

# Missouri Drought Update and Growing Season Outlook

March 29, 2024

*2024 AG Lender Webinars: Crop Markets and Weather Outlook*

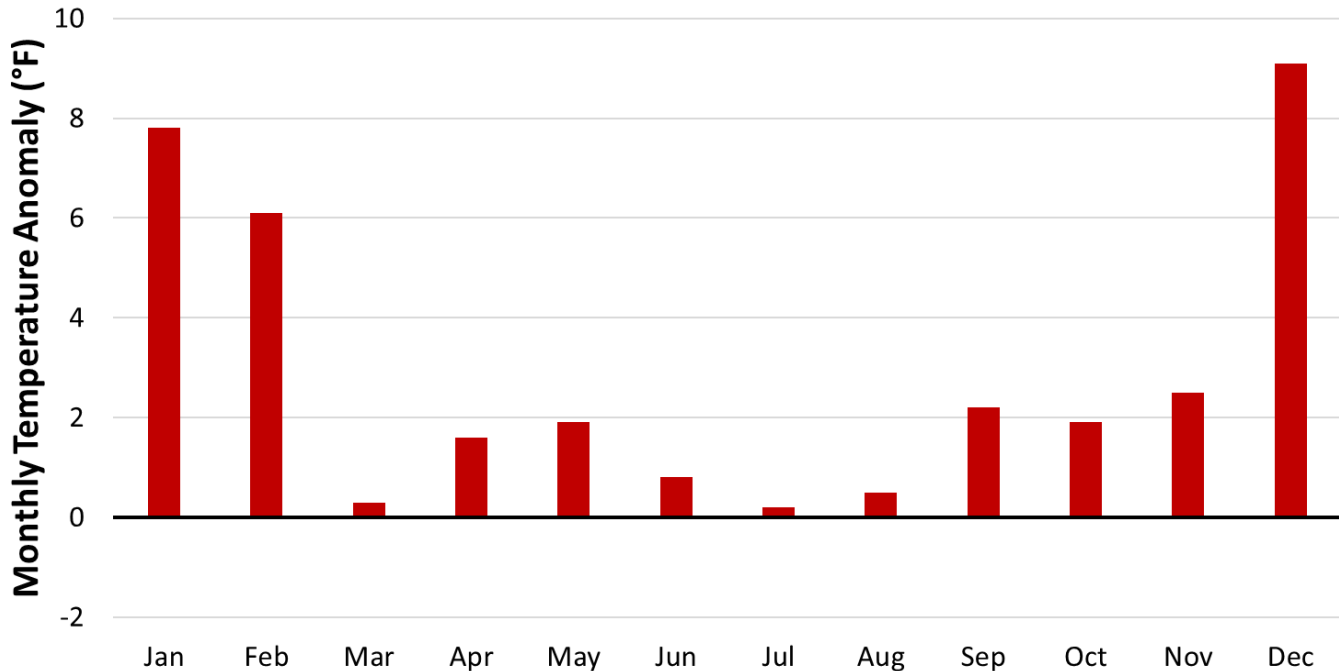
Zack Leasor

State Climatologist | Assistant Professor



# 2023 Climate Summary: Warm and Dry Year for Missouri

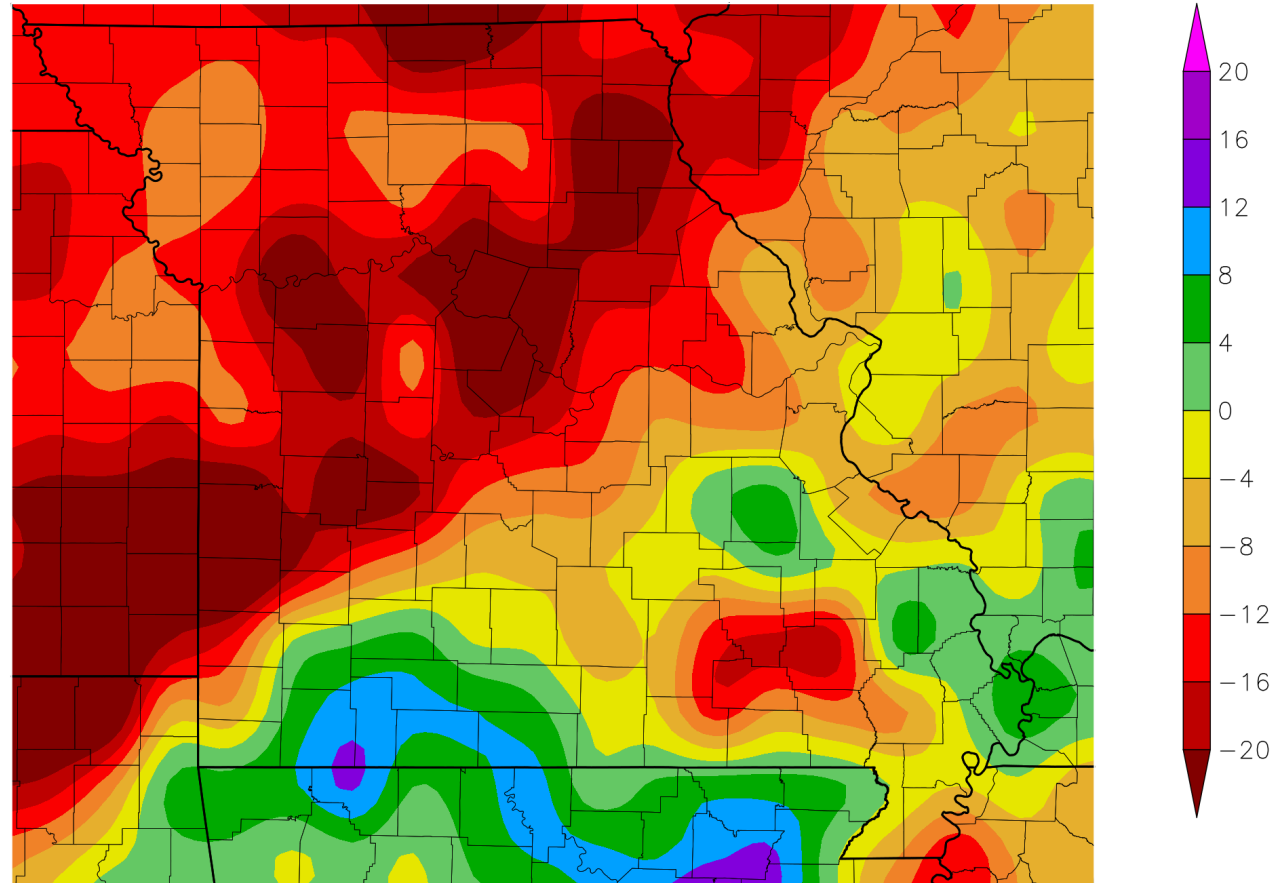
Missouri 2023 Monthly Temperature Departures from Average (1901 - 2000)



- Missouri's statewide average temperature during 2023 was 57.4°F (+ 2.9°F)
- This tied 2016 for Missouri's **third warmest year on record**
- All twelve months featured above normal monthly temperatures
- Howell and Oregon county recorded their warmest year on record
- More information: <https://extension.missouri.edu/news/2023-was-likely-earths-warmest-year-on-record-missouris-third>

# 2023 Climate Summary: Warm and Dry Year for Missouri

Departure from Normal Precipitation (in)  
12/5/2021 – 12/4/2023



Generated 12/5/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

<https://hprcc.unl.edu/maps.php?map=ACISClimateMaps>

# 2023 Climate Summary: Warm and Dry Year for Missouri

## Missouri Precipitation

April-November

↕ Period	↕ Precipitation	Rank (out of 129)	↕ Anomaly <small>1901-2000 Mean: 30.86 in</small>
April -November 1901	15.66"	1	-15.20"
April -November 1953	16.32"	2	-14.54"
April -November 1980	20.72"	3	-10.14"
April -November 2012	21.58"	4	-9.28"
April -November 1976	21.77"	5	-9.09"
April -November 1930	22.63"	6	-8.23"
April -November 2023	22.71"	7	-8.15"
April -November 1936	22.78"	8	-8.08"
April -November 1897	22.81"	9	-8.05"
April -November 1963	23.20"	10	-7.66"

- **Missouri's 7<sup>th</sup> driest April – November period (- 8.15") going back to 1895**

- **The 2023 drought is a one-in-20-year drought event (return period = 18.4 years)**

Ranks based on data from 1895 to 2023 (129 years)

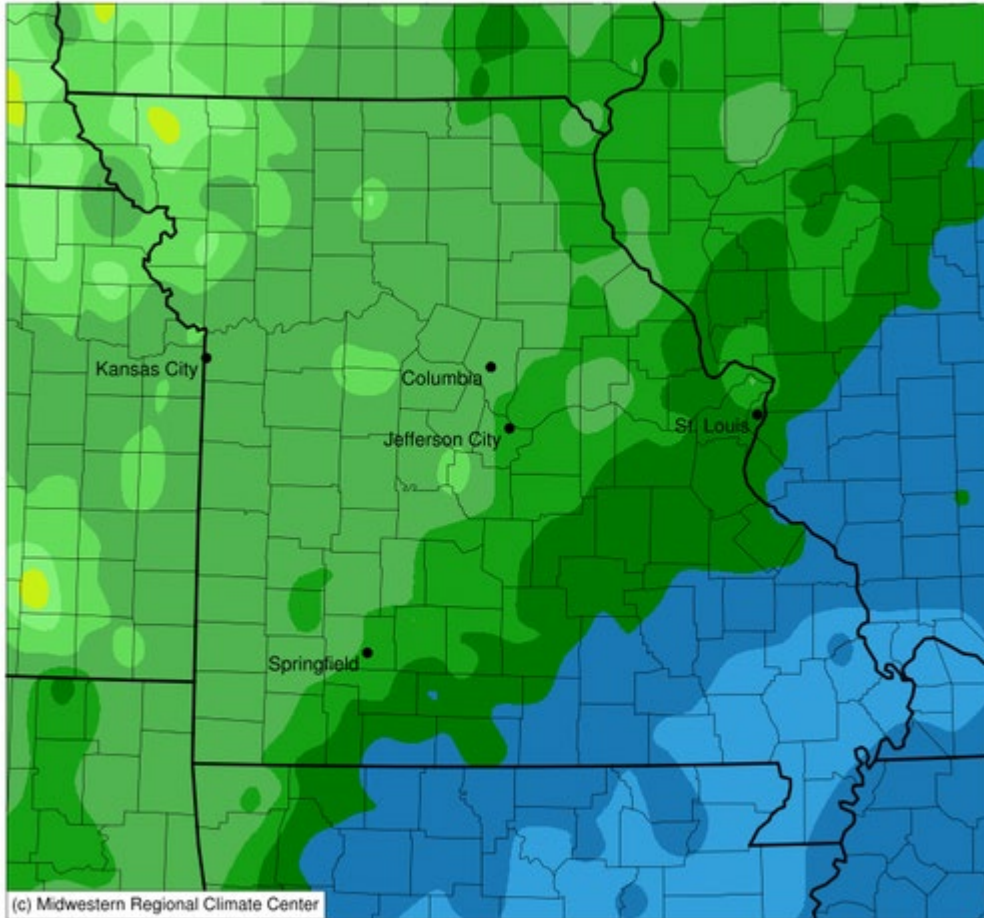
<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>





# January 2024 Summary: Cold and Wet for Missouri

Accumulated Precipitation (in)  
January 01, 2024 to January 31, 2024



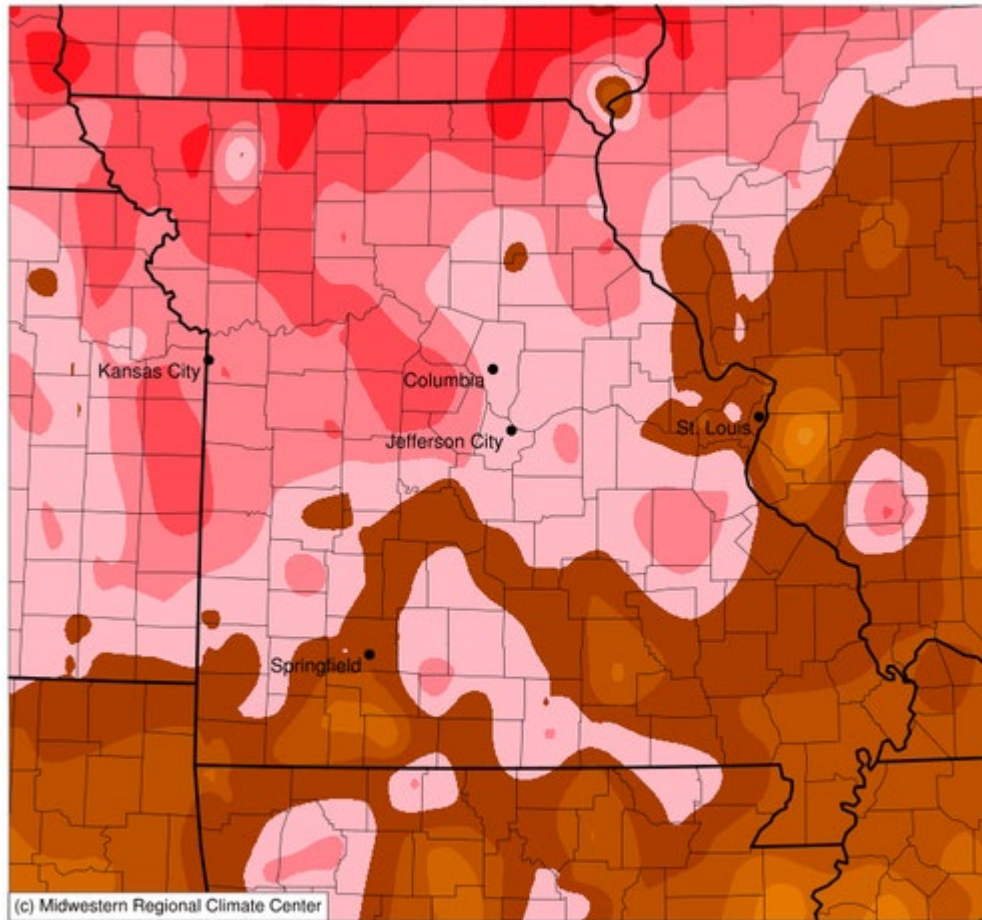
- Missouri's statewide average temperature during January 2024 was 27.9°F (- 1.5°F)
- January was the first month with below normal monthly average temperatures in 14 months, going back to October of 2022
- Missouri's statewide average precipitation in January was 3.51" (+ 1.42")
- Missouri's 14<sup>th</sup> wettest January on record!

