

RECLAMATION

Managing Water in the West

2017 Colorado River Annual Operating Plan

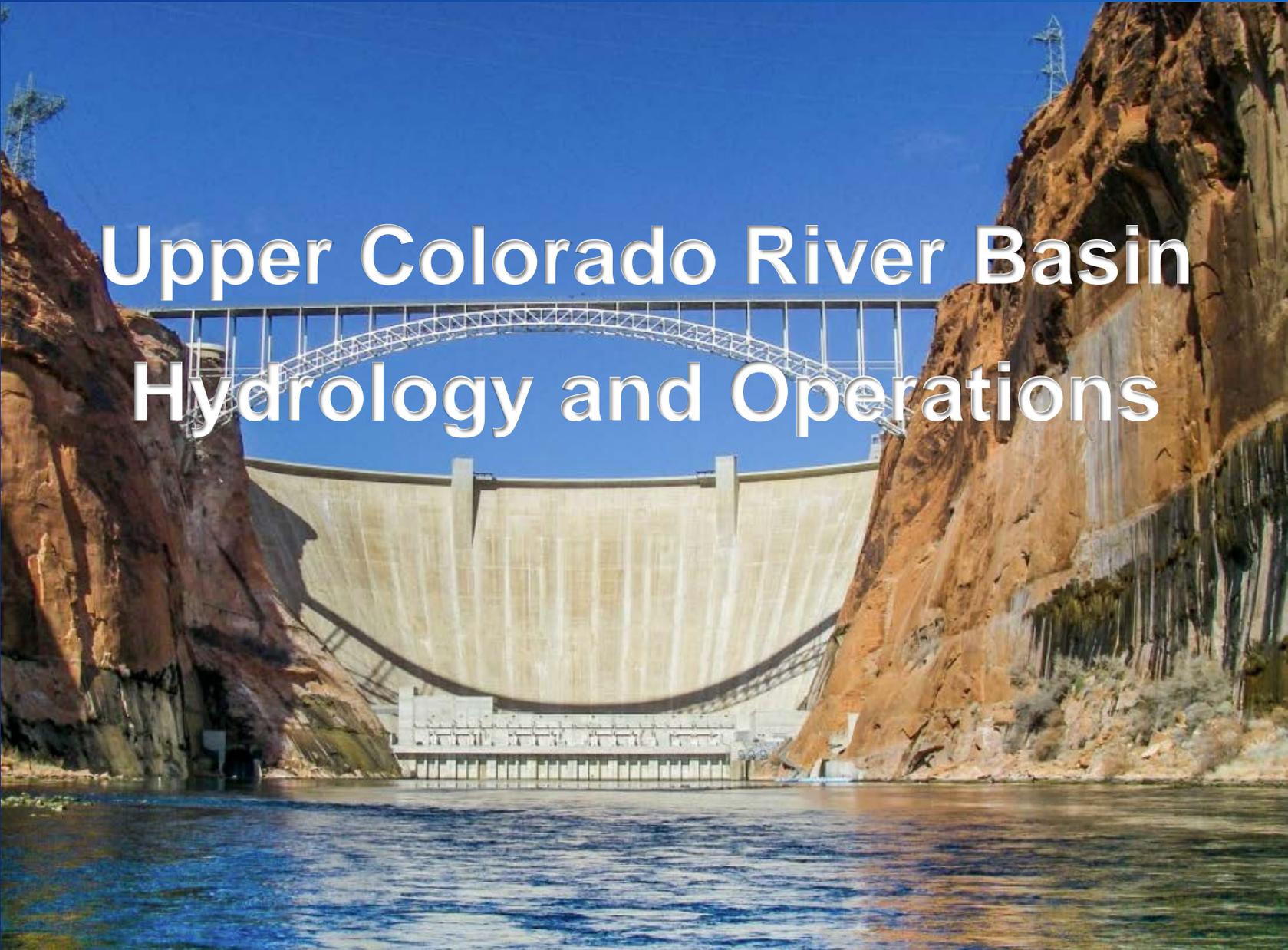
Colorado River Management Work Group
Final Consultation
September 8, 2016



U.S. Department of the Interior
Bureau of Reclamation

2017 Colorado River AOP Final Consultation Meeting

- Welcome and Introductions – *Brent Rhees / Jennifer McCloskey*
- Opening Remarks – *Chris Cutler / Steve Hvinden*
- Upper Basin Hydrology and Operations – *Paul Davidson*
- Lower Basin Hydrology and Operations – *Noe Santos*
- 2017 AOP Review Process – *Chris Cutler / Steve Hvinden*
- Review of Draft 2017 AOP – *CRMWG*
- Conclusion/Wrap-up - *Chris Cutler / Steve Hvinden*
- Next Steps
- Reminder of Future Meeting Date
- Adjourn



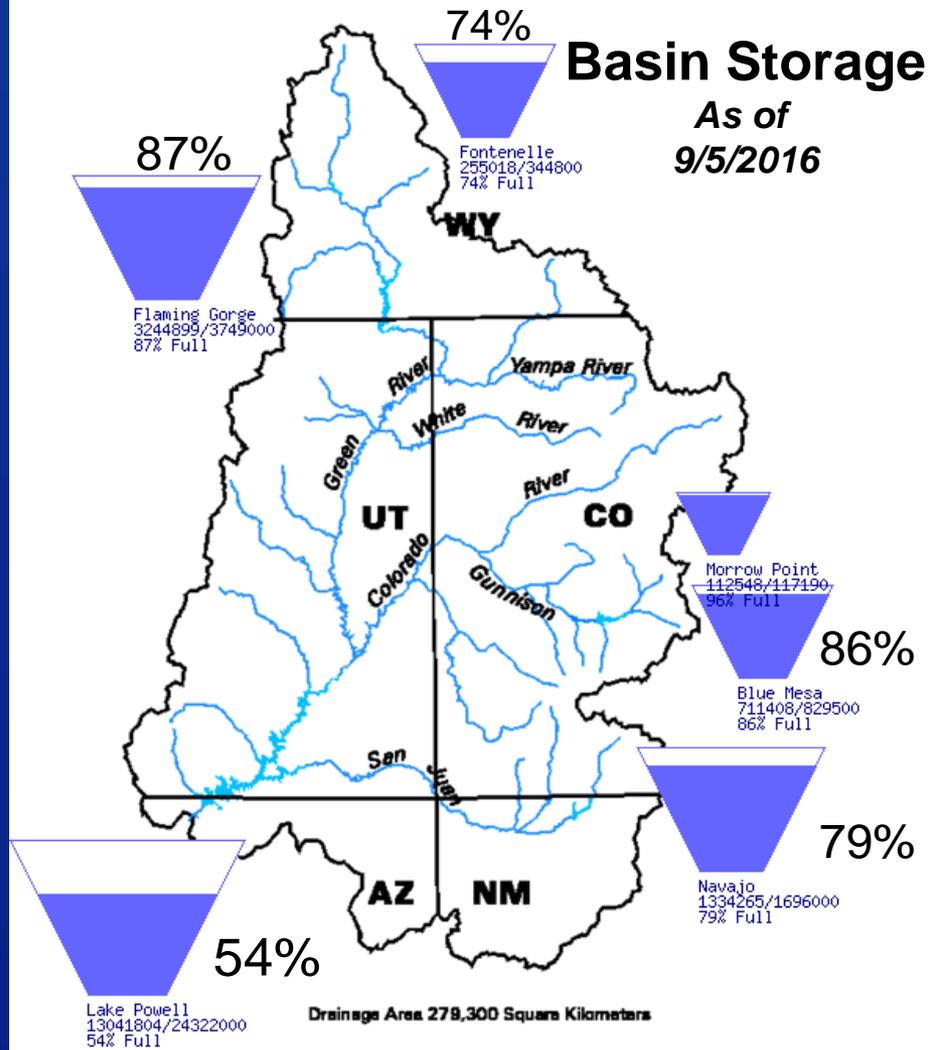
Upper Colorado River Basin Hydrology and Operations

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Upper Basin Storage

Data Current as of:
09/05/2016

Upper Colorado River Drainage Basin



April to July 2016 Observed Inflow

Reservoir	Apr-Jul Observed (KAF)	Percent of Average ¹
Fontenelle	650	90%
Flaming Gorge	1,048	107%
Blue Mesa	602	89%
Navajo	562	76%
Powell	6,610	92%

¹ Percent of average based on period 1981-2010.

