



— BUREAU OF —
RECLAMATION

Glen Canyon Monthly Operations Call

Basin Hydrology and Operations

June 22, 2023

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.”

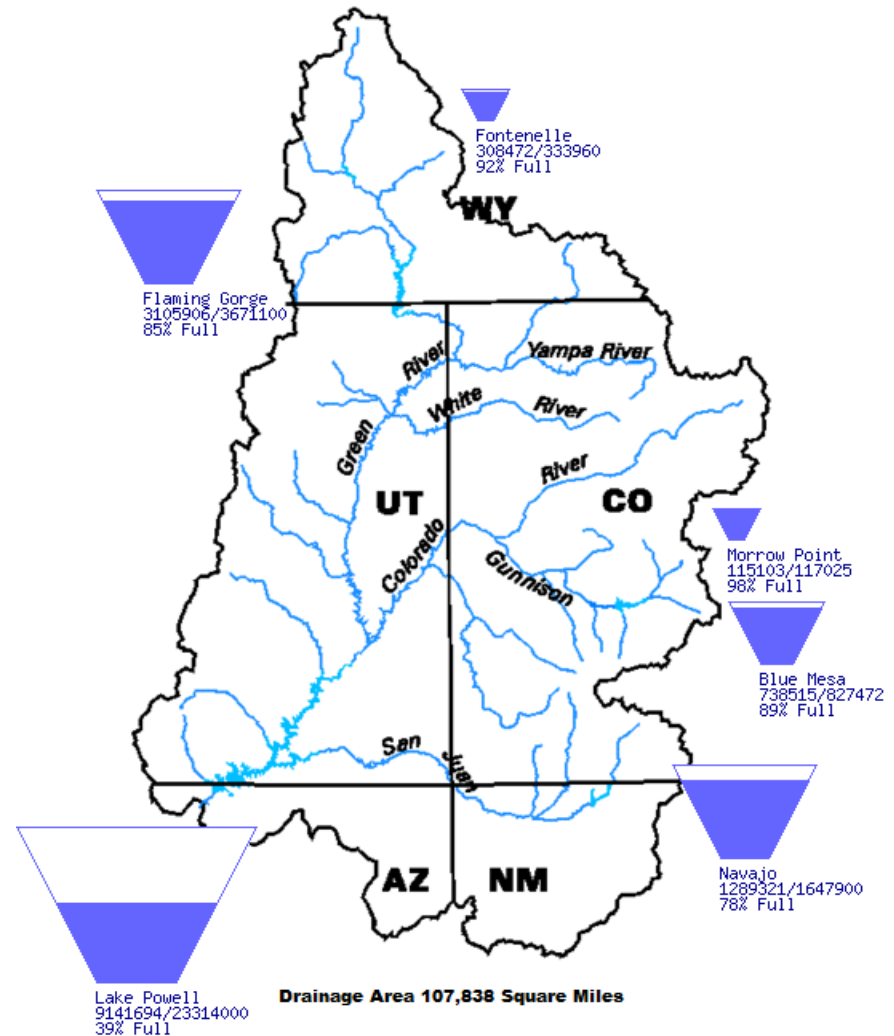


Upper Basin Storage (as of June 19, 2023)

Data Current as of:
06/19/2023

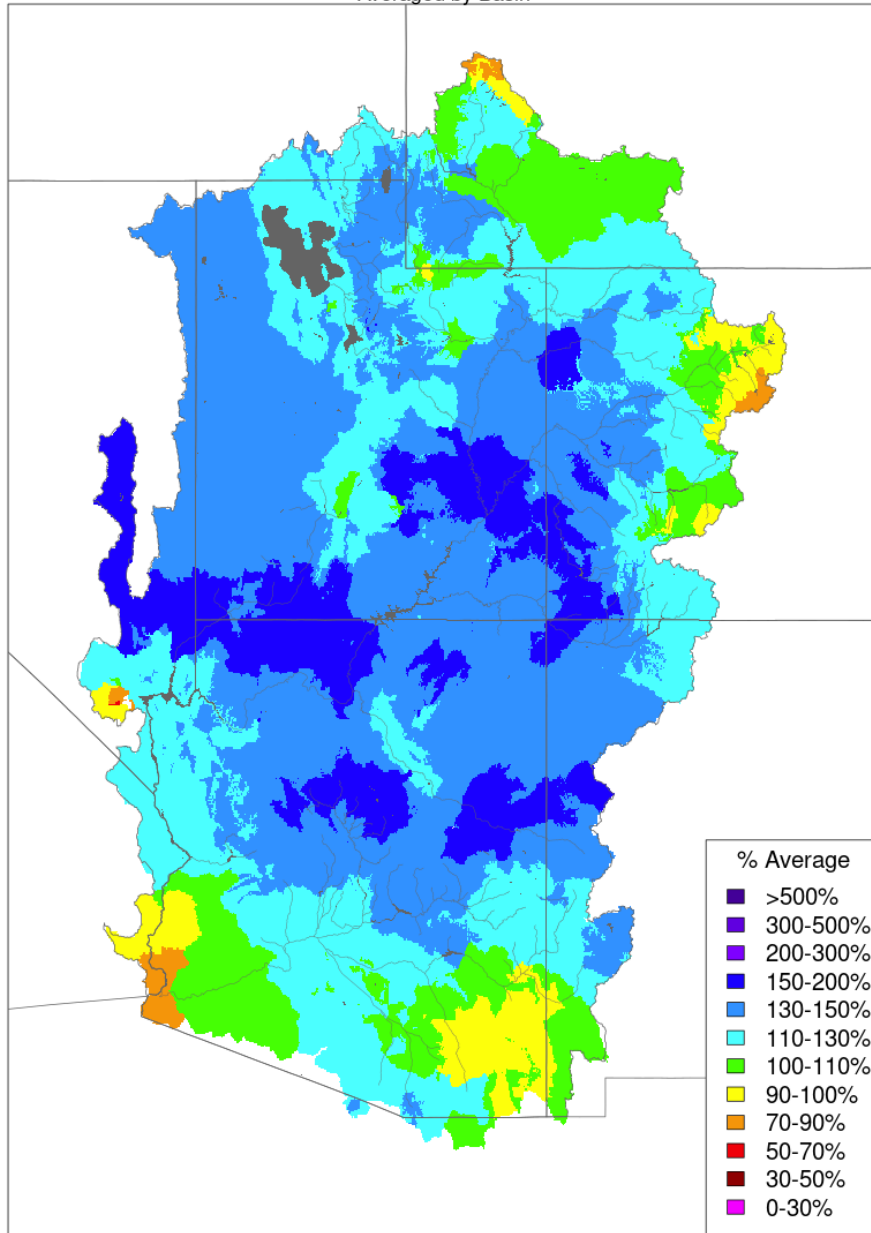
Upper Colorado River Drainage Basin

Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	92	0.31	0.33	6,502.70
Flaming Gorge	85	3.11	3.67	6,025.65
Blue Mesa	90	0.74	0.83	7,509.44
Navajo	78	1.65	1.65	6,059.75
Lake Powell	39	9.14	23.31	3,578.08
UC System Storage	49	14.72	29.93	



