Southern Oscillation Index (SOI) Peak Follow-Up Dec 19, 2025

It was an interesting 13 days since last post Dec 6 watching the weather and models coming together.

And now there's more model agreement of the active weather continuing into mid-January.

Another Signal of What Might be Expected Soon:

Jan 14 2014 daily SOI (Southern Oscillation Index) value was above 50, and the pressure at Darwin was at 998mb for 2nd consecutive day.
Nov 19 & 23 2025 SOI was 38.

A reading of a 50 does not occur often, based on 23+ years of record.
Here are FEW times the SOI daily number has been in the mid 40's or above and events that followed:

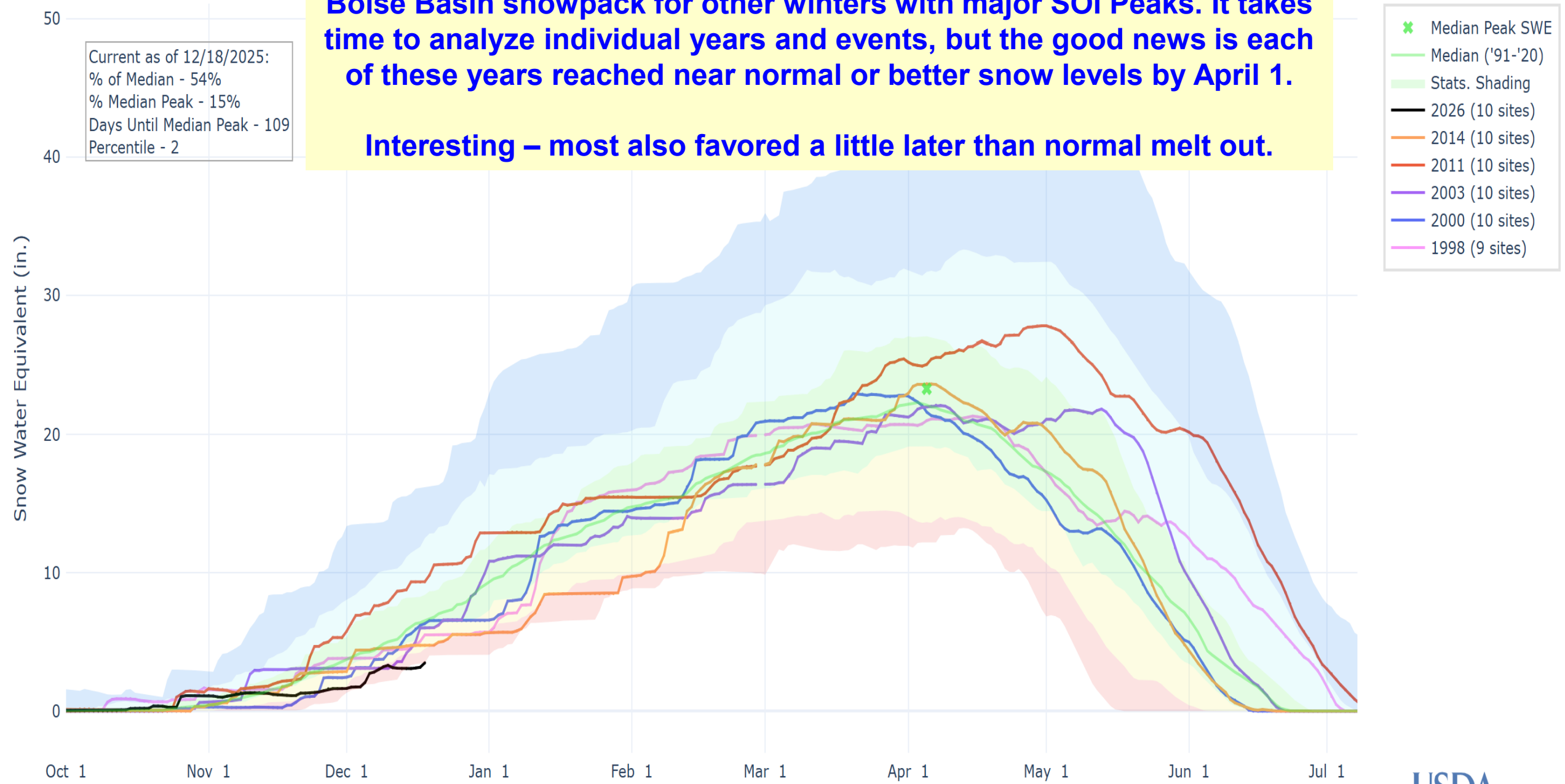
- **Nov 19 & 23 2025: (38.) Cooler wet weather arrived Dec 18 _____**
- **Jan 14/15 2014: (54.90) Abundant Moisture Feb/Mar 2014**
- **Dec 25 2011: (49.20) Snowstorm/Arctic Blast Jan 14, 2012**
- **Jan 17/18 2011: (50.87, 55.43) Snow/Arctic Blast Feb 24, 2011**
- **Dec 22/23 2003: (44.34, 44.34) Snow/Arctic Blast Jan 2, 2004**
- **Dec 4/5 2000: (49.61, 47.14) Modified Arctic Air Dec 10-15, 2000**
- **Dec 11/12 1998: (51.02, 49.60) Major Arctic Blast Dec 19, 1998**

It's no fool proof method, but is now showing agreement with models

SNOW WATER EQUIVALENT IN BOISE

Boise Basin snowpack for other winters with major SOI Peaks. It takes time to analyze individual years and events, but the good news is each of these years reached near normal or better snow levels by April 1.

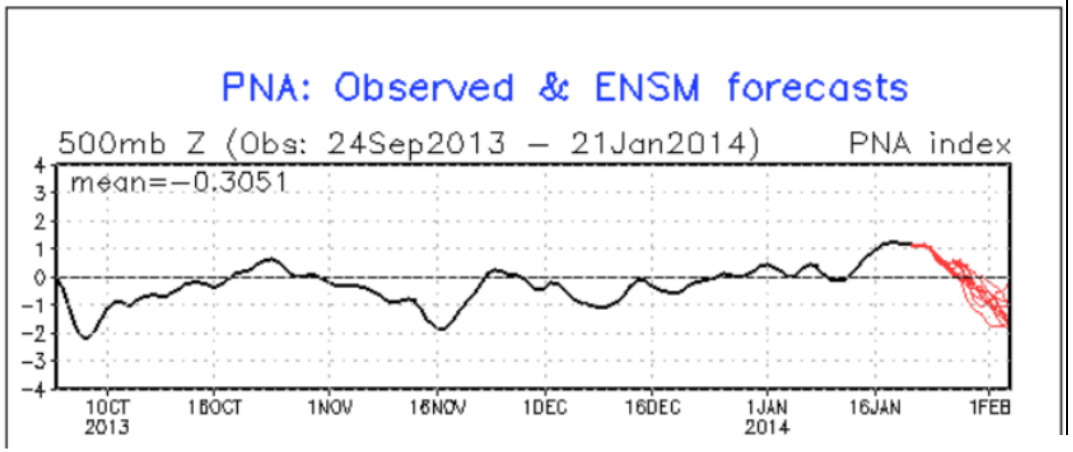
Interesting – most also favored a little later than normal melt out.



PNA from Jan 21 2014

The PNA is getting interestingly negative:

Pacific North American Index is one parameter (index) that helps for moisture in the PAC NW but there are others that are needed too.



As Jan Curtis hinted at back in 2014:
It's no fool proof method but is interesting seeing other models show agreement.

Here are a few of the best indicators I could find.

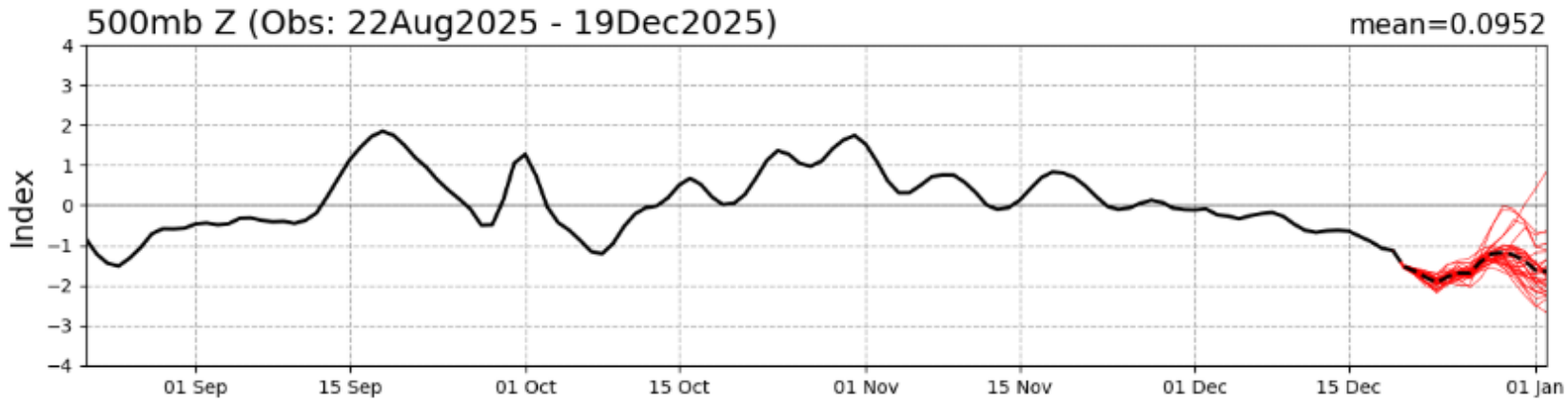
Left - PNA from Jan 2014

Below is the good news. Current PNA Dec 19, 2025

PNA is still decreasing and staying negative and showing a little dip after Jan 1. Sweet !

