Weather and Climate Summary and Forecast
July 2024 Report

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Summary:

- Warmer than average[1] temperatures over most of the western US in June. Cooler across the northern portions of Washington, Idaho, and Montana, with coastal zones near average.
- June was dry for much of the western US, especially across California and the intermountain regions. A wetter than average month was seen in northwestern Oregon and western Washington along with some tropical moisture affecting the Four Corners region.
- Heat accumulation is currently running near average to above average for inland areas of California and Oregon, while coastal zones and much of Washington and the Snake River Valley are below average.
- A ridge of high pressure has taken over much of the western US bringing with it a long-duration heat wave. Not much relief, even at the coast, over the next 7-10 days or more. Minimum temperatures are likely to be elevated to near records.
- No precipitation in the short or long term forecasts for most of the west, except possibly some monsoon flow into the southwest. Increasing dryness and high temperatures are elevating fire weather concerns which will likely be with us from now through the start of fall rains.
- The three-month forecast through September has the western US headed into a likely warmer and drier than average period. Some indication for a cooler and wetter September, time will tell.
- ENSO-neutral is in place in the Tropical Pacific with La Niña likely to develop during late summer to early fall. North Pacific coastal waters have warmed as well. Taken together, a warm summer is more likely, along with what is already an early and more active hurricane season in the Atlantic and Gulf.

Past Month and Year to Date:

June 2024 was dominated by a heat dome over much of the southern, central, and eastern US that resulted in the majority of the country ending up substantially warmer than average. The warmest conditions were seen across California, the Great Basin, Rockies, and Plains (Figure 1; 4-8 degrees above average). Coastal zones of California were closer to average and areas from Washington across the northern tier of states to the Great Lakes saw temperatures 1-3 degrees below average. The heat dome brought significant heat to the eastern US during the second half of June, resulting in the month being 1-4 degrees above average for much of the east (not shown).

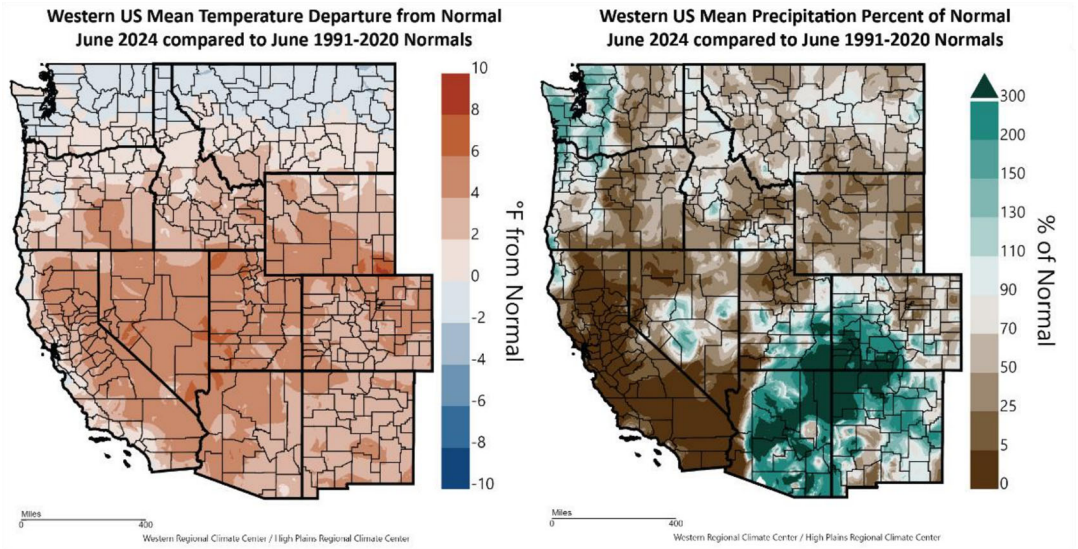

Figure 1 – Western US June 2024 temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps)

[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.

