Weather and Climate Summary and Forecast
October 2023 Report

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October 2, 2023

Summary:

- September brought generally average to cooler than average[1] temperatures over much of the west coast.
- A shift to a more active trough pattern out of the Gulf of Alaska allowed low pressure areas to bring a wetter than average month to northern California and most of the PNW, while the systems did not reach the rest of California resulting in a very dry month.
- Drought conditions continue in the PNW and southwest. Conditions look good heading into the rainy season for California and the Basin.
- The dominant trough pattern of late September gives way to ridging over the first 10 days or so of October. A bump up in temperatures for pretty much everyone, even quite warm for some inland and southern regions. Dry conditions will allow the PNW to dry out, helping to complete the harvest.
- While mid-October looks potentially wet, the month on balance is forecast to be drier than average in the PNW and closer to average in California. Temperatures are forecast to be normal to above average over much of the western US, especially in the PNW.
- The 90-day forecast transitioning us into the first half of winter is largely holding to typical El Niño effects producing a warmer and drier PNW and slightly cooler and potentially wetter southern tier of states. However, the north and tropical Pacific Ocean basins are out of sync right now with a cold PDO conflicting with the strengthening El Niño. This often means that what we get will be very different from the expected effects. As such I am in a holding pattern on the seasonal forecast until we get a little further into the transition to fall and winter.

Past Month and Year to Date:

Generally cool across most of the west in September with temperatures mostly near average to 1-2°F below average west of the mountains and 1-2°F warmer than average eastward (Figure 1). Much warmer conditions were seen across the southwest and across the Rockies. The cool conditions were largely driven by the dominance of a trough over the west coast during the second half of the month that also brought cloud cover and rain to many. Precipitation amounts for the month were substantially below average south of the trough axis in California, while northern California into the PNW received some substantial precipitation amounts (Figure 1). Early month monsoon flow and thunderstorms brought 200-400% of normal precipitation for portions of the southwest, Great Basin, and Rockies. September was

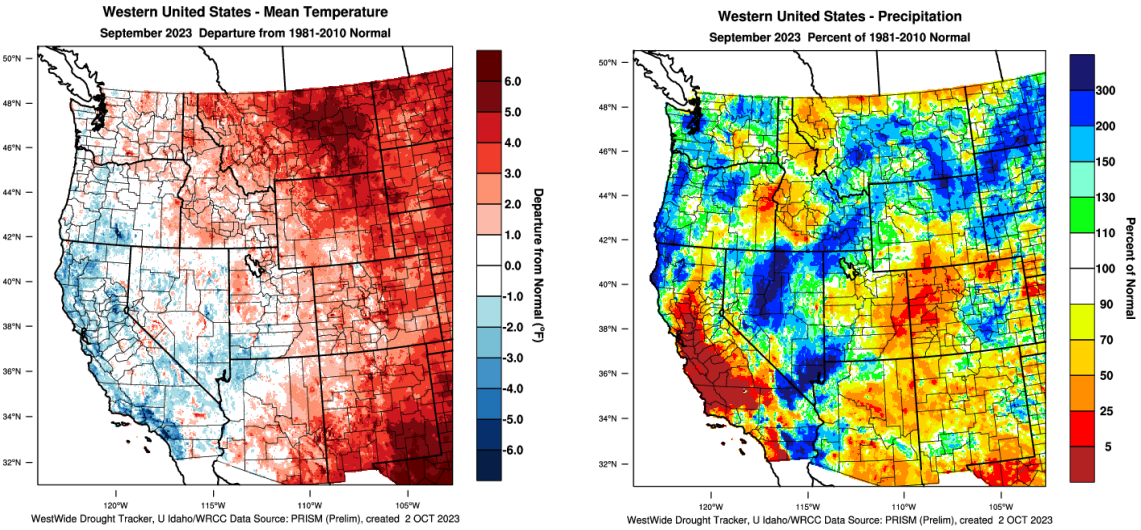

Figure 1 – Western US September 2023 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

[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.

very warm across most of the rest of the country with temperatures running 4-6°F above average across Texas, northward into the Plains, Great Lakes, and New England. Precipitation amounts were mixed across the rest of the US with the northern Plains and the eastern seaboard experiencing a very wet month, while much of the south and Midwest was extremely dry (not shown).

