



— BUREAU OF —
RECLAMATION

Glen Canyon Monthly Operations Call

Basin Hydrology and Operations

February 21, 2024

Background

This briefing is being provided consistent with the provision in Attachment B - Section 1.1 of the LTEMP ROD which states:

“Annually, Reclamation will develop a hydrograph based on the characteristics above. Reclamation will seek consensus on the annual hydrograph through monthly operational coordination calls with governmental entities, and regular meetings of the GCDAMP Technical Working Group (TWG) and AMWG.

Reclamation will conduct monthly Glen Canyon Dam operational coordination meetings or calls with the DOI bureaus (USGS, NPS, FWS, and BIA), WAPA, and representatives from the Basin States and UCRC. The purpose of these meetings or calls is for the participants to share and seek information on Glen Canyon Dam operations. One liaison from each Basin State and from the UCRC may participate in the monthly operational coordination meetings or calls.”

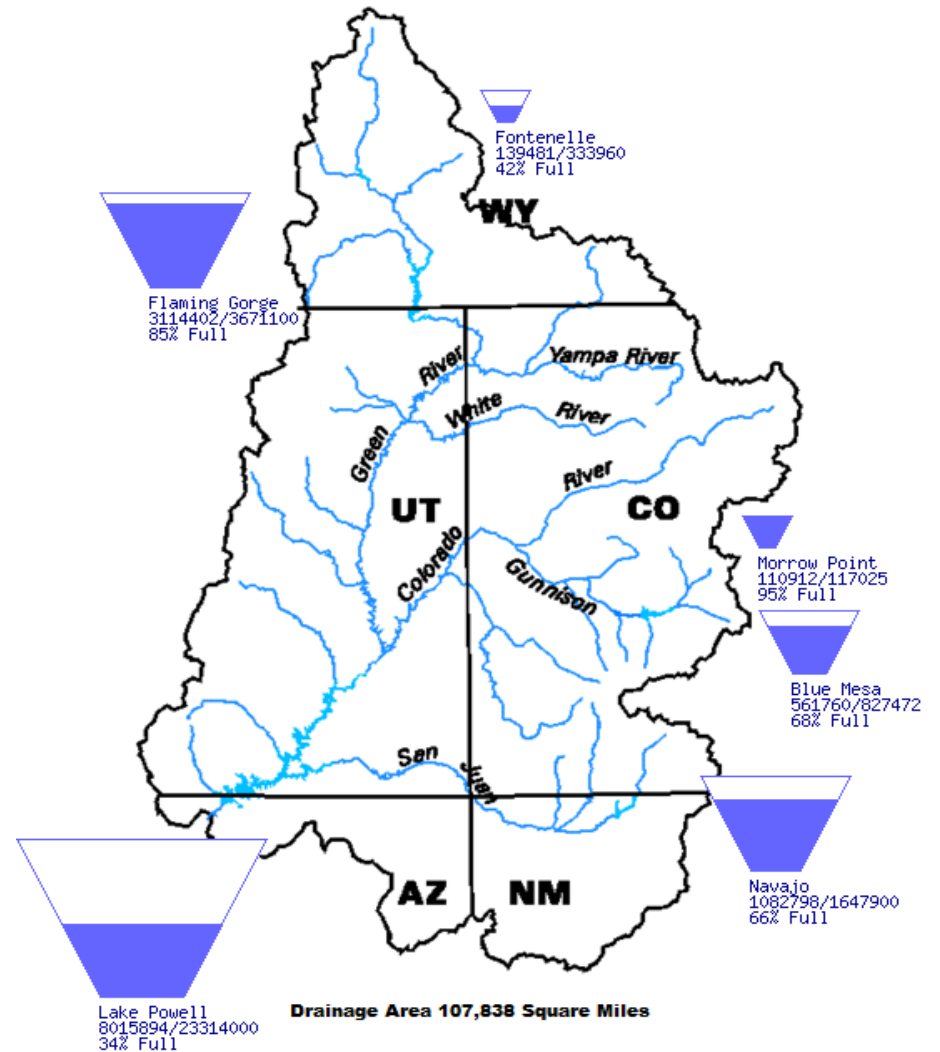


Upper Basin Storage (as of January 20, 2024)

Data Current as of:
02/19/2024

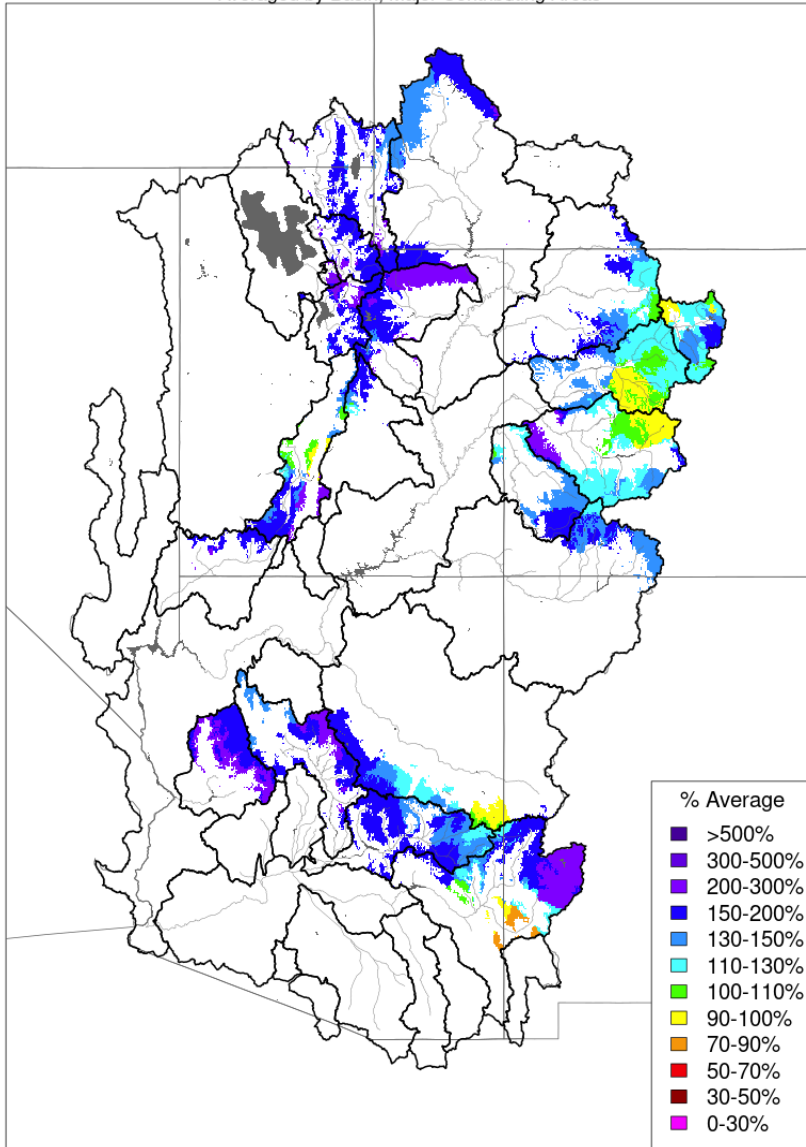
Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	42	0.14	0.33	6,476.19
Flaming Gorge	85	3.11	3.67	6,025.89
Blue Mesa	68	0.56	0.83	7,487.95
Navajo	66	1.08	1.65	6,042.09
Lake Powell	34	8.02	23.31	3,563.20
UC System Storage	44	13.04	29.93	
Total System Storage	43	24.95	58.48	

Upper Colorado River Drainage Basin



Month to Date Precipitation - February 20 2024

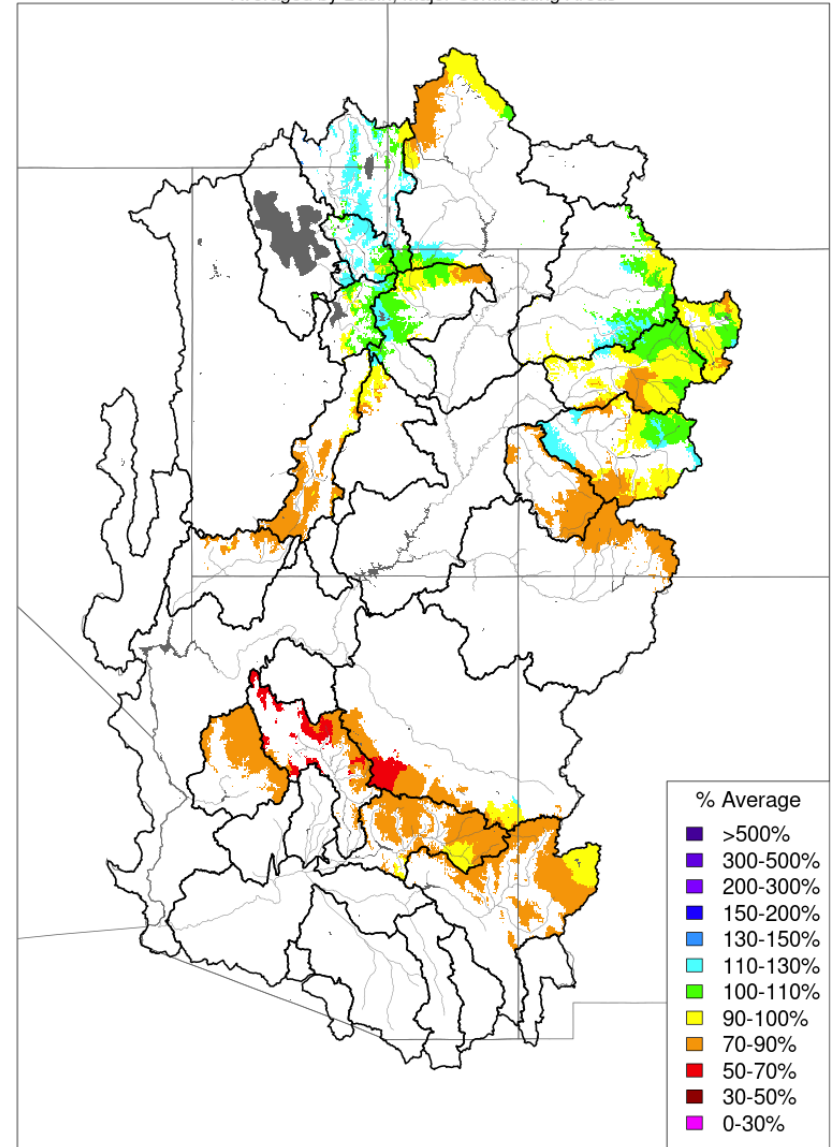
Averaged by Basin, Major Contributing Areas



Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

Water Year to Date Precipitation, October 01 - February 20 2024

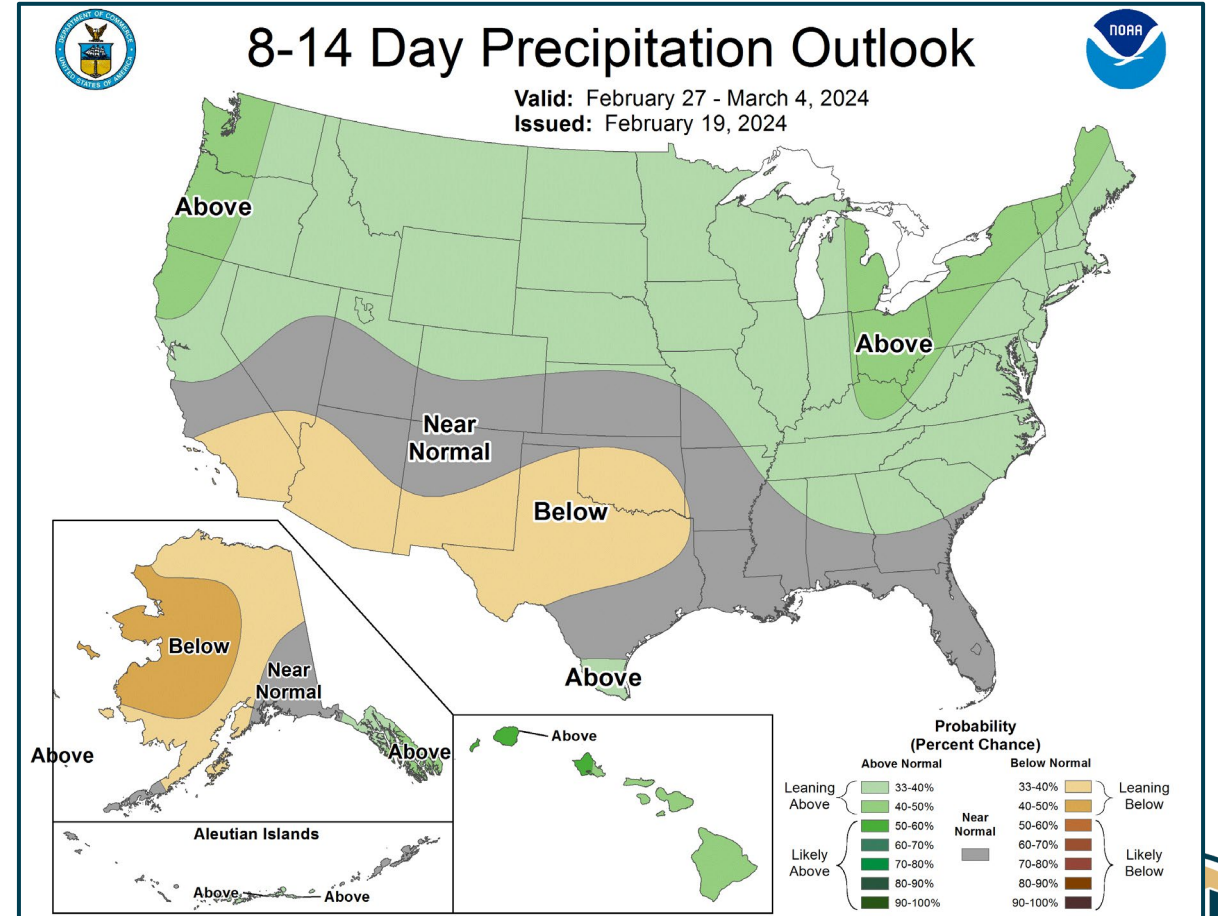
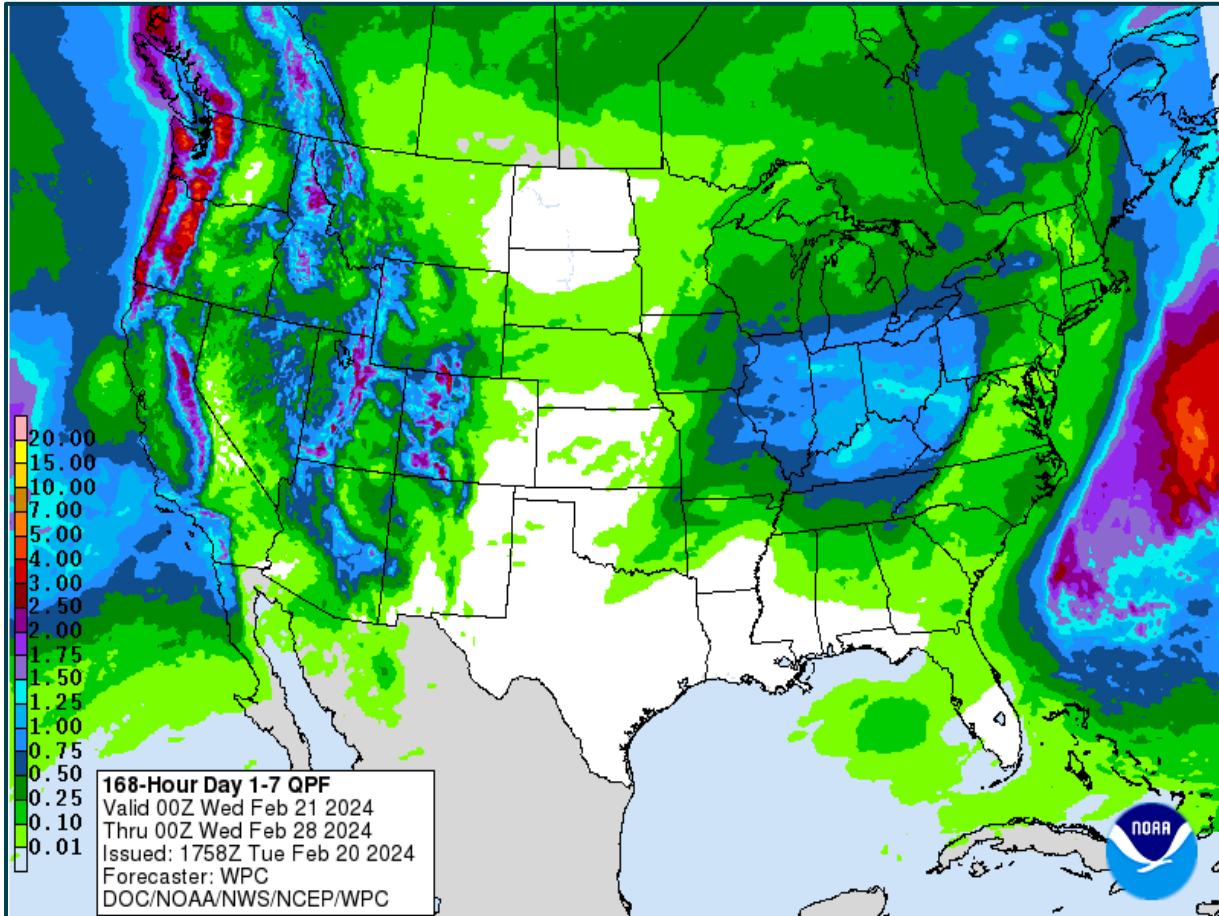
Averaged by Basin, Major Contributing Areas



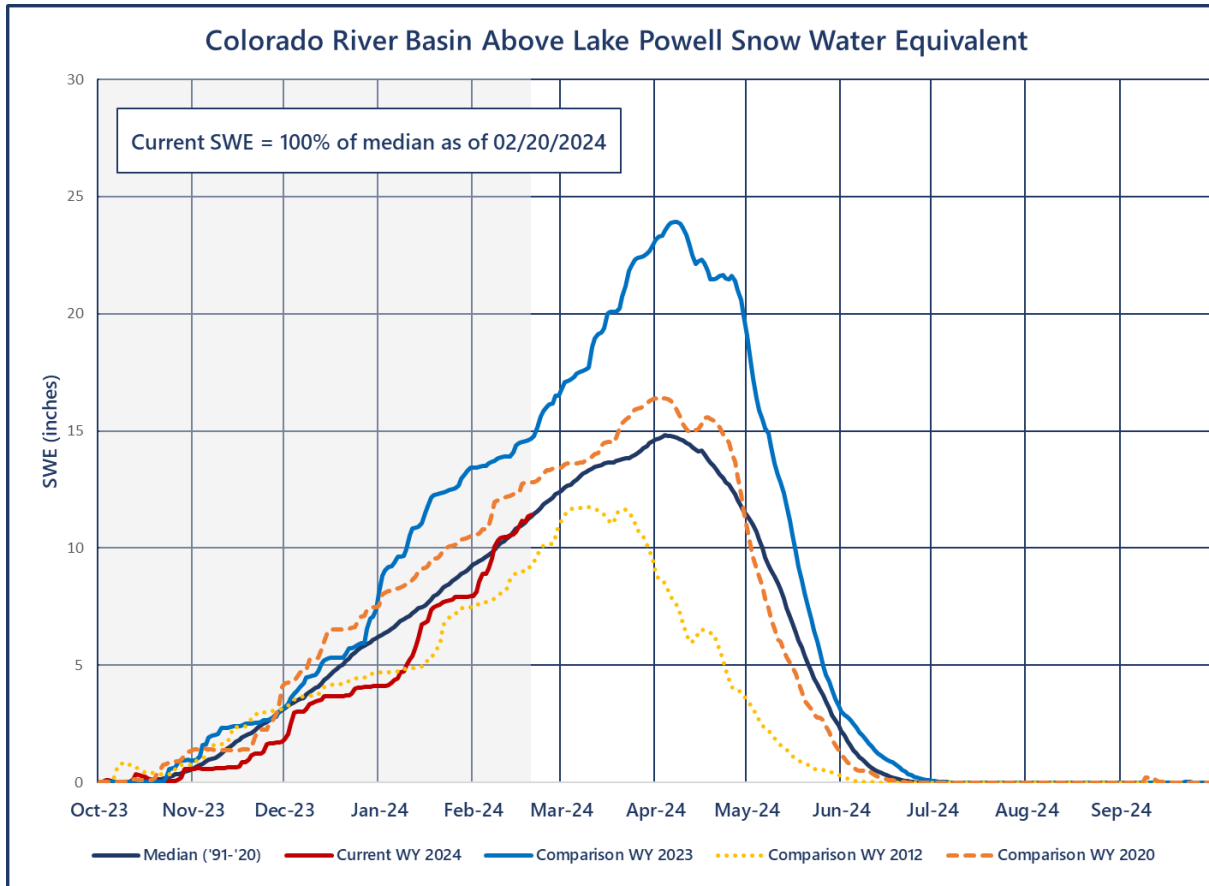
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov



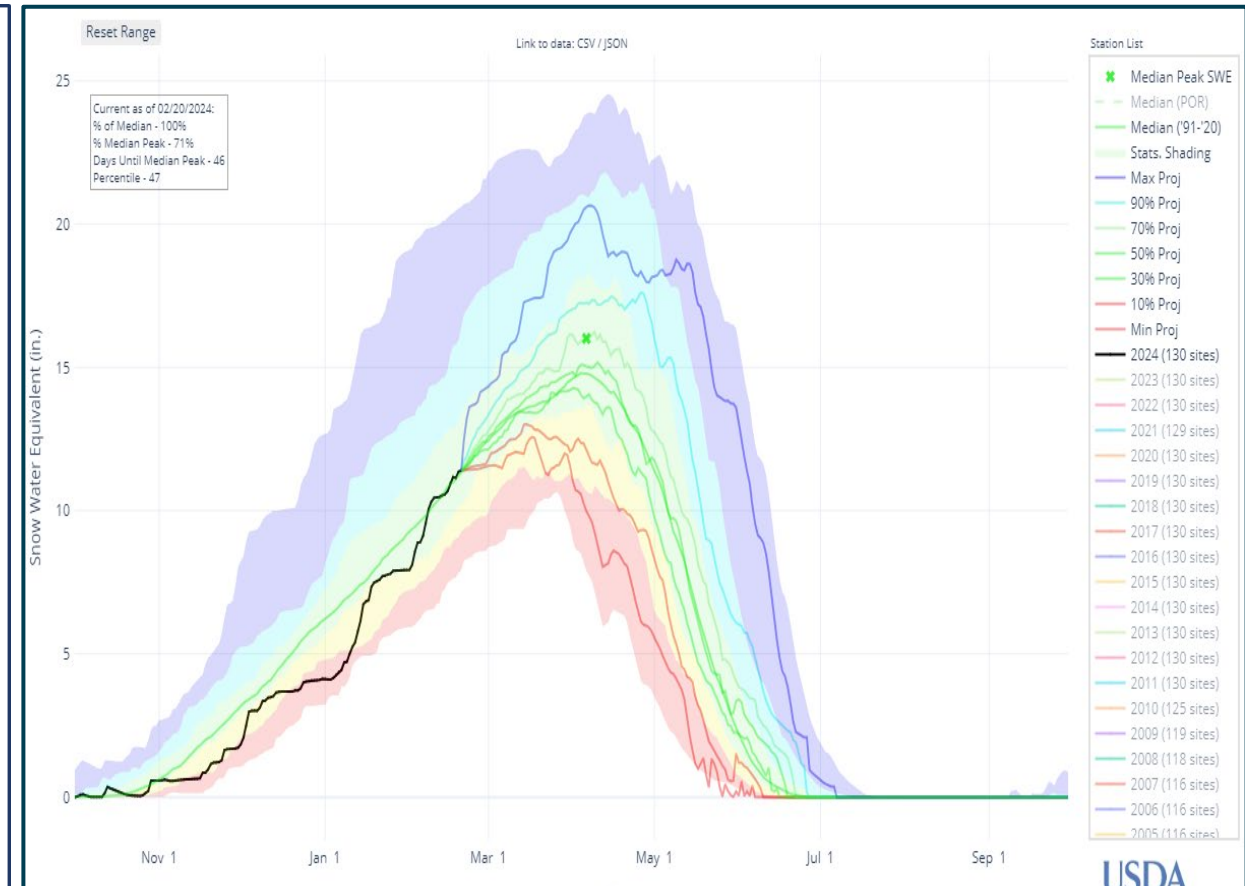
Weather Prediction Center and Climate Prediction Center Precipitation Forecasts



