

Weather and Climate Summary and Forecast

April 2019 Report

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Summary:

- The cold February extended into March for much of the country, resulting in an overall colder than average month in the US. Conditions in the western US were closer to normal, except in the inland PNW and northern Rockies where temperatures were up to 10 degrees below average for the month.
- April snow packs are running above average for California, portions of Oregon, the central Great Basin, and southern Rockies, while the northern Cascades across into Idaho and Montana are still below average.
- Short term forecasts through mid-month are calling for a general wetter than average, and average to slightly warmer period, for much of the western US. No cold air events that might bring widespread frost are in the forecast through mid-month.
- The temperature forecast for April through June continues to show the odds toward a warmer than average western US, while precipitation is forecast to be near average south and lower than average in the PNW.

The cold February continued into March making the second half winter overall cooler than average after a very mild first half of winter. While the Arctic and much of Siberia continued to see record-breaking warmth for this time of year, cold air continued to push south into the US during the month. For the western US temperatures in March were near average to 2-10°F below average with eastern Oregon, Washington, the northern Rockies, and the Plains experiencing the coldest conditions (Figure 1). The rest of the country was mostly cooler than average during March, especially the upper Midwest, Great Lakes, and Ohio River valley (not shown). Only the Four Corners region, the southeast and Florida saw warmer than average conditions during the month. Precipitation amounts in March varied tremendously across the west with the PNW, northern Rockies, and southwest seeing 50% or less than normal while central California east through the Great Basin and the central Rockies experienced 110-300% of normal (Figure 1). Conditions also varied across the rest of the country with substantially higher than average precipitation across the north-central Plains and portions of the Midwest where substantial flooding occurred and is still ongoing (not shown). The rest of the eastern US was largely drier than average in March, however, Texas and the Gulf Coast states experienced 50% or less than normal for the month.

