

WY 2021 Water Resources Update - April 16th 2021

Topics:

- There's melting snow, so where's the flow?
- How dry has it been?
- Any chance of precip towards the end of April?

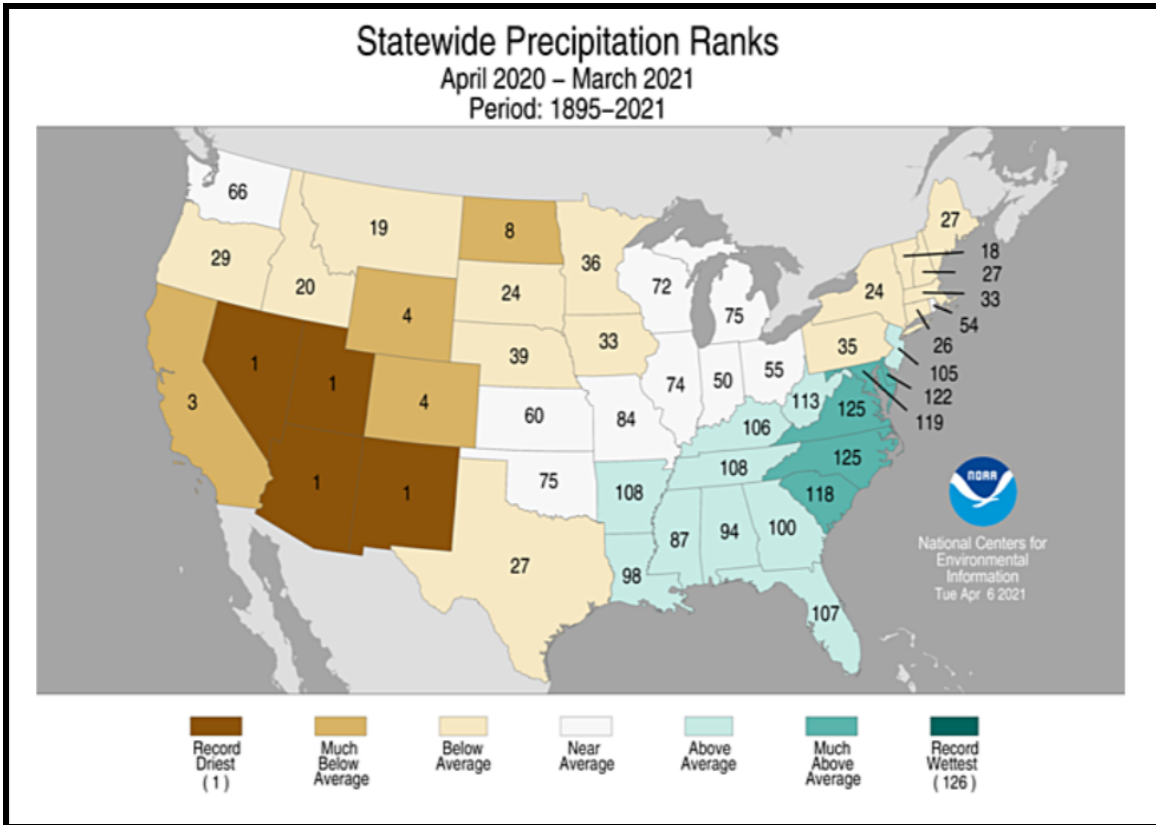
Details:

The snow course SWE measurements taken at the beginning of the month ranged from roughly 60-80% of normal from the Northern Sierra down through the Merced. Further south down through the Tulare, the percentages were a bit lower...40-50%. However, the April-July runoff forecasts around that time were not as good. The runoff efficiency has been reduced quite a bit due to the below normal precipitation the last couple of years. This water year has experienced colder than normal precipitation (especially the late January AR), which has resulted in higher than normal SWE yield for the given amount of precipitation. However, a lot of the aerial coverage of snow on April 1st was sitting on dry soils. As a result, the April-July runoff forecasts on April 1st were not as optimistic, ranging from 35 to 55% of normal. As we've progressed through the first few weeks of April, the runoff accumulations have tracked similarly ranging from 35% of normal at Oroville to around 65% in the Southern Sierra while experiencing slightly above normal temperatures. Since the beginning of the month we've continued to experience below normal precipitation, and there has been little in the forecasts as well. Because of the below normal April, the AJ forecasts have continued a downward trend. April-July runoff projections have dropped slightly ranging from 30-50% of normal.