Upper Colorado SWE – New Web Links!



https://nwcc-apps.sc.egov.usda.gov/awdb/basin-plots/POR/WTEQ/assocHUC2/14_Upper_Colorado_Region.html



https://nwcc-apps.sc.egov.usda.gov/awdb/basin-plots/Proj/WTEQ/assocHUC2/14_Upper_Colorado_Region.html

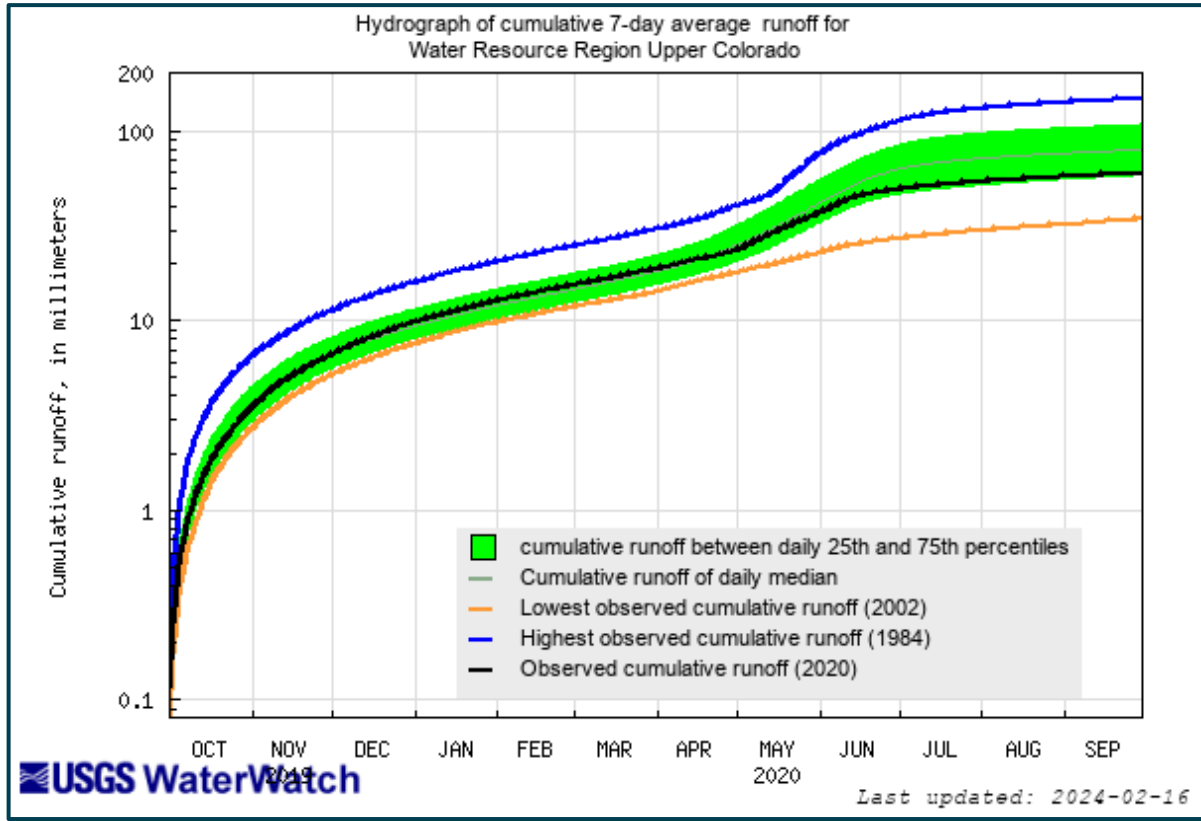
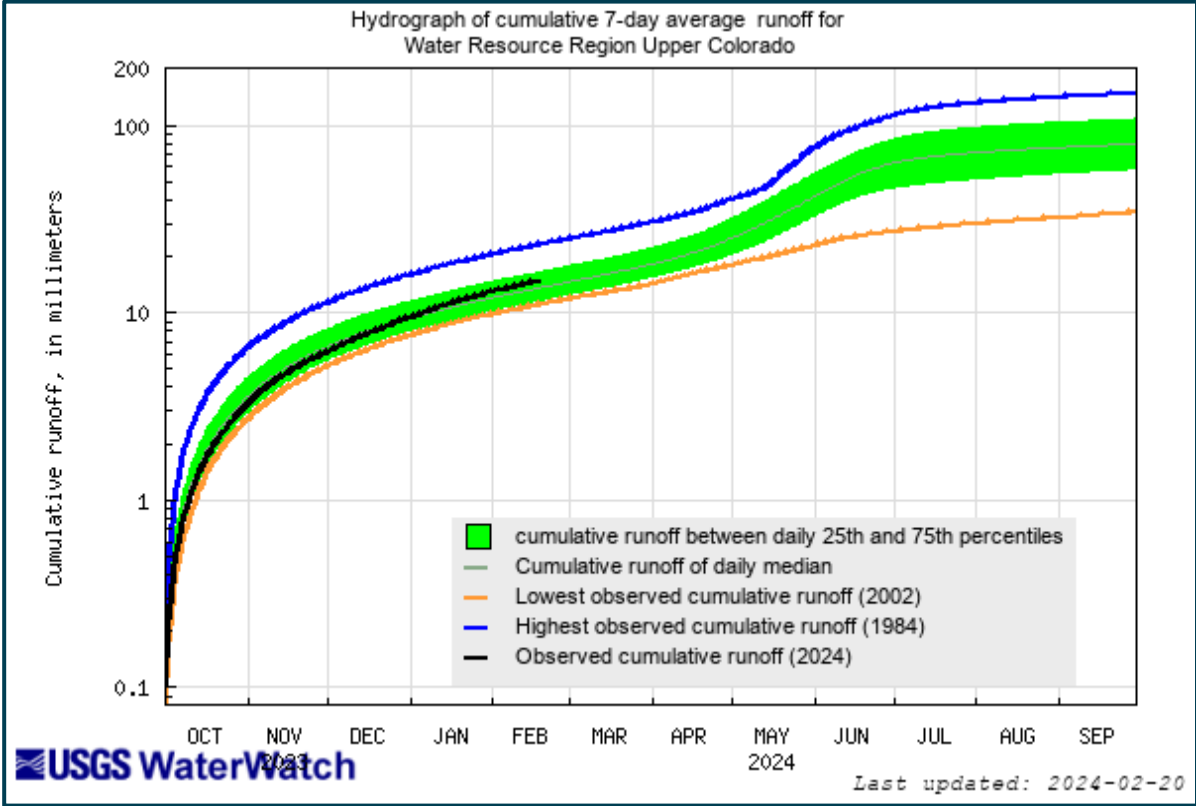


Upper Colorado Observed Inflows

Observed WY2020 = 5.85 maf (61% of avg)

Feb Midmonth WY2024 = 7.58 maf (79% of avg)

Feb Midmonth WY2020 = 8.56 maf (89% of avg)*



<https://waterwatch.usgs.gov/index.php>

<https://waterwatch.usgs.gov/index.php>

*WY2020 averages are based on the 1991 through 2020 period of record. The February 2020 percent of average based on the 1981 through 2010 period of record is 79% of average.



Most Probable February Forecast Water Year 2024

April – July 2024
Forecasted Unregulated Inflow
as of February 5, 2024

Reservoir	Inflow (kaf)	Change from Jan	Percent of Avg ¹
Fontenelle	540	+5	73
Flaming Gorge	680	+5	70
Blue Mesa	560	+70	88
Navajo	390	+15	62
Powell	4,700	+500	74

February Midmonth = 4,900 kaf +200 (77%)

Water Year 2024
Unregulated Inflow Forecast
as of February 5, 2024

Reservoir	Inflow (kaf)	Change from Jan	Percent of Avg ¹
Fontenelle	870	-8	81
Flaming Gorge	1,148	-7	81
Blue Mesa	799	+71	88
Navajo	553	+17	61
Powell	7,356	+438	77

February Midmonth = 7,576 kaf +220 (79%)

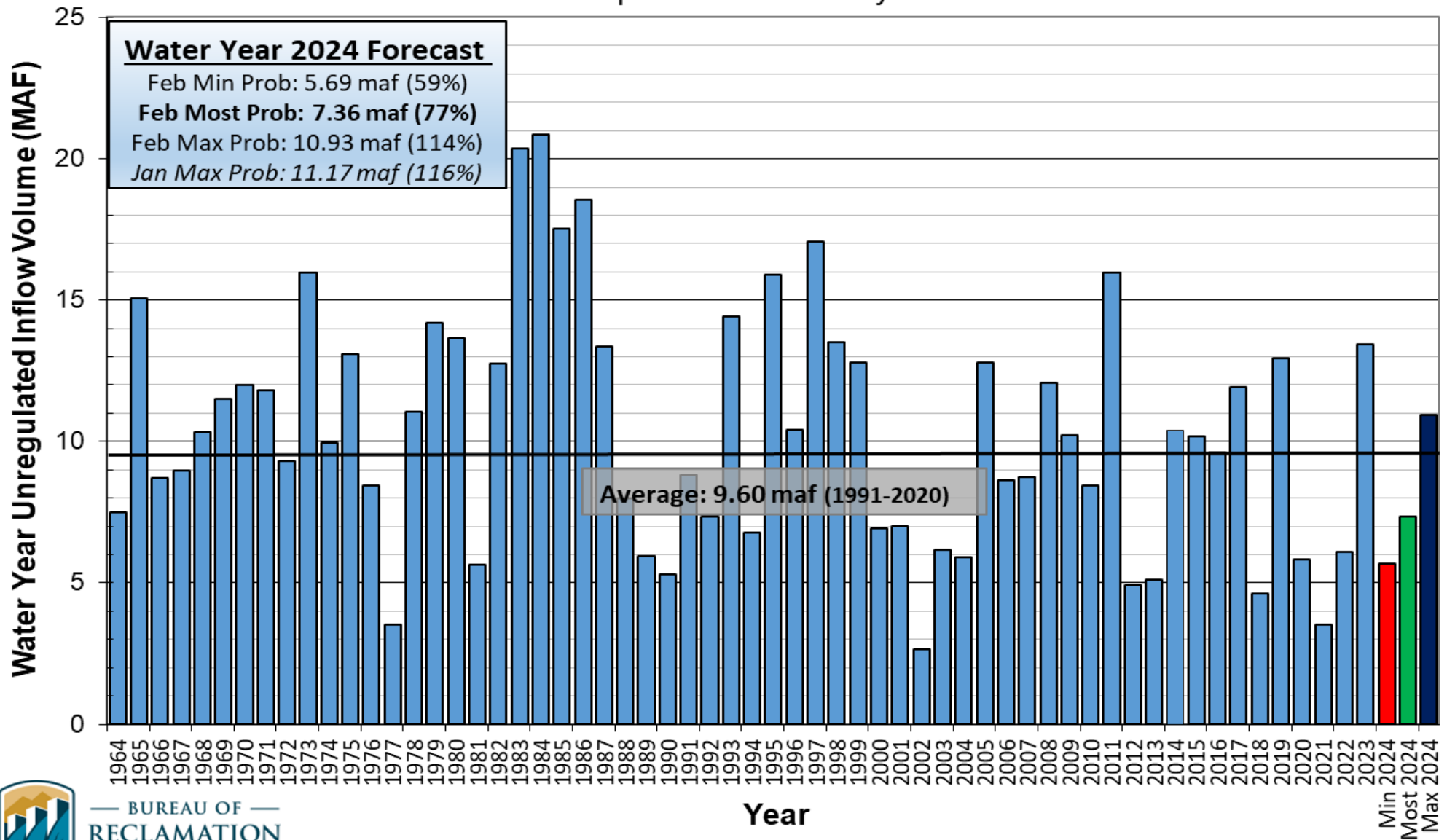
¹Averages are based on the 1991 through 2020 period of record.



