

# Weather and Climate Summary and Forecast

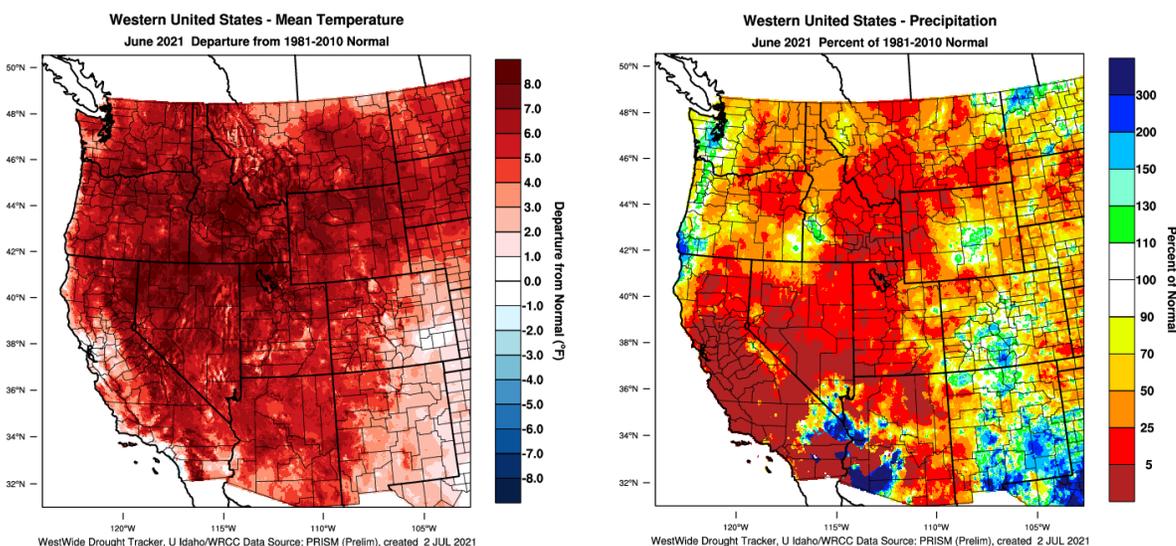
## July 2021 Report

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July 2, 2021

### Summary:

- Extreme heat events over the west and northern states brought June to average to substantially warmer than average<sup>1</sup>, while the middle of the country to the southeast was cooler than average.
- Early June rains in the PNW helped some, but overall, June was dry over most of the west.
- Varying levels of drought now encompass over 98% of the west, with over 80% in severe to extreme drought. Additional areas in the PNW, northern Rockies, and northern Plains are likely to see drought development further as the summer progresses, while June brought an indication of possible summer monsoon activity in the southeast.
- A seasonal to warm start to July is forecast to continue throughout the month. Seasonally dry conditions are also forecast for the month over most of the west. Hints at monsoon flow in the southwest stay in the forecast for July.
- The Pacific Ocean remains in an ENSO-neutral state in the tropics and the North Pacific remains in the negative phase of the PDO. The result is likely less tropical influence on our summer weather. Coastal zone SSTs from the Gulf of Alaska to Baja have warmed and are projected to warm through the summer. The result is likely a lessening of the coastal zone marine layer influences along the coast. The overall summer forecast continues to tilt the odds to warmer than average temperatures and remaining seasonally dry for the western US.

