

Weather and Climate Summary and Forecast

July 2018 Report

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Summary:

- Near normal temperatures were experienced over much of the western US wine producing regions in June, although Central to Southern California was cooler than average due to continued strong coastal upwelling that has kept coastal zones in California cooler than average. Dry conditions continued in the western US in June adding to the growing drought concerns and fueling early season fires in many states.
- Short to medium term forecasts indicate that the warmest conditions of the summer so far will likely build from south to north through mid-July. Extreme heat and offshore flow will start in Southern California and build into the PNW as a strong ridge of high pressure builds in over the west. The greatest likelihood of precipitation in the short-term is for Southern California and desert southwest with increasing monsoon flow.
- Relatively warm and dry weather is favored in July for the western US, however, indications are that August and September will likely be more moderate, or near average to slightly above average. All analog years and forecasts continue to indicate that 2018 is likely to end up close to the average heat accumulation of the last five years across the majority of the western US.

June 2018 ended up surprisingly close to average to slightly below average across much of California into the PNW and northern Rockies (Figure 1). Coastal SSTs flipped to cooler than average over the last 30 days, and when combined with strong coastal upwelling, produced a strong marine layer and persistent cloudiness that kept coastal zones in California and Oregon cooler than average. In addition, a high occurrence of late season frontal passages in northern Oregon, Washington and British Columbia brought cooler conditions and some rain during the month. Much warmer than average temperatures continued in the Four Corners and southern Rockies contributing to continued drought conditions and an active early fire season. The majority of the rest of the US was also much warmer than average in June with portions of Texas and the Plains up to 6°F above average (not shown). Precipitation amounts in June were lower than normal with California and Nevada being the driest (Figure 1) and Oregon, Washington and Idaho experiencing scattered wetter than average conditions. Precipitation amounts were mixed across the rest of the country with the Ohio River valley experiencing the wettest conditions (not shown).