https://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/pna.shtml

PNA Index: Observed & GEFS Forecasts

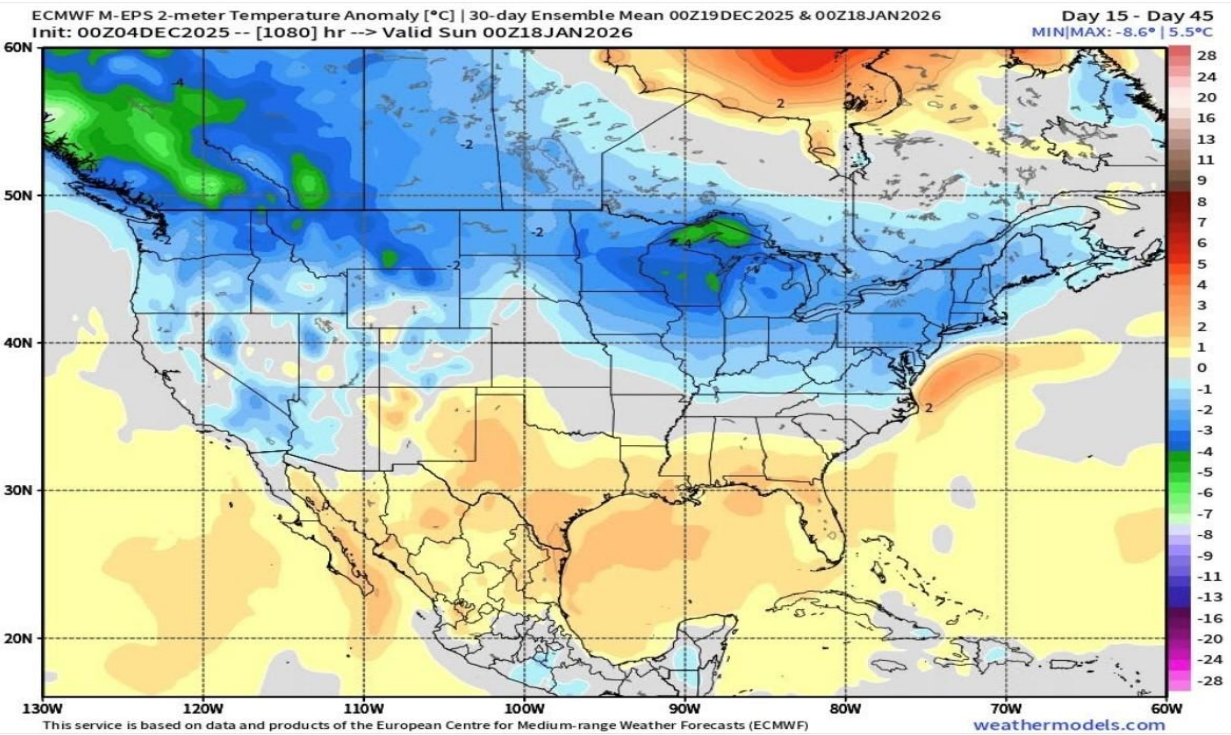


My Personal Weatherman ···

· Follow

1d ·

No end in sight!! Here's the temperature anomaly map from December 17th to January 17th from the new Euro weeklies ensemble mean to show the general idea. This map doesn't mean there won't be some days with above normal temperatures in the northeast.



This Temperature Anomaly Map is (Degrees C) is from Dec 4 and shows Day 15 - Day 45 (Dec 17 - Jan 18) favoring colder than normal temps across the Canadian border.

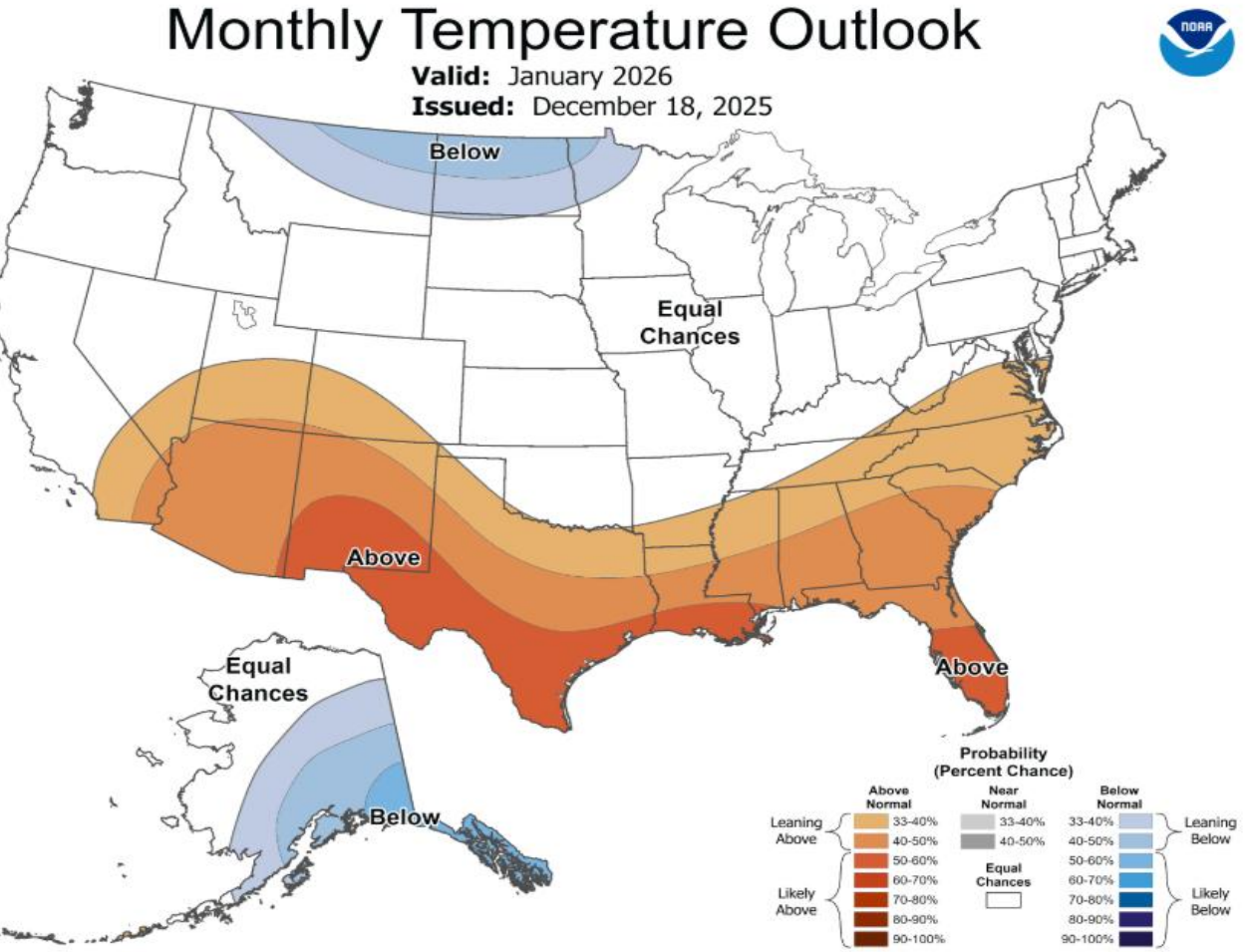
Shades of blue/green are below 0 C.

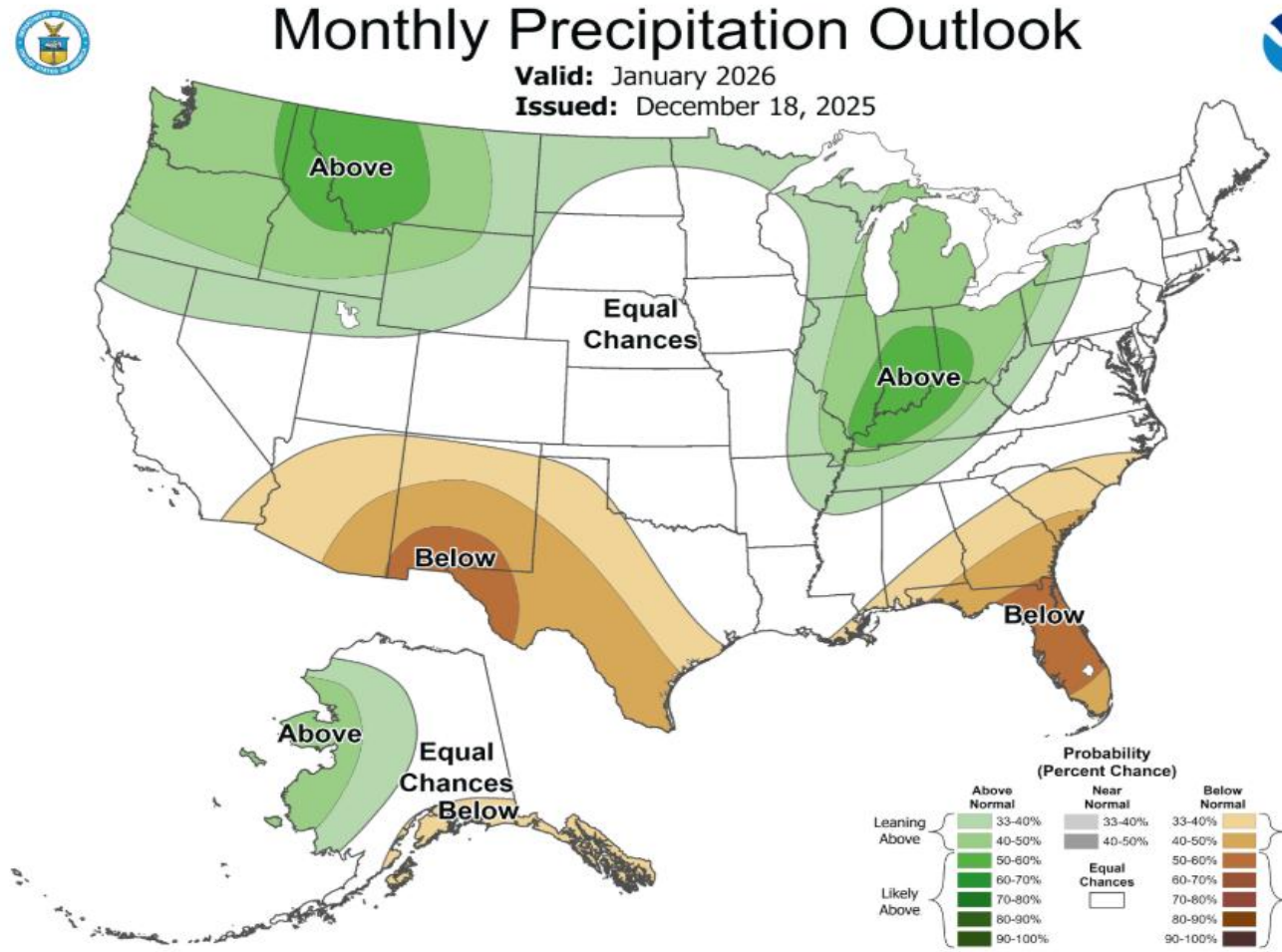
Today, Dec 19, is colder than yesterday and the day before…

Timely Dec 18 NWS release of Official 30-Day Forecast (I'm still looking for the Unofficial 30-Day Forecast). Temp Outlook map shows smaller chance for below normal temps along the Canadian border and Equal Chances in white. This is for full month of Jan. Precip Outlook favors above normal Precip in PNW.

