

Weather and Climate Summary and Forecast

June 2024 Report

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Summary:

- Average to cooler than average¹ temperatures in May across most of the western US. Exceptions were a warmer than average month in central to northern California and portions of the southwest.
- It was a mostly dry month of May for much of the western US. A wetter than average month was experienced from northwest California into Oregon and across much of Montana.
- Snowpacks remain robust in much of the Rockies and near average in northern Oregon and portions of the Sierra Nevada mountains. In contrast, lower than average snowpacks are seen across the northern areas of Montana, Idaho, and most of Washington.
- Zonal flow and rain for the PNW and mild temperatures and dry south into California to start the month. The forecast has a ridge dominating for the rest of the month, tilting the odds to a warmer than average June over most of the west. The exception may be coastal California where cold offshore ocean temperatures may facilitate a stronger than normal marine layer resulting in slightly cooler coastal temperatures.
- The dry season has started, but thunderstorm potential increases in the forecast for much of the interior west, while northwestern Washington will likely continue to see frontal rains for a portion of the month.
- Moving out of a coolish start to the growing season, the 90-day seasonal forecast has the western US headed into a likely warmer and drier than average summer.
- El Niño is likely to shift to neutral over the next month with La Niña developing during late summer to early fall. As such the seasonal models are favoring a warmer summer for much of the US, along with a more active hurricane season in the Atlantic and Gulf.

Past Month and Year to Date:

May 2024 ended up close to what was forecasted for most of California and coastal areas of Oregon but was much colder than forecasted over the inland PNW, the Great Basin, and northern Rockies (Figure 1). A warmer than average month was experienced over northern California, south into the central valley, and into portions of the southwest. Cooler than average temperatures ranging from 2-4 degrees were experienced in the central portions of the west. While the west was mostly cool in May, the entire eastern US saw much warmer than average conditions from the Rockies and Plains eastward with temperatures 2-6 degrees above average (not shown).

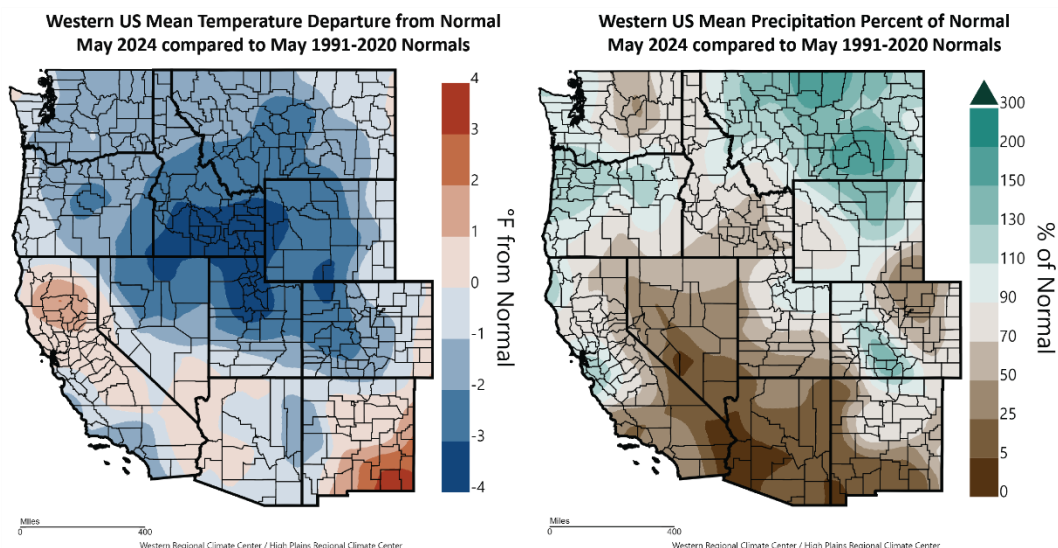


Figure 1 – Western US May 2024 temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps)

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.

