



# GREAT LAKES DROUGHT MONITORING, IMPACTS, AND SEA GRANT

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# NATIONAL SEA GRANT COLLEGE PROGRAM

Network of **33 Sea Grant programs** in every coastal and Great Lakes state, as well as Guam and Puerto Rico.

Federal-state partnerships:

- NOAA
- State University partners



# NATIONAL SEA GRANT COLLEGE PROGRAM

Provide **integrated research, communication, education,** and **extension** programs to coastal communities that lead to the responsible use of the nation's ocean, coastal and Great Lakes resources through informed personal, policy, and management decisions.



# HISTORY OF SEA GRANT

1862 Morrill Act: established many Land Grant Universities

1914 Smith Lever Act: ensure the flow of information from researchers and the USDA to the people.

1966: Sea Grant College Program created

## “County Agents in Hip Boots”

Some are cooperative Extension, some are not.

- Bottom line...we're on the ground in communities and working with stakeholders!



# DROUGHT REPORTING AND SEA GRANT

~1,000 people

Wide range of topics...

- Aquatic invasive species
- Sustainable seafood/aquaculture
- Pollution prevention
- Ecosystem services
- Coastal restoration
- Land use planning
- Water resources
- Climate change
- Environmental literacy

**Sea Grant Climate Network**  
Seeks to increase the effectiveness of Sea Grant climate programming and outreach nationwide.

Reach out to Sea Grant in your state and make a connection!

# RECENT GREAT LAKES DROUGHT IMPACTS

## Summer – Fall 2016: Eastern Great Lakes Basin

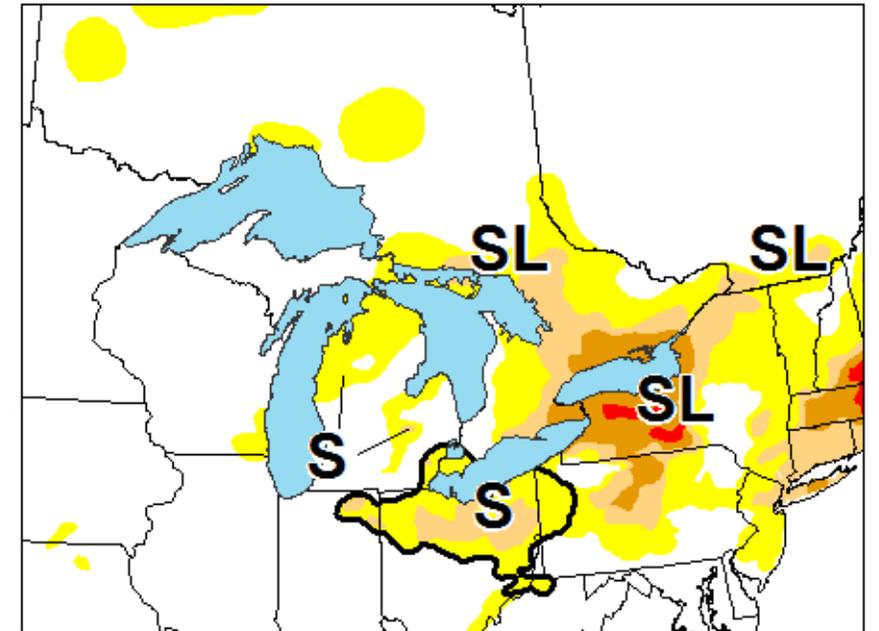
### New York:

- Extreme drought for the 1<sup>st</sup> time on the US Drought Monitor (so since at least 2000)

### Impacts

- Record low streamflow and groundwater
- Private wells going dry
- Ithaca, NY: estimated 30 days of water left
- Yields of corn, soybeans, hay were lower than average
- Dried up pastures

