



Center for Western Weather  
and Water Extremes

SCRIPPS INSTITUTION OF OCEANOGRAPHY  
AT UC SAN DIEGO

# CW3E Seasonal Outlook: January–March 2025

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January 13, 2025*

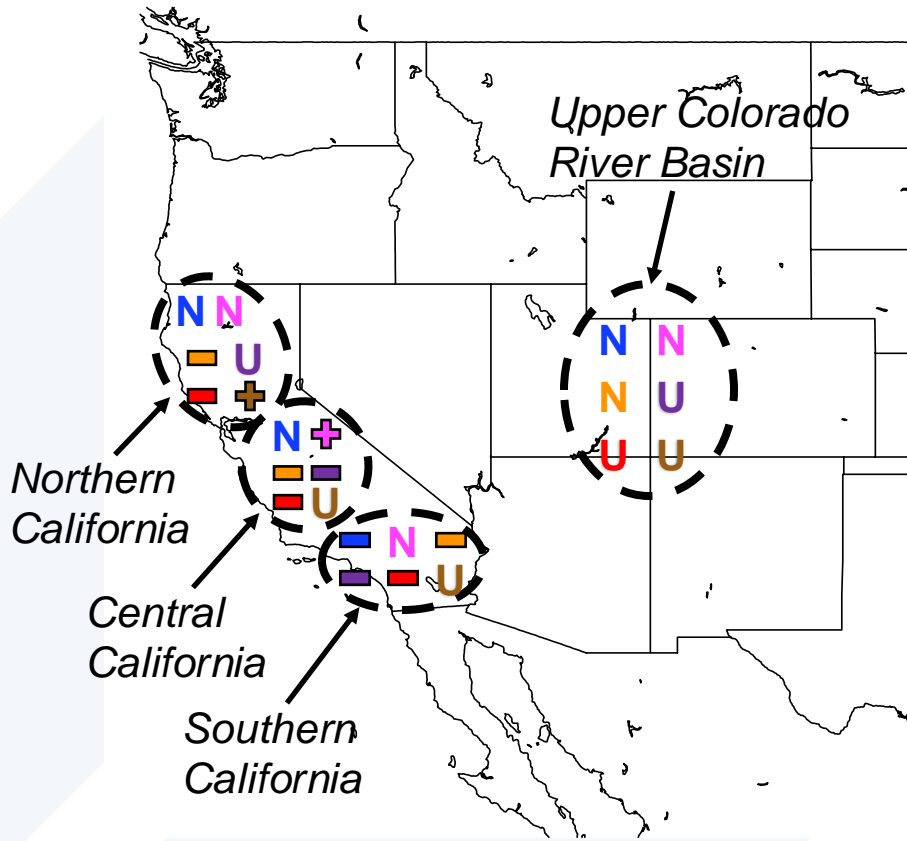
UC San Diego



# Summary: Jan–Mar 2025 Seasonal Forecasts

- Most experimental seasonal forecast products favor below-normal precipitation in Southern CA for the Jan–Mar 2025 period
  - CW3E CCA model predicts near-normal precipitation in Southern CA with moderate confidence
  - CW3E Machine Learning (ML) and NOAA NMME models show strong agreement on drier than normal conditions in Southern CA
  - Most seasonal forecasts issued by other institutions are leaning towards below normal precipitation over Southern CA
- Experimental seasonal forecast products show greater uncertainty over Northern and Central CA
  - CW3E CCA model forecasts near-normal precipitation in Northern CA with low confidence and above-normal precipitation in Central CA with low-to-moderate confidence
  - CW3E ML and NOAA NMME models generally agree on near-normal precipitation overall in Northern CA and Central CA
  - Seasonal forecasts issued by other institutions show some disagreement in Northern CA and lean towards below-normal precipitation in Central CA

# Seasonal Synthesis Precipitation Outlook: Jan–Mar 2025



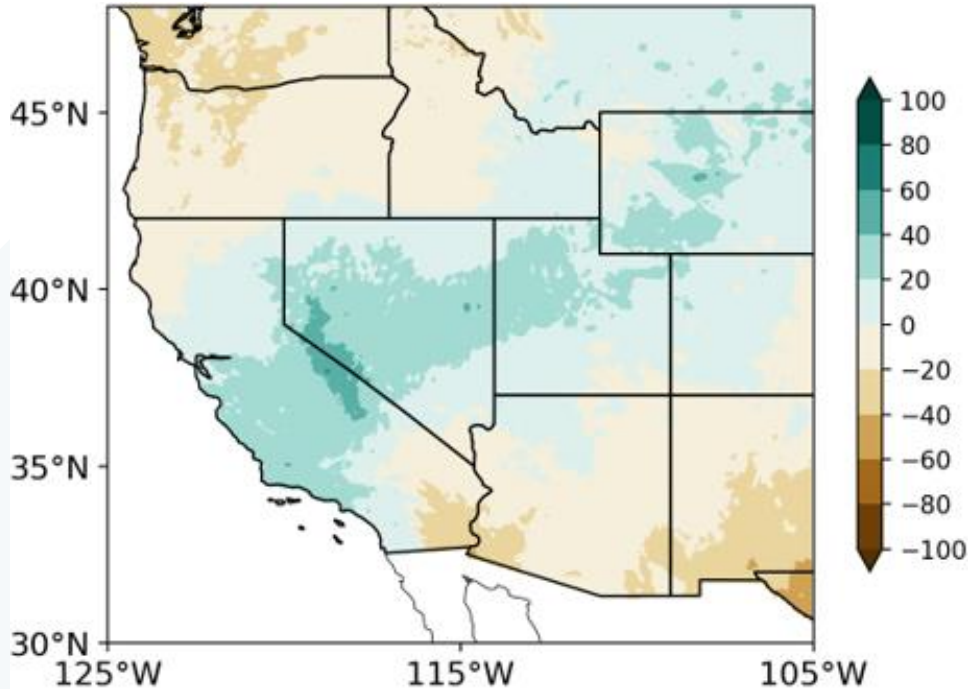
- +** Above Normal
- Below Normal
- N** Normal
- U** Uncertain/Equal Chances

