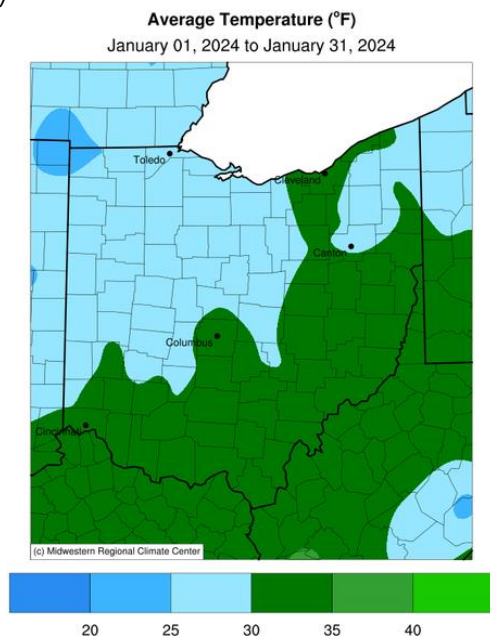


## Review – January 2024

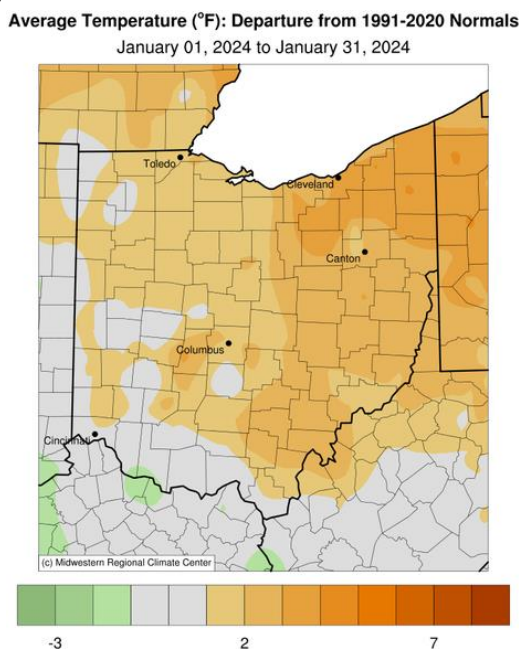
### Temperature

January temperatures were generally warmer than average across Ohio, with much of the state seeing averages below freezing over the month. While temperatures were generally consistent, the northern half of the state saw cooler conditions than the south, with the two regions seeing average temperature ranges of 25–30°F and 30–35°F, respectively (Fig. 1a). Compared to the 30-year record, temperature departures followed a gradient across the state, with the northeast seeing departures of up to 3°F higher than normal and temperatures in the southwest staying within a degree of normal (Fig. 1b). At the county level, rankings were generally mild, with much of the southwest ranking near normal. Meanwhile, while the rest of the state's counties ranked in the warmer third of their records, most individual rankings were towards the middle of the pack (Fig. 2).

a)



b)



County Average Temperature Rank (130 years)

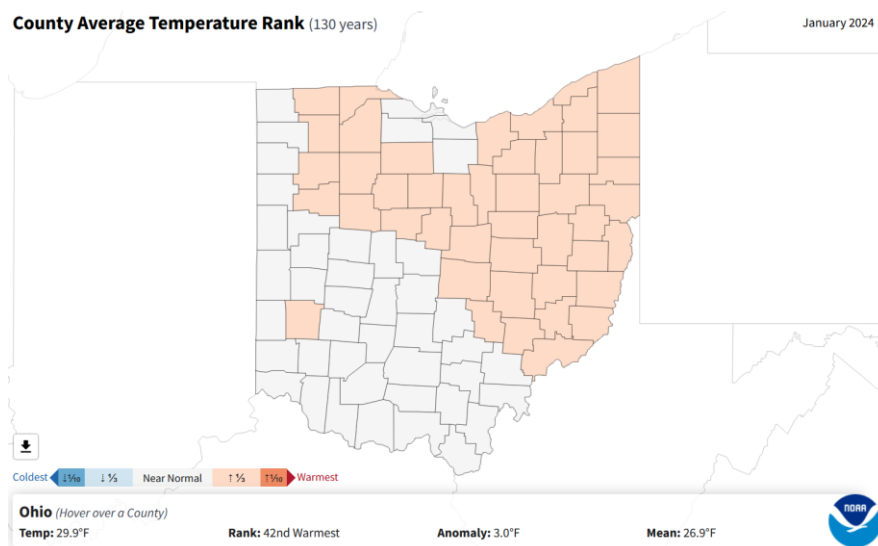


Figure 1a: Average temperature and 1b: Departure from Normal for the month of January 2024. Data courtesy of the Midwest Regional Climate Center (<http://mrcc.purdue.edu>).

