Key Takeaways

Global Conditions
A weak La Niña is forecast to develop by late 2024 and persist into early 2025, which increases the chances for below-average precipitation in southern California. A Madden-Julian Oscillation event is underway, which will increase the chances for below-average precipitation in California during the first three weeks of December.

Regional Conditions
Drought remains and has intensified in the Southwest U.S. and southern California due to below-average precipitation and above-average temperatures at the start of the 2024-2025 wet season. Reservoir levels remain near- and above average, though groundwater generally remains low due to decades of pumping.

Water Utilities Sector-Specific Drought Outlook
Reservoir storage and groundwater levels are expected to be lower in October 2025 compared to December 2024 (high confidence).

Agriculture Sector-Specific Drought Outlook
Crop stress, which may reduce agricultural productivity, is expected through spring 2025 in southern California (high confidence).

Public Health Sector-Specific Drought Outlook
Intermittent poor air quality is expected during winter 2024 and spring 2025 in southern California due to wildfire smoke and blowing dust (high confidence).

About the Outlook

This outlook disseminates sector-specific drought scenarios that are based on tailored monitoring and forecasting information, which will enable users to make proactive decisions ahead of drought. The focus sectors include water utilities, agriculture, and public health in Southern California.

The next outlook will be released on Thursday, January 23, 2025.

Lines of Evidence
Several perspectives are used to inform sector-specific drought scenarios.

- Observed Conditions: Current state of the region from observations as of December 5, 2024 at 10am PT.
- Predictions: Expert interpretation of many types of forecasts to anticipate the future.
- End-of-Season Outcomes: Combination of season-to-date observations and similar historical periods to project chances of outcomes.

Interpreting Scenarios

A confidence level for each scenario is provided based on guidance from the IPCC AR5:

- Low confidence indicates little agreement among several sources of evidence.
- Medium confidence indicates modest agreement among several robust sources of evidence.
- High confidence indicates close agreement among several robust sources of evidence.

Global Perspective

Weak La Niña increases chances of below-average precipitation.

- The El Niño-Southern Oscillation, composed of El Niño, La Niña, and neutral phases, is related to weather anomalies that are used to predict conditions months to seasons in the future (Figure 1).
- La Niña increases the chances of below-average precipitation in Southern California and the Southwest United States during its October–April wet season (Figure 1).
- A weak La Niña is forecast to develop by late 2024 and persist into early 2025 (Figure 2).

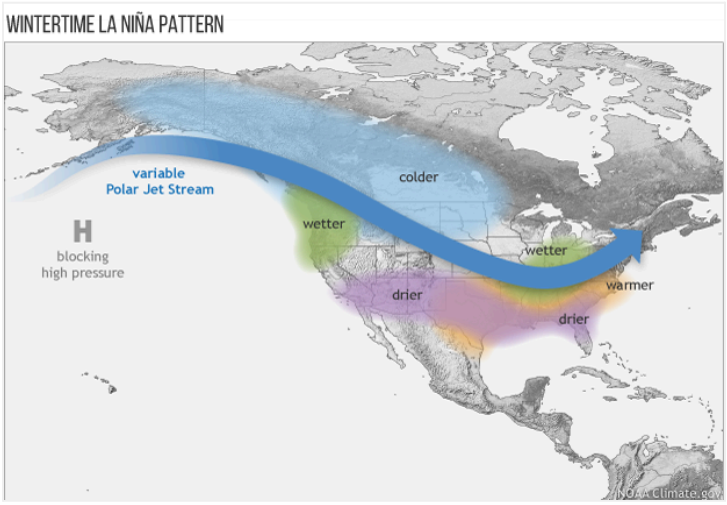

Figure 1: Wintertime conditions related to La Niña. Image courtesy of [NOAA climate.gov](climate.gov).