Year-to-date temperatures in the western US continue to show near average to warmer than average temperatures in the PNW (Figure 2). Portions of California are also now closer to average, although the south coast into the Sierra Nevada mountains and across the Great Basin and Rockies has remained cooler than average. Year-to-date precipitation amounts continue to show the dry conditions in the PNW and much of the southwest, while the precipitation amounts during the winter and spring across California and Nevada continue to reflect upwards of 300% of normal for those regions (Figure 2). Most of the northern Rockies and Front Range have also had a wetter than average year-to-date helping to reduce drought conditions in those regions as well. So far, the year has seen strong east-west temperature differences with the west cooler or closer to average and the eastern US running substantially above average (2 to 6°F; not shown). Precipitation amounts year-to-date across the eastern half of the country are spatially mixed with moderately drier than normal conditions experienced in the Plains, much of Texas, portions of the Midwest, and Florida, with the southeast, mid-Atlantic, and New England turning wetter than average due to tropical systems and nor'easters bringing substantial rain in the last 30-45 days (not shown).

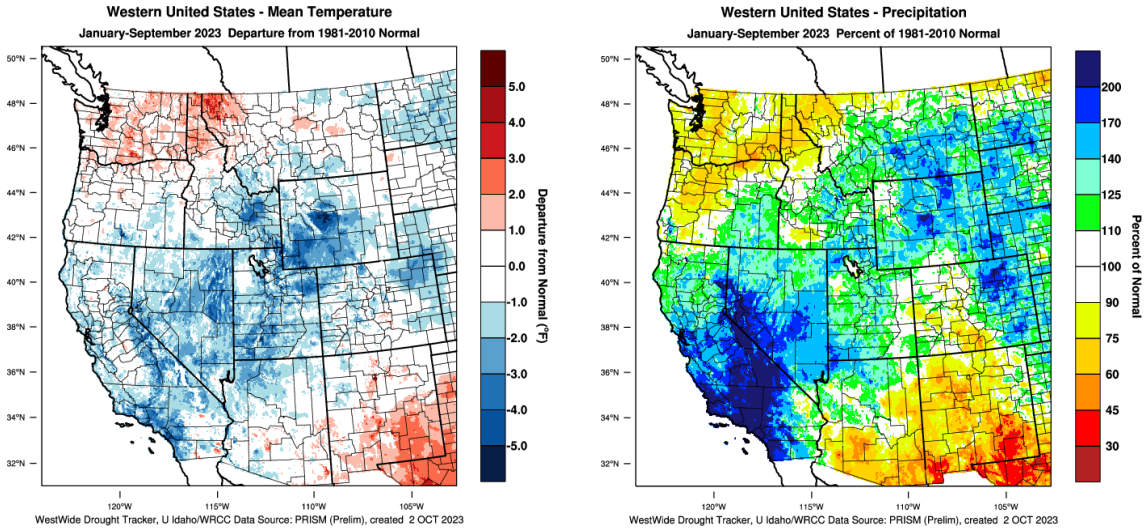

Figure 2 – Western US 2023 year to date (January 1, 2023, to September 30, 2023) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Heat Accumulation:

After a cool September, growing degree-day (GDD) accumulations were smaller than average amounts for the month. Areas in the western valleys of the PNW, growing regions in the eastern basins of Washington and Oregon, and much of the Snake River Valley of Idaho all saw near average to slightly above average GDD for the month of September. For California, scattered areas within the north and central coast zones and much of the central valley saw near average September GDD, but most of the state experienced below average amounts. As such, GDD departures for the western US for March through September remain close to where they were last month, largely higher than average in the PNW and northern states and near average to lower than average in California, Nevada, western Arizona, and areas of the Rockies (Figure 3).

