

Weather and Climate Summary and Forecast

February 2024 Report

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Summary:

- January was dominated by an Arctic event mid-month, ending up colder than average¹ for the northern Rockies and much of the PNW, while southern Oregon to central California and across to the central Rockies were much warmer than average.
- January precipitation was above average in the PNW and below average for much of California, the opposite of what would be expected during a typical El Niño winter. But change is afoot.
- Mountain basins are currently running below average for snow water equivalents for much of the western US. There is still time to make these deficits up, but water managers are starting to show some concern.
- A major change in circulation is ushering in a more typical El Niño pattern over the west, resulting in a strong southerly storm path tapping into subtropical moisture that will bring substantial rain to California.
- The seasonal forecast continues to hold to a 'typical' El Niño pattern, dry and mild in the PNW and wetter in California and across the south. Observations and modeling are pointing to the continued weakening of El Niño into spring and early summer. Concerns about too much precipitation too fast for some, not enough for others, and a cool April and slow start to the growing season are top of my mind.

Past Month and Water Year:

January 2024 will be remembered by many in the western US as being extremely cold with ice and snow, while others not far away will recall a very warm month (Figure 1). An Arctic air mass moved south into the US plugging much of the country to extremely low temperatures mid-month. For the western US, the cold air was prominent in the northern Rockies into much of the inland PNW with cold air pushing into western valleys. This pattern can be seen in the overall January temperature departures in Figure 1, however, there were also areas of southwestern Oregon, California, and the Great Basin that experienced a very warm month. For the rest of the country, cold extremes extended south into Texas and the Mississippi River valley where temperatures were 6-8 degrees below average while the Great Lakes and New England ended the month with temperatures 6-8 degrees above average (not shown). Precipitation in January was largely above average in the PNW and below average for much of California, the opposite of what would be expected during an El Niño winter (see ENSO Watch below). For much of the western valleys in the PNW, this came as snow and

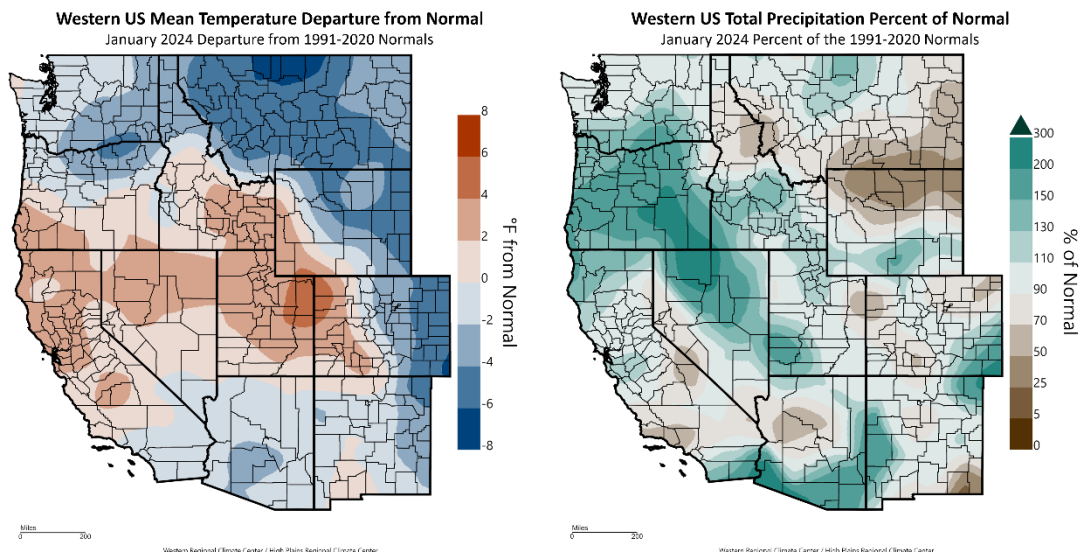


Figure 1 – Western US January 2024 temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps)

¹ Note that all references to normal or averages in this report are to the 1991-2020 climate normal for each weather/climate parameter unless stated otherwise. See this website (<https://www.climateofwine.com/climate-normals>) for more information on climate normal.

then ice during the mid-month deep freeze. Portions of the Rockies, south into west Texas, and north into the northern Plains and western Great Lakes saw a January with anywhere from 5-70% of normal precipitation. The rest of the country from eastern Texas, north across the central Plains, and eastward to the Atlantic coast experienced a much wetter than average month (not shown).