Water Year Precipitation, October 2022 - May 2023

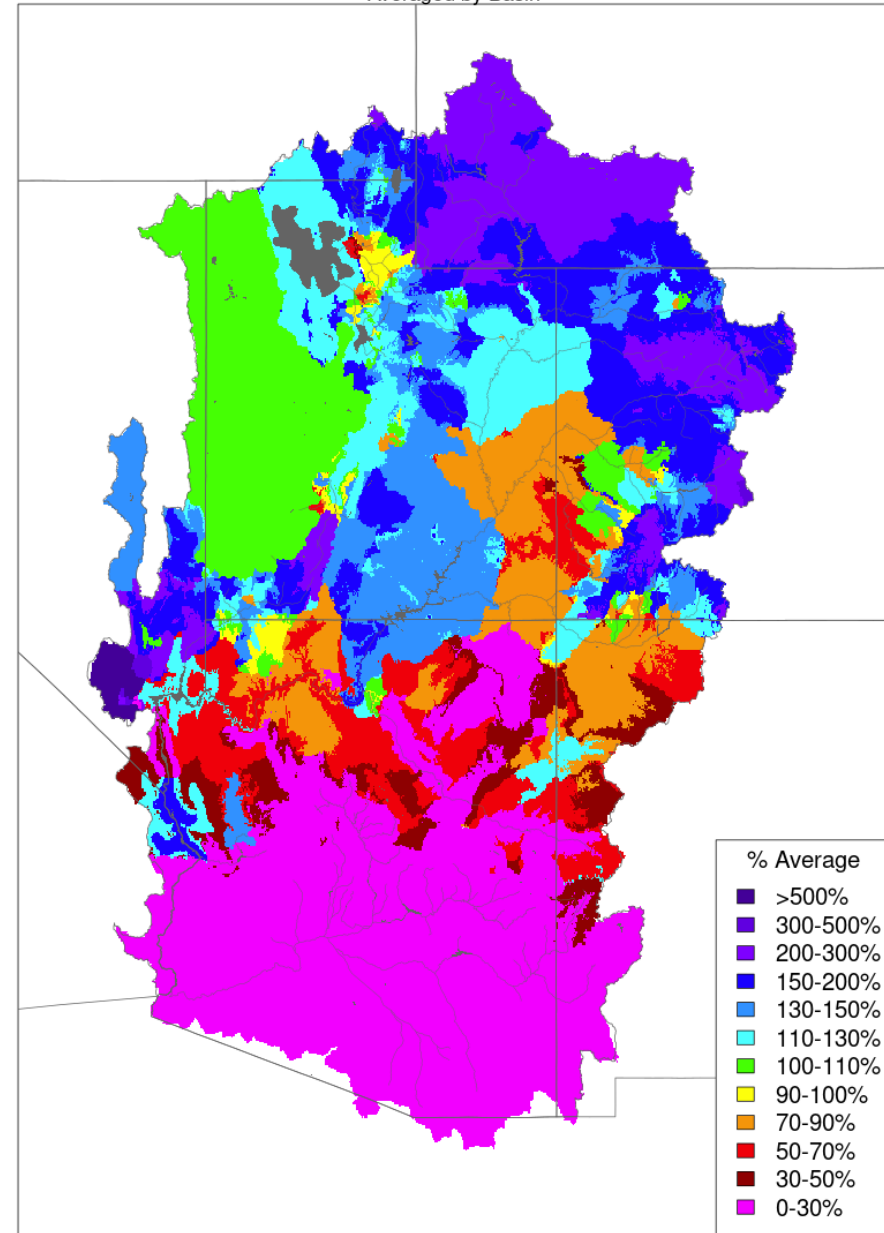
Averaged by Basin



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

Month to Date Precipitation - June 21 2023

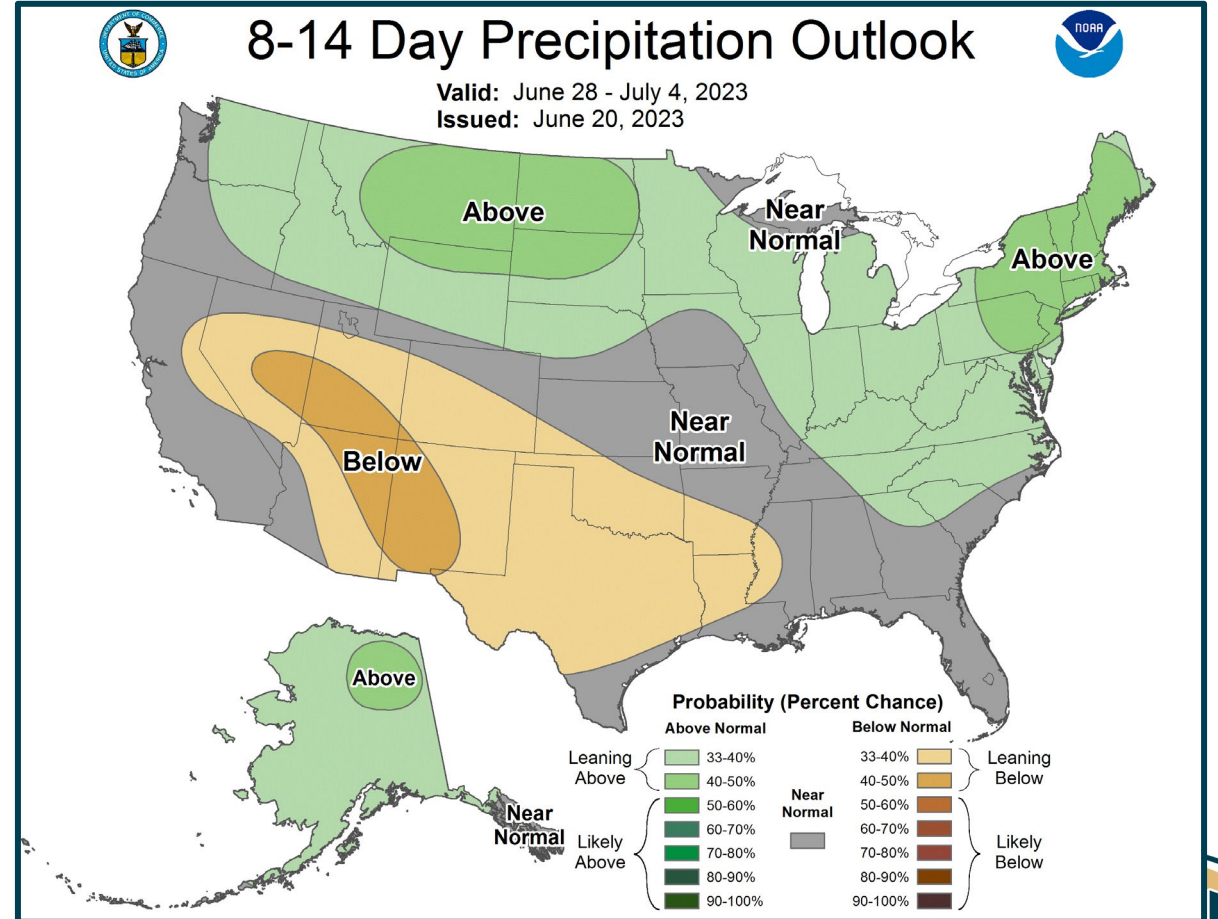
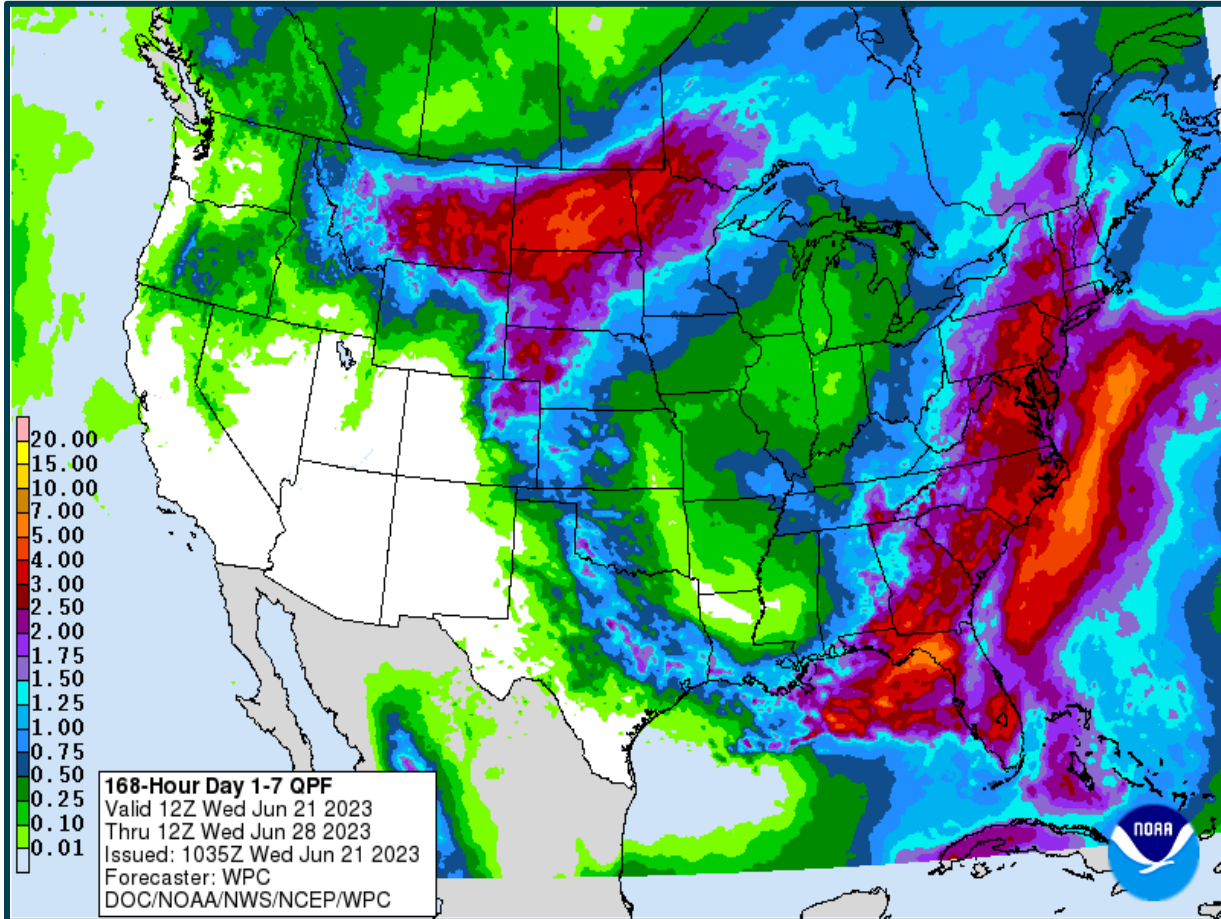
Averaged by Basin



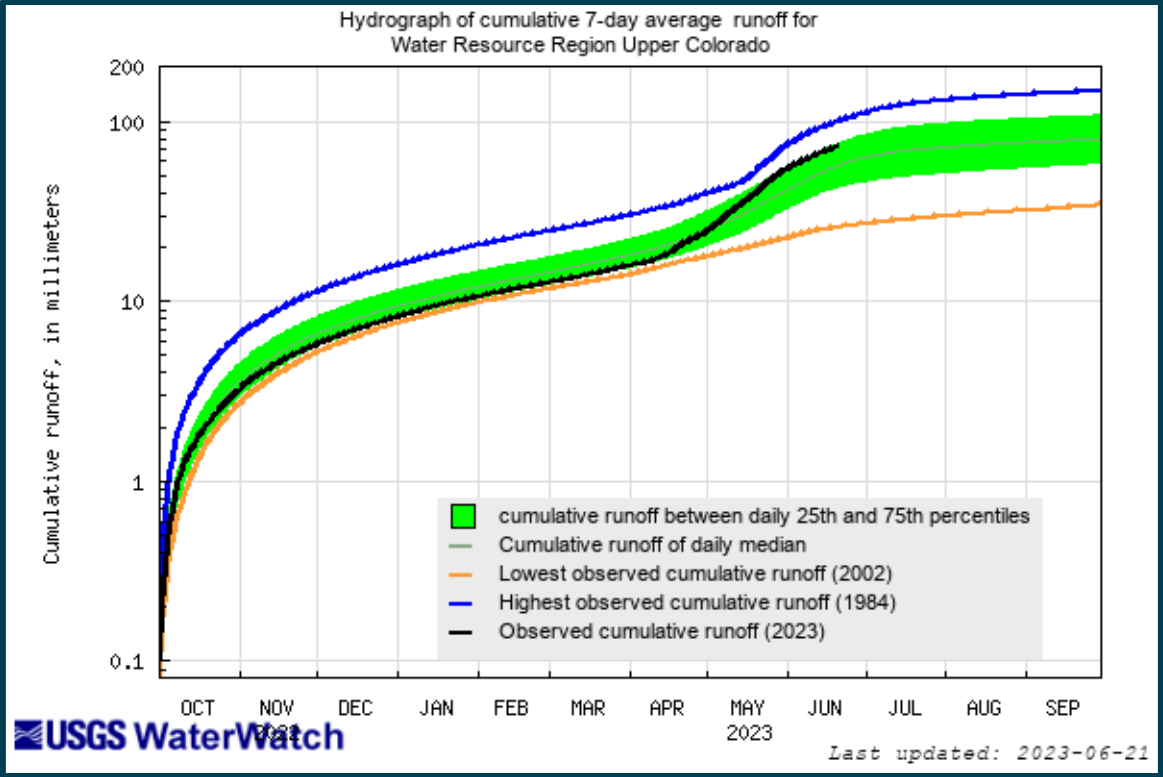
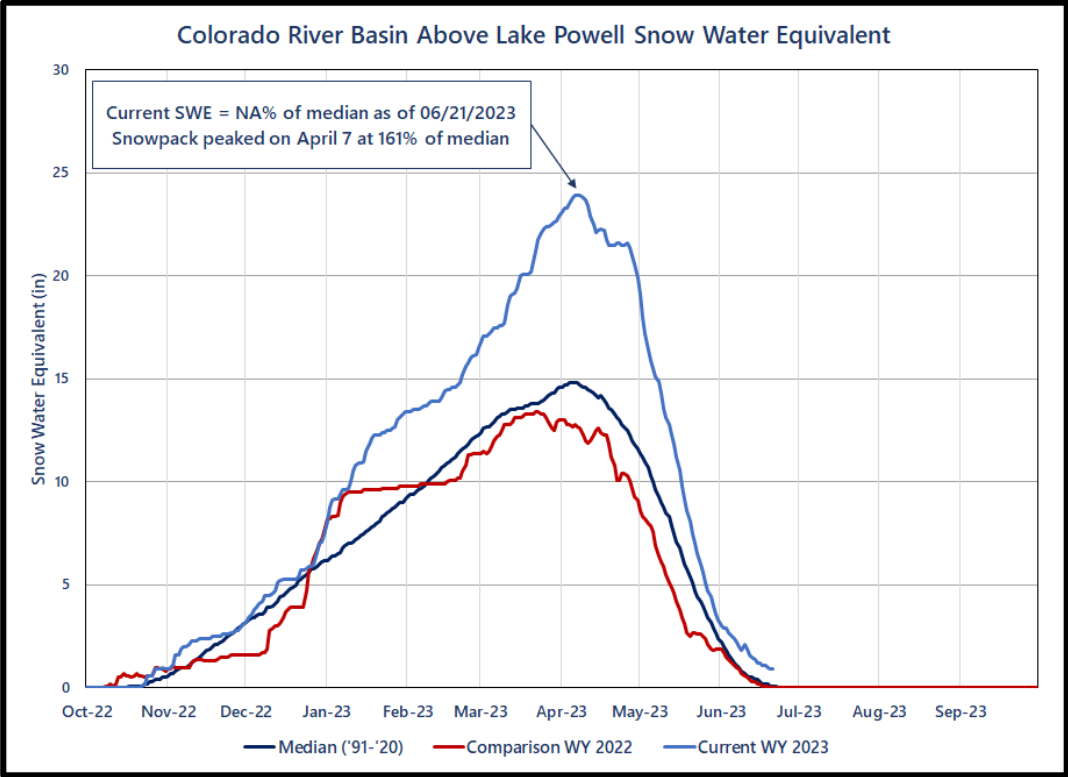
Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov



