2025 Monsoon Outlook

Comparing current conditions to climatology

Arizona Weather Webinar - May 15, 2025

Chelsea Peters

Contributing Author - John Glueck







2025 Monsoon Outlook

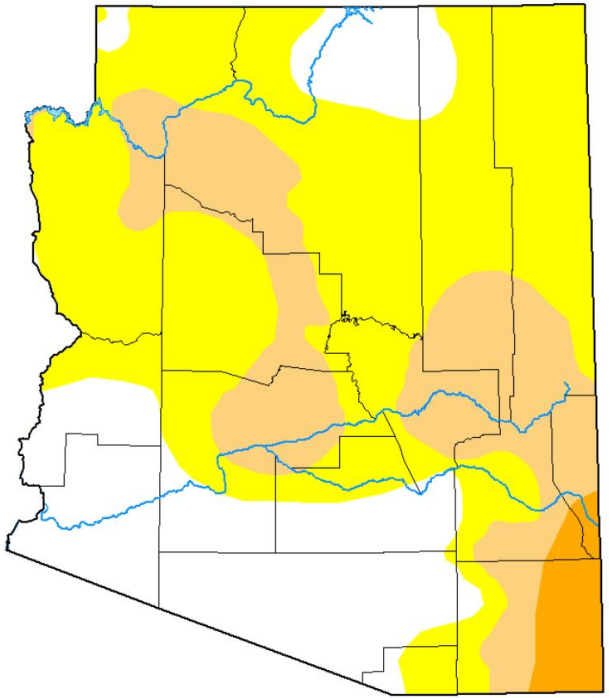
Overview

- Current Conditions
- Climatological Correlations
  - Preceding Winter Season Precipitation
- Climate Models
- CPC Outlooks
- Summary

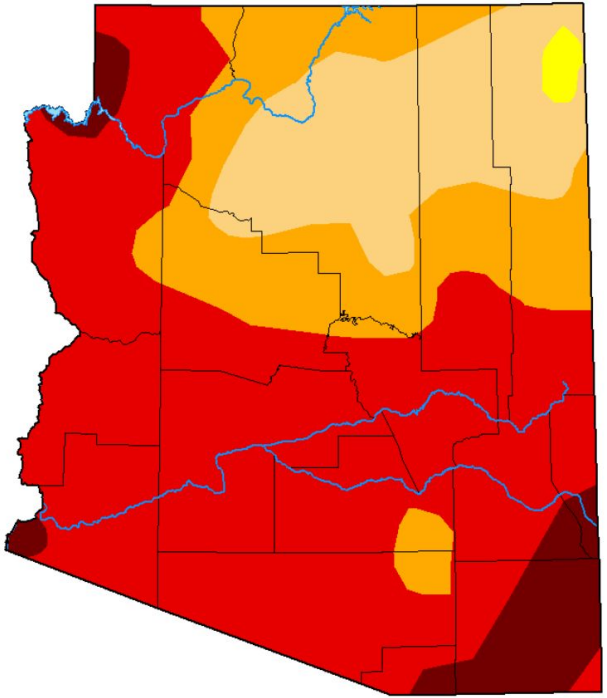
Drought Conditions

Current Drought Conditions vs 1 Year Ago

1 Year Ago
(May 14, 2024)



Today
(May 15, 2025)



100% of AZ is in Drought Conditions with over 80% in Severe to Exceptional Drought

Intensity:

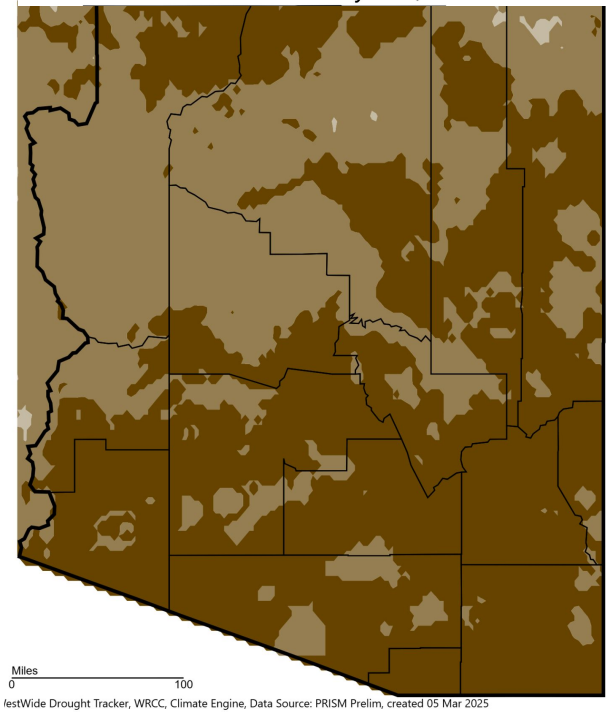
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

How Did We Get Here?

Winter 2024-2025 & Current Water Year

Arizona - Precipitation

December 2024 - February 2025, Percentile



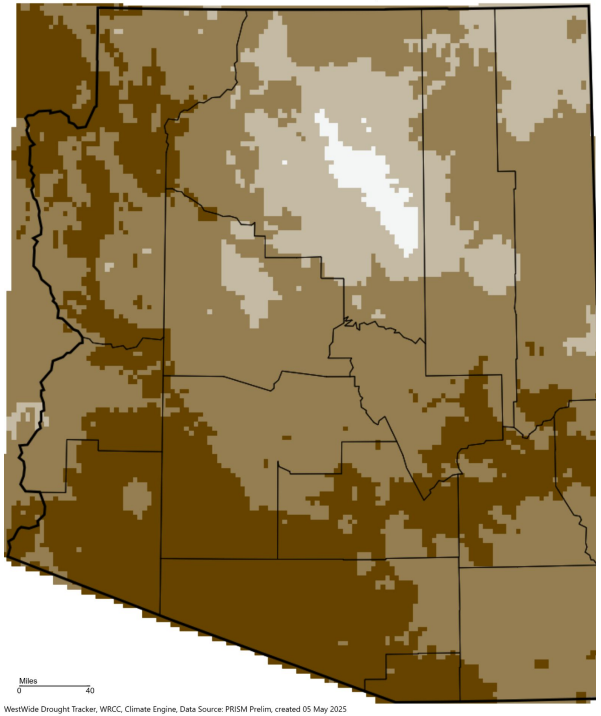
Record Wettest
Much Above Normal Top 10%
Above Normal Top 33%
Near Normal
Below Normal Bottom 33%
Much Below Normal Bottom 10%
Record Driest

Rankings (1895-2025)

estWide Drought Tracker, WRCC, Climate Engine, Data Source: PRISM Prelim, created 05 Mar 2025

Arizona - Precipitation

October 2024 - April 2025, Percentile



Record Wettest
Much Above Normal Top 10%
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Rankings (1895-2025)

WestWide Drought Tracker, WRCC, Climate Engine, Data Source: PRISM Prelim, created 05 May 2025

ENSO Contributions

Previous ENSO (Winter 2024-2025)