Method	Forecast Period	Organization(s)	Northern CA	Central CA	Southern CA	Upper CO
Machine Learning based Forecast (Gibson et al.)	Jan–Mar	Jet Propulsion Laboratory California Institute of Technology Center for Western Weather and Water Extremes SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO	N	N	—	N
CCA Seasonal Precipitation Forecast (Gershunov et al.)	Jan–Mar	Center for Western Weather and Water Extremes SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO	N	+	N	N
Univ. of Arizona Hybrid Seasonal Forecast (Scheffic et al.)	Jan–Jan		—	—	—	N
IRI/CPC Forecast (Robertson et al.)	Jan–Mar		U	—	—	U
NMME Seasonal Forecast	Jan–Mar	The North American Multi-Model Ensemble	—	—	—	U
NOAA CPC Operational Outlook	Jan–Mar		+	U	U	U

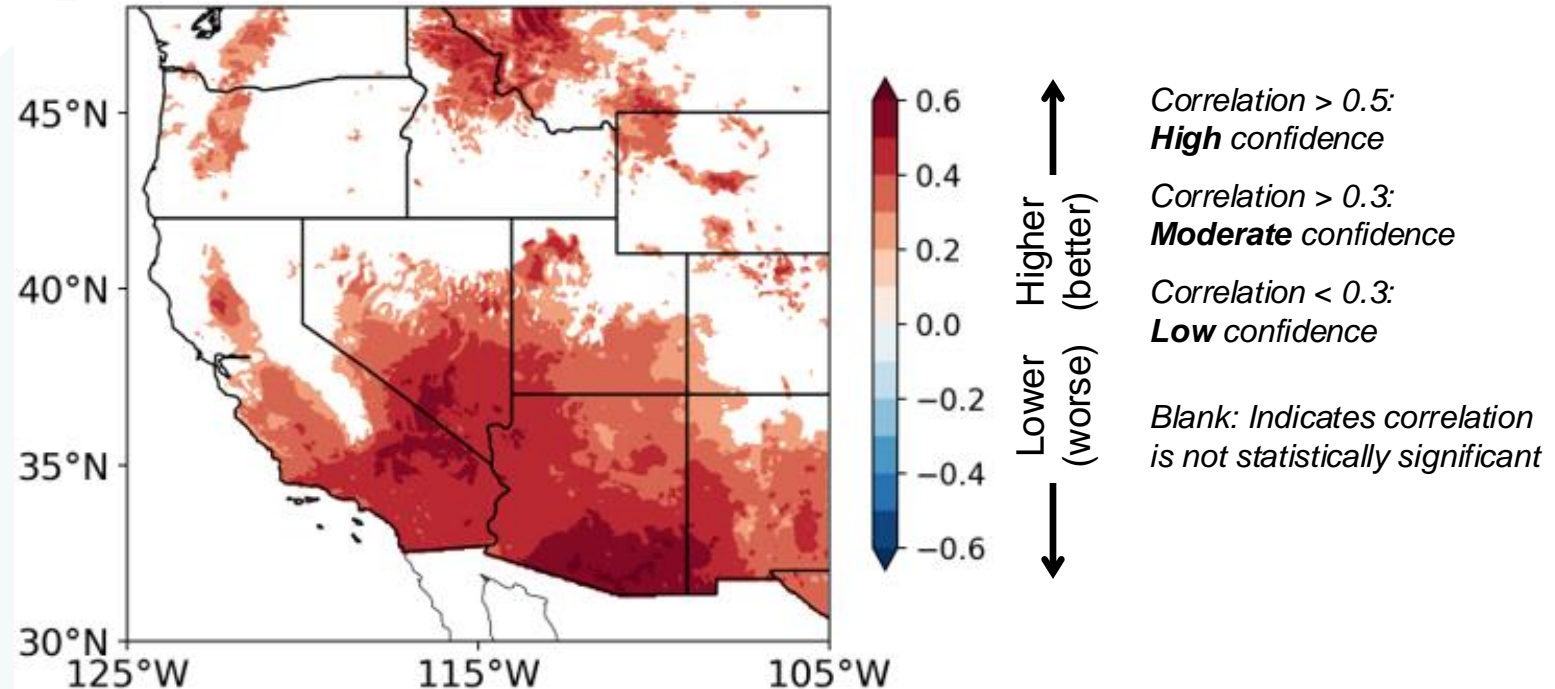
[DeFlorio et al. \(2024, BAMS\)](#)

