Winter Outlook

December 2023 - February 2024

NWS Louisville

Background Photo:
Warren County, January 12, 2018
Courtesy Chris Allen

Upfront - The Takeaways

Climate Prediction Center (CPC) Outlook
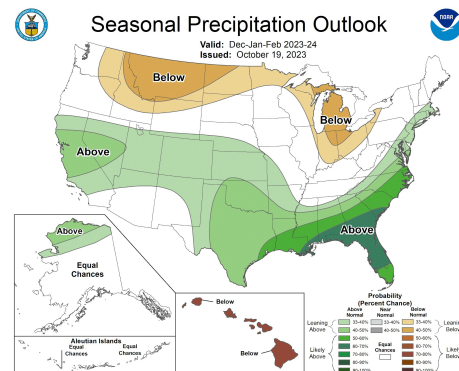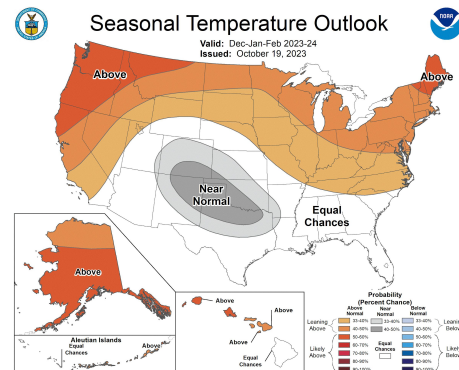
CPC Temperature Outlook:

- Enhanced chances for **above-normal** temperatures across the northern United States as well as Alaska and much of Hawaii. Odds lean toward **near normal** from the Front Range of the Rockies to the Red River Valley. No areas are *favored* for **below-normal** temperatures.
- "Equal chances" means there is no clear indication of **above-**, **near-**, or **below-normal** temperatures.

CPC Precipitation Outlook:

- Enhanced chances for **wetter-than-normal** conditions from California through the southern Plains to the Southeast and East Coast
- Enhanced chances for **drier-than-normal** from the interior Pacific Northwest to the Great Lakes
- Elsewhere, there are equal chances of **above-**, **near-**, and **below-normal** precipitation.

What's Uncertain

- El Niño will **not** be the only factor this winter. Other atmospheric variables, both large-scale and local, will come into play. Unfortunately it is very difficult to predict these other entities on a seasonal timescale.

Seasonal Temperature Outlook
Valid: Dec-Jan-Feb 2023-24
Issued: October 19, 2023

Seasonal Precipitation Outlook
Valid: Dec-Jan-Feb 2023-24
Issued: October 19, 2023

The **CPC winter forecasts above show only the most likely outcome** where there is greater confidence, not the only possible outcome.

Rationale for the CPC Winter Outlook Issued on October 19, 2023

✔ El Niño has already formed and, as a result, an El Niño Advisory is in effect.

✔ El Niño is anticipated to affect temperature and precipitation across parts of the United States during the upcoming months, so the CPC temperature and precipitation outlooks reflect El Niño impacts.

✔ El Niño is anticipated to continue through the Northern Hemisphere spring, with a 95% chance of El Niño in January - March and an 80% chance during the March - May time period.

✔ El Niño is expected to reach its peak strength during November - January, with high confidence that it will be moderate to strong. There is a 75% chance of a strong El Niño, and about a 1-in-3 chance of an El Niño strength on par with those of 2015-16 and 1997-98.

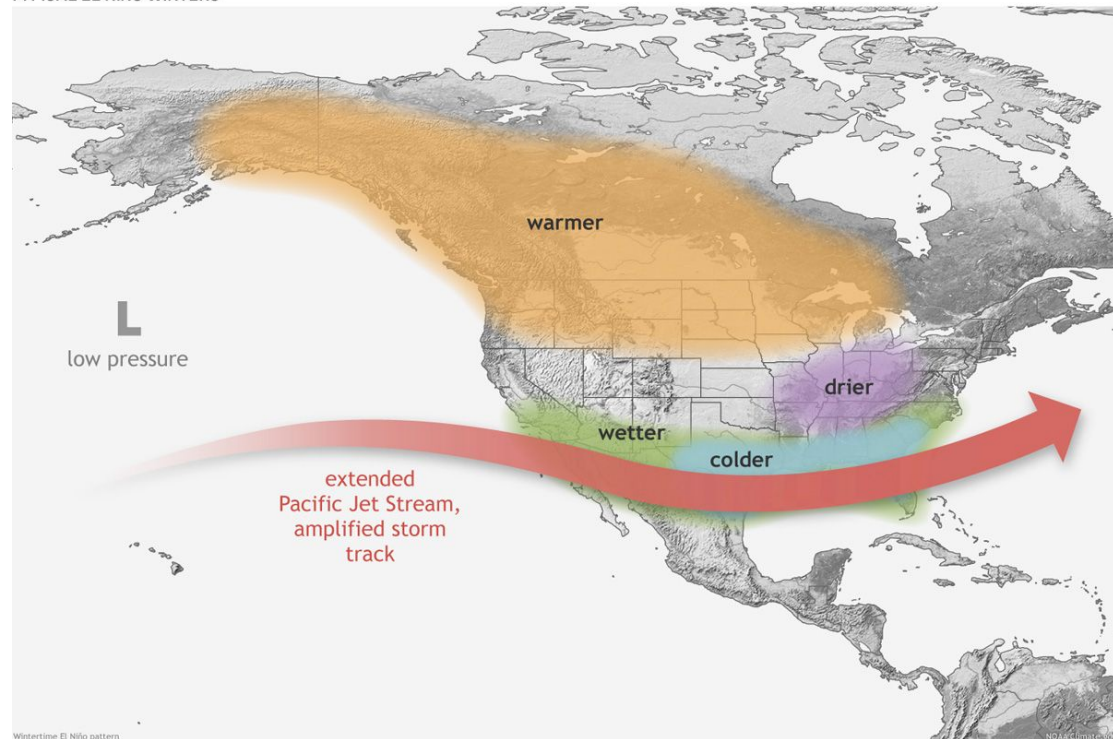✔ Recent temperature & precipitation trends were also considered when preparing this seasonal outlook.

