BUREAU OF RECLAMATION

Glen Canyon Monthly Operations Call

Basin Hydrology and Operations

January 17, 2024

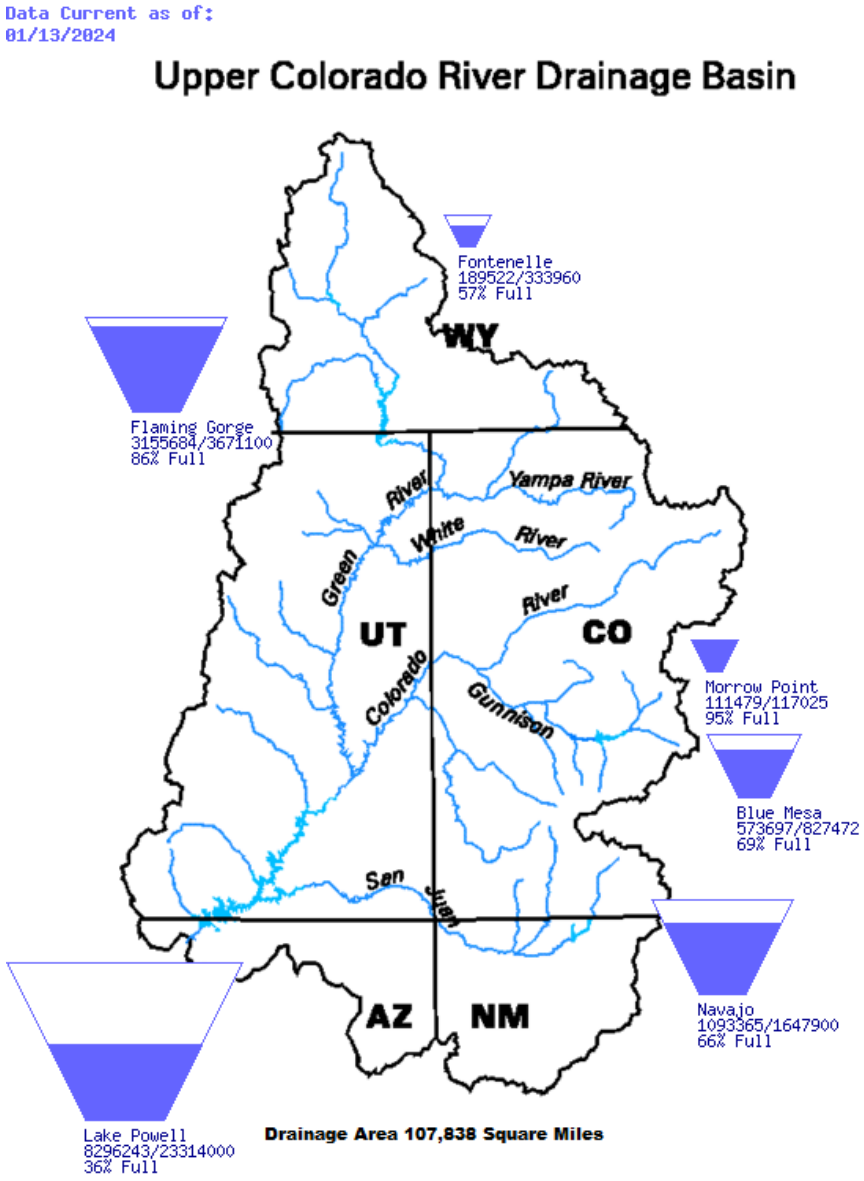
Background

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."

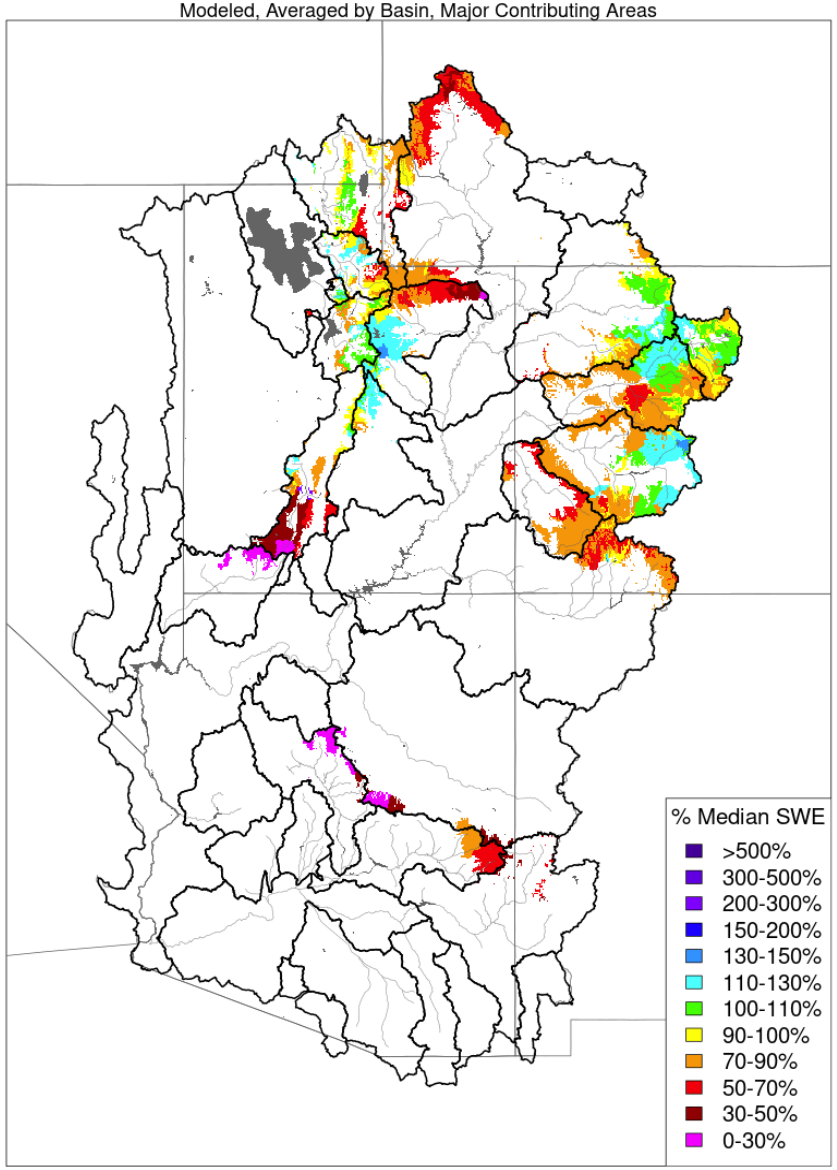
Upper Basin Storage (as of January 15, 2024)

Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	56	0.19	0.33	6,484.97
Flaming Gorge	86	3.15	3.67	6,026.93
Blue Mesa	70	0.57	0.83	7,489.46
Navajo	66	1.09	1.65	6,042.99
Lake Powell	36	8.28	23.31	3,5666.79
UC System Storage	45	13.41	29.93	
Total System Storage	42	24.82	58.48	



Snow Conditions - January 16 2024

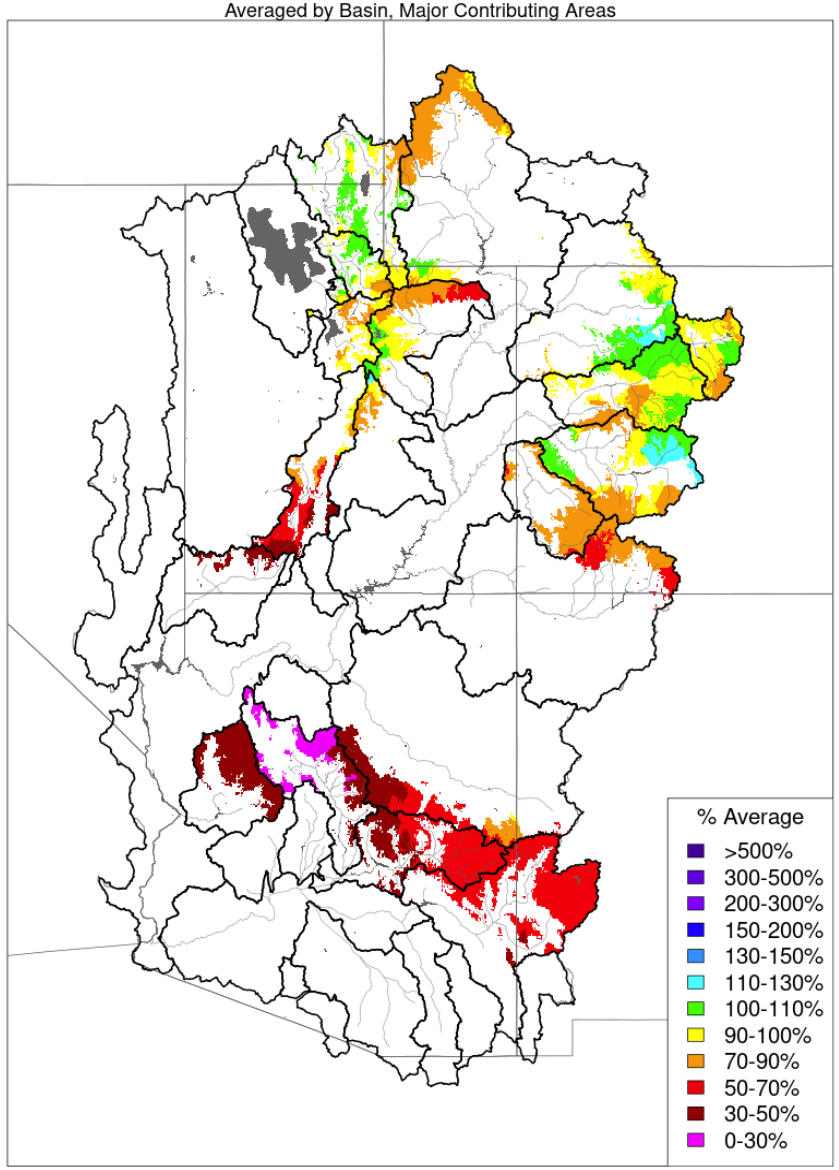
Modeled, Averaged by Basin, Major Contributing Areas



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

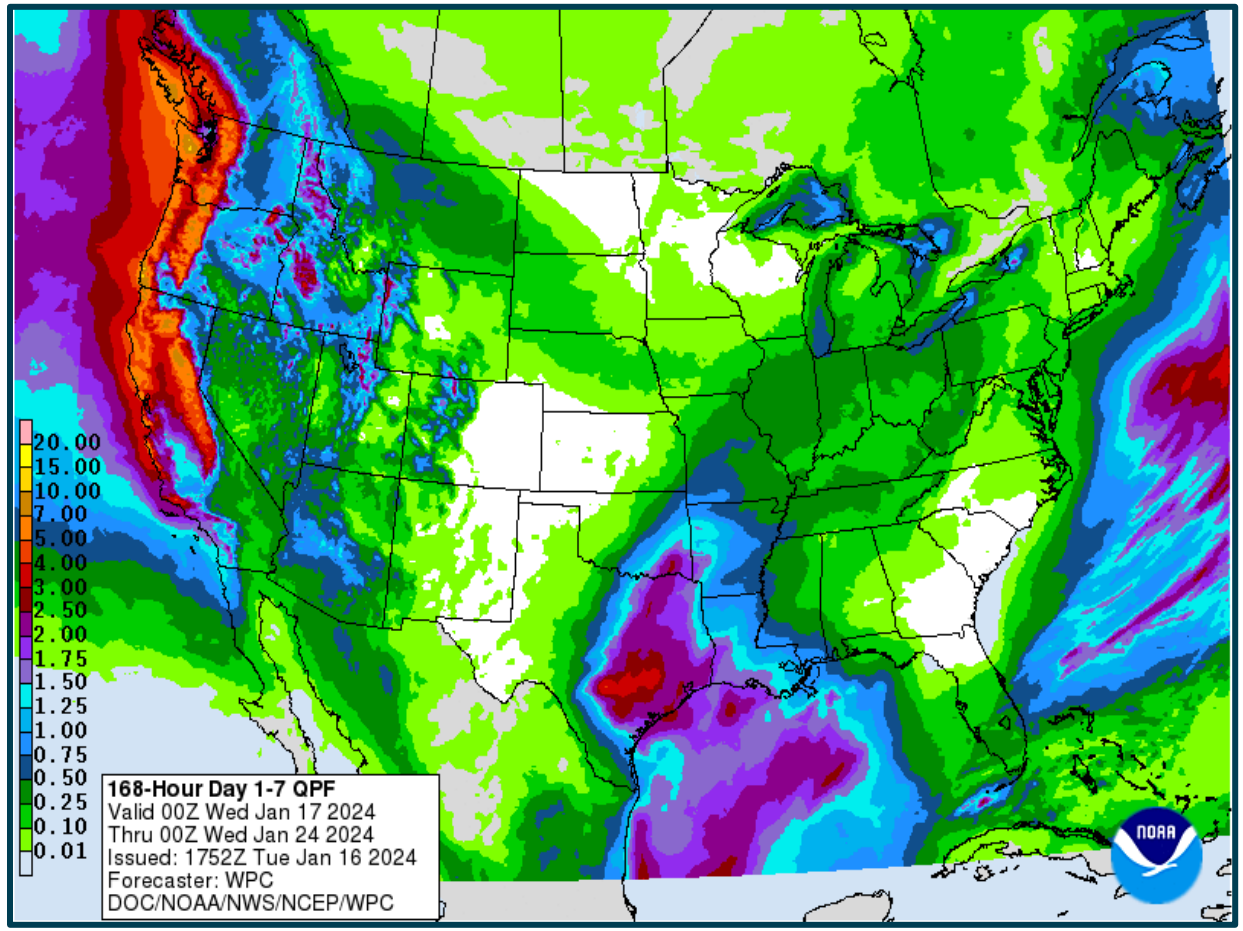
Water Year to Date Precipitation, October 01 - January 16 2024

