

Weather and Climate Summary and Forecast September 2017 Report

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Summary:

- Dominant high-pressure ridge produced record heat events and seasonally dry conditions in August in the majority of the western US.
- Current conditions favor continued warmer than average and drier than average conditions in September throughout the western US.
- Extended forecast calls for much of the same, no indication at this point for anything other than a typical fall transition.

Heat and smoke were the signature for August 2017 in the western US. A total of 81 fires, spread across nine western states have burned more than 1.4 million acres to date. A hot, dry and unstable ridge of high pressure maintained its grip over the western US during August – the result was multiple heat waves and a forecast that held true across the west. Overall August ended up warmer than the 1981-2010 average with the warmest conditions (+2-6°F) seen across central to northern California and Nevada, Oregon, Washington, and western Idaho and Montana (Figure 1). Areas around the Bay Area, the Salinas Valley, and portions of the Columbia Valley where near normal during the month, as was a large swath of the Great Basin, Rockies, and desert southwest. Harvest started from south working its way north during the month, with the recent heat spikes kicking harvest into high gear in some regions while others are holding out for the vines and fruit to recover and become more in balance. The warmth experienced in the west ends abruptly along the Rockies with a cooler than normal eastern US also holding true to forecast (not shown).

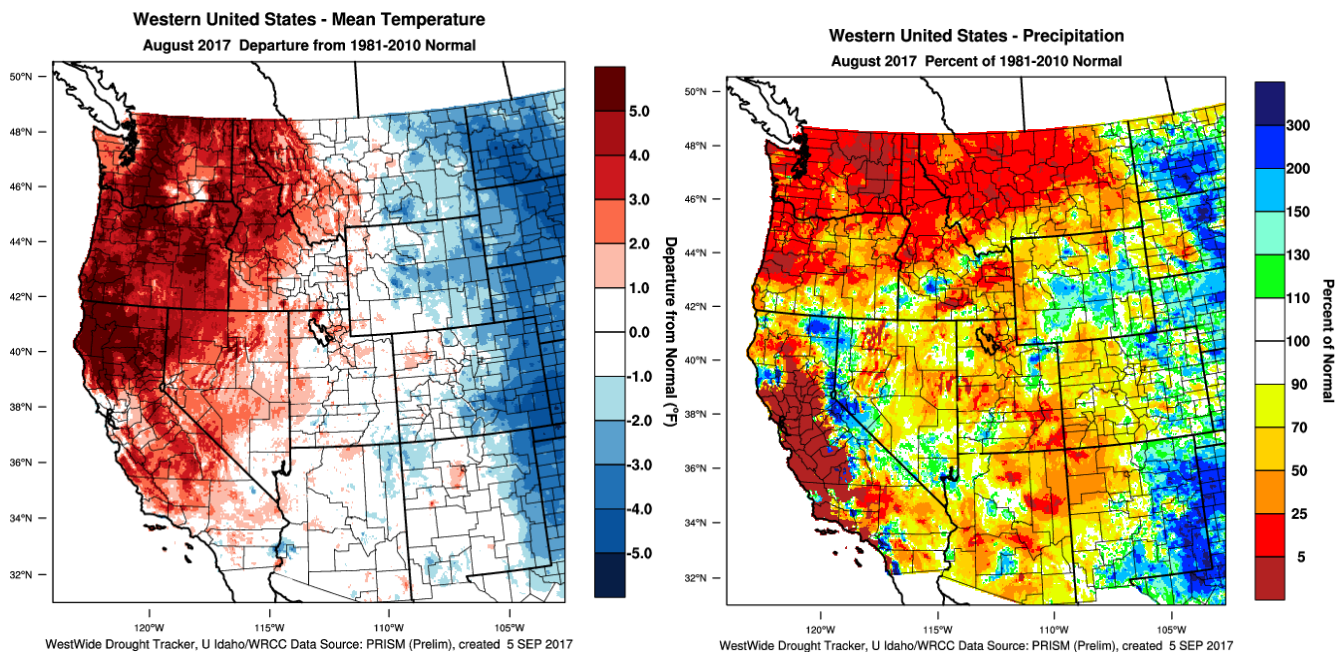


Figure 1 – Western US August 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

A seasonally dry August occurred throughout the western US with only scattered areas in California and the Great Basin receiving anything substantial through isolated thunderstorms (Figure 1). The majority of the west saw 20-75% of normal precipitation, although many stations in Washington, Oregon and California recorded no measurable rainfall resulting in less than 5% of normal (Figure1). Precipitation amounts nationwide were dominated by Hurricane

Harvey and the absolute dumping of rain experienced in Texas and Louisiana (not shown). The northern Plains were also wetter than average while the Ohio River valley, the southeast, and New England were drier than normal.

