

Weather and Climate Summary and Forecast Summer 2017

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The heat was on in June ... partially. After a very cool period around the 10th of the month, conditions changed rapidly with a warm up that saw the first major heat spike of the year between June 16-19. The majority of the western US ended up warmer than normal during the month of June (Figure 1) with the southwest and Great Basin seeing conditions 3-5°F above normal. Isolated areas around the Salinas Valley, the Bay Area, the Olympics, and eastern Washington and Oregon saw a more normal June in terms of temperatures (Figure 1). The warm up has accelerated vine growth with most regions reporting average to slightly ahead of average phenology. For the rest of the United States, the month saw a flip-flop from May with the southeast seeing slightly below normal temperatures while the east coast was near normal and everything from the Plains westward was warmer than normal (not shown).

Precipitation in June returned the western US to more seasonal accumulation amounts in general (Figure 1). The main spatial signature for the month was the dry and hot southwest and Great Basin where conditions resulted in 25% or less of normal precipitation. Isolated rain events contributed to relatively wet zones in the western Olympics, southwest Oregon and northwest California, north-central Nevada and portions of the north coast and north-central valley of California (150-300% of normal; Figure 1). Early season monsoon onset is also evident in portions of New Mexico and west Texas. Precipitation amounts nationwide were largely dominated by the dry conditions in the west, which extended out into much of the Great Plains and Mississippi River valley. The wettest region was the south where Tropical Storm Cindy delivered tremendous rainfall to the Gulf Coast states and throughout much of the southeast and even into New England (not shown).

