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2018 Growing Season ~~Weather~~ Wetter Overview

Jim DeGrand and Aaron Wilson

State Climate Office of Ohio | Dept. of Geography | Byrd Center | OSU Extension

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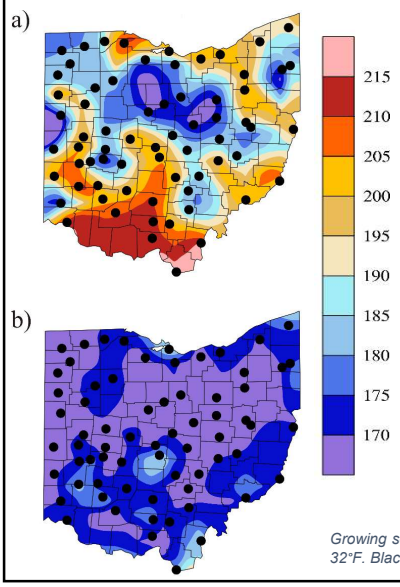
Growing Season Length



- Last frost date (32°F): Apr 21 and May 1
- First frost date (32°F):Oct 16 and 25
- Growing season length approximately 10 days longer than the long-term median and is consistent with the climate trends
- Spatially, the patterns are consistent with the topography and infrastructure of Ohio.

Growing season length defined by the number of days between minimum temperature observations of a) 28°F and b) 32°F. Black dots represent station locations used to spatially interpolate across the state.

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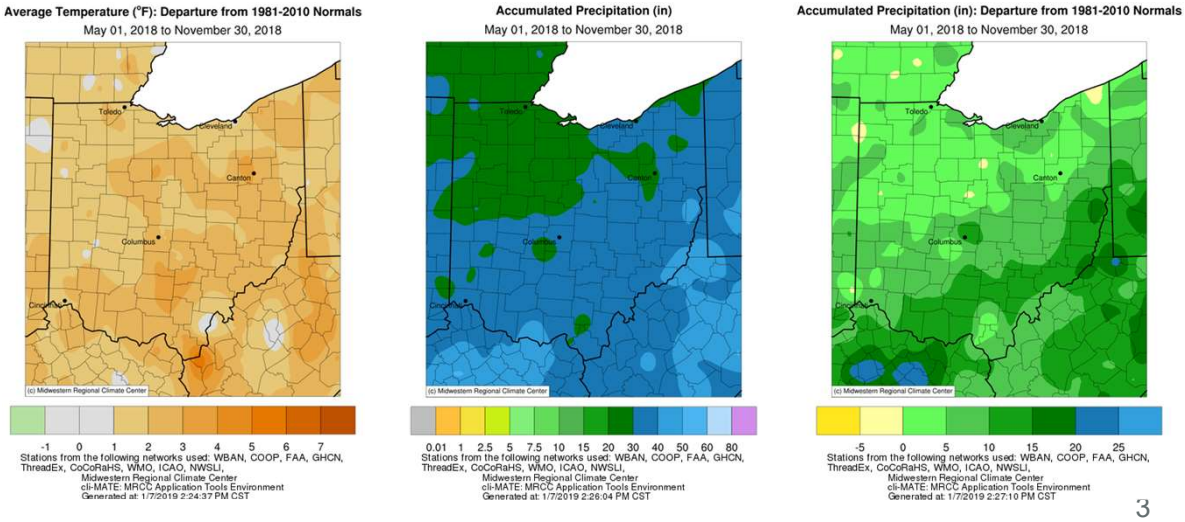
Growing Season Overview: May-November



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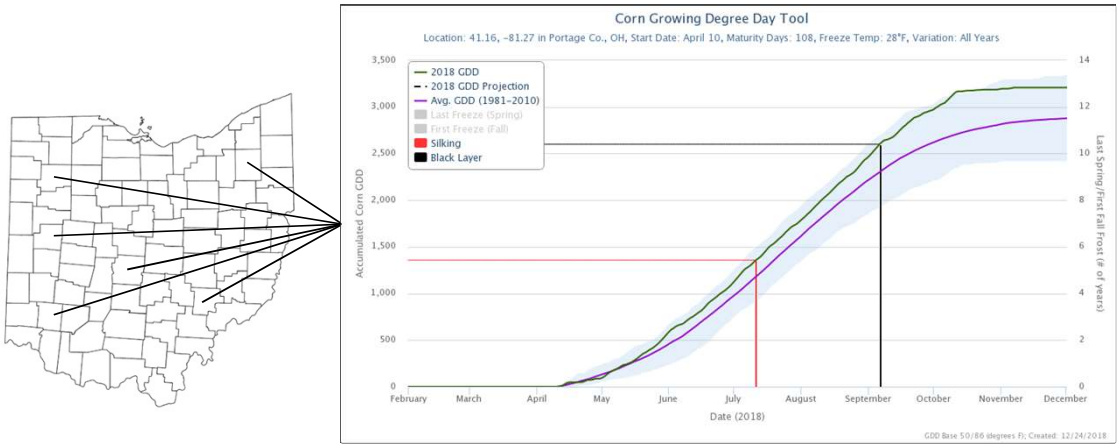
Growing Season Overview: Growing degree days



