

Weather and Climate Summary and Forecast

June 2018 Report

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Summary:

- May was much warmer than normal over much of the western US, although Central to Southern California was near average to cooler than average due to prominent marine layer intrusions. The month ended up being one of the driest May's on record for much of the coastal regions to interior valleys in the west.
- Current conditions have warmed to seasonal or warmer than average temperatures. Short to medium term forecasts also tilt the odds to warmer than average conditions for the western US. Short term forecasts do call for some rain in the PNW, but conditions should dry out into mid-June.
- The seasonal forecast for June through August suggests a strong chance for warmer than average conditions over the western US. The precipitation forecast calls for seasonally dry conditions during the same period, with the PNW likely to be the driest region. All analog years and forecasts indicate that 2018 is highly likely to end up close to the average heat accumulation of the last five years across the majority of the western US.

The 2018 spring has produced temperatures in the west that are flipped north-south from those seen in 2017. The May 2018 map in Figure 1 shows a pattern of a warmer north and cooler south, the opposite seen in 2017. Temperatures in Oregon, Washington and Idaho in May were 2-6°F above normal in May with major cities experiencing one of their warmest May's on record. Warmer than normal conditions were also experienced in much of the Rockies (Figure 1), however Central to Southern California and portions of the southwest experienced average to 2°F below average temperatures. The bulk of the rest of the US was also much warmer than average in May with portions of the Ohio River Valley up to 9°F above average (not shown). Precipitation amounts in May were mixed over the western US with coastal and inland areas in California, Oregon, and Washington along with the desert southwest experiencing one of its driest May's on record (Figure 1). Wetter than average conditions were seen throughout the Sierra Nevada mountains, into areas of the Great Basin and northern Rockies. Precipitation amounts were mixed across the rest of the country, with the dominant signature being a much wetter than average Florida, southeast, and mid-Atlantic region (not shown).

