BUREAU OF RECLAMATION

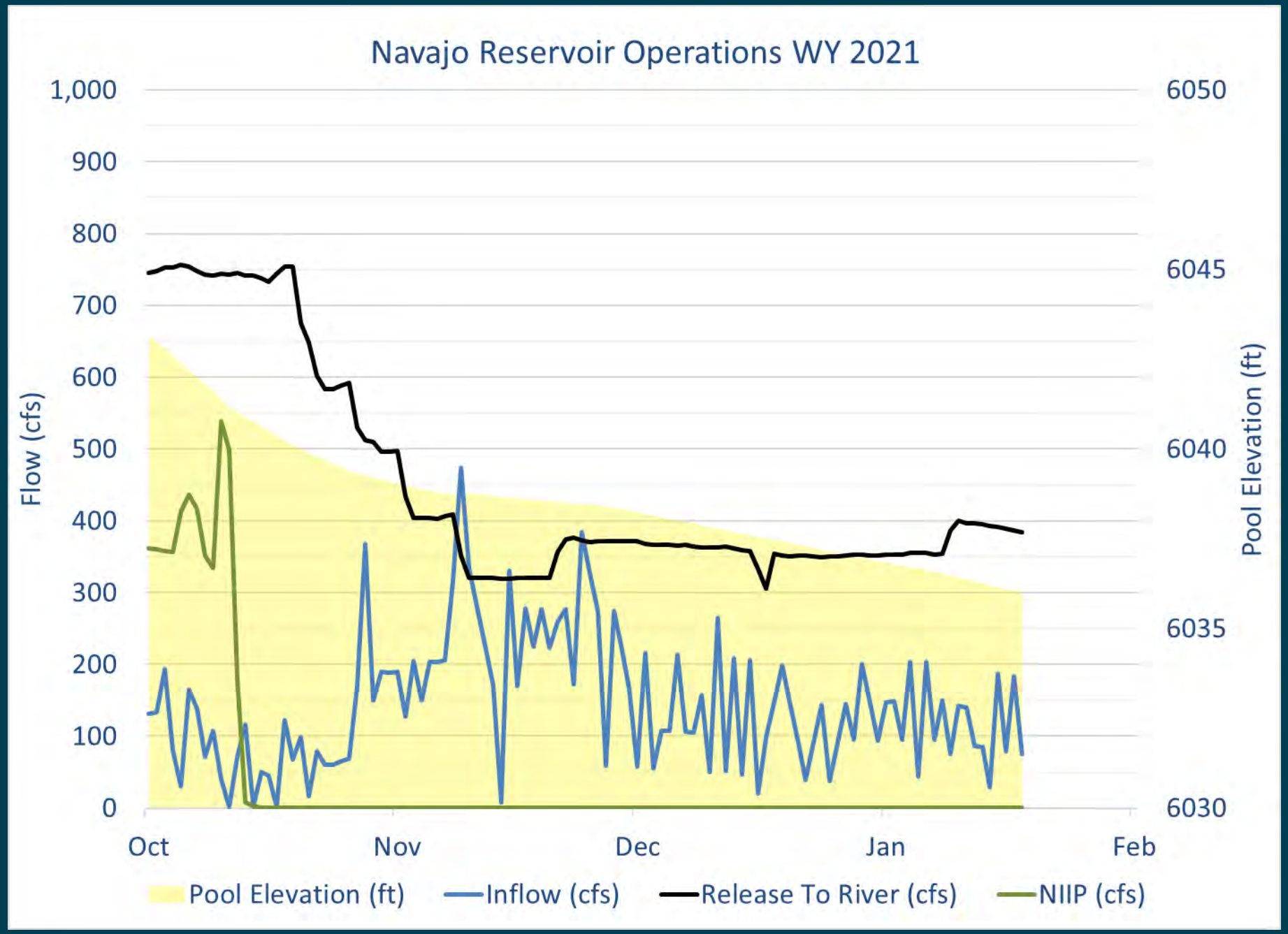
Navajo Unit Operations Coordination Meeting

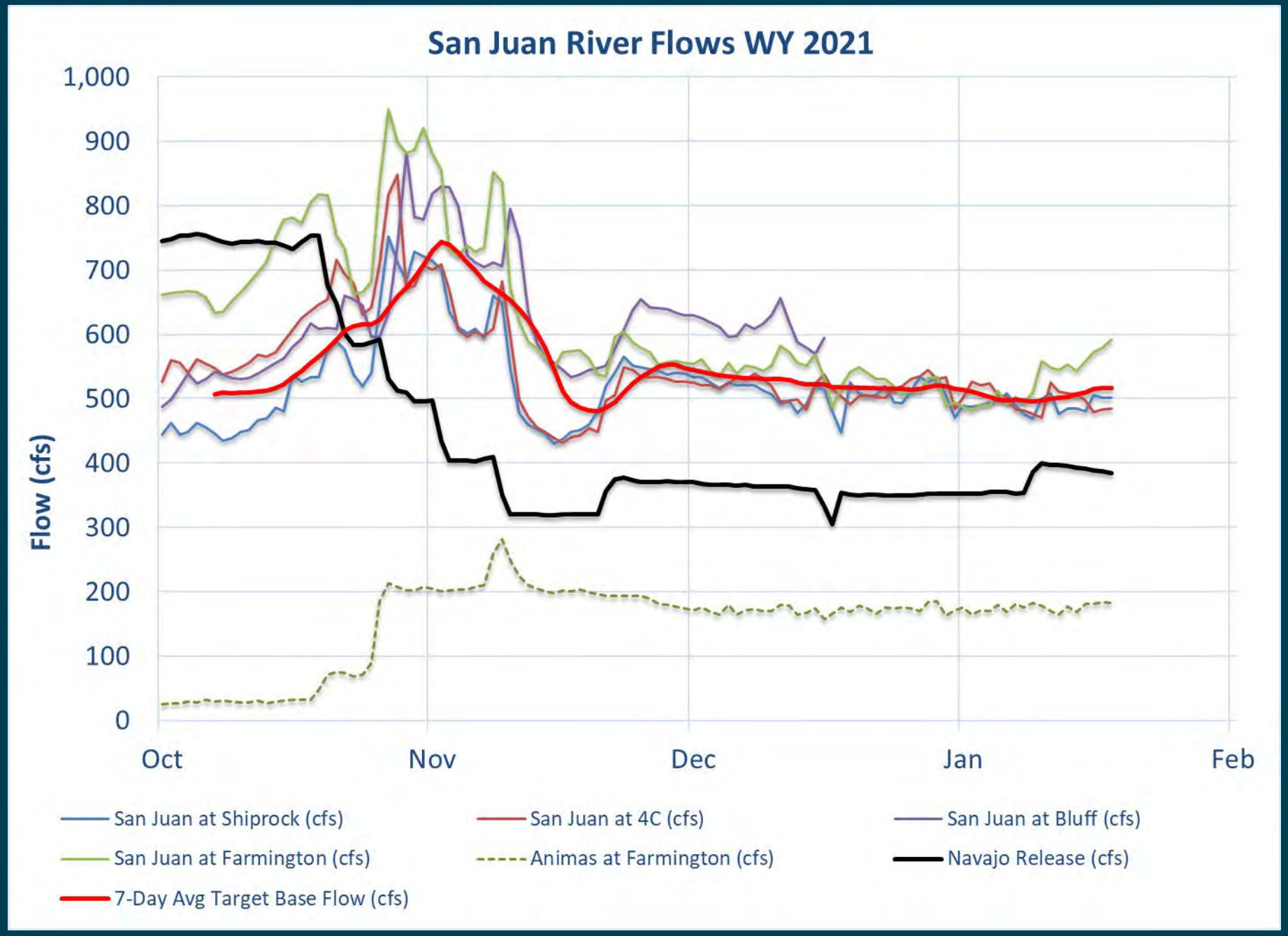
January 19, 2021 1:00 PM

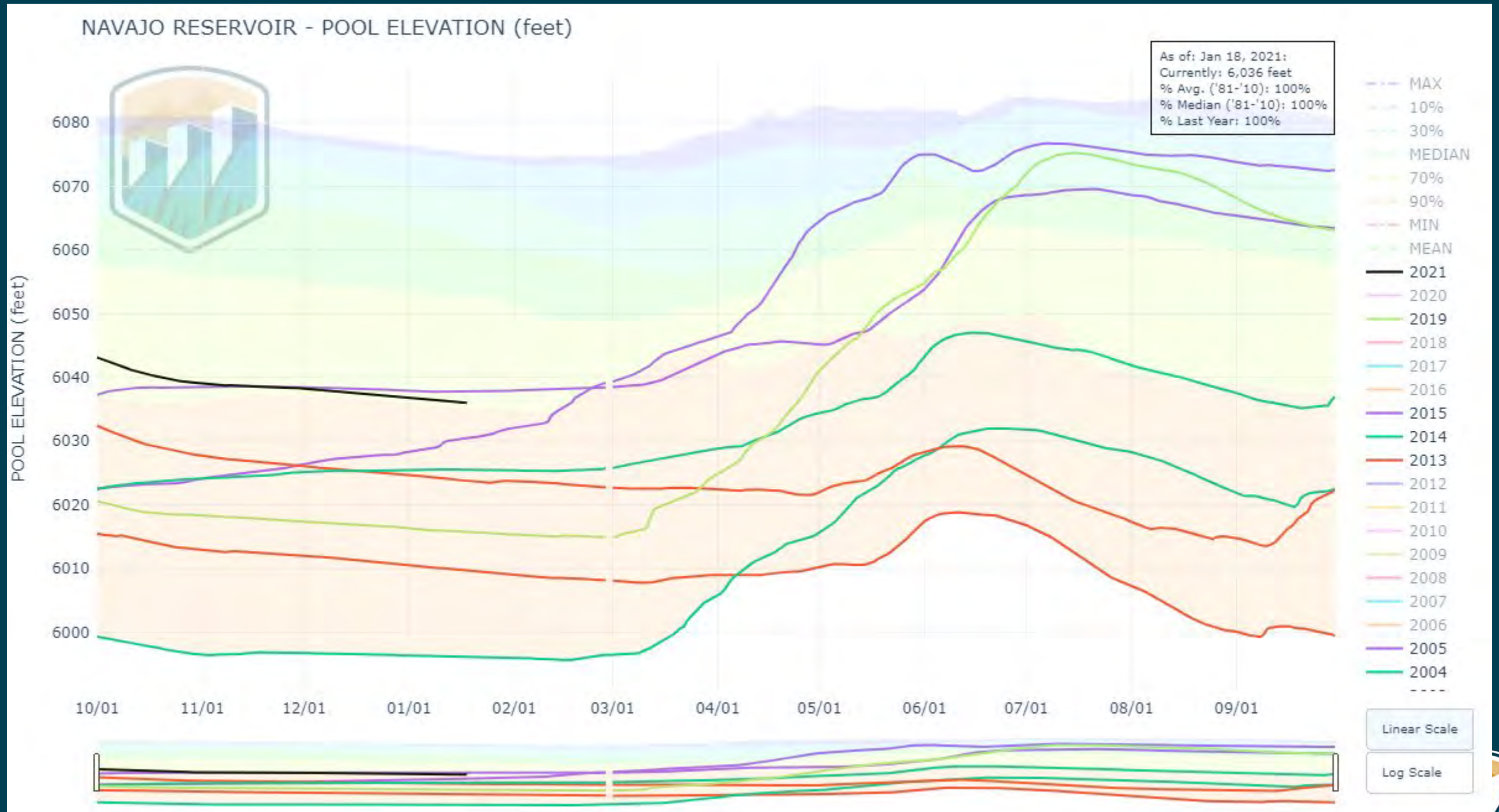
Microsoft Teams Virtual Meeting

Agenda

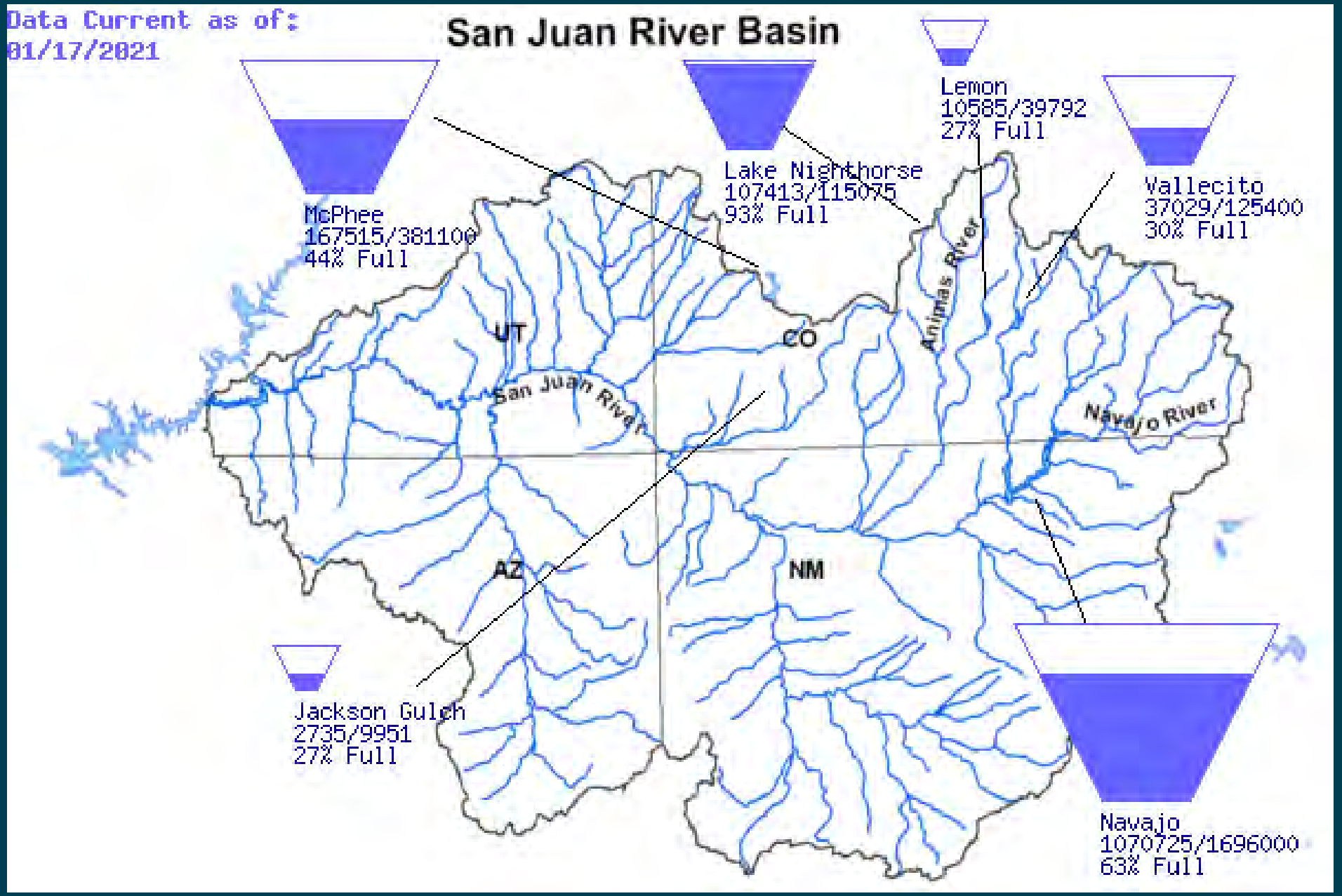
- Review of operations to date WY 2021
- Current reservoir status
- Current soil and snowpack conditions
- WY 2021 weather and flow forecasts
- WY 2021 proposed operations
- Navajo Dam maintenance activities
- Reports from other entities


Navajo Reservoir Operations WY 2021
1,000
900
800
700
600
500
400
300
200
100
0
Flow (cfs)
6050
6045
6040
6035
6030
Pool Elevation (ft)
Oct
Nov
Dec
Jan
Feb
Pool Elevation (ft)
Inflow (cfs)
Release To River (cfs)
NIIP (cfs)

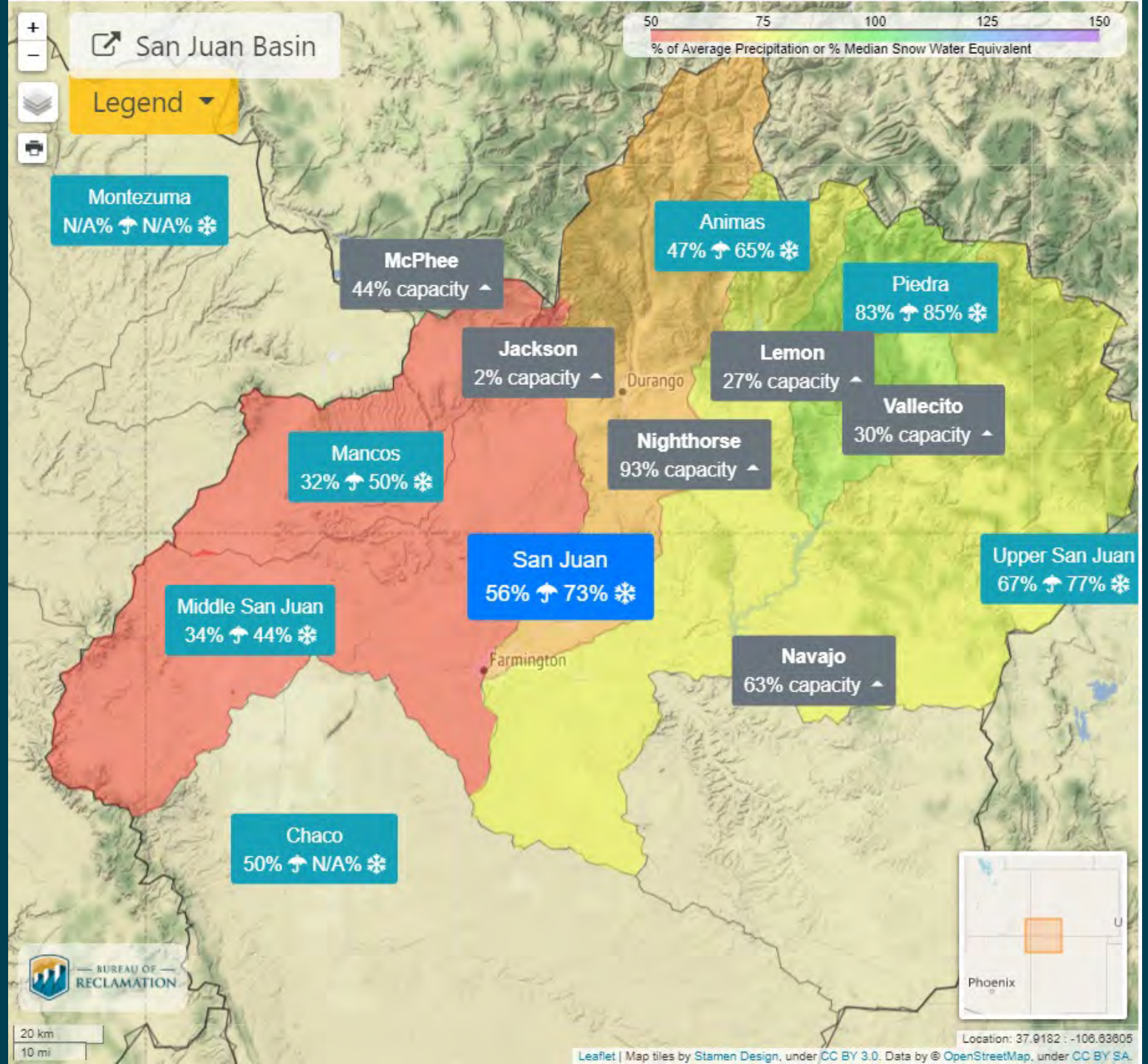

San Juan River Flows WY 2021
Flow (cfs)
1,000
900
800
700
600
500
400
300
200
100
0
Oct
Nov
Dec
Jan
Feb
San Juan at Shiprock (cfs)
San Juan at 4C (cfs)
San Juan at Bluff (cfs)
San Juan at Farmington (cfs)
Animas at Farmington (cfs)
Navajo Release (cfs)
7-Day Avg Target Base Flow (cfs)



Reclamation Hydro Data
https://www.usbr.gov/uc/water/hydrodata/reservoir_data/site_map.html

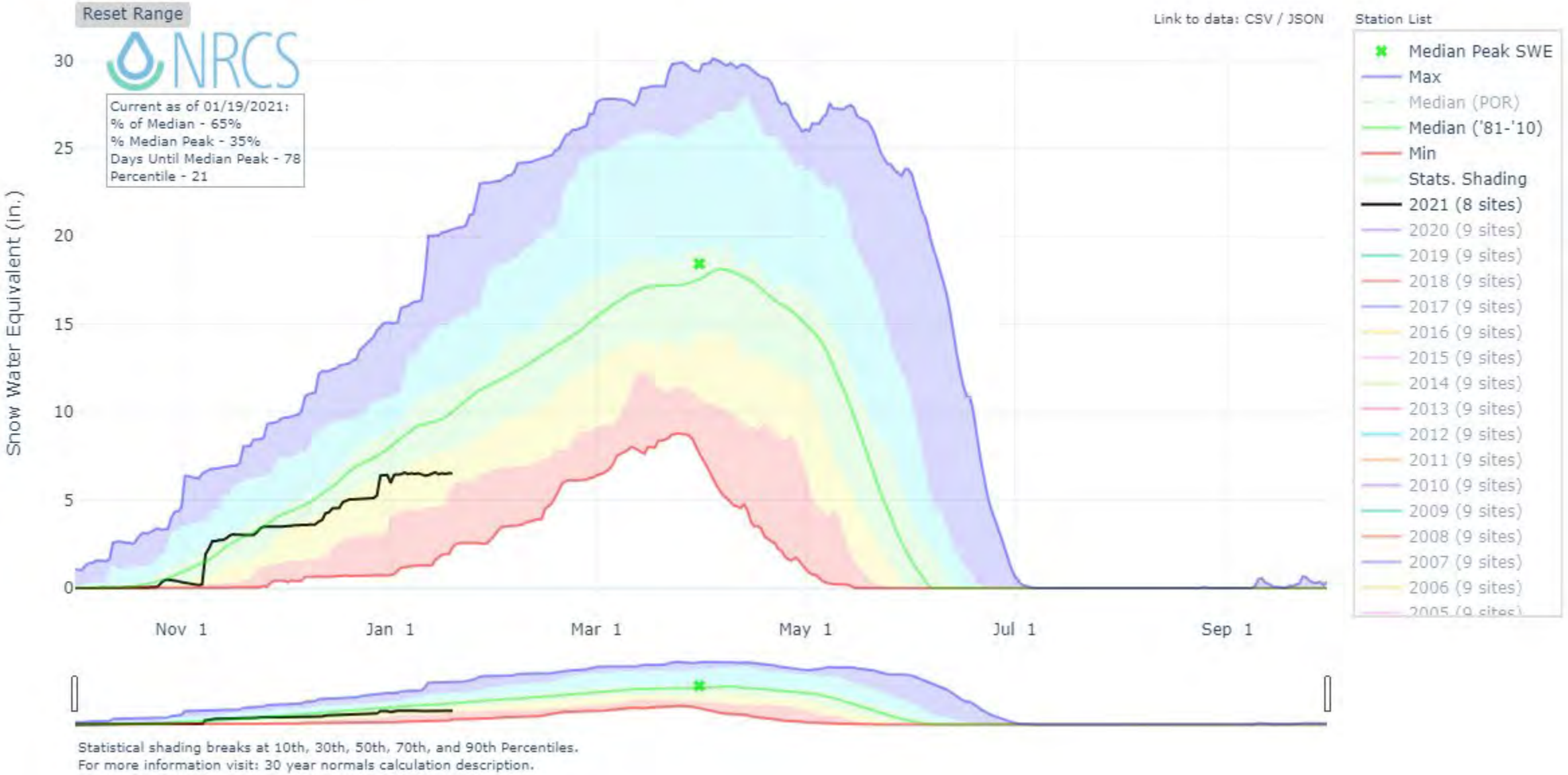


Reclamation Teacup Diagrams
https://www.usbr.gov/uc/water/basin/index.html



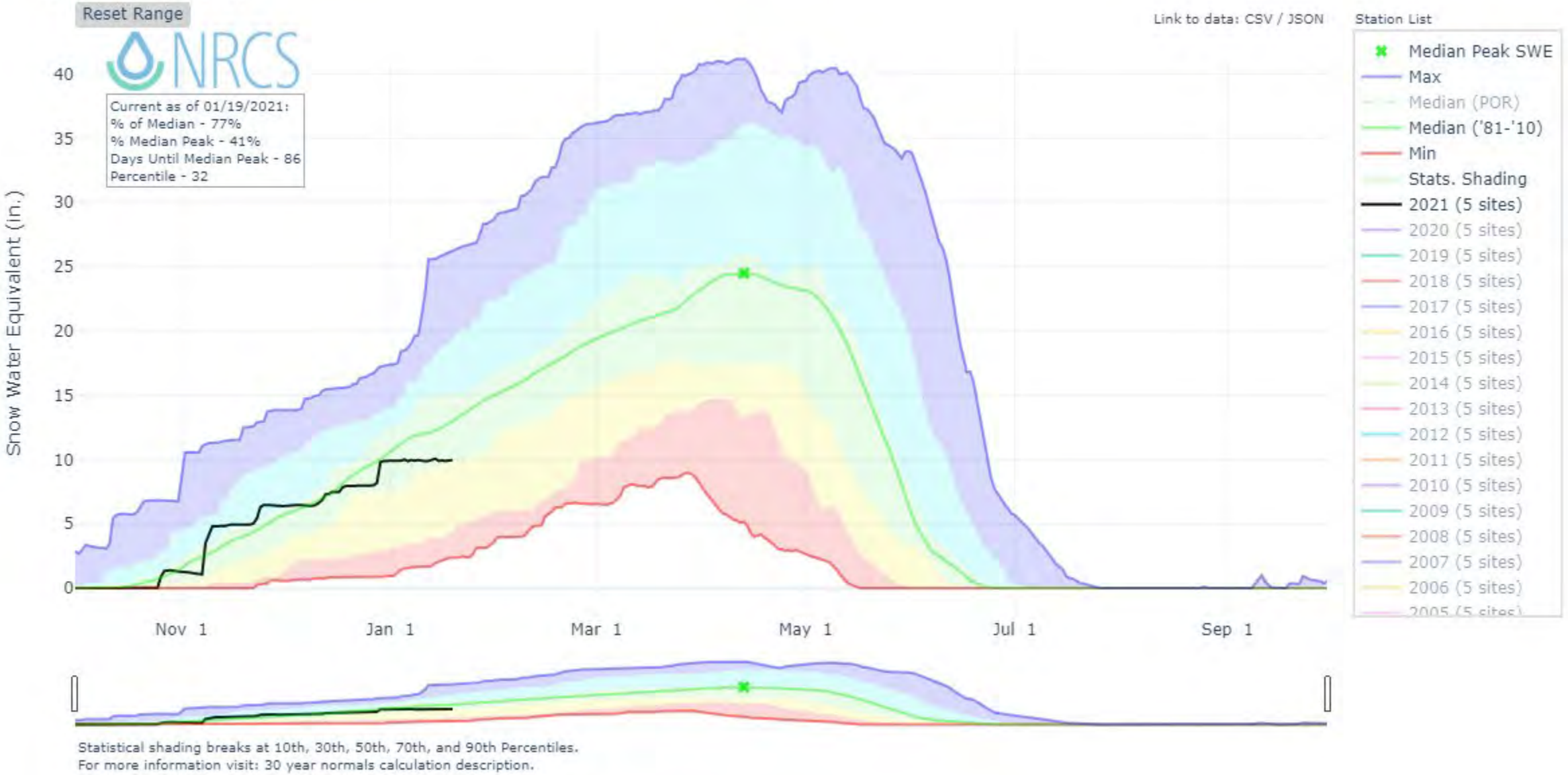
Reclamation HydroData Basin Status
https://www.usbr.gov/uc/water/hydrodata/status_maps/

SNOW WATER EQUIVALENT IN ANIMAS



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
For more information visit: 30 year normals calculation description.