El Niño– What is it?

El Niño is anomalously warm water in the central and eastern tropical Pacific Ocean with a corresponding response in atmospheric circulation. During these events…
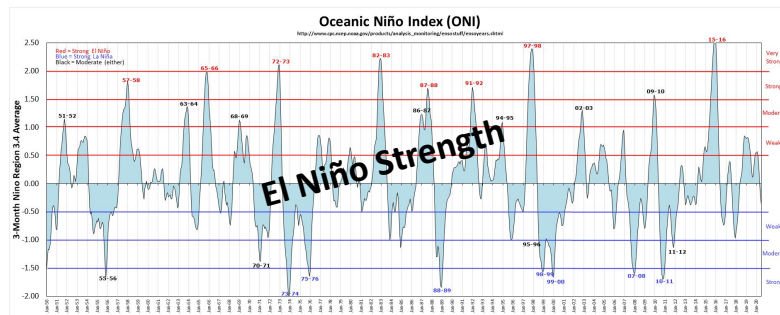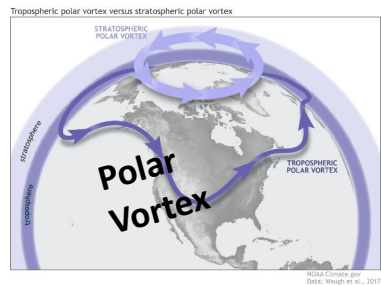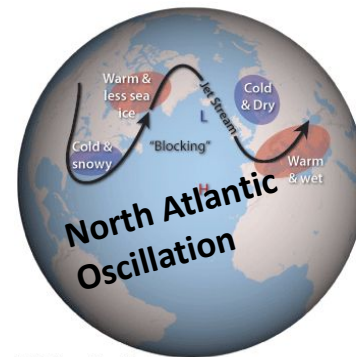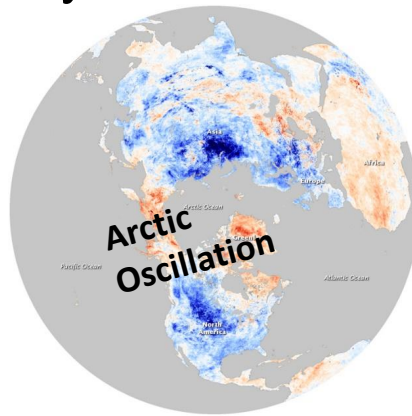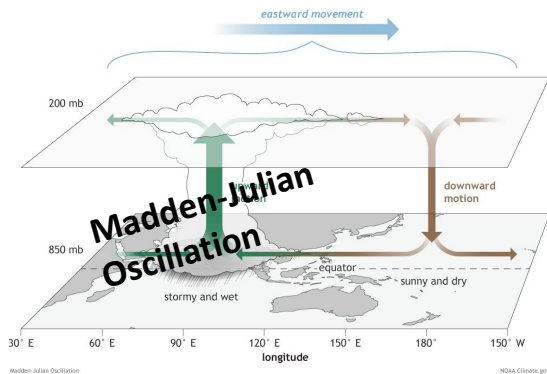
1) The normal easterly winds (trade winds) along the equator weaken, so they push less warm water toward Asia.

2) The Pacific jet stream strengthens and extends eastward, more frequent storm systems across the southern United States.

3) Because El Niños vary in strength and position, and work in concert with myriad other atmospheric phenomena, not all El Niños are the same.

TYPICAL EL NIÑO WINTERS

warmer

L
low pressure

drier

wetter

colder

extended Pacific Jet Stream, amplified storm track

Wintertime El Niño pattern

In Addition to El Niño, Many Other Factors Come Into Play

Madden-Julian Oscillation

Arctic Oscillation
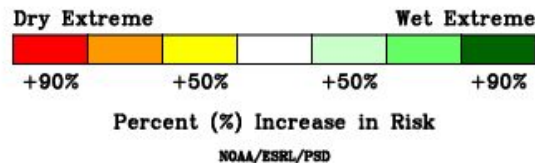
North Atlantic Oscillation

