

Weather and Climate Summary and Forecast

May 2021 Report

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Summary:

- The west coast was mostly warmer than average¹ during April, while the middle of the country was colder than average and the eastern half of the country warmer than average.
- April was dry pretty much everywhere across the west with many locations seeing the driest April on record.
- A dry month added to the severity and spatial extent of drought with 96% of the western US now in some category of drought and roughly 65% in severe to extreme. Additional areas in the PNW, northern Rockies, and Texas likely to see drought development further as the summer progresses.
- Mild start to May will likely hold for most through mid-month then moderate warming later in the month. While there appear to be a few systems that may bring precipitation to the PNW, not much likely south into California and the southwest.
- No large-scale frost events on the horizon at this point.
- Continued weakening of La Niña conditions in the Tropical Pacific. Some warming of SSTs in the Gulf of Alaska but coastal California waters remain cool. The best bet is for continued marine layers and a slow warm-up for coastal regions northward into Oregon and Washington. The forecast for a warmer than average summer is still in play for most except the extreme northwest which is still holding to near average temperatures.

A mixed bag from last month's forecast, where cool conditions with frost pressure were, fortunately, a no-show for most of the west. April ended up largely warmer than average from the Cascades and Sierra Nevada west and south into the desert southwest (Figure 1). The inland PNW south into Nevada was near average for the month, while the Rockies and Plains ranged from 1 to 4°F below average for the month. The cool conditions extended south and east, while the Great Lakes and New England saw a warmer than average month (2-4°F, not shown)). Unfortunately, what the forecast got right for the month of April was the continued dry conditions over the entire west (<50% of normal for most areas; Figure 1), with only a few isolated areas in the Rockies, Front Range, and southern New Mexico seeing above-average precipitation. Most of the rest of the country saw a relatively dry month of April, with only the Gulf Coast, Florida, southern Plains, and western Great Lakes seeing wetter than average conditions (not shown).

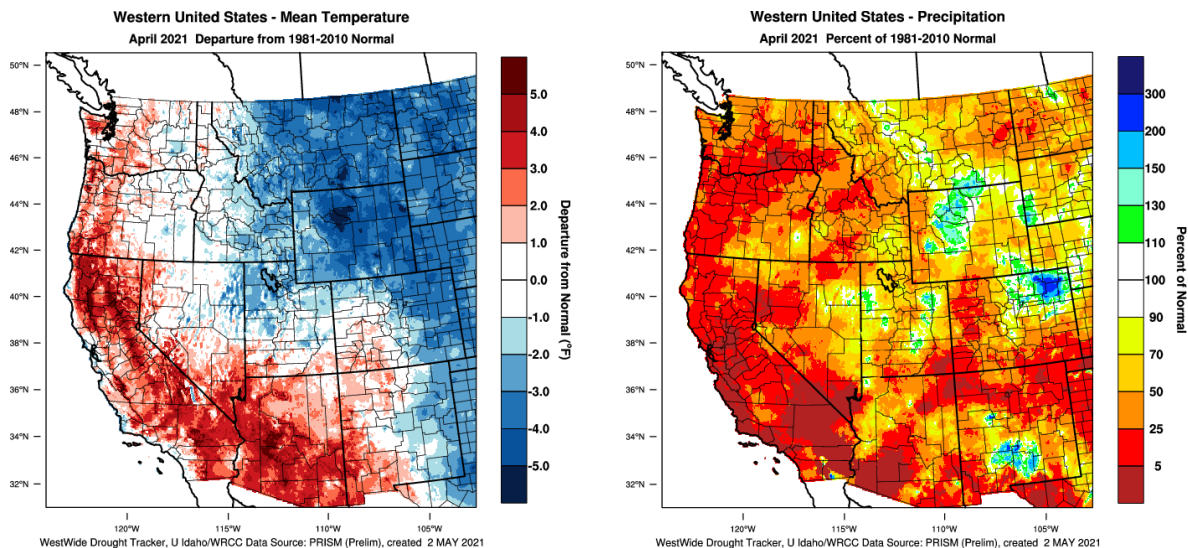


Figure 1 – Western US April 2021 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

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.

