



— BUREAU OF —
RECLAMATION

Colorado River System Mid-term Projections

James Prairie
June 16, 2022

Colorado River Basin Storage

(as of June 12, 2022)

Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Lake Powell	27%	6.64	3,536
Lake Mead	28%	7.37	1,046
Total System Storage	35%	20.71	- - -

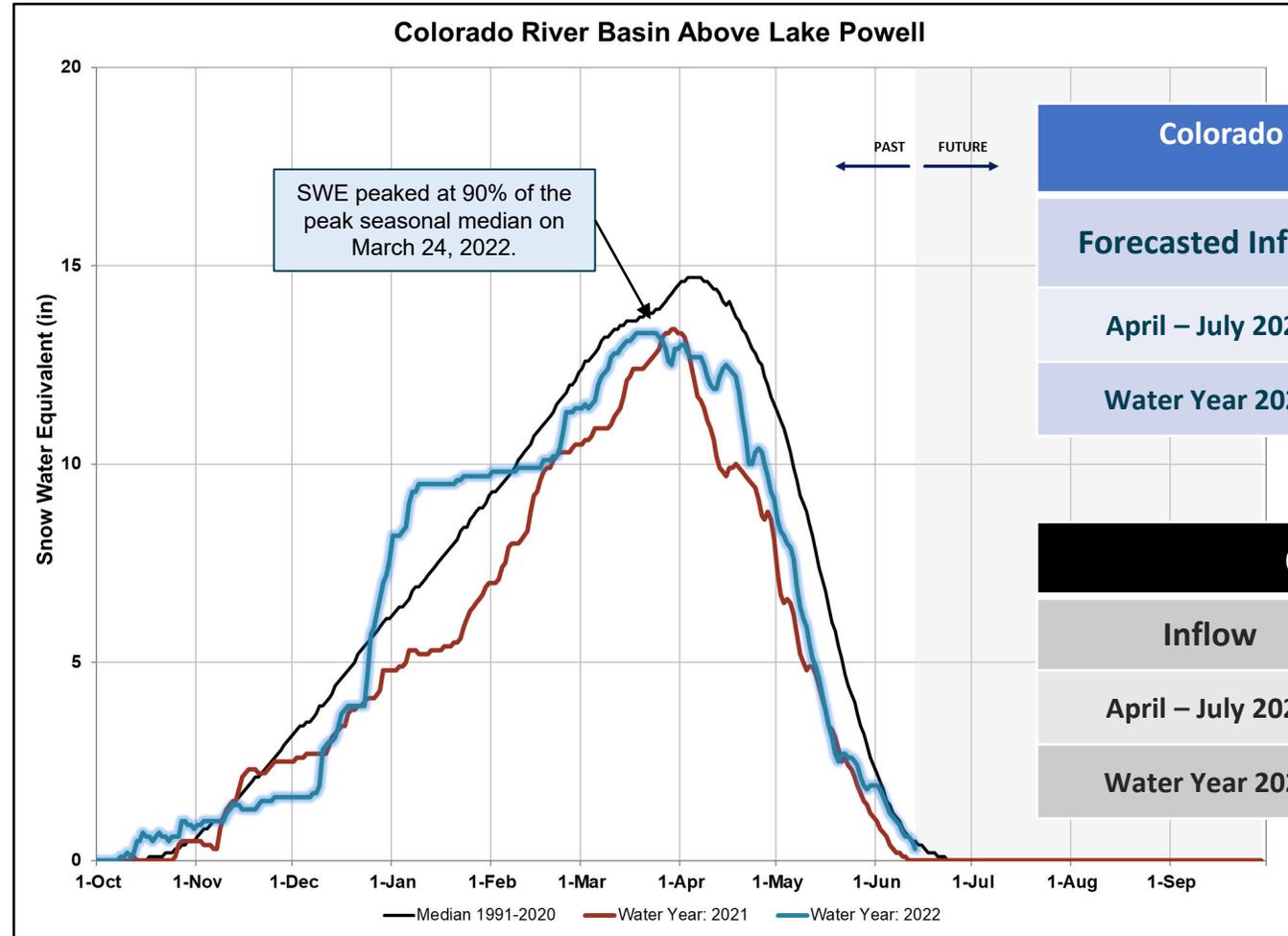
Total system storage was 42% of capacity, with 25.01 maf in storage, at this time last year.

Water Year Snowpack and Precipitation^{1,2} as of June 13, 2022

Colorado River Basin above Lake Powell

Water Year 2022
Precipitation
(year-to-date)
91% of average

Water Year 2021
Precipitation
84% of average



Colorado Basin River Forecast Center Dated June 3, 2022		
Forecasted Inflow	MAF	% of Average
April – July 2022	3.50	55%
Water Year 2022	5.61	58%

Observed 2021		
Inflow	MAF	% of Average
April – July 2021	1.85	29%
Water Year 2021	3.50	37%

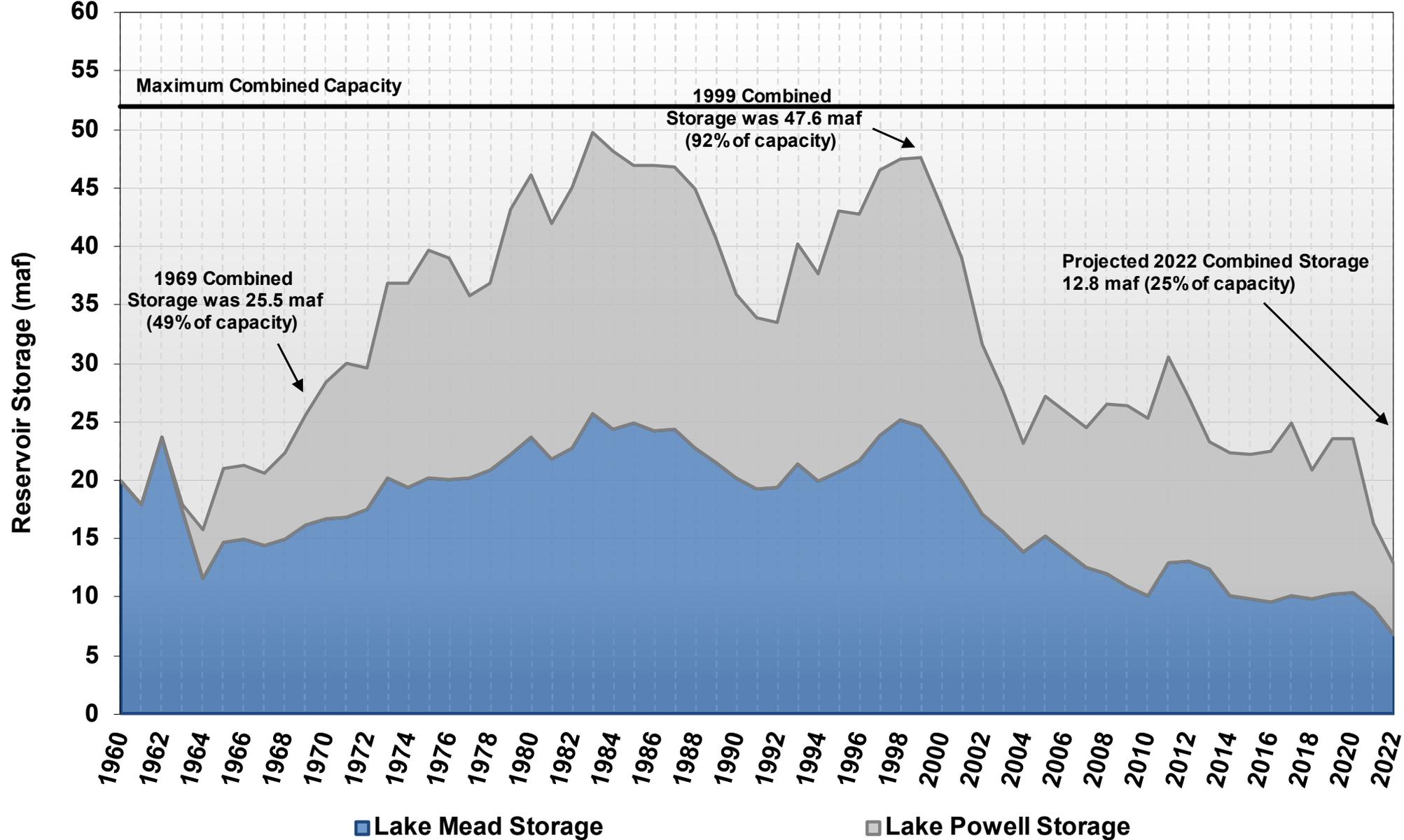
¹Percent of normal precipitation is based on an arithmetic mean, or average; percent of normal snowpack is based on the median value for a given date.