Year to date temperatures remain above average globally and for the US as a whole. The US is currently the 2nd warmest on record for January-August (Figure 2). Washington continues to show the effects of a cold late winter and early spring with year to date temperatures running -0.5 below average to +0.5°F above average. California year to date is +2.5°F warmer than average, Oregon is +1.3°F, and Idaho is +1.9°F. The remainder of the western US ramped up and is now running 1-3°F above average. The dry summer in the west has not altered the cumulative precipitation pattern for the first half of 2017, which continues to show overall wetter than average conditions in the western US (Figure 2). Some isolated regions are showing drier than normal conditions year to date, including southern Nevada, southern Arizona, and eastern Montana. The continued dry conditions in the northern Great Plains remains one of the driest areas in the US (not shown), while the rest of the eastern US has experienced average to wetter than average conditions year to date, especially along the Gulf states (not shown).

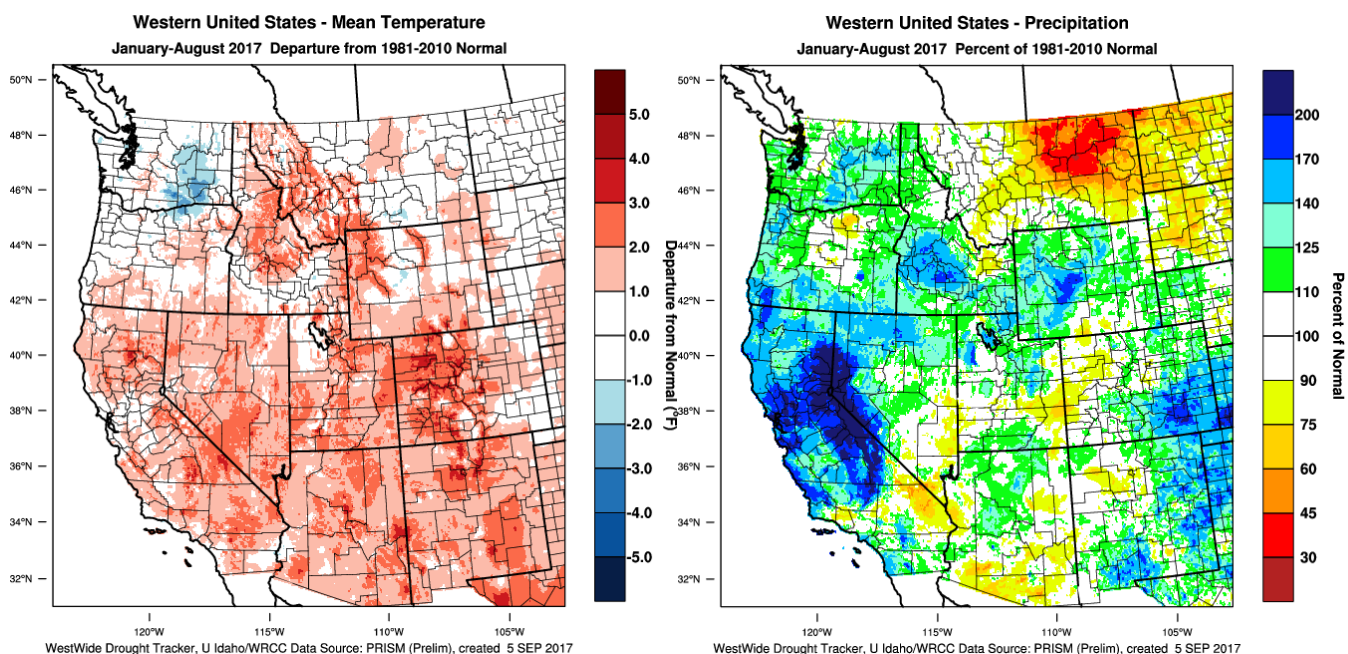


Figure 2 – Western US January-August 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Temperatures over the last two months have brought heat accumulation departures from normal for January-August above normal for most regions in the west. Some areas in Washington are near or just slightly below normal, while Idaho and Oregon are about 10-15% above average, and California is 5-25% above average (Figure 3). Wine regions continue 5-20 days ahead of average, except a portion