

Weather and Climate Summary and Forecast Summer 2017

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The month of May brought warmer conditions, but more importantly no major frost impacts. Northern California and the Sierra Nevada's, northward and west of the Cascades in Oregon and Washington were warmer than normal for the month (1-3°F) (Figure 1). Areas from central to southern California and eastern Washington and Oregon were close to normal in terms of temperatures while the Rockies and desert southwest were cooler than normal for the month (Figure 1). The warm up along with plenty of soil moisture has brought a flush of growth with most regions reporting average to slightly ahead of average vine growth, but still behind the past few years. Again, the western US was fortunate to not have the frost impacts like in Europe, where they are still assessing the damage to this year's crop. For the rest of the United States, the southeast was the only other region with above normal temperatures while Texas to the Great Plains and Great Lakes were near normal to cooler than normal (not shown).

For the first month in quite a while, the western US was largely drier than normal (Figure 1). From Central California to the Oregon border precipitation amounts were 5-50% of average while western Oregon and eastern Washington and Oregon were 50-90% of average. Some areas of Southern California, the Sierra Nevada's, and the Olympic Mountains were wetter than average, with 150-300% of normal (Figure 1). Precipitation amounts nationwide were mixed with drier than normal areas across the northern Great Plains, New Mexico, Texas, and Florida, while portions of the Great Lakes, the Ohio River valley, the Gulf Coast states and much of the eastern seaboard were much wetter than normal for the month (not shown).