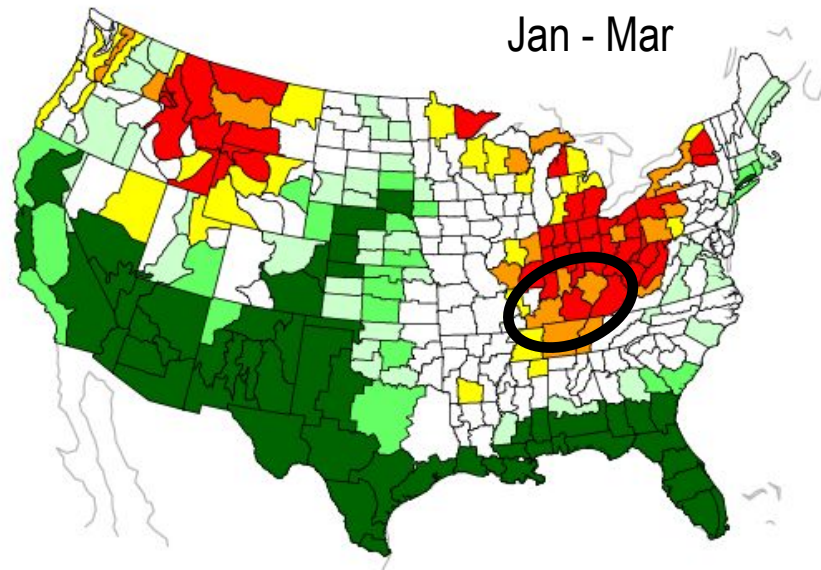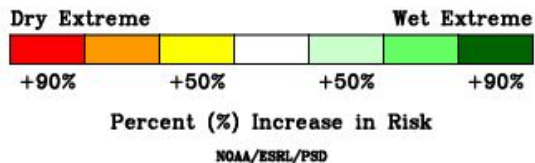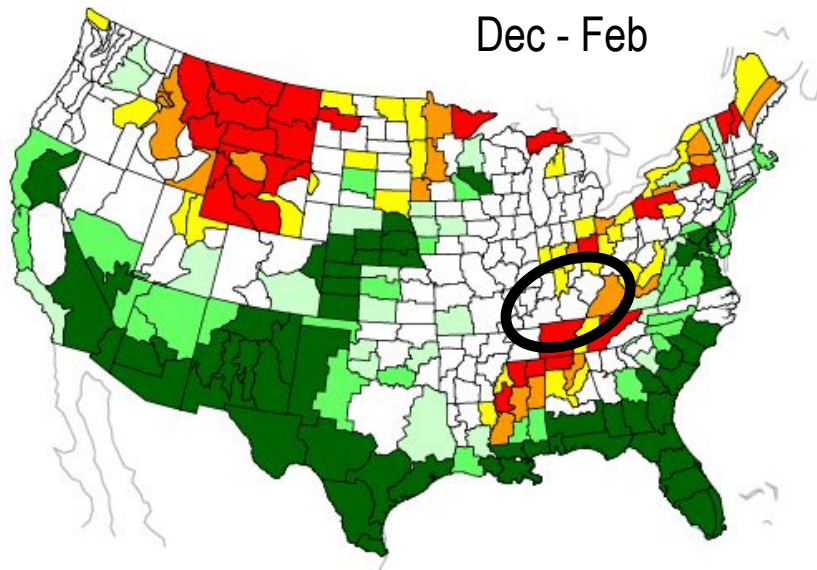Polar Vortex

El Niño Strength

...and more!

There are many patterns in the atmosphere that combine to give us the weather we experience. Many of these patterns, including those shown above, occur over the space of days, weeks, or a month or two. These patterns are extremely difficult to forecast more than a few weeks in advance. This makes the construction of a forecast for an entire season very challenging.

Increased Risk of Precipitation Extremes Dec – Mar During El Niño

There is an increased risk of dry extremes in the Ohio Valley during El Niño, especially January through March.

Dec - Feb

Jan - Mar

Dry Extreme · Wet Extreme
+90% · +50% · +50% · +90%
Percent (%) Increase in Risk
NOAA/ESRL/PSD

Snowfall

Snowfall is extremely difficult to predict since it is dependent on both temperature and precipitation.

This image, from a local study, shows snowfall anomalies among past strong El Niños. Very generally speaking, snowfall increases, relative to climatology, across southern portions of the U.S. and decreases in the north.

