**Weather and Climate Summary and Forecast**
**August 2018 Report**

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Summary:

- July 2018 will likely go down as one of the top five warmest July's on record for many locations across the west. The only exception was the average to slightly cooler than average conditions in and around the Bay Area where continued strong coastal upwelling and cooler SSTs have predominated. Dry conditions persisted in the western US in July, fueling numerous fires in many states, and adding to long-term drought concerns.
- Continued warmer than average conditions are forecasted over the next 10 days to two weeks. While not as warm as what was experienced in July, conditions will likely remain warmer than average through the third week of August. The greatest likelihood of precipitation in the short-term is for Southern California, the desert southwest and into the Great Basin with increasing monsoon flow expected.
- The seasonal forecast continues to indicate a relatively warm and dry western US through late summer and early fall. There is some indication of drought development in the PNW, but I would not bet on this yet. Current year heat accumulation, and 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.

July 2018 played out to the forecasted warm and dry conditions, especially in the western US where many areas experienced one of the warmest July's on record and unfortunately an active fire season. Temperatures were 1-6°F above average across the west (Figure 1), except in the monsoon region of the desert southwest and the Bay Area where coastal SSTs continued cooler than average due to strong coastal upwelling that produced a strong marine layer (see North Pacific discussion below). Warmer than average temperatures continued in the Four Corners and southern Rockies and extended into Texas and the Gulf Coast. The northern Plains and the southeastern US experienced near average conditions while the northeast was much warmer than average (not shown). While July is normally dry throughout the west, precipitation amounts were less than 25% of normal except in regions that received some monsoon rain in the southwest and isolated areas of thunderstorm activity which unfortunately lead to numerous fire outbreaks. Precipitation amounts were mixed across the rest of the country with the Plains and the middle Atlantic to southern New England experiencing the wettest conditions and extreme flooding (not shown).