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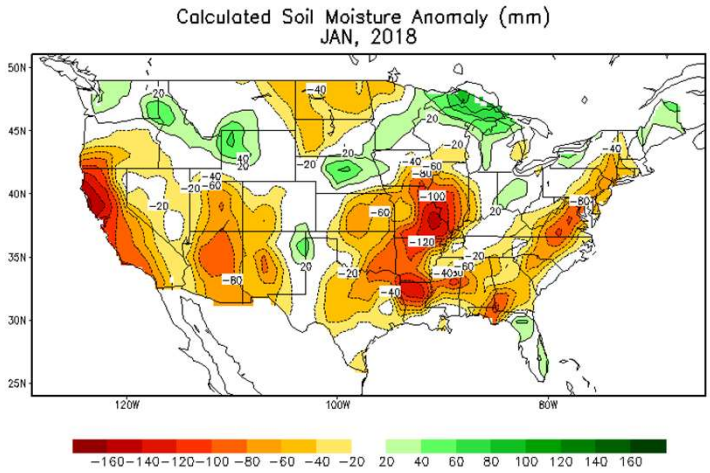
Soil Moisture Evolution



https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml

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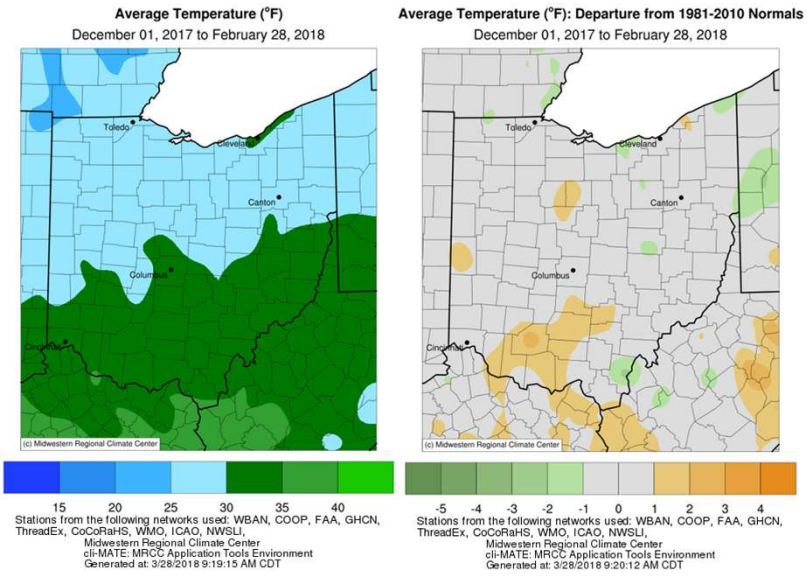

DJF Temperature Summary

- Ranks as the 44th warmest in Ohio since 1895.
- Close to average across over much of the state
- Early part of the season was well below average, but a warm February

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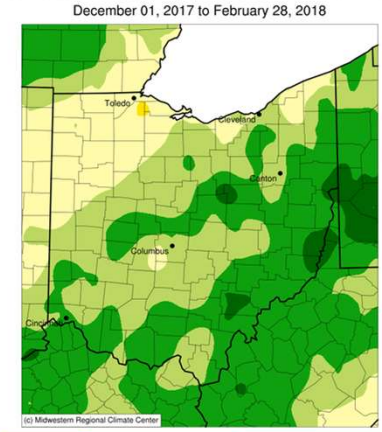
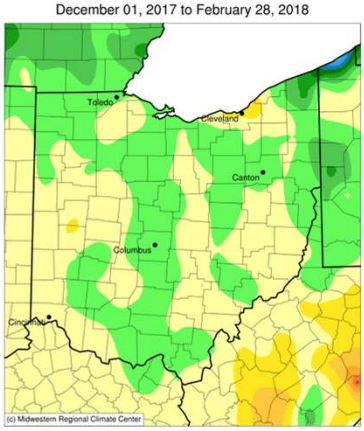
Accumulated Precipitation (in): Percent of 1981-2010 Normal
December 01, 2017 to February 28, 2018



Stations from the following networks used: WBAN, COOP, FAA, GHCN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI,
Midwestern Regional Climate Center
cli-MATE: MRCC Application Tools Environment
Generated at: 3/28/2018 9:21:22 AM CDT

Accumulated Snowfall (in): Departure from 1981-2010 Normals
December 01, 2017 to February 28, 2018



Stations from the following networks used: WBAN, COOP, FAA, GHCN, ThreadEx, CoCoRaHS, WMO, ICAO, NWSLI,
Midwestern Regional Climate Center
cli-MATE: MRCC Application Tools Environment
Generated at: 4/11/2018 12:15:59 AM CDT