Accumulation in Oregon was near average for the month, with the main weather stations in the main wine producing regions accumulating enough to remain above average over the long-term. Each of the four locations are slightly to substantially above both the 1981-2010 (+11% to +25%) and 1991-2020 (+1% to +22%) climate normals for the March to September period. Eastern Oregon and Washington are running right at or slightly above the 1991-2020 climate normal. Compared to the average of the last 15 years these locations have seen 2-10% more GDD to date and 7-10% over what they accumulated in the same period in the 2022 vintage.

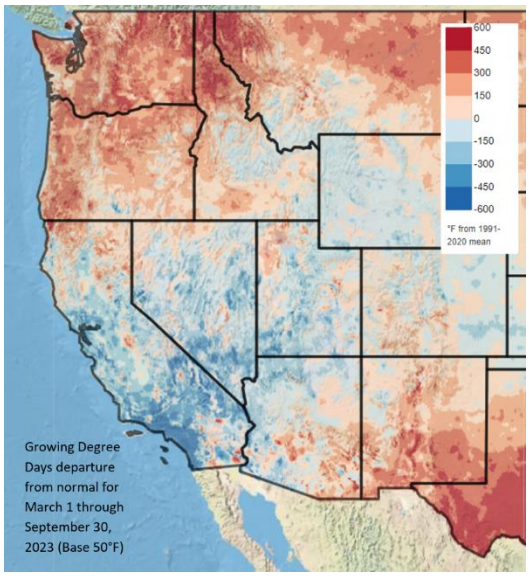

Figure 3 – Western US March through September 2023 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

