Colorado River Basin Water Supply Briefing

April 7, 2021

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Colorado Basin River Forecast Center

Please mute your phone until the question period

Today's Presentation

Soil Moisture Conditions

March/Early April Weather Review

Current Snowpack

2021 Water Supply Forecasts

April Forecast Error

Upcoming Weather

CBRFC Hydro Science Update

Contacts & Questions

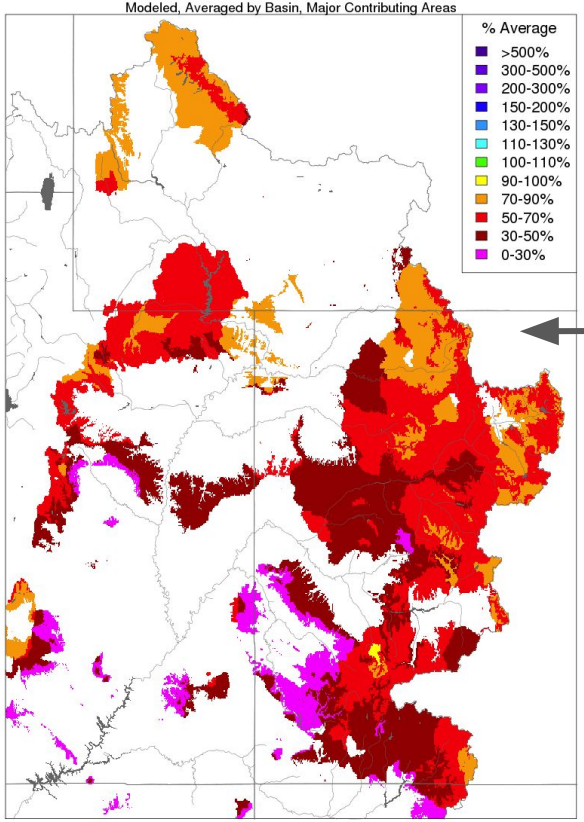
Webinar recording & slides will be made available on CBRFC webpage

Soil Moisture Conditions

Upper Colorado River Basin

Soil Moisture - Fall - 2020 (November 15)

Modeled, Averaged by Basin, Major Contributing Areas



Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

Water supply impacts are most pronounced when soil moisture conditions and snowpack conditions are both much above or much below average.

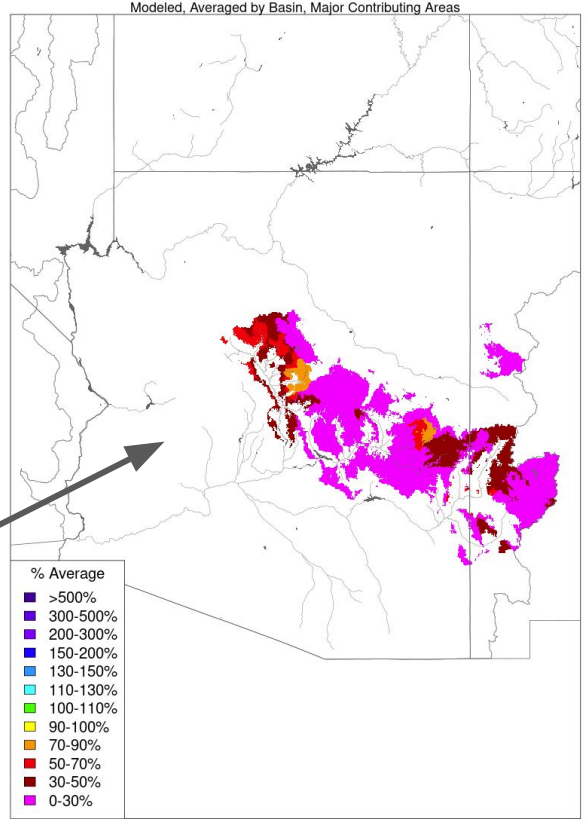
Model soil moisture is generally in the bottom 5 across the Upper Colorado over the 1981-2020 40-year period. The San Juan and Dolores are generally in the bottom 3 with some areas being record dry.

Lower Colorado River Basin soil moisture conditions remain much below normal after a mostly dry March and a mostly much below average snow season nears its end.

Lower Colorado River Basin

Soil Moisture - April 05 2021

Modeled, Averaged by Basin, Major Contributing Areas



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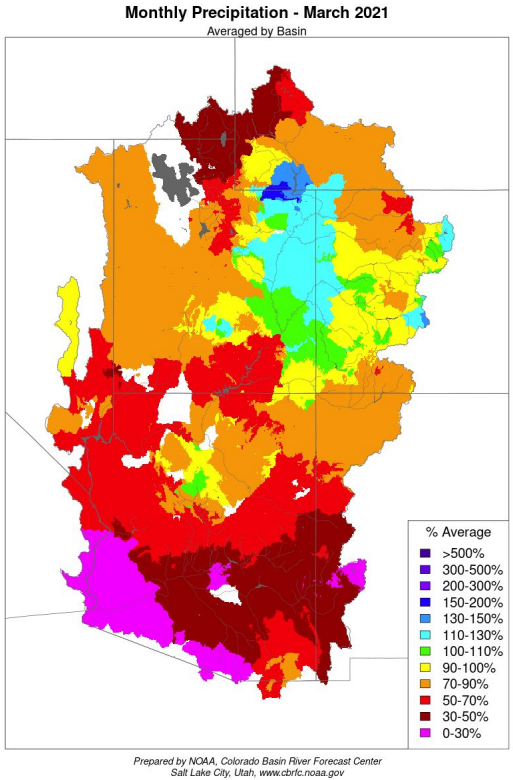
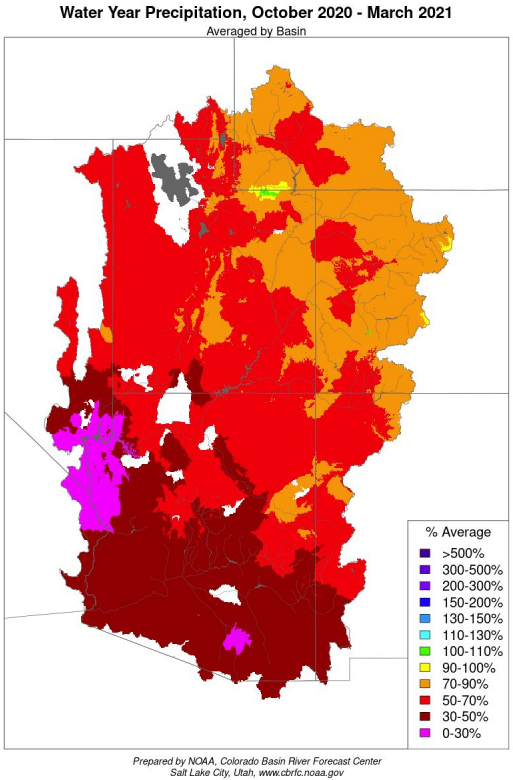
Precipitation Summary



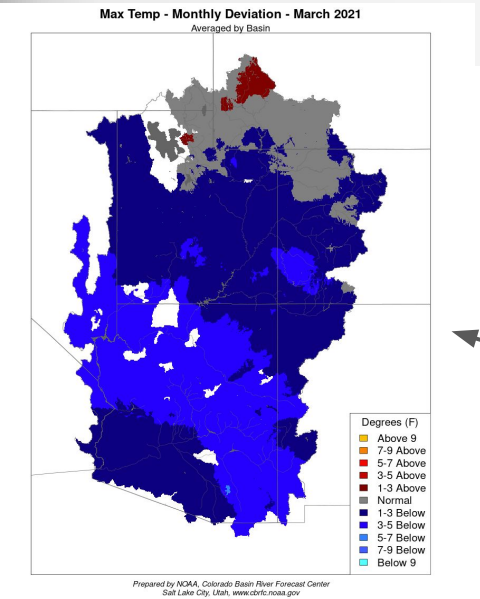


Mixed bag for monthly precip. Above normal across portions of Colorado and northern slopes of Uintas, and near to below normal elsewhere.

Water Year 2021
Oct-Mar Precip Summary

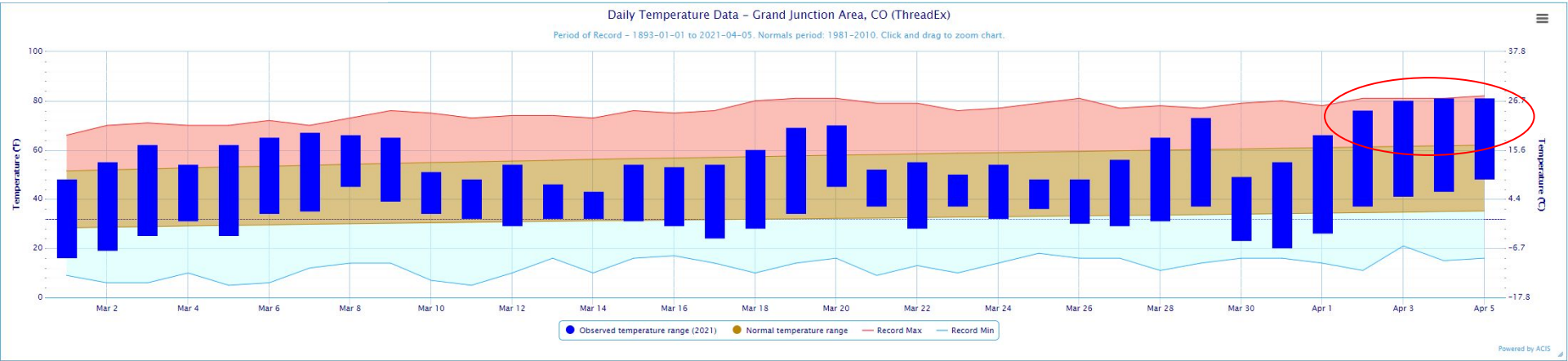
Basin	Precip (% Avg)
Upper Green	85%
Duchesne	70%
Price/San Rafael	70%
Yampa/White	75%
Upper CO Mainstem	80%
Gunnison	80%
Dolores	75%
San Juan	75%
Lake Powell	75%
Virgin	60%
Verde	50%
Salt	50%
Little Colorado	55%
Upper Gila	50%