The current water year (October 1, 2023, through January 31, 2024) has been warmer than average over the entire western US (Figure 2). Central California, southern Oregon, and portions of the Basin and Rockies have experienced temperatures 2-4 degrees above average for the water year to date, while eastern Oregon and Washington and the northern Rockies of Montana and Idaho have been closer to average. The bulk of the continental US has also been warmer than average for the water year so far (not shown). The northern Plains across the Great Lakes and into New England have seen the warmest conditions, 3-7 degrees above average, while small areas along the Gulf Coast are the only areas that have seen below average temperatures (0-1 degree). For the water year to date, precipitation amounts in the western US have been on the dry side so far. The driest regions are much of inland California, portions of the Great Basin and the southwest, along with much of the northern Rockies of Montana and Idaho (Figure 2). These regions have experienced 30-90% of normal precipitation and are also showing snow water equivalents (SWE) in mountain basins that are 50% or less than normal for this time of year (not shown). Wetter than average water year to date areas include coastal zones of central California, Oregon, and southwestern Washington which are currently 100-110% above average. The areas showing the wettest conditions are southwestern Arizona and the eastern valleys of Washington south into Oregon and across southern Idaho and northern Nevada and Utah (Figure 2). These areas have seen 110-150% of normal precipitation so far this water year. SWE in the basins in these areas are also some of the highest in the west, running 5-25% above average. For the rest of the country, the water year to date has been drier than average in the northern Plains, Ohio River Valley, and mid-south, while wetter than average conditions have been experienced in the central to southern Plains, Florida, and the central Atlantic states into New England (not shown).

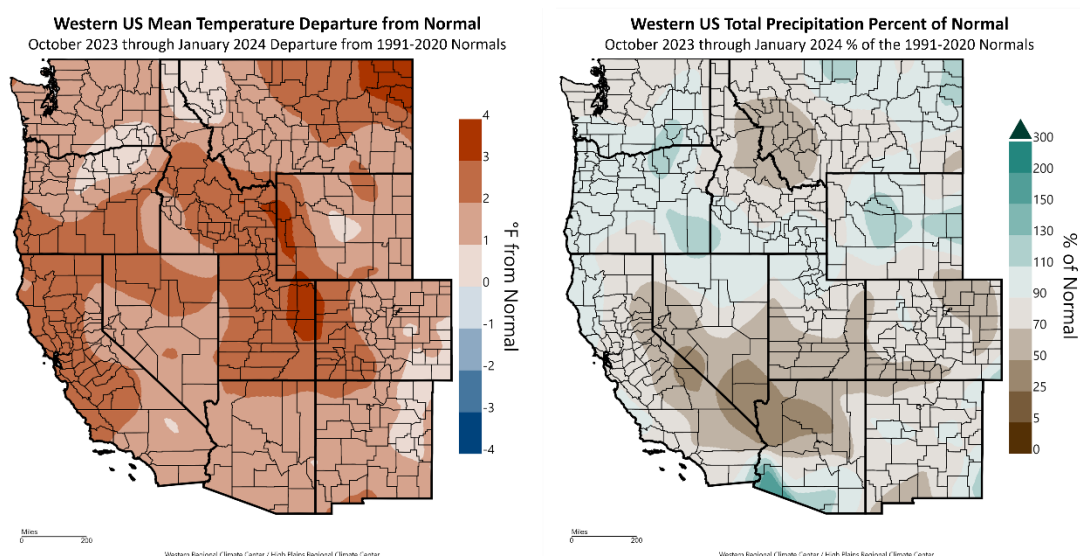


Figure 2 – Western US Water Year (October 1, 2023, through January 31, 2024) temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps).