SNOW WATER EQUIVALENT IN UPPER SAN JUAN



Statistical shading breaks at 10th, 30th, 50th, 70th, and 90th Percentiles.
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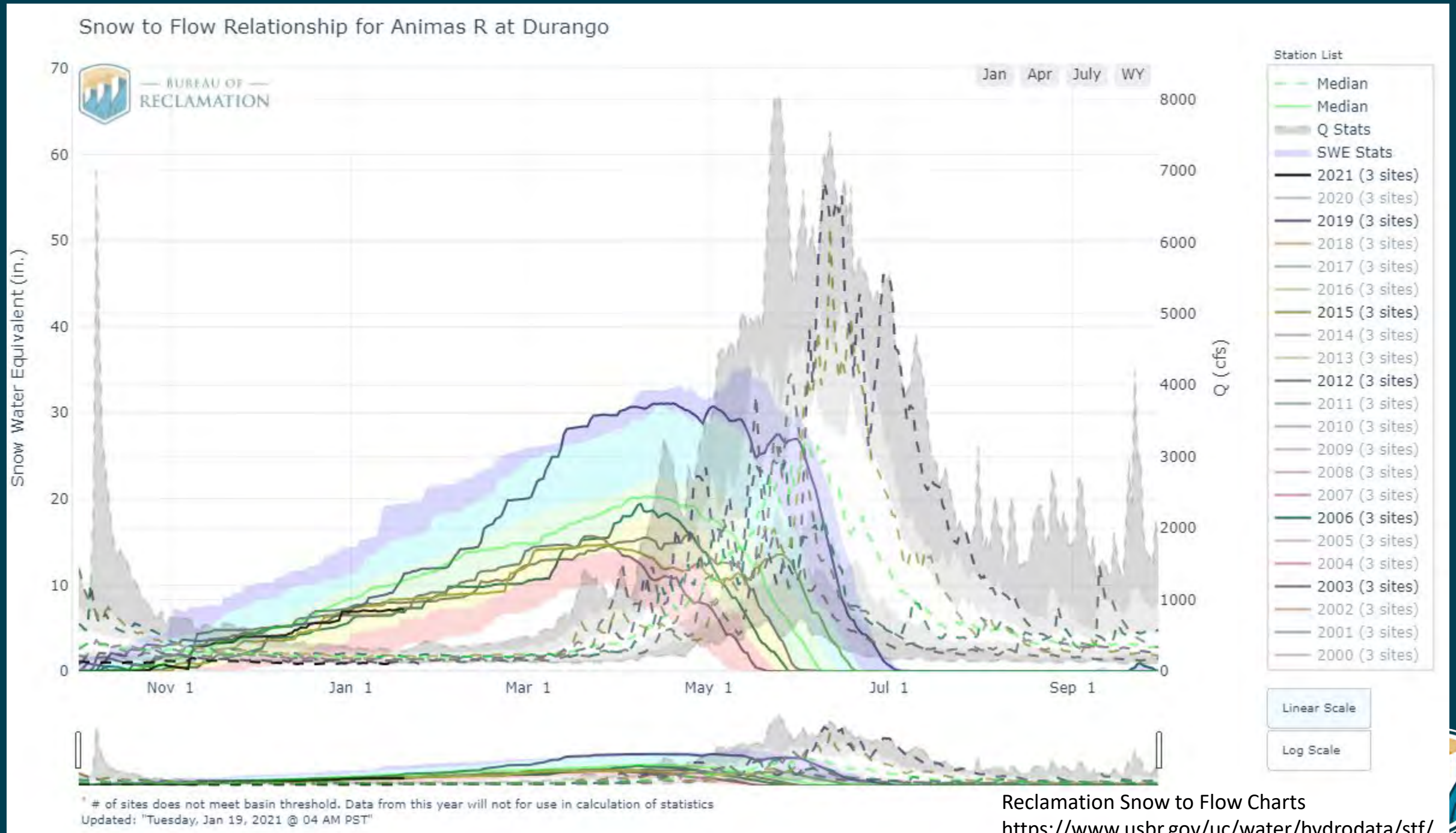


Reclamation Snow to Flow Charts
https://www.usbr.gov/uc/water/hydrodata/stf/

Weather Outlook

January 2021

Aldis Strautins

National Weather Service

Grand Junction, CO

http://www.weather.gov/gjt

Weather Outlook
January 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 year.

- So far for the beginning of January colder than normal with precipitation well below normal.

- The latest storm in late December brought some brief relief to southwestern Colorado but the first half of January has been dry.

- Exceptional drought remains entrenched over the head waters and Four Corners region.

Weather Outlook
January 2021

Discussion / Outline

- ENSO-La Nina conditions are present and are expected to continue this winter and then transition toward neutral during the Spring.

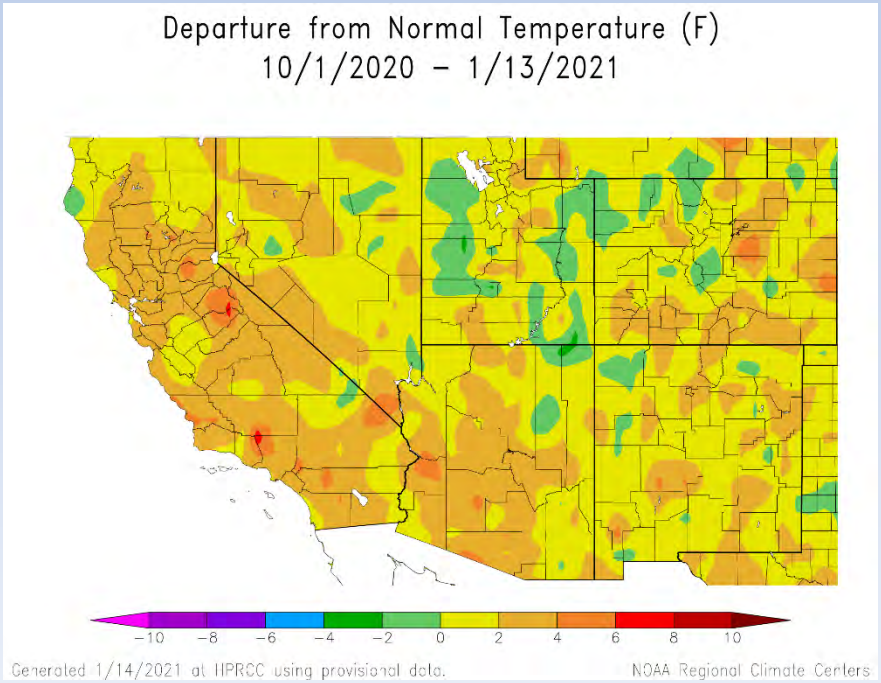
- A more progressive pattern is indicated for the second half of January which would allow more storms and increased precipitation chances.

- Spring into early summer higher chances of below normal precipitation. Higher chances of above normal temperatures

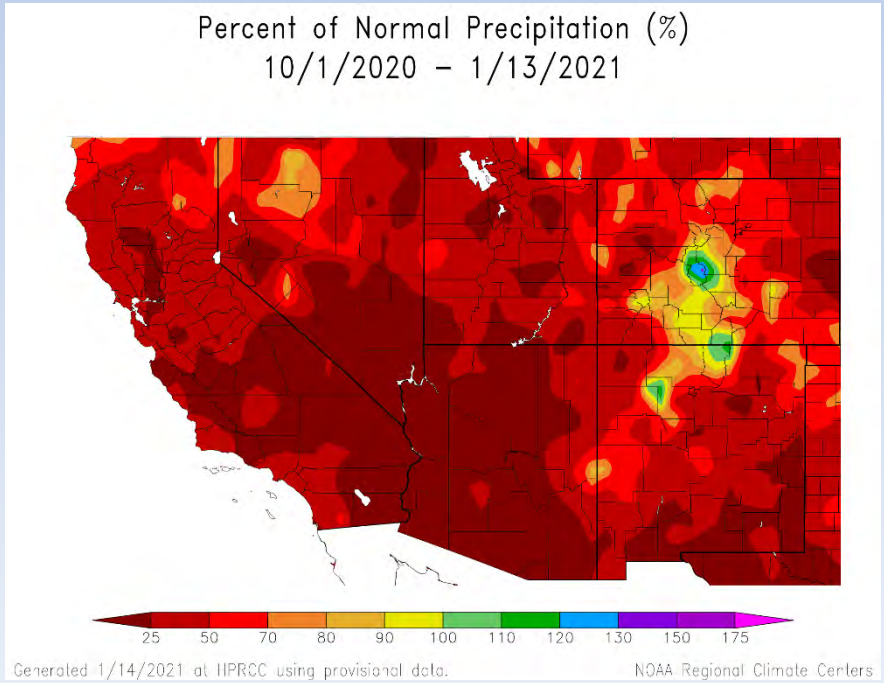
- Drought is predicted to remain.

The Past
January 2021

Temperature
Departure from normal



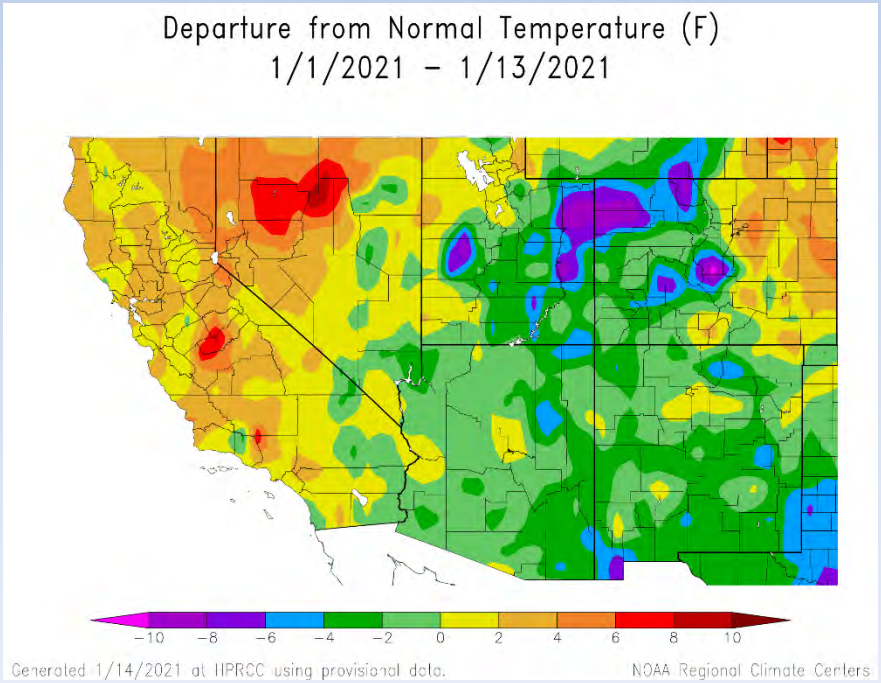
Precipitation
% of normal



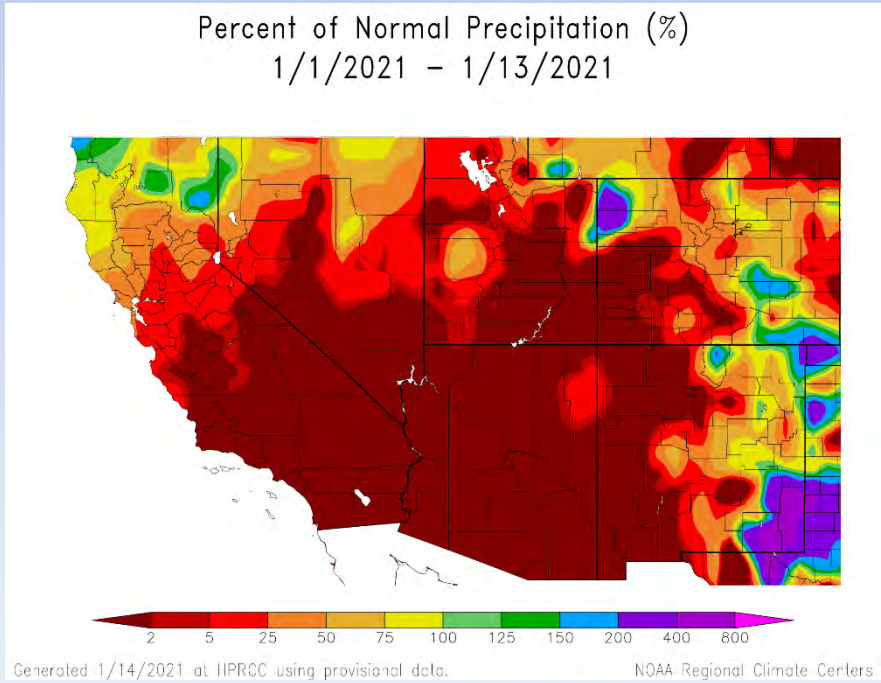
Water Year 2021

The Past
January 2021

Temperature
Departure from normal



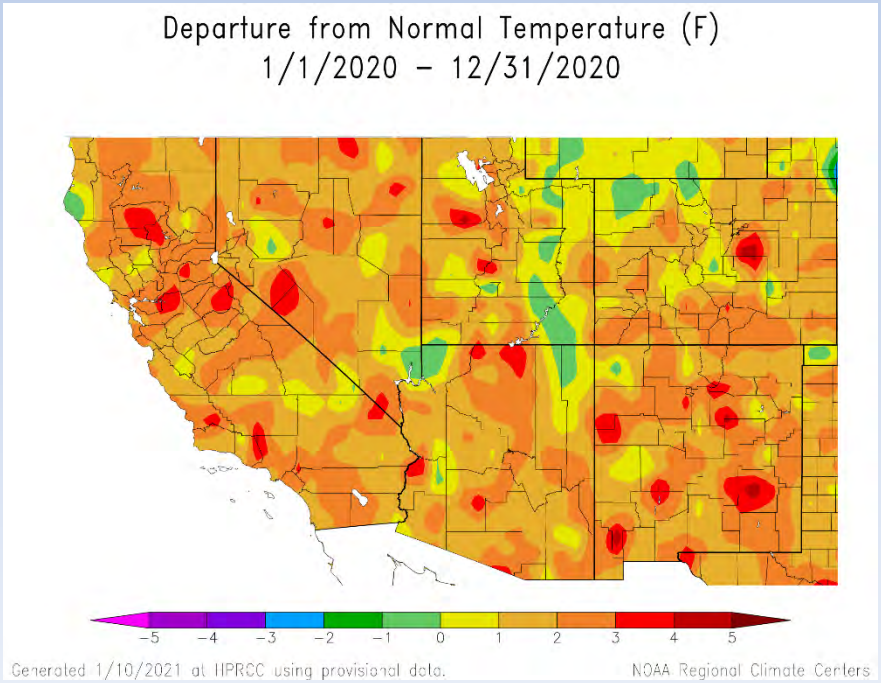
Precipitation
% of normal



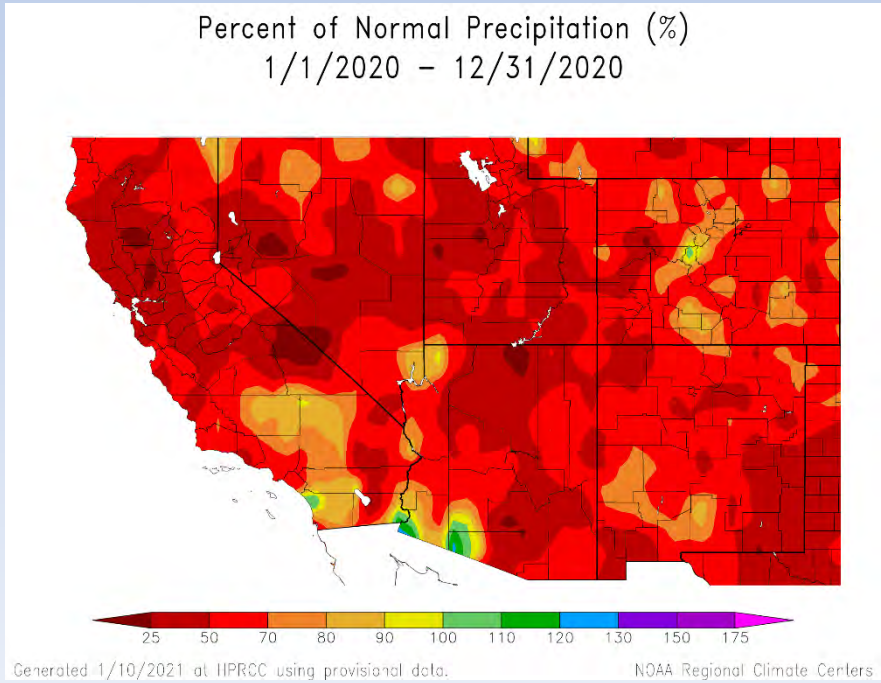
From January 1, 2021

The Past
January 2021

Temperature
Departure from normal



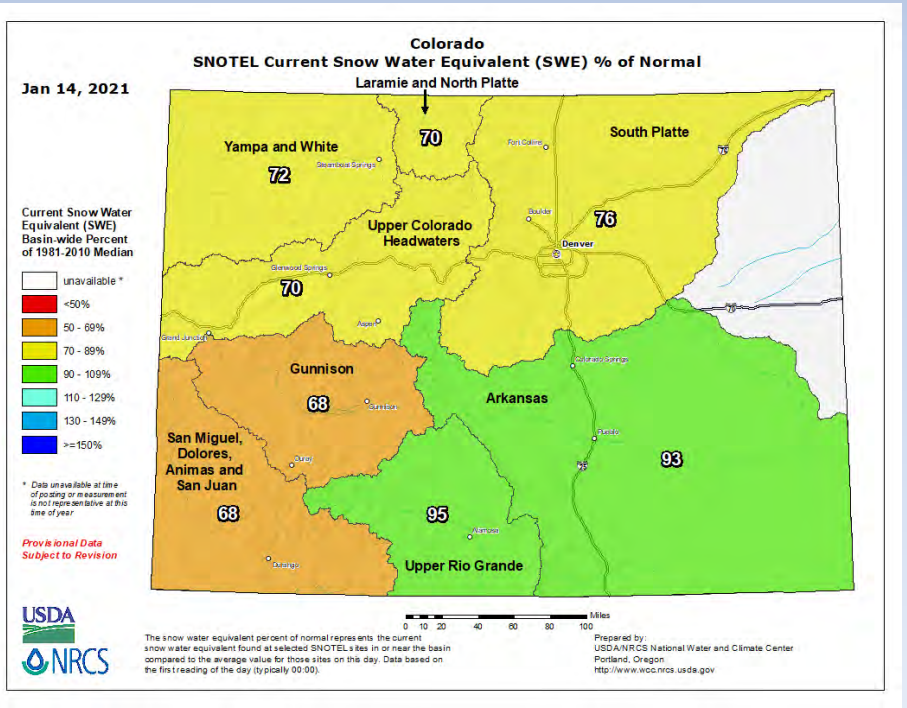
Precipitation
% of normal



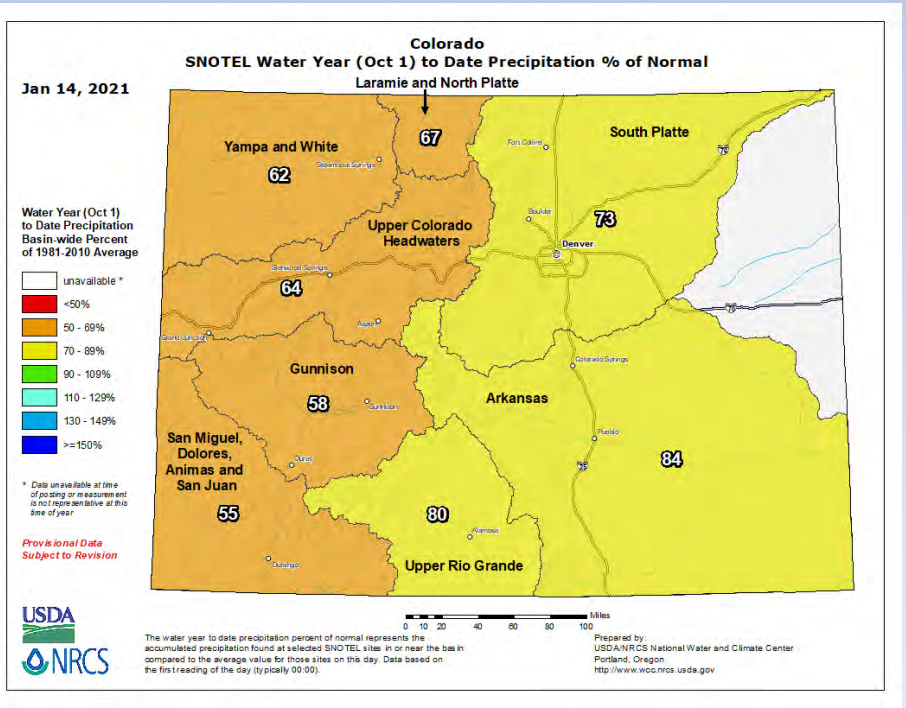
From January 1, 2020 through December 31, 2020