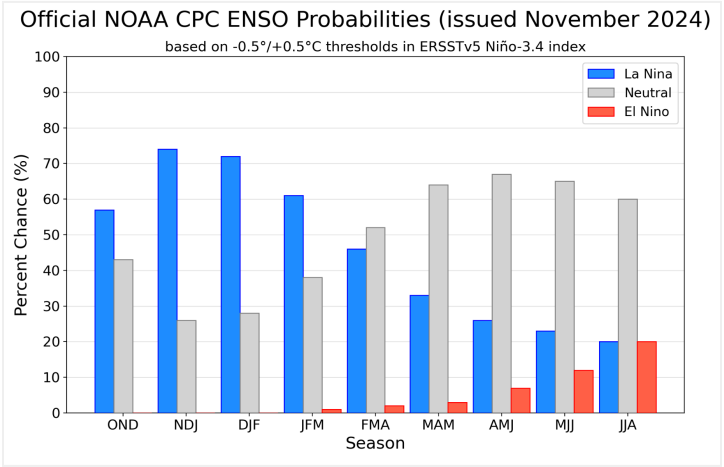

Figure 2: Chances of El Niño, La Niña, and neutral El Niño-Southern Oscillation (ENSO) phases for three-month seasons spanning October-December (OND) 2024 to June-August (JJA) 2025 from the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Climate Prediction Center (CPC) [November 14, 2024 ENSO Diagnostic Discussion](). These chances peak with a >75% chance of La Niña development over the winter months.

The current and forecast Madden-Julian Oscillation phase decreases chances of precipitation in early December.

- The Madden-Julian Oscillation (composed of eight phases as it moves through the Indo-Pacific) is related to weather anomalies used to predict conditions in California several weeks in the future.
- A Madden-Julian Oscillation event is underway and will move into its 6th phase, decreasing the chances of a precipitation event in California during the first three weeks of December (Figure 3).

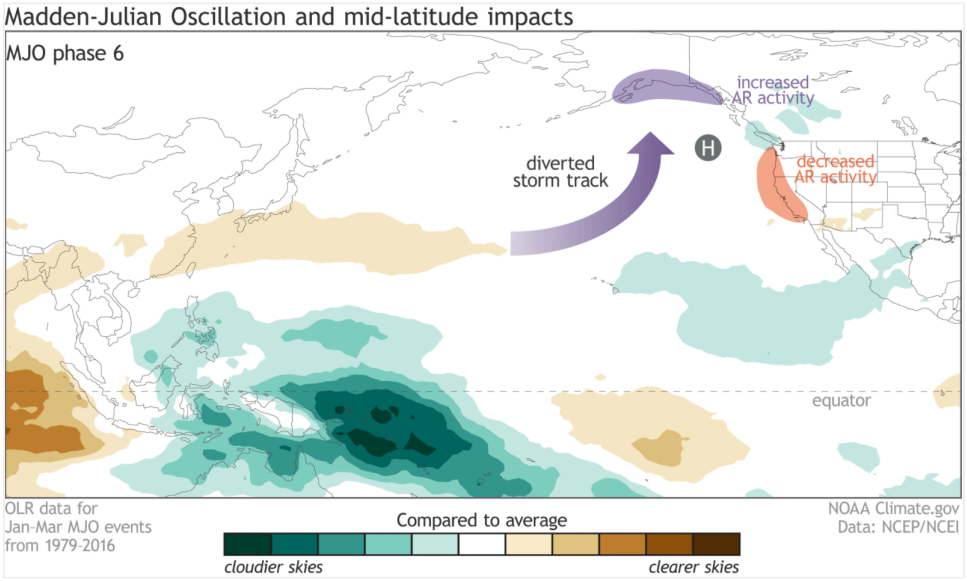

Figure 3. Storm track and atmospheric river activity in North America related to phase 6 of the Madden-Julian Oscillation.

Regional Perspective

- Drought is expected to persist in the Southwest U.S. through the end of February 2025 according to the NOAA NWS Climate Prediction Center (Figure 4).
- Forecasts indicate increased chances of below-average precipitation through May 2025 in the Southwest U.S. (Figure 5).
- Forecasts indicate that above-average temperatures are most likely across the Southwest U.S. through May 2025 (Figure 6).

