March 1, 2019 Water Supply Forecast Discussion

The Colorado Basin River Forecast Center (CBRFC) geographic forecast area includes the Upper Colorado River Basin, Lower Colorado River Basin, and Eastern Great Basin.

Water Supply Forecast Summary:

February into early March will be remembered as a pivotal period in the 2019 water supply forecast season due to significant precipitation and dramatic increase in snowpack in many areas.

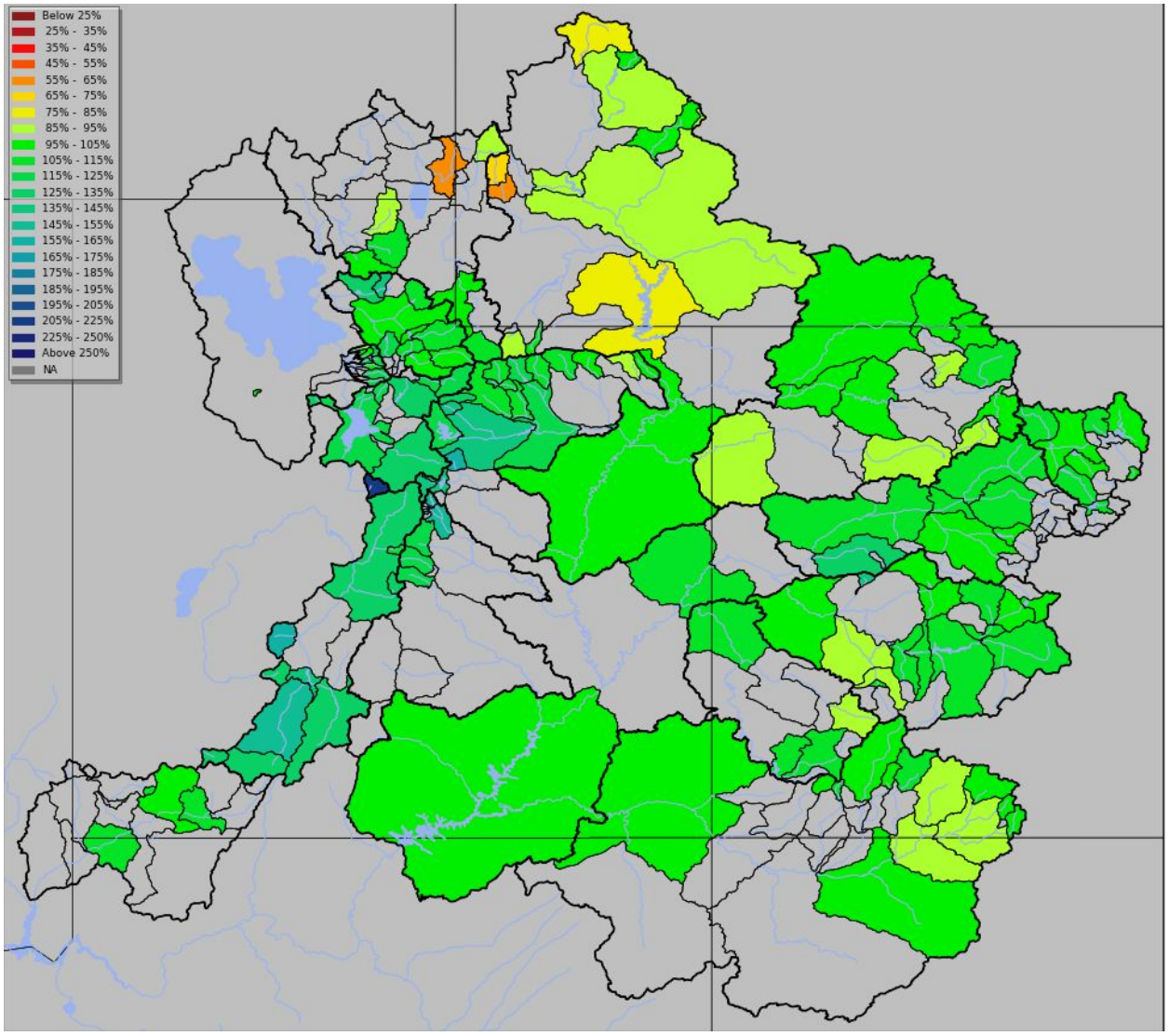
Throughout the Upper Colorado River Basin and Great Basin water supply volume forecasts increased over those issued in early February. In several areas forecasts were increased greater than 50 percent of average. Some of the most significant increases occurred in the San Juan River Basin. Increases greater than 30 percent of average occurred in the Gunnison, Dolores, and Duchesne River Basins. Volume increases were impressive with the Lake Powell inflow forecast increasing 2 million acre-feet from February 1st. The highest forecast volumes with respect to average are in the San Rafael Basin and Duchesne River Basin with up to 150 percent of the 1981-2010 average expected. Forecasts in the Green River Basin of Wyoming range from near 60 to 100 percent of average. Much of the remaining Upper Colorado River Basin is forecast to range from near 90 to 115 percent of average.

In the Great Basin increases greater than 50 percent of average occurred in the Sevier River Basin with significant increases in the Provo Basin and parts of the Weber and Six Creeks Basins. Most forecasts in the Provo, Weber, and Six Creeks Basins are forecast to range from near 100 to 130 percent of average with 85 to 110 percent of average forecast in the Bear River Basin.

