

## Navajo Unit Operations Coordination Meeting

April 23<sup>rd</sup> 2024

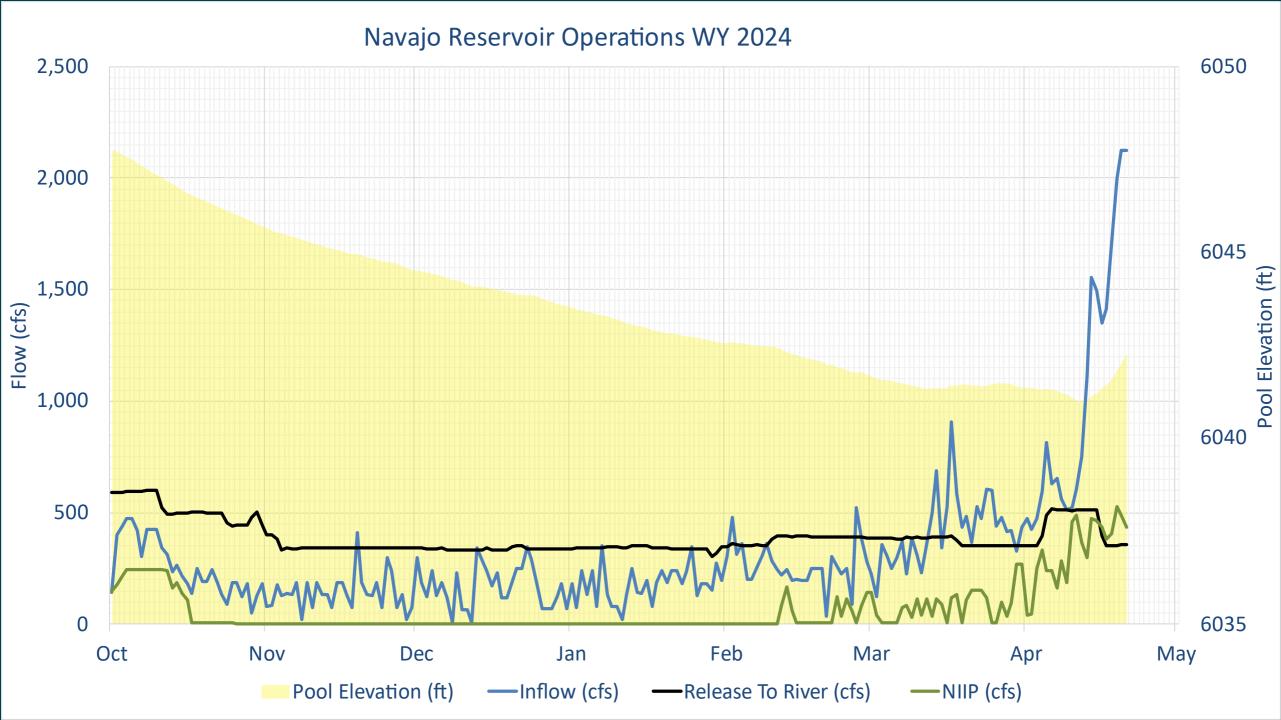
1:00 PM

Farmington Civic Center / Microsoft Teams

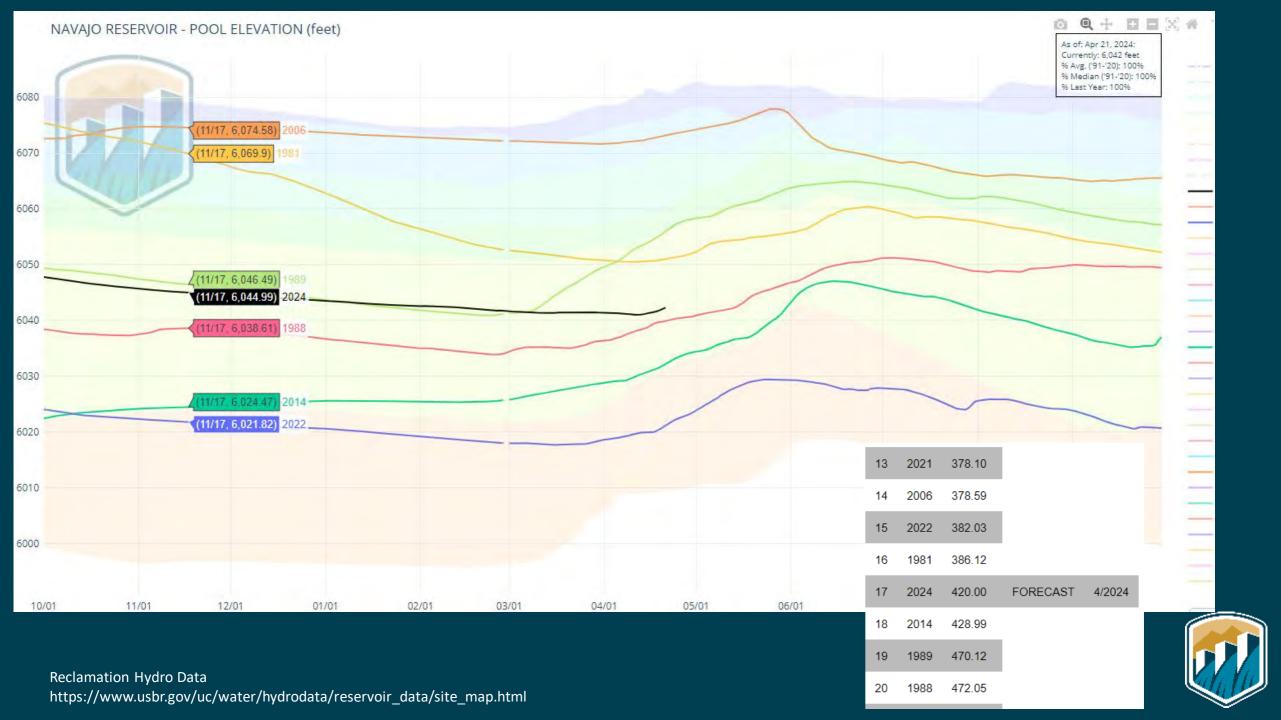
## Agenda

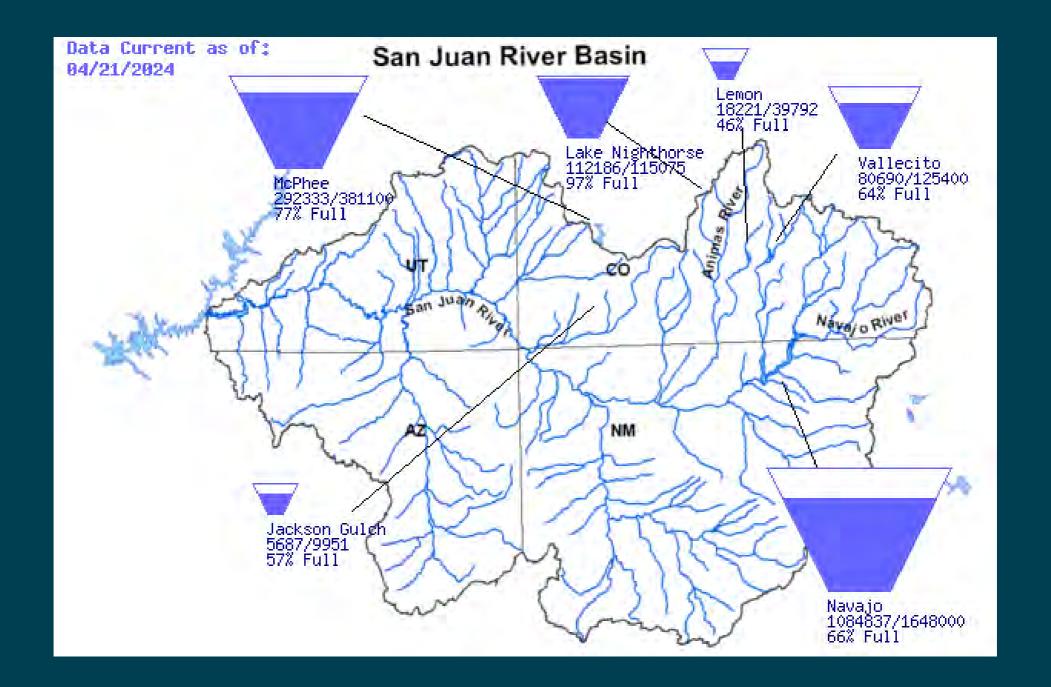
- Introductions
- WY 2024 Operations to date
- Seasonal Weather Outlook
   – Erin Walter, NWS
- Spring Runoff Forecast
   – Ashley Nielson, CBRFC
- WY 2024 planned operations
- NMISC and TNC release update Colleen Cunningham, NMISC
- Maintenance Update
- SJRIP Update
- Comments and Reports





