

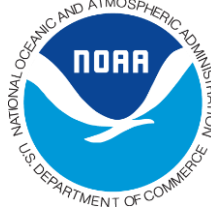
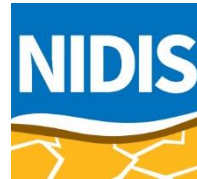


**Wisconsin State Climatology Office**  
NELSON INSTITUTE FOR ENVIRONMENTAL STUDIES  
UNIVERSITY OF WISCONSIN-MADISON



# North Central US Climate- Drought Outlook 21 December 2023

**Dr. Steve Vavrus, Director**  
**Wisconsin State Climatology Office**  
**University of Wisconsin-Madison**  
**sjvavrus@wisc.edu**  
**608-265-5279**



**United States Department of Agriculture**  
**Midwest Climate Hub**

# General Information

- **Providing climate services to the North Central US**
  - Collaboration Activity Among:
    - NOAA NCEI/NWS/OAR/NIDIS/
    - USDA Climate Hubs
    - American Association of State Climatologists
    - Midwest and High Plains Regional Climate Centers
    - National Drought Mitigation Center
- **Next Regular Climate/Drought Outlook Webinar**
  - January 18, 2024 (1 PM CDT) Jerry Brotzge– Kentucky State Climatologist – Kentucky Climate Center
- **Past webinars**
  - <https://mrcc.purdue.edu/webinars>
  - <https://hprcc.unl.edu/webinars.php>
- **Open for questions at the end (enter them along the way).**

Tonight at 9:27 CST



Maria Pilar Martinez Aguerri  
Getty Images

## **Current and Recent Conditions**

- Warm
- Dry

## **Impacts**

- **Weather events**
- **Ice and snow shortage**
- **Drought effects**

## **Outlooks**

- **Holiday week**
- **Winter season**
- **El Niño influence**

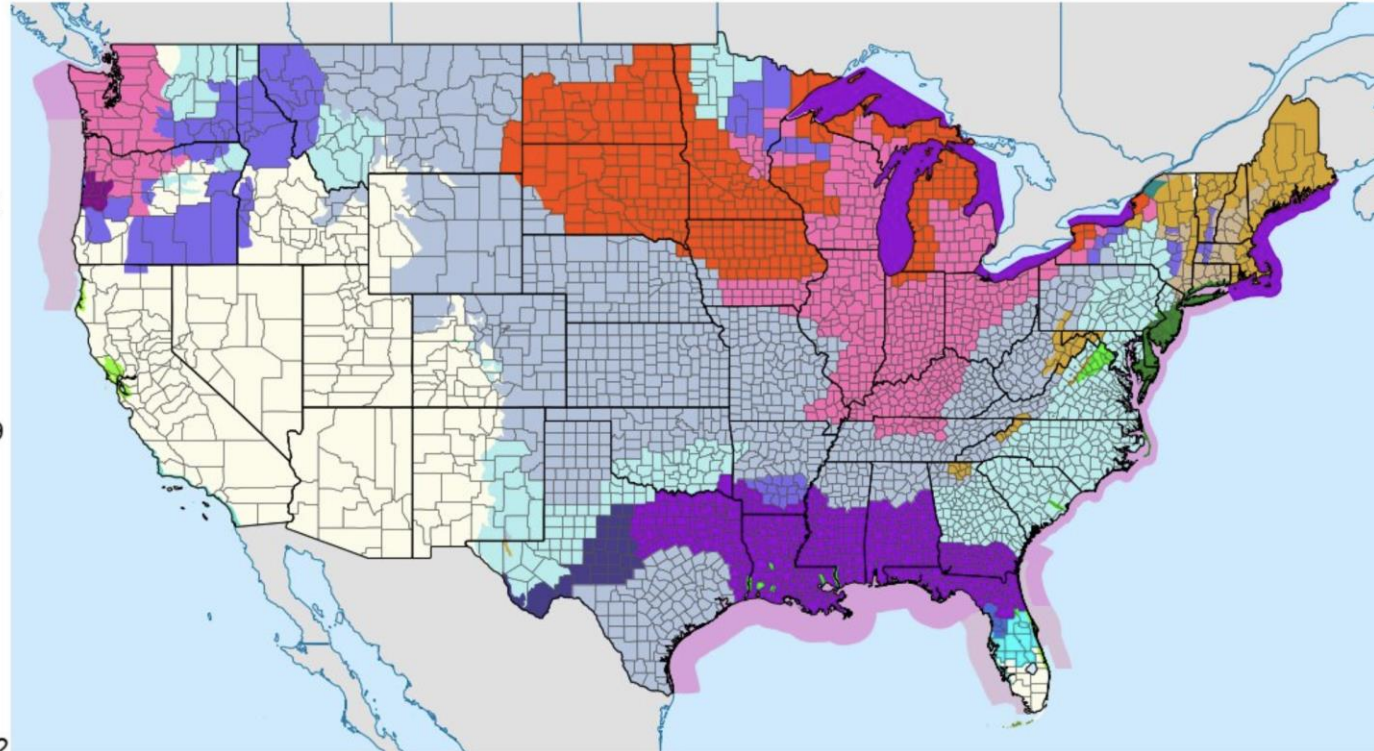
# Oh, What a Difference a Year Makes. . .



Current Watches, Warnings, and Advisories

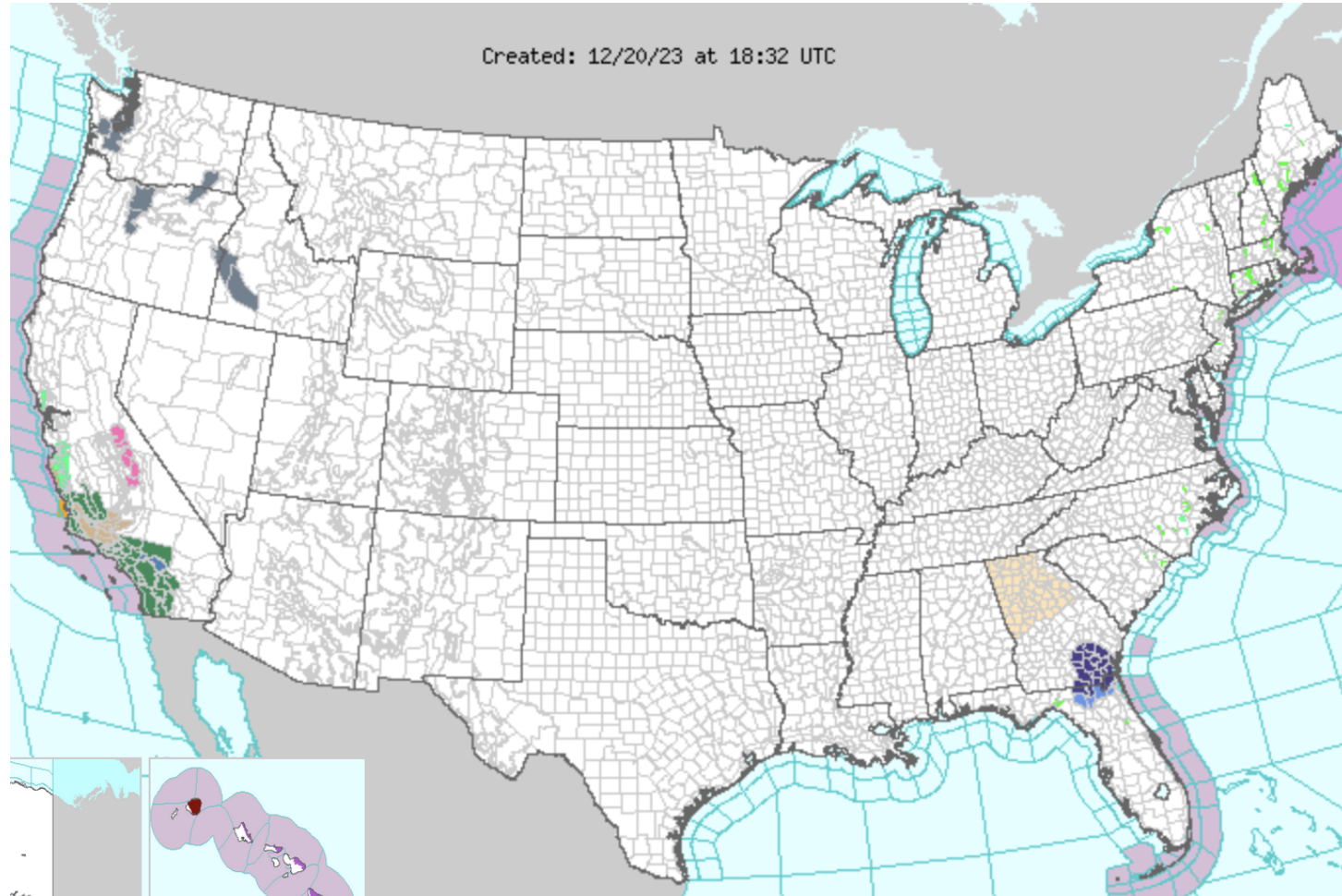
NWS on December 22, 2022

- Blizzard Warning Pop: 11,394,035
- Ice Storm Warning Pop: 507,733
- Winter Storm Warning Pop: 60,334,004
- High Wind Warning Pop: 9,916,350
- Storm Warning Pop: 214,280
- Coastal Flood Warning Pop: 26,584,099
- Lakeshore Flood Warning Pop: 1,536,561
- Flood Warning Pop: 1,781,357
- Flood Warning Pop: 265,232
- Lake Effect Snow Warning Pop: 81,110
- Gale Warning Pop: 453,428
- Wind Chill Warning Pop: 80,831,589
- Hard Freeze Warning Pop: 40,056,404
- Freeze Warning Pop: 1,769,445
- Winter Weather Advisory Pop: 18,884,409
- Wind Chill Advisory Pop: 98,572,573
- Flood Advisory Pop: 26,777
- Coastal Flood Advisory Pop: 10,492,850
- Lakeshore Flood Advisory Pop: 104,423
- Flood Advisory Pop: 24,482
- High Surf Advisory Pop: 674,511
- Rip Current Statement Pop: 3,540,524
- Small Craft Advisory Pop: 261,606
- Hazardous Seas Warning Pop: 546
- Wind Advisory Pop: 109,196,359
- Beach Hazards Statement Pop: 4,850,752
- Low Water Advisory Pop: 15,486
- Flood Watch Pop: 22,802,857
- High Wind Watch Pop: 616,402
- Freeze Watch Pop: 8,558,070
- Coastal Flood Statement Pop: 3,081,440
- Freezing Spray Warning Pop: 86,944
- Freezing Spray Advisory Pop: 30,451
- Gale Watch Pop: 19,084
- Hard Freeze Watch Pop: 4,271,222



# Oh, What a Difference a Year Makes. . .

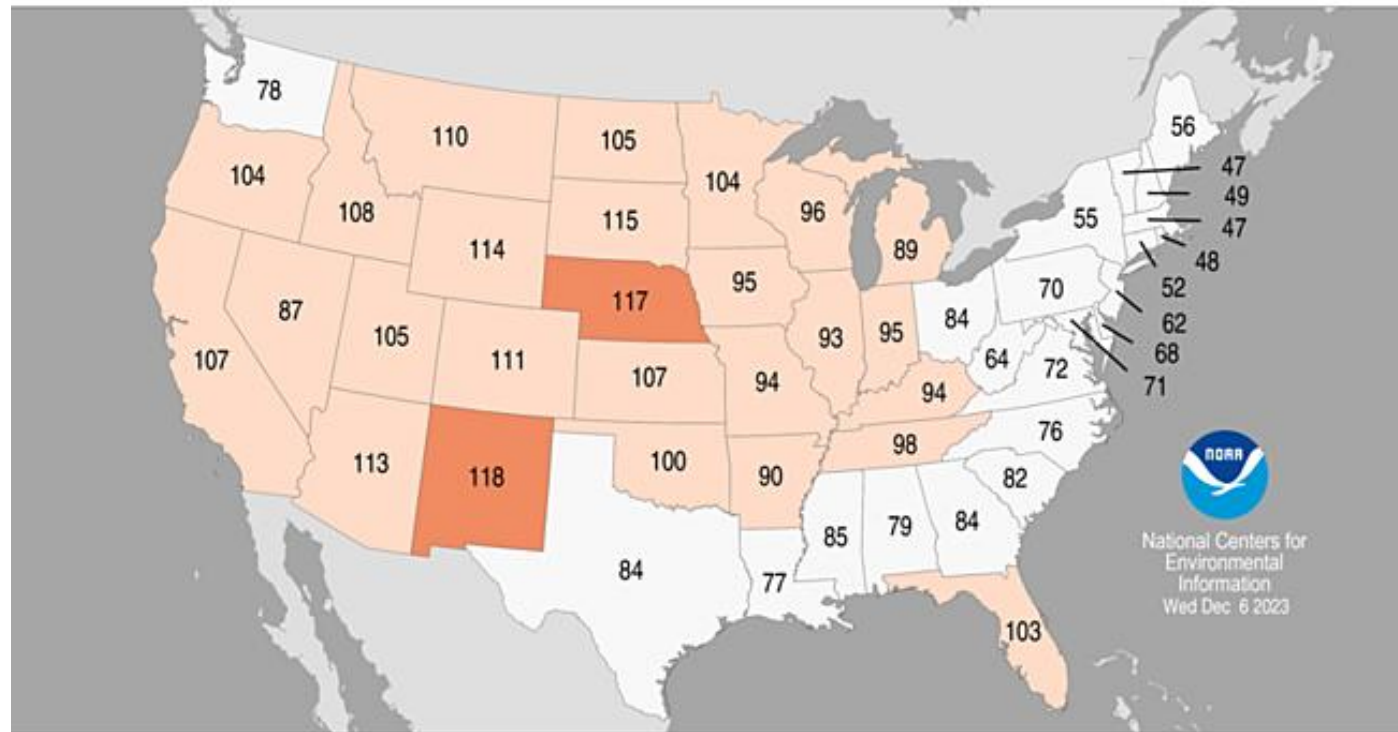
## NWS Map on December 20, 2023



- |                        |                              |                       |                           |
|------------------------|------------------------------|-----------------------|---------------------------|
| Special Marine Warning | Flood Advisory               | Wind Advisory         | Special Weather Statement |
| Winter Storm Warning   | High Surf Advisory           | Frost Advisory        | Marine Weather Statement  |
| Storm Warning          | Heavy Freezing Spray Warning | Rip Current Statement | Air Quality Alert         |
| Flood Warning          | Dense Fog Advisory           | Gale Watch            |                           |
| Gale Warning           | Small Craft Advisory         | Winter Storm Watch    |                           |
| Freeze Warning         | Brisk Wind Advisory          | Flood Watch           |                           |

