

Weather and Climate Summary and Forecast October 2018 Report

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Summary:

- Much of Washington, Oregon, coastal California and the Bay Area and delta region had a cooler than average September. This was largely the result of the blocking ridge over Alaska that keep much of these areas with relatively cool air flow. Points to the south and east were flipped with much warmer than average temperatures. Even with some rain in western Oregon and Washington, dry conditions persisted in the western US in September continuing long-term drought concerns.
- The major change over the short term (10-14 days) is a turn to colder than average over much of the entire western US. The pattern shift is the result of what is happening in Alaska, one of the warmest and driest falls ever seen. The greatest likelihood of precipitation for California and the desert southwest may have already occurred over the last couple of days, while more northern areas have some coming over the next few days.
- The seasonal forecast balances the current cool conditions with expected warmer conditions into early winter. The forecast continues to point to a dry period through the end of the year for the PNW, and other regions to likely see average precipitation. Heading into the final weeks of the season heat accumulation is likely to end up slightly below average to close to the average heat accumulation of the last five years.

September brought us widely varying temperatures like a transition month should, but the month ended up cooler than average for many along the west coast. Temperatures were 1-3°F below average across much of Washington, Oregon, coastal California and the delta of California (Figure 1). The Bay Area and delta conditions continued from previous months where coastal SSTs remained cooler than average due to strong coastal upwelling (see North Pacific discussion below). In contrast, warmer than average temperatures (1-7°F) over the Four Corners, southern California, and southern Rockies were seen during the month. For the rest of the country, the northern Plains and Texas were cooler than average, while the rest of the country was much warmer than average (not shown). A week of showers mid-month brought the first significant rainfall to northwestern Oregon and western Washington, otherwise, the majority of the rest of the western US saw 25% or less of normal precipitation (Figure 1). Similar to the temperature flip-flop seen in the west in September, the dry conditions in the west were largely replaced by much wetter than normal conditions in the east with the exception of Florida and Georgia which were relatively dry (not shown).