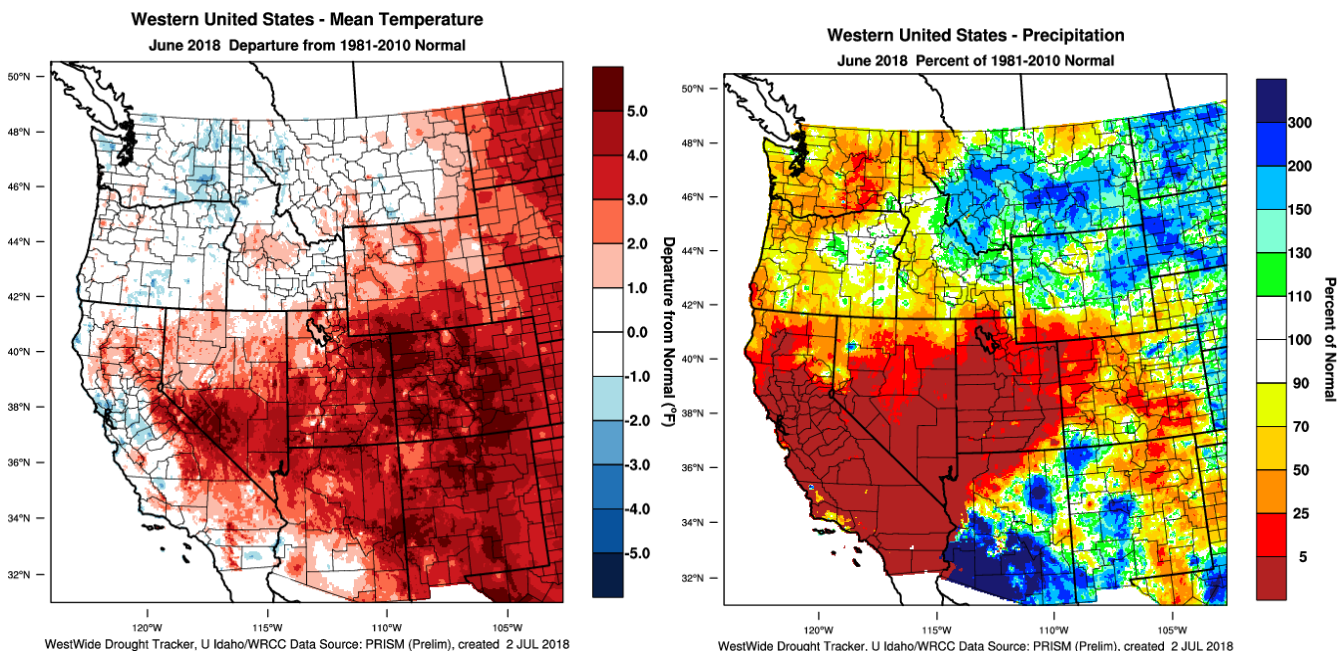


Figure 1 – Western US June 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The average conditions seen in June continue to keep the western US close to average to slightly warmer than average temperatures (0-4°F) for the water year (Figure 2). The Central Valley of California, Northern California, Oregon, and Washington continue running near normal temperatures for the water year. However, Southern California, the Sierra Nevada mountains, across into the desert southwest and the Four Corners and the Rockies remain warmer than average (+1-6°F). Eastern Montana across the Plains eastward to the Great lakes continue to run cooler than normal for the water year to date. Dry conditions continued for much of the west in June, adding to the deficit for the water year (Figure 2). Southern California across into the desert southwest and Four Corners region continue running 20-40% of normal, while central to northern California and much of Oregon have been 60-90% of normal. Washington, northern Idaho, Montana and a small area of the northern Sierra Nevada's continue to show 110-200% greater than average precipitation for the water year (Figure 2). For the rest of the country Texas and the southern Plains have been mostly dry, while the Great Lakes region, northern New England and the Ohio River valley have been slightly wetter than average and the southeast has been near normal (not shown).