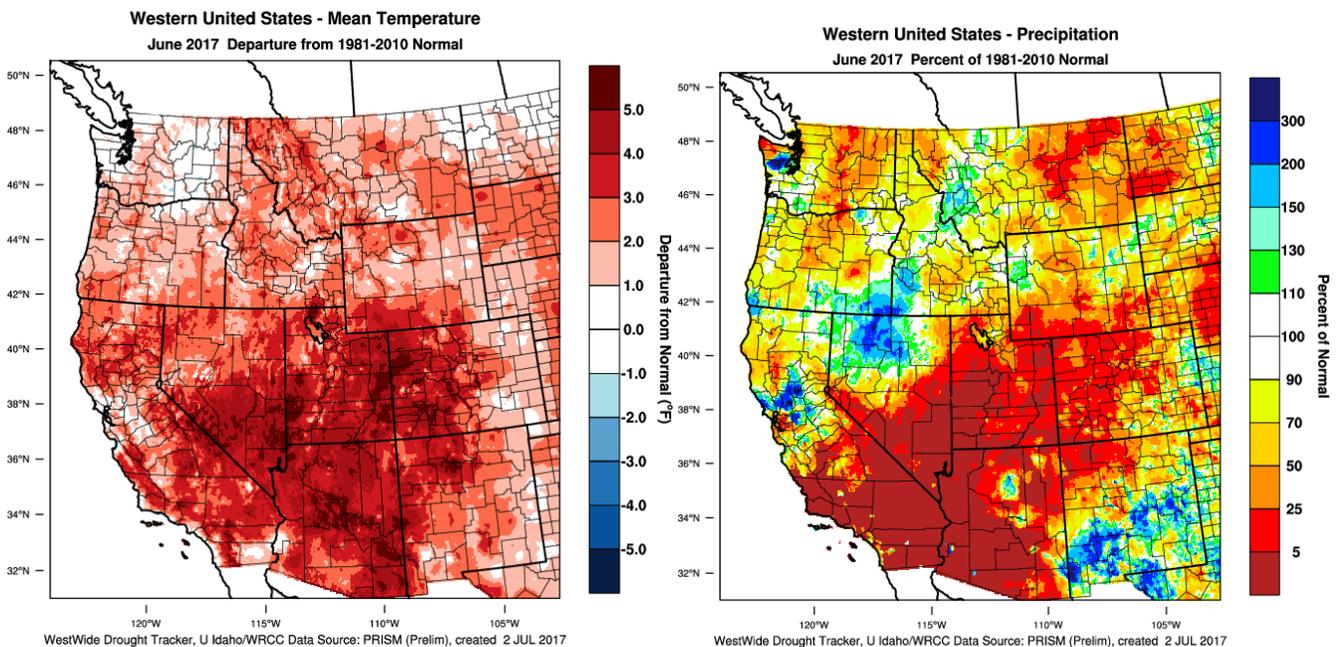


Figure 1 – Western US June 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Conditions in June elevated the western US year to date (January through June) temperatures closer to average (Figure 2). For California, the majority of the state is near average to slightly above year to date (+2.5°F statewide), while Oregon is average to slightly below average (+0.8°F statewide), Washington continued to track below average (-0.4°F statewide), and Idaho was warmer than average (+1.5°F statewide). The desert southwest, Rockies, and Four Corners region added to their warmer than average year to date values, while the rest of the country was also

substantially warmer than average (3.4°F above normal nationwide; not shown). The cumulative precipitation amounts for the first six months of 2017 continues the overall trend of wetter than average conditions in the western US (Figure 2). Drier than normal conditions are seen in southern Nevada, southern Arizona, and eastern Montana. The dry conditions in Montana extend out across the Great Plains as one of the driest areas in the US (not shown). The rest of the eastern US has experienced average to wetter than average conditions year to date (not shown).

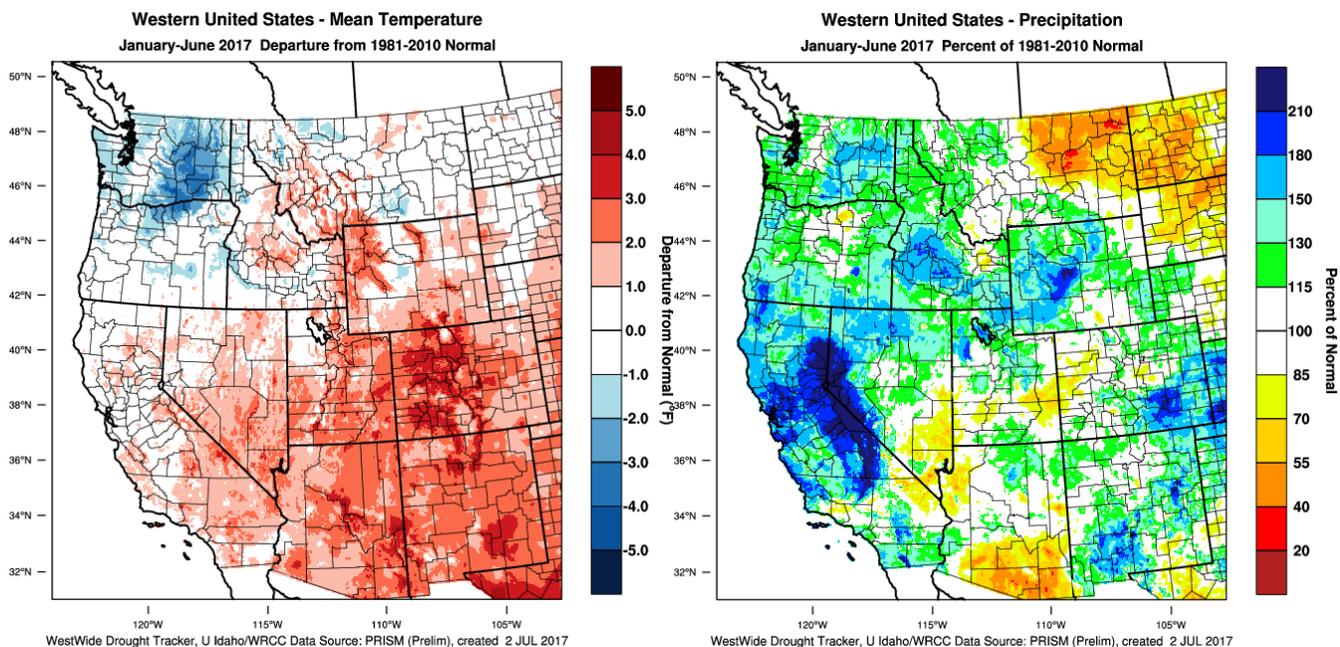


Figure 2 – Western US January-June 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Heat accumulation departures from normal for January-June are running near the 1981-2010 average in Washington and Idaho, about 10% above average in Oregon, and 10-15% above average in California (Figure 3). Most wine regions continue to run 0-10 days ahead while eastern Oregon/Washington and Idaho are running 2-6 days behind. Heat accumulation (GDD) amounts for four locations in Oregon are tracking above the 1981-2010 normals for this period, but are below the values seen at this point in 2015 (see the Appendix Figure 1 for four locations in Oregon). Analog years with 2017 heat accumulation for the western US wine regions include 2006, 2009, and 2012-13.