²Statistics are based on the 30-year period of record from 1991-2020.



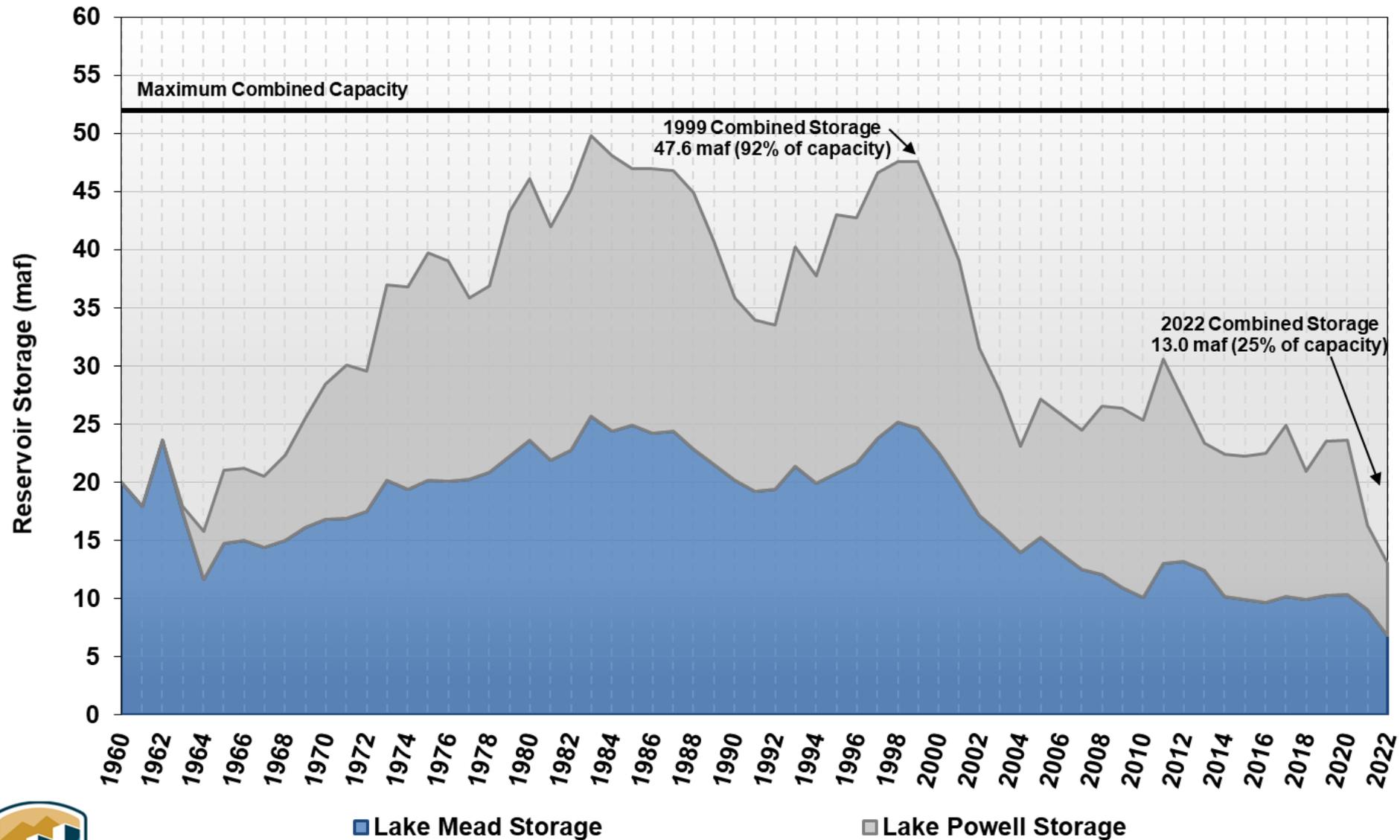
Lake Powell and Lake Mead End of Water Year Storage