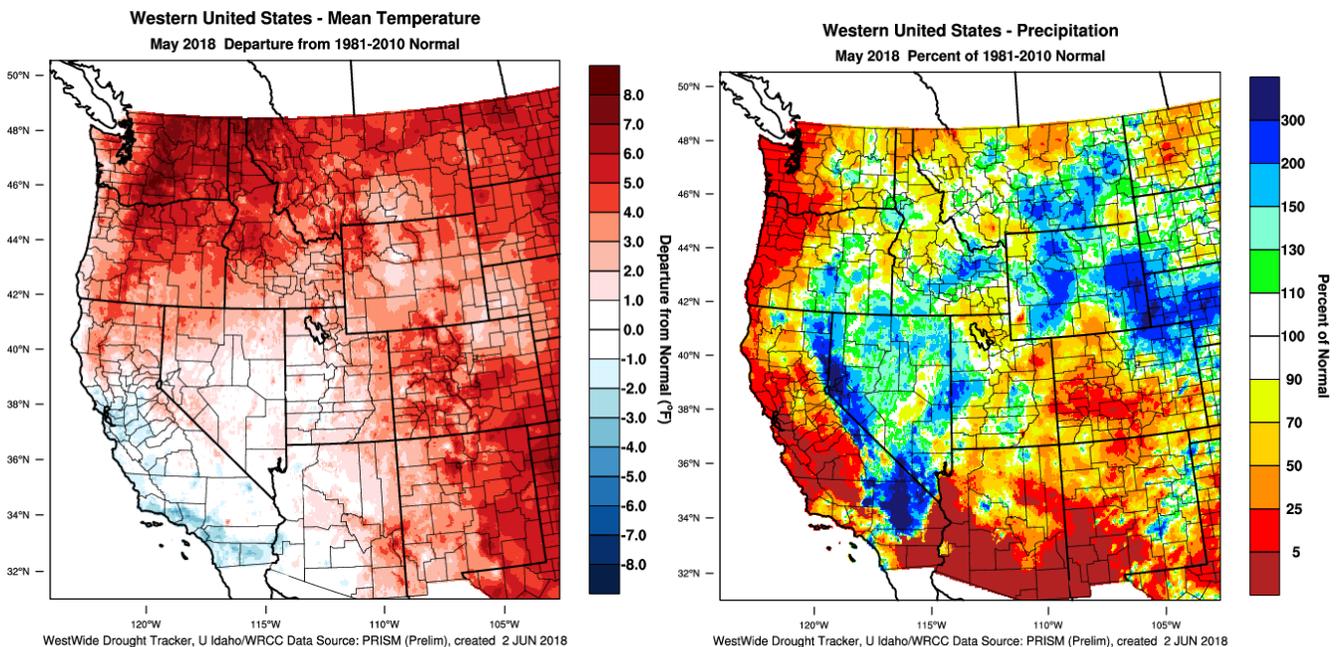


Figure 1 – Western US May 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The relatively warm May has brought the western US close to average to warmer than average temperatures (-1 to +4°F) for the water year (Figure 2). The Central Valley of California, Northern California, Oregon, and Washington are now running near normal temperatures for the water year. However, Southern California, across into the desert southwest and the Four Corners and the Rockies remain warmer than average (+1-5°F). The contrast with the Plains and eastern US continues to be seen in Figure 1 where eastern Montana eastward to the Great lakes has experienced a very cold water year to date. The dry May in many areas of the west only added to the already dry water year amounts (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 the southern to northern 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).

