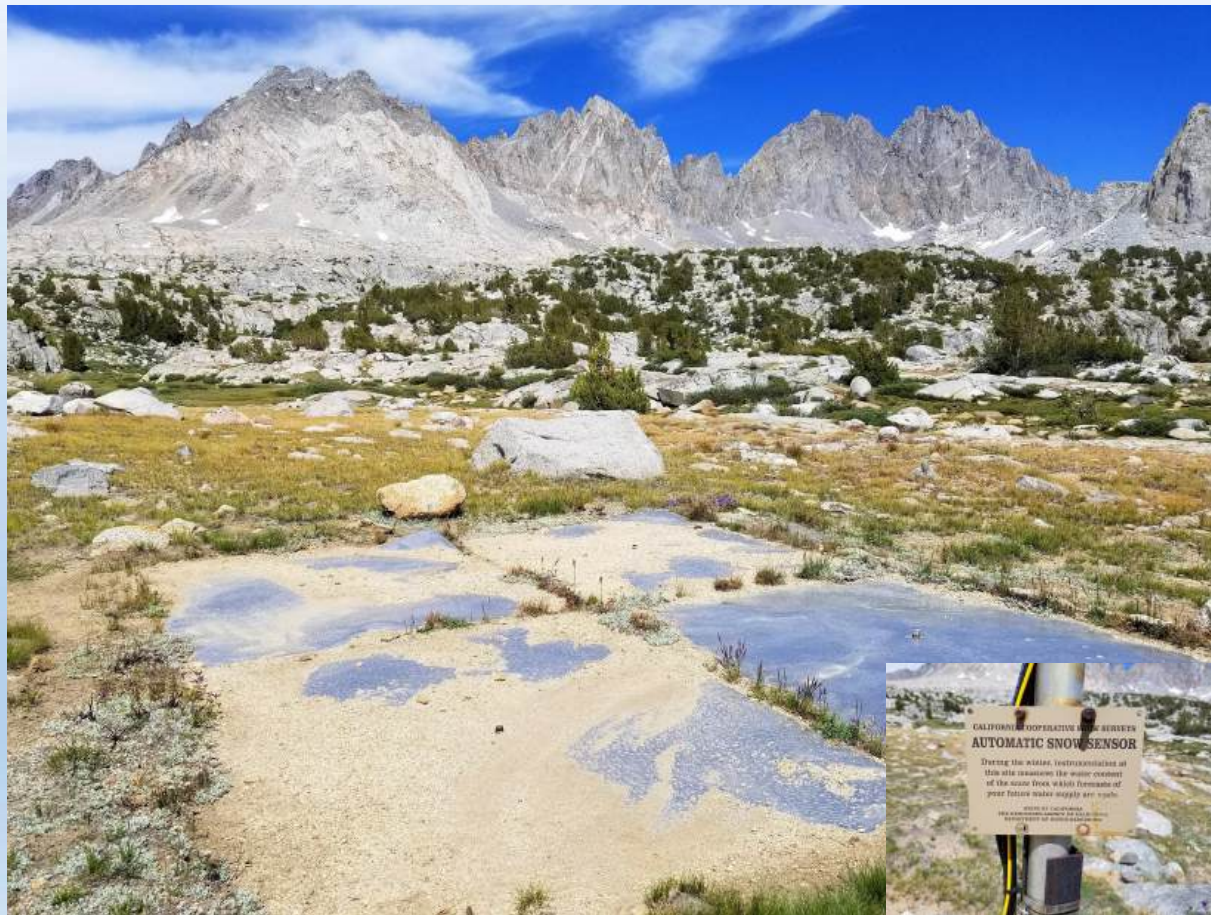




2020 Water Year Recap



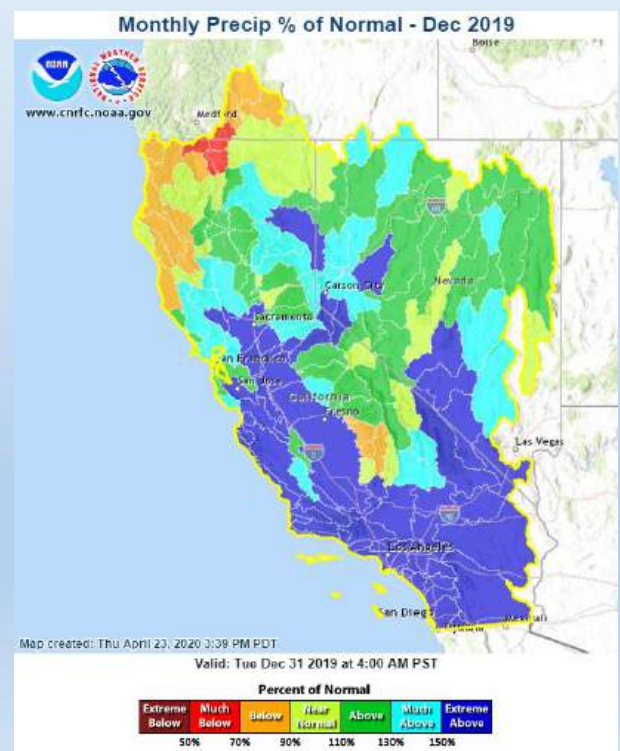
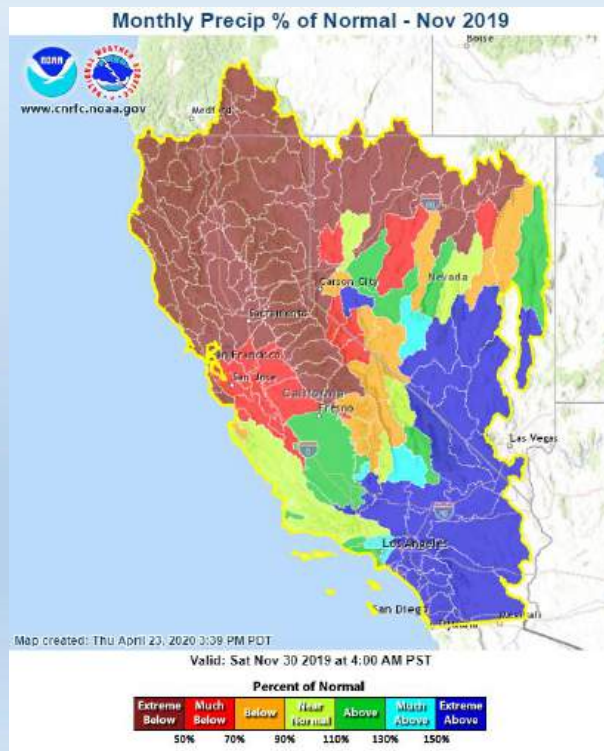


Highlights

- Dry fall throughout California and Nevada
- Moderate storms in Dec & late Jan kept AJ forecasts near median
 - Low snow levels associated with storms
- Record to near-record dry February throughout the Sierra
 - Some melt observed below 7kft in early March
- Wet conditions in late March/early April improved water supply conditions
- Warm period in late April and early May led to rapid depletion of the snowpack and early snowmelt peaks
- AJ runoff was 40-70% of average in the Sierra; driest conditions in the south
- Well below average snowpack in the Ruby Mountains; better snowpack in the watersheds above Elko
- FSNC1 only forecast point to reach flood stage
 - Only a few points reached monitor stage
 - No weir flow on Sac River