OFFICIAL 30-Day Forecasts

Issued: December 18, 2025





Mark Margavage's Weather Discu... · Follow
10h ·

🚨 Record Setting SOI Drop 🚨
⚠️ Big Winter Storm Signal ⚠️

The Southern Oscillation Index (SOI) is a key indicator of the strength and phase of the El Niño–Southern Oscillation (ENSO). Sustained strongly positive SOI values (typically 30-day average > +7 or +8) are associated with La Niña conditions, and sustained strongly negative values with El Niño.

This graph shows a very sharp collapse of the SOI from strongly positive (La Niña-like) values around +18 in mid-to-late November 2025 down to slightly positive or near-neutral values by early December 2025.

According to Grok A.I. "This is one of the fastest SOI drops on record."

After a sudden SOI plunge of this magnitude and speed, the most common lag time to the first big Eastern U.S. winter storm or polar vortex disruption-driven cold wave is about 2–3 weeks, with a broader 10–35-day window of elevated risk.

Let's digest Mark's post from around Dec 5 in more detail. Interesting according to Gork A.I. this is one of fastest SOI drops.

After a sudden SOI plunge, the lag time to big Eastern events is about 2-3 weeks, with an elevated risk window of 10-35 days.

Mark is an Easten forecaster, while Jan was a Western forecaster. Jan also mentioned the time lag for major Western events but not in detail like Mark. Thanks Mark !

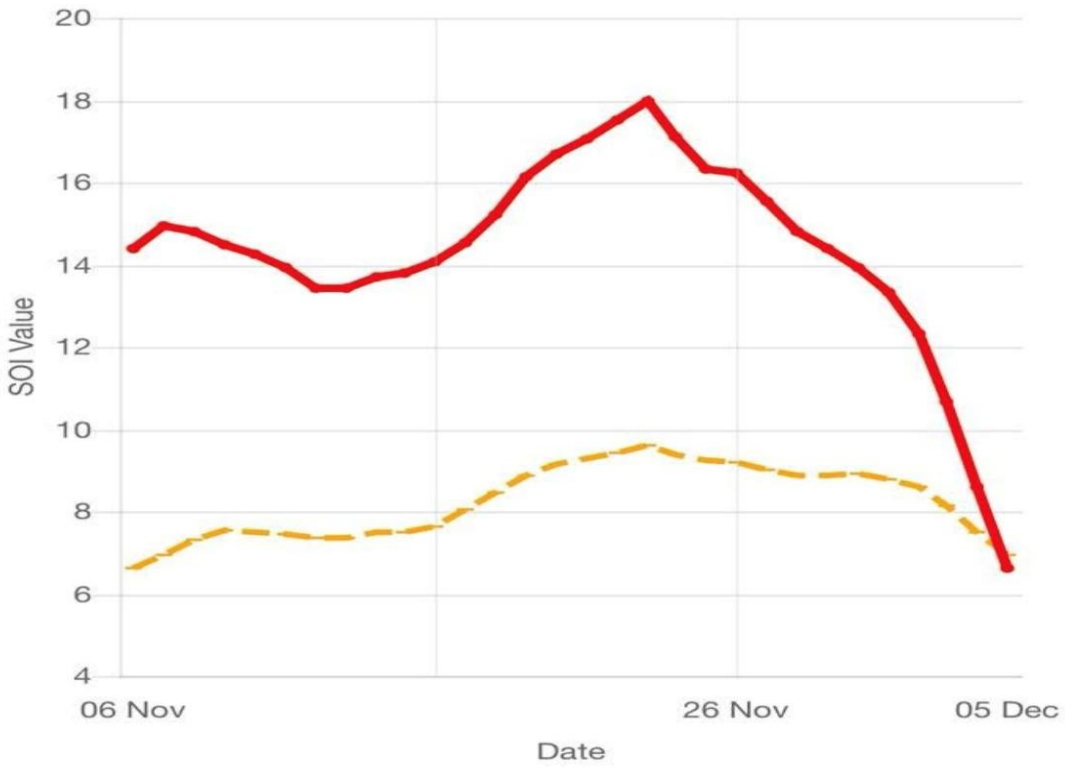
I'm just a middleman and observer. Mark is the only other person that I've heard of looking at SOI Drops like Jan did. Thanks again Mark ! Here's an A.I. summary of using daily SOI Drops. Never stop learning !!

AI Overview

While the standard Southern Oscillation Index (SOI) uses monthly averages for long-term climate prediction, researchers are exploring **daily SOI (dSOI) values and their rate of change** (e.g., 9-11 day or 19-21 day trends) to capture faster weather shifts, revealing potential for predicting **short-term severe weather events** (like tornadoes, heavy rain, hail) and hydrological extremes, particularly in regions like the western U.S., by correlating abrupt dSOI changes with mid-latitude weather patterns. Daily data helps identify evolving ENSO states that monthly averages might miss, improving forecasts for water management and severe weather risk.

So for the drop shown in this image (finalized ~5 Dec 2025), the highest winter storm threat in the Eastern US is roughly December 18 – January 10, peaking late December to very early January 2026. So Christmas could be extremely Wintery this year!
~Meteorologist Mark Margavage
#winteriscoming

Recent (preliminary) Southern Oscillation Index values

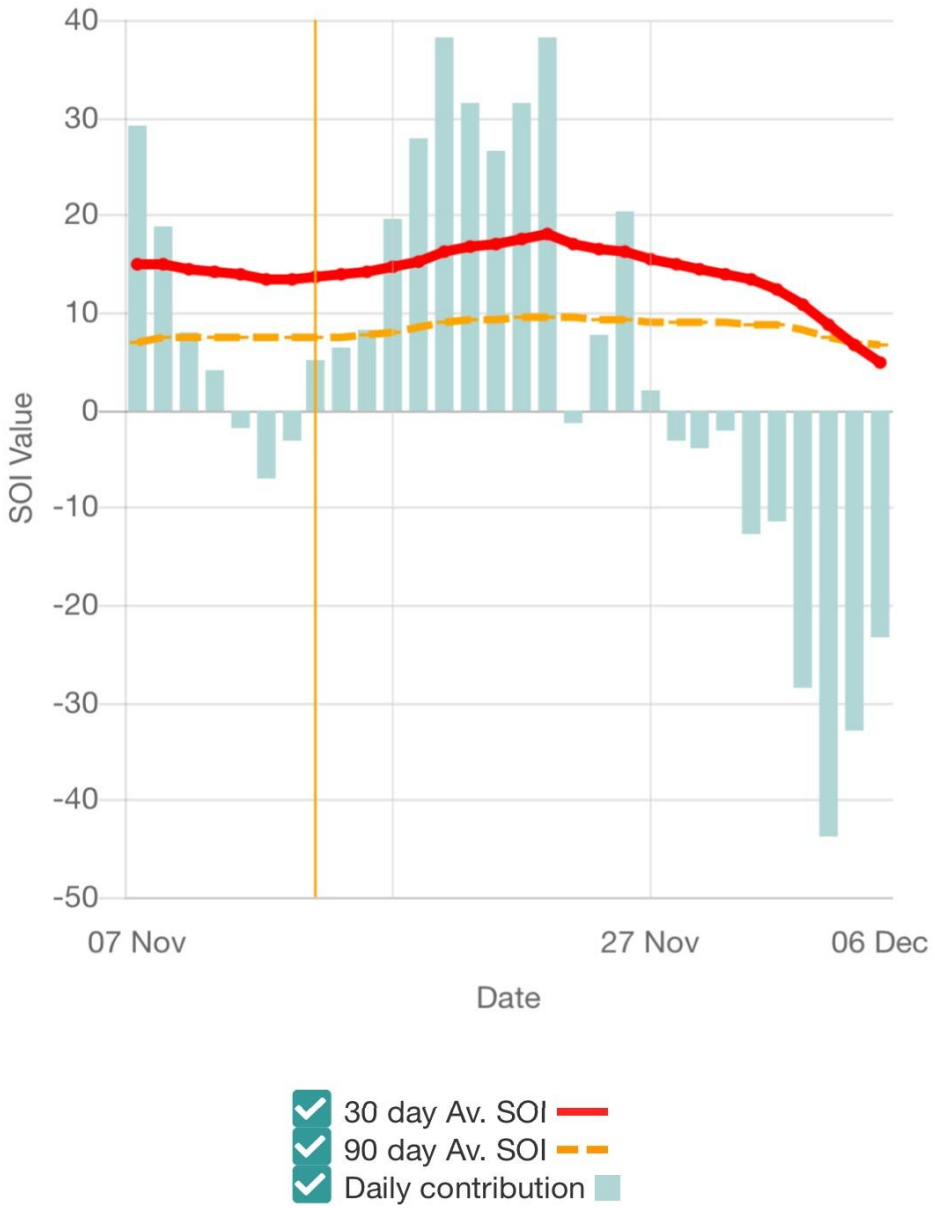


We'll keep watching the weather, models, forecasts and outlooks to see if these winter storm threats also peak in the West late December to early January.

Time will tell what happens the next few weeks, then we'll ask again - how long can this last ?

Interesting, I started this post on Dec 18 and today, Dec 19, there are more models and agreement with this pattern now lasting into mid-Jan.

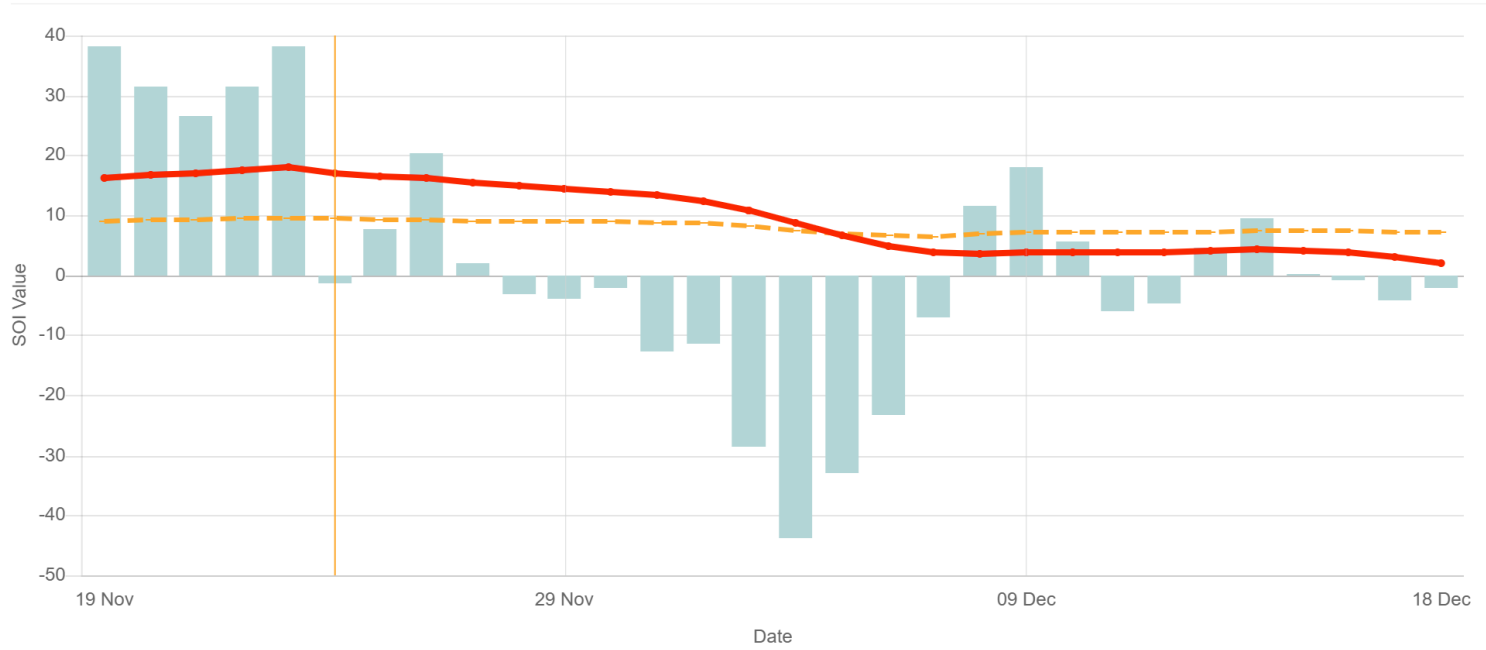
Recent (preliminary) Southern Oscillation Index values



Recent SOI daily values below are more typically.

