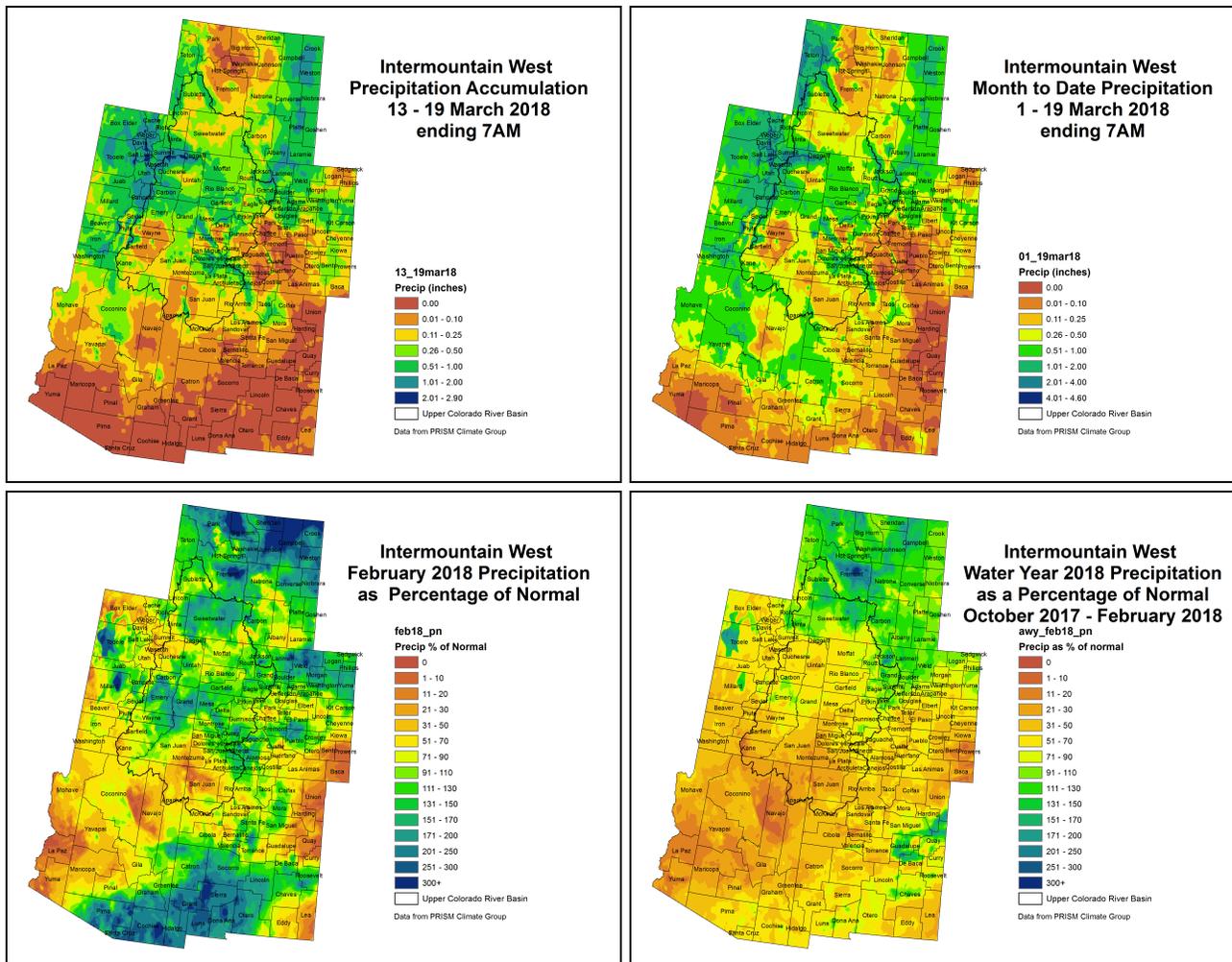


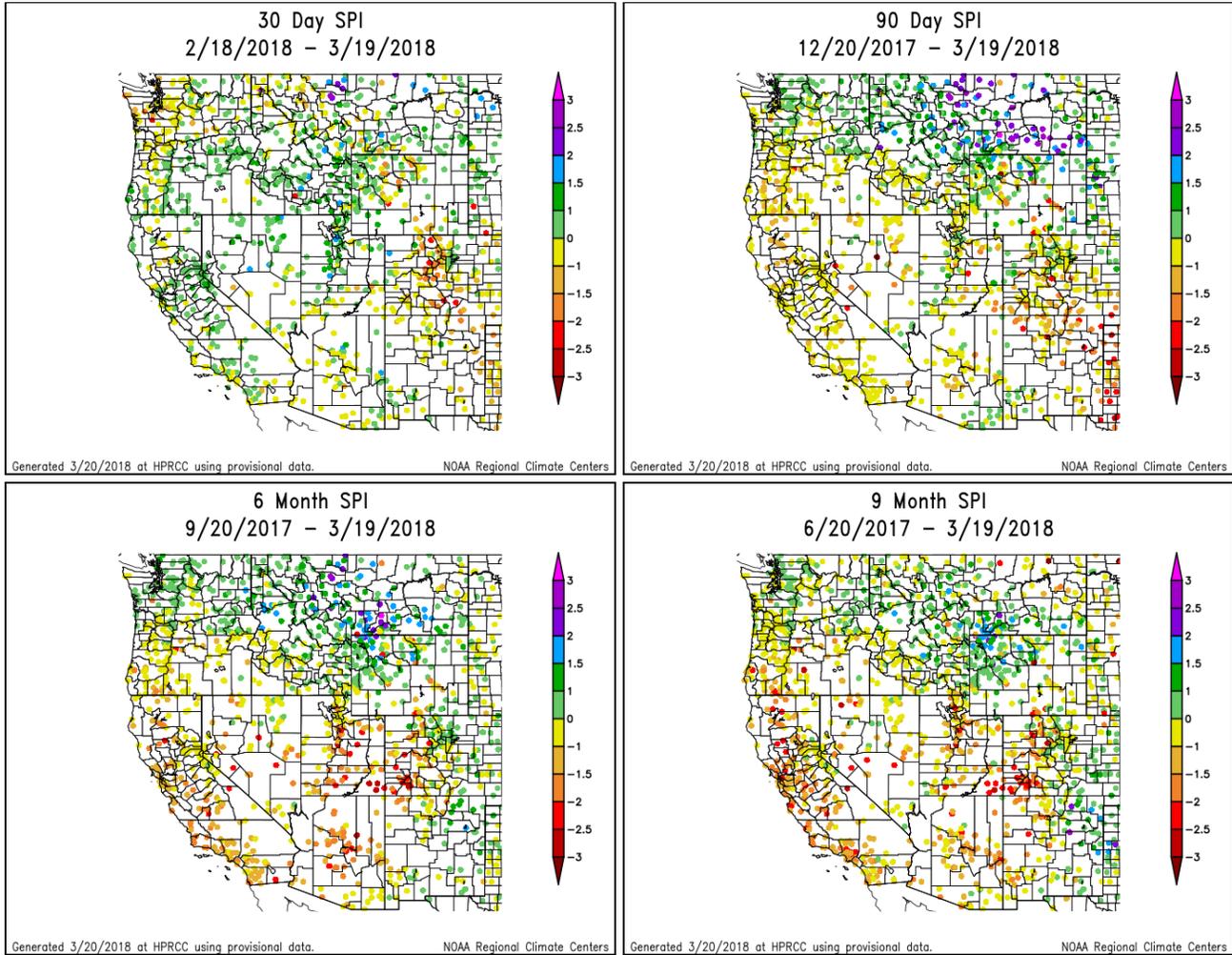
# NIDIS Intermountain West Drought Early Warning System March 20, 2018

