

Weather and Climate Summary and Forecast

September 2025 Report

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Summary:

- Warmer than average¹ August for the majority of the western US. Coastal zones warmed slightly as well.
- Monsoon moisture brought thunderstorms to the west, with some locally heavy rains but mostly dry lightning events. The first hint of fall with a frontal passage and some rain in western Washington, otherwise dry.
- The drought footprint in the west remains, although anticipated fall temperatures and rains have lowered the 90 day outlook to improved conditions or complete removal of drought in the PNW.
- A complex circulation pattern over the eastern Pacific and west will bring an extreme heat event to western Canada and inland PNW over a week or so. More seasonal temperatures south. Monsoon moisture is likely for much of California, the mountains and basin, but dry lightning concerns and wildfire risk will be elevated.
- September is looking to be warm to start, then mild and mostly dry till the end of the month, when rain chances increase, especially across the PNW.
- The 90-day forecast is calling for a mostly warm and dryish three-month period with September likely warm to mild and mostly dry, October turning more seasonally cool and on the wetter side, and then November mild and dry to seasonally average precipitation.

Past Month and Year to Date:

August 2025 was warmer than average over most of the western US, especially in northern California, into the PNW, and over the Four Corners region, where temperatures were 2-5°F above average (Figure 1). Much of southern California, the Great Basin, and Rockies were closer to 1°F above average, while a few areas were slightly below average due to increased cloud cover from monsoon flow northward (note the pattern of precipitation in Figure 1). Along the coast, the persistent upwelling and enhanced marine cloud layers that have been in place most of the summer slackened in August, bringing coastal zone temperatures up slightly. The eastern US experienced an August that was relatively cool in the central Plains and southeast, driven by cloud cover from Hurricane Erin along with colder air dropping out of Canada, while Florida, New England, and the northern Plains saw warmer than average temperatures for the month (not shown).

August precipitation over the west was largely driven by some onshore flow in Washington late in the month and monsoon flow into California and the Great Basin. While some regions received moderate to heavy rain from

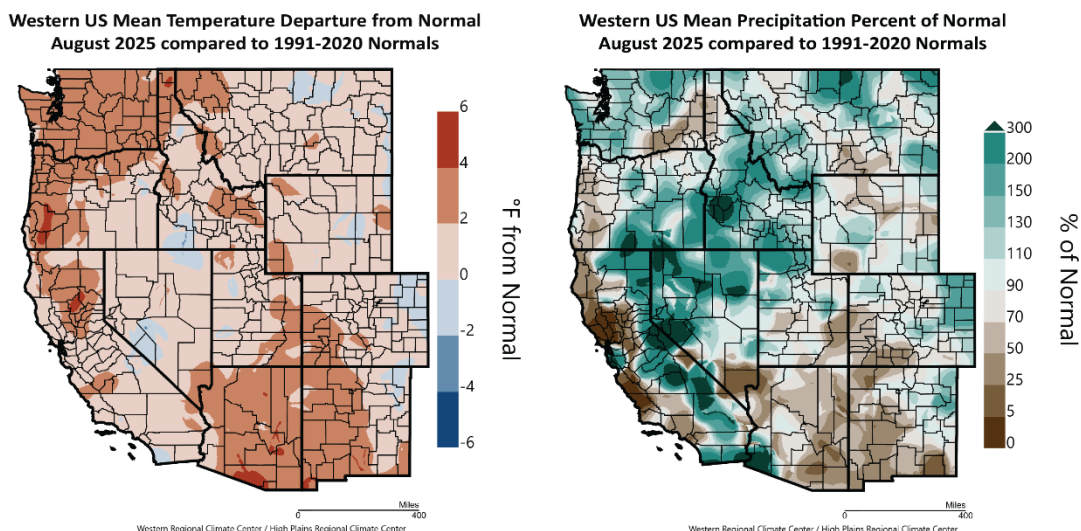


Figure 1 – Western US August 2025 temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center and High Plains Regional Climate Center, 2025)

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.

thunderstorms, the western US gets so little precipitation in the summer that 100-300% of normal shown in Figure 1, did not amount to much in most regions. In addition, the Four Corners region, which normally benefits most from monsoon precipitation, did not receive much during August. The rest of the country saw wetter than normal conditions from the northern to southern Plains and across the southeast, while the central Mississippi River valley, the Ohio River Valley, and the northeast were extremely dry during the month (not shown).

