

# Weather and Climate Summary and Forecast

## December 2023 Report

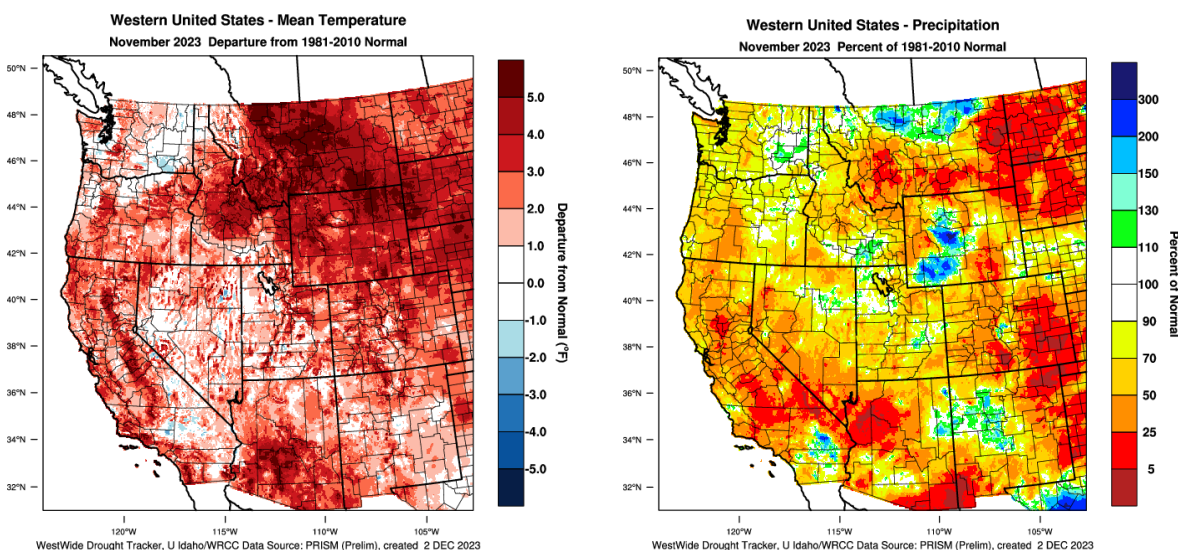
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December 4, 2023

### Summary:

- November turned mild for the western US with most areas seeing warmer than average<sup>1</sup> temperatures for the month.
- A dry November was experienced throughout most of the western US. Most areas were between 20 to 90% of average in November, with small areas of the inland PNW, inland southern California, and the Rockies seeing 110-220% of normal precipitation.
- Drought conditions have improved slightly over the western US with the PNW and southwest continuing to show the driest conditions.
- A very wet start to December in the north, drier south. The overall December forecast favors a near average to warmer than average month over the western US. The storm track dips a little south mid-month, favoring a wetter period for California and an overall wet month for the PNW.
- Sea surface temperatures (SSTs) in the Tropical Pacific are now warm enough to categorize it as a strong El Niño. Modeling indicates a very high likelihood of El Niño conditions persisting during the rest of 2023 and first quarter of 2024. The North Pacific (cold) remains out of phase with the Tropical Pacific (warm) which could end up making this El Niño anything but typical. But forecasts and the media think otherwise. We shall see ...