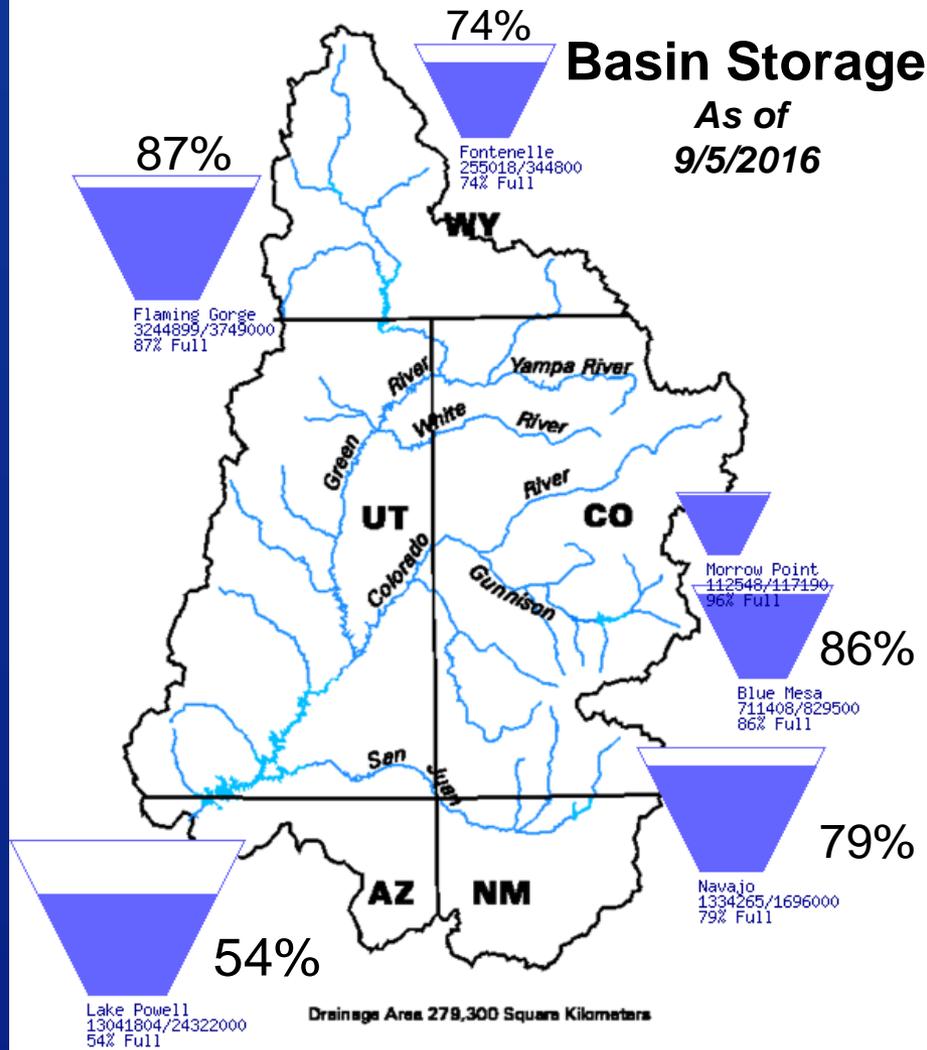
<http://www.usbr.gov/uc/water/basin/>

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Upper Basin Storage

Data Current as of:
09/05/2016

Upper Colorado River Drainage Basin



CBRFC Unregulated Inflow Forecast dated August 1, 2016

Water Year 2017 Forecasted Inflow

Reservoir	Water YR Forecast (KAF)	Percent of Average ¹
Fontenelle	945	87%
Flaming Gorge	1,290	89%
Blue Mesa	840	88%
Navajo	915	93%
Powell	9,630	89%

¹ Percent of average based on period 1981-2010.

