Weather and Climate Summary and Forecast
December 2017 Report

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Summary:

- November was relatively cool and wet from central California throughout most of the PNW, while warm and very dry from southern California across into the Great Basin and Rockies.
- A persistent ridge over the eastern Pacific and western US will keep things clear, dry and seasonal to warmer than average in the west for at least the next 2 weeks. Early winter snowpacks will melt away while fog and frost will be prevalent in the valleys. While the west is dry, the east is likely to be cold and wet.
- The seasonal forecast from December through February continues to tilt the odds to winter being cool/wet in the PNW and cool to average and dry in California. If the ridging pattern continues in the eastern Pacific, then the likelihood of an even drier southern half of California and desert SW will increase.

Temperatures during the month of November were mixed across the west (Figure 1). Central California north through western Oregon and much of Washington were near average to slightly cooler than average. Conversely, Southern California across the southwest, Four Corners, Rockies and inland PNW were much warmer than normal (up to 8°F above normal), while in eastern Montana and the northern Plains temperatures were much colder than average (Figure 1). Precipitation in November partially followed the temperature pattern with much of Northern California, Oregon (except central), and Washington wetter than average. Many areas in Oregon and Washington had over 25 days in the month with measurable rainfall, with locations being near average up to 130% of normal for the month. Southern California and the desert southwest remained dry, continuing the ongoing drought conditions (see the drought section below), while the northern Rockies were wetter than normal. The western warmth continued into the plains and across Texas, transitioning to near normal temperatures in portions of the Gulf Coast and Mississippi River valley while the Great Lakes to the middle Atlantic and into New England were cooler than average (not shown). Precipitation amounts nationwide were mostly lower than normal, especially in the Plains, the southeast, mid-Atlantic states, and New England. Wetter than average conditions during the month were confined to portions of the PNW, northern Rockies and Great Lakes (up to 200% of normal) (not shown).

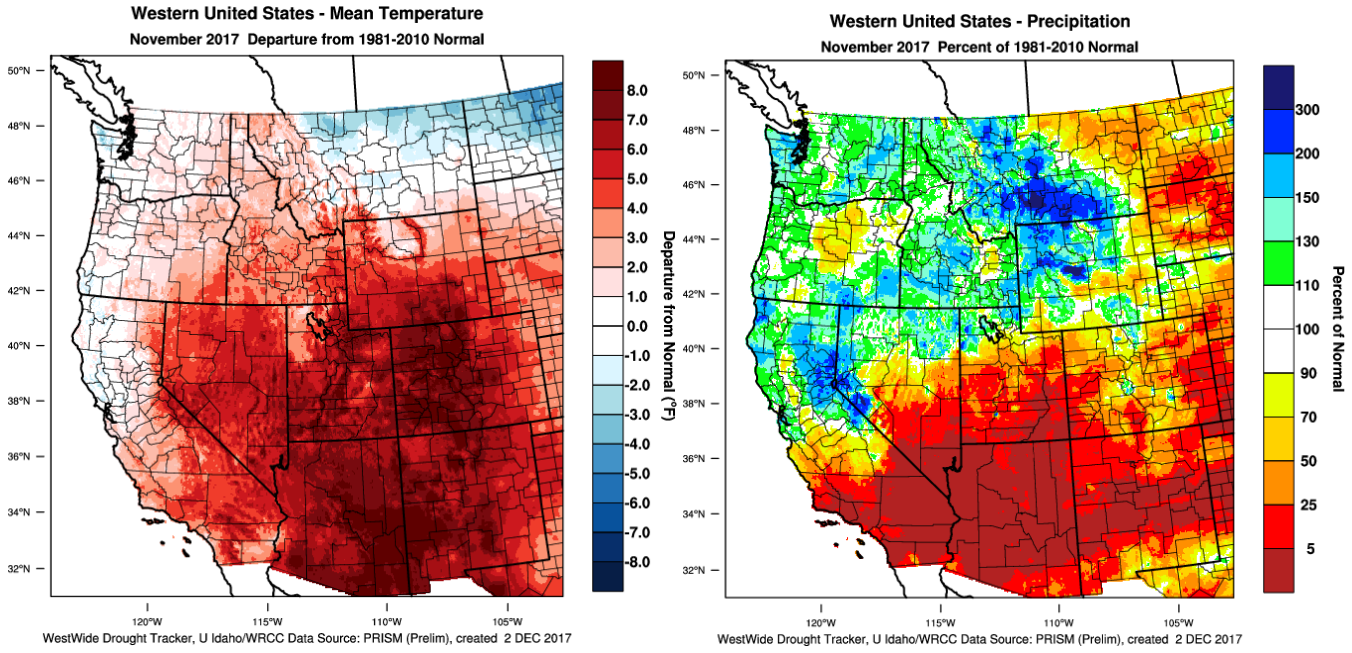

Figure 1 – Western US November 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