The start of the dry season in the west was just that, mostly dry, but with significant spatial differences (Figure 1). June 2024 was dry over most of California, the Great Basin, the inland areas of the PNW, and northern Rockies with generally less than 50% of average precipitation. However, a sharp transition to a substantially wetter than average month occurred in the southwest and Four Corners region. This was partially due to some early season monsoon flow, but mostly to moisture streaming out of the Gulf of Mexico with an early tropical storm. Western portions of the PNW also had a wetter than normal month with enough frontal passages to bring 110-200% of normal precipitation to northwestern Oregon and western Washington (Figure 1). A dry June was also experienced across the south and into the mid-Atlantic where less than 40% of normal was seen (not shown).

Temperatures year-to-date remain mostly warmer than normal, averaging 0.5-2.0 degrees above average over most of the west but with areas in the southwest and the inland PNW and northern Rockies experiencing temperatures 0.5-2.0 degrees below average (Figure 2). Beyond the cooler areas in the west, the rest of the continental US has been warmer than average year-to-date (not shown). The warmest conditions continue to be seen across the northern Plains, the Great Lakes, the upper Midwest, and New England where temperatures have been 2-8 degrees above average.

Precipitation year-to-date over the western US continues to run between 90-200% of normal (Figure 2). The wettest conditions have been over much of coastal California and especially the south coast, along with much of Arizona. Portions of Oregon and the Great Basin have seen 90-130% of average precipitation so far this year. The driest regions have been across much of Washington and the northern Rockies of Montana and Idaho, which have experienced 50-90% of normal precipitation (Figure 2). It has been a mixed year to date over the rest of the country with extremely dry conditions in west Texas, the central Plains, and portions of the mid-Atlantic and Florida, while wetter than average year to date conditions have been seen across the Great Lakes and into New England (not shown).

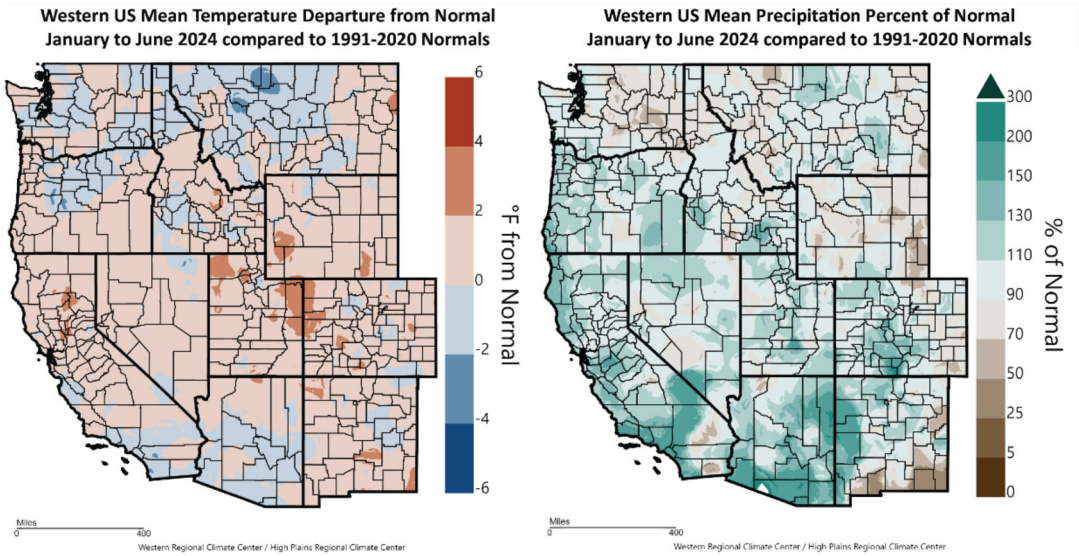

Figure 2 – Western US year-to-date (January 1 through June 31, 2024) temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps).

Heat Accumulation:

A relatively warm month over the western US accelerated growing degree-days (GDDs) to largely above the 1991-2020 average accumulation (Figure 3). However, coastal zones in California are still running behind average GDD as the onshore flow has moderated temperatures along the coast. Areas in southern Arizona and New Mexico are also running below average heat accumulation, while the PNW is mostly near average to slightly below average GDD for the March through June period. In terms of days ahead or behind in accumulation, the data in Figure 3 finds the western US mixed, with the majority of the west running 2-18 days ahead while portions of eastern Washington and Oregon, the Snake River Valley, and the coastal zones of California are running 2-20 days behind normal accumulation amounts (not shown).