Water Years 1960 through 2022



Lake Powell and Lake Mead End of Water Year Storage

Water Years 1960 through 2022

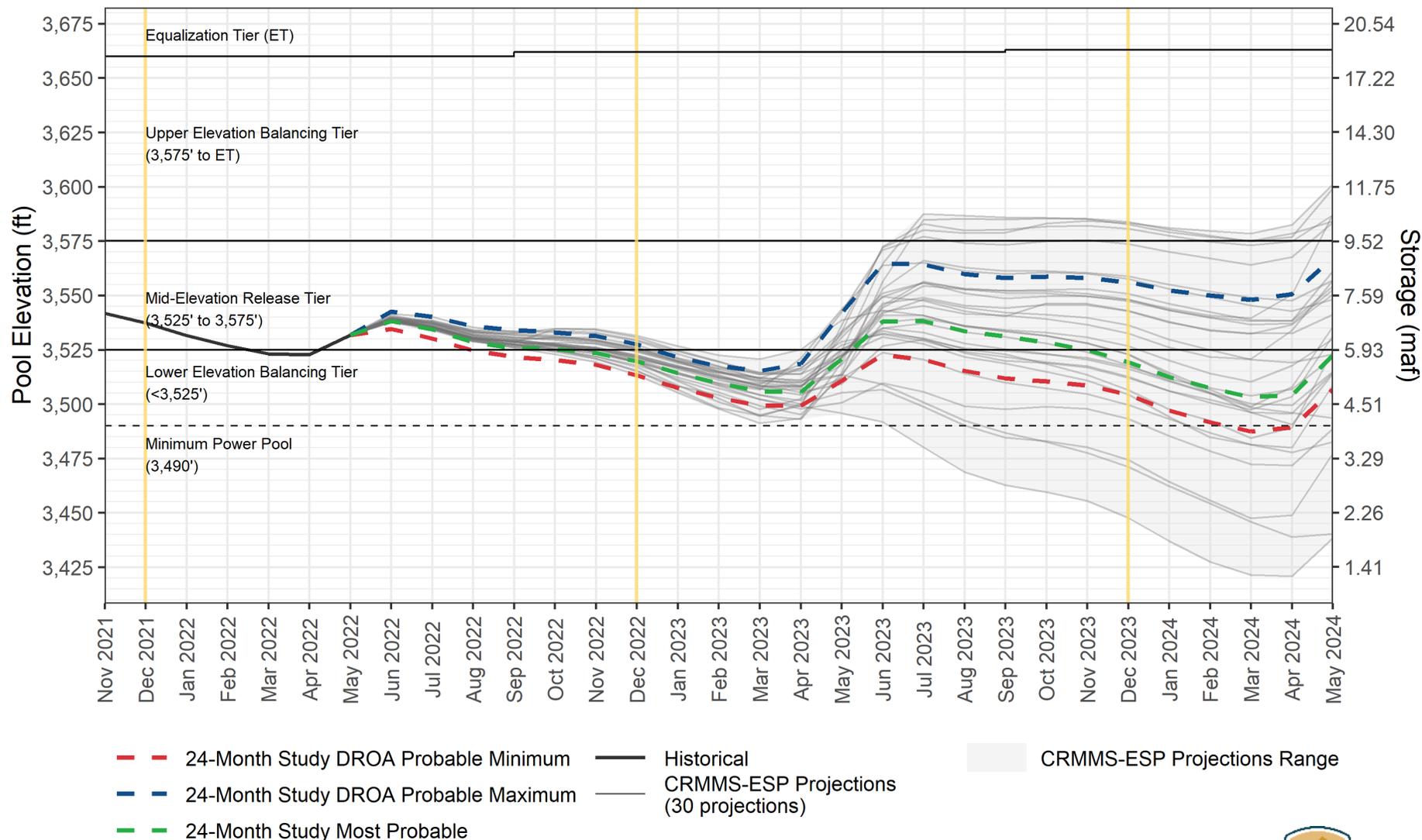


* Projected end of water year 2022 storage based on the May 2022 24-Month Study



Lake Powell End-of-Month Elevations¹

CRMMS Projections from June 2022

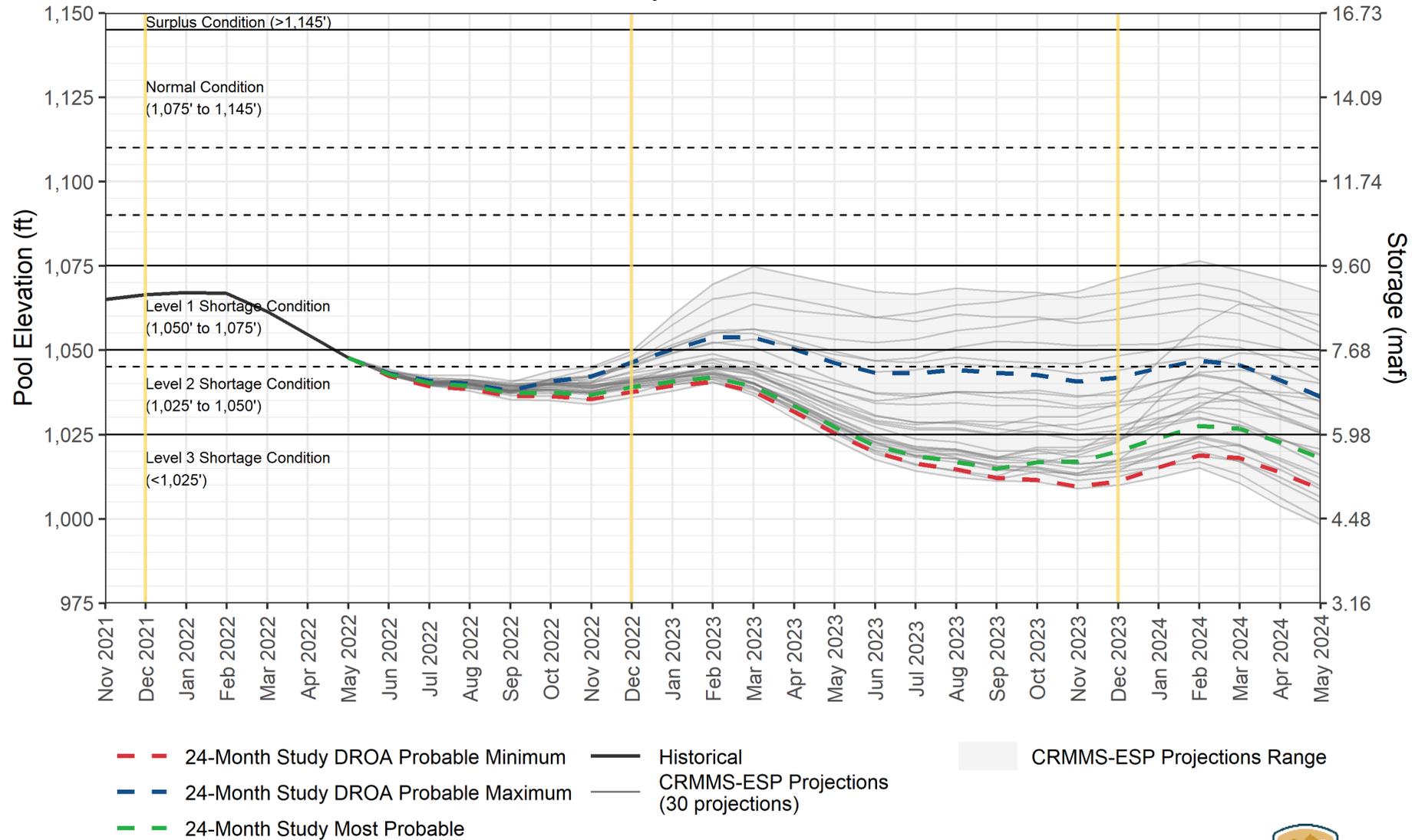


¹ Projected Lake Powell end-of-month physical elevations from the latest CRMMS-ESP and 24-Month Study inflow scenarios.



