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RECLAMATION

Glen Canyon TWG

Basin Hydrology, Operations, and Water Quality

June 14, 2023

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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.”

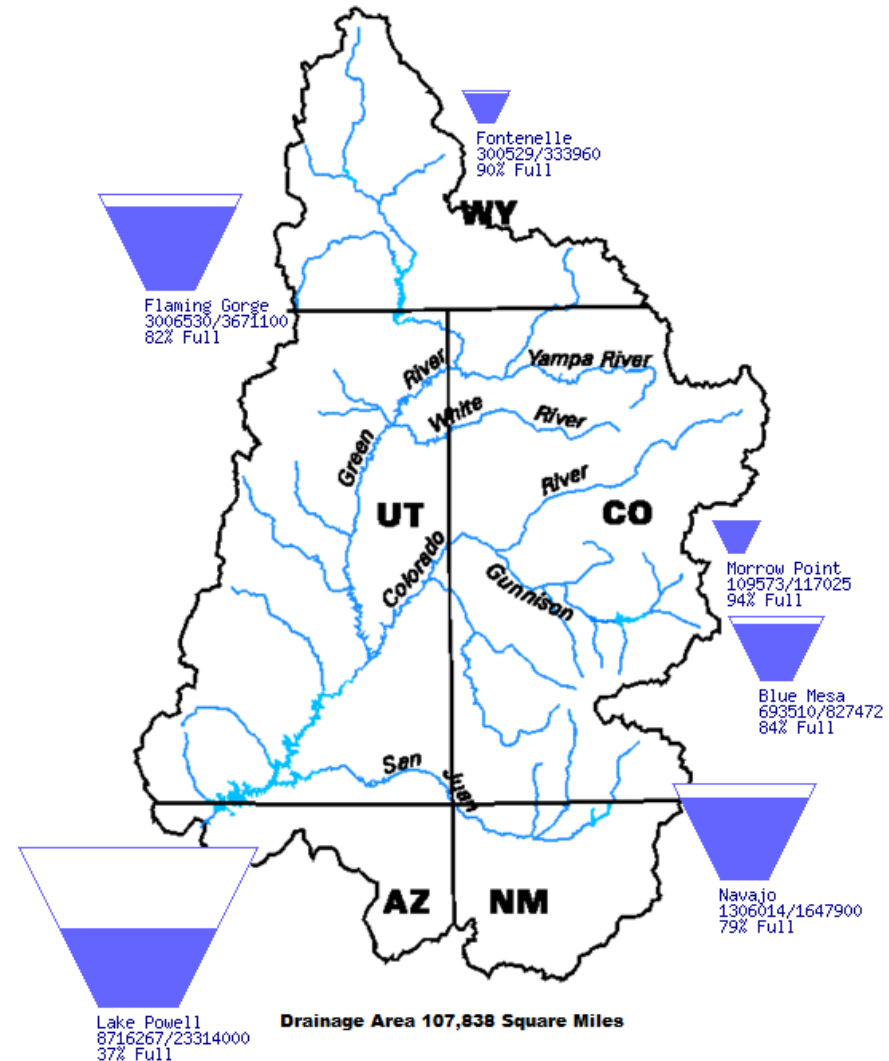


Upper Basin Storage (as of June 12, 2023)

Data Current as of:
06/12/2023

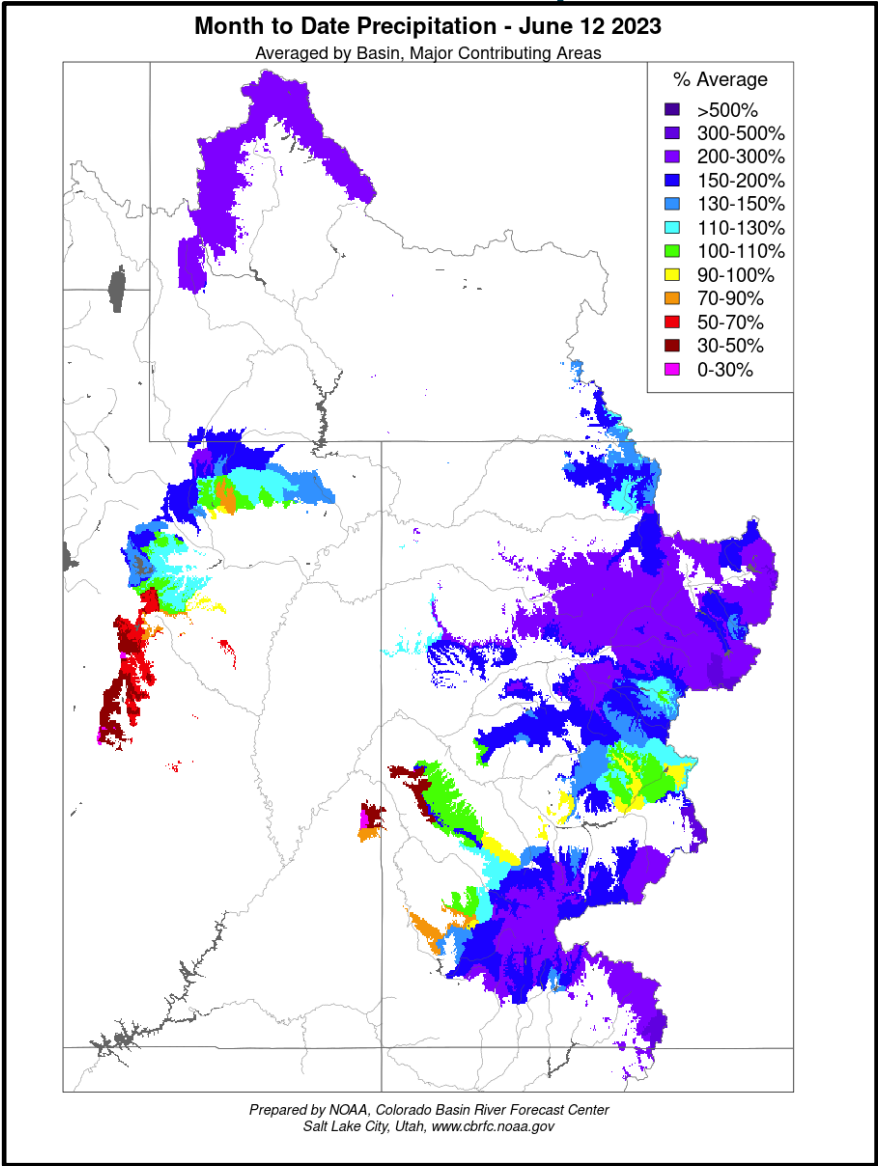
Upper Colorado River Drainage Basin

Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	90	0.30	0.33	6,501.65
Flaming Gorge	82	3.01	3.67	6,022.81
Blue Mesa	84	0.69	0.83	7,504.21
Navajo	79	1.31	1.65	6,061.06
Lake Powell	37	8.72	23.31	3,572.61
UC System Storage	47	14.15	29.93	
Total System Storage	42	24.46	58.48	