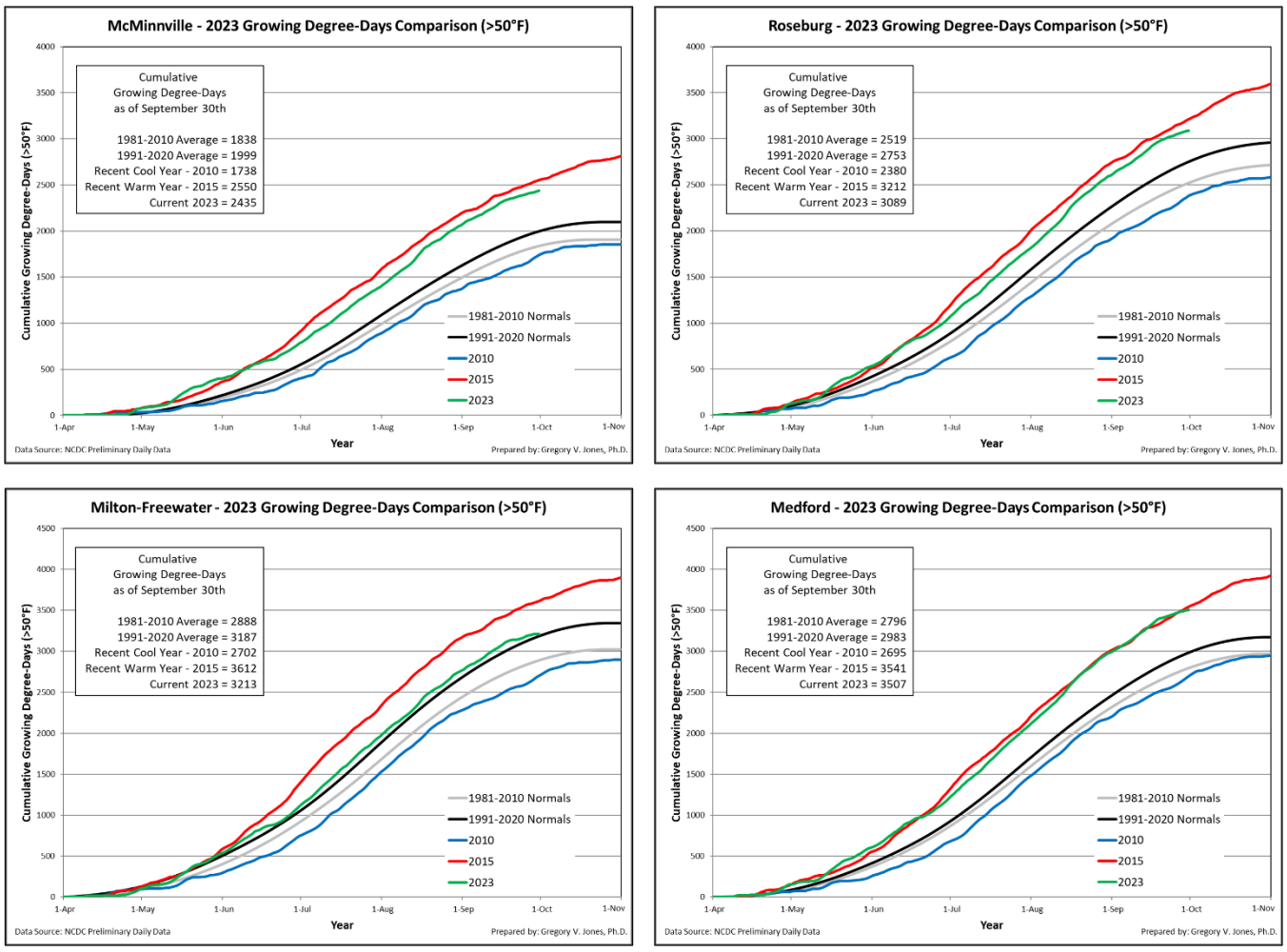

Figure 4 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2023) and a recent cool year (2010), a recent warm year (2015), and both the 1981-2010 and 1991-2020 climate normals are shown (NCDC preliminary daily data).

Drought Watch – Precipitation during the month of September did not alter the overall pattern of drought across the US with the same areas seeing drought from last month: the PNW, central Plains, western Great Lakes, and Four Corners across to Texas, and in the western Gulf Coast states (Figure 5). Across the continental US, the overall drought footprint continues to fluctuate between 50-60% but the most extreme drought categories have risen to just over 10% of the

continental US. For the western US, large regional differences in drought continue and the overall footprint has fallen slightly to 44% while the most extreme categories remain at close to 5%. Washington remains at nearly 95% of the state in some level of drought while the most extreme categories have risen to nearly 10%. Even with a moderately wet month (Figure 1), Oregon has not seen much change remaining at just under 76% of the state in some level of drought and has increased from no areas to nearly 7% of the state in extreme drought categories (severe, extreme, and exceptional). Idaho has continued to drop with just over 25% drought coverage today, with a small area (<1%) in the more extreme categories. September brought little change to California drought concerns with the state remaining at 6% in some level of drought with no areas with the more extreme drought categories (Figure 5).

The big changes in the seasonal drought forecast are for conditions to improve from Texas eastward to the panhandle of Florida (Figure 5, right panel). Additional improvements are forecast along the Oregon and Washington coast, although the inland PNW and areas along the northern border with Canada are forecast to remain in drought into the first part of winter. Portions of the Four Corners and upper Midwest are likely to remain dry during the next three months. California and Nevada along with portions of Arizona, Utah, and much of the Rockies are forecast to remain out of drought into the first half of winter (Figure 5).