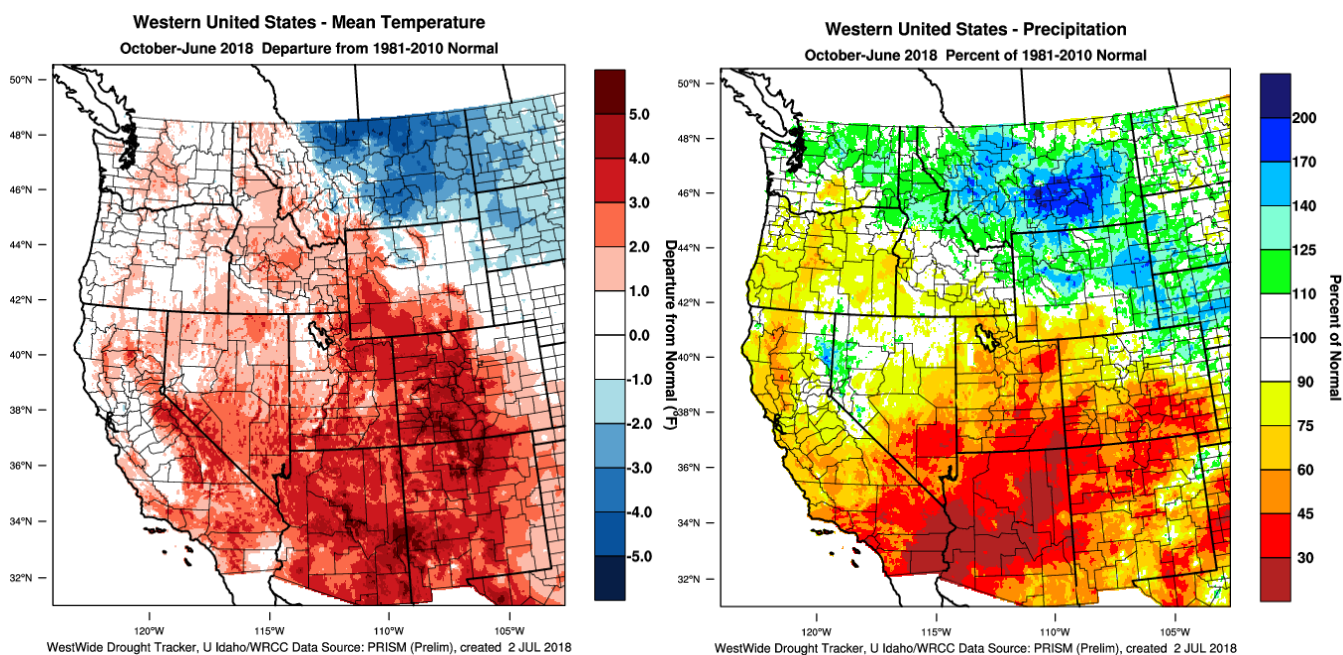


Figure 2 – Western US Water Year October 2017 - June 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Western US growing degree-days (GDD) are running near the 1981-2010 average to moderately above normal (5-20%) (Figure 3). Wine regions in Idaho, Washington and Oregon continue to GDD running 50-250 units above normal, or one to two weeks ahead of average. California saw mixed conditions with much of the state near normal to above normal except in the Bay Area and the Central to Southern California coasts where near shore upwelling contributed to a strong marine layer and cloud cover that has kept heat accumulation slightly below normal for the season (one to two weeks behind average accumulation) (Figure 3). Heat accumulation amounts for four locations that I have tracked for many years in Oregon were slightly above average in June due to temperatures that were 0.8-1.8°F above normal. GDD in these four locations are all above the 1981-2010 normals for April through June (see the Appendix Figure 1 for four locations in Oregon). The GDD to date in the 2018 is slightly behind to roughly the same as the GDD seen in 2017 and is very close to the values seen in 2013 and 2014 at this point in the growing season.

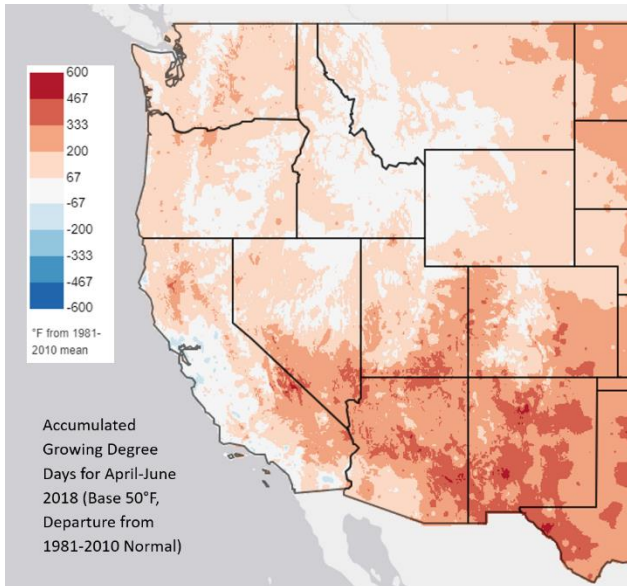


Figure 3 – Western US April-June 2018 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – So far the summer has continued the trend toward dry conditions leading to numerous fires across the west. The general pattern of drought in the US over the last month has not changed much with the end of June US Drought Monitor continuing to show that US drought footprint is at near record levels with the main areas of severe to extreme drought seen from the panhandle region across to the Four Corners region and the desert southwest (Figure 4). The US seasonal drought outlook though the end of September shows some change, especially in the Four Corners regions which is expected to see some improvement due to forecasted monsoon precipitation (see below), however, drought persistence or further development for Central to Southern California, Texas, and eastern Oregon is likely (Figure 4, right panel).

