March 1, 2017 Water Supply Forecast Discussion

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

Water Supply Forecast Summary:

Somewhat drier conditions occurred for the first time in three months in parts of the Colorado River and Great Basin during February, however that was not the case everywhere. Precipitation was much above average over northern sections of the CBRFC forecast area including the Green River Basin of Wyoming, northern Great Basin, and Duchesne River Basin. Several SNOTEL sites in these areas recorded their highest February precipitation on record and many more were in the top 3 of record.

Snowpack conditions throughout the Upper Colorado River Basin and Great Basin remained quite significant as of early March. Many areas had snow conditions that exceeded 150 percent of the historical median for early March with some exceeding 200 percent of median.

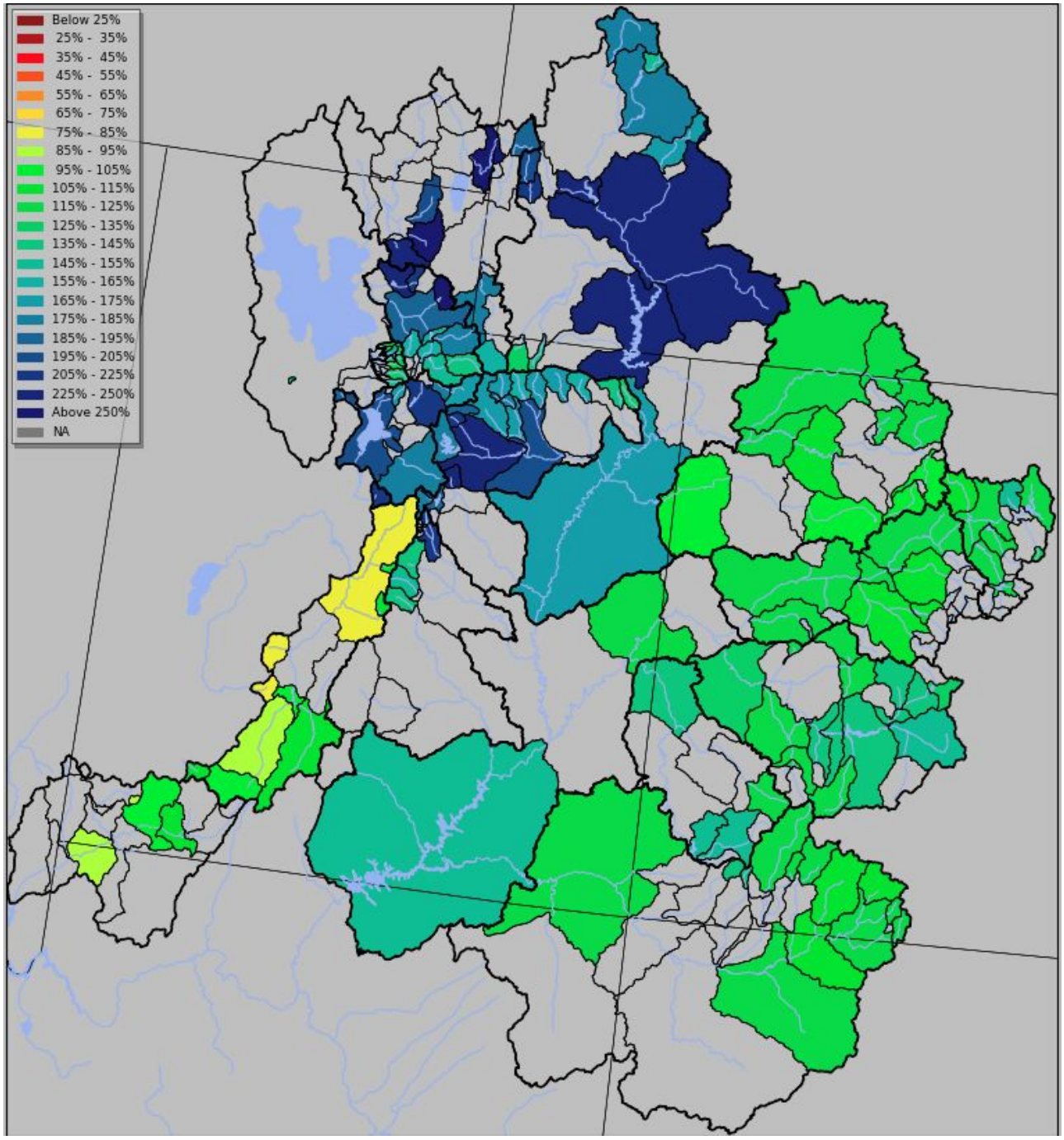
Water supply volume forecasts for the April-July period continue to be above average throughout the Upper Colorado River and Great Basins. Forecasts have continued to increase, some significantly, from those issued in early February in the wetter areas mentioned. Largest increases to forecasts between February 1st and March 1st occurred throughout the Green River Basin of Wyoming, Great Basin (Bear, Weber, Six Creeks, Provo), and Duchesne River Basin, with lesser increases in headwaters of the Colorado River mainstem and Gunnison River Basin. Some minor decreases to forecast volumes occurred in parts of the Yampa, San Juan, and Virgin River Basins. Even in those areas with decreases seasonal volume forecasts remain well above average.

Runoff volume forecasts are quite significant for some locations. These include several locations in the Green River Basin of Wyoming, Bear River Basin, Weber River Basin, and Duchesne River Basin where some April-July volume forecasts exceed 230 percent of average. Forecast runoff volumes for the Green River at Warren Bridge and Flaming Gorge Reservoir inflow would be new record maximums if they verify.

