Weather and Climate Summary and Forecast
February 2023 Report

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February 4, 2023

Summary:

- Warmer than average[1] January in much of the PNW and into the central valley of California while most other areas in the west were near average to colder than average.
- The first half of January saw the train of moisture continue into the western US, bringing record-breaking precipitation to much of California, the Great Basin, and Rockies, but unfortunately, flooding and extreme snowfall amounts were experienced by many. While California was wet, much of the PNW was drier than average.
- The February forecast is hinting at a continued dry down for California and wet in the PNW. Temperatures are likely to be cooler than average north and closer to average south.
- Drought conditions have improved, but have not gone away. Snowpacks are up to 200% above average and reservoirs are close to full for this time of year, but without more inputs through spring, drought conditions will return. The forecast has northern California into the PNW expected to improve into spring, while large areas of the Great Basin and Plains are likely to stay locked into drought into spring and early summer.
- Even with the major bust in the La Niña weather forecast for portions of December and January, forecasts are still anticipating conditions to flip back to cool and wet in the PNW and average to cool and dry south into California and the southwest for the rest of the winter and early spring. The CPC is also expecting La Niña conditions in the Tropical Pacific to give way to neutral conditions in spring with some hints at El Niño in late summer or fall, while the PDO is expected to remain in a strong negative phase with cold near-shore SSTs along the western coast of North America.

Past Month and Water Year to Date:

A train of atmospheric rivers dominated the western US weather during January. The events were not well forecast because they were driven by strong Arctic influences from record warmth in Siberia to a record-breaking cold outbreak over eastern North America. Combined these Arctic influences ultimately buckled the jet stream over the Pacific into meridional north-south troughing with a direct line of precipitation events into California. The result was 200-300% or more of normal precipitation from central California into the Great Basin and Rockies, while the PNW ended up drier

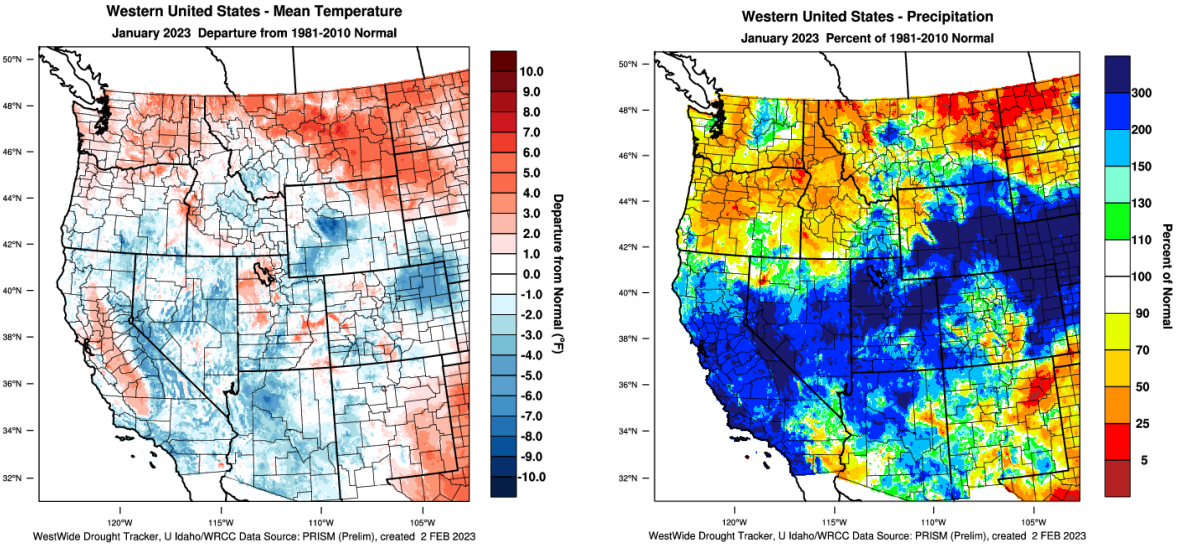

Figure 1 – Western US February 2023 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

