Weather and Climate Summary and Forecast

Spring 2016

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Apologize for the brief hiatus, catching up on things, kind of like the rainfall of the last 30 days! The second half of winter has been a tale of two periods, generally warm and dry in February and warm and wet in March … but not as we would have expected. Over the last 30 days temperatures have been above normal throughout the west, with departures of 1-2°F in most locations but 5-7°F in the southwest and up to 10°F in the northern Rockies (Figure 1). The rest of the United States has seen similar conditions over the last 30 days with temperatures above normal, with especially warm conditions across the northern tier of states, into New England and the mid-Atlantic (not shown).

After a very dry February for most the western US, March has brought some much needed rain and snow to many, but left others high and dry. The last 30 days has seen 150-300% or more of normal precipitation to areas from just south of the Bay Area, throughout Northern California, into much of Oregon, Washington and Idaho (Figure 1). Southern California and the southwest continued dry over this period, nearly the opposite of what would be expected in a normal El Niño year. The rest of the US was mixed with dry conditions extending throughout much the southwest into the northern Rockies and much of the Great Plains, while the Mississippi and Ohio river valleys were substantially wetter than normal and the southeastern US was dry (not shown).

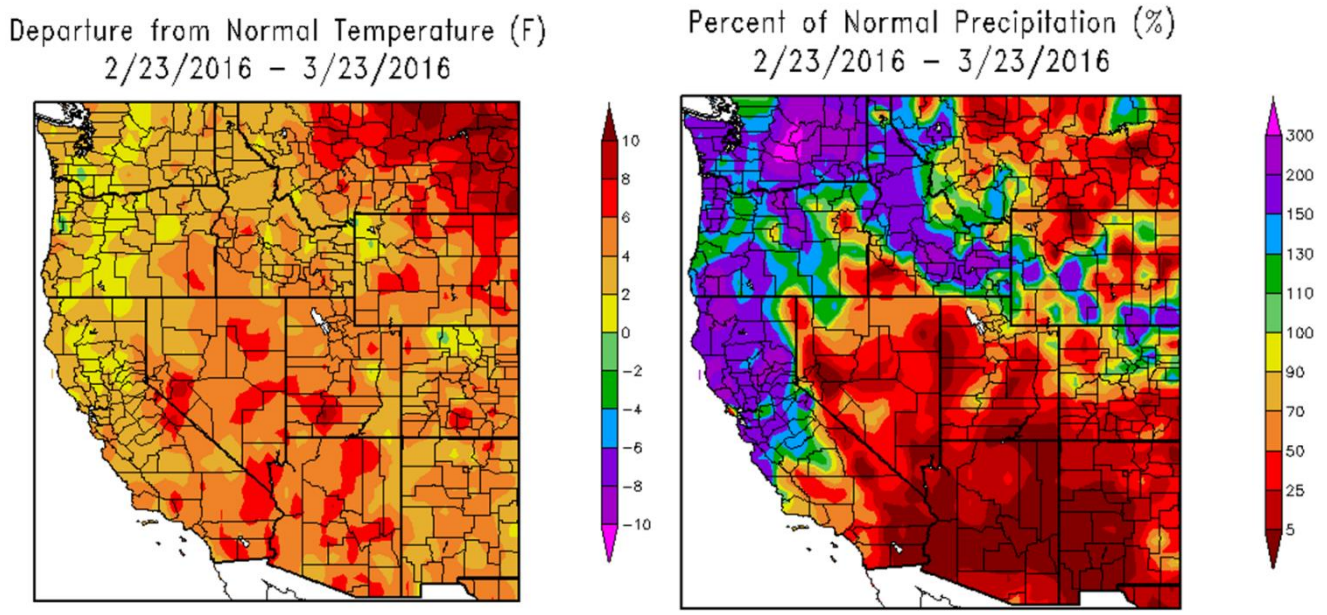

Figure 1 – Western US last 30 days from February 23 to March 23 2016 temperature departure from normal (left) and percent of normal precipitation (right; images from High Plains Regional Climate Center).

Winter summary maps for the water year of October through February show a normal to warmer than normal western US with mixed precipitation amounts (Figure 2). Average temperatures for the period have run 1.0-4.0°F or more above the 1981-2010 climate normals for much of California, Oregon and Washington. While conditions in the southwest were near normal, areas in the northern Rockies have seen a winter 5°F or more above normal. This pattern continues across the entire US, with temperatures running 1.0-3.0°F above normal (not shown). Precipitation amounts since October have been near normal to above normal from Northern California, across Nevada and into the PNW, while the southwest has remained mostly drier than expected (Figure 2). The rest of the US was generally wetter than average, especially from Texas into the Great Plains and the Ohio River Valley and in portions of the Southern Eastern US (not shown). The current US Drought Monitor reflects the water year precipitation pattern with

continued dry conditions in central and southern California into the southwest and Great Basin, and a return to normal conditions in portions of western Oregon, much of Washington and much of the rest of the US (Figure 3).

