CW3E Atmospheric River Outlook: 17 December 2025

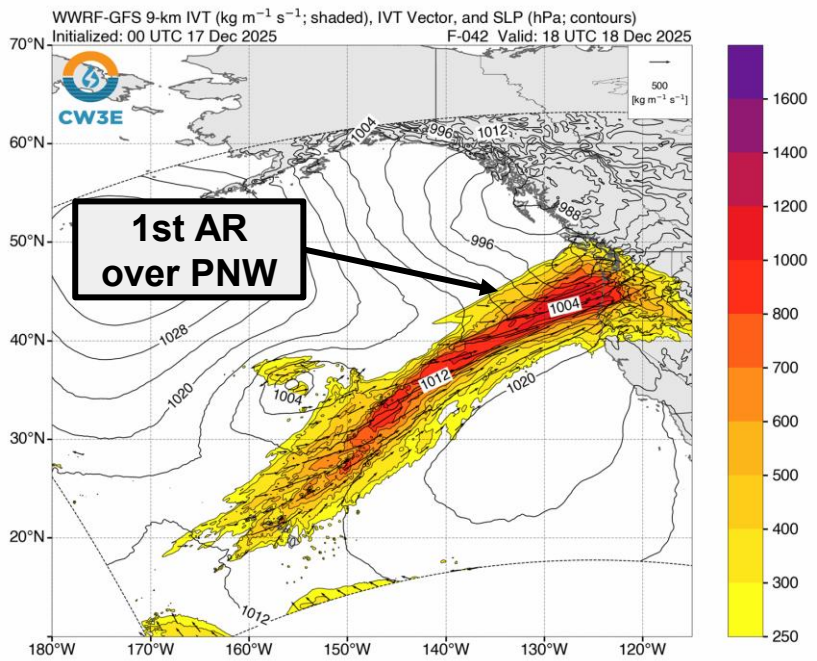
Additional Atmospheric River Activity Forecast over the Pacific Northwest and Northern California

- Another strong atmospheric river (AR) is forecast to move onshore over the Pacific Northwest on early on Thu 18 Dec, with southwesterly IVT >900 kg m^{-1} s^{-1} forecast in the core of the AR, shifting southward along the US West Coast and bringing AR conditions to Northern California early on Fri 19 Nov.
- A second, weaker AR is forecast to move onshore over Northern California late on Sat 20 Dec with southwesterly IVT >600 kg m^{-1} s^{-1} forecast in the core of the AR, with AR conditions eventually dissipating early on Mon 22 Dec.
- CW3E's West-WRF ensemble control member is forecasting AR3/AR4 conditions along coastal Washington and Oregon with the first AR and AR2/AR3 conditions along coastal Oregon and Northern California with the second AR.
- CW3E's GEFS and ECMWF ensemble AR Landfall tools are also highlighting the potential for additional AR activity over the US West Coast, with high confidence (~70–90% probability) in AR conditions over California beginning Wed 24 Dec and moderate confidence (~50–70% probability) over the Pacific Northwest beginning Sun 28 Dec although some forecast uncertainty remains.
- The NWS Weather Prediction Center (WPC) is forecasting 72-hour precipitation amounts of 7–10 in. over the southern Cascades and Coast Ranges in WA, OR, and N. CA with the first AR (period ending 4 PM Sat 20 Dec), with an additional 5–7 in. forecast over the Coast Ranges in N. CA and the northern Sierra Nevada with the second AR (period ending 4 PM Mon 22 Dec).
- WPC has also issued **marginal risk** (level 1 of 4; ≥5% probability of flash flooding) and **slight risk** (level 2 of 4; ≥15% probability) excessive rainfall outlooks (EROs) over western WA, OR, and Northern CA with the first AR (Thu 18 Dec–Sat 20 Dec) and over the Northern California Coast Ranges and northern Sierra Nevada with the second AR (Sat 20 Dec–Mon 22 Dec).
- The NWS Northwest River Forecast Center (NWRFC) is forecasting significant stream level rises in Oregon with the first AR, with 17 stream gages forecast to rise above flood stage, 3 gages above moderate flood, and 2 gages to reach major flood stage.
- Freezing levels will start relatively low over the Pacific Northwest, and then rise significantly with the first AR on 18 Dec. Over the Sierra Nevada, freezing levels are forecast to remain above 7,000 feet during the second AR, resulting in primarily rainfall.