## Precipitation



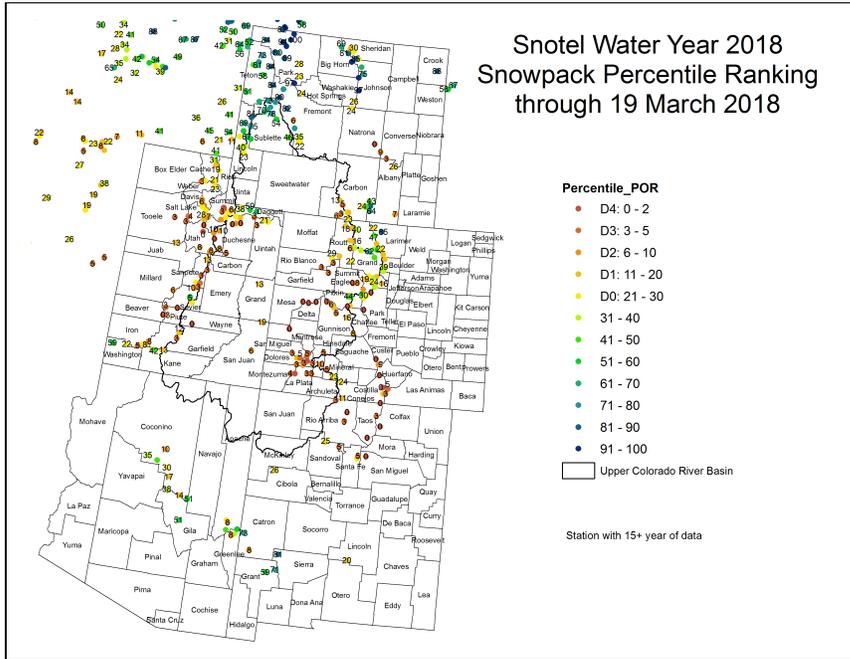
The images above use daily precipitation statistics from NWS COOP, CoCoRaHS, and CoAgMet stations. From top to bottom, and left to right: most recent 7-days of accumulated precipitation in inches; current month-to-date accumulated precipitation in inches; last month's precipitation as a percent of average; water-year-to-date precipitation as a percent of average.

## Standardized Precipitation Index

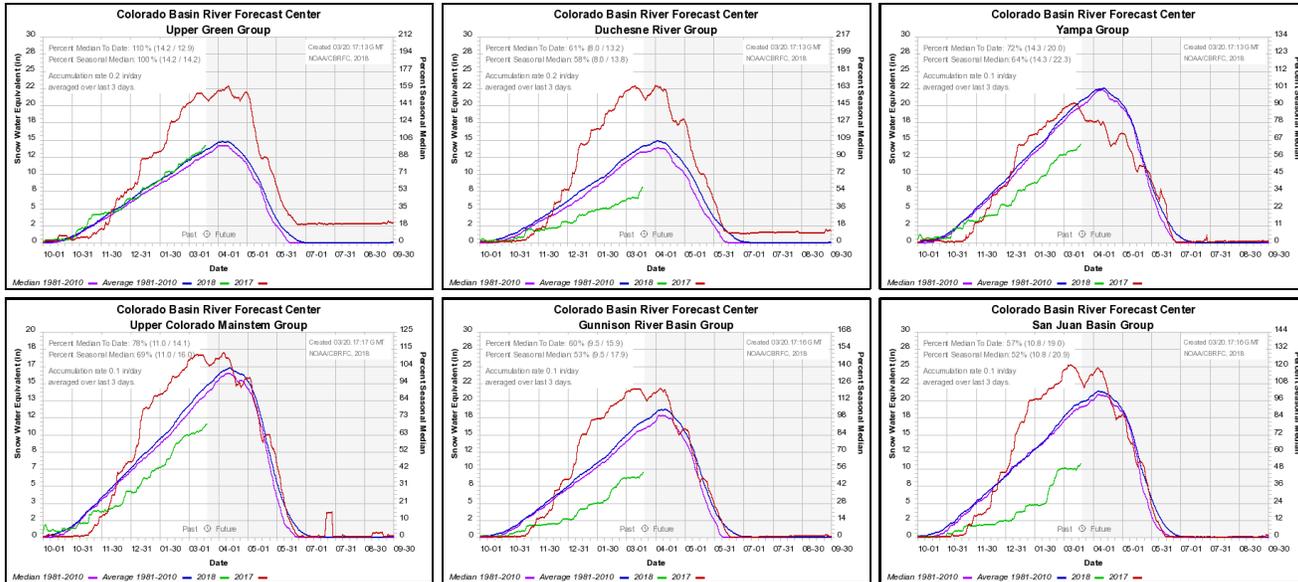


Standardized Precipitation Index standardizes precipitation accumulations for a specified time period into percentile rankings. -1.0 to -1.5 is equivalent to a D1 to D2. -1.5 to -2.0 is equivalent to a D2 to D3. -2.0 and worse is equivalent to a D3 to D4. 30- and 60-day SPIs focus on short-term conditions while 6- and 9-month SPIs focus on long-term conditions. SPI data provided by High Plains Regional Climate Center.

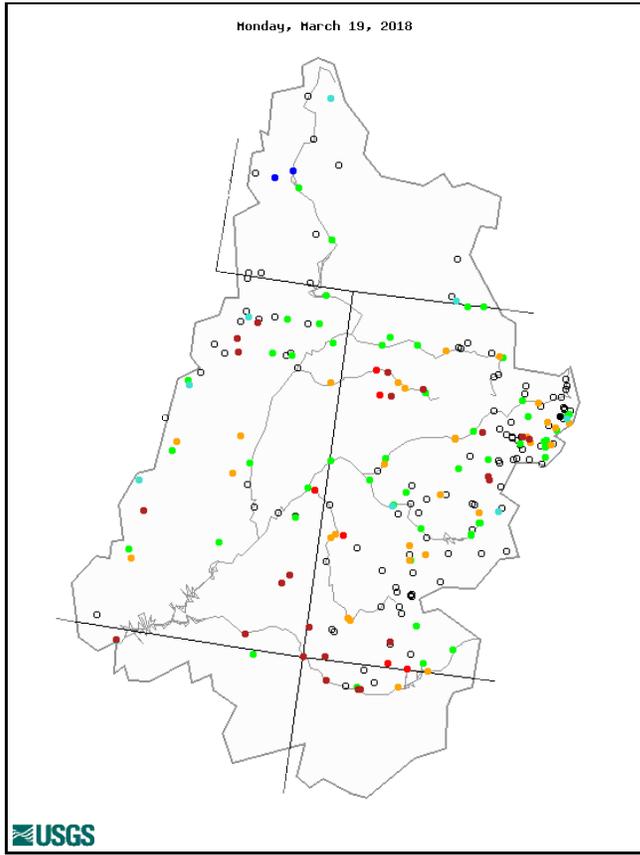
## Snotel and Snowpack



The above image shows SNOTEL snowpack percentiles for each SNOTEL site in the Intermountain West. The images below show accumulated snow water equivalent in inches (green) compared to average (blue) and last year (red) for several different sub-basins across the UCRB (and were created by the Colorado Basin River Forecast Center).

