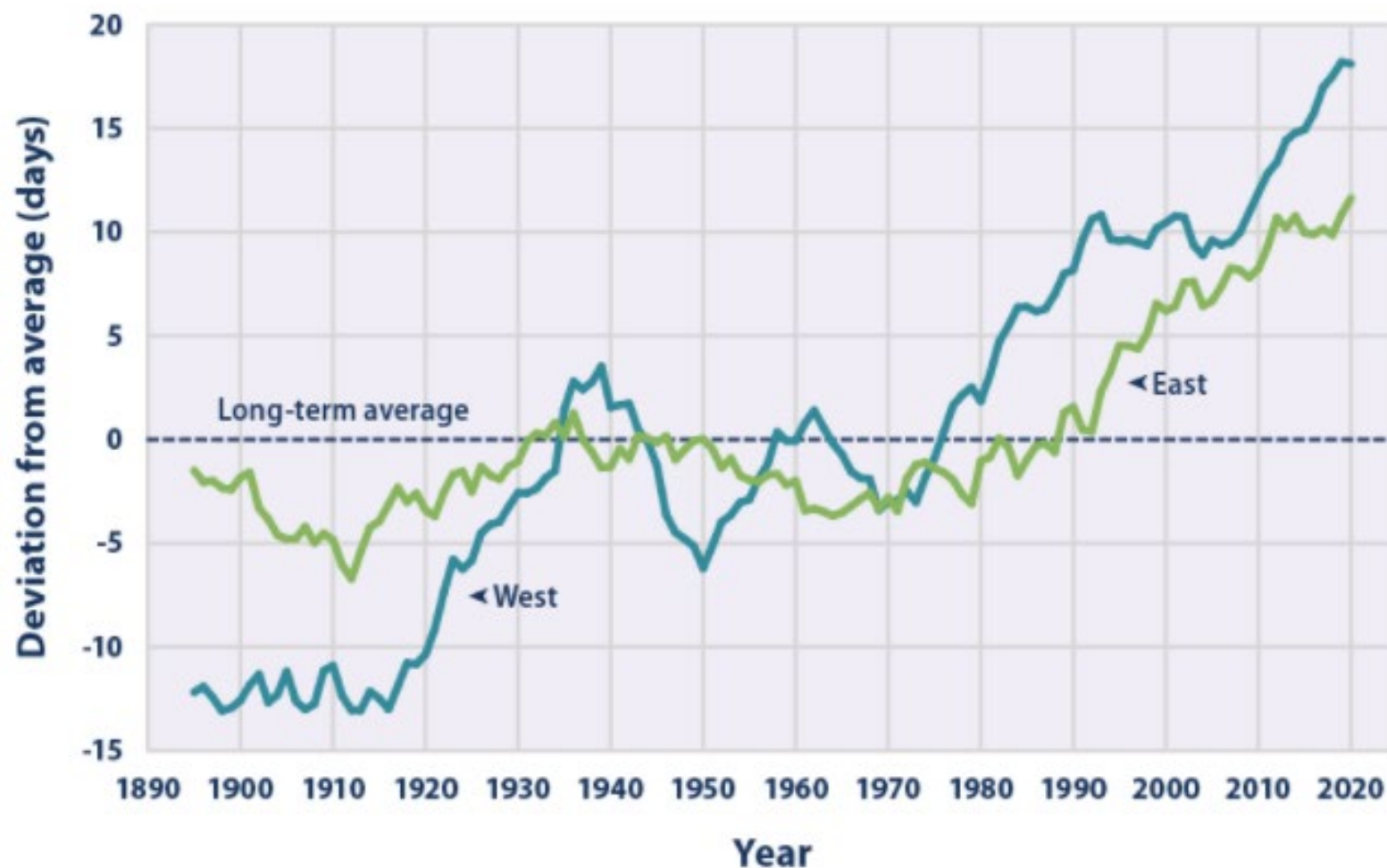
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Length of the Growing Season