# Seasonal Outlook: Jan–Mar 2025 Precipitation (CCA Model)

## JFM Precipitation Anomaly (% of Normal)



## JFM Historical Forecast Skill



- CW3E’s statistical model based on December SST is predicting near-normal precipitation in Northern CA with low confidence, above-normal precipitation in Central CA with low-to-moderate confidence, and near-normal precipitation in most of Southern CA with moderate confidence during Jan–Mar 2025
- This product is an outlier compared to most other seasonal forecast products, which are showing dry conditions in the southwestern US and wet conditions in the northwestern US, consistent with a canonical weak La Niña response
- Above-normal precipitation in Central CA appears to be tied to a long-term SST warming trend in the Western Pacific, which explains the deviations from the typical canonical La Niña pattern

**CCA:** Canonical correlation analysis relating seasonal precipitation anomalies to observed monthly Pacific SST anomalies (click [here](#) for more information)

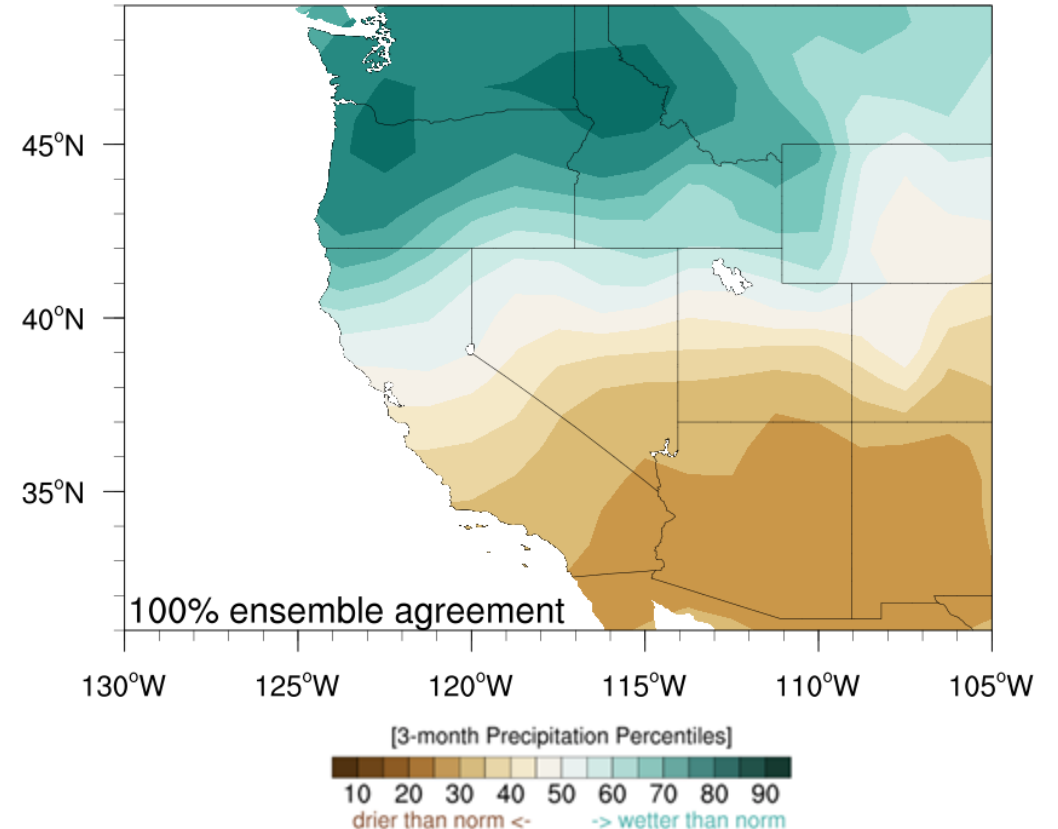
**Above-normal:** >+20%; **Below-normal:** <-20%

# Seasonal Outlook: Jan–Mar 2025 Precipitation (ML + NMME Models)

- CW3E ML and NOAA NMME models show strong agreement on a wet north/dry south pattern in the western US during Jan–Mar 2025, but the forecasts are a little more nuanced over CA
- All ML + NMME models are predicting near-normal precipitation overall in Northern CA; the ML models favor wet conditions near the CA/OR border, and most NMME models favor dry conditions closer to the Bay Area
- A majority of ML + NMME models (6/8 members) are also predicting near-normal precipitation overall in Central CA, but two NMME models are predicting below-normal precipitation. Nearly all models show a north-south gradient in Central CA, with drier conditions favored farther south.
- A majority of ML + NMME models (7/8 members) are predicting drier than normal conditions in Southern CA

