CW3E Seasonal Outlook: 18 Nov 2024

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- **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/**

- **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*

- Experimental seasonal forecast products tilt the odds towards below-normal precipitation in Southern CA for the Nov 2024-Jan 2025 period
  - CW3E's CCA model predicts near-normal precipitation in Southern CA with moderate confidence
  - CW3E's Machine Learning (ML) and NOAA NMME models tilt the odds towards drier than normal conditions in Southern CA
  - Most seasonal forecasts issued by other institutions are showing below normal precipitation over Southern CA, but with low confidence

- Experimental seasonal forecast products show greater uncertainty over Northern and Central CA
  - CW3E's CCA model forecasts near-normal precipitation in Northern and Central CA with low confidence
  - CW3E's Machine Learning (ML) and NOAA NMME models tilt the odds towards near-normal precipitation in Northern and Central CA
  - Seasonal forecasts issued by other institutions show uncertain precipitation in Northern CA and tilt the odds toward below-normal precipitation in Central CA

Center for Western Weather and Water Extremes
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Seasonal Synthesis Precipitation Outlook: Nov 2024 – Jan 2025
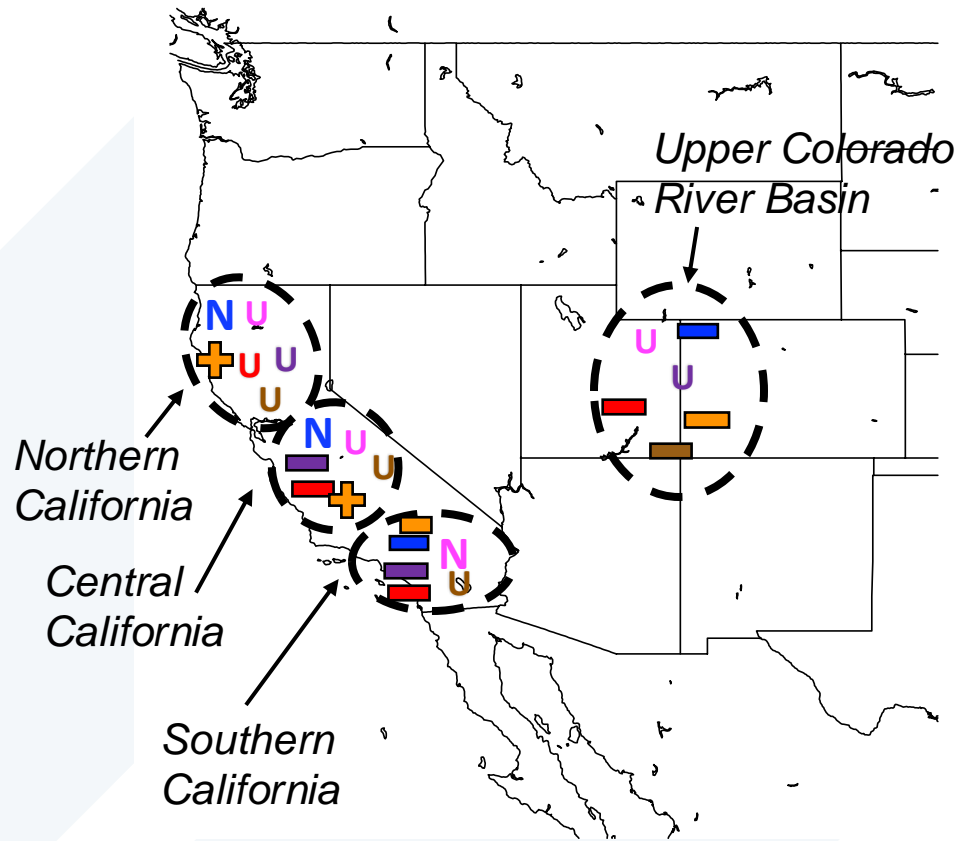
Methods	Forecast Period	Organization(s)	Nor Cal	Cen Cal	So Cal	Upper Colo
Machine Learning based Forecast (Gibson et al.)	Nov-Jan	Jet Propulsion Laboratory California Institute of Technology / Center for Western Weather and Water Extremes	N	N	Below Normal	Below Normal
CCA Seasonal Precipitation Forecast (Gershunov et al.)	Nov – Jan	Center for Western Weather and Water Extremes	U	U	N	U
Univ. of Arizona Hybrid Seasonal Forecast (Scheftic et al.)	Nov-Jan	(Univ. of Arizona)	Above Normal	Above Normal	Below Normal	Below Normal
IRI/CPC Forecast (Robertson et al.)	Nov-Jan	IRI	U	Below Normal	Below Normal	U
NMME Seasonal Forecast	Nov-Jan	The North American Multi-Model Ensemble	U	Below Normal	Below Normal	Below Normal
NOAA CPC Operational Outlook	Nov-Jan	NOAA	U	U	U	Below Normal