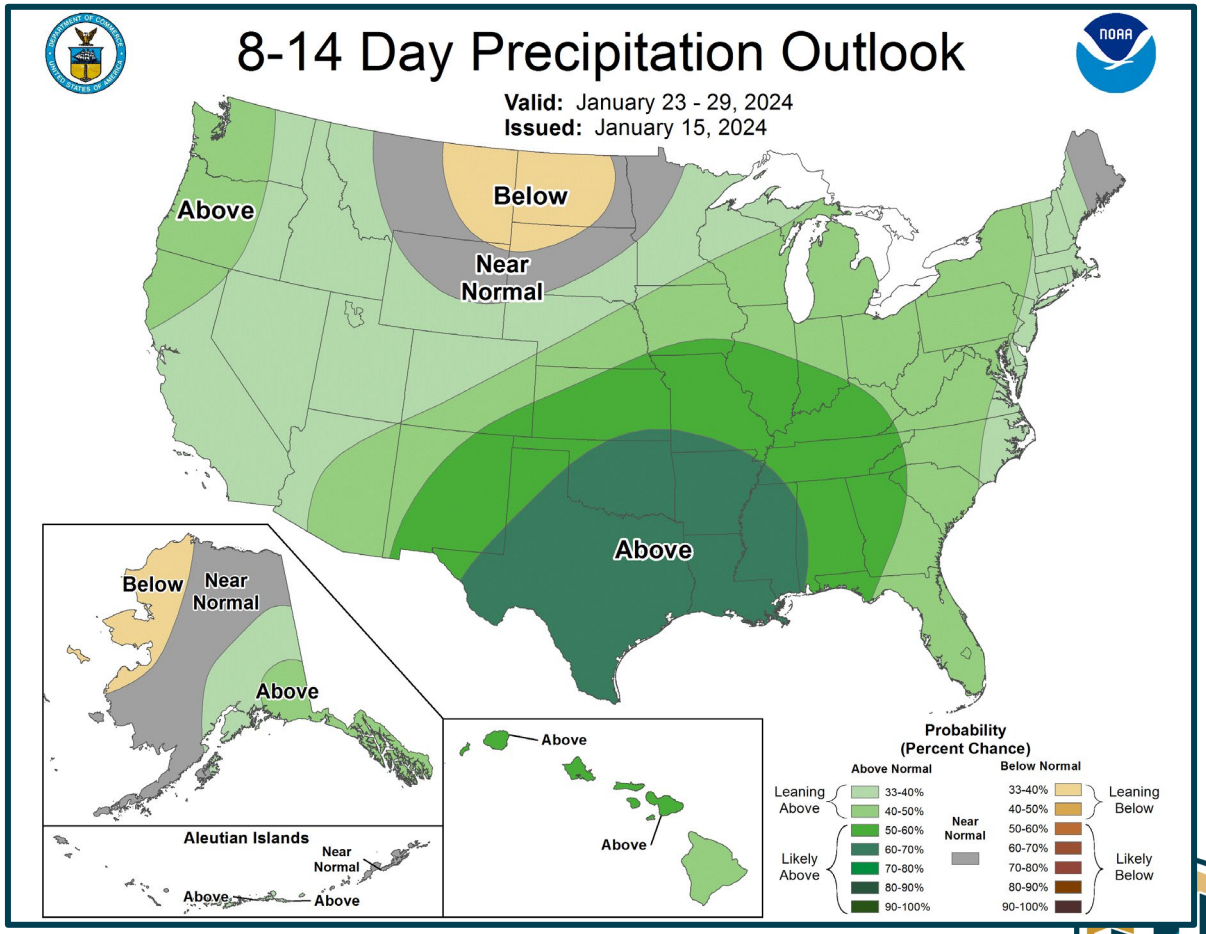
Averaged by Basin, Major Contributing Areas



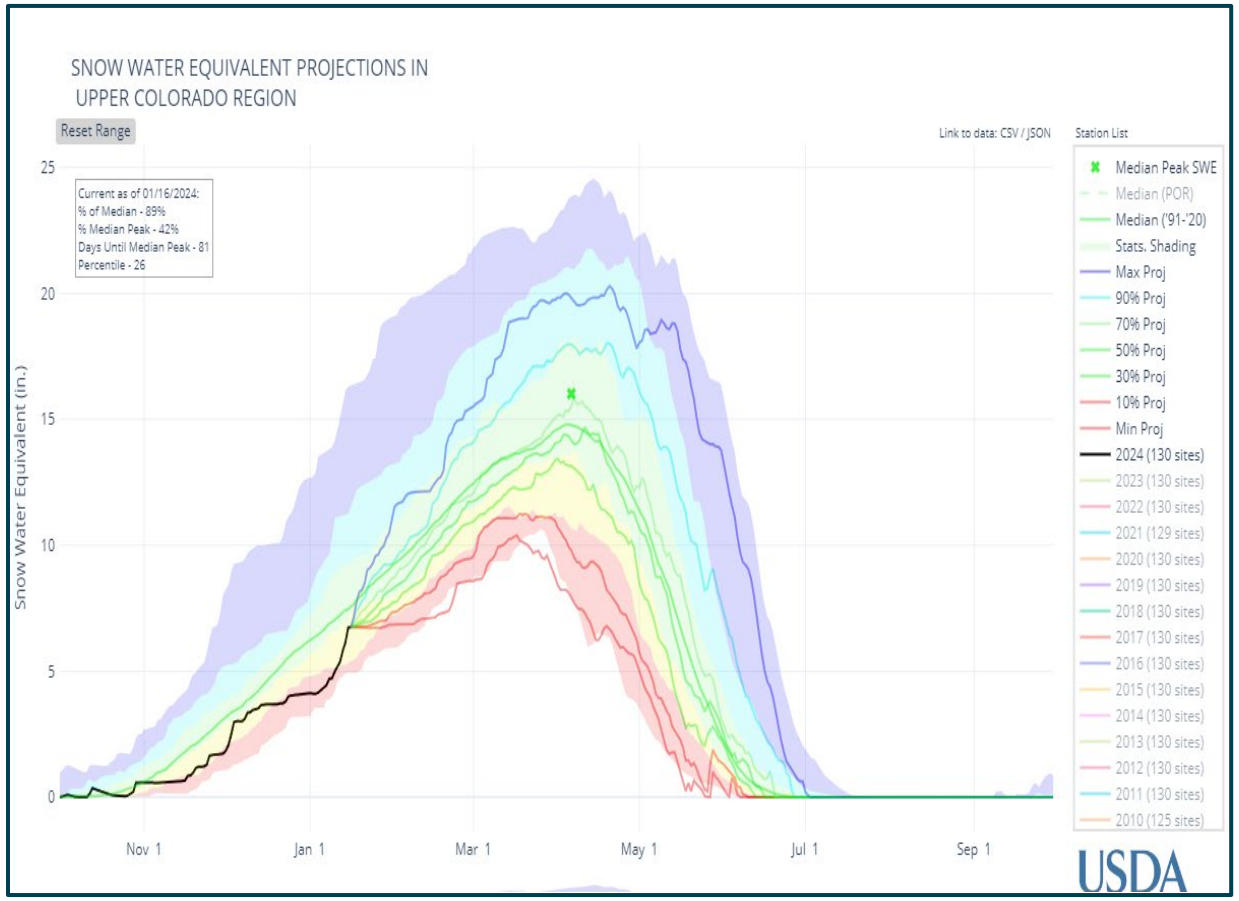
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov

Weather Prediction Center and Climate Prediction Center Precipitation Forecasts

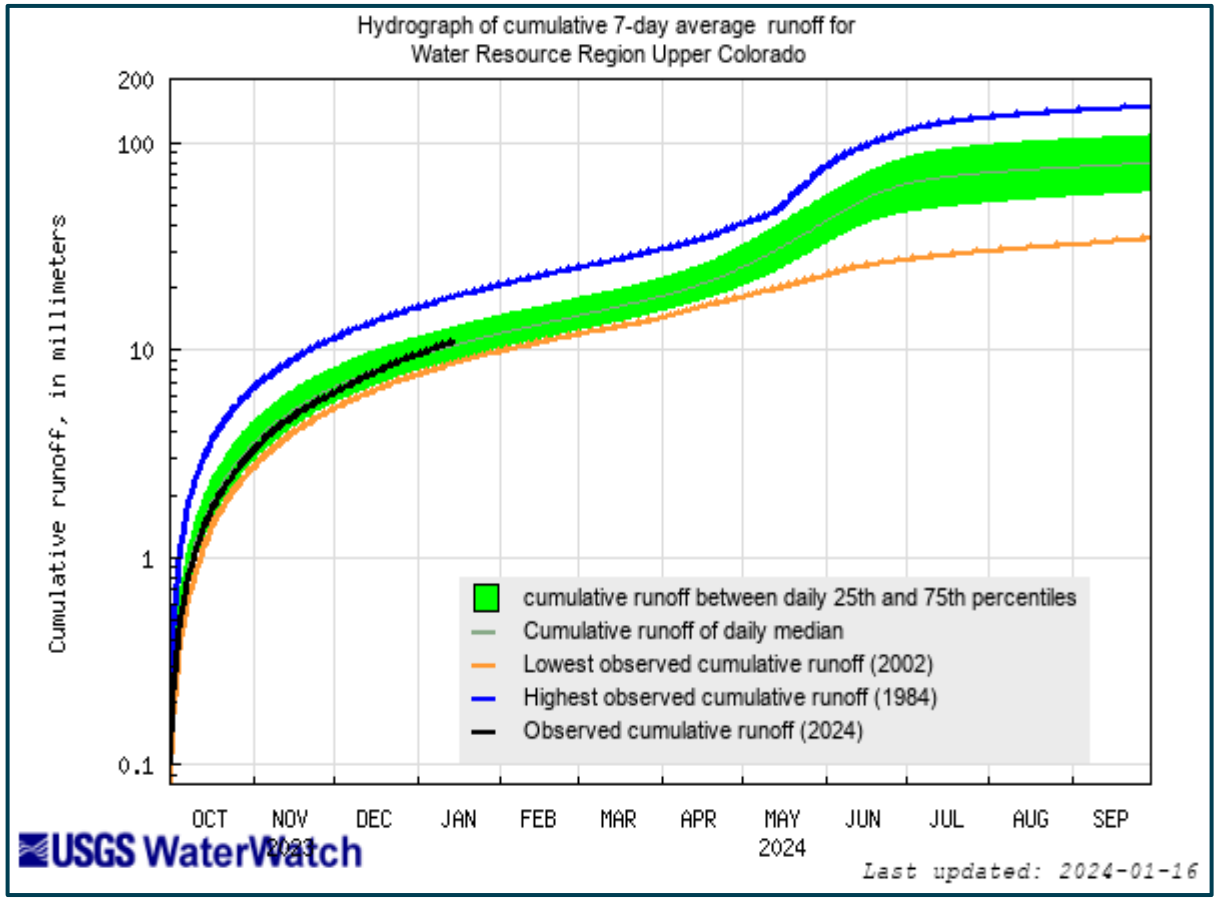




Upper Colorado SWE and Observed Inflows



https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/Proj/WTEQ/assocHUC2/14_Upper_Colorado_Region.html