Figure 2: State of Ohio average temperature ranks by county for January 2024. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).

## Review – January 2024

### Precipitation

While precipitation totals varied throughout Ohio, the entire state recorded higher accumulated precipitation than historical normals for January. While most of the state received 5-6 inches of precipitation, much of northern Ohio received only 4 inches, with some localized areas seeing only 2-3 inches. In contrast, areas in the southwest and southeast recorded up to 5-8 inches (fig. 3a). Such varied precipitation resulted in similarly varied departures from historical normal. While most of the state saw 1-2 inches more precipitation than normal, much of the northeast saw only 0-1 inches more, while the southwest and southeast saw 2-4 inches more (Fig. 3b). At the county level, rankings were inconsistent throughout the state. While most of Ohio's counties ranked within the wettest third of their records, various counties in the southwest, northwest, and east ranked within the wettest tenth (Fig. 4). Most notable was Fulton County, which recorded its 7<sup>th</sup> wettest January on record.

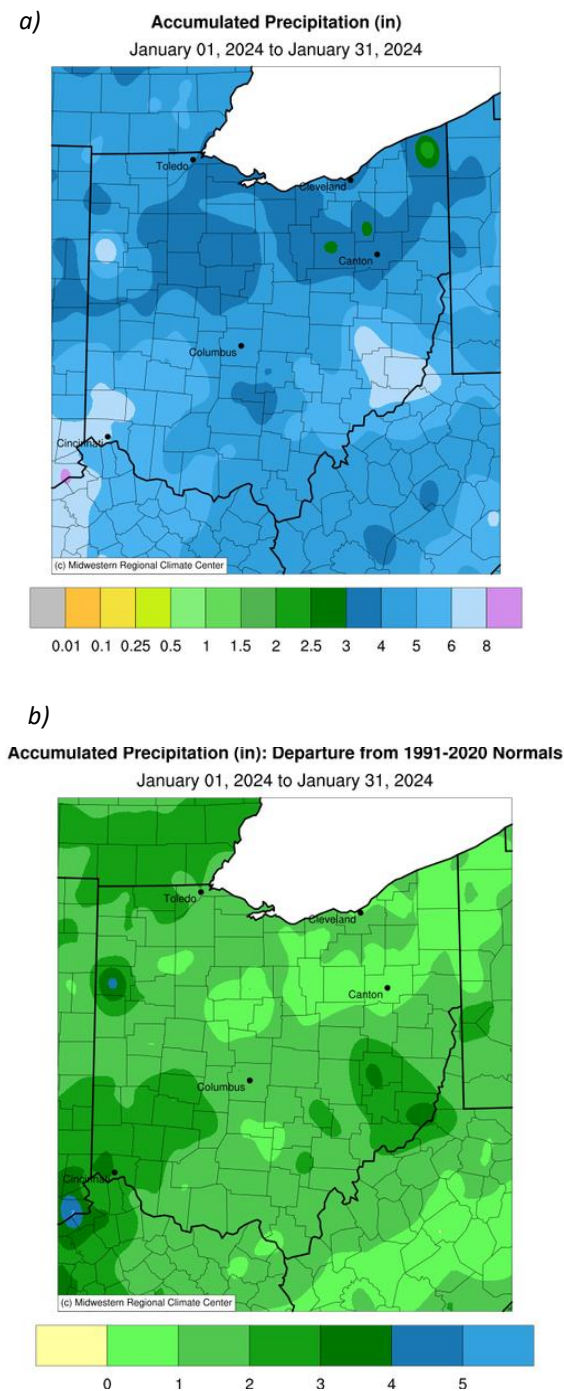


Figure 3a: Accumulated precipitation and 3b: Departures from Normal for the month of January 2024. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