May 2024 was mostly dry over the western US with the southwest, southern California, Nevada, Idaho, and eastern Washington running between 5-80% of average (Figure 1). The exceptions were in the Bay Area and northern California, portions of Oregon and western Washington, and most of Montana where 110-200% of normal occurred in May. A dry month was also experienced across southwestern Texas and into the north-central Plains, portions of the Great Lakes states, and into New England. While west Texas was very dry, extreme rainfall across eastern Texas led to severe flooding. A wetter than average month was also experienced across the Gulf Coast and into the southeast (not shown).

Year-to-date conditions over the western US continue to be mixed but have averaged mostly warmer and wetter than normal (Figure 2). Temperatures have been warmer than average across an area from central to northern California, southwestern Oregon, into Idaho, the Great Basin, and the Rockies (1-3 degrees higher than normal). A cooler than average first five months of the year has been seen in north-central Oregon, central Montana, and across southern California and much of Arizona where temperatures have been 1-3 degrees below normal. Except for the cooler areas in the west, the majority of the continental US has been warmer than average year-to-date (not shown). The warmest conditions have been seen across the northern Plains, the Great Lakes, the upper Midwest, and New England where temperatures have been 2-8 degrees above average. The Gulf Coast and southeastern US have been running slightly above average for the first four months (0.5-2.0 degrees).

Overall, the year-to-date precipitation amounts in the western US continue to be largely 90-200% of normal (Figure 2). The wettest conditions include much of coastal California and especially the south coast, along with much of Arizona, Oregon, and the Great Basin. 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). Mountain snowpacks are in the big melt with Washington and northern basins at the lowest levels for this time of year (<75%) while portions of the Rockies have 120-300% of normal for the start of June. For the rest of the country, the year-to-date has been largely wetter than average although areas across west Texas, New Mexico, and the southern Plains remain dry (not shown), contributing to the ongoing drought in the region (see Drought section below).

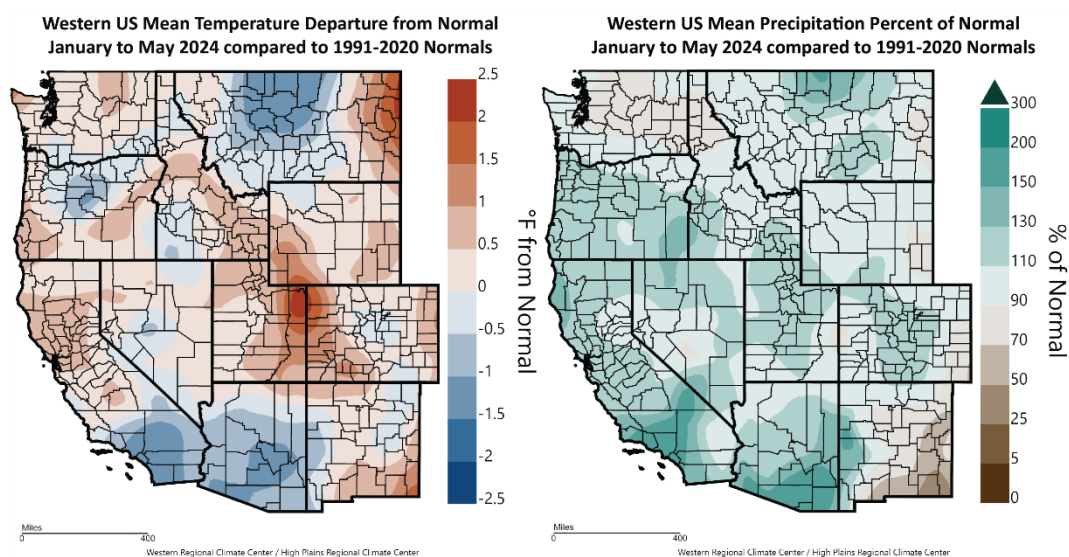


Figure 2 – Western US year-to-date (January 1 through May 31, 2024) temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center, 2024: ACIS Climate Maps).

