Weather and Climate Summary and Forecast
May 2019 Report

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May 3, 2019

Summary:

- April brought a warm up to the west, with largely above average to near average temperatures across the region. Most of the northern portions of the west experienced a wet month, but it was quite dry south.
- The western US snowpack ended the season with above average depths and water equivalents in California, the southern to northern Rockies, but below average in western Oregon and most of Washington.
- Short-term forecasts through mid-month are favoring a drier and warmer than average period for much of the western US. No cold air events with widespread frost are in the forecast through mid-month.
- The temperature forecast for May through July continues to indicate the likelihood of a warmer than average western US, while precipitation is forecast to be near average south and lower than average in the PNW.

After a relatively cold February and cool March, April brought mostly warmer than average temperatures over the western US (Figure 1). Temperatures were near average to 2-5°F above average with California seeing the warmest conditions while near-average temperatures were seen in western and eastern Washington, and portions of the northern Plains and Rockies. The rest of the country was mixed with mostly cooler than average temperatures in upper Midwest, Great Lakes, Texas and the western Gulf Coast region, to warmer than average temperatures over most of the eastern US (not shown). Precipitation amounts in April varied mostly north to south across the western US with most of central to southern California and the desert southwest seeing moderate to extremely dry conditions, while Oregon, portions of Washington, Idaho and the northern Great Basin seeing a wetter than average April (Figure 1). Precipitation amounts over the country in April were near normal to moderately above normal (Texas and Gulf Coast), with the Four Corners across into the central Plains experiencing a dry month (not shown).

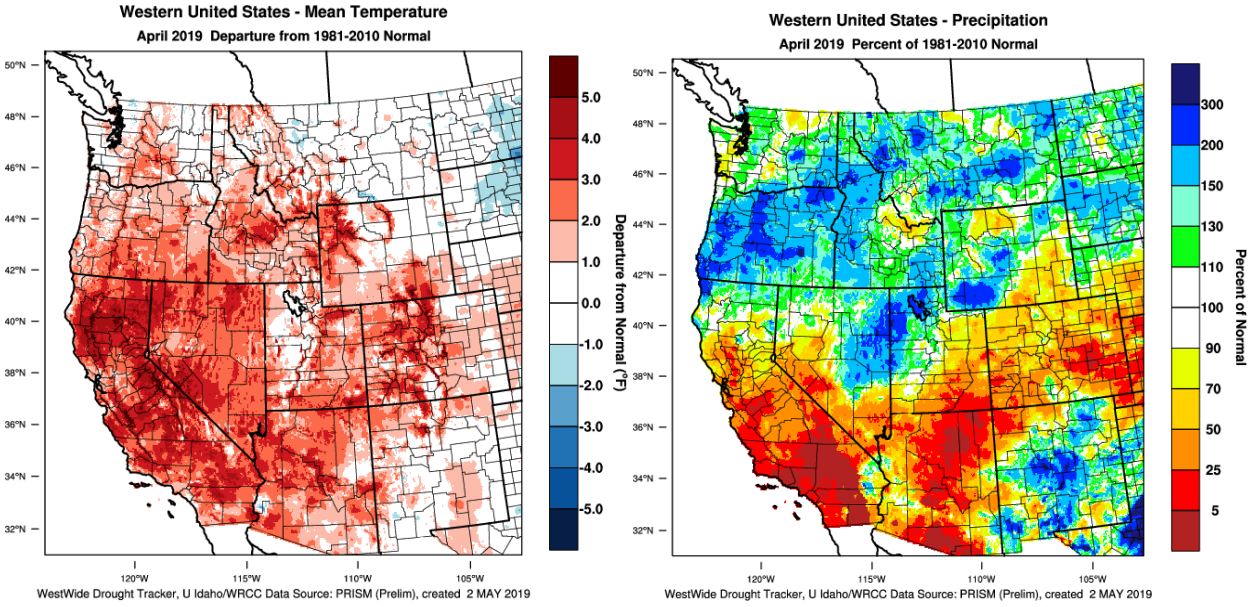

Figure 1 – Western US April 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Figure 2 shows temperature and precipitation during the water year for October 2018 through April 2019. During this seven-month period the majority of the western US was near average. Cooler than average temperatures have been seen in eastern Washington, Oregon, scattered areas throughout the Great Basin, Rockies and southwest and across the Plains (Figure 2). Eastern Oregon and Washington are running up to 2-3°F colder than average for the winter while areas in the northern Rockies and eastern Montana and Wyoming were 5 degrees or more below average. The