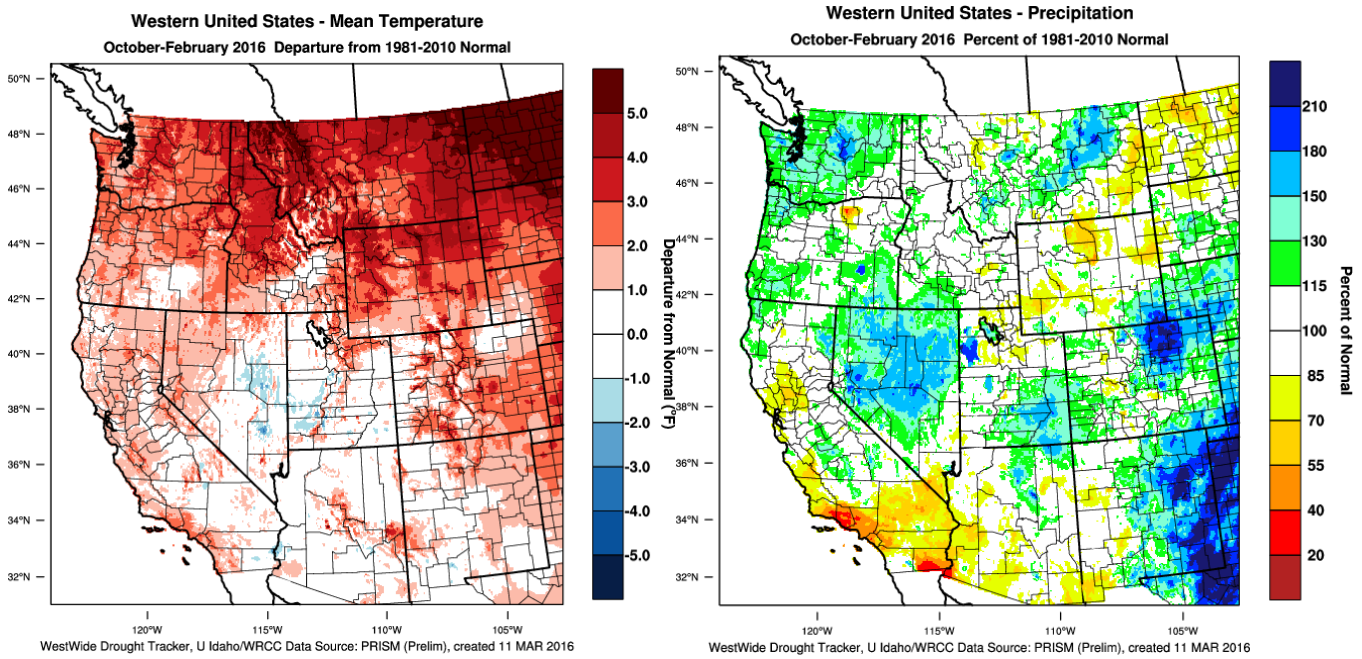

Figure 2 – Western US 2015-16 Water Year to date (Oct 2015 through February 2016) temperature departure from normal (left) and percent of normal precipitation (right; images from WestWide Drought Tracker, Western Region Climate Center; University of Idaho).