The relatively warm August has increased year to date temperatures in the western US to mostly above average (Figure 2; Note that this figure has an extended scale does not allow for much finer scale differentiation in temperatures [I cannot control this mapping feature unfortunately]). Coastal zones from Washington, Oregon, and California all continue to show the effects of the wind fields offshore producing upwelling of colder water to the surface and deeper, more persistent marine layers, and cooler than average temperatures. Most of these areas are running 0.5-1.5 degrees cooler than the average for the 1991-2020 period. Other regions that have been relatively cool year to date are mostly in the northern Plains southward along the Front Range of the Rockies. Most everywhere else has been warmer so far this year, running 0.5-3.5 degrees warmer than average. While the western US has been mostly warmer than average, the Plains from the Canadian border to northern Texas has seen temperatures closer to average or as much as 2 degrees below average (not shown). For the eastern third of the country, temperatures year to date are running 1-4 degrees above average, with the warmest conditions occurring in the northeastern US (not shown).

Even with the relatively wet August for portions of the western US (Figure 1), year to date amounts continue the general pattern from earlier in the year (Figure 2). Drier than average conditions are found in central to southern California, the southwest, Four Corners, Great Basin, Washington, northern Oregon, and portions of Idaho, with 10-80% of normal year to date. The exception continues to be the areas from northern California into southern and central Oregon, continuing eastward to the northern Rockies, which have seen a wetter than average for the first eight months of the year. The general pattern of year to date precipitation for the rest of the country also continues with August amounts not changing the situation much. The eastern two thirds of the country are near average to moderately above average, although drier conditions remain in Florida and New England (not shown).

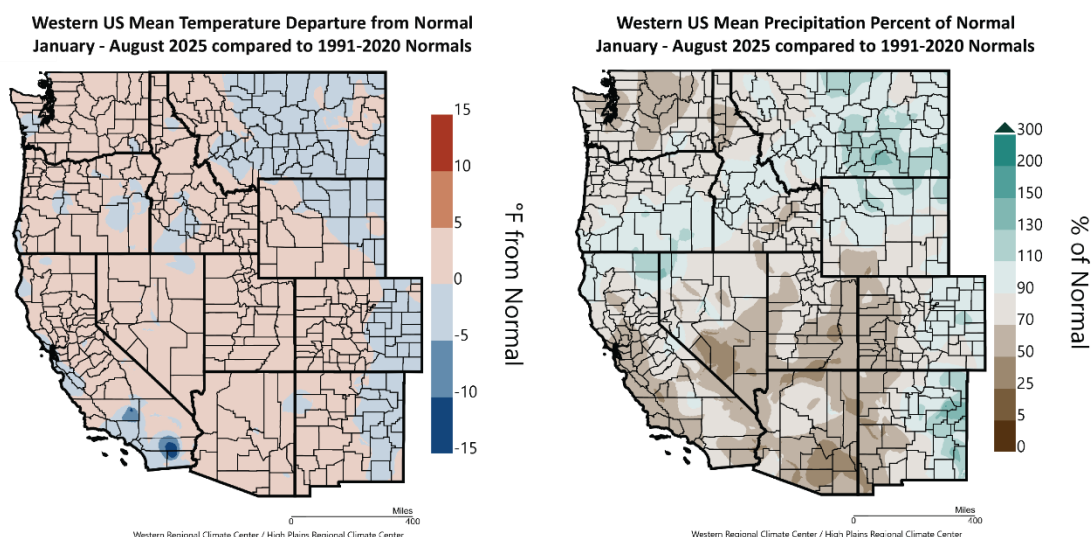


Figure 2 – Western US Year-to-Date (January 1 through August 31, 2025) temperature departure from normal (left) and percent of normal precipitation (right; images from Western Regional Climate Center and High Plains Regional Climate Center, 2025).

Heat Accumulation: An odd year for sure, with areas of coastal California seeing cooler than average conditions and lower heat accumulation, while inland and higher elevation areas have seen extreme warmth and significantly higher heat accumulation. Outside the coastal zones and a few isolated areas, most of the west has seen higher GDD values for March through August 2025. Inland regions in California, western and eastern valleys in the PNW, the Great Basin, Idaho, and Montana are mostly 100-500 GDD above the 1991-2020 climate normals (Figure 3) while coastal zones in California, isolated areas of the southwest and mountain locations scattered across the west are currently running near average up to 500 GDD below average. The current vintage has warmer areas running 5-24 days ahead of normal growing degree-day accumulation, while the coolest regions are running up to 20 days behind normal accumulation for this point in the vintage (not shown).