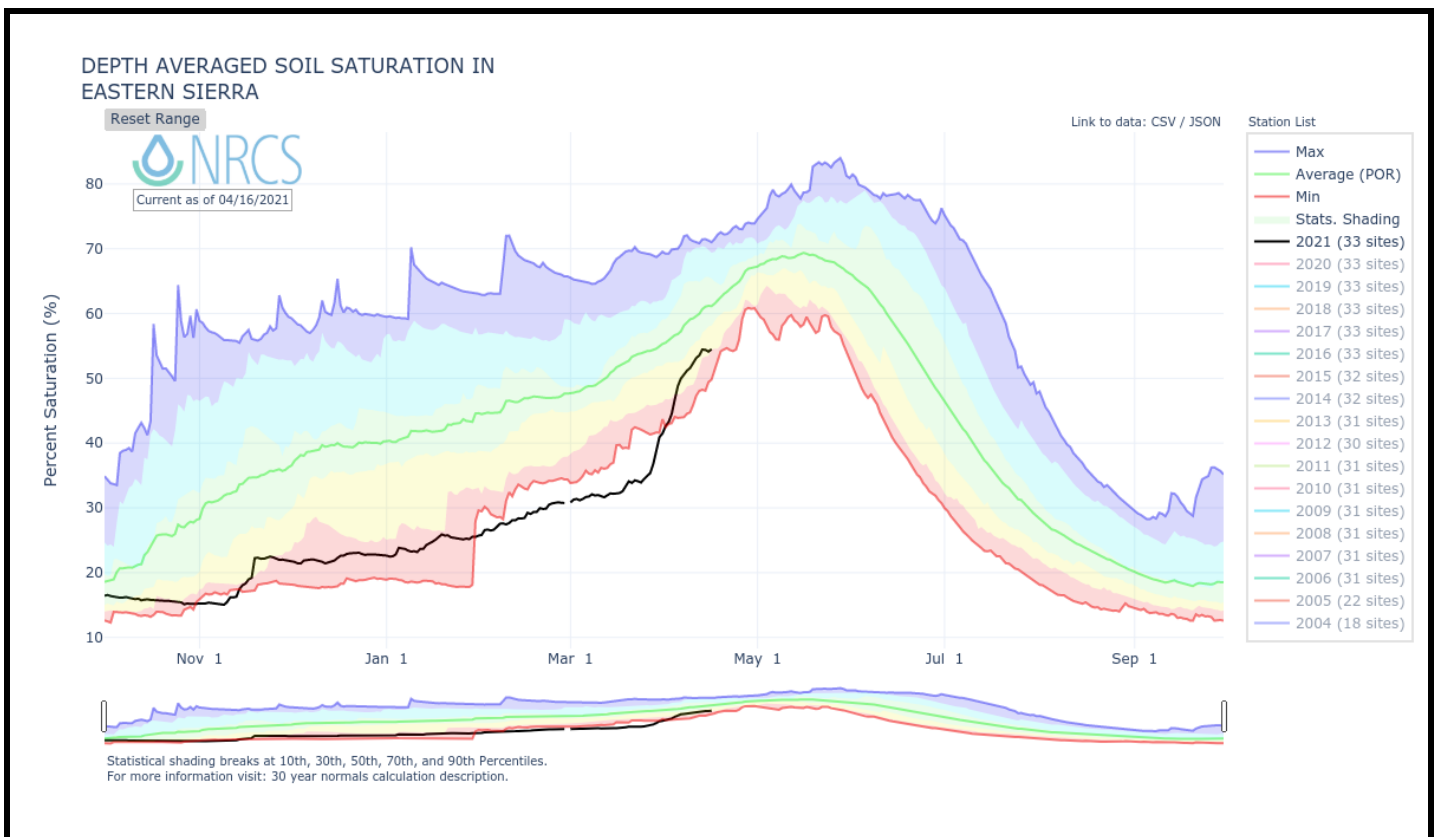
So we know that these dry conditions have adversely affected the April-July runoff forecasts discussed above, but how dry has it been? This two year stretch has been very dry compared to normal. One of our HAS forecasters, Dan Kozlowski, totaled up the precipitation covering the 2020 and 2021 water years for the 8-station (Northern Sierra), 5-station (San Joaquin), and 6-station (Tulare) indices. He then ranked them with other historical two year totals. The 8-station ranked second driest, with only the 1976-77 period being drier. The 6-station Tulare was also ranked 2nd driest, and the 5-station San Joaquin was third.