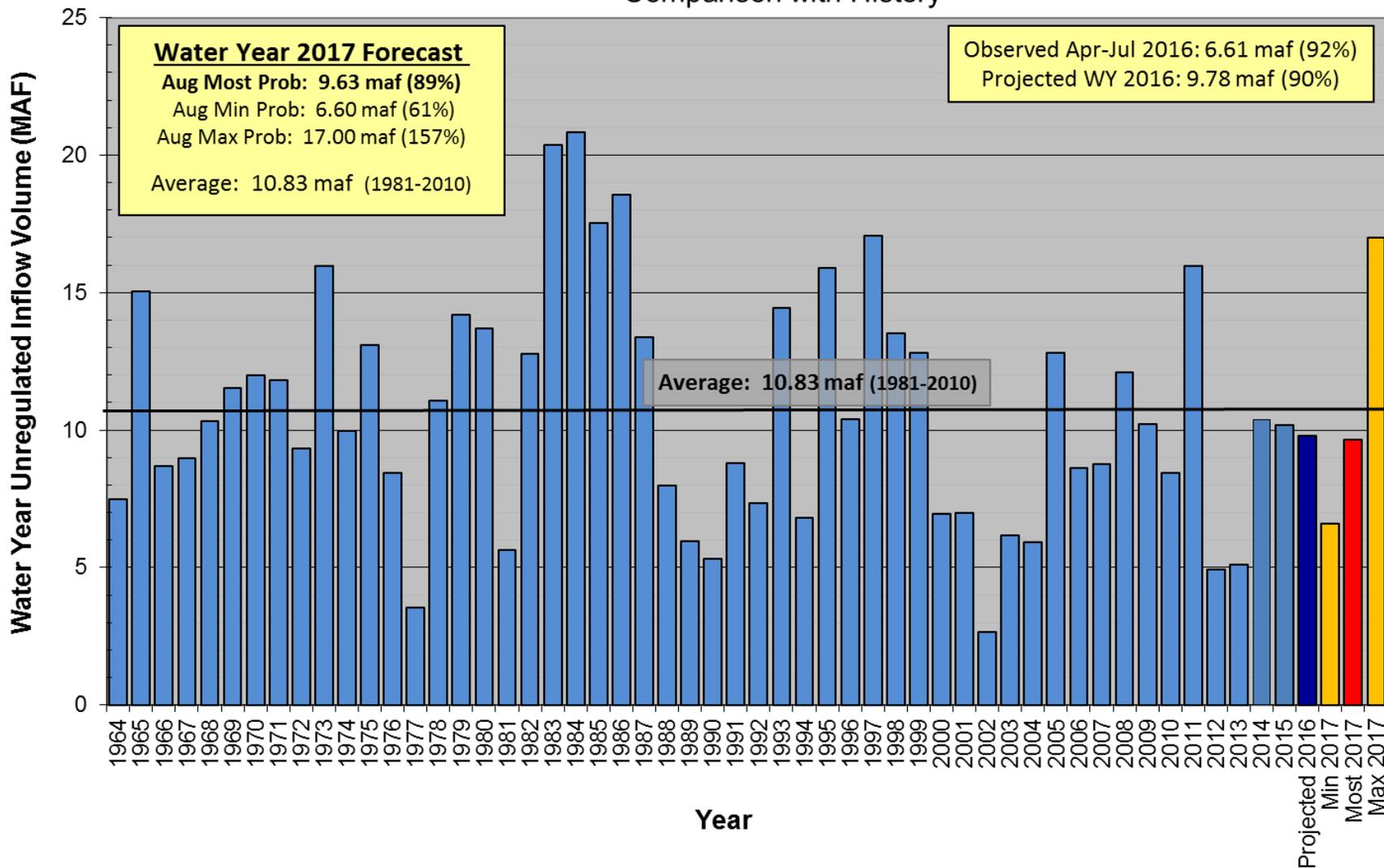
<http://www.usbr.gov/uc/water/basin/>

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Lake Powell Unregulated Inflow

Water Year 2017 Forecast *(issued August 1)*

Comparison with History



Projected Operations Water Years 2016 and 2017

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Lake Powell 2016 Operating Tier

Upper Elevation Balancing

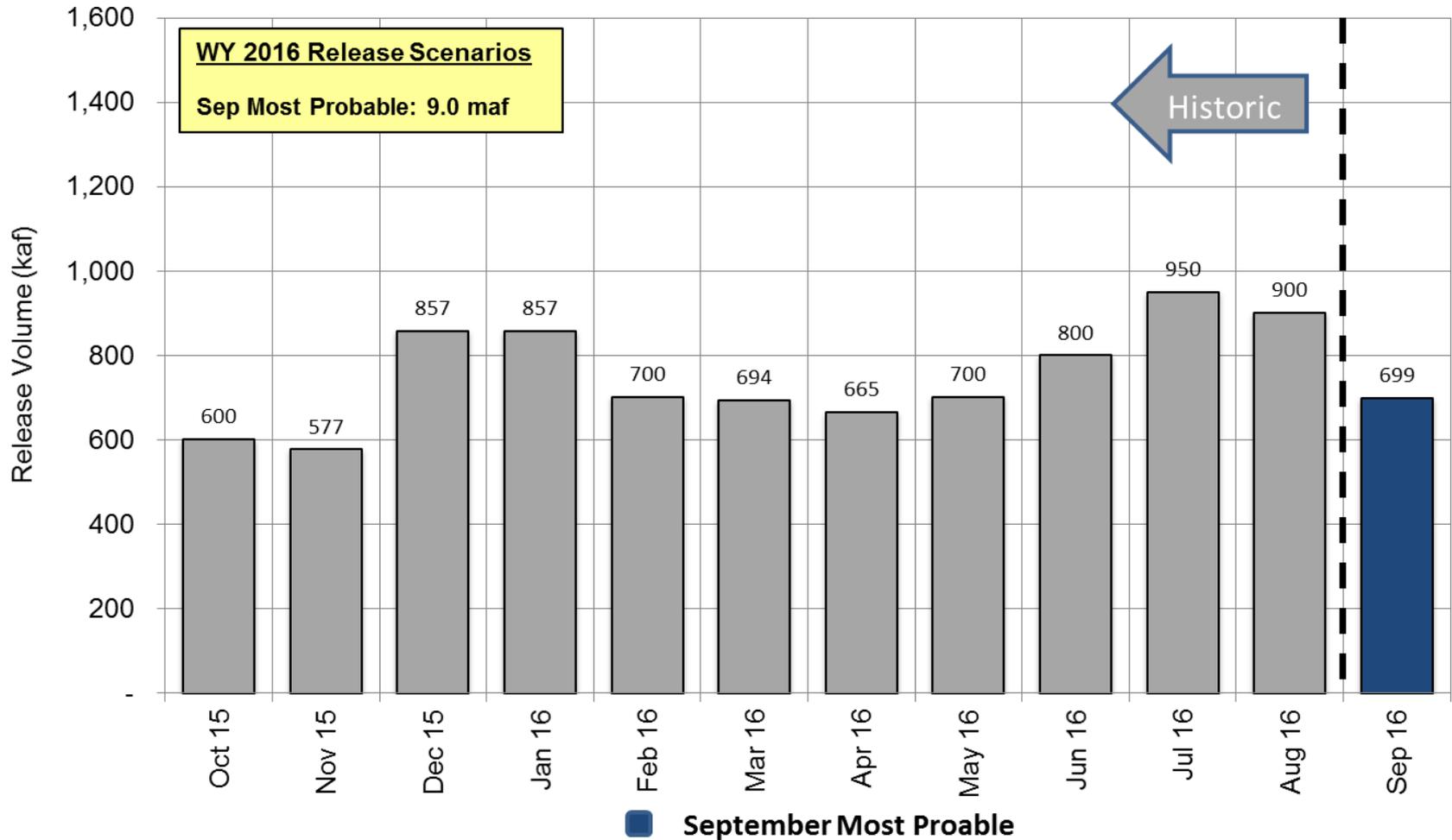
- Tier was set using the August 2015
- April Adjustment to Balancing
- Goal: balance contents of Lake Powell and Lake Mead by end of water year
 - release 8.23 maf - 9.0 maf
 - Currently projecting 9.0 maf release

Lake Powell		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹
3,700	Equalization Tier Equalize, avoid spills or release 8.23 maf	24.3
3,636 - 3,666 (2008-2026)	Upper Elevation Balancing Tier³ Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)
3,575	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5
3,525	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	5.9
3,490		4.0
3,370		0

Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2016

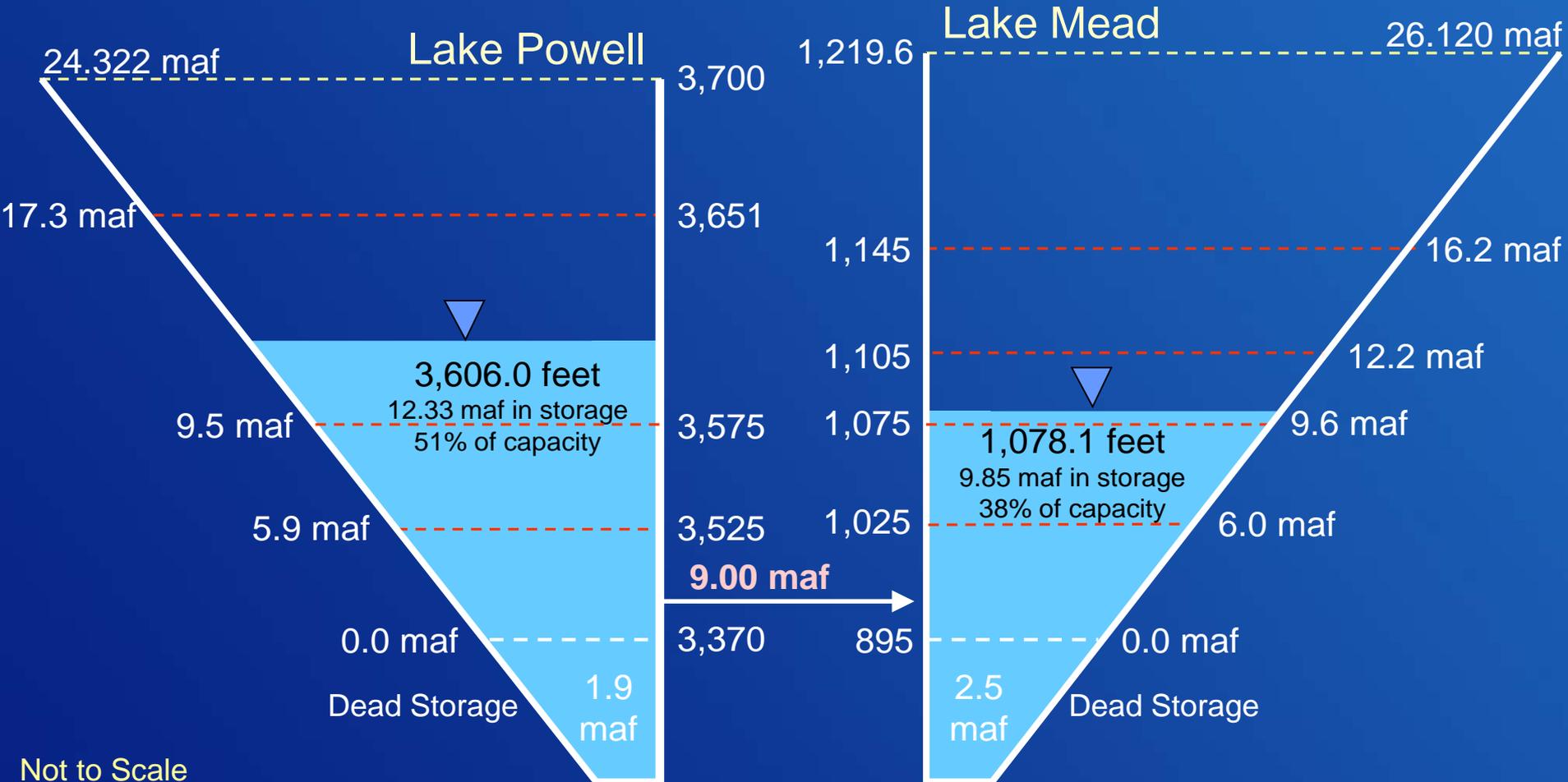
Updated September 2016



End of Water Year 2015

September 30, 2015

Unregulated Inflow into Powell = 10.17 maf (94% of average)



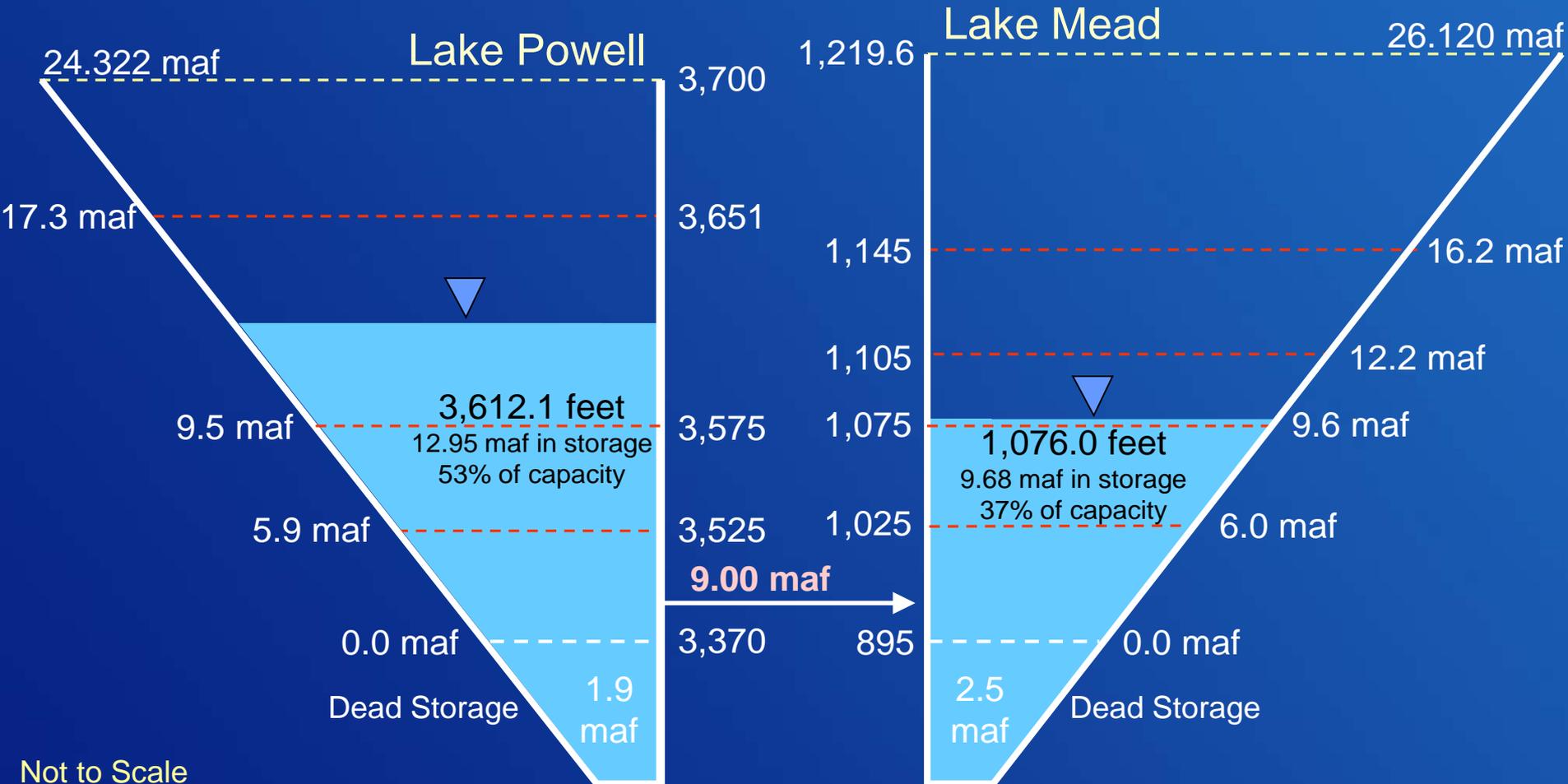
Not to Scale

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End of Water Year 2016 Projections

August 2016 24-Month Study Most Probable Inflow Scenario¹

Projected Unregulated Inflow into Powell¹ = 9.78 maf (90% of average)



