# CW3E Atmospheric River Outlook: 19 December 2025

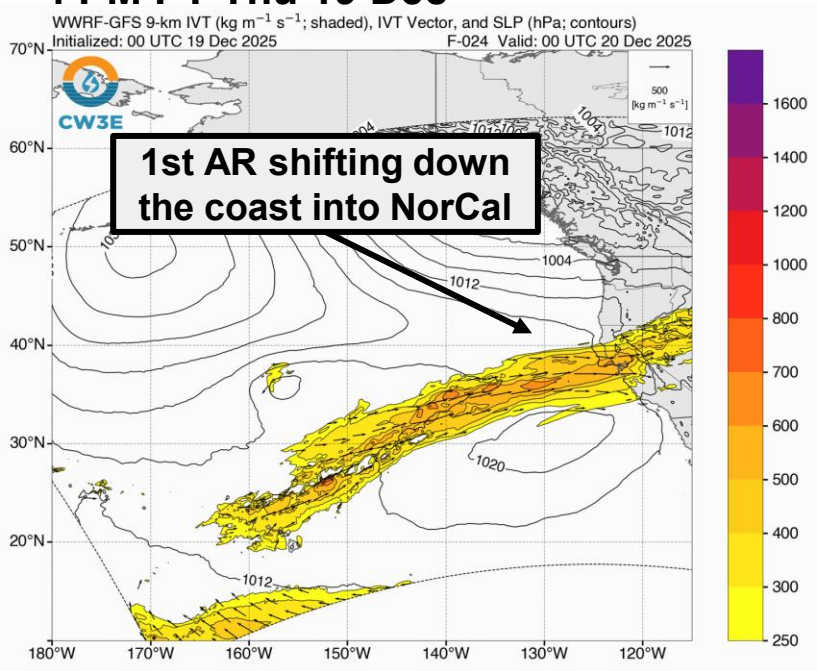
## Active Period with Multiple Atmospheric Rivers Forecast over California this Weekend into Next Week

- An atmospheric river (AR) currently located over the US West Coast is forecast to shift southward into Northern and Central California through early Sat 20 Dec. This AR will be followed by a second AR that is forecast to develop late Sat 20 Dec and bring AR conditions to Northern and Central California through Mon 22 Dec.
- A third, stronger AR is forecast to develop in association with a mid-level trough on Tue 23 Dec and bring strong southwesterly IVT >750 $m^{-1}$ $s^{-1}$ over Central and Southern California through Thu 25 Dec.
- CW3E's West-WRF ensemble control member is forecasting AR3 conditions along coastal Northern California with the first and second ARs and AR3 conditions along coastal Central and Southern California with the third AR.
- CW3E's ECMWF AR Landfall tool is showing high confidence (90–100% probability of IVT >250 $m^{-1}$ $s^{-1}$) over coastal Northern and Central California with the first and second ARs during Sat 20 Dec–Mon 22 Dec, followed by a period of high confidence (75–95% probability) in AR conditions over Central and Southern California during Tue 23 Dec–Thu 25 Dec.
- The NWS Weather Prediction Center (WPC) is forecasting 7-day rainfall amounts of 10–20 in. over the Sierra Nevada, 7–10 in. over the Coast Ranges of Northern and Central California, and 3–7 in. over the Transverse Ranges in Southern California.
- WPC has also issued **marginal risk** (level 1 of 4; ≥5% probability of flash flooding) excessive rainfall outlooks (EROs) over Northern California for Fri 19 Dec–Wed 24 Dec and **slight risk** (level 2 of 4; ≥15% prob.) EROs for Sun 21 Dec–Wed 24 Dec.
- Despite these high precipitation totals, significant riverine flooding is not currently forecast in California as shown by the joint DWR/CNRFC forecasts. As these storms progress and soil conditions become more saturated, it is recommended to pay close attention to the DWR/CNRFC forecasts for changes in river forecasts or to the local NWS offices for local flood guidance.
- Freezing levels over the Sierra Nevada with the first and second AR are forecast to start above ~9,000 feet and gradually lower to ~7,000 ft during the third AR. This will limit significant snowfall with the first and second AR, and facilitate significant snowfall accumulations during the third AR, particularly in the Central and Southern Sierra Nevada.