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

Most Probable January Forecast
Water Year 2024

April – July 2024
Forecasted Unregulated Inflow

as of January 4, 2024

Reservoir	Inflow (kaf)	Change from Dec	Percent of Avg[1]
Fontenelle	535	-80	73
Flaming Gorge	675	-130	70
Blue Mesa	490	-45	77
Navajo	375	-62	60
Powell	4,200	-600	66

Water Year 2024
Unregulated Inflow Forecast

as of January 4, 2024

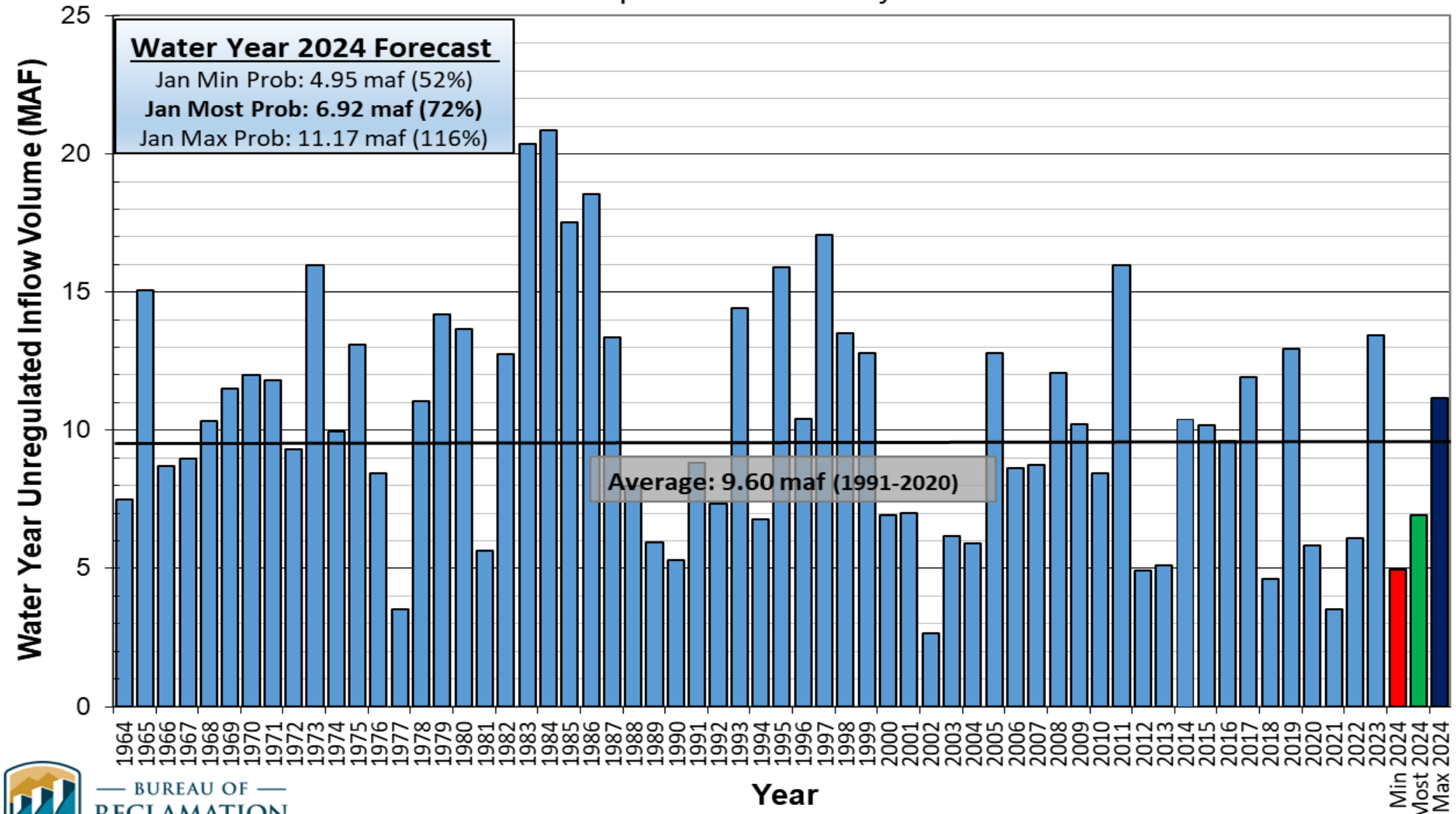
Reservoir	Inflow (kaf)	Change from Dec	Percent of Avg[1]
Fontenelle	878	-83	82
Flaming Gorge	1,155	-134	82
Blue Mesa	728	-49	81
Navajo	536	-64	59
Powell	6,918	-701	72

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

Lake Powell Unregulated Inflow

Water Year 2024 Forecast *(issued January 4)*

Comparison with History



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Upper Colorado Basin

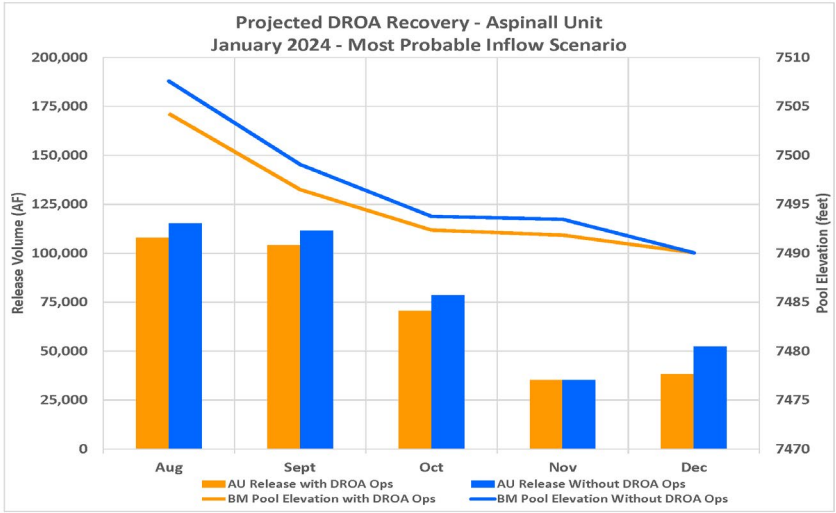
Hydrology and Operations Projections Based on January 2024 24-Month Study

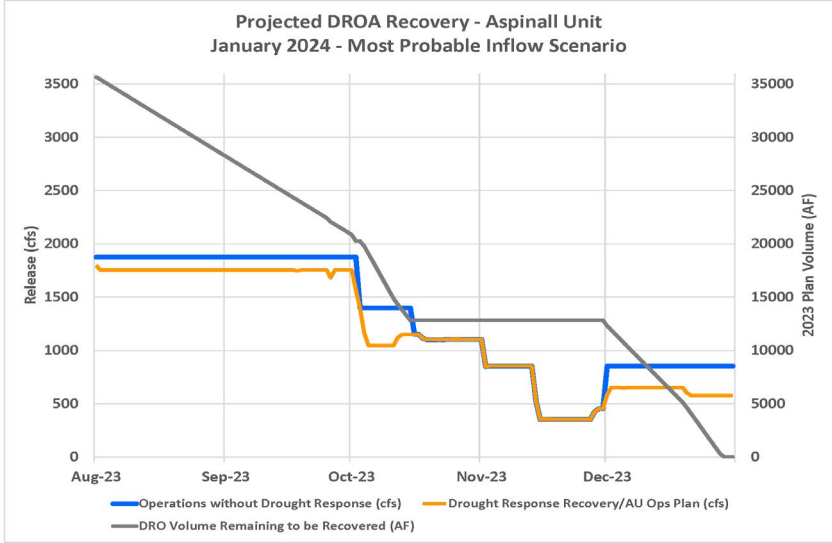
Upper Basin Reservoir Operations
Water Years 2024 and 2025

- 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

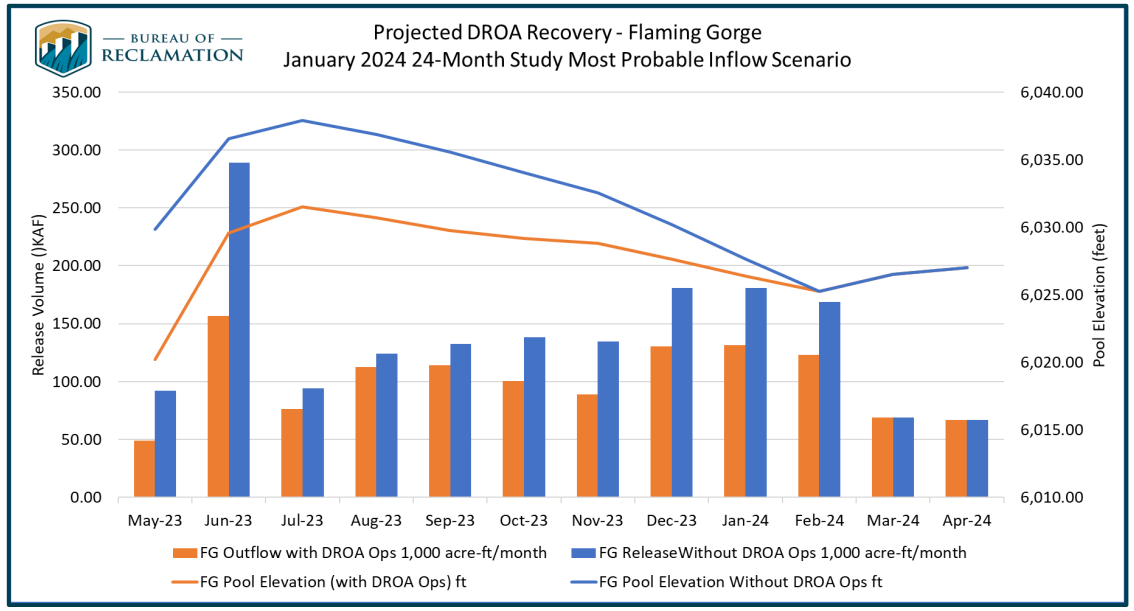
- November 2023 recovery amount 0 AF
- December 2023 recovery amount of 13 kaf
- Incremental Recovery at Blue Mesa COMPLETED by midnight 12/29.
- Icing target ACHIEVED at 7490.05’ on midnight 12/31.