Drought Watch – Some minor changes to the pattern of drought in the continental US, yet the overall framework remains much the same from the last couple of months. January precipitation lowered the drought area in the PNW (Figure 1) and portions of Texas and the mid-south, while drought continues in areas of the Four Corners, Gulf states, and upper Midwest. A growing concern for lack of snow this current water year is showing up in the drought development in the northern Plains and Rockies (Figure 3). The overall drought footprint for the continental US depicted in Figure 3 has dropped slightly from last month with roughly 45% in drought, although the most extreme drought categories increased slightly at close to 11%. Areas in drought across the western US increased slightly to 52% from last month with the most extreme categories remaining below 5%. A moderately wet January continued to lower Washington’s drought area to close to 25% of the state with the most extreme categories dropping off the map. Precipitation in January also helped lower drought concerns in Oregon (Figure 1) with the overall drought footprint

dropping to just over 32% and the extreme drought categories (severe, extreme, and exceptional) also dropping off the map. Drier conditions inland resulted in Idaho seeing increases in overall drought coverage at just over 56% with the most extreme drought categories (mostly in the northern portion of the state) increasing to roughly 9%. January precipitation in California was mixed (Figure 1) with much of the coastal areas and northern/southern California seeing a wet month while the mountains and central valley experienced a dry month. As a result, the drought level in California increased slightly to just below 10% in some level of drought but continued with no areas with the more extreme drought categories (Figure 3).

Figure 3 (right panel) has the seasonal drought outlook over the last half of winter and the start of spring. The outlook is pointing to some improvements in the overall drought footprint in the US, with much of the Four Corners region, portions of east Texas and Gulf Coast states, along with areas of the Midwest likely to see drought removal or at least some improvement. Portions of the upper Midwest and western Great Lakes are forecast to see drought persist likely through spring. While the western side of the Four Corners improves, the eastern side of the region throughout much of New Mexico and western Texas is forecast to remain in drought. The PNW is forecast to move out of drought west of the Cascades, but inland areas of Oregon and Washington along with portions of the Sawtooth mountains and northern Rockies are forecast to have drought persist or develop further (Figure 3; right panel).