### Past Month and Year to Date:

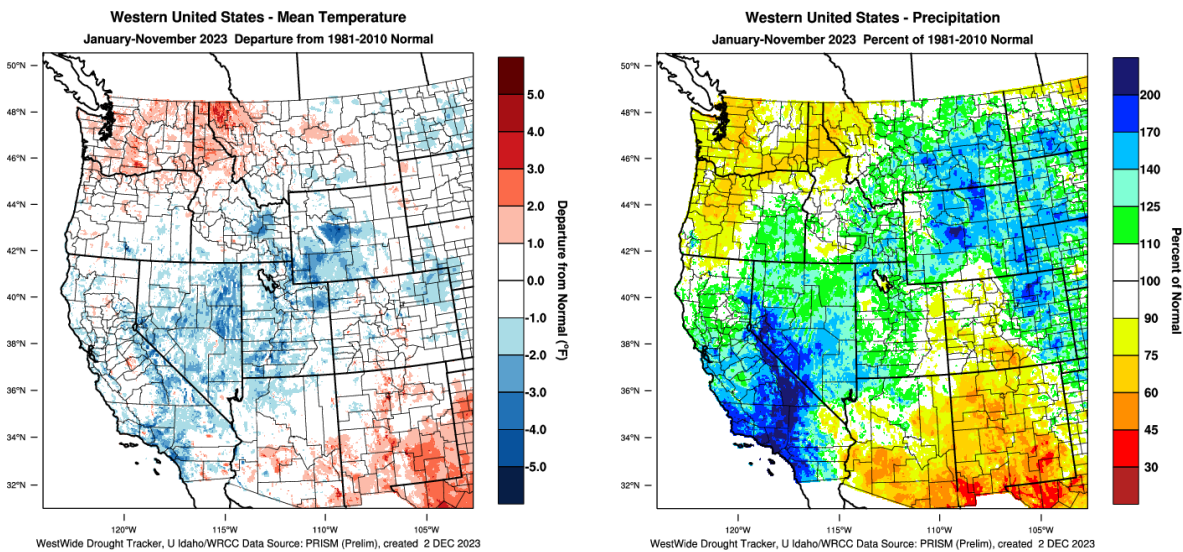
After a cool end to the 2023 vintage, November turned warmer than average with temperatures 1-5 degrees above average over much of the western US (Figure 1). Temperatures were closer to average or up to 1 degree cooler than average in portions of the Willamette Valley, eastern Oregon and Washington, and inland southern California. The month also ended up mostly drier than average with the majority of the west running less than 90% of average for the month (Figure 1). Areas in California and the southwest had an even drier month running 20-50% of normal, while some inland areas in southern California and eastern Washington saw upwards of 120-150% of average. While the west was warmer than average, the east was closer to average or cooler than average with New England seeing the coolest conditions with 2-4°F below average for the month (not shown). In terms of precipitation, most of the rest of the country was drier than average, especially in the Plains and Midwest, with only portions of the Rockies, southern Texas, and Florida seeing above-average rainfall during the month (not shown).



**Figure 1** – Western US November 2023 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

<sup>1</sup> Note that all references to normal or averages in this report are to the 1981-2010 climate normal for each weather/climate parameter unless stated otherwise. Also, note that the 1991-2020 climate normals are starting to become available across reporting agencies and will be used in this report when possible.

As we head into the last month of 2023, year-to-date numbers are holding with the western US running close to average (Figure 2). Slightly warmer than average temperatures year-to-date have been seen in Washington across to western Montana while portions of California, most of Nevada, and the Rockies have experienced a cooler than average year-to-date. East of the Rockies, the northern and central Plains have seen near average temperatures year-to-date but the rest of the eastern US from Texas to New England has experienced 1-5 degrees above average temperatures for 2023 (not shown). Year-to-date precipitation amounts in the western US show a large area from California northeast into the Great Basin, Rockies, and Plains that has experienced 110-220% of normal for the year (Figure 2). Northward and southward of this wetter than average area is the PNW and southwest, which have seen 45-85% less than average, continuing the broader drought conditions in those regions (see Drought Watch). For the rest of the country, year-to-date drier than average conditions continue for many regions adding to the broader drought issues for the country, especially in Texas and the Midwest (see the Drought discussion below). However, many areas across the northern Plains, portions of the Great Lakes, the southeast, and into Florida have largely been near average to wetter than average for the year (not shown).



**Figure 2** – Western US year to date (January-November 2023) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

**Drought Watch** – A relatively dry November across the western US (Figure 1) resulted in some minor expansion of drought in the region while other areas received enough precipitation to stay out of drought (Figure 3). The overall drought pattern in the west continues to show the PNW and Four Corners regions remaining moderately to significantly dry. For the continental US, the overall drought footprint depicted in Figure 3 continues to fluctuate between 50-60% although the most extreme drought categories have dropped to just under 8%. The overall footprint in the western US has risen slightly to just above 45% but the most extreme categories have remained close to 5%. November brought enough precipitation to lower Washington’s drought area to just above 77% of the state although the most extreme categories have increased to nearly 20%. A relatively dry November for much of Oregon (Figure 1) left the state in a similar drought situation as last month, with slightly more than 65% in some level of drought and the extreme drought categories (severe, extreme, and exceptional) dropping to just under 10%. Idaho also saw some improvement with just under 24% drought coverage today but with a bump to over 11% now in the most extreme drought categories (mostly in the northern portion of the state). A dry November in California did not move the drought level very much with just below 5% remaining in some level of drought with no areas with the more extreme drought categories (Figure 3).

