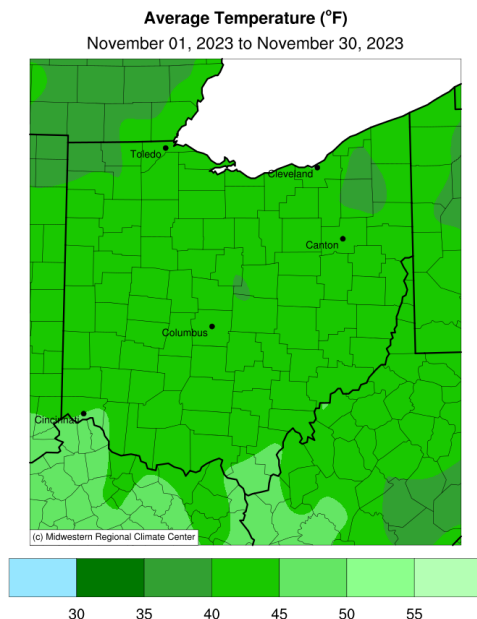


Review – November 2023

Temperature

Temperatures were generally near historical expectations in November as Ohio moved into the later part of autumn. Average temperatures were mostly uniform throughout the state, ranging from 40-45°F, with small areas in the northwest and northeast dipping down to the 35-40°F range (Fig. 1a). Compared to the 29-year record, temperatures were mostly within a degree of normal, with a swath of eastern Ohio reaching 1-2°F below normal and areas near Cleveland, Toledo, and central Ohio reaching 1-2°F above normal (Fig. 1b). At the county level, most of Ohio ranked near normal, with the western third of the state reaching the warmer third of the record (Fig. 2). Overall, despite ranking warmer than average, the temperature departures seen in the western counties were generally mild.

a)



b)

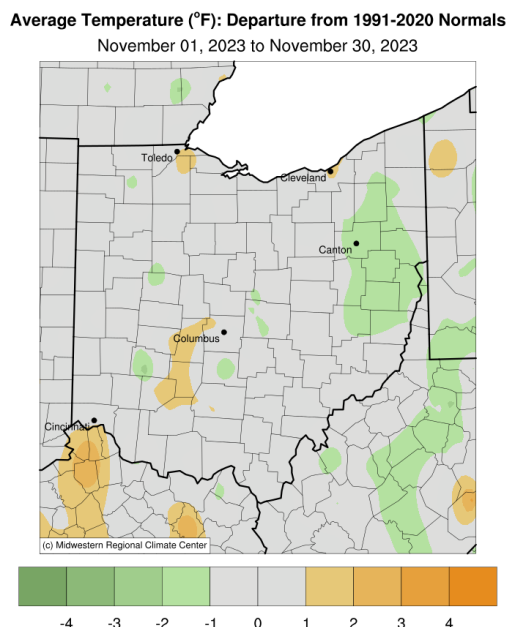


Figure 1a: Average temperature and 1b: Departure from Normal for the month of November 2023. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

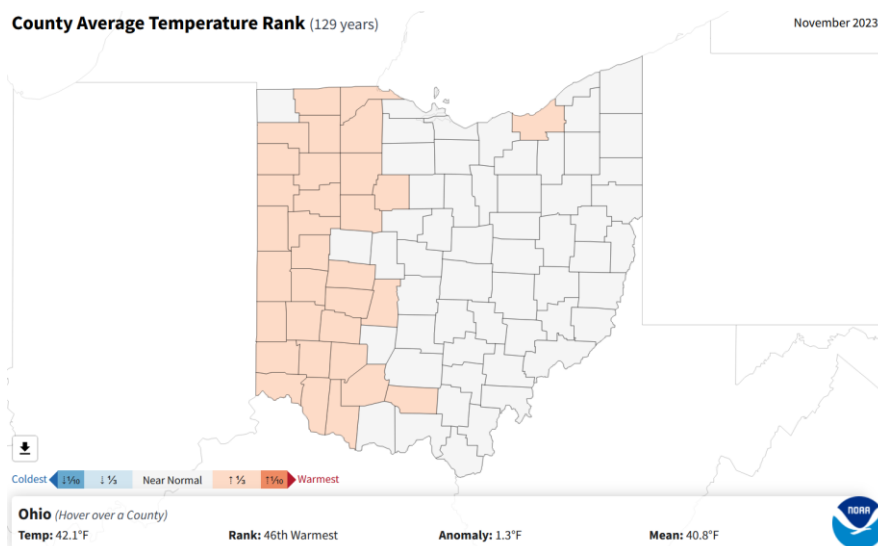


Figure 2: State of Ohio average temperature ranks by county for November 2023. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).

