June 1, 2015 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.

Seasonal Water Supply Forecasts:

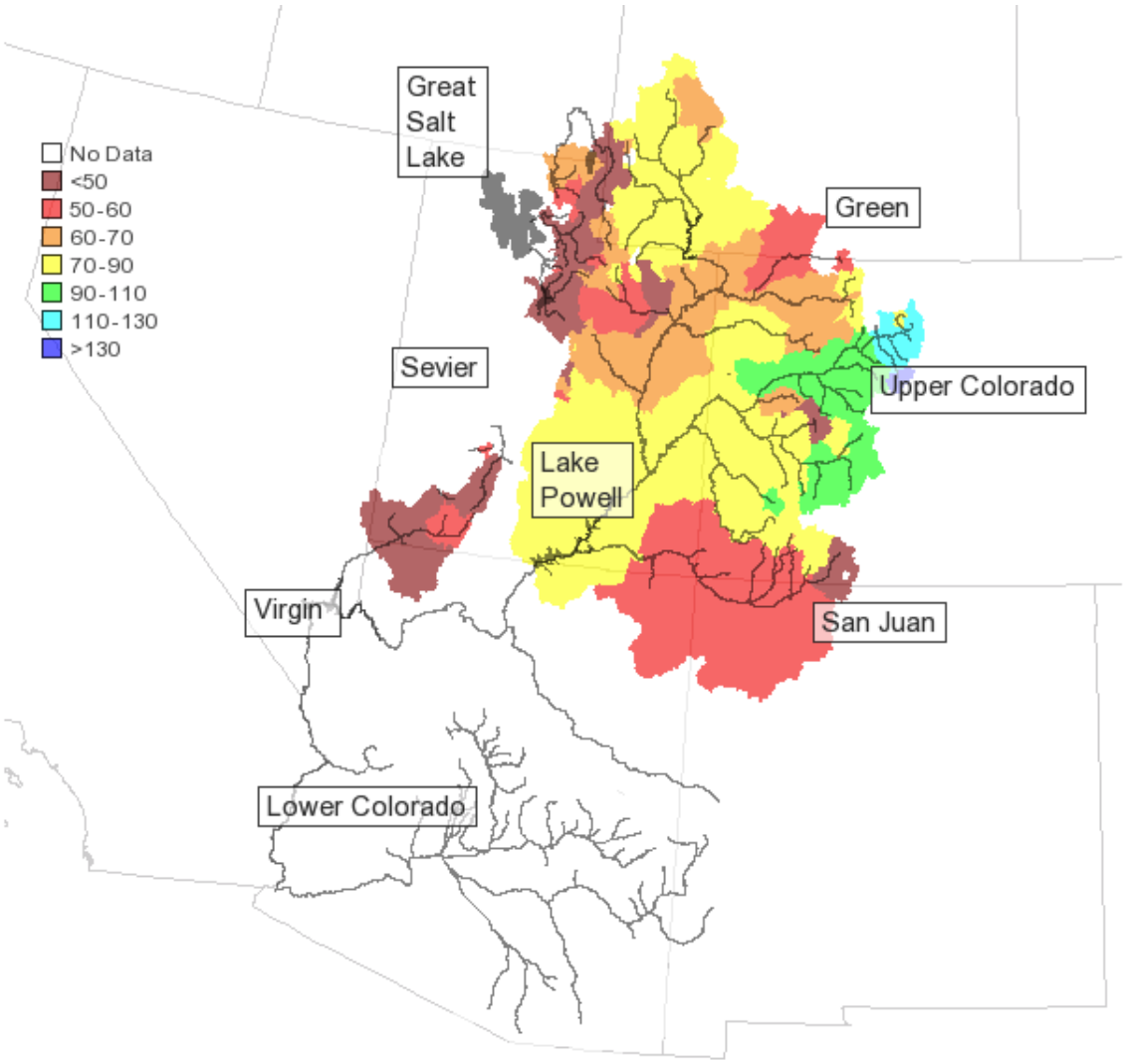
Quick Summary:

May was a complete reversal of the 2014-2015 winter season as significant precipitation and below average temperatures occurred throughout the month. Monthly precipitation amounts were impressive with several locations throughout the CBRFC forecast area receiving between 200 and 400 percent of their May average and some locations nearing record amounts. Cooler temperatures also delayed melting of the higher elevation snowpack resulting in higher June runoff volumes than previously anticipated.

Snowpack was at or near record low levels at many locations entering May with much below average April-July runoff volumes expected particularly in the Great Basin, Duchesne River Basin and areas south including the Virgin River Basin and San Juan Basin. The impact of the May precipitation to water supply forecasts varied but was most significant in these areas where a lack of runoff contribution was expected due to the lack of snow. In some river basins where heavier precipitation was observed during the month of May, April-July runoff volume forecasts issued the first of May have already been exceeded.

Although seasonal water supply forecasts improved everywhere, many remain below to much below average due to the warm dry winter. An exception to this is the Colorado River headwaters where near to above average runoff volumes are expected as snow conditions were more favorable. Lowest runoff volumes with respect to average are expected in the Great Basin and Virgin River Basin.