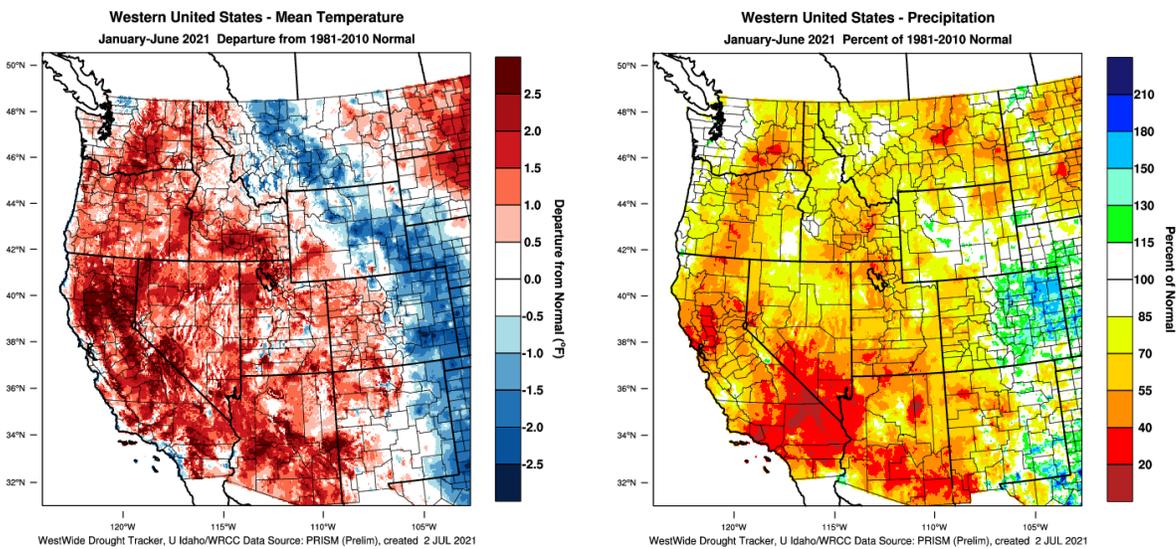
Last month's forecast called for extreme heat later in the month, but I do not think anyone thought that it would be as extreme as it was. Daily and all-time records were broken for maximum and high minimums across hundreds of locations across the west. As a result, the month ended up substantially warmer than average over the west with some areas seeing temperatures 6-8°F above average for the month (Figure 1). Only the Bay Area and a few coastal zones in California escaped the heat with closer to average temperatures. Warmer than average temperatures in June were felt across the northern tier of states, while Texas across the Gulf Coast states to the southeast were closer to average for the month (not shown). The monthly forecast for June was spot on for precipitation with dry conditions prevailing (<25% of normal for most; Figure 1), with portions of western Oregon and Washington seeing above-average precipitation, while some welcomed monsoon rain occurred in the southwest. Dry conditions in June extended across the Plains and into New England, while most of the rest of the country experienced wetter than average conditions (not shown).



**Figure 1** – Western US June 2021 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

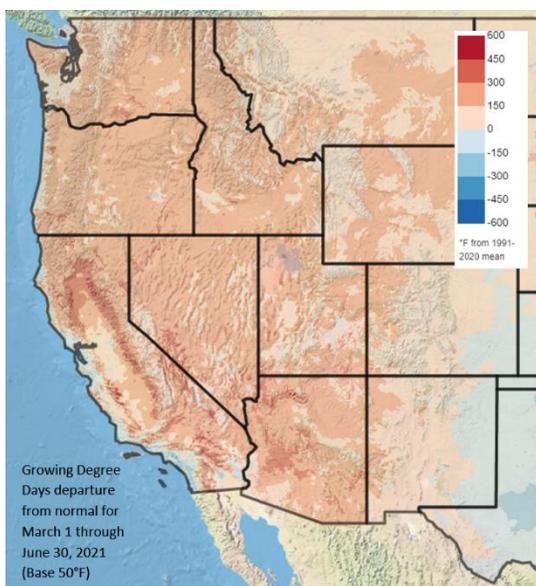
<sup>1</sup> Note that all references to normal or averages in this report are to the 1981-2010 climate normal for each weather/climate parameter unless stated otherwise. Also, note that the 1991-2020 climate normals are starting to become available across reporting agencies and will be used in this report when possible.