El Niño/La Niña

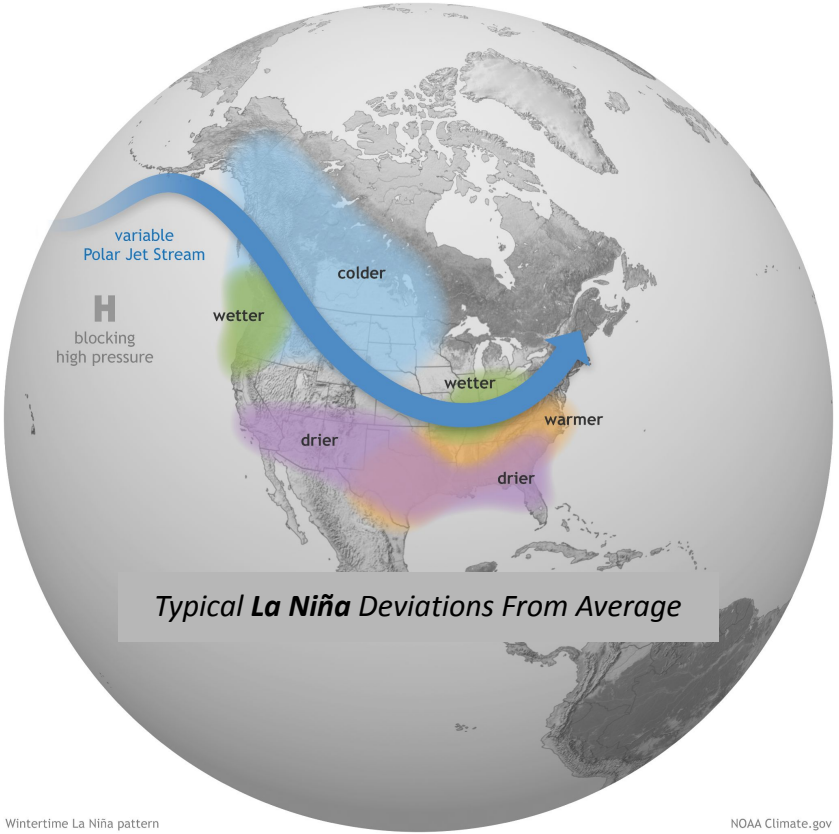
Experienced Weak La Niña Conditions

La Niña Wintertime Effects in AZ

⚠️No two seasons are alike

Drier than average

La Niña conditions *eventually* developed this past winter, delivering on the forecast which favored **drier than normal** conditions for the Southwest.



Climate Correlations?

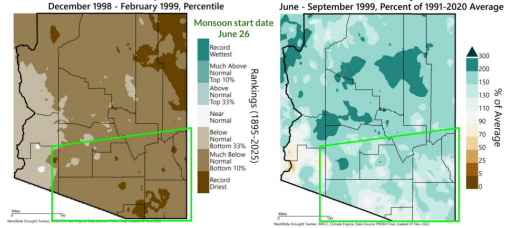
Do the DRIEST winters lead to a wetter than normal Monsoon?

Climate Correlations

Preceding Winter Season Influence - Climate Division 7 (Southeast Arizona)

Winter 1998-1999; Monsoon 1999 | ENSO (Winter): Strong La Niña

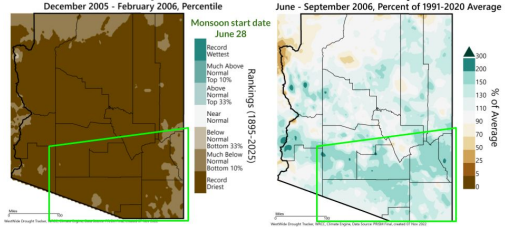
4th driest Winter on record



8th wettest Monsoon on record

Winter 2005-2006; Monsoon 2006 | ENSO (Winter): Weak La Niña

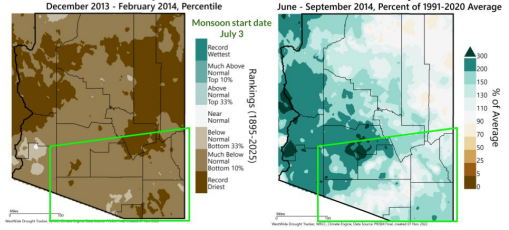
Driest Winter on record



10th wettest Monsoon on record

Winter 2013-2014; Monsoon 2014 | ENSO (Winter): Neutral

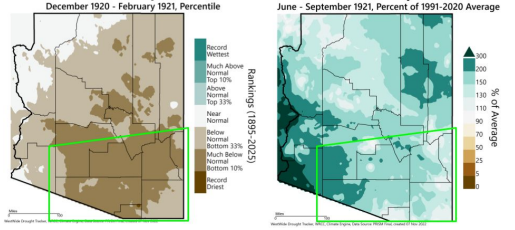
5th driest Winter on record



9th wettest Monsoon on record

Winter 1920-1921; Monsoon 1921

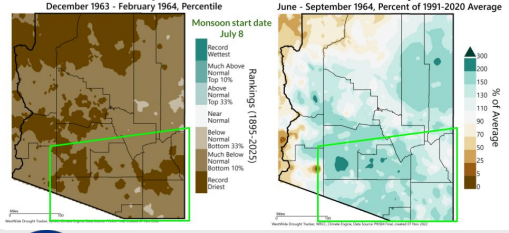
9th driest Winter on record



5th wettest Monsoon on record

Winter 1963-1964; Monsoon 1964 | ENSO (Winter): Moderate El Niño

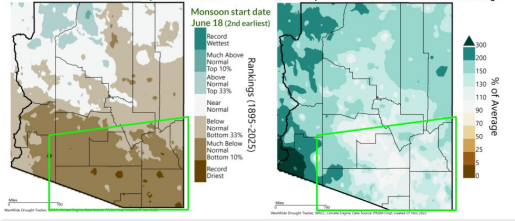
3rd driest Winter on record



12th wettest Monsoon on record

Winter 1966-1967; Monsoon 1967 | ENSO (Winter): Neutral

6th driest Winter on record



15th wettest Monsoon on record

Top 10 DRIEST Winters

Six (60%) resulted in Top 15 WETTEST Monsoon

Two (20%) resulted in Near Normal Monsoon

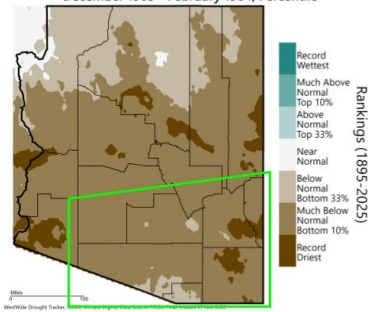
Two (20%) resulted in Below Normal Monsoon

Climate Correlations

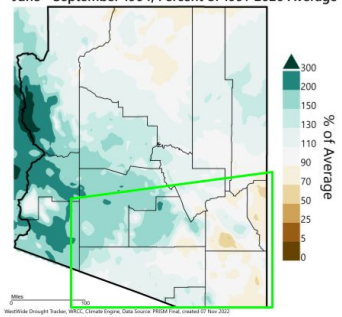
Preceding Winter Season Influence - Climate Division 7 (Southeast Arizona)

Winter 1903-1904; Monsoon 1904

7th driest Winter on record

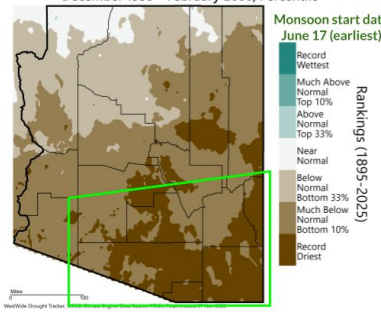


Near normal Monsoon

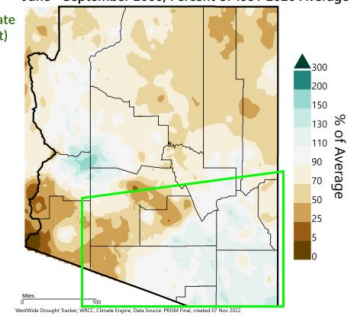


Winter 1999-2000; Monsoon 2000 | ENSO (Winter): Strong La Niña

2nd driest Winter on record



Near normal Monsoon



Top 10 DRIEST Winters

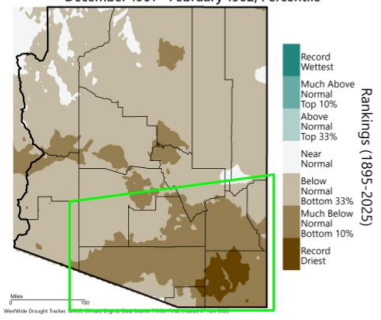
- Six (60%) resulted in Top 15 WETTEST Monsoon
- **Two (20%) resulted in Near Normal Monsoon**
- Two (20%) resulted in Below Normal Monsoon

Climate Correlations

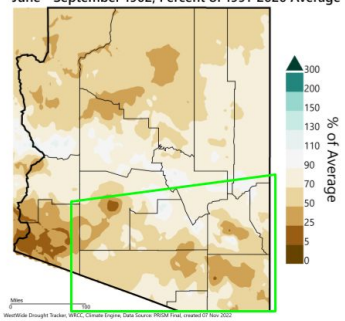
Preceding Winter Season Influence - Climate Division 7 (Southeast Arizona)