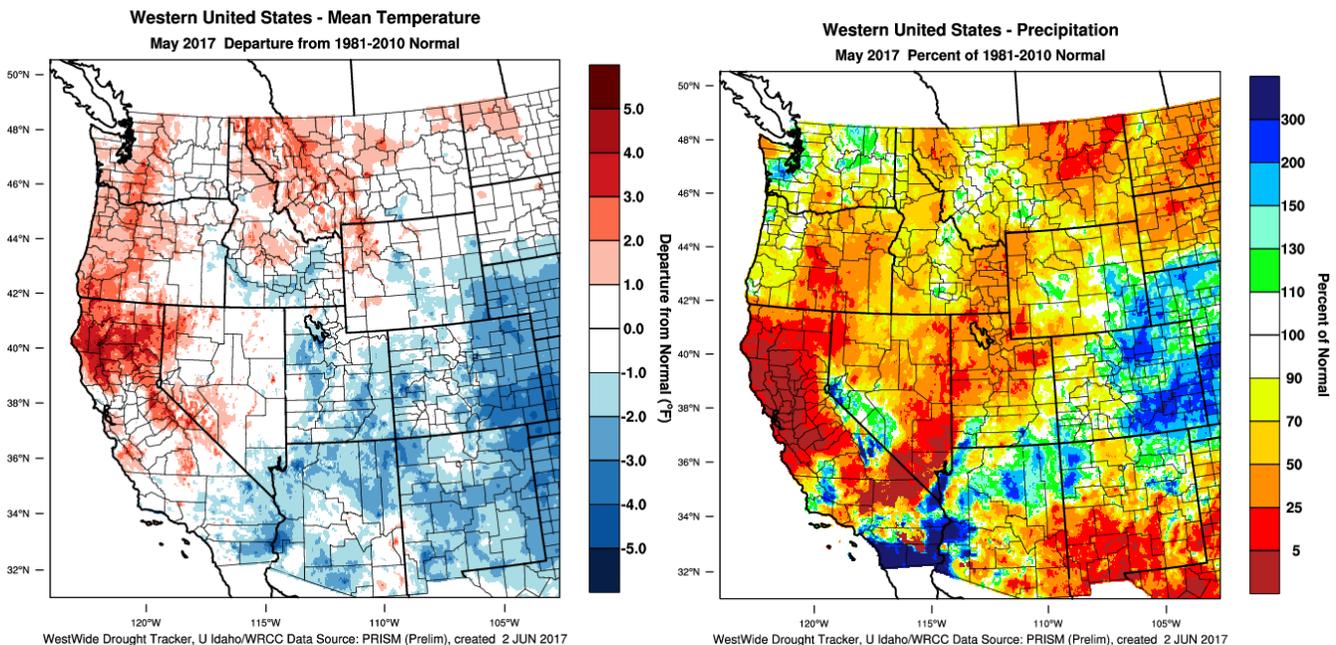


Figure 1 – Western US May 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

While May brought generally warmer conditions to the western US, the first five months of 2017 continue to show normal to colder than normal conditions (Figure 2). For California, the majority of the state is near average to slightly above, while Oregon is average to slightly below average on the west side, and eastern Washington and Oregon continue much below average (1-4°F below normal). The desert southwest, Rockies, and Four Corners region has been warmer than average and this pattern continues eastward with the rest of the country running substantially warmer than average (2-6°F above normal; not shown). The cumulative precipitation amounts for the first five

months of 2017 shows a much wetter than average western US that extends into the majority of the Rockies (Figure 2). Only southern Nevada, southern Arizona, and eastern Montana have been drier than normal. Nationwide average to wetter than average conditions for the year has occurred pretty much everywhere except the northern Great Plains and Georgia-Florida which are substantially drier than average (not shown).

