



— BUREAU OF —
RECLAMATION

Glen Canyon Monthly Operations Call

Basin Hydrology and Operations

May 18, 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.”

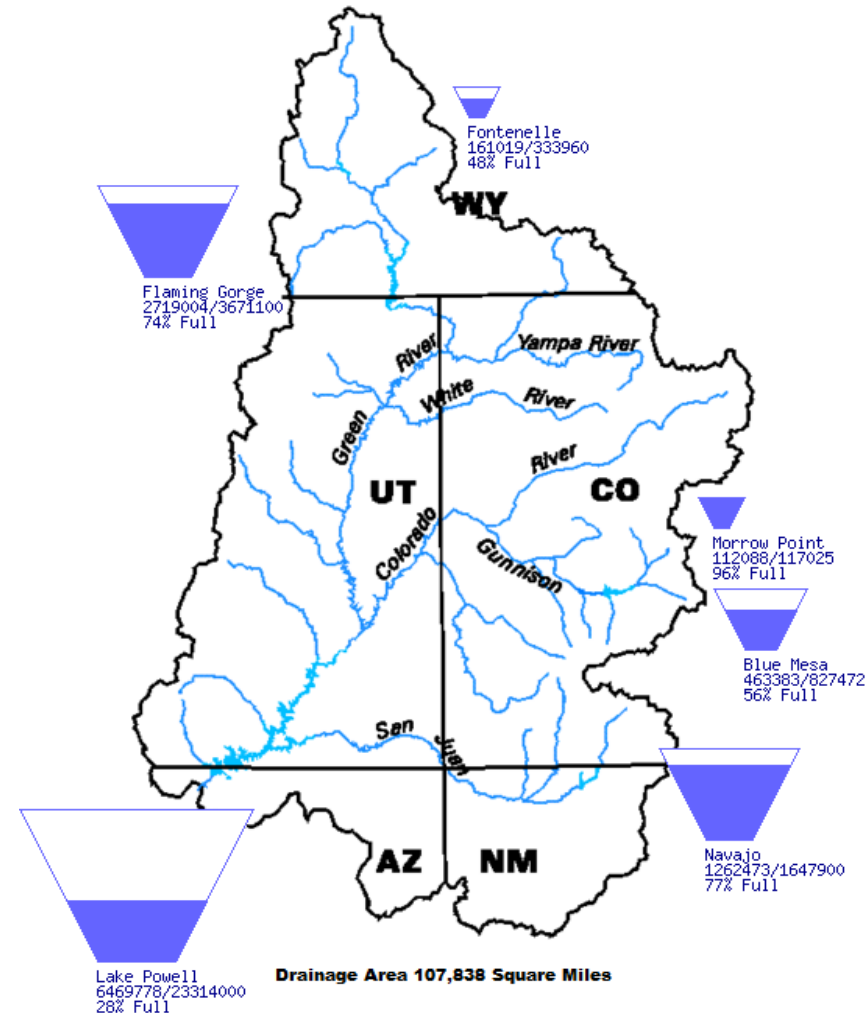


Upper Basin Storage (as of May 17, 2023)

Data Current as of:
05/16/2023

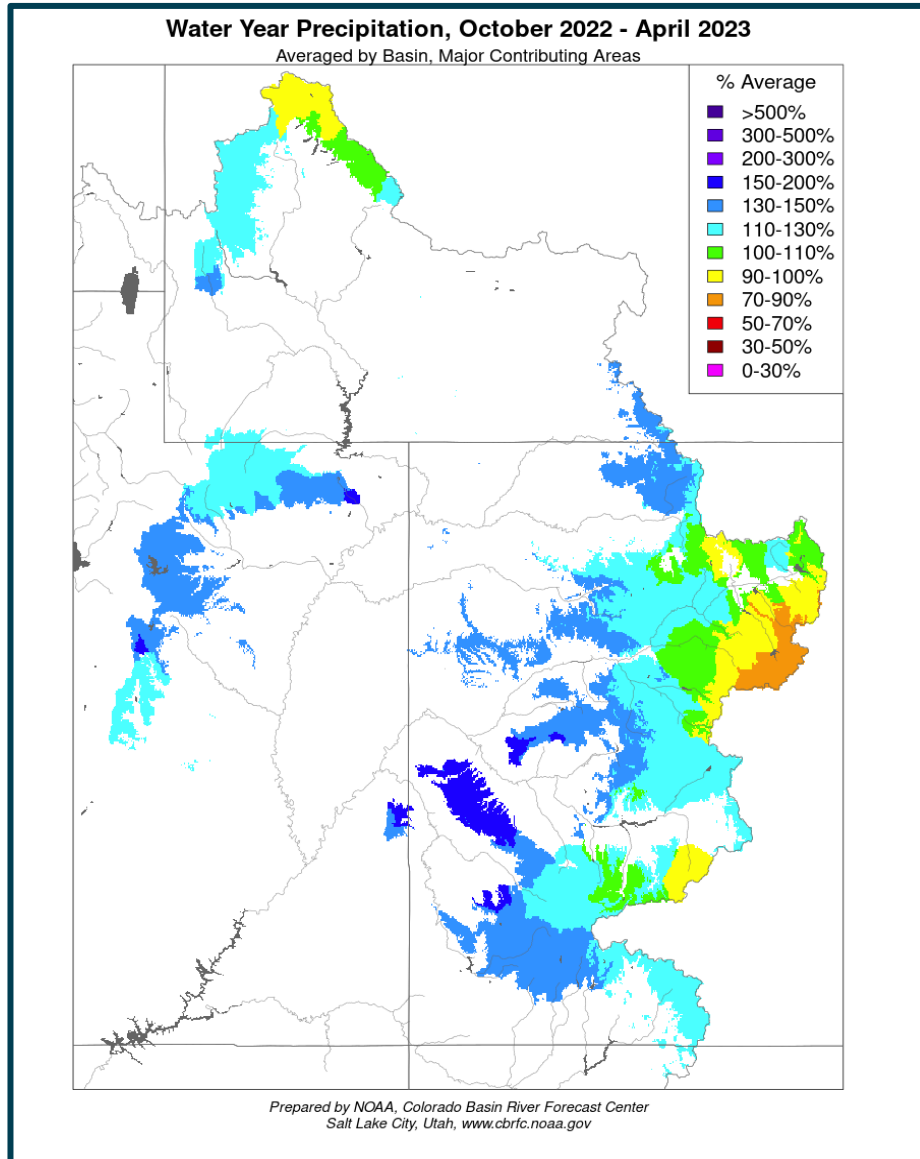
Upper Colorado River Drainage Basin

Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	49	0.16	0.33	6,481.16
Flaming Gorge	74	2.73	3.67	6,014.53
Blue Mesa	57	0.47	0.83	7,475.29
Navajo	77	1.26	1.65	6,057.73
Lake Powell	28	6.55	23.31	3,541.61
UC System Storage	38	11.31	29.79	
Total System Storage	37	21.42	58.48	