August was quite warm across Oregon, with temperatures 1.9 to 4.2 degrees warmer than average with the resulting heat accumulation (GDD) amounts that are currently 15-29% above the 1981-2010 climate normals, and 4-20% above the 1991-2020 climate normals for the Rogue Valley, Umpqua Valley, Walla Walla Valley, and Willamette Valley (Figure 4). Each of the four stations are tracking below the GDD observed during the 2015 vintage, although the Rogue Valley and Umpqua Valley are now within a couple of percent of the warmest vintage in Oregon in the last 25 years. Compared to the 2024 vintage, these four locations are now 2-10% higher during the 2025 vintage to date.

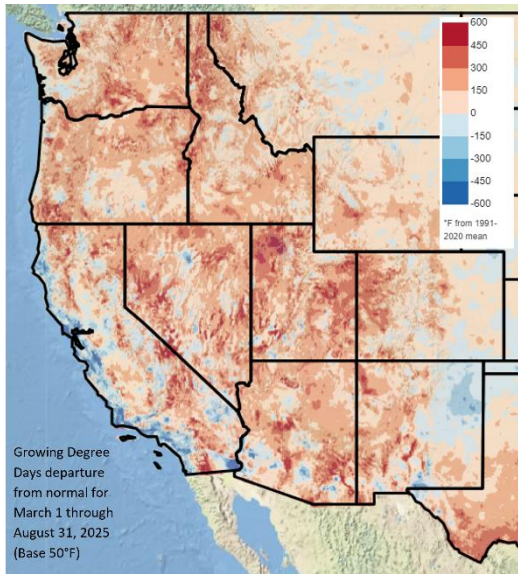


Figure 3 – Western US March through August 2025 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