Ranks based on data from 1895 to 2023 (129 years)

<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>

# February 2024 Summary: Warm and Dry for Missouri

Average Temperature (°F): Departure from 1991-2020 Normals  
February 01, 2024 to February 29, 2024



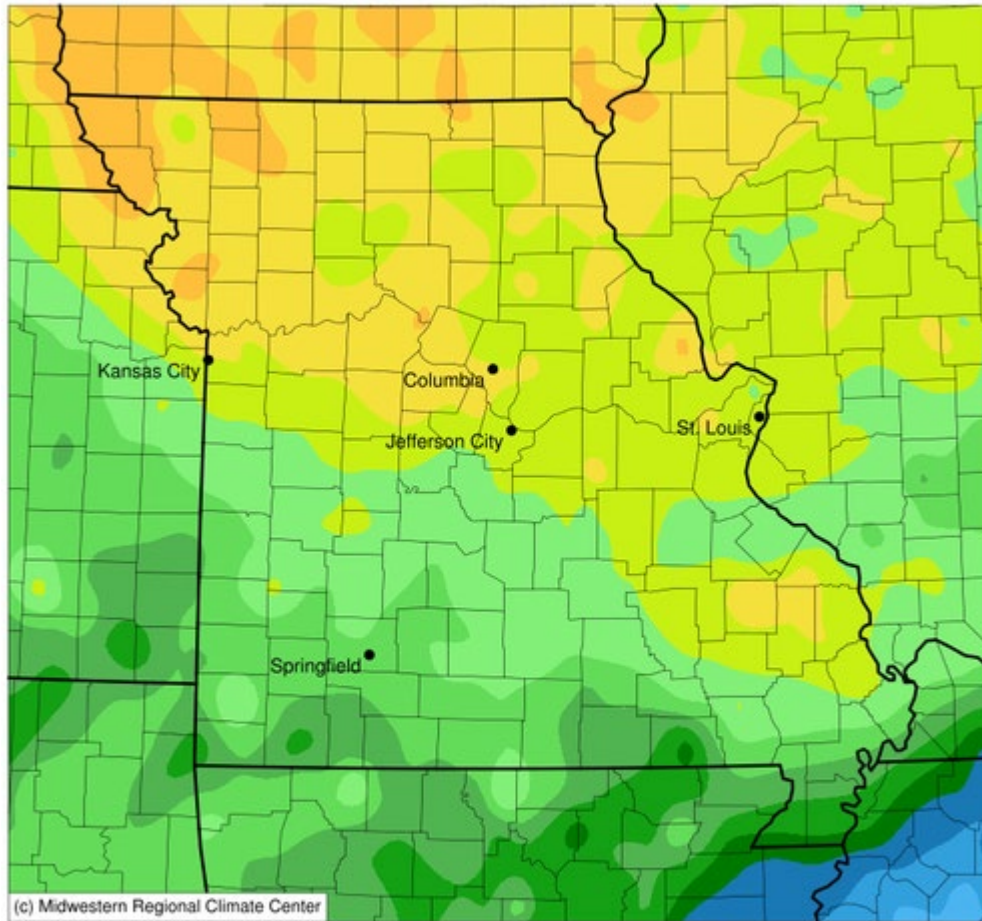
- Missouri's statewide average temperature during February 2024 was 45.9°F (+ 12.1°F)
- February's monthly temperature was also 2.3°F higher than the March average
- 2024 was Missouri's warmest February on record (back to 1895)

<https://mrcc.purdue.edu/CLIMATE/>

# February 2024 Summary: Warm and Dry for Missouri

## Accumulated Precipitation (in)

February 01, 2024 to February 29, 2024



- Missouri's statewide average precipitation during February 2024 was 0.61" (-1.41")
- 2024 was Missouri's 9<sup>th</sup> driest February on record (back to 1895)
- Saline, Randolph, and Scotland counties recorded their driest February on record

<https://mrcc.purdue.edu/CLIMATE/>

0.01 0.1 0.25 0.5 1 1.5 2 2.5 3 4 5 6 8



# March Month-to-Date Summary

## Kansas City

- Temperature **+ 3.7°F above normal**
- Precipitation **- 0.32" below normal**

## St. Louis

- Temperature **+ 6.4°F above normal**
- Precipitation **- 0.81" below normal**

## Springfield

- Temperature **+ 3.9°F above normal**
- Precipitation **- 0.81" below normal**

## Columbia

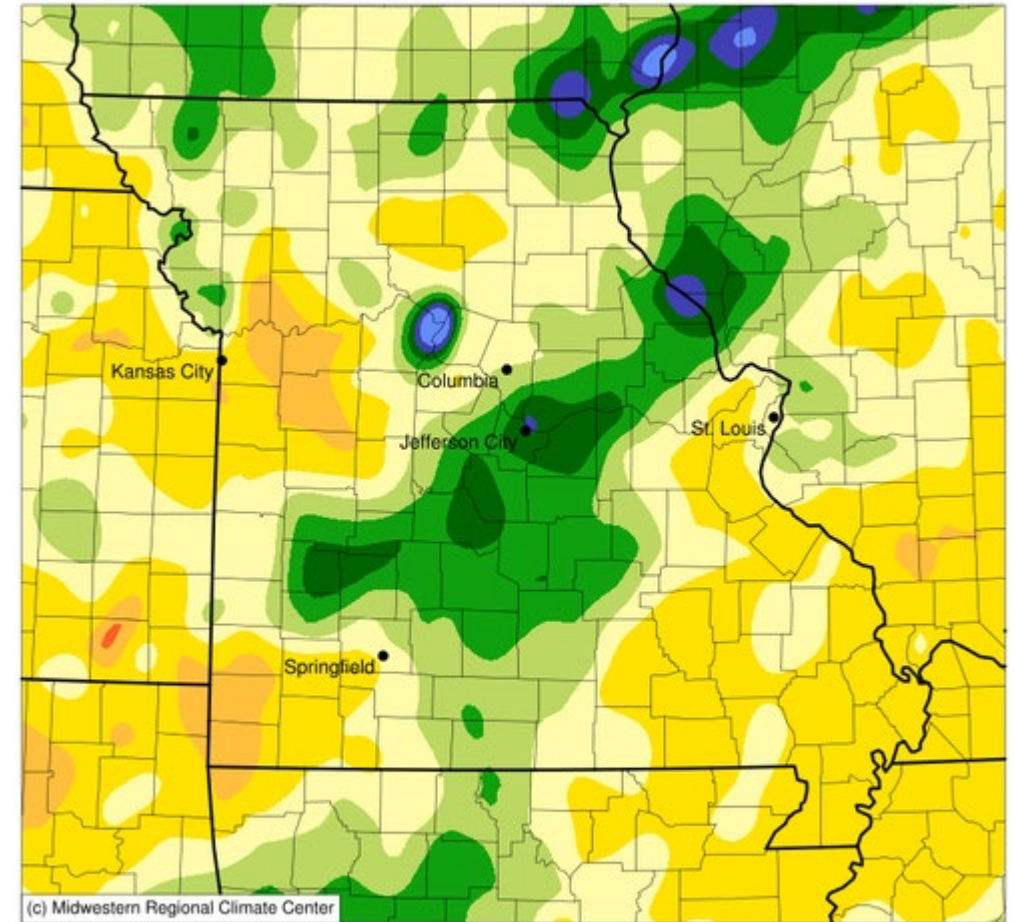
- Temperature **+ 4.5°F above normal**
- Precipitation **+ 0.67" above normal**

## Cape Girardeau

- Temperature **+ 4.0°F above normal**
- Precipitation **- 1.86" below normal**

## Accumulated Precipitation (in): Percent of 1991-2020 Normals

March 01, 2024 to March 29, 2024



(c) Midwestern Regional Climate Center



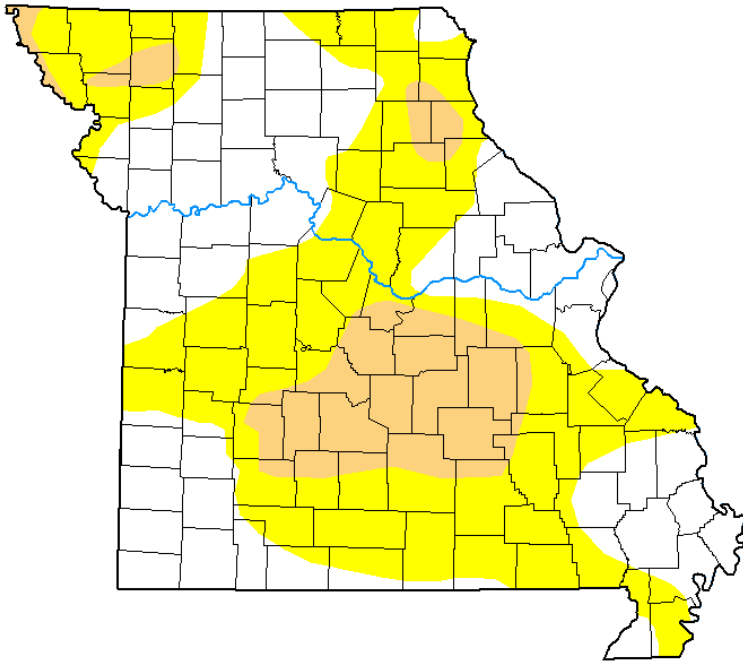
25 50 75 100 125 150 175 200

<https://mrcc.purdue.edu/CLIMATE/>

# January 2024 Summary: Cold and Wet for Missouri

## U.S. Drought Monitor Missouri

January 30, 2024  
(Released Thursday, Feb. 1, 2024)  
Valid 7 a.m. EST



- Intensity:**
- None
  - D0 Abnormally Dry
  - D1 Moderate Drought
  - D2 Severe Drought
  - D3 Extreme Drought
  - D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

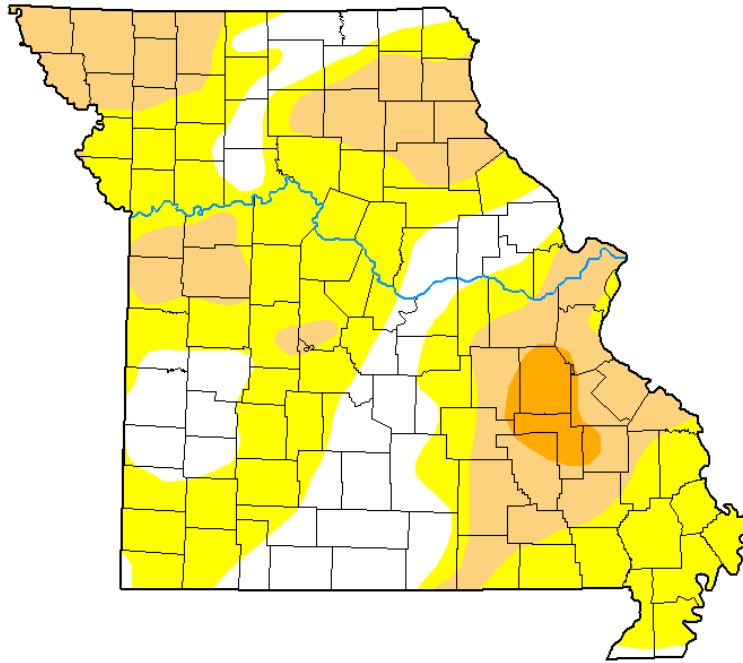
**Author:**  
Brian Fuchs  
National Drought Mitigation Center



[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)

## U.S. Drought Monitor Missouri

March 26, 2024  
(Released Thursday, Mar. 28, 2024)  
Valid 8 a.m. EDT



- Intensity:**
- None
  - D0 Abnormally Dry
  - D1 Moderate Drought
  - D2 Severe Drought
  - D3 Extreme Drought
  - D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

**Author:**  
Brad Rippey  
U.S. Department of Agriculture



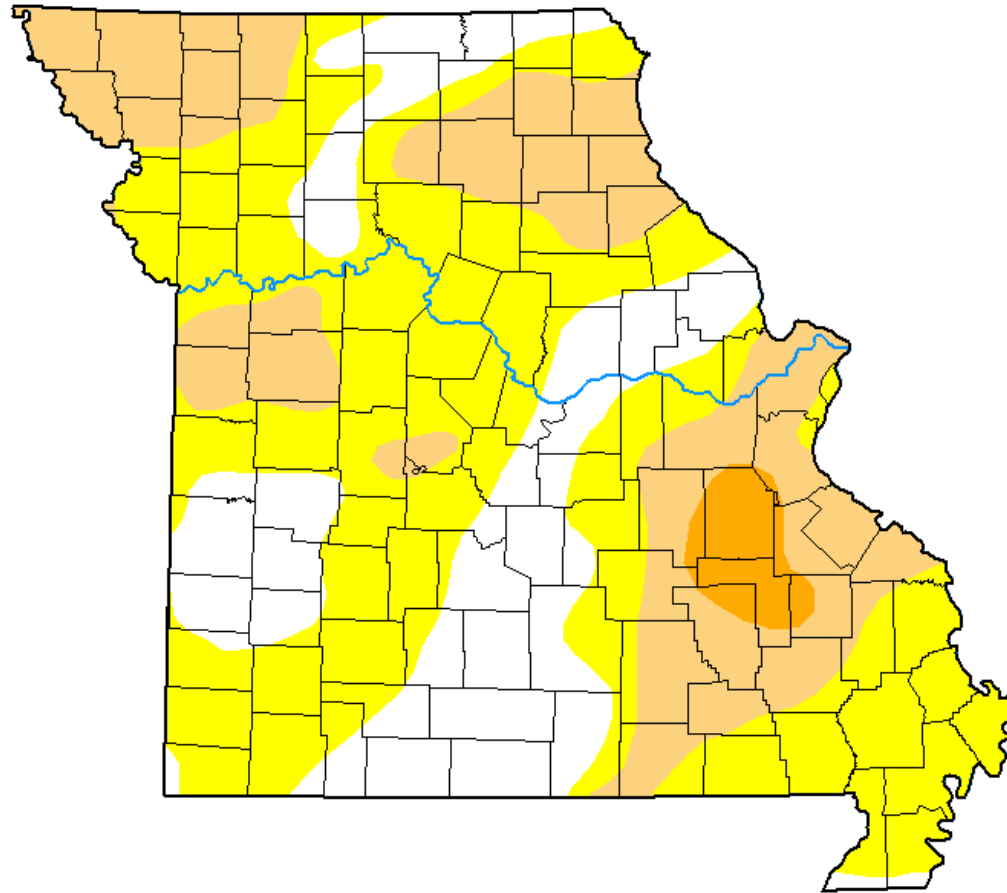
[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)









# Drought Update: March 2024

## U.S. Drought Monitor Missouri

**March 26, 2024**  
(Released Thursday, Mar. 28, 2024)  
Valid 8 a.m. EDT



### Intensity:

-  None
-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
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*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>*

### Author:

Brad Rippey  
U.S. Department of Agriculture

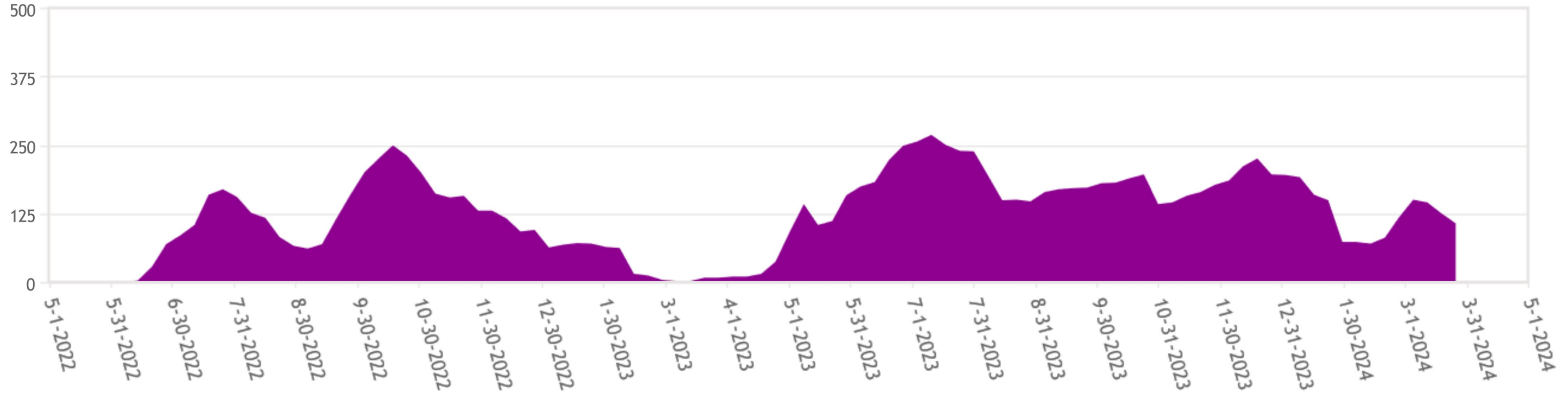


[droughtmonitor.unl.edu](https://droughtmonitor.unl.edu)