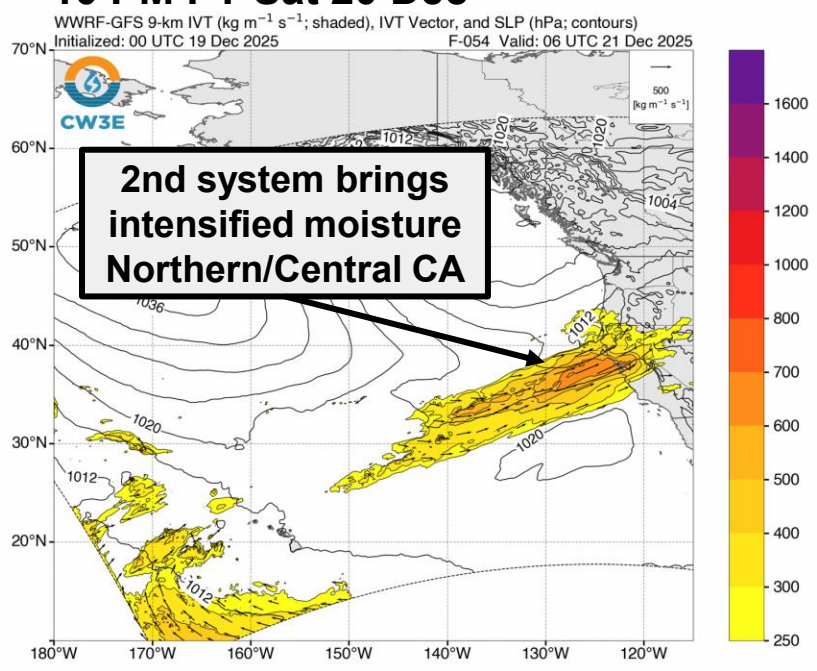
# CW3E AR Outlook: 19 December 2025

## West-WRF IVT & SLP Forecast: Initialized 00 UTC 19 Dec 2025

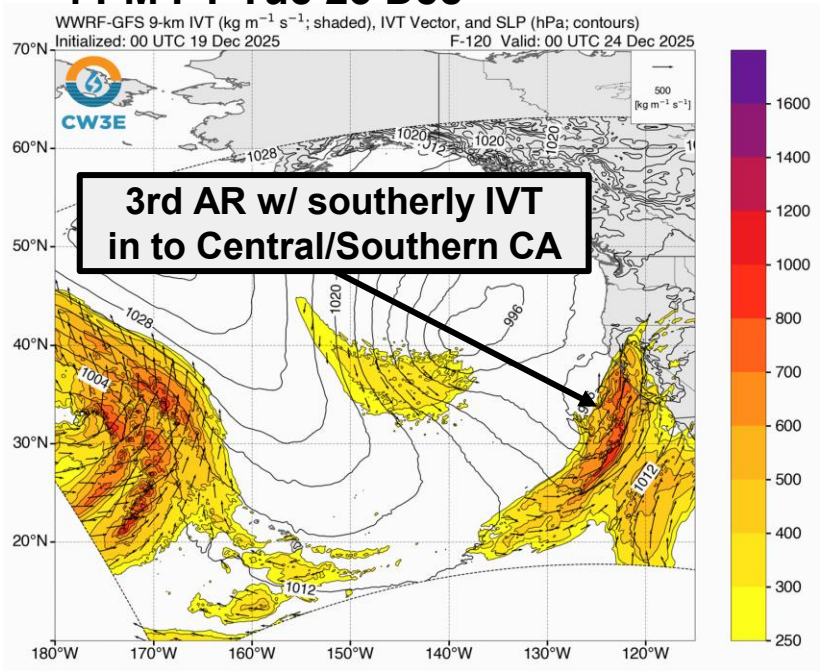
### 4 PM PT Thu 19 Dec




### 10 PM PT Sat 20 Dec



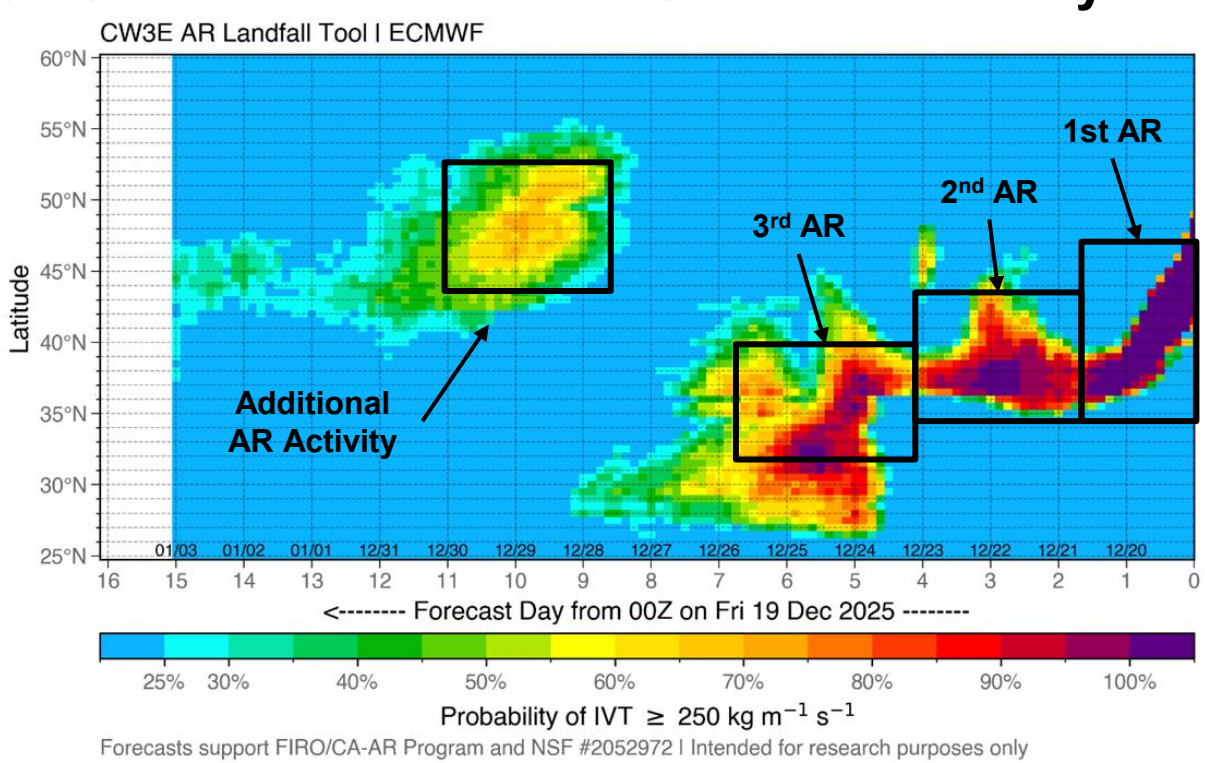

### 4 PM PT Tue 23 Dec

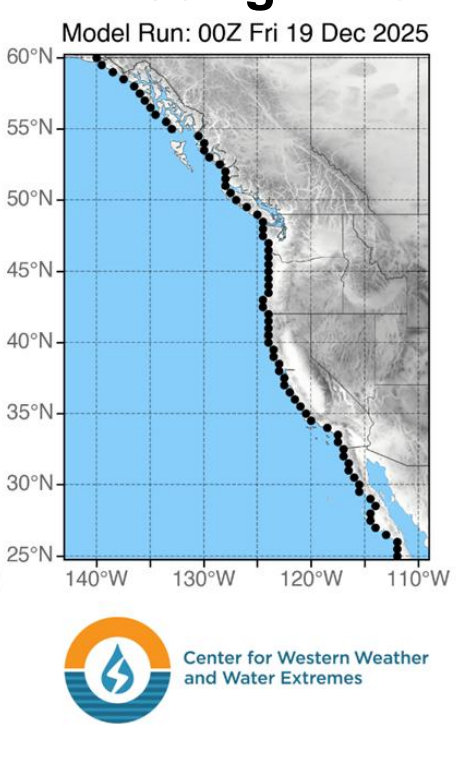


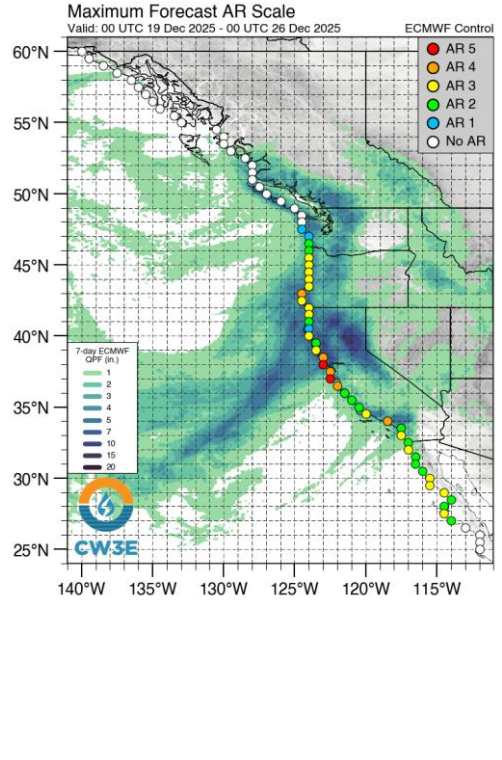

- An AR currently located over the US West Coast is forecast to shift southward through today, bringing IVT >650 kg m$^{-1}$ s$^{-1}$ into Northern and Central California through early Sat 20 Dec (*left*).
- A second AR is forecast to develop offshore of California on Sat 20 Dec along the same westerly corridor of elevated moisture, with a plume of IVT >500 kg m$^{-1}$ s$^{-1}$ forecast over Northern and Central California through Mon 22 Dec (*center*).
- A third, stronger AR is forecast to develop in a similar location on Tue 23 Dec with a strong surface low-pressure in association with a deep mid-level trough (*not shown*), resulting in an area of nearly southerly IVT >750 m$^{-1}$ s$^{-1}$ over California (*right*).

# CW3E AR Outlook: 19 December 2025

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



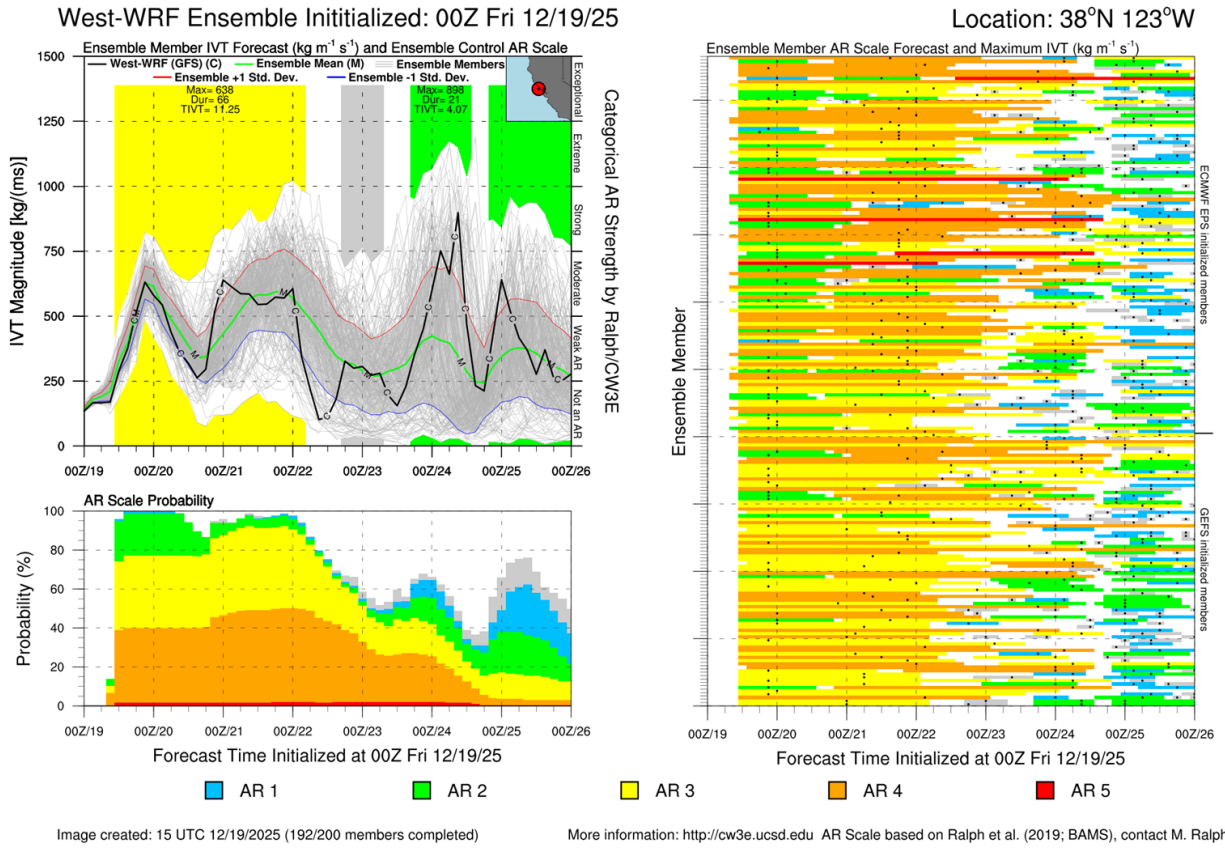



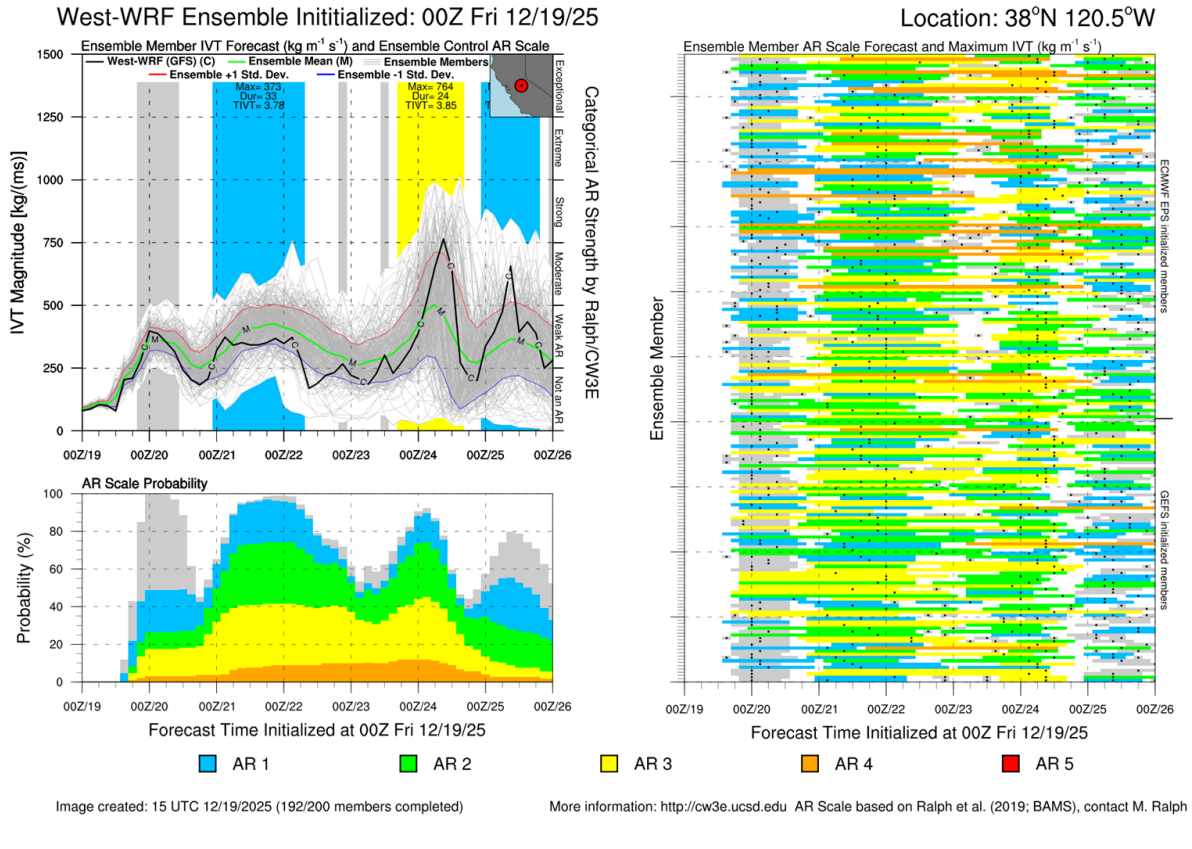




- The 00Z ECMWF AR Landfall tool is showing high confidence in AR conditions over coastal Oregon and Northern California as the first AR shifts southward today into Sat 20 Dec. This is followed by another period of high confidence in AR conditions for coastal Northern and Central California between Sat 20 Dec–Mon 22 Dec.
- This is followed closely by a third period of AR conditions with the highest probabilities of AR conditions forecast over Central and Southern California between Tue 23 Dec–Thu 25 Dec.
- There is also a period medium confidence (60-70% probability) in AR conditions over British Columbia, Washington, and Oregon beginning Sat 27 Dec–Mon 29 Dec although this is still a long-lead forecast.