Heat accumulation (GDD) amounts for four locations that I have tracked for many years in wine regions in Oregon are continuing to show a cooler inland versus warmer western valley difference. The Willamette, Umpqua, and Rogue

valleys are mostly above both the 1981-2010 and 1991-2020 climate normals for the March through June period, while inland areas in the PNW are 5-25% below average (Figure 4). Compared to the last 15 years, Southern Oregon is 3-5% above average while the Willamette Valley is 7% lower than average and Milton-Freewater is 11% lower than average. Compared to the 2023 vintage at the end of June, the regions range from 9-21% below last year at this time.

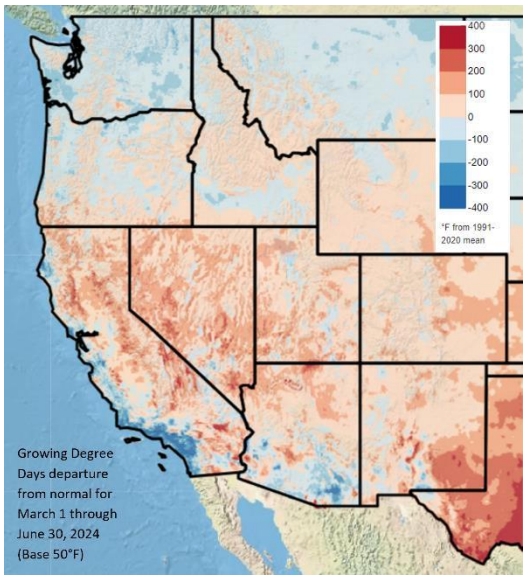

Figure 3 – Western US March through June 2024 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