March/Early April Temperatures

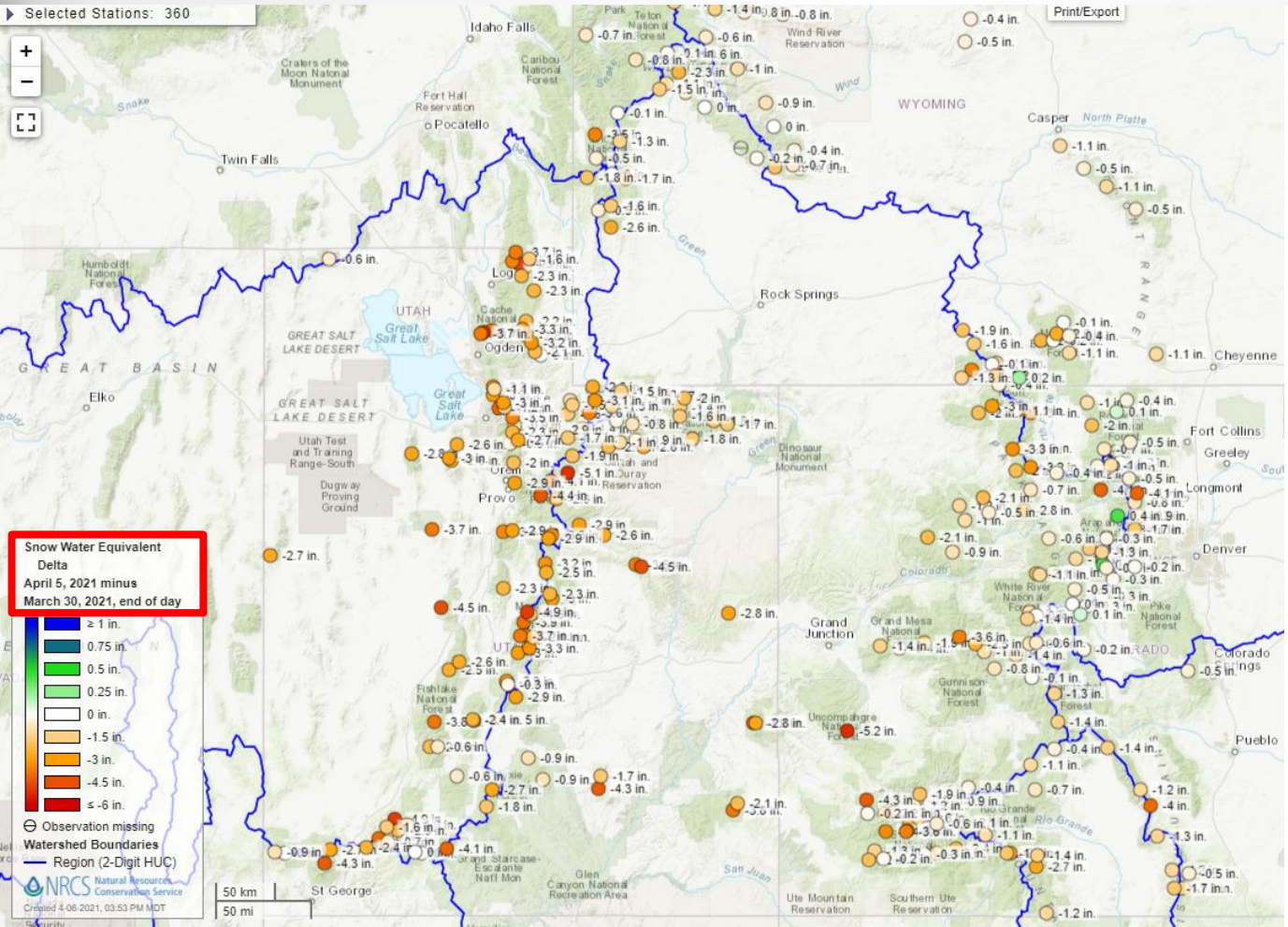


March monthly temperatures were generally near to below normal, with the coolest anomalies across the Lower Basin. The lack of prolonged stretches of above normal temperatures helped preserve snow through the month.

Mild/cool end to March, followed by near record highs to start April.



Early April Snowmelt - NRCS SNOTEL Stations



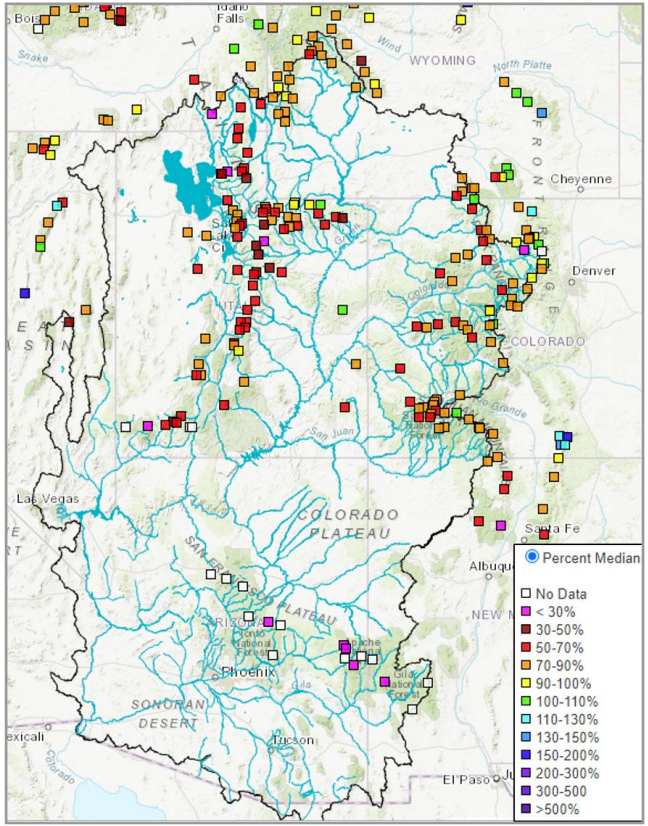
Widespread 1-4 inches of snowmelt across the region during the past week due to much above normal temperatures.

Snowmelt magnitude was generally largest at elevations below 9,500 feet across central/southwest Utah and southwest Colorado. Less snowmelt occurred in Wyoming and at higher elevations along the Continental Divide.

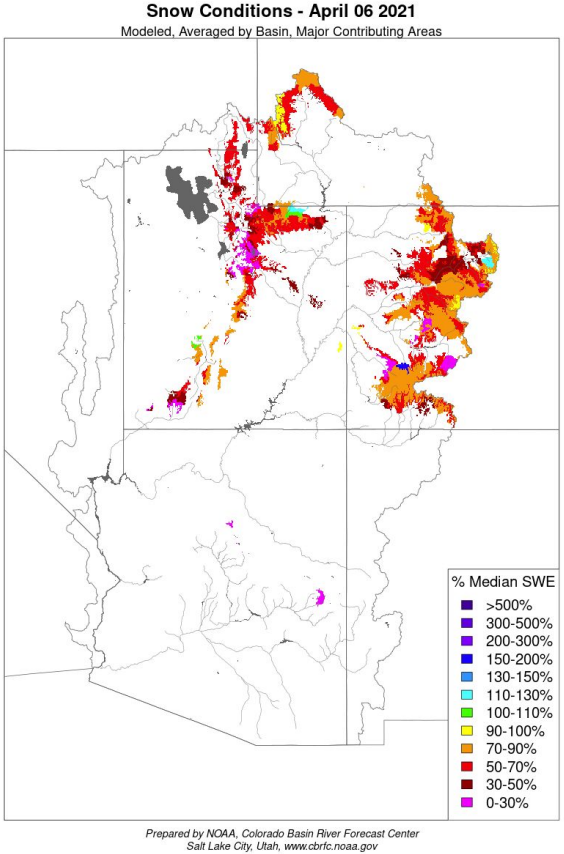
Snow across the Lower Colorado River Basin has mostly melted out and the majority of SNOTEL stations across Arizona are reporting less than an inch of SWE.

Early April Snow Conditions

SNOTEL (Observed)



CBRFC (Model)

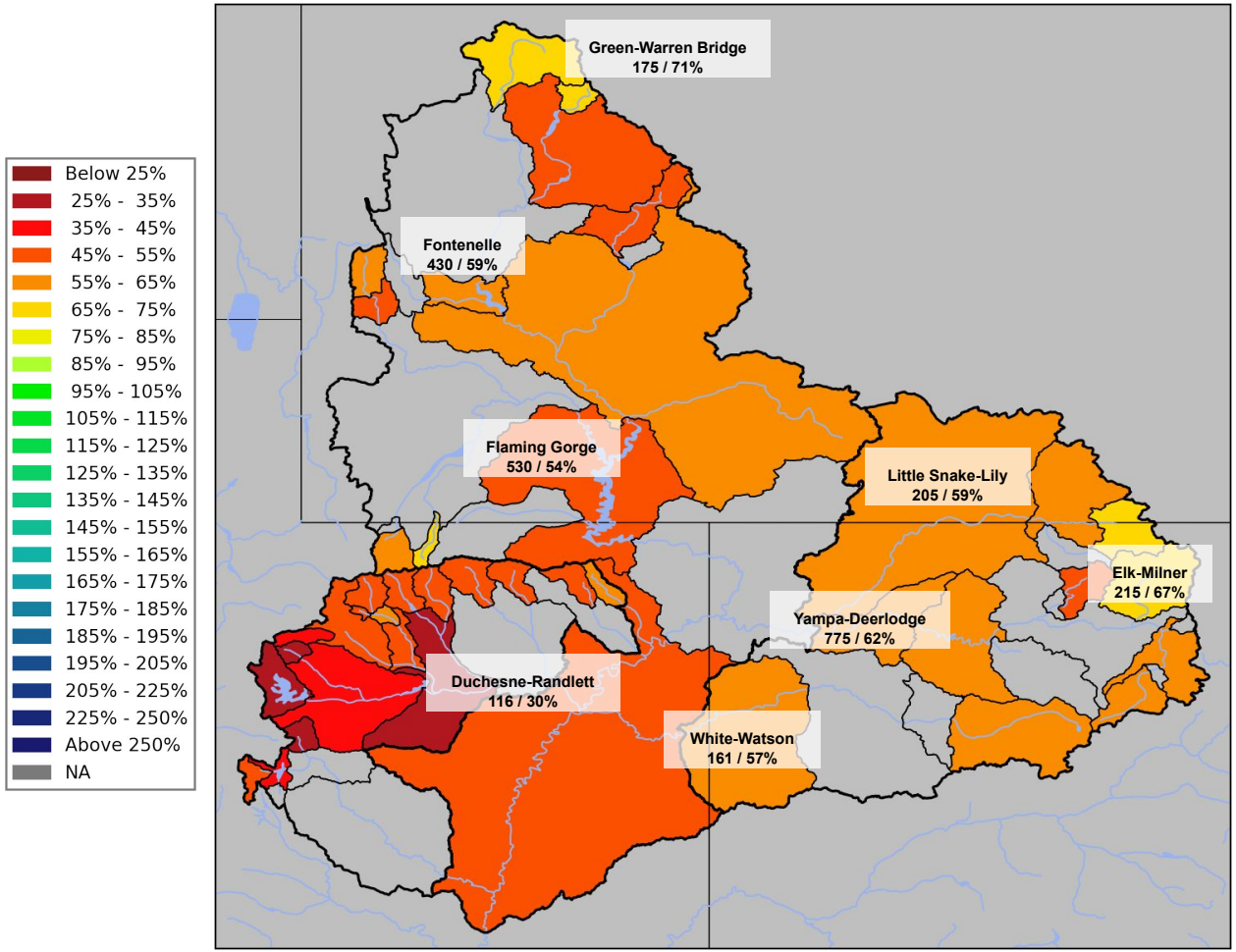


Apr 6 SWE Summary (SNOTEL)

Basin	SWE (% Median)
Upper Green	80%
Duchesne	60%
Price/San Rafael	55%
Yampa/White	75%
Upper CO Mainstem	80%
Gunnison	75%
Dolores	65%
San Juan	80%
Lake Powell	75%

Lower Colorado River Basin SWE has mostly melted out

Apr 1st Water Supply Forecasts: Green, Yampa, White, Duchesne



April 1st 2021 Forecasts

Volume (kaf) / % of 1981-2010 avg

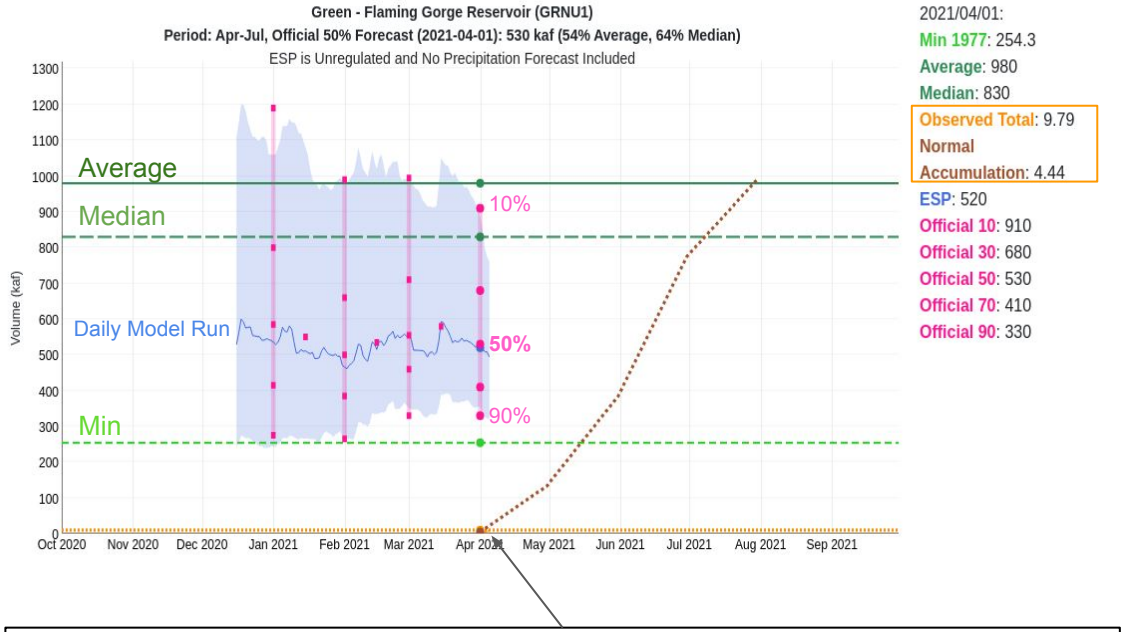
Forecast Ranges & (1-month Trend)