Heat Accumulation:

Growing degree-days (GDDs) over the western US from March through the end of May 2024 is running slightly above to moderately below the 1991-2020 average accumulation (Figure 3). The central coast and southern California across into the southwest continue at much lower than average accumulation for the early part of the season. Scattered areas in central to northern California, southern Oregon, and across the PNW have accumulated slightly more than average, but the numbers overall are generally within +/- 10% of normal accumulation. Converting the mapped data in Figure 3 to days ahead or days behind normal finds the western US with a mixed bag with 2-10 days ahead in central to northern California up into southern Oregon and portions of the western valleys of the PNW and with the inland PNW and the central coast to southern California regions 5-24 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 showing an inland versus western valley difference with the Willamette, Umpqua, and Rogue valleys mostly above both the 1981-2010 and 1991-2020 climate normals for the March through May period, while inland areas in the PNW are 5-25% below average (Figure 4). Compared to the last 15 years, all areas are slightly below average, and compared to 2023 the regions are currently 15-35% below last year at this time.

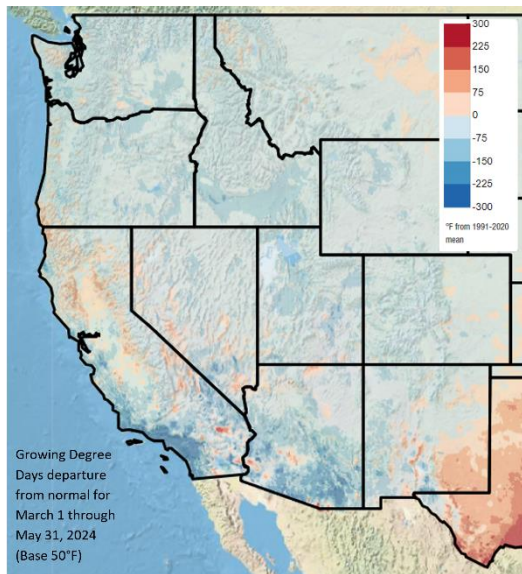


Figure 3 – Western US March through May 2024 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