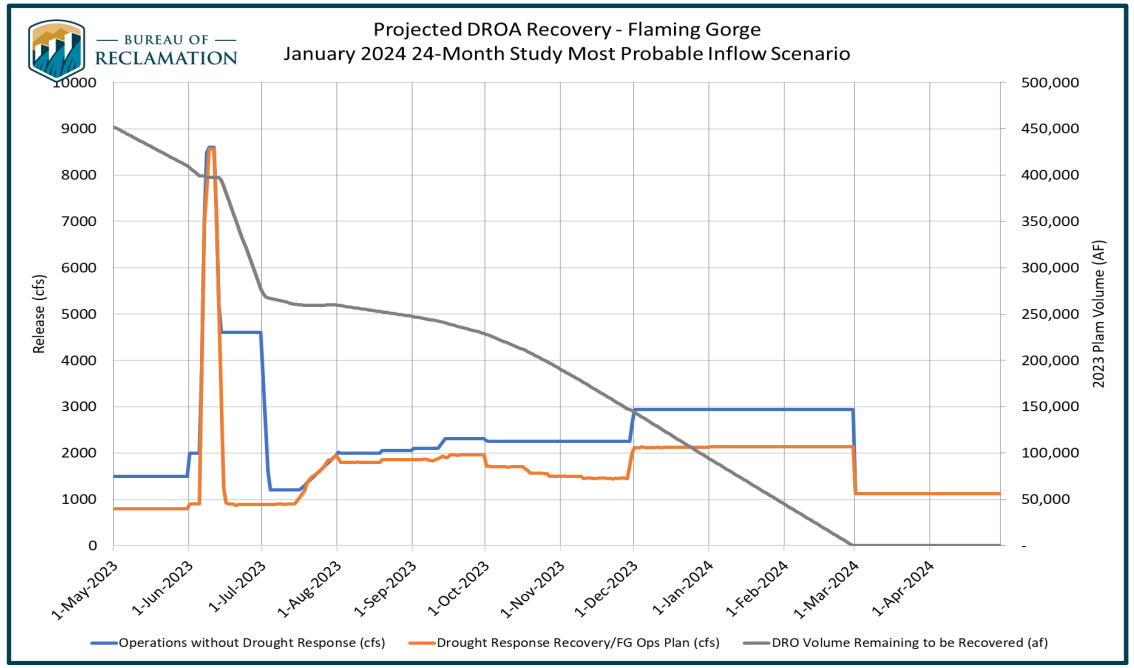




DROA Recovery - FG

- November 2023 recovery amount 46 kaf at Flaming Gorge.
- December 2023 recovery amount of 50.3 kaf
- Projected to achieve incremental recovery in February 2024 and the May 1 Drawdown Target of 6,027 (mod-dry target)



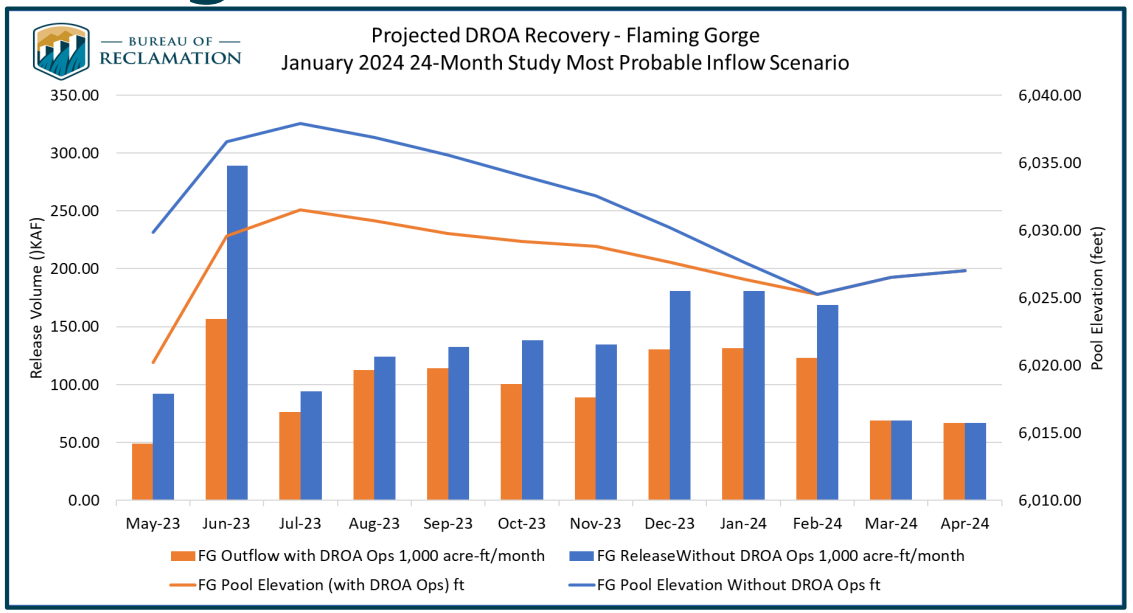


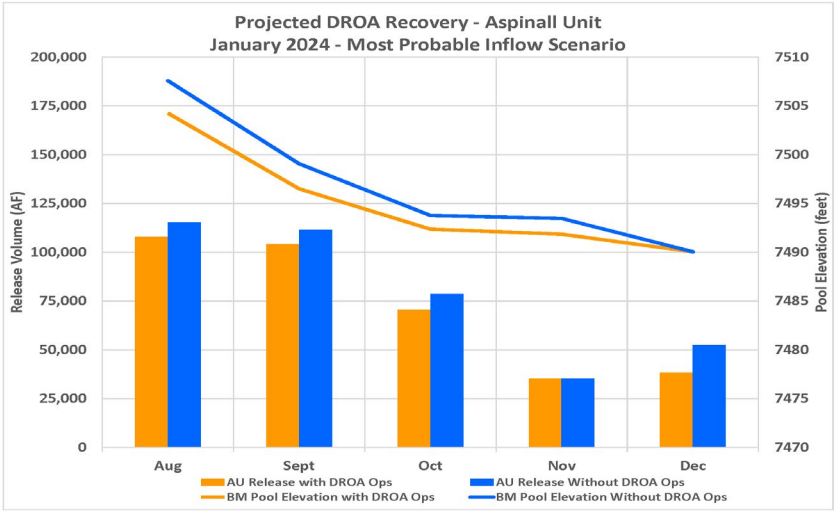
Drought Response Operations Agreement (DROA)

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]	-358	95
Blue Mesa	36	0	-36	0
Navajo	0	0	0	0
Total DROA Volume (kaf)	161	328	-394	95

[1]DROA operational year is from May through April.
[2]Positive 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
[4]DROA volumes through September 2023