Map labels: Upper Colorado River Basin, Northern California, Central California, Southern California

Legend:
- ✚ Above Normal
- ▬ Below Normal
- N Normal
- U Uncertain/Equal Chances

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NASA Jet Propulsion Laboratory — California Institute of Technology

DeFlorio et al. (2023, BAMS)

NDJ Precipitation Anomaly (% of Normal)

NDJ Historical Forecast Skill
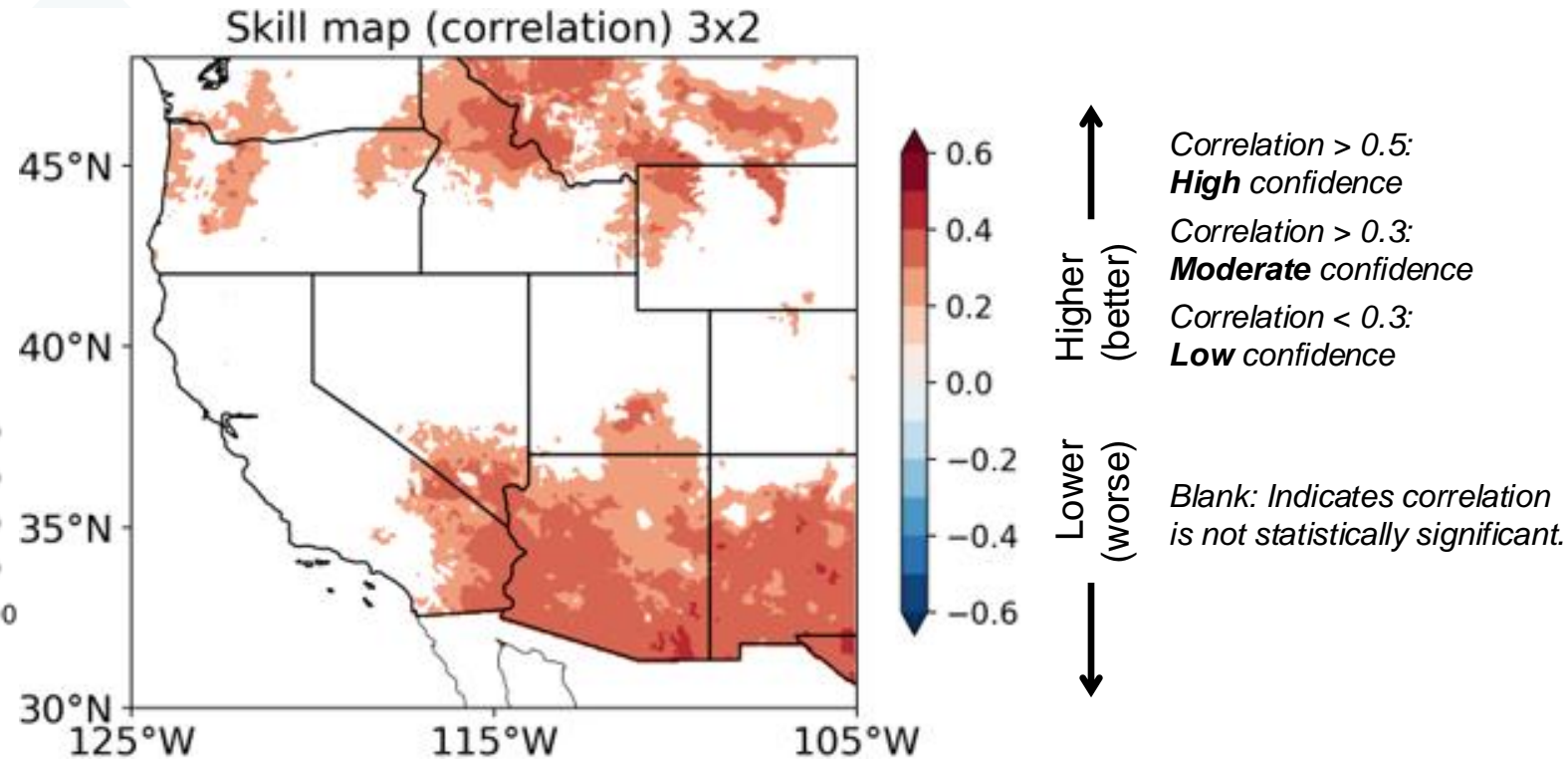
- CW3E statistical model based on October SST favors slightly below normal precipitation in Northern and Central CA (low confidence) and slightly below normal precipitation in Southeastern CA (moderate confidence) during Nov–Jan