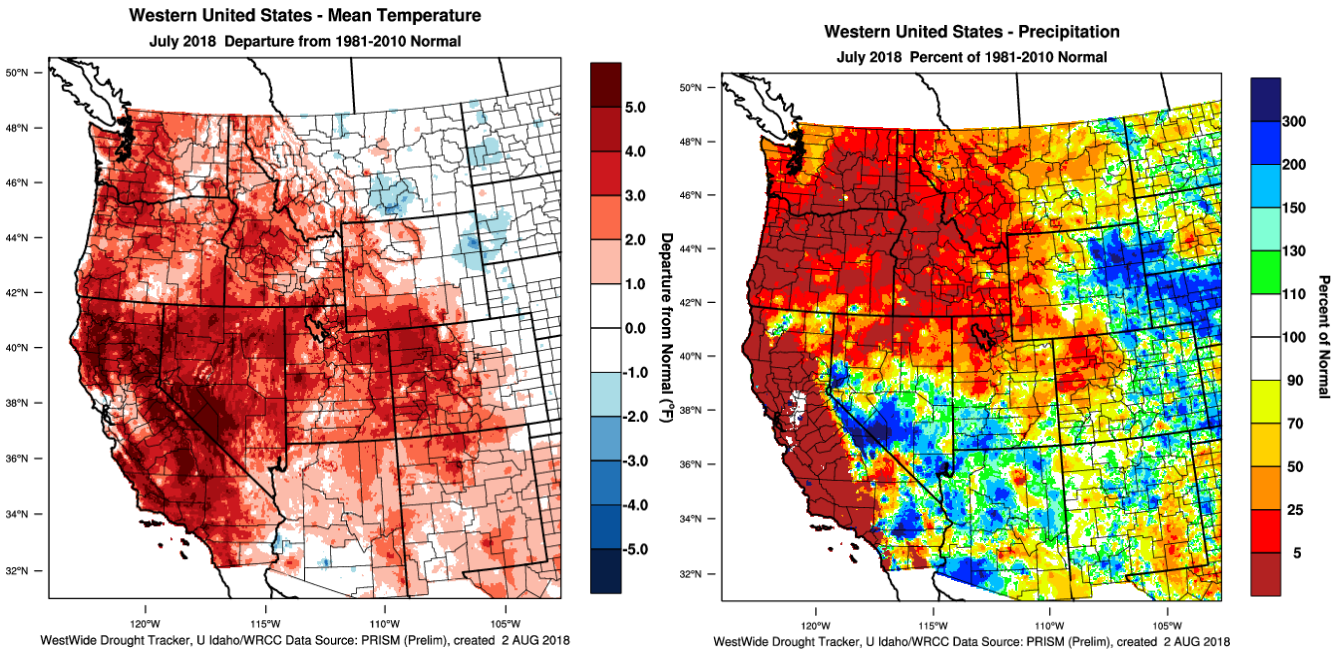


**Figure 1** – Western US July 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The record warmth seen in July across much of the west continues to keep the western US largely warmer than average for the water year with the Four Corners the warmest region (Figure 2). However, the Central Valley of California along with portions of Northern California, Oregon, and Washington continue running near normal temperatures for the water year. Eastern Montana across the Plains eastward to the northern Great lakes continue to run cooler than normal for the water year to date. The dry conditions experienced in July added to the current water year deficit throughout much of the west (Figure 2). Southern California across into the desert southwest and Four Corners region continue running 15-45% of normal, while central to northern California and much of Oregon and some of southern Idaho and Washington have been 60-90% of normal. Northern Washington and 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 continue 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).