Lake Powell Unregulated Inflow

Water Year 2024 Forecast (issued February 5)

Comparison with History





Upper Colorado Basin

Hydrology and Operations
Projections Based on January
and February 2024 24-
Month Study



Upper Basin Reservoir Operations

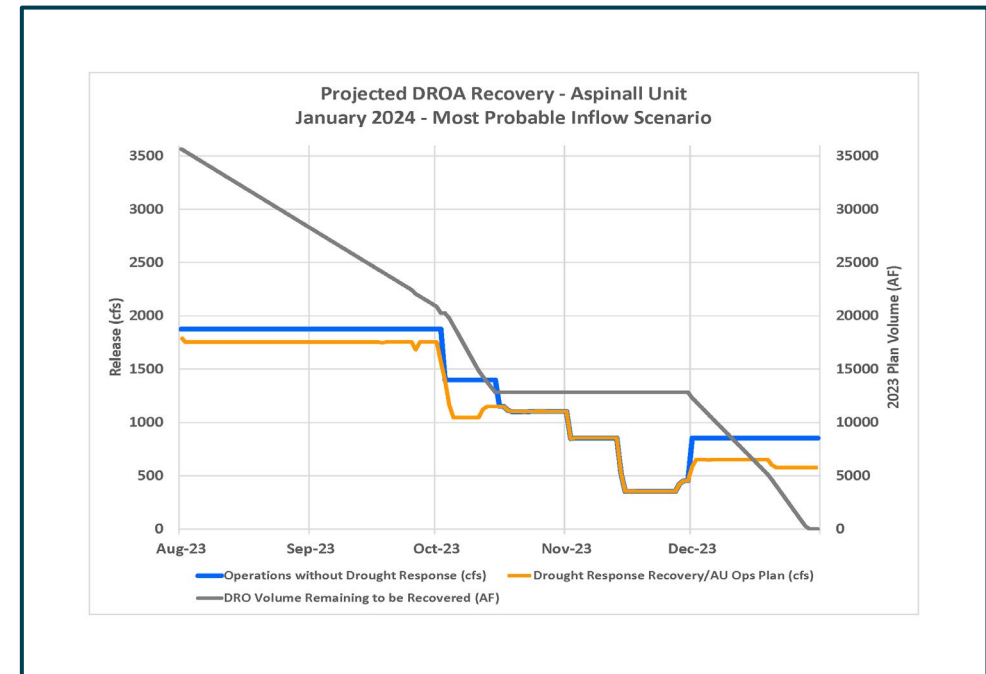
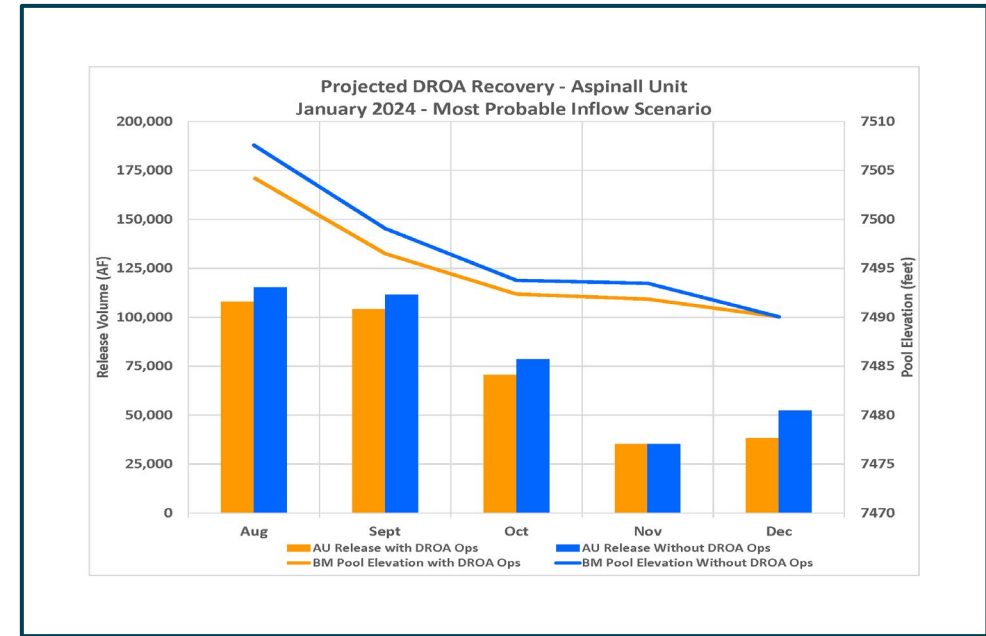
Water Years 2024 and 2025

- Lake Powell will be operated consistent with the 2007 Interim Guidelines, the Upper Basin Drought Response Operations Agreement and Upper Basin Records of Decision
- Lake Powell WY 2024 will operate in the Mid-Elevation Release Tier where Lake Powell will release 7.48 maf
- Reclamation will also ensure all appropriate consultation with Basin Tribes, the Republic of Mexico, other federal agencies, water users and non-governmental organizations with respect to implementation of these monthly and annual operations.



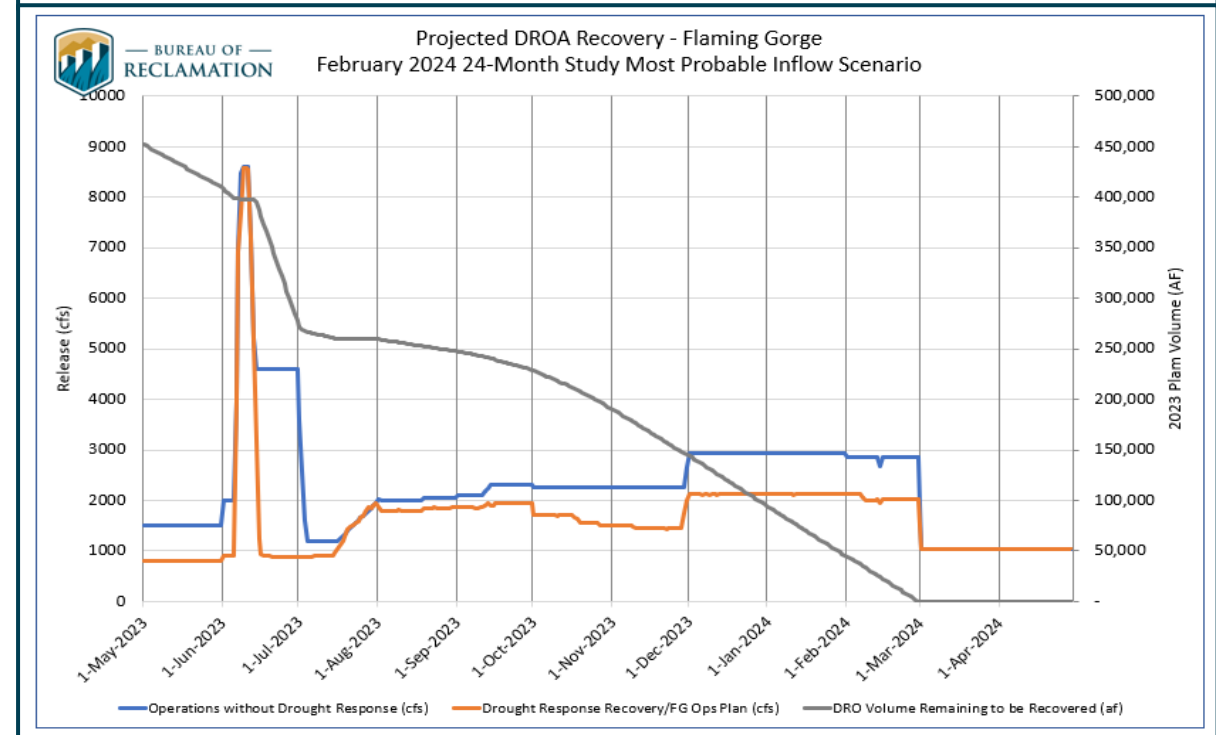
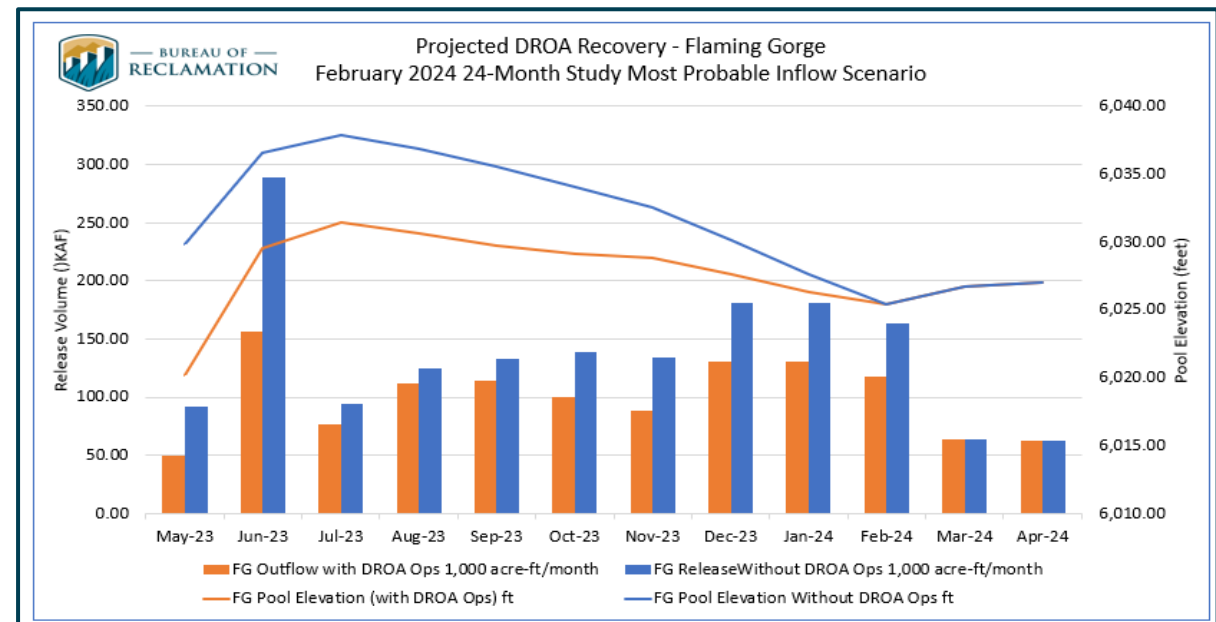
DROA Recovery - BM

- December 2023 recovery amount of 13 kaf
- Incremental Recovery at Blue Mesa COMPLETED by midnight 12/29.
- Icing target ACHIEVED at 7490.05' on midnight 12/31.