- This precipitation outlook for NDJ is consistent with a neutral-emerging weak La Nina pattern, which favors drier conditions in the southwestern US and wetter conditions in the northwestern US

CCA: Canonical correlation analysis relating seasonal precipitation anomalies to observed monthly Pacific SST anomalies (click here for more information)
Above-normal: >+30%; Below-normal: <−30%

- A plurality of combined ML + NMME ensemble members tilt the odds towards drier than normal conditions across the southwestern U.S. and wetter than normal conditions across the northwestern U.S. (62% ensemble agreement; 5/8 members)

- A majority of the ML + NMME forecasts are predicting patterns consistent with drier than normal conditions in Southern CA (7/8 members)

- ML and NMME forecasts are predicting near-normal precipitation over Northern and Central CA with moderate confidence (5/8 members)

Skill assessment: Gibson et al. 2021

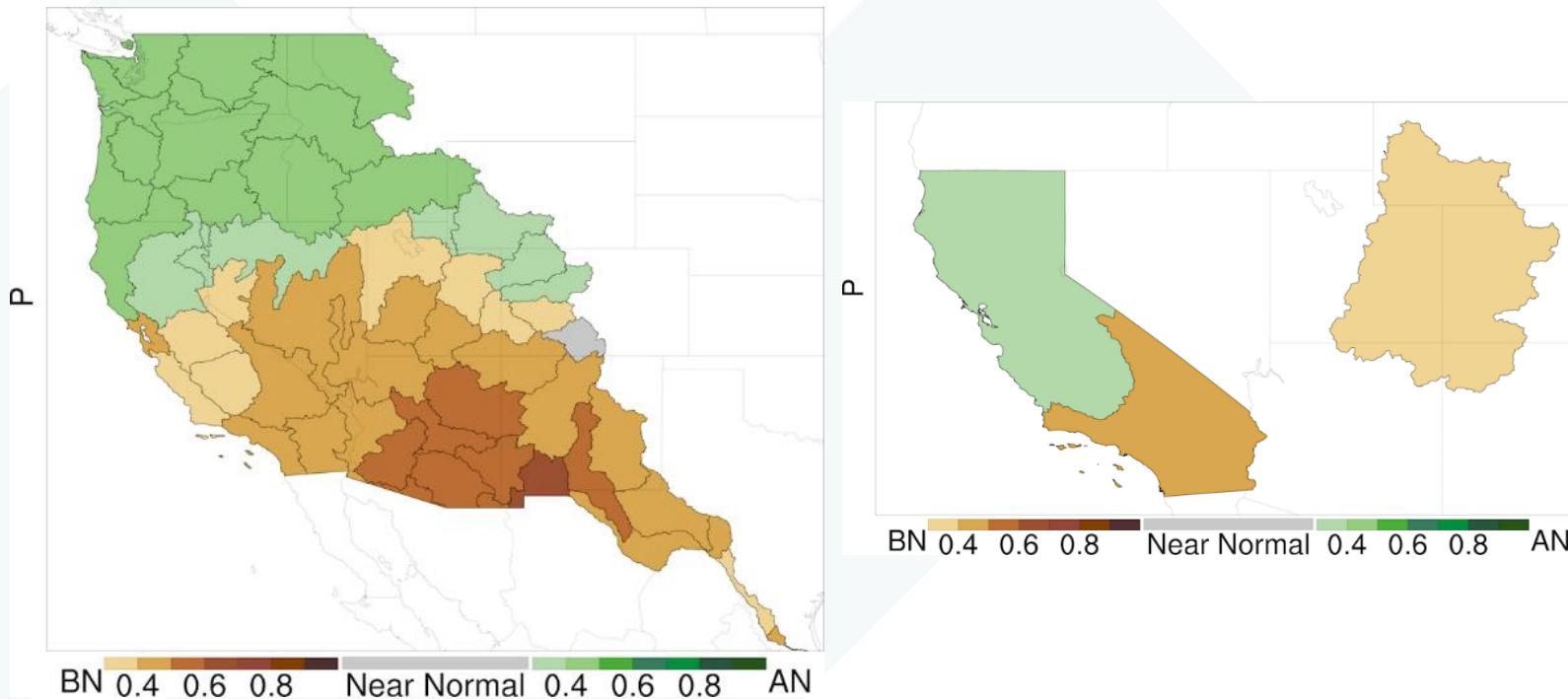**62% chance of a wet north and dry south in the Western U.S.**
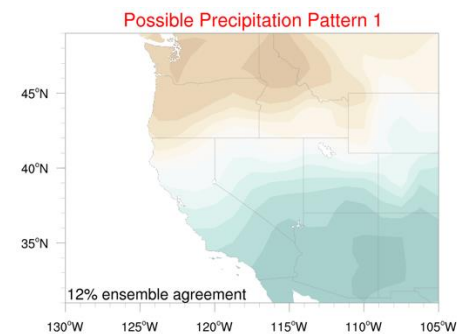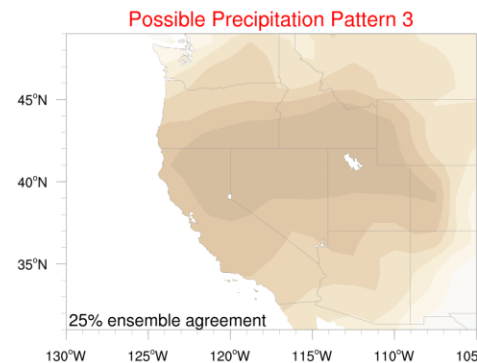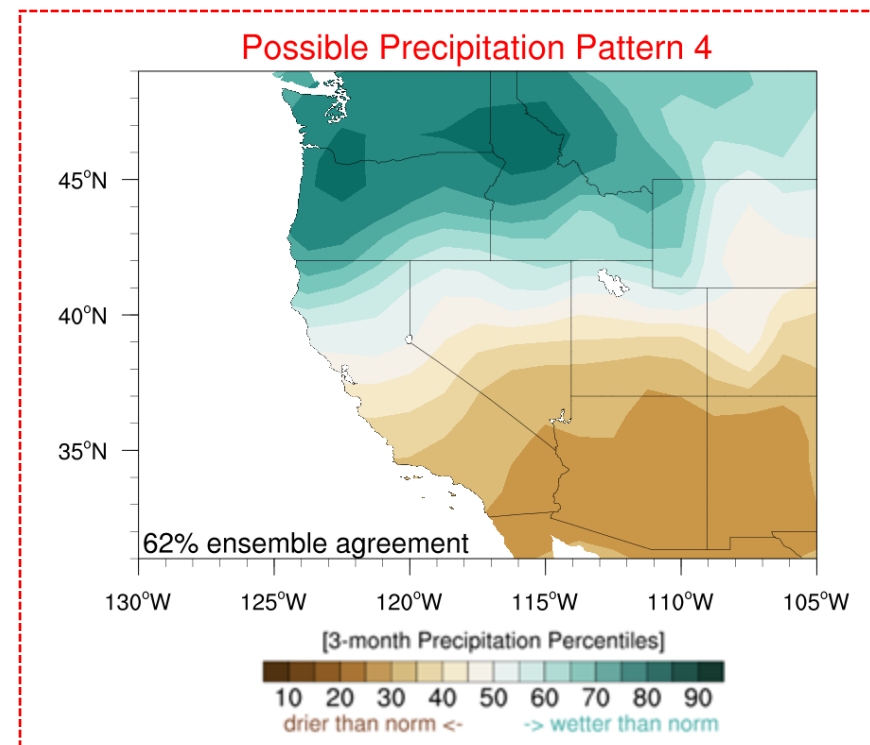
The ensemble is comprised of both CW3E ML models (4 ensembles) and NOAA NMME models (4 ensembles)