This is an overview of historical El Niño snowfall seasons; it is not a forecast for this season.
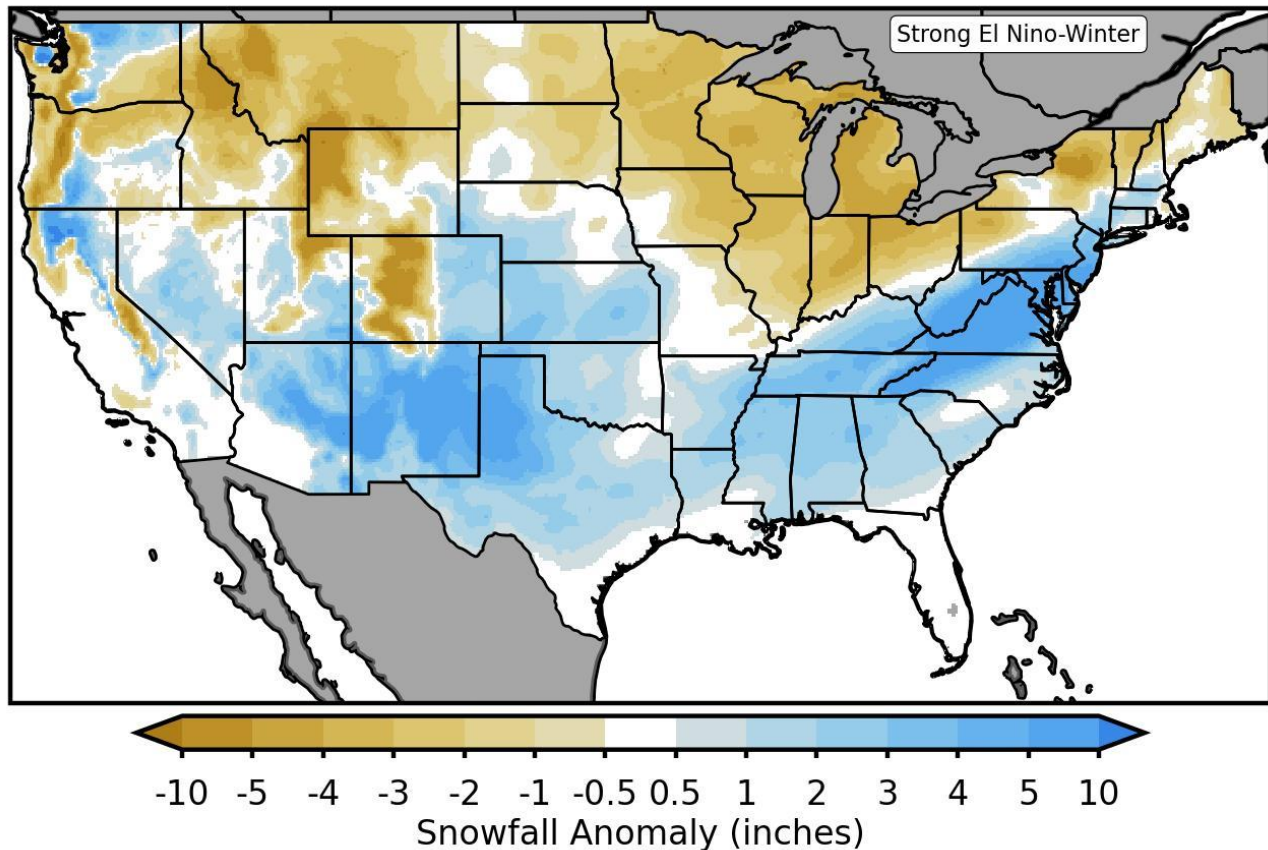
Strong El Nino-Winter

Snowfall Anomaly (inches)

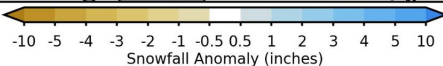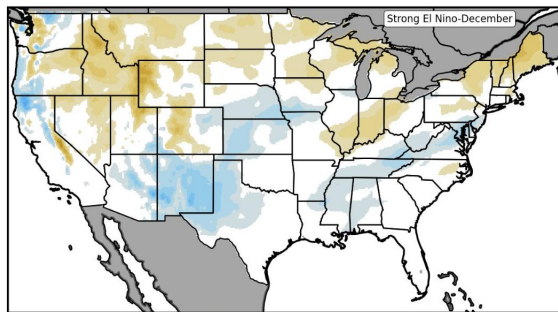-10 -5 -4 -3 -2 -1 -0.5 0.5 1 2 3 4 5 10

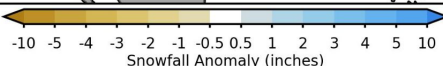Snowfall climatology and ENSO anomalies were determined using ERA5 Land Reanalysis dataset
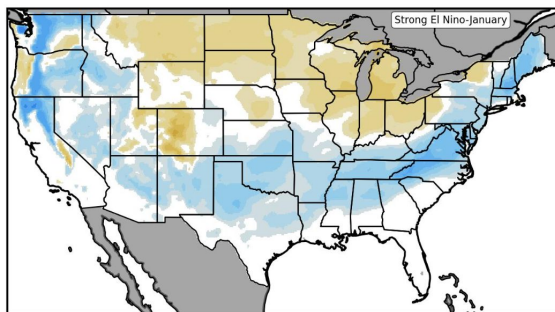
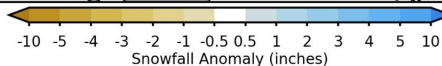# Monthly Climatological Tendencies for Snowfall During Strong El Niños

These maps show averages from past strong El Niños. While these maps are not an explicit forecast for this winter, they give an idea of how strong El Niños have behaved in the past.

December

January

February

On average, in previous strong El Niño events, the Ohio Valley has been sandwiched between less snowy than average conditions to the north and snowier than average conditions to the south. The second half of the winter has been slightly snowier than the first half of the winter, especially in Kentucky.

Snowfall climatology and ENSO anomalies were determined using ERA5 Land Reanalysis dataset