North American Drought Monitor  
As of 8/31/2016



#### Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

#### Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

# RECENT GREAT LAKES DROUGHT IMPACTS

Summer 2012 – Early 2013:  
Western Great Lakes Basin

Widespread severe drought  
Extreme drought near the basin

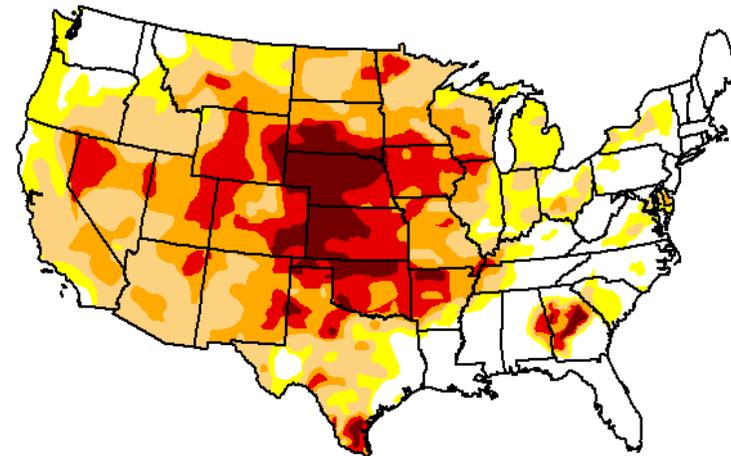
Very low streamflows across the  
southern Lake Michigan in IL/IN.

## U.S. Drought Monitor CONUS

October 9, 2012  
(Released Thursday, Oct. 11, 2012)  
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.28	76.72	63.55	39.91	20.15	6.18
Last Week 10/2/2012	24.10	75.90	64.58	40.07	20.12	6.07
3 Months Ago 7/10/2012	20.02	79.98	60.84	37.19	11.61	0.74
Start of Calendar Year 1/3/2012	50.41	49.59	31.90	18.83	10.18	3.32
Start of Water Year 9/25/2012	23.41	76.59	65.45	42.12	21.48	6.12
One Year Ago 10/11/2011	57.83	42.17	30.47	23.85	17.12	9.76



### Intensity:



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

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CPC/NCEP/NWS/NOAA



<http://droughtmonitor.unl.edu/>

# GATHERING AND DOCUMENTING

## Great Lakes Quarterly Climate Report

### Partners

- Environment & Climate Change Canada
- Great Lakes Environmental Research Laboratory
- U.S. Army Corps of Engineers
- NWS River Forecast Centers
- Midwest Climate Hub
- State Climatologists
- Sea Grant

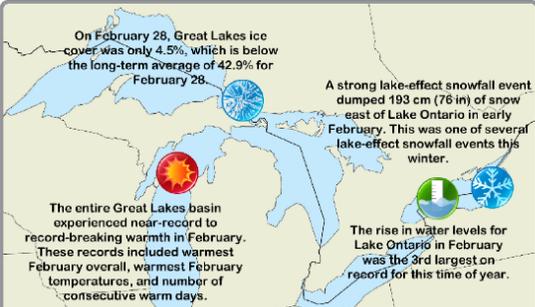
**Quarterly Climate Impacts and Outlook**
**Great Lakes Region**

March 2017

**Great Lakes Significant Events - for December 2016 - February 2017**

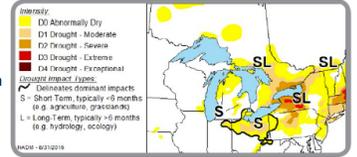
Despite near-normal temperatures in December and a cold first half of January, winter 2016-17 will be remembered for the unseasonably warm weather in late January through February. Toronto, ON recorded its highest ever February temperature of 19°C (66°F) on February 23. As did three other stations on February 24: Syracuse, NY with a temperature of 22°C (71°F), Binghamton, NY with a temperature of 21°C (70°F), and Erie, PA with a temperature of 25°C (77°F). Erie's record was also its warmest winter day on record. Chicago, IL experienced the longest stretch of consecutive days that were 18°C (65°F) or higher from February 17-22. During the February 18-25 time period, several stations in the southern Canadian basin were marked as extremely above normal.

The above-normal temperatures resulted in minimal ice cover on the Great Lakes. As of February 28, the



### Regional Impacts - for June - August 2016

**Drought**  
After persistent dry conditions, drought developed in the eastern Great Lakes basin. Several counties in New York experienced extreme drought conditions for the first time since at least 2000, when the U.S. Drought Monitor data began.



North American Drought Monitor as of 8/31/16  
(www.drought.gov)

**Agriculture**  
The yields of corn, soybeans, and hay are expected to be lower than average in some drought areas. Dried up pastures forced farmers in New York to supplement with feed, which is usually saved for the winter. Despite the drought conditions in New York, grape growers indicated berries were ripening faster than usual and may be smaller in size, but higher quality. Areas to the west that were wetter are expecting above-average yields this summer.

Seasonal growing degree day accumulations were above average for much of the basin. This may reduce the risk for fall freeze damage since crops may reach maturity before the first killing freeze.