colder than average conditions in the northern Rockies and Plains extends into the entire central portion of the country, Great Lakes, and northern New England, while the southeast has been moderately warmer than average (not shown).

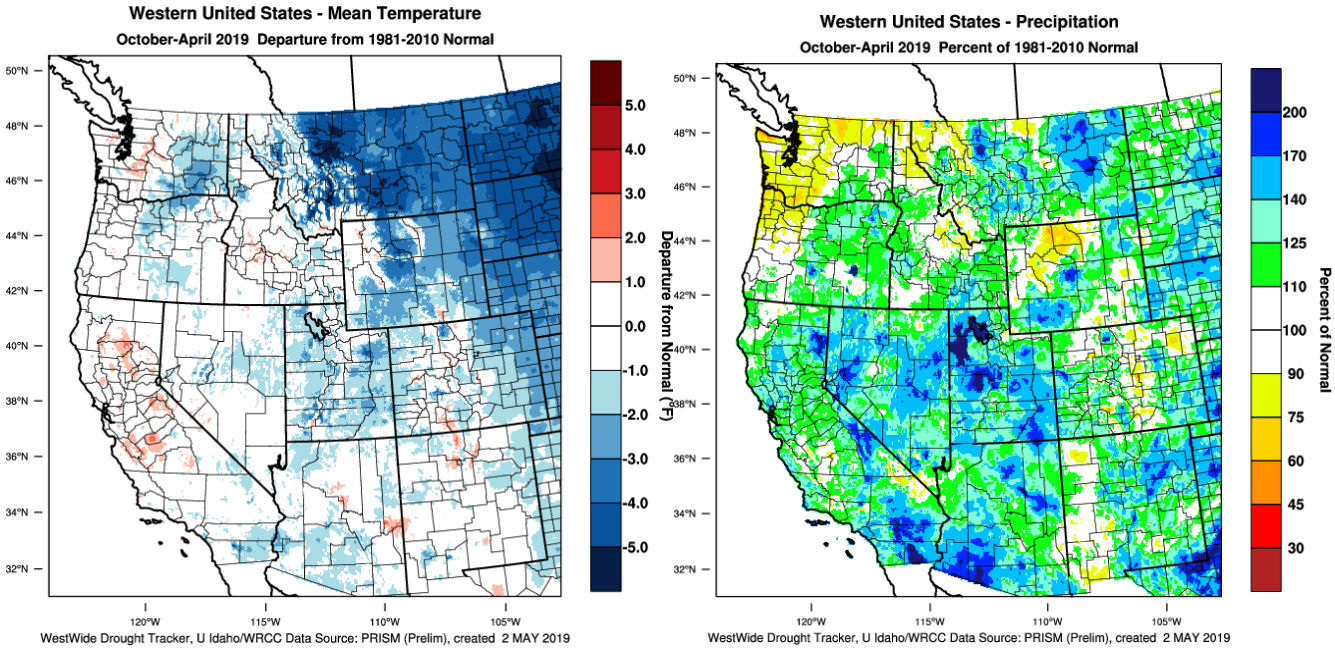

Figure 2 – Western US Water Year October 2018 - April 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The water year precipitation amounts in the western US range from moderately wetter than average in California, the southwest, Great Basin and Rockies (115-200% of average) to moderately drier than average in northwestern Oregon and Washington, and the northern portions of Washington, Idaho, and Montana (60-85% of average; Figure 2). The eastern US has largely seen precipitation amounts running 110-200% of normal so far this winter (not shown), with only the southernmost portion of Texas and south Florida experiencing a drier than average winter.