Upper Green: 50 - 75% avg
(0 - 10% decrease)

Yampa/White: 45 - 65% avg
(0 - 10% decrease)

Duchesne: 25 - 55% avg
(0 - 5% decrease)

Upper Green Water Supply Forecasts & Snow Conditions

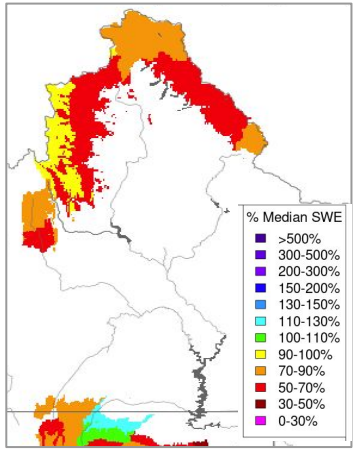


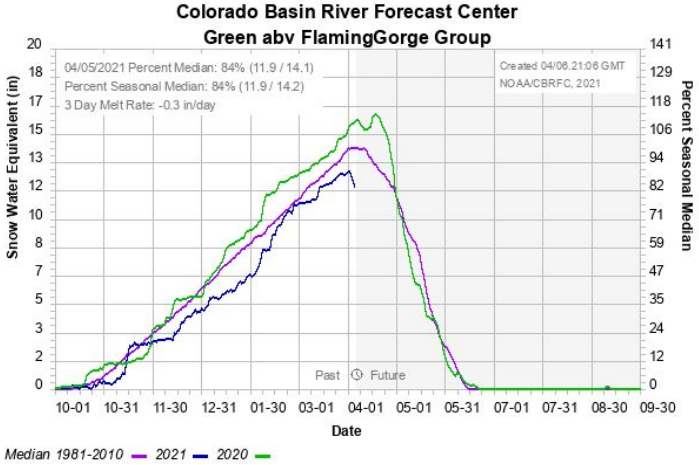
2021/04/01:
Min 1977: 254.3
Average: 980
Median: 830
Observed Total: 9.79
Normal Accumulation: 4.44
ESP: 520
Official 10: 910
Official 30: 680
Official 50: 530
Official 70: 410
Official 90: 330

April 1 - start accumulating observed runoff through July 31 forecast period

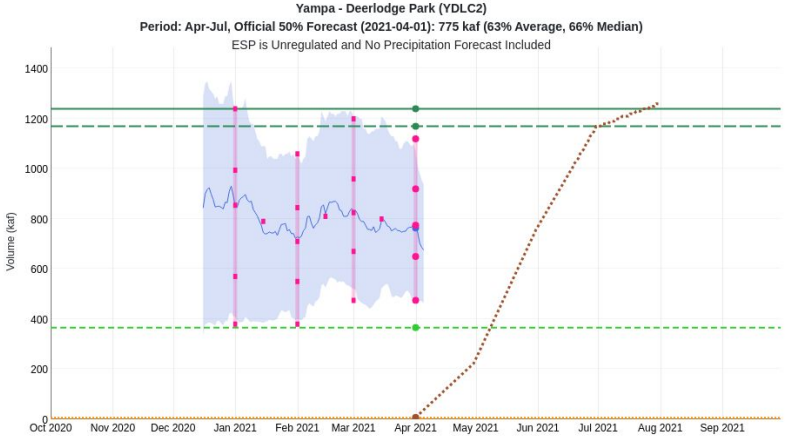
Any missing/bad observations (streamflow/diversions) need to be estimated

Model Snow: 4/6



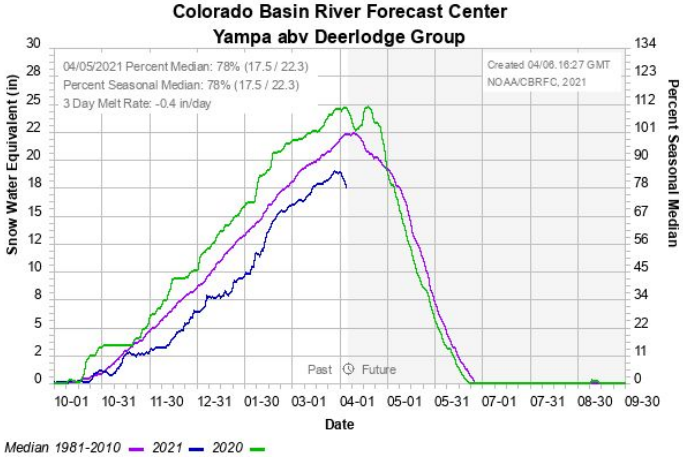


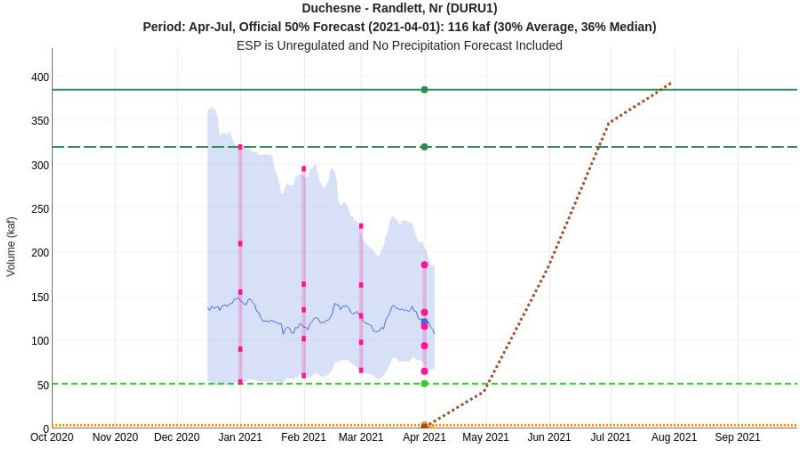
Yampa & Duchesne Water Supply Forecasts & Snow Conditions



2021/04/01:
Min 2002: 366.16
Average: 1240
Median: 1170
Observed Total: 4.47
Normal
Accumulation: 7.46
ESP: 764
Official 10: 1120
Official 30: 920
Official 50: 775
Official 70: 650
Official 90: 475

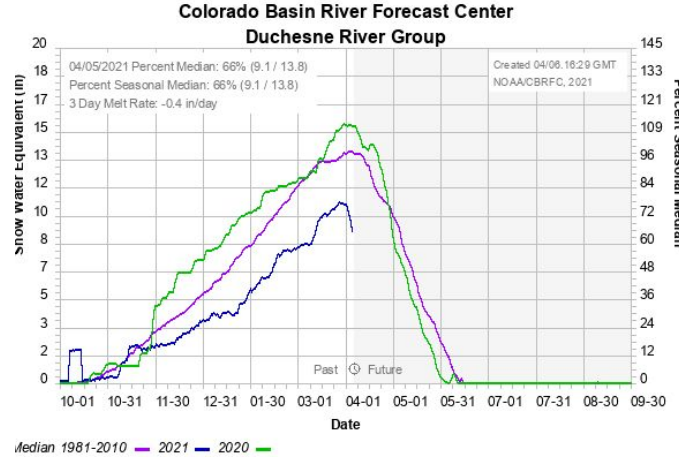
Forecast guidance has decreased by 8-10% of average since the first of month.





2021/04/01:
Min 1977: 50.97
Average: 385
Median: 320
Observed Total: 3.87
Normal
Accumulation: 1.39
ESP: 121
Official 10: 186
Official 30: 132
Official 50: 116
Official 70: 94
Official 90: 65

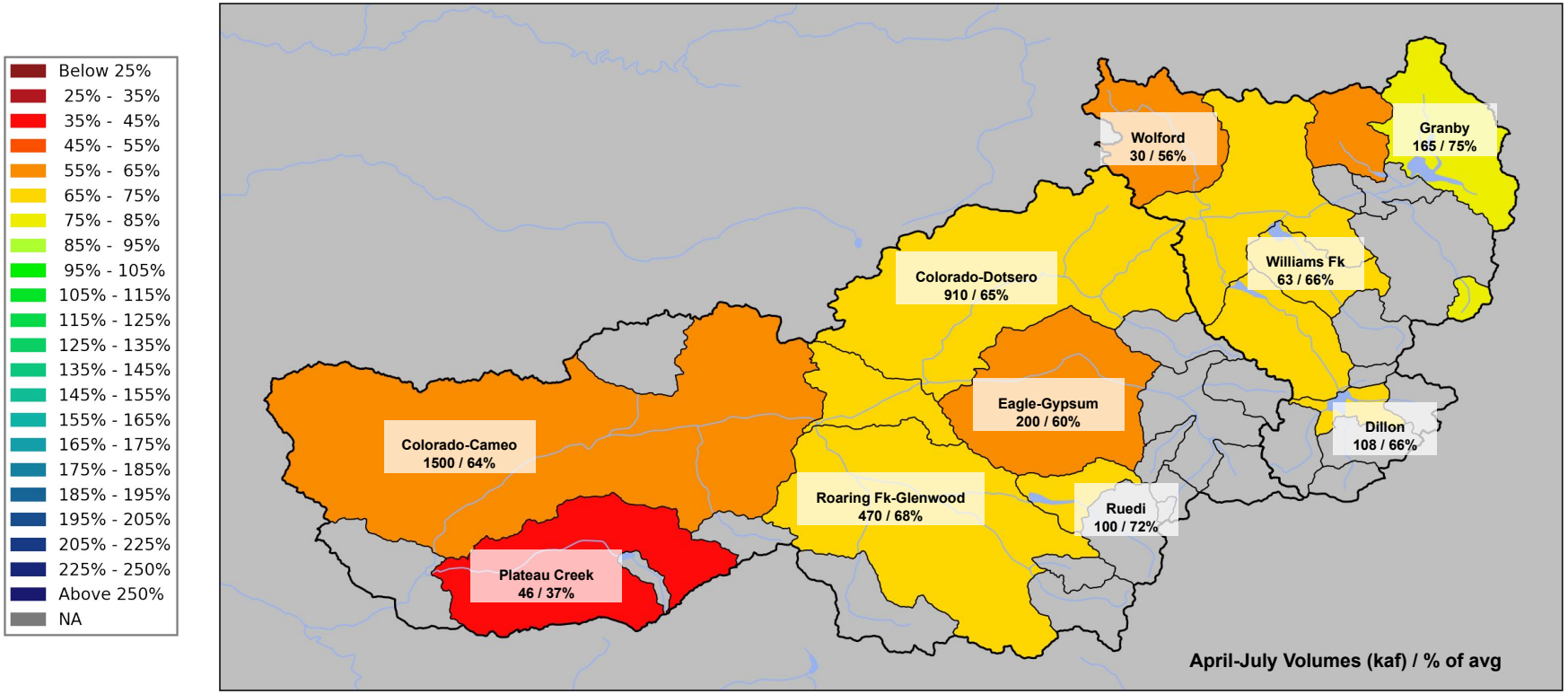
Very poor conditions continue in the Duchesne River basin.



