

Weather and Climate Summary and Forecast Spring 2016

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May 9, 2016

With the early growth this spring a cautious watch for frost during April played out across the western US. While generally warm conditions prevailed, a cool blast of air out of the North Pacific during the last week of the month brought frost risk to some regions. While mild compared to the devastating frosts in Europe during April 24-27 (e.g., Burgundy, Loire Valley, Germany, etc.), areas in the western valleys of Northern California and Oregon have reported some frost damage.

Overall April ended up much warmer than average over most of the western US, especially Oregon, Washington and Idaho where temperatures 5-7°F above normal were experienced in wine regions (Figure 1). Growing degree-days are higher than normal over all of California, Oregon, and Washington with April accumulations running much higher than the last two warm years (2014 and 2015) (see the Appendix figure for four locations in Oregon). GDD accumulations are running roughly 15-25 days ahead of 2015. In terms of precipitation, it was a mixed month again across the west but flipped from the last few months with a dry Northern California throughout the PNW and relatively wet into the SW. While the central coast to southern coast of California was drier than normal, some areas of the Central Valley, the Sierra Nevada and much of the Great Basin received some much needed April rains (Figure 1). For the rest of the US the Rockies and Great Plains were much wetter than average in April, while much of the eastern third of the country was drier than normal (not shown). Temperatures across the rest of the US in April were largely warmer than normal with the exception of the Great Lakes and northern New England which was cooler than normal (not shown).

