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Managing Water in the West

2020 Colorado River Annual Operating Plan

Colorado River Management Work Group

Second Consultation

July 25, 2019

2020 Colorado River AOP
Second Consultation Meeting

- Welcome and Introductions – **Steve Hvinden / Chris Cutler**
- Upper Basin Hydrology and Operations – **Heather Patno**
- Lower Basin Hydrology and Operations – **Noe Santos**
- 2020 AOP Review Process – **Steve Hvinden / Chris Cutler**
- Review of Draft 2020 AOP – **CRMWG**
- Wrap-up and Next Steps
- Reminder of Future Meeting Dates

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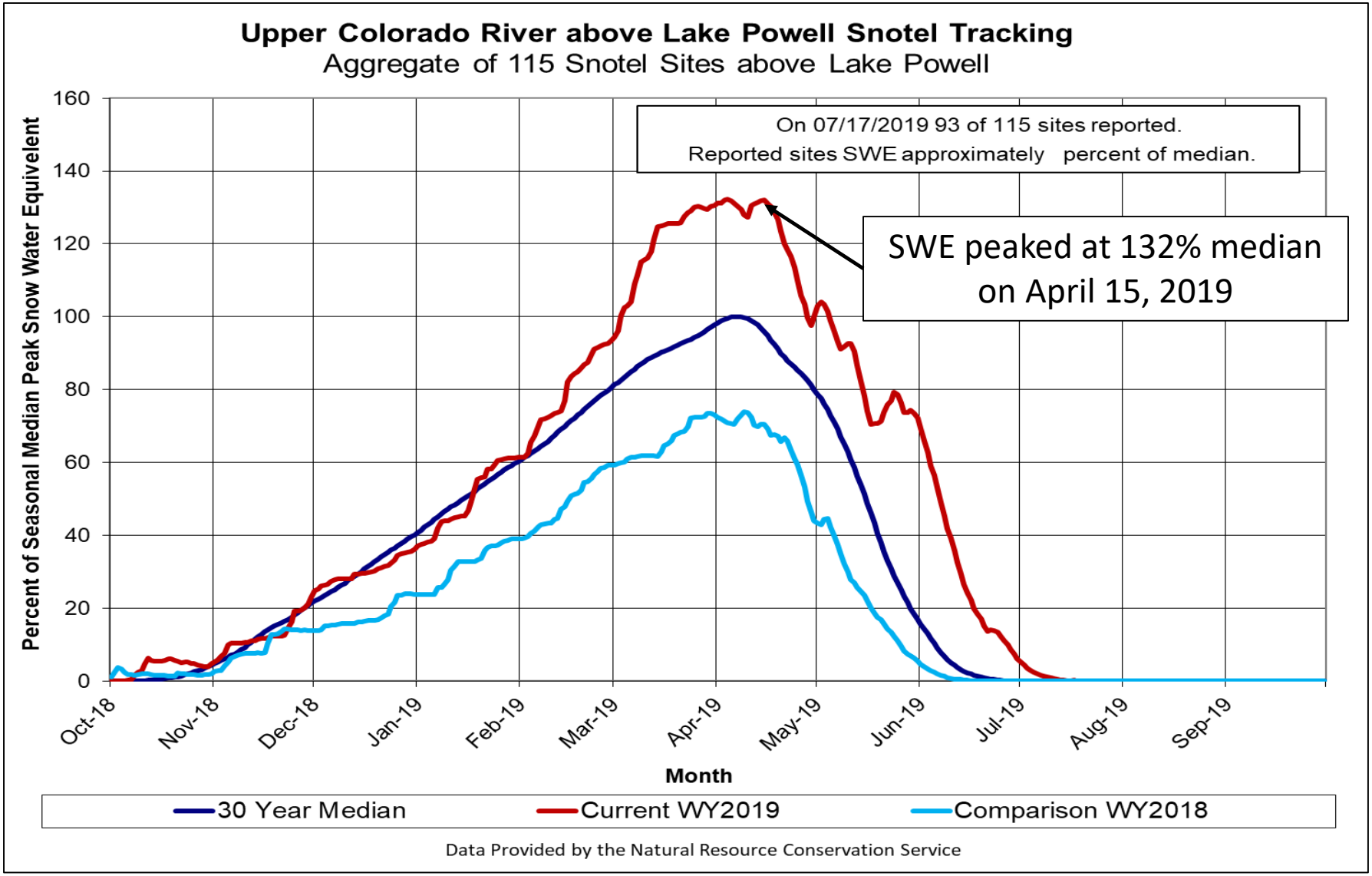
2020 Annual Operating Plan

