Weather and Climate Summary and Forecast

Harvest 2016

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A transition to a fall circulation pattern in the North Pacific brought generally cooler than anticipated temperatures to the west. While portions of California and Nevada saw conditions slightly above normal (0-2°F), the PNW and the desert SW experienced near normal to cooler than normal temperatures during the month (Figure 1). September precipitation amounts were mixed over the western US with the bulk of California, Oregon, and eastern Washington much drier than normal (Figure 1). However, portions of southern California and desert SW experienced monsoon flow that carried northward producing areas of 200% above normal rainfall in the intermountain west and the northern Rockies. Nationwide, precipitation patterns were mixed with the wettest areas being the northern Rockies, the upper Mississippi Valley where extreme flooding occurred, and Florida to the mid-Atlantic region due to tropical storm moisture. The rest of the southern states and up into New England saw less than 25% of normal precipitation for the month of September (not shown). September nationwide saw temperatures flip from a relatively cool pattern in the west to much above normal temperatures from the Rocky Mountain states over the whole of the eastern US. Temperatures throughout the east were 2-5°F above normal with the most astonishing record being New Orleans where they recorded a record 43 days where the nighttime temperatures did not drop below 80°F (not shown).

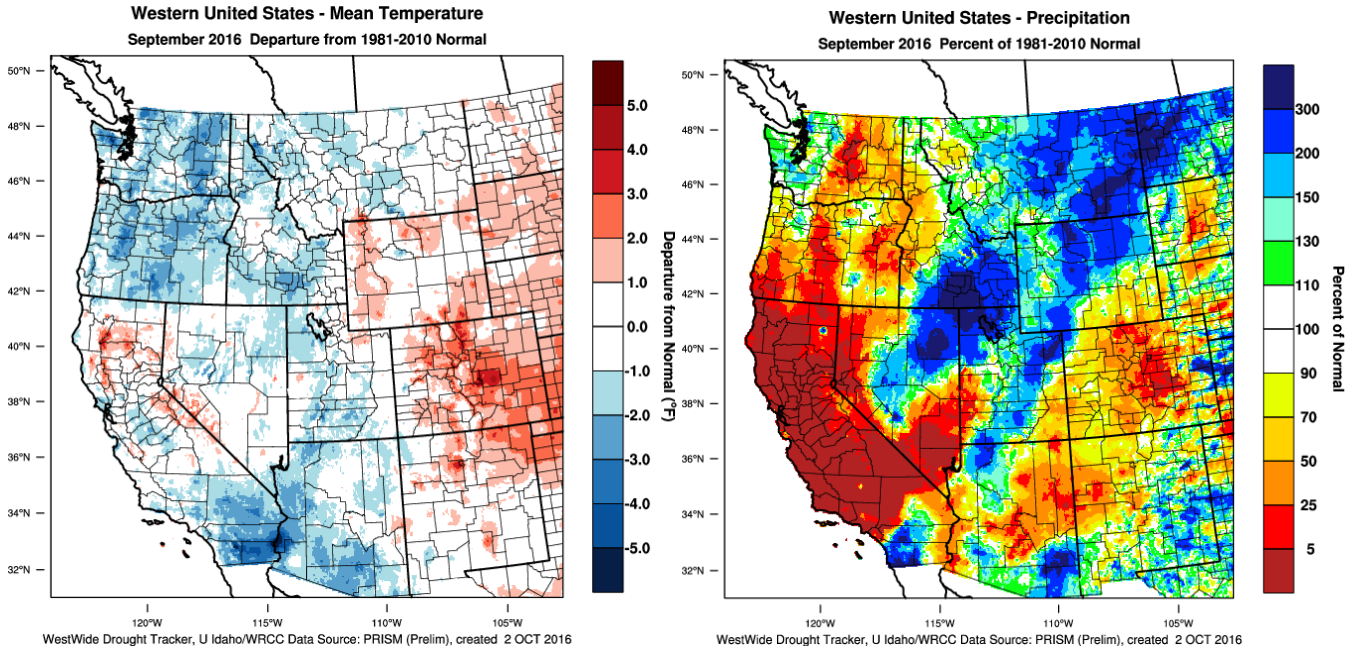

Figure 1 – Western US September 2016 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The coolish September lowered the cumulative conditions since the first of the year, but the western US continues to show a largely warmer than normal 2016 (Figure 2). Average temperatures for the period have run 1-4°F or more above the 1981-2010 climate normals for much of California, Oregon, Idaho and Washington. However, scattered areas have trended to average, especially in the Four Corners region of the southwest. The warmest areas of the west remain in the northern Rockies to the Dakotas where temperatures have been 3-4°F above normal. The general pattern continues across the entire US, with temperatures running 1-3°F above normal in most regions but 4-5°F or more above normal in the northern Rockies and Plains states and closer to normal in southern Texas and southern Florida (not shown). Precipitation amounts through September 2016 have been 90 to 175% of normal from central California into southern Oregon, central Washington and portions of the northern Rockies (Figure 2). Dry conditions continue to hold across eastern Oregon into Idaho and eastern Montana along with Southern California and across

the southwest. The wetter than average conditions extend out of the northern Rockies and into the Great Plains then south into the Mississippi and Ohio river valleys then Texas, while portions of the southeastern US and New England have been drier than average so far this year (not shown).