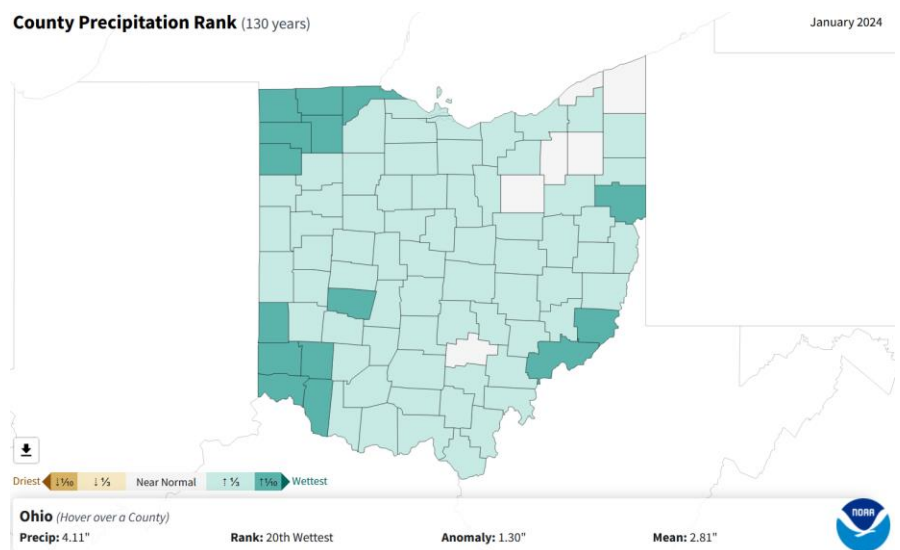
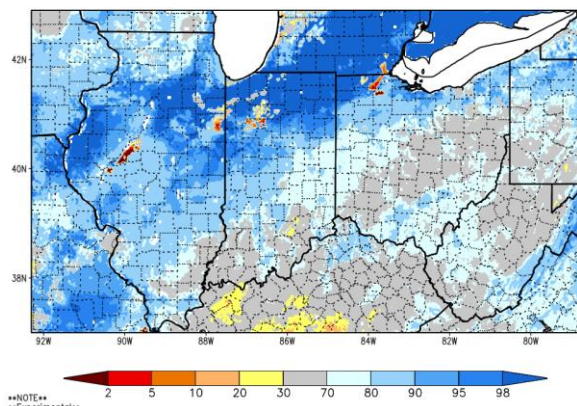


Figure 4: State of Ohio precipitation ranks by county for January 2024. Courtesy of the National Centers for Environmental Information (<https://www.ncdc.noaa.gov/sotc/>).



## Review – January 2024

a) SPoRT-LIS 0–40 cm Soil Moisture percentile valid 31 Jan 2024



b) SPoRT-LIS 0–200 cm Soil Moisture percentile valid 31 Jan 2024

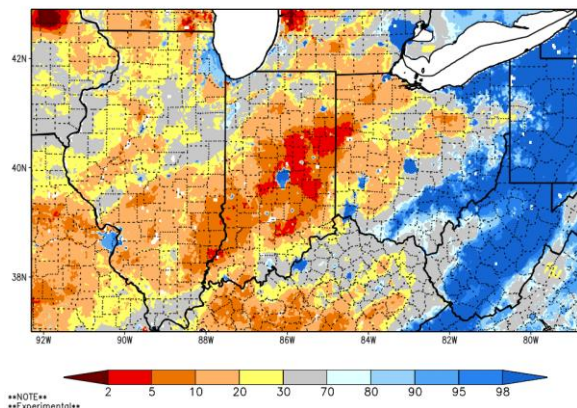


Figure 5a: 0–40 cm and 5b: 0–200 cm soil moisture percentile across the region at the end of January 2024. Courtesy of NASA SPoRTLIS ([https://weather.msfc.nasa.gov/sport/case\\_studies/lis\\_IN.html](https://weather.msfc.nasa.gov/sport/case_studies/lis_IN.html)).

## Soil and Energy

With higher-than-average precipitation accumulation occurring throughout the state, January saw a striking reversal from last month's soil moisture conditions. At the 0–40 cm depth, much of the northern and western Ohio recorded moist soil conditions, while the rest of the state saw generally moderate soil moisture (Fig. 5a). Meanwhile, while the 0–200 cm depth still featured dry soil conditions in the western half of the state, the severity of the dryness was largely reduced compared to the previous month, with eastern Ohio seeing moist soil on the last day of January (Fig. 5b).

Although temperatures were generally higher than normal during January, the occurrence of below-freezing conditions meant that the occurrence of Heating Degree Days (HDDs) was not significantly affected, resulting in minimal departures for the month. Meanwhile, as expected for the winter months, Cooling Degree Days (CDDs) continued to be non-existent in the state (Fig. 6).

**Product Note:** Both NASA SPoRT LIS soil moisture products contain small pockets of inaccurate data indicating extremely wet or dry conditions. These small-scale errors can emerge in remote sensing products covering large areas or grid-spacings. For more information, please contact Geddy Davis ([davis.5694@osu.edu](mailto:davis.5694@osu.edu)).