Upper Colorado Basin Hydrology

Snow Conditions



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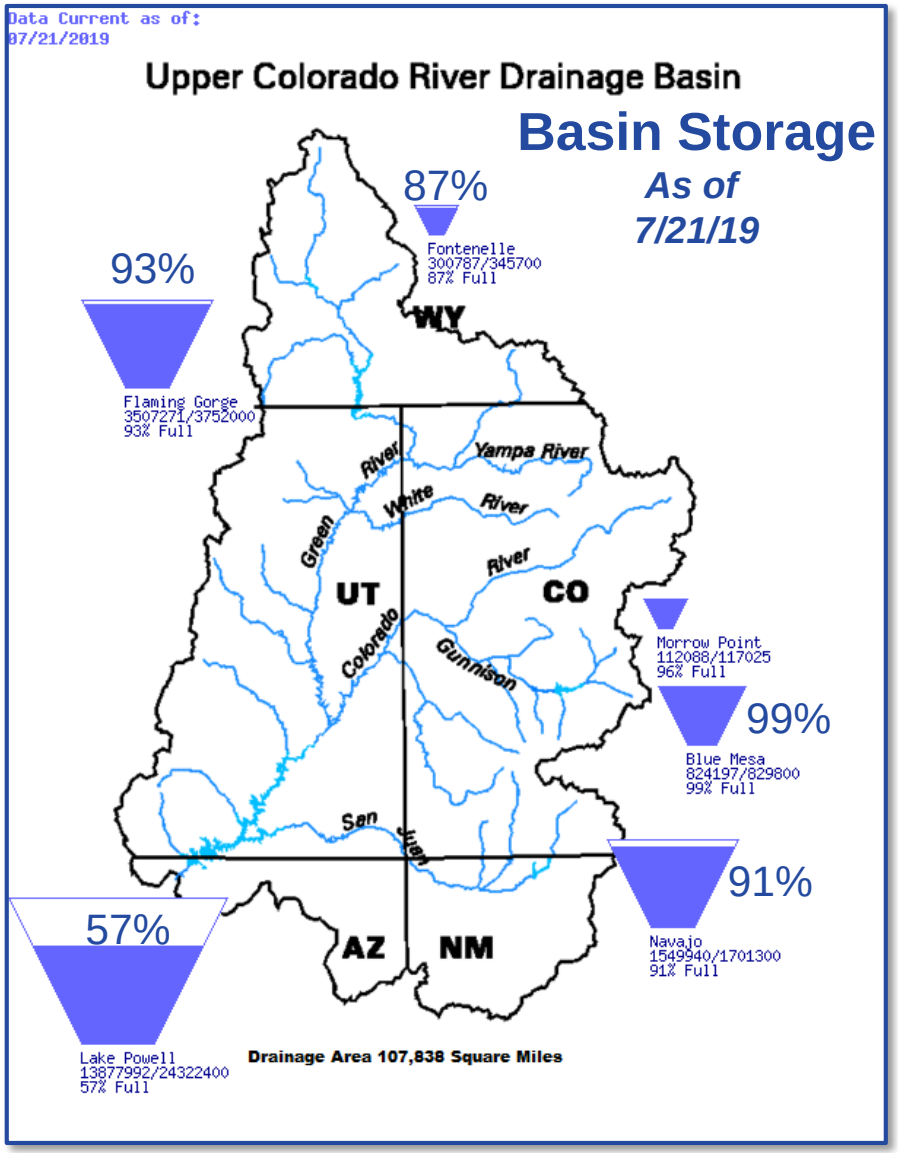
Upper Basin Storage