Weather Prediction Center and Climate Prediction Center Precipitation Forecasts



Upper Colorado SWE and Observed Inflows



Available online at: https://waterwatch.usgs.gov/index.php?id=wwdur_cumrunoff



Most Probable June Forecast Water Year 2023

April – July 2023
Forecasted Unregulated Inflow
as of June 6, 2023²

Reservoir	Inflow (kaf)	Percent of Avg ¹
Fontenelle	830	113
Flaming Gorge	1,280	132
Blue Mesa	845	133
Navajo	1,010	160
Powell	10,700	167

Water Year 2023
Unregulated Inflow Forecast
as of June 6, 2023

Reservoir	Inflow (kaf)	Percent of Avg ¹
Fontenelle	1,125	105
Flaming Gorge	1,628	115
Blue Mesa	1,095	121
Navajo	1,251	137
Powell	13,845	144

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

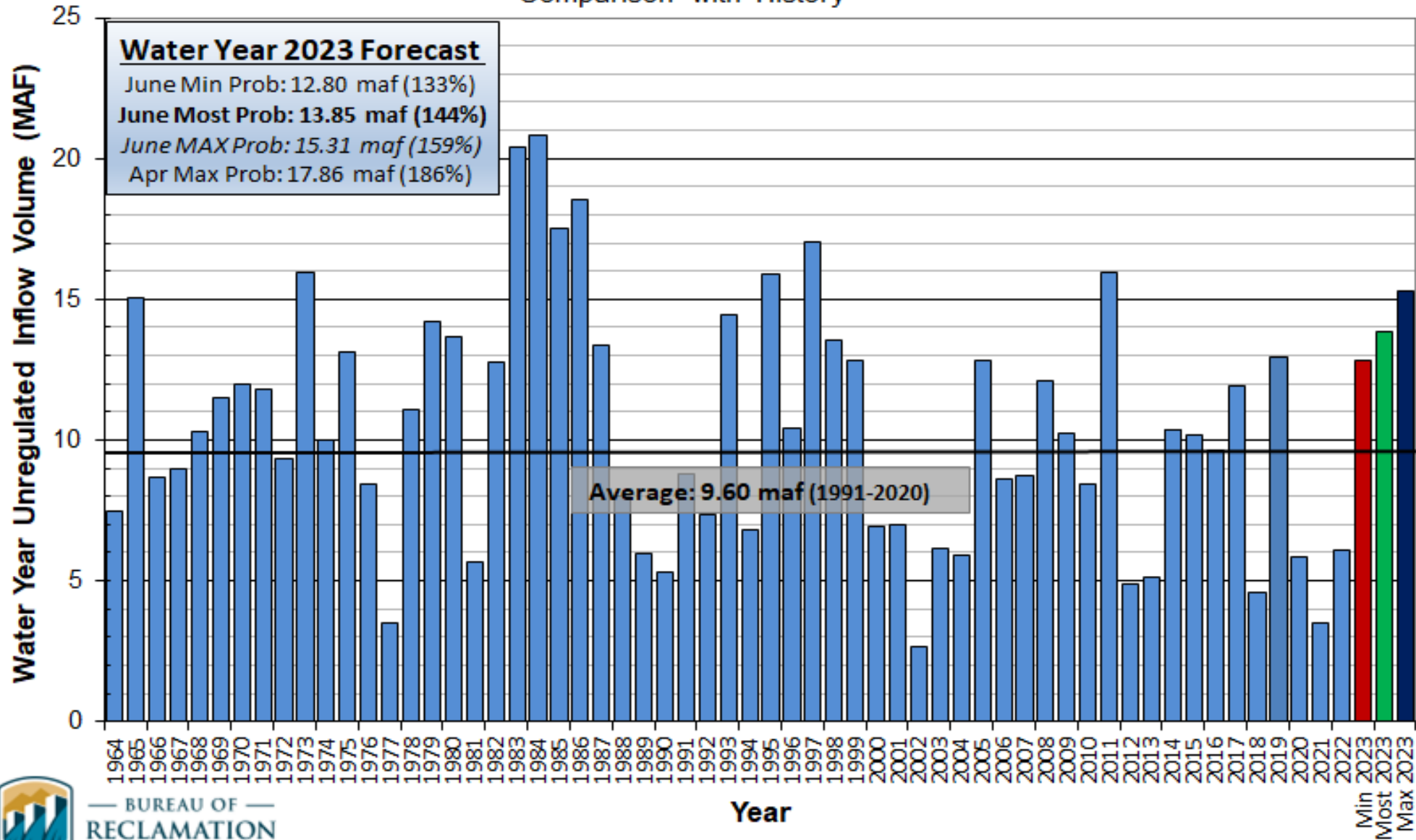
²Midmonth forecasts as of June 16th increased for the Green River Basin reservoirs and all other reservoir forecasts remained steady.



Lake Powell Unregulated Inflow

Water Year 2023 Forecast (issued June 6)

Comparison with History



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Year





Upper Colorado Basin

Hydrology and Operations
Projections Based on April
and June 2023 24-Month
Study



Upper Basin Reservoir Operations in Water Year 2023

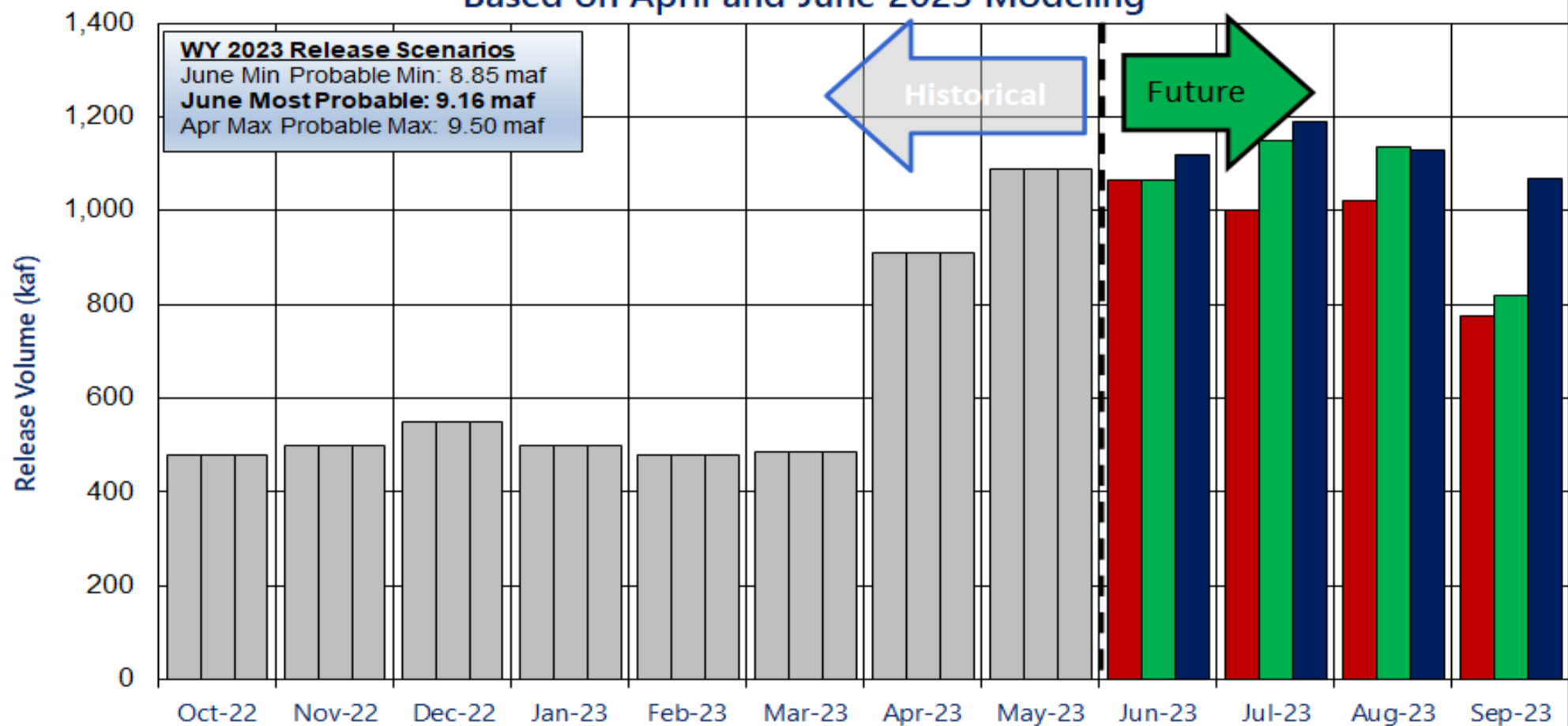
- Lake Powell will be operated consistent with the 2007 Interim Guidelines, the Upper Basin Drought Response Operations Agreement and Upper Basin Records of Decision
- Lake Powell’s projected end of calendar year (CY) 2022 “tier determination” elevation in the August 2022 24-Month Study determined Lake Powell’s operating tier in water year (WY) 2023
 - Lake Powell will operate in the Lower Elevation Balancing Tier where Lake Powell and Lake Mead will balance contents with Glen Canyon Dam release volumes no less than 7.0 maf and no more than 9.5 maf
- Consistent with the provisions of the 2007 Interim Guidelines, and to preserve the benefits to Glen Canyon Dam facilities from 2022 Operations into 2023 and 2024, Reclamation will consult with the Basin States on monthly and annual operations. 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.
 - The Glen Canyon Dam annual release was initially set to 7.00 maf
 - In April 2023, Reclamation evaluated hydrologic conditions and determined balancing releases are appropriate under the conditions established in the 2007 Interim Guidelines
 - Balancing releases will be limited (with a minimum of 7.00 maf) to protect Lake Powell from declining below elevation 3,525 feet at the end of December 2023. Lake Powell will release between 7.0 MAF and 9.5 MAF in WY 2023
 - Reclamation has removed the operational neutrality of the 0.480 maf that was retained in Lake Powell under the May 2022 action, such that balancing releases are based on the physical storage of Lake Powell and Lake Mead