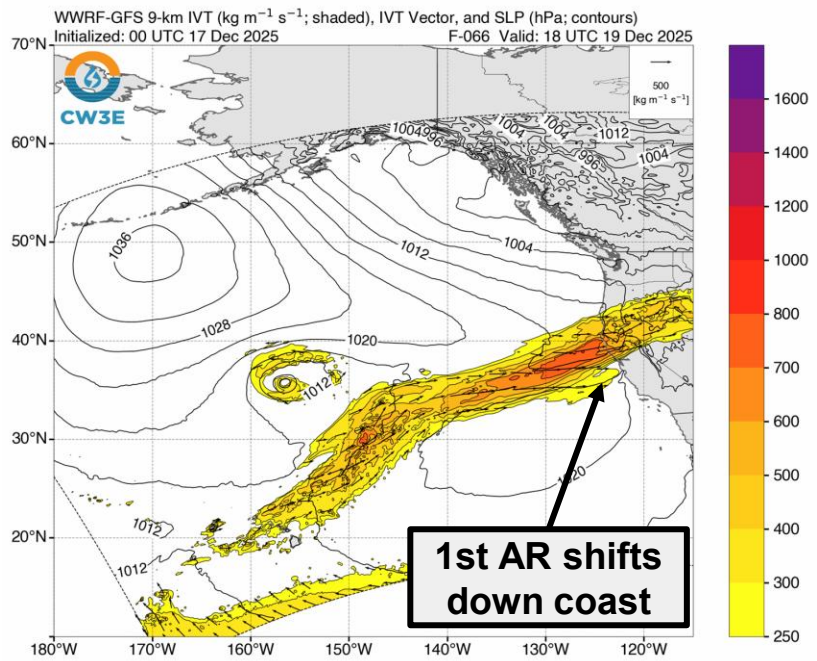
CW3E AR Outlook: 17 December 2025

West-WRF IVT & SLP Forecast: Initialized 00 UTC 17 Dec 2025

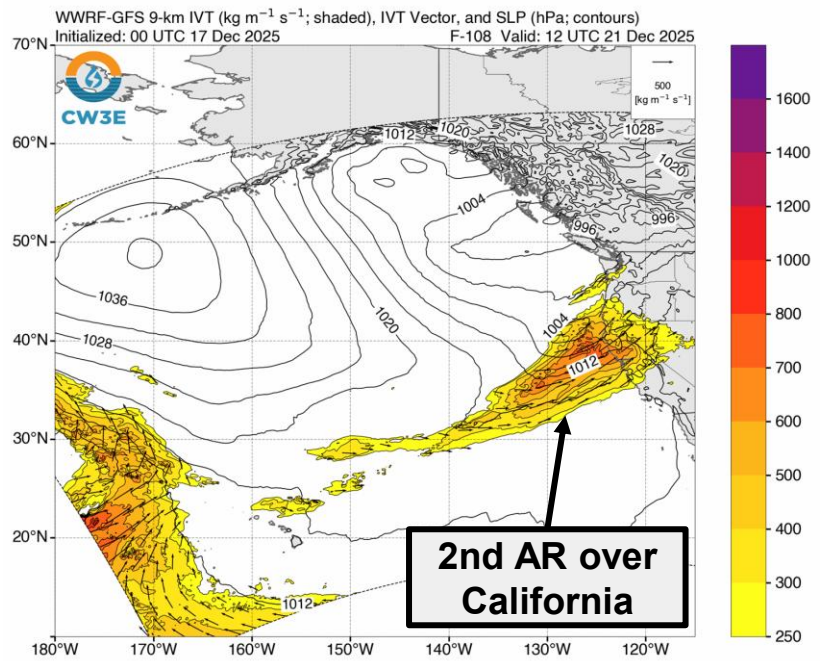
10 AM PT Thu 18 Dec



10 AM PT Fri 19 Dec



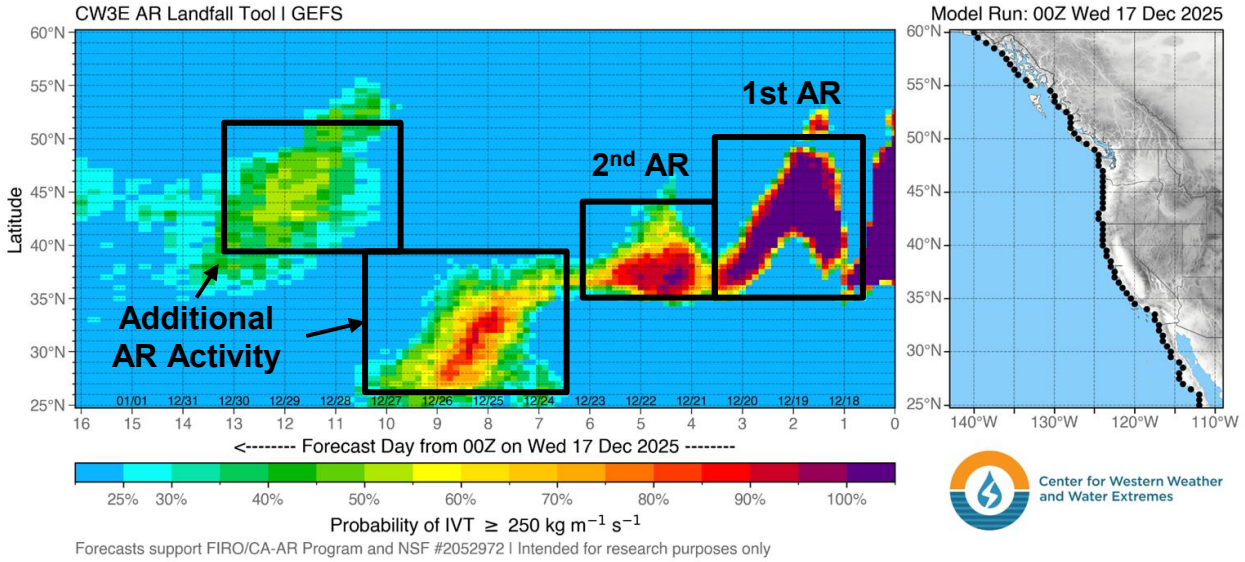
4 AM PT Sun 21 Dec

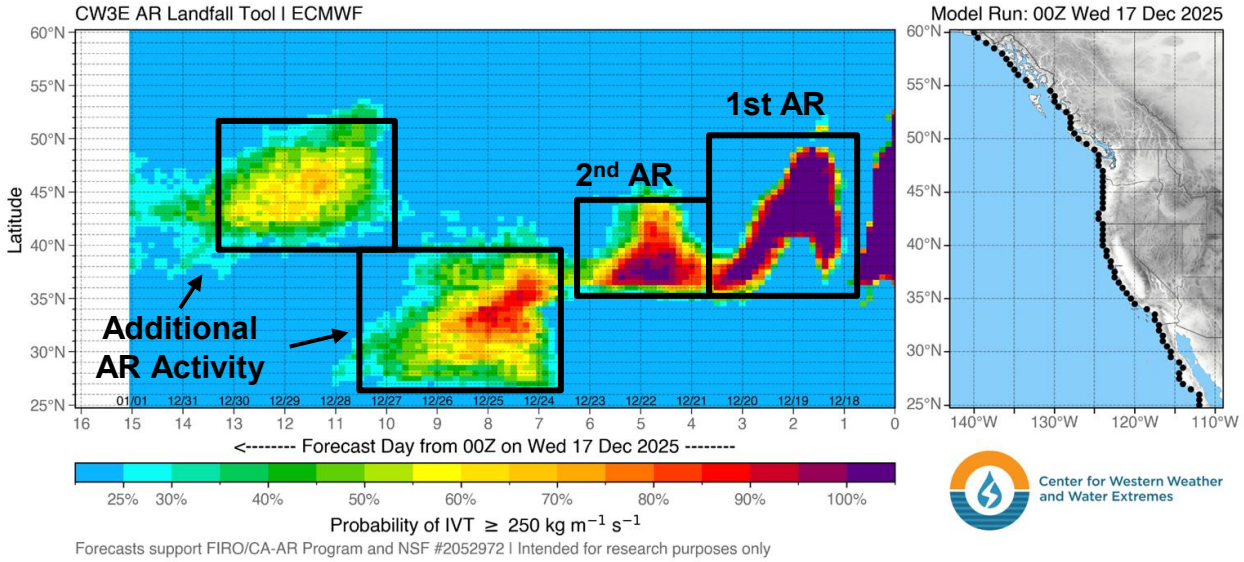


- A strong atmospheric river that developed near Hawai'i is forecast to shift to the northeast and move onshore over the Pacific Northwest early on Thu 18 Dec, with southwesterly IVT >900 kg m^{-1} s^{-1} forecast in the core of the AR (*left*).
- This first AR is forecast to remain over the Pacific Northwest for ~24 hours before shifting southward along the US West Coast and bringing AR conditions to Northern California early on Fri 19 Nov (*center*) and dissipating over the region the following day.
- A second, weaker AR is forecast to move onshore over Northern California late on Sat 20 Dec with southwesterly IVT >600 kg m^{-1} s^{-1} forecast in the core of the AR, with AR conditions eventually dissipating early on Mon 22 Dec.

CW3E AR Outlook: 17 December 2025

CW3E AR Landfall Tool: Probability of IVT >250 kg m^{-1} s^{-1}



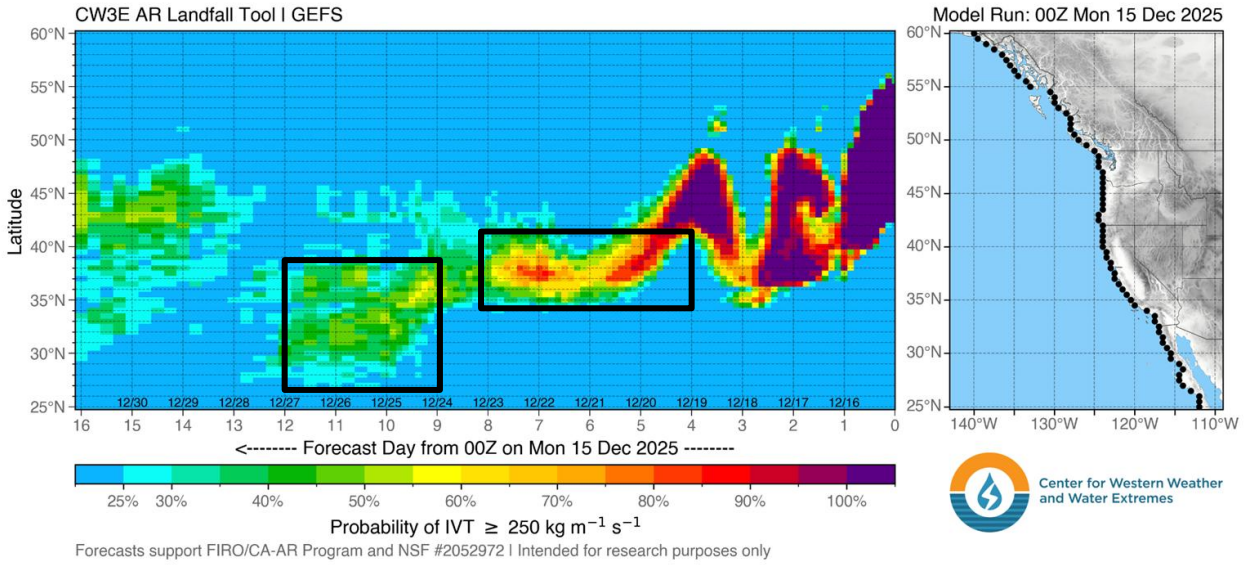


- There is strong model confidence (100% probability in GEFS and ECMWF ensembles) in a period of AR conditions beginning over the Pacific Northwest on Thu 18 Dec and persisting over the region before shifting south along the coast into Northern California.
- The GEFS and ECMWF ensembles also both have high probabilities (~80–90%) in a period of AR conditions over Northern California beginning Sat 20 Dec, although the ECMWF ensemble has a slightly further northward extensions of AR conditions into Oregon as compared to the GEFS.
- Forecast probabilities of AR conditions beginning Wed 24 Dec are also increasing over Central and Southern California in both the GEFS and ECMWF (~70–90% probability) ensembles.
- The GEFS and ECMWF landfall tools are also displaying ~40–70% probability of AR conditions beginning around Sun 28 Dec over the Pacific Northwest, which is in alignment with long-range forecasts discussed in CW3E's 16 Dec 2025 Subseasonal Outlook.

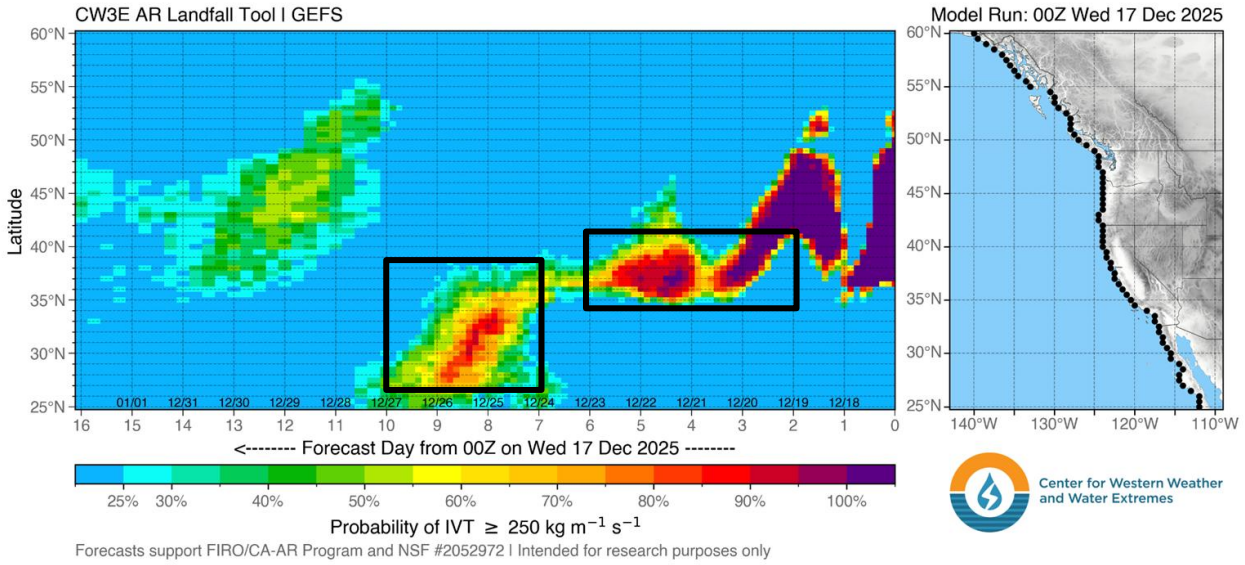
CW3E AR Outlook: 17 December 2025

dProg/dt: AR Landfall Probability (GEFS)