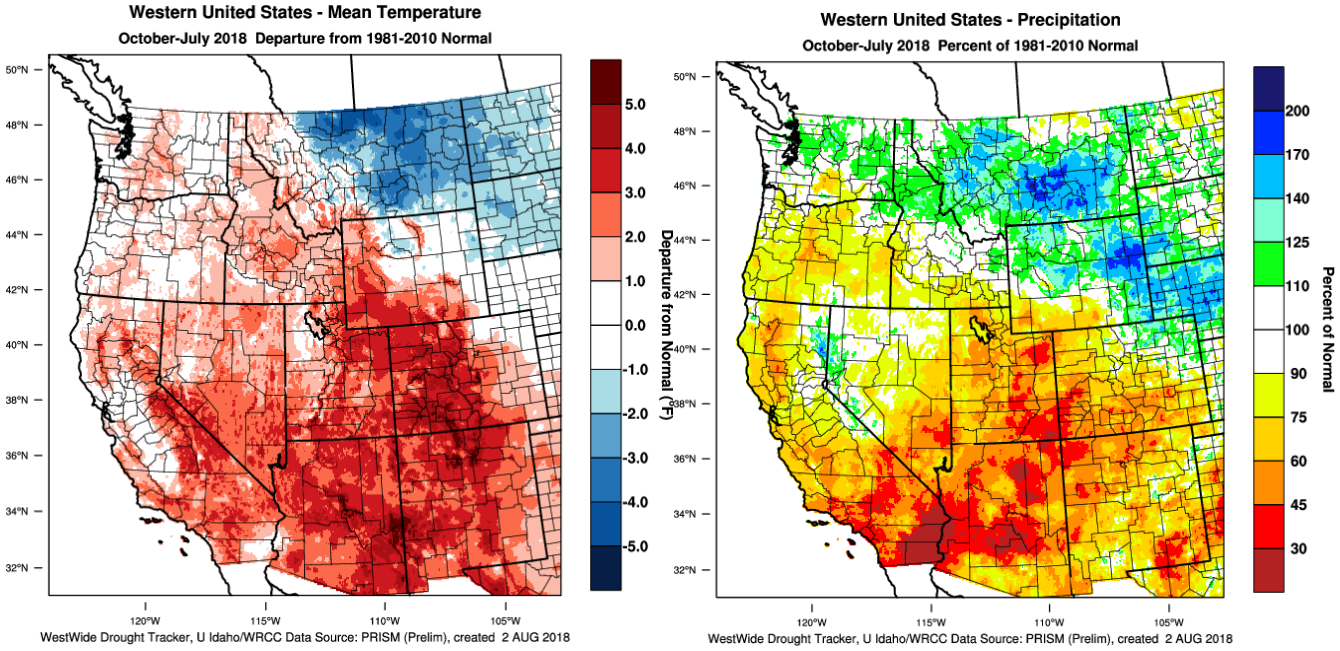


**Figure 2** – Western US Water Year October 2017 - July 2018 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

With a record warm July growing degree-days (GDD) over the western US are now running largely above the 1981-2010 average (5-30%) (Figure 3). Wine regions in Idaho, Washington and Oregon are now running 100-300 GDD units above normal, or two to three weeks ahead of average. California saw mixed conditions with much of the state near normal to above normal except in the Bay Area corridor where near shore upwelling and lower SSTs (see North Pacific discussion below) contributed to a strong marine layer and cloud cover that has kept heat accumulation slightly below to normal for the season (now roughly one week behind average accumulation) (Figure 3). Heat accumulation amounts for four locations that I have tracked for many years in Oregon are now slightly above average in July due to temperatures that were 2.9-4.3°F above normal. GDD in these four locations are 12-28% above the 1981-2010 normals, 10-15% above the average for the last 15 years, and slightly higher than 2017 for April through July (see the Appendix Figure 1 for four locations in Oregon). The GDD to date in 2018 for western US wine regions is slightly behind to roughly the same as the GDD seen in 2017 and continues to run very close to the values seen in 2013 and 2014 at this point in the growing season.

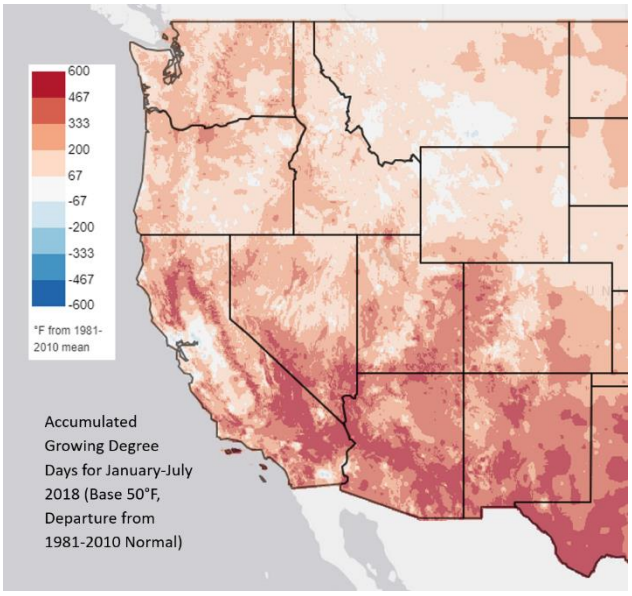


**Figure 3** – Western US January-July 2018 growing degree-days departure from the 1981-2010 normals (image from Climate Impacts Research Consortium, University of Idaho).

**Drought Watch** – The dry July added to the general trend toward short to long-term dry conditions in the west and have led to an active fire season across the region. While the general pattern of drought in the US over the last month has not changed much, some notable shifts are contributing to the longer term outlook. The US Drought Monitor continues to show that the 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). However, the US seasonal drought outlook though the end of October shows some changes, especially in the PNW where drought development and persistence is forecast into the start of fall. In addition, the Four Corners region is expected to see some improvement due to forecasted monsoon precipitation (see below), however, drought persistence or further development for eastern New Mexico, Texas, the southern Plains and along the western Mississippi River valley is likely (Figure 4, right panel).