1 Season 8-Station Avg ~50"				1 Season 5-Station Avg ~40"				1 Season 6-Station Avg ~30"			
2 Water Years		8-STATION		5-STATION		6-STATION					
RANK	PRECIP	WY RANGE	RANK	PRECIP	WY RANGE	RANK	PRECIP	WY RANGE			
1	47.34	1976-1977	1	39.37	2014-2015	1	27.66	2014-2015			
2	54.03	2020-2021	2	40.35	1976-1977	2	27.87	2020-2021			
3	60.09	1923-1924	3	42.20	2020-2021	3	30.22	2013-2014			
4	63.42	1987-1988	4	46.83	2013-2014	4	31.75	1976-1977			
5	68.14	1990-1991	5	47.21	1987-1988	5	33.65	1959-1960			
6	68.18	1991-1992	6	47.68	1912-1913	6	35.93	1960-1961			
7	68.54	2014-2015	7	49.21	1930-1931	7	37.25	2012-2013			
8	68.58	1933-1934	8	49.34	1960-1961	8	39.30	2015-2016			
9	70.05	1931-1932	9	51.37	2012-2013	9	39.51	1987-1988			
10	70.15	1924-1925	10	51.83	1923-1924	10	39.80	1971-1972			

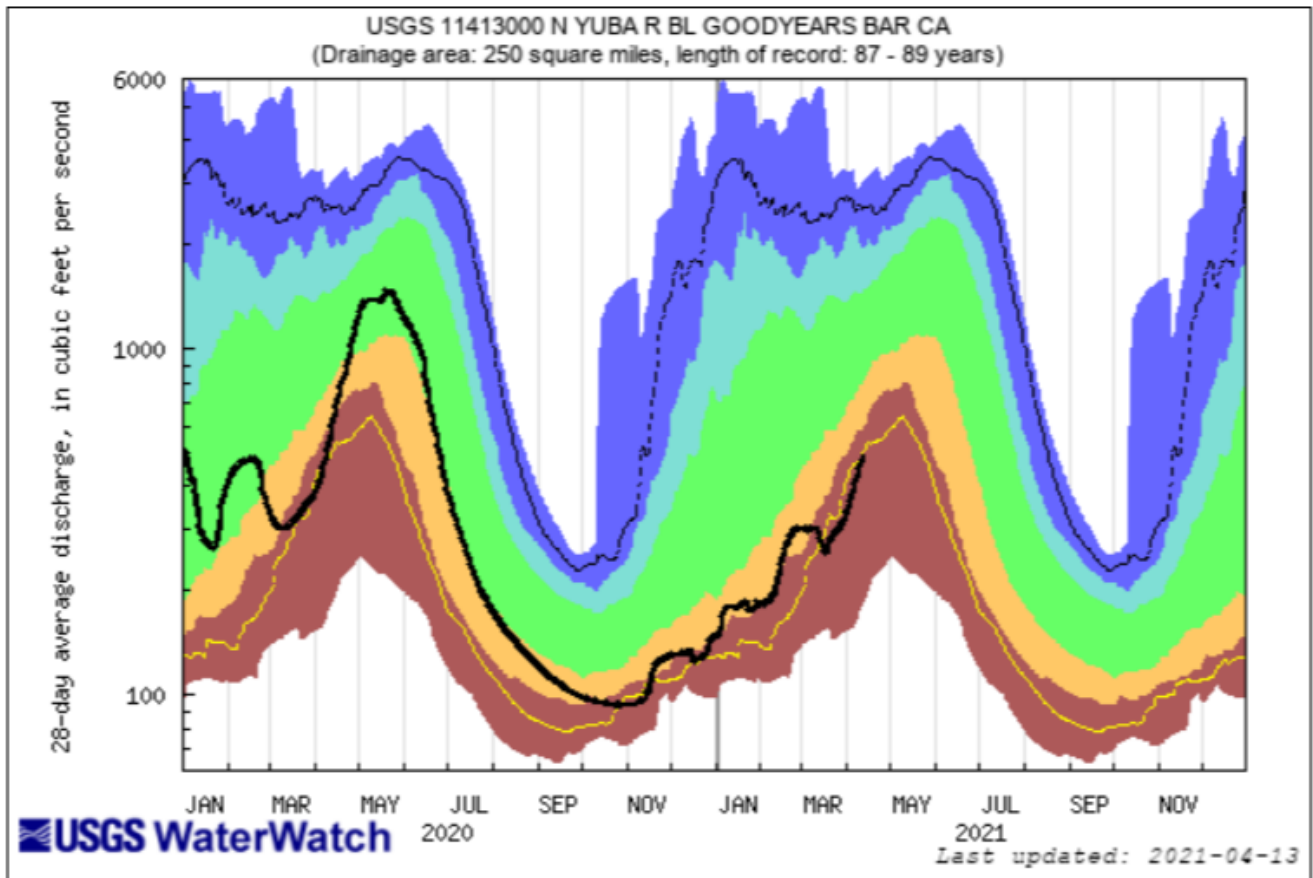
Looking at the National Climatic Data Center (NCDC) 12 month precipitation rankings, CA ranks as the third driest while NV is the driest on record:



As a result of the extremely low precipitation, the soils have reacted as expected. The [NRCS](#) has a very nice graphic showing soil moisture saturation covering various sites in the Eastern Sierra. As you can see below, the soil saturation levels were below the minimum for much of February and March. As the snowmelt began, the soil saturation levels began to increase, but are still 10-30% of normal.