Initialized: 00Z 15 Dec



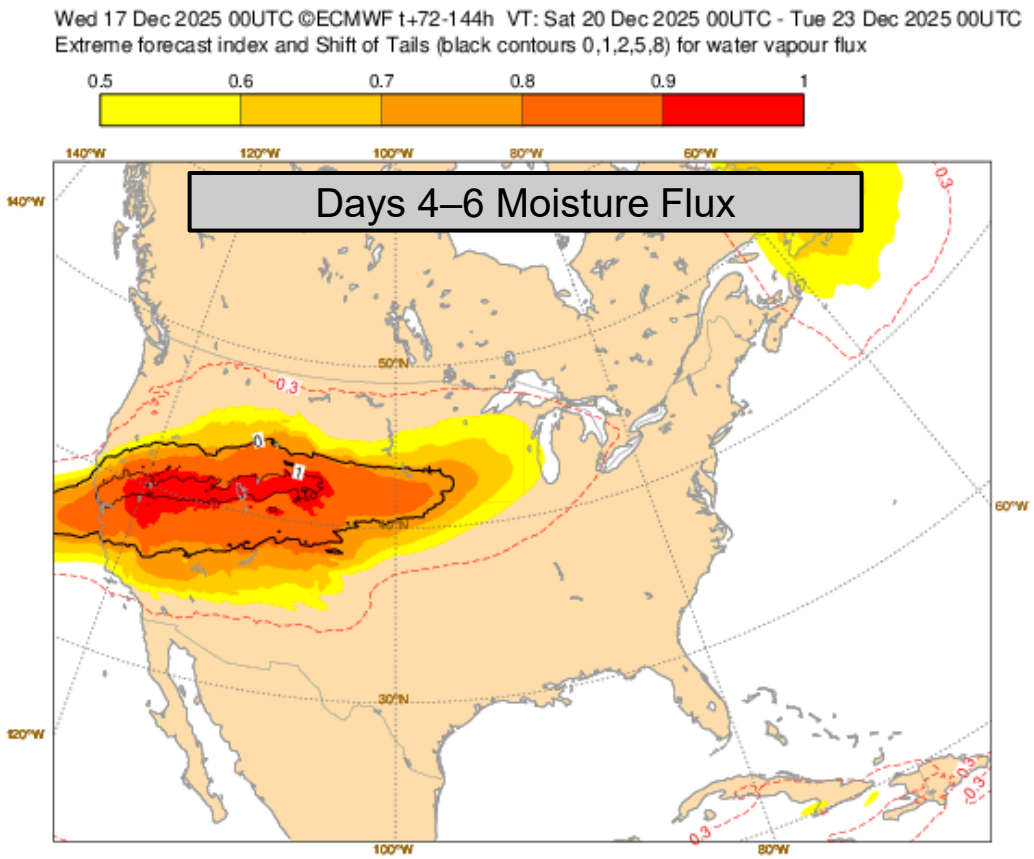
Initialized: 00Z 17 Dec

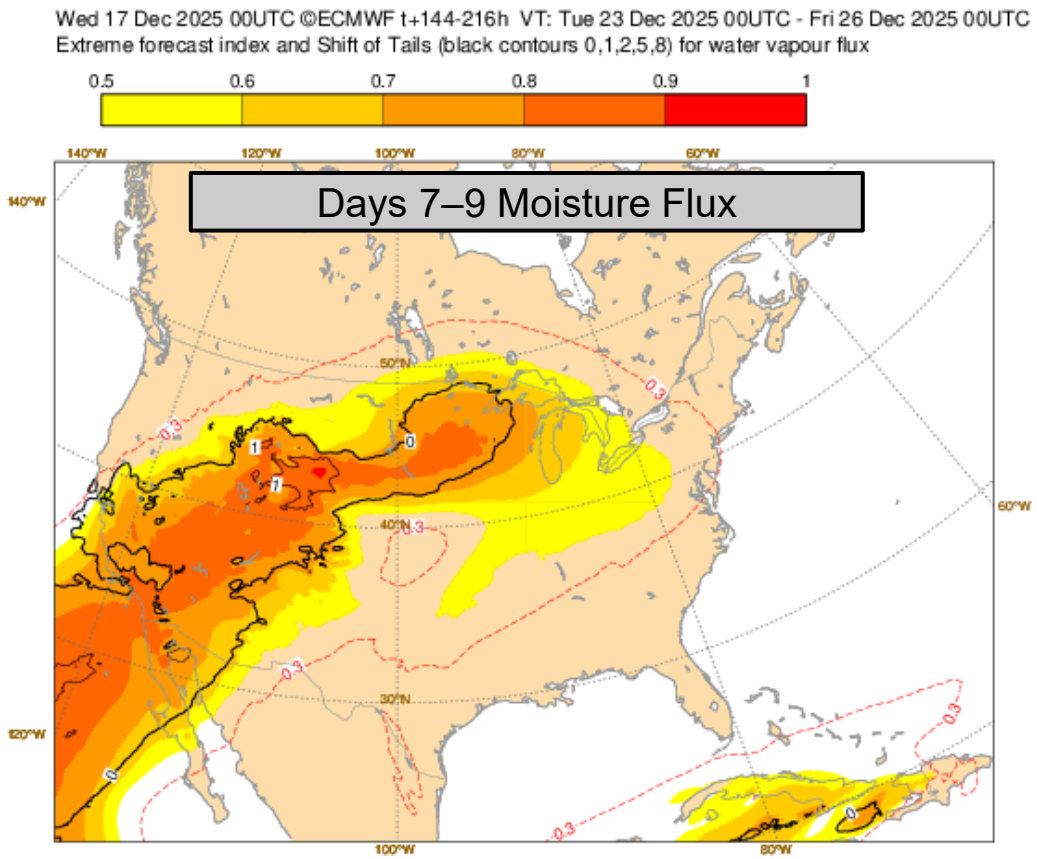


- GEFS forecast confidence in landfalling AR activity over coastal Central California during the first and second ARs has increased since the 00Z Mon 15 Dec initialization. More than 90% of GEFS members are now forecasting AR conditions near the Bay Area.
- The 00Z Wed 17 Dec initialization is also showing a large increase in the likelihood of AR conditions over coastal Southern California on 24-25 Dec (70-90% likelihood now versus 40-50% likelihood in the 00Z Mon 15 Dec initialization) in association with the potential third AR.

CW3E AR Outlook: 17 December 2025

ECMWF Extreme Forecast Index (EFI)

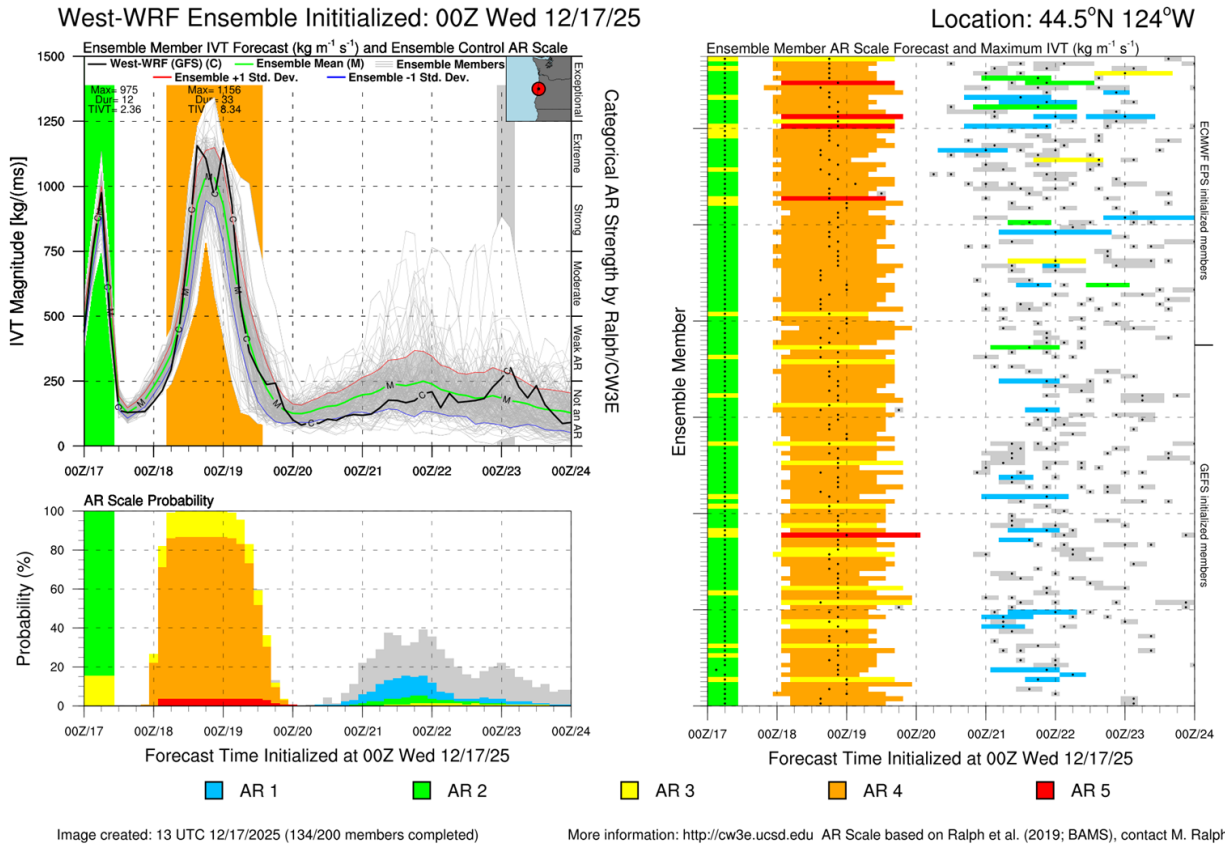


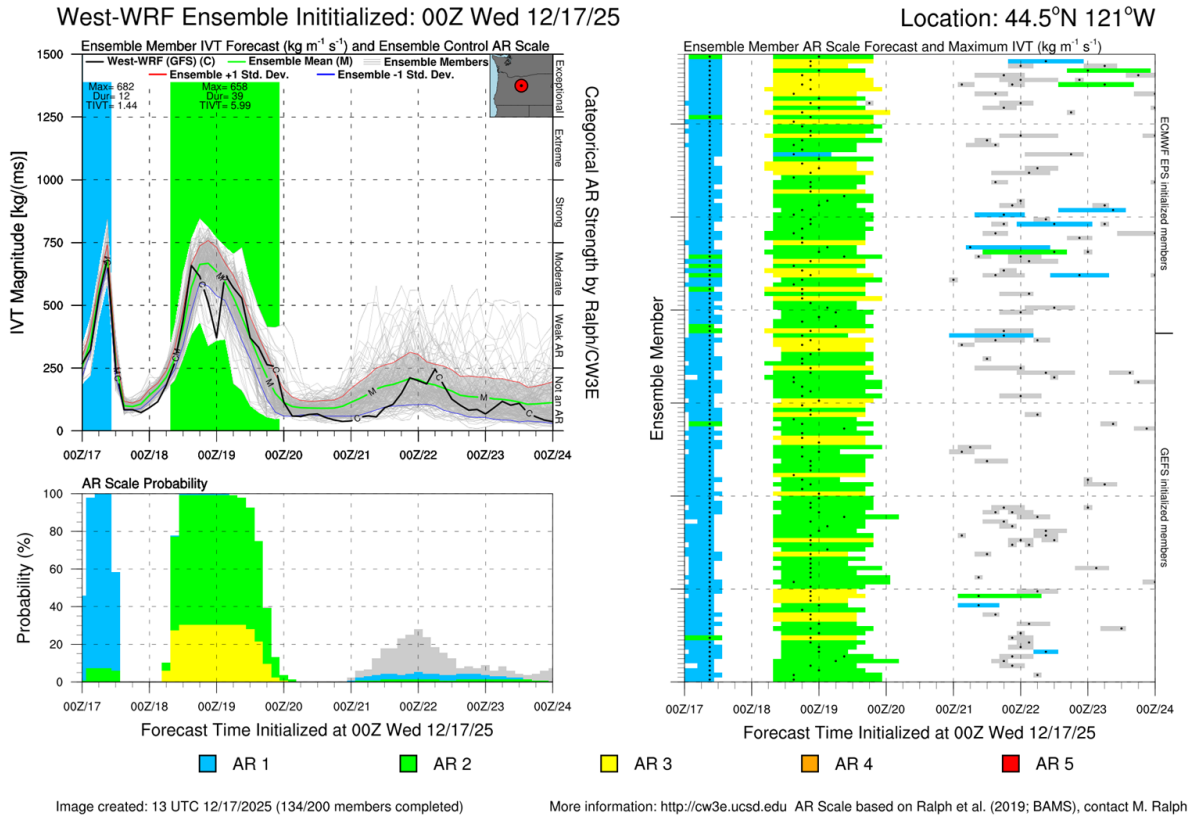


- ECMWF's Extreme Forecast Index (EFI) is showing strong signals (EFI >0.8) for anomalous moisture flux over Northern California in association with the first/second ARs on 19–22 Dec and Southern California in association with the potential third AR next week.
- These strong signals for anomalous moisture flux extend well into the interior Western US.
- The EFI product is a useful forecast tool for indicating the potential for extreme or unusual of weather.