Lake Mead End-of-Month Elevations¹

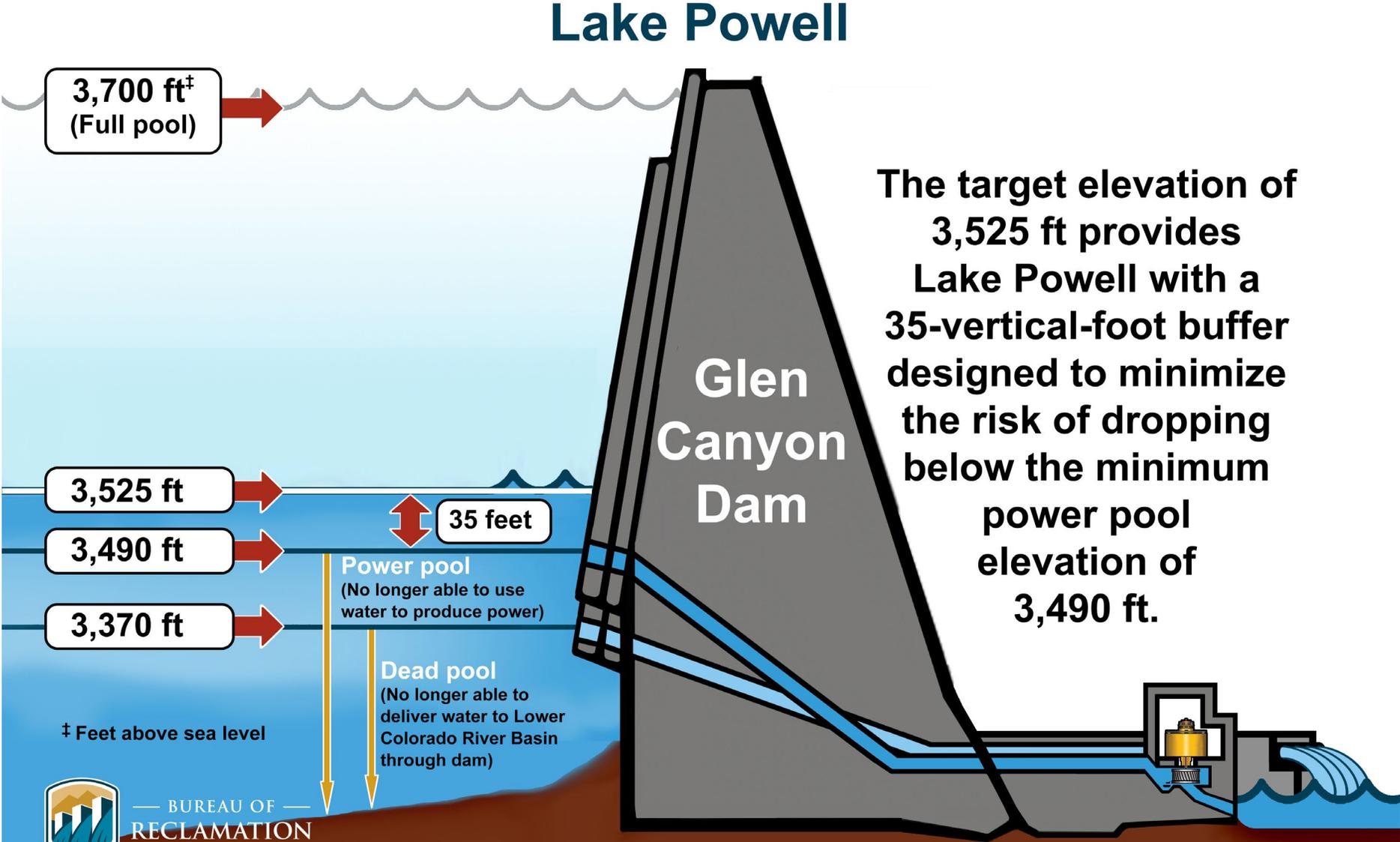
CRMMS Projections from June 2022



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



Lake Powell Key Elevations



Actions to Protect Glen Canyon Dam

2021

- 2021 DROA release from UB Reservoirs (161 kaf)

2022

- Powell monthly release adjustments
- 2022 DROA release from UB Reservoirs (500 kaf)
- Powell WY 2022 Annual Release Reduction (480 kaf)

Future Actions

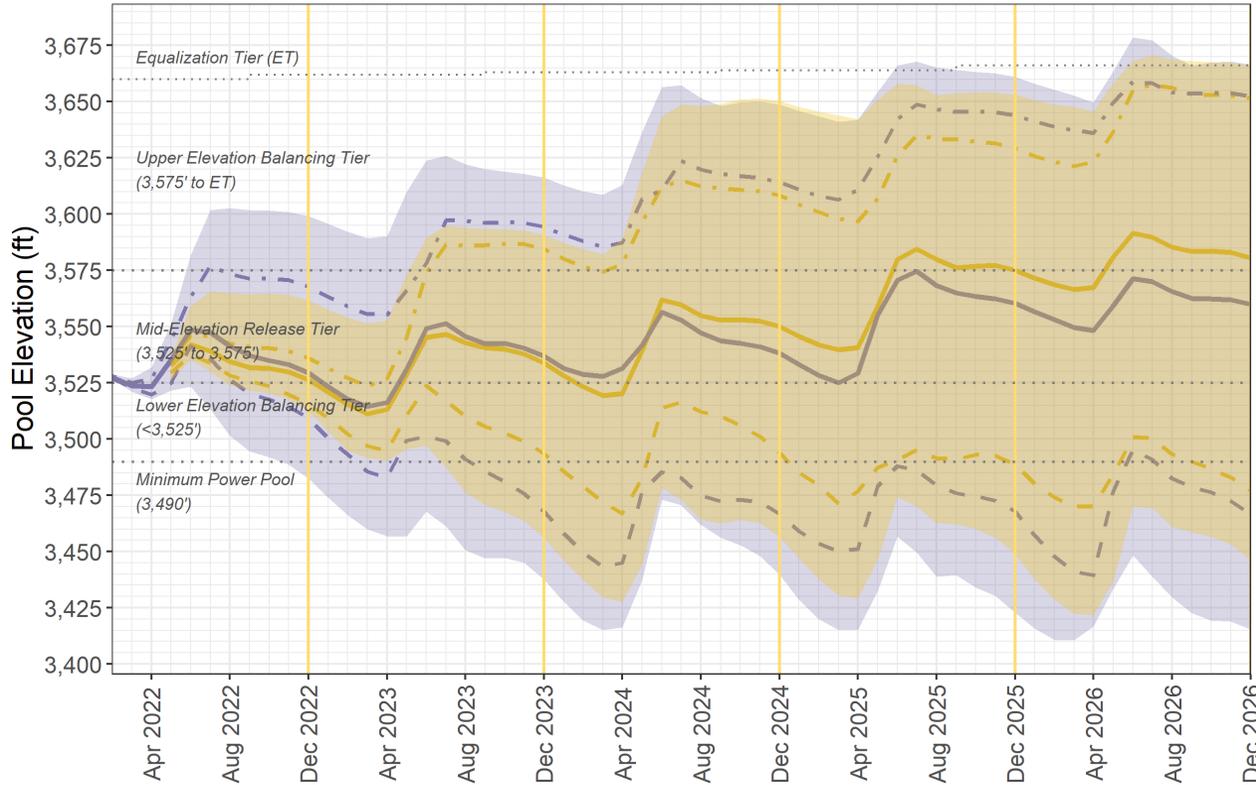
- Potential 2023 DROA release from UB Reservoirs
- Potential other evaluations and actions



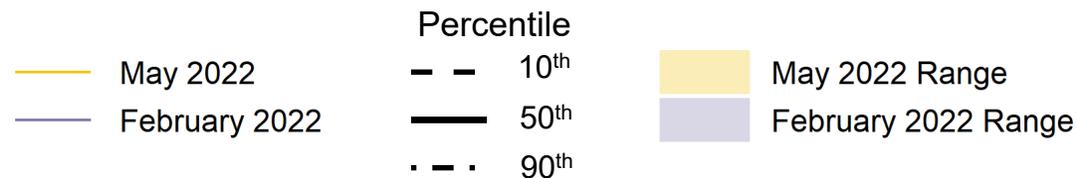
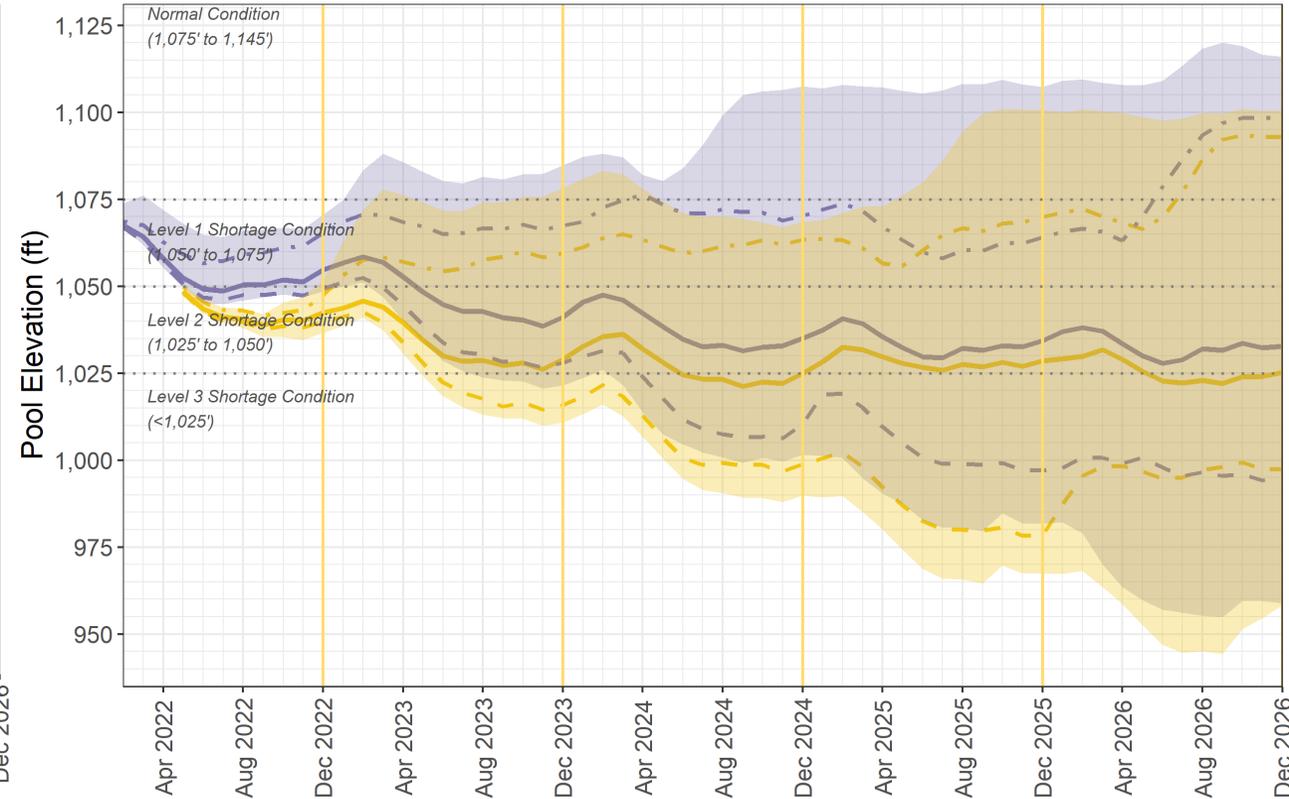
May 2022 vs. February 2022 CRMMS-ESP 5-Year Projections

