BUREAU OF RECLAMATION

# Navajo Unit Operations Coordination Meeting

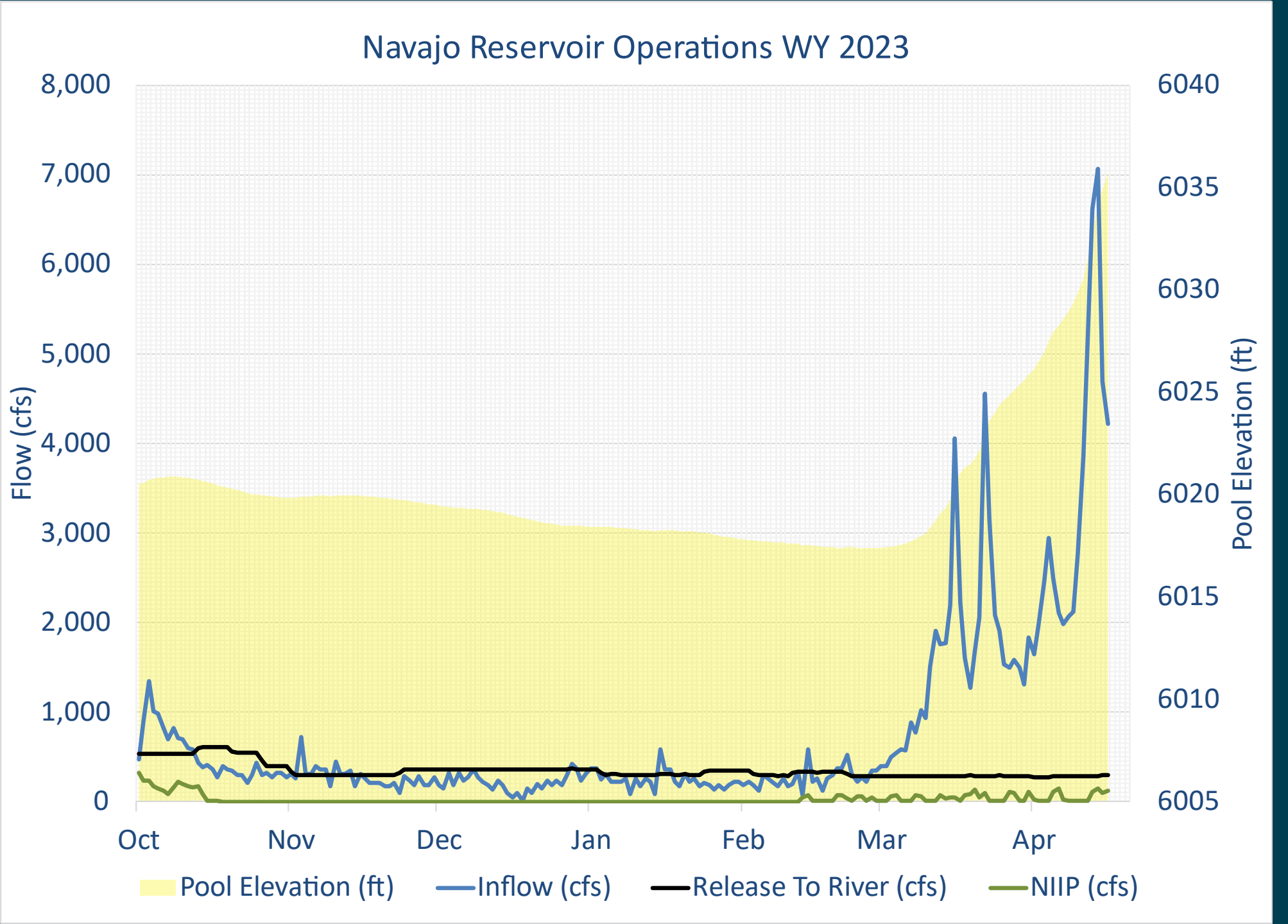
April 18th, 2023

1:00 PM

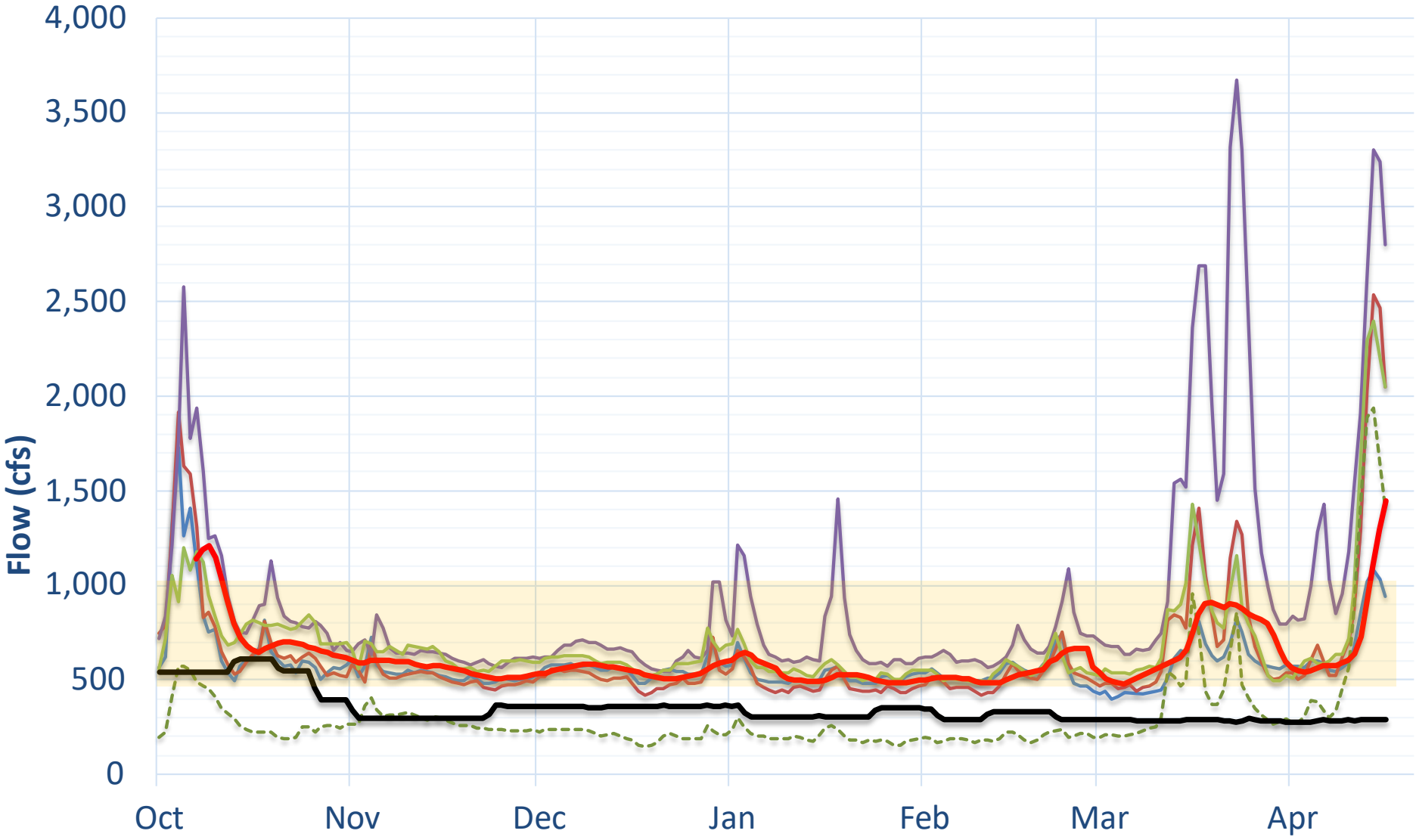
Farmington Civic Center and Microsoft Teams

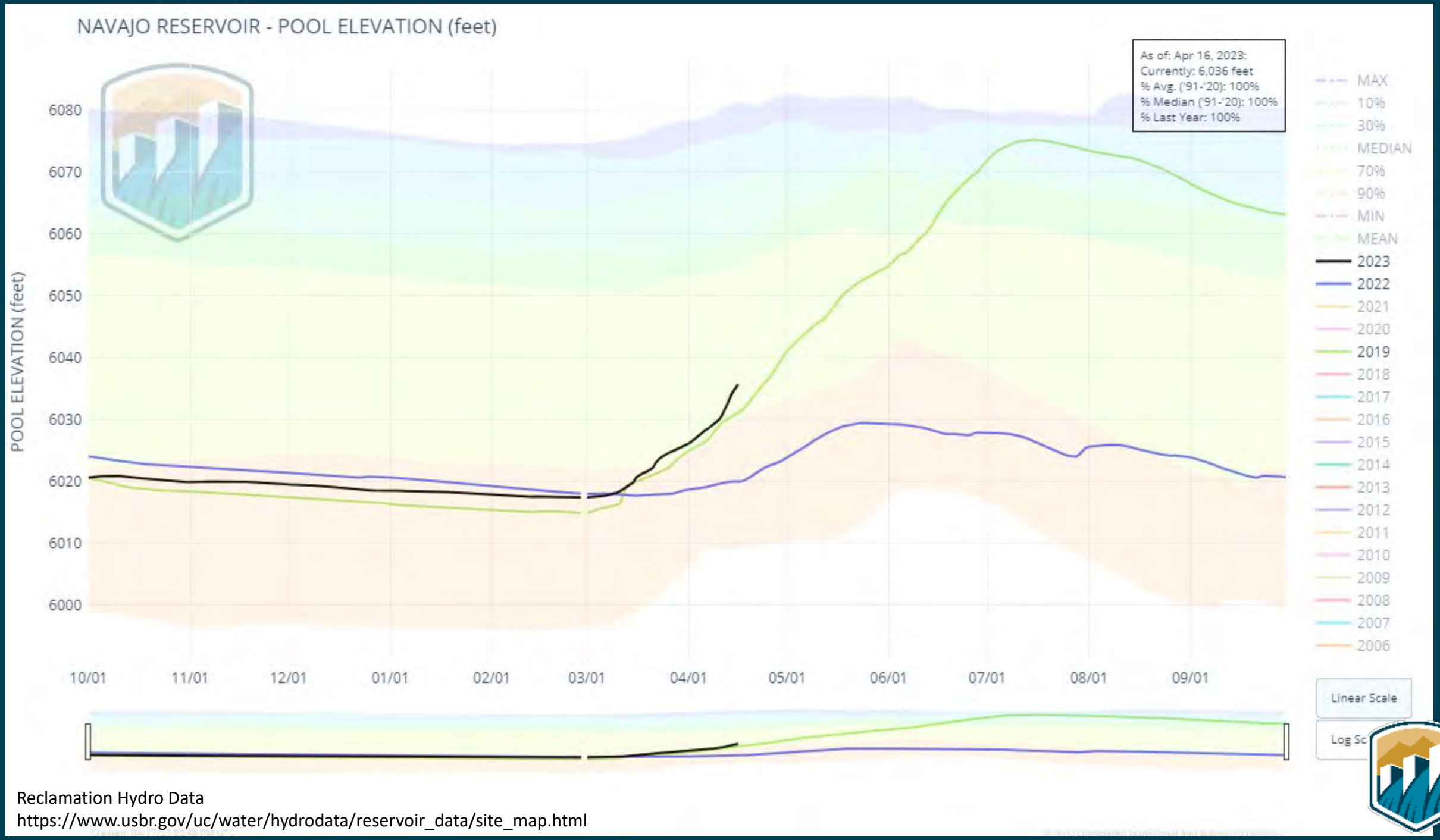
# Agenda

- Introductions
- WY 2023 Review of operations to date
- Weather Forecast – Erin Walter, NWS Grand Junction
- Streamflow Forecast – Ashley Nielson, CBRFC
- WY 2023 planned operations
- SJRIP Update – Raphaela Ware, SJRIP
- NMISC Update – Colleen Cunningham, NMISC
- Comments and Reports


Navajo Reservoir Operations WY 2023
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Flow (cfs)
6040
6035
6030
6025
6020
6015
6010
6005
Pool Elevation (ft)
Oct
Nov
Dec
Jan
Feb
Mar
Apr
Pool Elevation (ft)
Inflow (cfs)
Release To River (cfs)
NIIP (cfs)

# San Juan River Flows WY 2023

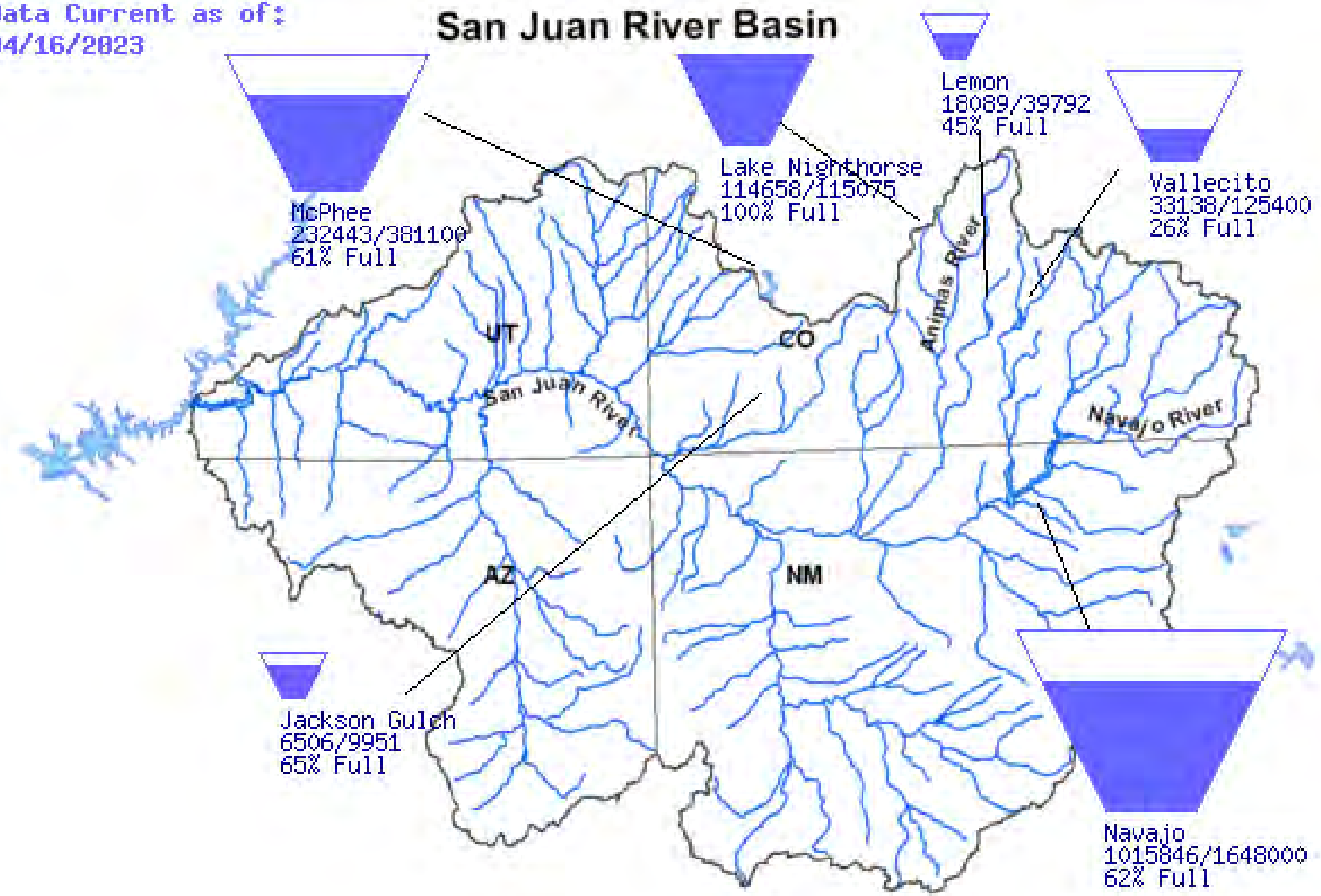





Reclamation Hydro Data
https://www.usbr.gov/uc/water/hydrodata/reservoir_data/site_map.html