of eastern Oregon/Washington which is still 2-6 days behind. Heat accumulation (GDD) amounts for four locations in Oregon continue to track above the 1981-2010 normals for this period, but remain below the values seen at this point in 2015 (see the Appendix Figure 1 for four locations in Oregon). The 2017 heat accumulation to date in the western US wine regions is now similar to 2013-14 and 2016.

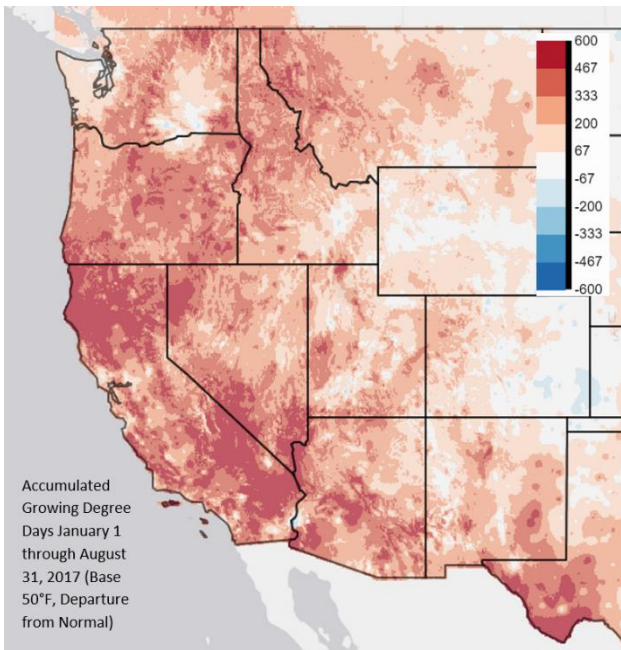


Figure 3 – Western US January through August 2017 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – No change over the last 30 days in drought conditions nationwide (Figure 4; left panel). Montana and the northern Great Plains continues to show the most severe drought conditions nationwide. Abnormally dry conditions have spread more extensively throughout the PNW but intensity is not much more than seasonally dry at this point. Coastal Central to Southern California across into Southern Arizona continue to exhibit long-term moderate drought. Scattered short-term drought exists across many areas of the rest of the country (areas in yellow in Figure 4, left panel). The seasonal drought outlook for the United States through November (Figure 4, right panel) predicts drought to persistent in the two main regions of Montana/Northern Great Plains and California/Arizona. Additional drought development and persistence is likely in Montana and extending into Idaho. Monsoon flow in September might alleviate the conditions in portions of southern Arizona (see forecast periods). The rest of the country is forecast to be largely free from drought through the end of the summer.

