



— BUREAU OF —
RECLAMATION

Glen Canyon Monthly Operations Call

Basin Hydrology and Operations

December 22, 2020

Background

This briefing is being provided consistent with the provision in 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 Colorado Basin

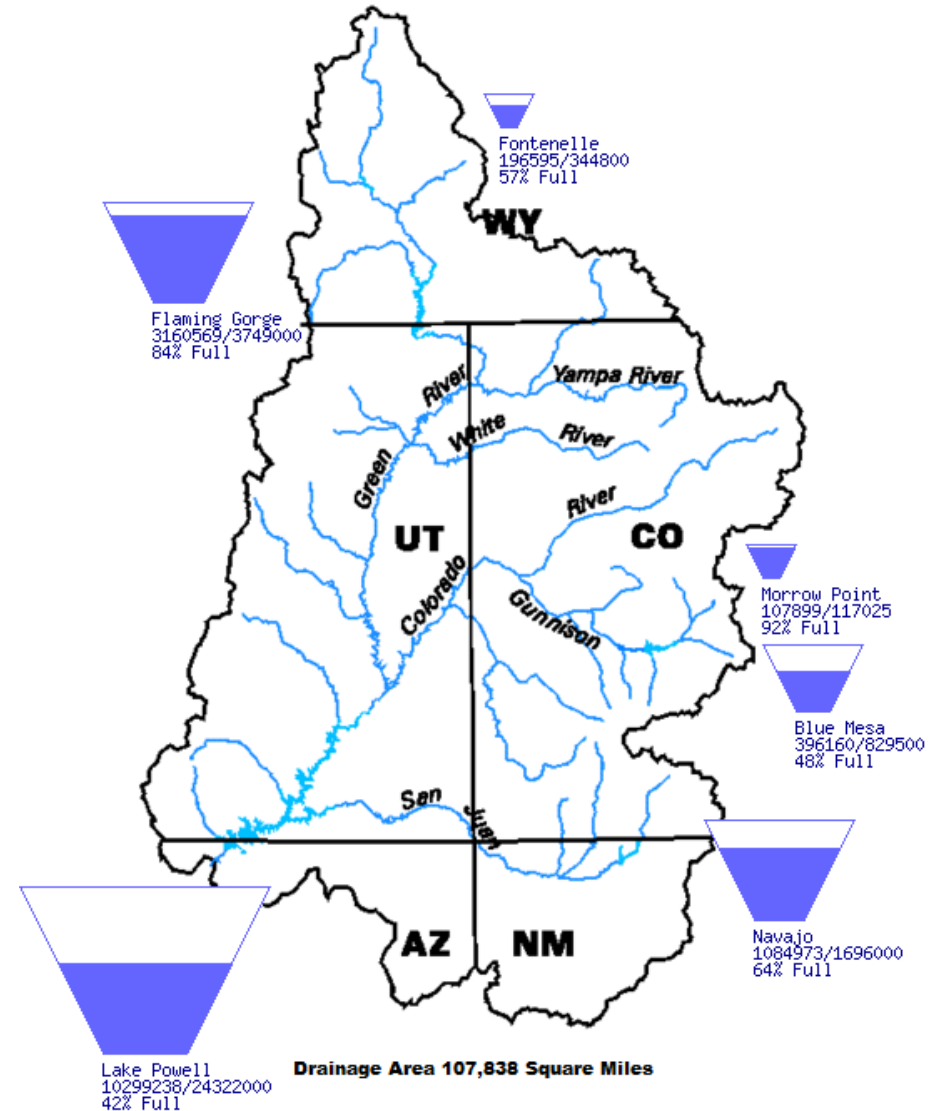
Projected Operations for Water Year 2021 Based on December 2020 Modeling



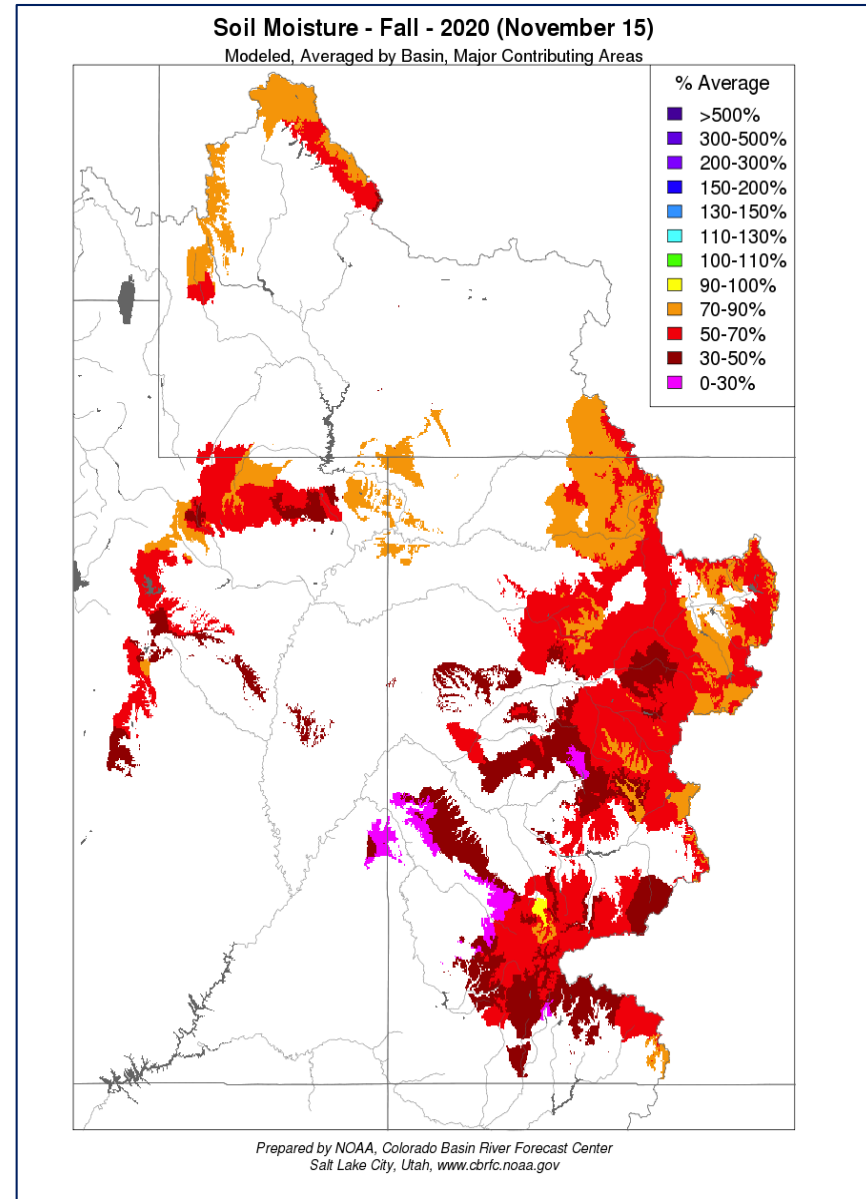
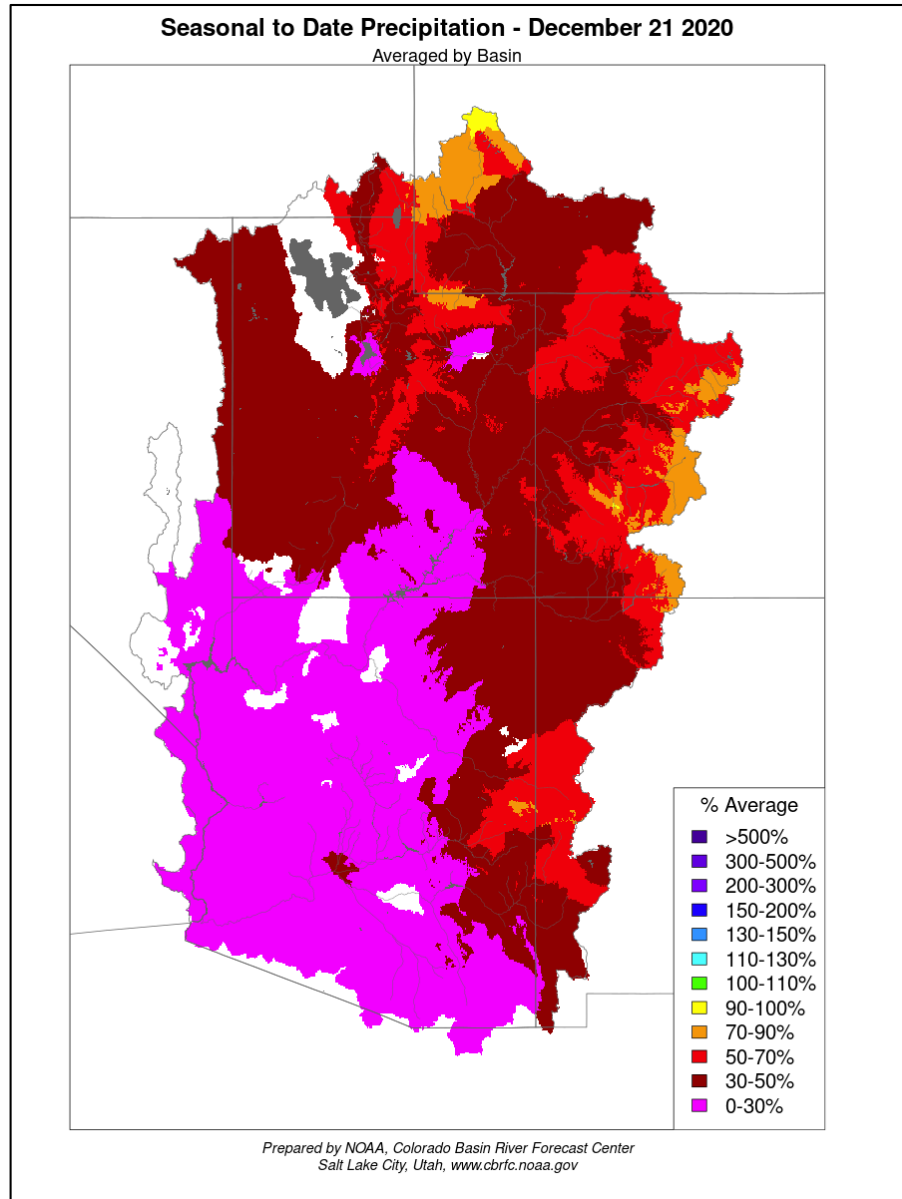
Upper Basin Storage (as of December 21, 2020)