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2023

Based on April and June 2023 Modeling



WY 2023 Release Scenarios
 June Min Probable Min: 8.85 maf
June Most Probable: 9.16 maf
 Apr Max Probable Max: 9.50 maf

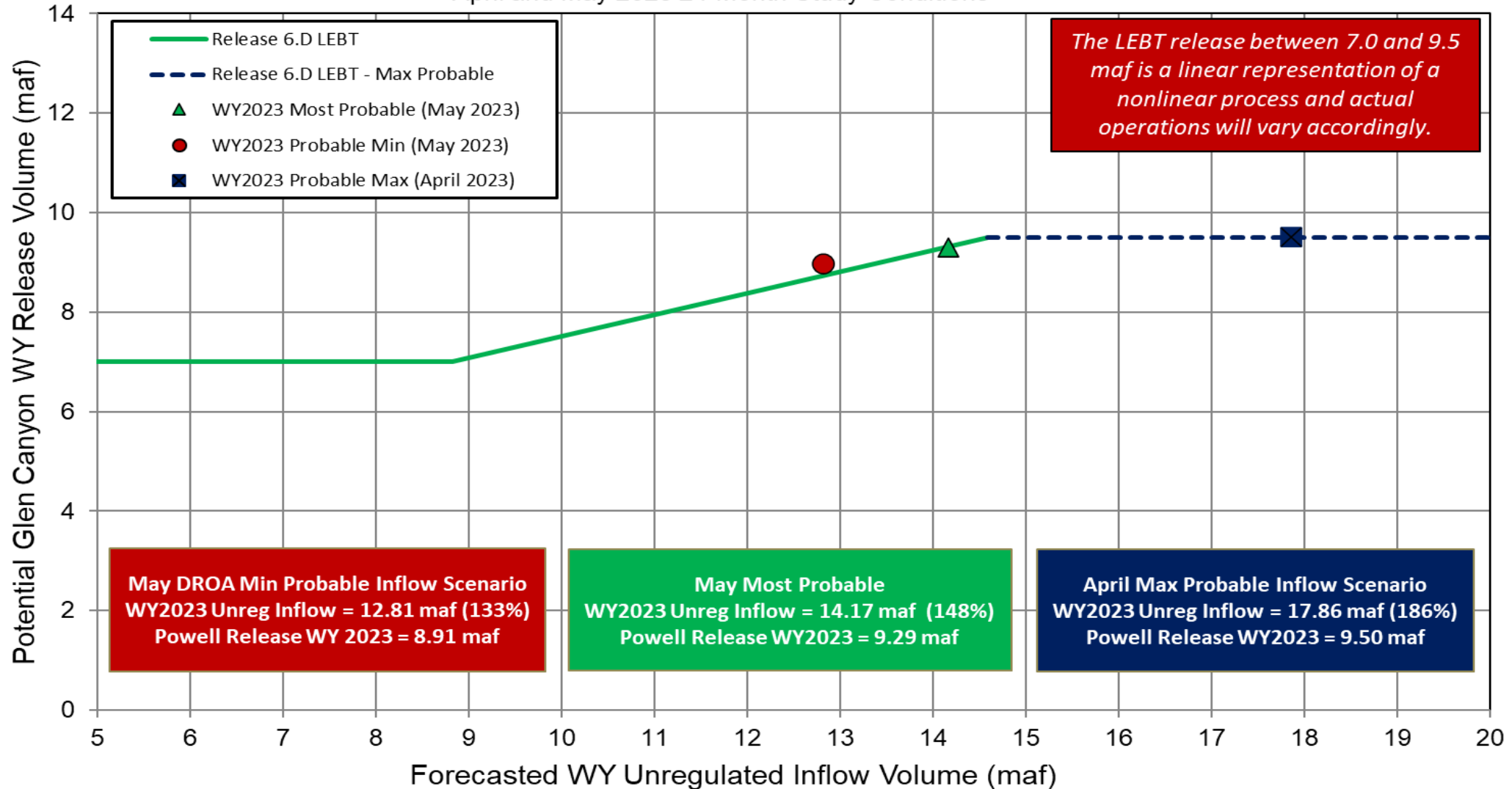
	10/1/2022	11/1/2022	12/1/2022	1/1/2023	2/1/2023	3/1/2023	4/1/2023	5/1/2023	6/1/2023	7/1/2023	8/1/2023	9/1/2023
■ June Min Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,254	1,064,000	1,000,000	1,020,000	775,000
■ June Most Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,254	1,064,000	1,150,000	1,135,000	820,260
■ April Max Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,254	1,118,000	1,190,000	1,130,000	1,068,705

■ June Min Probable ■ June Most Probable ■ April Max Probable



Lake Powell Release Scenarios under Section 6.D and WY2023 Protect Powell Elevation 3,525 ft

Water Year 2023 Release Volume as a Function of the Lower Elevation Balancing Tier based on
April and May 2023 24-Month Study Conditions



*The Drought Response Operations Agreement (DROA) can be found here: <https://www.usbr.gov/dcp/finaldocs.html>



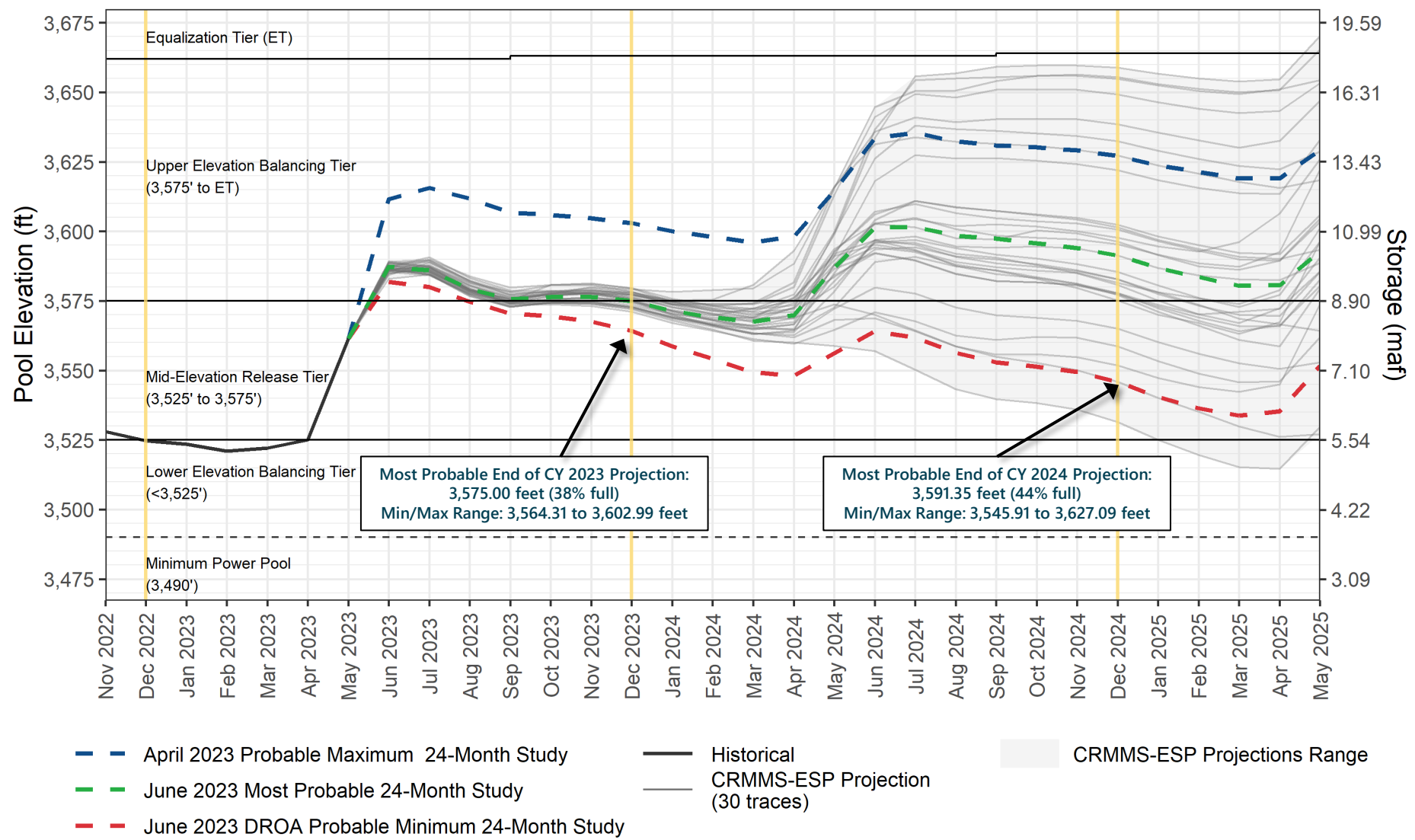
Reclamation Operational Modeling Model Comparison