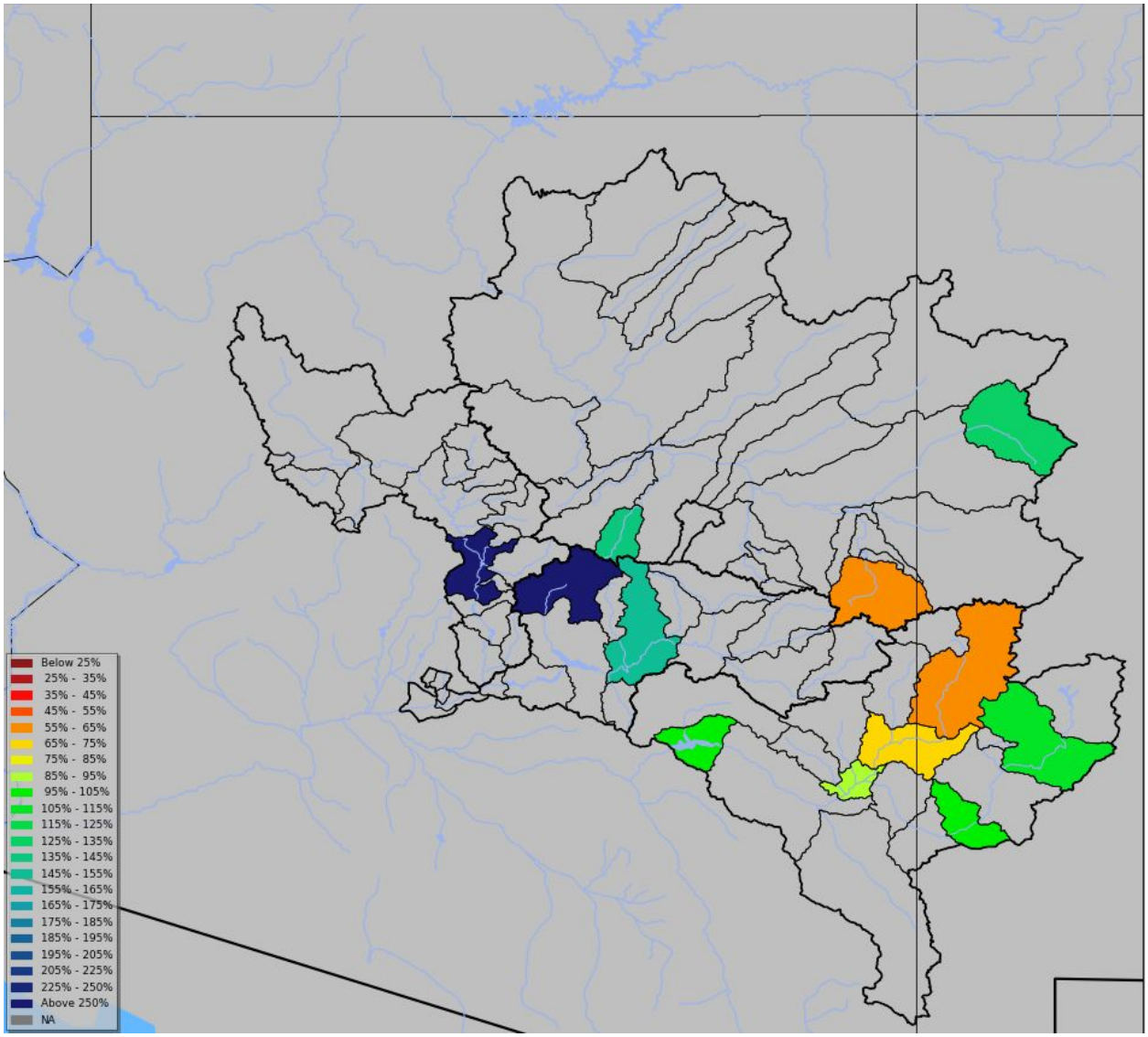
April-July unregulated inflow forecasts for some of the major reservoirs in the Upper Colorado River Basin include Fontenelle Reservoir 630 KAF (87% average), Flaming Gorge 830 KAF (85% of average), Blue Mesa Reservoir 740 KAF (110% of average), McPhee Reservoir 330 KAF (112% of average), and Navajo Reservoir 690 KAF (94% of average). The Lake Powell inflow forecast is 7.30 MAF (102% of average).

The Lower Colorado River Basin was also very wet in most areas with upwards to 10 inches or more of precipitation received in the Virgin River Basin headwaters and also in the Verde and Tonto River Basins of Arizona. April-July runoff forecasts in the Virgin River Basin increased by 20 to 35 percent of average and now range from near 100 to 110 percent of average (150 to 180 percent of median). January-May runoff volume forecasts in the Salt and Verde River Basins range from near 170 to over 300 percent of median. Significant runoff has already occurred this winter due to snowmelt and heavy precipitation. Conditions have been drier in the Gila River Basin and eastern headwaters of the Little Colorado River Basin where January-May runoff volumes are generally expected to be less than 80 percent of the 1981-2010 median.

Seasonal Water Supply Forecasts:



Upper Colorado, Great, Virgin River Basins: 2019 April-July forecast volumes as a percent of 1981-2010 average (50% exceedance probability forecast)



Lower Colorado Basin (AZ/NM): 2019 March-May forecast volumes as a percent of 1981-2010 median (50% exceedance probability forecast)