DJF Precipitation Summary

- Ranks as the 28th wettest in Ohio since 1895.
- Near to above average
- Dry across NW Ohio.
- Snowfall was close to the long-term average

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A Very Wet and Warm February

- Winter of extreme variability: Cold January/Warm February
- Cincinnati eclipsed its daily and all-time February record temperature on the 20th at 79°F.
- 2nd wettest February on record for Ohio

Coney Island flooding in Cincinnati on February 24, 2018.
- Brian Lewis

- The Ohio River at Cincinnati crested at 60.53 ft. on February 26, 2018 – the highest since 1997

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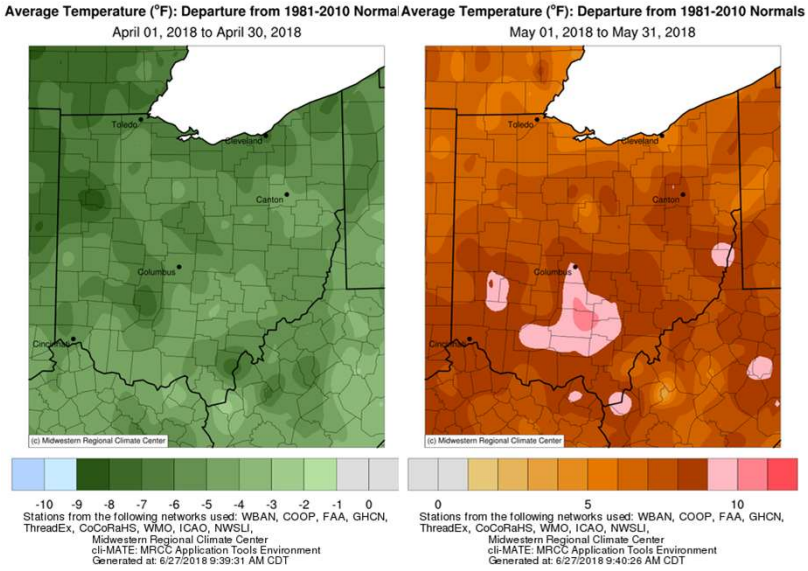

MAM Temperature Summary

- MAM ranks as the 49th warmest – close to average
- Extreme monthly variability again
- 9th coldest April
- Warmest May

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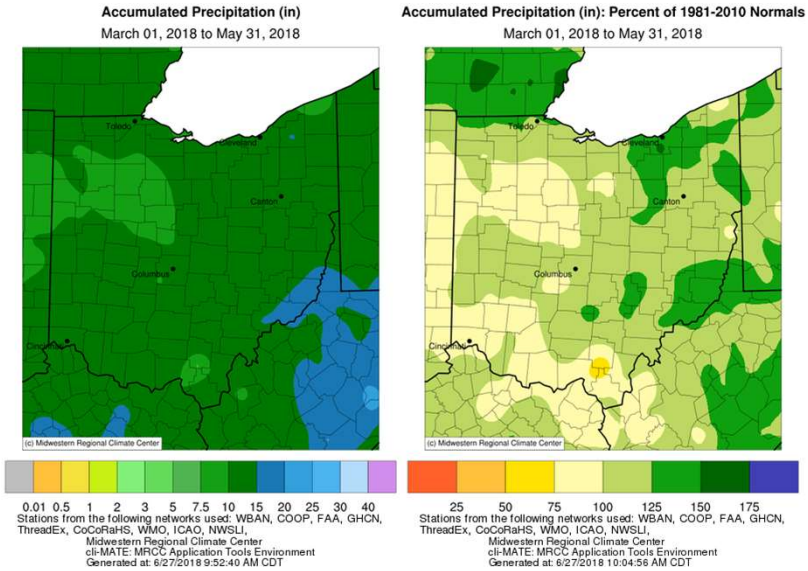

MAM Precipitation Summary

- Above average - ranks as the 38th wettest since 1895.
- The greatest totals fell across the southeast counties
- Western counties were a bit below average

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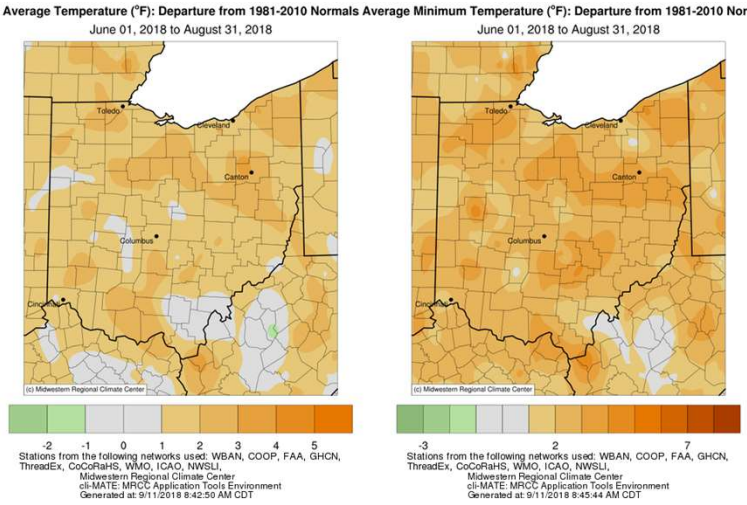

JJA Temperature Summary

- The 2018 summer season ranks as the 17th warmest in Ohio since 1895.
- June 2018 ranks as the 4th warmest.
- The warmth was driven by overnight lows that were well above average.