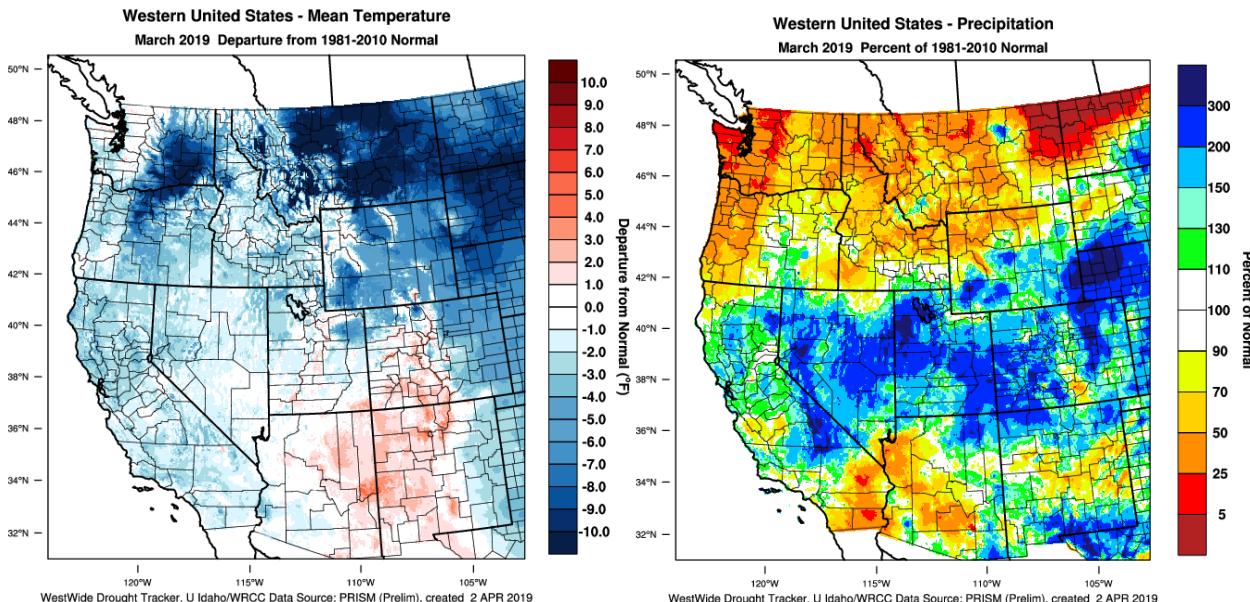


Figure 1 – Western US March 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Figure 2 shows temperature and precipitation over the entire winter of 2018-19. The winter ended near average to cooler than average over the western US. Western Washington, Oregon, central to northern California and scattered areas throughout the Great Basin, Rockies and southwest ended up close to average or slightly above average for the winter (Figure 2). Eastern Oregon and Washington ended up 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 Great Basin and the northern Rockies 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). The final winter 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 western 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 south Texas and south Florida experiencing a drier than average winter.