# Drought Update: March 2024

Missouri Drought Severity and Coverage Index



From the U.S. Drought Monitor website, <https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx>, 3-29-2024

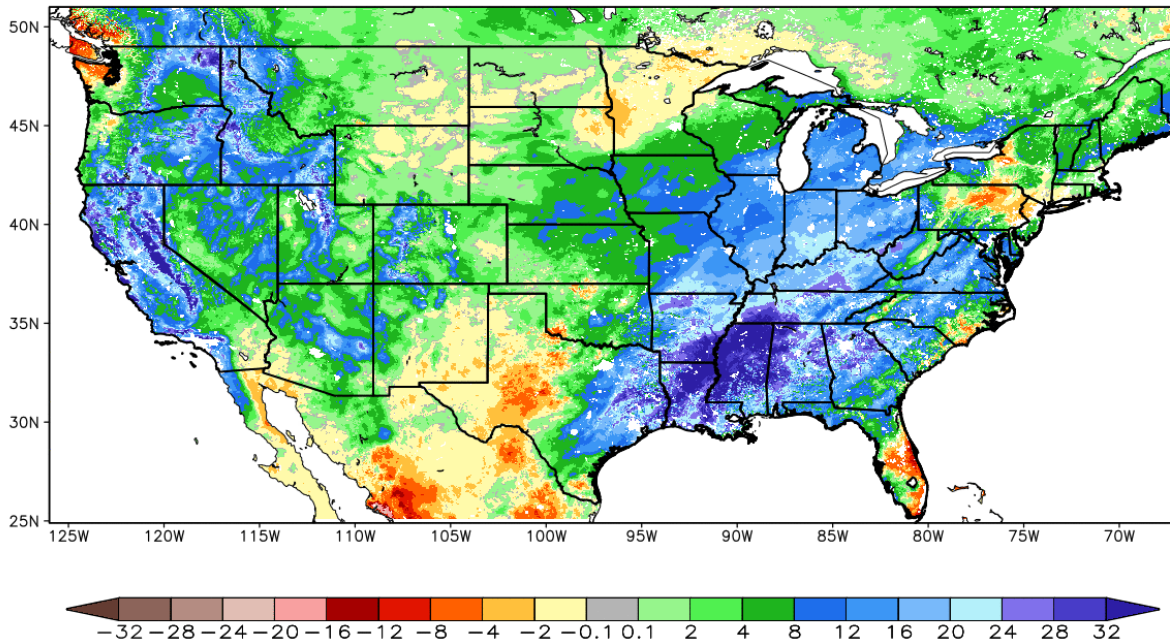


**Current DSCI: 108**

**DSCI one year ago: 9 (3/28/23)**

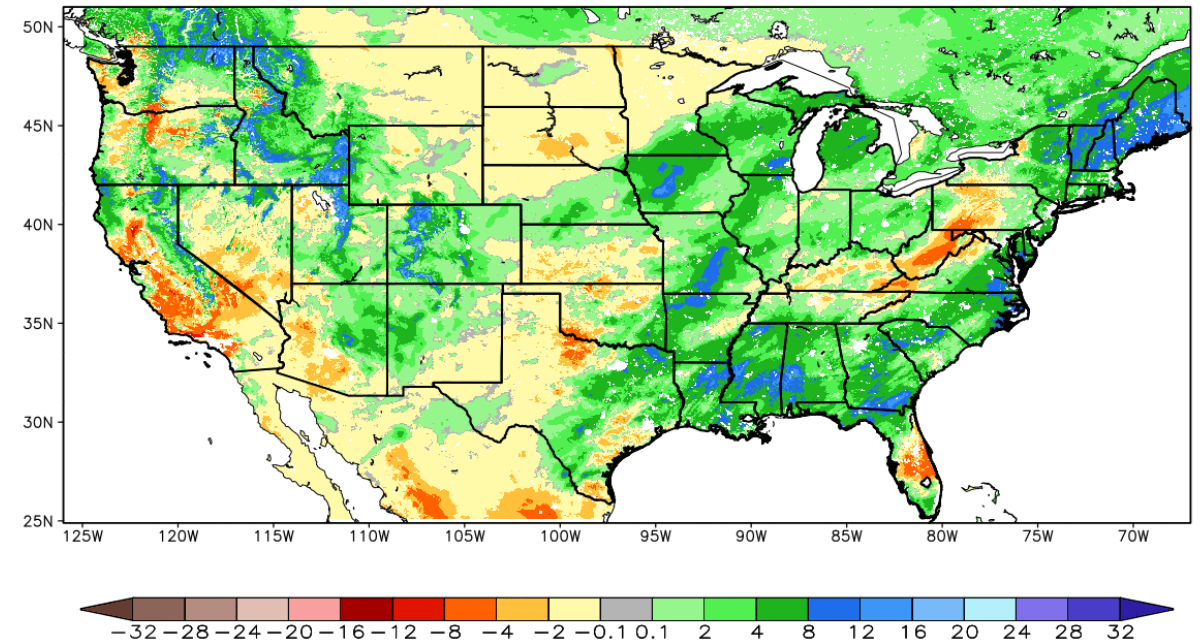
# Drought Update: March 2024

3-Month Difference in Column Relative Soil Moisture (%) valid 12z 28 Mar 2024



\*\*NOTE\*\*  
\*\*Experimental\*\*

1-Month Difference in Column Relative Soil Moisture (%) valid 12z 28 Mar 2024

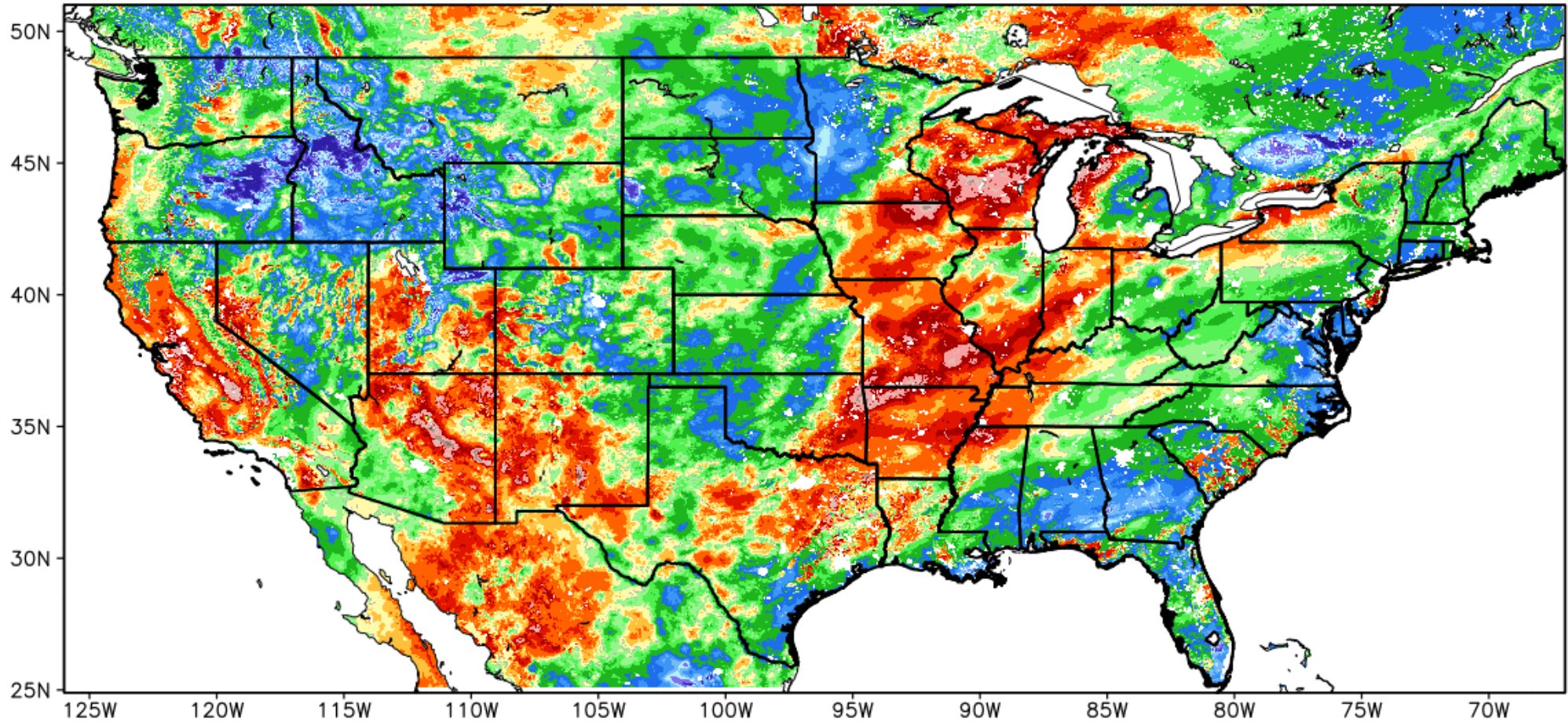


\*\*NOTE\*\*  
\*\*Experimental\*\*

<https://weather.ndc.nasa.gov/sport/>

# Drought Update: March 2024

1-Year Difference in Column Relative Soil Moisture (%) valid 12z 09 Mar 2024



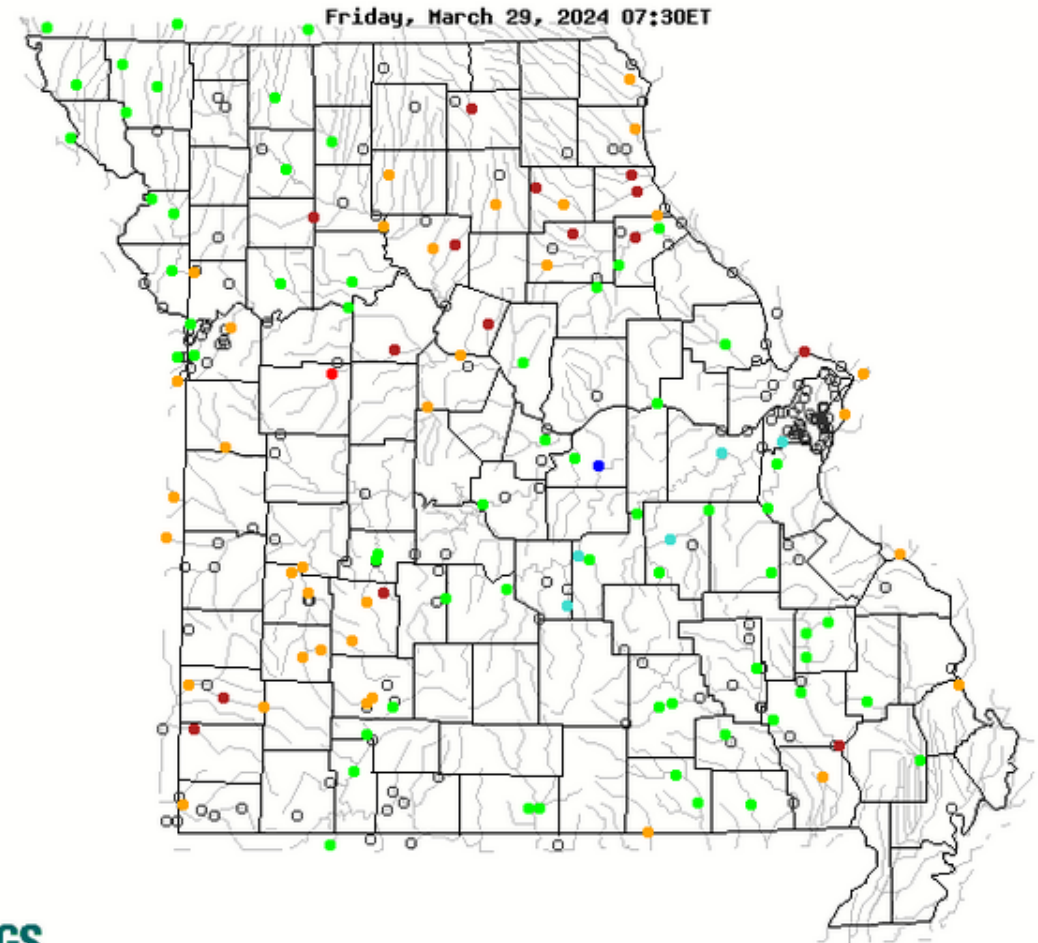
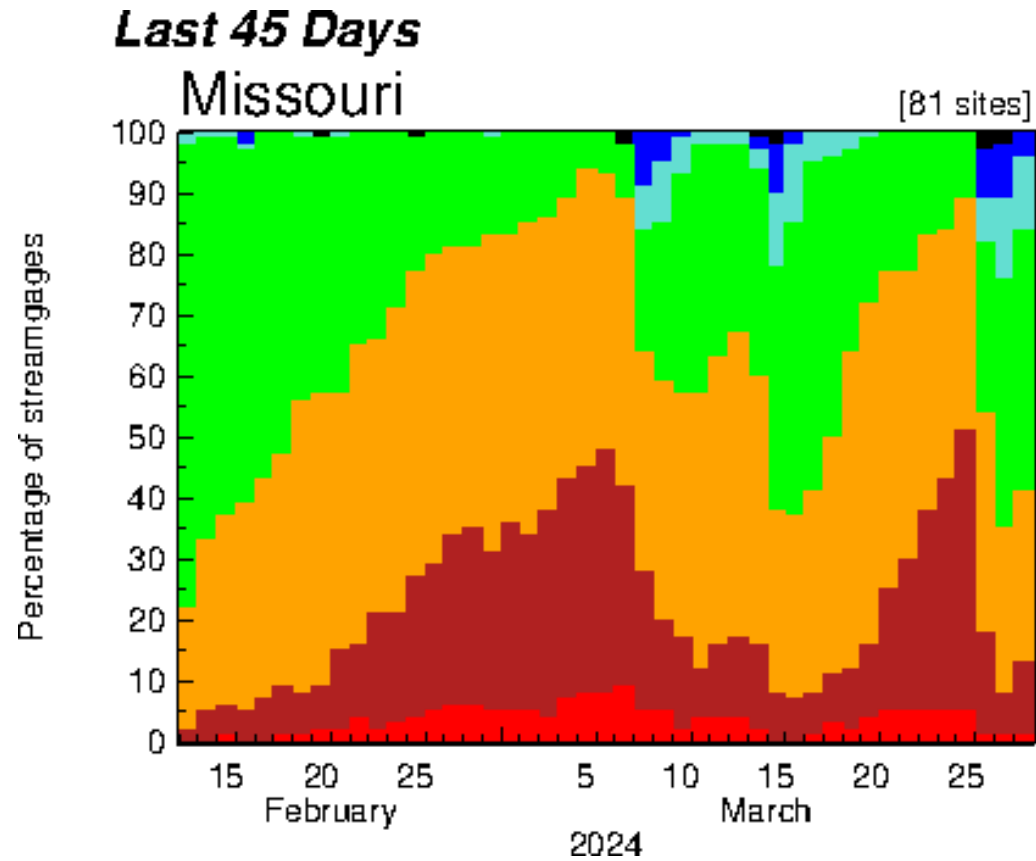
<https://weather.ndc.nasa.gov/sport/>