The first run at growing degree-days mapped over the western US shows an April that was above normal in California, slightly above normal in western Oregon, and near average in eastern Oregon and Washington (Figure 3). Higher heat accumulation is occurring from the south to the north in the central valley of California as expected,

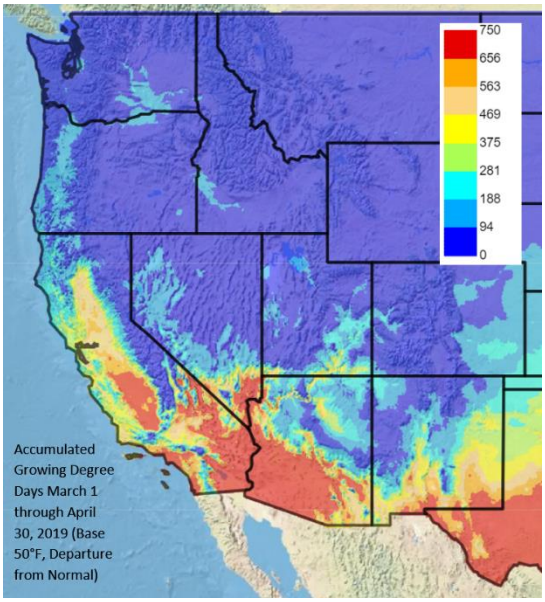

Figure 3 – Western US March through April 2019 growing degree-days (image from Climate Impacts Research Consortium, University of Idaho).

filling outward to the coastal wine regions throughout the state. Reports of bud break across the west point to a fairly normal timing in most of California to slightly behind normal in Oregon and Washington (5-10 days behind). Heat accumulation (GDD) amounts for four locations that I have tracked for many years in Oregon are all above the 1981-2010 normals for the month of April and are above the same time in 2018, is similar to what was seen in 2015 (see the Appendix Figure 1 for four locations in Oregon).

Drought Watch – a relatively wet March and April has lowered drought concerns over much of the US. This continues a trend of the declining drought footprint in the US with even the main areas of the most extreme drought in the Four Corners region and the PNW declining in extent and severity (Figure 4, left panel). The western US snowpack ended the season with above average depths and snow-water equivalent amounts in California, the southern to central to northern Rockies, but below average in western Oregon and most of Washington (not shown). Some concern for short to long-term drought still exists in the PNW as the May through July forecast shows (see the 90-day forecast below). The US seasonal drought outlook (Figure 4, right panel) also shows that drought persistence and development are likely in the PNW; however, the spatial extent has declined by removing much of Oregon and Idaho from drought categories. The Four Corners and all other current drought areas are forecast to see improvement or removal through mid-summer.