# November Temperatures

Statewide Average Temperature Ranks  
November 2023  
Period: 1895–2023



Mild over nearly all  
North Central region



# Autumn Temperatures (Sep-Nov)

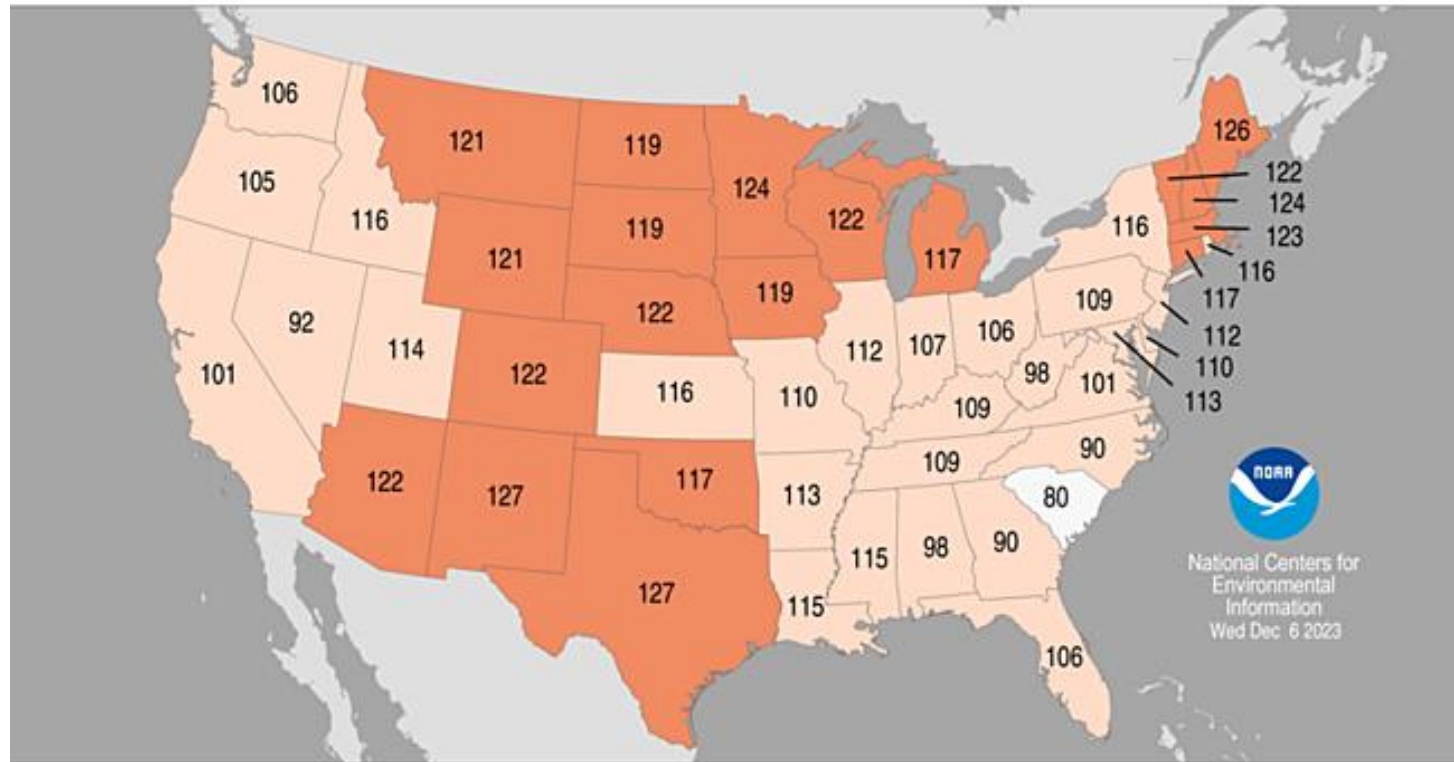
## Statewide Average Temperature Ranks

September – November 2023

Period: 1895–2023

**Exceptionally warm autumn**  
**\* 6<sup>th</sup> warmest in U.S.**

**Among 10 warmest autumns in many North Central states**



National Centers for  
Environmental  
Information  
Wed Dec 6 2023

Record  
Coldest  
(1)

Much  
Below  
Average

Below  
Average

Near  
Average

Above  
Average

Much  
Above  
Average

Record  
Warmest  
(129)

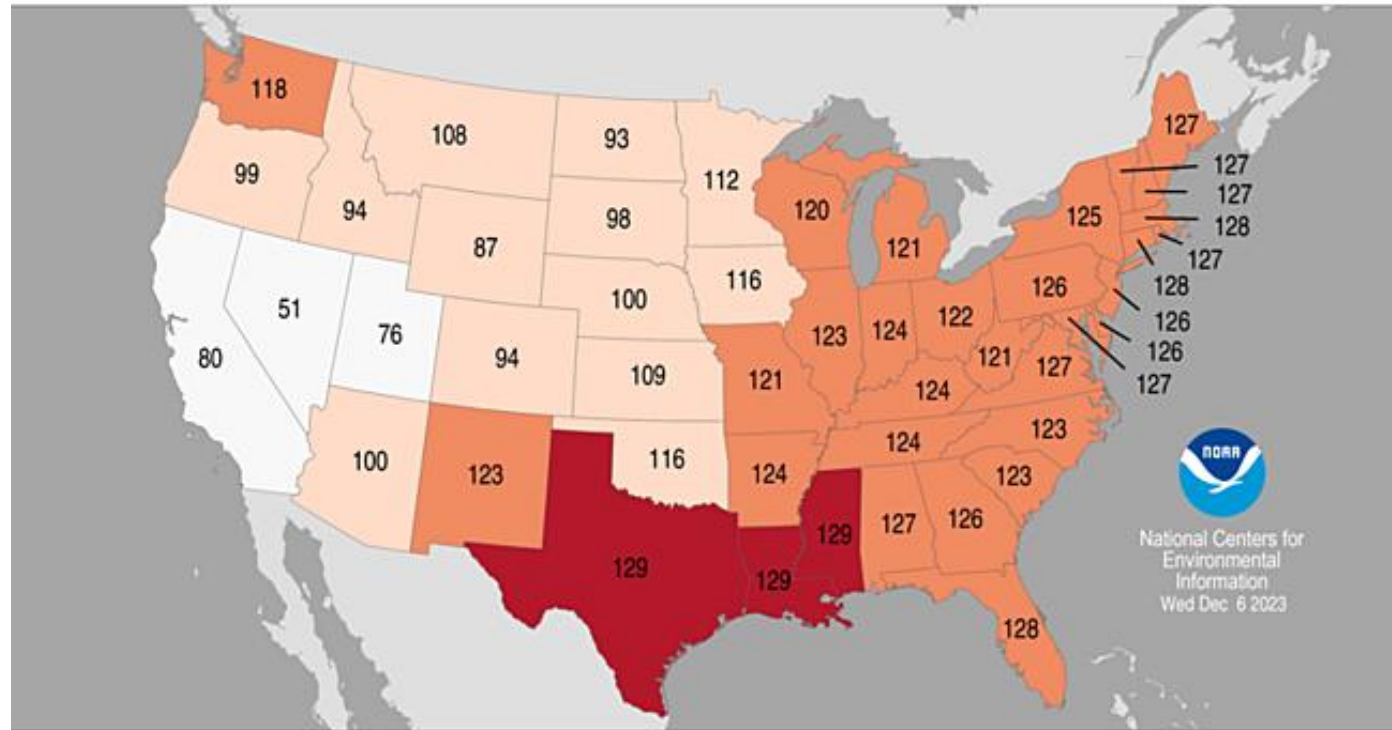


# Year-to-Date Temperatures (Jan-Nov)

## Statewide Average Temperature Ranks

January – November 2023

Period: 1895–2023



National Centers for Environmental Information  
Wed Dec 6 2023



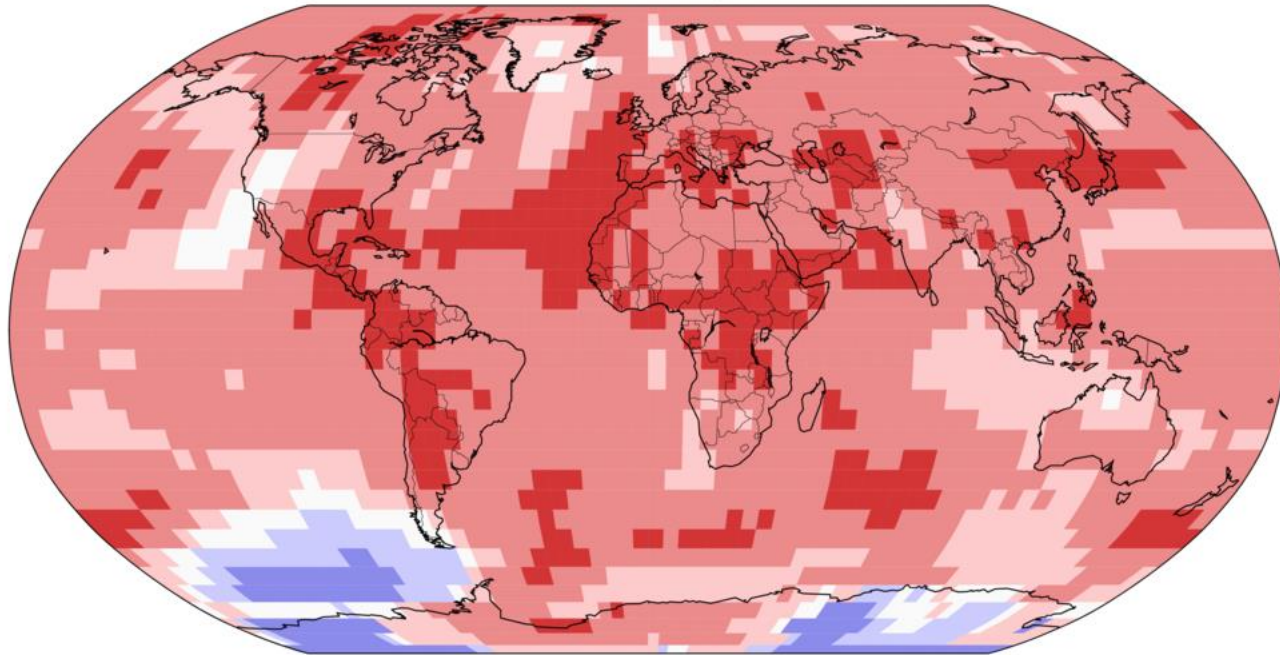
10<sup>th</sup> warmest year-to-date in continental U.S.

# Year-to-Date Temperatures (Jan-Nov)

Land & Ocean Temperature Percentiles Jan–Nov 2023

NOAA's National Centers for Environmental Information

Data Source: NOAAGlobalTemp v5.1.0–20231208



Record Coldest

Much Cooler than Average

Cooler than Average

Near Average

Warmer than Average

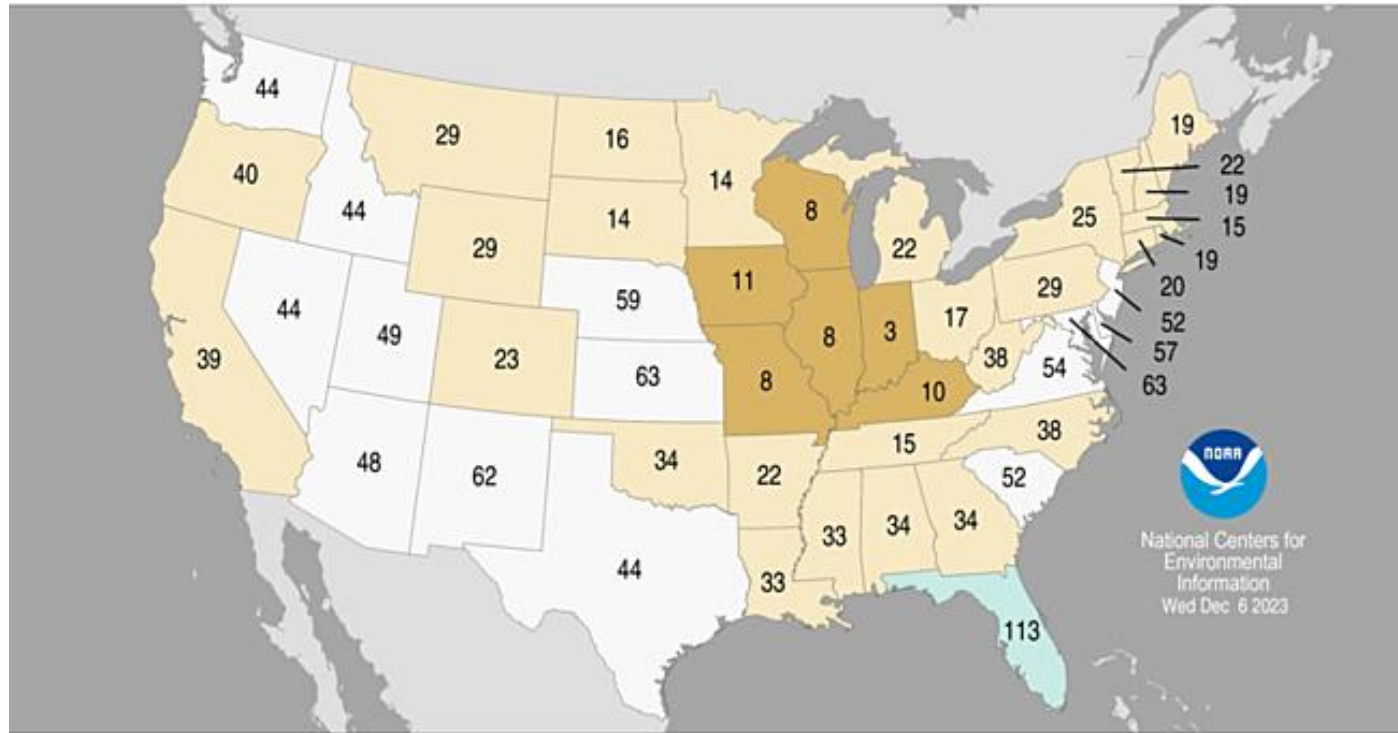
Much Warmer than Average

Record Warmest

*2023 is the warmest year on record globally*

# November Precipitation

Statewide Precipitation Ranks  
November 2023  
Period: 1895–2023



National Centers for  
Environmental  
Information  
Wed Dec 6 2023

Record  
Driest  
(1)

Much  
Below  
Average

Below  
Average

Near  
Average

Above  
Average

Much  
Above  
Average

Record  
Wettest  
(129)

## Very dry in Midwest

- Indiana 3<sup>rd</sup> driest

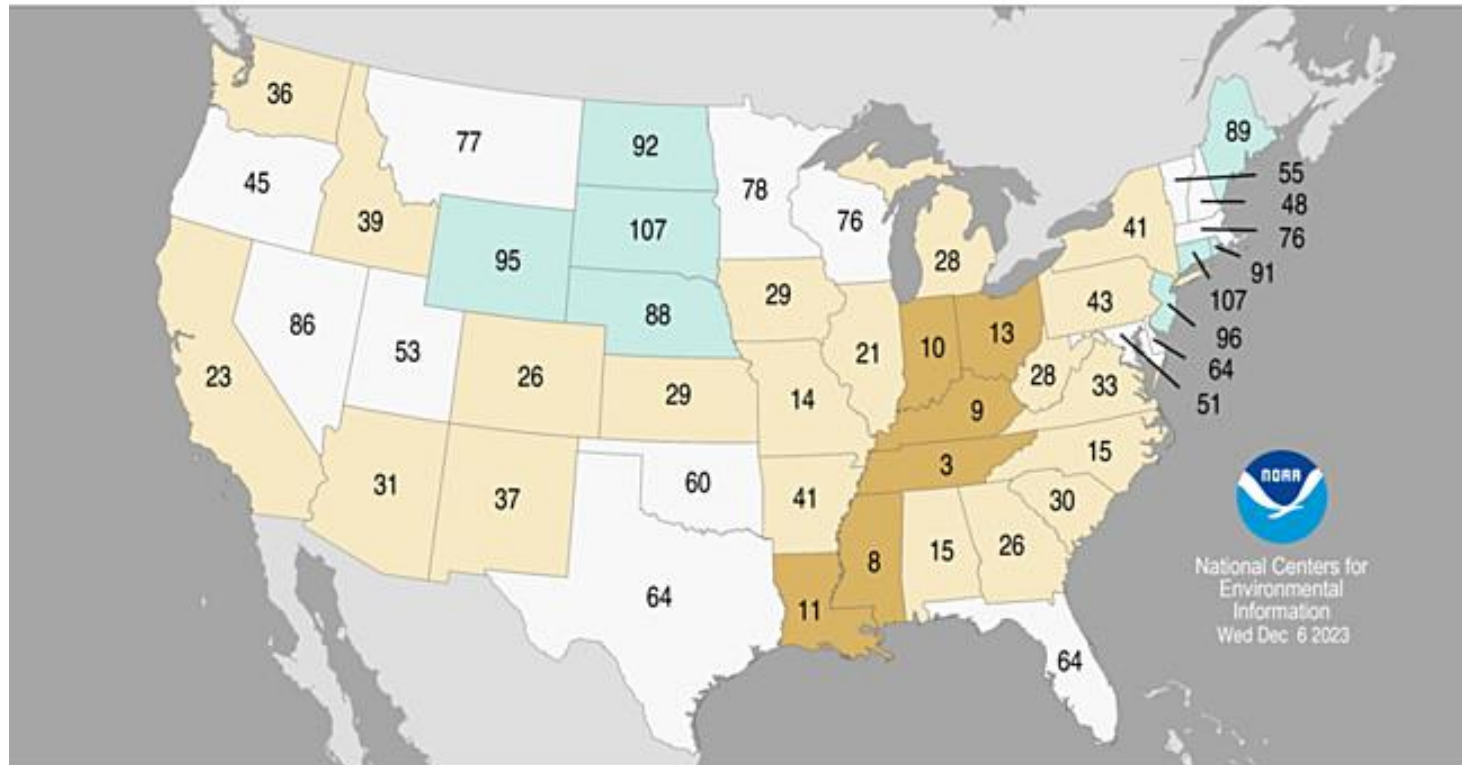
- WI, IL, MO, KY top 10

## Dry U.S. as a whole

- \* 12<sup>th</sup> driest Nov
- \* Only Florida wet

# September-November Precipitation

Statewide Precipitation Ranks  
September – November 2023  
Period: 1895–2023



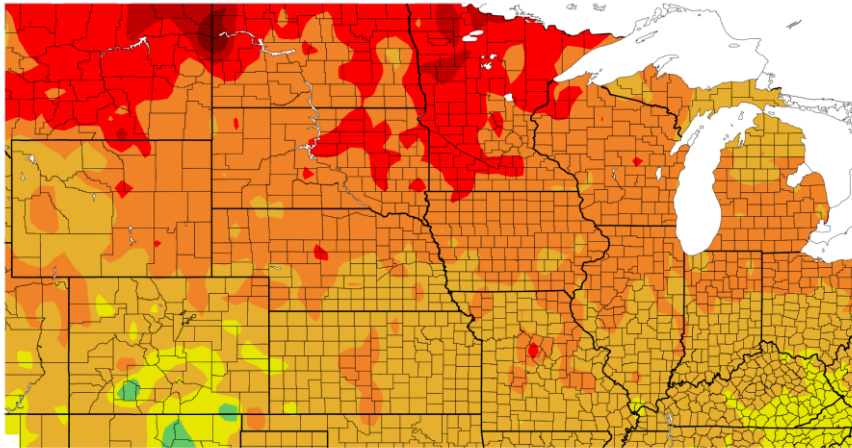
NOAA  
National Centers for  
Environmental  
Information  
Wed Dec 6 2023