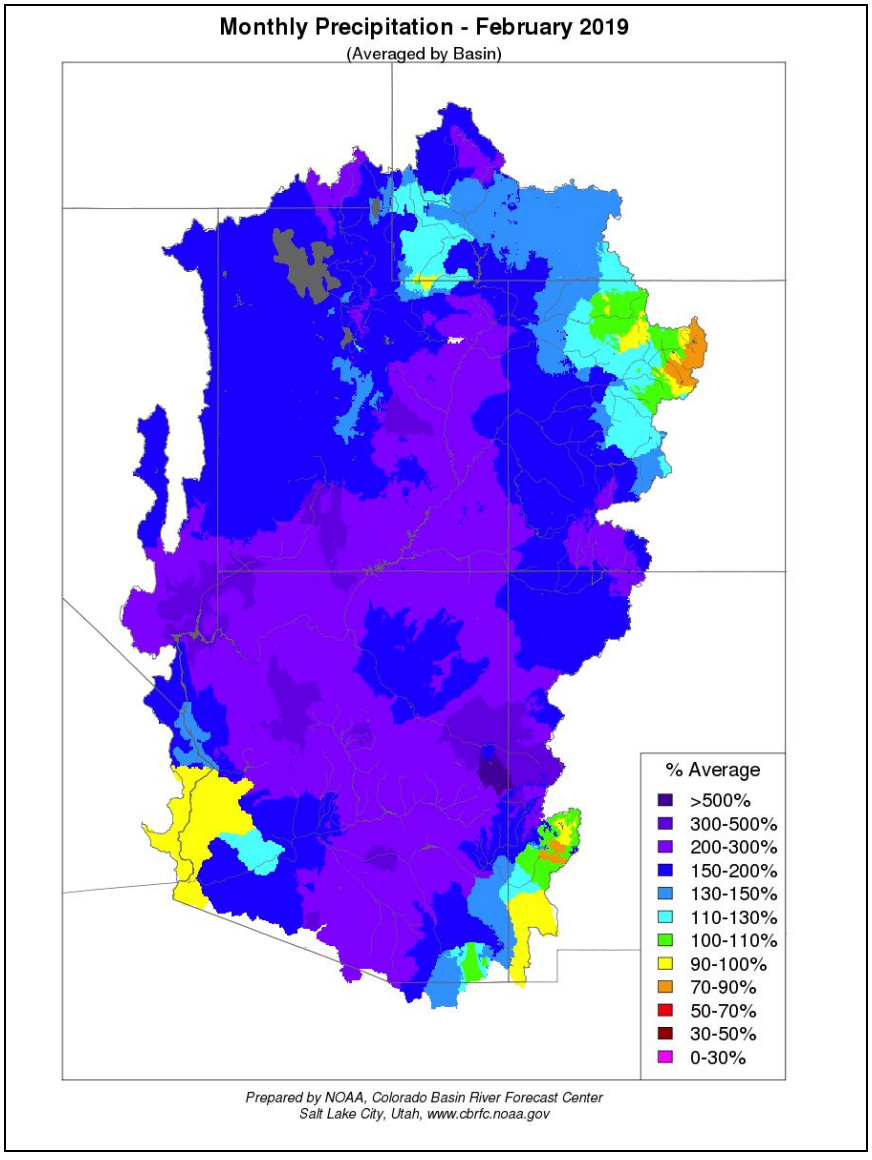
For specific site water supply forecasts, refer to: https://www.cbrfc.noaa.gov/rmap/wsup/wsuplist.php

Water Supply Discussion

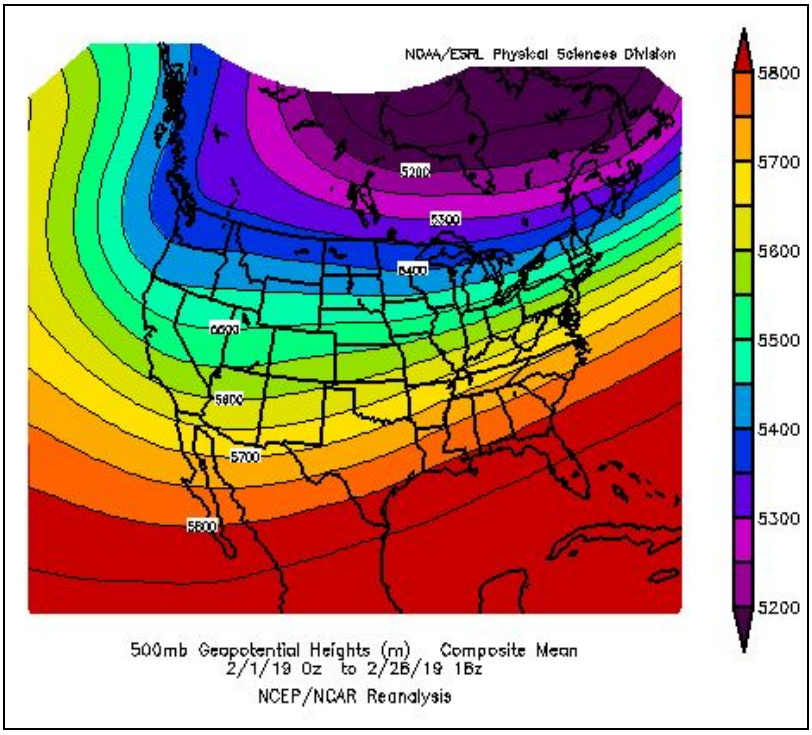
February Precipitation:

February was a game-changer month across much of the Colorado River Basin, with many areas receiving significant increases in water year precipitation and seasonal snowpack. A persistent, anomalous trough was located across the Western U.S. through much of February. This led to multiple, potent storm systems moving eastward from off the West Coast through the Colorado River Basin. Due to the Pacific origin of many of these systems, they carried large amounts of moisture inland. In fact, one storm in particular targeted the Lower Colorado Basin on Valentine's day