DROA Recovery - FG

- December 2023 recovery amount of 50.3 kaf
- January 2024 recovery amount ~50 kaf
- Projected February volume ~45 kaf
- Projected to achieve incremental recovery in February 2024 and the May 1 Drawdown Target of 6,027 (mod-dry target)



Drought Response Operations Agreement (DROA)

Completed DROA Volumes^{1,2}

Reservoir	2021 DROA Volume (kaf)	2022 DROA Volume (kaf)	2023 DROA Volume (kaf) ⁴	Total DROA Volume (kaf)
Flaming Gorge	125	328 ³	-408	45
Blue Mesa	36	0	-36	0
Navajo	0	0	0	0
Total DROA Volume (kaf)	161	328	-444	45

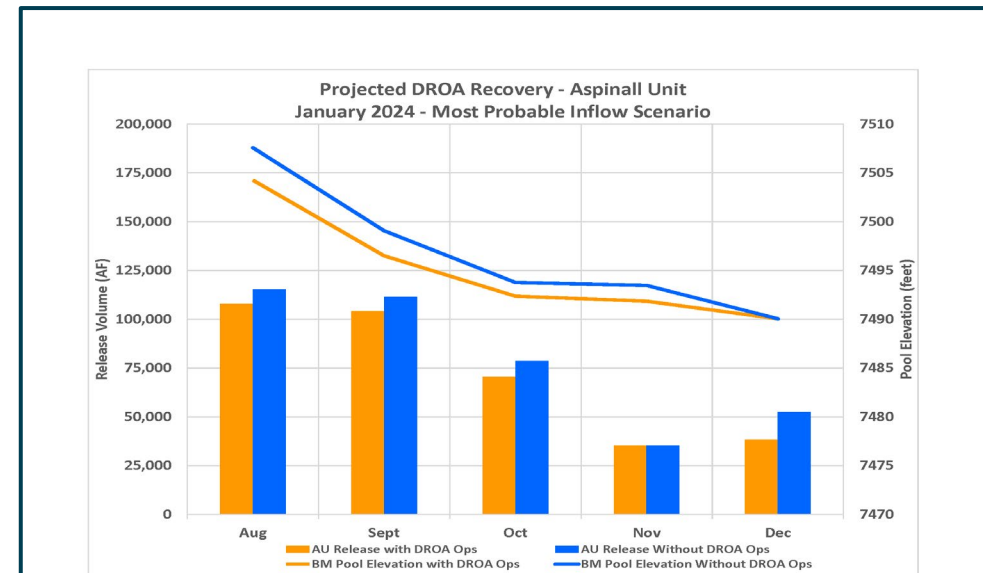
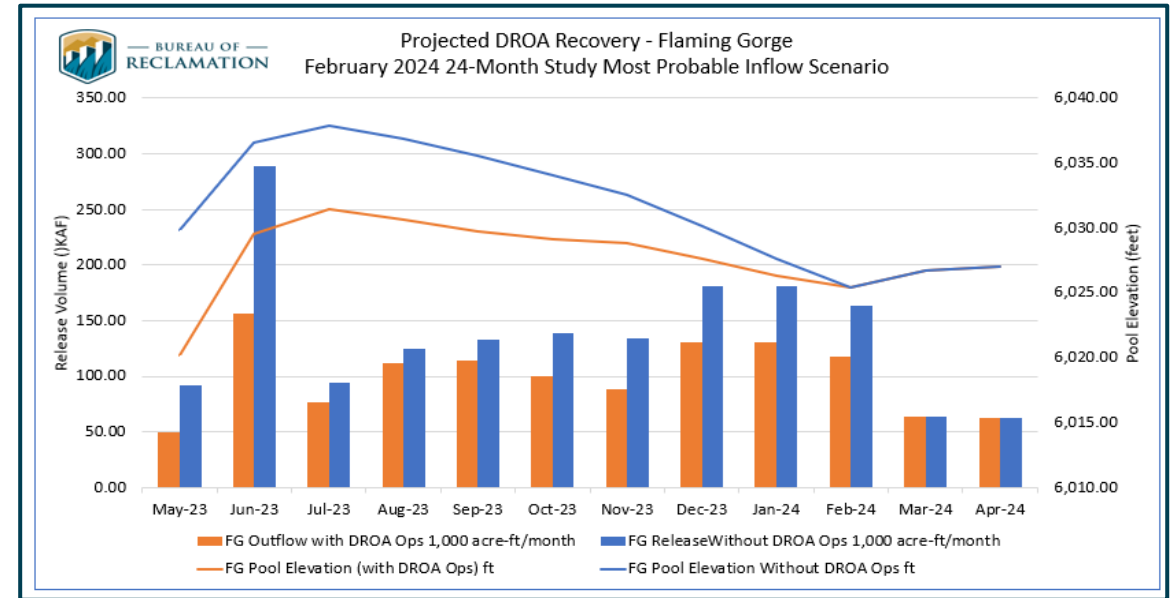
¹DROA operational year is from May through April.

²Positive values indicate Drought Response Operations Releases and negative values indicate Drought Response Operations Recovery

³ 463 kaf of DROA releases prior to DROA release suspension on March 6, 2023.

-135 kaf of DROA recovery from March 7, 2023 through April 30, 2023

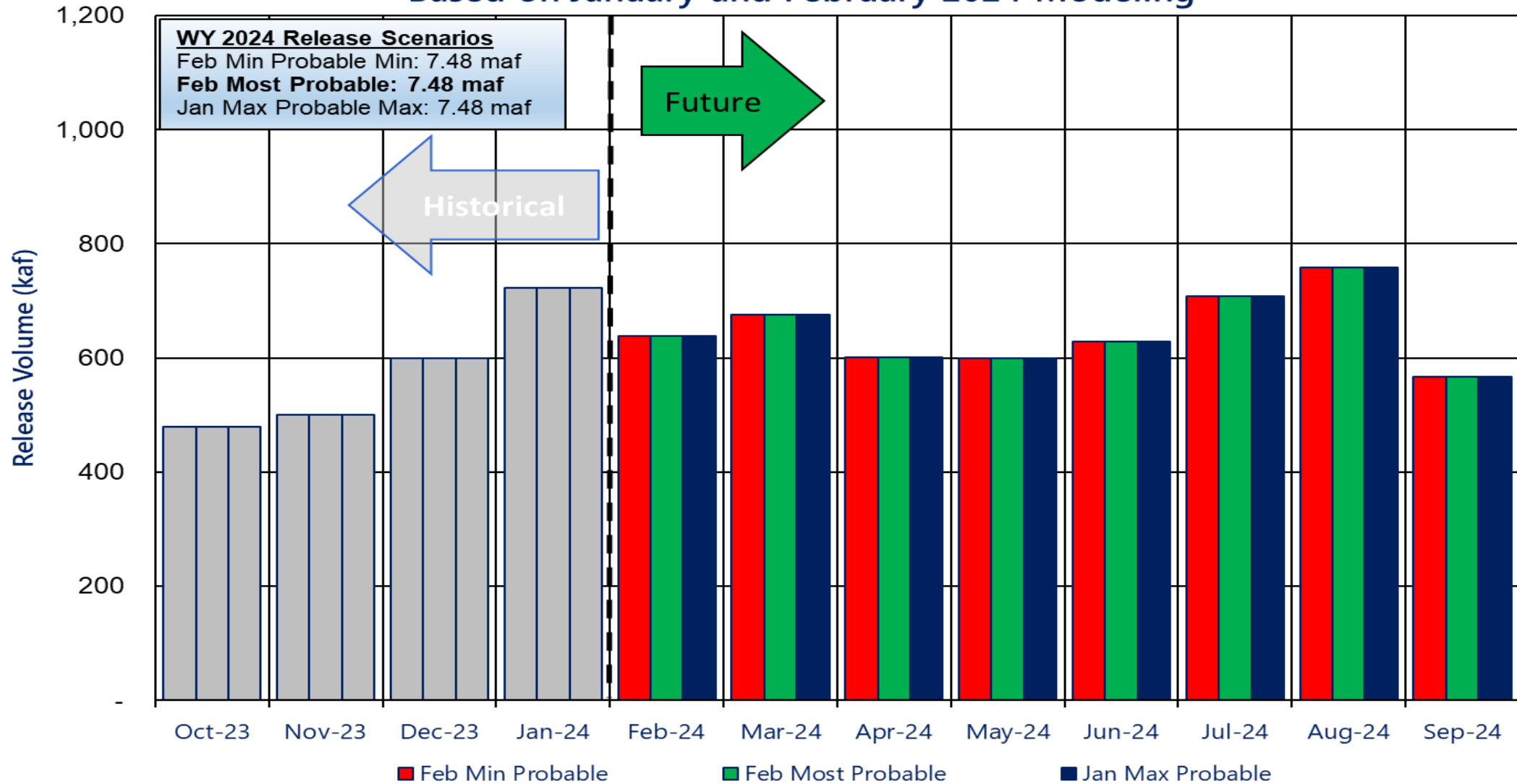
⁴DROA volumes through September 2023



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2024

Based on January and February 2024 Modeling



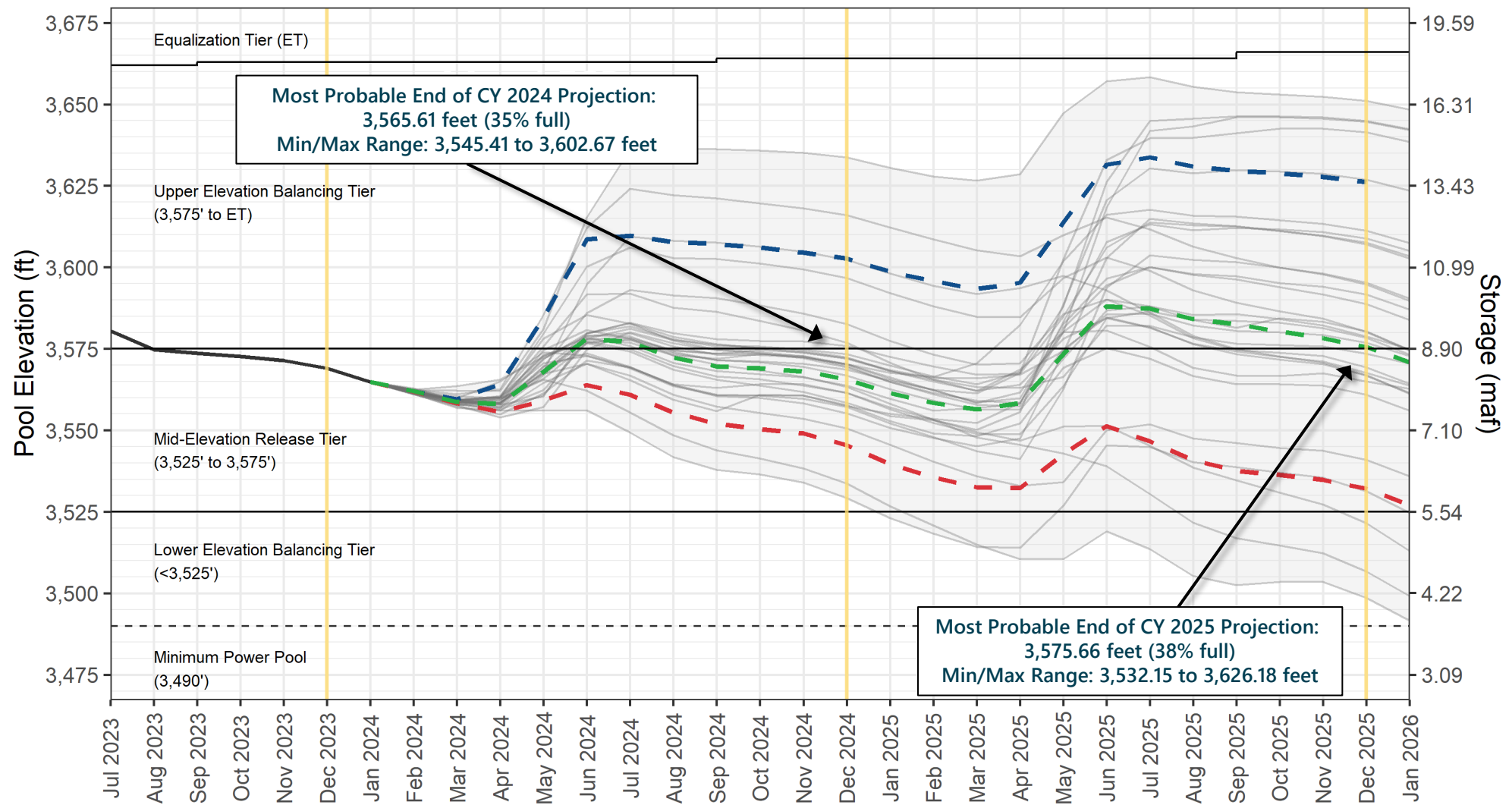
Reclamation Operational Modeling Model Comparison

	Colorado River Mid-term Modeling System (CRMMS)		CRSS
	24-Month Study Mode (Manual Mode)	Ensemble Mode (Rule-based Mode)	
Primary Use	AOP tier determinations and projections of current conditions	Risk-based operational planning and analysis	Long-term planning, comparison of alternatives
Simulated Reservoir Operations	Operations input manually	Rule-driven operations	
Probabilistic or Deterministic	Deterministic – single hydrologic trace	Deterministic OR Probabilistic 30 (or more) hydrologic traces	Probabilistic – 100+ traces
Time Horizon (years)	1 - 2	1 - 5	1 - 50
Upper Basin Inflow	Unregulated forecast, 1 trace	Unregulated ESP forecast, 30 traces	Natural flow; historical, paleo, or climate change hydrology
Upper Basin Demands	Implicit, in unregulated inflow forecast		Explicit, 2016 UCRC assumptions
Lower Basin Demands	Official approved or operational		Developed with LB users