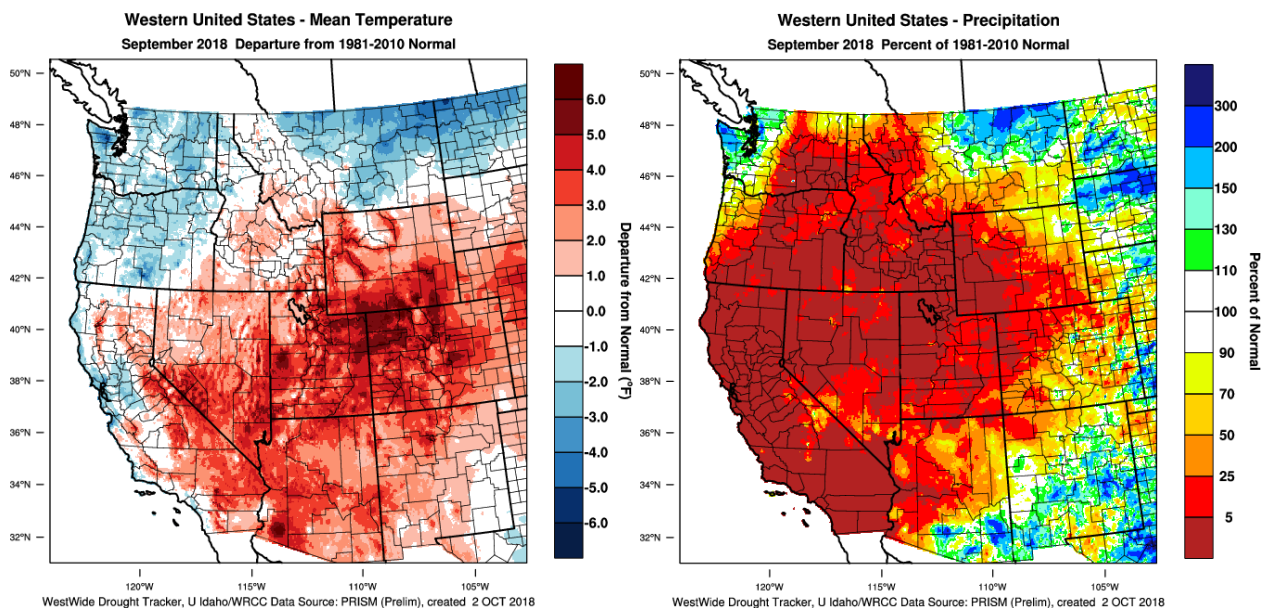


Figure 1 – Western US September 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Closing the book on the water year we can see from Figure 2 that the western US ended up mostly warmer than normal with the exceptions being a significant amount of Washington, portions of Oregon, most of the north coastal area of California and the Central Valley, which ended up near normal ($\pm 1^\circ\text{F}$). Eastern Montana across the Plains eastward to the northern Great lakes ended up cooler than normal for the water year, while the bulk of the rest of the country was between $1\text{-}2^\circ\text{F}$ warmer than average (not shown). For the water year that just ended, the western US ended up largely below normal in precipitation (Figure 2). Washington, northern Idaho, Montana, much of Wyoming, and a small area of the northern Sierra Nevada were the only areas to end up near average to slightly above average for the water year. The driest regions were Southern California across into the desert southwest and Four Corners region where 15-45% of normal was seen, which is also reflected in the Drought Monitor (see below). For the rest of the country, Texas and the southern Plains ended up mostly dry, while the rest of the eastern US ended the water year wetter than average (not shown).