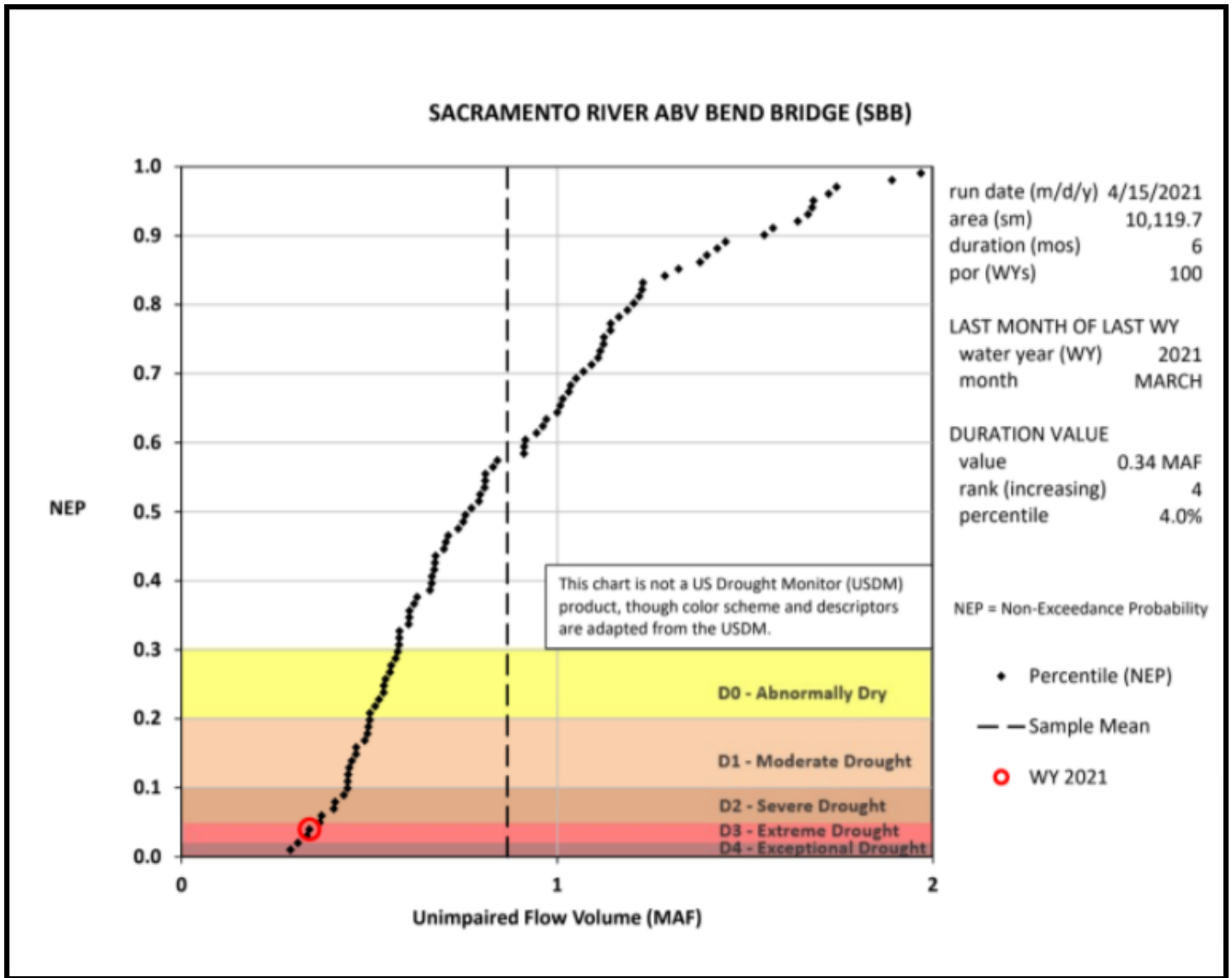


The streamflows have also shown a similar trend. The USGS [Water Watch](#) drought duration hydrographs are a good way to see this. Below is the 28-day average duration hydrograph for the Yuba River near Goodyears Bar. As you can see, the streamflows were in the 10% of normal range in the fall of 2020 due to the previously dry water year. Things did not get much better as we progressed through the current water year as we continued to experience below normal precipitation. Streamflow exceedance levels have trended upward some during the April snowmelt period, but are still well below normal for most rivers in the Sierra.