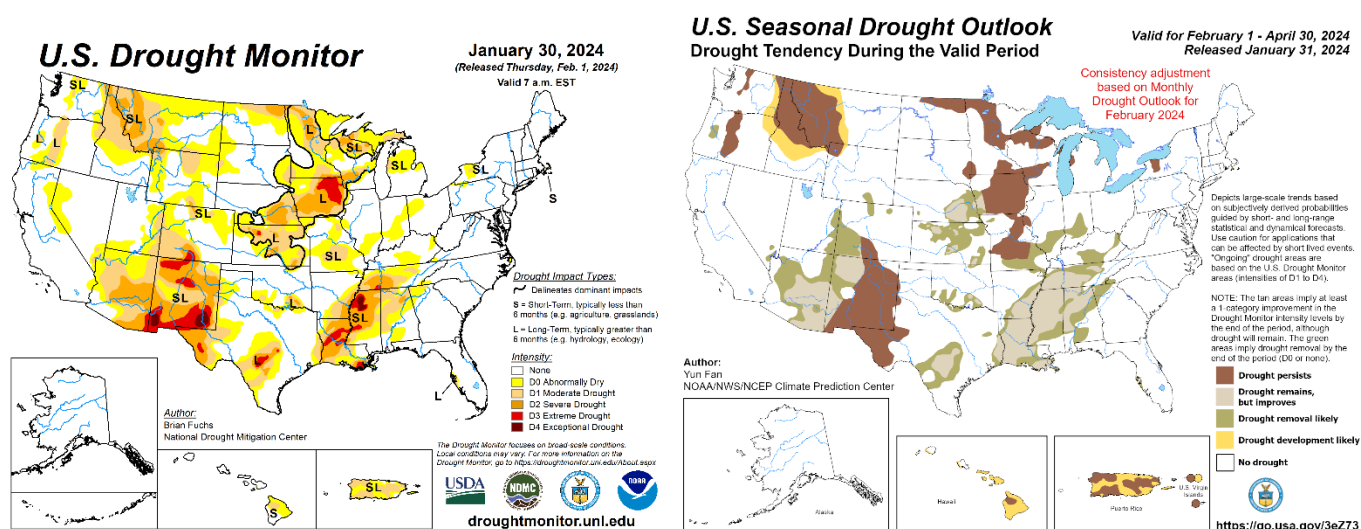


Figure 3 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – The mid-January ENSO update (El Niño Southern Oscillation) has the Tropic Pacific holding to a moderately strong El Niño. Key atmospheric and oceanic variables remain consistent with an El Niño event, such as Sea Surface Temperatures (SSTs) which are still quite warm, indicating an ongoing El Niño event (Figure 4). However, the Southern Oscillation Index (SOI; surface pressure anomalies) has shifted to ENSO-neutral which could indicate the start of the weakening of the event. An El Niño Advisory remains in place from the Climate Prediction Center (CPC). Current modeling plumes forecast SSTs to remain above average through the spring of 2024. Afterward, the forecast points to a likely return to ENSO-neutral levels during April to June 2024 (73% chance). The official outlook from numerous agencies confirms this forecast with the outlook calling for El Niño continuing with high probability but waning into spring and summer, then shifting to the highest probability being the La Niña category. We have seen a rather atypical El Niño so far, but with the shift of the jet stream and storm track south we may be seeing an awakening of more typical conditions with heavy rain south into California and rather mild and dry conditions in the PNW (see the February and 90-day forecasts below).

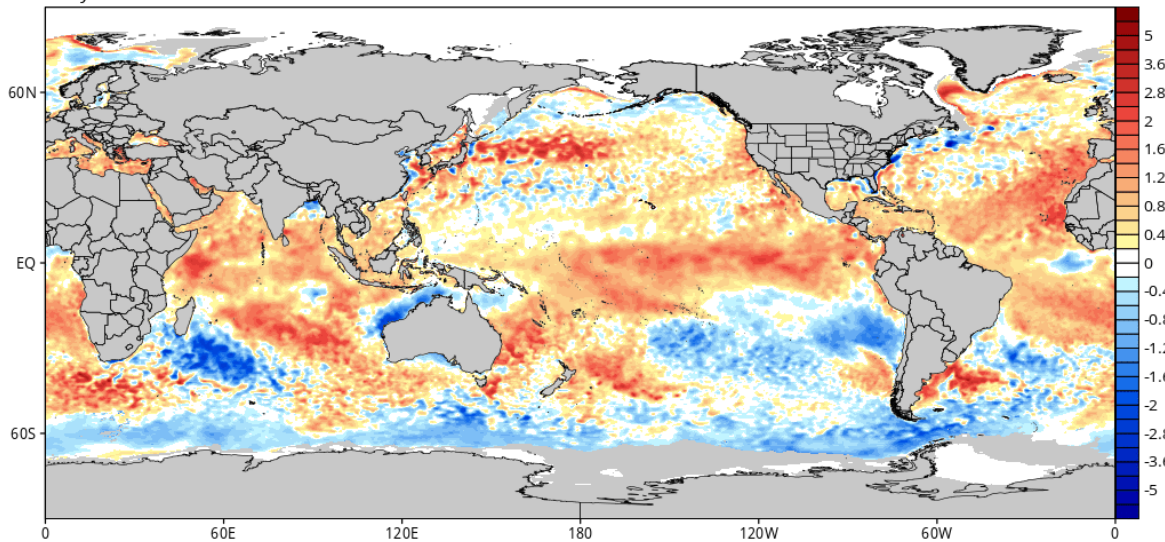


Figure 4 – Global sea surface temperatures (°C) for the period ending February 2, 2024 (image from Tropicaltibtits.com).