**\*\*NOTE\*\***  
**\*\*Experimental\*\***



# Drought Update: March 2024



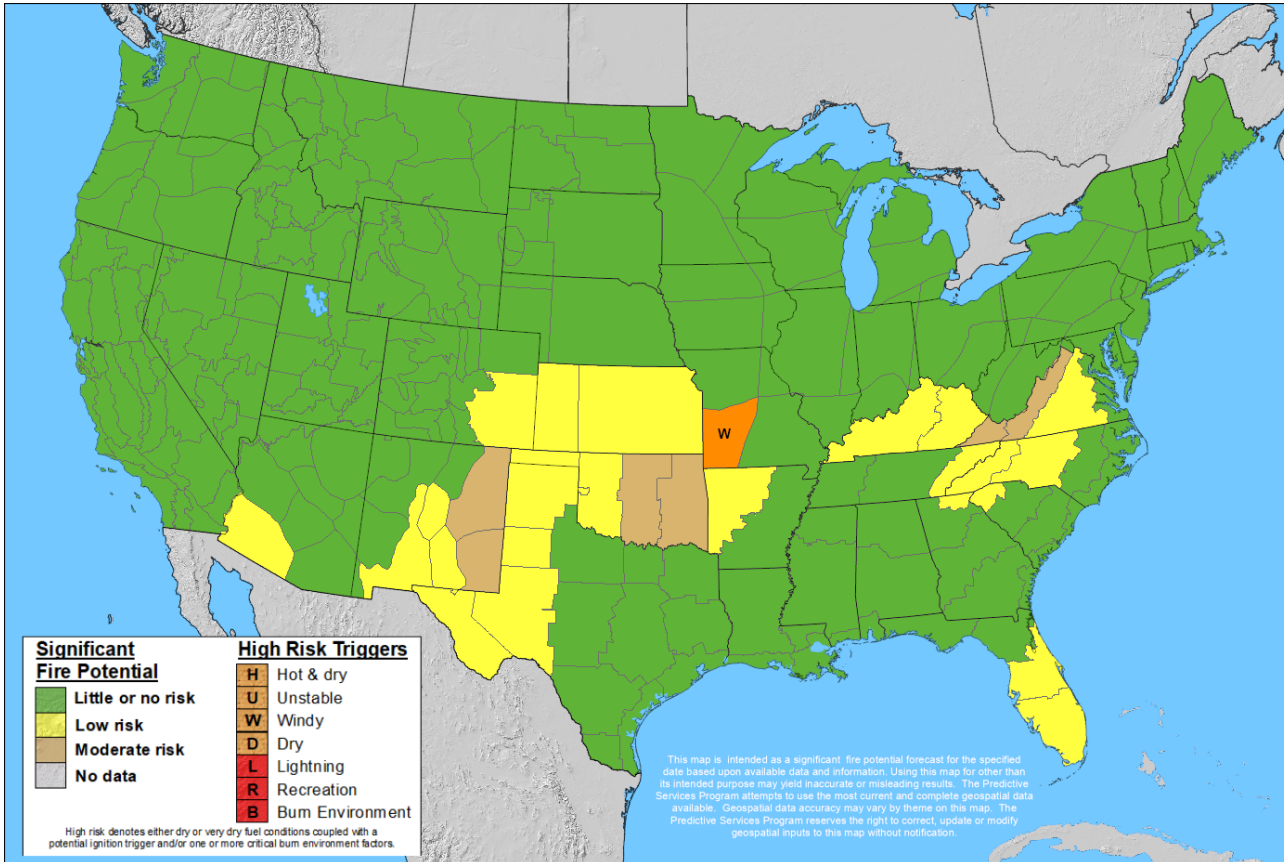
Search USGS streamgage

Choose a data retrieval option and select a location on the map  
 List of all stations  Single station  Nearest stations  Peak flow

Explanation - Percentile classes							
Low	<10 Much below normal	10-24 Below normal	25-75 Normal	76-90 Above normal	>90 Much above normal	High	Not-ranked

<https://waterwatch.usgs.gov/index.php?m=real&r=mo&w=map>

# Drought Update: March 2024

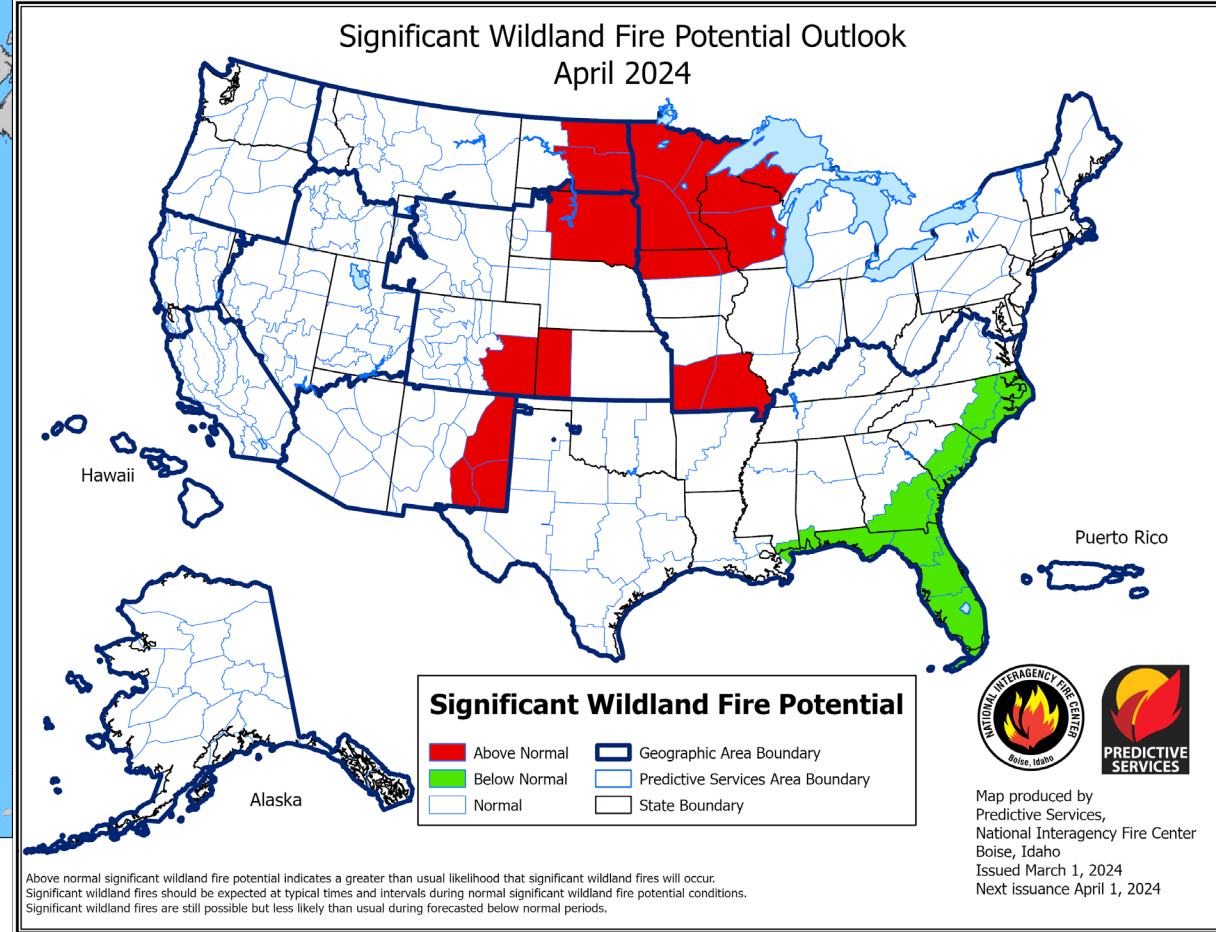


## SIGNIFICANT FIRE POTENTIAL

Valid For: Friday, March 29, 2024

Issued On: Thursday, March 28, 2024 12:28 PM (MT)

Map produced by the USDA Forest Service Geospatial Technology and Applications Center in coordination with the National Predictive Services Program



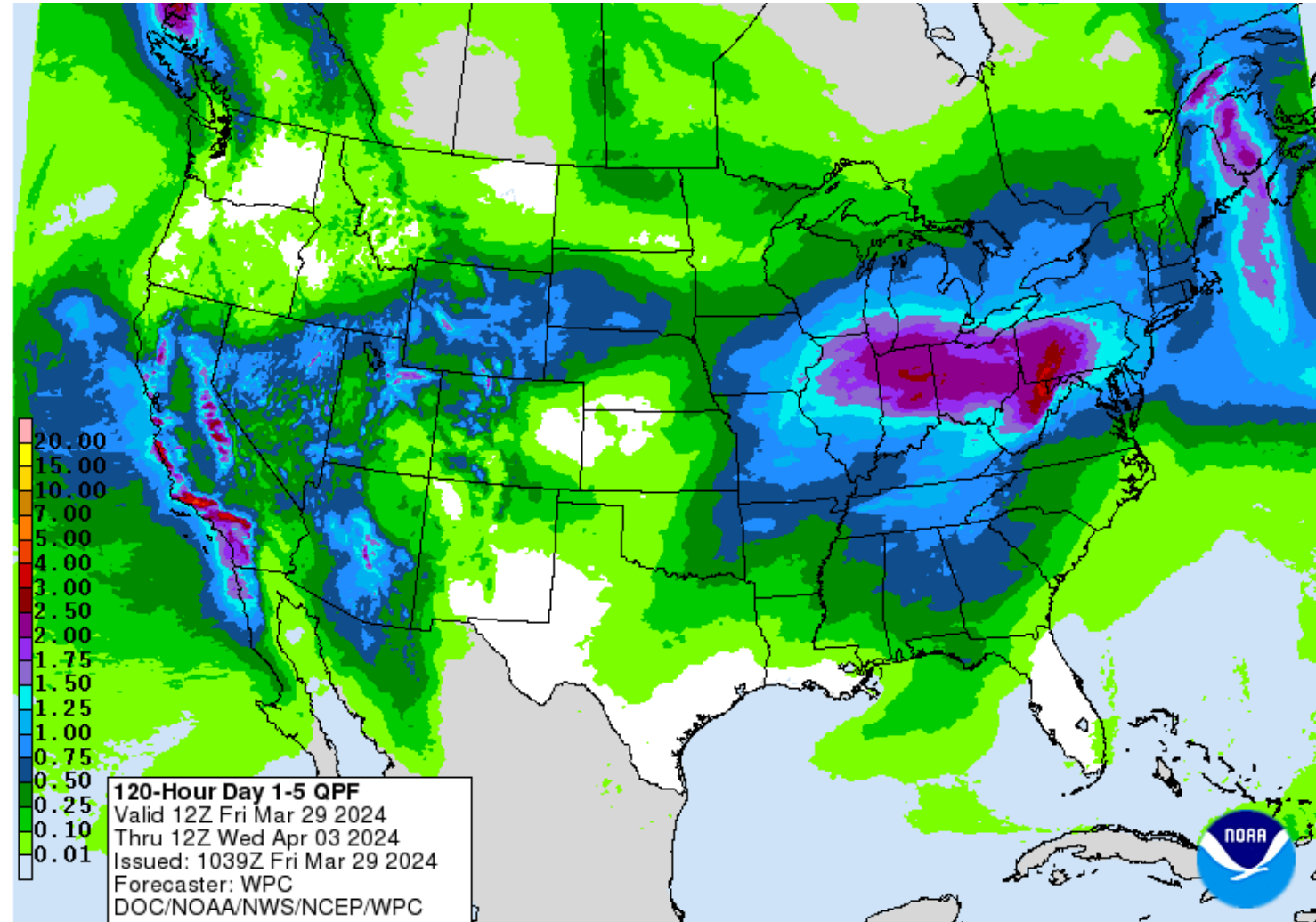
# Drought Update: March 2024

- Wetter conditions in December and January helped significantly with drought recovery
- Unfortunately, drought concerns are on the rise again after one of the warmest and driest February months on record
- There are still residual impacts from the 2023 drought with dry soils and low streamflow
- Precipitation totals have been highly localized in March, but some locations have received beneficial rainfall



# Looking Ahead...

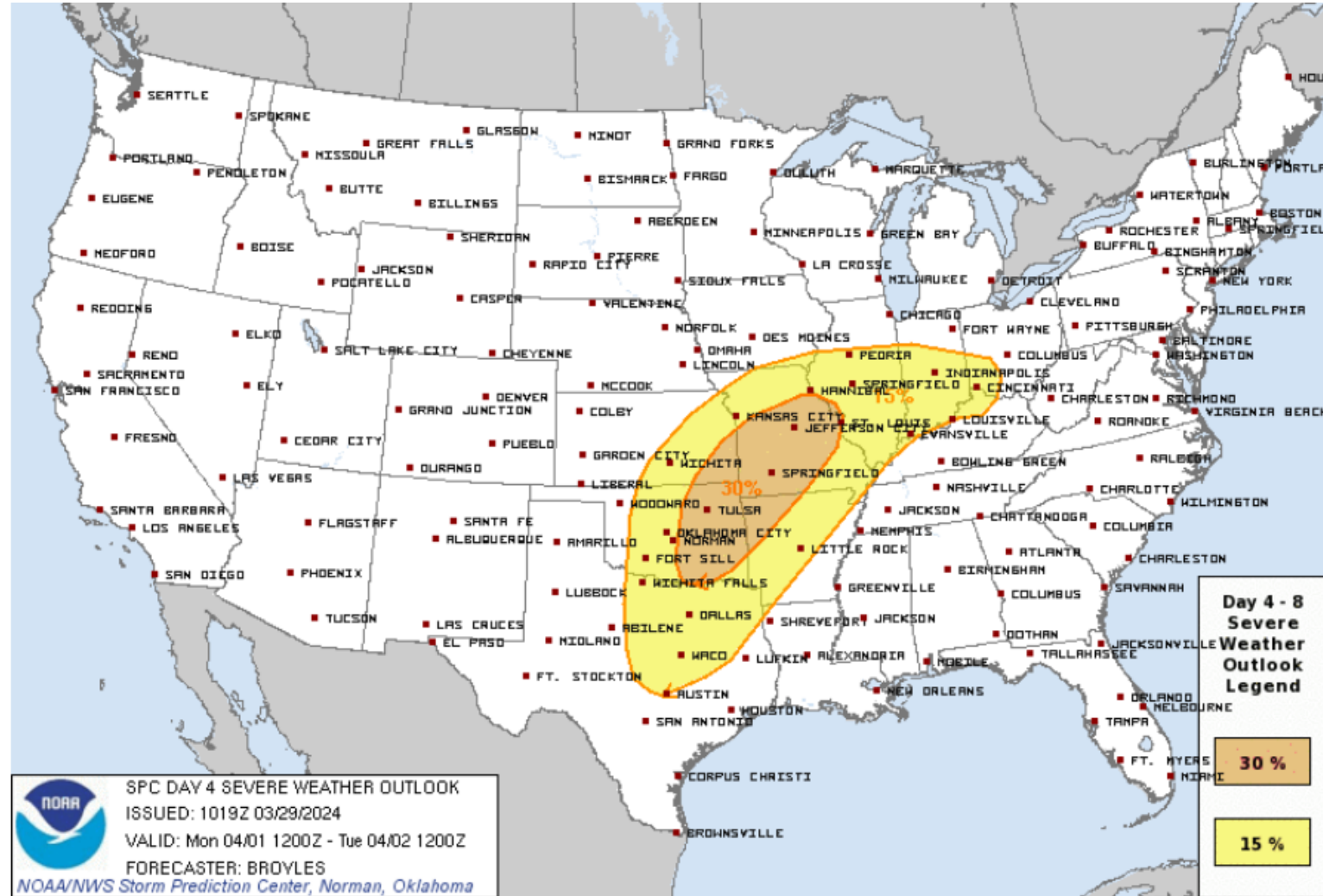
- Rain and storm chances will increase on Sunday ahead of a system that will bring several rounds of moderate precipitation through Tuesday
- Rainfall totals  $> 1''$  are possible





# Looking Ahead...

- Rain and storm chances will increase on Sunday ahead of a system that will bring several rounds of moderate precipitation through Tuesday
- Rainfall totals  $> 1''$  are possible