Upper Colorado River Drainage Basin

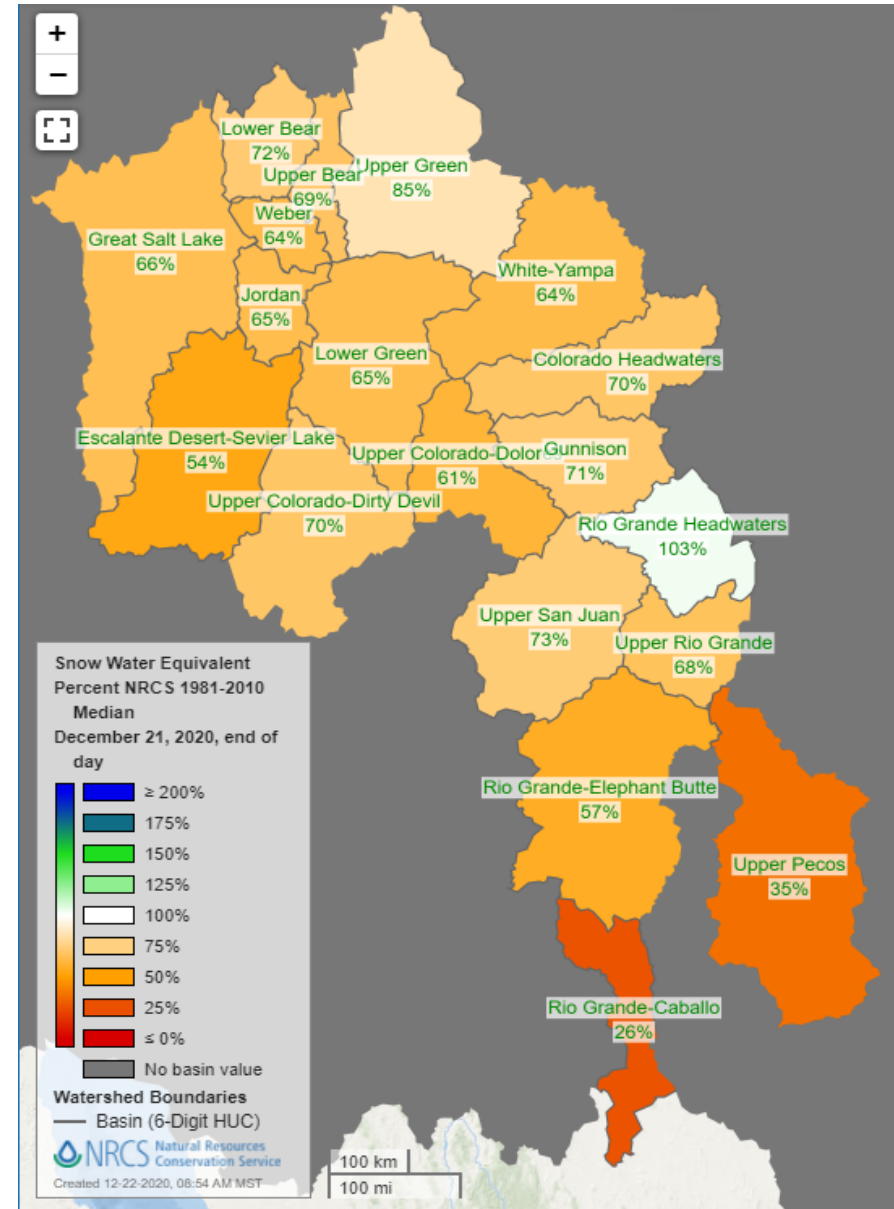
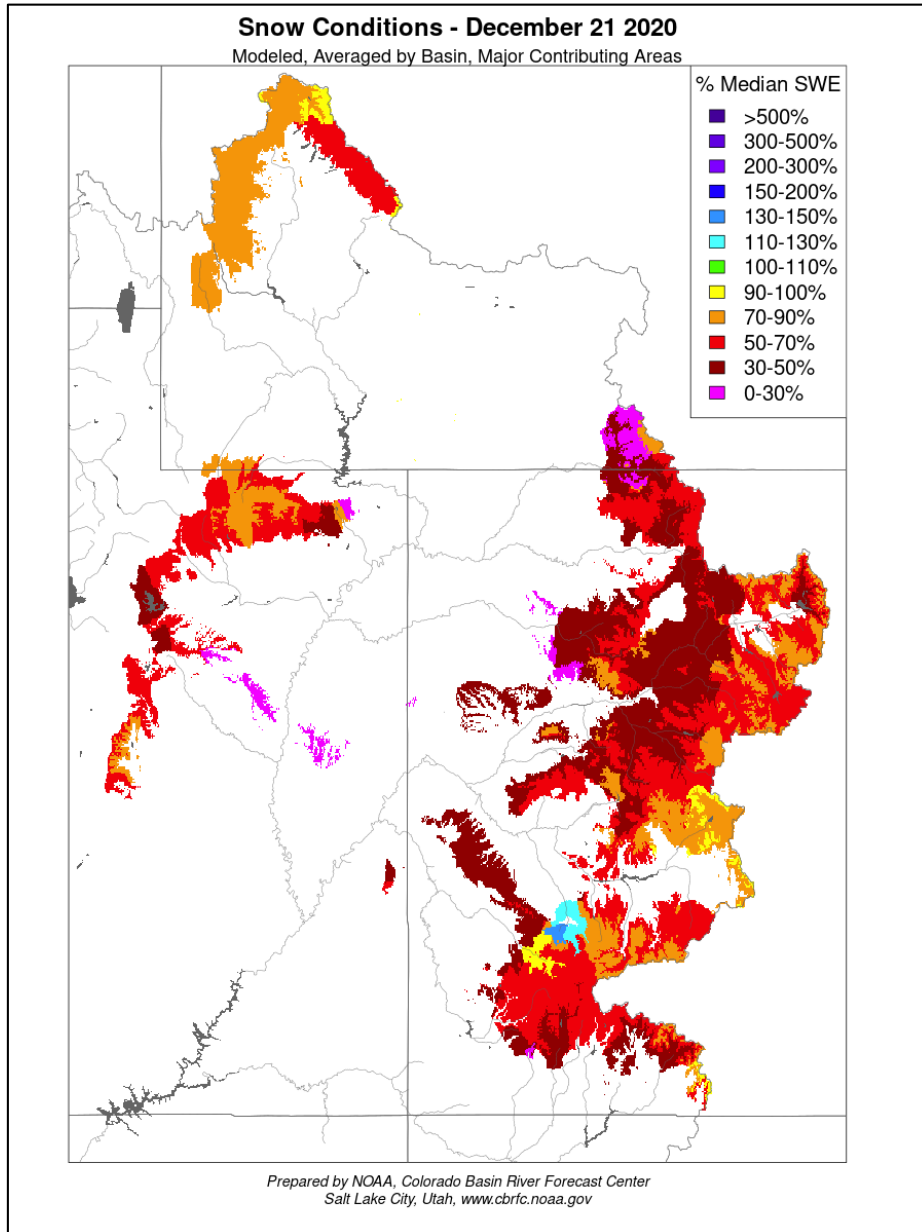
Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Fontenelle	57	0.196	6,485.15
Flaming Gorge	84	3.16	6,024.99
Blue Mesa	48	0.396	7,464.61
Navajo	64	1.08	6,037.35
Lake Powell	42	10.28	3,583.97



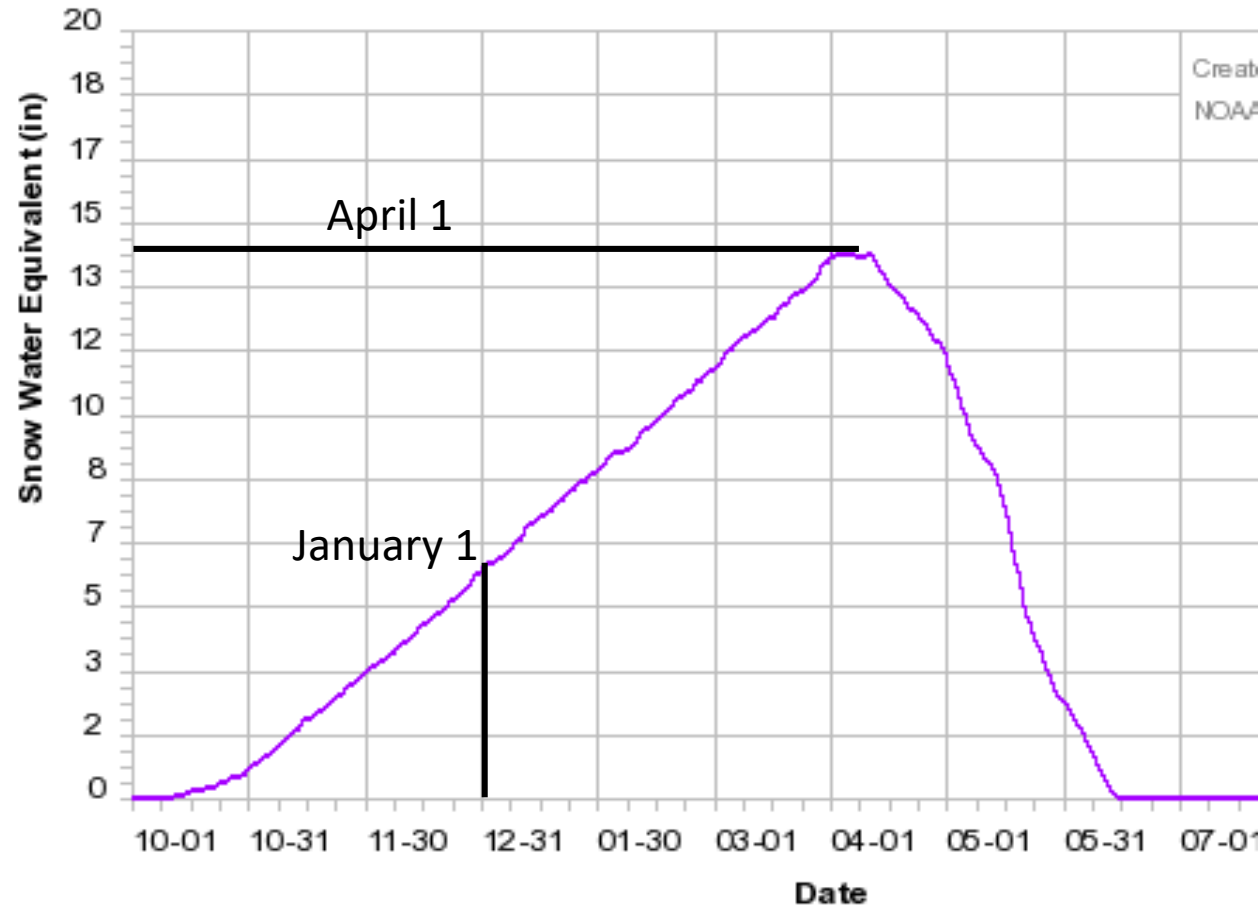
Seasonal Precipitation and Soil Moisture



Seasonal Snow Conditions and Basin SWE



Forecast Development



Median 1981-2010

January 1st Forecast

- **What we know:**
 - About 40% snowpack accumulation
 - Fall Soil Moisture conditions
- **What we don't know:**
 - Jan-May weather
 - About 60% of the snowpack accumulation

