

Ohio's Changing Climate: Current and Future Perspectives

Aaron B. Wilson

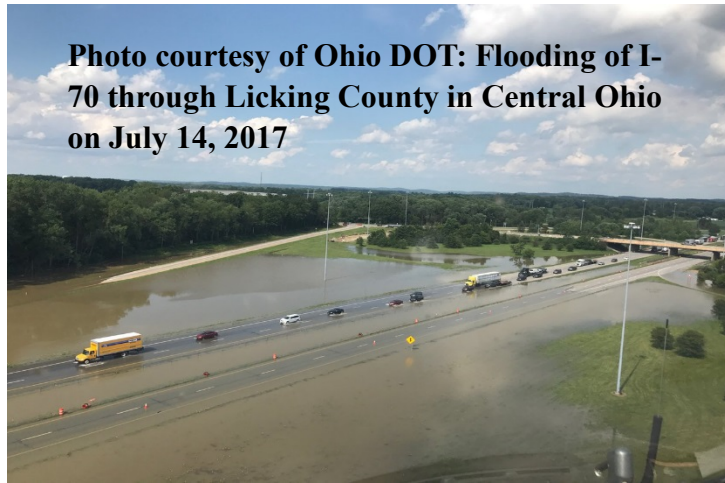
Byrd Center | OSU Extension | State Climate Office of Ohio

Understanding Algal Blooms: State of the Science Conference

September 11, 2019



THE OHIO STATE UNIVERSITY



“Climate Change directly impacts our *economic and environmental* sustainability.”



Photo Credit: Jeff Stachler

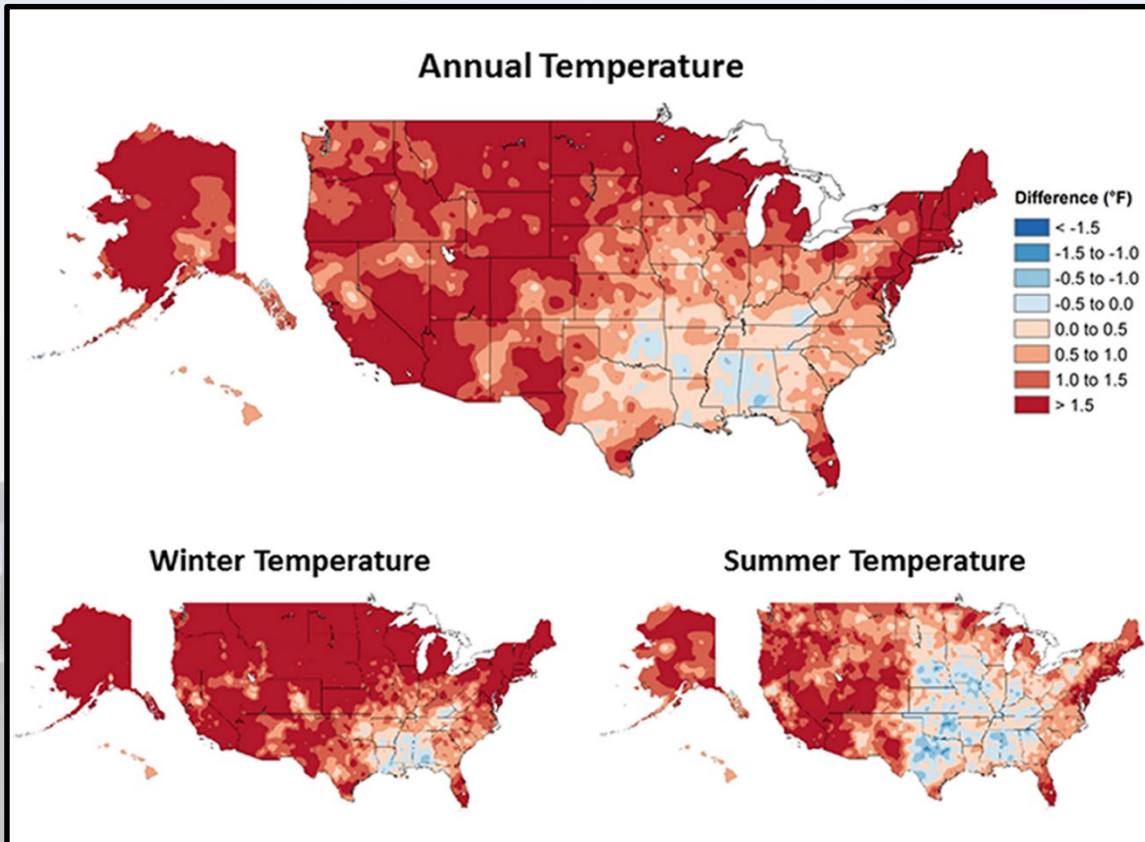


Photo Credit: Mary Gruber



Photo Credit: Greg McGlinch

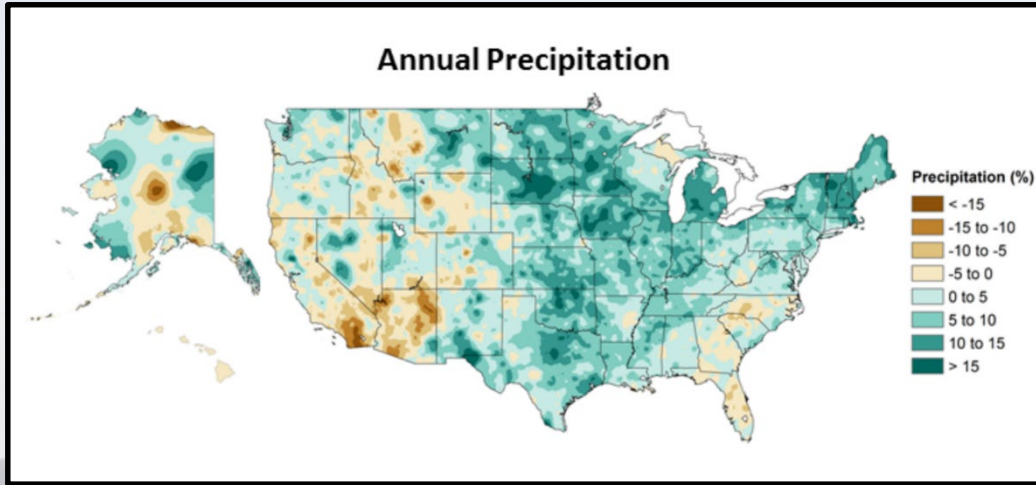
Seasonal Differences in Warming



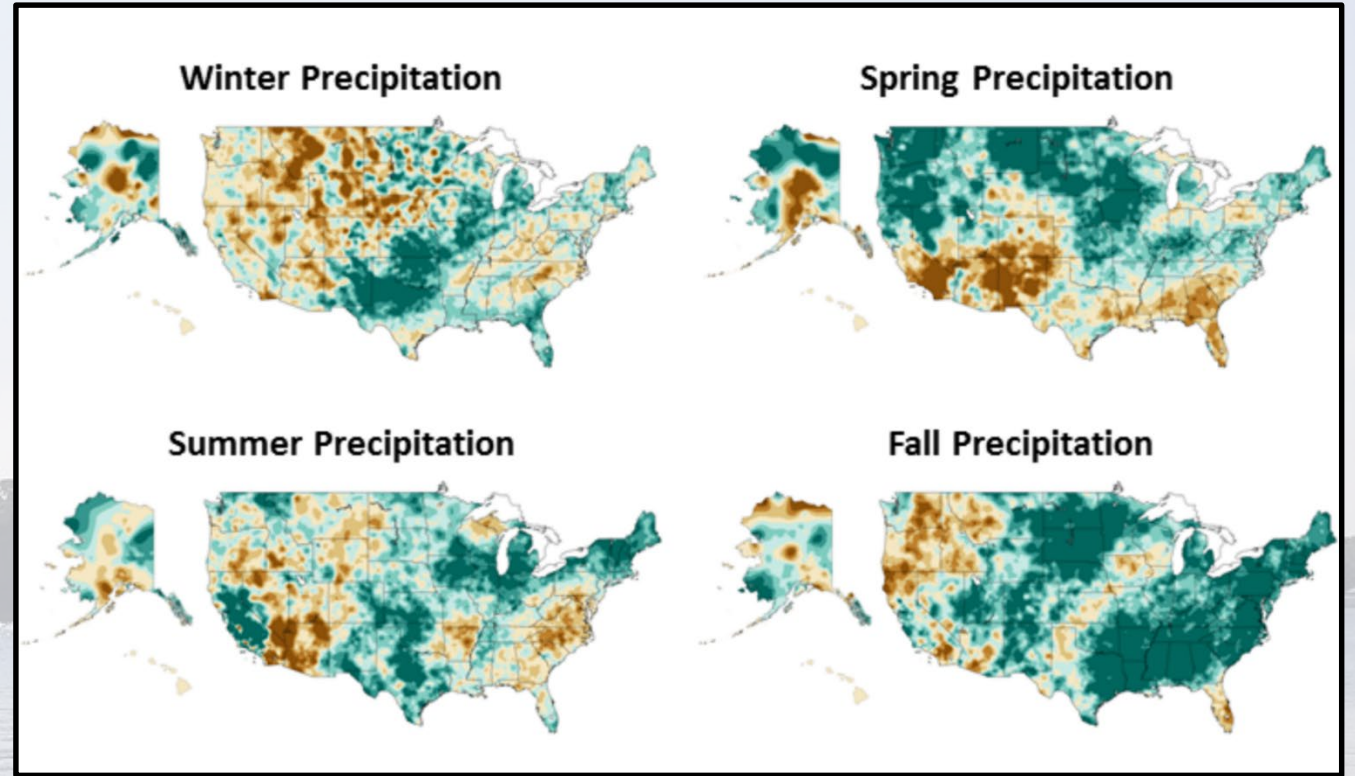
- More than 95% of the land surface demonstrated an increase in annual average temperature
- Paleoclimate records suggest recent period the warmest in at least the past 1,500 years
- Greatest and most widespread in winter

Annual average temperature over the contiguous United States has increased by 1.2°F (0.7°C) for the period 1986–2016 relative to 1901–1960 and by 1.8°F (1.0°C) based on a linear regression for the period 1895–2016: National Climate Assessment CCSR: <https://science2017.globalchange.gov/>