Lake Powell End-of-Month Elevations

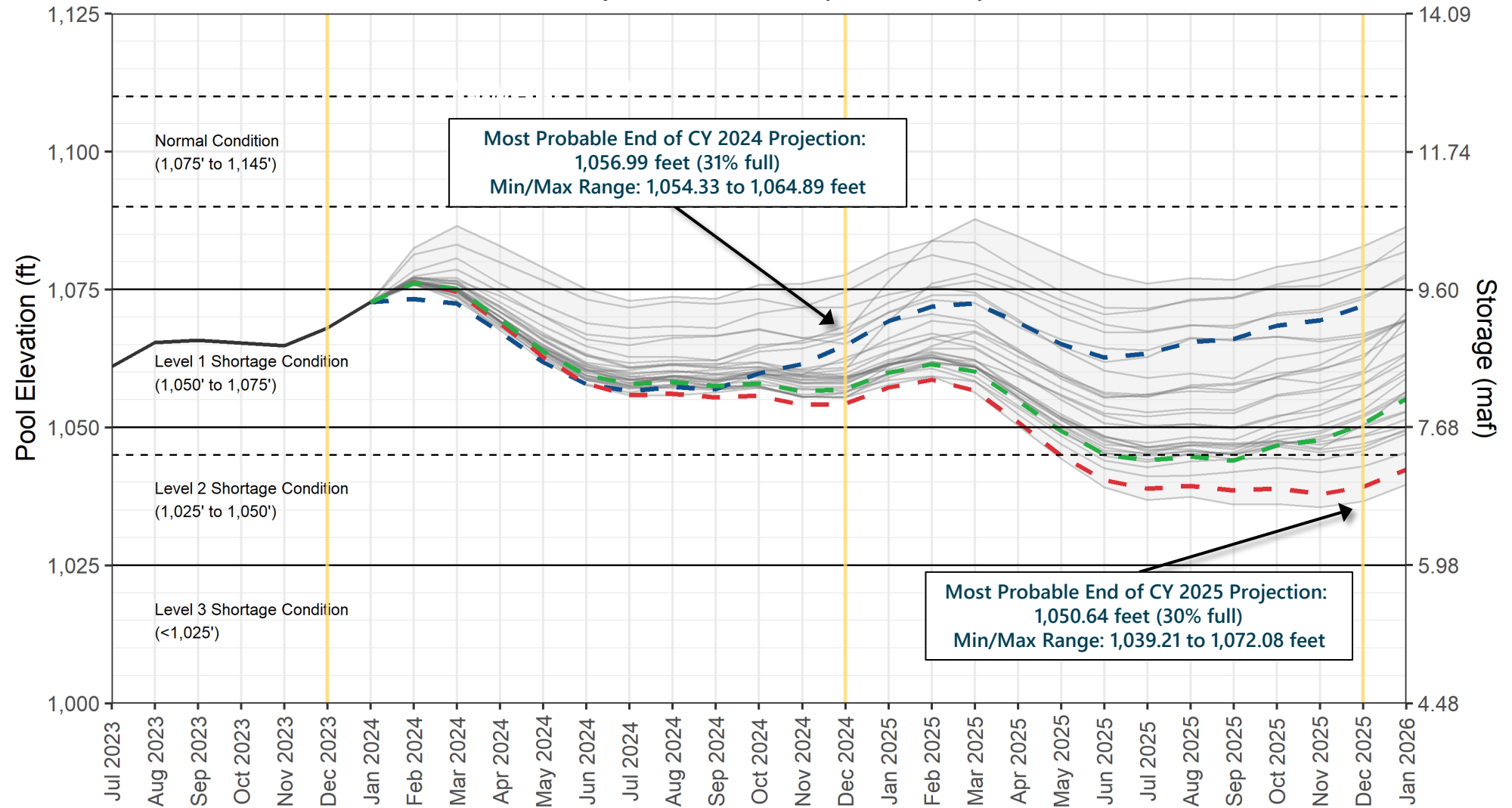
CRMMS Projections from January and February 2024



- January 2024 Probable Maximum 24-Month Study
- February 2024 Most Probable 24-Month Study
- February 2024 DROA Probable Minimum 24-Month Study
- Historical
- CRMMS-ESP Projection (30 traces)
- CRMMS-ESP Projection Range



Lake Mead End-of-Month Elevations CRMMS Projections from January and February 2024



- — January 2024 Probable Maximum 24-Month Study
- — February 2024 Most Probable 24-Month Study
- — February 2024 DROA Probable Minimum 24-Month Study
- Historical
- — CRMMS-ESP Projection (30 traces)
- CRMMS-ESP Projections Range





Upper Colorado Basin

Hydropower Maintenance



Glen Canyon Dam Power Plant Unit Outage Schedule for 2024

Unit Number	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	Mar 2024	Apr 2024	May 2024	Jun 2024	Jul 2024	Aug 2024	Sep 2024
1	██████████							██████████				
2	██████████											
3	██											
4	██											
5							██████████					
6							██████████					
7						██████████						
8						██████████						
Units Available	4	4	6	6	6	6	6	5	7	7	8	8
Capacity (cfs)	12,400	19,450	19,400	19,300	19,200	19,200	19,100	15,800	23,250	23,200	26,700	26,600
Capacity (kaf/month)	770	1,030	1,190	1,190	1,100	1,160	1,180	1,110	1,280	1,630	1,640	1,580
Max (kaf) ¹	480	500	600	723	639	675	601	599	628	709	758	567
Most (kaf) ¹	480	500	600	723	639	675	601	599	628	709	758	567
Min (kaf) ¹	480	500	600	723	639	675	601	599	628	709	758	567
											(updated 02-20-2024)	

FEB MOST²
 FEB MOST
 7.48 maf
 7.48 maf
 7.48 maf

1 Projected release, based on February 2024 24MS for the minimum and most probable and the January 2024 24MS for the maximum probable 24-Month Study model runs.
 2 Dependent upon availability to shift contingency regulation, which will increase capacity by 30-40MW (3%) at current efficiency.



Glen Canyon Dam Power Plant Unit Outage Schedule for 2025

Unit Number	Oct 2024	Nov 2024	Dec 2024	Jan 2025	Feb 2025	Mar 2025	Apr 2025	May 2025	Jun 2025	Jul 2025	Aug 2025	Sep 2025
1		██████████										
2		██████████					██████████					
3				██████████								
4				██████████								
5									██████████			
6									██████████			
7						██████████						
8						██████████						
Units Available	8	6	6	6	6	6	6	7	6	6	8	8
Capacity (cfs)	26,500	19,400	19,400	19,400	19,400	19,400	19,400	23,000	19,400	19,400	26,600	26,600
Capacity (kaf/month)	1,580	1,160	1,460	1,360	1,090	1,220	1,270	1,410	1,230	1,190	1,630	1,580
Max (kaf) ¹	643	642	715	857	758	801	713	710	745	842	900	674
Most (kaf) ¹	480	500	600	723	639	675	601	599	628	709	758	568
Min (kaf) ¹	480	500	600	723	639	675	601	599	628	709	758	568

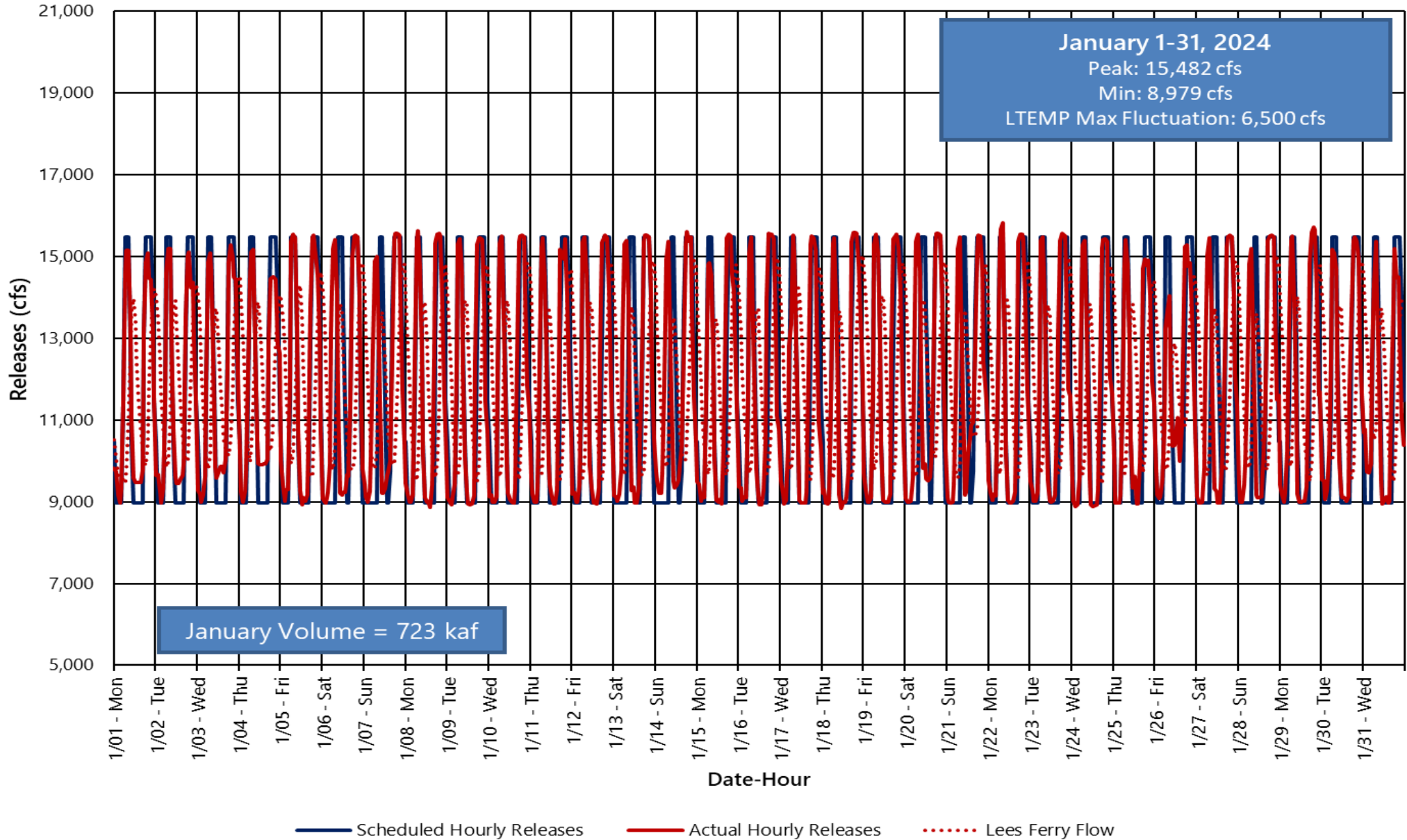
FEB MOST²
 FEB MOST
 9.00 maf
 7.48 maf
 7.48 maf

(updated 02-20-2024)