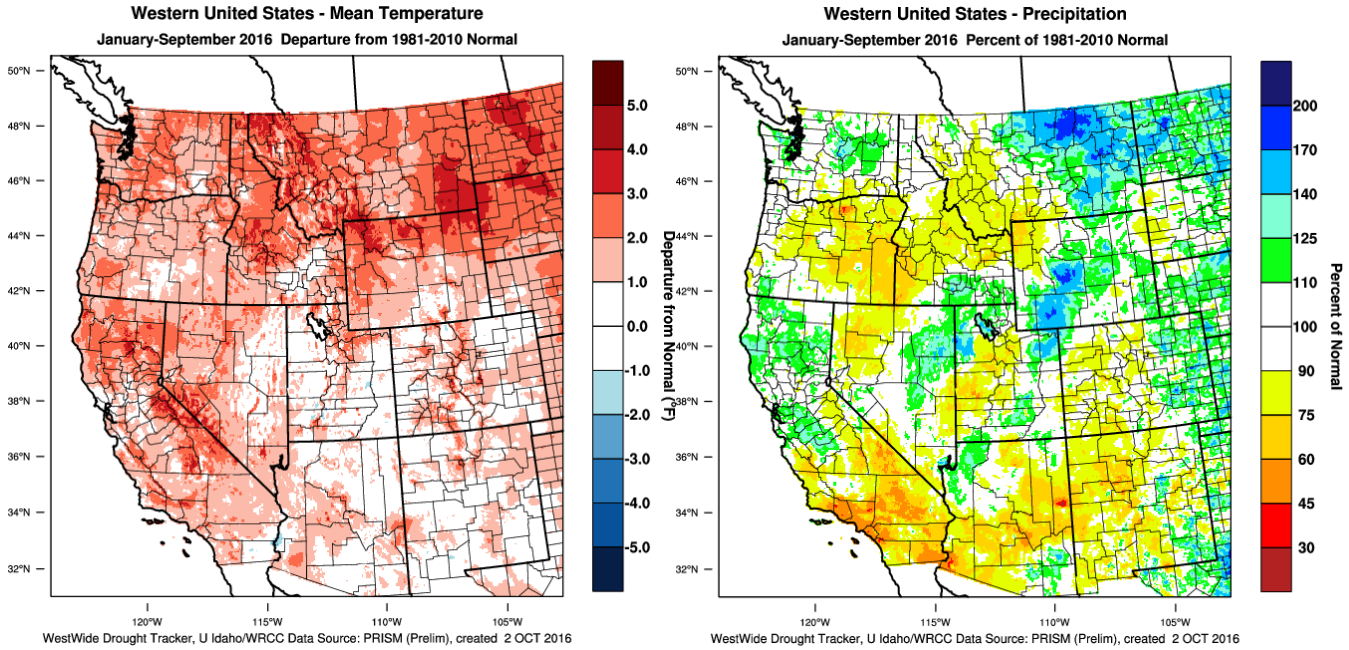

Figure 2 – Western US year to date (January through September 2016) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Heat accumulation for the western US was lower than normal for September, but the year is still on track to be higher than normal over most of the western portions of California, Oregon, and Washington (Figure 3). Growing degree-day (GDD) accumulation in September was near normal to slightly below normal in the PNW. The region that saw the coolest conditions was in the Columbia and Walla Walla valleys of Washington and Oregon. Higher than average GDD was seen scattered throughout northern to central California, but most locations were near normal (+/- 50 GDD). January through September accumulations are running near normal up to 500 units higher than the 1981-2010 normals throughout much of the western wine regions, however inland areas of the PNW have trended to normal or slightly