Annual and Seasonal Changes in Precipitation

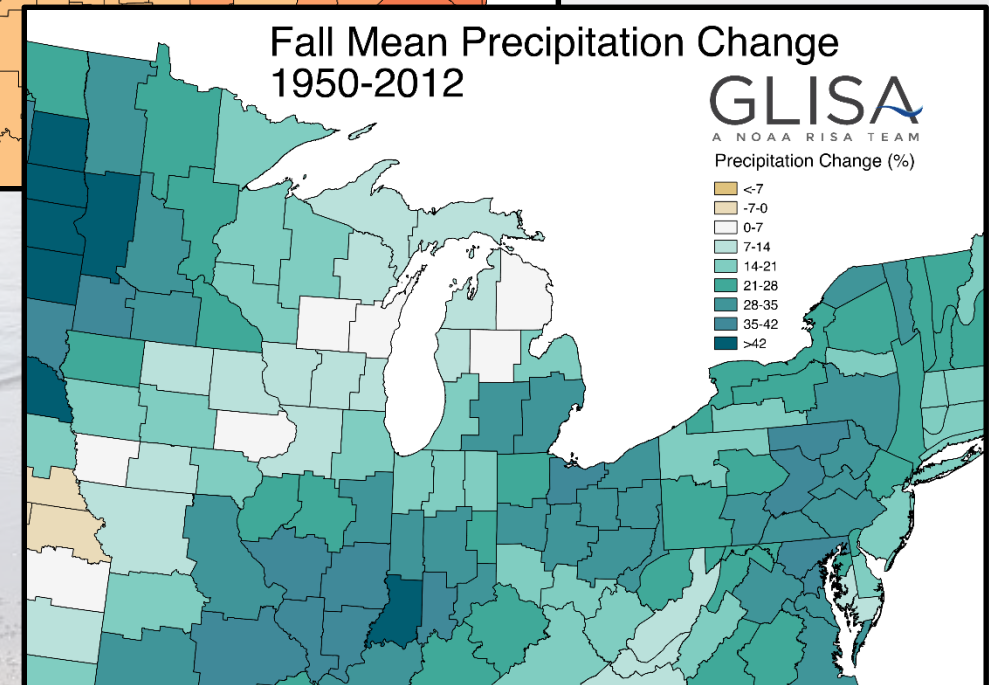
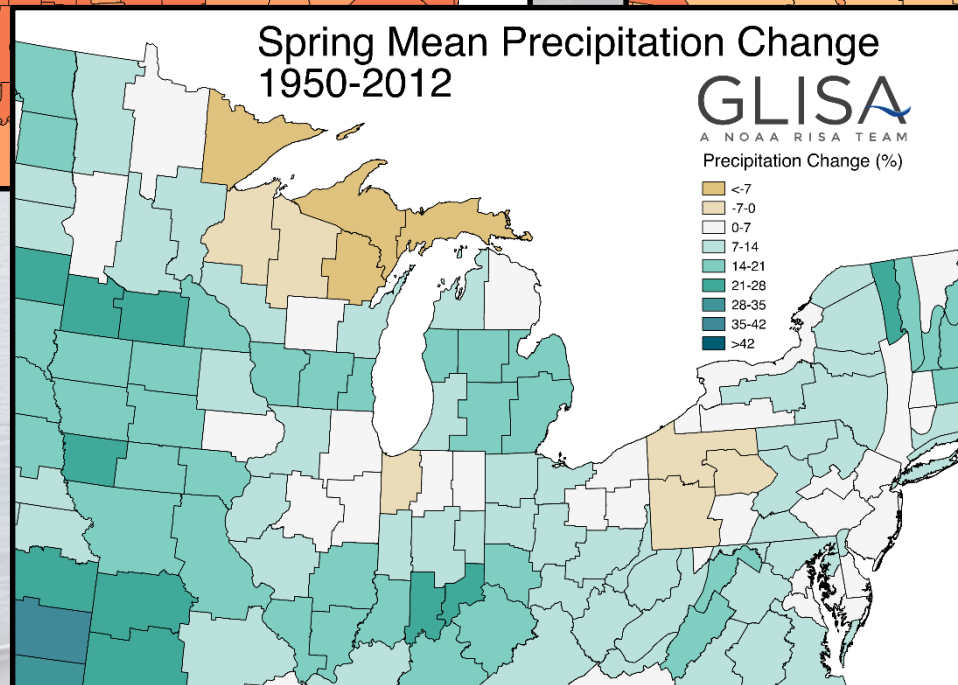
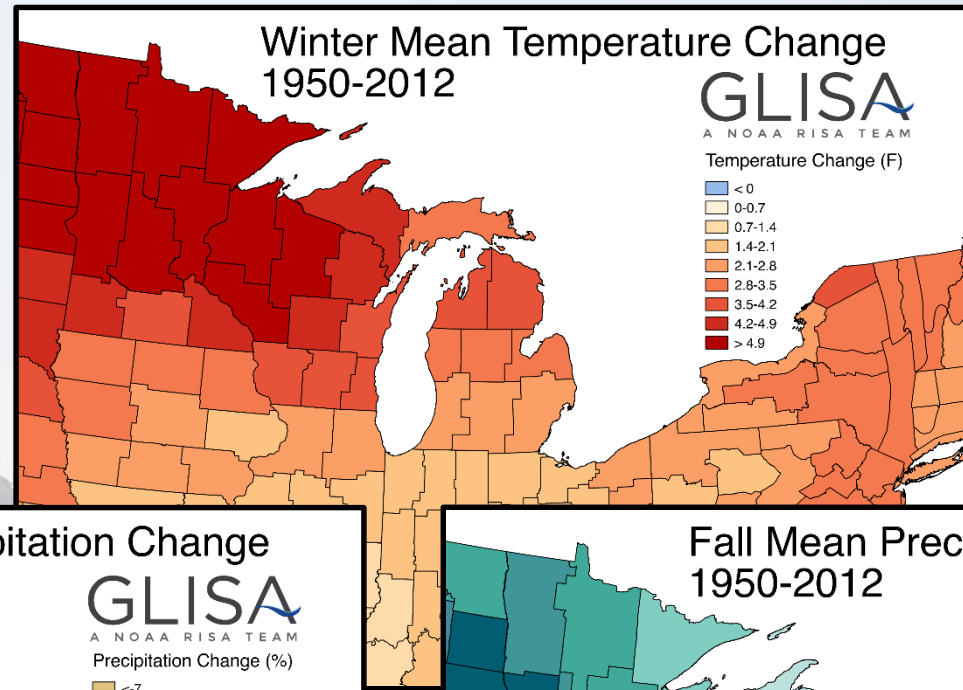
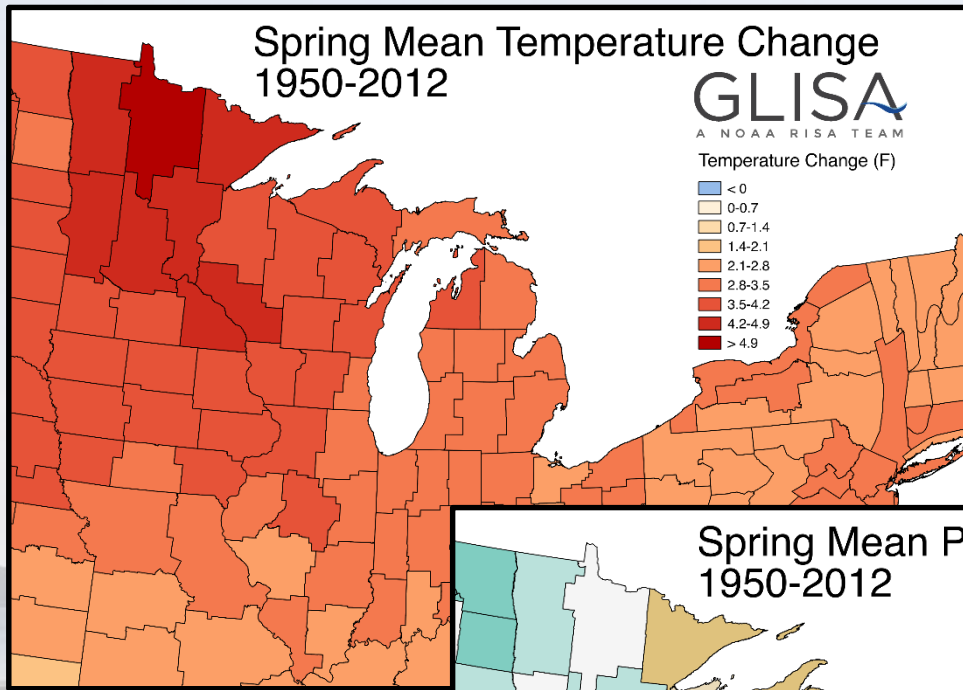


National Climate Assessment CCSR:
<https://science2017.globalchange.gov/>

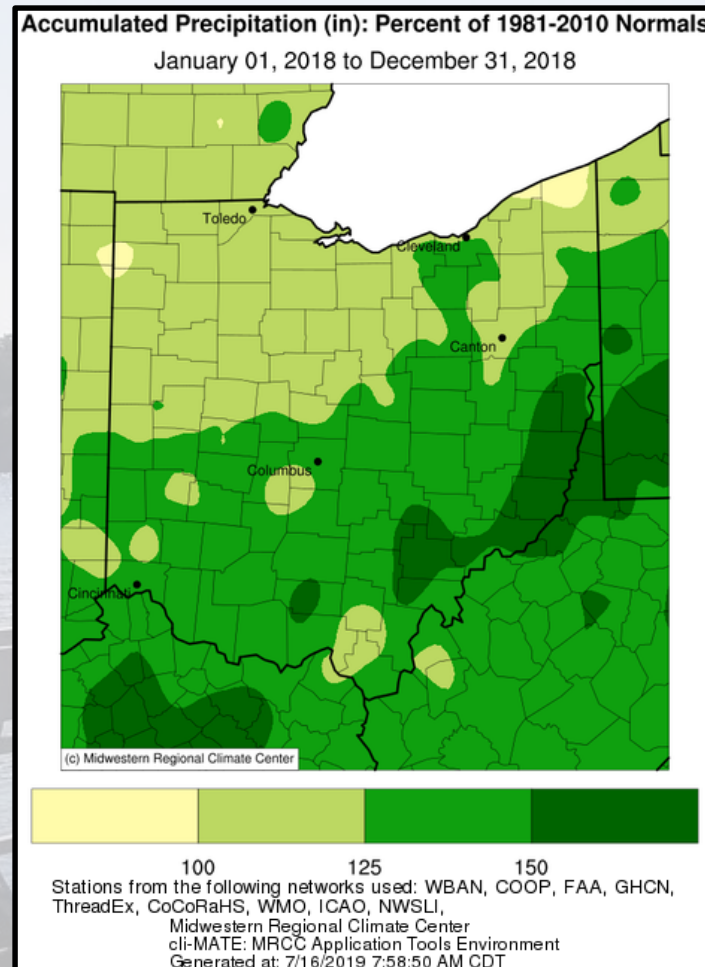
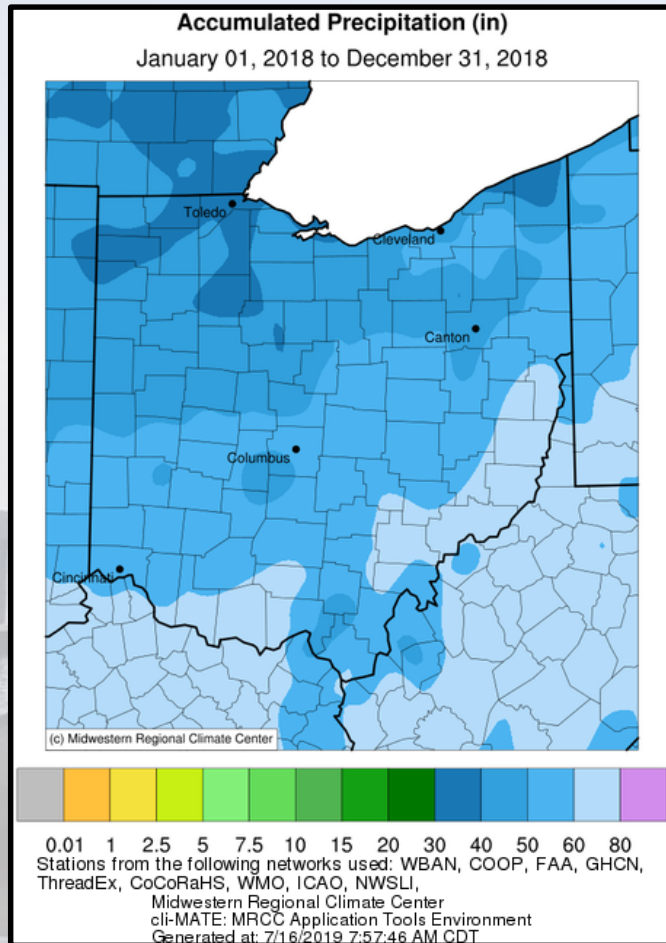