East-west split in  
North Central states

Indiana & Kentucky  
very dry autumn

# December Conditions

Departure from Normal Temperature (F)  
12/1/2023 – 12/19/2023



Generated 12/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

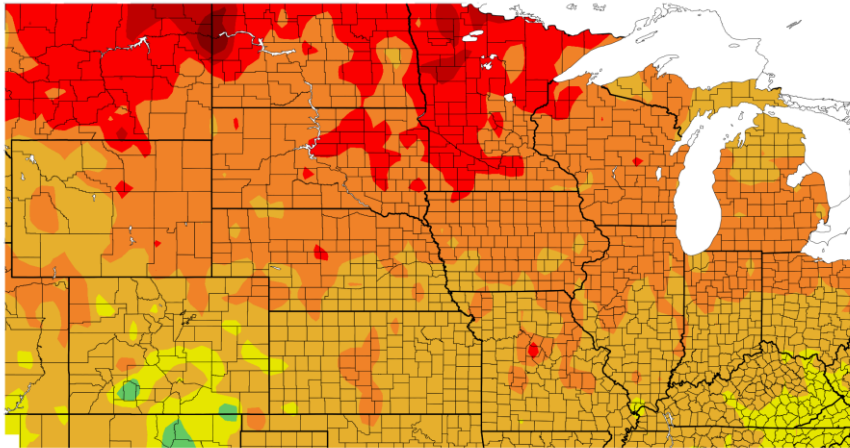
*Very warm (and El Niño-like) December!*

**Warmest December on record in Minnesota?**

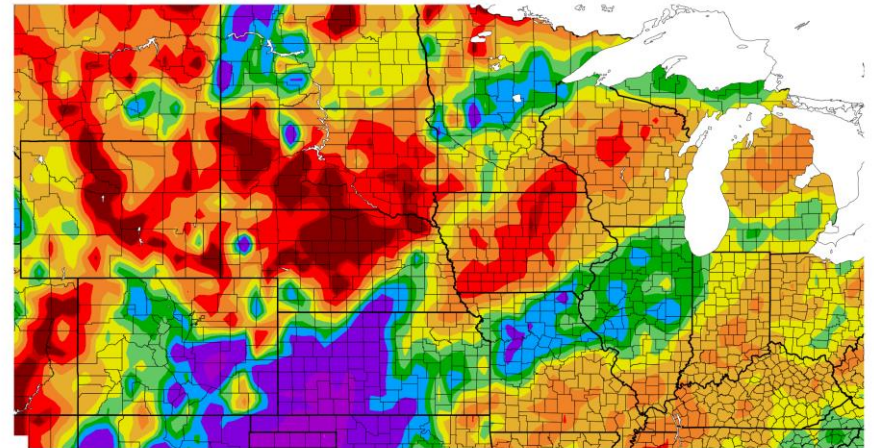
<https://hprcc.unl.edu/maps.php?maps=ACISClimateMaps>

# December Conditions

Departure from Normal Temperature (F)  
12/1/2023 – 12/19/2023



Percent of Normal Precipitation (%)  
12/1/2023 – 12/19/2023



Generated 12/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers



Generated 12/20/2023 at HPRCC using provisional data.

NOAA Regional Climate Centers

*Very warm (and El Niño-like) December!*

*Mixed bag*

**Warmest December on record in Minnesota?**

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



**MRCC**  
Midwestern Regional  
Climate Center

## DRY, DRY DECEMBER

### Month-To-Date December Precipitation Ranks (as of Dec. 18)

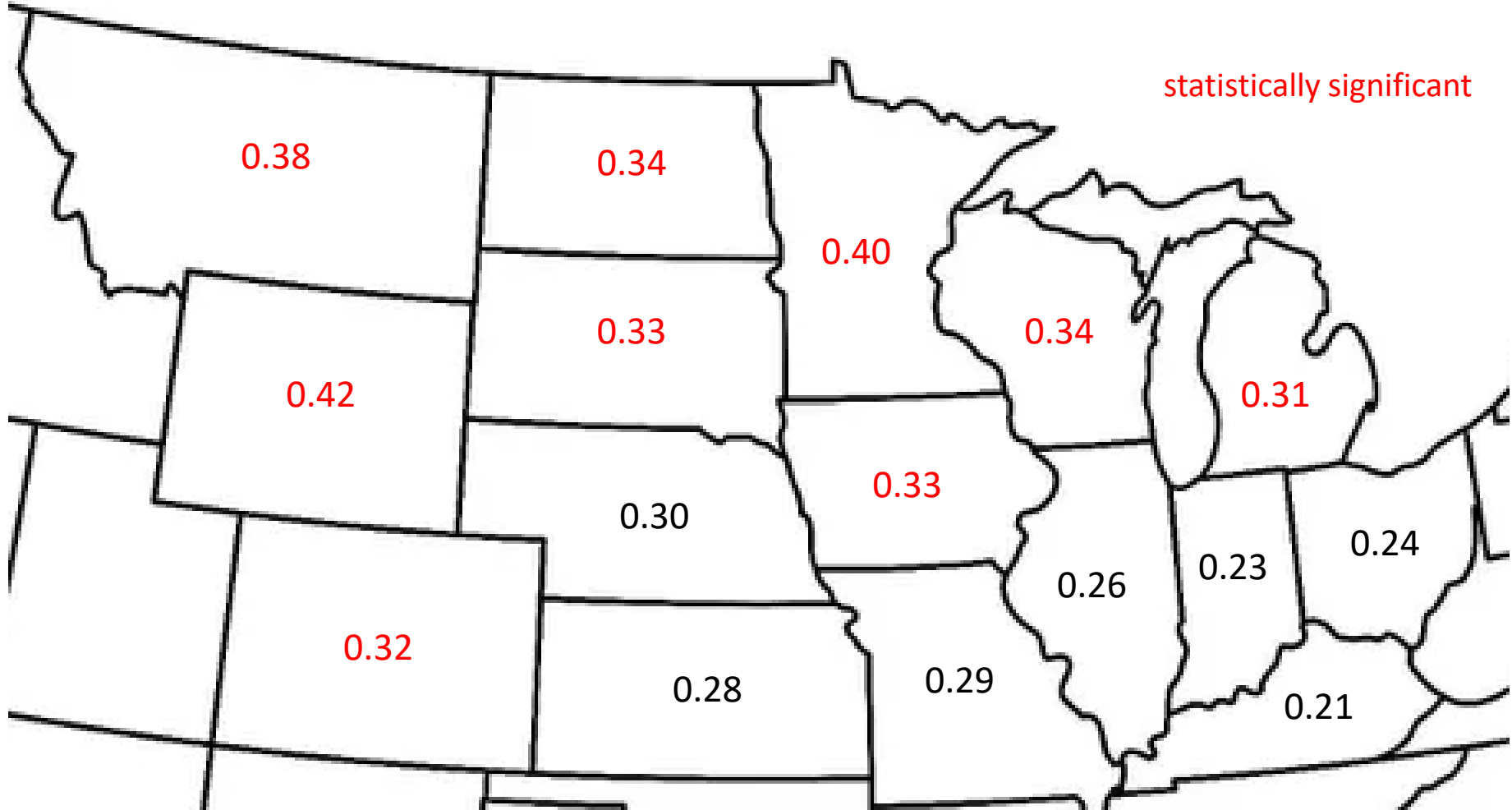
- Waterloo, IA- 0.12"- 1st Driest
- Springfield, MO- 0.25"- 3rd Driest
- Decorah, IA- 0.20"- 3rd Driest
- Rochester, MN- 0.09"- 3rd Driest
- Wausau, WI- 0.22"- 4th Driest
- La Crosse, WI- 0.32"- 10th Driest



**DID YOU  
KNOW?**

# Persistence of December Temperature Anomalies into January

*Correlation between December and January anomalies, 1990-2020*



statistically significant

- *December temperature anomalies tend to persist into January*
- *Stronger persistence in northern and western states*



# **Events and Impacts**

# Thanksgiving Weekend Snowstorm in Kansas

Reminder: this is what snow looks like!

Manhattan, KS: 6" snowfall

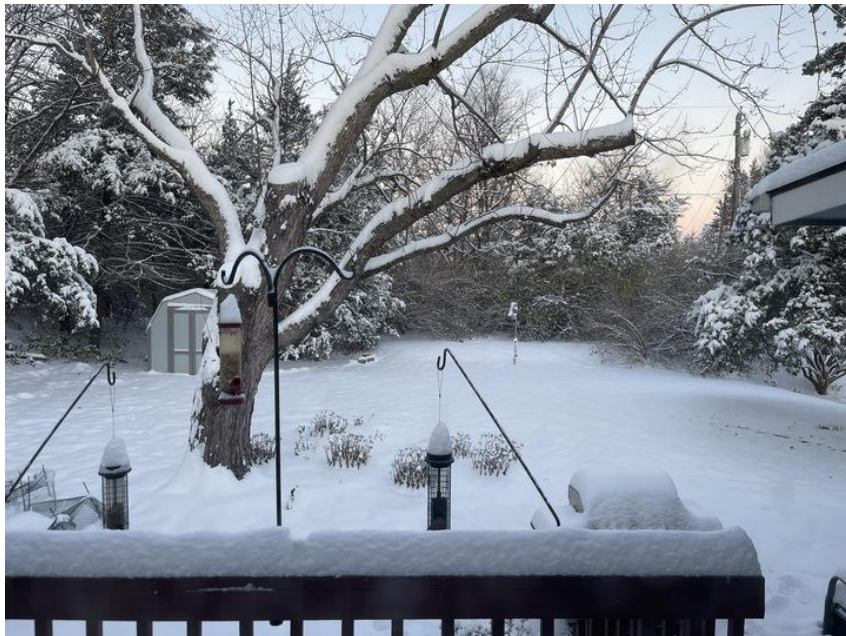
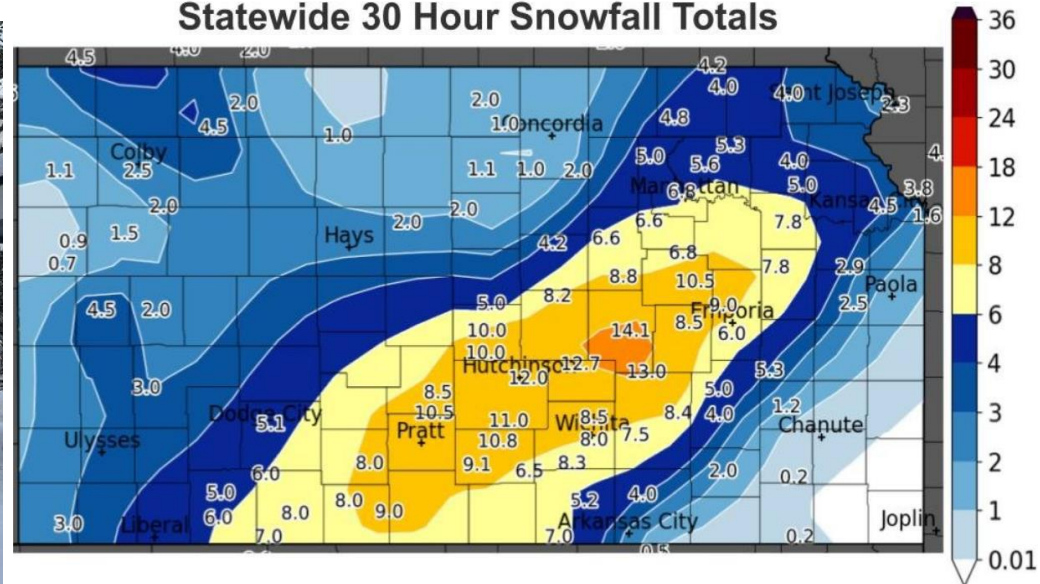


Photo: Matt Sittel

November 24<sup>th</sup>-25<sup>th</sup>  
Statewide 30 Hour Snowfall Totals



14" maximum = heaviest snowfall in a decade in KS

# Not much Lake Ice (Wisconsin)

Lake Wingra in Madison, WI



*Photo by David Liebl*

# Not much Lake Ice (Minnesota)

Minnesota

## Crews work to rescue several dozen people stranded by shifting ice on Upper Red Lake

MPR News Staff December 18, 2023 6:55 AM



Kelliher Fire and Rescue was among the agencies who assisted with the rescue of about 30 stranded people amid shifting ice at Upper Red Lake on Sunday. 🚒 Kelliher Fire & Rescue