SNOTEL
January 2021

SWE

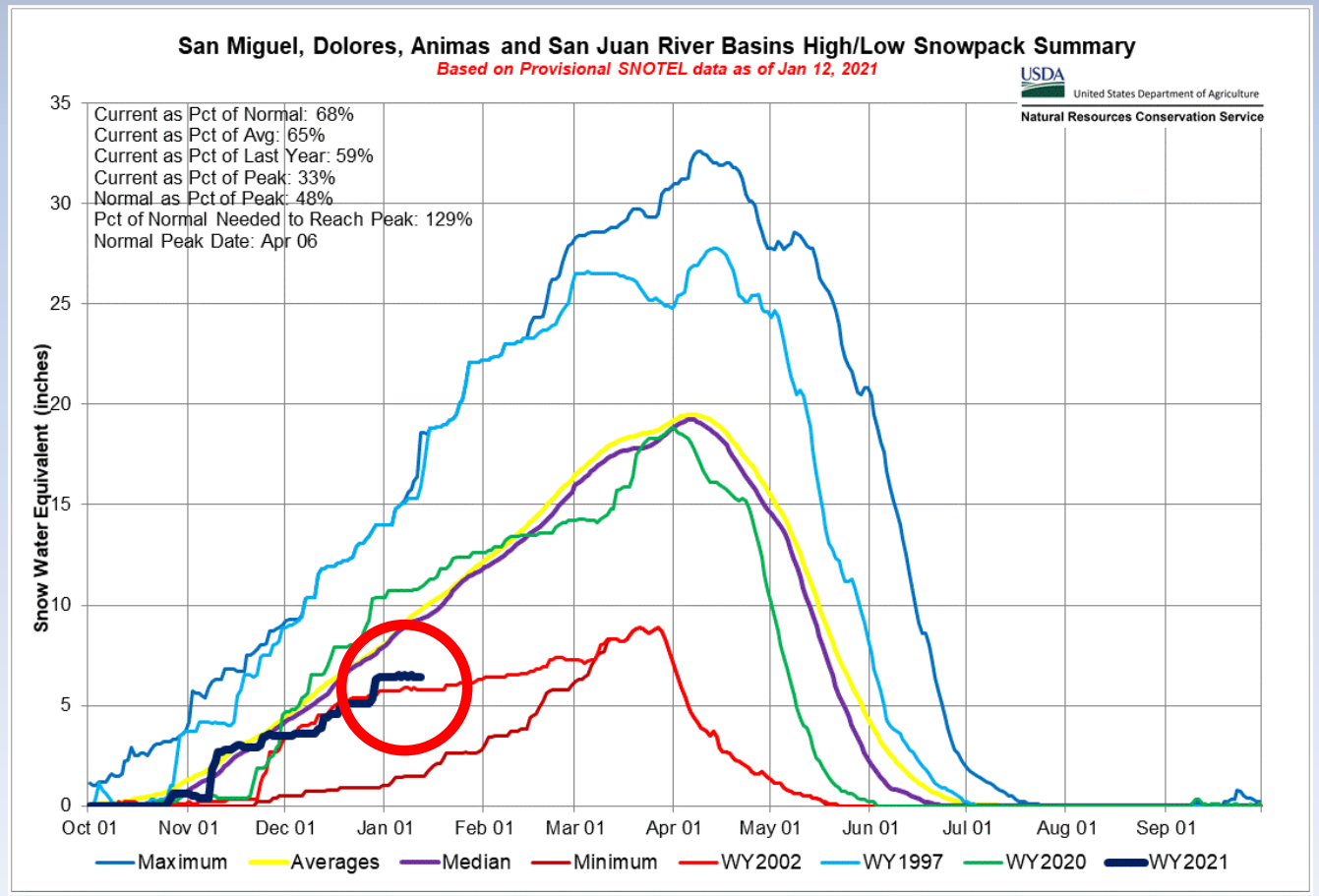


Precipitation



SNOTEL - Percent of Normal - Colorado
Water Year 2021

Snow
January 2021



SNOTEL Snow Water Equivalent – NRCS Southwestern Colorado

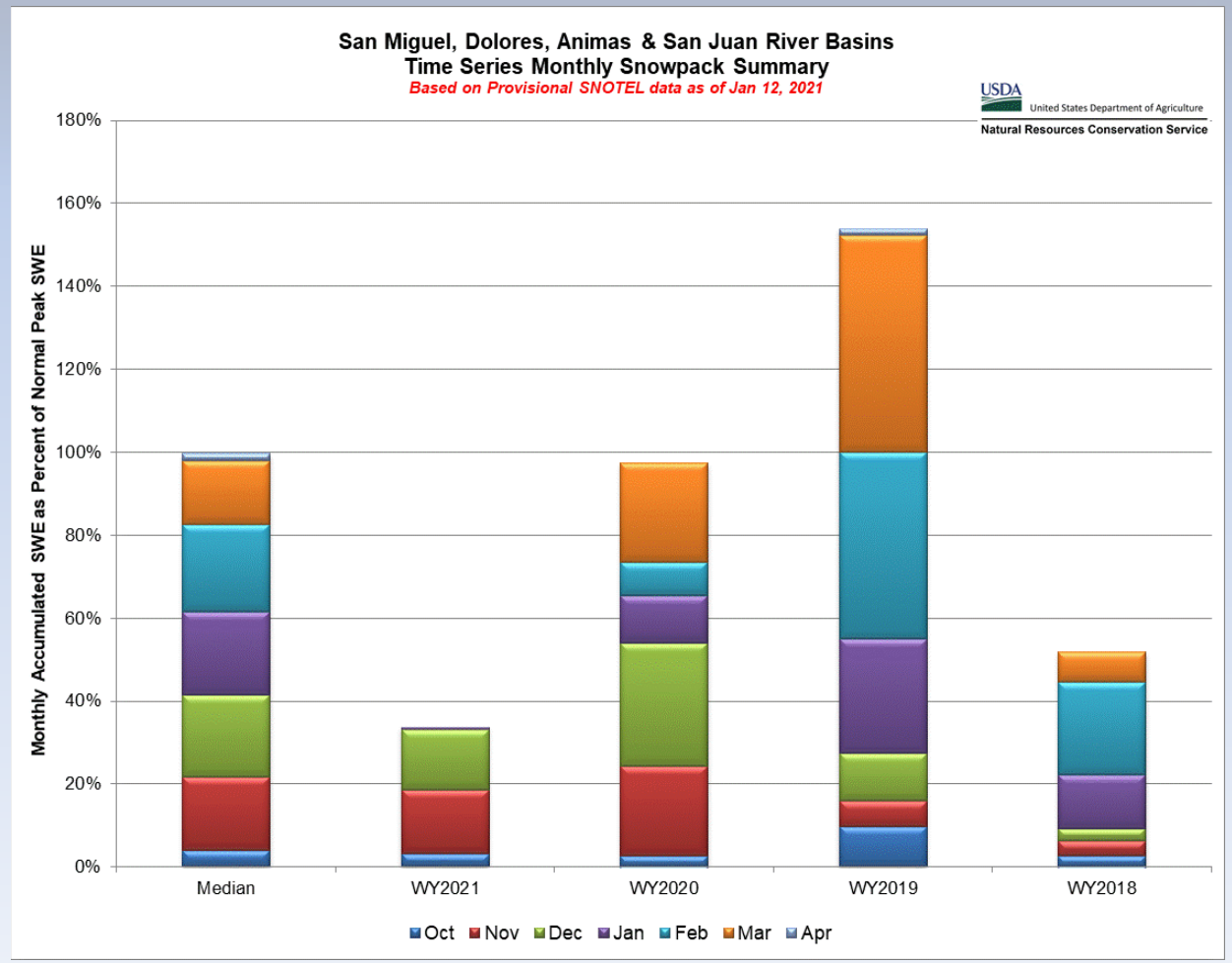
Snow
January 2021

SWE Pct of Normal
As of Jan 14

Dolores Basin: 65%
San Juan Basin: 82%
Animas Basin: 66%

Precip Pct of Normal
As of Jan 14

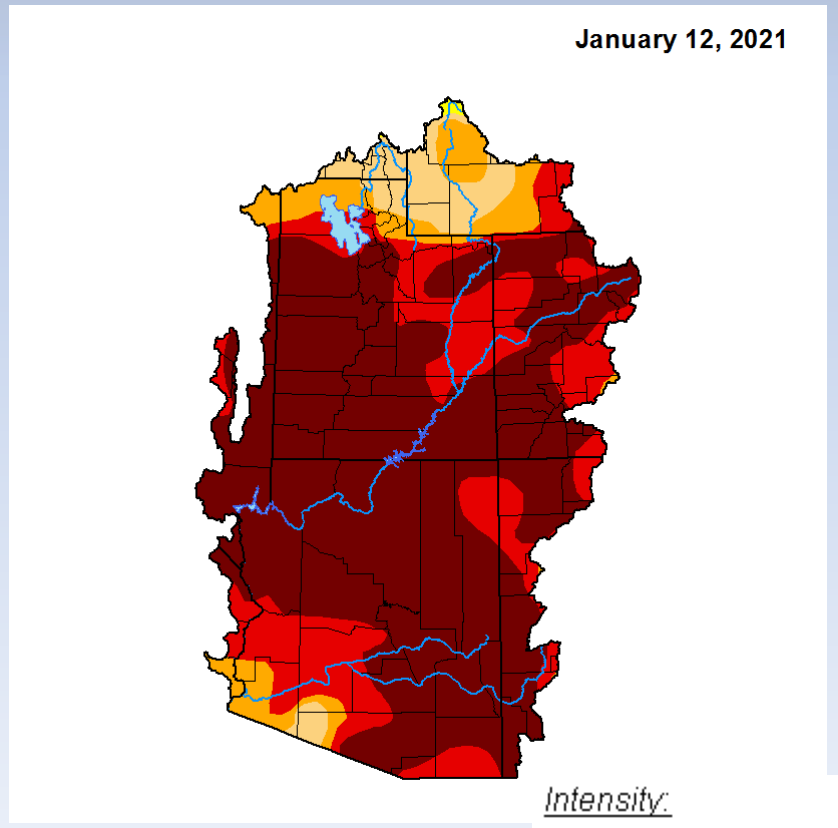
Dolores Basin: 53%
San Juan Basin: 66%
Animas Basin: 48%



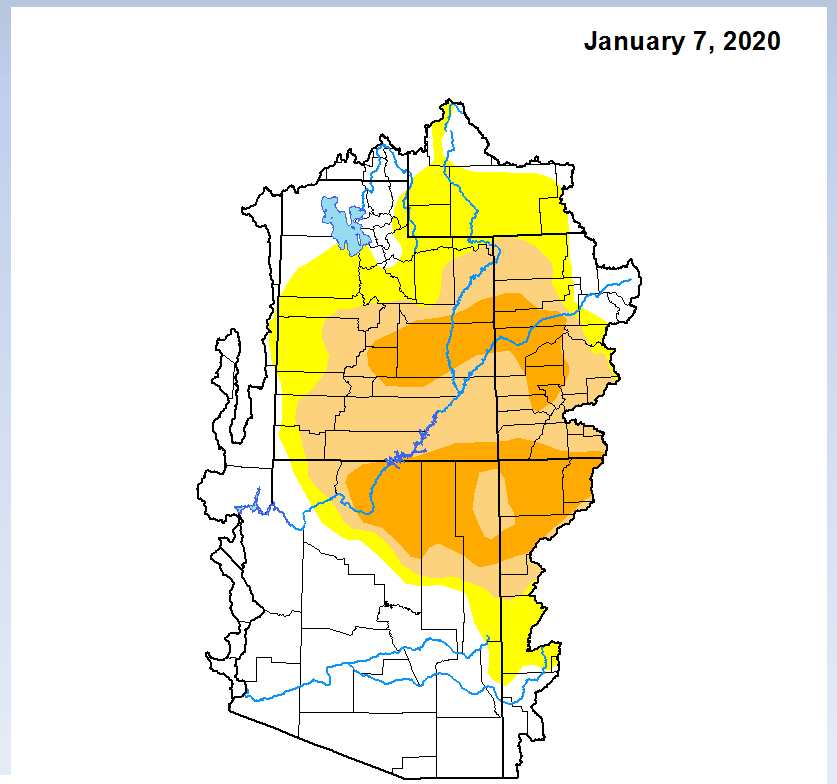
SNOTEL Snow Water Equivalent – NRCS
Southwestern Colorado

Drought
January 2021

January 12, 2021



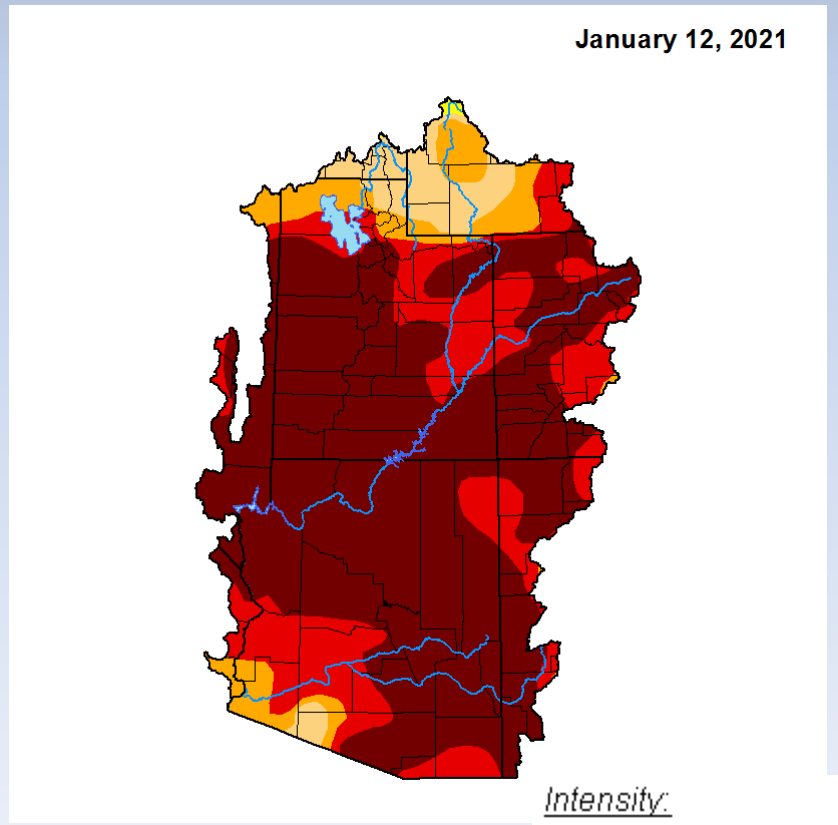
January 7, 2020



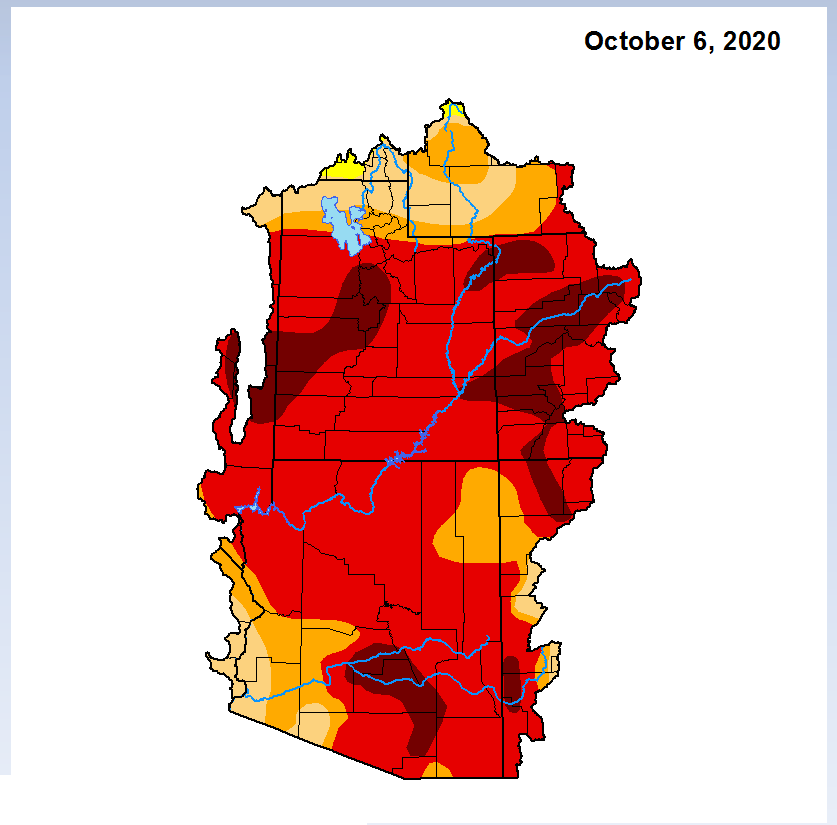
Drought – Monitor

Drought
January 2021

January 12, 2021



October 6, 2020



Intensity:

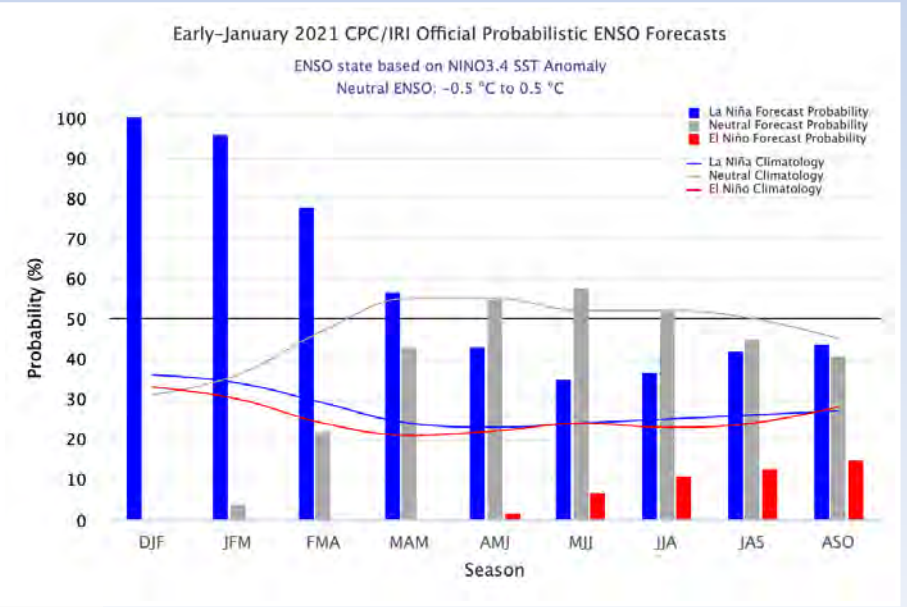
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Drought – Monitor

ENSO
January 2021

CPC/IRI Early-Month Consensus ENSO Forecast Probabilities
(using NWS CPC classification system)

Season	La Niña	Neutral	El Niño
DJF 2021	100%	0%	0%
JFM 2021	96%	4%	0%
FMA 2021	78%	22%	0%
MAM 2021	57%	43%	0%
AMJ 2021	43%	55%	2%
MJJ 2021	35%	58%	7%
JJA 2021	37%	52%	11%
JAS 2021	42%	45%	13%
ASO 2021	44%	41%	14%