North Pacific Watch – The general pattern in North Pacific SSTs has continued for many months now. However, I do anticipate some changes with the CDAS data release on February 8th. Right now, warm SSTs are found out over the center of the North Pacific and along the west coast of the US (Figure 4), although cooler anomalies are still found in the same locations as they have for a few months now. Cooler surface waters also continue in the near-shore areas of the Gulf of Alaska but have abated elsewhere and they are likely to continue warming some more. The current conditions still have the Pacific Decadal Oscillation (PDO) in a strong negative phase, but I believe the next release of the data will lower the strength of the PDO somewhat. For the first half of the winter North Pacific SSTs were out of phase with the tropical Pacific (warm), but the current flip to a more active El Niño pattern over the past week or so indicates that enough of a shift may have occurred already. So, while we have had an atypical El Niño to this point, it may have flipped and will give a second half of winter with broader weather conditions over the western US that we have come to expect.

Forecast Periods:

Next 5 Days: The storm track has shifted south with significant precipitation and the potential for flooding from two atmospheric rivers being supported by a strong zonal jet stream. Temperatures will be on the warm side, so most of it will be rain except at the highest of elevations. Temperatures will be seasonal in the PNW, with the only precipitation over this period likely to be spotty on the west side and more likely inland.

6-10 Day (valid February 7-11): Shift in circulation at the start of the month will carry into the first ten days of February. Expect moderate to significantly higher than average precipitation for central to southern California and into the southwest and Rockies. The PNW is forecast to see near normal precipitation during this period while the east coast is forecast to see largely below normal precipitation for this time of year. Due to the cloud cover and associated rain, California and the southwest are forecast to see below normal temperatures while the PNW will be closer to average. A major flip-flop will be seen east of the Rockies with substantially warmer than average temperatures expected, especially in the upper Midwest and Great Lakes.

8-14 Day (valid February 9-15): The general pattern over the US continues with central to southern California and the southwest likely to continue to see above average precipitation, while northern California into the PNW is expected to be close to normal to below normal mid-month. Much of the rest of the country is expected to see near normal to slightly above normal precipitation. The overall temperature framework appears to continue to hold to the southwest, Basin, and Rockies likely remaining cooler than average, the PNW and the coastal areas down to the Bay Area seeing closer to seasonal temperatures, while the eastern US is forecast to see above average temperatures.

30 Day (valid February 1-29): The February temperature outlook is favoring above average temperatures from the PNW across the northern tier of states to the eastern Great Lakes with the northern Plains having the greatest chance (Figure

5). California, the southwest, and across the southern tier of states and to the Atlantic seaboard are likely to be closer to normal temperatures for the month. The more southerly storm path over the Pacific is likely to hold long enough over the month to result in above normal precipitation over much of California, the southwest, into the Rockies, and across the Gulf Coast states to Florida. The PNW has a higher probability of seeing a drier than average month along with the Great Lakes and into New England (Figure 5).

90 Day (valid February-March-April): The 90-day forecast into early spring continues to hold from last month. The outlook is largely dominated by the expected conditions from the ongoing El Niño (see ENSO Watch above). The probability for warmer than average temperatures is moderately high from central California, into the PNW, and across the northern tier of states to New England (Figure 5). The forecast is pointing to the PNW having the greatest probability of seeing above average temperatures during the next three months. Southern portions of the country either have equal chances of slightly above to below or near normal temperatures. The 90-day precipitation forecast is pointing to the PNW likely seeing below average precipitation along with portions of the Great Lakes and Ohio River valley. Likely as a carry-over from wet conditions in February, southern California has a decent chance of ending up with a wetter than average second half of winter. The greatest chance for a wetter than average 90-day period appears to be along the Gulf Coast, into Florida, and the southeast (Figure 5).