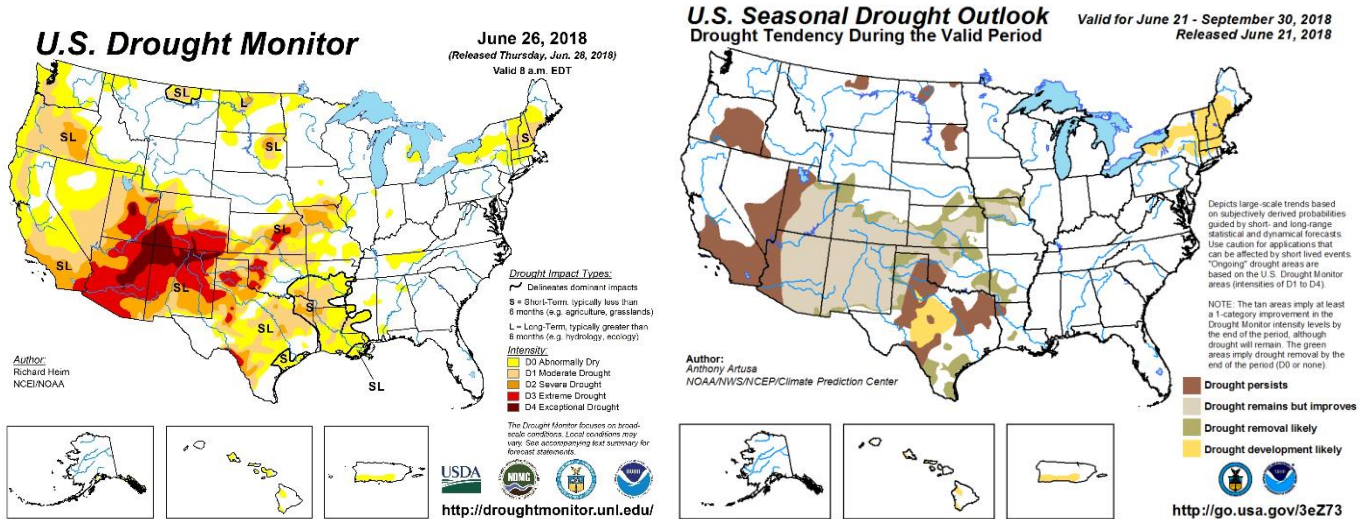


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – Across numerous agencies there have been rumblings of an El Niño event developing in the tropical Pacific for a few weeks now. In mid-June 2018, the status of El Niño, La Niña, and the Southern Oscillation, or ENSO, shows that the east-central tropical Pacific waters are reflecting ENSO-neutral conditions. Most of the key atmospheric variables, including winds, also indicate neutral conditions at this time. The official forecasts from numerous agencies calls for ENSO-neutral during summer, with about an even chance for El Niño during autumn, rising to about 65% for winter. The latest forecasts of statistical and dynamical models collectively favor weak to moderate El Niño development by year’s end, but forecasters continue to hedge on this due to low confidence at this time of year. If the conditions for neutral conditions hold into the summer, the weather across the US will likely

follow the warmer than average conditions in the 90-day forecast and beyond (see forecast periods below and Appendix Figure 2).

