



Madison's 3rd coldest day this winter (Dec 11, 2024). Credit: WI SCO.

North Central U.S. Climate & Drought Outlook

December 19, 2024

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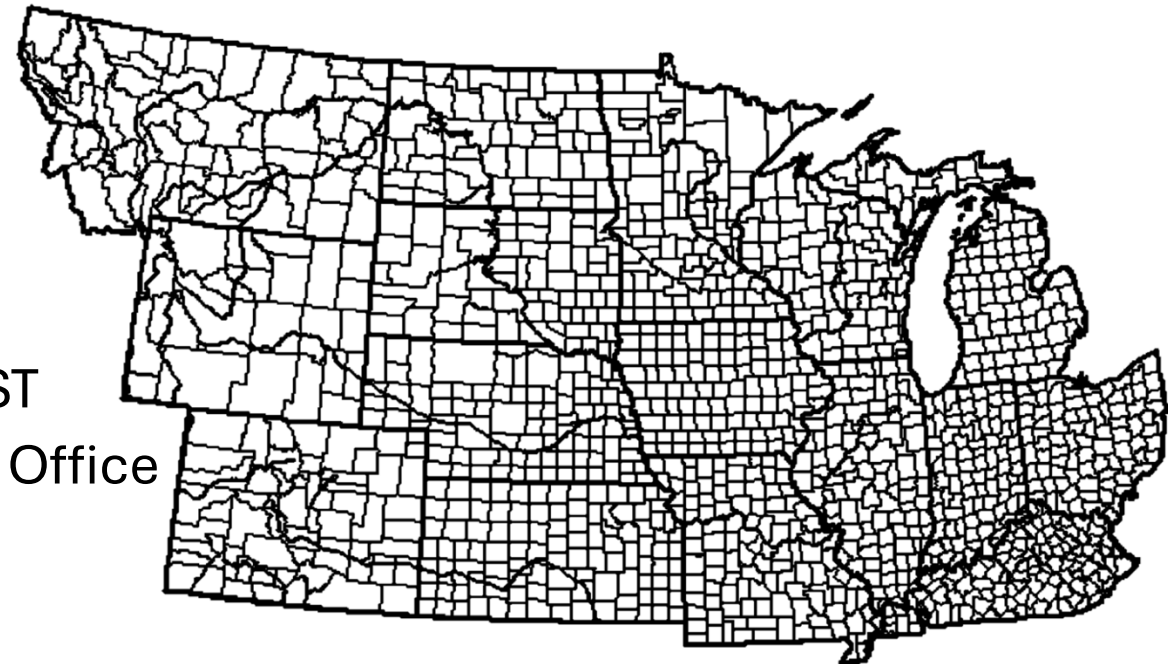


Wisconsin State Climatology Office

UNIVERSITY OF WISCONSIN-MADISON

General Information

- Providing Climate Services to the North Central U.S.
 - Collaboration Among:
 - NOAA NCEI, NWS, OAR, and NIDIS
 - USDA Climate Hubs
 - American Association of State Climatologists
 - Midwest and High Plains Regional Climate Centers
 - National Drought Mitigation Center
- Today's and Past Recorded Webinars
 - <https://mrcc.purdue.edu/webinars>
 - <https://hprcc.unl.edu/webinars.php>
- Next Webinar
 - Thursday, January 16, 2024 @ 1:00pm CST
 - Dr. Zachary Hoylman – Montana Climate Office



Outline

- Recent Temperature & Precipitation
- Impacts
 - Agriculture
 - Drought
 - Hydrology
- Winter weather
- Outlooks
- Questions

November in Indiana
Credit: Melissa Widhalm



Recent Temperature & Precipitation

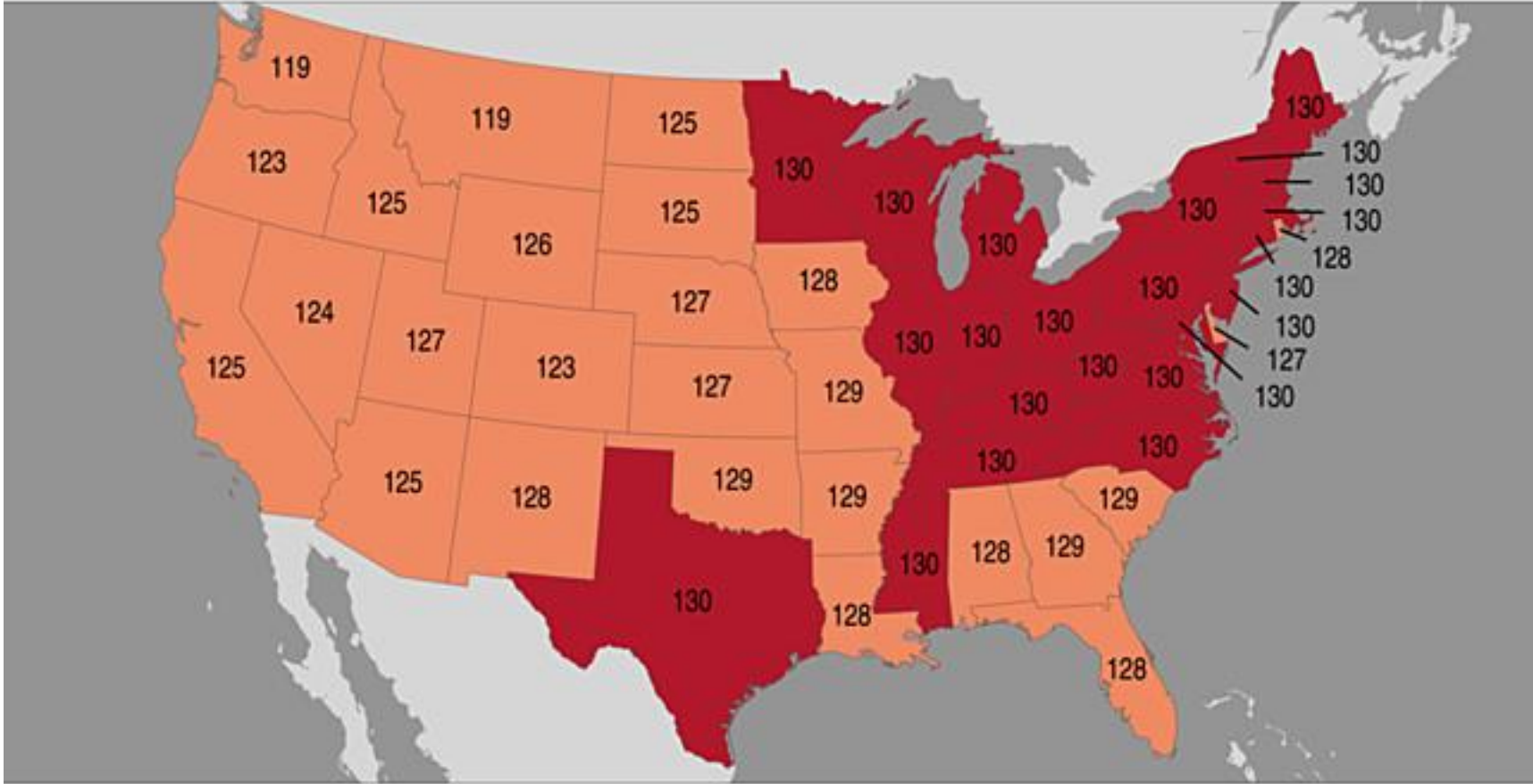
January-November 2024

Statewide Average Temperature Ranks

January - November 2024

Ranking Period: 1895-2024

NOAA's National Centers for Environmental Information



- Record warmest Jan-Nov 2024 in North Central U.S.:
 - IL, IN, KY, MI, MN, OH, WI
- Many other states in our region near their record warmest Jan-Nov 2024

Record Coldest
(1)

Much Below Average

Below Average

Near Average

Above
Average

Much Above Average

Record Warmest
(130)



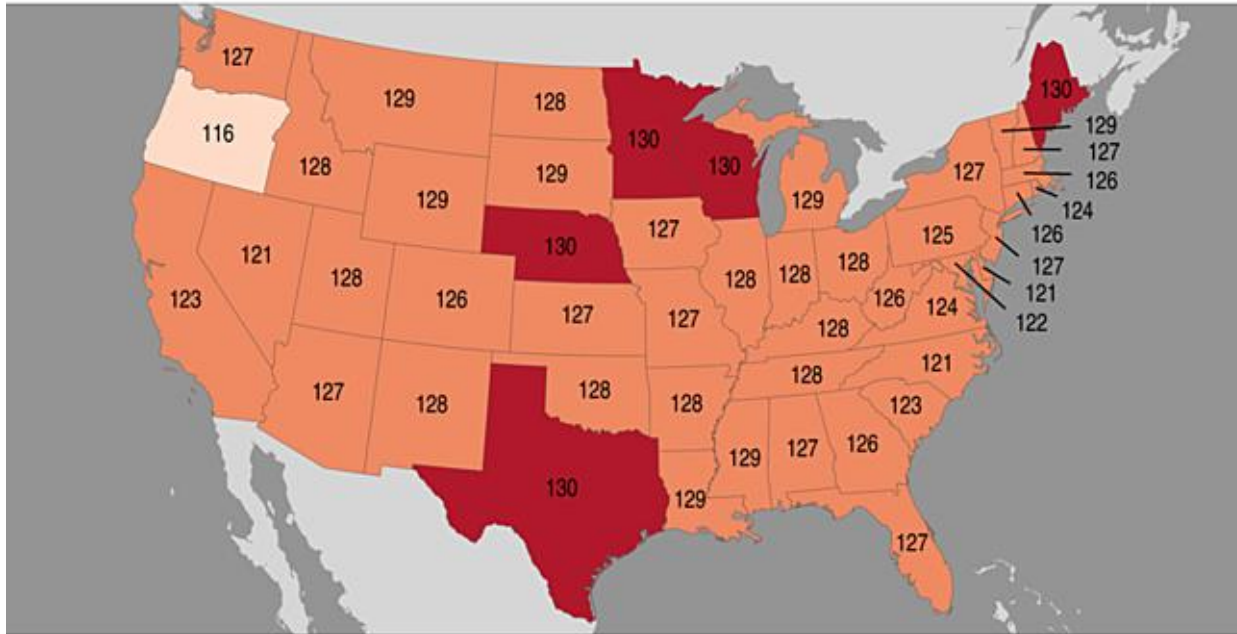
Autumn (September-November)

Statewide Average Temperature Ranks

September - November 2024

Ranking Period: 1895-2024

NOAA's National Centers for Environmental Information



Created: Thu Dec 5 2024
Source: nClimGrid - Monthly

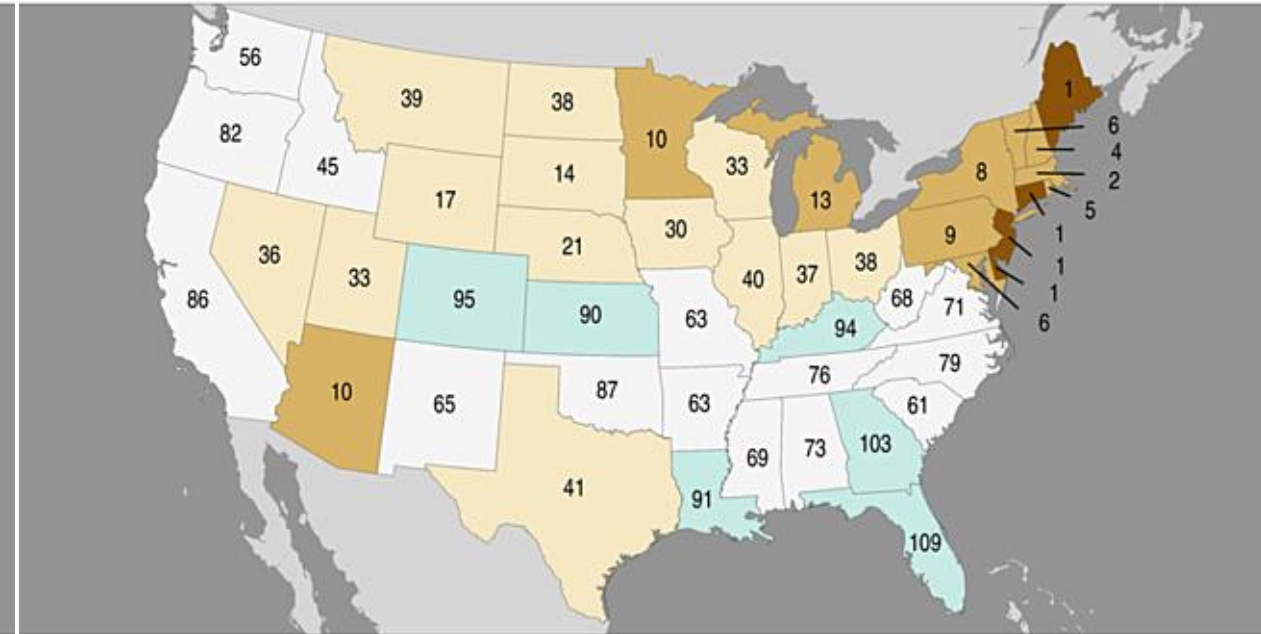
- Record warmest fall: MN, NE, WI
- 2nd or 3rd warmest for all others in the region
 - Except CO, which was 4th warmest

Statewide Precipitation Ranks

September - November 2024

Ranking Period: 1895-2024

NOAA's National Centers for Environmental Information



Created: Thu Dec 5 2024
Source: nClimGrid - Monthly

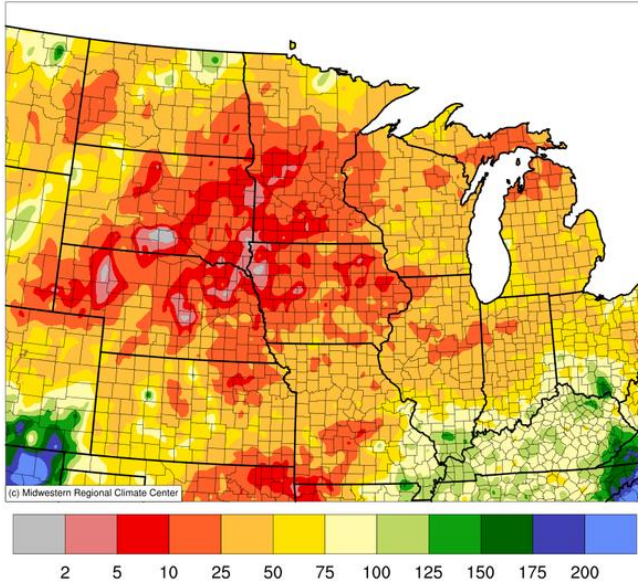


- Drier than average in mid & northern states
 - Particularly MN & MI
- Wetter than average in CO, KS, and KY
- Near normal in MO

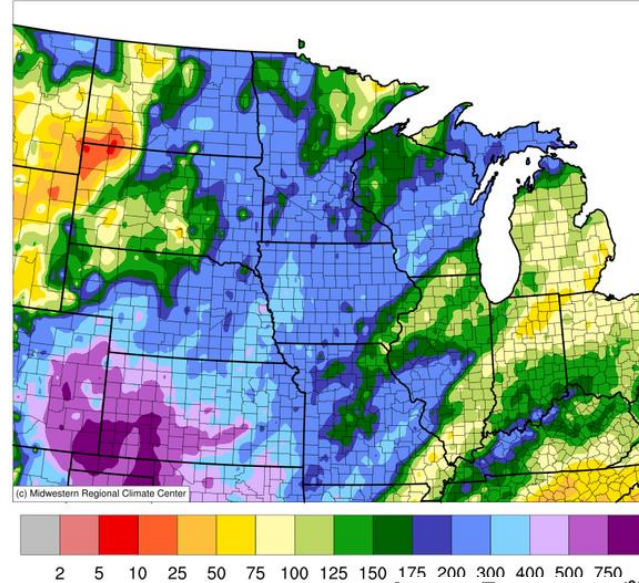
Credit: [NCEI](#)

September 1-October 30 → October 31-November 30

Accumulated Precipitation (in): Percent of 1991-2020 Normals
September 01, 2024 to October 30, 2024

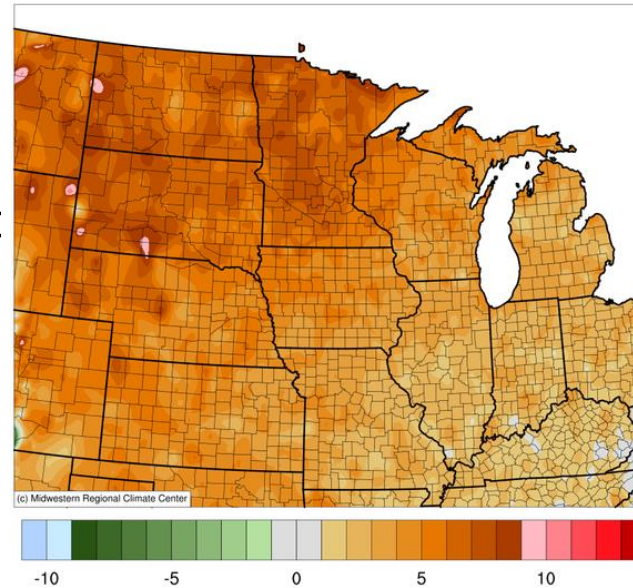


Accumulated Precipitation (in): Percent of 1991-2020 Normals
October 31, 2024 to November 30, 2024

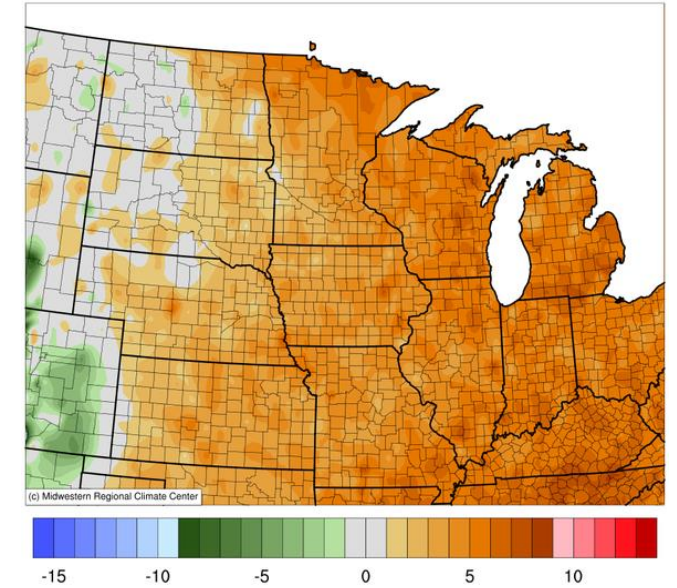


- Sept 1-Oct 30 Precip
 - Most of region < 50% of normal
 - Patches in the Plains < 5% of normal
- Oct 31-Nov 30 Precip
 - Widespread 200+% of normal
 - 750% of normal in SW KS/SE CO
 - Monthly totals of 2-10+” in KS

Average Temperature (°F): Departure from 1991-2020 Normals
September 01, 2024 to October 30, 2024



Average Temperature (°F): Departure from 1991-2020 Normals
October 31, 2024 to November 30, 2024



- Sept 1-Oct 30 Temp
 - Widespread warmth, particularly to the northwest (+8-10°F)
- Oct 31-Nov 30 Temp
 - Warmer to the east
 - Near normal to the west
 - Below normal in CO & WY