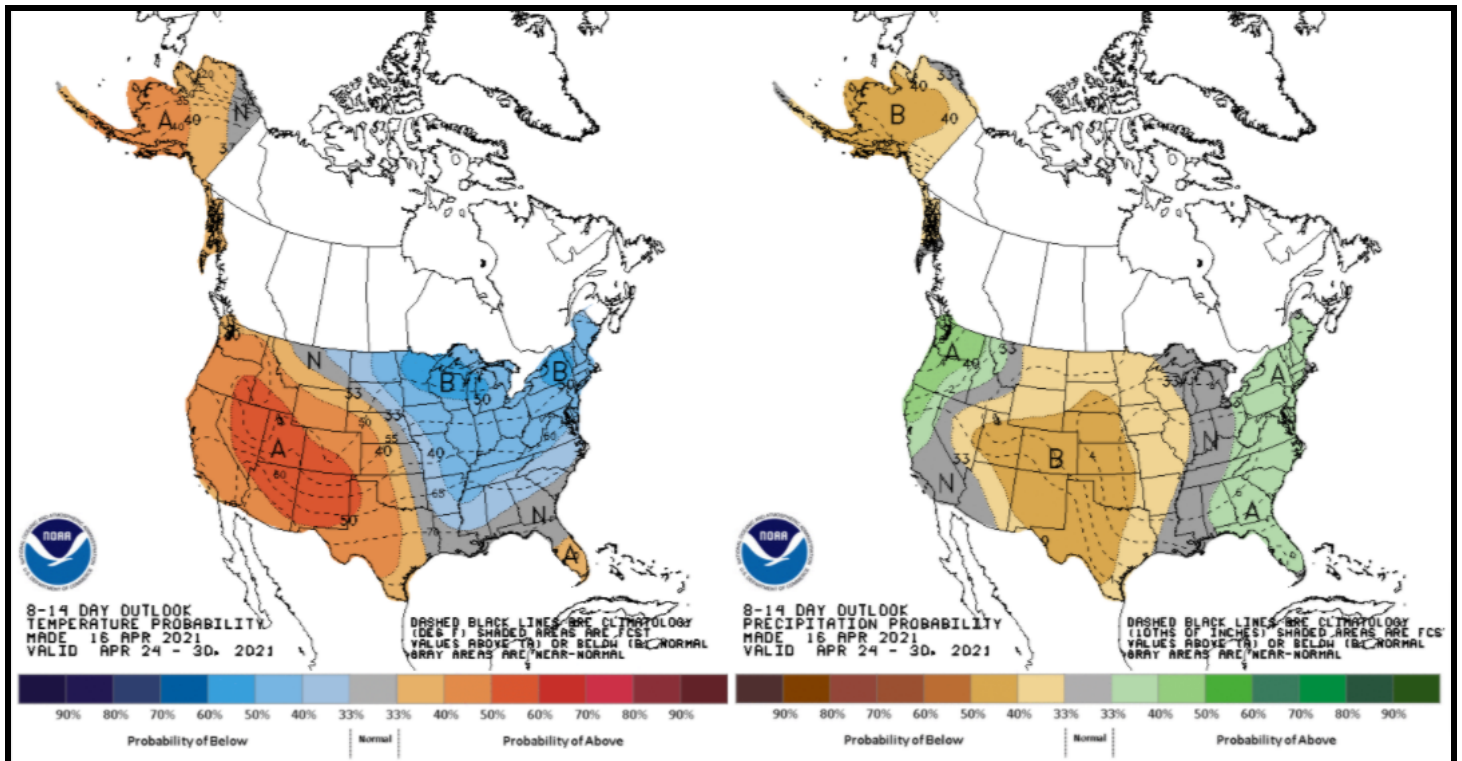
Explanation - Percentile classes						
lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile - highest
Much below Normal	Below normal	Normal	Above normal	Much above normal		Flow

Also, one of our hydrologic forecasters, Brad Moore, has developed drought duration hydrographs for many locations in California indicating how abnormally low the streamflows have been over the past 6 and 12 month periods. Below is a frequency curve for the natural flow volume at Bend Bridge for the last 6-month period covering the past 100 year record. The y axis is the non-exceedance probability. As you can see, the Bend Bridge full natural flow volume over the past 6 months ranks the 4th driest in the period of record. Brad also shaded some of the lower areas to indicate drought severity. Although this is not an official Drought Monitor product, colors were chosen to mimic the Drought Monitor color scheme. We plan on providing access to the larger suite of plots on our web page. We'll share out that link when it becomes available.



Looking Ahead:

CPC has indicated a chance for above normal precipitation in Northern California for week two (see below graphic). They also mentioned in today's Hazard Outlook discussion regarding week 2..."models continue to advertise some degree of anomalous 500-hPa troughing over the northeastern Pacific during Week-2, with the potential for at least one atmospheric river event. However, both raw and calibrated forecast guidance indicates negligible widespread chances of an inch of precipitation falling during 24 hours."



So as of now, there isn't much in the longer range forecast, but it is something to be hopeful about. Anything is better than an April "shutout".

Conclusion:

The cold storms that did occur this year was good news, but the low frequency of events coupled with extremely dry soils has resulted in a pretty bleak picture for the 2021 snowmelt season. We may get some additional precipitation towards the end of the month, but nothing to put much of a dent into the deep deficits.