

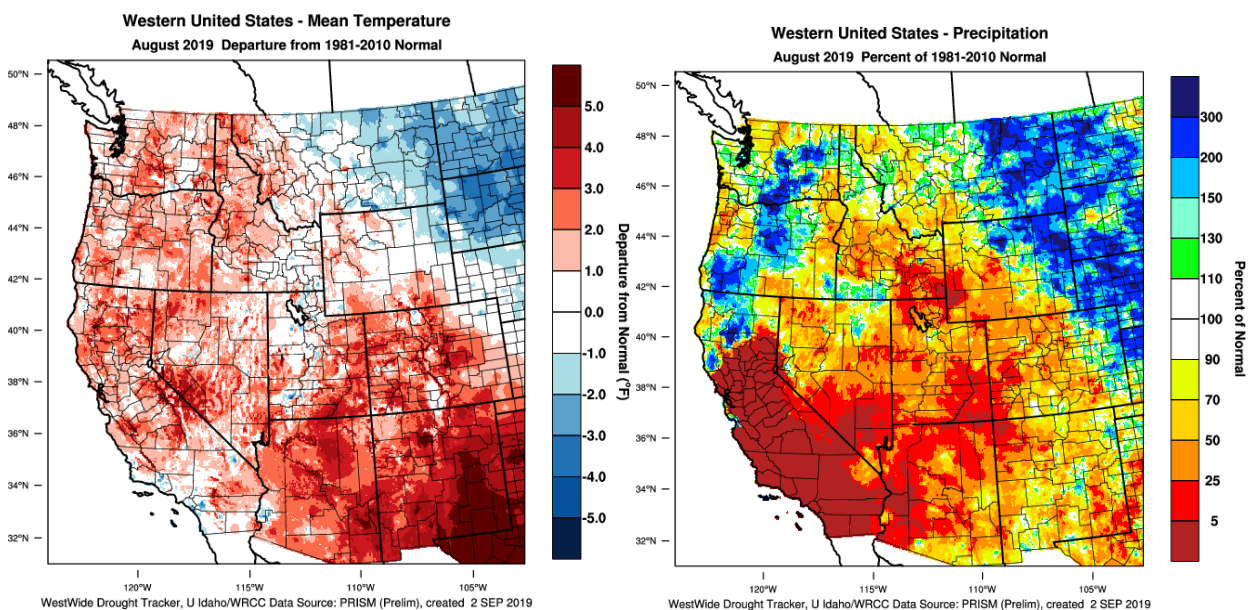
# Weather and Climate Summary and Forecast September 2019 Report

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## Summary:

- A moderately warm August, but low heat stress compared to recent years. The month was dry south and slightly wet north, but concerns for drought conditions in the PNW and fire risk across the west continue.
- Heat accumulation continues to lag the warmest of the last few years but remains largely above average in all but portions of the northern and southern coast of California and eastern Washington, which are closer to average or slightly below average. Harvest across the west has commenced for sparkling and early varieties.
- The forecast through mid-month indicates a warm start to September becoming cool through mid-month then warming to slightly above average later in the month with no major heat events. Some precipitation is forecast for the northwest, likely more than we want, while the rest of the west will likely stay dry.
- A very warm North Pacific continues its influence on the forecast for September through November, with the western US likely seeing a warmer than average end of summer and start to fall. The precipitation forecast calls for near-average conditions throughout the west, with no clear signal for the onset of fall rains in the forecast at this time.

The August forecast for warmer than average<sup>1</sup> temperatures over most of the western US was spot on (Figure 1). Conditions across the west were largely 0.5-4.5°F warmer than normal, although some onshore flow did keep heat extremes to one of the lowest levels in the last 5 years or so. Some isolated areas along the coast in southern California, eastern Oregon and Washington, and the northern Great Basin and Rockies saw near average temperatures during the month. The cool year to date across the northern Rockies and into the northern and central Plains continued in the month of August. Extreme temperatures brought areas of the Four Corners, southern Rockies, and Texas to much warmer than average for the month, while much of the rest of the eastern US was near average to slightly above average (not shown). The western US precipitation pattern reflected the anomalous frontal passages that were in place for a few periods in the month with northern California and southern Oregon seeing 200-300% of average (still < 1" in most places), onshore flow in western Washington, thunderstorm activity in eastern