Weather

## Warm weather forces cancellation of planned Minnesota Ice Festival

Andrew Krueger December 20, 2023 10:15 AM

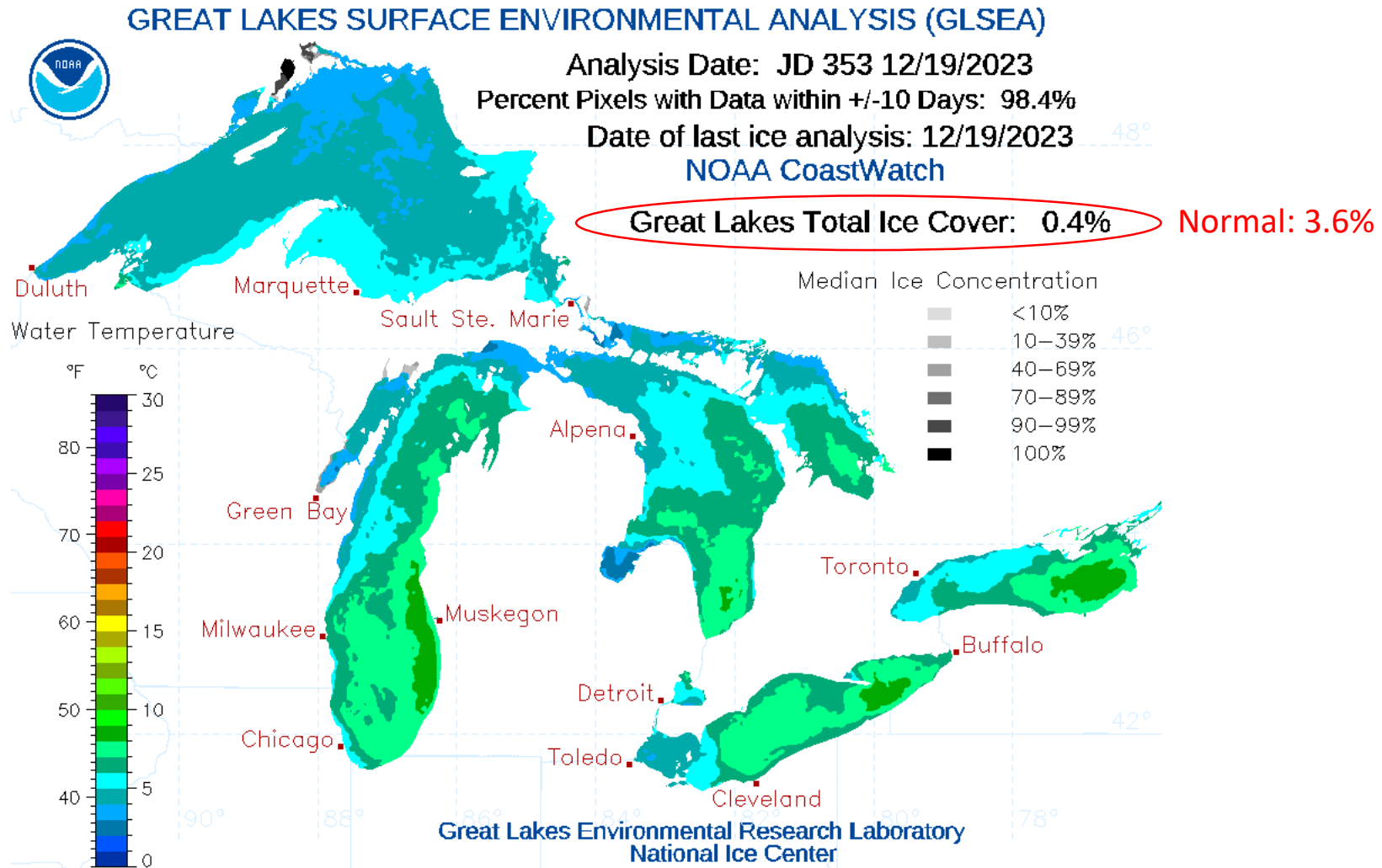


2023 Minnesota Ice Maze. 🍷 Snack Media & Minnesota Ice

- *Winter recreation impacts*

*Minnesota Public Radio*

# Not much Lake Ice (Great Lakes)



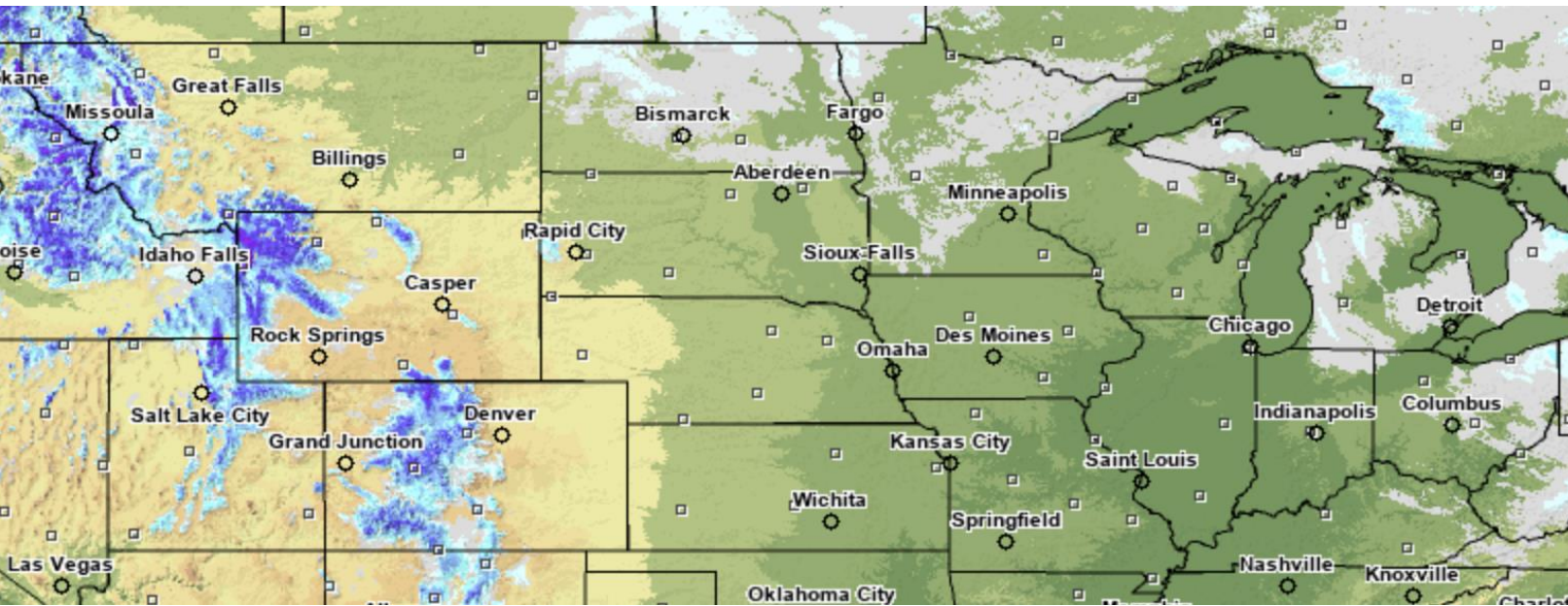
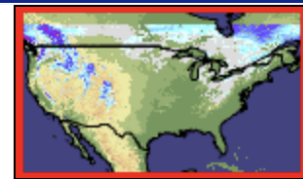
<https://coastwatch.glerl.noaa.gov/satellite-data-products/great-lakes-surface-environmental-analysis-glsea/>

*Favorable setup for heavy lake-effect snowfall if an Arctic airmass (ever) arrives*

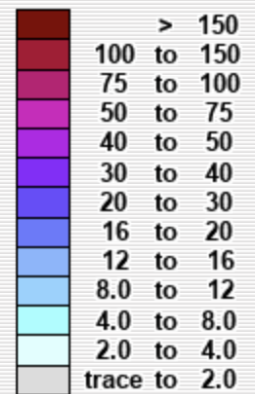
# Minimal Snow Cover

Today, December 21st

## Snow Depth (inches)



Inches of depth



Not Estimated

Elevation in feet

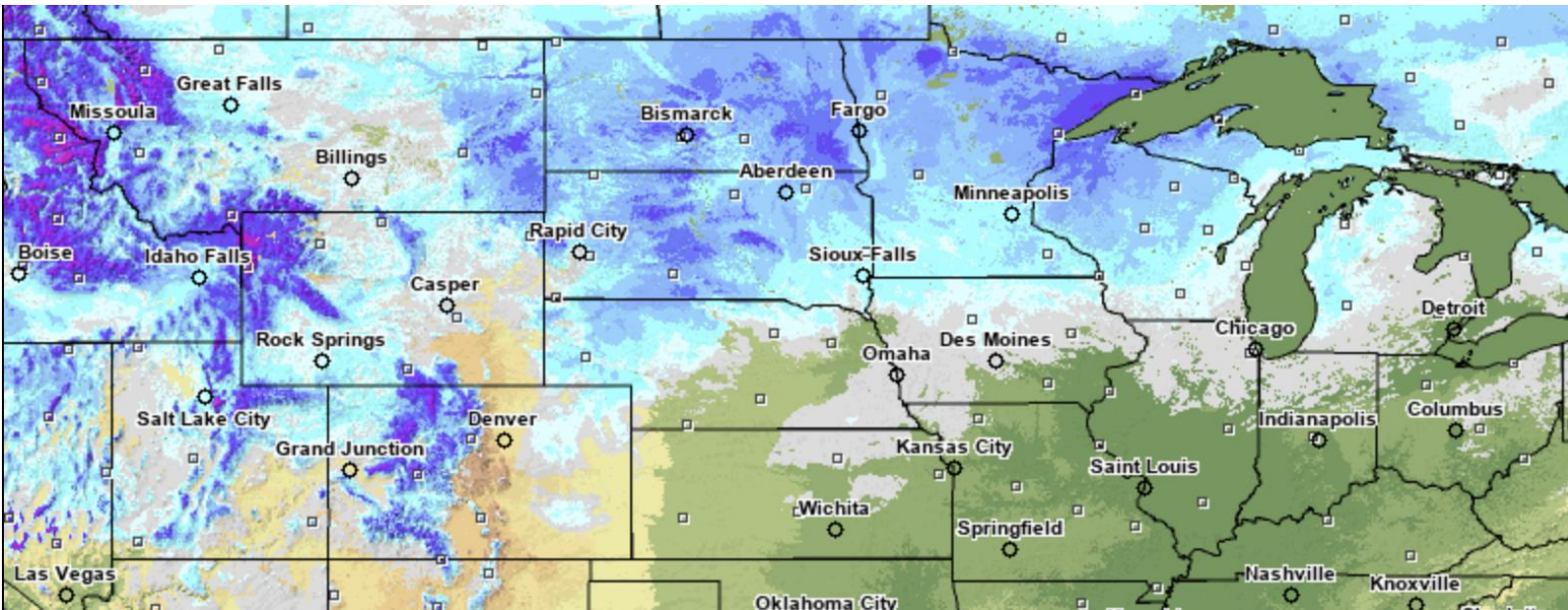
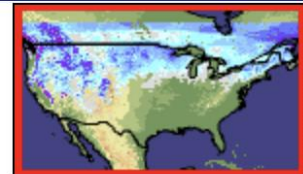


<https://www.nohrsc.noaa.gov>

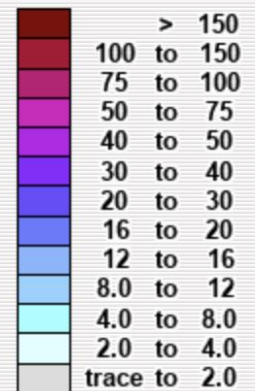
# Minimal Snow Cover

Last year, December 21st

## Snow Depth (inches)

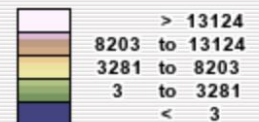


Inches of depth



Not Estimated

Elevation in feet

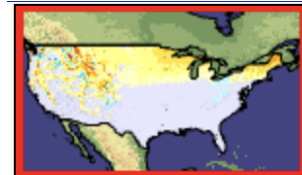
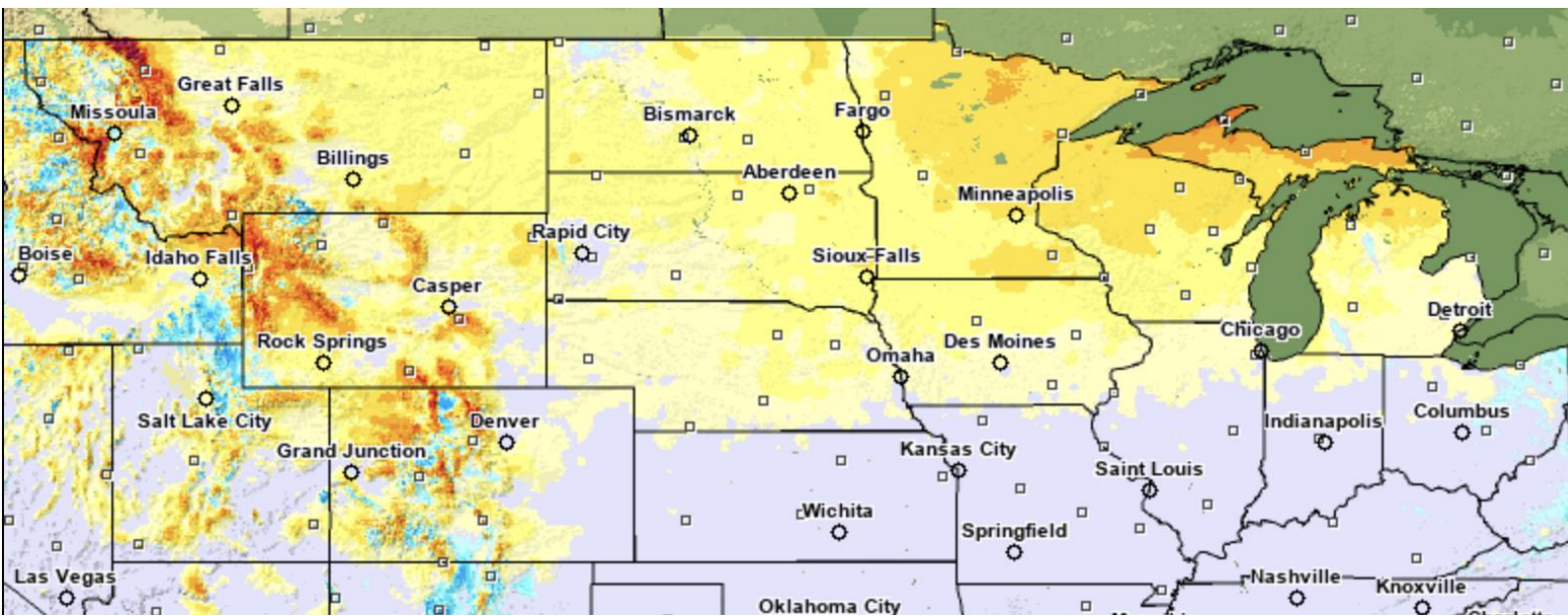


<https://www.nohrsc.noaa.gov>

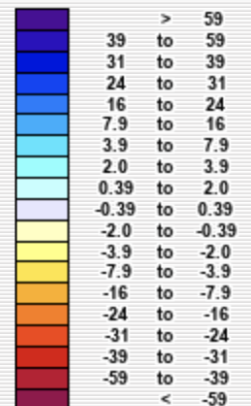
# Minimal Snow Cover

Today, December 21st

## Snow Depth Departure from Normal (inches)



### Inches of depth



Not Estimated

### Elevation in feet



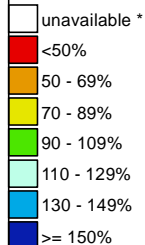
<https://www.nohrsc.noaa.gov>



# Westwide SNOTEL Current Snow Water Equivalent (SWE) % of Normal

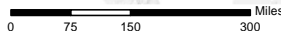
Dec 20, 2023

Current Snow Water Equivalent (SWE) Basin-wide Percent of 1991-2020 Median



\* Data unavailable at time of posting or measurement is not representative at this time of year

Provisional data subject to revision



The snow water equivalent percent of normal represents the current snow water equivalent found at selected SNOTEL sites in or near the basin compared to the average value for those sites on this day. Data based on the first reading of the day (typically 00:00).

Prepared by:  
USDA/NRCS National Water and Climate Center  
Portland, Oregon  
<https://www.nrcs.usda.gov/wps/portal/wcc/home/>

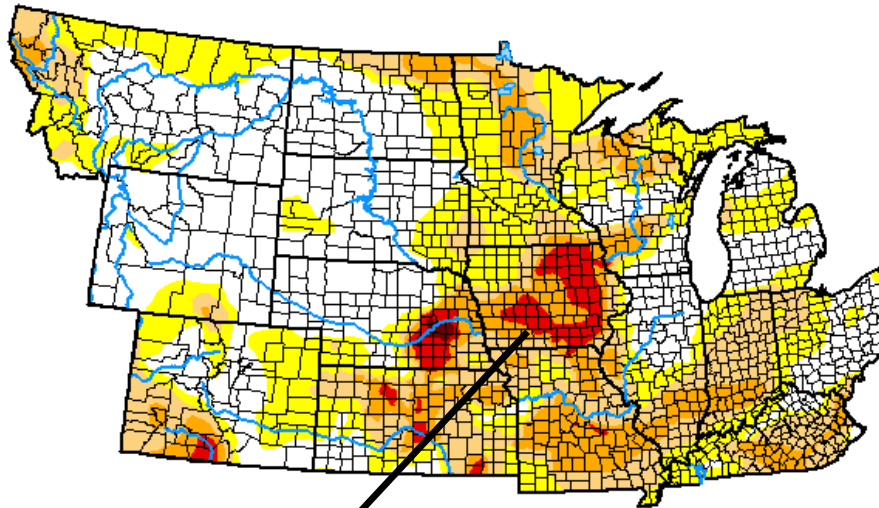


# U.S. Drought Monitor NWS Central

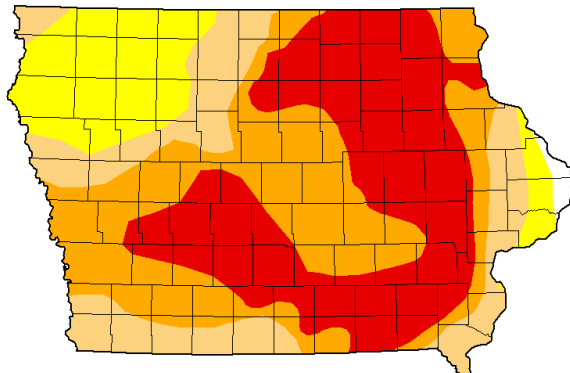
**December 19, 2023**  
(Released Thursday, Dec. 21, 2023)  
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
<b>Current</b>	39.58	60.42	32.81	14.43	3.04	0.17
<b>Last Week</b> 12-12-2023	41.17	58.83	30.74	14.15	2.86	0.25
<b>3 Months Ago</b> 09-19-2023	41.23	58.77	39.47	23.31	8.94	1.04
<b>Start of Calendar Year</b> 01-03-2023	25.76	74.24	48.98	24.27	9.90	3.48
<b>Start of Water Year</b> 09-26-2023	39.86	60.14	40.32	19.88	6.29	0.49
<b>One Year Ago</b> 12-20-2022	20.41	79.59	52.55	25.95	10.90	3.85



Iowa



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:

Curtis Riganti  
National Drought Mitigation Center



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

# Impacts in Iowa

## Osceola officials ask residents to drink bottled water amid drought

Share



Updated: 6:12 PM CST Dec 15, 2023

According to State Climatologist Justin Glisan, last week was the 180th week in a row that certain areas of the state have experienced at least moderate drought.

That's almost 4 years, making this the longest continuous drought in the state since the 1950s.