below normal. Four long-term monitored locations in Oregon show that GDD is tracking close to 2015 in most of Oregon, but is much lower in eastern Oregon (see Appendix Figure 1).

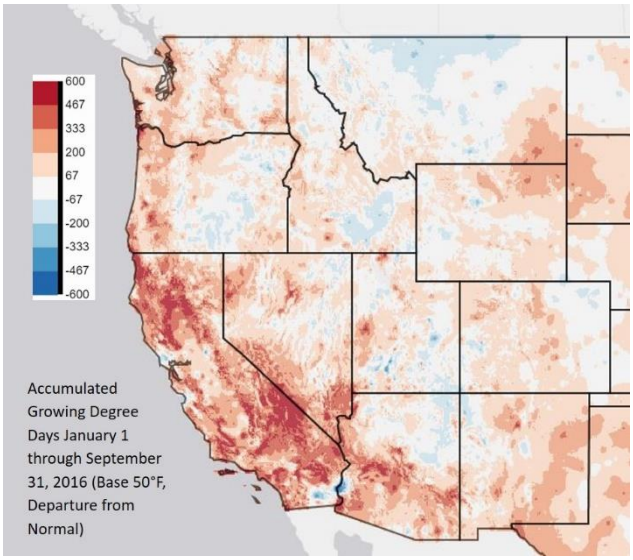

Figure 3 – Western US January through September 2016 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – Similar conditions from the last few months, although there was a slight expansion of drought in the western US. Conditions as of the end of September continue to show central and southern California and into the southwest and Great Basin under extreme to exceptional drought (Figure 4). The US seasonal drought outlook forecasts that the driest regions in California, Nevada, Arizona and eastern Oregon will likely persist through the end of December and beyond. Some drought removal is likely along coastal Oregon and across the northern Rockies as the winter snow season is expected to pick up over this time period.