Refreshing Figure 2 to represent year-to-date values, shows that January through April has delivered close to average temperatures for much of the western US. Portions of California, the southwest, and central Washington were slightly warmer than average while the Front Range of the Rockies and plains south into Texas were cooler than average (1-4°F; Figure 2). The central portion of the country has been cooler than average year to date, while the southeast has been near average and Florida, New England, and the Great Lakes have been warmer than average (not shown). Precipitation amounts year to date in the western US continue to reflect the ongoing dry conditions with most areas seeing less than 70% of normal (Figure 2). Portions of western Oregon and Washington, eastern Oregon, Central Idaho, and northern Nevada are running closer to average year to date. The dry conditions depicted in Figure 2, also reflect the current and projected drought concerns in the west (see Drought section below). Dry conditions year to date are also occurring in the Great Lakes across to New England while the central portion of the country has largely been near average to wetter than average year to date (not shown).

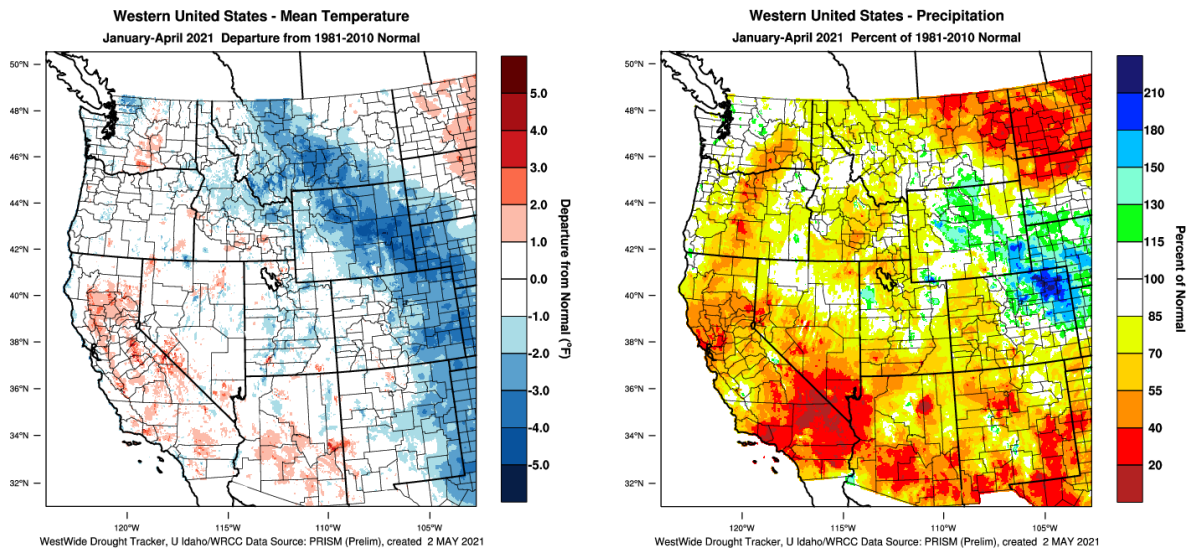


Figure 2 – Western US year to date (January-April 2021) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The first run at growing degree-days (GDDs) mapped over the western US shows a March through April that was slightly above average in most of the western sections of California, Oregon, and Washington (Figure 3). However, some coastal areas in the Bay Area and central to south coast of California have seen a slower start to heat

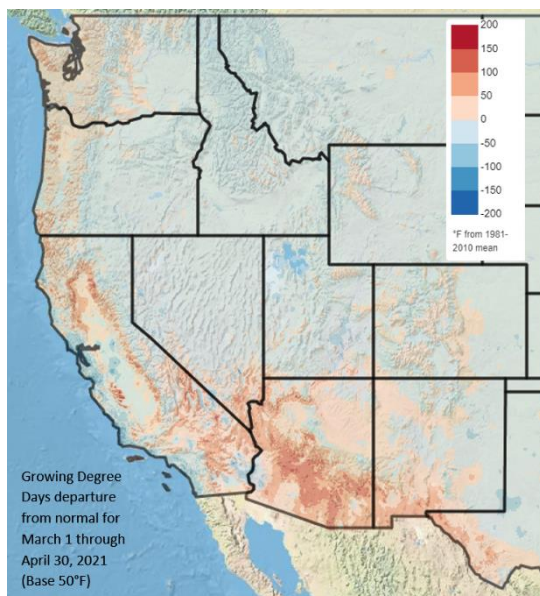


Figure 3 – Western US March through April 2021 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

accumulation largely due to the coastal waters cooling during the months of March and April keeping the marine layer and fog prevalent. Interior portions of the PNW have also seen a slower start to heat accumulation. Most locations are running +/- 20% of their average GDDs.