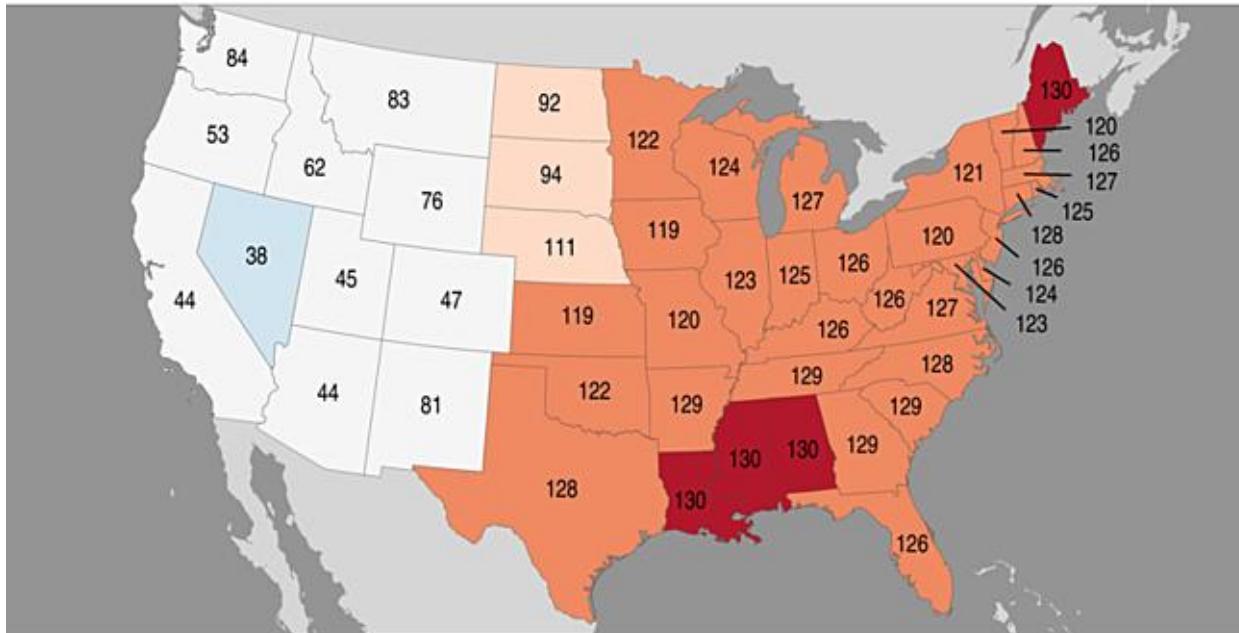
November

Statewide Average Temperature Ranks

November 2024

Ranking Period: 1895-2024

NOAA's National Centers for Environmental Information



Created: Thu Dec 5 2024
Source: nClimGrid - Monthly

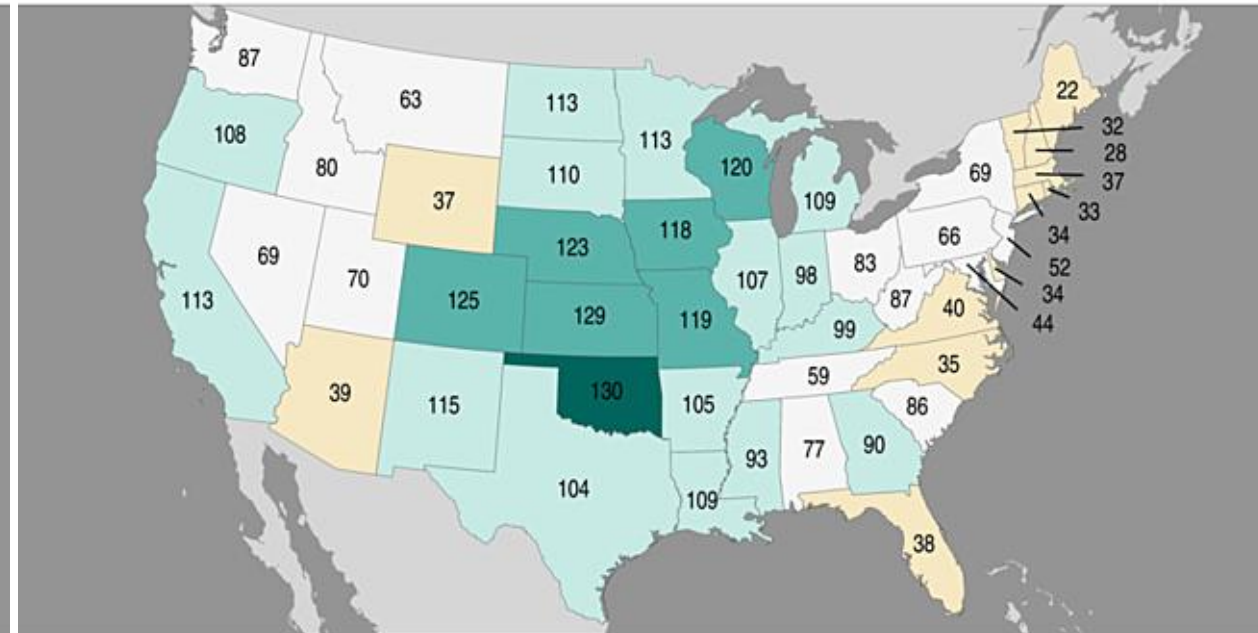


Statewide Precipitation Ranks

November 2024

Ranking Period: 1895-2024

NOAA's National Centers for Environmental Information



Created: Thu Dec 5 2024
Source: nClimGrid - Monthly

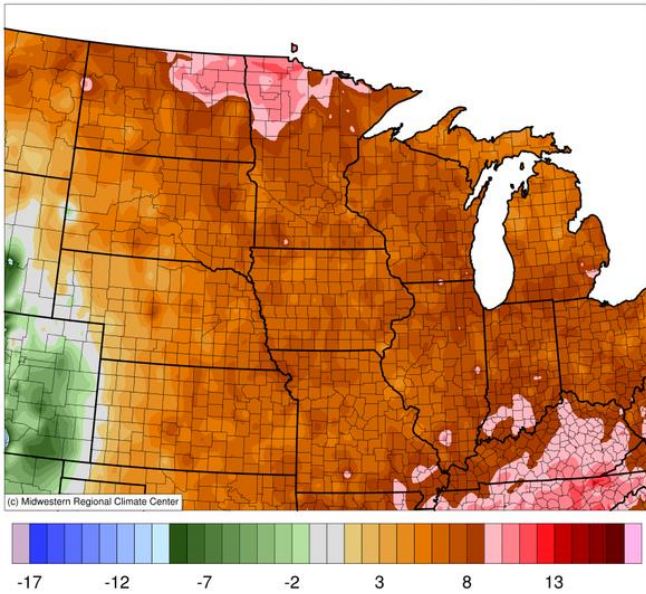


- Top 10 warmest for Midwestern states (11th for IA)
- Warmer than normal in the Plains
- Near normal to west

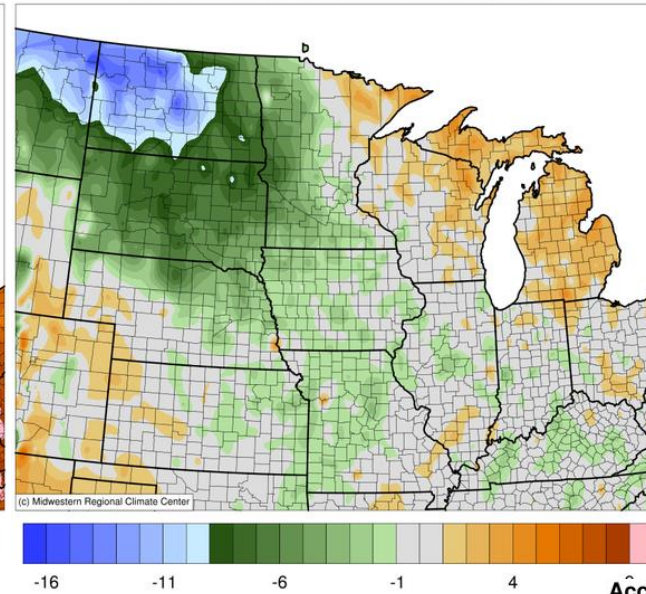
- Kansas saw its 2nd wettest November
- CO, NE, IA, WI had top 10 wettest
- Wetter than normal for others, except OH, MT, WY

November 1-19 → November 20-30

Average Temperature (°F): Departure from 1991-2020 Normals
November 01, 2024 to November 19, 2024



Average Temperature (°F): Departure from 1991-2020 Normals
November 20, 2024 to November 30, 2024

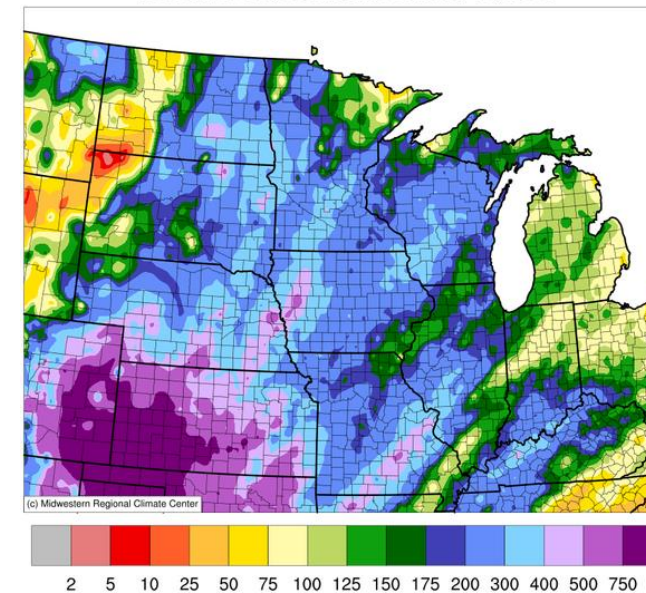


- Nov 1-19 Temp
 - Widespread +8-10°F, except CO & WY
- Nov 20-30 Temp
 - Significant change to cold in northern Plains

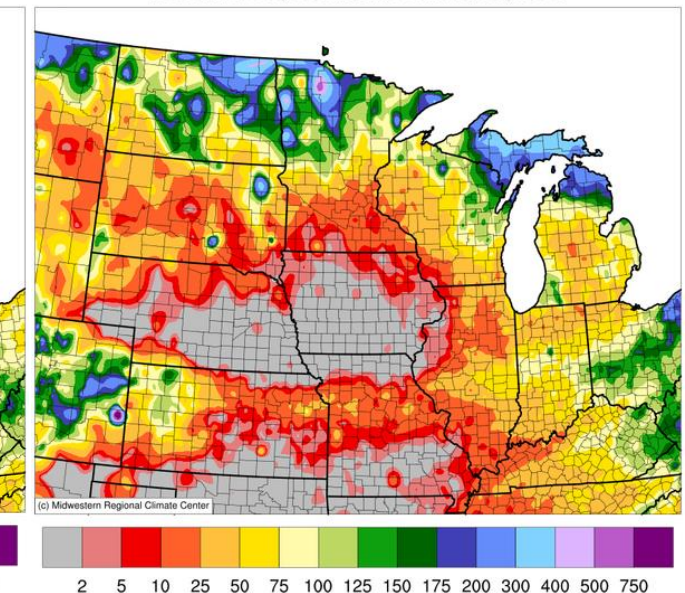


- Nov 1-19 Precip
 - Widespread 200+% of normal
 - 750% of norm in KS & CO
- Nov 20-30 Precip
 - < 75% of normal for most
 - A few > 100% on the fringes

Accumulated Precipitation (in): Percent of 1991-2020 Normals
November 01, 2024 to November 19, 2024



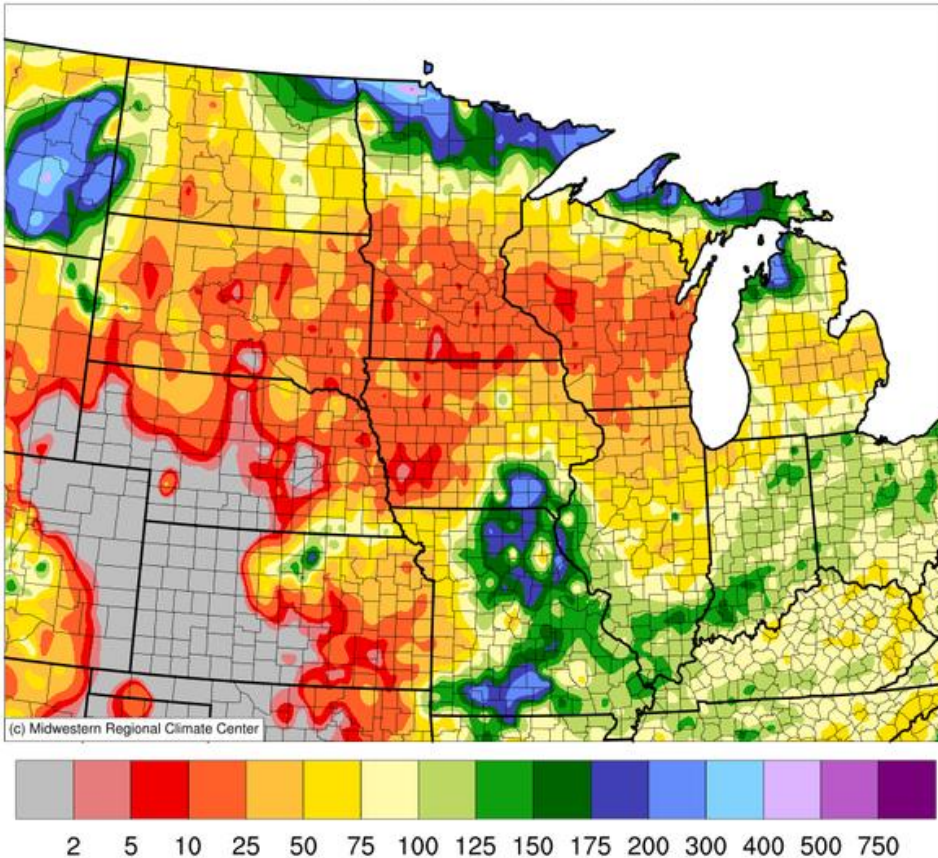
Accumulated Precipitation (in): Percent of 1991-2020 Normals
November 20, 2024 to November 30, 2024



December

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

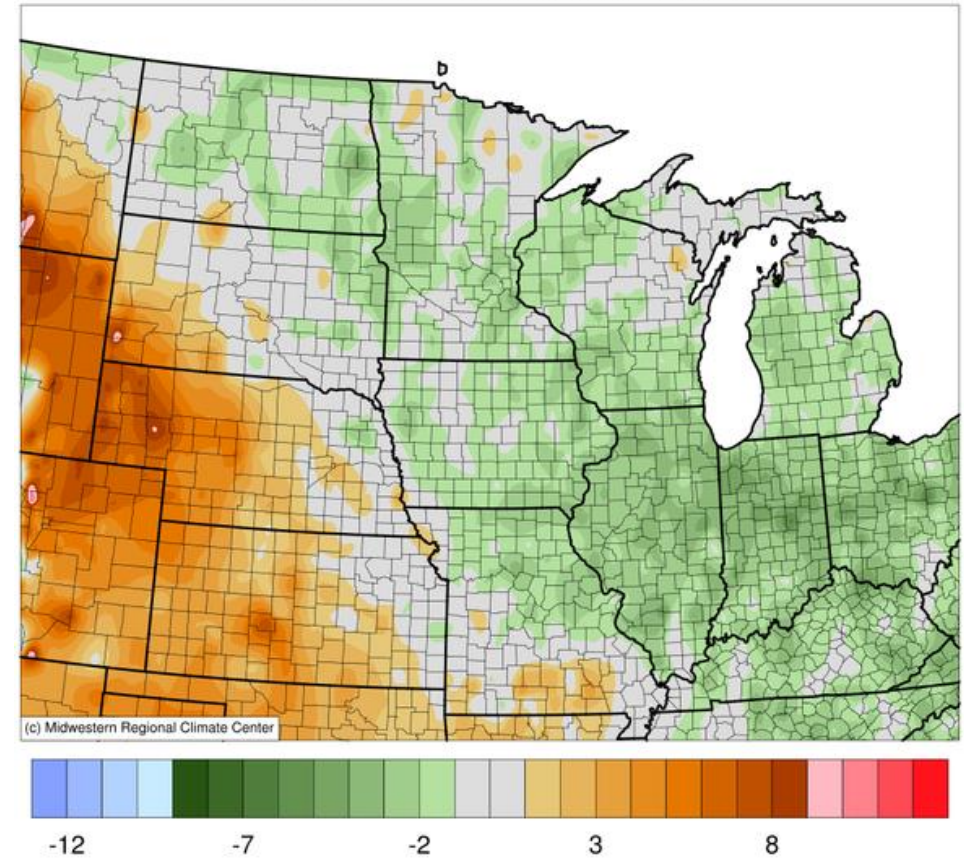
December 01, 2024 to December 17, 2024



- Very little precip in the southern Plains
- Widespread < 50% of normal precipitation
- Exceptions: far north and southeast Midwest
- **Reminder:** Climatologically driest time of year

Average Temperature (°F): Departure from 1991-2020 Normals

December 01, 2024 to December 17, 2024



- Warmer (cooler) than normal to the west (east)
- Rollercoaster of temps between cold & warm

Impacts

Agriculture

West Lafayette, IN
Credit: Melissa Widhalm



Indiana
Credit: Austin Pearson

Graves County, KY | Nov 21 2024
Credit: Jerry Brotzge



Louisville, KY | Nov 21 2024
Credit: Edward (Chip) Zimmer



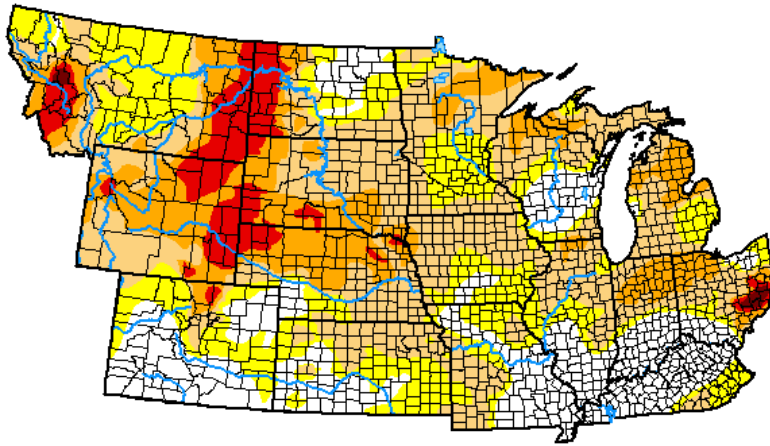
- Fast-paced harvest season with little rain breaks
- Winter wheat seems to be doing better than anticipated, likely because rain fell at the right time
- Pasture/rangeland recovering with precipitation
- Rose bushes blooming and banana trees surviving until mid-November
- Waterfowl migration delayed because of warmth



West of Cheyenne, WY | End of Nov 2024
Credit: Justin Derner

Drought Change – Nov 19 to Dec 17

U.S. Drought Monitor NWS Central



November 19, 2024

(Released Thursday, Nov. 21, 2024)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	20.64	79.36	56.39	23.92	7.19	0.28
Last Week 11-12-2024	15.46	84.54	58.78	31.16	6.74	0.30
3 Months Ago 08-20-2024	50.17	49.83	21.87	7.52	1.68	0.11
Start of Calendar Year 01-02-2024	39.12	60.88	34.11	13.18	2.68	0.01
Start of Water Year 10-01-2024	20.79	79.21	36.88	12.04	3.20	0.40
One Year Ago 11-21-2023	46.15	53.85	30.93	13.25	2.82	0.25

Intensity:



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:

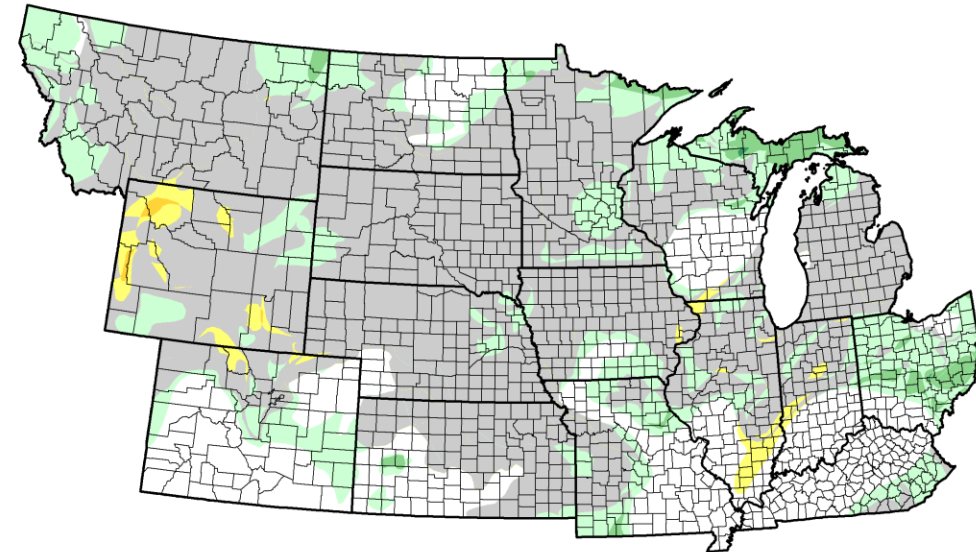
Richard Tinker
CPC/NOAA/NWS/NCEP



droughtmonitor.unl.edu

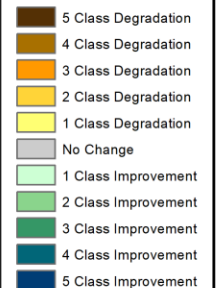
- Exceptional drought (D4) in Ohio
- Extreme drought to the west
- 56% of region in drought (D1-D4)

U.S. Drought Monitor Class Change - NWS Central 4 Week



December 17, 2024
compared to
November 19, 2024

droughtmonitor.unl.edu

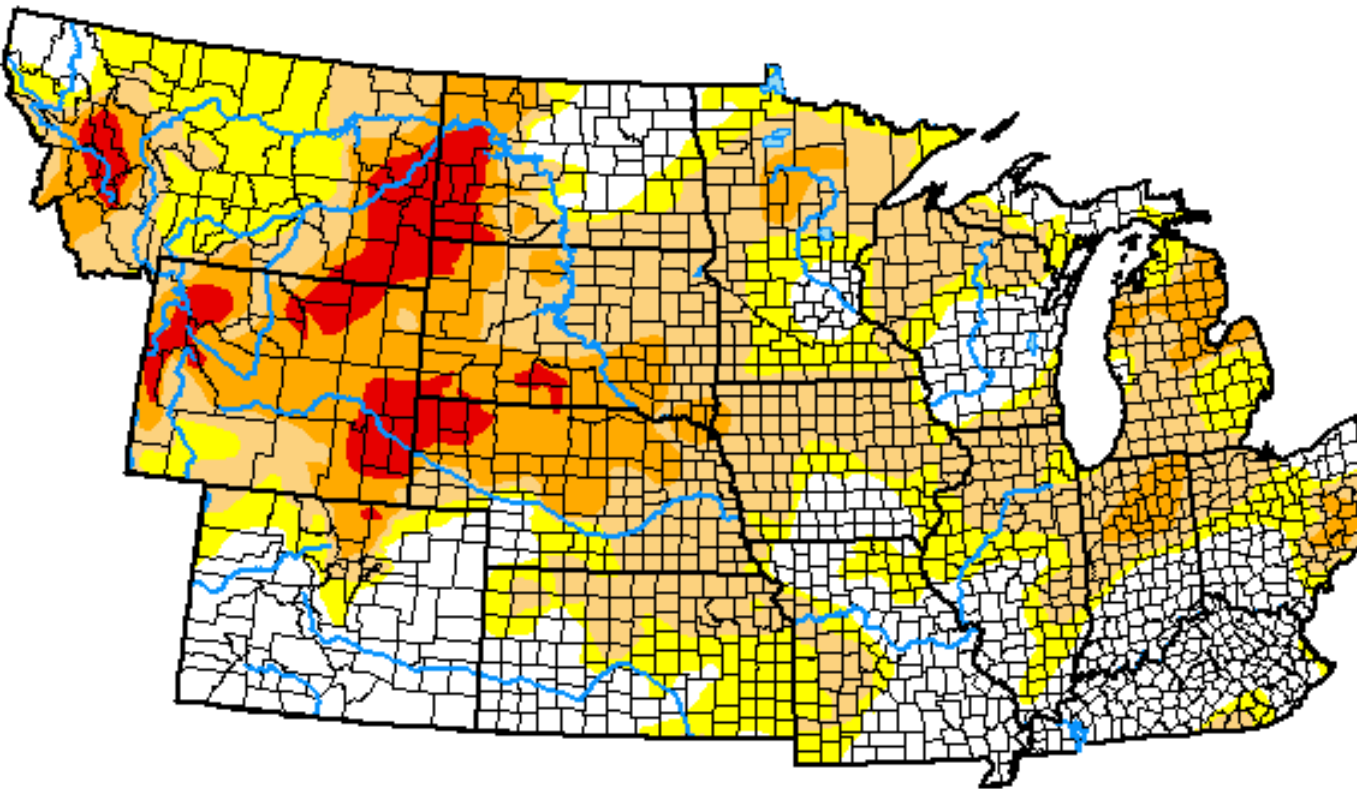


- Mostly unchanged with many patches improvement and only a few patches of degradation

U.S. Drought Monitor – Dec 17

U.S. Drought Monitor NWS Central

December 17, 2024
(Released Thursday, Dec. 19, 2024)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.36	71.64	50.94	20.20	5.39	0.00
Last Week 12-10-2024	24.76	75.24	53.14	20.41	6.08	0.00
3 Months Ago 09-17-2024	23.85	76.15	39.29	12.69	3.05	0.46
Start of Calendar Year 01-02-2024	39.12	60.88	34.11	13.18	2.68	0.01
Start of Water Year 10-01-2024	20.79	79.21	36.88	12.04	3.20	0.40
One Year Ago 12-19-2023	39.58	60.42	32.81	14.43	3.04	0.17

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate 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

- 51% of region in drought (D1-D4)
- Lingering drought since the summer for some, such as out west and even in Iowa

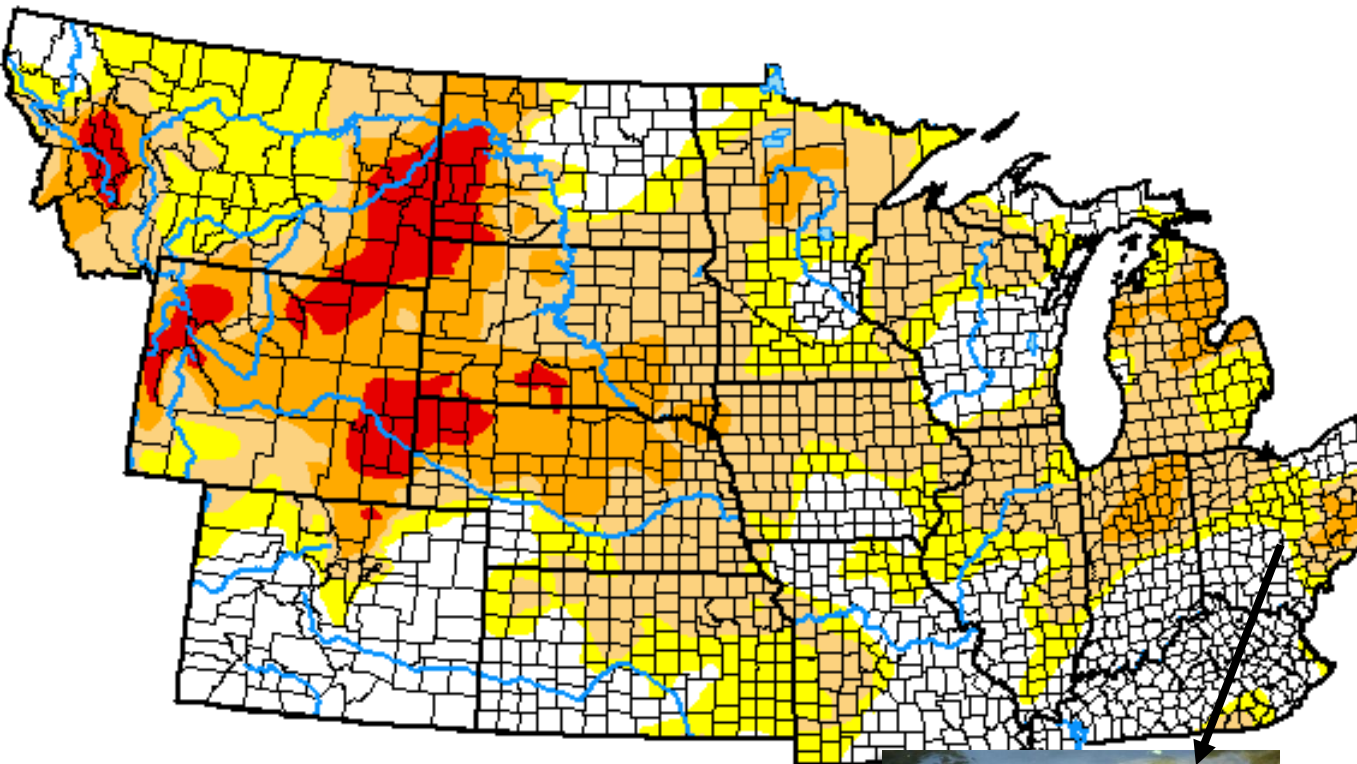


droughtmonitor.unl.edu

U.S. Drought Monitor – Dec 17

U.S. Drought Monitor NWS Central

December 17, 2024
(Released Thursday, Dec. 19, 2024)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	28.36	71.64	50.94	20.20	5.39	0.00
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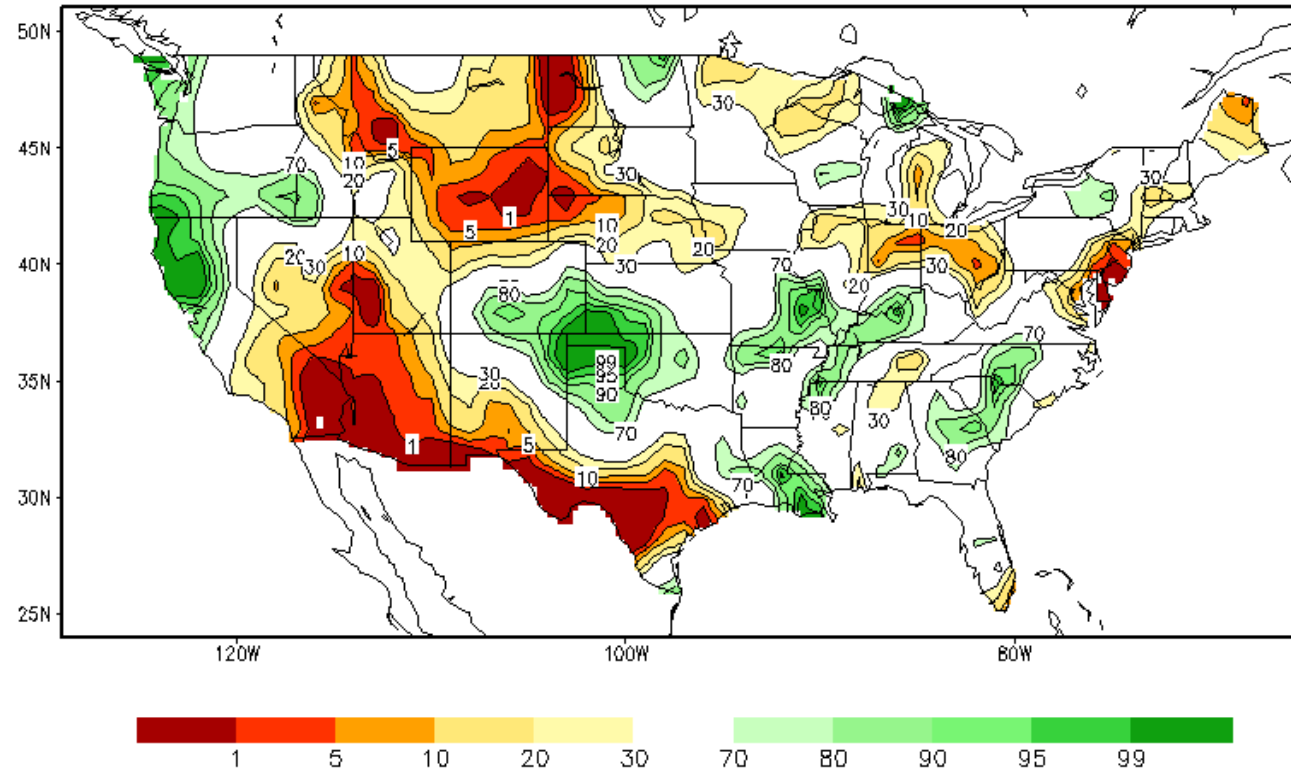
droughtmonitor.unl.edu

- Ecological drought indicator: muskrats and muskrat traps
- Due to drought, muskrats are in farm ponds
- Muskrat traps at local hardware stores are at all-time lows



Soil Moisture and Streamflow

Calculated Soil Moisture Ranking Percentile
DEC 17, 2024



14-Day Average Streamflow
December 3-17 2024



USGS

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

- November precip helped recharge soils
- Lack of December precip causing decline in moisture
 - Fortunately, ET is not adding to the loss

Credit: [NOAA CPC](#)

- Soils took up most of the initial precip, causing streamflow to rebound slower
- Mixed bag around the region
- Gap in the northern Plains due to frozen gauges

Credit: [USGS](#)

Major Rivers

- Mississippi River

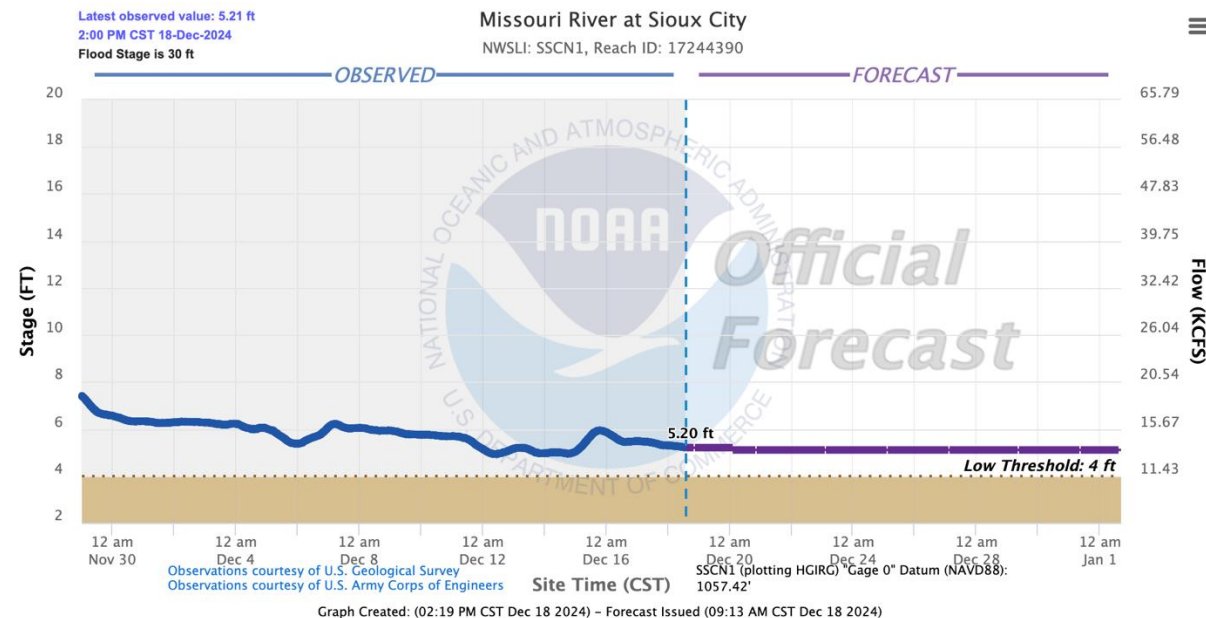
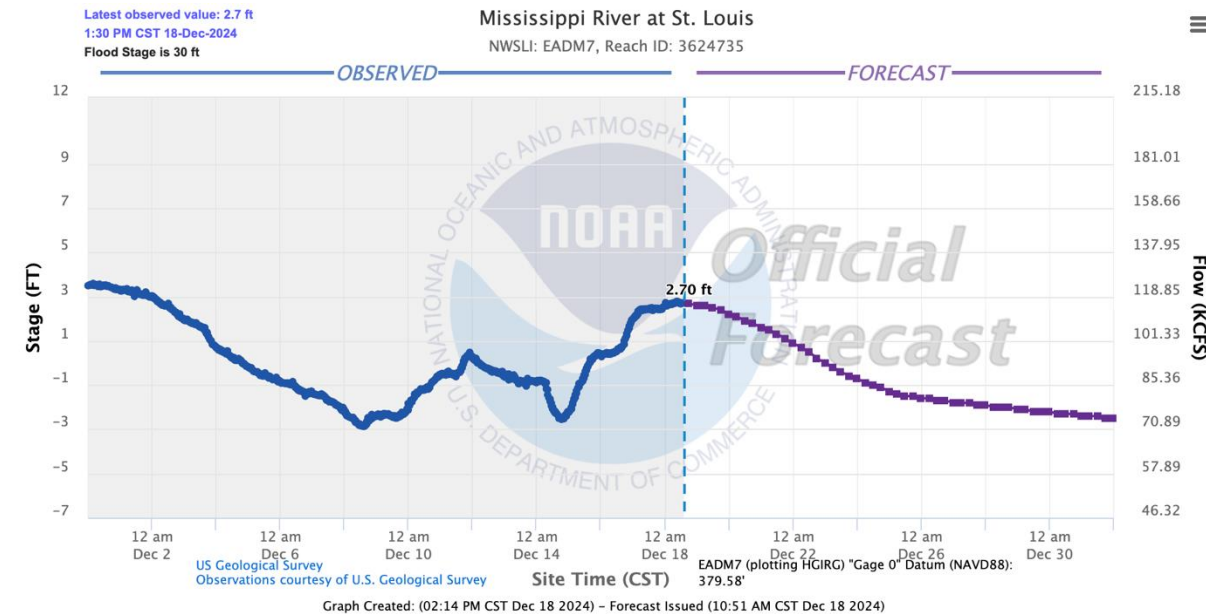
- Monitoring low levels around St. Louis
 - Effect of decreased flows on the Missouri River
 - Low stages mean the threat for ice bites
 - Dredging south of St. Louis

- Missouri River

- Winter release from Gavins Point Dam (South Dakota) around Dec 13
 - Final decrease in flow will reach St. Louis next week
- Recent rains caused minor flooding in MO
- Saw ice last week in the north and west, but warm temps this week stopped the formation
- No longer seeing floating pan ice at Bismarck, ND
- Water temps in ND are hovering around 32°F, so the next cold snap should start ice formation right away