Need an App to alert me when daily SOI values are above 30 !!

Recent (preliminary) Southern Oscillation Index values



30 day Av. SOI — 90 day Av. SOI — Daily contribution

Date	Tahiti (hPa)	Darwin (hPa)	Daily Contribution	30 day Av. SOI	90 day Av. SOI
18 Dec 2025	1010.09	1006.80	-2.23	1.89	7.24
17 Dec 2025	1010.15	1007.25	-4.26	2.89	7.21

Long-Duration Atmospheric River Pattern Continues Across the West

Issued December 9, 2025
Updated December 19, 2025

December 27, 2025 - January 16, 2026

A Bering Sea ridge and northeast Pacific trough will keep atmospheric rivers aimed at the western U.S. The greatest risk becomes focused on the Pacific Northwest by Dec 27.

During the busy holiday travel period and beyond, impacts may include flooding, landslides, and difficult mountain travel. Burn scar areas could see flash flooding and debris flows, and power outages are possible due to strong winds and heavy precipitation.

(a) Heavy Rain / Heavy Snow / High Winds / Flooding

High risk (>60% chance) of heavy precipitation for Western Washington Dec 27–29. Moderate risk (40–60%) of heavy precipitation extends through Jan 2 across western Washington and Oregon and northwestern California. Flooding is possible from the Pacific Northwest to Northern California.

High risk of heavy snow for Washington Cascades Dec 27–29. Moderate Risk of heavy snow extends through Jan 2 for the Cascades south to the Klamath Mountains. A moderate risk of heavy snow is also forecast for the Northern Rockies Dec 27–Jan 2.

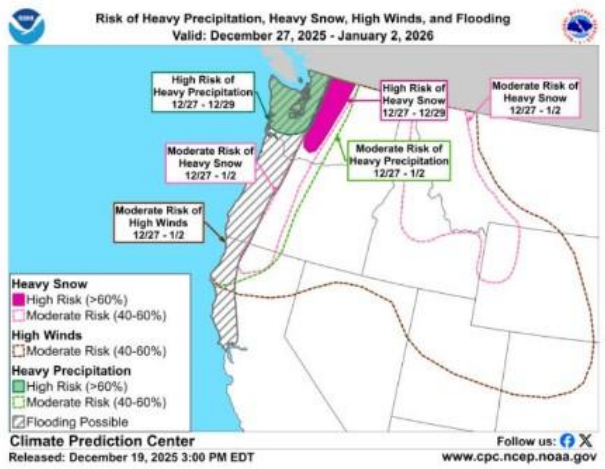
Moderate risk of high winds from the Pacific Northwest and Northern California to the Northern Rockies and Great Basin. Strongest gusts are most likely along the coast and at higher elevations.

(b) Looking Ahead

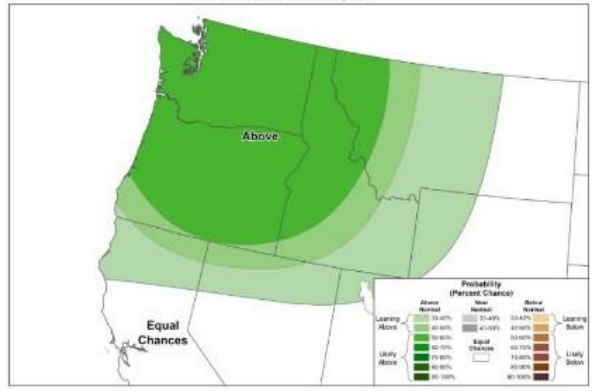
The forecast supports continued active weather well into January. Above-normal precipitation is likely for the Pacific Northwest and Northern Rockies Jan 3–16.

** For short-term forecasts (prior to December 27), visit www.wpc.ncep.noaa.gov and weather.gov.*

(a)



(b)



National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Climate Prediction Center
www.cpc.ncep.noaa.gov

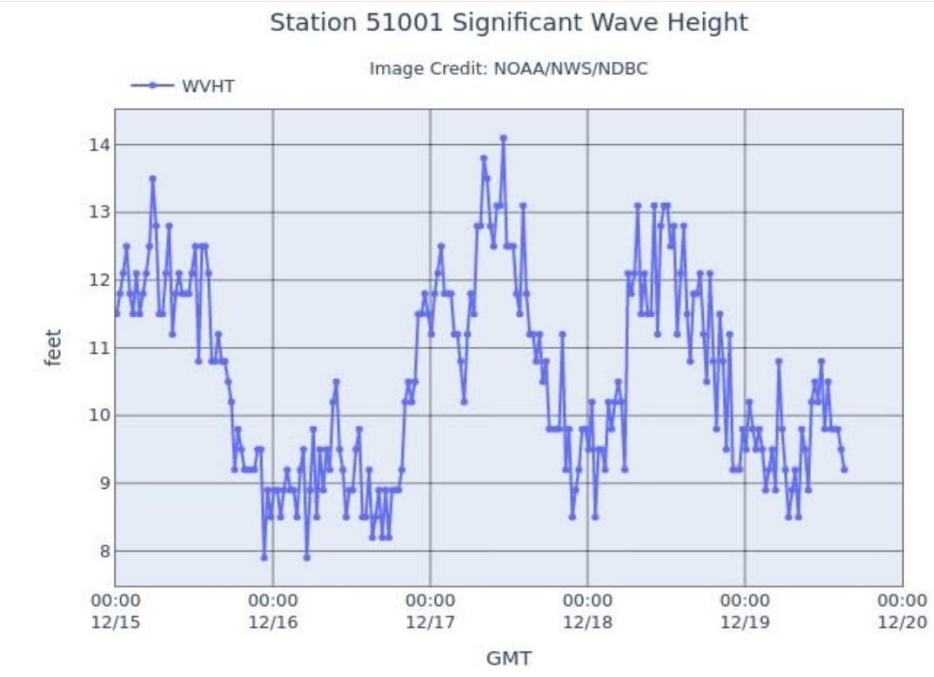
****Key messages are subject to change due to changes in forecast information and tools.*

**More good news –
NWS issued this Dec 9 and updated today Dec 19.**

This shows the active weather pattern should continue well into January 2026 for the PNW and Northern Rockies !!

The Powder Buoy
1h ·

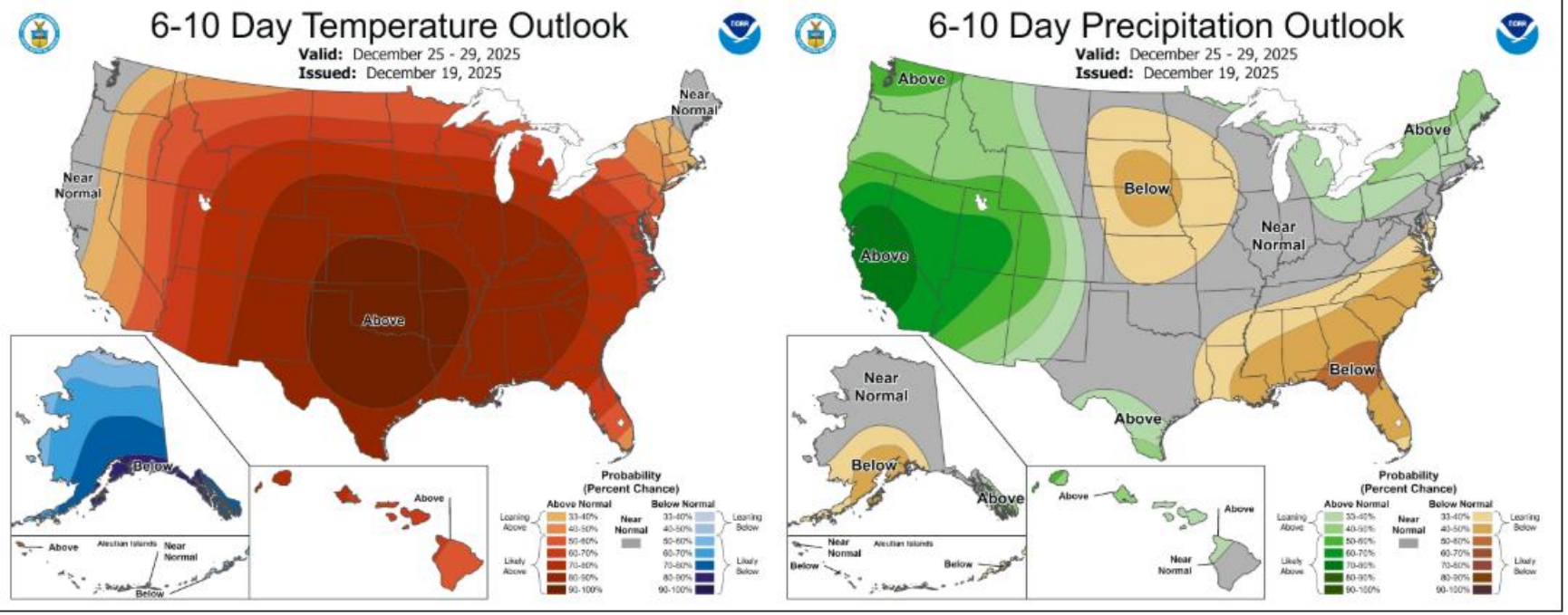
Lots of buoy pops going on out there. This latest one pulls us into the new year. There's some more on the horizon for the first week of January too. Don't want to get too far ahead of things, focusing on this weekwnd and Christmas snow for now, let's get those temps down. See you Saturday at Freedog's solstice/ pray for snow party. #yeahbuoy