[1] 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.

than average (Figure 1). Temperatures ended the month near average to below average across much of the mountainous regions of California, the Great Basin, and the Rockies, while the central valley of California, Oregon, and the rest of the PNW was slightly above average for the month. The eastern US ended up substantially above average (4 to 12°F) for the month of January (not shown), which was a strong rebound from the bitter cold of December's Arctic blast. In terms of precipitation, much of the rest of the country also was influenced by the atmospheric rivers with the moisture plume extending from California to the Great Lakes and even dipping across the south where severe weather in the Ohio River valley and the southeast occurred (not shown). A dry month was experienced across the northern Plains, Texas, and Florida (not shown).

Figure 2 represents the water year (October to date) temperature and precipitation. For the western US temperatures have so far been near average to slightly above average for California, Oregon, and Washington, while the Great Basin, southwest, and Rockies have largely seen below average temperatures. The precipitation pattern for the water year so far reflects the major inputs that came from the atmospheric rivers of late December and first half of January. Much of central to southern California into the Great Basin and the Rockies is running roughly 120-240% more than normal to date. The PNW is currently at 70% of normal to near aveage or even slightly above normal for eastern areas of Oregon, Washington, and Idaho (Figure 2). For the rest of the US, the eastern half of the country has largely seen a much warmer than average water year with the warmest conditions (up to 5°F above average) experienced in New England. Precipitation amounts for the water year are mixed across the eastern half of the country with drier than normal amounts experienced in the Plains, much of Texas, and Florida, while the southeast and portions of the eastern seaboard have been wetter than average (not shown).