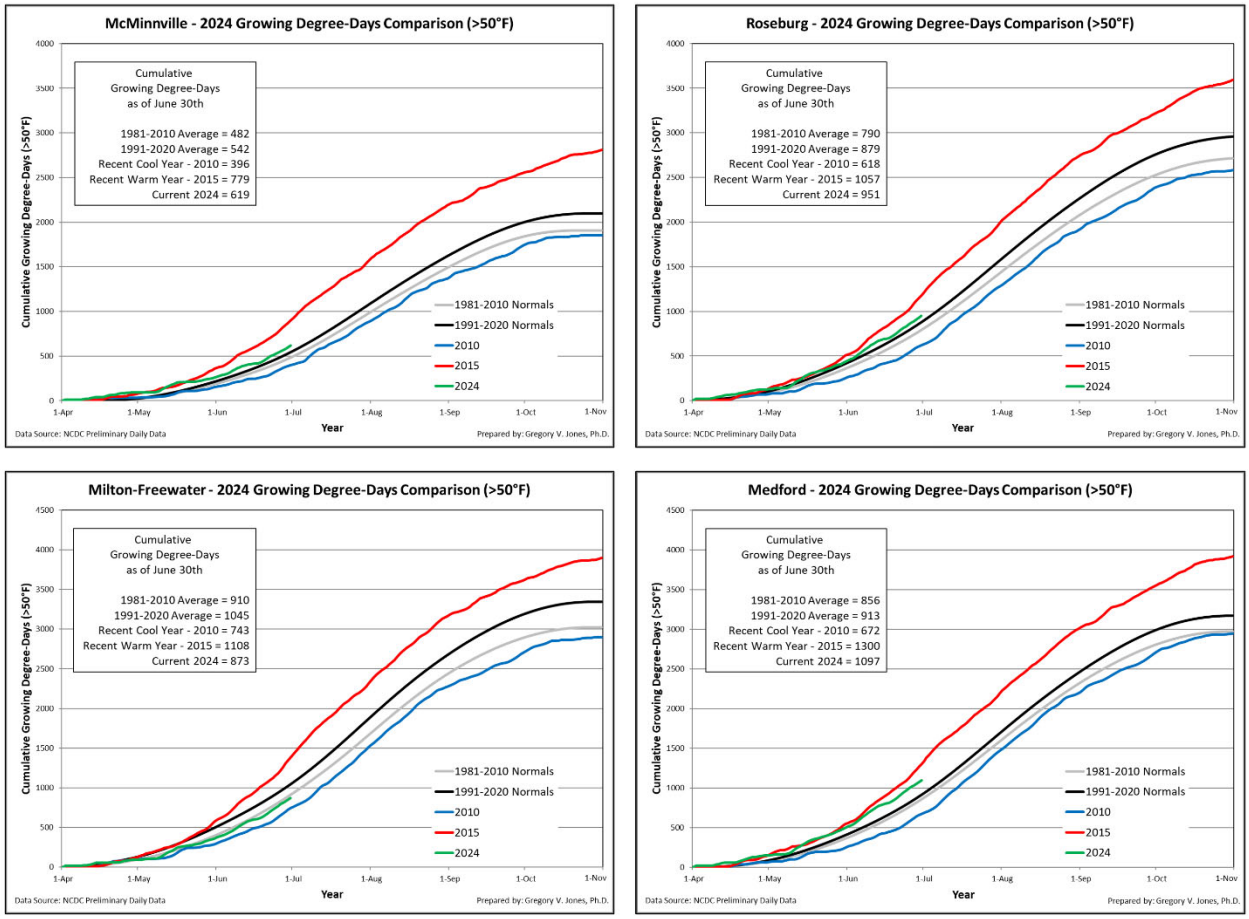

Figure 4 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2024) and a recent cool year (2010), a recent warm year (2015), and both the 1981-2010 and 1991-2020 climate normals are shown (NCDC preliminary daily data).

Drought Watch – June saw little to no rainfall over much of the US, especially in the east. Combined with very warm temperatures in the east, the antecedent dryness, and dry month resulted in rapidly developing drought concerns. Areas across the south and mid-Atlantic have moved into a moderate drought (Figure 5) while existing drought regions either stayed the same or expanded. Even with some tropical moisture inundating areas of Texas, the western portions of Texas and the Four Corners region have remained very dry. Drought and this month's abnormal dryness also expanded or intensified in portions of the northern Rockies and Pacific Northwest. The conditions in June increased the overall drought footprint for the continental US to over 45% in drought with the most extreme drought categories staying under 3%. The drought area in the western US rose to just over 51% with the most extreme categories decreasing slightly to close to 4%. A dry June in the PNW increased drought concerns with Washington seeing an increase to close to 70% of the state in drought and a move to nearly 4% of the state in moderate to extreme drought. All but the northwestern areas of Oregon were drier than normal in June (Figure 1) increasing the state's drought footprint to nearly 30%, but none in the more extreme drought categories. For Idaho, a dry June furthered drought concerns with the northern portion of the state and neighboring Montana mostly in moderate to severe drought. As a state, Idaho is close to 49% in some level of drought with nearly 6% in moderate to extreme drought. All but the extreme northwest of California experienced a drier than average month (Figure 1), but antecedent conditions have kept the state below 3% in some level of drought with no areas in the more extreme categories (Figure 5).

Looking at the second half of summer, the seasonal drought outlook shows expanding areas of potential drought (Figure 5; right panel). Areas of concern include much of the mid-south and into the mid-Atlantic region and the southern Plains. The areas with more prolonged drought are forecast to expand, these include Texas, New Mexico, the Four Corners, and the southern Rockies along with much of the northern Rockies and Plains in Montana and Wyoming. Oregon, Washington, and Idaho are forecast to see some areas develop further into drought as the summer progresses.