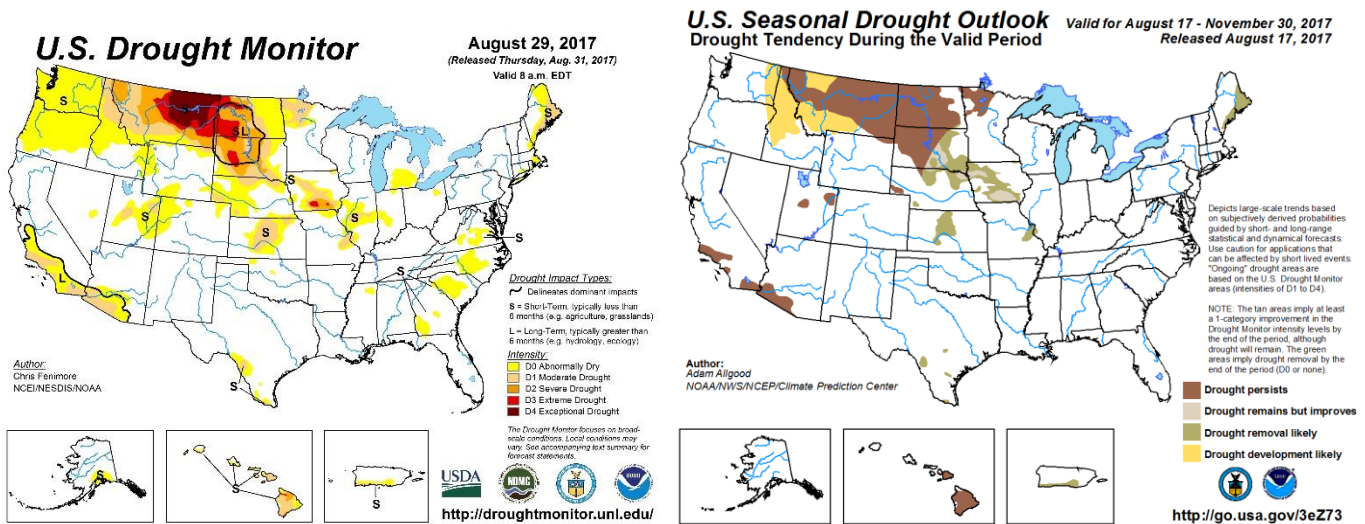


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – An ENSO-neutral state remains in place. August reports all show near-average SSTs in the east-central Pacific and the atmosphere maintaining ENSO-neutral patterns. All ENSO prediction models continue to indicate ENSO-neutral as the most likely condition during the last of summer through fall and into early winter. Neutral is now

avored 2 to 1 over either El Niño or La Niña development. Neutral conditions tend to mean that there is little tropical influence in mid-latitude weather and statistically tilts the odds to favoring the next few months to be warm and dry across the southern half of the US; wet and cool the further north one goes into Canada (see forecast periods below).

North Pacific Watch – Continued warming of the North Pacific Ocean over the last 30 days has returned the basin to the conditions seen during 2015-2016 (Figure 5). SSTs over the basin are running 1-4°F warmer than average, with some isolated areas in the Gulf of Alaska and off of California currently 1-2°F below normal (note figure is in °C). The latest September-October-November (SON) ensemble forecast for SST continues the same basic spatial pattern and degree of warmth in the basin. The continued warm conditions in SST in the North Pacific would enhance the likelihood that the western US would see a warmer than average SON (see 90-day forecast below). Combined with no other climate variability components evident at this time, the Tropics and North Pacific are continuing to display conditions that would indicate that the warm and seasonably dry 30 and 90 day forecasts for the west are likely to hold (below and in Appendix Figure 2).

