



— BUREAU OF —  
RECLAMATION

# Navajo Unit Operations Coordination Meeting

April 20, 2021 1:00 PM

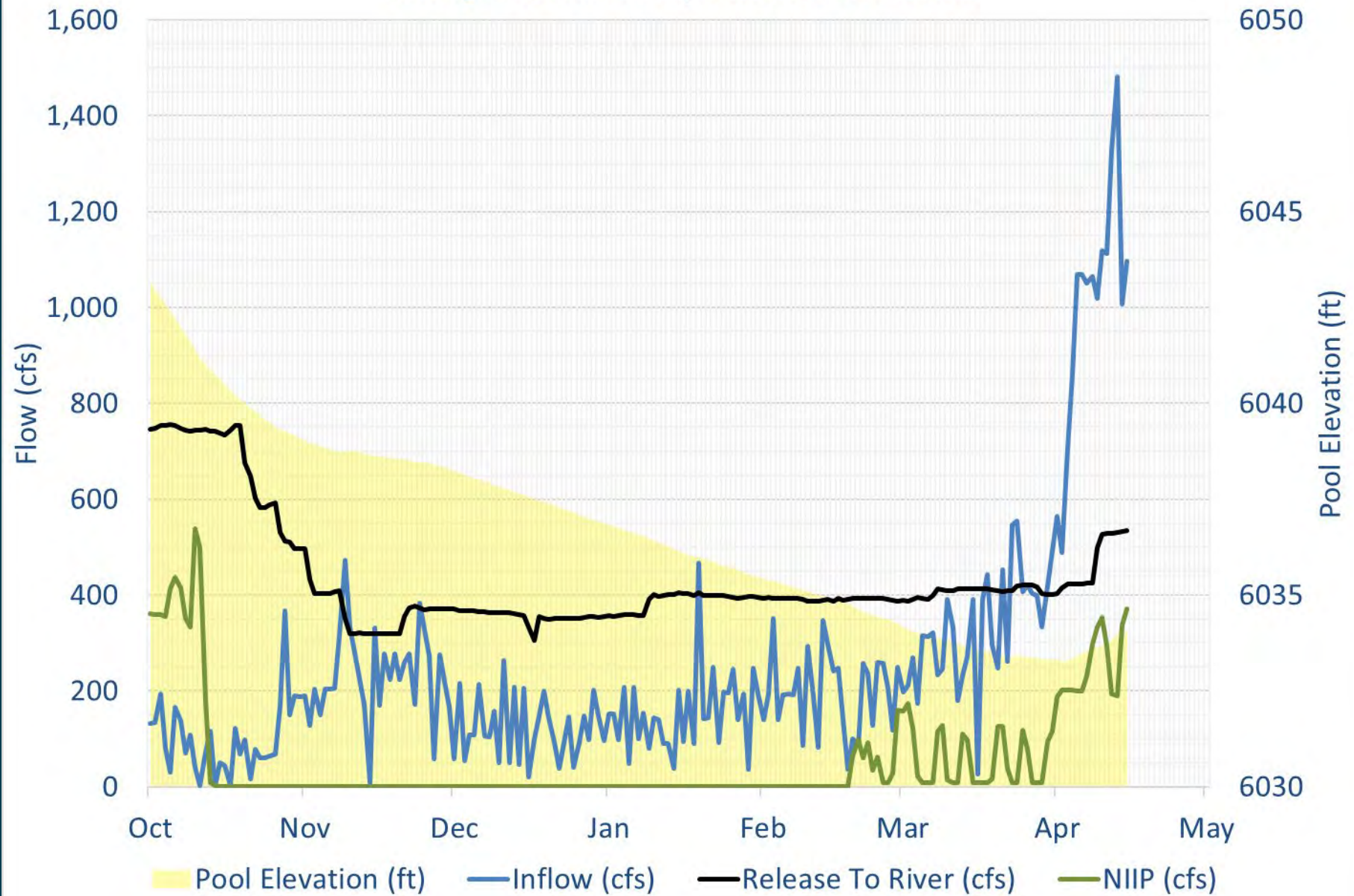
Microsoft Teams Virtual Meeting

# Agenda

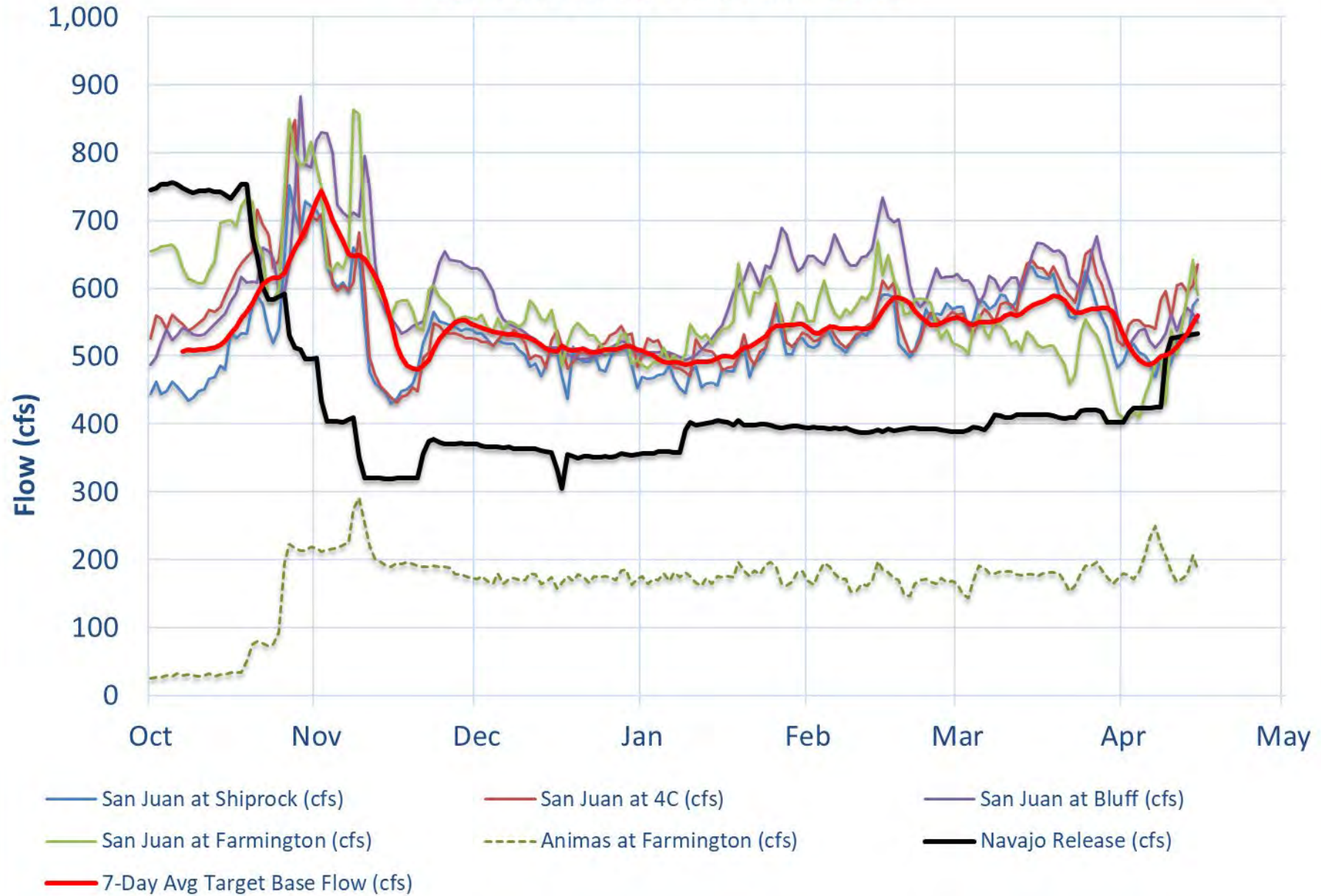
- Review of operations to date WY 2021
- Current basin status
- WY 2021 weather – Aldis Strautins, NWS
- WY 2021 flow forecast – Ashley Nielson, CBRFC
- Colorado Dust on Snow – Jeff Derry, CSAS
- WY 2021 proposed operations
- Comments and Reports



## Navajo Reservoir Operations WY 2021

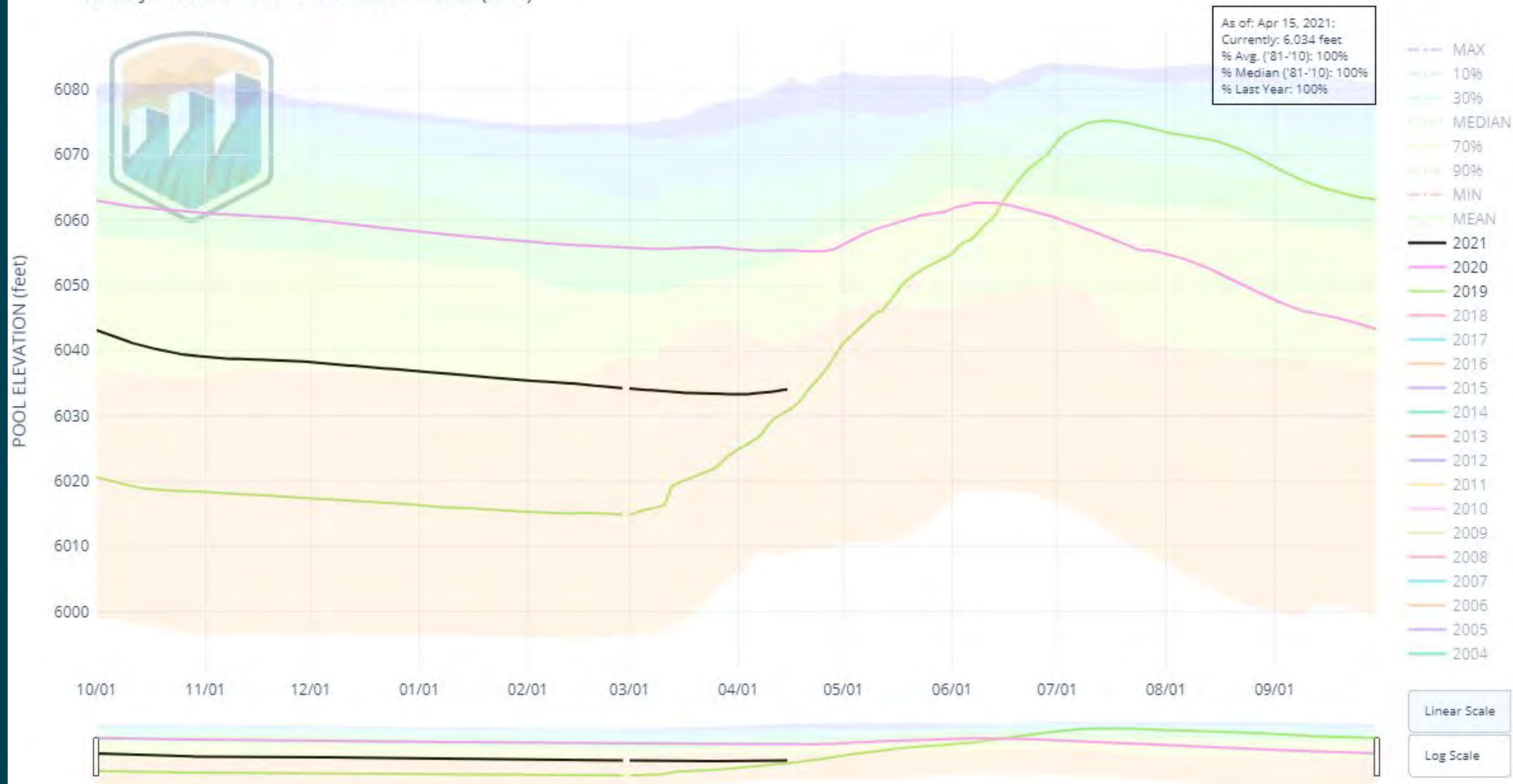


## San Juan River Flows WY 2021



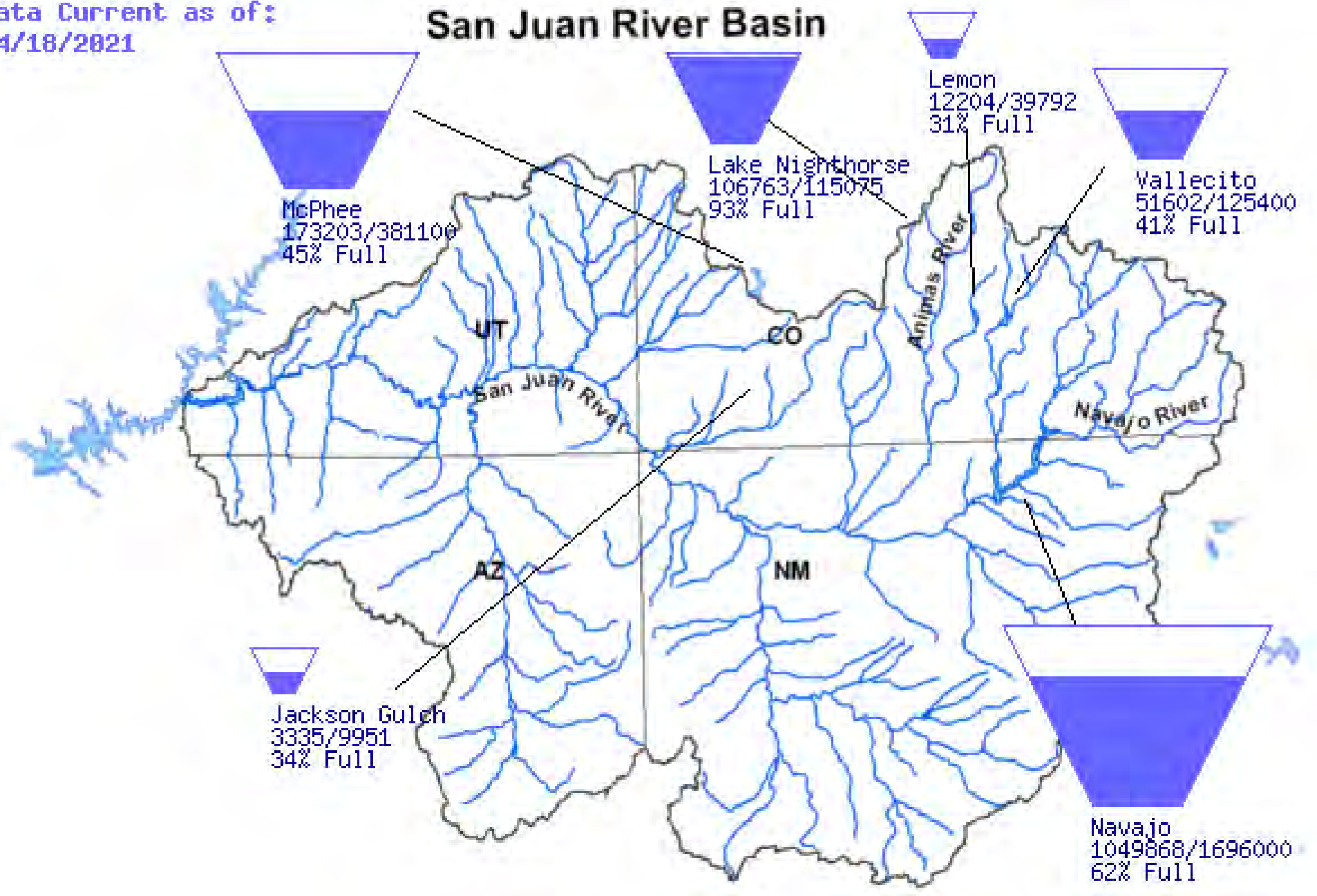


# NAVAJO RESERVOIR - POOL ELEVATION (feet)

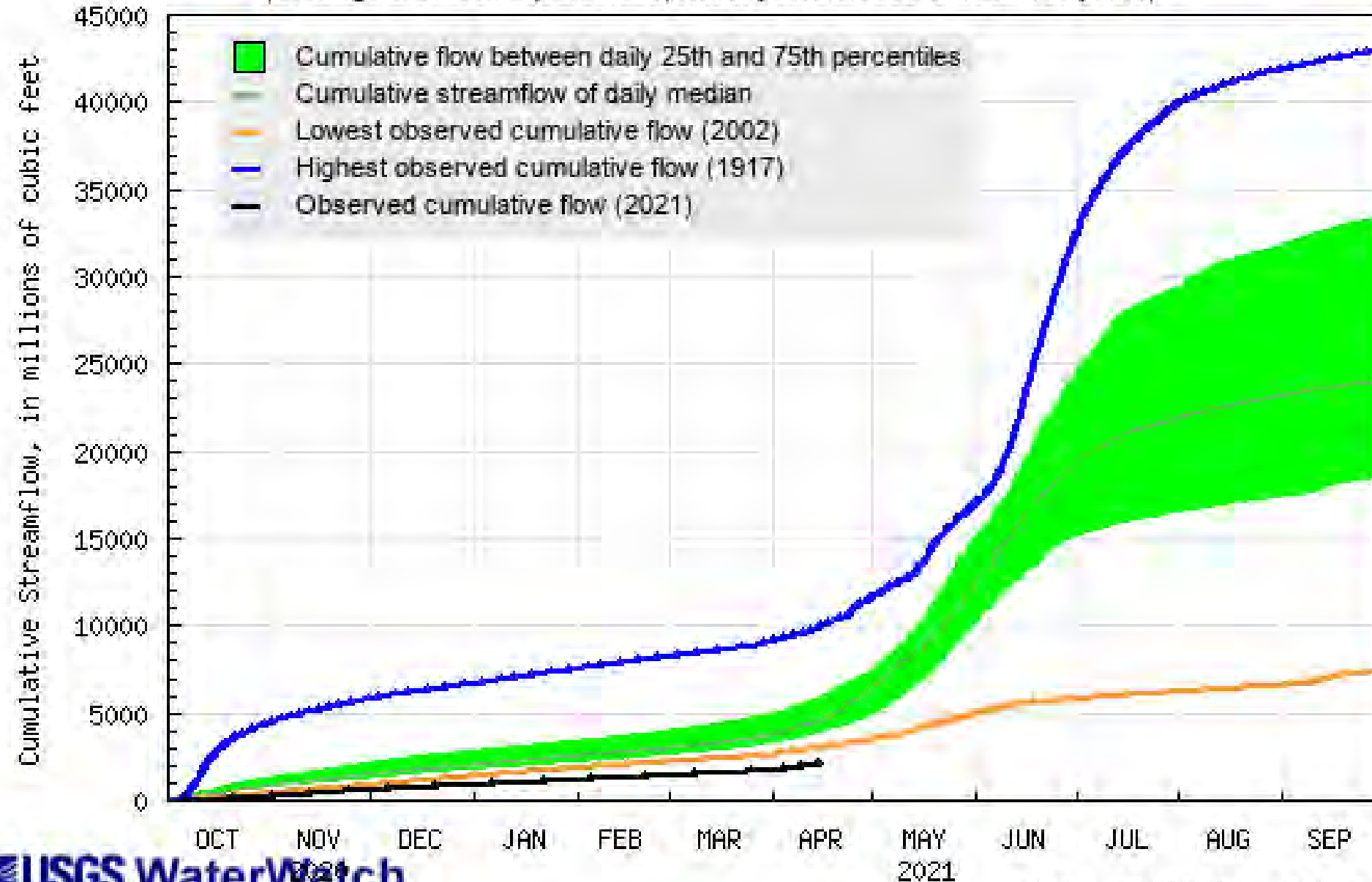


Data Current as of:  
04/18/2021

## San Juan River Basin



USGS 09361500 ANIMAS RIVER AT DURANGO, CO  
(Drainage area: 701 square miles, No. of years of record: 106 - 109 years)