- National average increase of 4% in annual precipitation since 1901: Ohio: 5-15%
- Driven strongly by fall trends (10-15% in some locations)
- Regional Spring, Summer, and Fall Trends across Ohio
- Increased Intensity of rainfall events

Great Lakes Seasonal Changes



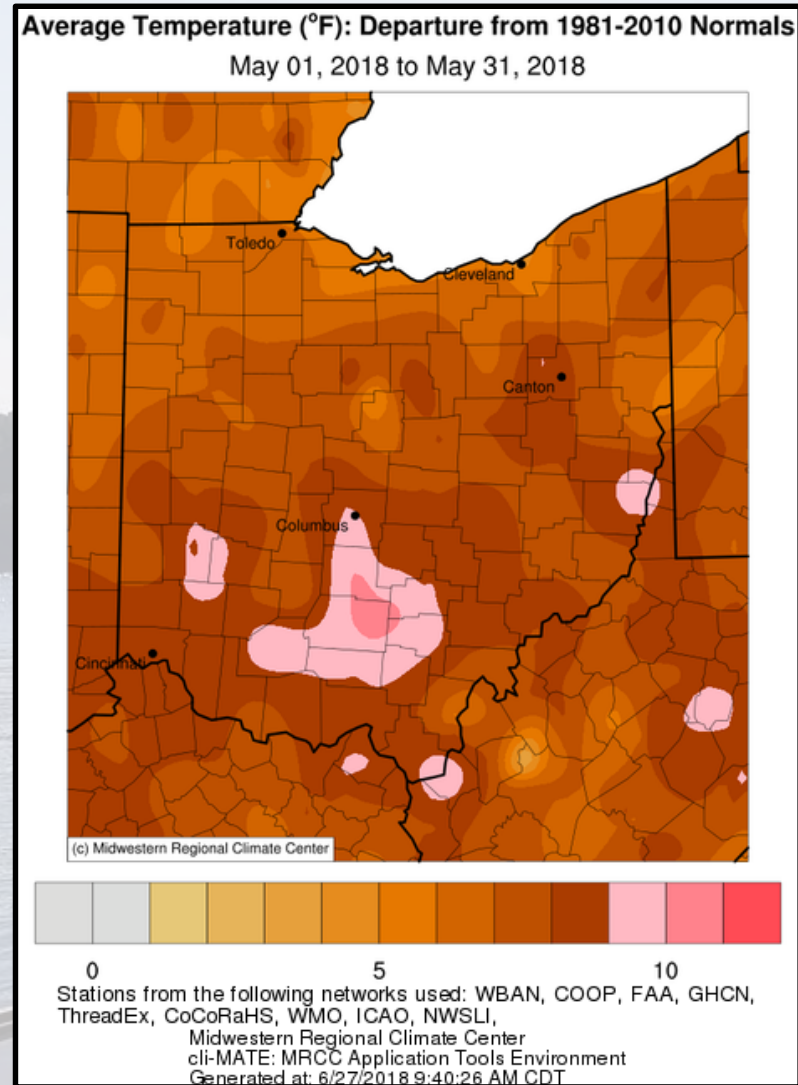
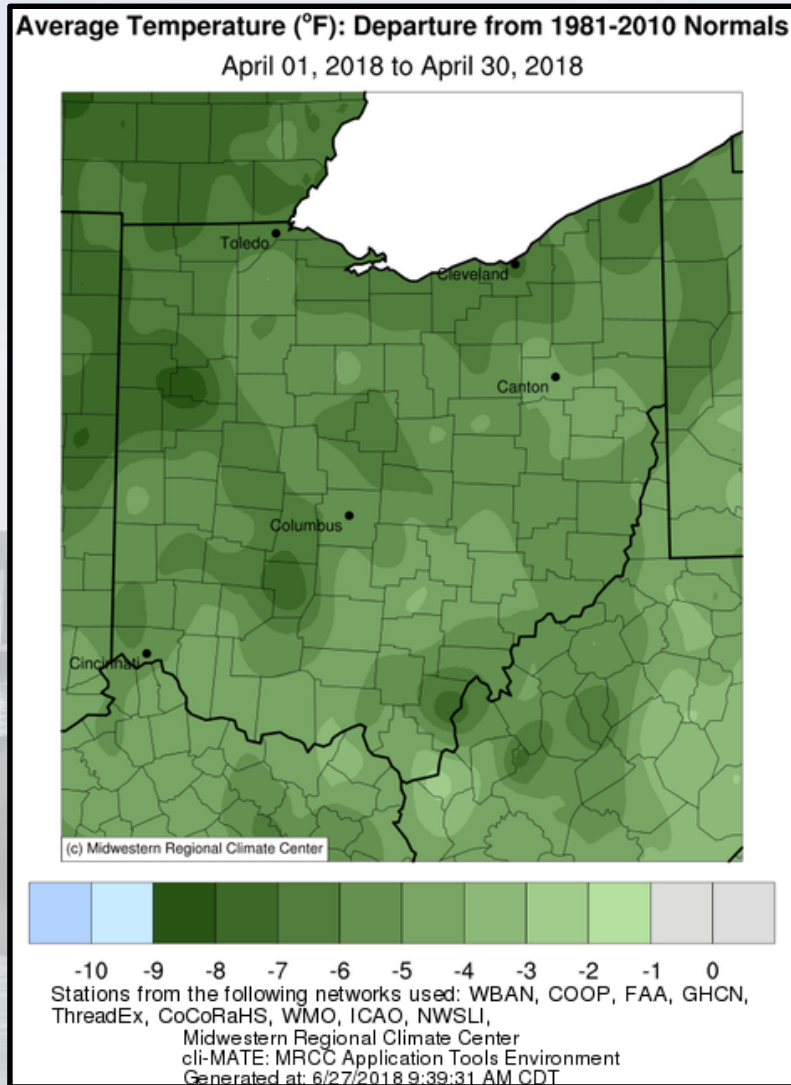
2018 for the State of Ohio



RANK	YEAR	AVERAGE	DIFFERENCE
1	2011	55.95	16.50
2	1990	51.07	11.62
3	2018	50.83	11.38
4	1950	48.34	8.89
5	1996	46.85	7.40
6	2003	46.42	6.97
7	1929	46.42	6.62
8	2017	45.51	6.06
9	2004	45.45	6.00
10	1937	45.18	5.73

- 19th Warmest
- 3rd Wettest
- Modern Period (1895 – 2018)

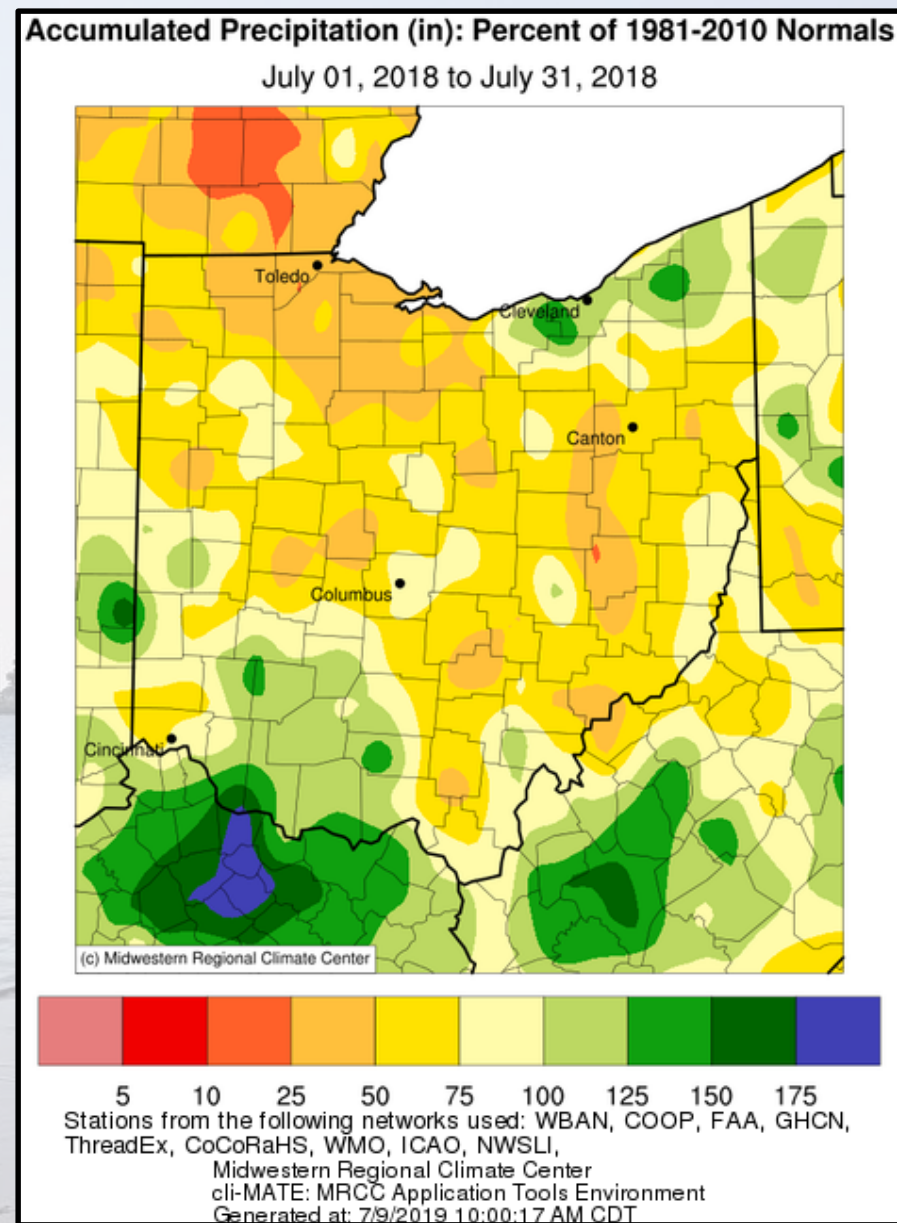
Recall the Variability of Spring 2018



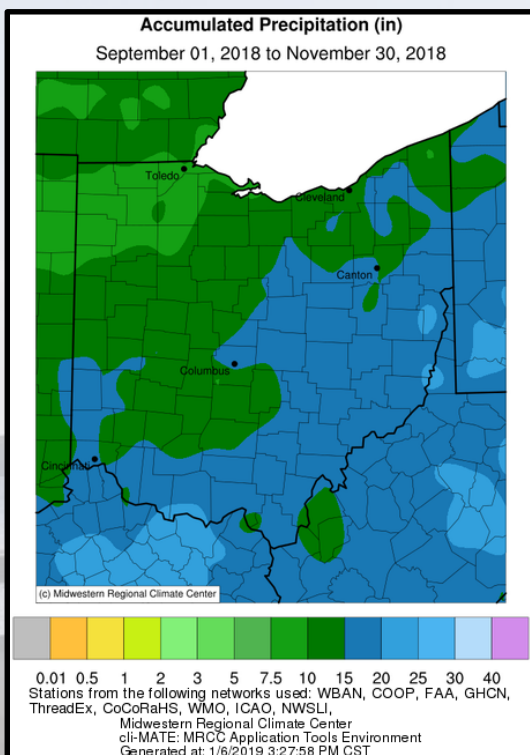
- MAM 2018 ranks as the 49th warmest – close to average
- **Extreme monthly variability**
- 9th coldest April on record (1895-present)
- Warmest May (1895-present)
- Stayed wet and cool across northern Ohio through about mid-May

How can it be so dry, when it's been so wet?

