BUREAU OF RECLAMATION

Navajo Unit Operations Coordination Meeting

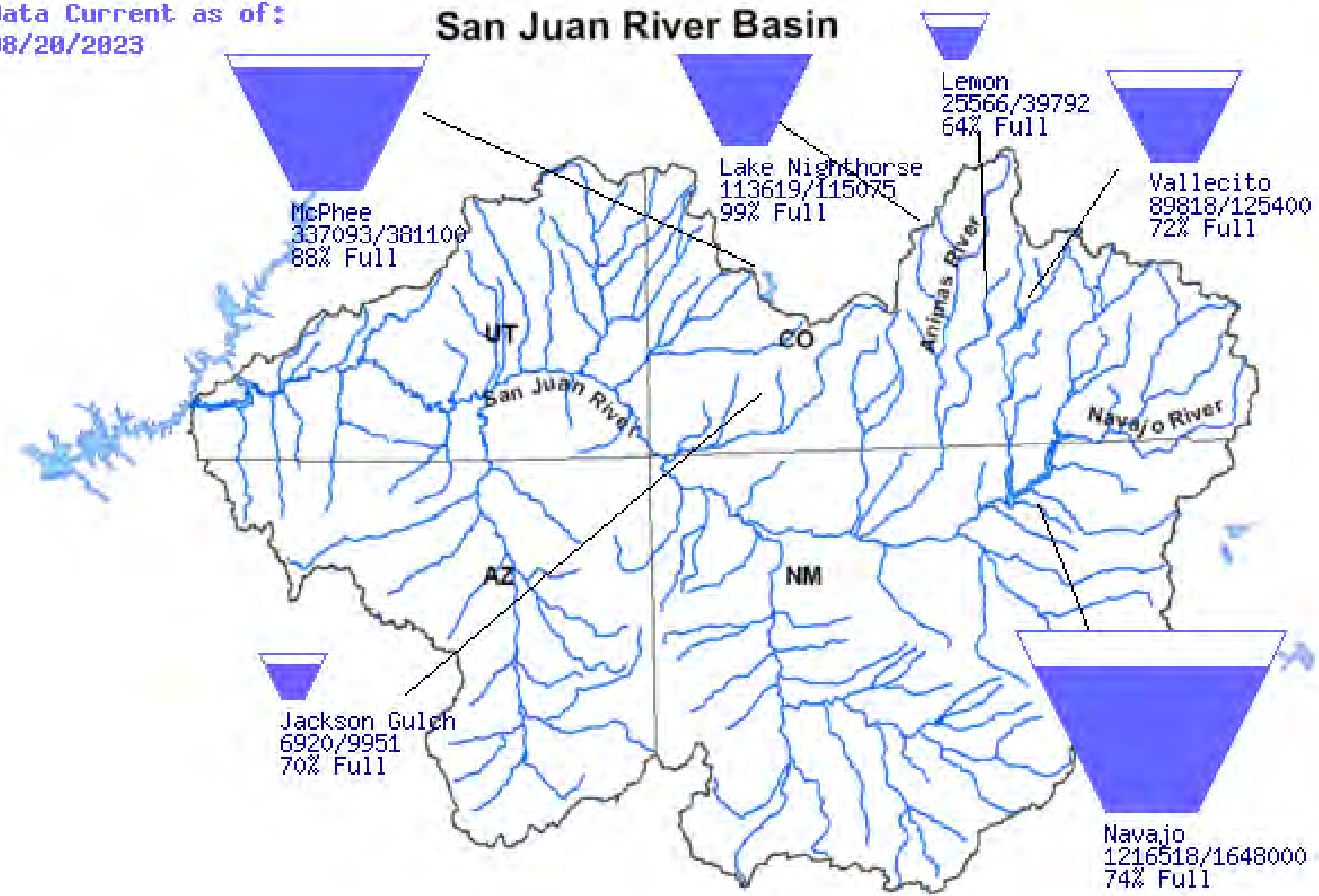
August 22, 2023

1:00 PM

Thank you for joining. The meeting will begin shortly.

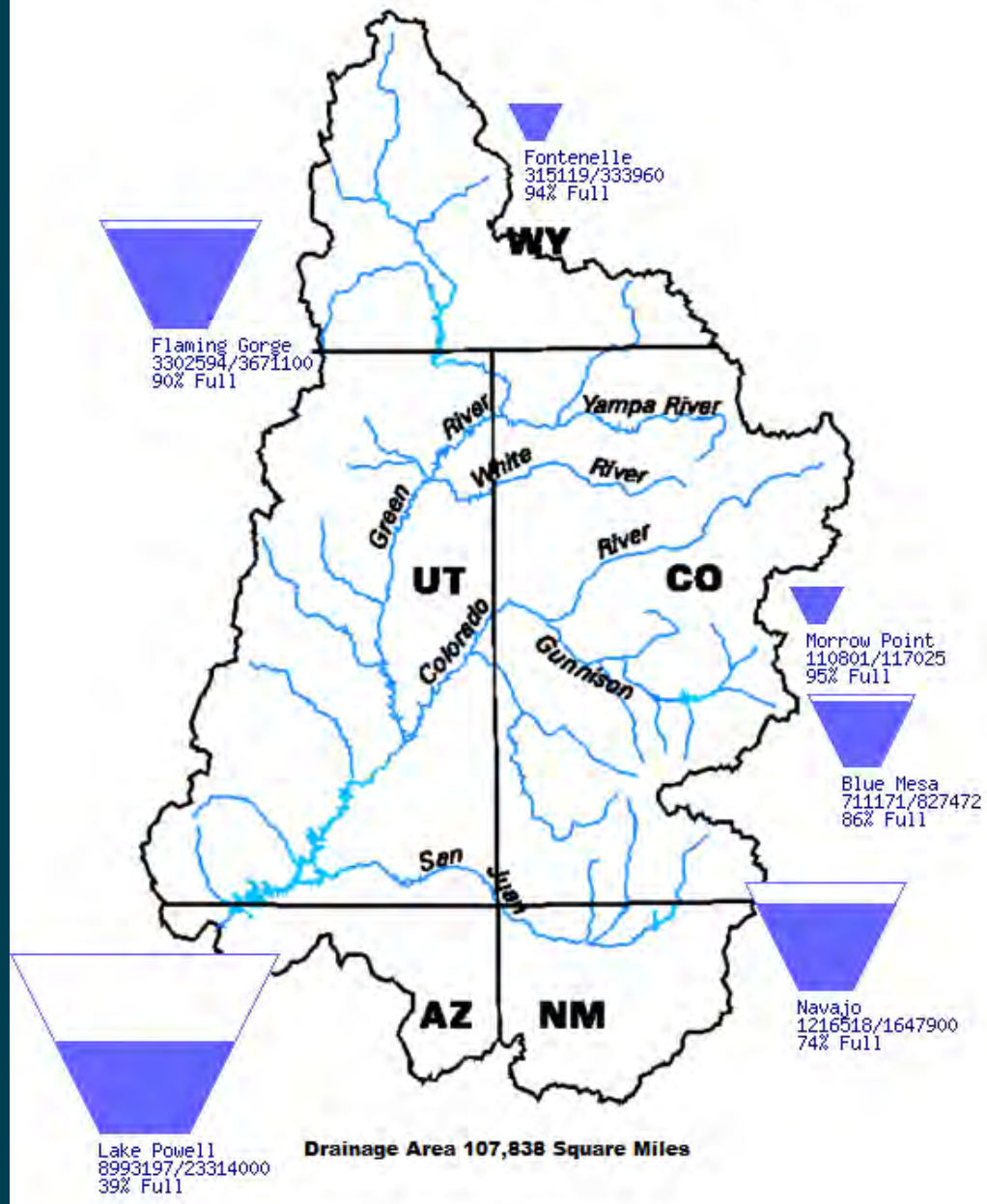
Data Current as of:
08/20/2023

San Juan River Basin



Data Current as of:
08/20/2023

Upper Colorado River Drainage Basin



Navajo Operations Meeting
August 22, 2023

Water Year 2023
Runoff Review

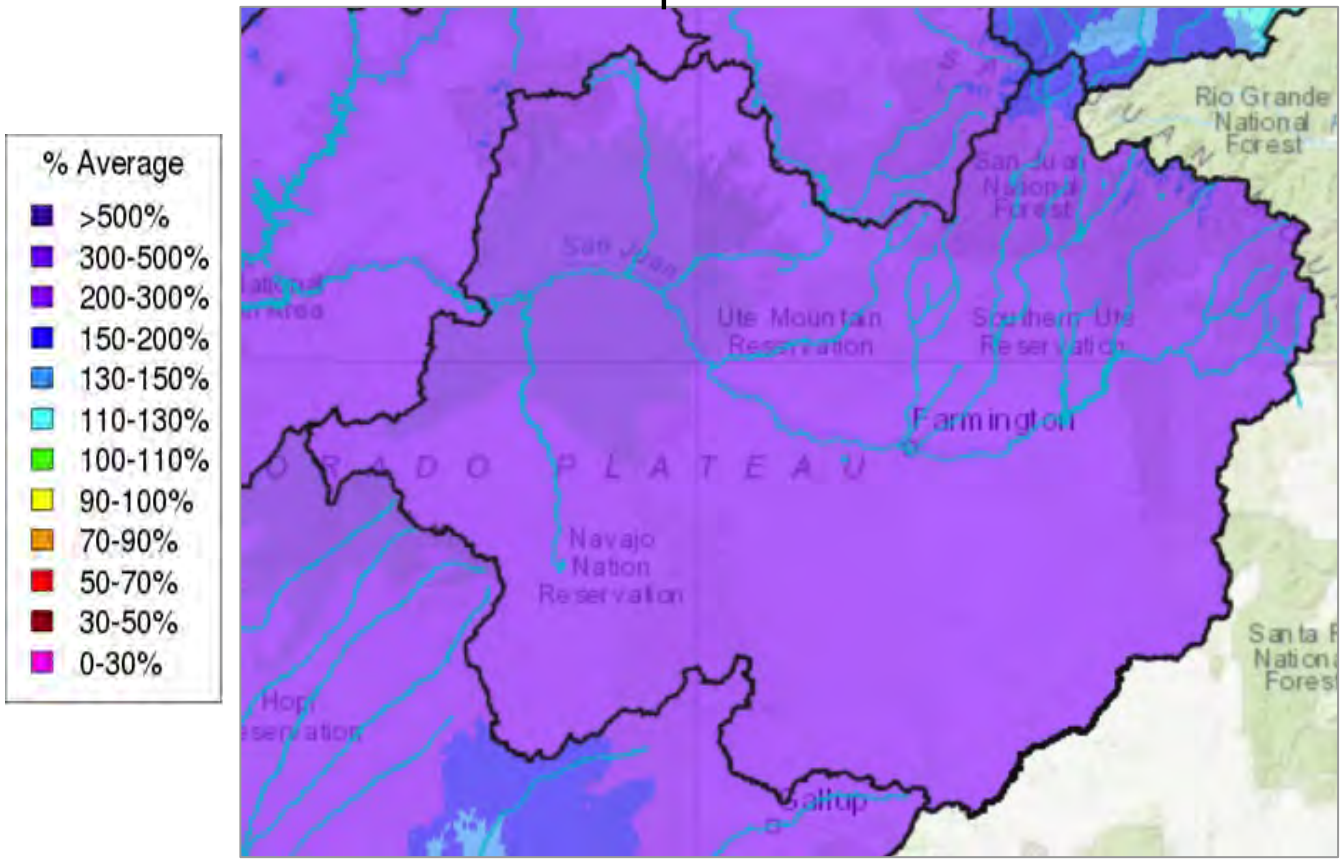
Ashley Nielson
Senior Hydrologist
Colorado Basin River Forecast Center
National Weather Service/NOAA

Outline

- Water Year 2023 Conditions Summary
  - Precipitation
  - Snow
- 2023 Water Supply Forecast Evolution
- 2023 Water Supply Forecast Performance
- Late August conditions

March Precipitation

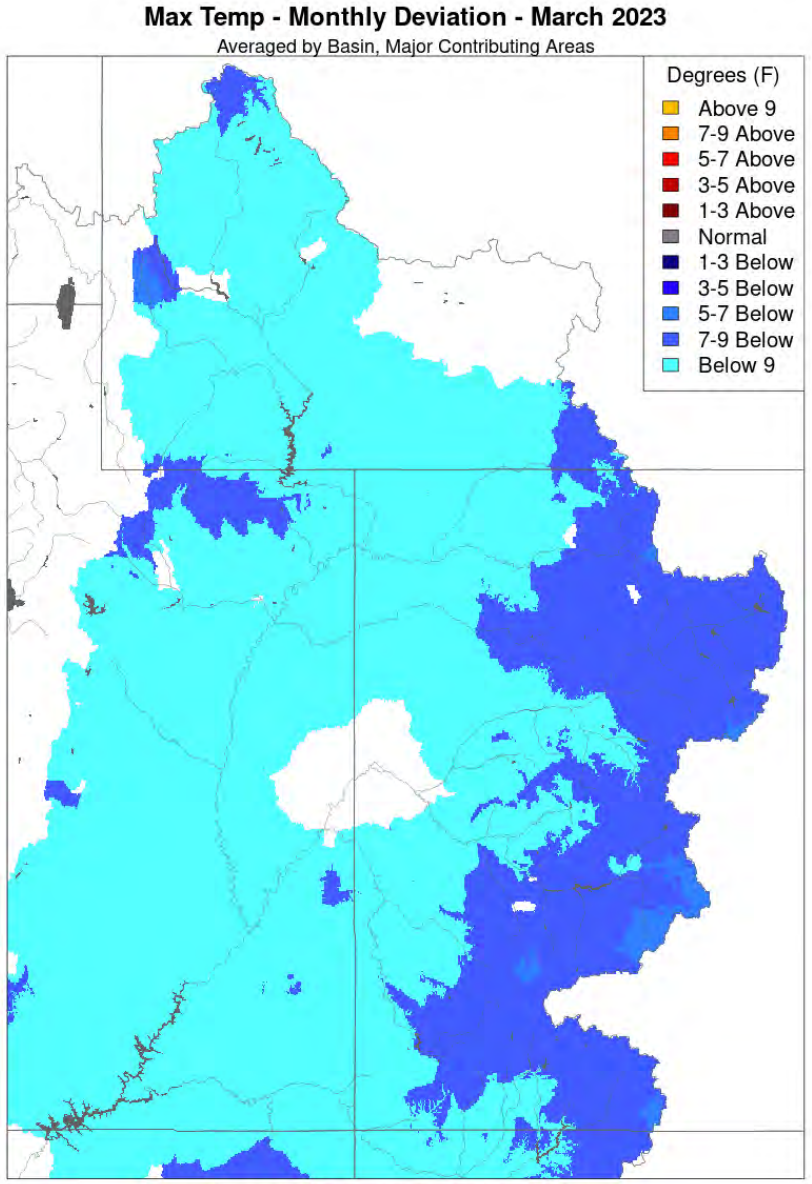
March 2023 Precipitation



Animas River Basin: 225%

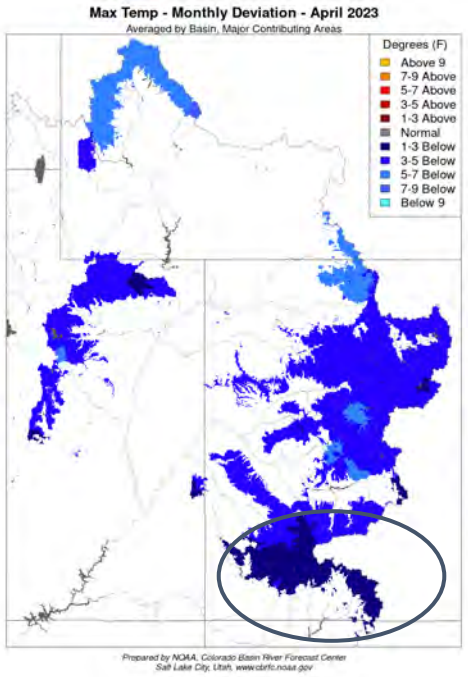
Above Navajo Reservoir: 230%

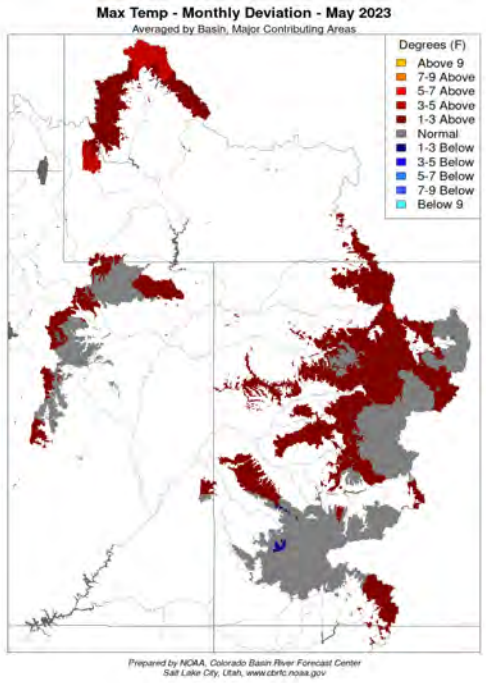
Observed precipitation is averaged by CBRFC defined basin elevation zones.