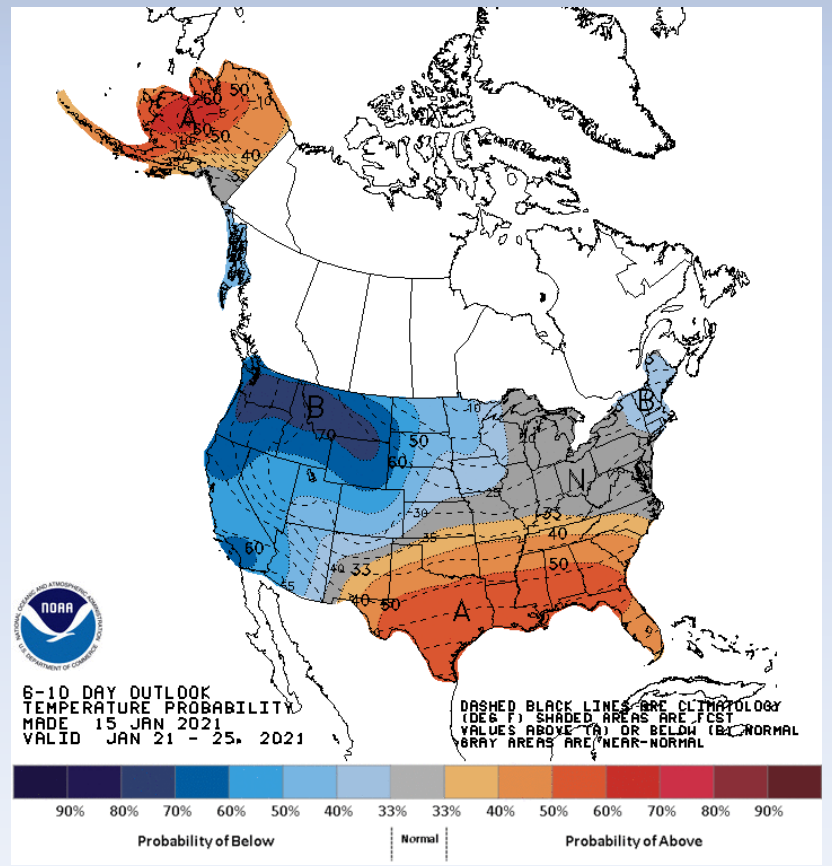
ENSO – Outlook

La Nina remaining through winter

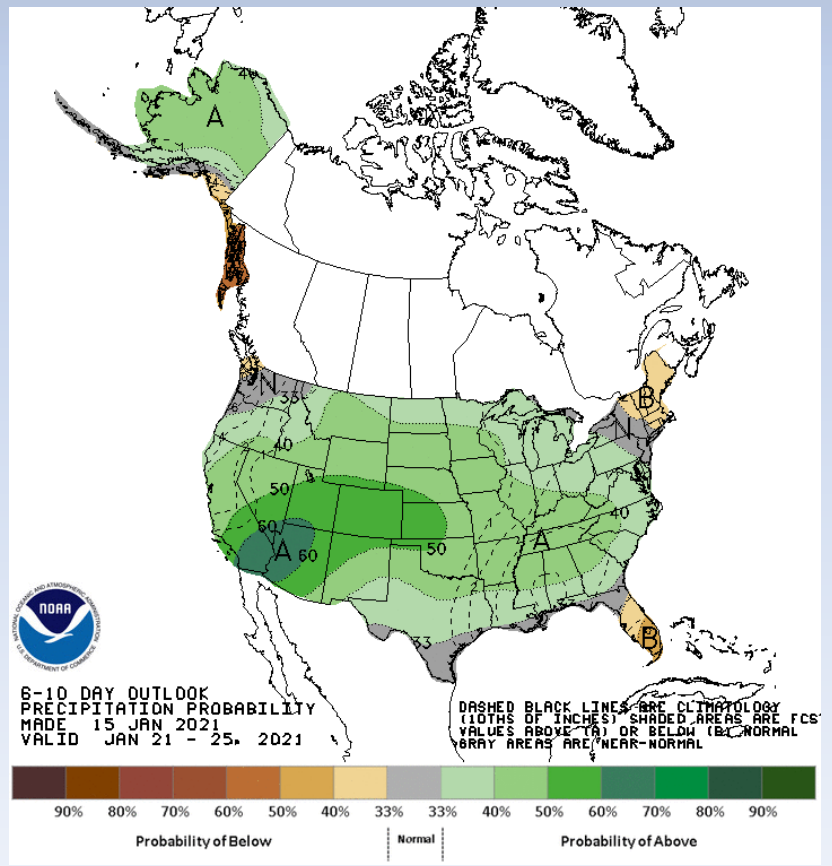
Weather Outlook

January 2021

Temperature



Precipitation



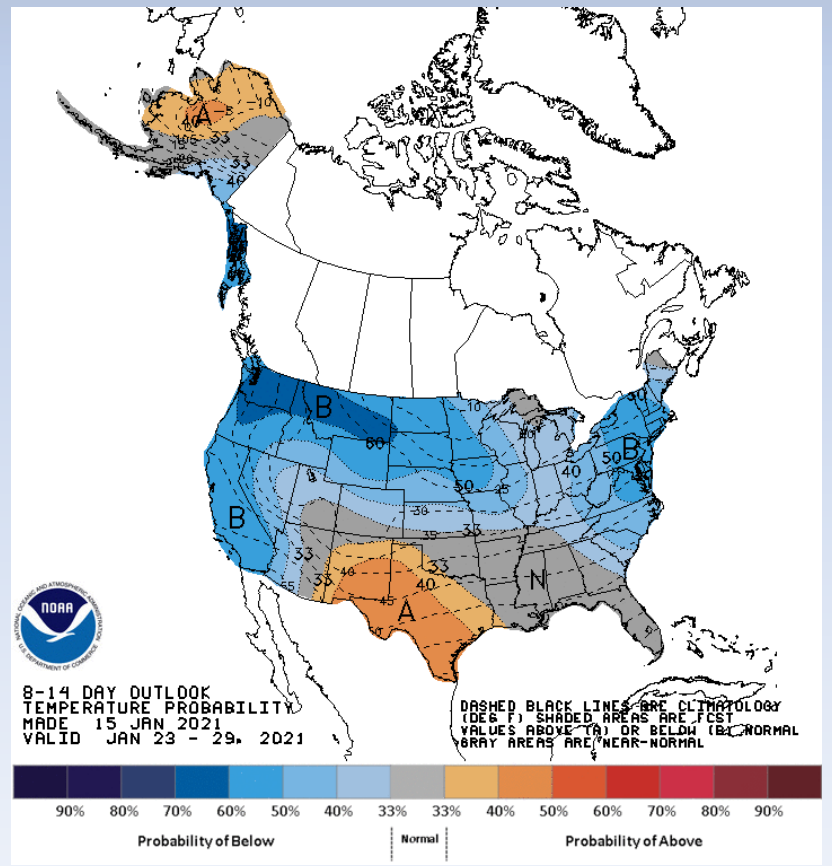
Jan 21-25 – Outlook

updated Jan 15

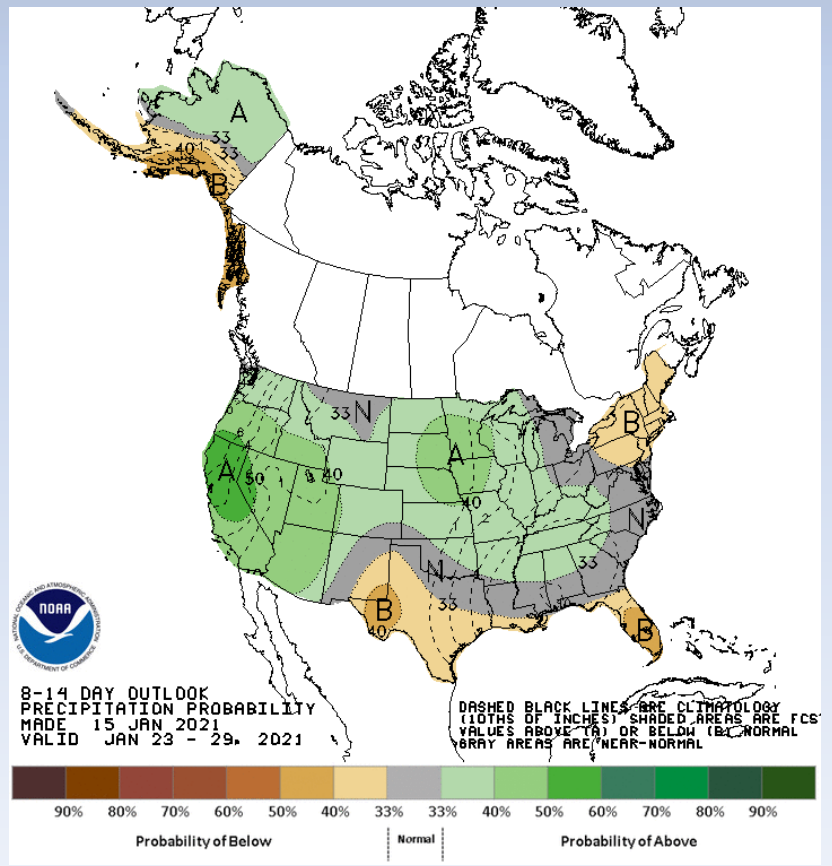
Weather Outlook

January 2021

Temperature



Precipitation



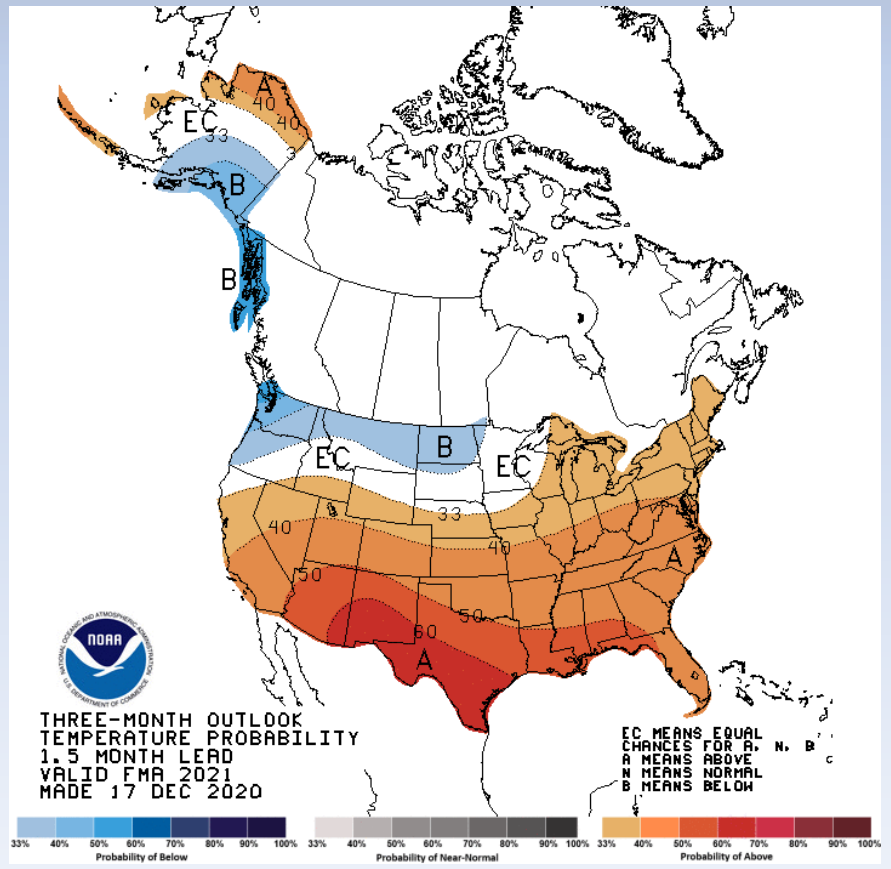
Jan 23-29 – Outlook

updated Jan 15

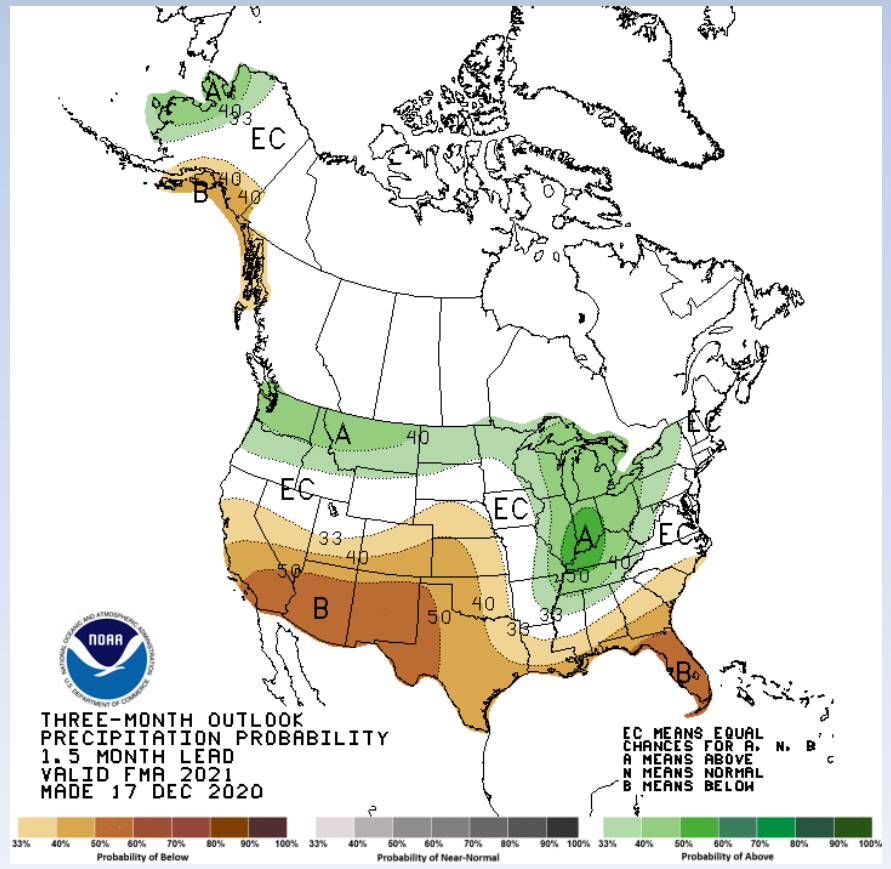
Weather Outlook

January 2021

Temperature



Precipitation

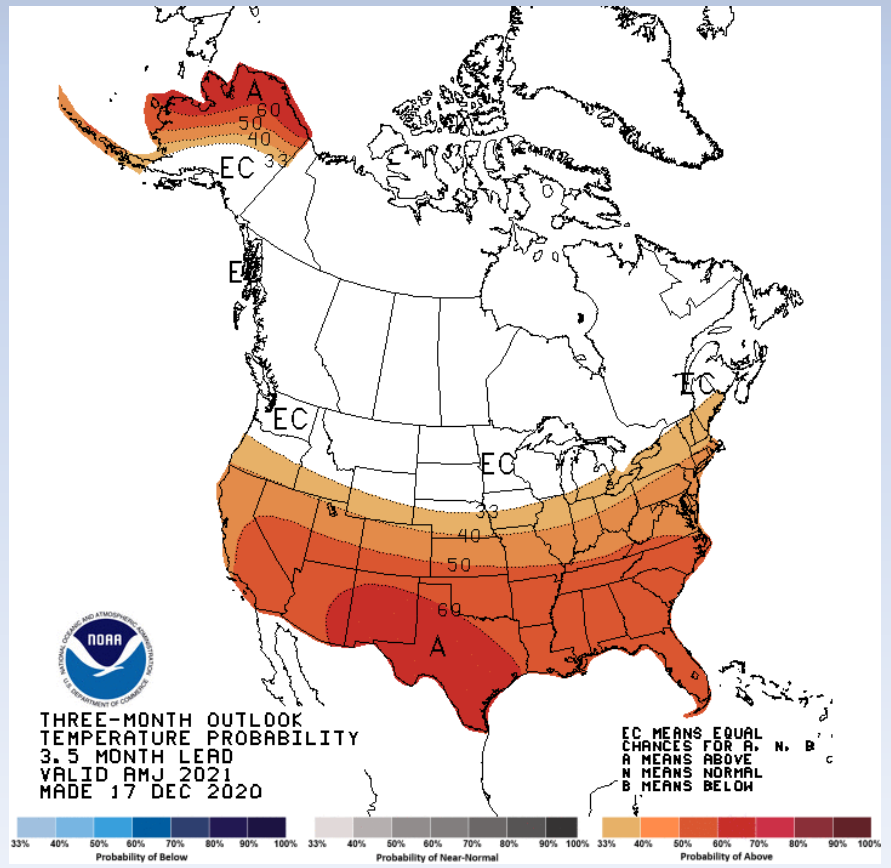


Feb/Mar/Apr – Outlook

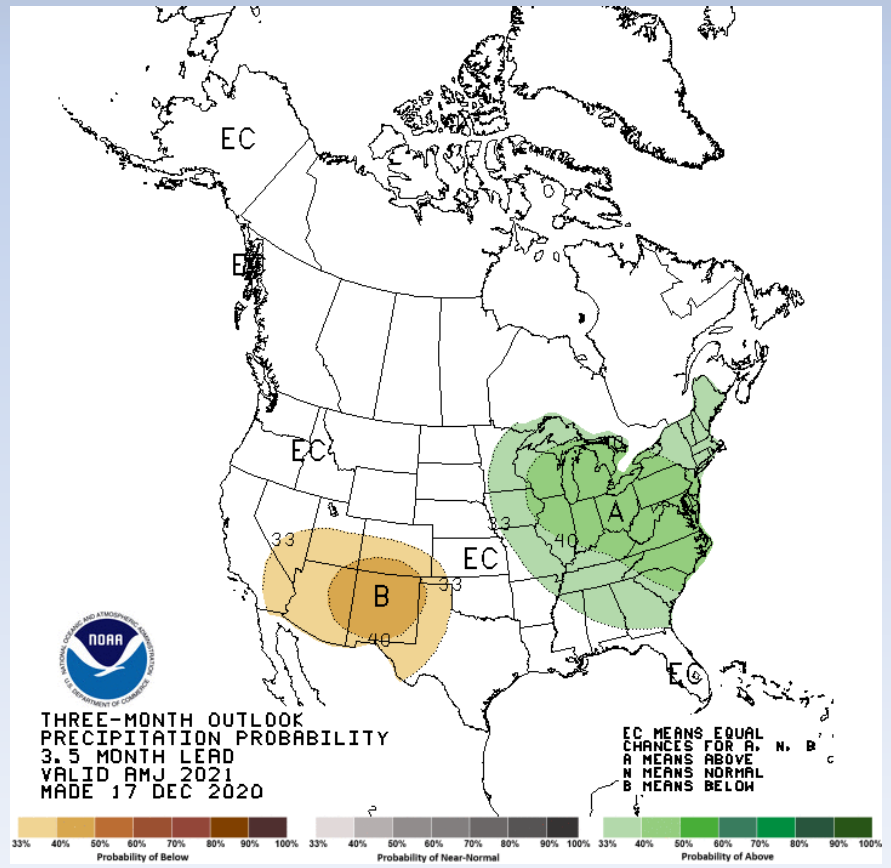
Weather Outlook

January 2021

Temperature



Precipitation

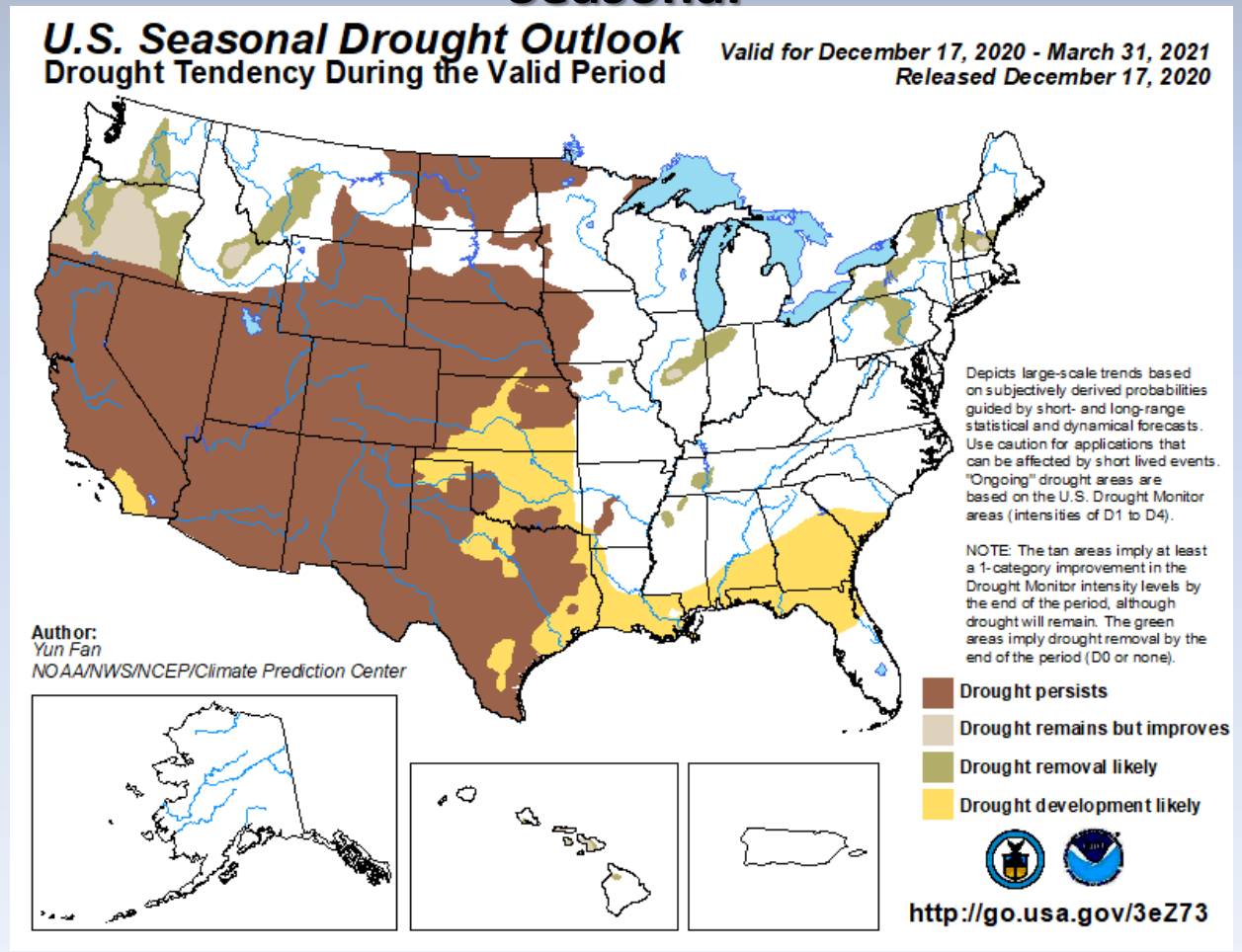


Apr/May/Jun – Outlook

Weather Outlook

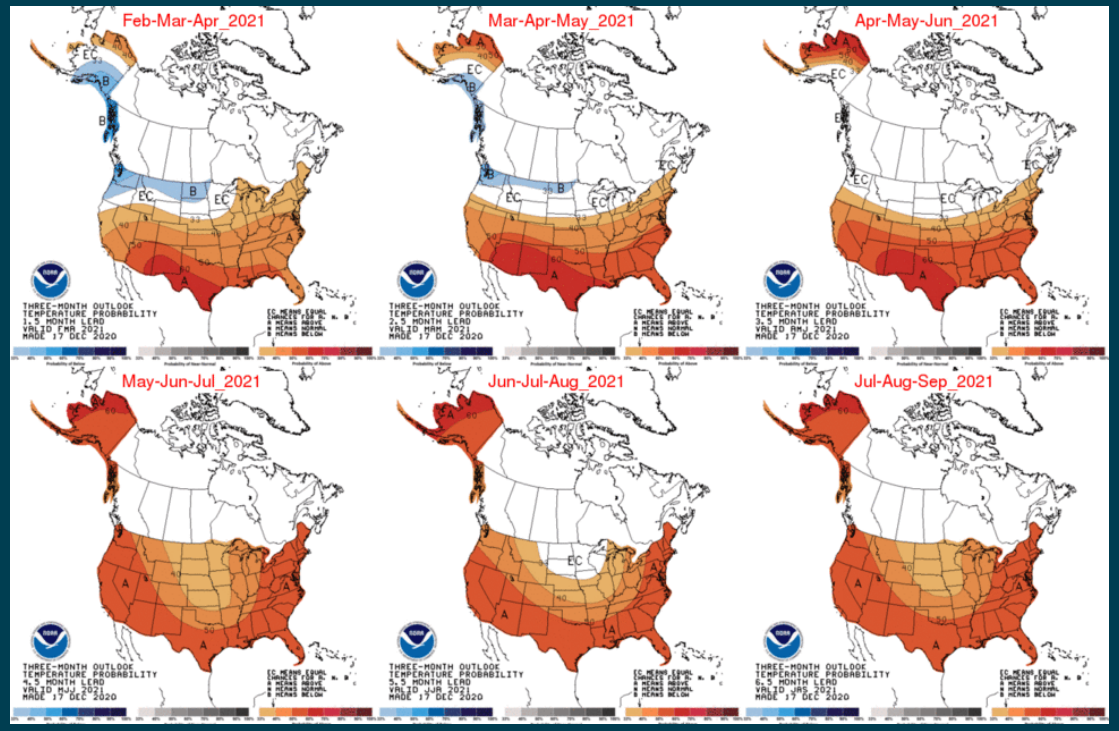
January 2021

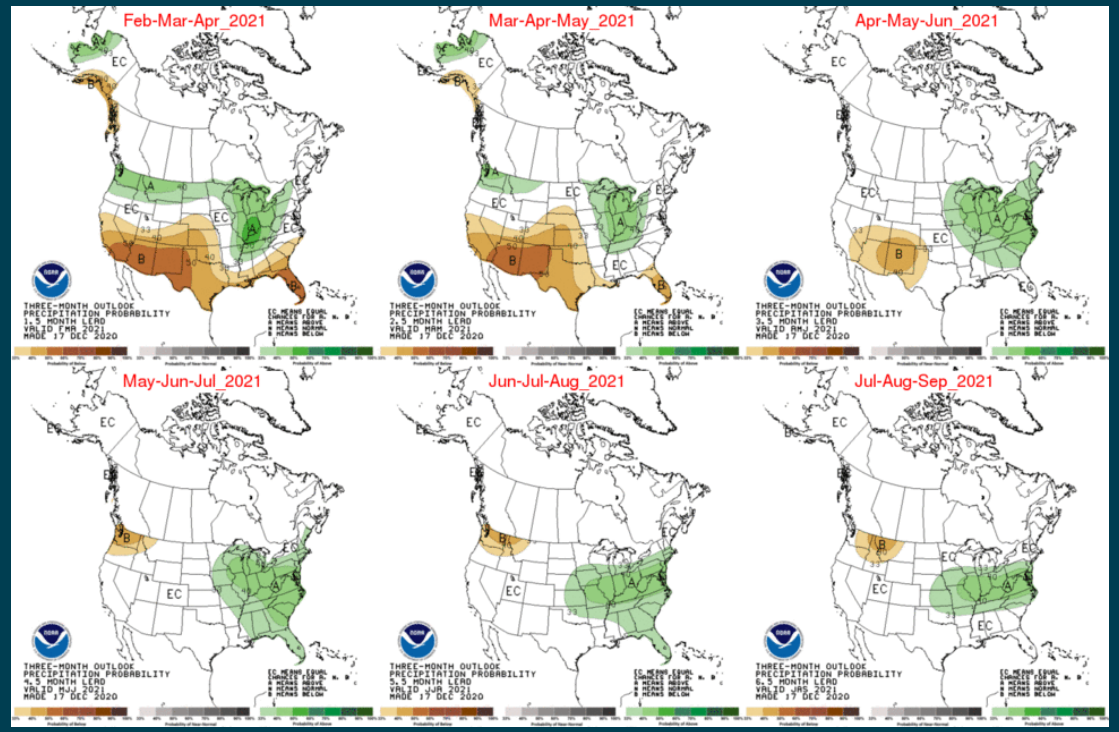
Seasonal



Drought– Outlook

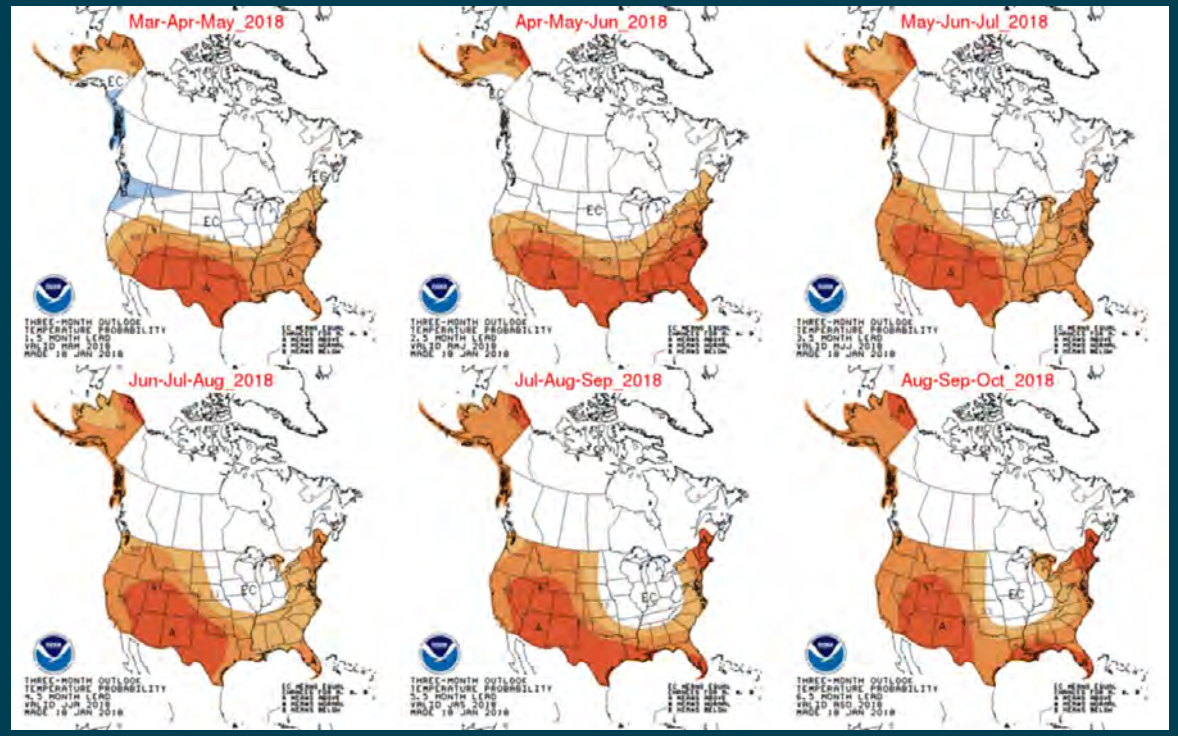
CPC Seasonal Outlook (updated Jan 18, 2021)

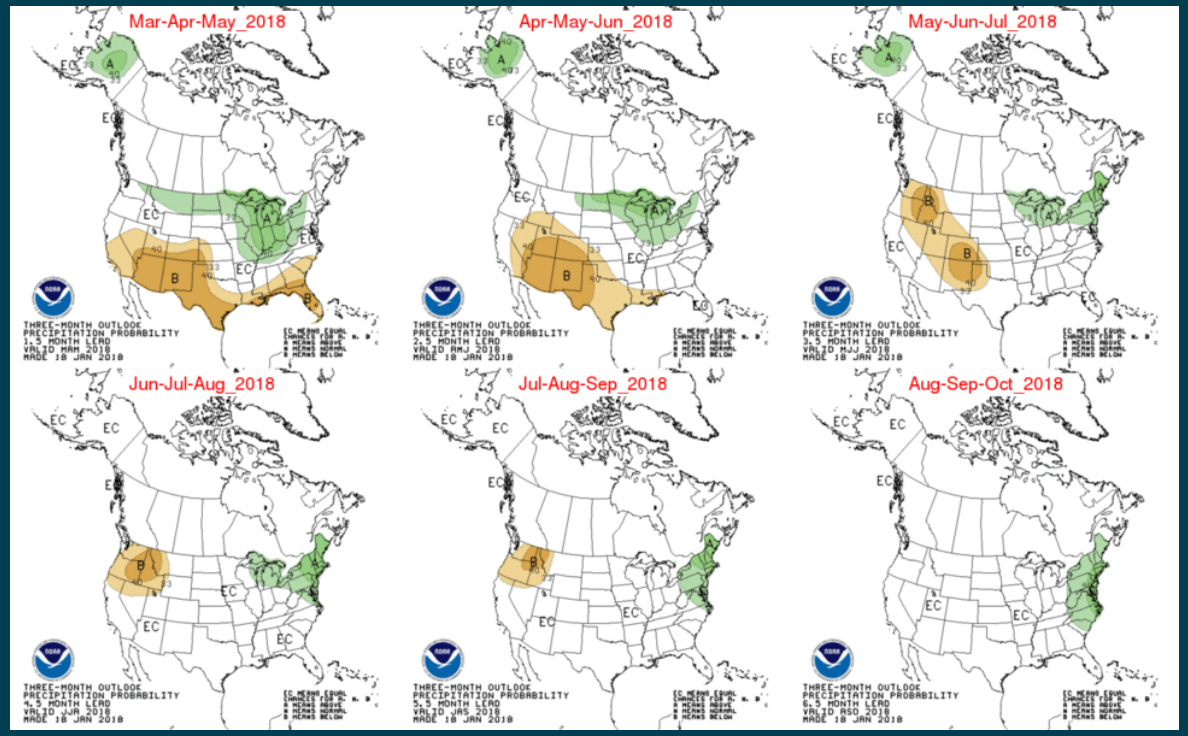




La Niña is expected to continue through the Northern Hemisphere winter 2020-21 (~95% chance during January-March), with a potential transition to ENSO-neutral during the spring 2021 (55% chance during April-June).