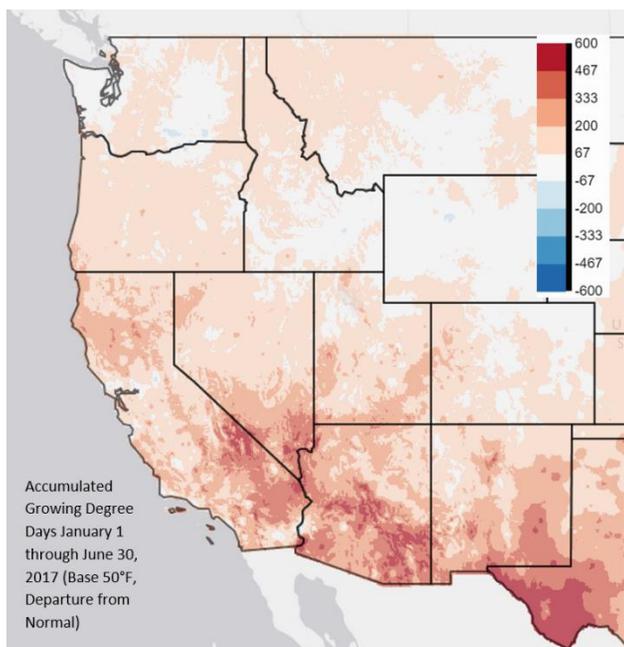


Figure 3 – Western US January through June 2017 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – While overall drought conditions nationwide have not changed much from May to June (Figure 4), the multi-month dry run in the Great Plains has initiated severe to extreme drought in that region. Coastal southern California and across southern Arizona are still experiencing dry conditions and continue at the ‘long-term’ drought impact criteria. Scattered short-term drought exists across many areas of the rest of the country (Figure 4, left panel). The seasonal drought outlook for the United States through September (Figure 4, right panel) predicts drought to persistent in portions of southern California and Arizona. Drought persistence is also likely in portions of the Plains, while the rest of the country is forecast to be largely free from drought through the end of the summer.