- Ohio River

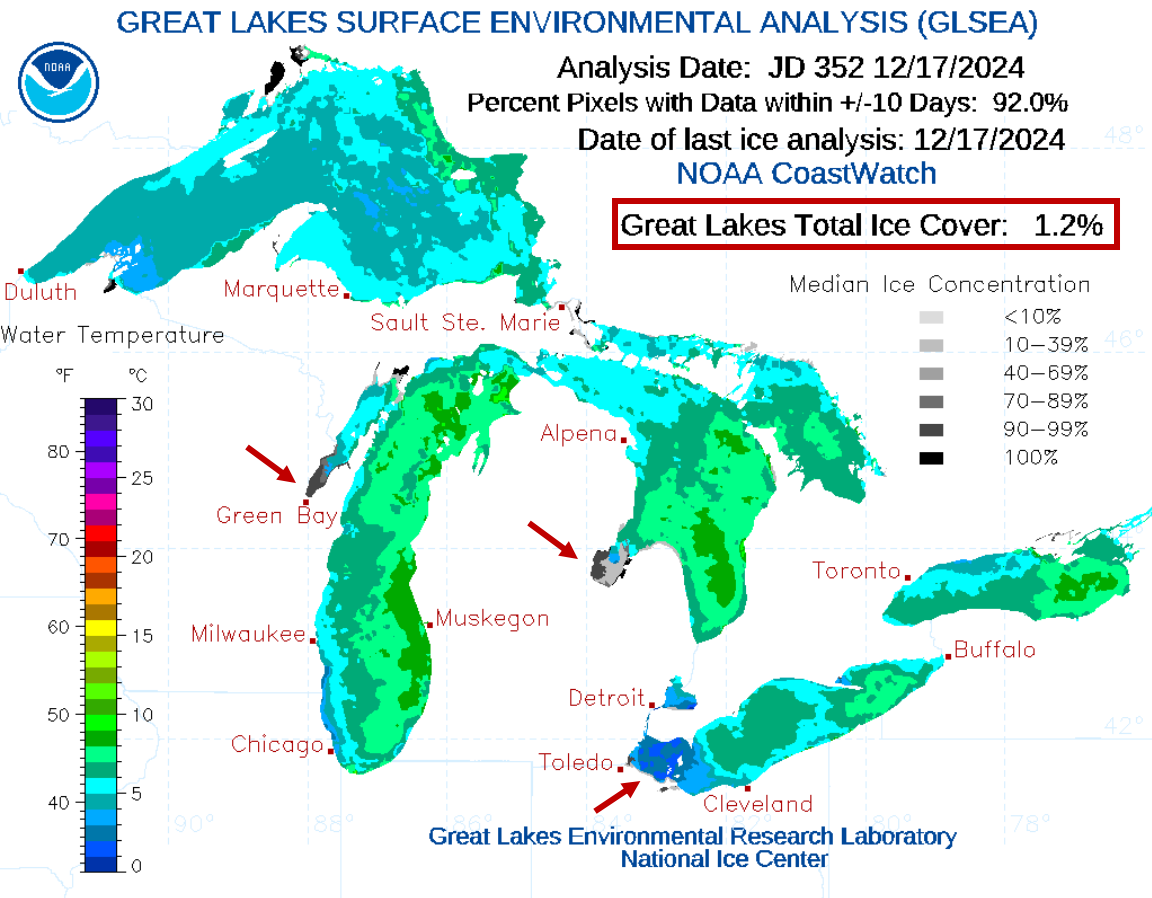
- “Sweet Spot” between drought improvement and minimal floods



Mississippi at St. Louis: [NOAA NWPS](#)

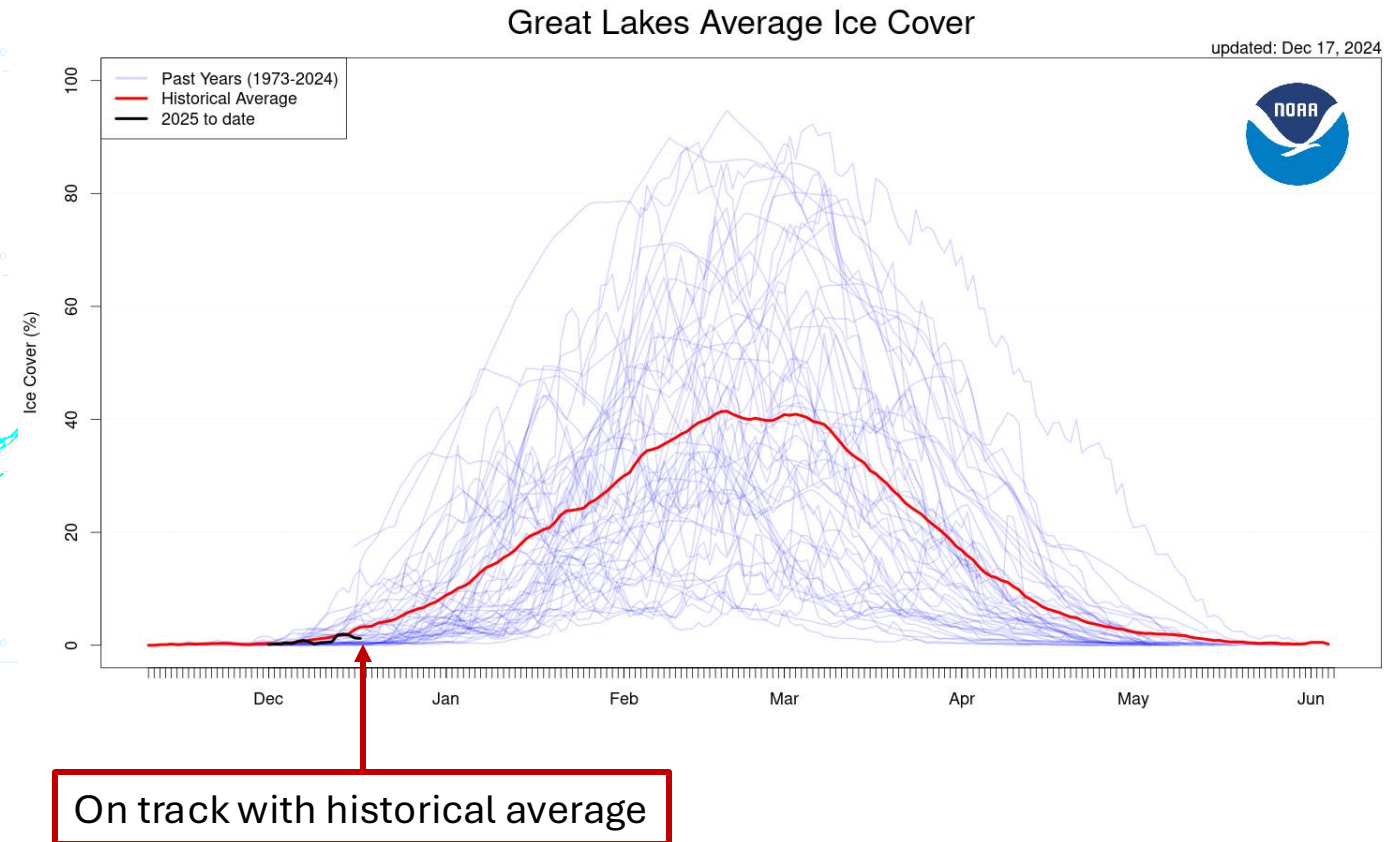
Missouri at Sioux City: [NOAA NWPS](#)

Great Lakes Ice Cover



- 1.2% total ice cover
- Ice forming in shallow regions: Saginaw Bay, Western Lake Erie, Green Bay

Credit: [GLSEA](#)



Credit: [NOAA GLERL](#)

Local Lake Ice Cover

- Lakes Monona and Wingra (Madison, WI) declared iced-over December 13 and 1, respectively
 - 2 days ahead of (later than) normal for Monona (Wingra)
 - Records going back to 1800s
- Lake Monona re-opened as of December 17

Lady Liberty frozen in Lake Mendota, Madison, WI

Credit: WI SCO



SUV falls through ice on Puckaway Lake
(Green Lake County) | Dec 2024

Credit: [TMJ4](#)



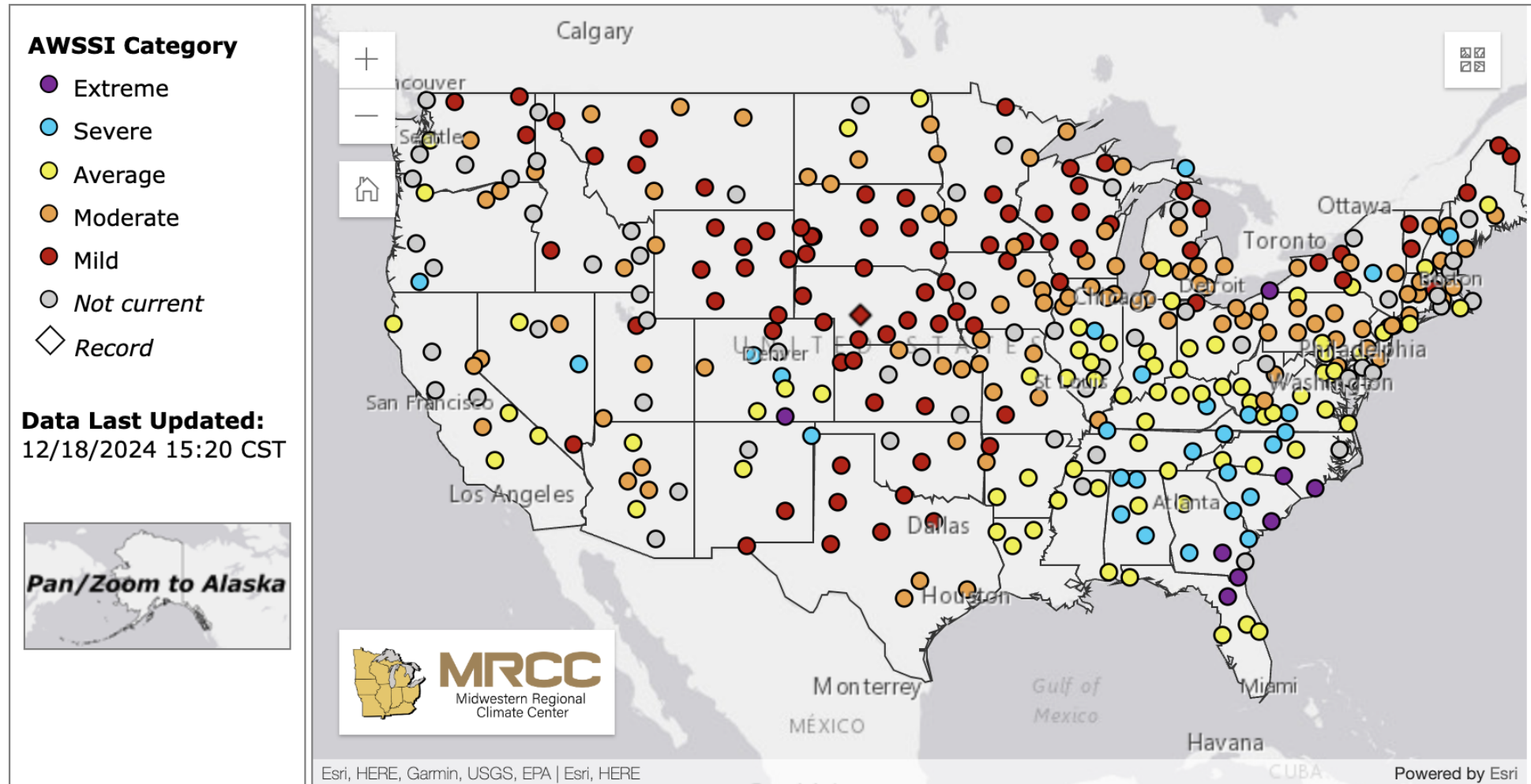
Ice fishing in Bismarck, ND | Dec 2024

Credit: [KEYR](#)

Winter Weather

Accumulated Winter Season Severity Index

- What is AWSSI? A way to quantify the severity of winter
- Variables included: maximum & minimum temperatures, snowfall, snow depth



Credit: [MRCC](#)

I'm dreaming of a...White Thanksgiving!



2024 saw 1-3", which is only a 12% probability!
Credit: Laura Edwards & [NWS Aberdeen](#)



We have a low stratus deck in the temperature 'sweet spot' for ice/snow formation (-10° to -18°C), and the supercooled liquid water droplets in the cloud are just missing something to 'latch' onto.

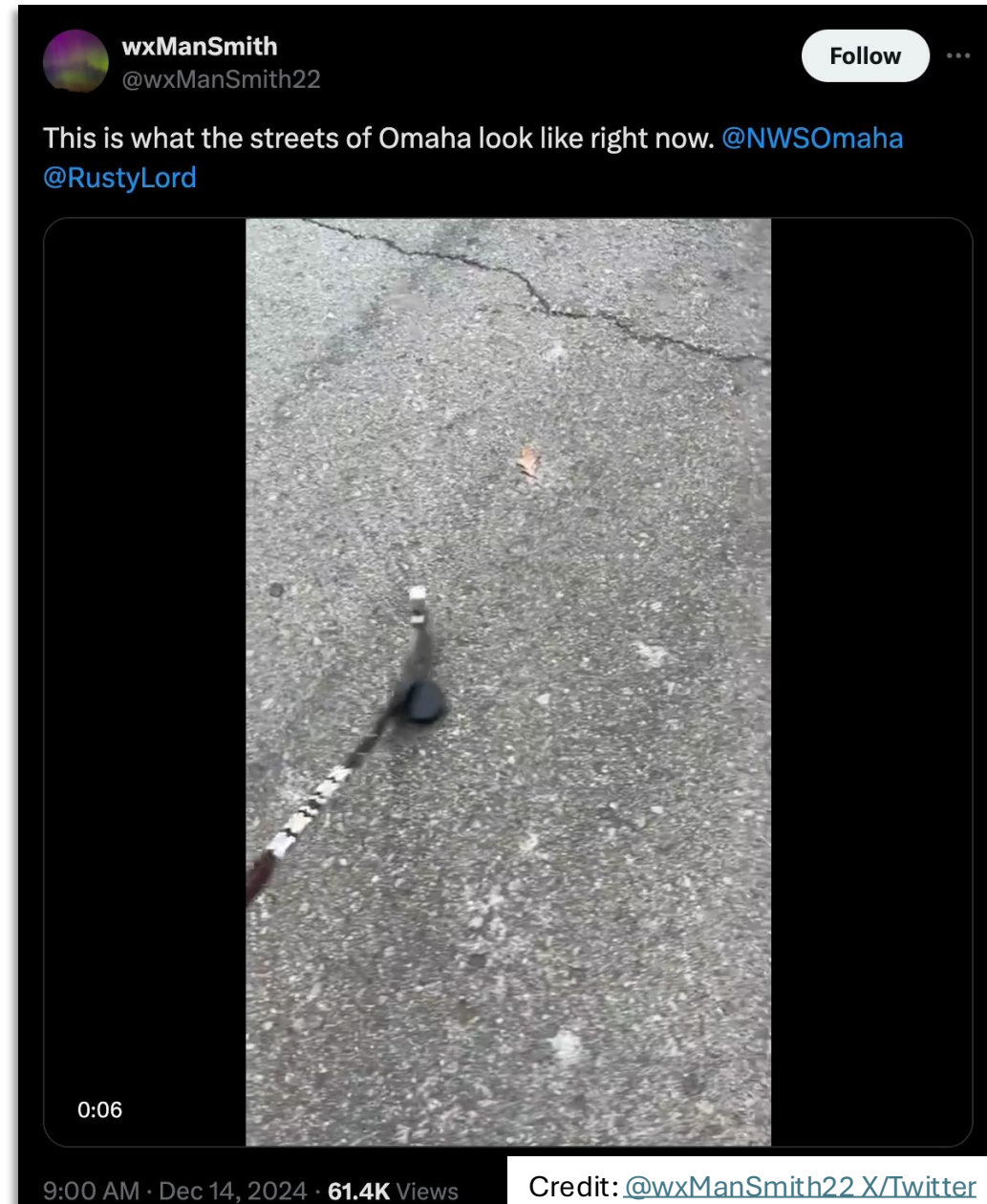
That's where a factory near Menomonie, WI comes in! The steam/tiny particles emitted from the factory are just enough to create snowflakes. This narrow plume of snow extends for nearly 100 miles to the southeast. A light dusting has accumulated on roads/grassy areas, so take caution if traveling for the holiday.

Photos: Paige Veserat, NWS MPX

Snow Squalls and Ice Storms



WIDOT traffic camera from Slinger, WI during snow squall Dec 4
Credit: [NWS MKX](#)



Omaha area auto repair shops slammed after Friday's 'catastrophic' ice storm

Published: Dec. 16, 2024 at 10:35 PM CST



Credit: [CBS News](#)

Banged up cars are lining up at auto body shops across the Omaha metro.

Credit: [KOLN-KGIN](#)

Lake Effect Snow

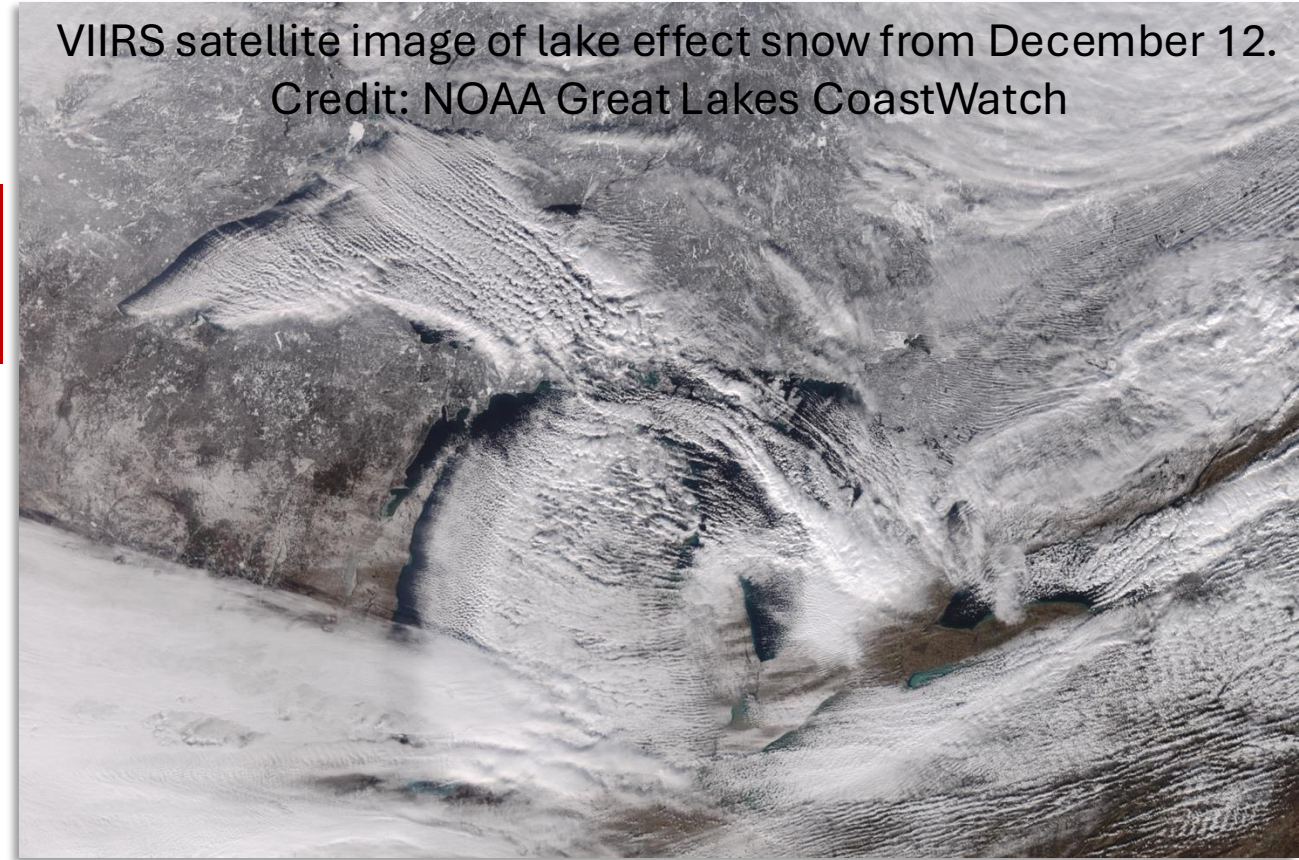
Year-to-date (YTD) average surface temperatures by lake (°F)
January 1 - November 24

Lake	YTD 2024	YTD long-term average	YTD long-term minimum	YTD long-term maximum
Superior	47.4	44.4	40.3	47.9
Michigan	53.7	50.6	46.7	53.7
Huron	51.9	49.0	45.7	51.9
Erie	56.7	53.9	51.5	56.7
Ontario	54.9	51.7	48.3	54.9

Credit: [NOAA GLERL](#)

- Lakes Michigan, Huron, Erie, and Ontario broke their records for year-to-date (Jan 1-Nov 24) maximum temperatures
 - Result of warm fall 2024 & warm winter 2023-24

VIIRS satellite image of lake effect snow from December 12.
Credit: NOAA Great Lakes CoastWatch



Lake Effect Snow

Saybrook, OH with 63.2" of snow!