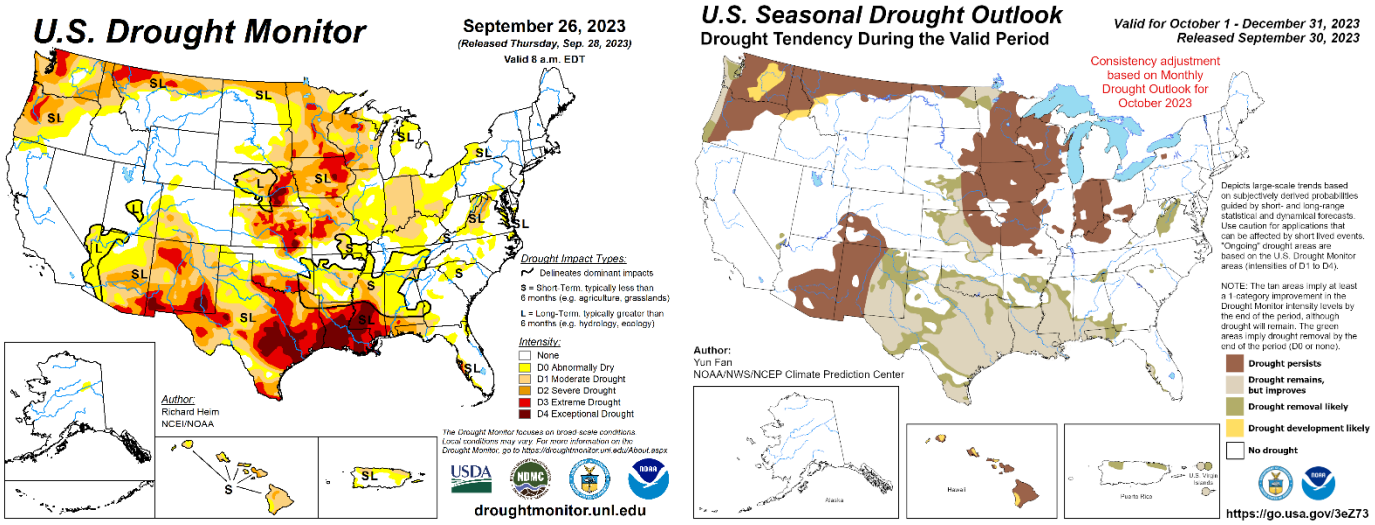

Figure 5 – Current US Drought Monitor and Seasonal Drought Outlook.

ENSO Watch – Strengthening El Niño conditions in the central-eastern Pacific continued over the last month with sea surface temperatures (SSTs) now running nearly 2°F above average in the core ENSO zone (Figure 6). All key ocean and atmosphere variables across the tropics are consistent with moderate El Niño conditions and additional atmospheric factors across the Pacific are starting to sync further with the warmer SSTs. At this time the Climate Prediction Center maintains an El Niño advisory and the vast majority of the models in the ENSO prediction plume continue to forecast that this El Niño event will persist into the North Hemisphere winter (>90%) and that it is highly likely to continue into the early spring of 2023-24 then has a near 60% chance of transitioning to ENSO-neutral by May-July 2024.

North Pacific Watch – While the main ENSO region in the Tropical Pacific has consistently warmed, the last 30-45 days has brought some changes in the pattern in North Pacific sea surface temperatures (SSTs) (Figure 6). The Gulf of Alaska has cooled and spatially now covers a much larger area. This is likely the result of the troughing that set up in the second half of September. While warmer surface water temperatures remain along the coast from southern Canada to Baja, the area has shrunk, and temperatures are not as warm. The plume of cooler SSTs extending from southern Baja to Hawaii has also contracted in overall area and has become less evident along the coast (Figure 6). Even with these changes, the region remains in a strong negative Pacific Decadal Oscillation situation. The combination of cold PDO and El Niño this fall into winter could act to mute the effect of one or the other, I think it will be an interesting winter.