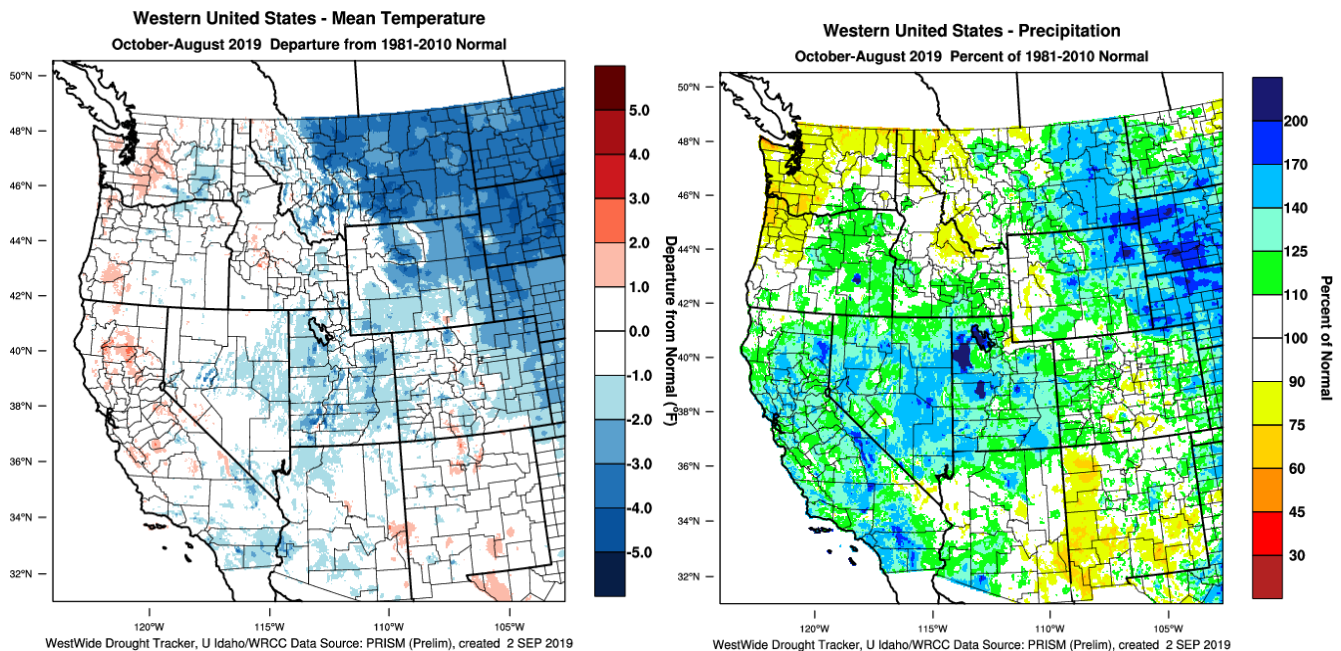


**Figure 1** – Western US August 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

<sup>1</sup> Note that all references to averages in this report are to the 1981-2010 climate normal for each weather/climate parameter unless stated otherwise.

Oregon/Washington and no monsoon to speak of (Figure 1). The driest areas in the country in June were California, the desert southwest, and Texas, while the rest of the country experienced near average to moderately higher than average precipitation for the month, especially the northern Plains and the lower Mississippi (not shown).

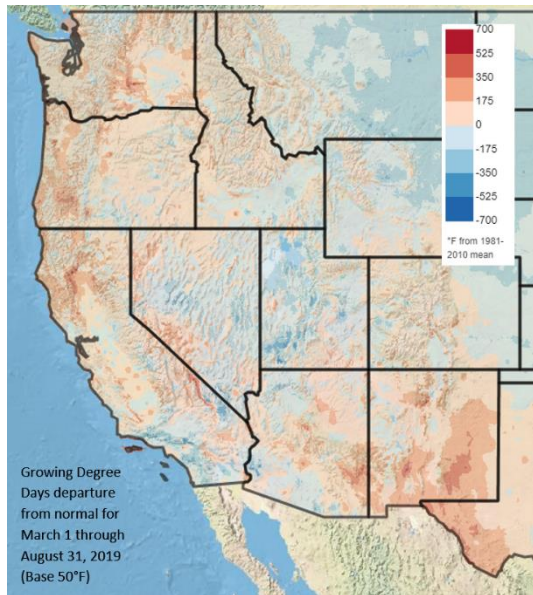
For the water year from October through August, the general temperature pattern continues from previous months with the eleven-month period showing near average temperatures over most of the west coast and inland states, except for warmer than average conditions in scattered areas in Washington, Oregon, and California. Cooler than average conditions have held in eastern Washington and Oregon, portions of southern California and into the desert southwest, Great Basin, and Rockies. The northern Rockies into the northern and central Plains have seen substantially colder than average conditions during this period (up to 6°F colder than average) and is one of the only places on the planet to see a cooler than average year to date. The rest of the country has largely stayed near average to warmer than average, especially in the southeast and into the Mid-Atlantic (not shown).



