

## Review – December 2022

### Temperature

After a long stretch of near-normal temperatures, Ohio saw both frigid and warm temperatures at the end of December. In the month's first three weeks, temperatures generally stayed around 0-2°F above normal until a powerful cold front on December 22<sup>nd</sup> brought substantial drops in temperature. Its passage exposed the state to a sub-freezing polar airmass in the days surrounding Christmas, lasting nearly a week. Soon after, warm air traveling from the Gulf of Mexico raised temperatures well above normal for the end of the year. Overall, temperatures in Ohio averaged around 25-35°F, with variability in both directions resulting in averaged departures of only 0-2°F less than recent normals (Figs. 1a and 1b). Though mostly near the middle, three distinct county-level regions in the north and southwest ranked in the warmer third of their 128-year record (Fig.2).

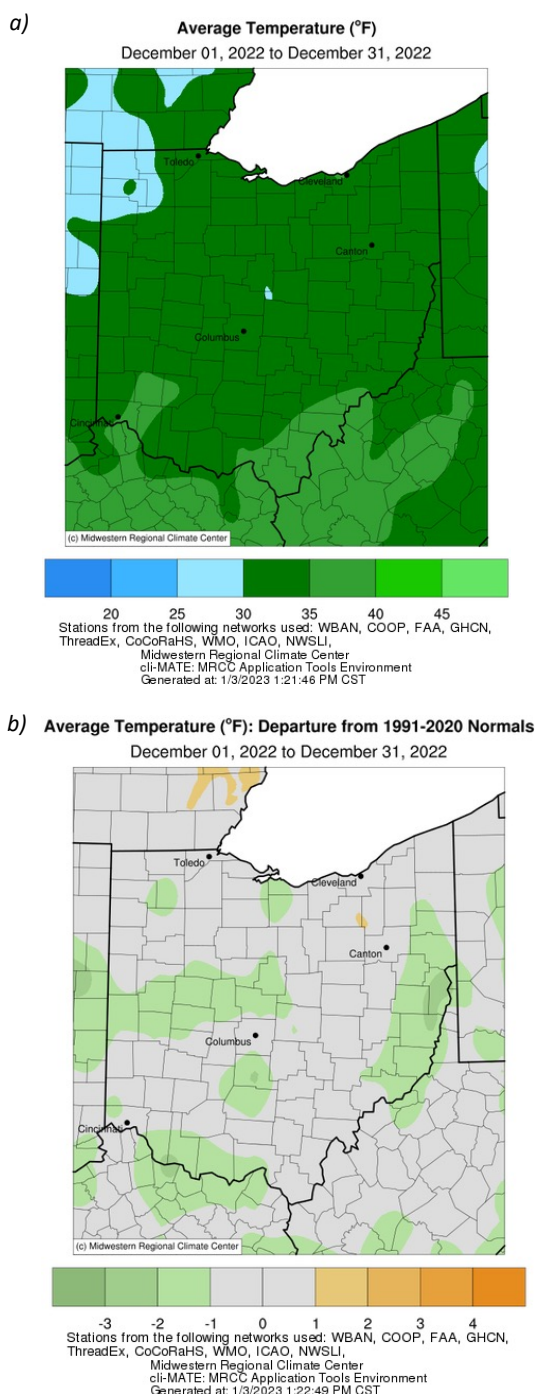


Figure 1a: Average temperature and 1b: Departure from Normal for the month of December 2022. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