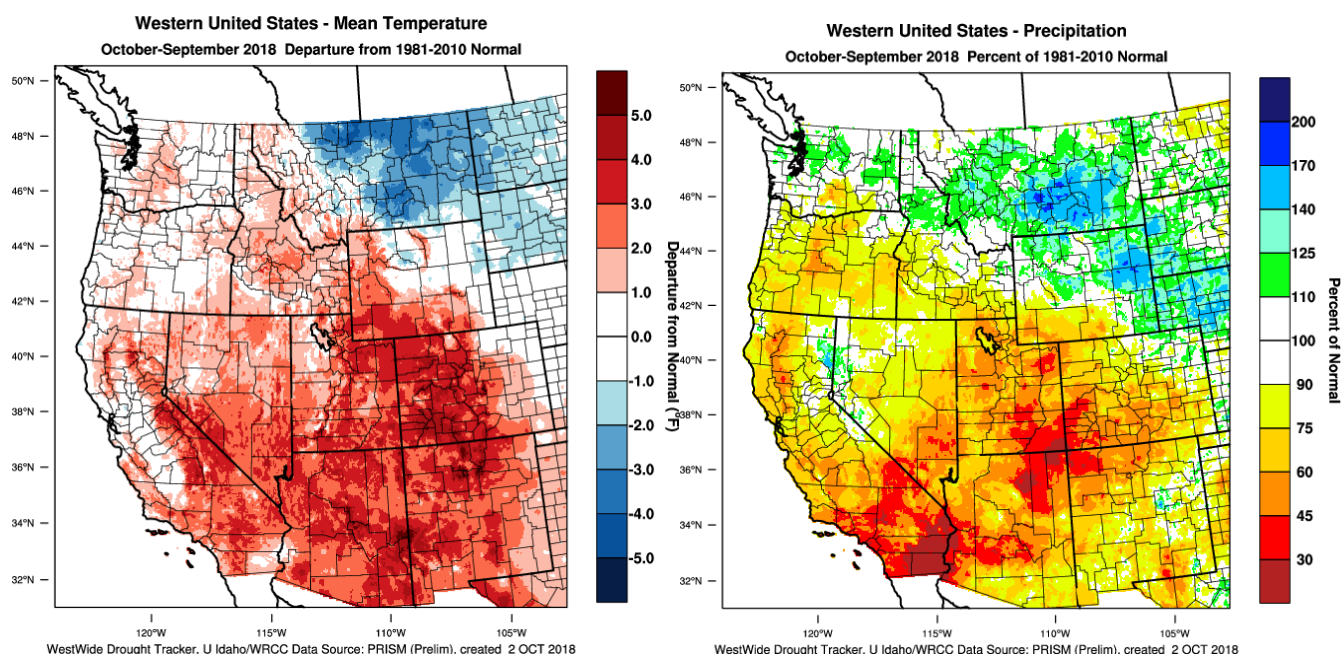


Figure 2 – Western US Water Year October 2017 - September 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The cool September did not add much to the growing season's heat accumulation (GDD) over the western US. Much of the west is sitting above the 1981-2010 average, although this has declined slightly to 5-20% above (Figure 3). Wine regions in Idaho saw heat accumulation numbers increase some, while portions of eastern Washington and Oregon dropped to near average or slightly below average. California again saw mixed conditions with much of the state near normal to above normal except in the Bay Area and Delta corridor where near shore upwelling and lower SSTs (see North Pacific discussion below) continued to contribute to a stronger than average marine layer and cloud cover that has kept heat accumulation slightly below to normal for the season (Figure 3). Western Oregon wine region heat accumulation is still running above normal, but the cool September (-0.2 to -1.5°F) did not add much to the total. GDD amounts for four locations that I have tracked for many years in Oregon are now slightly to moderately above average. GDD in these four locations are 4-16% above the 1981-2010 normals, 2-7% above the average for the last 15 years, and slightly lower than 2017 for April through September (see the Appendix Figure 1 for four locations in Oregon). With only one more month to go in the growing season, GDD in 2018 for western US wine regions will likely end up below average for some regions in California and eastern Washington, but near the 2012-2017 average for most other regions.

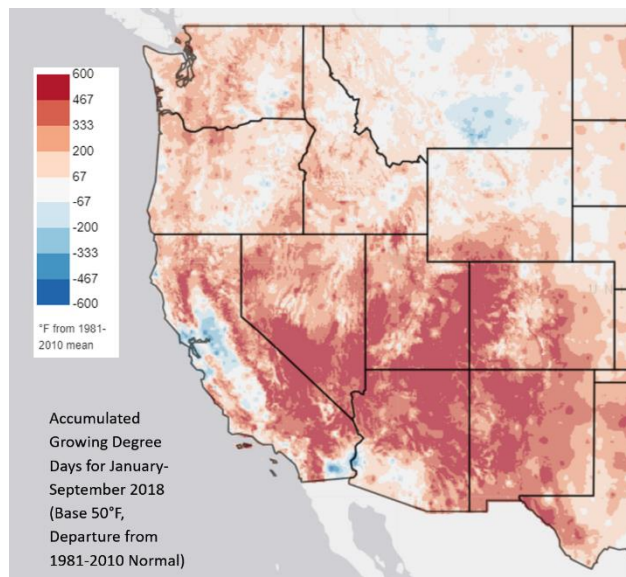


Figure 3 – Western US January-September 2018 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – Dry conditions continued over the vast majority of the western US resulting in expansion of drought in the region (Figure 4, left panel). The US Drought Monitor continues to show that the US drought footprint is at near record levels with the main areas of severe to extreme drought over the Four Corners region and the desert southwest with increases in severity seen in Oregon. The longer term prognostic for the US through the end of the year shows some changes, especially in the PNW where portions of western Oregon and Washington will likely see some improvement in the first half of winter. However, much of the long term persistent drought seen in the rest of Oregon, portions of Washington, northern and southern California, and the Four Corners region is expected to continue through to the end of the year (Figure 4, right panel). The eastern half of the US is largely free of any current or ongoing drought conditions.