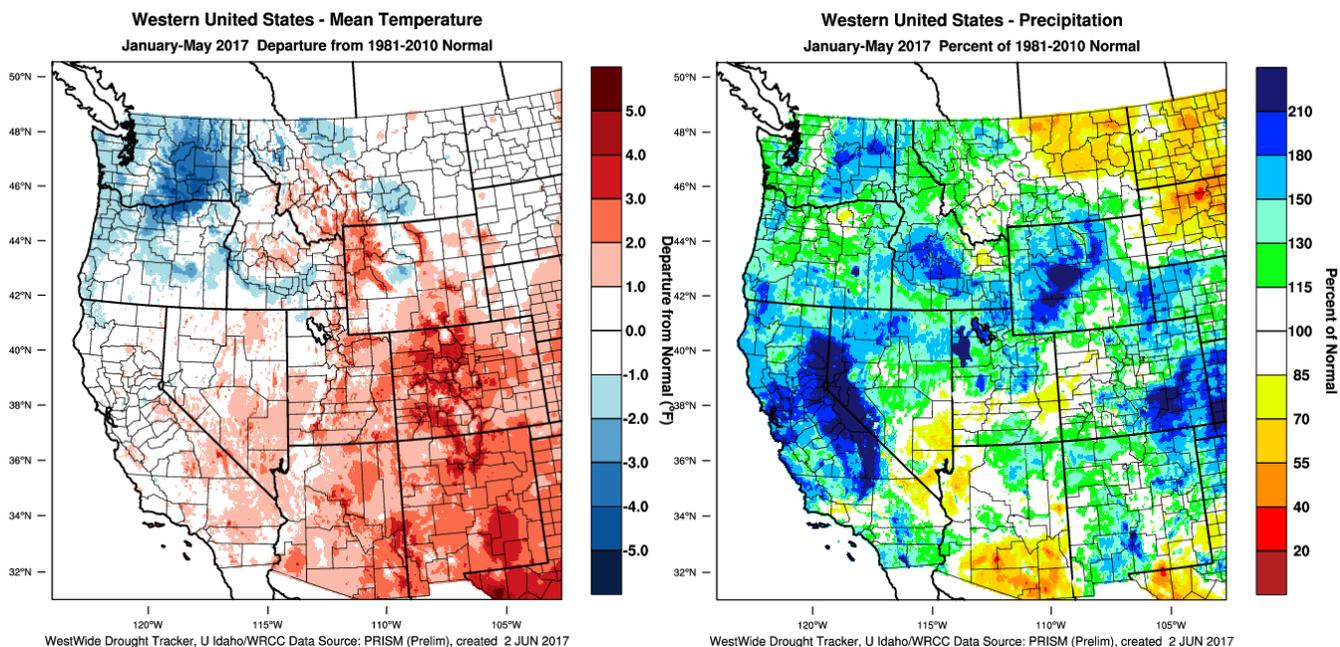


Figure 2 – Western US January-May 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Heat accumulation amounts follow the general temperature patterns in Figure 1 and 2. January through May accumulations are running right at or slightly above the 1981-2010 normals throughout much of the western wine regions. Portions of California are running 5-10% above normal while Oregon is near normal and eastern Washington is slightly below normal (Figure 3; data from the CIRC). Most wine regions are running 0-10 days ahead while eastern Washington is running 5-10 days behind. GDD accumulations for four locations in Oregon caught up some in May, running above the 1981-2010 normals for this period and even close to the values seen at this point in 2015 (see the Appendix Figure 1 for four locations in Oregon).

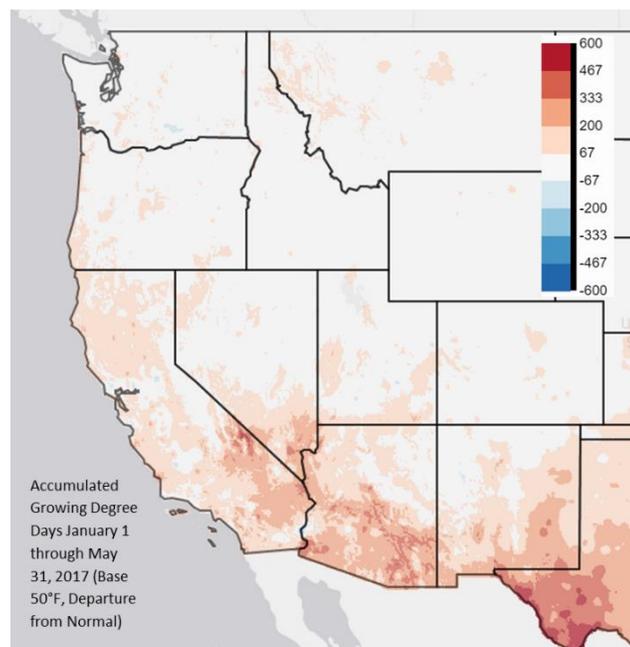


Figure 3 – Western US January through May 2017 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – Drought conditions in the US area are currently at a near a record low spatially (Figure 4). While some regions of coastal Central to Southern California are still experiencing dry conditions the bulk of the area is in the lowest category, abnormally dry. Drought conditions have also abated in much of Oklahoma and the Ozarks, while the most severe drought conditions in the southeast and Florida have continued to intensify (Figure 4, left panel). The US seasonal drought outlook through August (Figure 4, right panel) forecasts that some areas in southern California and Arizona will likely see drought persist in the summer. Drought persistence is likely in portions of Georgia, while Florida and surrounding areas of the southeast are likely to see some improvement due to a forecast calling for increased early season tropical storm activity.