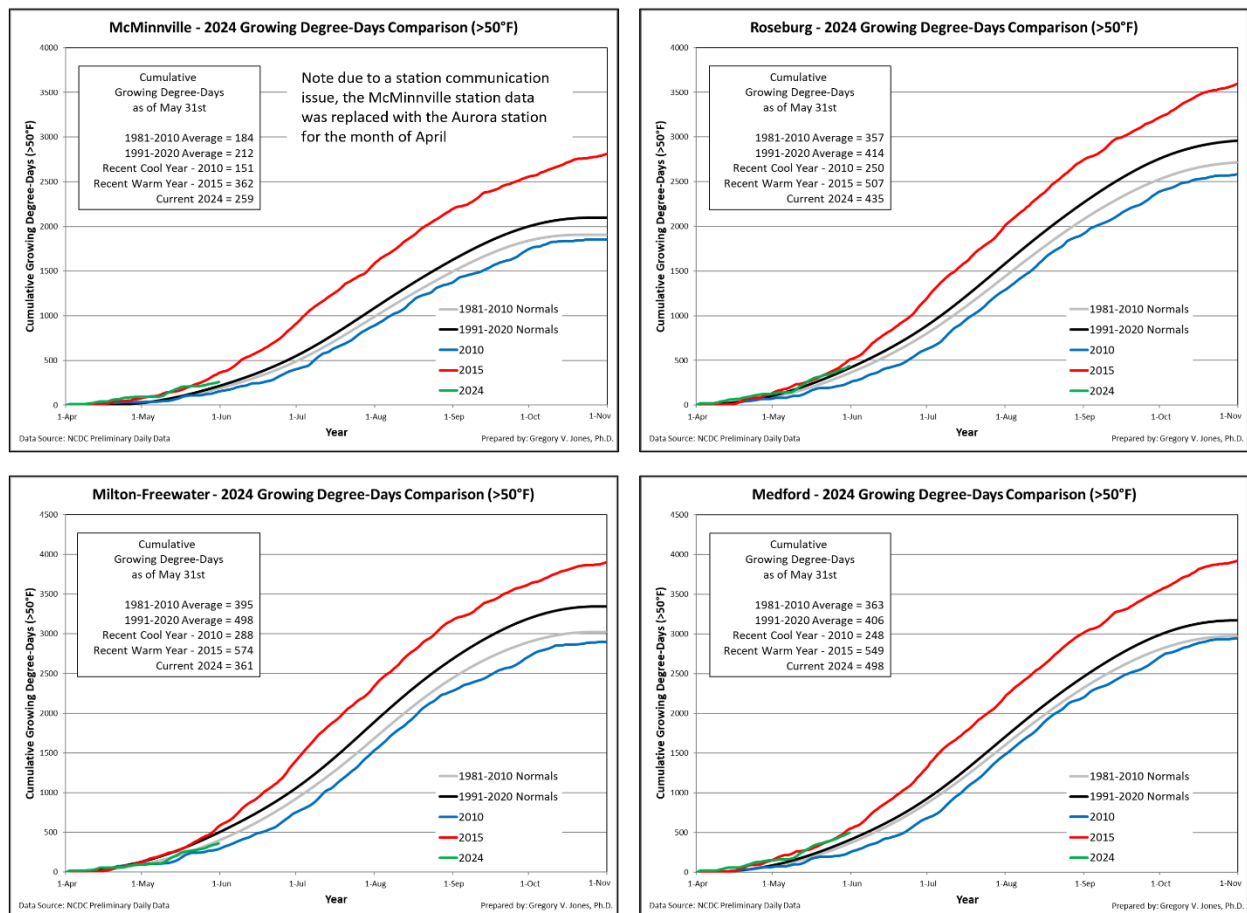


Figure 4 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2024) and a recent cool year (2010), a recent warm year (2015), and both the 1981-2010 and 1991-2020 climate normals are shown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

Drought Watch – Over the last month the most widespread improvements were made to portions of the Midwest and in eastern parts of the High Plains and South, where above-normal precipitation was observed this past week. Dry conditions continued across the western portions of Texas and the Four Corners region, with increasing drying occurring in parts of the western Plains and Florida Peninsula (Figure 5). Drought and abnormal dryness also expanded or intensified in portions of the northern Rockies and Pacific Northwest. Overall, the month saw the overall drought footprint for the continental US lowered to roughly 27% in drought with the most extreme drought categories dropping to close to 4%. For the western US, the current drought area dropped slightly again in May to just under 40% with the most extreme categories decreasing slightly to just below 6%. A relatively dry May in the PNW increased drought concerns with Washington seeing an increase to 65% of the state in drought, but no areas worse than moderate drought. A wetter May in Oregon (Figure 1) lowered the state’s drought footprint to close to 12% and removed all extreme drought conditions. For Idaho, a relatively dry month of May kept the northern portion of the state and neighboring Montana in moderate to extreme drought (9% in Idaho), however, the rest of the state has remained at under 30% in some category of drought. Even with a relatively dry month of May for most of California (Figure 1) the state has continued its drop in drought area with just over 1% of the state being abnormally dry (isolated to the southeast along the border with Arizona (Figure 5).

The seasonal drought outlook through August continues to show concerns in some areas and much better conditions for others (Figure 5; right panel). The middle of the country east to the Atlantic coast is now forecast for drought improvement or complete removal. Texas, New Mexico, and the southern Rockies are forecast to see the overall drought footprint increase into summer, which would be expected given the shift to La Niña that is anticipated (see forecast section below). Oregon is forecast to remain drought free, however, most of Washington across northern Idaho and into the Rockies are forecast to see drought conditions persist and develop further over the region.