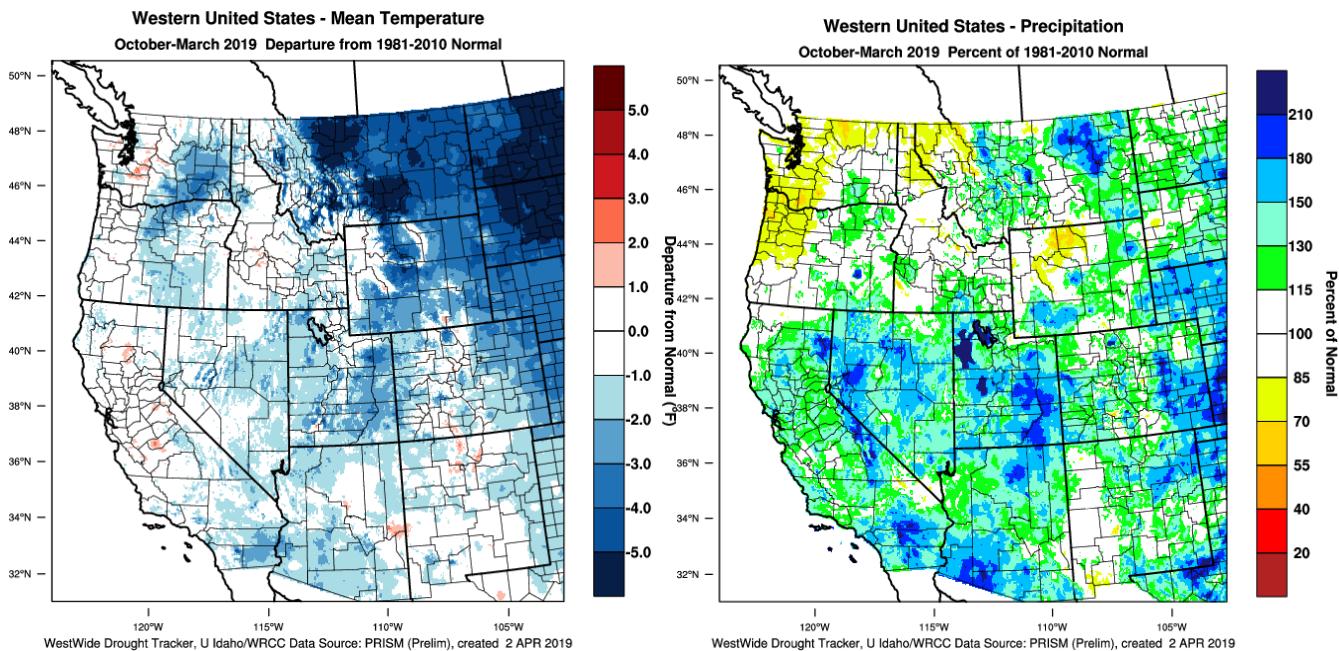


Figure 2 – Western US October 2018 - March 2019 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Drought Watch – The wetter than average winter across the US has lowered drought conditions over much of the country. Currently, 80% of the country has no drought designation, which is much lower than it has been in many years (Figure 3; left panel). This is especially dramatic in California, where only 7% of the state is in the lowest drought classification. As was forecasted before the winter started, the PNW has seen a drier than average winter (Figure 2) and remains in abnormally dry conditions to moderate drought. Other areas of the country experiencing some level of drought include the Four Corners, central Texas, and the Gulf Coast and the southeastern US. The longer-term outlook for the US through June continues to show these dramatic changes with little long term drought tendency across the country and especially in California (Figure 3; right panel). The dry areas in the PNW are forecast to see some persistence in drought conditions, while some regions will develop further, and others will likely see conditions improve. The rest of the country is forecast to see improvements in drought conditions with much of the areas currently in drought being removed during the spring and early summer. Snow packs in the western US are currently above average in California, Southern and Eastern Oregon, and the central to southern Rockies while the northern Cascades and the mountains across northern Idaho and Montana are running 50-80% of normal for this time of year (not shown).

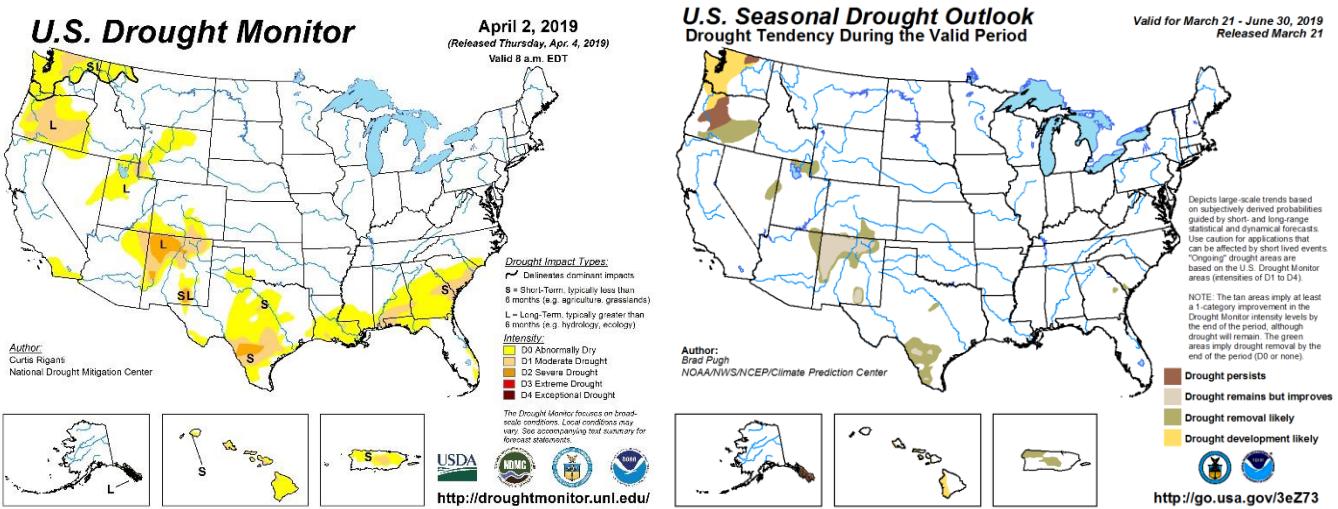


Figure 3 – Current US Drought Monitor and seasonal drought outlook.

ENSO Watch – El Niño continues to be in play in the tropics. El Niño-level SSTs in the tropical Pacific warmed into the weak El Niño level during mid-February through mid-March. While surface SSTs are moderately warm, subsurface waters became more strongly warmer than average during the last 30–45 days. Also, patterns in the atmosphere now clearly suggest El Niño conditions. Collective model forecasts show a continuation of at least weak El Niño-level SSTs through spring and summer, likely even lasting throughout the rest of 2019. The official CPC/IRI outlook, with an El Niño advisory, calls for an 80% chance of El Niño prevailing during Mar-May, decreasing to 60% for Jun-Aug. If the El Niño conditions continue to hold to weak, the weather across the western US will still likely continue to follow the slightly warmer and drier than average conditions in the 90-day forecast (especially in the PNW and the northern tier of states) and beyond (see forecast periods below and Appendix Figure 1). Areas across the southern portion of the country will likely see a wetter than average late winter and early spring, which has already played out to some degree.