Apr 1st Water Supply Forecasts: Upper Colorado River Mainstem

Forecast Ranges & (1-month Trend):

Granby to Kremmling: 55 - 80% avg (+/- 5%)
Kremmling to Cameo: 35 - 70% avg (+/- 5%)



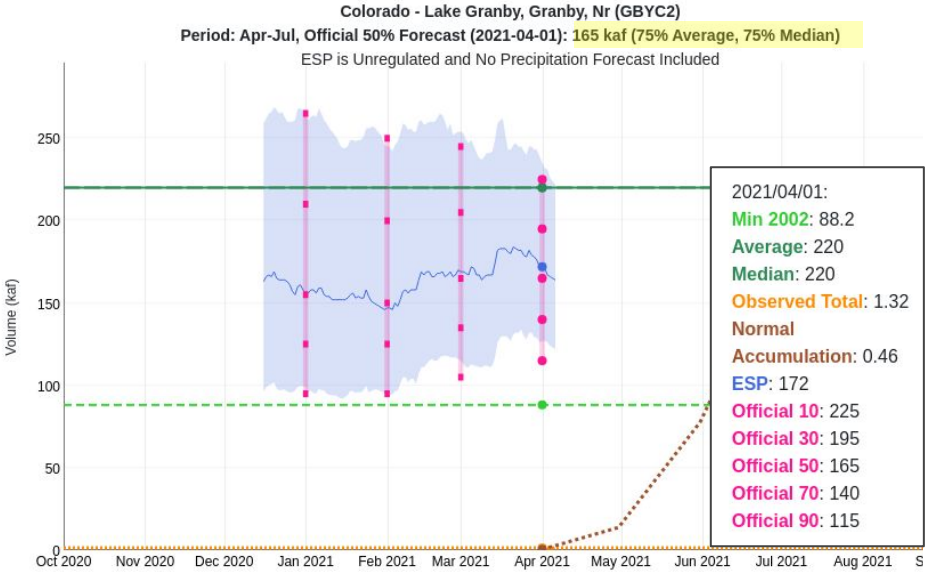
Upper Colorado Mainstem Water Supply Forecasts & Snow Conditions

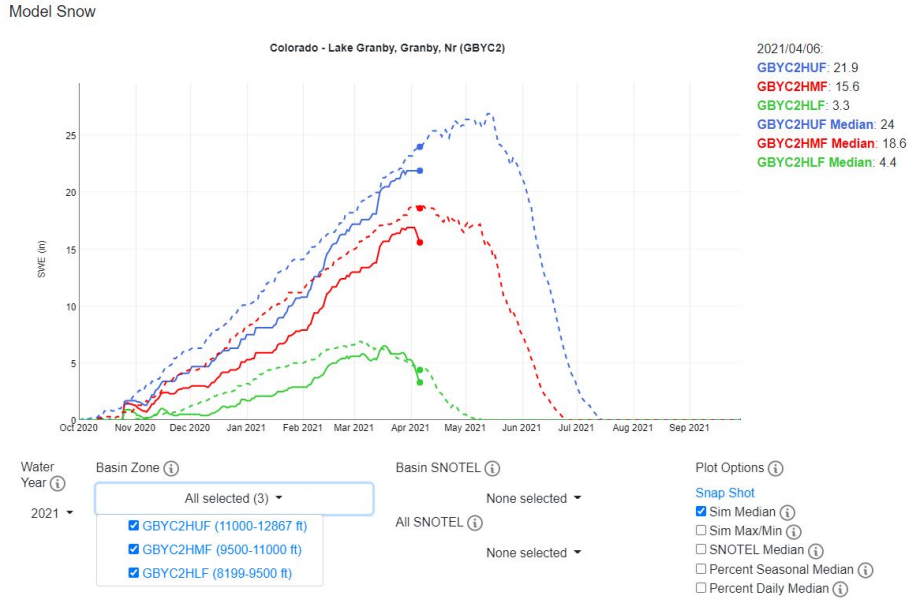
Near normal March precipitation across Upper CO mainstem.

April water supply forecasts similar to March forecasts.

April 6 Model Snow Summary (%Median)

Upper Zone	>11,000’	91%
Middle Zone	9,500’-11,000’	84%
Lower Zone	<9,500’	75%

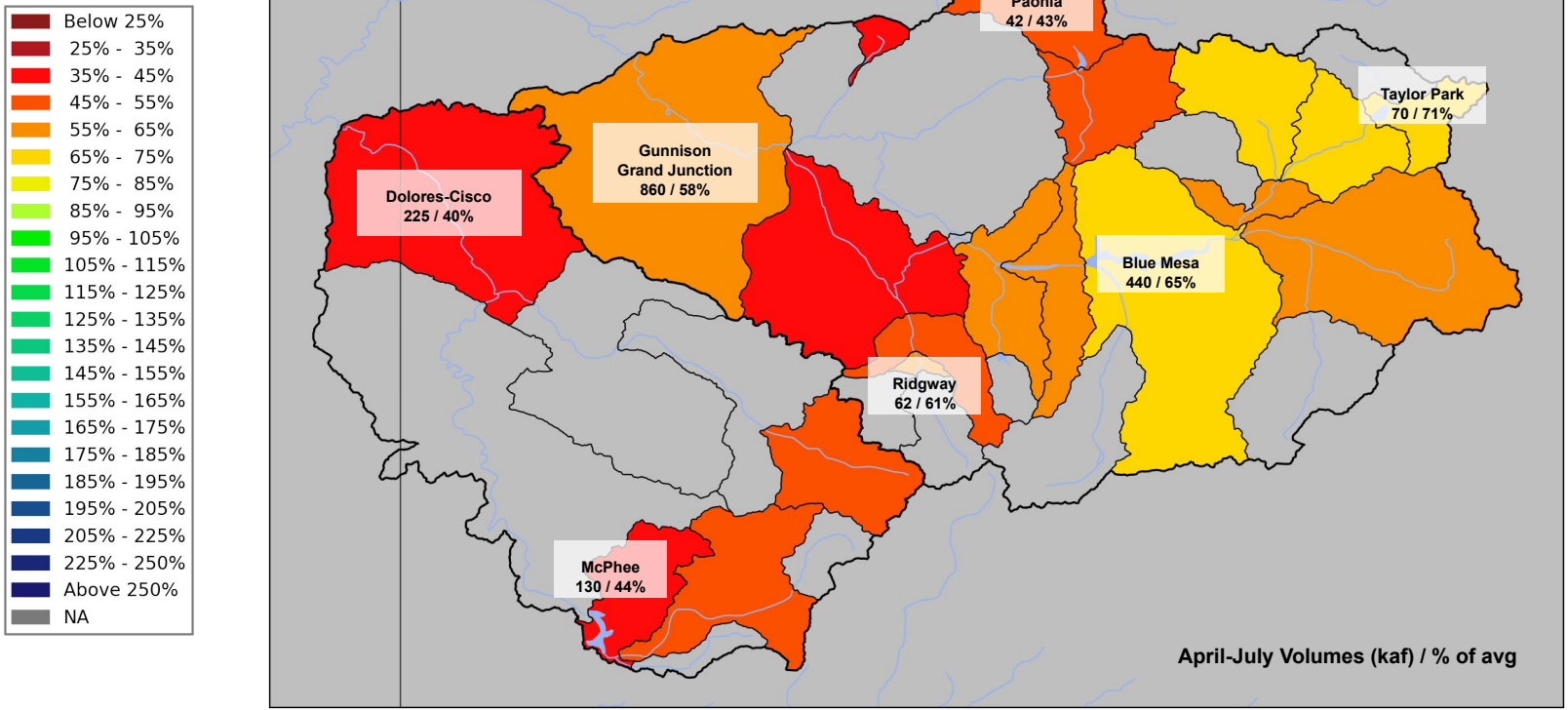




Apr 1st Water Supply Forecasts: Gunnison, Dolores

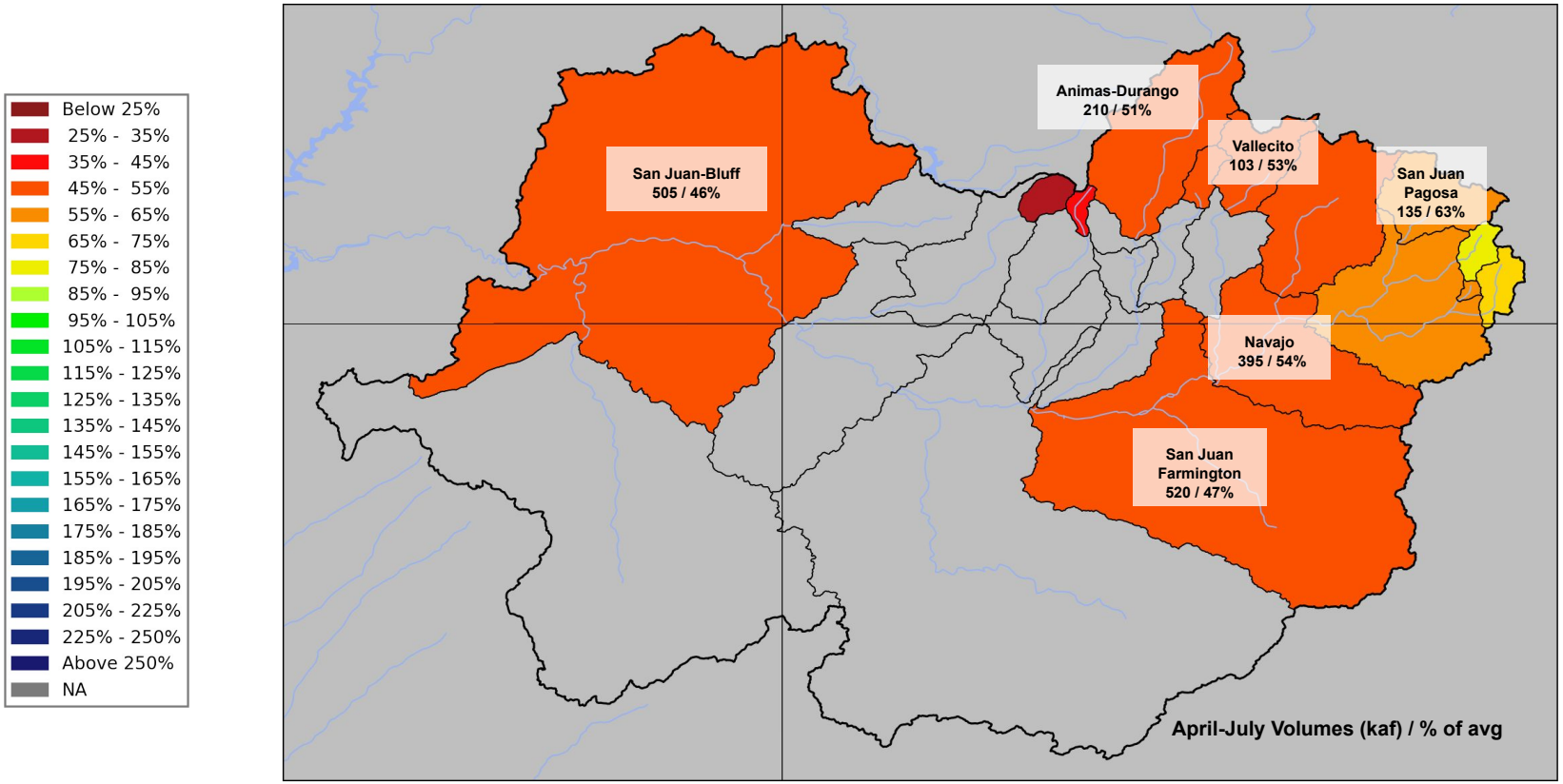
Forecast Ranges & (1-month Trend):

Gunnison: 40 - 70% avg (+/- 5%)
Dolores: 40 - 50% avg (+/- 5%)

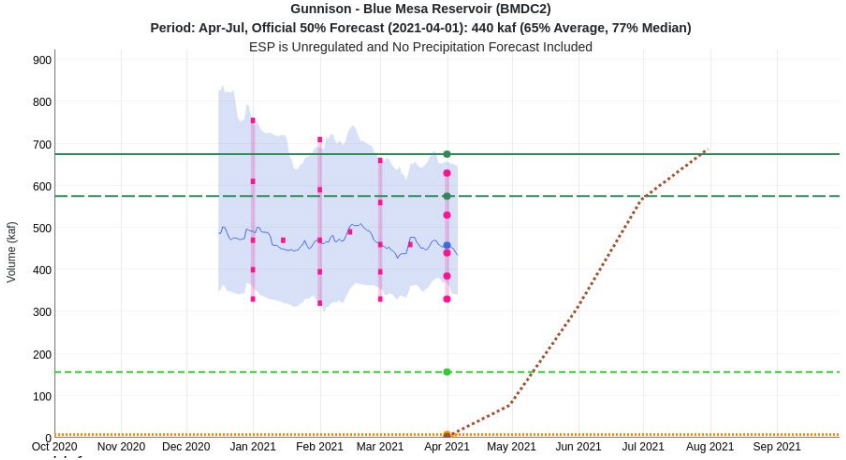


Apr 1st Water Supply Forecasts: San Juan

Forecast Range & (1-month Trend):
35 - 75% of average (0 - 5% decrease)