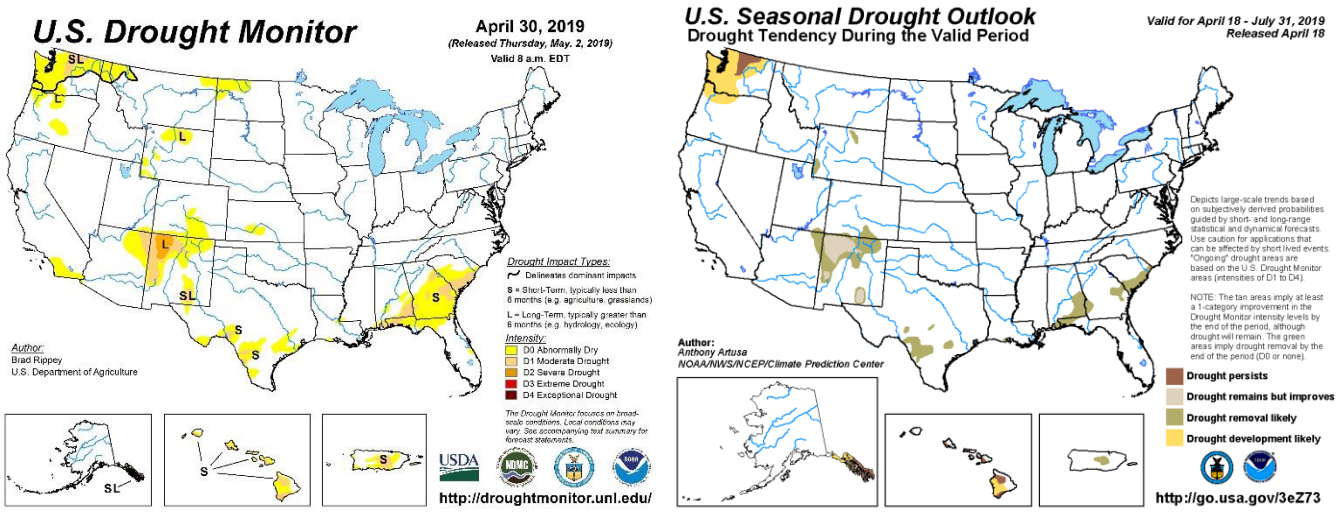

Figure 4 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – El Niño continues to be in play in the tropics. El Niño-level SSTs in the tropical Pacific maintained at a weak level during March and early April, while temperature anomalies of subsurface waters decreased somewhat but continued to be positive. Patterns in the atmosphere show moderately weak El Niño conditions. Collective model forecasts show a continuation of at least weak El Niño-level SSTs lasting through 2019. The somewhat more cautious official CPC/IRI outlook, with an El Niño advisory, call for an approximate 65% chance of El Niño prevailing during Jun-Aug, decreasing to 50-55% for September through November. If these conditions continue to hold the weather across the western US will still likely follow the slightly warmer and drier than average conditions in the 90-day forecast along the west coast and especially in the PNW (see forecast periods below and Appendix Figure 1). Areas across the central to eastern portions of the country will likely see a wetter than average late spring and early summer, which has already played out to some degree.