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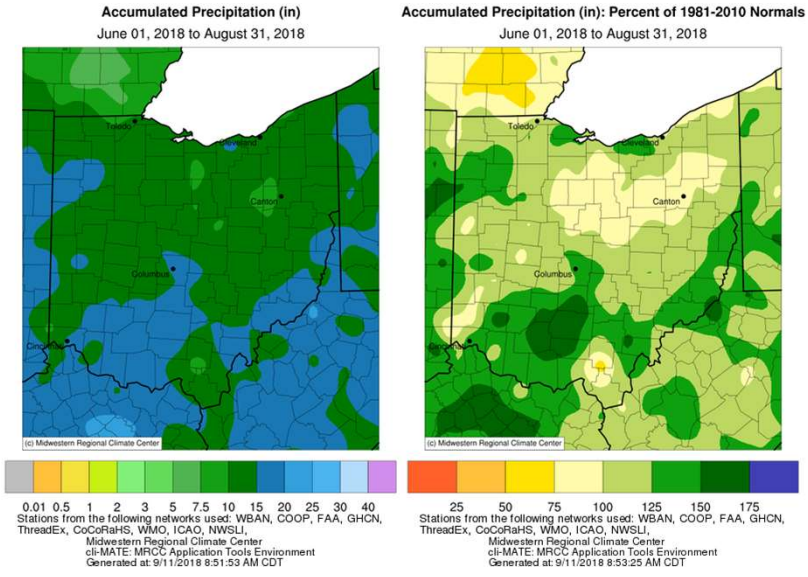

JJA Precipitation Summary

- Above average and ranks as the 17th wettest since 1895.
- The greatest totals (15-20”) fell across the southern and western counties with lighter amounts (7.5-15”) across the north

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2018 record temperatures

Maximum (maxT) and minimum (minT) temperature records set in 2018						
Location	highest maxT	lowest maxT	Ratio	highest minT	lowest minT	Ratio
Cincinnati	4	2	2.00	6	2	3.00
Cleveland	6	0	> 6.00	11	0	> 11.00
Columbus	1	3	0.33	12	0	> 12.00
Toledo	5	1	5.00	7	0	> 7.00
Youngstown	6	4	1.50	9	2	4.50

Summer Dryness Extent

- Dry conditions across northwest Ohio during July greatly impacted producers still trying to catch up from the cold, wet spring.
- By July's end, some damage had already been done, especially to hay and vegetable growers.

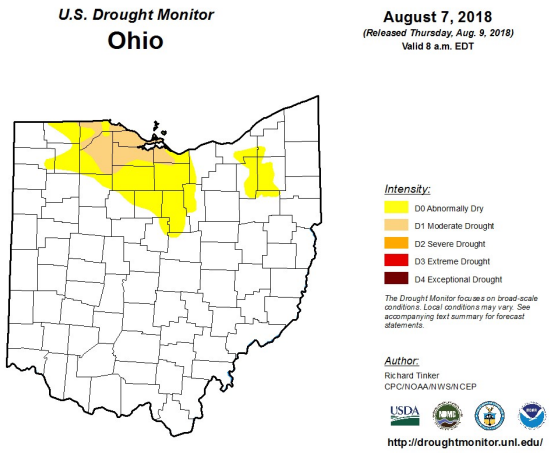

Figure: Maximum extent of drought conditions as depicted by the U.S. Drought Monitor on August 7, 2018.

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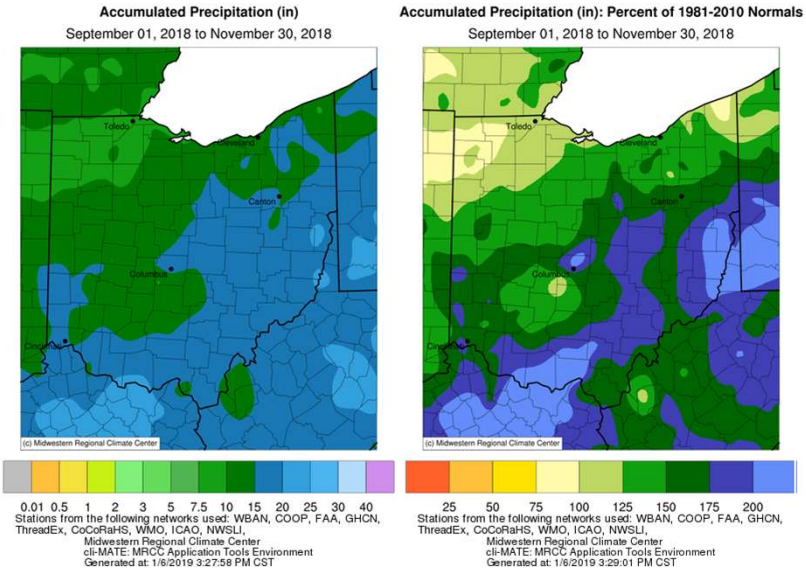