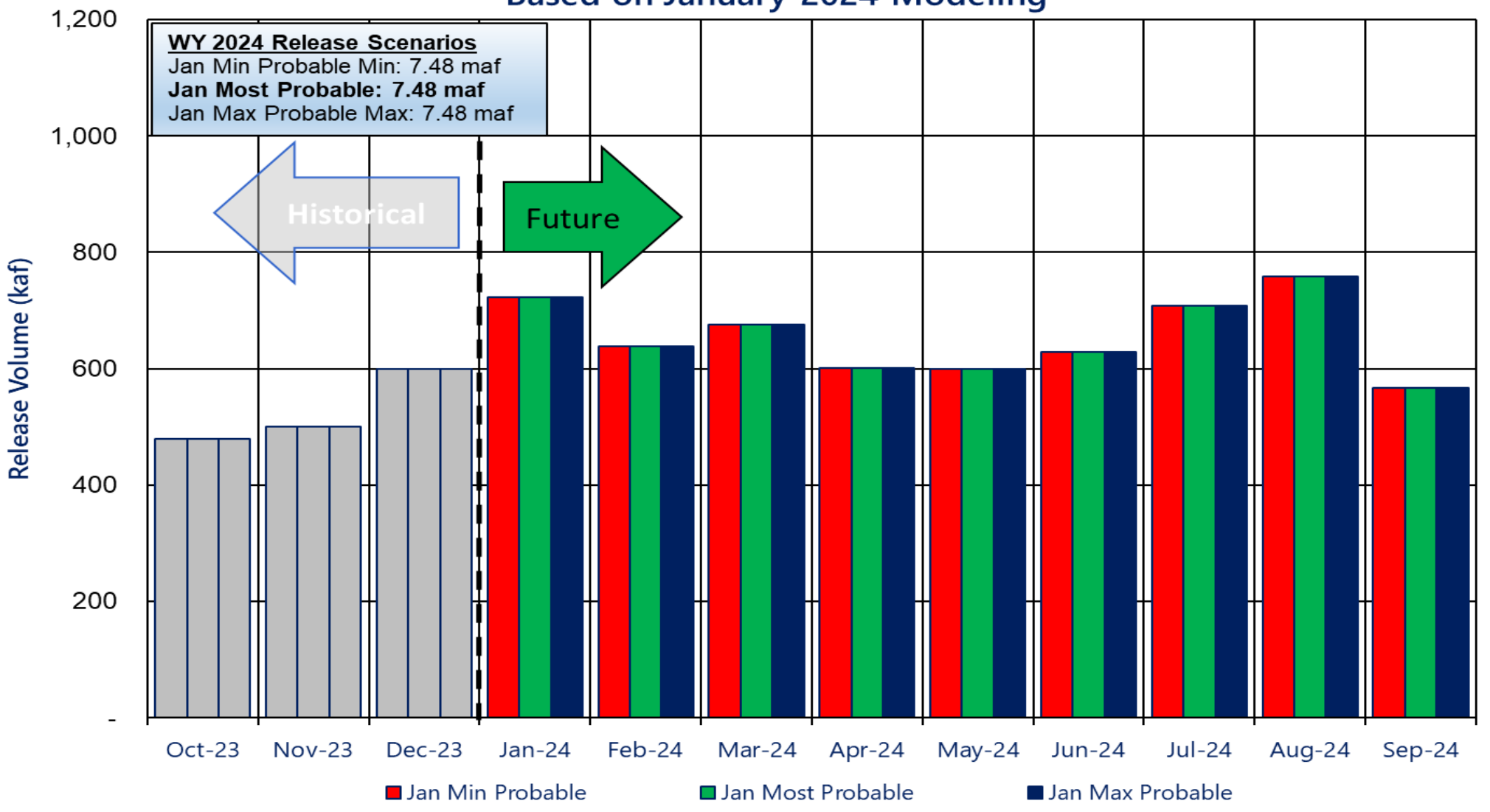




Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2024

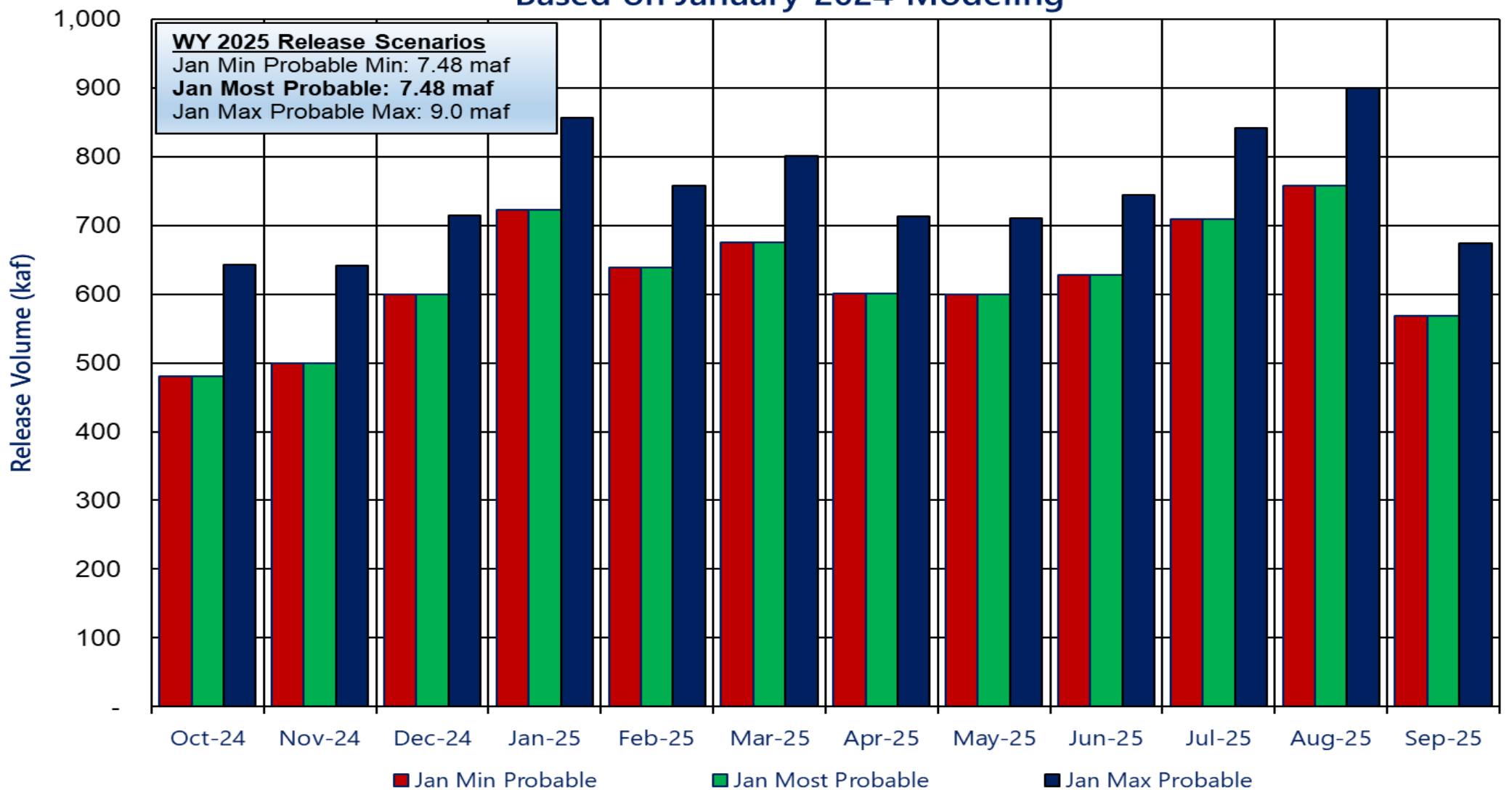
Based on January 2024 Modeling



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2025

Based on January 2024 Modeling

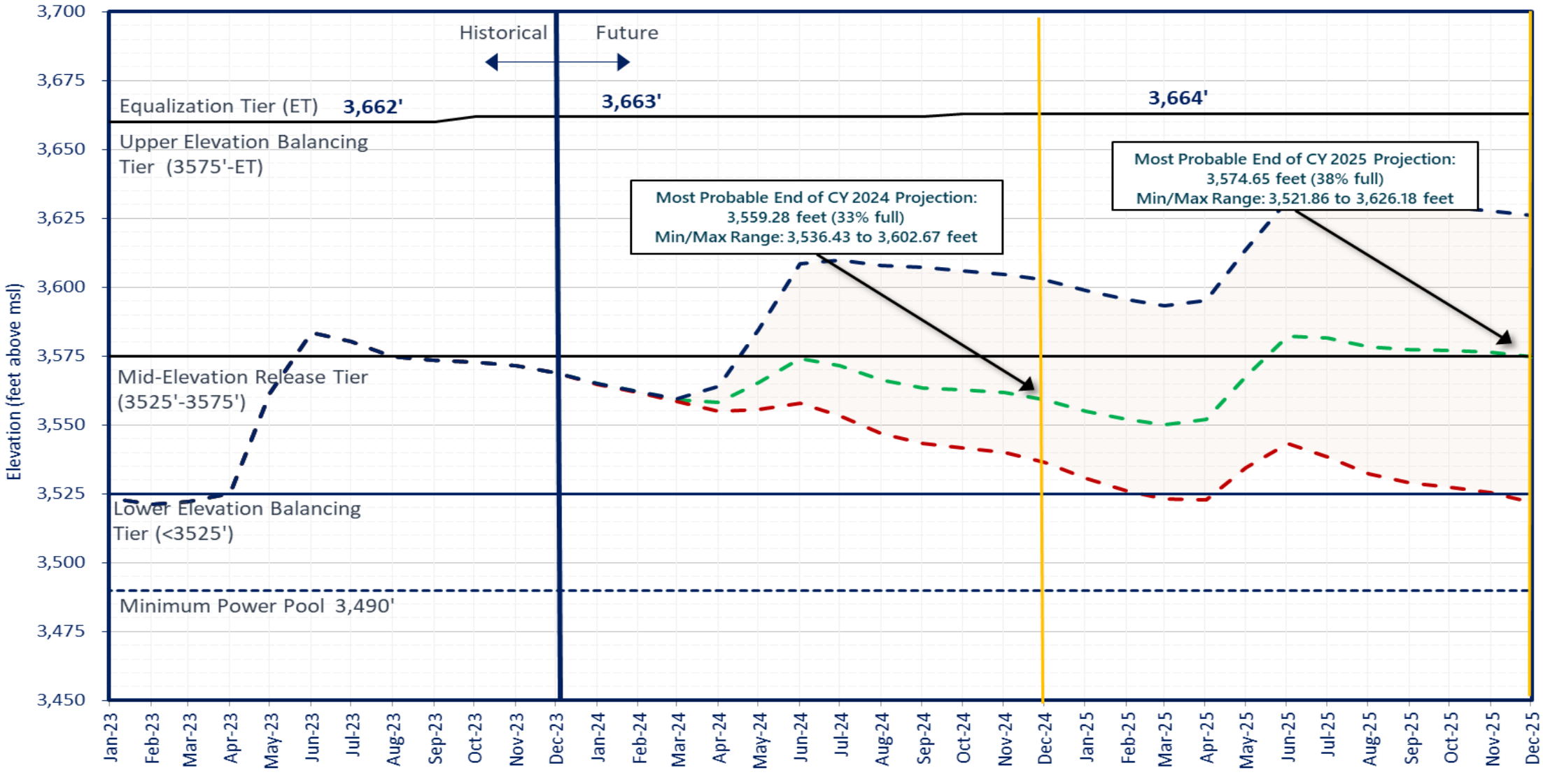


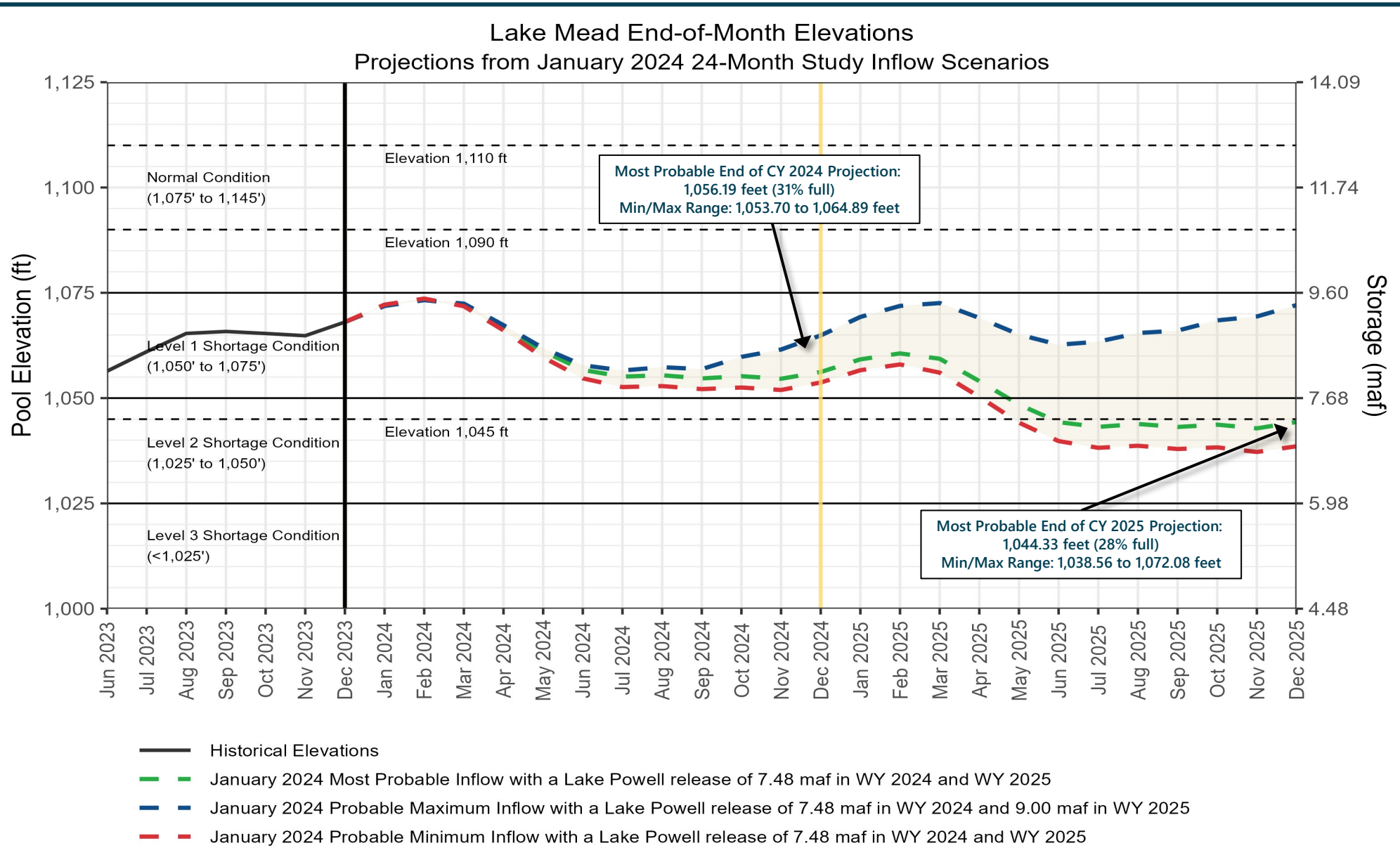
Reclamation Operational Modeling
Model Comparison

	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

Projections from the January 2024 24-Month Study Inflow Scenarios





The Drought Response Operations Agreement (DROA) is available online at https://www.usbr.gov/dcp/finaldocs.html.

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	6	8	8	8	8	
Capacity (cfs)	12,400	19,450	19,400	19,300	19,200	19,200	19,100	19,300	23,100	23,100	26,400	26,300	JAN MOST[2]
Capacity (kaf/month)	770	1,030	1,190	1,190	1,100	1,160	1,180	1,110	1,280	1,620	1,620	1,570	JAN MOST
Max (kaf)[1]	480	500	600	723	639	675	601	599	628	709	758	567	7.48 maf
Most (kaf)[1]	480	500	600	723	639	675	601	599	628	709	758	567	7.48 maf
Min (kaf)[1]	480	500	600	723	639	675	601	599	628	709	758	567	7.48 maf
										(updated 01-16-2024)			

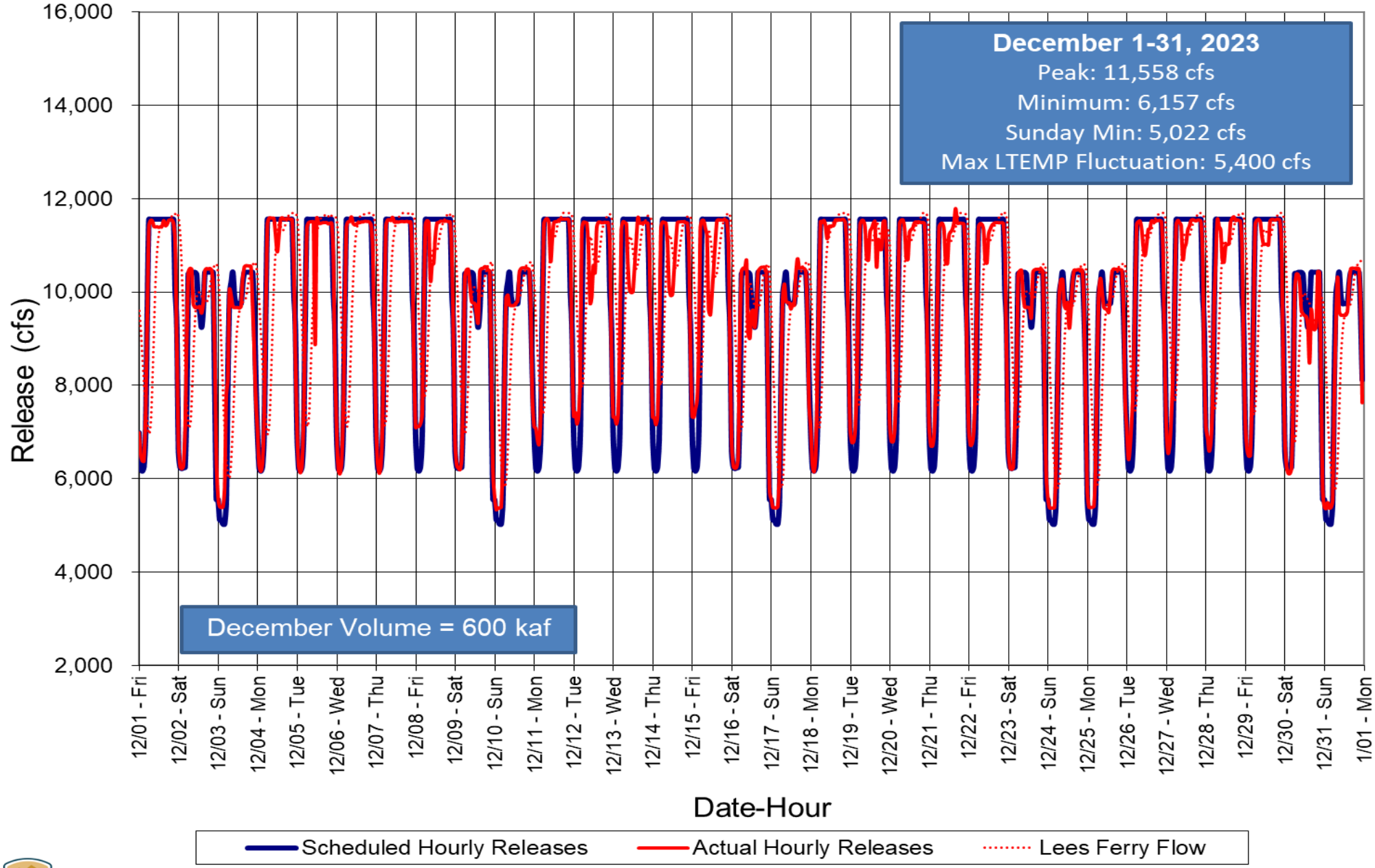
1 Projected release, based on January 2024 24MS for the minimum, maximum and most probable 24-Month Study model runs.
2 Dependent upon availability to shift contingency regulation, which will increase capacity by 30-40MW (3%) at current efficiency.