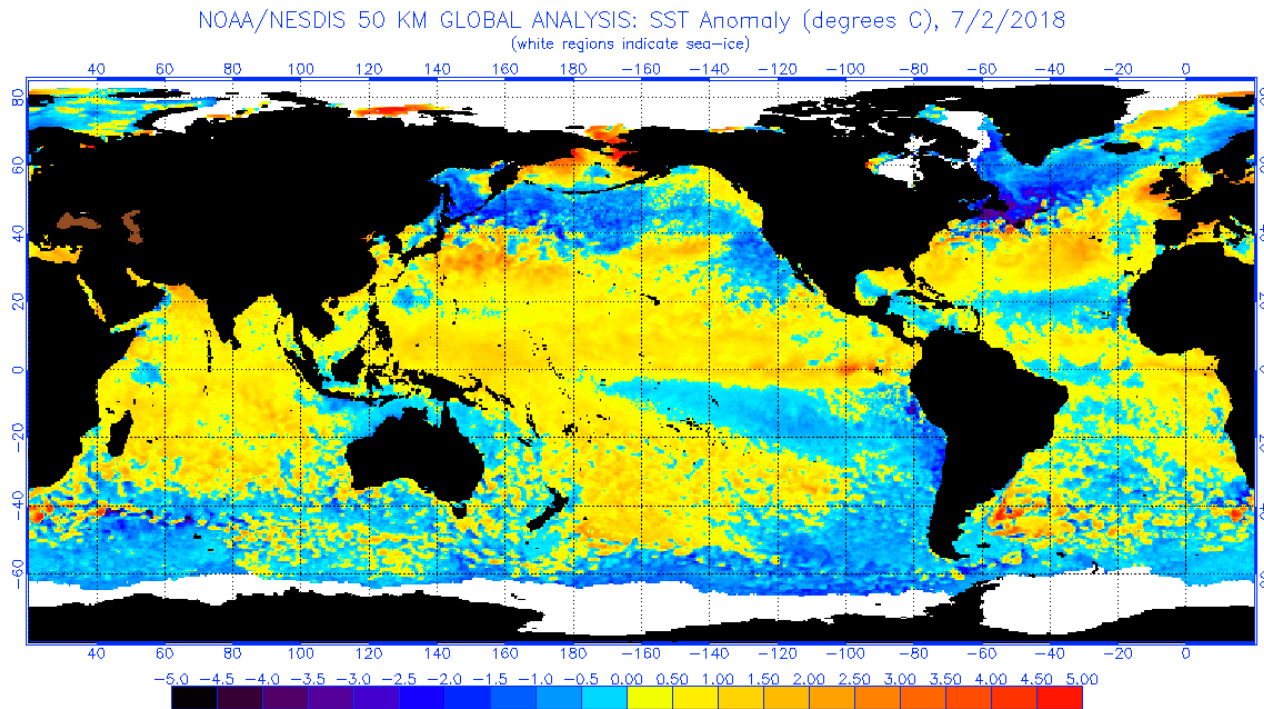


Figure 5 – Global sea surface temperatures (°C) for the period ending July 2, 2018 (image from NOAA/NESDIS).

North Pacific Watch – Cooler than average SSTs off the west coast (Figure 5), especially California, along with near-shore upwelling have contributed to a robust marine layer, coastal cloudiness, and near normal to slightly cooler than normal temperatures in many areas. The warming of the North Pacific from roughly 40 to 50°N along the coast and out into the southern Gulf of Alaska has waned some and likely has contributed to the near average temperature conditions in recent months, with slightly wetter than average conditions across the northern PNW and Rockies (Figure 1). There is no clear consensus on how the North Pacific SST will evolve over the next 90 days. If cooler than average near shore conditions remain, then coastal zones will likely stay near average to slightly cooler. 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 July 10-14): After a relatively average start to July the next week is forecast to see a heat event start in Southern California and the desert southwest and build into Northern California and the PNW. Temperatures are likely to be much above average during this forecast period with the bullseye of the event settling over northern Nevada, eastern Oregon, and southern Idaho. Temperatures across the majority of the rest of the US are expected to remain warm, especially into the Great Lakes, Ohio River valley, and into New England. The only area forecast to be normal to slightly below normal is the southern reaches from eastern Arizona to Louisiana where cloud cover and rain is forecast due to expected seasonal monsoon development. The PNW is forecast to be drier than average during this period while the rest of the US is mixed with the northern tier of states expected to be drier than average and the Gulf Coast wetter than average with everywhere in between near normal.

8-14 Day (valid July 12-19): The only change in the temperature forecast into mid-month is that the heat event is expected to build even further into the PNW with the bulk of the western US forecast to have above average conditions. The desert southwest is forecasted to remain below average due to monsoon cloud cover and rain, otherwise the rest of the country is forecast to see above normal temperatures. The precipitation forecast through mid-month shows the PNW remaining dry while the possibility for some southerly flow from monsoon development