**Water Resources**  
As a result of drought conditions, streamflow and groundwater levels were at record or near-record low levels in parts of New York, with

some private wells going dry. In late July, Ithaca, New York's water supply was critically low, with an estimated 30 days of water left without significant rain or reduction in use.

**Transportation & Infrastructure**  
The mid-July flash flooding around western Lake Superior resulted in many road closures, including major interstates. In Lake Superior, numerous vessels were affected by downburst winds. Six vessels became adrift and some were overturned. Preliminary damage estimates for eight Wisconsin counties totaled over \$28 million to public infrastructure.



Highway near Highbridge, WI (Photo: NWS Duluth/Tracy Packingham)

Hot and dry weather and aging infrastructure led to a dozen water main breaks in the Buffalo, New York area in July.

**Water Quality**  
The size of the western Lake Erie harmful algal bloom is smaller this year due to developing and persistent drought conditions in the region. However, NOAA scientists have found that toxic algae is still forming as bloom toxin concentrations are significantly higher than last year. The drivers behind changes in toxicity are still under investigation and areas of algal scum could still present risk and should be avoided.

Dec 2016-Feb 2017: Diff. from Avg (%) February 23.      (+12.2 in) (+0.4 in) (+18.5 in) (+3.5 in) 1918-2016


Great Lakes Region  
Quarterly Climate Impacts and Outlook  
- March 2017 -

<http://mrcc.isw.illinois.edu/pub/pub6GreatLakes.jsp>  
[www.ec.gc.ca/eau-water/default.aspx?lang=En&n=15329803-1](http://www.ec.gc.ca/eau-water/default.aspx?lang=En&n=15329803-1)  
 #regionalclimateoutlook

# DROUGHT IMPACTS

## Great Lakes Water Levels

Multi-year droughts can affect water levels, but a few months or a year of dry conditions will likely not.

1999-2013: unusually long period of low water levels

- High over-lake evaporation
  - Reduced cloudiness
  - Increased solar insolation
  - Less ice cover