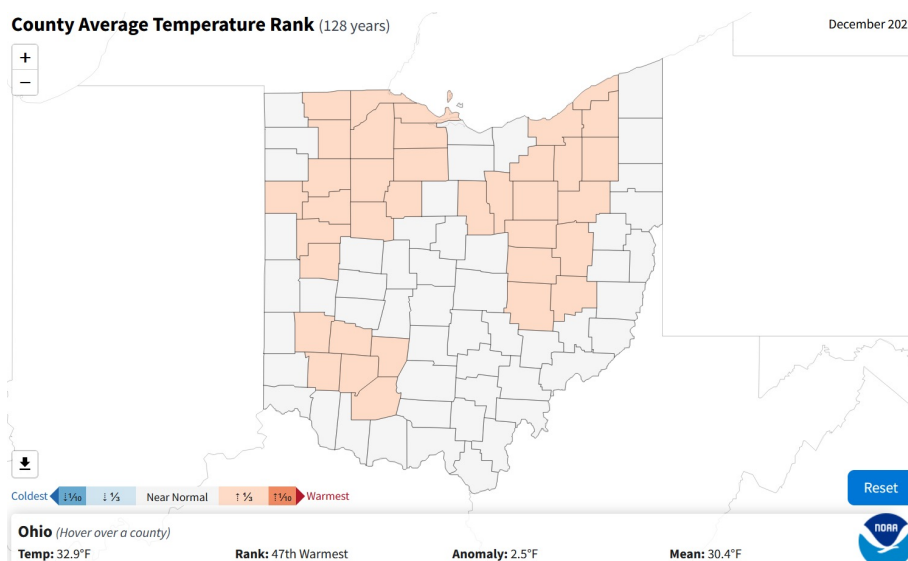
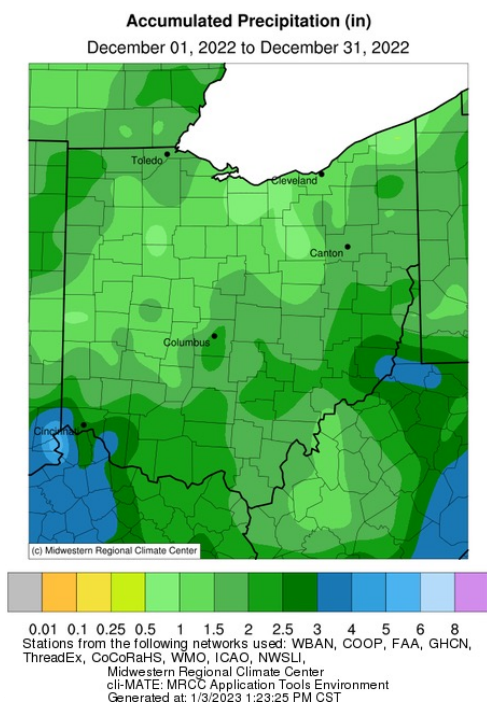


Figure 2: State of Ohio average temperature ranks by county for December 2022. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).

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a)



b)

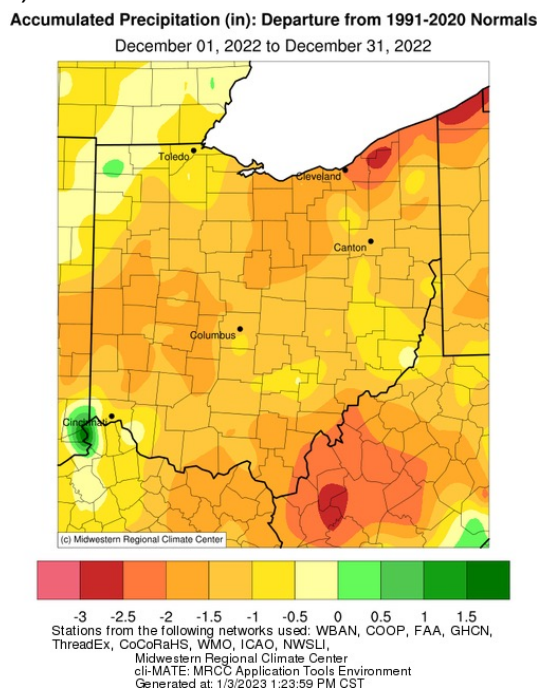


Figure 3a: Accumulated precipitation and 3b: Departures from Normal for the month of December 2022. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

## Precipitation

Despite multiple light precipitation events in December, the majority of Ohio saw less accumulated precipitation than normal over the month. Most of Ohio received around 1.5 to 3 inches of liquid-equivalent precipitation, with a band in the north and west of the state seeing only 0.5 to 1 inches. Additionally, local areas in the far southwest and southeast received more than 3 inches (Fig. 3a). With this, precipitation in nearly all of Ohio totaled 0.5 to 2 inches less than 30-year normals, with a small area in the northeast seeing up to 3 inches less. Only local pockets west of Cincinnati and in the state's far northwest received up to 0.5 inches more precipitation than normal (Fig. 3b). Compared to the 128-year record, nearly every county in the state ranked in the drier third, with counties in the dry band reaching past the driest ten. Notably, Lake and Cuyahoga counties saw their second driest December on record (Fig. 4).