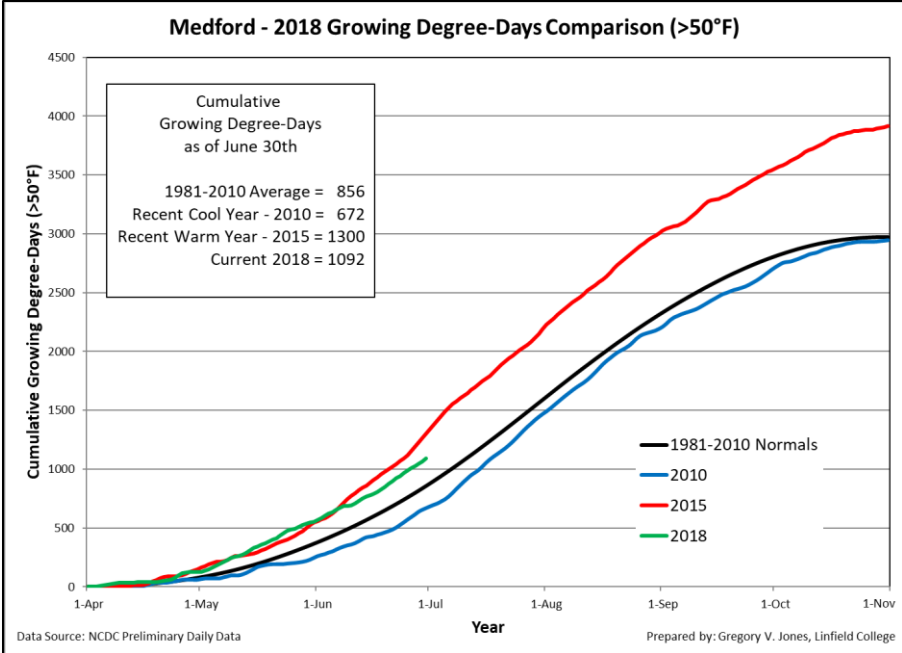
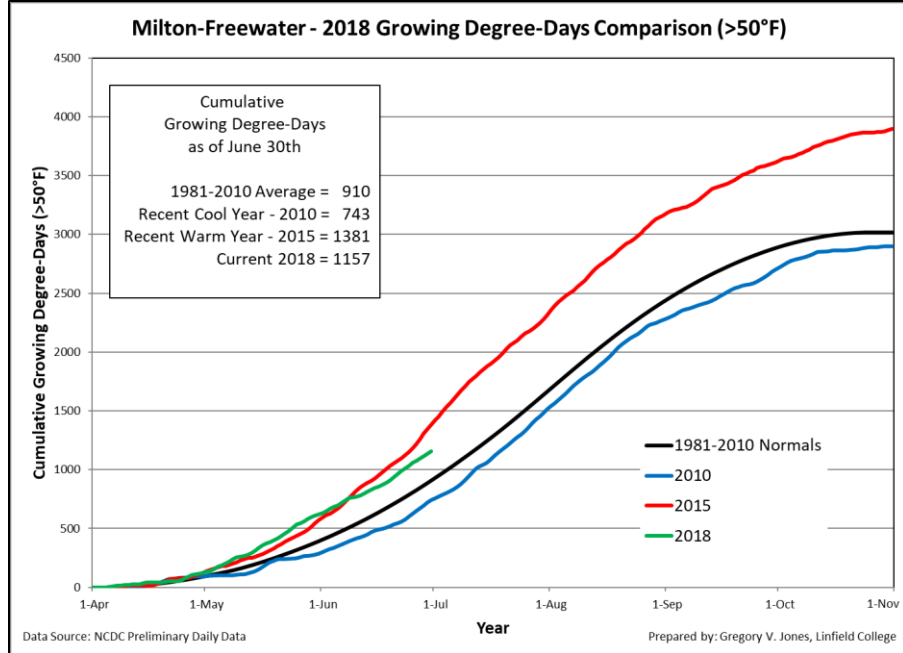
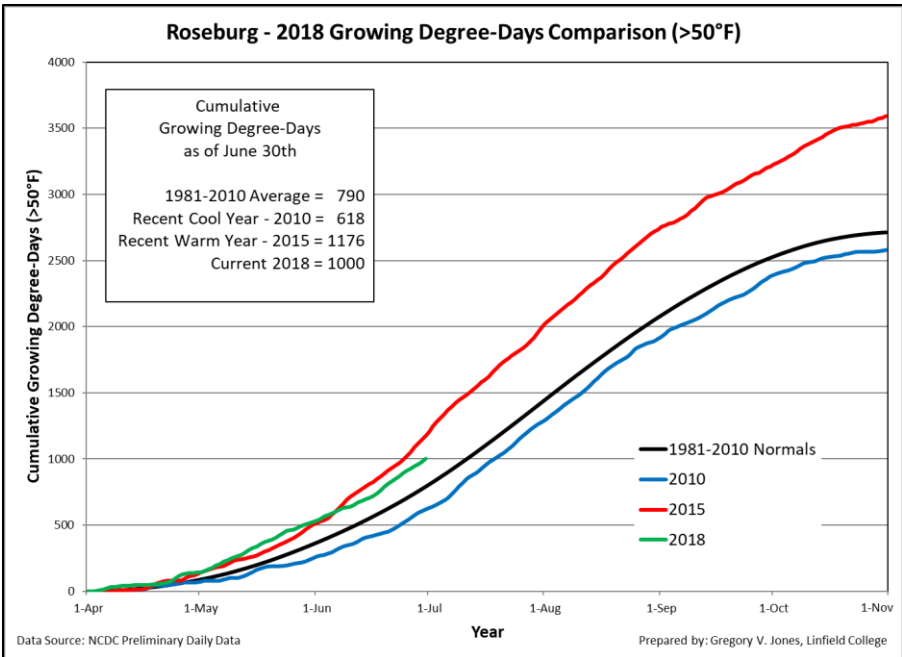
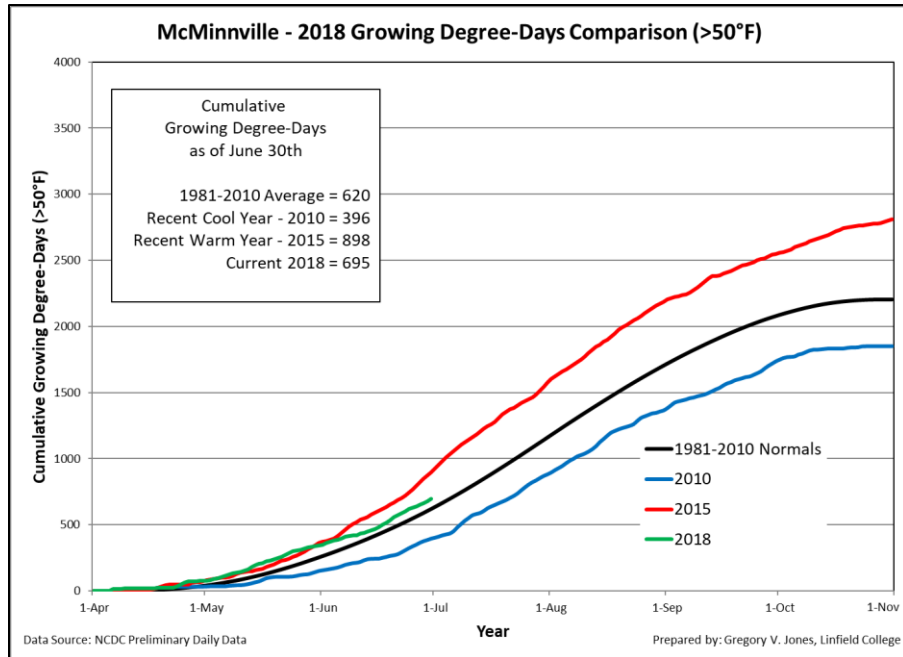
in the southwest to bring thunderstorms to southern to northern California and into the Great Basin. For the rest of the country, the Great Plains south to Texas is forecast to be drier than average through mid-month, while the southeast into New England is forecast to see above average precipitation.