While it’s the wet season, some regions are forecast to have continuing drought concerns. The seasonal drought forecast is similar to last month with drought conditions remaining in the south from Texas to the east coast (Figure 3; left panel), although improving conditions or complete removal from drought is likely in those regions. The upper Midwest is forecast to see drought persist into winter, along with a large area of the desert southwest. The PNW is forecast to remain in drought, but the western valleys and coastal mountains are expected to improve or have drought status likely removed (Figure 2; right panel).

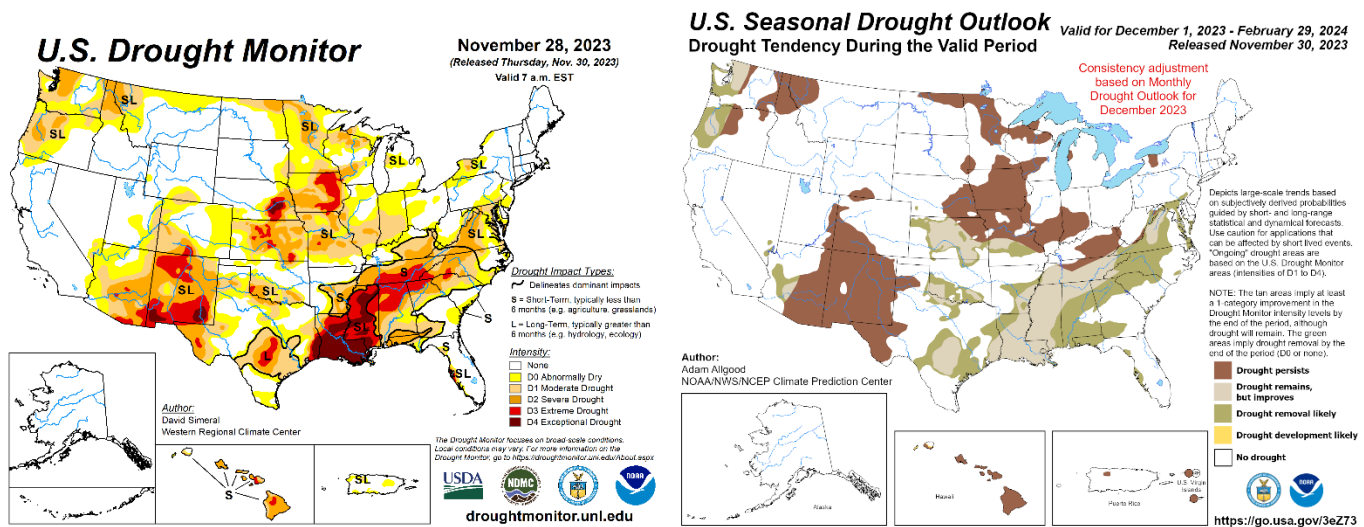


Figure 3 – Current US Drought Monitor and seasonal drought outlook.

**ENSO Watch** – The tropical Pacific continues in El Niño conditions with SSTs in the central-eastern equatorial Pacific remaining substantially above average (Figure 4), indicating that the tropical Pacific is experiencing strong El Niño conditions. The evolution of other key oceanic and atmospheric variables is consistent with El Niño conditions. As such the Climate Prediction Center (CPC) is continuing the El Niño Advisory. Modeling efforts also continue to predict SSTs remaining above average during the rest of 2023 and the first quarter of 2024, then returning to ENSO-neutral levels during late spring to early summer. The official outlook from numerous agencies confirms this forecast with the outlook calling for El Niño continuing with high probability. El Niño conditions are contributing to the model forecasts given below and applied research that both point to the PNW likely seeing a warmer/drier winter, while California has higher odds to be wetter during the winter and near average for temperatures (see the 90-day forecast below). Although conditions in the North Pacific could influence the magnitude of the effects of this El Niño.