The year to date temperature pattern for the western US continues to show mostly warmer than average conditions (Figure 2). However, the cool early portion of the year and a moderately cool October and November are now showing scattered areas throughout the west that are near normal to slightly below normal for the year. Eastern Washington and Oregon remain the coolest year to date area in the entire country. The warmest areas of the west continue to be in California across the Great Basin and into the Rockies where temperatures have been 2-3°F above normal for the year to date. The general nationwide pattern continues from last month with the vast majority of the US running 2-3°F above normal, with the exception being the PNW and across the northern Plains (not shown). Adding a relatively wet November northward continued the pattern of a wetter than average central California north throughout most of Oregon, Washington, and Idaho (Figure 2). Dry conditions (50-80% of normal) continue to hold across eastern Montana along with Southern California and across the southwest. Nationwide the wetter than average conditions for the year extend across much of the eastern half of the US (not shown). Drier than average areas continue in the northern Plains and in the desert southwest, continuing the moderate to extreme drought conditions in these regions (see drought discussion below).

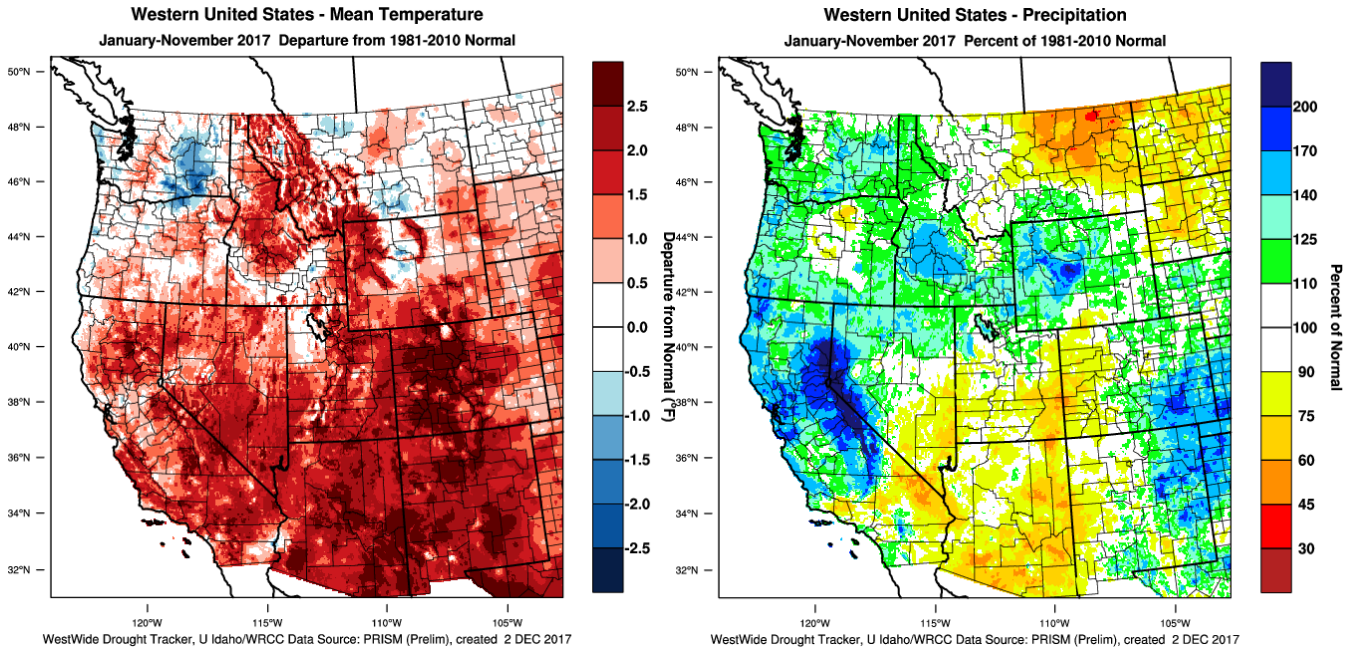

Figure 2 – Western US January-November 2017 temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

Drought Watch – The Drought Monitor is currently indicating the broad observed and forecasted patterns across the US. Significant areas of Southern California, Arizona and the Four Corners region, and across Texas and the southeast continue to show moderate to severe drought (Figure 3; left panel). The northern Plains also continue to show moderate to extreme drought. The US seasonal drought outlook (Figure 3, right panel) forecasts that the driest regions that remain in California and Arizona will likely persist through the end of February with additional area forecast to show drought development. The Gulf Coast is also forecast to have drought development that is largely due to the current La Niña (see below). The drought conditions are likely to get better in some areas of the northern Plains, but continue in the driest areas of eastern Montana and the western Dakotas.