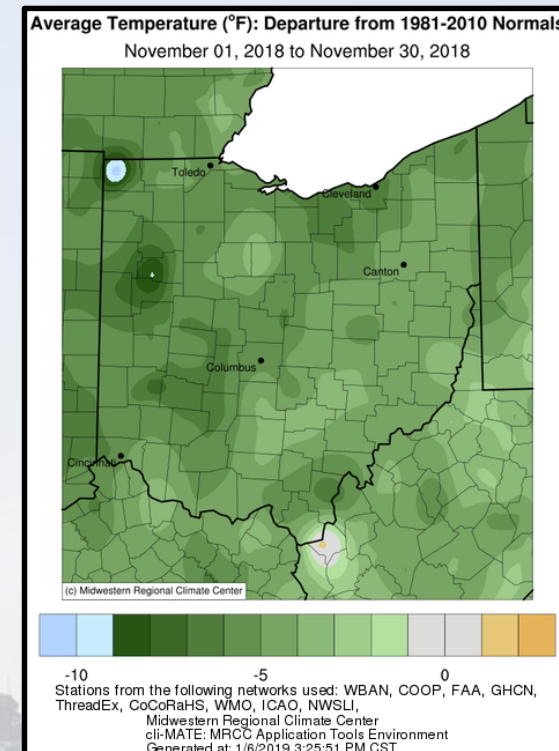
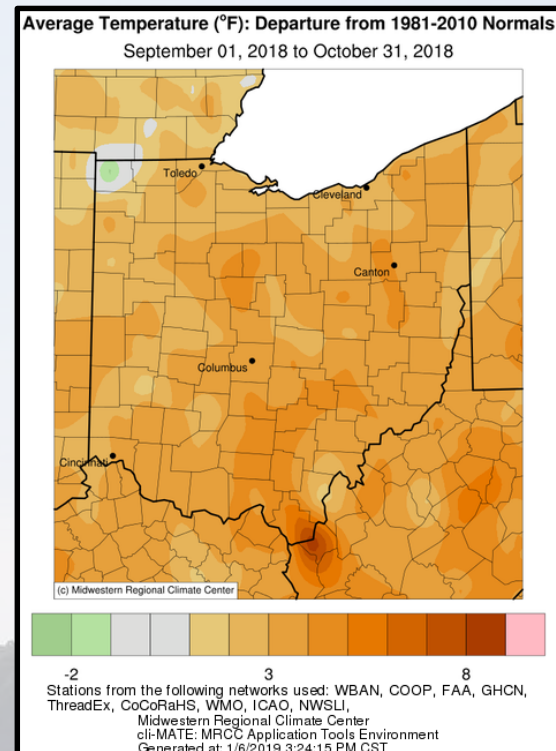
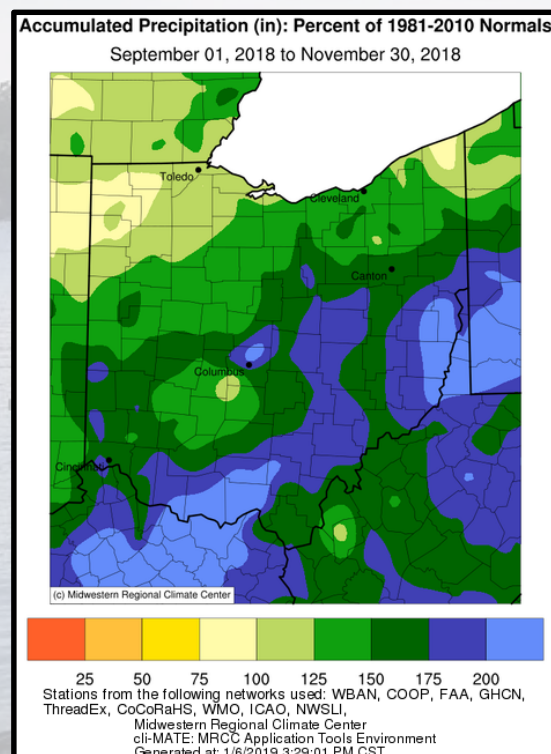
- June 2018 ranks as the 4th warmest with the summer of 2018 ranked as the 17th warmest (1895-2018)
- Warmth driven strongly by warm overnight lows
- Moderate drought conditions were experienced across parts of NW Ohio (Ottawa, Lucas, Wood, Sandusky, Huron Counties)



A Crazy Fall in Ohio



Fall 2018: Extreme Variability



- 3rd wettest on record since 1895.
- Sep. 2018 ranks as 2nd wettest.
- Driven largely by tropical activity

2019 – Wet Again!

- Winter was the 11th wettest for Ohio – focused mostly along and south of I-70
- March-May 2019 rank as the 36th warmest and 32nd wettest for the state
- West-central and northwest Ohio ranked 7th and 3rd wettest on record, respectively.
- St. Marys, Ohio (Auglaize County), CoCoRaHS observer reported over 20 inches of precipitation between March 1 and May 31 - *that's over half of their normal yearly rainfall in just three months.*
- Multiple observers in excess of 15 inches
- Reports of 20-26 days of at least a trace of precipitation during the month of May
- Only 7 days suitable for fieldwork during May

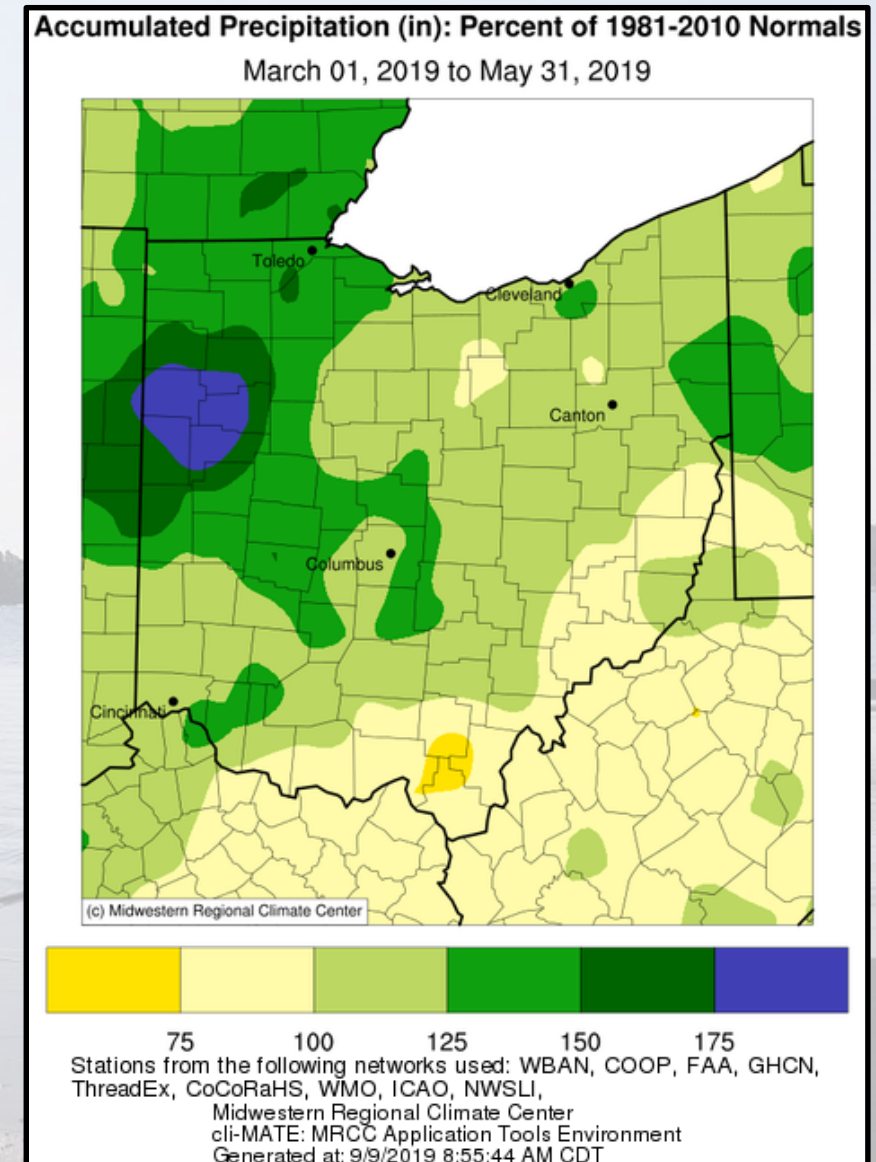
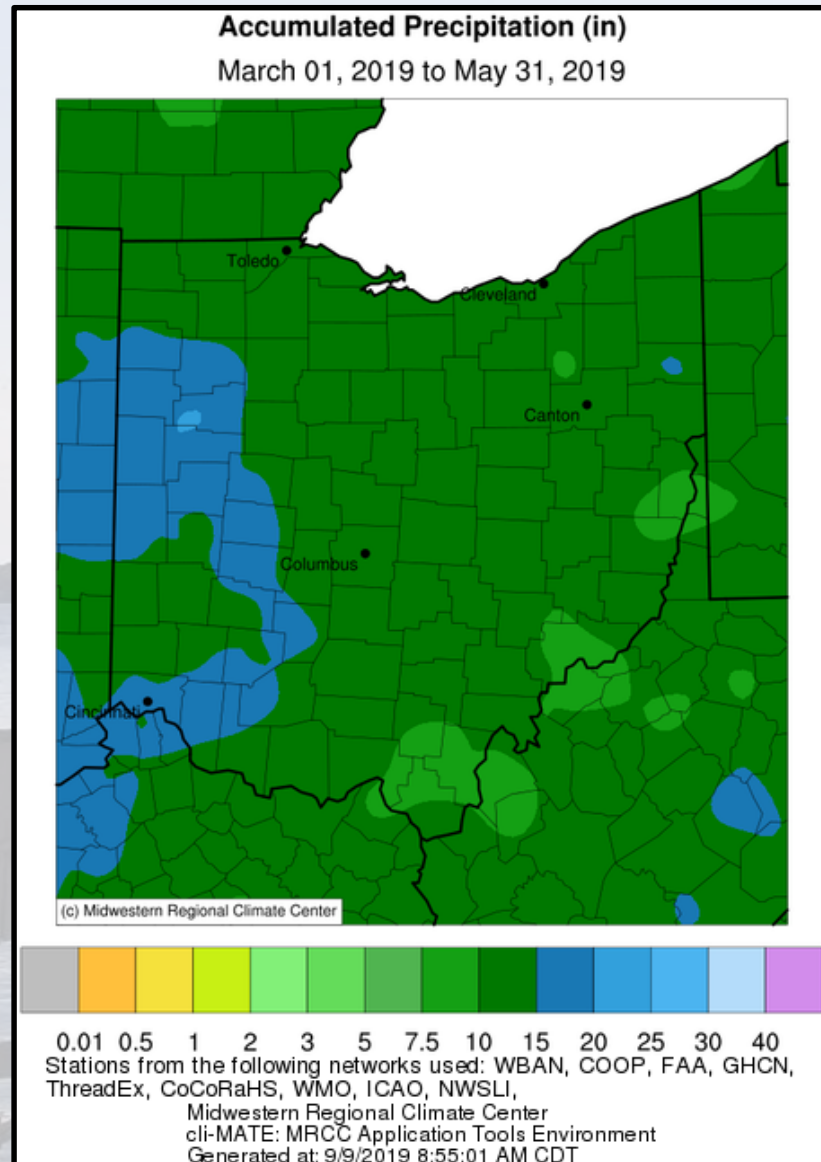