Not to Scale

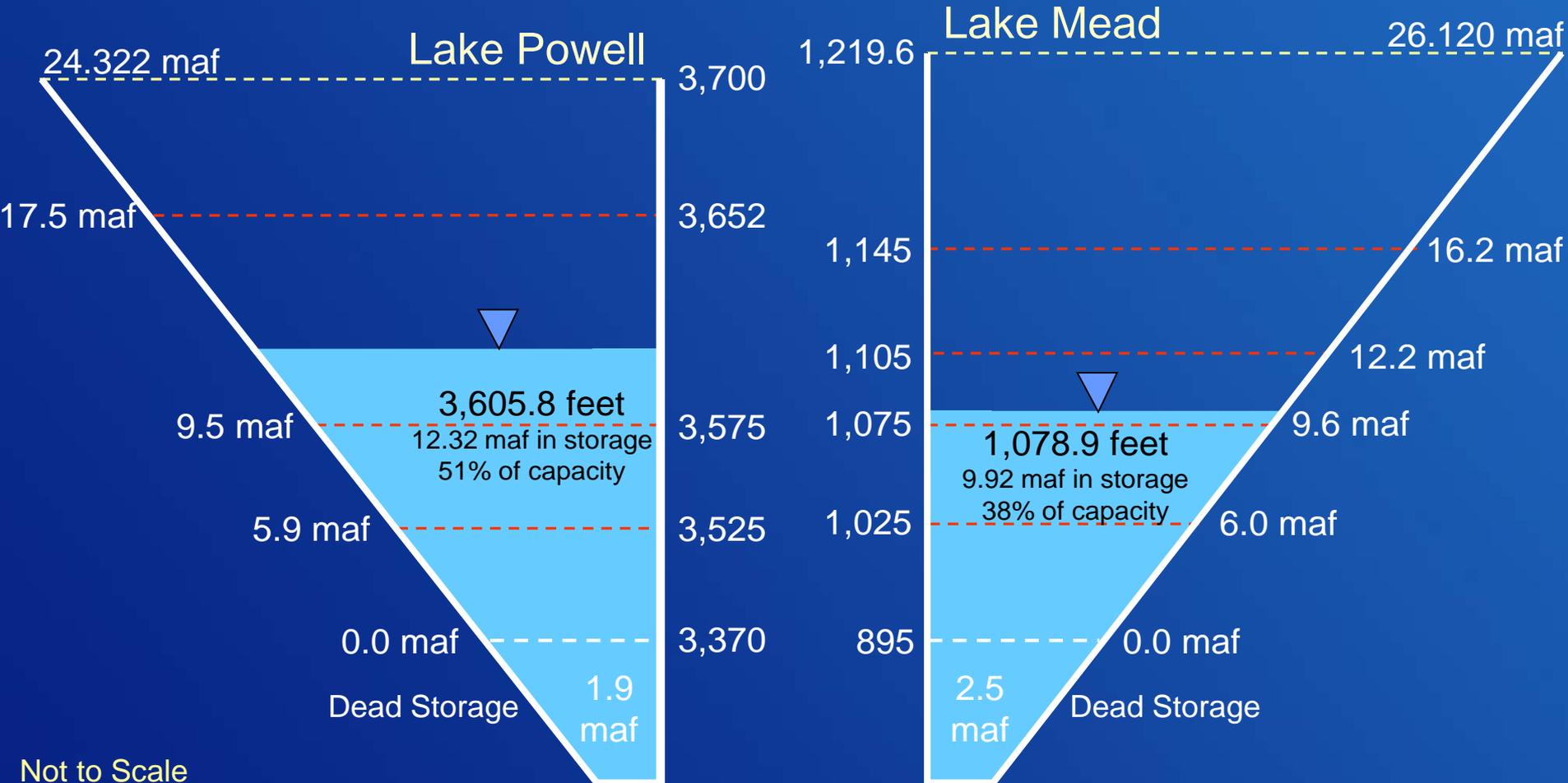
¹ WY 2016 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 8/1/16.

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End of Calendar Year 2016 Projections

August 2016 24-Month Study Most Probable Inflow Scenario¹

Based on a 9.00 maf release pattern from Lake Powell in Water Year 2017



Not to Scale

¹ WY 2016 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 8/1/16.

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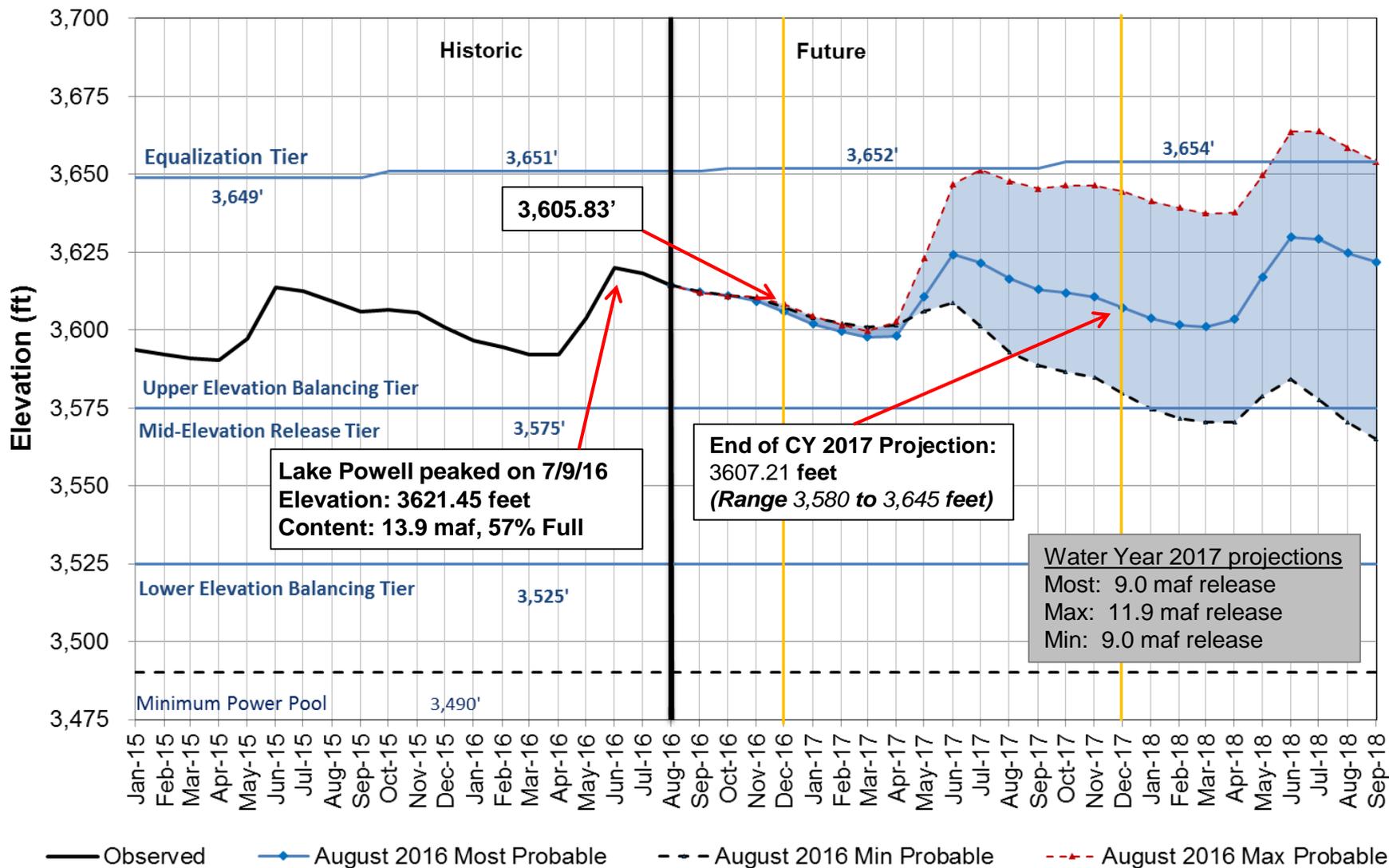
Lake Powell 2017 Operating Tier Scenarios

Based on August 2016 modeling

Inflow Scenario	Operating Tier Release Volume
Minimum Probable	Upper Elevation Balancing 9.0 maf
Most Probable	Upper Elevation Balancing 9.0 maf
Maximum Probable	Upper Elevation Balancing 11.9 maf