Winter 1901-1902; Monsoon 1902

8th driest Winter on record

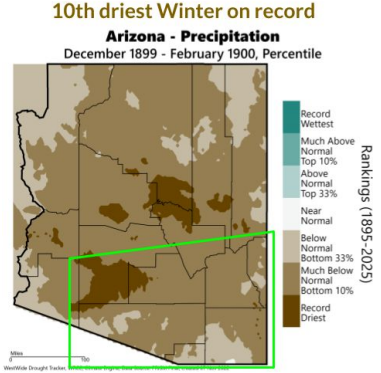


6th driest Monsoon on record

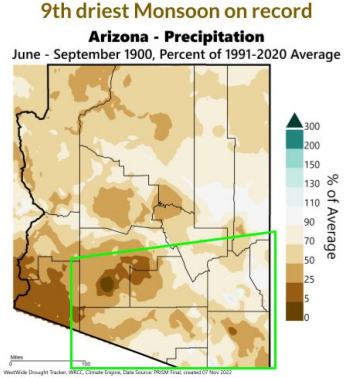


Winter 1899-1900; Monsoon 1900

10th driest Winter on record



9th driest Monsoon on record



Top 10 DRIEST Winters

Six (60%) resulted in Top 15 WETTEST Monsoon

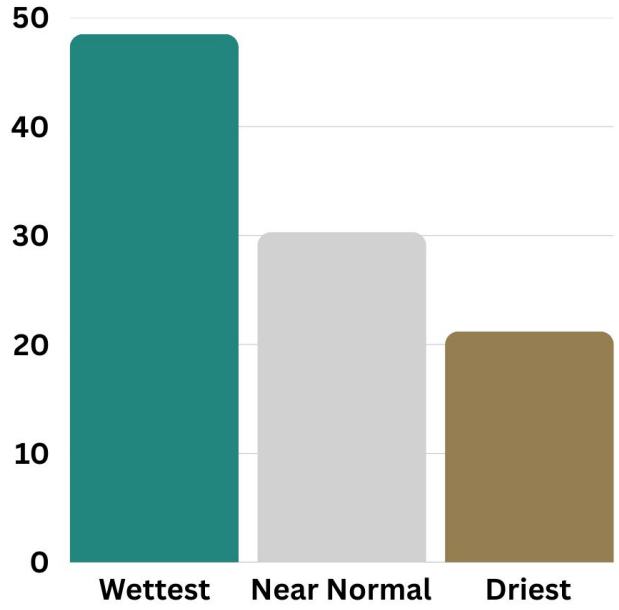
Two (20%) resulted in Near Normal Monsoon

Two (20%) resulted in Below Normal Monsoon

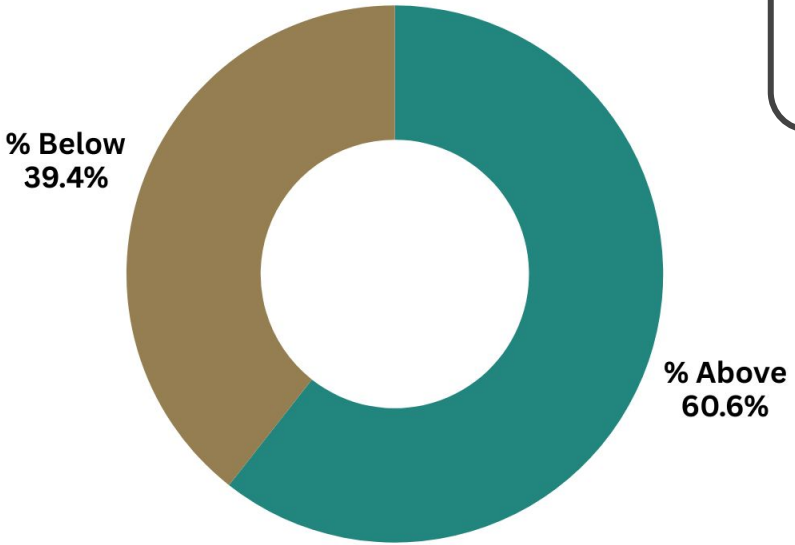
Climate Correlations

Preceding Driest 25% of Winters vs Monsoon Precipitation - Climate Division 7 (Southeast Arizona)

DRIEST 25% Winters (33 Total Winters) → Following Monsoon Precipitation



Compared to Normal (7.31”)



50%
Monsoons with 10+ inches occurred after a Dry Winter

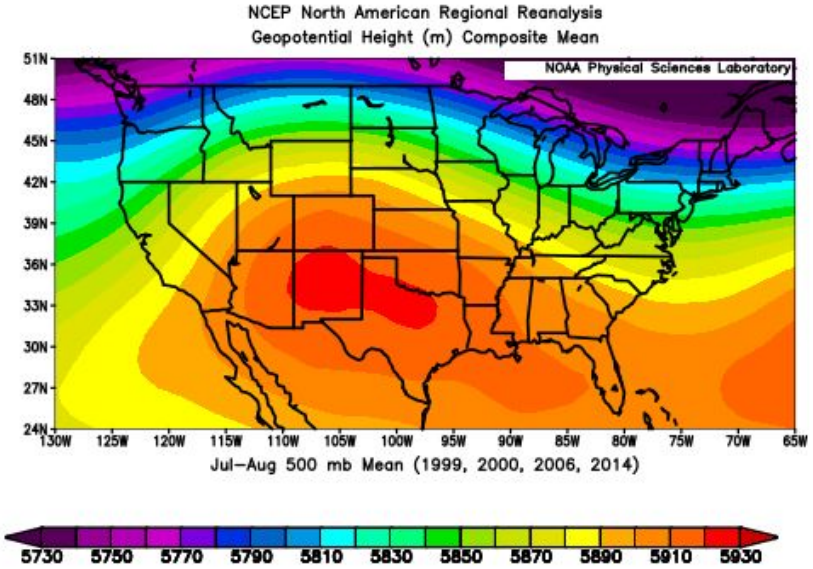
Data does not include 2024-2025 Winter

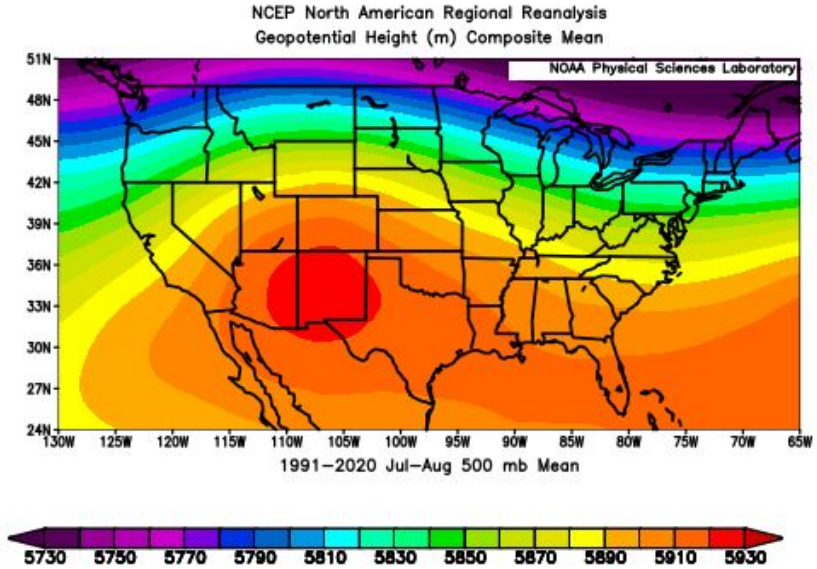
Normal Refers to the latest 30-Year Normal Period (1991-2020)