The very warm June elevated the year-to-date temperatures across the western US to mostly above average (Figure 2). Coastal zones from California north to Canada and elevated areas have been closer to average year-to-date, while a small area of the northern Cascades has been cooler than average. The area from the Front Range of the Rockies south into the southern Plains and Texas has been cooler than average year-to-date (Figure 2), while the southeast has been near average and Florida, New England, the northern Plains, and the Great Lakes have been warmer than average (not shown). Year-to-date precipitation amounts in the western US continue to reflect the ongoing dry conditions with most areas seeing 85% or less of normal (Figure 2). Portions of western Oregon and Washington, and the Northern Rockies are running closer to average year-to-date. The dry conditions depicted in Figure 2 have expanded over the last month and continue to reflect ongoing and projected drought concerns in the west (see Drought section below). Dry conditions year-to-date are also occurring across the northern Plains, much of the Great Lakes, and into New England, while the central portion of the country and southeast has largely been near average to wetter than average (not shown).



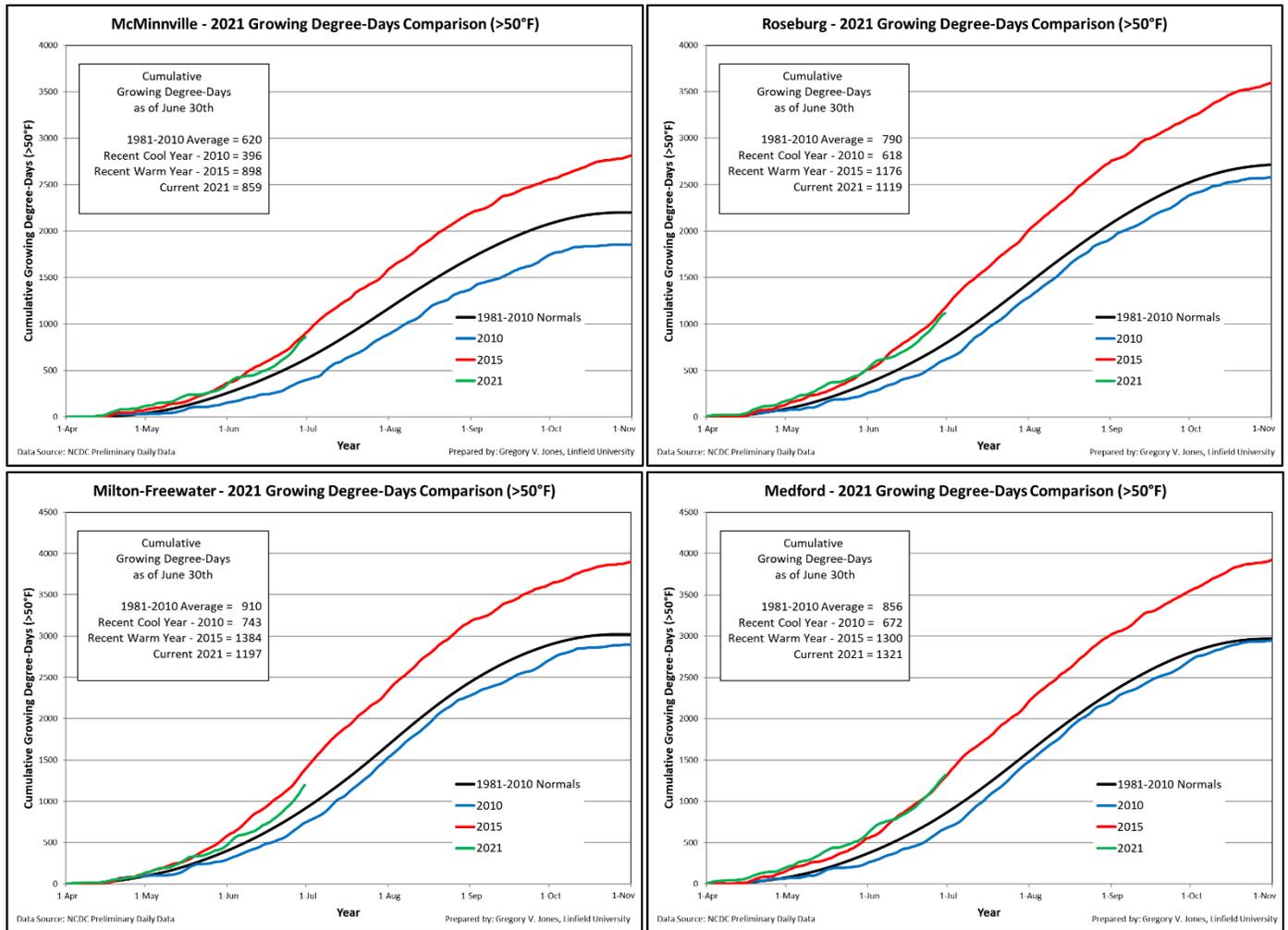
**Figure 2** – Western US year to date (January-June 2021) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Growing degree-days (GDDs) for the western US from March through June shows that accumulations are slightly to moderately above average in most of the western regions of California, Oregon, Washington, and Idaho (Figure 3; note that this data is now referenced to the 1991-2020 climate normals). However, coastal zones from Washington to southern California have been slower accumulating heat due to cooler coastal ocean temperatures driving stronger marine layers. Most inland areas are currently running 5-20 days ahead of normal growing degree-day accumulations, while the coastal zones are near average to 10 days behind.