Photo Credit: Greg McGlinch

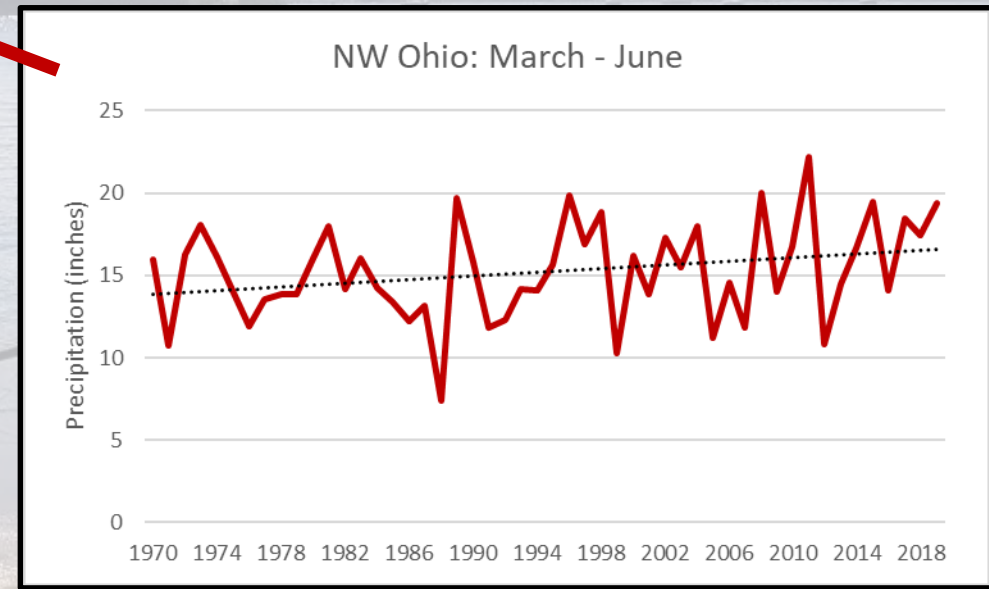
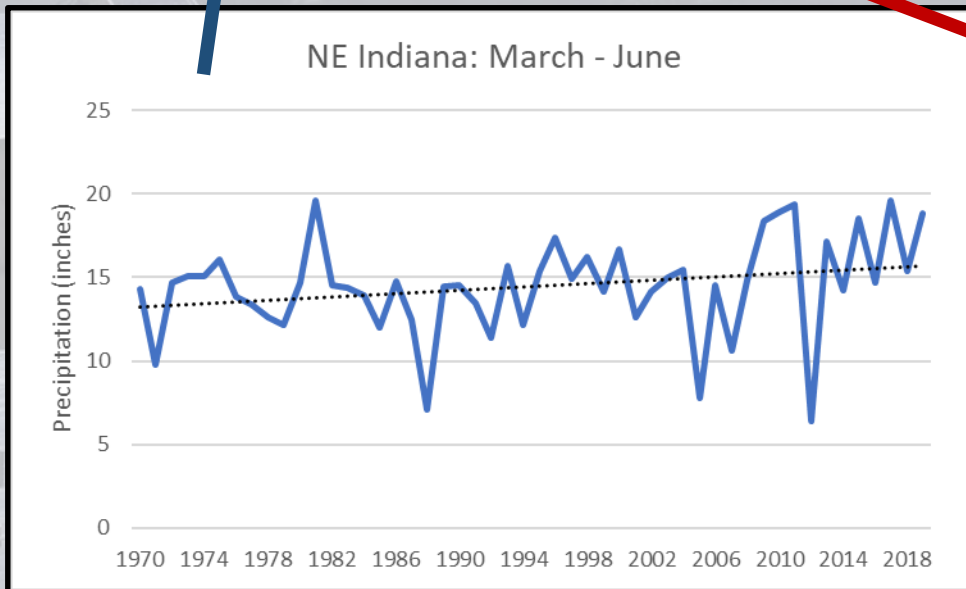
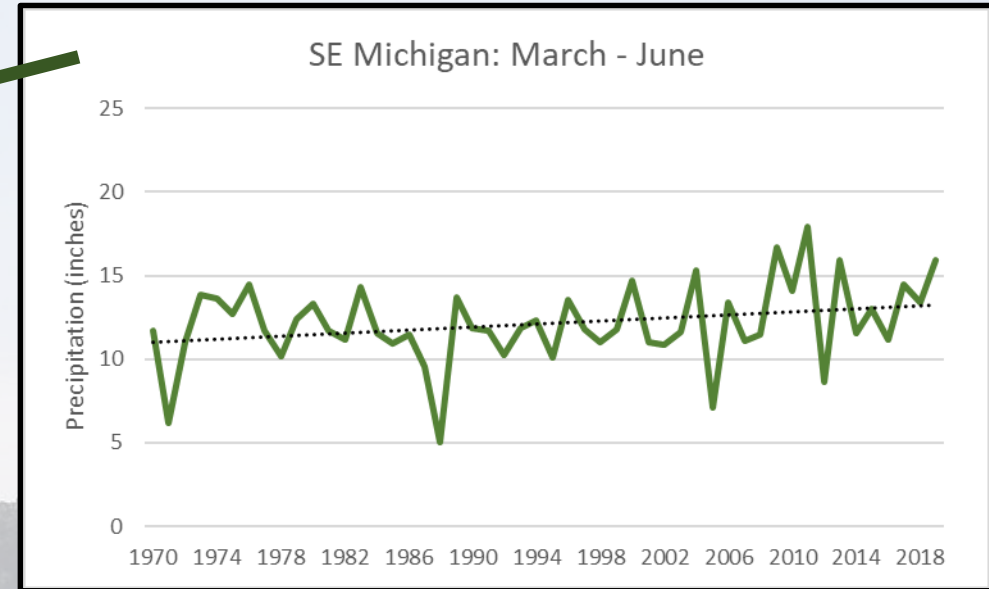
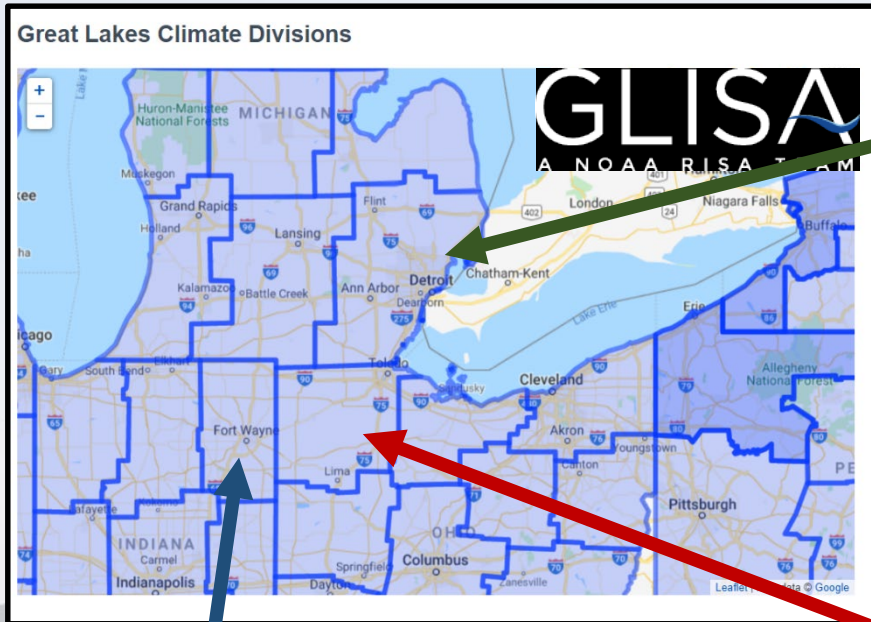


Photo Credit: Amanda Douridas

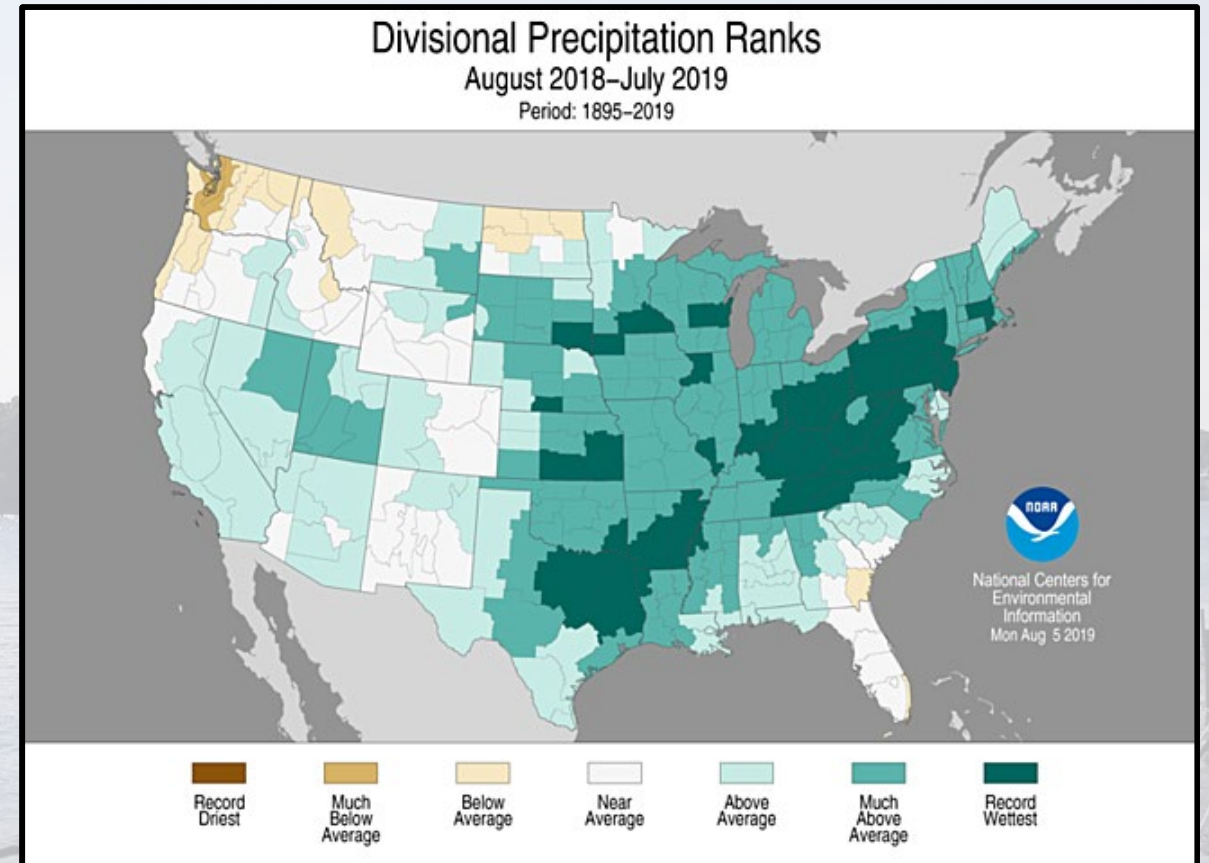
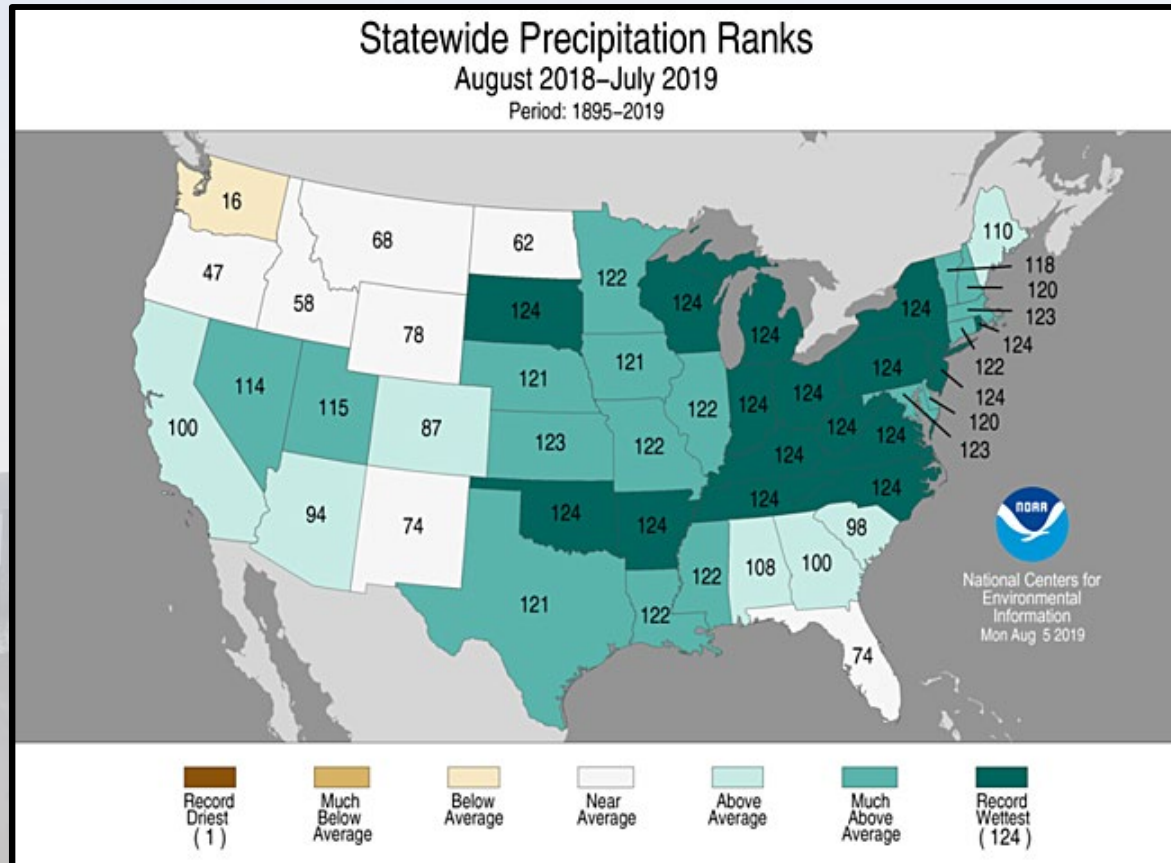
Spring 2019 In the Western Basin