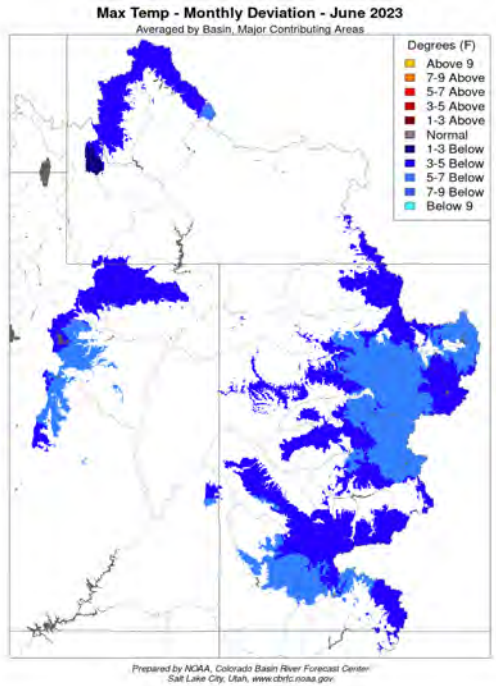


April-June Precipitation/Temperature

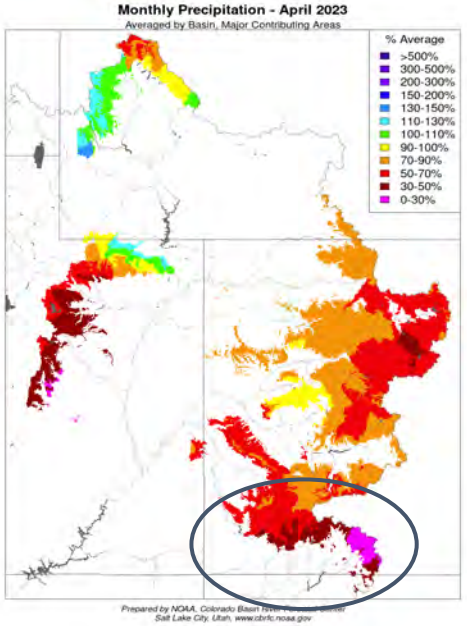
Monthly Max Temperature Anomaly

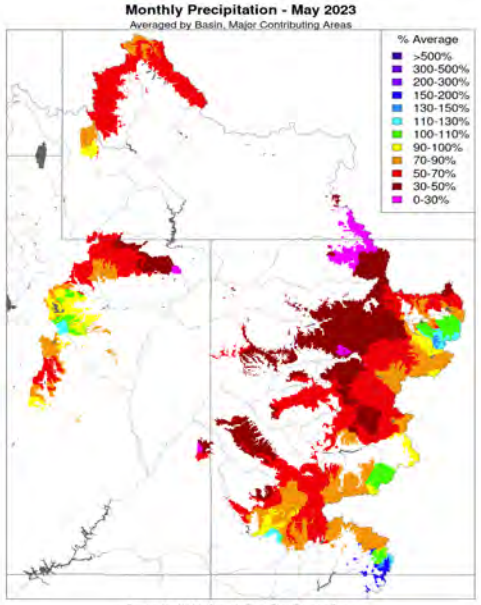


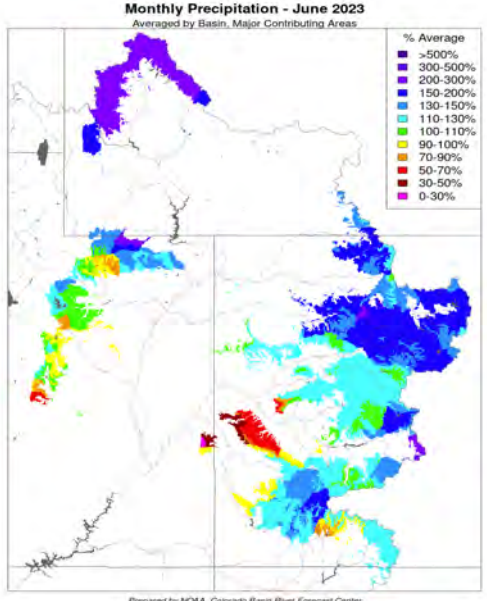




Monthly Precipitation % Average

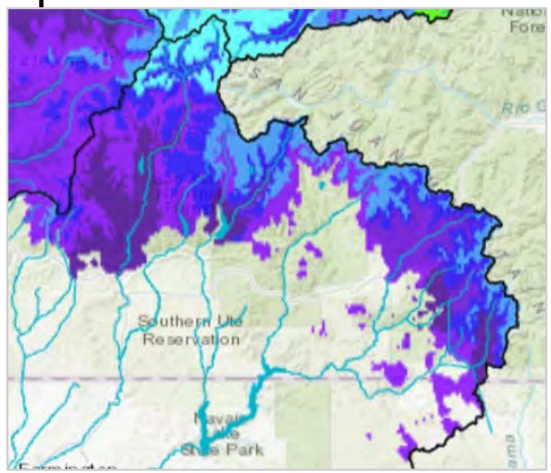




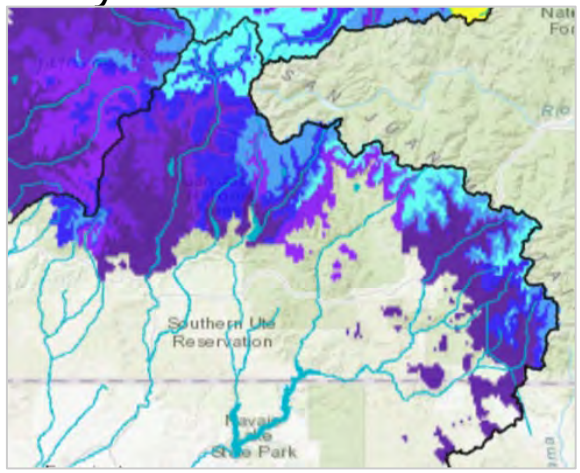


Snow Conditions: CBRFC Model Snow Water Equivalent

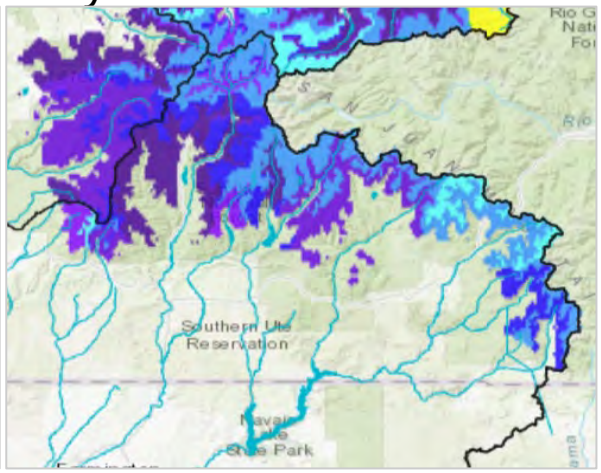
April 1



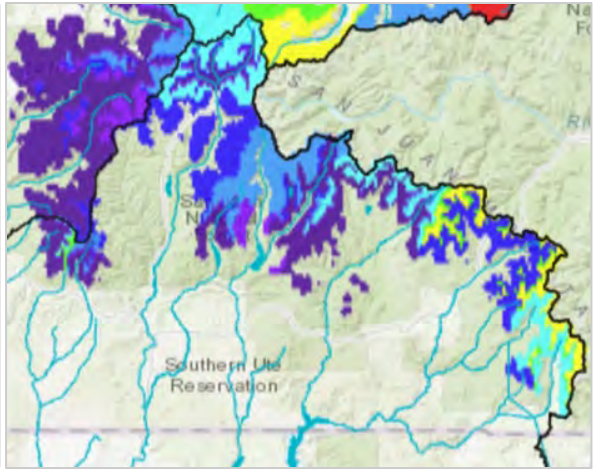
May 1

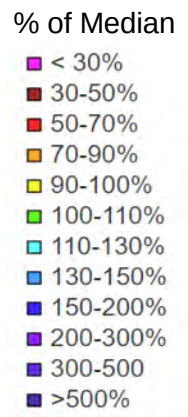


May 15

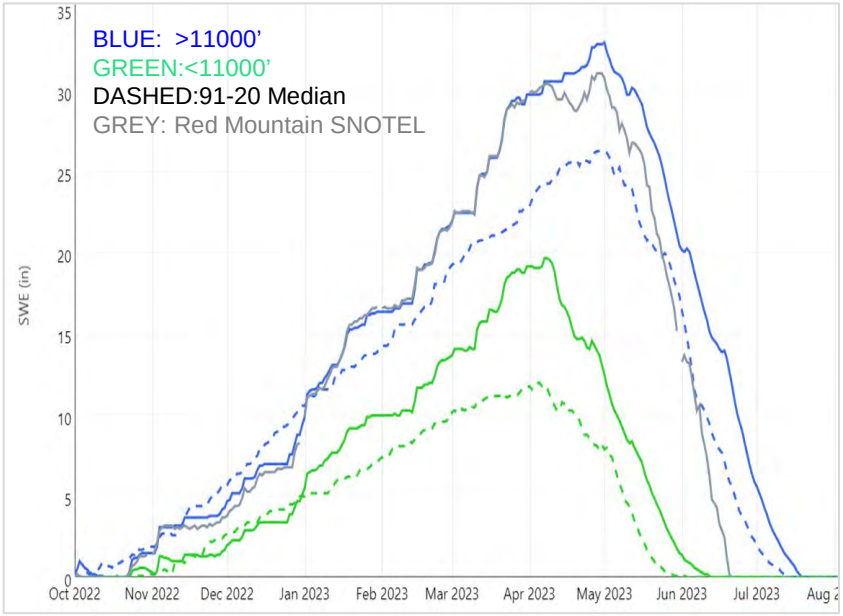


June 1

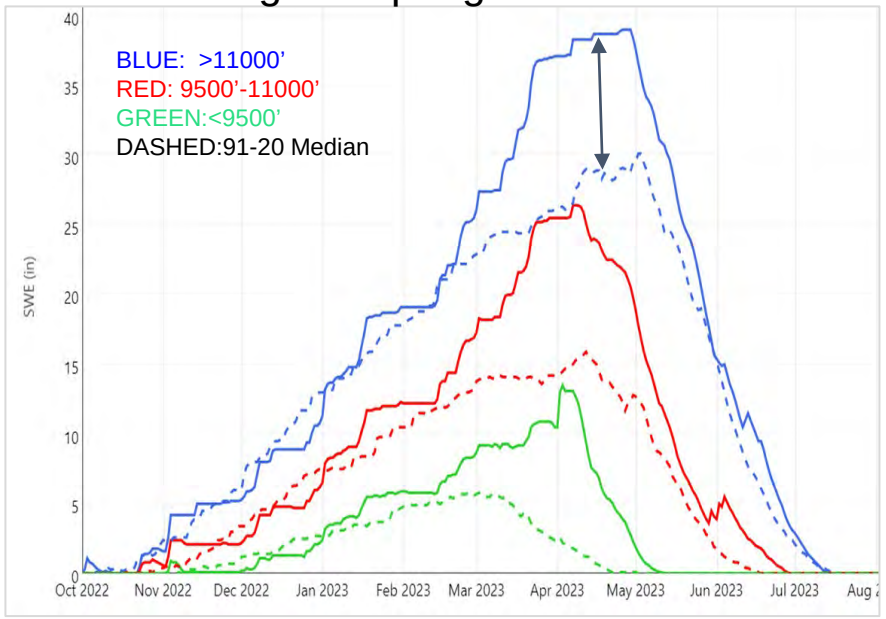




Animas below Silverton



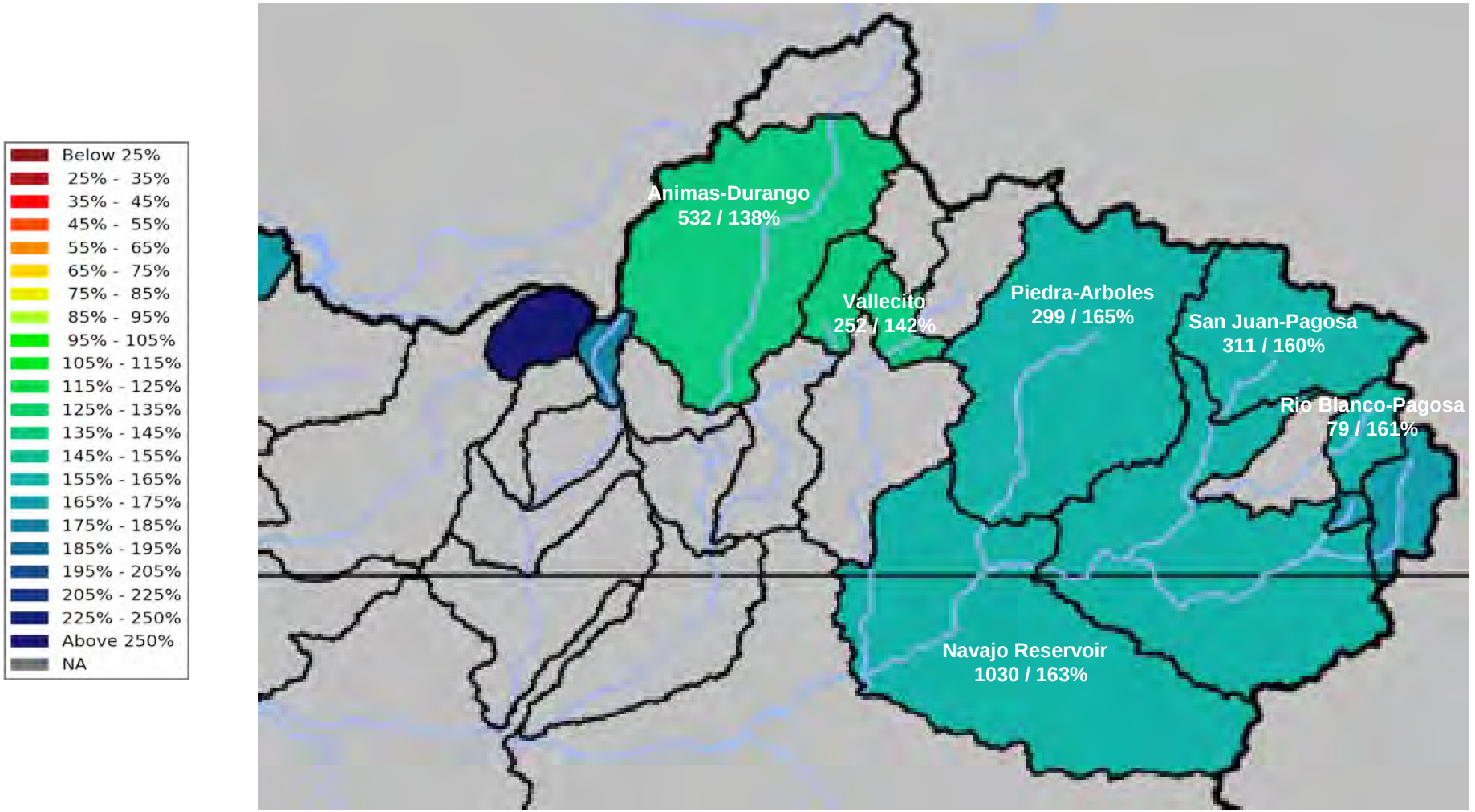
San Juan-Pagosa Springs



- Peak SWE
  - Above normal at all elevations
- Peak SWE Timing
  - Near Normal above 9500'
  - Late below 9500'
- Melt Out
  - Delayed at all elevations
  - ~3 weeks late below 9500'

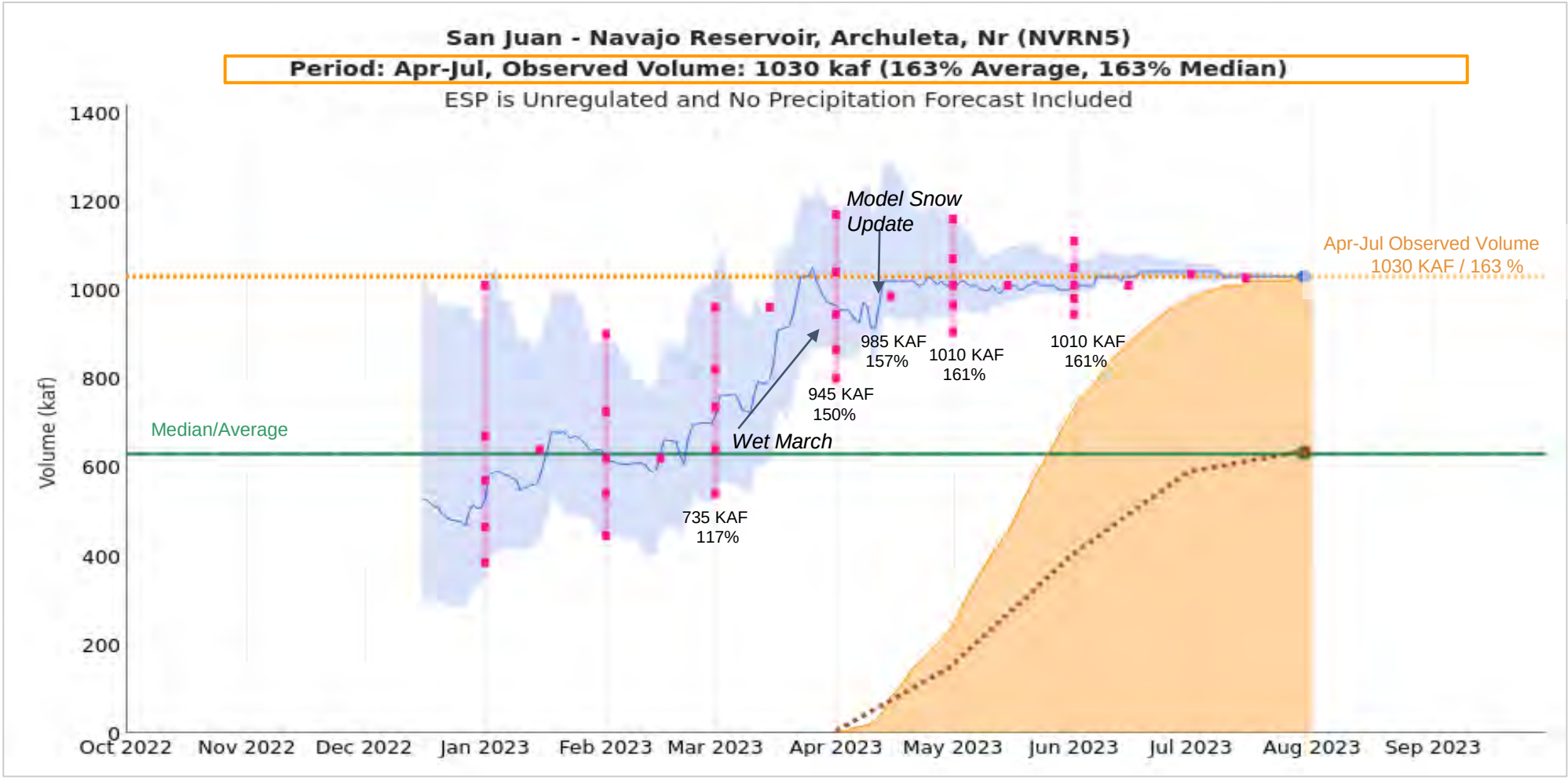
San Juan River Basin: April-July Observed Volumes

April-July Unregulated Observed Volumes
Volume in 1000's acre-feet / Percent of 1991-2020 average



April-July observed volumes ranged from 135-175% of average.

Water Supply Forecast Evolution: Navajo Reservoir Inflow

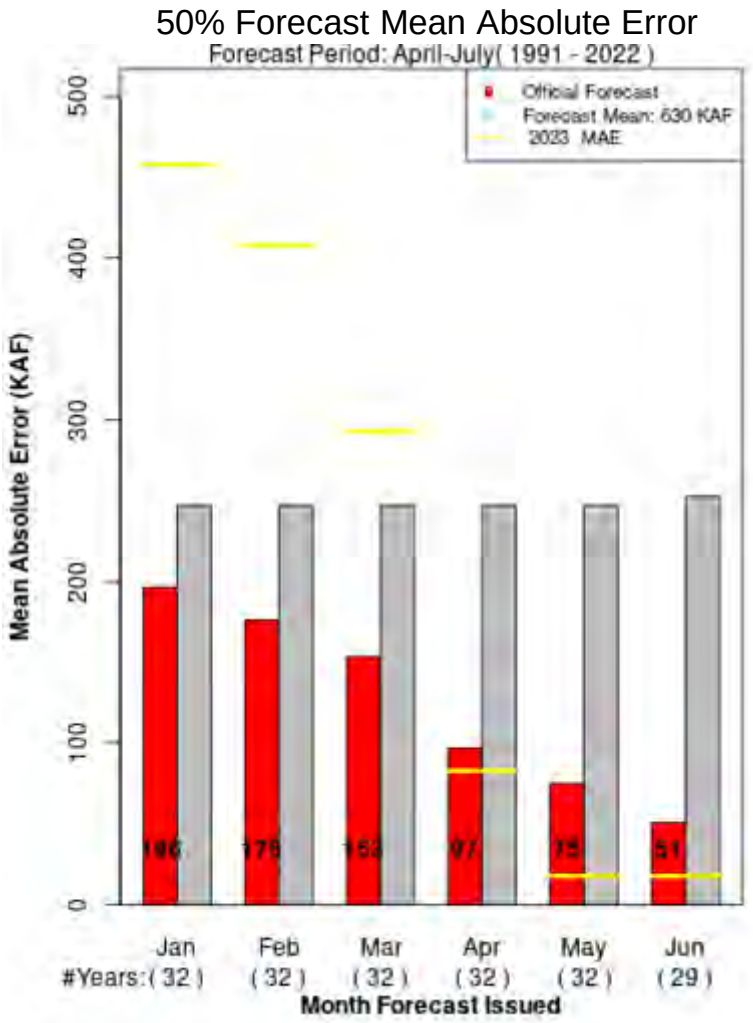


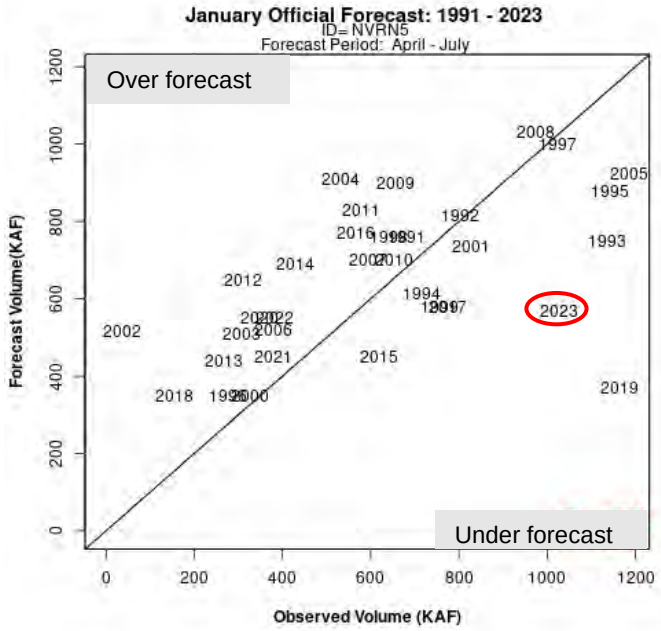
Blue shading: Daily Raw Model Guidance 90% - 10% exceedance range
Blue line: Daily Raw Model Guidance 50% exceedance
Pink line: Official forecast 90%, 70%, 50%, 30%, 10% exceedance
Brown dotted: Average observed
Orange dashed: 2023 Observed Streamflow

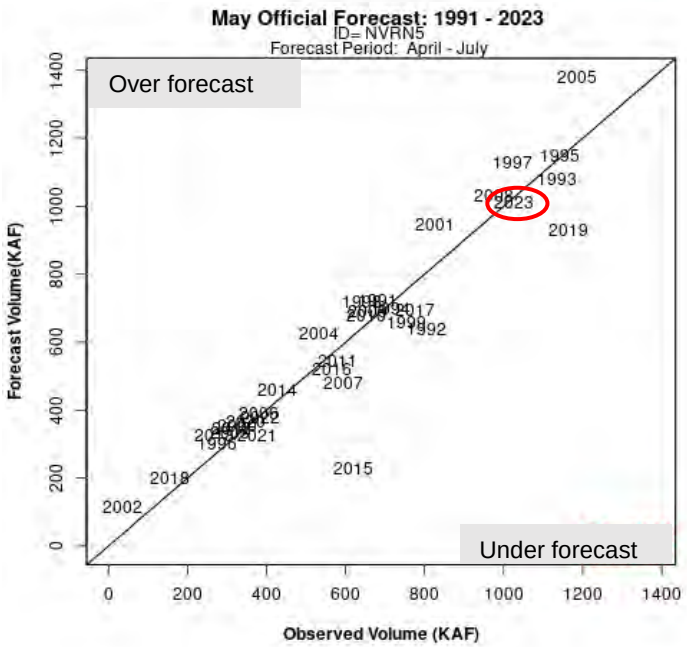
Navajo Inflow Forecast Evolution Plot

The forecast increased from March to April due to much above normal precipitation and below normal temperatures in March. An adjustment to the model snow was made in mid-April resulting in an another forecast increase between April-May. The forecast remained steady after May.