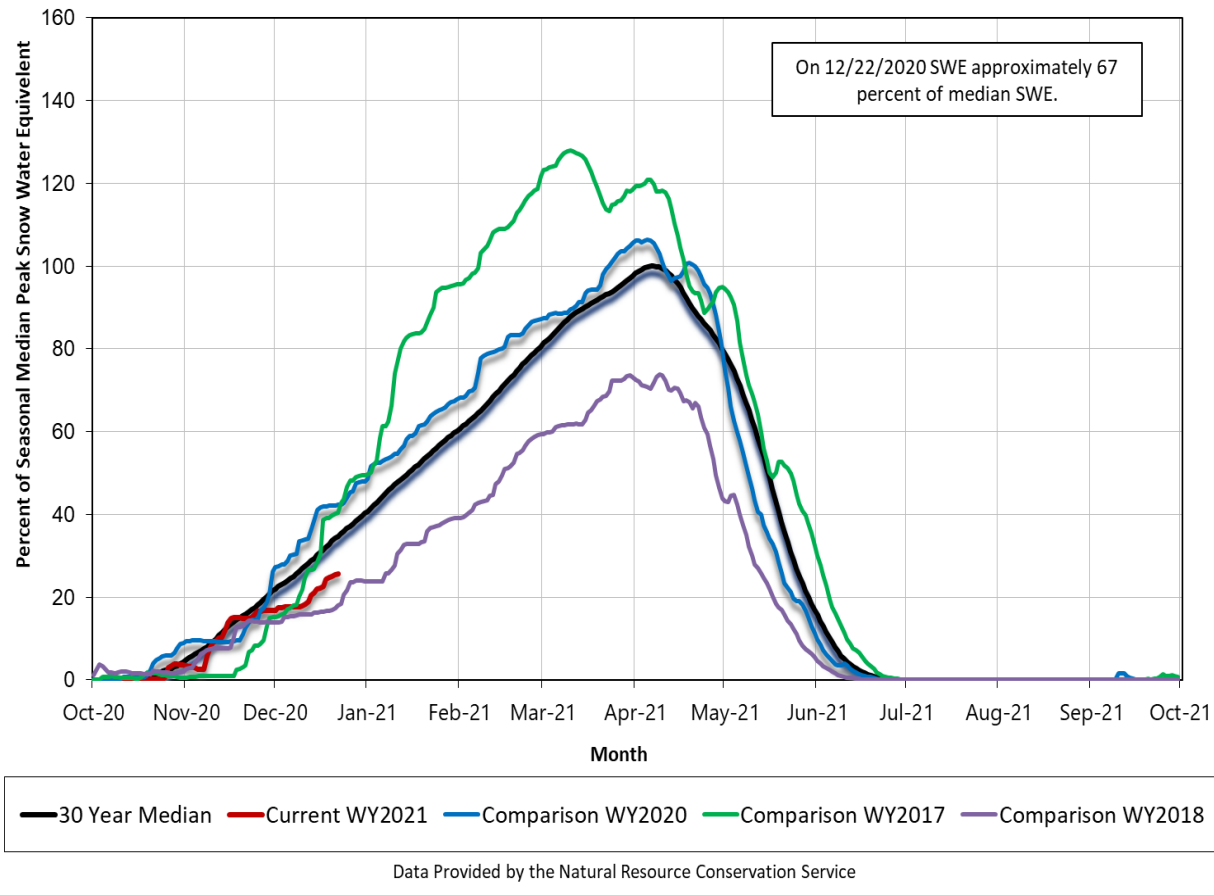
April 1st Forecast

- **What we know:**
 - About 98% of the snowpack accumulation
 - Dec-March weather
- **What we don't know:**
 - April-May weather
 - Snowmelt pattern



Current SWE and WY2021 Forecast

Upper Colorado River above Lake Powell Snotel Tracking



Water Year 2021
Forecasted Unregulated Inflow
as of December 1, 2020

Reservoir	Unregulated Inflow (kaf)	Percent of Average ¹
Fontenelle	799	74
Flaming Gorge	986	68
Blue Mesa	655	68
Navajo	613	57
Powell	6,250	58

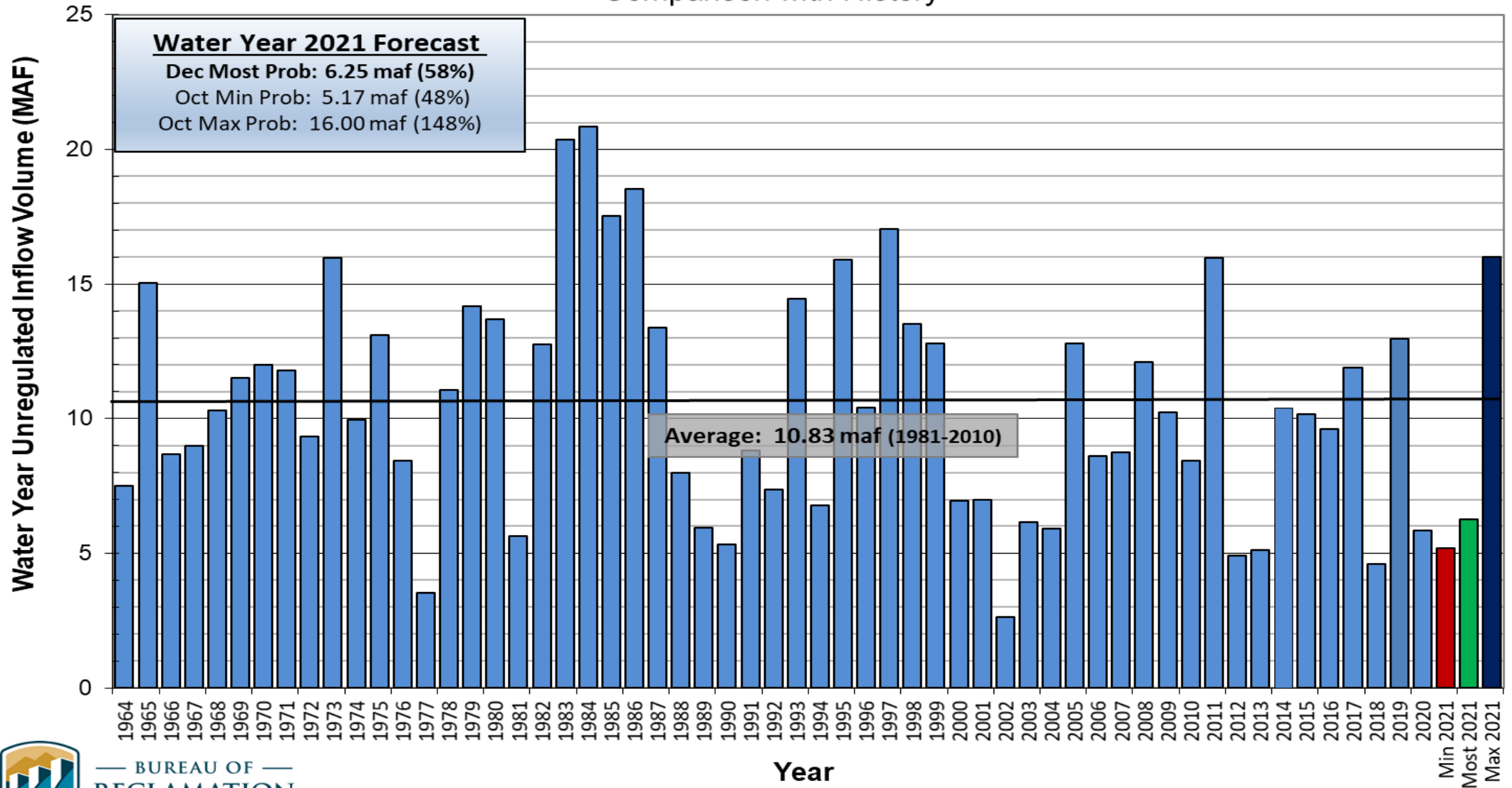
¹ Percent of average based on the period of record from 1981-2010.



Lake Powell Unregulated Inflow

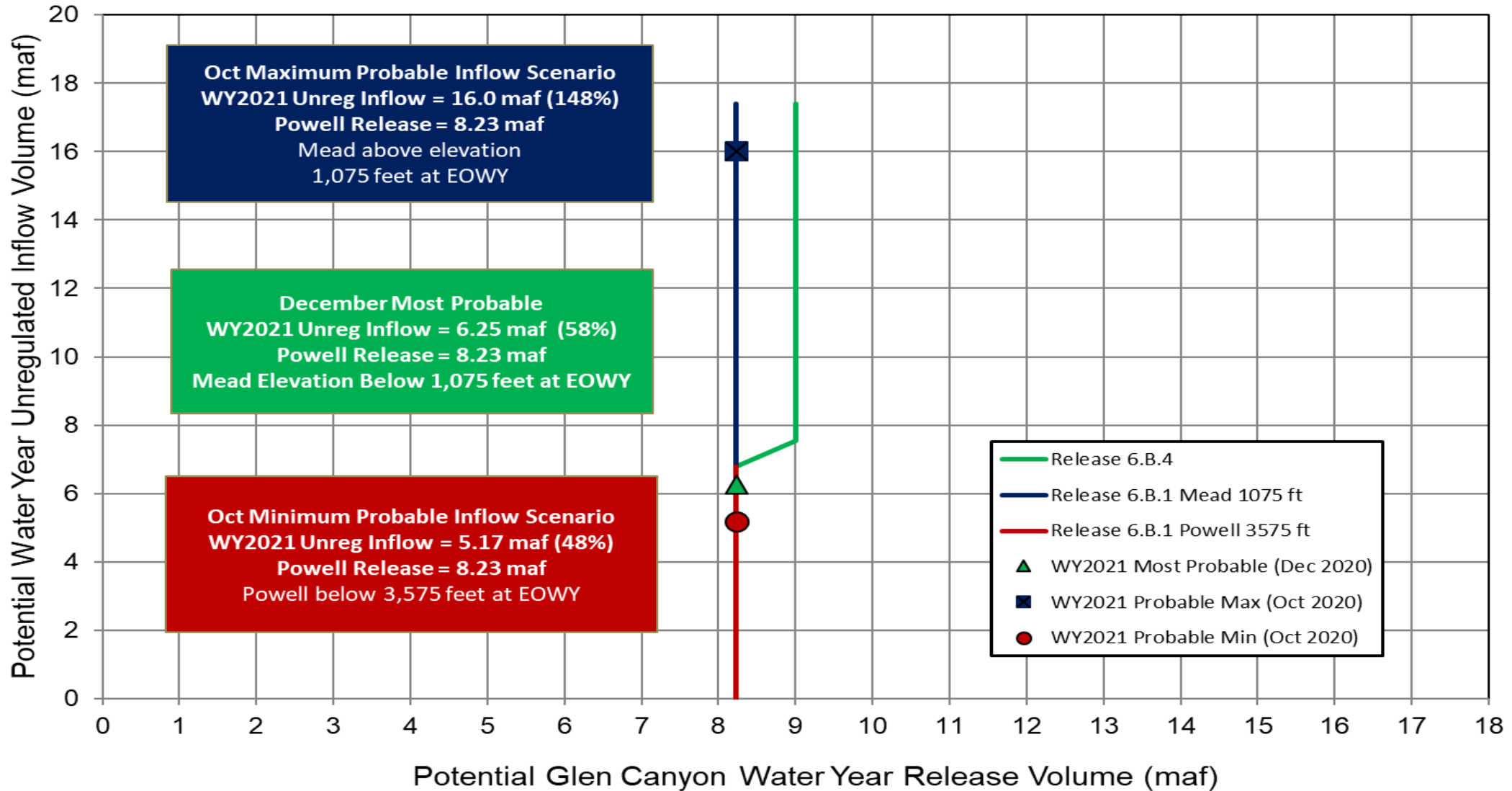
Water Year 2021 Forecast *(issued December 1)*