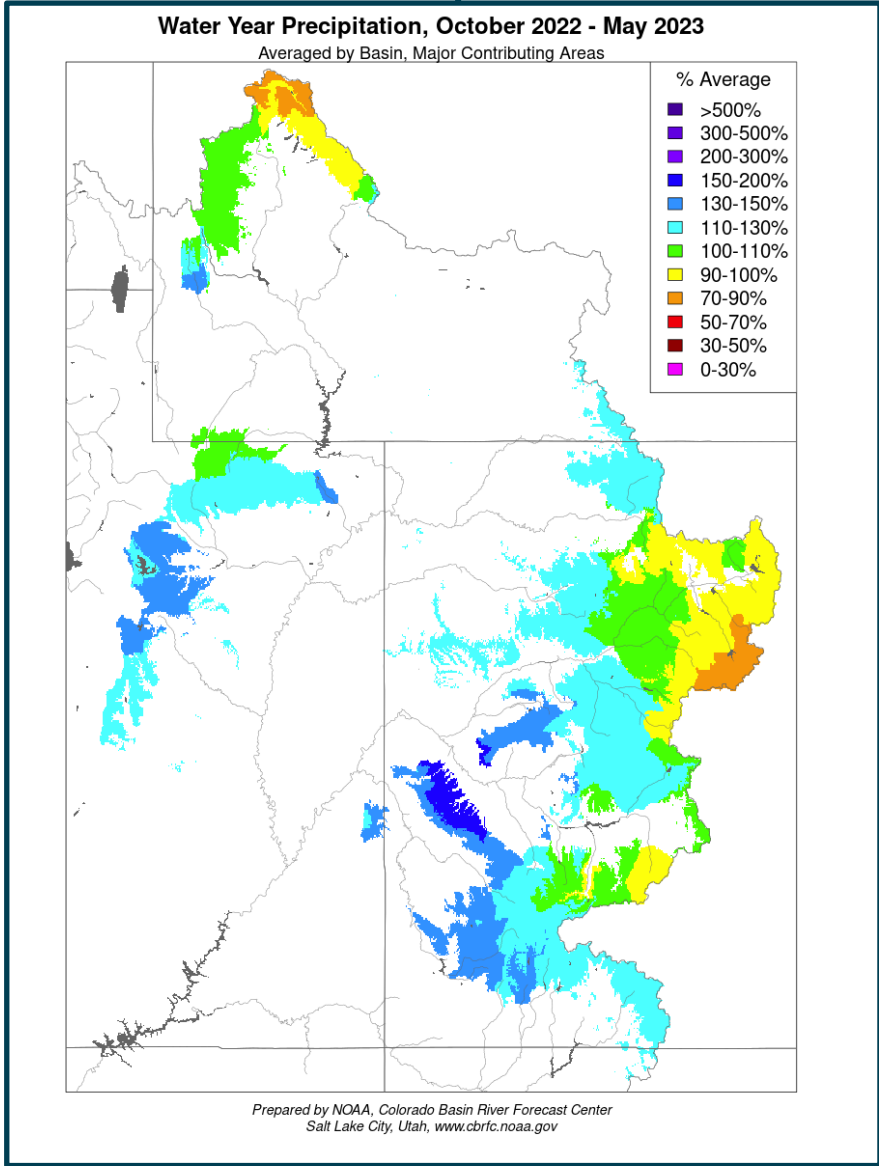


June Month and May WY Precipitation

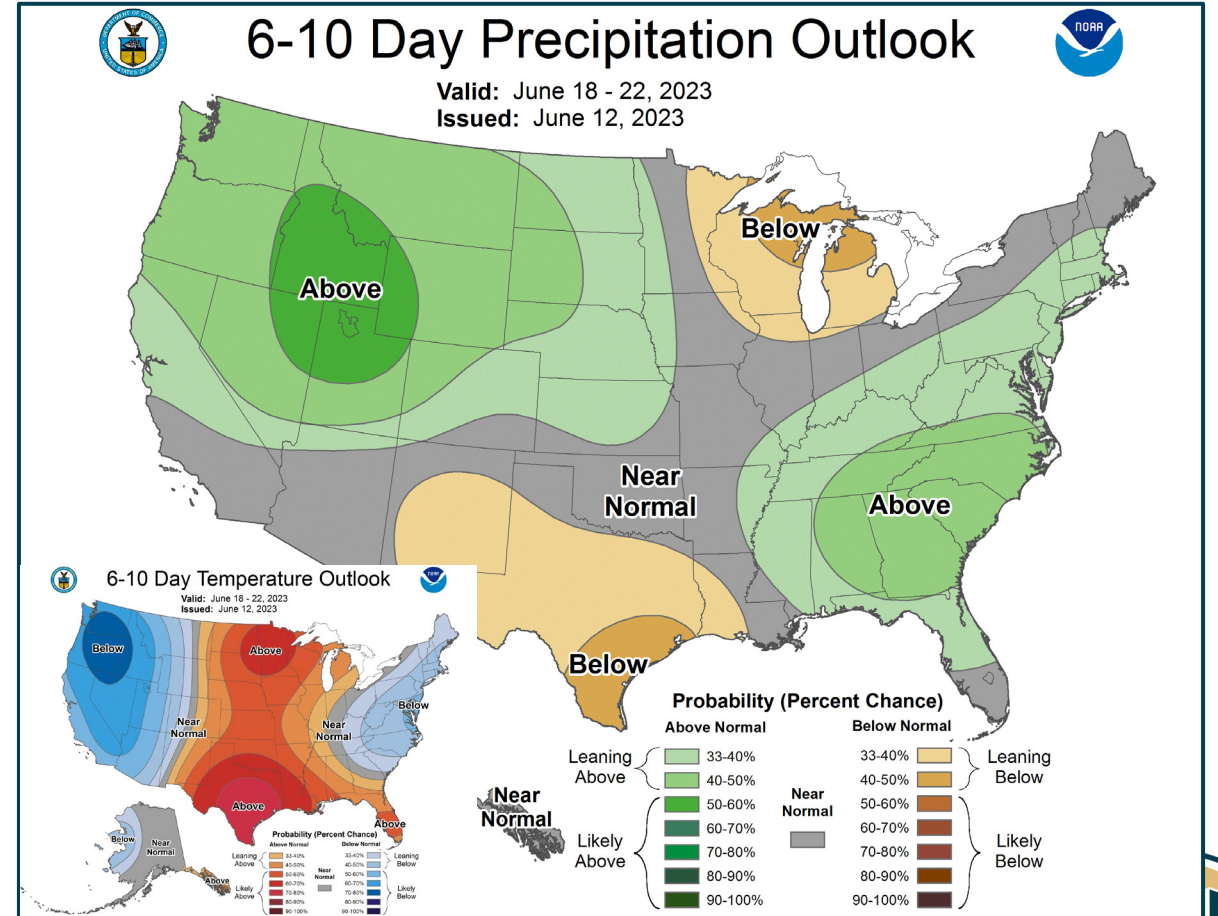
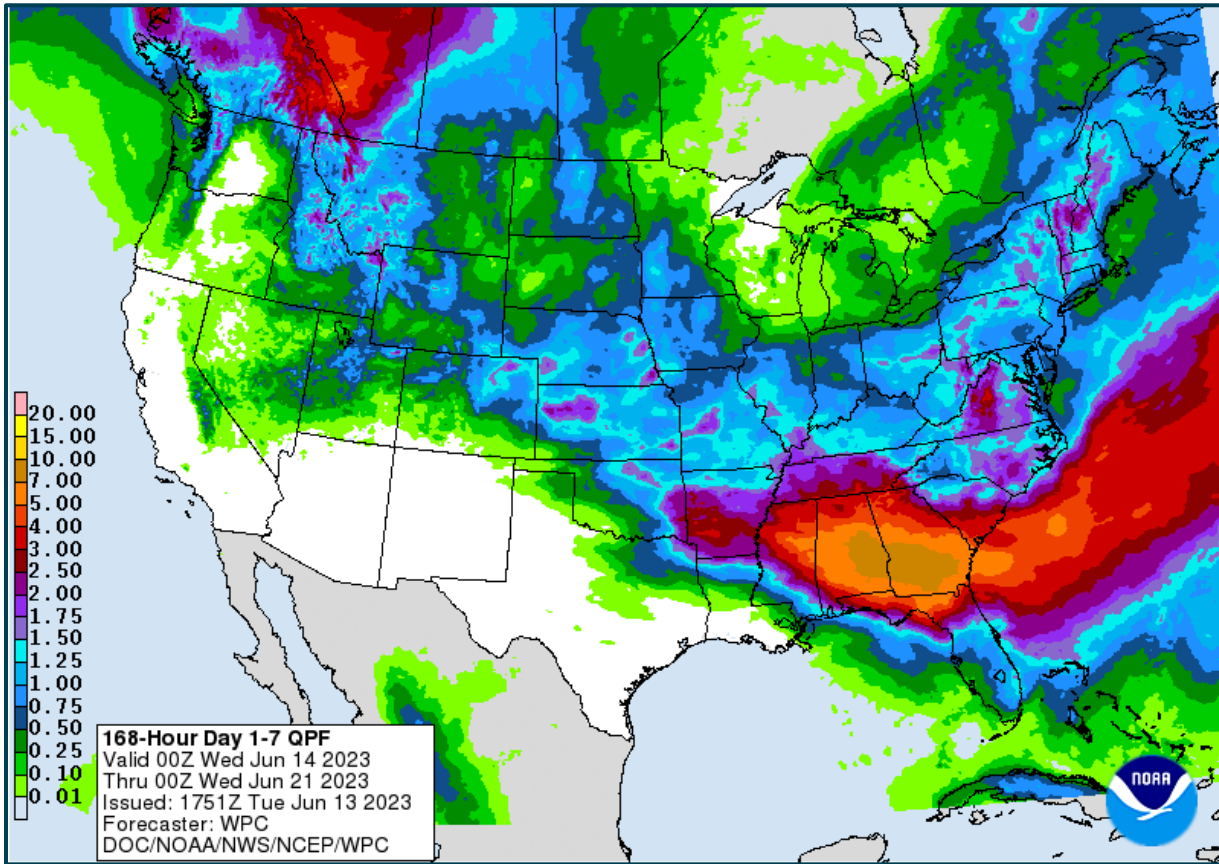
Month to Date Precipitation