30 Day (valid July 1-31): The warm up during the first couple of weeks of July is likely to hold through the rest of the month with the majority of the country forecast to see above average temperatures. A slight cool down to average conditions in the second half of the month for the PNW is forecast to keep July near average while portions of the northern Rockies is forecast to see below average temperatures (see Appendix Figure 2). The current extreme heat in the Great Lakes and northeast is likely to hold and should get close to a record for the month of July. In terms of precipitation, the bulk of the country is forecast to be near average for the month of July. The deviations from average in the forecast include continued monsoon precipitation likely in the southwest, some likely tropical storm rainfall in the southeast and a forecast for moderately dry conditions in the Texas and the southern Plains (see Appendix Figure 2).

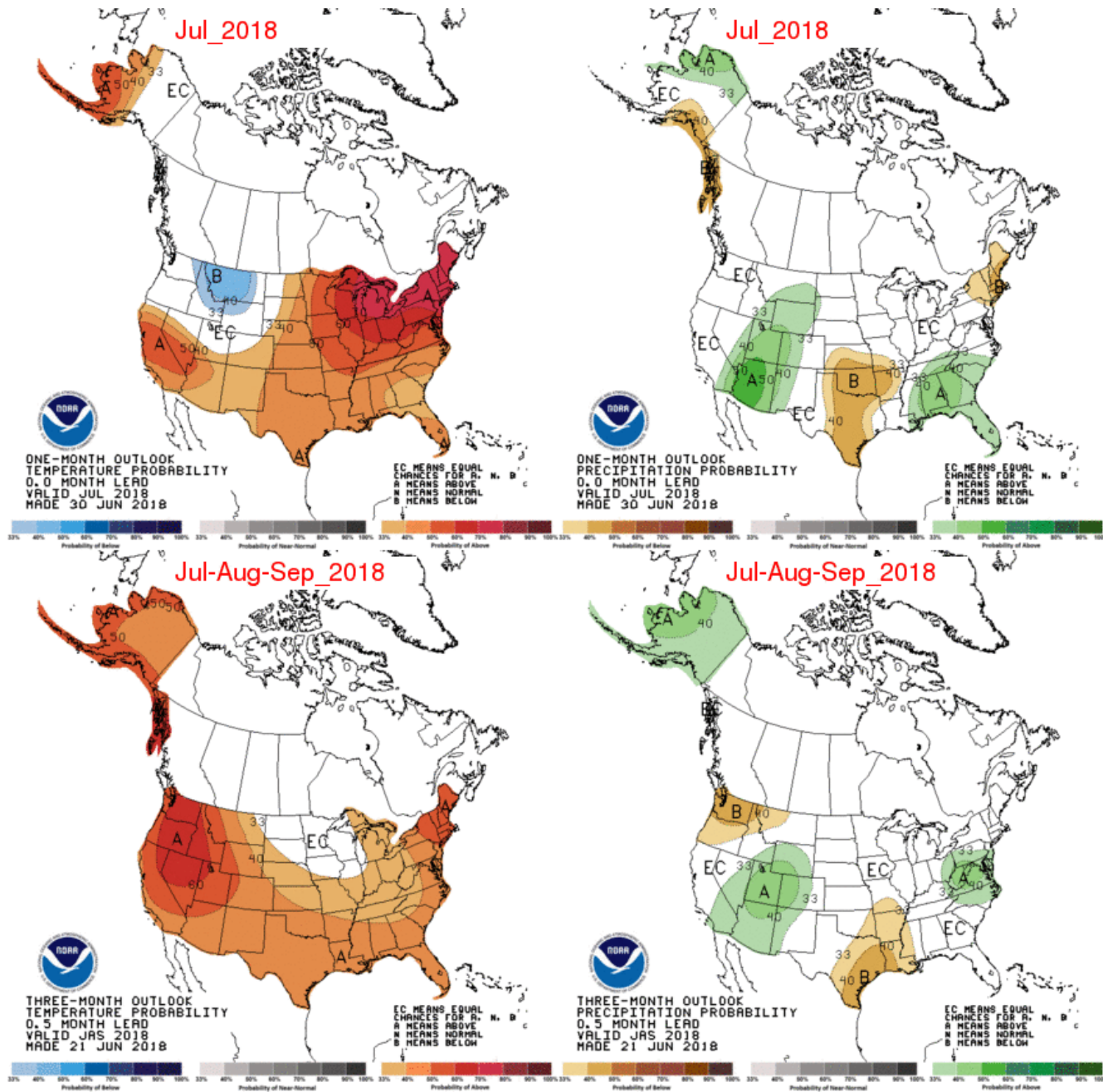
90 Day (valid July-August-September): The July through September seasonal forecast for is tilting the odds to the majority of the US experiencing a warmer than average summer, with the only exception being the northern Plains and upper Mississippi River valley where near average temperatures are forecast (see Appendix Figure 2). The bullseye for the likely warmer than average conditions is most likely in the Great Basin extending into the PNW, however this will likely come from a much warmer than average July and early August, then a moderate ending to the period. The precipitation forecast over the next 90 days nationwide does not shift much from the July forecast given above with some expected monsoon precipitation developments in the desert southwest, a drier than average PNW and Texas Gulf Coast, and a wetter than average southeast to middle Atlantic states (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 (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 July (top panel) and July, August, September (bottom panel) (Climate Prediction Center, climate.gov).