Comparison with History



Lake Powell Release Scenarios under Section 6.B

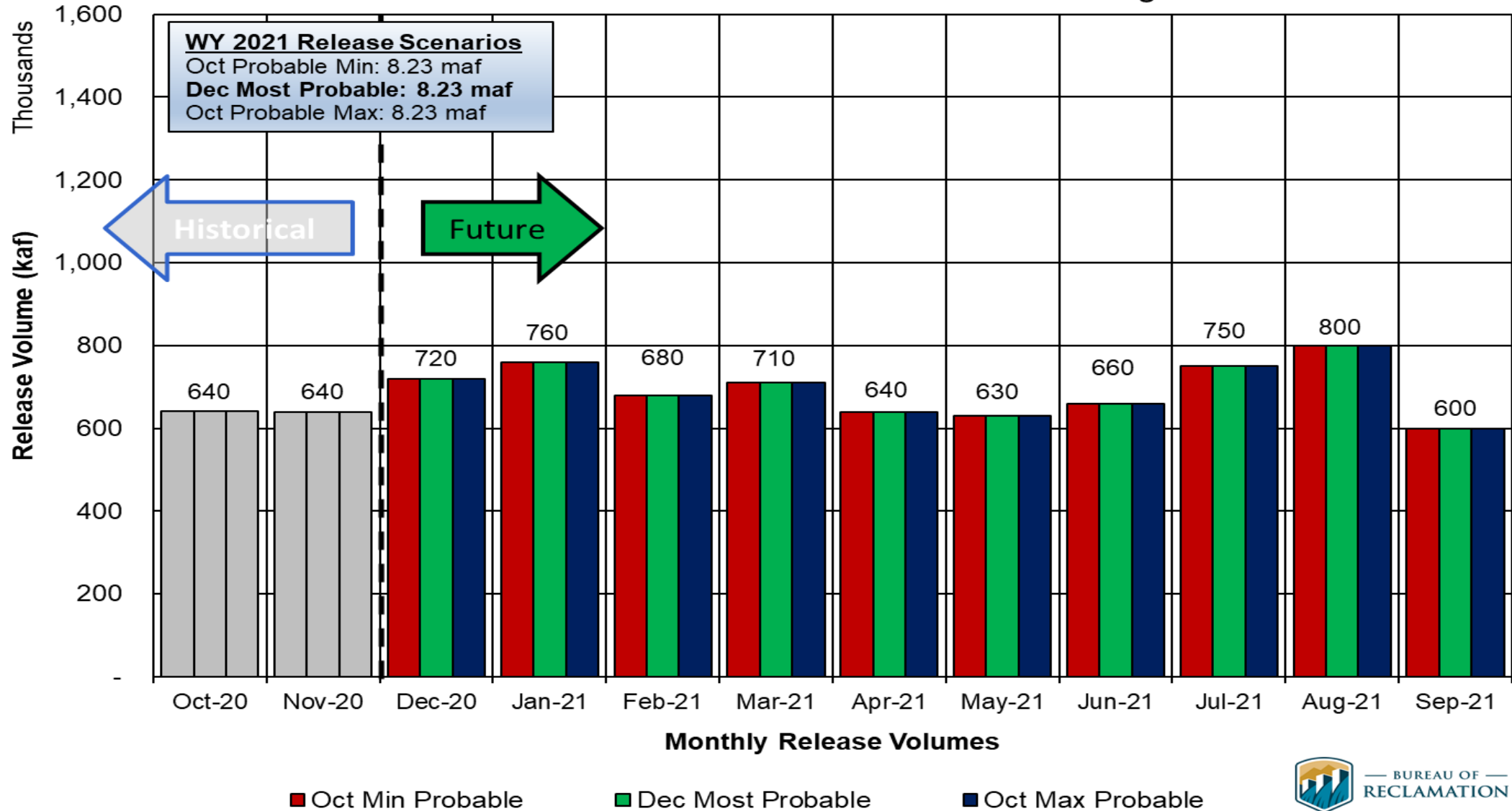
Water Year 2021 Release Volume as a Function of Upper Elevation Balancing Tier based on October and December 2020 24-Month Study Conditions



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2021

Based on October and December 2020 Modeling



LTEMP Operational Flexibility

1.2 OPERATIONAL FLEXIBILITY UNDER ALTERNATIVE D

Reclamation retains the authority to utilize operational flexibility at Glen Canyon Dam because hydrologic conditions of the Colorado River Basin (or the operational conditions of Colorado River reservoirs) cannot be completely known in advance. Consistent with current operations, Reclamation, in consultation with WAPA, will make specific adjustments to daily and monthly release volumes during the water year. Monthly release volumes may be rounded for practical implementation or for maintenance needs. In addition, when releases are actually implemented, minor variations may occur regularly for a number of operational reasons that cannot be projected in advance.

Reclamation also will make specific adjustments to daily and monthly release volumes, in consultation with other entities as appropriate, for a number of reasons, including operational, resource-related, and hydropower-related issues. Examples of these adjustments may include, but are not limited to, the following:

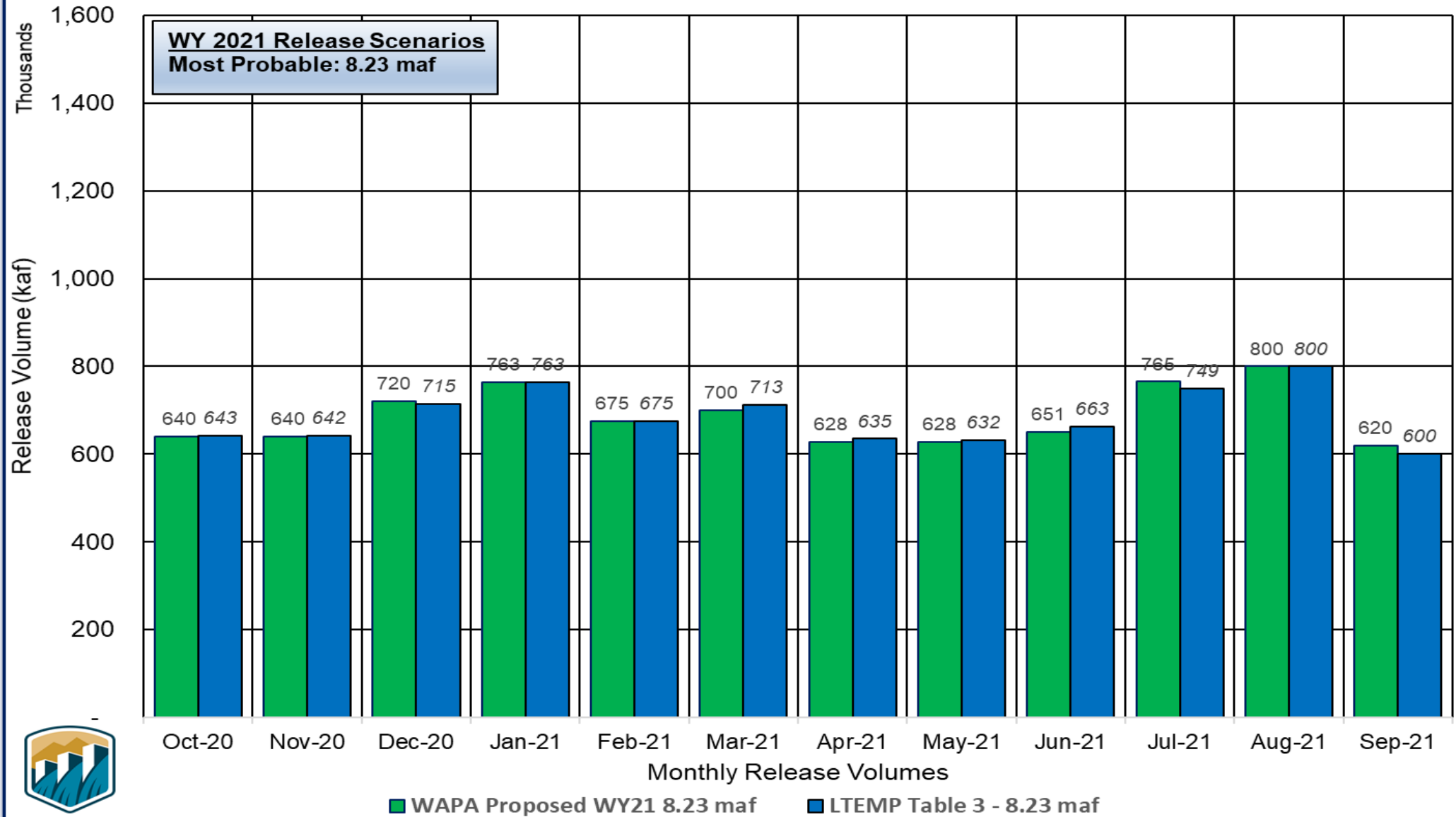
- For water distribution purposes, volumes may be adjusted to allocate water between the Upper and Lower Basins consistent with the Law of the River as a result of changing hydrology;
- For resource-related issues that may occur uniquely in a given year, release adjustments may be made to accommodate nonnative species removal, to assist with aerial photography, or to accommodate other resource considerations separate from experimental treatments under the LTEMP;
- For hydropower-related issues, adjustments may occur to address issues such as electrical grid reliability, actual or forecasted prices for purchased power, transmission outages, and experimental releases from other Colorado River Storage Project dams.

In addition, Reclamation may make modifications under circumstances that may include operations that are prudent or necessary for the safety of dams, public health and safety, other emergency situations, or other unanticipated or unforeseen activities arising from actual operating experience (including, in coordination with the Basin States, actions to respond to low reservoir conditions as a result of drought in the Colorado River Basin). In addition, the Emergency Exception Criteria established for Glen Canyon Dam will continue under this alternative. (See, e.g., Section 3 of the Glen Canyon Operating Criteria at 62 FR 9448, March 3, 1997.)