SON Precipitation Summary

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

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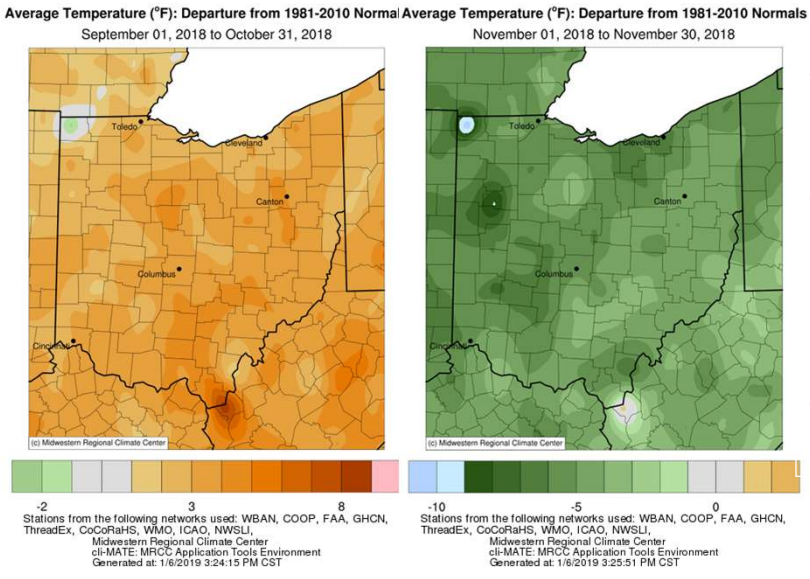

SON Temperature Summary

- Extreme monthly variability!
- Warm Sep-Oct, with warm overnight lows and high humidity throughout Oct.
- Nov. 2018 ranks as the 10th wettest, with mean temperatures running 4-5° F below average.

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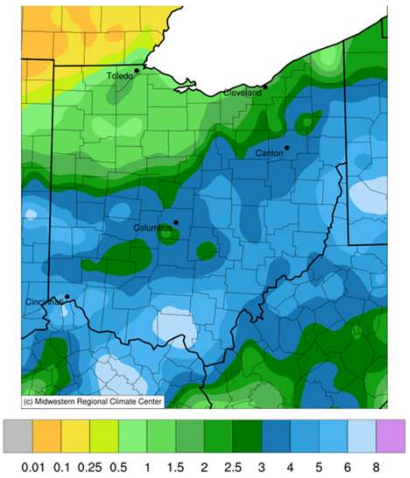
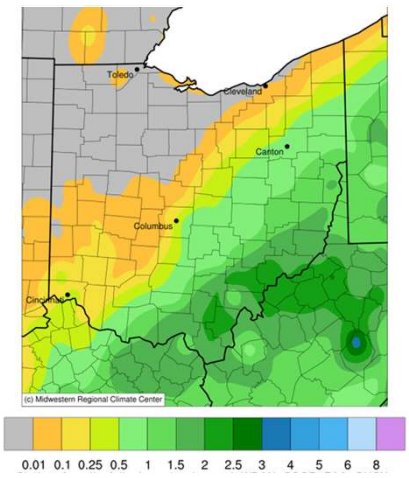
Tropical storm Gordon Remnants: September 8-10, 2018



Hurricane Florence Remnants: September 18-18, 2018



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National Weather Service
Central Region Climate Outlook

Dec 2018 – Feb 2019
Friday, November 16, 2018 4:14 AM

Important Messages:

- ENSO neutral conditions remain across the Tropical Pacific, but the odds have increased to an 85% chance of an El Niño developing in the DJF period as warm subsurface waters are continuing to expand eastward.
- A weak El Niño remains the most likely scenario this winter, with classic El Niño relationships expected to be heavily impacted by other teleconnection patterns such as the Arctic Oscillation (AO) and Madden-Julian Oscillation (MJO).

December 2018 Temperature & Precipitation Outlooks

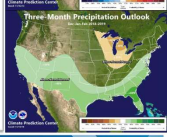
● Above normal temperatures are favored across the far western portions of Central Region during the month of December as a strong –AO and the MJO are expected to have an impact over the first half of the month. There is some indication for the patterns to flip over the second half of December. The Great Lakes Region has the highest potential for below normal temperatures next month.
● For December, El Niño has a good signal for an increased dry potential from the Ozarks to the SE Great Lakes region. This signal should be enhanced by a strong –AO this December. The western portions of the region could see some upslope enhanced precipitation next month with the remainder of Central Region in an area of equal chances for above, near or below normal precipitation.

Seasonal Drought Outlook

Status quo is expected for much of Central Region. Some improvement remains possible near the four corners region of Colorado where increased precipitation associated with El Niño could provide some relief. A few small pockets of drought elsewhere across the region look to persist.