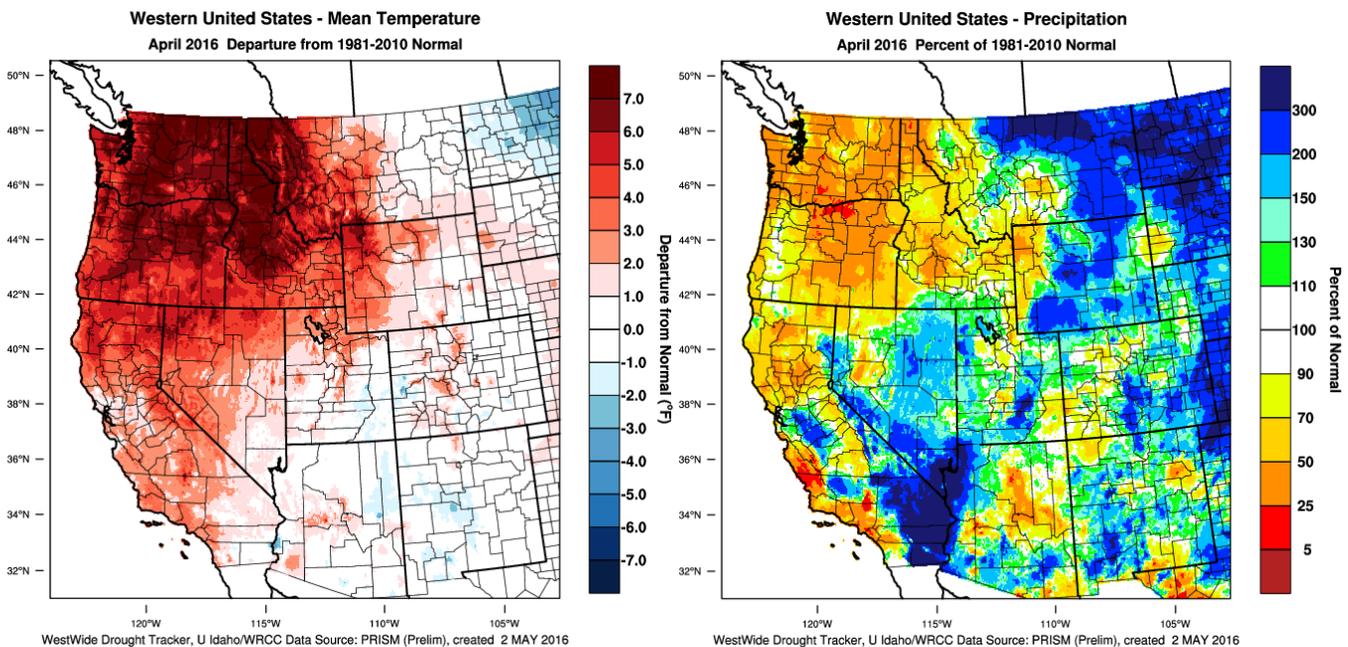


Figure 1 – Western US April 2016 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Cumulative conditions since the first of the year show a largely warmer than normal western US with precipitation amounts mixed (Figure 2). Average temperatures for the period have run 1-4°F or more above the 1981-2010 climate normals for much of California, Oregon, Idaho and Washington. While portions of Montana and the Dakotas have been up to 7°F above normal, areas in eastern Nevada and the Four Corners have been closer to normal for the year to date. This pattern continues across the entire US, with temperatures running 1-3°F above normal in most region

but 5°F or more above normal in the northern Rockies and Plains states (not shown). For 2016 precipitation amounts have been 90 to 150% of normal from Northern California across to Nevada and into much of the PNW (Figure 2). Dry conditions have been seen across eastern Oregon into Idaho and eastern Montana along with Southern California and across the southwest. The wetter than average conditions extends out of the northern Rockies and into the Great Plains then south into the Gulf Coast states, while portions of the eastern US have been drier than average so far this year (not shown). The western US drought conditions have not changed much since the first of the year with continued dry conditions in central and southern California into the southwest and Great Basin (Figure 3). However, drought conditions have improved in the PNW, across the Rockies and throughout much of the rest of the US.

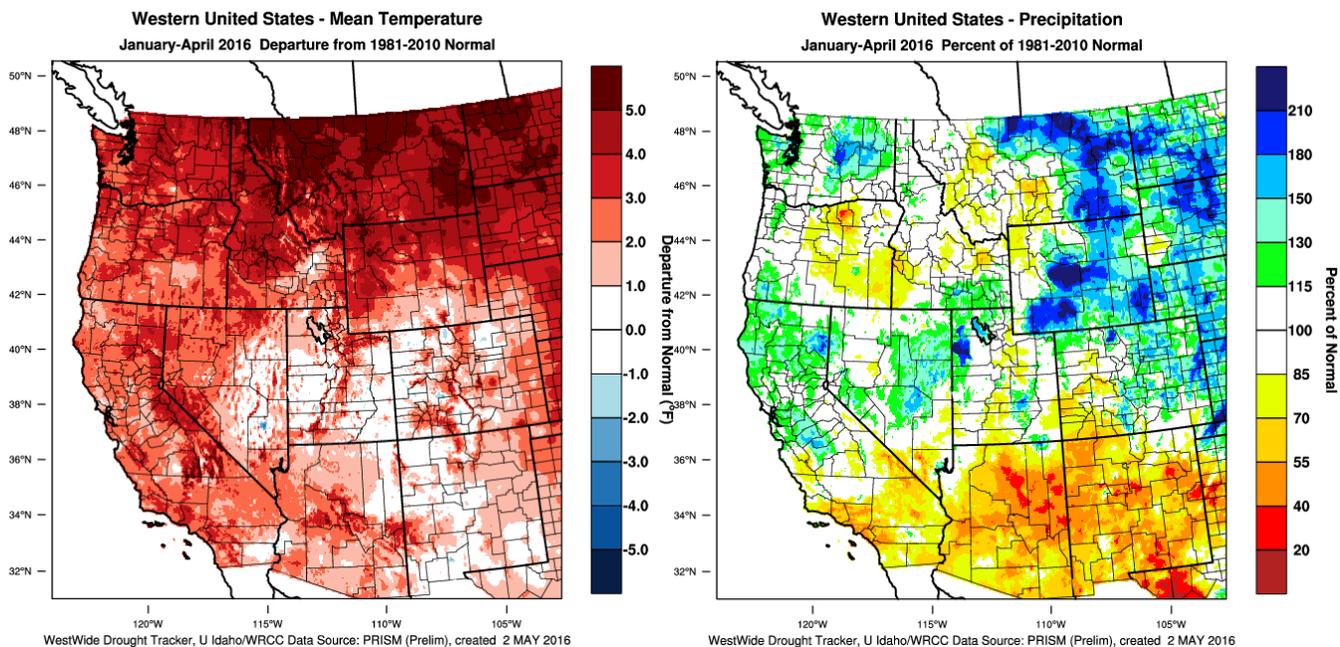


Figure 2 – Western US year to date (January through April 2016) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