Seasonal Outlook: University of Arizona 3-Month Precipitation Outlook

NDJ Precipitation Forecast

Forecast Issued Oct 2024

- The University of Arizona produces probabilistic 3-month precipitation forecasts every month based on ensemble seasonal predictions from NCEP and ECMWF. These forecasts incorporate bias correction and climatological information to improve the prediction skill.

- The forecast indicates a slight wetter than normal in Northern and Central CA and drier than normal for Southern CA with low confidence (< 50% probability)

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 about these seasonal forecasts.

Seasonal Outlooks: CPC 3-Month Precipitation Outlook


Seasonal Precipitation Outlook

Valid: Nov-Dec-Jan 2024-25
Issued: October 17, 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 October is also showing uncertain precipitation in CA during Nov 2024–Jan 2025
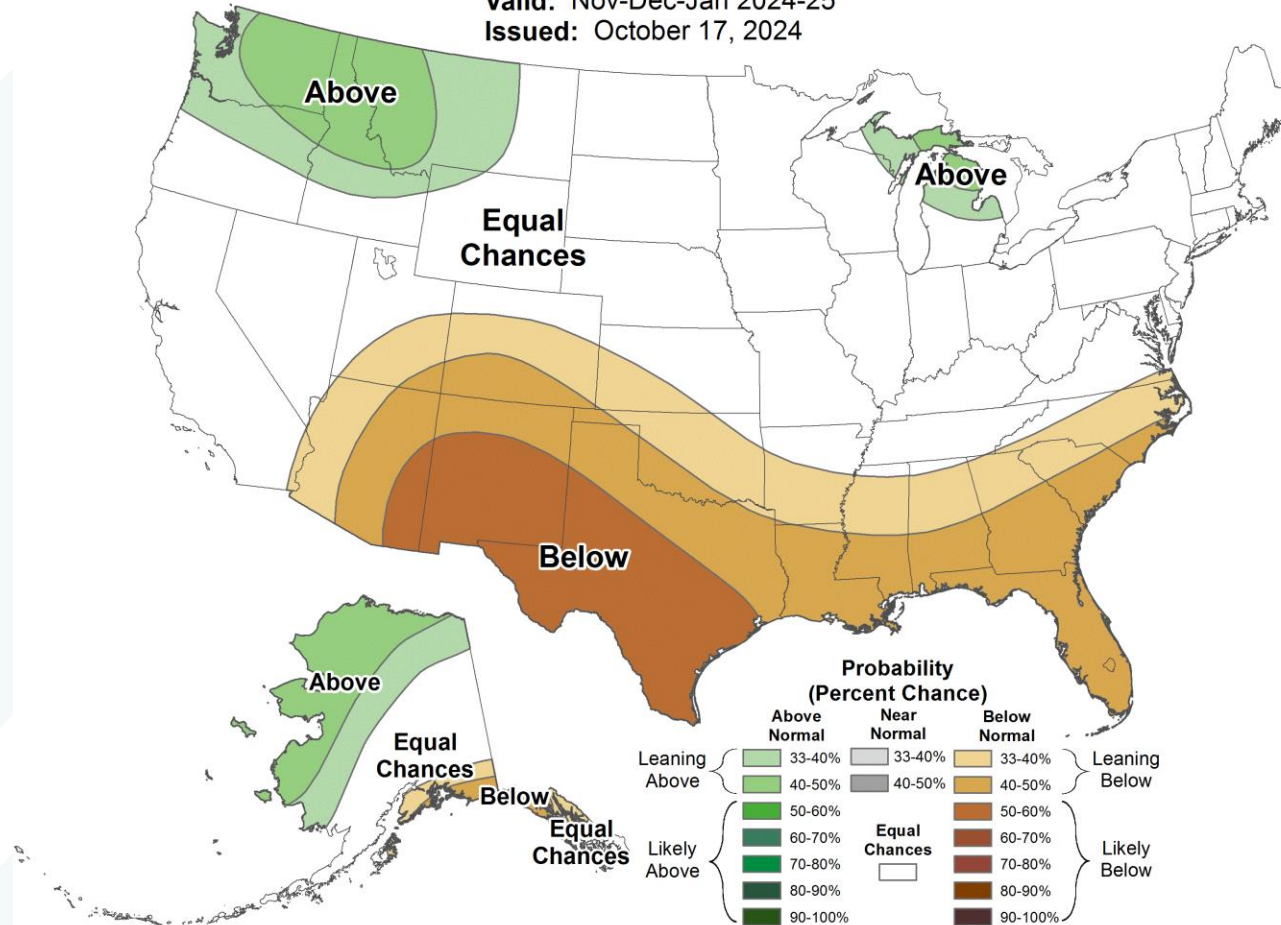
This graphic shows the probability of below-normal (brown), near-normal (grey), and above-normal (green) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain.
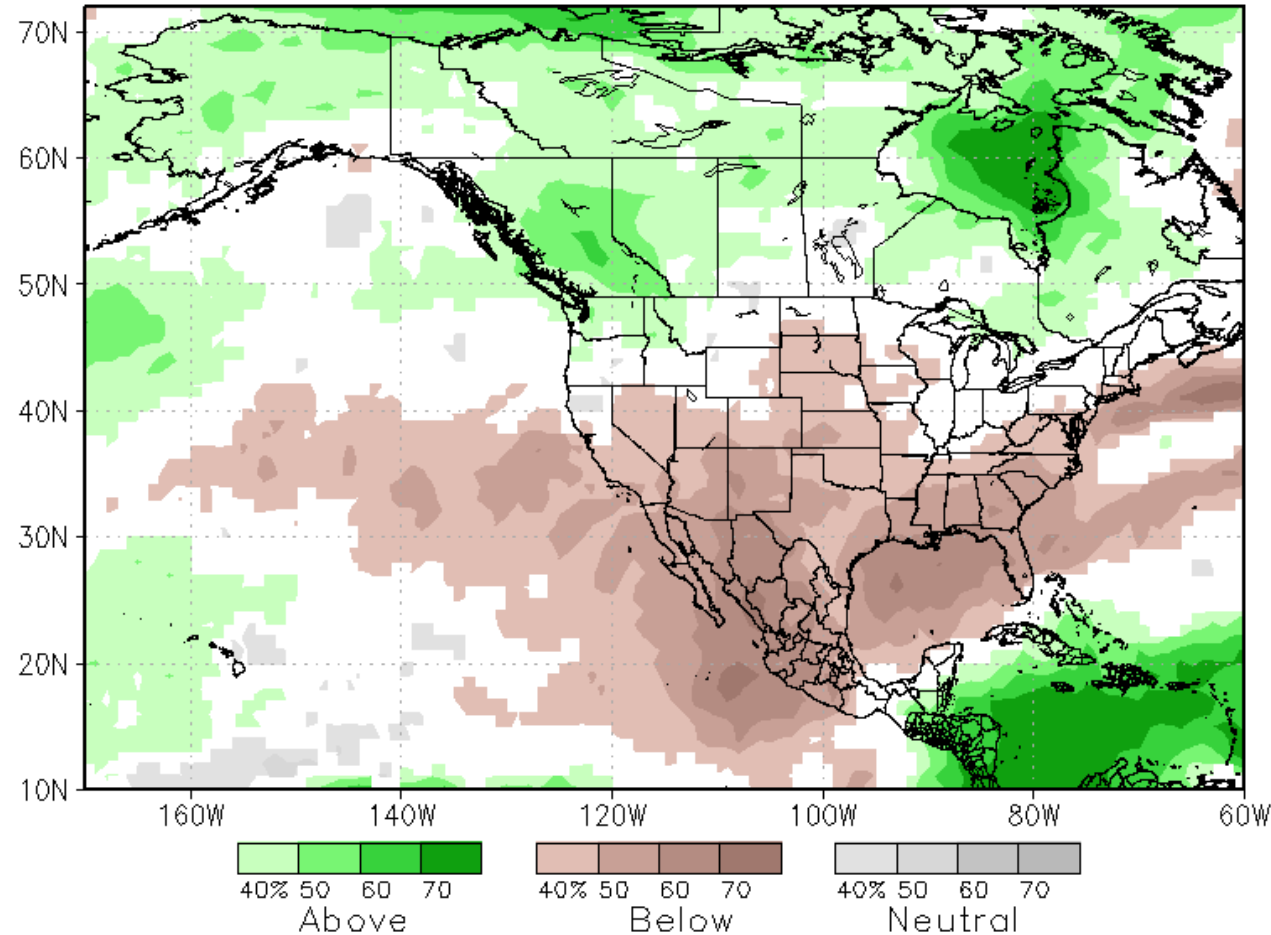
Graphics provided by the NOAA NWS Climate Prediction Center. For more information about this forecast product: https://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal_info.php.