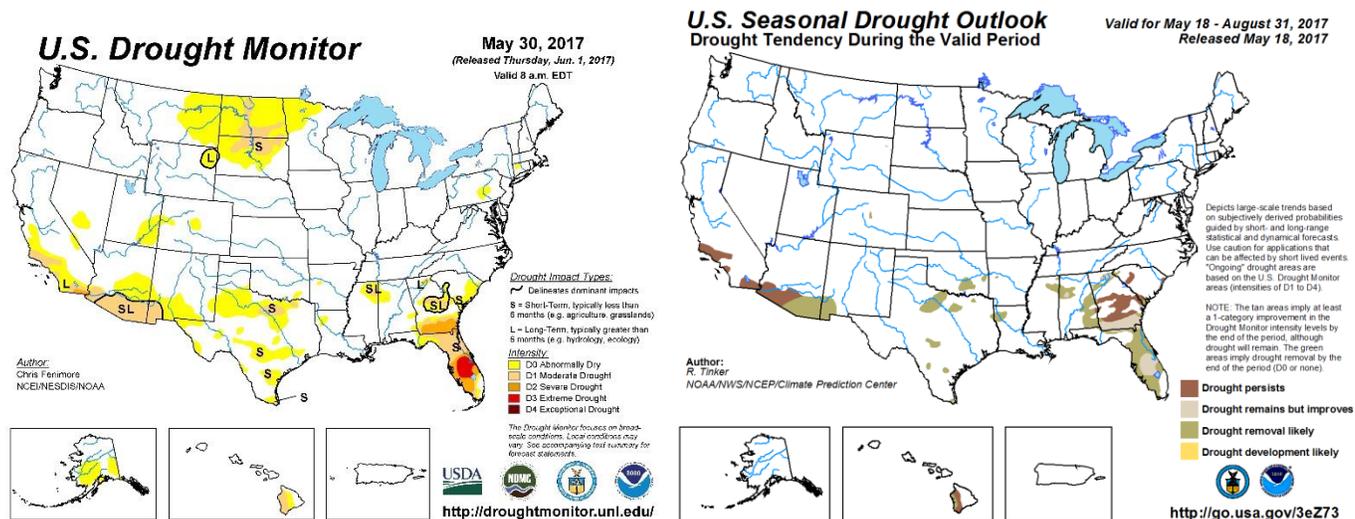


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – Observation agencies are just releasing their latest El Niño watch updates. Currently the majority of agencies are at the ‘watch’ stage, meaning that there is about a 50 per cent chance of El Niño developing in 2017, or double the normal likelihood. However, many indicators have shown little or no increase in tropical sea surface temperatures (SST) for several weeks (Figure 5), suggesting El Niño development has stalled for now. The current outlook shows SSTs across the tropical Pacific remain warmer than average, though cooling has occurred in some areas over recent weeks in response to stronger than average trade winds. Virtually all models have reduced the extent of predicted ocean warming compared to earlier in the year, indicating that if El Niño forms, it is likely to be weak. From my read on it, all evidence points 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 to cold in the north (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 warm the western US slightly but need to be considered along with the North Pacific conditions (see below).

North Pacific Watch – Not much change from last month ... Cooler than average ocean temperatures in the Gulf of Alaska and eastern North Pacific continue, although there has been some shifting in recent months (Figure 5). Sea surface temperatures (SST) in this area remain 3-4°F cooler than average and 5-8°F cooler than last year at this time (note figure is in °C). Also note that surface air temperatures northward across the sub-arctic are much warmer than normal (not shown). The combination has produced a fairly entrenched low-pressure area over the North Pacific that has spawned numerous late season troughs with colder than normal air aimed at the west coast. The latest JJA ensemble forecast for SST predicts the North Pacific to stay cooler than average, but that it will weaken from its current magnitude and spatial extent. Overall, I continue to feel confident that the current North and Tropical Pacific conditions would continue to favor an average to slightly cooler than average PNW into Northern California and a

moderately dry and slightly warmer than normal southern California extending across the desert southwest. The take home from the warmer Arctic and cooler North Pacific also continues to point to a weaker temperature gradient between the tropics and the poles, resulting in more occurrences of a wavy, amplified jet stream capable of producing more extreme weather in the mid-latitudes.