Monsoon Ridge Position

Composite 500mb mean height for 1999, 2000, 2006, 2014 vs 1991-2020 mean

Monsoon Upper Ridge Mean Position is Slightly North & East

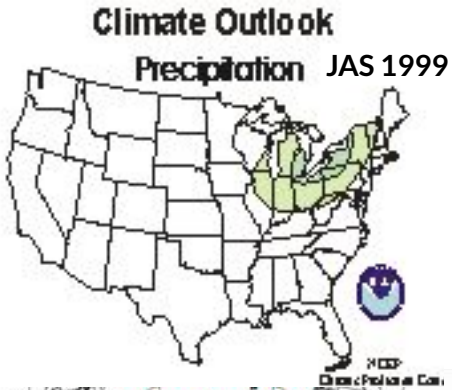


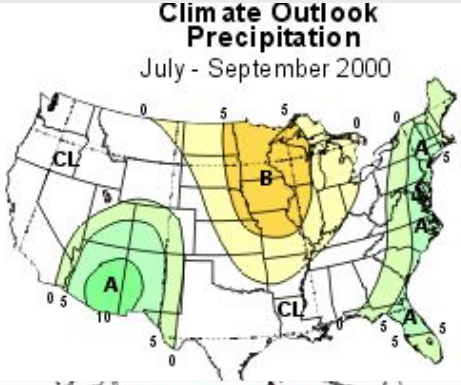


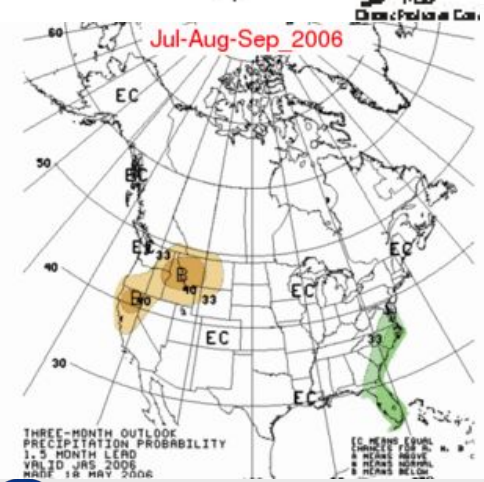
**Monsoons 1999, 2000, 2006, 2014 ranked in the top 10 wettest, following top 5 driest winters*

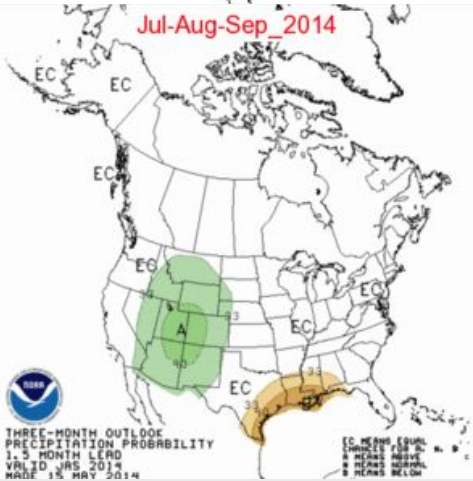
Past CPC Outlooks

After Record Dry Winters









Past CPC Outlooks Following Record Dry Winters:

- **50% Equal Chances for following Monsoon**
- 50% Above Normal Precipitation for following Monsoon

Climate Models

ENSO Contributions

Current ENSO Status

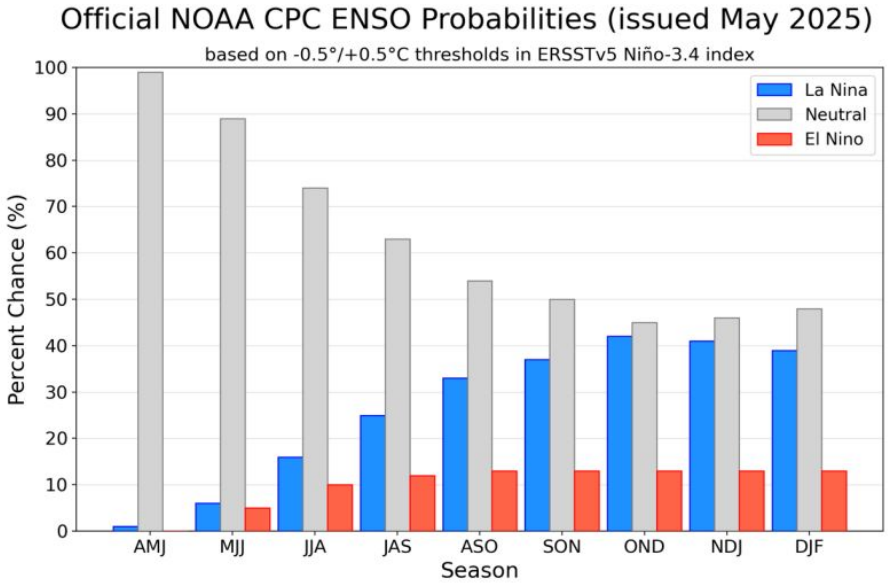
El Niño/La Niña Status & Forecast

Neutral Conditions

ENSO-Neutral is favored to persist through Summer 2025, with greater than 50% chance through August-October 2025.

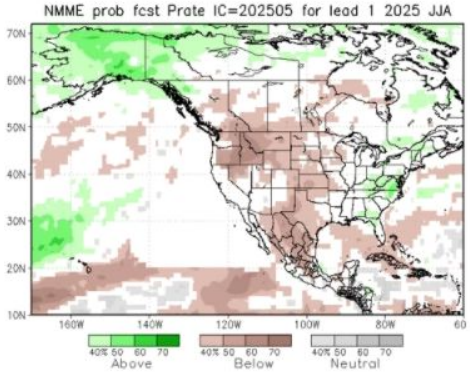
During the fall and early winter, ENSO-neutral is slightly favored over the possible return of La Niña.

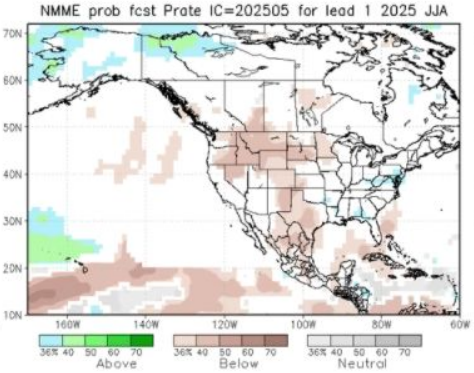
ENSO contribution during the summer is marginal, primarily driven by tropical influence.

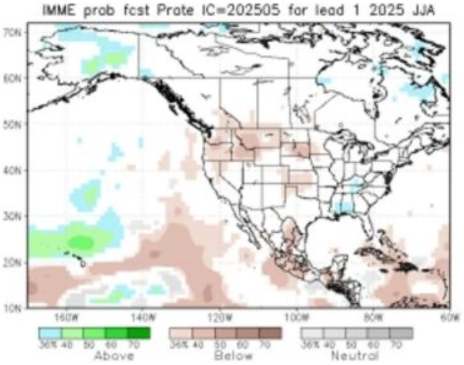


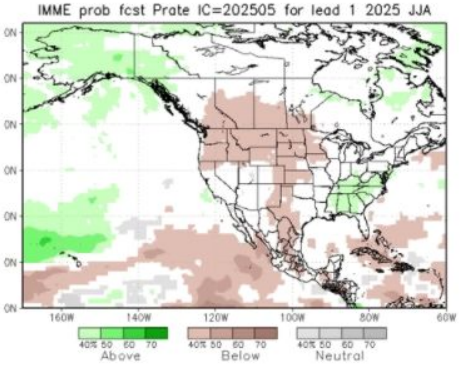
Climate Models

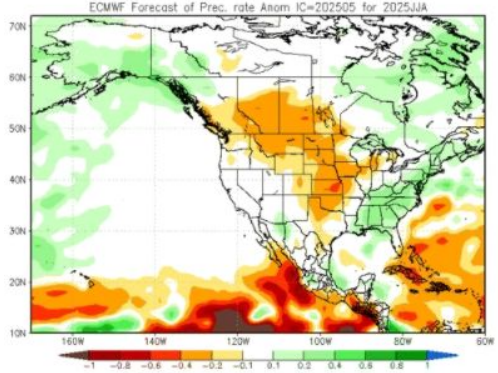
CPC Tools - Precipitation - June-July-August