USGS WaterWatch

Last updated: 2021-04-16









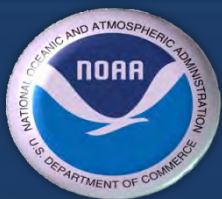
# Weather Outlook

## April 2021



### Discussion / Outline

- Since the first of the water year temperatures over southeastern Utah were cooler than normal and over southwestern Colorado warmer than normal. For Precipitation well below normal over the headwaters since the first of the water year.
- So far for the beginning of January colder than normal with precipitation well below normal for most locations except along the Utah and Colorado border north of the Four Corners.
- Storms in late February and March brought some brief relief to portions of the Four Corners Region but the first half of April has been very dry.



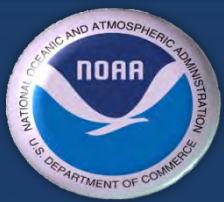
# Weather Outlook

## April 2021



### Discussion / Outline

- Extreme to Exceptional drought remains entrenched over the head waters and Four Corners region.
- ENSO - Neutral conditions are present and are expected to continue this spring into summer and then transition toward a weak La Nina next fall.
- Spring into early summer higher chances of below normal precipitation. Higher chances of above normal temperatures
- Drought is predicted to remain.



# The Past

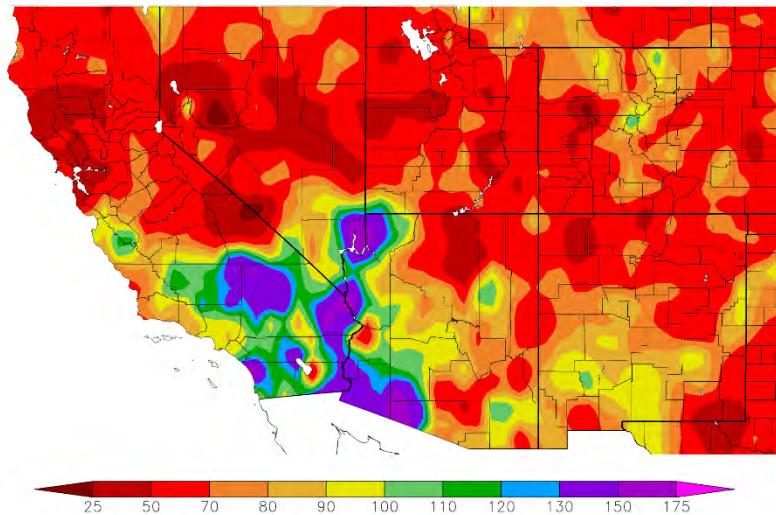
## April 2021



### Water year 2020

### Aug – Oct 2020

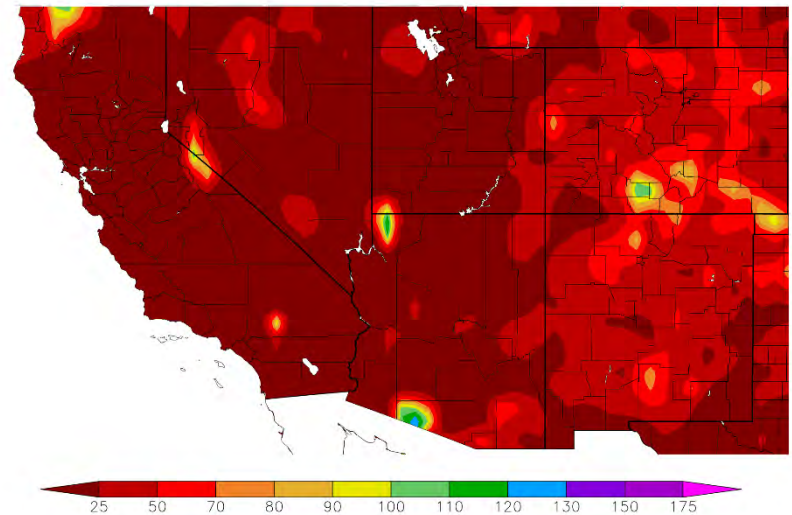
Percent of Normal Precipitation (%)  
10/1/2019 – 9/30/2020



Generated 10/10/2020 at HPRCC using provisional data.

NOAA Regional Climate Centers

Percent of Normal Precipitation (%)  
8/1/2020 – 10/31/2020



Generated 11/20/2020 at HPRCC using provisional data.

NOAA Regional Climate Centers

## Precipitation - % of normal



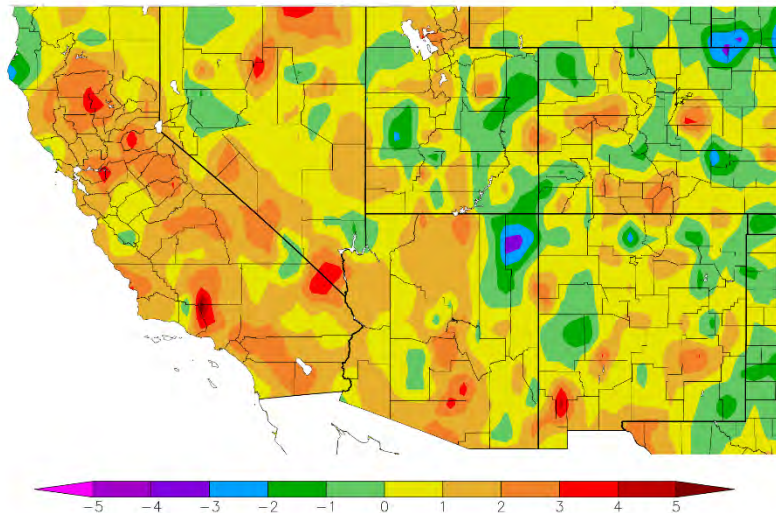
# The Past

## April 2021



### Temperature Departure from normal

Departure from Normal Temperature (F)  
10/1/2020 – 4/15/2021

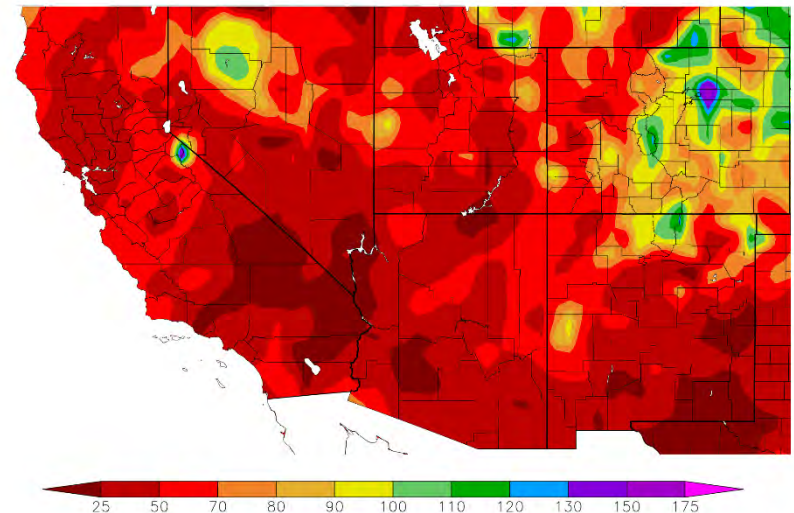


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

### Precipitation % of normal

Percent of Normal Precipitation (%)  
10/1/2020 – 4/15/2021

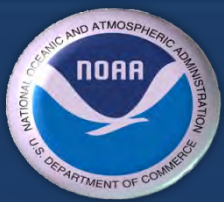


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

## Water Year 2021





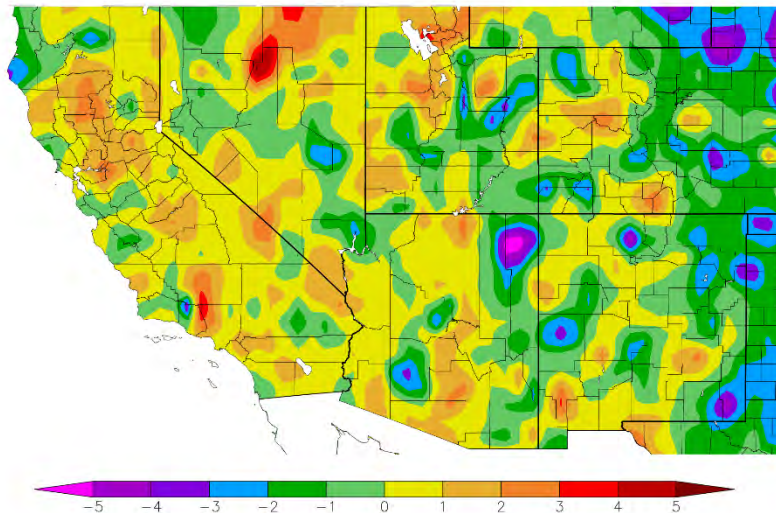
# The Past

## April 2021



### Temperature Departure from normal

Departure from Normal Temperature (F)  
1/1/2021 – 4/15/2021

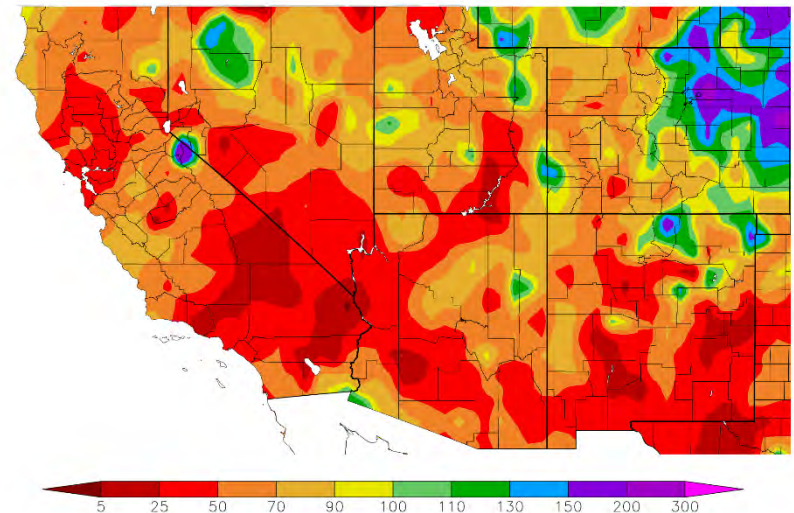


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

### Precipitation % of normal

Percent of Normal Precipitation (%)  
1/1/2021 – 4/15/2021

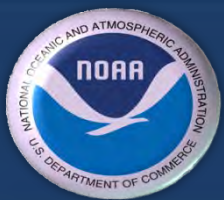


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

## Since Jan 1, 2021





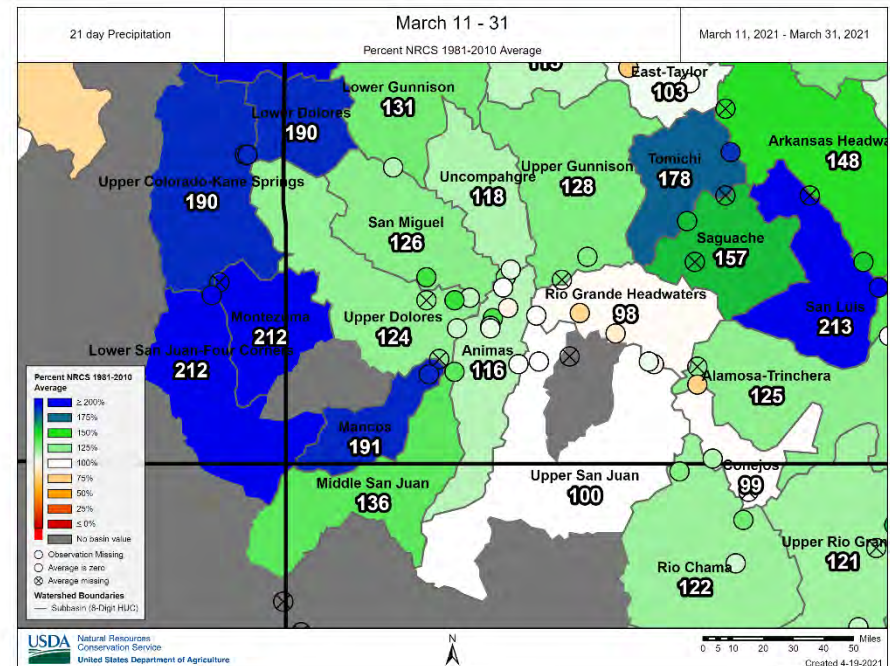
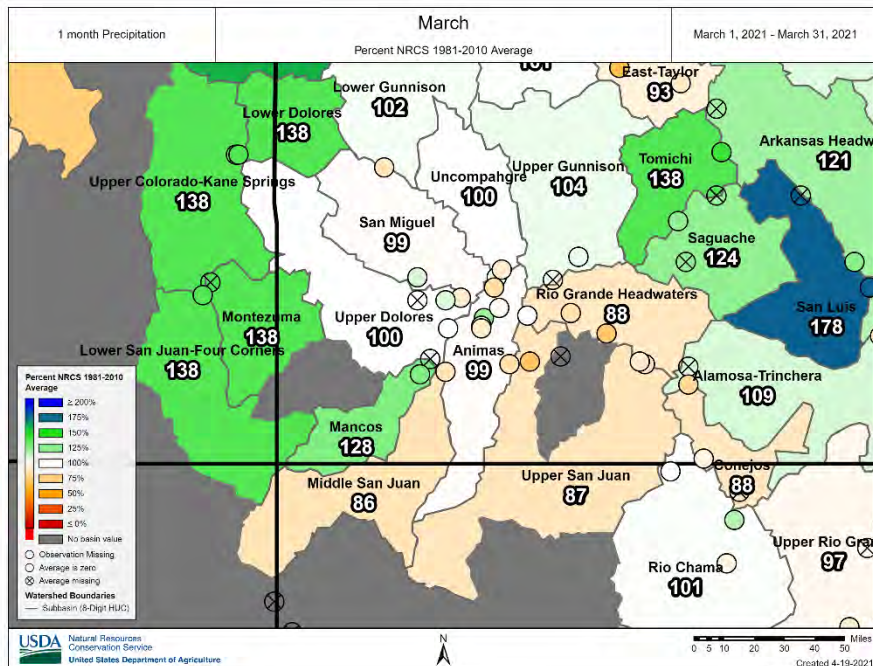
# Snotel

## April 2021



### March, 2021

### March 11-31, 2021



## SNOTEL - Precipitation

## Percent of Normal



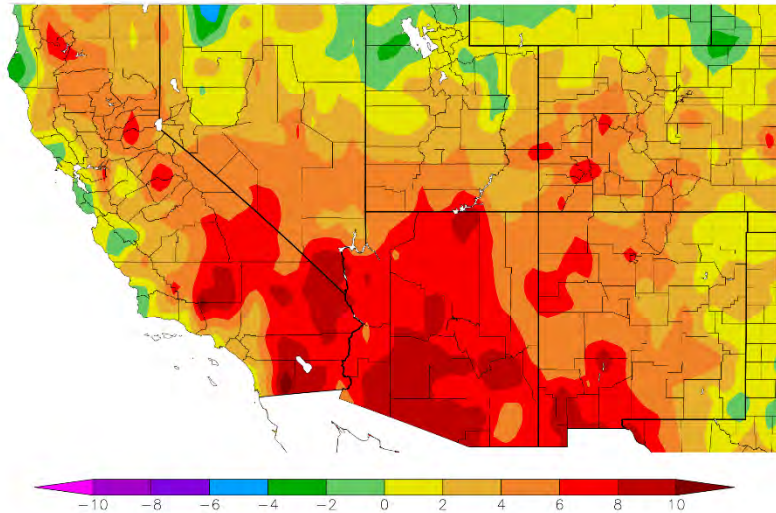
# The Past

## April 2021



### Temperature Departure from normal

Departure from Normal Temperature (F)  
4/1/2021 – 4/15/2021

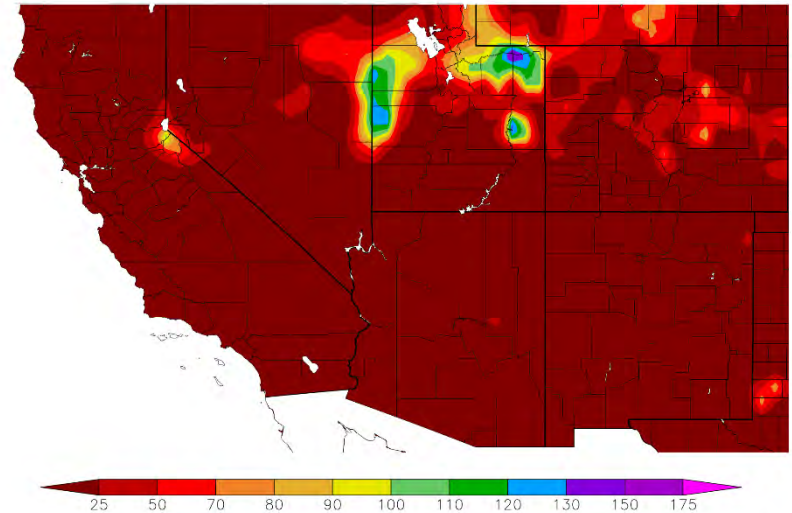


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

### Precipitation % of normal

Percent of Normal Precipitation (%)  
4/1/2021 – 4/15/2021

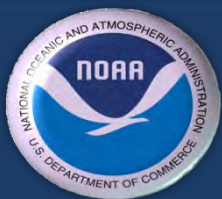


Generated 4/16/2021 at IPRCC using provisional data.