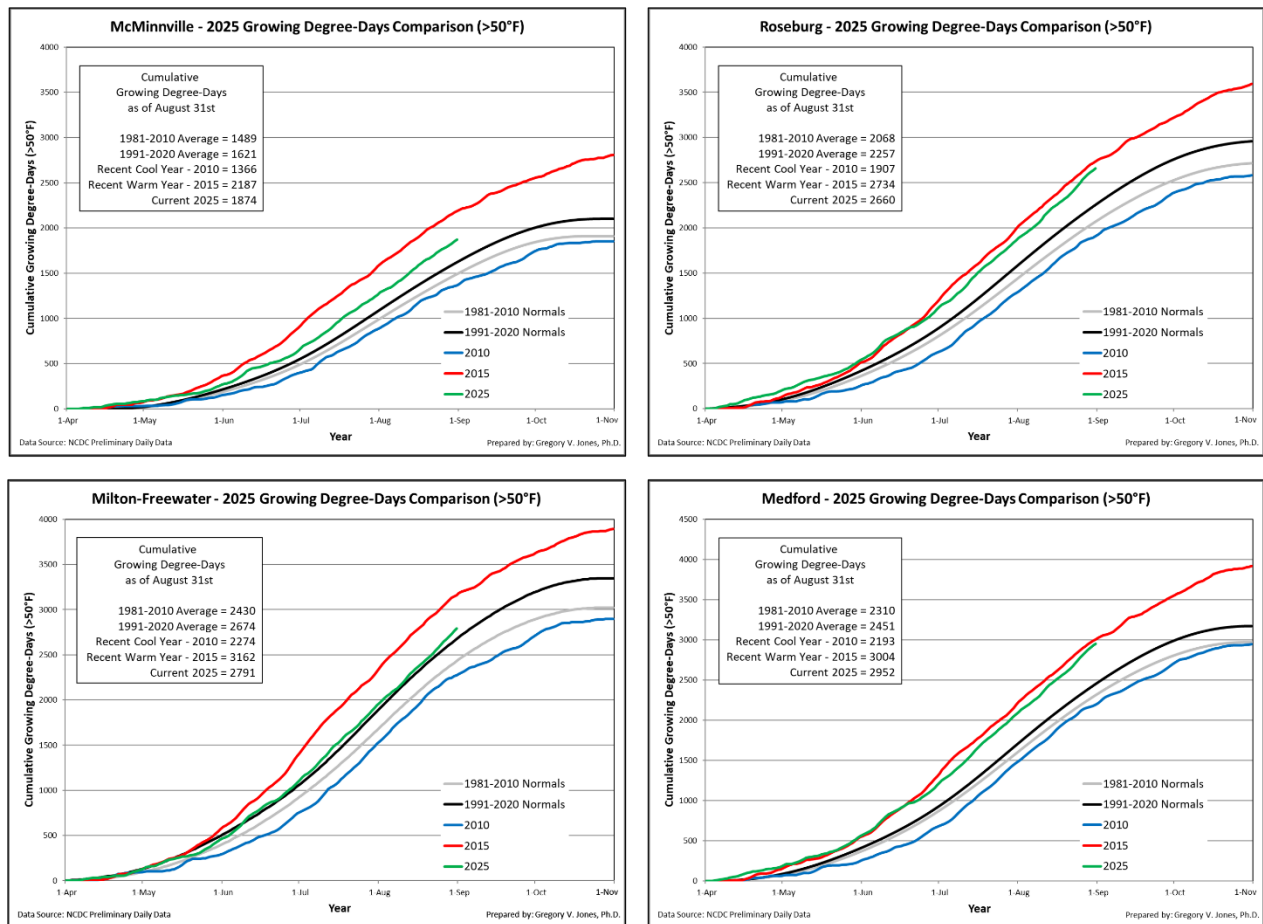


Figure 4 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2025) and a recent cool year (2010), a recent warm year (2015), and both the 1981-2010 and 1991-2020 climate normals are shown (NCDC preliminary daily data).

Drought Watch – The major precipitation events over the last month were Hurricane Erin skirting the east coast and the arrival of monsoon flow, albeit relatively weak, over the western US. Dry conditions in the middle Mississippi River valley, into the Ohio River valley, and up into New England moved much of the region into short-term drought, while dry conditions remained in place over the western US (Figure 5), even with monsoonal moisture in the Great Basin (Figure 1). The overall drought footprint over the continental US rose slightly in August, increasing to nearly 52% with the most extreme categories of drought rising to 20%, occurring only in the west. The overall dry summer in the western US continues drought concerns in some regions, with the area from southern California, across much of the southwest, and into the Rockies remaining the most prolonged and severe drought situation in the country (Figure 5). The overall drought footprint in the west fell slightly during the month of August and is now just over 82%, with the most extreme categories rising slightly to just over 47% of the western states. Washington remains at 100% of the state in some level of drought, with the most extreme categories of drought rising to nearly 80%. Monsoon moisture in southeastern Oregon helped lower the state to nearly 77% of the state in some level of drought, with the extreme drought categories remaining at 32%. Montana’s overall drought footprint dropped to nearly 53% of the state, with the extreme categories also declining to just under 23% of the state. Like Washington, Idaho saw its overall drought footprint remain at 100%, while the most extreme drought categories rose to just over 57% of the state. California’s overall area in drought in August remained at just over 76% of the state with the more extreme drought categories also remaining close to 23% of the state now enduring more severe drought (Figure 5).

The big change for the shift to meteorological fall is the lowering of drought concerns over much of the PNW (Figure 5; right panel). This comes from the expected transition to seasonally cooler temperatures and the start of fall rain. Portions of central to northern California are forecast to remain out of drought heading into fall, while the rest of the west is forecast to remain dry. This includes large areas of southern California, the southwest, and the Rocky Mountains. In addition, areas along the Front Range and central Plains are likely to see drought conditions develop further. I would expect that the forecast for some additional monsoon rain heading into fall might lower the concerns in the southwest, but not change things dramatically. After two relatively dry months, portions of the Mississippi and Ohio river valleys, along with portions of the Appalachian Mountains, are likely to see drought develop heading into fall (Figure 5; right panel).

