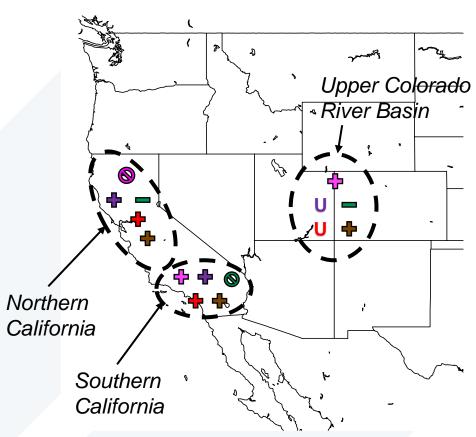# CW3E S2S Outlooks: Glossary & Context

- **The outlooks are based on CW3E's and collaborating institutions' subseasonal-to-seasonal (S2S) forecast products. CW3E's S2S products can be found here: https://cw3e.ucsd.edu/s2s_forecasts/.**

- **CW3E seasonal 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*
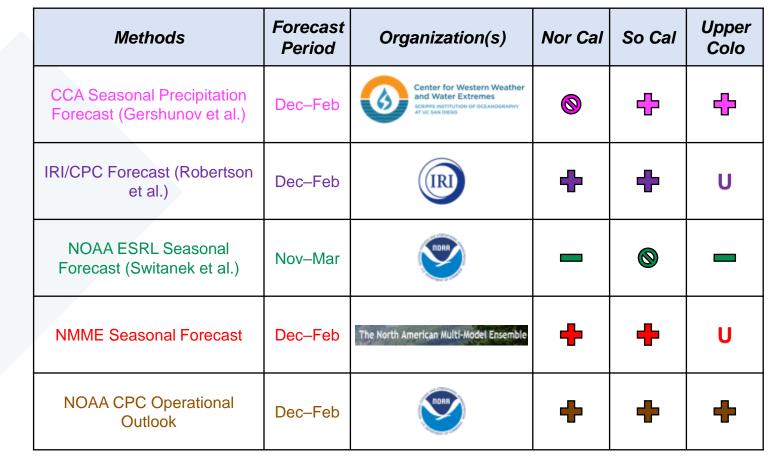
- Experimental seasonal forecast products generally agree on higher likelihood of above-normal precipitation over California

  - CW3E's CCA model based on Nov SST is predicting above-normal precipitation over Southern CA with moderate confidence and near-normal precipitation over Northern and Central CA with low confidence

  - Most seasonal forecasts issued by other institutions are showing low confidence in above-normal precipitation over all of CA

- Odds of reaching normal water year precipitation have decreased over most of CA since the beginning of WY 2024

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

Seasonal Synthesis Precipitation Outlook: Dec 2023 – Feb 2024

Methods	Forecast Period	Organization(s)	Nor Cal	So Cal	Upper Colo
CCA Seasonal Precipitation Forecast (Gershunov et al.)	Dec–Feb	Center for Western Weather and Water Extremes — SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO	🚫	+	+
IRI/CPC Forecast (Robertson et al.)	Dec–Feb	IRI	+	+	U
NOAA ESRL Seasonal Forecast (Switanek et al.)	Nov–Mar	NOAA	—	🚫	—
NMME Seasonal Forecast	Dec–Feb	The North American Multi-Model Ensemble	+	+	U
NOAA CPC Operational Outlook	Dec–Feb	NOAA	+	+	+

Upper Colorado River Basin

Northern California

Southern California

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NASA Jet Propulsion Laboratory
California Institute of Technology

+ Above Normal

— Below Normal

🚫 Normal

U Uncertain/Equal Chances

DeFlorio et al. (2023, BAMS)

DJF Precipitation Anomaly (% of Normal)

Total Precipitation Relative Anomaly (%)
Predictor: Nov 2023 SST   Forecast Valid: Dec 2023 - Feb 2024

Dashed contour represents +/-50%
CW3E, Scripps, UC San Diego; Contact B. Kawzenuk/M. Deflorio/M. Ralph