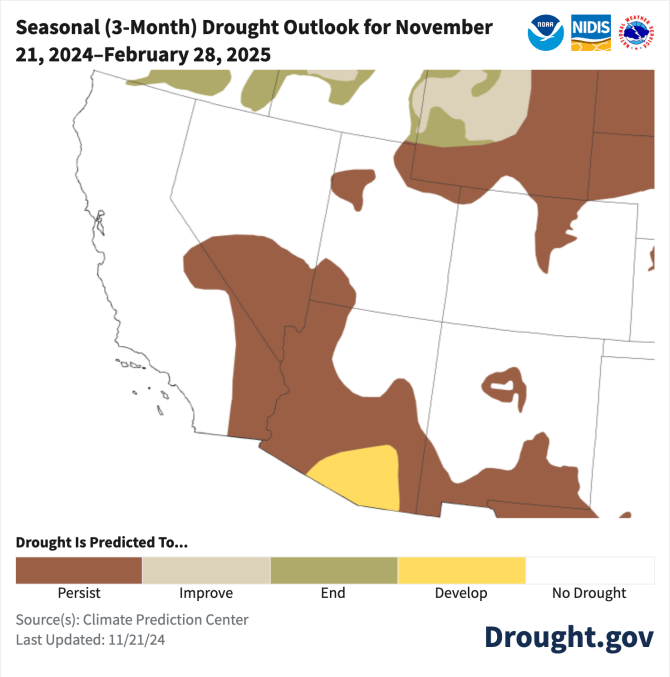

Figure 4. U.S. Seasonal Drought Outlook valid for November 21, 2024–February 28, 2025, issued on November 21, 2024 by the NOAA NWS Climate Prediction Center. Map from drought.gov.

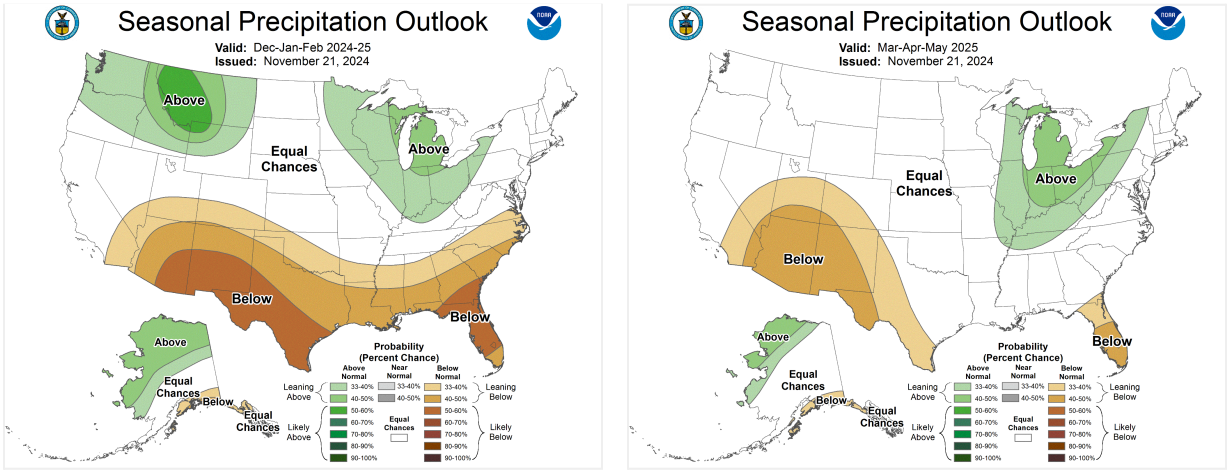

Figure 5. Chances of above- (green), below- (brown), and near- (gray) average precipitation valid for (left) December 2024-February 2025 and (right) March 2025-May 2025 issued on November 21, 2024 by the NOAA NWS Climate Prediction Center.