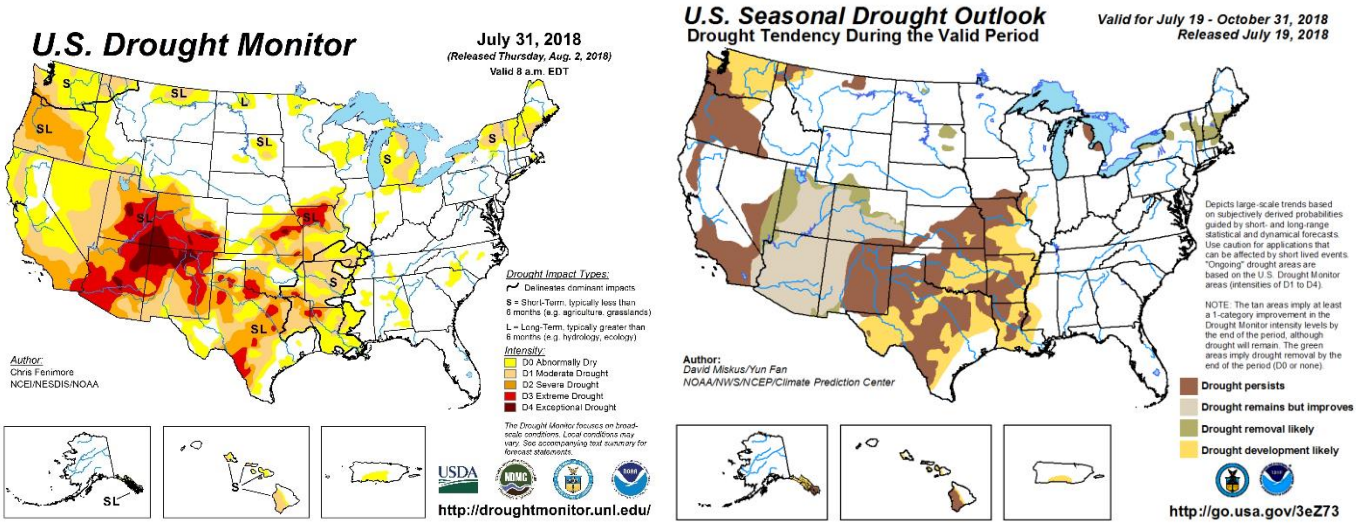


**Figure 4** – Current US Drought Monitor and seasonal drought outlook.

**ENSO Watch** – The long term discussion across numerous agencies continues to reflect the likelihood of an El Niño event developing in the tropical Pacific in the fall. In mid-July 2018, the status of El Niño, La Niña, and the Southern Oscillation, or ENSO, shows that the east-central tropical Pacific waters continue to reflect 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 a 65% chance of El Niño development during fall, rising to 70% for winter 2018-19, resulting in an El Niño watch being put into effect. The latest forecasts of

statistical and dynamical models collectively favor weak El Niño development by late summer or early fall, growing to weak or moderate strength during late fall and winter; forecasters are largely buying into this scenario now that the spring forecasting barrier is largely passed. If the conditions for neutral-ENSO continue to hold into the summer, the weather across the US will likely continue to follow the warmer than average conditions in the 90-day forecast and beyond (see forecast periods below and Appendix Figure 2).