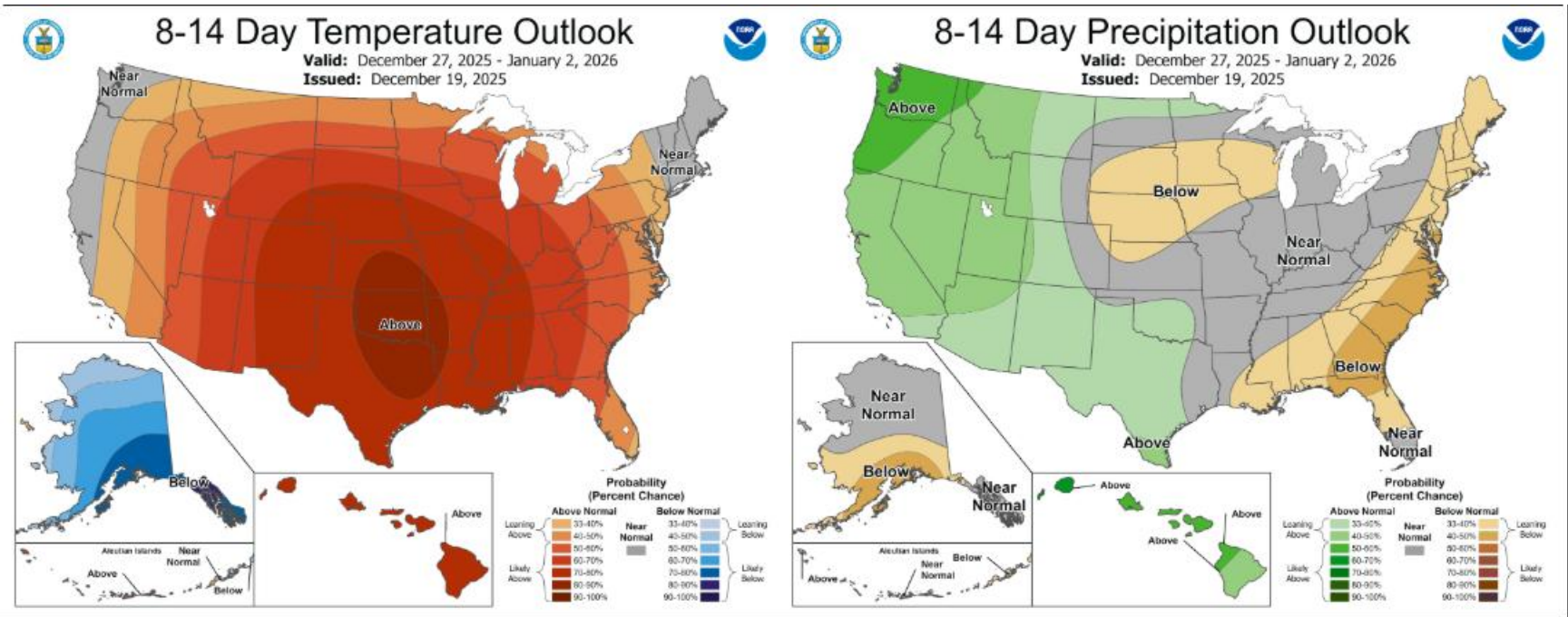
And the Bouy is popping too !!

I got a Buoy Pop marked on my calendar for Christmas day and now more in January.

Nice to see agreement in different forecasts methods.

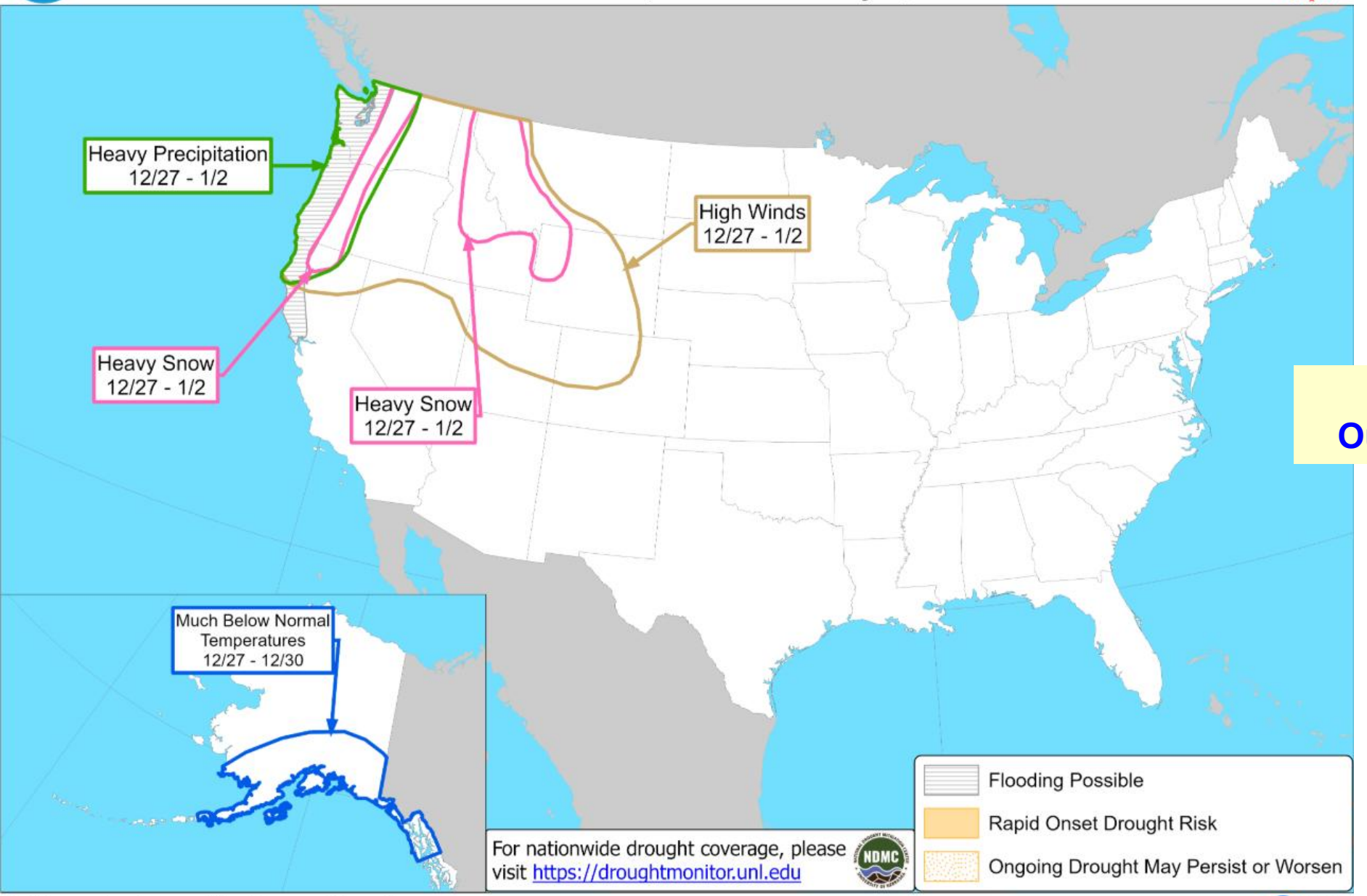


NOAA's 6-10 and 8-14 are looking more promising for the West & PNW !



Days 8-14 U.S. Hazards Outlook

Valid: December 27, 2025 - January 2, 2026



Same with the Hazard Outlook for Dec 27 - Jan 2.