December through February Temperature & Precipitation Outlooks

● Above normal temperatures are favored across all but the southeastern portions of Central Region this winter. This is supported by ensemble model forecasts with the expanded area of above, near or below normal temperatures across the southeastern US supported by a typical ENSO signal as well as the potential continuation of the –AO.
● Below normal precipitation is forecast for the Great Lakes region into the Ohio River Valley over the next 3 months. Above normal precipitation extends from the southwest and southern plains into Colorado and parts of southwestern Kansas and southern Wyoming. This is largely based on model guidance and an expect wet southern jet stream associated with typical El Niño conditions.



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For more info, contact: ray.wolf@noaa.gov

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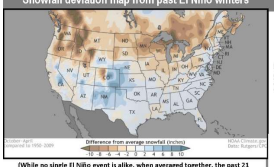
National Weather Service
Central Region Climate Outlook

Dec 2018 – Feb 2019
Friday, November 16, 2018 4:14 AM

Inputs into the Outlooks

ENSO Status: **El Niño Watch**

Snowfall deviation map from past El Niño winters



(While no single El Niño event is alike, when averaged together, the past 21 El Niño cold seasons have seen below normal snowfall across most of the Northern Plains and Great Lakes areas, with above normal snowfall across parts of the Central and High Plains.)

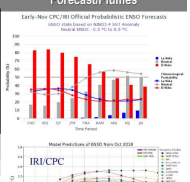
Typically, El Niño winters do tip the odds towards:

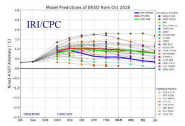
- Above-normal temperatures from the Pacific Northwest into the Great Lakes Region
- Cooler than normal temperatures across the southeastern U.S.
- Above-normal precipitation across the southern States
- Below-normal precipitation across the Ohio Valley

Useful Links/Info:

NOAA's Winter Outlook
Latest ENSO Blog from Climate.gov
Sea Surface Temperatures from the Climate Prediction Center
Latest ENSO Discussion from the Climate Prediction Center
Drought Information from the US Drought Monitor
Interactive GIS Mapping from NCEI (Anomalies/Rankings)
Local Climate Analysis Tool (LCAT) – Account registration required
NWS Forecast Maps from Western Region

IRI/CPC Probabilistic ENSO Forecast/Plumes





- The official CPC/IRI ENSO probability forecast calls for a 85 percent for EL Niño conditions to develop over the next couple of months and persist through spring when ENSO neutral conditions become favored.
- Model consensus continues to point towards a weak El Niño with sea surface temperature anomalies across the Tropical Pacific peaking around +1.0°C.

Other Teleconnection Effects

- Because of the weak El Niño conditions forecast for this winter, other teleconnection patterns such as the MJO (which can contribute to heavy precipitation across the west) the PNA and the AO (which can result in Artic air masses moving south) will likely have significant impacts on actual weather conditions this winter.

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2019 Projections

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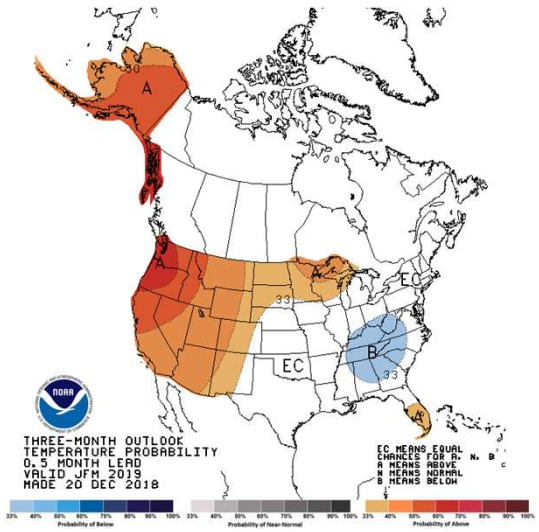
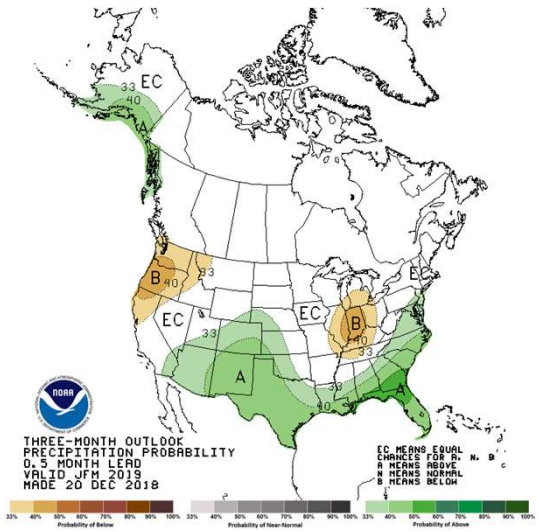
2019 Projections: January - March