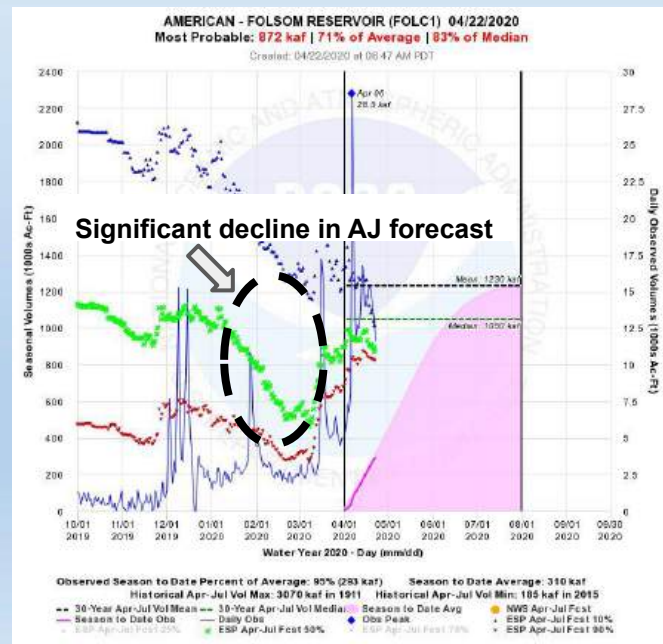
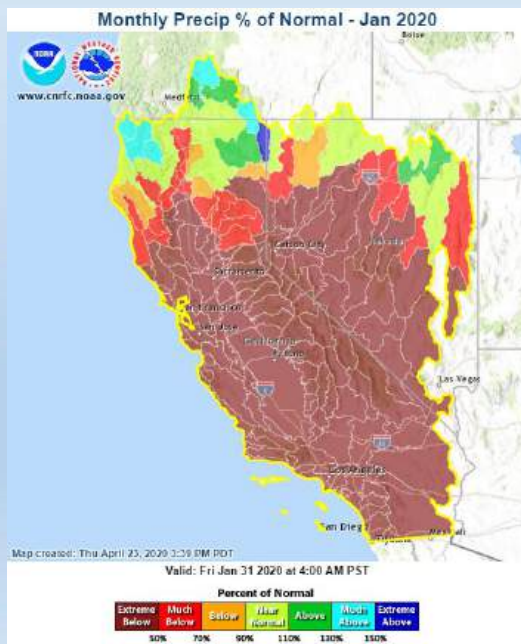
Dry fall conditions

- Slow start to the water year with below normal precip
 - Near average precip observed in December



Dry winter

- Continued dry conditions throughout winter
- Sierra precip indices for February were at/near record lows
- Significant decline in AJ forecasts





Miracle March?

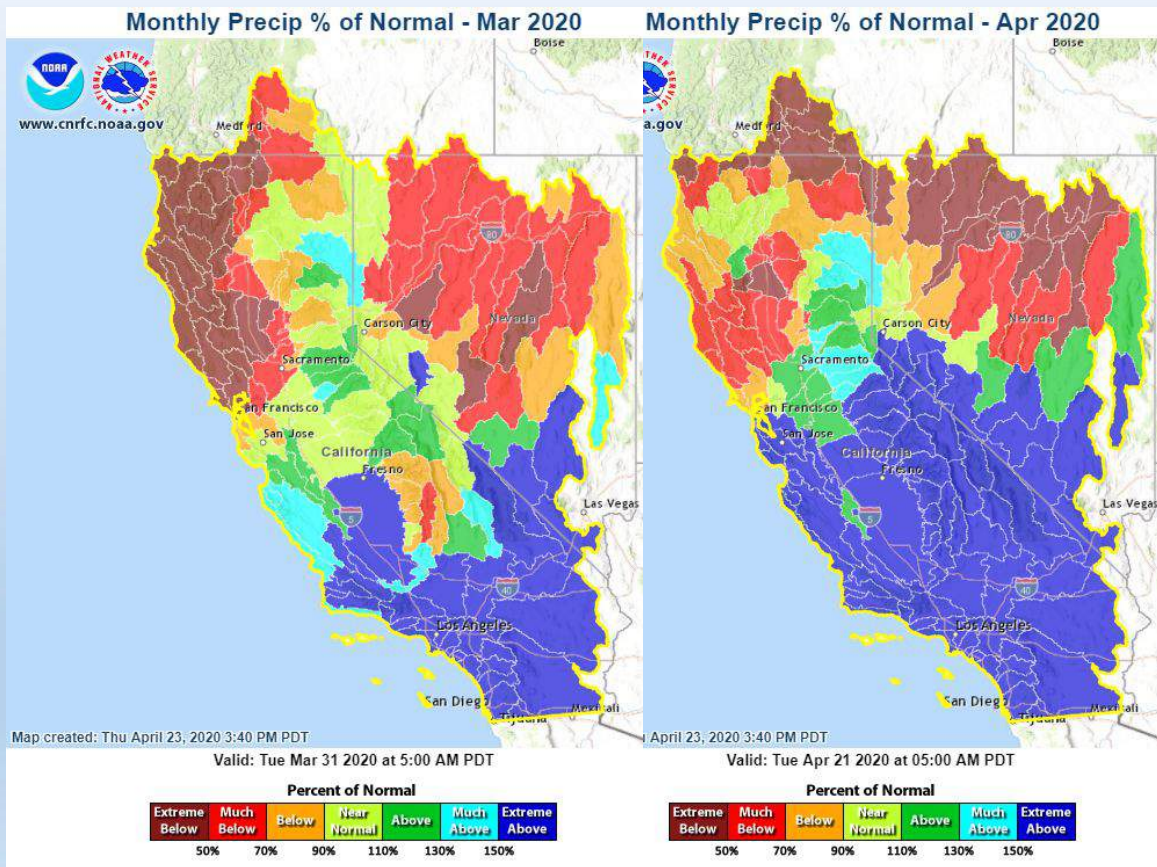


- Not quite, but provided a much needed boost to AJ forecasts
 - Indices show near average conditions for the month

	March 2020 Precipitation	% of Average For March	Season Total to 3/31/20	% of Seasonal Average to 3/31/20
Northern Sierra (8 stn index)	6.2 inches	81%	24.2 inches	55%
San Joaquin (5 stn index)	6.2 inches	101%	18.0 inches	54%
Tulare (6 stn index)	3.5 inches	76%	12.2 inches	50%

Spring precip summary

- Heavy precip across Southern California
 - Cutoff low the 2nd week of April brought a series of precip events
- April also brought above average precip to the Sierra south of Lake Tahoe
 - Near average conditions to the north of Tahoe

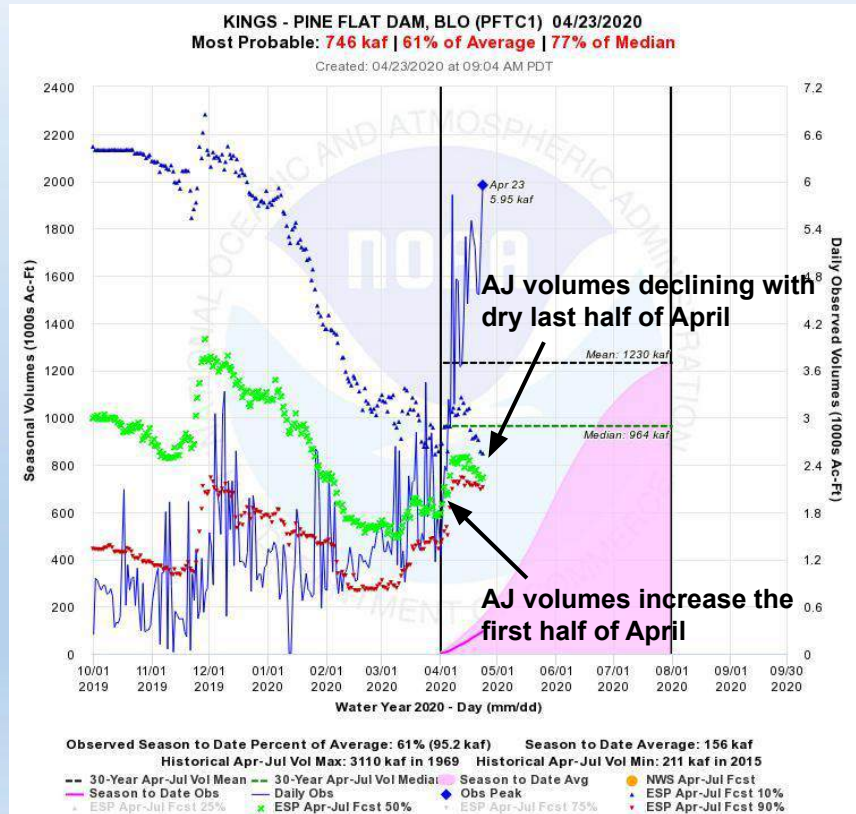


Spring precip impacts

- Additional precip the first half of April improved water supply conditions across much of the Sierra
 - Systems were cold with low snow lines
- Some of the gains in AJ volume made in the 1st half of April were lost with a dry second half of April