Heat accumulation (GDD) amounts for four locations that I have tracked for many years in wine regions in Oregon are all substantially above the 1981-2010 normals for the month of April and above the average of the last 16 years for the sites. Compared to the last vintage (2020) there is a north-south difference in sites with Roseburg and Medford being down 12-24% during the same period in 2021 while McMinnville and Milton-Freewater are running 36 and 8% above the last vintage, respectively (see the Appendix Figure 1 for four locations in Oregon).

Drought Watch – Little relief in sight for the ongoing western US drought (Figure 4). A very dry spring has continued to elevate the region's drought with the southwest persisting as the epicenter. Following last month, drought zones now extend from Texas throughout the Rockies and into the northern Plains and across to the west coast. Nearly 96% of the western US continues in some category of drought with roughly 65% in severe to exceptional drought

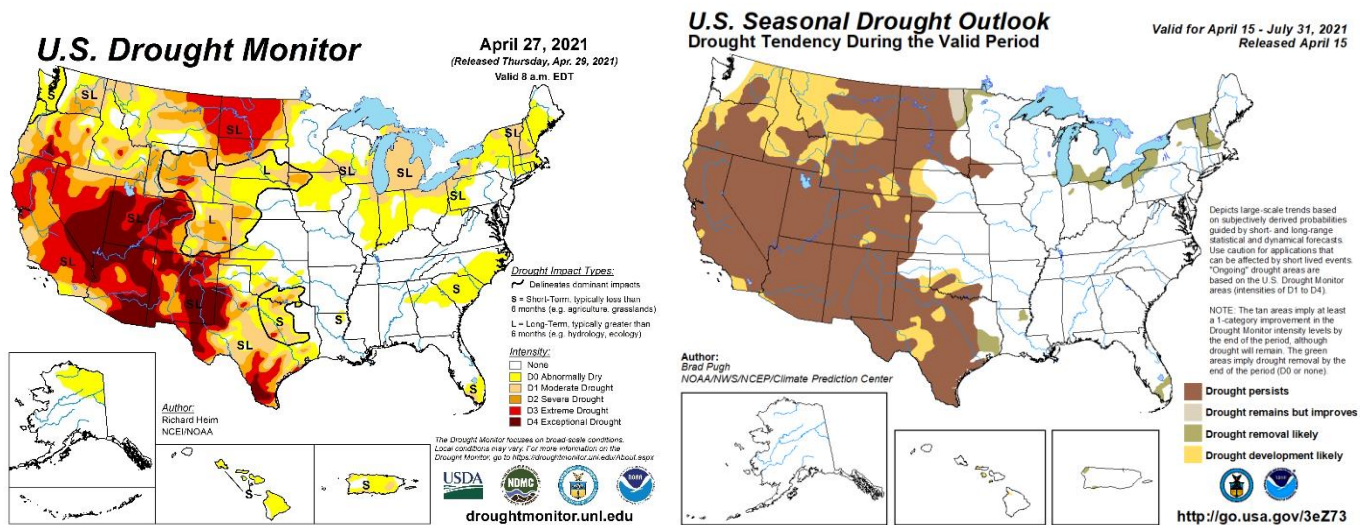


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

conditions. Small portions of the Washington Cascades, the Rocky Mountains in Montana, and the Bitterroot Mountains are now the only areas of the west that are not currently listed in a drought category. The long-term outlook for the US through July continues the forecasted dry conditions for much of the west with further development expected in the southern Plains, Texas, and areas of Montana and the PNW. While winter precipitation in the PNW lowered drought concerns some, the extremely dry April and now forecast for May is changing the drought categories quickly (Figure 4, right panel).

ENSO Watch – Continuing the trend from the previous couple of months, the Tropical Pacific has further weakened from La Niña conditions experienced during the winter (Figure 5). As of mid-April, the Climate Prediction Center (CPC) reported that SSTs in the east-central Pacific have dropped to roughly 0.4°C (0.7°F) below average, with patterns in all key atmospheric variables consistent with continued weakening La Niña conditions. The majority of model forecasts continue to point to the Tropics returning to near normal during spring, though a La Niña advisory remains in effect for the time being. The official CPC/IRI outlook and other agency outlooks are consistent with these model forecasts, calling for a likely transition in April and May. The forecasts point to diminishing La Niña influences on weather patterns across the country, but not removing them completely. There is also some chatter about El Niño conditions developing later in the summer or early fall. Too soon to tell, but coming soon ...