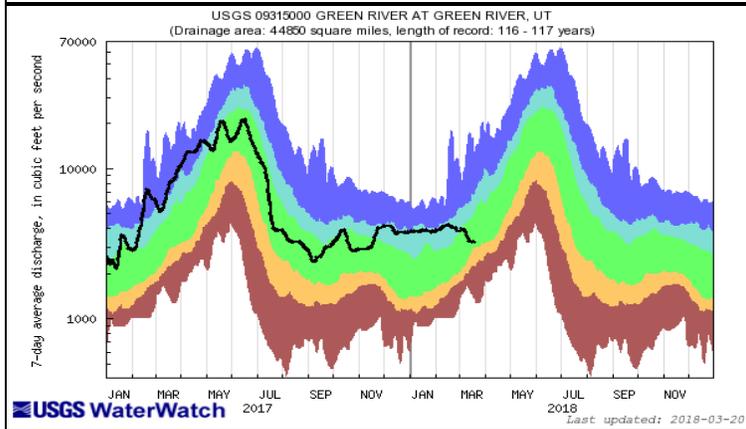
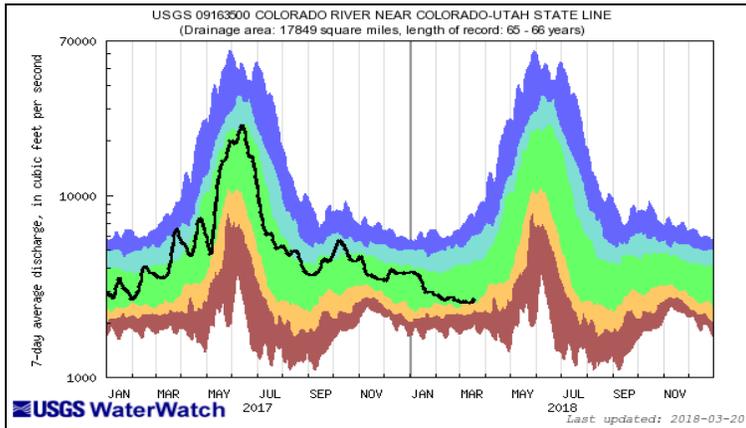


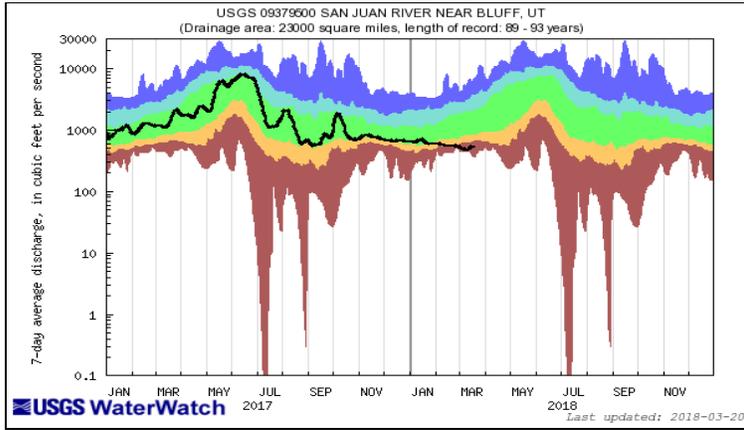
# Streamflow



Explanation - Percentile classes

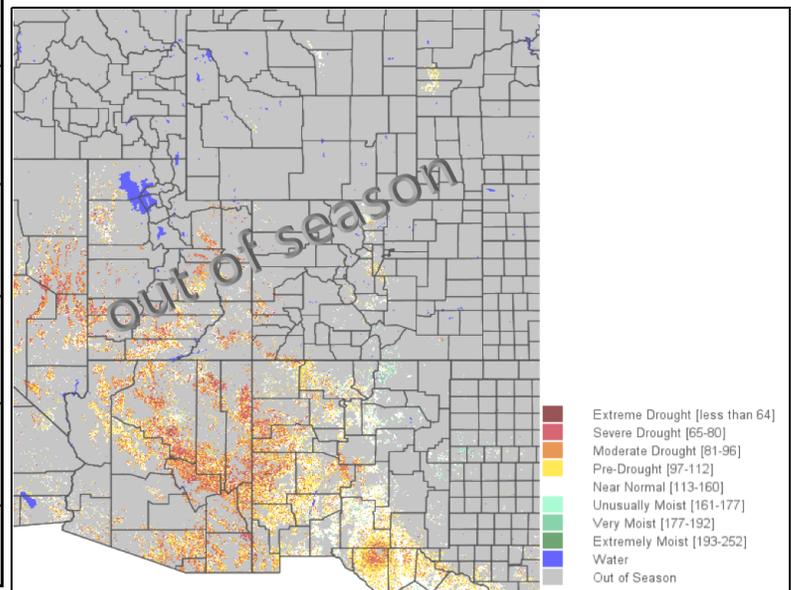
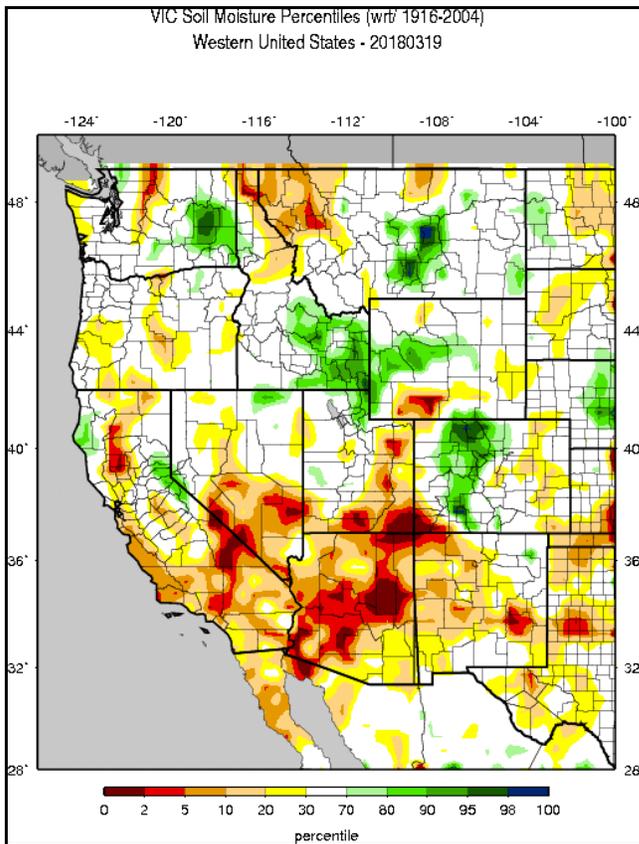
<span style="color: red;">●</span>	<span style="color: red;">●</span>	<span style="color: orange;">●</span>	<span style="color: green;">●</span>	<span style="color: cyan;">●</span>	<span style="color: blue;">●</span>	<span style="color: black;">●</span>	<span style="color: black;">○</span>
Low	<10	10-24	25-75	76-90	>90	High	Not-ranked
	Much below normal	Below normal	Normal	Above normal	Much above normal		





The top left image shows 7-day averaged streamflows as a percentile ranking across the UCRB. The top right image shows 7-day averaged discharge over time at three key sites around the UCRB: The Colorado River at the CO-UT state line; the Green River at Green River, UT; and the San Juan River near Bluff, UT. All streamflow data provided by United States Geological Survey.