DJF Historical Forecast Skill

Correlation Coefficient between Observed and Predicted Precipitation (1948-2015)
Predictor: NOV SST   Forecasts valid: DJF

*Hatching represents correlation coefficient values above (below) 0.5 (-0.5)

Correlation > 0.5: **High** *confidence*

Correlation > 0.3: **Moderate** *confidence*

Correlation < 0.3: **Low** *confidence*

- CW3E statistical model based on November SST is predicting near-normal precipitation in Northern and Central CA with low confidence, and above-normal precipitation in Southern CA with moderate confidence during Dec–Feb

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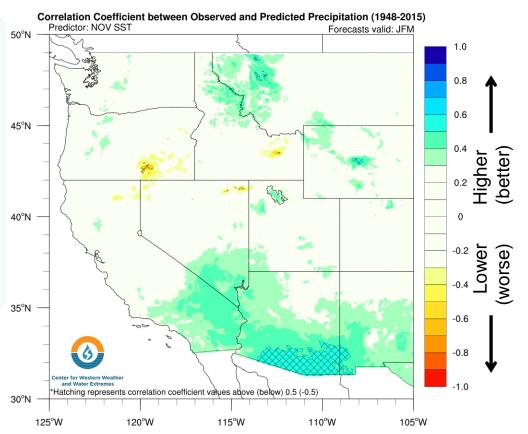**Above-normal: >+30%; Below-normal: <−30%**

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JFM Precipitation Anomaly (% of Normal)

JFM Historical Forecast Skill

Correlation > 0.5:
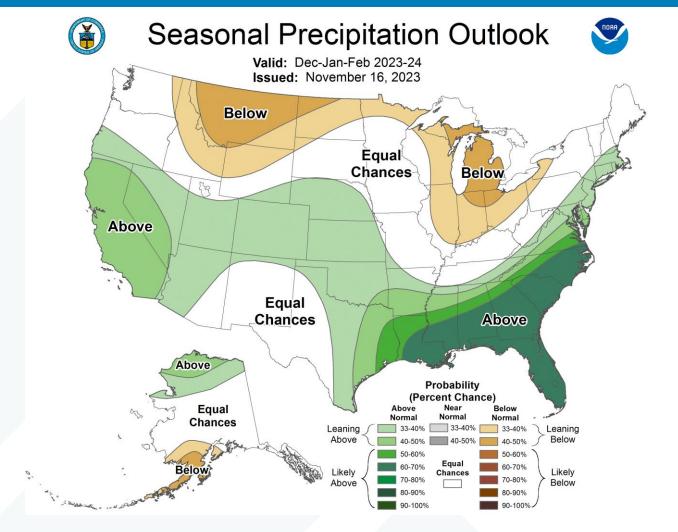***High** confidence*

Correlation > 0.3:
***Moderate** confidence*

Correlation < 0.3:
***Low** confidence*

- CW3E statistical model based on November SST is predicting above-normal precipitation in Northern and Central CA with low confidence, and above-normal precipitation in Southern CA with moderate confidence during Jan–Mar

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%
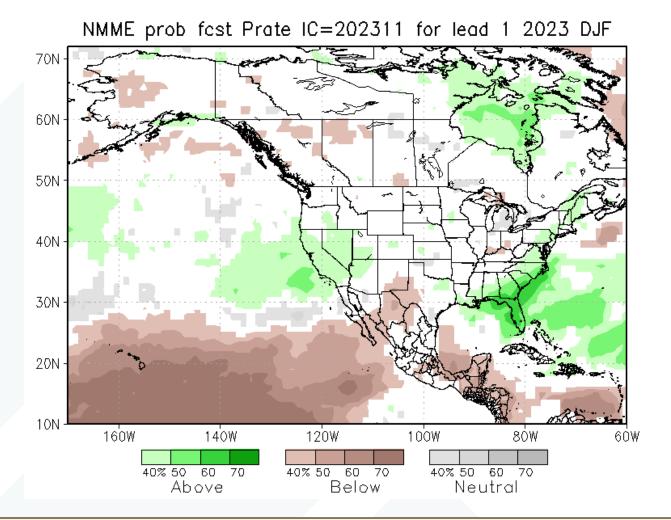
Seasonal Outlooks: CPC 3-Month Precipitation Outlook