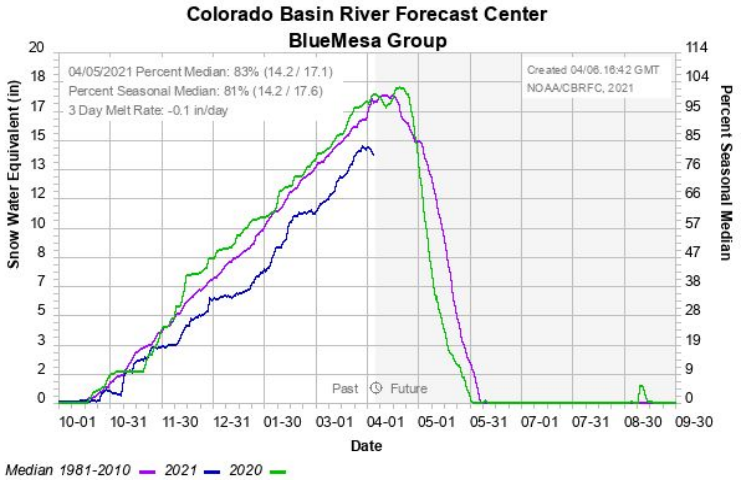


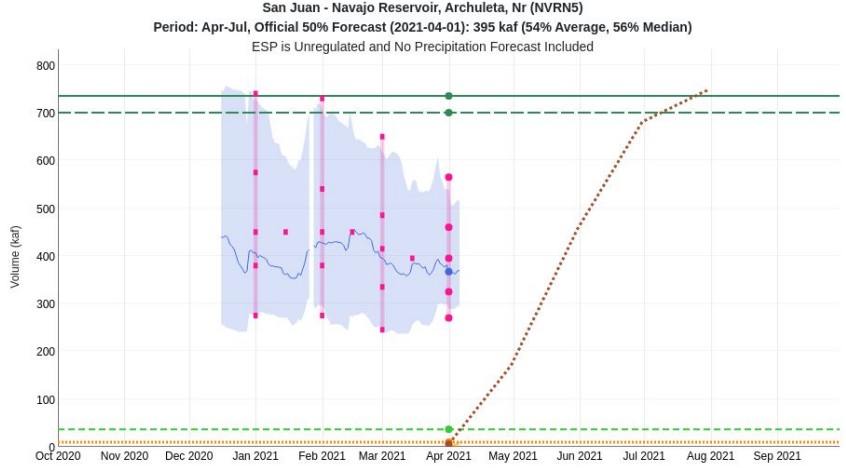
Southwest Colorado Water Supply Forecasts & Snow Conditions



2021/04/01:
Min 2002: 156.55
Average: 675
Median: 575
Observed Total: 7.74
Normal
Accumulation: 2.57
ESP: 458
Official 10: 630
Official 30: 530
Official 50: 440
Official 70: 385
Official 90: 330

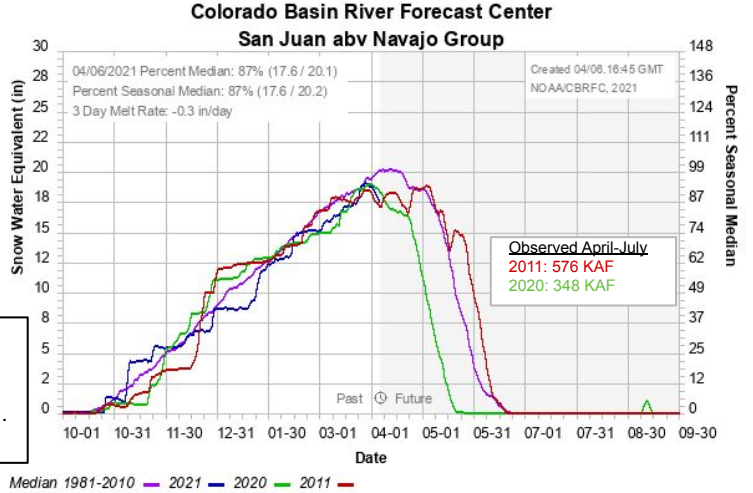
440 kaf would be 11th lowest volume dating back to 1981



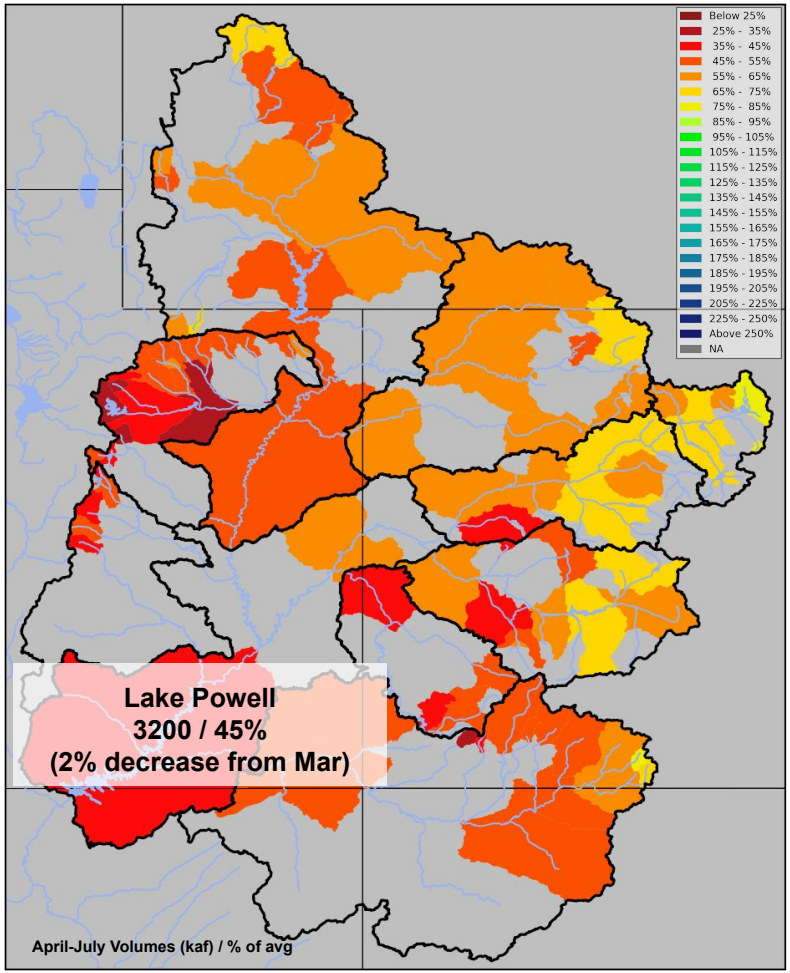


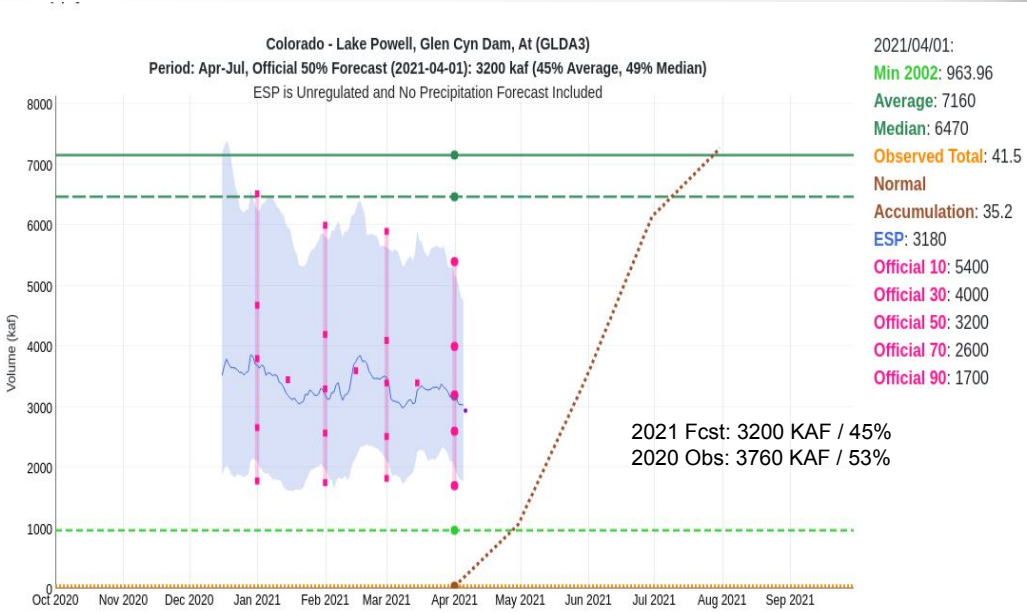
2021/04/01:
Min 2002: 36.74
Average: 735
Median: 700
Observed Total: 9.87
Normal
Accumulation: 5.68
ESP: 367
Official 10: 565
Official 30: 460
Official 50: 395
Official 70: 325
Official 90: 270

Forecast guidance will most likely trend down between now and the middle of month.



Apr 1st Water Supply Forecasts: Upper Colorado (Lake Powell)





Lake Powell summarizes the hydrologic conditions throughout the Upper Colorado River Basin.

5 Lowest Historical Years: April-July Volume / % avg

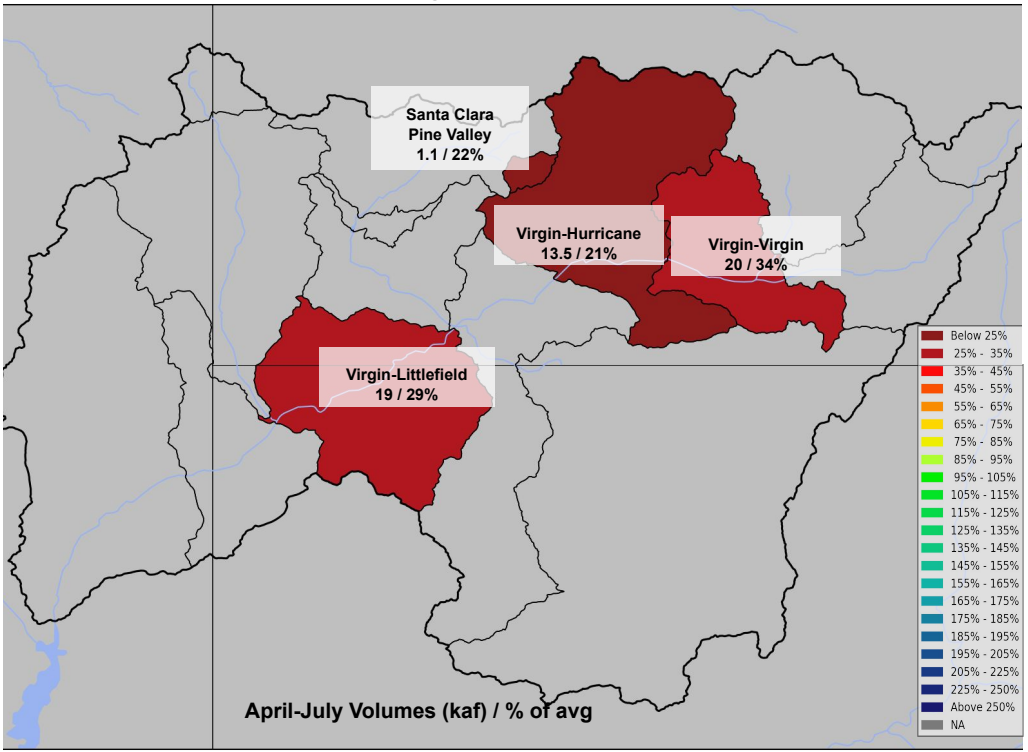
2002: 946 KAF / 13%
1977: 1208 KAF / 17%
2012: 2063 KAF / 29%
2013: 2558 KAF / 36%
2018: 2602 KAF / 36%