CW3E AR Outlook: 17 December 2025

West-WRF AR Scale: Coastal and Inland Pacific Northwest





- The 00Z West-WRF control member is forecasting an AR4 (based on the Ralph et al. 2019 AR Scale) for a coastal point in Lincoln County, Oregon, with ~85% of ensemble members agreeing on AR4 conditions.
- The West-WRF control member is also forecasting an AR2 for an inland point in Crook County, Oregon, with a significant amount of inland moisture penetration forecast with this system.

CW3E AR Outlook: 17 December 2025

West-WRF AR Scale: Coastal and Foothills Northern California

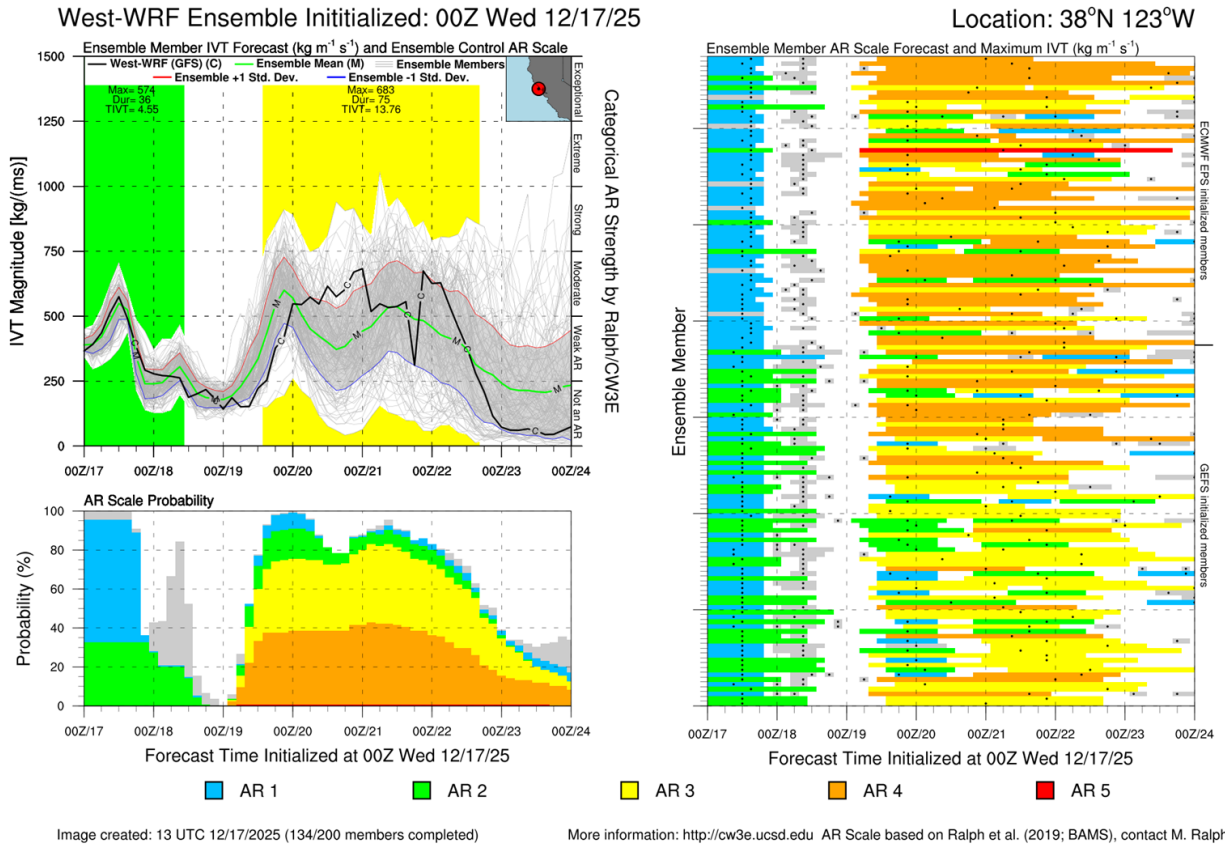


Image created: 13 UTC 12/17/2025 (134/200 members completed)

More information: http://cw3e.ucsd.edu AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

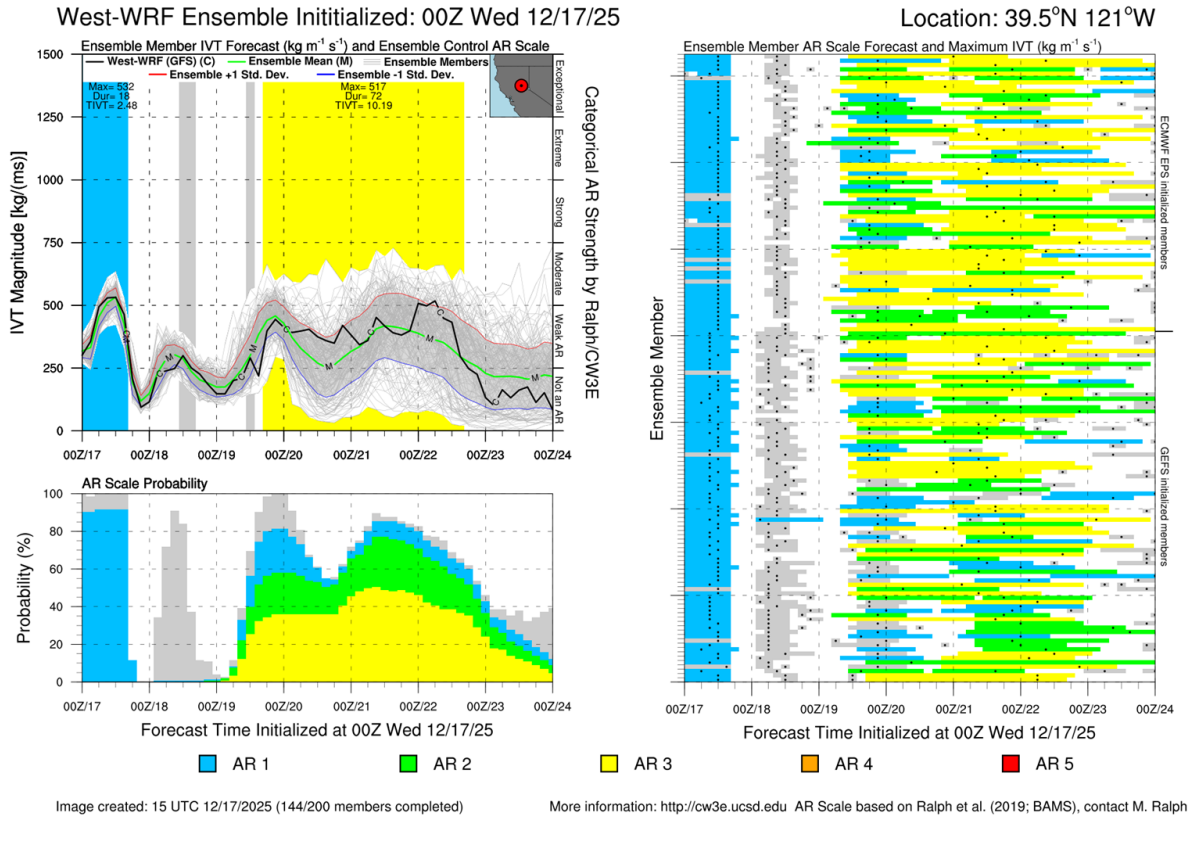


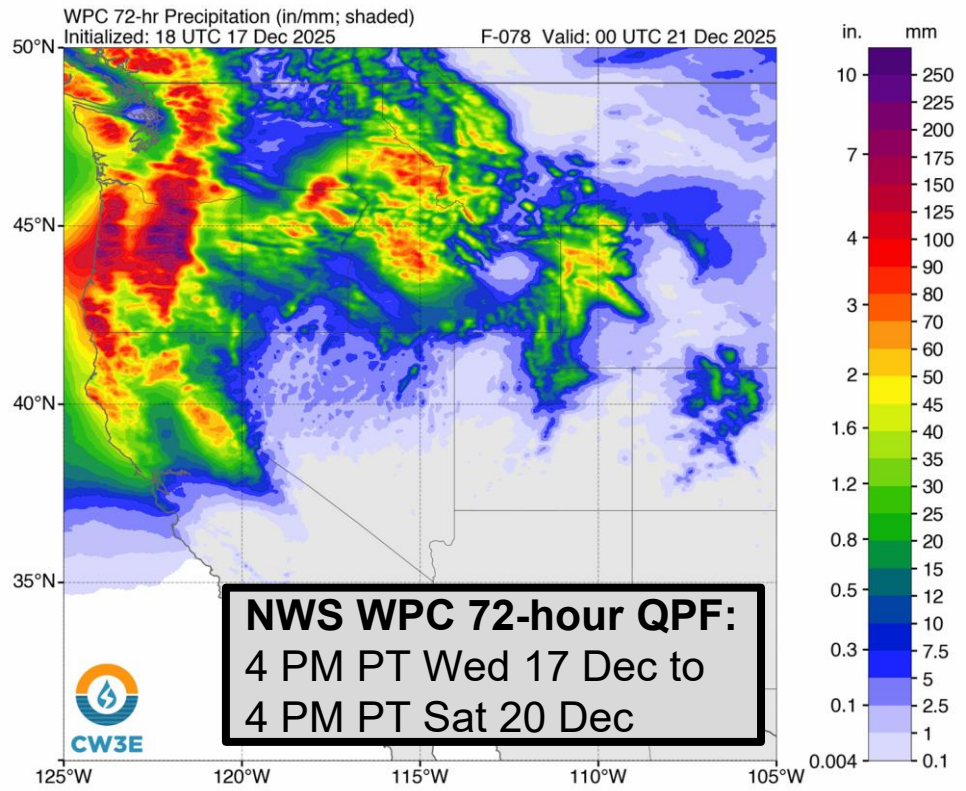
Image created: 15 UTC 12/17/2025 (144/200 members completed)