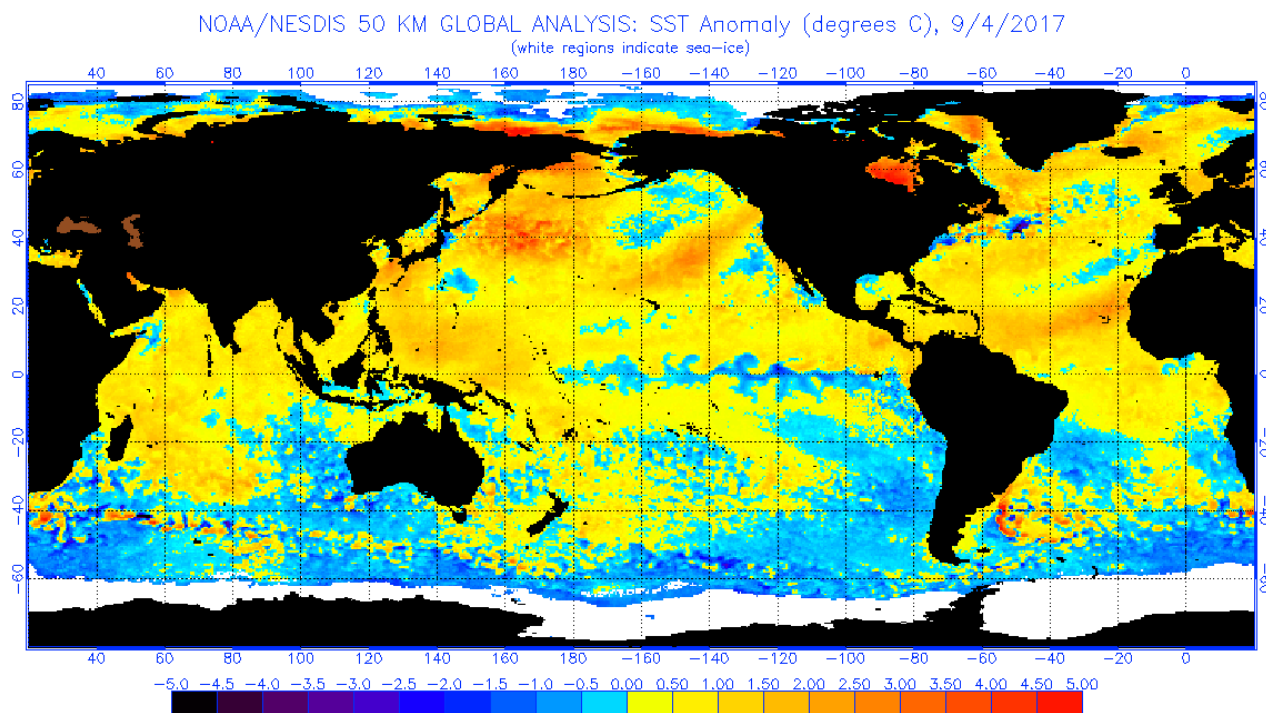


Figure 5 – Global sea surface temperatures (°C) for the period ending September 4, 2017 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day (valid September 11-15): Current heat and smoke, combined with the remnants of a tropical system moving up from Baja has made for stifling conditions from California through Washington. Some indication that the low pressure from the south might push through and clear out the air, but any hope of rain is tied to scattered thunderstorm activity with the southerly flow. Heading into this forecast period will be a welcomed cool down to more seasonal temperatures. Models have been waffling back and forth during the 6-10 period and appear to be pointing to a greater likelihood of being warm and dry through the 15th. Any rain appears to be limited to the thunderstorms coming from the south during this time. Nationwide this period is forecast for warm west and cool east. The cool east is will likely be accompanied by moisture from the tropics, including Hurricane Irma depending on her path. Some moisture forecast for the west, but appears more monsoon driven and likely will influence the Great Basin with not as much along the west coast.

8-14 Day (valid September 13-19): Not much difference from the 6-10 day forecast, although temperatures along the west coast are expected to moderate to a little closer to seasonal during this forecast period. All indicators point to