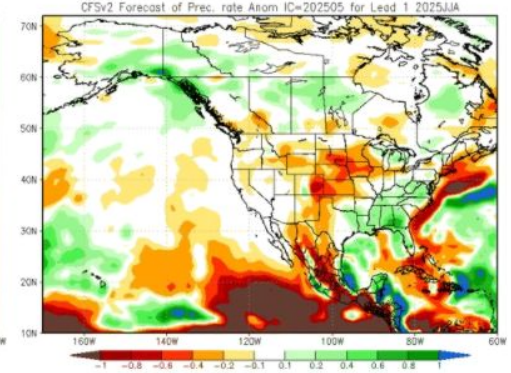


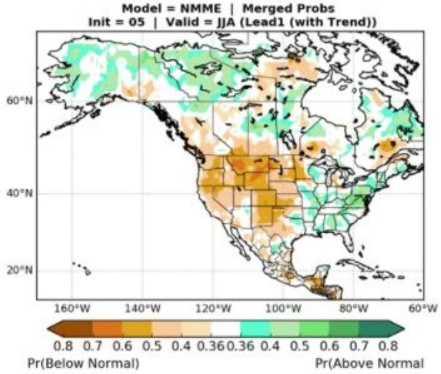


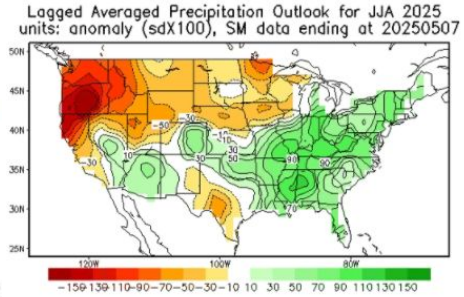












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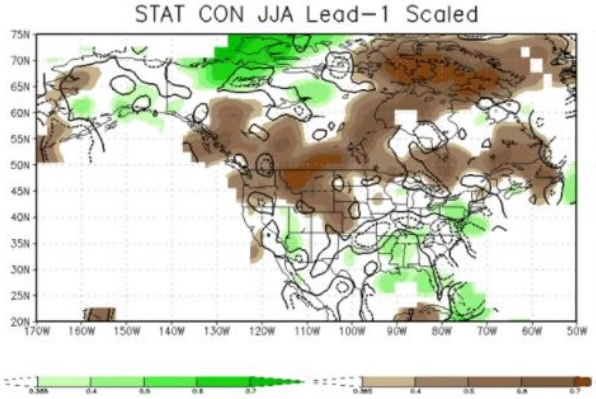
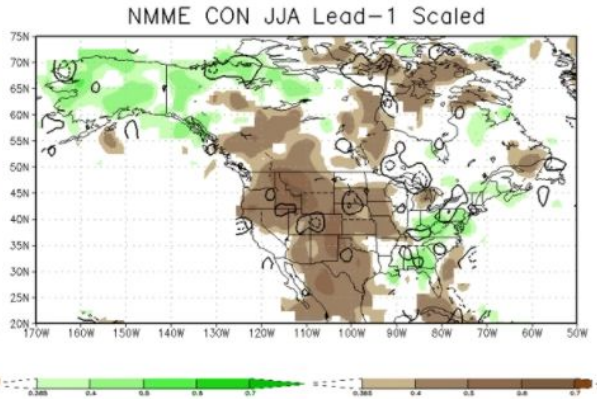
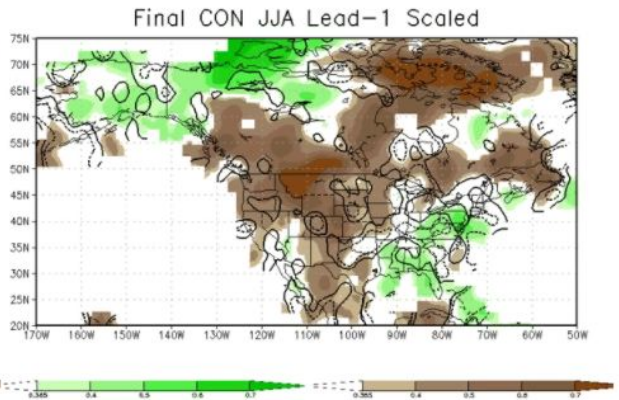
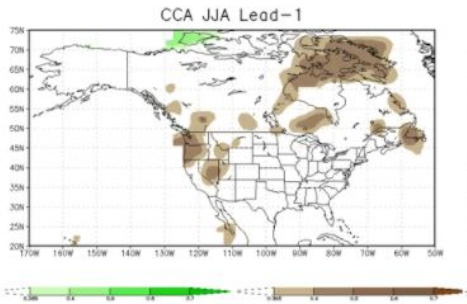
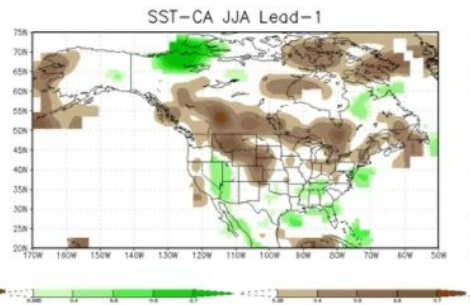
CPC Tools - Precipitation - June-July-August