End-of-Month Pool Elevations

Lake Powell



Lake Mead



* These projected elevations may not be representative of the full range of future possibilities that could occur. These projections rely on future hydrology from the CBRFC's ESP method; other methods may result in a wider range of future hydrology and elevations.

* The chart above displays projected physical elevations.



Possible Future Scenarios



2 Possible Future Hydrology Scenarios

1. Average 4-year inflow (2023-2026) to Powell is 56% of normal*

- Next year is like this year 2022 , followed by three years comparable to 2002, 2003, and 2004
- Represented by the 2001-2004 historical hydrology sequence created using the Index Sequential Method.
- Referred to as "NN 2"

2. Average 4-year inflow is 76% of normal*

- Next year is like 2021 (46% of normal), followed by a wet year and then two dry years
- Represented by the 2018, 2019, 2000 and 2001 historical hydrology sequence created using the Index Sequential Method
- Referred to as "NN 19"

Period	% of Average (1991-2020)
2001-2004	59%
2018-2021	73%
2000-2021	88%



% Avg. Inflow to Powell

NN 2

63%

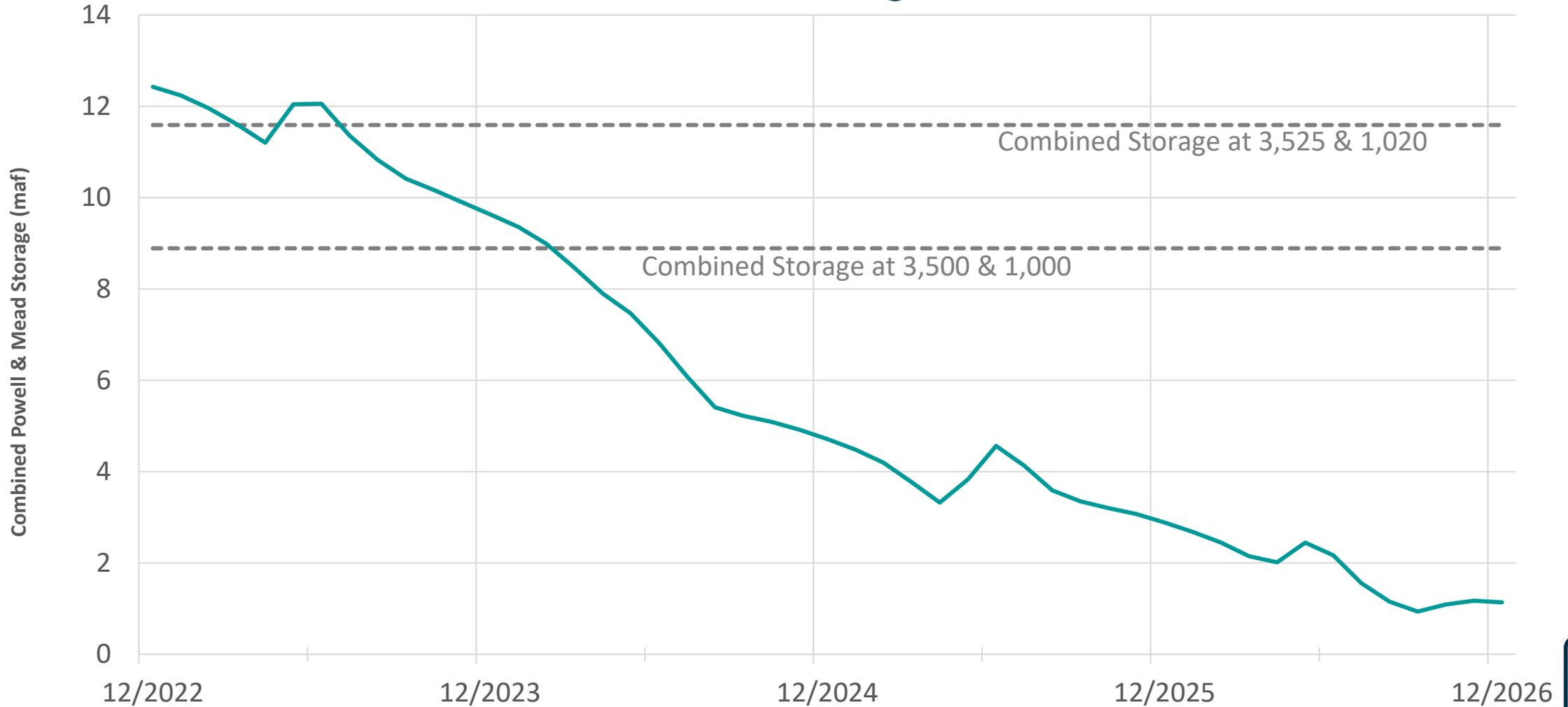
36%

68%

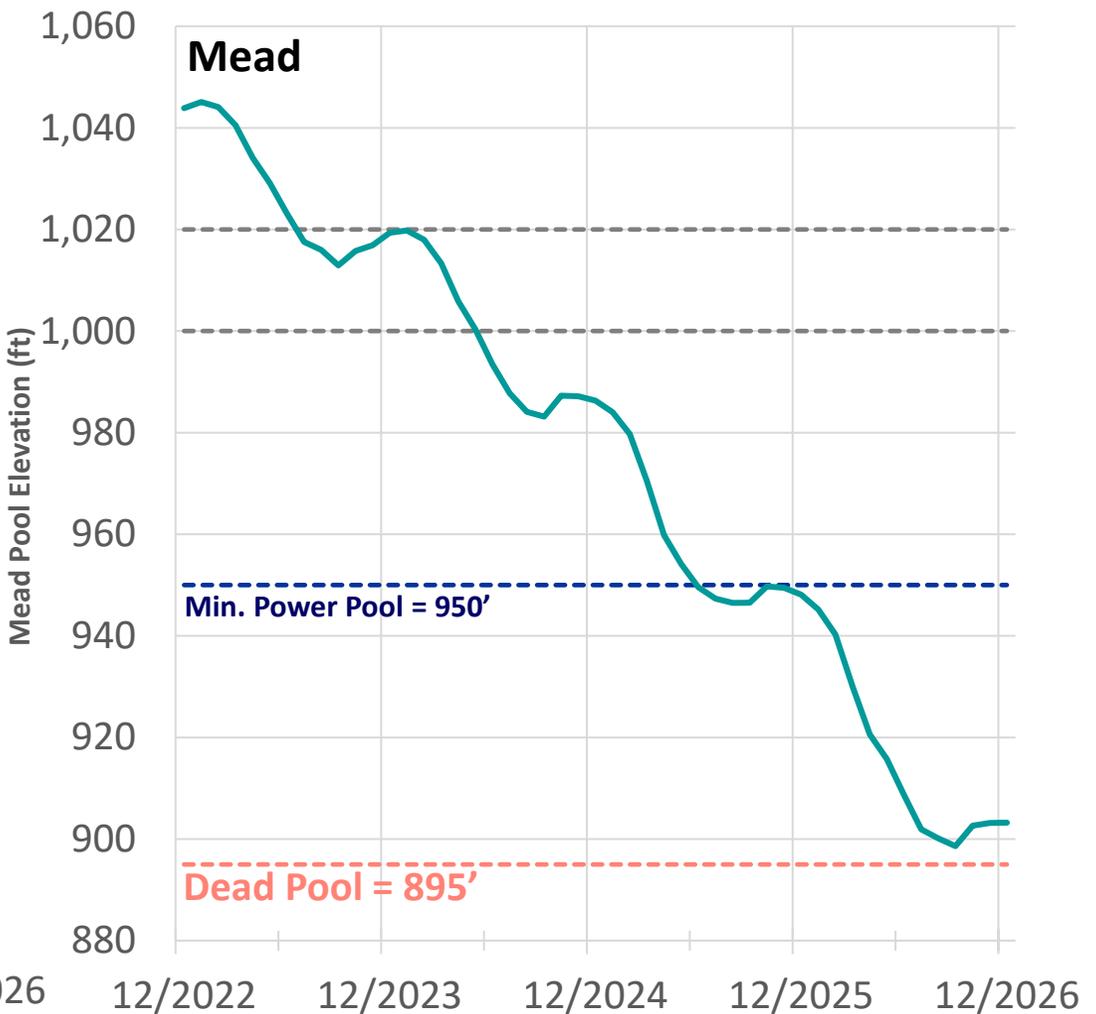
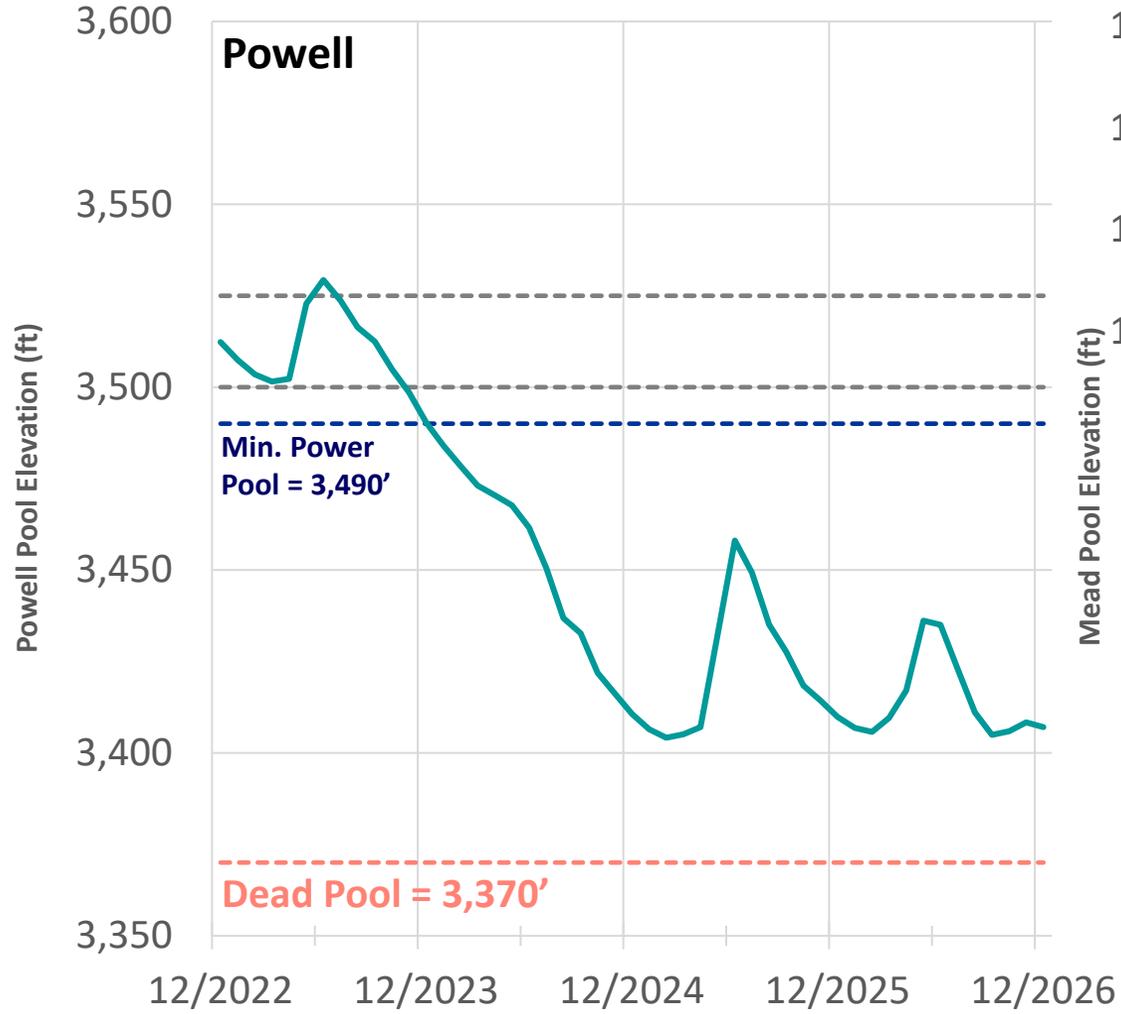
58%