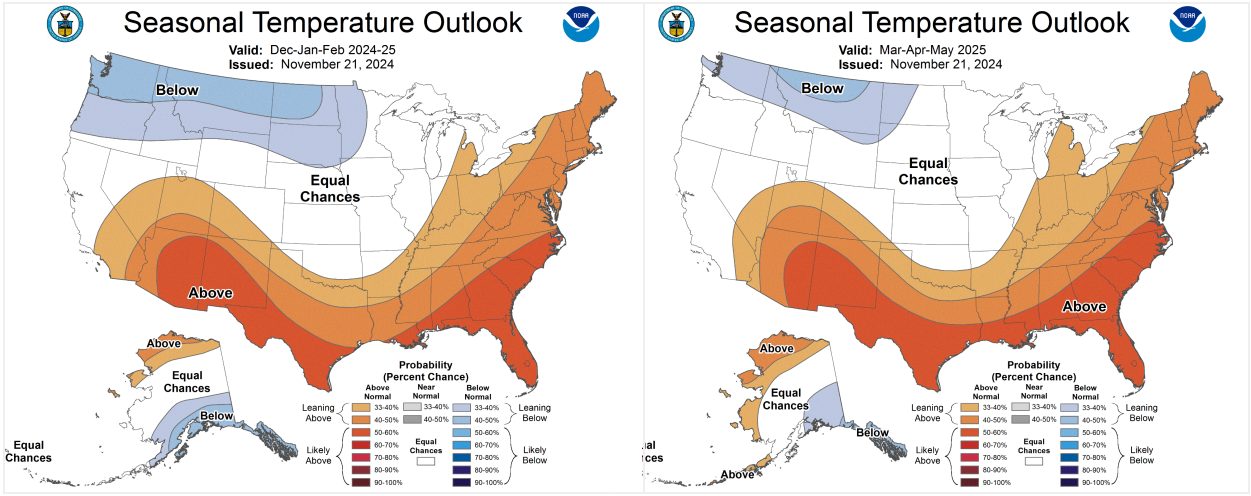

Figure 6. Chances of above- (red), below- (blue), and near- (gray) average temperature valid for (left) December 2024-February 2025 and (right) March 2025-May 2025 issued on November 21, 2024 by the NOAA NWS Climate Prediction Center.

Water Utilities Sector-Specific Drought Outlook

Reservoir storage and groundwater levels are expected to be lower in October 2025 compared to December 2024 (high confidence).

Supporting Evidence:

- Lower reservoir storage due to:
  - Increased chances of below-average precipitation and above-average temperatures in the 2024-2025 wet season (Figure 7), and
  - Below-average snow water equivalent in spring 2025.
- Lower groundwater levels due to:
  - Chances of recharge are low through October 2025 due to forecast below-average precipitation in the 2025 wet season amid continued use.
  - Several areas in southern California are reporting low groundwater.