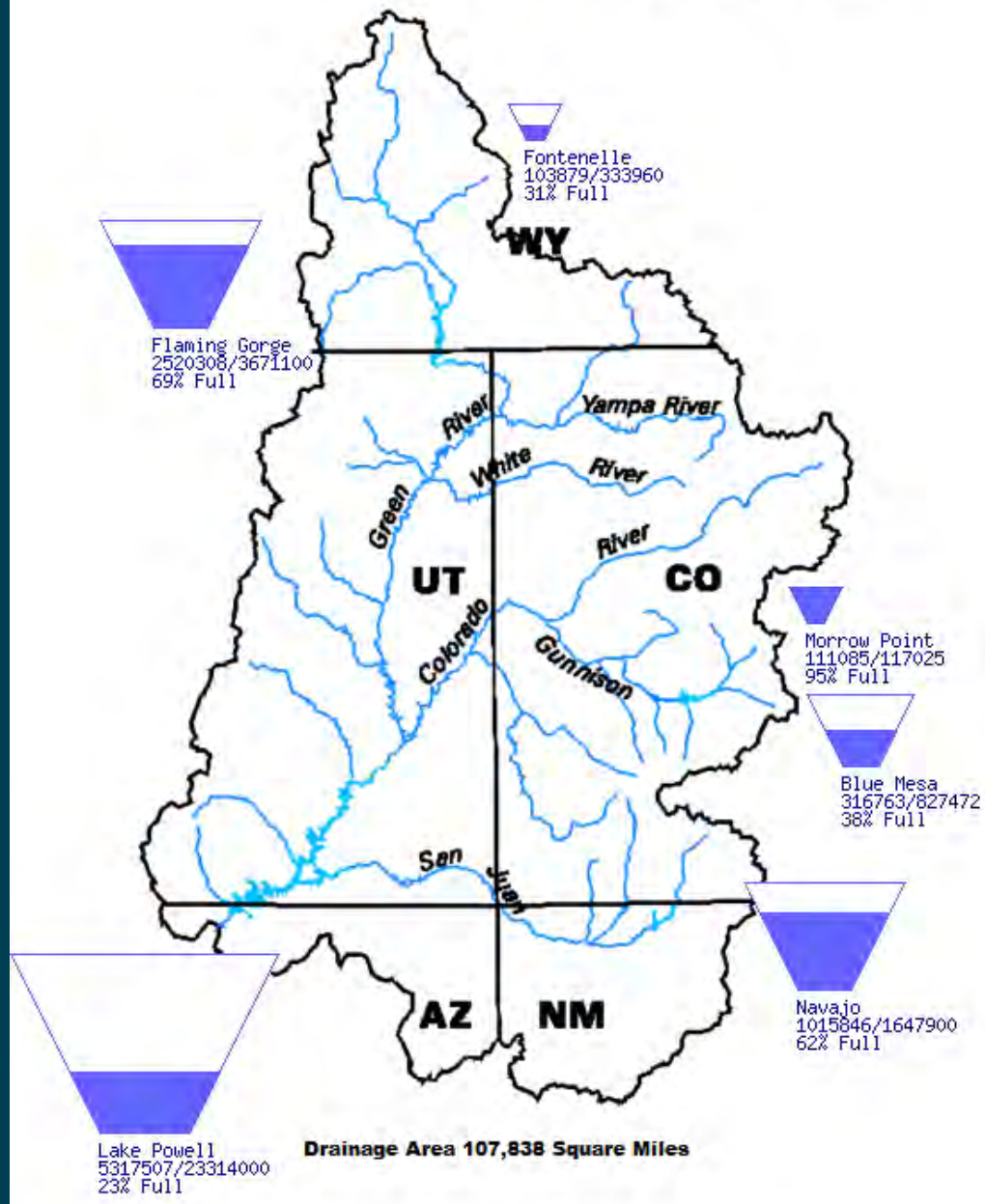
Data Current as of:
04/16/2023

# San Juan River Basin



Data Current as of:
04/16/2023

# Upper Colorado River Drainage Basin



# Hydrologic Outlook

## Navajo Reservoir - San Juan Basin

April 18th, 2023

Grand Junction, CO
NATIONAL WEATHER SERVICE
www.weather.gov/gjt

# 2023 Hydrologic Outlook

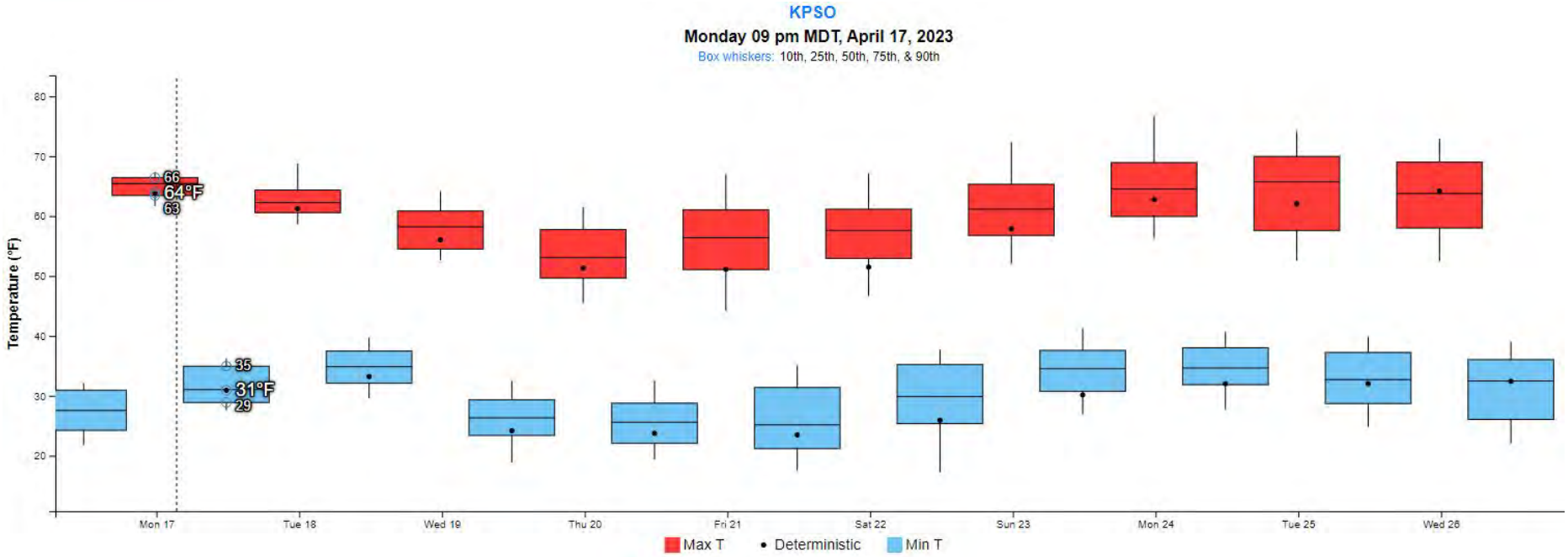
April 18th, 2023

## Snowpack April 1st versus April 16th


# 2023 Hydrologic Outlook

April 18th, 2023

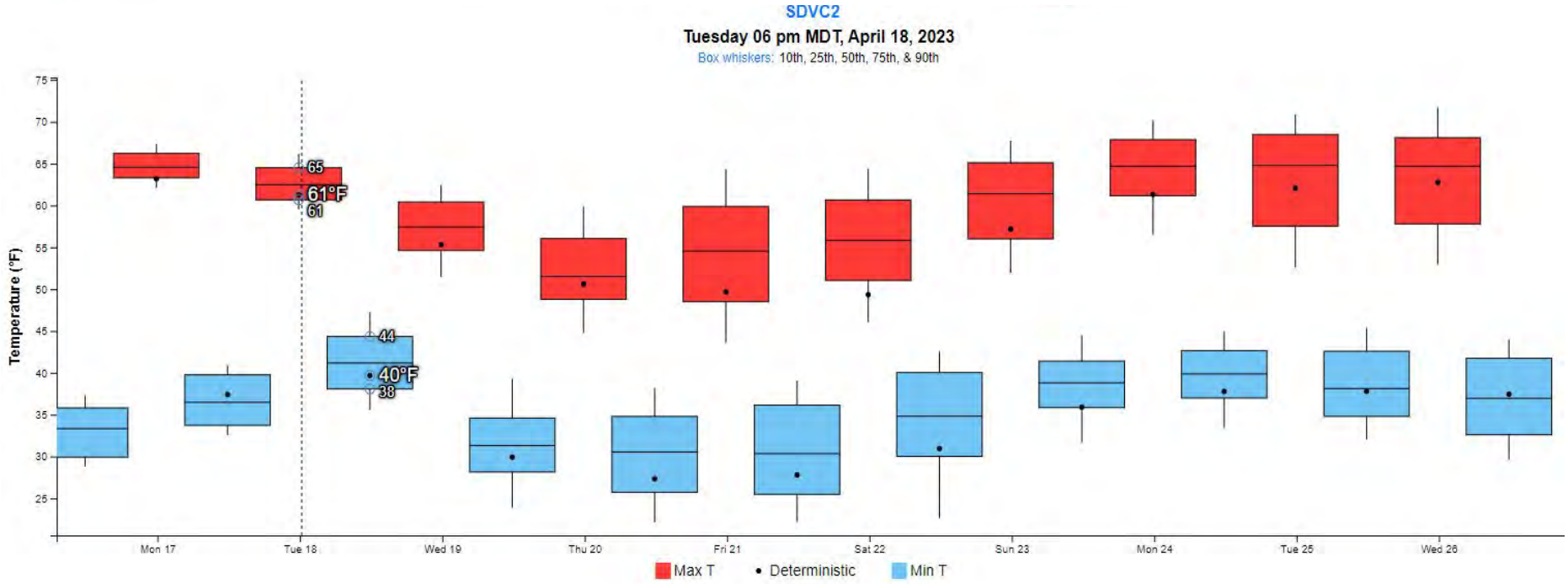
## Short Term Temperature Outlook: Pagosa Springs (elevation: 7657 ft)



# 2023 Hydrologic Outlook

April 18th, 2023

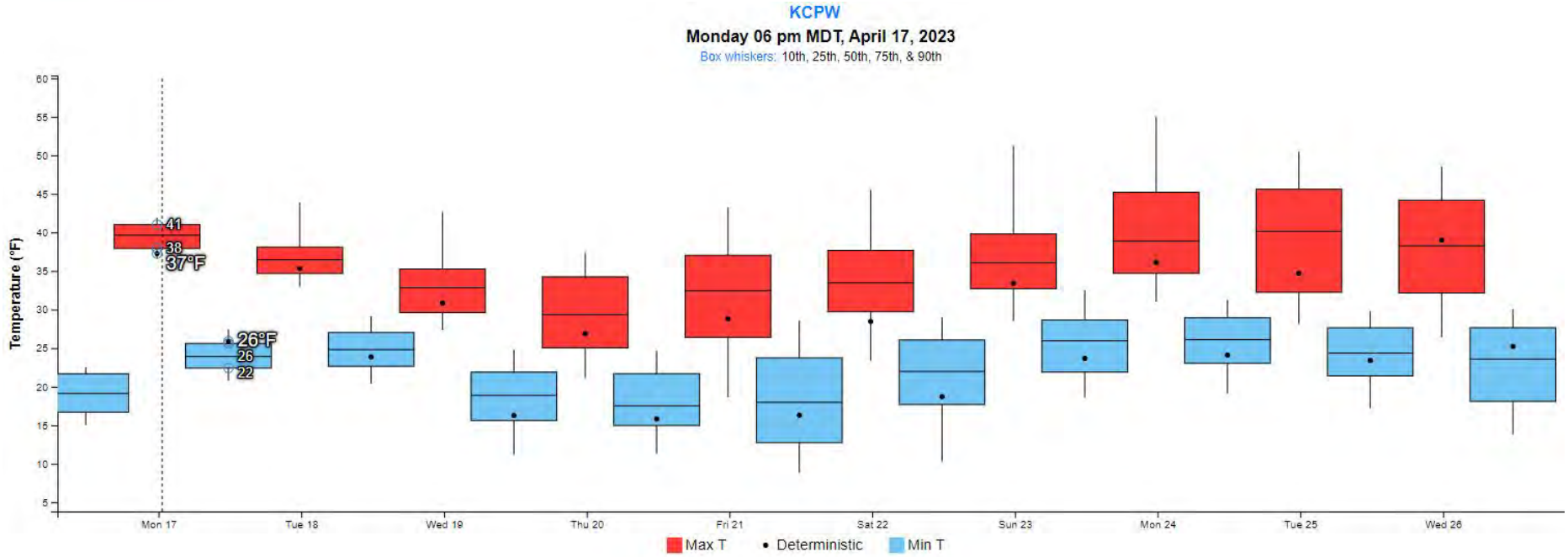
## Short Term Temperature Outlook: Sandavol Mesa (SDVC2, Elevation: 8491 ft)



# 2023 Hydrologic Outlook

April 18th, 2023

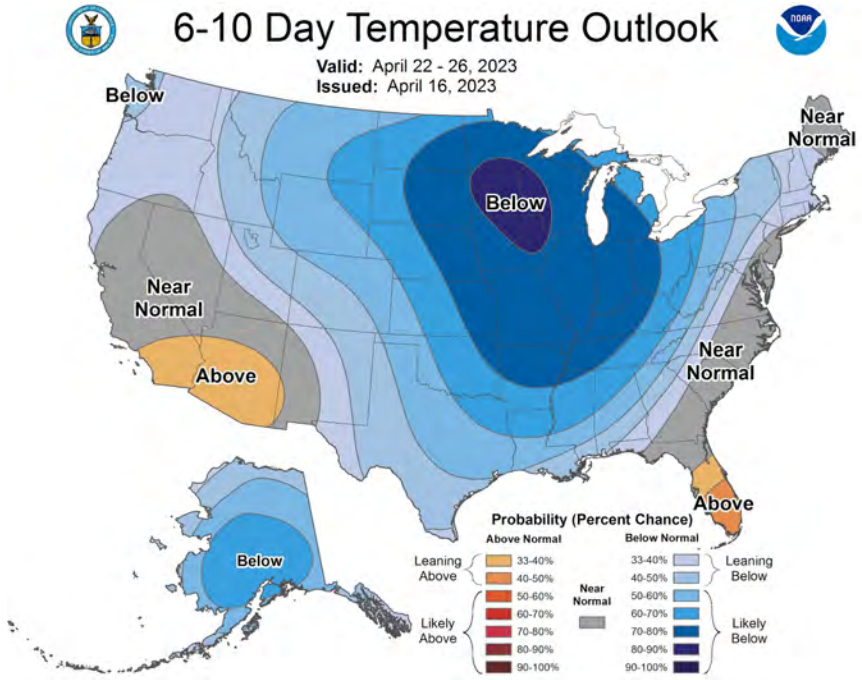
## Short Term Temperature Outlook: Wolf Creek Pass (elevation: 11759 ft)