56%

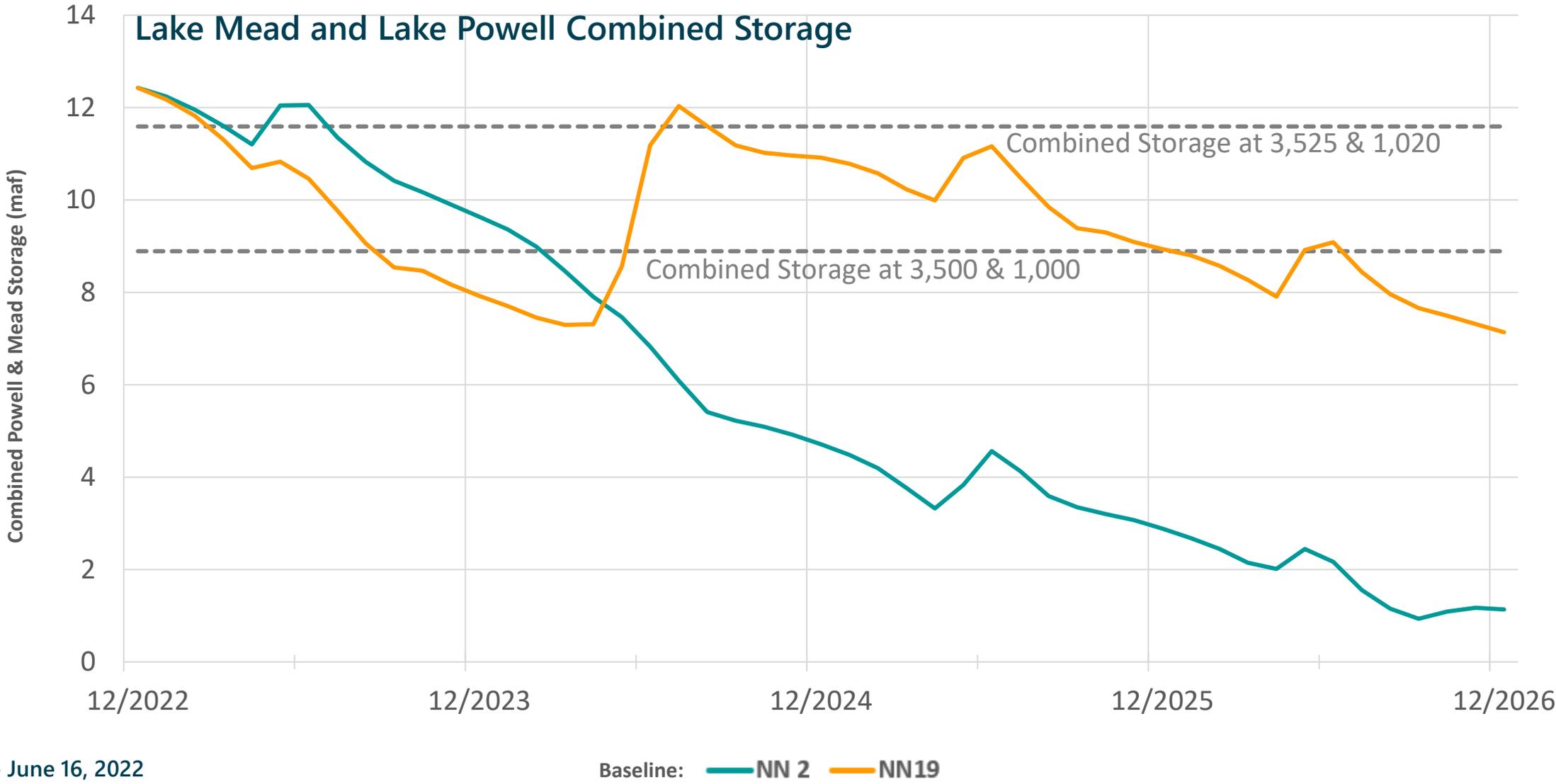
Lake Powell and Lake Mead Combined Storage



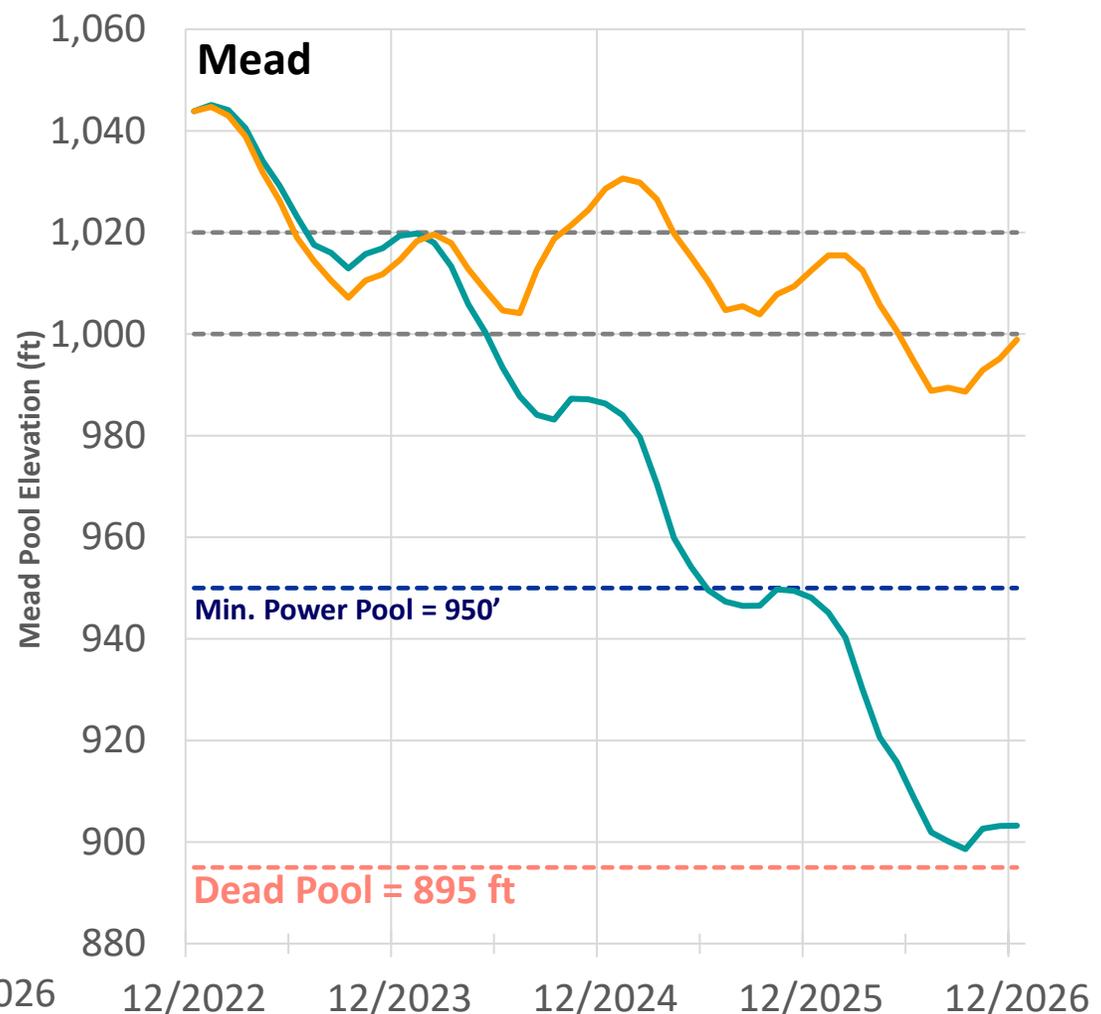
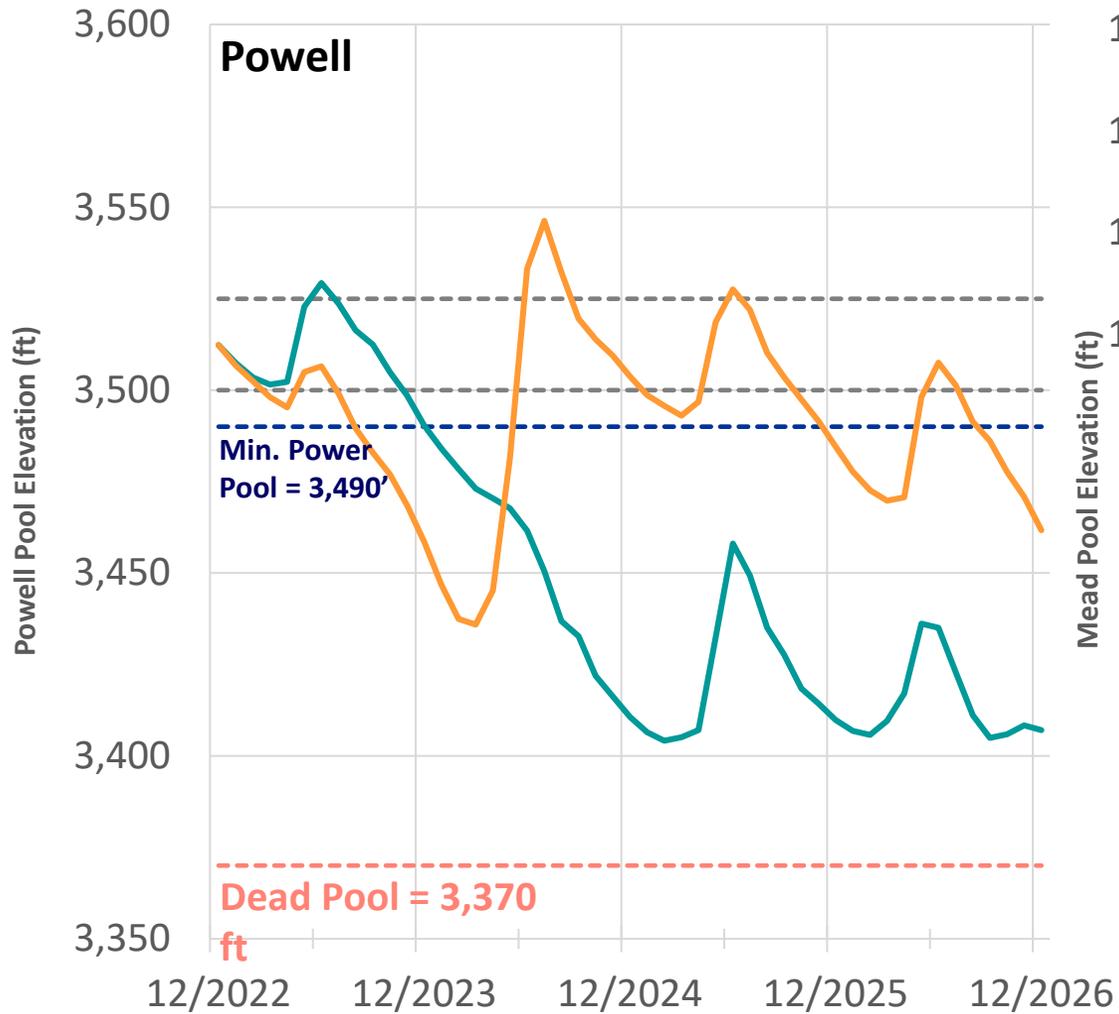
	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>Average</u>
% Avg. Inflow to Powell	63%	36%	68%	58%	56%