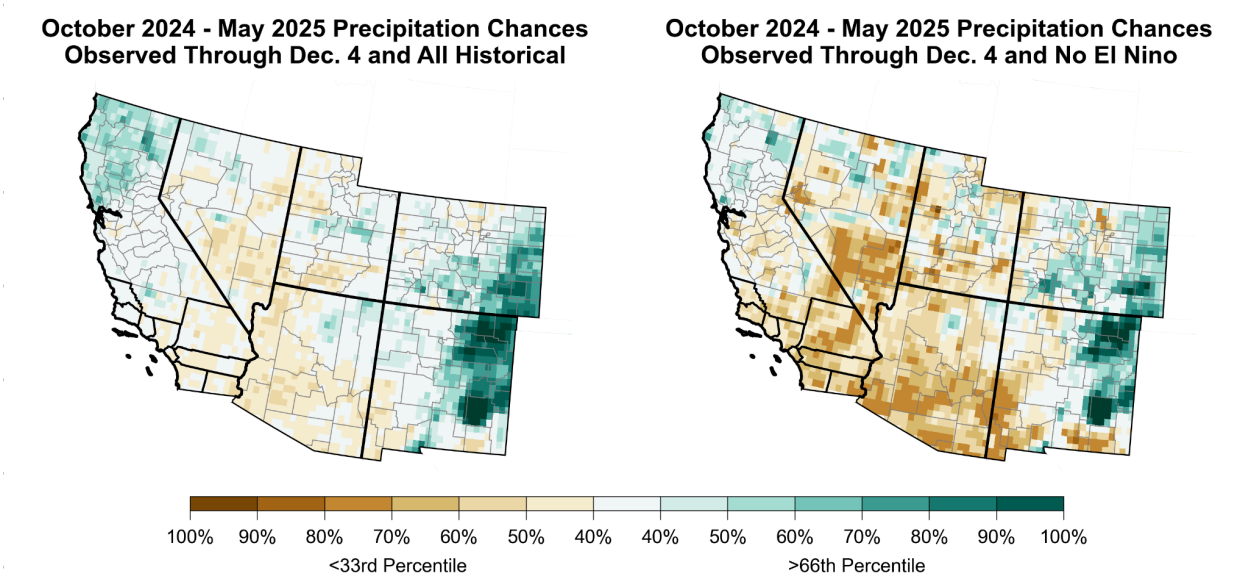

Figure 7. Chances of above- (green) and below- (brown) average precipitation in October-May based on observed conditions from October 1, 2024 to December 4, 2024 and historical conditions for the rest of the season. Historical conditions include all years since 1979 (left) and non-El Niño years since 1979 (right) defined by the NOAA NWS Climate Prediction Center. Above- and below-average precipitation are defined by precipitation falling in the lower and upper thirds of potential outcomes. Source: NOAA Physical Sciences Laboratory using data from the NOAA NWS Climate Prediction Center.

Agriculture Sector-Specific Drought Outlook

Crop stress, which may reduce agricultural productivity, is expected through spring 2025 in southern California (high confidence).

Supporting Evidence:

- Below-average precipitation in southern California is most likely (Figures 5 and 7) due to increases in the number of days with no precipitation (Figure 8).
- Above-average seasonal temperatures are most likely in southern California (Figure 9).
- La Niña, and conditions that resemble it, are related to intermittent cold air outbreaks in the United States that lead to below-freezing temperatures in southern California (Figure 10).

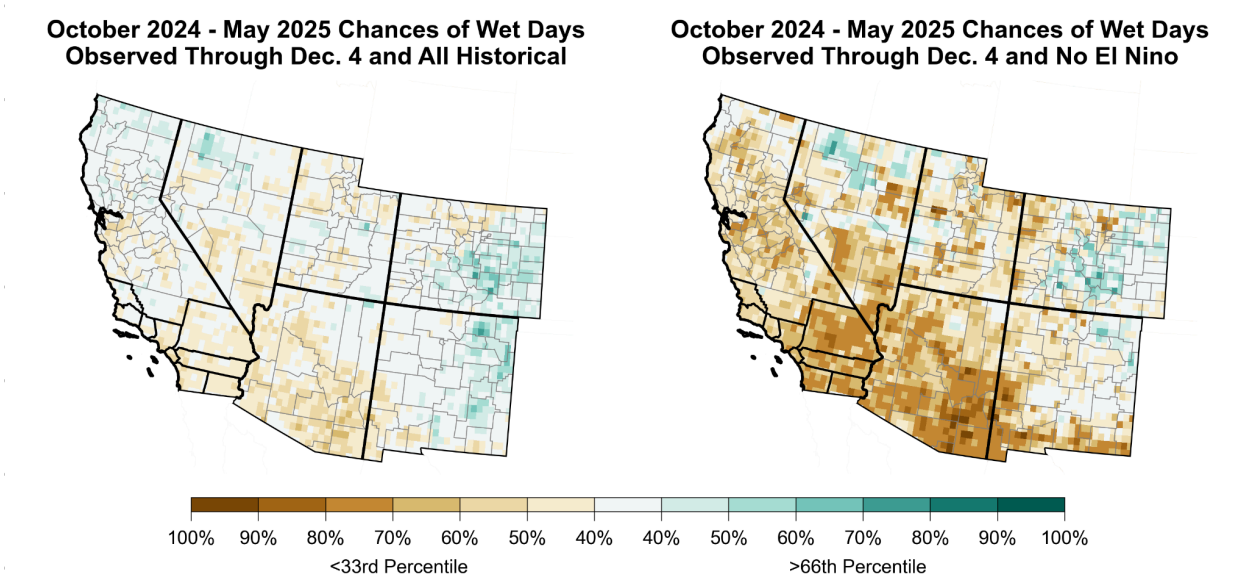

Figure 8. Chances of above- (green) and below- (brown) average days with precipitation in October-May based on observed conditions from October 1, 2024 to December 4, 2024 and historical conditions for the rest of the season. Historical conditions include all years since 1979 (left) and non-El Niño years since 1979 (right) defined by the NOAA NWS Climate Prediction Center. Above- and below-average days with precipitation are defined by such days falling in the lower and upper thirds of potential outcomes. Source: NOAA Physical Sciences Laboratory using data from the NOAA NWS Climate Prediction Center.