NOAA Regional Climate Centers

## From April 1, 2021





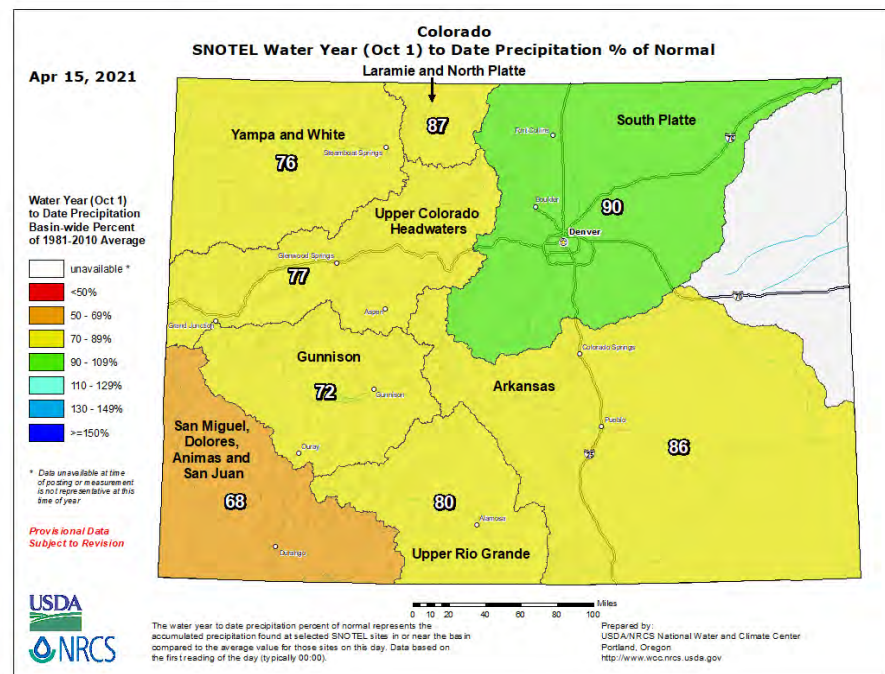
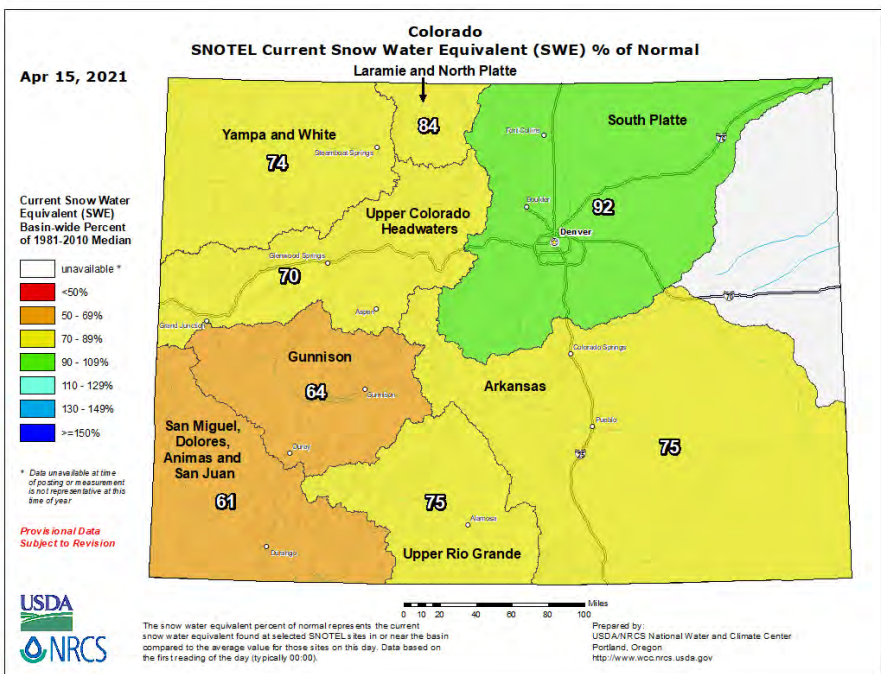
# Snotel

## April 2021



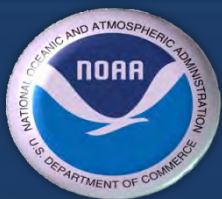
### SWE

### Precipitation



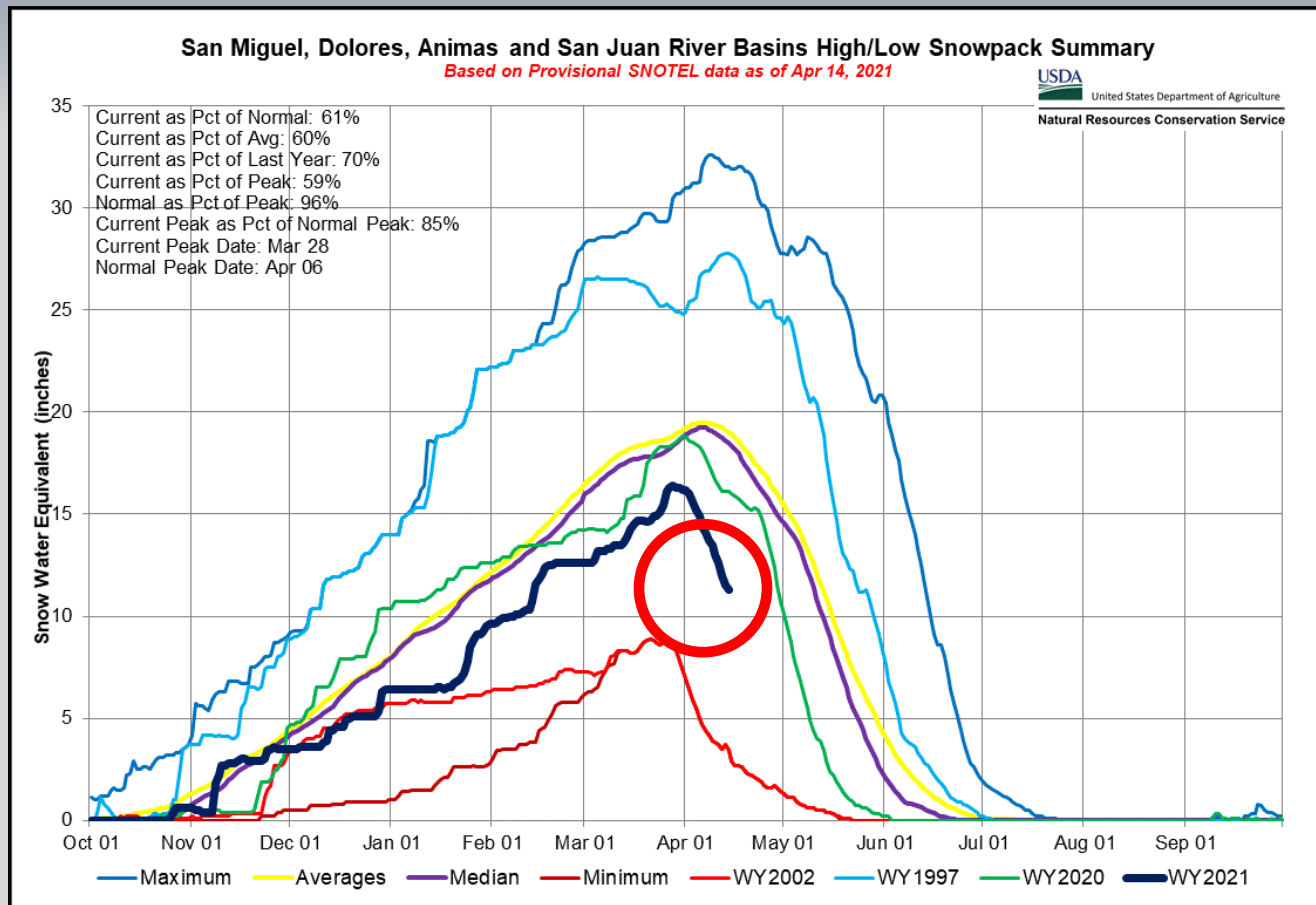
## SNOTEL - Percent of Normal - Colorado

### Water Year 2021 (as of Apr 15)



# Snow

## April 2021



**SNOTEL Snow Water Equivalent – NRCS  
Southwestern Colorado**



# Drought

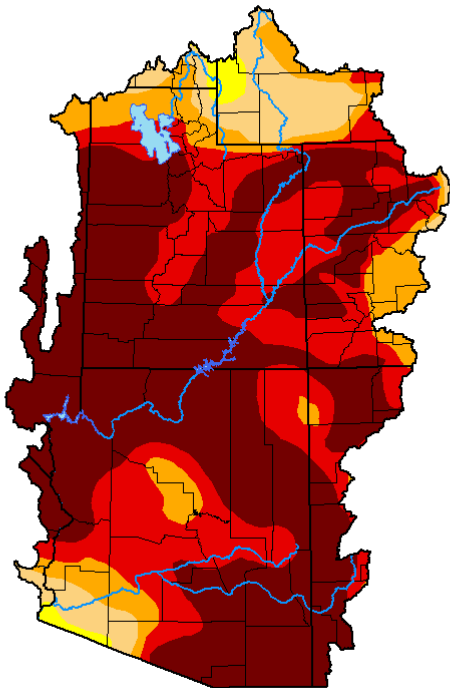
## April 2021



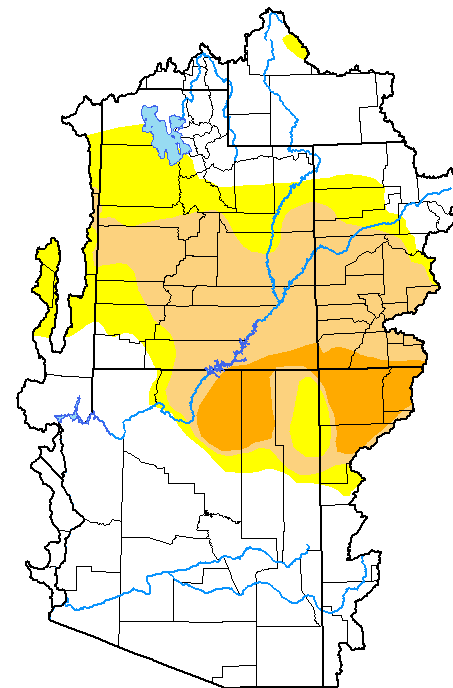
**April 13, 2021**

**April 14, 2020**

April 13, 2021



April 14, 2020

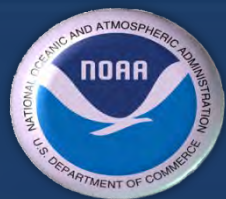


Intensity:



## Drought – Monitor





# ENSO

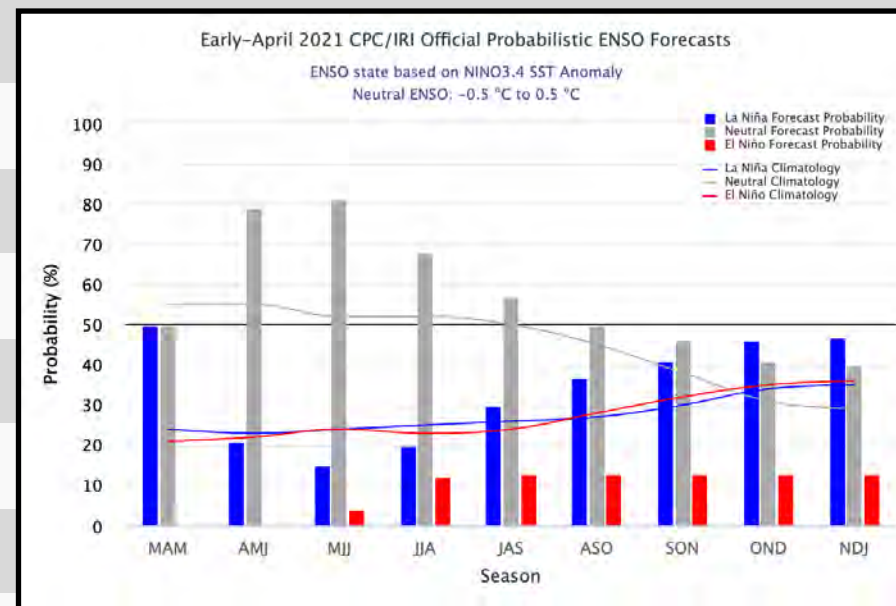
## April 2021



### CPC/IRI Early-Month Consensus ENSO Forecast Probabilities

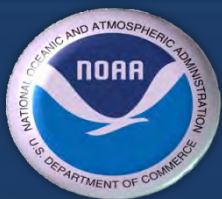
(using NWS CPC classification system)

Season	La Niña	Neutral	El Niño
MAM 2021	50%	50%	0%
AMJ 2021	21%	79%	0%
MJJ 2021	15%	81%	4%
JJA 2021	20%	68%	12%
JAS 2021	30%	57%	13%
ASO 2021	37%	50%	13%
SON 2021	41%	46%	13%
OND 2021	46%	41%	13%
NDJ 2022	47%	40%	13%