# CW3E AR Outlook: 19 December 2025

## West-WRF AR Scale: Coastal and Foothills Northern California

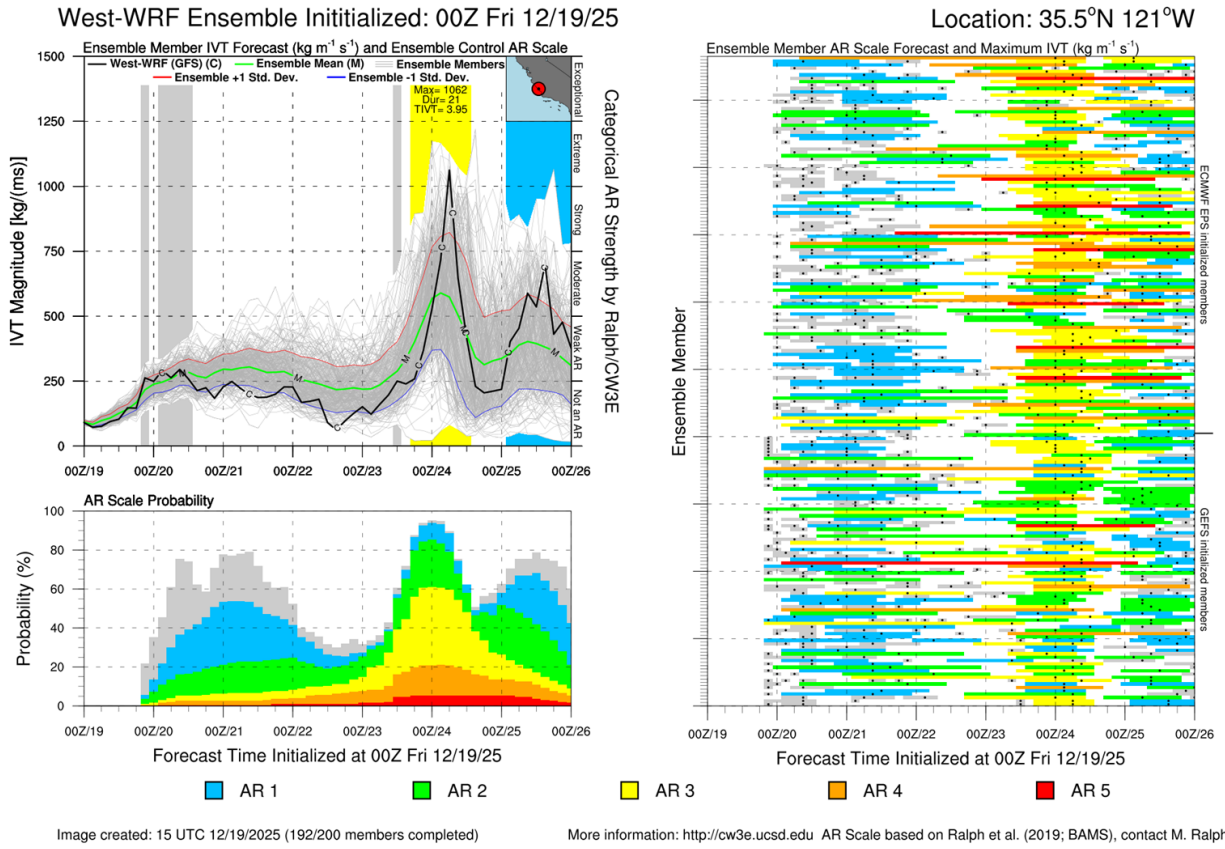


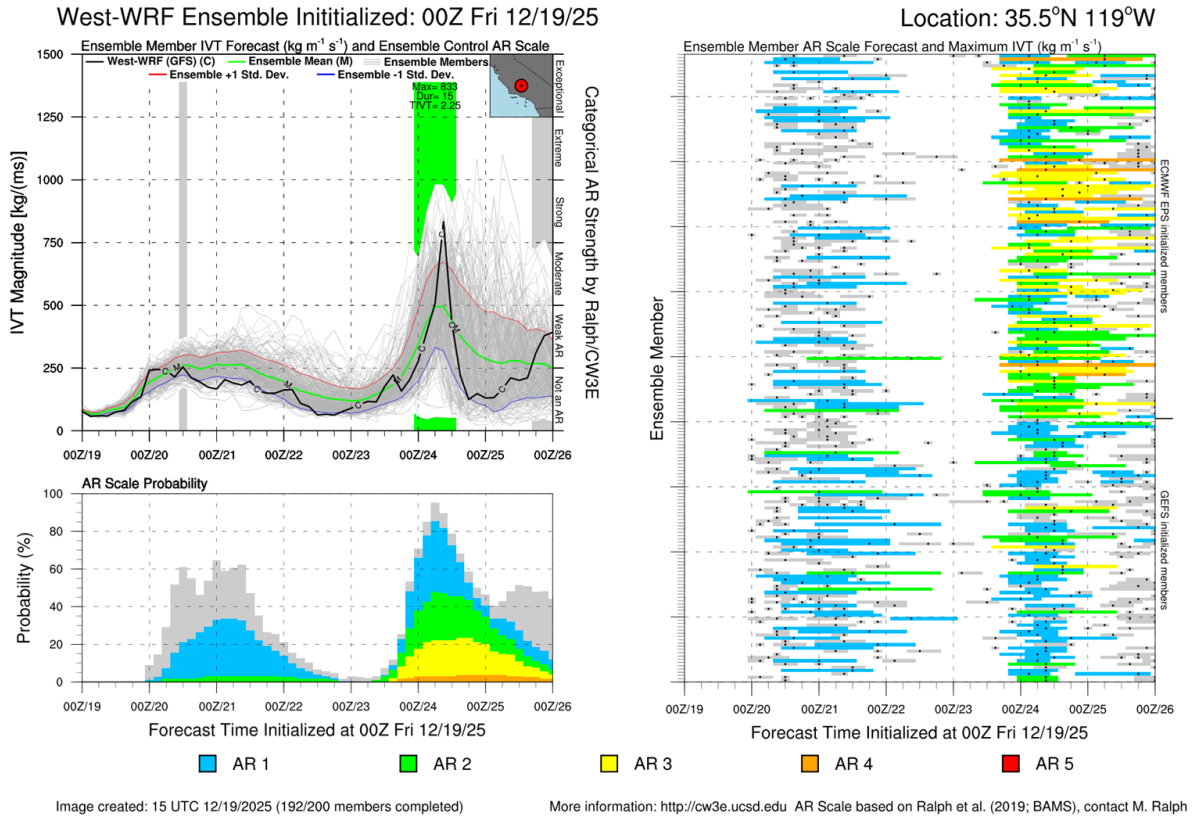




- The 00Z West-WRF ensemble control member is forecasting AR3 conditions (based on the Ralph et al. 2019 AR Scale) for a coastal point near the Bay Area, with ~80% of ensemble members forecasting at least AR3 conditions and ~40% forecasting AR4.
- In the foothills of the Sierra Nevada, ~70% of ensemble members are forecasting at least AR2 conditions, while ~40% of members are forecasting AR3 due to a multi-day period of AR conditions forecast over the region.

# CW3E AR Outlook: 19 December 2025

## West-WRF AR Scale: Coastal and Foothills Southern California



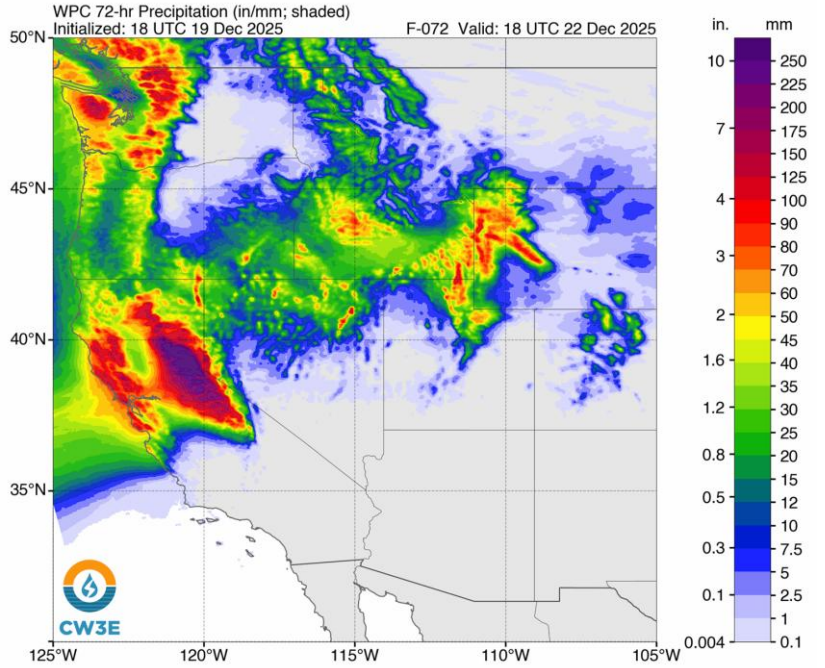




- The 00Z West-WRF ensemble control member is forecasting an AR3 (based on the Ralph et al. 2019 AR Scale) for a coastal point near Morro Bay, CA, with ~80% of ensemble members forecasting at least an AR2 and ~60% forecasting AR3 conditions.
- The West-WRF ensemble control member is also forecasting an AR2 for an inland point in the foothills of the southern Sierra Nevada, with a significant amount of inland moisture penetration forecast with the southwesterly IVT during the third system.

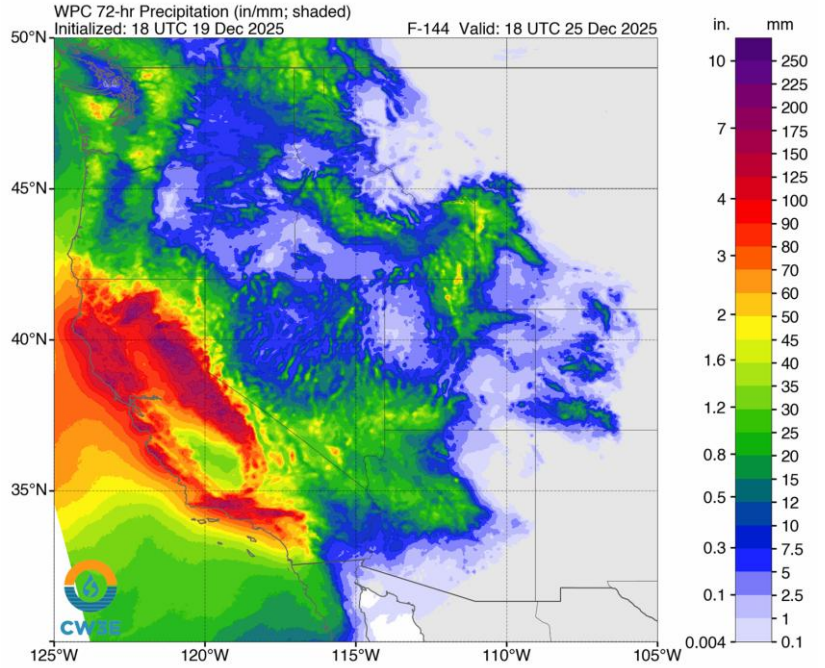
# CW3E AR Outlook: 19 December 2025

## NWS WPC Quantitative Precipitation Forecasts

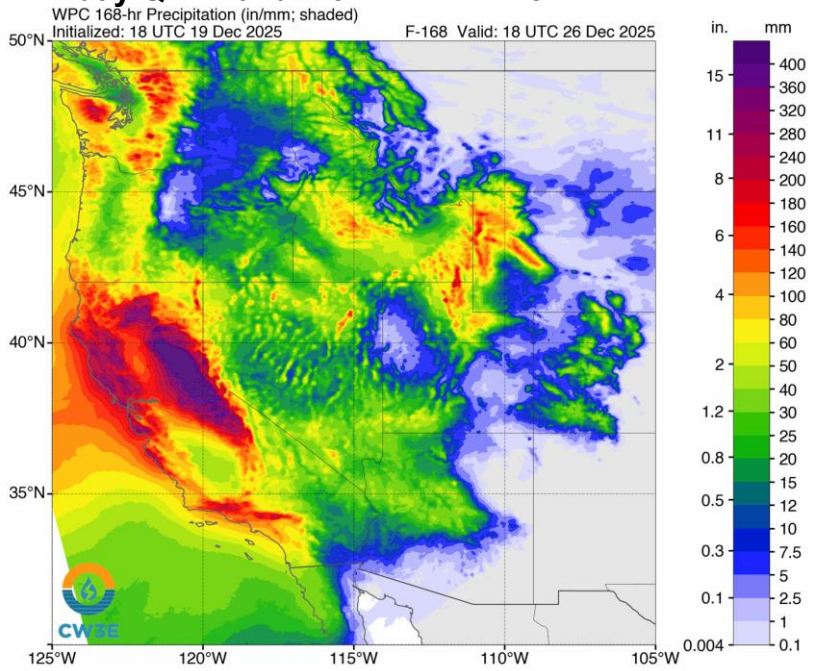
**72-hour QPF Valid:** 10 AM PT Mon 22 Dec