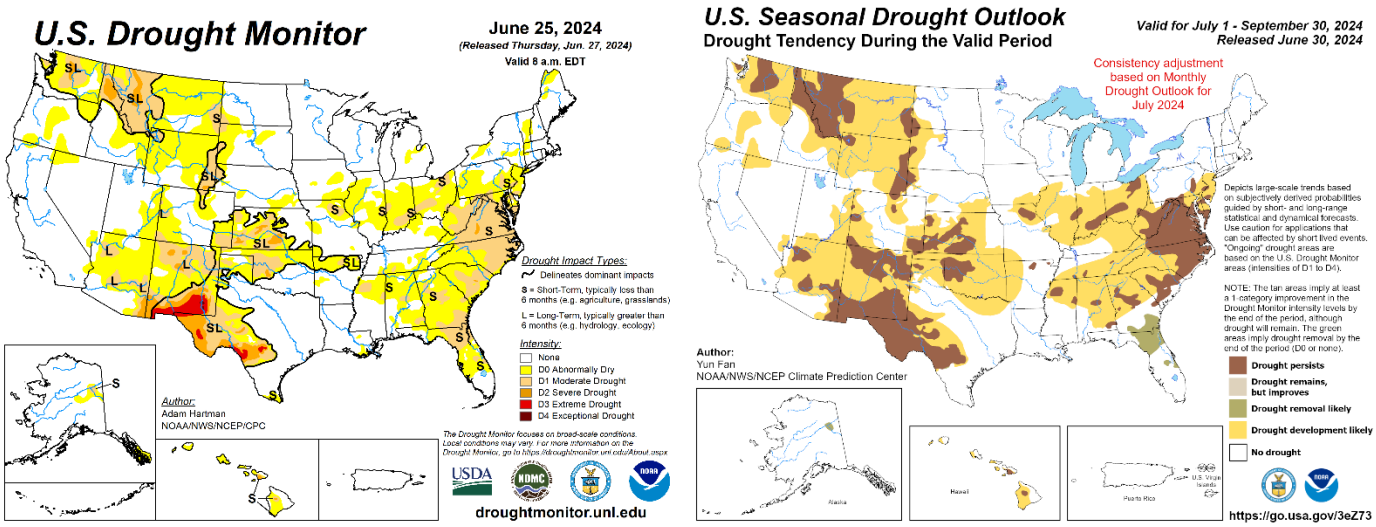

Figure 5 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – ENSO-neutral conditions are present in the Tropical Pacific. Similar to last month, above average equatorial sea surface temperatures (SSTs) continue in the western and central Pacific Ocean while below average SSTs continue to emerge in the east-central to eastern Pacific Ocean (Figure 6). Other characteristics of the atmosphere and ocean remain close to what is expected from ENSO-neutral conditions. The Climate Prediction Center (CPC) and numerous other agencies are forecasting that ENSO-neutral will continue during the summer and then is forecast to develop into La Niña during July through September (65% chance) and persist into the Northern Hemisphere winter (85% chance during November 2024 to January 2025). This status and forecast continue to drive 1) the 2024 forecast for the US this summer (Figure 7), 2) the Atlantic and Gulf of Mexico hurricane season, which has seen an early start with strong named systems already, and 3) global temperatures which are anticipated to moderate in the second half of the year. However, I am not too confident that La Niña will lower what appears to be a record warm year, again.