	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 Elevations¹

CRMMS Projections from April and June 2023

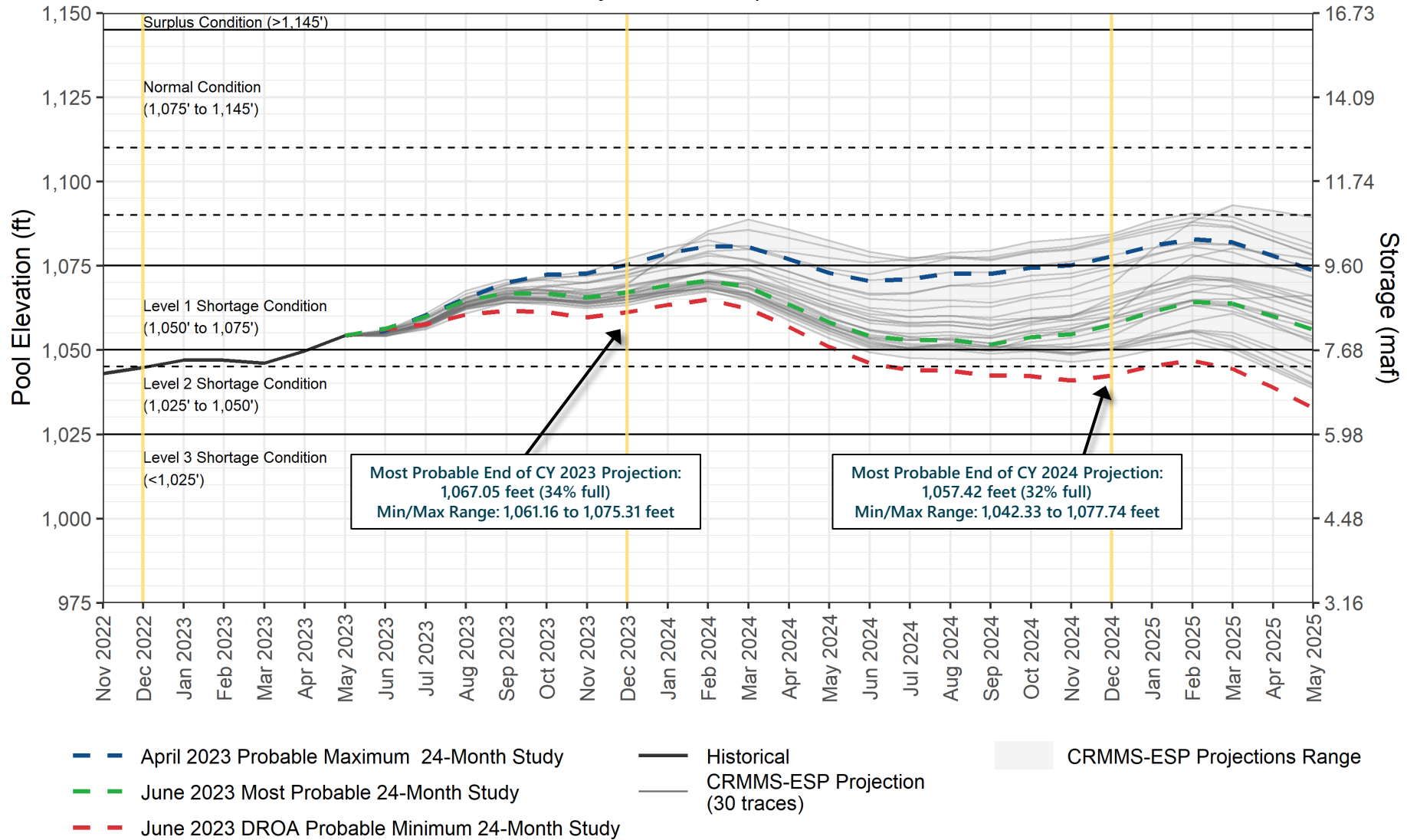


¹ Projected Lake Powell end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.



Lake Mead End-of-Month Elevations¹

CRMMS Projections from April and June 2023



¹ Projected Lake Mead end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.





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	[Outage]											
2	[Outage]											
3	[Outage]						[Outage]					
4	[Outage]											
5					[Outage]	[Outage]						
6					[Outage]	[Outage]						
7							[Outage]	[Outage]				
8							[Outage]	[Outage]				
Units Available	4	4	6	6	4	6	5	5	8	8	8	8
Capacity (cfs)	12,400	12,400	19,600	19,500	12,250	19,300	15,850	16,250	27,650	27,650	27,550	27,550
Capacity (kaf/month)	780	1,040	1,200	1,200	1,000	1,190	1,020	1,240	1,640	1,640	1,700	1,640
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

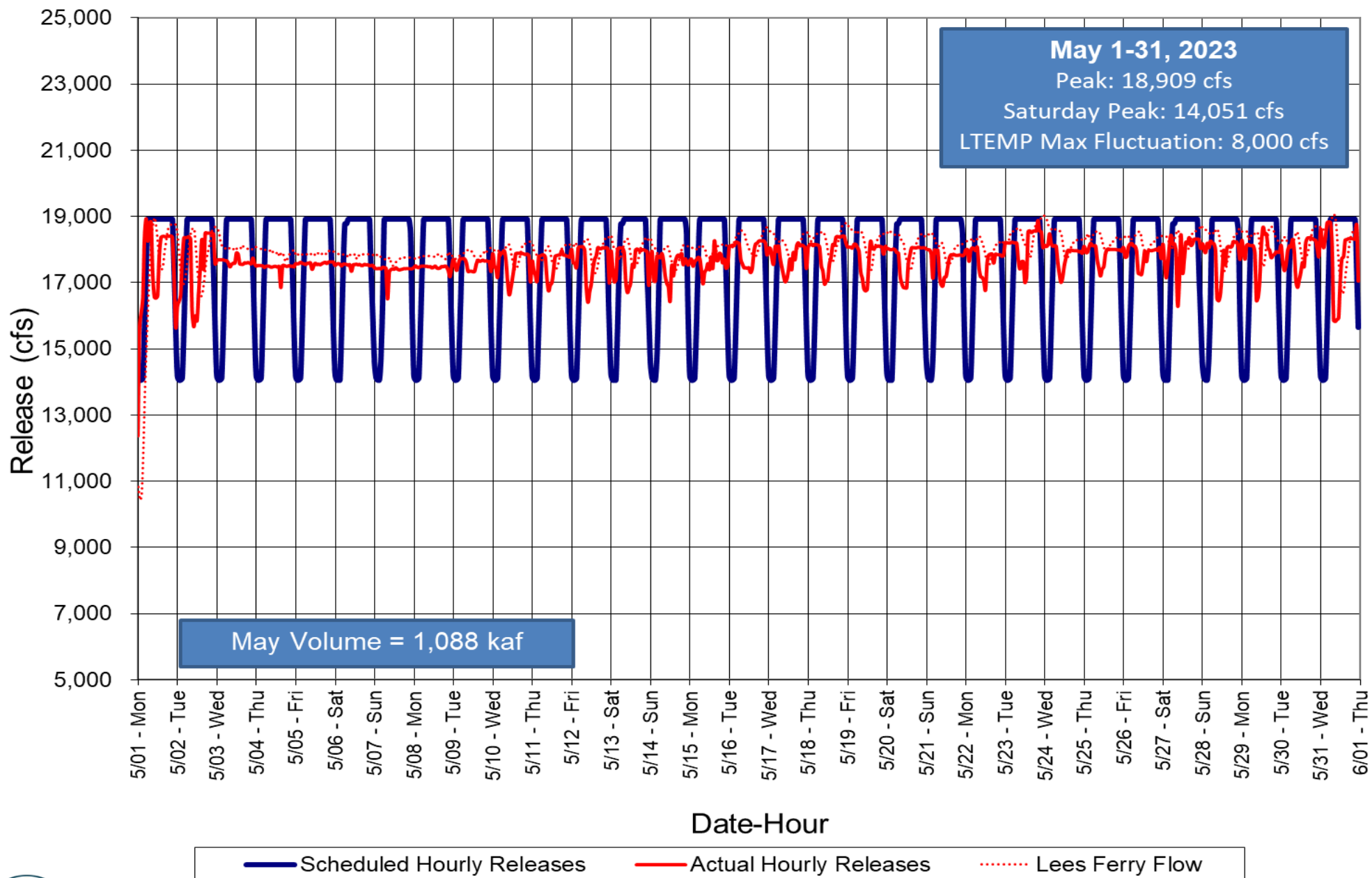
JUN MOST²
 JUN MOST
 9.00 maf
 7.48 maf
 7.48 maf

(updated 06-21-2023)

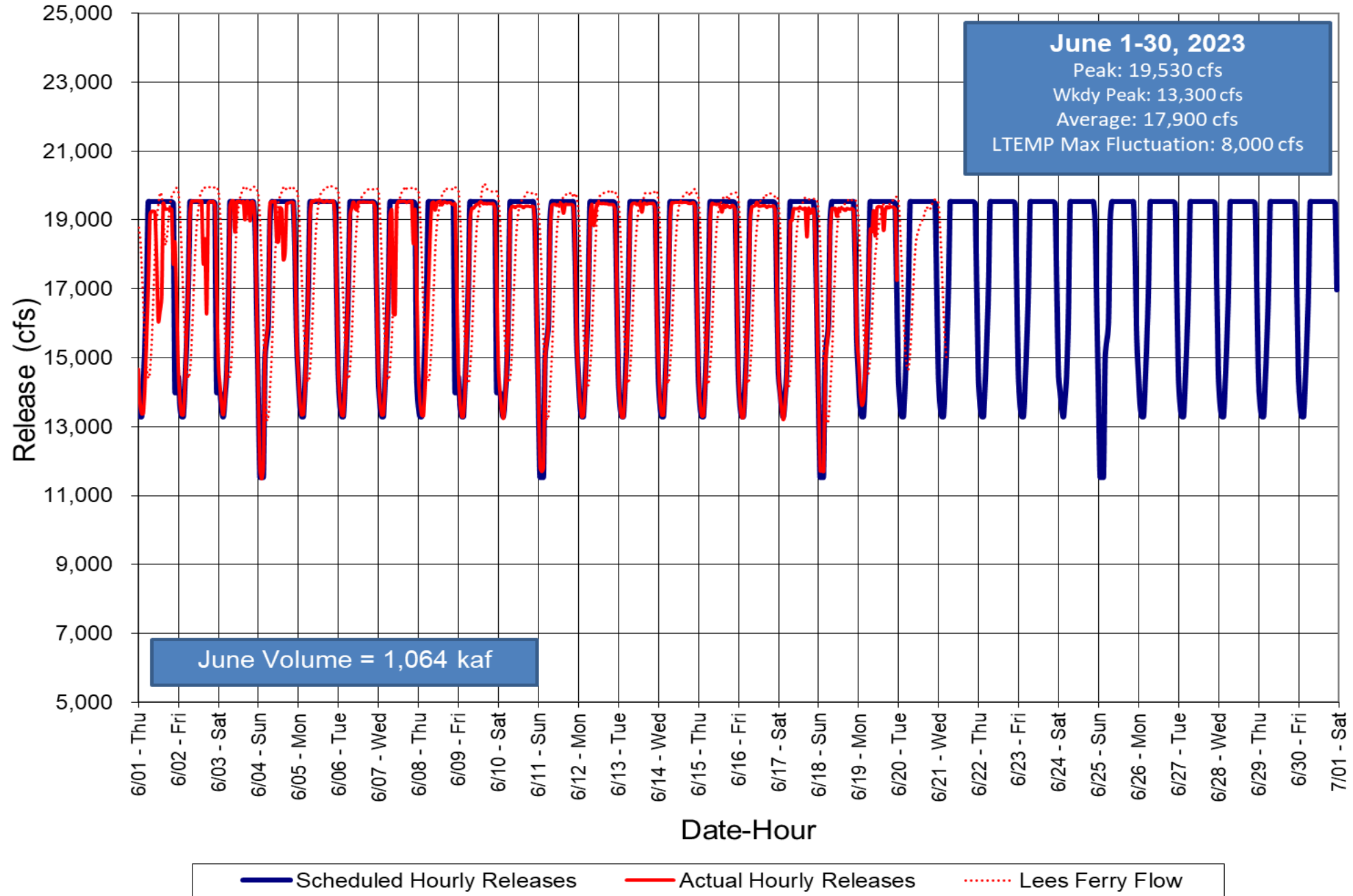
1 Projected release, based on April 2023 24MS for the maximum probable and June 2023 24MS for the minimum and most probable inflow projections and 24-Month Study model runs.
 2 Dependent upon availability to shift contingency reserves, which will increase capacity by 30-40MW (3%) at current efficiency.