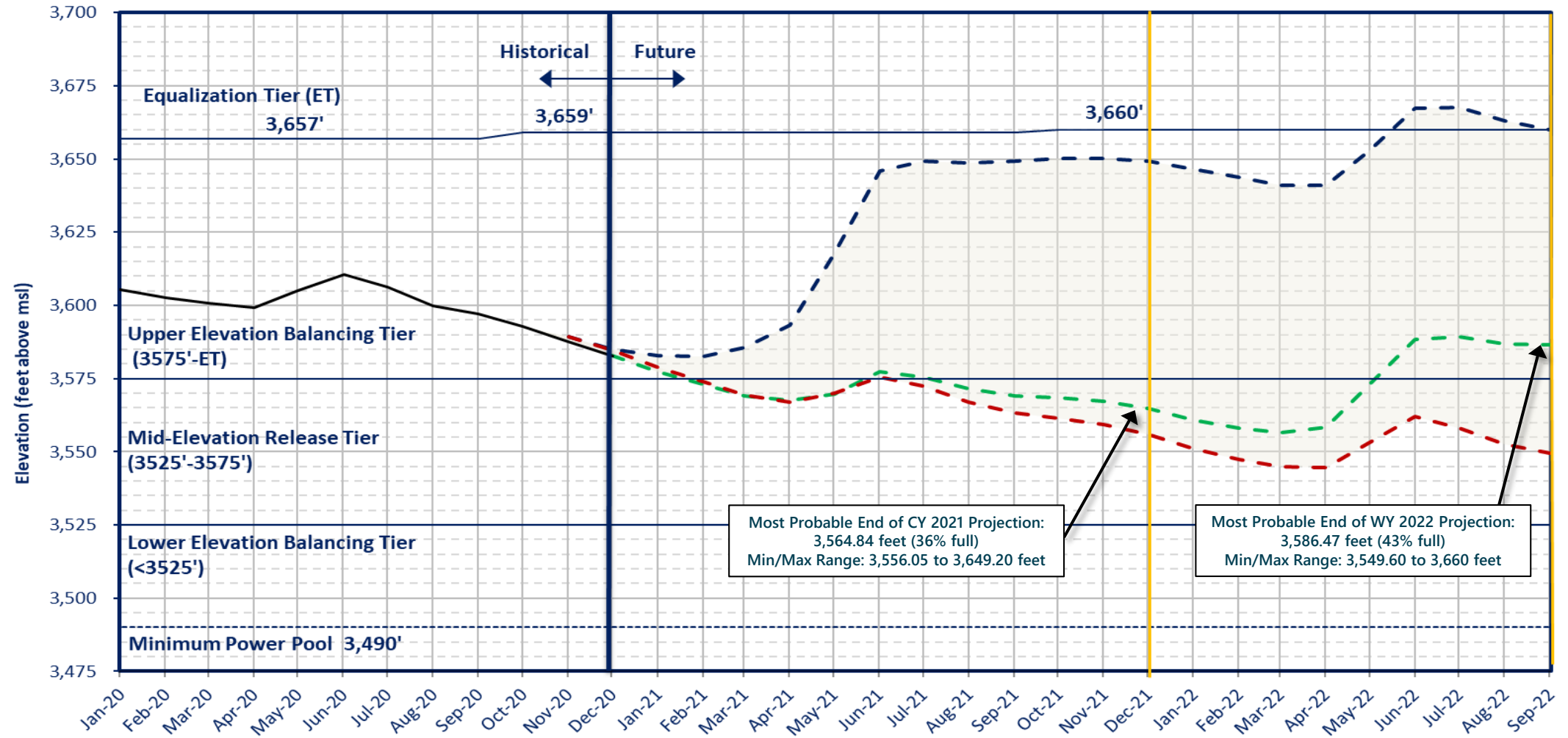
Lake Powell Monthly Release Volume Distribution

WAPA Proposed 8.23 maf Pattern for Water Year 2021



Lake Powell End of Month Elevations

Historical and Projected based on October and December 2020 24-Month Study Inflow Scenarios



- Dec 2020 Most Probable - Lake Powell release of 8.23 maf in WY2021 and 7.48 maf in WY2022
- Oct 2020 Max Probable - Lake Powell release of 8.23 maf in WY2021 and 11.67 maf in WY2022
- Oct 2020 Min Probable - Lake Powell release of 8.23 maf in WY2021 and 7.48 maf in WY2022
- Historical Elevations

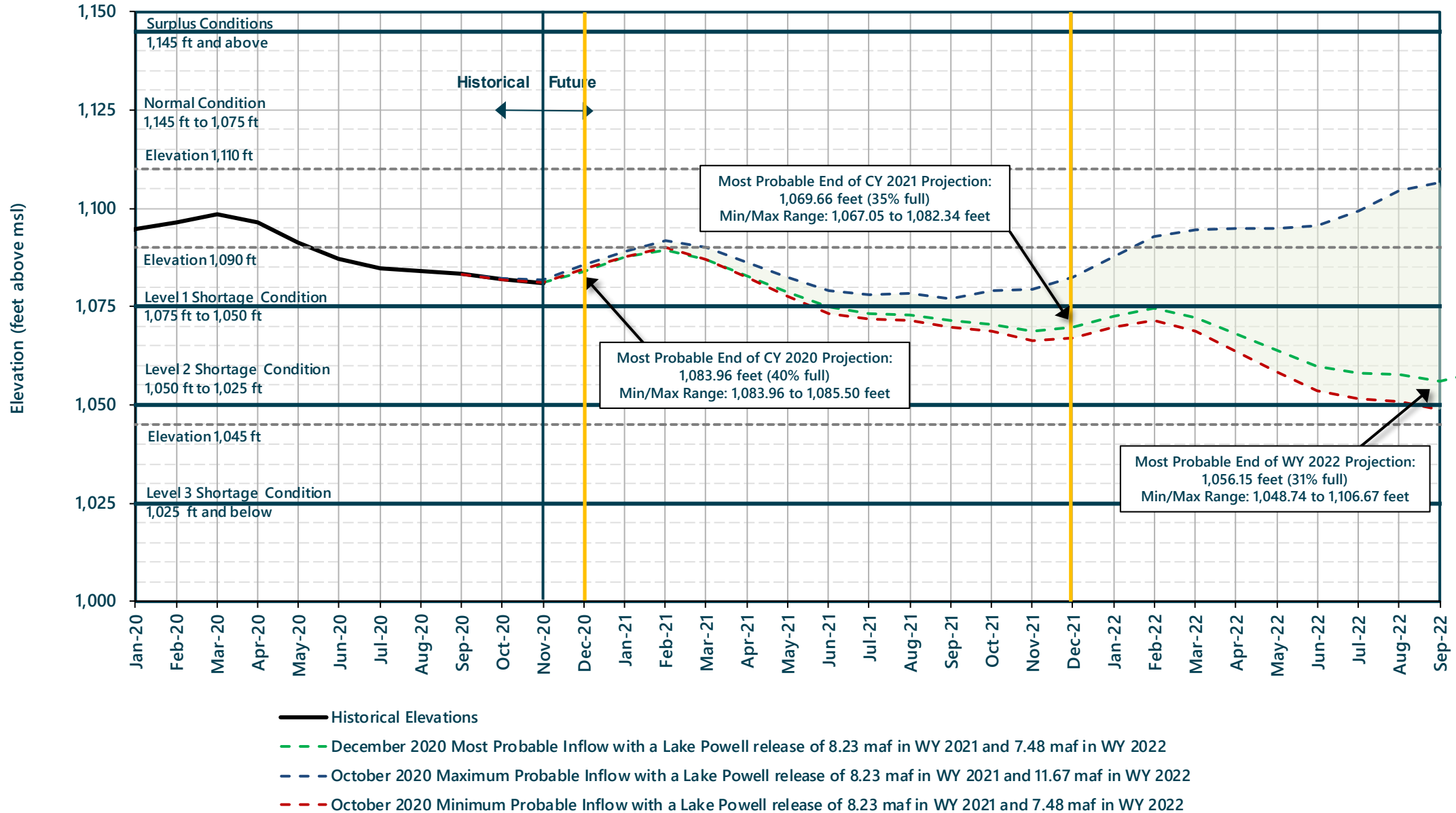


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Lake Mead End of Month Elevations

Projections from the October and December 2020 24-Month Study Inflow Scenarios



Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2021

Unit Number	Oct 2020	Nov 2020	Dec 2020	Jan 2021	Feb 2021	Mar 2021	Apr 2021	May 2021	Jun 2021	Jul 2021	Aug 2021	Sep 2021	
1	[Outage]				[Outage]							[Outage]	
2	[Outage]				[Outage]							[Outage]	
3	[Outage]									[Outage]			
4		[Outage]								[Outage]			
5			[Outage]										
6	[Outage]		[Outage]										
7					[Outage]								
8					[Outage]								
Units Available	5	5/4	6	6	6	6	6	6	6	6	6	6/4	
Capacity (cfs)	16,400	16,400 / 12,200	19,800	19,600	19,500	19,400	19,400	19,400	19,600	19,600	19,500	19,400 / 12,300	DEC MOST ³
Capacity (kaf/month)	1,040	1,140	1,250	1,220	1,100	1,220	1,220	1,270	1,260	1,310	1,340	1,100	OCT MAX
Max (kaf) ²	640	640	720	760	680	710	640	630	660	750	800	600	8.23
Most (kaf) ¹	640	640	720	760	680	710	640	630	660	750	800	600	8.23
Min (kaf) ²	640	640	720	760	680	710	640	630	660	750	800	600	8.23
										(updated 12-11-2020)			

- 1 Projected release, based on December 2020 Most Probable Inflow Projections and 24-Month Study model runs.
- 2 Projected release, based on October 2020 Min and Max Probable Inflow Projections and 24-Month Study model runs.
- 3 Dependent upon availability to shift contingency reserves, which will increase capacity by 30-40MW (3%) at current efficiency.



Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2022

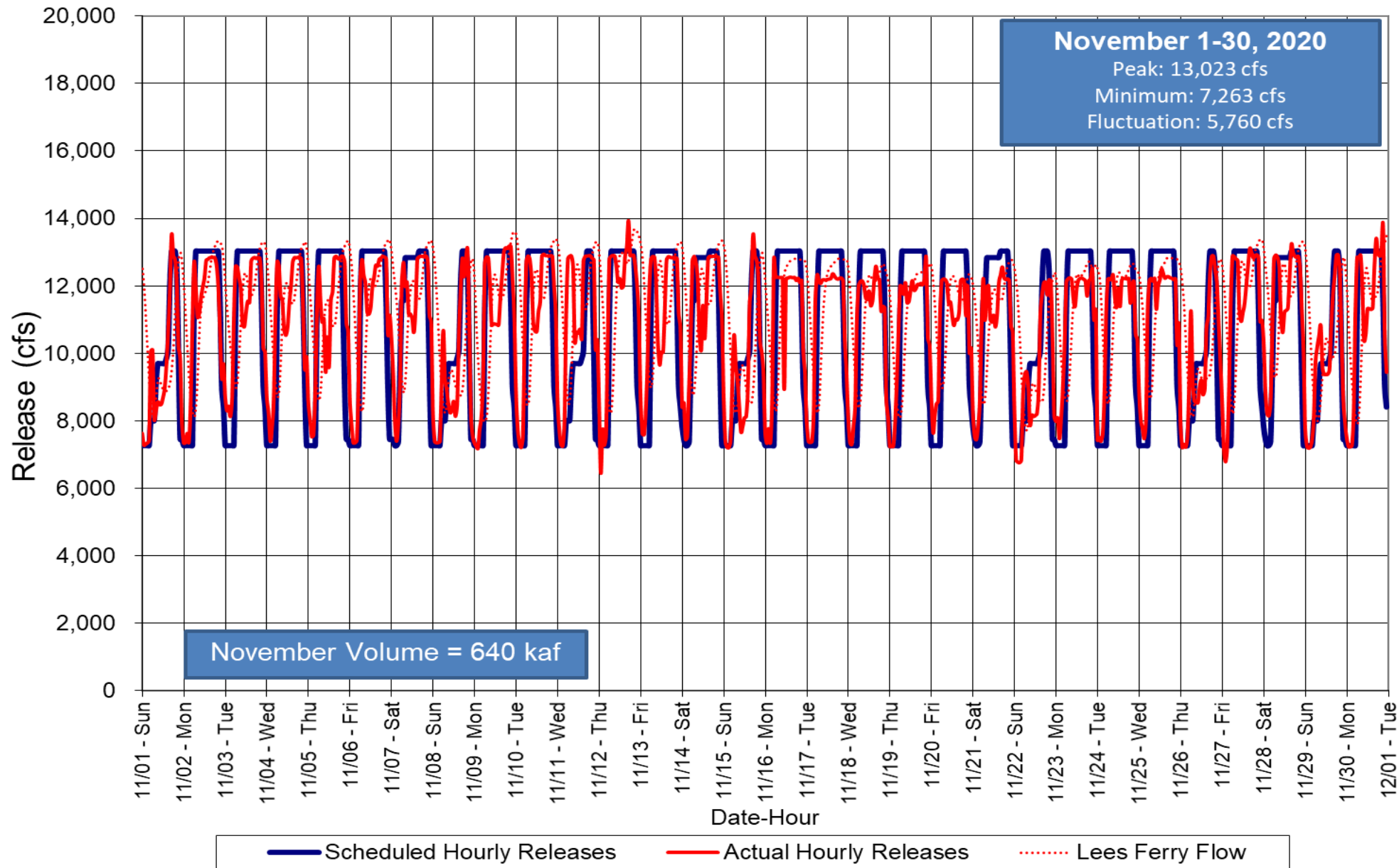
Unit Number	Oct 2021	Nov 2021	Dec 2021	Jan 2022	Feb 2022	Mar 2022	Apr 2022	May 2022	Jun 2022	Jul 2022	Aug 2022	Sep 2022
1												
2												
3												
4												
5												
6												
7												
8												
Units Available	4	4/5	6	6	4	6	8	7	8	8	8	8/6
Capacity (cfs)	12,400	12,400 / 15,800	15,900	19,400 / 12,300	12,200	19,300	26,400	23,300	27,400	27,400	27,300	20,100
Capacity (kaf/month)	870	970	1,350	1,770	1,210	1,390	1,720	1,600	1,760	1,820	1,810	1,340
Max (kaf) ²	640	640	720	950	950	1,100	1,050	1,050	1,075	1,250	1,280	968
Most (kaf) ¹	480	500	600	720	640	675	600	600	630	710	760	565
Min (kaf) ²	480	500	600	720	640	675	600	600	630	710	760	565
										(updated 12-11-2020)		