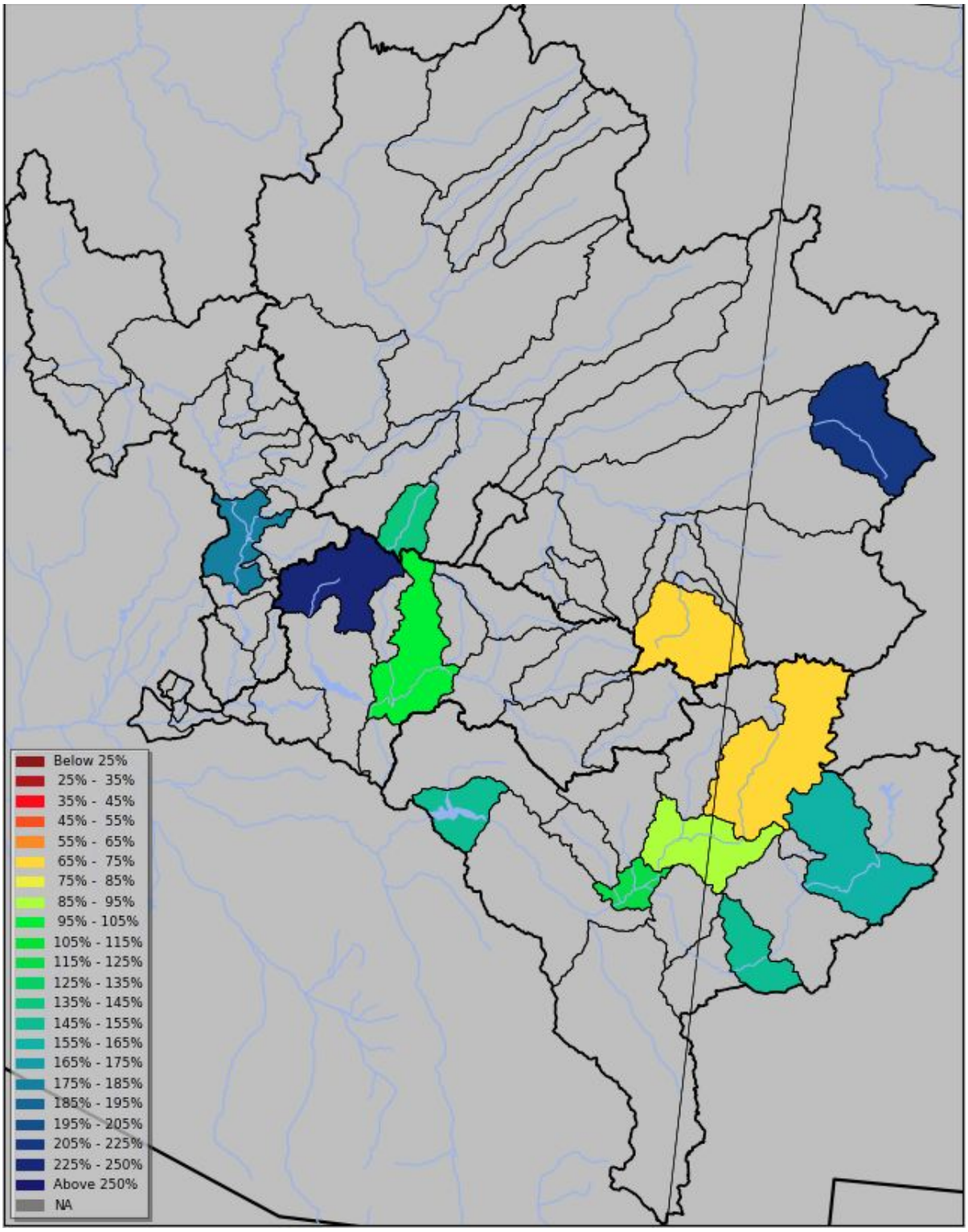
April-July unregulated inflow forecasts for some of the major reservoirs in the Upper Colorado River Basin include Fontenelle Reservoir 1.68 MAF (232% of average), Flaming Gorge 2.26 MAF (231% of average), Blue Mesa Reservoir 970 KAF (144% of average), McPhee Reservoir 440 KAF (150% of average), and Navajo Reservoir 840 KAF (114% of average). Lake Powell inflow is forecast at 10.40 MAF (145% of average),

The Lower Colorado River Basin was relatively dry for most of February prior to a storm system at the end of the month. This system brought parts of the Verde and Little Colorado River Basin to above average precipitation for the month. Runoff from the storm system was enough to increase the overall January-May volumes particularly in the Verde River Basin. The outlook for the March-May period is for much above median volumes in the Verde River Basin, Gila River Basin headwaters, and parts of the Little Colorado River Basin due to saturated soils and efficient runoff from any additional precipitation that occurs.

Seasonal Water Supply Forecasts:



Upper Colorado, Great, Virgin River Basins: 2017 April-July forecast volumes as a percent of 1981-2010 average (50% exceedance probability forecast)



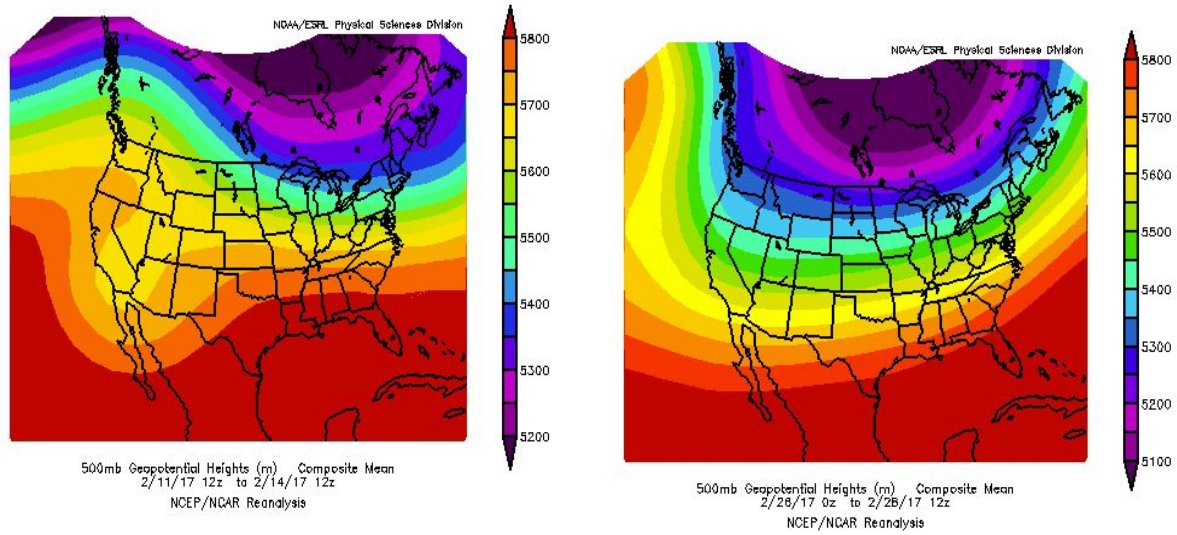
Lower Colorado Basin (AZ/NM): 2017 Marc -May forecast volumes as a percent of 1981-2010 median (50% exceedance probability forecast)

For specific site water supply forecasts click here

Water Supply Discussion

Weather Synopsis:

The February weather pattern brought a mix of dry and record warm conditions along with some fairly potent storm systems. Similar to what has occurred throughout the winter, storm systems tapped rich moisture sources in the Pacific Ocean and transported that moisture into the West Coast and on occasion farther inland to the Great Basin and Colorado River Basin. Such a system impacted primarily the northern Great and Green River Basins the second week of February. Mild temperatures with this system melted some low elevation snow and combined with rain that resulted in low elevation flood issues. Later in the month a cold storm system brought additional snow to northern areas while subtropical moisture was tapped and impacted parts the Lower Colorado River Basin in Arizona.