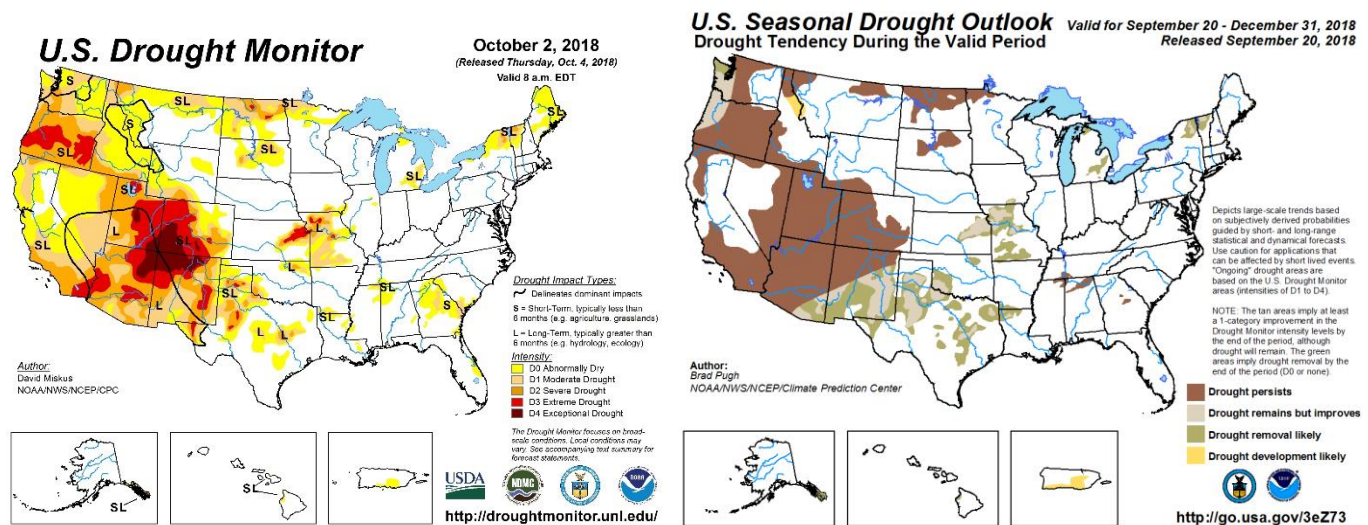


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – The long term discussion across numerous agencies continues to point to the likelihood of an El Niño event developing in the tropical Pacific in the fall. However, in mid-September 2018, the east-central tropical Pacific waters reflected ENSO-neutral conditions, with near to slightly above-average SST (Figure 5). The key atmospheric variables also suggested neutral conditions, although weakly westerly low-level wind anomalies have developed. The subsurface water temperature continued to be above-average. Most of the key atmospheric variables, including winds, also indicate neutral conditions at this time. The official forecasts from numerous agencies calls for a 50-55% chance of El Niño development during fall, rising to 65-70% for winter 2018-19. As such, an El Niño watch remains in

effect. If the conditions for neutral-ENSO continue to hold for now, the weather across the US will likely continue to follow the drier than average conditions in the 90-day forecast and beyond (see forecast periods below and Appendix Figure 2).