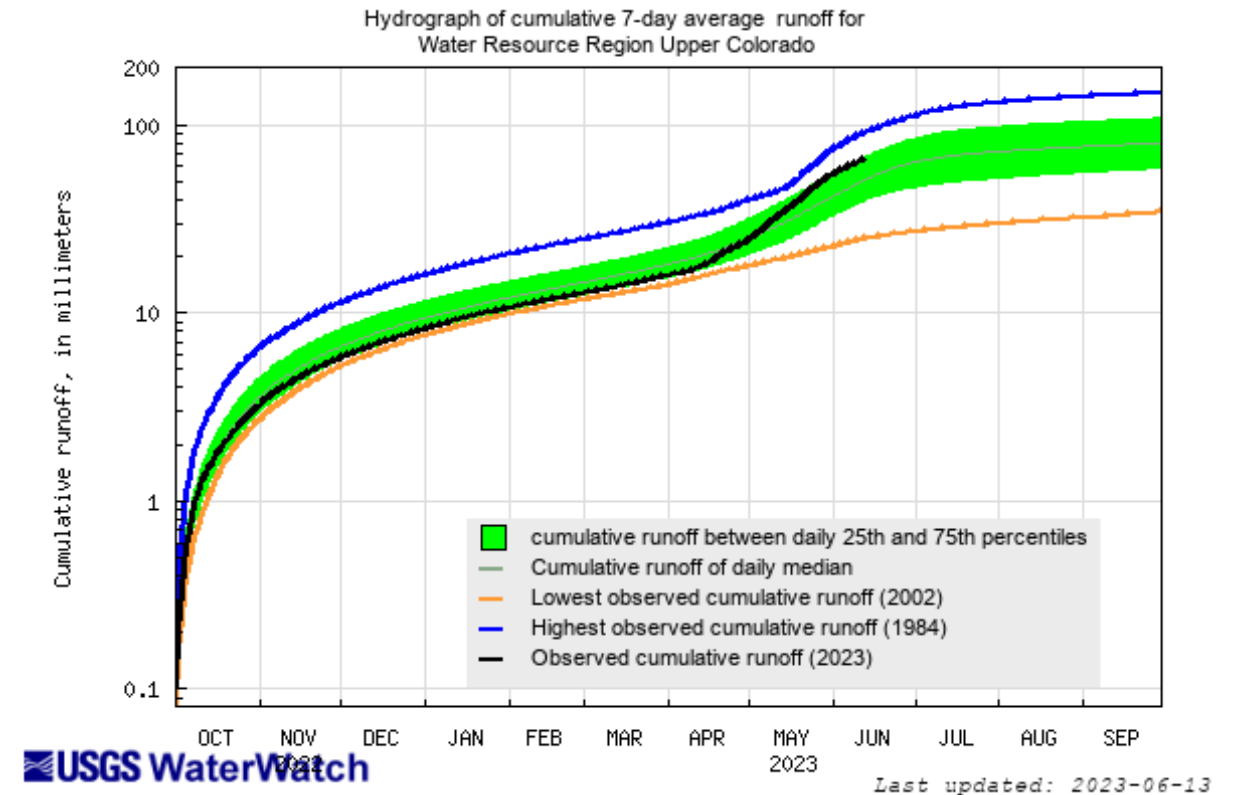
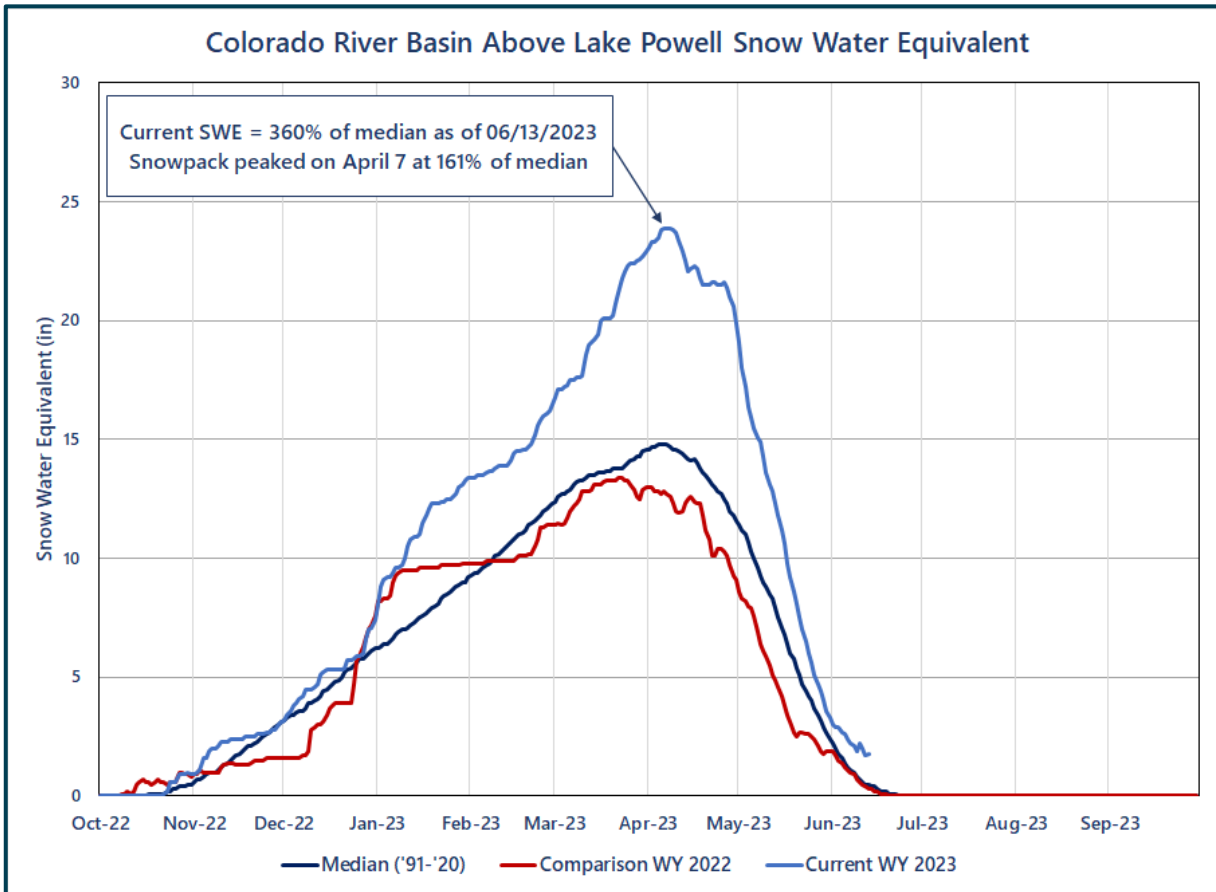
WY Precipitation