DEC MOST³
 OCT MAX
 11.67
 7.48
 7.48

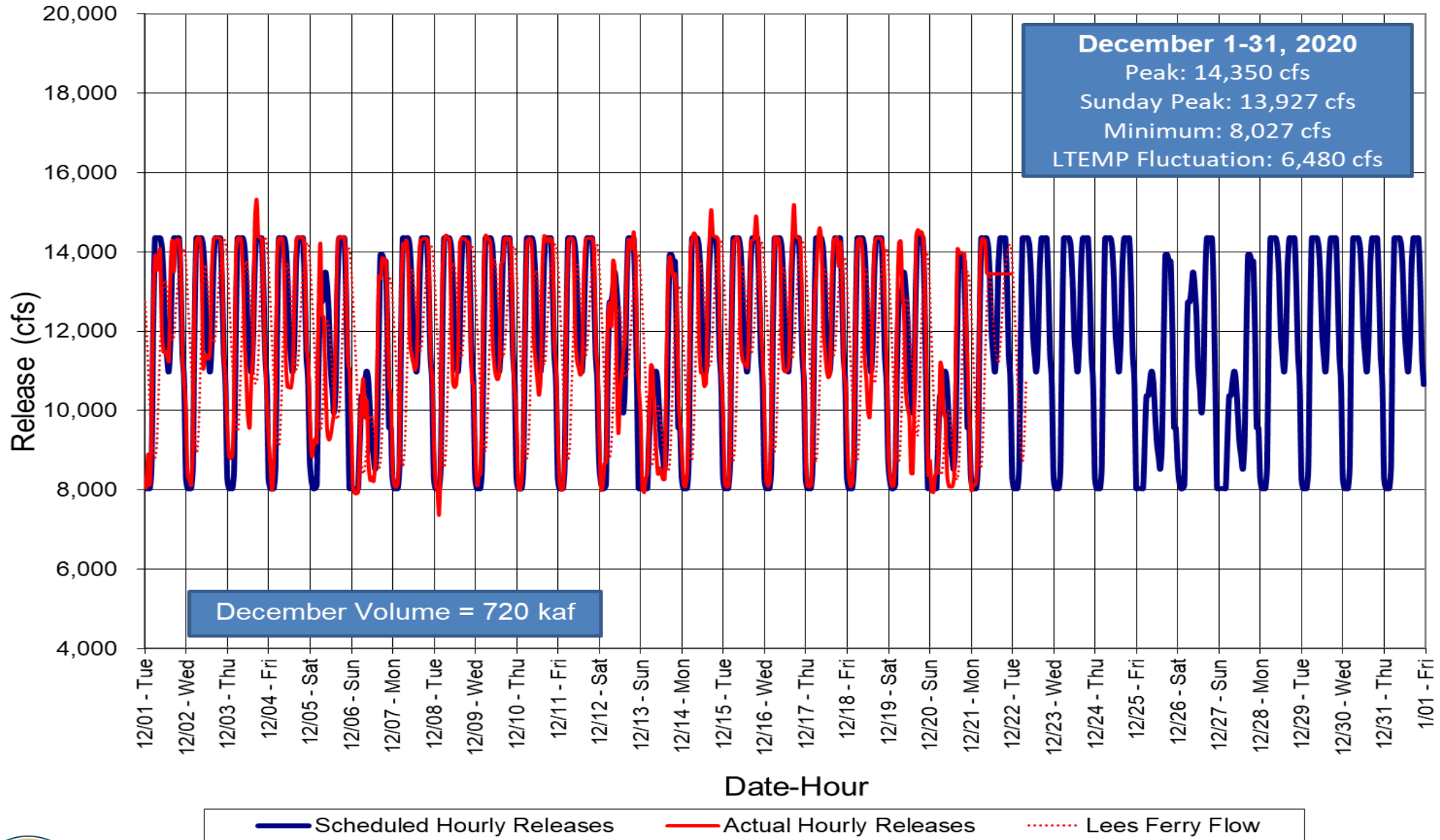
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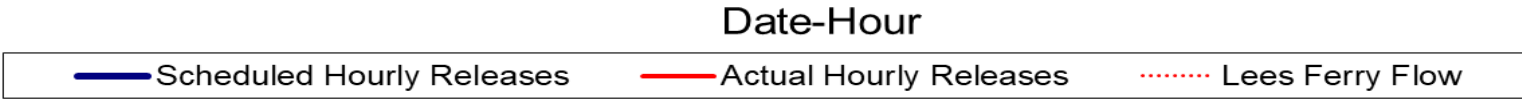
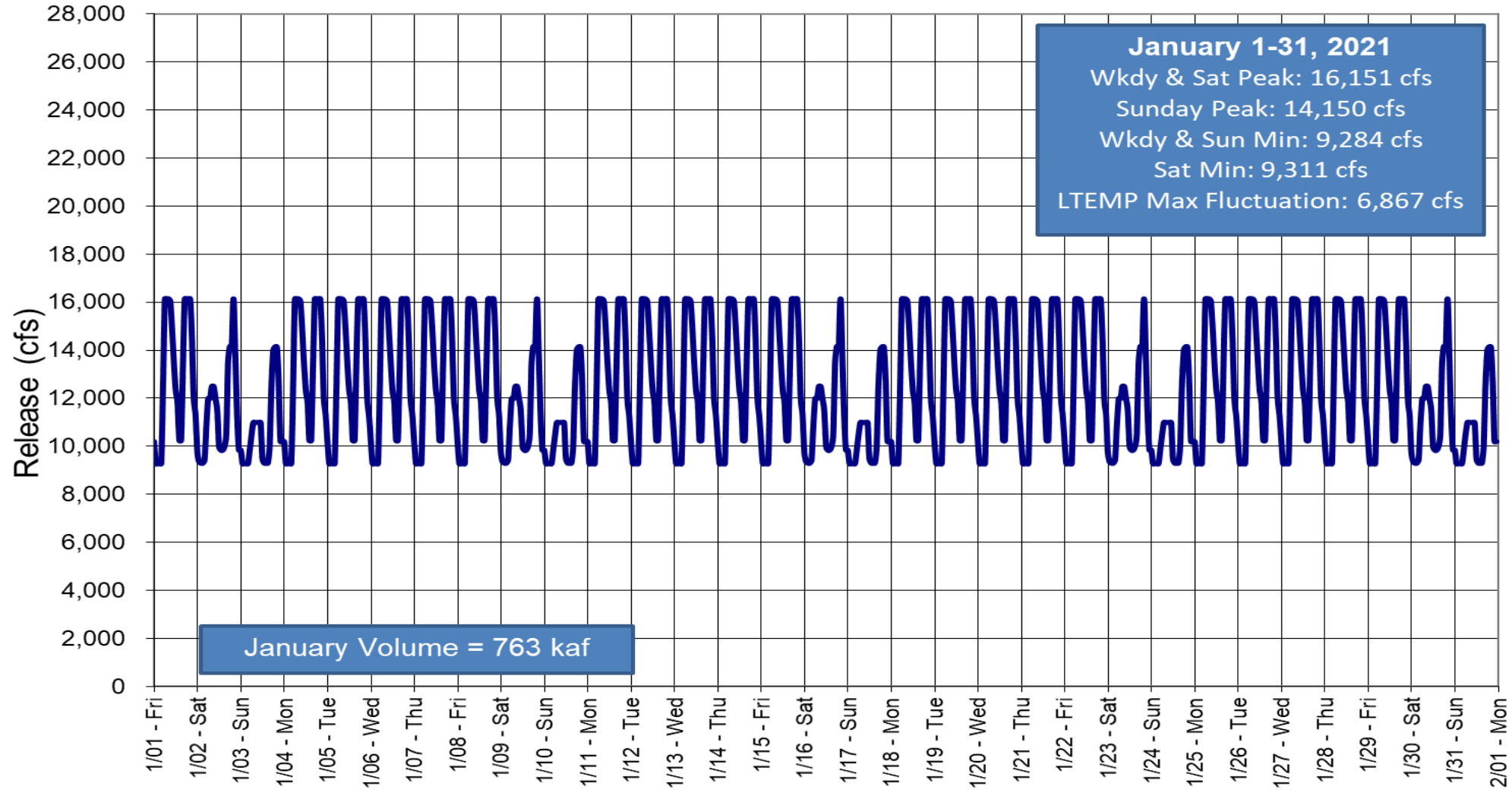
Glen Canyon Dam Hourly Release Pattern November 2020