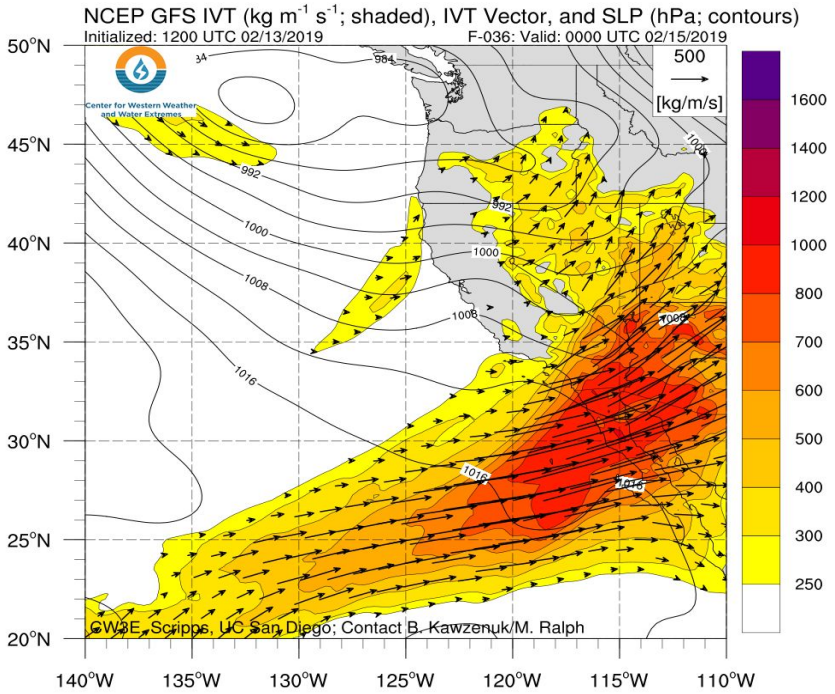
(see image below), with deep subtropical moisture and high snow levels (above 9000 feet). The higher terrain of Arizona received 2-5 inches of rain from this system, and when combined with melting snowpack, resulted in quite high flows on the Verde and Salt Rivers. By the end of the month, the highest wet anomalies (in percent of normal terms) were across areas of Arizona, southern Utah, and southwest Colorado where 200-300% of average precipitation fell. Over the northern half of Utah into the Green River Basin of Wyoming, 130-200% of average was observed. Really the only area that was near to slightly below normal for the month (70-110% of average) was the Upper Colorado Headwaters Region.



February 2019 Percent of Normal Precipitation
(Averaged by basins defined in the CBRFC hydrologic model)



Mean 500mb height pattern through the month of February. Note the strong, anomalous trough across the Western U.S. that was responsible for the very wet month across much of the Colorado River Basin.



A potent storm system moved across the Western U.S. on Valentine's Day (February 14) with a deep subtropical moisture plume directed into Arizona (orange/red colors). The higher elevation areas along the Mongollon Rim received torrential rainfall amounts (2-5 inches) from this system.

Snowpack:

The SNOTEL map image below indicates much above normal (median) snow conditions across much of Utah and western Colorado as well as in the Salt and Verde river basins in Arizona. Near to above normal snowpack exists in the Green River headwaters of Wyoming, the north slope of the Uinta Mountains in Utah, and the Bear River Basin of northern Utah and southern Idaho. Improvements to the snowpack occurred over the entire area since the beginning of February due to much above average precipitation over the last month, including the first few days of March. Many basins have now reached or exceeded their normal seasonal peak snow water equivalent amounts. Most notably, the San Juan River Basin snowpack went from 85 percent of normal on February 1st to 130 percent of normal on March 5th and is currently 110 percent of the seasonal peak. The Virgin River Basin improved from 115 percent of normal on February 1st to 160 percent of normal on March 5th and is now 145 percent of the seasonal peak.

While the percent of normal values in the Verde River Basin in Arizona are quite high at this time, the areal extent of the remaining snowpack is limited to the very highest elevations at this time and melting rapidly. Any additional precipitation events that hit that area will have a much greater impact on streamflows than the current snowpack will as it melts out.