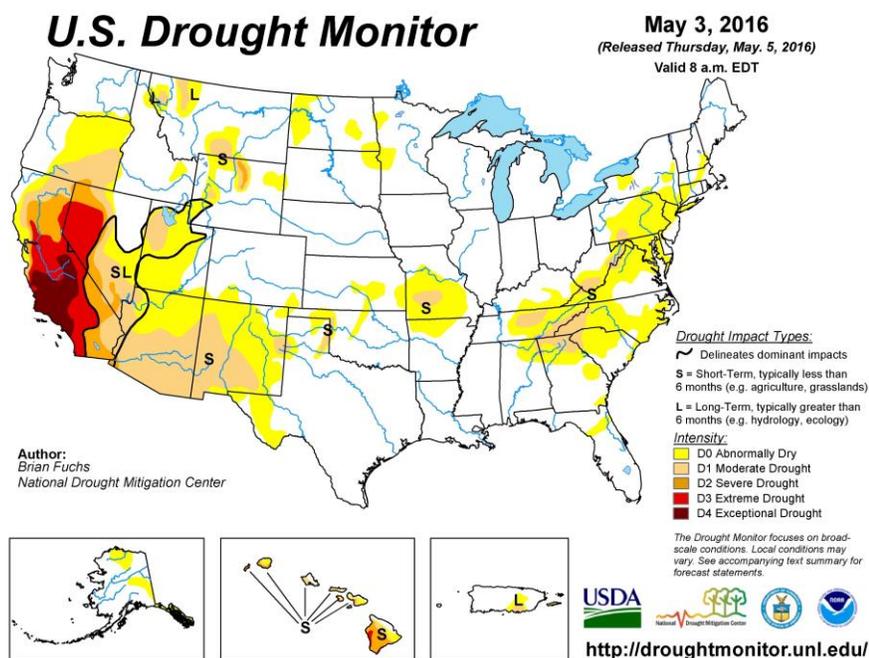


Figure 3 – Current US Drought Monitor.

El Niño Watch – Continued weakening of El Niño ... most prediction models indicate the continued weakening El Niño conditions during the rest of the northern spring season, returning to neutral by late spring or early summer 2016, with La Niña development likely by fall. Sea surface temperatures in the tropical Pacific have continued to weaken removing the fuel for what was once considered one of the strongest El Niños on record (Figure 4). Even with this weakening we could still see some El Niño effects in the western US with the longer term forecasts calling for some enhancement of SW monsoons and summer thunderstorm activity in the Great Basin. All observation agencies are now pointing to 50% or greater likelihood that we will transition into La Niña conditions next fall, which would likely spell a colder and snowier winter.

North Pacific Watch – Warmer than average sea surface temperatures (SST) along the west coast in the North Pacific continue (Figure 4). However, the magnitude and spatial extent of the warm waters have both declined from the conditions seen during 2012-2015. The cooler than average conditions out over the central North Pacific also extends further east and covers a greater area than the last few years. The warmer coastal waters along the west coast should help bolster a warmer than average growing season, especially higher minimum temperatures, but the cooler pool might be indicative of a slowing of this effect. Long range forecasts are typically driven by conditions in the North Pacific and the state of El Niño in the tropics. If we continue to see a shift to cooler waters in the North Pacific AND the tropics transition to La Niña, the western US will likely shift into a cooler regime, especially into the fall and winter. As such I will monitor how it evolves over the next few months.