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)	26,300	19,300	19,300	19,300	19,300	19,300	19,300	22,800	19,300	19,300	26,300	26,300	JAN MOST[2]
Capacity (kaf/month)	1,520	1,150	1,450	1,350	1,080	1,210	1,260	1,400	1,220	1,180	1,620	1,570	JAN MOST
Max (kaf) [1]	643	642	715	857	758	801	713	710	745	842	900	674	9.00 maf
Most (kaf) [1]	480	500	600	723	639	675	601	599	628	709	758	568	7.48 maf
Min (kaf) [1]	480	500	600	723	639	675	601	599	628	709	758	568	7.48 maf
										(updated 01-16-2024)			

1 Projected release, based on January 2024 24MS for the minimum, maximum and most 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 Hourly Release Pattern December 2023



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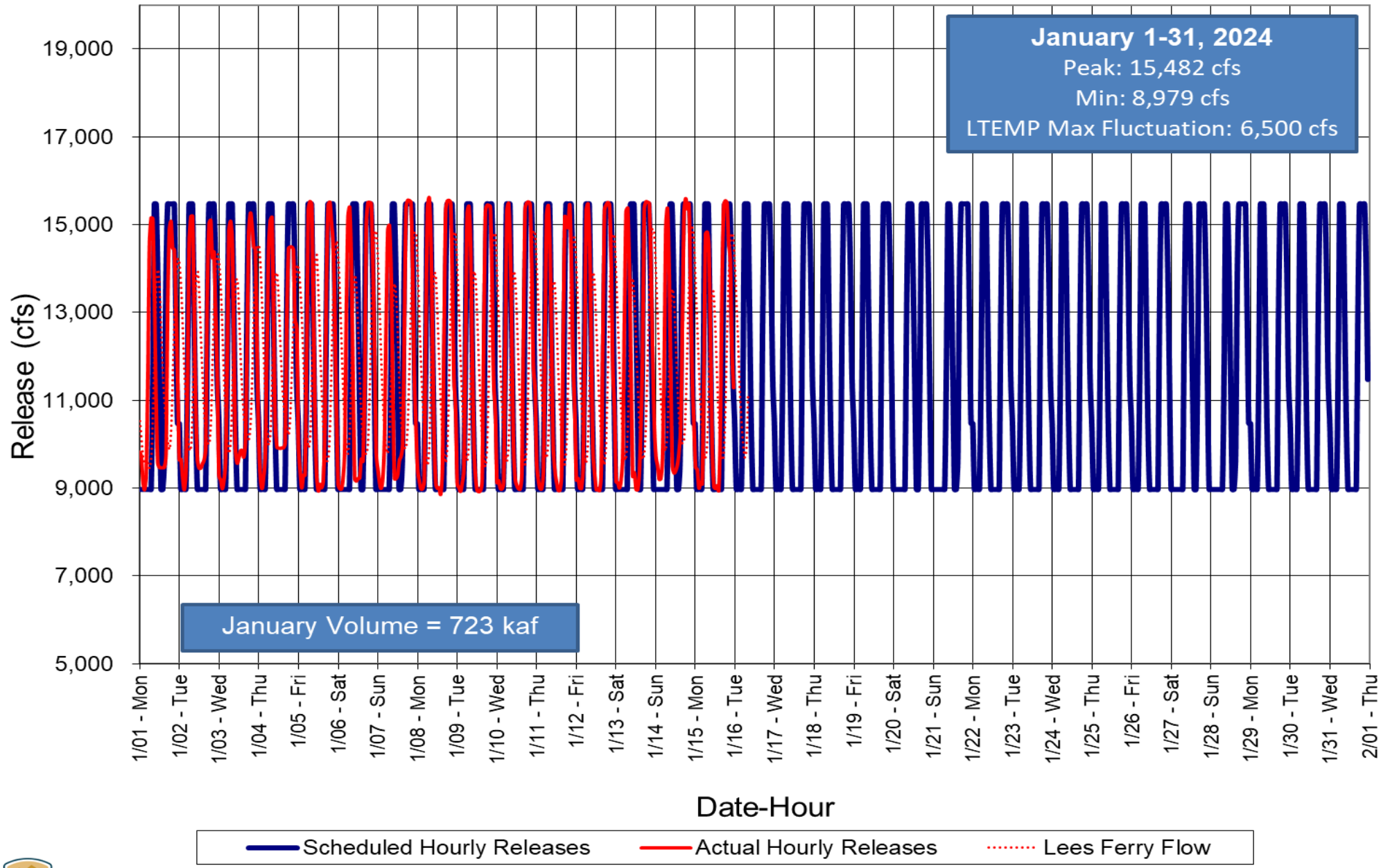
Glen Canyon Dam Hourly Release Pattern January 2024



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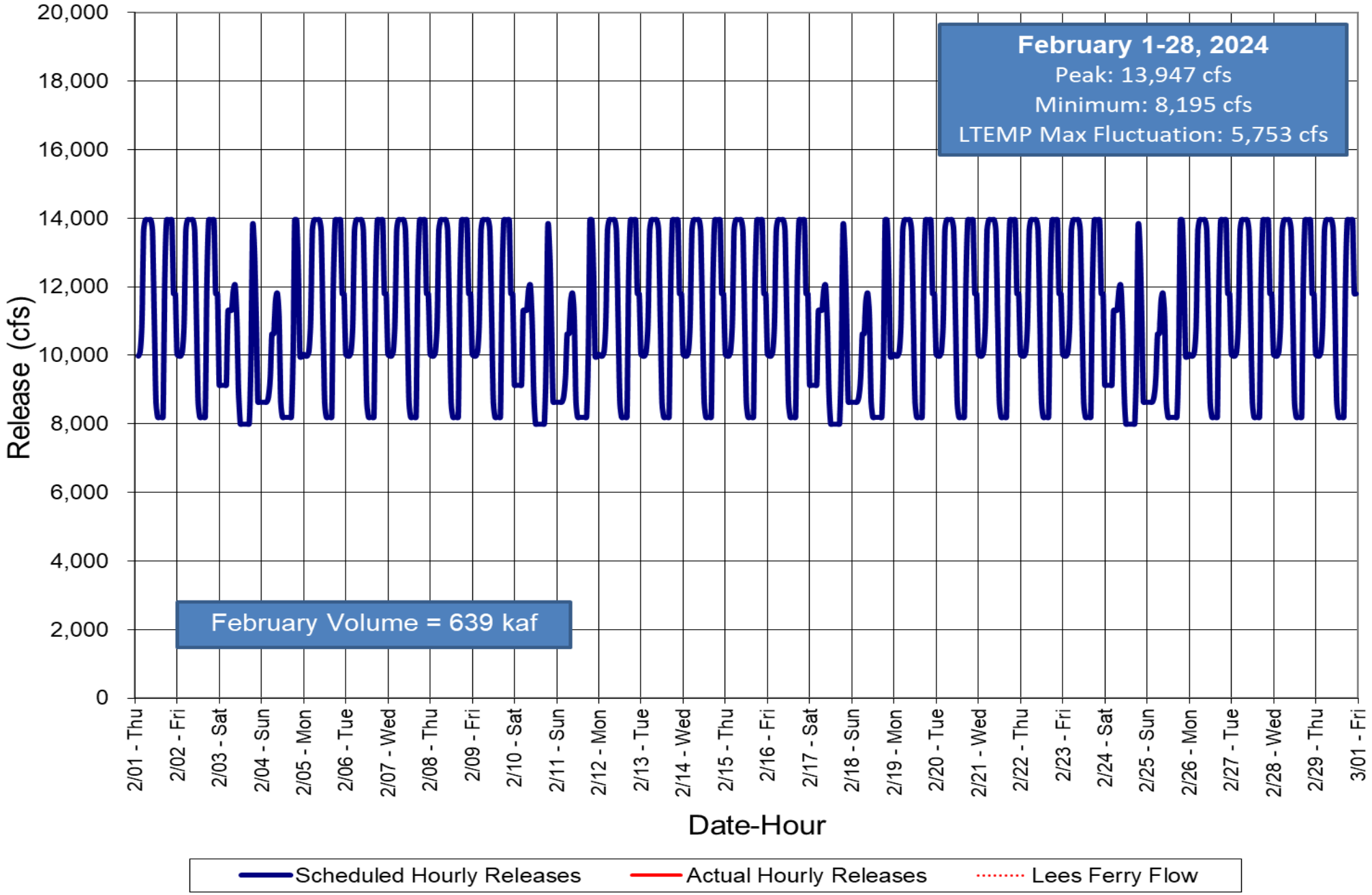
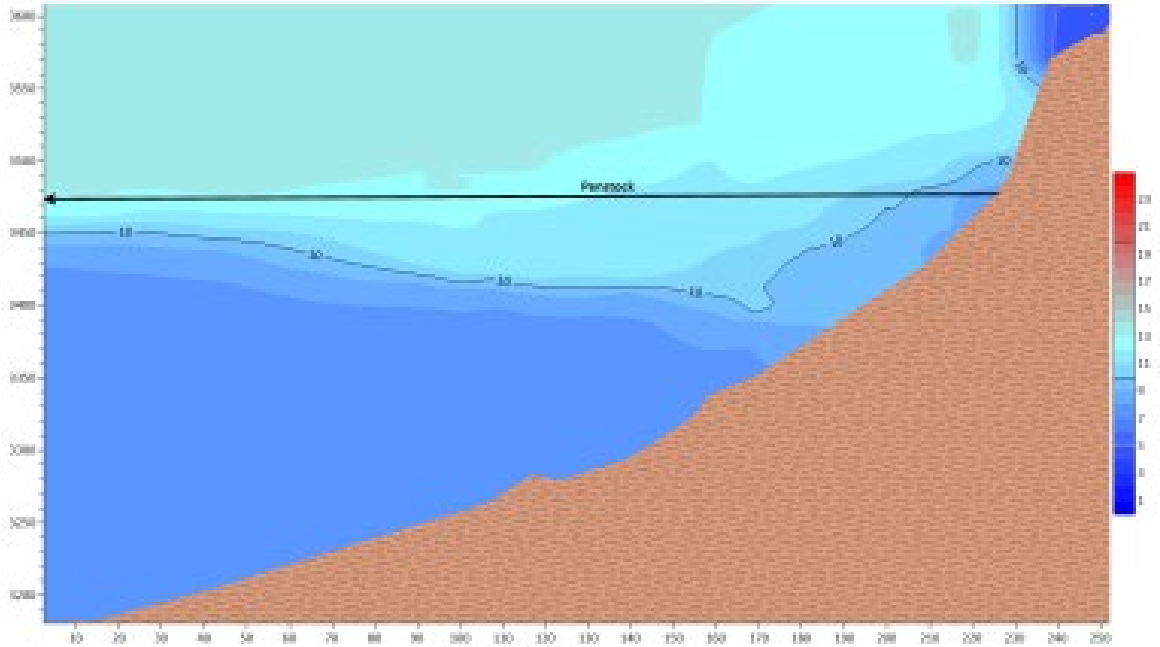
Glen Canyon Dam Hourly Release Pattern February 2024