					Average
NN 2	63%	36%	68%	58%	56%
NN 19	46%	123%	70%	67%	76%



	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>Average</u>
% Avg. Inflow to Powell	NN 2 63%	36%	68%	58%	56%
	NN 19 46%	123%	70%	67%	76%



Protection Volume Analysis & Results



Protection Volume Analysis

Objective: quantify the volume of additional water needed to maintain, i.e., “absolutely protect”, specific elevations at Lake Powell and Lake Mead for the next 4 years (2023-2026) based on plausible hydrologic futures

Preliminary analysis considers two protections levels:

- 3,525 feet at Lake Powell and 1,020 feet at Lake Mead
- 3,500 feet at Lake Powell and 1,000 feet at Lake Mead

Approach

- Quantify the volume of water necessary to keep Powell and Mead at these elevations by injecting this “protection volume” water into the system at Powell and Mead
 - Not assigned to anyone
 - In addition to Lower Basin Shortages, DCP contributions, and Minute 323 Reductions and Savings volumes
- Use three different hydrologic futures to quantify volumes:
 - "Stress Test" - resample historical record from 1988-2019
 - Resample historical record from 2000-2019
 - Climate change-based hydrology
- Initial conditions (December 31, 2022) incorporate this year’s DROA and reduced release from Glen Canyon Dam



Lake Powell Elevations and Necessary Protection Volumes

2023-2026 Average Lake Powell Inflow	Avg Lake Powell End-of-Year Elevation Without Action (ft)				Annual Volumes (maf) Needed to Protect:	
	2023	2024	2025	2026	Powell 3,525' & Mead 1,020' Avg (Min – Max)	Powell 3,500' & Mead 1,000' Avg (Min – Max)
Greater than 95%	3,545	3,571	3,590	3,605	0.6 (0.3 – 2.0)	0.2 (0.0 – 1.4)
80% - 95%	3,509	3,515	3,517	3,513	1.3 (0.3 – 2.8)	0.6 (0.0 – 2.1)
64% - 79%	3,501	3,488	3,464	3,447	2.1 (1.1 – 3.1)	1.3 (0.4 – 2.3)
50% - 63%	3,481	3,431	3,411	3,409	3.5 (2.5 – 4.5)	2.7 (1.7 – 3.7)
Less than 50%	3,441	3,401	3,403	3,404	4.2 (4.2 – 4.2)	3.5 (3.5 – 3.5)

3,500' < Pool Elevation < 3,525'

Pool Elevation < 3,500'

* 1991-2020 Avg = 9.46 maf
 2000-2021 Avg = 8.31 maf
 2018-2021 Avg = 6.86 maf (73% of 1991-2020)
 2022 = ~6.0 maf (63% of 1991-2020)

Powell Elevation (ft)	Storage (maf)	% Capacity
3,525	5.9	24.4
3,500	4.5	18.5
3,490	4.0	16.4
3,370	0.0	0.0



Lake Mead Elevations and Necessary Protection Volumes

2023-2026 Average Lake Powell Inflow	Avg Lake Mead End-of-Year Elevation Without Action (ft)				Annual Volumes (maf) Needed to Protect:	
	2023	2024	2025	2026	Powell 3,525' & Mead 1,020' Avg (Min – Max)	Powell 3,500' & Mead 1,000' Avg (Min – Max)
Greater than 95%	1,049	1,052	1,059	1,066	0.6 (0.3 – 2.0)	0.2 (0.0 – 1.4)
80% - 95%	1,028	1,025	1,020	1,021	1.3 (0.3 – 2.8)	0.6 (0.0 – 2.1)
64% - 79%	1,028	1,017	998	983	2.1 (1.1 – 3.1)	1.3 (0.4 – 2.3)
50% - 63%	1,018	988	943	914	3.5 (2.5 – 4.5)	2.7 (1.7 – 3.7)
Less than 50%	1,006	917	895	896	4.2 (4.2 – 4.2)	3.5 (3.5 – 3.5)

1,000' < Pool Elevation < 1,020'

Pool Elevation < 1,000'

* 1991-2020 Avg = 9.46 maf
 2000-2021 Avg = 8.31 maf
 2018-2021 Avg = 6.86 maf (73% of 1991-2020)
 2022 = ~6.0 maf (63% of 1991-2020)

Mead Elevation (ft)	Storage (maf)	% Capacity
1,020	5.7	21.7
1,000	4.5	17.1
950	2.0	7.7
895	0.0	0.0



Summary

- We do not know what runoff will be next year, but if it is below average, we are vulnerable to falling below the 3,525'/1,020' combined storage volume if we do not act.
- Even with a good year, we can quickly be back in the same position we are in today, or worse.
- If 2023 inflow is like 2022, Lake Powell and Lake Mead together need an additional 2.5 maf to stay above the 3,525'/1,020' combined storage volume.
- Each year we fall short of protecting whatever elevations we choose to protect, the volumes needed to stabilize the system in future years increase.