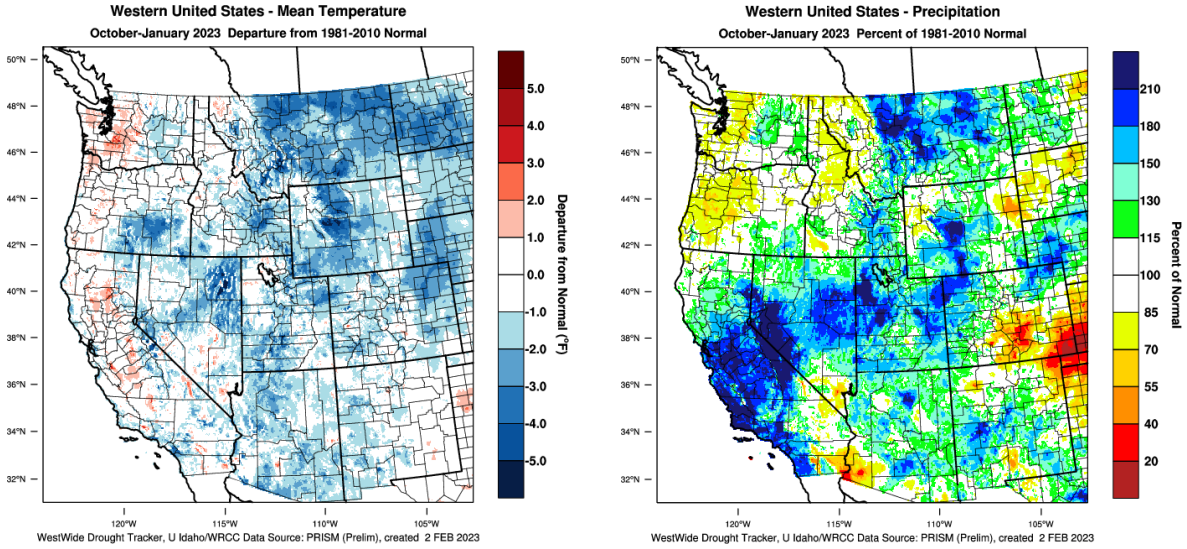

Figure 2 – Western US Water Year (October 1, 2022 to January 31, 2023) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Drought Watch – With waves of precipitation hitting the US from the Pacific, almost every region of the country saw some improvement or at least no change in drought conditions with the only exception being the southern Plains (Figure 3). However, there is still a large drought areal coverage in the US, including many areas of the west. At the end of January, nearly 45% of the lower 48 states are in drought, according to the U.S. Drought Monitor. Of course, the major improvements came across California, the Great Basin states, and the Rockies where record-breaking precipitation (both snow and rain) fell across the region. Drought conditions have declined over the western US, from over 90% in some level of drought a month ago to just over 80% now. But the biggest recovery has been from the most extreme categories of drought (extreme and exceptional) which have dropped from 15% to under 5% over the west. Reductions in drought area occurred in Washington where only 35% of the state is in drought with all of it being the lower category levels. Oregon did not improve as much as Washington, with 84% of the state remaining in some level of drought and 15% remaining in the most extreme categories. Idaho also remains mostly in drought with over 96% of the state seeing drought conditions. For California, nearly 100% of the state remains in some level of drought but the big change is that none of the state is now in either of the most extreme drought categories for the first time in many years.

The seasonal drought outlook for the second half of winter (Figure 3, right panel) continues to exhibit some potentially good news with areas of central to northern California and much of the PNW and northern Rockies likely to have drought categories removed altogether or see some improvement into spring. However, large areas of southern California, the Great Basin, and Four Corners region are expected to remain in drought into spring. The area of the country expected to experience worsening drought conditions is the central Plains south into Texas and portions of the southeast coast and Florida. The forecast for the next 90 days is supporting the drought forecast (Figure 3 and see forecast section below) with a wet northern tier of states and a drier southern tier of states.