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



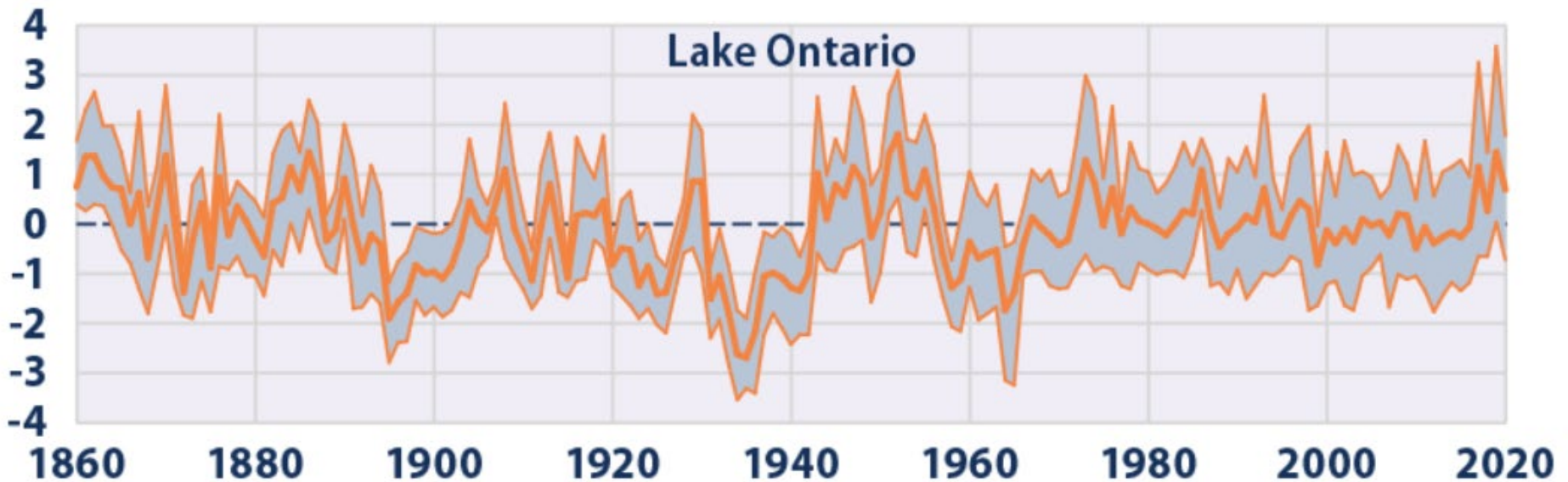
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Lake Ontario – Water Levels