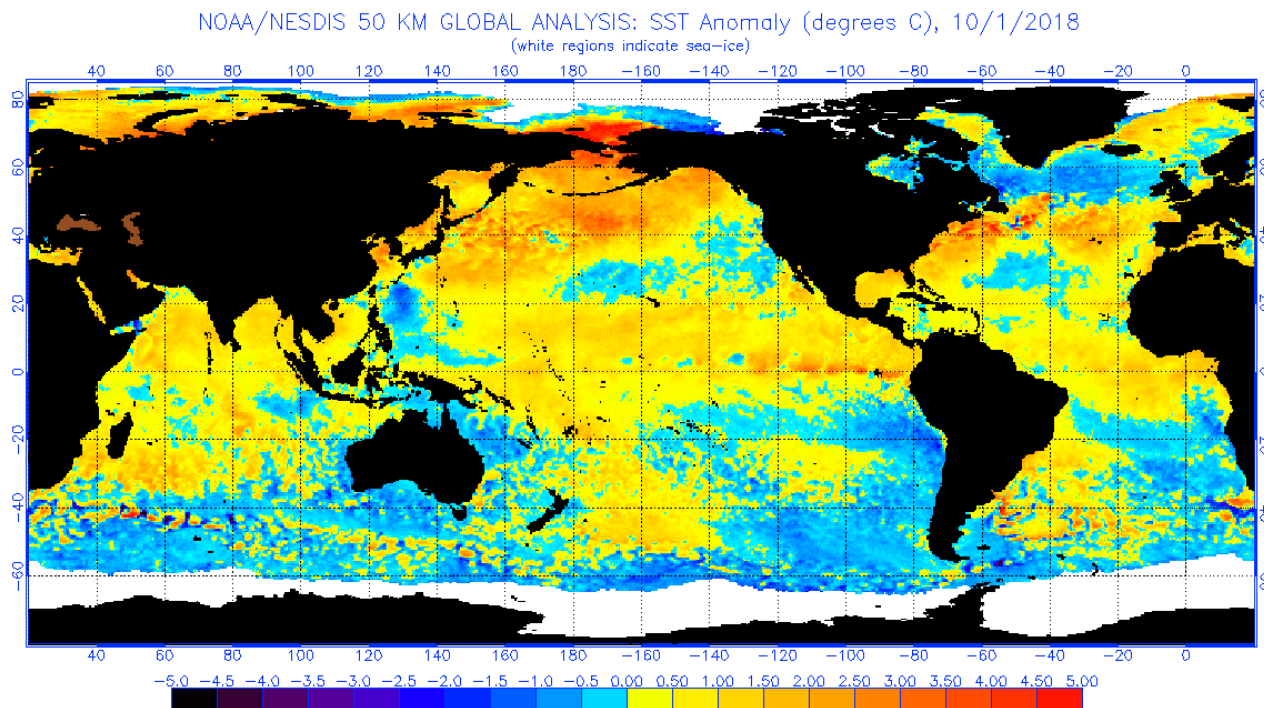


Figure 5 – Global sea surface temperatures (°C) for the period ending October 1, 2018 (image from NOAA/NESDIS).

North Pacific Watch – Two things are evident this month, 1) the entire North Pacific up into the Bering Sea has warmed tremendously, and 2) the conditions that have contributed to the cooler than average Bay Area region are largely still in place (Figure 5). The warming of the North Pacific over the last month has likely contributed to the strong ridging in the atmosphere (high pressure) over Alaska that has brought some of the sunniest, warmest and driest early fall weather the state has ever seen. In Anchorage, for example, temperatures have remained above normal for 32 straight days. Cooler than average SSTs off the west coast with a bullseye on the Bay Area, driven by near-shore upwelling have contributed to a robust marine layer, coastal cloudiness, and cooler than normal temperatures in the region (Figure 5). There continues to be no clear consensus on how the North Pacific SST will evolve over the next 90 days. If cooler than average near shore conditions along the California coast remain, then coastal zones will likely stay cooler than average. If the SSTs increase slightly and the upwelling subsides, then warming will ramp up along with the broader forecast for the next 90 days (see below).

Forecast Periods:

6-10 Day (valid October 9-13): Major circulation pattern shift over the Pacific and western North America during the last ten days will carry into this ten-day forecast. A high-pressure ridge over the central North Pacific is bringing extremely warm conditions to Alaska, but also opening the door for a southerly flow of very cold air over the entire western US. Expect temperatures to be substantially below normal in the inland western US and moderately below normal along coastal zones all along the west coast from Canada to Mexico. This pattern change also extends eastward with the eastern half of the US forecast to be much above normal over the next ten days. In terms of precipitation, the pattern change does open the door to more fall-like precipitation events with the first coming over the next couple of days. Conditions will remain unsettled with off and on rain events through mid-month. The west coastal areas will likely be near normal rainfall for this time of year, while the inland western US will likely see substantially higher than average precipitation and even accumulating early season snow in the Rockies. The wetter than average forecast extends to the Mississippi River valley and Great Lakes with the rest of the eastern US expected to see near normal rainfall amounts.