The increase in water supply runoff forecasts were generally 10-15 percent of the seasonal average in the Great Basin, 10-20 percent of average in the Sevier River Basin, 10-35 percent of average in the Green River Basin above Flaming Gorge and Duchesne River Basin, and 15-25 percent of average in the Upper Colorado mainstem, Gunnison, Dolores, and San Juan River Basins. The Lake Powell inflow forecast increased from 3 million to 5 million acre-feet between May 1st and June 1st and is now at 70 percent of the 1981-2010 average.



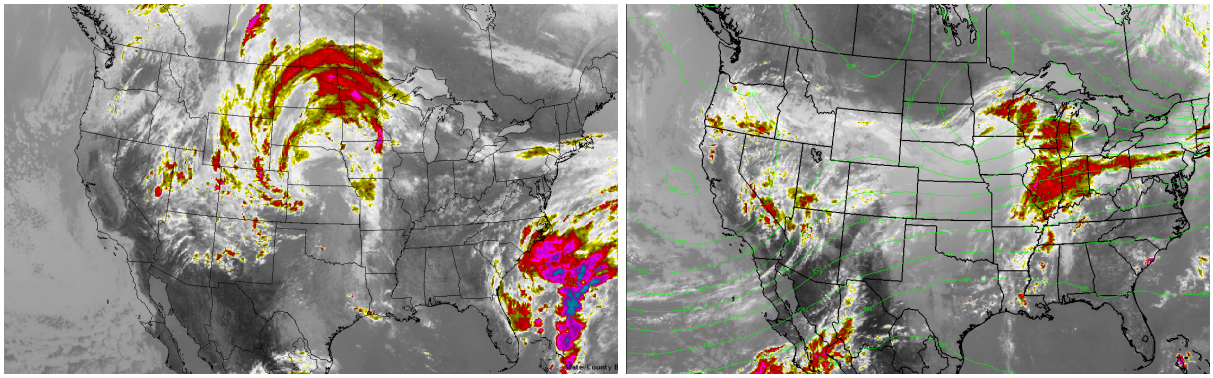
Upper Colorado Basin: April-July runoff volumes as a percent of 1981-2010 average

[Click here for specific site water supply forecasts]

Water Supply Discussion

Weather Synopsis:

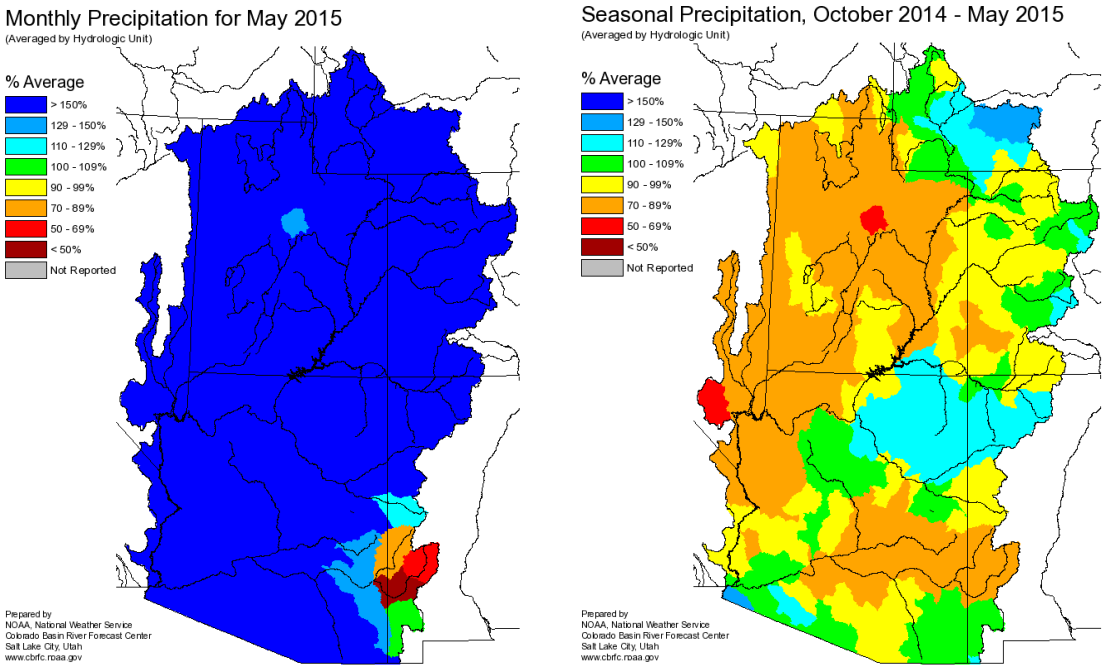
A large scale weather pattern change took place in mid April and carried throughout May. This pattern change resulted in a trough of low pressure over the western U.S. with the CBRFC forecast area subject to frequent storms. Moisture was plentiful with the storm systems and precipitation was both heavy and widespread. Below average temperatures for the month acted to preserve high elevation snowpack into early June.



Left Image: A satellite image from May 6th shows a large storm system with wrap around precipitation affecting most of the CBRFC forecast area. **Right Image:** Another storm system is preparing to move through the area shown in the satellite image from May 19th.