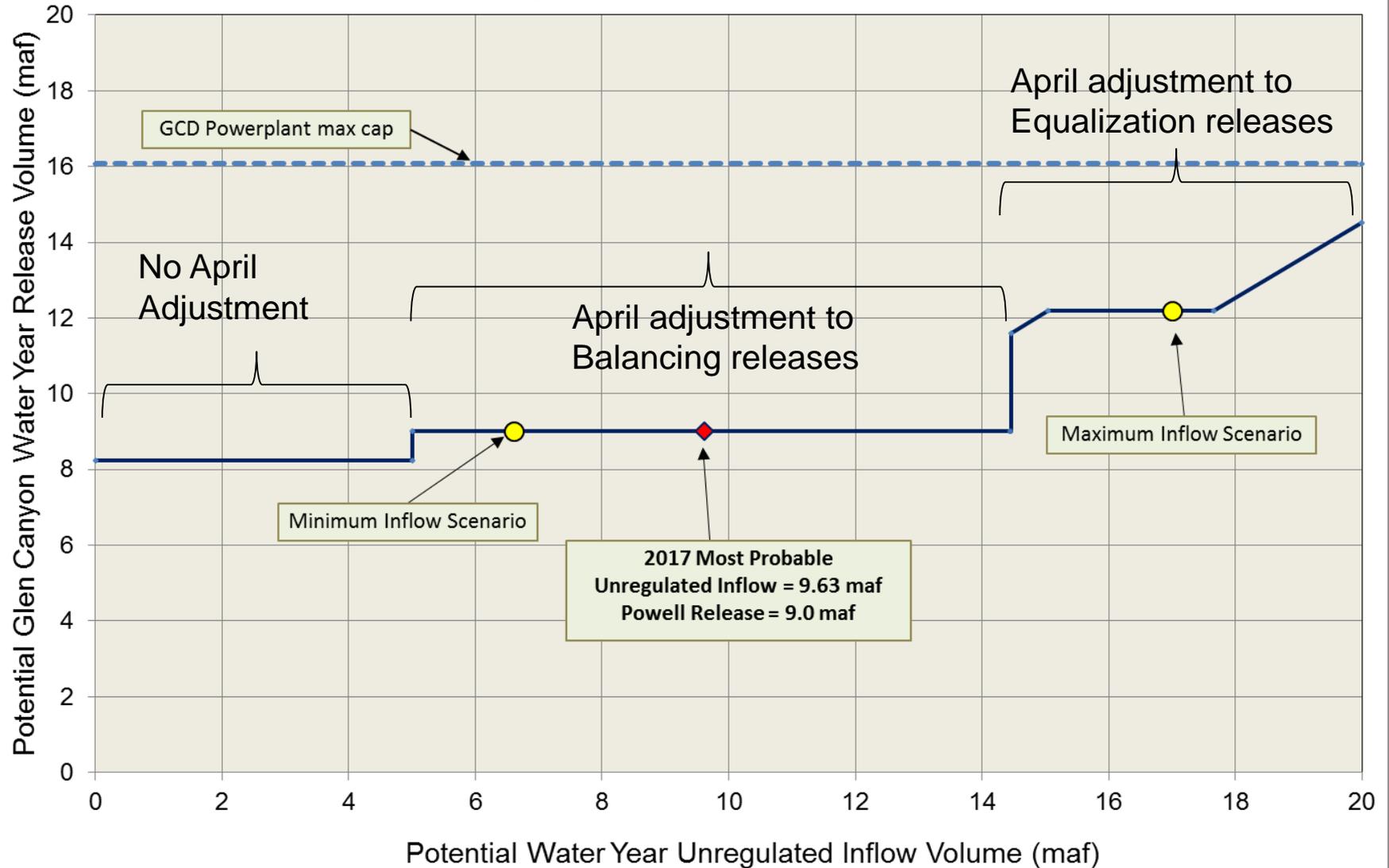
Lake Powell End of Month Elevations

Historic and Projected based on August 2016 Modeling



Potential Lake Powell Release Scenarios

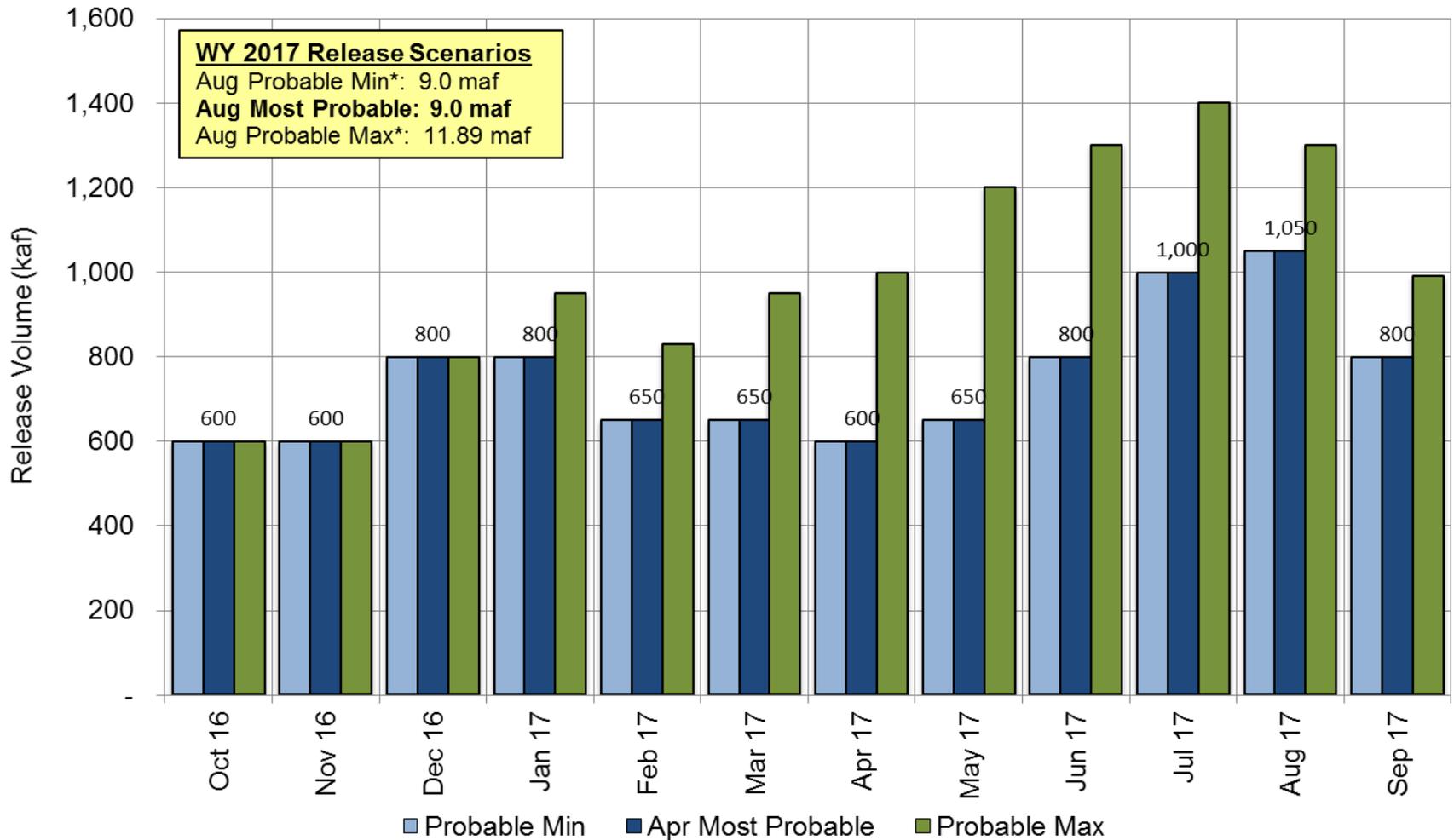
Water Year 2017 Release Volume as a Function of Unregulated Inflow Volume
based on August 2016 24-Month Study Conditions



Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2017

Updated August 2016



* Probable Min and Max annual release volume is based on April Min and Max inflow forecasts

An aerial photograph of the Hoover Dam and Hoover Dam Bypass Bridge. The dam is a large concrete structure with a curved top, situated in a deep canyon. The bridge is a long, multi-arched concrete structure that spans across the canyon, bypassing the dam. The Colorado River flows through the canyon below. The surrounding landscape is rugged and rocky, with some winding roads and power lines visible. The sky is clear and blue.