Upper Air Pattern (approximately 18,000 feet) during February 2017
Left: Mid month storm system with a strong southwest flow that favored many northern areas.
Right: Storm system at the end of that brought significant moisture to parts of southwest Arizona.

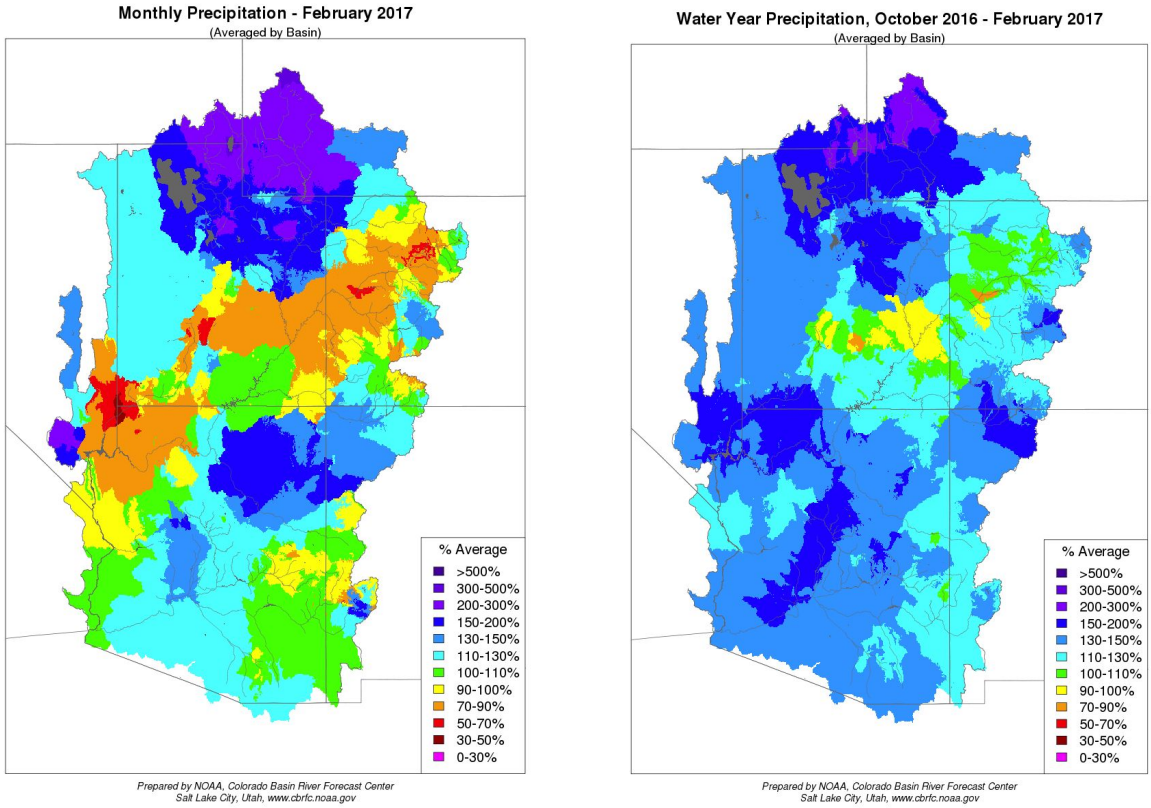
Precipitation and Temperature:

The February monthly precipitation image below indicates very wet conditions over the northern third of the CBRFC forecast area, above average precipitation over most of the Lower Colorado River Basin of Arizona and New Mexico, with a swath of below average precipitation over parts of the Yampa River Basin, Colorado River mainstem, and lower Gunnison River Basin. The distribution of precipitation during the month generally favored the northern areas during the first half of the month and the southern areas, that include the San Juan and Lower Colorado River Basin, during the last week of the month.

The wettest areas in the north, that include the Bear River Basin and Green River Basin of Wyoming, received precipitation amounts that ranged from 250 to over 400 percent of average. With a few exceptions, most SNOTEL sites in the Green River Basin of Wyoming, Bear River Basin, Weber River Basin, Six Creeks drainages, Provo River Basin, and Duchesne River Basin have received December through February precipitation that ranks as the highest on record. Most records for these sites range from 34-39 years in length. This is noteworthy since SNOTEL sites are high elevation sites and best represent the conditions where April-July runoff is generated.

Water year (October 2016 - February 2017) precipitation is above average throughout the CBRFC forecast area and

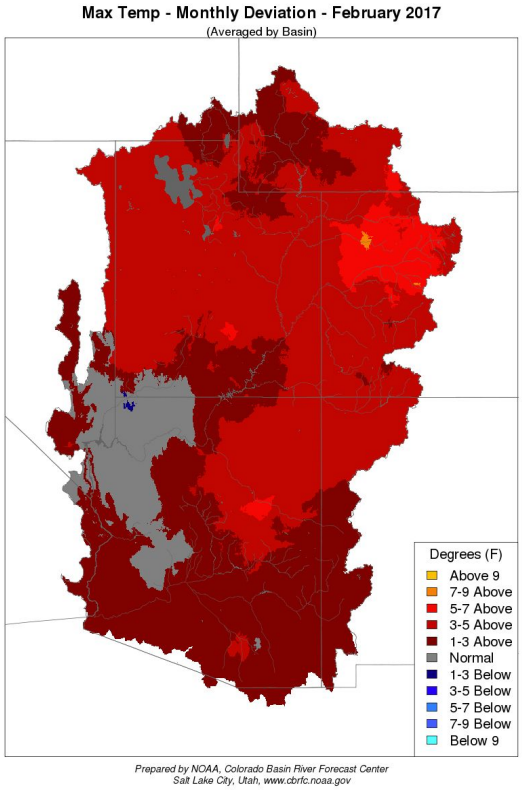
now exceeds 200 percent of average over parts of the Green River Basin of Wyoming and Bear River Basin.



Images: February 2017 and water year (Oct 2016-Feb 2017) precipitation graphics
(Averaged by basins defined in the CBRFC hydrologic model)

Overall, February was a warm month with mean daily temperatures reaching levels of 15 to 25 degrees above average on several occasions. This was most notable during the first and third weeks of the month ahead of storm systems. The mild temperatures caused snowmelt at lower elevations that resulted in saturated soils. Rainfall, combined with the wet soils and snowmelt, led to some flooding issues particularly across low elevation areas in parts of the Bear River Basin in northern Utah and southern Idaho.