Climate Prediction Center Short-Term Precipitation Forecast



Upper Colorado SWE and Observed Inflows



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



Most Probable May Forecast Water Year 2023

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

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

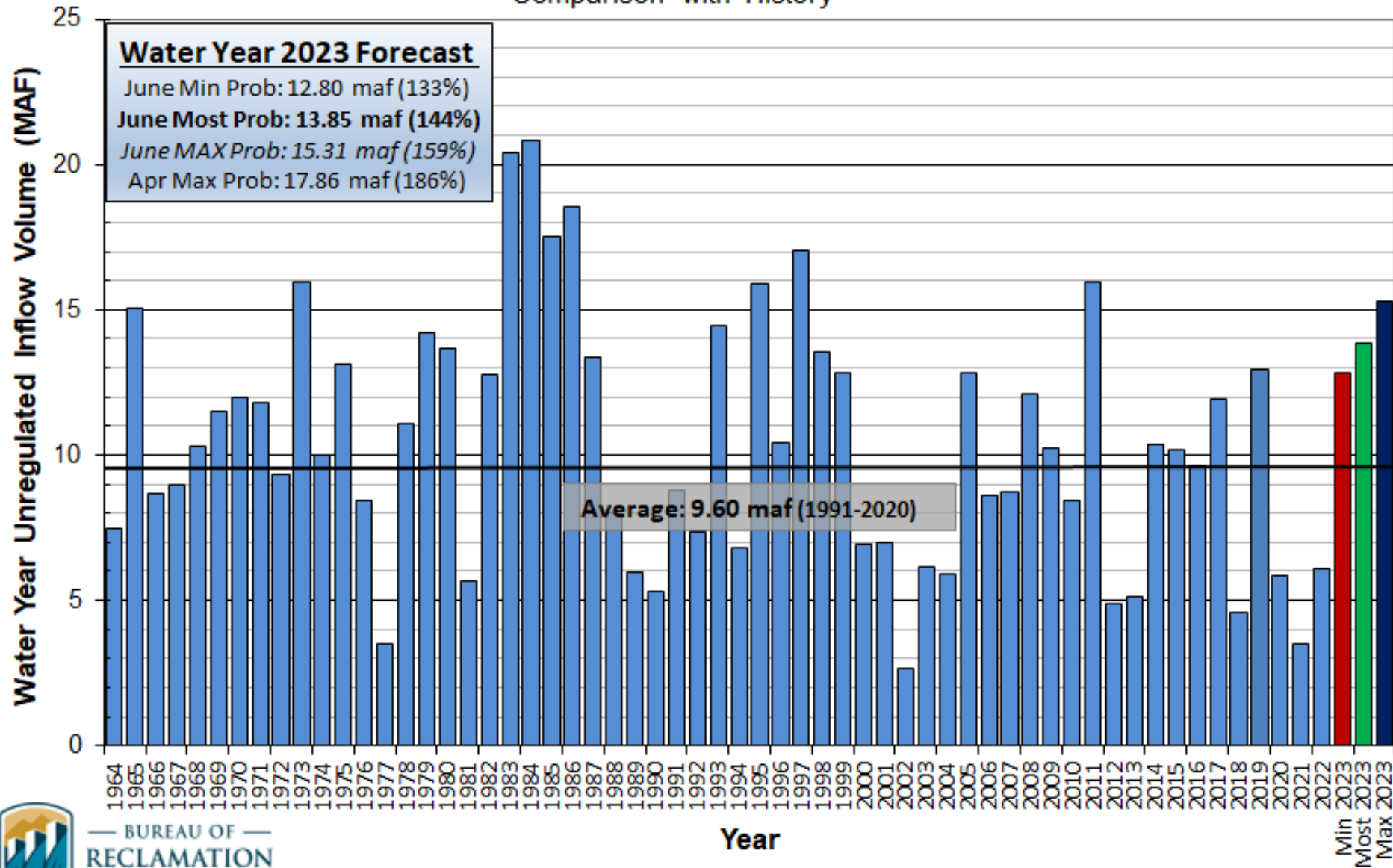
¹Averages are based on the 1991 through 2020 period of record.