Climate Prediction Center

Released: December 19, 2025 3:00 PM EST

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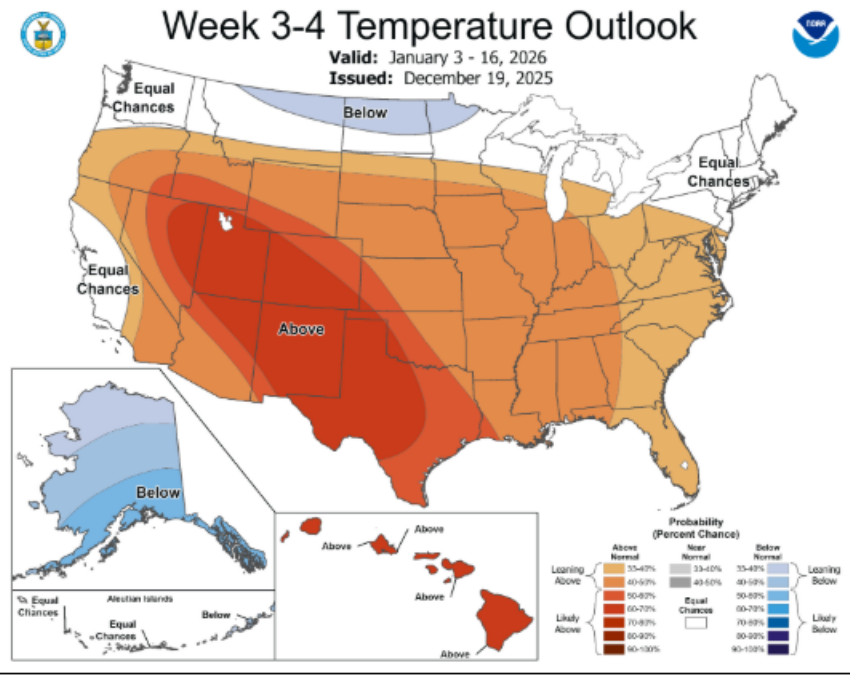
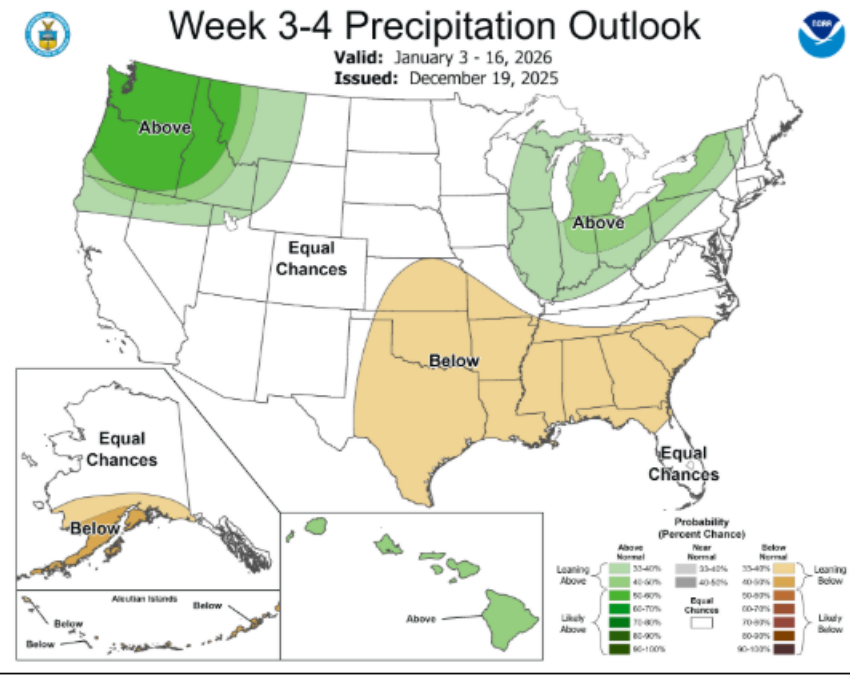
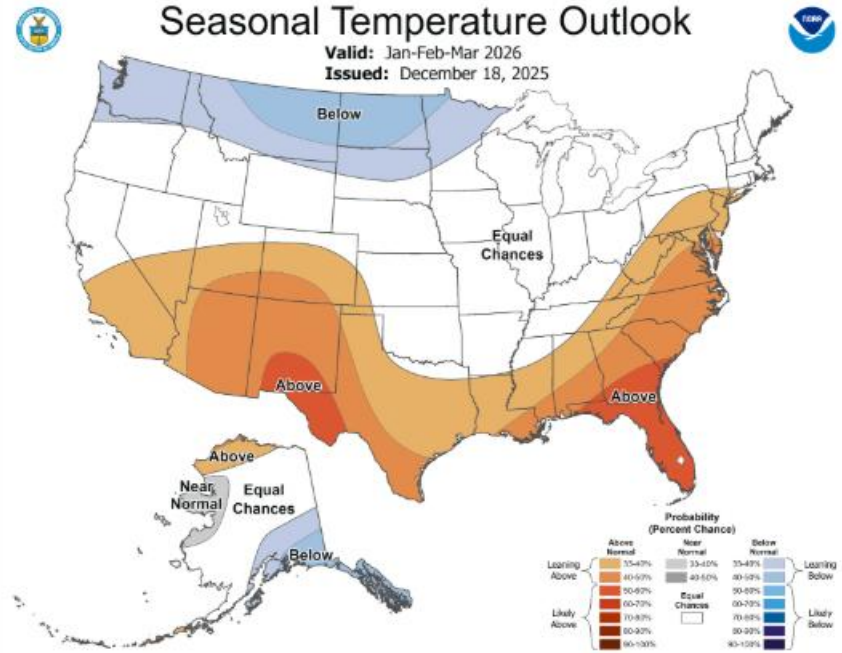
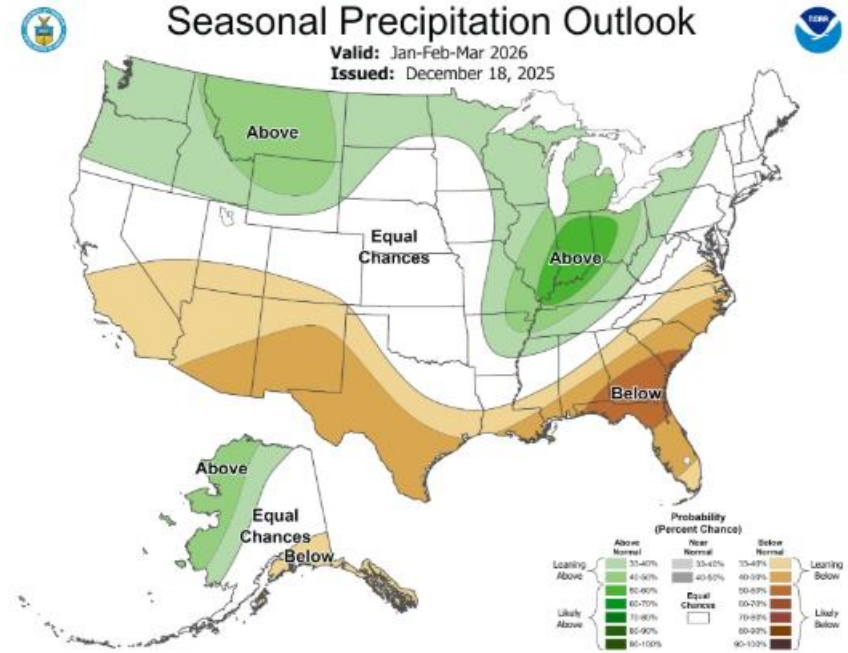








Week 3 – 4 (Jan 3-16) are looking optimistic too.

Let's hope warmer temps remain south of us.

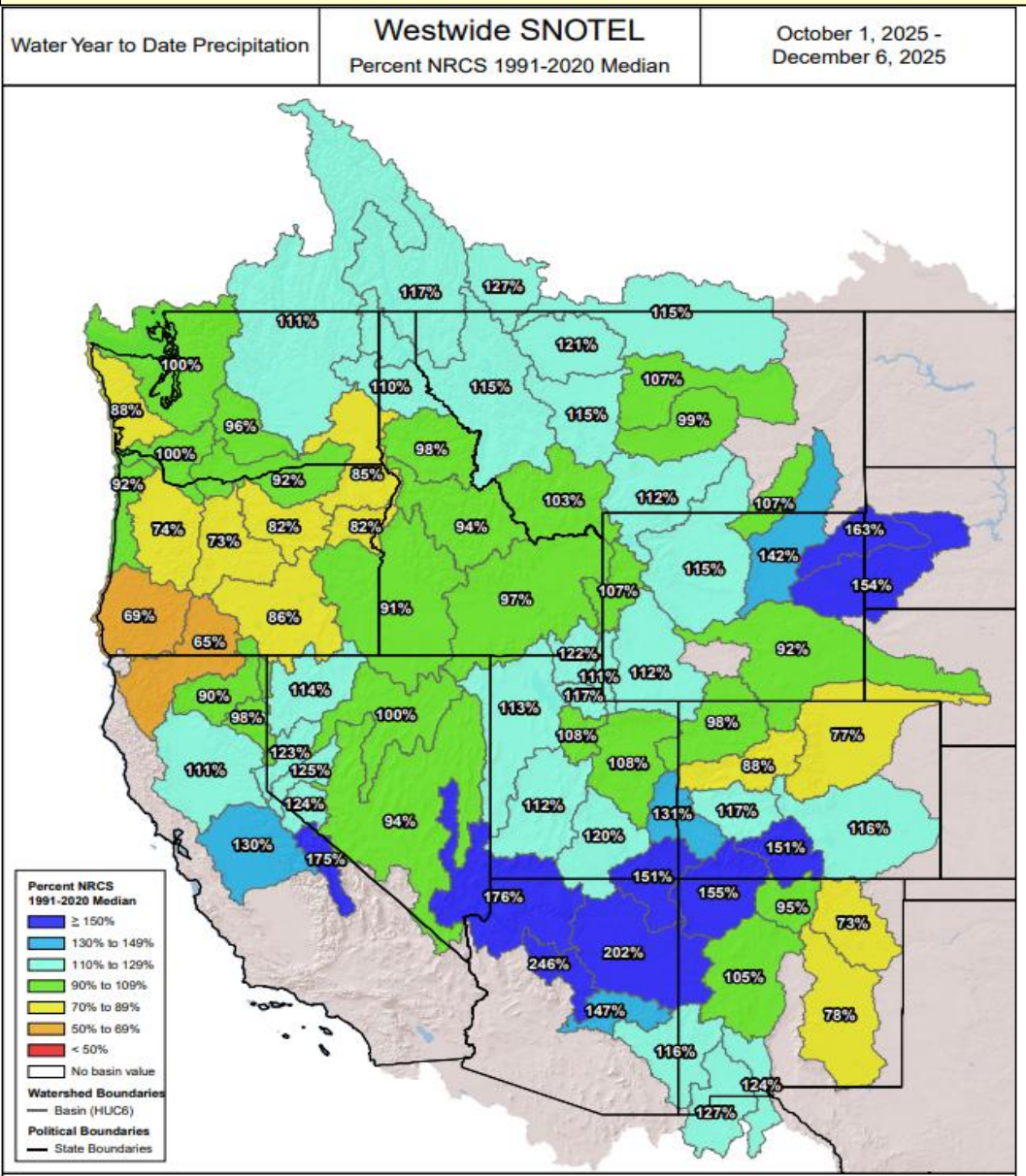
Current Conditions Dec 6 2025

This will be something we watch all winter – difference between Water Year to date Precip and Current Snowpack – here's Dec 6 and Dec 19