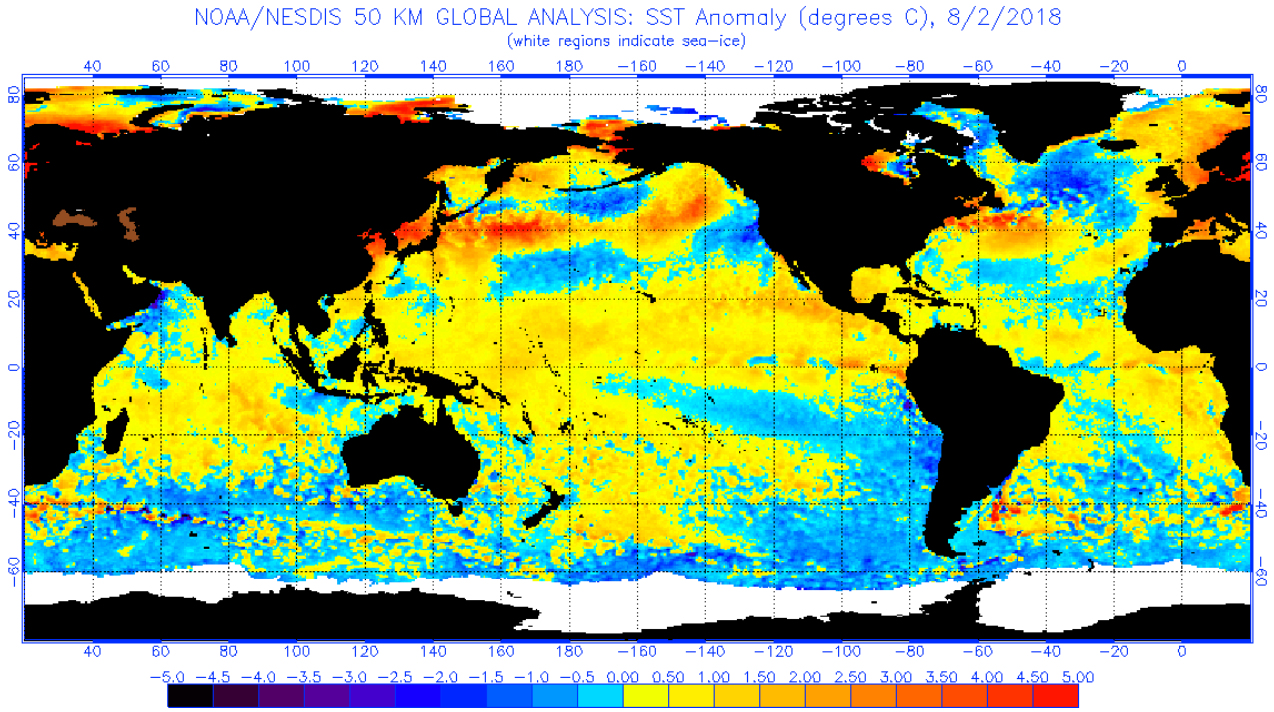


**Figure 5** – Global sea surface temperatures (°C) for the period ending August 2, 2018 (image from NOAA/NESDIS).

**North Pacific Watch** – The conditions that have contributed to the cooler than average Bay Area region are largely still in place. Cooler than average SSTs off the west coast with a bullseye on the Bay Area, driven by near-shore upwelling have contributed to a robust marine layer, coastal cloudiness, and near normal to slightly cooler than normal temperatures in the region (Figure 5). The warming of the North Pacific from roughly 40 to 50°N along the coast and out into the southern Gulf of Alaska has picked up and likely has contributed to the record warmth experienced in July over most of the western US (Figure 1). Currently 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 along the California coast 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 August 10-14):** After some relief from the heat early in August (due to a slight shift in the high pressure area over the western US), heat is likely to return over this forecast period. Temperatures are likely to be much above average during this forecast period with the bullseye of the event settling over Nevada and extending across the entire western US. Warmer than average temperatures across the northern tier of the US (the Great Lakes, Ohio River valley, and into New England) are forecasted through mid-month, while the southern states are forecast to be cooler than average due to Gulf of Mexico moisture and cloud cover. The majority of California and the PNW is forecast to be normal during this period (which is pretty much nothing!), 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 August 12-19):** Only a slight shift occurs in this forecast period with the likelihood of warmer than average conditions dropping slightly. If this does materialize it will be due to a shift in the high pressure ridge

allowing more onshore flow over the west coast, but I would not expect to cool down very much. The desert southwest and Texas is forecast to see below average temperatures due to monsoon cloud cover and rain, otherwise the rest of the country is forecast to see above normal temperatures, especially in the Great Lakes and New England. 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 California and into the Great Basin. For the rest of the country, the Great Plains and northern New England is forecast to be drier than average through mid-month, while the southeast into New England is forecast to see above average precipitation for this time of year.

**30 Day (valid August 1-31):** The continued warm conditions forecast through mid-month above will likely end up keeping August above average throughout the western US. However, there is some indication that the last ten days of the month might bring more moderate (average) temperatures to the west. A warm August is forecast across the south and in the northern Great Lakes and New England while the rest of the country is forecasted to have an equal change of slightly above to slight below average temperatures (see Appendix Figure 2). In terms of precipitation, the only consistent signals are for the likelihood of more monsoon rain in the southwest, a wetter than average southeast to the Great Lakes, and a drier that average Texas and inland PNW. Otherwise a large area of the country, including California and western Oregon and Washington is forecast to be near average for the month of August (see Appendix Figure 2).

**90 Day (valid August-September-October):** The forecast into the harvest period overall looks good for the western US. The August through October seasonal forecast for is tilting the odds to the majority of the US experiencing a warmer than average tail end of summer and start of fall, 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 in the Great Basin extending into the PNW. The precipitation forecast over the next 90 days nationwide does not shift much from the August forecast given above with monsoon precipitation expected in the desert southwest to Texas and the bulk of the country forecasted to be near average during this period (see Appendix Figure 2). The forecast for a drier than average end of summer and start of fall in the PNW couples with the US Drought Monitor's outlook for drought development and persistence in the region (Figure 4).