**Figure 2** – Western US Water Year October 2018 - August 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Water year precipitation amounts have not changed much from last month, with amounts continuing to be moderately wetter than average in much of California, portions of the southwest, Great Basin and portions of the Rockies. The water year period to date has been 110-200% of average for these regions (Figure 2). A relatively dry water year to date continues in northwestern Oregon and Washington and some scattered areas in the northern Rockies (60-85% of average; Figure 2). The central and eastern US has largely seen precipitation amounts running 110-200% or more of normal so far this water year (not shown), with only the southernmost portion of Texas and south Florida experiencing a drier than average conditions.

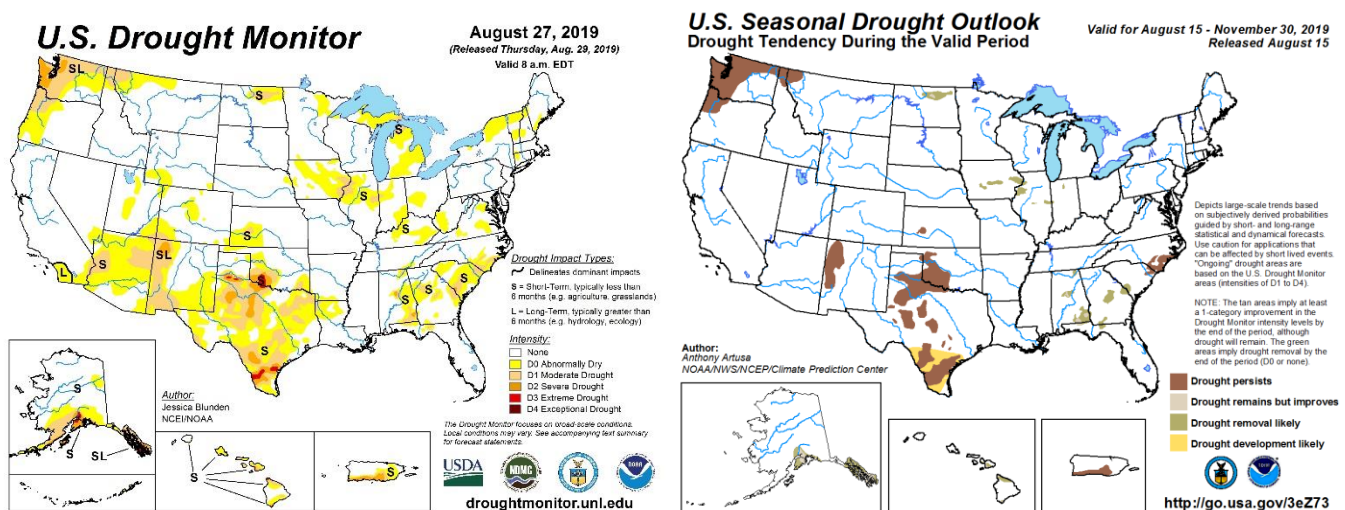
Seasonal deviations in growing degree-days (GDD) mapped over the western US since March shows a mixed pattern (Figure 3). While some areas are running up to 250-500 GDD above average, coastal areas of central to southern California, the North Coast, and portions of eastern Washington are closer to the average or slightly below average for this time of year. In terms of the deviation in days, current conditions continue to place much of northern California, western Oregon, and western Washington 5-15 days ahead of normal for heat accumulation, while coastal areas in the North Coast, central to southern California, and eastern Washington are running 2-8 days behind in heat accumulation (not shown).