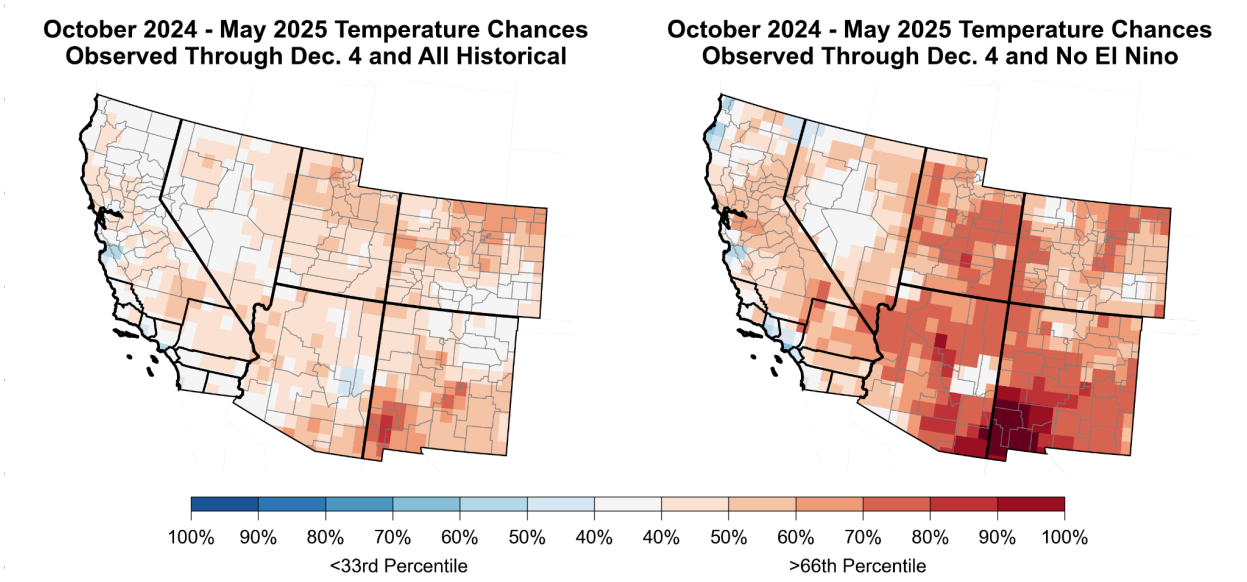

Figure 9. Chances of above- (red) and below- (blue) average maximum daily temperature in October-May based on observed conditions from October 1, 2024 to December 4, 2024 and historical conditions for the rest of the season. Historical conditions include all years since 1979 (left) and non-El Niño years since 1979 (right) defined by the NOAA NWS Climate Prediction Center. Above- and below-average temperatures are defined by temperatures falling in the lower and upper thirds of potential outcomes. Source: NOAA Physical Sciences Laboratory using data from the NOAA NWS Climate Prediction Center.