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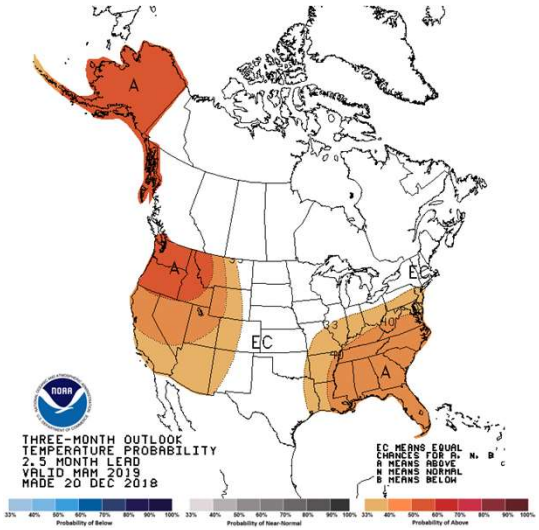
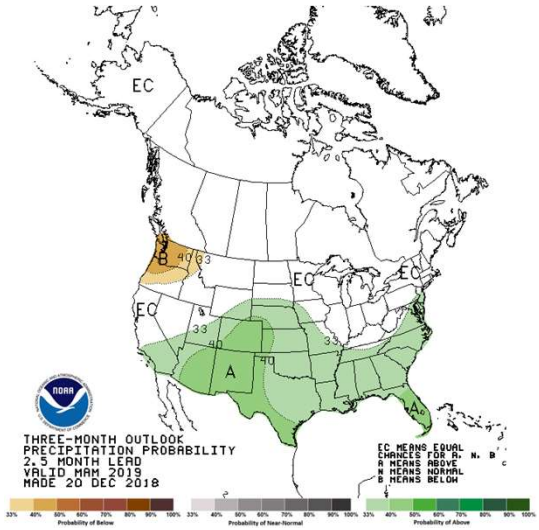
2019 Projections: March – May





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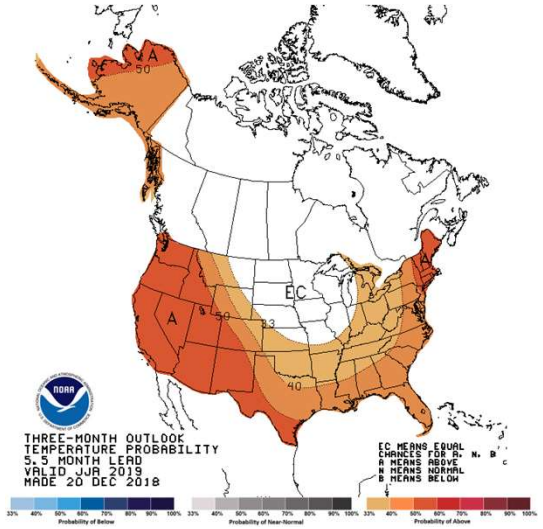
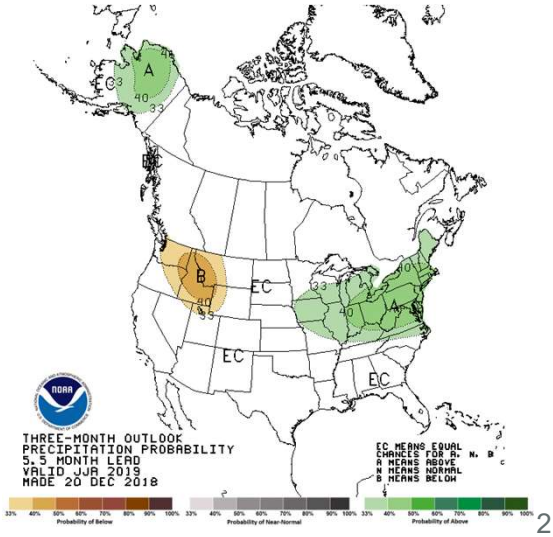
2019 Projections: June - August





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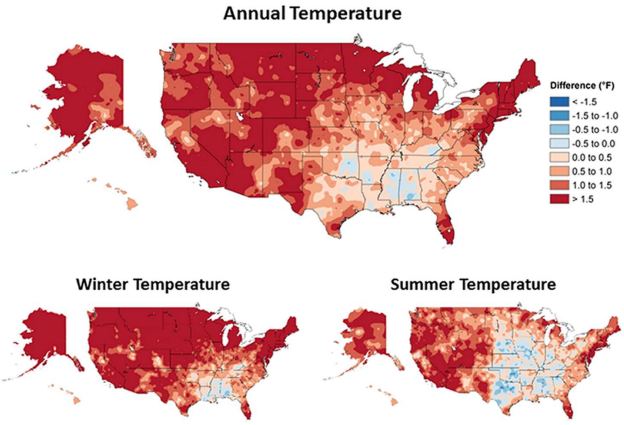
Long-term Trends: Temperature