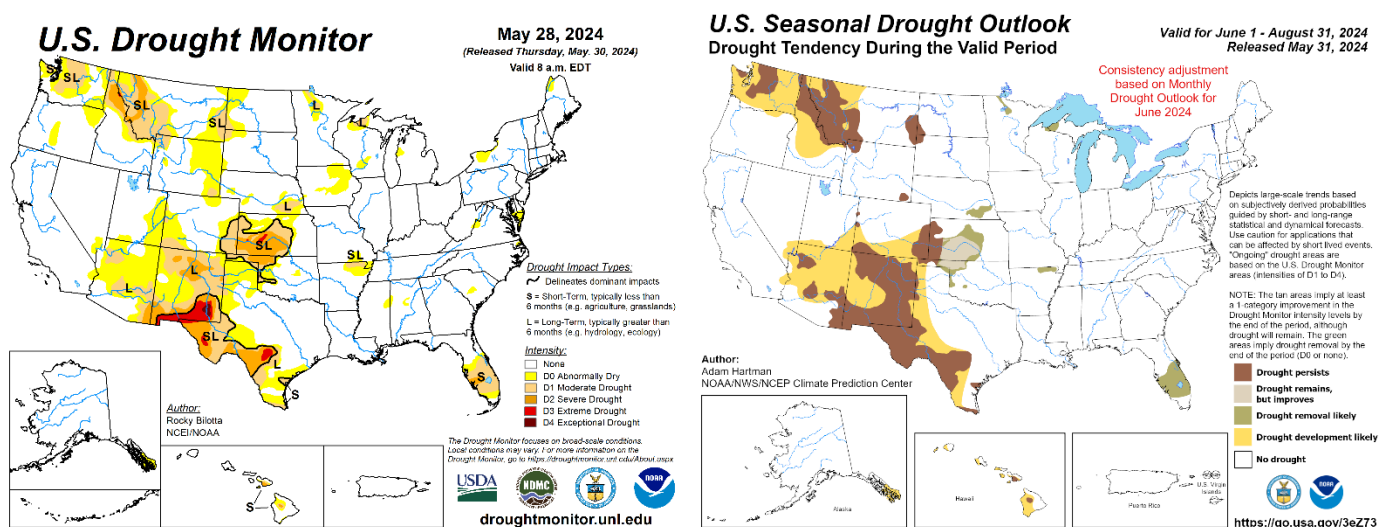


Figure 5 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – El Niño conditions in the central-eastern tropical Pacific continue to transition toward ENSO-neutral. Above average equatorial sea surface temperatures (SSTs) in the western and central Pacific Ocean and below average SSTs continue to emerge in the east-central to eastern Pacific Ocean (Figure 6). Key variables in the atmosphere and ocean are also showing signs of a shift to more neutral conditions. The Climate Prediction Center (CPC) and numerous other agencies are forecasting that the current El Niño will continue to weaken over the month of June with a 49% chance of La Niña developing during June through September or 69% during July through September. The ongoing shift to ENSO-neutral and later in the summer/fall to La Niña in the tropical Pacific is driving much of the 2024 forecast for the globe and the US. Typically, El Niño conditions add to warmer temperatures globally and have dominated the conditions so far in 2024 but the shift to La Niña is forecast to lower global temperatures slightly in the second half of 2024. For the US, the shift to La Niña is correlated with the development of a semi-permanent ridge over the middle of North America which should bring a hot and dry summer, as discussed in the forecast section below and shown in Figure 7.