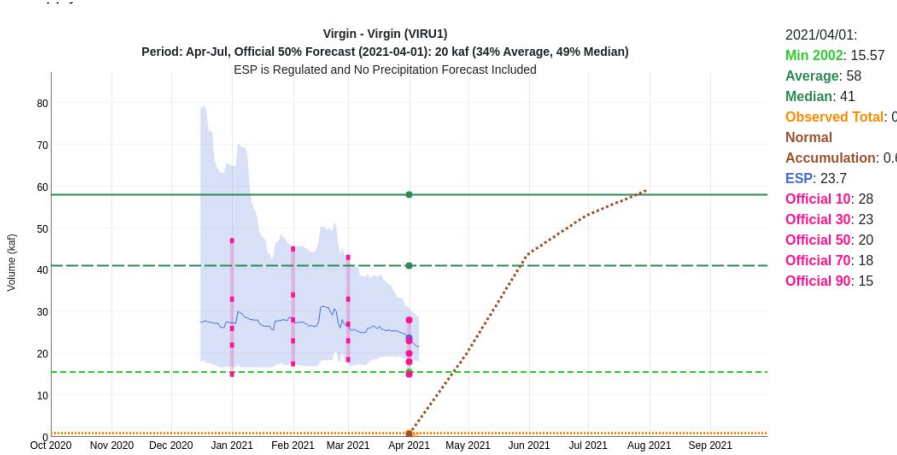
*Currently a ~30% chance to be in the bottom five

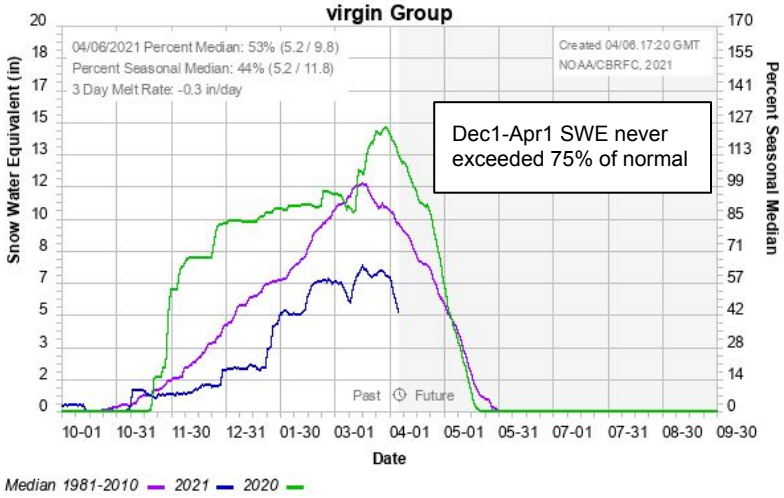
Apr 1st Water Supply Forecasts: Virgin River Basin

Forecast Range & (1-month Trend):

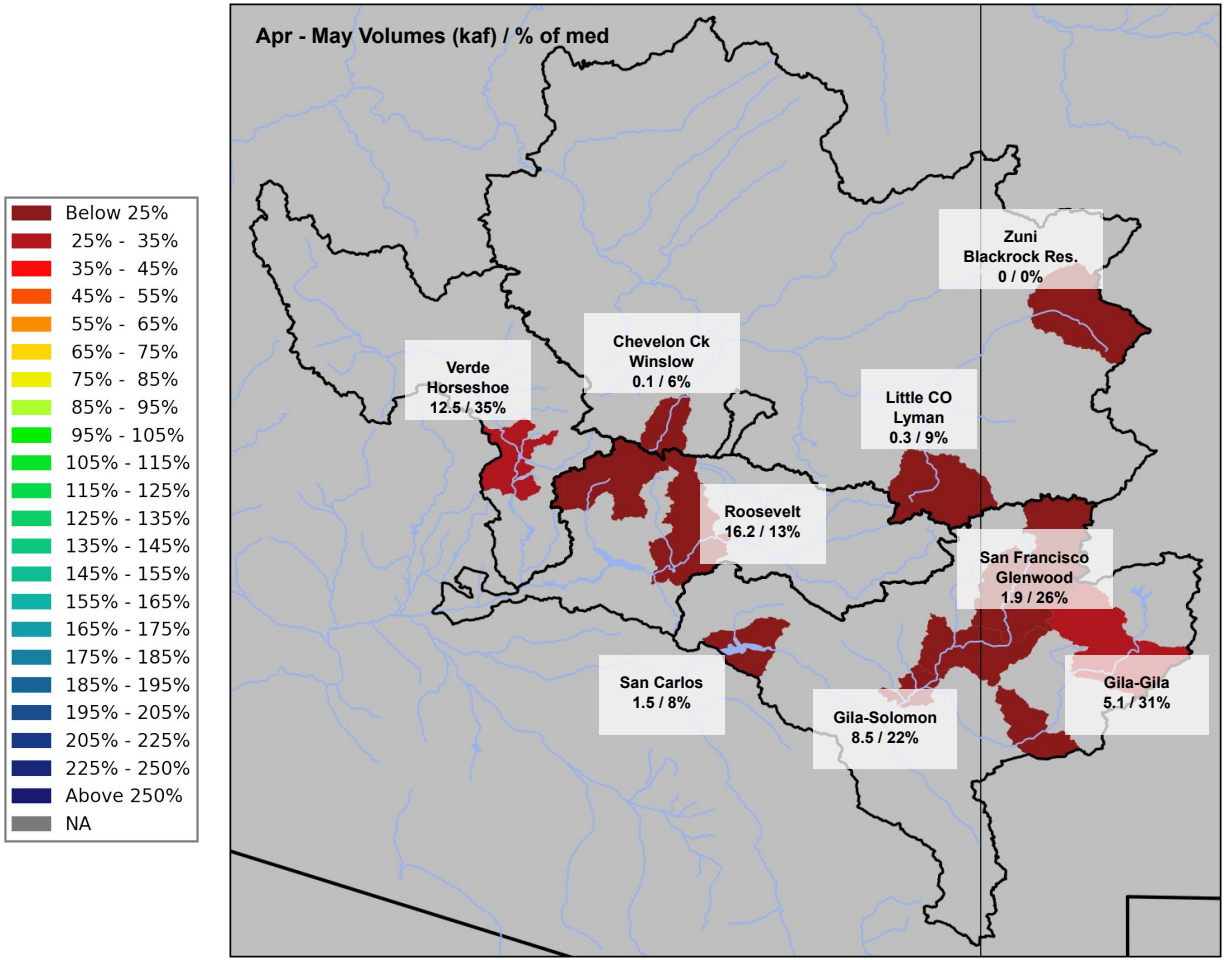
20 - 35% avg (0 - 10% decrease)







Apr 1st Water Supply Forecasts: Lower Colorado River Basin



April - May Forecast Period
Volume (kaf) / % of 1981-2010 Median

Forecast Ranges

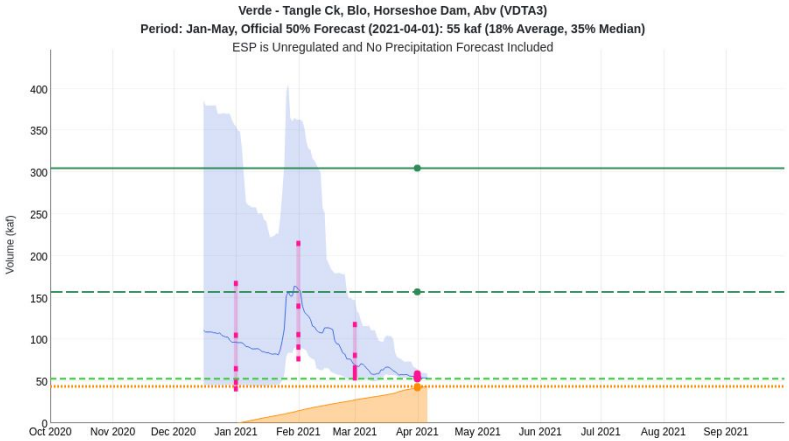
Little Colorado: 0 - 10%

Upper Gila: 10 - 30%

Salt: 5 - 15%

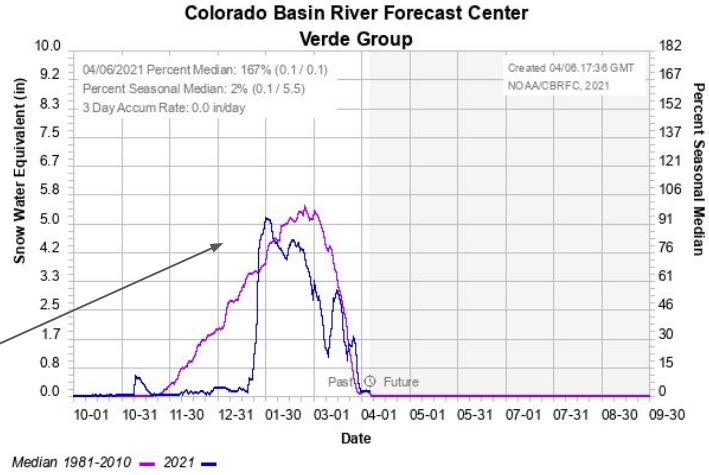
Verde: 35%

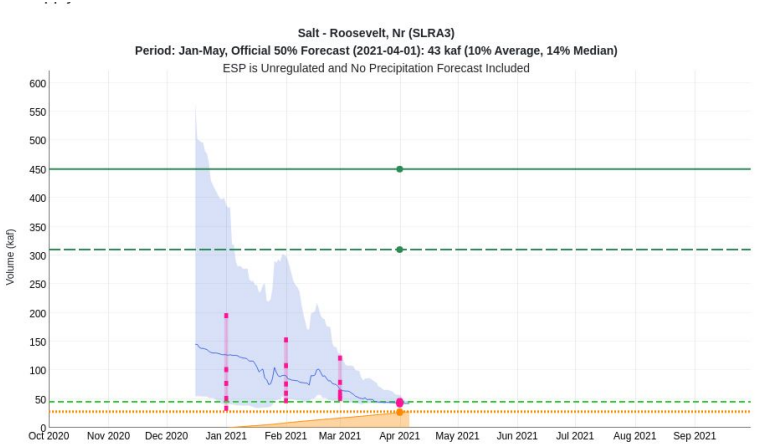
Lower Colorado Water Supply Forecasts & Snow Conditions



2021/04/01:
Min 2018: 52.98
Average: 305
Median: 157
Observed
Accumulation: 42.2
Observed Total: 43.8
ESP: 54.5
Official 10: 59
Official 30: 56
Official 50: 55
Official 70: 54
Official 90: 53

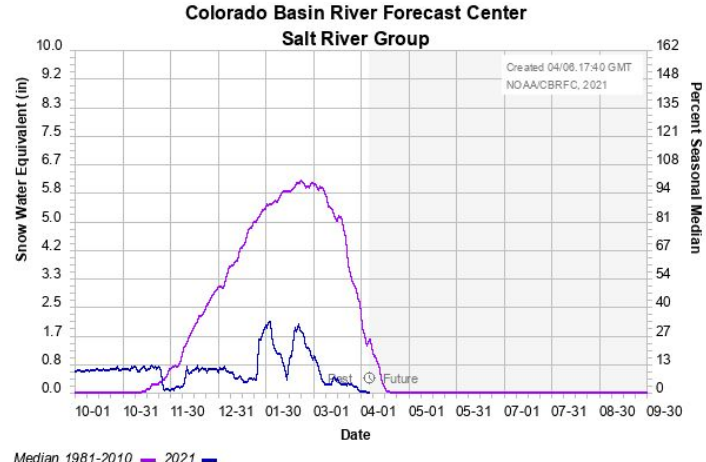
Within the Lower Basin, the Verde River Basin had the most favorable snow conditions (near normal) during 2021.