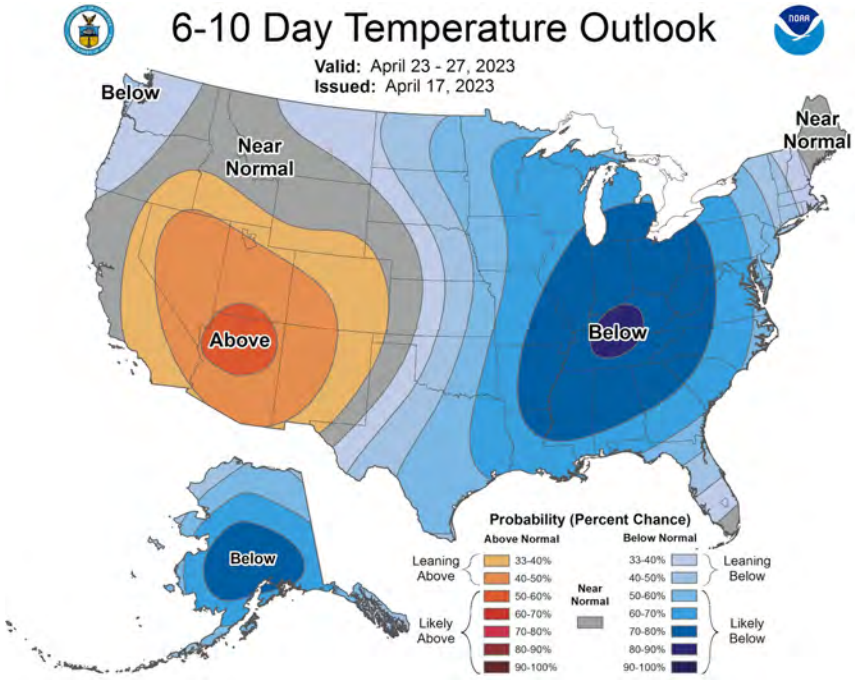


# 2023 Hydrologic Outlook

April 18th, 2023

**Short Term: 6 to 10 Day Forecast**

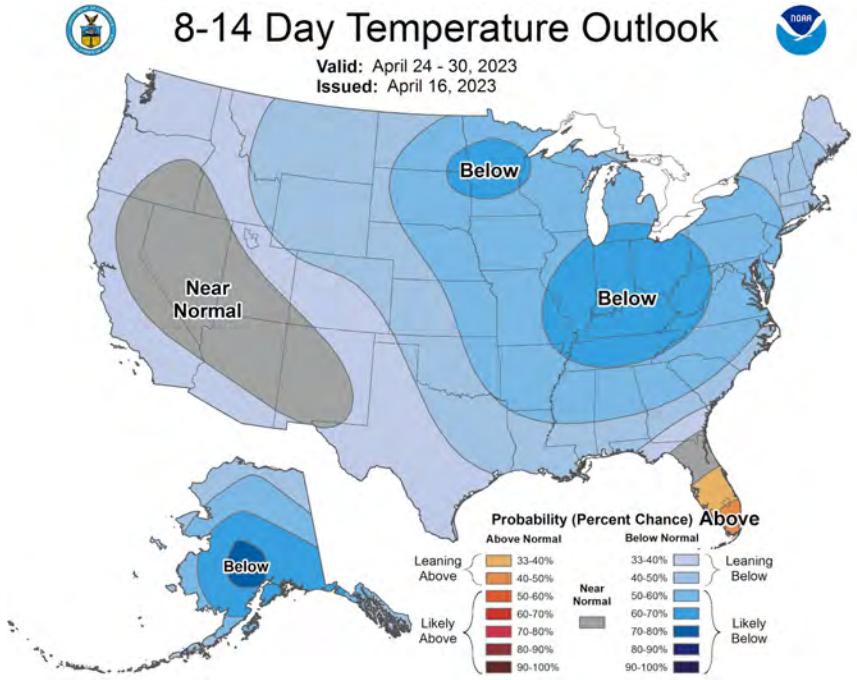


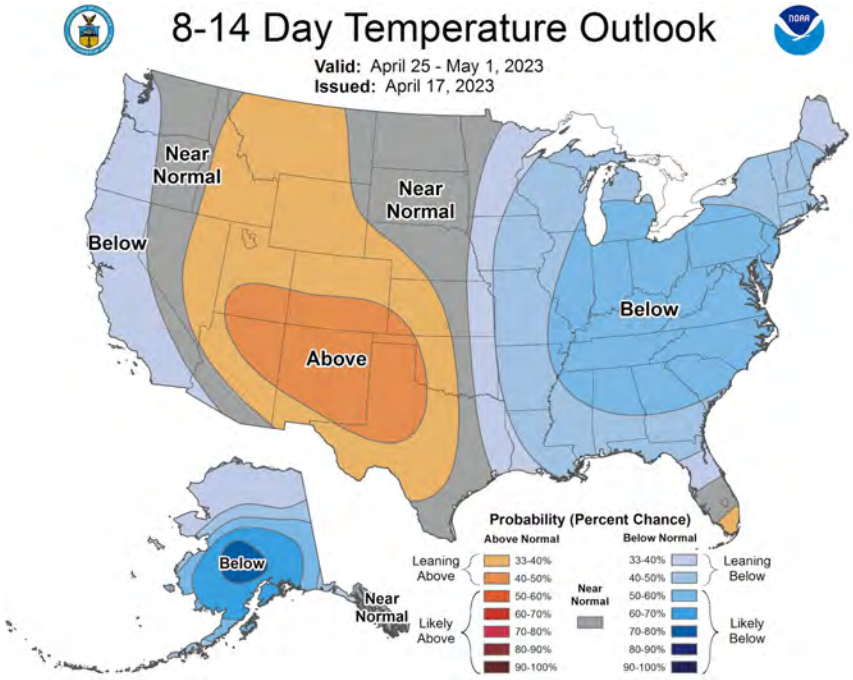



# 2023 Hydrologic Outlook

April 18th, 2023

**Short Term: 8 to 14 Day Forecast**



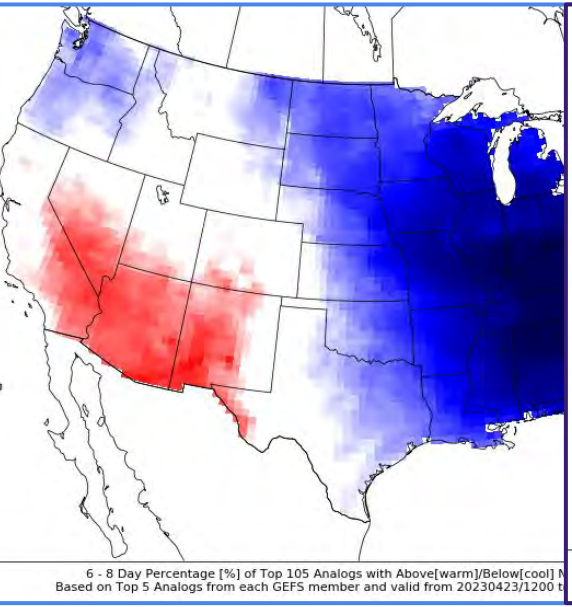



# 2023 Hydrologic Outlook

April 18th, 2023

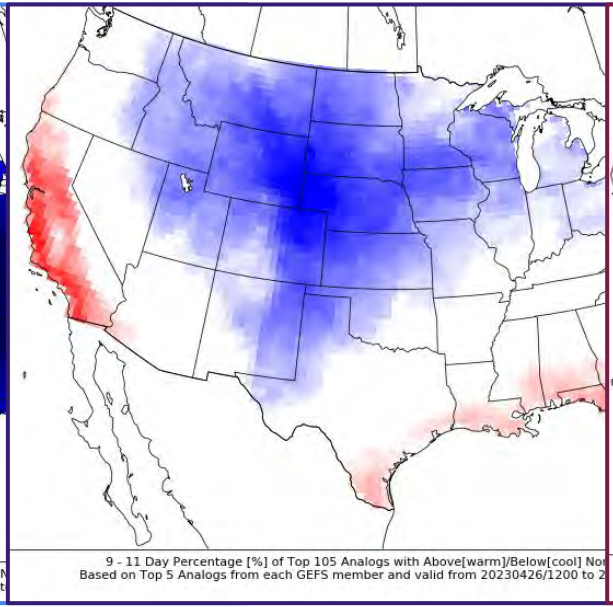
**Mid Range Forecast: 6 to 10 Day Above (red) vs Below (blue) Normal Temp**

## 6 to 8 Days



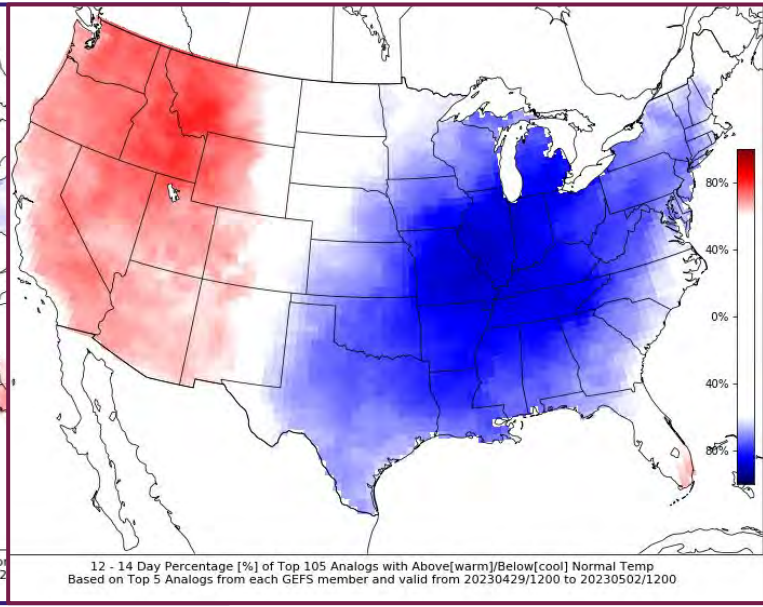
6 - 8 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool] N
Based on Top 5 Analogs from each GEFS member and valid from 20230423/1200 t

## 9 to 11 Days



9 - 11 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool] No
Based on Top 5 Analogs from each GEFS member and valid from 20230426/1200 to 2

## 12 to 14 Days



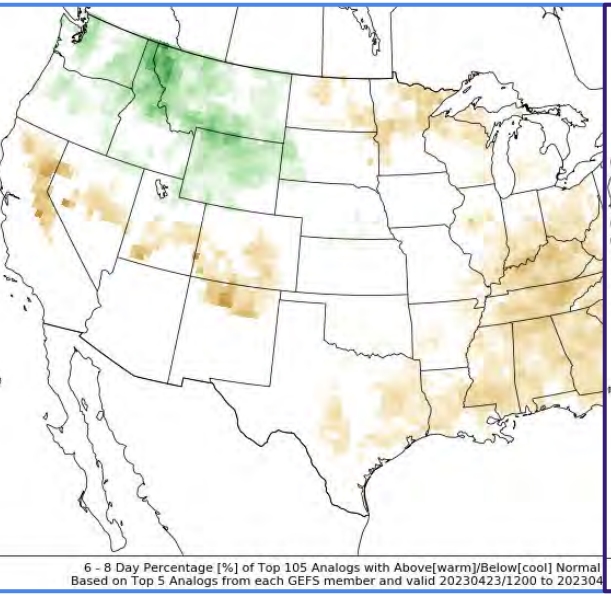

12 - 14 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool] Normal Temp
Based on Top 5 Analogs from each GEFS member and valid from 20230429/1200 to 20230502/1200

# 2023 Hydrologic Outlook

April 18th, 2023

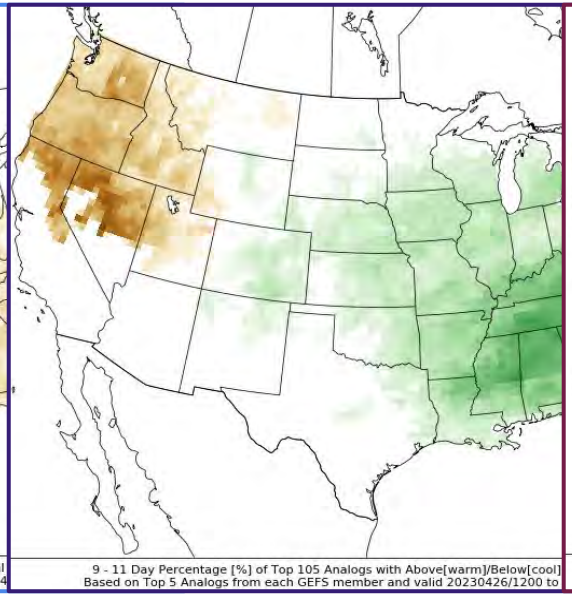
**Mid Range Forecast: 6 to 14 Day Above (green) vs Below (brown) Normal Precip**

## 6 to 8 Days



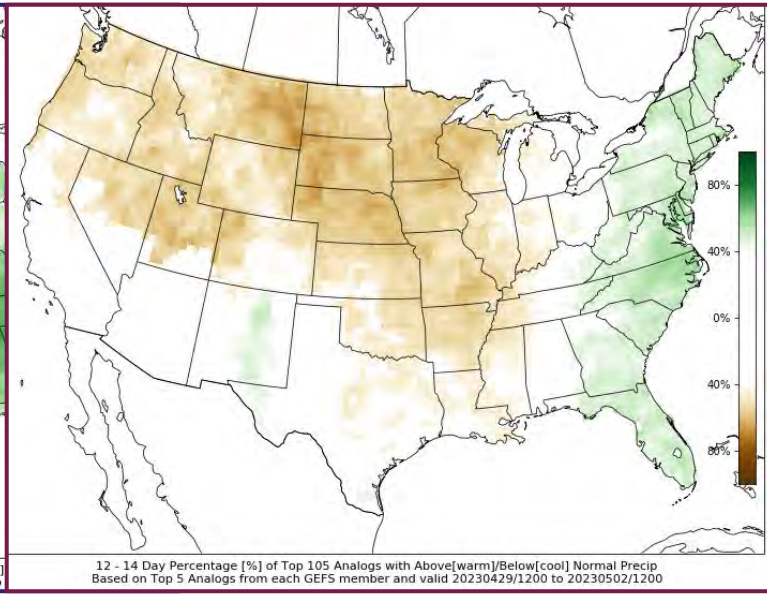
6 - 8 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool] Normal
Based on Top 5 Analogs from each GEFS member and valid 20230423/1200 to 202304

## 9 to 11 Days



9 - 11 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool]
Based on Top 5 Analogs from each GEFS member and valid 20230426/1200 to

## 12 to 14 Days

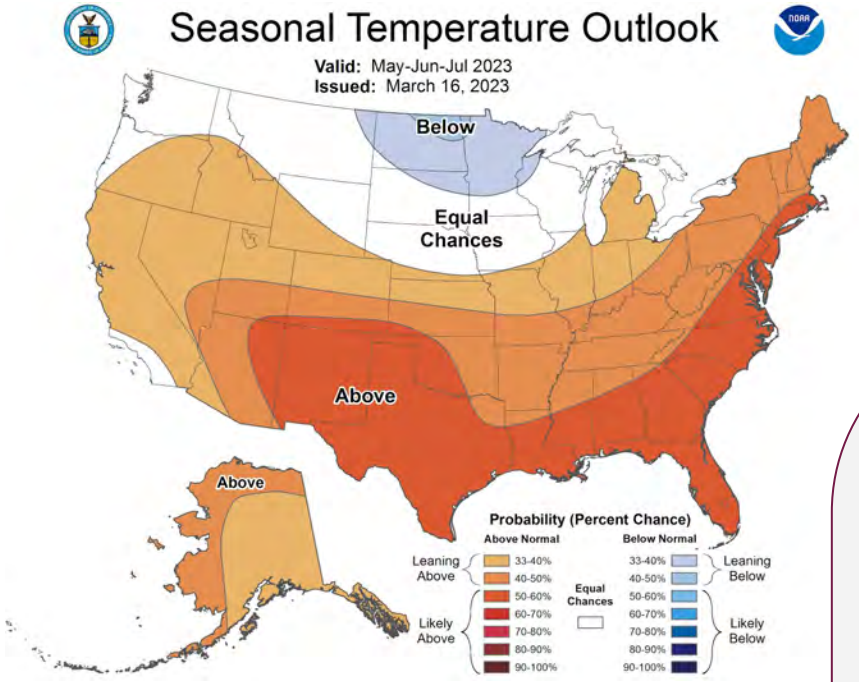


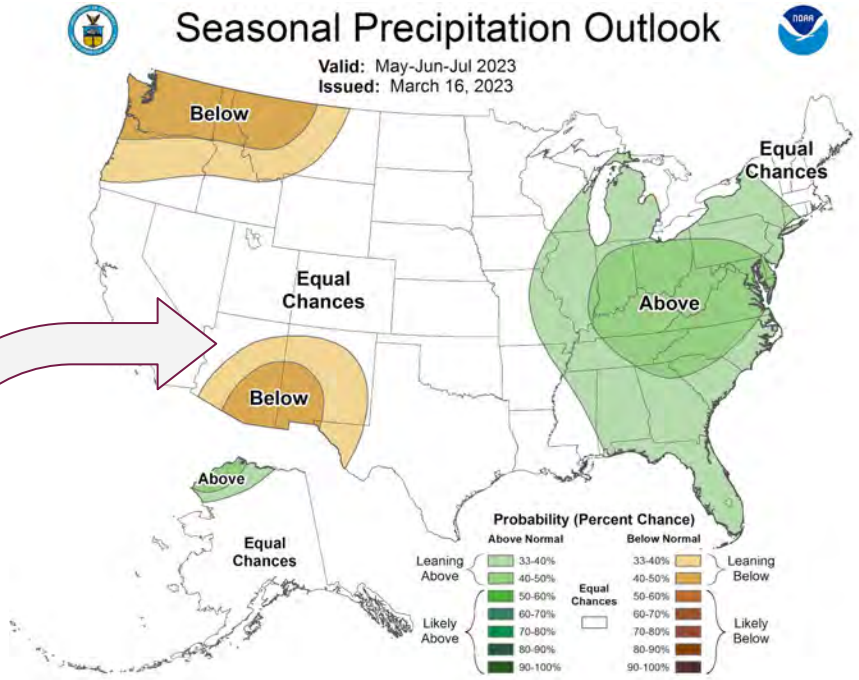

12 - 14 Day Percentage [%] of Top 105 Analogs with Above[warm]/Below[cool] Normal Precip
Based on Top 5 Analogs from each GEFS member and valid 20230429/1200 to 20230502/1200

# 2023 Hydrologic Outlook

April 18th, 2023

**Three Month Outlook (May - July)**




***Monsoon* Related?!**

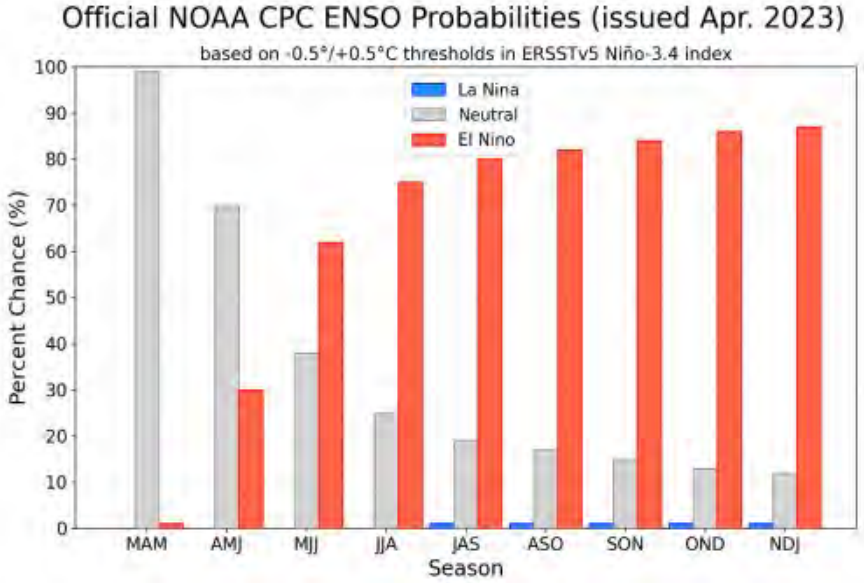
# 2023 Hydrologic Outlook

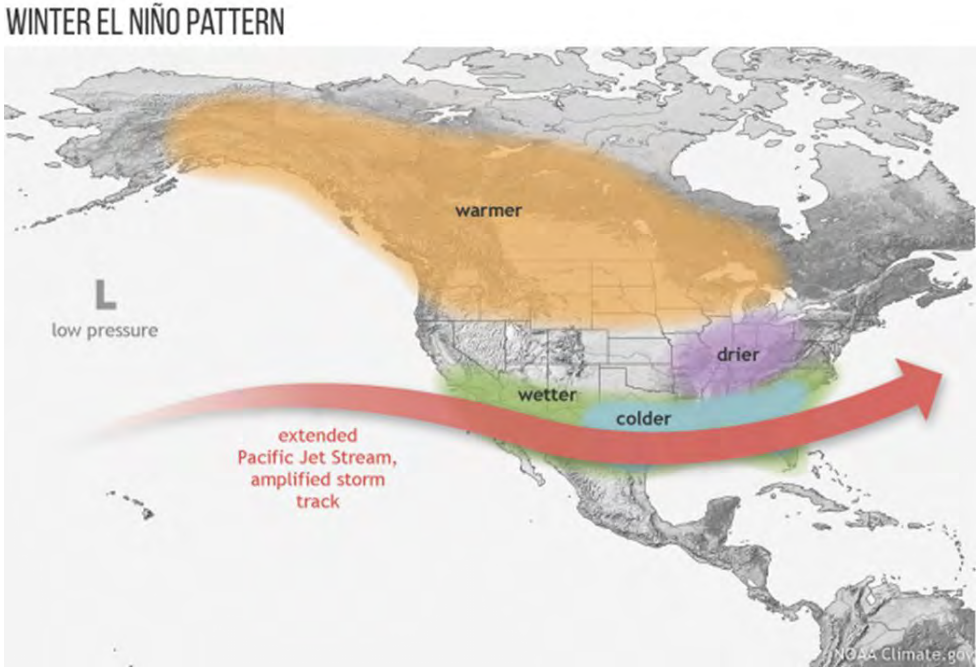
April 18th, 2023

## Current ENSO Status & Predictions: Updated April 17th

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

**ENSO-neutral** conditions are observed and expected to continue through the Northern Hemisphere spring and early summer 2023