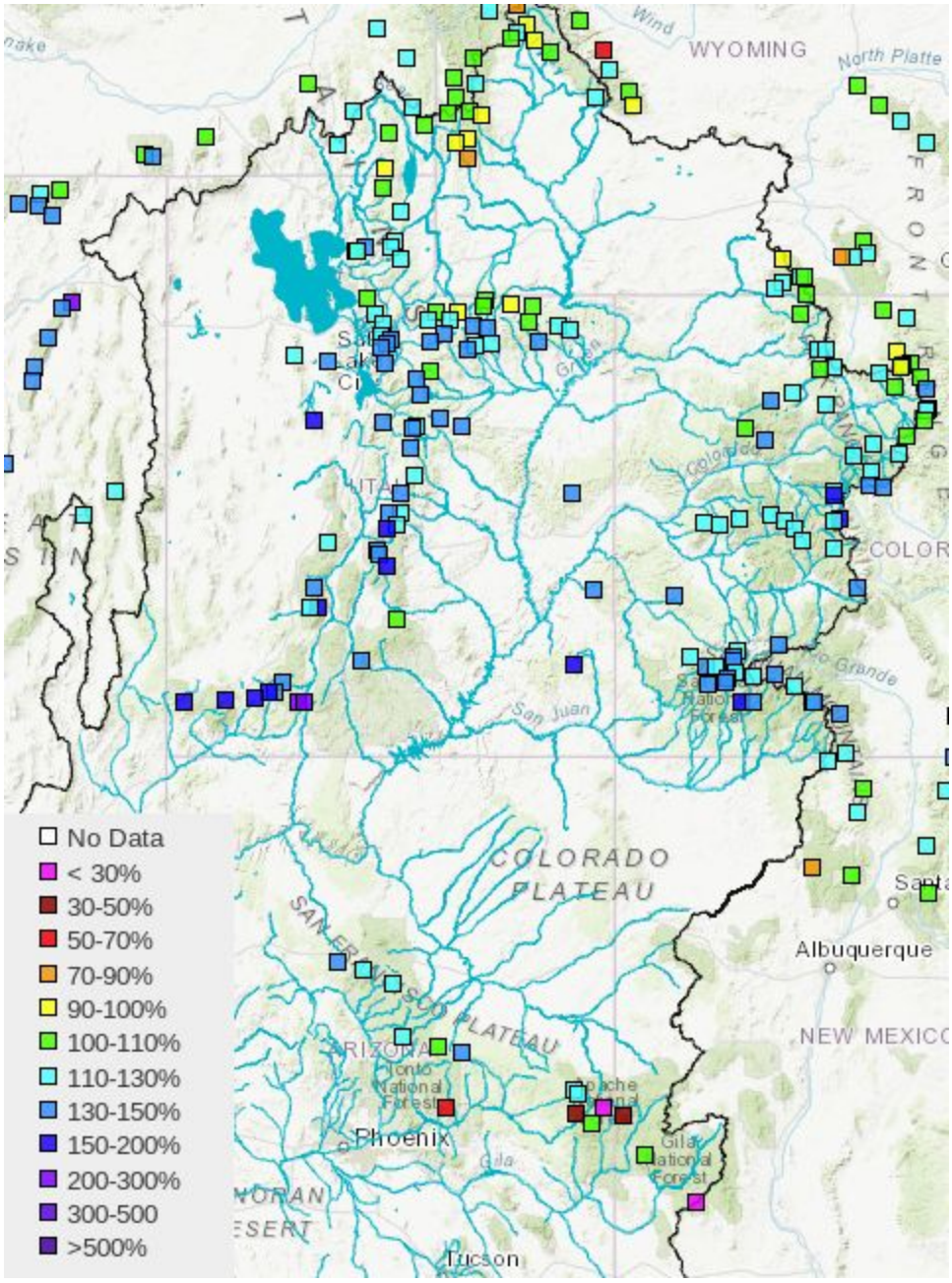
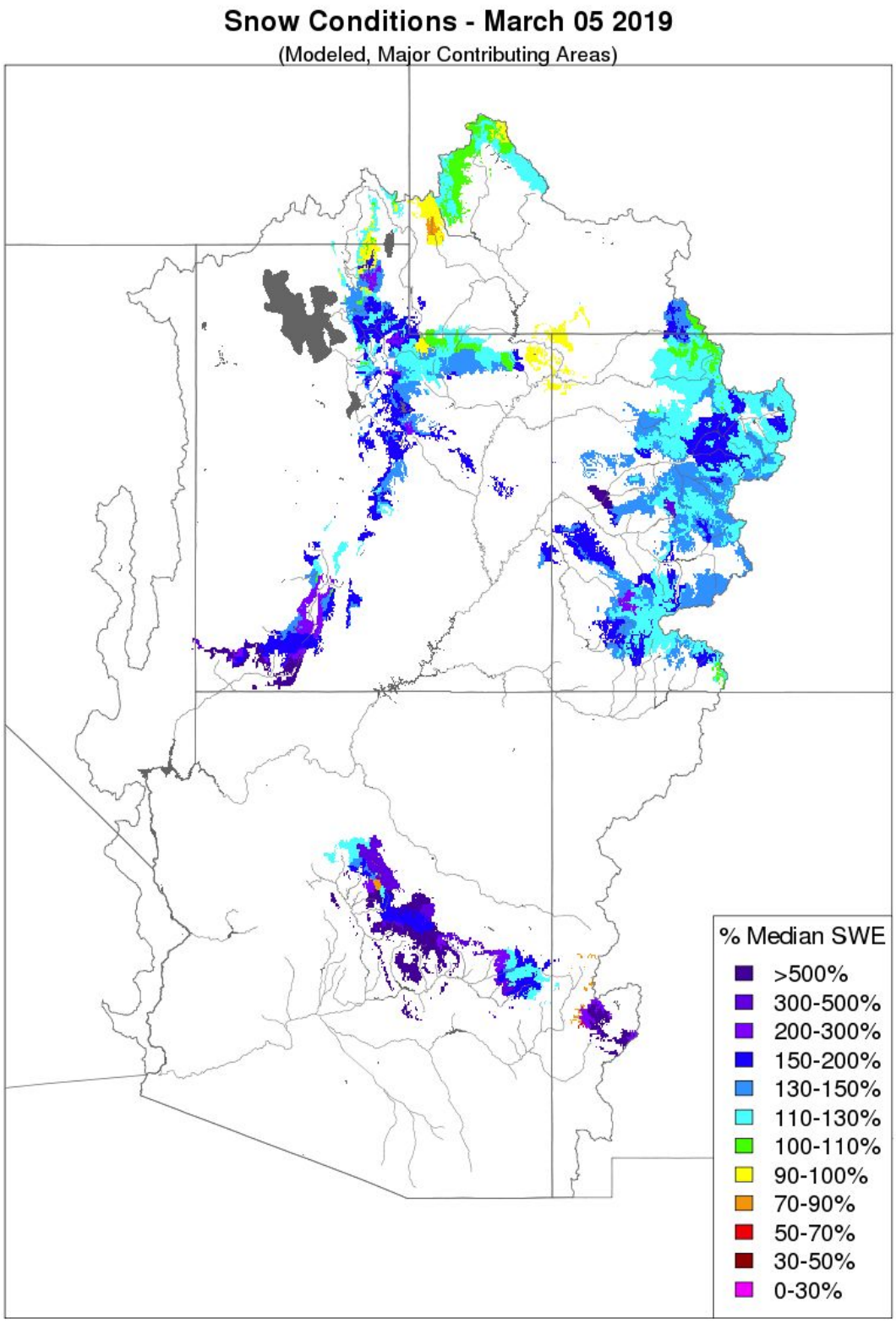


Image: Percent Median Snow Conditions as of March 5th 2019 (SNOTEL)

The image below is the representation of snow in the CBRFC hydrologic model.