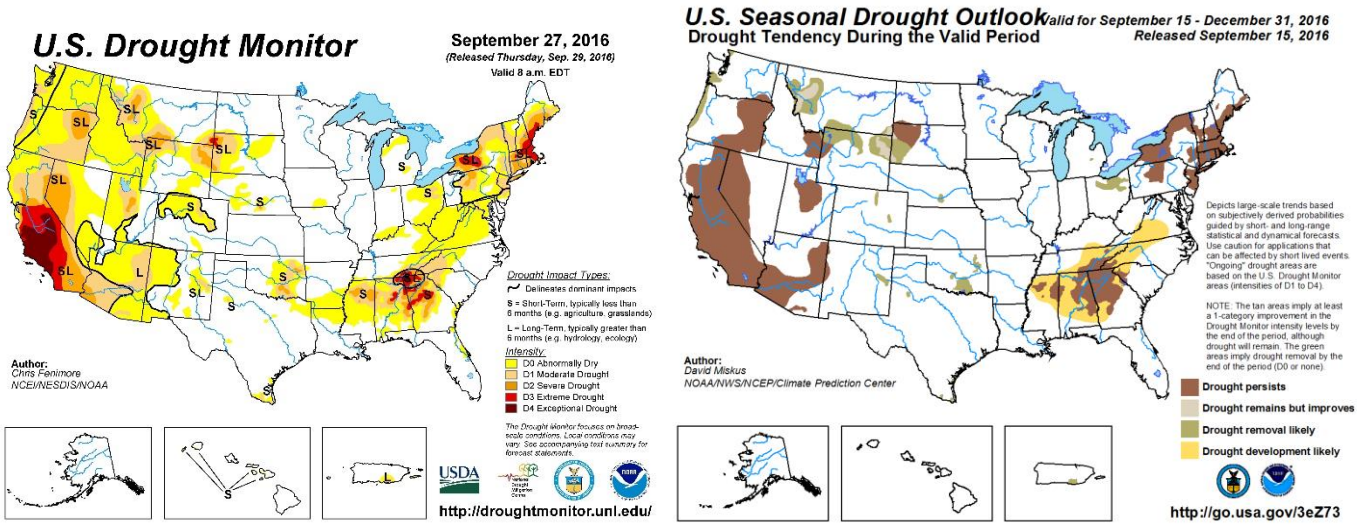

Figure 4 – Current US Drought Monitor and seasonal drought outlook.

La Niña Watch – More and more observations and forecasts are pointing to **La Nada** this winter. As mentioned here in the last few months, cooler tropical SST were favored and the development of a La Niña appeared likely for the winter. However, this transition has been slow and many are now calling for neutral (normal) to possibly weak La Niña conditions in tropical SST. La Niña conditions were pointing to wetter and cooler winter conditions in the Pacific Northwest, but with the shift to neutral conditions the winter forecast has one less factor that helps guide these predictions. Given these changes, forecasting agencies and individuals are calling for normal winter precipitation for the western US, especially from northern California into the PNW, with slightly warmer temperatures. However, conditions in the North Pacific will now likely play a more prominent role for our winter (see below).

North Pacific Watch – Some warming in the North Pacific over the last month or so was met with numerous stories of the return of the BLOB in the media. However, while warmer than average sea surface temperatures (SST) in the North Pacific continue (Figure 4), there is some evidence that these conditions will slowly wane over the next 30-90 days. The BLOB is associated with persistent high pressure over the eastern Pacific, and since high pressure produces weaker winds there is less stirring of cold water to the surface. As more troughing has been in place of late, the high pressure has given way to lower pressure and cooler surface waters. If this trend continues, this winter might trend to cool and wet, especially in terms of PNW snow amounts at higher elevations. More next month as these signals become clearer.