Forecast Performance: Navajo Reservoir Inflow Volume







2023 Forecast Error:

- Forecast errors fell into the normal range of errors for the April-June forecasts.
- January-March forecast errors were higher than normal and fell outside of the min/max forecast range due to:
  - March precipitation being in the top10th percentile.
  - Model not capturing all of the March precipitation which resulted in a model snow update in mid-April.
    - Gages are less reliable in large snow years.

Forecasts Performance: Animas River Peak Flow

Mid-April Peak Flow Forecast

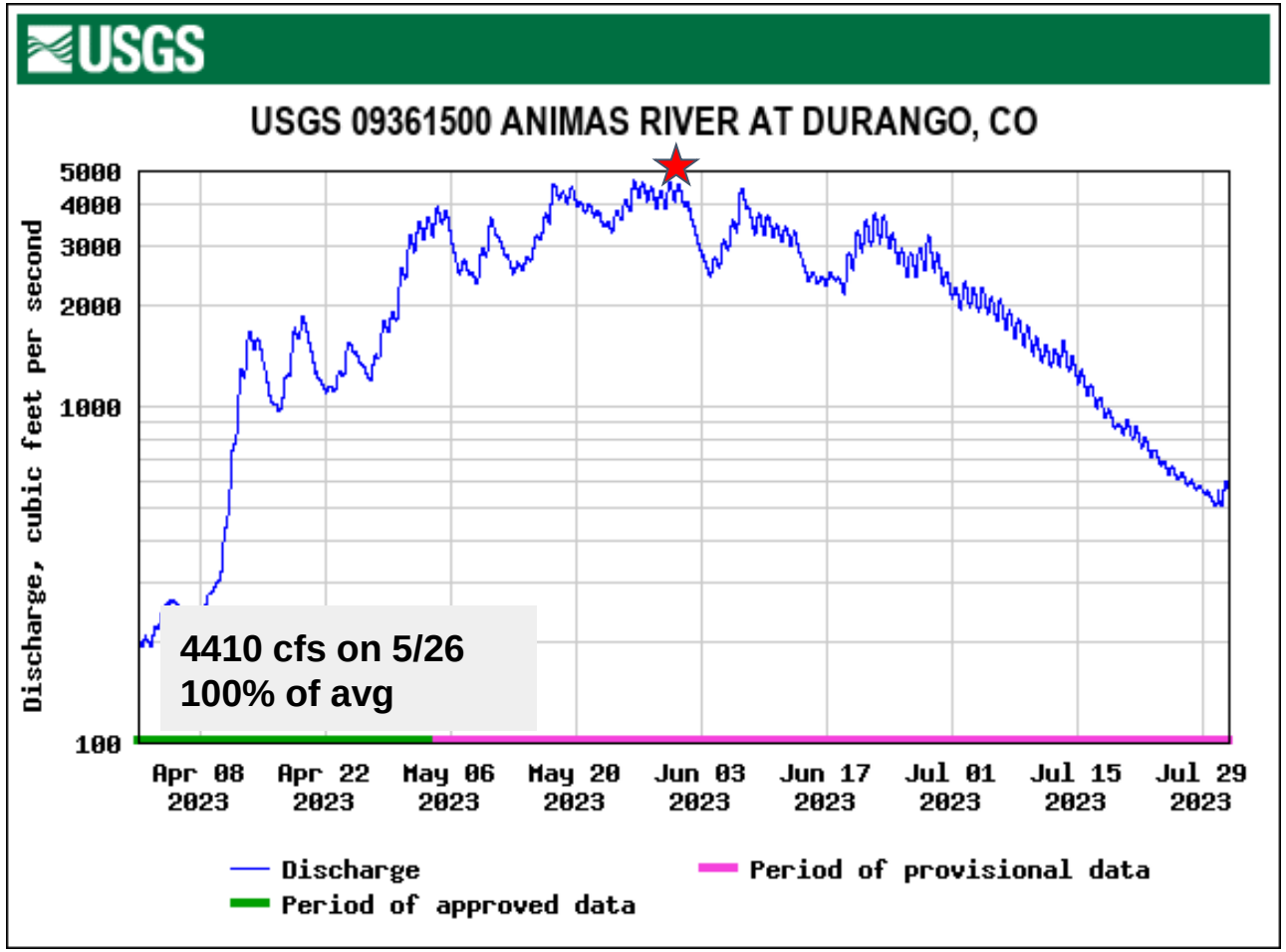
Daily Peak Flow Forecast Magnitude

Exceedance Probability	Mean Daily Flow (cfs)
Maximum	9087
10%	8356
25%	8013
50%	6865
75%	5568
90%	5366
Minimum	4882

Magnitude and Timing are independent forecasts.

Daily Peak Flow Forecast Timing

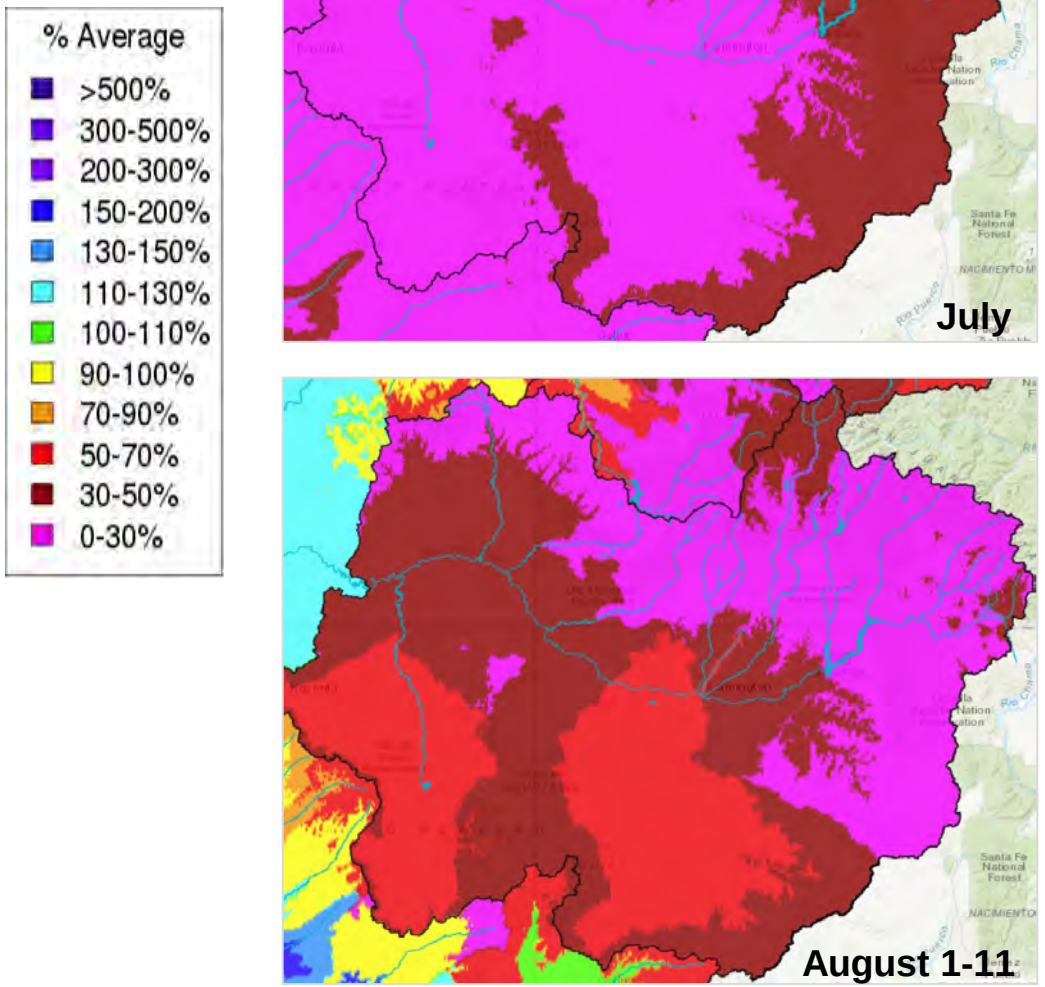
Exceedance Probability	Date of Peak
Latest	2023-06-22
10%	2023-06-20
25%	2023-06-07
50%	2023-06-03
75%	2023-05-22
90%	2023-05-17
Earliest	2023-05-14



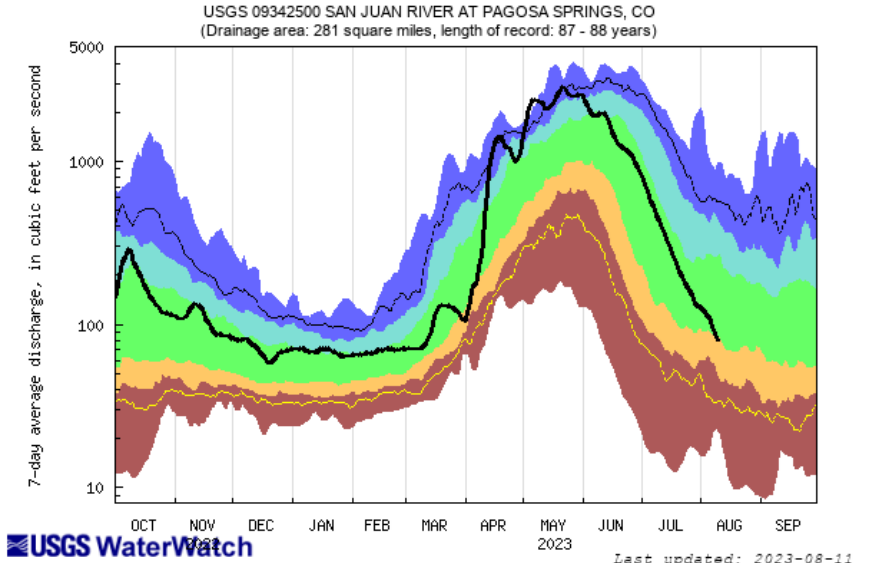
Unsettled spring weather with periods of above and below normal temperatures,cloud cover, and sporadic precipitation produced an extended period of high flows rather than a single well defined peak.This resulted in the early season peak flow forecasts that assume “normal” spring weather to over forecast the peak flow.

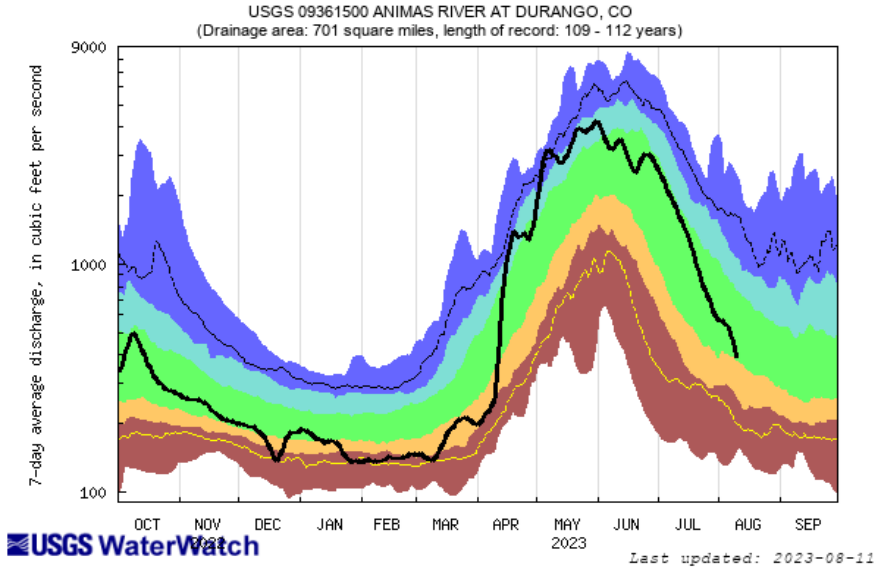
Late August Conditions

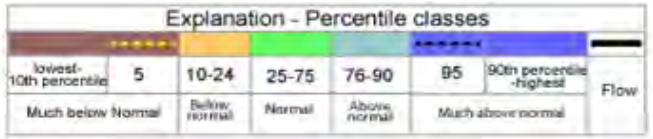
Precipitation



Streamflow







Summary:

- Water Supply Conditions:
  - April -July observed unregulated runoff volumes ranged from 135-175% of average.
    - March was a game changer for water supply conditions.
      - Above normal precipitation and below normal temperatures.
    - Above normal snow conditions and delayed melt, particularly at lower elevations.
    - Unsettled spring weather resulted a extended period of high flows.
      - Near normal peak flows
      - Less efficient runoff in the Animas

  - Current conditions
    - Delayed start to the monsoon
      - Dry July and August…so far
    - Streamflows are near average but declining rapidly to below normal conditions.

- Water Supply Forecasts
  - Forecasts increase from Mar-May due March precipitation and snow model adjustment.
  - Early season forecasts (Jan-Mar) had higher than normal errors.
    - This in not unexpected given the March precipitation and model assumptions.
  - Late season (Apr-Jun) forecasts performed well.
  - Peak flow forecasts were over forecast.

Contact Information

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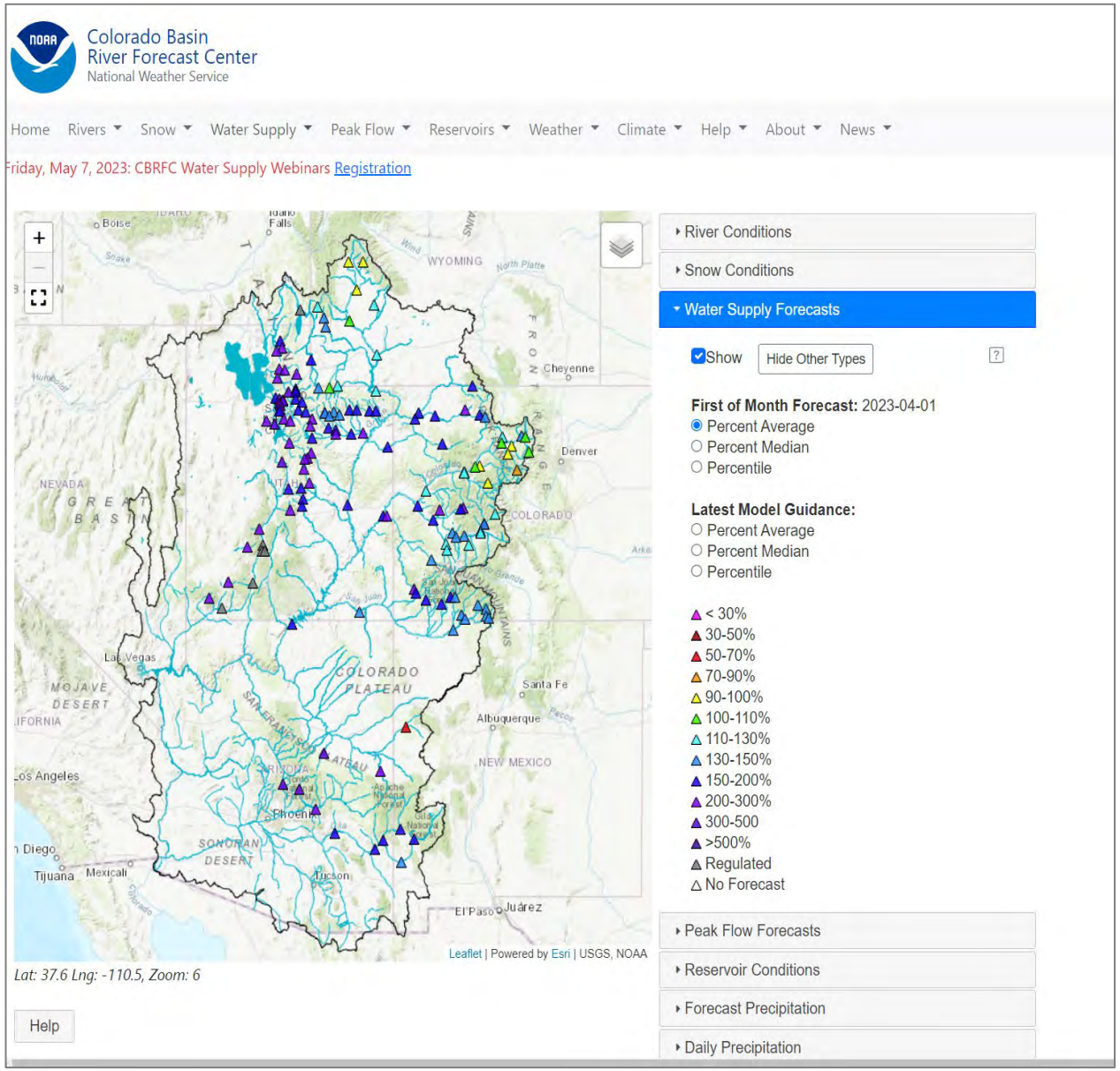
Operational Hydrologist
Available 7 days as week: 6:30am-4pm
Email: cbrfc.operations@noaa.gov
Phone: 801-524-4004

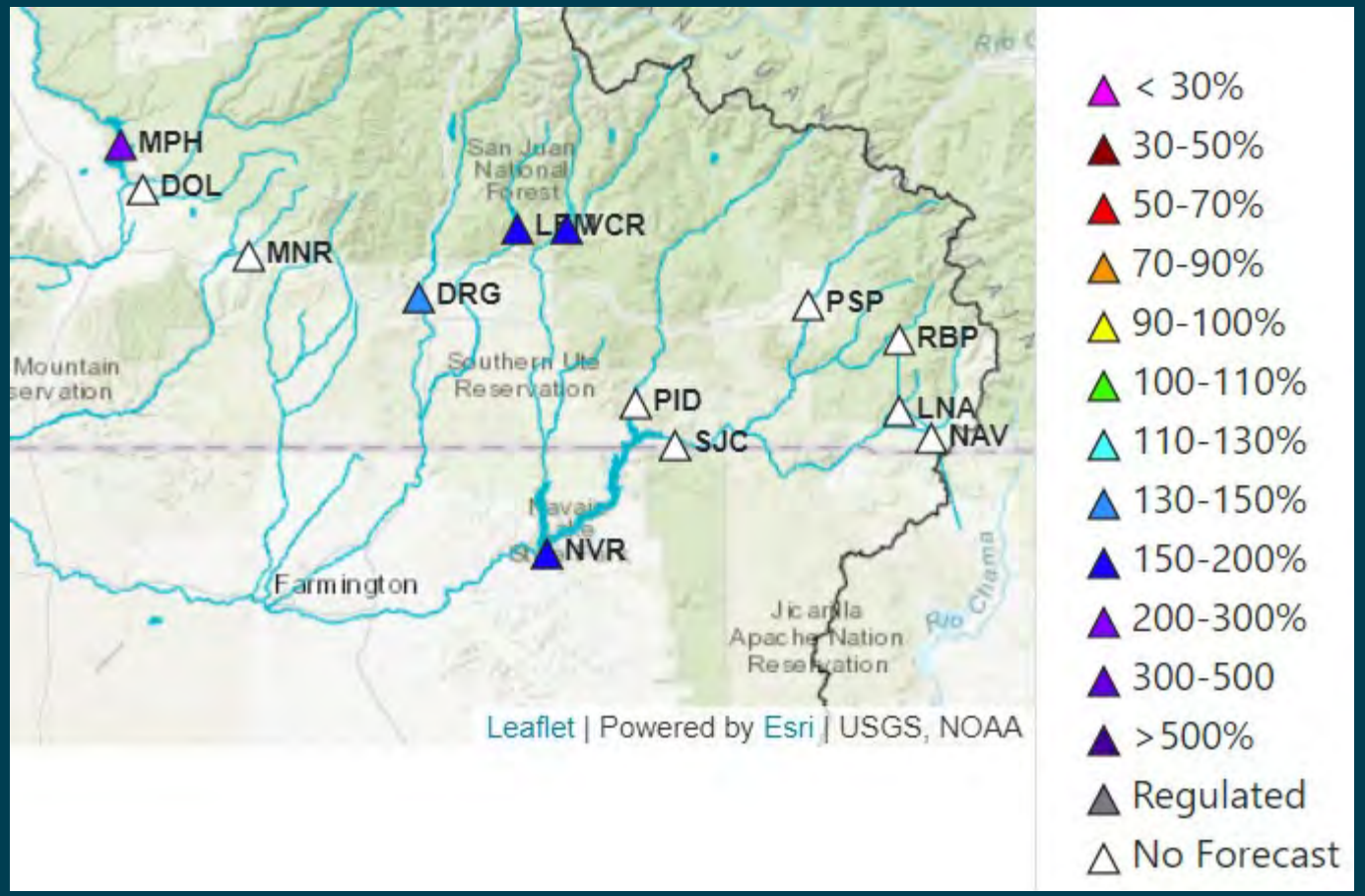
CBRFC Webpage
https://www.cbrfc.noaa.gov/