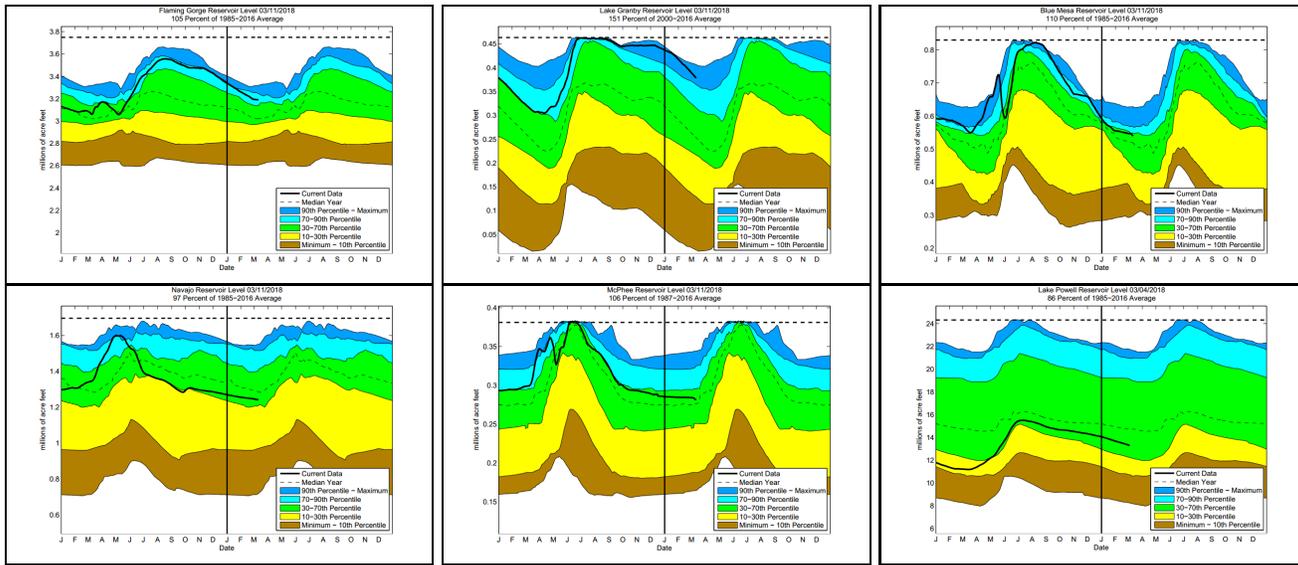
## Surface Water



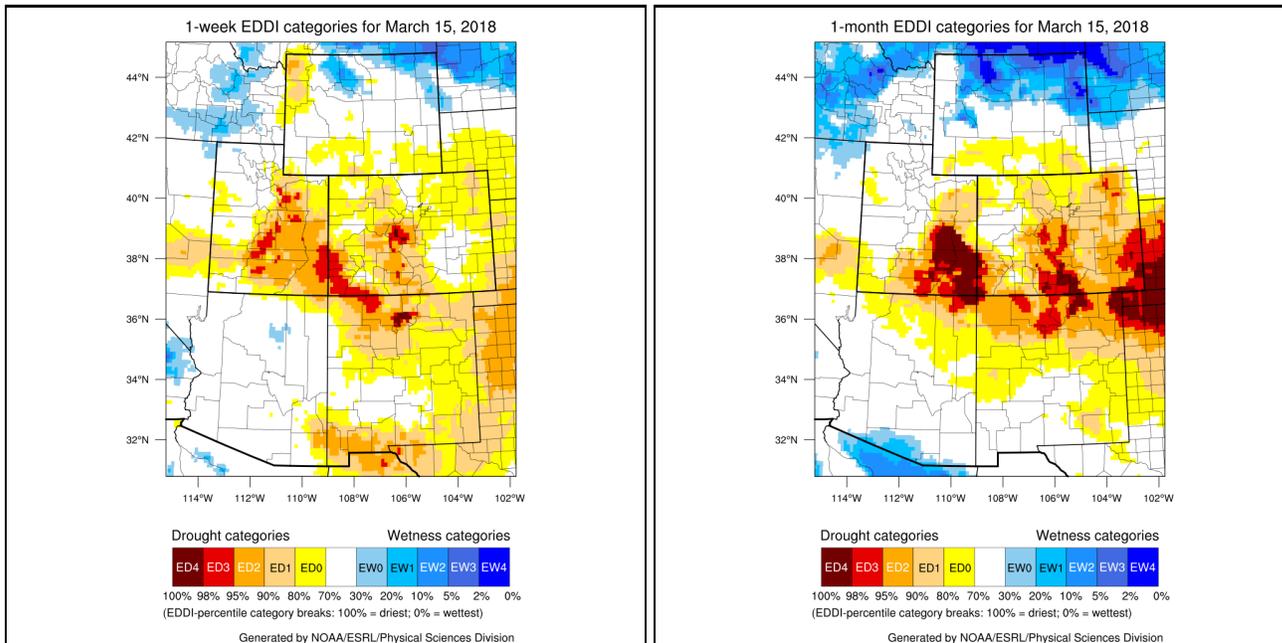
The top left image shows VIC modeled soil moisture as a percentile ranking. The top right image shows satellite-derived vegetation from the VegDRI product (which updates on Mondays).

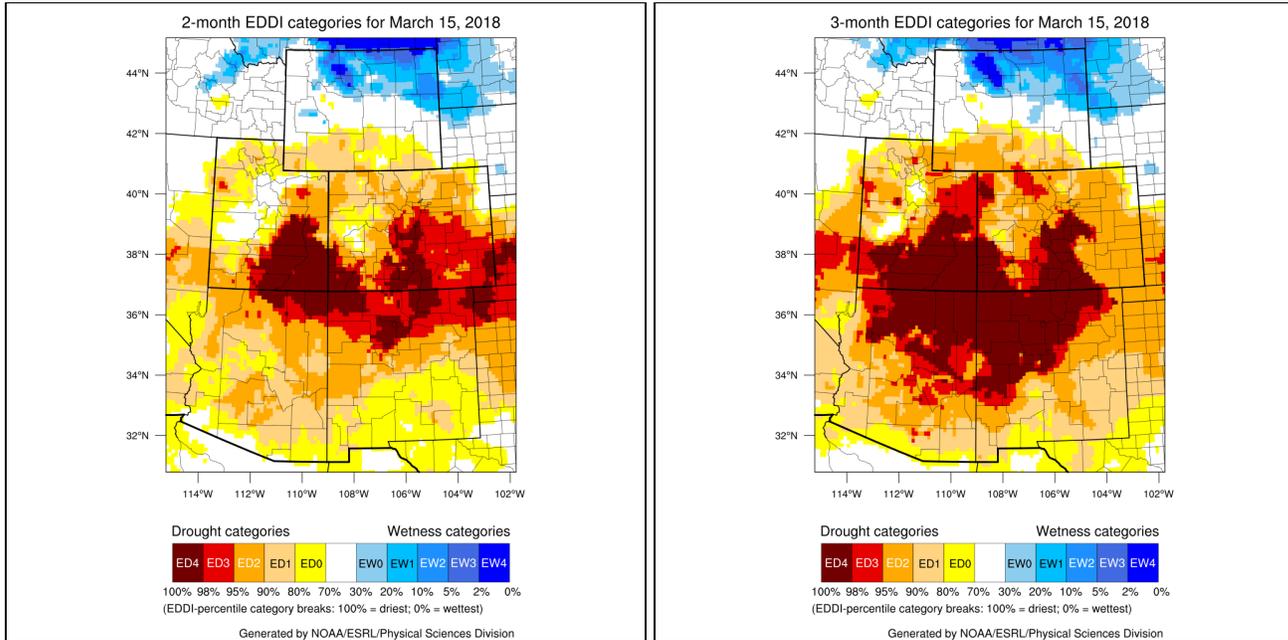
The graphs shown below are plots of reservoir volumes over the past full year and current year to date (black). The dashed line at the top of each graphic indicates the reservoir's capacity, and the background color-coded shading provides context for the range of reservoir