## ENSO – Outlook

**Neutral remaining through spring and summer**

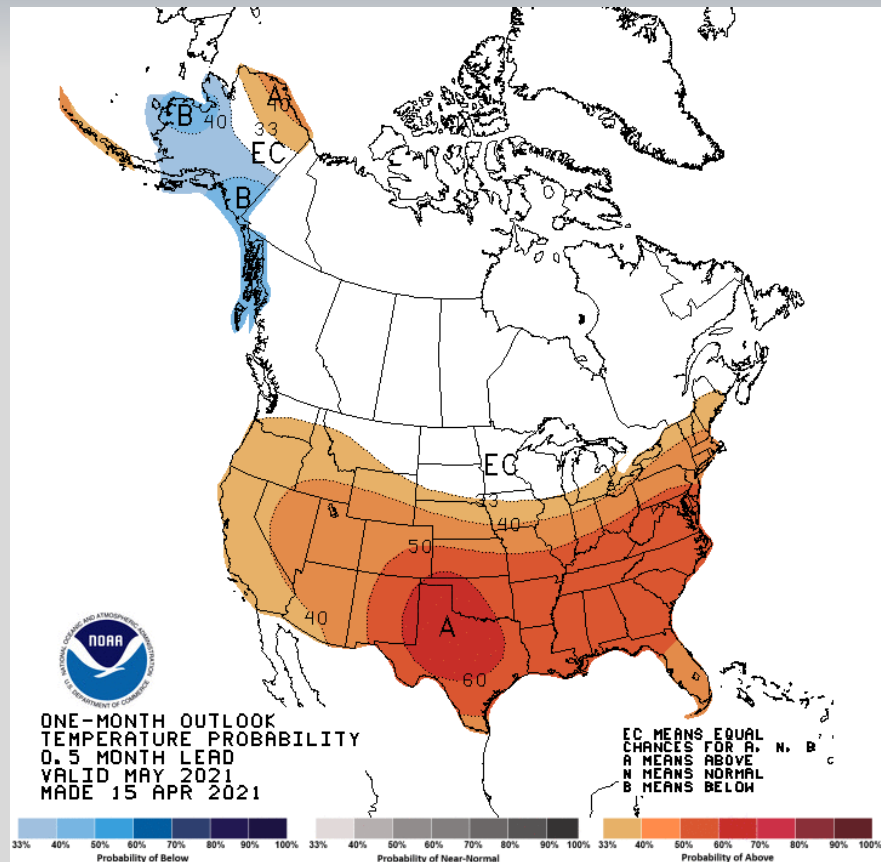


# Weather Outlook

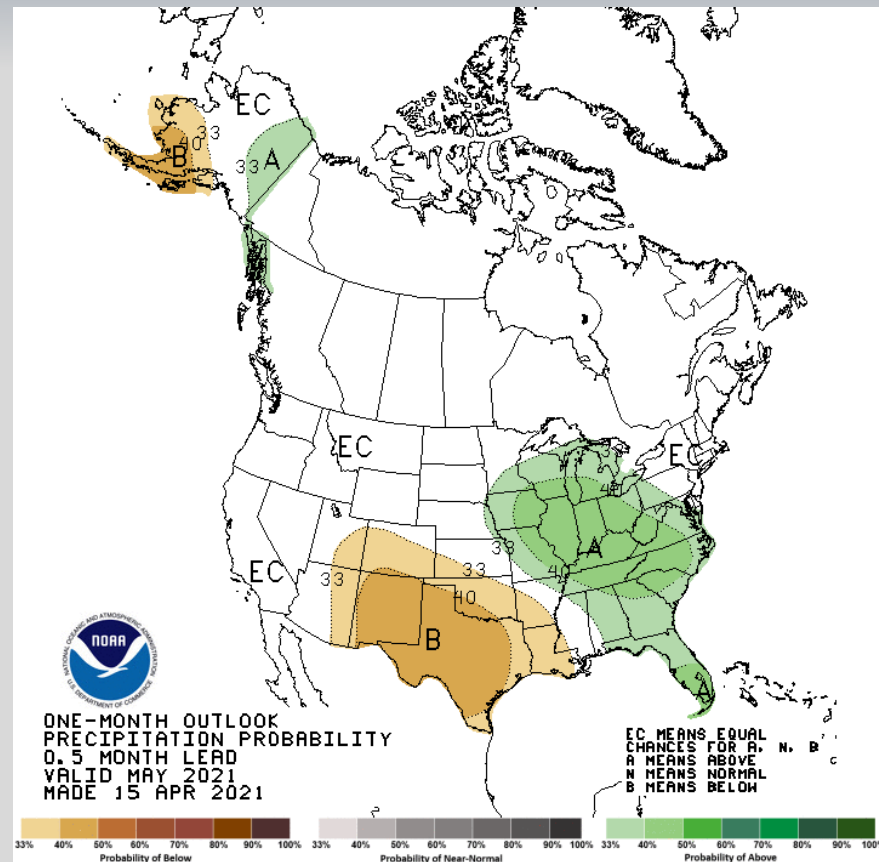
## April 2021



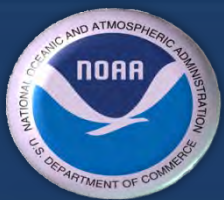
### Temperature



### Precipitation



## May – Outlook

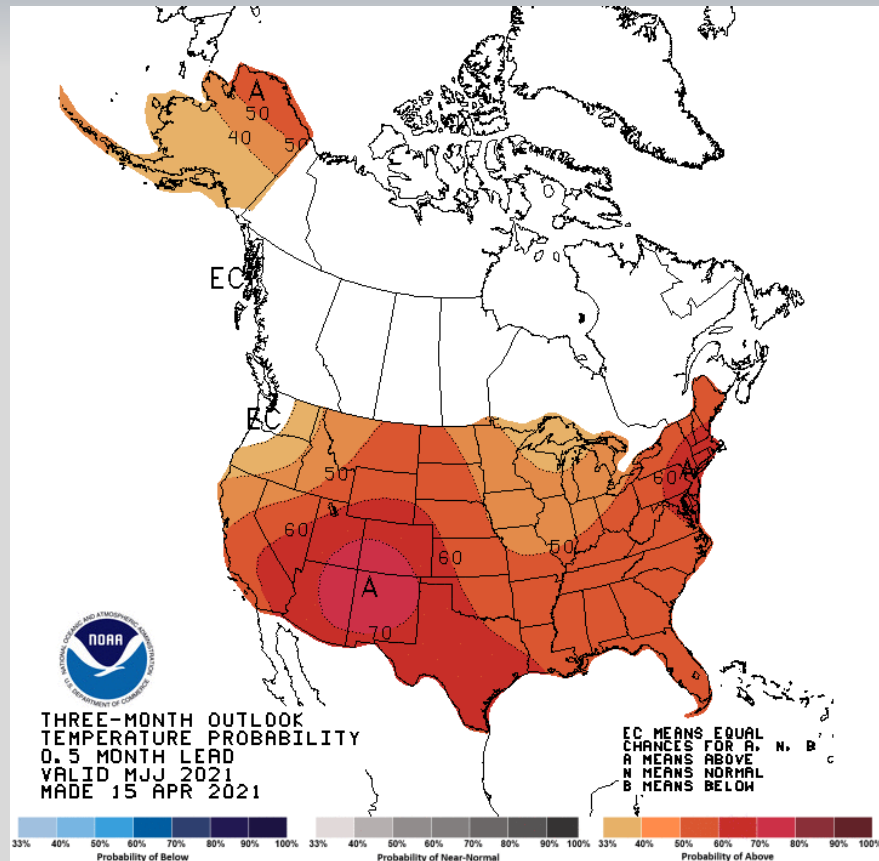


# Weather Outlook

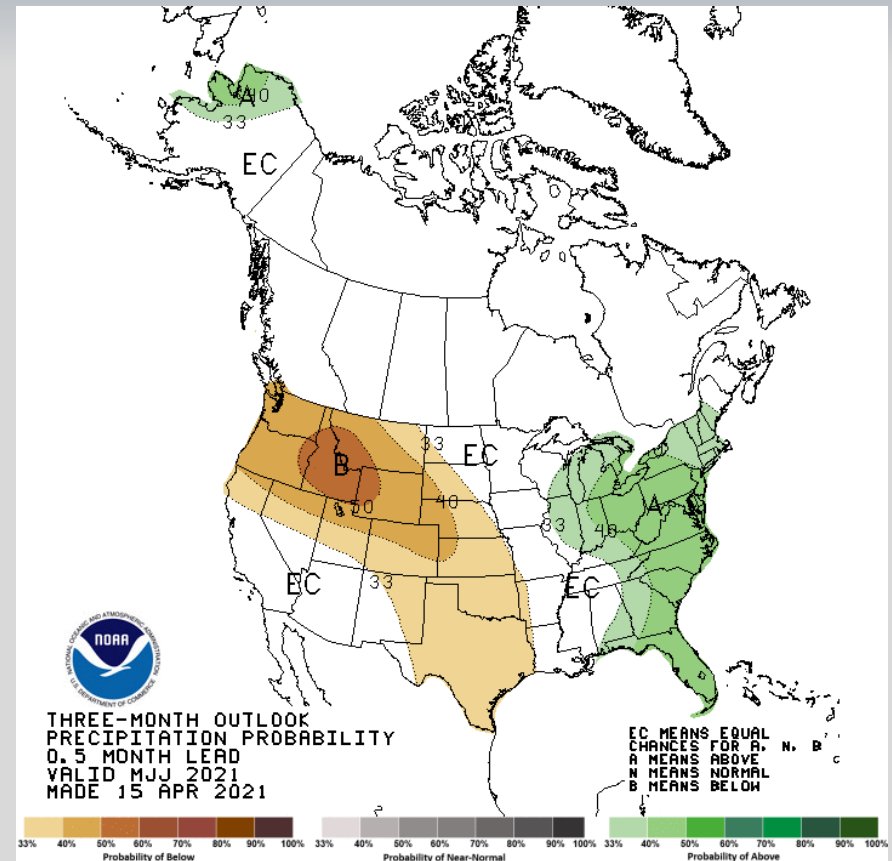
## April 2021



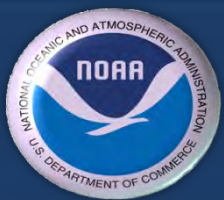
### Temperature



### Precipitation



## May/Jun/Jul – Outlook

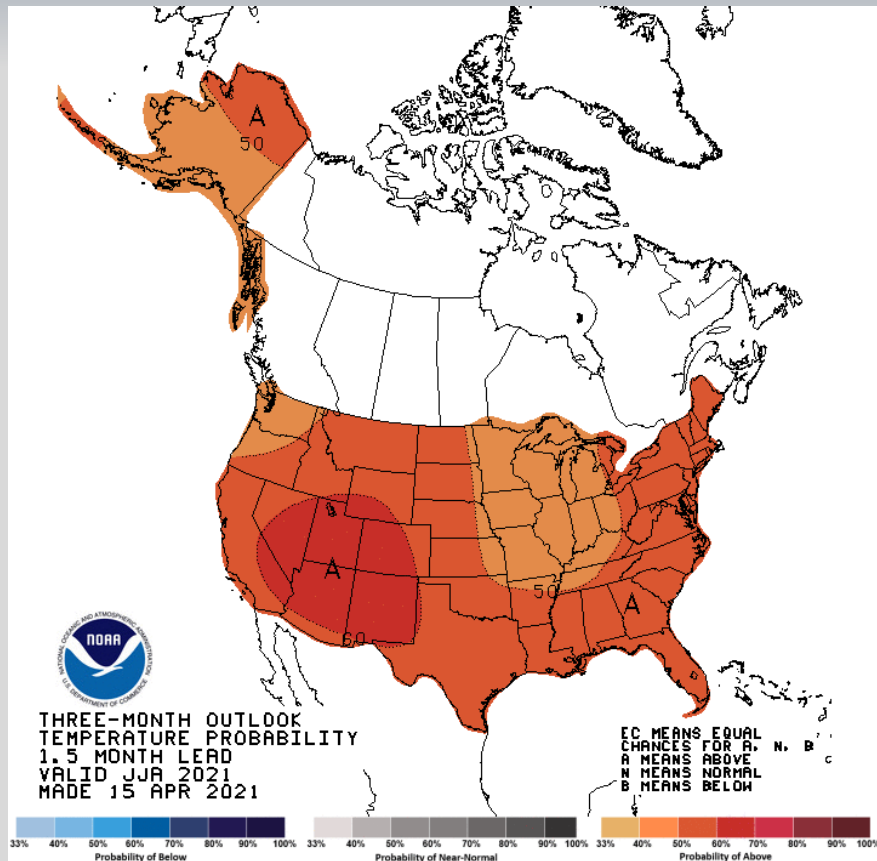


# Weather Outlook

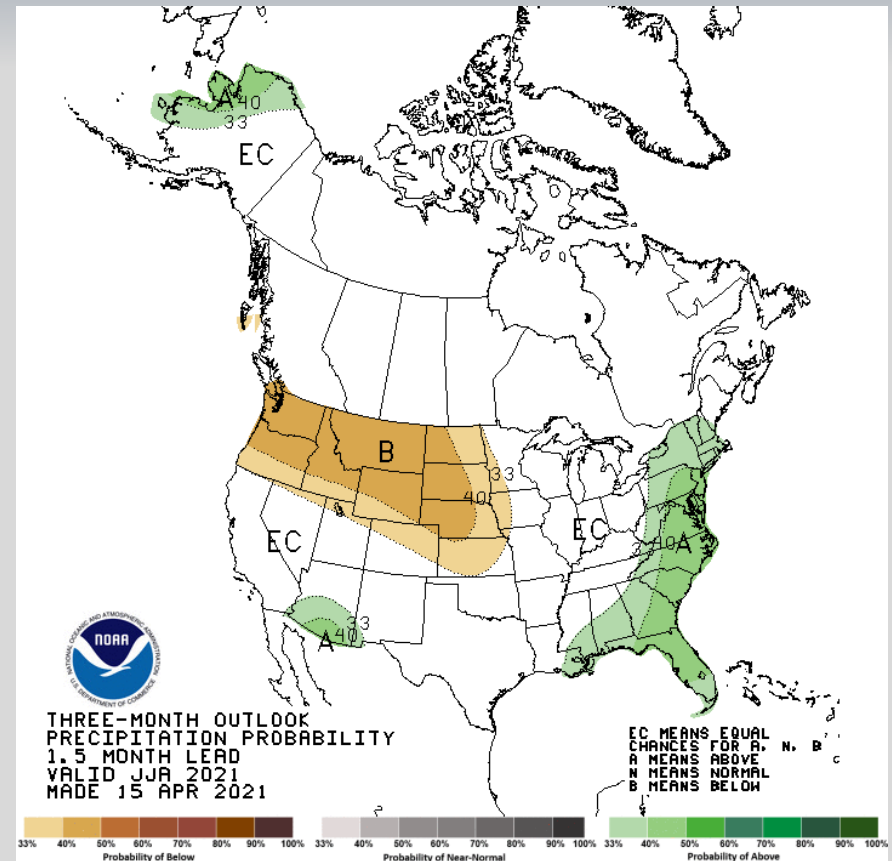
## April 2021



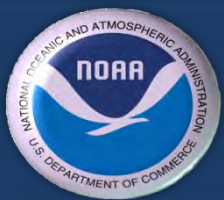
### Temperature



### Precipitation



## Jun/Jul/Aug – Outlook

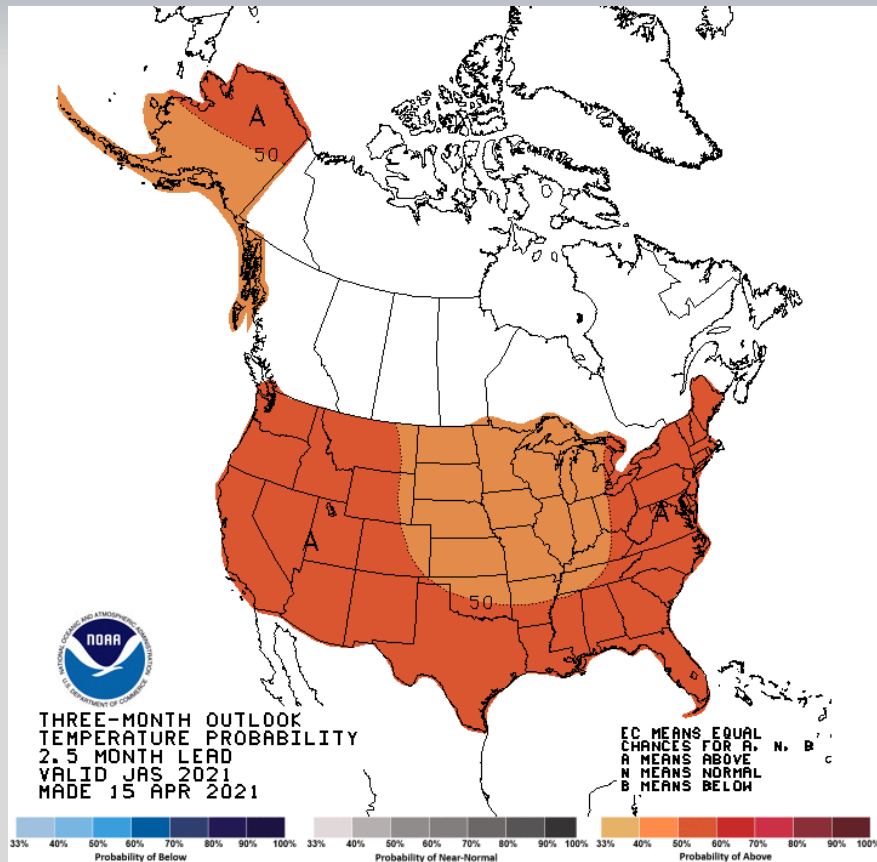


# Weather Outlook

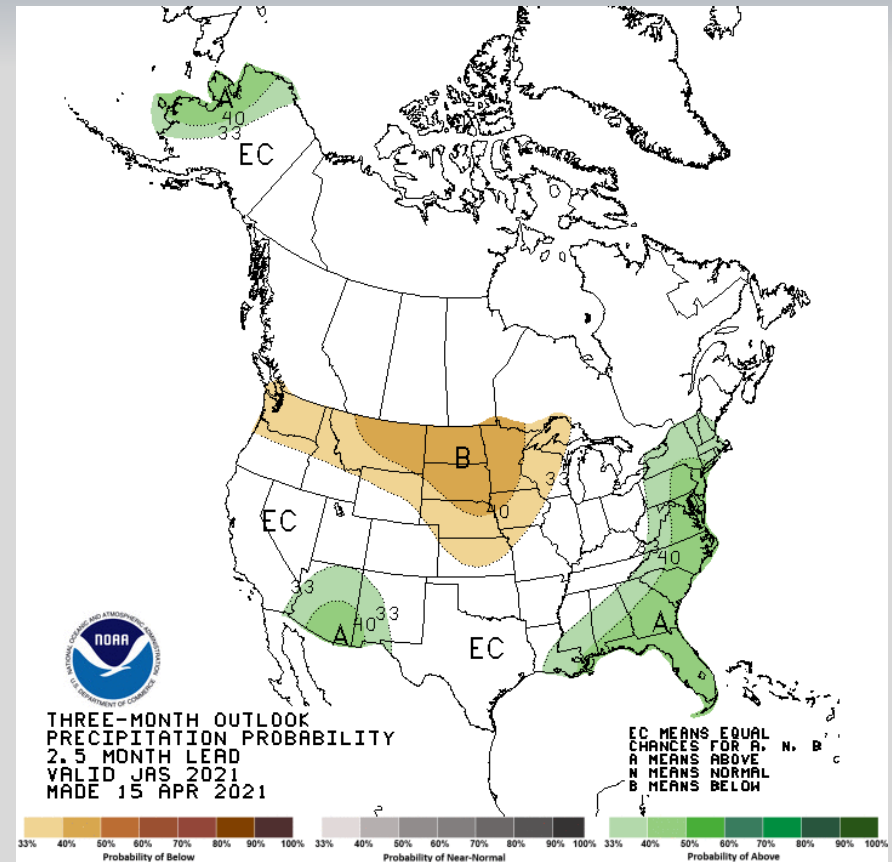
## April 2021



### Temperature

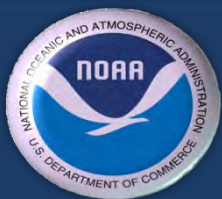


### Precipitation



## Jul/Aug/Sep – Outlook





# Weather Outlook

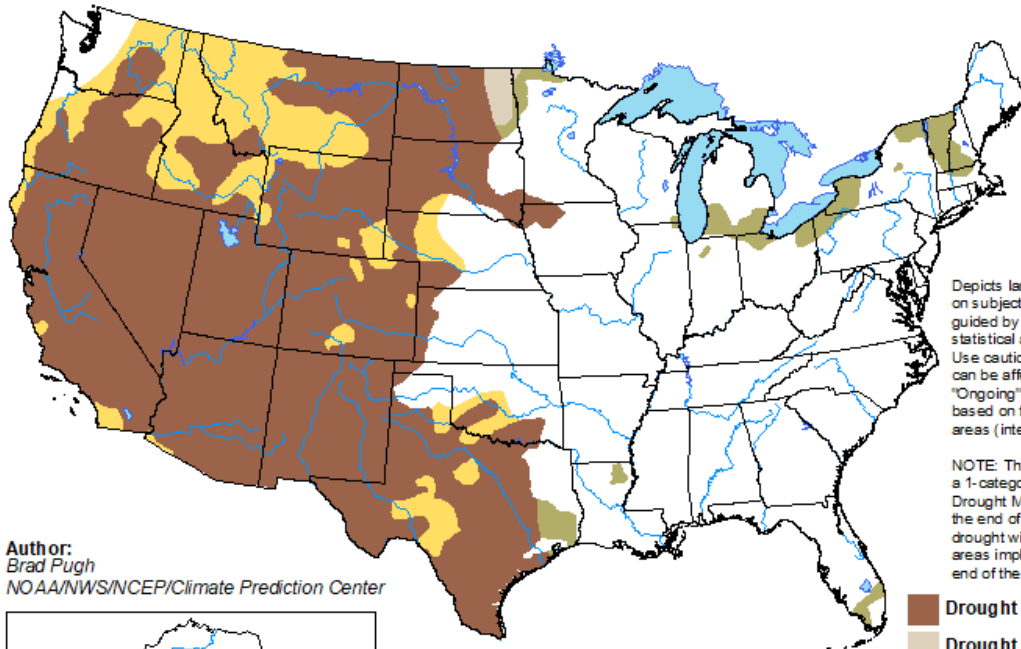
## April 2021



### Seasonal

#### **U.S. Seasonal Drought Outlook** Drought Tendency During the Valid Period

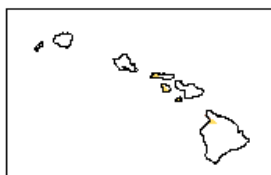
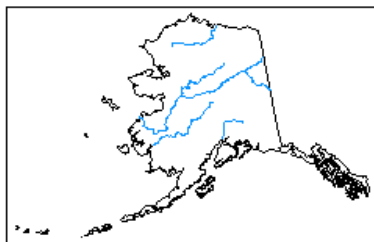
Valid for April 15 - July 31, 2021  
Released April 15



Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

Author:  
Brad Pugh  
NOAA/NWS/NCEP/Climate Prediction Center



- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely



<http://go.usa.gov/3eZ73>

## Drought– Outlook



# Weather Outlook

## April 2021



**Aldis Strautins**  
**NWS Grand Junction, CO**  
<http://www.weather.gov/gjt>

# Navajo Reservoir/San Juan Basin Water Supply Outlook April 20, 2021

Ashley Nielson  
Senior Hydrologist  
Colorado Basin River Forecast Center  
National Weather Service/NOAA

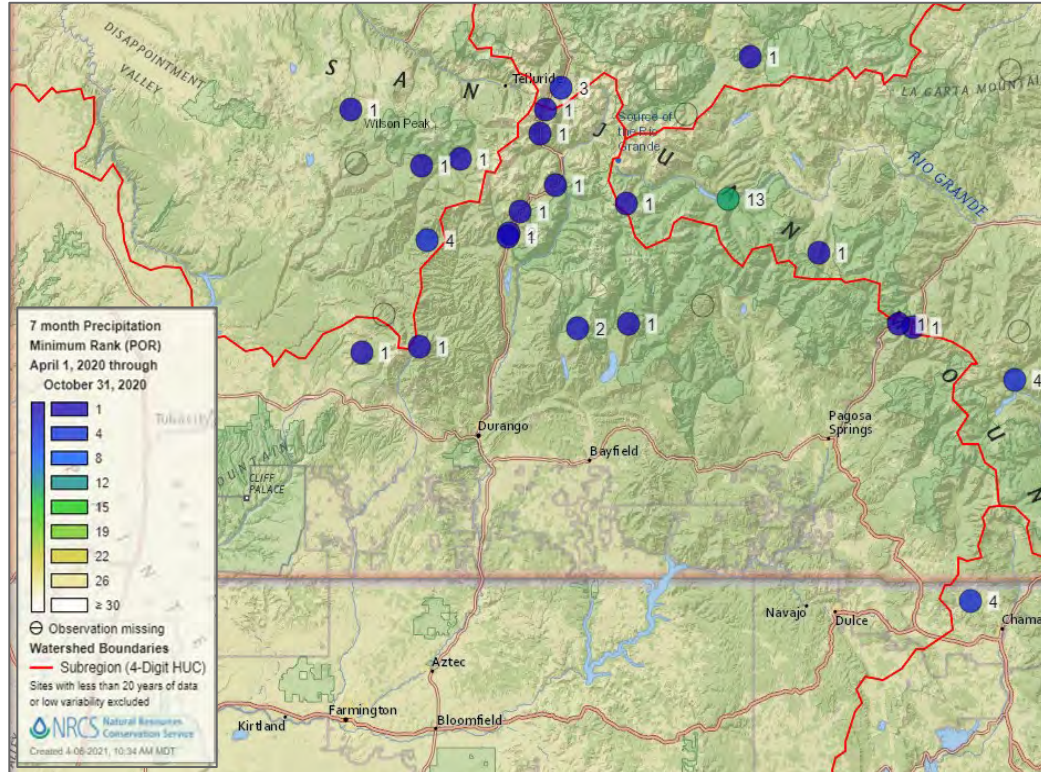


- Modeled Soil Moisture Conditions
- Snow Conditions
- April 2021 Water Supply Forecasts
- Forecast Uncertainty
- Summary
- Contact Information



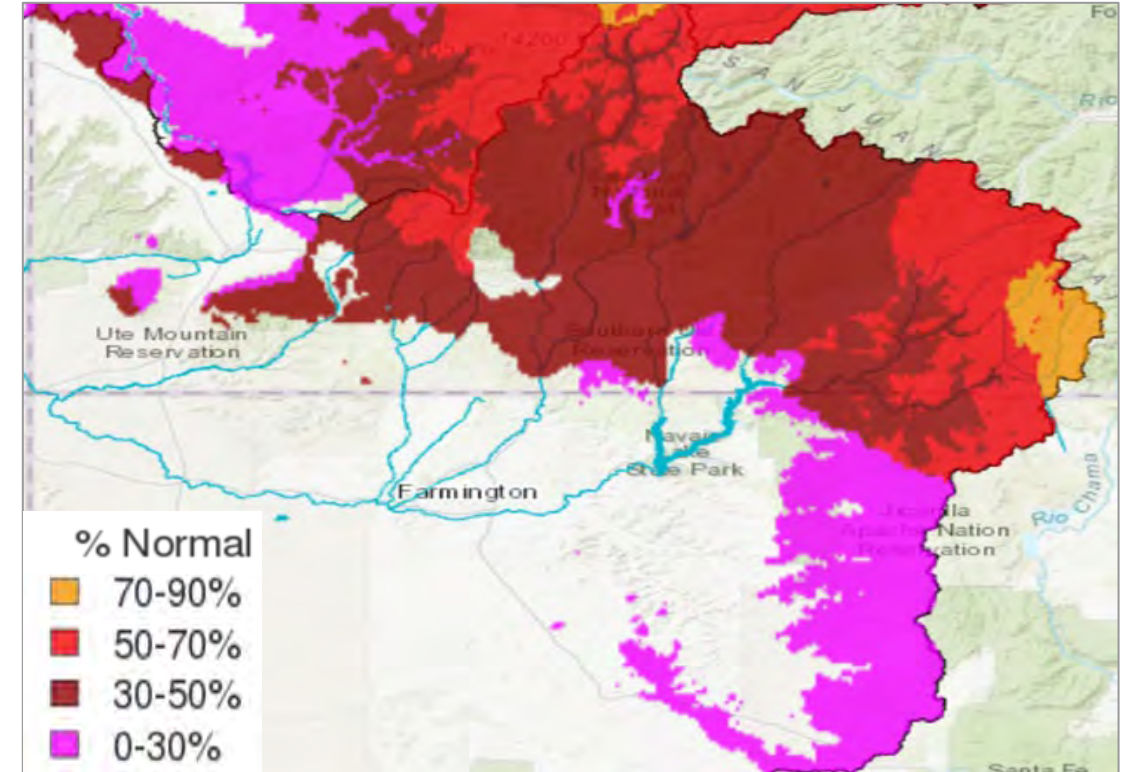
# Modeled Fall Soil Moisture Conditions

April - October 2020 SNOTEL Precipitation Ranking



- Near to record low historical precipitation from April-October of last year.
- SNOTELs have a 35-40 year period of record.
- Lack of monsoon and a below average 2020 spring runoff exacerbated dry conditions.

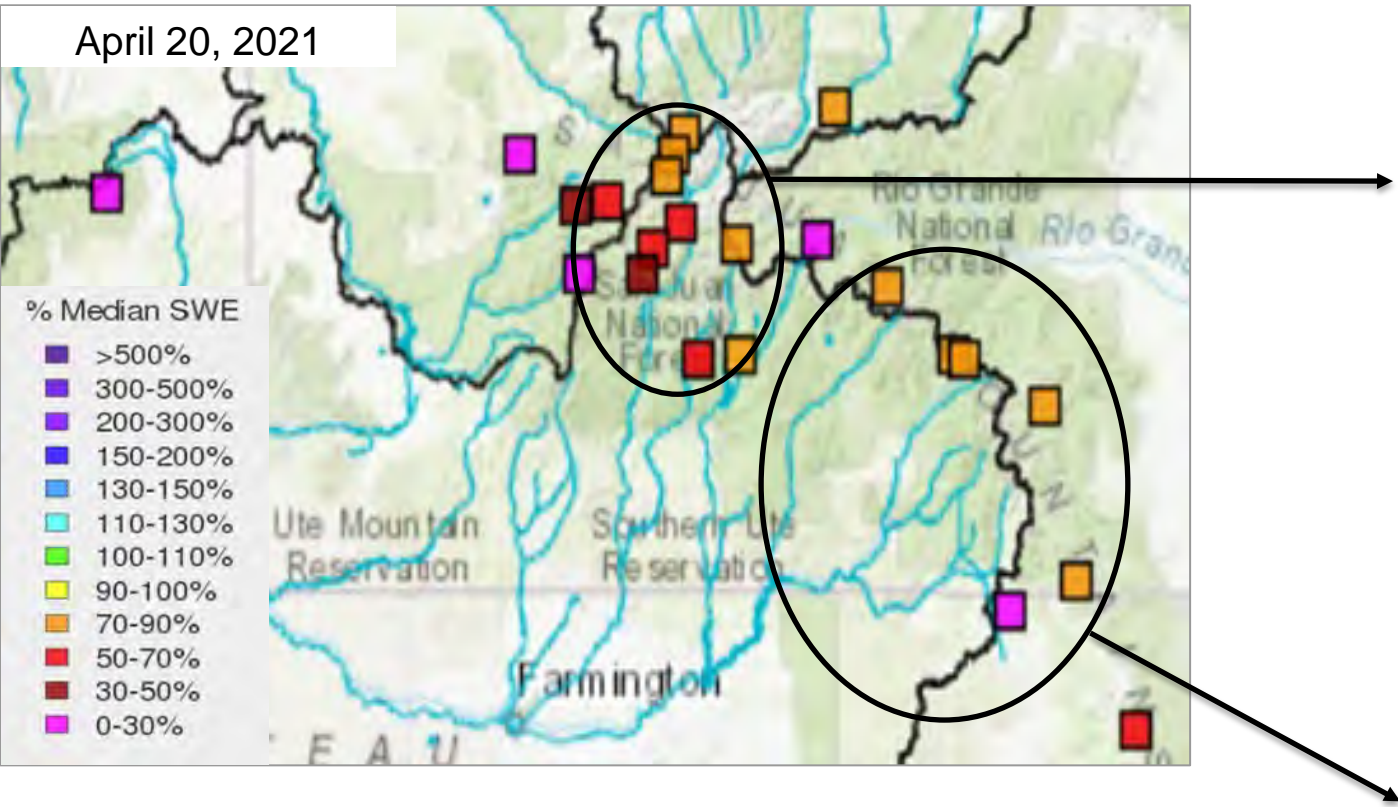
Fall 2020 Modeled Soil Moisture Conditions



- Soil moisture conditions entering the winter were below normal and generally in the bottom 3 of the 1981-2020 40-year period.
- Conditions are similar to last year in the eastern headwaters but worse over the rest of the basin.
- A portion of the snowmelt will be absorbed into the dry soils. The forecasts are accounting for this loss.

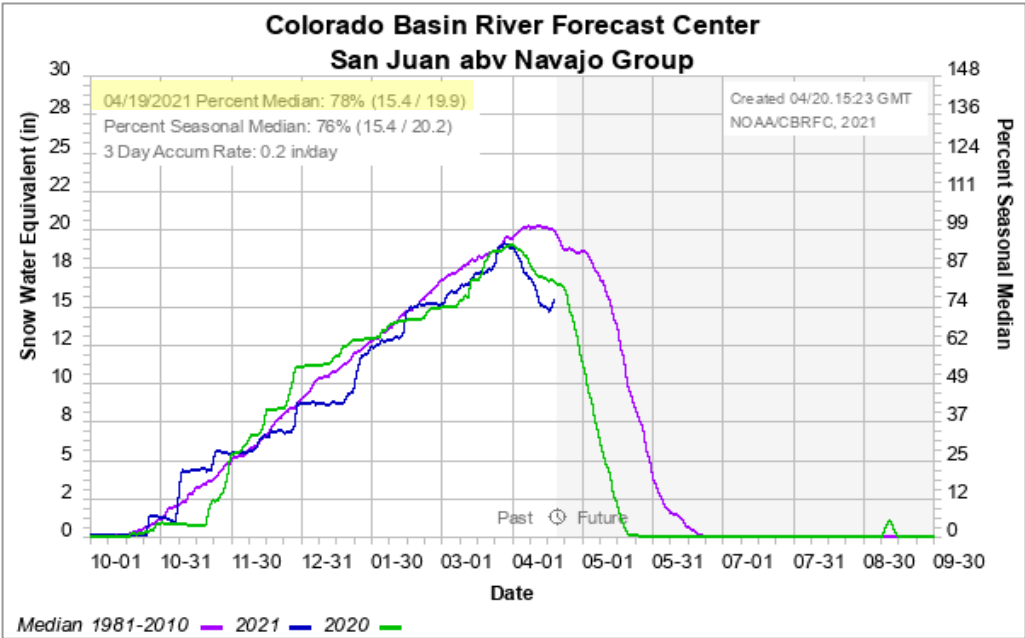
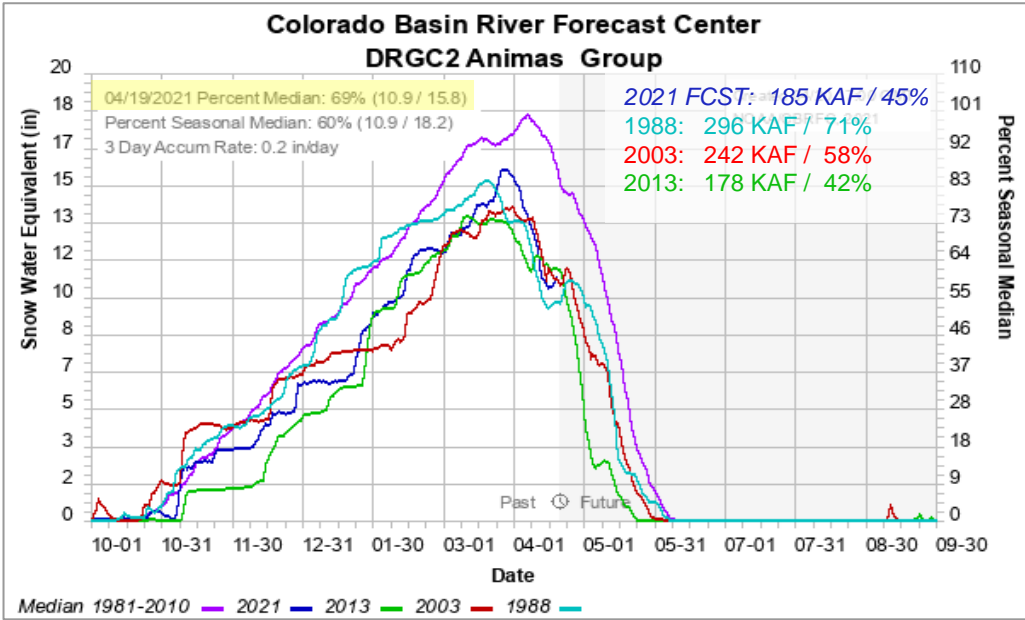