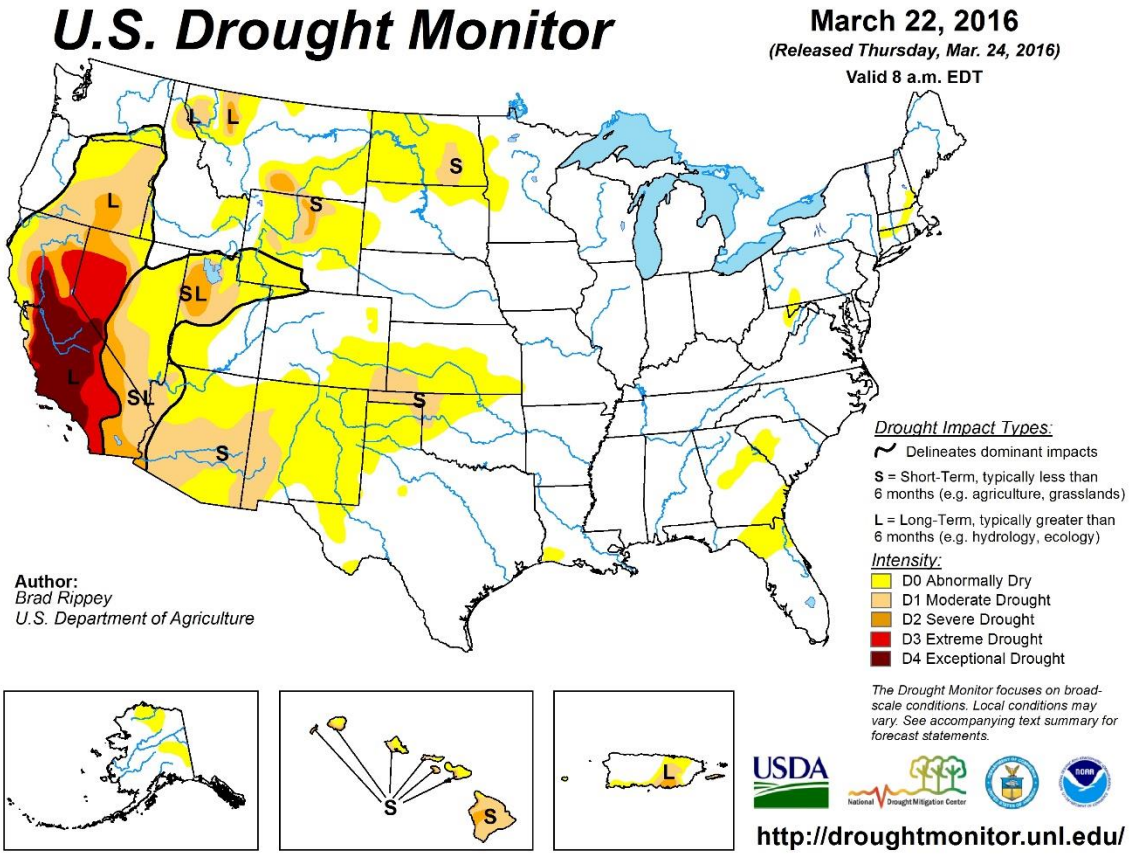

Figure 3 – Current US Drought Monitor.

El Niño Watch – As of mid-March the Climate Prediction Center still has the status as an "El Niño Advisory". However, the CPC and other agencies throughout the Pacific are indicating that the current strong El Niño will continue to weaken with a transition to ENSO-neutral during the late spring or early summer (Figure 4). Forecasters from many governments in the Pacific are in agreement with the general model consensus, though the exact timing of the transition is difficult to predict. However, El Niño effects throughout the region are expected to continue as there is a lag time from when the ocean temperatures shift to when the atmosphere responds. 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.

As mentioned last month the current El Niño has **not** brought similar impacts over the western US compared to other large El Niños. Interestingly, **very little** of this winter's western US precipitation has come from the tropics, with the majority of it being tied to a classic west coast winter pattern. Just goes to show us how much we know! Even though the winter precipitation has not been what was expected, reservoirs in the western US and especially northern California are getting some much needed inflow, whether it will be enough to lower lingering drought concerns is the issue. Also, snow packs over the western US are in much better shape than they were at this time last year. But we still have a long way to go to get to the average for the water year.

North Pacific Watch – One reason that the winter has been different than expected is the shift in temperatures of the "blob" of warmer than normal sea surface temperatures (SST) in the North Pacific (Figure 4). During 2012-2015 the North Pacific was much warmer than normal and contributed to our warm years, especially higher minimum temperatures. However, the North Pacific SSTs have unexpectedly cooled even along much of the western North American coast. The result was likely the shift in the jet stream and a more vigorous late winter precipitation pattern in the west. Long range forecasts are typically driven by conditions in the North Pacific and the state of El Niño in the tropics. This shift to cooler waters in the North Pacific causes me more concern than what is happening in the tropics, and as such I will monitor how it evolves over the next few months.