levels observed over the past 30 years. The data are obtained from the Bureau of Reclamation. Some of the reservoir percentiles don't line up at the new year due to differences in reservoir levels at the beginning of 1985 and the end of 2014. Dead storage has been subtracted. Note: Lake Granby data are obtained from the Colorado Division of Water Resources, and only goes back to the year 2000.



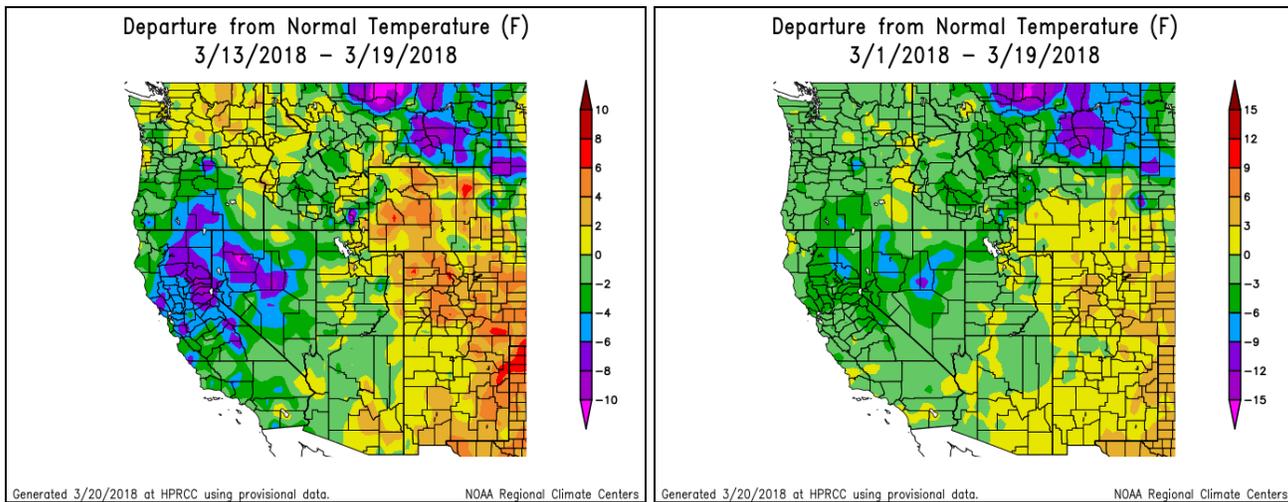
# Evaporative Demand



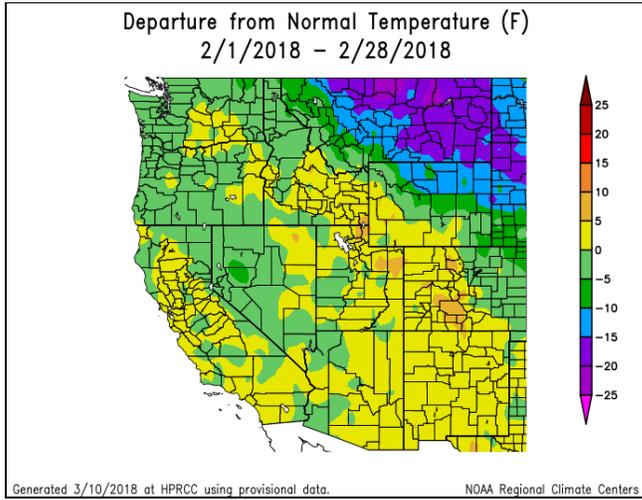


The above images are available courtesy of NOAA’s Evaporative Demand Drought Index (EDDI). Drought classification listed is a function of the depth of reference evapotranspiration accumulated over a given period of record with respect to a climatology of 1981-2010. The drought categories displayed are in line with the [US Drought Monitor's Percentile Ranking Scheme](#). Data used to generate these maps come from the North American Land Data Assimilation System Phase-2 (NLDAS-2) project, which assimilates observations of temperature, wind speed, radiation, and vapor pressure deficit. The date indicates the last day of the period of record, and the week number indicates the window size for the period of record.