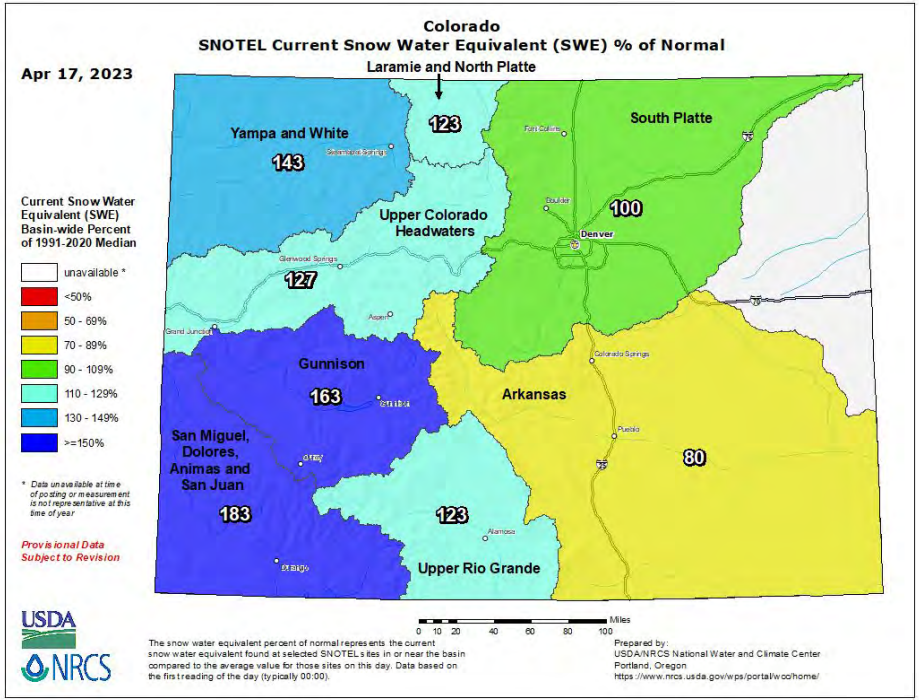



# 2023 Hydrologic Outlook

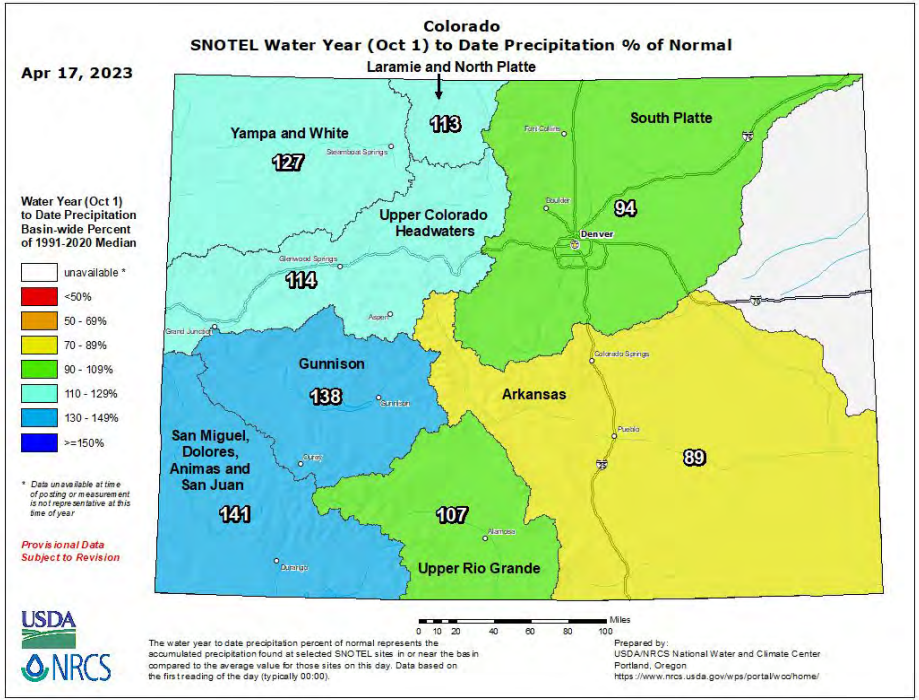
April 18th, 2023

**SWE vs Precipitation [NRCS]**

## Snow Water Equivalent (SWE)




## Water Year Precipitation (%)

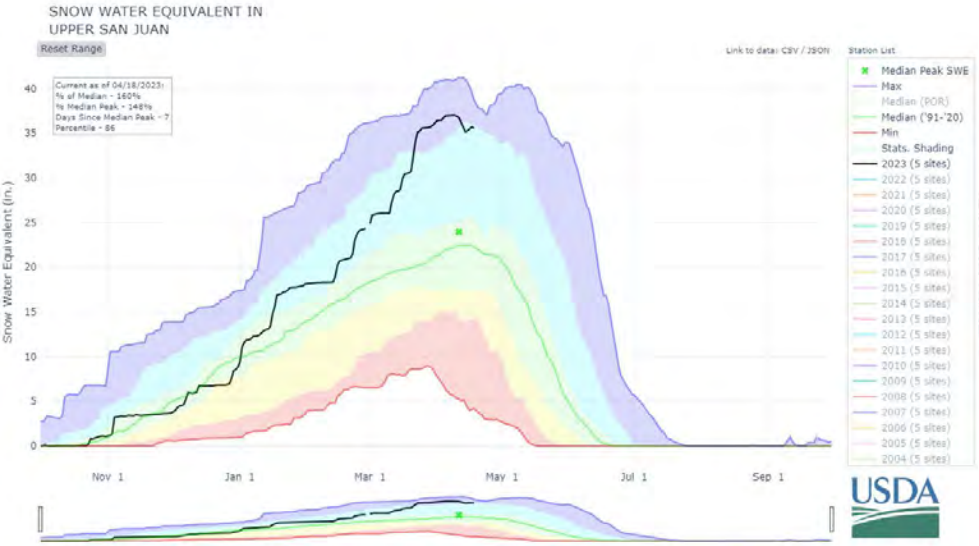


# 2023 Hydrologic Outlook

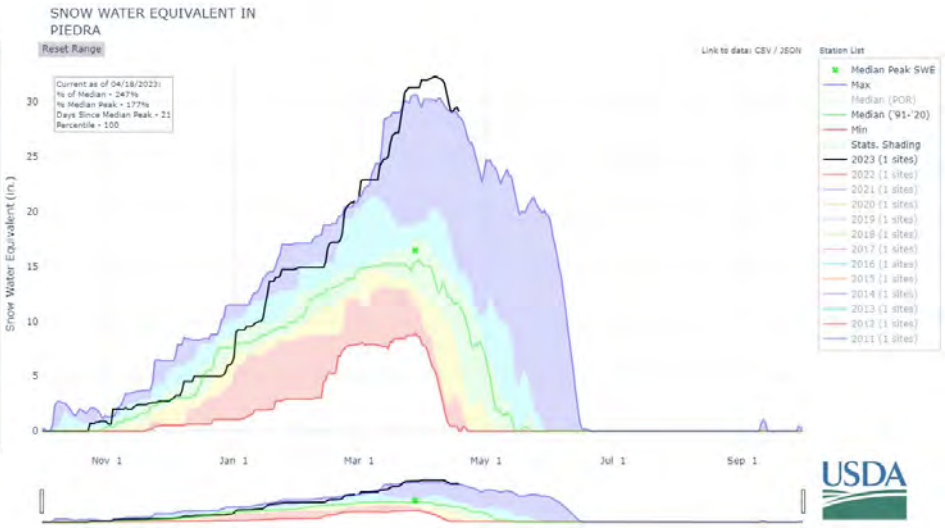
April 18th, 2023

**Subbasin Averages [NRCS]**

## Upper San Juan
## 157%




## Piedra
## 247%

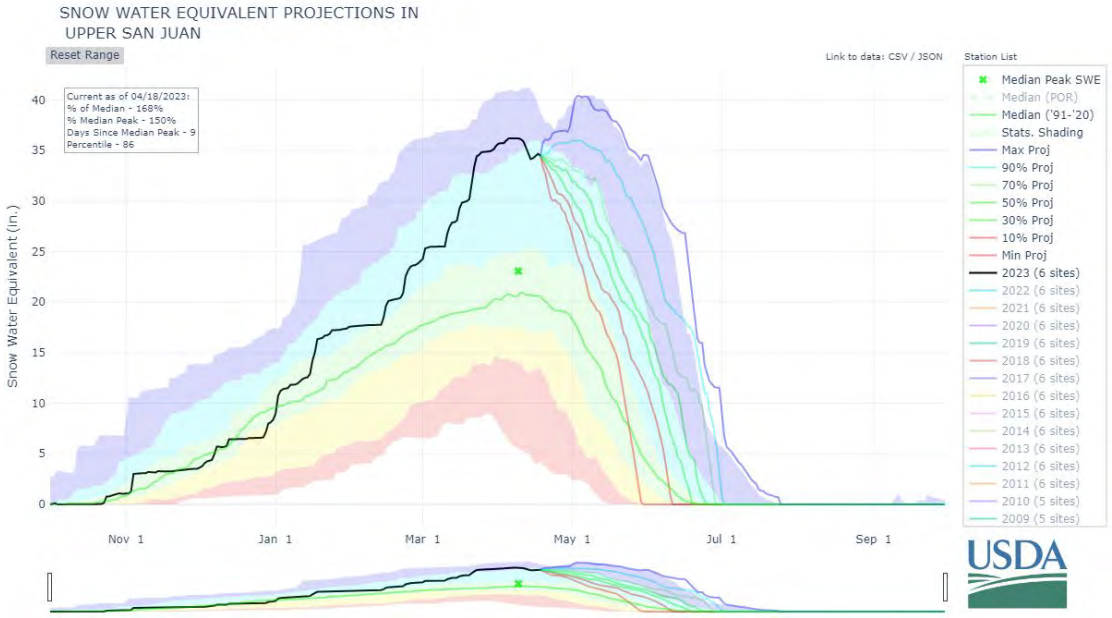


# 2023 Hydrologic Outlook

April 18th, 2023

## Subbasin Projections [NRCS]

## Colorado Subbasin Projections

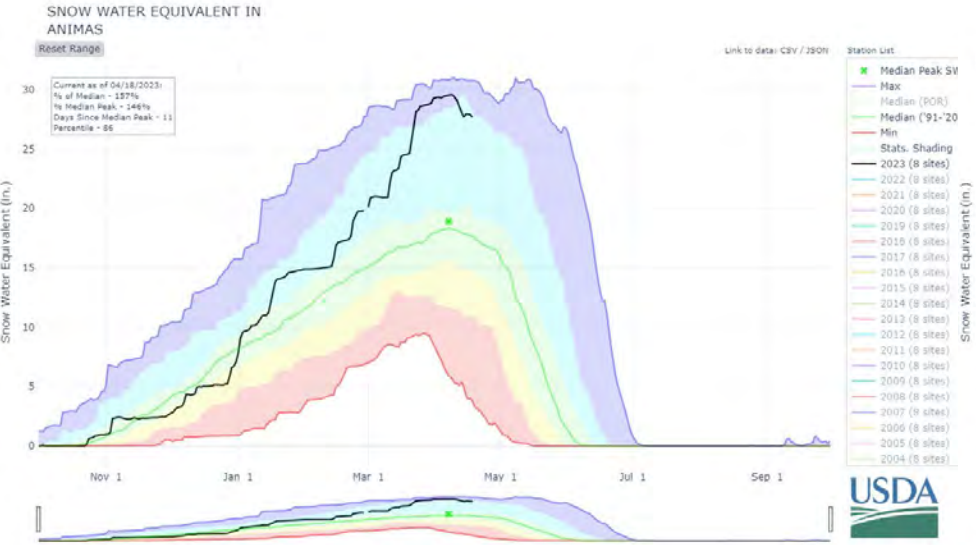


# 2023 Hydrologic Outlook

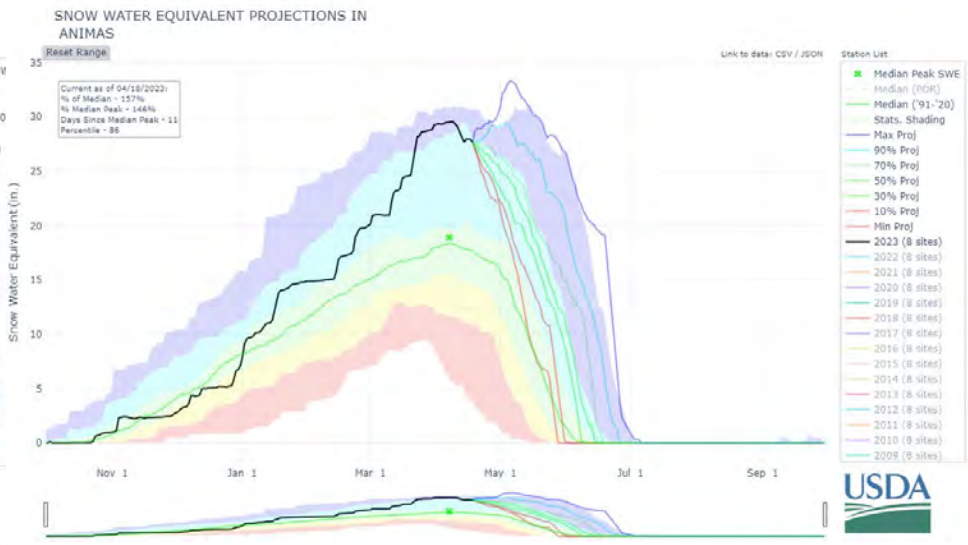
April 18th, 2023

## Subbasin Averages & Projections [NRCS]

### Animas
### 157%




### Subbasin Projections



# Thank you!

## Any Questions?

email: erin.walter@noaa.gov
office phone: 970-256-9463
cell phone: 720-384-7792

# Helpful Links:

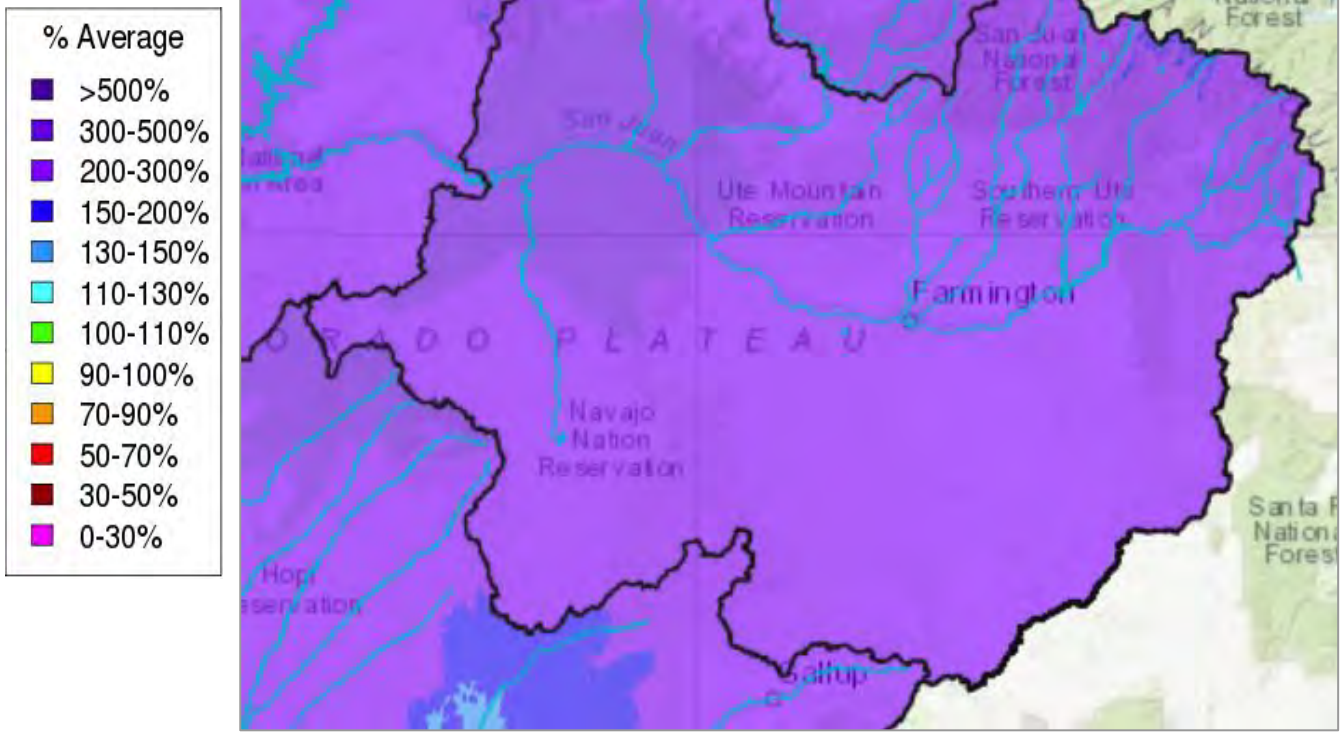
CBRFC Homepage: https://www.cbrfc.noaa.gov/lmap/lmap.php
NRCS Colorado: https://www.nrcs.usda.gov/wps/portal/wcc/home/quicklinks/states/colorado