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



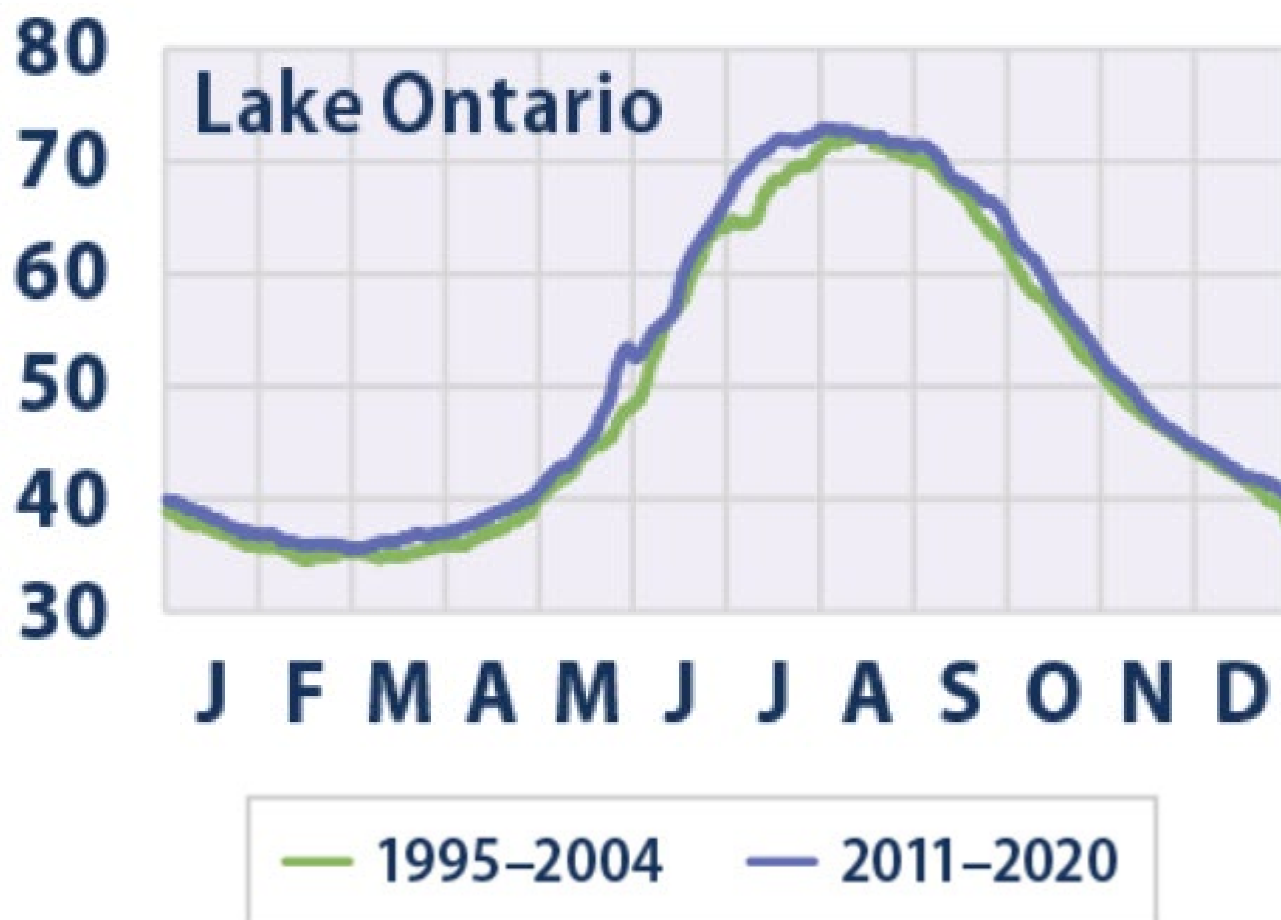
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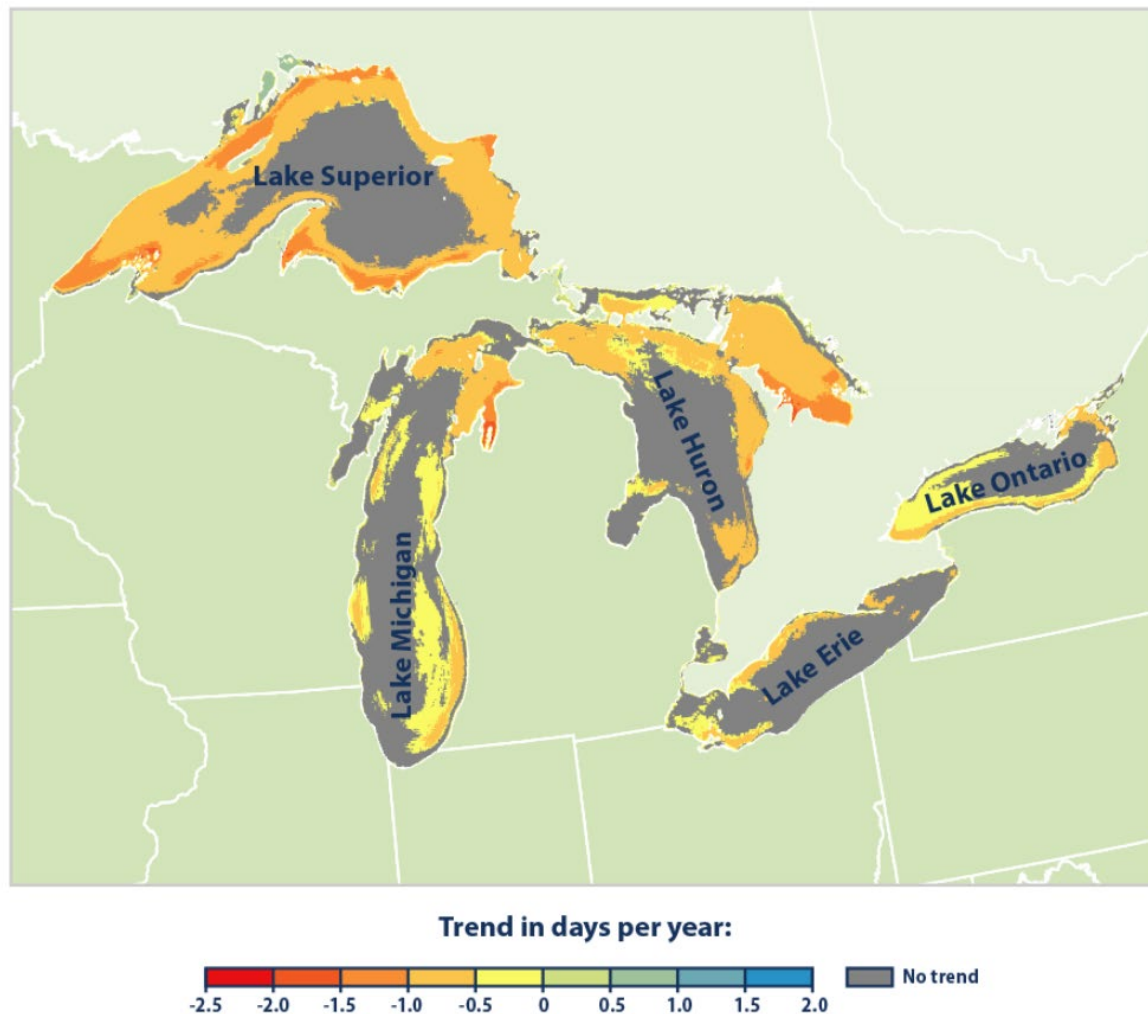
Lake Erie Ontario Temperatures