**Figure 3** – Western US March through June 2021 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho). Note that this data is now referenced to the 1991-2020 climate normals.

Nearing mid-vintage, growing degree-days for four locations that I have tracked for many years in wine regions in Oregon are all substantially above the 1981-2010 normals for through June (32-54%) and above the average of the last 16 years for the sites (21-30%). Compared to the 2015 vintage, one of the warmest years on record, Medford, Roseburg, and McMinnville are now within a percent or two, while Milton-Freewater is roughly 12% below the GDD accumulated during the 2015 vintage (Figure 4). Compared to the 2020 vintage, the four locations are currently 8 to 34% above.



**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 (2021) and a recent cool year (2010), a recent warm year (2015), and the 1981-2010 climate normals are shown (NCDC preliminary daily data).

**Drought Watch** – The western US continues to be dominated by drought conditions (Figure 5). Over 98% of the west is in some level of drought, with only a small area of the northern Cascades and northern Rockies not in drought at this time. The highest drought categories, extreme and exceptional, now make up roughly 60% of the western US. Drought zones extend into the northern Plains and across to the Great Lakes and northern New England, while much of the central portion of the US, Gulf Coast, and the southeast are largely drought-free at this time. Both the monthly outlook (July) and long-term outlook for the US through September continue the forecasted dry conditions for much of the west with further development expected in the Rockies, Montana, Idaho, and the PNW (Figure 5, right panel). The seasonal outlook does highlight the possible enhanced monsoon flow in portions of the desert southwest where some drought improvement is likely.