# Navajo Reservoir/San Juan Basin Water Supply Outlook April 2023


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

# March Precipitation/Temperature

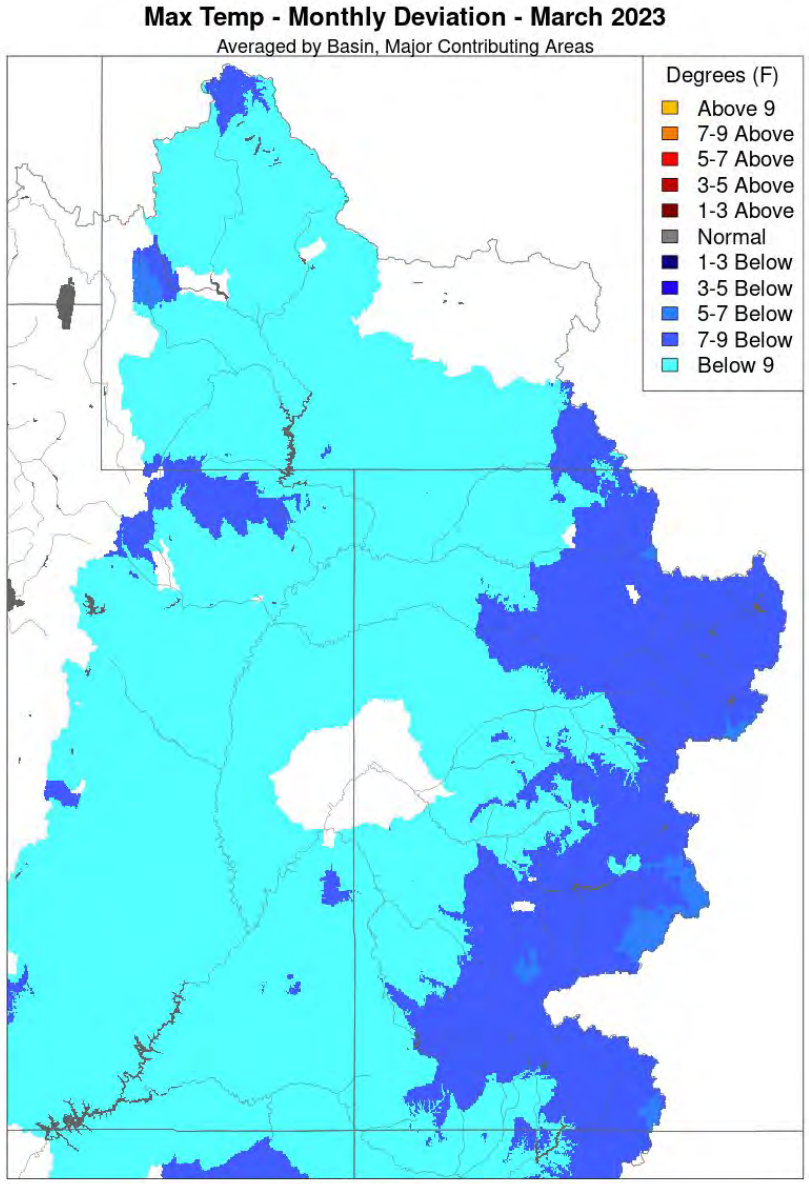
## March 2023 Precipitation




Animas River Basin: 225%

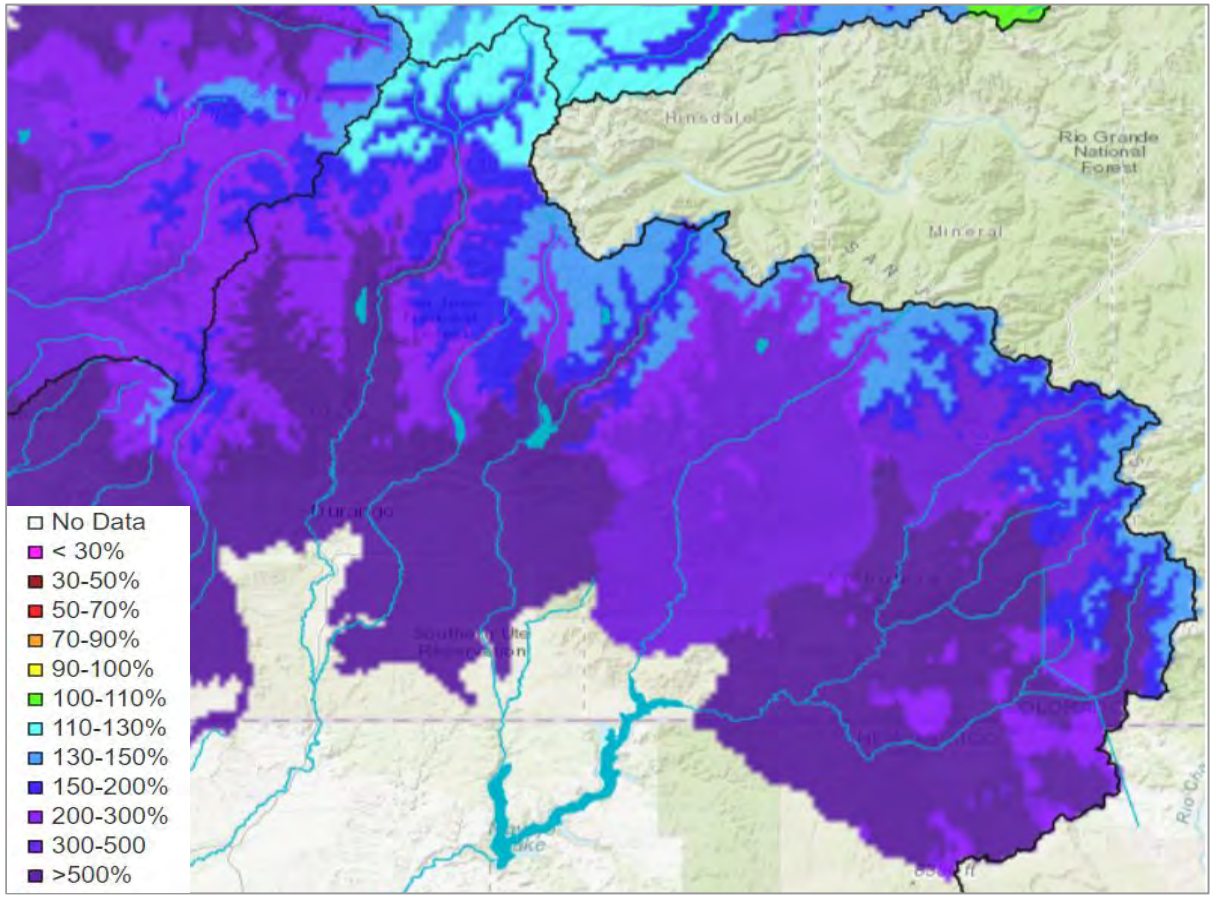
Above Navajo Reservoir: 230%

*Observed precipitation is averaged by CBRFC defined basin elevation zones.*

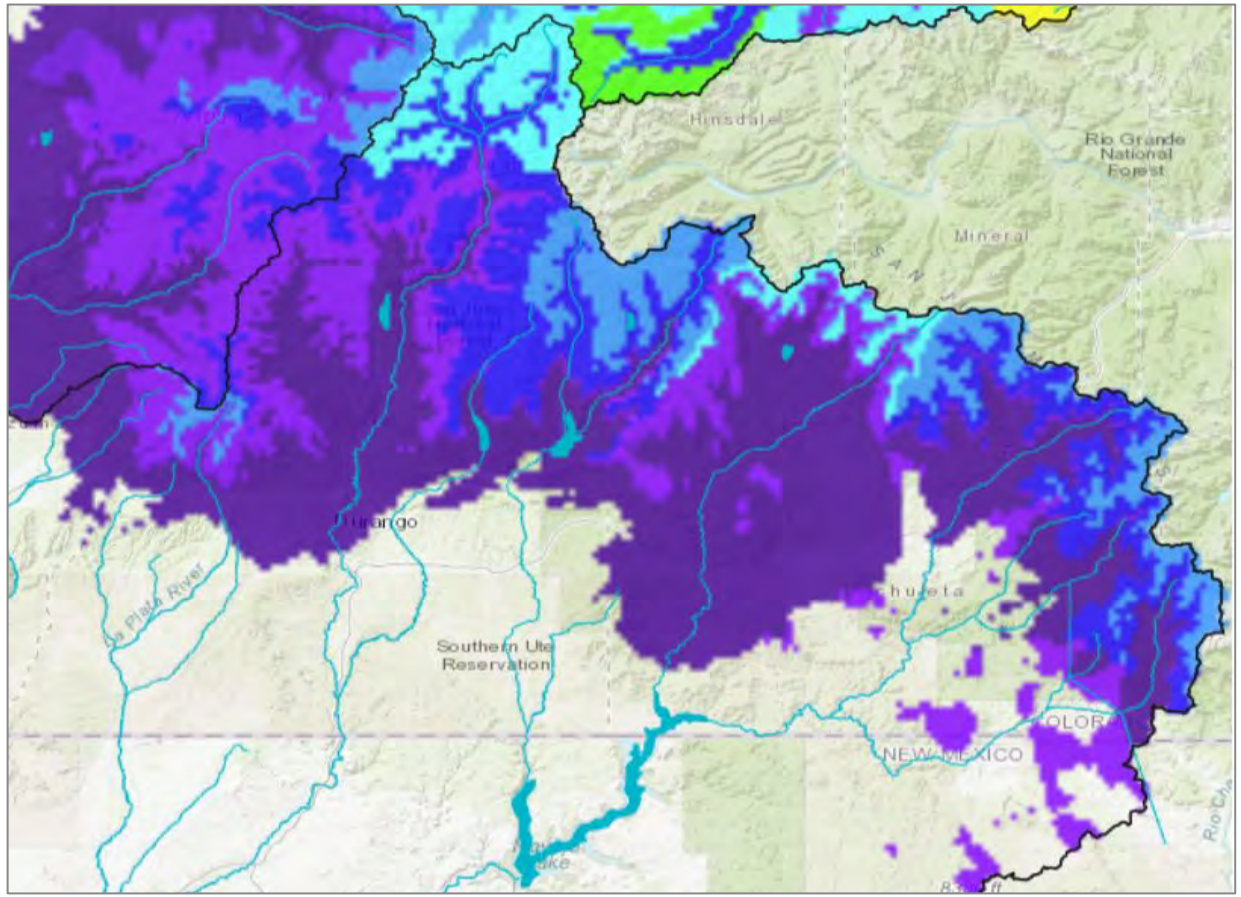


# Snow Conditions: CBRFC Model Snow

April 1, 2023



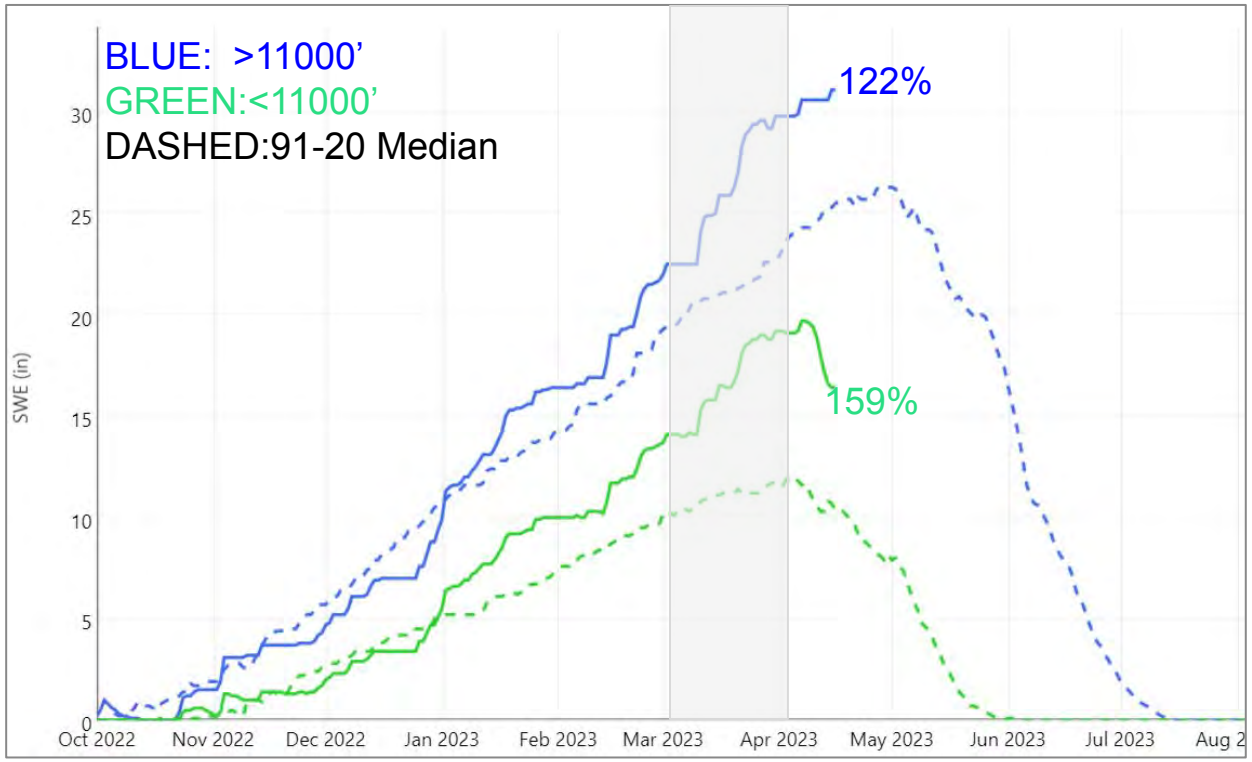

April 16, 2023



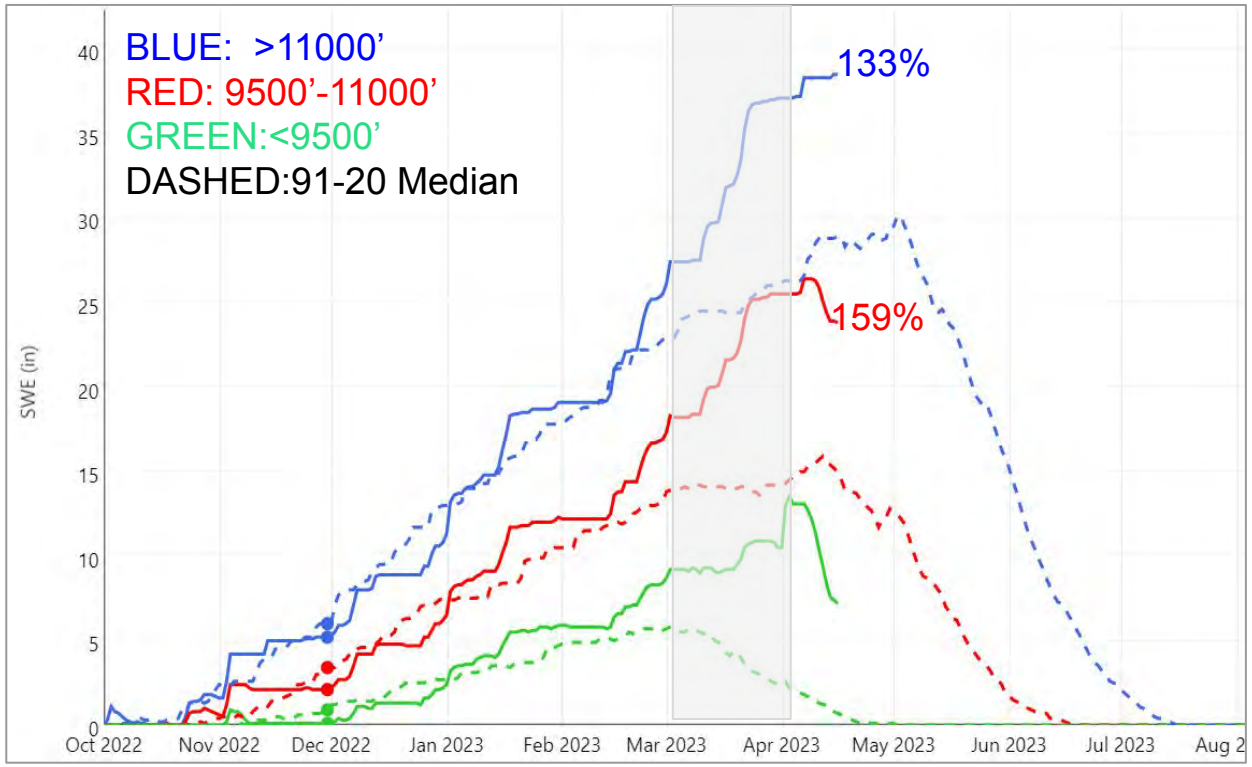

- Snow is above normal at all elevations.
- Snowmelt has started over the last week at elevations below 11,000’.