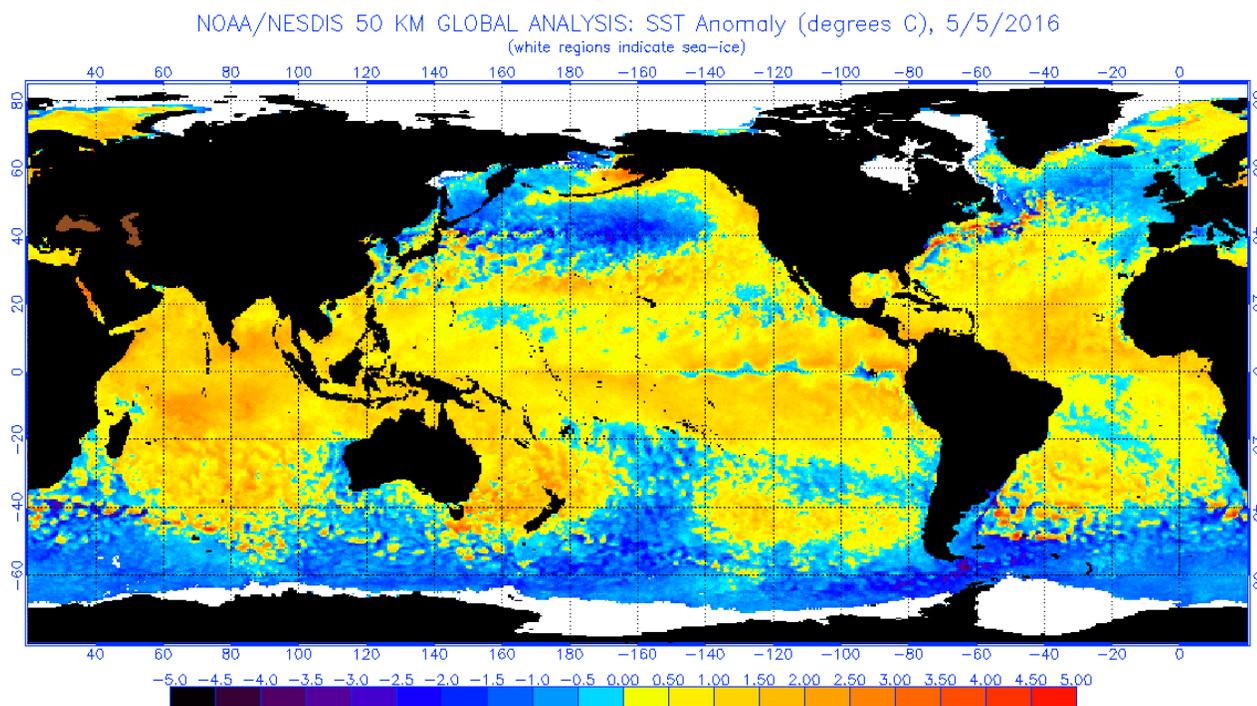


Figure 4 – Global sea surface temperatures (°C) for the period ending May 5, 2016 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day: Short term forecast points to continued warmth in the west, but cool in the east. Temperatures during this period are forecast to be near normal across the western US with the exception of the PNW where conditions are expected to be above normal. The precipitation forecast for this period shows an above normal likelihood across the PNW and into the Rockies. California and into the southwest is forecast to see normal precipitation during this period. There are no dominant cold air masses expected during this period, so it appears that frost pressure might be behind us in 2016.

8-14 Day: Similar to the 6-10 day forecast with the overall pattern dominated by a greater chance of warm conditions in the PNW, but cooler conditions expected in the Great Basin. Precipitation forecasts into the third week in May tilt