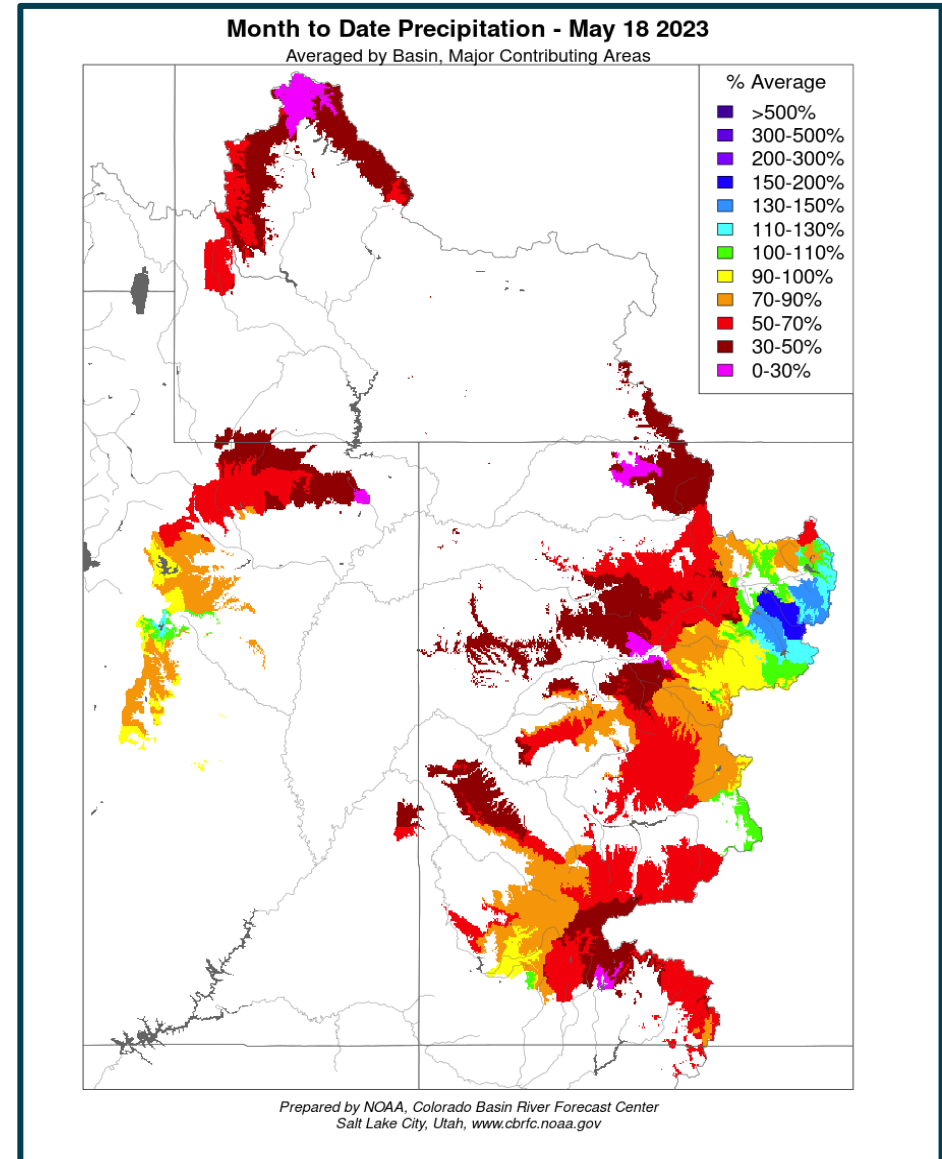


April WY Precipitation and May Month to Date

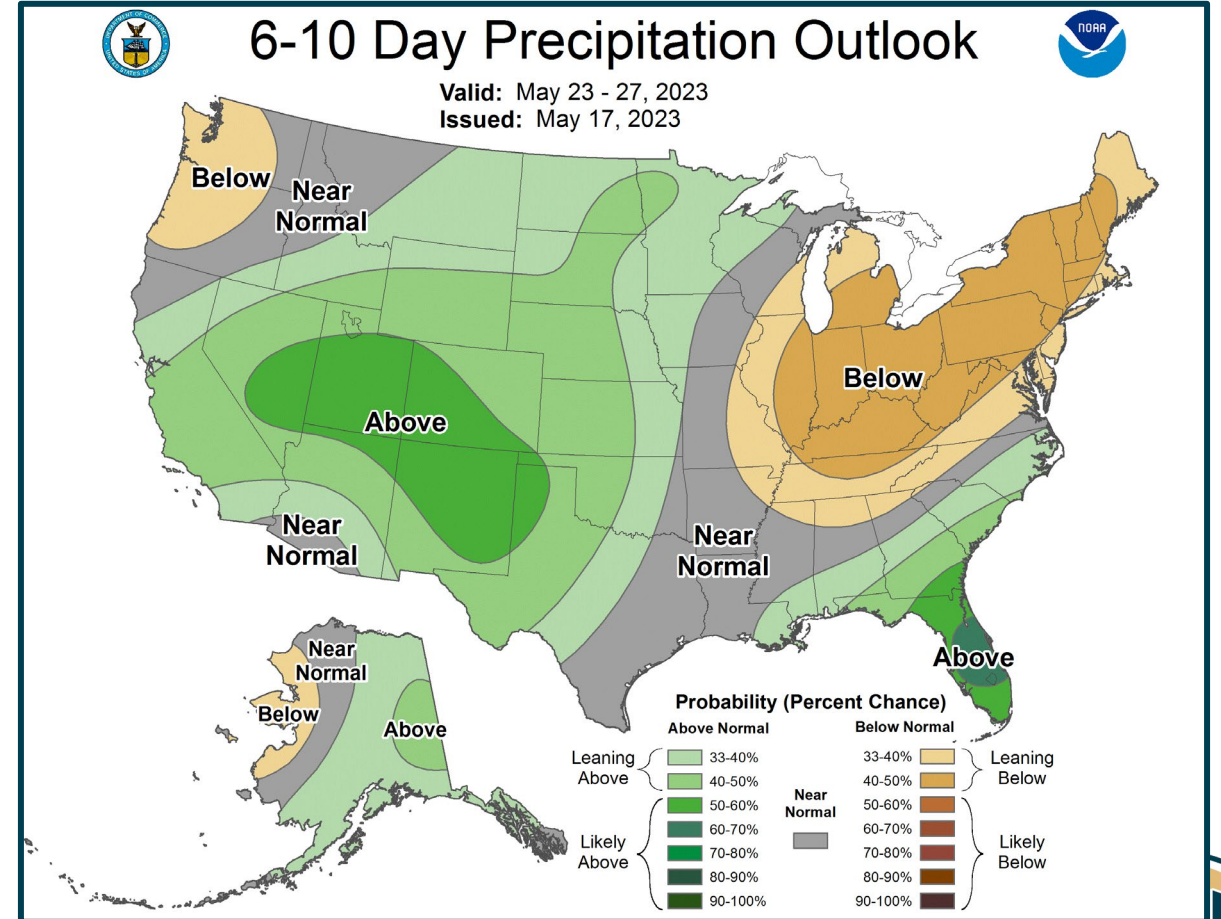
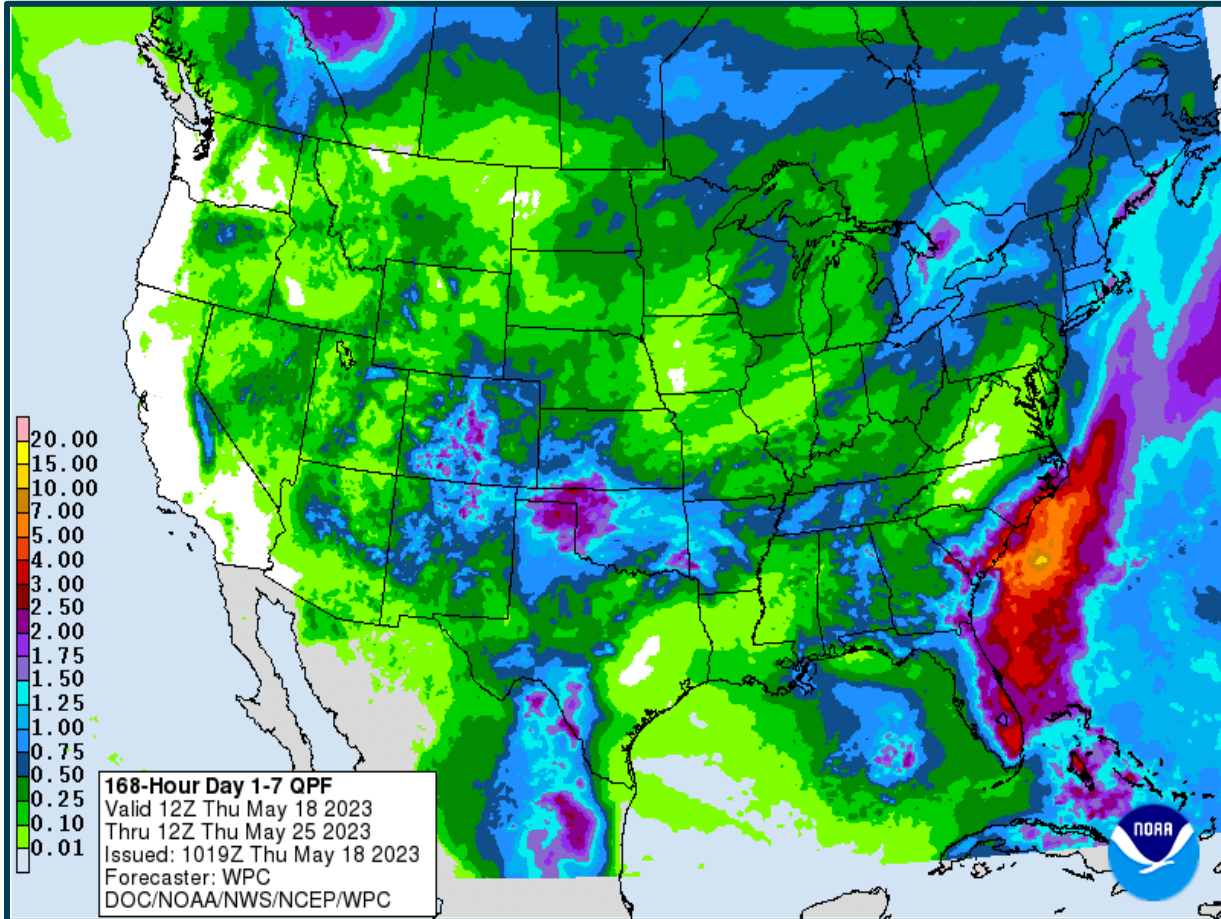
WY Precipitation



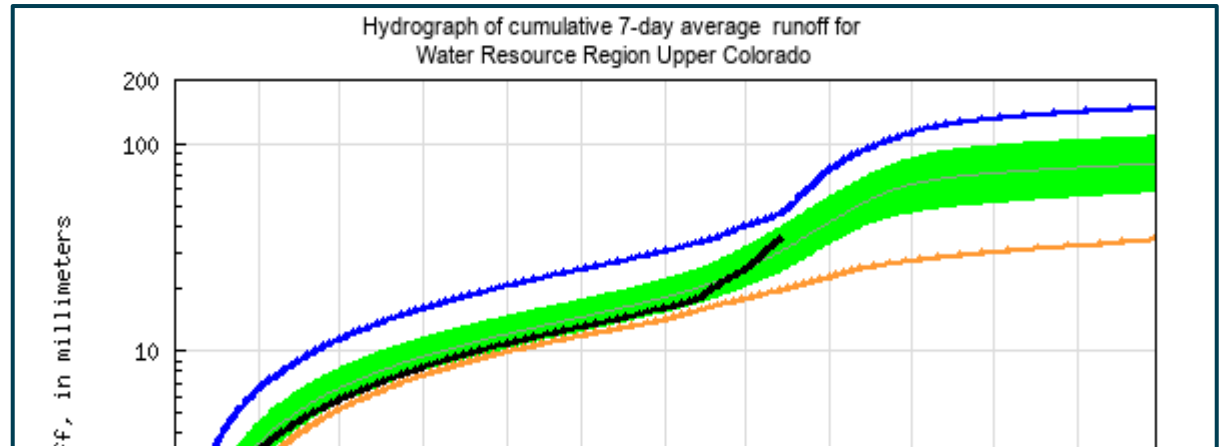
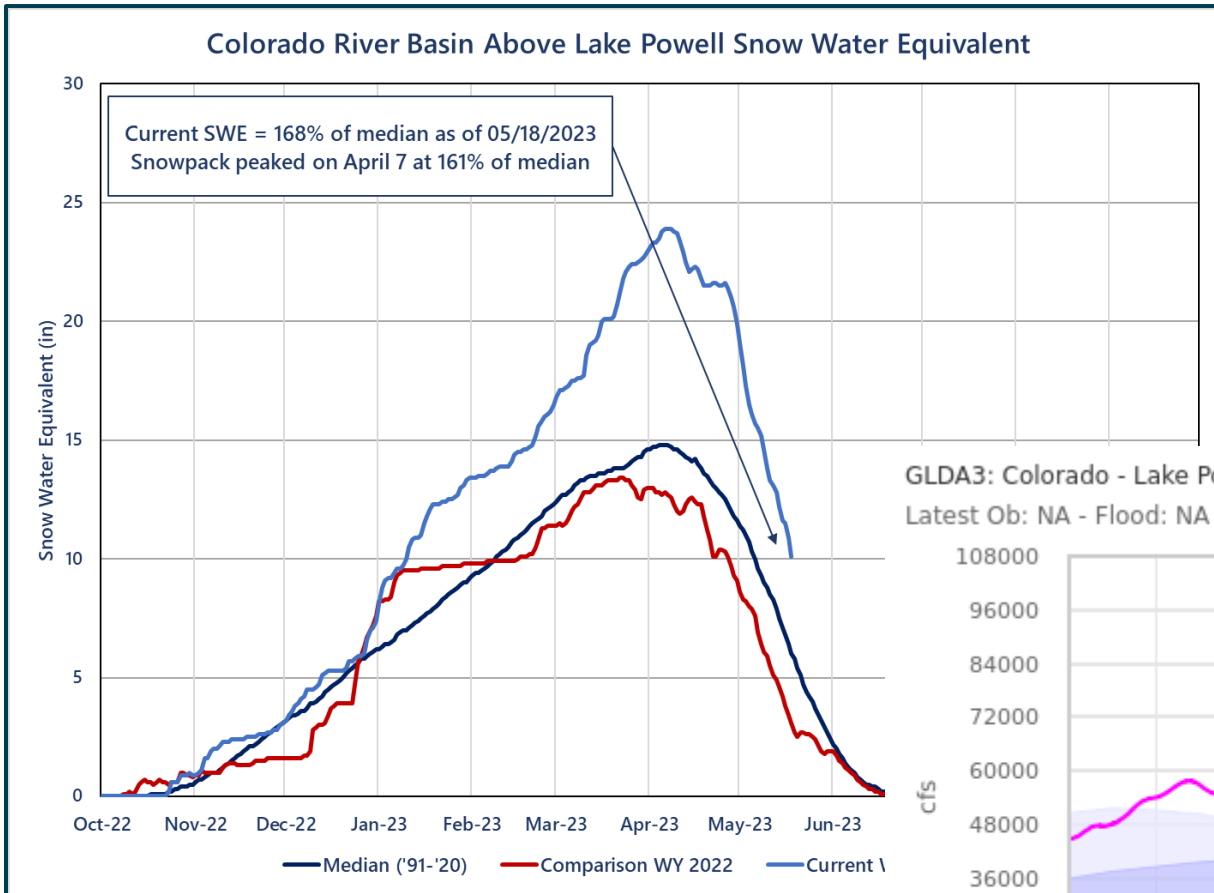
Month to Date Precipitation