Maximum and minimum monthly temperature deviation from average are displayed in the image below. Several new temperature records were set at various locations during the month and included both daily maximum and high minimum temperatures.



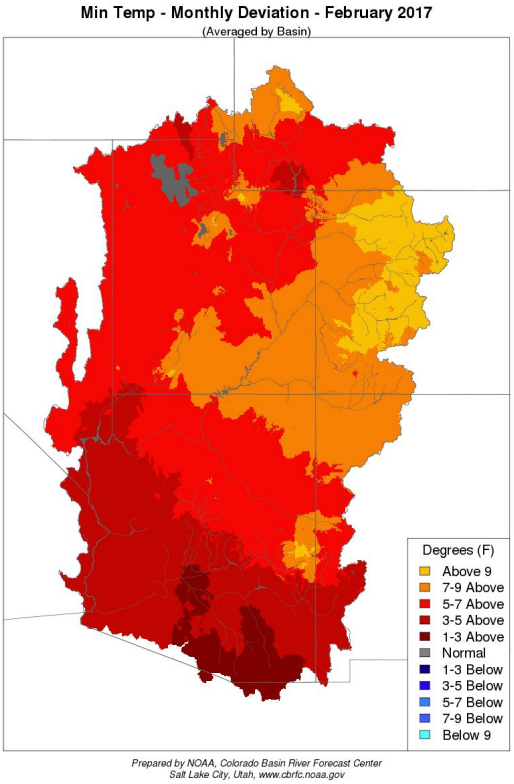


Image: Monthly maximum and minimum temperature departure from average for February 2017.
(Averaged by basins defined in the CBRFC hydrologic model)

Snowpack:

A considerable snowpack exists in much of the Upper Colorado River Basin and Great Basin with several sites at record high levels for early March. Several locations in the Green River Basin of Wyoming, Duchesne River Basin, and Bear River Basin range from 175 to 200 percent of the historical median. Snowpack conditions in the upper Gunnison River Basin range from near 150 to 190 percent of median. A few sites in the Yampa and White River Basins are near average, while elsewhere in the Upper Colorado River Basin and Great Basin snowpack conditions are generally between 120 and 160 percent of median.

The end of month storm system in the Lower Colorado River Basin also pushed snow conditions back above median at higher elevations in the Salt River Basin and Verde River Basin.

The SNOTEL map image below indicates a widespread heavy snowpack across much of the CBRFC forecast area. Those sites depicted by a dark blue or purple marker have a snowpack ranging from 150 to 300 percent of median for early March.

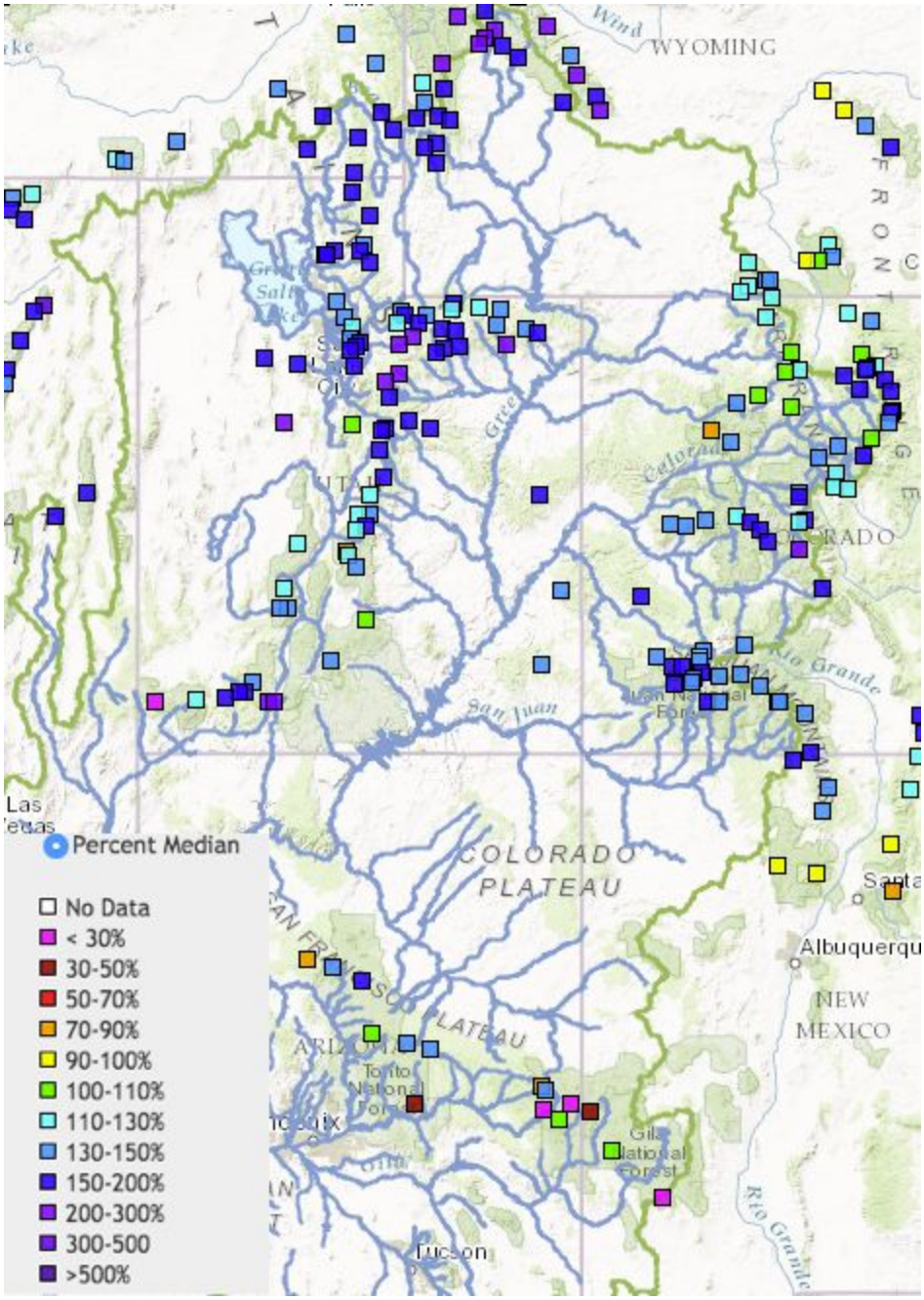
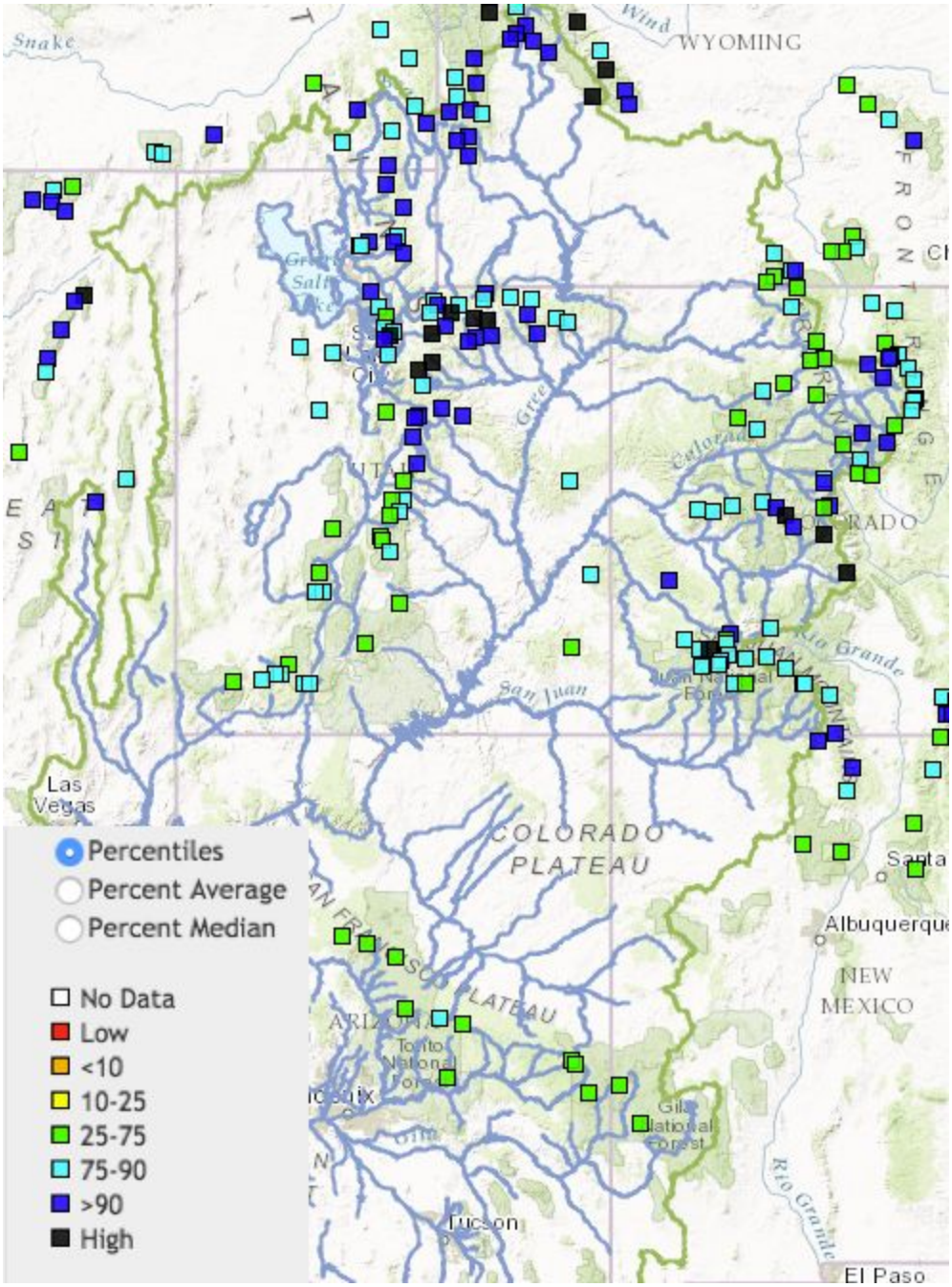