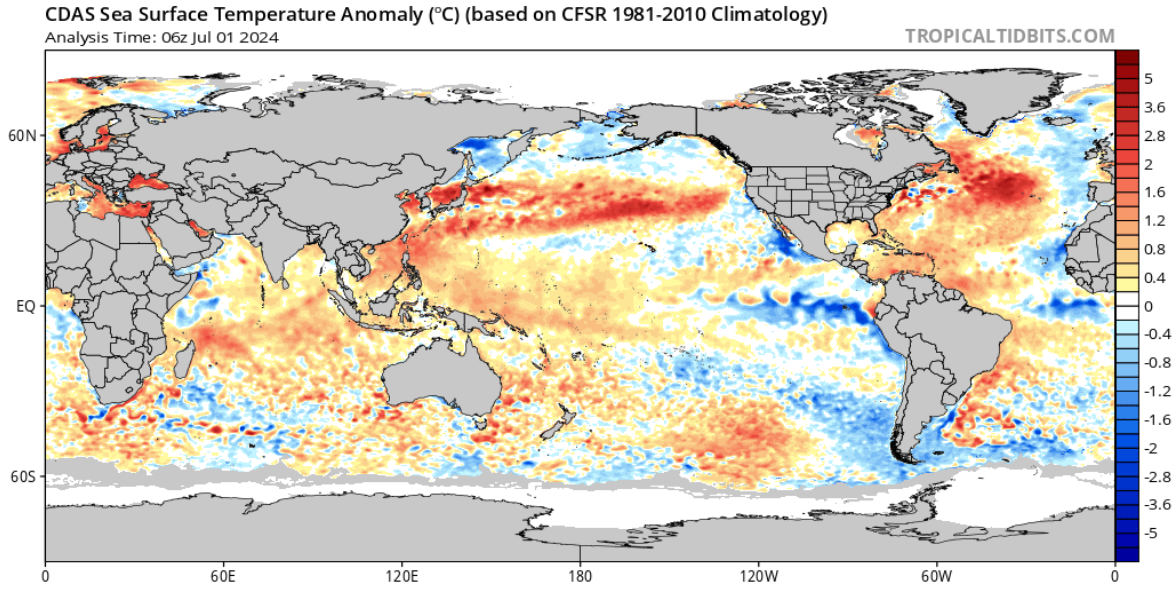

Figure 6 – Global sea surface temperatures (°C) for the period ending July 1, 2024 (image from Tropicaltibits.com).

North Pacific Watch – The overall pattern of SSTs in the North Pacific has not changed much over the last month. A broad pattern of warm surface temperatures continues over the central North Pacific extending from Japan to the west coast (Figure 6). Cool SSTs continue to be found off California south to central Mexico, however, the spatial range has declined while warming slightly during June. The Gulf of California has remained very warm compared to average. This pattern of SSTs has the Pacific Decadal Oscillation (PDO) remaining in a negative phase. As mentioned for the past few months, the cooler SST anomalies, along with a more north-south extended jet stream over northwestern North America, have likely supported the slightly cooler past few months over portions of the west. This effect will likely decline during the second half of summer, which appears headed to moderately warmer than average conditions (see Forecast below).

Forecast Periods:

Next 5 Days: The end of June saw a ridge build over the west that will dominate the weather over the next ten days or so. As such the heat is on for much of the western US. While high temperatures are likely to push to over 100 for most inland and even coastal areas, record-breaking highs will not be the signature of this heat event but the length of time that the heat wave stays in place will be.

6-10 Day (valid July 6-10): The ridge will continue to dominate during this forecast period with a high probability that the entire west will experience much warmer than normal temperatures. Some relief is possible along the coast, but warmer than normal there as well. Warm conditions give way to cooler conditions in the upper Midwest from a trough dipping down out of Canada. Temperatures are likely to remain above average across the south and along the entire eastern portion of the country. Below average precipitation is forecast across most of the west, while the south and east are likely to see above average precipitation, especially in south Texas where tropical moisture moving onshore is likely.

8-14 Day (valid July 9-15): Not much change moving into mid-month with the ridge over the west continuing to bring a high probability of warmer than average temperatures. Possibly more coastal relief as the ridge moves slightly eastward and pulls cooler air onshore. The rest of the country is forecast to see near normal (south Texas) to above normal temperatures during mid-month. In terms of precipitation, the PNW is likely to stay drier than average, while much of California will be near normal, which at this time of year is simply dry. Monsoon moisture is forecast for the southwest and tropical moisture in south Texas will likely bring above average precipitation during this period.

30 Day (valid July 1-31): The forecast of the overall month of July is calling for warmer than average for the vast majority of the country (Figure 7). The exception is across the northern Plains and Great Lakes where there are equal chances for above average, normal, or below average temperatures. The July precipitation forecast for the western US follows what we normally see this time of year, our seasonally dry summer. The greatest probability for a drier than average month is centered over the PNW while the rest of the west has equal chances for above average, normal, or below average

precipitation. The June precipitation forecast for the rest of the country is pointing to a likely dry central to southern Plains and a wetter than average Great Lakes and coastal zones from south Texas to New England (Figure 7).

90 Day (valid July-August-September): A warm summer is forecast for much of the US with the warmest conditions likely over the Four Corners, intermountain west, and along the Gulf Coast and east coast (Figure 7). Coastal zones in the west have equal chances of above average, normal, or below average temperatures that is likely being driven by cooler coastal zone ocean temperature and moderate onshore flow potential. The summer precipitation forecast has the western US likely seeing below average amounts from the southwest, into the Rockies, and northern Plains, while California, Oregon, and Washington have equal chances of above to below average rainfall. Much of the country has a 90-day forecast of equal chances of above to below precipitation, with the Gulf Coast and southeast more likely to see above average precipitation (Figure 7).