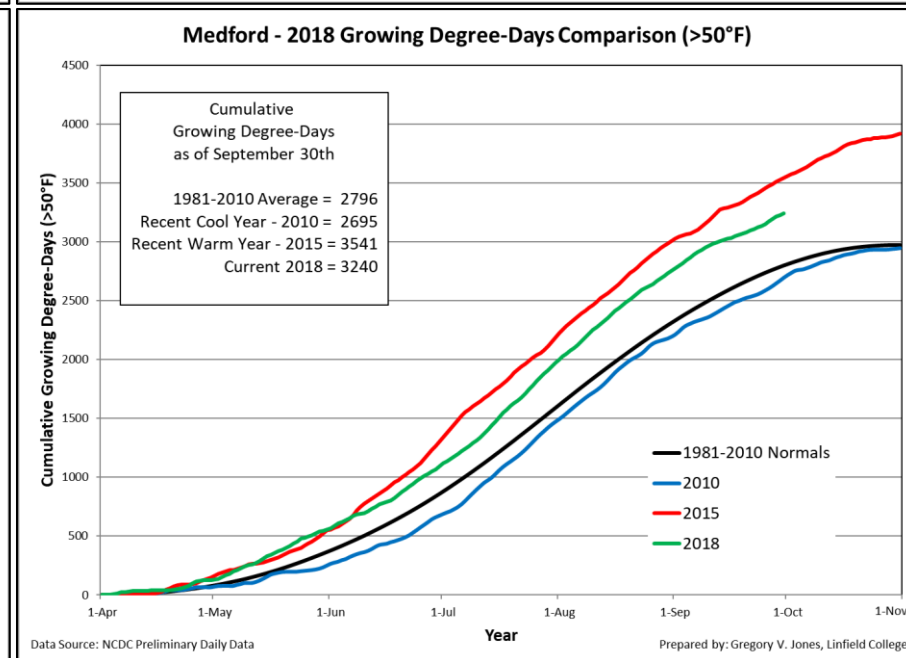
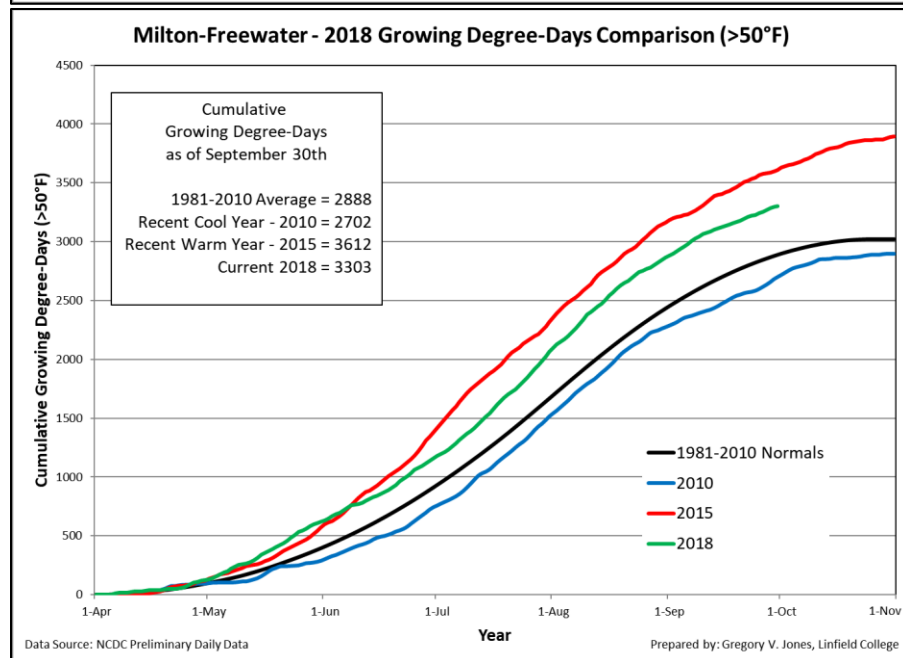
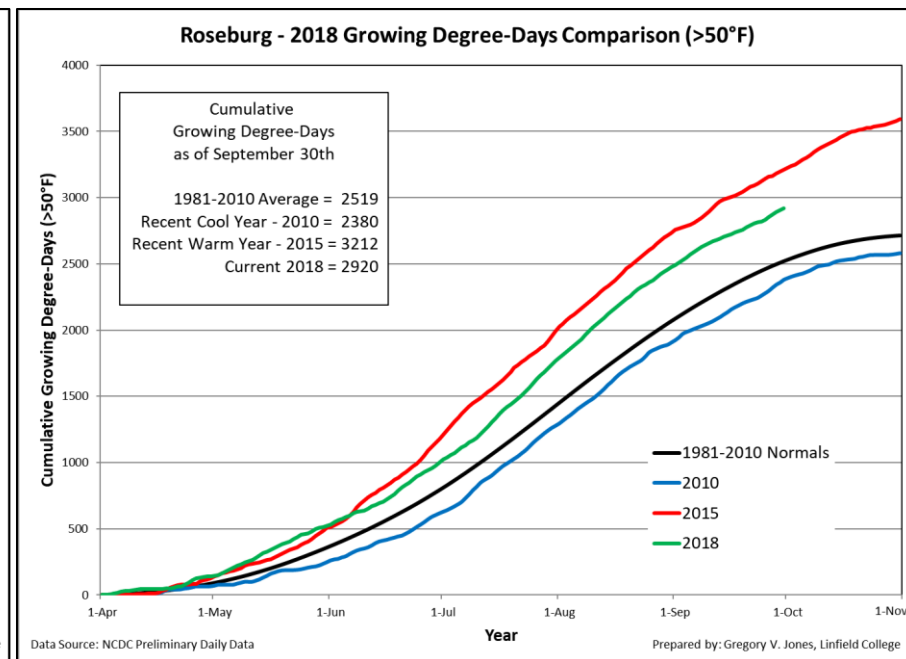
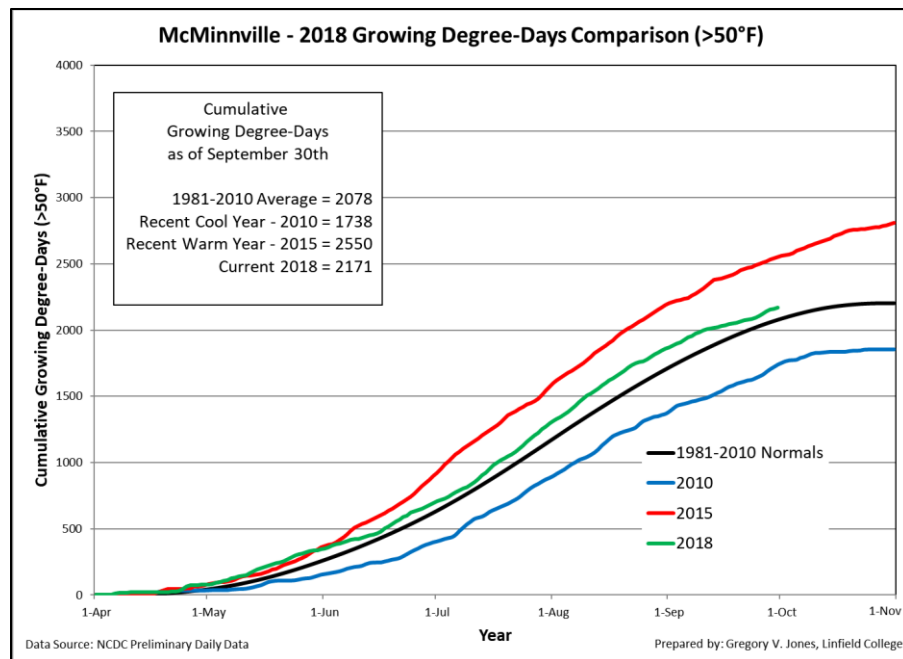
8-14 Day (valid October 11-17): Not much change into the two week forecast period with the bulk of the western US expected to remain colder than normal for this time of year. The coastal areas from Washington through Oregon to Northern California will likely see closer to normal temperatures during this period. A similar forecast extends into the Rockies and northern Plains with colder than average temperatures likely through mid-month while the eastern US will likely continue to see much warmer than average temperatures. The main change into this forecast period is that the PNW down into northern California will likely dry out and see below average rainfall for this period. The rest of the western US and the rest of the country are forecast to be wetter than average for mid-October.