Lower Colorado River Basin Hydrology and Operations

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Colorado River Basin Storage (as of September 5, 2016)

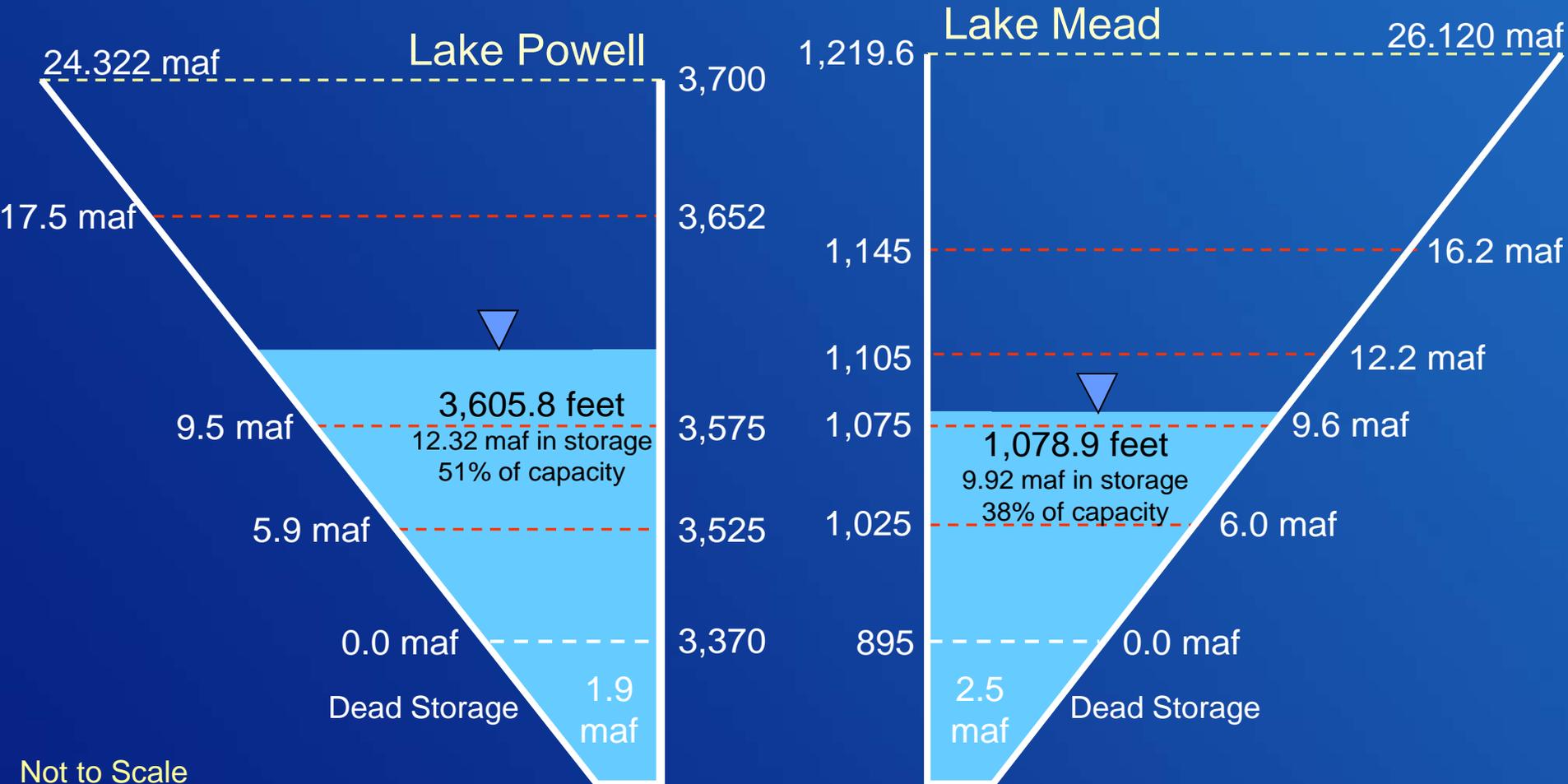
Reservoir	Percent Full	Storage (MAF)	Elevation (Feet)
Lake Powell	54%	13.04	3,613
Lake Mead	37%	9.63	1,075
Total System Storage*	51%	30.60	NA

***Total system storage was 30.76 maf or 52% this time last year**

End of Calendar Year 2016 Projections

August 2016 24-Month Study Most Probable Inflow Scenario¹

Based on a 9.00 maf release pattern from Lake Powell in Water Year 2017



Not to Scale

¹ WY 2016 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 8/1/16.

Lake Powell & Lake Mead Operational Table

Operational Tiers for Water/Calendar Year 2017¹

Lake Powell			Lake Mead		
Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹	Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf) ¹
3,700	Equalization Tier Equalize, avoid spills or release 8.23 maf	24.3	1,220	Flood Control Surplus or Quantified Surplus Condition Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	Upper Elevation Balancing Tier ³ Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)	1,200 (approx.) ²	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	22.9 (approx.) ²
			1,145	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf	15.9
3,575	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5	1,105	1,078.93 ft	11.9
3,525	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	5.9	1,075	Shortage Condition Deliver 7.167 ⁴ maf	9.4
3,490			1,050	Shortage Condition Deliver 7.083 ⁵ maf	7.5
3,370	0	0	1,025	Shortage Condition Deliver 7.0 ⁶ maf Further measures may be undertaken ⁷	5.8
			1,000		4.3
			895		0