**72-hour QPF Valid:** 10 AM PT Thu 25 Dec




**7-day QPF Valid:** 10 AM PT Fri 26 Dec

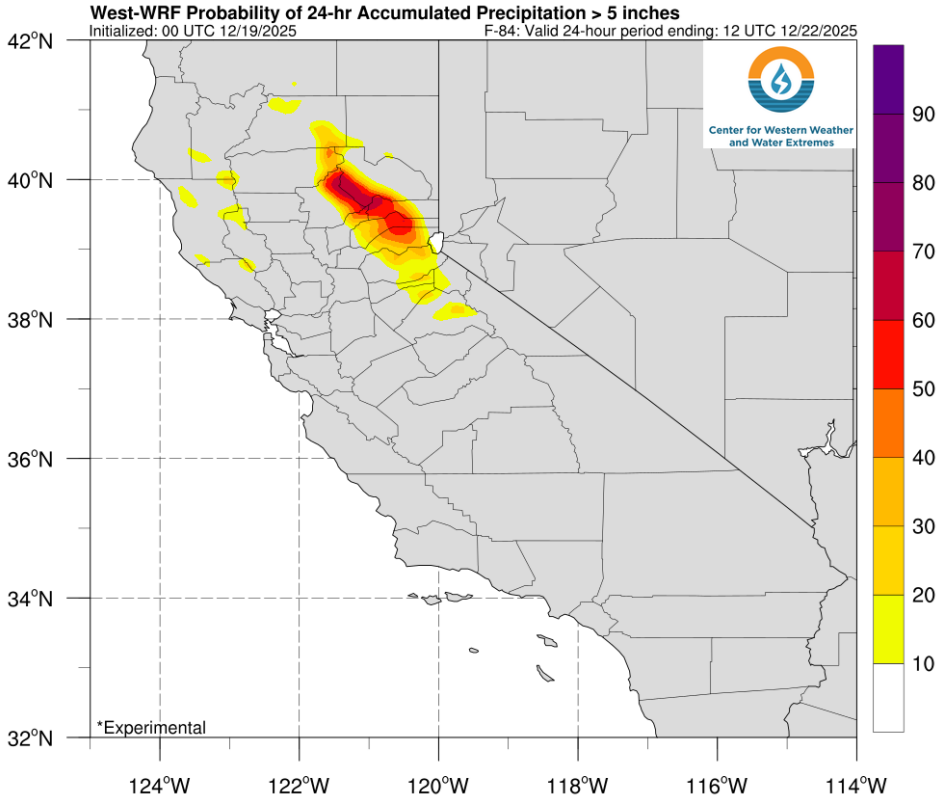



- The NWS Weather Prediction Center (WPC) is forecasting 72-hour precipitation (ending 10 AM Mon 22 Dec) amounts of 3–6 in. over the Northern California Coast Ranges and >7 in. in the Northern Sierra Nevada with the first and second AR (left).
- WPC is also forecasting 72-hour precipitation (ending 10 AM Thu 25 Dec) amounts of 3–6 in. over the Northern & Central California Coast Ranges and the Transverse Ranges with 6–9 in. over the Sierra Nevada with the third AR (center).
- The WPC is forecasting 7-day rainfall amounts of 10–20 in. over the Sierra Nevada, 7–10 in. over the Coast Ranges of Northern and Central California, and 3–7 in. over the Transverse Ranges in Southern California (right).

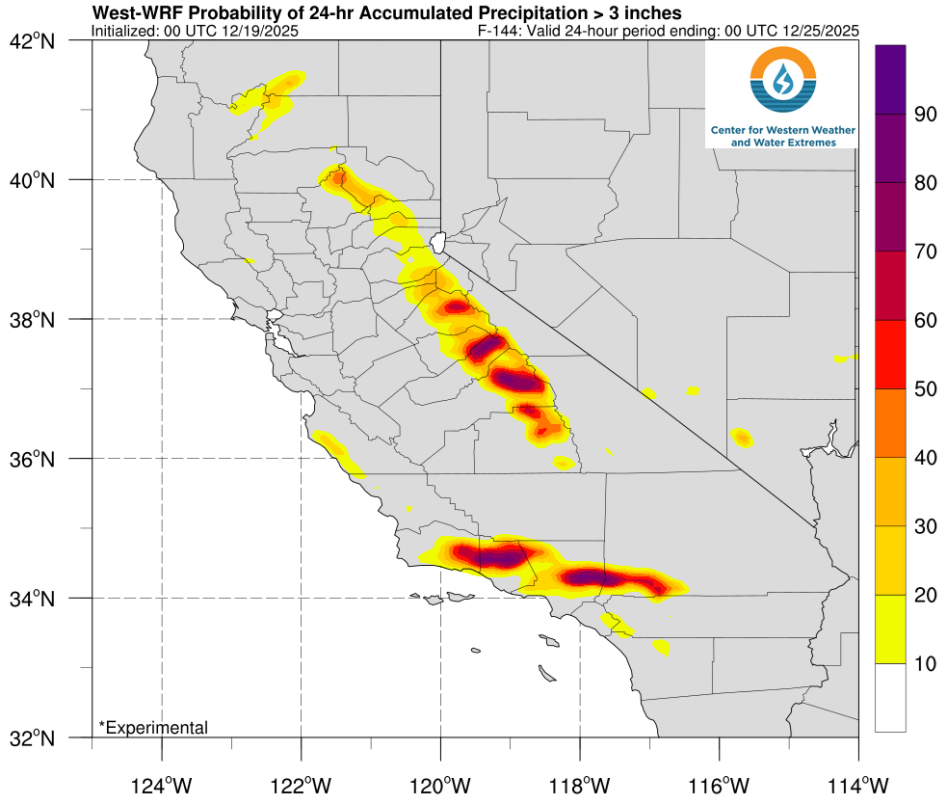
# CW3E AR Outlook: 19 December 2025

## West-WRF QPF Exceedance Probabilities

Probably of >5 inches: 24-h Period Ending 4 AM PT 22 Dec




Probably of >3 inches: 24-h Period Ending 4 PM PT 24 Dec

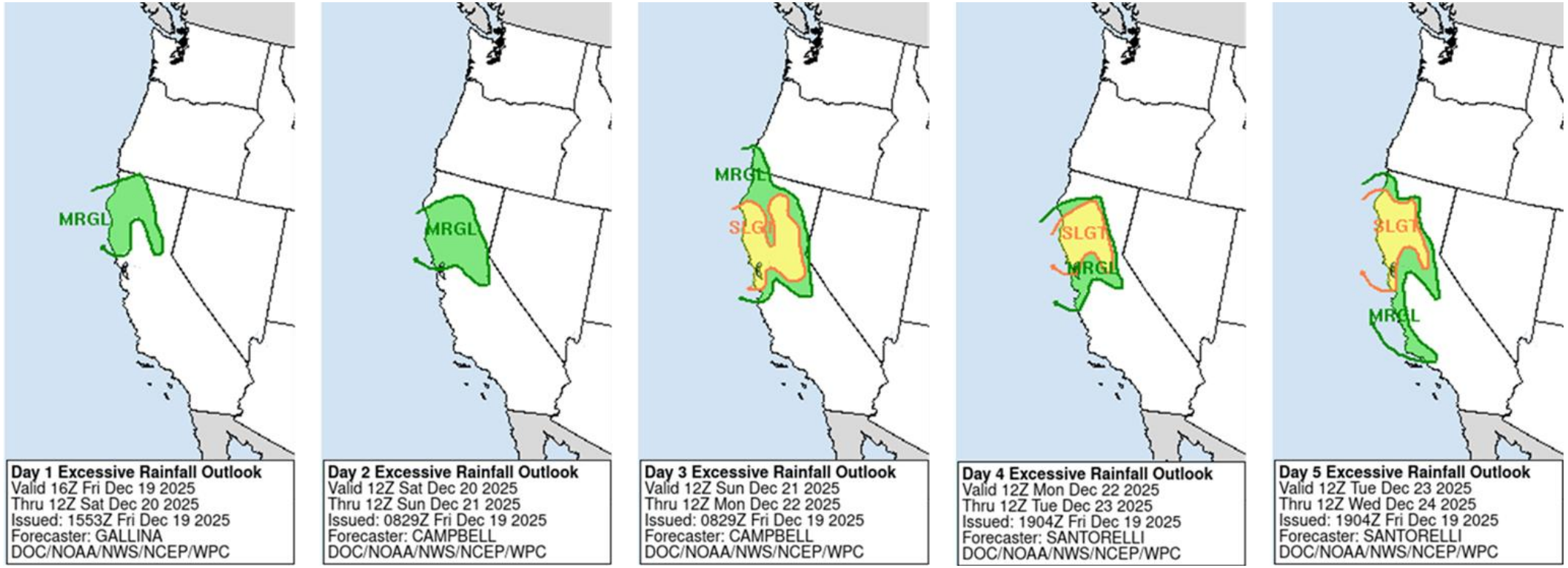



- The heaviest precipitation during the second AR is forecast over the Northern Sierra Nevada, where CW3E's West-WRF ensemble is showing >50% likelihood of precipitation exceeding 5 inches during the 24-hour period ending 4 AM PT Mon 22 Dec.
- The heaviest precipitation during the third AR is forecast over the Central/Southern Sierra Nevada and Transverse Ranges, where CW3E's West-WRF ensemble is showing >70% likelihood of >3 inches during the 24-hour period ending 4 PM PT Wed 24 Dec.