## San Juan River Flows WY 2024 1,100 1,000 900 800 700 600 Flow (cfs) 500 400 300 200 100 0 Oct Feb May Nov Dec Jan Mar Apr ·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)

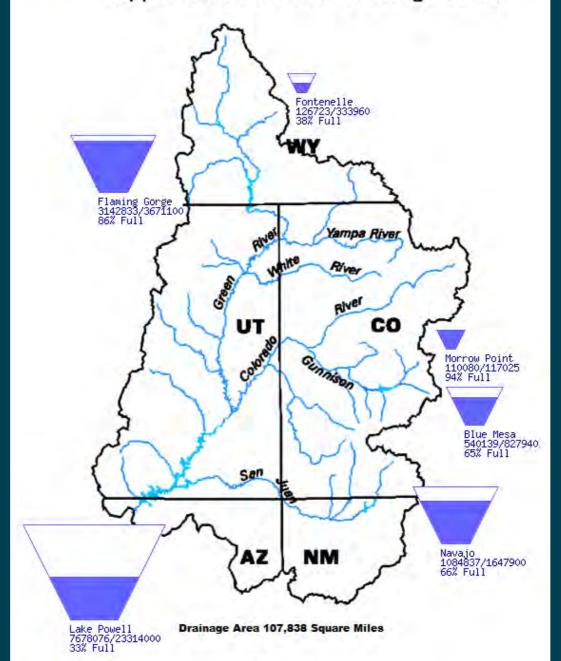






Data Current as of: 04/21/2024

## Upper Colorado River Drainage Basin





## Water Year 2024 Totals

Water Year 2024 is October 1, 2023-September 30, 2024

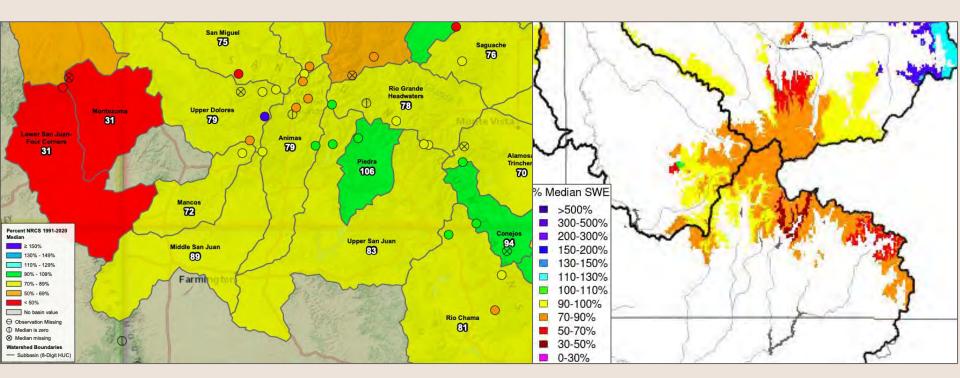
## So far this water year:

- Navajo Modified Unregulated Inflow has totaled 161 kaf (54% avg for this date)
- Navajo Release has totaled 158 kaf (72% avg for this date)
- Calculated Evaporation has totaled 7 kaf
- NIIP has diverted 28 kaf
- San Juan-Chama has diverted 9 kaf



## Modeled SWE by Basin

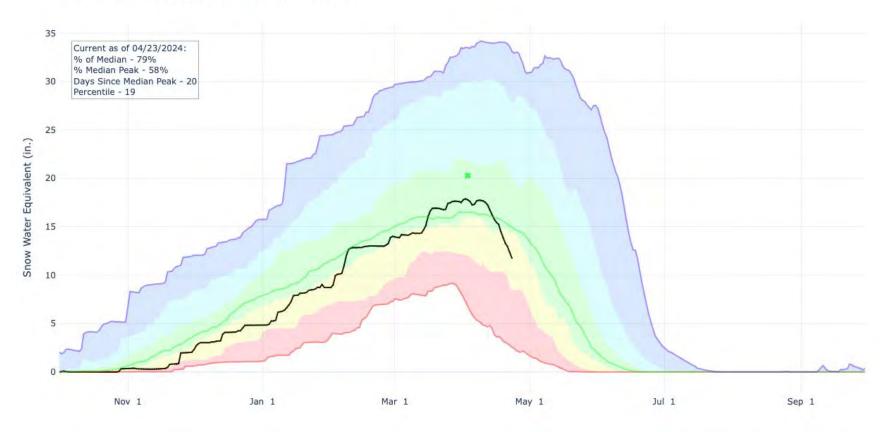
NRCS & CBRFC as of April 22nd 2024







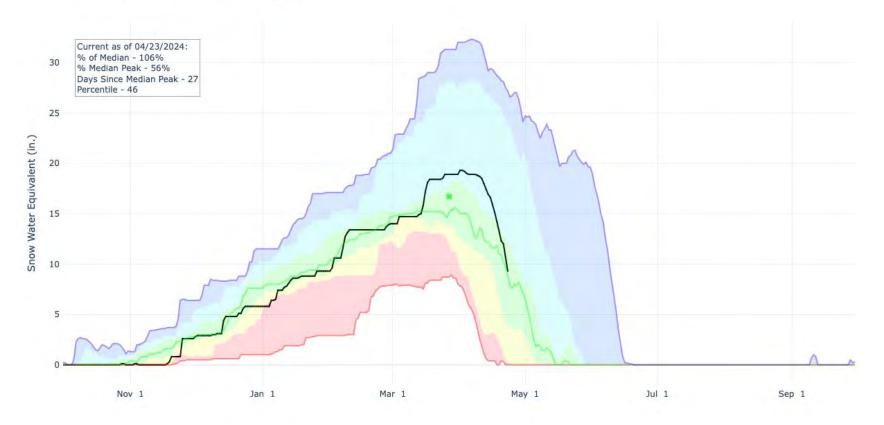
#### SNOW WATER EQUIVALENT IN UPPER SAN JUAN







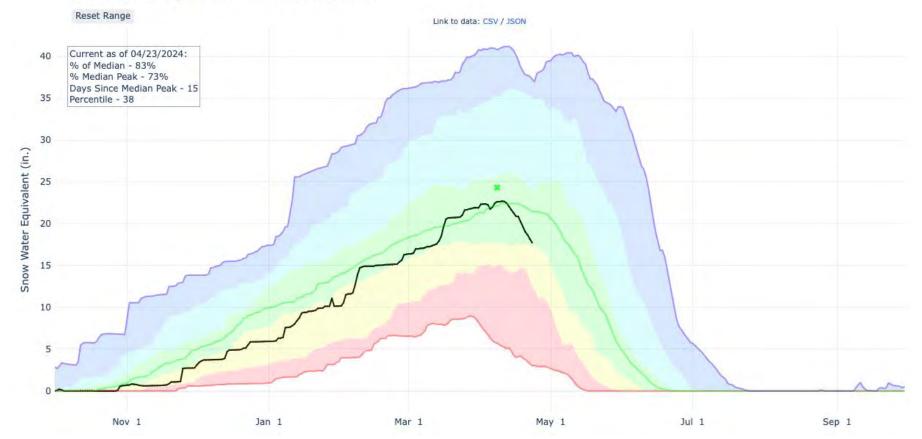
#### SNOW WATER EQUIVALENT IN PIEDRA







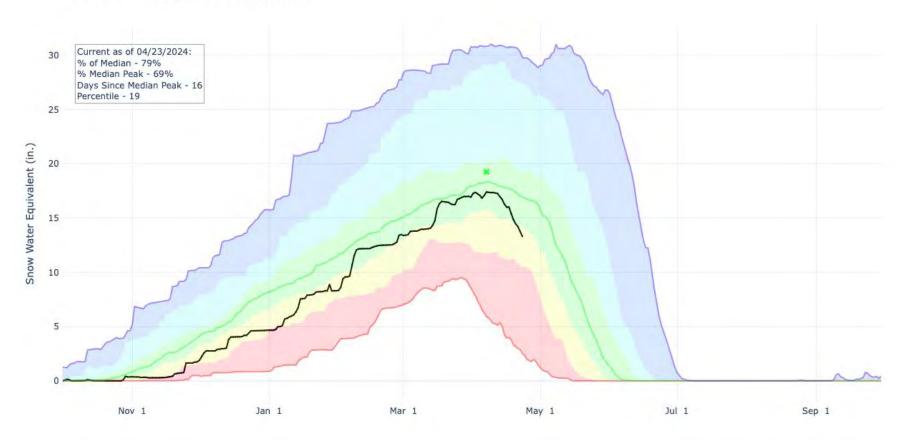
#### SNOW WATER EQUIVALENT IN UPPER SAN JUAN