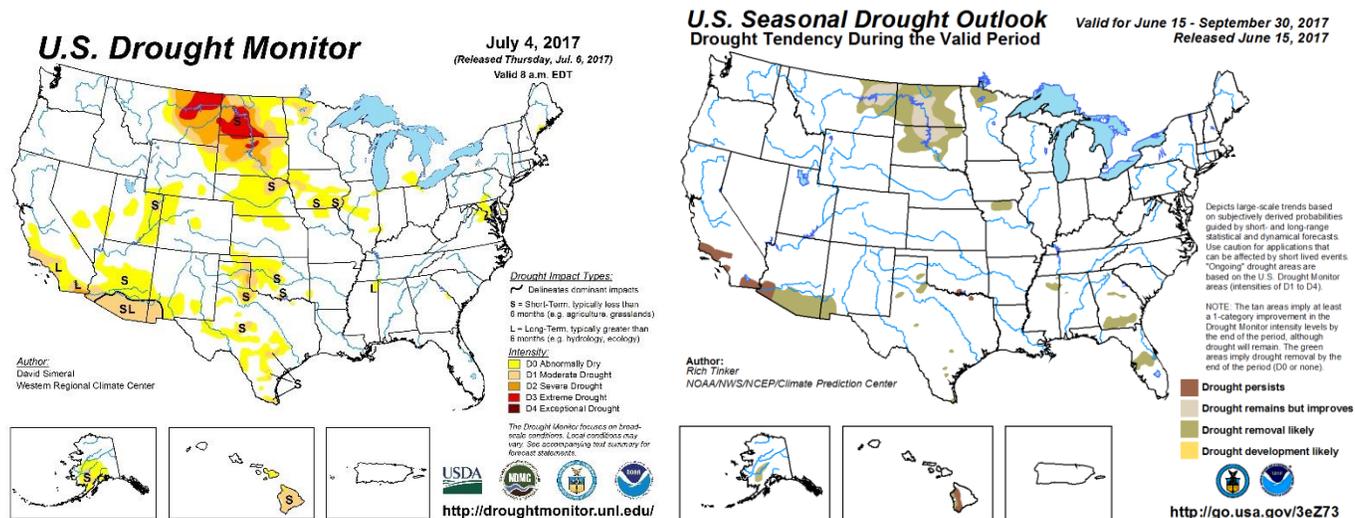


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – In mid-June, the tropical Pacific remained in an ENSO-neutral state, with SSTs not far from the El Niño threshold in the east-central tropical Pacific but with the atmosphere maintaining ENSO-neutral patterns. The collection of latest ENSO prediction models indicates ENSO-neutral as the most likely condition during summer, with chances for El Niño development rising to about 50% during fall and early winter. Many indicators continue to show little or no increase in tropical sea surface temperatures (SST) for several weeks now (Figure 5), suggesting El Niño development has stalled for now and nearly all models are indicating that if El Niño does form, it is likely to be weak. My assessment here has not changed much, with the majority of the evidence pointing to the tropical Pacific remaining close to neutral conditions where the equatorial sea surface temperatures (SSTs) are near average to slightly above average across the central and east-central Pacific (Figure 5). Neutral conditions tend to mean that there is little tropical influence in mid-latitude weather. Statistically, neutral conditions in the tropics would slightly favor 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 and Appendix Figure 2). If El Niño conditions (warmer than average tropical SSTs) do develop by summer or early fall, we will likely see some transition to overall warmer and moister conditions in the Tropical Pacific sector. These conditions can bring stronger monsoonal flow in the southwest and overall warm the western US slightly, but need to be considered along with the North Pacific conditions (see below).

North Pacific Watch – Again, not much change from last month ... Cooler than average ocean temperatures in the Gulf of Alaska and North Pacific continue and now extend across the entire latitude band from ~35-55 degrees north latitude (Figure 5). Sea surface temperatures (SST) in this area continue to run 3-4°F cooler than average and 5-8°F cooler than the last few years during the same month (note figure is in °C). The latest July-August-September ensemble forecast for SST predicts the North Pacific to warm slightly north of 45° and stay cooler than average south of 45°. Overall, I continue to feel confident that the current North and Tropical Pacific conditions would continue to favor air temperatures that are average to slightly cooler than average in Washington and Idaho, average to warmer than average in Oregon, and warmer than average in California. Of course, the boundaries of these conditions do not follow state lines so some variation about the region is likely. I do not see much in the way of additional variability

components influencing our weather the rest of the growing season and agree with the 30 and 90 days forecasts from the CPC given below and in Appendix Figure 2.