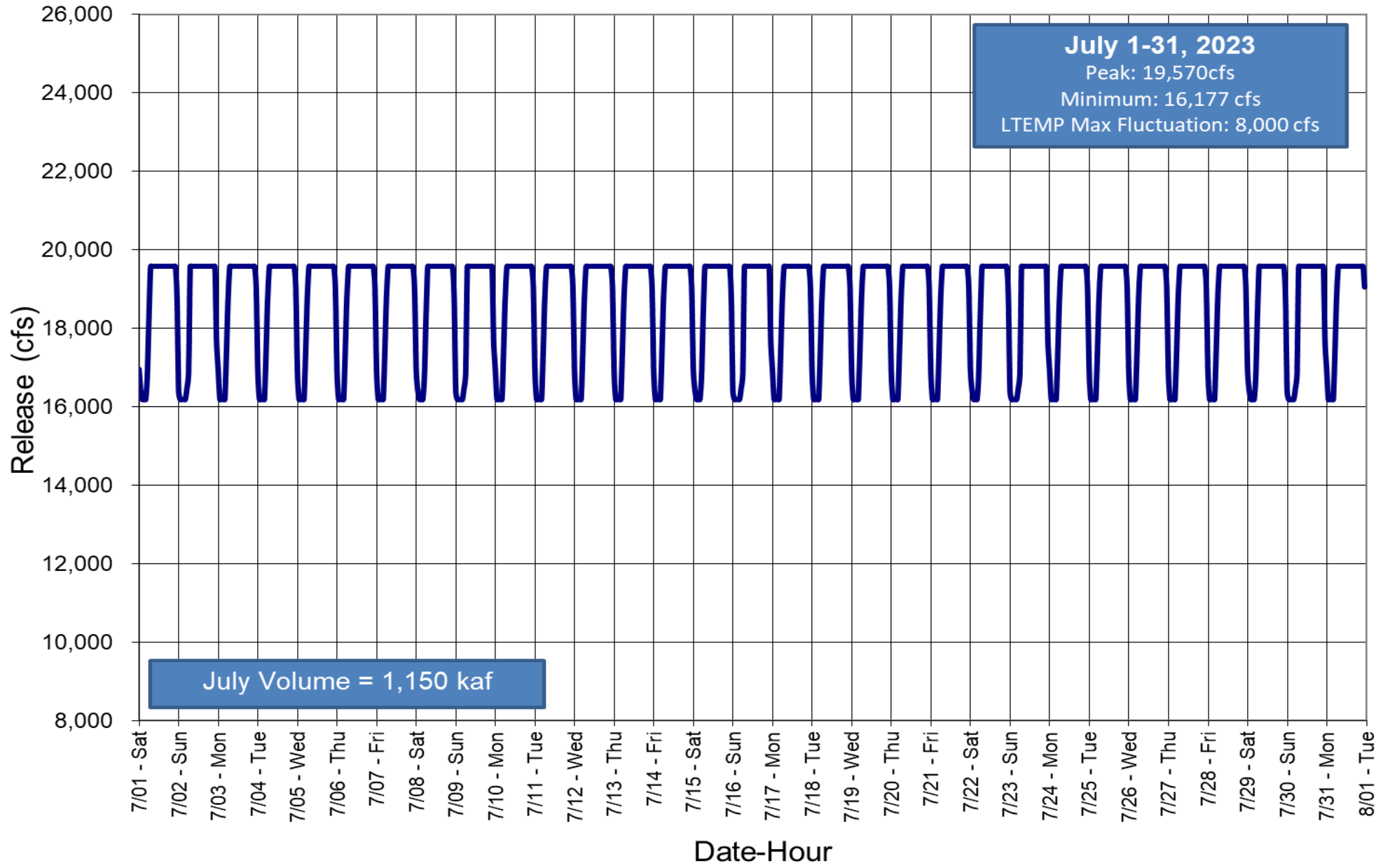
Glen Canyon Dam Hourly Release Pattern May 2023