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Precipitation

Ohio saw less precipitation than normal for the month due to precipitation events that, although frequent, were generally very light. Precipitation accumulation varied from east to west, with the eastern bulk of Ohio receiving around 1.5-3 inches of rain in the month. In the western portion, accumulation was limited to around 0.5-1.5 inches, with the northwest seeing only 0.5-1 inches (Fig. 3a). Accumulated precipitation departures followed a similar east-west gradient, with the eastern portion seeing departures of -0.5 to -1.5 inches and the western portion seeing departures of -1.5 to -2.5 inches (Fig. 3b). At the county level, most of Ohio ranked in the drier third of the record, with large portions of the northwest and southwest ranking within the driest tenth. Consistent with accumulation trends, the northwest counties saw the greatest departures from normal, with Lucas and Williams Counties seeing their third driest November on record (Fig. 4)

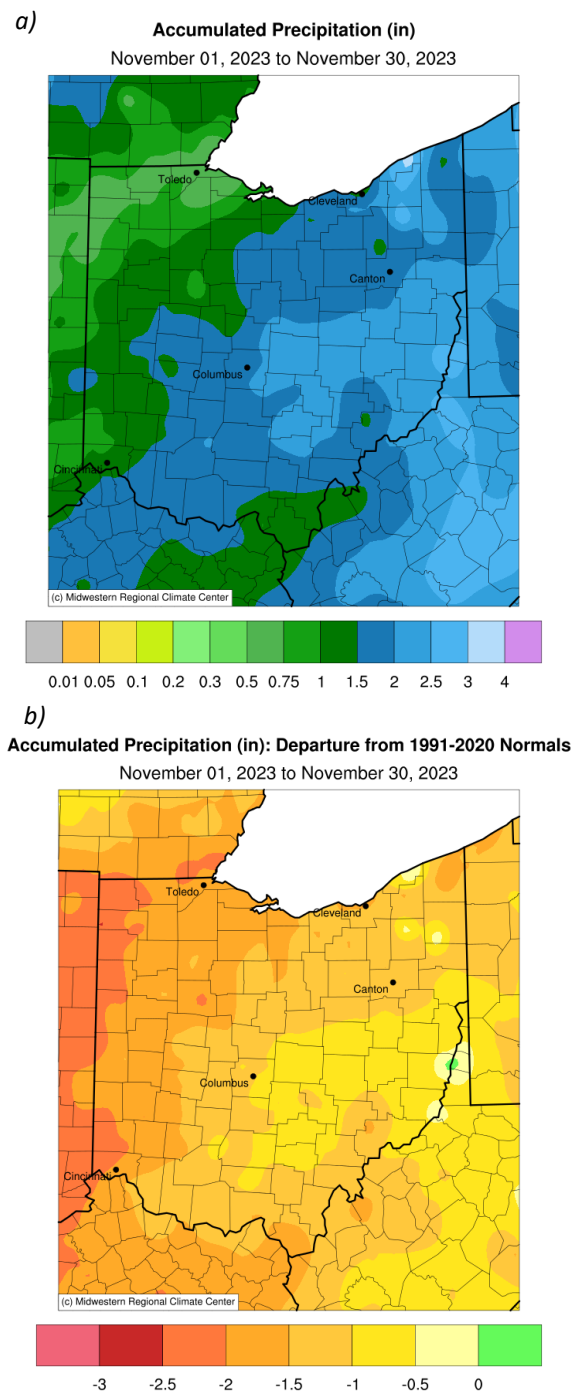


Figure 3a: Accumulated precipitation and 3b: Departures from Normal for the month of November 2023. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

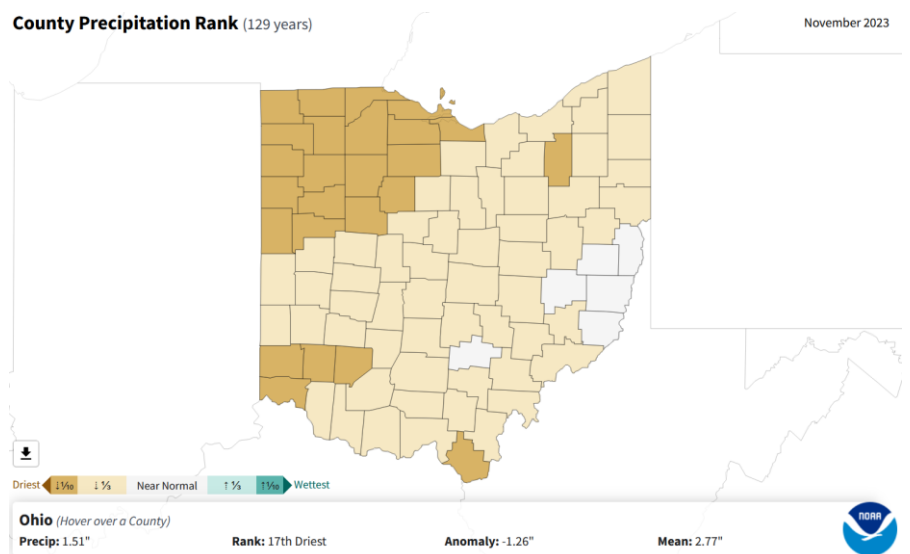
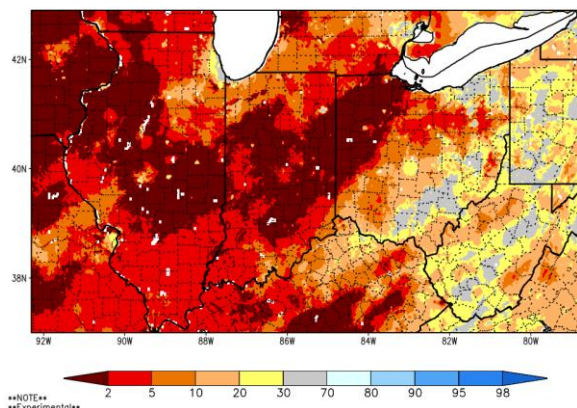