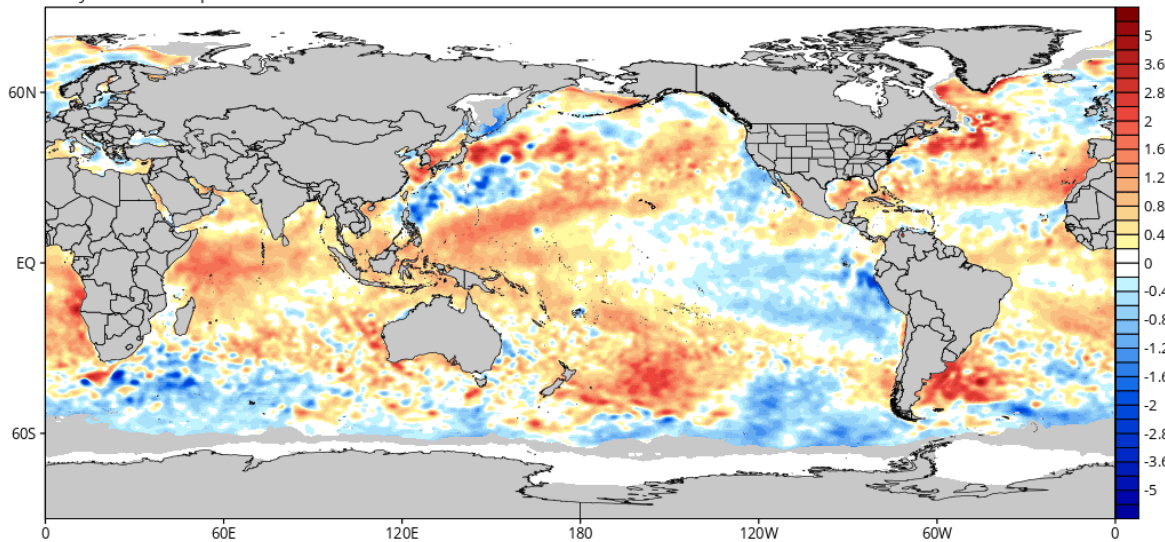


Figure 5 – Global sea surface temperatures (°C) for the period ending April 30, 2021 (image from Tropicaltidbits.com).

North Pacific Watch – Colder SSTs across the North Pacific continue from last month, although the magnitude and spatial extent are smaller. Cool surface temperatures remain in the Gulf of Alaska, along the PNW and California coast, and south and southwest out toward Hawaii (Figure 5). There remains a large area of warmer than average SSTs in the central and western North Pacific, but even the magnitude of the warmth has declined some over the last 30 days. These changes do not alter the Pacific Decadal Oscillation (PDO), which remains just below the negative or cold phase. Many are saying that this has had an influence on the relatively cool spring in the western US albeit April ended up warmer than forecast. During this transition period to summer, there is typically less forecast strength for both the Tropical and North Pacific, but the one thing that most agencies are pointing to is that much of the western US will remain dry heading into summer with some areas in the PNW transitioning back into drought (see above).

Forecast Periods:

Next 5 Days: Early warmth in the month gives way to off and on mild to cool periods due to the passage of a couple of cold fronts. Slight chance of precipitation, which increases northward into the PNW. Coastal areas will see strong marine layers and fog, while inland areas (especially in California) remain warm. No evidence of the potential for frost events over the entire west during this period.

6-10 Day (valid May 9-13): Near-average temperatures for most of the west coast with central California with the best chance to see above-average temperatures (no frost events). These conditions give way to a strong chance for a cooler than average early May over the interior western US, Rockies, and across through the Great Lakes and New England. On the other hand, the Gulf Coast and southeast are forecast to be quite warm for this time of year. The western US is forecast to remain relatively dry, while the central portion of the country is forecast to see a wet period.

8-14 Day (valid May 11-17): The western US is forecast to stay warmer than average into mid-month. Continuing the pattern from the previous forecast period, the central to the northern portion of the country is forecast to see below-average temperatures while the Gulf and southeast are forecast to see warmer conditions. Overall, the precipitation forecast through mid-month remains on the dry side for the bulk of the western US. There is a chance for one rain event but right now the models keep it north and on the light side. The rest of the US is forecast to see more than average precipitation from mid-May.