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 May 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



Most Probable May Forecast Water Year 2023

April – July 2023
Forecasted Unregulated Inflow
as of May 4, 2023

Reservoir	Inflow (kaf)	Percent of Avg ¹
Fontenelle	830	113
Flaming Gorge	1,300	135
Blue Mesa	830	131
Navajo	1,010	160
Powell	11,000	172

Water Year 2023
Unregulated Inflow Forecast
as of May 4, 2023

Reservoir	Inflow (kaf)	Percent of Avg ¹
Fontenelle	1,135	106
Flaming Gorge	1,658	118
Blue Mesa	1,083	120
Navajo	1,260	138
Powell	14,170	148

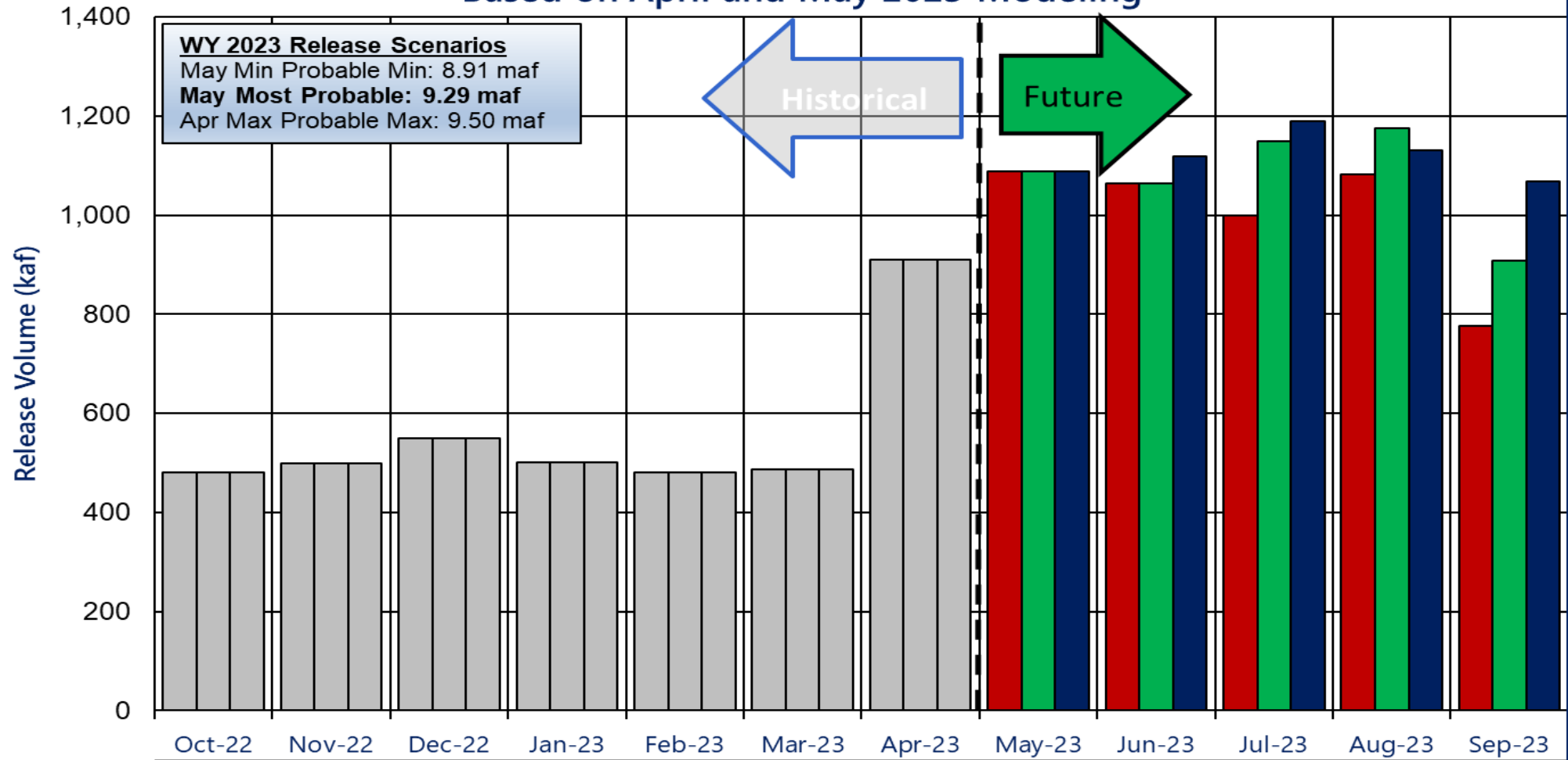
¹Averages are based on the 1991 through 2020 period of record.



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2023

Based on April and May 2023 Modeling



	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23
	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
■ May Min Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,000	1,064,000	1,000,000	1,082,000	776,145
■ May Most Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,000	1,064,000	1,150,000	1,175,000	908,947
■ April Max Probable	480,052	498,343	549,827	500,751	480,408	486,044	909,310	1,088,000	1,118,000	1,190,000	1,130,000	1,068,705