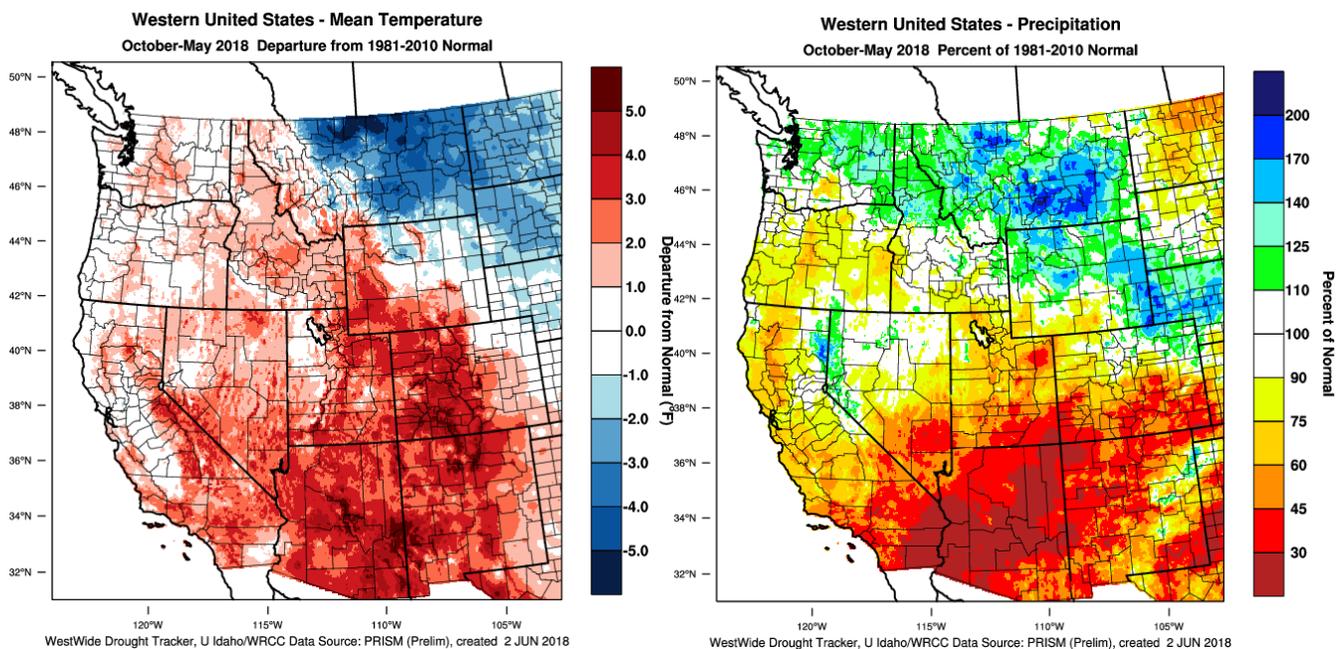


Figure 2 – Western US Water Year October 2017 - May 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Growing degree-days (GDD) over the western US show an April through May that was largely above normal (Figure 3). Wine regions in Idaho, Washington and Oregon have seen GDD running 50-250 units above normal. 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 marine cloud cover conditions keep heat accumulation slightly below normal for the months of April and May (Figure 3). Heat accumulation amounts for four locations that I have tracked for many years in Oregon are all above the 1981-2010 normals for the months of April and May, and are close to or above the GDD that was seen at this same time in both 2015 and 2017 (see the Appendix Figure 1 for four locations in Oregon).

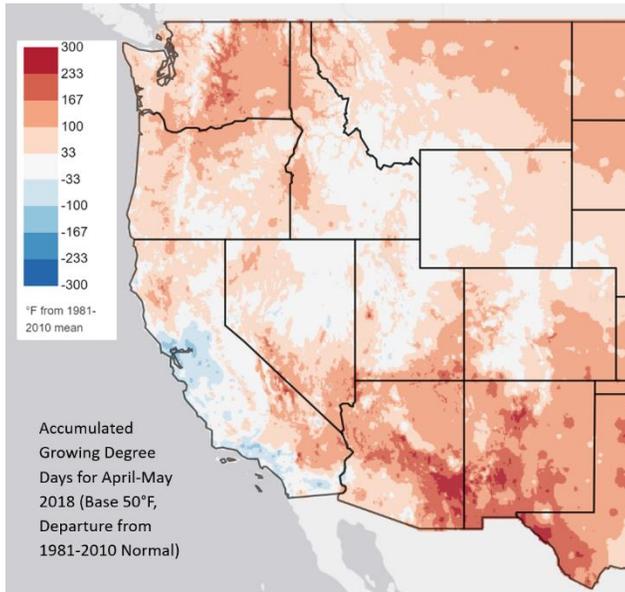


Figure 3 – Western US April-May 2018 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

Drought Watch – Very little change in the overall pattern of drought in the US over the last month. The end of May US Drought Monitor shows that US drought footprint continues 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 through the end of August also did not change much, continuing to show the forecast pattern with drought persistence or further develop for Central to Southern California across to New Mexico and in eastern Oregon. The forecast also continues to show some potential improvements in Texas and Oklahoma (Figure 4, right panel).