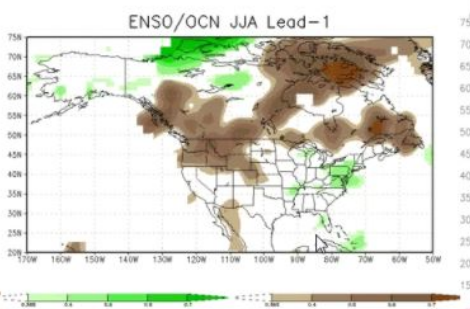


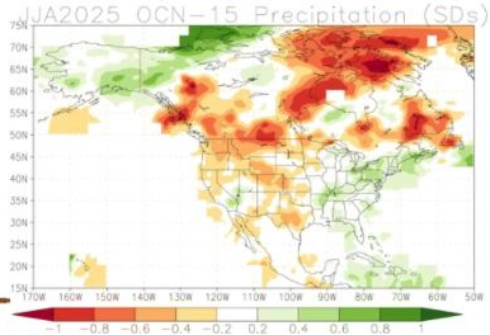






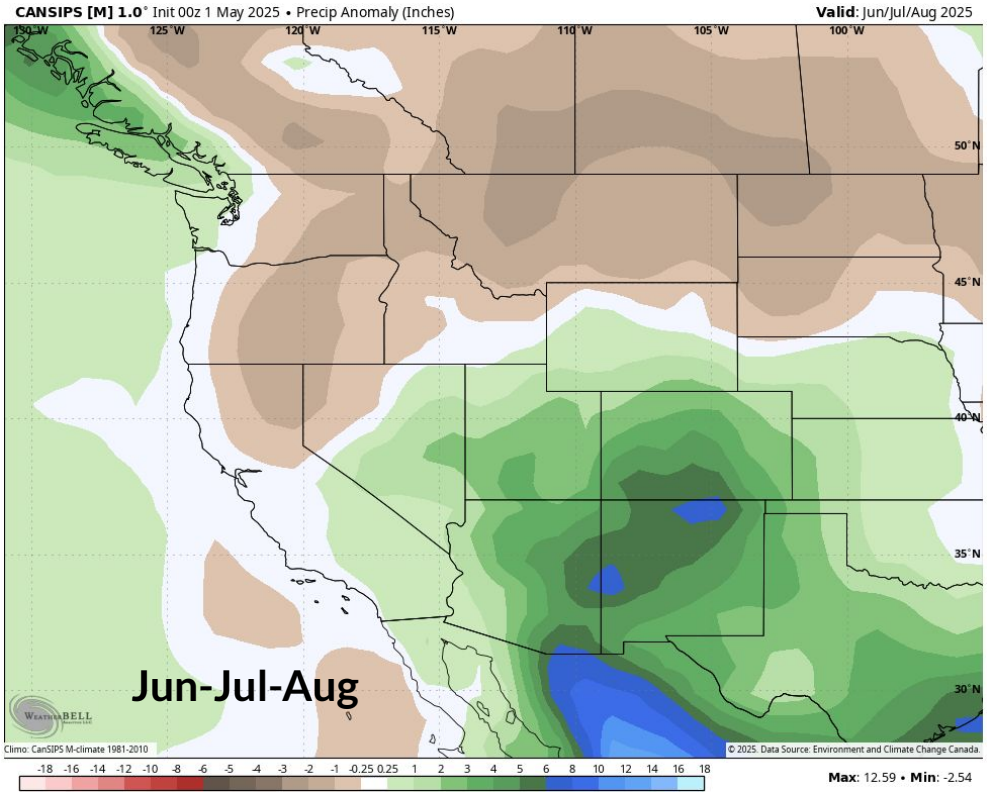


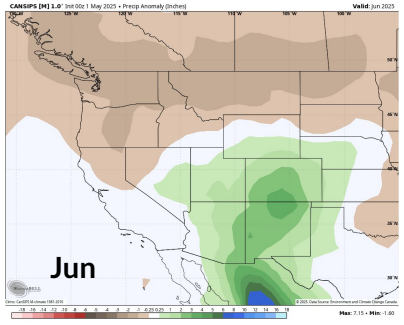


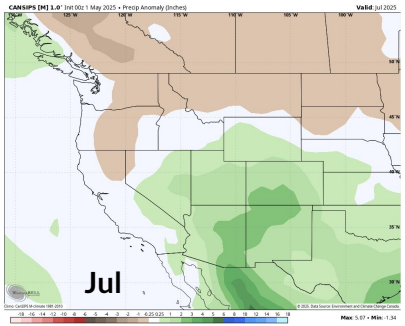


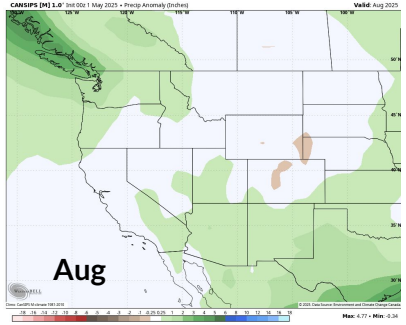
Climate Models

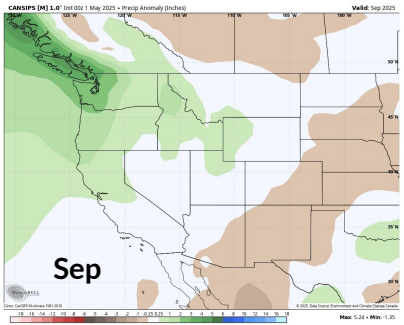
CANSIPS Model - Precipitation Anomaly











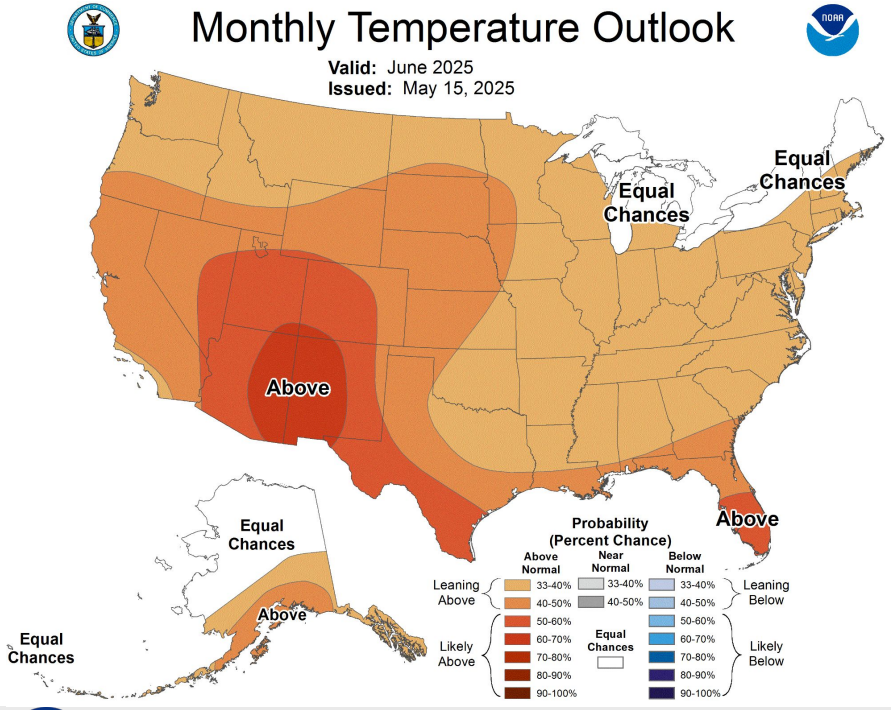
CPC Outlooks

Monsoon Outlook

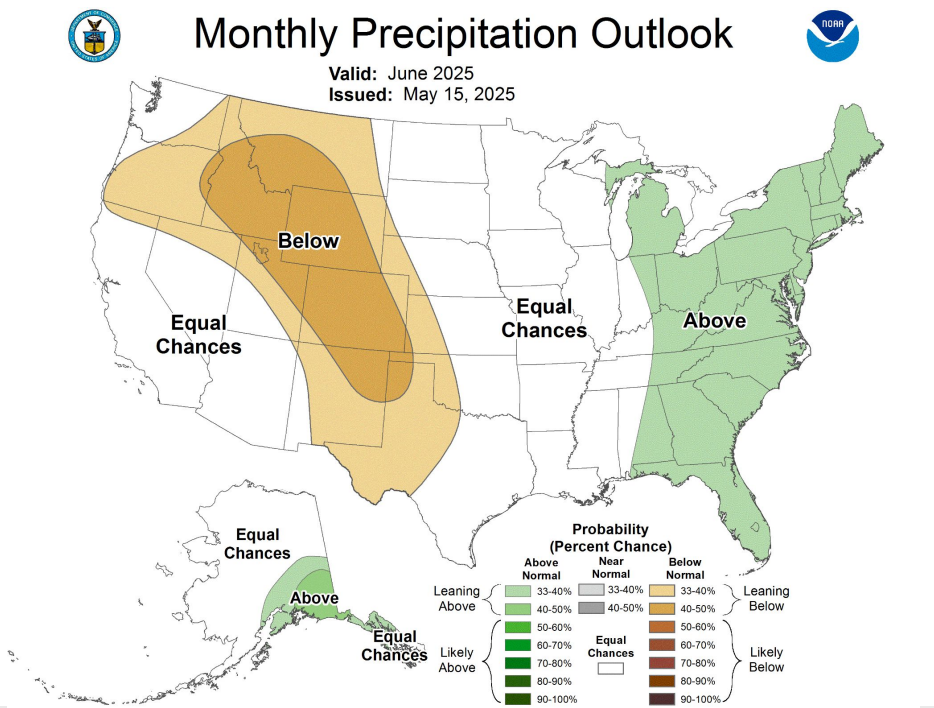
1-Month - June

Outlook Favors

Above Normal (50-70%) Temperatures



Equal Chances (33%) Precipitation

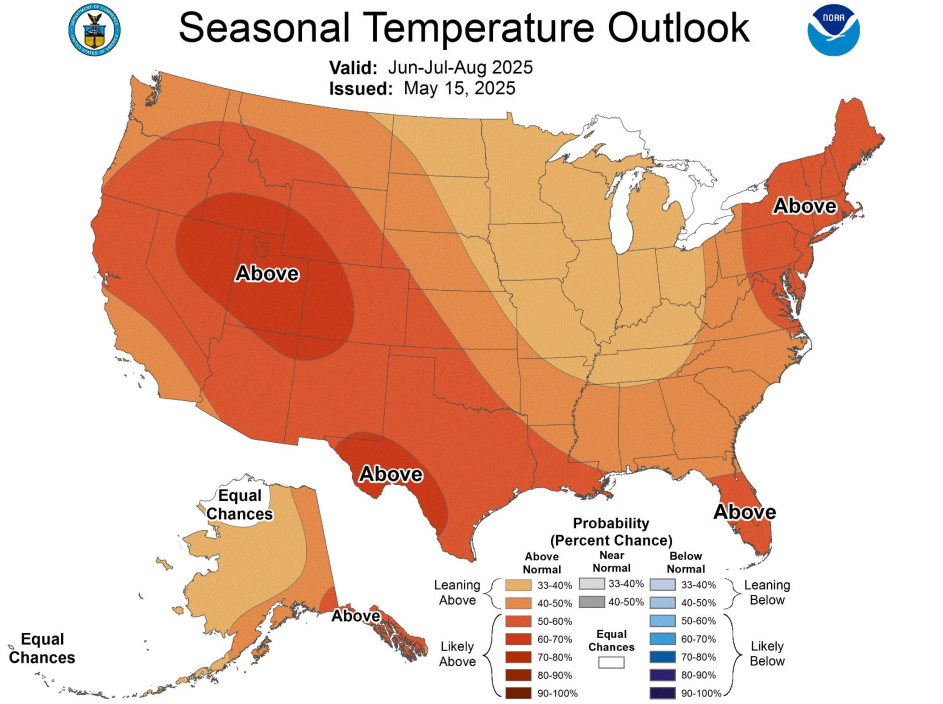


Monsoon Outlook

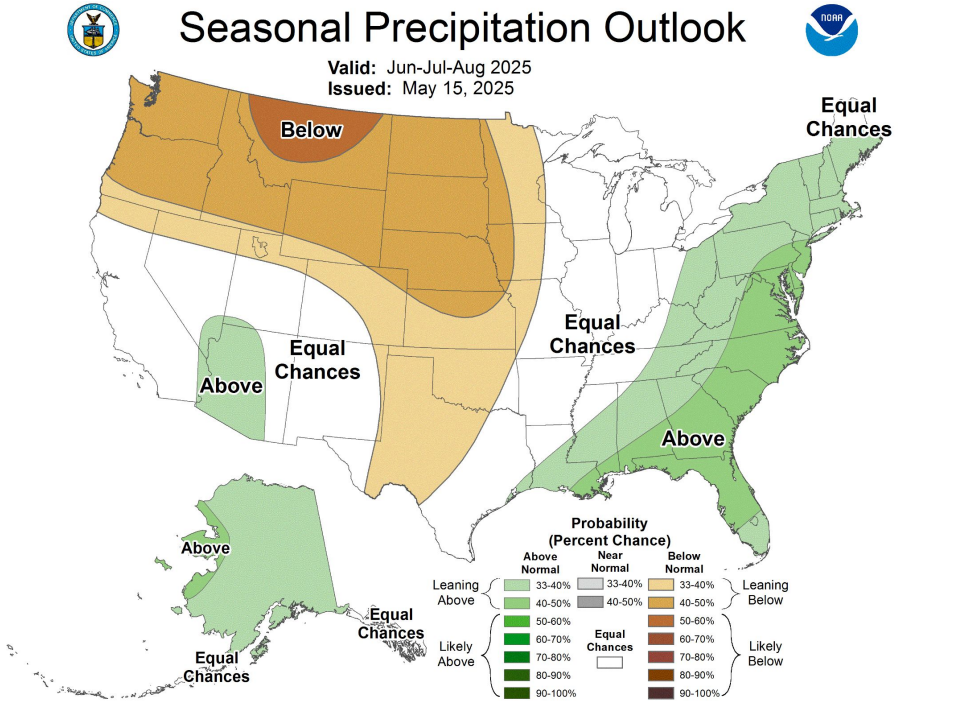
June-July-August

Outlook Favors

Above Normal (50-60%) Temperatures



Above Normal (33-40%) Precipitation

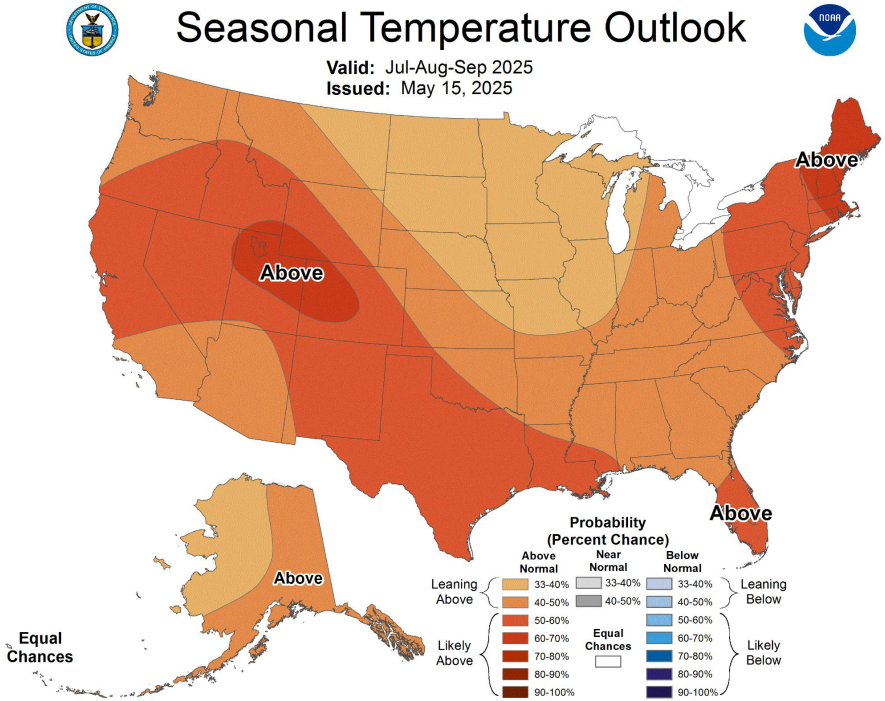


Monsoon Outlook

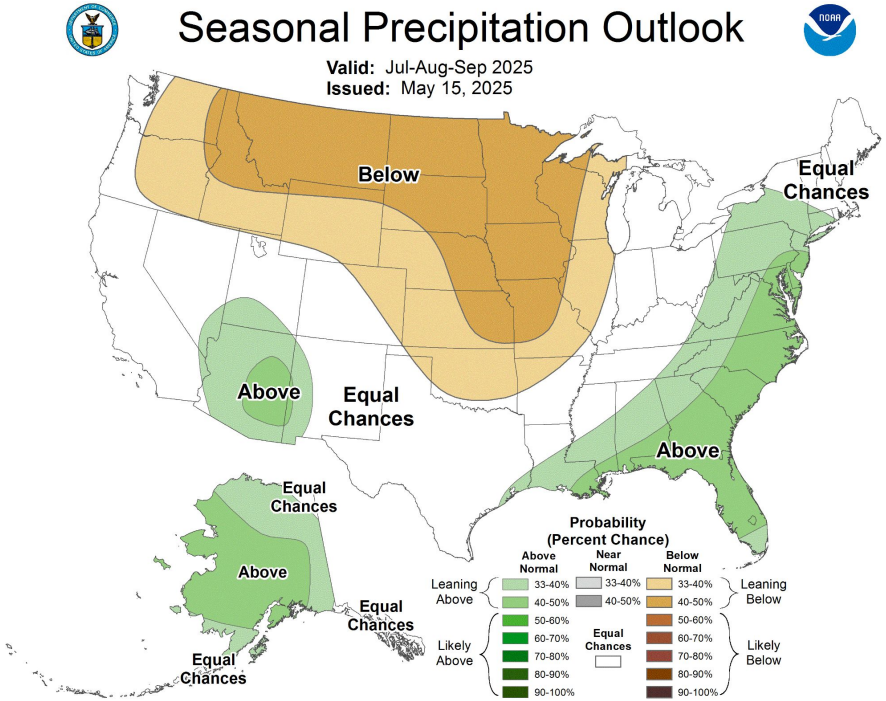
July-August-September

Outlook Favors

Above Normal (40-50%) Temperatures



Above Normal (33-50%) Precipitation

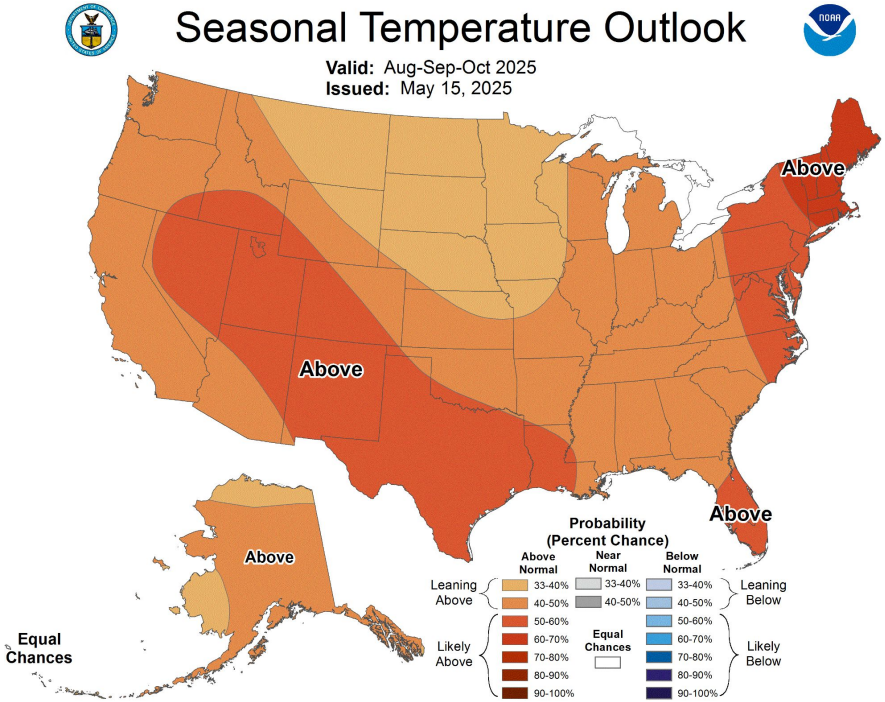


Monsoon Outlook

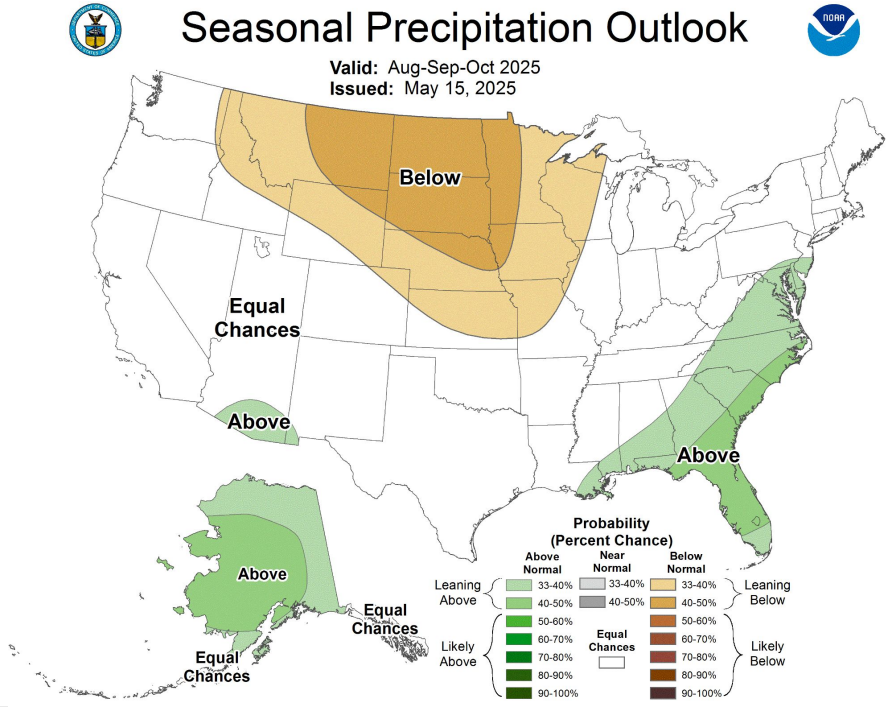