Credit: [NWS/Erin Buckley Arsulic](#)



NWS Gaylord @NWSGaylord · Nov 29

View from beneath one of those intense lake effect bands this morning. Snow is fluffy but wet. If you run into one of these, it will quickly be discombobulating. Please drive safely out there and send us snow reports! #miwx #northernmichigan #lakeeffect #snow



1

6

23

Above: Gaylord, MI snowiest day on record!

Nov 29, 2024

Credit: [NWS Gaylord](#)

Stats Credit: [NOAA Climate.gov](#)

Right: Gaylord, MI on Dec 2, 2024

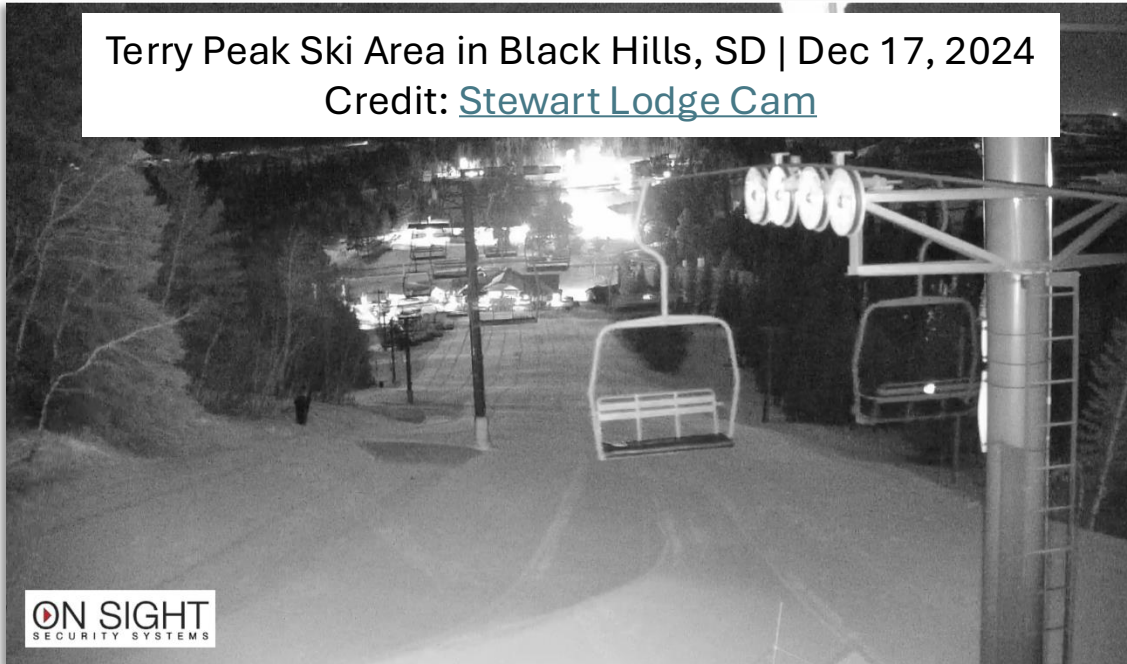
Credit: [NWS Gaylord](#)



Winter Recreation

Terry Peak Ski Area in Black Hills, SD | Dec 17, 2024

Credit: [Stewart Lodge Cam](#)



Browns-Steelers in Cleveland, OH | Nov 21, 2024

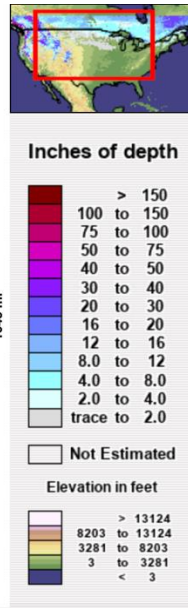
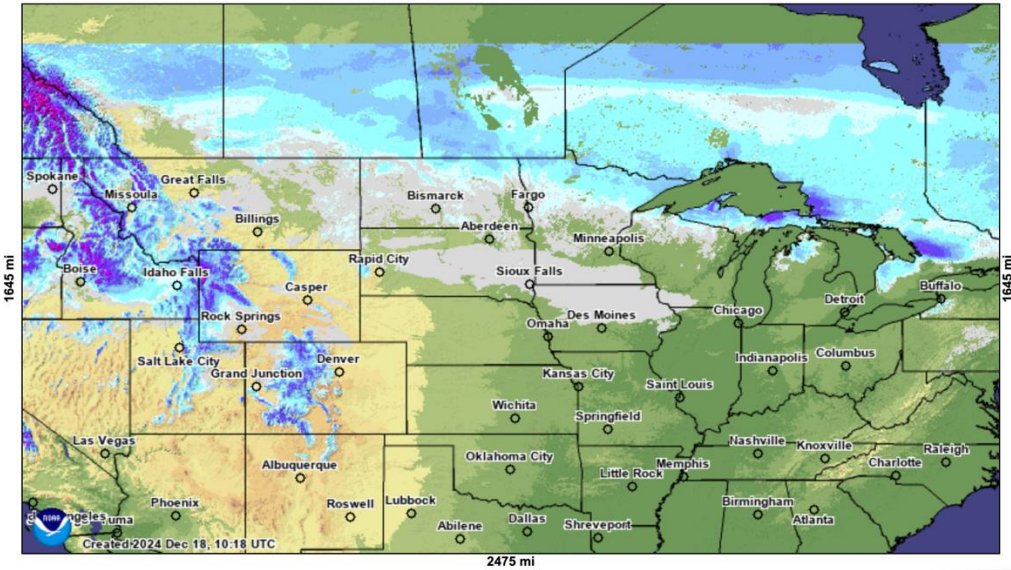
Credit: [Mary Clarke](#)



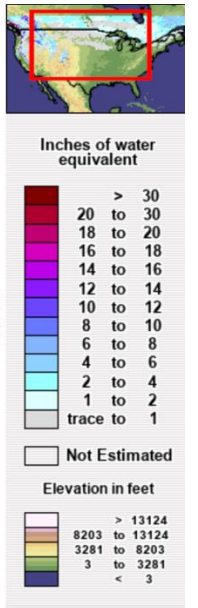
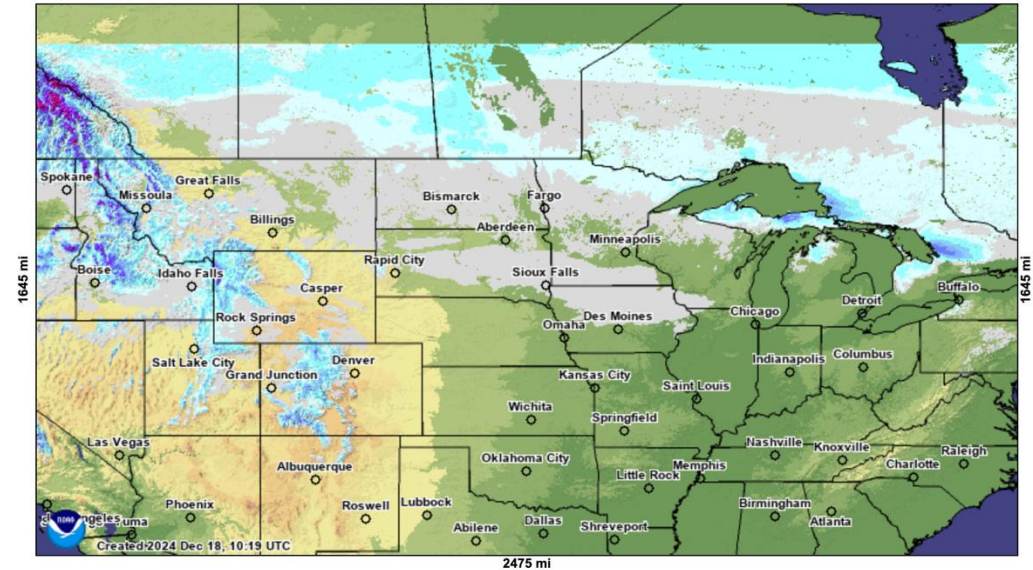
Snowmobilers in the Keweenaw Peninsula, MI
Credit: Bridgette Mason

Current Snow Observations & Anomalies

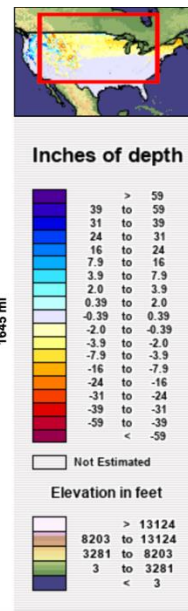
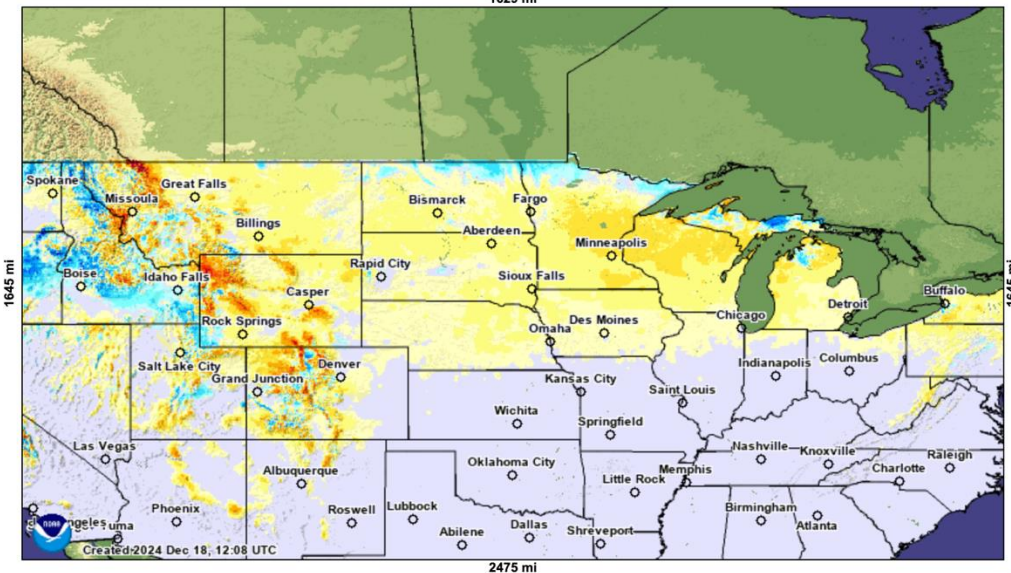
Modeled Snow Depth for 2024 December 18, 6:00 UTC
1629 mi



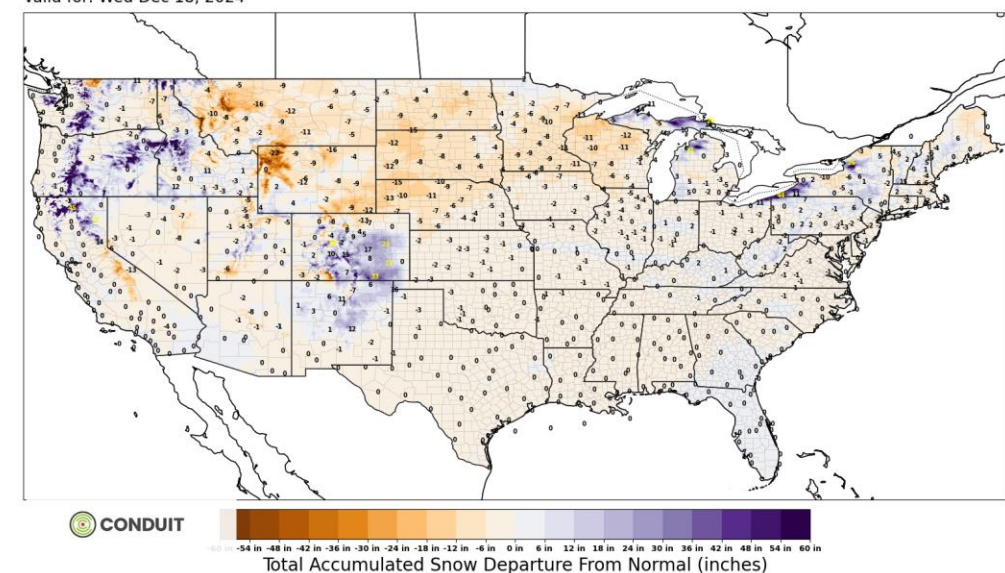
Modeled Snow Water Equivalent for 2024 December 18, 6:00 UTC
1629 mi



Modeled Snow Depth Departure from Normal (Daily) for 2024 December 18, 6:00 UTC
1629 mi



Season-to-Date Departure From Normal Snowfall: Beginning Sept 30, 2024
Valid for: Wed Dec 18, 2024

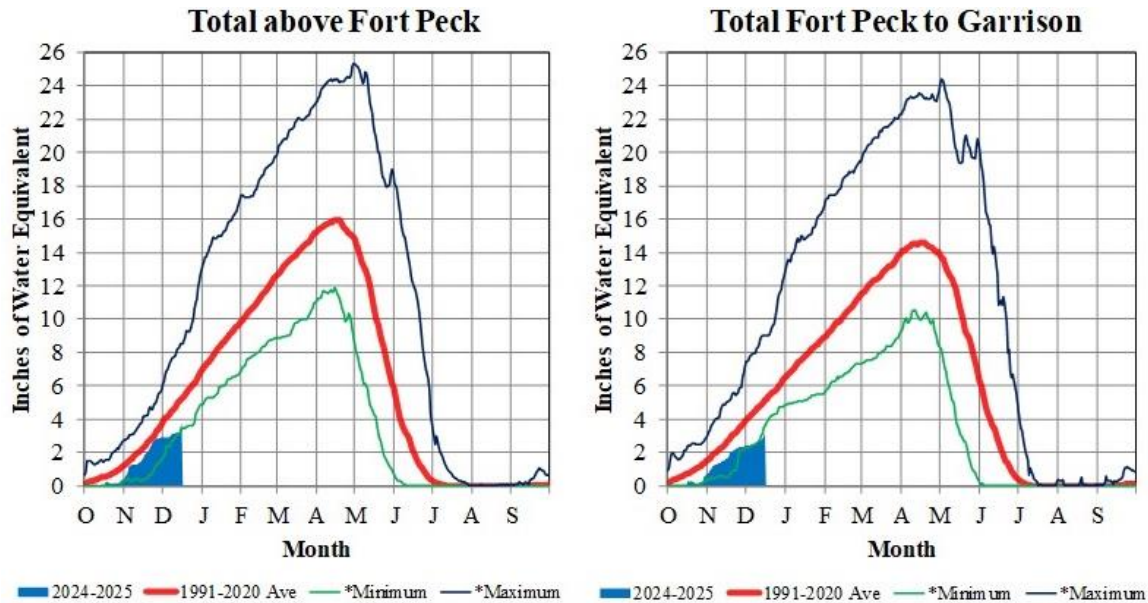


Credit: [NOHRSC](#)

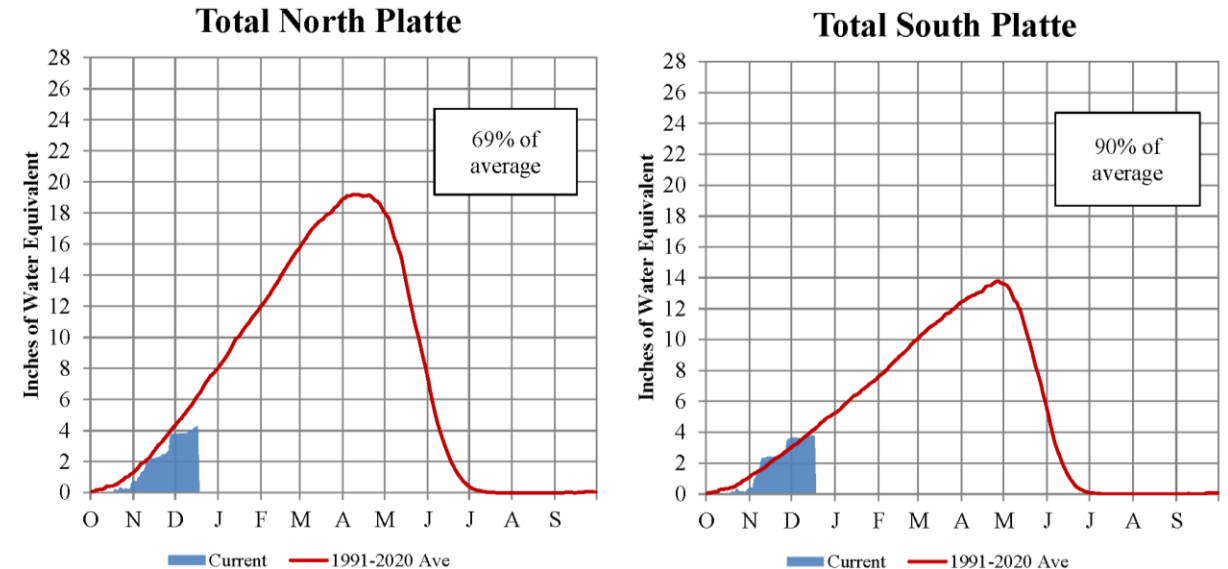
Credit: [Ag Wx](#)

Snowpack Water Content

Missouri River Basin – Mountain Snowpack Water Content
December 16 2024



Platte River Basin – Mountain Snowpack Water Content
December 17 2024



- Snowpack water content is running below average as of mid December
- Accumulation is still early in the season, thus there is still room to increase water content

On December 16, 2024 the mountain Snow Water Equivalent (SWE) in the "Total above Fort Peck" reach is 3.8" and 72% of the (1991-2020) average. The mountain SWE in the "Fort Peck to Garrison" reach is 3.2" and 62% of the (1991-2020) average. The normal peak for both reaches occurs near April 17.

*Refers to the minimum or maximum SWE in the basin for that day in the historical years 1991-2020.

The North and South Platte River Basin mountain snowpacks normally peak near April 10 and the end of April, respectively. As of December 17, 2024, the mountain snowpack SWE in the "Total North Platte" reach is 4.2", 69% of the (1991-2020) average. The mountain snowpack SWE in the "Total South Platte" reach is 3.8", 90% of the (1991-2020) average.