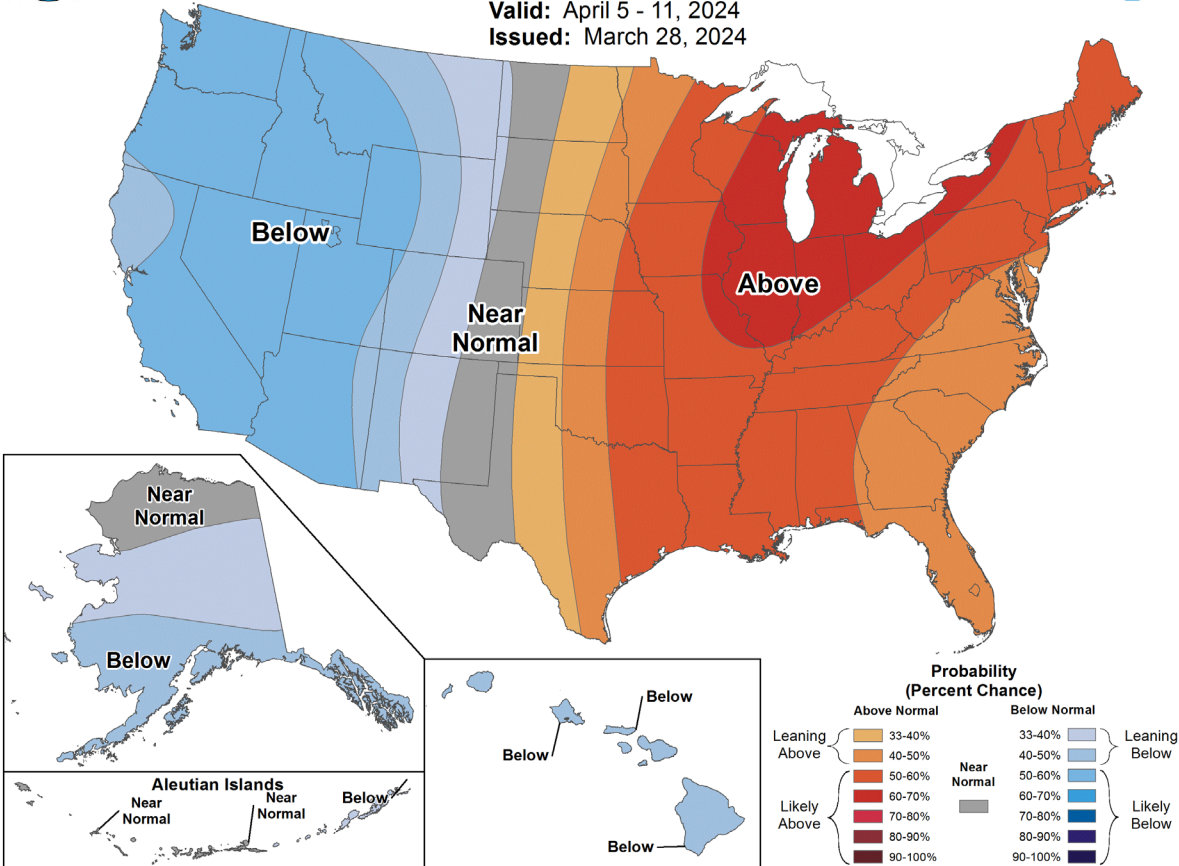


# Looking Ahead...



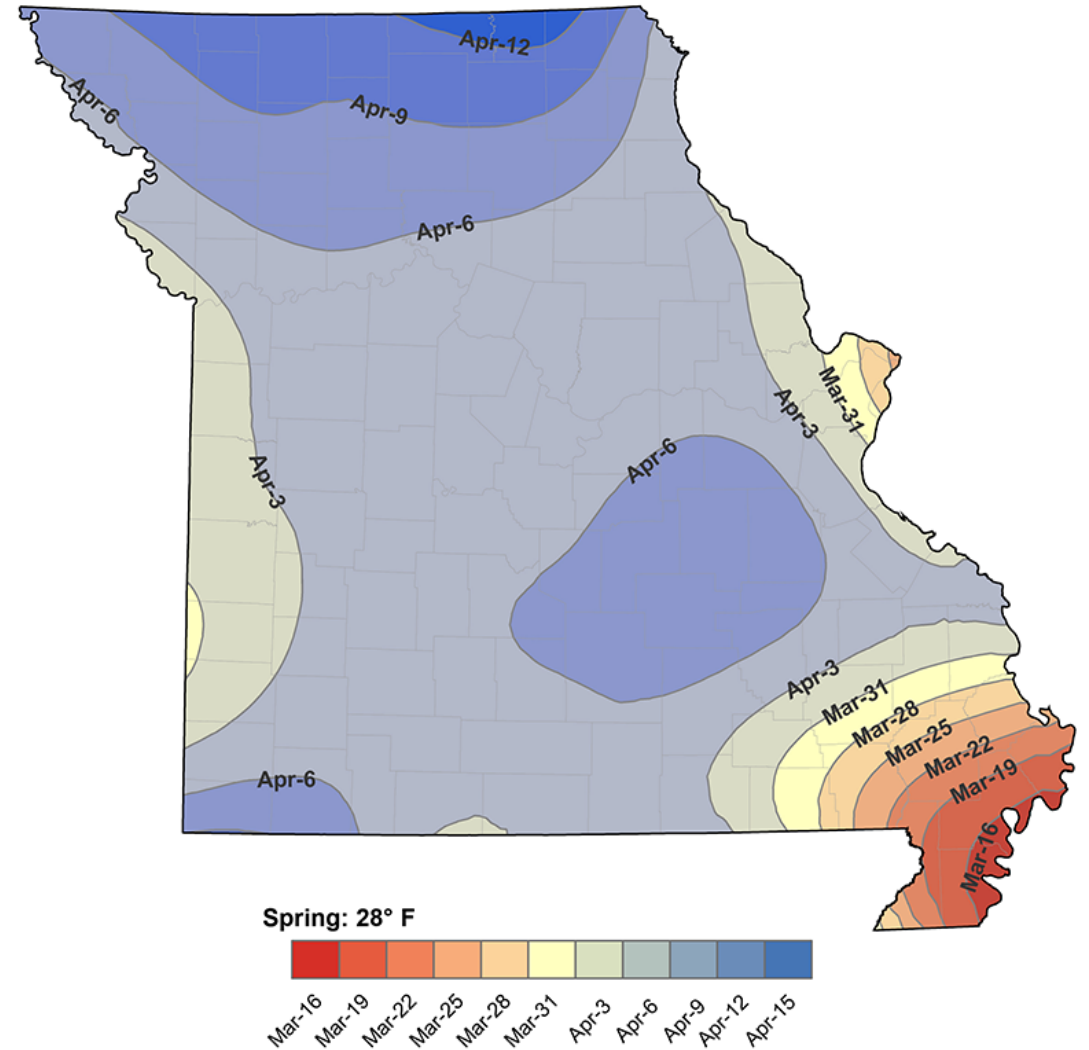
## 8-14 Day Temperature Outlook

Valid: April 5 - 11, 2024  
 Issued: March 28, 2024



<https://ipm.missouri.edu/frostfreezeguide/>

# Median Date of Last Spring Hard Freeze



Source: MU IPM Program / Missouri Climate Center / NOAA-NCEI.

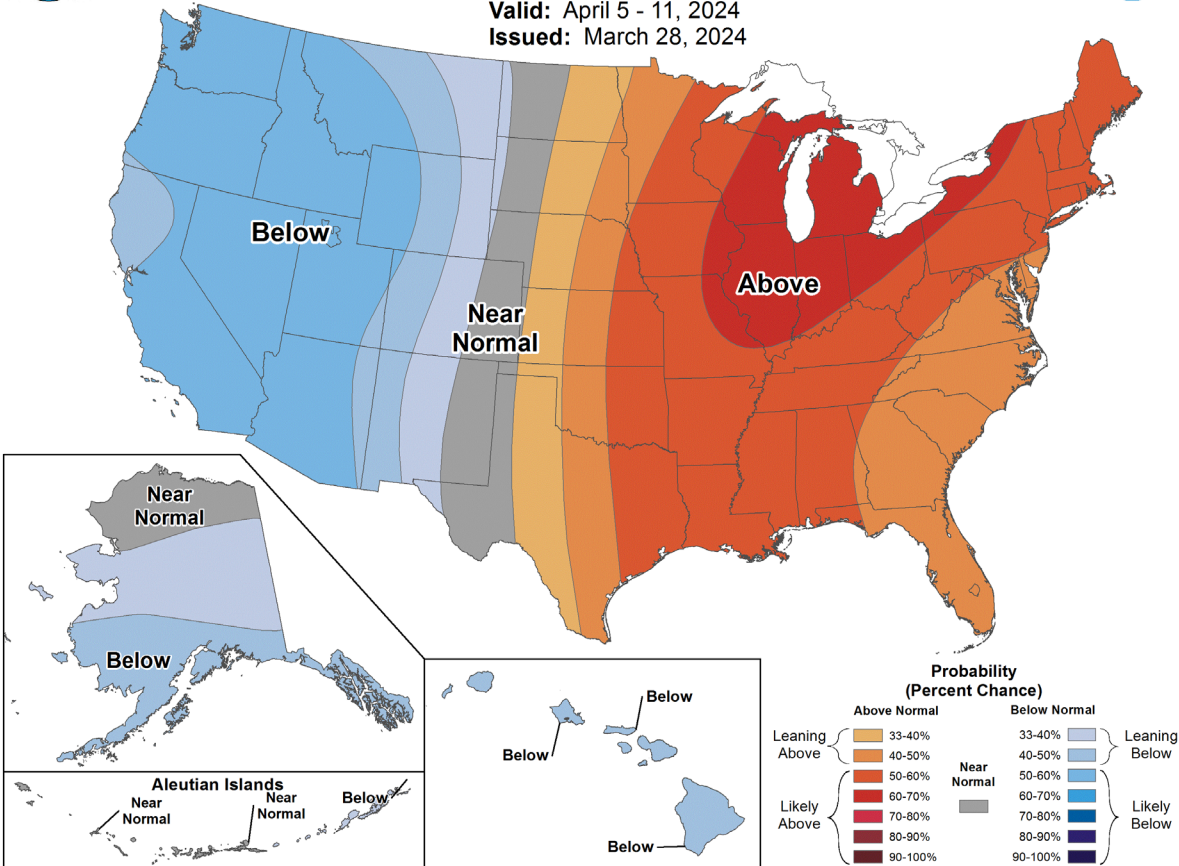
<https://www.cpc.ncep.noaa.gov/>

# Looking Ahead...



## 8-14 Day Temperature Outlook

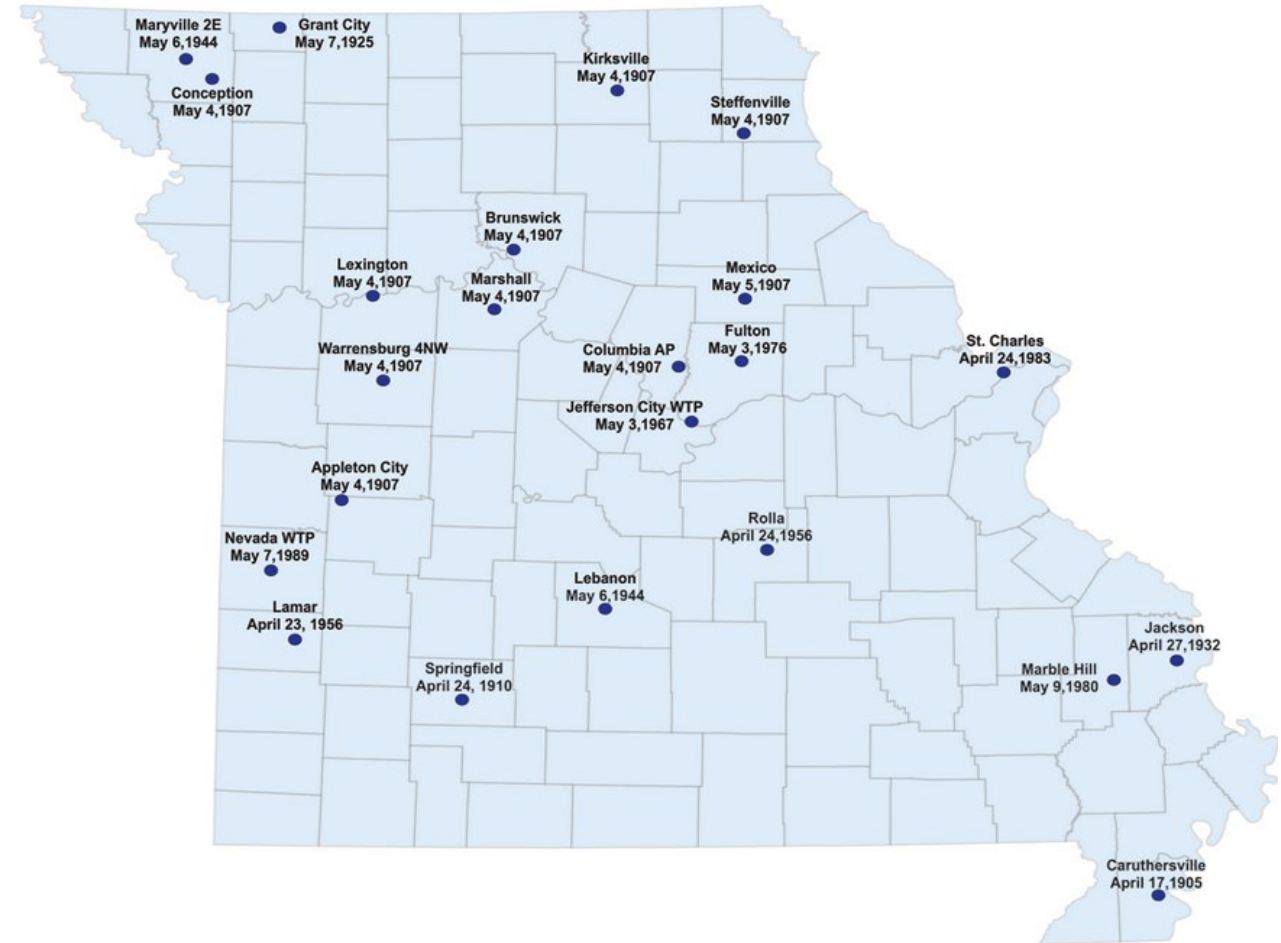
Valid: April 5 - 11, 2024  
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<https://ipm.missouri.edu/frostfreezeguide/>

# Median Date of Last Spring Hard Freeze

## Spring Extreme Dates of Temperature $\leq 28^\circ$



<https://www.cpc.ncep.noaa.gov/>



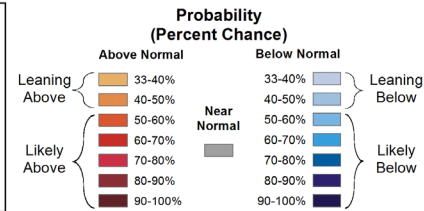
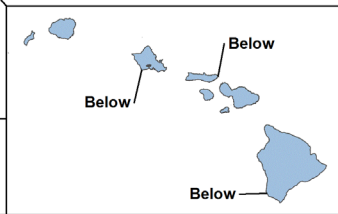
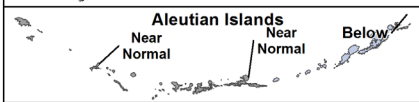
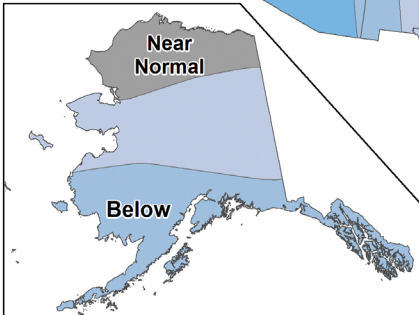
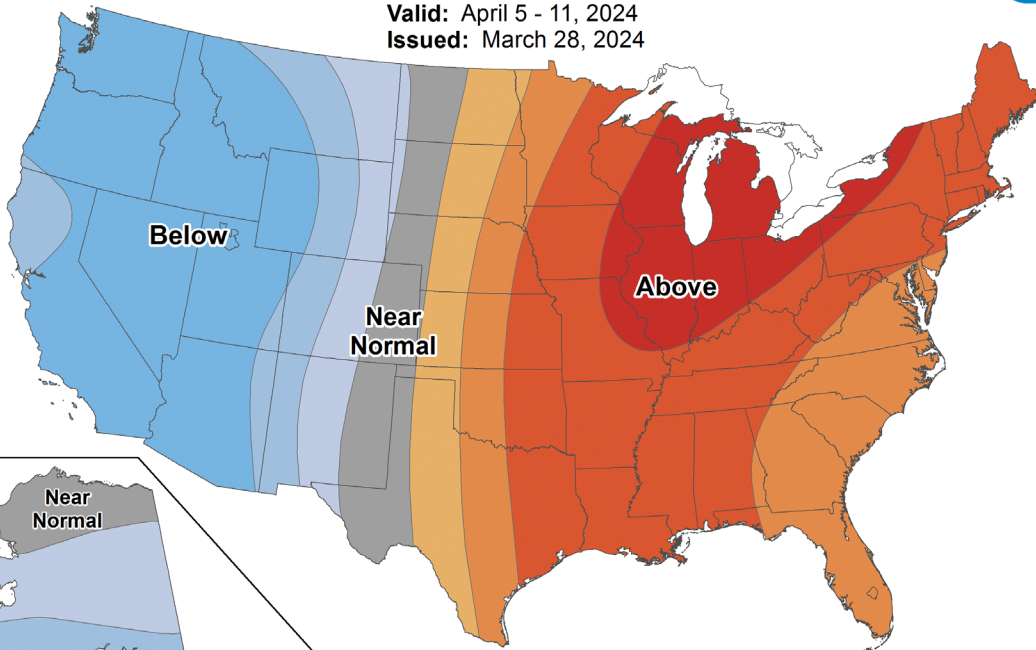
# Looking Ahead...