Figure 4: State of Ohio precipitation ranks by county for November 2023. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).

Review – November 2023

a) SPoRT-LIS 0–40 cm Soil Moisture percentile valid 30 Nov 2023



b) SPoRT-LIS 0–200 cm Soil Moisture percentile valid 30 Nov 2023

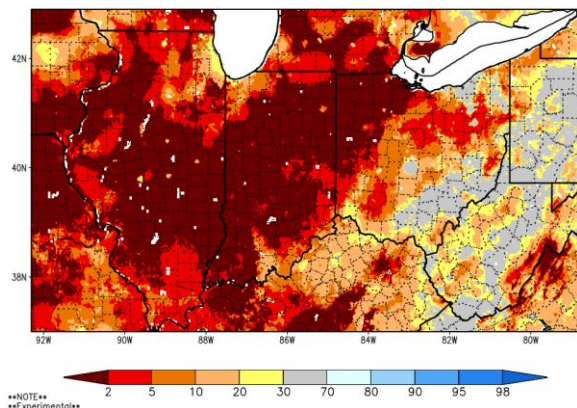


Figure 5a: 0–40 cm and 5b: 0–200 cm soil moisture percentile across the region at the end of November. Courtesy of NASA SPoRTLIS (https://weather.msfc.nasa.gov/sport/case_studies/lis_IN.html).

Soil and Energy

A combination of below-normal precipitation and seasonal drying led to a large-scale decrease in soil moisture throughout Ohio in November. Coinciding with precipitation trends, the northwestern portion of Ohio experienced severe soil dryness at both 0–40cm and 0–200cm levels, while the rest of the state saw more moderate dryness (Figs. 5a and 5b). While general drying is expected during this time of year, the significant dehydration seen in northwest Ohio and the bulk of neighboring midwestern states may be exacerbated by continued below-normal precipitation accumulation in the coming months.

With autumn developing into its later half, Heating Degree Days (HDDs) have come to dominate the state, with no Cooling Degree Days (CDDs) seen anywhere in Ohio during November. With near-average temperatures over the month, departures for both HDDs and CDDs were minimal. For many in Ohio, November marked the switch from AC usage to heating, initiating the transition to wintertime trends in energy usage.

Climate Division	Heating Degree Days	Normal	Departure	Cooling Degree Days	Normal	Departure
1	716	733	-17	0	0	0
2	694	708	-14	0	0	0
3	741	722	19	0	0	0
4	686	700	-15	0	0	0
5	682	683	-1	0	0	0
6	711	716	-5	0	0	0
7	708	695	13	0	0	0
8	652	660	-8	0	0	0
9	631	637	-6	0	0	0
10	673	672	2	0	0	0
Statewide	687	691	-4	0	0	0



Figure 6: (Left) November 2023 heating & cooling degree days. (Right) Corresponding Ohio Climate Divisions. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

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Notable Events

Despite the occurrence of lake effect precipitation that blanketed northeast Ohio with up to 13 inches of snow on November 28th, November is now the third month in a row with a near absence of impactful weather events in Ohio. While such inactivity is great for human activities in the region, it is important to remember that the potential for impactful weather always exists. As such, this section is dedicated to historical November weather events that have impacted the lives of Ohioans over the years.

As those in the northeast understand, November can be a very snowy time of the year for Ohio. There is no better example than the Great Appalachian Storm of 1950, which blanketed the entire state in at least 10 inches of snow on November 25th, resulting in the worst blizzard in Dayton history, as well as river flooding near Cincinnati. The storm is perhaps best known for its coincidence with that year's Ohio State-Michigan football game, now known as the legendary Snow Bowl (Fig. 7).