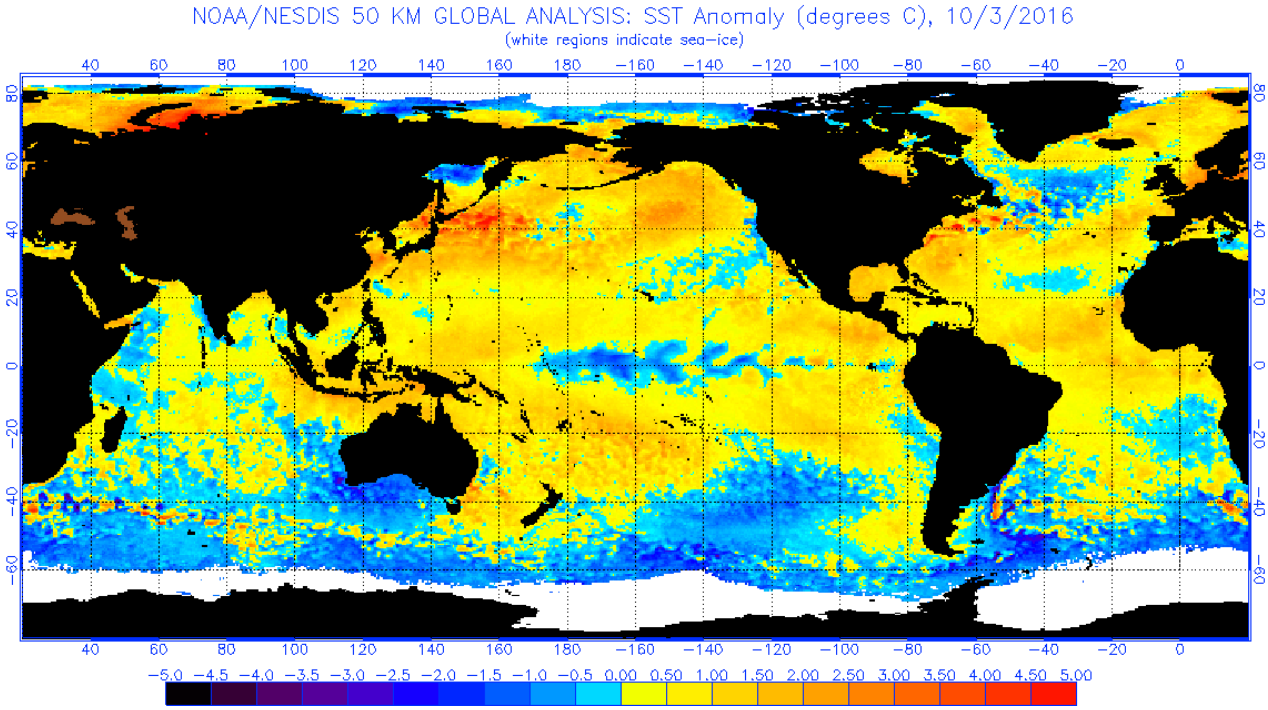

Figure 4 – Global sea surface temperatures (°C) for the period ending October 3, 2016 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day: The next few days bring off and on again showers as the general pattern in the North Pacific favors troughing and pulses of energy coming toward the west coast. Weekend of October 7-9 looks to trend warmer and drier. Afterwards the general pattern shifts to a wetter period during the following week. The 6-10 day outlook from the CPC reflects this pattern with a high likelihood for a slightly wetter than average PNW to normal rainfall for central to southern California. Temperatures for this period are forecast to have a greater chance to being warmer than normal over all of the western half of the US.

8-14 Day: Wet period likely October 10-17 will be the main signature out two weeks. Temperatures appear to continue the general warmer than normal conditions from the 6-10 period. The CPC outlook expands the likelihood of warmer than normal conditions nationwide. The precipitation forecast during this period continues to show the entire PNW having a higher likelihood of wetter than average conditions while central to southern California are likely to be closer to normal.

30 Day: The 30 day forecast for the month of October points to the month ending up close to normal or slightly warmer than normal up and down the west coast (see Appendix Figure 2). However, the cooler pattern in the PNW over the first two weeks of the month could keep overall temperatures for the month to normal or slightly cooler than normal. For the month, precipitation is forecasted to be above normal in the PNW across the northern Rockies, while the southern portion of the western US has an equal chance to be slightly above average, normal, or slightly below average (in other words there is nothing indicating anything other than normal October rainfall amounts).

90 Day: Of late there has been some mixed messages from the forecast community with many indicating a likely strong and stormy start to the winter for the PNW and dry for central to southern California. However, the CPC is continuing to point to the first half of winter October-November-December (OND) forecast having elevated chances of above average temperatures for the majority of the continental United States (NOAA's Climate Prediction Center,

see Appendix Figure 2). The early winter precipitation forecast for the west does not change much from the October outlook, with much of the west forecasted to have an equal chance to be slightly above average, normal, or slightly below average, while portions of the PNW and northern Rockies are forecasted to be wetter than normal. Current SST patterns in the Tropical and North Pacific waters are favoring neutral conditions with no clear driving influences for anything other than normal winter precipitation amounts across the west. Again, the month of October will give way to more insights into how the heart of the winter period precipitation patterns and amounts will play out.