2019 April - July Forecasted Inflow

Issued July 16, 2019

Reservoir	Forecast (kaf)	Percent of Average[1]
Fontenelle	805	111
Flaming Gorge	1,185	121
Blue Mesa	1,075	159
Navajo	1,140	155
Powell	10,600	148

[1] Percent of average based on 1981-2010 period.

http://www.usbr.gov/uc/water/basin/index.html

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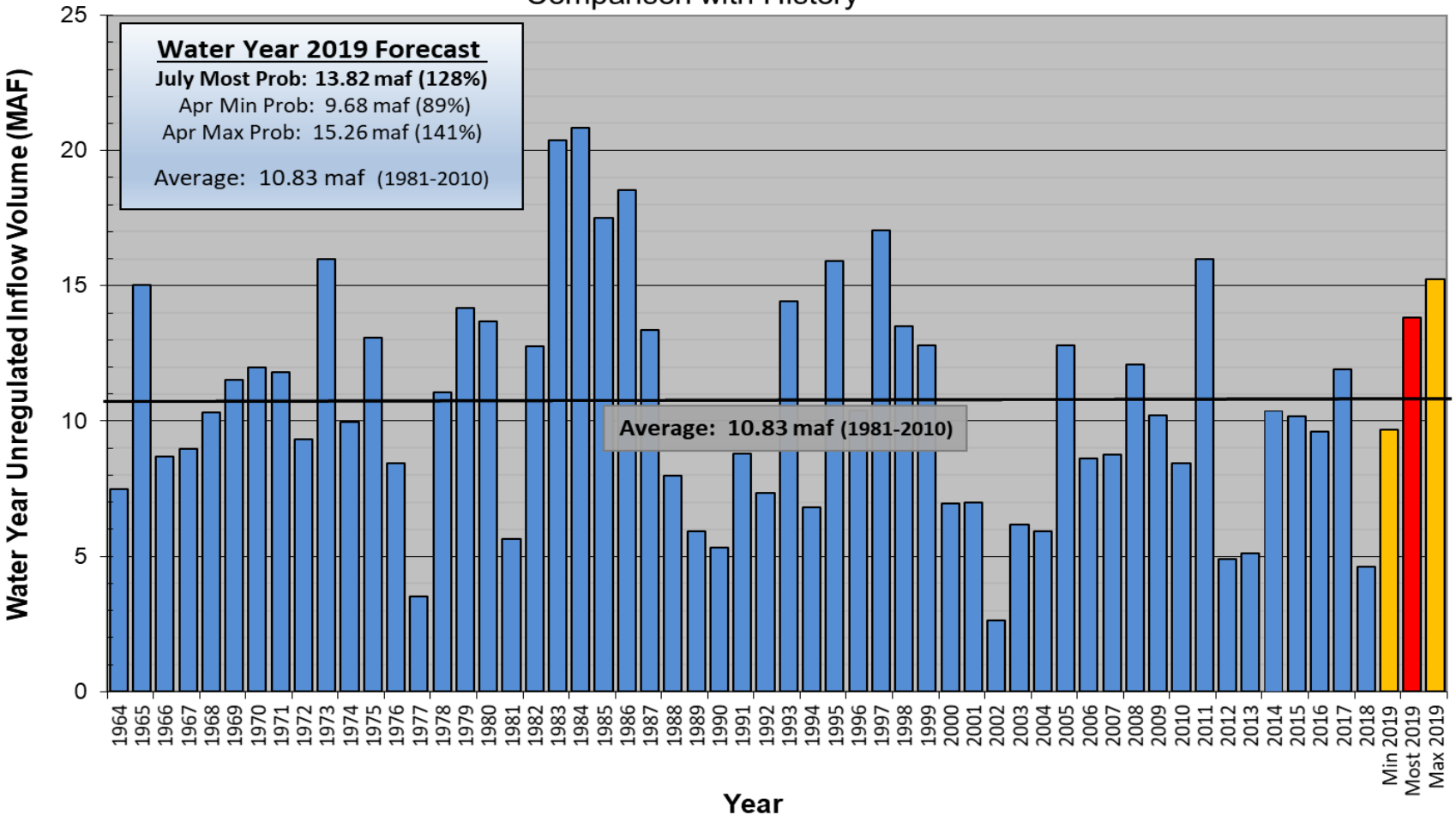
Lake Powell Unregulated Inflow
Water Year 2019 Forecast *(issued July 2)*
Comparison with History