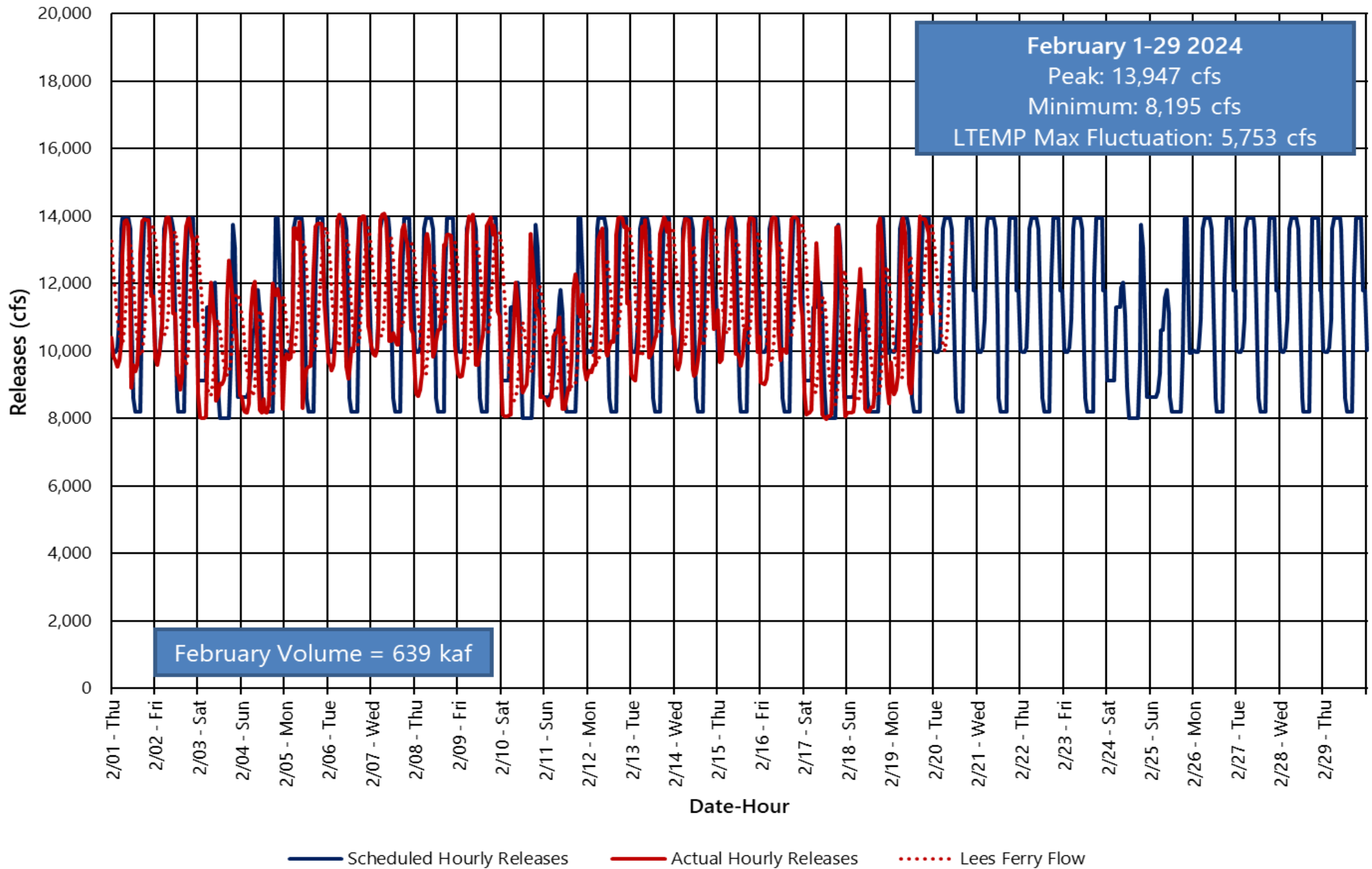
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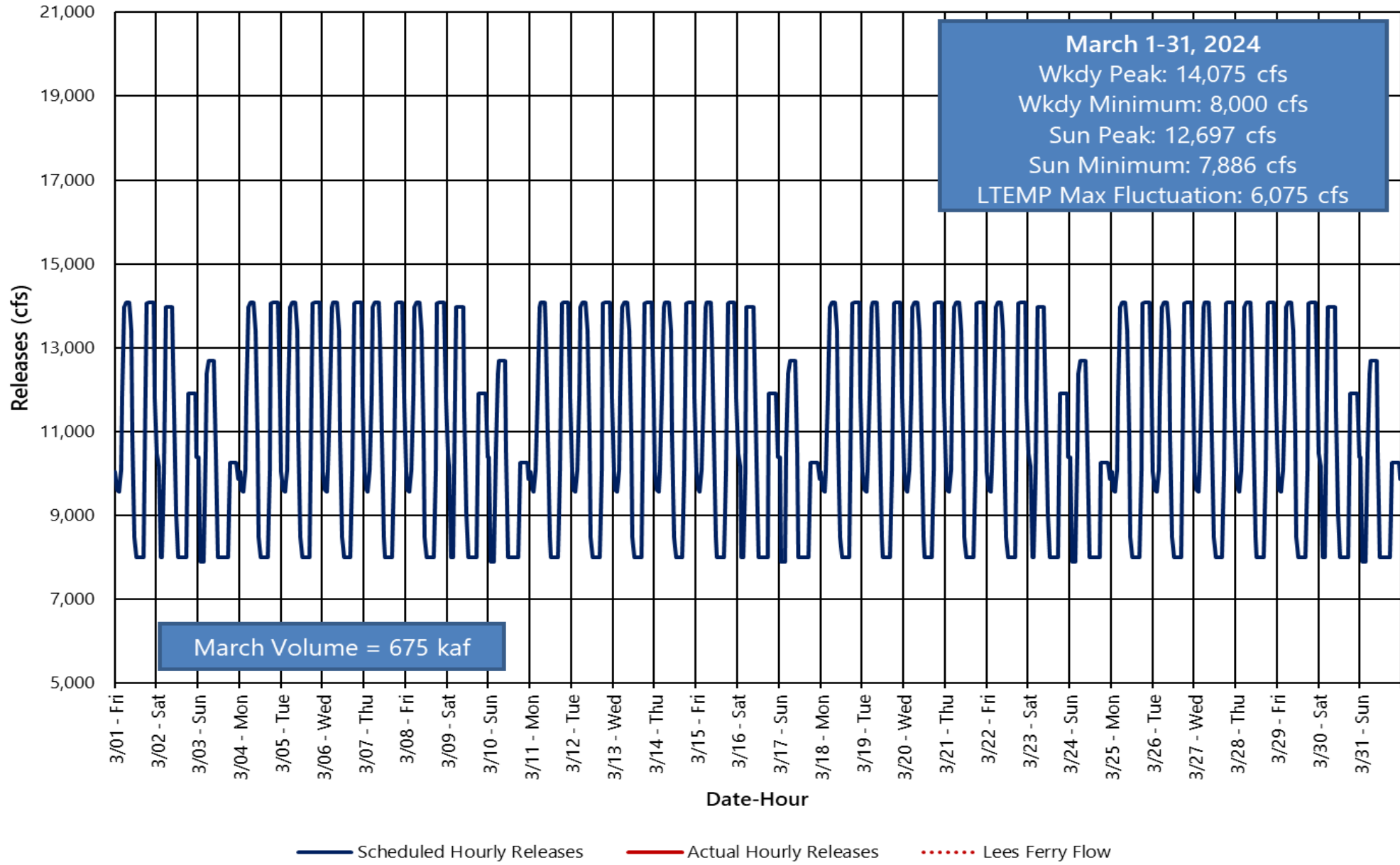
Glen Canyon Dam Hourly Release Pattern - January 2024



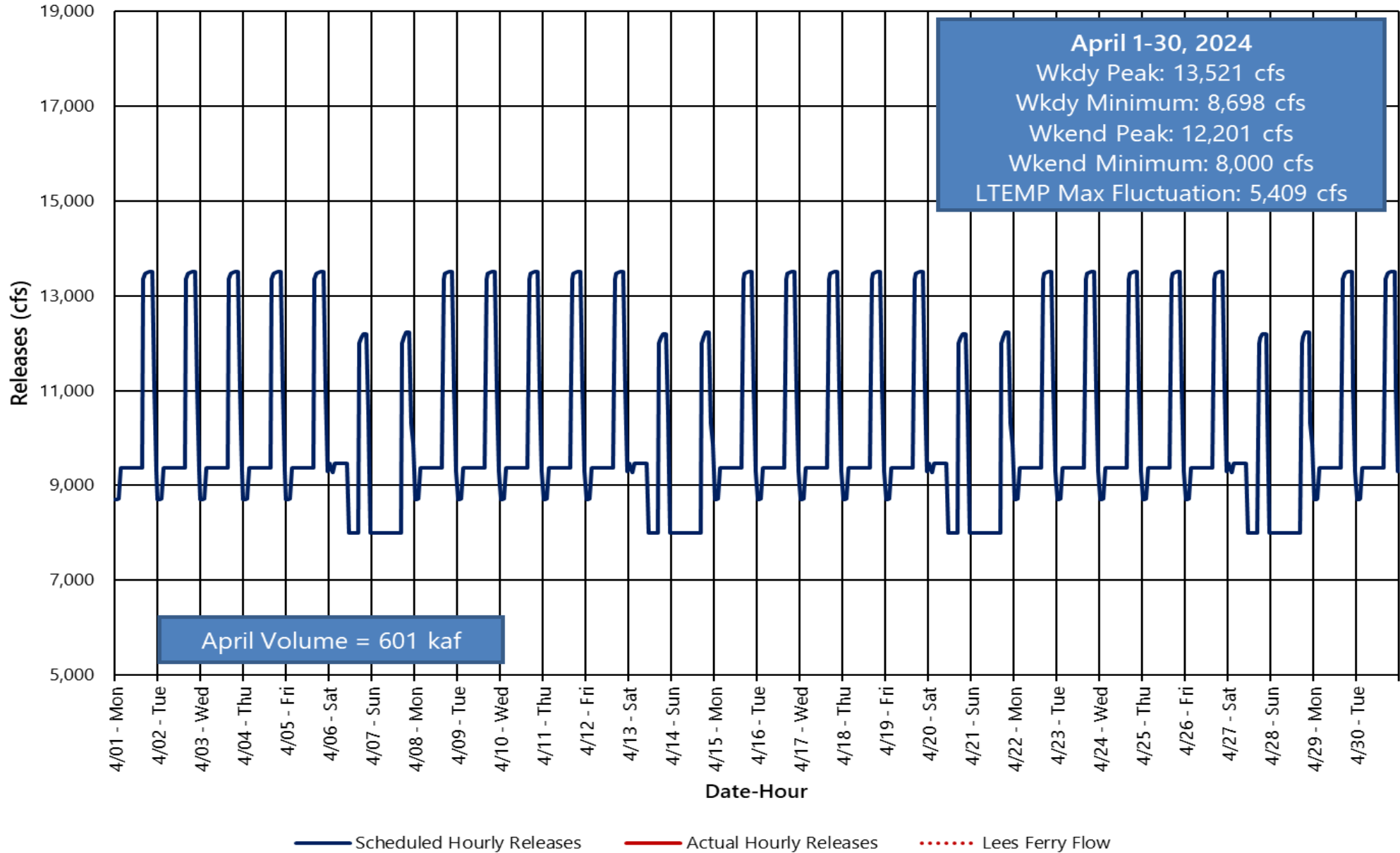
Glen Canyon Dam Hourly Release Pattern - February 2024