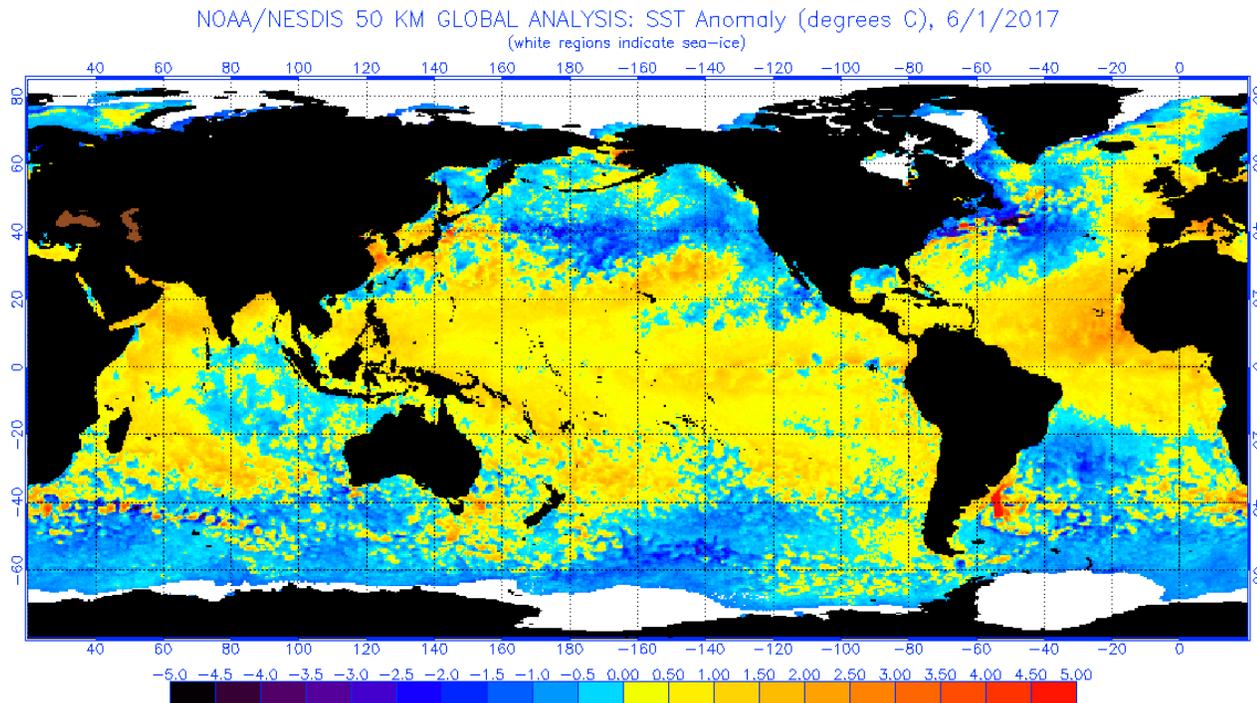


Figure 5 – Global sea surface temperatures (°C) for the period ending June 1, 2017 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day (valid June 10-14): The roller coaster ride of spring temperatures and changeable weather will continue across the west. Early summer-like conditions the week of June 5-9 will be followed by a return to cool and wet weather that's more typical of early to mid-spring rather than early June. A strong upper trough will usher in cool and occasionally wet weather for much of the west coast. The entire western US to the Rockies is forecast to have a greater than average chance for cool conditions. The rest of the US has a high likelihood of warmer than average conditions over this same period. In term of precipitation, the PNW and northern Rockies are likely to see wetter than normal conditions through mid-month while central to southern California and the desert southwest are likely to be normal. Areas east from the Gulf Coast to the Great Lakes are likely to be drier than average during this period.