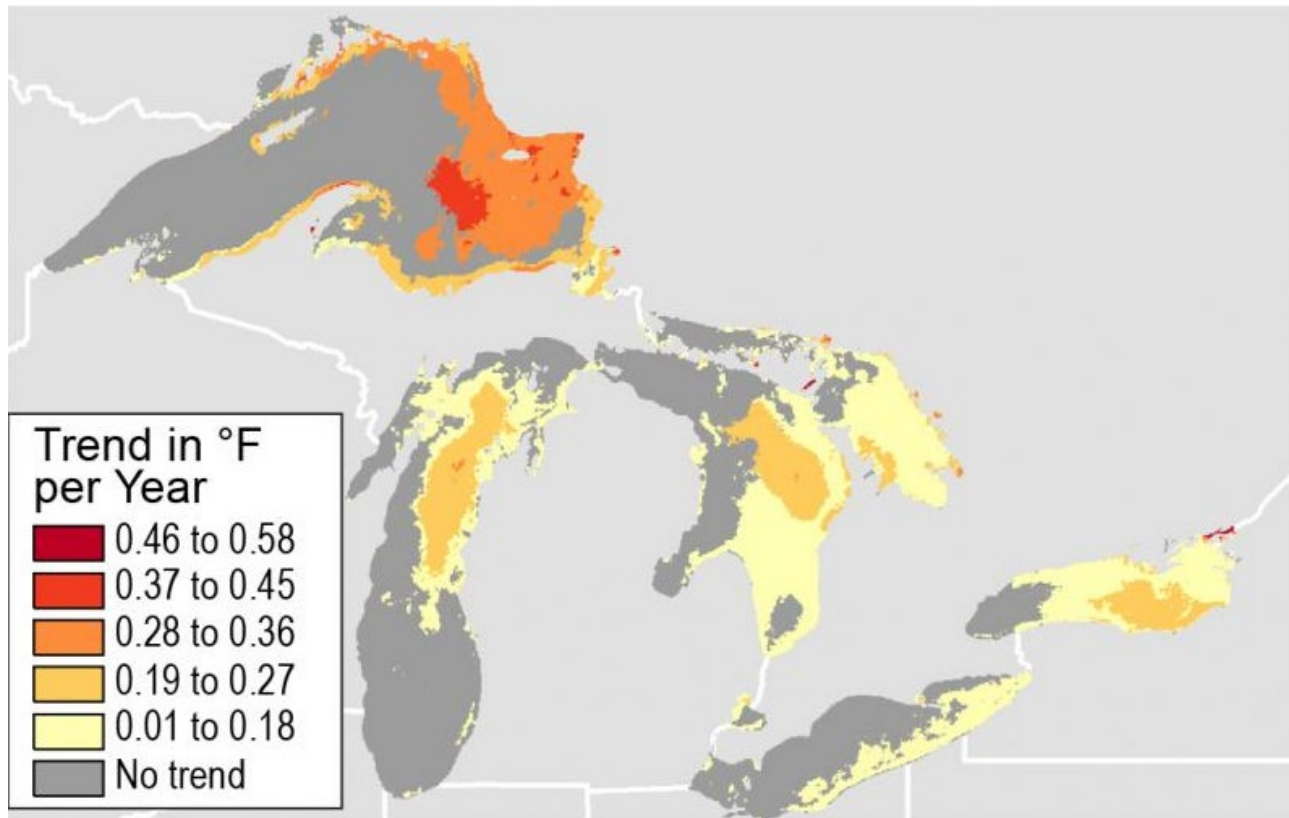
Lake Ontario Ice Cover



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?



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Reference websites:

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