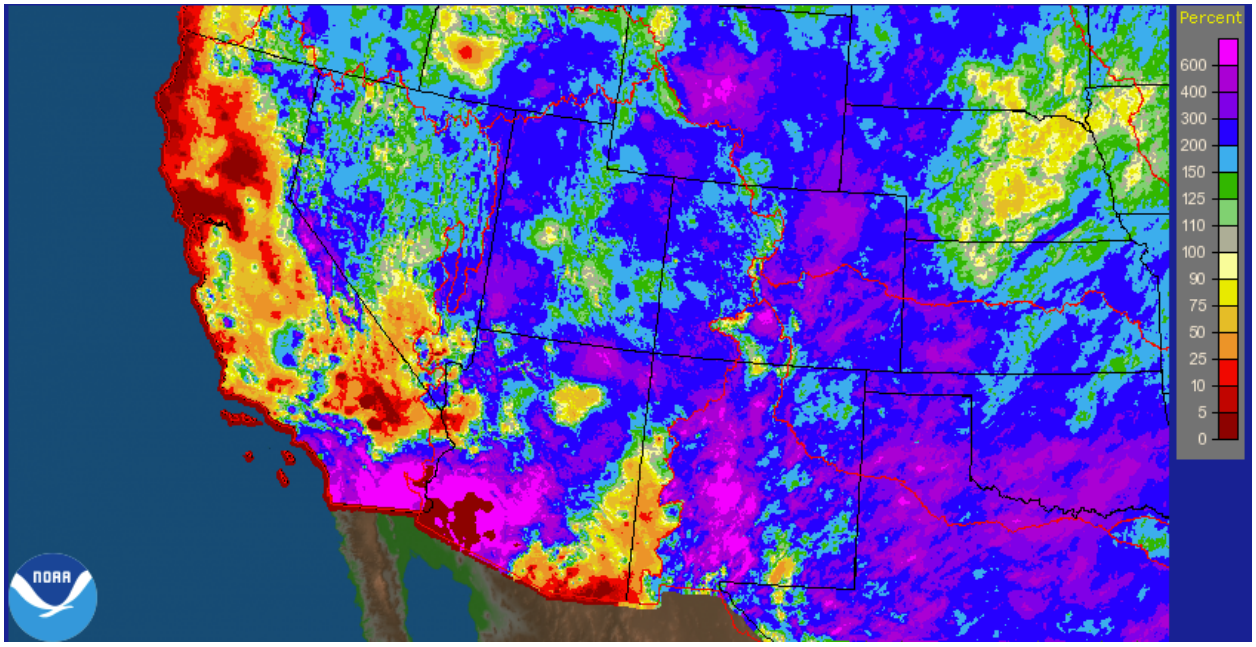
Precipitation and Temperatures:

Precipitation was much above average for May throughout the CBRFC forecast area. Many locations received between 200 to 400 percent of average precipitation with locations in the Great Basin, San Juan River Basin, and Virgin River Basin exceeding 400 percent of average. Some locations approached record amounts during the month with Logan, Cedar City and Bryce Canyon Utah reporting their second wettest May on record. Many locations in the Green River Basin above Flaming Gorge received record precipitation for the month of May. Many locations received 2-4 inches of precipitation above their May average with as much as 4-8 inches above average at some locations in the Great Basin, Virgin River Basin and San Juan River Basin.