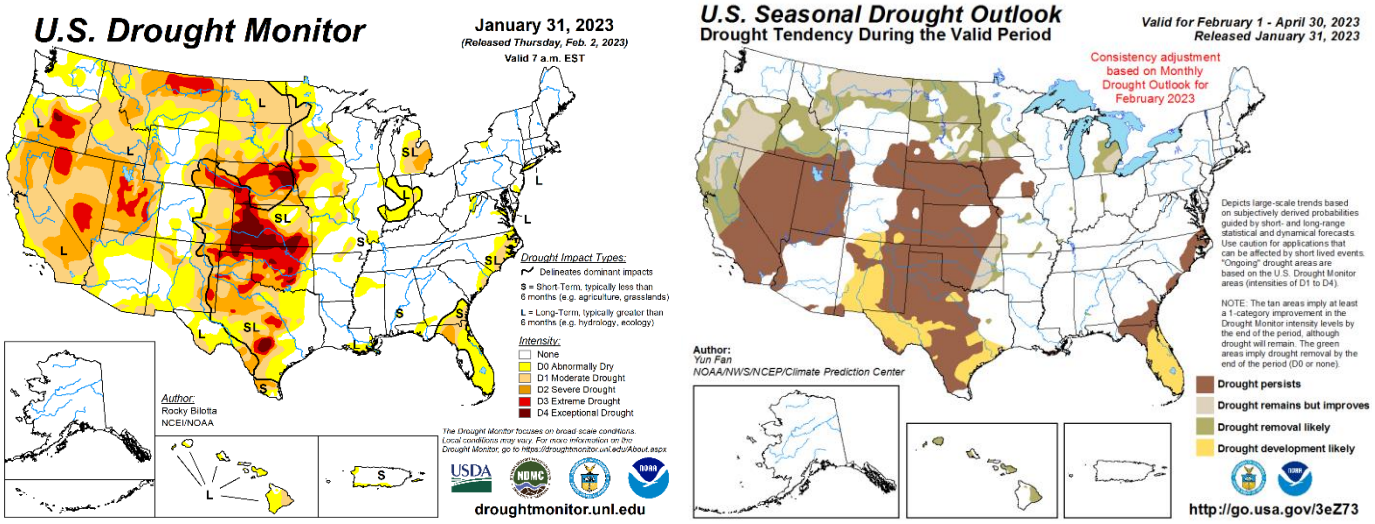

Figure 3 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – Sea surface temperatures (SSTs) remain below average in the central-eastern equatorial Pacific maintaining the La Niña conditions that have been in place this winter (Figure 4). Regional circulation in both the ocean and atmosphere are also consistent with La Niña conditions at this time. The Climate Prediction Center (CPC) is continuing the La Niña Advisory for the time being. Modeling efforts also continue to predict SSTs remaining below average over the next 30-60 days but then warming and transitioning the Tropical Pacific to ENSO-neutral levels during spring (March to May). The official outlook from numerous agencies affirms this forecast. Models and forecasters are pointing to El Niño developing later in 2023 with the probability currently low through May-July 2023 (44% chance) but increasing thereafter with probabilities in the 53-57% range by late summer.

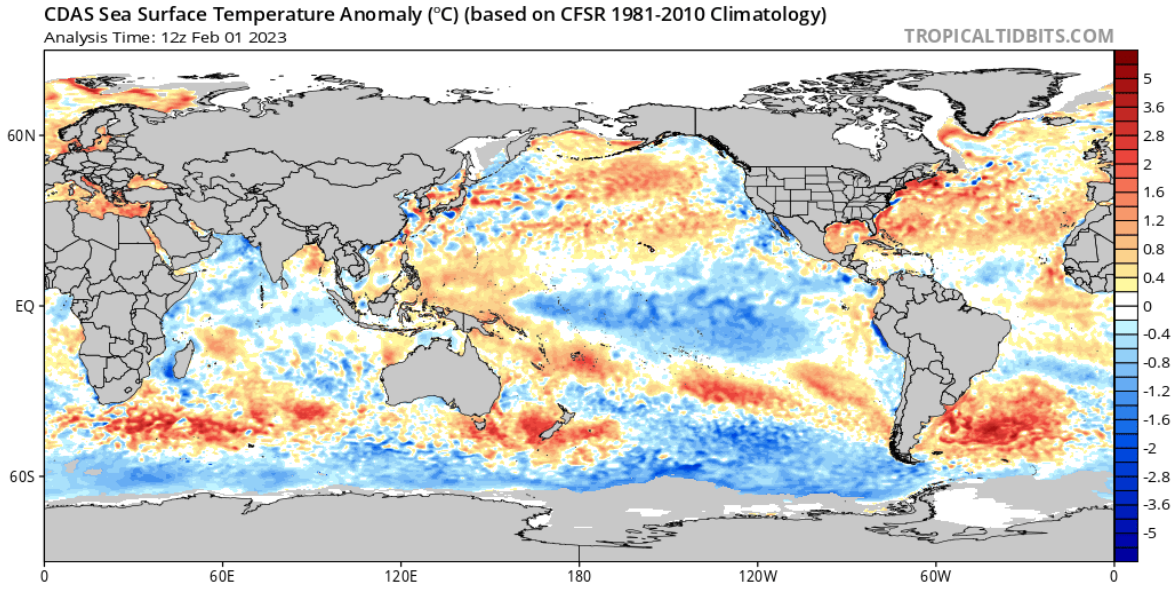

Figure 4 – Global sea surface temperatures (°C) for the period ending February 1, 2023 (image from Tropicaltibits.com).

While the extreme precipitation events of late December and early January in California were not indicative of historic relationships with typical La Niña conditions, they were the result of amplified meridional circulation created from the extreme Arctic blocking event that ushered in the extreme cold of mid to late December. The train of atmospheric rivers was the result. This appears to have subsided, and we are now seeing current patterns (see forecast periods below) that are more typical. As such, La Niña is still contributing to the model forecasts pointing to the PNW likely seeing a cooler/wetter second half of winter and transition to spring, while California is likely to be closer to average over the next few months for both precipitation and temperatures (see the 90-day forecast below).