Seasonal Outlooks: NMME 3-Month Precipitation Outlook

NMME prob fcst Prate IC=202410 for lead 1 2024 NDJ

- 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 October favors below-normal precipitation in central and Southern CA during Nov 2024–Jan 2025, but with low confidence (< 50% probability)

- The forecast is also showing uncertain precipitation in Northern CA
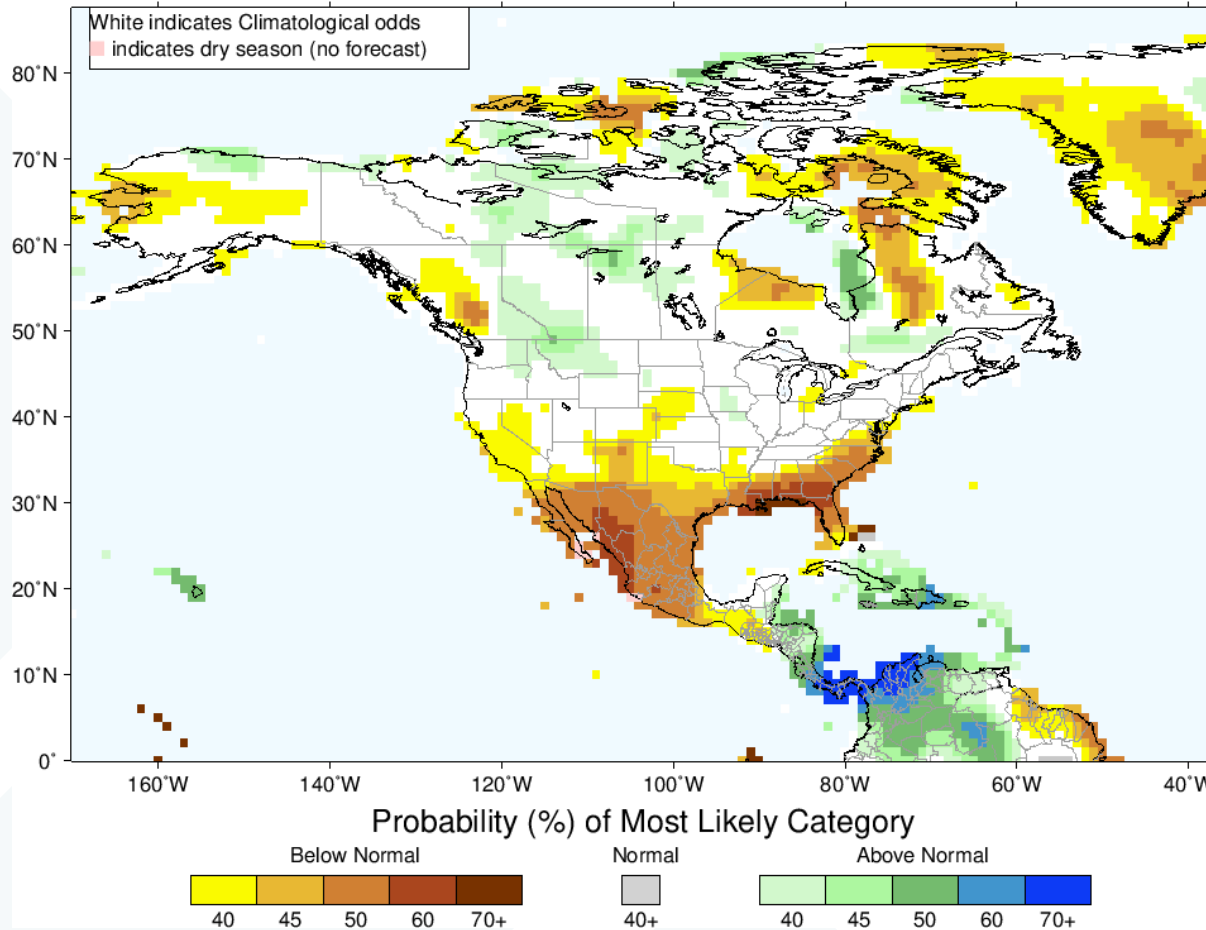
This graphic shows the probability of below-normal (brown), near-normal (grey), and above-normal (green) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain.