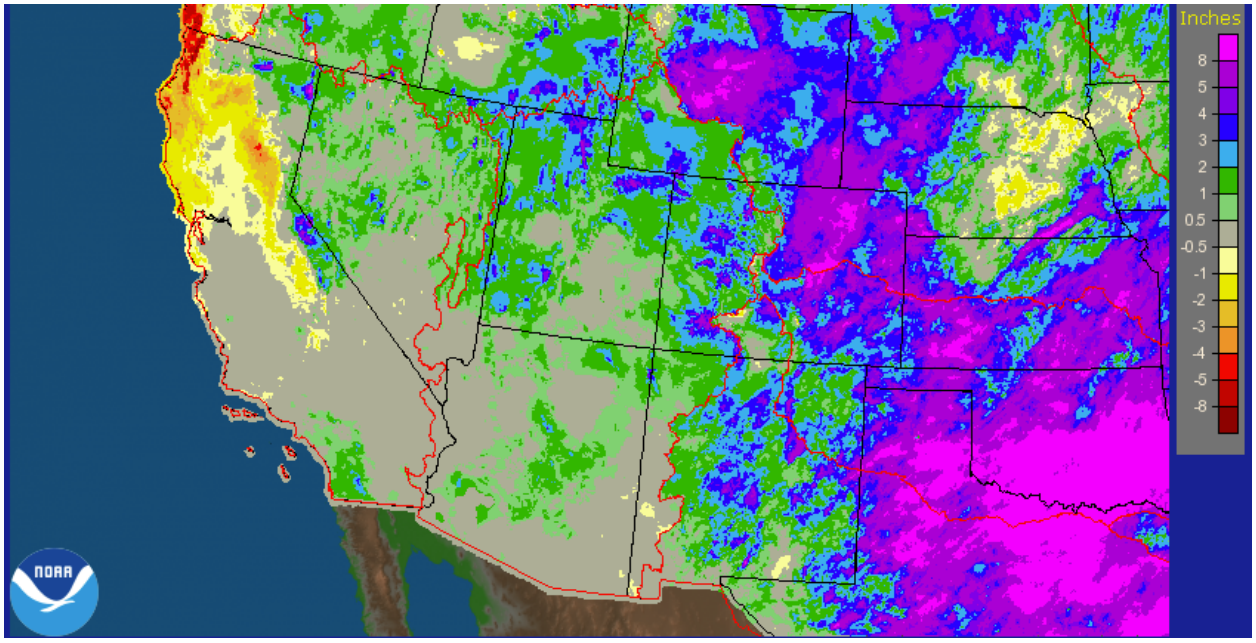


Monthly and seasonal precipitation graphics

Seasonal October - May precipitation remains well below average over much of the Great Basin extending south into the Virgin River Basin, lower elevations of the San Juan River Basin, and tributaries of the Green and Colorado Rivers in southeast Utah. Seasonal precipitation has increased closer to the 1981-2010 average over parts of the San Juan, Gunnison, and Yampa River Basins and is average or above average in parts of the Green River Basin above Flaming Gorge and Colorado River headwaters.

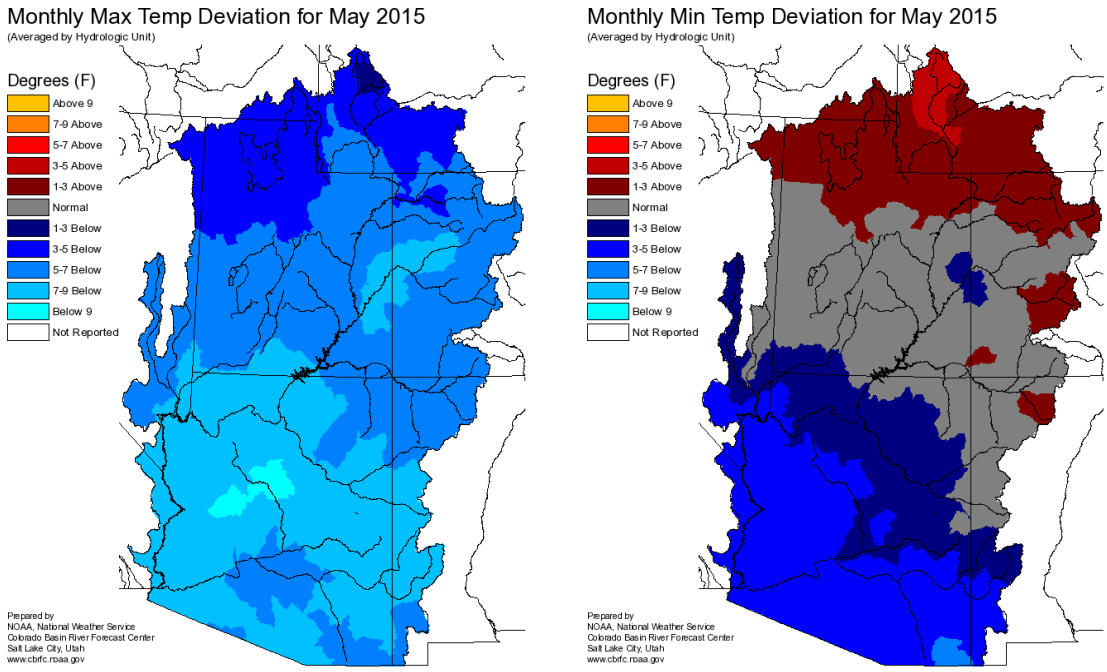


Another view of May 2015 precipitation that shows many areas in the 300-400 percent of average range



Departure from average precipitation for May 2015 in inches

Maximum temperatures during May were much cooler than average and impacted the remaining high elevation snowpack by slowing the melt and retaining the snow into early June. Minimum temperatures were near to above average in locations that were affected by frequent cloud cover.