Figure courtesy of CA DWR

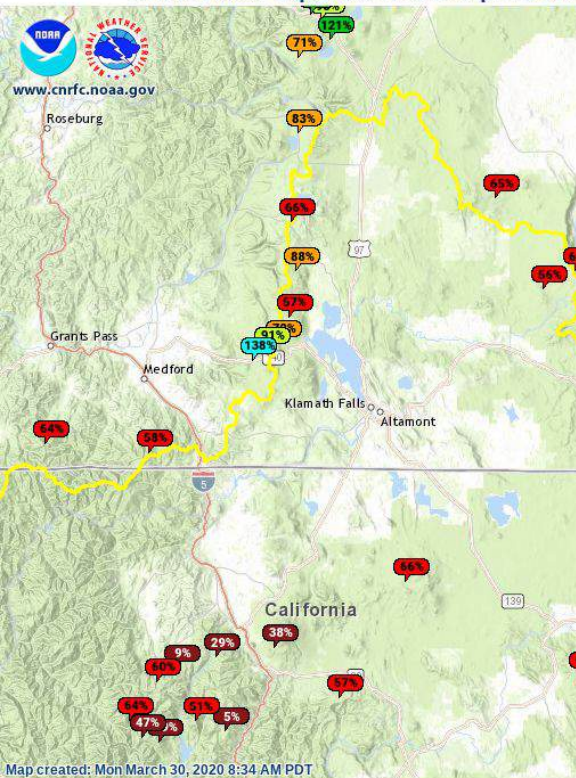




April 1st snowpack conditions

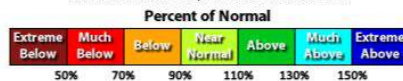


Snow Water Equivalent % of April 1 No

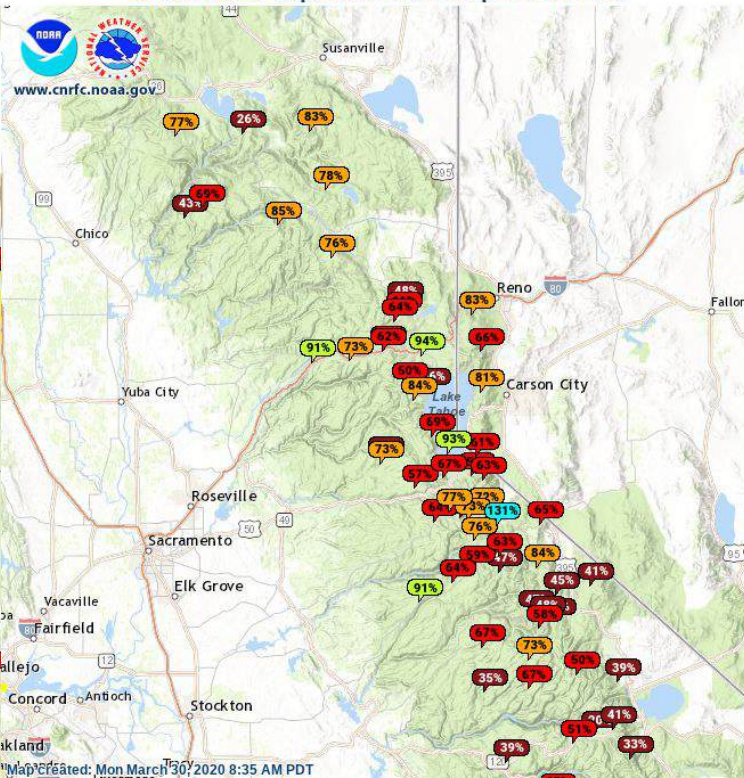


Map created: Mon March 30, 2020 8:34 AM PDT

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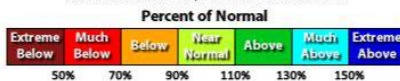


Snow Water Equivalent % of April 1 Normal

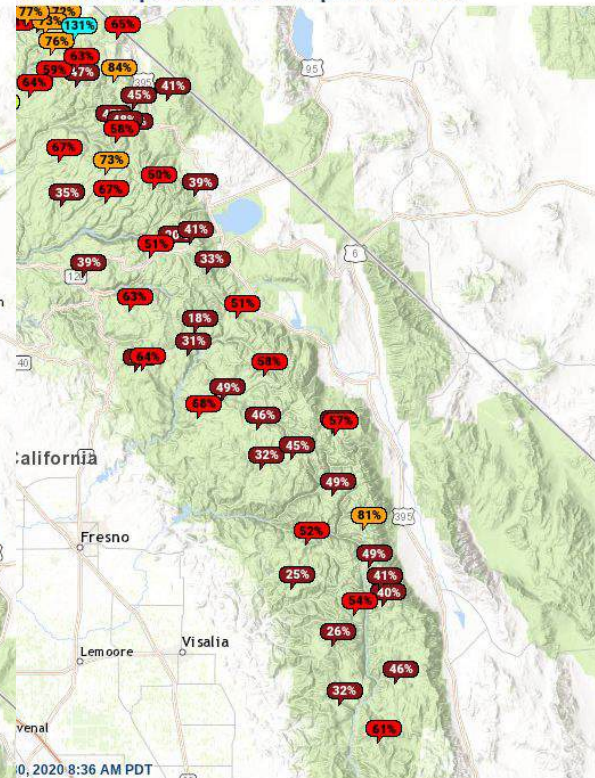


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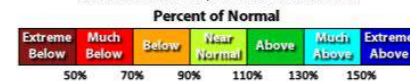


Snow Water Equivalent % of April 1 Normal



Map created: Mon March 30, 2020 8:36 AM PDT

Valid: Mon Mar 30, 2020 at 5:00 AM PDT



Snowpack peaks

- Wet conditions continued into first half of April
 - Cold storms were again the norm
- Peak snowpack similar to that of 2018
 - Mid-April snowpack peak 3-4 weeks later in 2020