Climate Division	Heating Degree Days	Normal	Departure	Cooling Degree Days	Normal	Departure
1	1187	1232	-46	0	0	0
2	1134	1200	-66	0	0	0
3	1095	1206	-111	0	0	0
4	1150	1183	-33	0	0	0
5	1098	1146	-48	0	0	0
6	1107	1183	-76	0	0	0
7	1063	1149	-86	0	0	0
8	1101	1107	-6	0	0	0
9	1027	1047	-20	0	0	0
10	1041	1103	-61	0	0	0
Statewide	1100	1153	-53	0	0	0



Figure 6: (Left) January 2024 heating & cooling degree days. (Right) Corresponding Ohio Climate Divisions. Data courtesy of the Midwestern Regional Climate Center (<http://mrcc.purdue.edu>).

## Review – January 2024

### Notable Events

While January was littered with various rain and snow events across Ohio, the month's most notable event occurred on January 24-25 with the development of exceedingly high humidity and historical fog cover across the region. After a multi-day stretch of below-freezing temperatures and snow accumulation throughout the state, warm and moist air began traveling northward from the Gulf of Mexico towards the Midwest and Great Plains. This resulted in a layer of warmer air resting on top of the cold air near the surface, preventing it from rising upwards.

For air to rise, it needs to be less dense than the air surrounding it. In the atmosphere, this usually happens when air is warmer than its surroundings, just like in a hot air balloon (Fig. 7). During this event, the air at the surface was much colder than the air above it, forcing it to stay near the ground. As the pre-existing snow evaporated, the water vapor was unable to rise, causing very high humidity and widespread dense fog throughout the bulk of Ohio, along with much of the central United States (Fig. 8).

While no significant fog-related damage to life or property was reported in Ohio, impacts were still widespread with prevalent traffic jams, school delays, and generally uncomfortable conditions. Overall, the event ranked as one of the foggiest days in US history.

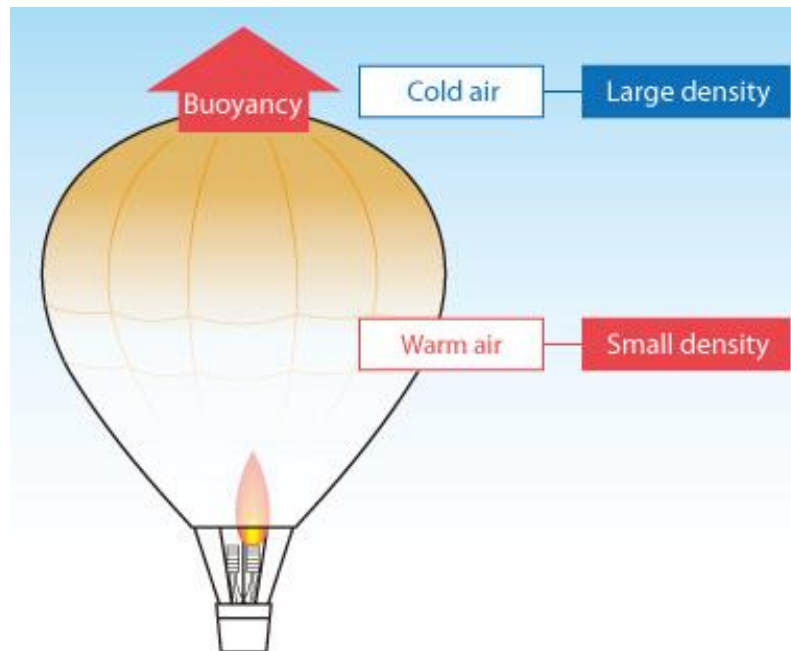


Figure 7: Diagram showing the buoyancy of a hot air balloon due to differences in air density and temperature. Image courtesy of Hexagon (<https://www.cradle-cfd.com/media/column/a73>).