# Snow Conditions: SNOTEL Snow Water Equivalent



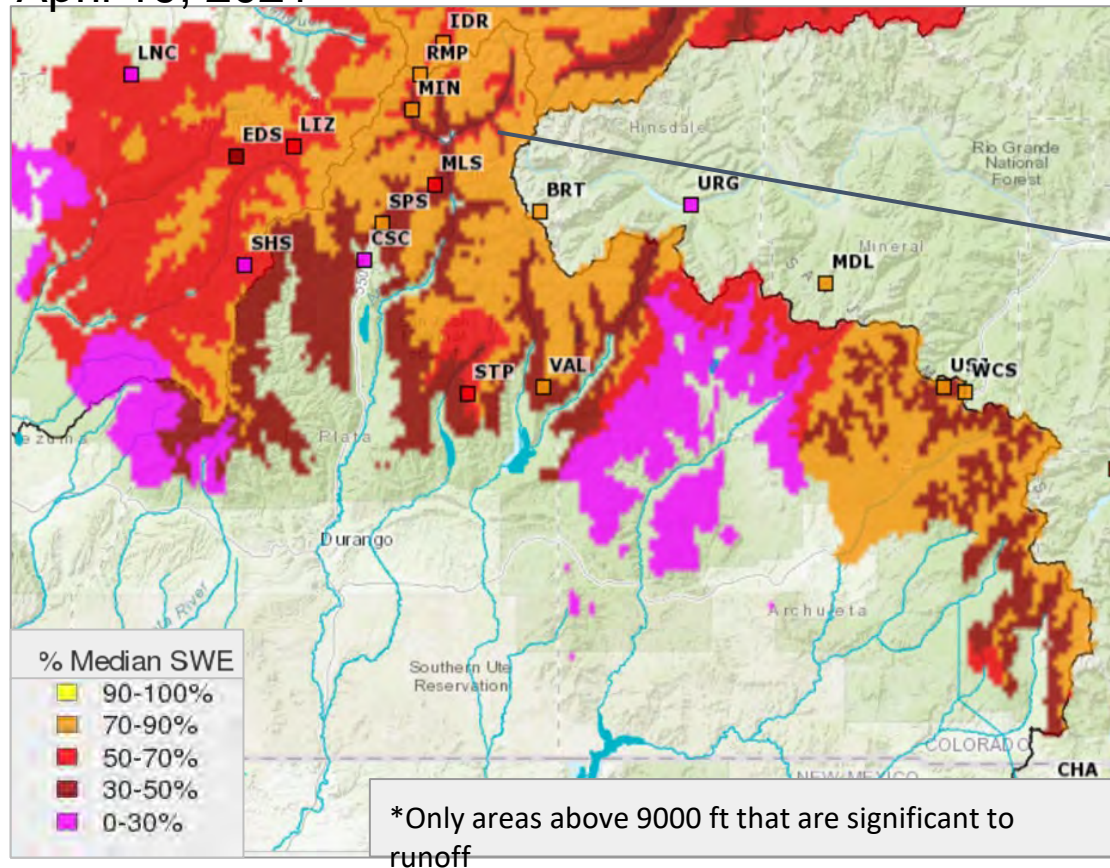
Snowpack in the San Juan Basin is much below normal. Snow did not reach the normal peak SWE and significant early melt has occurred.

SWE vs. runoff is not a 1-to-1 relationship; spring weather will play a role in the final outcome.



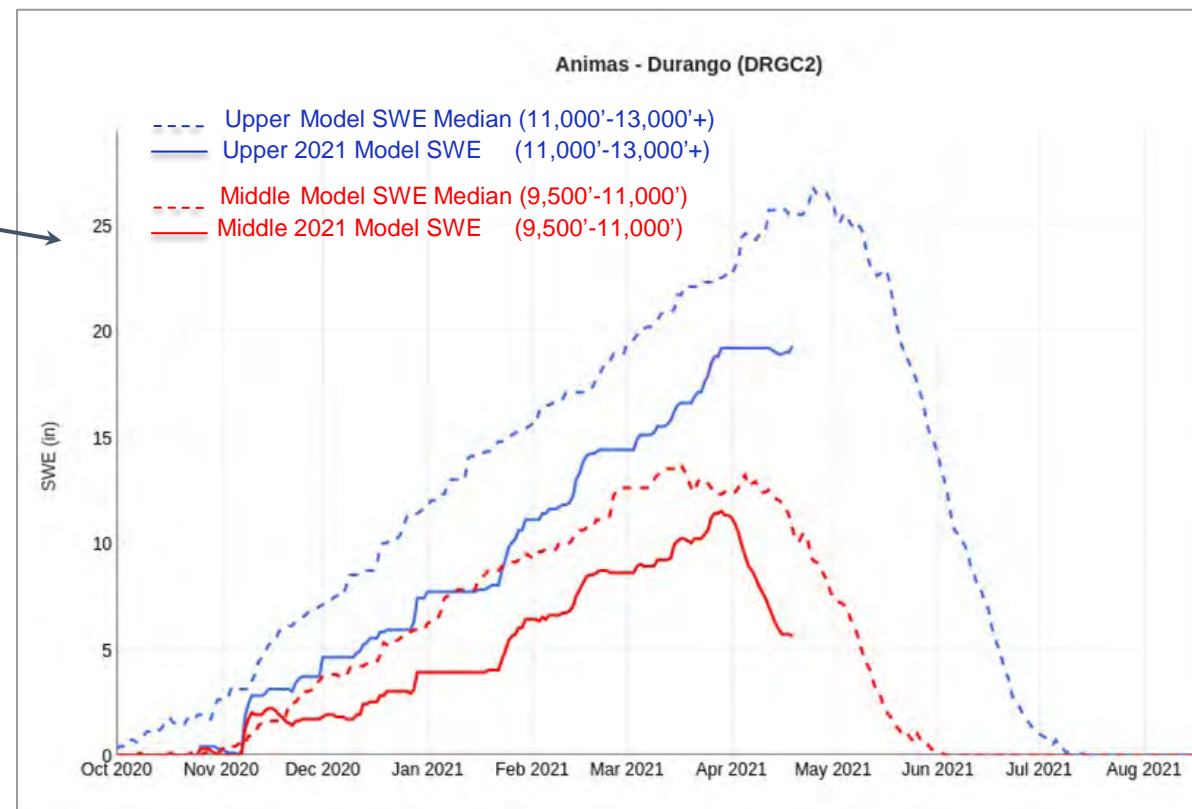
# Snow Conditions: CBRFC Model Snow Water Equivalent

April 19, 2021



Model snow includes areas above and below SNOTEL sites.

- SNOTEL locations range from 8,500-11,500'
- Some modeled basins extend to over 13,000'

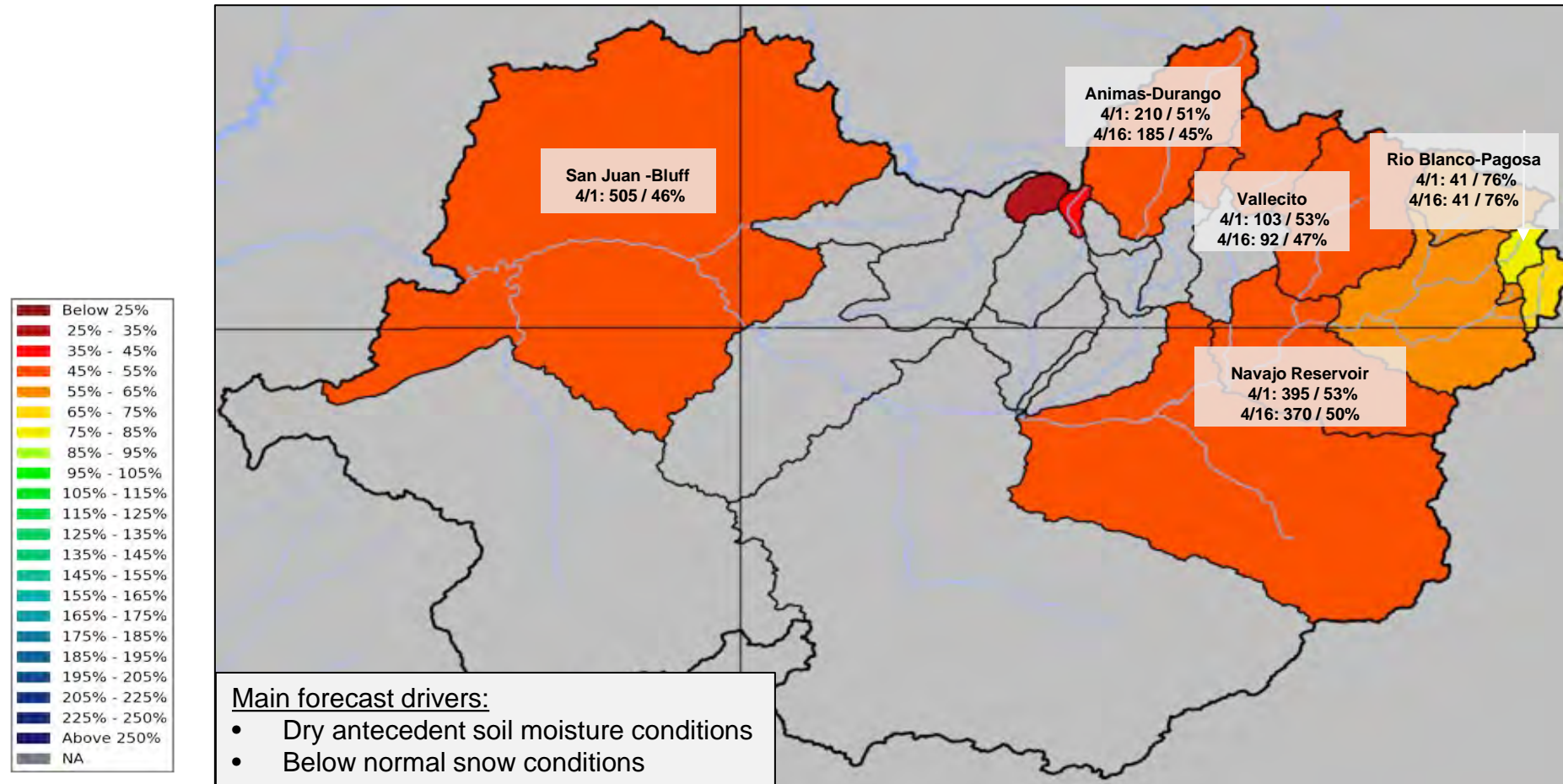


- Modeled snow is below normal above 9500'
- Significant melt has occurred below 11,000'; earlier than normal.
- Snow is still accumulating above 11,000'.
- Model indicates normal time of peak for SWE above 11,000' is early May.



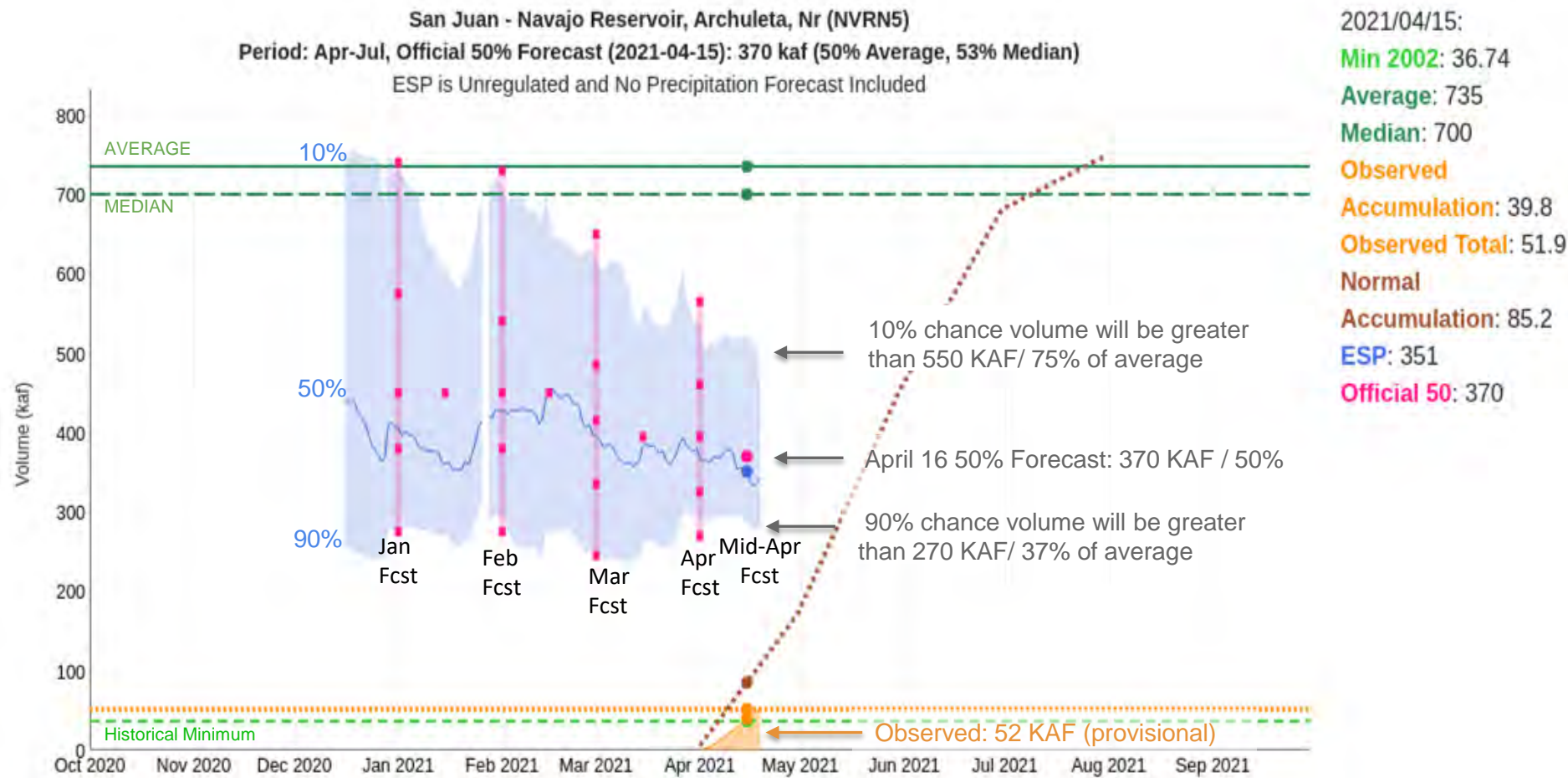
# April 1<sup>st</sup> Water Supply Forecasts: San Juan River Basin

## April-July Forecasts Volume in 1000's acre-feet / Percent of 1981-2010 average



- April 1st forecasts range from 35-75% normal with a median forecast of 50%.
- Forecast guidance has decreased by ~5-10% of average since the April 1st forecasts.

# Forecast Progression: Navajo Reservoir Inflow



Blue shading: Daily Raw Model Guidance 90% - 10% exceedance range  
Blue line: Daily Raw Model Guidance 50% exceedance  
Pink line: Official forecast 90%, 70%, 50%, 30%, 10% exceedance

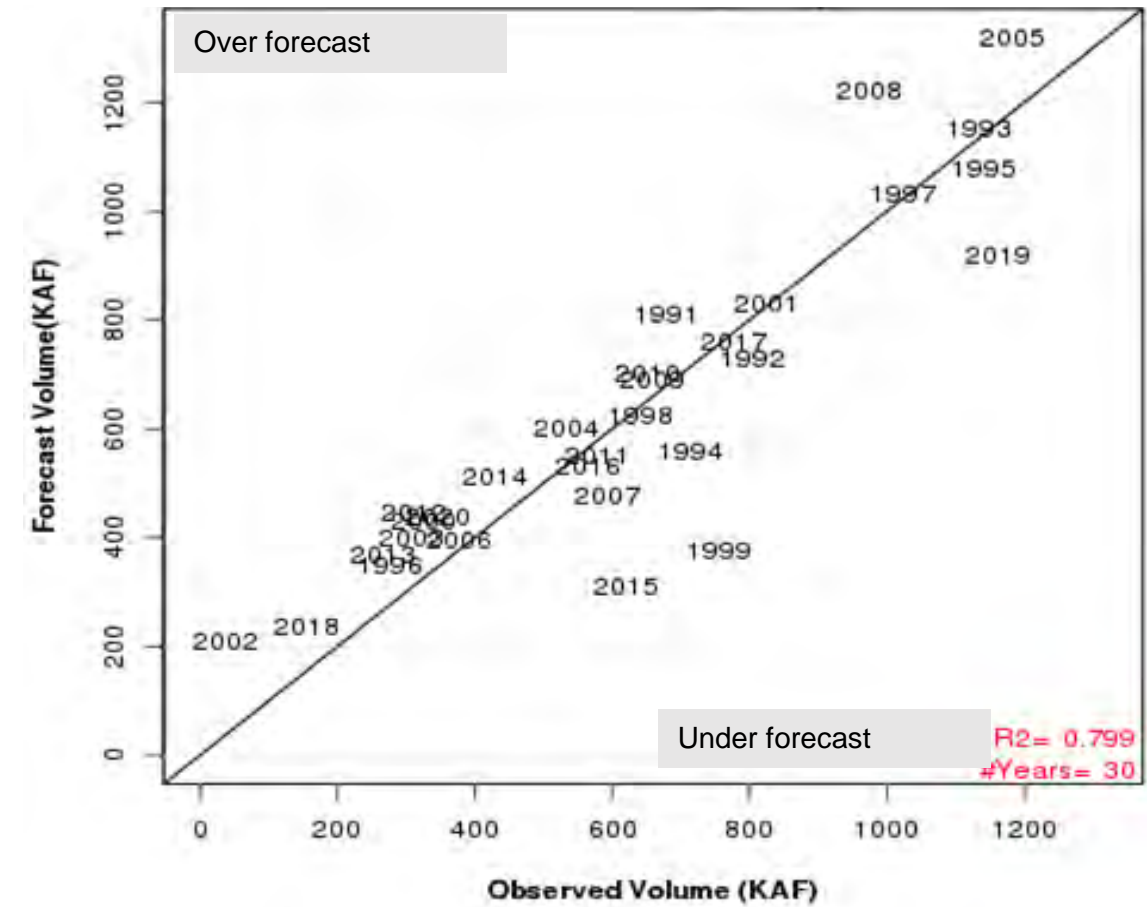
Green solid: 1981-2010 average April-July volume  
Green dotted: 1981-2010 median April-July volume