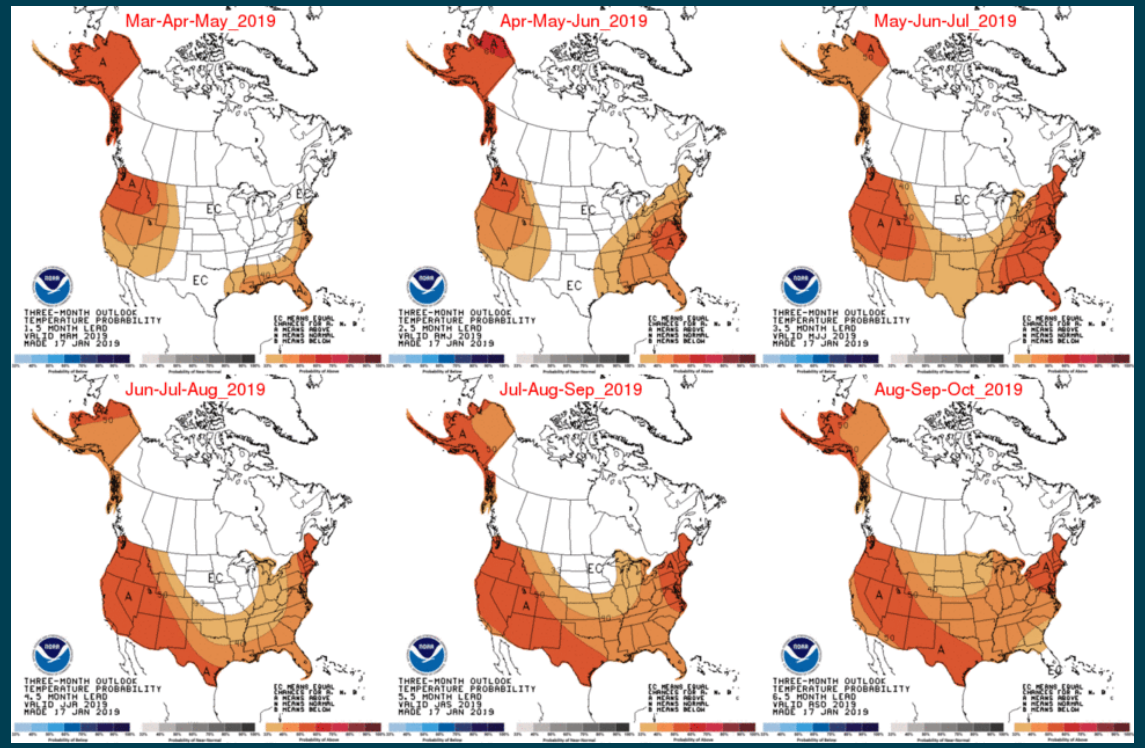
CPC Seasonal Outlook (from 2018)

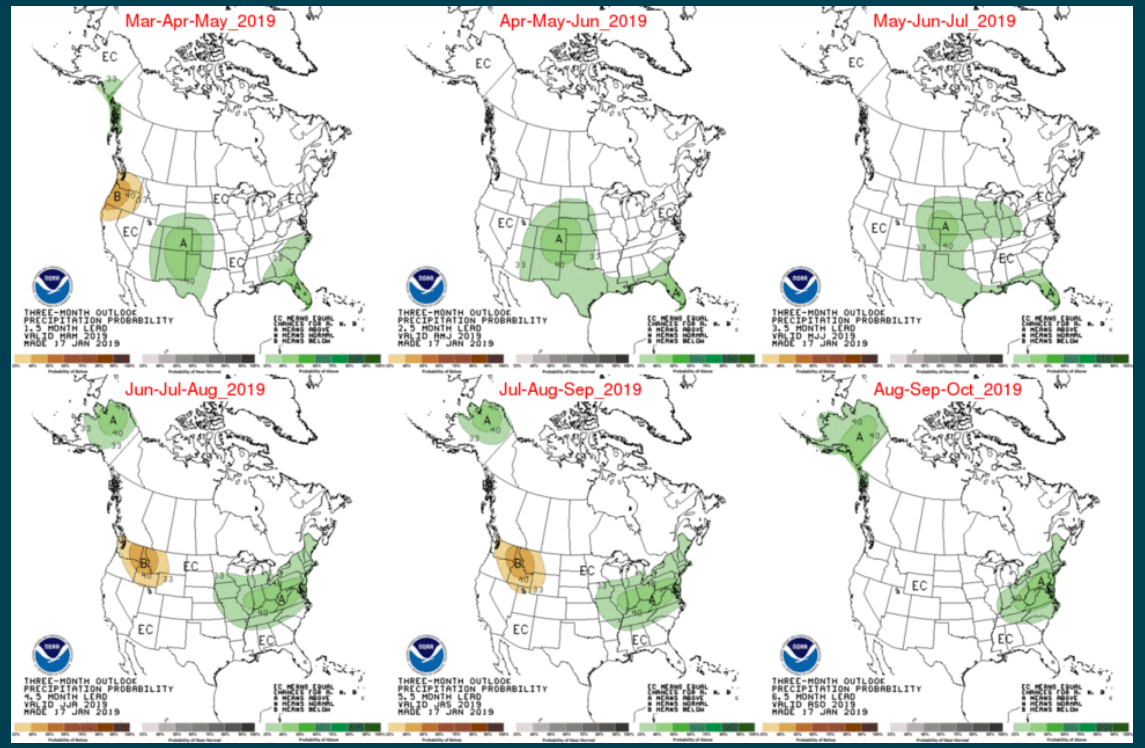




Weak La Niña

CPC Seasonal Outlook (from 2019)





Weak El Niño

Navajo Reservoir/San Juan Basin Water Supply Outlook January 2021

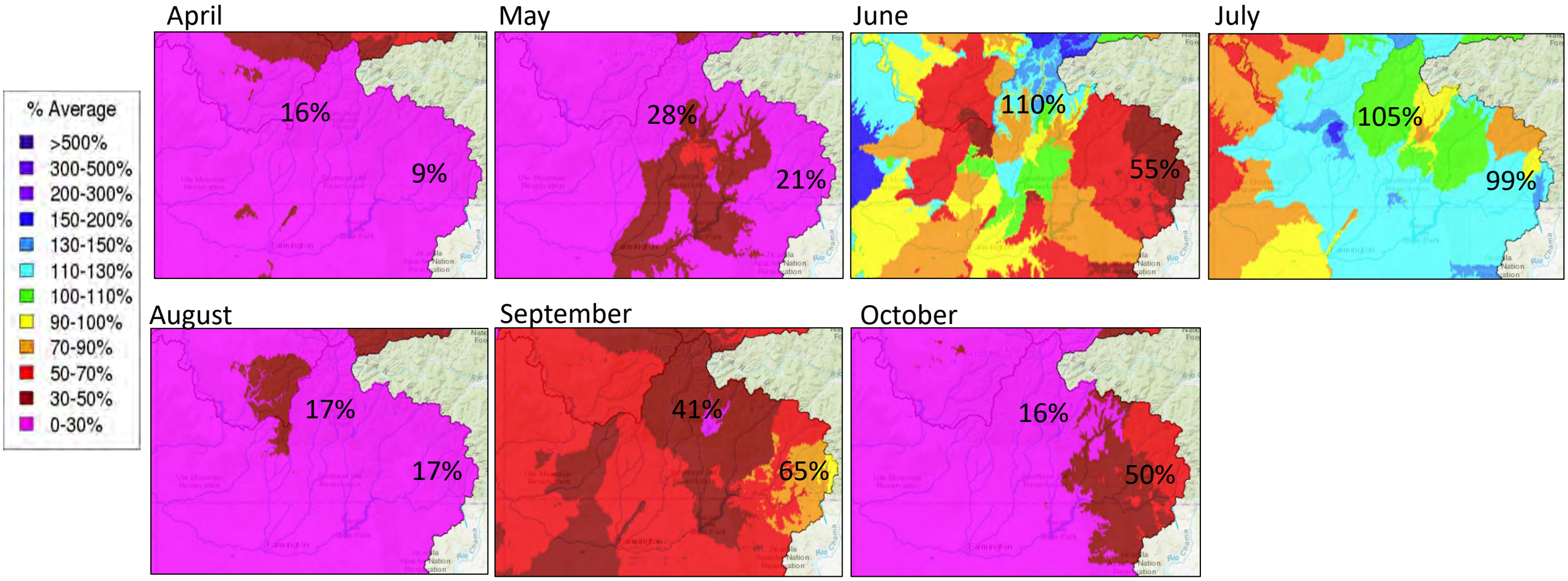
Ashley Nielson

Senior Hydrologist

Colorado Basin River Forecast Center

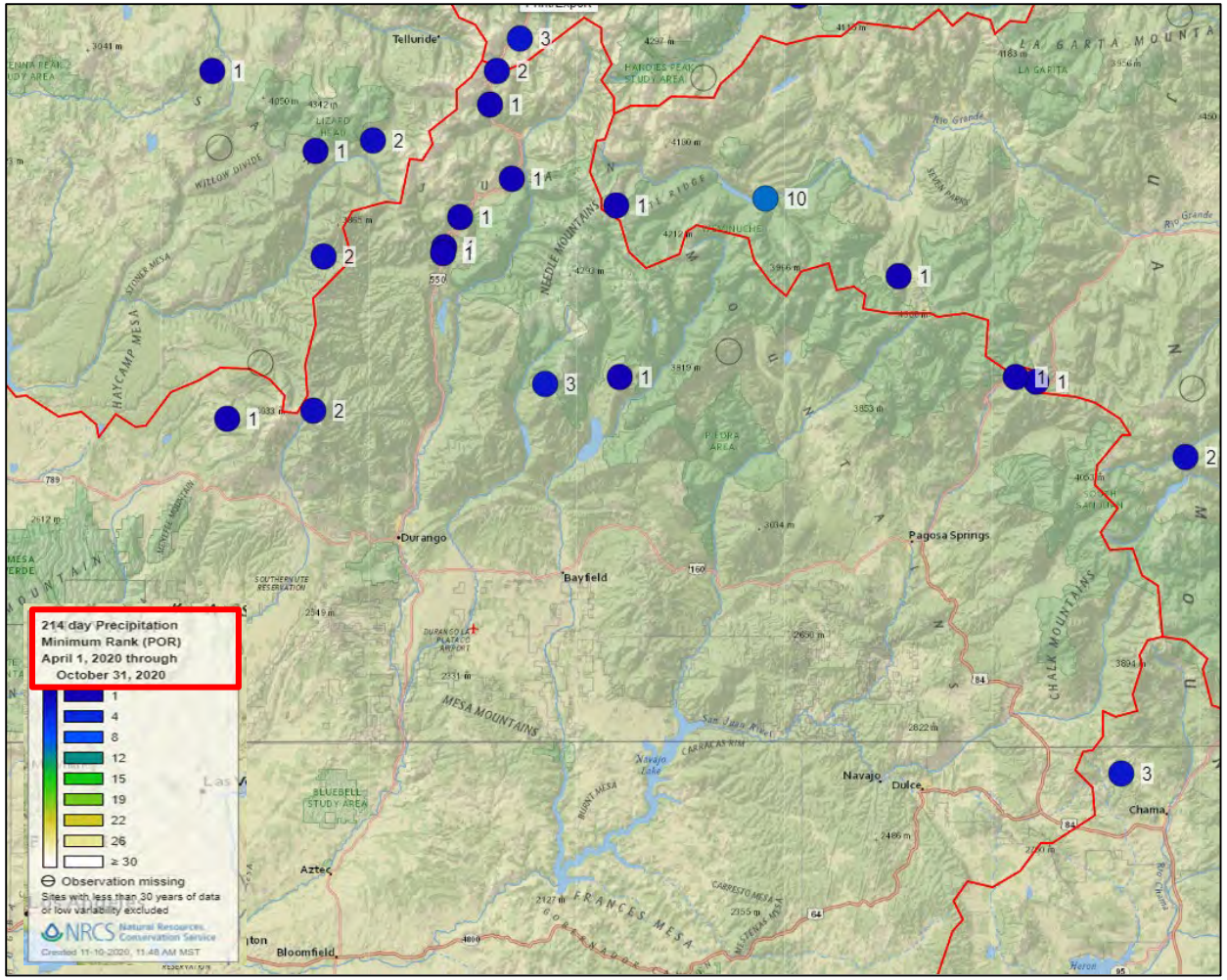
National Weather Service/NOAA

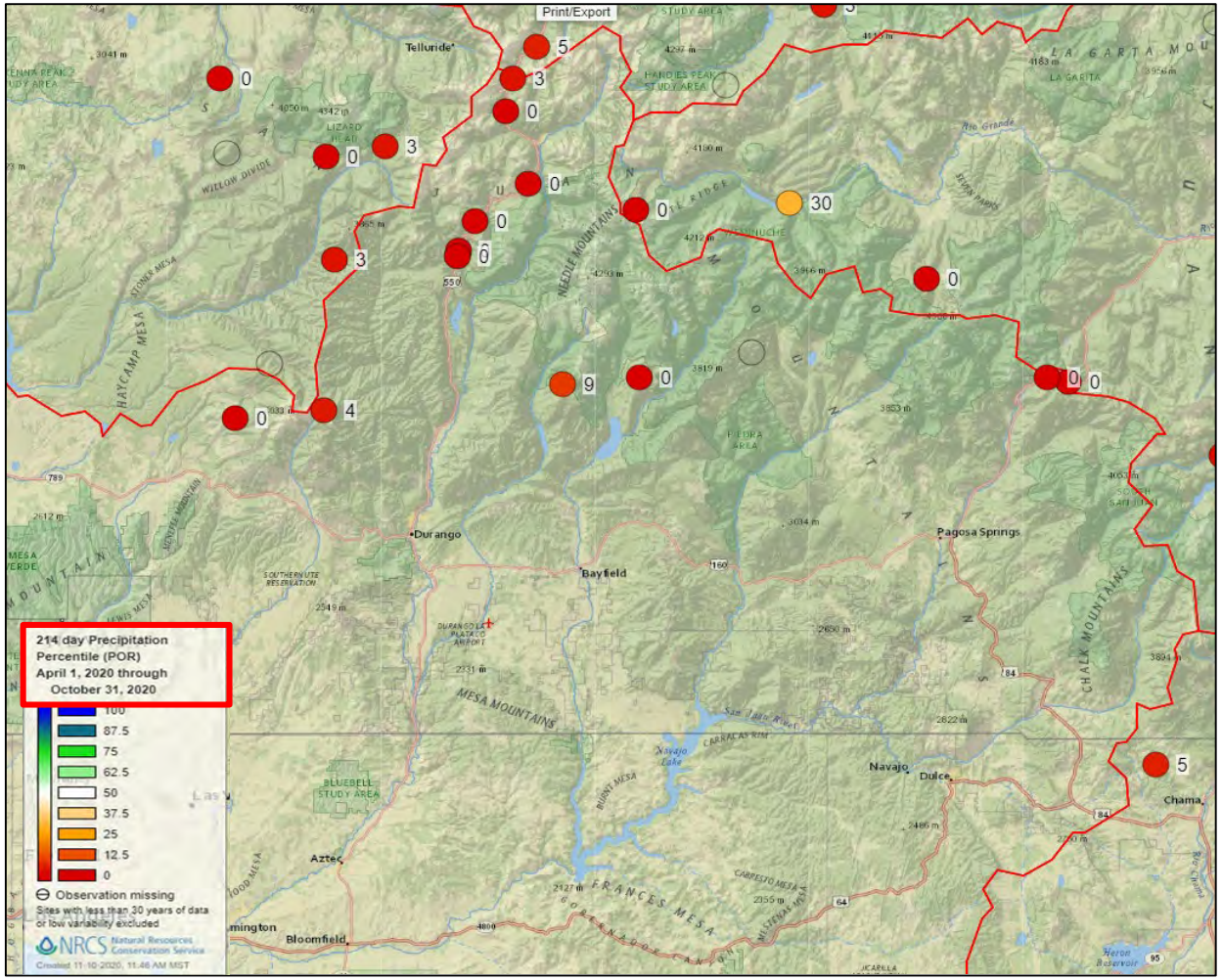
April-October 2020 Observed Monthly Precipitation Summary



- Anomalous ridging dominated the weather pattern from the late spring into the fall across the region.
- Very little monsoon activity; one event in July
- Record to near record dry Apr-Oct

April-October 2020 Observed SNOTEL Precipitation Statistics (NRCS)





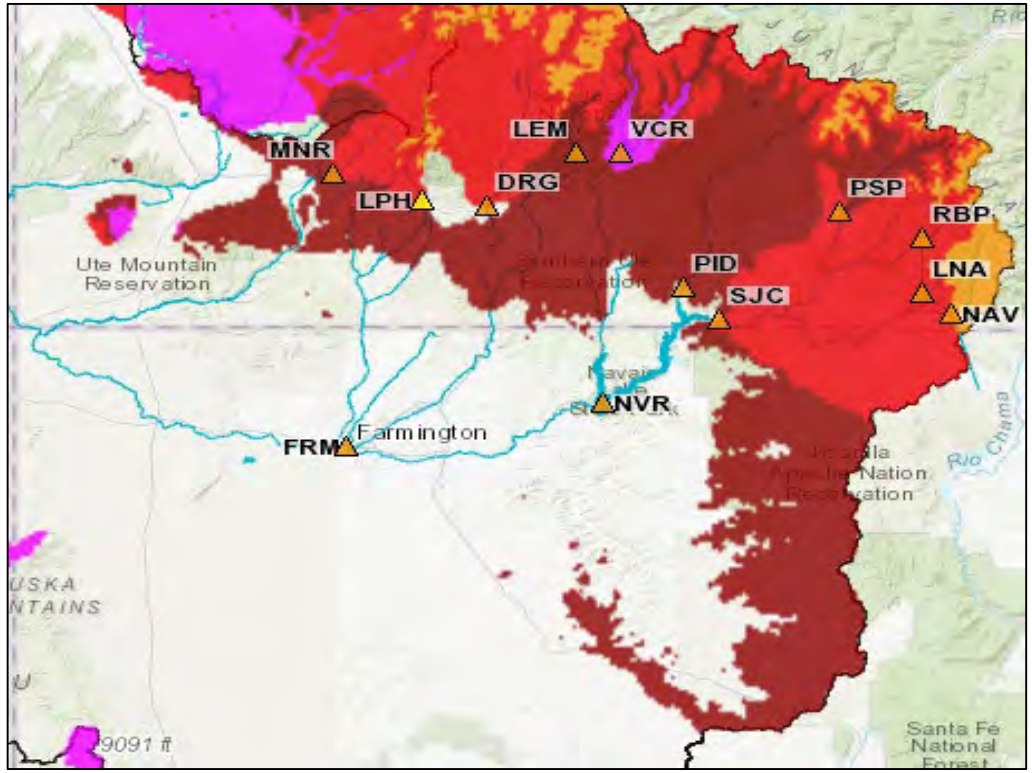
- Near/record dry Apr-Oct precipitation across the region
- SNOTELS have a 35-40 year period of record.

Fall Model Soil Moisture Conditions: 2019 vs. 2020

San Juan River Basin

Soil moisture conditions entering the winter season

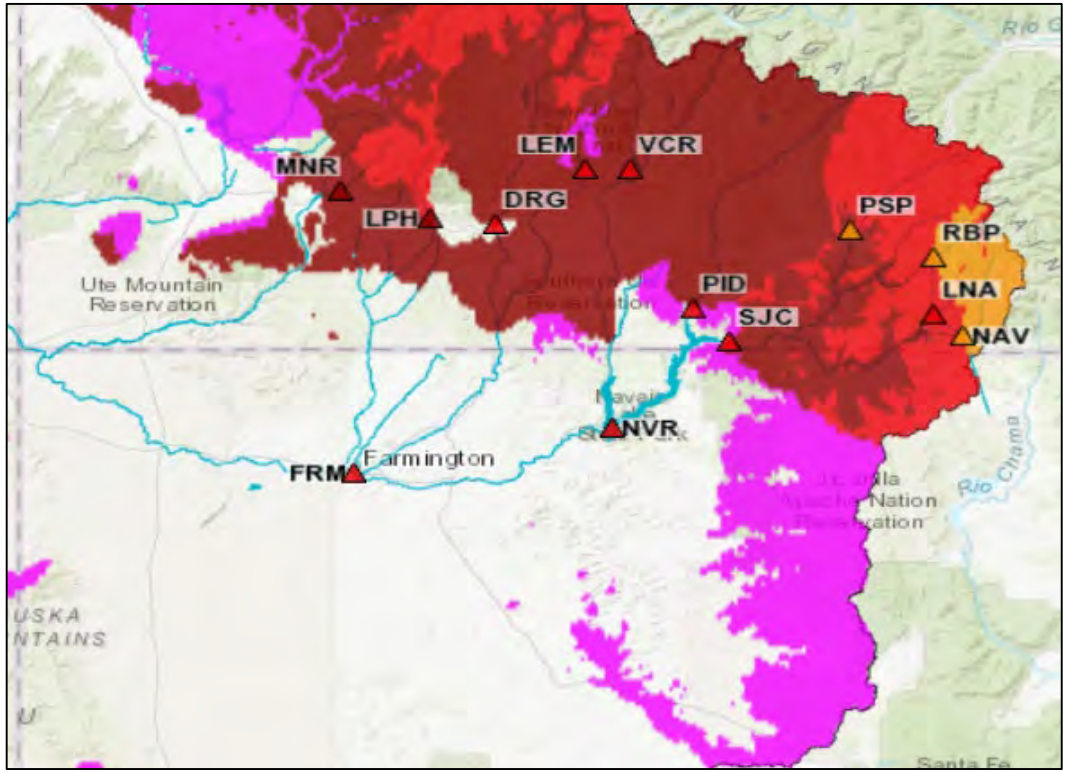
Fall 2019



Percent of normal soil moisture

- 70-90%
- 50-70%
- 30-50%
- 0-30%

Fall 2020

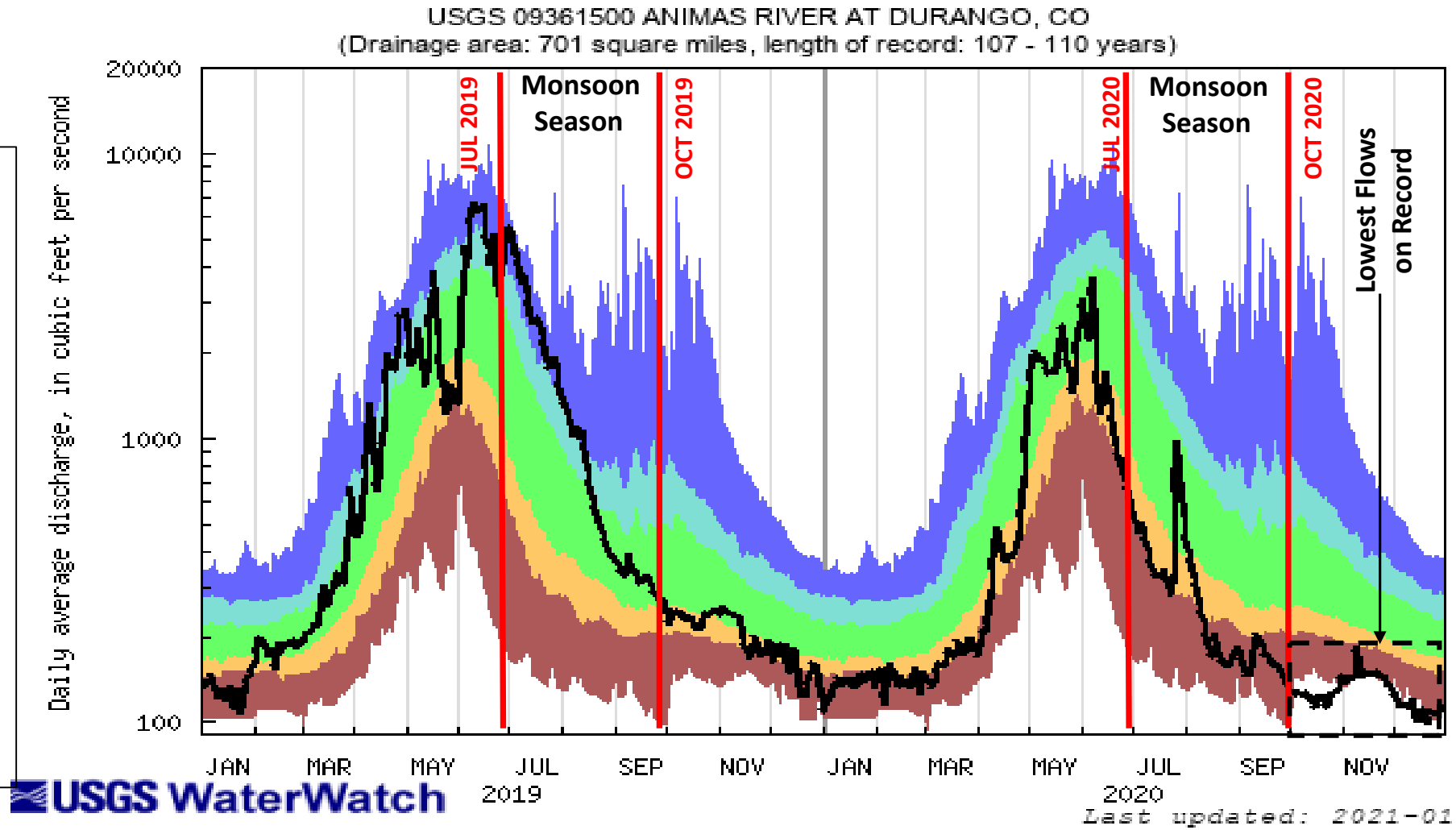


Soil moisture conditions are below normal and generally in the bottom 3 of the 1981-2020 40-year period. Conditions are similar to last year in the eastern headwaters but worse over the rest of the basin.