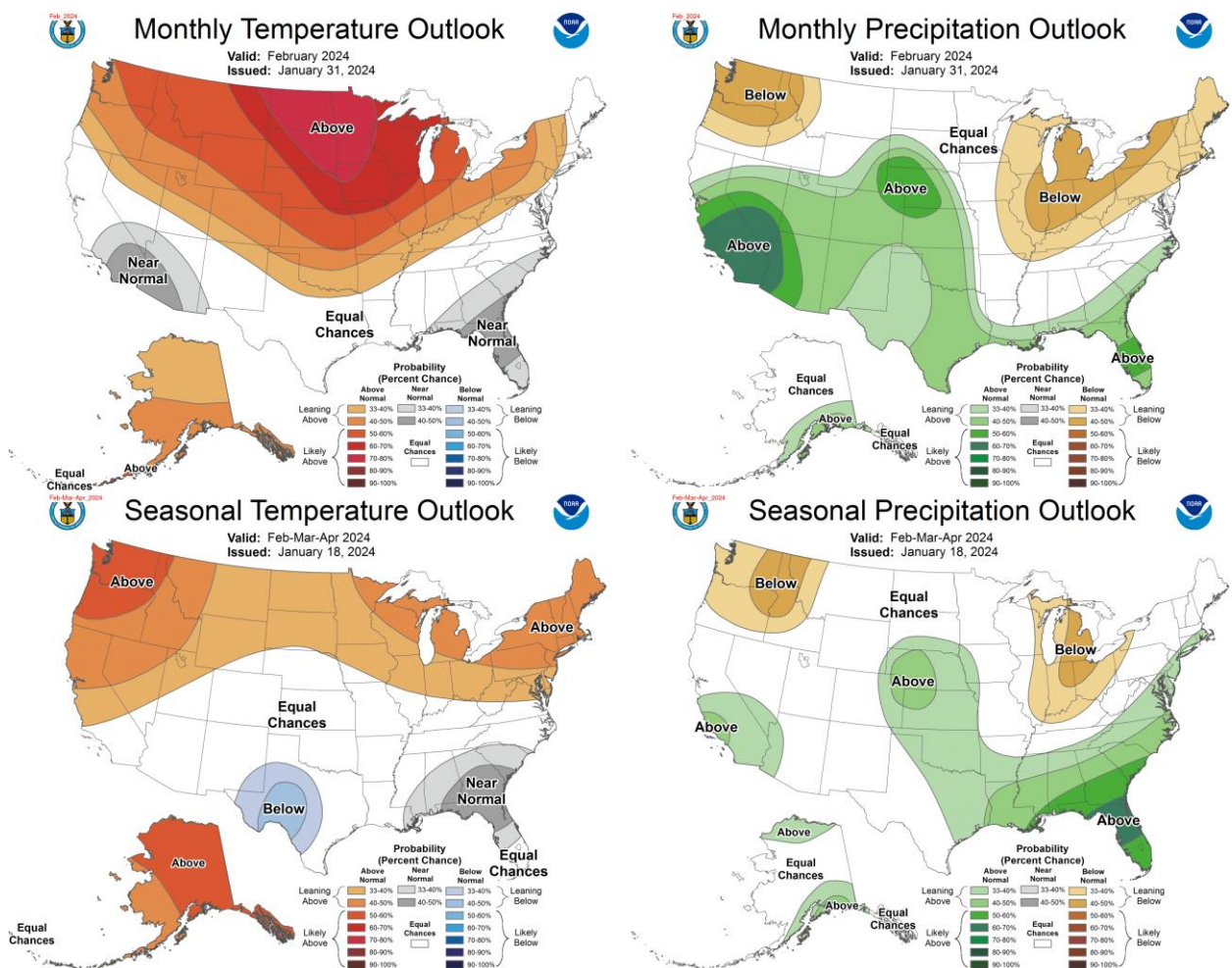


Figure 5 – Temperature (left panel) and precipitation (right panel) outlooks for the month of February (top panel) and February, March, and April (bottom panel) (Climate Prediction Center, climate.gov).

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