**All models favor a wet north/dry south pattern in the Western US**

Possible Precipitation Pattern 4



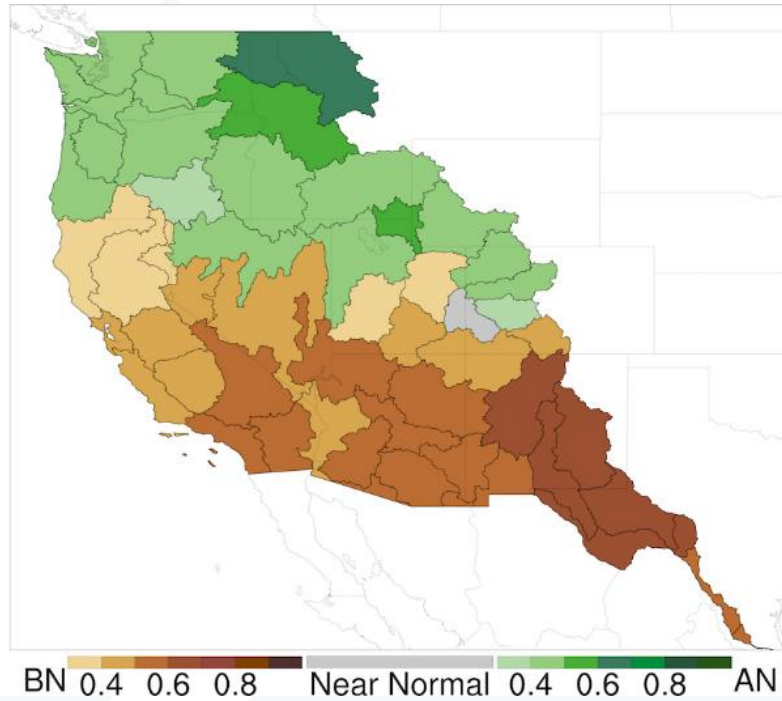
The ensemble is comprised of four CW3E Machine Learning (ML) models and four NOAA North America Multi-Model Ensemble (NMME) models. See [Gibson et al. \(2021\)](#) for a detailed skill assessment.

**Above-normal: >65<sup>th</sup> percentile; Below-normal: <35<sup>th</sup> percentile**

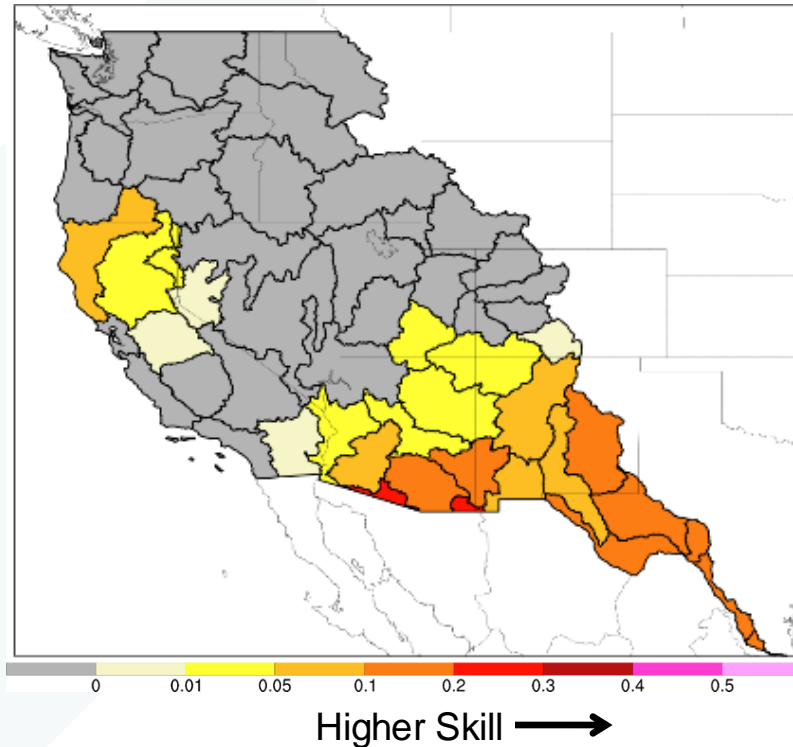
# Seasonal Outlook: University of Arizona 3-Month Precipitation Outlook

Forecast Issued Dec 2024

## JFM Precipitation Forecast



## Historical Forecast Skill (CRPSS)



- The University of Arizona produces probabilistic 3-month precipitation forecasts based on ensemble seasonal predictions from NCEP and ECMWF. These forecasts incorporate bias correction and climatological information to improve the prediction skill.
- The JFM precipitation forecast initialized in Dec 2024 shows a moderate likelihood ( $\geq 50\%$  probability) of below-normal precipitation in Southern CA and leans toward below-normal precipitation in Northern and Central CA

This graphic shows the probability of 3-month precipitation being in the below-normal (bottom third), near-normal (middle third), or above-normal (top third) category, with only the dominant category shown for each basin. Graphics provided by the Bill Scheftic and Xubin Zeng at the University of Arizona. See [Scheftic et al. \(2023\)](#) for more information.