# CW3E AR Outlook: 19 December 2025

## NWS WPC Excessive Rainfall Outlooks

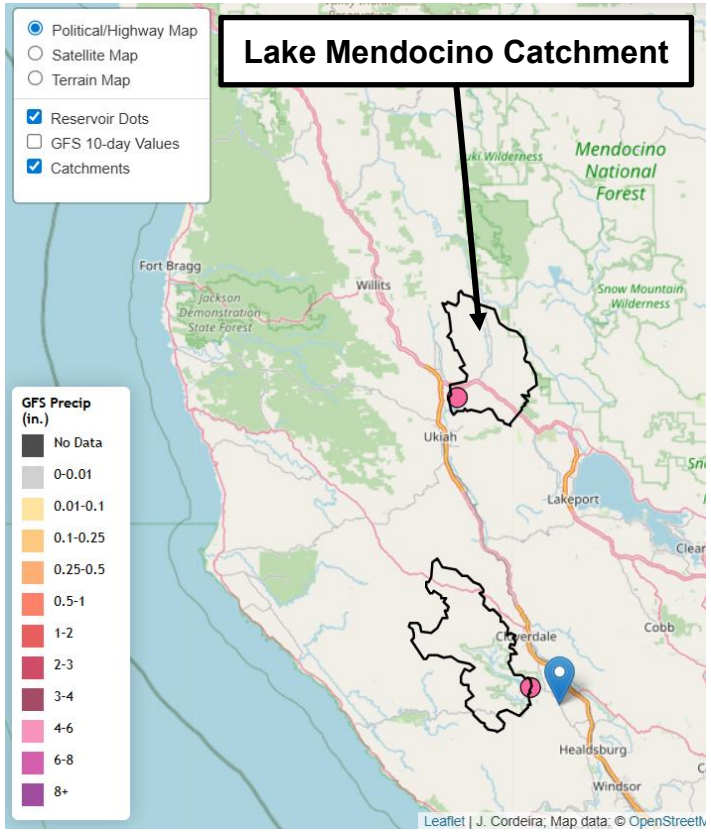
Risk of rainfall exceeding flash flood guidance within 25 miles of a point to the right of a line
HIGH: At Least 70% SLGT: At Least 15%
MDT: At Least 40% MRGL: At Least 5%

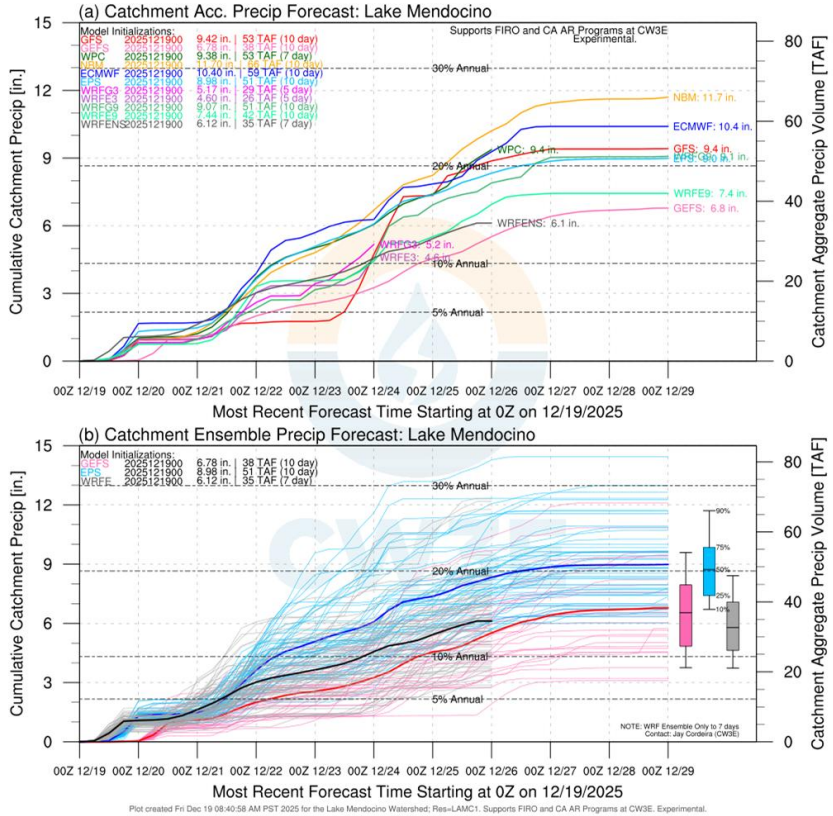


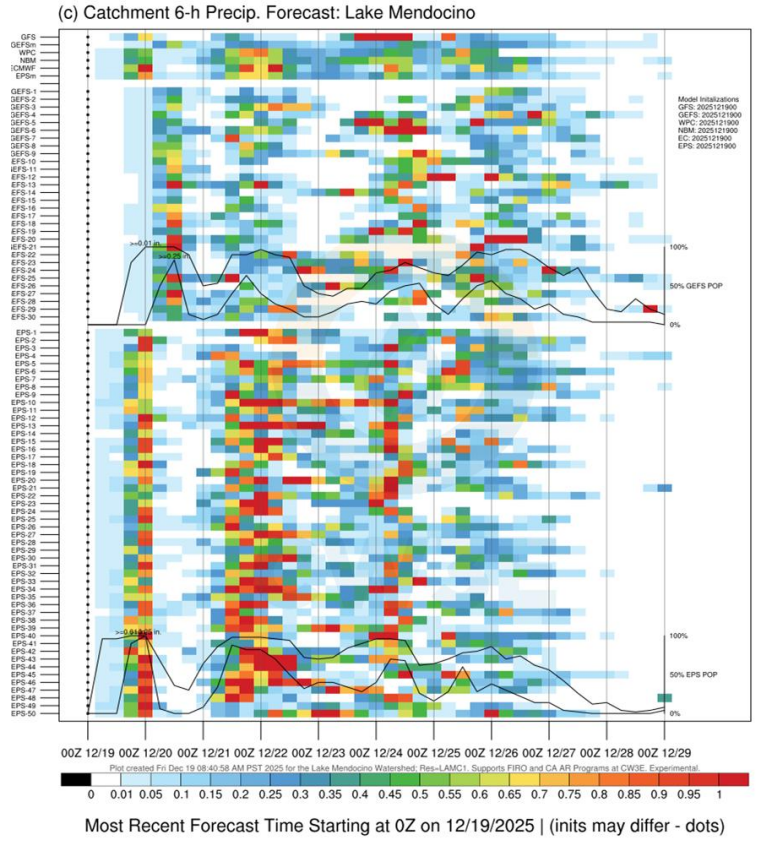

- The NWS WPC has issued excessive rainfall outlooks (EROs) highlighting the potential for rainfall exceeding flash flood guidance over Northern California in association with AR activity over the next 5 days.
- WPC has issued **marginal risk** (level 1 of 4; ≥5% probability of flash flooding) EROs over the Coast Ranges in Northern California and the Northern Sierra Nevada between Fri 19 Dec–Wed 24 Dec. WPC also issued **slight risk** (level 2 of 4; ≥15% probability) EROs over these same regions focused on the later period between early Sun 21 Dec–Wed 24 Dec.

# CW3E AR Outlook: 19 December 2025

## Watershed Precipitation Forecasts: Lake Mendocino Catchment



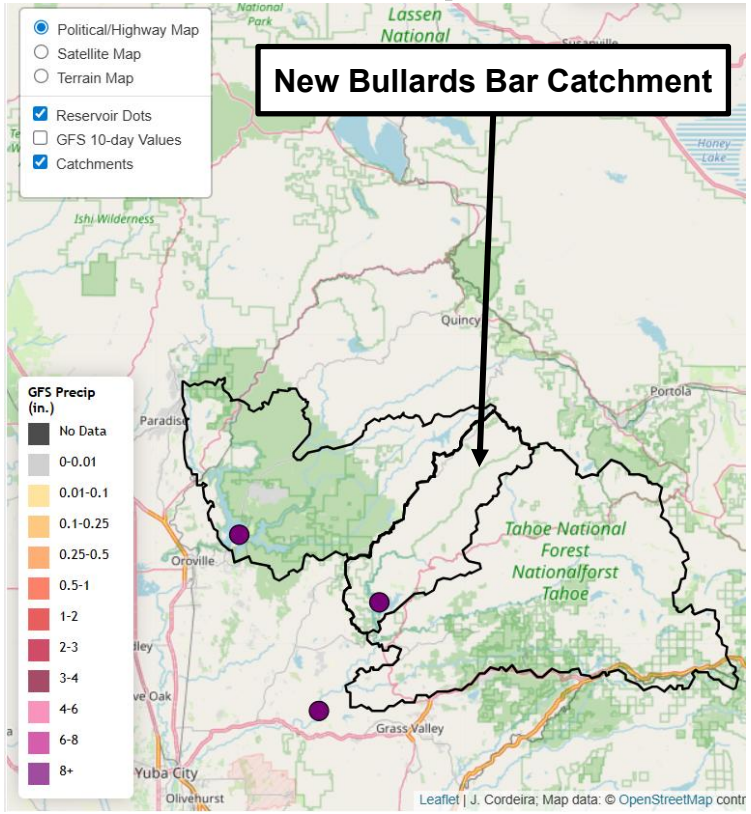



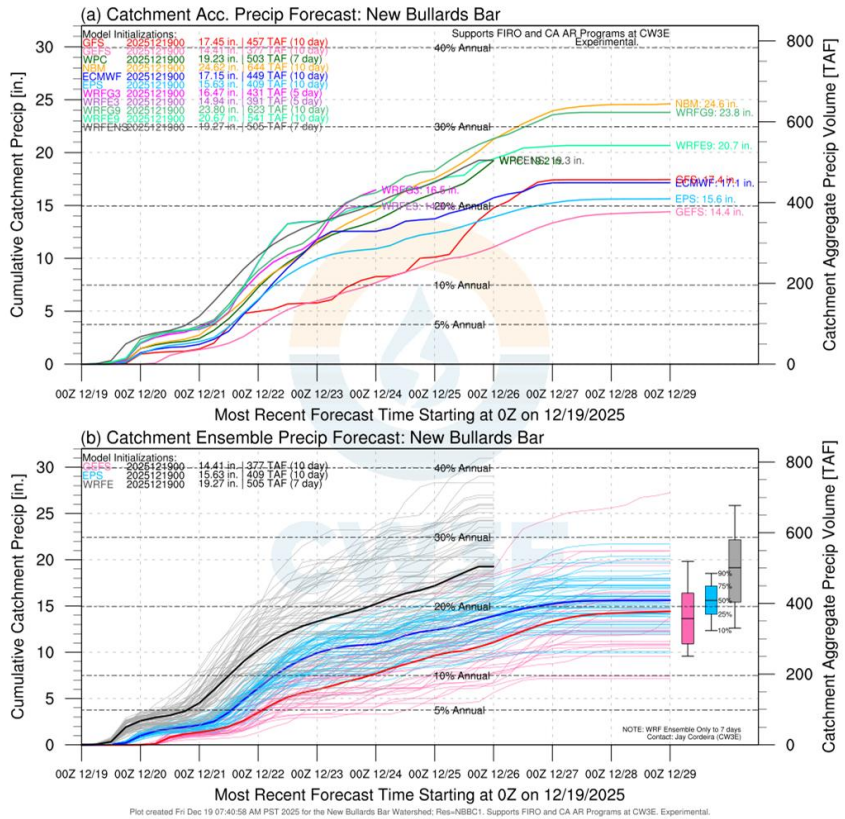



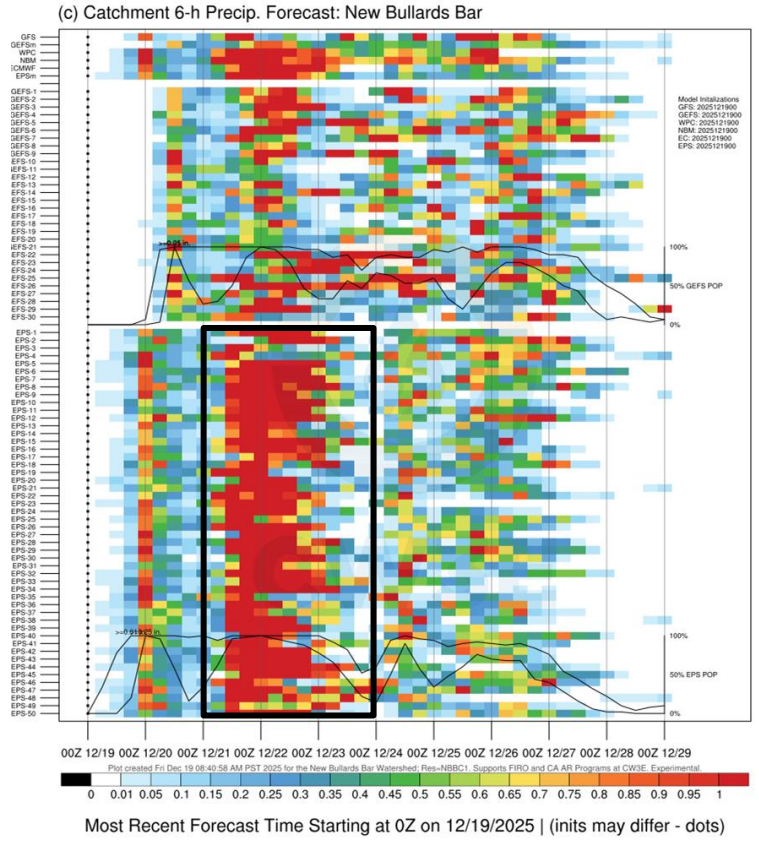

- GEFS, ECMWF, and West-WRF ensembles are forecasting 7-day precipitation totals >10% of normal annual precipitation (~4.2 inches) in the Lake Mendocino catchment by 4 AM Thu 25 Dec.
- Several ECMWF and West-WRF members, as well as the deterministic GFS, ECMWF, and NBM, are forecasting >20% of normal annual precipitation (~8.7 inches).
- Overall, the ECMWF ensemble is forecasting higher precipitation amounts compared to the GEFS and West-WRF ensembles.