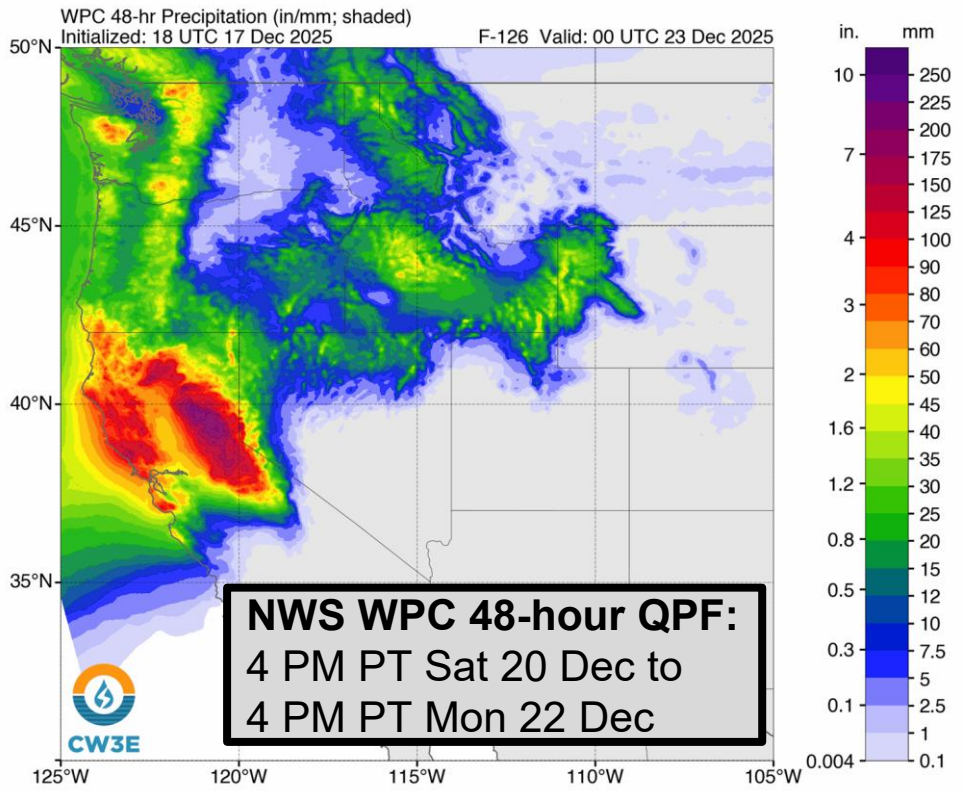
More information: http://cw3e.ucsd.edu AR Scale based on Ralph et al. (2019; BAMS), contact M. Ralph

- The 00Z West-WRF control member is forecasting an AR3 (based on the Ralph et al. 2019 AR Scale) for a coastal point near the Bay Area, with ~75% of ensemble members forecasting at least AR3 conditions and ~40% of members are forecasting AR4.
- In the foothills of the Sierra Nevada, ~70% of ensemble members are forecasting at least AR2 conditions, while ~40% of members are forecasting AR4 due to a multi-day period of AR conditions forecast over the region.

CW3E AR Outlook: 17 December 2025

NWS WPC Quantitative Precipitation Forecasts

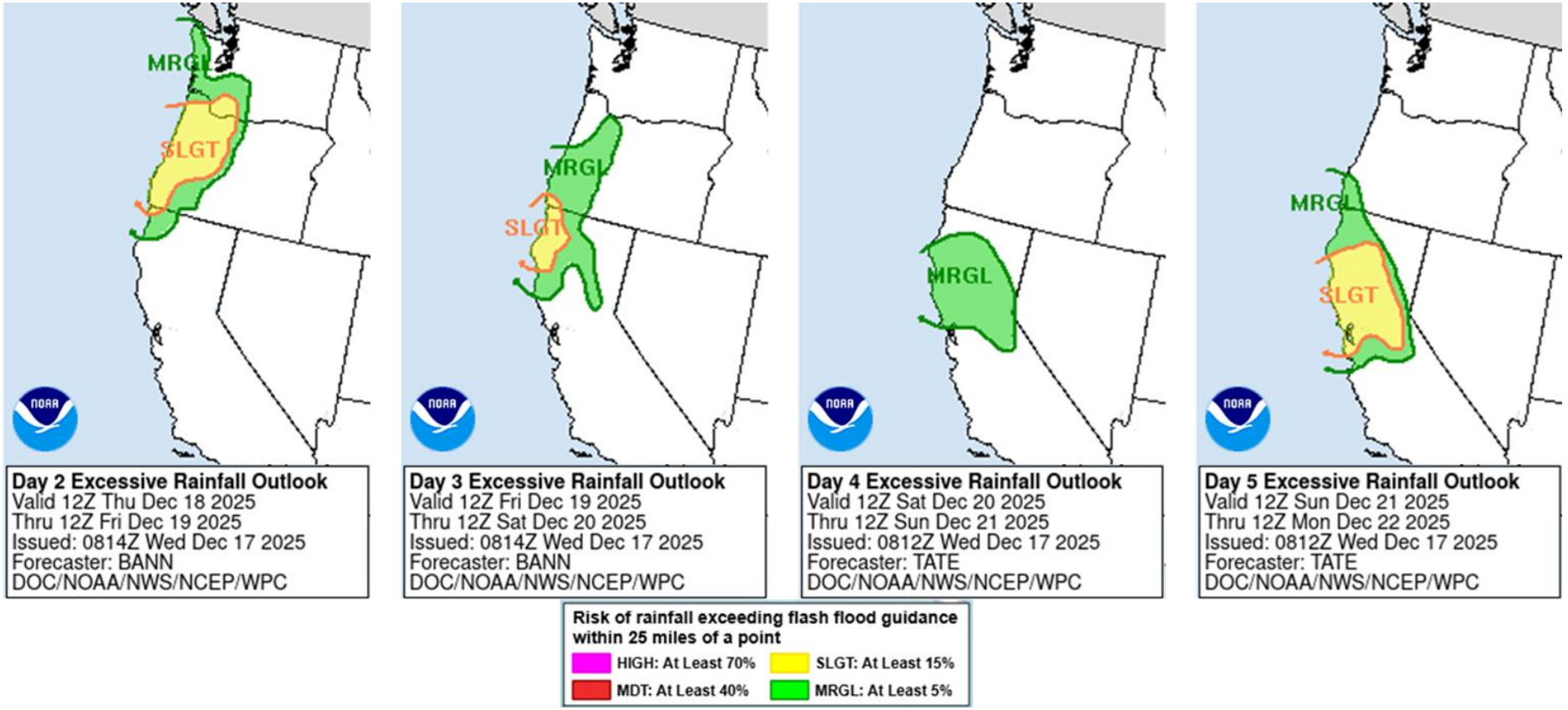




- The NWS Weather Prediction Center (WPC) is forecasting 72-hour precipitation amounts >10 in. over the southern Cascades and a broad region of 5–10 in. over the Coast Ranges in Washington, Oregon, and Northern California for the period ending 4 PM PT on Sat 20 Dec in association with the first AR.
- WPC is also forecasting 48-hour precipitation amounts of 7–10 in. over the northern Sierra Nevada and 5–7 in. over the Coast Ranges in Northern California for the period ending 4 PM PT Mon 22 Dec. in association with with the second AR.