# Seasonal Outlook: CPC 3-Month Precipitation Outlook



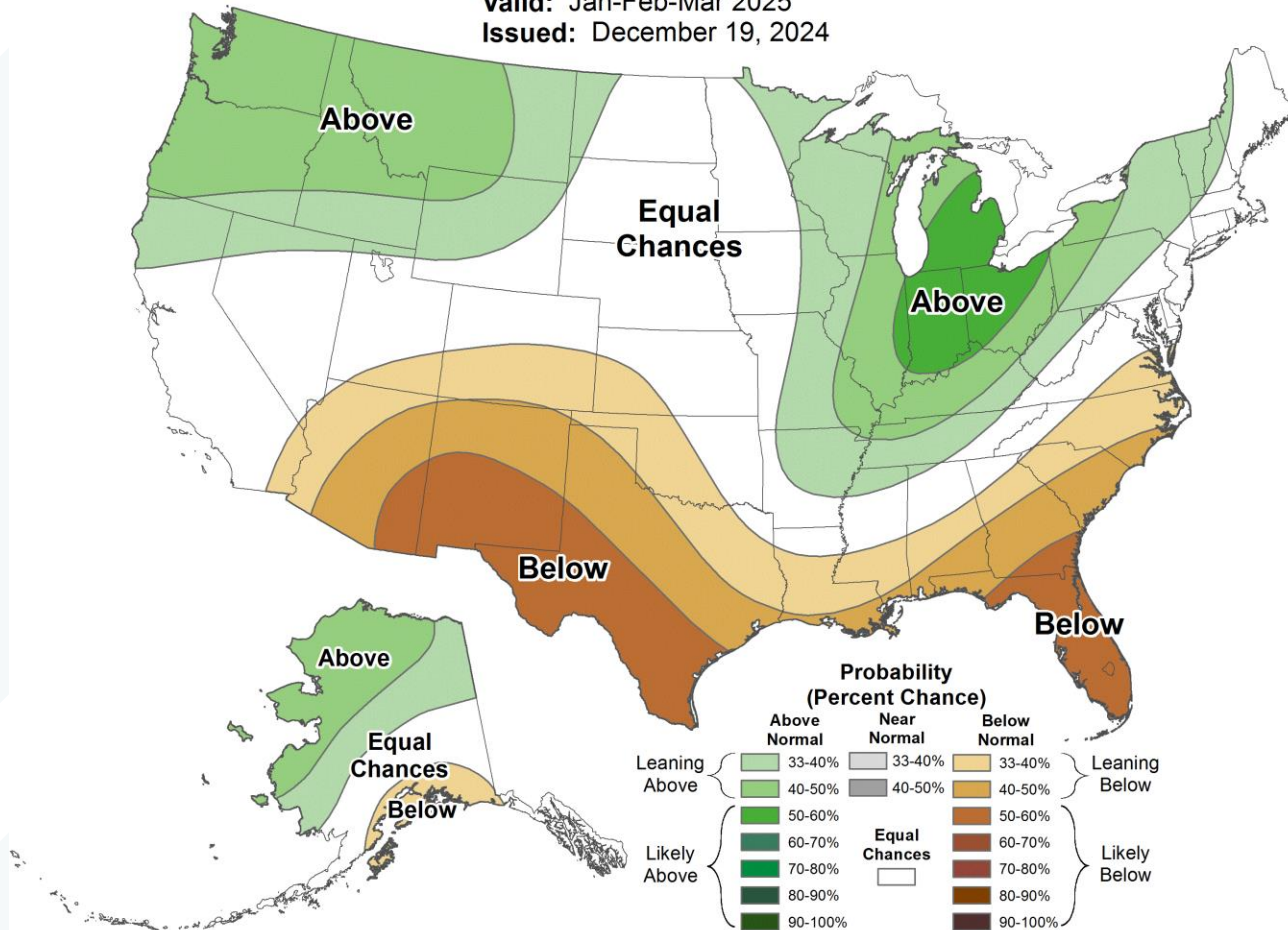
## Seasonal Precipitation Outlook



Forecast Issued Dec 2024

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

- The NOAA Climate Prediction Center (CPC) issues probabilistic 3-month precipitation outlooks for the CONUS and Alaska every month
- These outlooks are based on a combination of dynamical and statistical models
- The forecast issued in Dec tilts the odds toward above-normal precipitation in Northern CA during Jan–Mar 2025, but is more uncertain in Central and Southern CA