Brown dotted: Average observed  
Orange dashed: 2021 Observed Streamflow

[Navajo Reservoir Inflow Forecast Plot Link](#)  
[San Juan River Forecast Plots Link](#)

# Forecast Verification

Navajo Reservoir Inflow  
April 1<sup>st</sup> Forecast 1991-2020



Mar 1<sup>st</sup> average error: 22%  
Apr 1<sup>st</sup> average error: 18%  
May 1<sup>st</sup> average error: 15%

Historical Forecast Errors with similar April 1 Forecasts

YEAR	APR 1 FCST (KAF)	OBSERVED (KAF)	Error KAF / %
2003	400	307	93 / 30%: over
2006	395	379	16 / 4%: over
1999	375	755	380 / 50%:under
2013	370	267	103 / 38%: over



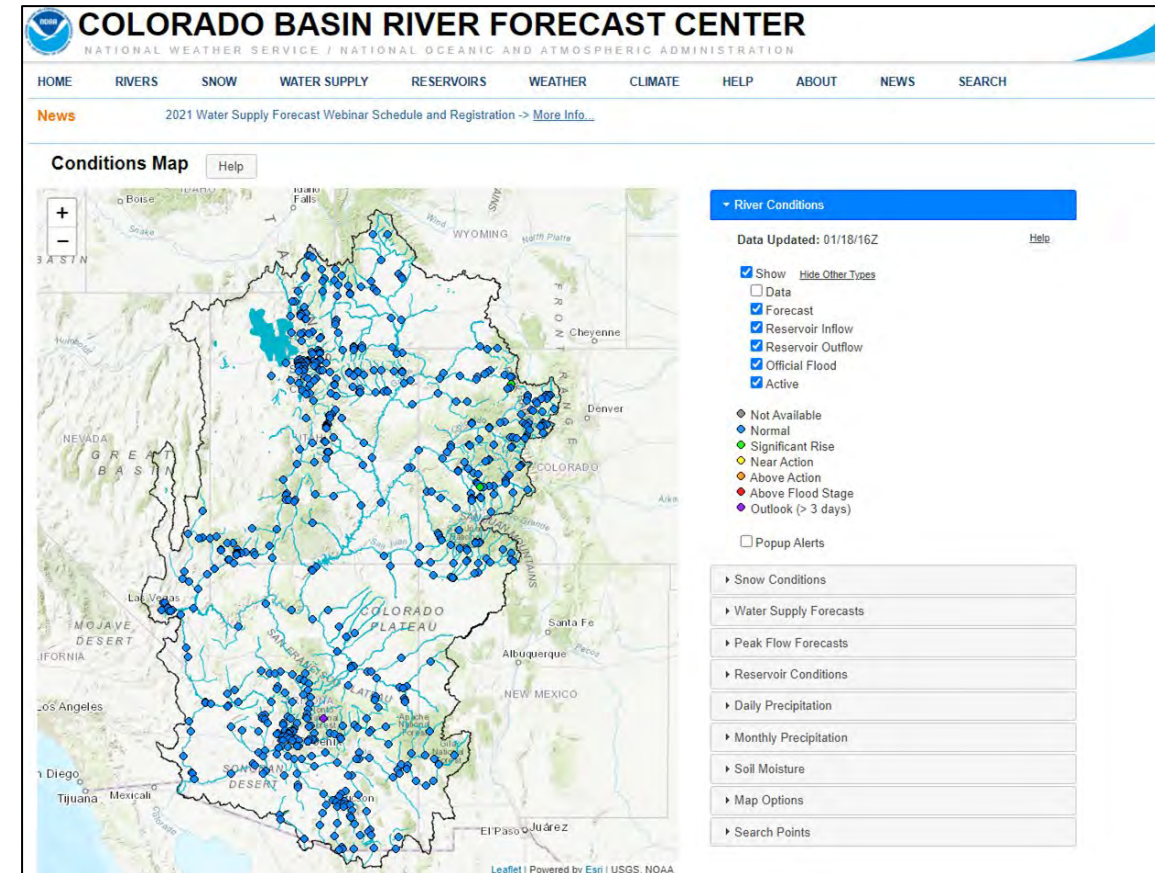
# Summary

- Below normal water year precipitation in the San Juan River Basin
- Below normal snow conditions
  - Early melt
- Near/record low antecedent soil moisture conditions entering water year 2021 snow accumulation & runoff season
  - Two consecutive years of poor Monsoon
  - Limited groundwater recharge since 2019 runoff
- April water supply forecasts (% of normal):
  - April 1st forecasts range between 35-75% of average
  - Forecast guidance has decreased by ~5-10% since the April 1st
  - Best conditions are located in the eastern headwaters and deteriorate moving west towards the Animas River Basin.
- Dry soils will most likely impact runoff with a portion of the snowmelt being absorbed into the ground.
- Early runoff implications:
  - Impacts depend on specific basin characteristics
  - Could be less efficient early in the melt due to dry soils
  - Could be more efficient due to faster melting snow pack
  - Could cause increased evapotranspiration in the later portion of normal the runoff period as bare ground and soils dry out sooner; ultimately leading to lower flows.

# Contact Info

## Contact Information

- Operational Hydrologist: in office
  - 801-524-4004
  - [cbrfc.operations@noaa.gov](mailto:cbrfc.operations@noaa.gov)
- Ashley Nielson - San Juan River Forecaster
  - [ashley.nielson@noaa.gov](mailto:ashley.nielson@noaa.gov)
  - 801-524-5130 x333



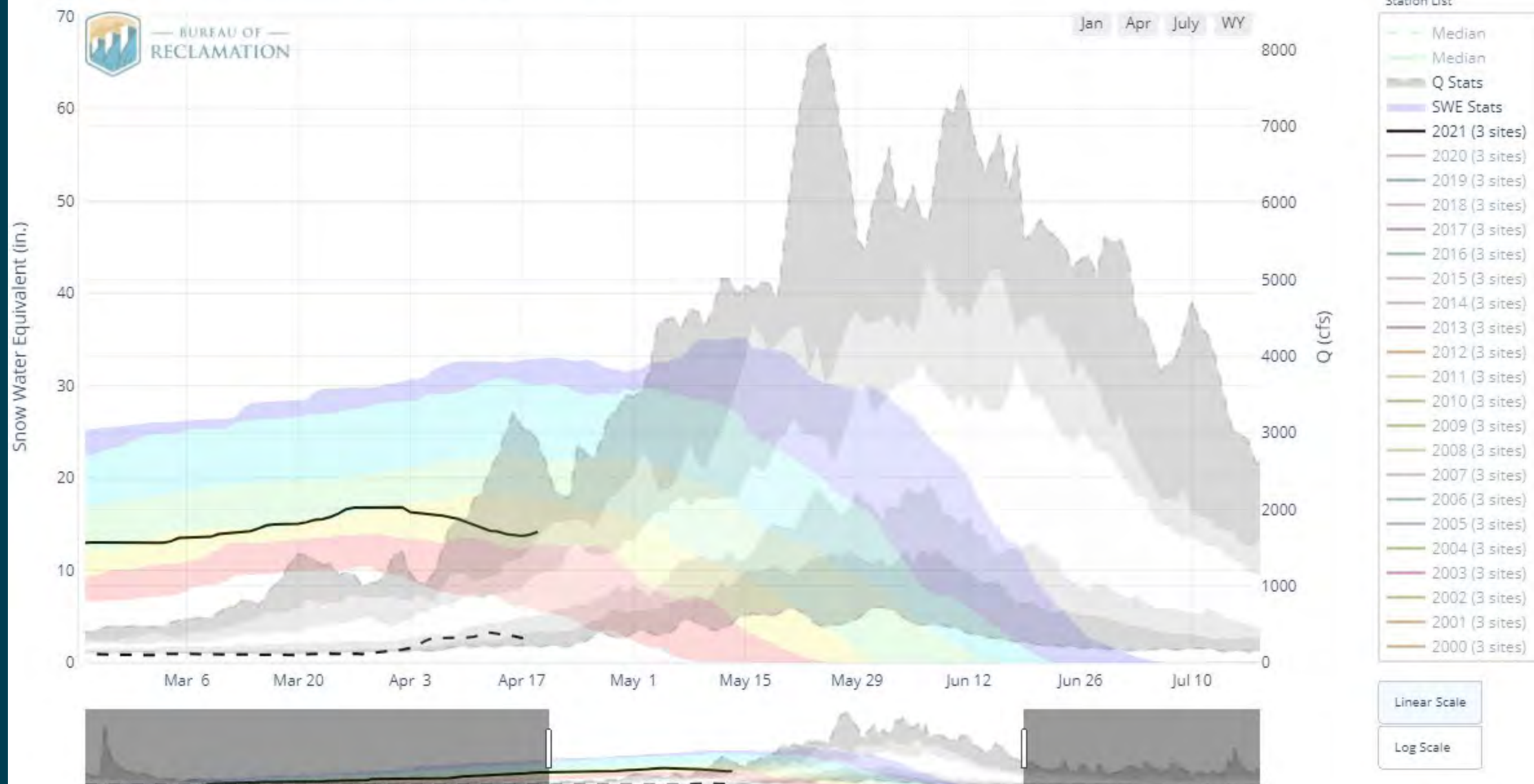
CBRFC Webpage

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

CBRFC Water Supply Presentations

<https://www.cbrfc.noaa.gov/present/present.php>

# Snow to Flow Relationship for Animas R at Durango



\* # of sites does not meet basin threshold. Data from this year will not for use in calculation of statistics

Updated: "Monday, Apr 19, 2021 @ 04 AM PST"



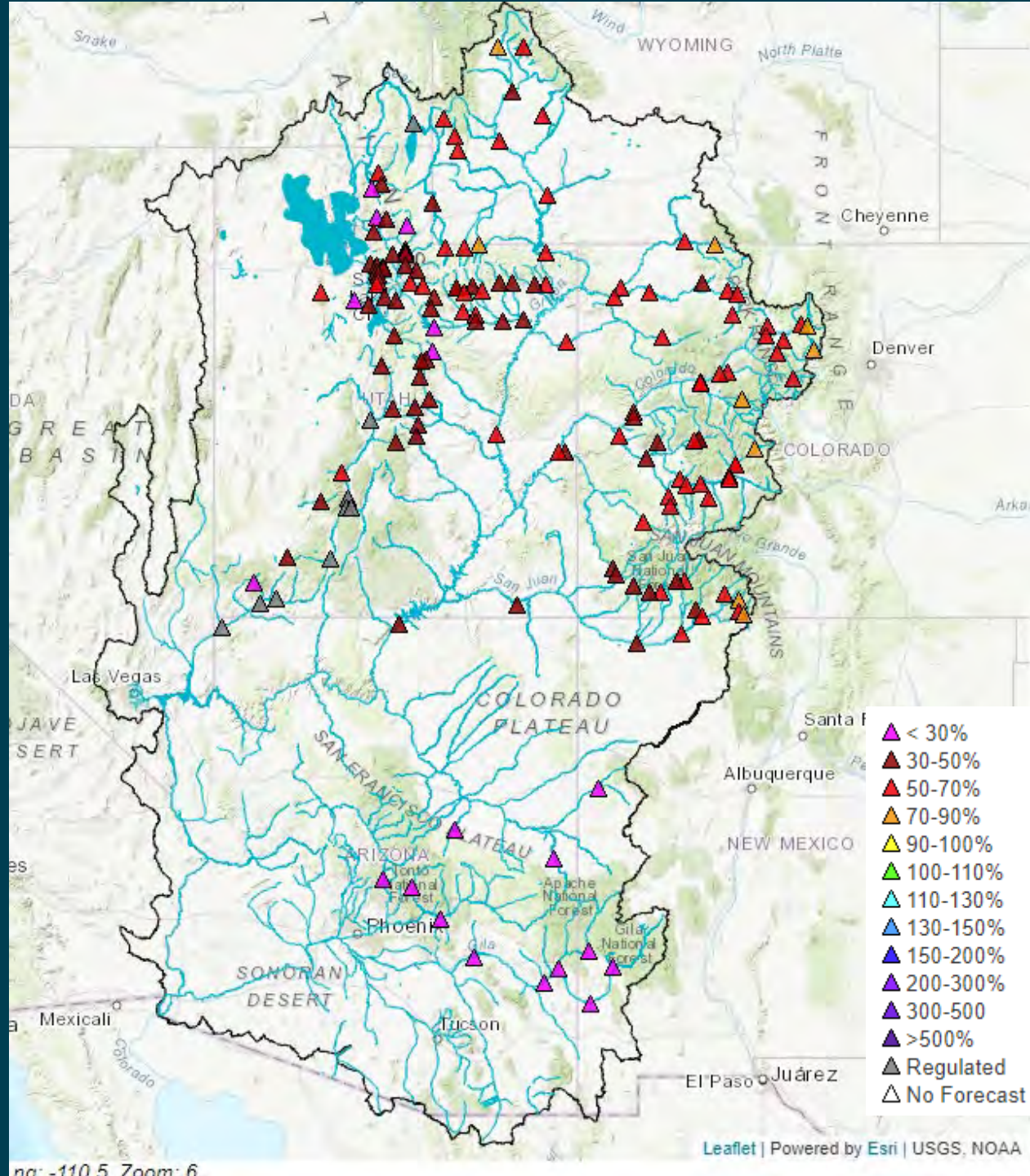


**Colorado Dust on Snow Program (CODOS)**  
Wolf Creek Pass, Reported April 14<sup>th</sup>, 2021



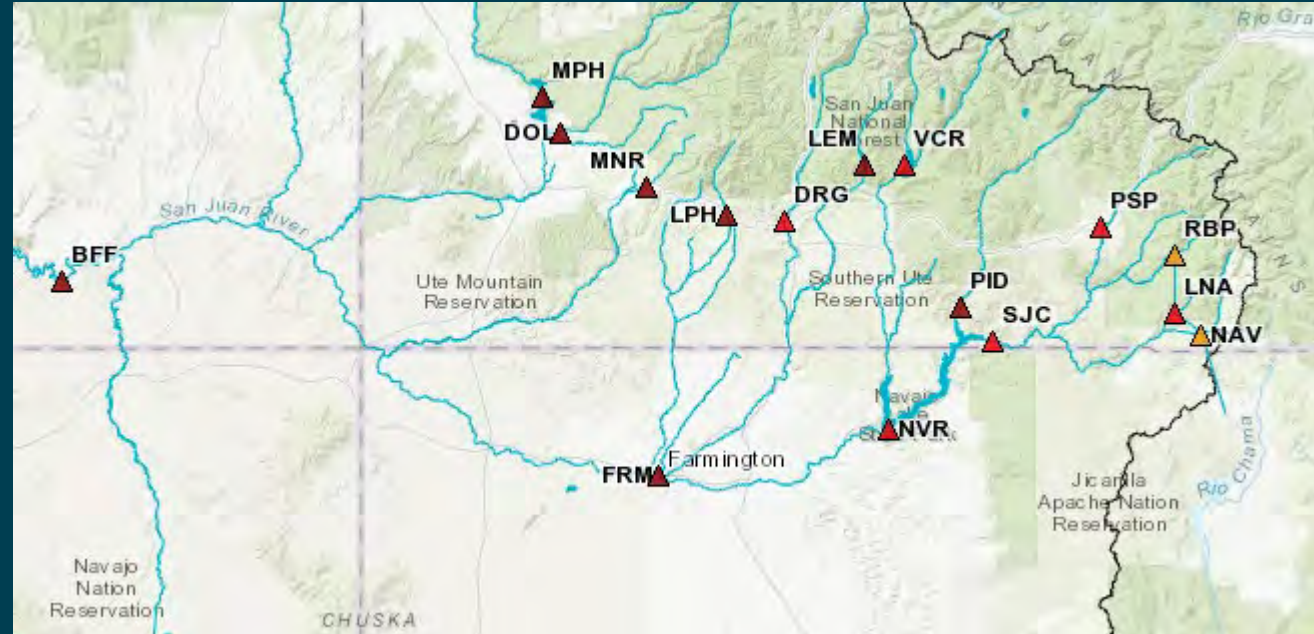


# Water Supply Forecasts (April-July)



# Water Supply Forecasts (April-July)

Navajo: 370 kaf (50% avg)  
Vallecito: 92 kaf (47% avg)  
Lemon: 22 kaf (40% avg)  
Animas: 185 kaf (45% avg)  
McPhee: 95 kaf (32% avg)  
Powell: 2,700 kaf (38% avg)