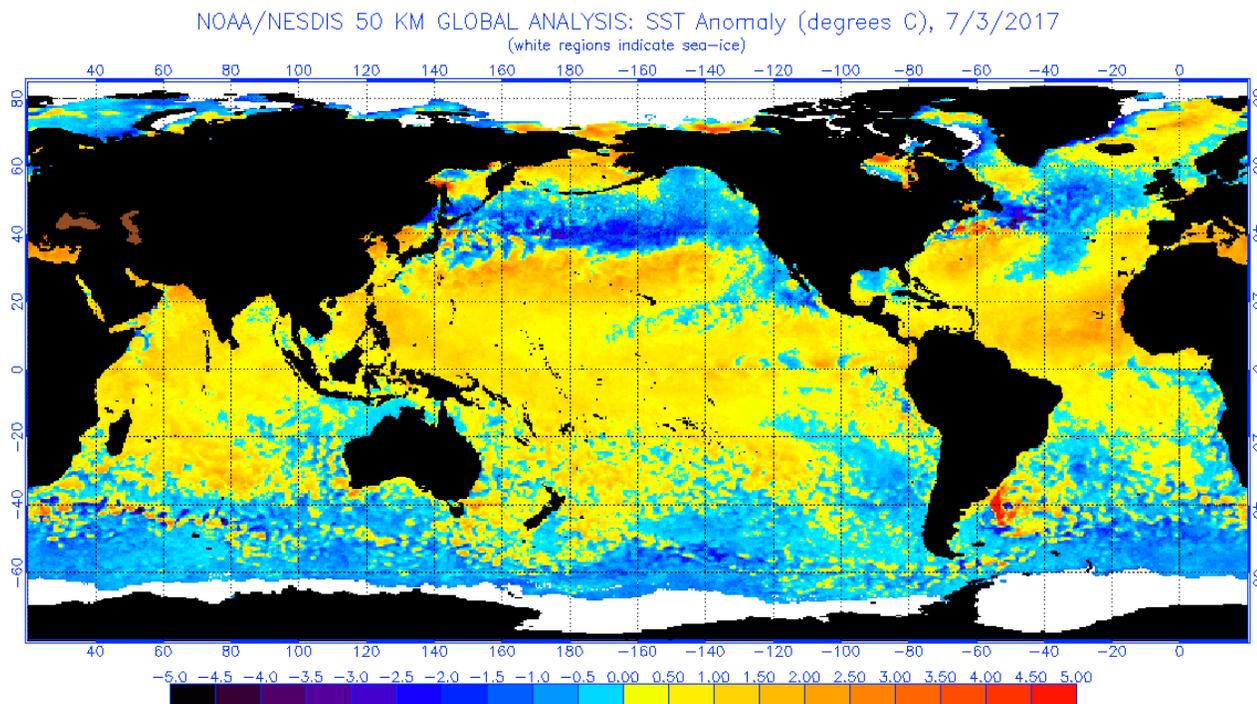


Figure 5 – Global sea surface temperatures (°C) for the period ending July 3, 2017 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day (valid July 13-17): The high-pressure ridge that materialized in mid-June has become entrenched in its normal summer pattern. The result has been consistent day-to-day heat with spikes that come from the slight shifts in the position of the high. The 6-10 day forecast calls for much of the same ... clear skies, temperatures that are 5-15 degrees above normal inland and relatively cool conditions near the coast. Pretty much the entire US, except northern New England, has a very high likelihood of much warmer than average conditions over this same period. In terms of precipitation, the PNW, northern Rockies, and Plains are forecast to see drier than normal conditions through mid-month. The majority of southern Oregon, Idaho and all of California are likely to be normal or in other words seasonally dry. The forecast does call for increased monsoon flow into the desert southwest during this period. Areas east from the Gulf Coast to New England are likely to be wetter than average during this period.