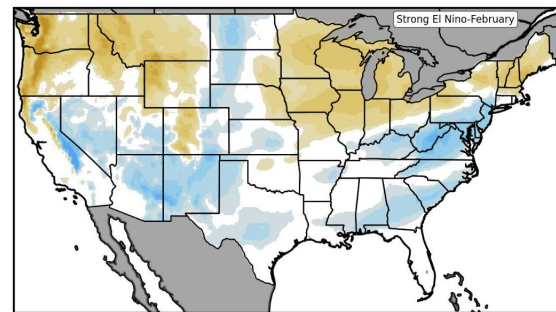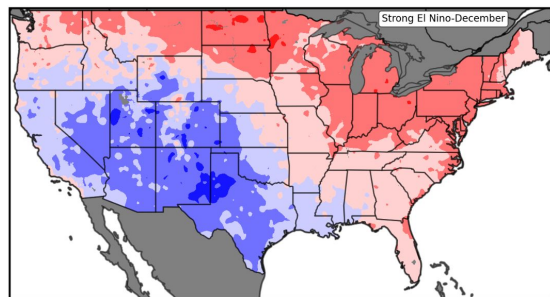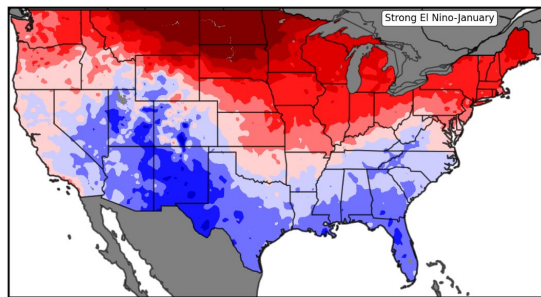# Monthly Climatological Tendencies for Maximum Temperature During Strong El Niños

These maps show averages from past strong El Niños. While these maps are not an explicit forecast for this winter, they give an idea of how strong El Niños have behaved in the past.

December   **January**   **February**
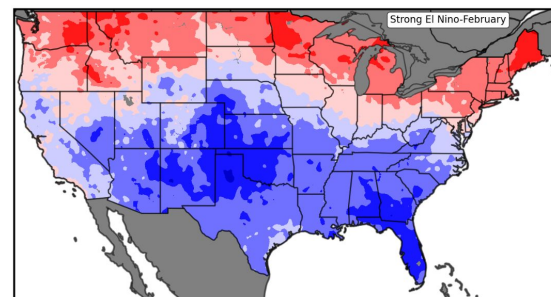
On average, in previous strong El Niño events, the Ohio Valley has been generally warmer than normal during the winter as a whole, though most of that warmth is in the first half of the season with colder conditions in the second half. If the El Niño doesn't intensify as much as expected, the temperature pattern across the U.S. could change.

Climatology and ENSO anomalies were determined using NCEI's nClimGrid Data

Monthly Climatological Tendencies for Precipitation During Strong El Niños

These maps show averages from past strong El Niños. While these maps are not an explicit forecast for this winter, they give an idea of how strong El Niños have behaved in the past.
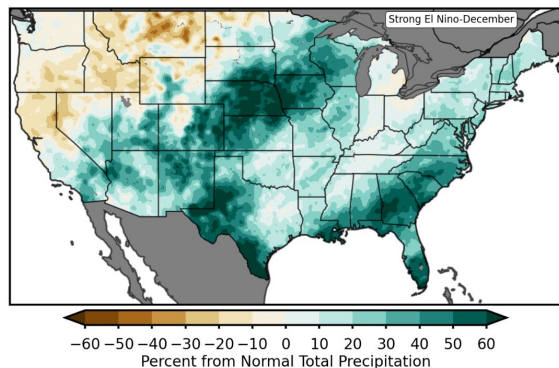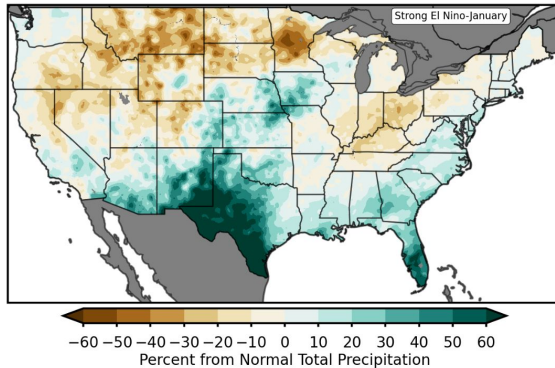

December
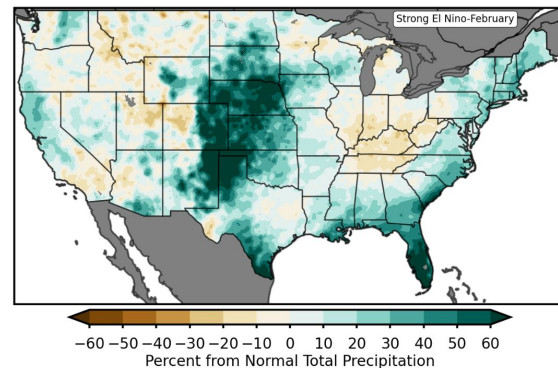
January

February

On average, in previous strong El Niño events, the Ohio Valley has been generally drier than normal, especially in January and February. This agrees with the CPC outlook of drought alleviation early in the season (or in late fall) followed by drier conditions later in the winter, resulting in an *overall* drier than normal season.