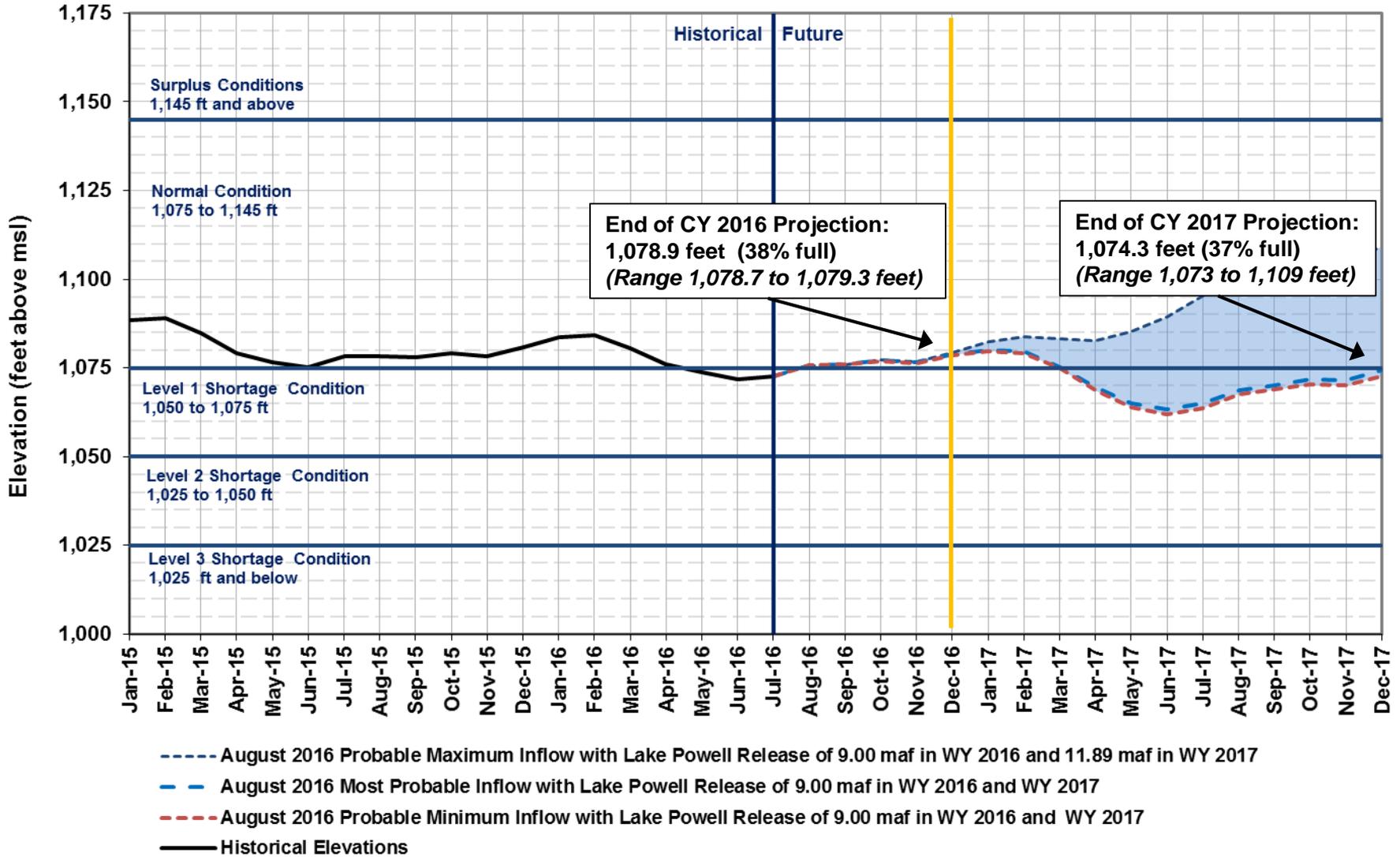
Diagram not to scale
¹ Acronym for million acre-feet
² This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.
³ Subject to April adjustments which may result in a release according to the Equalization Tier
⁴ Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada
⁵ Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada
⁶ Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada
⁷ Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

¹ Lake Powell and Lake Mead operational tier determinations were based on August 2016 24-Month Study projections and will be documented in the 2017 AOP.



Lake Mead End of Month Elevations

Projections from August 2016 24-Month Study Inflow Scenarios



Lower Basin Side Inflows – WY/CY 2016^{1,2}

Intervening Flow from Glen Canyon to Hoover Dam

Month in WY/CY 2015	5-Year Average Intervening Flow (KAF)	Observed Intervening Flow (KAF)	Observed Intervening Flow (% of Average)	Difference From 5-Year Average (KAF)	
HISTORICAL	October 2015	69	118	171%	49
	November 2015	56	41	73%	-15
	December 2015	54	43	79%	-12
	January 2016	62	89	145%	28
	February 2016	73	81	111%	8
	March 2016	55	31	56%	-24
	April 2016	53	68	127%	14
	May 2016	37	50	134%	13
	June 2016	21	14	68%	-7
	July 2016	78	70	90%	-6
August 2016	124	106	85%	-18	
FUTURE	September 2016	112			
	October 2016	69			
	November 2016	56			
	December 2016	54			
WY 2016 Totals	795	822	103%	28	
CY 2016 Totals	795	800	101%	6	

¹ Values were computed with the LC's gain-loss model for the most recent 24-month study.

² Percents of average are based on the 5-year mean from 2011-2015.

Projected Lake Mead Operational Tiers

Based on August 2016 24-Month Study Inflow Scenarios

Powell Inflow Scenario	CY 2017 Jan 1, 2017 Projection	CY 2018 Jan 1, 2018 Projections
Probable Maximum	Normal - ICS Surplus Condition Elevation 1,078.93 ft	Normal - ICS Surplus Condition Elevation 1,109.03 ft
Most Probable		Shortage Condition – Tier I Elevation 1,074.31 ft
Probable Minimum		Shortage Condition – Tier I Elevation 1,072.74 ft

YAO Operations Update

- Brock Reservoir and Senator Wash
2016 YTD accumulated storage¹

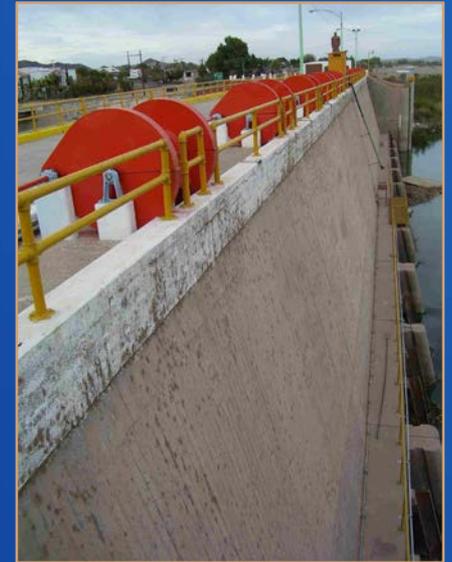
–Brock 106,994 AF

–Senator Wash 48,970 AF



- Excess Flows to Mexico

2016 YTD total² 2,536 AF

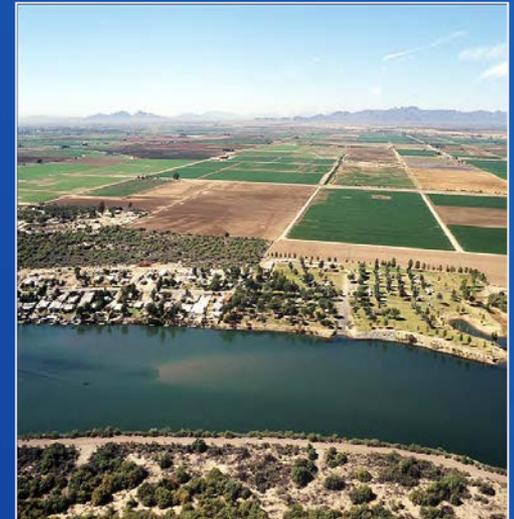


¹ Provisional year-to-date total through September 1, 2016

² Provisional year-to-date total through September 5, 2016

YAO Operations Update

- Pumped drainage return flows from the Wellton-Mohawk Irrigation and Drainage District
 - Flow at station 0+00 on the Main Outlet Drain from January through July 2016 was 54,800 AF at 2,654 ppm
- Provisional drainage Flows to the Colorado River
 - From the South Gila Drainage Wells January through April 2016 was 14,570 AF at 1,672 ppm
 - From the Yuma Mesa Conduit January through July 2016 was 0 AF





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