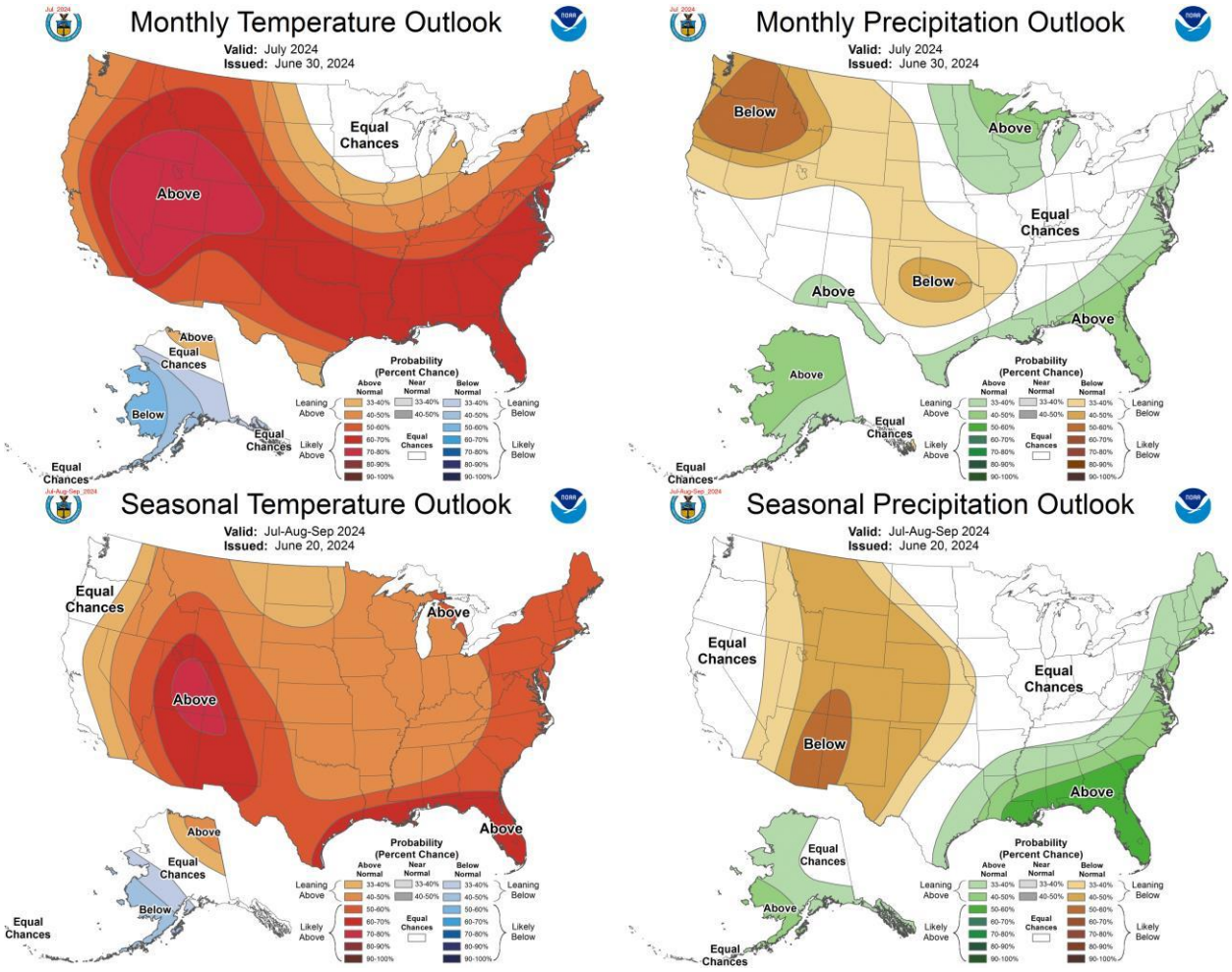

Figure 7 – Temperature (left panel) and precipitation (right panel) outlooks for the month of July (top panel) and July, August, and September (bottom panel) (Climate Prediction Center, climate.gov).

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