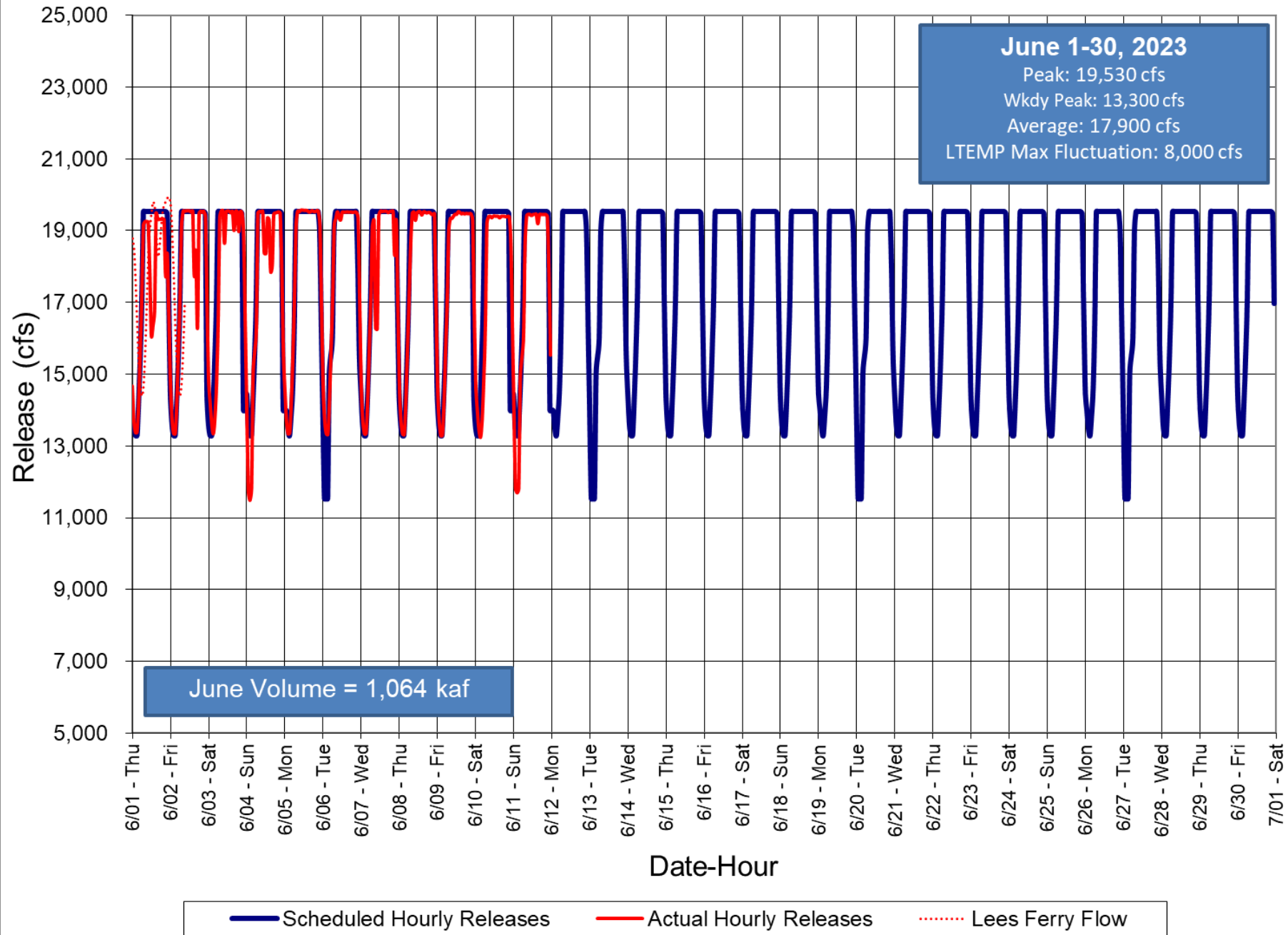
■ May Min Probable

■ May Most Probable

■ April Max Probable



Glen Canyon Dam Hourly Release Pattern June 2023



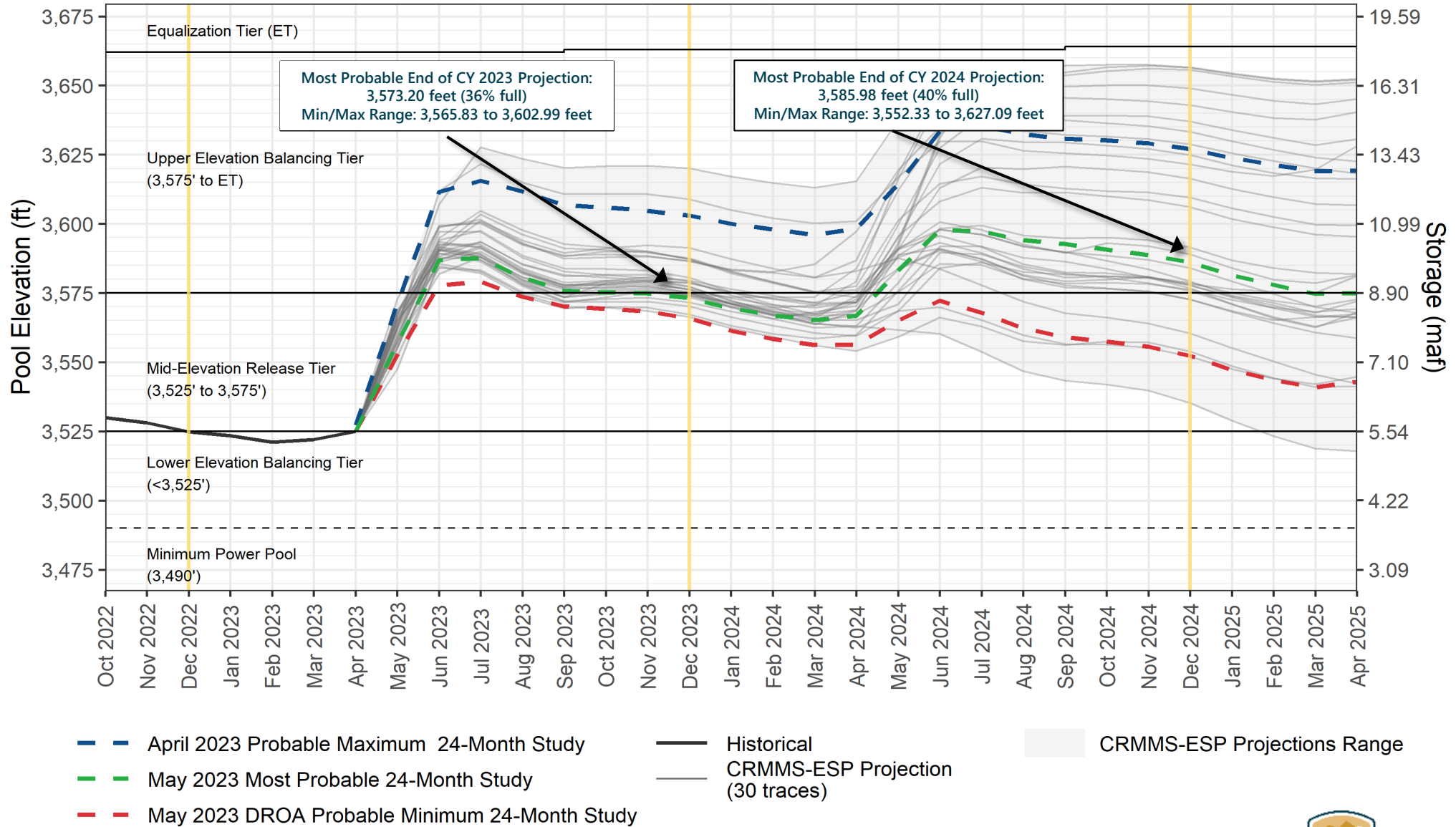
Reclamation Operational Modeling Model Comparison