August-September-October

Outlook Favors

Above Normal (40-50%) Temperatures

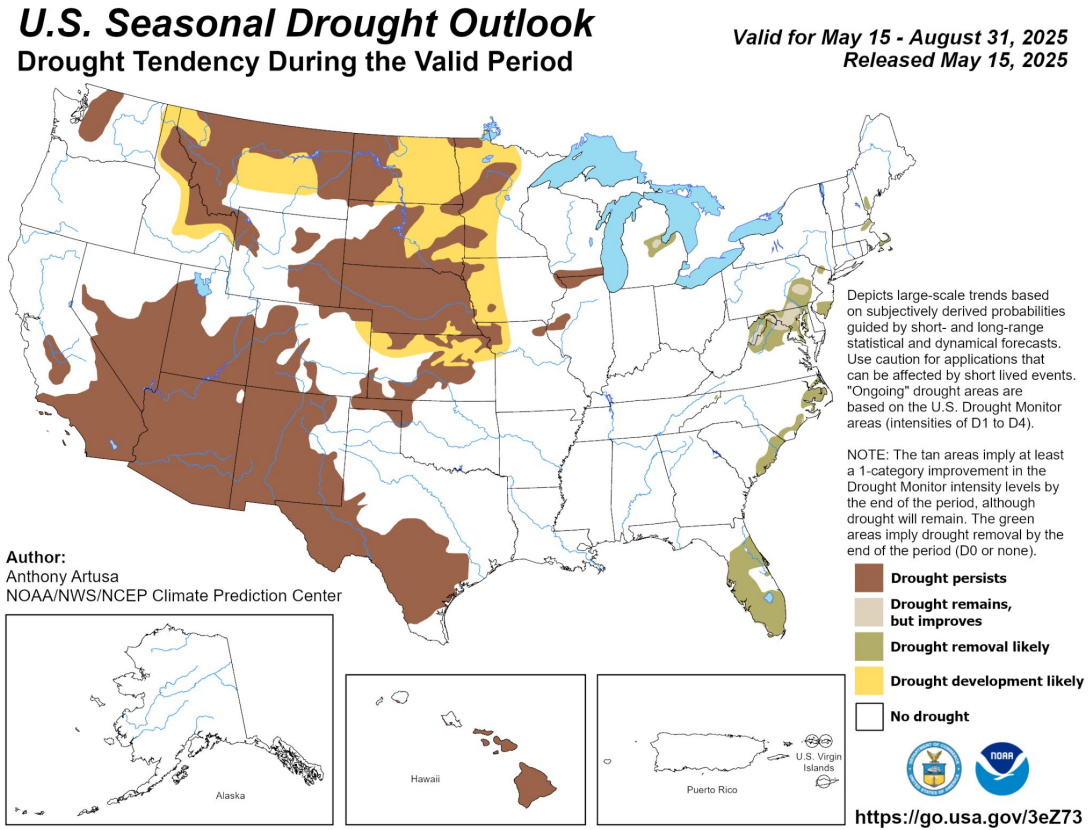


Above Normal (33-40%) Precipitation



Seasonal Drought Outlook

Valid for May 15 - August 31, 2025



An **above** and **warmer** than normal monsoon:

- Uncertainty in monsoon precipitation → Drought persists (for now)
- Localized areas that receive beneficial precipitation form monsoon storms would likely see drought improvement

Summary - 2025 Monsoon Outlook

Key Takeaways

CPC Outlook

- Current CPC Outlook Favors (33-50%) a **Wetter** and **Warmer** (40-70%) Monsoon
  - Drought Related/Early Monsoon Impacts Following a Dry Winter include longer and active wildfire season and more dust storms
- Seasonal Drought Outlook calls for drought to **persist**, but localized areas that receive beneficial precipitation would likely see drought improvement

Southeast Arizona (AZ-7)

- **6 of the 15 wettest Monsoons** have occurred after the **10 driest Winters** on record
- **7 of the 14 Monsoons** that record 10"+ for southeast Arizona followed a **dry winter**
- Overall, a Monsoon following at very dry Winter tends to be wetter (60%) than normal
- Monsoon ridge tends to be slightly north and east from climatological position
- 3 of the earliest Monsoon starts (6/17/2000, 6/18/1967, & 6/19/1994) occurred after a dry Winter

Climate Models

- Latest CPC model guidance indicating a weaker signal for monsoon precipitation than last few months
- Some models and statistical guidance showing a westward shift to the monsoon related rainfall
- CANSIP are still leaning wetter than normal, hinting that the June-July time frame could be the wetter months

Bottom Line:

- Climate outlooks have skill in predicting **seasonal totals/averages**
- However, Monsoon precipitation is inherently localized, some areas may not experience significant rainfall even if we end up with 'Above' normal precipitation
  - Arizona Monsoon Patterns can be realized within the 5-10 day forecast window, with increasing confidence on timing & impacts days 1-3
  - All impacts will be highlighted within our partner emails, NWS Chat 2.0, and through our social media channels