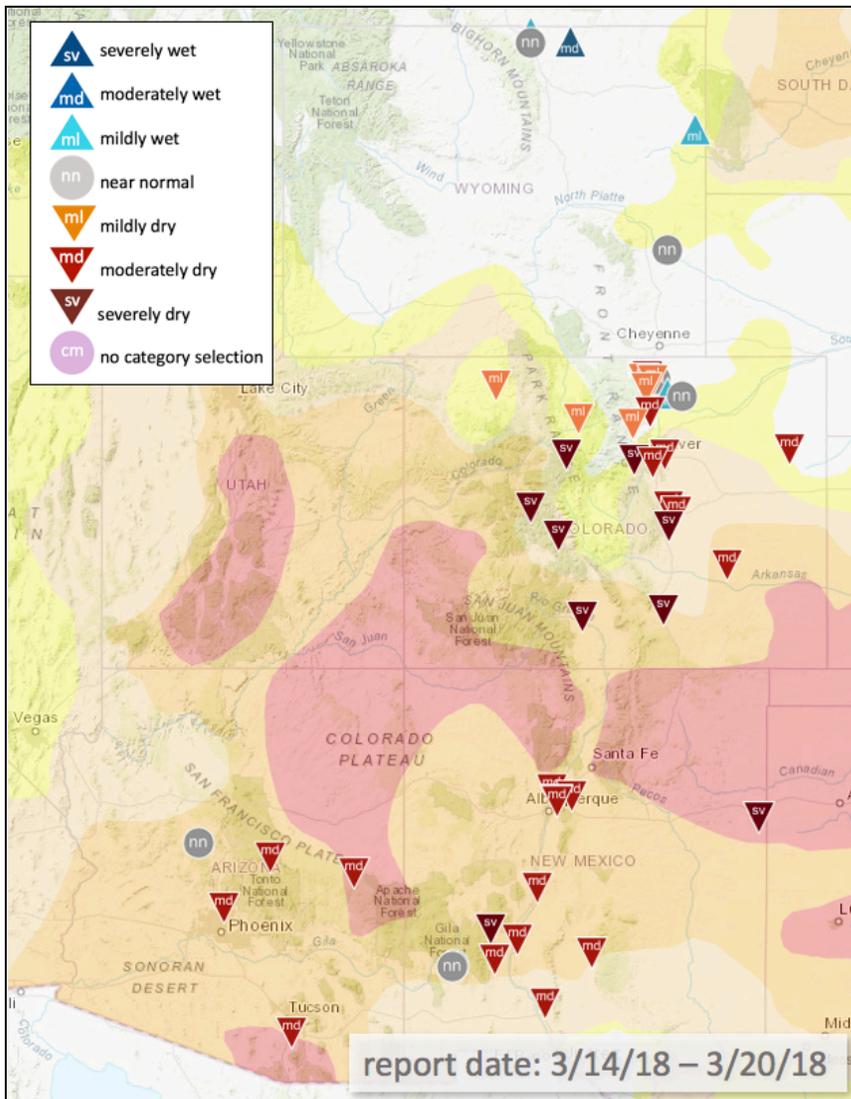
# Temperature



All images show temperature departures from average over different time periods (last 7 days on top left; month-to-date on top right; last full month on bottom). Temperature departure maps provided by HPRCC ACIS.



# Condition Monitoring and Impacts



Map of current condition monitoring reports submitted to CoCoRaHS in the last week overlaid on the

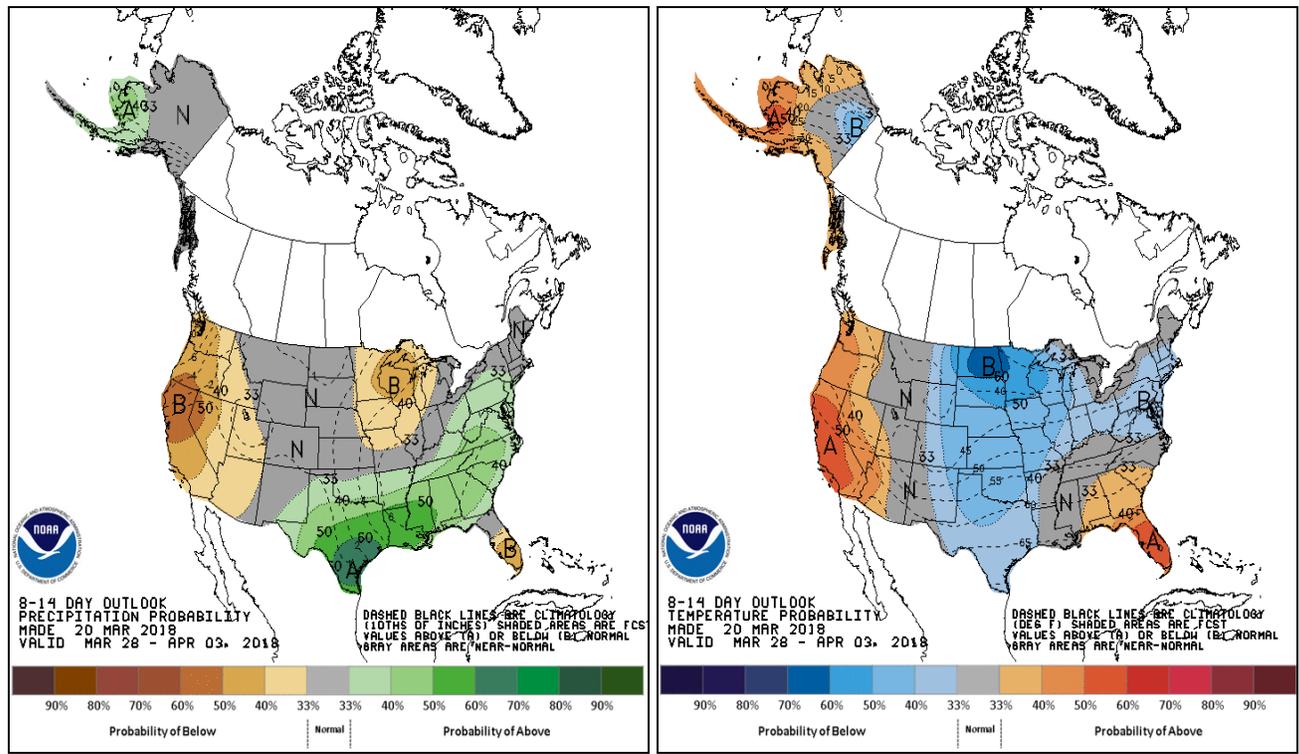
current U.S. Drought Monitor depiction. Specific impacts reports from local experts listed below.

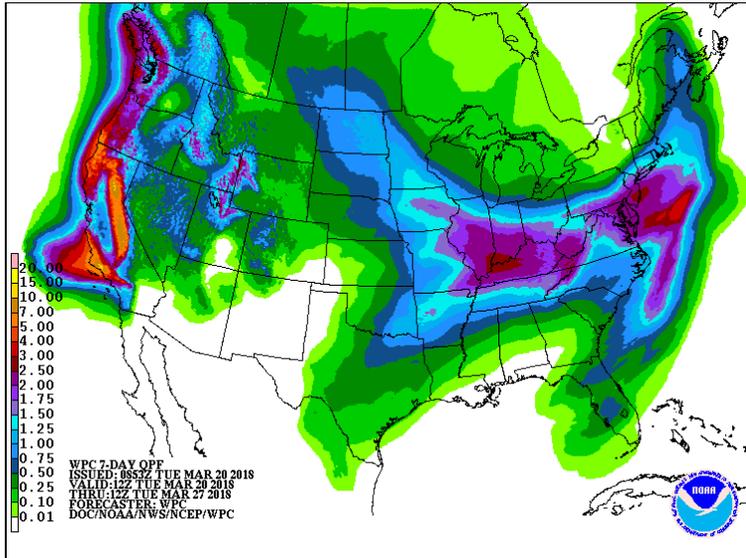
### Summit County/Vail Pass areas

The rain/snow line is high, no snow on the ground in Dillon and Silverthorne. The south facing slopes of Tenderfoot mountain were bare up to an estimate of about 10,000 ft. Bare spots are poking out at Arapahoe Basin that should not be bare in mid-March.