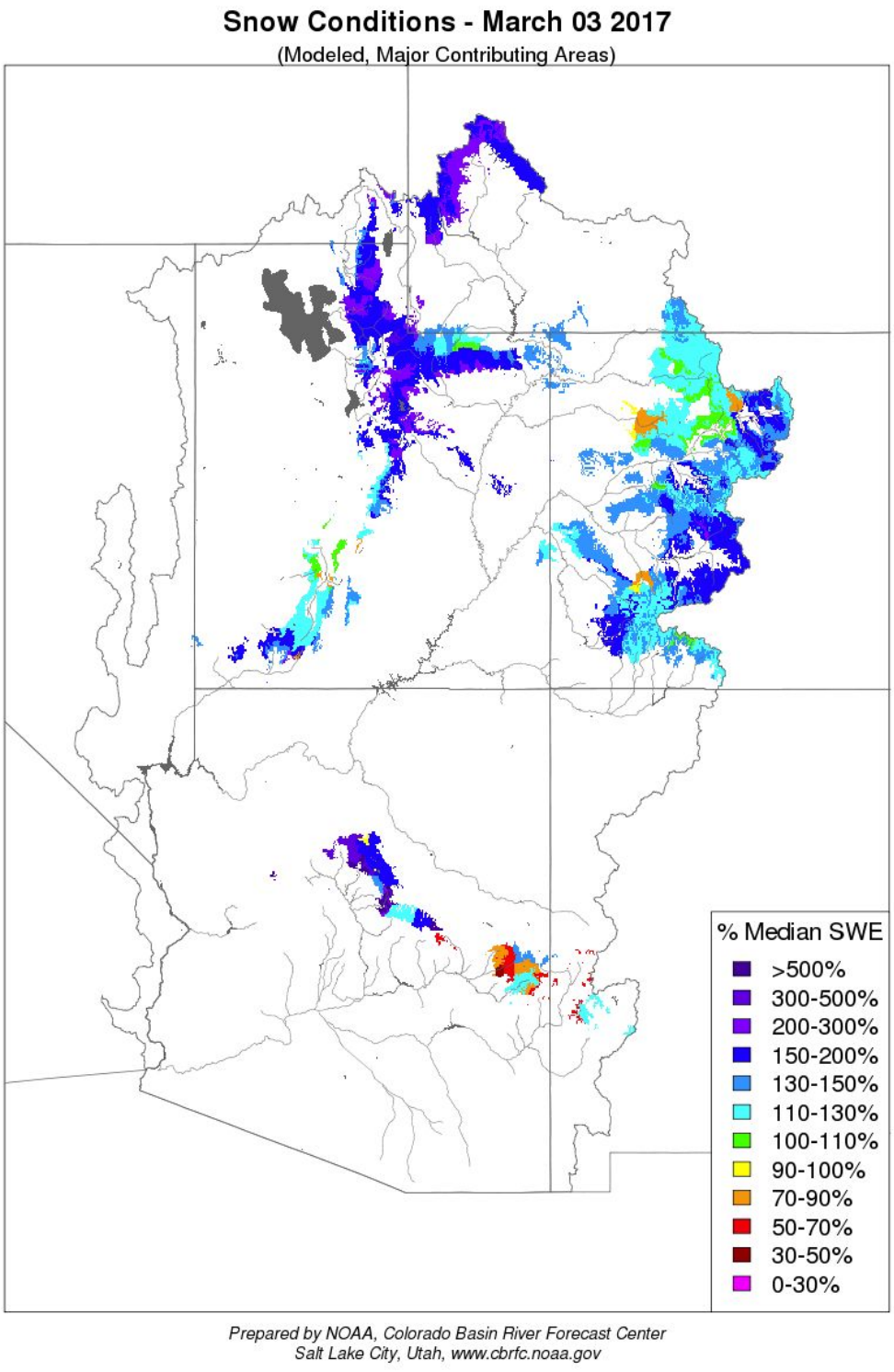
Image: Percent Median Snow Conditions as of March 3rd 2017