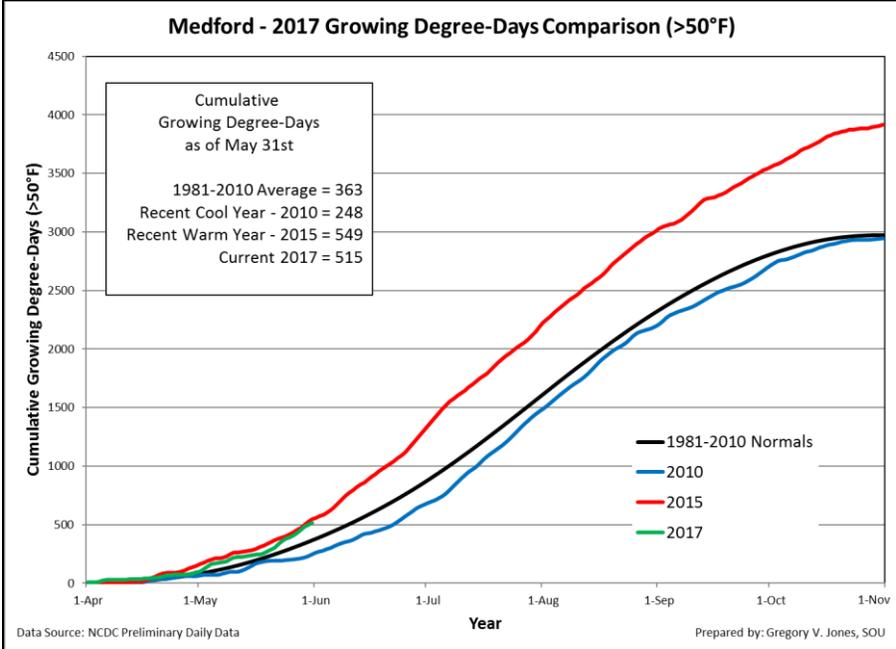
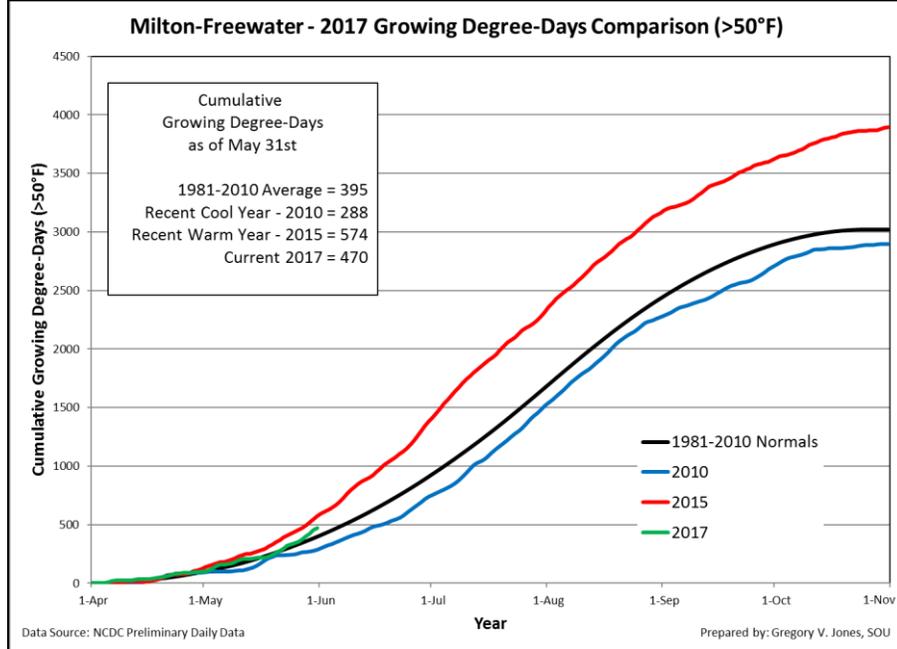
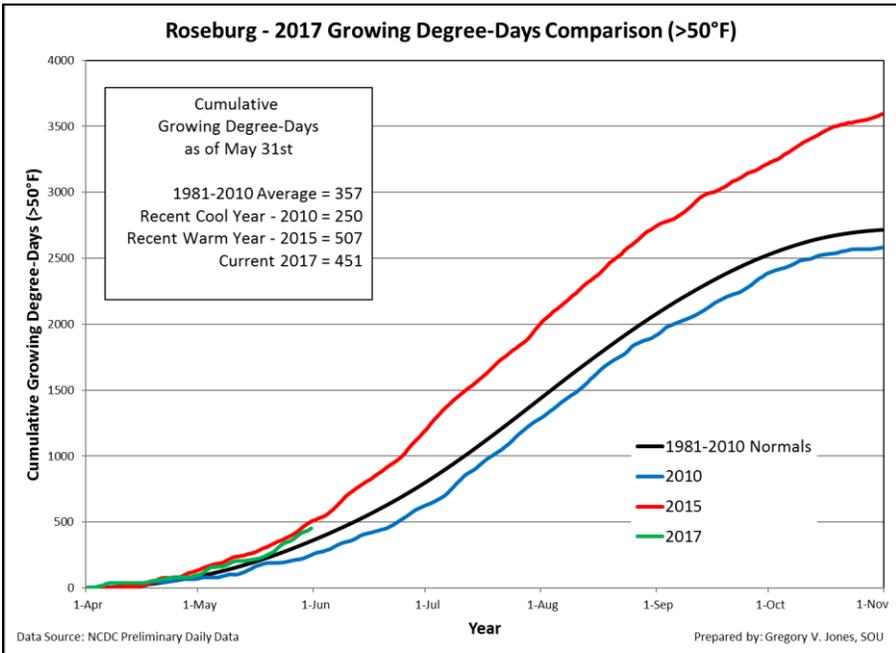
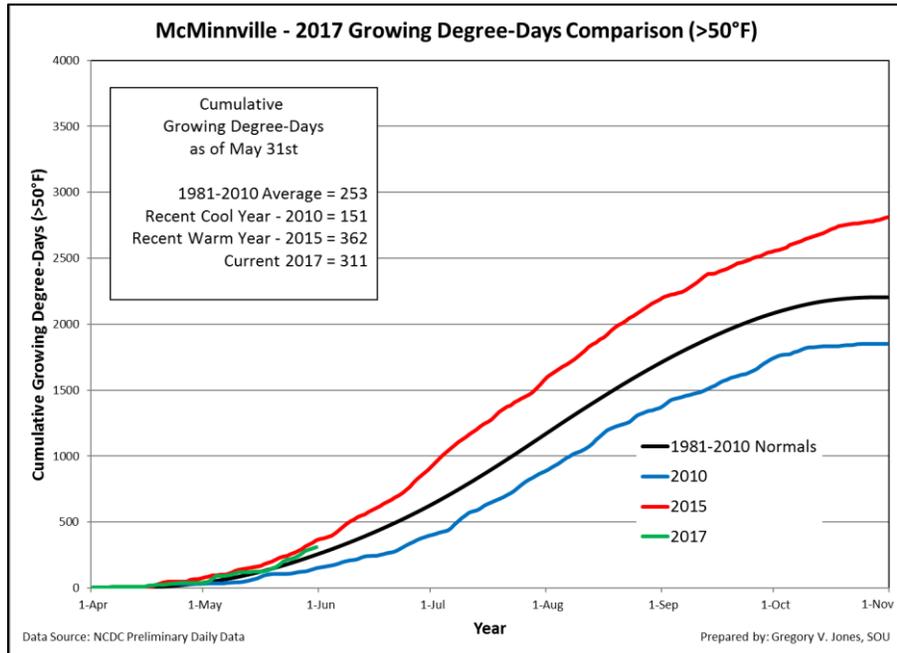
8-14 Day (valid June 12-18): The abnormally cool pattern for the western US is likely to continue from the 6-10 day period. The core of the cooler than average conditions is forecast to shift slightly north into the inland PNW and northern Rockies while the majority of California is forecast to warm to above normal. From the Rockies eastward the bulk of the rest of the country will likely see much warmer than average conditions. West coast precipitation during this period is forecast to quiet down with normal to below normal conditions while areas from the Mississippi River valley eastward are forecast to be wetter than average through mid-month.