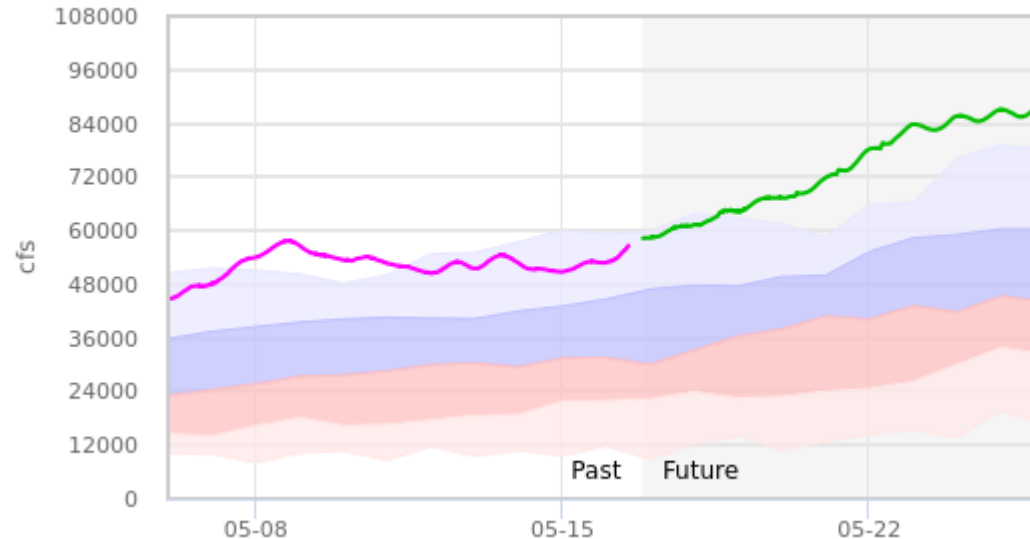
Weather Prediction Center and Climate Prediction Center Precipitation Forecasts



Upper Colorado SWE and Observed Inflows



GLDA3: Colorado - Lake Powell, Glen Cyn Dam, At - Fcst Date: 05/16/16Z - NOAA/CBRFC
Latest Ob: NA - Flood: NA - Action: NA



25th and 75th percentiles
off (2002)
off (1984)
(3)

JUN JUL AUG SEP

Last updated: 2023-05-15

[cumrunoff](#)



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

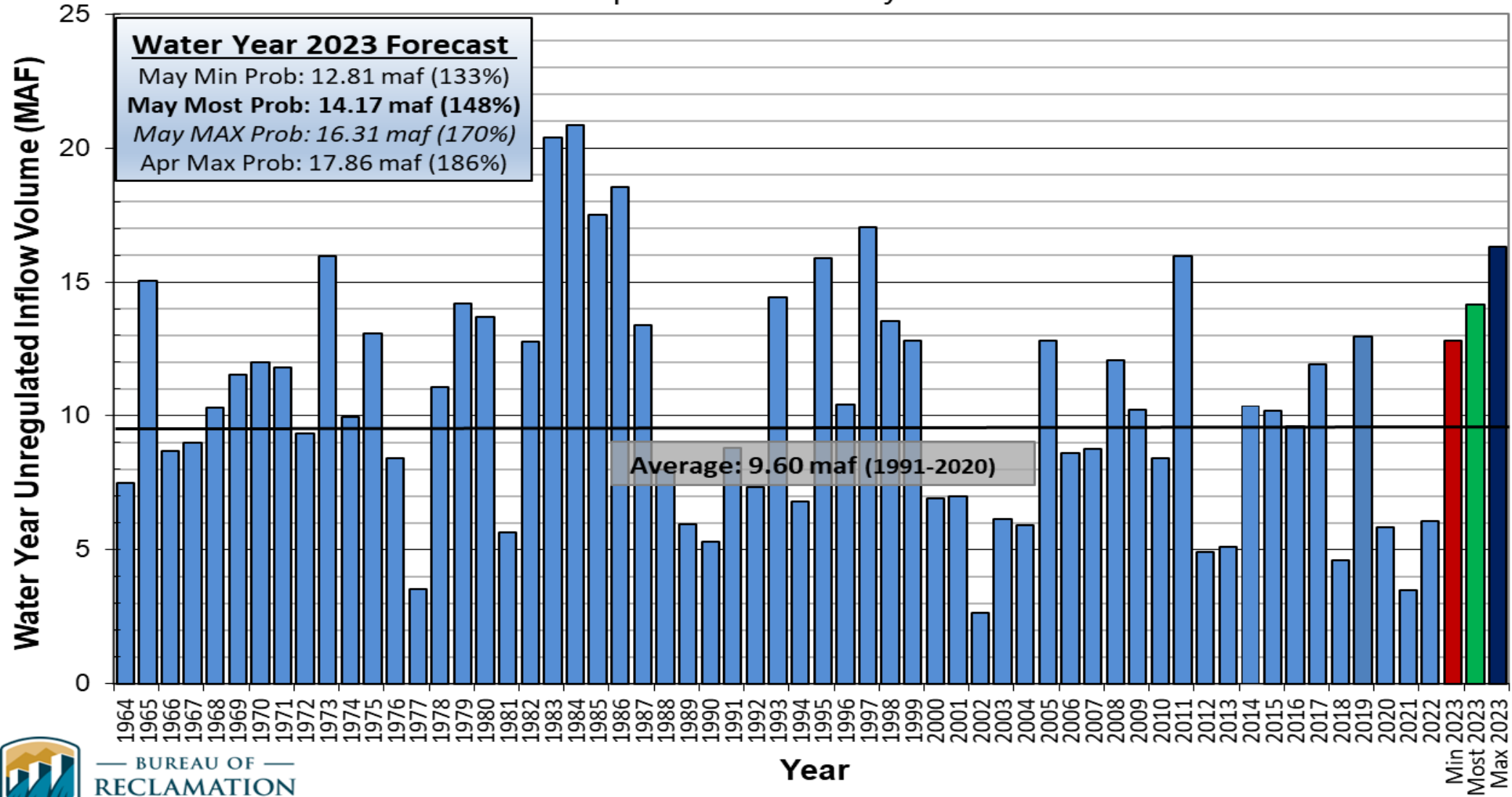
¹Averages are based on the 1991 through 2020 period of record.



Lake Powell Unregulated Inflow

Water Year 2023 Forecast *(issued May 4)*

Comparison with History





Upper Colorado Basin

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



Upper Basin Reservoir Operations in Water Year 2023

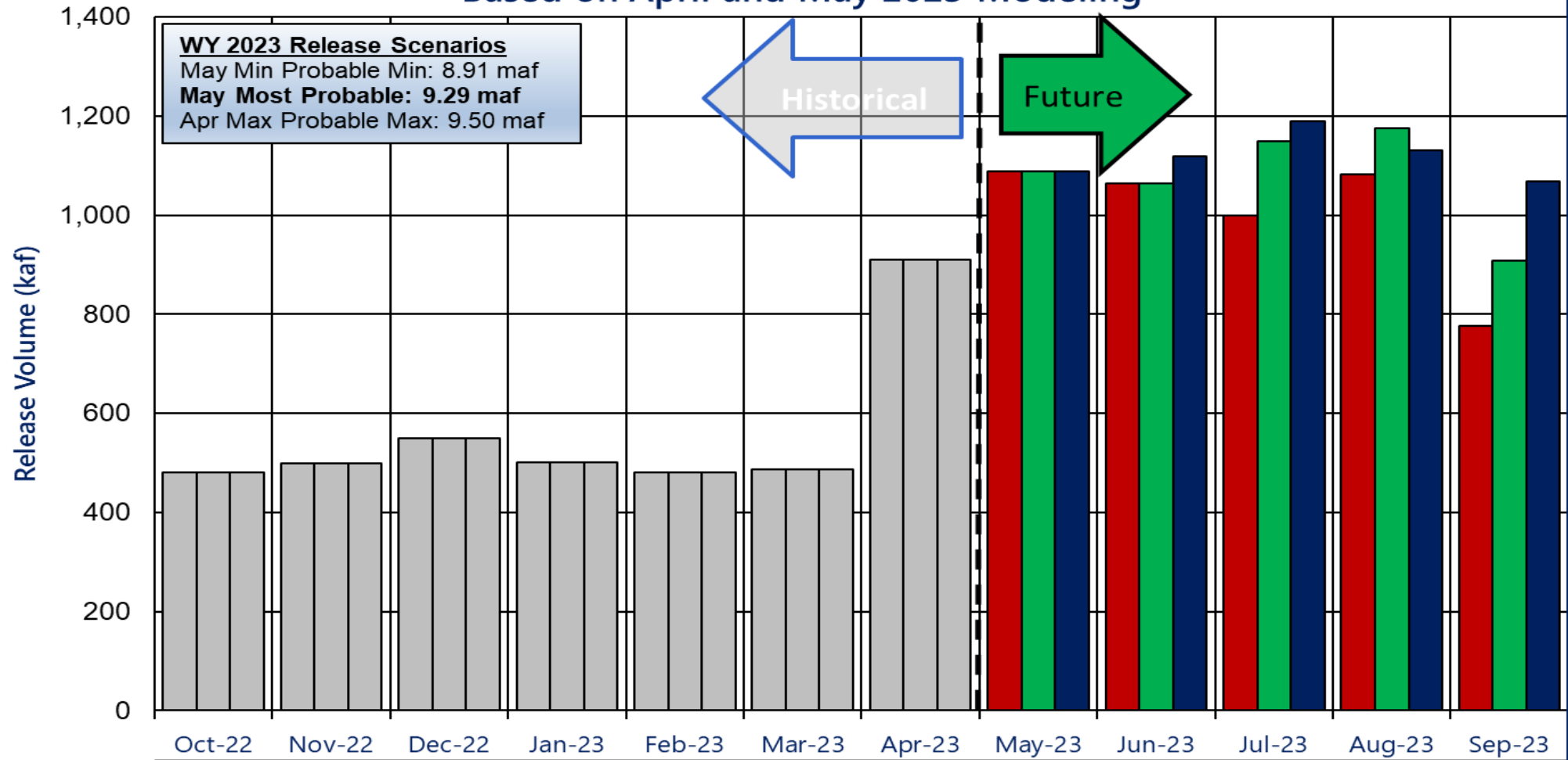
- Lake Powell will be operated consistent with the 2007 Interim Guidelines, the Upper Basin Drought Response Operations Agreement and Upper Basin Records of Decision
- Lake Powell's projected end of calendar year (CY) 2022 "tier determination" elevation in the August 2022 24-Month Study determined Lake 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