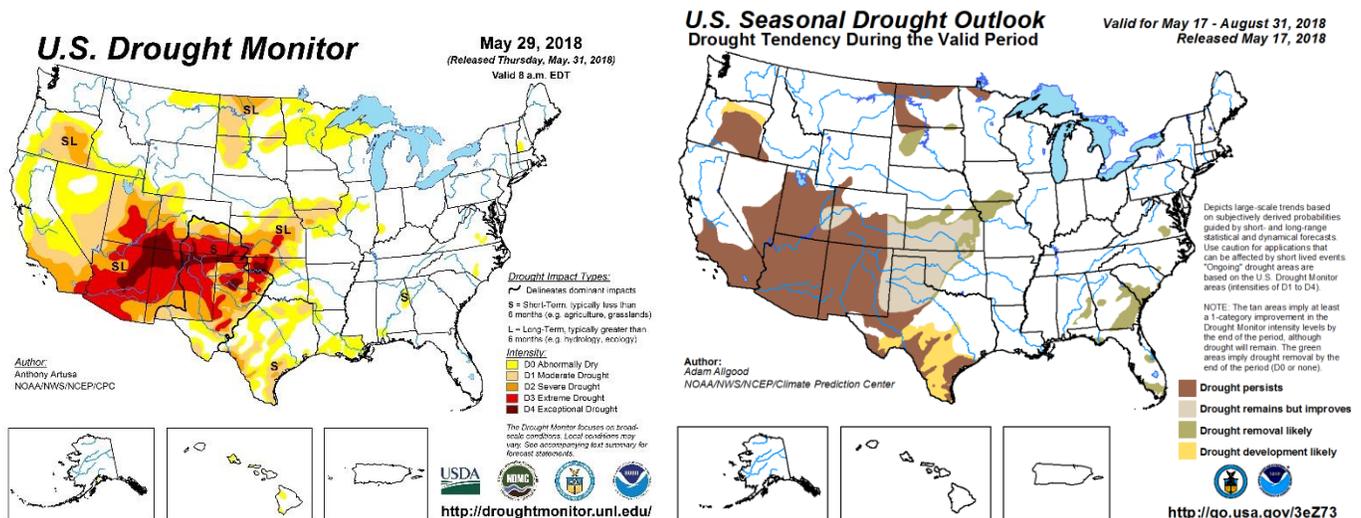


Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – In mid-May 2018, the status of El Niño, La Niña, and the Southern Oscillation, or ENSO, shows that the east-central tropical Pacific waters reflected ENSO-neutral conditions. Most of the key atmospheric variables also indicated neutral conditions, although the upper level wind anomalies show remnants of La Niña. The subsurface water temperature continued to be above-average. The official forecasts from numerous agencies calls for neutral conditions through the September-November season, with a nearly 50% chance of El Niño development by year's end. The latest forecasts of statistical and dynamical models collectively favor weak El Niño development by year's end, but forecasters 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).