Graphics provided by the NOAA NWS Climate Prediction Center. For more information about the forecast product: https://www.cpc.ncep.noaa.gov/products/NMME/about.html.

Seasonal Outlooks: IRI/CPC 3-Month Precipitation Forecast

IRI Multi–Model Probability Forecast for Precipitation for
November–December–January 2025, Issued October 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 October is showing below-normal precipitation in Central and Southern CA during Nov 2024–Jan 2025 but with low confidence (< 50% probability)

- The forecast is also showing uncertain precipitation in Northern CA

This graphic shows the probability of below-normal (yellow/brown), near-normal (grey), and below-normal (green/blue) precipitation during a 3-month period. Regions without shading indicate where the forecasts are more uncertain.
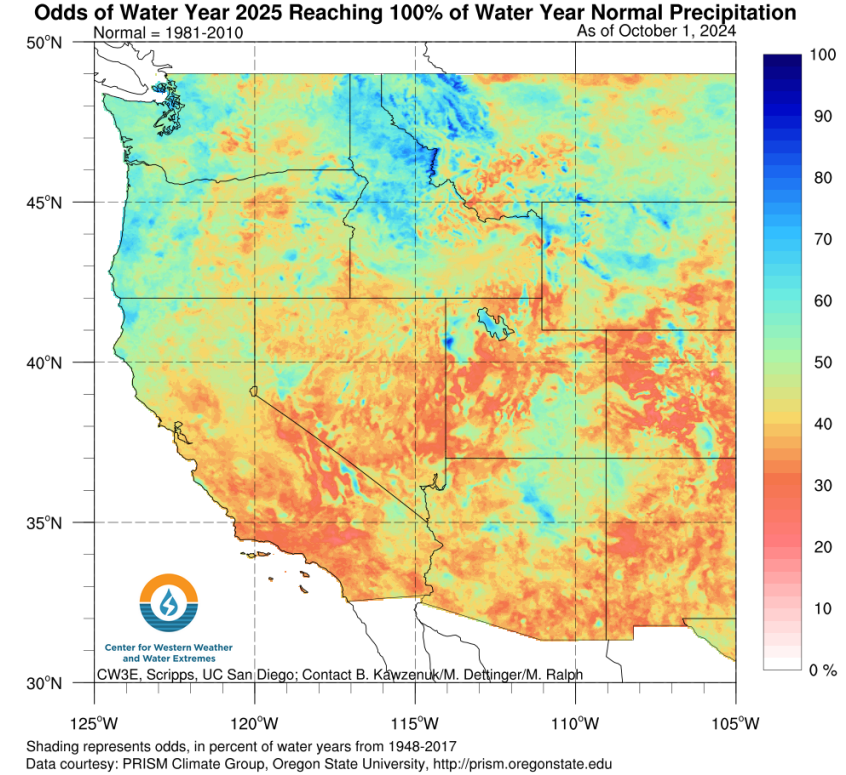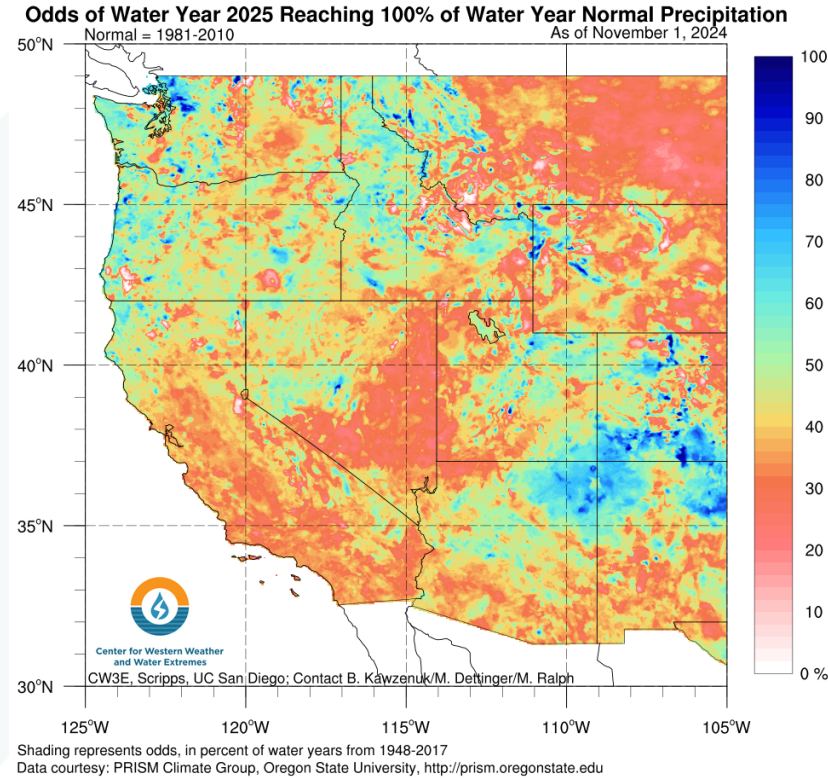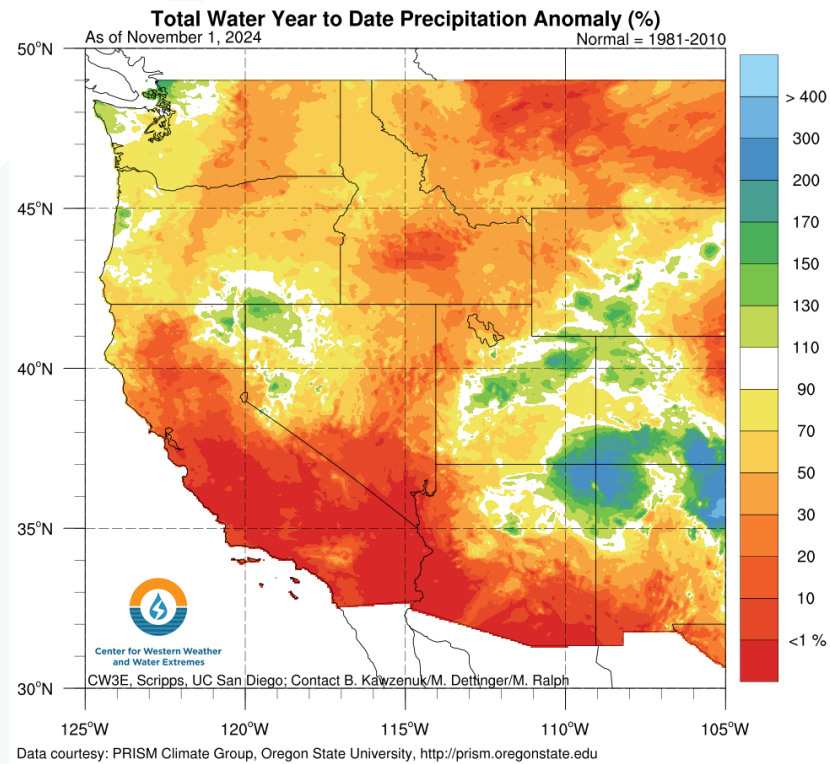
Graphics provided by the International Research Institute for Climate and Society, Columbia University, https://iri.columbia.edu. See Kirtman et al. (2014) for more information about the NMME.

Seasonal Outlook: Odds of Reaching Normal Water Year Precipitation

WY-to-Date Precipitation Anomaly (% of Normal): Start of Nov 2024

Start of Nov 2024 Odds

Start of Oct 2024 Odds

- As of 1 Nov, water-year-to-date precipitation was running below normal in CA
- Odds of reaching normal WY precipitation have decreased throughout much of CA and were <30% at the start of Nov