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

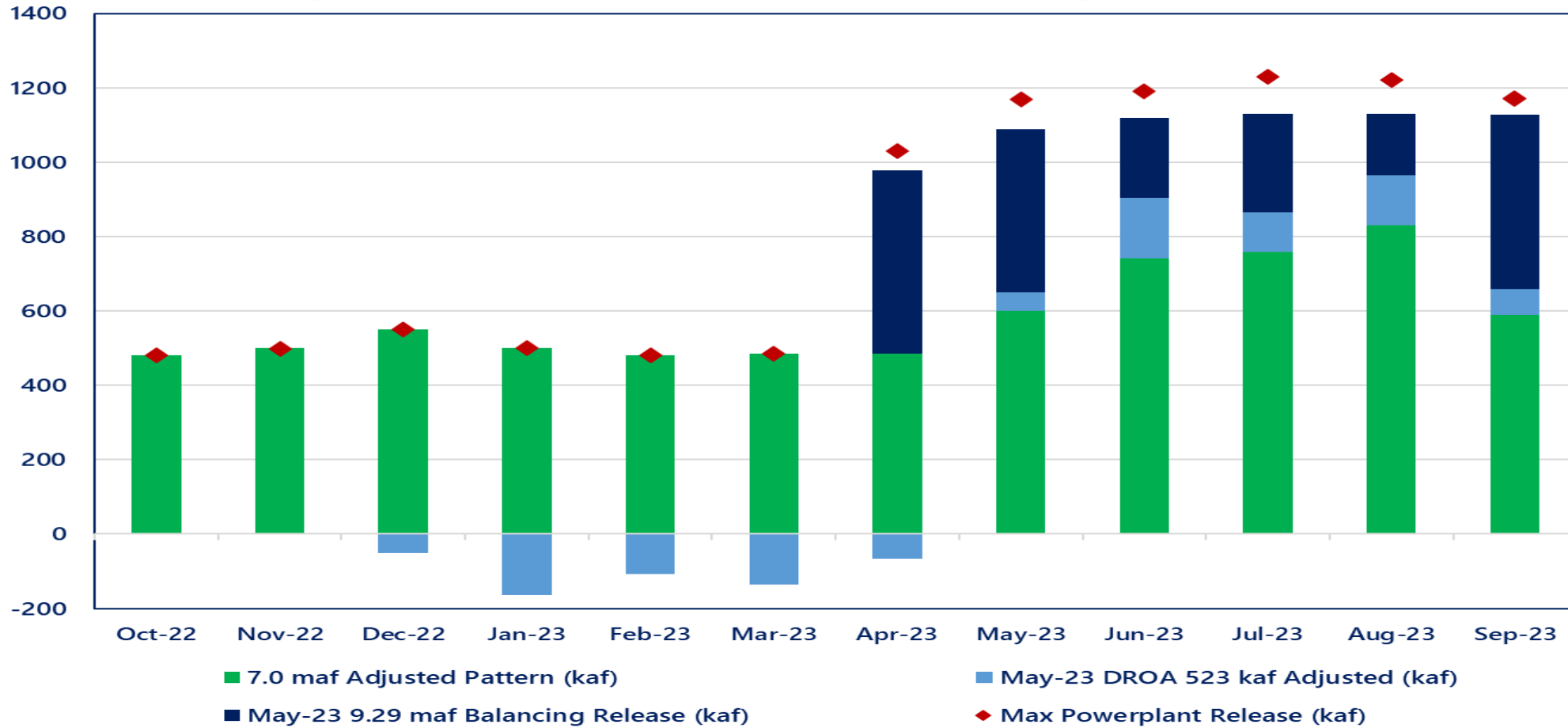
■ May Most Probable

■ April Max Probable



WY2023 May 24MS GCD Release Scenarios

Lake Powell Monthly Release Volume Distribution for WY2023 7.0 maf
Adjusted DROA Release of 523 kaf, and Balancing Release Scenarios

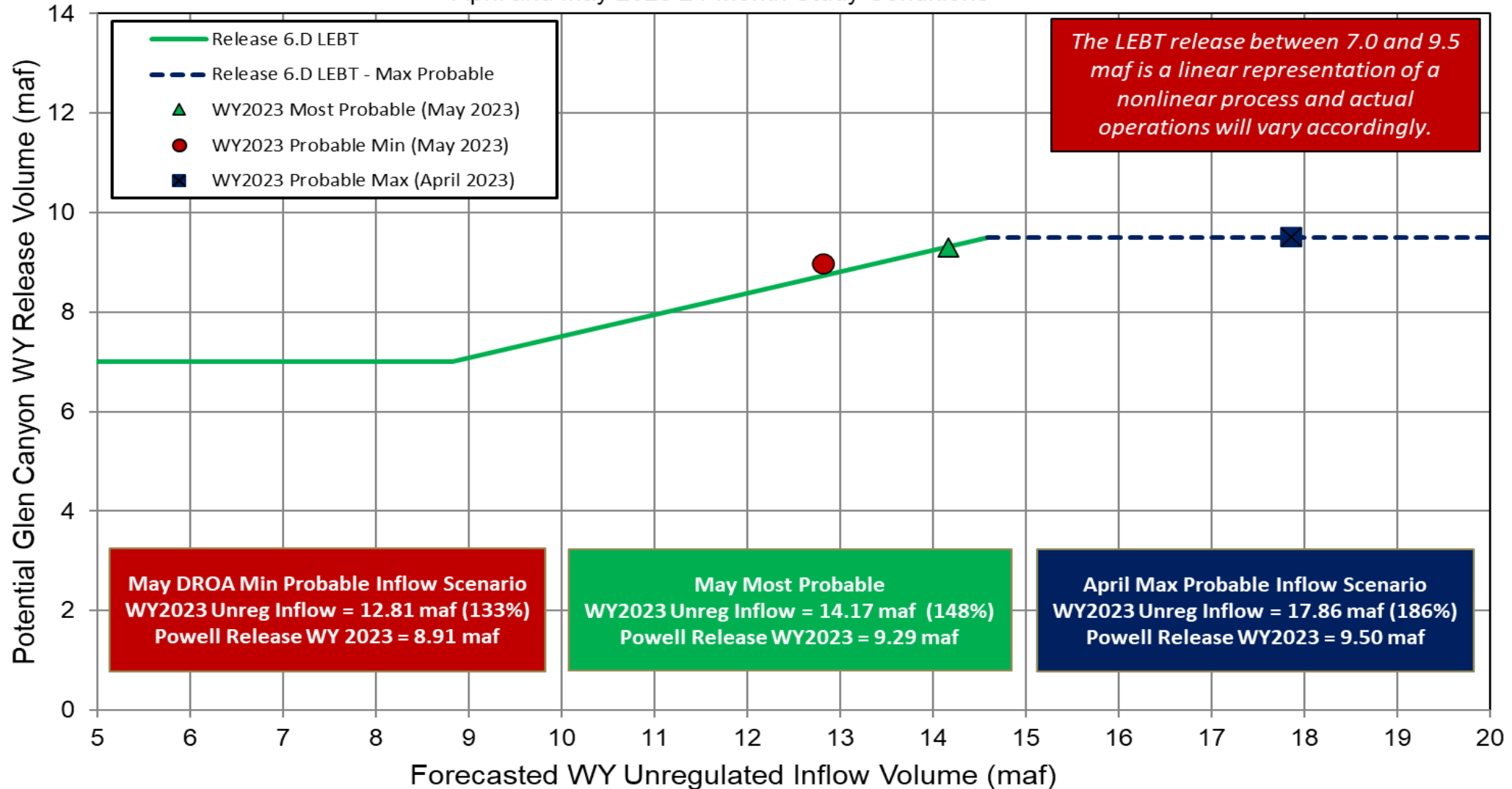


	WY2023	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Total
Max Powerplant Release (kaf)		480	498	550	501	480	485	1,030	1,170	1,190	1,230	1,220	1,170	
7.0 maf LTEMP Pattern (kaf)		480	500	600	664	587	620	552	550	577	652	696	522	7,000
May 24MS Min Prob 8.91 maf Pattern (kaf)		480	498	550	501	480	486	909	1,088	1,064	1,000	1,082	776	8,914
May 24MS Most Prob maf Release (kaf)		480	498	550	501	480	486	909	1,088	1,064	1,150	1,175	909	9,291
Potential 9.5 maf Release (kaf)		480	498	550	501	480	486	909	1,088	1,118	1,200	1,190	999	9,500



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>



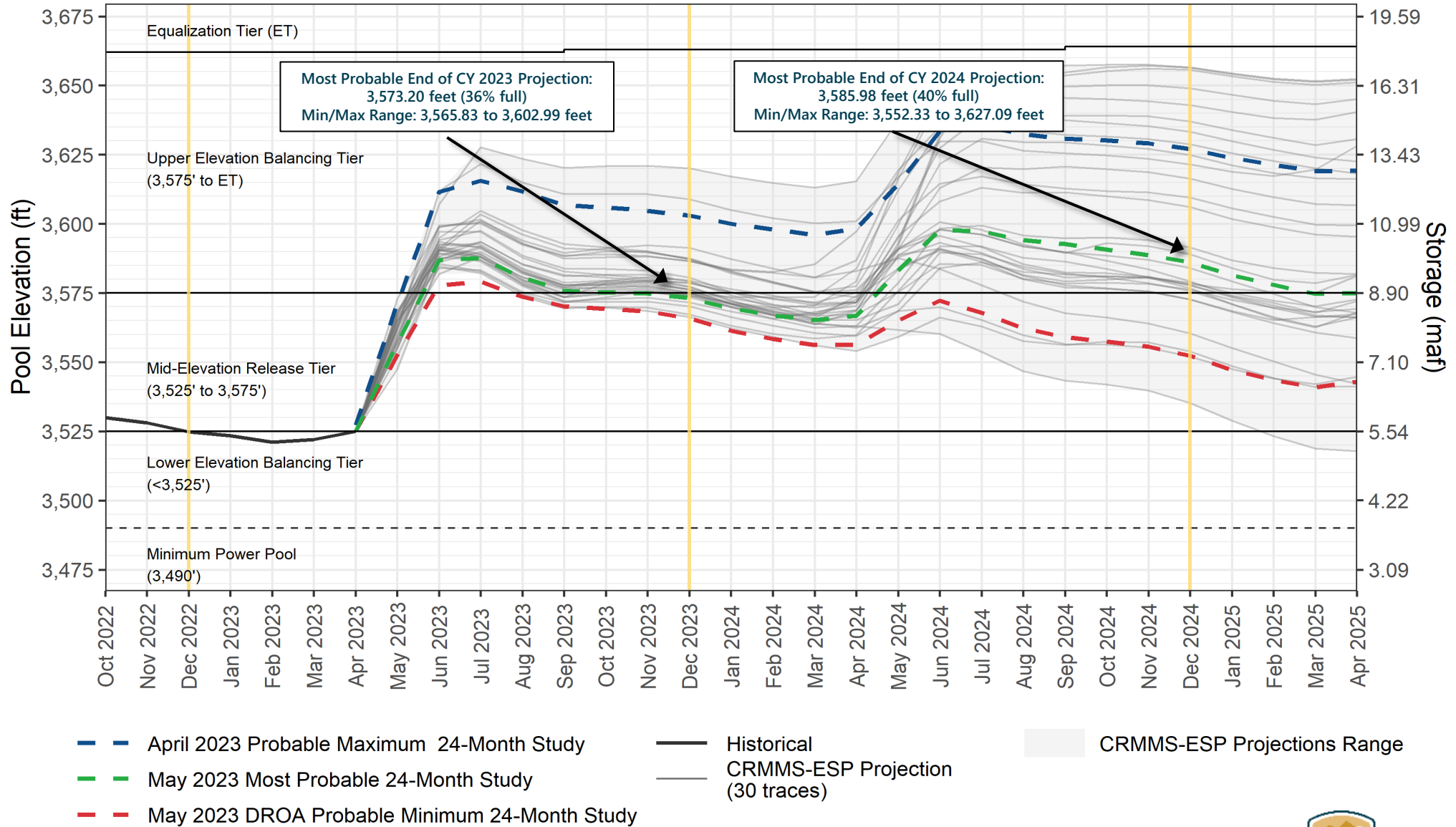
Reclamation Operational Modeling Model Comparison