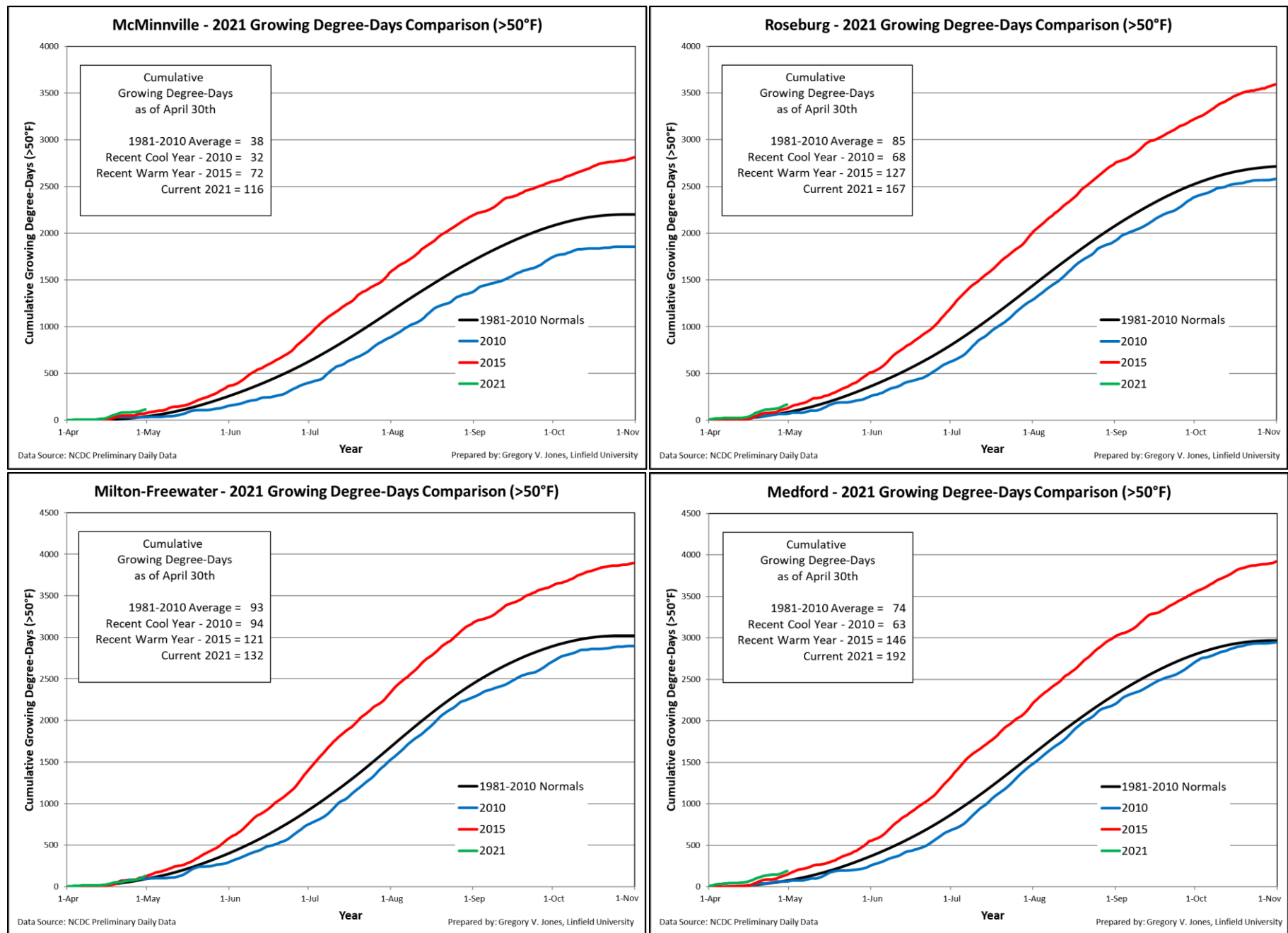
30 Day (valid May 1-31): The US is forecast to see a largely warm month southward and seasonal to cool pattern northward for the month of May (see Appendix Figure 2). For the western US, California is expected to see a warmer than average month while the PNW is will likely end up near average. Dry conditions are forecast for much of the

western US during May, while the central portion of the country is likely to closer to average and the eastern third of the country is likely to be wetter than average.