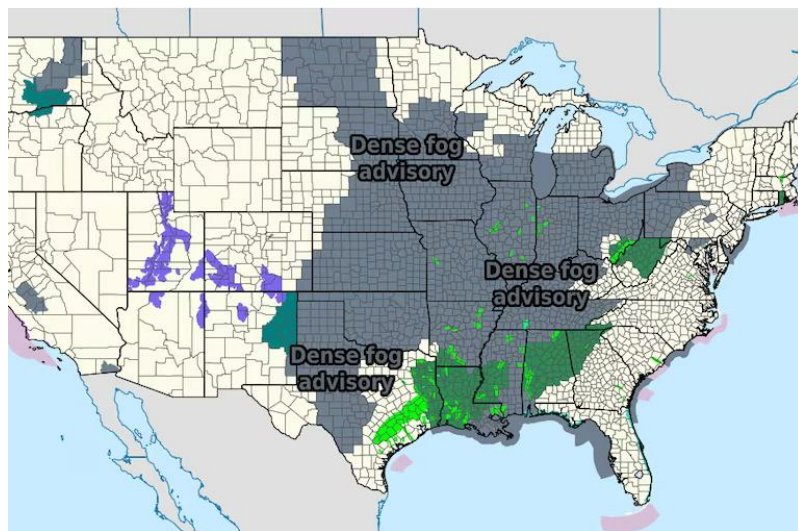


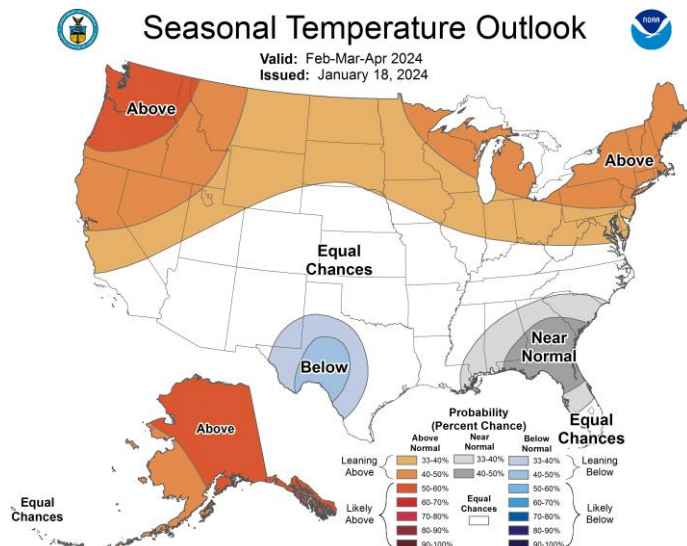
Figure 8: NWS hazardous weather advisory for January 24, 2024, showing a large swath of the United States under a dense fog advisory. Image courtesy of NWS Cleveland (<https://weather.gov/Cleveland>).





## Forecast: February - April

a)



b)

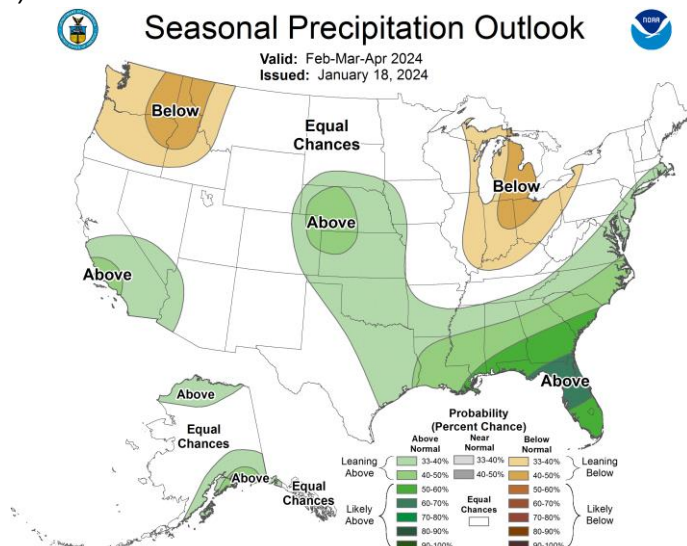


Figure 9a: Nationwide Seasonal Temperature and 9b: Precipitation Outlook for February-April. Courtesy of the Climate Prediction Center (<https://www.cpc.ncep.noaa.gov/>).

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## Looking Ahead

The CPC's 3-month outlooks suggest a continued trend of warm and dry conditions in Ohio through early spring. Temperatures are forecast to be above-normal in the entire state, although confidence is generally low, with the northeast corner of the state having the highest likelihood of occurrence (Fig. 9a). Meanwhile, precipitation is forecast to be below-normal in every part of the state except for the extreme southeast. With similarly low confidence for most of the state, precipitation predictions for northwest Ohio have the highest likelihood of occurrence (Fig. 9b). Overall, while these outlooks still predict warm and dry conditions for Ohio, they indicate a shift away from the consistent trend seen over the last several months. Though below-normal precipitation could have potential impacts on the early growing season in March and April, the lack of confidence in the CPC's outlooks makes predictions of such impacts uncertain.

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