	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 May 2023

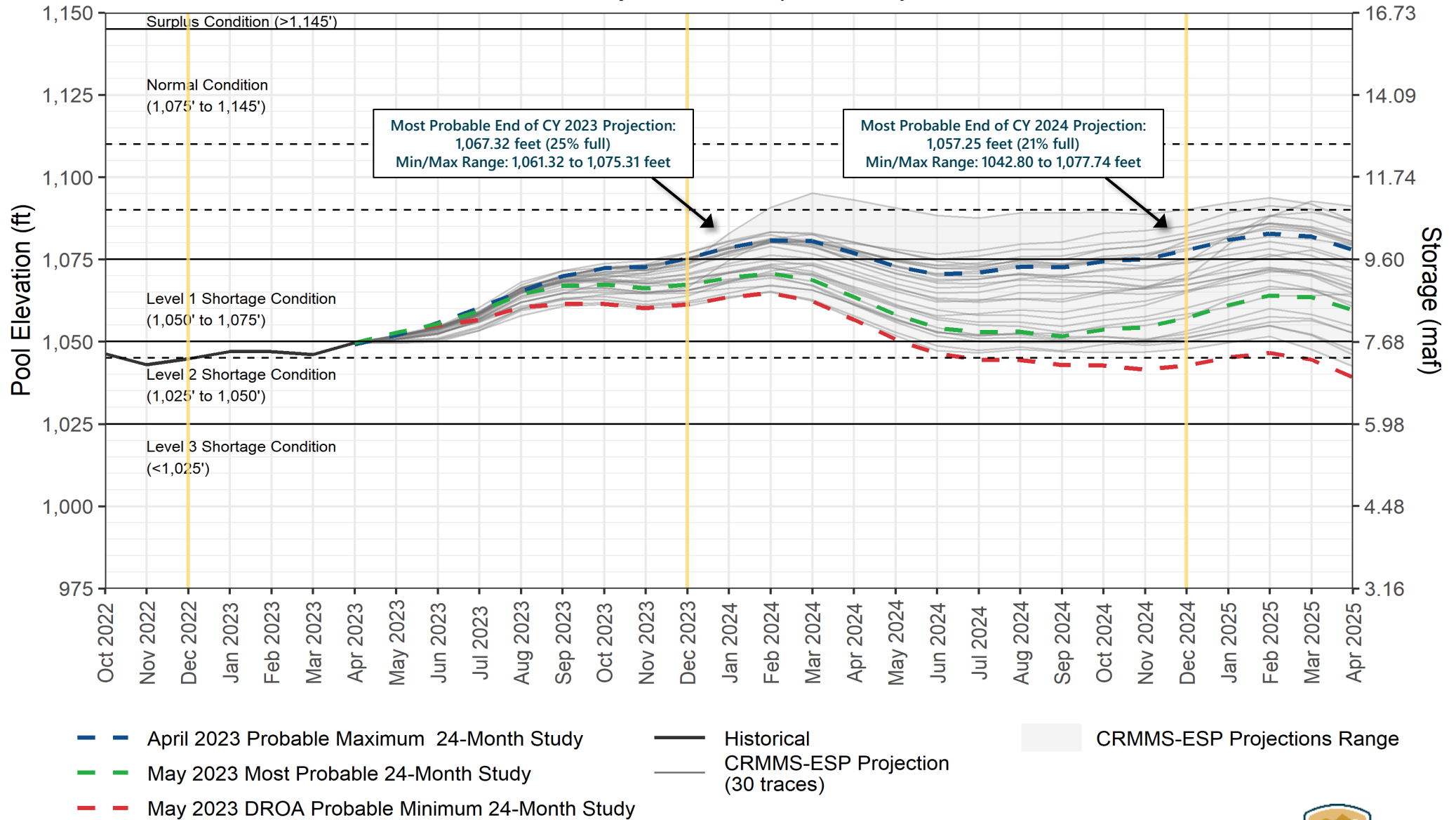


¹ Projected Lake Powell end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.



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.





Upper Colorado Basin

Hydropower Maintenance



Glen Canyon Dam Power Plant Unit Outage Schedule for 2023

Unit Number	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023	Apr 2023	May 2023	Jun 2023	Jul 2023	Aug 2023	Sep 2023	
1													
2													
3								[Outage Bar]					
4								[Outage Bar]					
5	[Outage Bar]												
6	[Outage Bar]												
7						[Outage Bar]							
8						[Outage Bar]							
Units Available	6	6	6	6	6	6	8	6	6	6	6	6	
Capacity (cfs)	18,200	18,150	18,050	18,000	17,919	17,900	24,500	19,100	19,900	19,900	19,700	19,600	MAY MOST ²
Capacity (kaf/month)	1,120	1,080	1,110	1,110	970	1,090	1,030	1,170	1,180	1,220	1,210	1,170	MAY MOST
Max (kaf) ¹	480	498	549	980	870	698	910	1,088	1,064	1,190	1,130	1,069	9.50 maf
Most (kaf) ¹	480	498	549	501	480	485	910	1,088	1,064	1,150	1,175	909	9.29 maf
Min (kaf) ¹	480	498	549	501	480	485	910	840	890	1,000	1,082	776	8.91 maf
													(updated 05-16-2023)

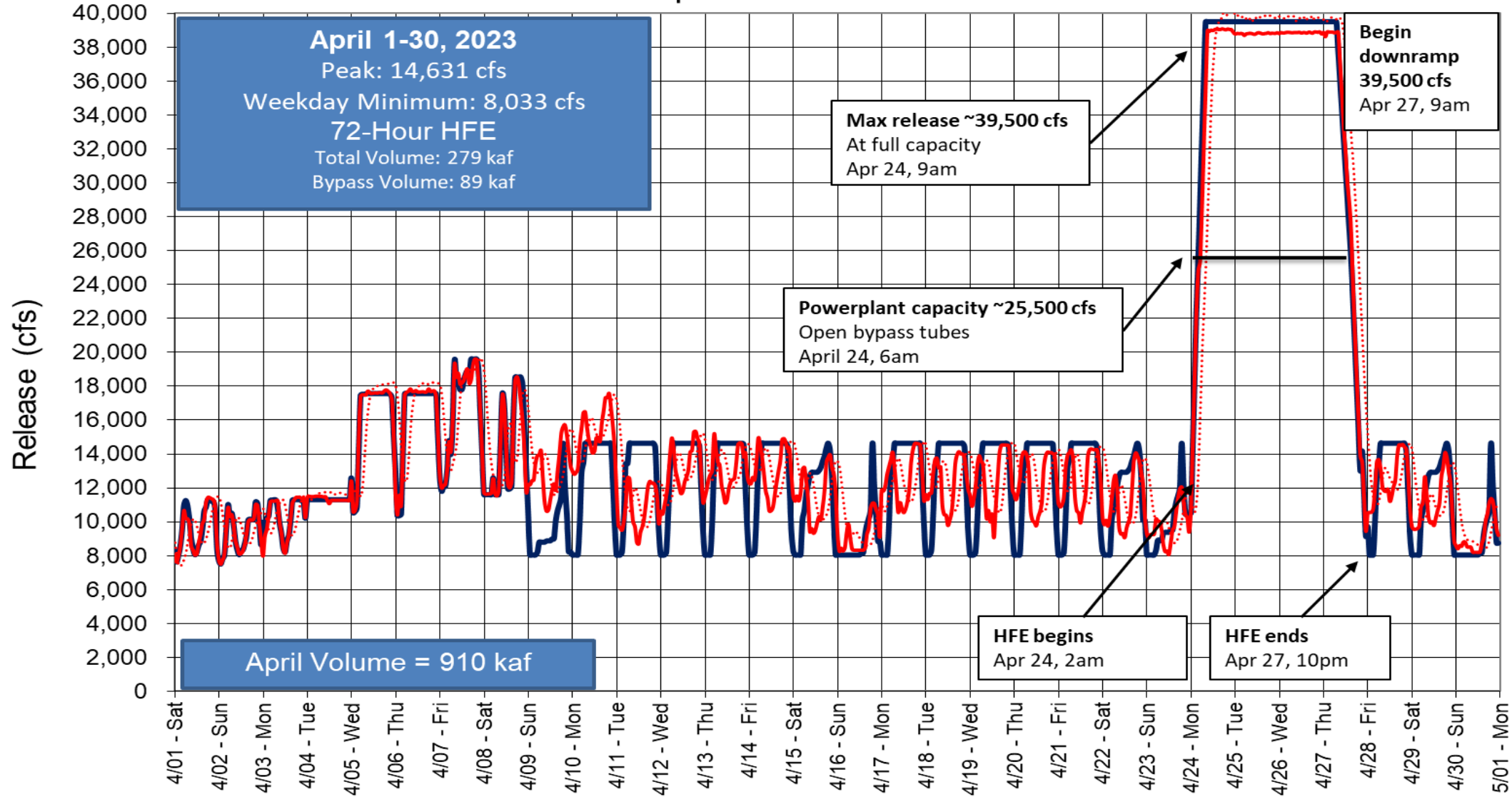
1 Projected release, based on April 2023 24MS for the maximum probable and the May 2023 24MS for the minimum and most probable inflow projections and 24-Month Study model runs.