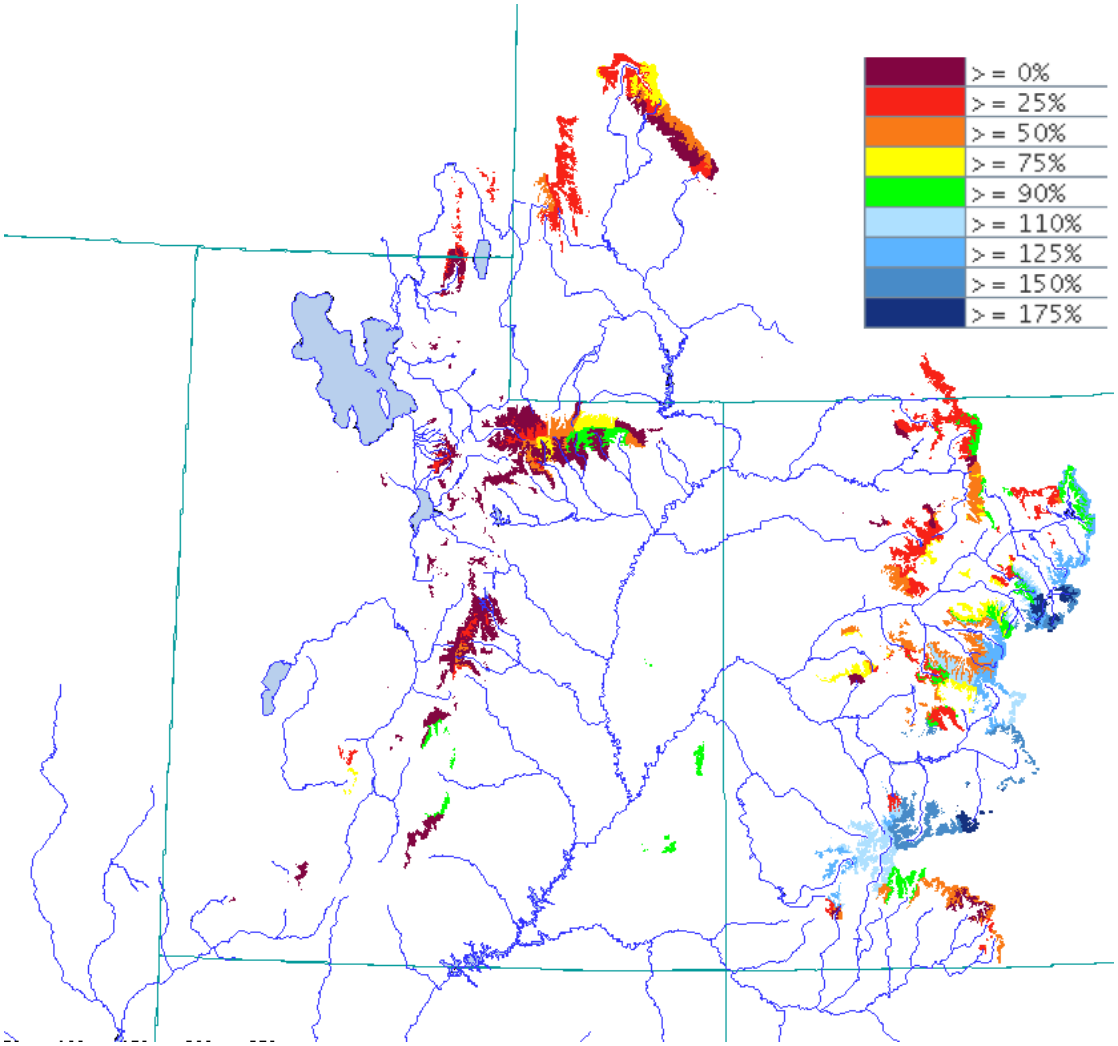
Monthly maximum and minimum temperature departure from average.

Snowpack:
The cooler wet weather in May retained remaining higher elevation snowpack into early June. The snow is primarily above 10,000 feet and not represented by SNOTEL sites of which most are located at lower elevations with many having melted out weeks ago. However, this high elevation snow is represented in the CBRFC hydrologic model. The model indicates that during May this high elevation snow either melted slower than what is typical or in some cases increased slightly.

The model representation of the high elevation snow indicates it is near or above the historical average model calibration for early June in the Colorado River headwaters, the upper Gunnison River Basin, and the Animas River Basin. However, the snowpack never reached the average seasonal peak in the Gunnison and Animas River Basins. While some June volumes may end up closer to average in these areas the April-July seasonal volumes are still expected to be below average.

In general snowpack conditions were very poor throughout the winter season with record early melt observed at many sites in the Great Basin, Virgin River Basin, Sevier River Basin, and Duchesne River Basin. With the exception of the Colorado River headwaters many areas never reached better than 70 percent of the average seasonal peak snow. The below average snowpack conditions continue to impact the April-July forecast volumes.

The image below shows CBRFC model snow as of June 3, 2015. Only areas with greater than 2 inches of snow water equivalent remaining are indicated.



CBRFC hydrologic model representation of the snowpack as of June 3 2015.
This snow is generally at 10,000 feet or higher in elevation,

Streamflow:

Streamflows were low entering the month and while the rainfall did increase streamflow in many areas, monthly volumes were generally below average simply due to the lack of snow melt. Average flow in the Great Basin was approximately 45% of average with near record low flows in Provo and Six Creeks watersheds. Streamflow volumes in the San Juan River Basin, Dolores River Basin , and Gunnison River Basin were generally 60-75 percent of average. The tributaries of the Colorado River above Cameo were in the 60-90 percent of average range, the Yampa River Basin 75-90 percent of average, and the Duchesne River Basin 55-70 percent of average.

The precipitation in the Green River above Flaming Gorge resulted in above average inflows to Fontenelle and Flaming Gorge reservoirs with volumes near 135 percent of average.

Soil Moisture:

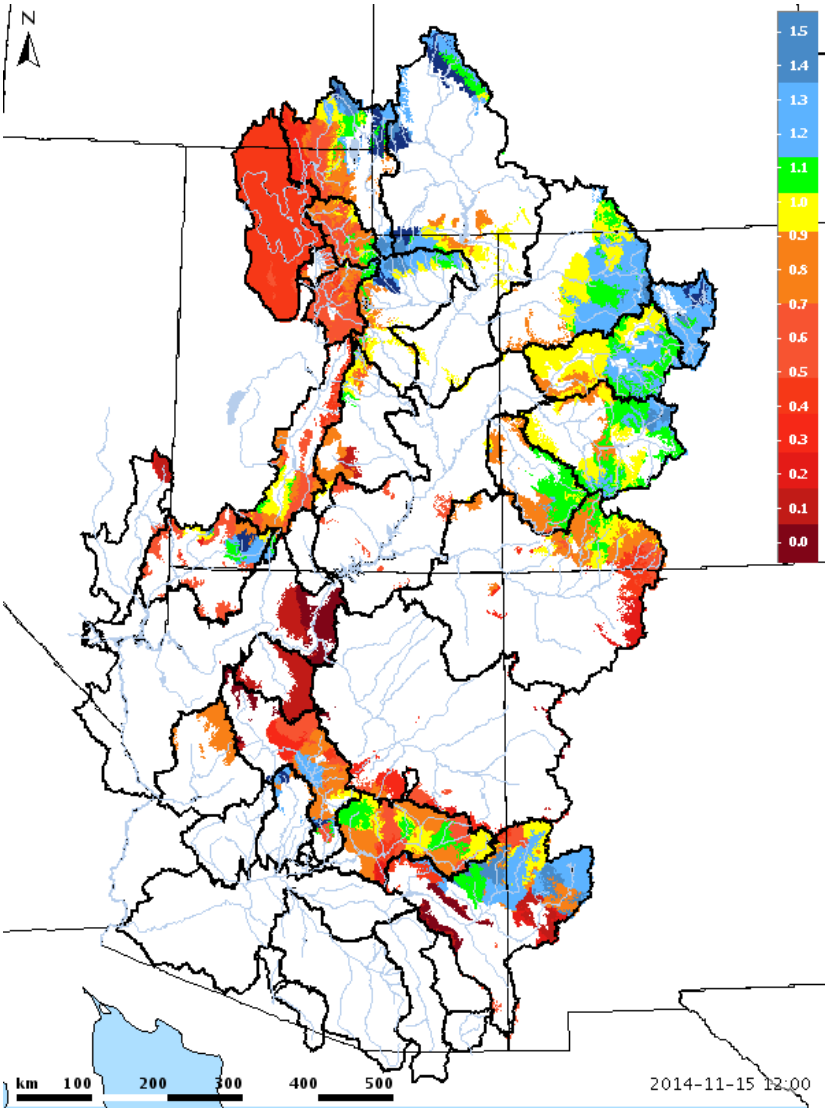
By early June the upper levels of soil are generally saturated due to snow melt. This year the significant precipitation received in May has been beneficial in areas where snow melted out very early. The recent rainfall acted to increase soil moisture, if only temporarily, in these lower and middle elevation areas. The impact would be more efficient runoff, again in the short term, if additional precipitation were to occur.

Soil moisture conditions entering the winter season have impacted runoff forecasts throughout the season. That information is summarized in the following text and image:

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 15th were above average over much of the Green River Basin above Fontenelle, headwaters of the Yampa and White River Basins, and the Colorado River headwaters above Kremmling. Above average soil moisture also existed over much of the Uinta Mountain range that drains into the Bear River, Duchesne River, and Green River above Flaming Gorge.

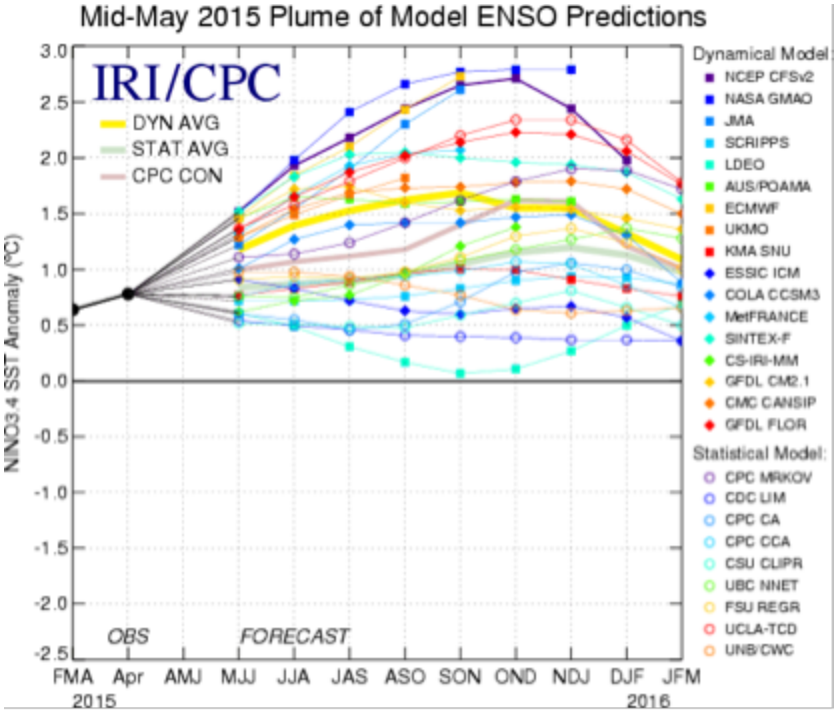
Soil moisture conditions were below average over the lower Bear River, Weber River, Provo River, and Six Creeks Basins. The Sevier River, San Juan River, and most of the Virgin River also had below average soil moisture conditions entering the winter. In Arizona, conditions varied but most areas were below average.

In the map below areas in blue are above the historical model soil moisture average while those in the red and orange are below average. Only the higher elevation areas are displayed. The areas in white are not included because they contribute very little to the runoff volumes.