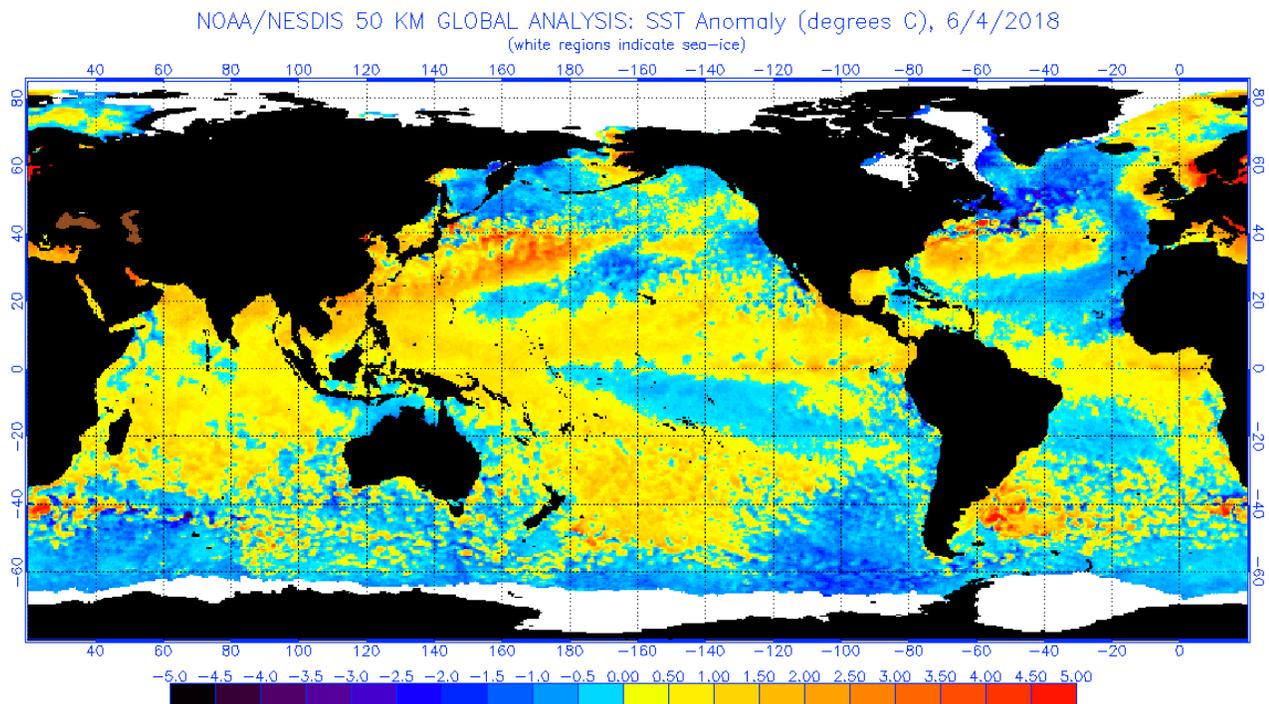


Figure 5 – Global sea surface temperatures (°C) for the period ending June 4, 2018 (image from NOAA/NESDIS).

North Pacific Watch – Very little change in the Pacific sea surface temperature patterns over the last 30 days (Figure 5). A portion of the North Pacific from roughly 40 to 50°N along the coast and out into the southern Gulf of Alaska has warmed slightly. This warming has likely been partly responsible for the warm and dry month of May in the PNW. If these conditions continue I would expect the rest of the summer to be warmer than average, but also have a slightly higher than average thunderstorm occurrence due to higher moisture levels in the atmosphere. Even with these changes we are still in the negative or cold phase of the Pacific Decadal Oscillation or PDO, a large-scale, long-term climate variability mechanism in the North Pacific Ocean that is closely associated with El Niño-La Niña cycles. The cold-PDO tends to have more prominent effects when it is matched by La Niña conditions in the Tropical Pacific. However, with the transition from La Niña to neutral conditions in the tropics we are likely to not see as strong of climate effects across the west.

Forecast Periods:

6-10 Day (valid June 9-13): The western US will see a north-south split in temperatures and precipitation during the second week of June. Unsettled conditions in the Gulf of Alaska will likely keep the PNW slightly cooler than average to average over the next week or so with the potential for a couple of minor rain events. Central to Southern California will likely see warmer than normal and drier than normal conditions during the same period. Temperatures across the majority of the rest of the US are expected to heat up into full summer mode with the bullseye of heat centered over the northern to southern Plains. The precipitation forecast for the rest of the US is spatially varied with the bulk of the Rockies, southern Plains and New England likely to be dry, while the southeast and portions of the Four Corners regions likely to be wetter than average.