Throughout the Upper Colorado River Basin and Great Basin model snow conditions correlate very closely to what SNOTEL sites indicate.



Modeled Snow: Snow representation from the CBRFC hydrologic model March 5th, 2019.

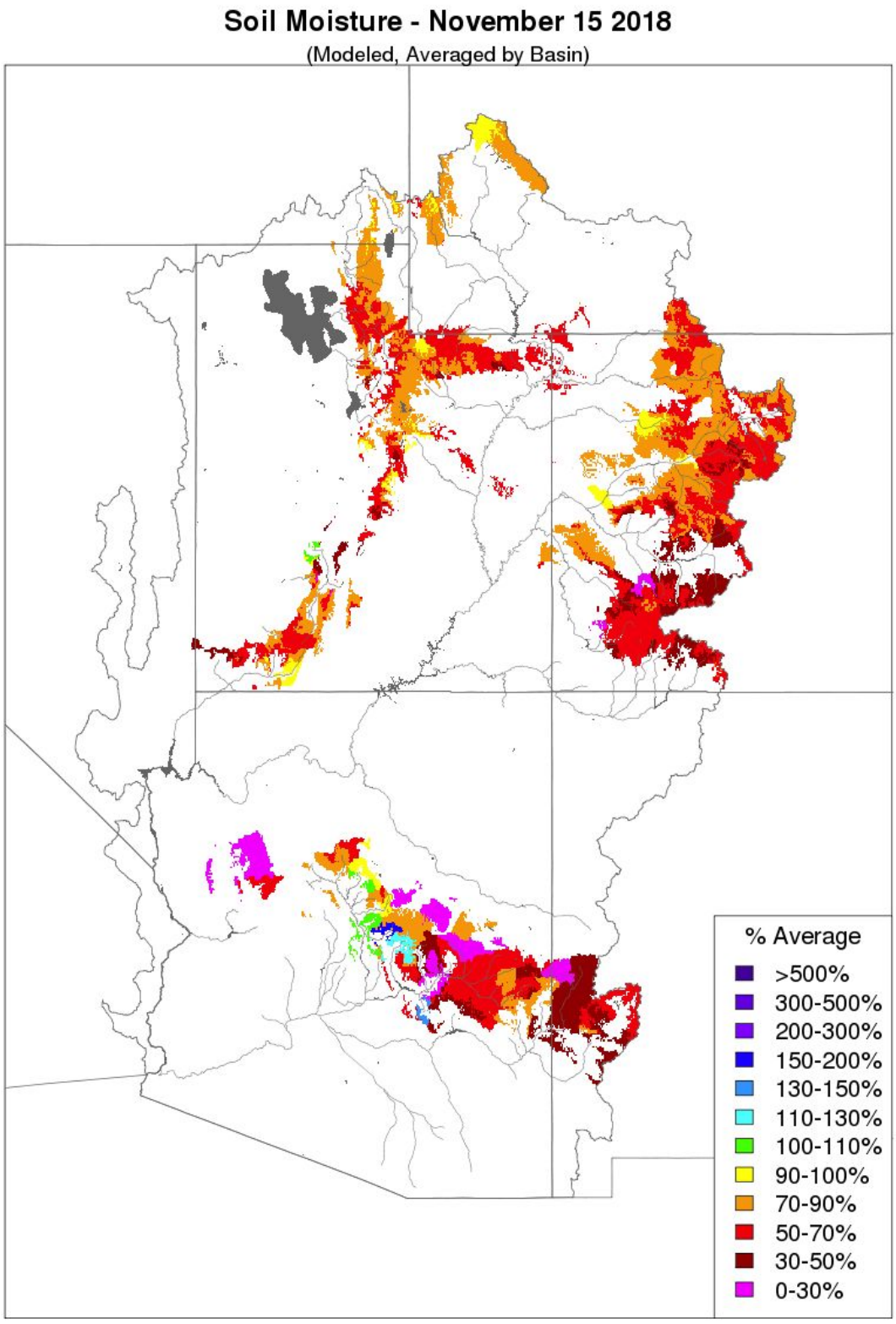
For updated SNOTEL information refer to: https://www.cbrfc.noaa.gov/lmap/lmap.php?interface=snow
For CBRFC hydrologic model snow: https://www.cbrfc.noaa.gov/rmap/grid800/index.php?type=snow

Soil Moisture:

Soil moisture conditions in the higher elevation headwater areas are important entering the winter, prior to snowfall, as it can influence the efficiency of the snowmelt runoff the following spring. The effects are most pronounced when soil moisture conditions and snowpack conditions are both much above or much below average. In areas where the soil moisture was below average entering the winter and the current snowpack is also much below median, spring runoff may be further reduced.

Modeled soil moisture conditions as of November 15th were below average over most of the Upper Colorado River Basin and Great Basin. In the Upper Colorado River Mainstem River Basin, soil moisture conditions were below average in headwater basins along the Continental Divide, and closer to average downstream. Soil moisture conditions in the Gunnison, Dolores, and San Juan basins were much below average.