**Figure 3** – Western US March through August 2019 growing degree-days departure from 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

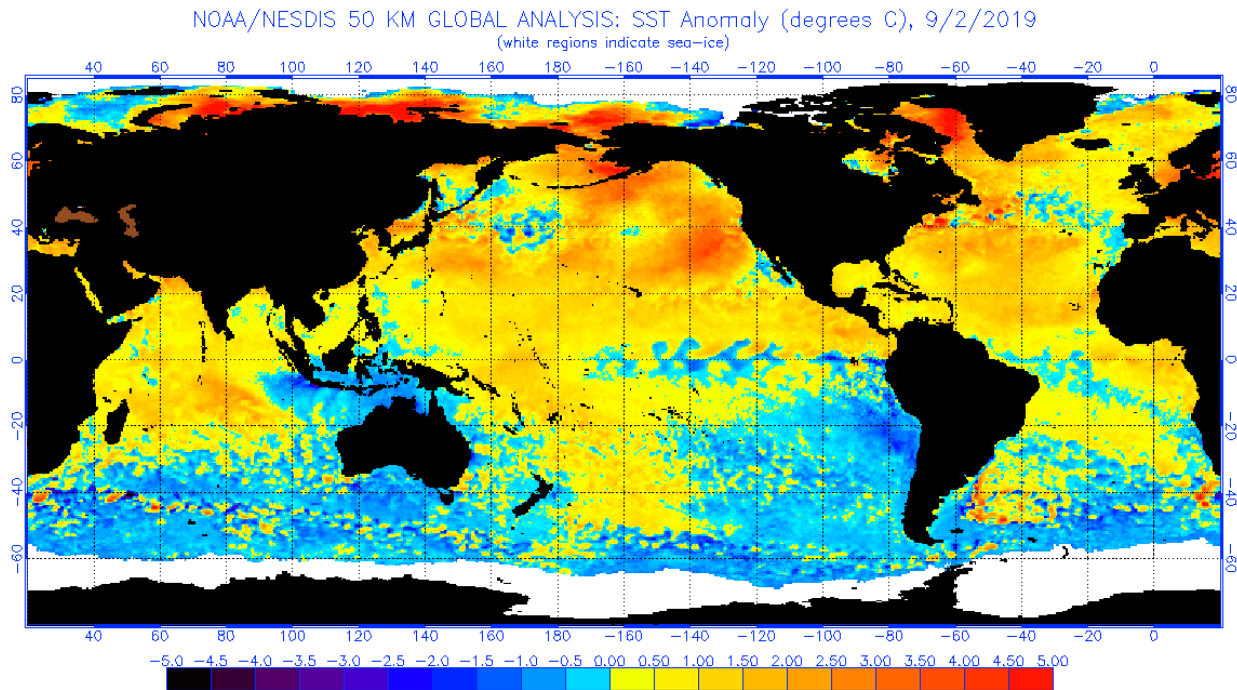
The 2019 harvest is underway in many regions, with sparkling varieties and other early ripening varieties picked across the west. Reports also indicate that mid-month may be the center of the harvest, but the forecasted mild and dry conditions should allow for a slow and steady harvest window. Heat accumulation (GDD) amounts for four locations that I have tracked for many years in Oregon continue to track near last year’s numbers but below the last few years. Locations in the Willamette Valley, the Umpqua Valley, the Rogue Valley, and the Walla Walla Valley are currently 10-25% above the 1981-2010 normals for the months of April through August and from the same to 6% lower than the same point in 2018 (see the Appendix Figure 1 for the four locations in Oregon).

**Drought Watch** – drought conditions expanded slightly over the US during the month (Figure 4, left panel). One of the most significant areas of drought concern continues to be western Washington, northwestern Oregon, and portions across the northern border areas with British Columbia. Other areas that saw drought conditions expand include the Four Corners, much of Texas, isolated areas of the Mississippi River valley and the northern Great Plains, and portions of the southeast. The US seasonal drought outlook shows continued concern for short to long-term drought in the PNW, especially western Washington, northwestern Oregon, and the northern Cascades, as the September through November forecast shows (see the 90-day forecast below). Additional areas of drought concern have diminished slightly from previous months, with only portions Texas remaining an area of concern (Figure 4, right panel).