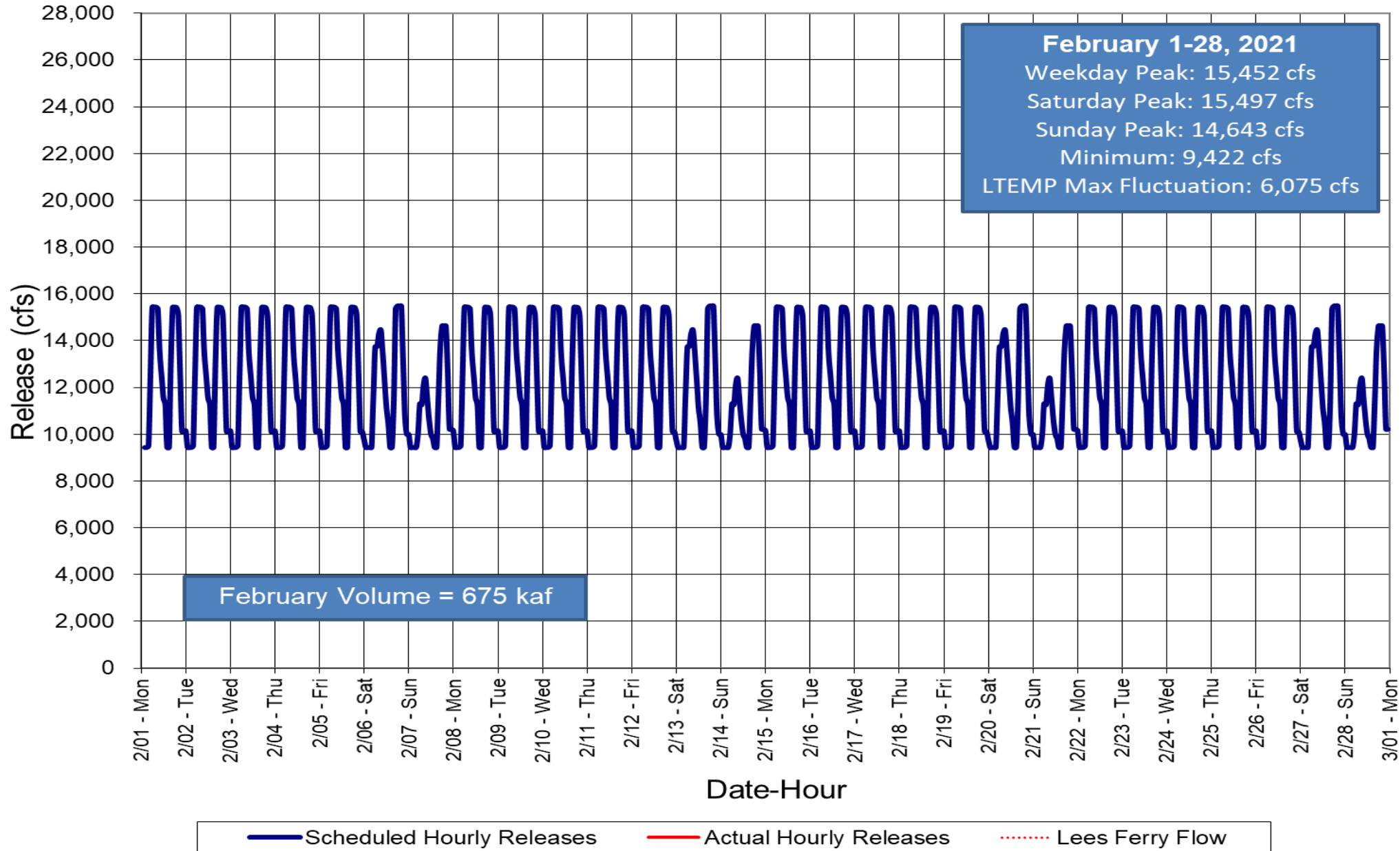
Glen Canyon Dam Hourly Release Pattern December 2020



Glen Canyon Dam Hourly Release Pattern January 2021



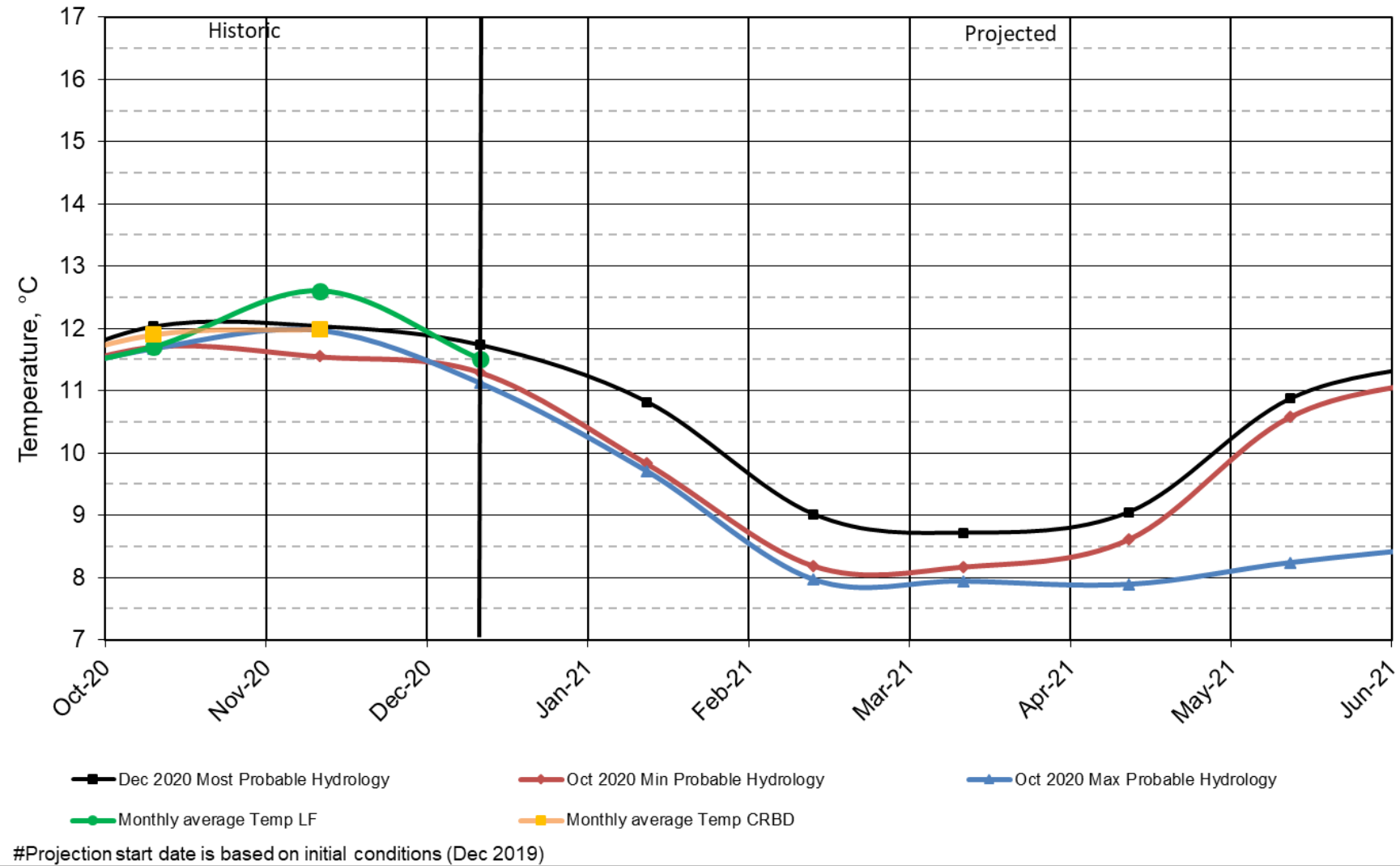
Glen Canyon Dam Hourly Release Pattern February 2021



Water Quality

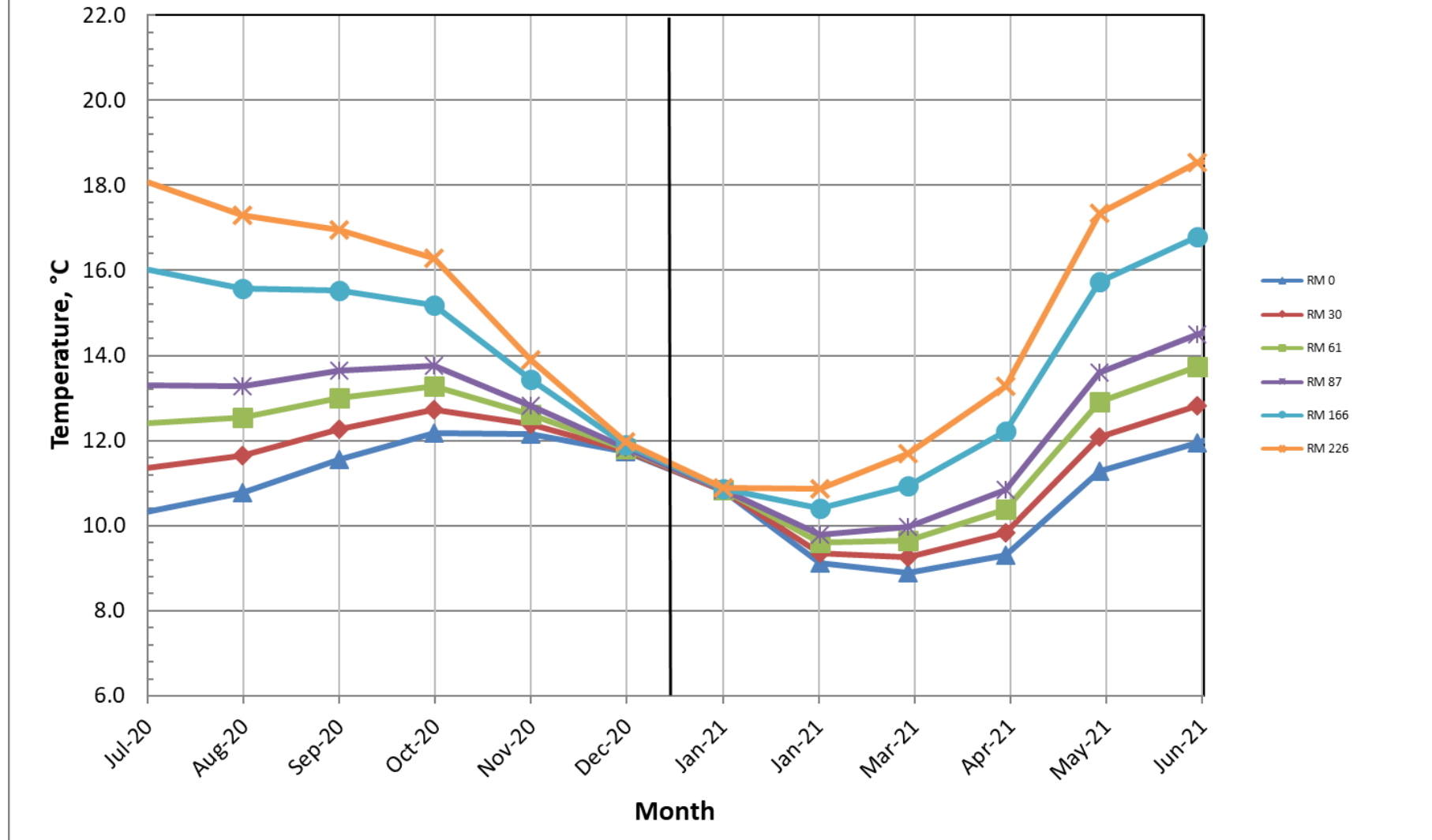


Lake Powell Release Temperature Projected Temperature based on December 2020 Forecast