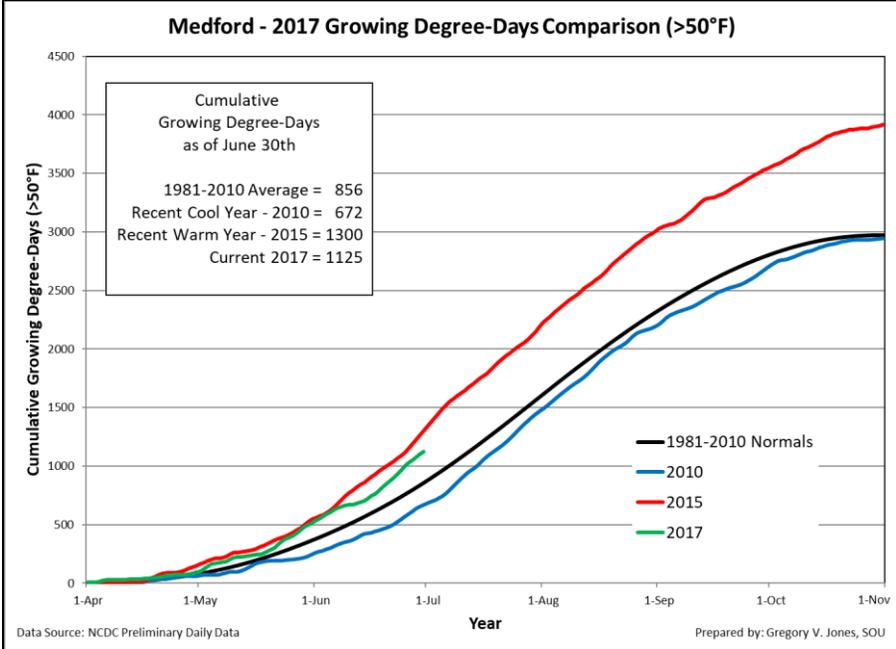
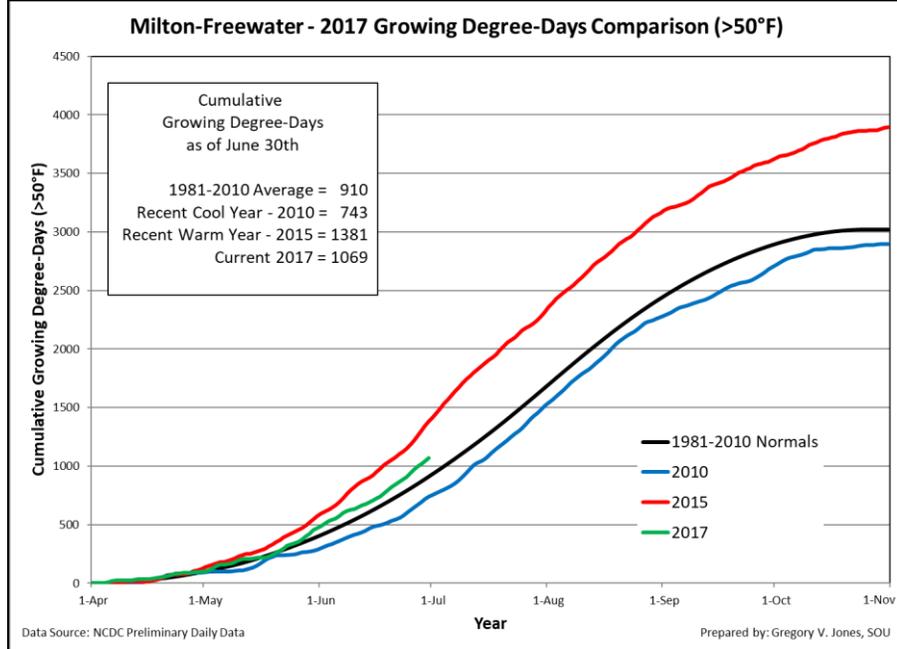
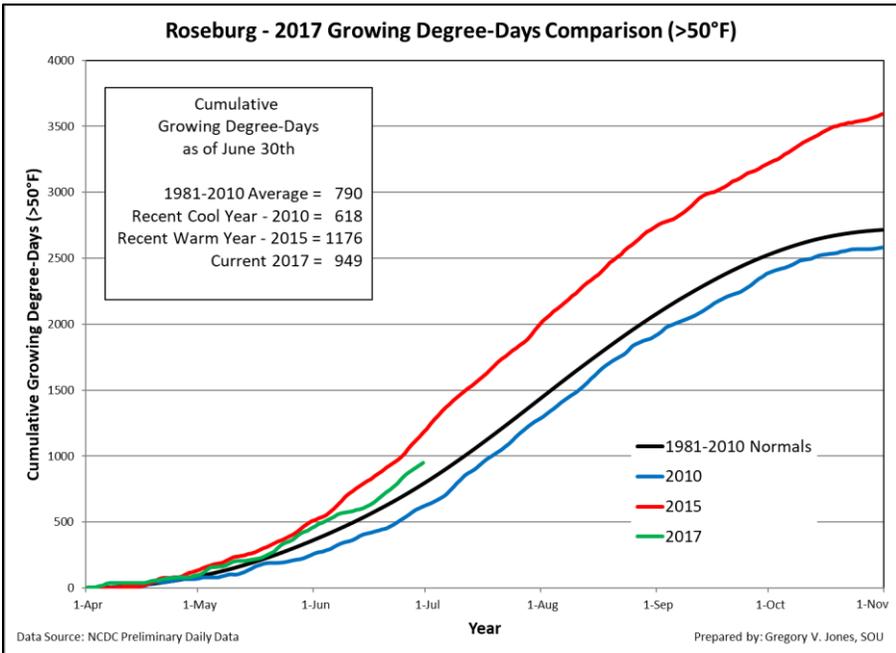
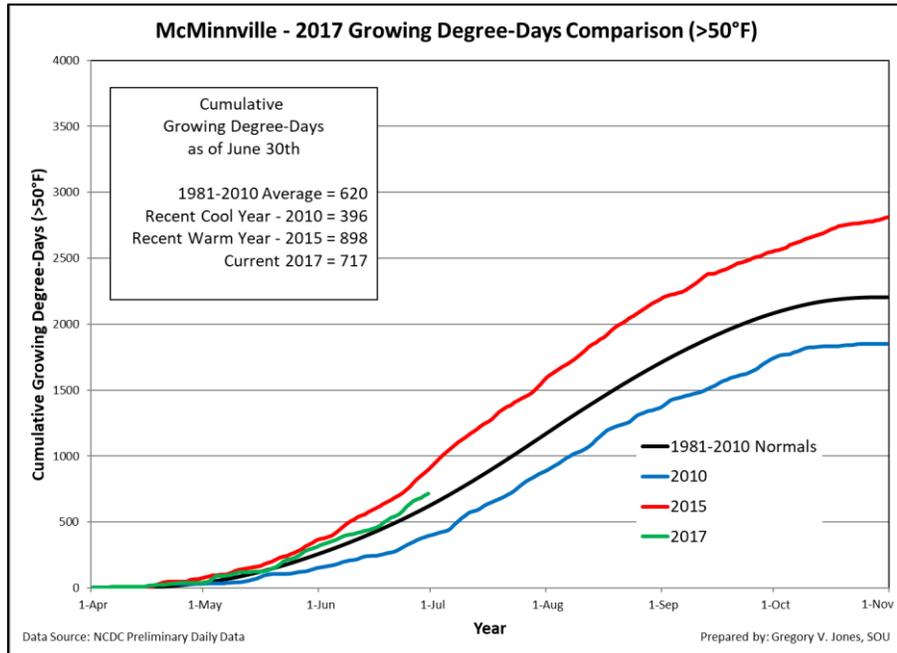
8-14 Day (valid July 15-21): Overall forecast does not vary much from the 6-10 day outlook due to the high-pressure ridge maintaining control over the western US. Expect warmer than average conditions throughout the west. The rest of the country will likely stay warmer than average, except the southeast, which is forecast to be cooler than average due to cloud cover and rain that extends into New England. The precipitation forecast for the western US during this period stays dry in the PNW, normal in California, and above normal in the monsoon region of the southwest.