## 8-14 Day Temperature Outlook



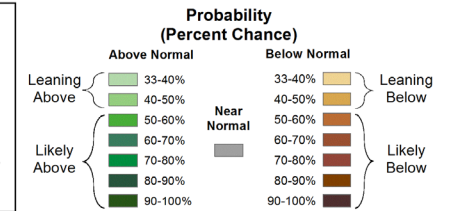
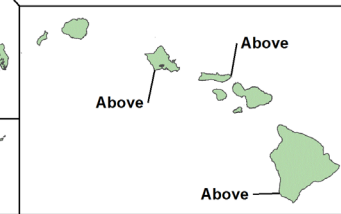
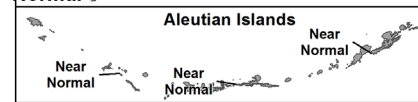
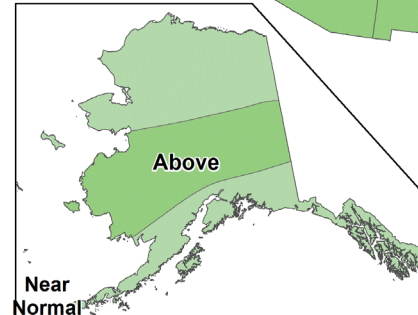
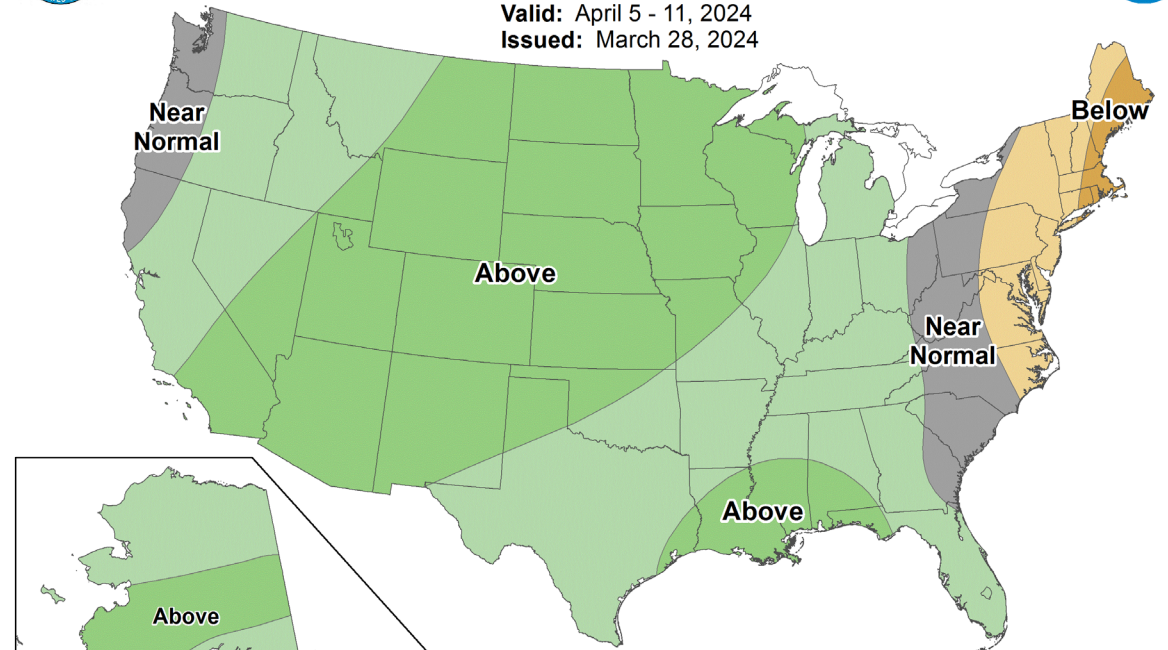
Valid: April 5 - 11, 2024  
Issued: March 28, 2024



## 8-14 Day Precipitation Outlook



Valid: April 5 - 11, 2024  
Issued: March 28, 2024



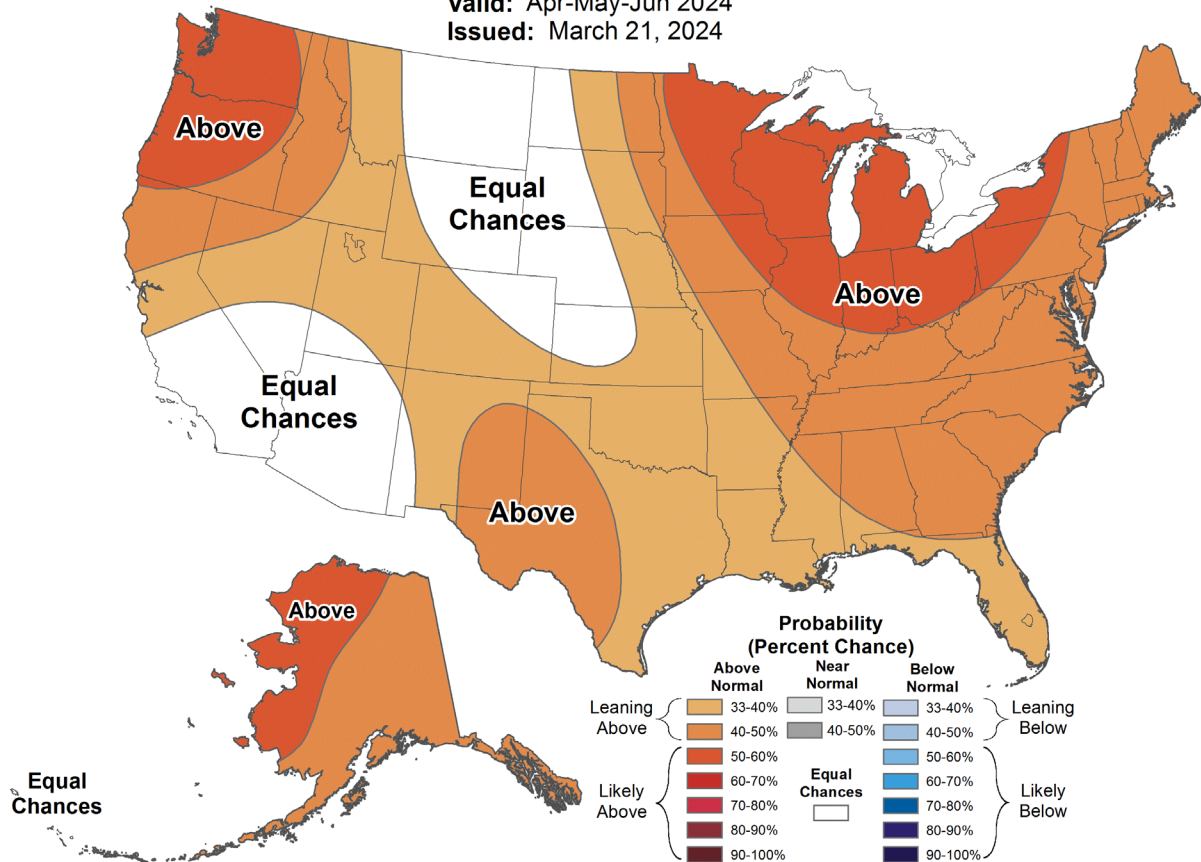
# Looking Ahead...



## Seasonal Temperature Outlook



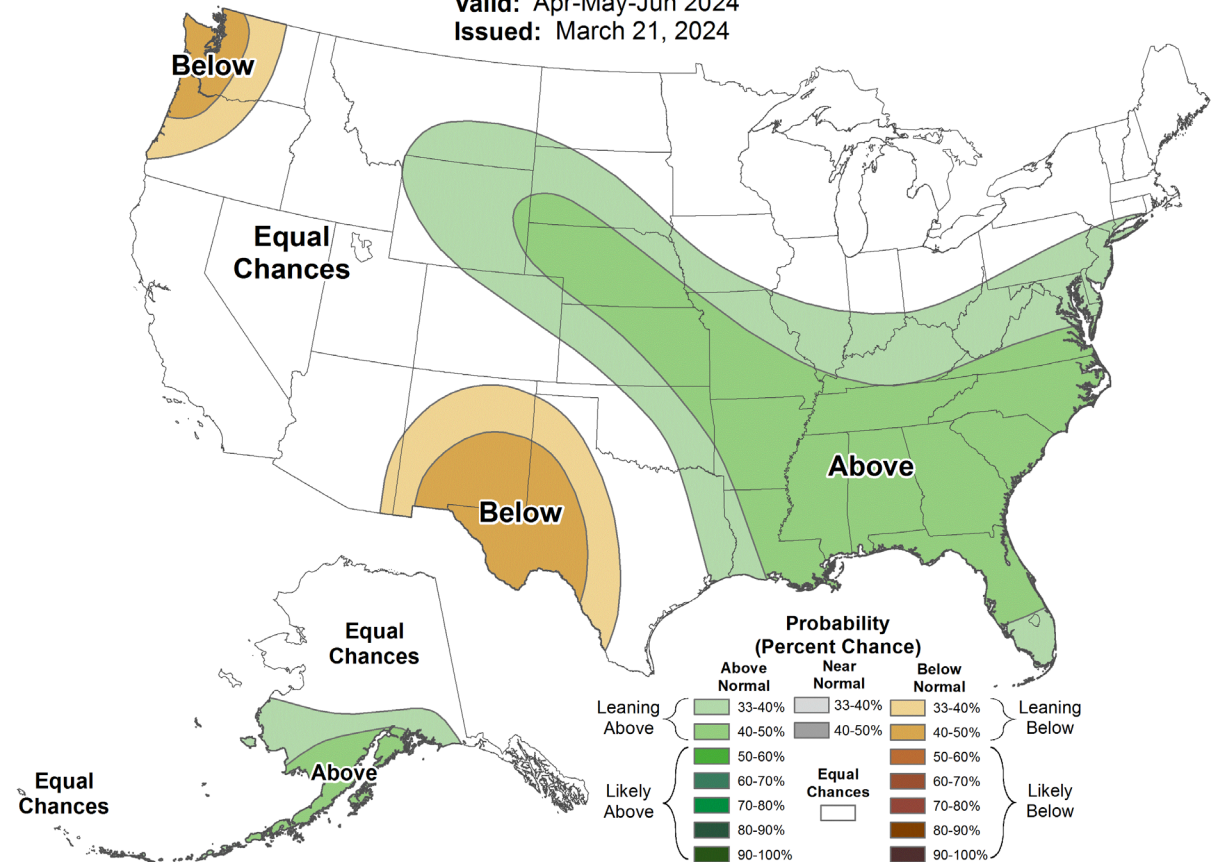
Valid: Apr-May-Jun 2024  
Issued: March 21, 2024



## Seasonal Precipitation Outlook



Valid: Apr-May-Jun 2024  
Issued: March 21, 2024



# Summary

ENSO Alert System Status: **El Niño Advisory** / **La Niña Watch**

El Niño conditions are observed.\*

Equatorial sea surface temperatures (SSTs) are above average across the central and eastern Pacific Ocean.

The tropical Pacific atmospheric anomalies are consistent with El Niño.

A transition from El Niño to ENSO-neutral is likely by April-June 2024 (83% chance), with increasing odds of La Niña developing in June-August 2024 (62% chance).\*

\* Note: These statements are updated once a month (2<sup>nd</sup> Thursday of each month) in association with the ENSO Diagnostics Discussion, which can be found by clicking [here](#).



Update prepared by:  
Climate Prediction Center / NCEP  
18 March 2024

## Official NOAA CPC ENSO Probabilities (issued Mar. 2024)

based on  $-0.5^{\circ}/+0.5^{\circ}\text{C}$  thresholds in ERSSTv5 Niño-3.4 index