Glen Canyon Dam Hourly Release Pattern - March 2024



Glen Canyon Dam Hourly Release Pattern - April 2024

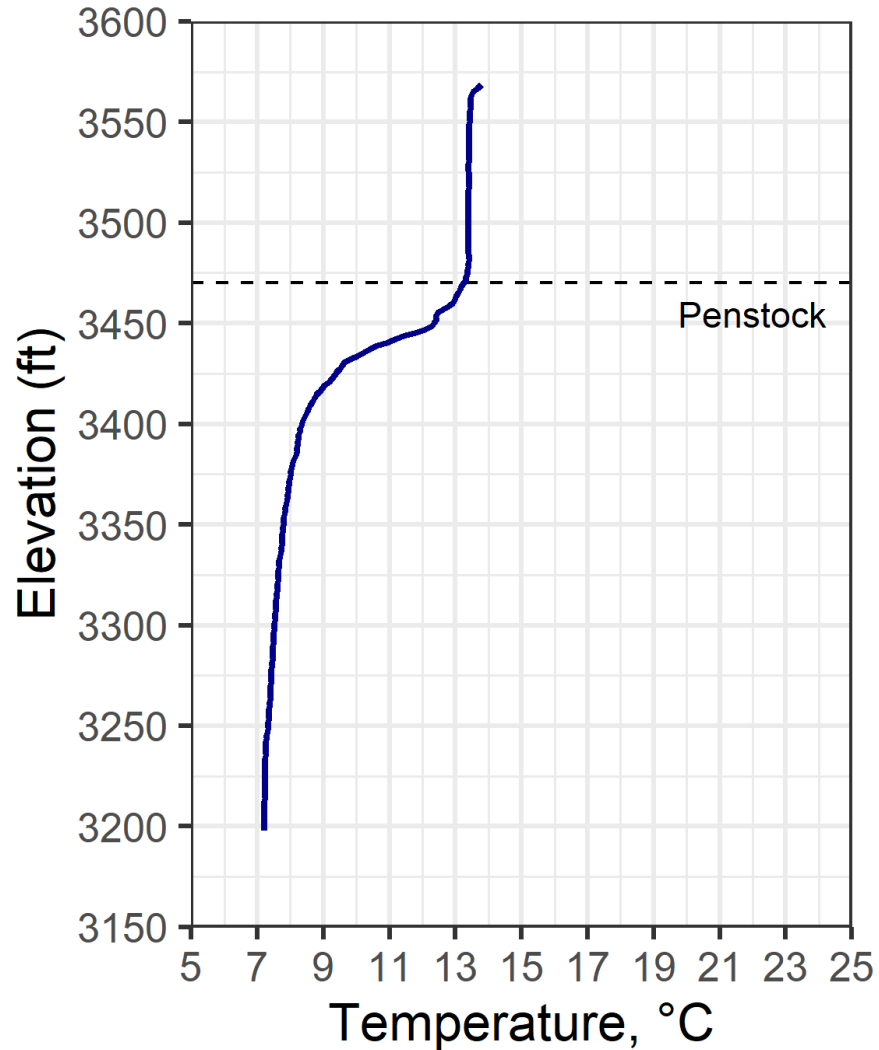


Water Quality

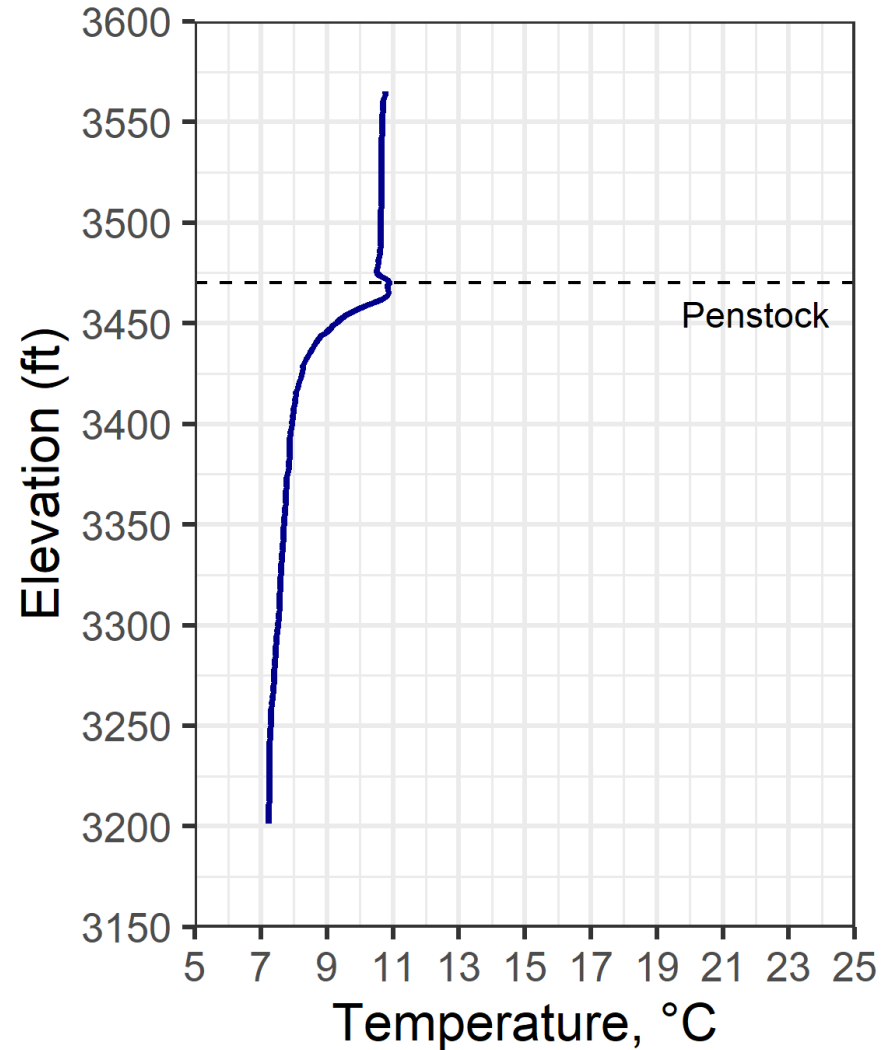


Observed Temp in Forebay near GCD

December 15, 2023



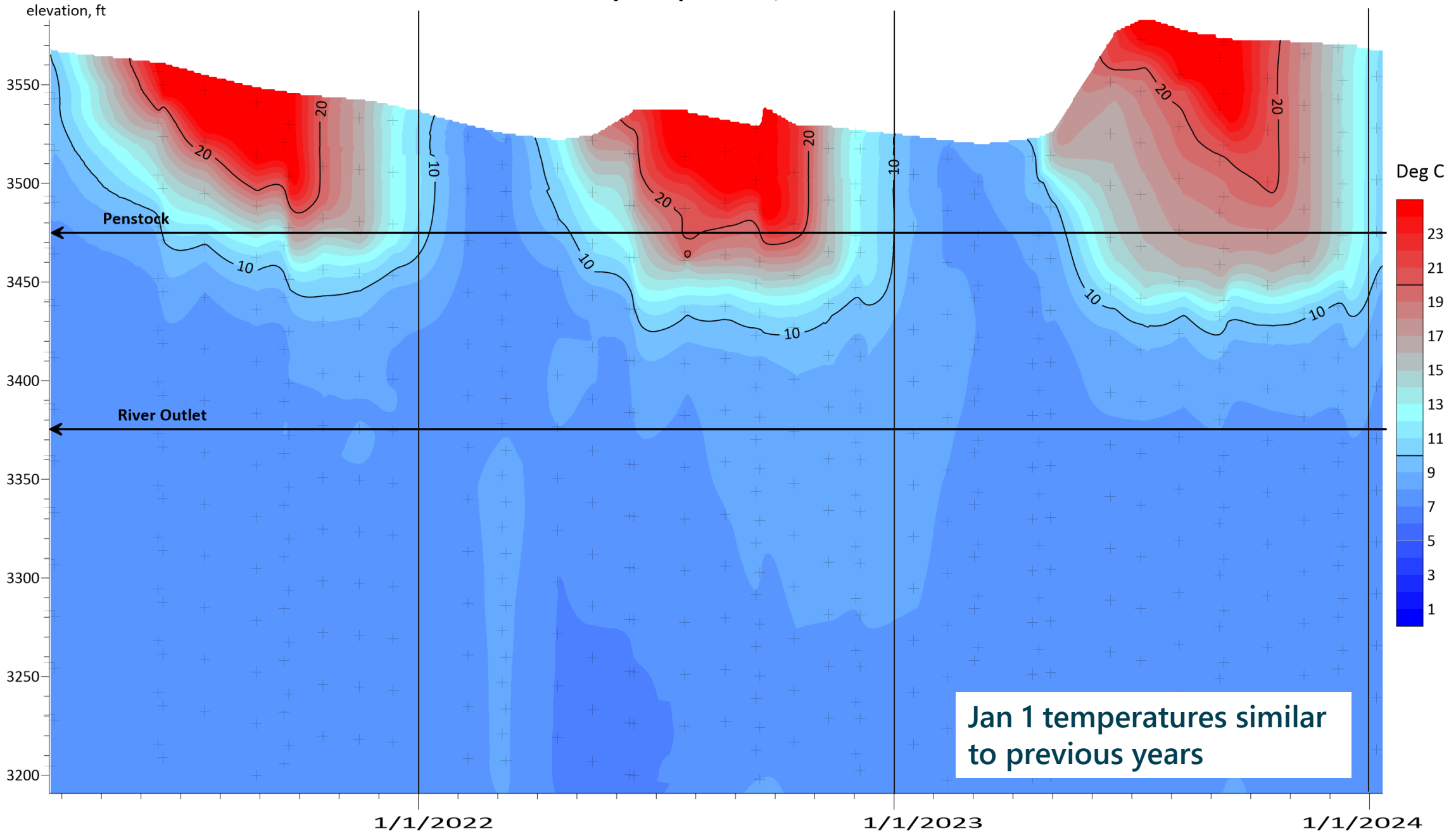
January 10, 2024



Reservoir continues to mix and temperatures become more homogenous



Lake Powell Forebay Temperature, March 2021 - Jan 2024



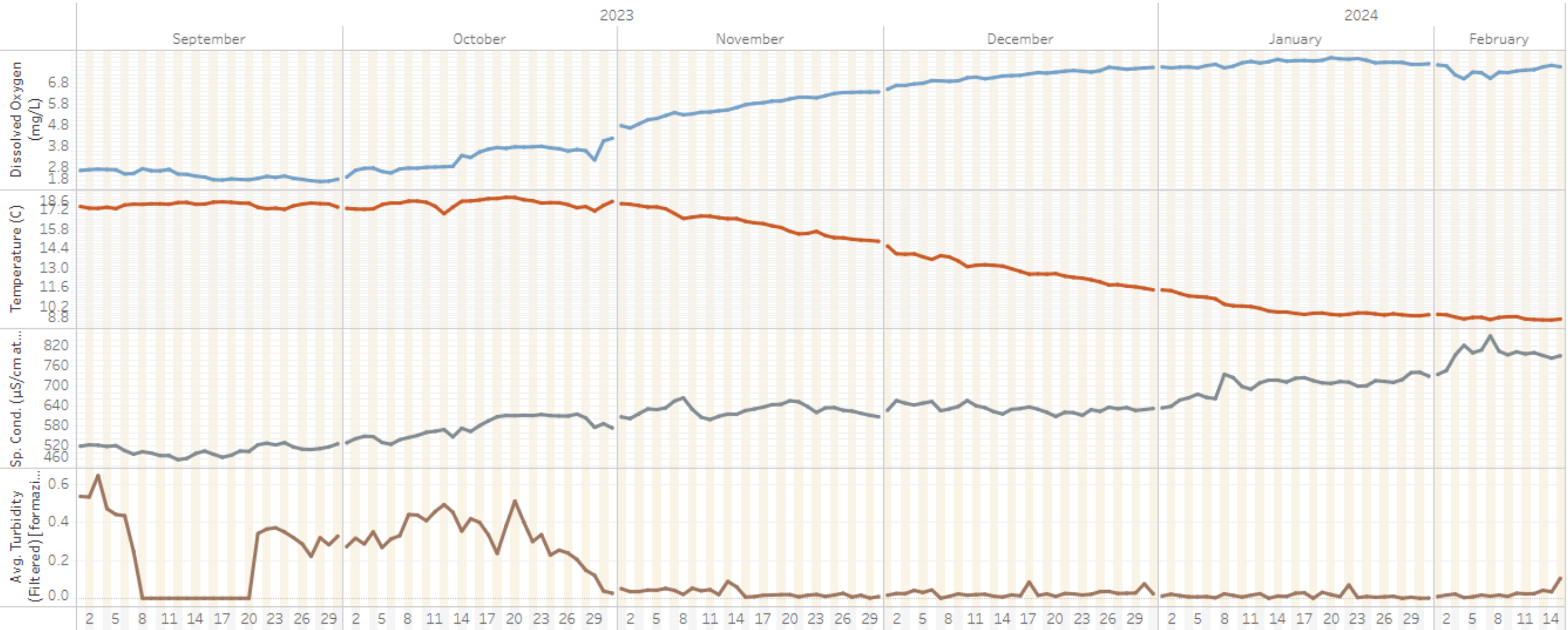
Glen Canyon Dam Site: Daily Averages

Select Date Range
 9/1/2023 — — 2/15/2024

[See Hourly Averages](#)



Daily Average Dissolved Oxygen, Temperature, Specific Conductance, and Turbidity Values



The water quality data shown here are filtered raw values and are subject to revision through quality control / quality assurance procedures. These data are being provided to meet the need for timely best science. The data have not received final approval by the U.S. Geological Survey (USGS) and are provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the data. Please visit GCMRC's Discharge, Sediment and Water Quality web site to plot or download the processed measurements from this station: https://www.gcmrc.gov/discharge_qw_sediment/station/GCDAMP/09379901

Changes to GCD Water Quality Model

- The Water Quality Group is transitioning to a new version of the Lake Powell CE-QUAL-W2 model
- Concurrently, re-evaluating modeling process with the goal of improving projection accuracy
- Expect the updated LP WQ model to be implemented for the March call



Questions?



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