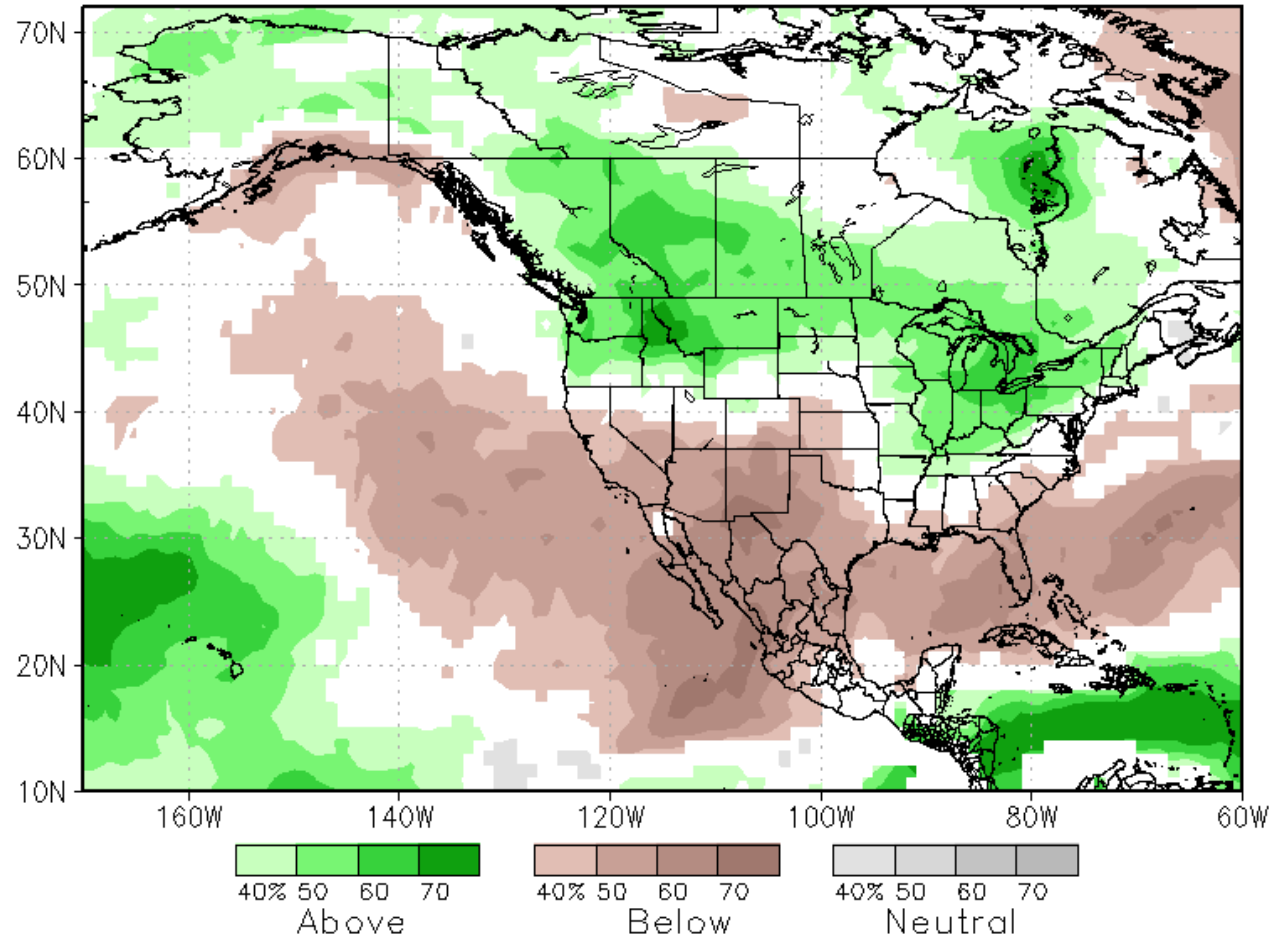


This graphic shows the probability of below-normal (brown), near-normal (grey), and above-normal (green) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain. Provided by the NOAA NWS Climate Prediction Center. More information about this forecast product can be found [here](#).

# Seasonal Outlook: NMME 3-Month Precipitation Outlook

Forecast Issued Dec 2024

NMME prob fcst Prate IC=202412 for lead 1 2025 JFM



- The CPC also issues probabilistic 3-month precipitation products every month using precipitation output from the North American Multi-Model Ensemble (NMME)
- The forecast issued in Dec is showing a moderate likelihood ( $\geq 50\%$  probability) of below-normal precipitation over Southern CA and leans toward below-normal precipitation over Northern and Central CA during Jan–Mar 2025

This graphic shows the probability of below-normal (brown), near-normal (grey), and above-normal (green) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain. Graphics provided by the NOAA NWS Climate Prediction Center. More information about this forecast product can be found [here](#).