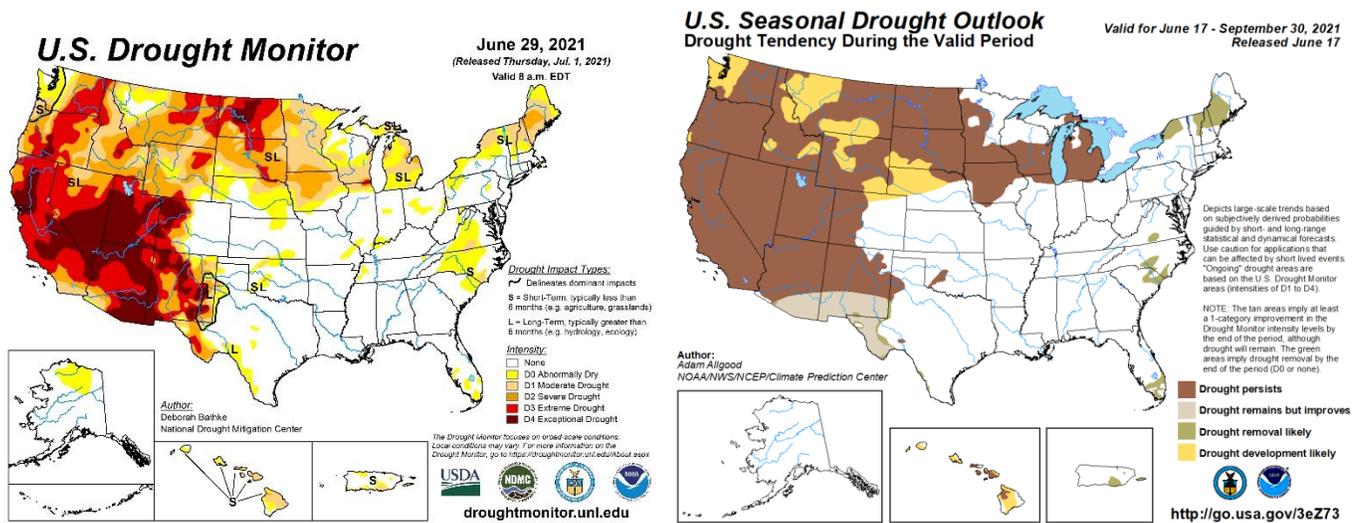


Figure 5 – Current US Drought Monitor and seasonal drought outlook.

**ENSO Watch** – The Tropical Pacific has weakened to neutral (Figure 6). As of mid-June, the Climate Prediction Center (CPC) reported that SSTs in the east-central Pacific have dropped to average, with patterns in all key atmospheric variables consistent with neutral conditions. The majority of model forecasts continue to point to the Tropics being ENSO-neutral through boreal summer, but with greater uncertainty moving into the fall and winter. The official CPC/IRI outlook and other agency outlooks are consistent with these model forecasts. ENSO-neutral in summer typically does not bring much influence on the weather in the western US, but the hint at increased monsoon flow is a welcome sign. There continues to be some chatter about El Niño conditions developing later in the early fall. Too soon to tell at this point, will keep an eye on conditions in the tropic.

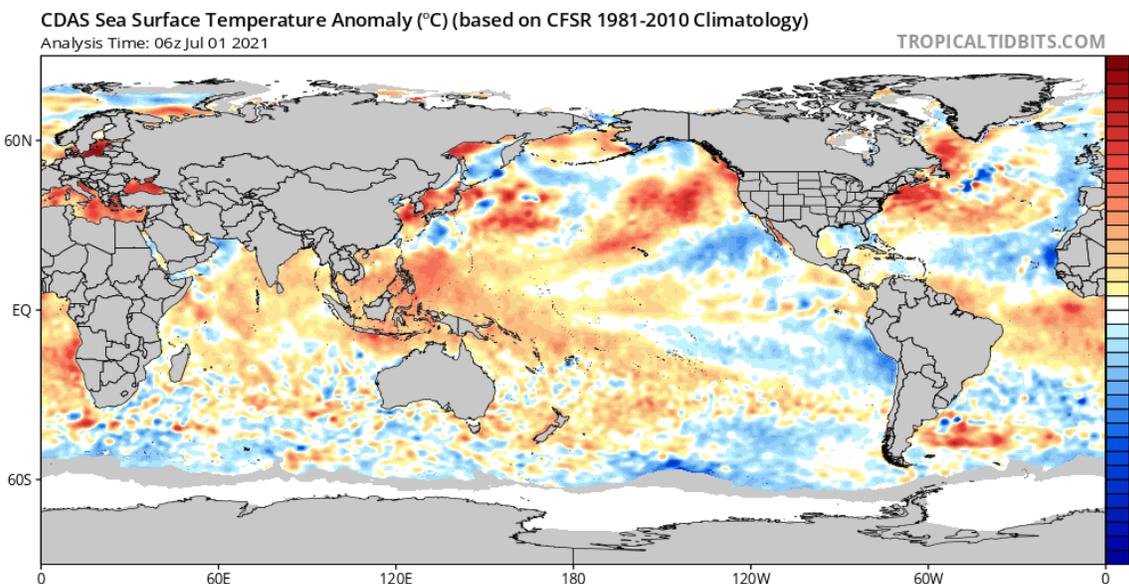


Figure 6 – Global sea surface temperatures (°C) for the period ending July 1, 2021 (image from TropicalTidbits.com).