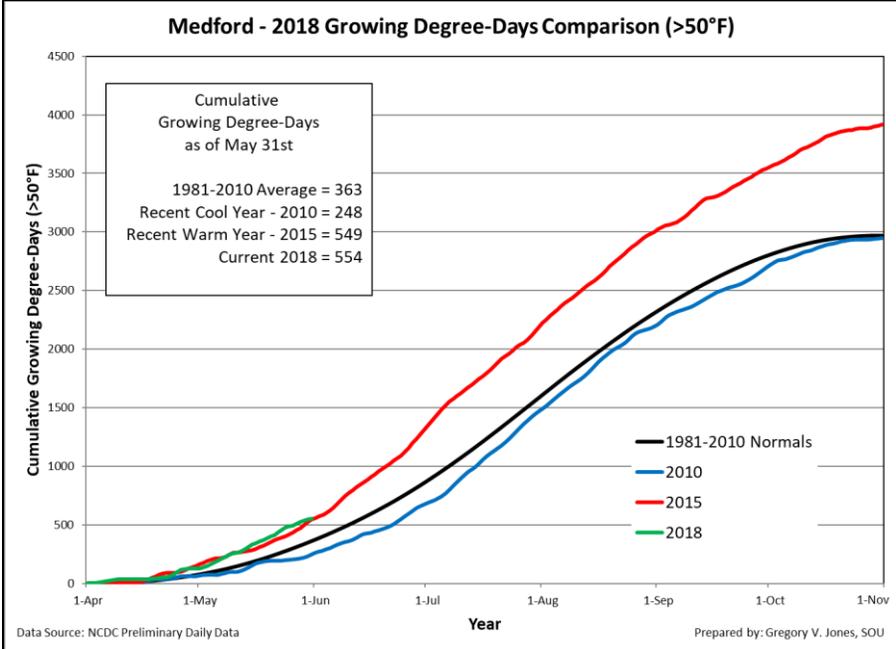
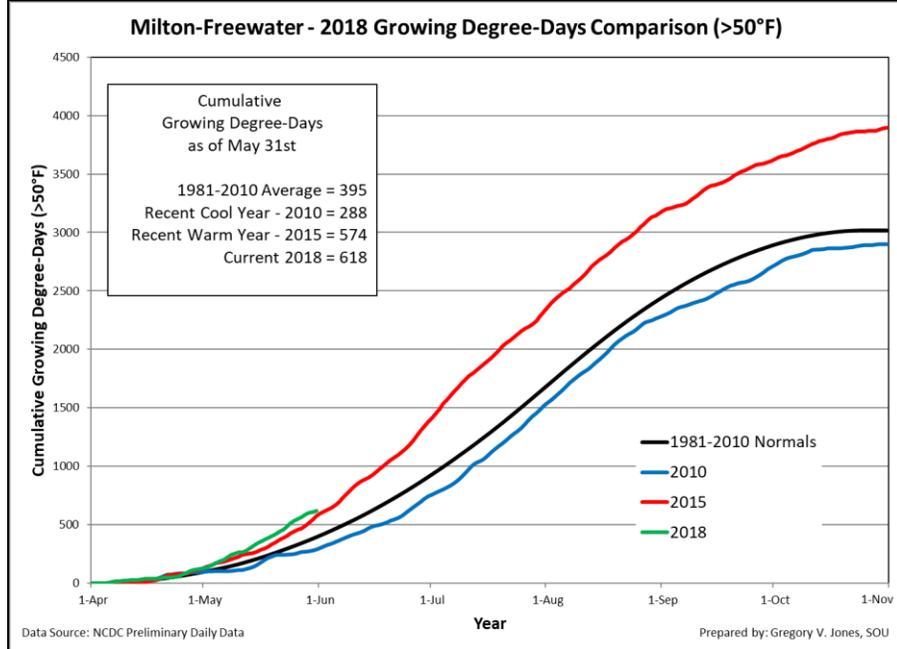
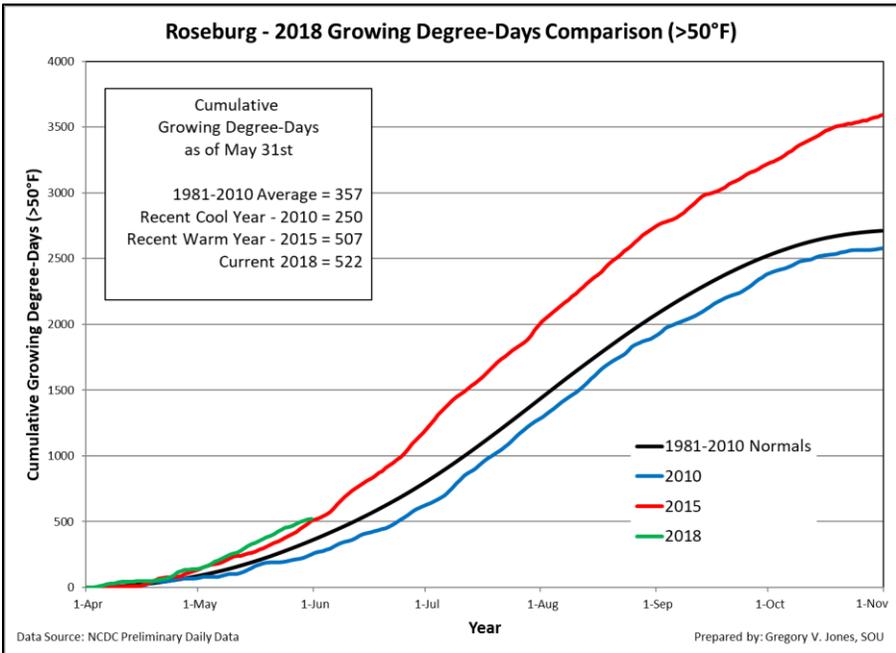
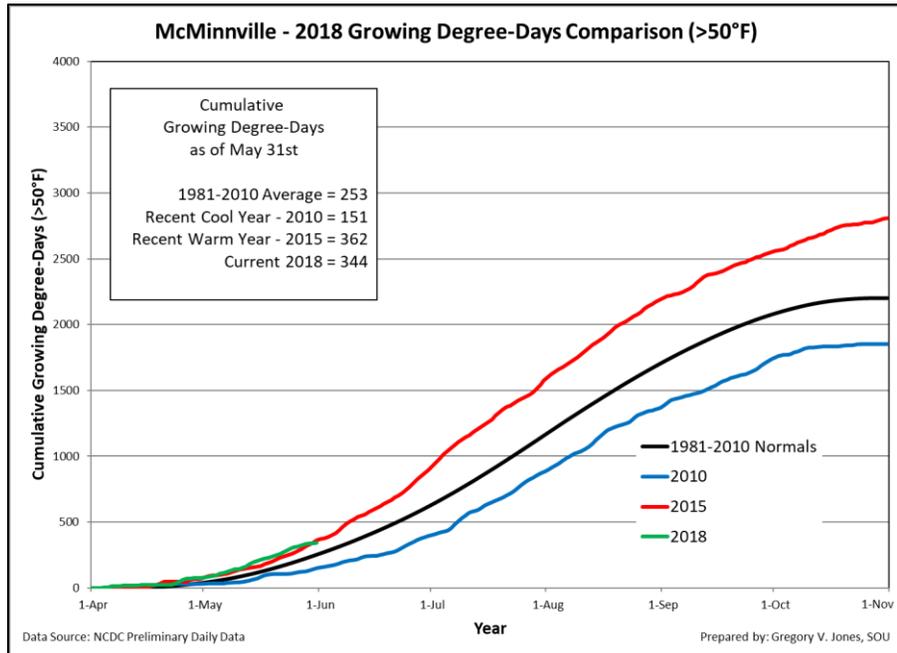
8-14 Day (valid June 11-17): Heading into the middle of the month the unsettled conditions in the Gulf of Alaska are forecast to give way to a more typical summer high pressure ridge. The result is a forecast for warmer than average and seasonally dry to drier than average conditions throughout the western US. Except Florida, the rest of the country is expected to be warmer than average during mid-month. The precipitation forecast for the rest of the country continues the general pattern from the 6-10 day period with the bulk of the Rockies, southern Plains and New England likely to be dry, while the southeast and portions of the Four Corners regions likely to be wetter than average.