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/

- 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

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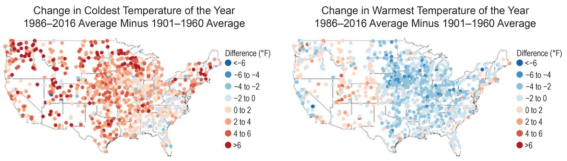
Long-term Trends: Temperature



https://science2017.globalchange.gov/chapter/6/

- The 1930s Dust Bowl era
- Agricultural intensification may have suppressed the hottest extremes in the Midwest. (Muller et al, 2016: Nature Climate Change; Science http://www.sciencemag.org/news/2018/02/america-s-corn-belt-making-its-own-weather)

NCA Region	Change in Coldest Day of the Year	Change in Warmest Day of the Year
Northeast	2.83°F	−0.92°F
Southeast	1.13°F	−1.49°F
Midwest	**2.93°F**	**−2.22°F**
Great Plains North	4.40°F	−1.08°F
Great Plains South	3.25°F	−1.07°F
Southwest	3.99°F	0.50°F
Northwest	4.78°F	−0.17°F

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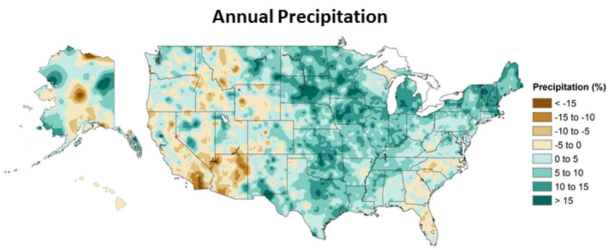
Long-term Trends: Precipitation



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

- Annual precipitation has decreased in much of the West, Southwest, and Southeast
- Increased in most of the Northern and Southern Plains, Midwest, and Northeast.
- National average increase of 4% in annual precipitation since 1901: Ohio: 5-15%

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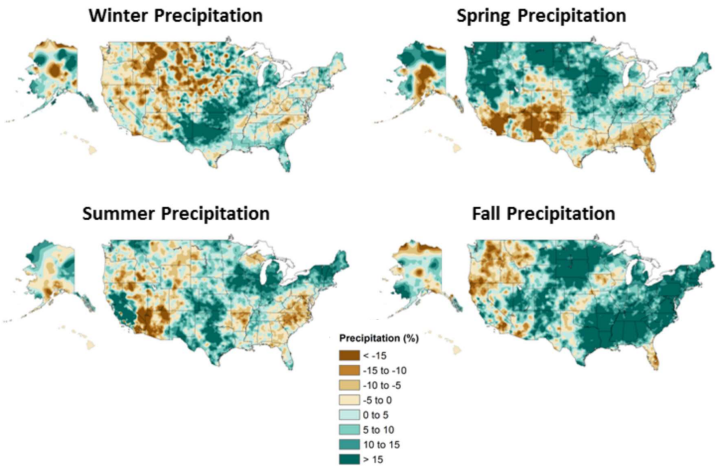
Long-term Trends: Precipitation

- National trends driven strongly by fall trends (10-15% in some locations)
- Spring trends in our region focused across SW Ohio, Southern Indiana and Illinois, into Missouri then across the rest of the Midwest



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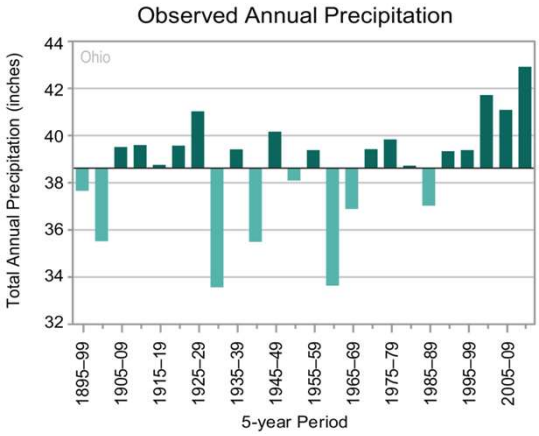
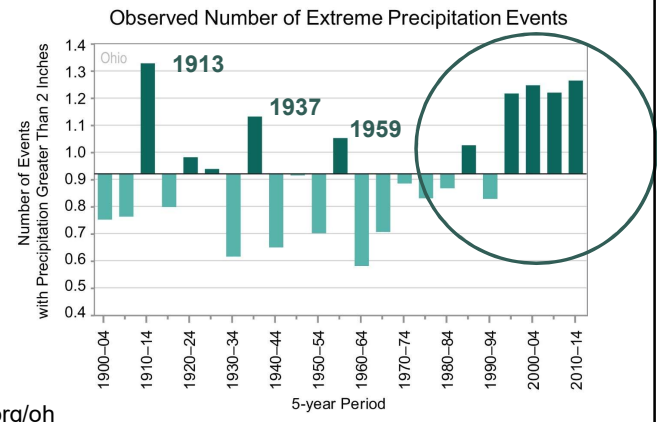
Long-term Trends: Precipitation





NOAA

https://statesummaries.ncics.org/oh

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