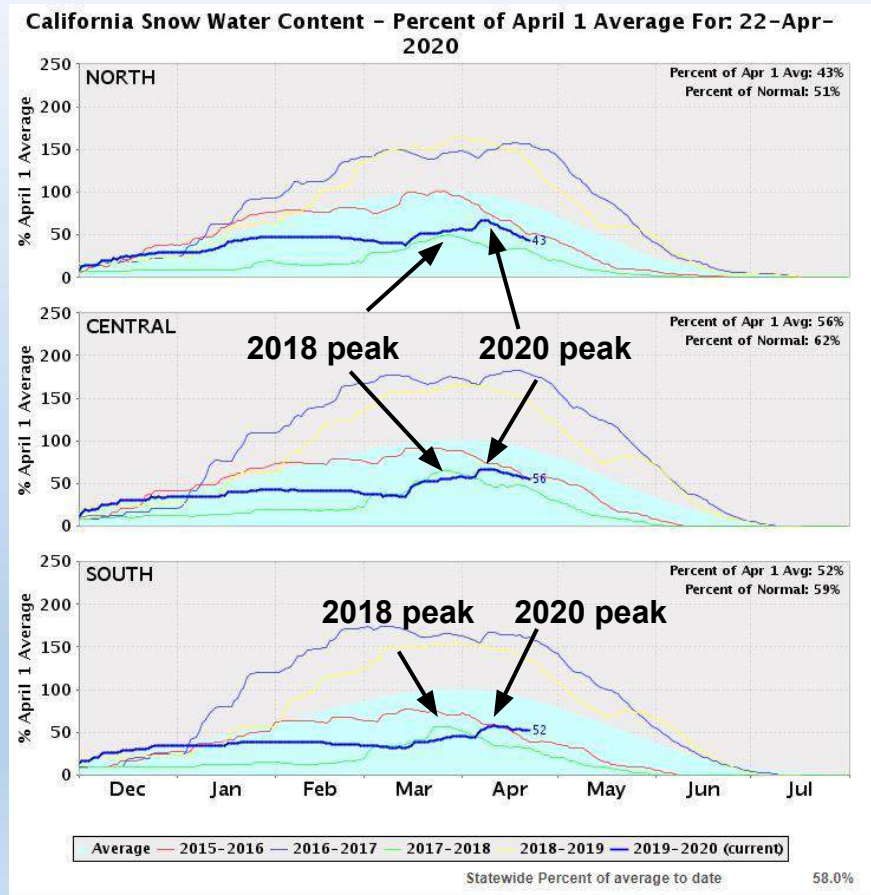
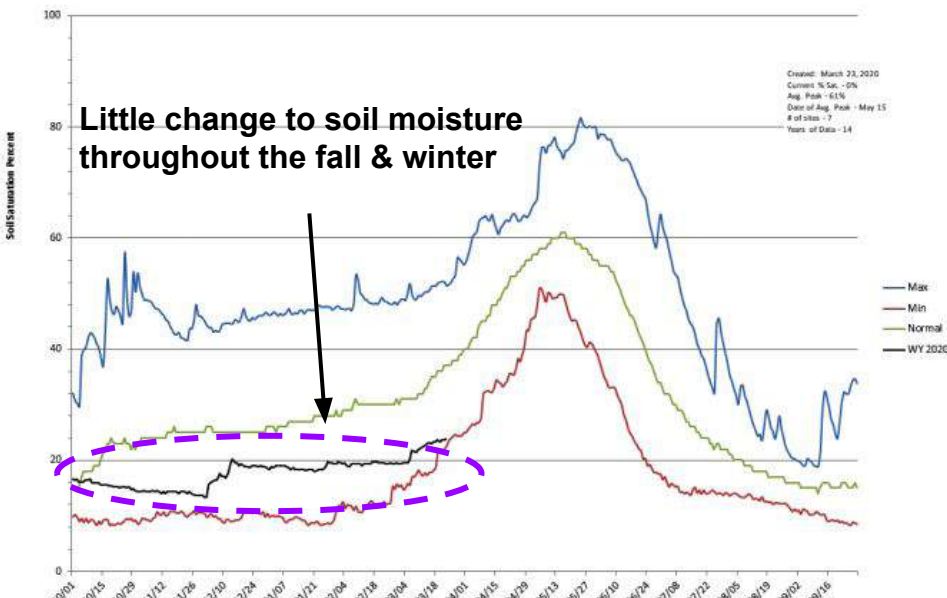


Figure courtesy of CA DWR

Soil moisture

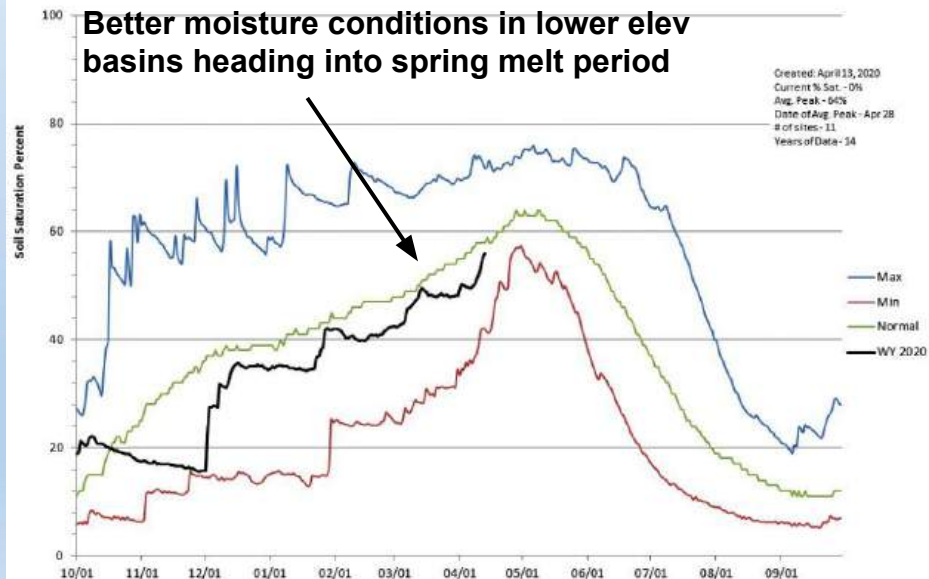
- Cold storms produced mostly snow in the fall/winter.
- Soil moisture lacking during transition to spring
 - More pronounced in higher elevation basins

4. Walker River Basin - Soil Saturation



Figures courtesy of NRCS Nevada Snow Survey

2. Truckee River Basin - Soil Saturation



Spring reservoir conditions

- Reservoir storage as of May 1st
- Reservoirs in good shape due to carryover from a wet WY 2019

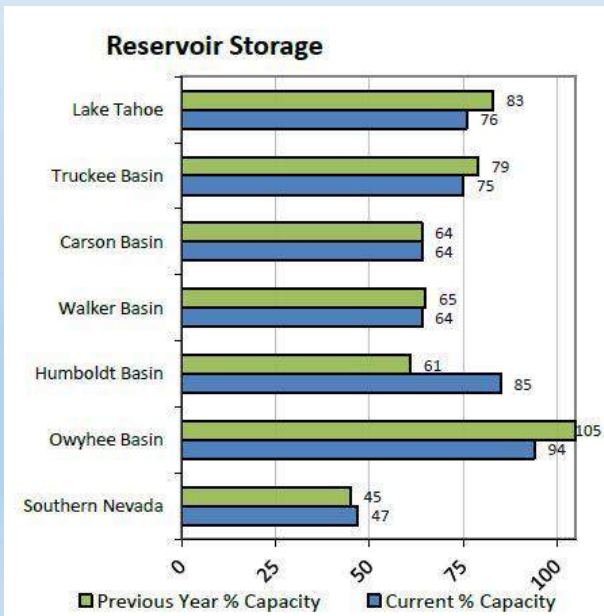


Figure courtesy of NRCS

California Data Exchange Center - Reservoirs

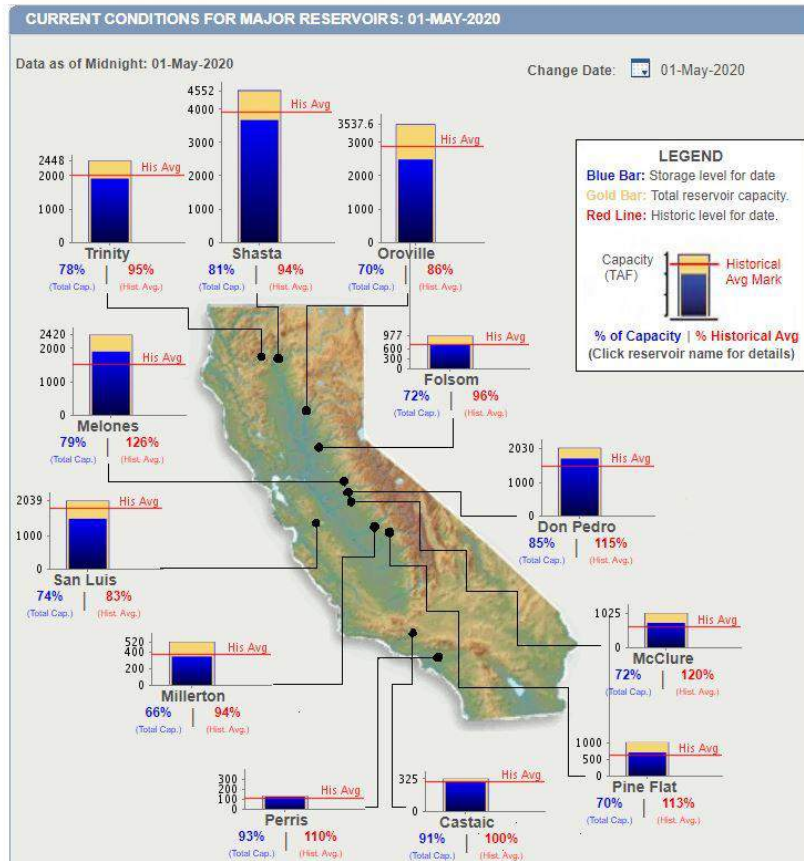


Figure courtesy of CA DWR

Spring heat wave

- Near record temps last week or April and early May
- Snowmelt peak flows April 30/May 1st