Glen Canyon Dam Hourly Release Pattern June 2023



Glen Canyon Dam Hourly Release Pattern July 2023

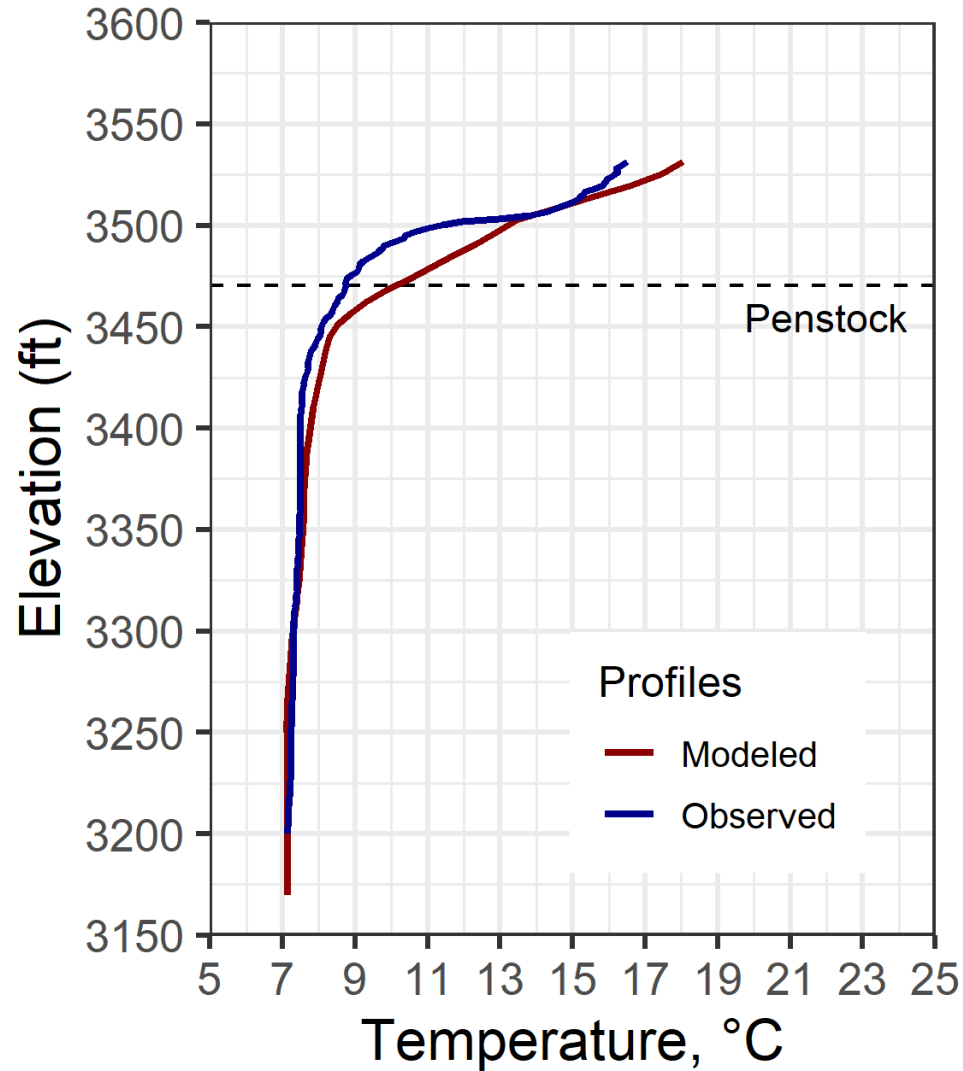


Water Quality



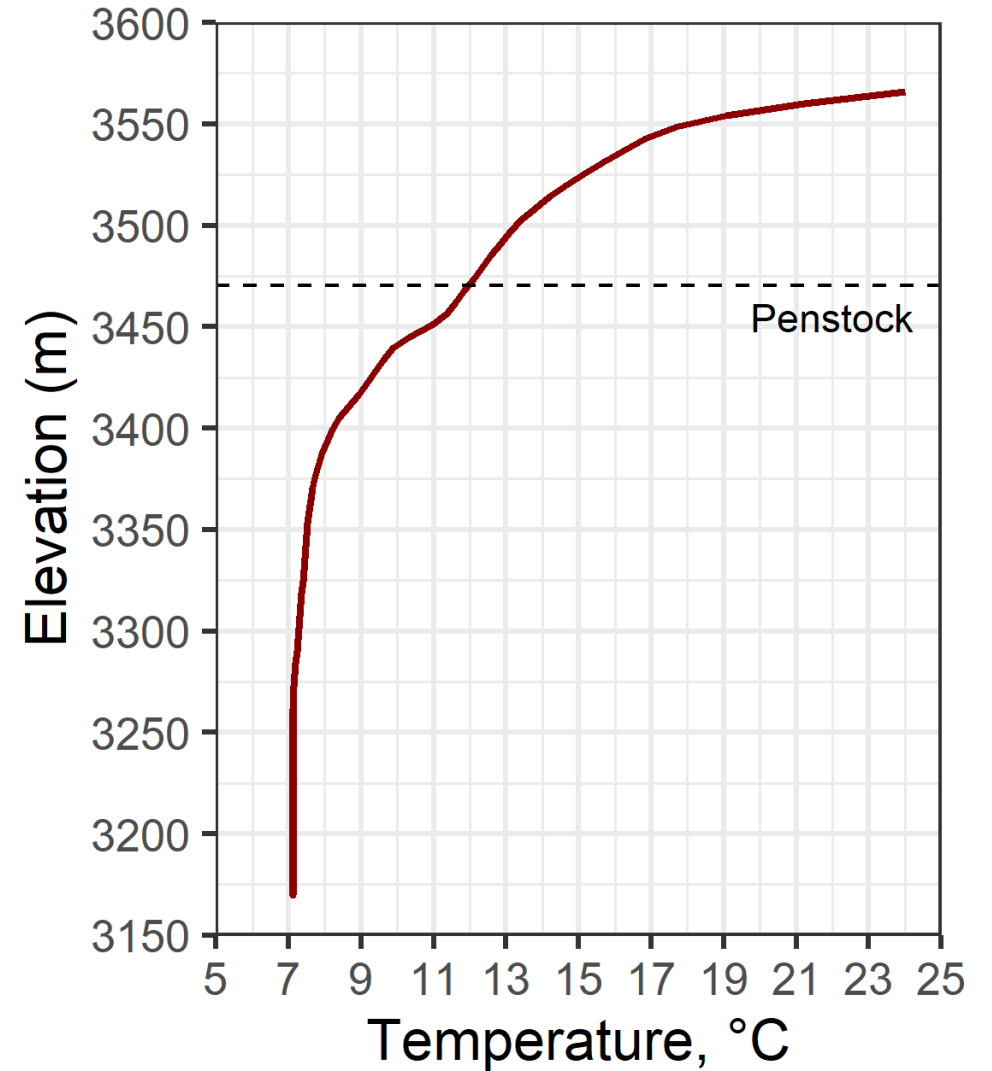
Latest Profile Comparison

May 10, 2023

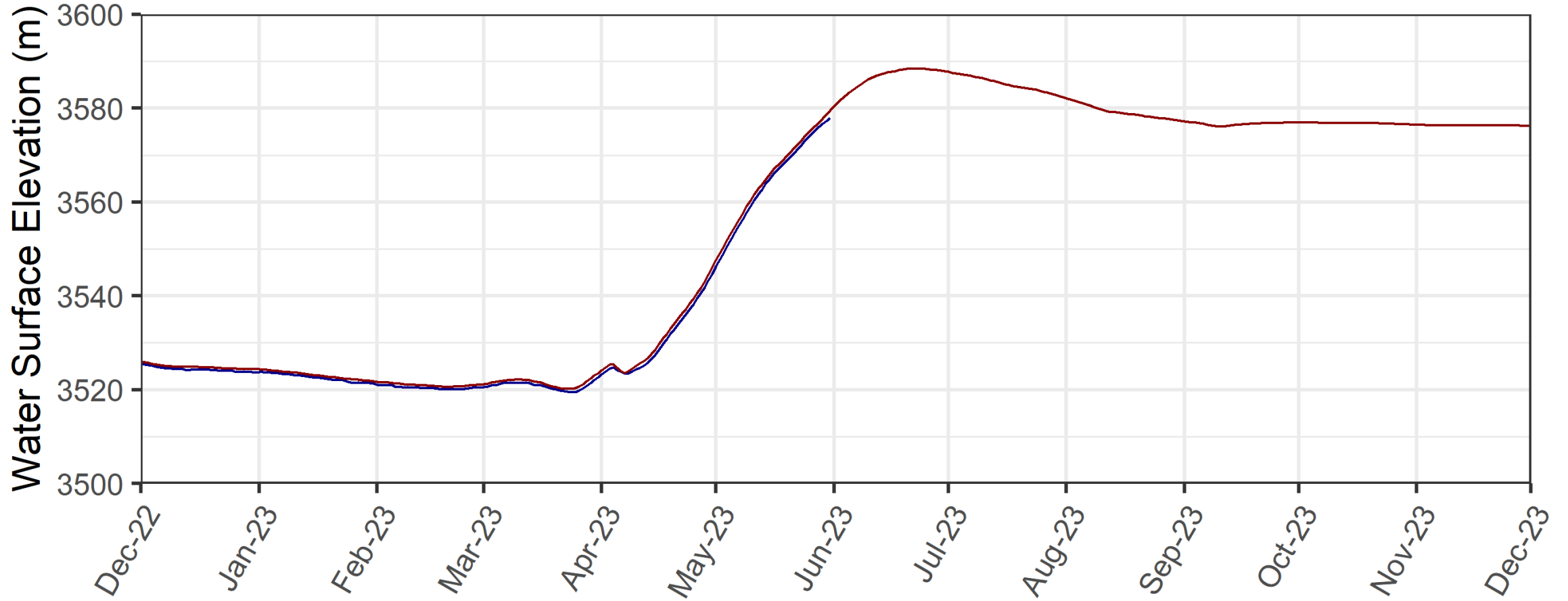


Powell Forebay

June 21, 2023



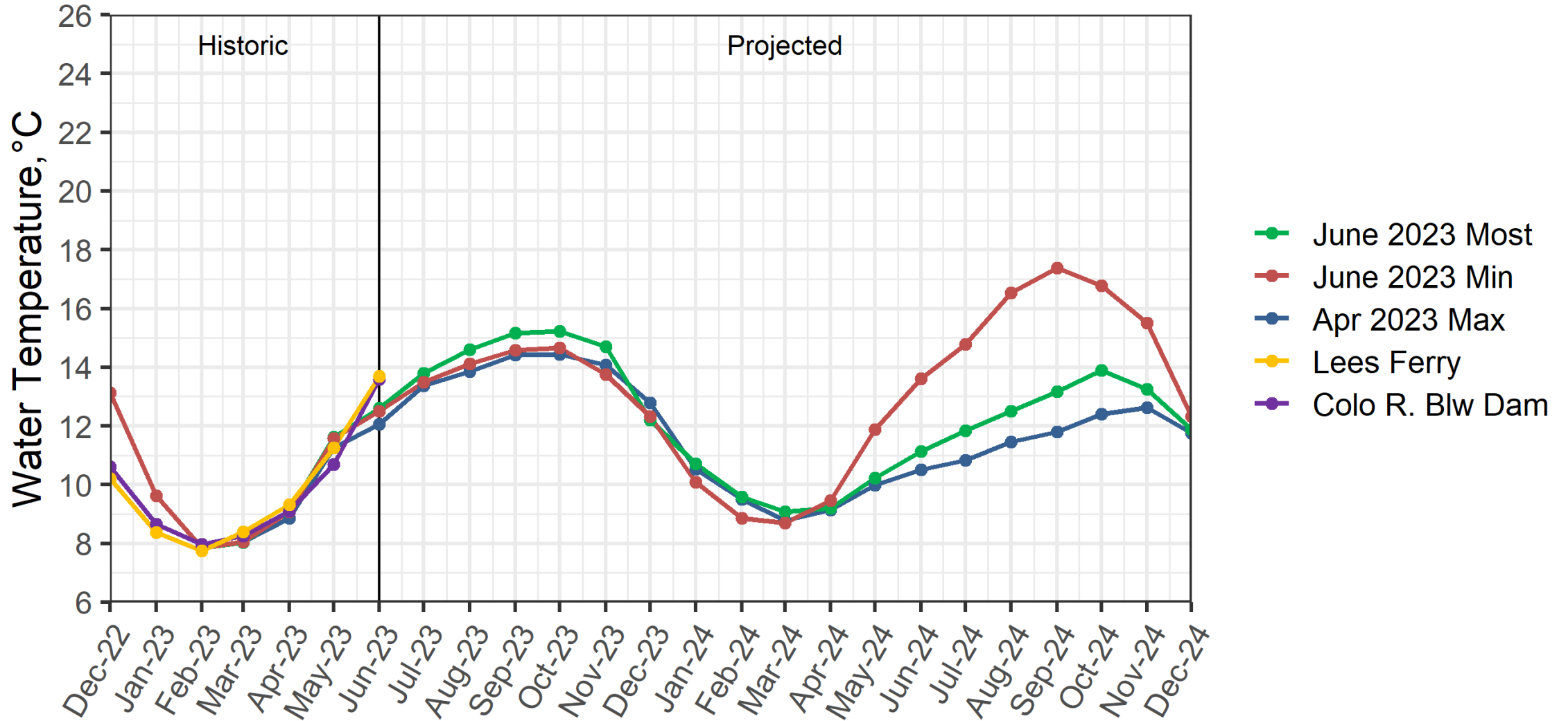
Lake Powell Elevation at Dam



- Modeled using June 2023 24-Month Most Probable Hydrology
- USGS Gage 09379900 - Lake Powell at Glen Canyon Dam, AZ