Source: USDA, Natural Resource Conservation Service

Provisional Data. Subject to Revision

Frost Depth

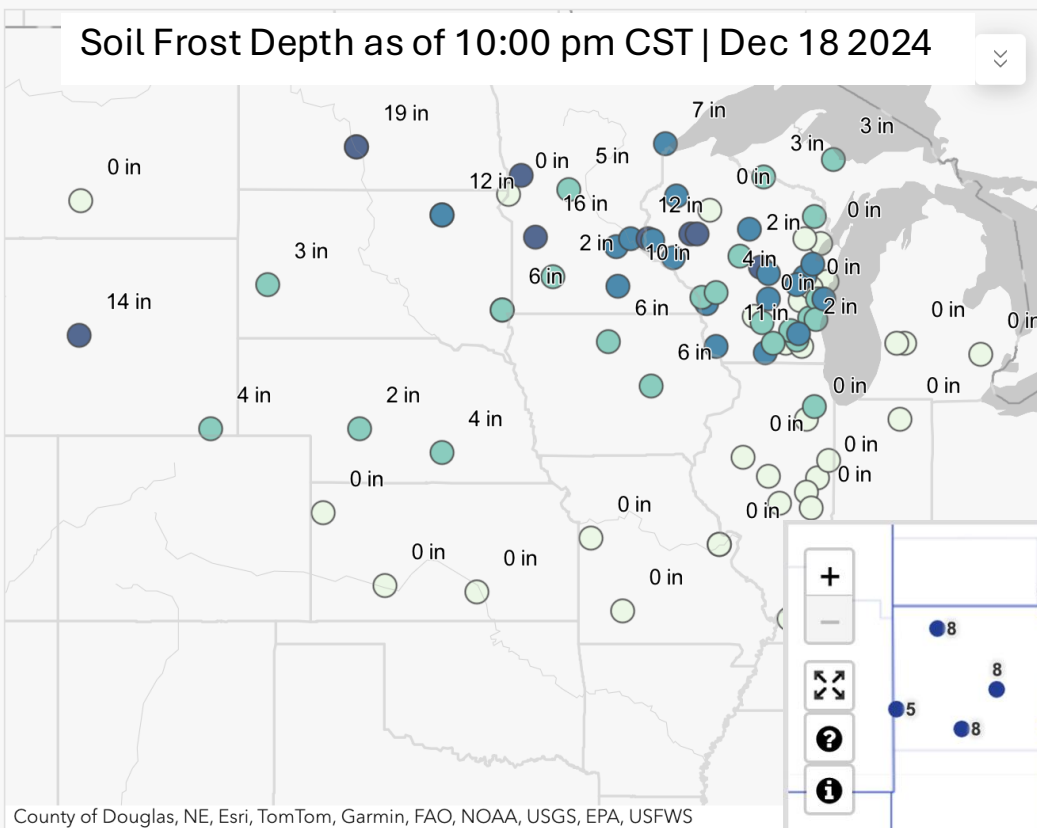
About This Map: This map displays recent frost depth measurements in terms of inches below the soil surface. Frost depth reports are commonly from frost tube instruments, visual reports from construction or cemetery sites, or other types of electronic probes.

To view all frost depth sites in the [NCRFC](#) service area, beyond those that recently reported, turn on the "All NCRFC Frost Depth Sites" layer using the layer list button in the top right. Click on any of the points on the map for site-specific information. Open the layer list to see additional data viewing options.

FrostDepth

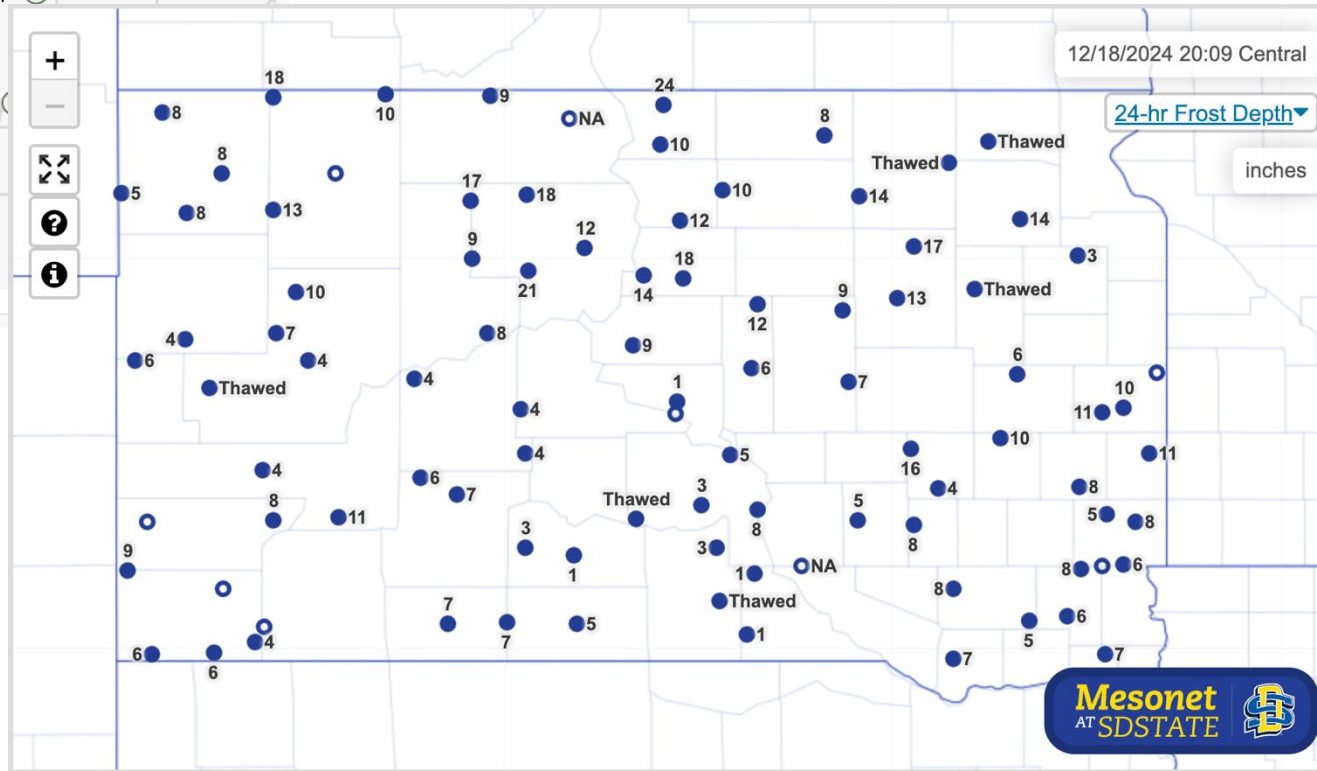


Credit: [NCRFC](#)



Credit: [SD Mesonet](#)

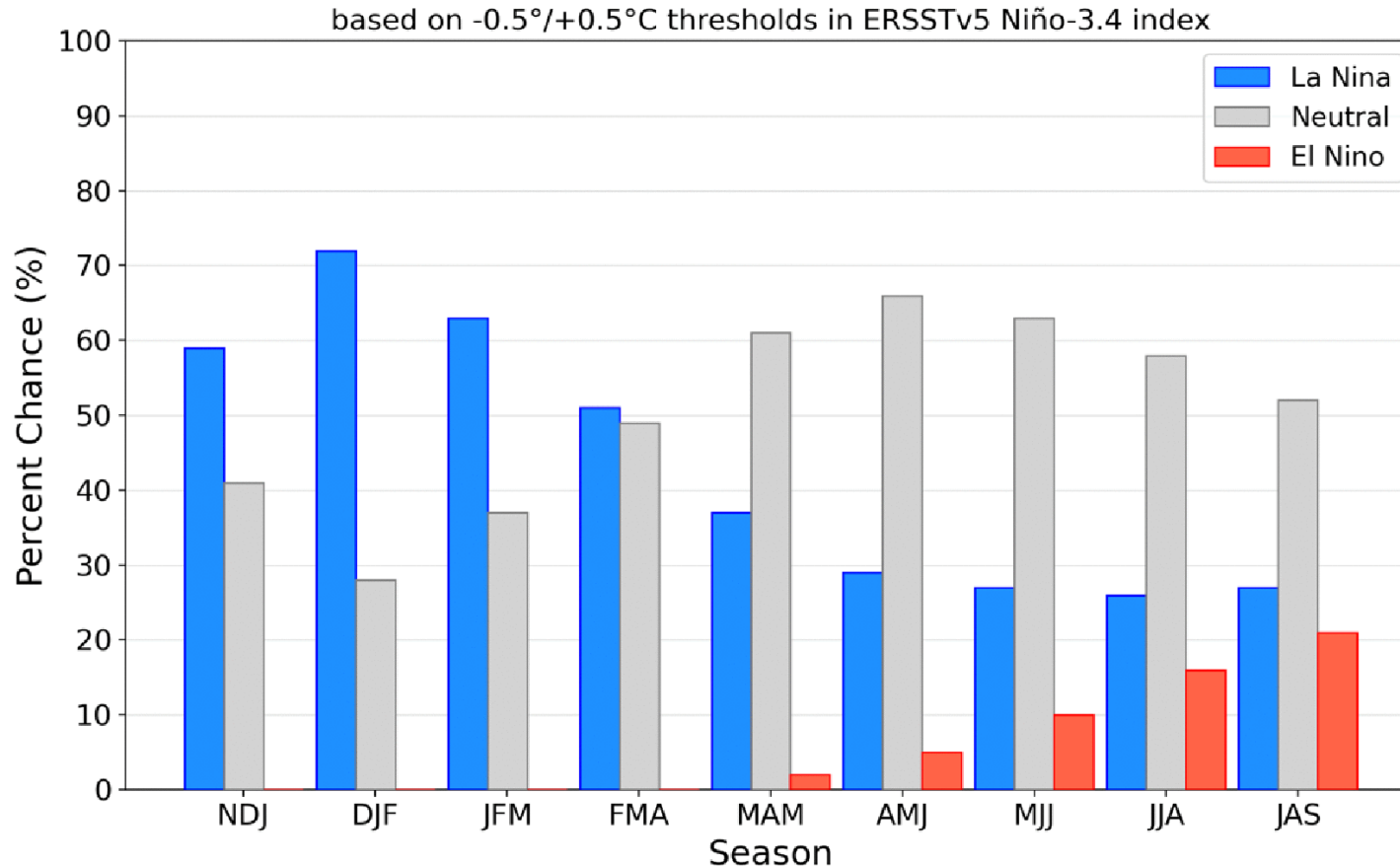
- Varying from no frost in the south to 10-20+" deep in the north
- Soils freeze faster with no snow cover and when soils are dry
- Concern for fall-seeded crops, water lines, & infrastructure if cold lingers and frost deepens



Outlook

La Niña Watch

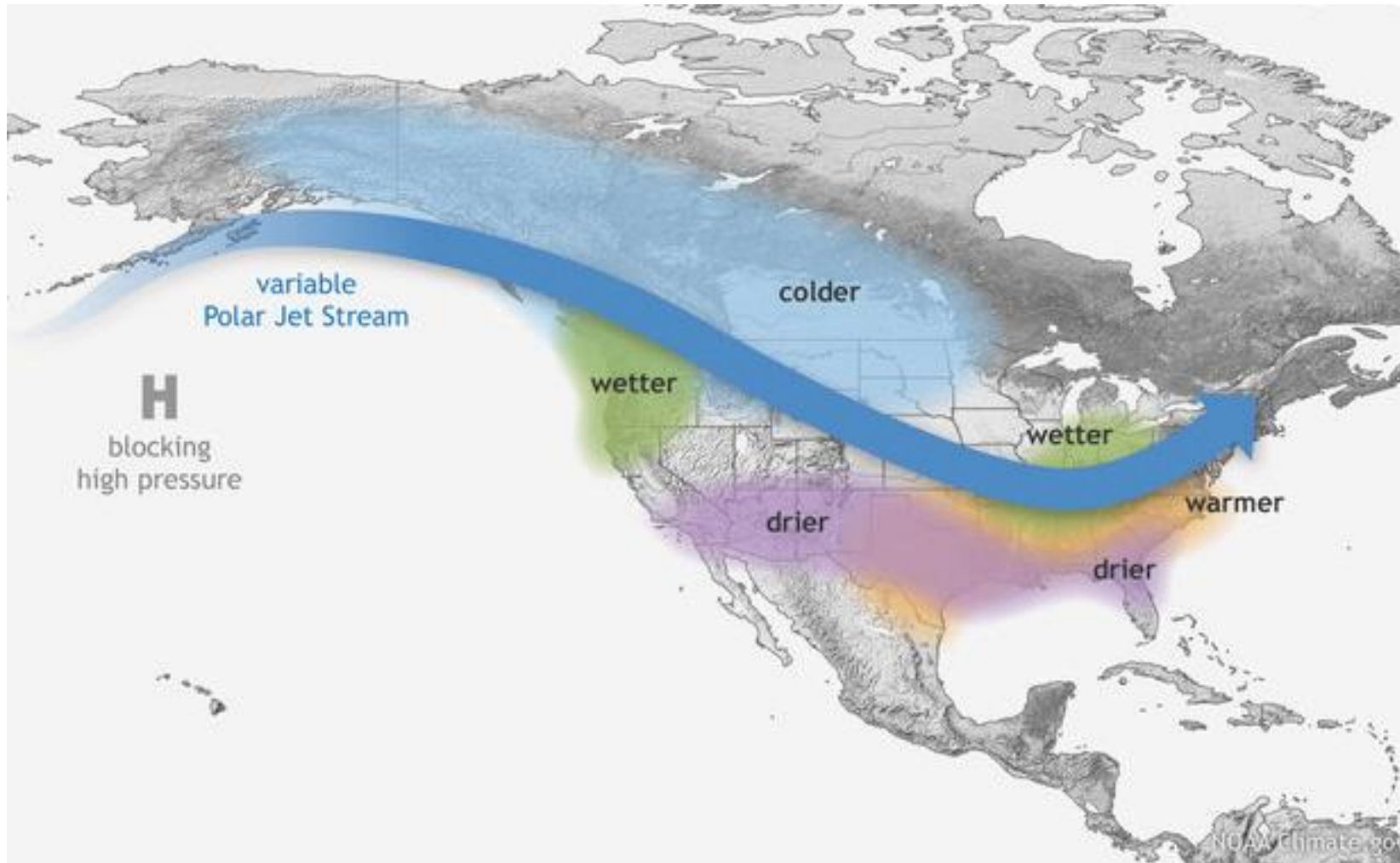
Official NOAA CPC ENSO Probabilities (issued December 2024)



- La Niña Watch means conditions in the tropical Pacific Ocean are favorable for La Niña
- La Niña conditions
 - **Sea surface temperatures** in the tropical Pacific are *cooler than normal* by 0.5°C or more
 - There is an **atmospheric response** in the tropical Pacific
- While La Niña criteria may not officially be met, the ocean and atmosphere are reflecting La Niña behavior

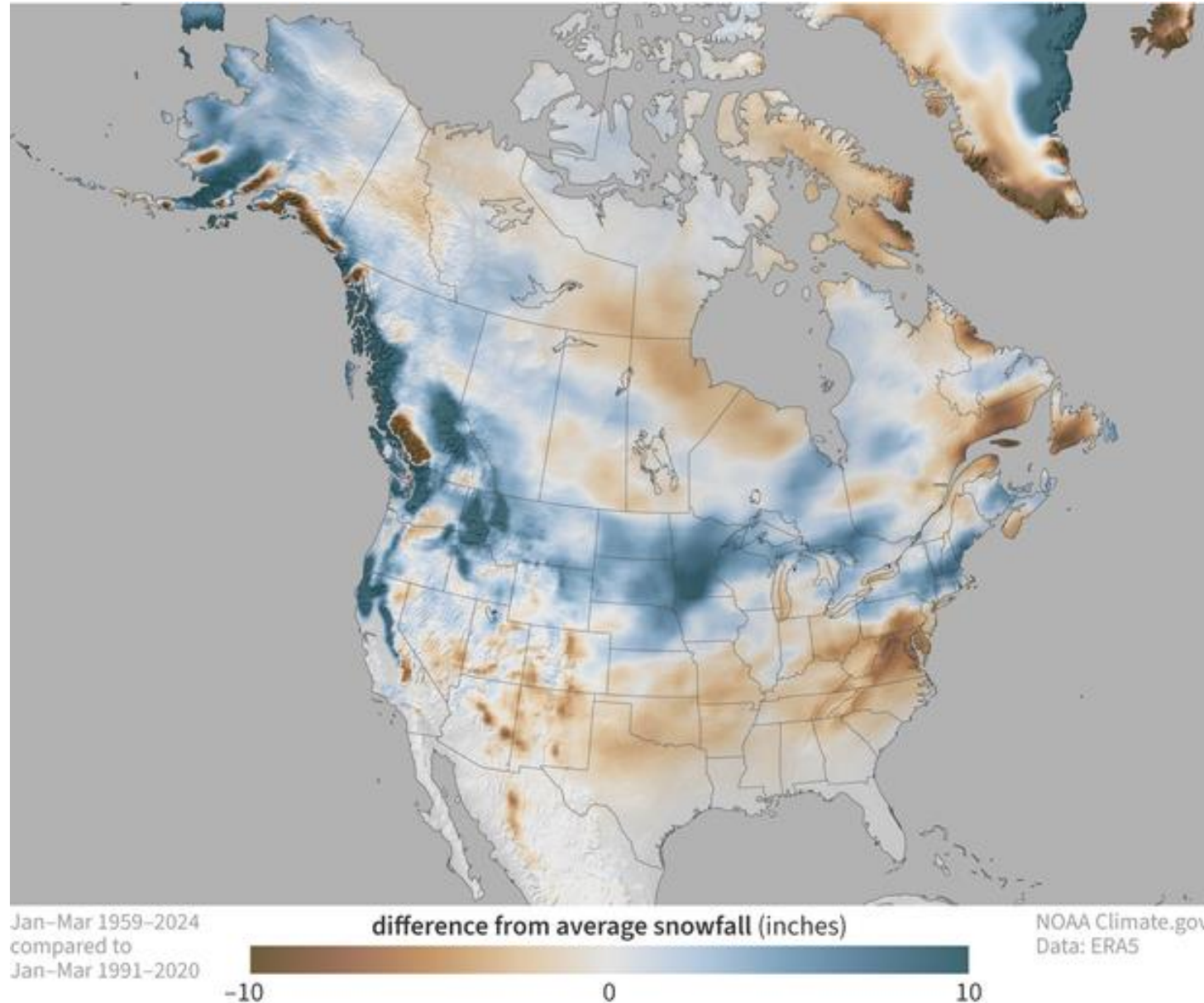
Figure 7. Official ENSO probabilities for the Niño 3.4 sea surface temperature index (5°N - 5°S , 120°W - 170°W). Figure updated 12 December 2024.