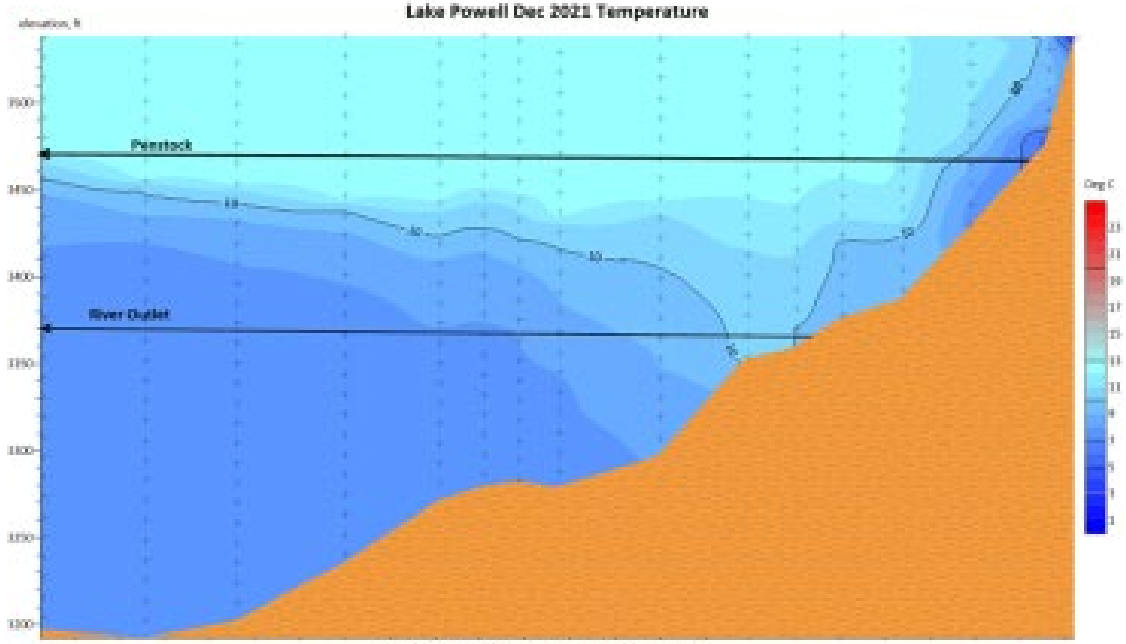


Water Quality

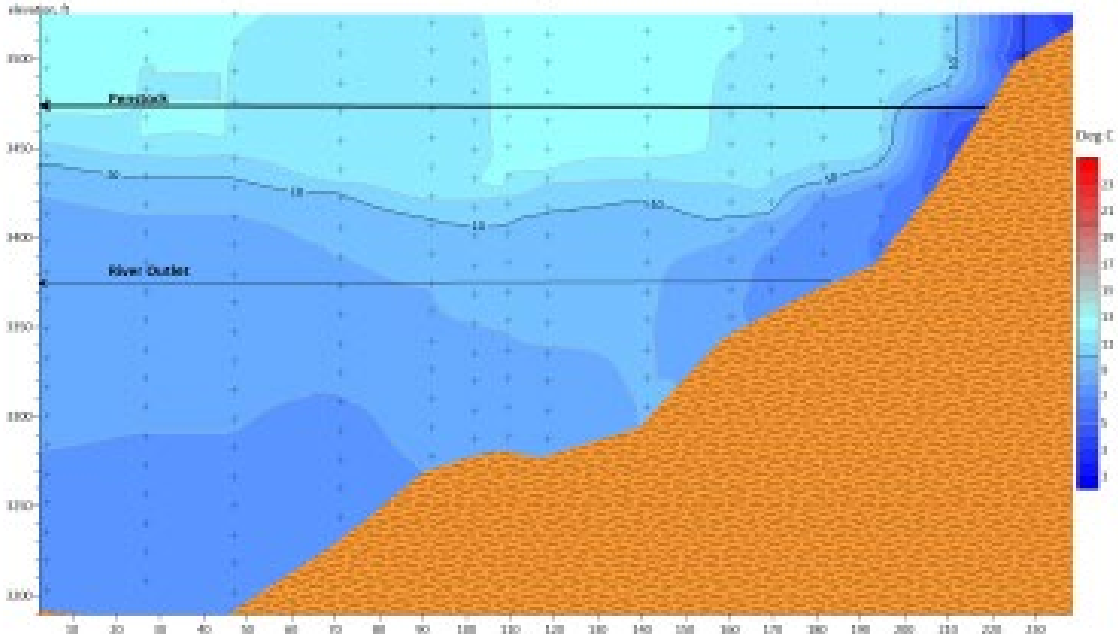
Lake Powell Temperature Dec 10-13 2019



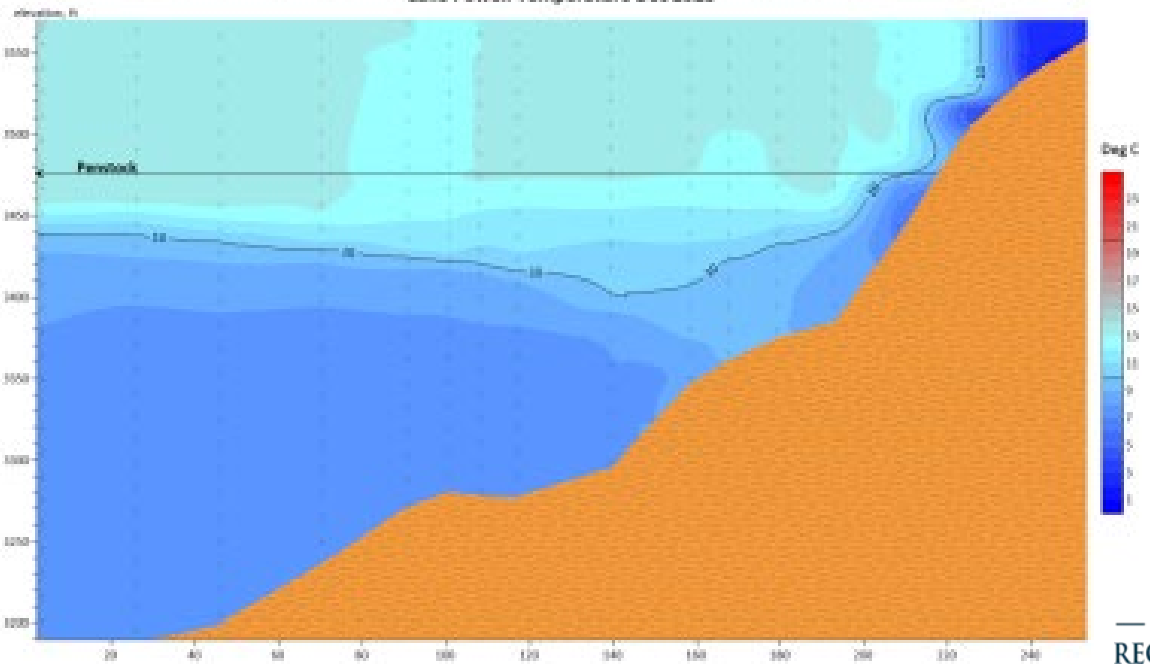
Lake Powell Dec 2021 Temperature



Lake Powell Temperature Dec 2022



Lake Powell Temperature Dec 2023



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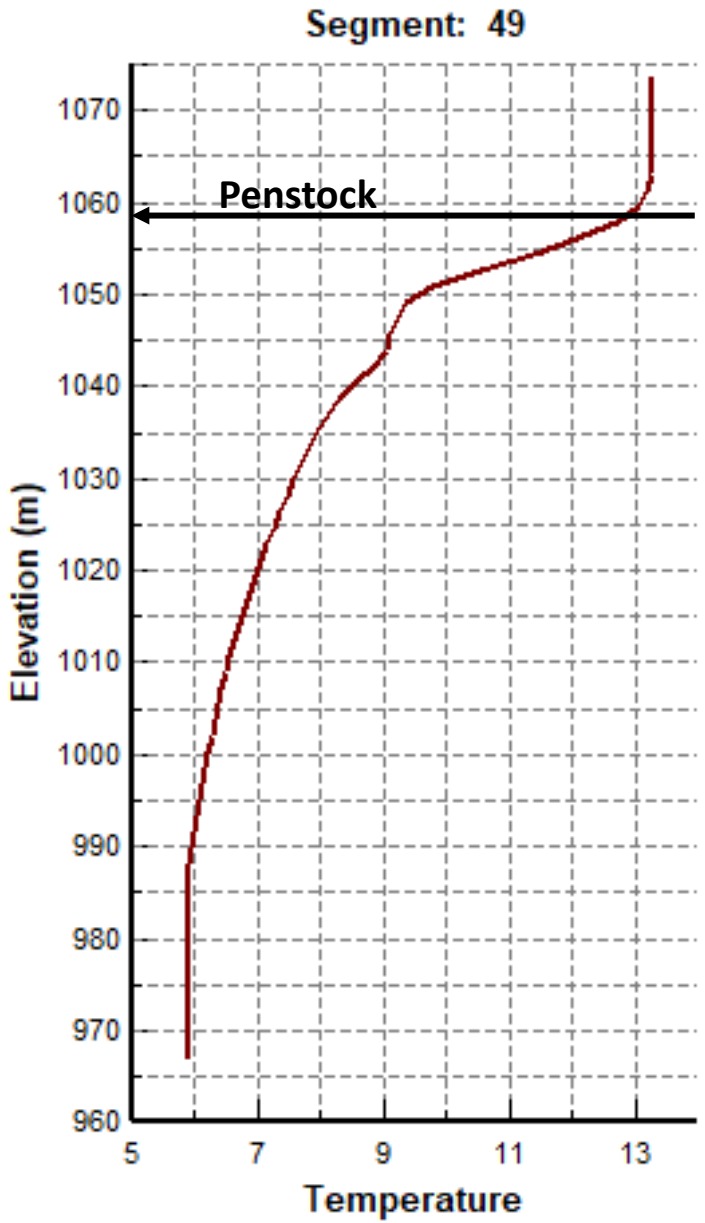
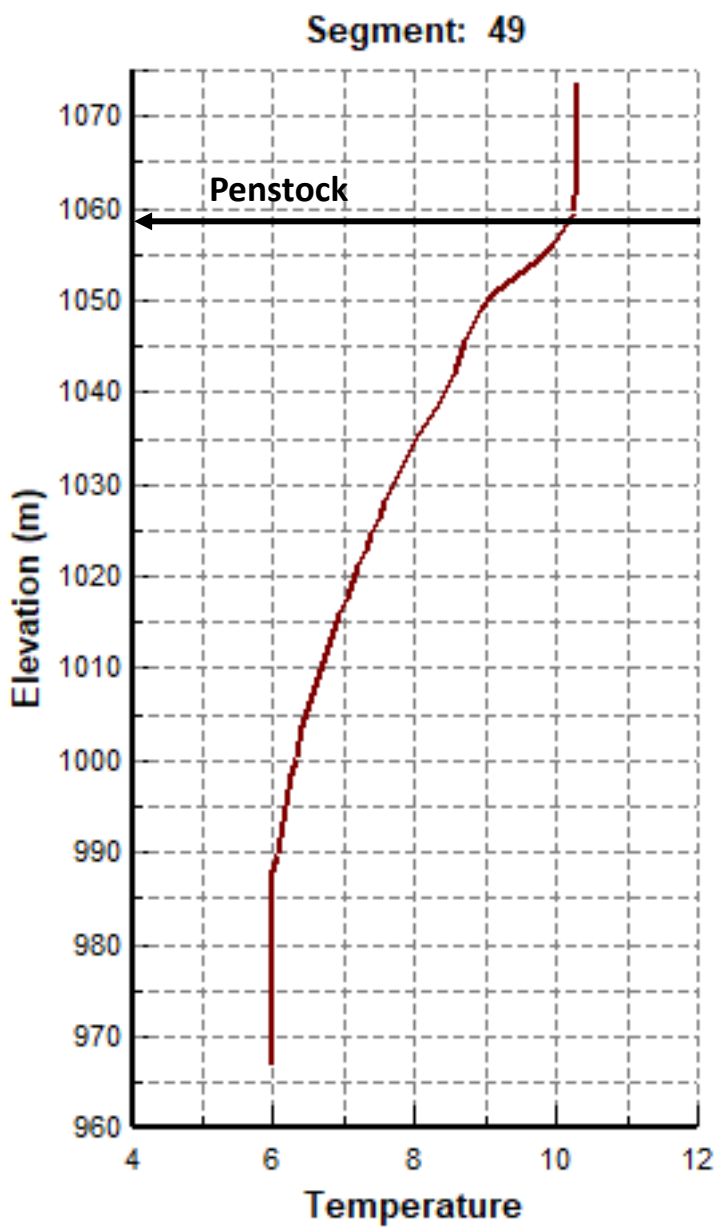
12/16/2023