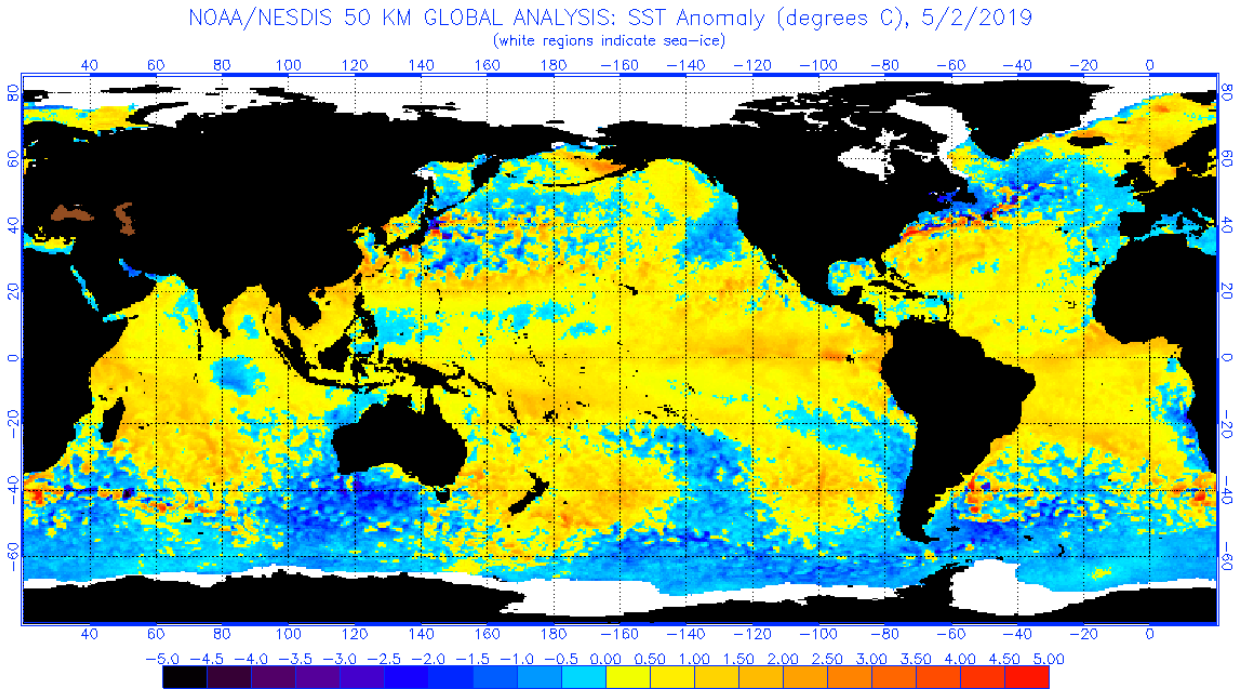

Figure 5 – Global sea surface temperatures (°C) for the period ending May 2, 2019 (image from NOAA/NESDIS).

North Pacific Watch – The Pacific continues to remain much warmer than average. However, a moderately sized area off the western US has been colder than average for the last 30 days or so (Figure 5). These colder surface waters have contributed to the troughing during March and most of April, which brought moderate rainfall amounts to portions of the western US, especially Oregon (Figure 1). The Pacific Decadal Oscillation continues holding to slightly negative values. There continues to be some indication that the colder conditions off the west coast are mostly near the surface and might rebound quickly with more seasonal air circulation over western North America. Regional forecasting agencies are continuing to say that the overall warmth of the Pacific (see Tropics above) will likely to enhance the normal weather/climate patterns in the west during weak to moderate El Niño years (see the MJJ forecast below). However, if coastal upwelling persists along the central California coast then there remains the potential for slightly cooler conditions into the summer.

Forecast Periods:

6-10 day (valid May 8-12): the short-term forecast calls for a building high-pressure ridge over the eastern North Pacific and western North America, which should bring delightful May conditions; dry and warm with less than average frost potential except on the coldest sites. The warm western US is in contrast to the forecast for a much cooler than normal central portion of the country, and book-ended by forecasted warmer than average conditions in the south and up the east coast. Northern California through the PNW and across Montana in the Plains are forecast to remain dry during this forecast period, while the southwest across through the Midwest and eastern US are forecast to see wetter than average conditions.

8-14 day (valid May 10-16): this forecast period does not deviate much from the 6-10 day period with a continued forecast for warmer than average conditions in the western US (especially in the PNW), cooler than average central portion of the US, and warmer than average period for the eastern US. The precipitation forecast is also similar with the PNW and northern Plains forecast to remain dry through mid-month while the rest of the country is largely forecast to see a wetter than average period.

30 day (valid May 1-31): the general pattern from the first two forecast periods in May (above) appears to be holding throughout the rest of the month (see Appendix Figure 2). The month's outlook is for a warmer than average west, cooler than average midsection of the country, and warmer than average east. Similarly, May's precipitation forecast

continues the first half of the month's drier than average conditions for the PNW, with the rest of the country forecast to be near average to above average.

90 day (valid May-June-July): the 90-day forecast through July exhibits a similar pattern to May (see Appendix Figure 2), with the expectation of a warmer than average western US, cool to average midsection of the country and a warmer than average eastern US. The MJJ outlook for precipitation shows near average conditions are expected along the west coast, except for northwest Oregon and western Washington, which is anticipated to remain dry. The rest of the county is expected to see average to above average precipitation during MJJ.