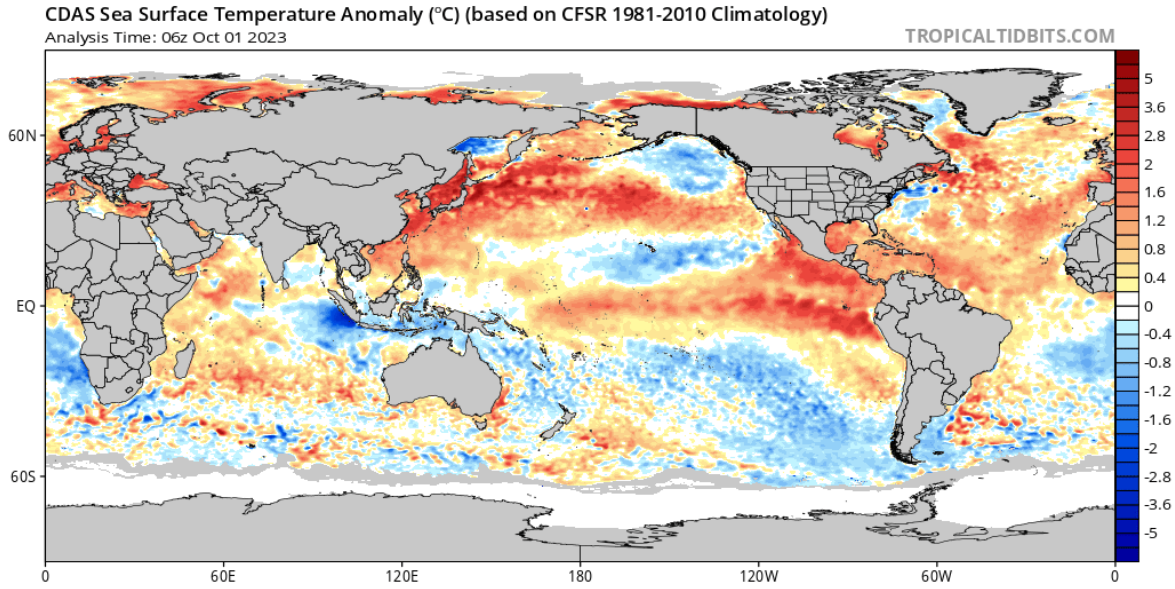

Figure 6 – Global sea surface temperatures (°C) for the period ending October 1, 2023 (image from Tropicaltibits.com).

Forecast Periods:

Next 5 Days: After a very cool end to September, a general warm-up for the western US is in the cards. A trough bringing unseasonably cool conditions in most areas and wet conditions to areas from northern California into the PNW will move out and be replaced by a ridge of high pressure. While there is a slight chance for showers from Oregon north into Canada on Tuesday, everyone will warm up and dry out into next weekend.

6-10 Day (valid October 7-11): Warm up continues into this forecast period with pretty much the entire western US likely to see above average temperatures, with the northern states having the greatest probability. While the west is warm, the eastern US from Texas to New England is forecast to dip below average during this forecast period. While the early part of this forecast period should remain dry, the end of the period is likely to turn wet in the PNW, northern California, and the desert SW. During this period the eastern US from the Great Plains south to the Gulf and along the eastern seaboard is forecast to see below normal precipitation for this time of year.

8-14 Day (valid October 9-15): The forecast for mid-month continues to point to the likelihood of the western US remaining above normal for temperatures, but the greatest probability shifts into the Great Plains, while the eastern US is likely to see near normal to below normal temperatures. For precipitation, mid-month appears to have an even greater probability of being wetter than normal from central California into the PNW where the probability is highest. The desert southwest, Rockies, and a portion of the mid-south should also see near normal precipitation mid-month, while the Gulf Coast to Florida is forecast to see a wet period and the upper Midwest, and Great Lakes to New England is forecast to see below average precipitation.

30 Day (valid October 1-31): The monthly temperature outlook for October shows that most of the country is likely to experience above normal temperatures (Figure 7). The greatest probability is for the northern tier of states, which would typically see this type of start to fall in an El Niño year. For precipitation, the October forecast is pointing to the PNW likely to see below average to near average amounts. A dry first half of the month, followed by a wet mid-month, then dry second half is leading to this forecast. The bulk of the western US is forecast to see above average precipitation for the month, while the eastern US is forecast to see below normal precipitation for October (Figure 7).

90 Day (valid October-November-December): As we move into fall and the first half of the winter, the forecast for the next 90 days is becoming more driven by the developing El Niño conditions in the Tropical Pacific with some additional guidance from the cold PDO that is hanging on in the North Pacific (Figure 6). The current forecast wisdom is holding to the western US likely seeing a warmer than normal start to the season with the greatest probability in the PNW (Figure 7). The middle of the country has equal chances for slightly above to below temperatures during this forecast period while the eastern seaboard and especially New England is forecast to see above average temperatures. The 90 day precipitation outlook is largely showing equal chances for slightly above to slightly below (seasonal) for most of the

middle latitudes of the country (Figure 7). The exceptions are the PNW and portions of the Great Lakes having a greater chance of below average precipitation and the southeast and Florida having a greater chance of above average precipitation.