# Impacts in Iowa

## Osceola officials ask residents to drink bottled water amid drought

Share



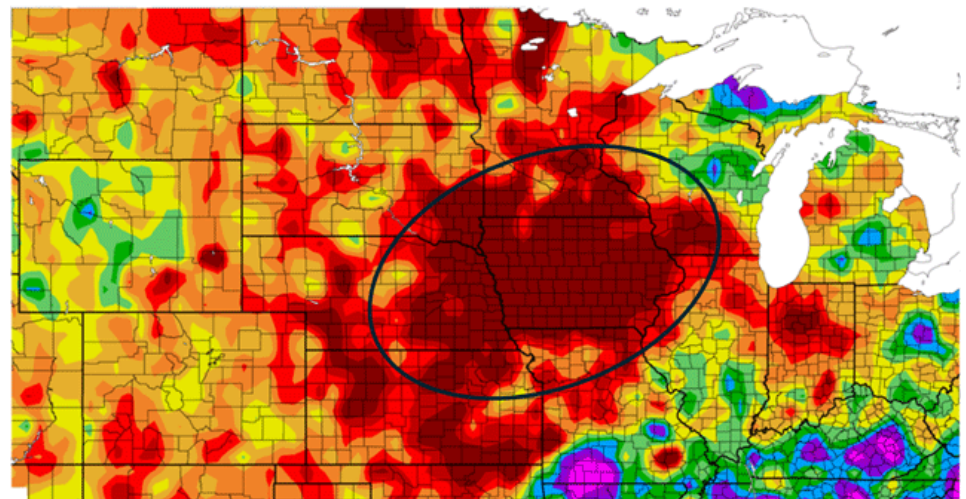
Updated: 6:12 PM CST Dec 15, 2023

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That's almost 4 years, making this the longest continuous drought in the state since the 1950s.



Departure from Normal Precipitation (in)  
12/12/2019 – 12/11/2023



## Ag Weather Forum

Driest Western Corn Belt in a Lifetime

12/18/2023 | 2:34 PM CST



By [Bryce Anderson](#), Ag Meteorologist Emeritus

Connect with Bryce:

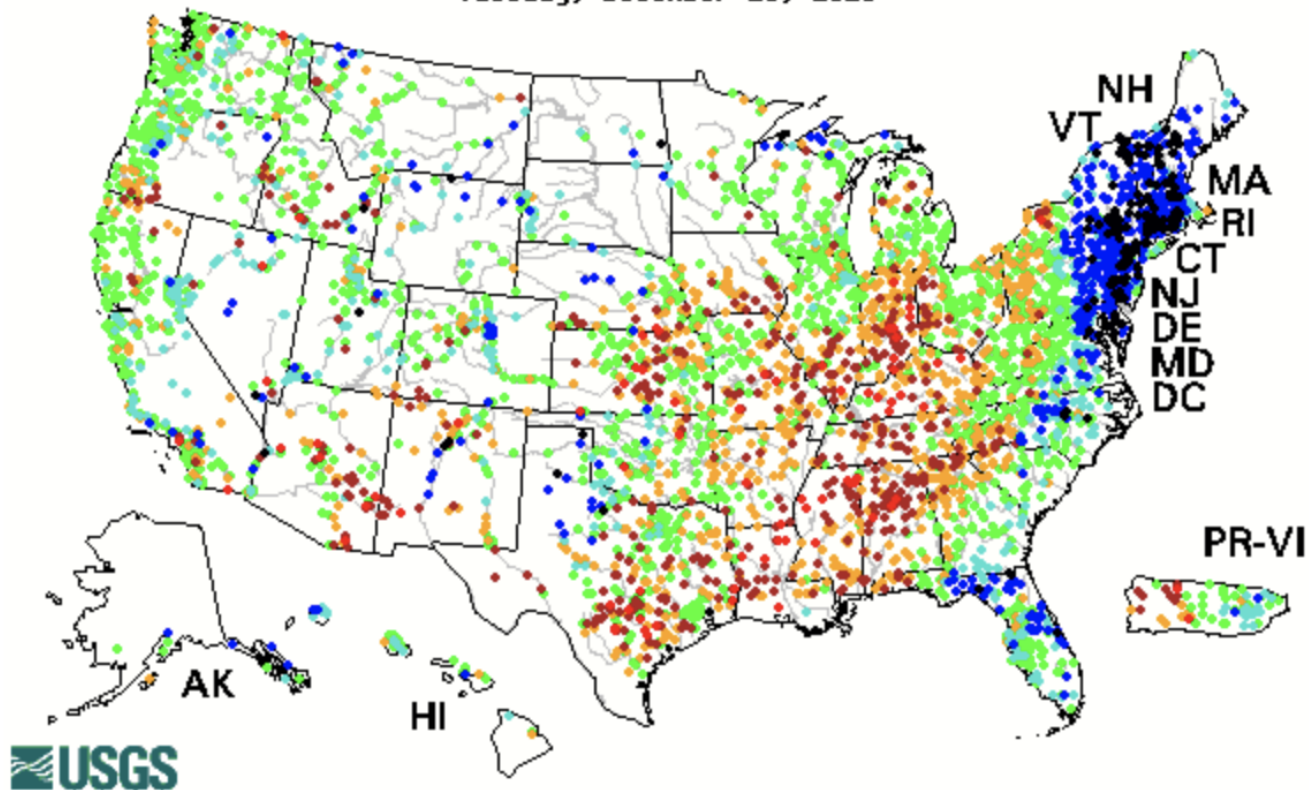
[@BAndersonDTN](#)

# 7-Day Average Streamflow

Tuesday, December 19, 2023

Tuesday, 19 December 2023

- Widespread low streamflow Southern MO + IL, Indiana, Kentucky
- Near-normal streamflow in Northern IL + Wisconsin
- Note: "Normal" category spans 25-75% of normal

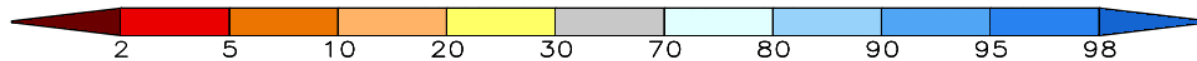
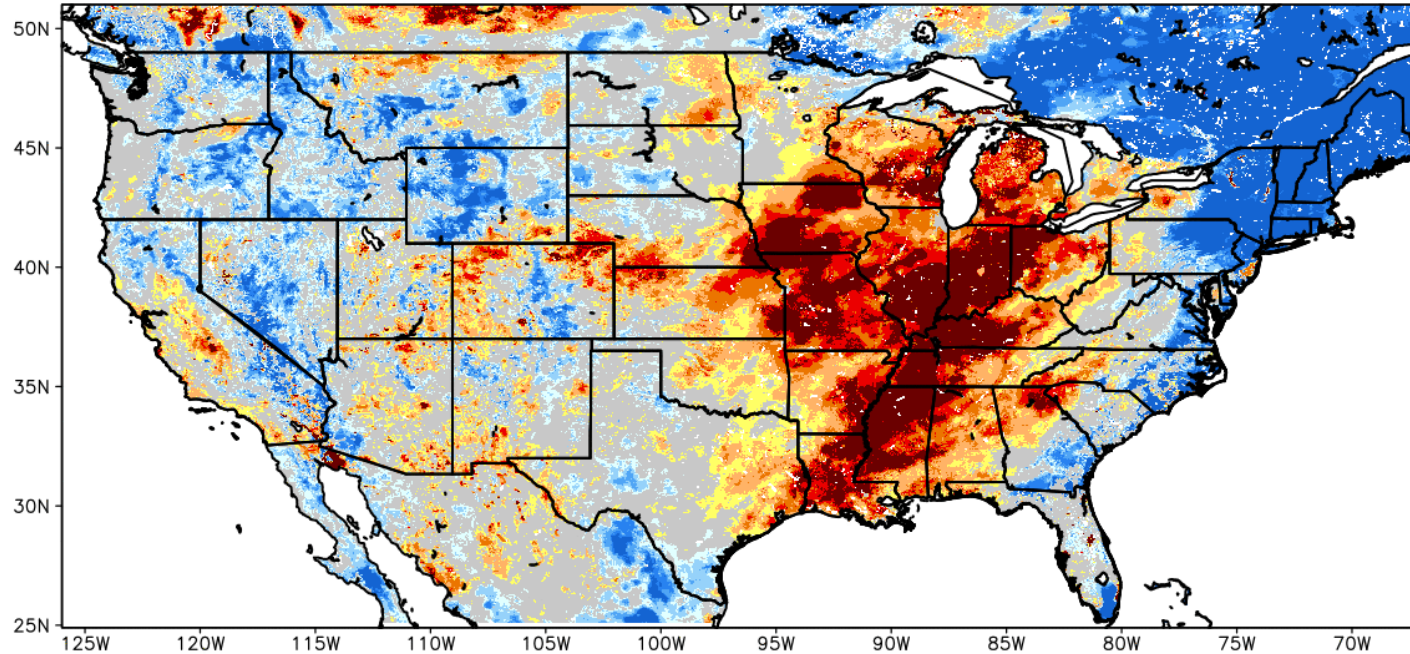


Explanation - Percentile classes							
Low	<10	10-24	25-75	76-90	>90	High	
	Much below normal	Below normal	Normal	Above normal	Much above normal		

<http://waterwatch.usgs.gov/index.php?id=pa07d>

# Soil Moisture

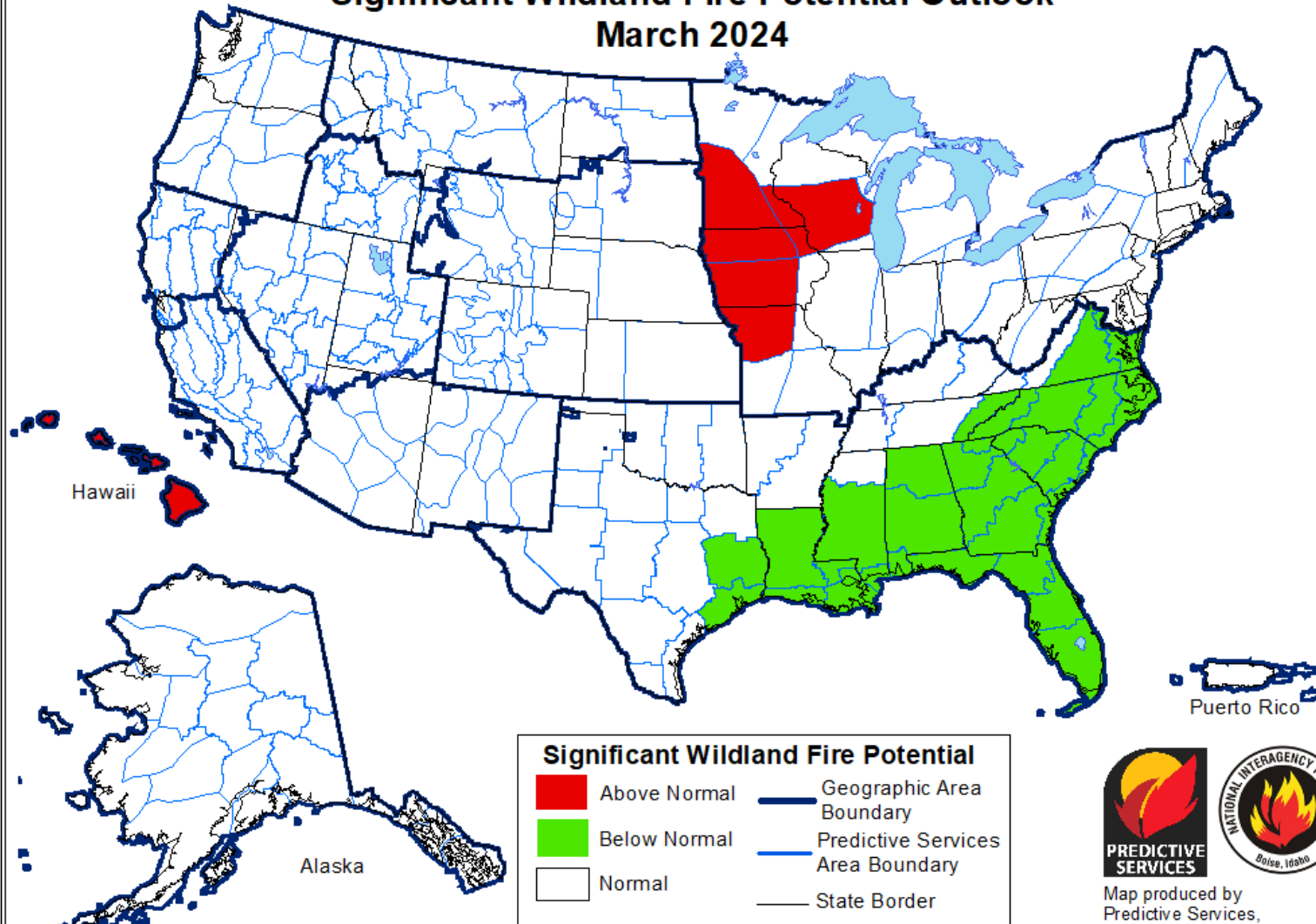
SPoRT-LIS 0-100 cm Soil Moisture percentile valid 20 Dec 2023



[https://weather.msfc.nasa.gov/sport/case\\_studies/lis\\_CONUS.html](https://weather.msfc.nasa.gov/sport/case_studies/lis_CONUS.html)

- Very dry soils in eastern region: IA, MO, IL, WI, MI, IN, KY, OH
- Subsoil “bone dry” in Iowa and Indiana
- Cover crop growth in Indiana is very slow
- Could lead to major agriculture impacts in IA if drought persists

# Significant Wildland Fire Potential Outlook March 2024



Above normal significant wildland fire potential indicates a greater than usual likelihood that significant wildland fires will occur. Significant wildland fires should be expected at typical times and intervals during normal significant wildland fire potential conditions. Significant wildland fires are still possible but less likely than usual during forecasted below normal periods.



Map produced by  
Predictive Services,  
National Interagency Fire Center  
Boise, Idaho  
Issued December 1, 2023  
Next issuance January 2, 2024



# Farmers face struggle through continued Mississippi River drought, Core continues to dredge

Extreme drought and a warm fall has left water levels in the Mississippi River low, proving problematic for farmers relying on the river to get crops to market

By Kennedy Hayes | FOXBusiness |



U.S. Stock Market Quotes

Quotes displayed in real-time

## Trouble comes to the Mississippi from prolonged drought

Commerce threatened in the nation's busiest shipping channel (Roll Call)

“We’ve got rice sold that we’re delivering right now, and it was supposed to be delivered to a river port, but they switched it to an in-land facility because they can’t do barges because the river is so low,” Jennings said.

- *USACE still dredging to enable navigation, but smaller barge loads are the norm*



ENVIRONMENT

# Nonstop dredging kept Mississippi River open this year, but moving sand creates its own problems



by **Chloe Johnson** / **Minneapolis Star Tribune**

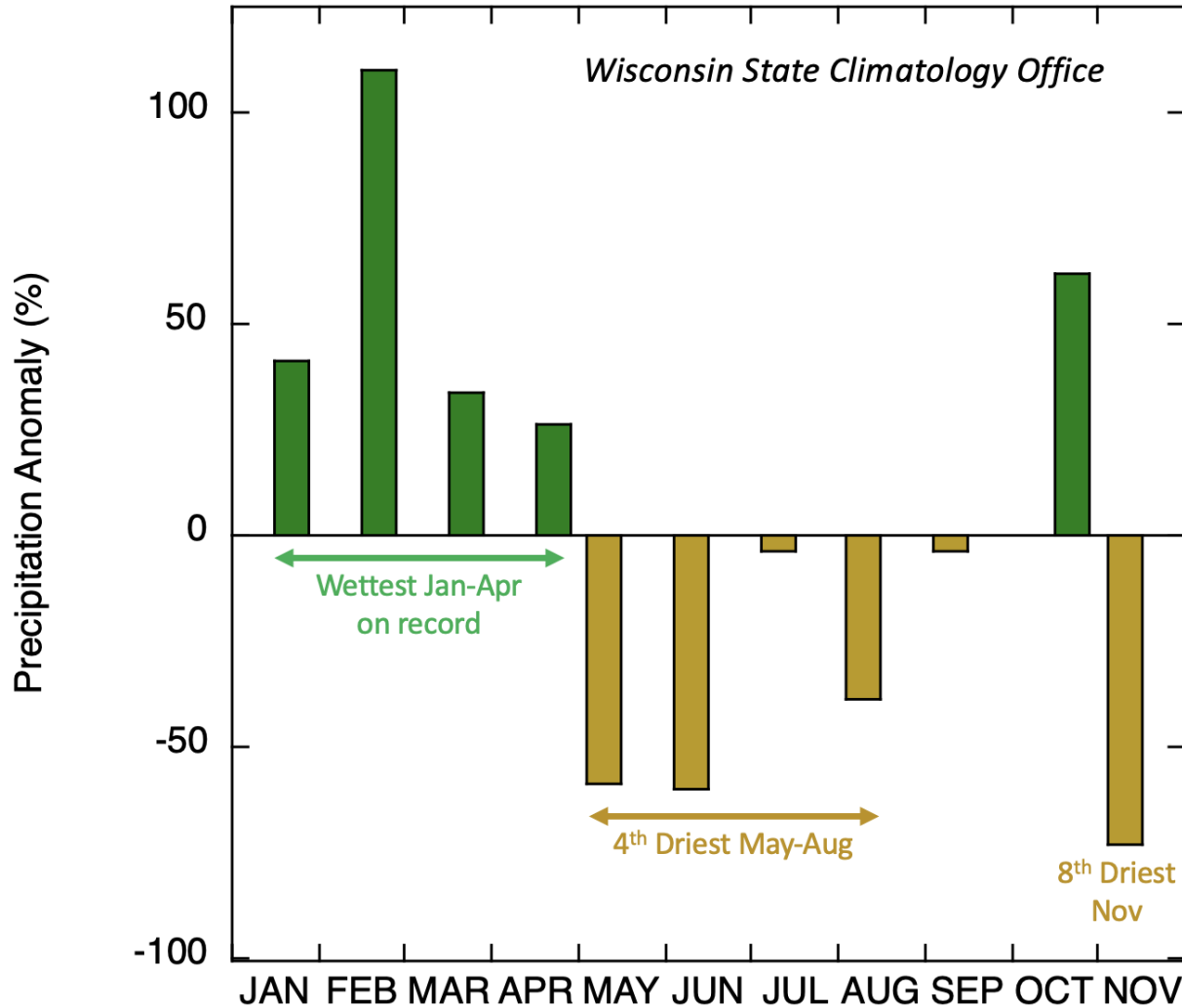
December 14th, 2023  Why you can trust Wisconsin Watch



“A quick switch from flood to drought is one of the most challenging dredging scenarios . . . .A sudden drop in flow means the water in the river loses velocity, and all the sand flowing with it drops to the bottom.”