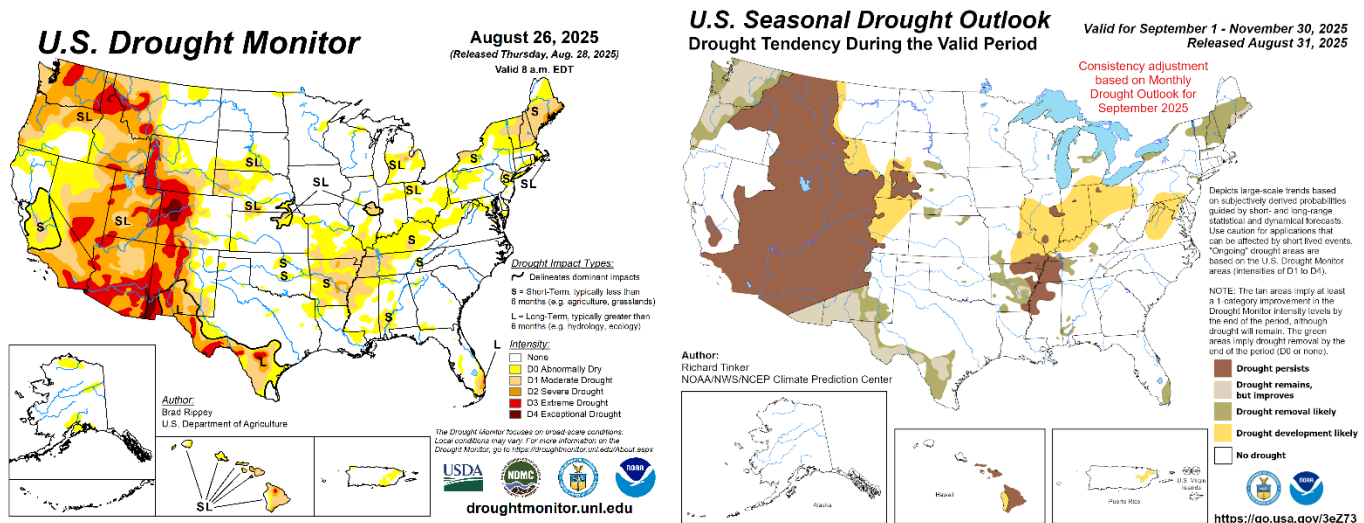


Figure 5 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – As of mid-August 2025, the equatorial Pacific remains in an ENSO-neutral state, with sea surface temperatures in the Tropical Pacific close to average (Figure 6). As such, the ENSO Alert System remains inactive at this time. Observations and modeling across numerous agencies indicate a moderate probability (68%) of ENSO-neutral conditions during the August through October 2025 period. The neutral conditions in both the SSTs and atmospheric circulation are expected to persist through the end of the forecast period. However, it is likely that during September through November or December that the Tropics will cool slightly, with the probabilities for ENSO-neutral decreasing slightly to roughly 50% but remaining higher than the probabilities for either La Niña or El Niño conditions to develop. During the shift from fall to winter, the probability of La Niña development increases to 39% and 44%, respectively. Looking ahead to the 2025/2026 winter and spring periods, ENSO-neutral once again becomes the dominant category

from forecast models, with gradually increasing probabilities heading into spring. Historical data indicate that ENSO-neutral winters tend to have more cold air outbreaks and are more often wetter than average, especially in the PNW. If ENSO-neutral persists into the spring, there is a greater chance of spring frost throughout the west and typically a slower start to the growing season.