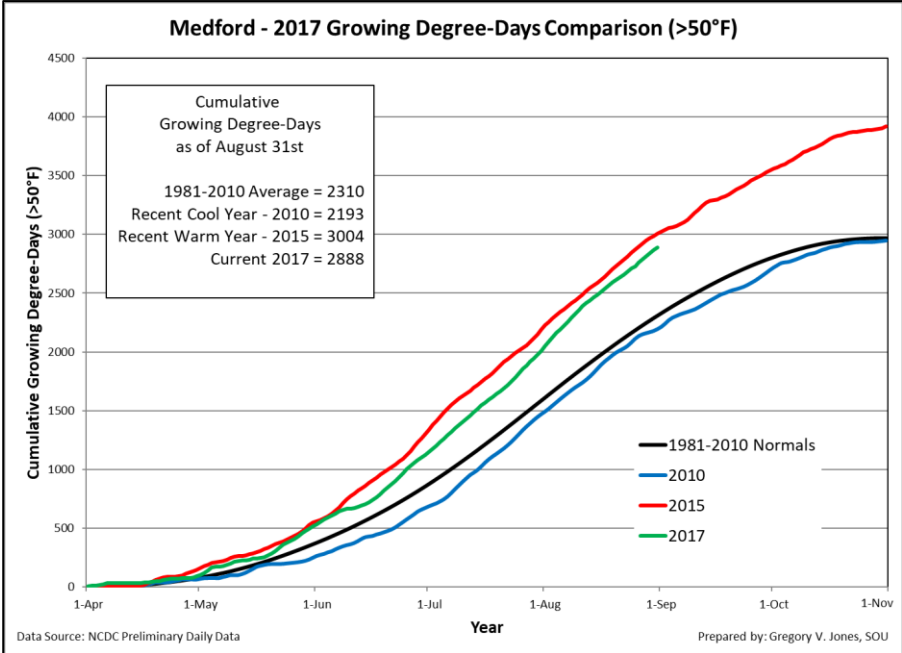
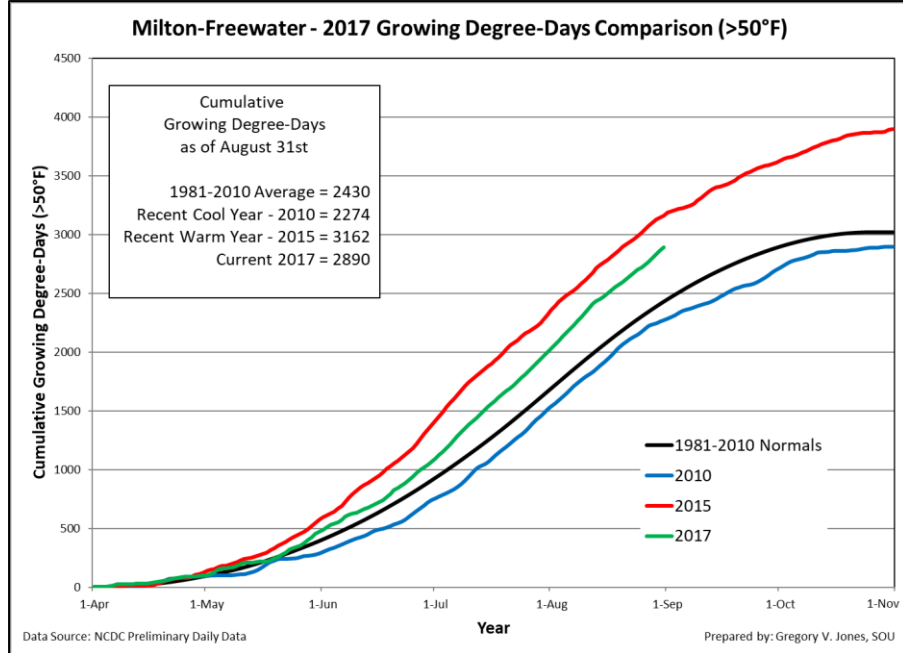
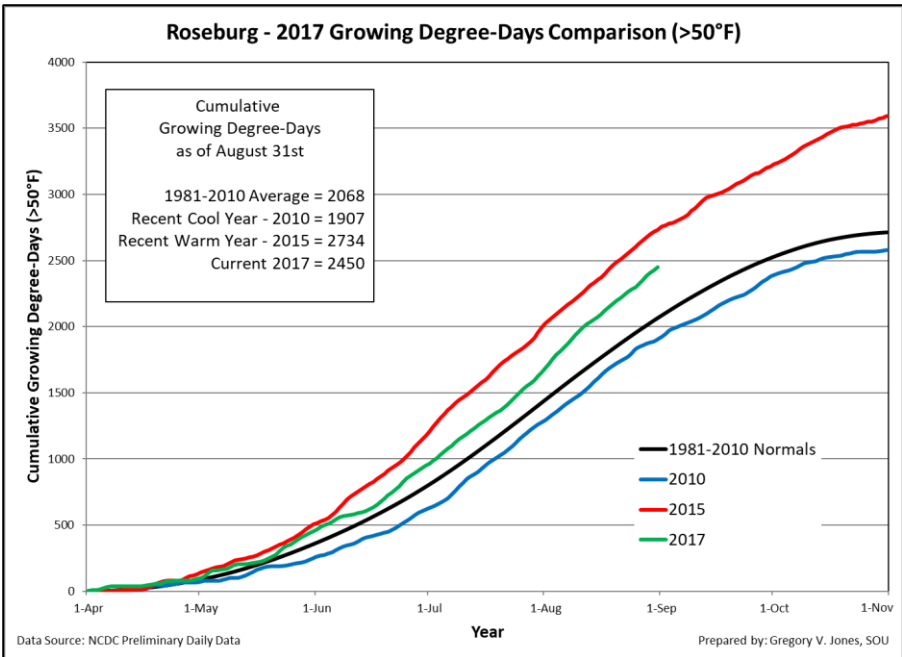
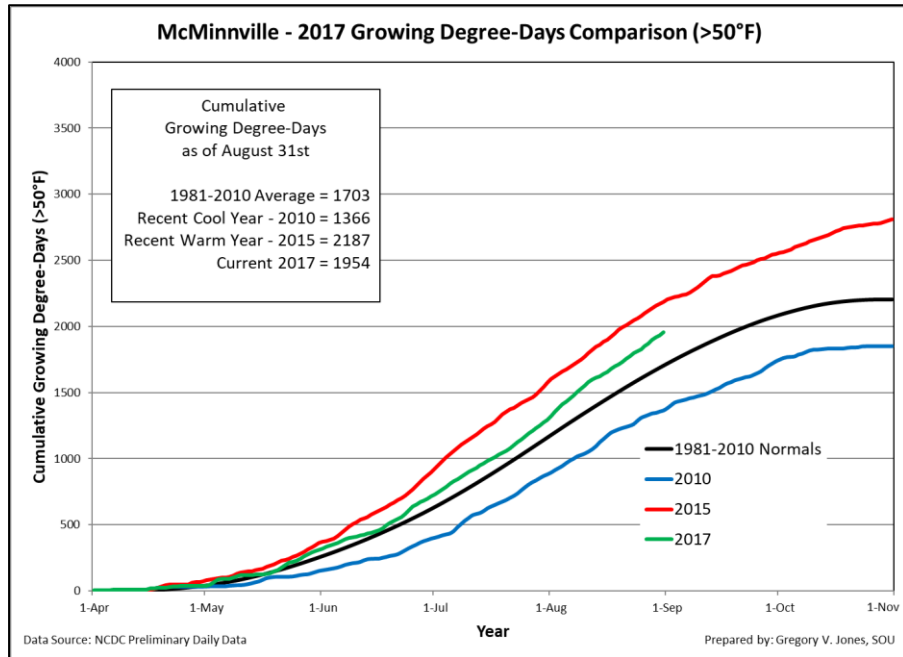
dry conditions likely continuing through the 19th of the month throughout the majority of the west coast. The eastern US is forecast to remain cooler than normal and moderately wet during this period with an active tropics contributing to the forecast.