1/13/2024



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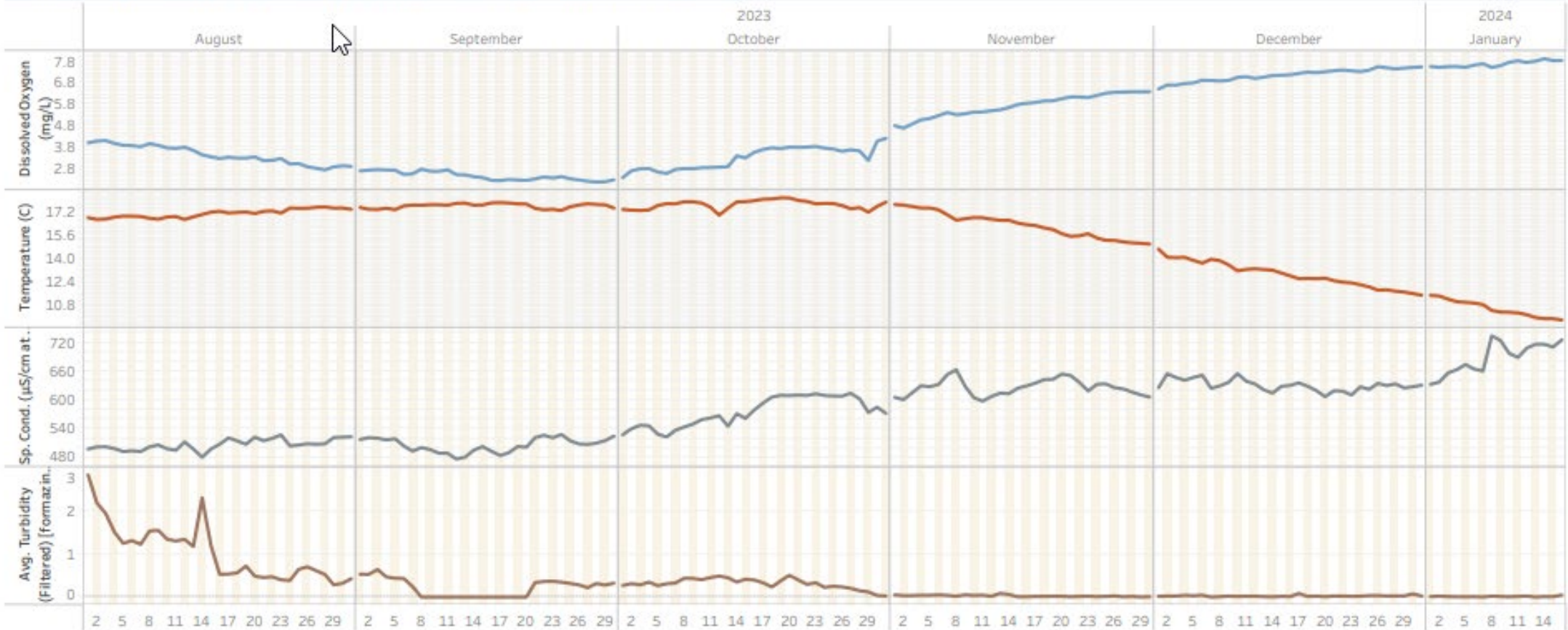
Glen Canyon Dam Site: Daily Averages

Select Date Range
8/1/2023 to 1/16/2024
and Null values

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

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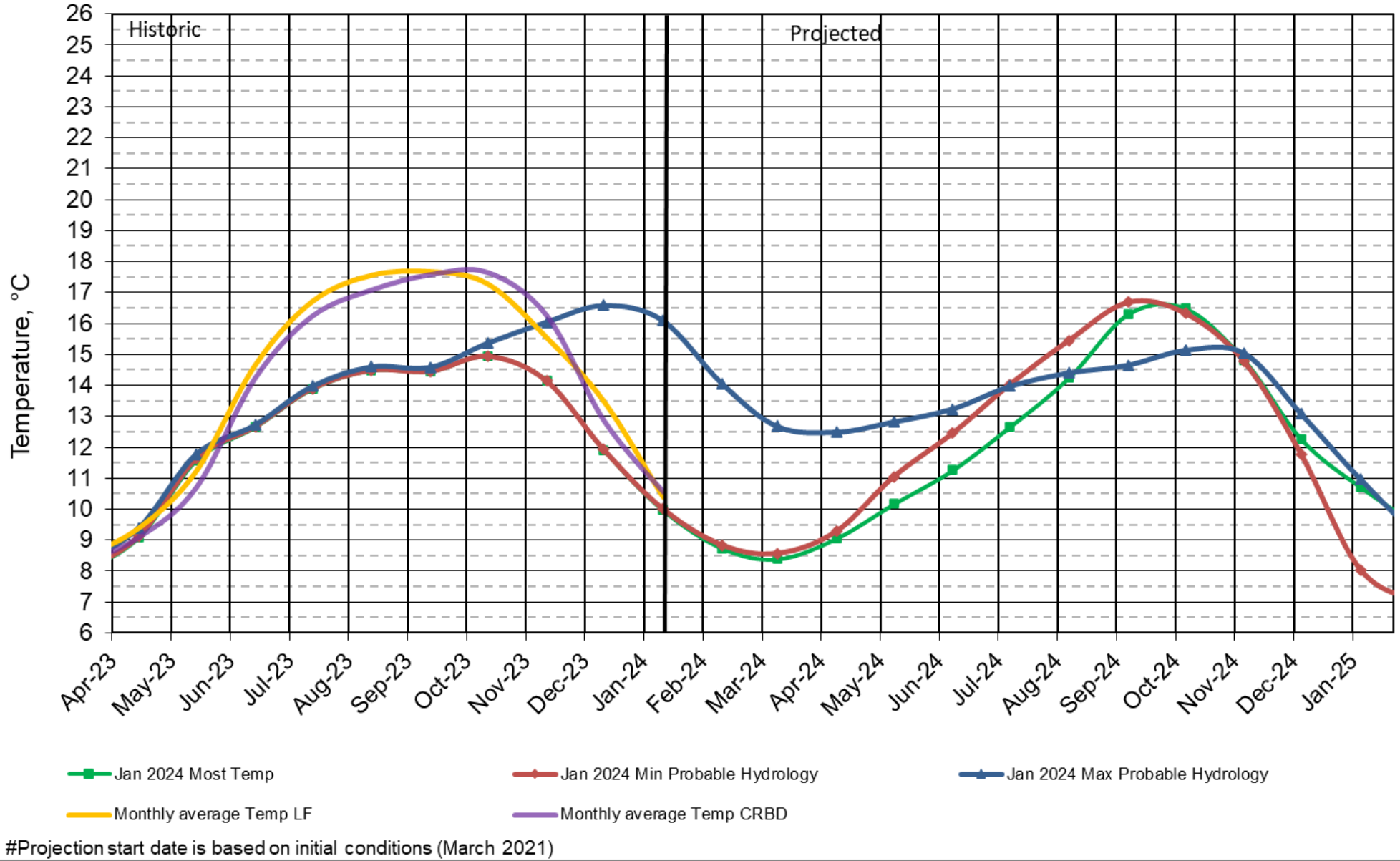
Lake Powell Release Temperature

Projected Temperature based on January 2024 Forecast



#Projection start date is based on initial conditions (March 2021)

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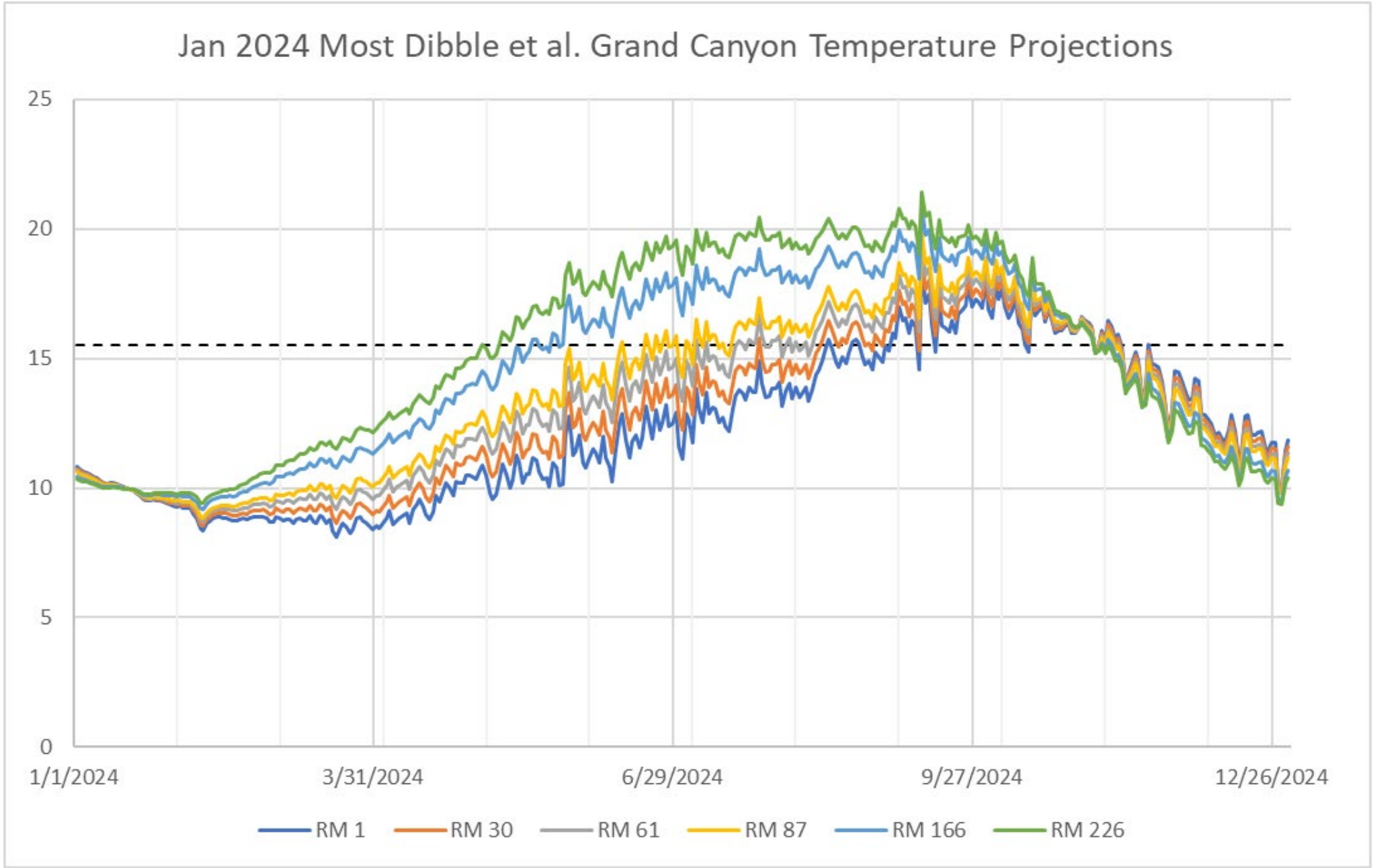

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Questions?
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