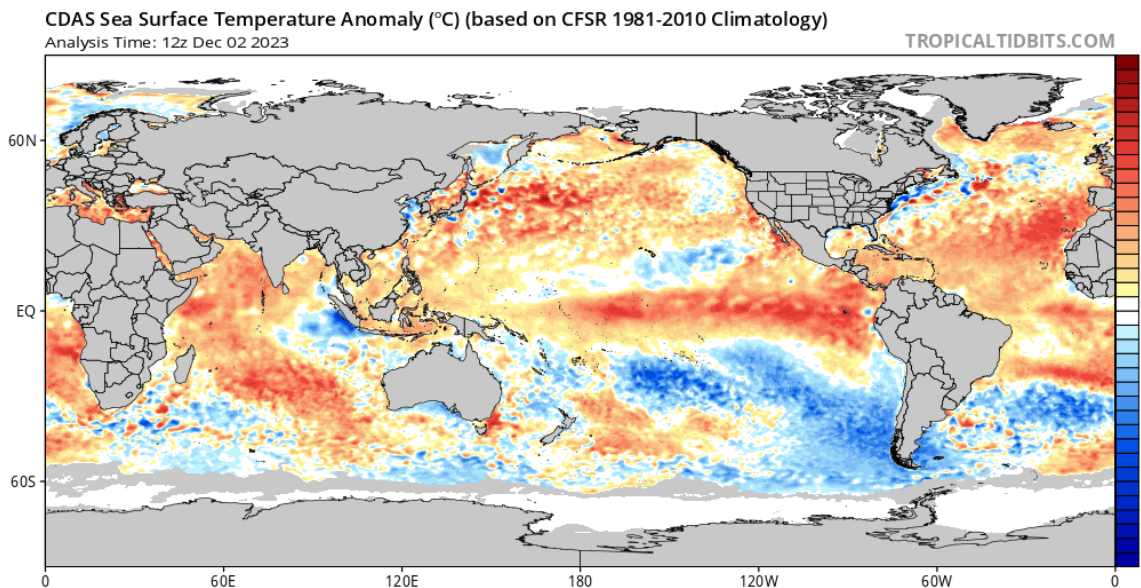


Figure 4 – Global sea surface temperatures (°C) for the period ending December 2, 2023 (image from TropicalTibbits.com).

**North Pacific Watch** – The pattern in North Pacific SSTs has remained spatially consistent over the last month (Figure 4). The near-shore areas of the Gulf of Alaska continue cooler than average with circulation over the region helping to mix cooler waters to the surface. Warm SSTs still exist over a large area in the central North Pacific and a cooler SST plume is found southwest of Baja California. These conditions keep the Pacific Decadal Oscillation in a strong negative phase,

where it has been for many months now. This type of pattern in North Pacific SSTs is out of phase with the tropical Pacific, which is substantially warmer than average (see above). However, there appears to be some shifting in the PDO but because the PDO does not change as rapidly as ENSO, we may not see the influences right away. I still hold that the combination of cold PDO and El Niño winter could act to mute the effect of one or the other resulting in a different spatial pattern or slightly different impact from El Niño this winter.

#### **Forecast Periods:**

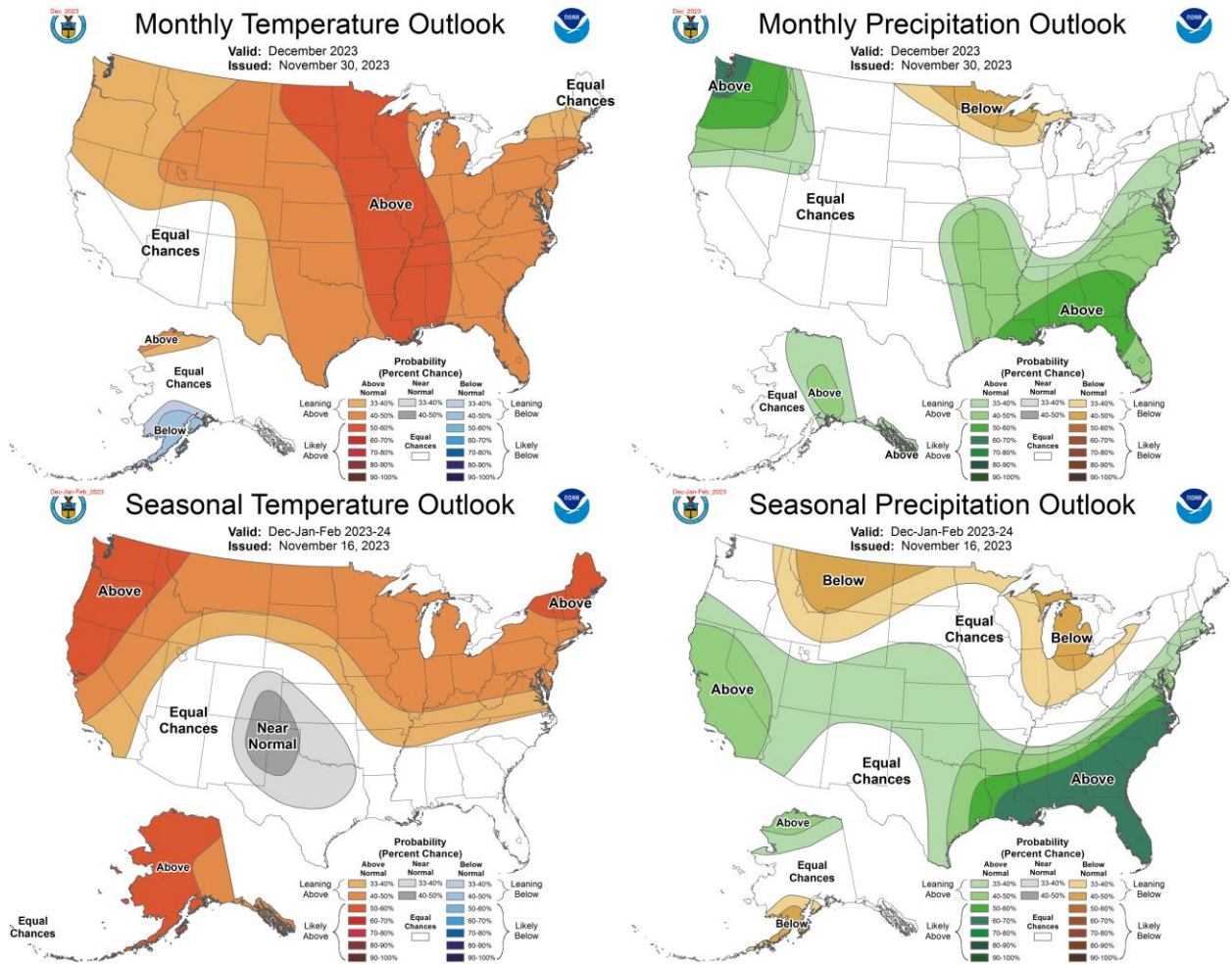
**Next 5 Days:** Wet from northern California into the majority of the PNW, dry south into the rest of California. Seasonal temperatures most everywhere, albeit a little warmer than average in southern California and the southwest.