CW3E AR Outlook: 17 December 2025

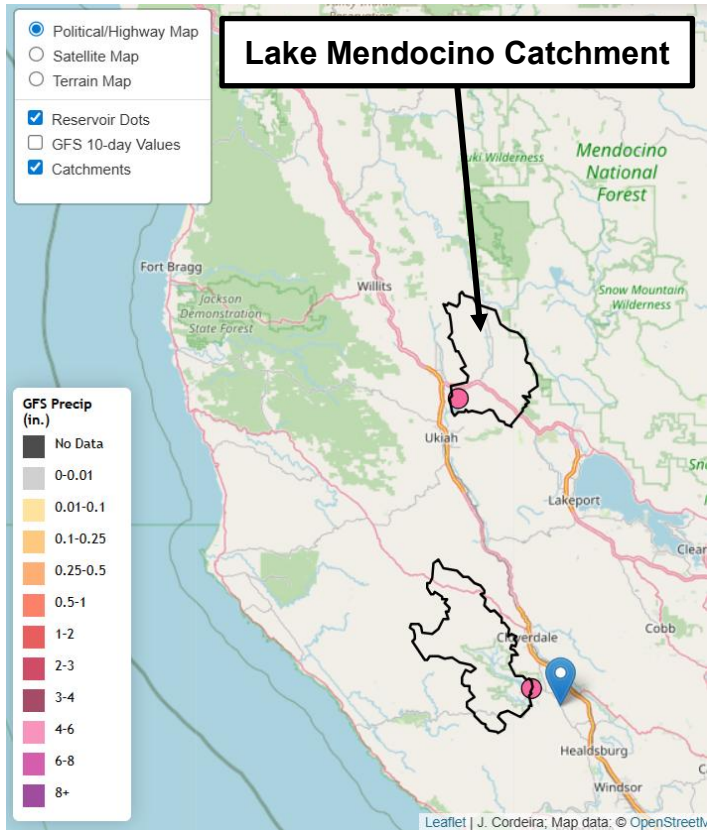
NWS WPC Excessive Rainfall Outlooks

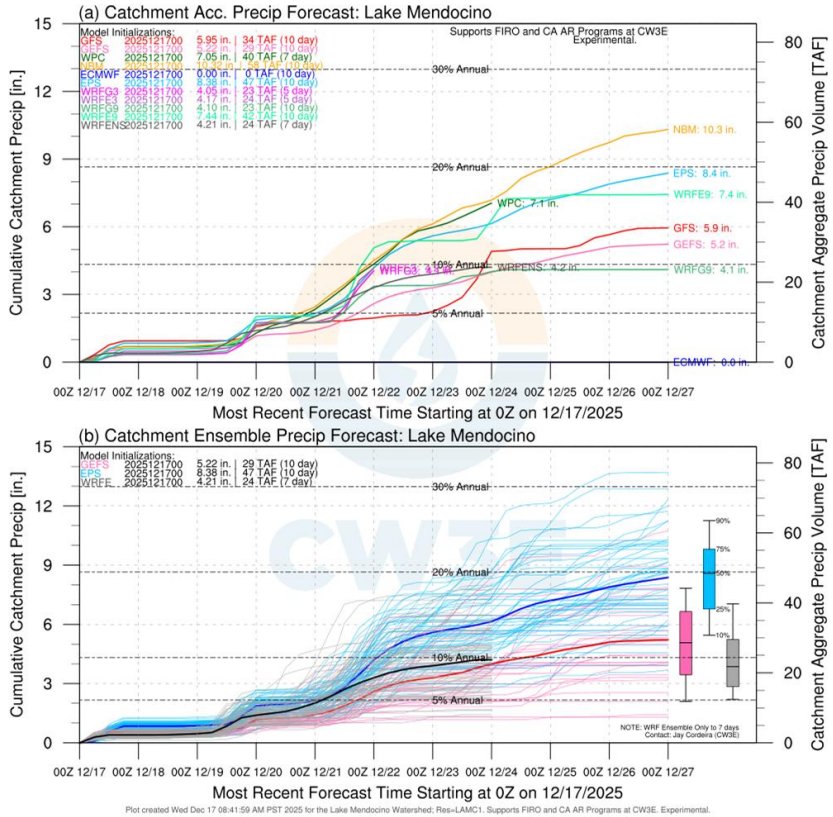


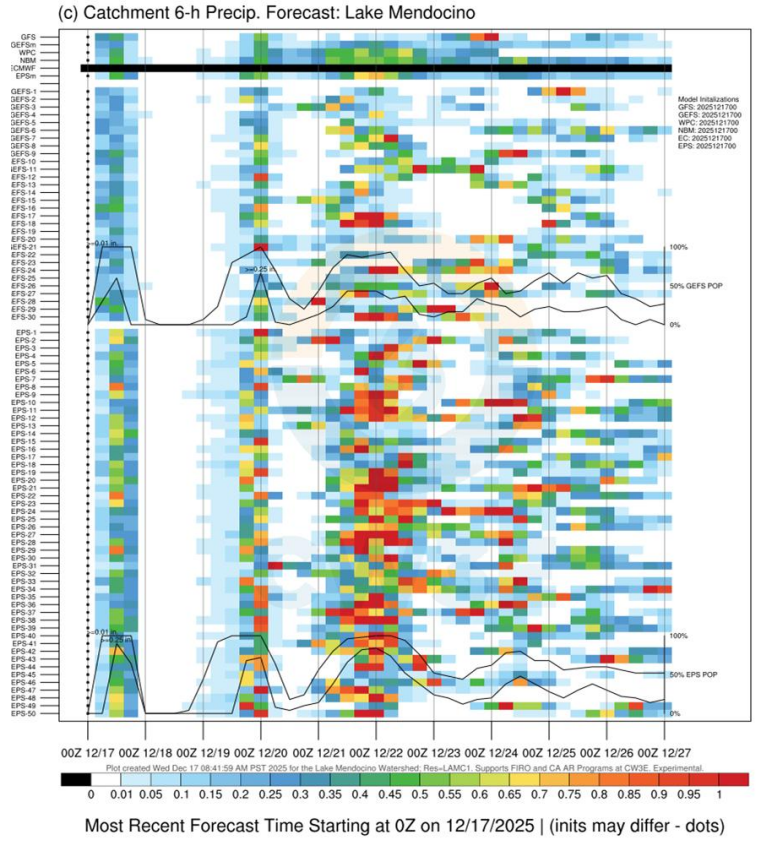
- In association with the first AR, NWS WPC has issued **marginal risk** (level 1 of 4; ≥5% probability of flash flooding) excessive rainfall outlooks (EROs) over western Washington, Oregon, and Northern California and **slight risk** (level 2 of 4; ≥15% probability) EROs over western Washington and coastal Northern California between early Thu 18 Dec–early Sat 20 Dec.
- In association with the second AR, WPC has issued **marginal risk** and **slight risk** EROs focused on the Northern California Coast Ranges and northern Sierra Nevada for the period between early Sat 20 Dec–early Mon 22 Dec.