# Snow Conditions: CBRFC Model Snow

## Animas-Silverton

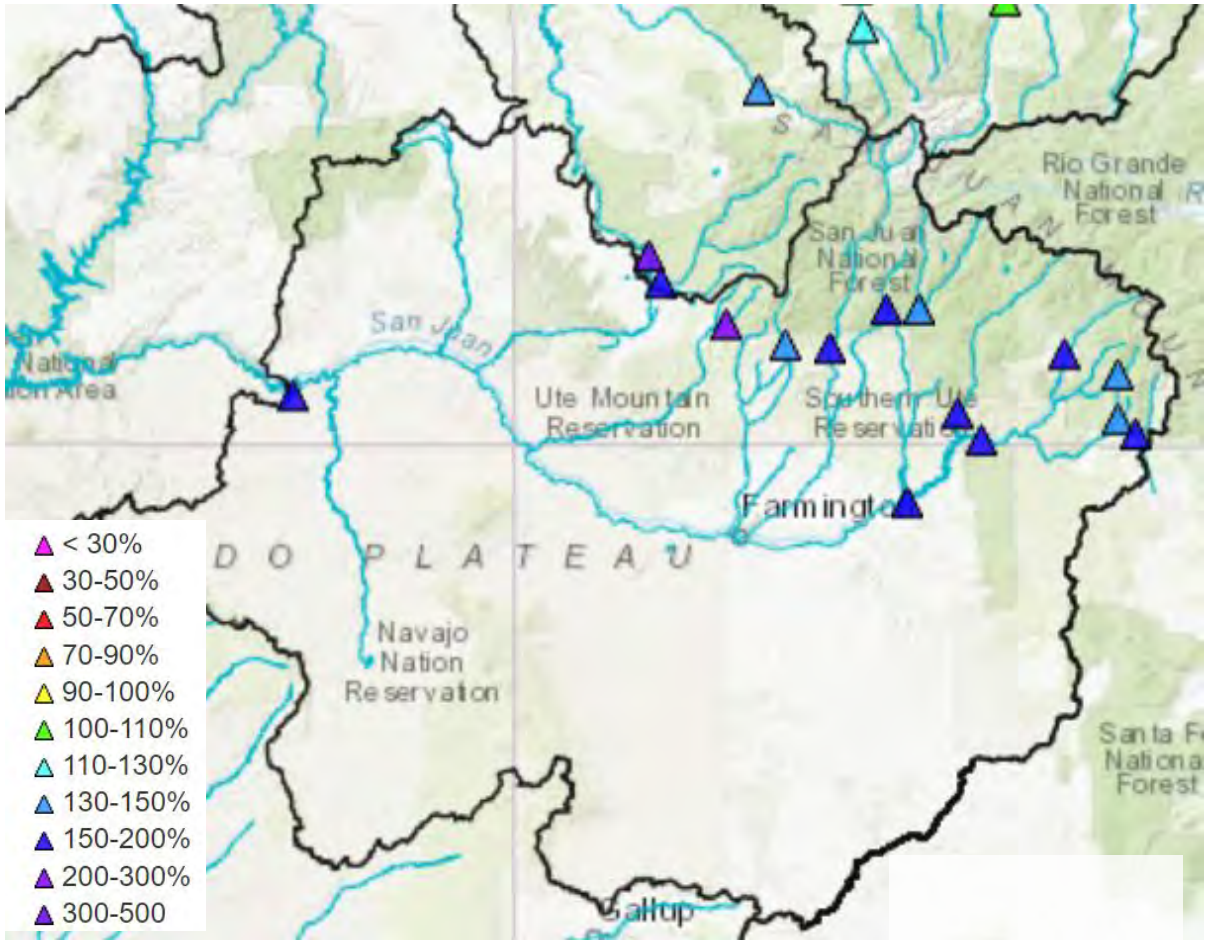



## San Juan-Pagosa Springs



# Mid-April Water Supply Forecasts: San Juan River Basin

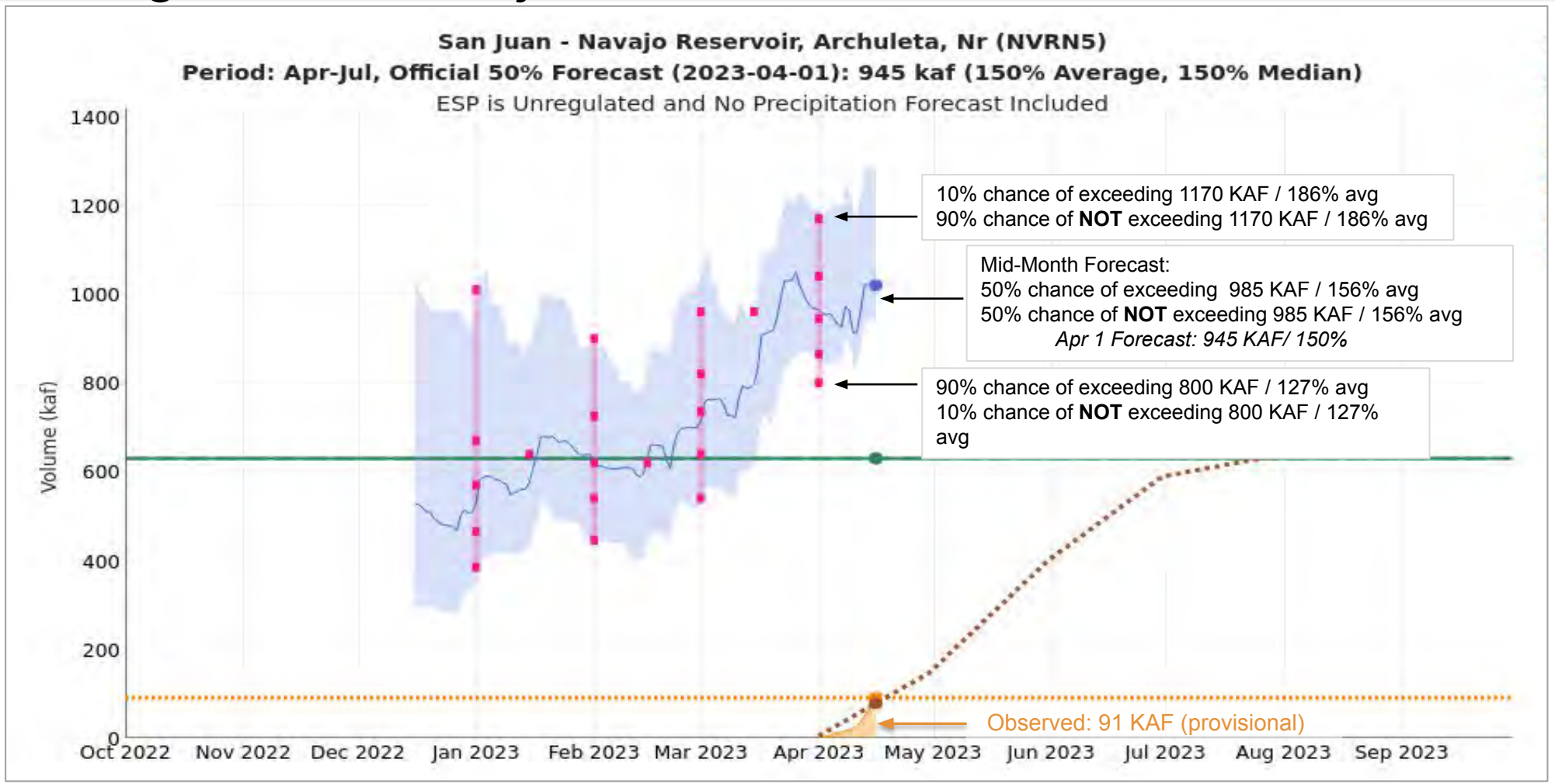
April-July Forecasts
Volume in 1000's acre-feet / Percent of 1991-2020 average




| River | Location | ESP Date | Avg Cond | Forecast Period | MP 50 | Avg | Pct Avg |
|---|---|---|---|---|---|---|---|
| San Juan | Pagosa Springs | 2023-04-16 | ▲ | Apr-Jul | 299 | 194 | 154 |
| San Juan | Carracas; Nr | 2023-04-16 | ▲ | Apr-Jul | 512 | 330 | 155 |
| Rio Blanco | Pagosa Springs; Nr; Blanco Dam; Blo | 2023-04-16 | ▲ | Apr-Jul | 72.3 | 49.0 | 147 |
| Navajo | Chromo; Nr; Oso Div Dam; Blo | 2023-04-16 | ▲ | Apr-Jul | 90.2 | 58.0 | 155 |
| Piedra | Arboles; Nr | 2023-04-16 | ▲ | Apr-Jul | 315 | 181 | 174 |
| Los Pinos | Vallecito Reservoir; Bayfield; Nr | 2023-04-16 | ▲ | Apr-Jul | 255 | 177 | 144 |
| San Juan | Navajo Reservoir; Archuleta; Nr | 2023-04-16 | ▲ | Apr-Jul | 1023 | 630 | 162 |
| Florida | Lemon Reservoir; Durango; Nr | 2023-04-16 | ▲ | Apr-Jul | 75.9 | 48.0 | 158 |
| Animas | Durango | 2023-04-16 | ▲ | Apr-Jul | 589 | 385 | 153 |
| La Plata | Hesperus | 2023-04-16 | ▲ | Apr-Jul | 32.4 | 23.0 | 141 |
| San Juan | Bluff; Nr | 2023-04-16 | ▲ | Apr-Jul | 1679 | 1110 | 151 |
| Mancos | Mancos; Nr | 2023-04-16 | ▲ | Apr-Jul | 40.4 | 17.2 | 235 |
| Little Navajo | Oso Div Dam;Bl;Chromo;Nr | 2023-04-16 | ▲ | Apr-Jul | 8.82 | 6.10 | 145 |

Mid-April 50% exceedance forecasts range from 140-235% average.

# 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: 1991-2020 average April-July volume
Green dotted: 1991-2020 median April-July volume

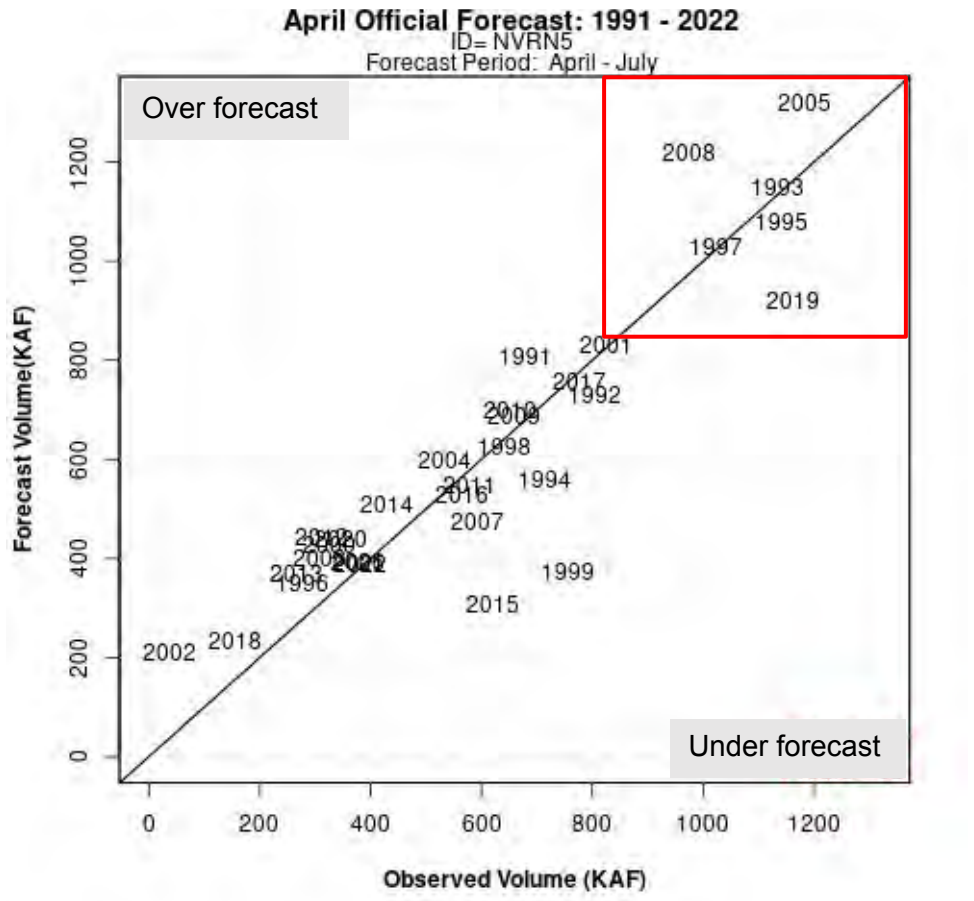
Brown dotted: Average observed
Orange dashed: 2023 Observed Streamflow

- Forecast range: 800-1170 KAF/ 127-186%
  - 800 KAF/127%: dry spring weather (2002,2020)
  - 985 KAF/156%: normal spring weather
  - 1170 KAF/186%: wet spring weather (2019,1995)
- 20% chance the April-July runoff will fall outside the forecast range.

*Navajo Inflow Forecast Plot Link*

# Navajo Reservoir Inflow Forecast Verification

Navajo Reservoir Inflow
April 1st 50% Forecast 1991-2021




Mar 1st average error: 22%
Apr 1st average error: 18%
May 1st average error: 15%

Historical Forecast Errors with similar April 1 Forecasts

| YEAR | APR 1 FCST (KAF) | OBSERVED (KAF) | Error KAF / % |
|---|---|---|---|
| 2001 | 830 | 826 | 2 / 0%: |
| 2019 | 920 | 1163 | 243 / 20%: under |
| **2023** | **945** | ? | ? |
| 1997 | 1030 | 1022 | 8/0.8%over |
| 1995 | 1080 | 1142 | 62 / 5%:under |

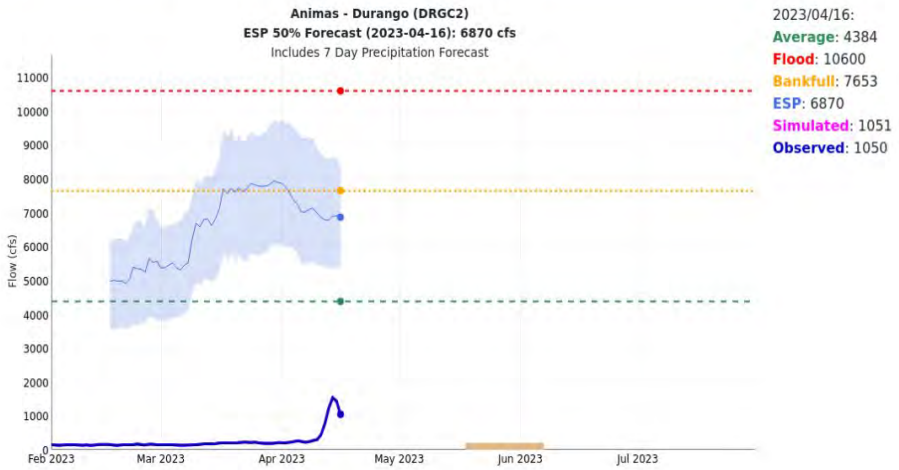
Primary Sources of Forecast Error:

- Future Weather
  - Uncertainty in precipitation and temperature forecasts
  - Extreme dry/wet events results in larger errors
    - Rarely forecast in advance
- Model States: Is the model representative of reality?
  - Snow
    - SNOTELs and Satellite images used to verify
  - Soil moisture
    - Extensive analysis done in Fall

# Animas River Peak Flow Forecast

## Daily Peak Flow Forecast - DRGC2 - Animas - Durango

| | |
|---|---|
| **Model Run Date** | 2023-04-16 (Incl 7 Day Precip Forecast) |
| **Flood Flow** | 10600 cfs |
| **50% Forecast** | 6865 cfs |
| **Rank of 50% Forecast** | 20th Highest Flow / 112 Total Years |
| **Percentile** | 83% of Years Below Forecast |
| **Peak to Date** | |
| **Average Peak** | 4384 cfs |
| **Percent Average** | 156% |
| **Normal Time of Peak** | 05-17 - 06-08 |
| **Last Year's Peak** | 2670 cfs, on 2022-05-17 |




## 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 |

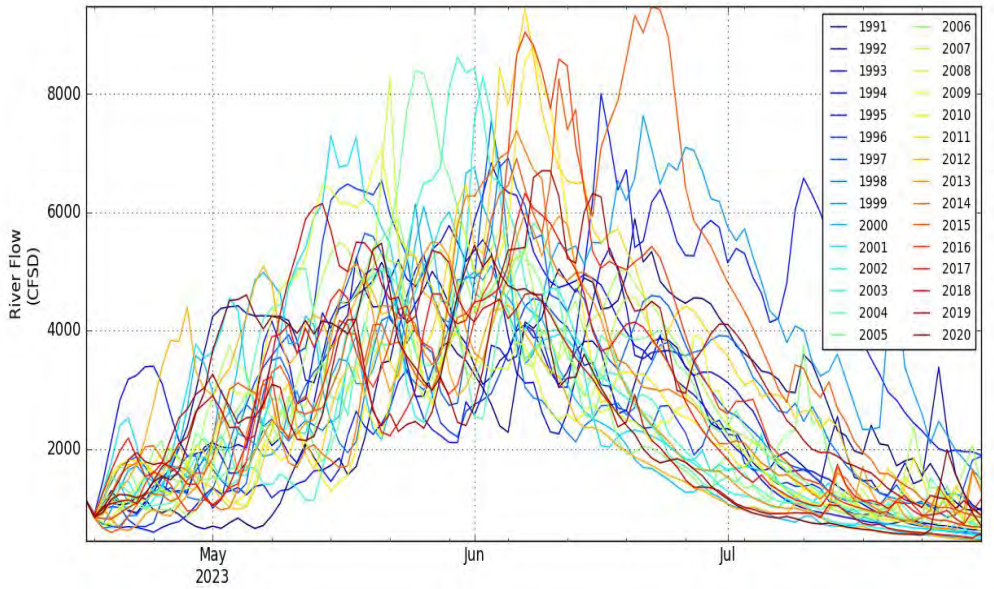
## Daily Peak Flow Forecast Timing

| 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 |

Magnitude and Timing are independent forecasts.