Departure from Normal Temperature (F)
4/24/2020 - 4/30/2020



Observed Date of Peak Flow/Inflow

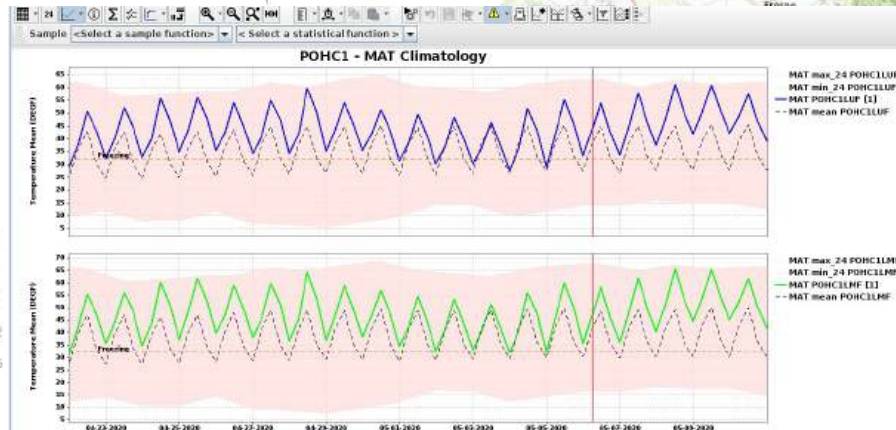
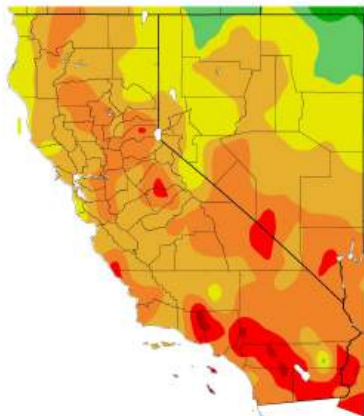


WEST WALKER RIVER - HWY 396 BELOW LITTLE WALKER (WWBC1)
Latitude: 38.30° N Longitude: 119.45° W Elevation: 8591 Feet
Location: Mono County in California River Group: Eastern Sierra

9 consecutive days of rise at WWBC1

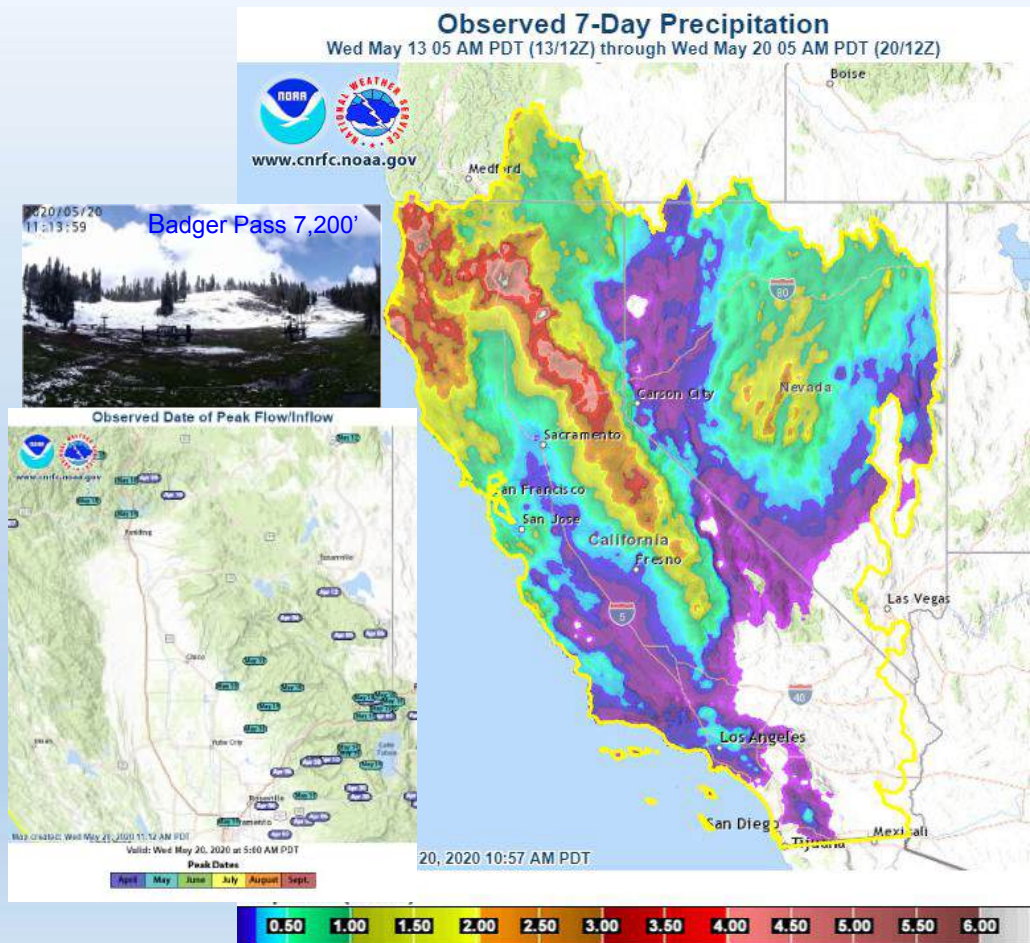


Departure from Normal Temperature (F)
5/4/2020 - 5/10/2020



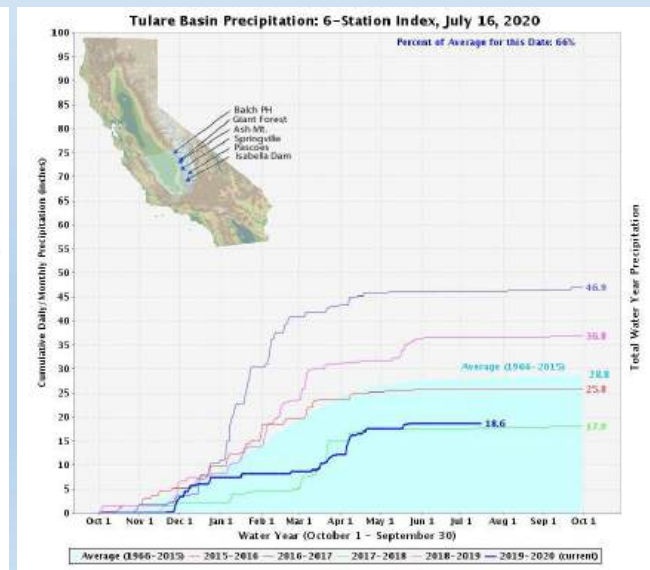
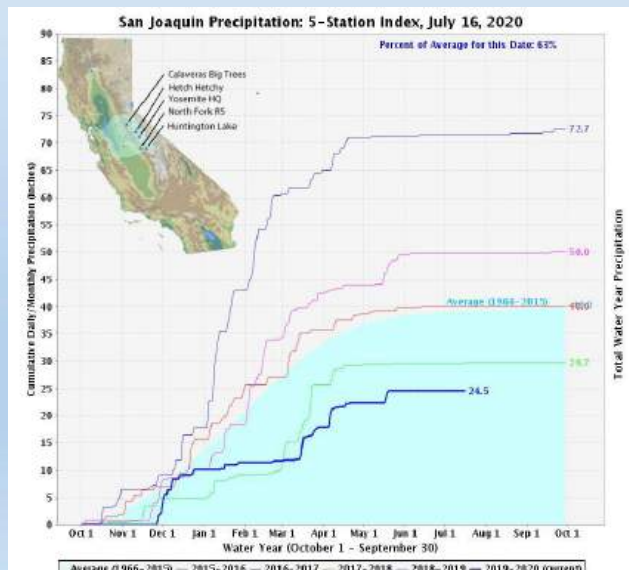
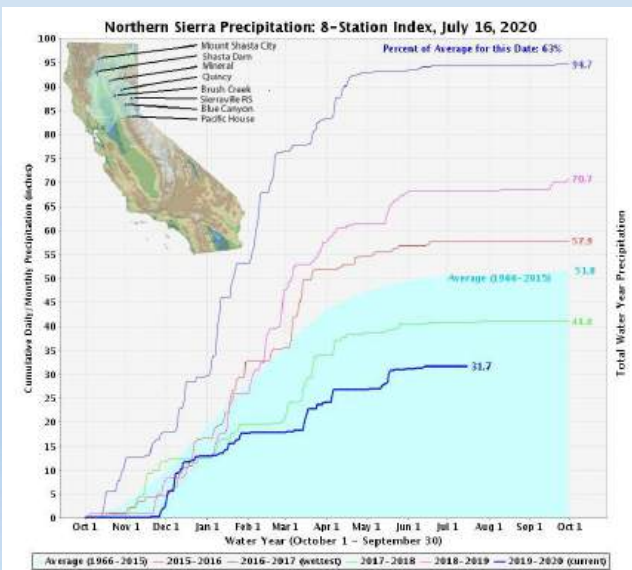
Mid-May storm