# CW3E AR Outlook: 19 December 2025

## Watershed Precipitation Forecasts: New Bullards Bar Catchment



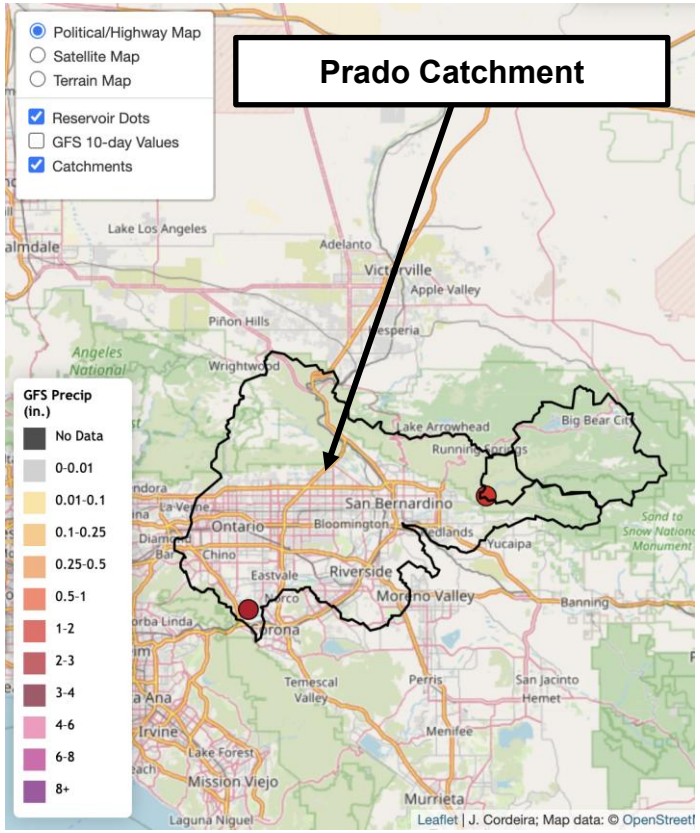



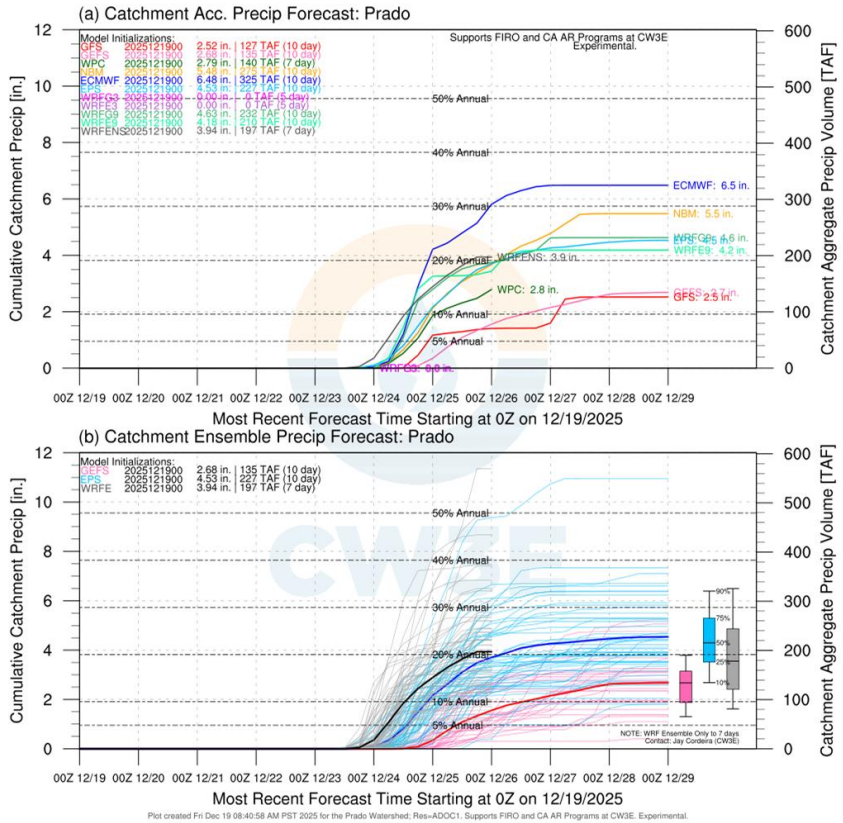



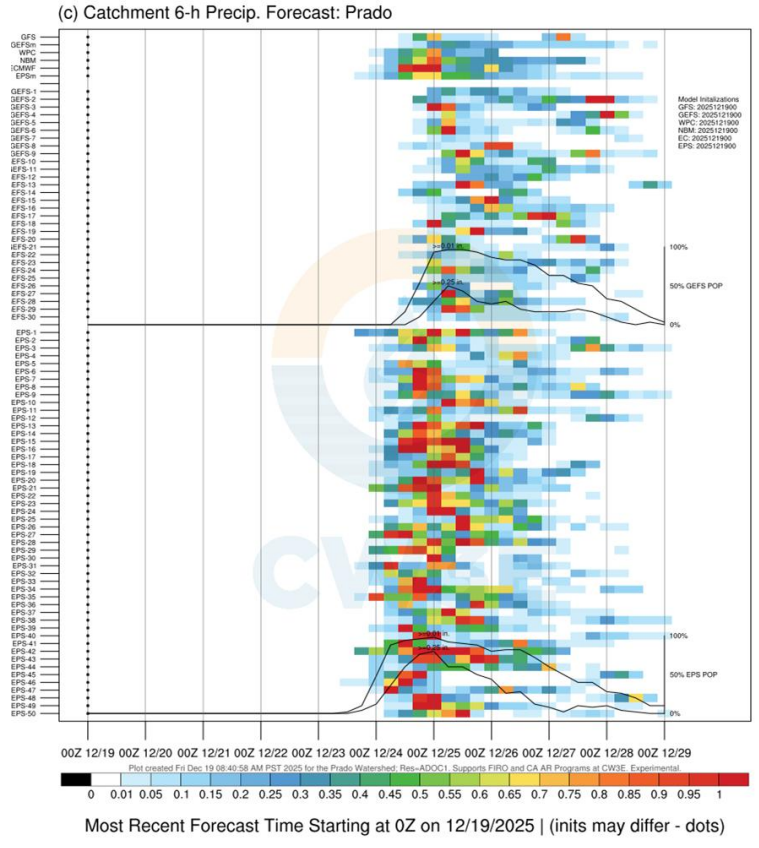

- The GEFS and ECMWF ensembles are forecasting 7-day precipitation totals >10% of normal annual precipitation (~7.5 inches) in the New Bullards Bar catchment by 4 AM Thu 25 Dec. West-WRF is forecasting much higher precipitation totals, with >75% of ensemble members forecasting >20% of normal annual precipitation (~15 inches).
- The heaviest precipitation in this catchment is expected during the second AR. Most ECMWF ensemble members are forecasting multiple consecutive 6-hour periods with >1 inch of mean areal precipitation on Sun 21 Dec and Mon 22 Dec (*annotated*).

# CW3E AR Outlook: 19 December 2025

## Watershed Precipitation Forecasts: Prado Catchment



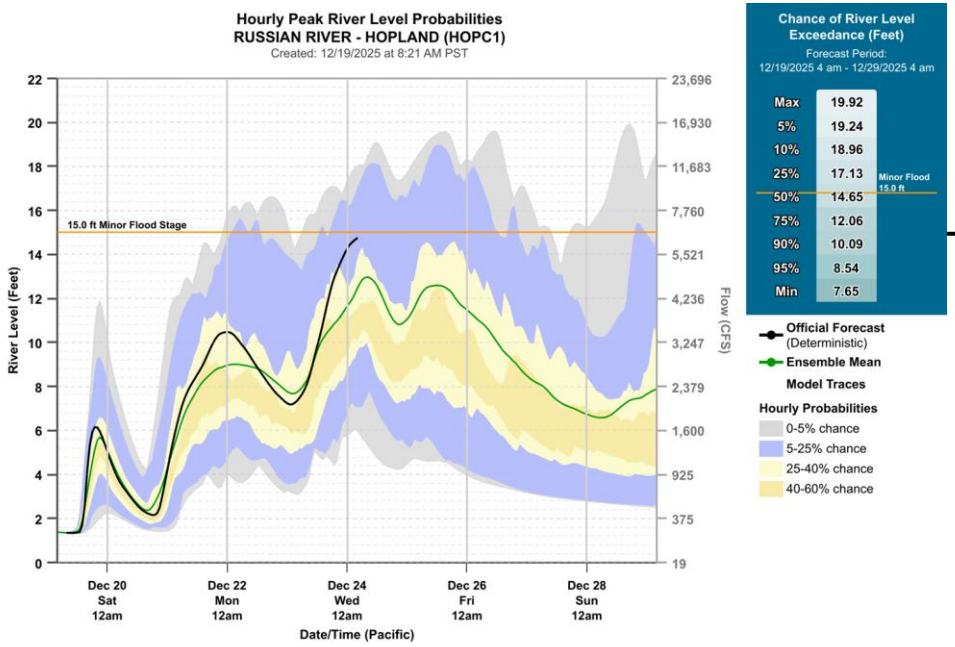




- The ECMWF and West-WRF ensembles are also showing potential for 7-day precipitation totals >20% of normal annual precipitation (~3.9 inches) in the Prado catchment by 4 AM Thu 25 Dec, with several members exceeding 30% (~5.7 inches).
- Overall, GEFS is forecasting much lower precipitation amounts (<10% of normal annual precipitation).
- Nearly all the precipitation in this catchment is forecast to occur during the third AR.