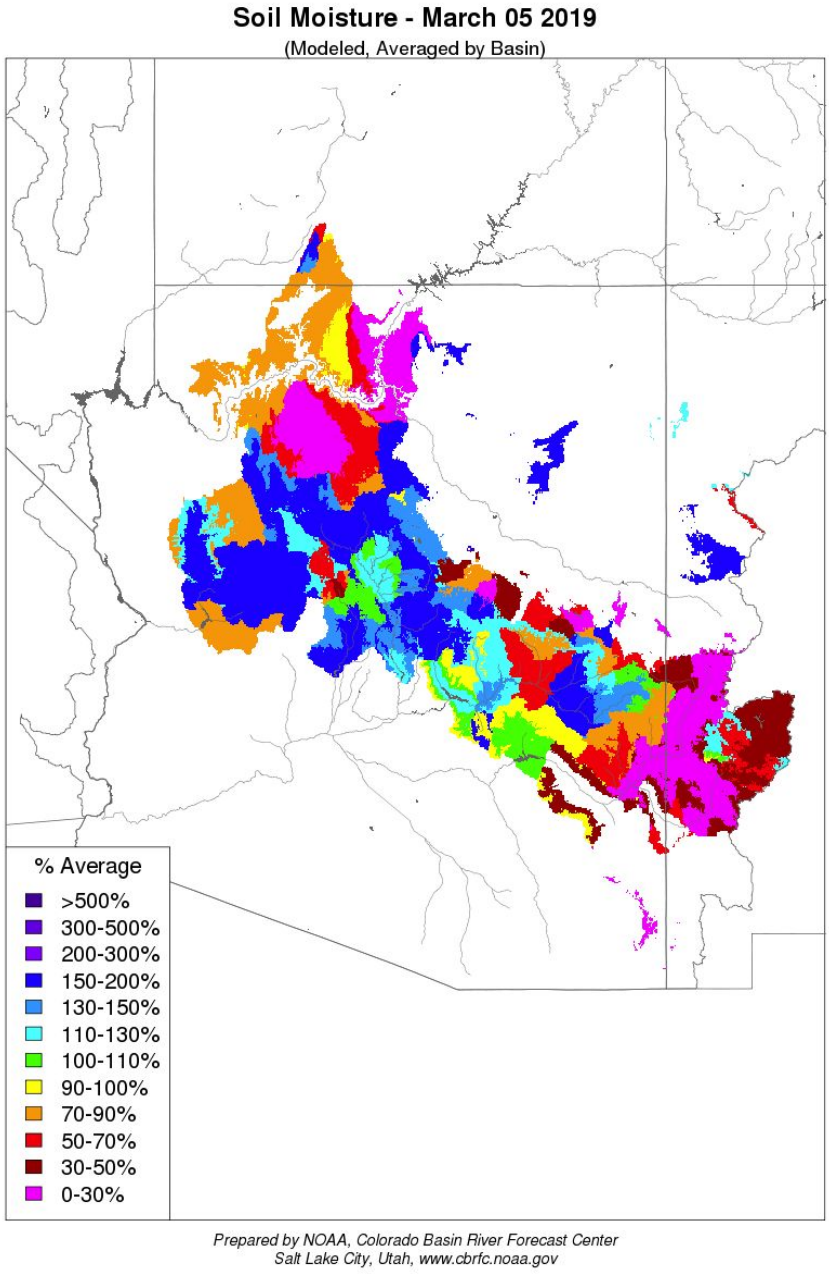
In the map below areas in cool colors (e.g blue and purple) are above the historical model soil moisture average while those in the warm colors (e.g red and orange) indicate below average conditions. Only the higher elevations which contribute the most to runoff are displayed.



CBRFC hydrologic model soil moisture entering the winter season.

Soil moisture conditions tend to fluctuate more in the Lower Colorado River Basin of Arizona and New Mexico in the winter due to the frequency of rain events and snow accumulation/melt. Soil conditions in the fall are less informative than they are in the northern basins that remain under snowpack throughout the winter season.

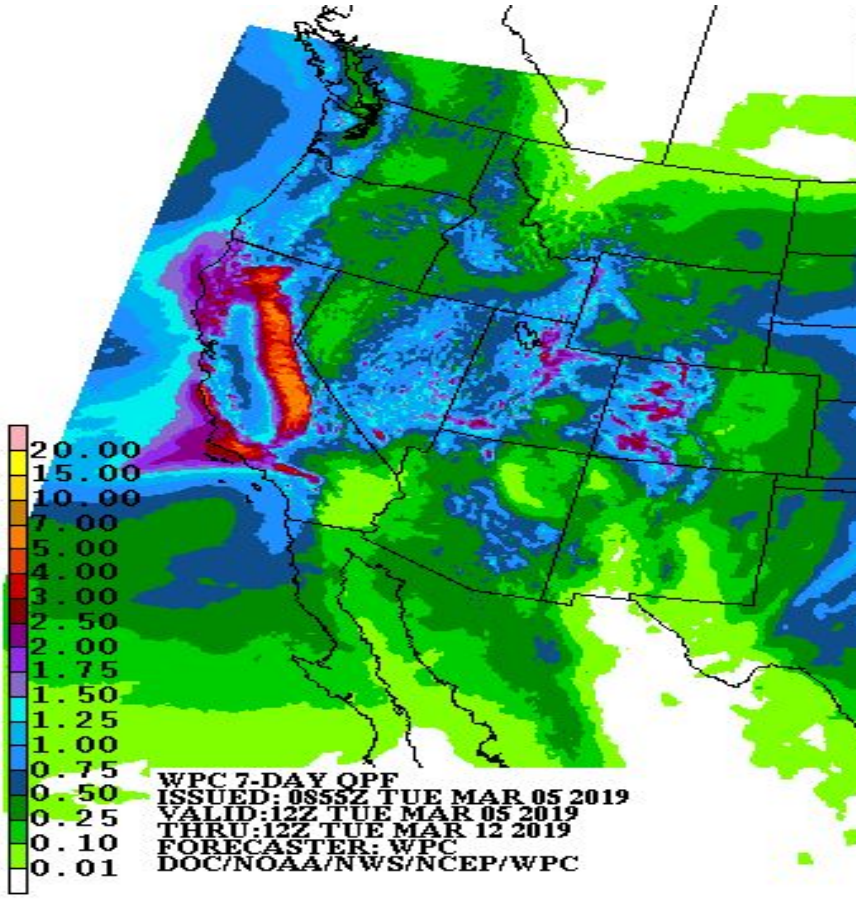
Early March soil moisture conditions have improved in the last month and are now near to above average across much of the Lower Colorado River Basin. Basins with above average soil moisture conditions (Verde, Agua Fria) are expected to experience more efficient runoff from rainfall or snowmelt. In basins with below average soil moisture conditions, a portion of any runoff that occurs from rainfall or snowmelt will likely be absorbed into the soil before contributing to streamflow.