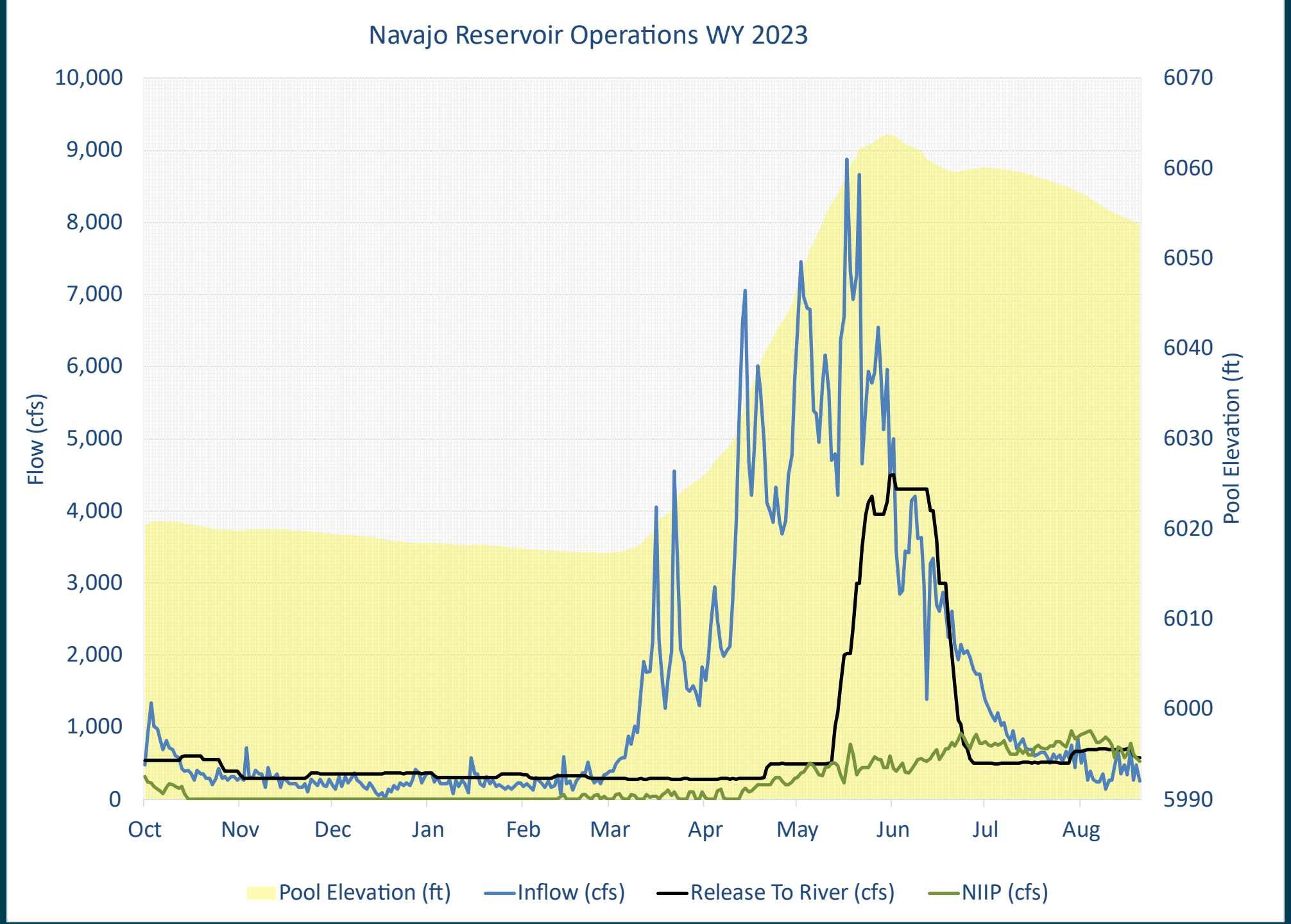
CBRFC Water Supply Presentations
https://www.cbrfc.noaa.gov/present/present.php



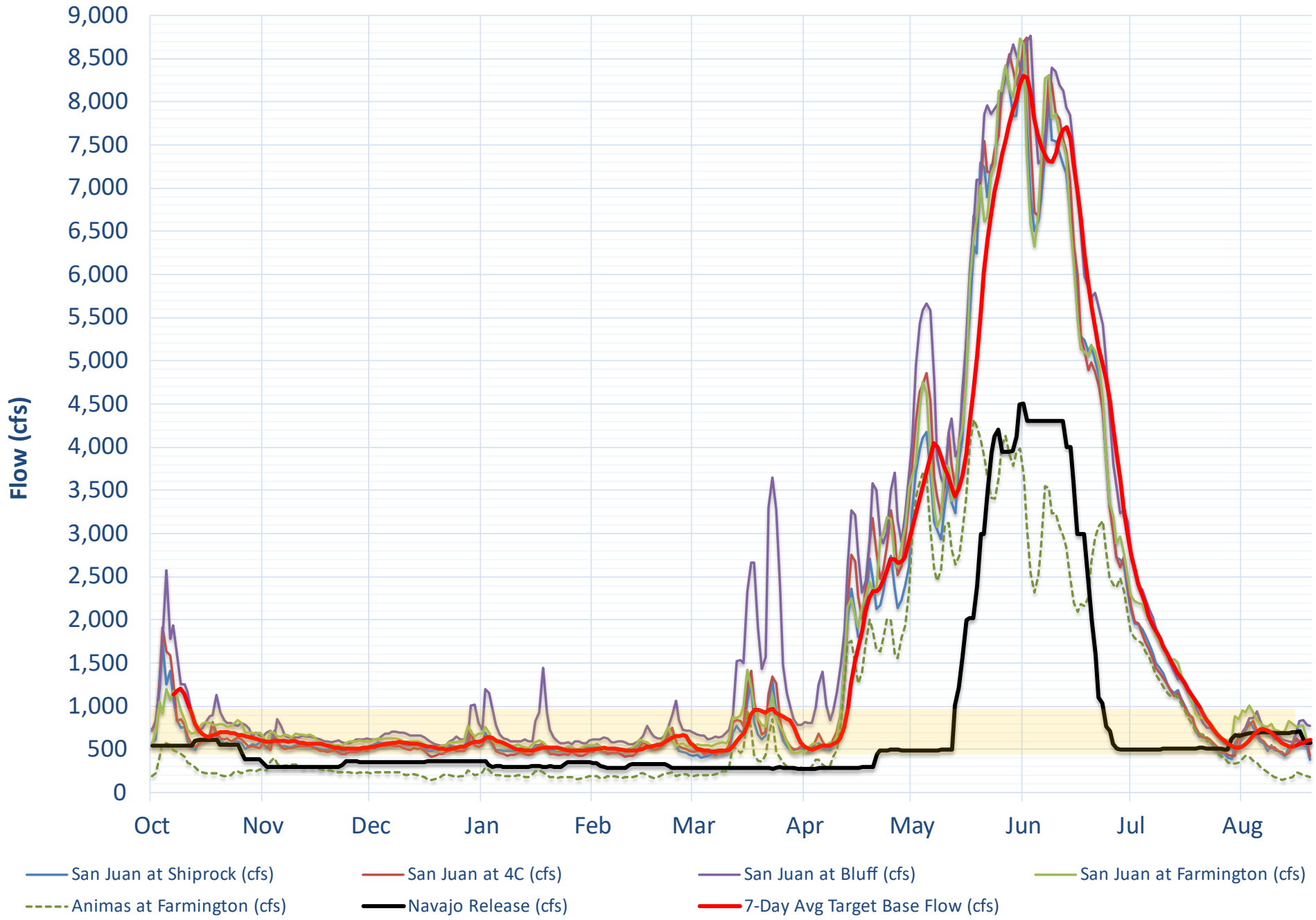
Final Water Supply (April-July)

Navajo:	1,028 kaf (163% avg)
Vallecito:	252 kaf (142% avg)
Lemon:	67 kaf (140% avg)
Animas:	532 kaf (138% avg)
McPhee:	527 kaf (207% avg)
Powell:	10,619 kaf (166% avg)




Navajo Reservoir Operations WY 2023
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Flow (cfs)
6070
6060
6050
6040
6030
6020
6010
6000
5990
Pool Elevation (ft)
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Pool Elevation (ft)
Inflow (cfs)
Release To River (cfs)
NIIP (cfs)

San Juan River Flows WY 2023



Navajo Dam Record of Decision 2006

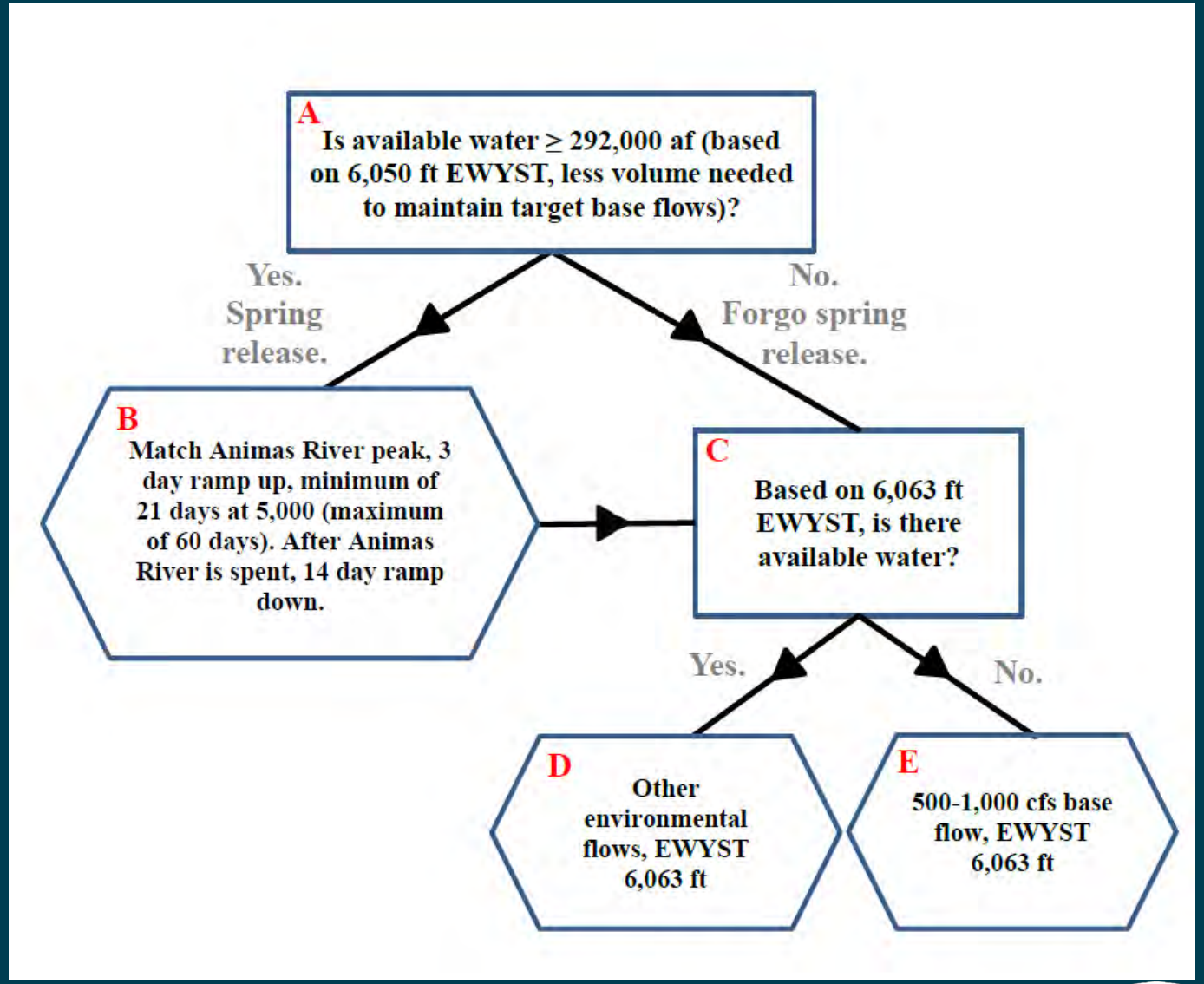
Summary of Action

The Bureau of Reclamation (Reclamation) has completed a final environmental impact statement (EIS) on the operation of Navajo Reservoir, Colorado River Storage Project, San Juan River, New Mexico, Colorado, and Utah. The proposed action is to operate Navajo Dam and Reservoir to meet Endangered Species Act (ESA) related Flow Recommendations for the San Juan River[1] or a reasonable alternative to those recommendations, in a manner which enables both current and future water depletions to proceed in compliance with the ESA. The EIS was prepared by Reclamation to provide sufficient releases of water at times, quantities, and durations believed to be necessary to conserve two endangered fish species, the Colorado pikeminnow (*Ptychocheilus lucius)* and the razorback sucker (*Xyrauchen texanus)* and their critical habitat, as recommended by the San Juan River Basin Recovery Implementation Program's (SJRBRIP)[2] Flow Recommendations, while protecting authorized purposes of the Navajo Unit. Reclamation's goal is to implement the proposed action and, at

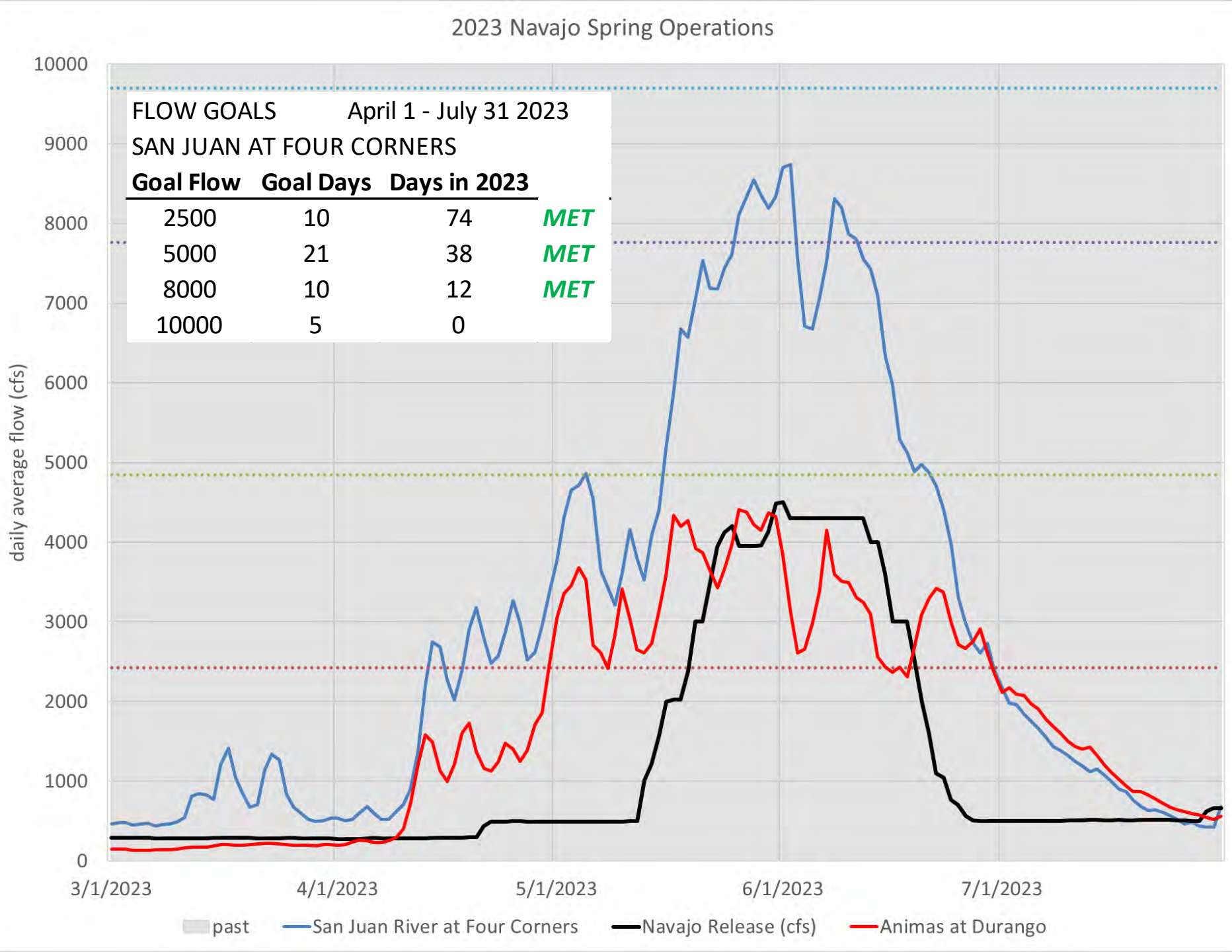
Spring Peak Release Determination

Reclamation operates to the ROD (2006).

The decision tree is used as a guide to aid in determining sufficient water available for a spring peak release. The final volume, shape, and timing is subject to conditions at the time of the release.