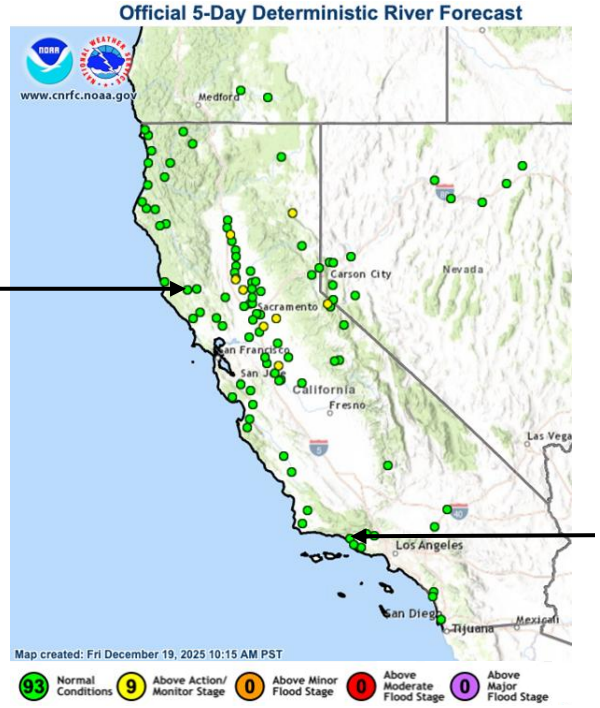
# CW3E AR Outlook: 19 December 2025

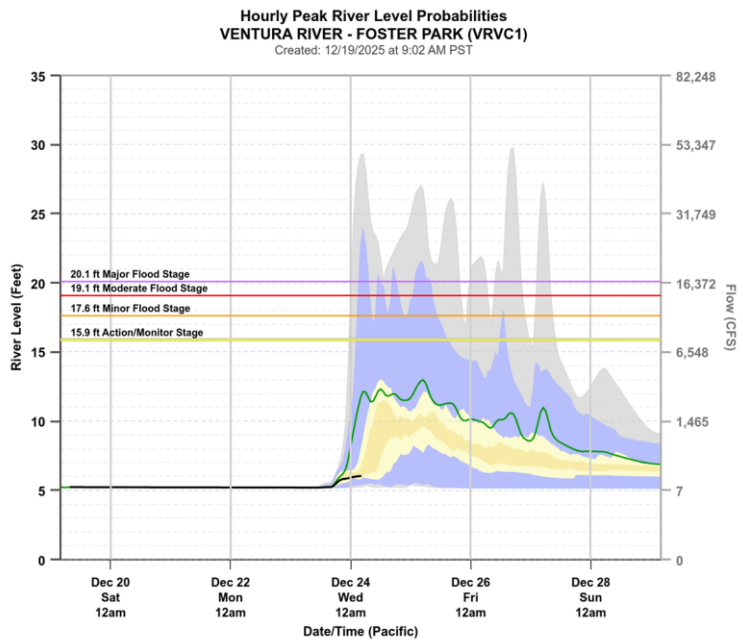
## CNRFC Streamflow Forecasts

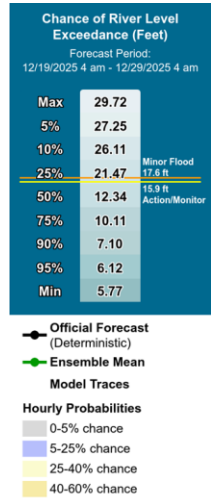








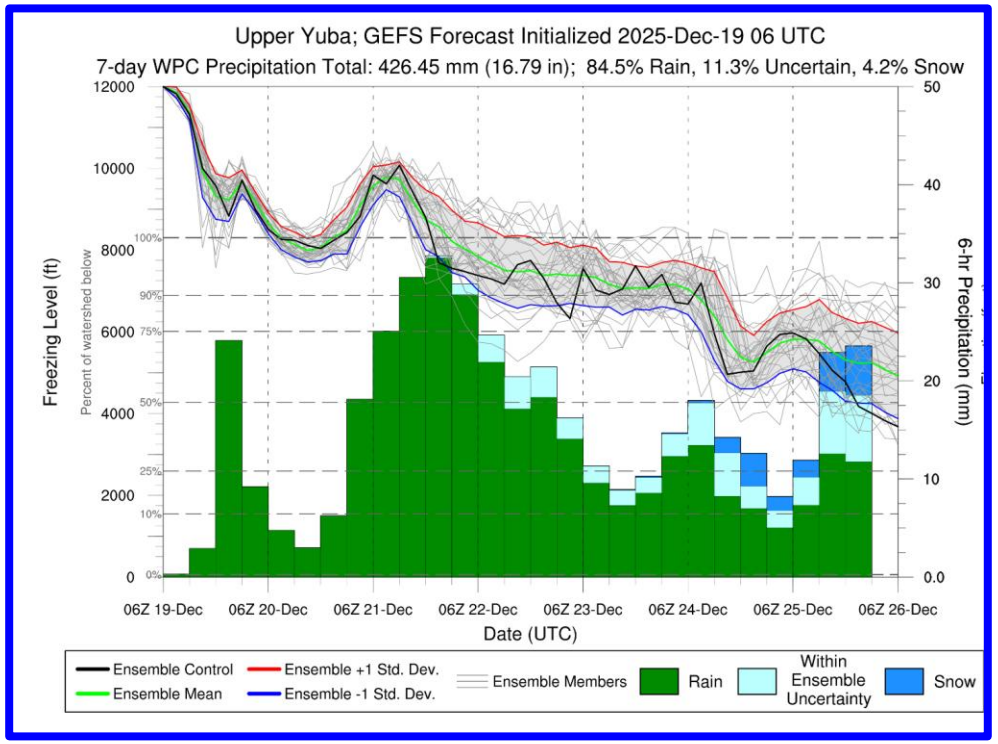



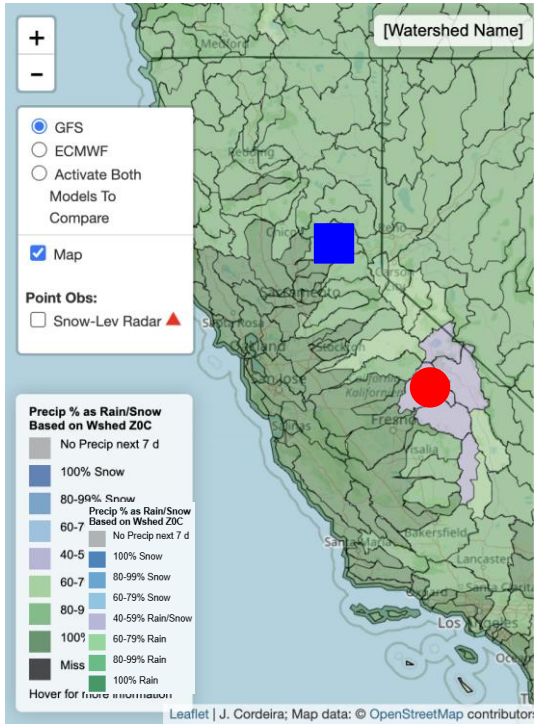



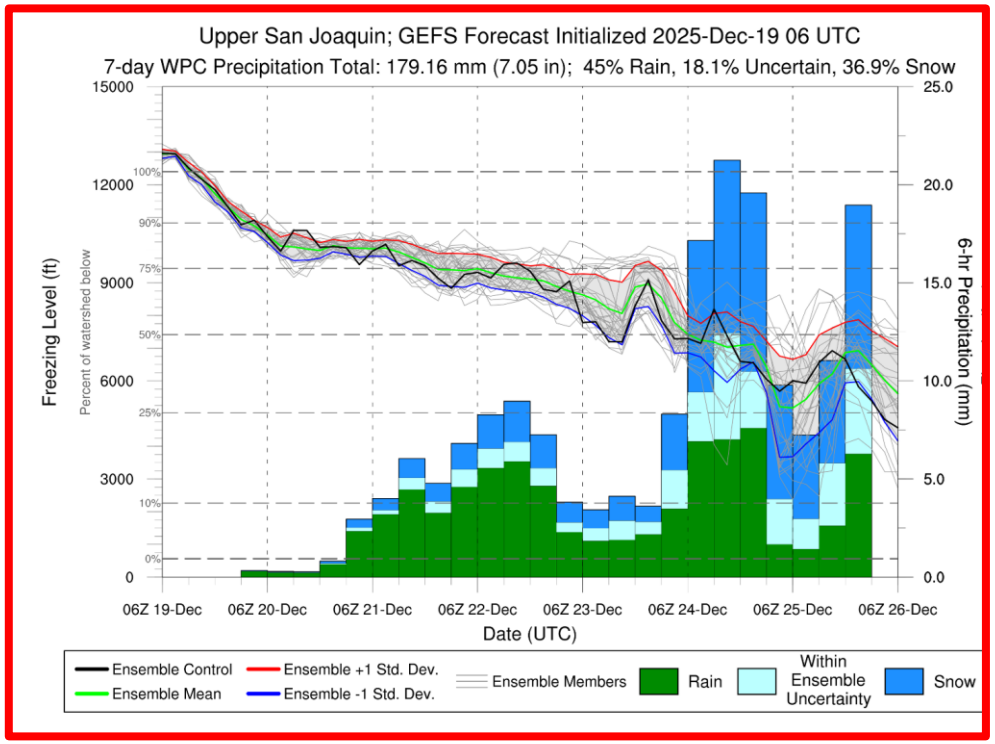

- Despite these high precipitation totals, significant riverine flooding is not currently forecast in California as shown by the joint DWR/CNRFC forecasts. As these storms progress and soil conditions become more saturated, it is recommended to pay close attention to the DWR/CNRFC forecasts for changes in river forecasts or to the local NWS offices for local flood guidance.
- While deterministic forecasts only show 9 stream gages exceeding action/monitor stage over the next 5 days, ensemble guidance is indicating the potential for multiple stream gages to reach flood stage later next week.
- Based on the HEFS ensemble, there is a 47% probability of the Russian River at Hopland (*left*) exceeding flood stage and a 31% probability of the Ventura River near Foster Park (*right*) exceeding flood stage during the next 10 days.