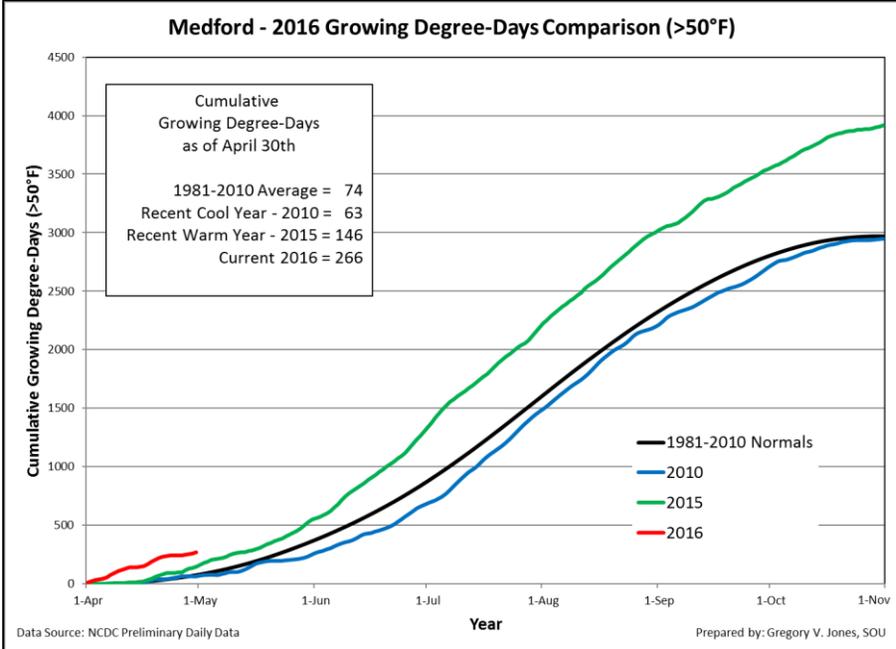
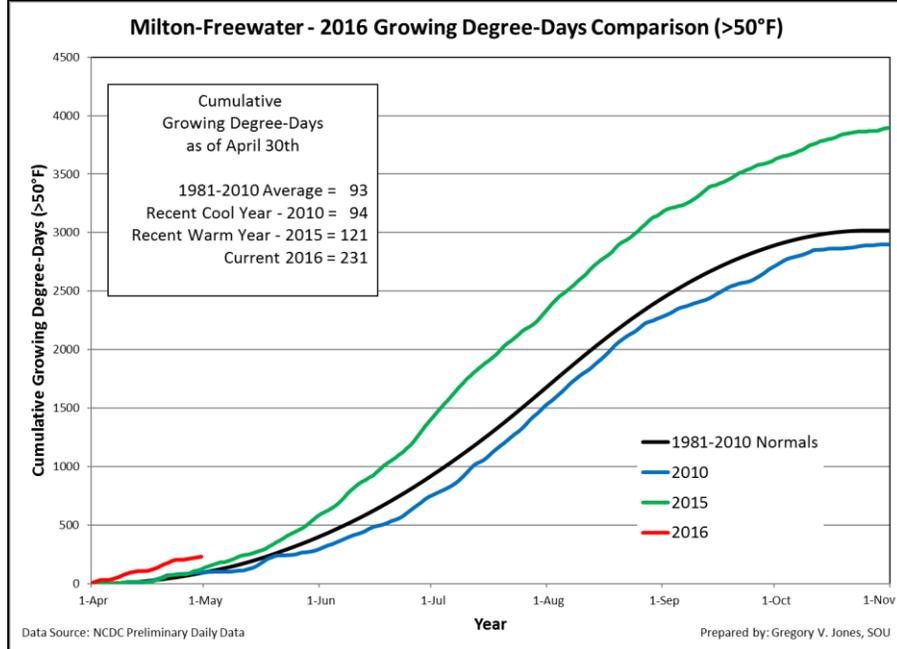
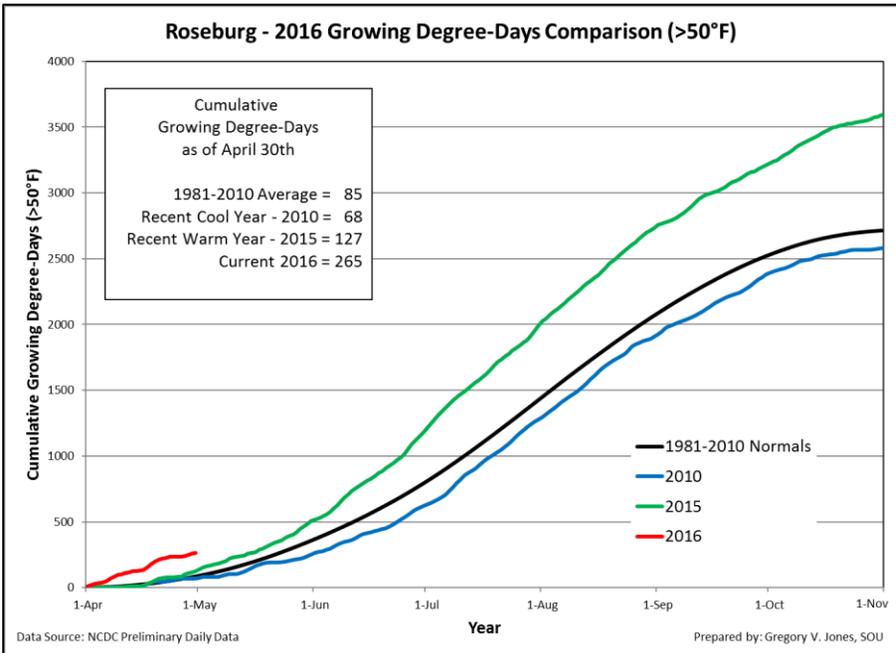
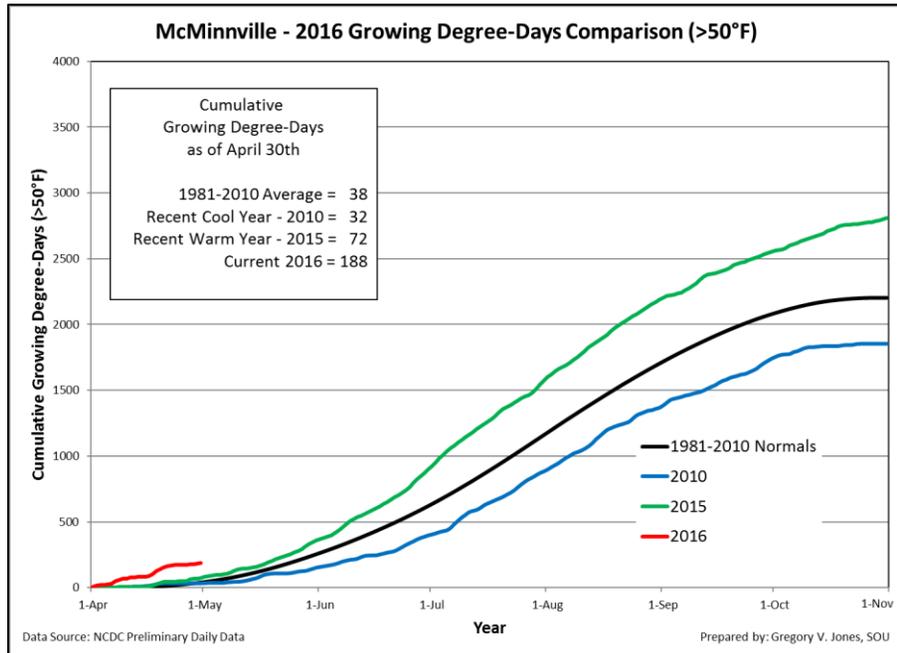
the odds to a wetter than normal PNW, northern California and Rockies, transitioning to average precipitation potential in southern California and the southwest. Again, no evidence for circulation that would bring increased frost risk.

30 Day: The forecast through the month of May calls for warmer than average conditions from northern California into the PNW and across the northern Rockies, while central to southern California is likely to be closer to normal temperatures during the month. Precipitation during May is forecasted to average to slightly above average across the southern tier of states from central California, throughout the Great Basin, and across to the Gulf Coast states. The PNW is forecasted to close to average rainfall potential during the month of May.

90 Day: The May-June-July (MJJ) forecast continues the 30 day May forecast as given above. No substantial change to the pattern in the western US with everywhere in California, Oregon, Washington and Idaho expected to see higher than normal temperatures. The precipitation forecast for the west does not change much, with normal to slightly above normal rainfall expected from southern Oregon south throughout California, while the rest of the PNW is forecast to have average rainfall conditions over the next 90 days. The precipitation forecast out over the next 90 days is driven by increasing chances of warm season thunderstorms which are typically quite spotty, so amounts received will vary tremendously.

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