The snow percentile image displayed below indicates where the current snow measurement ranks in the historical record for each site. Several sites are now depicted with black boxes indicating these are the highest values on record for this time of year. Sites in the dark blue are in the top 10 of record (typically 34-39 years) with most ranking as either the 2nd or 3rd highest for this time of year. Also of note is that sites depicted by dark blue or black have already exceeded (some by a significant amount) their annual peak snowpack that typically occurs anywhere from late March to early May.



Snow Percentile Image: Historical SNOTEL ranking as of March 3rd 2017

The image below is the representation of snow in the CBRFC hydrologic model. Only those areas that provide the greatest contribution to the April-July runoff volumes are displayed. The snow represented in the model closely mirrors the SNOTEL image. The takeaway message is significant snowpack is widespread as indicated by the hydrologic model. Largest snowpack areas compared to the historical median extend from central Utah through northern Utah into Wyoming and include primarily the Duchesne Basin, northern Great Basin, and the Green River Basin of Wyoming. Largest streamflow volumes with respect to average are forecast for these areas.



Modeled Snow: Snow representation from the CBRFC hydrologic model March 3rd 2017

For updated SNOTEL information refer to click here

For CBRFC hydrologic model snow click here

Soil Moisture:

Soil moisture conditions in the higher elevation headwater areas are important entering the winter, prior to snowfall, as it influences the efficiency of the snowmelt runoff the following spring. Modeled soil moisture conditions as of November 16th were above average over much of the Upper Green River Basin, Bear River Basin, and Duchesne River basins. Elsewhere in both the Great Basin and Upper Colorado River basin the modeled soil moisture conditions were 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 are displayed and the areas in white are not included.

A significant snowpack, that exists in several areas this year, can lessen the impact of dry soils on spring runoff volumes compared to years with a snowpack that is near or below normal. Similarly those areas that entered the winter season with above average soil moisture that also have a significant snowpack may experience enhanced runoff conditions this spring.

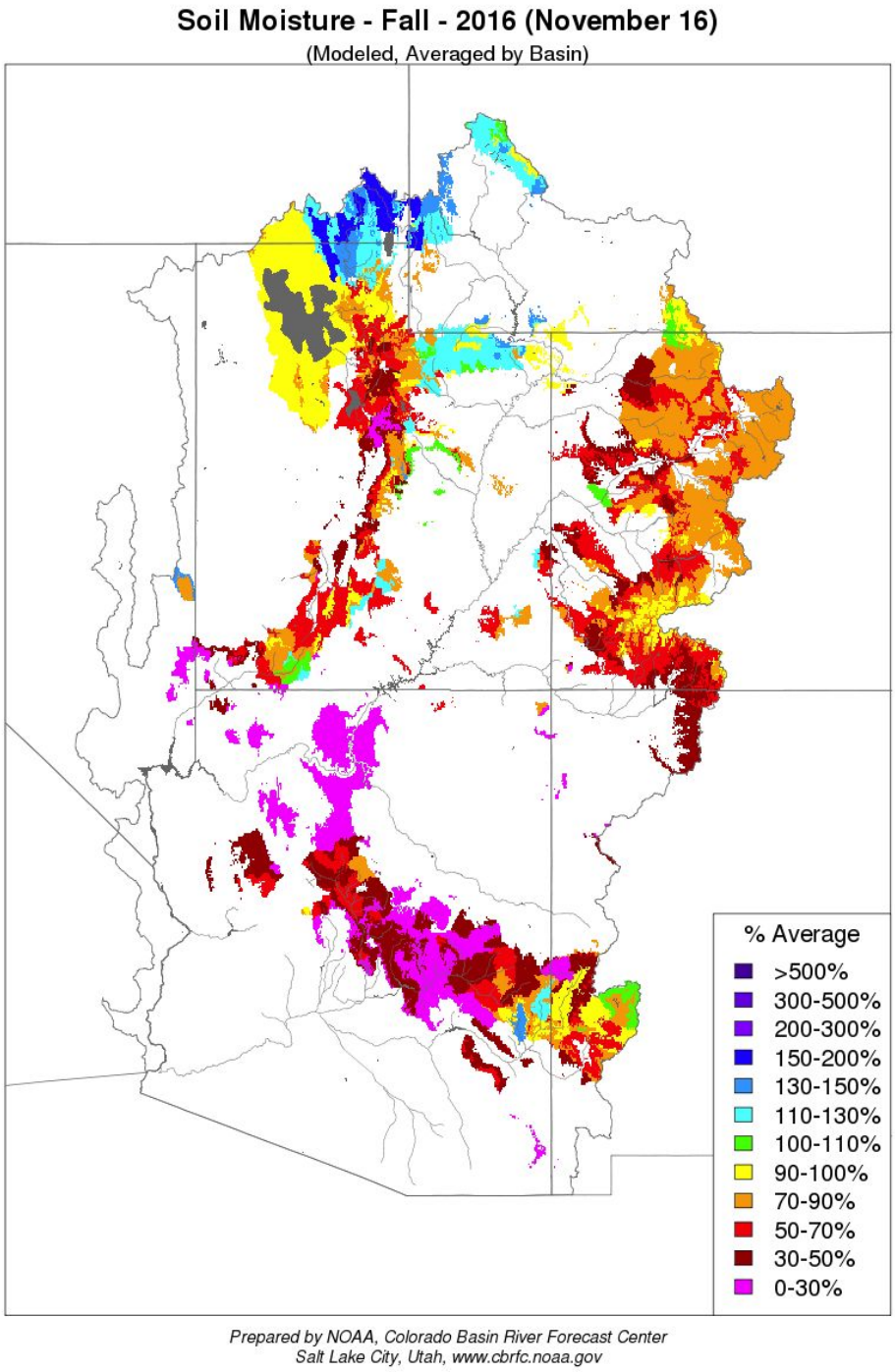


Image: Modeled soil moisture from the CBRFC hydrologic model entering the winter season

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 possibility of melting snow. Soil conditions in the fall are less informative than they are in the northern basins that remain under snowpack throughout the winter season. In the image below modeled soil moisture conditions are above average in the upper Gila River Basin and parts of the Little Colorado, Salt and Verde River Basins as of early March. These areas have experienced efficient runoff and significant streamflow rises due to recent rainfall. They are likely to continue experience more efficient runoff due to additional rainfall or snowmelt that may occur over the next few weeks.