**North Pacific Watch** – A general warming of the North Pacific Ocean continues with the most evident changes coming along coastal zones of the western US (Figure 6). While the Pacific Decadal Oscillation is holding in a cold or negative phase, it has dropped closer to neutral. The main differences from prior months are the magnitude and spatial extent of cool SSTs off of California extending southwest to Hawaii which has warmed and decreased in size. Cool surface temperatures remain in the Gulf of Alaska, but the magnitude and extent have declined in this area as well (Figure 6). The warming over the last 30 days or so in the North Pacific has likely contributed to our quite warm June and forecasted summer conditions. While cooler coastal temperatures supported a strong marine layer over the last couple

of months, there are some indications that say the effect will not last into the heart of the summer. As the Topics are likely to stay ENSO-neutral, which has less effect on west coast weather, shifts in the PDO might continue to play an outsized role until the fall. Warmer coastal waters will likely bring warmer conditions inland.

#### **Forecast Periods:**

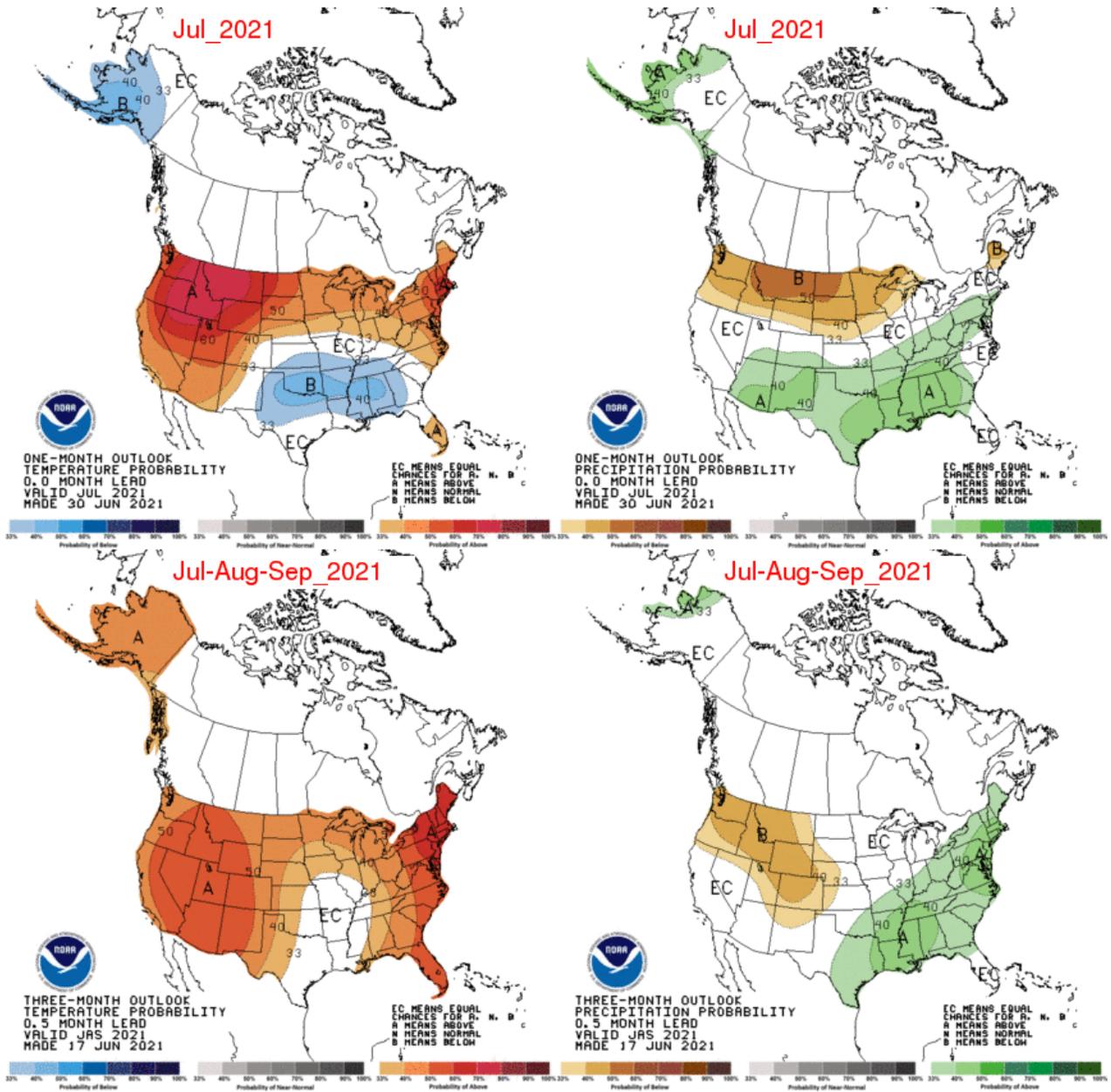
**Next 5 Days:** Dare I say normal? After a scorching end to June, the west appears headed closer to seasonal temperatures over the next five days. Some inland areas will stay in the mid-90s but no heat spikes like we just experienced. Absolutely no rain in the forecast other than maybe some drizzle in coastal zones where the marine layer is thick enough and persistent.