#### SNOW WATER EQUIVALENT IN ANIMAS

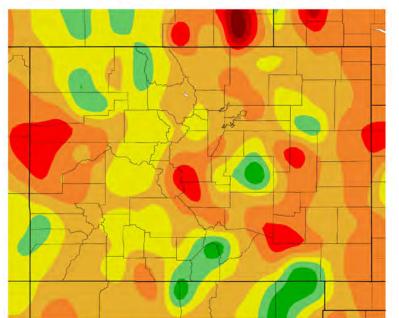




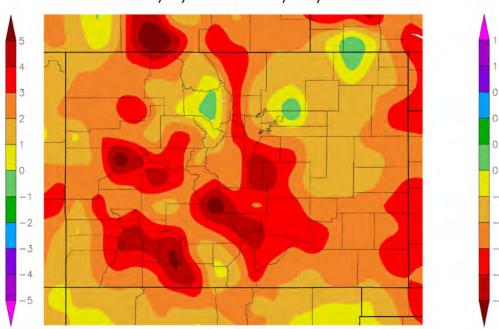


## Temperature/Precipitation Anomaly Since April 1

Departure from Normal Temperature (F) 4/1/2024 - 4/22/2024



Departure from Normal Precipitation (in) 4/1/2024 - 4/22/2024

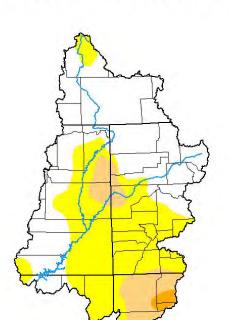




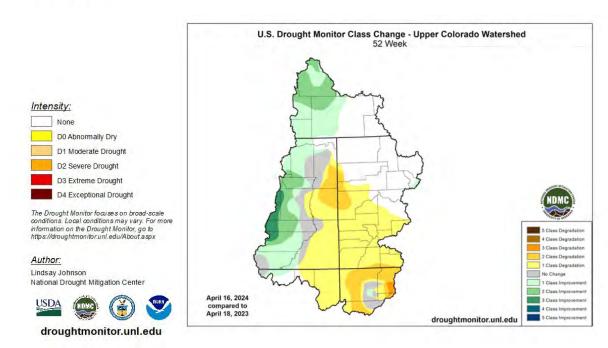


## **Drought Monitor**

U.S. Drought Monitor
Upper Colorado Watershed



April 16, 2024 (Released Thursday, Apr. 18, 2024) Valid 8 a.m. EDT







## 7-Day Forecast Over the San Juan Basin

				T 100 T 100							1	Maxi	mu	m Te	emp	erat	ure	Fore	cas	st												
		4/23			4/	24			4/	25			4/	26			4/	27			4/2	28			4/	29			4/	30		
		Tue			W	ed			Th	nu			F	ri			Sa	at		> .	Su	n			Mo	on			Tu	ie		
	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	Maximum
Silverton	56	61	58	35	53	60	57	34	50	50	43	28	42	47	44	28	33	43	42	27	37	47	46	26	44	56	54	31	54	59	56	61
Wolf Creek Summit	49	51	50	39	46	51	49	38	41	43	37	31	35	40	38	32	34	36	35	28	38	43	41	31	44	49	48	37	48	53	50	53
Dolores	65	72	70	50	61	70	68	48	59	60	55	38	47	57	56	39	37	51	51	39	48	59	57	40	54	67	66	47	62	71	69	72
Miller Mtn	47	52	51	41	44	50	50	40	39	41	36	30	33	39	38	30	28	34	34	25	33	40	40	27	36	46	47	34	43	51	48	52
Columbine Basin SNOTEL	48	53	52	40	43	52	51	41	40	42	36	30	28	39	39	30	27	34	34	24	28	40	40	28	34	46	47	33	41	51	47	53
Durango	68	76	74	52	64	73	71	51	63	64	60	43	53	62	60	44	40	55	56	39	53	62	60	43	58	70	69	49	65	75	73	76
Pagosa Springs	66	74	72	47	61	72	70	46	62	63	58	36	48	60	59	38	39	54	54	35	49	61	60	38	54	69	67	42	64	73	70	74
Farmington	70	80	79	60	68	78	78	59	64	68	62	51	58	67	66	51	52	59	60	45	55	66	66	48	62	76	76	54	68	81	79	81





## 7-Day Forecast Over the San Juan Basin

141: 4	0	F
wing	GUST	Forecast

		4/23 Tue			- 2/3	24 ed				25 hu			72	26 ri			4/ S					28 un				29 on			- 12	30 Je		
	6am	12pm	6pm	12an	n 6am	12pn	n 6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	16pm	Maximum
Silverton	8	18	207	8	6	16	20	12	9	24	24	17	12	25	297	201	16	21.	23	17	16	22*	24	17	14	20	23	181	171	287	30	30
Wolf Creek Summit	15	23	30.	16	16	28	30	22#	18	41#	48	32	24	29.	32	23	21#	25	24	18	17	26	25	18	17	24	24	20#	22	32	35	48
Dolores	6	17	21	8	8	17	21#	141	10	29	31	171	14	22	26	161	131	20	21*	14+	14	22*	22*	14	12	18	20	14	13	24	26	31
Miller Mtn	14	24	29	20	15	26	267	20*	154	38	39	20*	18	24	30	201	16#	21#	24→	22	16	22*	25→	204	17	22	24	18	17	25	29	39
Columbine Basin SNOTEL	14	21#	23	20	16	23	23	25→	16+	36≱	36→	20*	18	24	28	21#	17#	22#	26*	24	20	24	26*	22	17	22	24	184	17	24#	28	36
Durango	6	18	25	7	5	17	23	9	5	25	33	15	10	21	26	14	9	18	24	17	12	22	25	14	10	17	21	13	10	20	25	33
Pagosa Springs	5	16	23	6	5	17	23#	6	5	22#	31-	13	10	20-	28-	141	101	17	21-	10	8.0	17	22*	10	8	16#	21	10=	9#	21	28	31
Farmington	7	13+	20→	12	8	13	20	15	9	25	29	20-	13	21	24	16	15	20-	28*	16	12	25	25	13	9	15	17	12	12	177	24	29





								Rain Forecast Ranges																					
		4/23 Tue			4/2 We				-	/25 hu			4/26 Fri				1.75	27 at				28 un				/29 Ion		7.3	/30 Tue
4	6am	12pm	6pm	12am	16am	12pn	n 6pm	12ar	n 6am	12pm	6pm	n 12am 6am 12pm 6pm				12am	6am	12pm	16pm	12an	n 6am	12pm	6pm	12am	6am	12pm	6pm	12am	Total
Silverton	0	0	0	0	0	0	0	0	<.1"	13"	<.1"	<.1"	<.1"	<.1"	<.1"	.13"	.13	".13"	<.1"	<.1"	<.1"	<.1"	0	0	0	0	0	0	.5-1"
Wolf Creek Summit	0	0	0	0	0	0	0	0	<.1"	<.1"	<.1"	0	0	<.1"	<.1"	.13"	.13	".13"	<.1"	0	0	0	0	0	0	0	0	0	.5-1"
Dolores	0	0	0	0	0	0	0	0	<.1"	<.1"	0	0	0	0	<.1"	<.1"	.13	" .13"	<.1"	0	0	0	0	0	0	0	0	0	.5-1"
Miller Mtn	0	0	0	0	0	0	0	0	<.1"	13"	<.1"	0	0	<.1"	<.1"	.13"	.13	" .13"	<.1"	0	0	0	0	0	0	0	0	0	.5-1"
Columbine Basin SNOTEL	0	0	0	0	0	0	0	0	<.1"	13"	<.1"	<.1"	0	<.1"	.13"	.13"	.35	" .13"	<.1"	0	0	0	0	0	0	0	0	0	1-1.5"
Durango	0	0	0	0	0	0	0	0	0	<.1"	0	0	0	0	<.1"	<.1"	.13	" <.1"	0	0	0	0	0	0	0	0	0	0	.35"
Pagosa Springs	0	0	0	0	0	0	0	0	<.1"	<.1"	0	0	0	0	0	<.1"	.13	" <.1"	0	0	0	0	0	0	0	0	0	0	.13"
Farmington	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<.1"	<.1"	<.1"	0	0	0	0	0	0	0	0	0	0	<.1"
										5	inov	w Fo	rec	ast R	land	es													
		4/23	3		4	/24			4	4/25	1.0.			4/26			4/	27			4/2	28			4/	29		4,	/30
		Tue	į.	1.	W	Ved			7	Thu				Fri			Si	at			Su	ın	-		M	on		T	ue
	6am	112рп	п брп	n 12ar	n 6an	112p	m 6pm	n 12a	m 6ar	n12pr	пбрг	n 12a	m 6ar	m 12pr	n 6pm	12am	n 6am	12pm	6pm	12am	6am	12pm	6pm	12am	6am	12pm	6pm	12am	Total
Silverton	0	0	0	0	0	0	0	0	0	Ţ	<1"	" <1'	' T	0	<1"	1-2"	1-2"	<1"	<1"	<1"	<1"	0	0	0	0	0	0	0	4-6"
Wolf Creek Summit	0	0	0	0	0	0	0	0	0	<1"	T	0	0	<1"	T	1-2"	2-3"	1-2"	<1"	0	0	0	0	0	0	0	0	0	6-8"
Dolores	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miller Mtn	0	0	0	0	0	0	0	0	0	1-2	T	0	0	<1"	' <1"	1-2"	2-3"	1-2"	0	0	0	0	0	0	0	0	0	0	6-8"
Columbine Basin SNOTEL	L 0	0	0	0	0	0	0	0	0	2-3	<b>"</b> <1"	" <1'	" 0	<1"	1-2"	2-3"	3-4"	2-3"	<1"	0	0	0	0	0	0	0	0	0	12-18"
Durango	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