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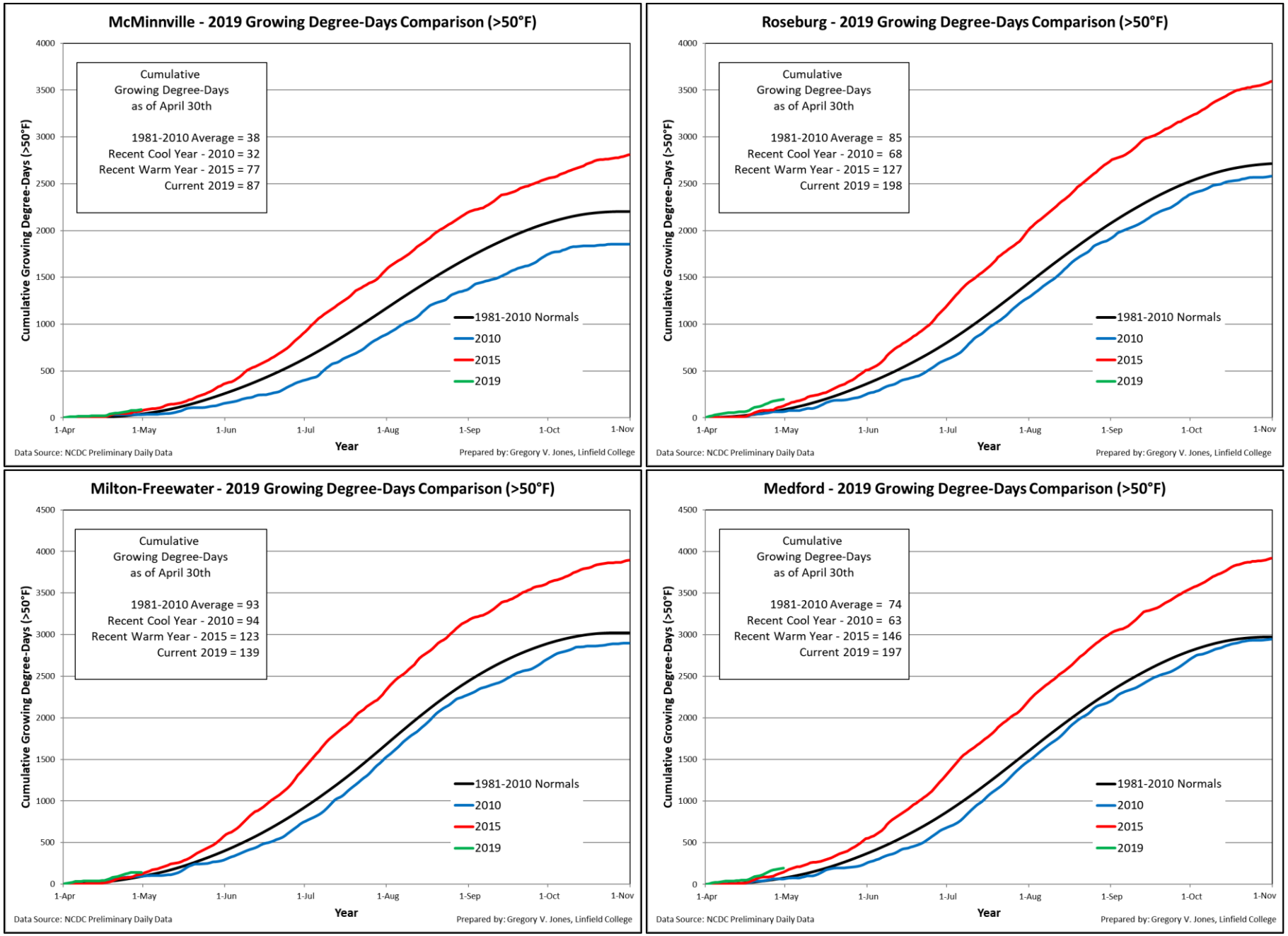
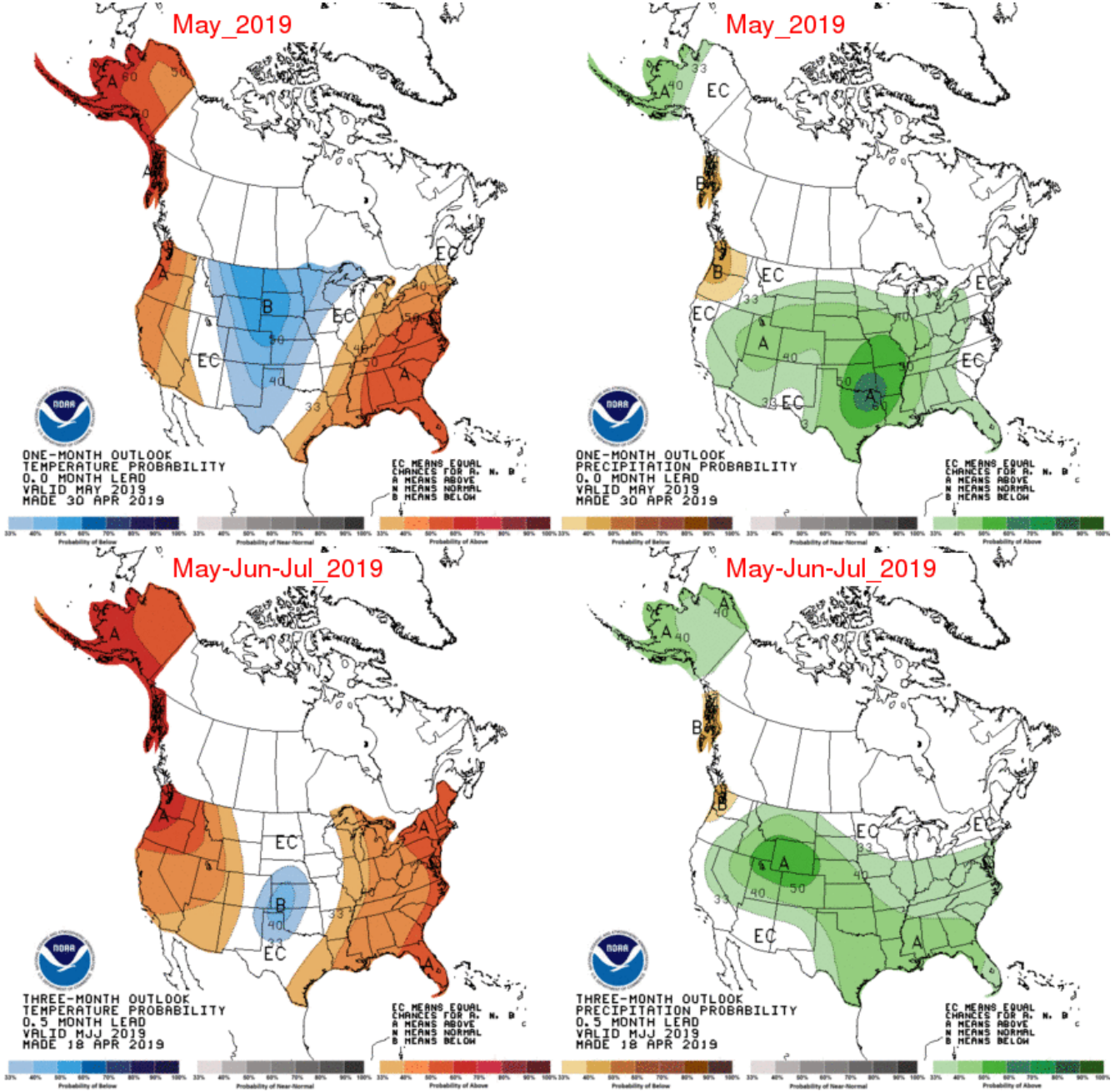


Appendix Figure 1 – Cumulative growing degree-days (base 50°F, no upper cut-off) for McMinnville, Roseburg, Milton-Freewater, and Medford, Oregon. Comparisons between the current year (2019) and a recent cool year (2010), a recent warm year (2015) and the 1981-2010 climate normals are shown (NCDC preliminary daily data).



Appendix Figure 2 – Temperature (left panel) and precipitation (right panel) outlooks for the month of May (top panel) and May, June, and July (bottom panel) (Climate Prediction Center, climate.gov).