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 April 2023

Compare HFE Patterns



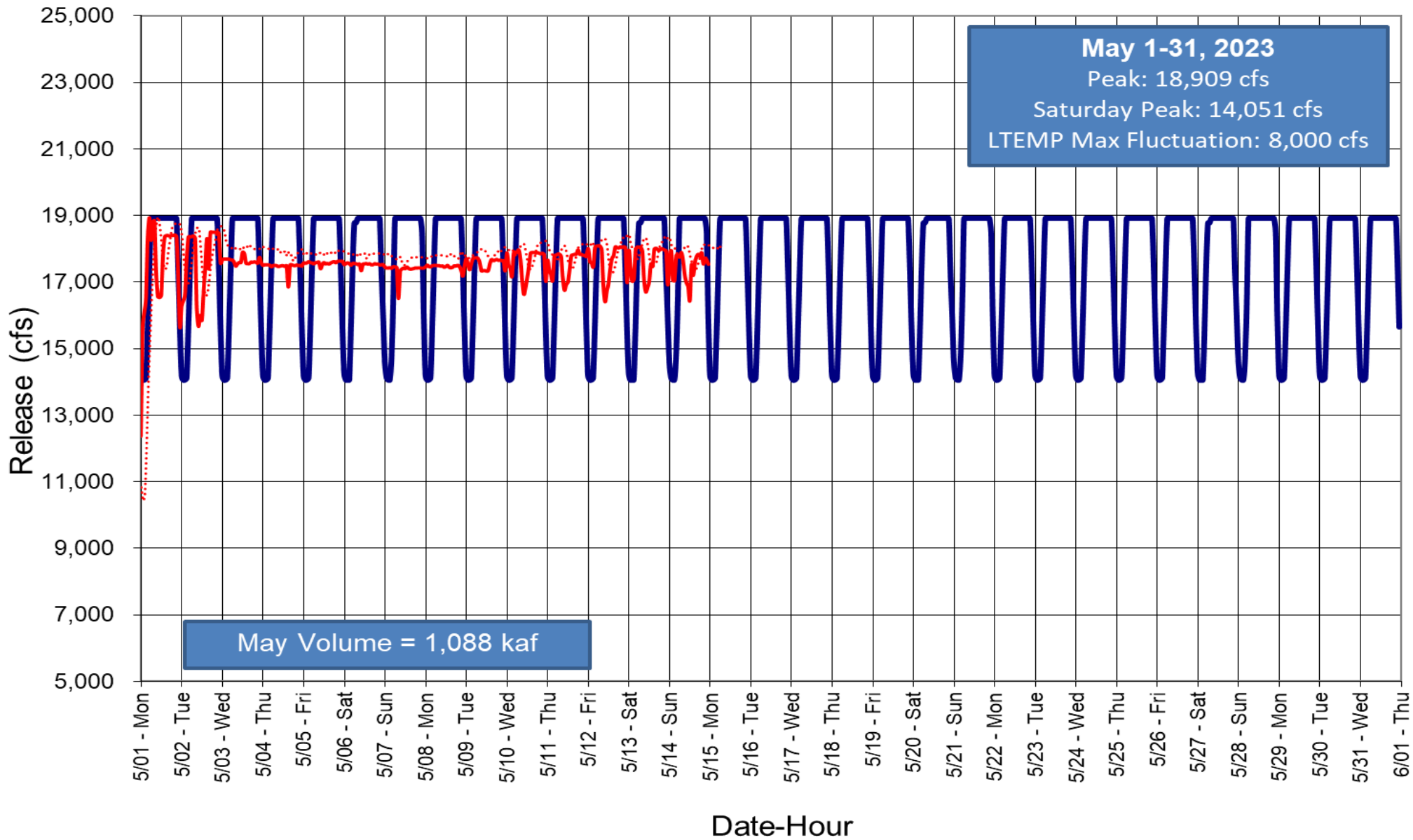
— 72-Hour HFE

— Actual Hourly Releases

..... Lees Ferry Flow



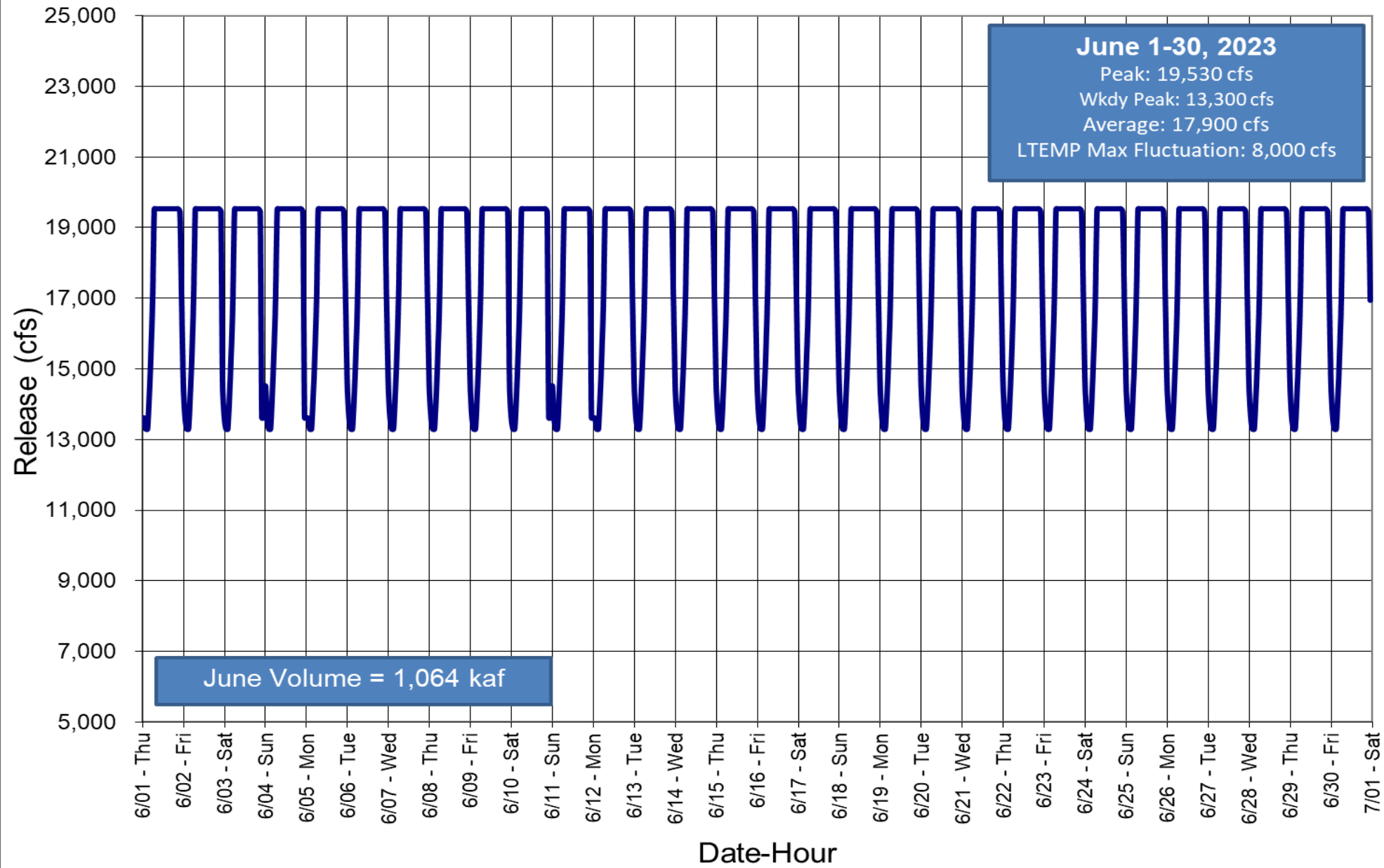
Glen Canyon Dam Hourly Release Pattern May 2023



— Scheduled Hourly Releases
 — Actual Hourly Releases
 ⋯ Lees Ferry Flow



Glen Canyon Dam Hourly Release Pattern June 2023

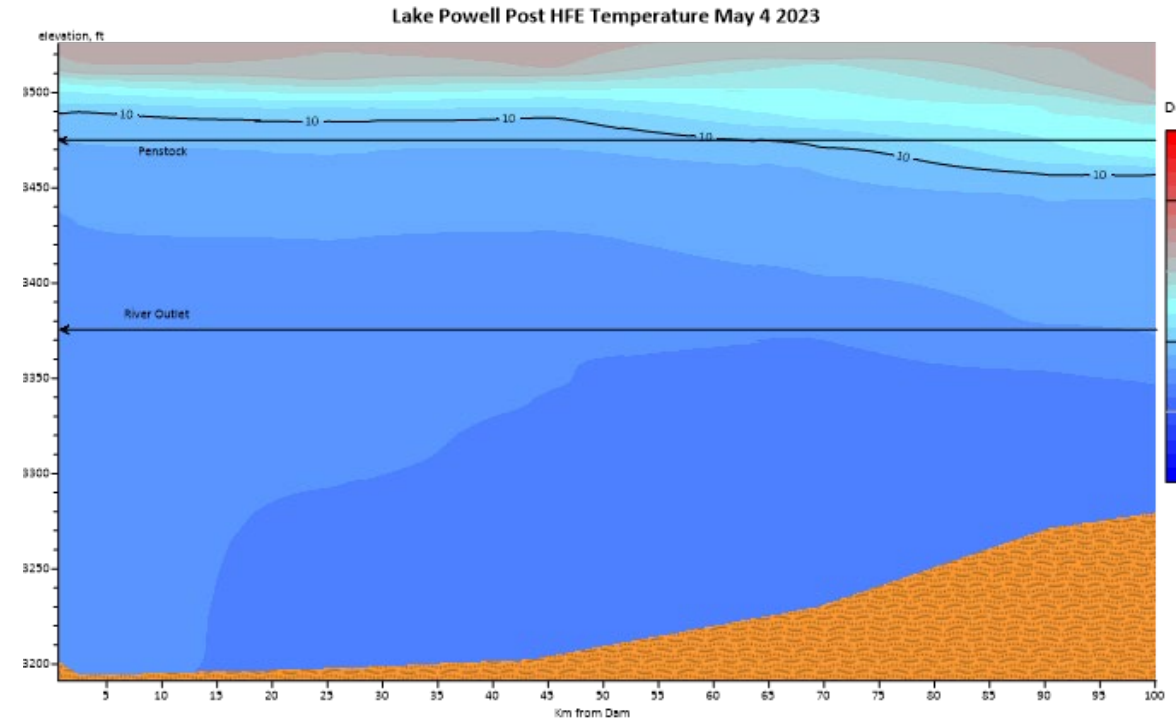
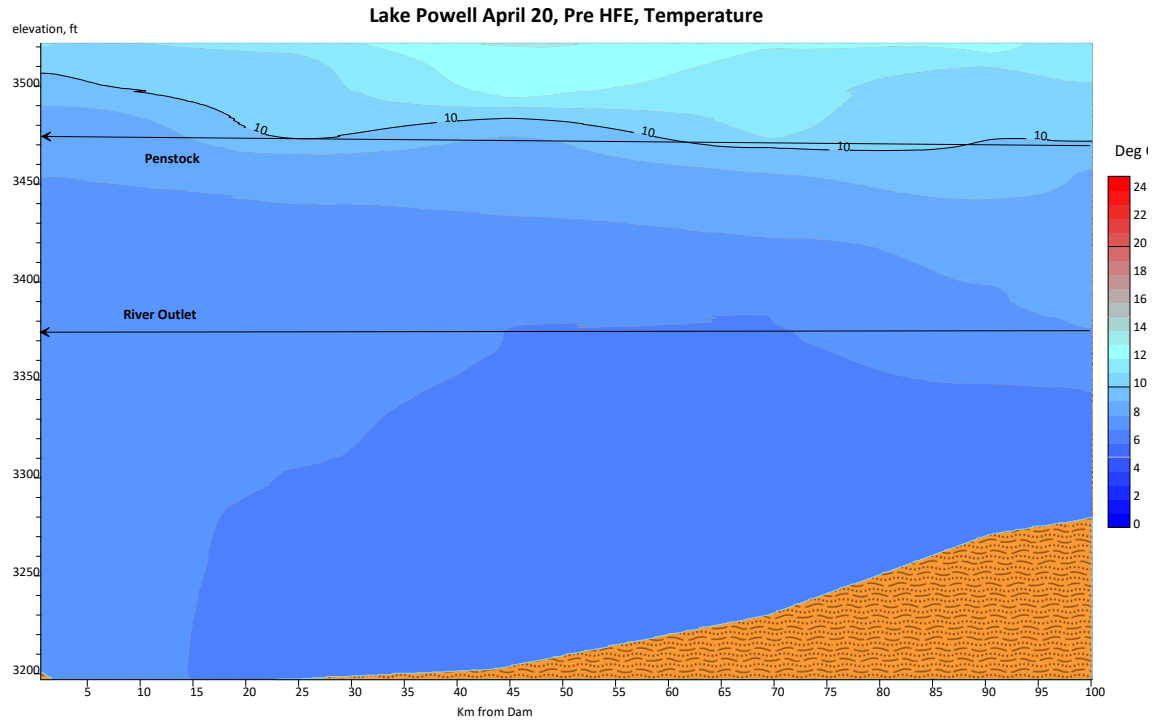