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

**ENSO Watch** – the weak El Niño conditions in the tropical Pacific have declined to neutral ENSO levels with only slightly warmer than average sea surface temperatures (SSTs) in the key areas of the Tropical Pacific (Figure 5). Patterns in most atmospheric variables also are showing ENSO-neutral conditions. Collective model forecasts favor ENSO-neutral through autumn and winter, but with higher chances for El Niño than La Niña. The official CPC/IRI outlook, no longer carrying an El Niño advisory, generally agrees with the model forecasts through winter. If these conditions continue to hold the weather across the western US will likely see less of a Tropical Pacific influence than if the El Niño conditions had stayed in place. However, the broader warming in the entire North Pacific will likely carry the influential role heading into late summer and early fall (see forecast periods below and Appendix Figure 1).



**Figure 5** – Global sea surface temperatures (°C) for the period ending September 2, 2019 (image from NOAA/NESDIS).

**North Pacific Watch** – Extremely warm SSTs persist with nearly the entire North Pacific much above average (Figure 5) and seasonal models are tilting the odds for the warmth to continue for at least the next month or so. The ‘blob’ of extremely warm ocean temperatures in the North Pacific should be the main influence in the 90 day forecast (see below) with a likely warm late summer/early fall for most of the west, but likely continued higher than average humidity and minimum temperatures. Coastal upwelling along the central California coast has helped keep North Coast temperatures down so far this vintage, but the overall area and magnitude of the upwelling have declined over the last 60 days. These conditions continue to suggest a relatively warm ending of the vintage. With the tropics moving to a neutral ENSO phase (see above), the warm North Pacific should play a larger role in the influence on the western US weather during the next 3-4 months.

**Forecast Periods:**

**Next 5 days:** mild to warm conditions through the week with a minor cool down into the weekend due to a shift to onshore flow in the PNW, California will not cool down as much but will have some marine layer incursions along the coast in the usual locations. No rain forecast west side, scattered thunderstorms east side/inland.

**6-10 day (valid September 8-12):** after a relatively warm start to the month, this forecast period will likely be influenced by onshore flow and marine layers with near-average to slightly cooler than average conditions. Coolest areas will likely be northward in western Washington and NW Oregon, and warmer areas likely south into California. The northern tier of states from the Rockies eastward are forecast to see slightly below average temperatures for this time of year, while the southern tier of states centered over Texas and the Gulf Coast will likely be much warmer than average. There is a possibility for a couple of rain events during this forecast period, but they appear to be more

likely to occur along the Canadian border across into the northern Plains. The period will also likely see continued thunderstorm activity in the Great Basin from Arizona to Idaho and eastern Washington/Oregon. Rain is not forecast for California during this time. Texas, the Gulf Coast states and up into the eastern seaboard is forecasted to be dry along with the higher temperatures during this period.