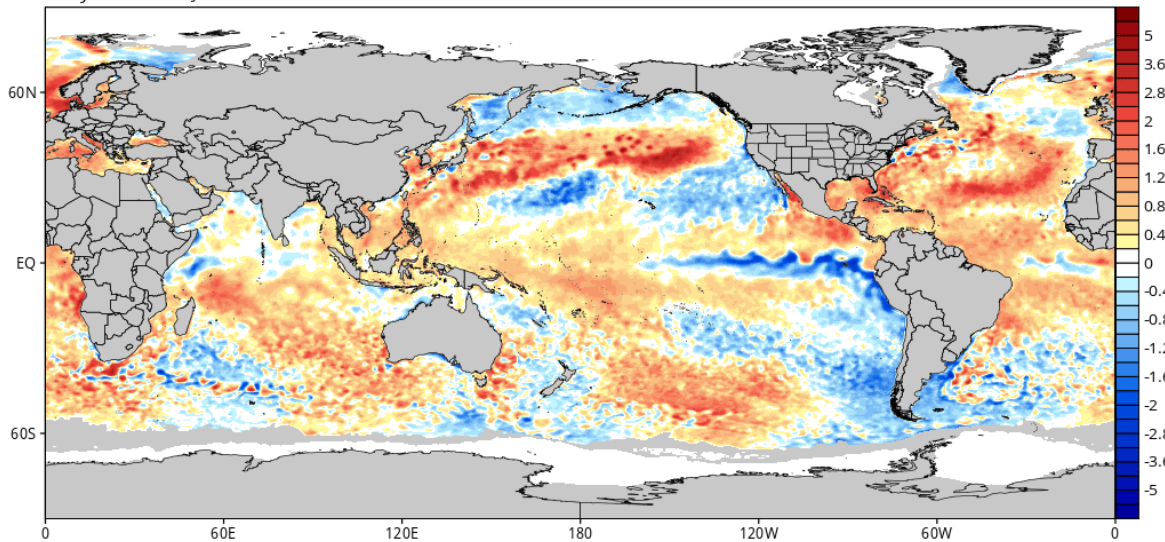


Figure 6 – Global sea surface temperatures (°C) for the period ending June 1, 2024 (image from Tropicaltidbits.com).

North Pacific Watch – Changes in SSTs in the North Pacific over the last month include broad warming over the central North Pacific that now extends from Japan to the west coast (PNW and Canada, Figure 6). From California south to central Mexico, the SSTs have cooled over the last month, while the Gulf of California has warmed substantially. Even with these changes, the overall pattern of SSTs continues with the Pacific Decadal Oscillation (PDO) in a negative phase, although is lower than it has been over the last 18-24 months. As mentioned last month, the cooler SST anomalies, along with a more north-south extended jet stream, have likely supported the cooler spring we have experienced in the west. However, this appears likely to wane over the next few months (see Forecast below).

Forecast Periods:

Next 5 Days: Shift to zonal flow will bring 2-3 days of rain, possibly heavy, and cool temperatures to the PNW over the first few days of the month. California will remain dry, but mild during this period. By mid-week a ridge builds from the south ushering in a very warm period with 100+ degrees for inland areas of California and the southwest. This ridge will expand north bringing 80s to 90s to much of the PNW.

6-10 Day (valid June 7-11): The ridge developing in the west will expand during this forecast period bringing an above average probability for warm temperatures. The probability is greatest in the inland PNW but extends over the entire western US. The precipitation forecast for the western US during this forecast period is pointing to likely dry in the PNW and above average chances in California and the Four Corners due to thunderstorm potential coming with the warm-up. With the ridge dominating the west, north-south flow will cover most of the eastern US with the forecast pointing to likely seasonally cool for most except along the Gulf Coast, Florida, and the southeast coast. The forecast for precipitation in the east is dry to normal for most, except in New England where above average precipitation is forecast for this period.

8-14 Day (valid June 9-15): The general pattern with a ridge dominating the west and a trough over the east continues. As such, warmer than average temperatures are likely over most of west with the greatest probability in the inland PNW. Closer to normal temperatures are likely over the southwest as early monsoon flow is possible. The precipitation forecast for the west heading into the middle of the month is mostly pointing to above average due to thunderstorms potential, however, note that we are heading into the dry season, so any amount is more than normal. For the eastern US the general forecast is much the same from the last period with cooler than average temperatures most everywhere except along the Gulf across to Florida and the southeastern coast. The precipitation forecast for the east is mostly pointing to near normal amounts to slightly above average in New England and Florida.

30 Day (valid June 1-30): The June forecast has most of the western US with an above average probability for a warmer than average month (Figure 7). The exception in the west is coastal zones from southern to northern California where cooler offshore ocean temperatures will likely contribute to persistent marine layers leaving the area near normal to

equal chances of below to above average conditions. The precipitation forecast for the western US appears to have much of the same with equal chances of above to below precipitation for much of the region, except portions of the far northwest where a wetter than normal month is forecast and the northern Rockies where drier than average conditions are forecast. The eastern US forecast is likely to see a warmer than average month, especially the Great Lakes region to northern New England and from Texas across the south. The June precipitation forecast is not very telling across the rest of the country with the southern Plains, Mississippi River valley, and New England having a decent chance for a wet month, while everywhere else has equal chances of above to below average precipitation (Figure 7).

90 Day (valid June-July-August): The three-month forecast into June, July, and August is holding to the majority of the country likely seeing a warmer than average start to summer (Figure 7). The area from the southwest up into the inland PNW has the greatest probability of a warmer 90-day period while a portion of the northern Plains will likely be closer to average. The three month precipitation forecast has the western US likely seeing below average amounts, while portions of California and the southwest 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).