North Pacific Watch – Negative Pacific Decadal Oscillation conditions (PDO; colder than average SSTs near North America) remain in the North Pacific. The cooler SSTs along the continent are in contrast with the overall pattern continuing to exhibit broad warmer than normal conditions over much of the central to western ocean basin (Figure 4). The cooler near-shore areas have extended southward along the west coast to Baja California. The strong circulation from troughing and the atmospheric river train over the last 30-45 days have helped to mix cooler waters to the surface all along the coast. This pattern continues the strong negative phase in the PDO, where it has been since late 2019. This type of pattern in cooler North Pacific SSTs continues to support the seasonal forecast showing the tendency for a cooler/wetter PNW, transitioning to cool and near average precipitation in northern California and to slightly cool and dry overall during the second half of winter and early spring in most of the rest of California.

Forecast Periods:

Next 5 Days: Seasonally cool with a circulation pattern that will bring multiple frontal passages and rain. The first will pack some high winds into Oregon and precipitation from the Bay Area north into Canada. Temperatures will not be as cold as the past week, with rain on the west side and mountain snow at higher elevations. Less precipitation on the east side of the Cascades into the inland PNW. Bitter cold in the east.

6-10 Day (valid February 6-10): Conditions continue to be favorable for frontal passages into early February with plenty of rain along the coast from northern California into the PNW. Little if any precipitation southward and less in the inland areas. Short term ridging will likely build in toward the end of this forecast period bringing seasonal to cool temperatures across the western US. With the west cool, the east will see quite warm conditions from southerly flow with the eastern seaboard seeing the greatest above average temperatures. For precipitation, the Gulf Coast and southeast are forecast to see a wetter than average period.

8-14 Day (valid February 8-14): Continued seasonal to cool for the western US with flow off the Pacific bringing off and on-again rain and snow through mid-month. Precipitation amounts for the west are expected to be moderate with no large storm events on the horizon at this point. The eastern US is likely to continue seeing much warmer than average temperatures into mid-month. Much of the country is likely to see near-average to above-average precipitation during this period.

30 Day (valid February 1-28): The forecast for February is pointing to the PNW experiencing a cooler than average month with much of the rest of the west likely to be closer to average (Figure 5). Following from the previous forecast periods, the eastern US will likely have a much warmer than average month that extends from the southwest, across the Gulf Coast states, and up along the eastern seaboard. California along with much of Oregon and Washington have equal chances of seeing slightly above to slightly below average precipitation for the month, while the inland PNW and northern Rockies across the northern Plains are forecast to see above average precipitation. The Great Lakes south into the Ohio River valley are also forecast to see a wetter than average month while the southwest across Texas and the Gulf Coast to Florida are forecast to see a drier than average month.

90 Day (valid February-March-April): The seasonal forecast for the western US continues to show the broader patterns expected from a negative PDO and La Niña during the second half of winter and early spring. This includes the odds for cooler than average temperatures across the PNW and into northern California with central to southern California having equal chances of being above to below average. This contrasts with the southwest across much of the south and eastern seaboard which is forecast to see above average temperatures (Figure 5). Precipitation is forecast to continue

above average across the northern tier of states while much of the west coast and Great Basin is forecast to see closer to average amounts of precipitation during the next three months. Higher than average precipitation amounts are also expected in and around the Great Lakes while much drier conditions are forecast for the southern tier of states from the southwest, across Texas, the Gulf Coast states, and Florida (Figure 5). However, over the next three months all forecasting agencies are anticipating relatively large month to month variation from now through the end of April.