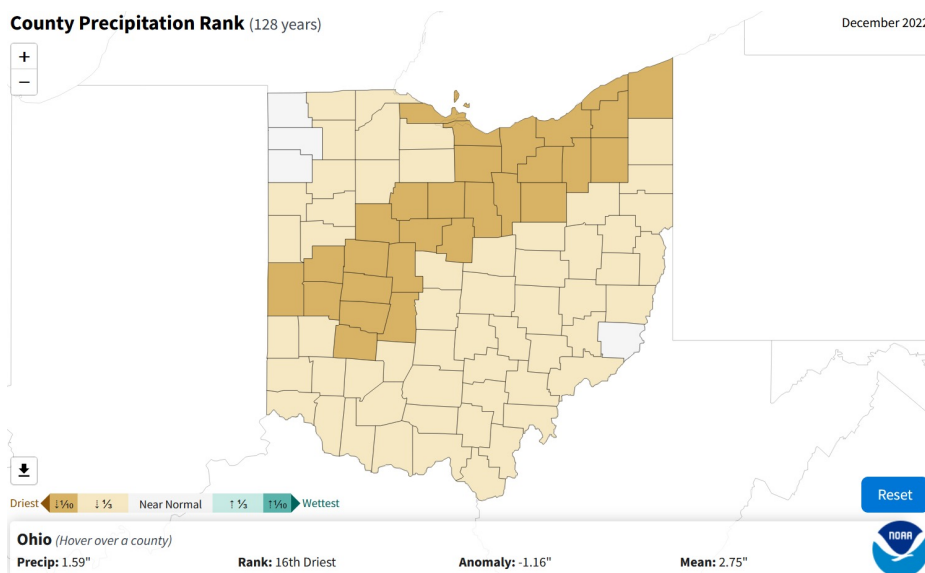


Figure 4: State of Ohio precipitation ranks by county for December 2022. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).



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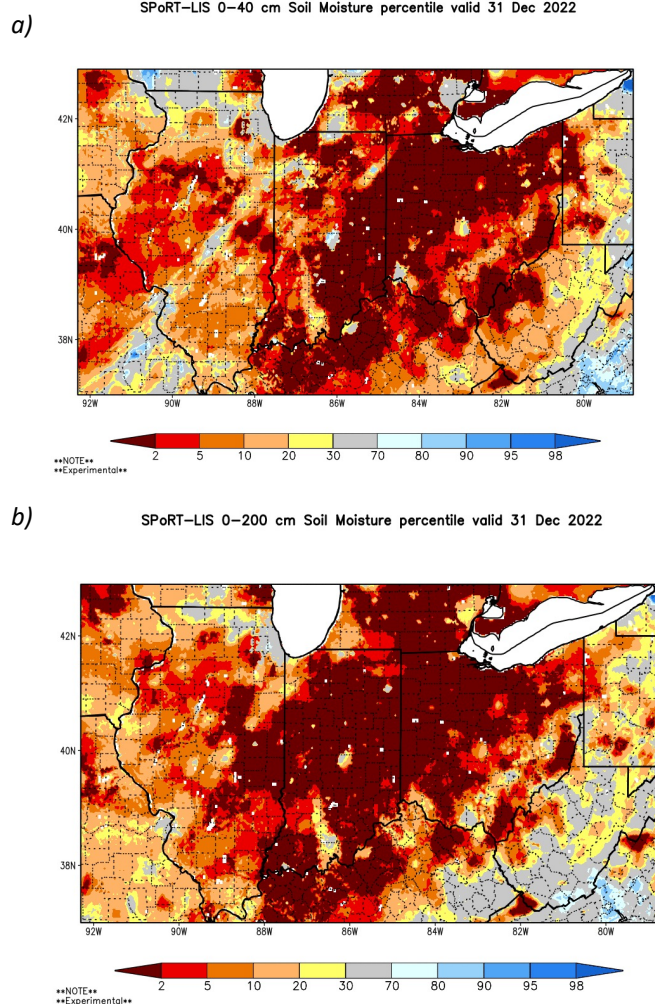


Figure 5a: 0-40 cm and 5b: 0-200 cm soil moisture percentile across the region at the end of December. Courtesy of NASA SPoRTLIS ([https://weather.msfc.nasa.gov/sport/case\\_studies/lis\\_IN.html](https://weather.msfc.nasa.gov/sport/case_studies/lis_IN.html)).