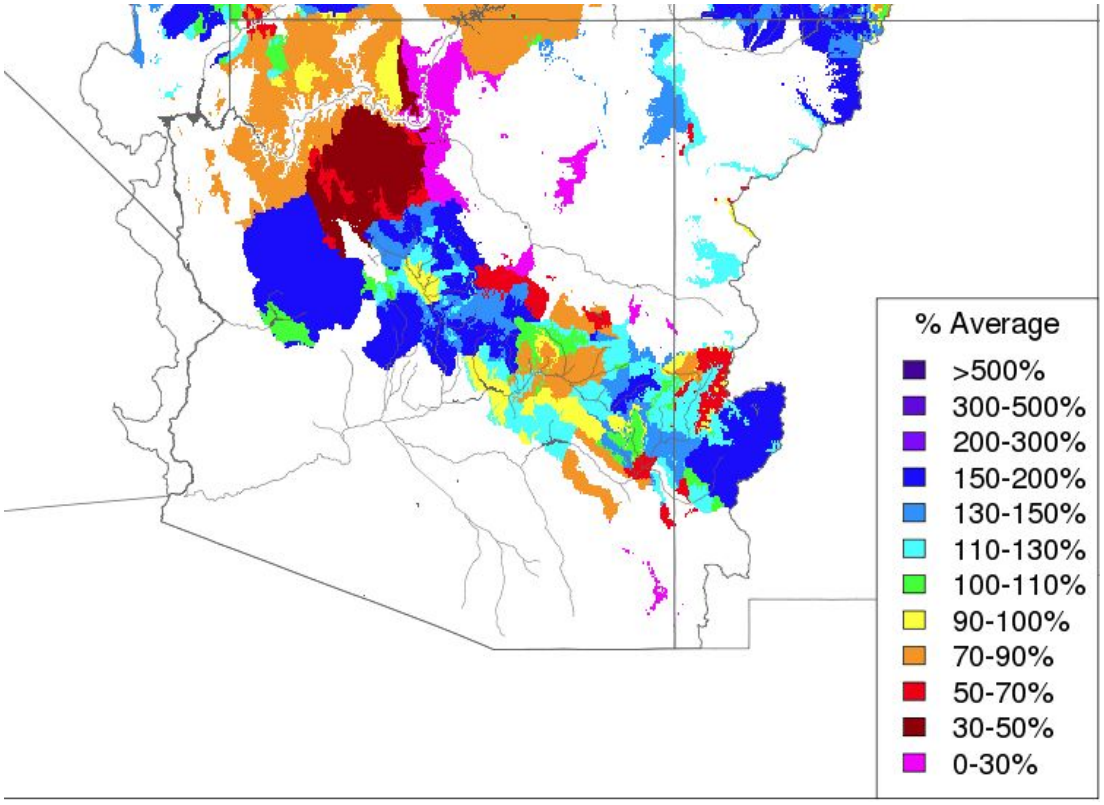


Image: Model soil moisture Lower Colorado River Basin (AZ/NM) as of March 3rd 2017

The following image is from the CBRFC hydrologic model and it indicates where the model suggests soils are becoming saturated. Typically it does not have much meaning during the winter season in the Upper Colorado River Basin and Great Basin as soil conditions remain fairly static under the snowpack. Higher elevations typically fall into red and orange categories this time of year prior to snowmelt. Dark green areas indicated in the model suggest soils are becoming saturated and these areas would experience more efficient runoff from snowmelt or additional rain. The dark green areas across lower elevations of the Bear River Basin in northern Utah and southern Idaho are saturated according to the model. This area has already experienced some flood related issues and will continue to experience very efficient runoff from additional snowmelt or rainfall this spring. Another area that is saturated are lower elevations in southwest Wyoming but they are not shown on this particular image.