- Widespread precip along north coast and Sierra
 - Heaviest precip fell as rain
 - Snow levels fell late
 - Little accumulation below 8kft
- Some mountain streams and reservoirs observed highest flows of the AJ period.
 - SHDC1, ORDC1, NBBC1, EXQC1
- Many peaks similar to snowmelt peaks on May 31st/April 1st



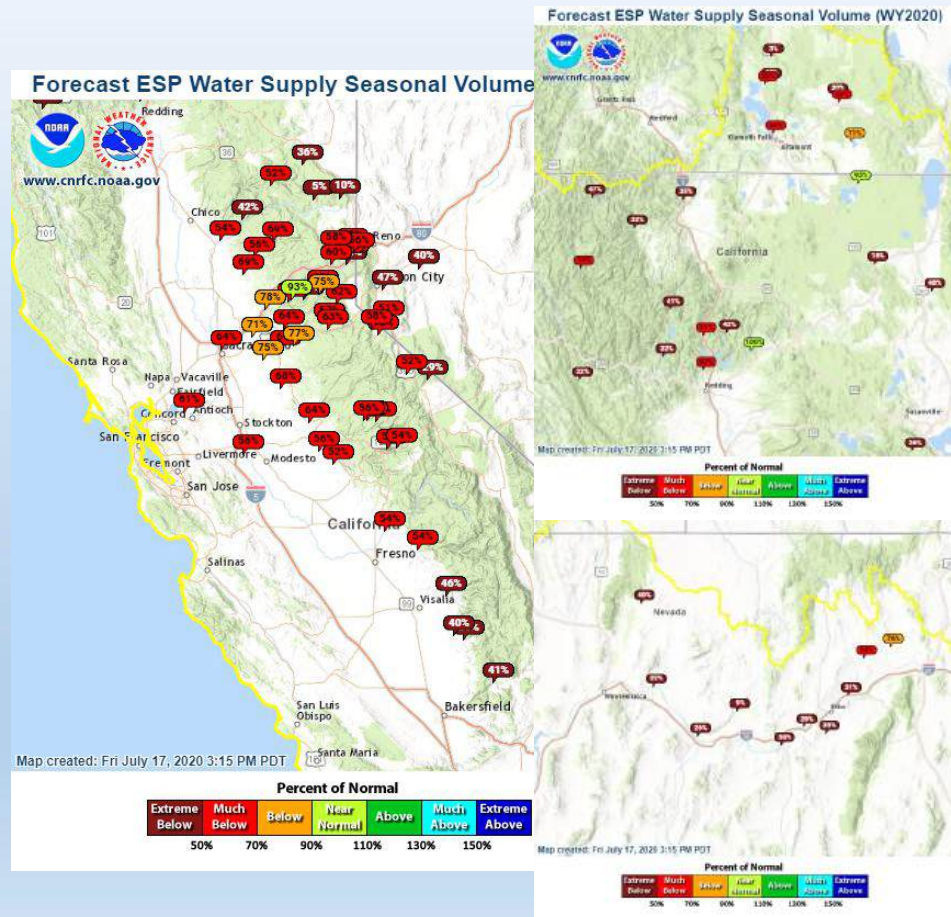
Water year precip summary

- All Sierra precip indices well below average
- San Joaquin and Tulare received more precip in MAM than DJF
 - Occurred 19 times in SJ and 17 in Tulare in last 98 years
 - Has only occurred 9 times in the northern Sierra



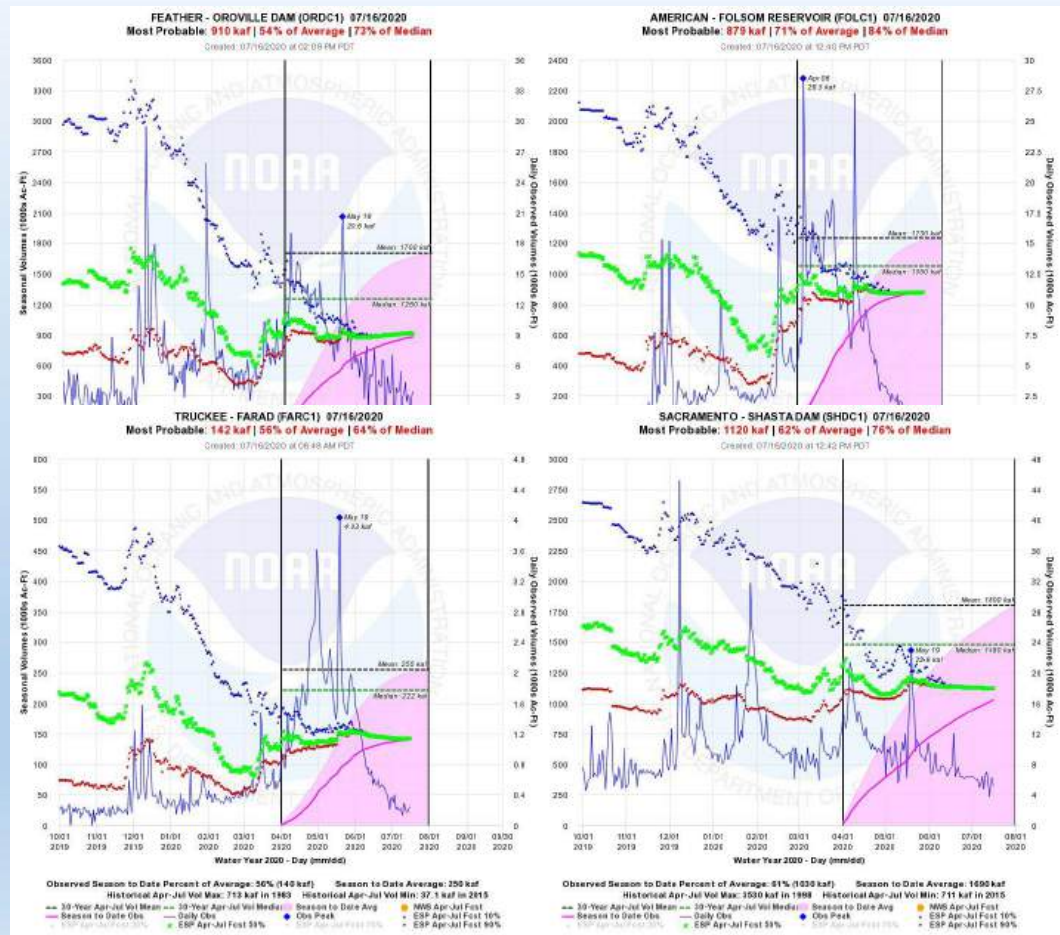
AJ runoff volume

- AJ runoff 50-60% of average throughout the Sierra
 - American highest at ~70%
 - Tulare basin the lowest at < 50%
- Extremely below average in the north coast and Humboldt basins