Water Year to Date Precipitation

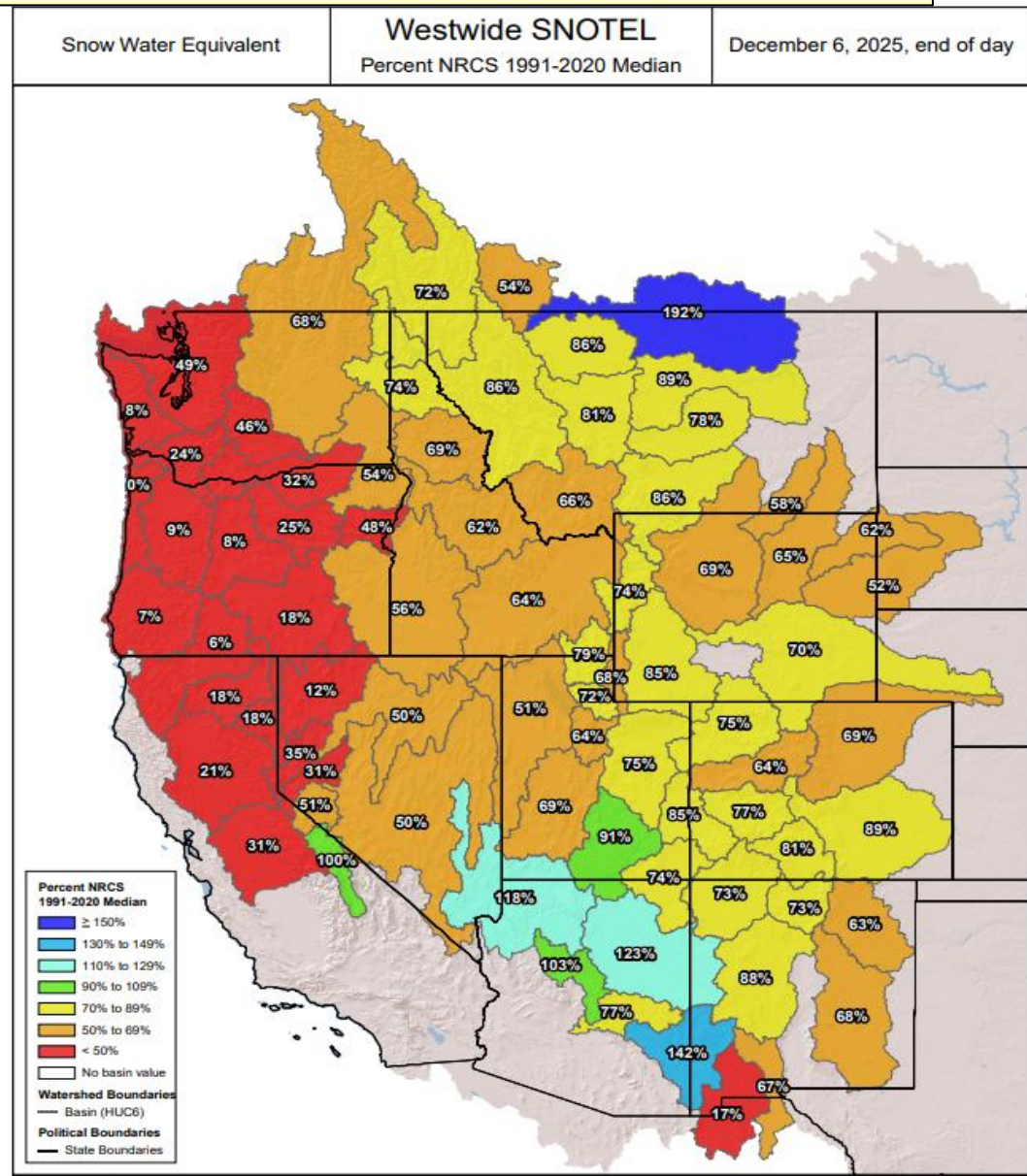
Based on SNOTEL

Snowpack



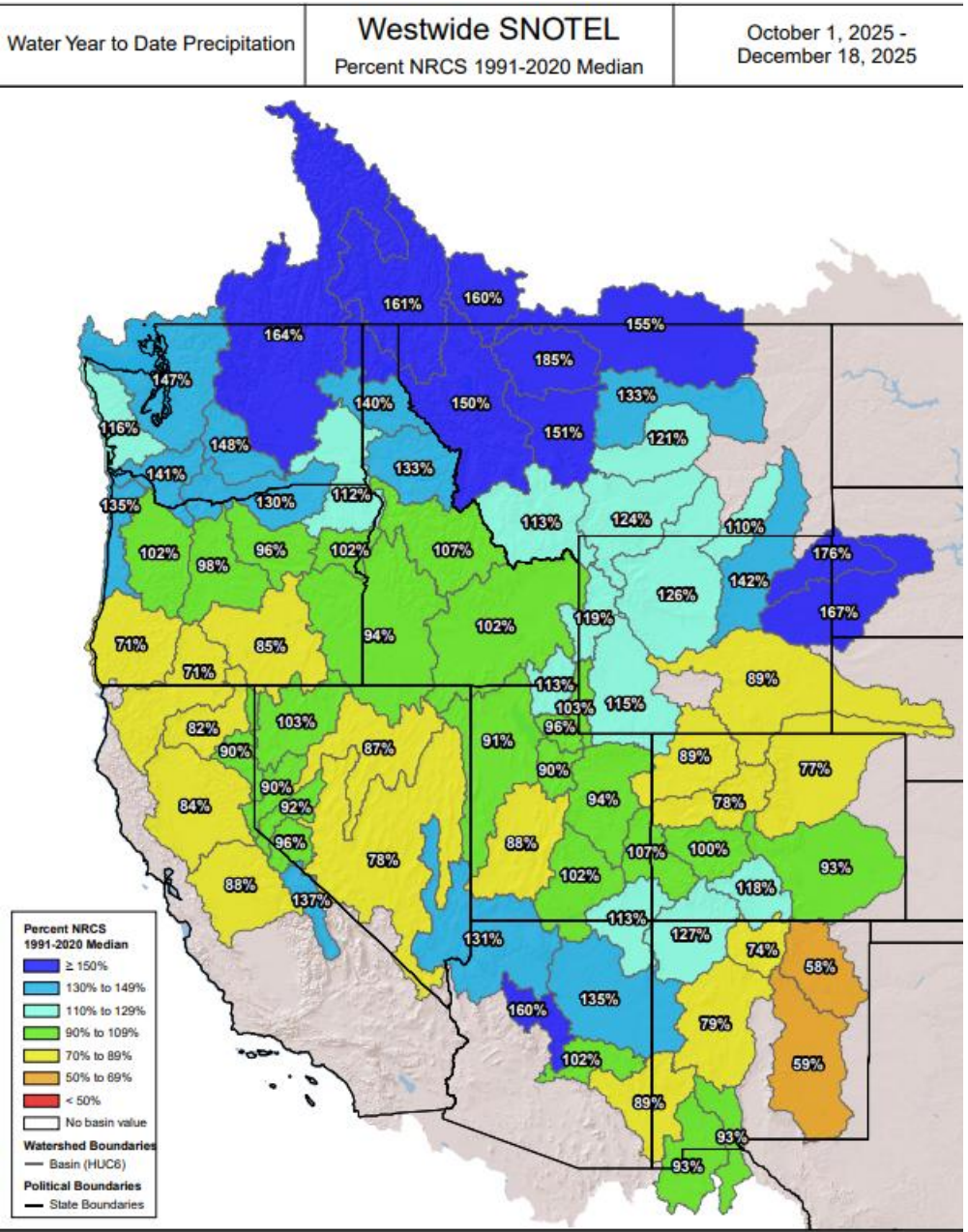
Water Year to Precipitation is better than expected.

Lower snow values influenced by warmer temperatures but also need to look at elevation of snow sites.



Current Conditions Dec 19 2025

Water Year to Date Precipitation Based on SNOTEL Snowpack

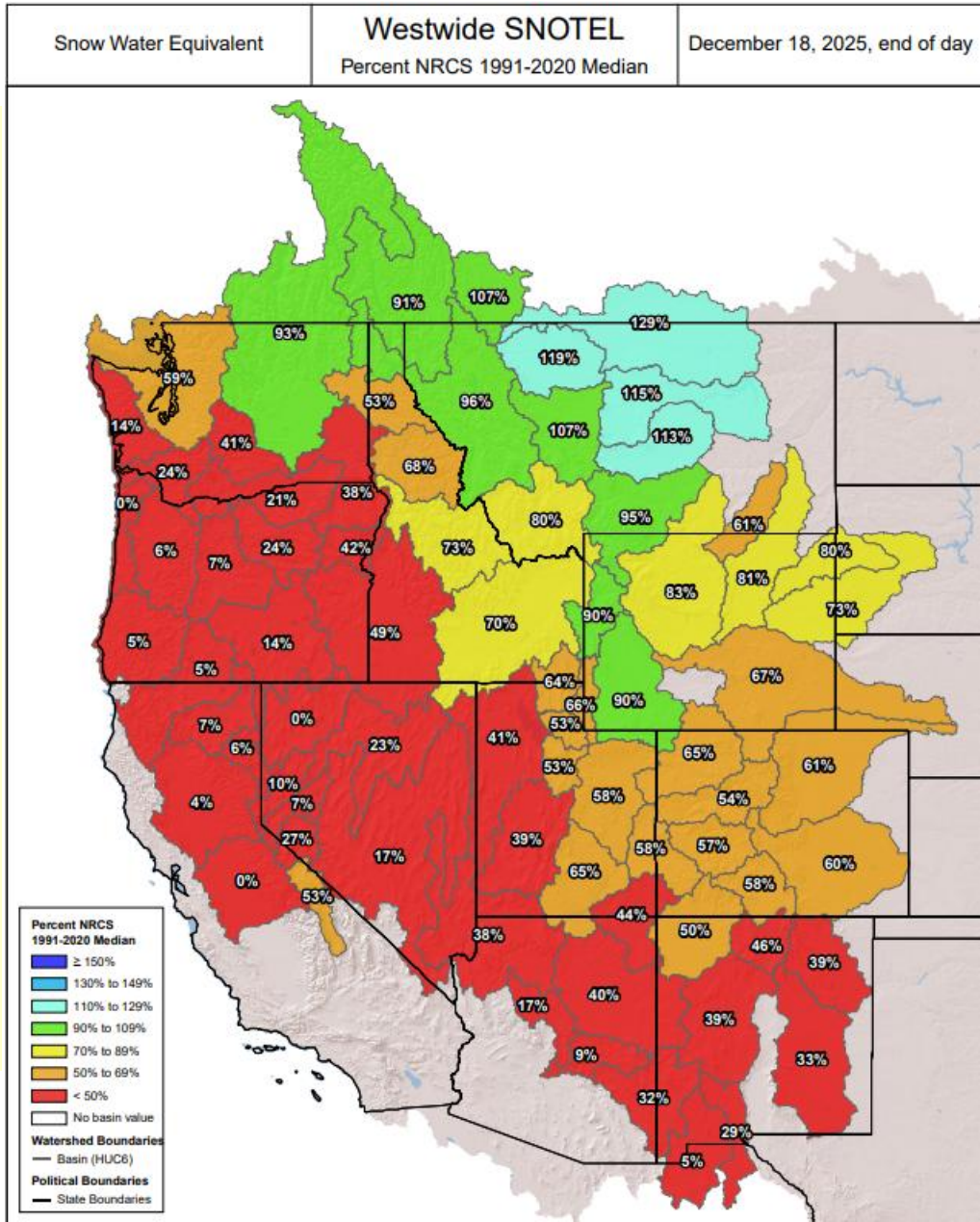


Water Year to date Precipitation left and Snow right.

What a difference in 13 days for precip amounts, but snow is still lacking because of warm temps.