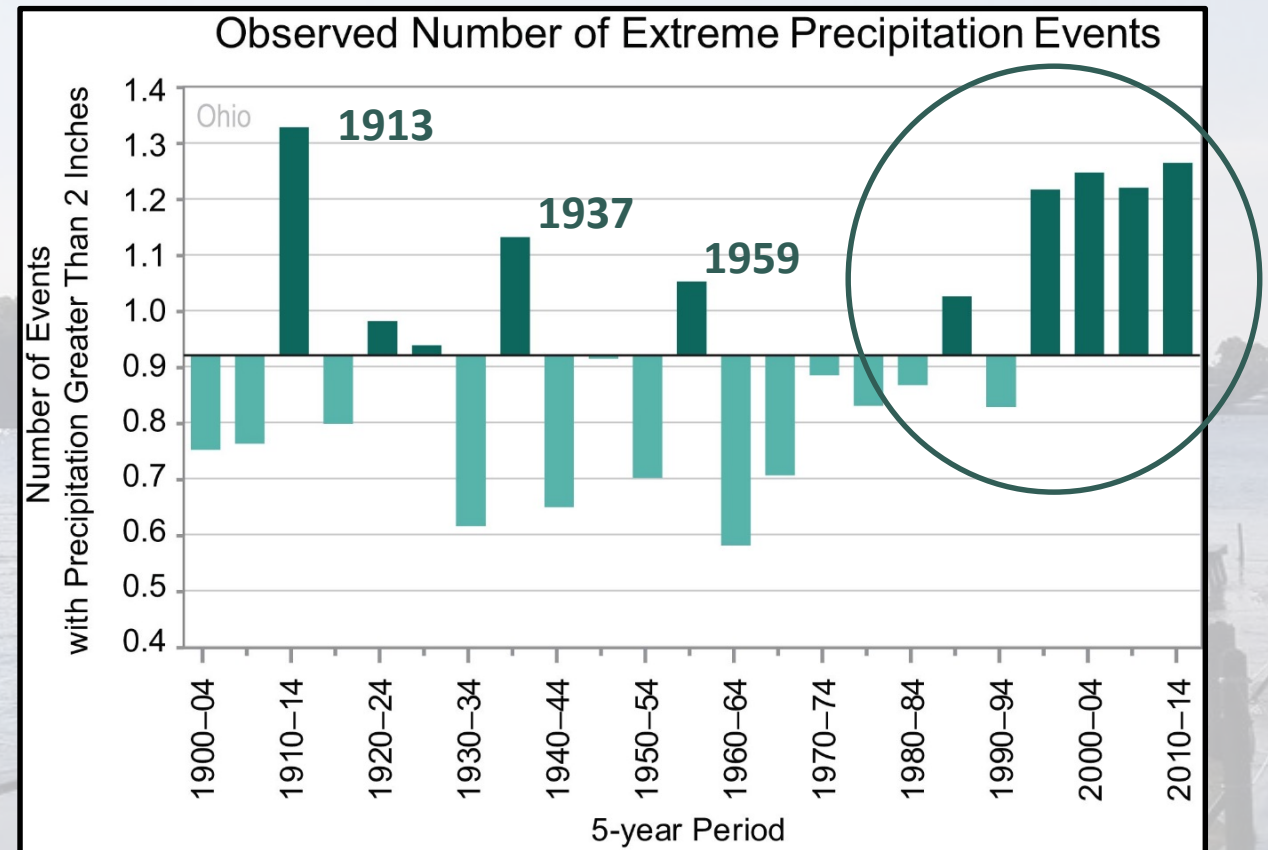
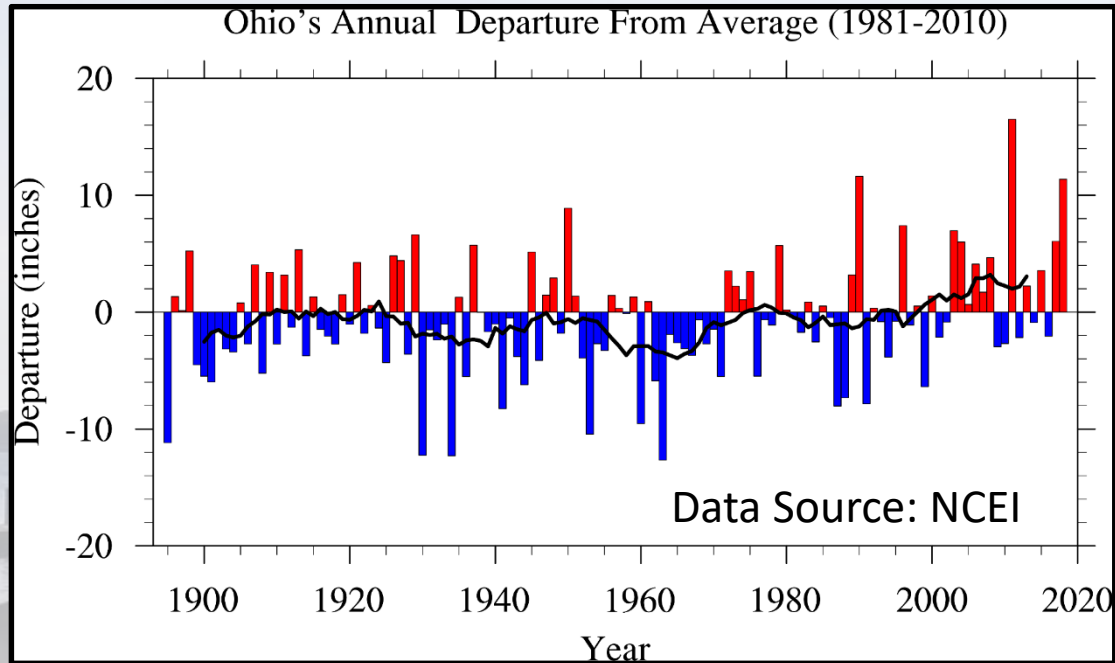
Western Basin Precipitation Trends



It's Been a VERY Wet Year!