— Scheduled Hourly Releases — Actual Hourly Releases Lees Ferry Flow

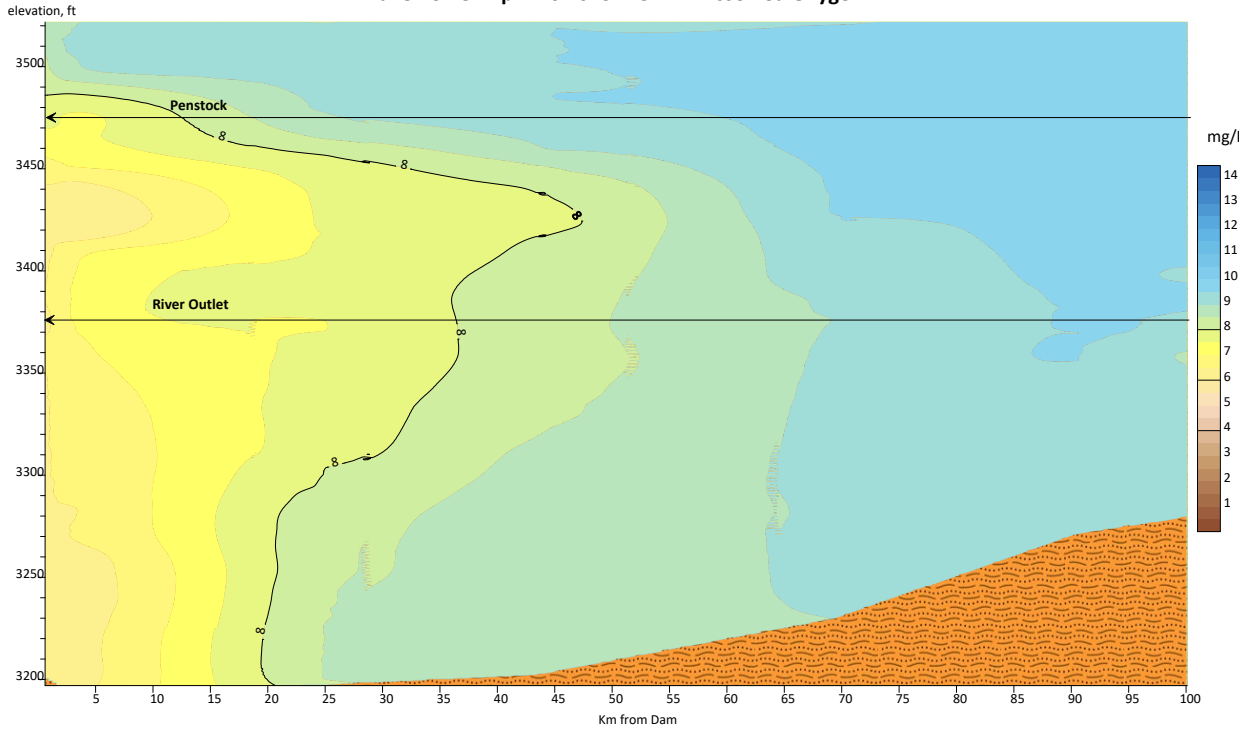


Water Quality

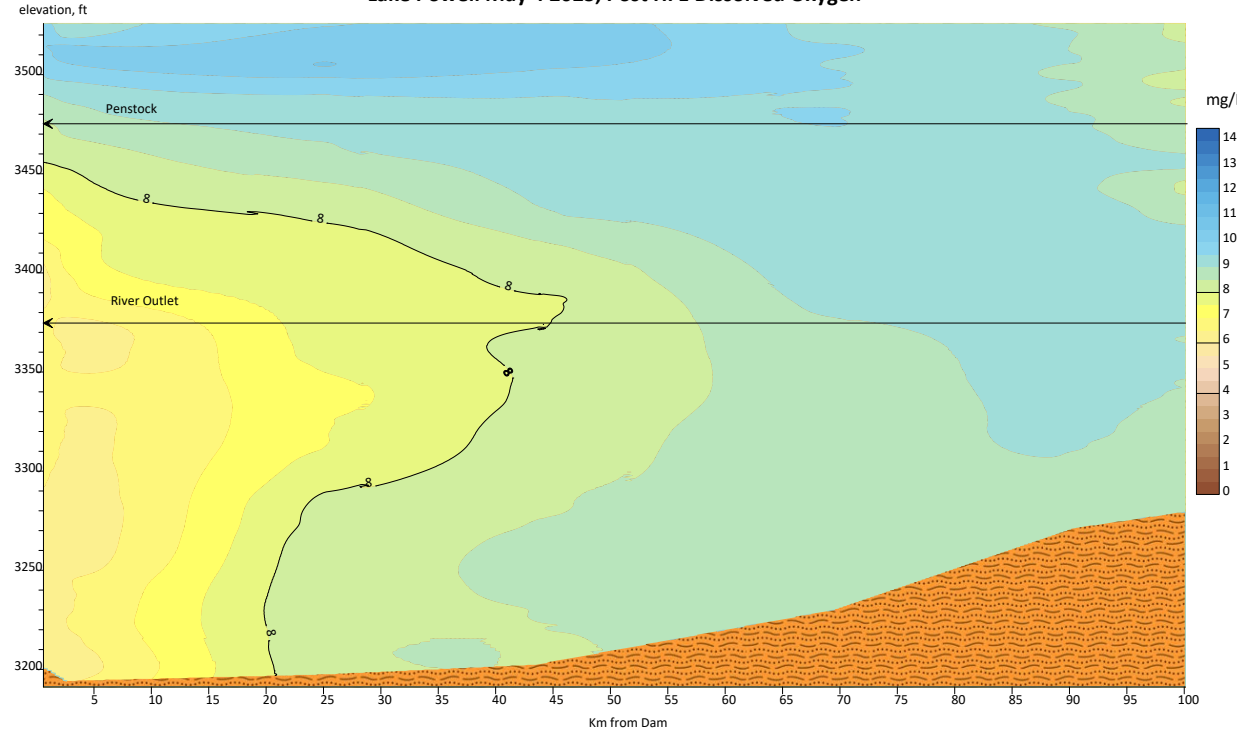




Lake Powell April 20 2023 Pre HFE Dissolved Oxygen

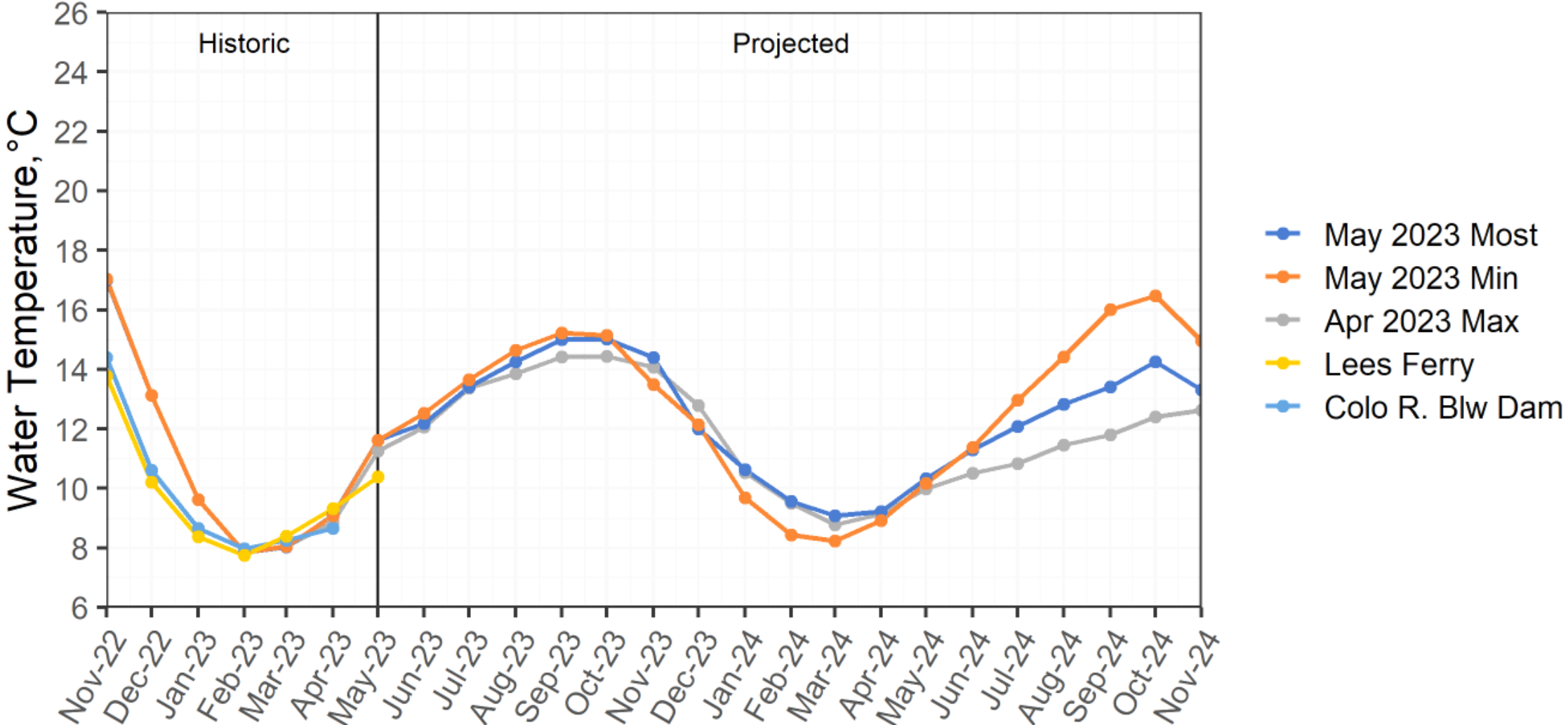


Lake Powell May 4 2023, Post HFE Dissolved Oxygen



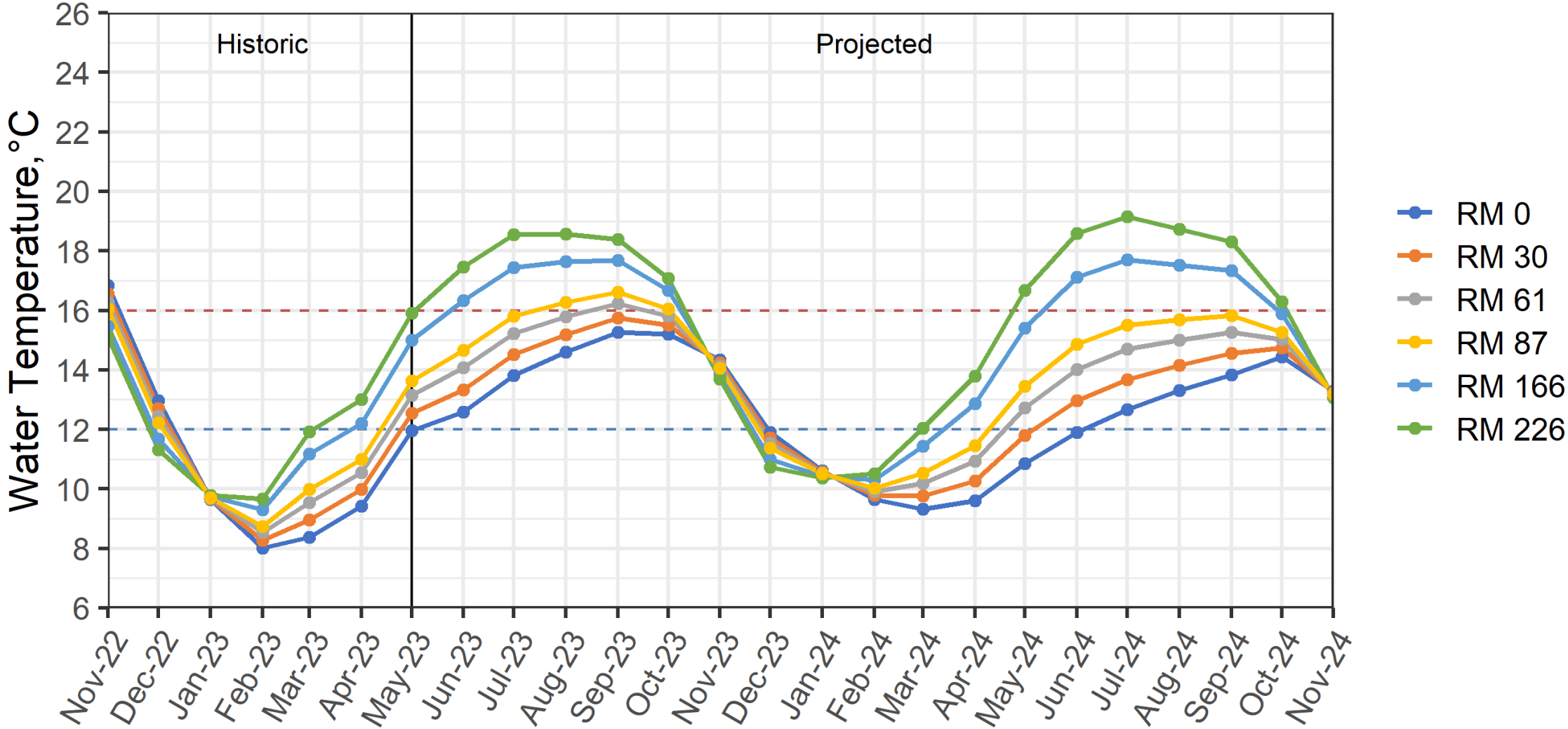
Lake Powell Release Temperature

Projected Temperature based on April and May 2023 Forecast



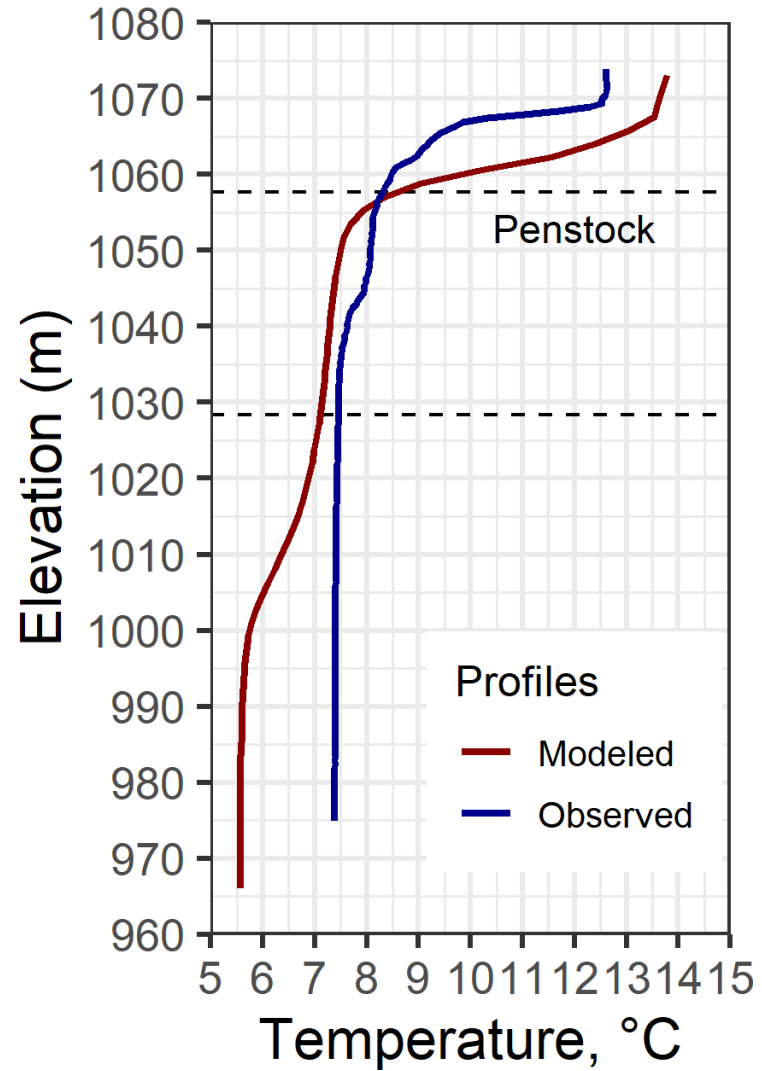
Colorado River, Grand Canyon Water Temperature