**6-10 Day (valid July 8-12):** Seasonal to warm temperatures through mid-month are forecast for the western US with interior areas of the Great Basin likely seeing the warmest conditions. As is often the case when the west is warm, the east is cool with Texas to the Great Lakes and New England forecast to see slightly below average temperatures through mid-month. Beyond a drizzle or two along the coast, the western US is forecast to remain seasonally dry, while the eastern US from Texas to New England is forecast to see a slightly above average wet period.

**8-14 Day (valid July 10-16):** Not much difference from the 6-10 day forecast above with continued warmer than average temperatures likely for the western US while Texas eastward is likely to see slightly below-average temperatures. The main difference in the forecast periods is with the possibility of enhanced monsoon flow in Arizona and New Mexico. The summer monsoons in the region have failed the past few years, so this is a welcome change. Otherwise, the Great Basin, PNW, and the Rockies are forecast to remain dry, while the eastern US is forecast to see slightly above average rainfall except along the Gulf Coast where dry conditions mid-month are forecast.

**30 Day (valid July 1-31):** Similar to the forecast pattern for June, the western US, across the northern Plains, into the Great Lakes and New England are forecast to see a largely warmer than average July, while the southern Plains and Gulf Coast region is likely to see below-average temperatures for the month (Figure 7). For the west coast, coastal zone temperatures have warmed (see above), reducing the strong difference between coastal and inland areas. Dry conditions are forecast for the PNW across the Northern Rockies to the Great Lakes, while the rest of the west has equal chances of slightly above to slightly below precipitation during July. The desert southwest will likely see enough monsoonal flow to see above-average rainfall for the month. The Gulf Coast is also likely to be wetter than average.

**90 Day (valid July-August-September):** Overall pattern for the summer continues from earlier forecasts this year indicating likely warmer than average temperatures for the majority of the US (Figure 7). The greatest above-average likelihood is centered over the western US and eastern seaboard, with the central portion of the country from Texas into the Plains likely seeing closer to average temperatures during the summer. The precipitation pattern forecast through JAS indicates that dry conditions are likely from the PNW southeast to northern Texas. Near-average precipitation is forecast for California and the desert southwest (largely due to increased probabilities around the monsoon season), into the Great Plains and Great Lakes, while the New England and the eastern seaboard and Gulf Coast are forecast to see above-average precipitation for the season.



**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).