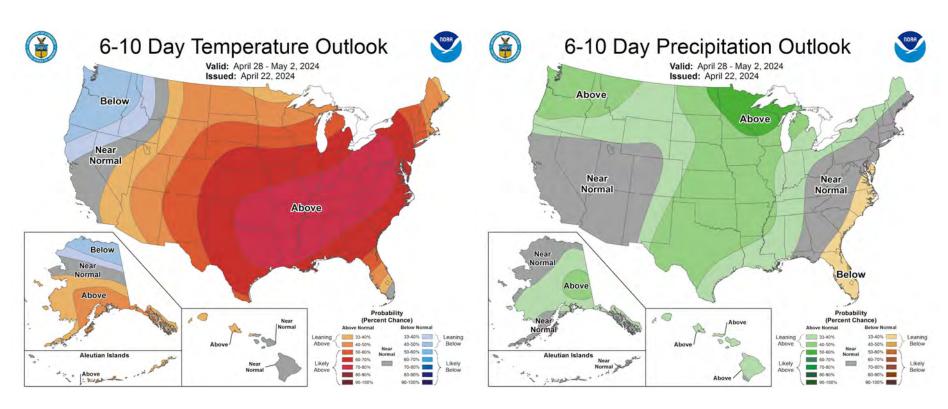


Pagosa Springs





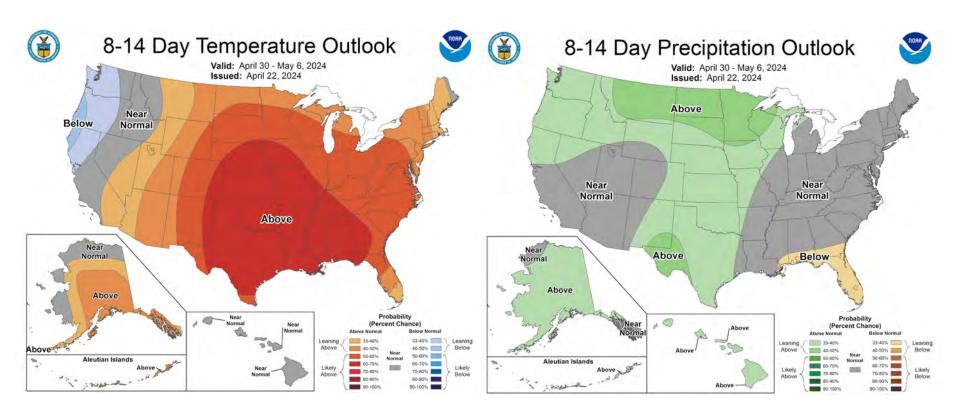
## 6 to 10 Day Outlook







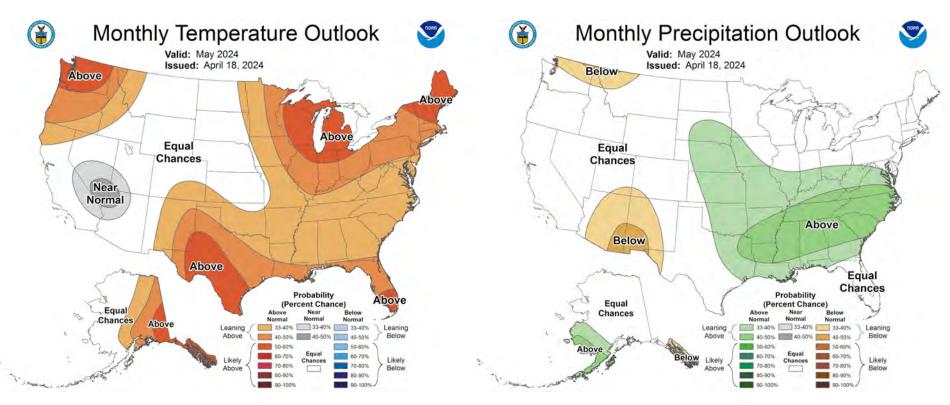
## 8 to 14 Day Outlook







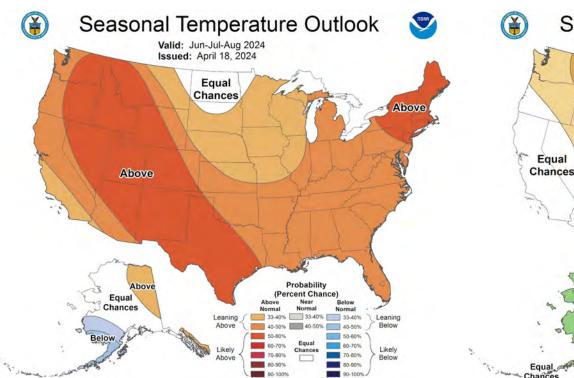
## One Month Outlook: May

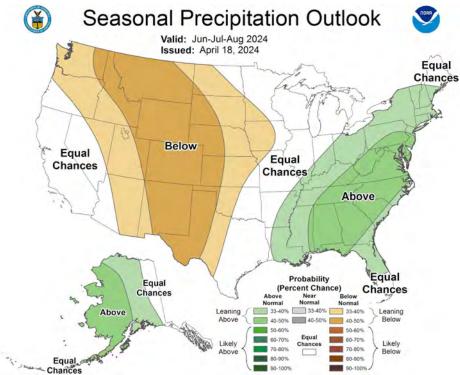






## **Seasonal Outlook**









# Thank You!

email: erin.walter@noaa.gov

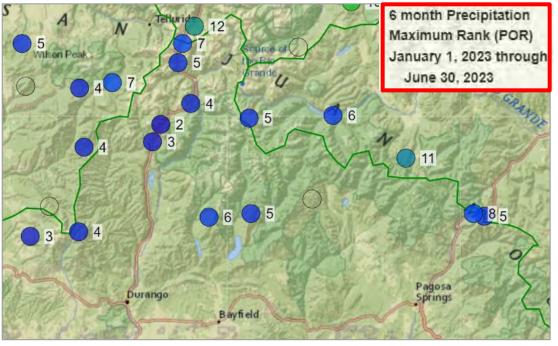
office phone: 970-256-9463

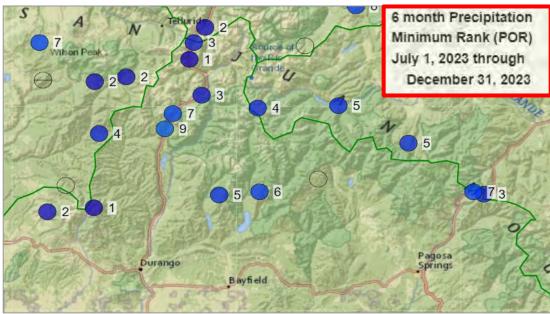
cell phone:720-384-7792



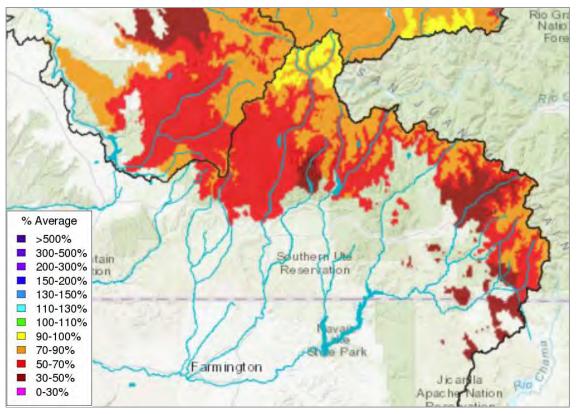


## A few reminders.....





## Fall 2023 Modeled Soil Moisture



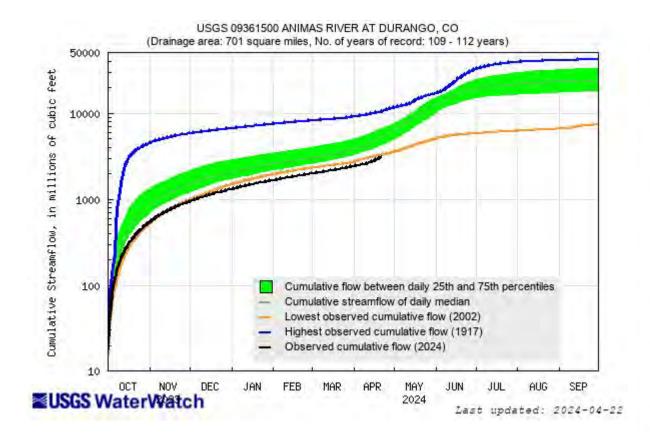
### Soil Moisture Impacts on Water Supply / Runoff

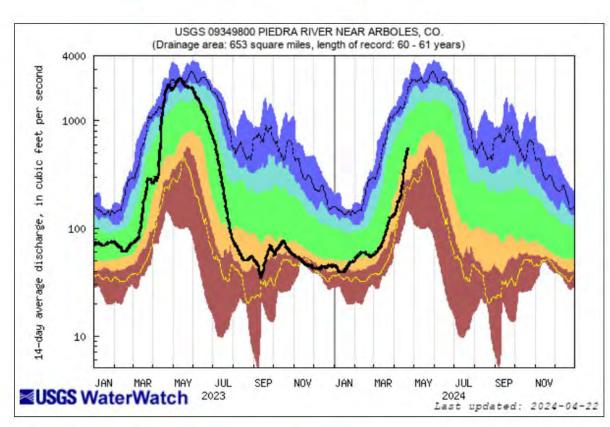
Below normal soil moisture conditions  $\rightarrow$  negative impact (decreased runoff efficiency)

## Runoff Efficiency

- Soil moisture deficit must be fulfilled before runoff can occur.