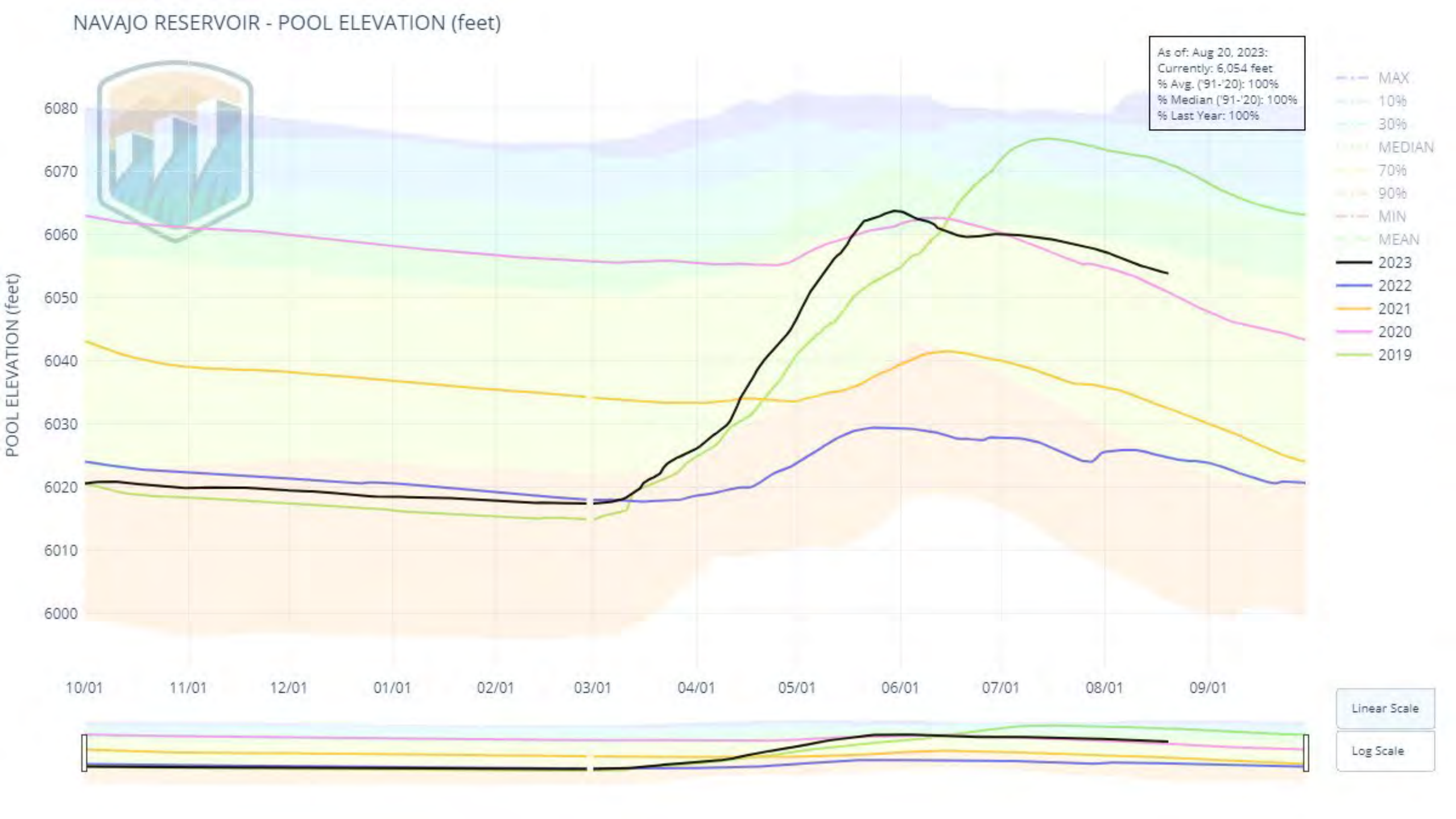
From the SJRIP 2018 Flow Recommendations update

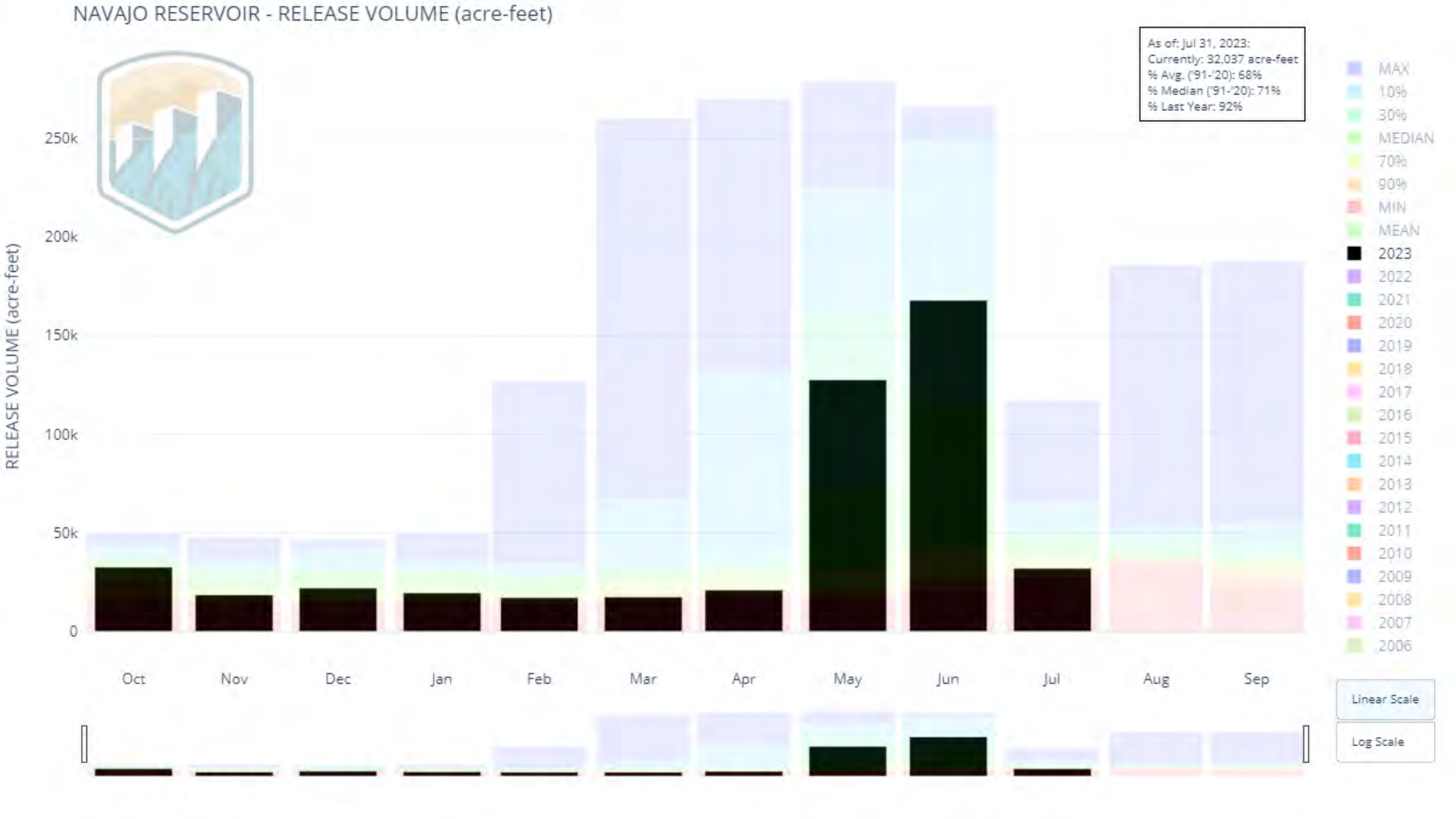

2023 Navajo Spring Operations
FLOW GOALS April 1 - July 31 2023
SAN JUAN AT FOUR CORNERS
Goal Flow Goal Days Days in 2023
2500 10 74 MET
5000 21 38 MET
8000 10 12 MET
10000 5 0
daily average flow (cfs)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
3/1/2023
4/1/2023
5/1/2023
6/1/2023
7/1/2023
past
San Juan River at Four Corners
Navajo Release (cfs)
Animas at Durango

Spring 2023 High Flow Release Volumes

- SJRIP-Recommended Spring Peak Release:
  - May 13 – June 13 ramp-up and peak, June 15 – June 26 ramp-down
  - Total volume over base 242.2 kaf
- Jicarilla Apache Nation Subleased Water to The Nature Conservancy and New Mexico Interstate Stream Commission:
  - June 13- June 15
  - 4,000 cfs for 48 hours
  - Total volume over base 14.7 kaf
- Total Release over base release: 256.9 kaf

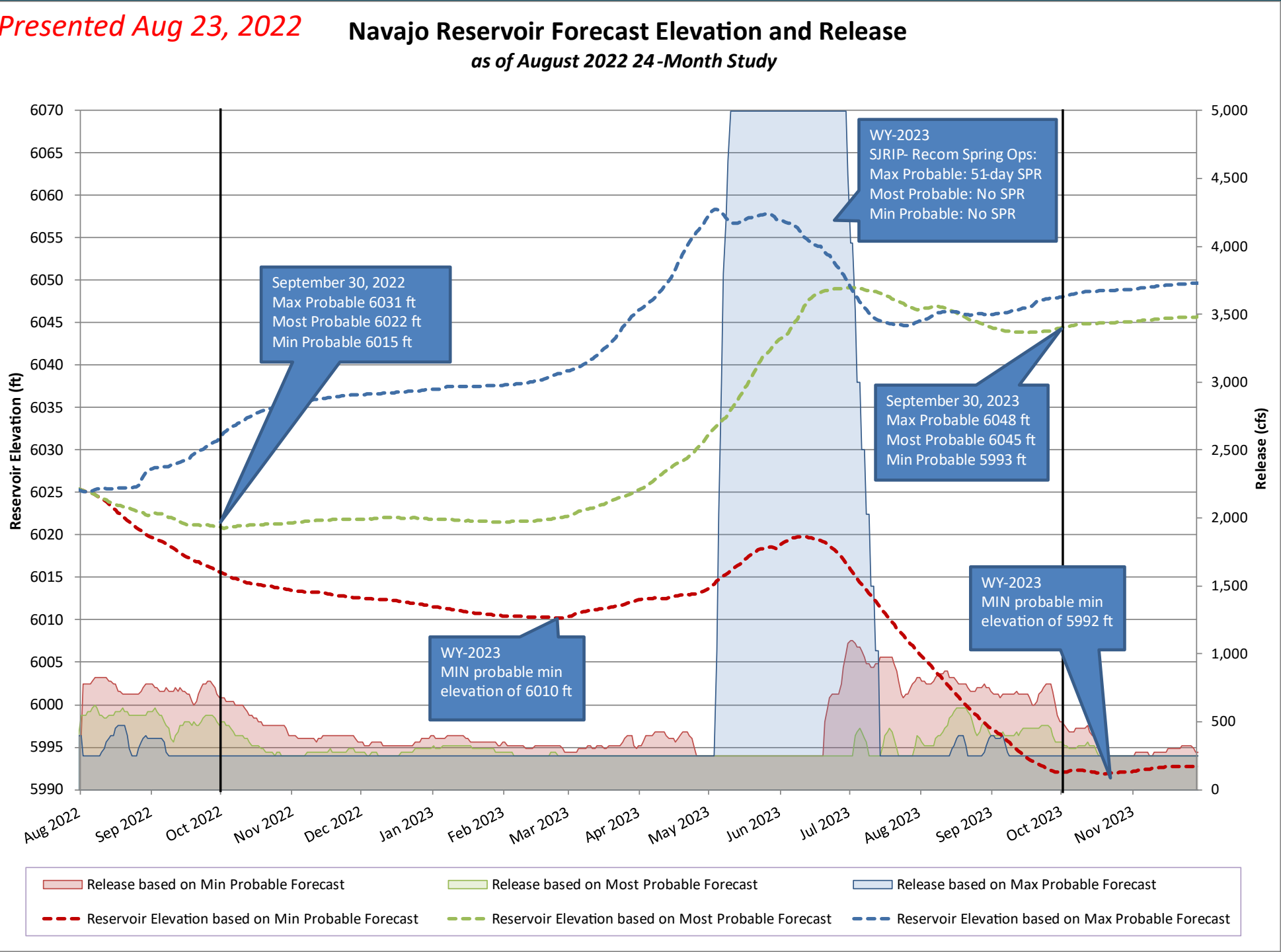
NAVAJO RESERVOIR - POOL ELEVATION (feet)



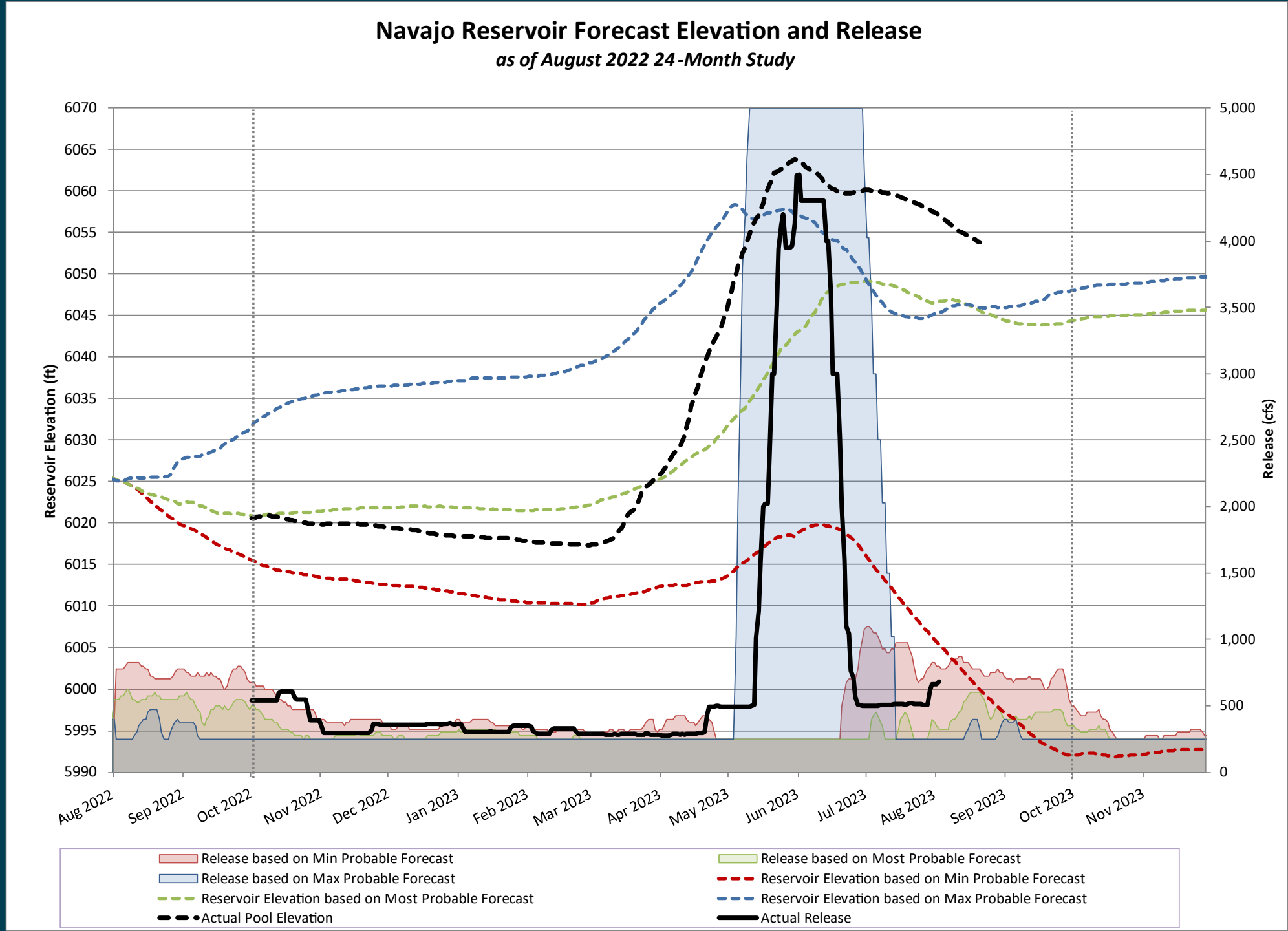

NAVAJO RESERVOIR - RELEASE VOLUME (acre-feet)
As of: Jul 31, 2023:
Currently: 32,037 acre-feet
% Avg. ('91-'20): 68%
% Median ('91-'20): 71%
% Last Year: 92%
RELEASE VOLUME (acre-feet)
250k
200k
150k
100k
50k
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
MAX
10%
30%
MEDIAN
70%
90%
MIN
MEAN
2023
2022
2021
2020
2019
2018
2017
2016
2015
2014
2013
2012
2011
2010
2009
2008
2007
2006
Linear Scale
Log Scale

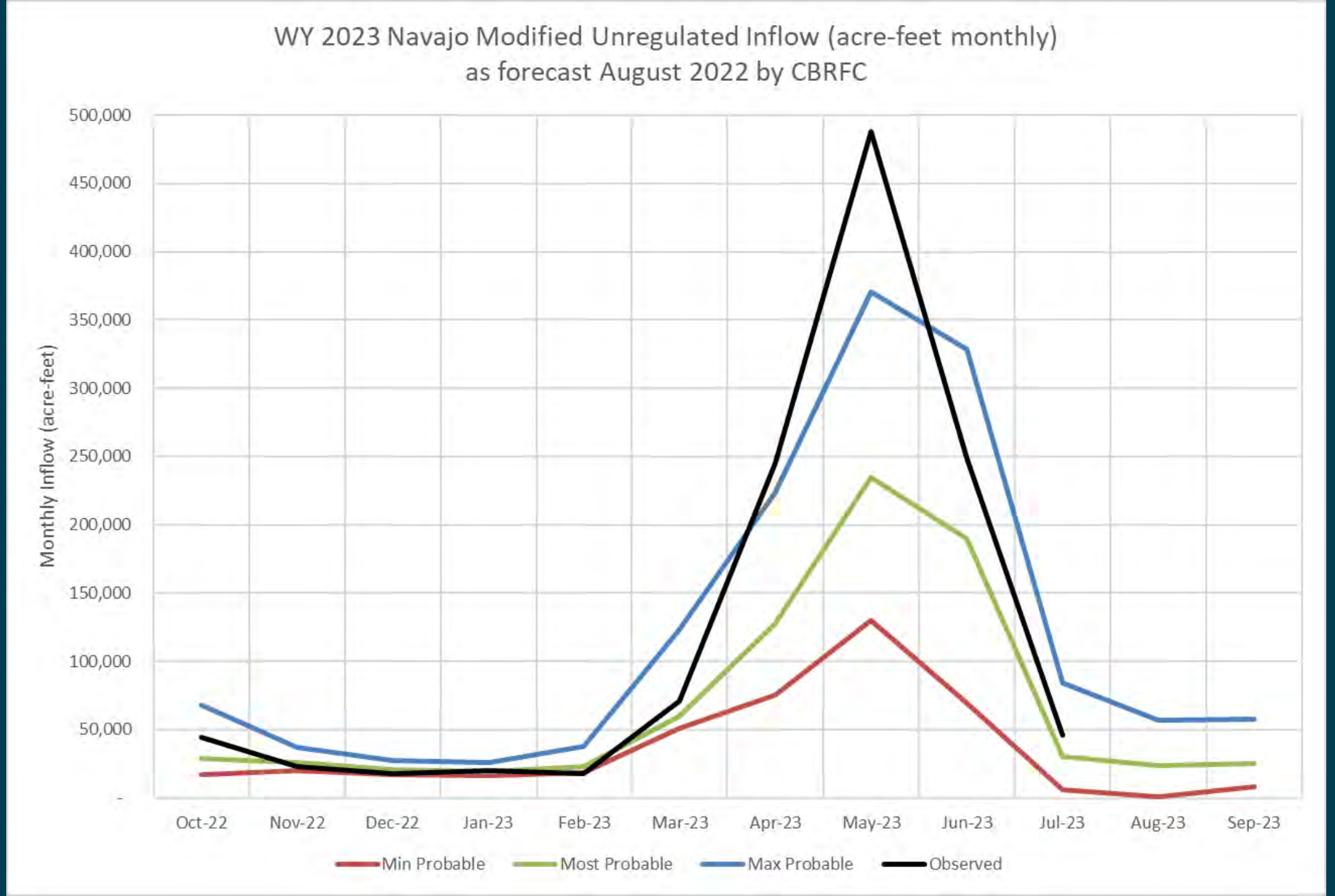
How did the Ops forecast from last August do?

Presented Aug 23, 2022



How did the Ops forecast from last August do?




WY 2023 Navajo Modified Unregulated Inflow (acre-feet monthly)
as forecast August 2022 by CBRFC
Monthly Inflow (acre-feet)
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
Oct-22
Nov-22
Dec-22
Jan-23
Feb-23
Mar-23
Apr-23
May-23
Jun-23
Jul-23
Aug-23
Sep-23
Min Probable
Most Probable
Max Probable
Observed

Forecast Probabilities Refresher

- MIN PROBABLE – There is a 90% chance the inflow will be higher than this
- MOST PROBABLE – There is a 50% chance the inflow will be higher than this and a 50% chance the inflow will be lower than this.
- MAX PROBABLE – There is a 10% chance the inflow will be higher than this
- This captures 80% of the uncertainty. There remains a 10% chance the inflow will be lower than the Min Probable and a 10% chance that the inflow will be higher than the Max Probable. How wide this range is can give an indication of the level of uncertainty.