	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 May 2023

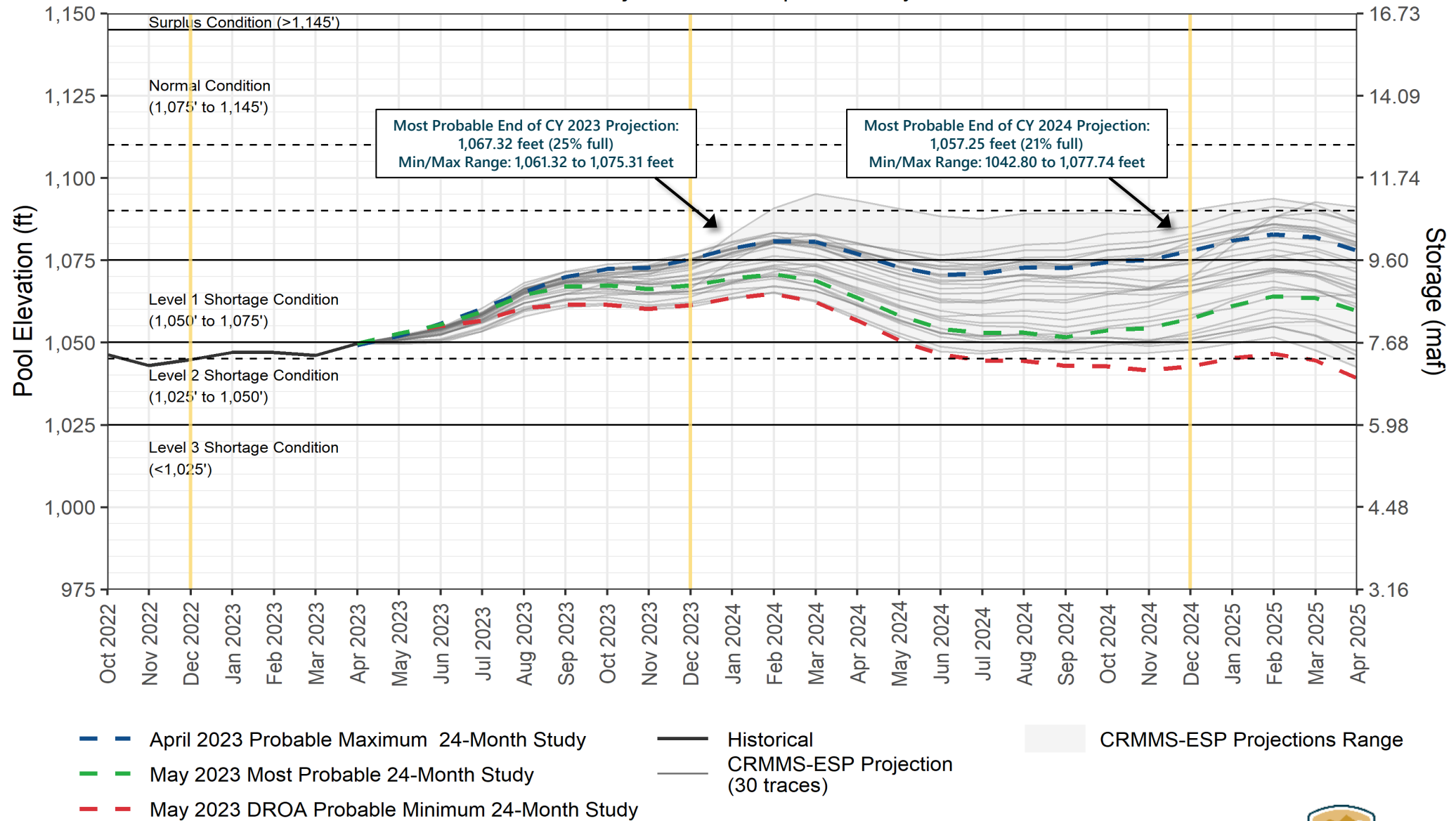


¹ Projected Lake Powell end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.