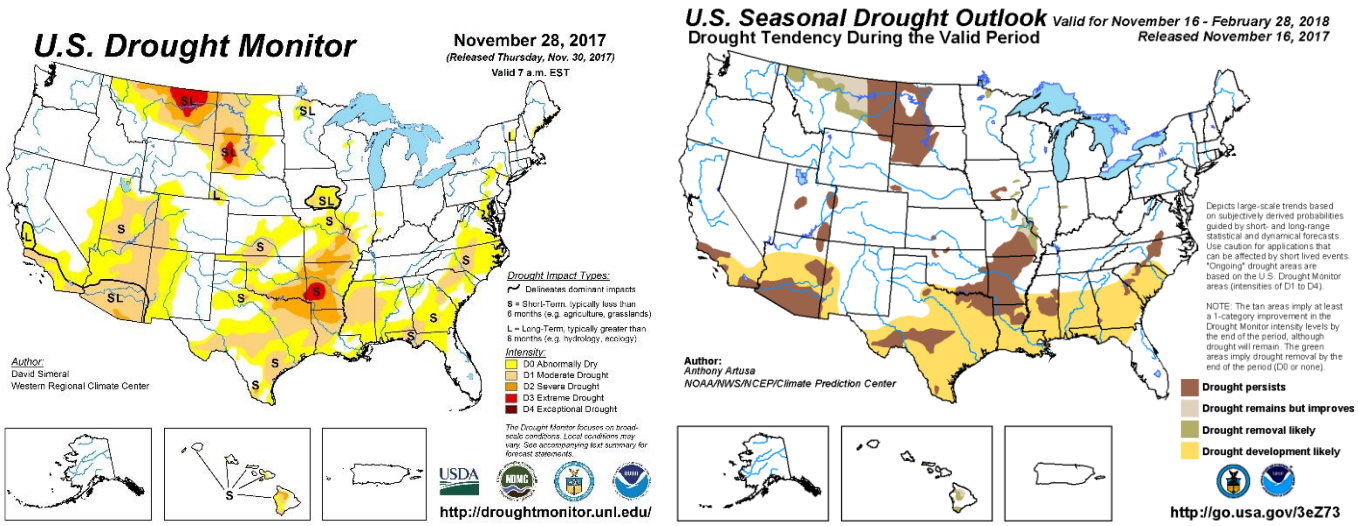

Figure 3 – Current US Drought Monitor and seasonal drought outlook.

La Niña Watch – The tropical Pacific currently is showing weak La Niña conditions, with SSTs in the east-central tropical Pacific past the threshold of La Niña and most atmosphere variables showing patterns suggestive of weak La Niña conditions. The collection of latest ENSO prediction models indicates weak La Niña as the most likely scenario for the remainder of Northern Hemisphere fall and for the winter. Given the current atmospheric and oceanic conditions (Figure 4), along with model forecasts, the forecaster consensus favors the continuation of weak La Niña conditions through December-January-February. As mentioned previously here, I believe if the forecasted conditions hold true, the next few months will be warm and dry in the southern half of the US; wet and 'coolish' in the north (see forecast periods below and Appendix Figure 1). One caveat to this is the development and longevity of the 'ridiculously resilient ridge' of high pressure, where depending on its position could transition the PNW to a colder and drier dormant season.