Forecast Issued Nov 2023

- 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 November tilts the odds towards above-normal precipitation in CA during Dec–Feb

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

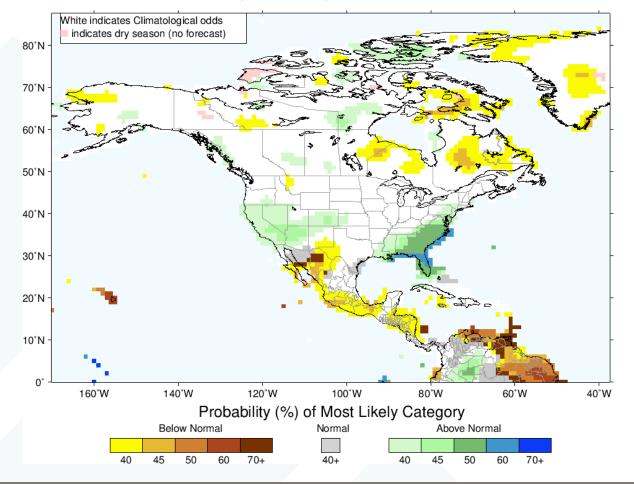NMME prob fcst Prate IC=202311 for lead 1 2023 DJF

- 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 November shows above-normal precipitation in CA during Dec–Feb, but with low confidence (< 50% probability)

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 3-Month Precipitation Forecast

IRI Multi–Model Probability Forecast for Precipitation for December–January–February 2024, Issued November 2023
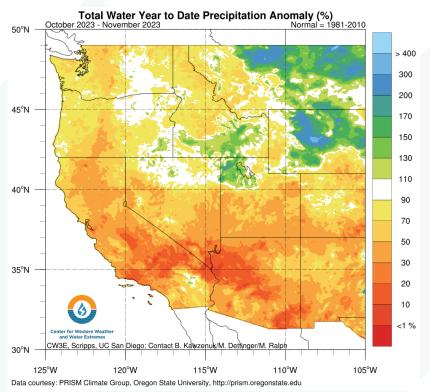
- The International Research Institute (IRI) issues probabilistic 3-month precipitation forecasts every month based on calibrated forecasts from the NMME

- The forecast issued in November is showing above-normal precipitation in CA during Dec–Feb, but with low confidence (< 50% probability)

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.
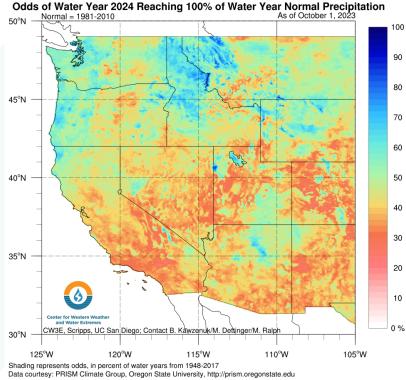
Graphics provided by the International Research Institute for Climate and Society, Columbia University, https://iri.columbia.edu. See Kirtman et al. (2014) for more information about the NMME.

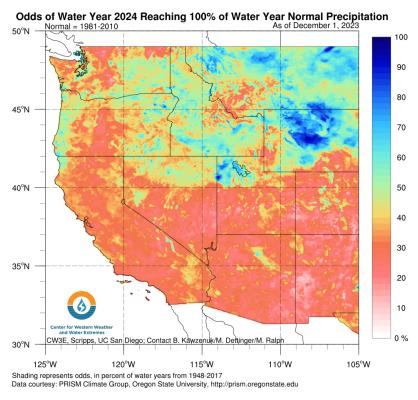# Seasonal Outlook: Odds of Reaching Normal Water Year Precipitation

WY-to-Date Precipitation Anomaly (% of Normal): Start of Dec 2023

Start of WY 2024 Odds

Start of Dec 2023 Odds

- WY 2024 is off to a dry start in much of California
- Odds of reaching normal WY precipitation have decreased throughout the state, especially in Northern CA