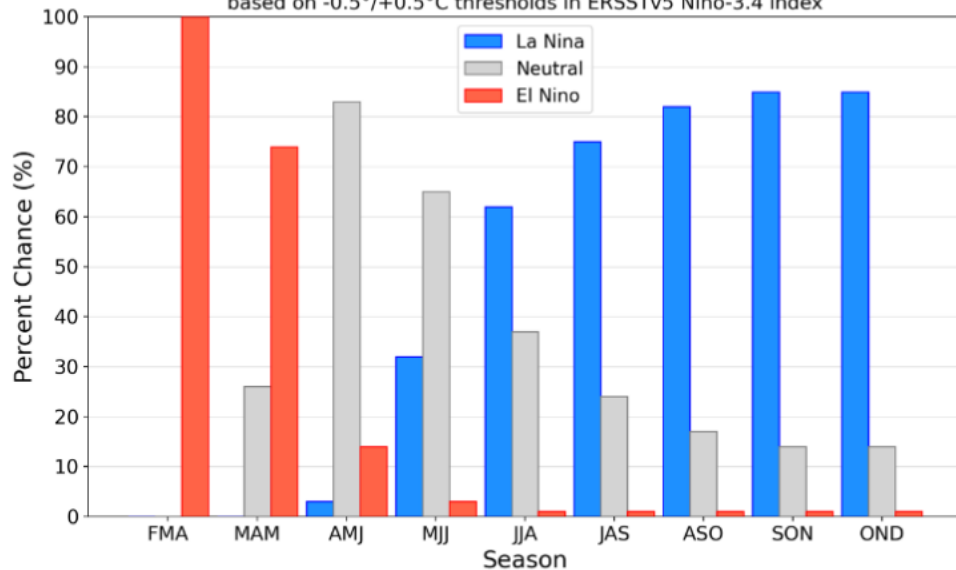
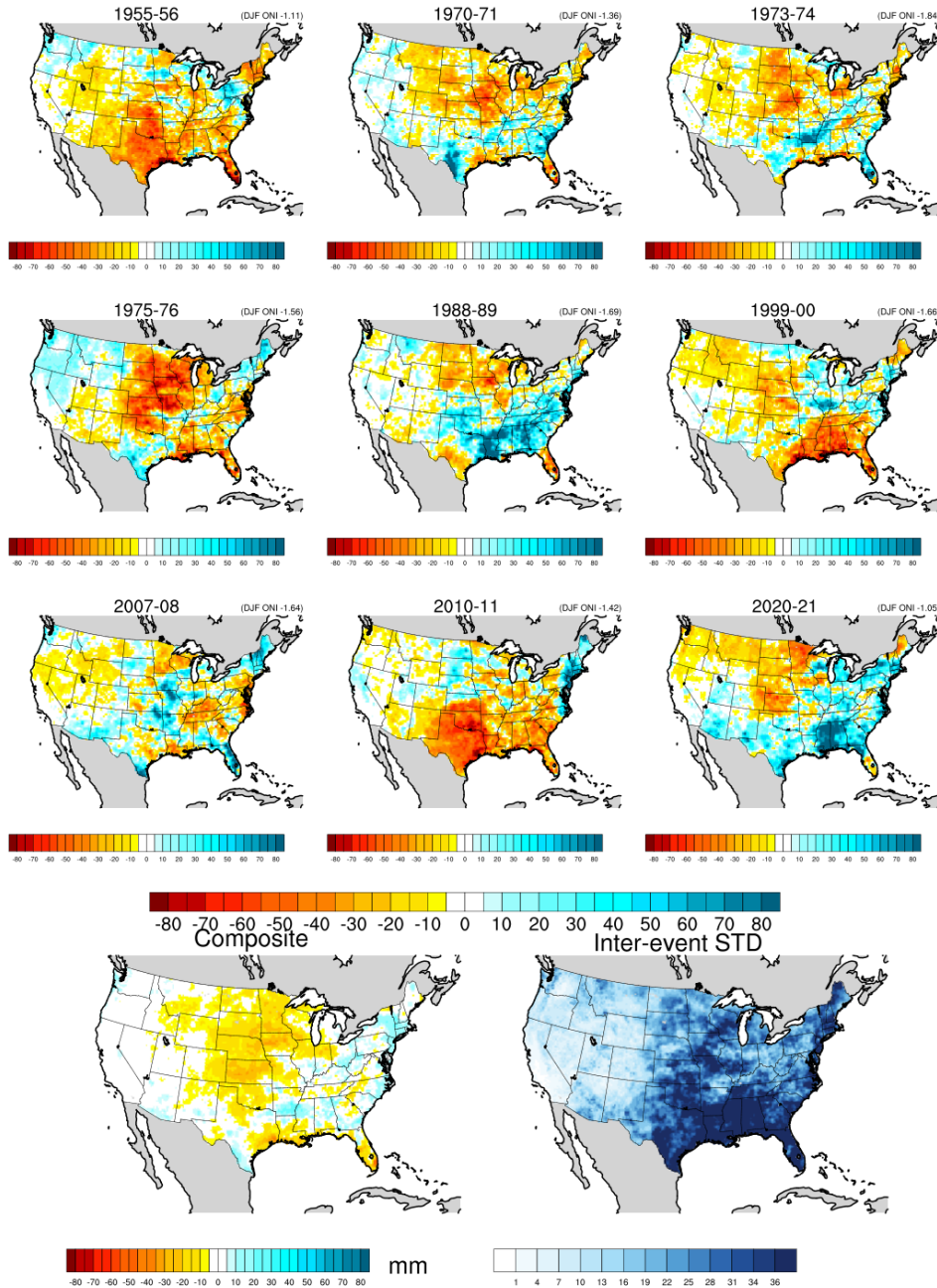


Figure 7. Official ENSO probabilities for the Niño 3.4 sea surface temperature index ( $5^{\circ}\text{N}$ - $5^{\circ}\text{S}$ ,  $120^{\circ}\text{W}$ - $170^{\circ}\text{W}$ ). Figure updated 14 March 2024.



# Jun-Aug Precipitation Anomalies from NCEI's nclimGrid During La Niña 1991-2020 climo



*Missouri precipitation during years with a flip from El Nino to La Nina in one season or less (back to 1950):*

1954	-5.20"
1964	-2.94"
1973	+16.64" (wettest year on record)
1983	+0.68"
1988	-6.29"
1998	+9.37"
2010	+4.07"
2016:	-1.06"

<https://psl.noaa.gov/enso/difference/>

# Looking Ahead...

- Above normal precipitation during Spring 2024 is necessary for drought recovery
- Seasonal outlooks are forecasting a higher probability of above normal precipitation during April and May
- El Niño pattern will switch to La Niña during Summer 2024
- There is still a lot of uncertainty surrounding 2024's long-range weather outlooks but La Niña can be associated with dry and warm conditions in the High Plains and Upper Midwest



# Contact Information

**Zack Leasor, PhD**

*Assistant Professor | Missouri State Climatologist*

School of Natural Resources | University of Missouri

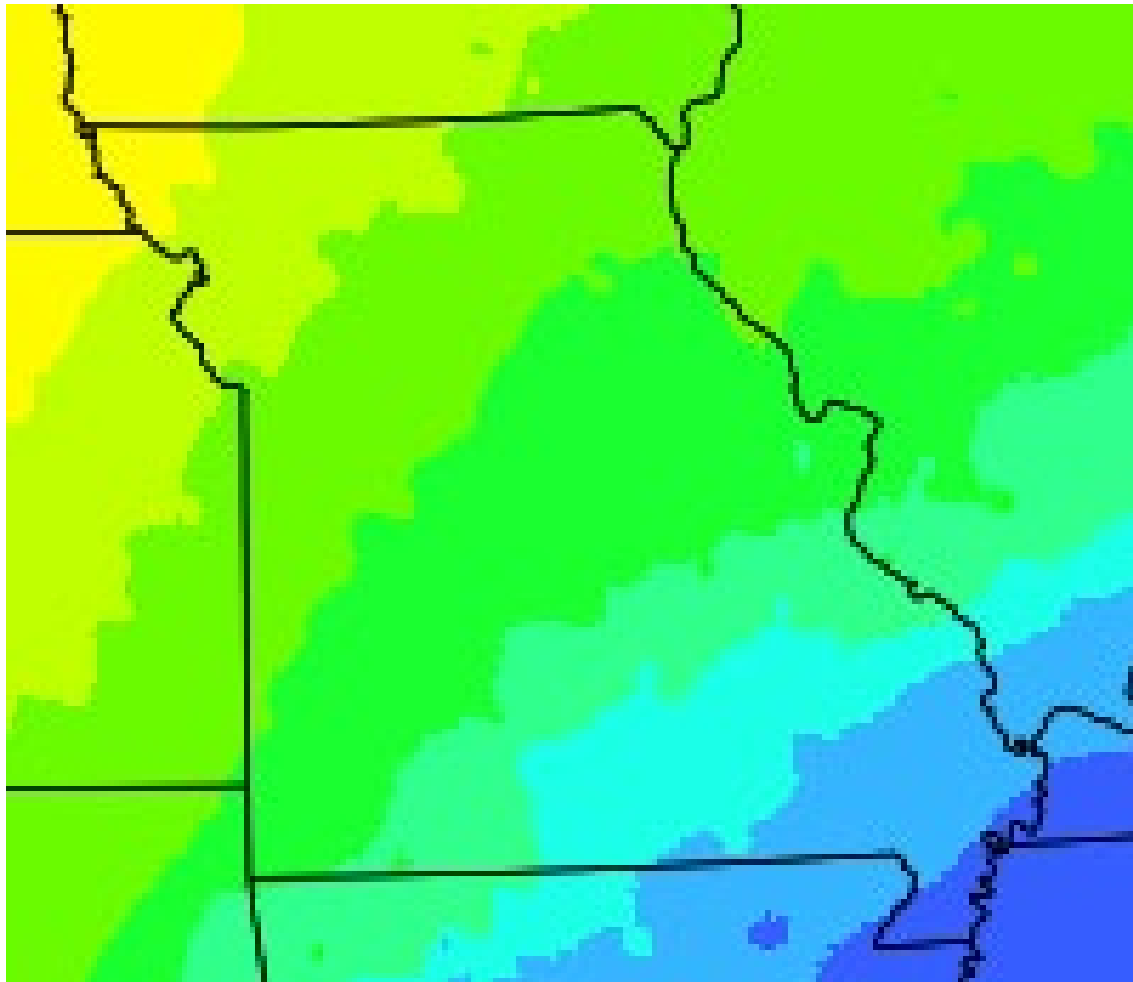
320 Anheuser-Busch Natural Resources Building | Columbia MO 65211

**O:** 573-882-5908 | **E:** [leasorz@missouri.edu](mailto:leasorz@missouri.edu)

**W:** <http://climate.missouri.edu>

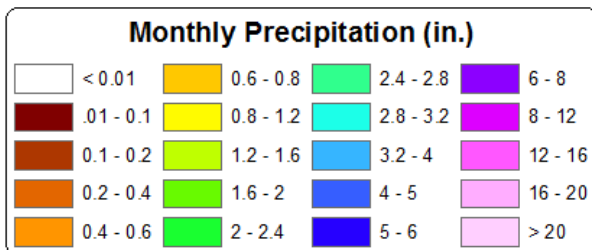


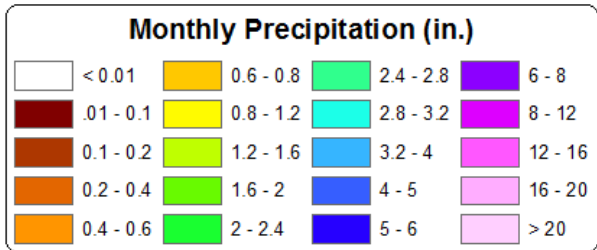
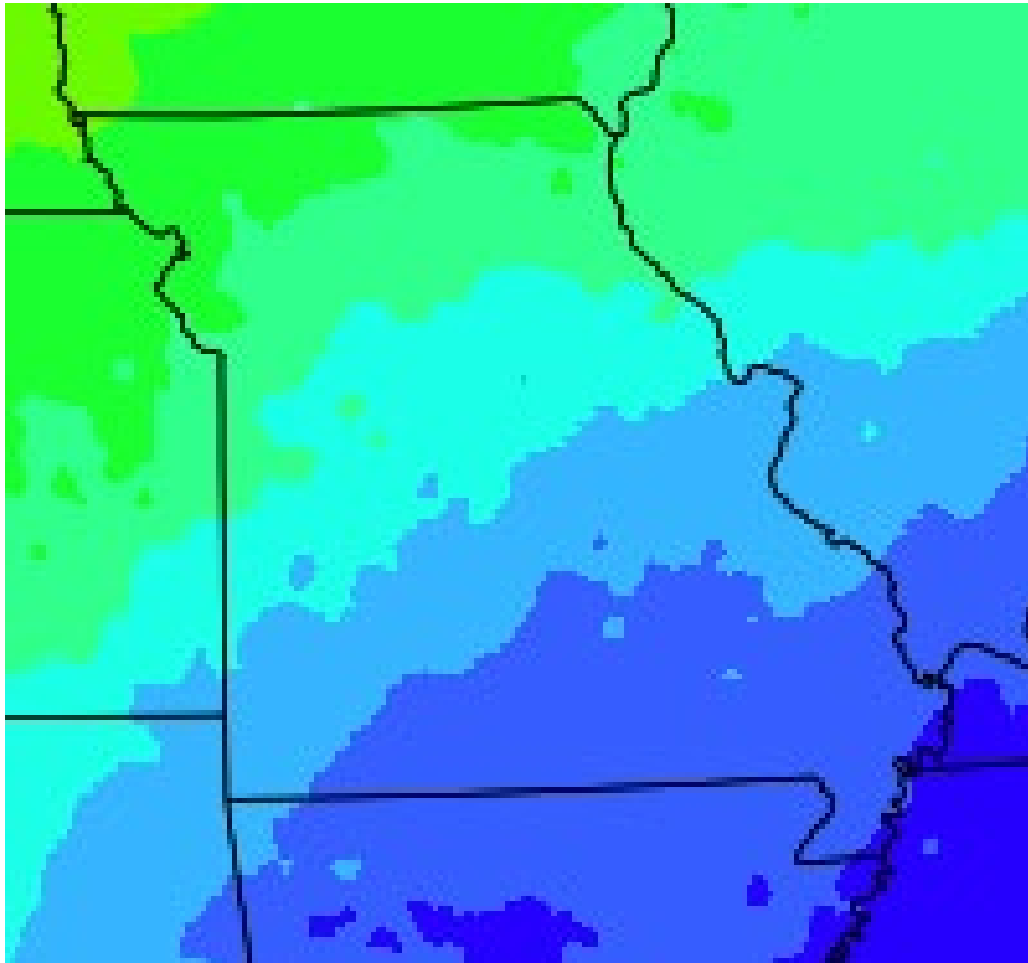




### 1991-2020 Missouri Statewide Mean Monthly Precipitation

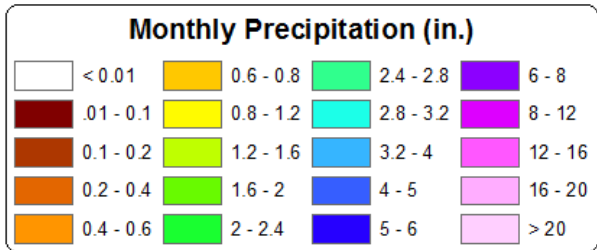
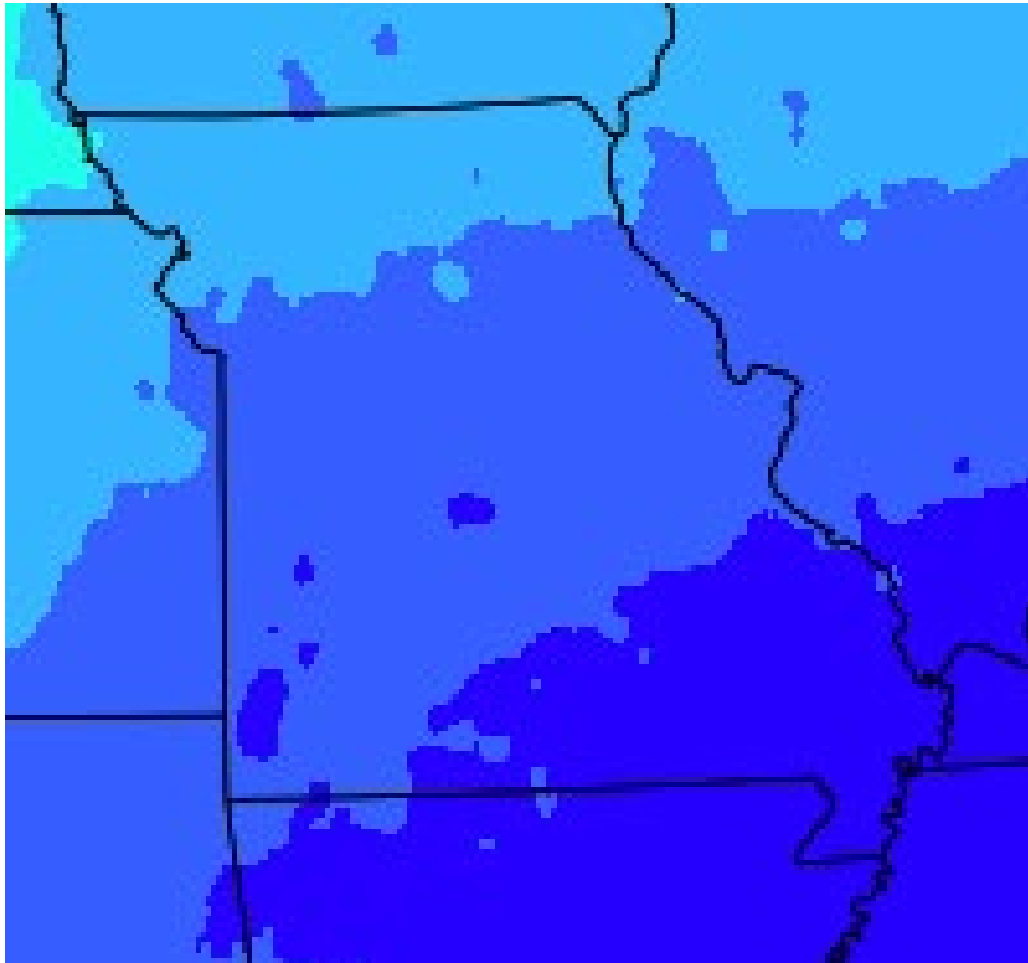
	Missouri Precip (in.)
Jan	2.09
Feb	2.02
Mar	3.21
Apr	3.97
May	4.66
Jun	4.62
Jul	3.71
Aug	3.71
Sep	4.10
Oct	3.19
Nov	2.91
Dec	2.31
<b>Total:</b>	<b>40.50</b>