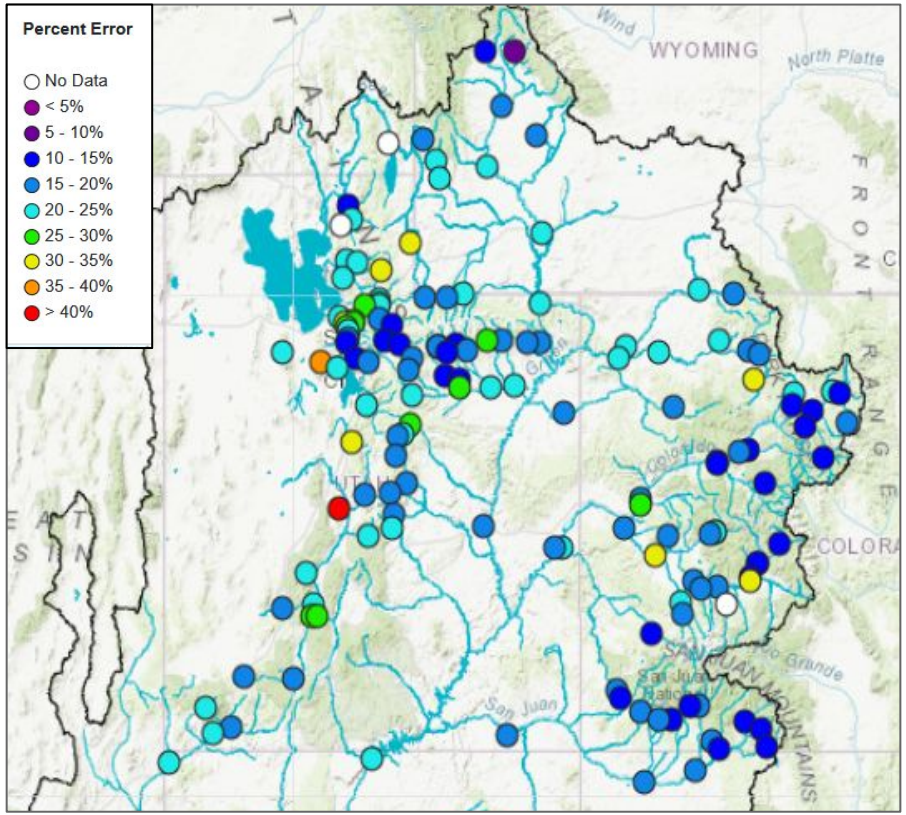
2021/04/01:
Min 2018: 45.02
Average: 450
Median: 310
Observed
Accumulation: 26.4
Observed Total: 28
ESP: 42.9
Official 10: 46
Official 30: 44
Official 50: 43
Official 70: 42
Official 90: 41

Jan-May forecast period; start showing accumulated volume on Jan 1st.



Historical (1981-2010) Forecast Verification

April Forecast Error: April-July Volume



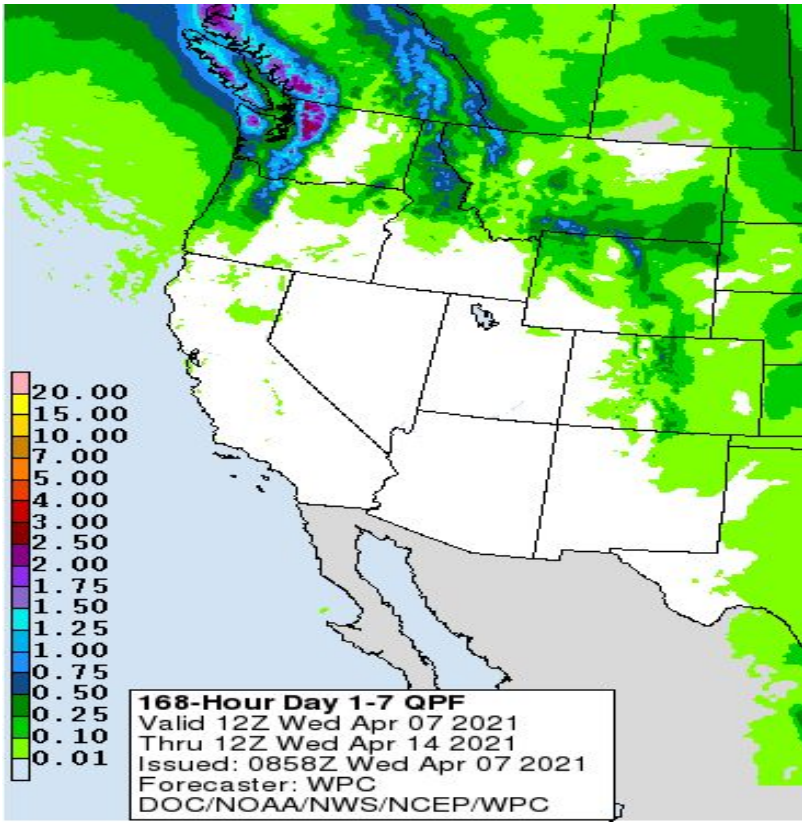
Location	Avg Apr Forecast Error
Green River - Warren Bridge	12%
Fontenelle Reservoir	21%
Yampa River - Deerlodge	20%
Blue River - Dillon Reservoir	14%
Colorado River - Cameo	16%
Blue Mesa Reservoir (Gunnison)	15%
McPhee Reservoir (Dolores)	16%
Navajo Reservoir (San Juan)	18%
Lake Powell	20%

Forecasts are better than just going with average
Error tends to decrease each month into the spring

Where Forecasts are Better:
- -Headwaters
- -Primarily snow melt basins
- -Known diversions / demands

Where Forecasts are Worse:
- -Lower elevations (rain or early melt)
- -Downstream of diversions / irrigation
- -Little is known about diversions / demands

Upcoming Weather: WPC April 7-13 Precipitation Outlook

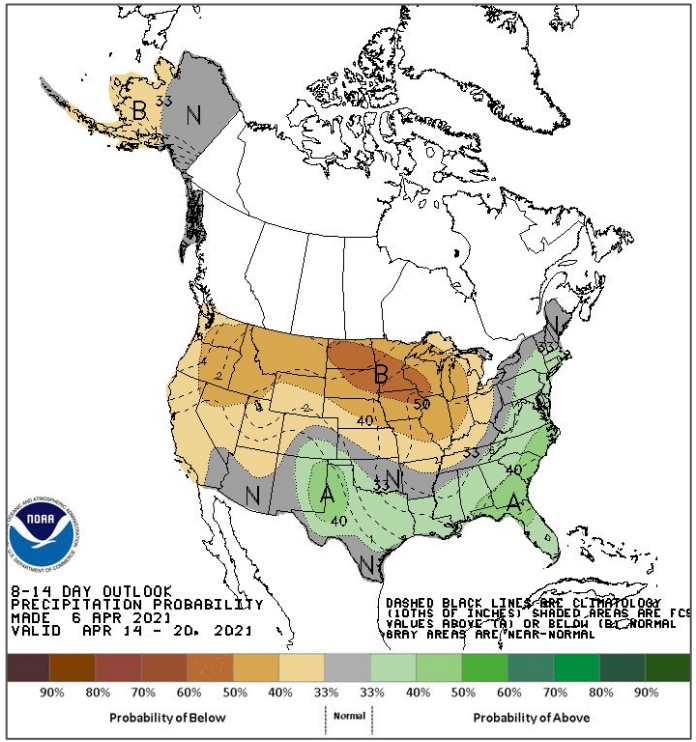


- Mainly tranquil weather through the remainder of the week, with a few weak systems brushing by to the north.
- Temperatures will be seasonal across the north, and 5-10 degrees above normal over southern UT/CO into the Lower Basin.
- Higher uncertainty in precipitation event along the Continental Divide and Front Range by next Tues/Wed.

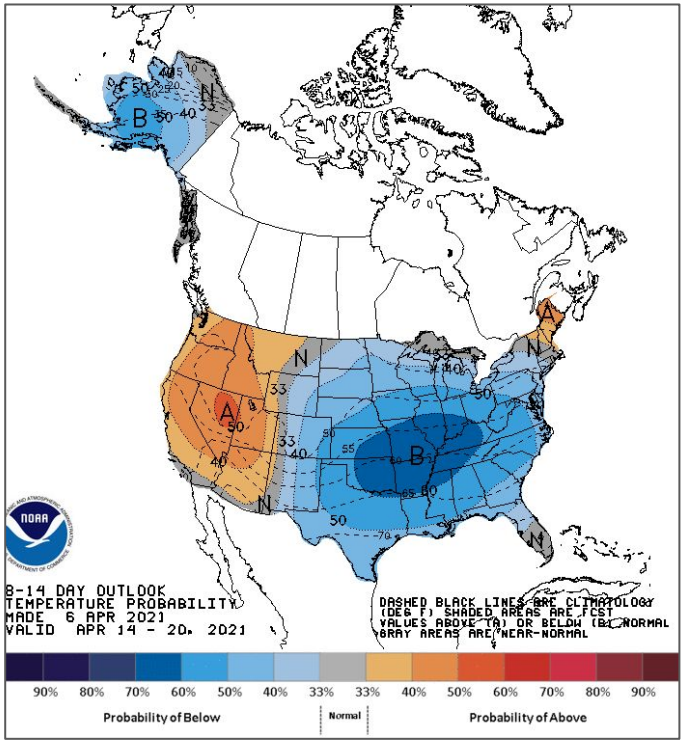
Upcoming Weather: 8-14 Day Outlook (April 14-20)

Weather model uncertainty is higher in the 8-14 day period, which is typical of spring. There is slightly elevated odds for below normal precip and above normal temps, especially across the Great Basin. Further east (across Colorado), near normal precip and near normal temps are favored.

Precipitation Outlook



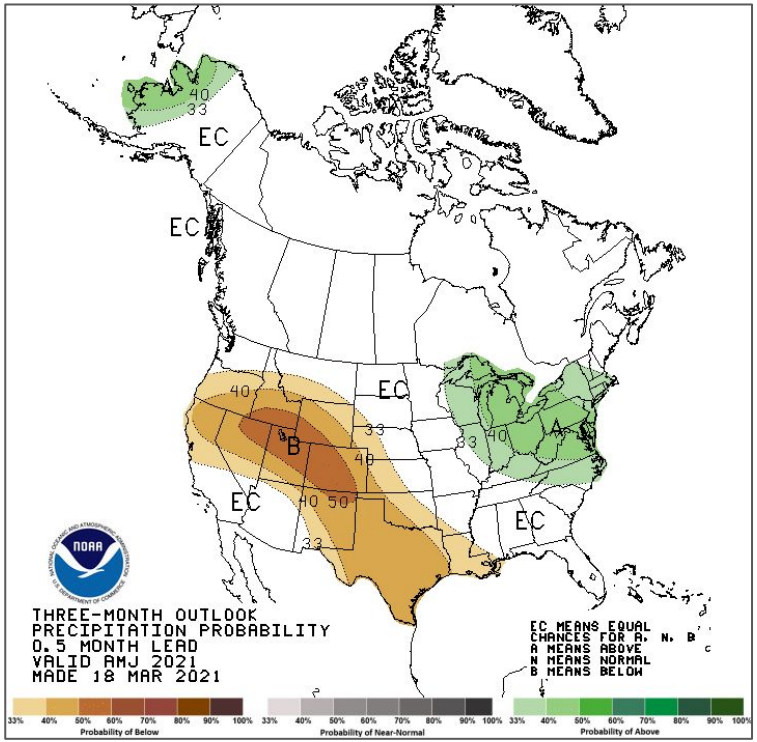
Temperature Outlook



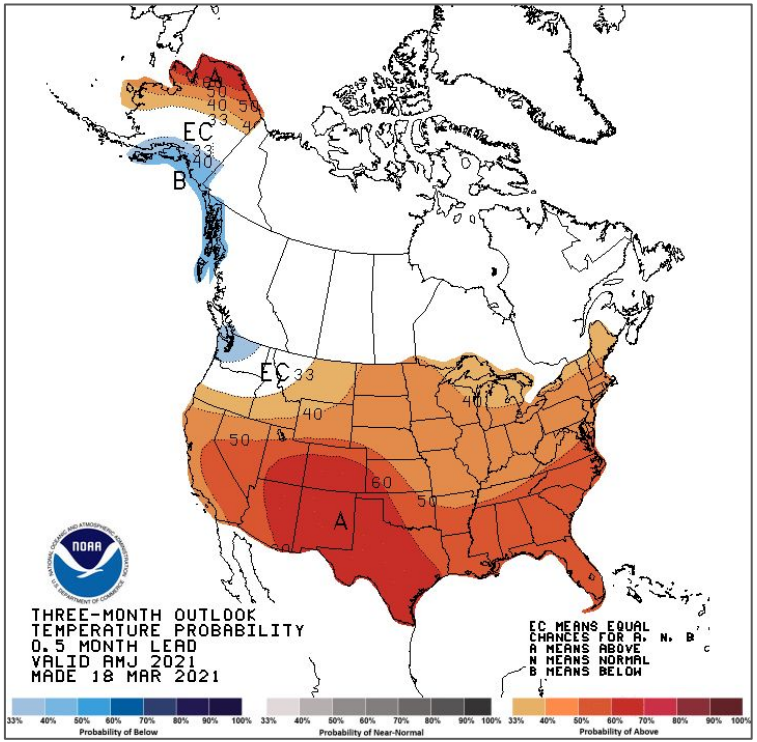
CPC Seasonal Outlook (April-June)

Elevated odds of below normal precipitation and above normal temps over much of the Upper Basin.