30 Day (valid October 1-31): The pattern shift that we are currently experiencing will likely hold through most of the month with overall temperatures being near normal to cooler than normal for most the western US and extending into the Great Plains (see Appendix Figure 2). The remainder of the country from the southern Rockies and Texas eastward is forecast to see an October that is moderately warmer than average. The October precipitation forecast tilts the odds of the PNW to having an overall drier than average month. Higher than average rainfall for the month is likely to occur in the desert southwest with inputs from the remnants of Hurricane Rosa and other monsoon-like flow. The rest of the country is forecast to see above normal to near normal precipitation for the month.

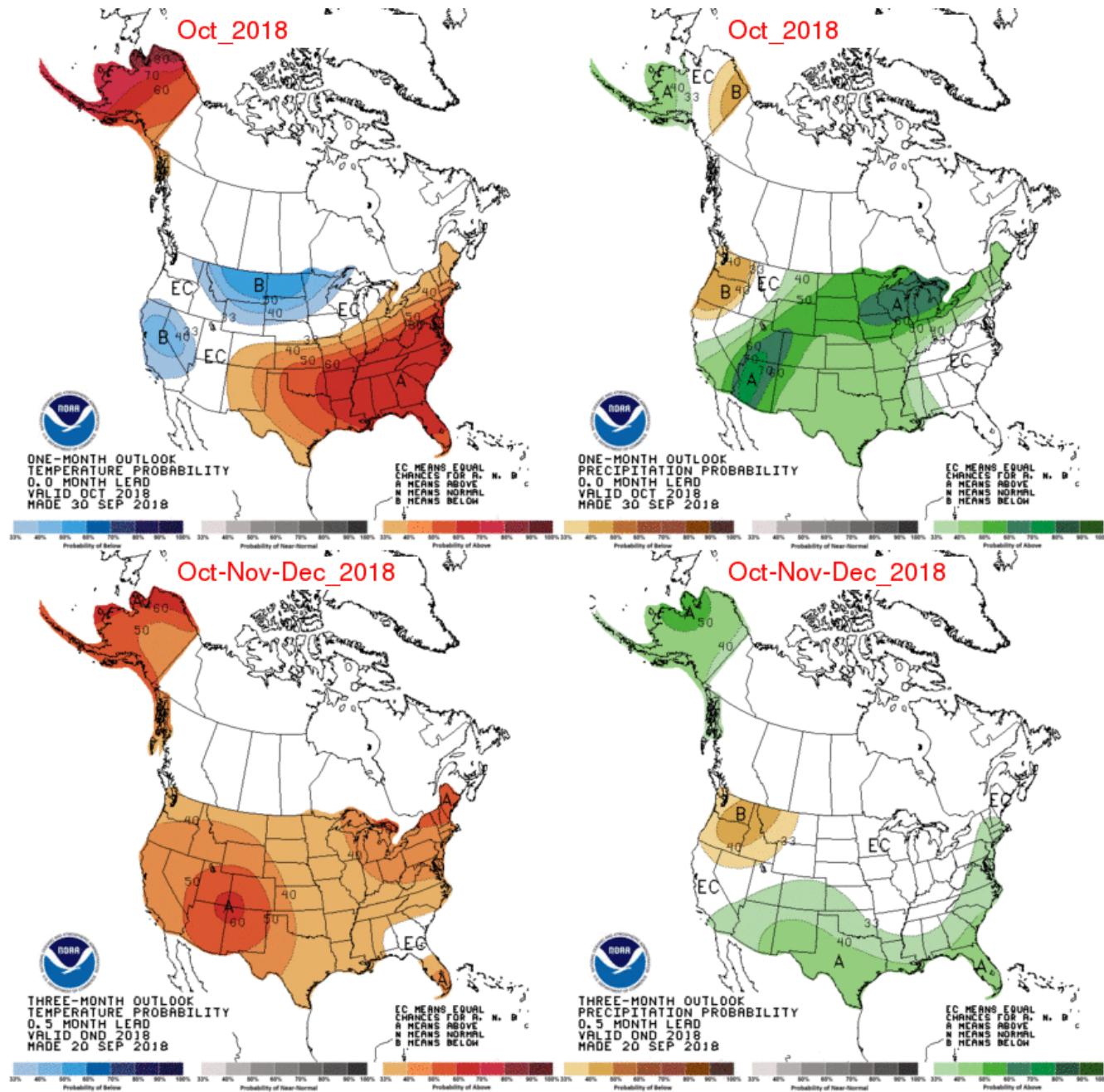
90 Day (valid October-November-December): The extended forecast into the first half of winter continues to hold from prior months. The October through December seasonal forecast is tilting the odds for most of the US to experience a warmer than average three-month period (see Appendix Figure 2). In terms of precipitation, the forecasted drier than average first half of the winter appears to be holding for the PNW, while most of California and the northern tier of states are expected to be near average during this period. The southern states from the desert southwest to the southeast and extending up along the east coast are forecast to see a wetter than average first half of winter (see Appendix Figure 2). The forecast for a drier than average first half of winter in the PNW couples with the US Drought Monitor's outlook for drought development and persistence in the region (Figure 4).

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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 (2018) 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 October (top panel) and October, November, December (bottom panel) (Climate Prediction Center, climate.gov).