Projected Temperature based on May 2023 Most Probable Forecast



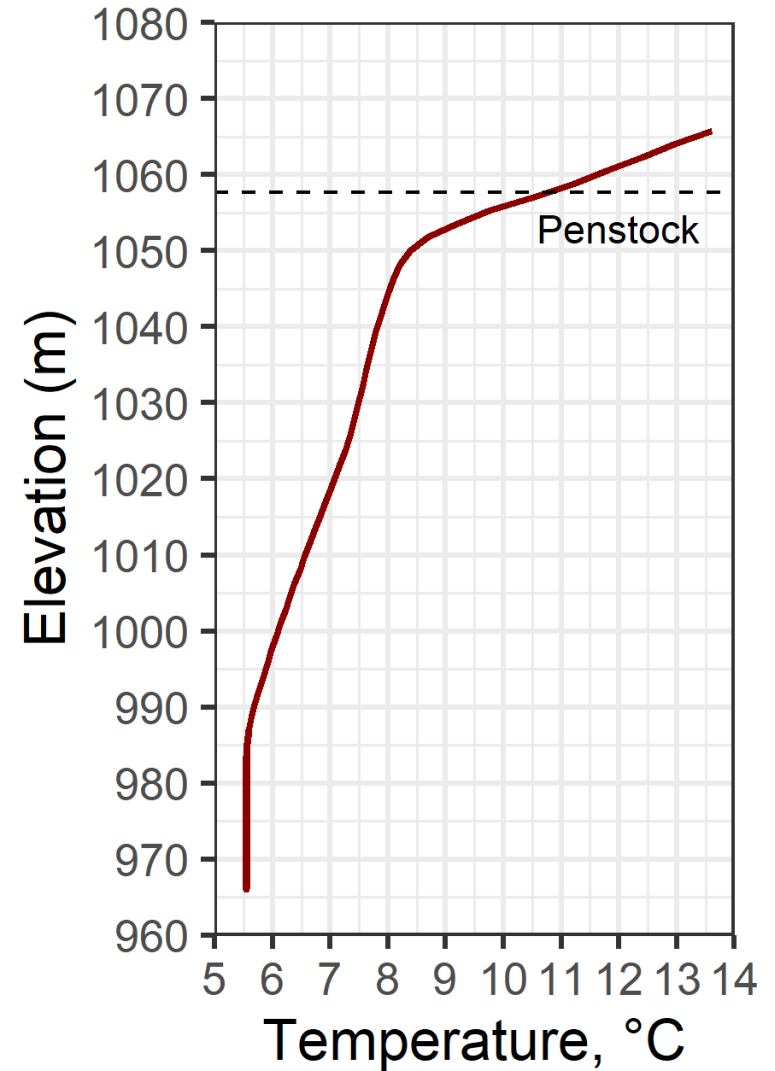
Profile Comparison

April 25, 2023



Powell Forebay

May 11, 2023

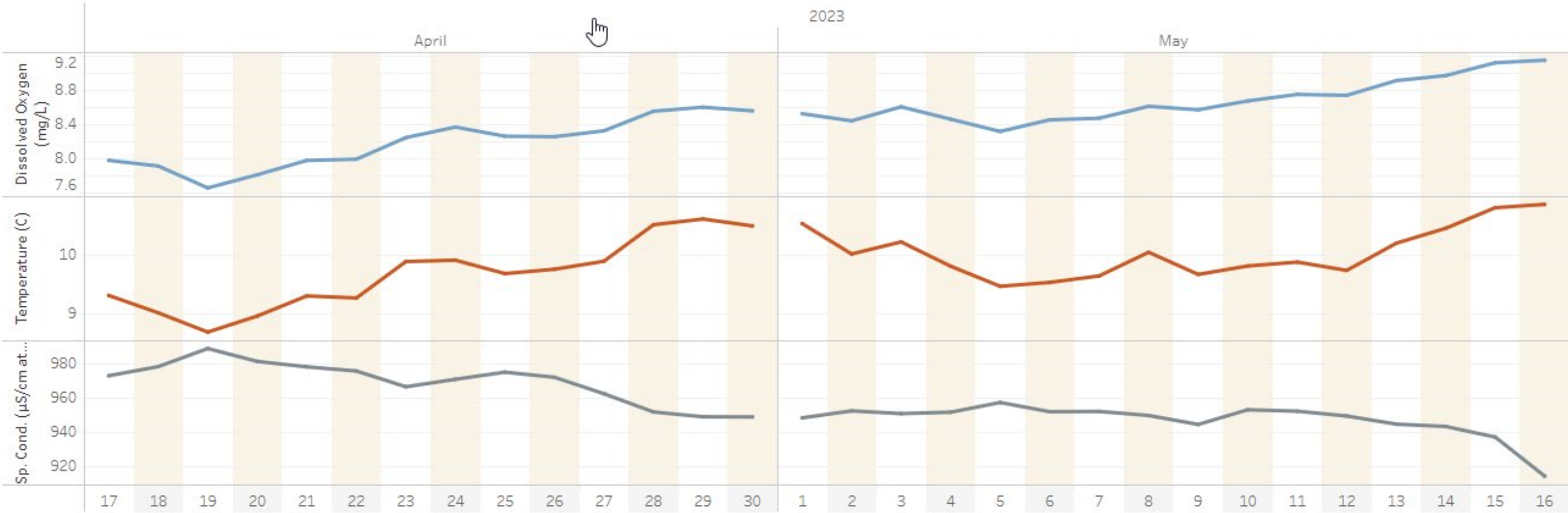


Daily Water Quality Data at Glen Canyon Dam

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Daily Dissolved Oxygen & Temperature Values



The trends of daily average Dissolved Oxygen, Temperature and Specific Conductance shown for the past 30 days.

Questions?



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