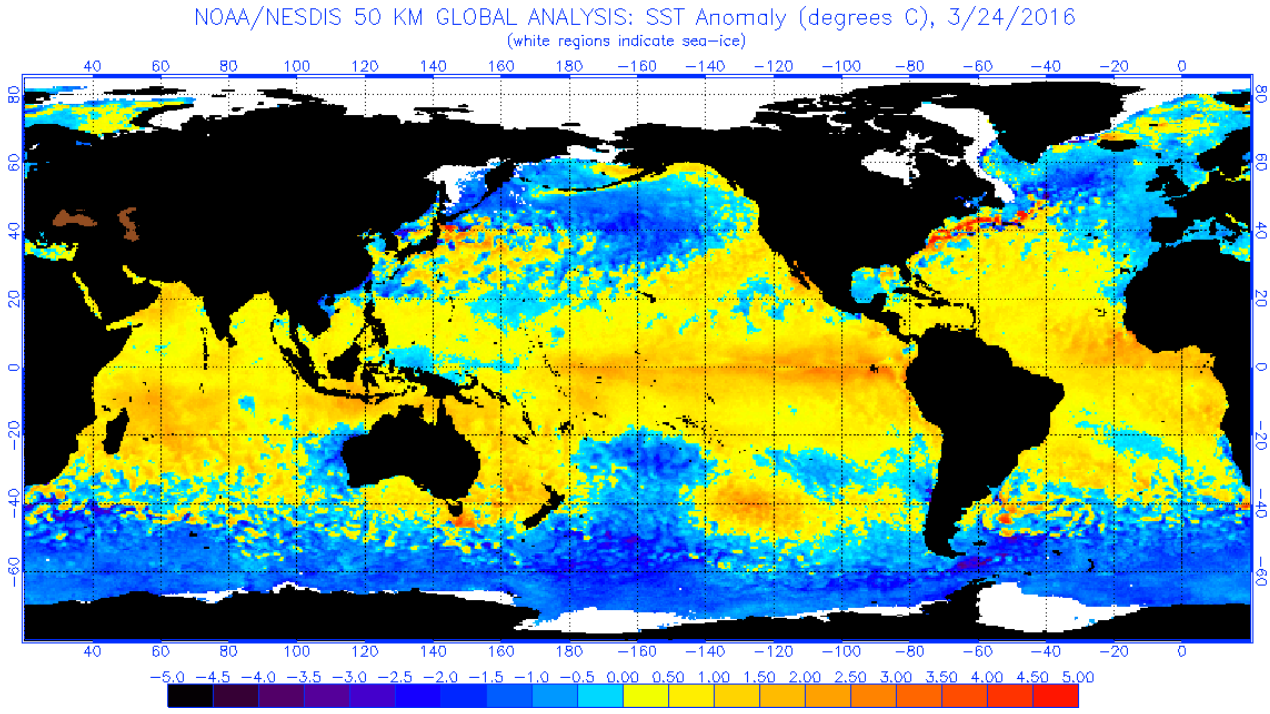

Figure 4 – Global sea surface temperatures (°C) for the period ending March 24, 2016 (image from NOAA/NESDIS).

Forecast Periods:

6-10 Day: Forecast has trended to warm and dry over most of the western US coast, cold and wet in the Rockies and northern Plains, and warm and wet for the southeast and east. This is due to what forecasts are showing is a set up for a ridge, trough, ridge pattern in the jet stream. The models are pointing to a ridge building in over the western

US, a trough across the center of the US and a ridge over the eastern US. If these conditions build in as expected we will likely see a warm up over much of the western valleys in California, Oregon and Washington. However, a building ridge will bring clear nights which will likely bring many locations to freezing or below.

8-14 Day: Does not deviate much from the 6-10 day forecast with the overall pattern dominated by a greater chance of warm in the west but shifting of the cooler conditions to the entire eastern US. Precipitation forecasts during the two week period into early April show a high likelihood of a dry PNW, transitioning to above average precipitation in southern California and the southwest. Circulation over the North Pacific and western US is likely to continue favoring a ridging pattern during this time period. Again, main issue with spring ridging is the potential for clear nights and frost conditions.

30 Day: Forecast through the month of April is tilting the odds to warmer than average conditions over the western US, while much of the rest of the US is forecast to have near normal temperatures. Precipitation during April is forecasted to average to slightly above average across the southern tier of states from central California across to the mid-Atlantic and southward. The PNW is forecasted to have a greater than average chance of being drier than normal during the month of April. Only concern here is the shifting of the North Pacific to cooler waters, which could keep minimum temperatures lower into the frost season.

90 Day: The April-May-June (AMJ) forecast continues the 30 day April forecast as given above. No substantial change to the pattern in the western US with most areas 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 a greater chance of seeing dry conditions over the next 90 days. Again, the main concern here is the shifting of the North Pacific to cooler waters, which could keep minimum temperatures lower throughout the frost season.

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