A look back at streamflow

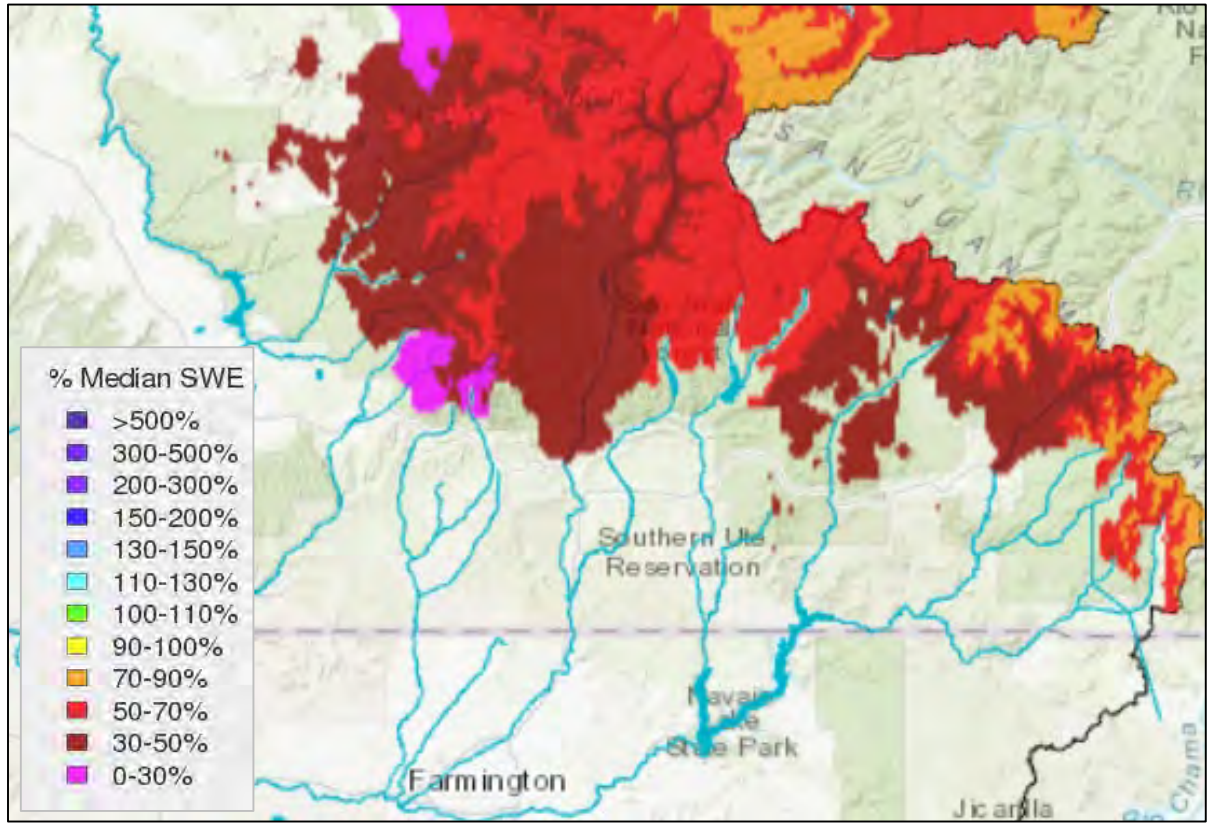
In the San Juan, monsoon precipitation is needed to help recharge groundwater and keep baseflows elevated through the summer and fall. There has not been significant recharge since 2019 runoff.

Flows have been record or near record low since late summer on the Animas. This is another example of the low antecedent conditions and an indirect indicator of the large soil moisture deficit present.

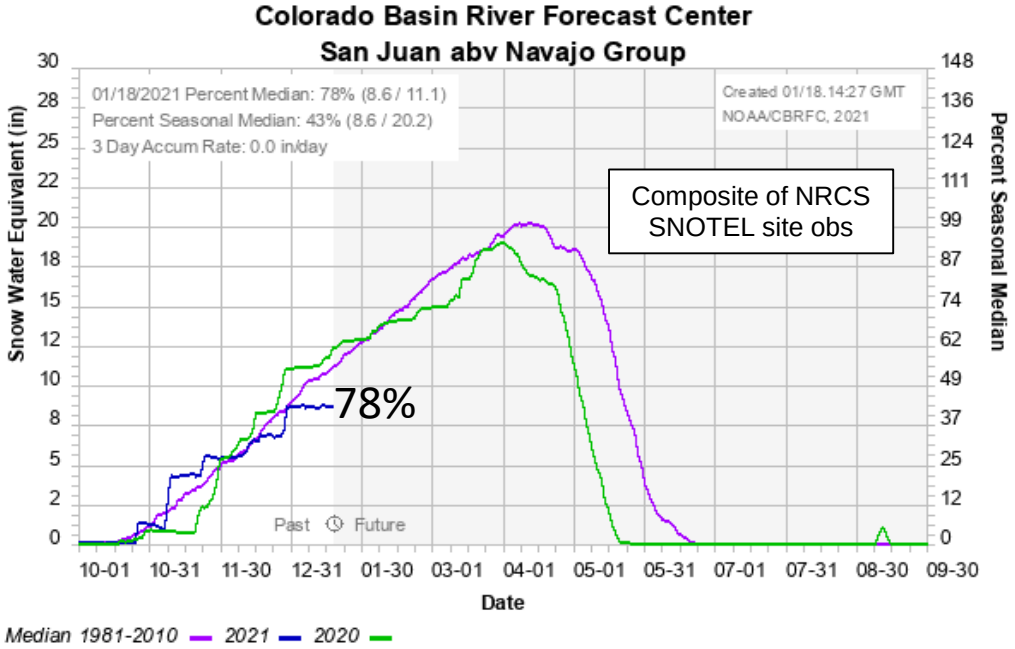


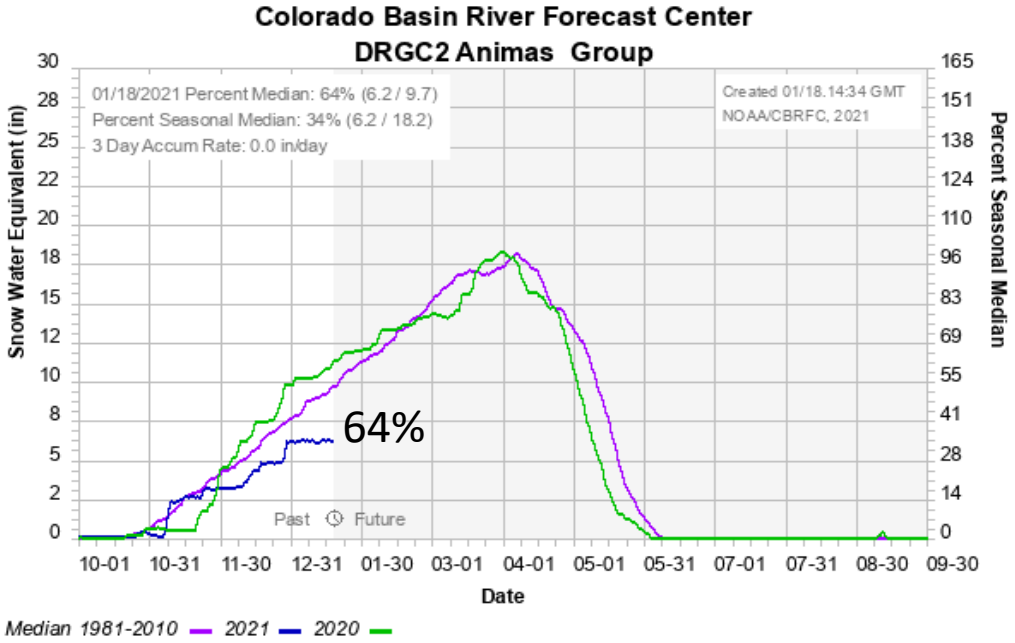
Snow Conditions: CBRFC Model and SNOTEL (NRCS)

CBRFC Model Snow: January 17



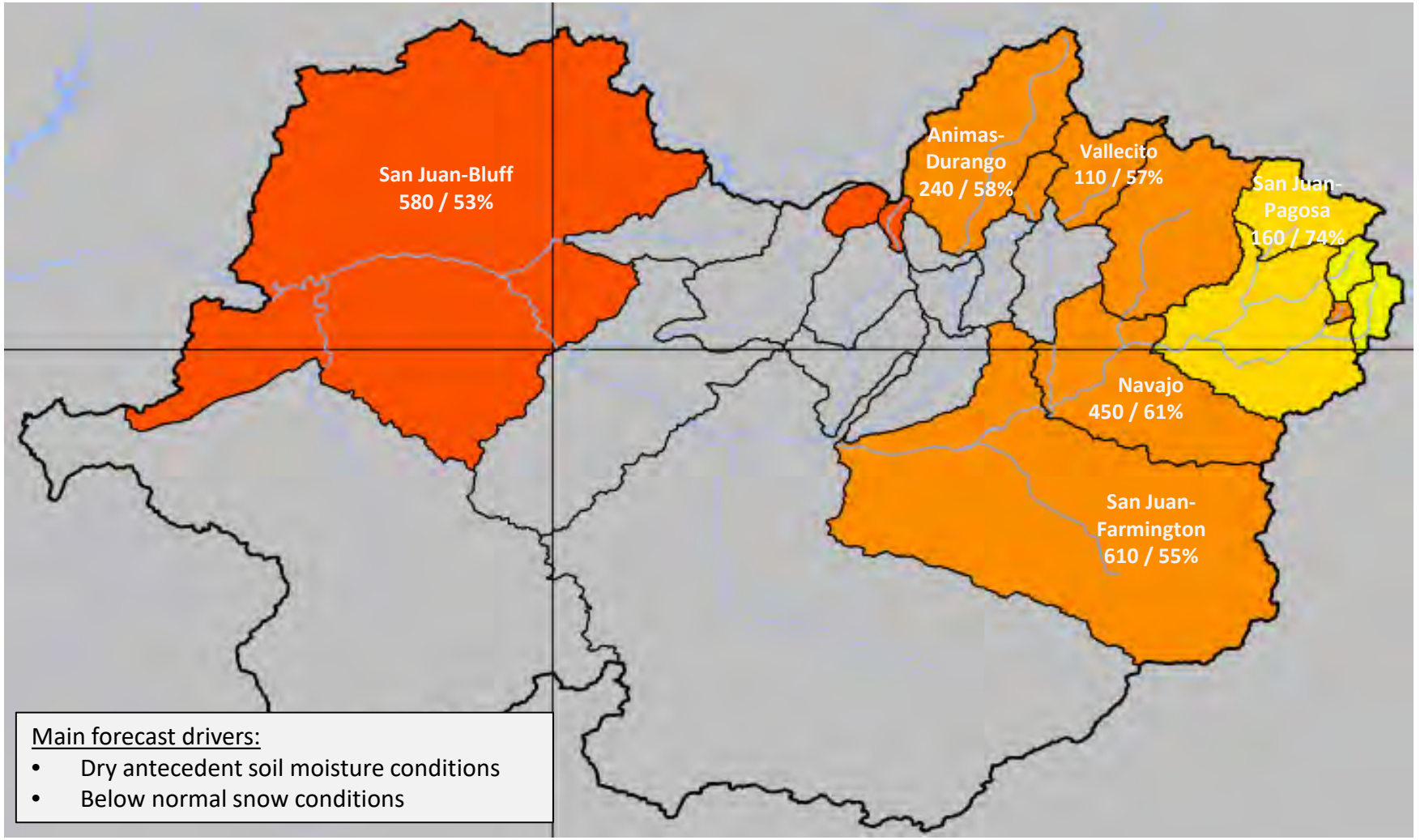
Snow conditions are below normal for mid January. The high elevation areas of the eastern headwaters above Navajo have the best snow conditions, between 70-85% of normal, due to storms in November and late December.





January 1st Water Supply Forecasts: San Juan River Basin

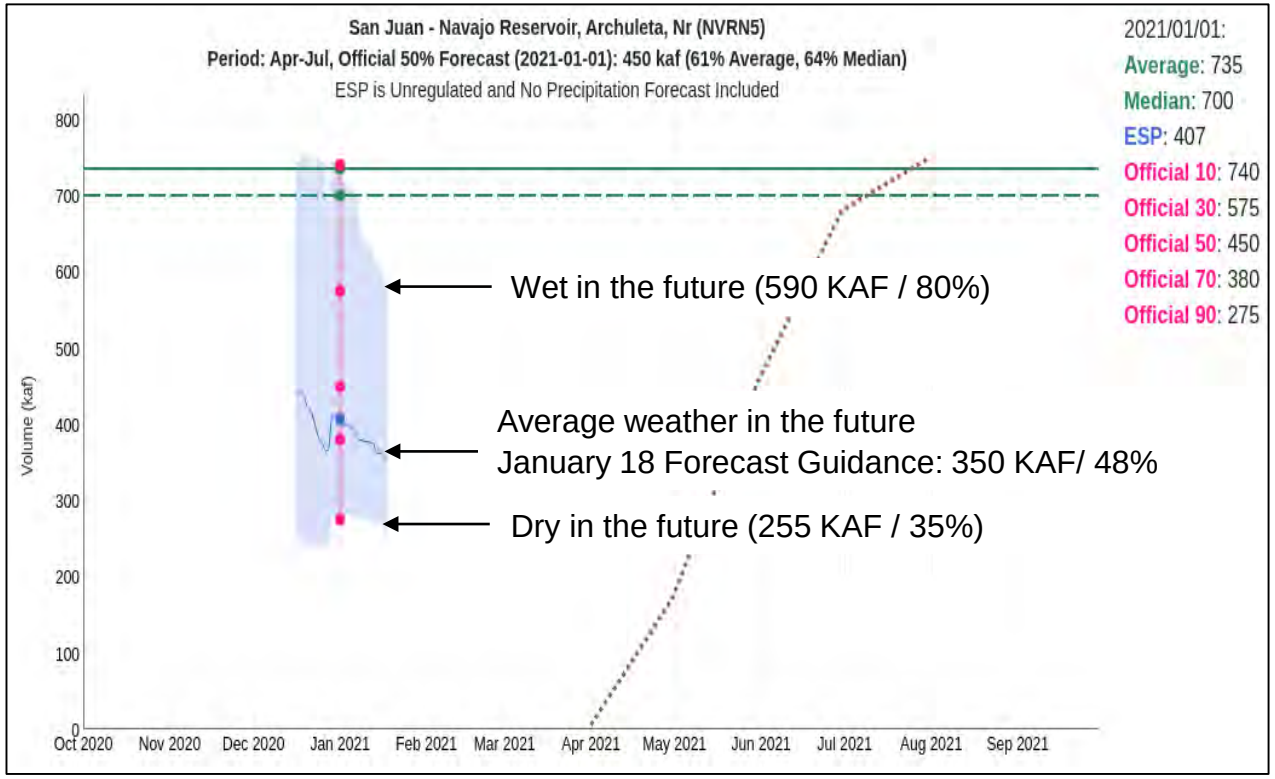
April-July Forecasts
Volume in 1000's acre-feet / Percent of 1981-2010 average



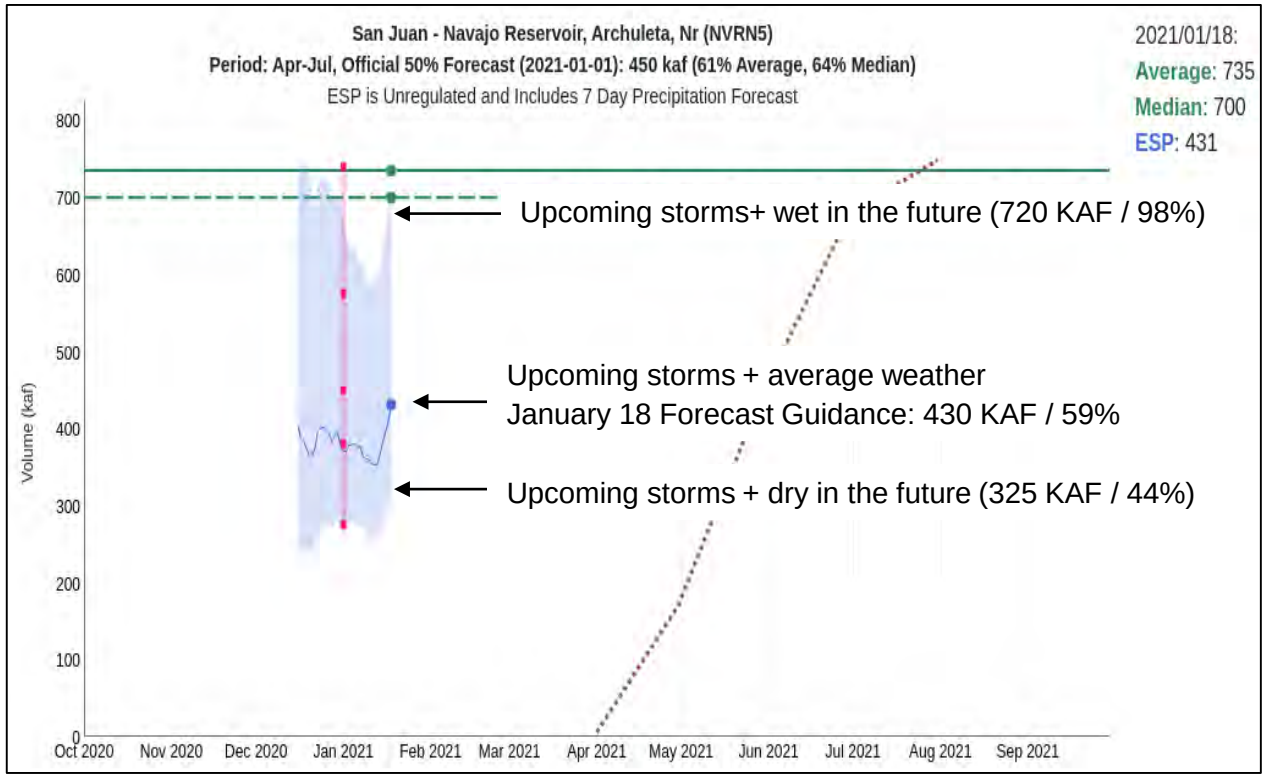
Early season forecasts range from 45-80% normal with a median forecast of 55% in the San Juan river basin.

Forecast Progression: Navajo Reservoir Inflow

Future Weather (precipitation/temperature) = Historical Climatology



Future Weather = 7 day Precipitation Forecast + Historical Climatology



Average Weather = Median of historical climatology
Historical Climatology = 1981-2015 historical temperature and precipitation

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

- The forecast has decreased since Jan 1 due to dry conditions.
- The forecast will continue to decrease if the upcoming storms do not verify.
- The forecast will likely stay similar to Jan 1 if the upcoming storms do verify.

Navajo Inflow Forecast Plot Link

Early Season Forecast Uncertainty

January 1st Forecast:

What we know:

- ~40% of snowpack accumulation
- Fall soil moisture conditions

What we **DON'T** know:

- Jan-May weather (4 months)
- ~60% of snowpack accumulation

Average January Forecast Error: ~200 KAF

April 1st Forecast:

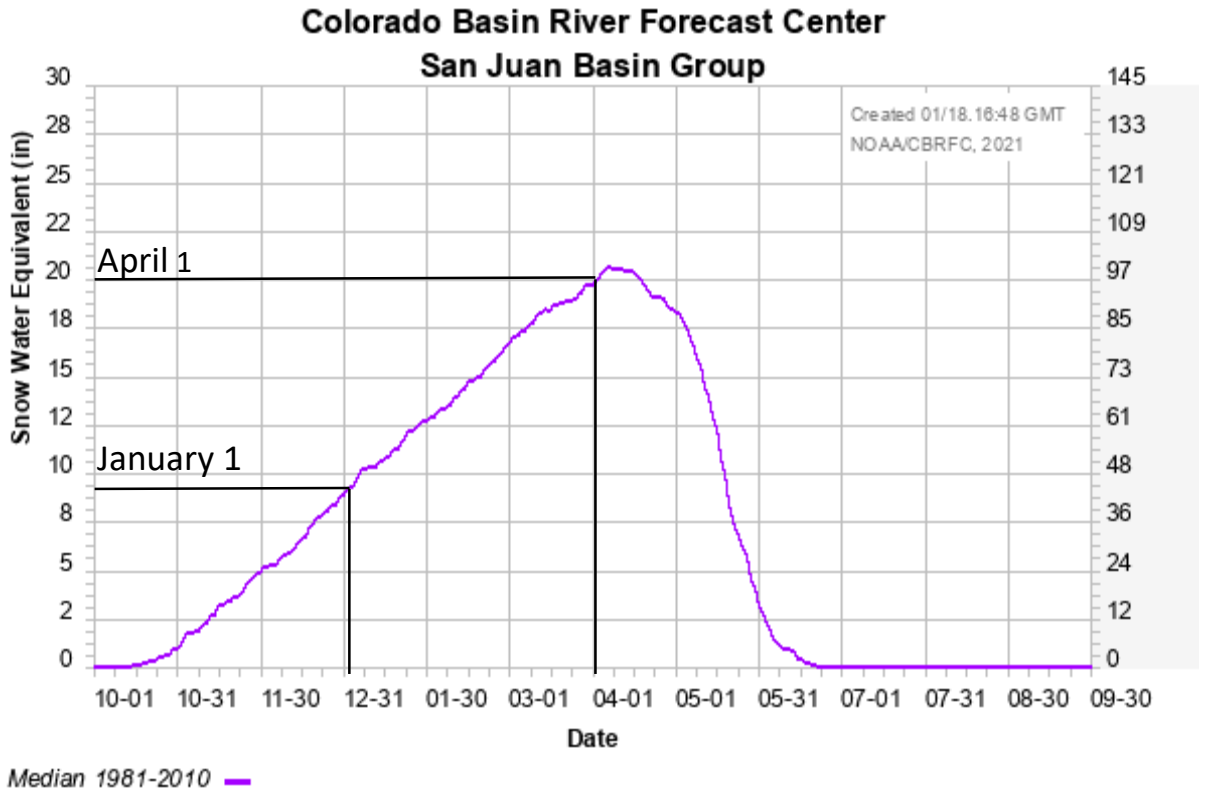
What we **KNOW**:

- ~98% of snowpack accumulation
- Dec-March weather

What we don't know:

- April-May weather (2 months)
- Snowmelt pattern

Average April Forecast Error: ~100 KAF

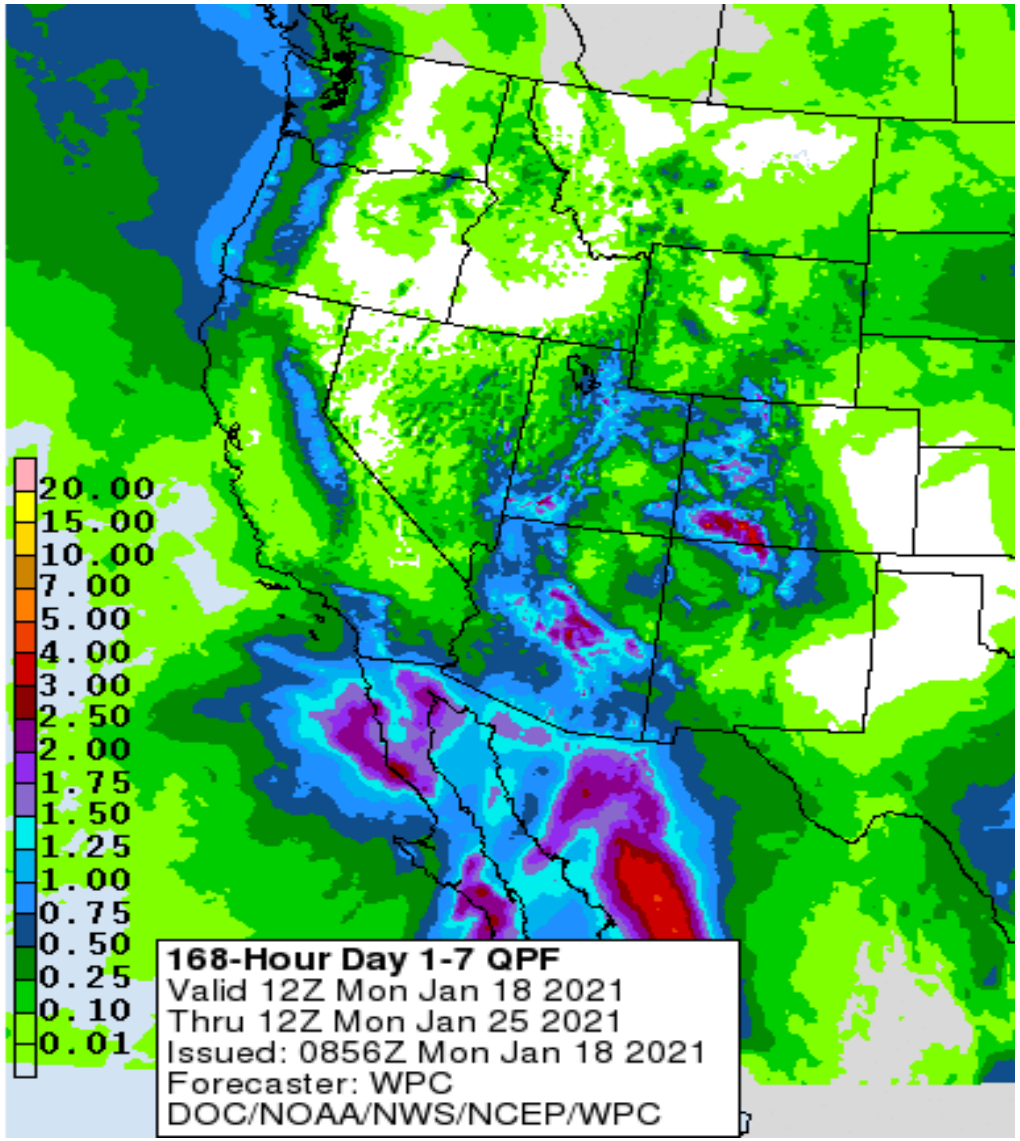


Historical Years with similar January 1 Forecasts

YEAR	JAN 1 FCST (KAF)	FCST % AVG	OBSERVED (KAF)	OBSERVED % AVG
2018	350	48%	154	21%
2019	370	50%	1163	158%
2013	440	60%	267	36%
2015	450	61%	619	84%
2021	450	61%	?	?