Climatology and ENSO anomalies were determined using NCEI's nClimGrid Data
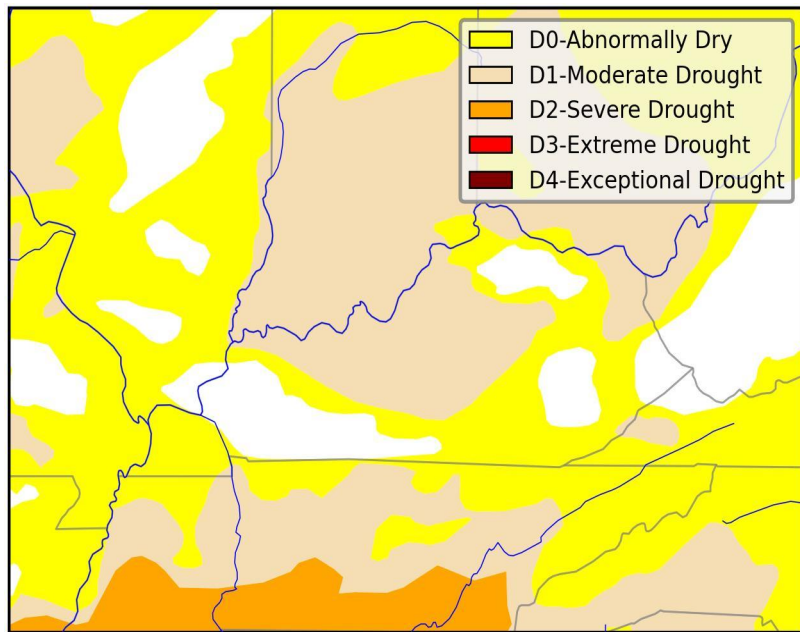
Drought Outlook

Current Drought Status

D0-Abnormally Dry	
D1-Moderate Drought	
D2-Severe Drought	
D3-Extreme Drought	
D4-Exceptional Drought	

Seasonal Drought Outlook

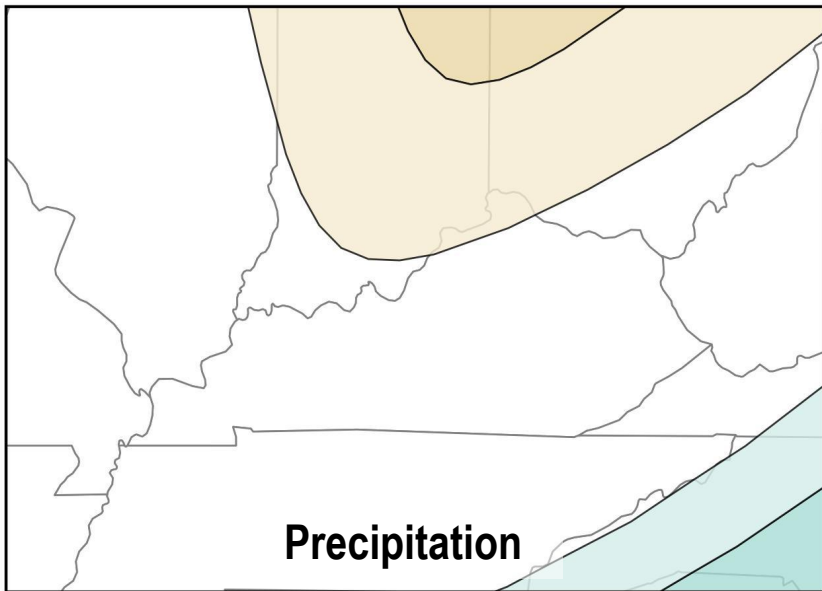|	
Drought persists	
Drought remains but improves	
Drought removal likely	
Drought development likely	
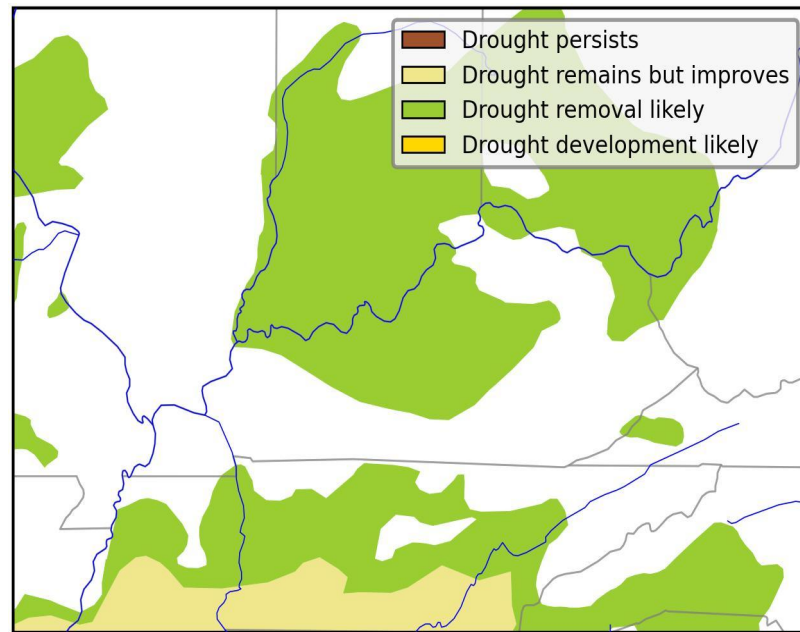
Climatology and a possibly wetter pattern this fall suggest that current drought conditions in the Ohio Valley may be alleviated.