High water on Lake Erie



Low water on Lake Michigan

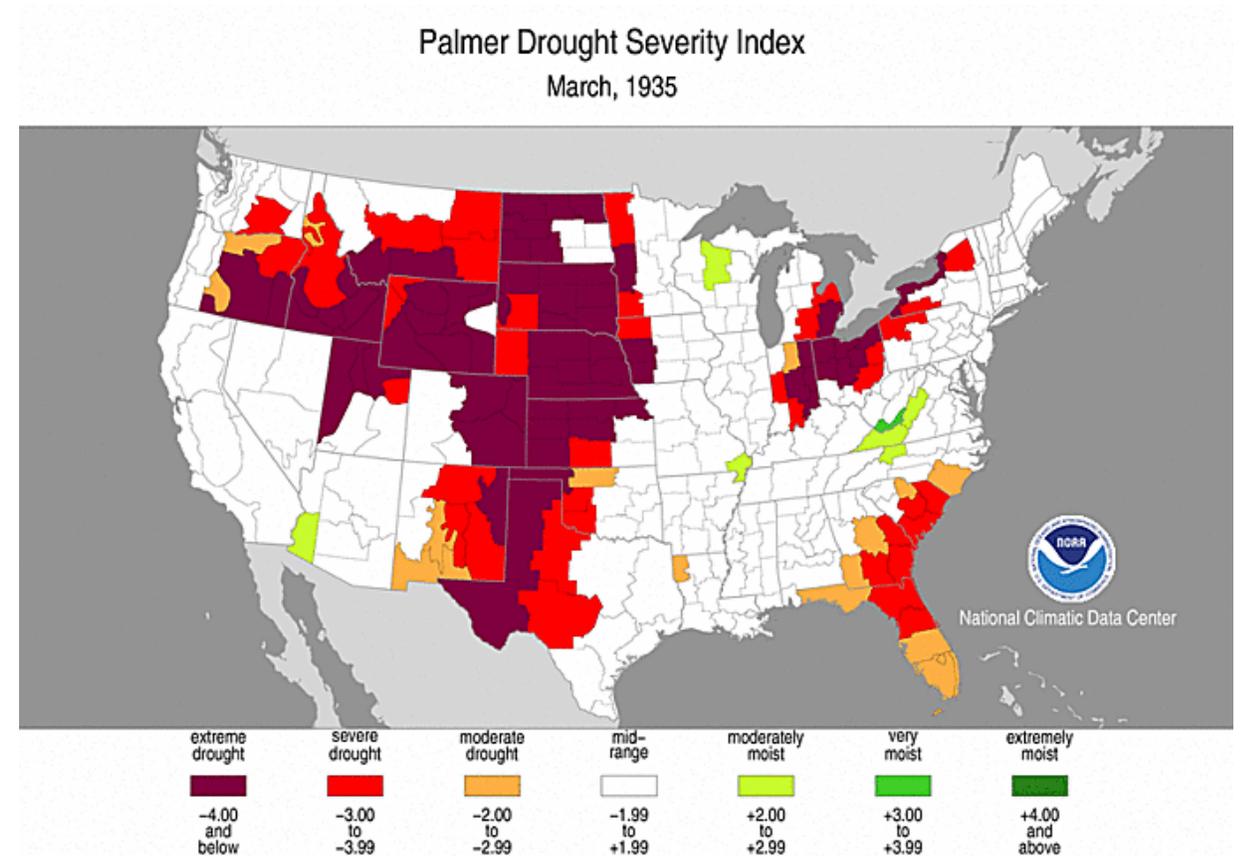
# DROUGHT IMPACTS

Record low water levels: do they correspond with drought?

Superior: 1925 or 1926

Michigan-Huron: 1964

Erie and Ontario: 1934-1936



# DROUGHT IMPACTS

## Water Quality

The 2012 North American drought and accompanying low tributary discharge was associated with a **record-breaking hypoxic event** in Lake Erie.

## Fish Habitat

Hypoxia decreases the amount and quality of habitat available for fish

- Also influences metabolism, growth, reproduction, and behavior

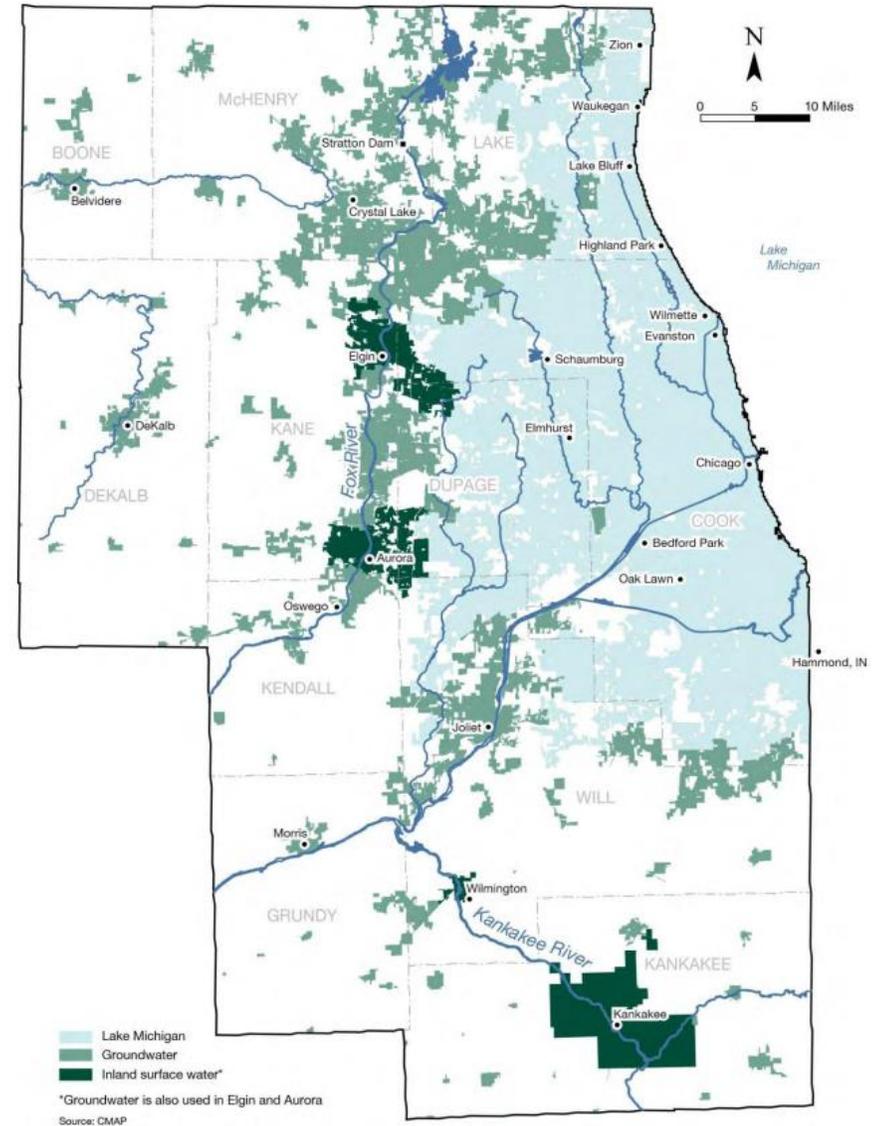
Low flows in Lake Superior streams are a serious problem for trout.