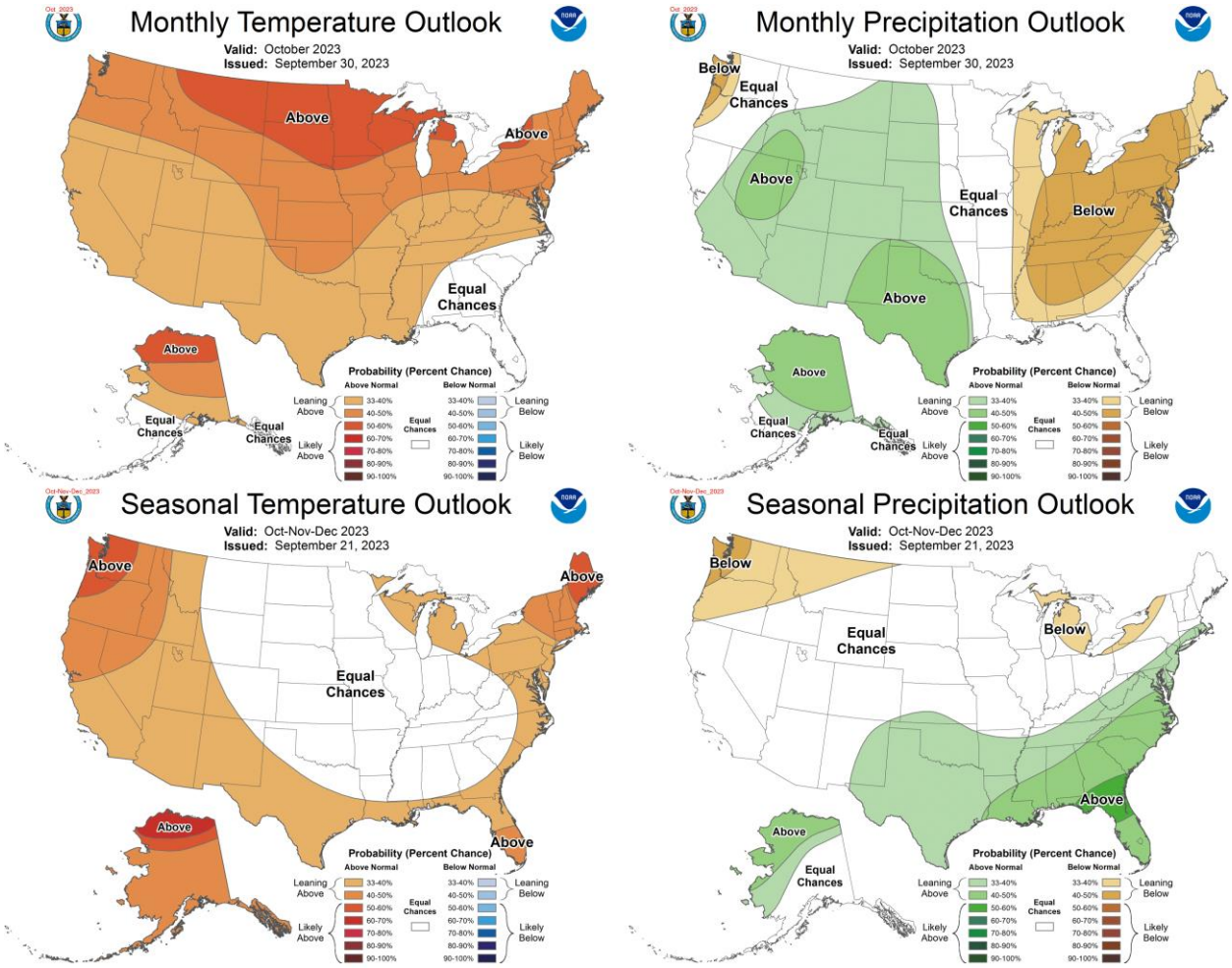

Figure 7 – Temperature (left panel) and precipitation (right panel) outlooks for the month of October (top panel) and October, November, and December (bottom panel) (Climate Prediction Center, climate.gov).

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