- Timing/magnitude of runoff is ultimately a result of:
  - Spring Weather (precipitation/temperature)
  - Snow Conditions
  - Soil Moisture Conditions
  - Dust conditions

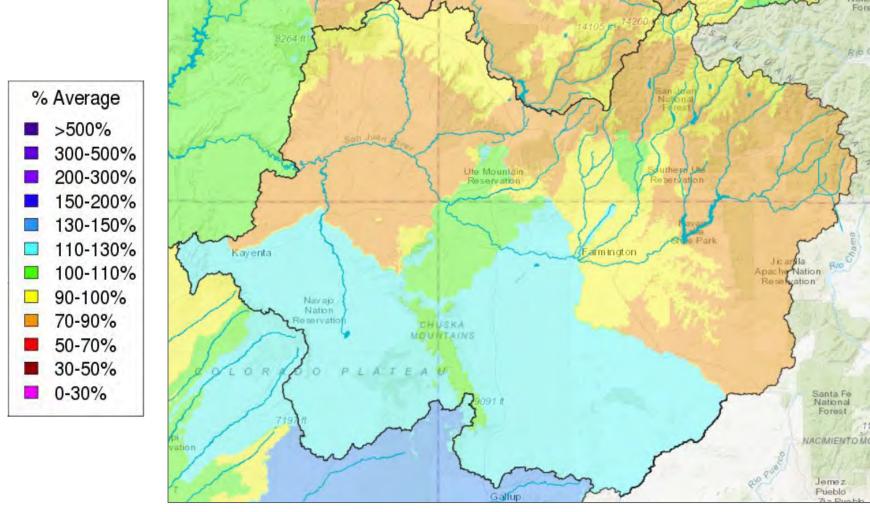
## **Streamflow Conditions**





	E	xplana	tion - Pe	ercentile	classes	ŝ	
- 2							_
lowest- 10th percentile	5	10-24	25-75	76-90	95	90th percentile -highest	Flow
Much below !	Normal	Below normal	Normal	Above	Mucha	bove normal	Tion

## 2024 Water Year Precipitation

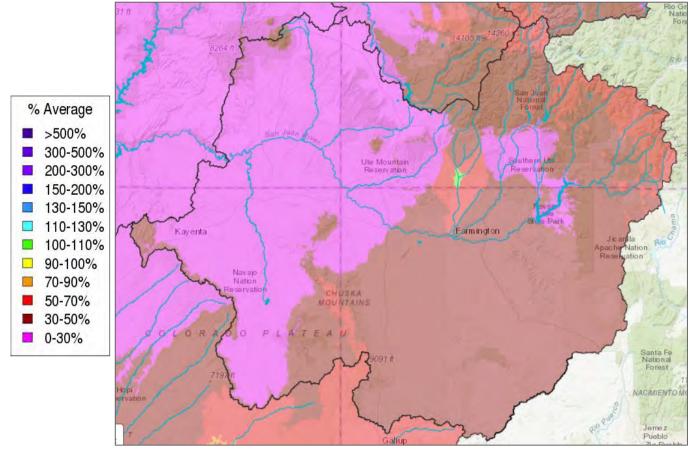


Above Navajo Reservoir: 90% Animas River Basin: 90%

Observed precipitation is averaged by CBRFC defined basin elevation zones.

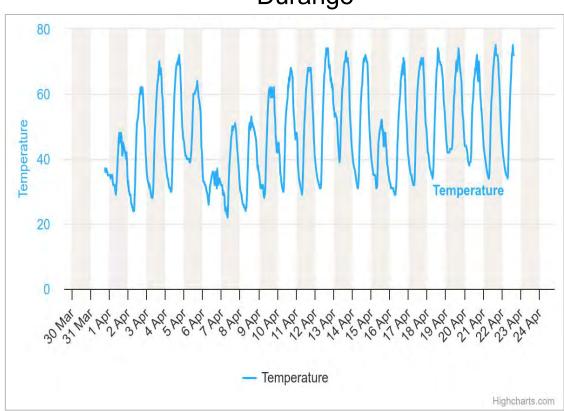
## **April Precipitation and Temperature**





Observed precipitation is averaged by CBRFC defined basin elevation zones.

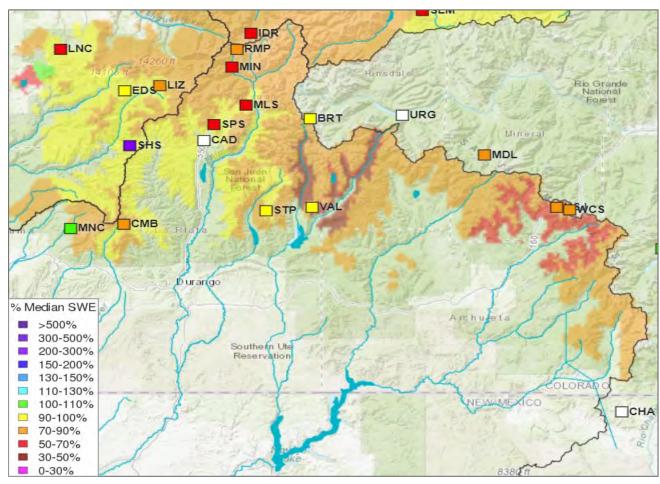
## April Observed Daily Temperatures Durango