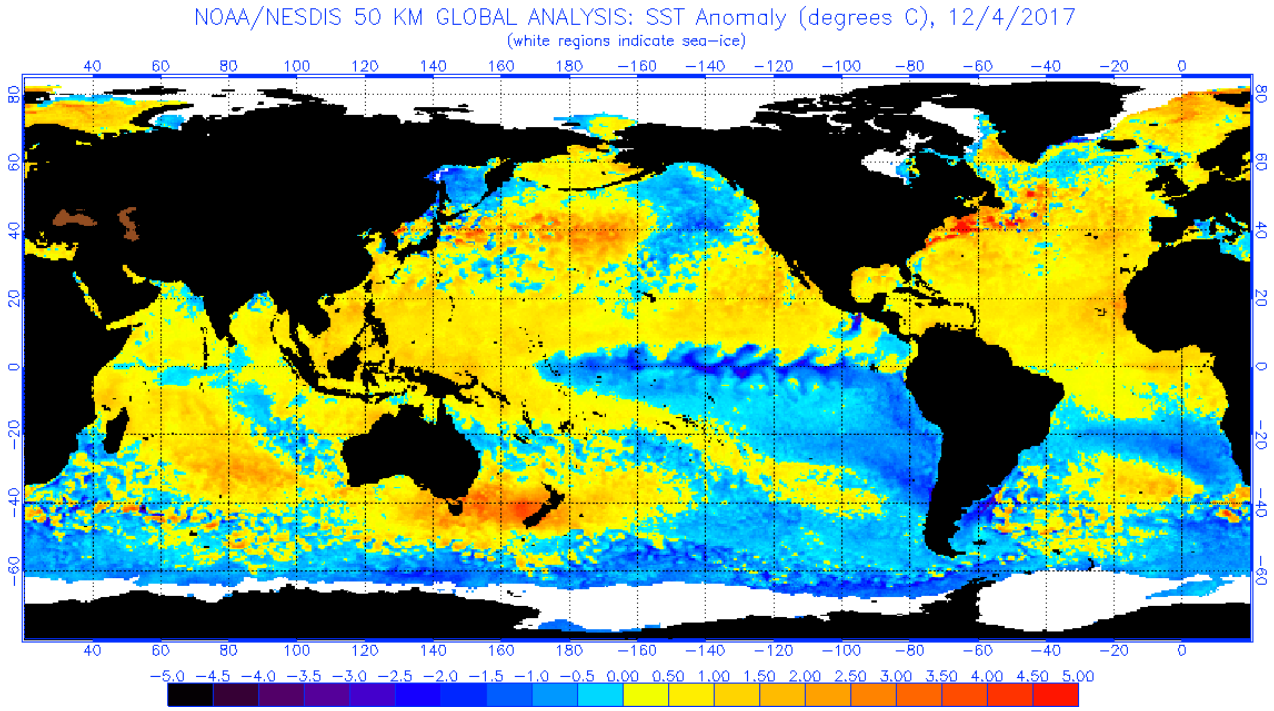

Figure 4 – Global sea surface temperatures (°C) for the period ending December 4, 2017 (image from NOAA/NESDIS).

North Pacific Watch – Moderate cooling in North Pacific SST has remained in place now for a couple of months (Figure 4). The warmer waters out in the central North Pacific and cooler waters in the Gulf of Alaska and along the

western coast are currently looking like the negative of 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 current conditions show a North Pacific that more in phase with the Tropical Pacific. During conditions like this the expected role that each mechanism plays is typically more enhanced. In other words, cold PDO and La Niña more strongly trend to being fairly cold and moderately wet for the PNW and cool, dry for California and the southwest.

Forecast Periods:

6-10 Day (valid December 10-14): A persistent west coast ridge and east coast trough will bring cool, dry conditions to the west and bitter cold to the east. Temperatures should remain above normal across the majority of the western US during this forecast period, with the PNW being closer to normal. After weeks of moderate rainfall, things will dry out considerable over the west with nearly everywhere being much drier than average. The combination of clear skies from the ridge, coolish temperatures, and plenty of moisture in the ground will produce valley fog and frost conditions through mid-month. The eastern side of the US is forecast to be substantially below normal in terms of temperatures with dry conditions in the southern tier of states and normal to wetter than average conditions in the northern states and into New England.

8-14 Day (valid December 12-19): The ridge over the eastern Pacific and the western US will likely persist through Dec 17-19. This will continue a relatively rare two week stretch of dry conditions for December in the western US. Clear skies and temperatures near normal to above normal will dry things out and remove the majority of the snowpack that had collected in weeks past. As we stay clear and dry, temperatures in the eastern half of the US are forecast to remain below normal while the precipitation forecast calls for significant snows across the Great Lakes and into New England with the south likely to remain dry.

30 Day (valid December 1-30): Overall pattern for December will likely be dominated by the ridge in the west and the trough in the east. As a result, the western US is forecast to be warmer than average south and near normal in the PNW, while precipitation for the month is forecast to end up dry across the west (NOAA's Climate Prediction Center, see Appendix Figure 1). On the other hand, the eastern US is forecast to have a colder than average month of December and near normal precipitation. And the middle of the country, Texas north to the Canadian border, is forecast to be near normal temperatures.