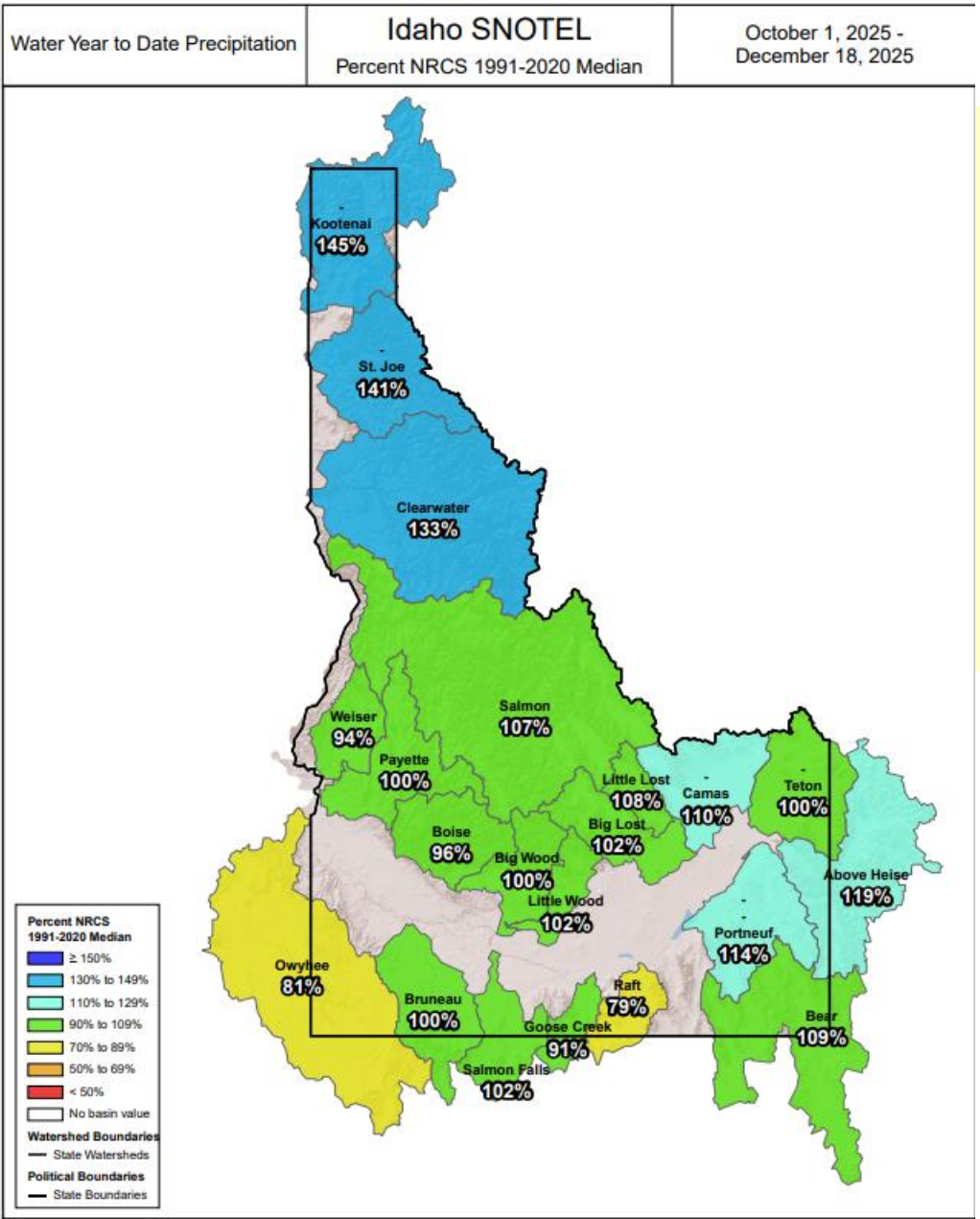
Who's counting the number of ARs hitting the West Coast?

Winter 2016-2017 saw 45 ARs. Any bets how many we'll see this year?



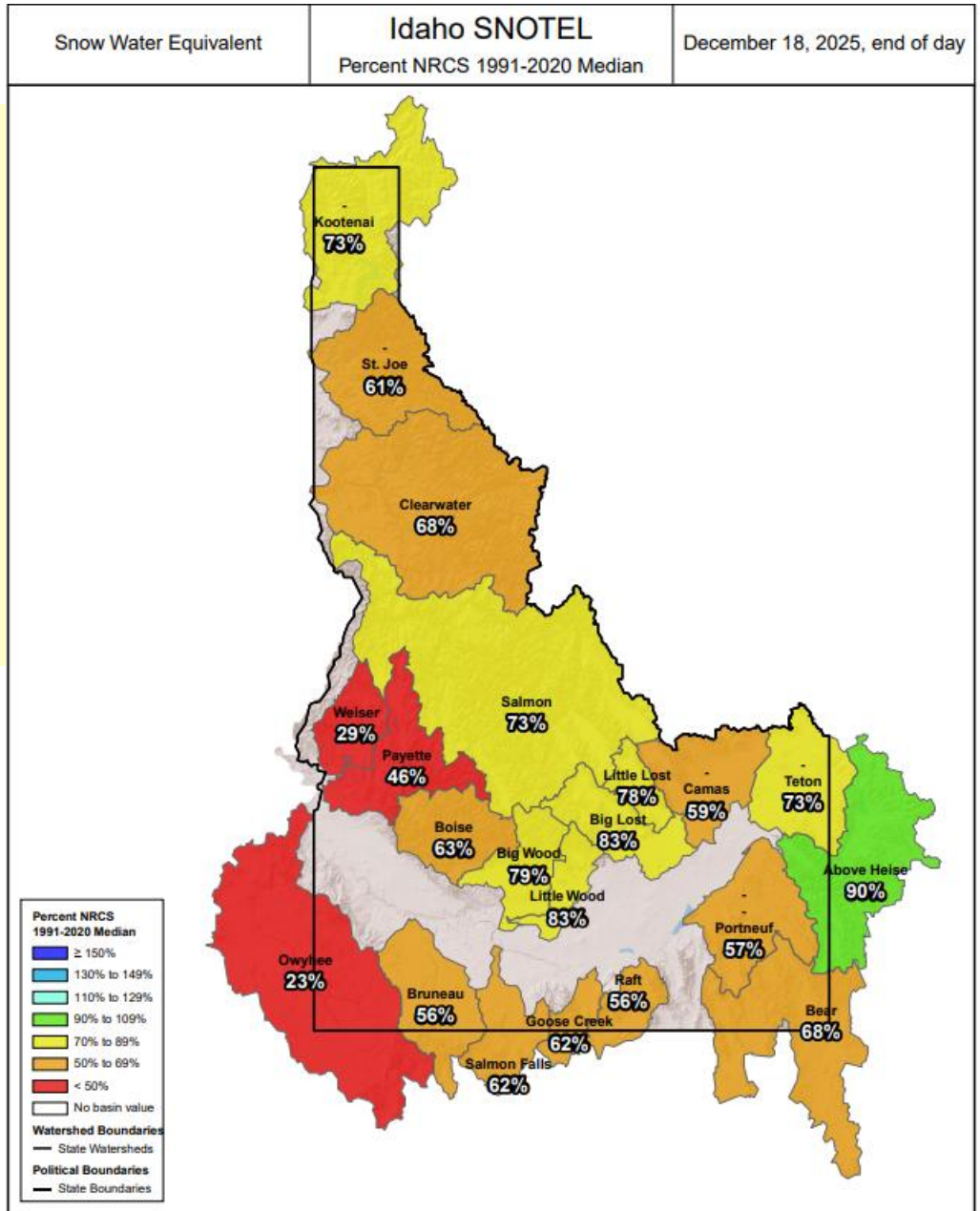
Idaho Current Conditions Dec 19 2025

Water Year to Date Precipitation Based on SNOTEL Snowpack



Water Year to date Precipitation left and Snow right.

There's room for improvement that we'll hopefully see by mid-January.



One of my favorite slides…

Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast

(From 1 Oct 2016 to 31 March 2017)

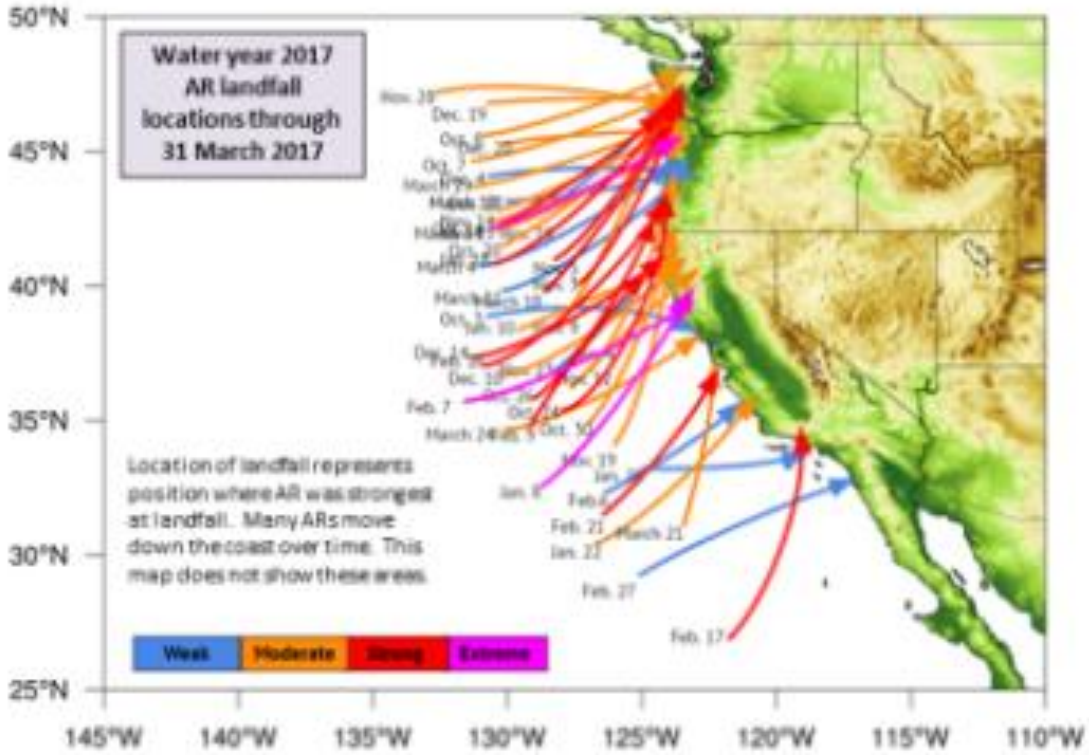
AR Strength	AR Count*
Weak	11
Moderate	20
Strong	12
Extreme	3

Ralph/CW3E AR Strength Scale

- Weak: IVT=250–500 kg m^{-1} s^{-1}
- Moderate: IVT=500–750 kg m^{-1} s^{-1}
- Strong: IVT=750–1000 kg m^{-1} s^{-1}
- Extreme: IVT>1000 kg m^{-1} s^{-1}

*Radiosondes at Bodega Bay, CA indicated the 10–11 Jan AR was strong (noted as moderate based on GFS analysis data) and 7–8 Feb AR was extreme (noted as strong)

- 45 Atmospheric Rivers have made landfall on the West Coast thus far during the 2017 water year (1 Oct. – 31 March 2017)
- This is much greater than normal
- 1/3 of the landfalling ARs have been "strong" or "extreme"



Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

By F.M. Ralph, B. Kawzenuk, C. Hecht, J. Kalansky

Experimental