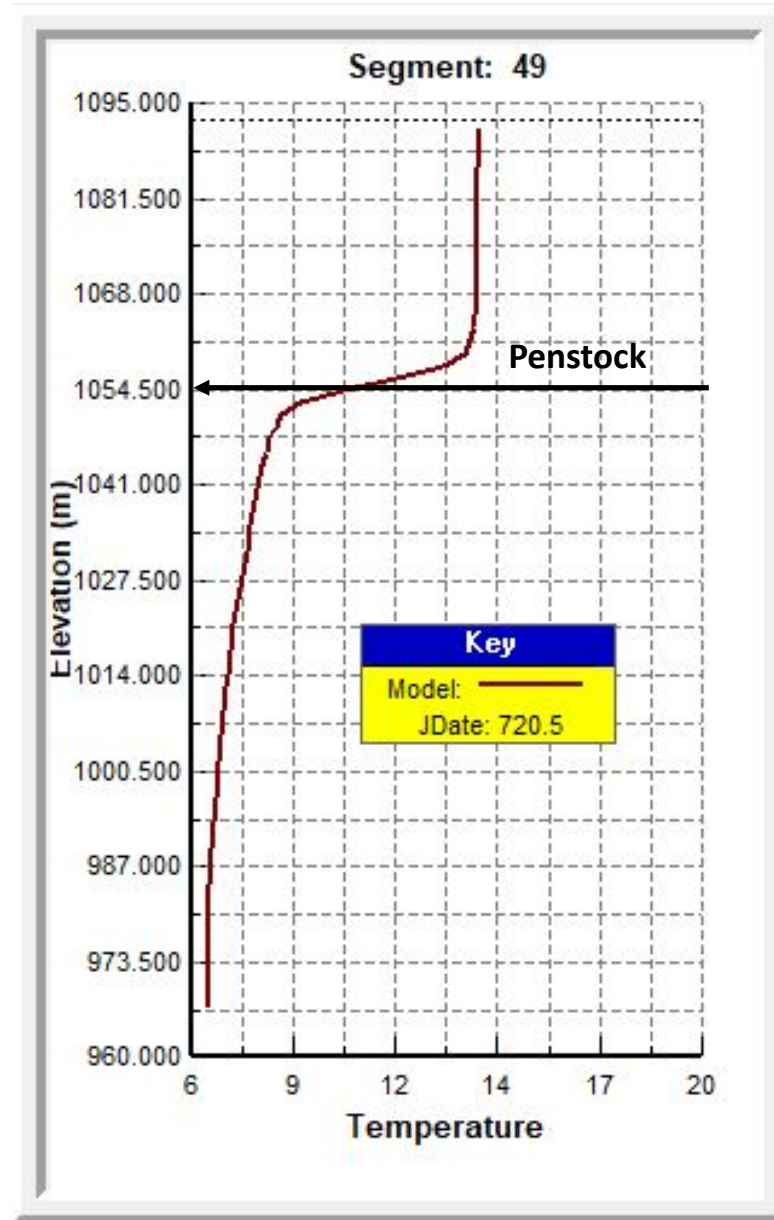


Colorado River, Grand Canyon Water Temperatures

Projections based on Dec. 2020, Most Probable Hydrology

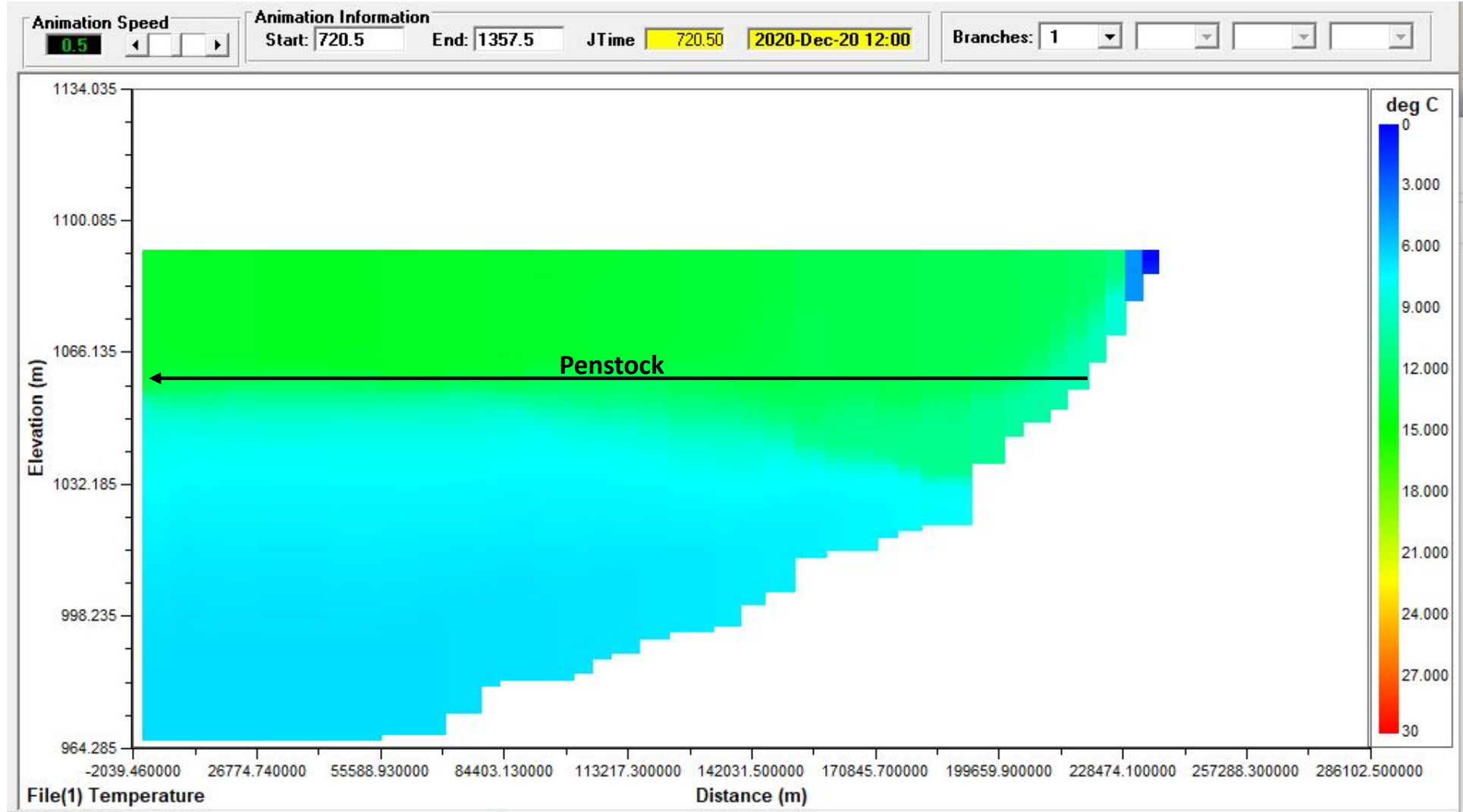


Temperature Profile of Lake Powell near Glen Canyon Dam 12/20/2020

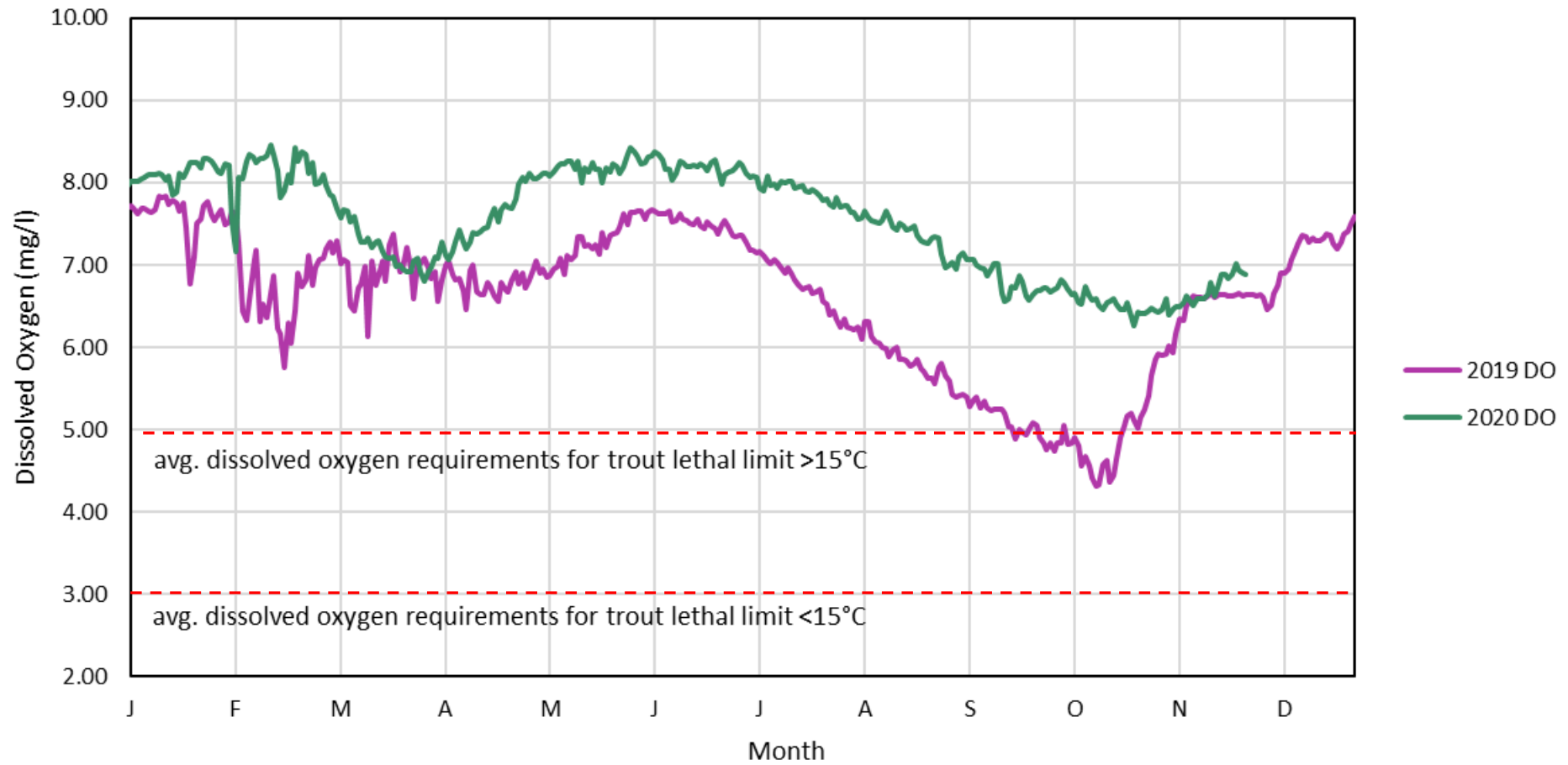


Cross Sectional Temperature Profile of Lake Powell

12/20/2020



DO Concentration at Glen Canyon Dam years 2019 and 2020



Questions/Discussion



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