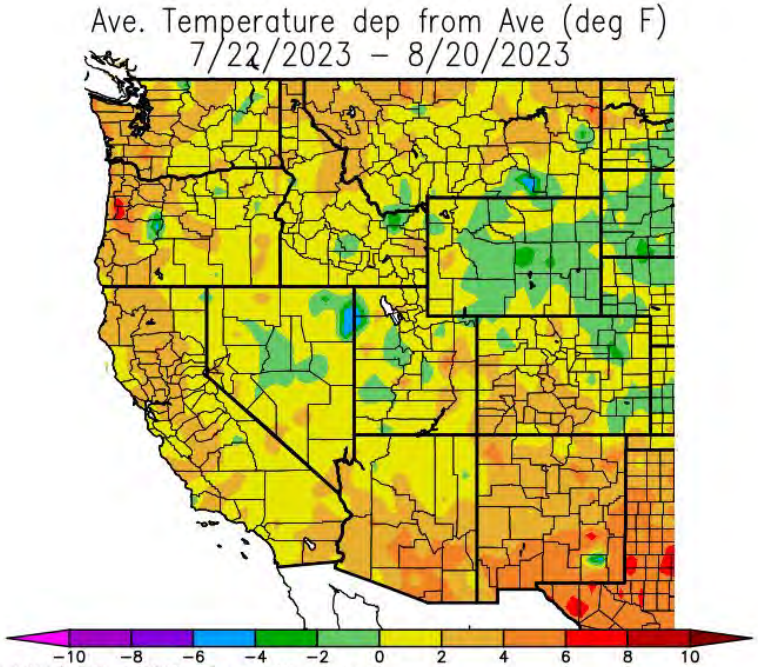
Seasonal Outlook

Navajo Reservoir

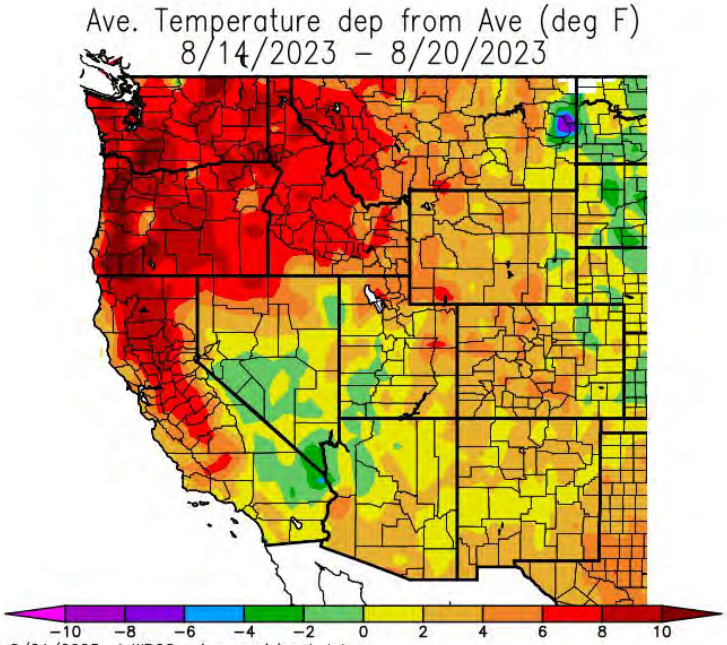
August 22nd, 2023

2023 Seasonal Outlook

30-Day & 7-Day Departure from Normal Temperature

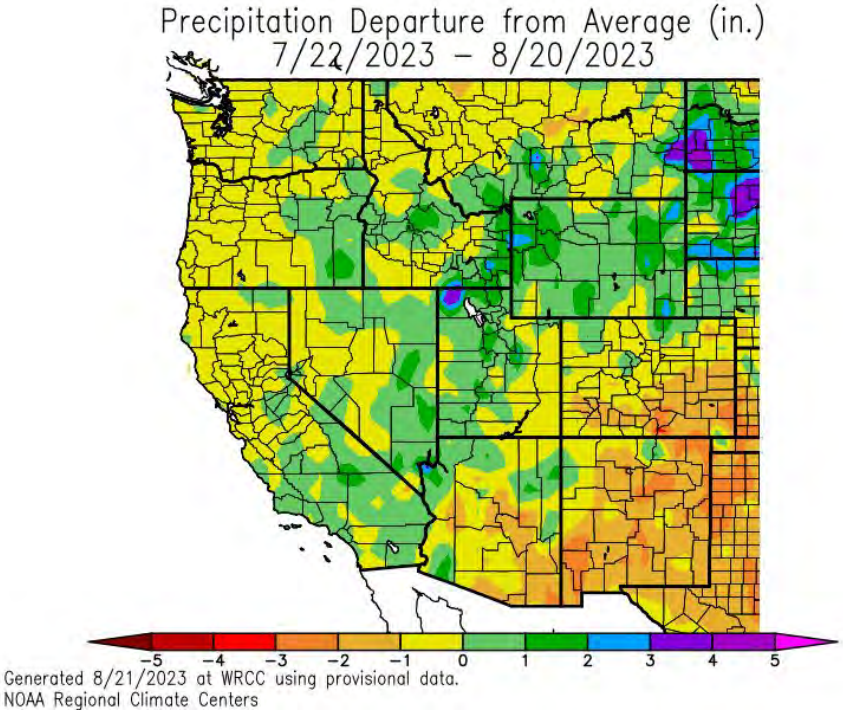


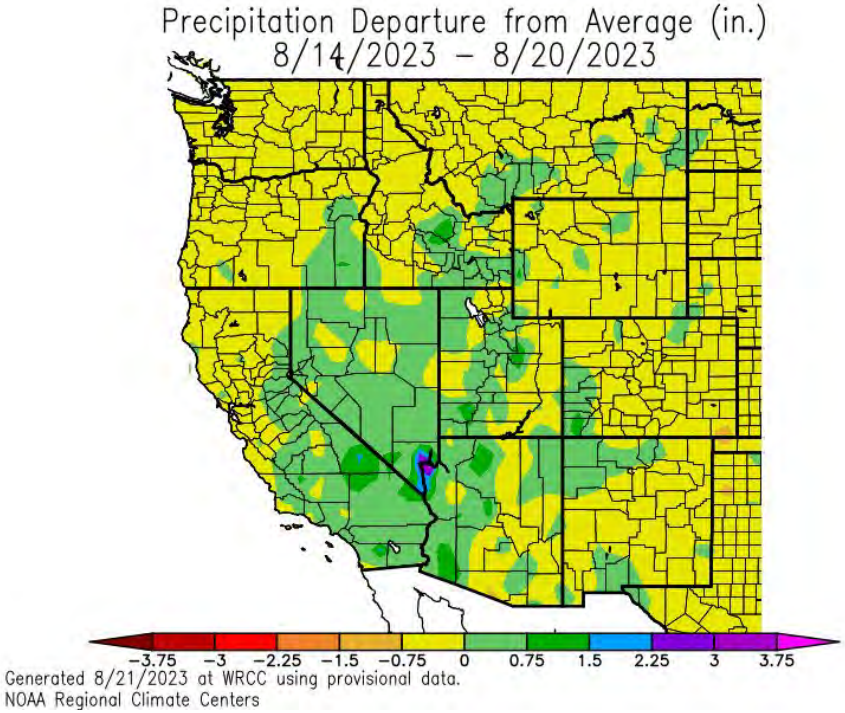
Generated 8/21/2023 at WRCC using provisional data.
NOAA Regional Climate Centers



Generated 8/21/2023 at WRCC using provisional data.
NOAA Regional Climate Centers

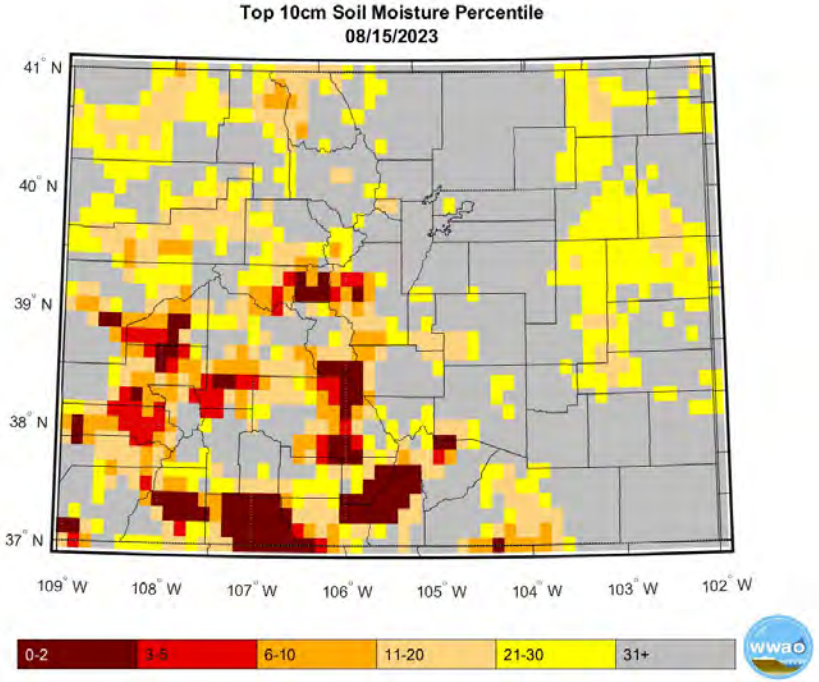
30-Day & 7-Day Departure from Normal Precipitation

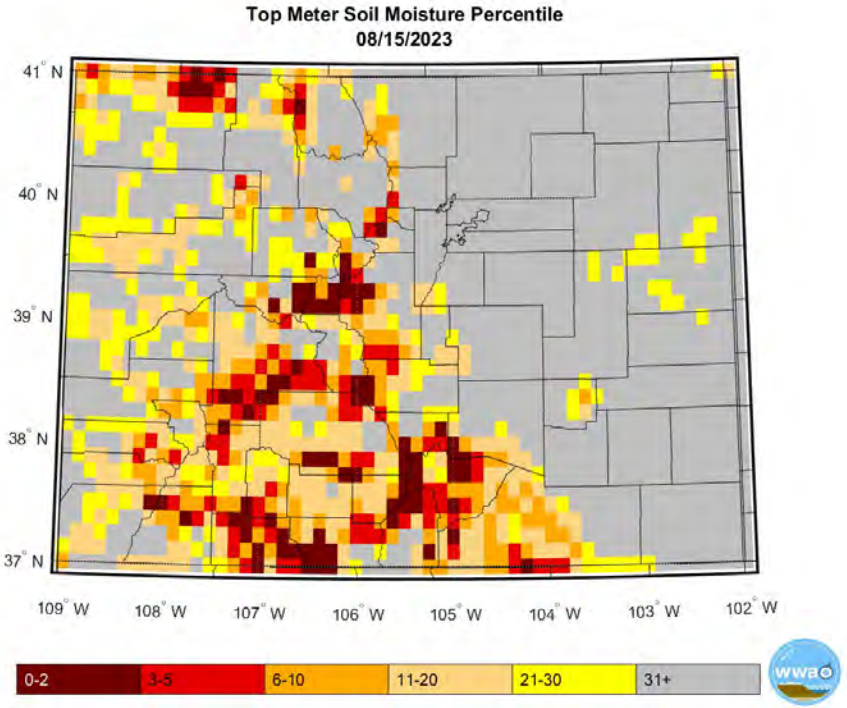




2023 Seasonal Outlook

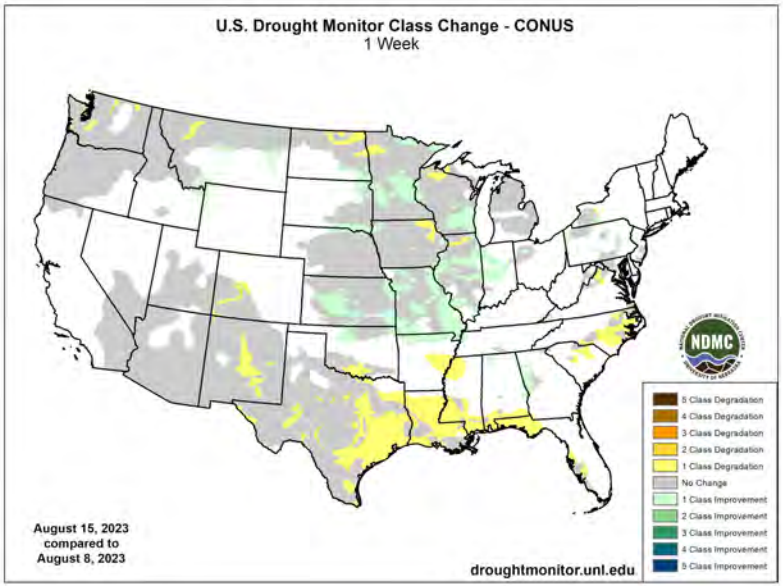
Soil Moisture Drought Monitor





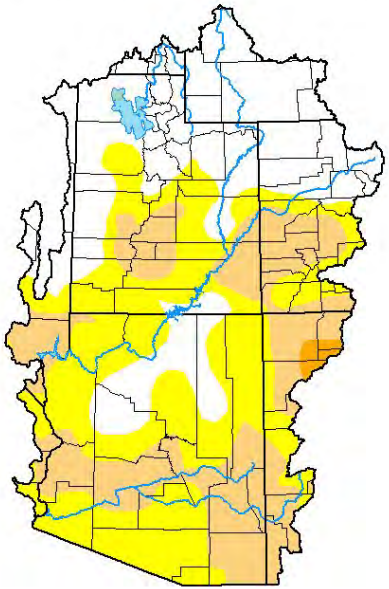
2023 Seasonal Outlook

US Drought Monitor



U.S. Drought Monitor

Colorado Basin RFC



August 15, 2023

(Released Thursday, Aug. 17, 2023)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	35.61	64.39	27.37	0.74	0.00	0.00
Last Week 08-08-2023	35.78	64.22	26.39	0.74	0.00	0.00
3 Months Ago 05-16-2023	63.85	36.15	10.12	1.00	0.00	0.00
Start of Calendar Year 01-03-2023	13.39	86.61	56.79	36.50	8.32	0.53
Start of Water Year 09-27-2022	0.50	99.50	73.05	45.22	18.24	1.01
One Year Ago 08-16-2022	0.37	99.63	89.69	56.52	25.11	1.13

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

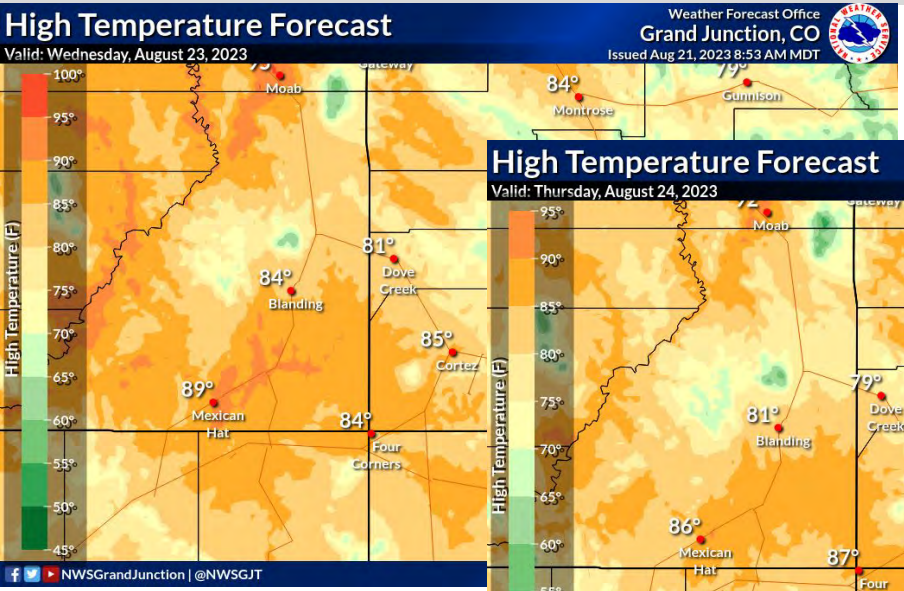
Author:

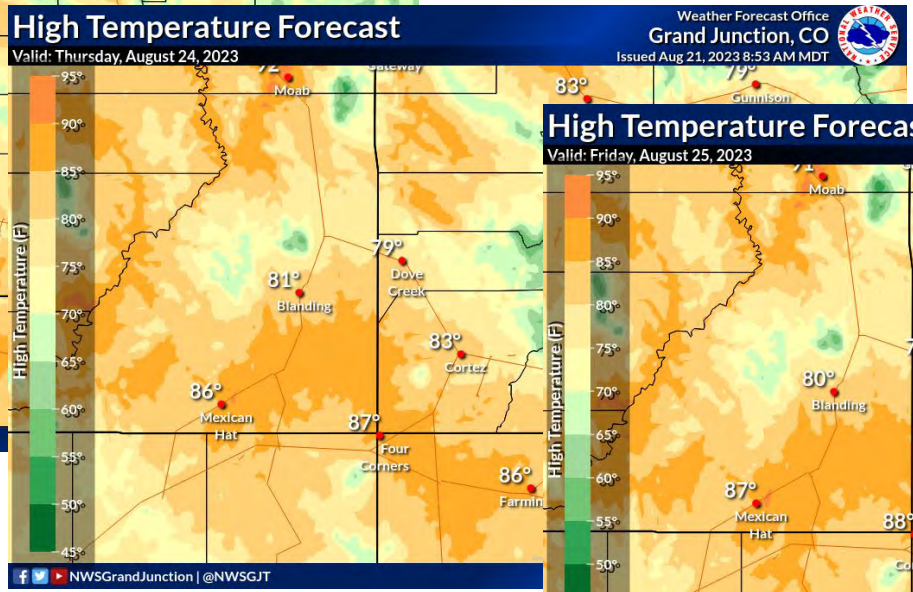
Lindsay Johnson
National Drought Mitigation Center