CW3E AR Outlook: 17 December 2025

Watershed Precipitation Forecasts: Lake Mendocino Catchment



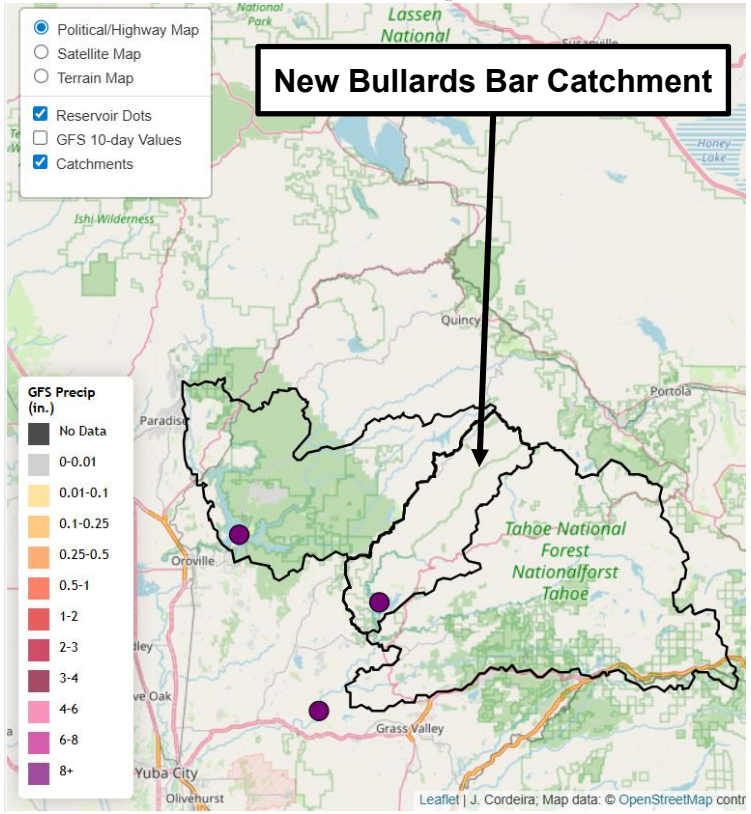


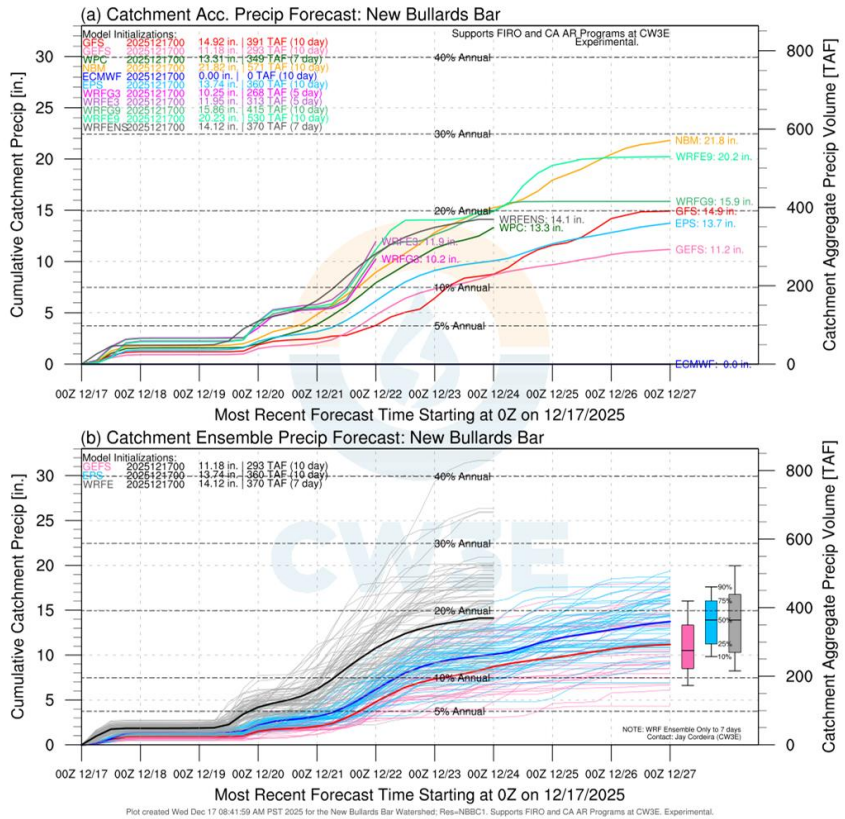


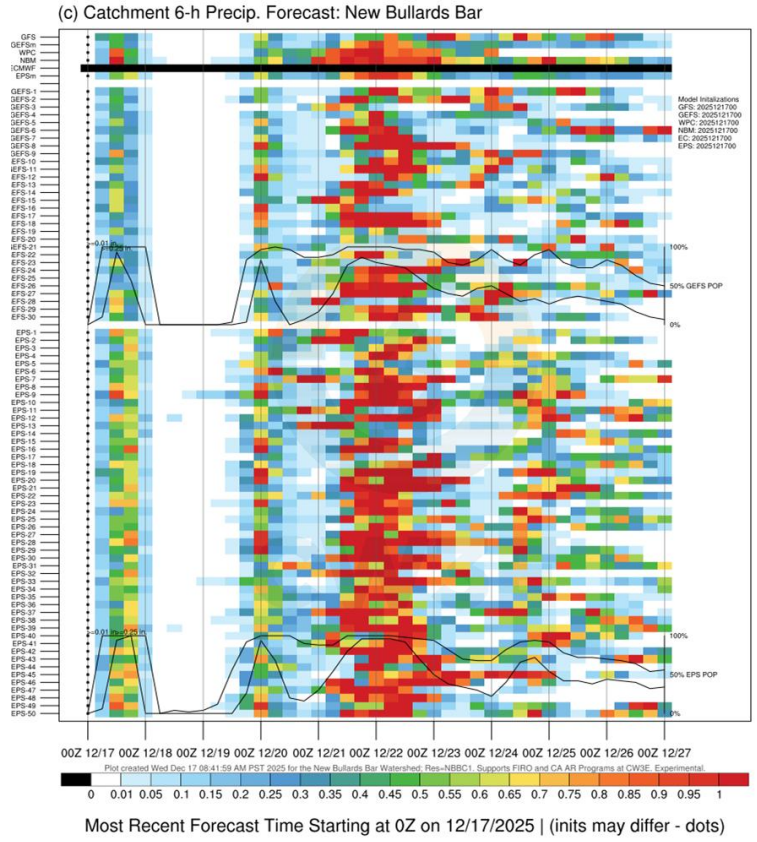
- The GEFS and West-WRF ensemble mean 7-day precipitation totals are forecast to be ~10% of normal annual precipitation (~4.2 in.) for the Lake Mendocino catchment, while the ECMWF ensemble is forecasting >6.0 in. of rainfall. The NWS WPC is forecasting ~7.0 inches over the catchment during this period.
- The heaviest precipitation is forecast over the catchment on Sun 21 Dec, with multiple GEFS and ECMWF ensemble members forecasting 6-hour precipitation amounts >1.0 inch on this date.

CW3E AR Outlook: 17 December 2025

Watershed Precipitation Forecasts: New Bullards Bar Catchment







- The GEFS and ECMWF ensembles are forecasting ~12% of normal annual precipitation (9–10 in.) over the next 7-days for the New Bullards Bar catchment, whereas the West-WRF ensemble mean is forecasting ~20% of normal (14 in.). There is a notable cluster of West-WRF members forecasting 20-30% of normal (15–22 in.), with a few forecasting upwards of 30% of normal.
- The heaviest precipitation is forecast on Sat 20 Dec & Sun 21 Dec with a majority of GEFS and ECMWF ensemble members forecasting multiple 6-hour periods of rainfall amounts >1 in. on these days.

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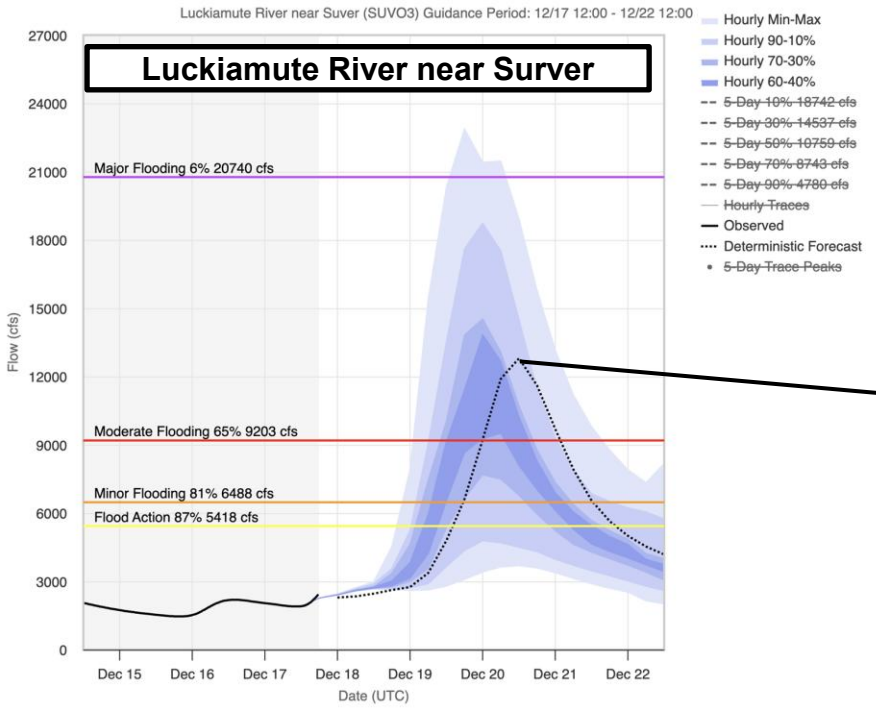
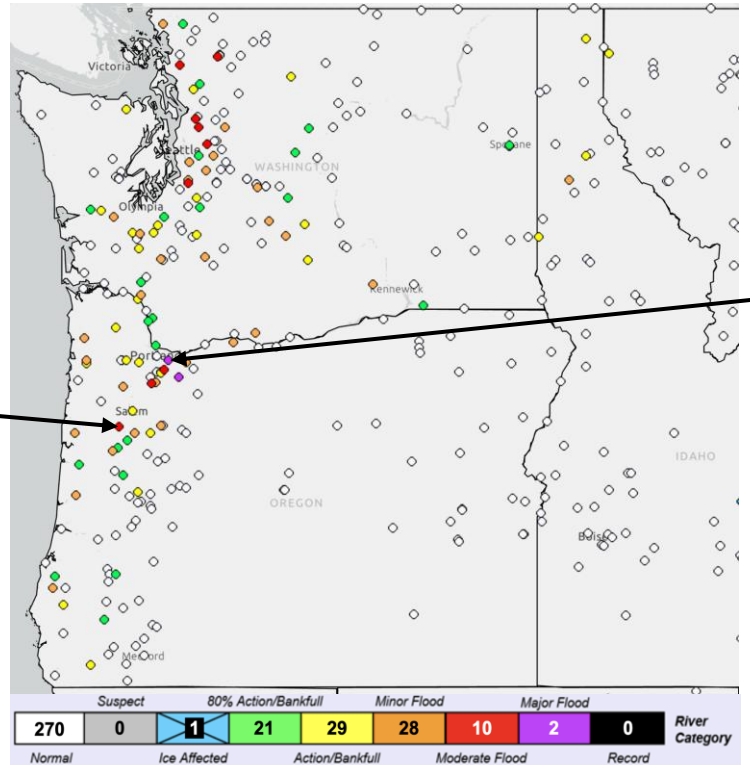
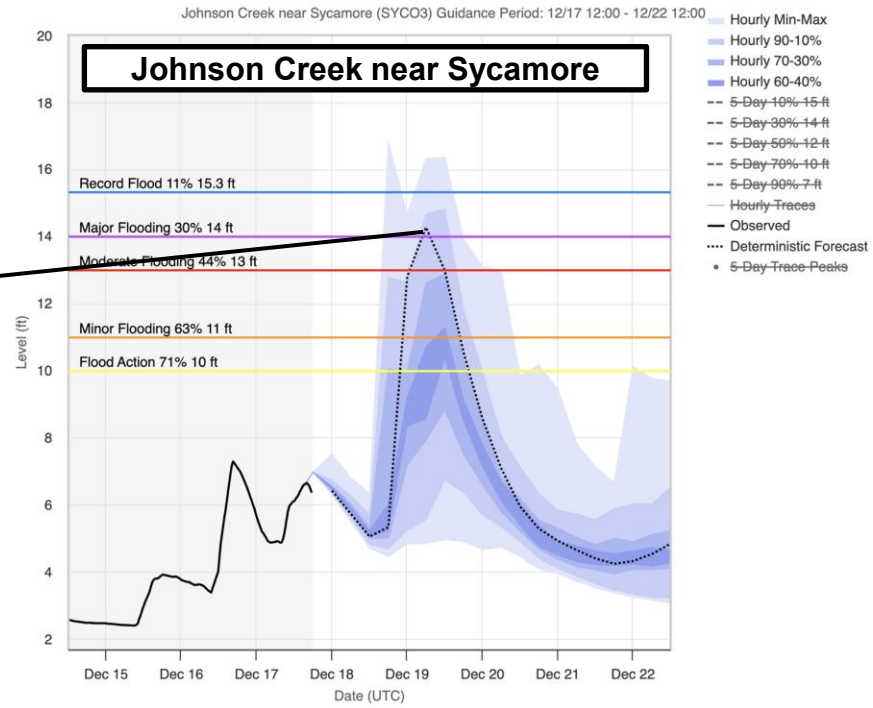
NWRFC Streamflow Forecasts