**6-10 Day (valid December 9-13):** Continued seasonal temperatures over much of the west, except for warmer than average temperatures over coastal zones of California and below average temperatures in portions of the Rockies. From the Plains eastward and south to Florida above average temperatures are forecast. Precipitation amounts are forecast to be above average from northern California into the PNW and below average across southern California and the southwest. The bulk of the rest of the country is forecast to see average to above average precipitation during this forecast period.

**8-14 Day (valid December 11-17):** Temperature outlook through mid-month is holding to nearly the entire country likely to see warmer than average temperatures with only the PNW and south Texas and the western Gulf Coast likely to be closer to normal. Storm tracks are expected to shift slightly south, bringing much of California above average precipitation during this forecast period. The PNW is expected to see average to slightly above average precipitation into mid-month. The majority of the rest of the country is expected to see near average precipitation, except for small areas in the northern Plains and southwest that are forecast to be drier than average and small areas in the southeast and New England that are forecast to see wetter than average conditions.

**30 Day (valid December 1-31):** The monthly outlook for December points to a largely warmer than average month for the bulk of the country (Figure 5). The greatest probability for a warmer than average month is in the middle of the country from the Plains south along the Mississippi River valley to the Gulf Coast. Southern California into the desert southwest is forecast to have equal chances of a slightly warmer to a slightly cooler month. The precipitation forecast for December is pointing to the PNW likely seeing a wetter than average month. The rest of the western US is forecast to have equal chances of above to below average precipitation, which also extends across much of the rest of the country, except the southeast which is forecast to see a wetter than average month, and the northwestern Great Lakes which is forecast to see a drier than average month (Figure5).

**90 Day (valid December-January-February):** The 90-day forecast heading into the heart of winter posits a warmer than average northern tier of states (Figure 5) that appears to be largely driven by the expected influence of the current El Niño (see ENSO Watch above). The area forecast to have the greatest probability of above average temperatures extends from the Bay Area north into most of the PNW and also across northern New England. Areas of the Rockies, across Texas, and the south are forecast to be near normal or have equal chances. Similar to the temperature forecast, the 90-day precipitation forecast appears to be driven mostly by anticipated El Niño conditions bringing wetter than average conditions to California across the southern states and especially in the southeast and Gulf Coast (Figure 5). Northern states are forecast to have equal chances or tilting to below average precipitation.



**Figure 5** – Temperature (left panel) and precipitation (right panel) outlooks for the month of December (top panel) and December, January, and February (bottom panel) (Climate Prediction Center, climate.gov).

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