# CW3E AR Outlook: 19 December 2025

## GEFS Watershed Freezing Level Forecasts



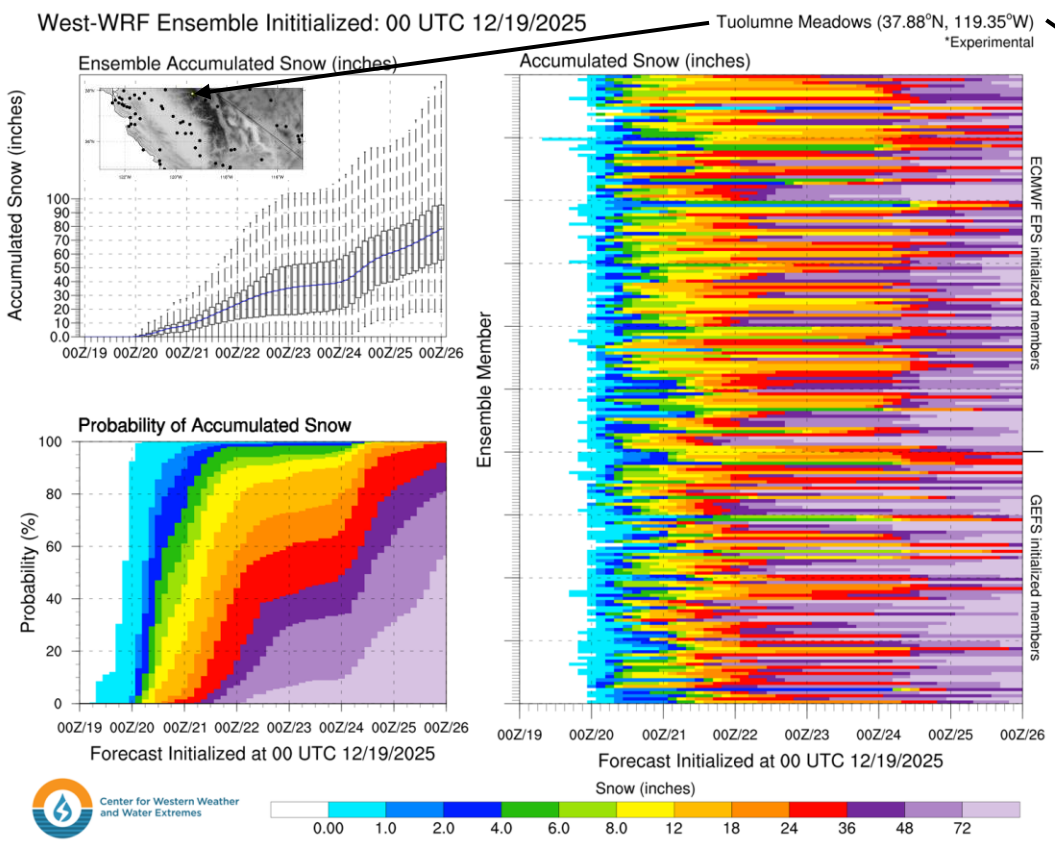



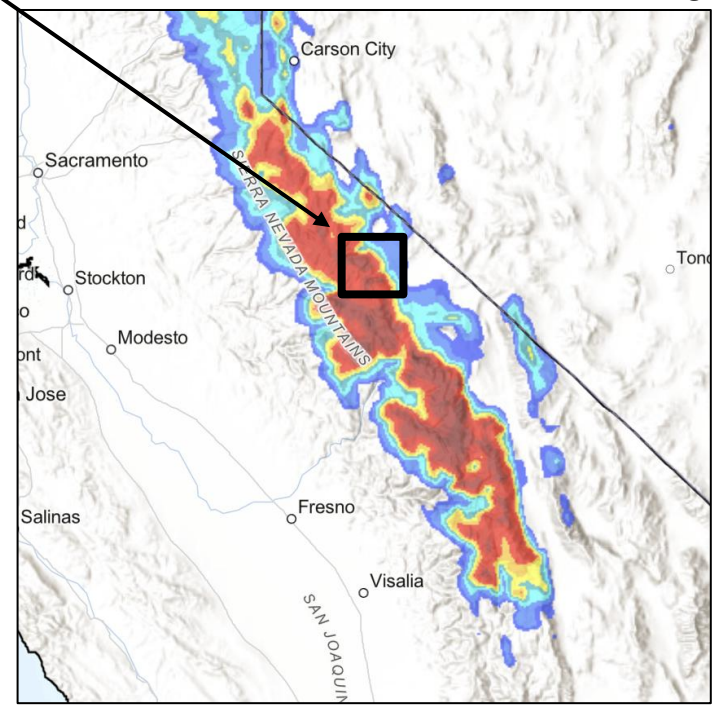

- Freezing levels over the Sierra Nevada are forecast to start out above 9,000 feet today and gradually lower to below 7,000 feet during the third AR.
- Snowfall accumulations during the first and second ARs will likely be limited to the highest peaks due to high freezing levels.
- Lower freezing levels during the third AR and beyond will likely facilitate heavy snowfall accumulations over a broader area.
- CW3E's watershed freezing level forecasts based on GEFS are indicating the potential for a significant portion of the precipitation to fall as snow in the Upper San Joaquin watershed over the next 7 days.

# CW3E AR Outlook: 19 December 2025

## Snowfall & Winter Storm Impacts




Probabilistic WSSI: Major Winter Storm Impacts
Valid: 24-h Period Ending 10 AM PT 25 Dec




Source: NOAA/NWS Weather Prediction Center

**Potential Winter Storm Impacts**

**Winter Weather Area**
**Expect Winter Weather.**
- Winter driving conditions. **Drive carefully.**

**Minor Impacts**
**Expect a few inconveniences to daily life.**
- Winter driving conditions. **Use caution while driving.**

**Moderate Impacts**
**Expect disruptions to daily life.**
- Hazardous driving conditions. **Use extra caution while driving.**
- Closures and disruptions to infrastructure may occur.

**Major Impacts**
**Expect considerable disruptions to daily life.**
- Dangerous or impossible driving conditions. **Avoid travel if possible.**
- Widespread closures and disruptions to infrastructure may occur.

**Extreme Impacts**
**Expect substantial disruptions to daily life.**
- Extremely dangerous or impossible driving conditions. **Travel is not advised.**
- Extensive and widespread closures and disruptions to infrastructure may occur.
- Life-saving actions may be needed.

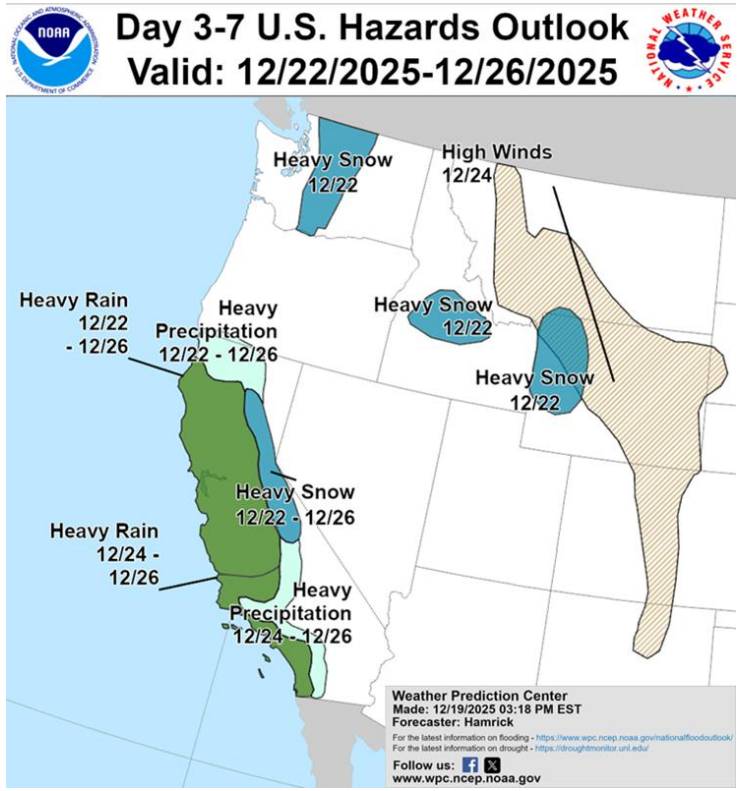
**Likelihood of Impact**

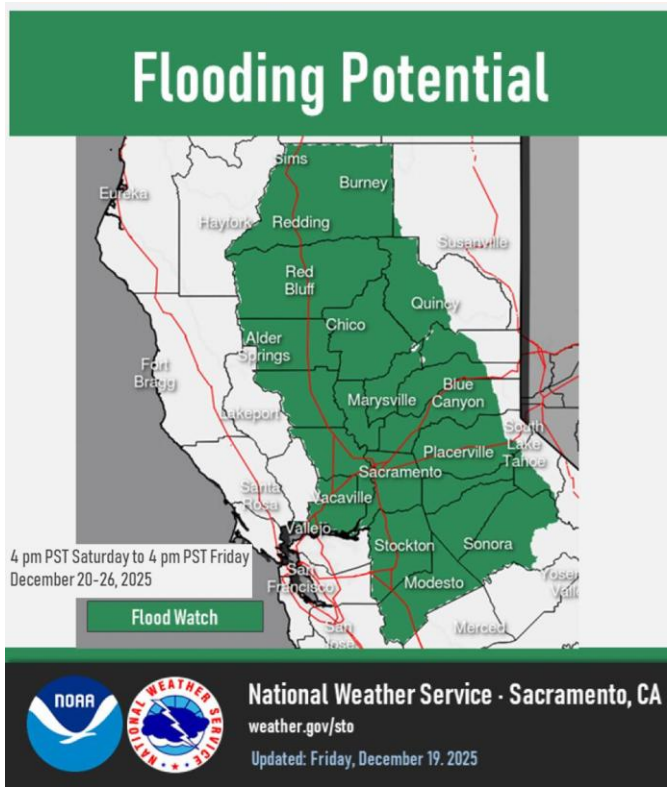
< 5% 5% 10% 20% 30% 40% 50% 60% 70% 80% 90% > 95%

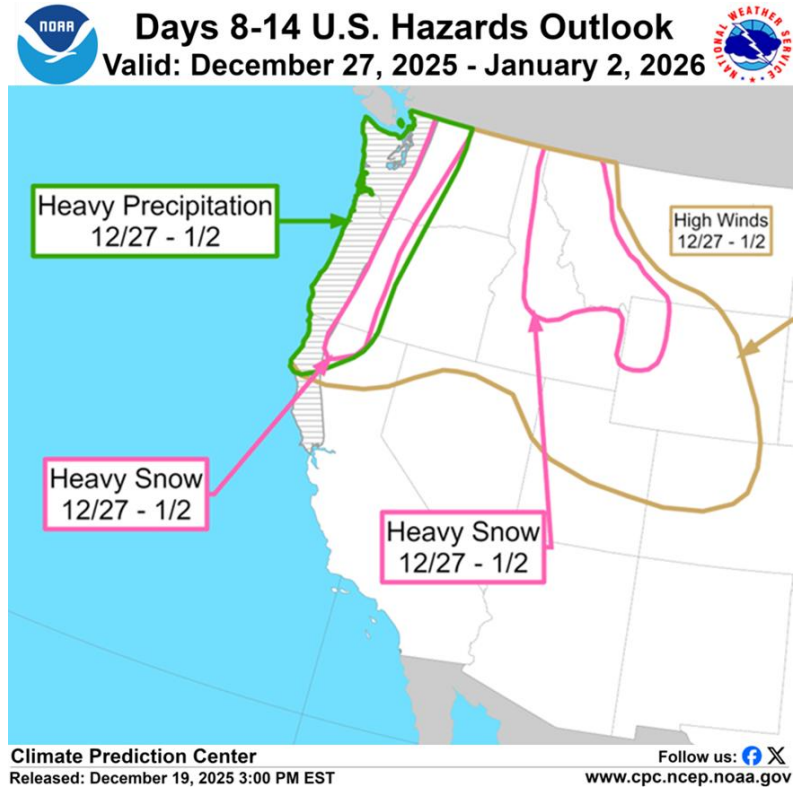
- Heavy snow is forecast in the higher terrain of the Central & Southern Sierra Nevada, particularly during the third AR and beyond.
- The West-WRF ensemble is showing ~80% probability of 48+ inches of total snow and ~55% probability of 72+ inches of total snow at Tuolumne Meadows through Thu 25 Dec.
- NWS WPC's Winter Storm Severity Index (WSSI) is indicating a high likelihood (>70% probability) of major winter storm impacts above 9,000 feet.

# CW3E AR Outlook: 19 December 2025

## National Weather Service Hazard Outlooks




- The NWS Weather Prediction Center has highlighted the risk of heavy rainfall, snow, and precipitation over Northern and Central California for Tue 22 Dec–Fri 26 Dec and for heavy rainfall and precipitation over Southern California for Wed 24 Dec–Fri 26 Dec.
- Local NWS Weather Forecast Offices have begun issuing product related to the various hazards related to these ARs (*center*).
- The NWS Climate Prediction Center has highlighted the risk for heavy precipitation and heavy snow over western Washington, Oregon, and Northern California for the long-range period during Sat 27 Dec–Fri 2 Jan (*right*).