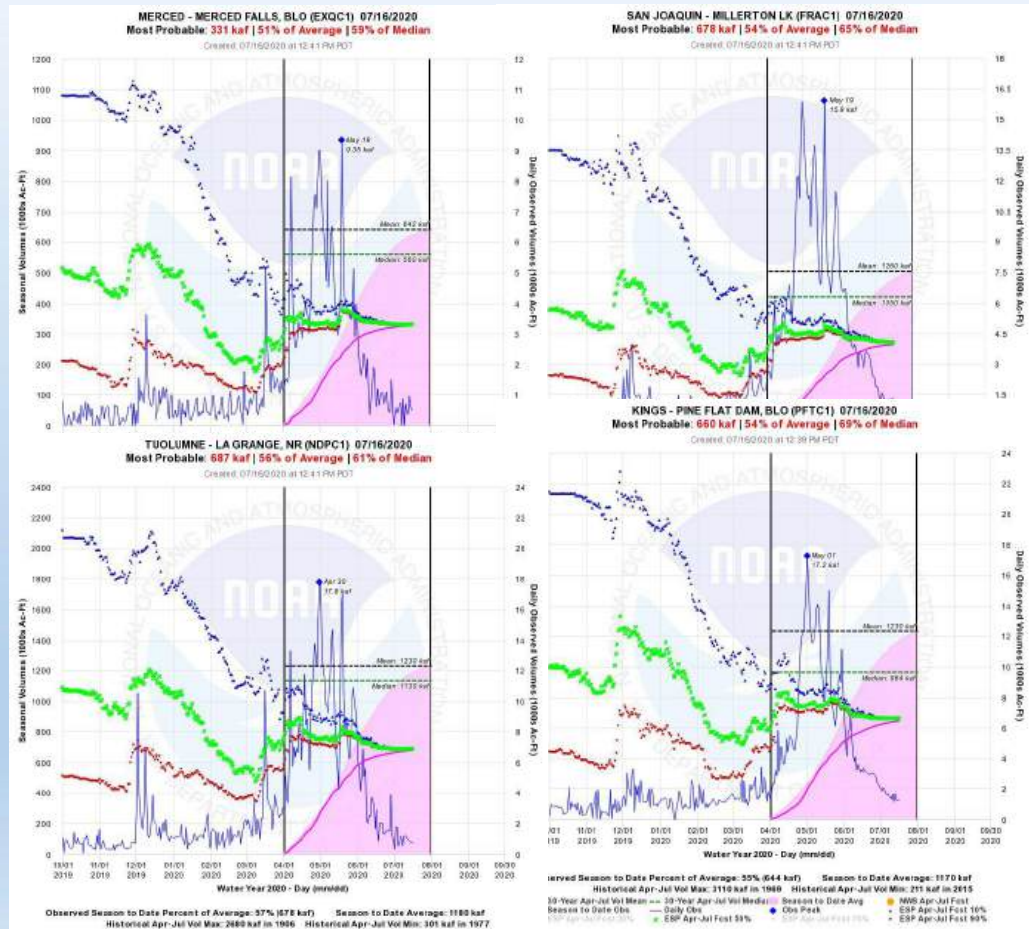


- AJ forecasts were good across northern CA watersheds
- All forecasts were slightly too high after mid-May storm, except ORDC1



San Joaquin AJ forecasts

- AJ volumes were similar to April 1st forecasts
- Increases in AJ forecasts after April 1st did not materialize
 - Steady decline after the mid-May storms
 - AJ volumes were at or below mid-April 90% forecasts
- Dry soil conditions in middle zones coupled with less rain in the SJ may have led to overforecasts after mid-May storm

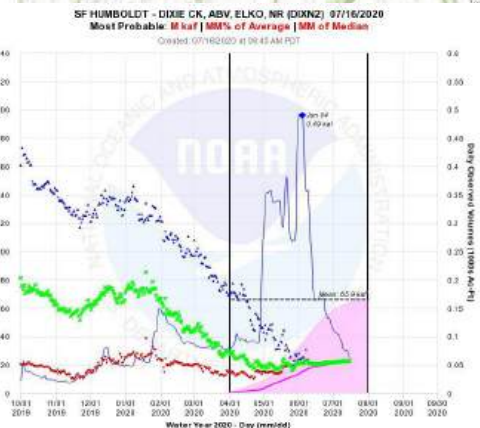
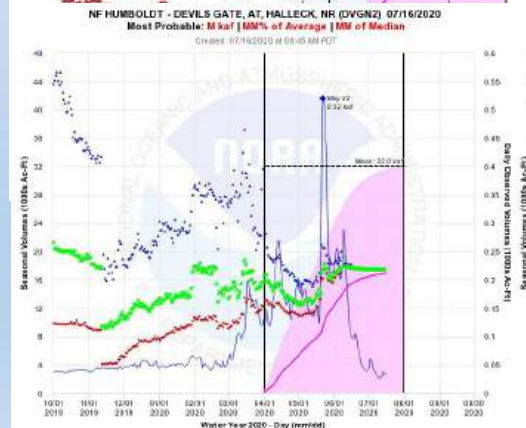
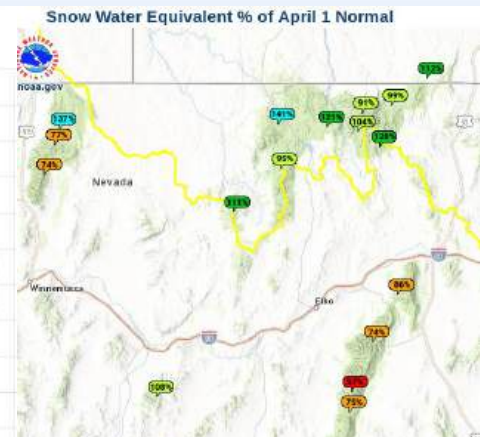
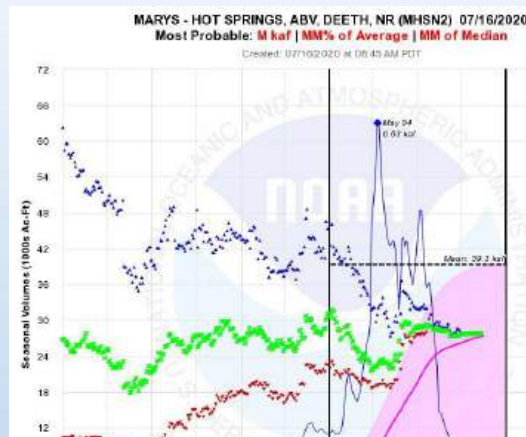




Humboldt AJ forecasts



- Snowpack was above average in the NF of the Humboldt and Marys
 - Well below average in the Ruby Mnts
- Dry spring led to declining AJ runoff, but rebounded during Mid-May storm, especially in tribs above Elko