30 Day (valid July 1-31): General pattern of a warm July remains in the forecast for the bulk of the country (see Appendix Figure 2). The exception is that the forecast does not have enough guidance for the extreme west coast, and calls for an equal chance of slightly above, normal, or slightly below normal temperatures. A similar situation can be seen in a wide area of the South and Midwest. The precipitation forecast for July remains dry in the upper PNW and northern Rockies, while the rest of the west is forecast to have an equal chance of slightly dry to slightly wet. Nevertheless, seasonally this would still mean quite dry. Portions of the South and the Ohio River valley are forecast to be wetter than average for the month due to increased chances of tropical systems (see Appendix Figure 1).

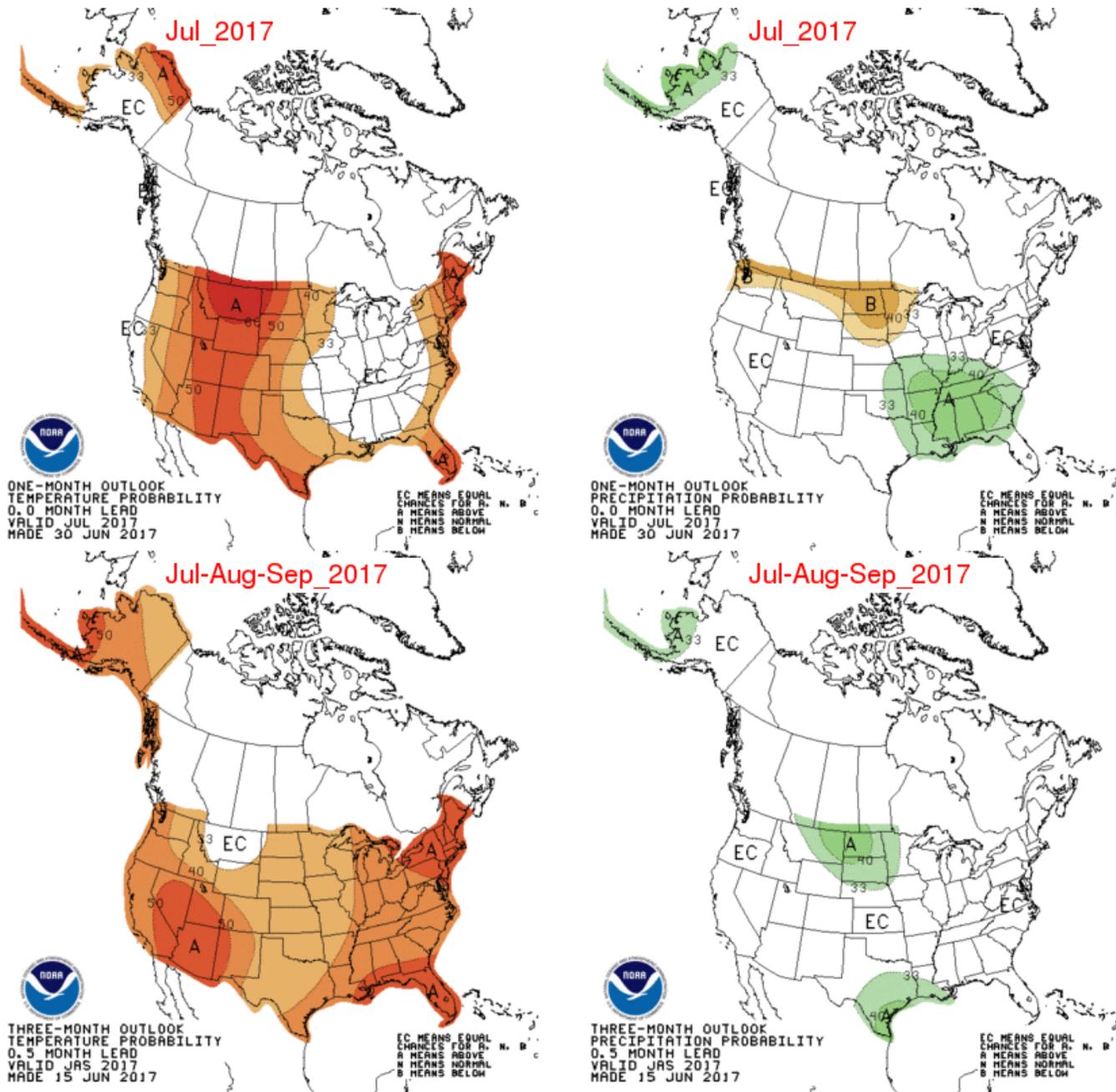
90 Day (valid July-August-September): The three-month (JAS) forecast from the CPC continues to show the bulk of the country with an above average chance of being warmer than normal with the desert southwest, Gulf Coast and New England likely seeing the warmest conditions. Portions of the northern Rockies and Plains are forecast to have an equal chance of seeing slightly above to slightly below average temperatures (NOAA's Climate Prediction Center, see Appendix Figure 2). I am continuing my overall viewpoint that the 90-day forecast for the western US wine regions will hold to normal to moderately warmer than normal summer temperatures. The JAS precipitation forecast is inconclusive with no clear signal in the short to long-term drivers of rainfall (monsoons, tropical storms, hurricanes, etc.). Therefore, slightly above average, normal, or slightly below average precipitation for the majority of the country is in place. The only areas forecast to be wetter than average are the northern Plains and the Texas coast (see Appendix Figure 2). For the western US, I see all evidence pointing to seasonally dry conditions.

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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 July (top panel) and July, August, and September (bottom panel) (Climate Prediction Center, climate.gov).