Local CPC Outlooks

Precipitation

Below Normal   Equal Chances   Above Normal
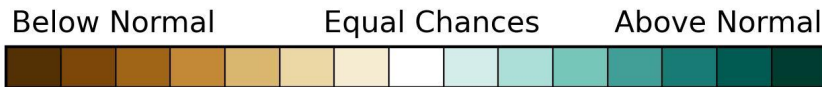
100 90 80 70 60 50 40 33 33 40 50 60 70 80 90 100
Probability (%)

Temperature

Below Normal   Equal Chances   Above Normal
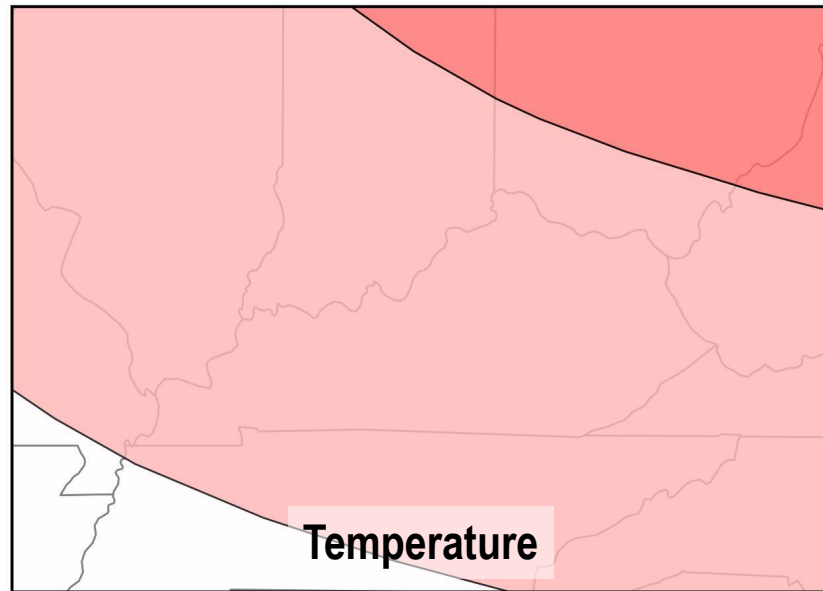
100 90 80 70 60 50 40 33 33 40 50 60 70 80 90 100
Probability (%)

In the official CPC outlook there are increased chances for below normal seasonal precipitation totals in portions of Indiana and Ohio. Chances lean toward a warmer than normal winter throughout the Ohio Valley.

Climate Prediction Center November Outlook

Monthly Temperature Outlook

Valid: November 2023
Issued: October 19, 2023
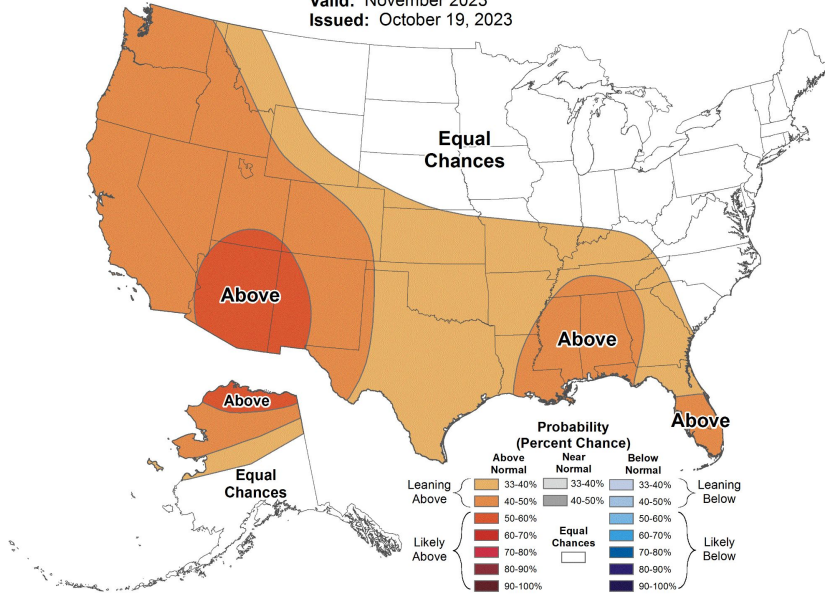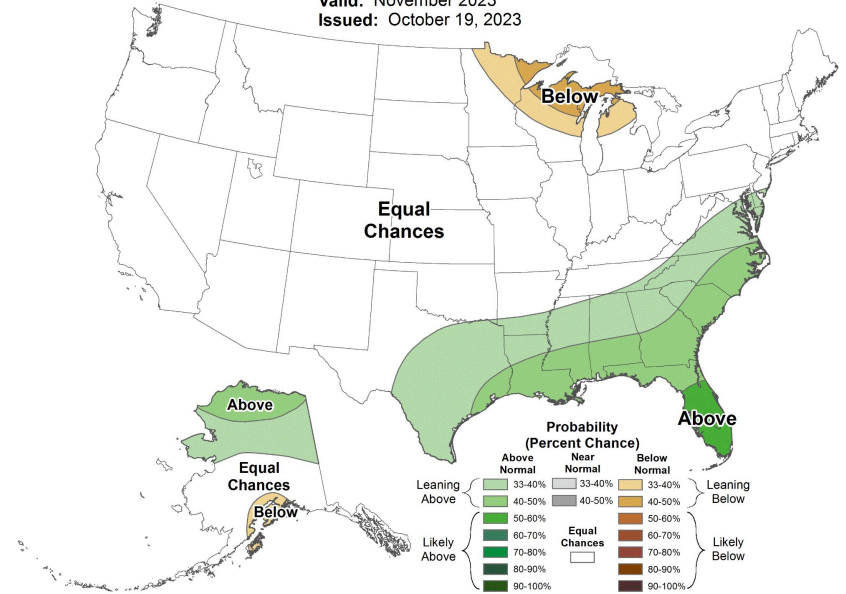
Equal Chances