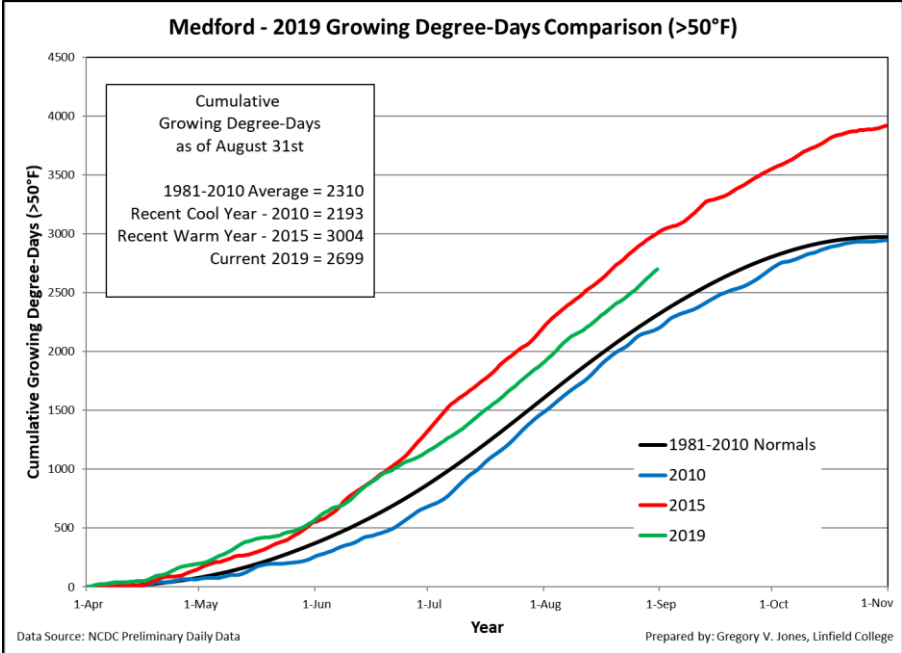
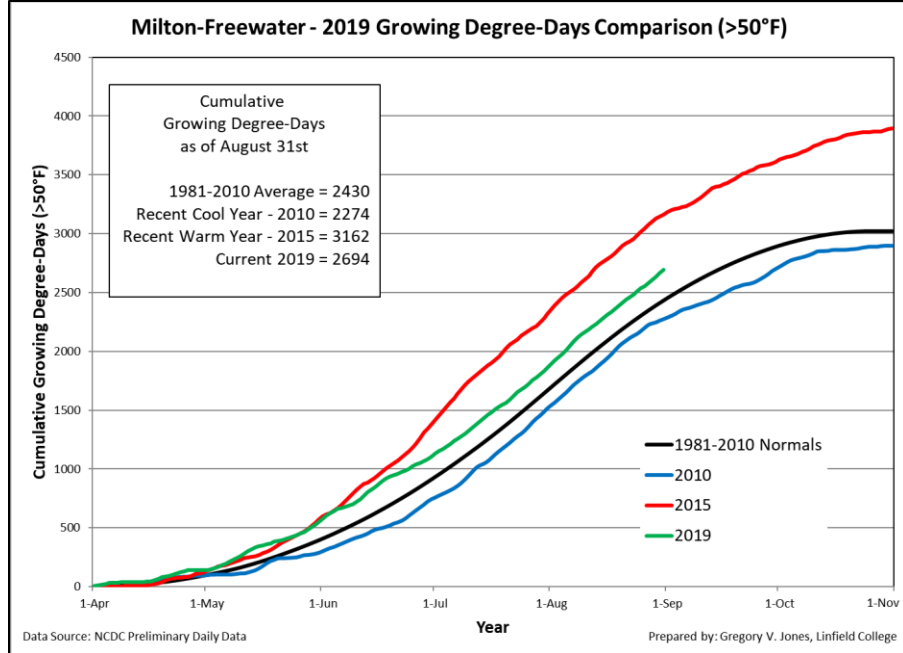
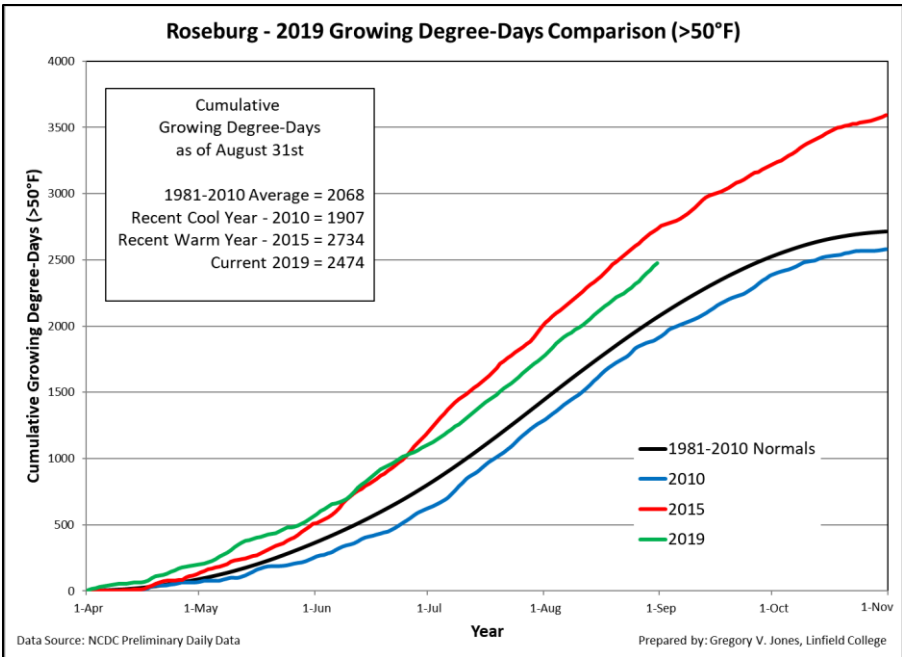
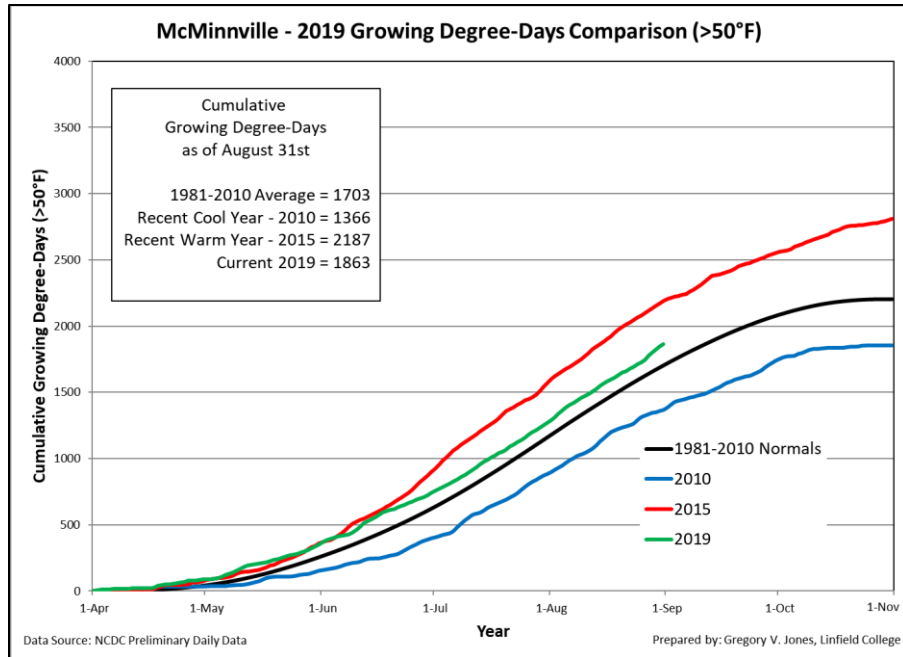
**8-14 day (valid September 10-16):** seasonal conditions should continue into mid-month with coastal temperatures expected to be slightly warmer than average, while inland conditions should remain near average temperatures for this time of year. The inland PNW is the only area in west, and the entire country, forecast to see below-average temperatures. The bulk of the country is forecast to see a warm-up into mid-month with the warmest areas likely continuing in Texas and along the Gulf Coast. A similar precipitation pattern holds during this period where dry conditions should prevail over much of the western US, except for the extreme northwest portion of Oregon and Washington and along the Canadian border. The northern Plains across to the Great Lakes is forecast to see wetter than average conditions for this time of year, while Texas, the Gulf Coast states and the Mid-Atlantic are forecast to be drier than average.