# Precipitation Ping Pong (Wisconsin)

## 2023 Monthly Precipitation Anomalies in Wisconsin (percent)



# Outlooks

**It's Beginning to Look a Lot Like. . . .**

**It's Beginning to Look a Lot Like. . . . Easter!**

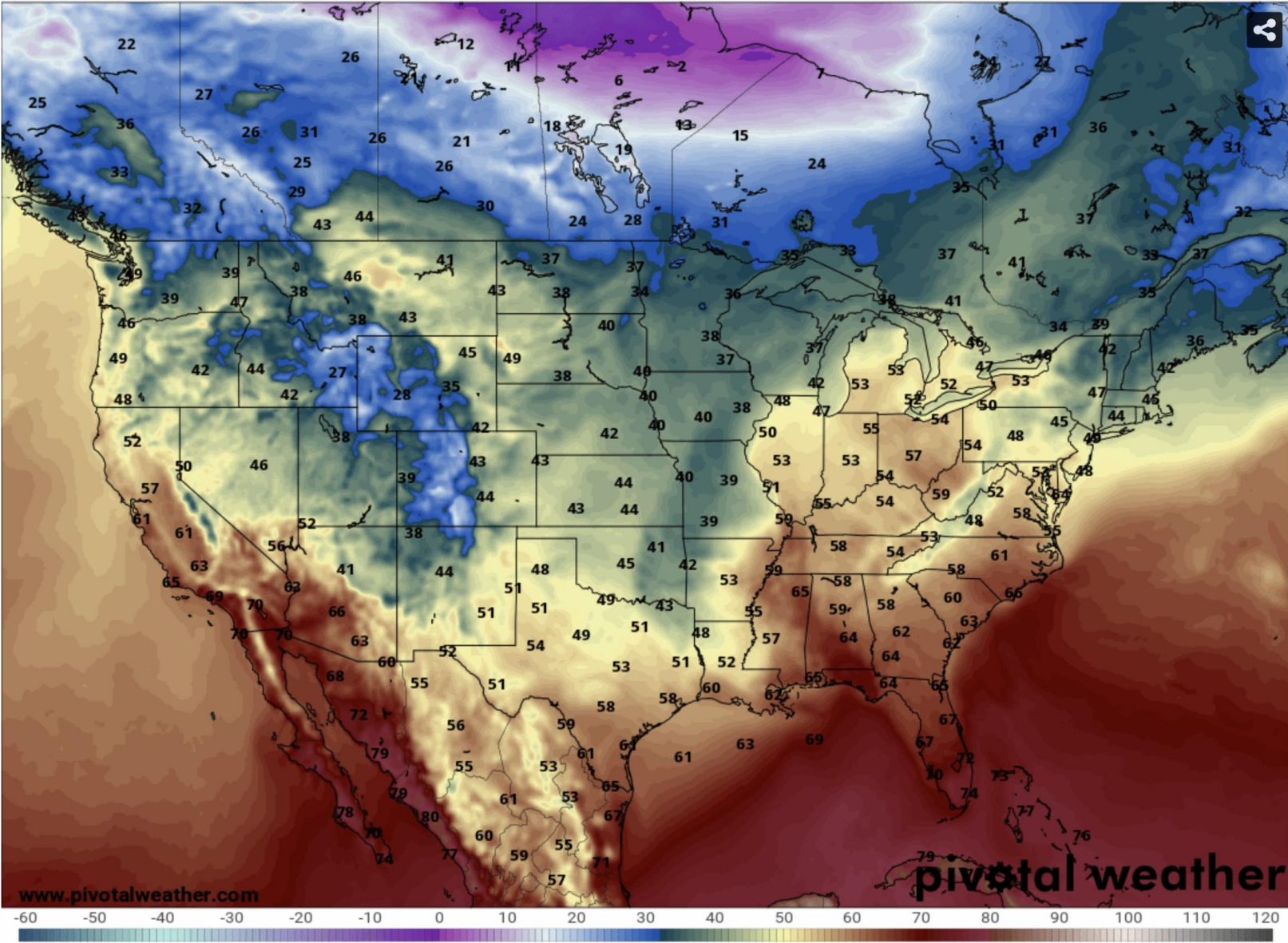


*Photograph: Acorn 1/Alamy*

# Christmas Afternoon Temperatures (GFS)

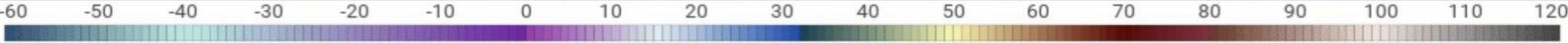
2 m AGL Temperature (°F)  
F111 Valid: Mon 2023-12-25 21z

Init: Thu 2023-12-21 06z GFS



www.pivotalweather.com

pivotal weather

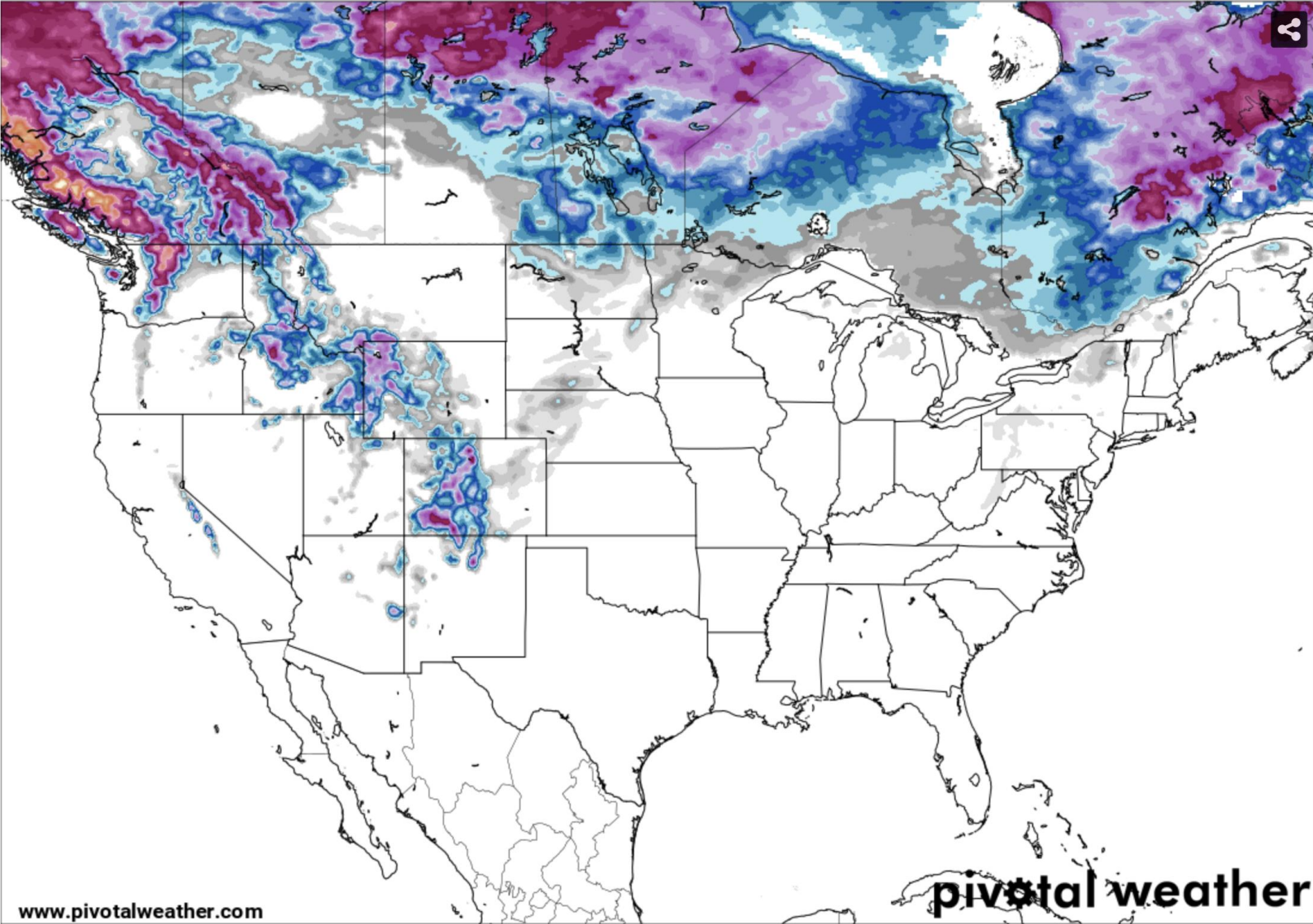


# Christmas Afternoon Snow Depth (GFS)

Snow Depth (in)

F111 Valid: Mon 2023-12-25 21z

Init: Thu 2023-12-21 06z GFS



[www.pivotalweather.com](http://www.pivotalweather.com)

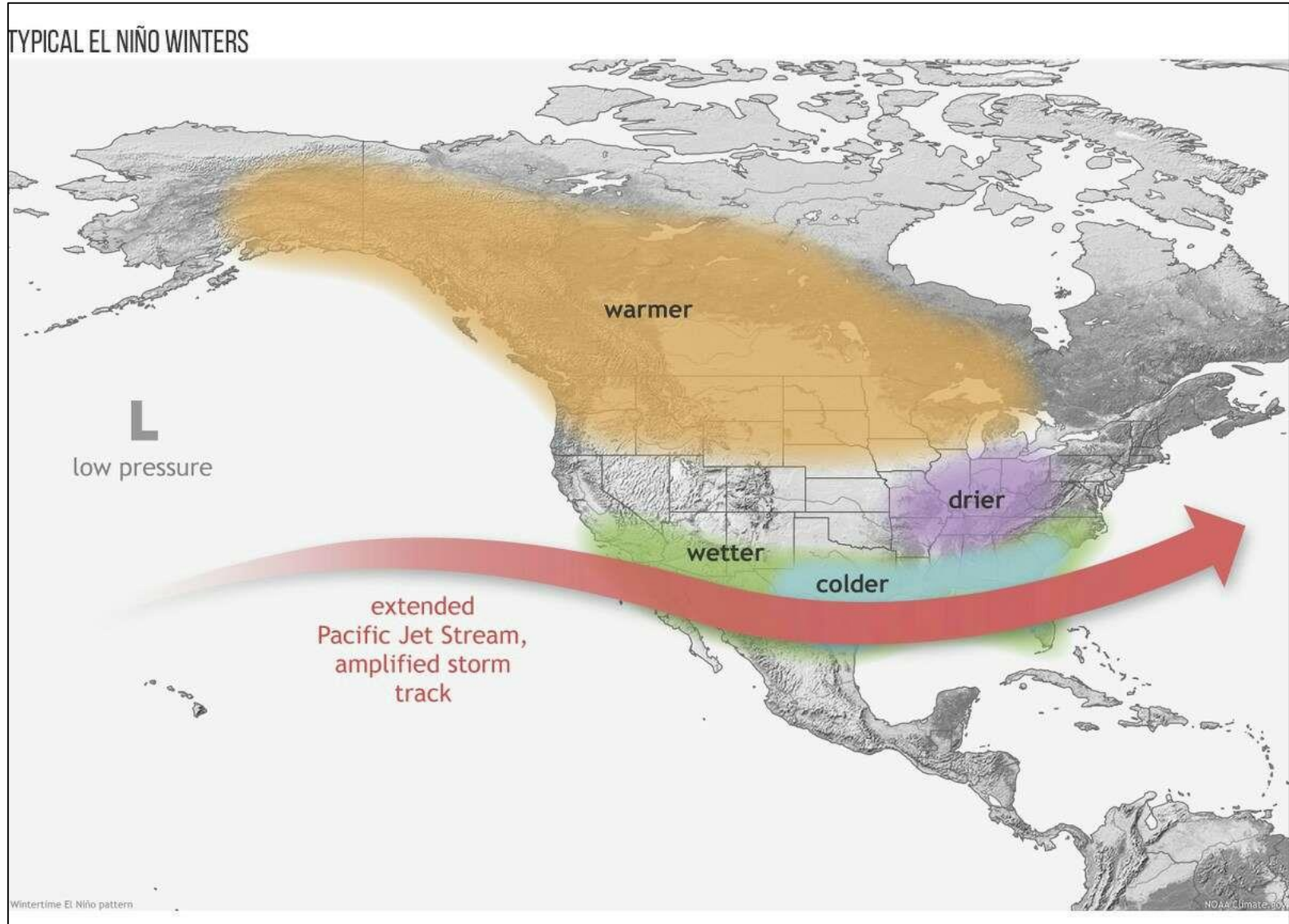
**pivotal weather**





# Typical El Niño Pattern during Winter

*Strong El Niño in Tropical Pacific, virtually certain to persist into the spring*