Precipitation Outlook



Temperature Outlook



Summary

- Near record (very dry) antecedent soil moisture conditions entering the 2021 spring runoff season

- March precipitation
  - Near/above normal across eastern Utah, western Colorado, and central Arizona
  - Below to much below normal elsewhere across the region

- Early April snowpack (SWE) conditions
  - Upper Colorado: 55-85% of normal
  - Lower Colorado: mostly melted out

- April water supply forecasts (% of normal):
  - Upper Colorado: 35-80%
    - Most favorable along the Continental Divide within Colorado; conditions generally declining from east to west across the region
  - Lower Colorado: 0-35%

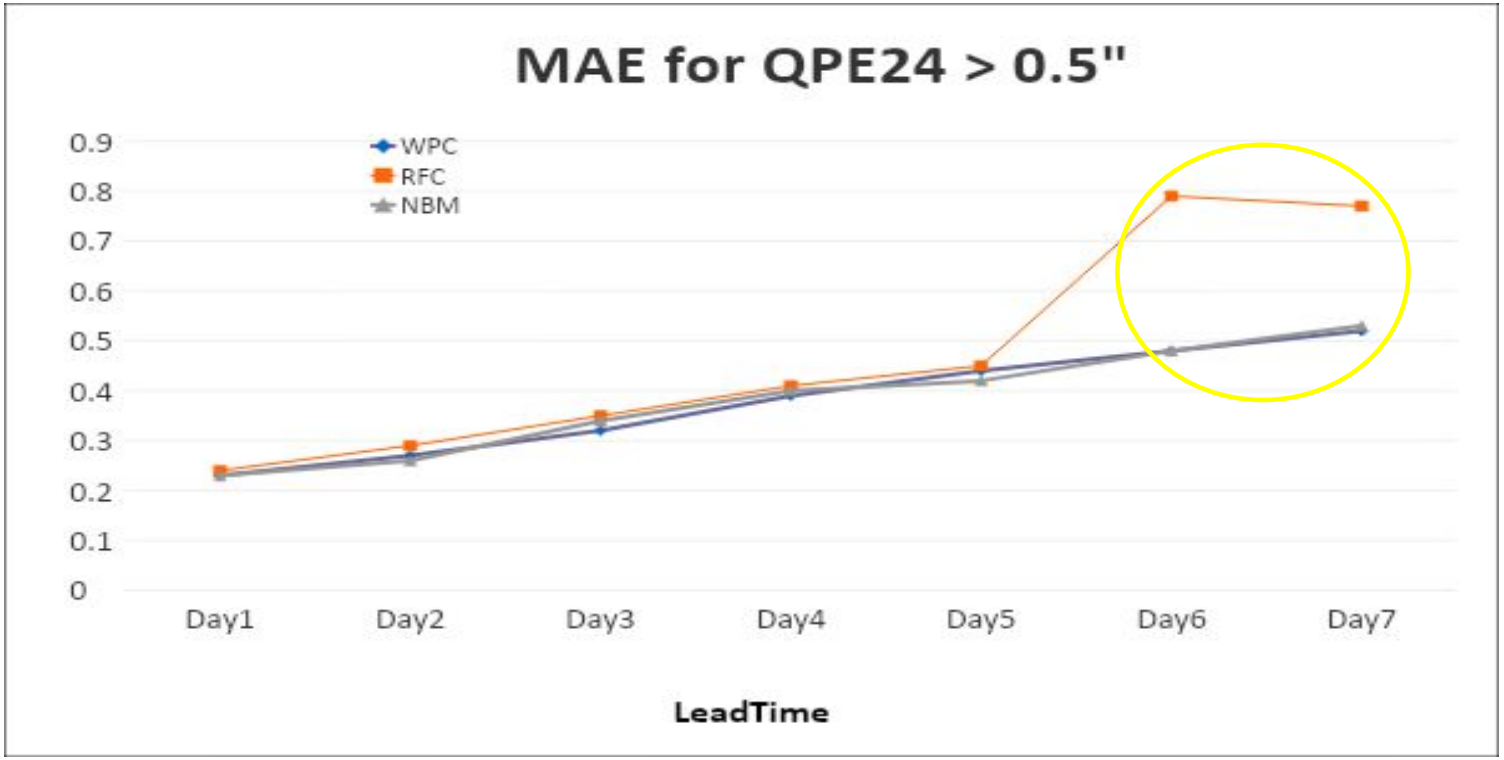
- Mostly dry weather forecast through this weekend
  - Water supply forecast guidance expected to decrease in coming week
- Higher uncertainty in precipitation event along the Continental Divide/Front Range next week

CBRFC Hydro Science Update - Quantitative Precipitation Forecast (QPF)

- Project: verify/determine if extending the forecast precipitation input to hydrologic model from 5 days to 7 days will add value to CBRFC streamflow forecasts

- Verification process:
  - Occurring since July 2018
  - 14 headwater basins across Upper Colorado (10) and Great Basin (4)
  - Compare forecast precipitation with observed precipitation on a daily timescale
  - 3 precipitation forecast datasets:
    - CBRFC (QPF=0 on Days 6/7)
    - Weather Prediction Center (WPC)
    - National Blend of Models (NBM)

QPF Verification over UCRB/Great Basin (July 2018 - June 2020)



- By forecasting QPF=0 on Days 6/7 and not using WPC, *overall* we're missing out (note big jump in error).

Now Using 7 days of QPF in Upper Basin

- *Verification indicates that using WPC QPF for Days 6/7 is more accurate than forecasting zero QPF. This is especially true during the wet months (Oct-May).*

***Changes as of Fall 2020**:*

1) Switch to using **WPC for Days 6/7 QPF** in the *Upper Basin and Great Basin* in our daily operational model. We still use QPF=0 for Days 8-10.

2) Use **seven** days of QPF/QTF in our ESP run that incorporates QPF (**ESP w/QPF**). Previously we were only using five days.

2021 Water Supply Webinar Schedule

**All Times Mountain Time (MT)*

Colorado River Basin

~~Friday~~	~~Jan 8th~~	~~10 am~~
~~Friday~~	~~Feb 5th~~	~~10 am~~
~~Friday~~	~~Mar 5th~~	~~10 am~~
Wednesday	Apr 7th	10 am
Friday	May 7th	10 am

Great Basin

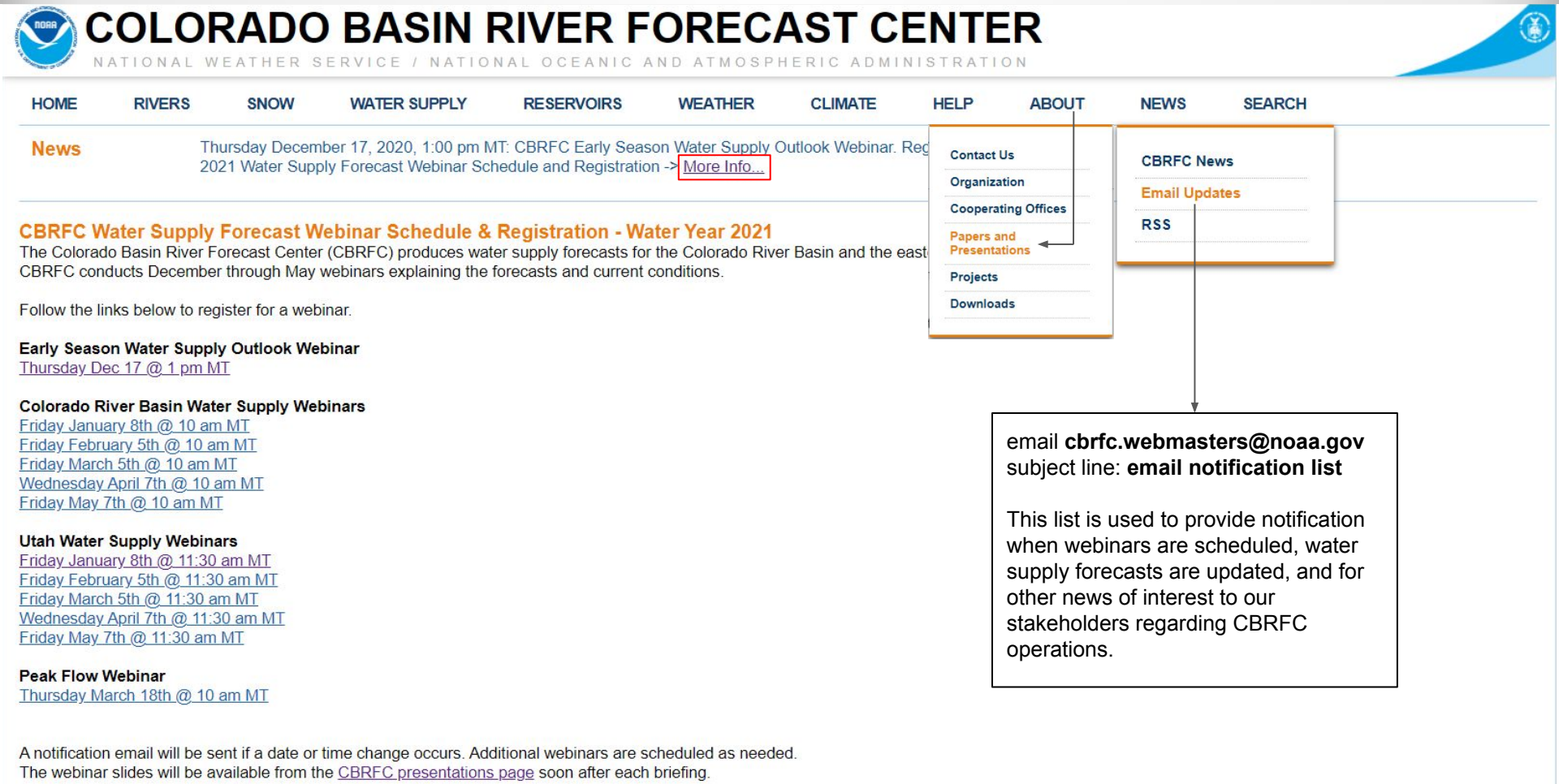
~~Friday~~	~~Jan 8th~~	~~11:30 am~~
~~Friday~~	~~Feb 5th~~	~~11:30 am~~
~~Friday~~	~~Mar 5th~~	~~11:30 am~~
Wednesday	Apr 7th	11:30 am
Friday	May 7th	11:30 am

Additional briefings scheduled as needed

Webinar schedule & registration information has been posted to the CBRFC web page

https://www.cbrfc.noaa.gov/

CBRFC Webinar Registration & Email List



email **cbrfc.webmasters@noaa.gov**
subject line: **email notification list**

This list is used to provide notification when webinars are scheduled, water supply forecasts are updated, and for other news of interest to our stakeholders regarding CBRFC operations.

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CBRFC Water Supply Presentations
https://www.cbrfc.noaa.gov/present/present.php