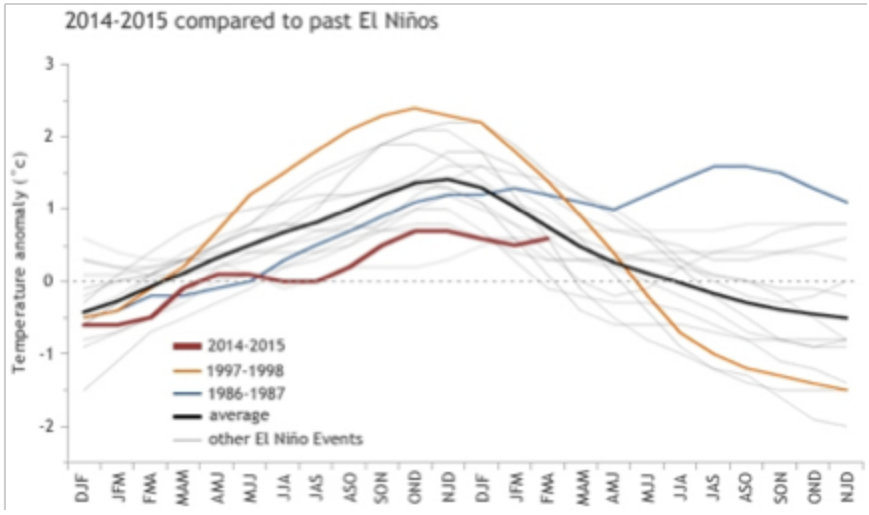


Climate Outlook:

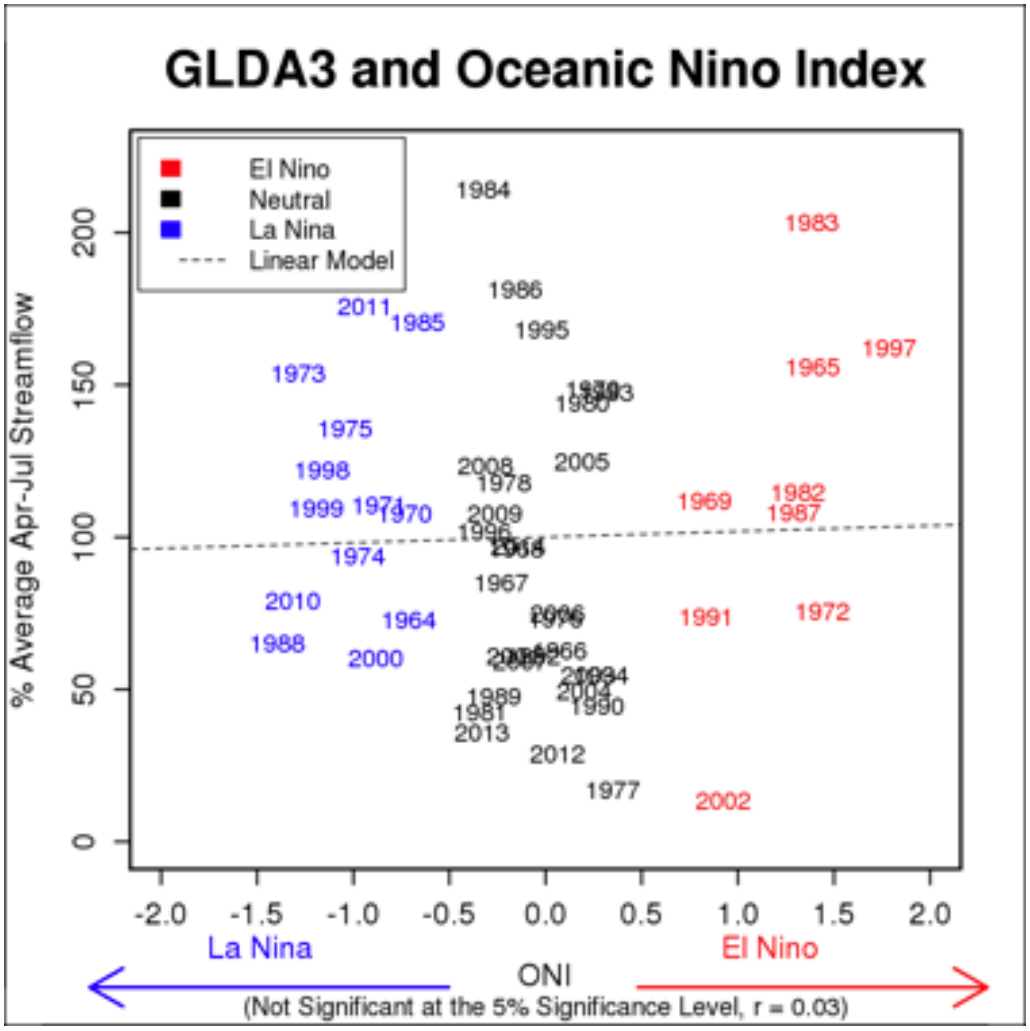
A weak El Niño Southern Oscillation (ENSO) condition currently exists. Climate models indicate approximately a 90% chance that El Niño conditions will persist through summer, and approximately a 80% chance that El Niño conditions will persist through 2015. The high confidence of continuing El Niño conditions is primarily due to persistent warm waters in the Pacific Ocean, persistent westerly trade winds, and consistent convective precipitation activity along the equatorial Pacific region (i.e., a weakened Walker Circulation). While it is difficult to say how strong this ENSO event will be, statistical models are favoring a weak El Niño, while dynamical models are currently favoring a stronger event.