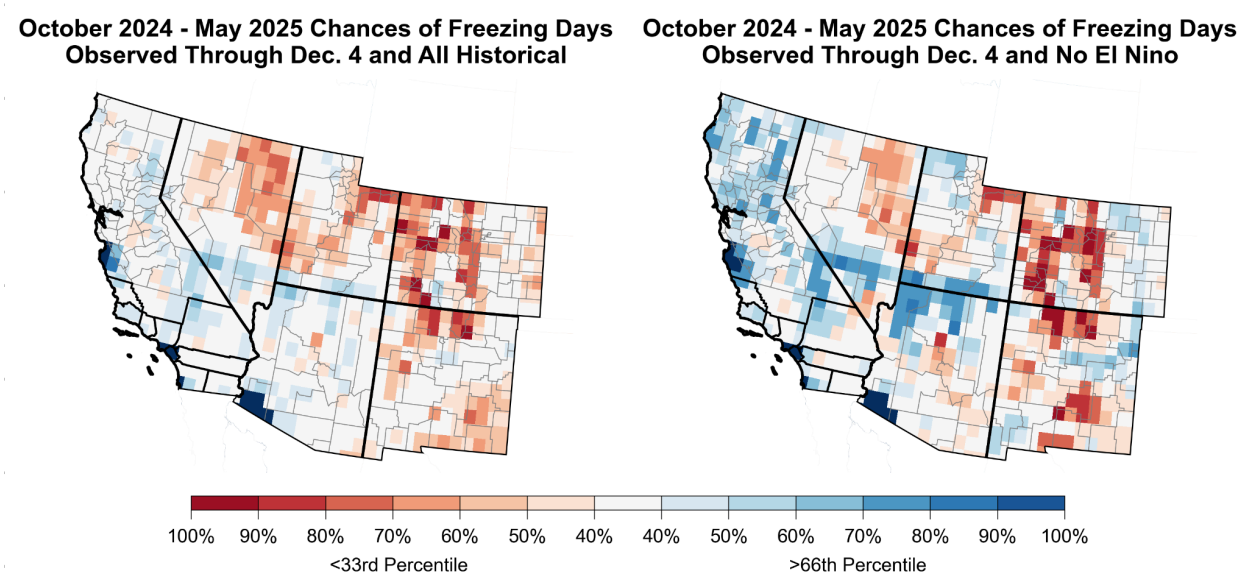

Figure 10. Chances of above- (red) and below- (blue) average days with minimum temperatures falling below 0° Celsius in October-May based on observed conditions from October 1, 2024 to December 4, 2024 and historical conditions for the rest of the season. Historical conditions include all years since 1979 (left) and non-El Niño years since 1979 (right)

defined by the NOAA NWS Climate Prediction Center. Above- and below-average days with minimum temperatures falling below 0° Celsius are defined by such days falling in the lower and upper thirds of potential outcomes. Source: NOAA Physical Sciences Laboratory using data from the NOAA NWS Climate Prediction Center.

Public Health Sector-Specific Drought Outlook

Intermittent poor air quality is expected during winter and spring 2025 in southern California due to wildfire smoke and blowing dust (high confidence).

Supporting Evidence:

- In winter and spring 2025, air quality will likely be reduced by smoke from wildland fires burning in the southwest United States.
- In spring 2025, air quality will likely be reduced by airborne particulates due to intermittent strong winds from the north and west blowing (Figure 11) over the forecast dry land surface (Figure 12) caused by below-average precipitation during the 2024-2025 wet season (Figures 5 and 7).