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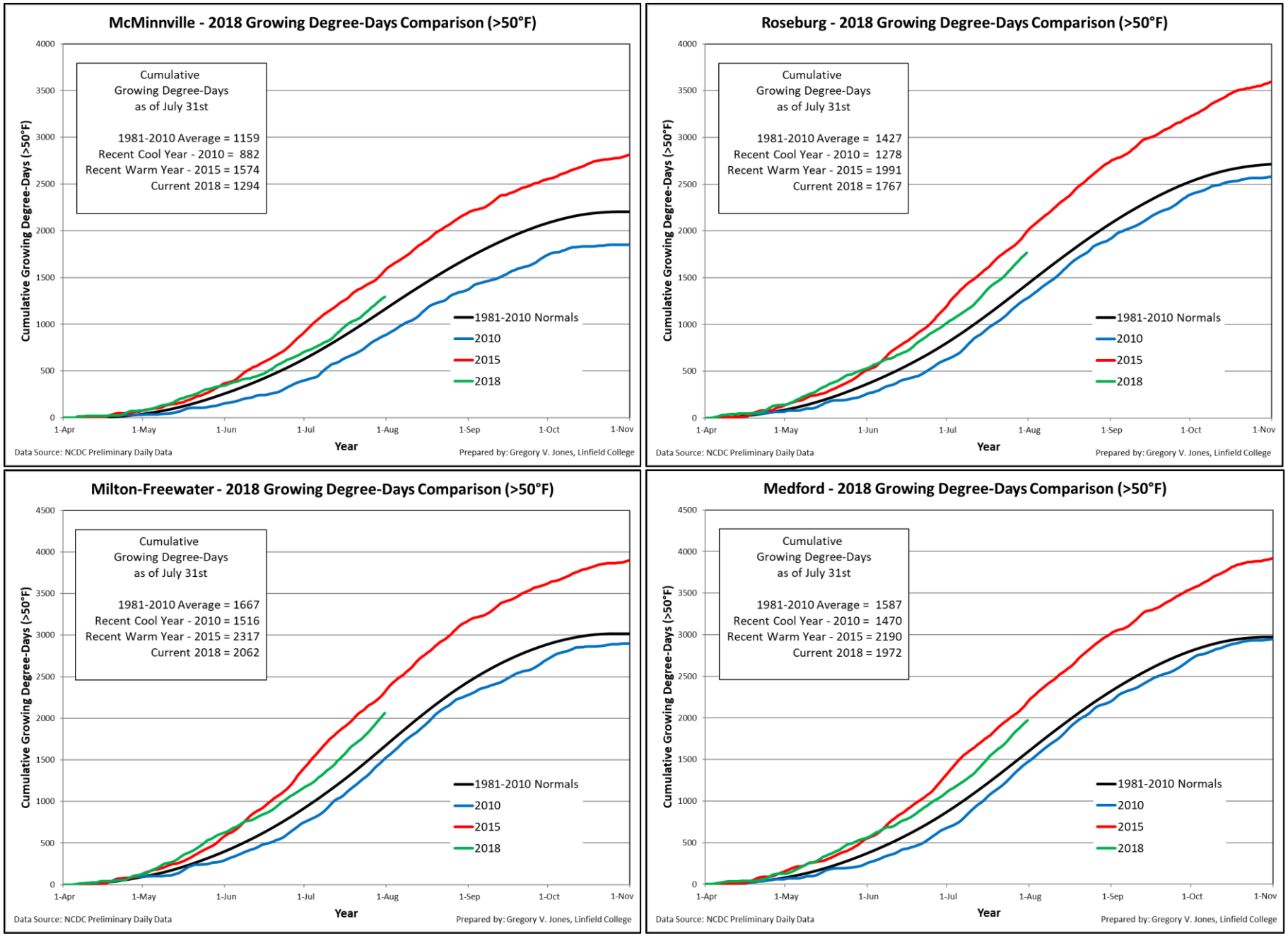
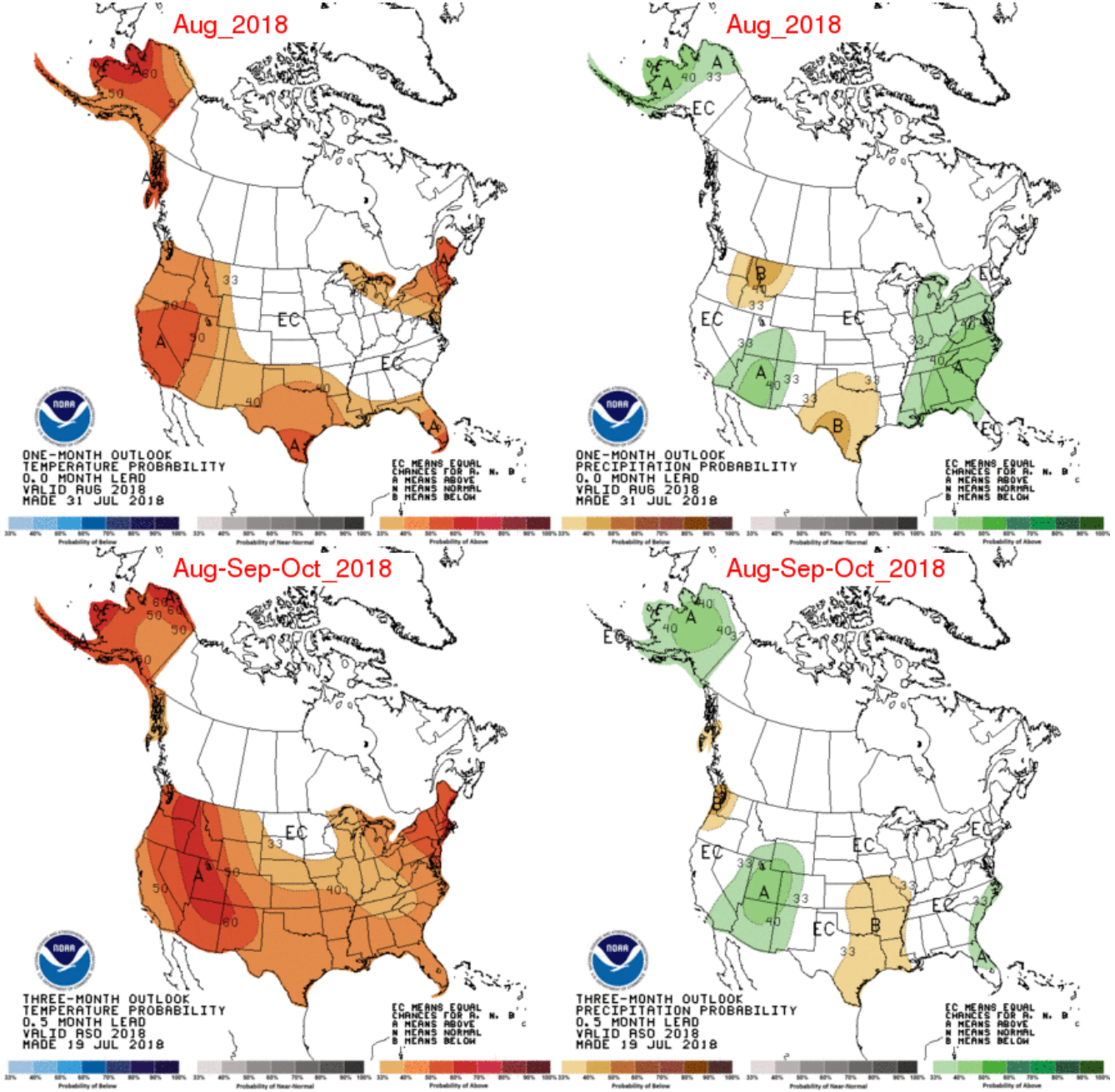



**Appendix Figure 1** – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2018) and a recent cool year (2010), a recent warm year (2015) and the 1981-2010 climate normals are shown (NCDC preliminary daily data).




**Appendix Figure 2** – Temperature (left panel) and precipitation (right panel) outlooks for the month of August (top panel) and August, September, and October (bottom panel) (Climate Prediction Center, climate.gov).