## 1991-2020 Missouri Statewide Mean Monthly Precipitation

	Missouri Precip (in.)
Jan	2.09
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## 1991-2020 Missouri Statewide Mean Monthly Precipitation

	Missouri Precip (in.)
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Dec	2.31
<b>Total:</b>	<b>40.50</b>

# February 2024 Summary

## Missouri Average Temperature

February

↕ Date	↕ Average Temperature	Rank (out of 130)	↕ Anomaly <small>1901-2000 Mean: 33.8°F</small>
February 2024	45.9°F	130	12.1°F
February 2017	45.1°F	129	11.3°F
February 1930	43.4°F	128	9.6°F
February 1976	43.3°F	127	9.5°F
February 1954	43.2°F	126	9.4°F
February 1999	42.4°F	125	8.6°F
February 2000	42.2°F	124	8.4°F
February 1932	41.8°F	123	8.0°F
February 1998	41.2°F	122	7.4°F
February 1992	41.1°F	121	7.3°F

- February 2024 was **Missouri's warmest February on record**
- The statewide average temperature in February (45.9 °F) was 2.3 °F higher than Missouri's average March temperature (43.6 °F)
- Missouri's average temperature this winter (DJF) was 38.5 °F (+ 6.4 °F), making it the state's second warmest winter behind 1932

Kansas City

- Temperature **3<sup>rd</sup> Warmest**
- Precipitation **5<sup>th</sup> Driest**

St. Louis

- Temperature **2<sup>nd</sup> Warmest**
- Precipitation **5<sup>th</sup> Driest**

Springfield

- Temperature **2<sup>nd</sup> Warmest**
- Precipitation **27<sup>th</sup> Driest**

Columbia

- Temperature **2<sup>nd</sup> Warmest**
- Precipitation **4<sup>th</sup> Driest**

Cape Girardeau

- Temperature **Warmest**
- Precipitation **Driest**

Ranks based on data from 1895 to 2023 (129 years)

<https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/>

# February 2024 Summary

Kansas City	
• Temperature	<i>3<sup>rd</sup> Warmest</i>
• Precipitation	<i>5<sup>th</sup> Driest</i>

St. Louis	
• Temperature	<i>2<sup>nd</sup> Warmest</i>
• Precipitation	<i>5<sup>th</sup> Driest</i>

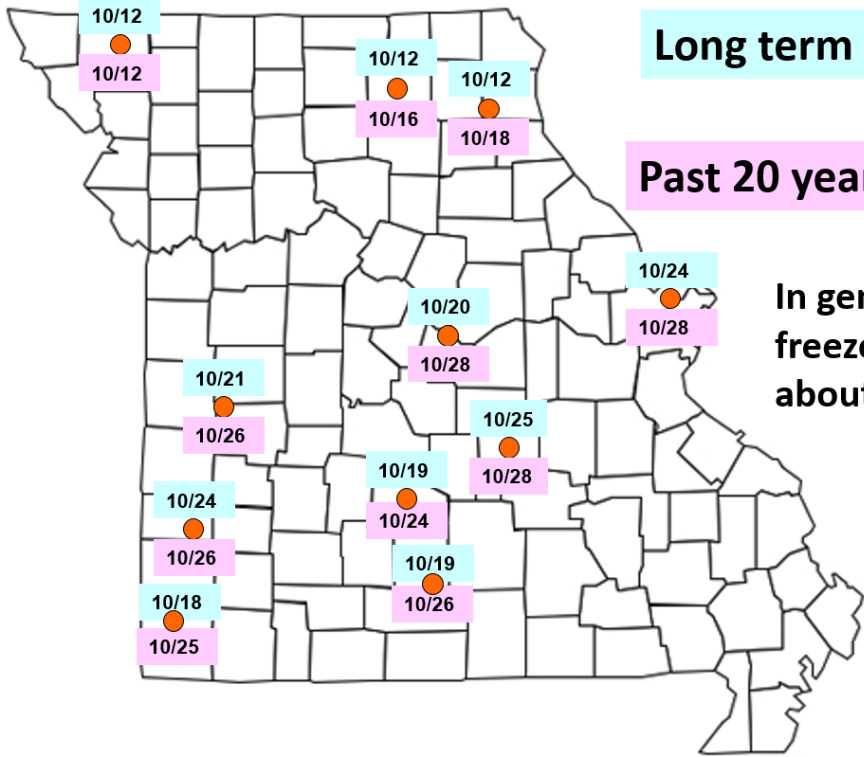
Springfield	
• Temperature	<i>2<sup>nd</sup> Warmest</i>
• Precipitation	<i>27<sup>th</sup> Driest</i>

Columbia	
• Temperature	<i>2<sup>nd</sup> Warmest</i>
• Precipitation	<i>4<sup>th</sup> Driest</i>

Cape Girardeau	
• Temperature	<i><u>Warmest</u></i>
• Precipitation	<i><u>Driest</u></i>

- Missouri's statewide average precipitation during February 2024 was 0.61" (-1.41")
- 2024 was Missouri's 9<sup>th</sup> driest February on record
- Saline, Randolph, and Scotland counties recorded their driest February on record
- Missouri's wintertime (DJF) precipitation was close to normal (+ 0.31")
  - *Not a lot of snow!*

## Median Date of First Fall Frost ( $\leq 32^{\circ}\text{F}$ )



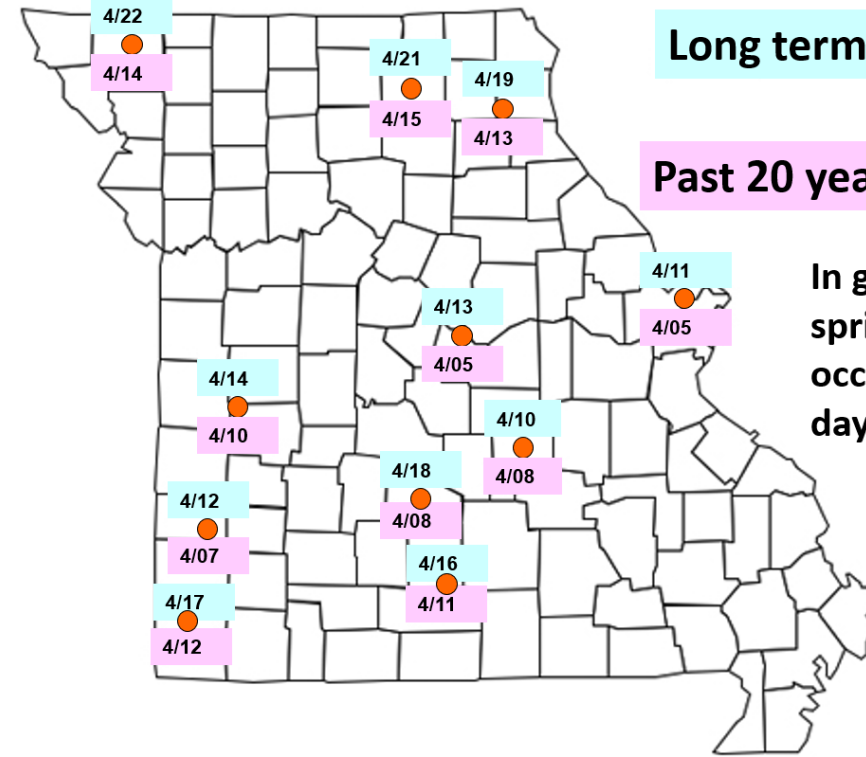
Long term (1895-2019)

vs.

Past 20 years (2000-2019)

In general, the first fall freeze is occurring about 5 days *later*...

## Median Date of Last Spring Frost ( $\leq 32^{\circ}\text{F}$ )



Long term (1895-2019)

vs.

Past 20 years (2000-2019)

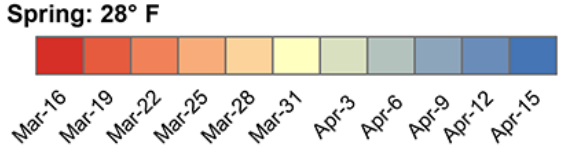
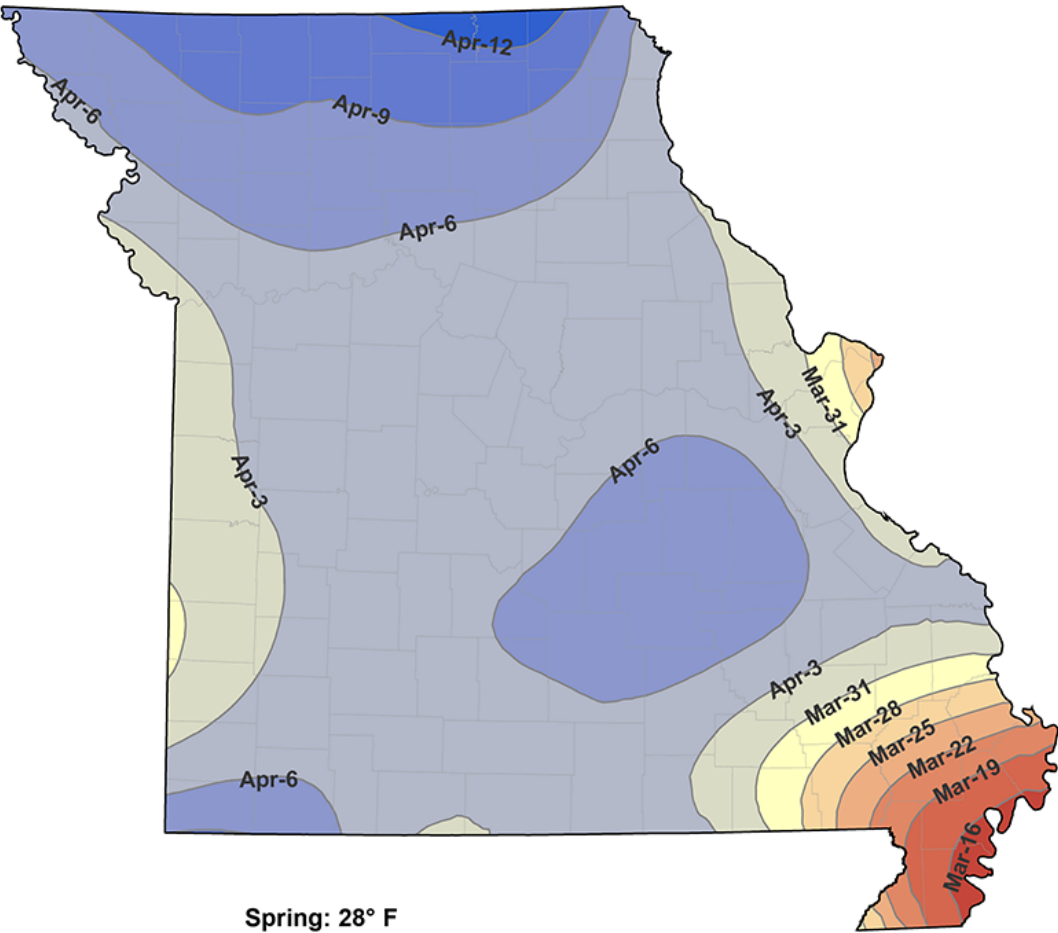
In general, the last spring freeze is occurring about 6 days *earlier*...

Missouri Climate Center Frost/Freeze Guide:  
<https://ipm.missouri.edu/frostfreezeguide/>

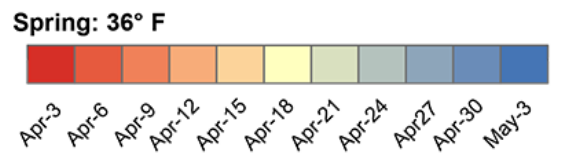
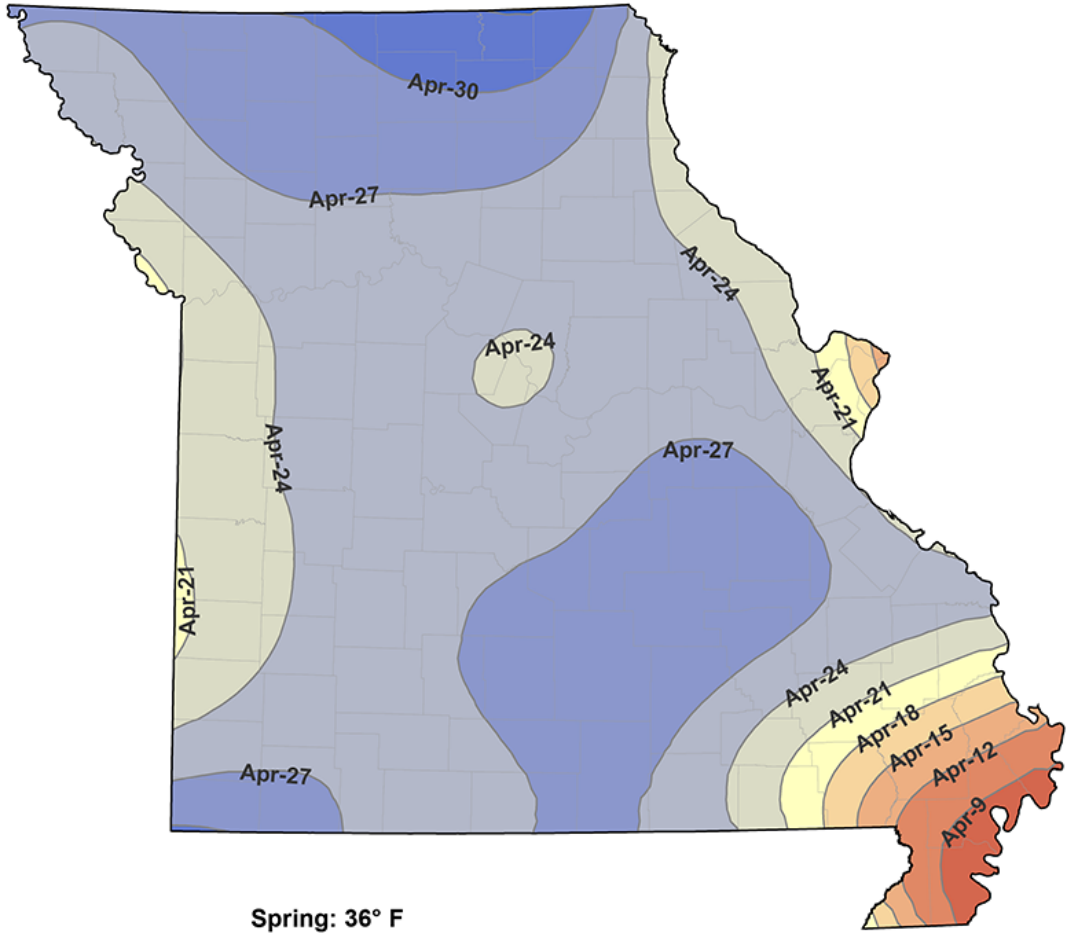
Source: NOAA/Missouri Climate Center



# Median Date of Last Spring Hard Freeze and Frost



Source: MU IPM Program / Missouri Climate Center / NOAA-NCEI.



Source: MU IPM Program / Missouri Climate Center / NOAA-NCEI.

<https://ipm.missouri.edu/frostfreezeguide/>