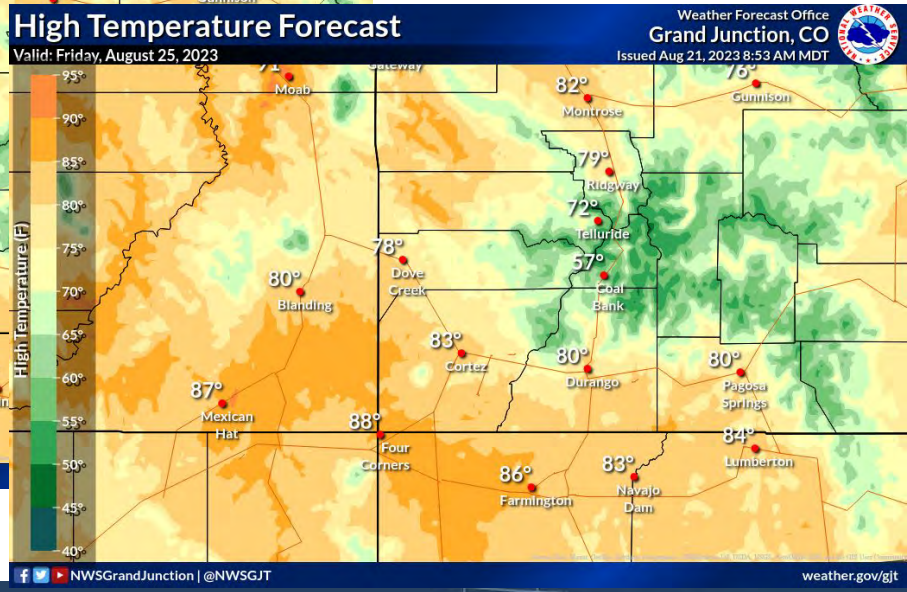
droughtmonitor.unl.edu

2023 Seasonal Outlook

NWS Max Temperature Forecasts

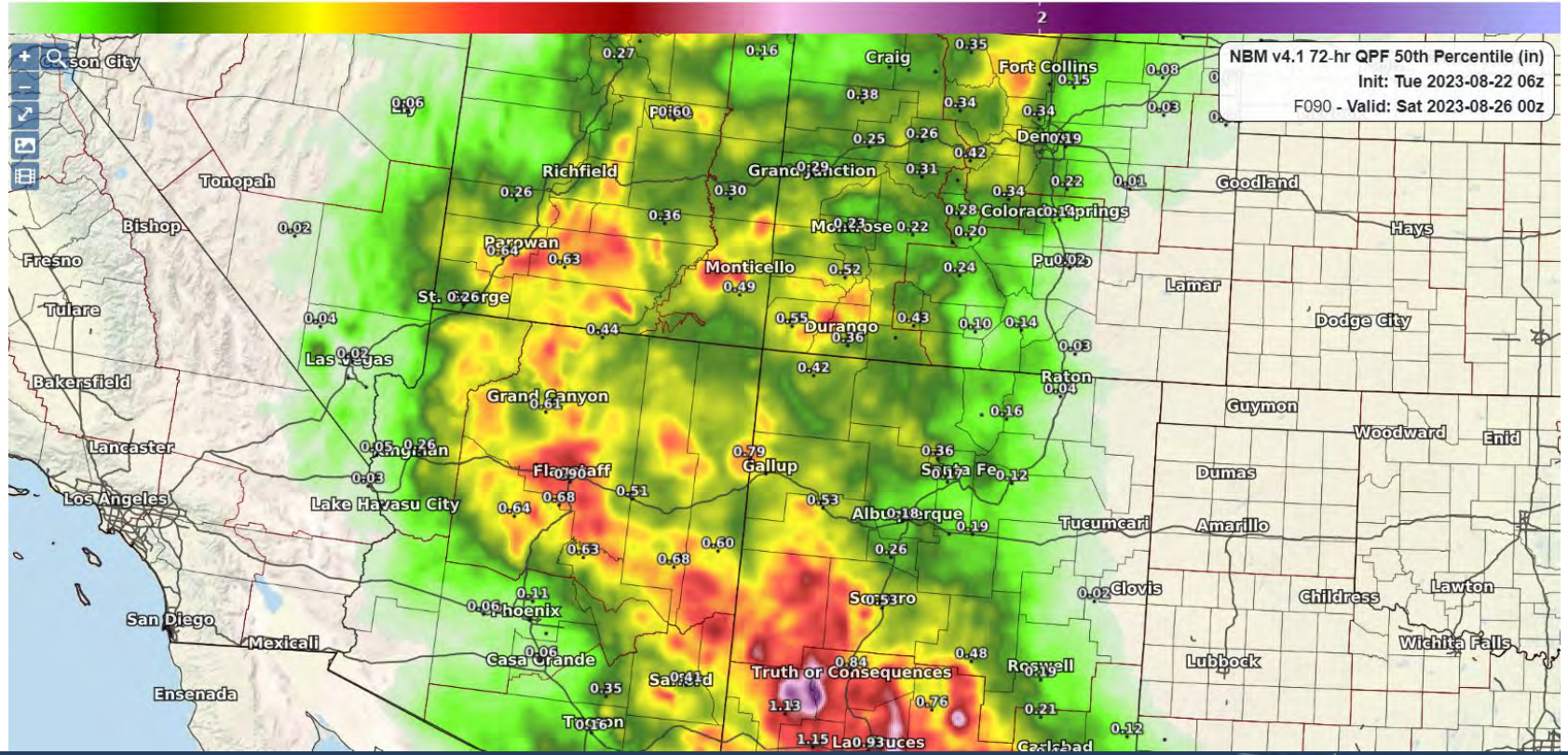






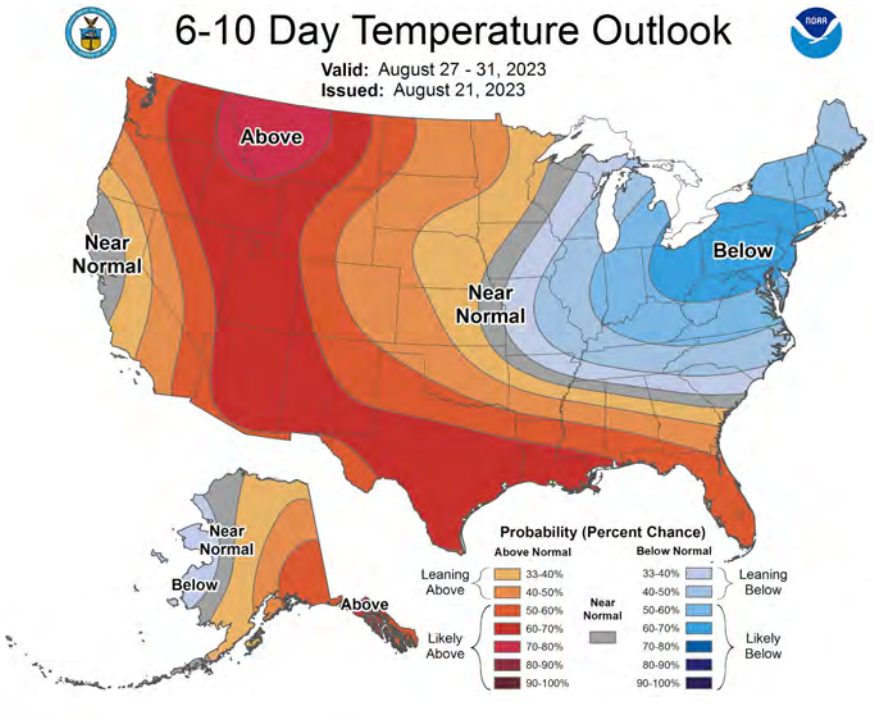
2023 Seasonal Outlook

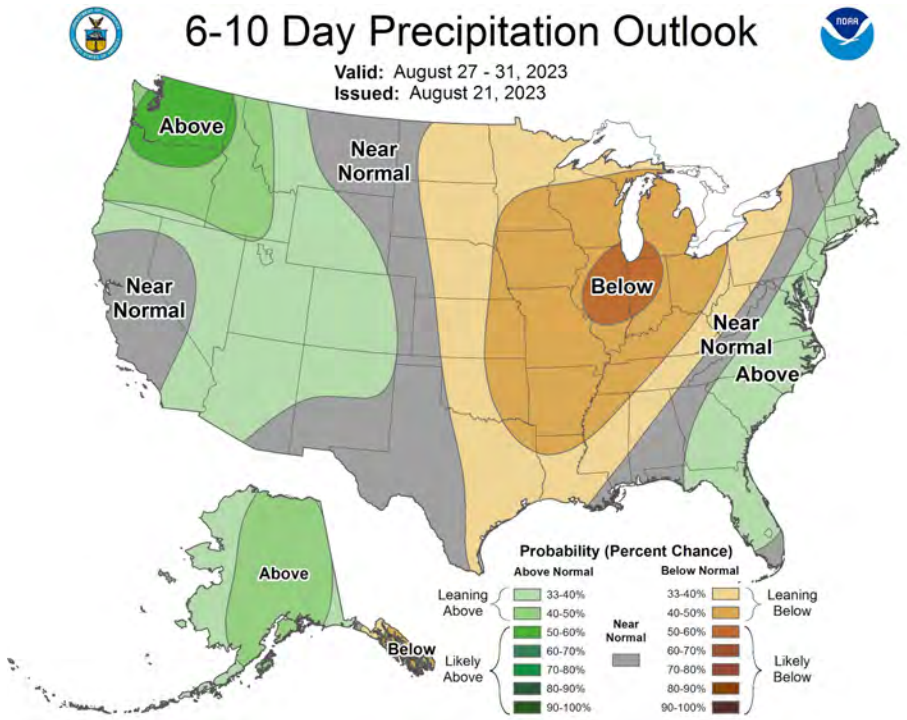
72-Hr Precipitation Estimate Ending Saturday 6 PM MDT



2023 Seasonal Outlook

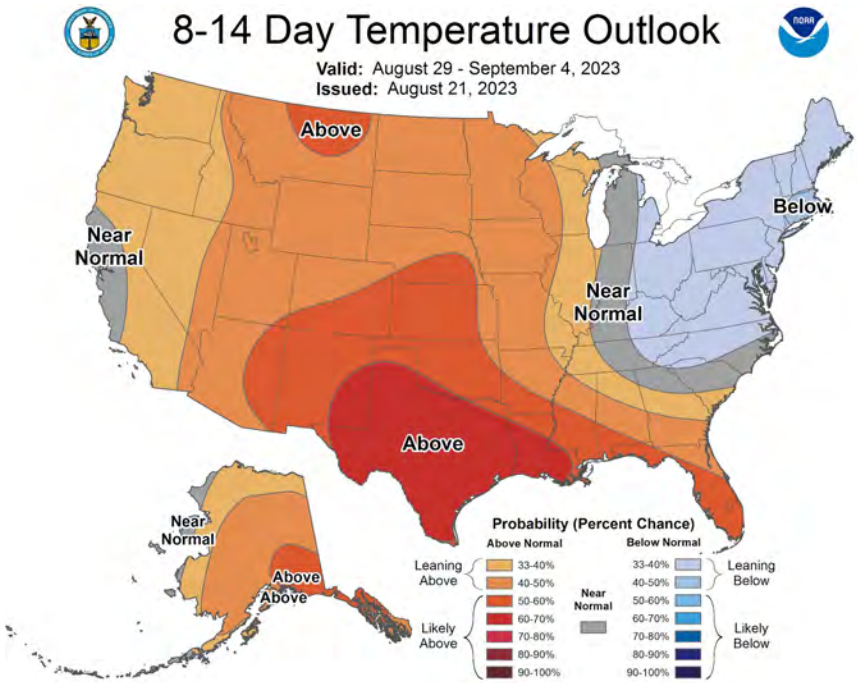
Climate Prediction Center: 6 to 10 Day Outlook

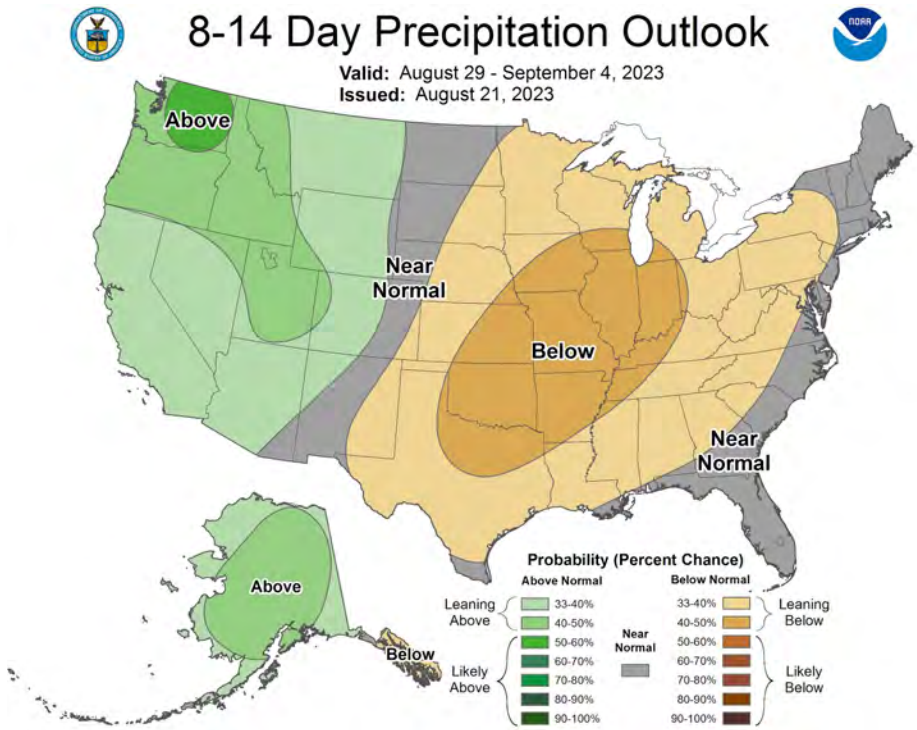




2023 Seasonal Outlook

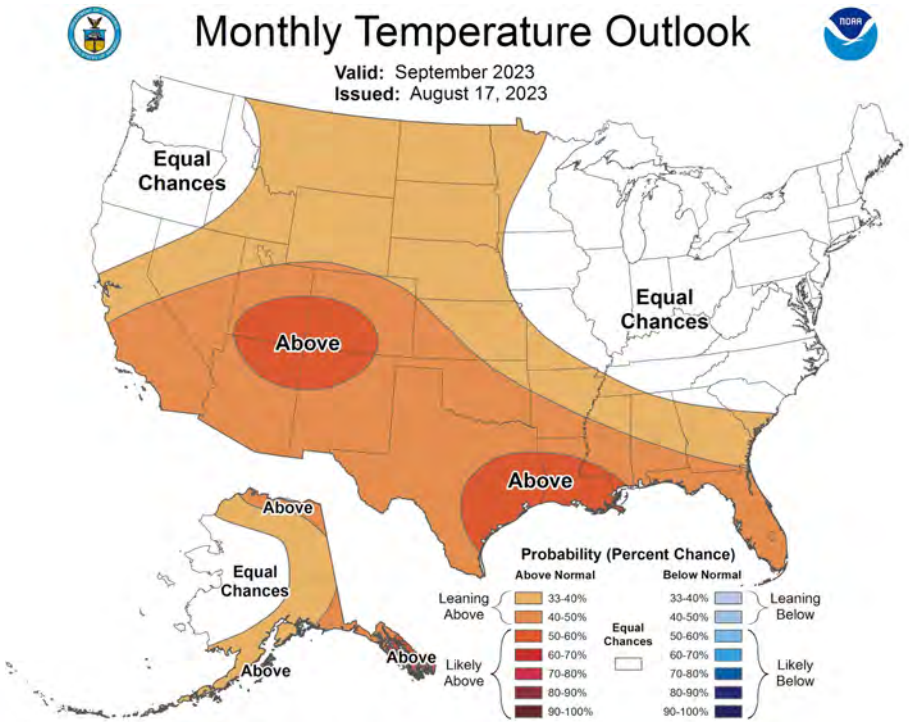
Climate Prediction Center: 8 to 14 Day Outlook

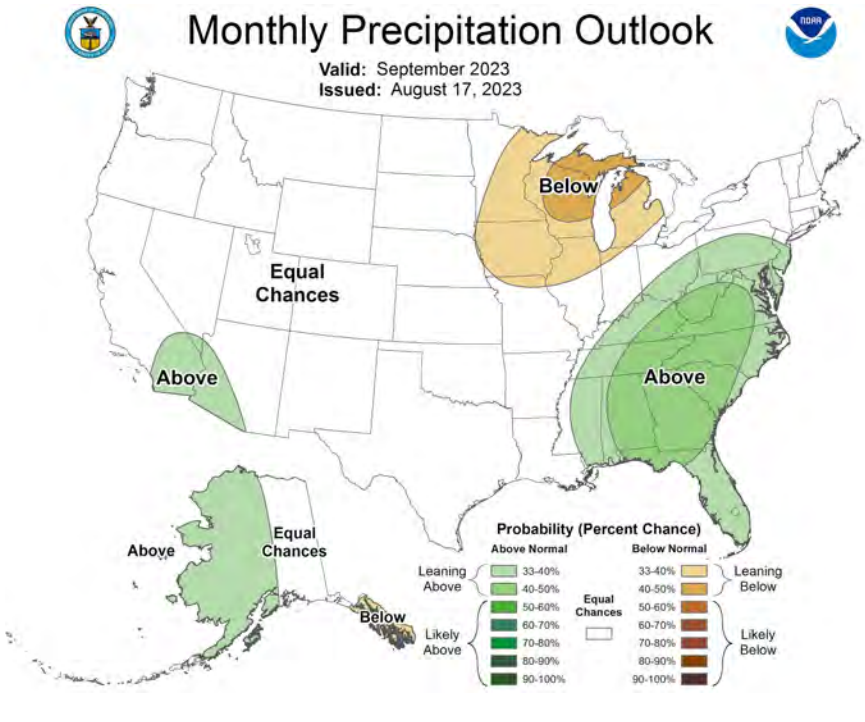




2023 Seasonal Outlook

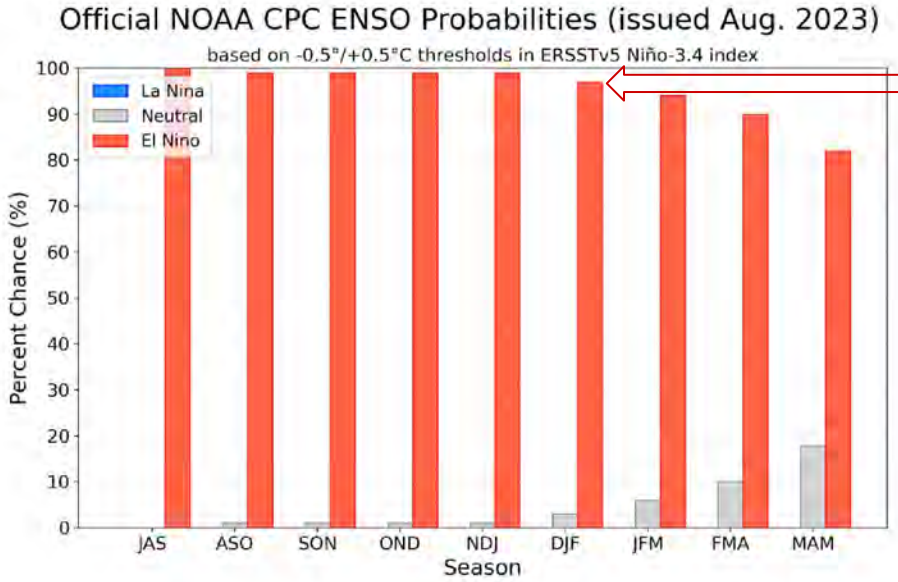
Climate Prediction Center: September Outlook





Current ENSO Alert System Status: **El Nino Advisory**

El Nino conditions are anticipated to continue through the Northern Hemisphere winter (greater than 95% through Dec, 2023 - Feb, 2024)



95% chance of El Nino continuing Dec - Feb, 2024

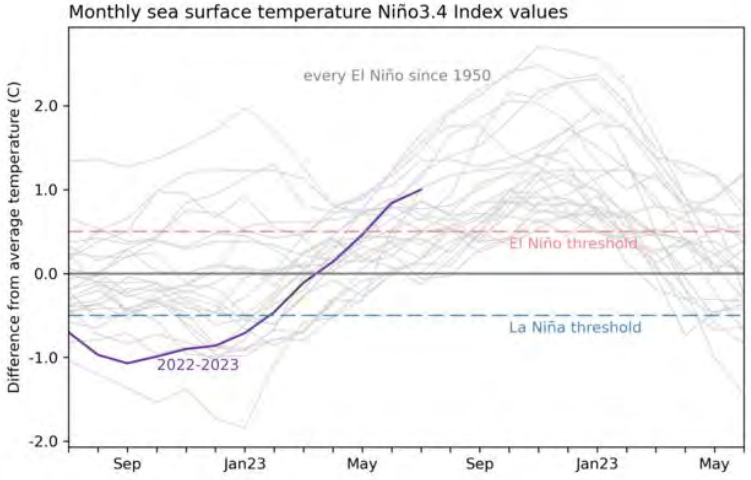
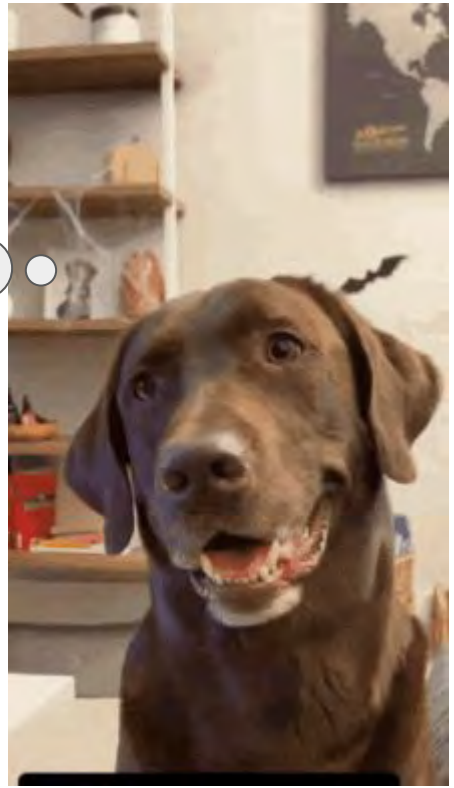


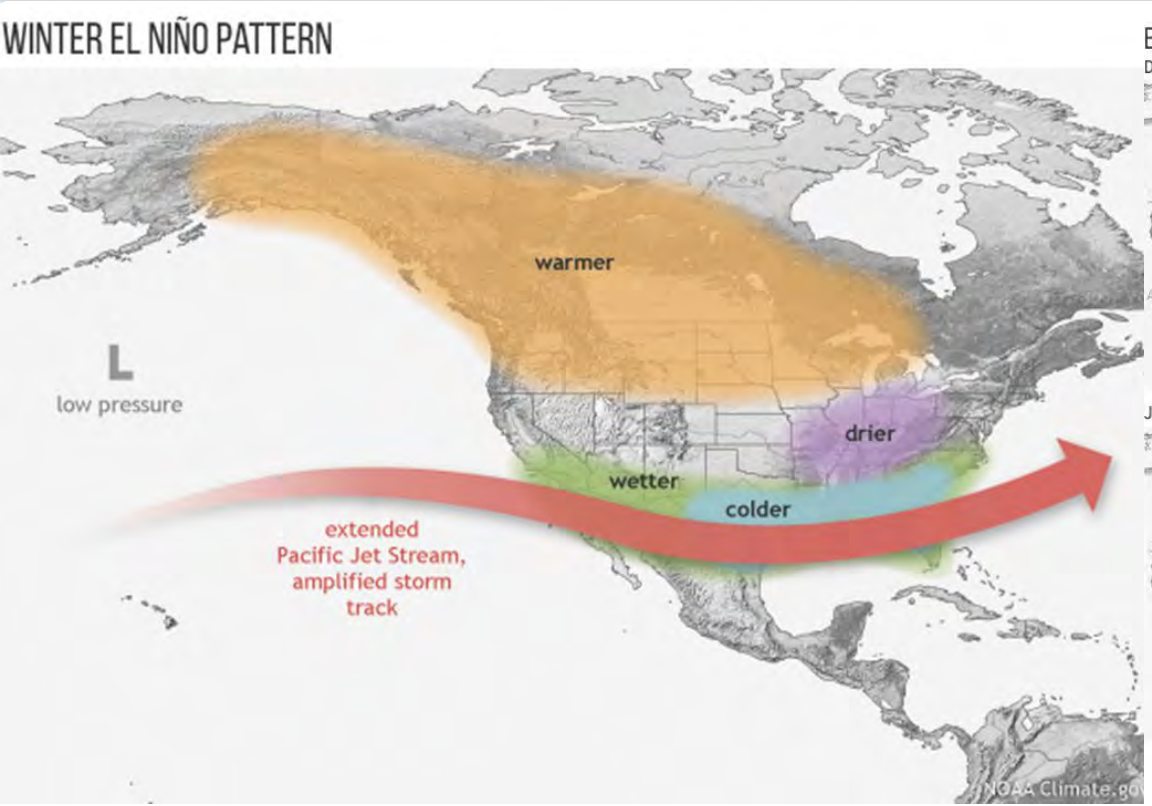
Figure 7. Official ENSO probabilities for the Niño 3.4 sea surface temperature index (5°N-5°S, 120°W-170°W). Figure updated 10 August 2023.