# DROUGHT IMPACTS

## Water Supply

Some communities rely on other surface water and groundwater, which can become threatened during drought

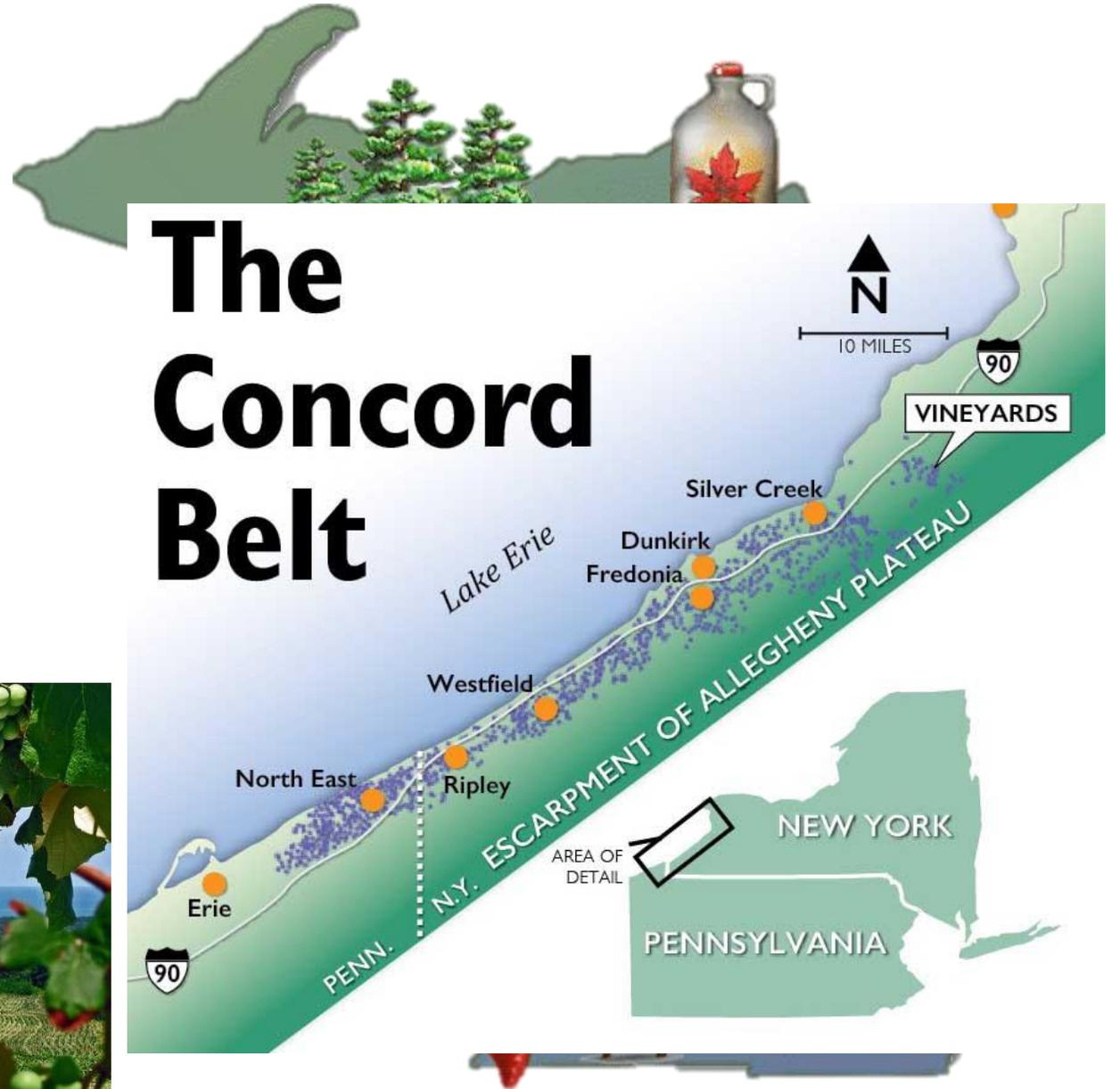


# DROUGHT IMPACTS

## Agriculture

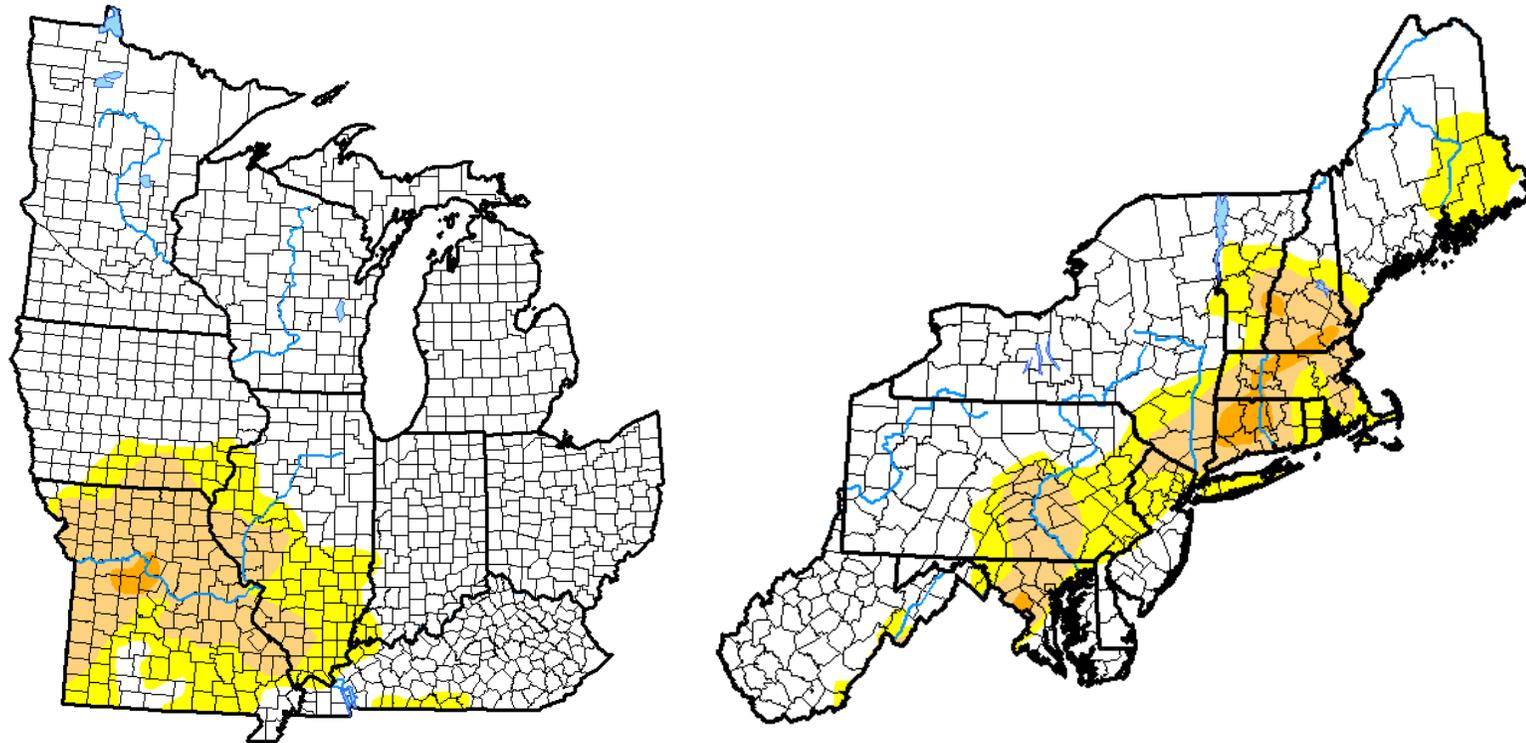
Many of the same crops and therefore impacts you'd find in the Midwest

**Specialty crops** much more widespread though



# FEEDBACK FROM GREAT LAKES USERS

More difficult to assess drought in the Great Lakes using the U.S. Drought Monitor with the basin broken up into two regions.



**THANK YOU!**



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