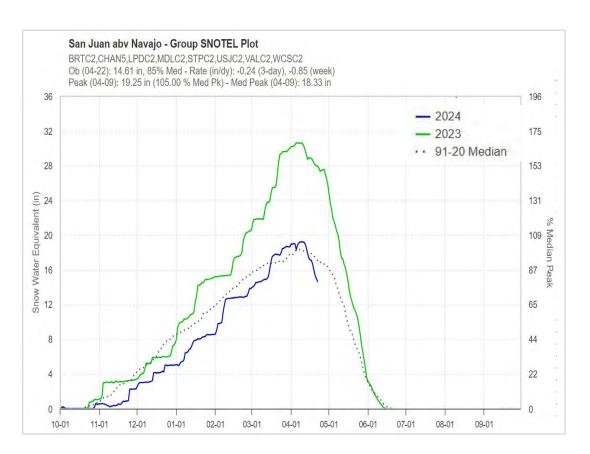


## Snow Conditions: SNOTEL and CBRFC Model Snow

## **April 22 SWE Conditions**

NRCS SNOTEL Observed (Squares) CBRFC Model (Significant Areas)

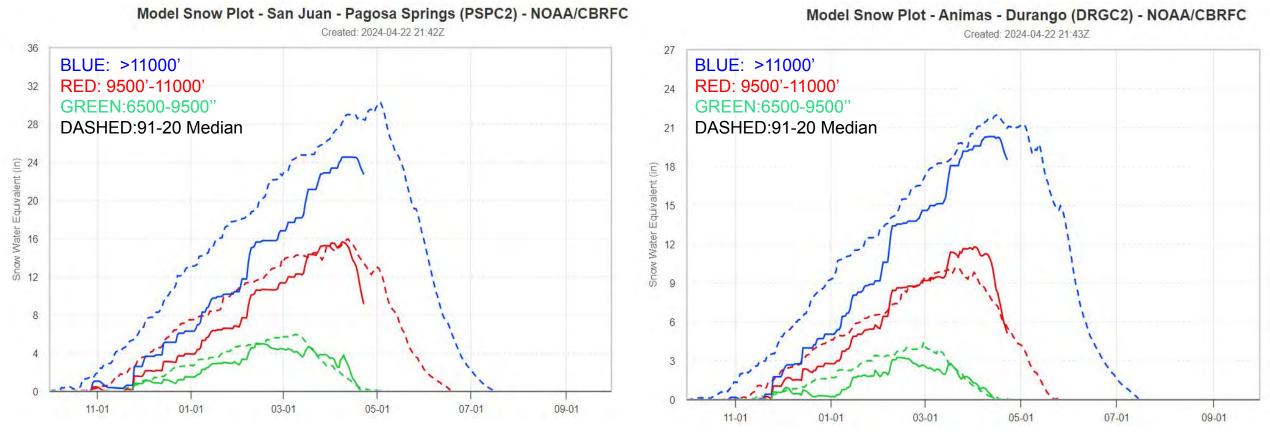




Model snow includes areas above and below SNOTEL sites.

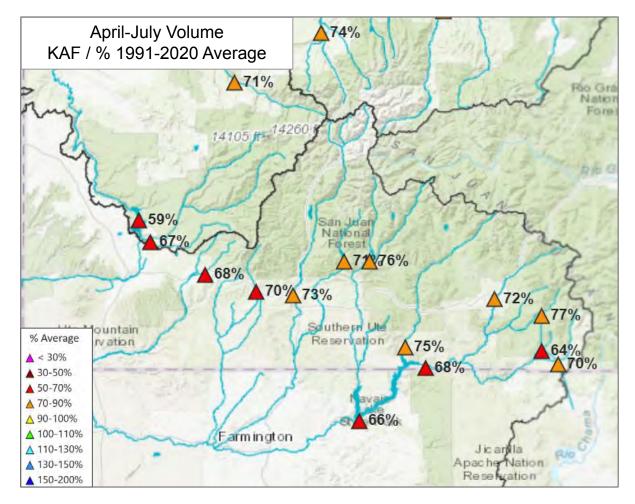
- SNOTEL locations range from ~8,500-11,500'
- Modeled basins range from ~4600-14,000'
  - Modeled snow below 7500' is not being shown on the map/plot.

## **Snow Conditions: CBRFC Model**



- Snow above 11000': below normal
- Snow between 9500-11000': near normal
- Snow below 9500': below normal peak
- Melt has occurred at all elevations but significant melt below 11000'

## April 22 Water Supply Volume Forecasts: San Juan River Basin



River	Location	Avg Cond	Forecast Period	Min 90	MP *	Max 10	Avg	Pct Avg
San Juan	Pagosa Springs	Δ	Apr-Jul	116	139	185	194	72
San Juan	Carracas; Nr	<b>A</b>	Apr-Jul	190	224	290	330	68
Rio Blanco	Pagosa Springs; Nr; Blanco Dam; Blo	Δ	Apr-Jul	32.0	38.0	45.0	49.0	77
Navajo	Chromo; Nr; Oso Div Dam; Blo	Δ	Apr-Jul	36.0	41.0	50.0	58.0	70
Piedra	Arboles; Nr	Δ	Apr-Jul	118	135	175	181	75
Los Pinos	Vallecito Reservoir; Bayfield; Nr	Δ	Apr-Jul	118	135	161	177	76
San Juan	Navajo Reservoir; Archuleta; Nr	<b>A</b>	Apr-Jul	353	419	547	630	66
Florida	Lemon Reservoir; Durango; Nr	<b>A</b>	Apr-Jul	29.0	34.0	44.0	48.0	71
Animas	Durango	Δ	Apr-Jul	241	282	368	385	73
La Plata	Hesperus	<b>A</b>	Apr-Jul	14.2	16.1	22.0	23.0	70
San Juan	Bluff; Nr	<b>A</b>	Apr-Jul	591	682	850	1110	61
Mancos	Mancos; Nr	<b>A</b>	Apr-Jul	9.30	11.8	17.2	17.2	68
Little Navajo	Oso Div Dam;Bl;Chromo;Nr	<b>A</b>	Apr-Jul	3.20	3.90	5.40	6.10	64

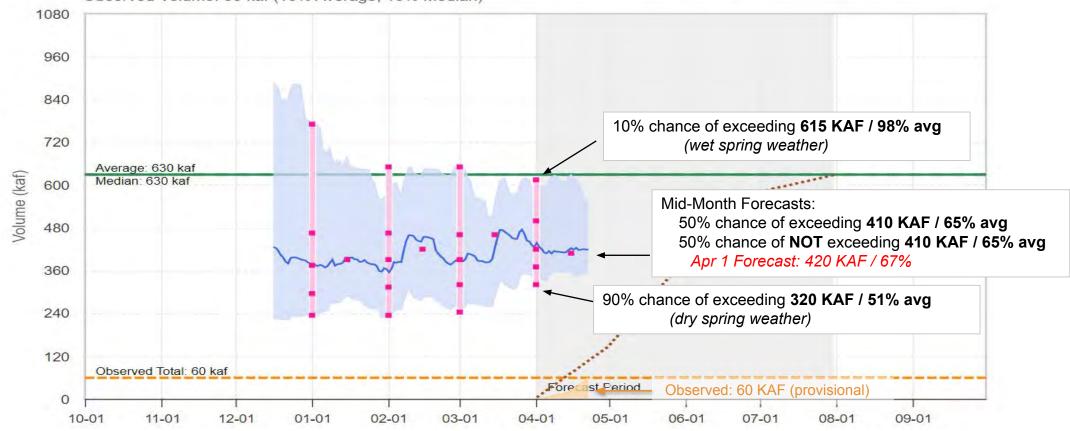
<sup>\*</sup>MP 50=Most Probable/50% Exceedance Forecast

50% exceedance forecasts range from ~60-75% average.

## Forecast Evolution: Navajo Reservoir Inflow

## 2024 Water Supply Forecast - San Juan - Navajo Reservoir, Archuleta, Nr (NVRN5)

ESP is Unregulated and No Precipitation Forecast Included
Official 50% Fcst (2024-04-15): 410 kaf (65% Avg, 65% Med), (30% of Yrs Below Fcst, 38 Highest Flow / 53 Tot Yrs)
ESP 50% Fcst (2024-04-22): 419 kaf (66% Avg, 66% Med), (30% of Yrs Below Fcst, 38 Highest Flow / 53 Tot Yrs)
Observed Volume: 60 kaf (10% Average, 10% Median)



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

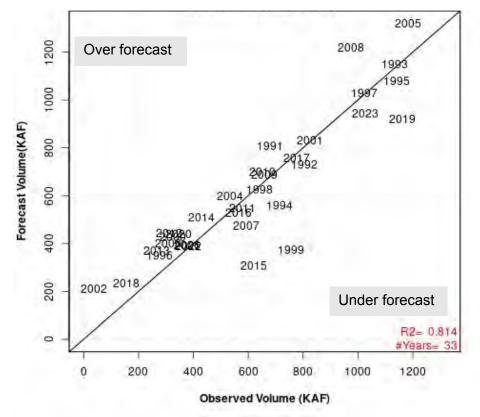
Brown dotted: Average observed

Orange dashed: 2024 Observed Streamflow

NOTE: 20% chance that the April-July runoff will fall outside of the forecast range.