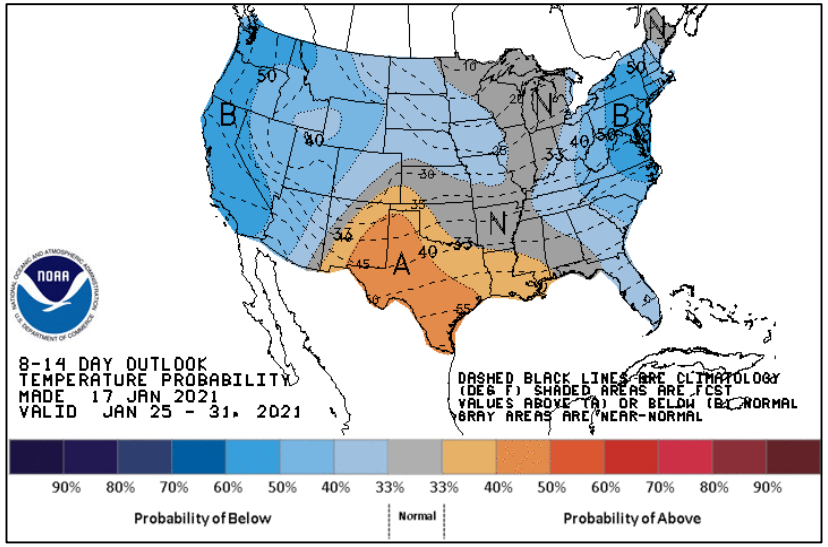
Upcoming Weather

January 18-25 Precipitation Outlook

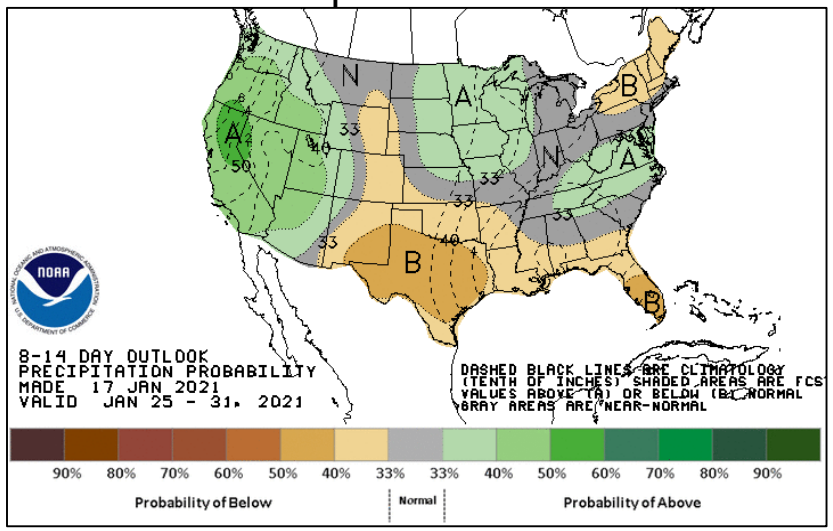


8-14 Day Outlook (January 25-31)

Temperature Outlook



Precipitation Outlook



Summary

- Near/record dry April-December 2020 period across the San Juan River Basin

- 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

- Slow start to the snow season
  - Current snowpack (SWE) conditions are below to well below normal across the majority of the basin
  - Early January is a little less than halfway (~40-50%) through the snow accumulation season

- January water supply forecasts (% of normal):
  - Range between 45-85% of average
  - Best conditions are located in the eastern headwaters and deteriorate moving west towards the Animas.
  - Trend in forecasts will depend on how storms over the next week materialize

- Weather pattern over the next 7-10 days looks more favorable for the San Juans
  - Decent chances for widespread precipitation
  - Could see more low/mid elevation snow than high elevation snow for first storm (Monday-Tuesday)
  - Closed lows are notoriously difficult to forecast.
  - Uncertainty remains for weekend and early next week storms

- Given the dry conditions, an above normal snowpack or a wet spring will be needed to see near average water supply volumes.
  - Dry soils will most likely impact runoff efficiency

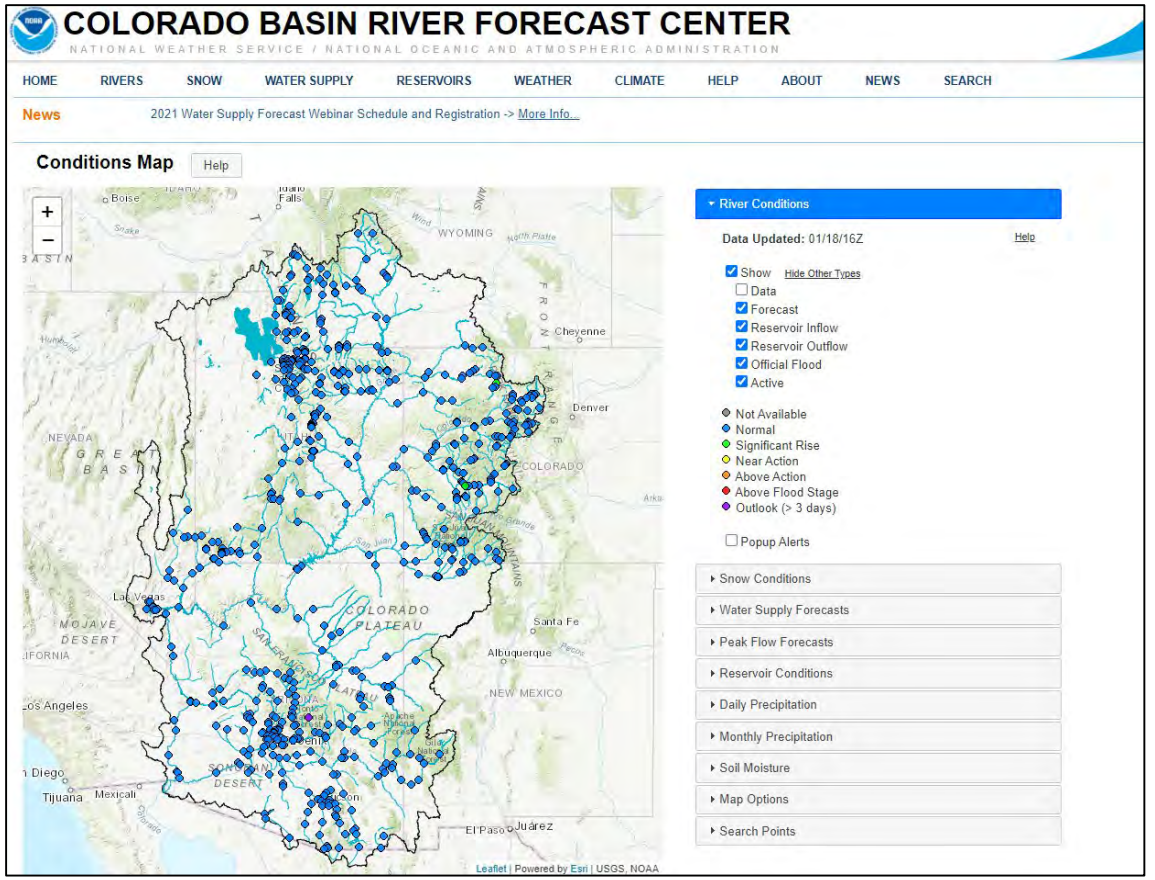
Contact Info/COVID-19 Updates

COVID-19 Staffing

- 1 person in the office per day
- Additional personnel in the office during:
  - Water Supply Forecast Updates (1st week of Month)
  - Hydrologic events (runoff/flooding)
- Maximum telework for the rest of the staff
- No changes in the foreseeable future

Contact Information

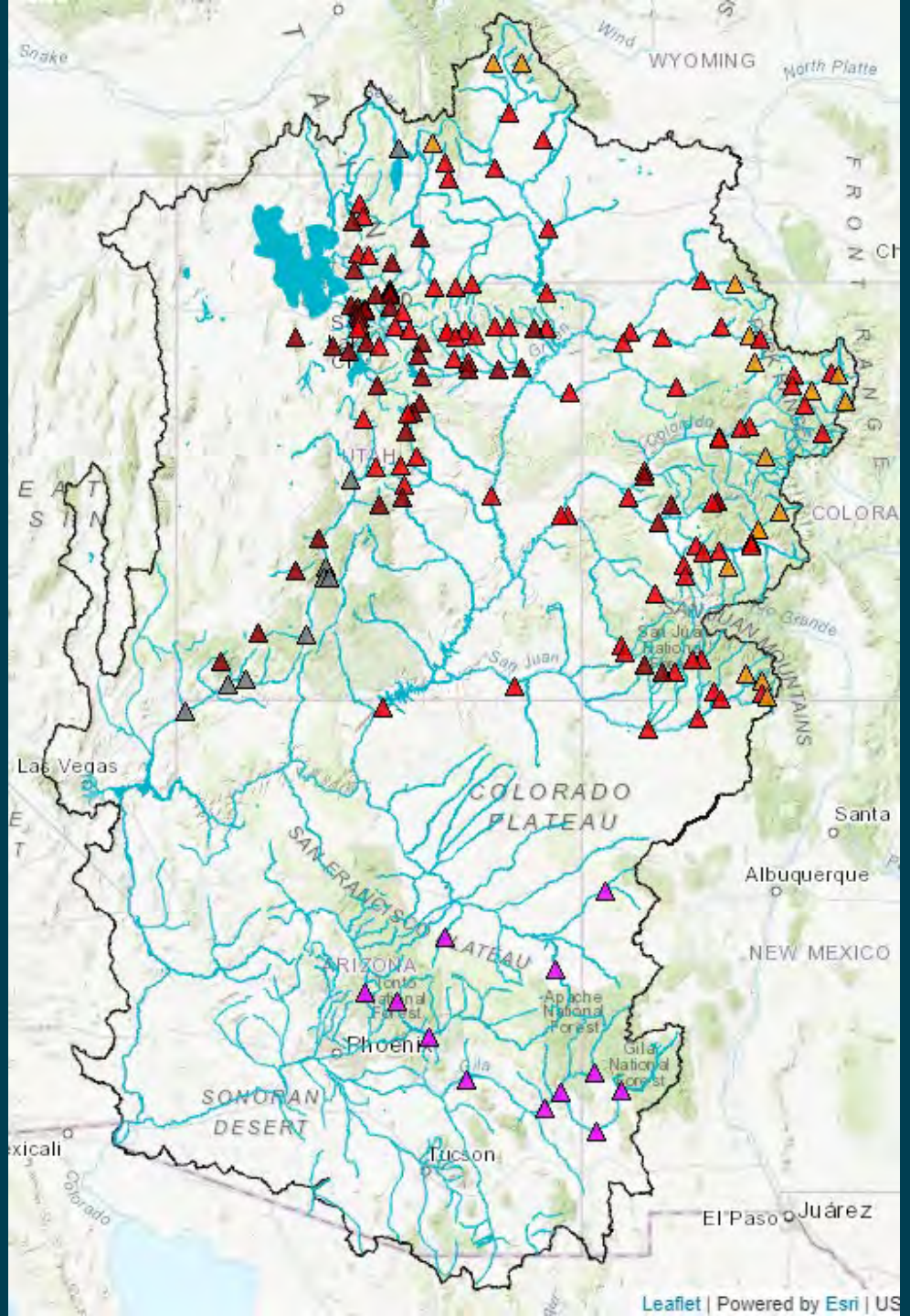
- Operational Hydrologist: in office
  - 801-524-4004
  - cbrfc.operations@noaa.gov
- Ashley Nielson - San Juan River Forecaster
  - ashley.nielson@noaa.gov
  - 801-524-5130 x333 ⟶ Forwards to my cell phone



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

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

Water Supply Forecasts (April-July)



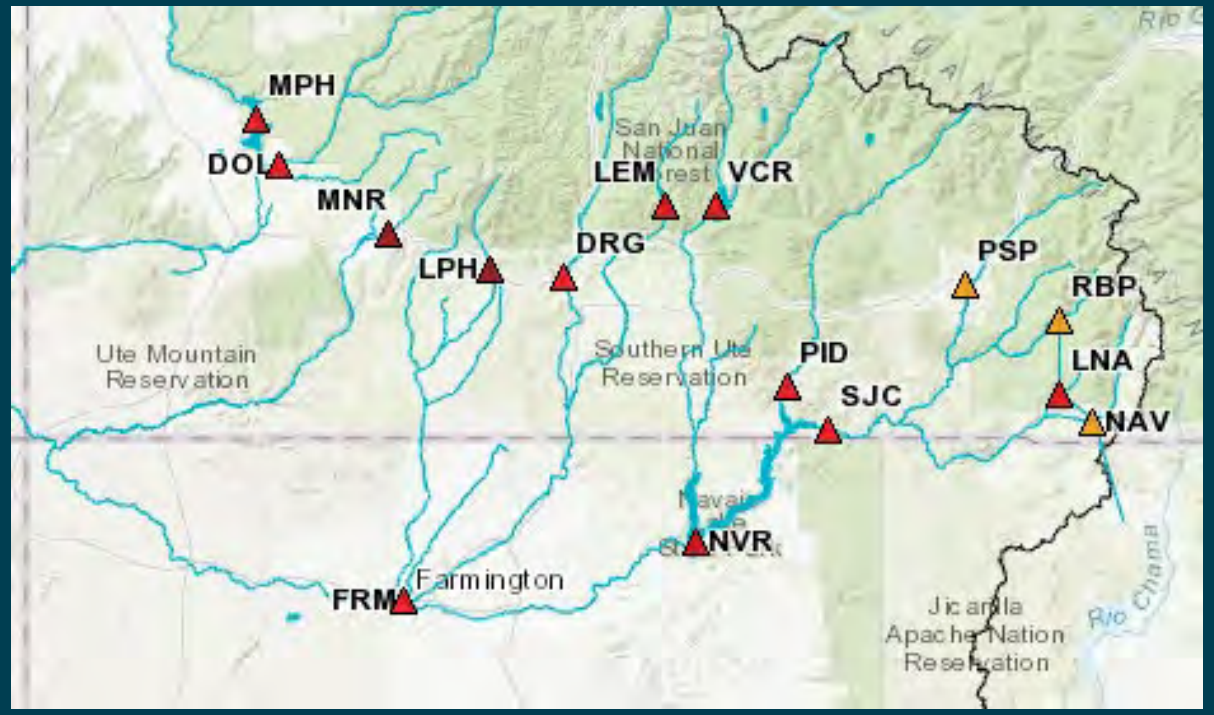
- < 30%
- 30-50%
- 50-70%
- 70-90%
- 90-100%
- 100-110%
- 110-130%
- 130-150%
- 150-200%
- 200-300%
- 300-500
- >500%
- Regulated
- No Forecast

CBRFC Water Supply Forecasts
https://www.cbrfc.noaa.gov/

As of Jan, 2021

Water Supply Forecasts (April-July)

Navajo:	450 kaf (61% avg)
Vallecito:	110 kaf (57% avg)
Lemon:	31 kaf (57% avg)
Animas:	240 kaf (56% avg)
McPhee:	170 kaf (58% avg)
Powell:	3,800 kaf (53% avg)



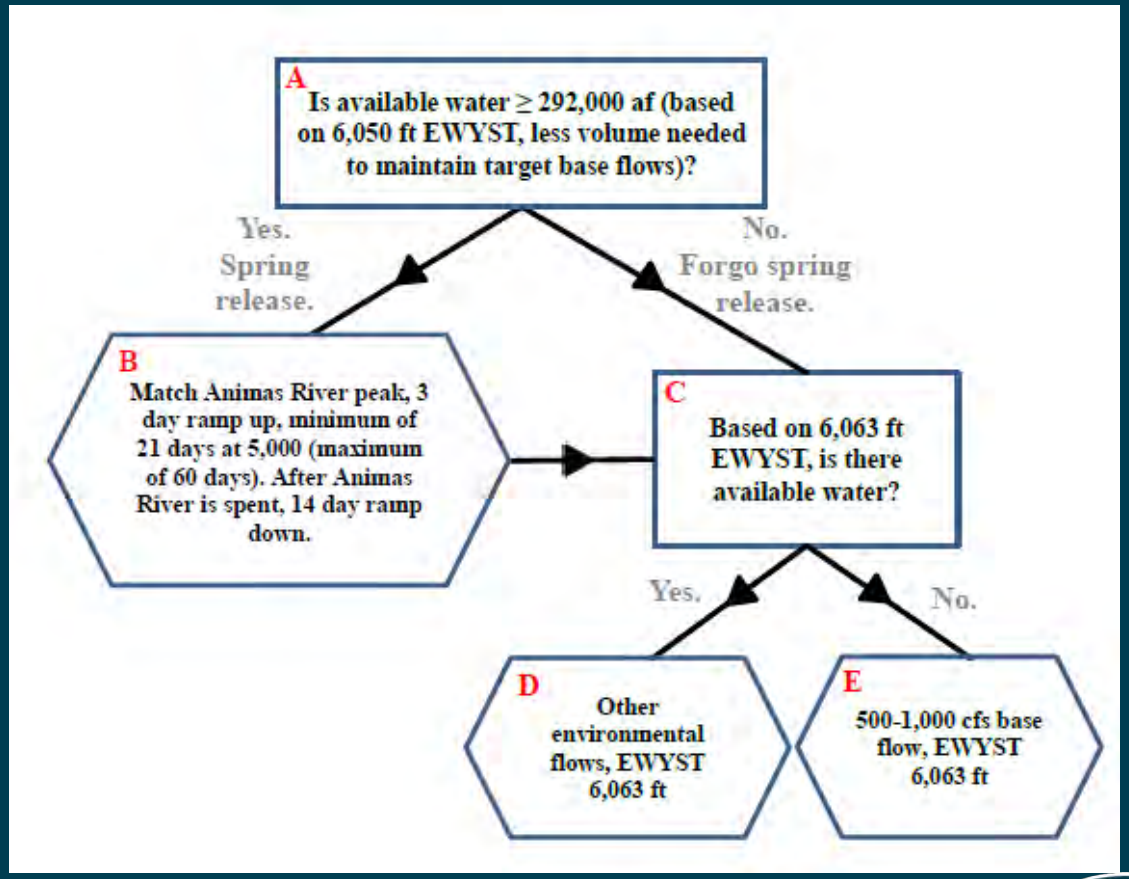
As of Jan, 2021

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

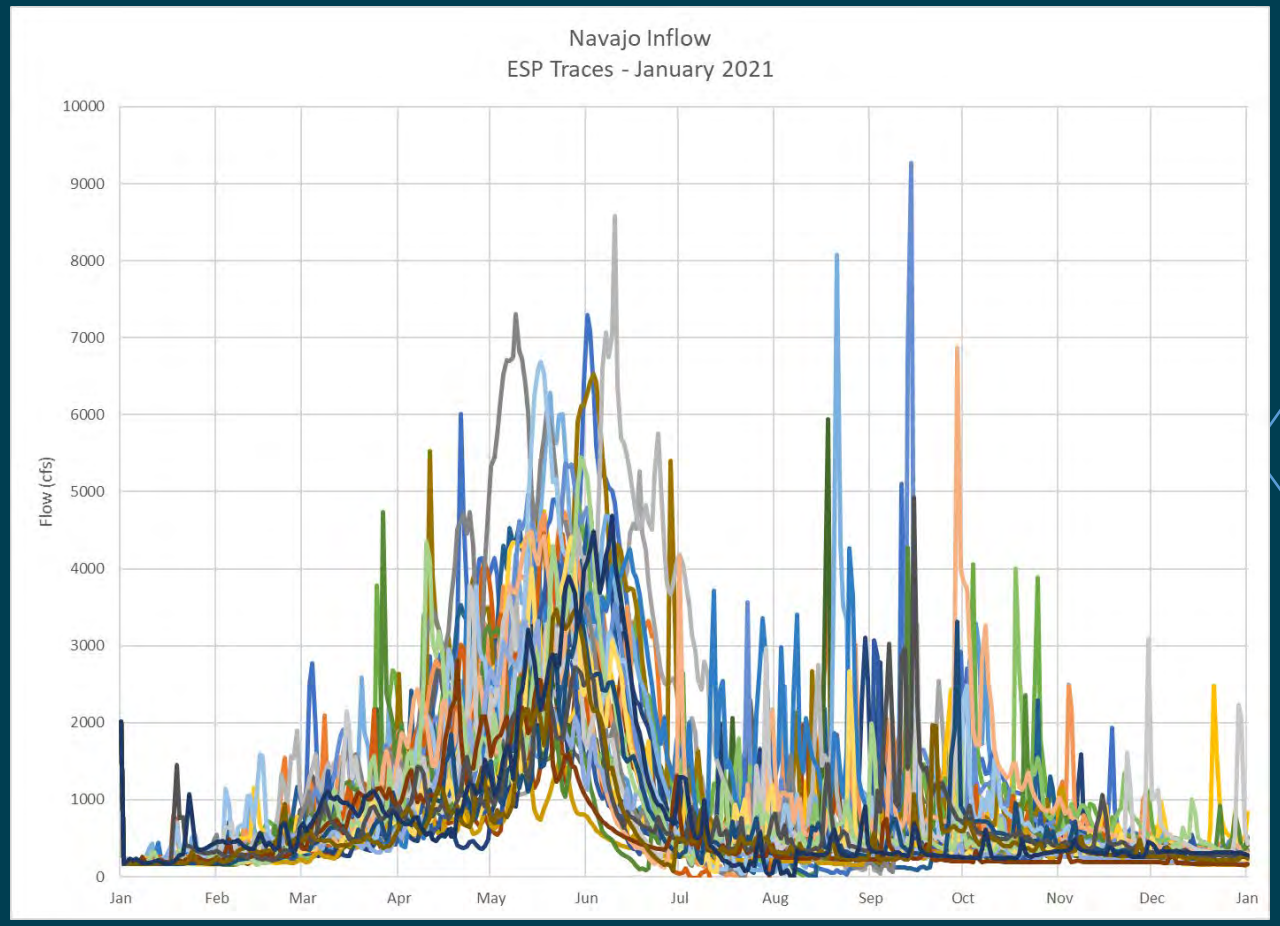
PRELIMINARY AVAILABLE WATER CALCULATION FOR WY 2021