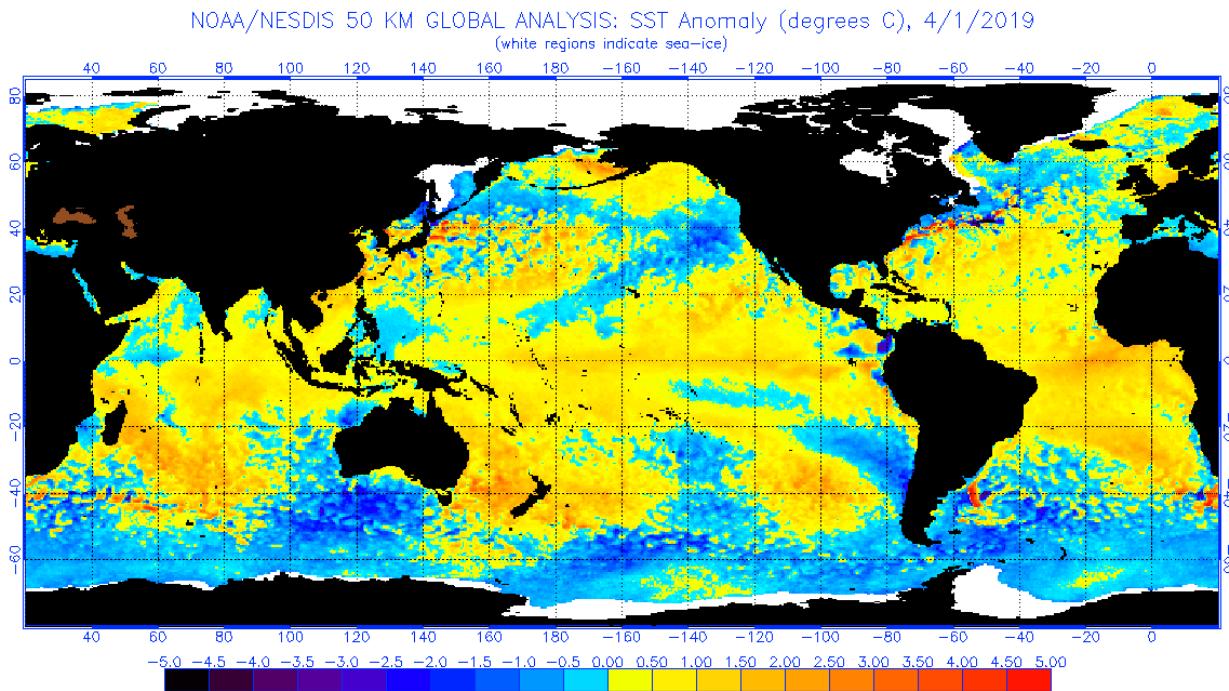


Figure 4 – Global sea surface temperatures (°C) for the period ending April 1, 2019 (image from NOAA/NESDIS).

North Pacific Watch – While the Pacific overall remains much warmer than average, a large area of cooler than average surface waters has developed stretching from the Marshall Islands near the equator to the west coast of

North America (Figure 4). The result is that the Pacific Decadal Oscillation is holding to slightly negative for the last few months. Surface SSTs in this area have been influenced by the larger area colder than average air filling out over the western US. The colder surface waters can then reinforce the current atmospheric conditions over the west. However, there continues to be some indication that the colder conditions 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 enhance the normal weather/climate patterns in the west during weak to moderate El Niño years (see the AMJ forecast below).