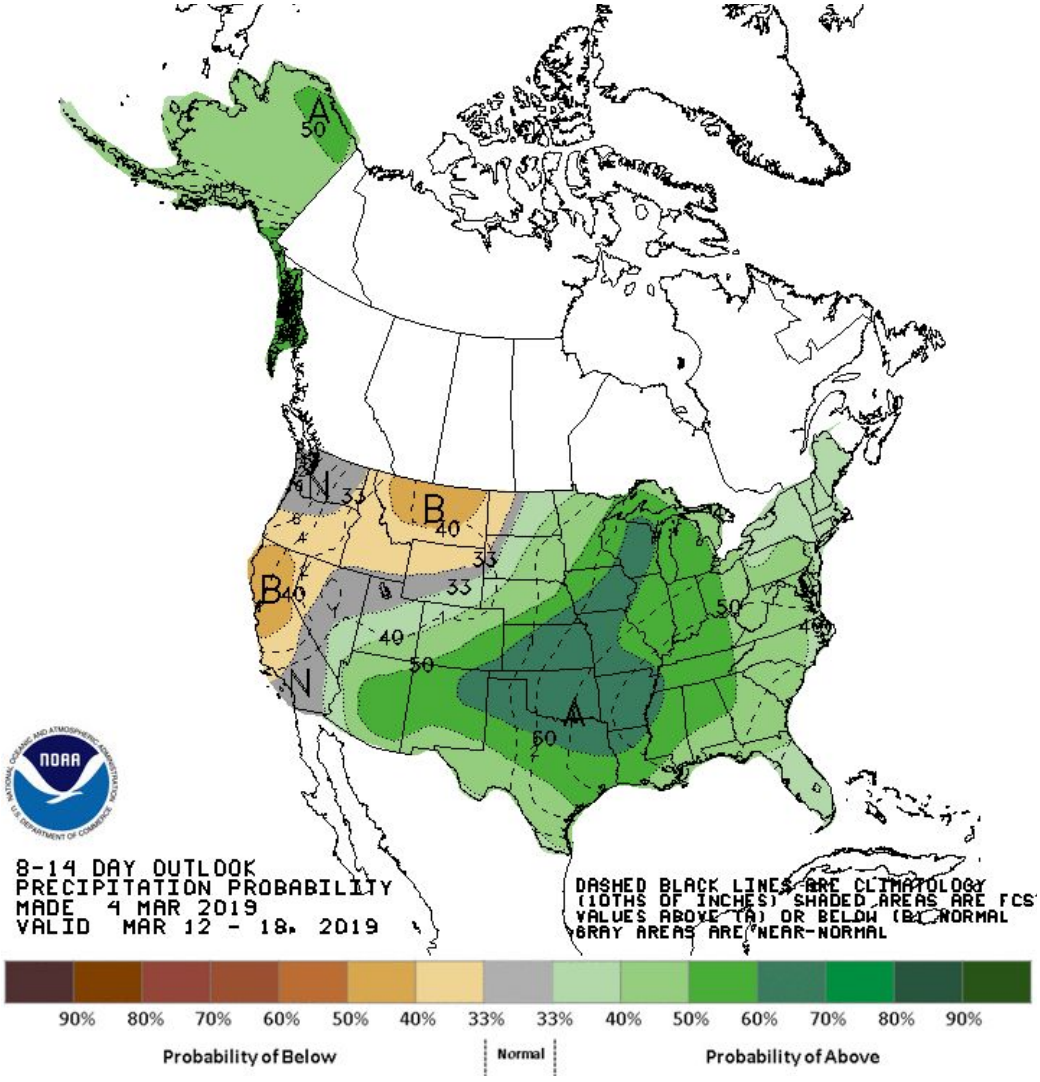
Lower Colorado River Basin (AZ/NM) CBRFC model soil moisture as of March 5, 2019.

Upcoming Weather:

The first week of March is starting right where February left off, with an active storm cycle across the Western U.S. A storm system moved across central Utah into Colorado last weekend (March 2-3), with 1-3 inches of precipitation falling over the mountain areas. Yet another storm with a good subtropical moisture tap will impact most of Utah and the northern half of Colorado on March 6. The next storm in this cycle will quickly traverse over mainly the Upper Colorado Region on March 8, providing another round of snow, albeit with more modest precipitation amounts. The very active start to March means that many locations across the Upper Colorado Region will have a high likelihood of at or above normal precip for the month of March as a whole. There is somewhat more uncertainty in the weather pattern for next week (March 11-17). While the Lower Colorado Region will not see significant precipitation from this week's systems, there is the potential for a deep closed low to bring higher precipitation amounts to areas of Arizona and New Mexico by Monday/Tuesday of next week (March 11-12). Overall, temperatures will be below normal for the first half of the month due to the persistent trough across the region.



NWS Weather Prediction Center precipitation forecast for March 5-12, 2019.



NWS Climate Prediction Center precipitation probability forecast for March 12-18, 2019.

For our online publication that contains basin conditions, summary graphics, and end of month reservoir content tables, refer to: https://www.cbrfc.noaa.gov/wsup/pub2/map/html/cpub.php