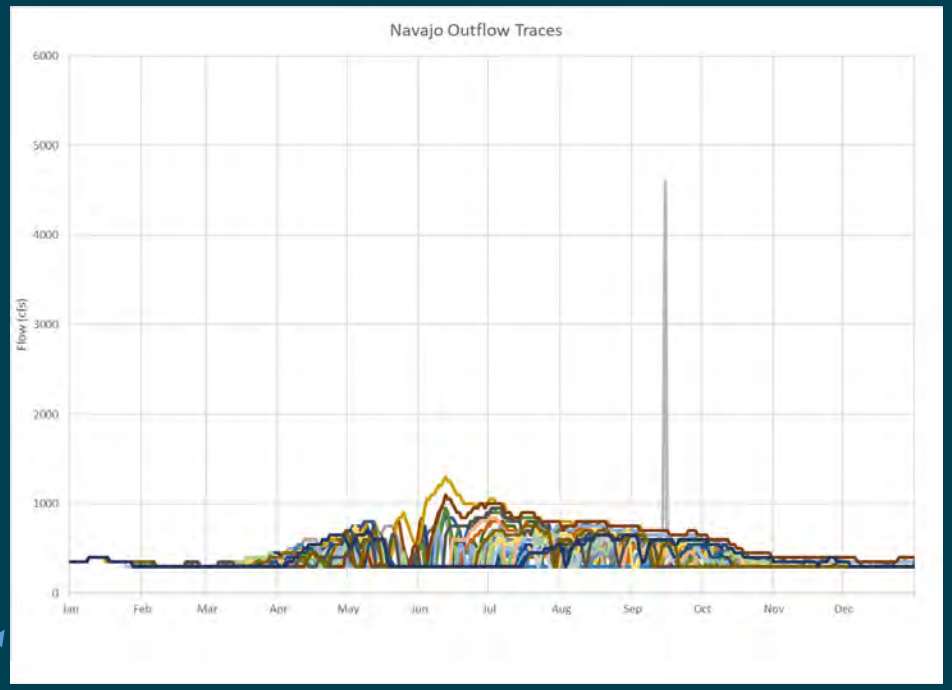
CBRFC Forecast Date: 1/11/2021

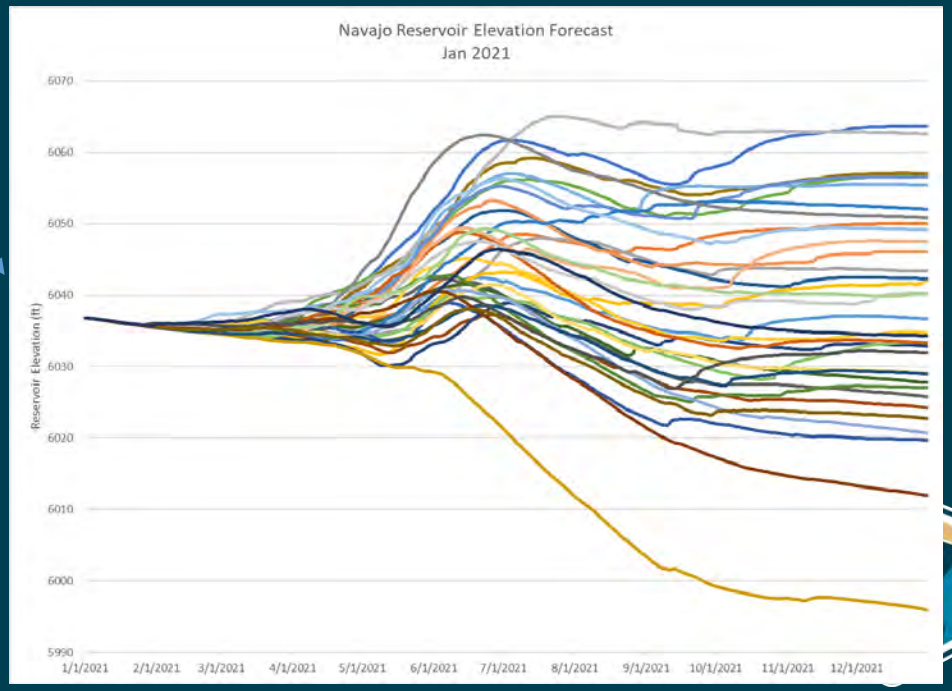
Current Forecast	Forecast	Available Water over 6050 (kaf)	Available Days at Peak (need min of 21 for SPR)	Proposed Release	Proposed Release Volume (kaf)	Available for Adaptive Management (Remaining water >6063 ft) (kaf)	Sept 30 Pool Elevation (ft) with proposed release
	MIN	-383	0	none	0	0	6011
	MOST	-76	0	none	0	0	6043
	MAX	146	3	none	0	0	6062



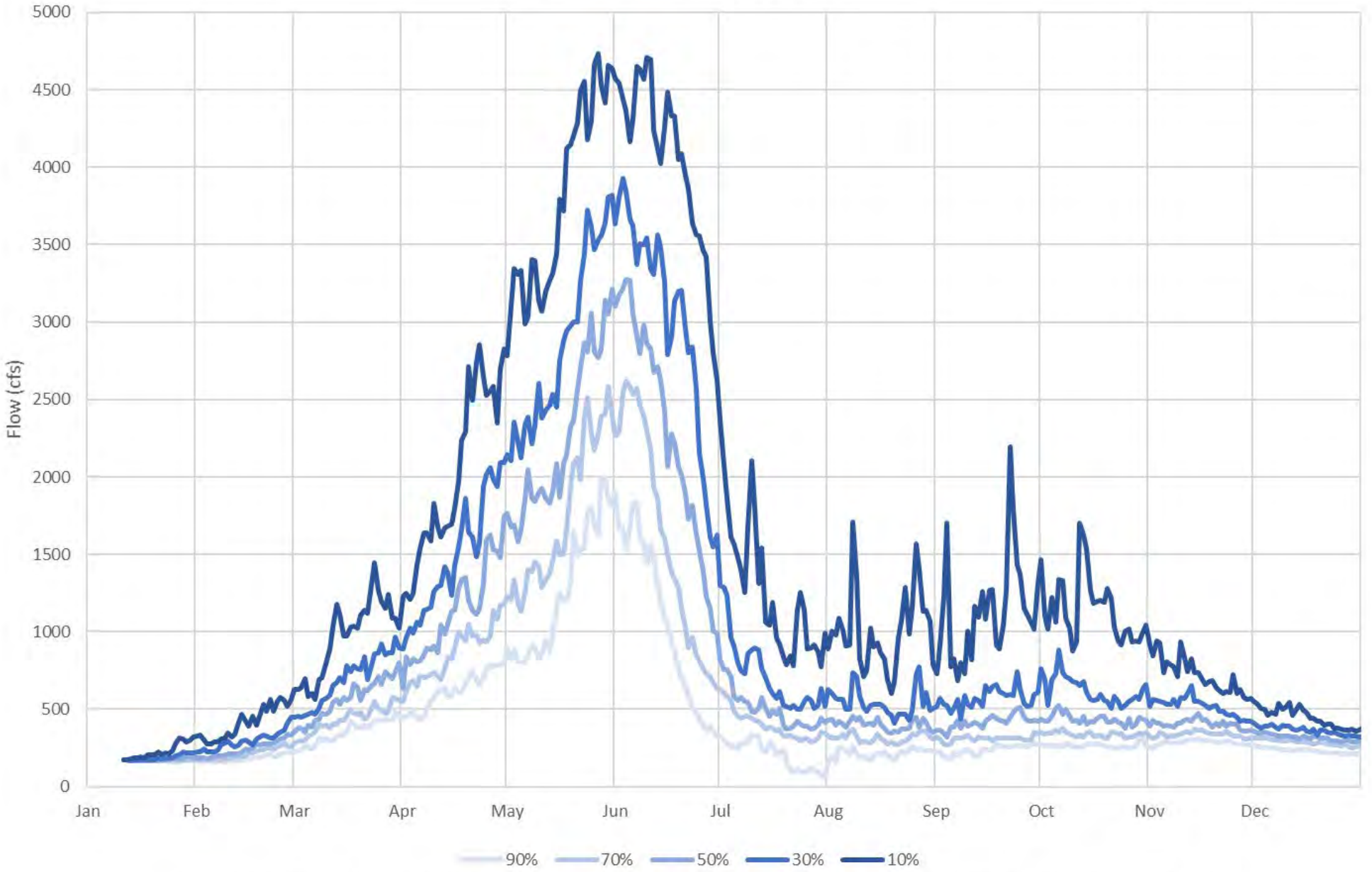
CBRFC Ensemble Streamflow Prediction (ESP) Traces





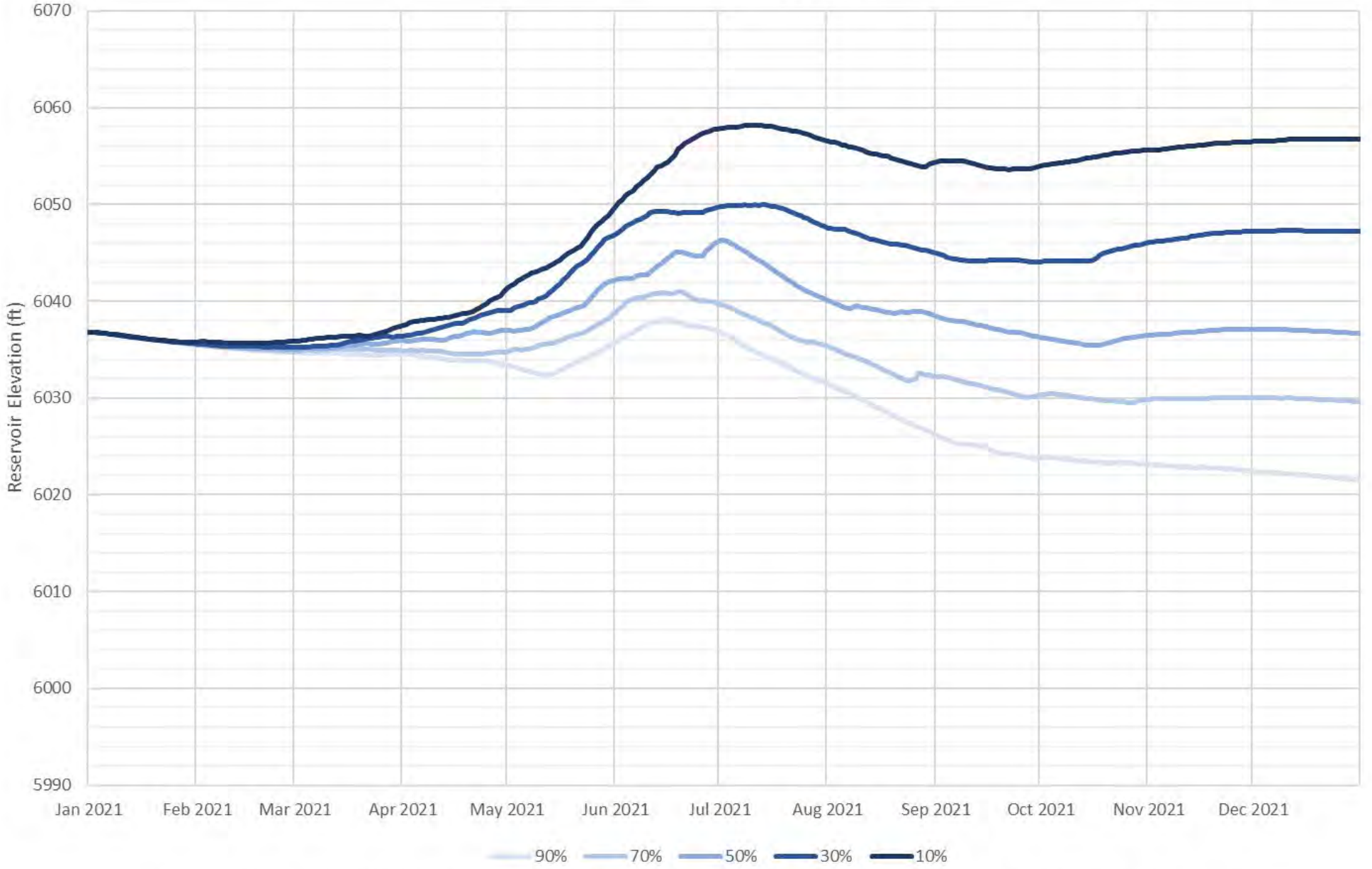


Navajo Inflow
ESP Statistics -January 2021



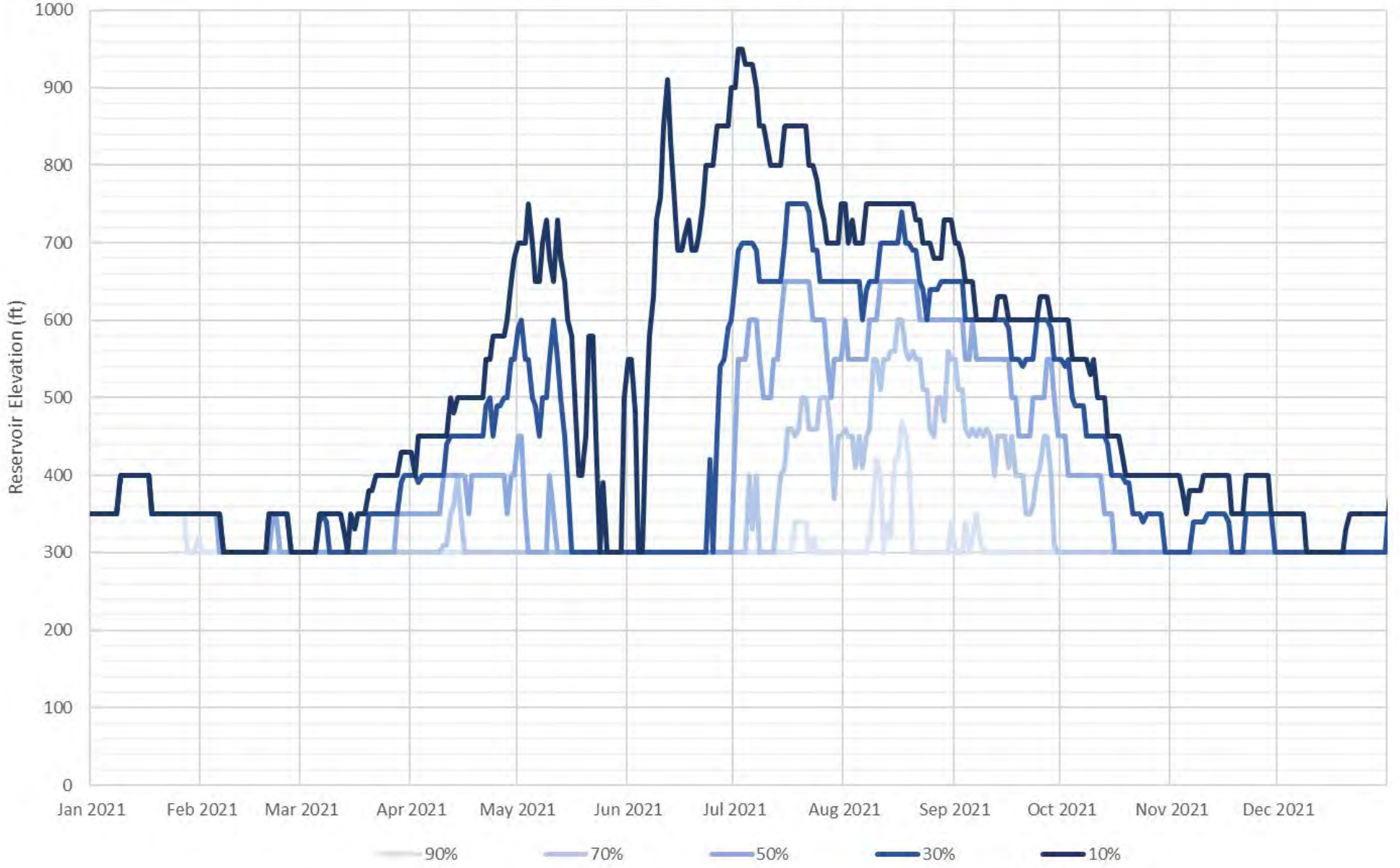
Probability release will be reached or exceeded. For example- the dark blue line reads as "there is a 10% chance the flows will be higher than this line."

Navajo Pool Elevation Probabilities through WY 2021



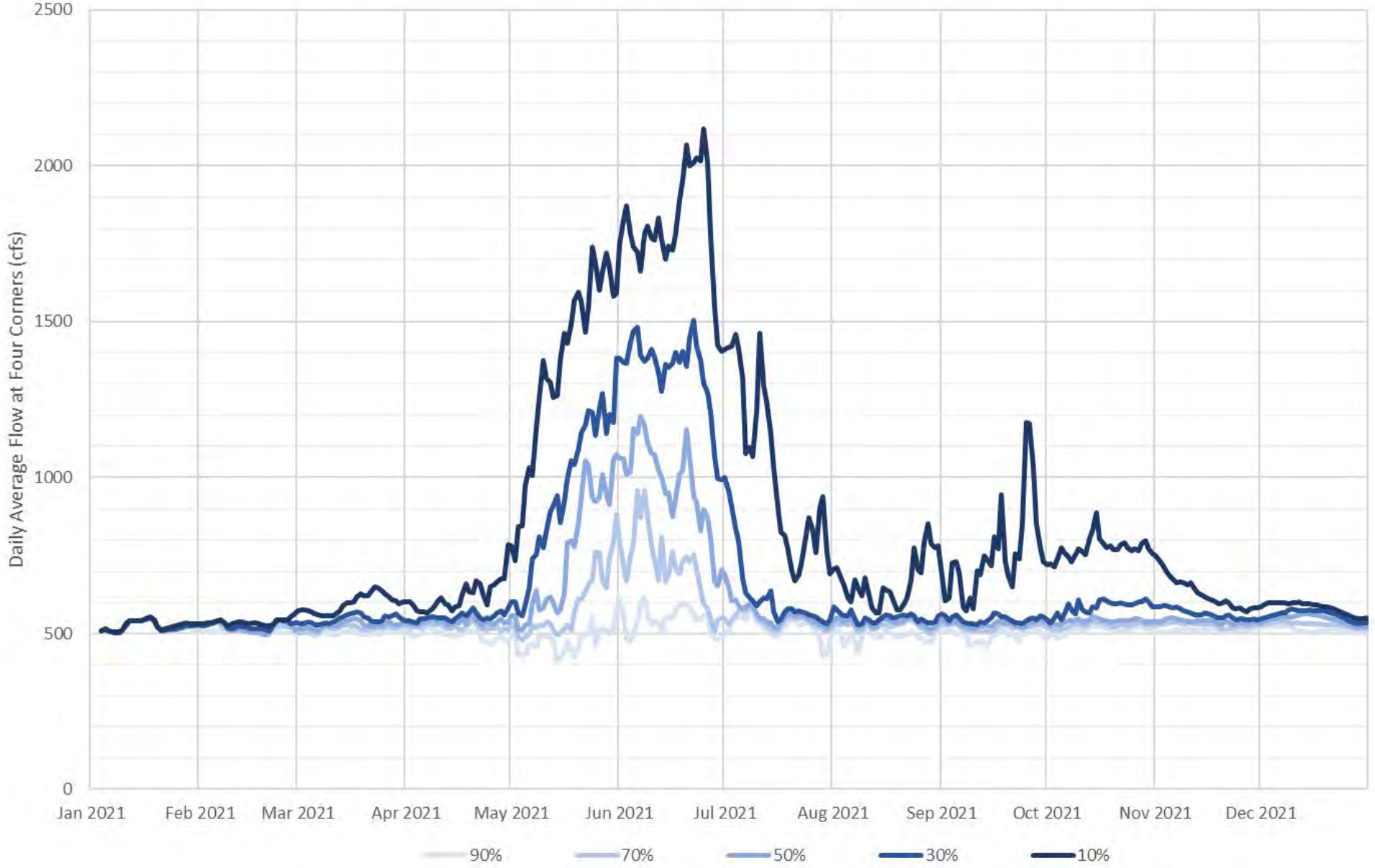
Probability release will be reached or exceeded. For example- the dark blue line reads as "there is a 10% chance the elevation will be higher than this line."

Navajo Releases Forecast Statistics through WY 2021



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 through WY 2021



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?

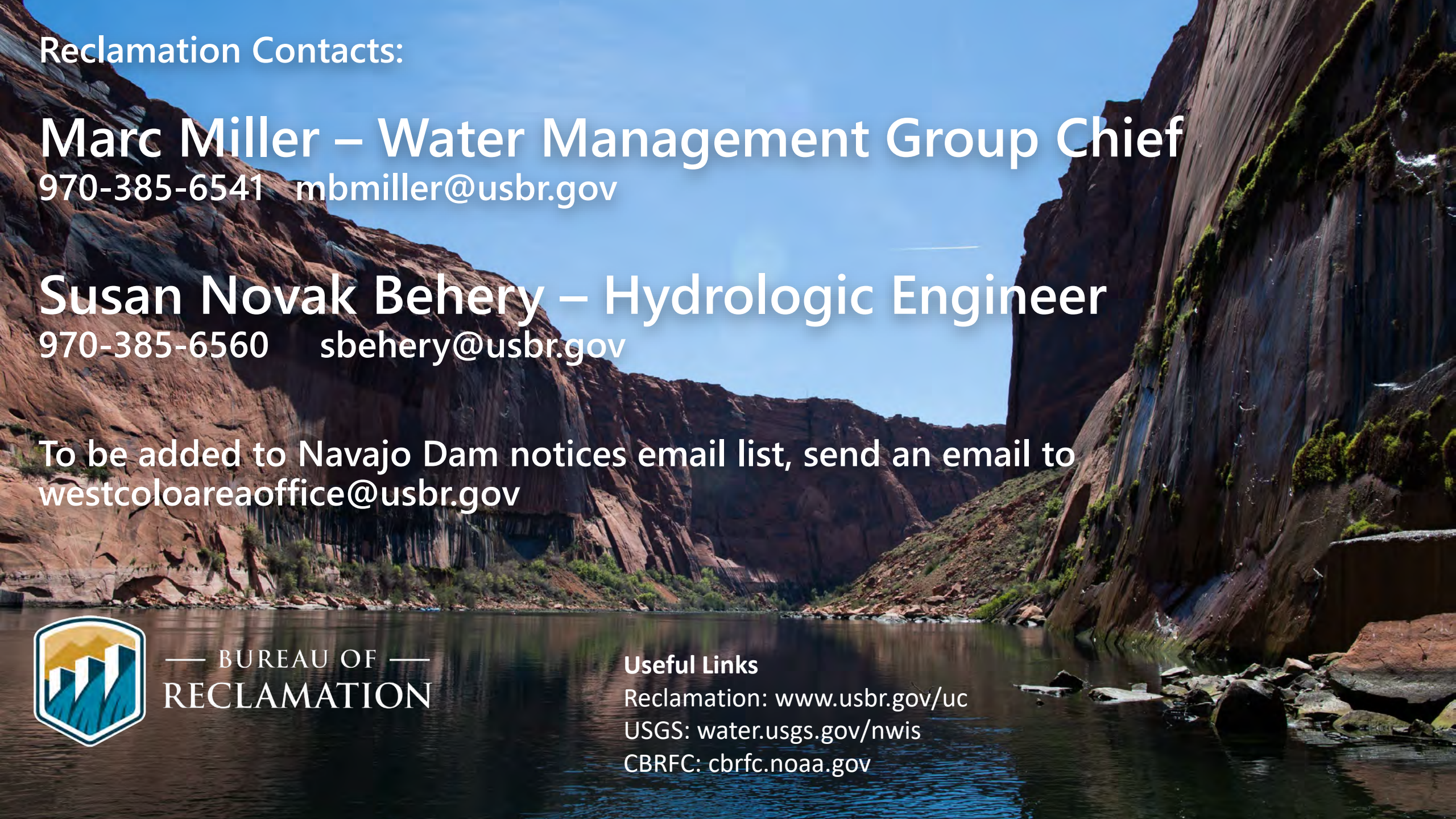
Based on current storage levels and the ESP trace forecasts,

- Less than 5% chance of SJRIP-prescribed spring peak release of at least 21 days at 5,000 cfs.
- 30% chance peak pool elevation will be 6050 ft or higher.
- 10% chance peak pool elevation will be 6060 ft or higher.
- 25% chance the Sept 30th pool elevation will be 6050 ft or higher.
- 5% chance the Sept 30th pool elevation will be 6060 ft or higher.
- Flows at Four Corners are unlikely to meet SJRIP Flow Targets under these forecasts.
- No runs result in a shortage for WY 2021, however, 6% chance of shortage in WY 2022.

Summary

Next mtg April 20th – Virtual Format Likely

- Snowpack is well-below average (65% above Navajo) and dry soils coming into the season further reduce the spring inflow forecasts.
- CPC outlook is showing a chance for drier than average conditions through the spring and a high chance for warmer than average.
- The April-July runoff most probable forecast for Navajo is 450kaf (61% of average).
- Based on current conditions (snowpack and reservoirs), and the range of forecast possibilities provided by CBRFC, a spring peak release in 2020 is very unlikely. BUT remember we have been in this situation in prior years (2019 for example). By spring there was enough for a large release. So do not count it out just yet!
- Expect low releases throughout the winter (300-500 cfs) as minimum releases to meet the target baseflows will be made.
- Currently no model runs result in a shortage for WY 2021.



Reclamation Contacts:

Marc Miller – Water Management Group Chief

970-385-6541 mbmiller@usbr.gov

Susan Novak Behery – Hydrologic Engineer

970-385-6560 sbehery@usbr.gov

To be added to Navajo Dam notices email list, send an email to westcoloareaoffice@usbr.gov

BUREAU OF RECLAMATION

Useful Links

Reclamation: www.usbr.gov/uc

USGS: water.usgs.gov/nwis

CBRFC: cbrfc.noaa.gov