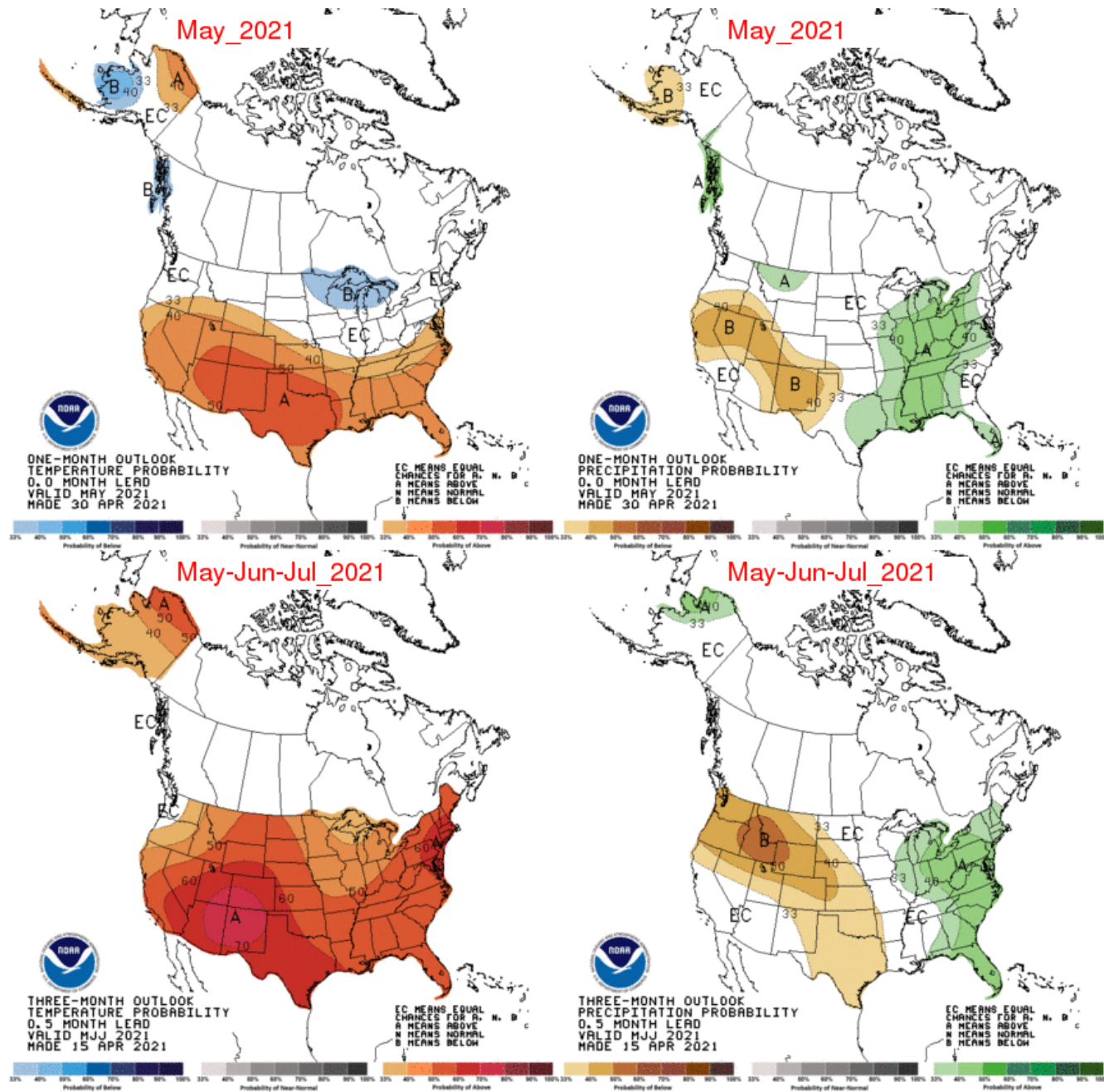
90 Day (valid May-June-July): Heading into the first half of summer the bulk of the US is expected to see warmer than average temperatures, except the PNW which has equal chances to be slightly below to slightly above (see Appendix Figure 2). The precipitation pattern forecast also continues the dry conditions with the bulk of the area from the PNW southeast to Texas likely to stay on the dry side. Near-average precipitation is forecast for the southwest, the Great Plains south to the Gulf Coast, while the Great Lakes to New England and south to Florida are forecast to see above-average amounts for the season.

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Appendix Figure 1 – 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).



Appendix Figure 2 – Temperature (left panel) and precipitation (right panel) outlooks for the month of May (top panel) and May, June, and July (bottom panel) (Climate Prediction Center, climate.gov).