90 Day (valid December-January-February): The seasonal forecast for DJF (NOAA's Climate Prediction Center, see Appendix Figure 2) appears to still be dominated by the La Niña (see section above) with the PNW across to the Great Lakes likely seeing colder and wetter than normal conditions. Further south across the country conditions are forecast to stay warmer than normal and drier than normal. Even though this forecast is partially tied to continued La Niña development, conditions could still change the dynamics at play over the western US. The precipitation forecast over the DJF period is less clear nationwide with much of the middle latitudes from east to west having an equal chance of being wetter than average, near normal, to drier than average (see Appendix Figure 2). For the western US, I am still leaning to a transition to a cooler DJF than this forecast shows, especially if the La Niña continues to develop. This would also point to a wetter (snowier) winter in the western US, especially in the PNW, but a drier than average central to southern California. Again, the pattern of this could change if the ridging builds in and becomes stuck in place for longer than currently forecast.

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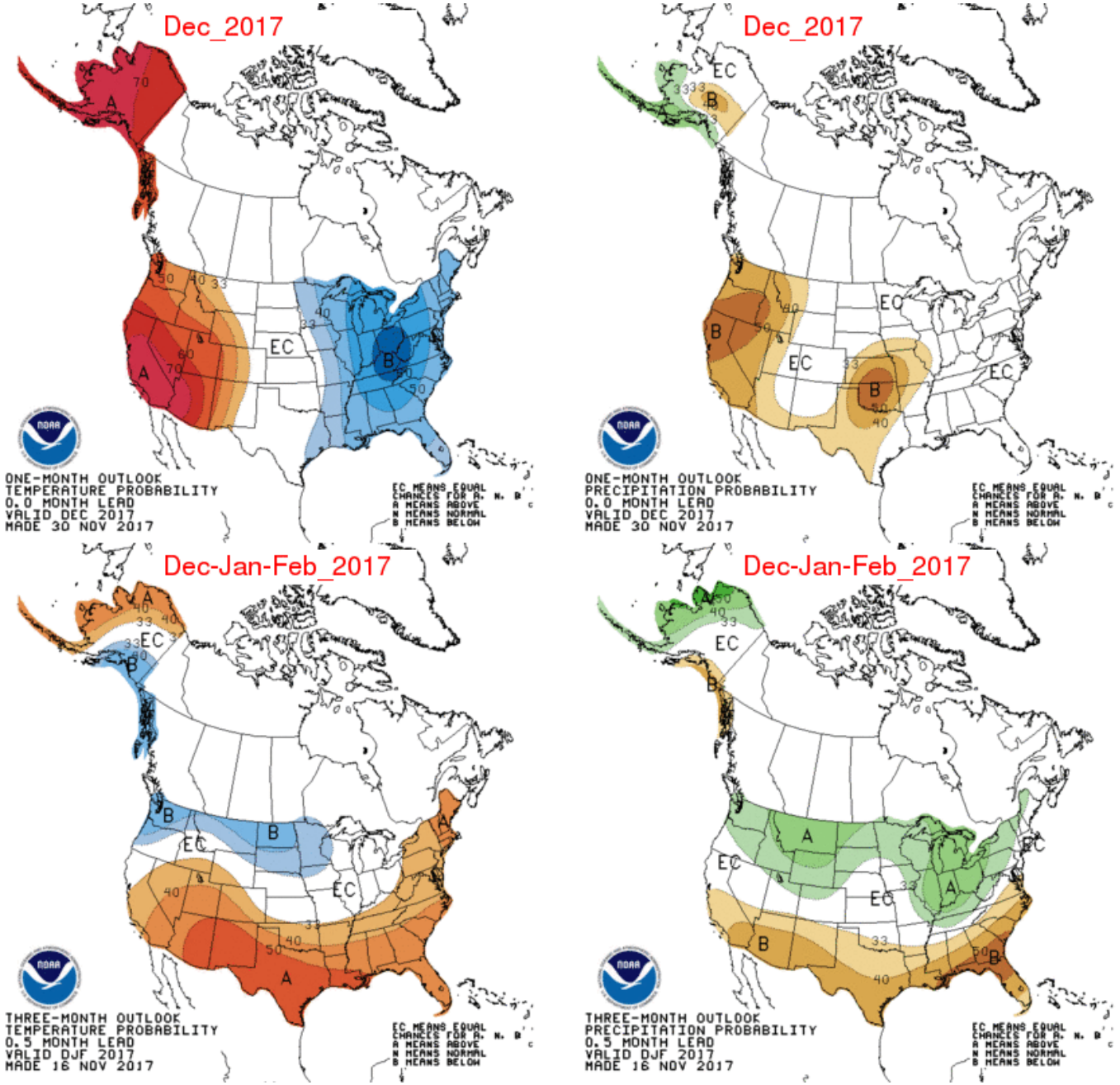

Appendix Figure 1 – Temperature (left panel) and precipitation (right panel) outlooks for the month of December (top panel) and December, January, and February (bottom panel) (Climate Prediction Center, climate.gov).