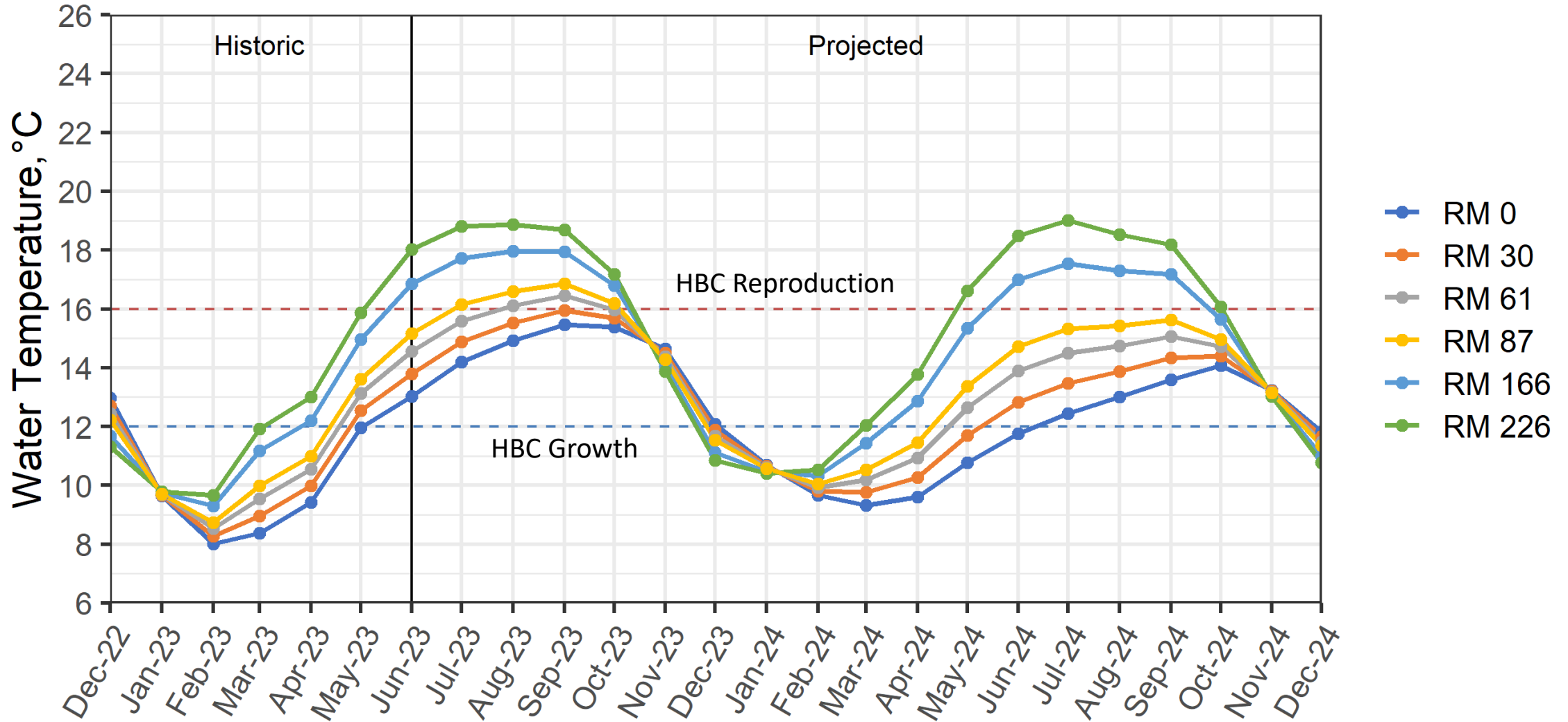
Lake Powell Release Temperature

Projected Temperature based on June 2023 Forecast



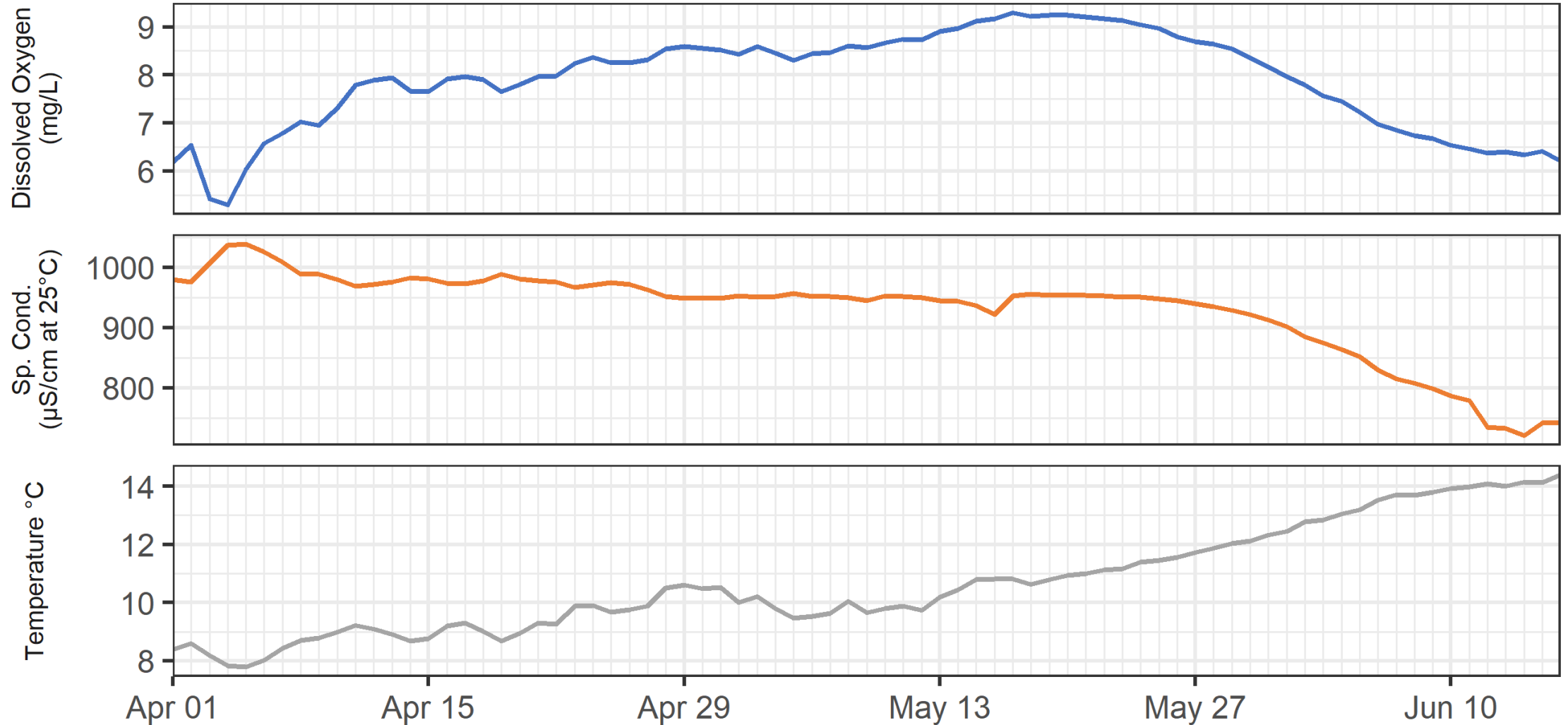
Colorado River Grand Canyon Water Temperature

Projected Temperature based on June 2023 Forecast

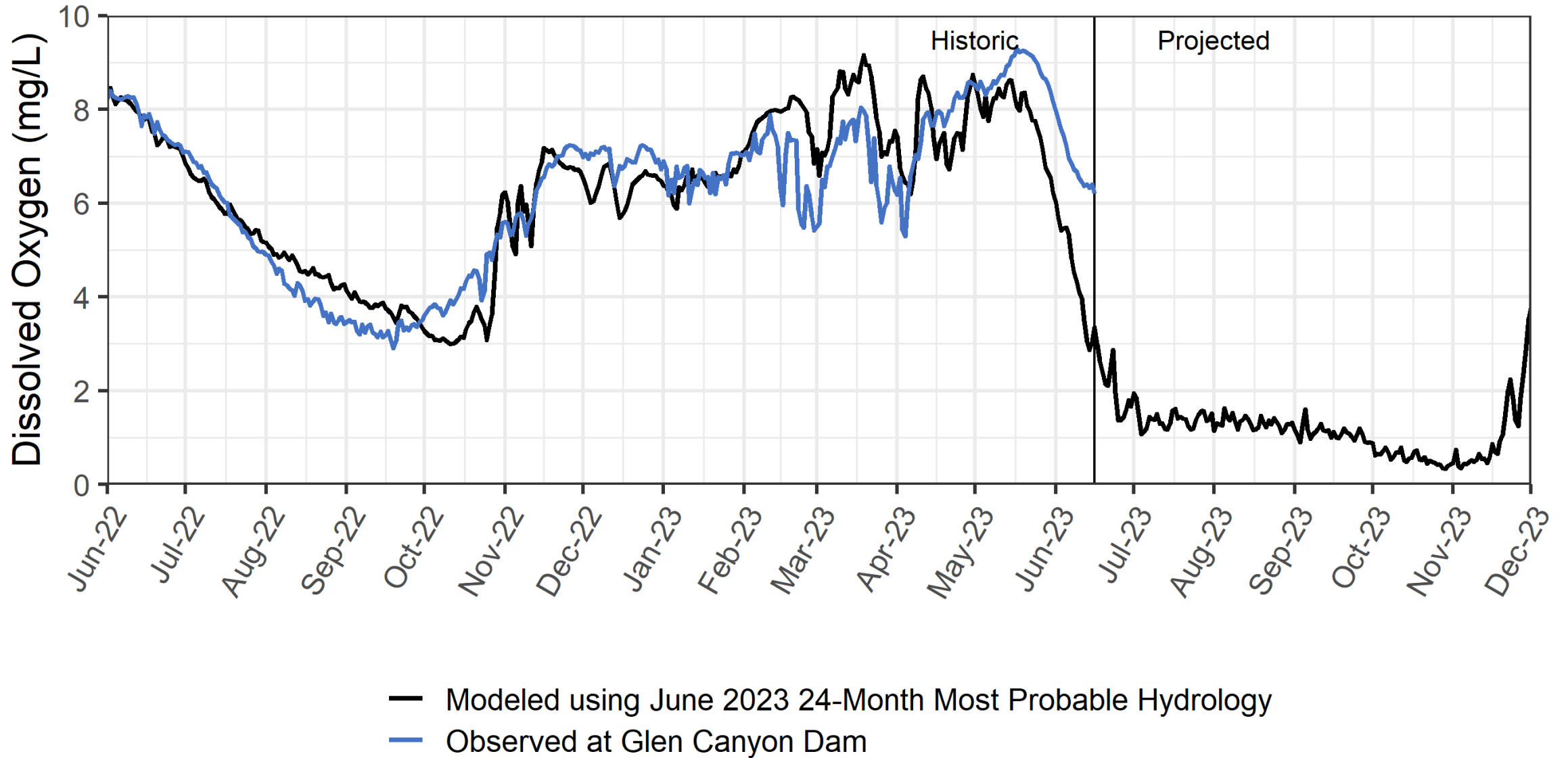


Observed Water Quality at Glen Canyon Dam

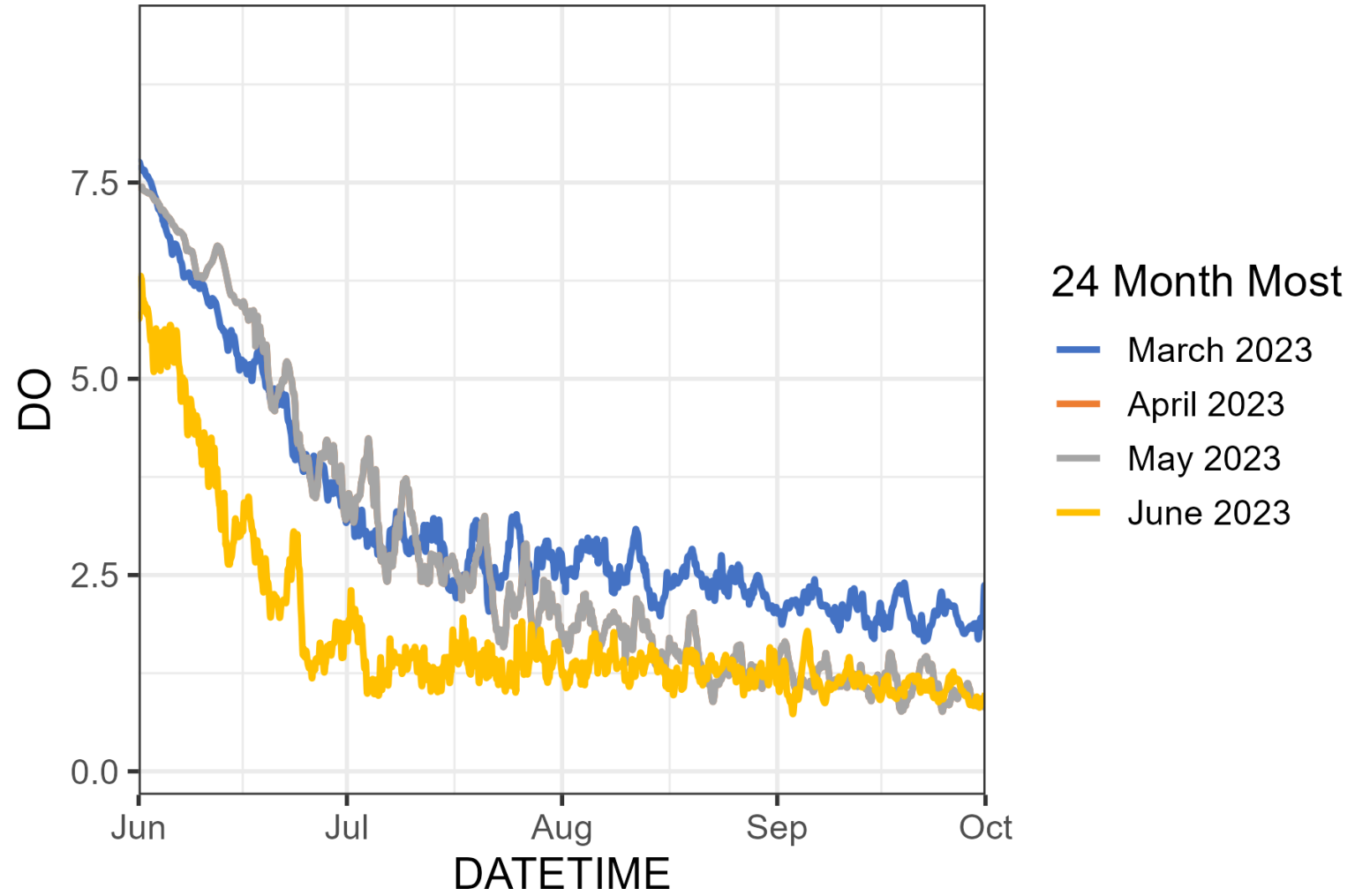
These data are preliminary or provisional and subject to revision



Dissolved Oxygen at Glen Canyon Dam



CE-QUAL DO Forecasts



Questions?



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