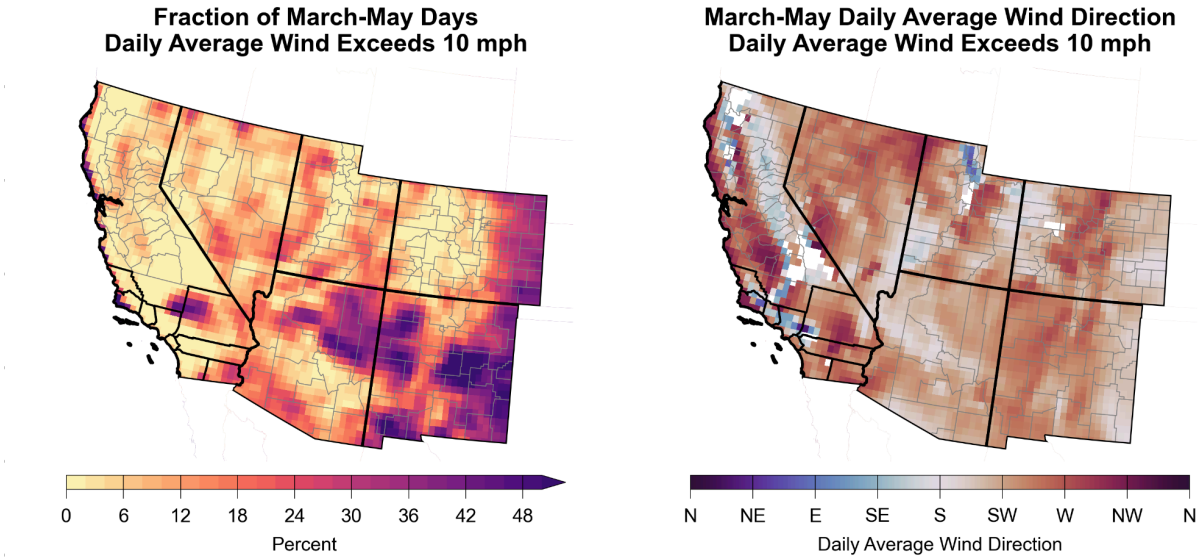

Figure 11. (left) Fraction of March-May days in which the daily average wind speed exceeds 10 miles per hour and (right) the average wind direction on such days. Source: NOAA Physical Sciences Laboratory using data from the ERA5 reanalysis.

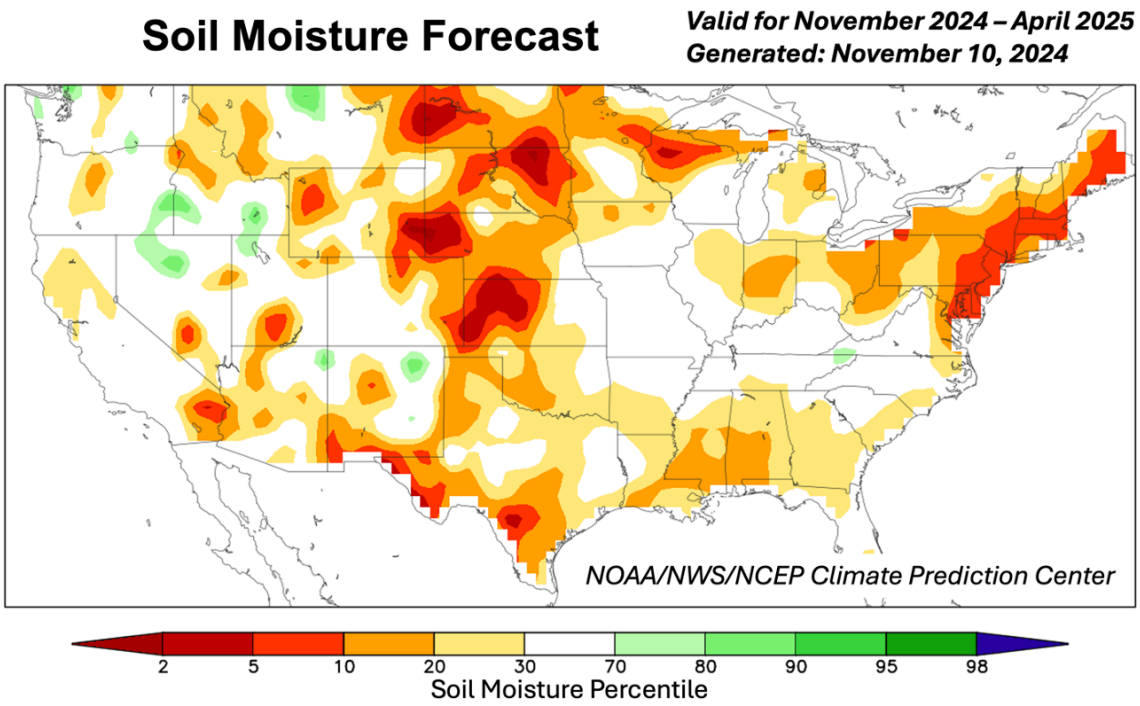

Figure 12. Forecast soil moisture percentile valid for November 2024-April 2025 issued on November 10, 2024 by the NOAA NWS Climate Prediction Center.