Climate Division	Heating Degree Days	Normal	Departure	Cooling Degree Days	Normal	Departure
1	1056	1067	-10	0	0	0
2	1002	1033	-31	0	0	0
3	1032	1033	-2	0	0	0
4	1036	1025	11	0	0	0
5	1022	990	32	0	0	0
6	1017	1024	-8	0	0	0
7	1008	993	15	0	0	0
8	988	963	24	0	0	0
9	934	911	23	0	0	0
10	972	957	14	0	0	0
Statewide	1006	998	8	0	0	0

## Soil and Energy

Below-average precipitation in December resulted in continuation of below average soil moisture at the end of the month throughout Ohio. At both 0-40cm and 0-200cm levels, the northwest half of the state recorded very dry soil moisture percentiles at the end of December, with the southeast recording slightly improved, but still dry moisture levels (Figs. 5a and 5b). Despite persistent dry conditions, dormant vegetation and lack of many active crops combined with multiple small-scale precipitation events in December resulted in minimal impacts in Ohio outside of some slow stream flow levels.

Despite the extended cold spell near Christmas, heating degree days (HDDs) remained close to expectations in December, with the northern half of Ohio seeing slightly fewer than the south. No cooling degree days (CDDs) were recorded despite the above-average temperatures experienced at the end of the month (Fig. 6).



Figure 6: (Left) December 2022 heating & cooling degree days. (Right) Corresponding Ohio Climate Divisions. Data courtesy of the Midwestern Regional Climate Center (<http://purdue.mrcc.edu>).

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### Notable Events

After a relatively calm and consistent first half of December, Ohio finished off the month with swings towards both temperature extremes. In the evening of December 22<sup>nd</sup>, Ohio experienced the passage of an unusually powerful cold front, which broke records by dropping temperatures by up to 40°F in six hours, resulting in an extended period of temperatures 15-25°F below normal (Fig. 7). Temperatures approaching zero, wind chills far into the negatives, and widespread icing left by the flash freeze combined with snow and winds created hazardous conditions for those travelling during the holiday season.

In stark contrast, the approach of an additional low-pressure system in the following days forced warm air from the Gulf of Mexico up into the Midwest, gradually raising temperatures in Ohio and resulting in average temperature departures of 5-17°F above normal in the final days of the year (Fig. 8). While the rapid change in conditions allowed for the quick clearing of ice and snow from roads before the New Year, pipes that had burst during the freezing event promptly began leaking water as temperatures reached well above freezing, resulting in instances of water damage throughout the state.

Average Temperature (°F): Departure from 1991-2020 Normals  
December 23, 2022 to December 26, 2022

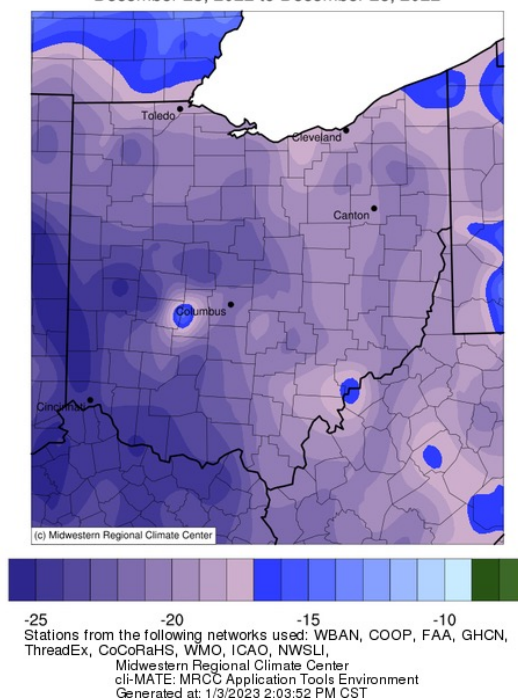
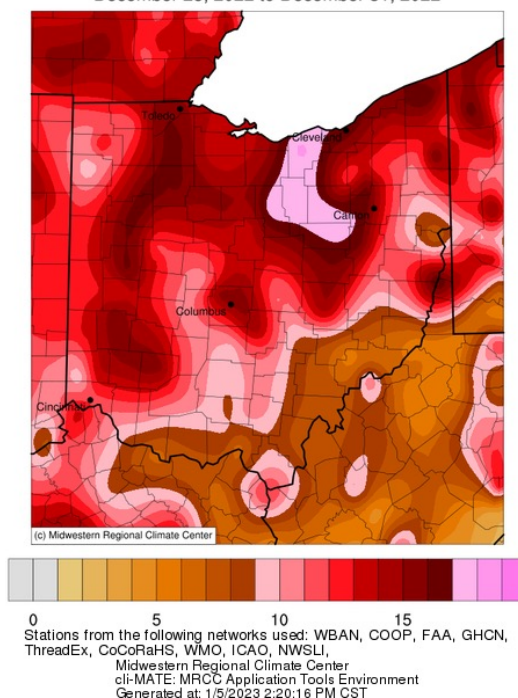