## Navajo Reservoir Inflow Forecast Verification

Navajo Reservoir Inflow April 1<sup>st</sup> 50% Forecast 1991-2023



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

## **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

## Peak Flow Forecast: Animas- Durango

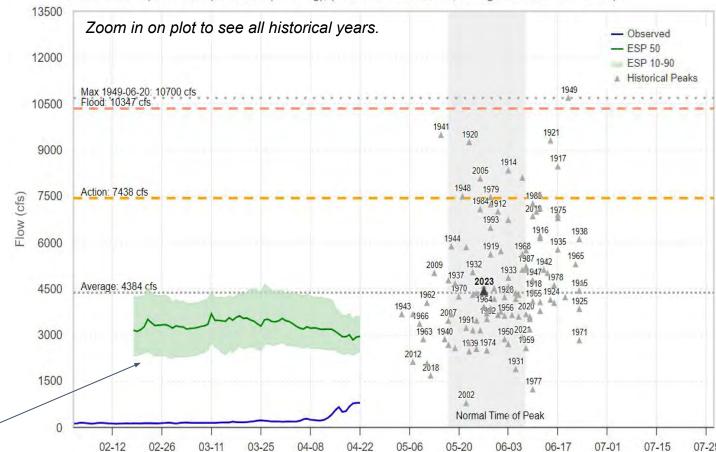
Peak Flow Forecas	st Overview
Model Run Date	2024-04-22 (Incl 7 Day Precip Forecast)
Flood Flow	10347 cfs
50% Forecast	2948 cfs
Rank of 50% Forecast	95th Highest Flow / 113 Total Years
Percentile	16% of Years Below Forecast
Peak to Date	
Average Peak	4384 cfs
Percent Average	67%
Normal Time of Peak	05-17 - 06-08
Last Year's Peak	4430 cfs, on 2023-5-27

## **Daily Peak Flow Forecast Magnitude**

Exceedance Probability	Mean Daily Flow (cfs)
Maximum	4405
10%	3574
25%	3441
50%	2948
75%	2613
90%	2434
Minimum	2360

#### 2024 Peak Flow Forecast - Animas - Durango (DRGC2)

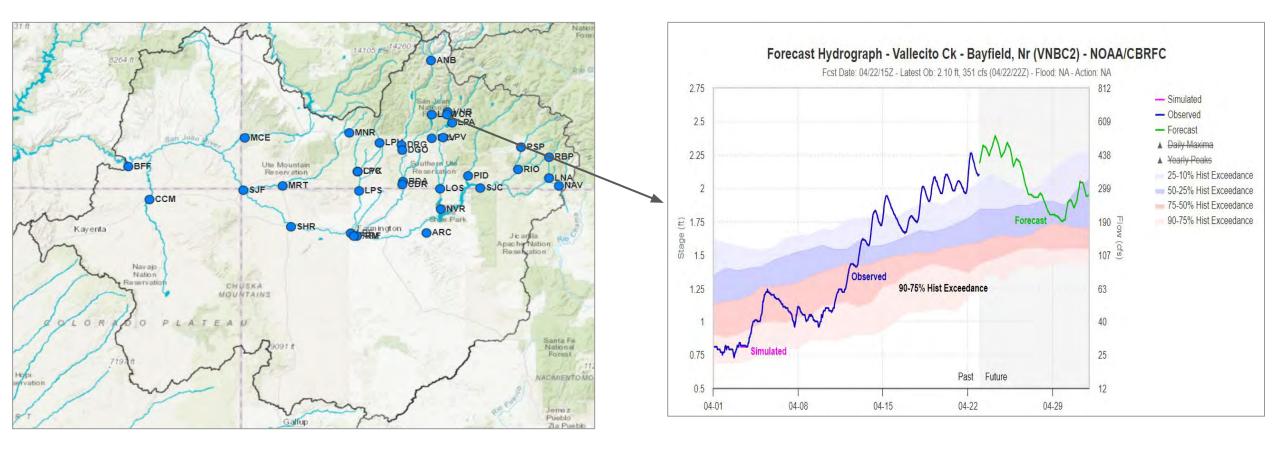
Includes 7 Day Precipitation Forecast, Mean Daily ESP ESP 50% Fcst (2024-04-22): 2948 cfs (67% Avg), (16% of Yrs Below Fcst, 95 Highest Flow / 113 Tot Yrs)



### Animas-Durango Peak Flow Forecast

- Peak flow magnitude and timing will depend on Spring weather.
- As flows increase and time of peak nears, the 10-day forecast hydrograph is a better source of information.

## 10-Day Streamflow Forecasts



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

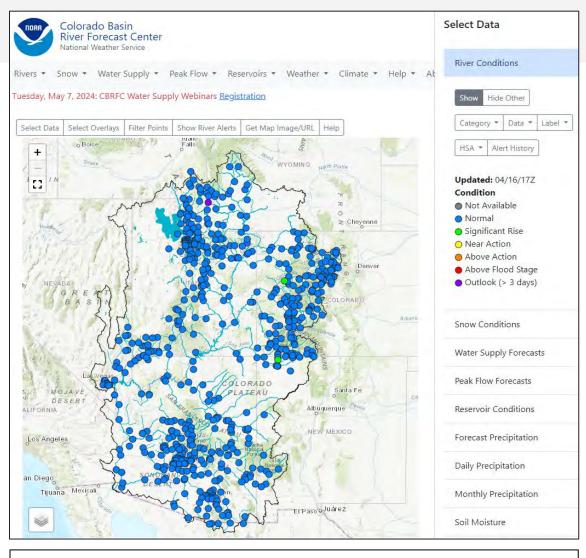
- Updated daily by ~10 am
- Include any known upstream reservoir release plans.

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

## Contact Info

## **Contact Information**

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- Operational Hydrologist: in office
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  - cbrfc.operations@noaa.gov



CBRFC Webpage <a href="https://www.cbrfc.noaa.gov/">https://www.cbrfc.noaa.gov/</a>

CBRFC Water Supply Presentations
<a href="https://www.cbrfc.noaa.gov/present/present.php">https://www.cbrfc.noaa.gov/present/present.php</a>

# Official 2024 Water Supply Forecast (April-July) as of mid-April 2024

Navajo: 410 kaf (65%\* avg)

Vallecito: 135 kaf (76% avg)

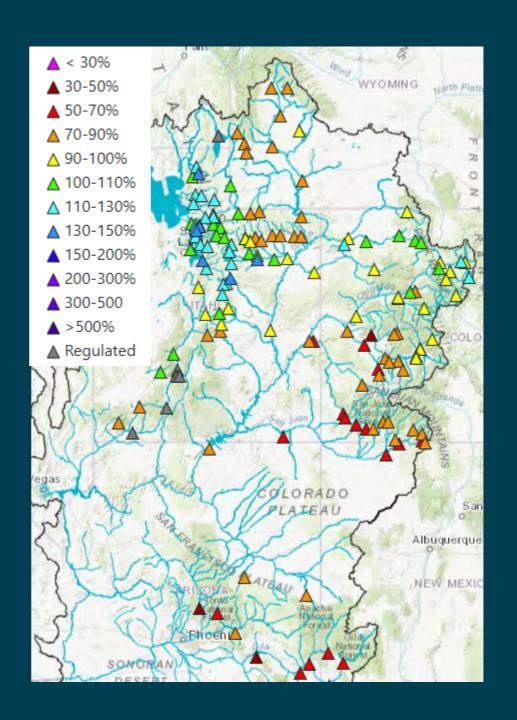
Lemon: 34 kaf (71% avg)

Animas: 285 kaf (74% avg)

McPhee: 170 kaf (67% avg)

Powell: 5,400 kaf (85% avg)