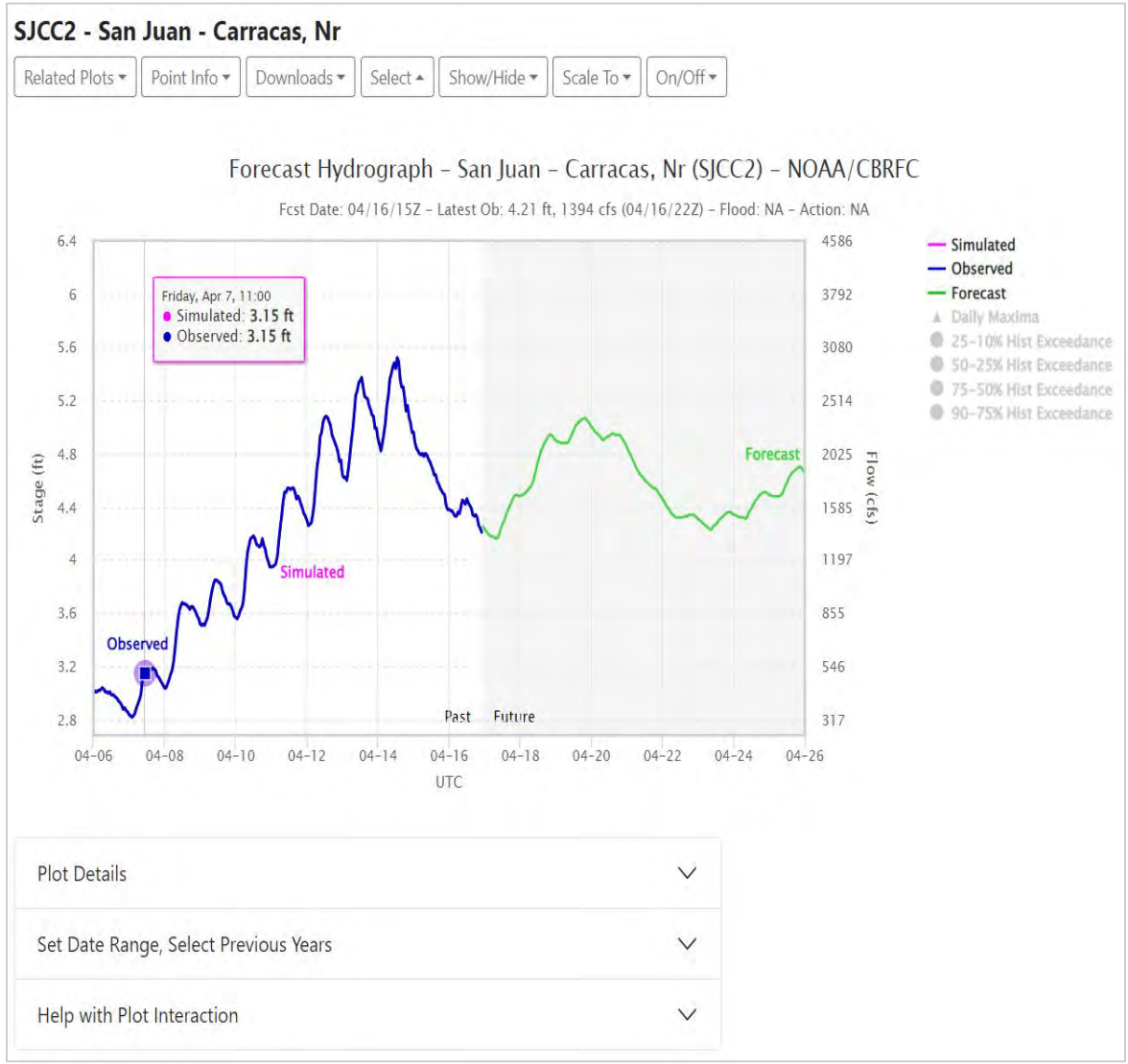
[*Animas-Durango Peak Flow Dashboard*]

### Animas-Durango Forecast Hydrographs




Many different runoff scenarios are still possible. Peak flow magnitude and timing will depend on spring weather.

# 10-Day Streamflow Forecasts


- 10-day streamflow forecasts use:
  - 7-day precipitation forecast
  - 10-day temperature forecast

https://www.cbrfc.noaa.gov/lmap/lmap.php?interface=river

# Summary:

- **Snow**
  - Above normal conditions at all elevations
  - Delayed melt of low elevation snow due to a cold and wet March.
  - Snowmelt has started of over the last week resulting in streamflow rises.

- **April Water Supply Forecasts**
  - Above normal precipitation and below normal temperatures in March significantly improved water supply conditions.
    - Additional snow accumulation at all elevations
    - Delayed snowmelt
  - Mid-April 50% forecasts range from 140-235% of average.
  - Expecting above average April-July runoff volumes for all locations.
  - Forecast uncertainty still exists in spring weather and how that will impact water supply forecasts.
    - Wet spring may result in higher water supply volumes.
    - Dry  spring may result lower water supply volumes.

- **Peak Flow Forecasts:**
  - Expecting above average peak flows.
  - Peak flows will be much higher than the previous two years.
  - High water and flooding are a concern but will depend on snowmelt timing and pattern.

# Contact Information

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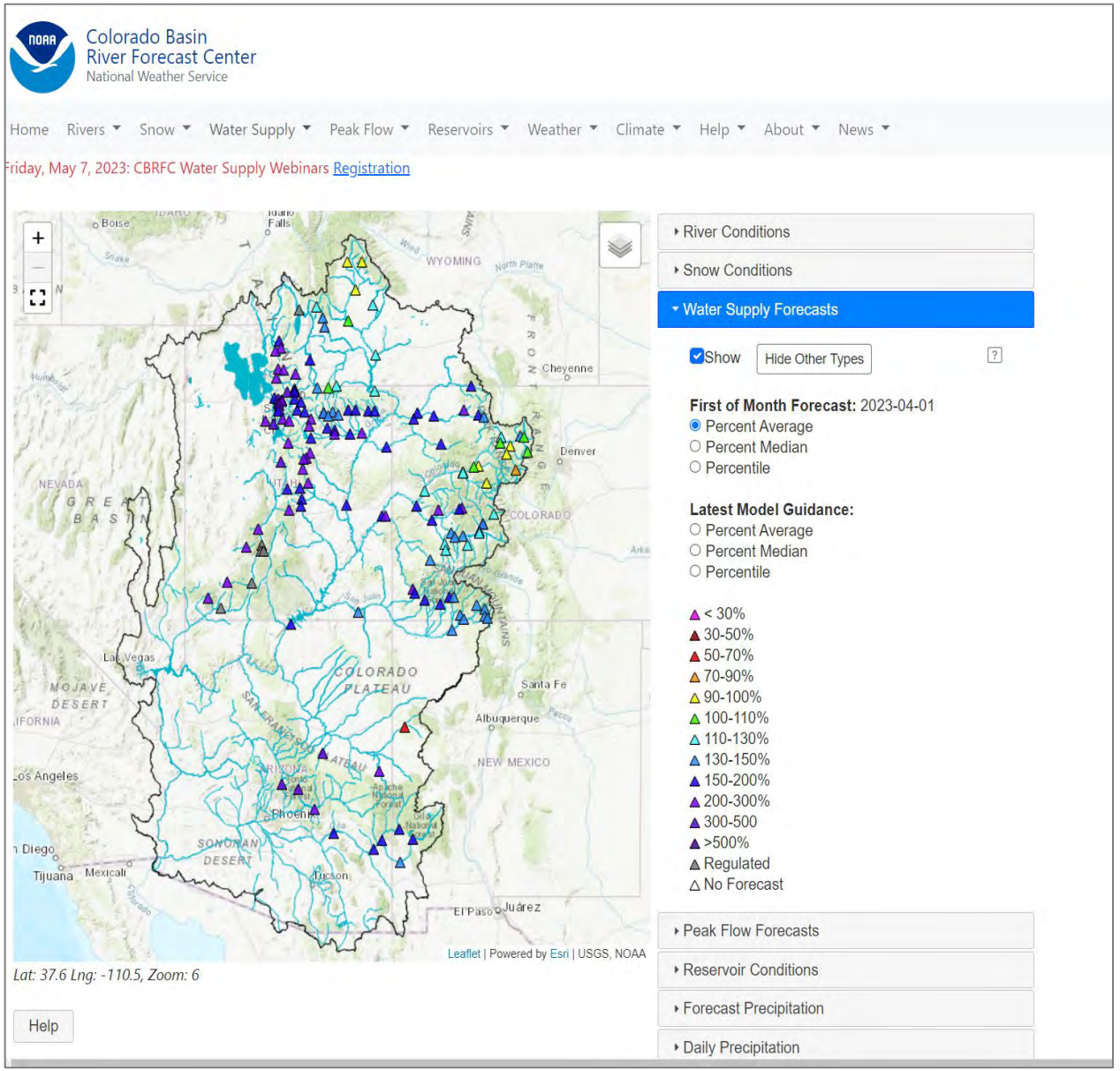
Phone: 801-524-4004

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

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

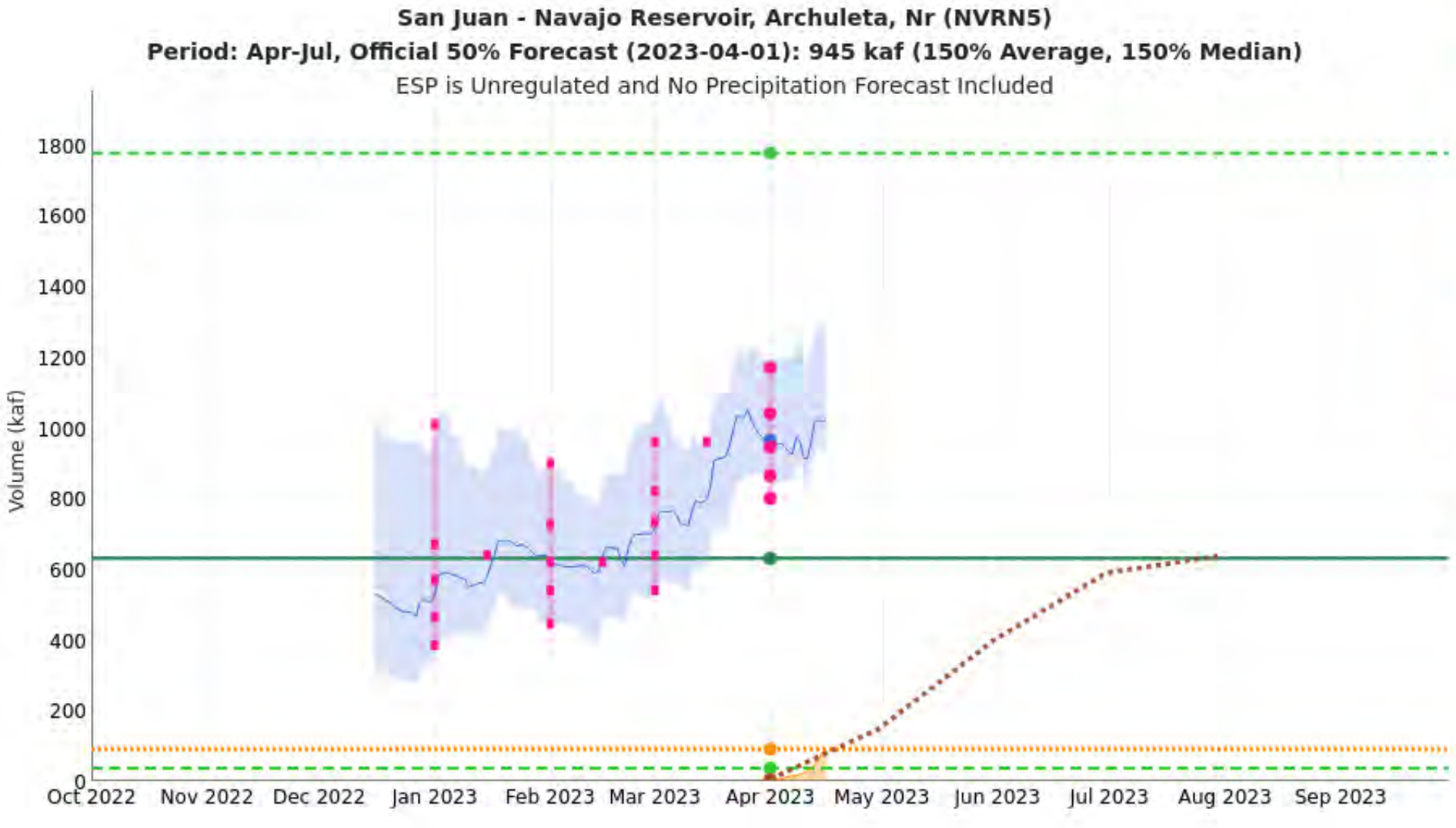


# Official Water Supply Forecast (April-July)

as of April 2023

| | |
|---|---|
| Navajo: | 945 kaf (150%* avg) |
| Vallecito: | 255 kaf (144% avg) |
| Lemon: | 77 kaf (160% avg) |
| Animas: | 590 kaf (153% avg) |
| McPhee: | 515 kaf (202% avg) |
| Powell: | 11,300 kaf (177% avg) |


*average of the 1991 – 2020 time period




2023/04/01:

**Max 1979**: 1776.84

**Min 2002**: 36.74

**Average**: 630

**Median**: 630

**Observed Total**: 90.7

**Normal Accumulation**: 4.9

**ESP**: 964

**Official 10**: 1170

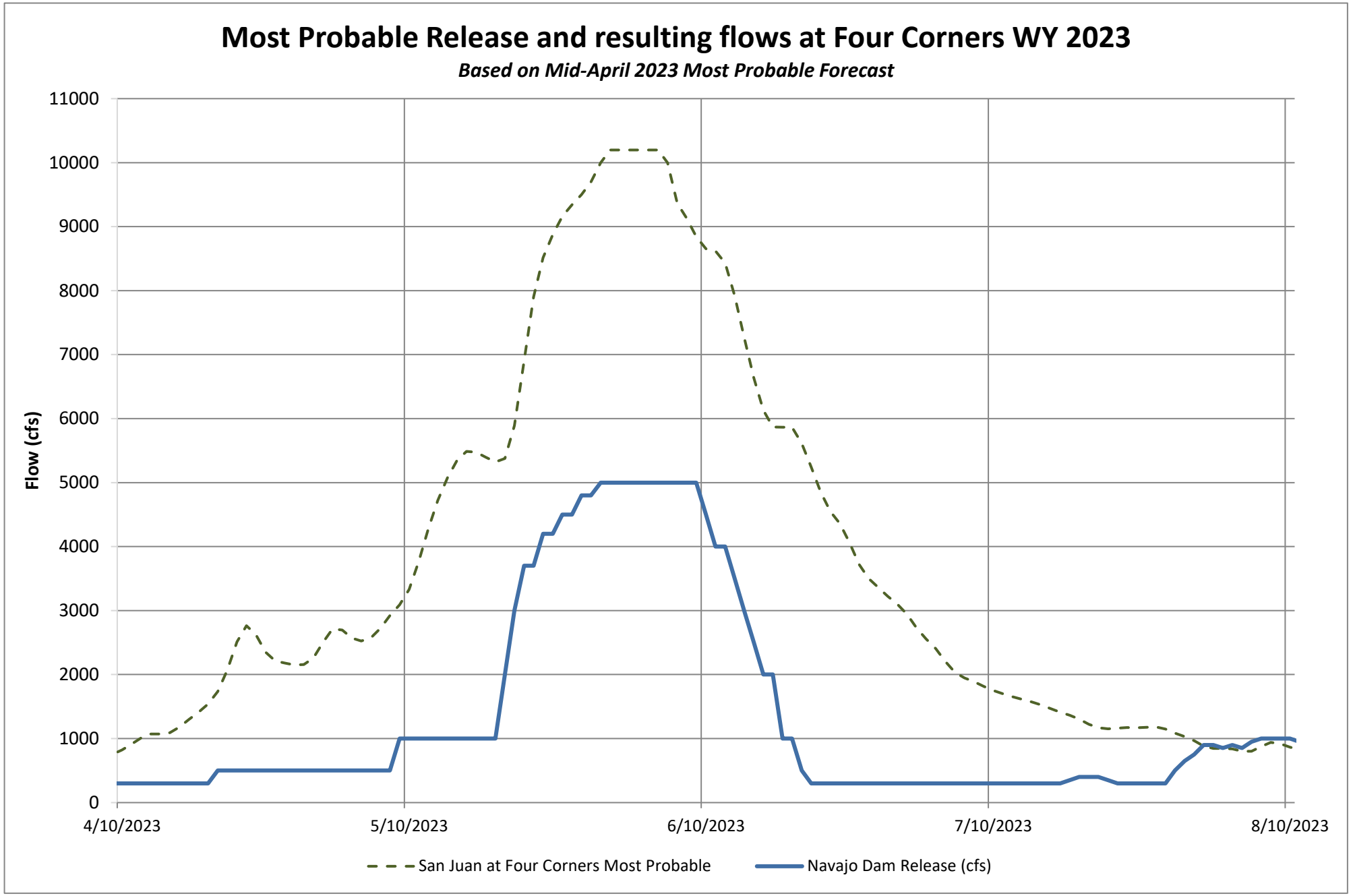
**Official 30**: 1040

**Official 50**: 945

**Official 70**: 865

**Official 90**: 800

The January min/max range was 385 kaf to 1,010 kaf. Since January, with the accumulated snowpack, we have trended towards the Max Probable forecast from January. Therefore operations presented will look similar to what we presented in the Max Probable back in January.


Most Probable Release and resulting flows at Four Corners WY 2023
Based on Mid-April 2023 Most Probable Forecast
Flow (cfs)
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
4/10/2023
5/10/2023
6/10/2023
7/10/2023
8/10/2023
San Juan at Four Corners Most Probable
Navajo Dam Release (cfs)

# SPRING OPERATIONS PLAN

- Purpose: channel maintenance and cleaning, meeting Endangered Species flow goals. Release is planned as per Reclamation's Record of Decision, 2006.
- Length: Spring flushing release of **7-10** days at 5,000 cfs. Ramp-up during the release will be coordinated with federal, state, local agencies on a daily basis. ***(May be larger as forecast increases.)***
- Timing: The release will be timed with the Animas River peak to maximize potential ESA benefits (likely mid/late May to start ramp up)
- Reservoir Elevations: The peak elevation will likely be 6060-6075 ft but could vary greatly based on weather/timing of runoff!

# Animas Peak Forecast and Timing

## Daily Peak Flow Forecast - DRGC2 - Animas - Durango

| | |
|---|---|
| **Model Run Date** | 2023-03-08 (Incl 7 Day Precip Forecast) |
| **Flood Flow** | 10600 cfs |
| **50% Forecast** | 5527 cfs |
| **Rank of 50% Forecast** | 34th Highest Flow / 112 Total Years |
| **Percentile** | 70% of Years Below Forecast |
| **Peak to Date** | |
| **Average Peak** | 4384 cfs |
| **Percent Average** | 126% |
| **Normal Time of Peak** | 05-17 - 06-08 |
| **Last Year's Peak** | 2670 cfs, on 2022-05-17 |

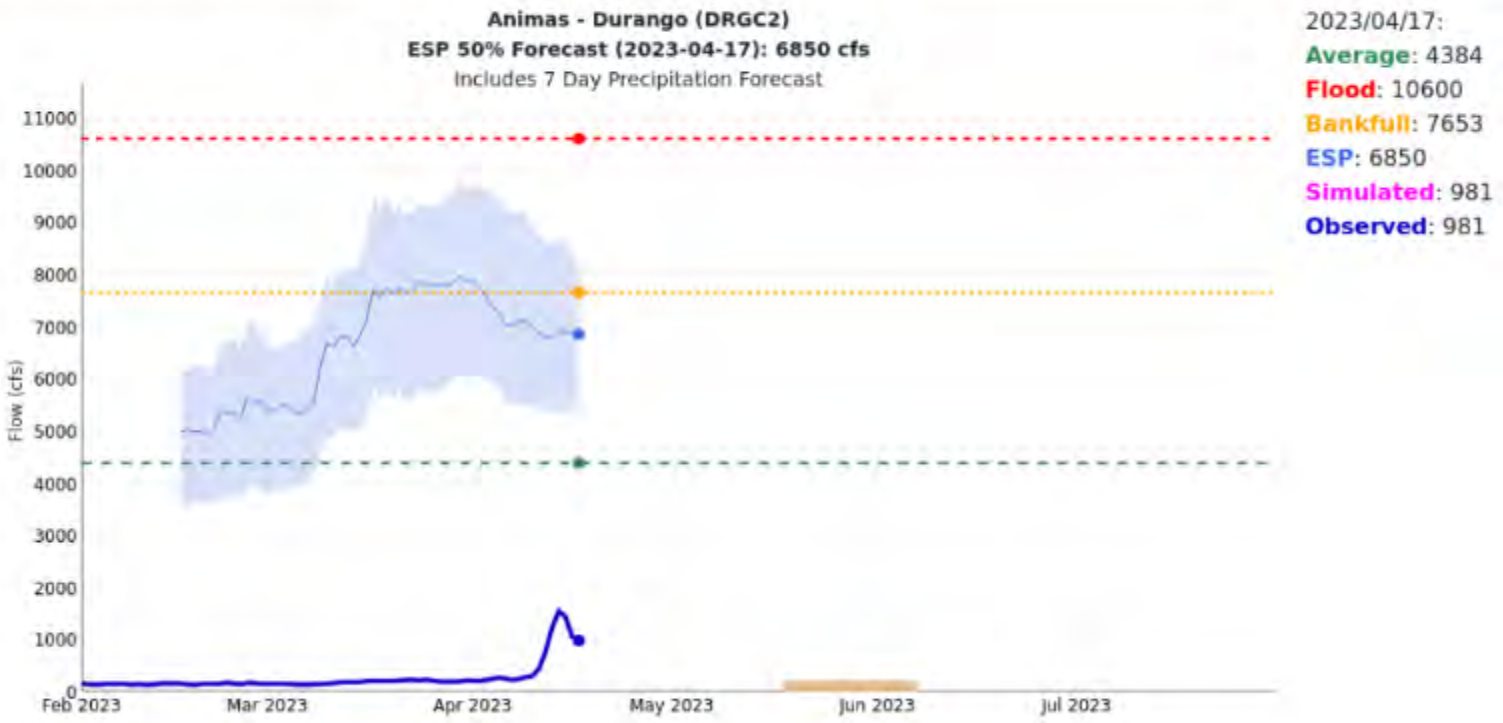



Image courtesy of Jeff Deems
Airborne Snow Observatories

Dust! A storm April 3rd had a dramatic effect on the dust situation. The Dolores, Grand Mesa, central and north-central mountains were more affected than the San Juans this time. Still enough that we will be paying attention.

Why do we care about dust? Dust layers make snowpack:
1. Melt faster
2. Melt earlier

This exposes soils earlier, reducing soil moisture, reducing runoff efficiency, and therefore volumes, and offsets the runoff with typical irrigation patterns.

Data from Jeff Derry, Center for Snow and Avalanche Studies

# Projected Operations WY 2023

- Runoff projections range from 800 kaf (127% of average) to 1170 kaf (186% of average) with a median of 945 kaf (150% of average)
- A **maintenance release** of 150-180 kaf is being planned, peaking at 5,000 cfs for 7-10 days. *(Length may change as forecast evolves)*
- Reservoir is forecast to peak between 6060 and 6075 ft (depending on timing of runoff and release). **(could be higher!)**
- End of water year (September 30th) reservoir elevation is projected to be 6050 to 6060 ft.

# Operations – DROA in WY 2023

- Drought Response Operations Plan (DROA)- releases from Initial Units to Lake Powell
- DROA Year 2023 is May 1, 2023 – April 30, 2024
- No releases are planned at this time.
- The Initial Unit Workgroups (Navajo, Flaming Gorge, Aspinall) have begun meeting to update Attachments that are part of the DROA Plan. Navajo Unit is under "Attachment E".
- DROA webpage: https://www.usbr.gov/dcp/droa.html

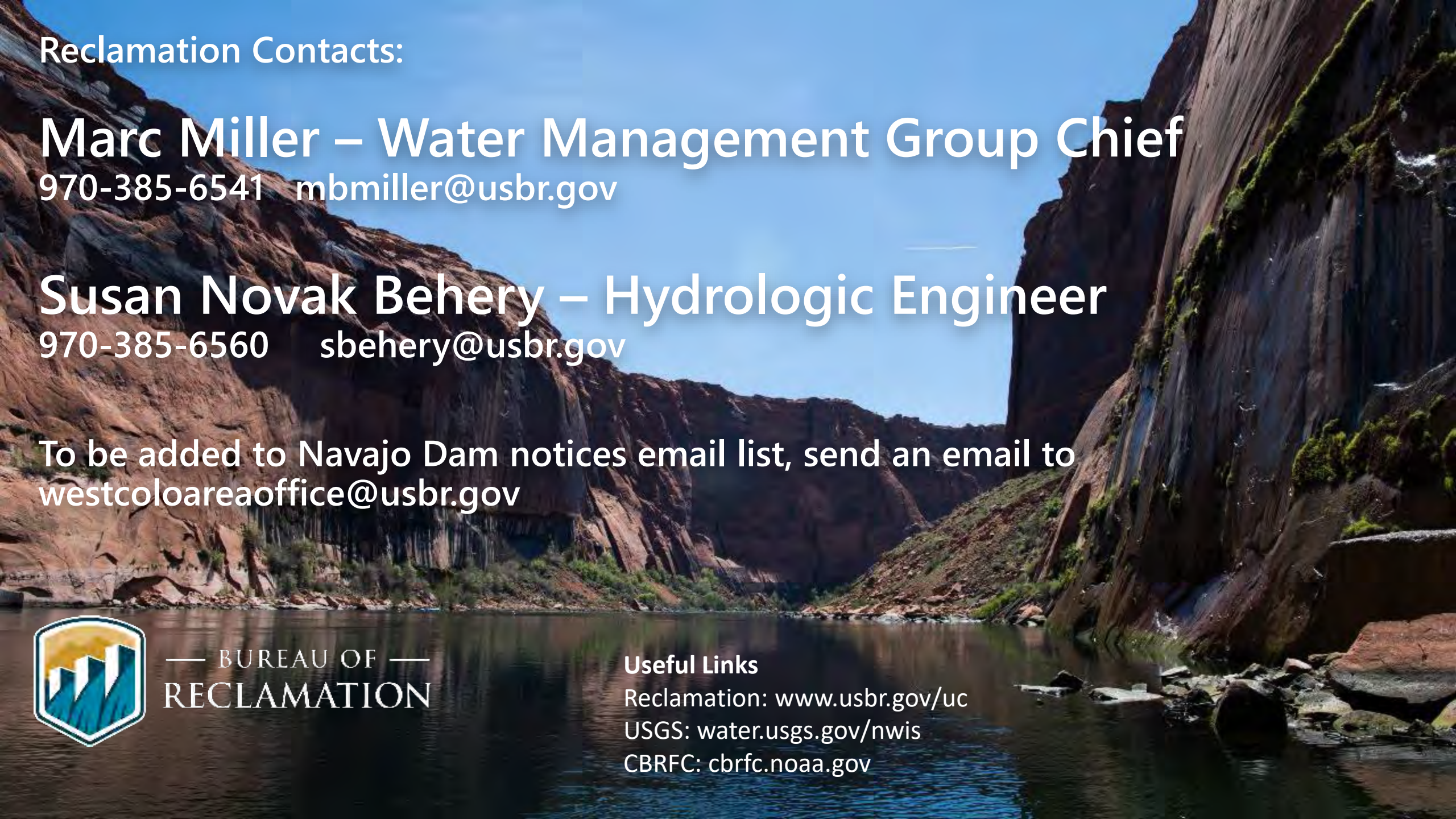
*Next Meeting August 22nd (?)*

# Stay up to date….

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

- Social Media:
  - Reclamation Colorado River Basin Facebook Page: https://www.facebook.com/coloradoriverbasin

- UC Water Operations Home: https://www.usbr.gov/uc/water/index.html
- DROA: https://www.usbr.gov/dcp/droa.html



Reclamation Contacts:

## Marc Miller – Water Management Group Chief

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## Susan Novak Behery – Hydrologic Engineer

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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


# JAN • NMISC • TNC

## Water Lease Agreement in the San Juan Basin

April 18, 2023

Presenters:
Colleen Cunningham, NMISC
Joe Trungale, TNC

# The JAN Water Lease Project

- NMISC obtained a permit to release up to 20,000 AF of water annually from Navajo Reservoir into the San Juan River beginning in 2023
- Water was obtained for up to 10 yrs from the JAN through a lease agreement with the NMISC and TNC
- Permitted water would meet the purposes of the Strategic Water Reserve
- Water is for compact compliance and endangered species management
- The leased water was previously diverted by PNM at the PNM Weir in Fruitland, NM
- Parties of the agreement sought to identify alternative uses of this water to provide the most benefit to the endangered Colorado pikeminnow and the razorback sucker

# Approach

- A Technical Team consisting of representatives of the NMISC, JAN, and TNC was assembled to identify alternative uses for this water
- The Team elicited input from 14 experts in hydrology, geomorphology, and fisheries with direct knowledge of the San Juan River
- The Team conferred with Susan Behery of BOR to better understand dam operations

# Flow Release Alternatives

**Three alternatives were examined:**

- **Supplement Winter Releases (Jan-May)**
- **Supplement a Spring Peak (May-Jun)**
- **Supplement Summer Baseflow (Jul-Sep)**

# Supplement Winter Releases (Jan-May)

## High magnitude/short duration flushing flow

**Potential benefit:** To clean gravel of sediment for razorback sucker spawning before the spring runoff

**Potential drawback:** Not limiting factor for razorback sucker

# Supplement the Spring Peak (May-Jun)

## Add water to annual spring peak

**Potential benefit:** Spring peak high flow events are the most important missing component of the current flow regime

**Potential drawback:** 20KAF is by itself not enough to produce an additive ecological benefit

# Supplement Summer Baseflow (Jul-Sep)

## Increase post-runoff baseflows

### Potential benefits:

- Maintain/increase low velocity rearing habitat
- Increase survival/recruitment of RBS/CPM early life stages

### Potential drawbacks:

- Water losses and unquantified use
- Several years of adaptive management may be necessary to determine optimal release(s)

# Initial 2023 JAN Lease Release Decision

## Initial 2023 Release Decision:

- Apply to spring peak if 20K tips the scale to make a release
- If not, supplement summer baseflow to benefit rearing habitats

## Justification:

- Low velocity rearing habitats critical limiting factor for RBS/CPM
- High spring flow critical to create/maintain habitat, but low likelihood
- Baseflow supplement provides “biggest bang for the buck”

# SJRIP: Spring Maintenance Release

## Biological Committee Recommendation on Spring Release:

- **Release a minimum of 7 days at 5,000 cfs if Animas River runoff peak is projected sufficient to meet SJRIP Flow Recommendations' 5-days at 10,000 cfs or 10-days at 8,000 cfs flow targets. Less than the 21 day Spring Peak Release in Decision Tree.**
- **If the Animas River is no longer contributing enough to meet these targets, recommend the release be ramped down to reach target baseflows to save water**

## Coordination Committee also provided comments

## Final Decision on volume and duration by BOR

# Where the NMISC is with the JAN release

## NMISC Decision on Release of JAN Lease Water:

- Waiting for more details on the volume and duration of the spring “maintenance” release
- Will decide on augmenting a spring release versus summer baseflow in the next few weeks

# What we hope to learn…

- **Implementation** – practical issues related to coordination
- **Flows** – released flows observed at the downstream gages
- **Physical** – distribution, connectivity, and quality of backwaters
- **Biological** – larval/YOY fish persistence in the backwaters
- **Adaptive Management** – incorporate what we learn into subsequent years' decisions