Above

Above

Above

Above

Equal Chances

Probability (Percent Chance)

	Above Normal	Near Normal	Below Normal	
Leaning Above	33-40%	33-40%	33-40%	Leaning Below
	40-50%	40-50%	40-50%	
Likely Above	50-60%	Equal Chances	50-60%	Likely Below
	60-70%		60-70%	
	70-80%		70-80%	
	80-90%		80-90%	
	90-100%		90-100%	

Monthly Precipitation Outlook

Valid: November 2023
Issued: October 19, 2023

Below

Equal Chances

Above

Above

Equal Chances

Below

Probability (Percent Chance)

	Above Normal	Near Normal	Below Normal	
Leaning Above	33-40%	33-40%	33-40%	Leaning Below
	40-50%	40-50%	40-50%	
Likely Above	50-60%	Equal Chances	50-60%	Likely Below
	60-70%		60-70%	
	70-80%		70-80%	
	80-90%		80-90%	
	90-100%		90-100%	

Climate Prediction Center Winter (Dec-Feb) Outlook
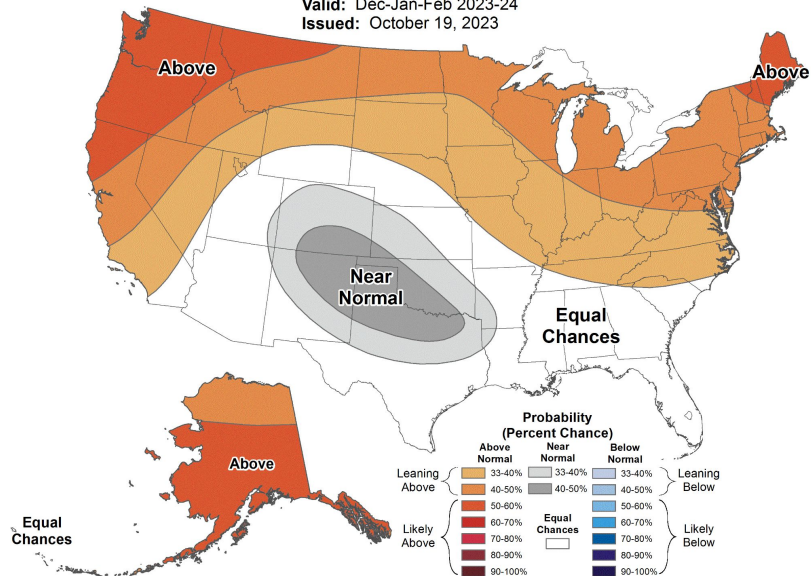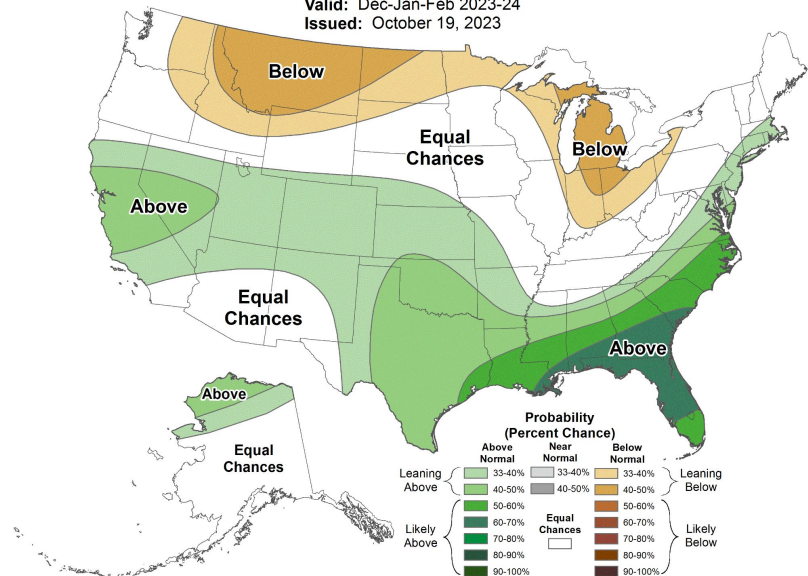
Summary

What's Currently Expected

- El Niño is expected to impact the 2023-24 meteorological winter (December 1-February 29).

- Enhanced chances for **above-normal** temperatures across the northern United States, Alaska, and much of Hawaii

- Enhanced chances for near-normal temperatures from the Front Range of the Rockies to the Red River Valley

- **Below-normal** temperatures are possible but unlikely.

- Enhanced chances for **wetter-than-normal** conditions from California through the Deep South to much of the East Coast.

- Enhanced chances for **drier-than-normal** conditions from the Pacific Northwest to the Great Lakes.

What's Uncertain

- On shorter time scales, other—less predictable—climate patterns can cancel out or amplify the typical influence of El Niño.

- Strong Arctic Oscillation episodes typically last a few weeks and are difficult to predict more than 1 to 2 weeks in advance.

- The mean storm track in the southern US will likely be more active than normal. This will result in more frequent, changeable weather. However, any more additional detail on specific storms and storm characteristics is beyond our ability to discern.

The next CPC Winter Outlook will be issued on Thursday, November 16.

Questions / Comments?

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