Lake Mead End-of-Month Elevations¹

CRMMS Projections from April and May 2023



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

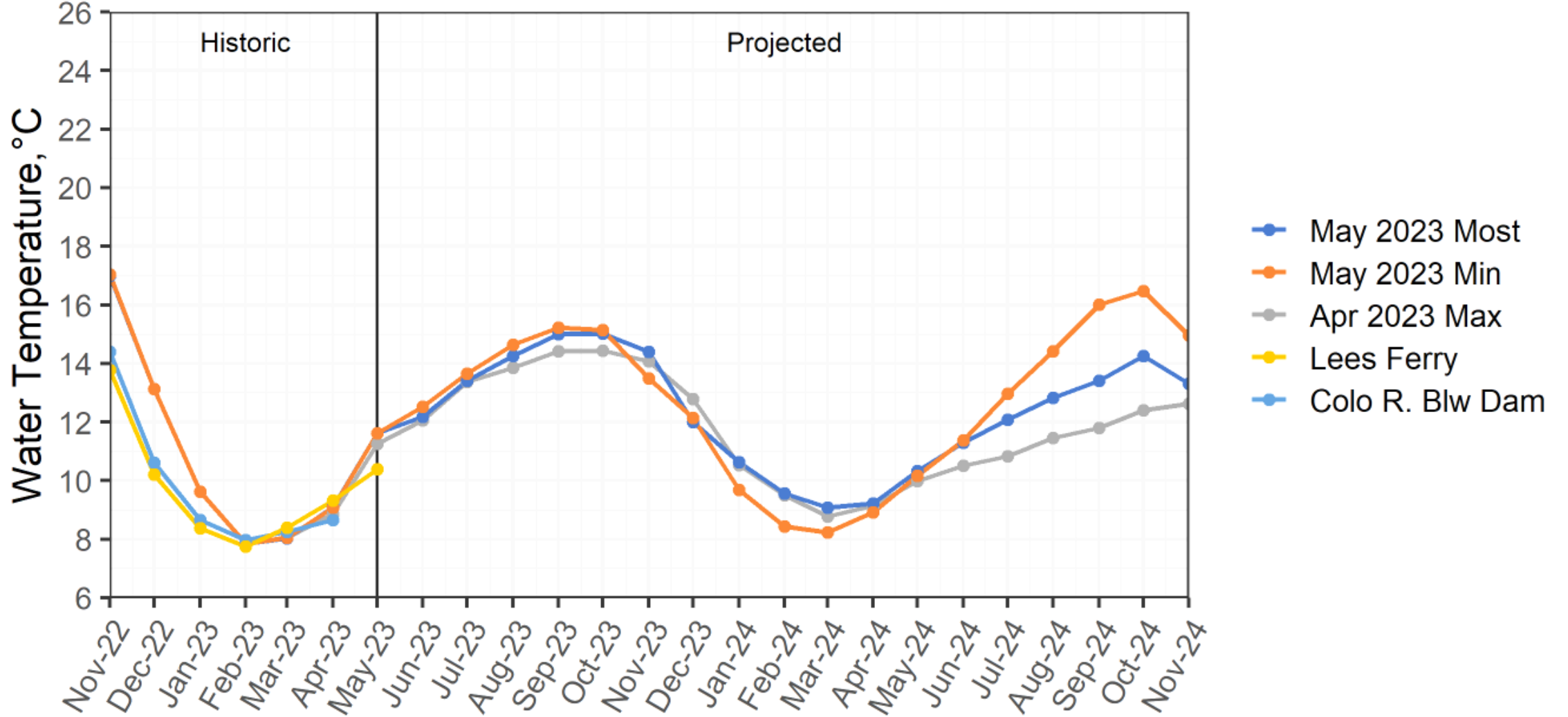


Water Quality



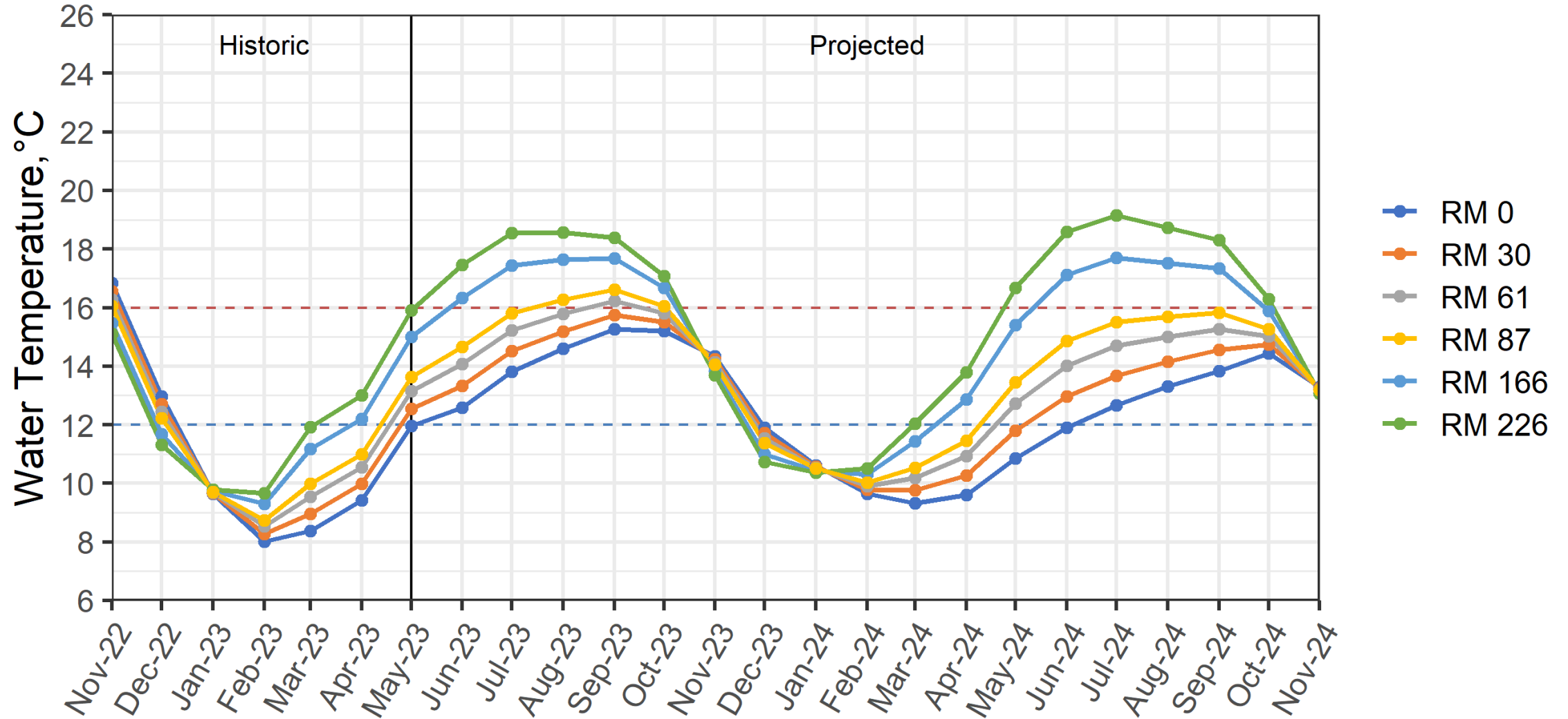
Lake Powell Release Temperature

Projected Temperature based on April 2023 Forecast



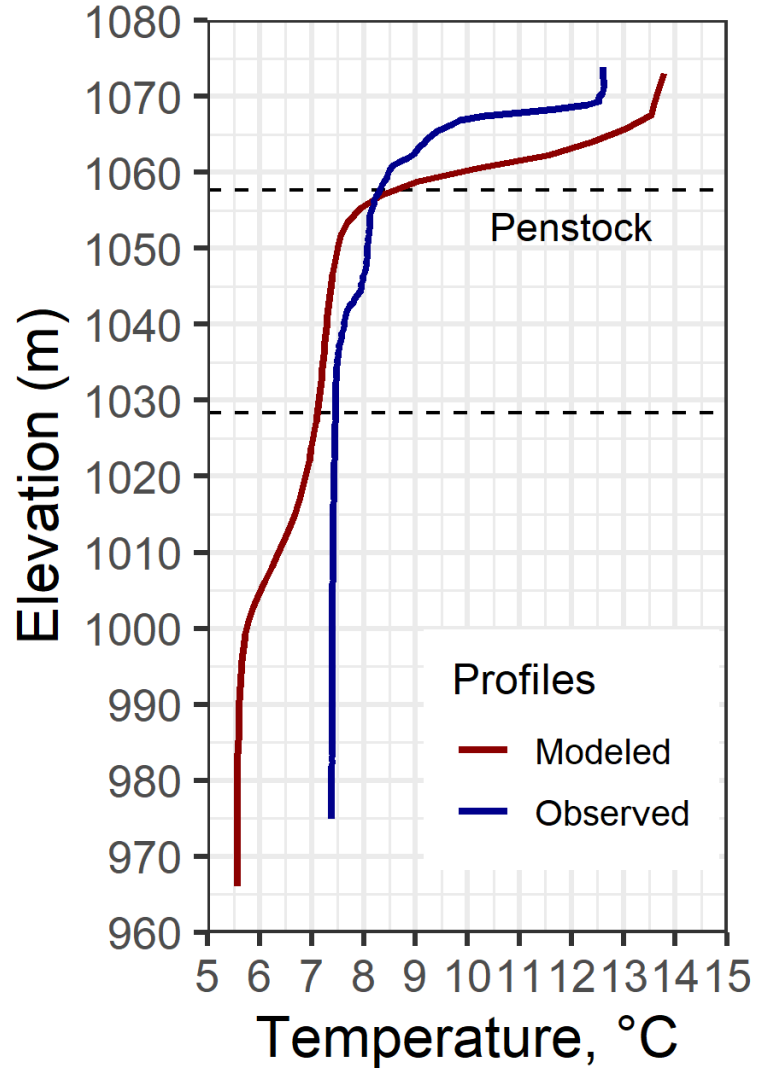
Colorado River, Grand Canyon Water Temperature

Projected Temperature based on April 2023 Forecast



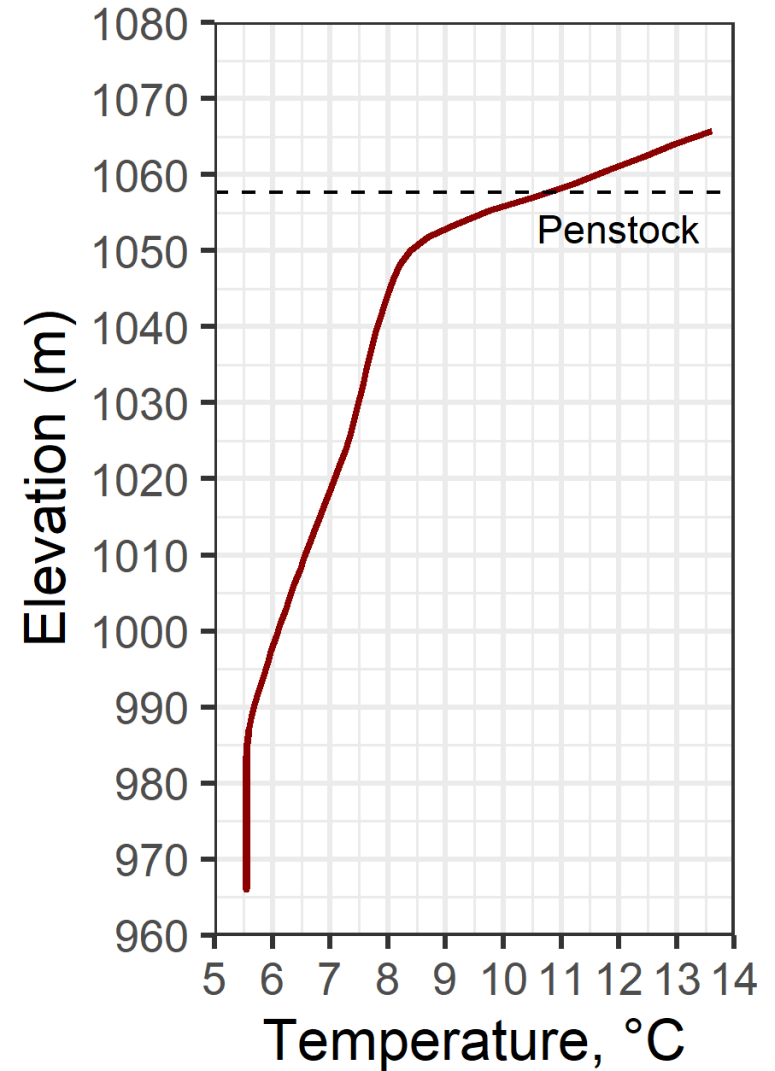
Profile Comparison

April 25, 2023



Powell Forebay

May 11, 2023



Questions?



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