Forecast Periods:

6-10 Day (valid April 9-13): The current forecast is pointing to a moderately wet period through mid-month with a strong north-south gradient in temperatures. The southern states are forecast to see warmer than average conditions through this forecast period, while the central to northern tier of states across the country are forecast to remain cooler than average for this time of year. Coastal areas and western valleys in Washington, Oregon, and California are forecast to see average to slightly warmer than average temperatures during this period. No extreme cold (frost conditions) are currently in the forecast. Much of Northern California and western Oregon and Washington will likely see a wet period through mid-month, maybe approaching average precipitation for the period. The central portion of the country extending across through most of the eastern US is forecast to be wetter than average while the southern Plains and Texas is forecast to be drier than average.

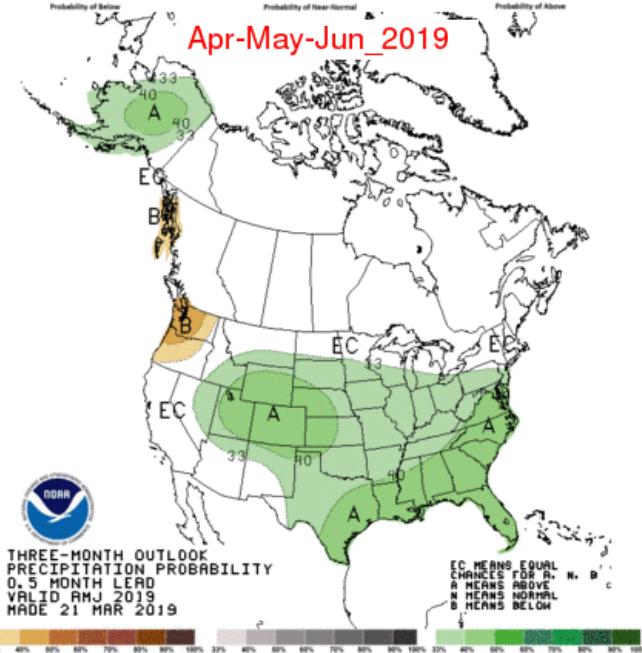
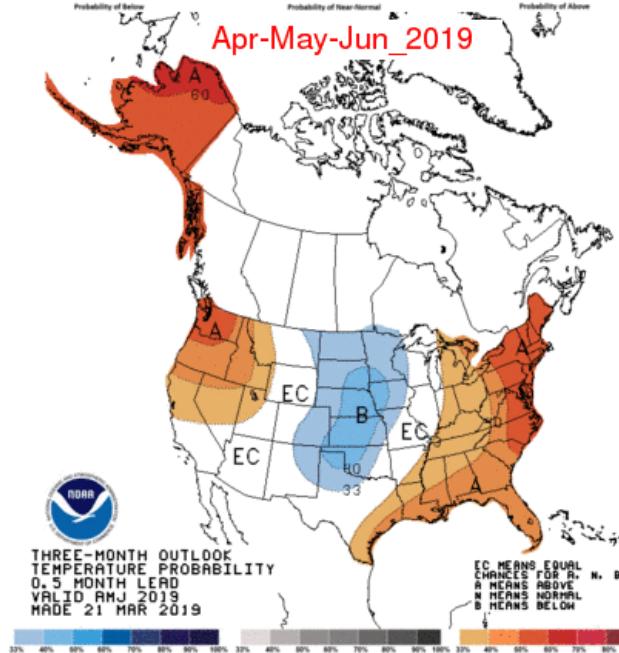
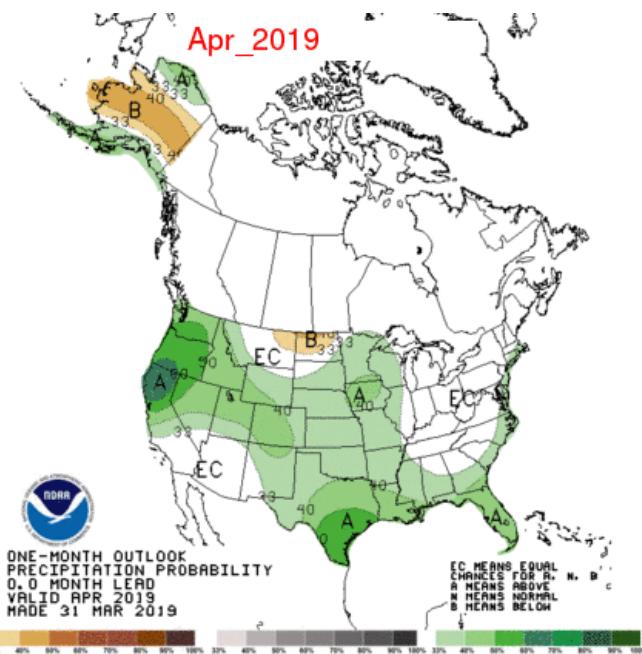
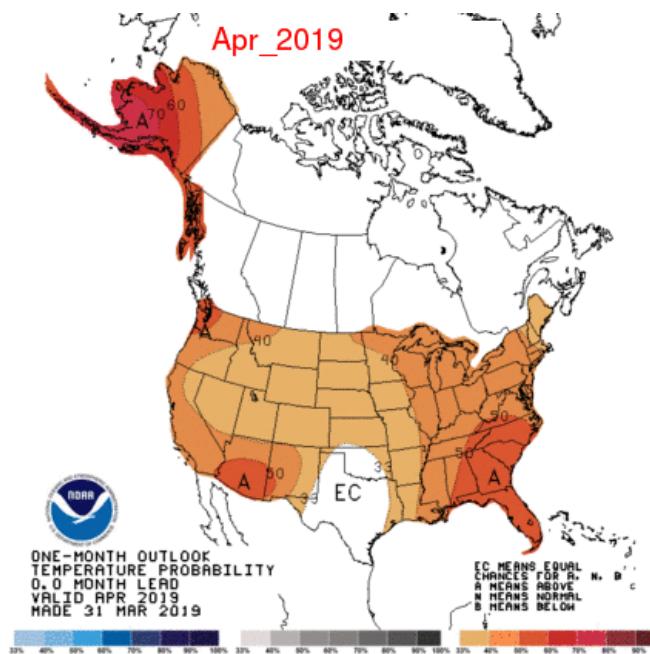
8-14 Day (valid April 11-17): This forecast period remains pretty consistent from the previous period above. The exception is that the west coast will likely tend toward being slightly cooler than average. Otherwise, the northern portion of the country is forecast to be cooler than normal, while the southern portion of the country is forecast to be warmer than normal. The broad precipitation forecast also stays in place with much of the west coast forecast to see near average to slightly wetter than average conditions through mid-month, which extends over most of the rest of the country. The PNW is forecast to see normal to slightly drier than normal mid-month conditions.