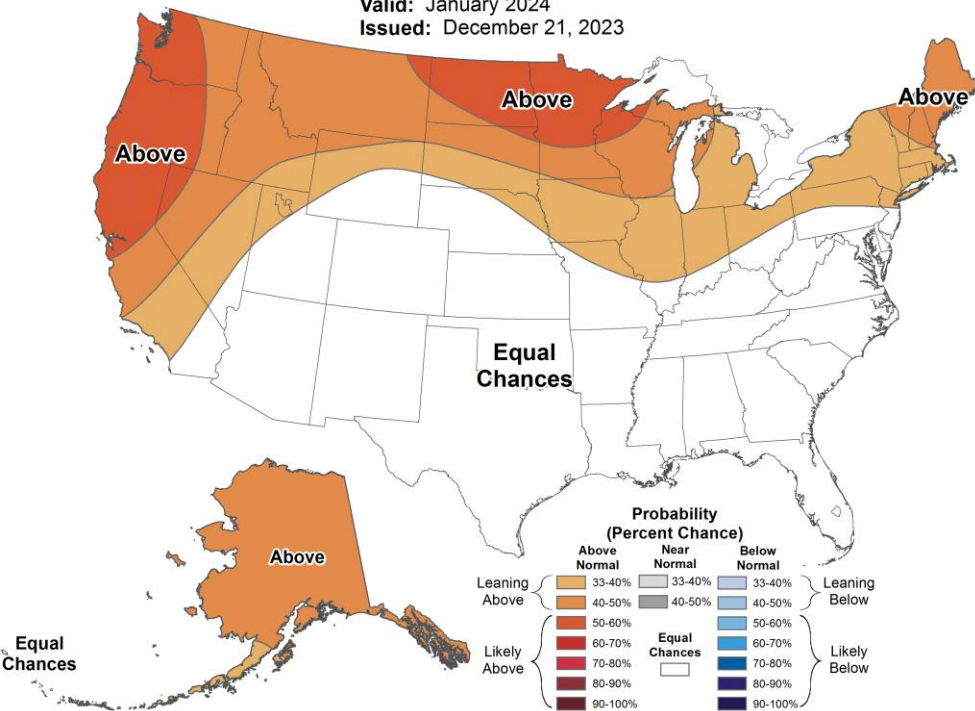
# Winter Outlook

## January



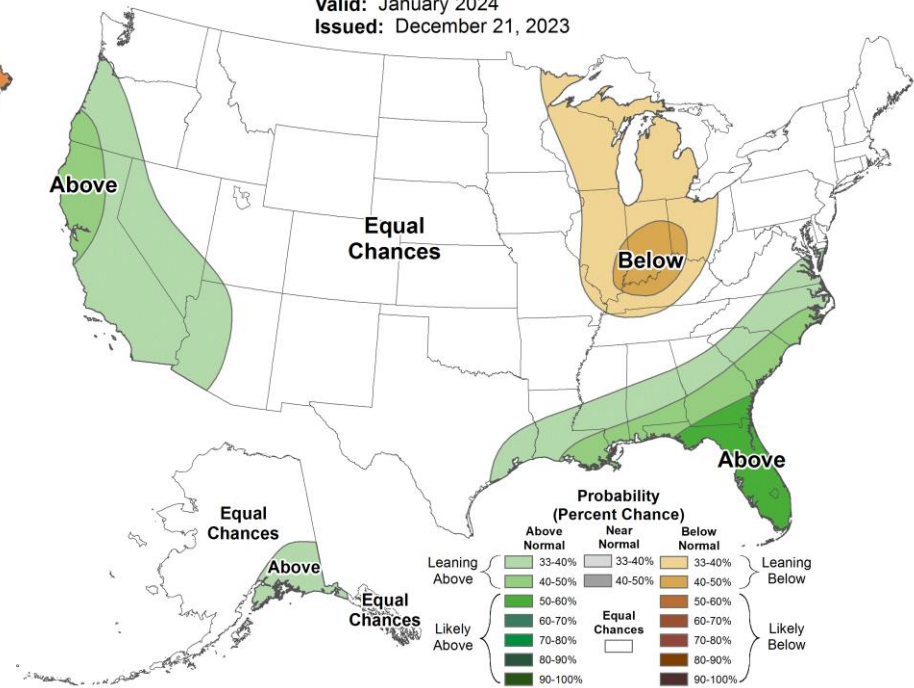
### Monthly Temperature Outlook

Valid: January 2024  
Issued: December 21, 2023



### Monthly Precipitation Outlook

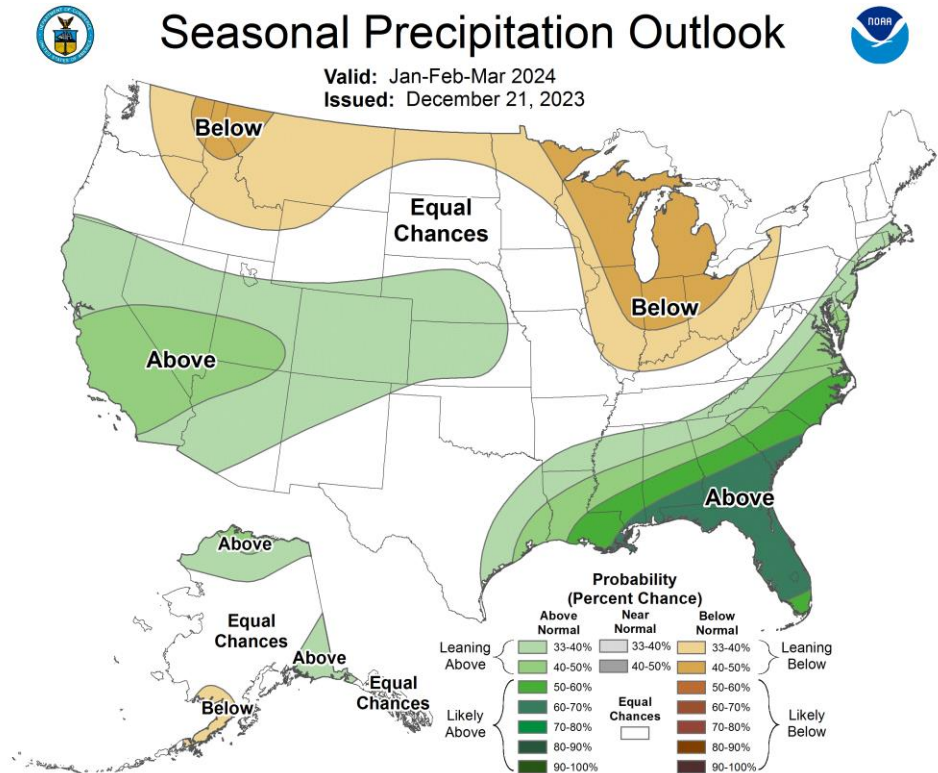
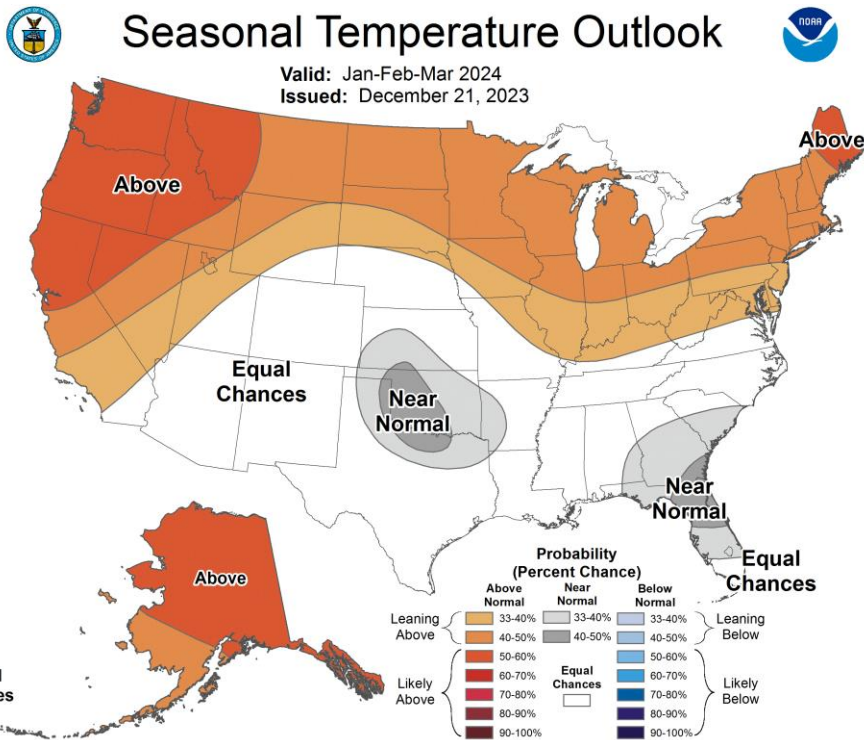
Valid: January 2024  
Issued: December 21, 2023



*Typical El Niño-like pattern*

# Winter Outlook

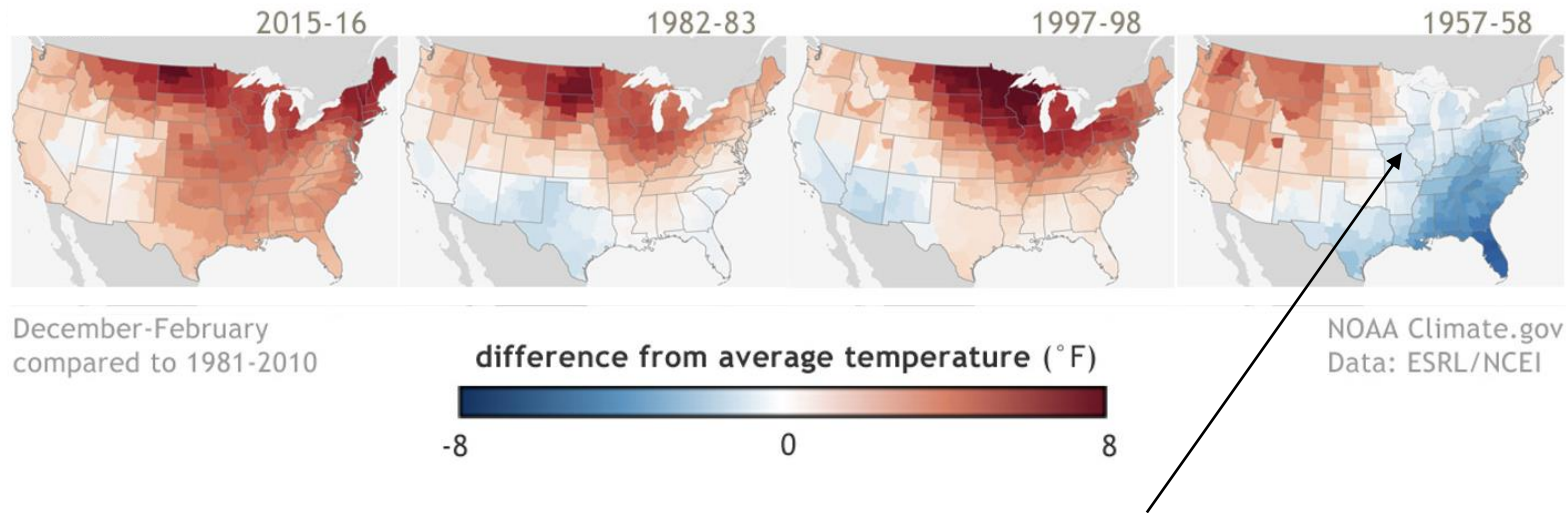
## January-March



*Typical El Niño-like pattern*

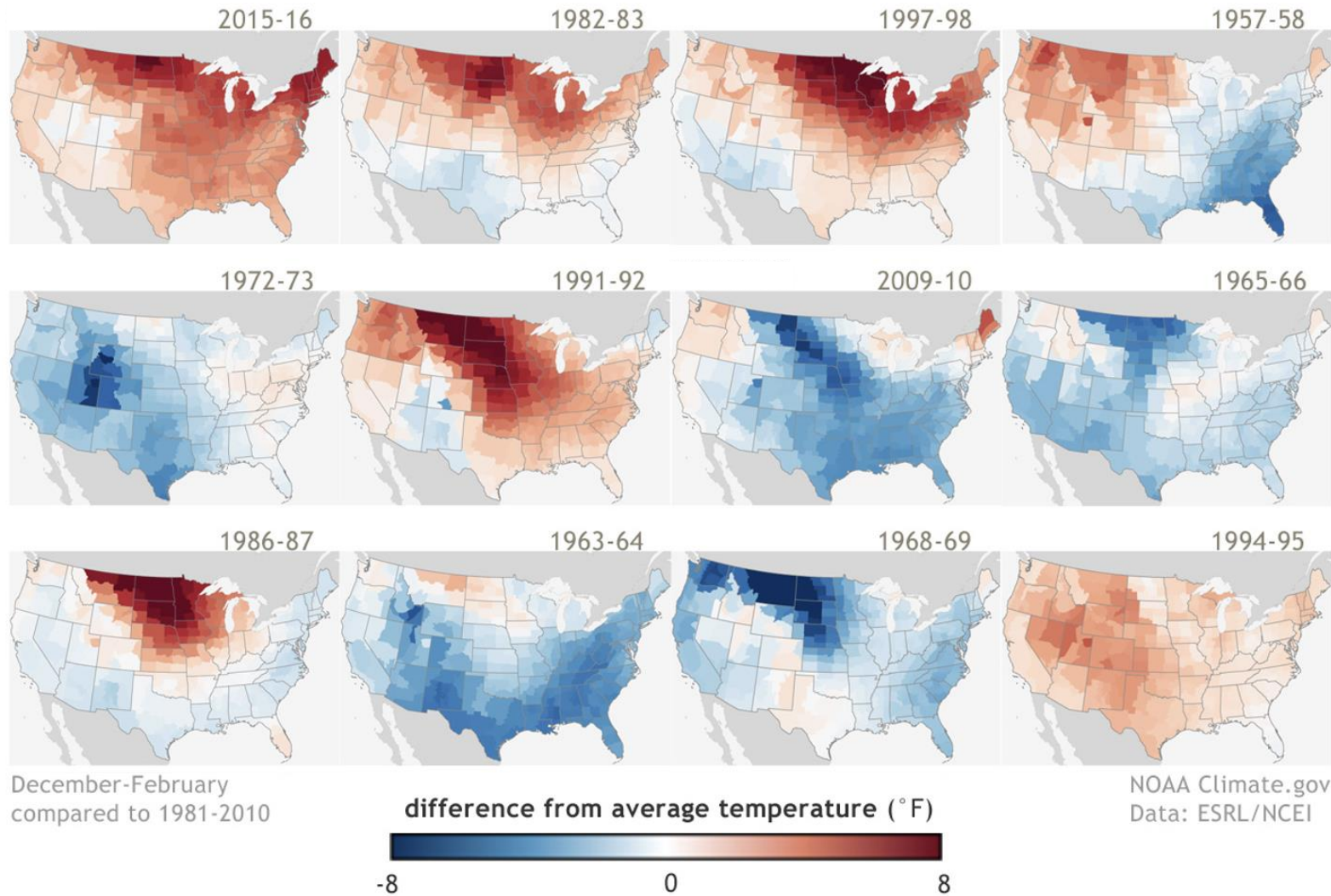
# Winters during Moderate-Strong El Niños since 1950

Strong



*\* One out of the four strong El Niños didn't fit the mold (east of MN)*

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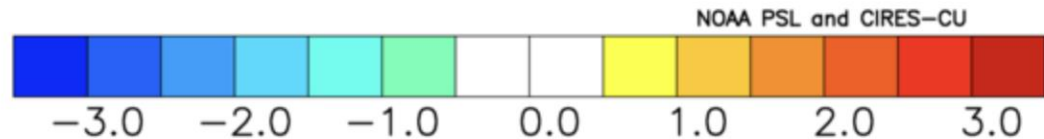
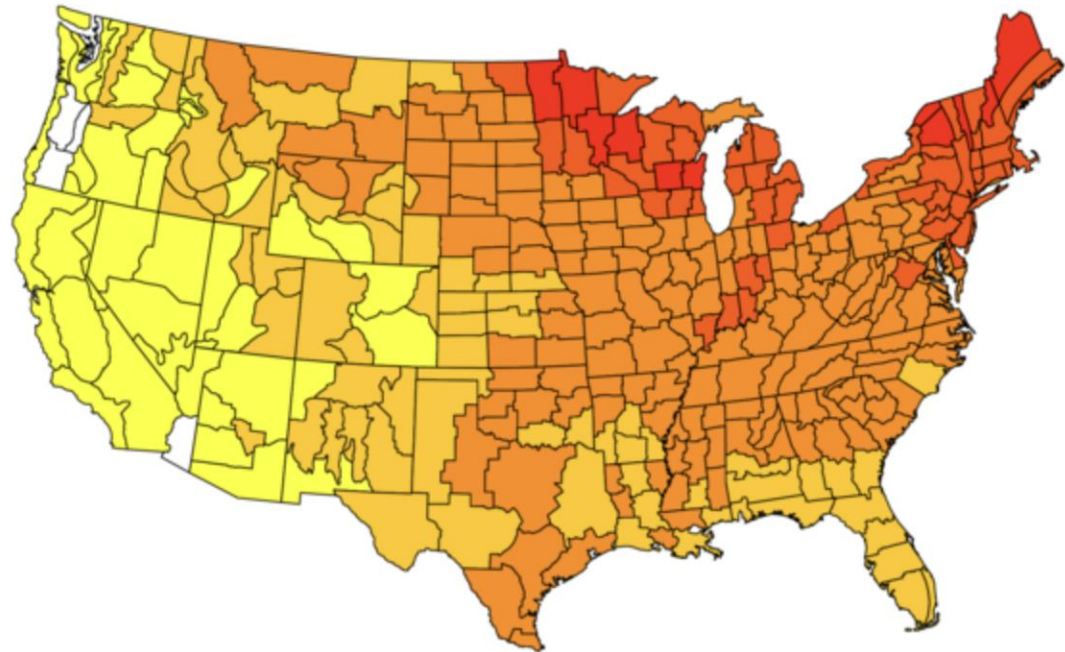