While November may bring chilly conditions to Ohio, it is not immune to severe weather. This was seen during the 2002 Veterans Day weekend tornado outbreak, which saw 19 confirmed tornadoes in Ohio, the strongest of which being an F4 that struck the city of Van Wert, resulting in 4 fatalities and 17 injuries (Fig. 8). While some periods may be calmer than others, history reminds us that it's always important to be weather aware.



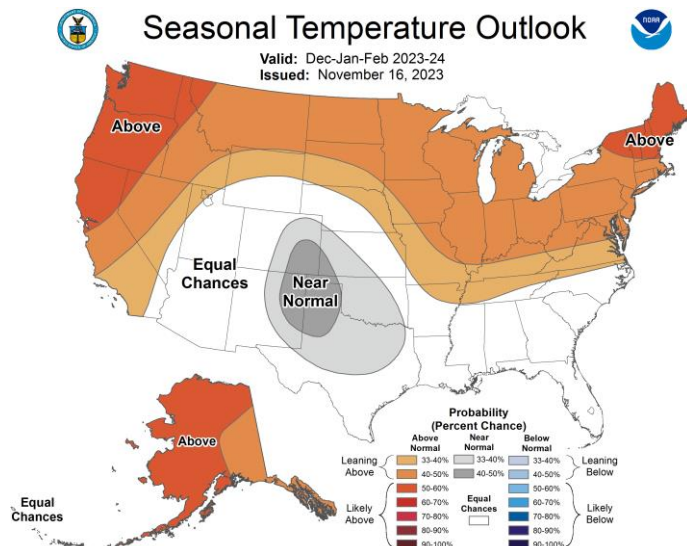
Figure 7: Image of the Ohio Stadium in Columbus, Ohio during the Ohio State-Michigan football game on November 25, 1950, known as the Snow Bowl. Image Courtesy of the Ohio State University (<https://www.ohiomagazine.com/ohio-life/article/1950-ohio-state-michigan-snow-bowl>)



Figure 8: Image of the F4 tornado that hit Van Wert, Ohio on November 10, 2002. Image courtesy of the Ohio State Highway Patrol (https://www.weather.gov/iwx/20021110_tornado_photos_vanwert)

Forecast: December 2023 – February 2024

a)



b)

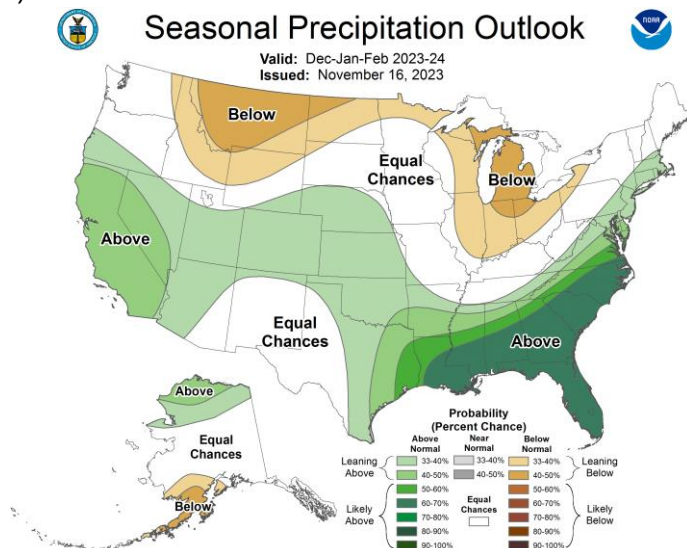


Figure 9a: Nationwide Seasonal Temperature and 9b: Precipitation Outlook for December 2023-February 2024. Courtesy of the Climate Prediction Center (<https://www.cpc.ncep.noaa.gov/>).

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Looking Ahead

The CPC's 3-month outlooks anticipate warm and dry conditions in Ohio through the start of the new year. In the entire state, temperatures are likely to be above-normal during the peak of the winter season (Fig. 9a). Meanwhile, most of Ohio could see below-normal precipitation accumulation, save for the southeastern portion of the state. While the northwest corner of Ohio has the highest likelihood, precipitation predictions are generally low confidence (Fig. 9b). Overall, these trends are indicative of the local influences of a strong El Niño pattern, which is currently active and expected to continue through at least spring. In Ohio, this means a milder winter as temperatures remain moderate and significant snow and ice events are reduced. While this is beneficial to both economic and human activities over the winter, reduced precipitation could lead to greater long-term soil dryness in Ohio, potentially impacting the early growing season as winter transitions into spring next year.

Note: these outlooks do not provide the quantity of above or below normal conditions, just the likelihood of occurrence (i.e., the probability).