Typical Winter La Niña Pattern



- Cooler for the northern Plains
- Wetter for the Ohio Valley

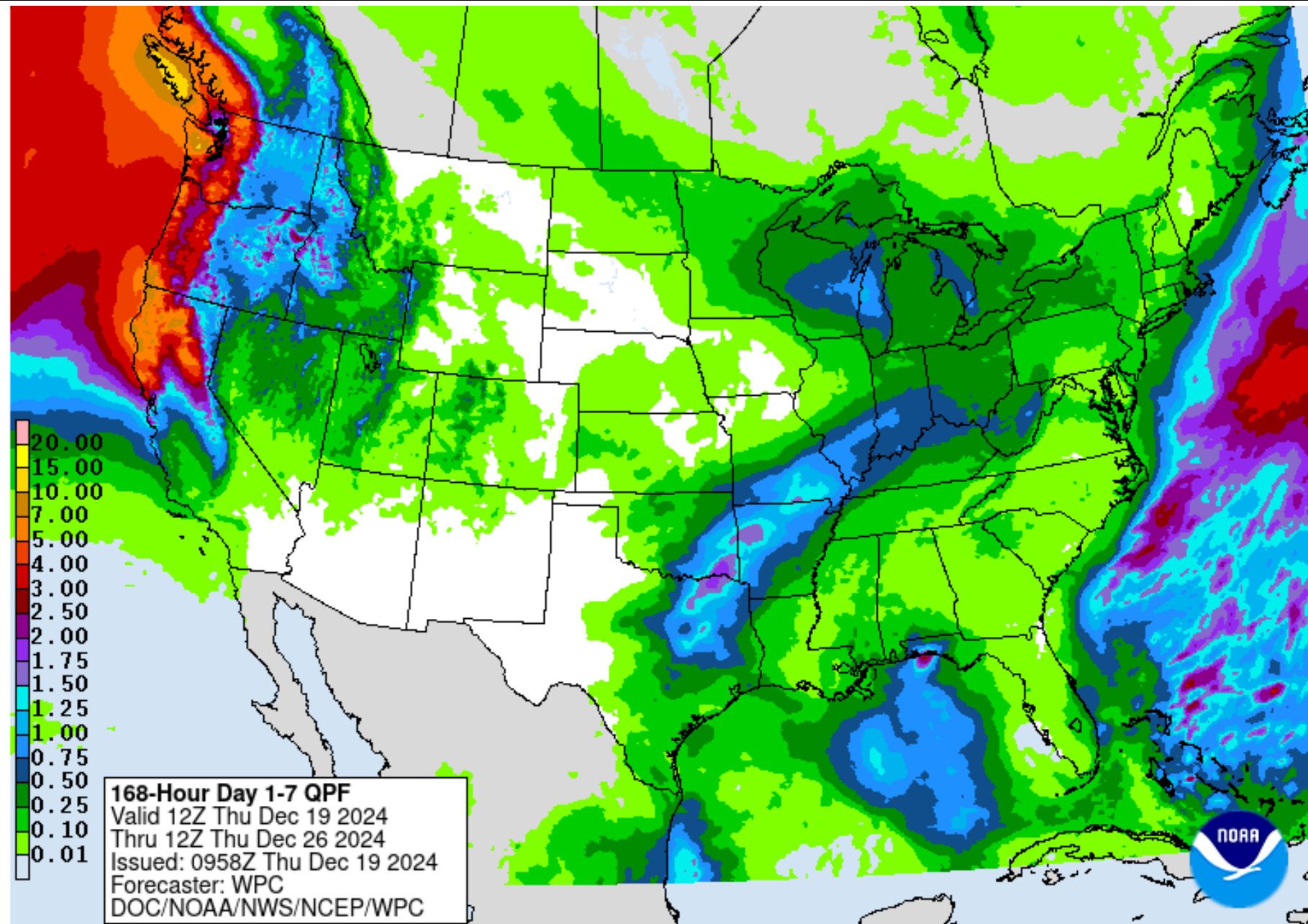
Snowfall During Weak La Niña Winters (January-March)



Credit: [NOAA Climate.gov](https://www.noaa.gov)

- 9 weak La Niña winters compared to the 1991-2020 average
- Most of the North Central U.S. saw above-average snowfall during the weak La Niña winters
- **Reminder:** Other climate signals, long-term trends, and short-term weather patterns can disrupt historical patterns

Precipitation Forecast – December 19-26



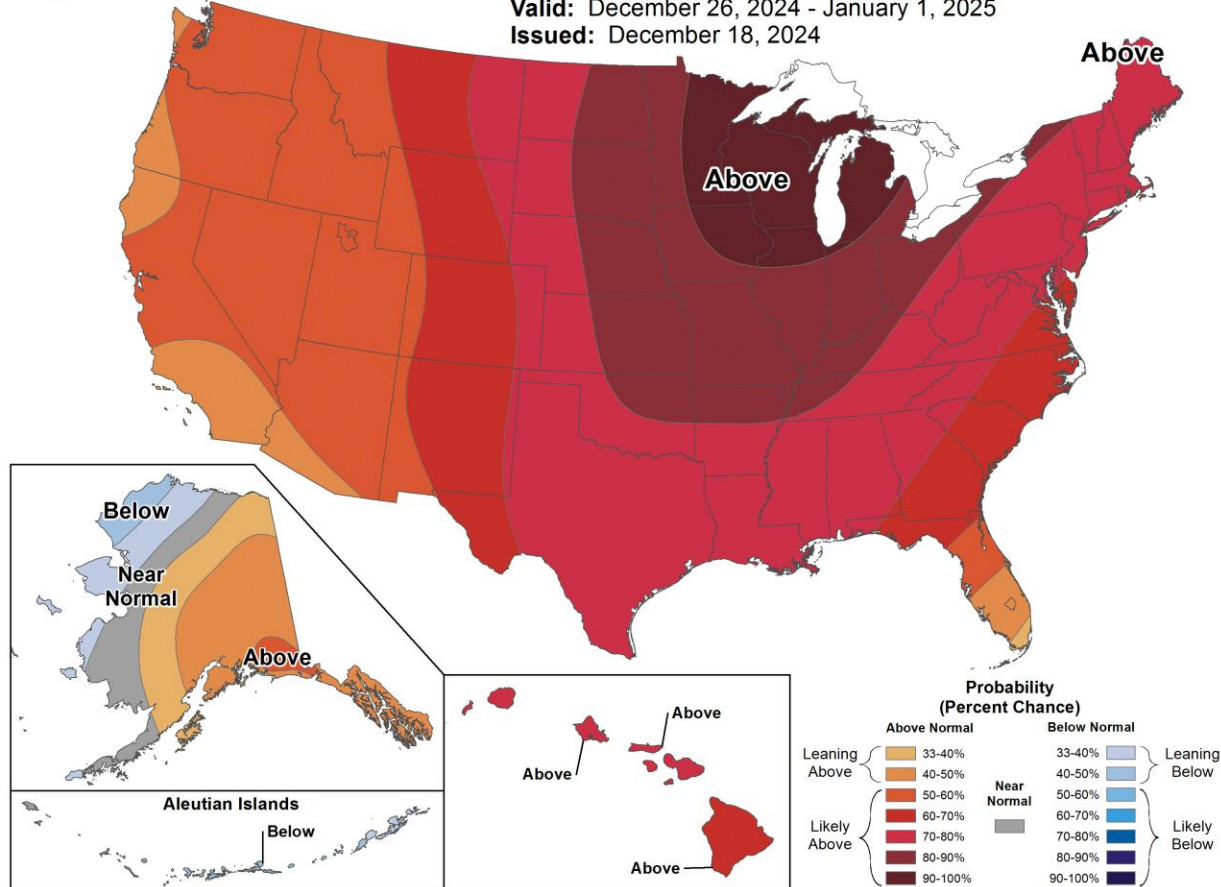
- Higher chances for precip over Great Lakes and southern Midwest
- Low chances for Plains and western states

8-14-Day Outlook



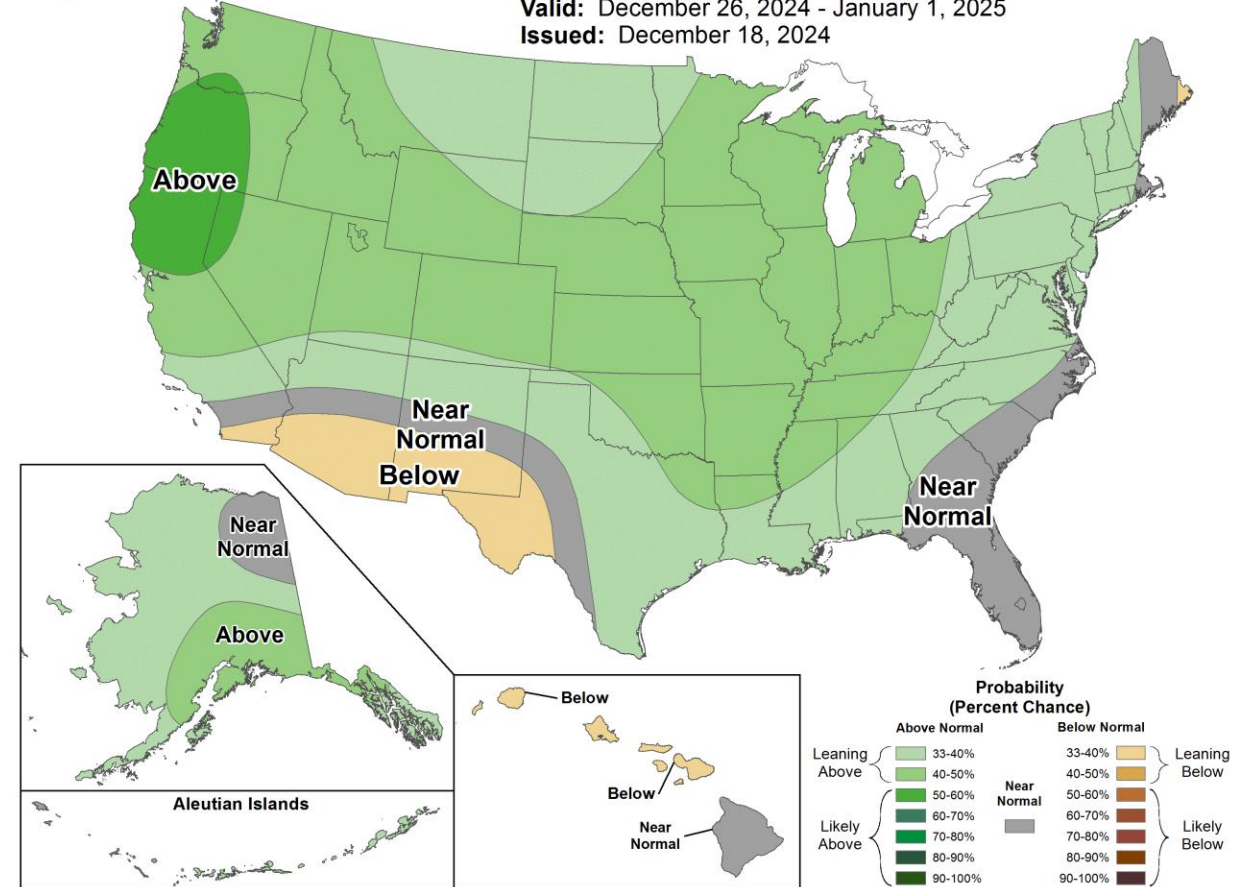
8-14 Day Temperature Outlook

Valid: December 26, 2024 - January 1, 2025
Issued: December 18, 2024



8-14 Day Precipitation Outlook

Valid: December 26, 2024 - January 1, 2025
Issued: December 18, 2024



- Very likely warmer than normal to end the year and slightly elevated chance for wetter than normal

Potential Hazards

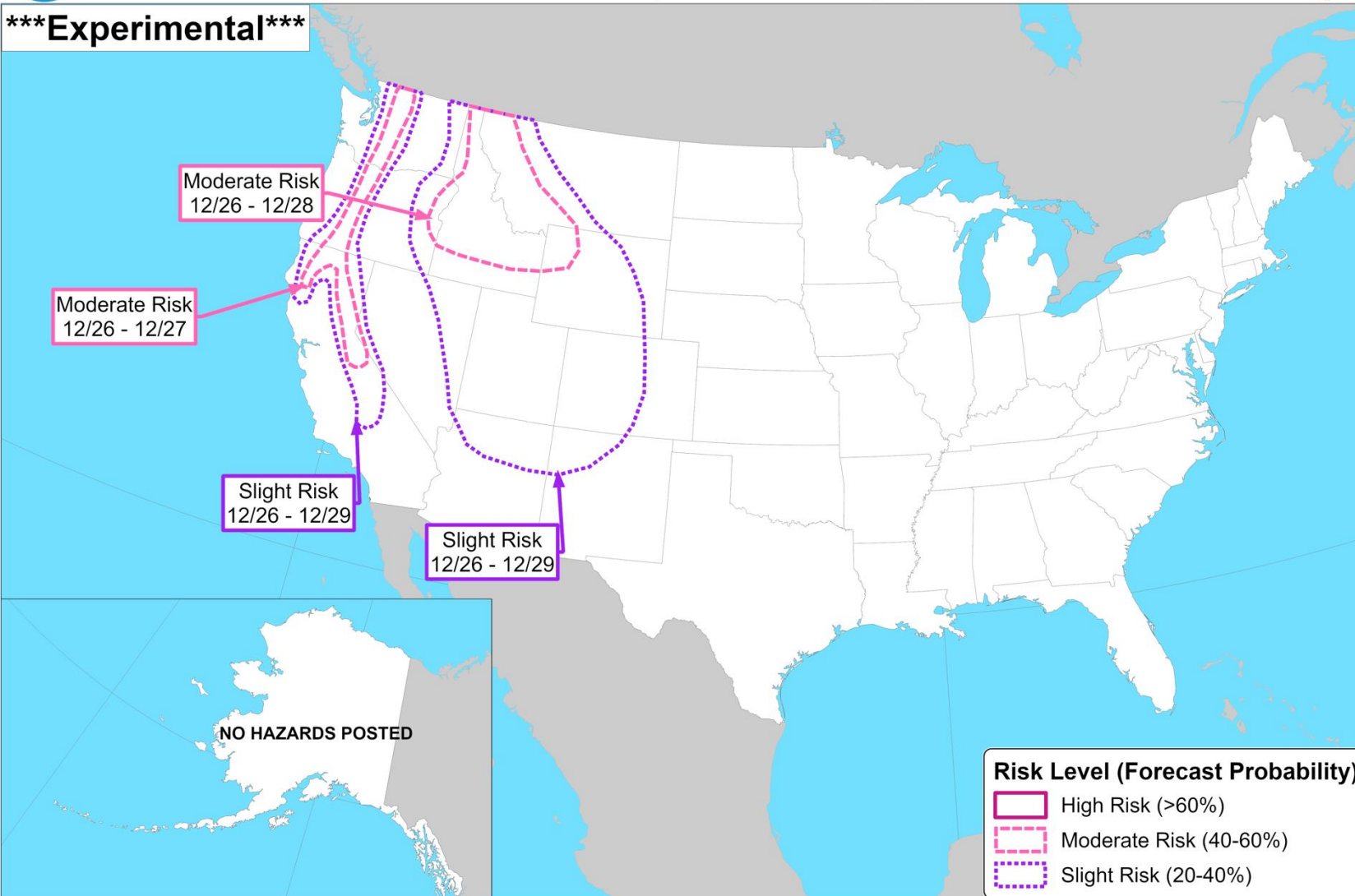


Risk of Heavy Snow

Valid: December 26, 2024 - January 1, 2025



Experimental



- Moderate risk (40-60%) for high elevation snowfall in western MT & northwest WY
- Slight risk (20-40%) for western WY & CO
- Could increase snowpack, but disrupt holiday travel

Climate Prediction Center

Released: December 18, 2024 3:00 PM EST

Follow us:

www.cpc.ncep.noaa.gov

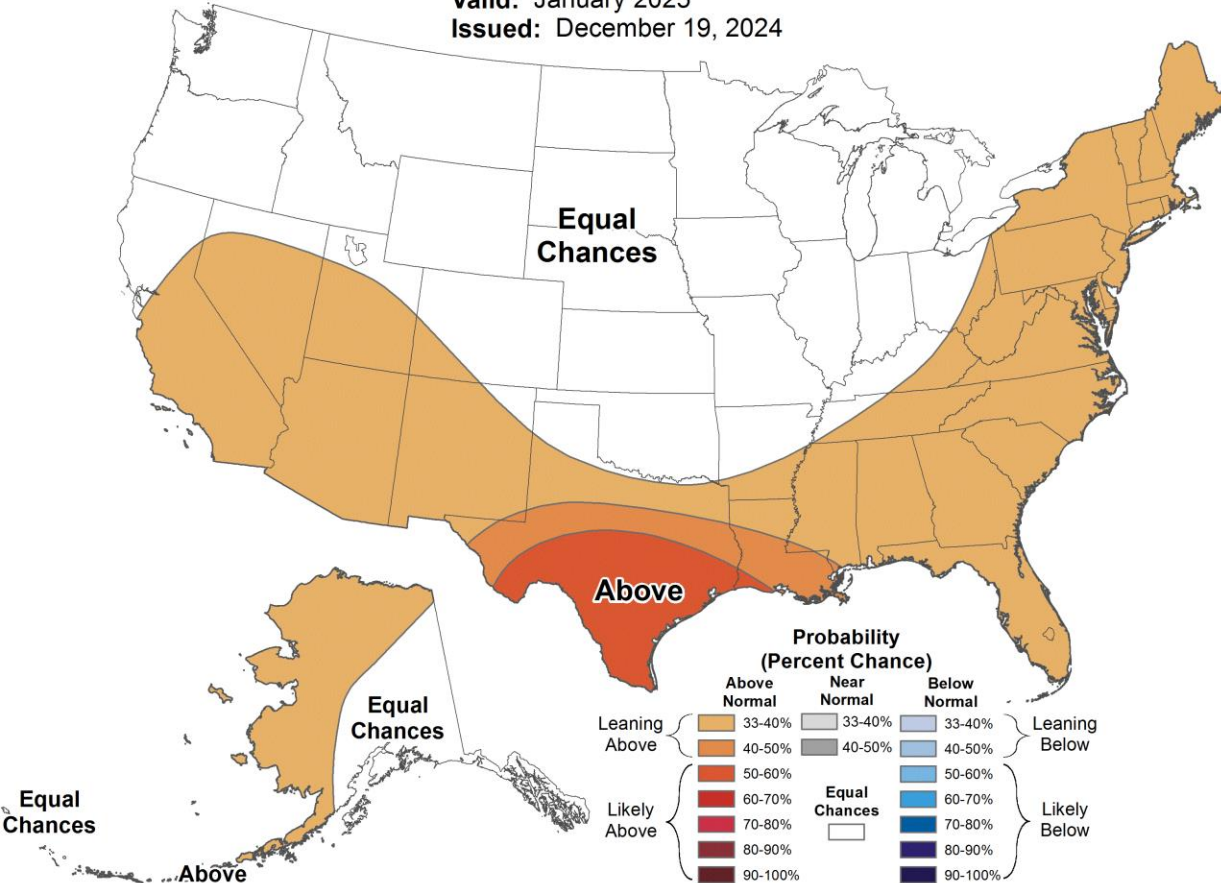
Credit: [NOAA CPC](https://www.noaa.gov/cpc)