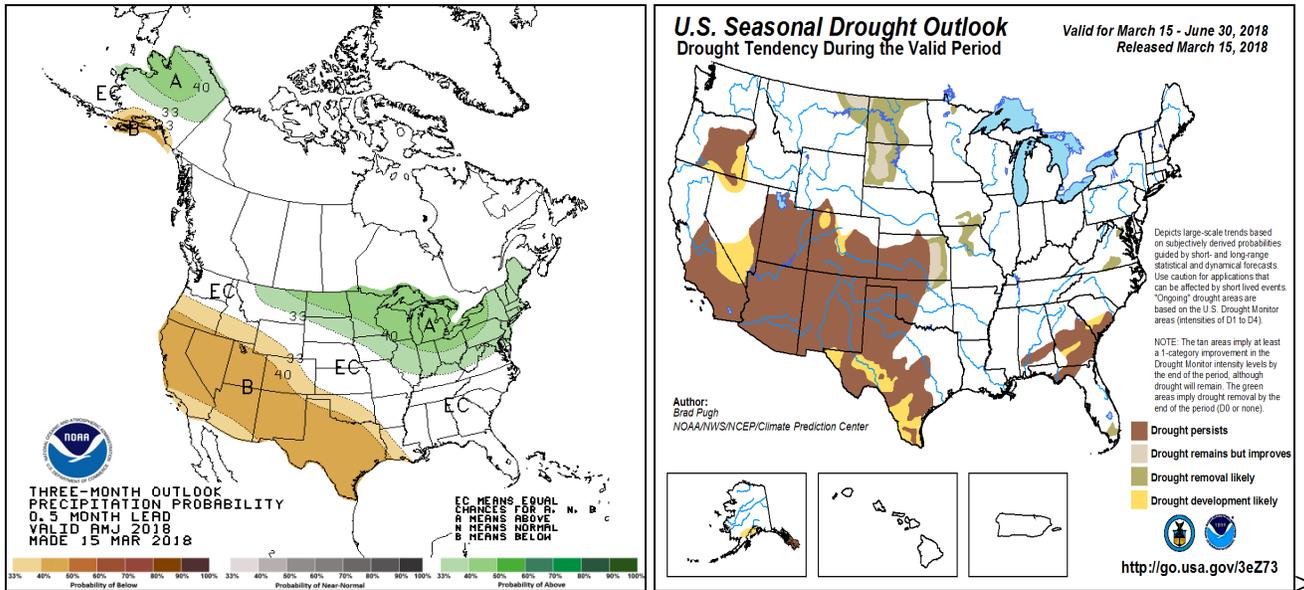
Too many bare spots for this time of year from the tunnel all the way to and past Vail Pass on the I-70 corridor. Not as bad as 2012, but definitely not in good shape. West of Vail, even the north facing slopes had remarkably low snow for mid-March.