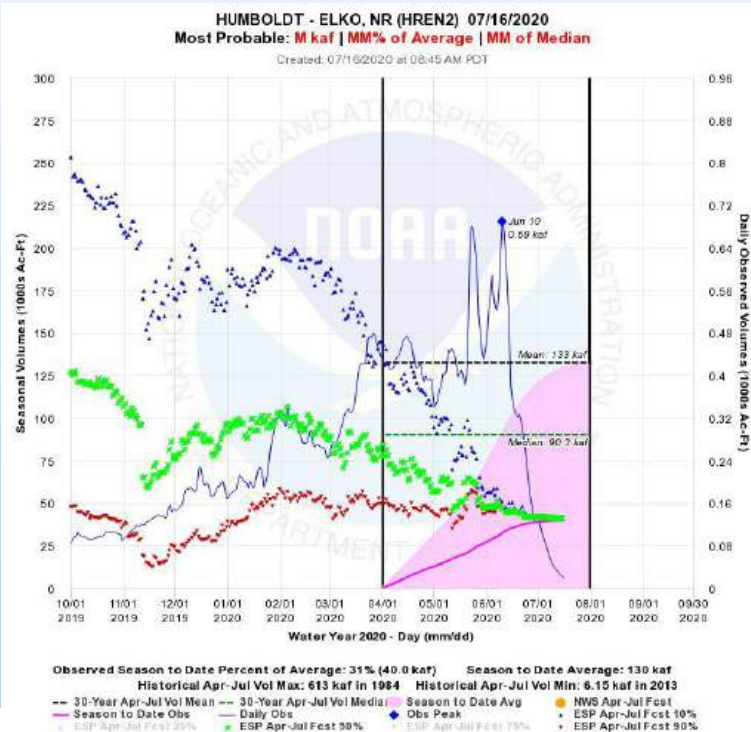
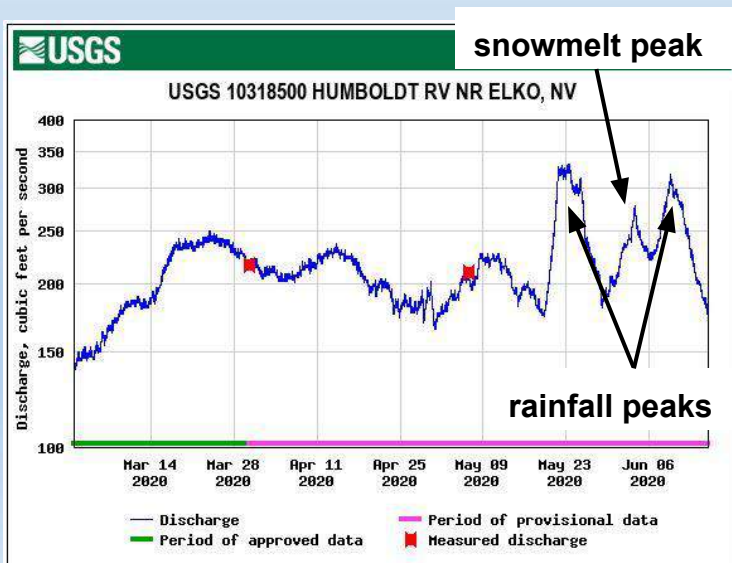


Observed Season to Date Percent of Average: 54% (17.8 kaf) Season to Date Average: 31.5 kaf
Historical Apr-Jul Vol Max: 133 kaf in 1952 Historical Apr-Jul Vol Min: 2.9 kaf in 1954
Season to Date Obs — 50 Year Apr-Jul Med — 50 Year Apr-Jul Med — ESP Apr-Jul Fcst 10% — ESP Apr-Jul Fcst 50% — ESP Apr-Jul Fcst 90%
Daily Obs — Daily Fcst — Obs Peak — ESP Apr-Jul Fcst Peak 10% — ESP Apr-Jul Fcst Peak 50% — ESP Apr-Jul Fcst Peak 90%

Observed Season to Date Percent of Average: 33% (22.1 kaf) Season to Date Average: 63.8 kaf
Historical Apr-Jul Vol Max: 178 kaf in 1955 Historical Apr-Jul Vol Min: 11.2 kaf in 1958
Season to Date Obs — 50 Year Apr-Jul Med — 50 Year Apr-Jul Med — ESP Apr-Jul Fcst 10% — ESP Apr-Jul Fcst 50% — ESP Apr-Jul Fcst 90%
Daily Obs — Daily Fcst — Obs Peak — ESP Apr-Jul Fcst Peak 10% — ESP Apr-Jul Fcst Peak 50% — ESP Apr-Jul Fcst Peak 90%

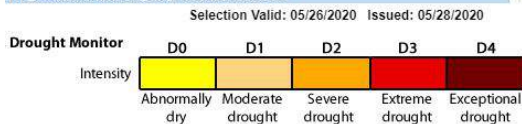
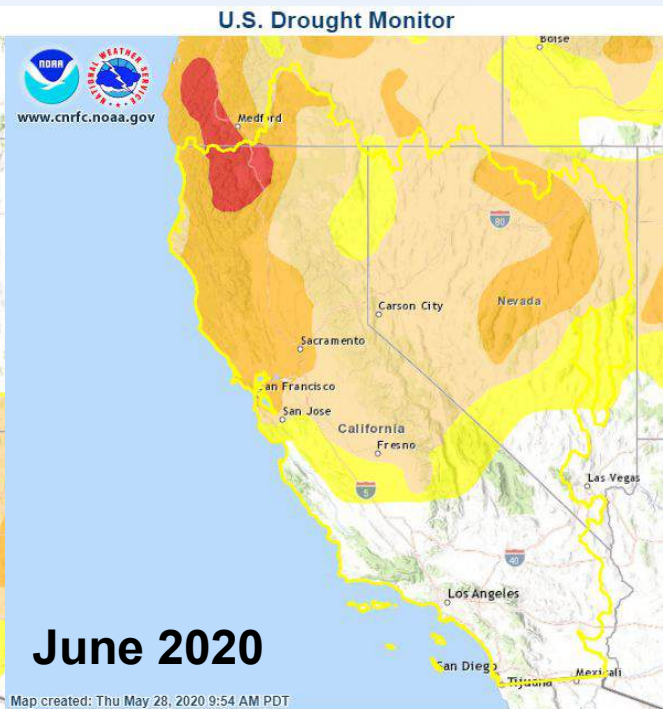
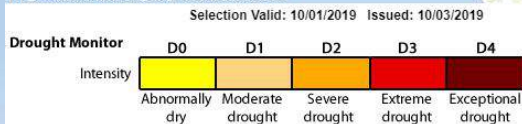
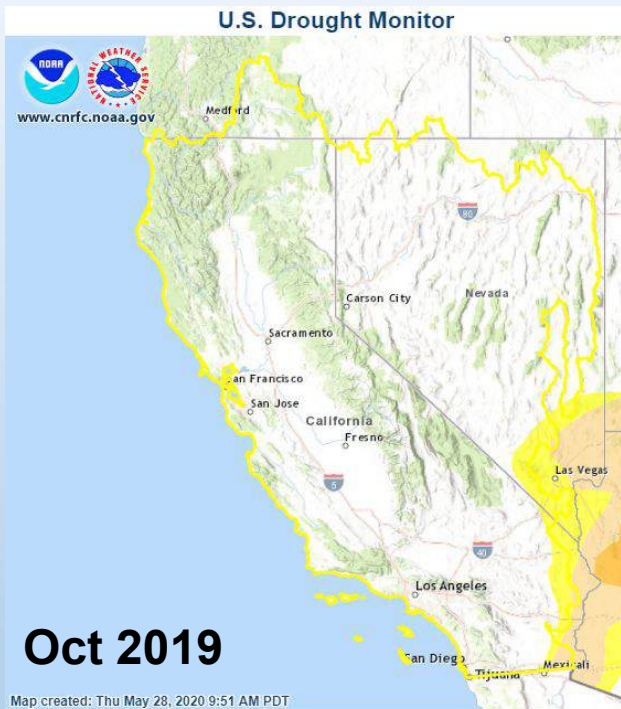
Where did the water go at Elko?

- AJ volume 50% of April 1st forecast
- MHSN2 + DVGN2 = 45kaf
 - HREN2 = 40kaf
- Volume loss downstream highlights dry Ruby mnts & losses from tribs during routing



Drought conditions

- Drought conditions developed in early spring, despite spring precip
- Drought most significant along the north coast through the Russian River basin
- Drought also developing in Humboldt



The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-U.

Source: US Drought Monitor

Flood events

- FSNC1 only forecast point to reach flood stage
- Only a few locations reached monitor stage
- No weir flow on the Sac River