As of April 15, 2021





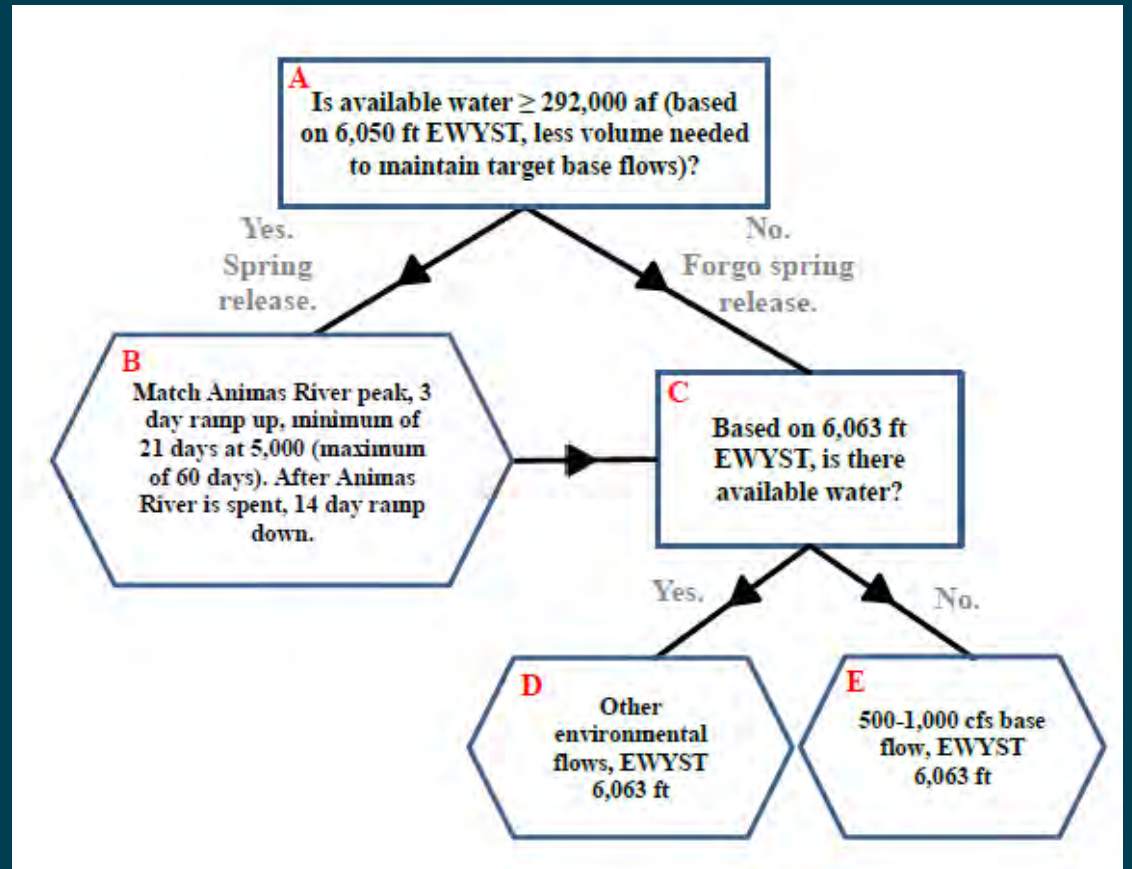
# San Juan River Recovery Implementation Program Modified Decision Tree (updated 2018)

## PRELIMINARY AVAILABLE WATER CALCULATION FOR WY 2021

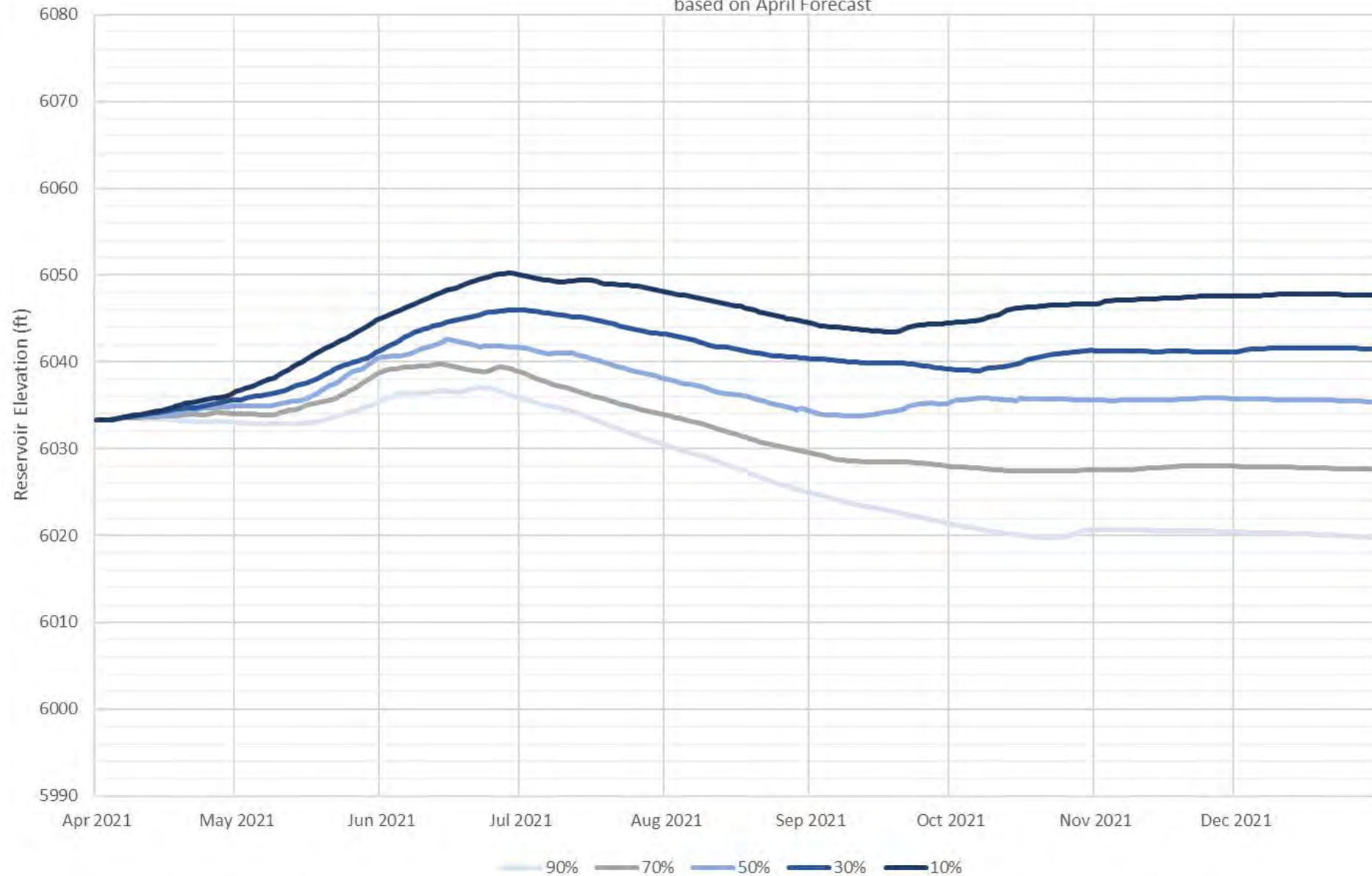
CBRFC Forecast Date:

April 2021

Current Forecast	Forecast	Available Water over 6050 (kaf)	Available Days at Peak (need min of 21 for SPR)	Proposed Release	Proposed Release Volume (kaf)	Volume over 6063 ft on Sept 30th (kaf)	Sept 30 Pool Elevation (ft) with proposed release
	MIN	-373	0	none	0	0	6013
	MOST	-149	0	none	0	0	6036
	MAX	-33	0	none	0	0	6052



# Navajo Pool Elevation Probabilities through WY 2021 based on April Forecast

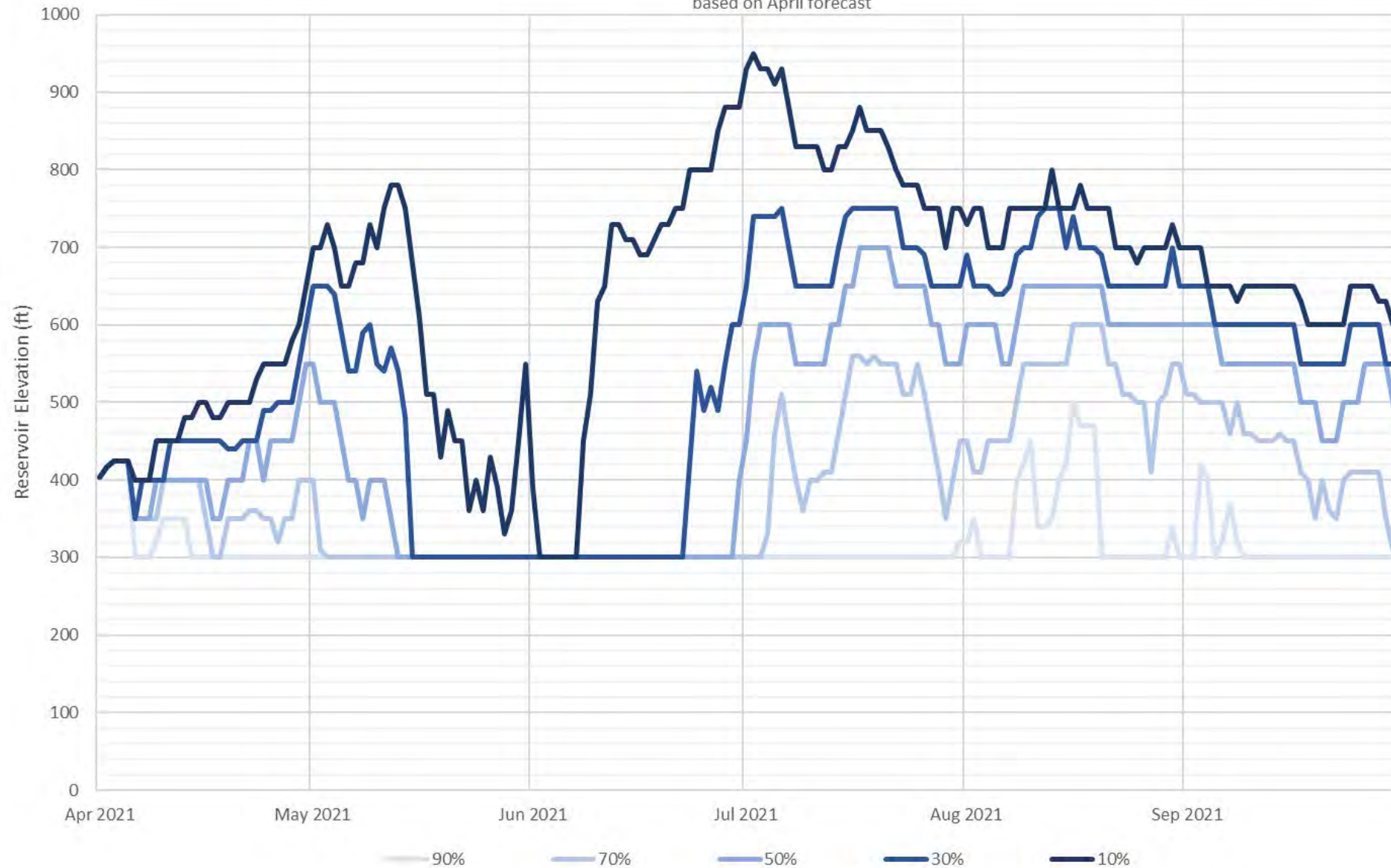


Probability release will be reached or exceeded. For example- the dark blue line reads as "there is a 10% chance the elevation will be higher than this line."





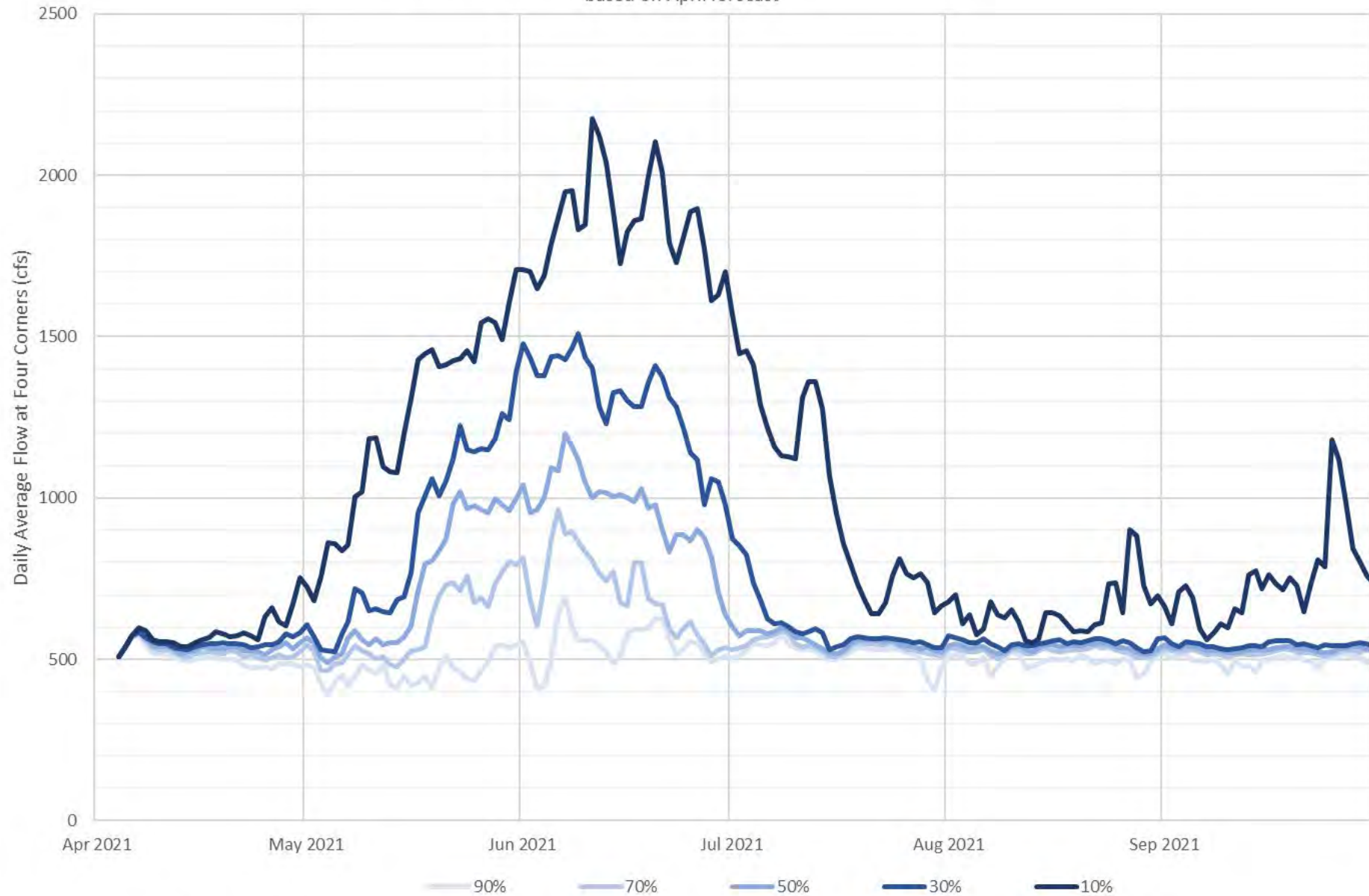
# Navajo Releases Forecast Statistics through WY 2021 based on April forecast



Probability release will be reached or exceeded. For example- the dark blue line reads as "there is a 10% chance the release will be higher than this line."



# Flows by Exceedance Probability at Four Corners based on April forecast



Probability release will be reached or exceeded. For example- the dark blue line reads as "there is a 10% chance the flows will be higher than this line."



# What does it mean?

Based on current storage levels and the ESP trace forecasts,

- No spring peak release is planned
- Releases through the summer will likely range from 600 cfs to 1,000 cfs.
- Most probable forecast peak pool elevation is near 6043 ft (Min Prob 6038)
- Most probable forecast Sept 30<sup>th</sup> pool elevation is near 6035 ft (Min Prob 6021)
- Flows at Four Corners are unlikely to meet SJRIP Flow Targets under these forecasts.
- No runs result in a shortage for WY 2021, however, 3% chance of shortage in WY 2022 (one run out of 35 results in a shortage).

# Summary

*Next mtg August 24<sup>th</sup> – Virtual? In-Person?*

- Extreme to Exceptional drought remains entrenched over the headwaters and Four Corners and is predicted to remain.
- Snowpack peak was below-average for the San Juans, and runoff has begun early.
- The April-July runoff most probable forecast for Navajo is 370kaf (50% of average). Other basins in the San Juans have similarly low forecasts.
- Antecedent soil moisture was record low entering this winter, which is another driver of below-average forecast runoff.
- Based on current conditions (snowpack and reservoirs), and the range of forecast possibilities provided by CBRFC, no spring peak release is planned
- Expect low releases throughout the runoff season (300-500 cfs) as minimum releases to meet the target baseflows will be made. Summer releases will likely be higher than normal, between 600 and 1,000 cfs releases will be likely unless we have a wet summer.
- Currently no shortage is in the forecast for the San Juan River Basin in water years 2021-2022.





## Reclamation Contacts:

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To be added to Navajo Dam notices email list, send an email to  
[westcoloareaoffice@usbr.gov](mailto:westcoloareaoffice@usbr.gov)



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RECLAMATION

### Useful Links

Reclamation: [www.usbr.gov/uc](http://www.usbr.gov/uc)

USGS: [water.usgs.gov/nwis](http://water.usgs.gov/nwis)

CBRFC: [cbrfc.noaa.gov](http://cbrfc.noaa.gov)