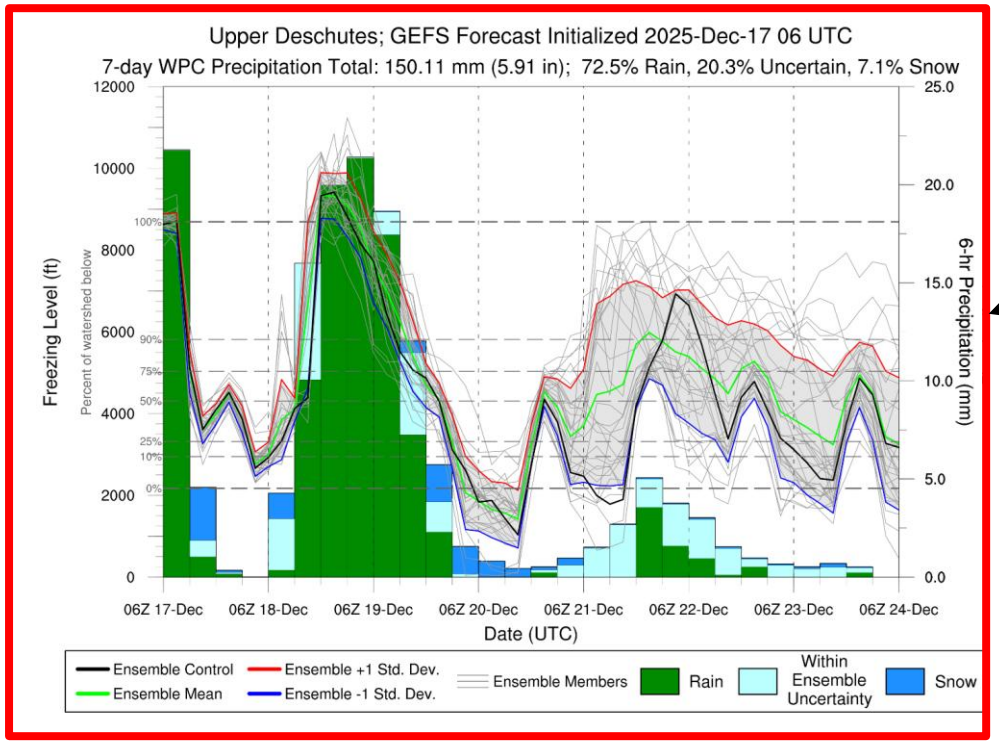


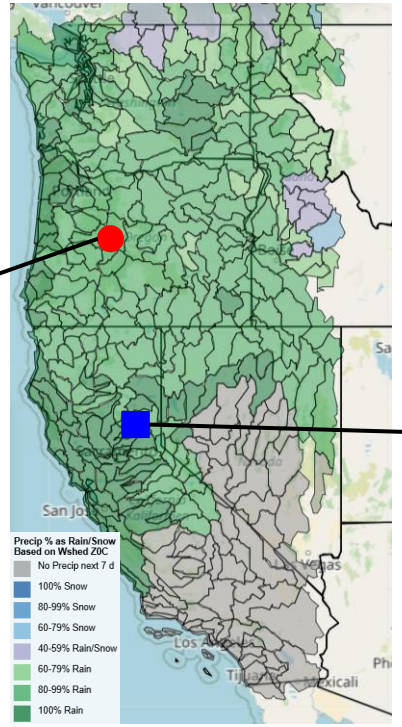


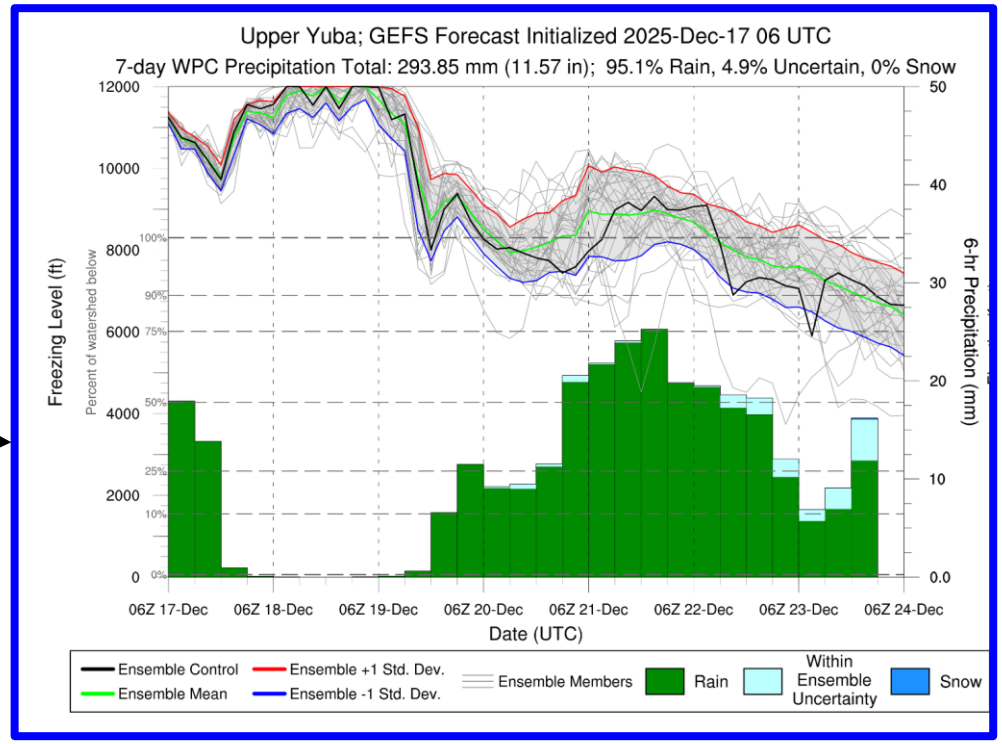
- While rivers in Washington are currently cresting or receding after yesterday's precipitation, rivers in Oregon are forecast to significantly rise over the next few days due to heavy precipitation during the first AR.
- 17 stream gages are currently forecast rise above flood stage during the next 3 days; 3 gages are forecast to reach moderate flood stage, and 2 gages are forecast to reach major flood stage.
- HEFS ensemble streamflow forecasts are indicating a 65% likelihood of moderate flooding at the Luckiamute River near Suver (*left*) and a 30% likelihood of major flooding at Johnson Creek near Sycamore (*right*).

CW3E AR Outlook: 17 December 2025

GEFS Watershed Freezing Level Forecast Comparison







- Freezing levels over the Pacific Northwest are forecast to begin below 4,000 feet as the first AR moves onshore over the region, but then rise significantly to over 7,000 feet on Fri 18 Dec. High freezing levels will lead to much of the precipitation falling as rain with significant snowfall accumulations primarily over high elevation locations.
- In the northern Sierra Nevada, freezing levels are forecast to remain above 7,000 feet for the majority of the AR period, resulting in primarily rainfall over the region from the second AR.

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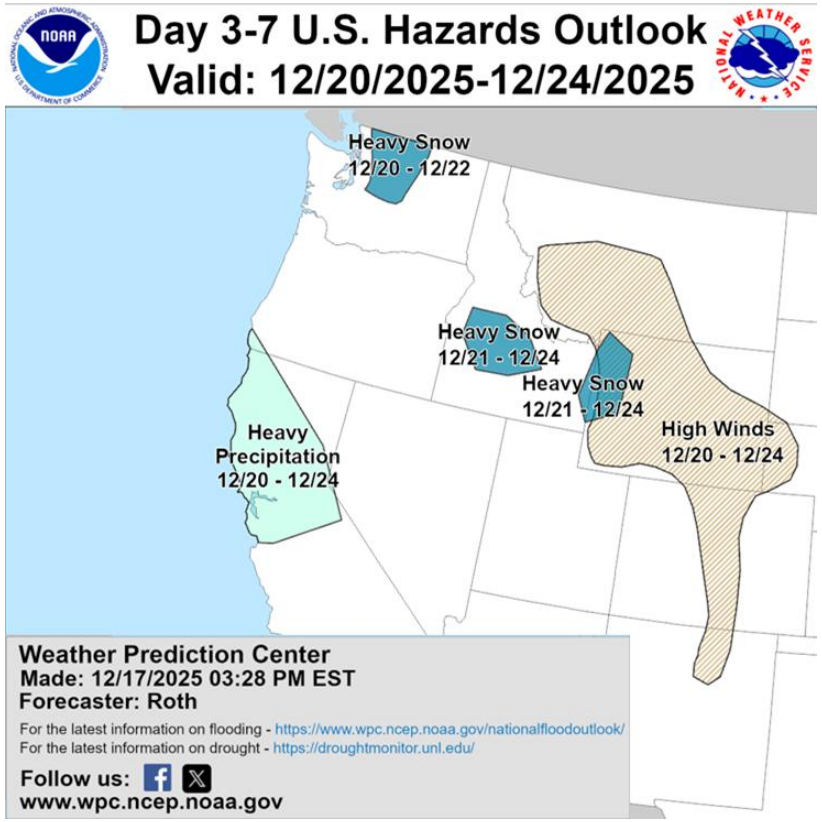
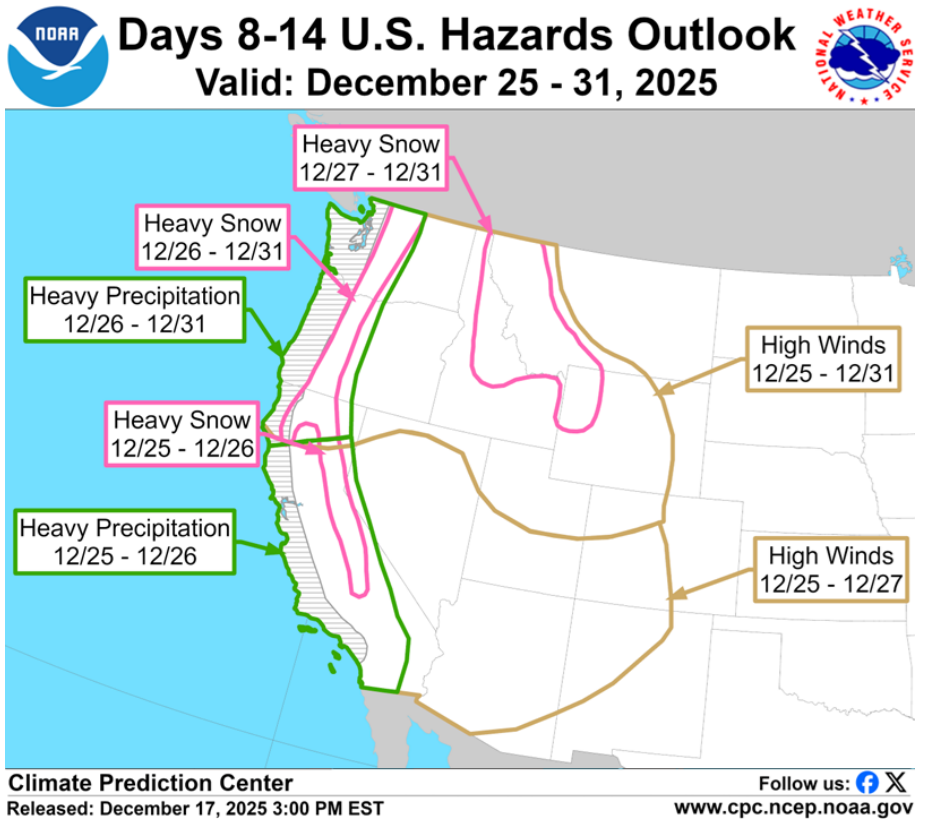
NWS Weather Prediction Center and Climate Prediction Center Hazard Outlooks





- The NWS Weather Prediction Center has highlighted the risk of heavy rainfall in the Coast Ranges of Northern California and the northern Sierra Nevada between Sat 20 Dec–Wed 24 Dec and the risk for heavy snow over the northern Cascades.
- The NWS Climate Prediction Center has highlighted the risk for heavy precipitation over California and heavy snow over the Sierra Nevada between Thu 25 Dec–Fri 26 Dec. They've also highlighted the risk for heavy precipitation over western Washington and Oregon and heavy snow over the Cascades between Fri 26 Dec–Wed 31 Dec.