30 Day (valid April 1-30): Even after a coolish first half of the month, the complete April forecast tilts the odds to the bulk of the country seeing above average temperatures (see Appendix Figure 1). For precipitation, the 30-day forecast for April across the western US shows the likelihood of a wetter than average Northern California into the PNW. The wetter than average forecast also holds through many other regions of the US with only the southwest and portions of the Great Lakes, Ohio River valley, and northeast likely being closer to average for the month.

90 Day (valid April-May-June): The current 90-day forecast shows that the western US, especially in the PNW, and from the Gulf Coast up along the east coast will likely see above-average temperatures (see Appendix Figure 1). The middle of the country has equal chances of being slightly warmer to slightly cooler than average, while portions of the central to northern Plains states are forecast to see a cooler than average April through June. The three-month forecast window for precipitation indicates an equal chance of being slightly above or below normal for the west coast, with the exception of the PNW which continues to see a forecast for drier conditions (see Drought discussion above). Above average precipitation during the AMJ three-month period is forecast for areas from the central Rockies, across to the east coast and throughout the southeastern US (see Appendix Figure 1).

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Appendix Figure 1 – Temperature (left panel) and precipitation (right panel) outlooks for the month of April (top panel) and April, May, June (bottom panel) (Climate Prediction Center, climate.gov).