January 2025 Outlook



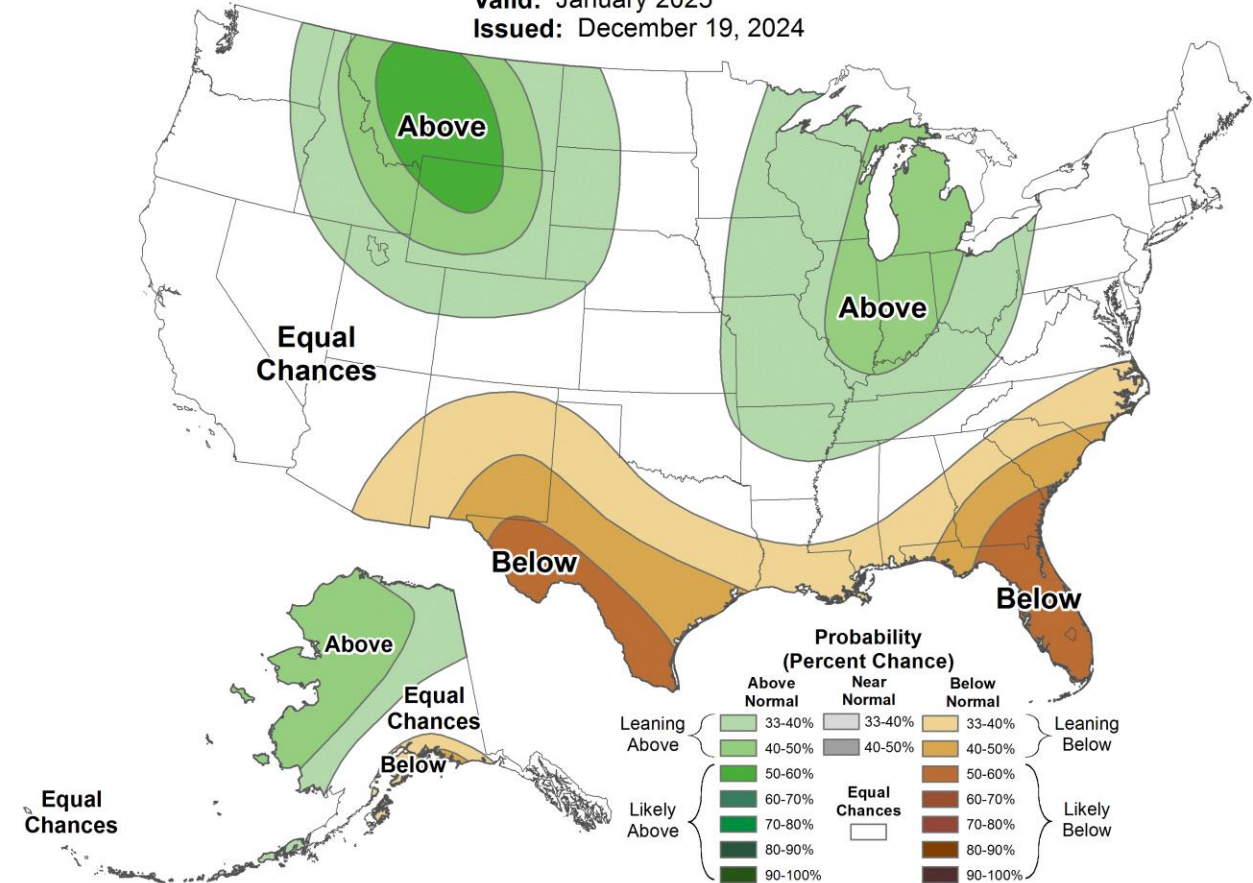
Monthly Temperature Outlook

Valid: January 2025
Issued: December 19, 2024



Monthly Precipitation Outlook

Valid: January 2025
Issued: December 19, 2024



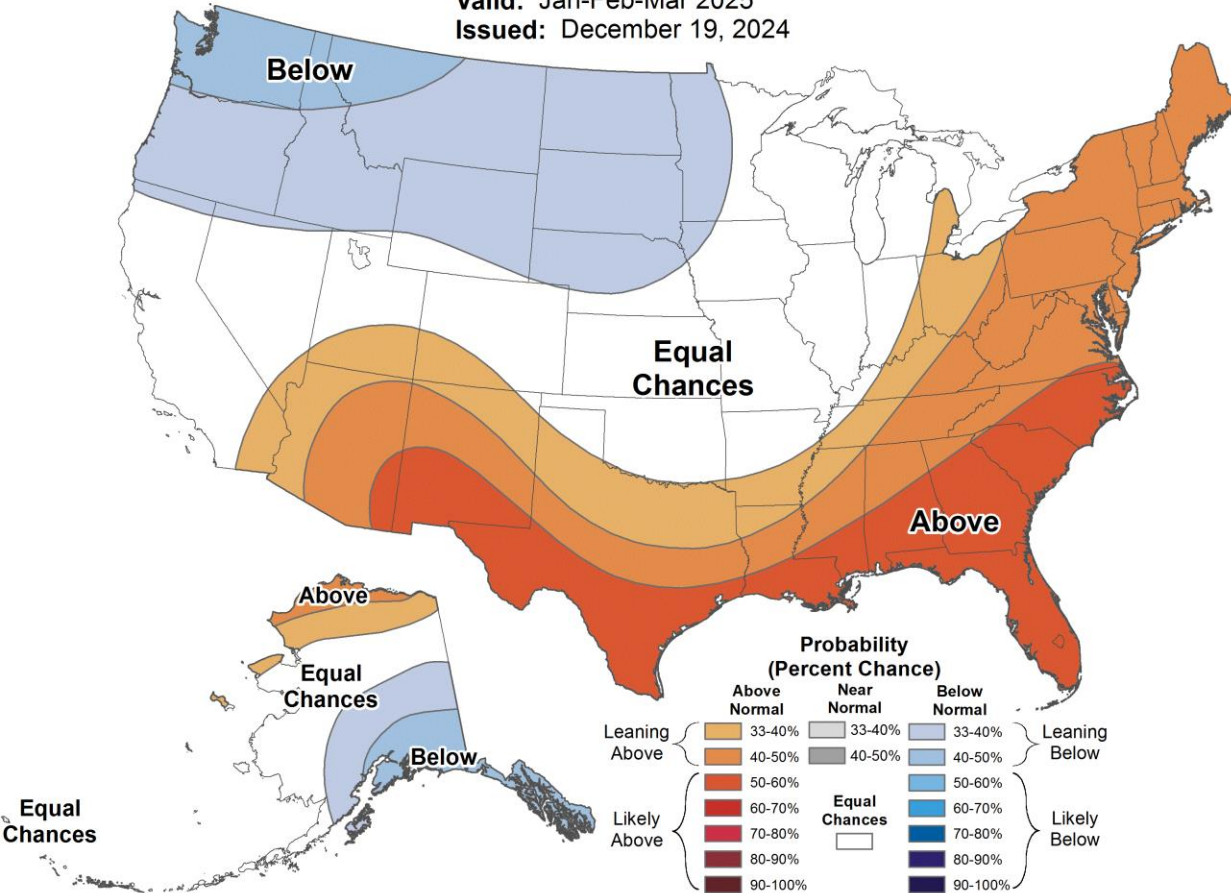
- Region-wide equal chances for above, near, or below normal temperatures
- Higher probability for wetter than normal conditions in the Great Lakes & *especially* Northern Rockies

January-February-March 2025 Outlook



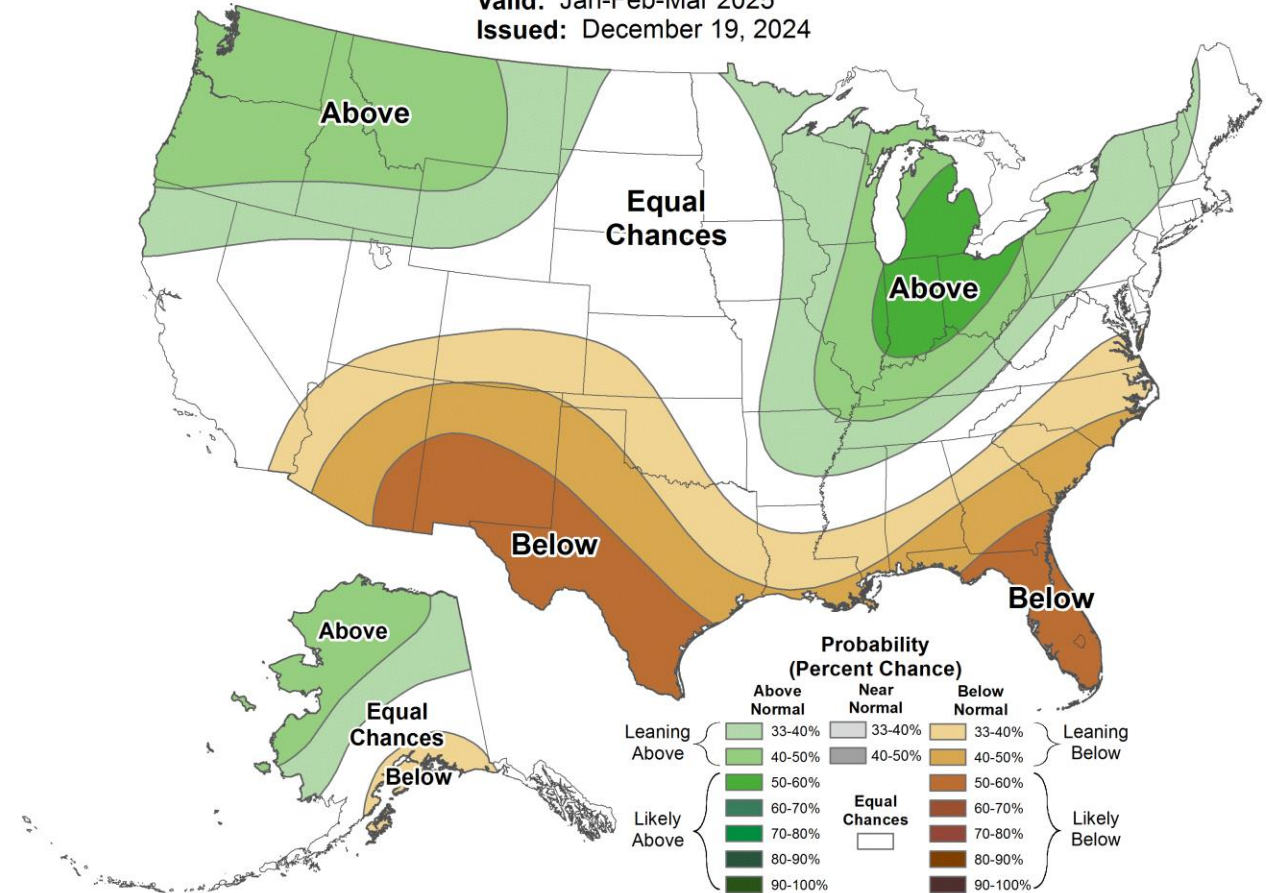
Seasonal Temperature Outlook

Valid: Jan-Feb-Mar 2025
Issued: December 19, 2024



Seasonal Precipitation Outlook

Valid: Jan-Feb-Mar 2025
Issued: December 19, 2024



- Slightly elevated chance for cooler in the north/northwest, warmer in the far east
- Higher probability for wetter than normal conditions in the Northern Rockies & *especially* Great Lakes

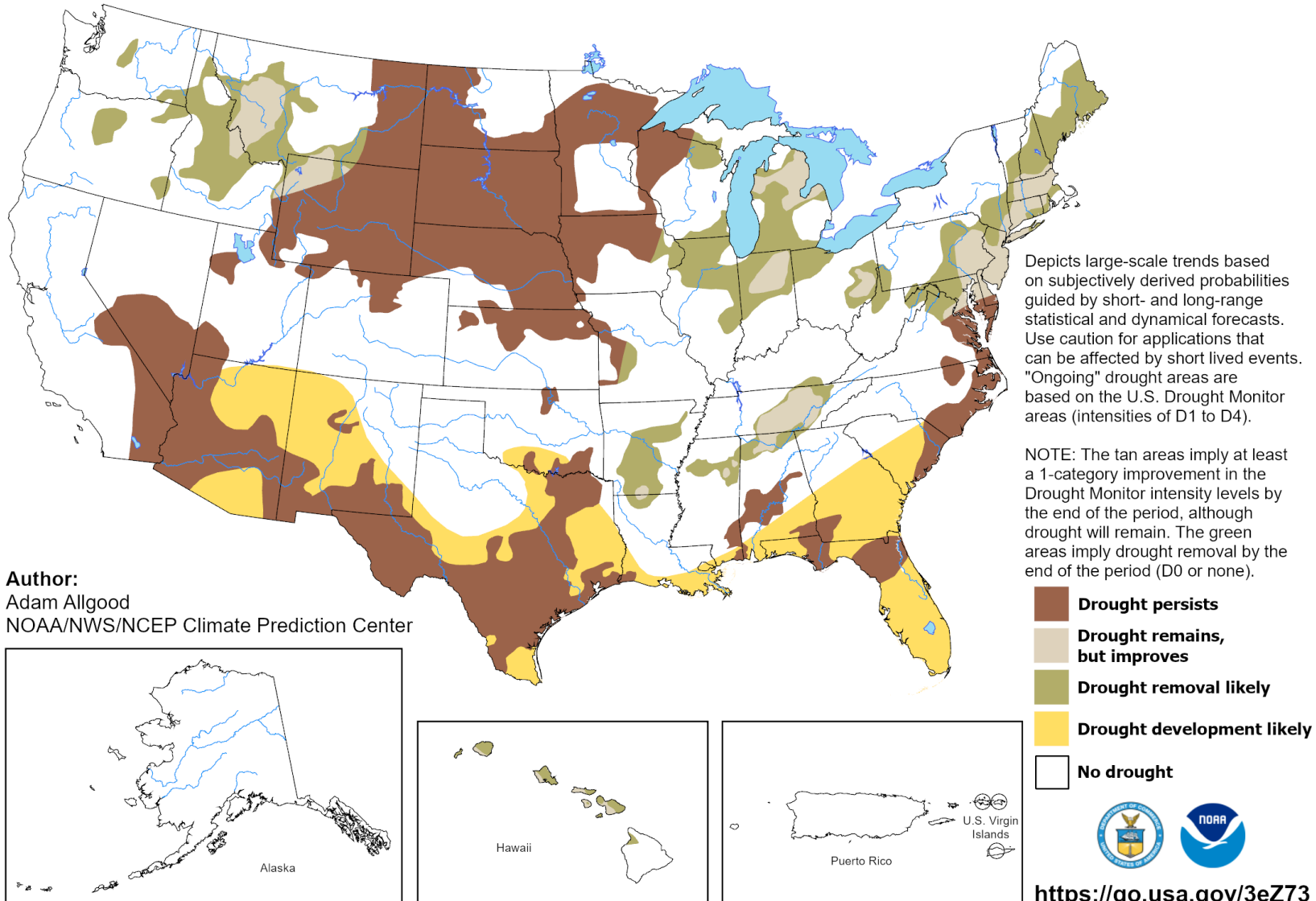
January-February-March 2025 Outlook

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for December 19, 2024 - March 31, 2025

Released December 19, 2024



Author:
Adam Allgood
NOAA/NWS/NCEP Climate Prediction Center

- Perhaps some drought improvement for the Great Lakes states and western MT & WY
- Persistent drought for Plains
 - Winter is our driest season, so drought improvement is difficult at this time of the year normally

<https://go.usa.gov/3eZ73>

Credit: [NOAA CPC](#)



Valid: Feb-Mar-Apr 2025
Issued: December 19, 2024

Below

Equal Chances

Above

Equal Chances

Below

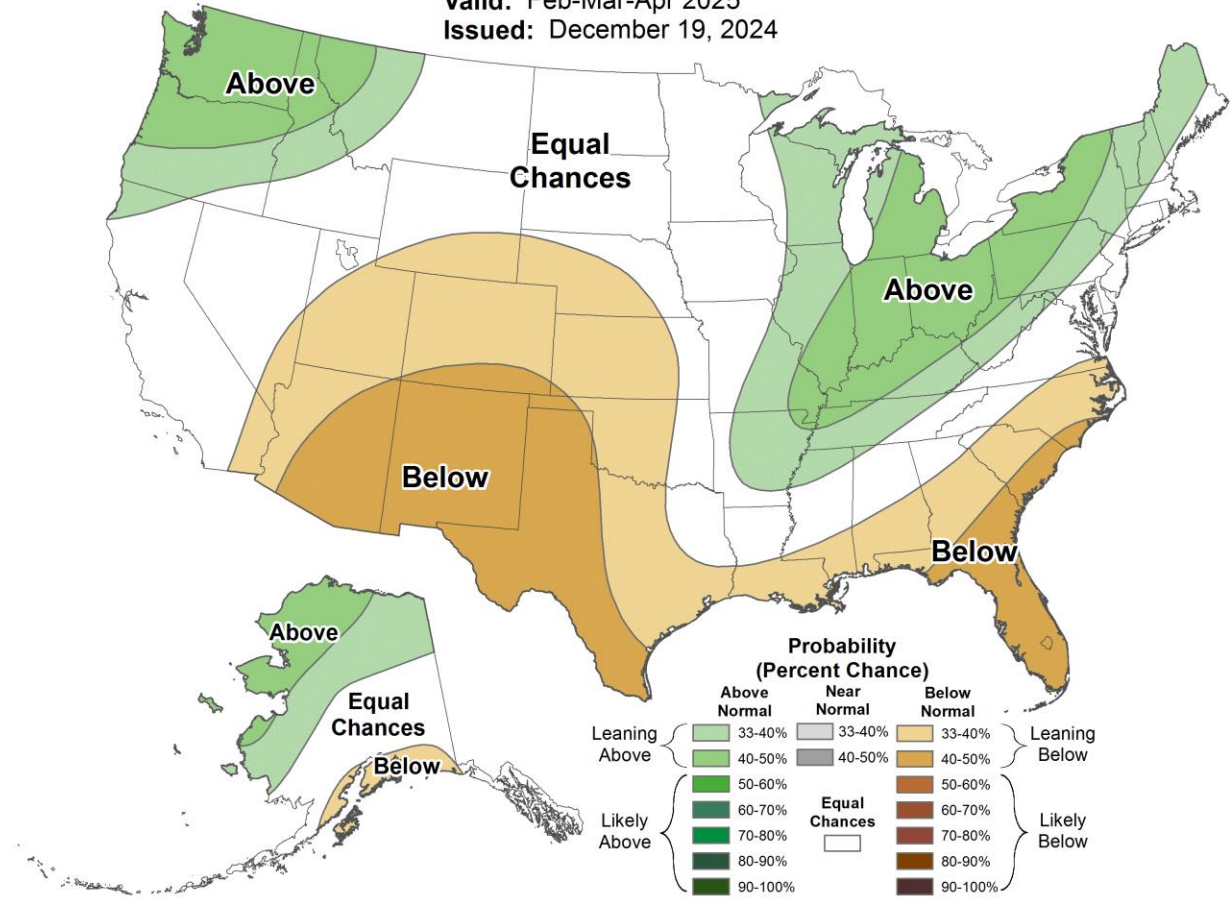
Above

Probability (Percent Chance)

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

Equal Chances

Likely Below



Summary

- Current Conditions

- Some drought and hydrology recovery, although slowing with less precip
- No major issues on the Mississippi, Missouri, or Ohio Rivers
 - Monitoring low flows around St. Louis and the threat for ice bites
- Great Lakes and local ice cover near normal for this time of year
- Winter made an appearance in the region, though some feel it more

- Outlook

- Best chances for precip for eastern & southern Midwest over next 7 days
- Potential for significant snow in the Rockies & west between Dec 26-29
- Weak La Niña Watch for Jan-Mar, meaning the potential for cooler and snowier conditions
 - Note: Relatively high chance La Niña will not officially emerge

Further Information – Partners

- Today's and Past Recorded Presentations
 - <https://mrcc.purdue.edu/webinars>
 - <https://hprcc.unl.edu/webinars.php>
- NOAA National Centers for Environmental Information – www.ncei.noaa.gov
- Monthly Climate Reports (US & Global) – <https://www.ncdc.noaa.gov/sotc/>
- NOAA Climate Prediction Center – www.cpc.ncep.noaa.gov
- Climate Portal – www.climate.gov
- U.S. Drought Portal – www.drought.gov
- National Drought Mitigation Center – <https://drought.unl.edu>
- State Climatologists – <http://www.stateclimate.org>
- Regional Climate Centers
 - Midwestern – <https://mrcc.purdue.edu>
 - High Plains – <https://hprcc.unl.edu>
- USDA Midwest Climate Hub – <https://www.climatehubs.usda.gov/hubs/midwest>



United States
Department of Agriculture
Midwest Climate Hub



Thank you very much! Questions?

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