**30 day (valid September 1-30):** the warm start to the month, followed by mild near average temperatures mid-month, appears to be finished with a warm ending. The overall month forecast is for the western US to be slightly to moderately warmer than average (see Appendix Figure 2). A relatively cool month is forecast for the Great Lakes and upper Midwest, while a warmer than average month along the southern tier of states from Arizona across Texas to Florida and into the Mid-Atlantic states is likely in play. Not much precipitation for the western states with the forecast calling for near-average conditions. The central portion of the country is forecast to experience a wetter than average month, with some monsoon rains for the southwest (Finally!), and the eastern seaboard will likely carry the rainfall signature from Dorian for a much wetter than average month.

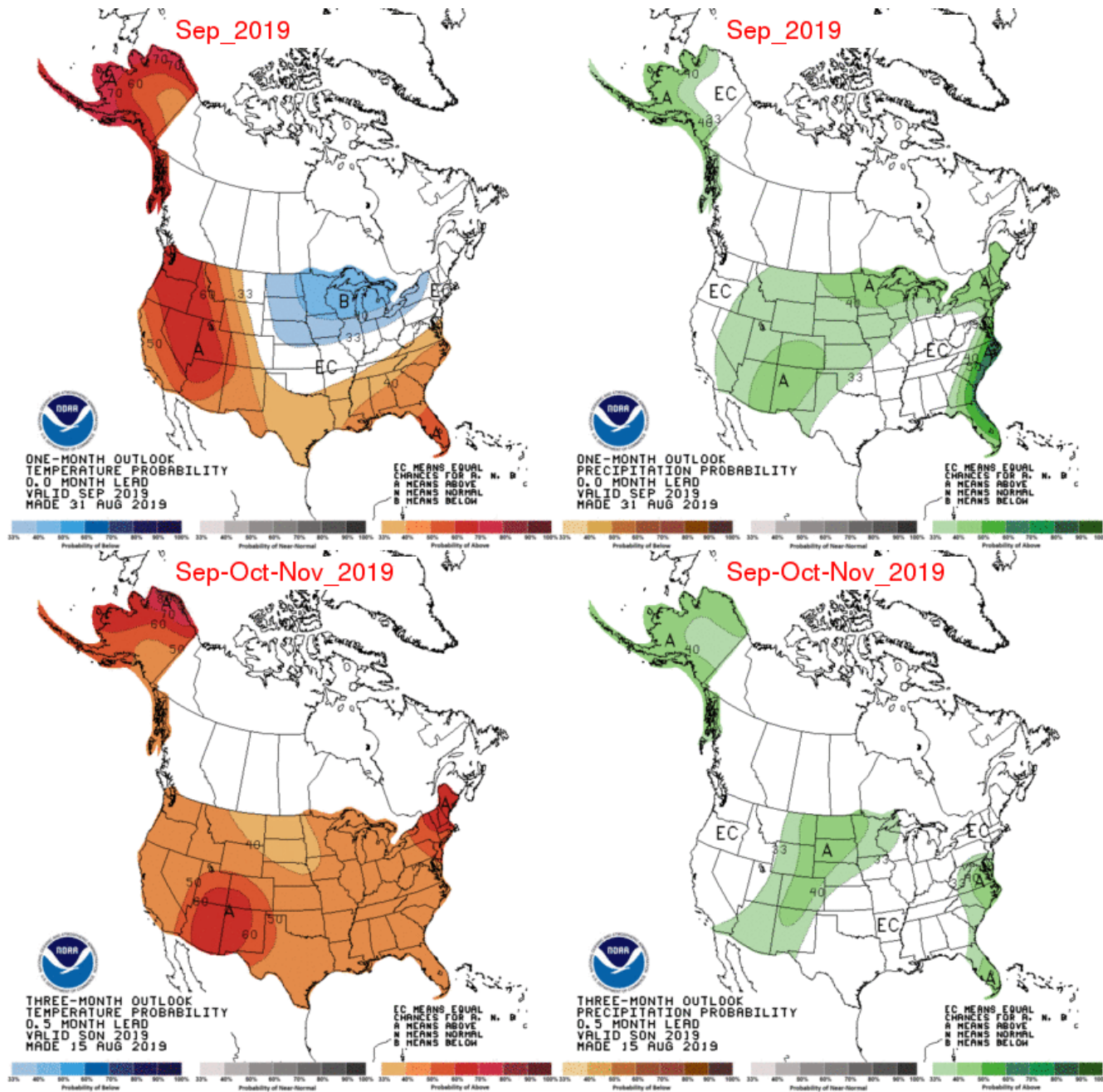
**90 day (valid September-October-November):** as we head into fall and the start of winter, the long-range temperature forecast has the entire US likely seeing a warmer than average three month period (see Appendix Figure 2). The areas with the highest likelihood are the desert southwest and the Four Corners region along with northern New England. Precipitation during the next 90 days is forecast to have equal chances for slightly above, near-normal, or slightly below for much of the country, which for the west coast means the typical late summer dry conditions and first fall rain events in mid to late September or early October. The only areas likely to see wetter than average conditions are in the northern and central Rockies across into the northern Plains, and the eastern seaboard from Florida to the Mid-Atlantic which will likely have tropical moisture accumulation.

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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 (2019) 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 September (top panel) and September, October, and November (bottom panel) (Climate Prediction Center, climate.gov).