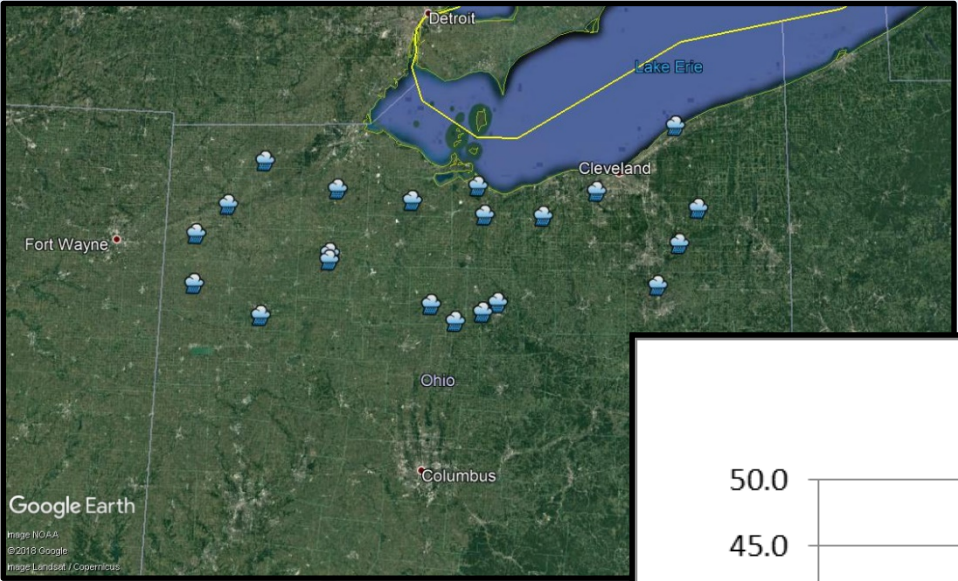


Long-term Precipitation Trends in Ohio

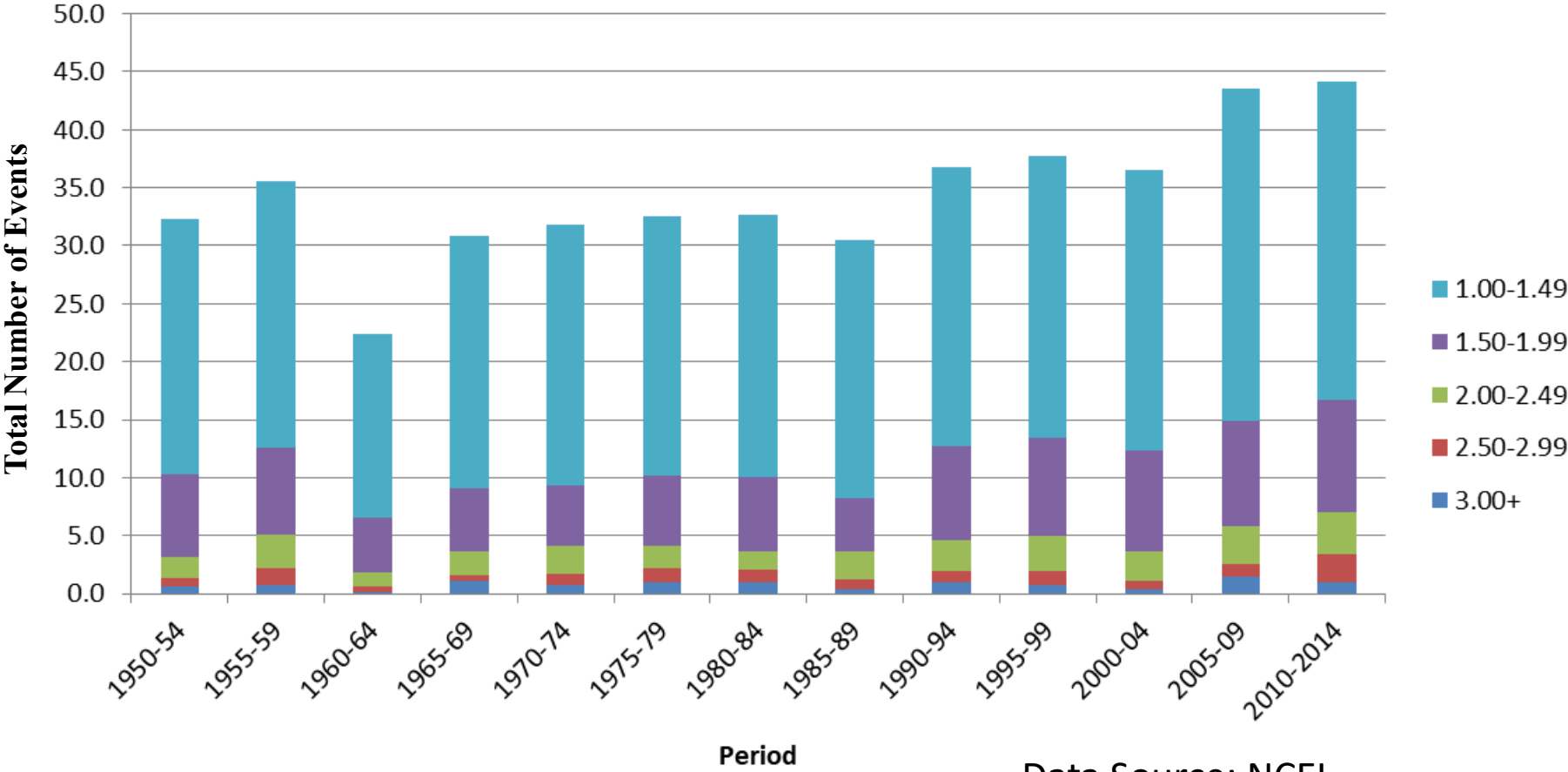


<https://statesummaries.ncics.org/oh>

Intensity of Rainfall



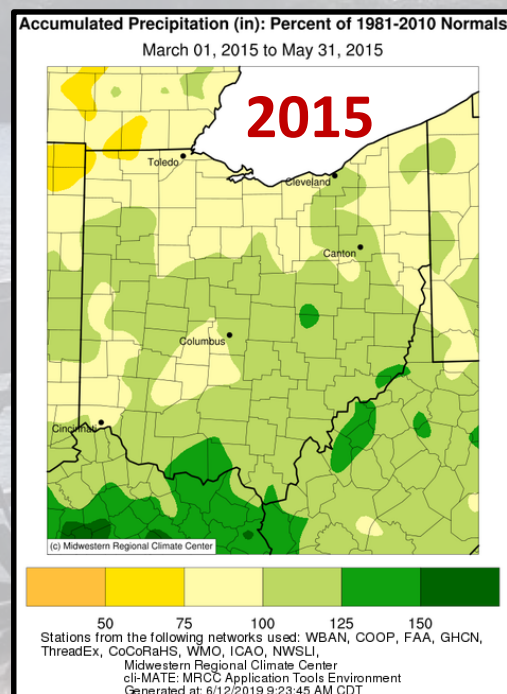
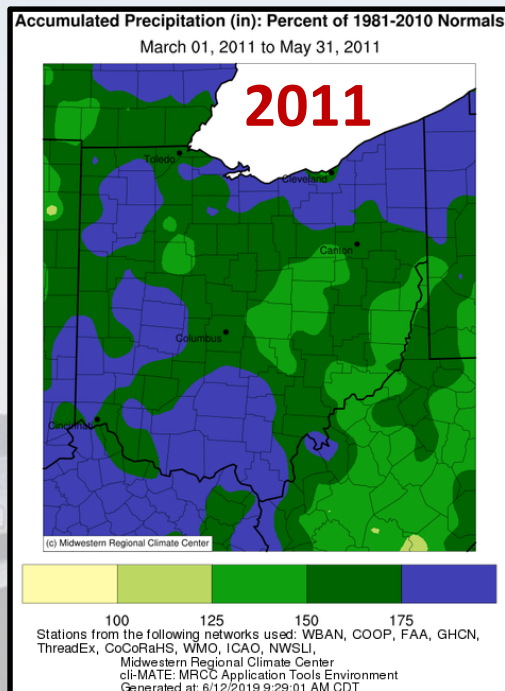
Northern Ohio Rainfall Trends



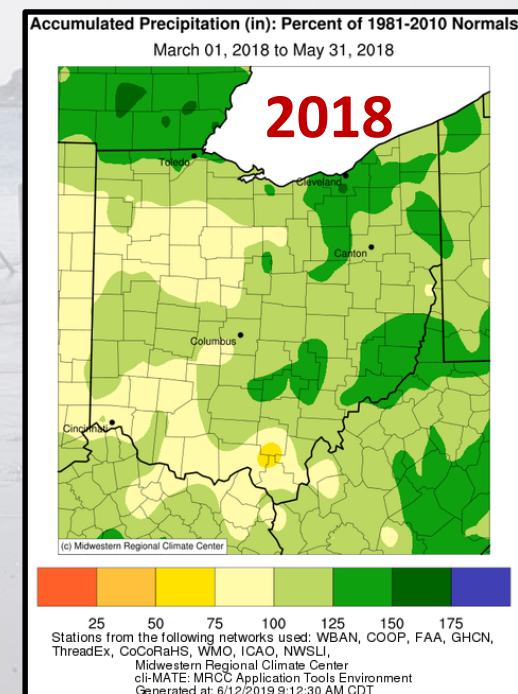
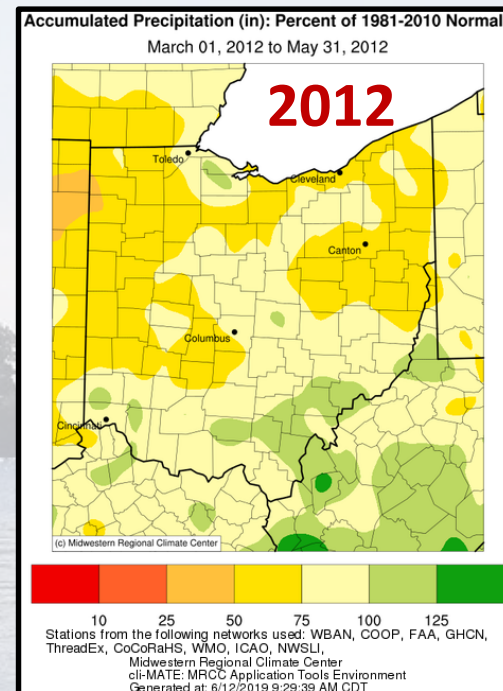
Data Source: NCEI

Spring Precipitation and HABs

Significant HAB



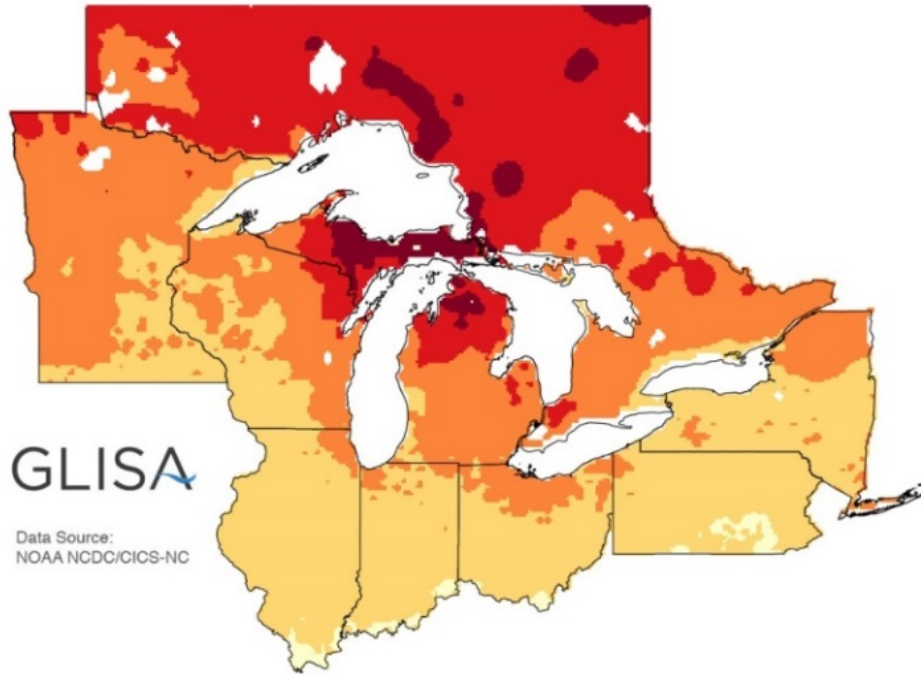
Mild HAB



Future Climate

Difference in Average Temperature

Period: 2041-2070 | Emission Scenario: A2

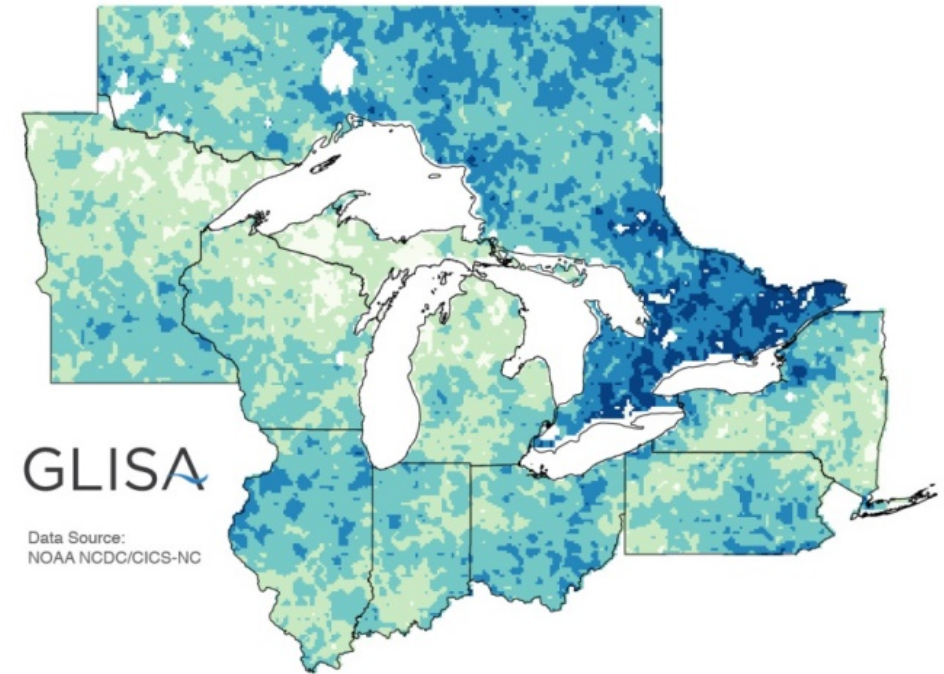


Temperature Difference (°F)