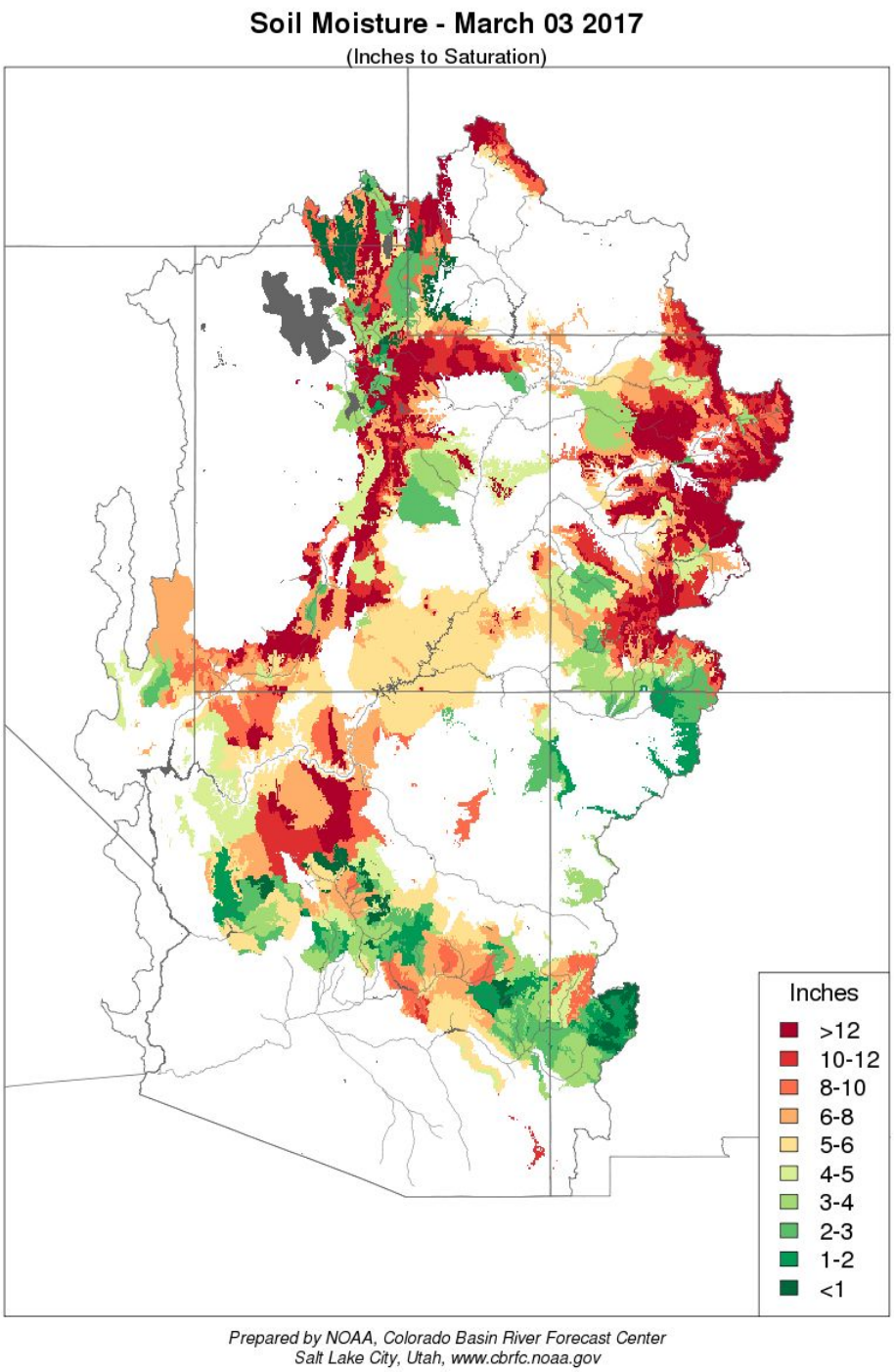


Image: Model saturation as of March 3rd 2017.

Upcoming Weather:

At this time, a couple of storm systems are expected to impact the Great Basin and Upper Colorado River Basin during the first half of the month. Between systems several days of dry weather with above average temperatures are likely. Storm systems do not appear likely to impact the Lower Colorado River Basin significantly in early March.

The main impact is that the snowpack in the higher elevations in the Great and Upper Colorado River Basins will likely be retained at least through mid month and possibly increase in these areas as well.

The impact of the early March weather pattern on water supply forecasts may not result in significant changes in the near term, but possible increases could occur if the pattern remains progressive with additional storms throughout the month.

The map below, from NOAA's Weather Prediction Center, illustrates 7-Day forecasted precipitation totals from March 4th through March 11th.

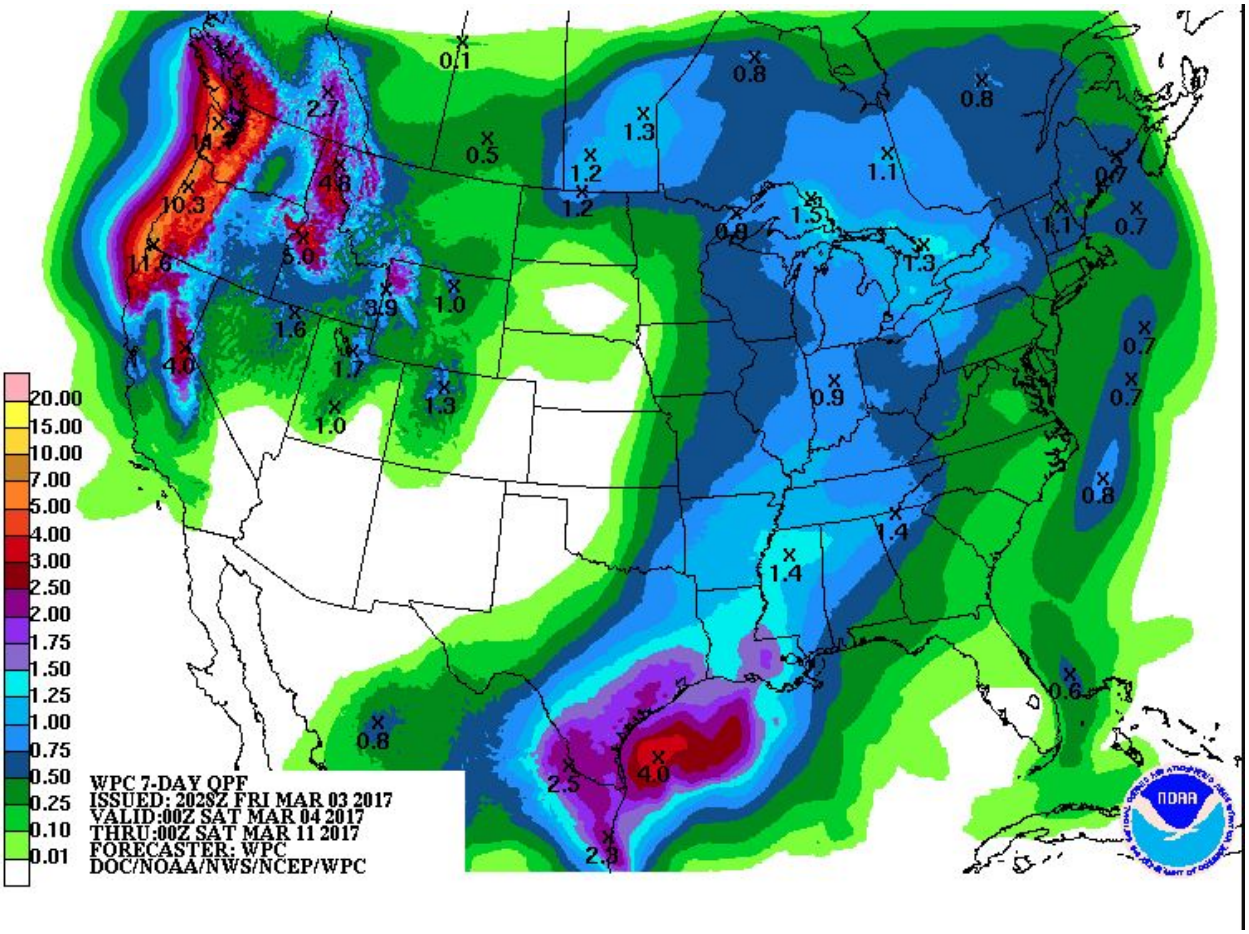


Image: NWS Weather Prediction Center precipitation forecast for Mar 4th - Mar 11th 2017

End Of Month Reservoir Content Tables

- Green River Basin
- Upper Colorado River Basin
- San Juan River Basin
- Great Salt Lake Basin
- Sevier Basin

Basin Conditions and Summary Graphics

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