30 Day (valid June 1-30): The one-month lead forecast is calling for the majority of the country to likely have a warmer than average June, with only New England, Florida and the coastal southeastern US forecast to be near normal (see Appendix Figure 2). The panhandle region across to the southwest and north into the Rockies is forecast to have the warmest conditions during the month of June. The month's precipitation forecast tilts the odds for the PNW to be below average while Central to Southern California should be near average (which during this time of year is pretty much dry). For the rest of the country the panhandle region and the Great Lakes to New England are expected to be dry during June while the southeast is likely to be wetter than average (see Appendix Figure 2).

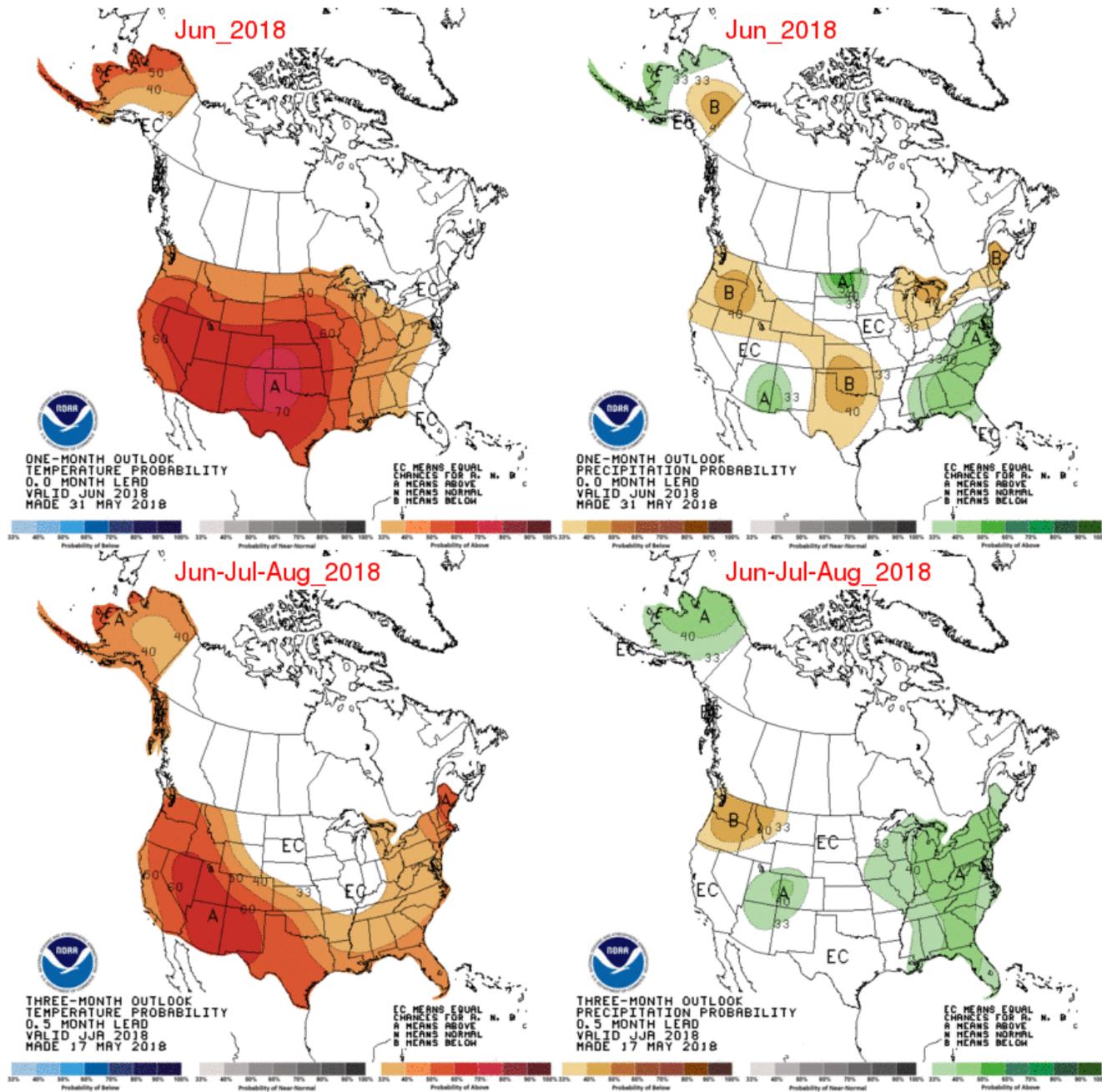
90 Day (valid June-July-August): The seasonal forecast for June through August is tilting the odds to a warmer first half of summer across the US with the exception of the northern Plains and upper Mississippi River valley where near average temperatures are forecast (see Appendix Figure 2). The warmer than average conditions are most likely in the desert southwest and extending into the PNW. The precipitation forecast over the next 90 days points to a pretty typical seasonal dry down to slightly drier than average conditions in the PNW, while California is expected to be near average or seasonally dry. The Great Lakes across to the mid-Atlantic and New England are forecast to be wetter than average during this period while the rest of the county is forecast to have an equal chance of being slightly drier to slightly wetter than average.

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