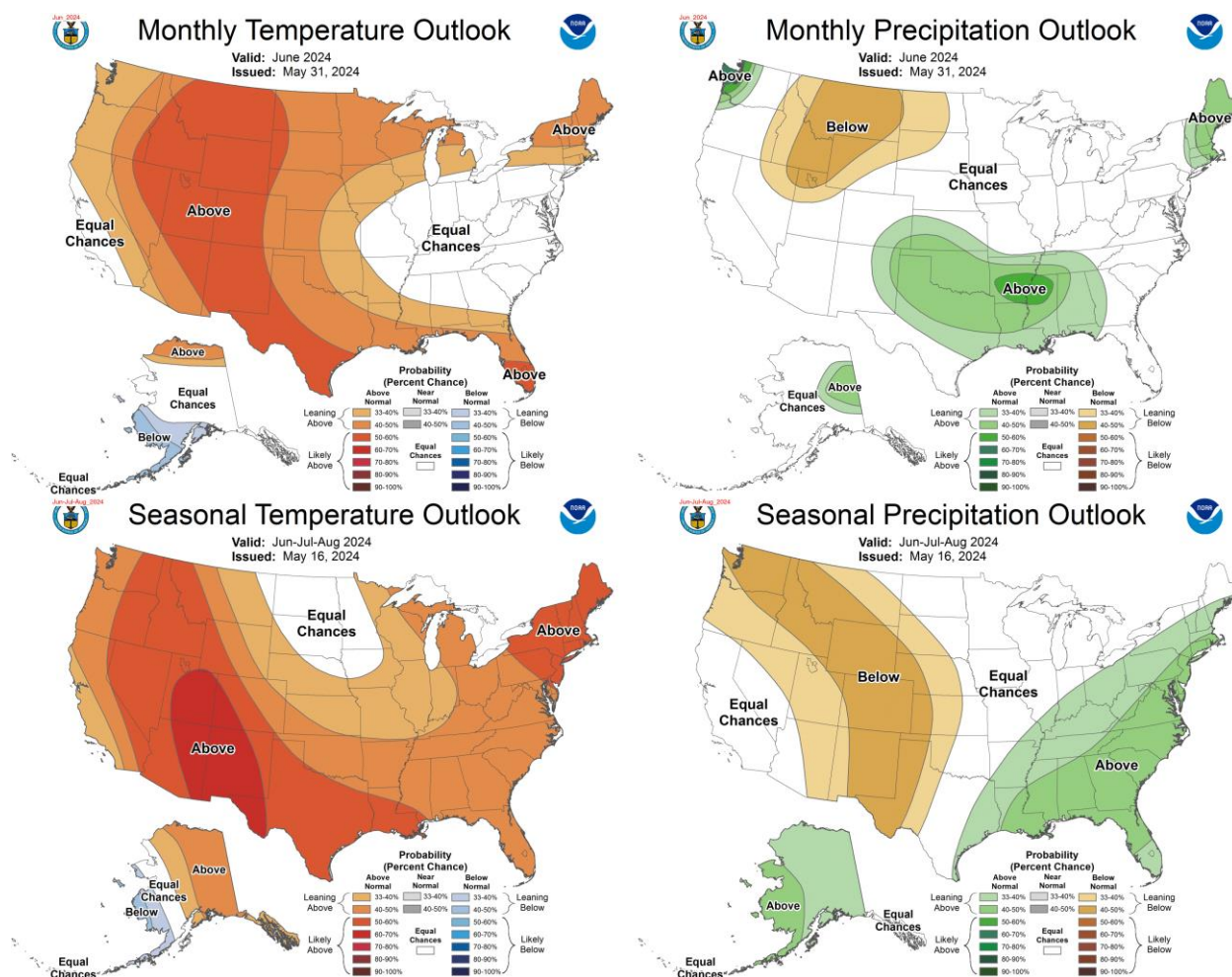


Figure 7 – Temperature (left panel) and precipitation (right panel) outlooks for the month of June (top panel) and June, July, and August (bottom panel) (Climate Prediction Center, climate.gov).

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