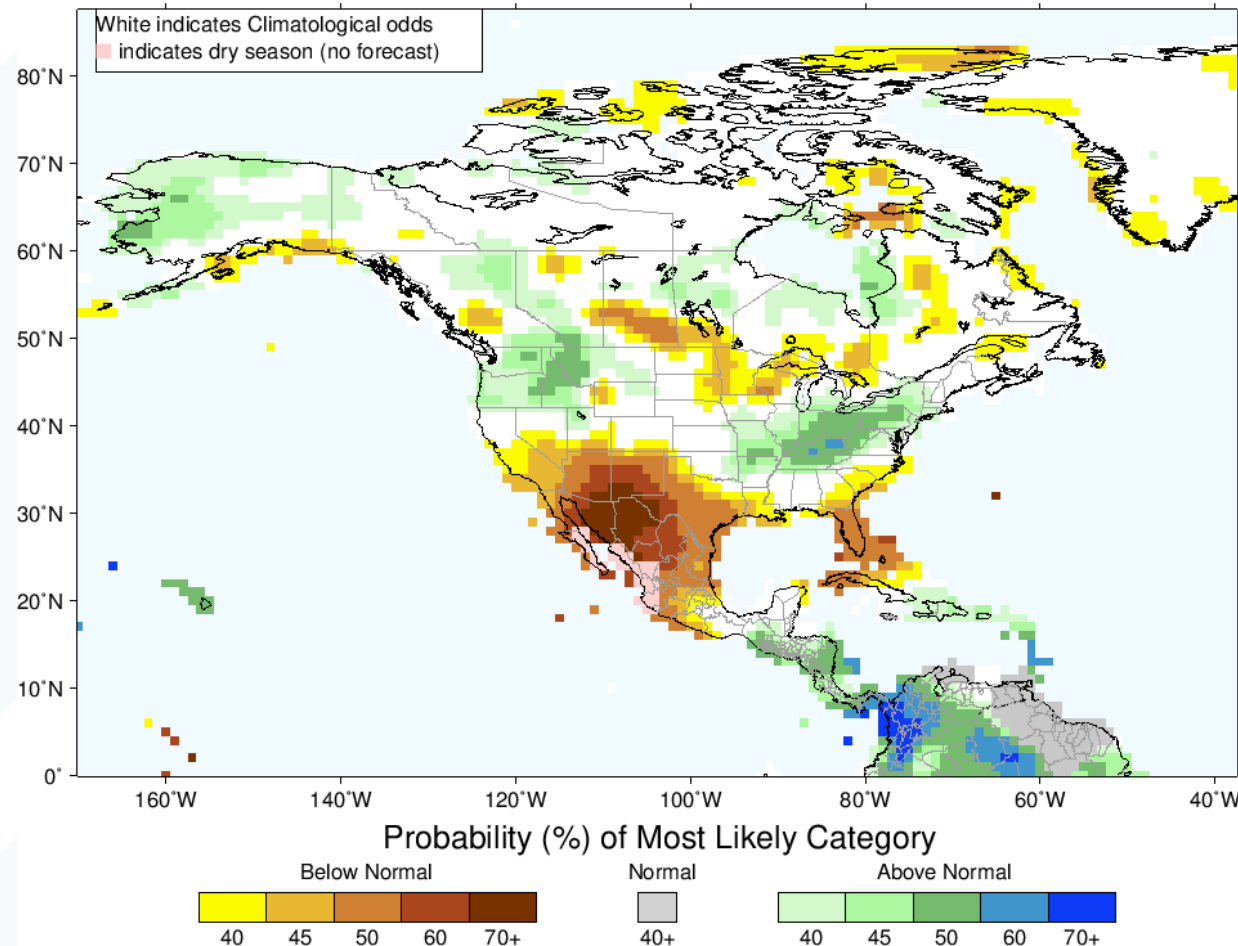


# Seasonal Outlook: IRI/CPC 3-Month Precipitation Forecast

IRI Multi-Model Probability Forecast for Precipitation for January–February–March 2025, Issued December 2024

**Forecast Issued Dec 2024**

- The International Research Institute (IRI) issues probabilistic 3-month precipitation forecasts every month based on calibrated forecasts from the NMME
- The forecast issued in Dec leans toward below-normal precipitation in Central and Southern CA during Jan–Mar 2025, but is more uncertain in Northern CA