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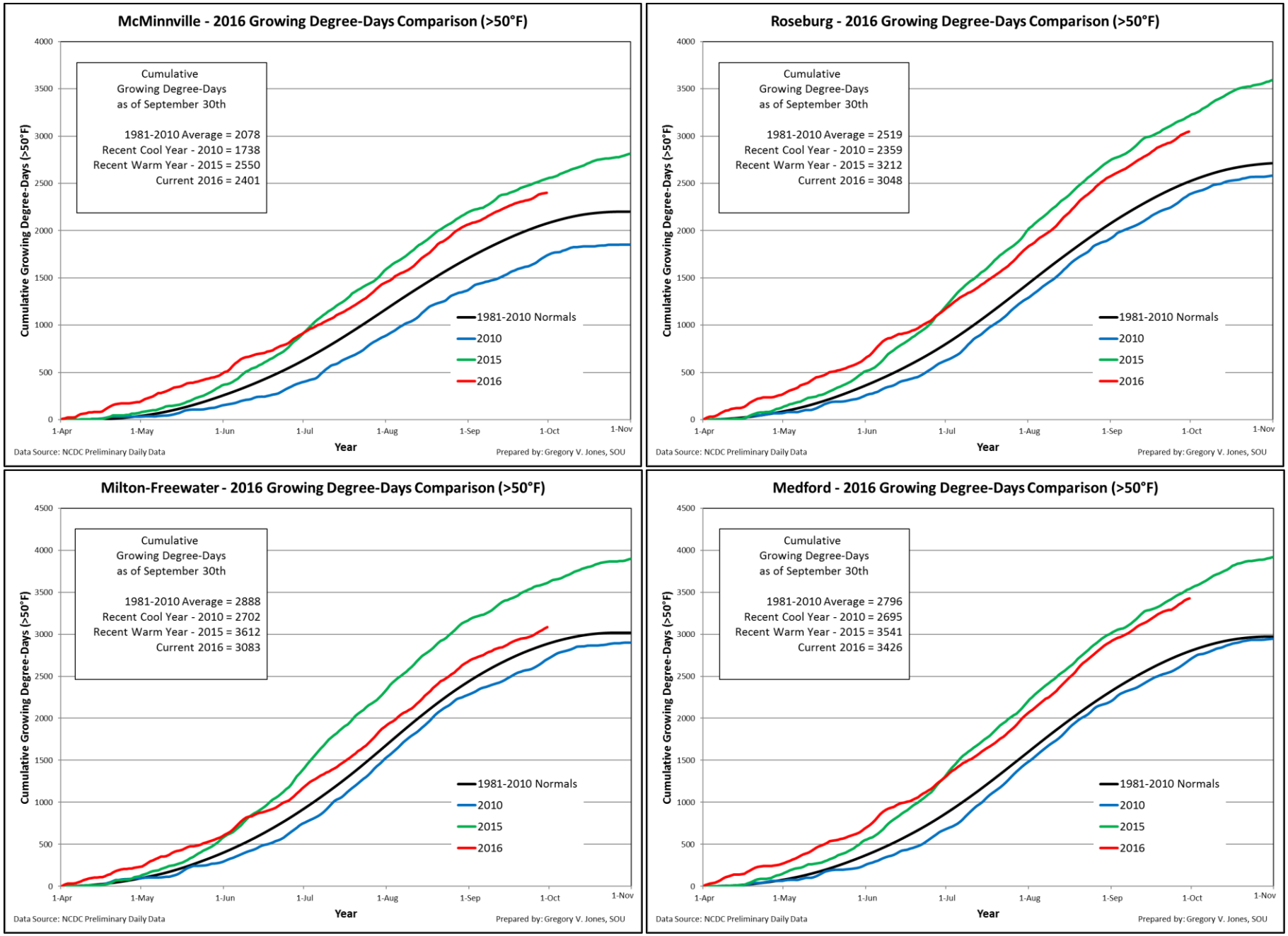
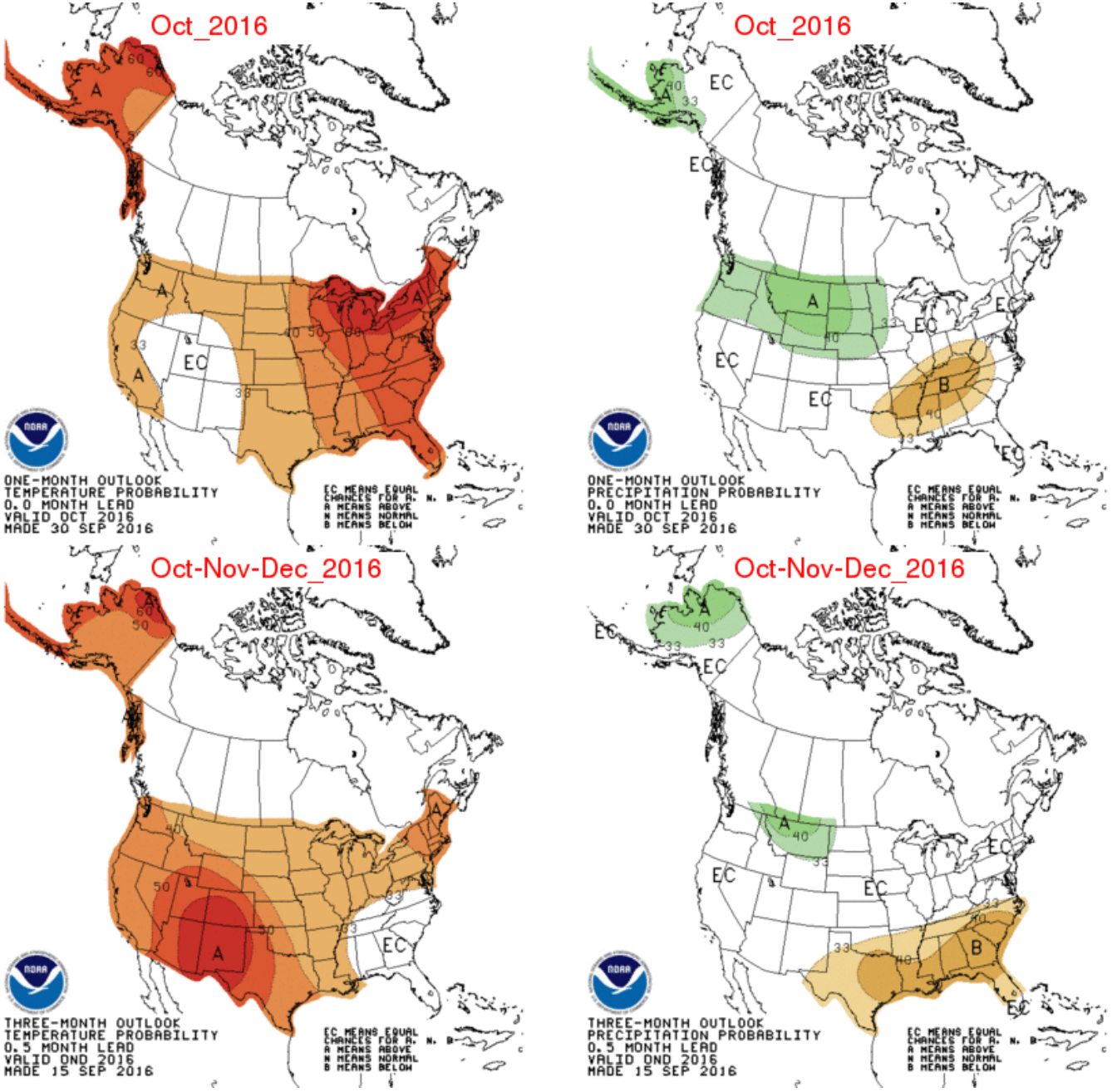


Appendix Figure 1 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2015) and a recent cool year (2010), a recent warm year (2015) and the 1981-2010 climate normals are shown (NCDC preliminary daily data).



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