## Outlook

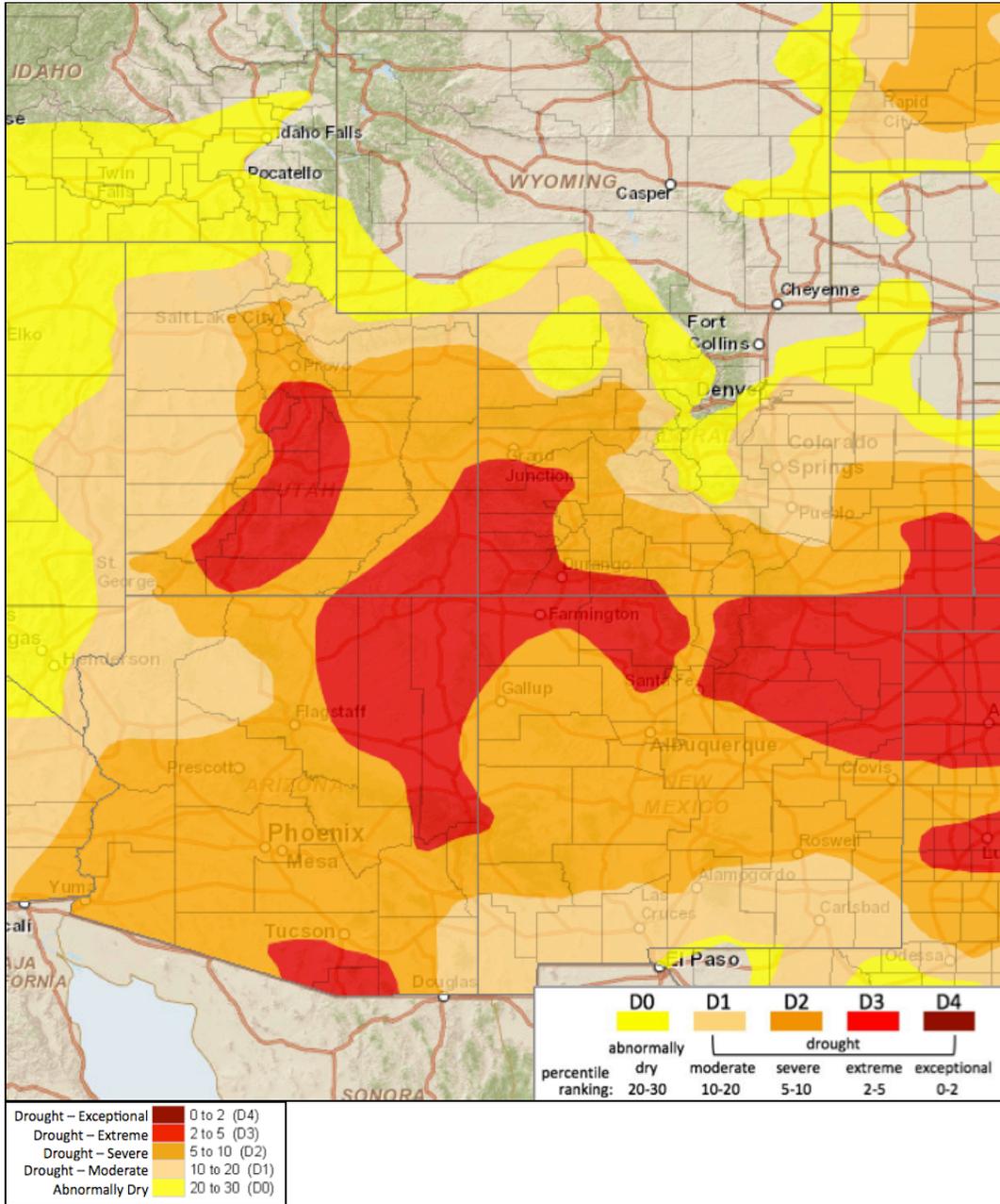




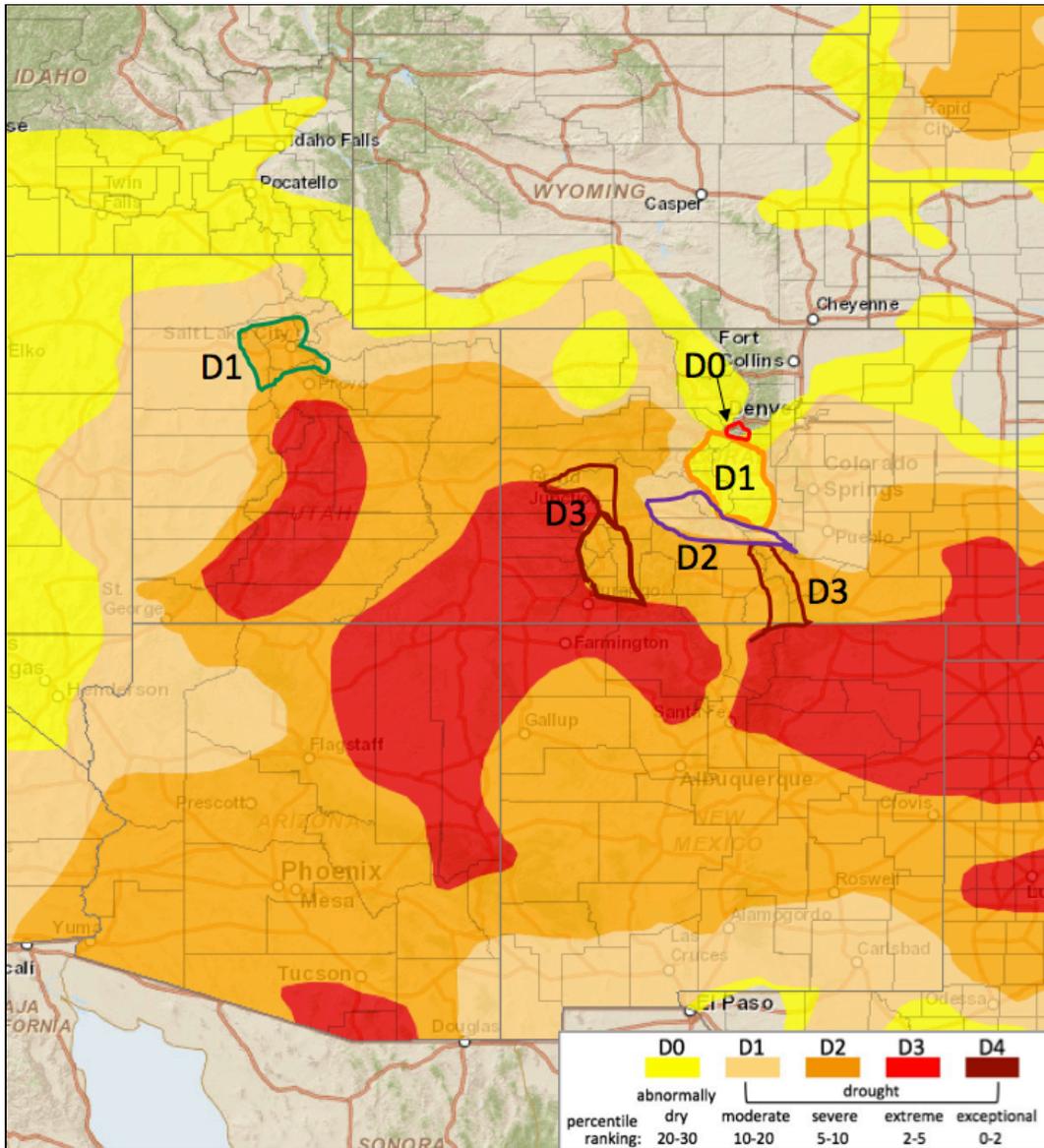
The top two images show Climate Prediction Center's Precipitation and Temperature outlooks for 8 - 14 days. The middle image shows the Weather Prediction Center's Quantitative Precipitation Forecast accumulation for seven days. The bottom left image shows the 3-month precipitation outlook from Climate Prediction Center, and the bottom right image shows the Climate Prediction Center's most recent release of the U.S. Seasonal Drought Outlook.



## Summary and Recommendations



Above is the most recent release of the U.S. Drought Monitor map for the UCRB region. Below shows the proposed changes for this week, with supporting text.



**Summary: March 20, 2018**

An active weather pattern has brought some storm events to the northern half and higher elevations of the Intermountain West region and windy conditions to the southern half and plains regions. Short-term SPIs show the worst dryness along the Continental Divide in Colorado. Mid-term SPI dryness is focused over southern CO and northern New Mexico. Extending to longer term, SPIs show the driest areas over Arizona and Utah and extending into western CO.

Last week, some decent snow storms helped bump snowpack numbers at most locations in the Upper Colorado River Basin, with the Wasatch front in central UT receiving between 1 and 2 inches in the lower elevations and more in the higher elevations. The mountains of western Wyoming continue with near to above average snow conditions, and the northern CO mountains continue to hover a little bit below average. Basins that have been struggling, like in central UT and southwest and southern CO, have seen

some relief in the past month, but it has not been enough to recover from emerging drought conditions. In southern CO, many SNOTEL sites continue to show 0-5th percentile ranking of water-year-to-date precipitation and snowpack. Snowpack observations that low at this time of year are insurmountable.

East of the mountains, a couple decent shots of precipitation fell last week over eastern WY and most of eastern CO. Unfortunately, a couple of spots (areas currently in severe drought or worse) missed out on those events. In southeast CO, despite some moisture accumulating, the area has been dealing with warmer than average temperatures and windy conditions, both which strip what available moisture there is from the vegetation. Most of NM and southern AZ also missed out on the recent moisture.

With the progression of spring, streamgages are beginning to come out of frozen conditions (recording gages increased from 80 at the beginning of the month to over 115). We are entering a time period where snow melt activity begins (even though we can still have some accumulating events meaning peak snowpack is not typical until early-to-mid April), and the rivers begin to respond with slowly increasing flows. What we're seeing in the Upper Colorado River Basin is that those flows aren't coming up as much as they normally do - pointing to the fact that the lower elevation mountains haven't had much snow to melt. This is one of our first observed spring impacts from a low winter snowpack season.

There is a bit of good news on the horizon - over the next two weeks, the Climate Prediction Center is calling for increased likelihood of below average temperatures and above average precipitation for the majority of the IMW. The below average temperatures are good for a couple of reasons: First, it slows the snowmelt process, allowing snowpack to continue its climb toward seasonal peaks. Second, it reduces the risk of fire danger, which we've already seen is a problem in eastern CO and NM. We are also at a time of year where above average precipitation can have significant impacts for most of the region. The spring marks a time where mountains typically still have decent accumulations, and the plains also ramp up their precipitation normals. The increased likelihood of precipitation above and beyond what is typically expected would be a huge step in relieving some of the current drought conditions. Well timed precipitation in the plains could help struggling crops, and over the mountains could boost the meager water supply that is expected.

Longer term, the story is not as hopeful, as the seasonal forecast for April - June shows an increased likelihood of above average temperatures for all of the IMW and below average precipitation for most of the region.

## **Recommendations**

**UCRB:** The U.S. Drought Monitor author has already proposed a slight

expansion of the D3 (maroon line) in the San Juan mountains to address dry 6-month and 9-month SPIs. While it's not quite perfect timing to expand there (with the area receiving 1-2 inches of moisture last week), it is justified when looking at snowpack percentiles, long-term precipitation deficits, and spring streamflow already showing early signs of stress. We also recommend expanding that D3 area slightly to the north to also capture the SNOTEL sites on the Grand Mesa (see the Mesa-Delta county line) that are showing 0 percentile precip and snowpack.

In addition to this change, we also recommend some expansions of D2 (purple), D1 (orange) and D0 (red) along the Continental Divide up to I-70 (Summit County) and west into Gunnison County. These changes follow areas where snowpack percentiles are low and March precipitation has been lacking. Two of our staff reported from around Summit County, observing slopes that should have snow on them right now are bare.

With a decent accumulation of precipitation in the last week around the Salt Lake City area, an improvement from D2 to D1 (green shape) is recommended there. Most of the SNOTEL sites in Salt Lake County saw an increase of 2 to 4 inches in snowpack.

**Eastern Colorado:** It is recommended that D3 be expanded following the Sangre de Cristo mountains in southern CO (maroon shape). SNOTEL snowpack are all under the 5th percentile, and water-year-to-date precipitation at those higher elevations is at the 0 percentile. They did not benefit from the storms that passed over the region this past week.