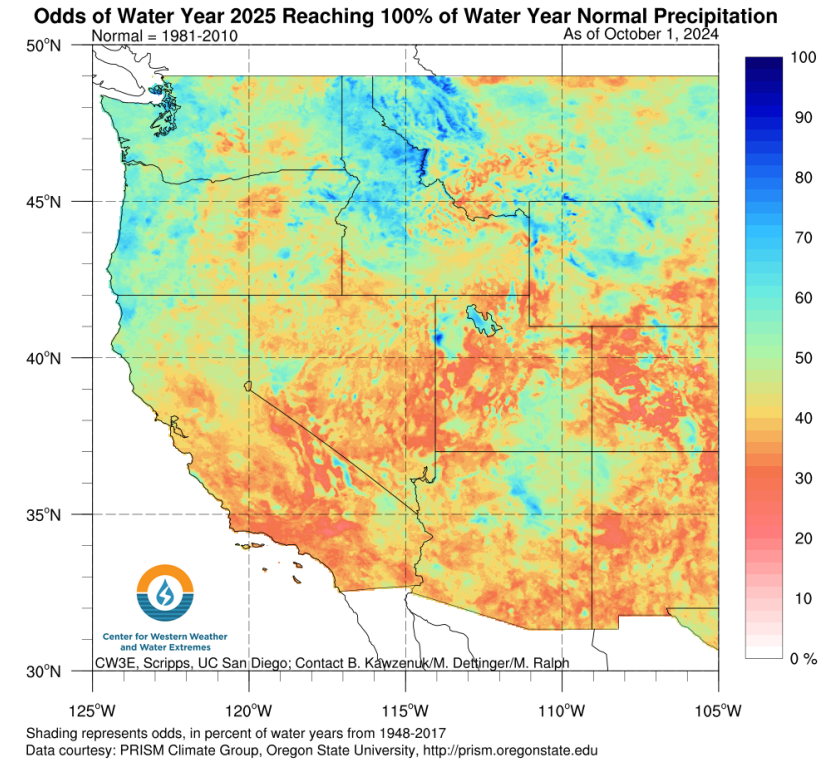
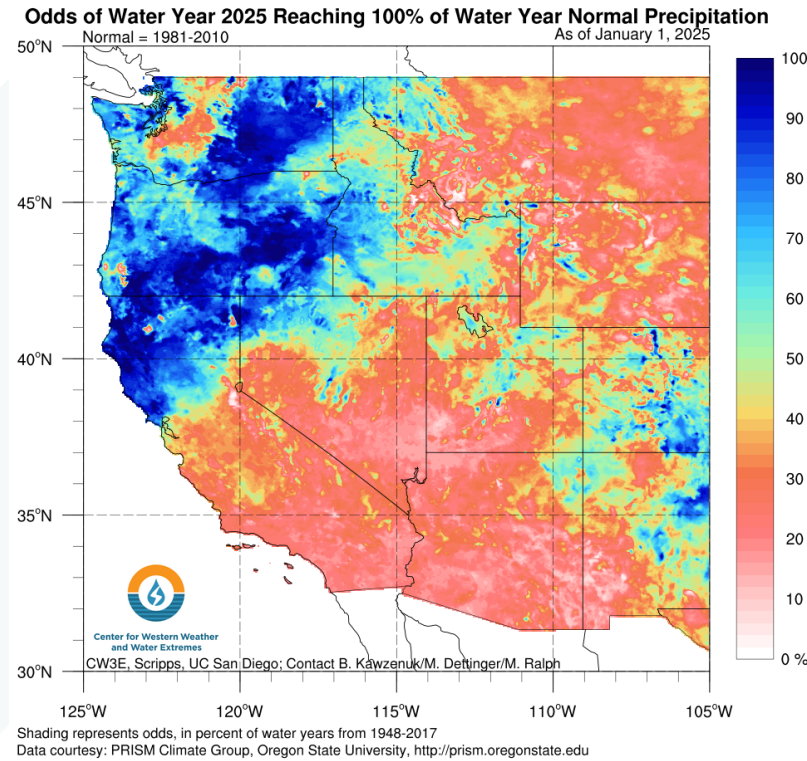
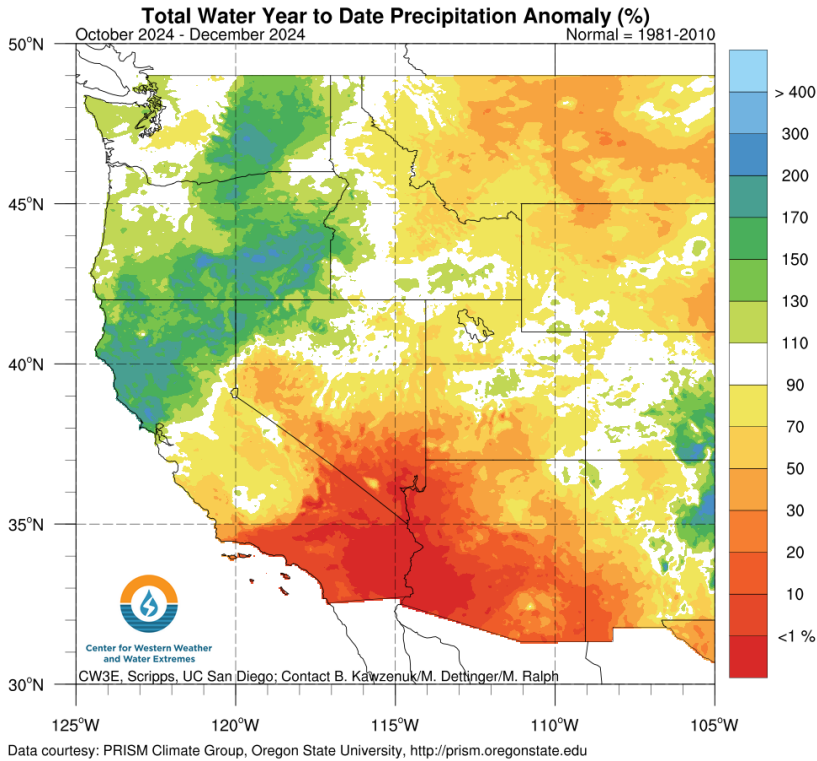
This graphic shows the probability of below-normal (yellow/brown), near-normal (grey), and above-normal (green/blue) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain. Graphics provided by IRI, Columbia University, <https://iri.columbia.edu>. See [Kirtman et al. \(2014\)](#) for more information.

# Odds of Reaching Normal Water Year Precipitation

## WY-to-Date Precipitation Anomaly (% of Normal): Start of Jan 2025

## Start of Jan 2025 Odds

## Start of Oct 2024 Odds



- As of 1 Jan, water-year-to-date precipitation was **above normal (> 130% of normal)** in Northern CA, **slightly below normal (50–90% of normal)** in Central CA, and **well-below normal (< 10% of normal)** in Southern CA
- Odds of reaching normal water year precipitation exceed 70% across much of Northern CA, but have decreased below 30% over much of Central and Southern CA since 1 Oct

# CW3E S2S Forecasts: Glossary & Context

- The outlooks are based on CW3E's and collaborating institutions' seasonal forecast products that can be found here: [https://cw3e.ucsd.edu/s\\_and\\_s\\_forecasts/](https://cw3e.ucsd.edu/s_and_s_forecasts/)
- CW3E seasonal (3 months lead time) precipitation products are produced using statistical and machine learning models. The suite of models includes:
  - CCA (canonical correlation analysis) based statistical model
  - Machine learning model, which also includes comparison to NMME (North American Multi-Model Ensemble)
- ***On the following slides, the term confidence refers to the forecasters' interpretation of the magnitude of the anomalies, the level of ensemble agreement, and the skill of the products used to generate the forecasts. All the tools used are shown in the outlook presentation.***
- ***The thresholds for below-normal, near-normal, and above-normal conditions are determined by forecast product and noted on each forecast product slide***