Figure 7: Average temperature departure on December 23<sup>rd</sup>-26<sup>th</sup> (above) and Figure 8: Average temperature departure on December 28<sup>th</sup>-31<sup>st</sup>, 2022 (below) from 1991-2020 normals across Ohio. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

Average Temperature (°F): Departure from 1991-2020 Normals  
December 28, 2022 to December 31, 2022

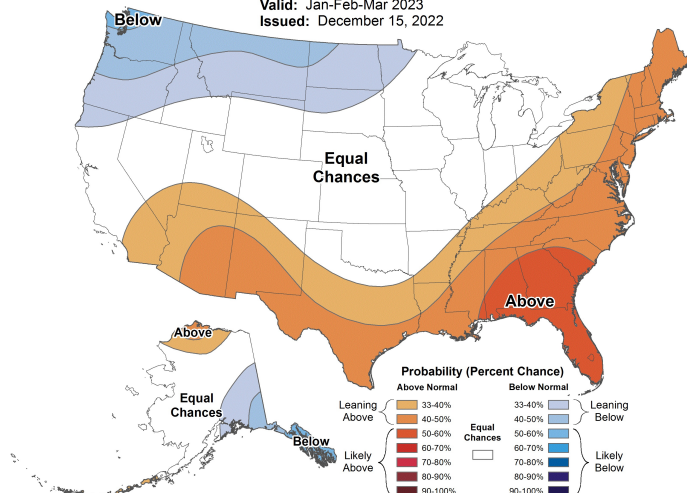




## Forecast: Jan-Mar 2023

### a) Seasonal Temperature Outlook

Valid: Jan-Feb-Mar 2023  
Issued: December 15, 2022



### b) Seasonal Precipitation Outlook

Valid: Jan-Feb-Mar 2023  
Issued: December 15, 2022

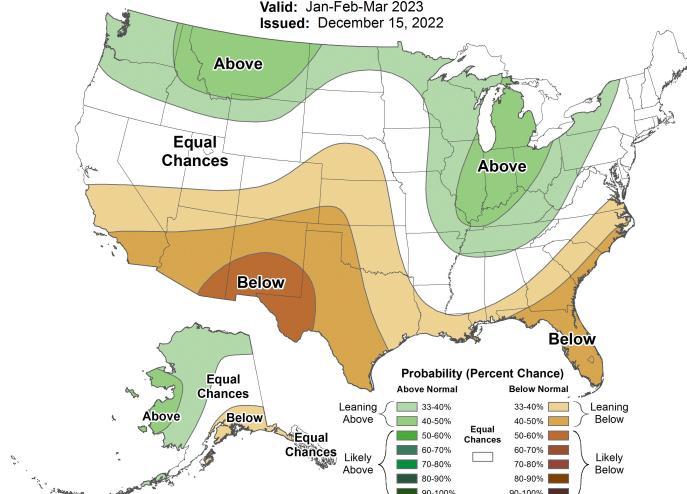


Figure 9a: Nationwide Seasonal Temperature and 9b: Precipitation Outlook for January-March. Courtesy of the Climate Prediction Center (<https://www.cpc.ncep.noaa.gov/>).

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## Looking Ahead

The Climate Prediction Center's 3-month outlook shows probabilities of above-average temperature and precipitation in Ohio over the first quarter of 2023. While somewhat uncertain, the southeastern half of the state has a slight probability of above normal temperatures, with the northwest having equal chances of higher or lower than average temperatures (Fig. 9a). Meanwhile, the entire state is predicted to have above-average precipitation in the following months, with the northwestern half having the highest probability (Fig. 9b). As the winter season continues through the beginning of the year, greater precipitation may result in a higher frequency of disruptive weather. On the other hand, above normal precipitation will be effective at helping to relieve dry soil and drought conditions that have persisted throughout the state.

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