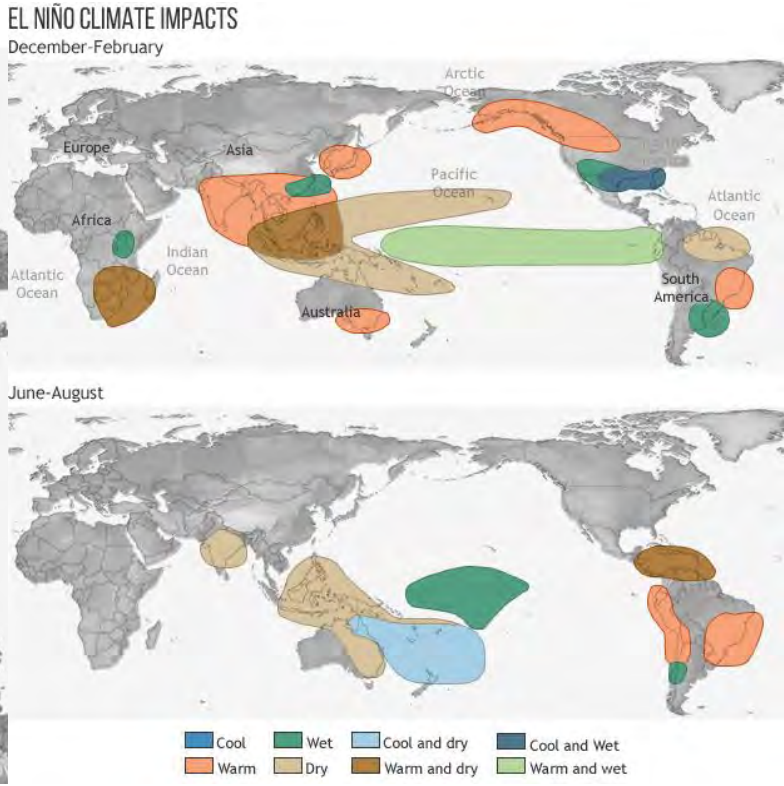
So what does that mean in terms of weather??...



Seasonal Outlook

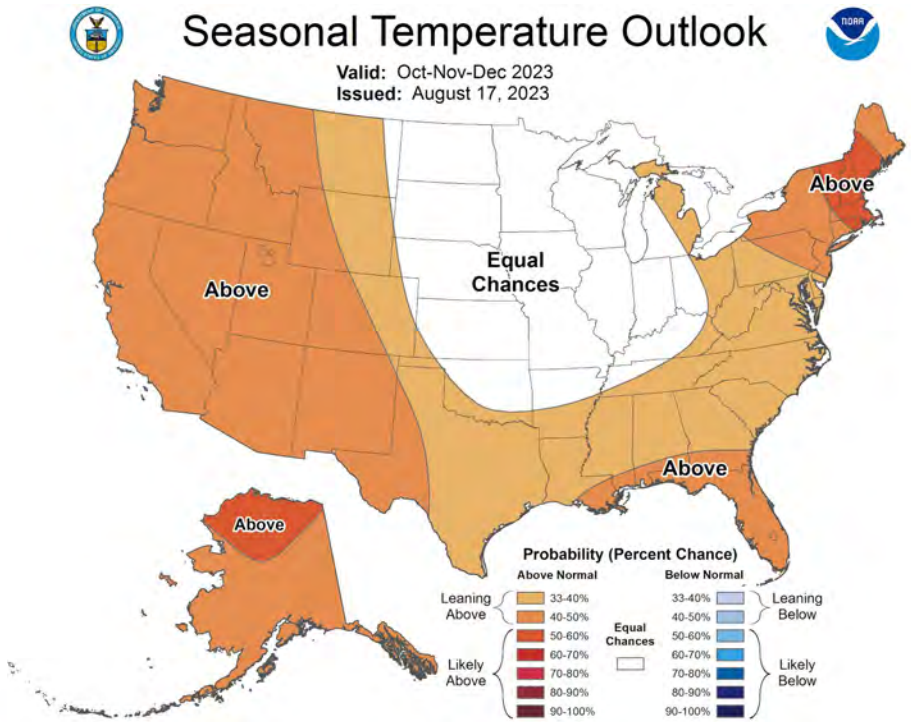
"Typical" ENSO Patterns & Impacts

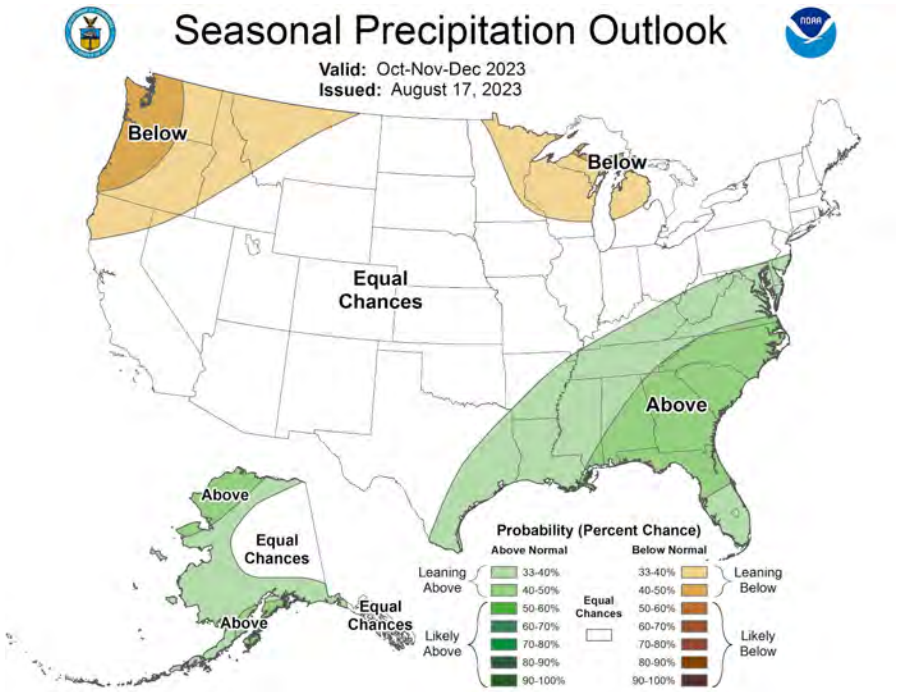




Seasonal Outlook

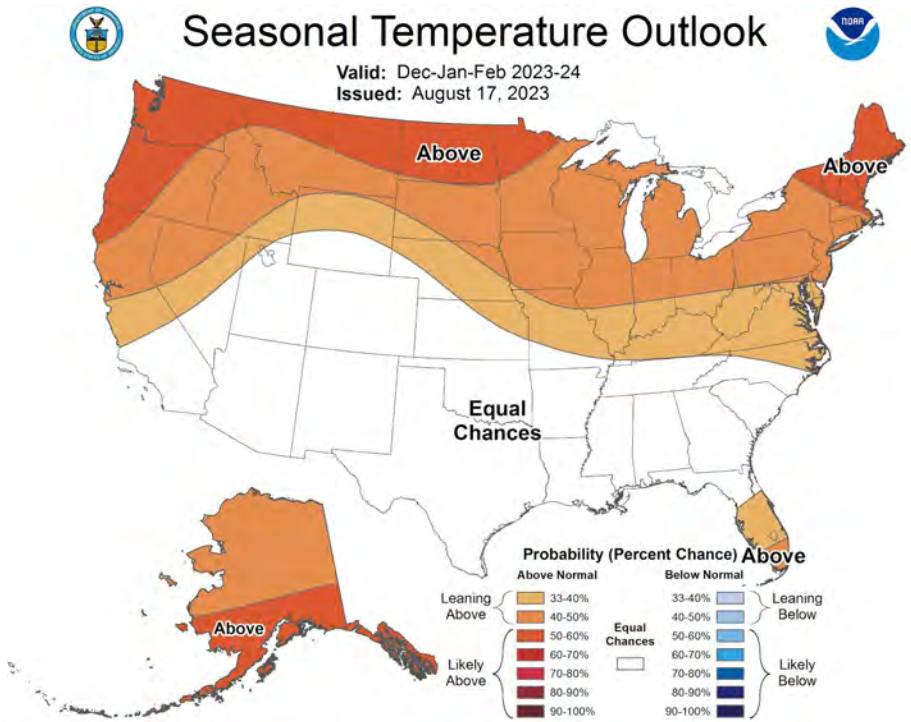
Climate Prediction Center: Seasonal Outlook Oct - Dec

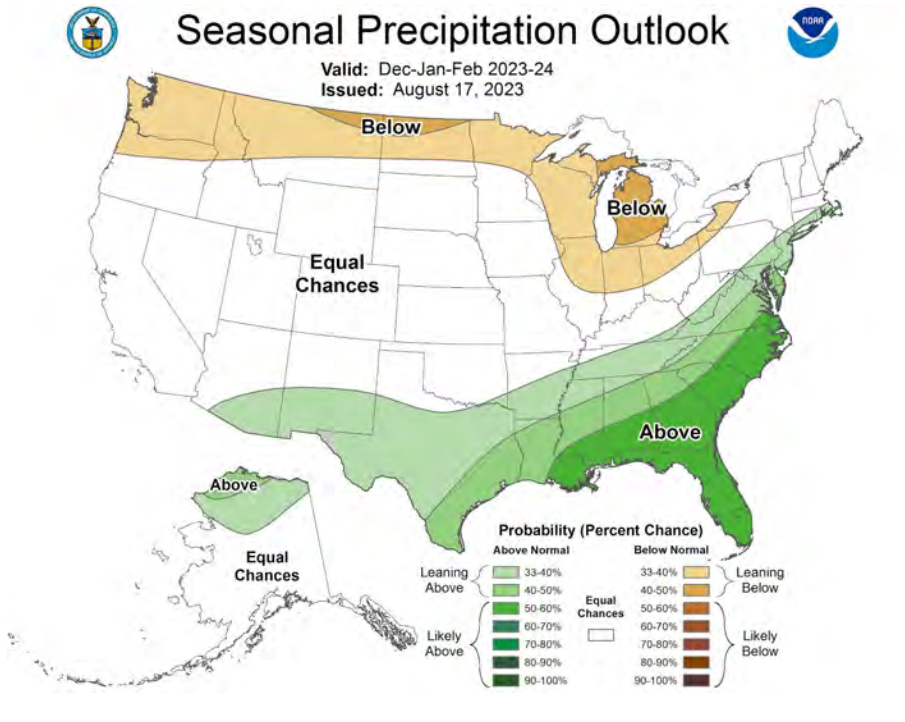




Seasonal Outlook

Climate Prediction Center: Seasonal Outlook Dec - Feb





Thank you!

Any Questions?

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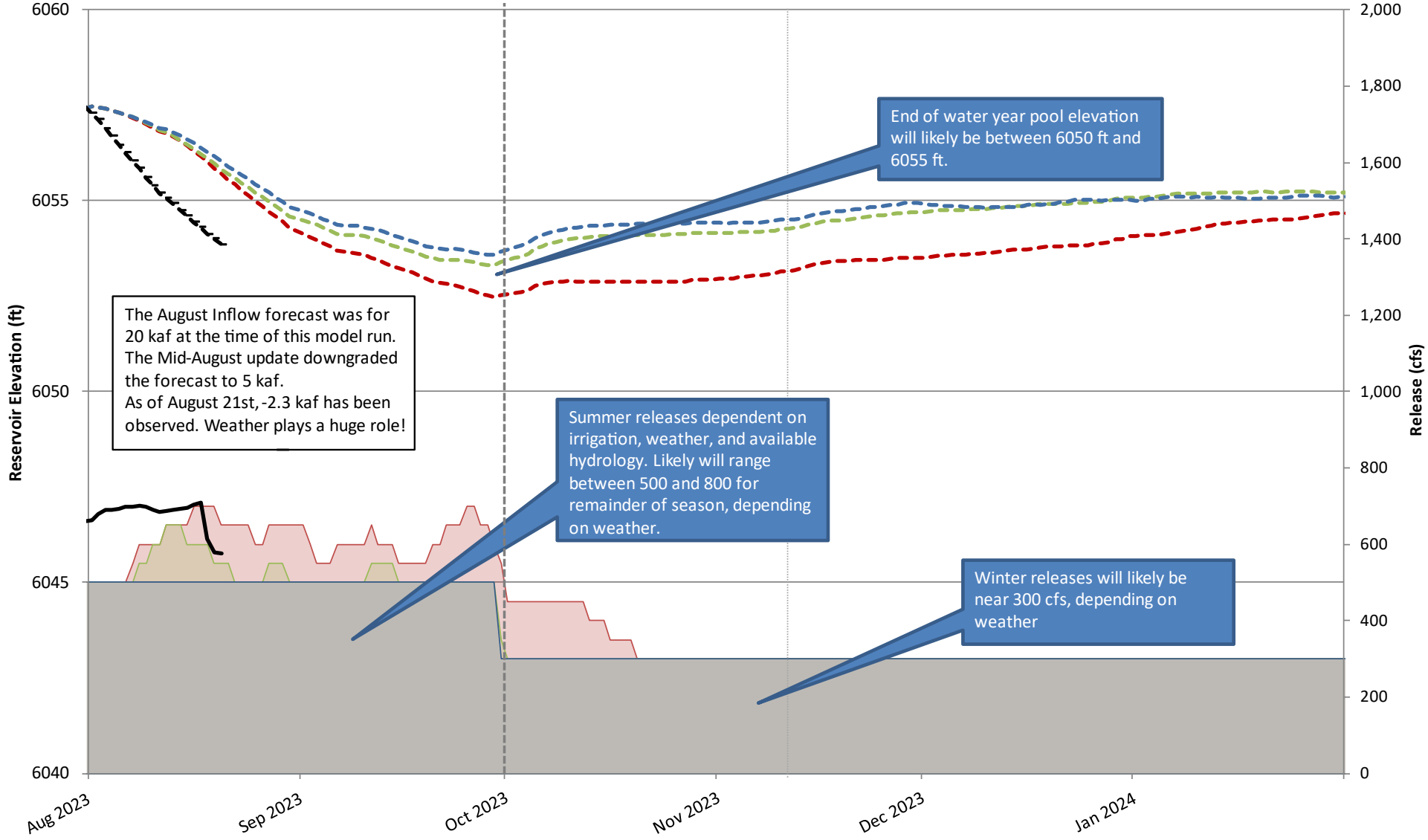
office phone: 970-256-9463
cell phone: 720-384-7792

Navajo Reservoir Forecast Operations Fall and Winter 2023

as of August 2023 CBRFC Forecast



Projected Operations WY 2024

Based on current streamflow conditions, storage levels, and statistical outlooks based on 30 years of historical hydrology,

- Runoff projections for WY 2024 range from 465 kaf (51% avg) – 1,500 kaf (165% avg) with a median projection of 845 kaf (93% avg).
- 60% chance of having sufficient available water to conduct a spring peak release
- <3% chance of falling below 5990 ft (min active storage)

Summary

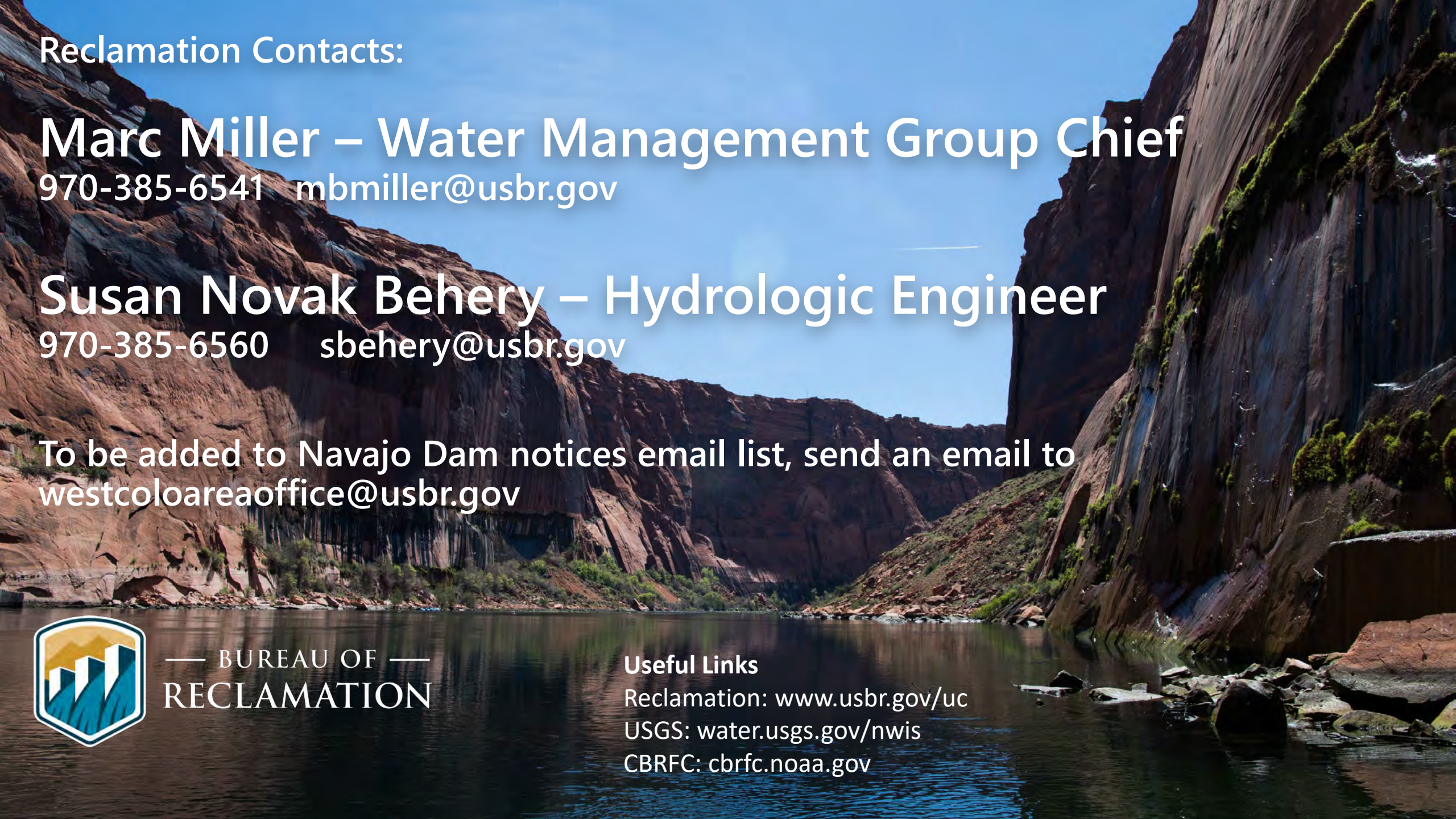
Next Meeting January 2023

- WY 2023 April-July runoff was well above average throughout the San Juan River Basin. Navajo Modified Unregulated Inflow totaled 1,028 kaf which was 163% of average.
- The current elevation is 6053.85 ft with a live storage of 1,216 kaf (74% full) and an active storage of 590 kaf (58% full). This is 94% of average for this time of year.
- A spring peak release was conducted that totaled 257 kaf over base, accomplishing three of four ESA goals.
- Summer and early Fall releases will likely range between 500 and 800 cfs during irrigation, subject to weather at the time. Late fall and winter releases will be lowered likely near 300 cfs as long as the downstream target baseflow can be satisfied.
- The current outlook for WY 2024 is wide, ranging from 51% of average to 165% of average.

Links

- Navajo Project Notices: https://www.usbr.gov/uc/wcao/water/rsvrs/notice/nav_rel.html
- Navajo Monthly Forecast Update: https://www.usbr.gov/uc/water/crsp/cs/nvd.html

- UC Water Operations Home: https://www.usbr.gov/uc/water/index.html
- Teacups: https://www.usbr.gov/uc/water/basin/index.html
- 24-Month Study: https://www.usbr.gov/uc/water/crsp/studies/index.html
- DROA: https://www.usbr.gov/dcp/droa.html



Reclamation Contacts:

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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