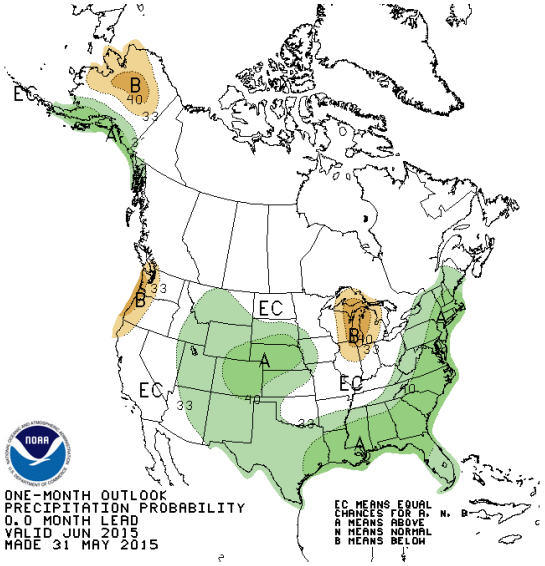
This particular ENSO event is unique, as warm winter sea surface temperatures typically do not persist through the spring and summer. Only the 1986-1987 ENSO event exhibited similar behavior.

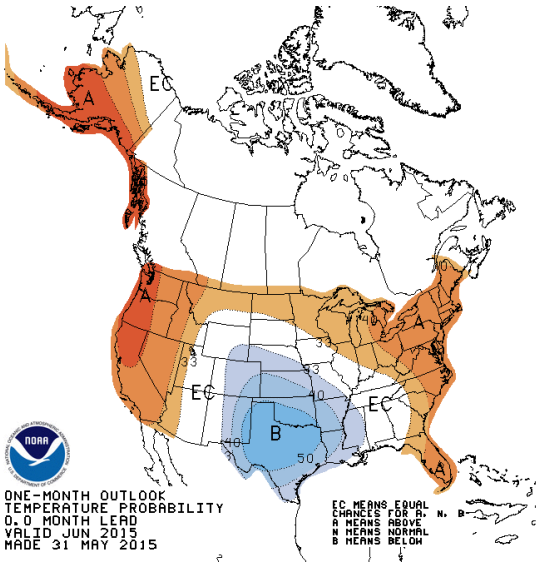


Over the CBRFC region, ENSO conditions most strongly correlate with winter precipitation in the Lower Colorado River Basin, and Southern Arizona in particular. It is not expected that ENSO conditions will have a significant impact to the CBRFC forecast area over the remainder of the water year, or to water supply forecasts in the region. Previous ENSO events plotted against the percentage of average April through July unregulated streamflow into Lake Powell are presented below; the plot indicates little correlation between ENSO events and unregulated streamflow in the Upper Colorado River Basin.



The latest one-month outlook issued by the Climate Prediction Center (CPC) indicates equal chances for warmer, normal, or cooler temperature conditions throughout much of the CBRFC region, with a slightly higher chance for above normal temperatures in the western Arizona and Utah, and potentially cooler temperatures in eastern Colorado. Latest CPC guidance also suggests an increased chance for above normal precipitation conditions throughout the CBRFC region, except in Southwestern Arizona. More details regarding the CPC's guidance is in the graphics below.





The latest CPC one month outlook, and other useful CPC products, may be found here.

Conclusion:

A very wet and cool May resulted in an increase in April-July water supply volume forecasts. Increases varied but were generally between 10-30 percent of the April-July average. Volume forecasts for the April-July period nearly doubled for some sites with several others increasing by 50 to 90 percent over the May 1st forecasts. This was most predominant in parts of the Great Basin, Duchesne River Basin, and San Juan River Basin. A few locations already exceeded the April-July volume forecasts issued in early May. Frequent storms throughout the month also impacted water use throughout the CBRFC forecast area with less demand than what is typically observed in May.

Impacts from the wet May were perhaps more significant this year than in a more normal year because of the very poor snowpack and dry conditions entering the month. For some locations May precipitation will play a larger component of the April-July volumes than usual because of the lack of contribution from this years snowpack.

The lack of snow received during the winter resulted in near record low snowpack and record early melt out in many areas, particularly in parts of the Great Basin, Duchesne River Basin, San Juan Basin, and lower elevation river basins. This will continue to be the primary driving factor behind the April-July runoff volumes. Despite increases nearly all areas are expected to see much below average runoff volumes with sites in the Great Basin and Virgin River Basin among the lower years on record. Only the Colorado River Headwater Basins are forecast to have volumes near or above average as snowpack conditions were more favorable in these areas.

Heading into summer the latest guidance from the Climate Prediction Center suggests an increased chance for above normal precipitation conditions throughout the CBRFC region, except in Southwestern Arizona, for the June-August period. A weak El Niño Southern Oscillation (ENSO) condition currently exists. While models differ on the eventual strength of this ENSO event it is expected to continue through 2015.

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

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