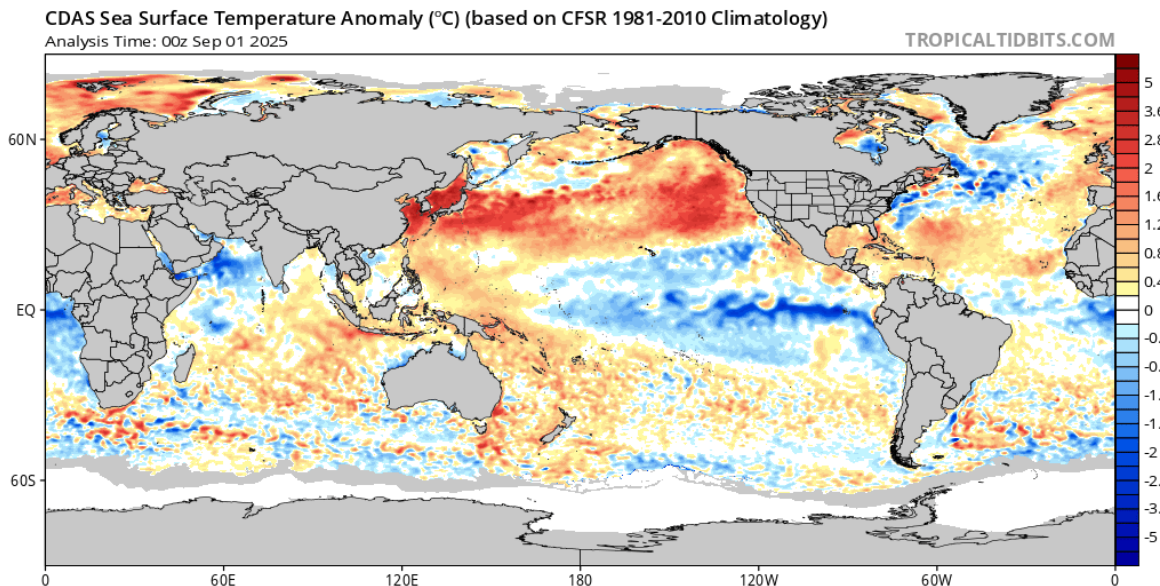


Figure 6 – Global sea surface temperatures (°C) for the period ending September 1, 2025 (image from Tropicaltidbits.com).

North Pacific Watch – The North Pacific is experiencing an extreme heat wave that extends from Asia to western North America (Figure 6). SSTs are 2-8°F warmer than average over much of the basin. SSTs even right along the west coast have now warmed up to above average. The Pacific Decadal Oscillation (PDO) index continues in a prolonged negative phase that has persisted since late 2019. Cooler SSTs in the North Pacific are now found mostly south of Hawaii to just off of Baja California. As mentioned previously, the PDO's effects on North American summer weather are less than what we observe in the winter. However, the shift from colder to warmer SSTs off the west coast has already warmed coastal temperatures and lowered the marine layer depth and extension along the coast of California. As such, I would expect warmer coastal temperatures heading into fall, but also a little boost to humidity levels and thunderstorm activity.

Forecast Periods:

Next 5 Days: Complex high versus low pressure area blocking regime to bring a very unusual eastern Pacific, Gulf of Alaska set-up, including extreme BC/interior PNW heat and increases in wildfire outbreak potential. Warmer north than south for the next few days to a week. Elevated chance for thunderstorms in the inland PNW, Cascades, and much of California, not much rain but dry lightning concerns for regions.

6-10 Day (valid September 7-11): Complex circulation over the eastern Pacific will continue to influence the western US with a ridge dominating the west, but cut-off lows and monsoonal moisture will be active as well. Warmer than average conditions will likely continue in western Canada and the inland PNW, although a cut-off low will bring moisture over the warm ground, elevating chances for thunderstorms over much of the region. California will see enough cloud cover from southerly monsoonal supported flow that will tamp down temperatures somewhat but increase thunderstorm activity. The concern for the West is with dry lightning and wildfire starts.

8-14 Day (valid September 9-15): Blocking conditions continue into mid-month with western Canada and the inland PNW remaining warmer than average. Onshore flow in California will likely tamp down temperatures through this forecast period. Monsoon moisture is likely to continue providing cloud cover and elevated chances for thunderstorms from southern California northward over the Sierra Nevada mountains and into the Great Basin. Precipitation amounts will vary widely due to the scattered thunderstorm activity, although the inland PNW has a decent chance of seeing above average precipitation into mid-month.

30 Day (valid September 1-30): Previous forecasts for September indicated dry and warm; however, there has been a slight tilt now to temperatures being closer to average overall. The month's forecast shown in Figure 7 shows that most of the western US has equal chances of above to below normal, in other words, likely holding to seasonal temperatures. The eastern US is also forecast for equal chances, while the northern Plains and Rockies are the only portions of the country with above normal temperatures forecast for the month. In terms of precipitation, the forecast is mostly holding to remaining dry for most of the month, then a potential shift in the jet stream bringing increased rainfall chances in the last week or so of the month, especially in the PNW. Equal chances of above to below normal precipitation for much of the rest of the west and the rest of the country are likely. Tropical storm activity is expected to bring a wetter than average month to the southeast and Florida (Figure 7).