30 Day (valid June 1-30): Even with the cool start to the month of June, the forecast for the entire month is to end up warmer than normal (see Appendix Figure 2) for the PNW south into California and the desert SW. For the rest of the US warmer than normal conditions are forecasted for Maine and Florida while the Ohio River Valley will likely be cooler than average. The precipitation forecast for June is tilting the odds for a dry PNW while portions of the northern Rockies across into the Ohio River valley and eastward to New England are forecast to be wetter than average for the month (see Appendix Figure 1).

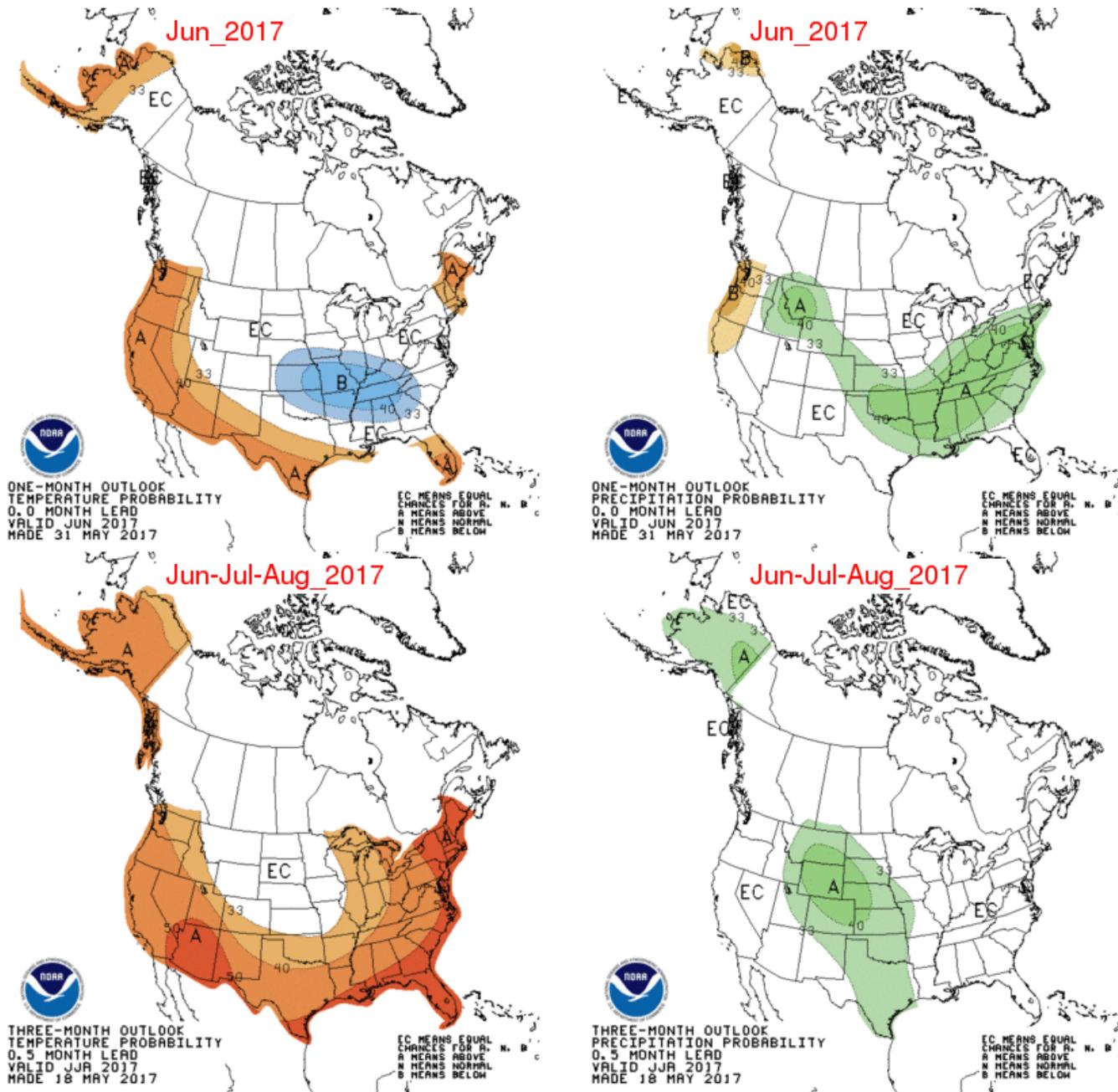
90 Day (valid June-July-August): The June-July-August (JJA) forecast from the CPC has the bulk of the country with an above average chance of being warmer than normal with the desert southwest, Gulf Coast and east coast likely seeing the warmest conditions. Portions of the PNW are forecast to have a lower chance of being warmer than normal while into the northern Rockies and Great Plains there is a broad area with an equal chance of seeing slightly above to slightly below average temperatures (NOAA's Climate Prediction Center, see Appendix Figure 2). My take on the 90-day forecast is that the western US wine regions will likely see normal to slightly warmer than normal summer temperatures. The JJA precipitation forecast for the west coast is holding to average conditions, or in other words seasonally dry. The Rockies have a small chance of being wetter than average, while the Great Lakes to the Gulf Coast and eastward are forecasted for an equal chance to be slightly above average, normal, or slightly below average precipitation (see Appendix Figure 2).

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