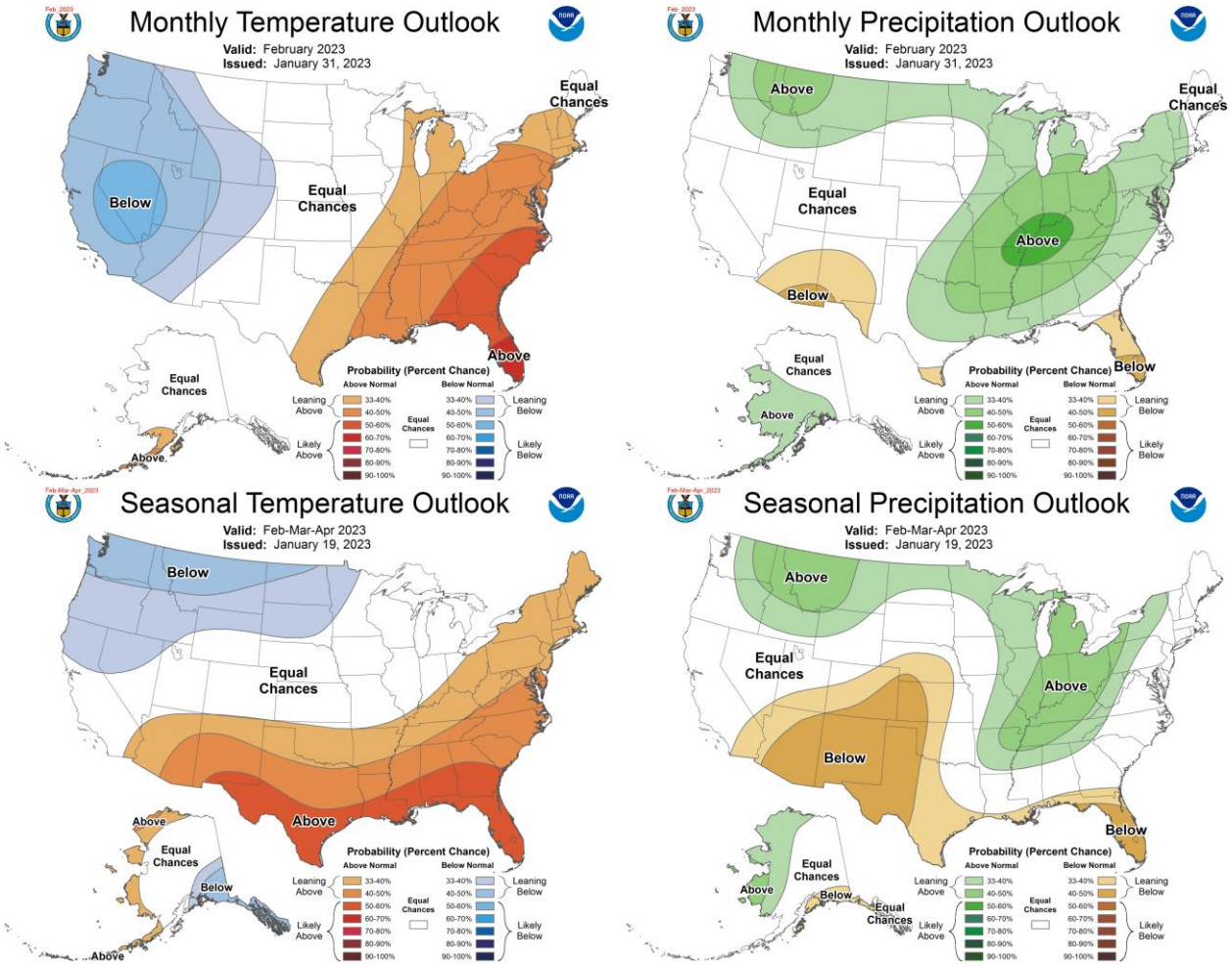

Figure 5 – Temperature (left panel) and precipitation (right panel) outlooks for the month of February (top panel) and February, March, and April (bottom panel) (Climate Prediction Center, climate.gov).

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