90 Day (valid September-October-November): Moving into meteorological fall, the seasonal outlook for the country is pointing to warmer than average temperatures for most regions (Figure 7). Equal chances for warmer to cooler conditions are forecast in the northern Plains and higher probabilities for warmer than average temperatures are given for the southwest desert region and New England. The precipitation forecast heading into fall is showing the start of frontal passages bringing a higher likelihood of a wetter than average PNW, potentially leading to lowered drought concerns (see Drought section above). The rest of the western US does not have a dominant outlook with equal chances of a drier to wetter 90 day period, while the Four Corners, southern Rockies, and southern Plains are likely to be drier than average (Figure 7). The southeast and Florida have an above average probability of seeing a wetter than average fall.

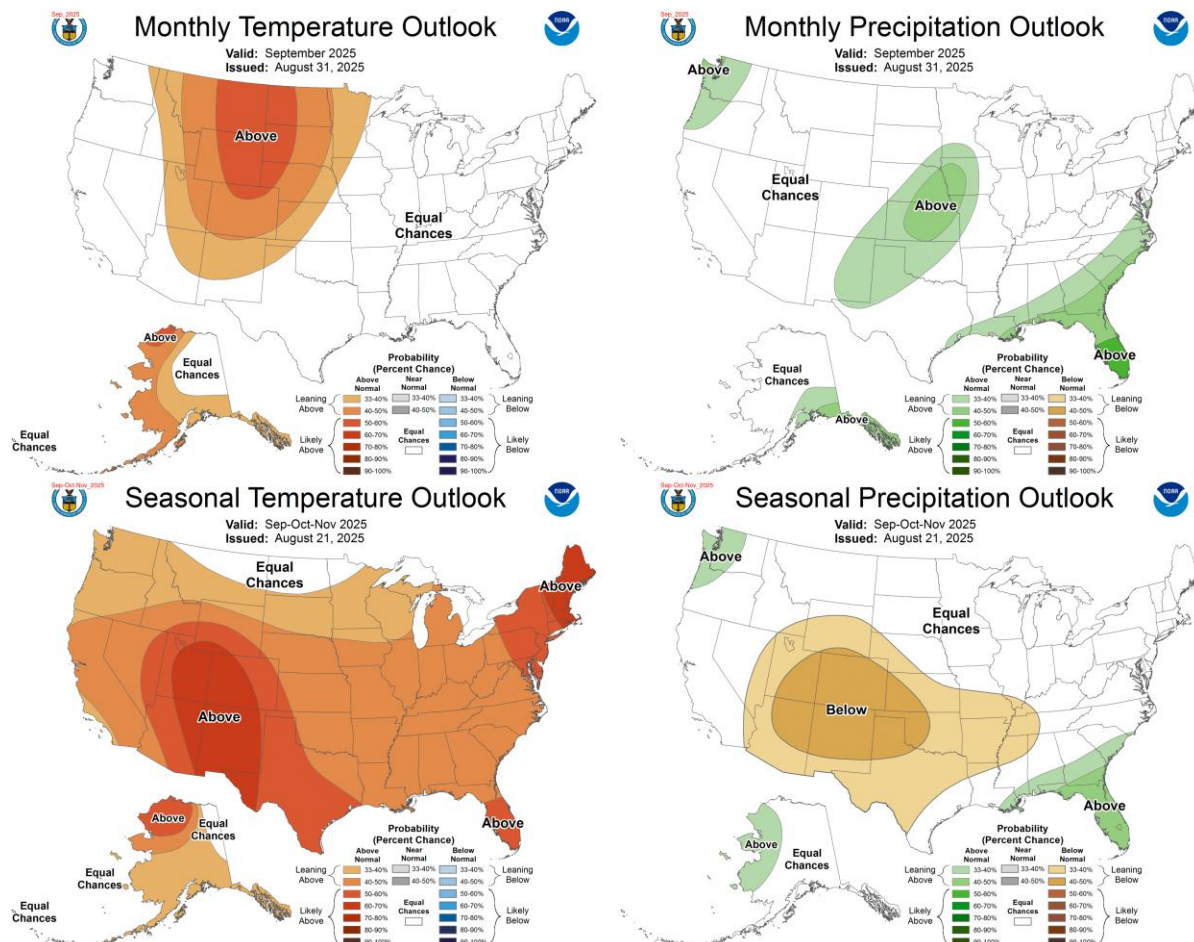


Figure 7 – Temperature (left panel) and precipitation (right panel) outlooks for the month of September (top panel) and September, October, and November (bottom panel) (Climate Prediction Center, climate.gov).

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