30 Day (valid September 1-30): Initial forecast runs for the month of September call for continued warm conditions with no indication of anything other than dry to seasonal for rainfall. The west-east flip in warmer than normal to cooler than normal conditions is forecast to hold for the month while the Plains and portions of the Midwest have an equal chance of slightly above, normal, or slightly below normal temperatures (see Appendix Figure 2). Extreme northern New England and Florida will likely stay above normal for temperatures. The precipitation forecast for August remains dry in the upper PNW, across the northern Rockies, and into the Plains. The precipitation forecast for the rest of the western US appears to be tied to monsoon flow with the interior basin forecast to be above normal and other areas with an equal chance of being slightly dry to slightly wet. The temperature forecast for September is clearly bolstered by the warmer North Pacific Ocean temperatures while the relatively dry forecast for the month is tied to the continued dominance of the ridging over the western US.

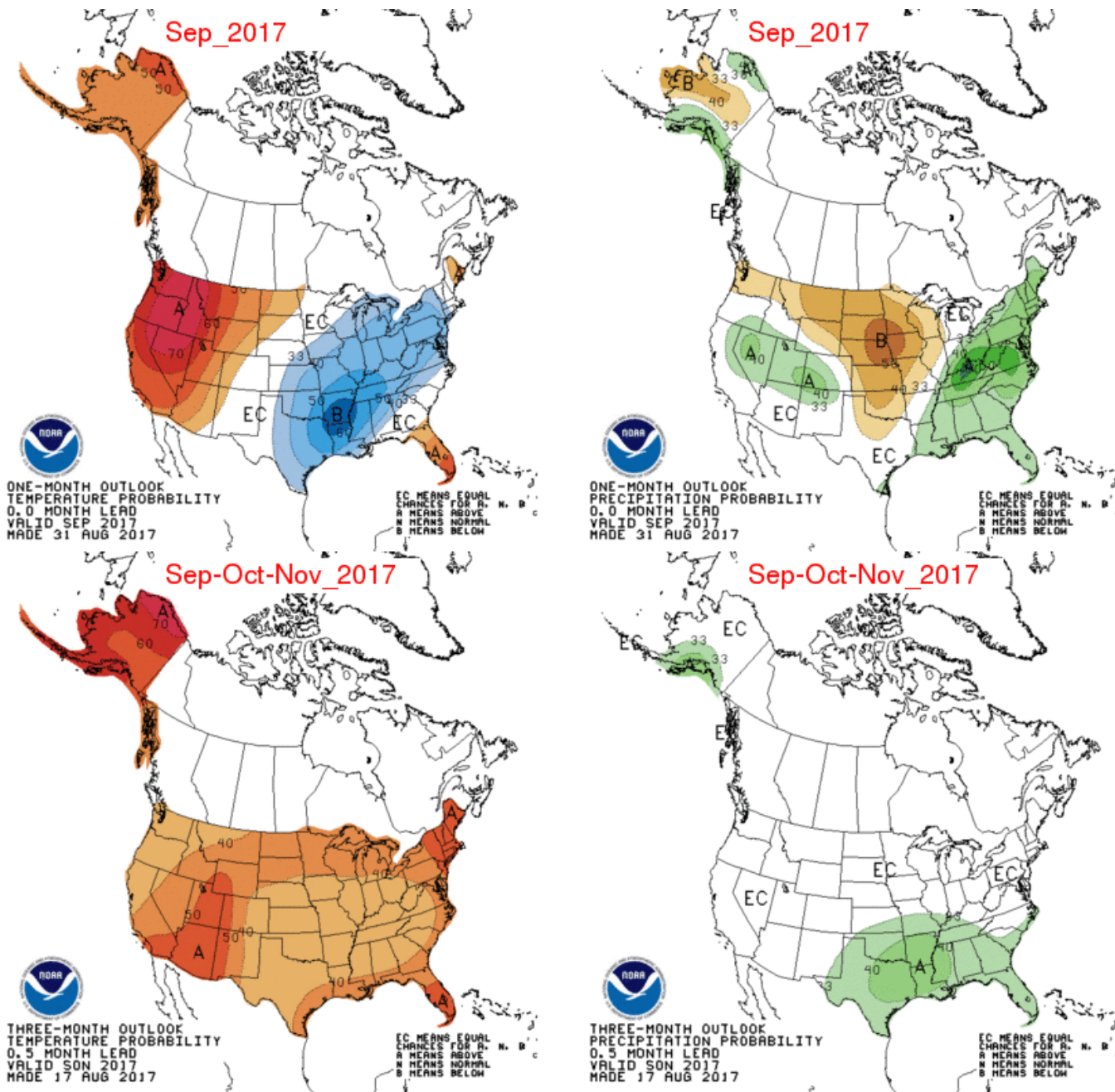
90 Day (valid September-October-November): Moving into fall and early winter the current three-month (SON) forecast from the CPC is staying the course with a continued forecast for warmer than normal temperatures nationwide (NOAA's Climate Prediction Center, see Appendix Figure 2). At this point there is nothing pointing to any dramatic shift from these conditions and I am continuing my overall viewpoint that the western US wine regions will hold to normal to moderately warmer than normal as we transition from late summer into fall and early winter. The 90 day forecast is supported by the warming in the North Pacific over the last couple of months (Figure 5). The SON precipitation forecast is largely based on the fact that there is no clear signal from the short to long-term drivers of rainfall heading into harvest and fall (low pressure out of the North Pacific, monsoons, etc.). There is some evidence that an active tropical season in the Gulf and Atlantic will continue to bring moisture to south and southeast. However, the rest of the country has an equal chance of being slightly above average, normal, or slightly below average precipitation for this three-month period (see Appendix Figure 2). For the western US, I continue to hold to the observations and models all pointing to seasonally dry conditions that will likely give way to a fairly normal start to the fall rainy 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 (2017) 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 August (top panel) and August, September, and October (bottom panel) (Climate Prediction Center, climate.gov).