Projected Change in Average Precipitation

Period: 2041-2070 | Emission Scenario: A2

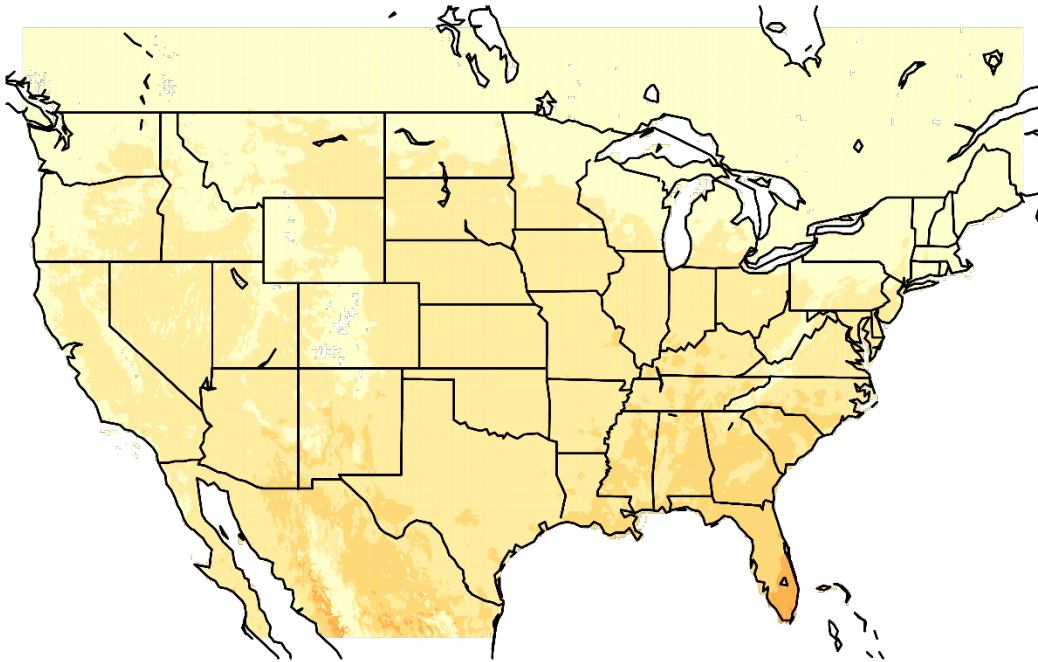


Precipitation Difference (Inches)

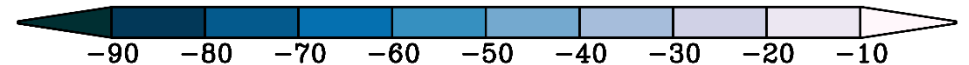
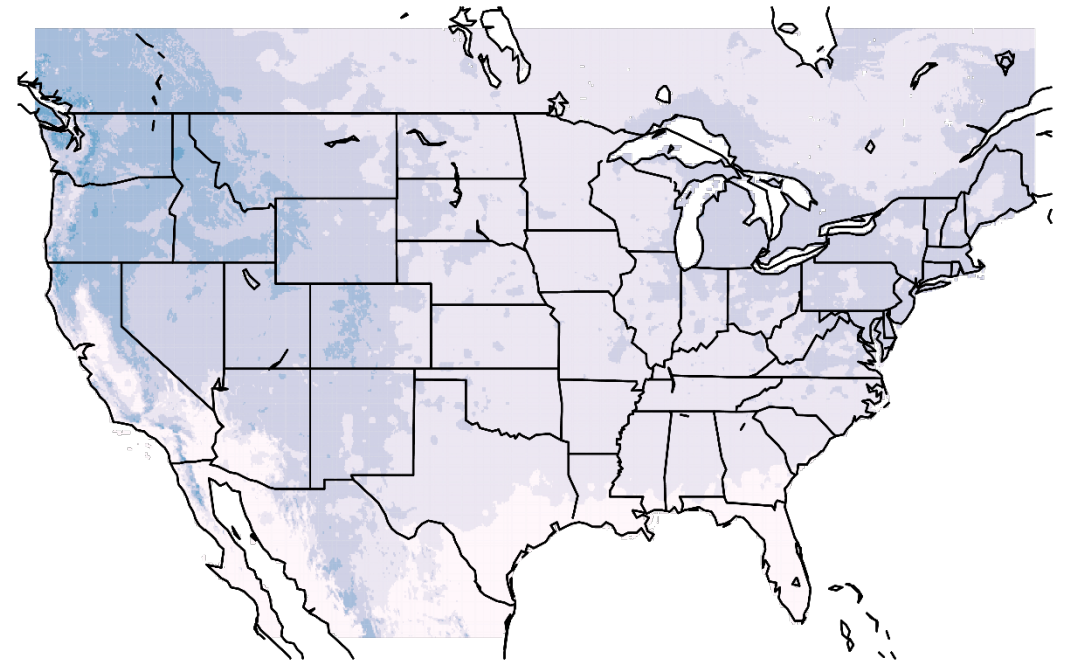


Temperature Changes

Change in annual #days Tmax > 90F by mid 21st century



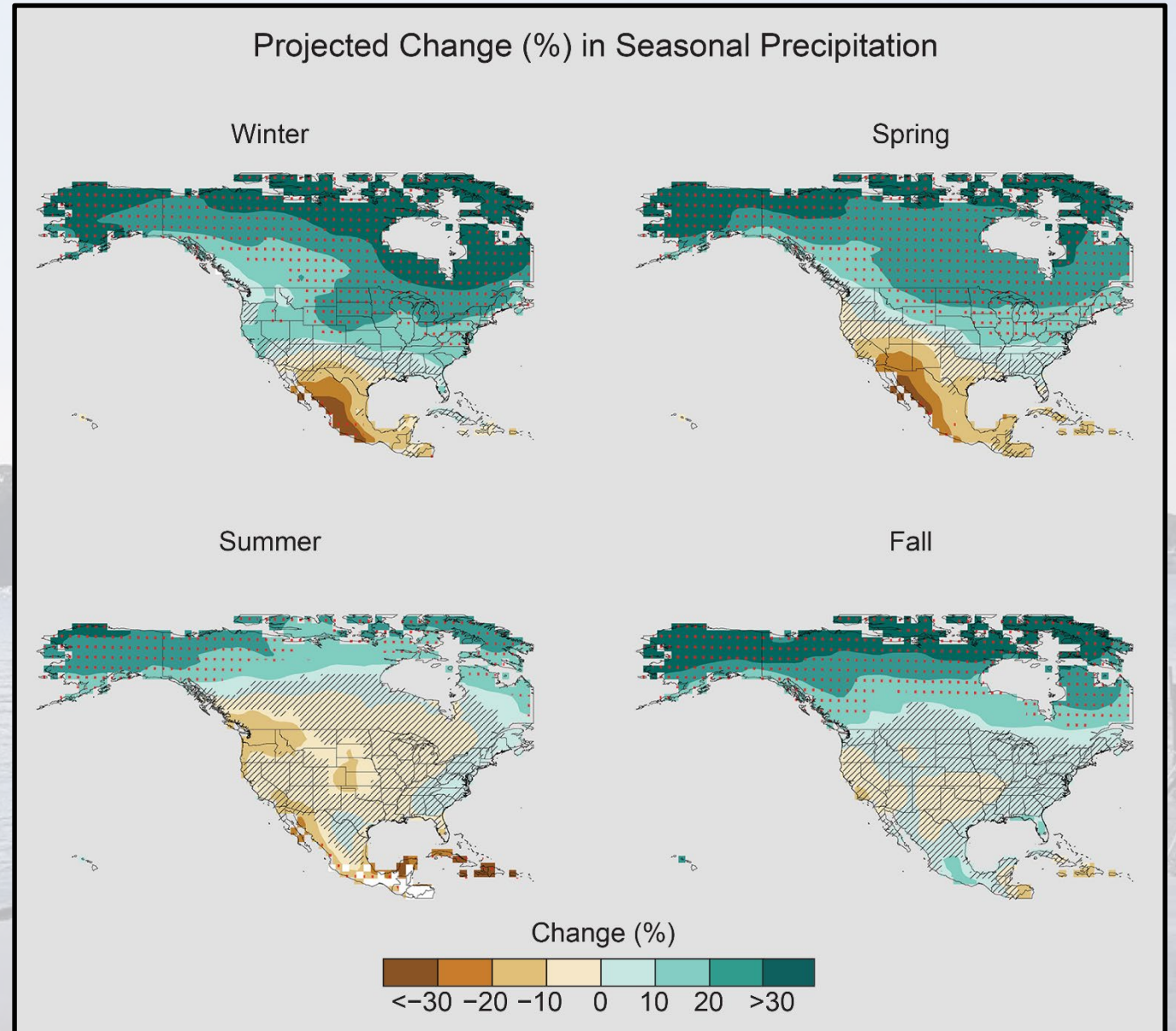
Change in annual # of frost days by mid 21st century



Seasonal Redistribution of Precipitation

-Fourth National Climate Assessment

<https://nca2018.globalchange.gov/>




Summary

- Trends are clear:
 - Warmer (winter-spring, overnight)
 - Wetter (especially during “Ag off-season”)
- Recent period (turn of the century) very challenging weather-wise from a water quantity/quality standpoint
- Future trends are more of the same: 2019 more of a new normal?


SCOO

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STATE CLIMATE OFFICE
OF OHIO




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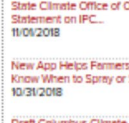
SCOO members installing new instruments at OARDC Wooster




Climate Smart Farming with Weather Ext.
RSVP
(go.osu.edu/climatesmart) for this Climate Smart eve
07/04/2019



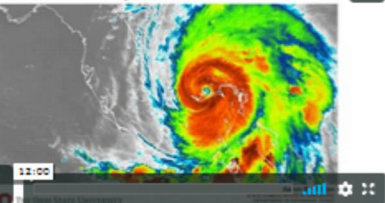
Bio Summ
On June 4 and 5, 2019, the Byrd Polar and Climate Research Center will host the Ohio Climate Services...
06/05/2019




Draft Columbus Climate Change Action Plan Available...
02/08/2018



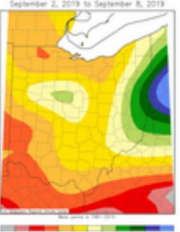
National Climate Assessment 4: Climate Science...
11/11/2017



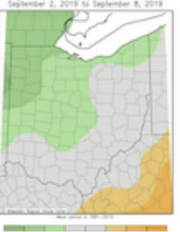
Hydrologic and Climate Assessment
September 3, 2019



Hydro-Climate Assessment for Sep. 3, 2019
Next update currently scheduled for Sep. 10, 2019.



Accumulated Precipitation: Percent of Mean
September 2, 2019 to September 8, 2019



Average Temperature (°F): Departure from Mean
September 2, 2019 to September 8, 2019

Ohio Quarterly Climate Summary
WINTER (December- February) 2019

READ THE SUMMARY [PDF]

[pdf] — Some links on this page are to PDF files requiring the use of [Adobe Reader](#). If you need these files in a more accessible format, please contact webmaster@climate.osu.edu.

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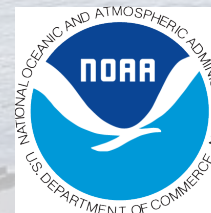
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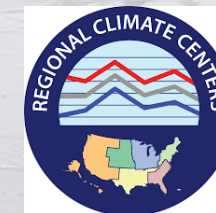
FARM Fertilizer Application Resource Monitor

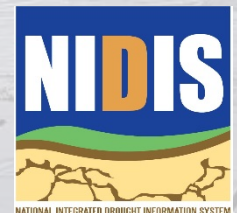



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