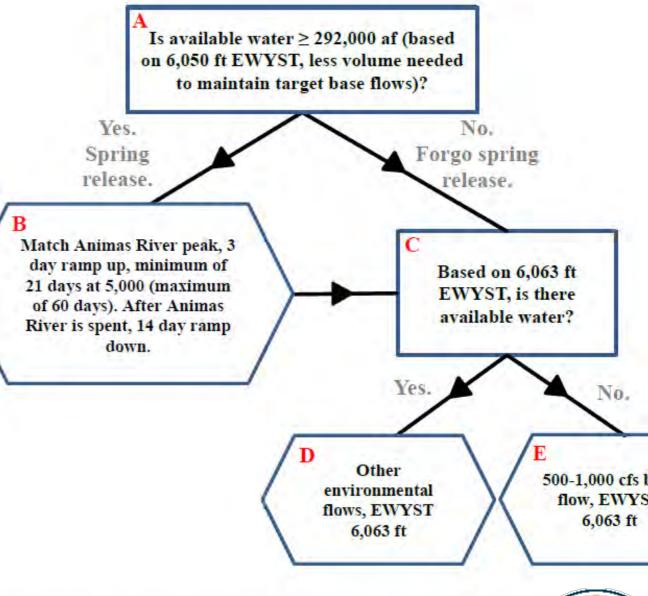
\*average of the 1991 – 2020 time period





# Spring Operations Calculations

- Reclamation calculates how much water could be "available" for a spring peak release.
- Calculation is based on the Decision Tree in the San Juan River Recovery Program's (SJRIP) modified Flow Procedures (2018)

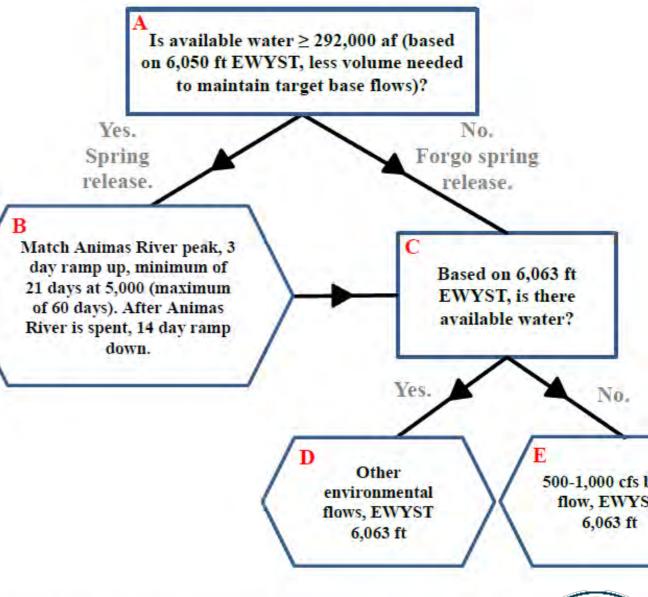


6. 2017 Navajo Dam operation decision tree for the San Juan River. See



# **Spring Operations Calculations**

- Forecast inflows into Navajo
- Expected contract fulfillment and ESA obligations for downstream target baseflows
- Calculate the forecast storage in the reservoir above the elevation of 6050 ft that will be on Sept 30<sup>th</sup> (end of water year)

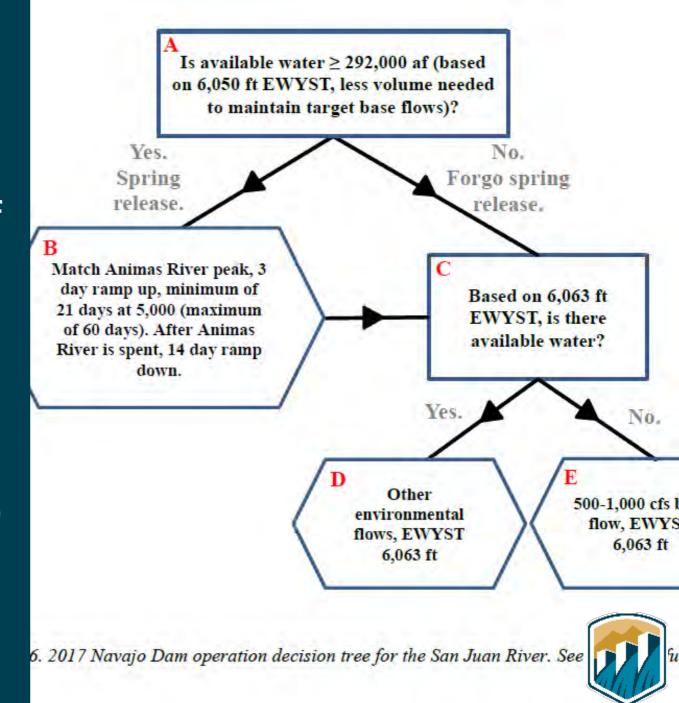


6. 2017 Navajo Dam operation decision tree for the San Juan River. See



# **Spring Operations Calculations**

- The SJRIP will take the results of the Decision Tree into account, along with several other factors, when making their Spring Operations recommendation to Reclamation
- Reclamation will operate in accordance with the ROD (2006) to coordinate with SJRIP on the implementation of the recommendation.

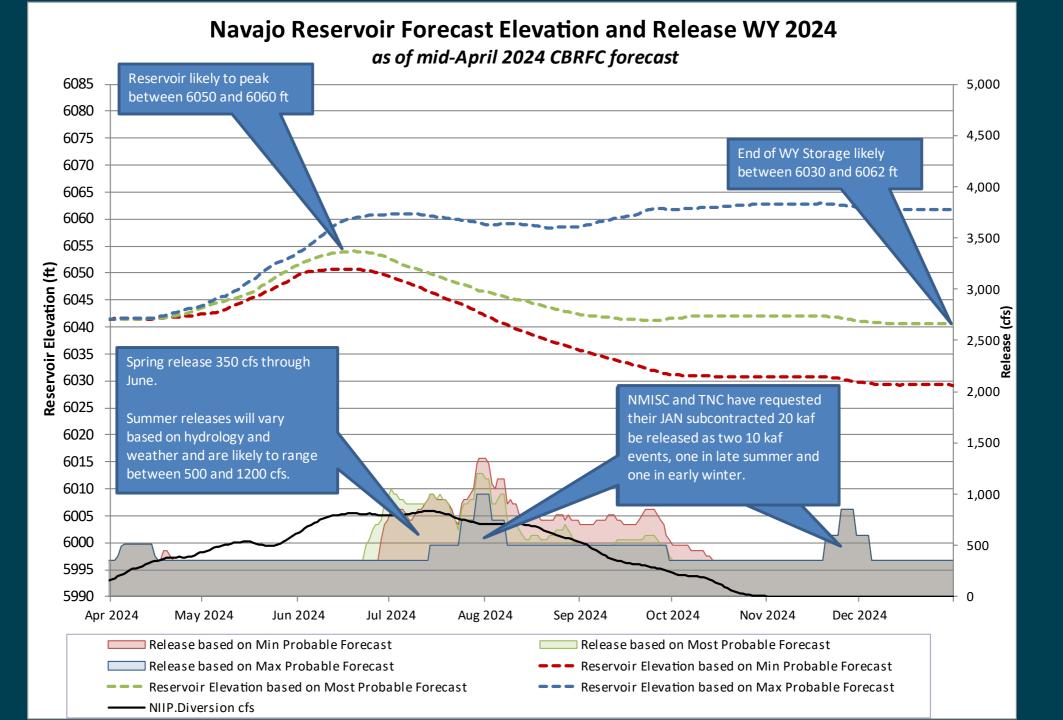


## Projected Operations WY 2024

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

- Navajo Reservoir April-July runoff projections range from 330 kaf (53% of avg) to 575 kaf (92% of avg) with a median of 410 (65% of avg)
- Current storage and projected runoff are insufficient to conduct a spring peak release as per the SJRIP Flow Recommendations.
- The SJRIP has recommended that no spring peak release be made in 2024.
- Releases in spring and summer 2024 will be made to target the SJRIPrecommended baseflows.
- Releases for the NMISC-TNC subcontracted JAN water will be made in two 10kaf increments in late summer and early winter.







## Maintenance Update

- An exploratory drilling project is underway on the dam face.
- You may see drill rigs and official personnel working along the face and crest of the dam through 2025.
- Periodic extended road closures will occur on NM 511 (crossing the dam) and NM 539 (dam crest).
- No road closures are planned during the summer recreational season (between Memorial Day and Labor Day). NM 539 will reopen on May 16, 2024 and road work will resume in the Fall of 2024.



## Next Meeting Tues, August 20th

## Links

- Navajo Project Notices: <a href="https://www.usbr.gov/uc/wcao/water/rsvrs/notice/nav\_rel.html">https://www.usbr.gov/uc/wcao/water/rsvrs/notice/nav\_rel.html</a>
- Navajo Monthly Forecast Update: <a href="https://www.usbr.gov/uc/water/crsp/cs/nvd.html">https://www.usbr.gov/uc/water/crsp/cs/nvd.html</a>

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