*\* Several moderate El Niños didn't fit the mold (some colder than normal)*

# Warming Winters also due to Climate Change

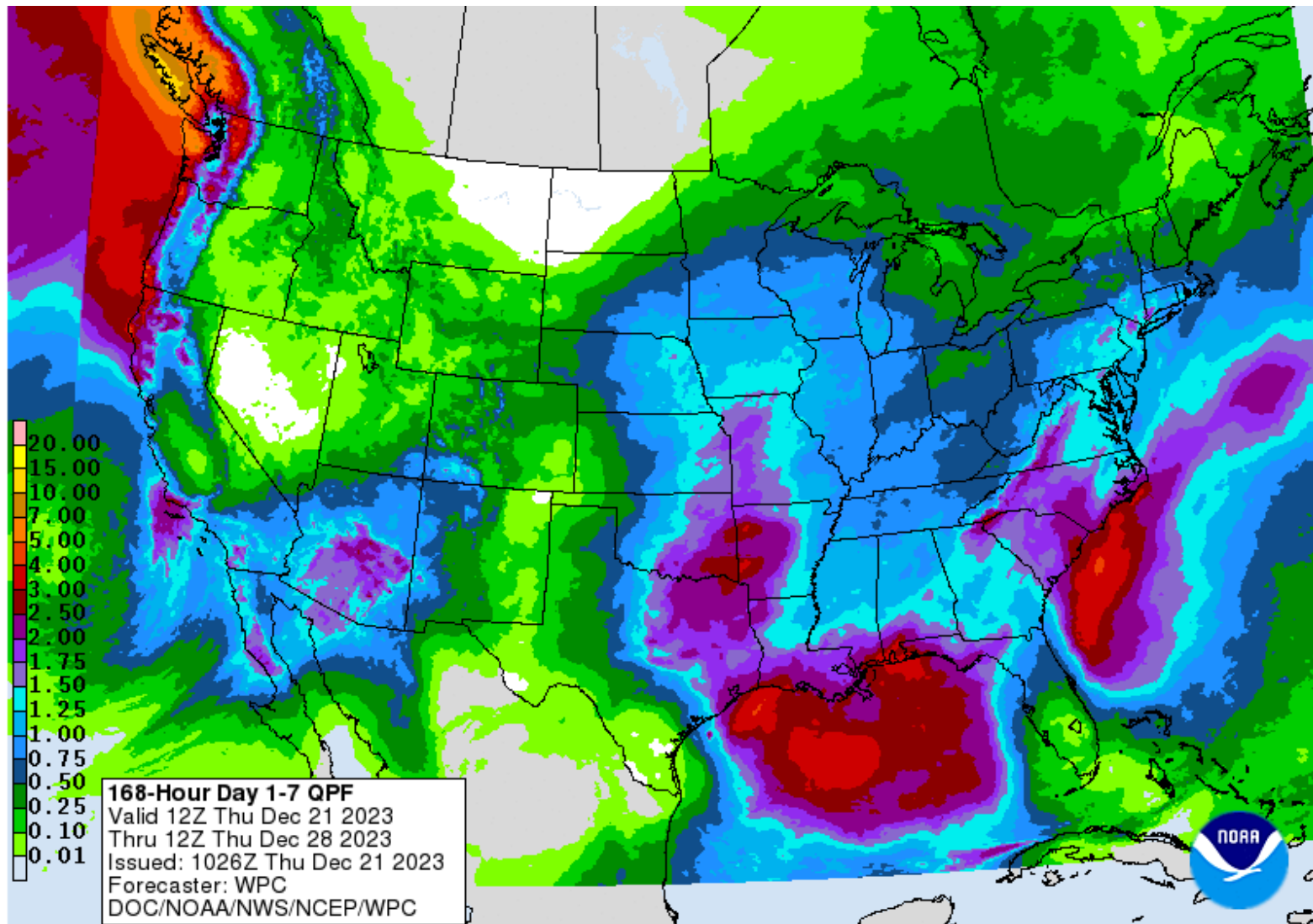
NOAA/NCEI Climate Division Composite Temperature Anomalies (F)  
Dec to Feb 1997–98 to 2022–23  
Versus 1971–2000 Longterm Average

Temperature anomalies during  
past 25 winters  
(vs. 1971-2000 normal)



*Long-term trends muddy the influence of El Niños on winter weather*

# 7-Day Precipitation Forecast (through Dec 28)



<https://www.wpc.ncep.noaa.gov/qpf/day1-7.shtml>

- *Heavy rainfall possible in Missouri and eastern Kansas (1.5"+)*
- *Substantial precipitation possible in most of North Central region*

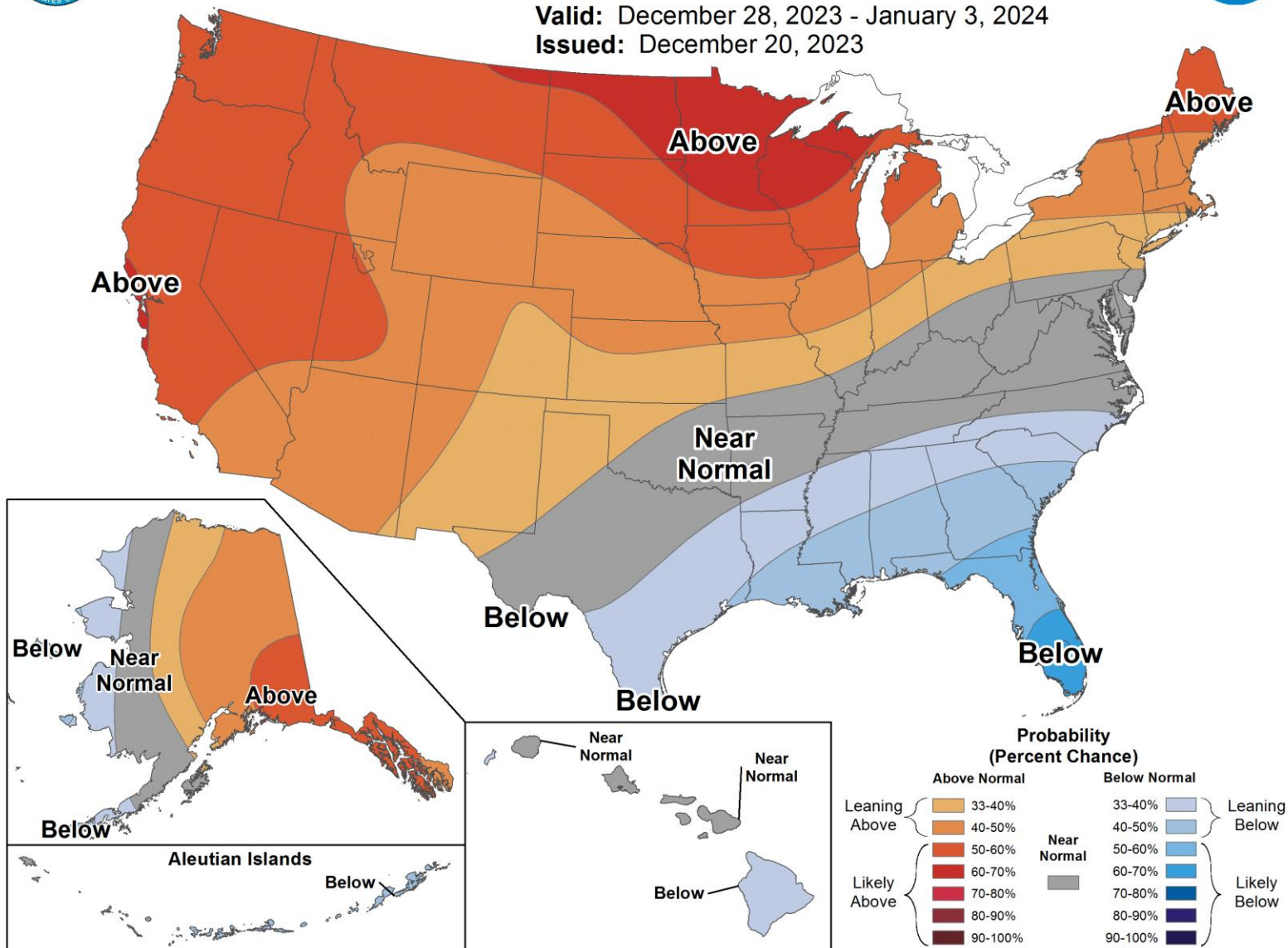


# 8-14 Day Temperature Outlook



Valid: December 28, 2023 - January 3, 2024

Issued: December 20, 2023





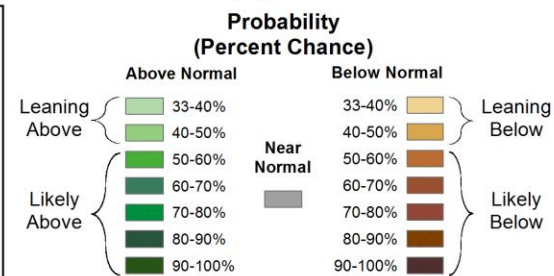
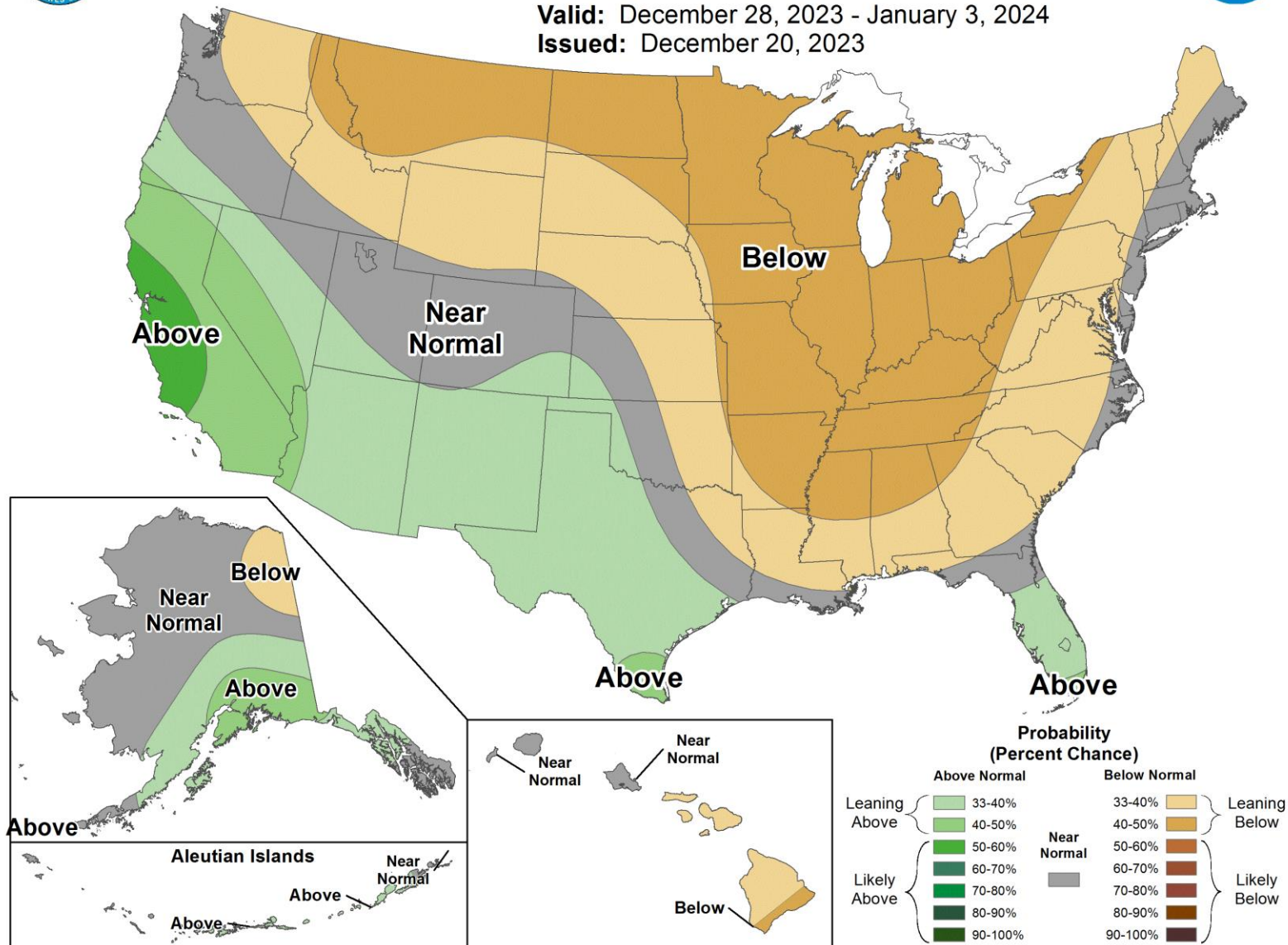


# 8-14 Day Precipitation Outlook



Valid: December 28, 2023 - January 3, 2024

Issued: December 20, 2023



# Major Take-aways

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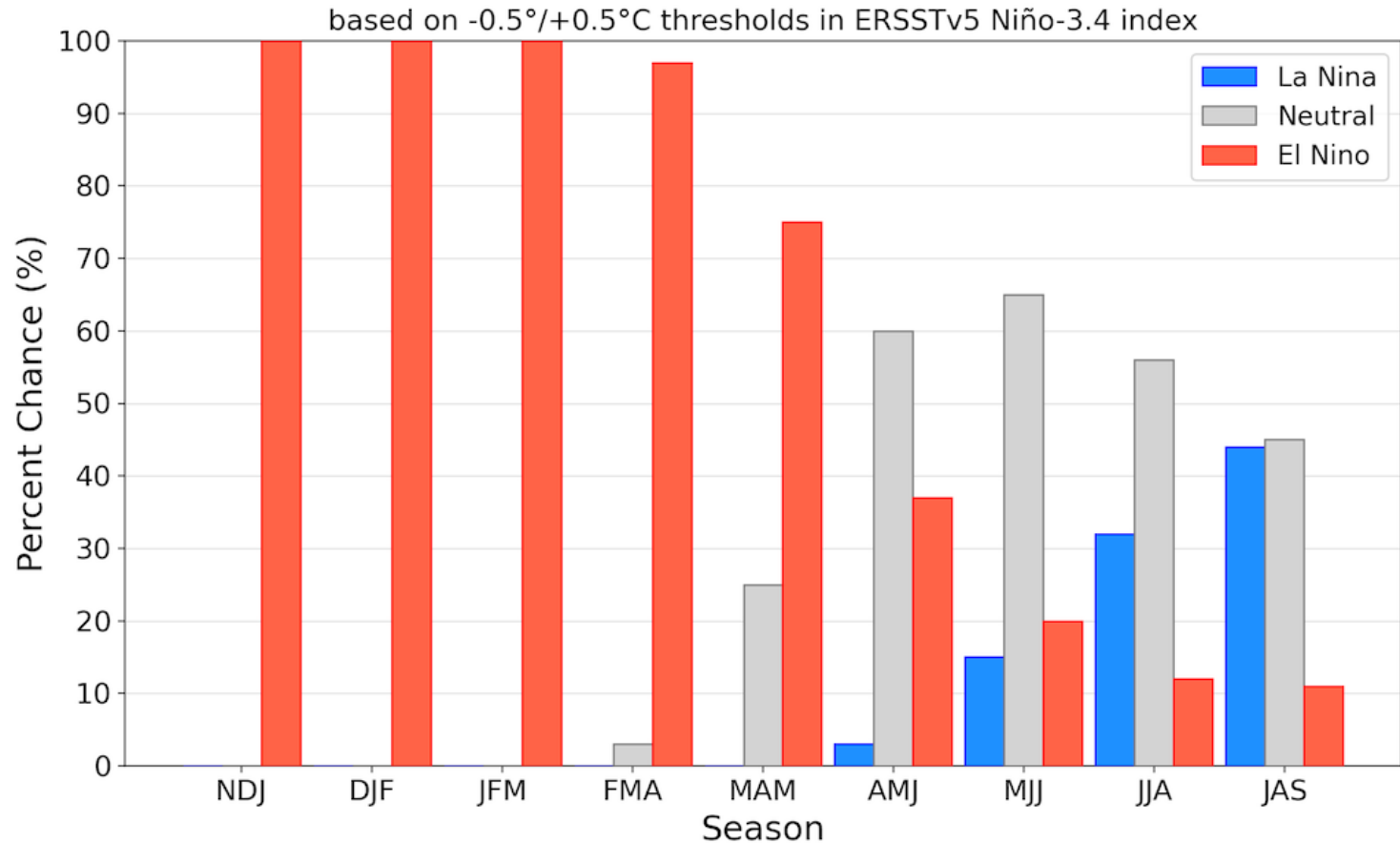
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- White Christmas? Fuhgeddaboutit! (except maybe for a lucky few from CO to MN)
- Wintertime El Niño weather pattern is alive and well → warm northern U.S. + dry tendency
- A continuation of the mild winter is likely, but *don't take it to the bank*

Extra slides



# Forecasted El Niño Evolution through next Summer

Official NOAA CPC ENSO Probabilities (issued Dec. 2023)



- *El Niño virtually certain to continue into spring*
- *After that, either neutral conditions or La Niña likely*