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2020 Annual Operating Plan

Upper Colorado Basin Projected Operations

Water Years 2019 and 2020

Lake Powell & Lake Mead Operational Table

Operational Tiers for Water/Calendar Year 2019[1]

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)		15.5 - 19.3 (2008-2026)
	3,586.55 ft ***Jan 1, 2019 projection*** **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	
3,575		9.5
	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	
3,525		5.9
	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	
3,490		4.0
3,370		0

Lake Mead

Elevation (feet)	Operation According to the Interim Guidelines	Live Storage (maf)[1]
1,220	**Flood Control Surplus or Quantified Surplus Condition** Deliver > 7.5 maf	25.9
1,200 (approx.)[2]		22.9 (approx.)[2]
	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	
1,145		15.9
1,105	**Normal or ICS Surplus Condition** Deliver ≥ 7.5 maf ***1,079.50 ft*** ***Jan 1, 2019 projection***	11.9
1,075	**Shortage Condition** Deliver 7.167[4] maf	9.4
1,050		7.5
	Shortage Condition Deliver 7.083[5] maf	
1,025		5.8
1,000	**Shortage Condition** Deliver 7.0[6] maf Further measures may be undertaken[7]	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 2018 24-Month Study projections as documented in the 2019 AOP.

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B. Upper Elevation Balancing Tier

1. In Water Years when the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet, the Secretary shall release 8.23 maf from Lake Powell if the projected January 1 Lake Mead elevation is at or above 1,075 feet.

2. If the projected January 1 Lake Powell elevation is below the elevation stated in the Lake Powell Equalization Elevation Table and at or above 3,575 feet and the projected January 1 Lake Mead elevation is below 1,075 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 7.0 maf from Lake Powell in the Water Year.

3. When operating in the Upper Elevation Balancing Tier, if the April 24-Month Study projects the September 30 Lake Powell elevation to be greater than the elevation in the Lake Powell Equalization Elevation Table, the Equalization Tier will govern the operation of Lake Powell for the remainder of the Water Year (through September).

4. When operating under Section 6.B.1, if the April 24-Month Study projects the September 30 Lake Mead elevation to be below 1,075 feet and the September 30 Lake Powell elevation to be at or above 3,575 feet, the Secretary shall balance the contents of Lake Mead and Lake Powell, but shall release not more than 9.0 maf and not less than 8.23 maf from Lake Powell in the Water Year.

5. When Lake Powell is projected to be operating under Section 6.B.2. and more than 8.23 maf is projected to be released from Lake Powell during the upcoming Water Year, the Secretary shall recalculate the August 24-Month Study projection of the January 1 Lake Mead elevation to include releases above 8.23 maf that are scheduled to be released from Lake Powell during the months of October, November, and December of the upcoming Water Year, for the purposes of determining Normal or Shortage conditions pursuant to Sections 2.A. or 2.D. of these Guidelines.

August Determination

April Determination

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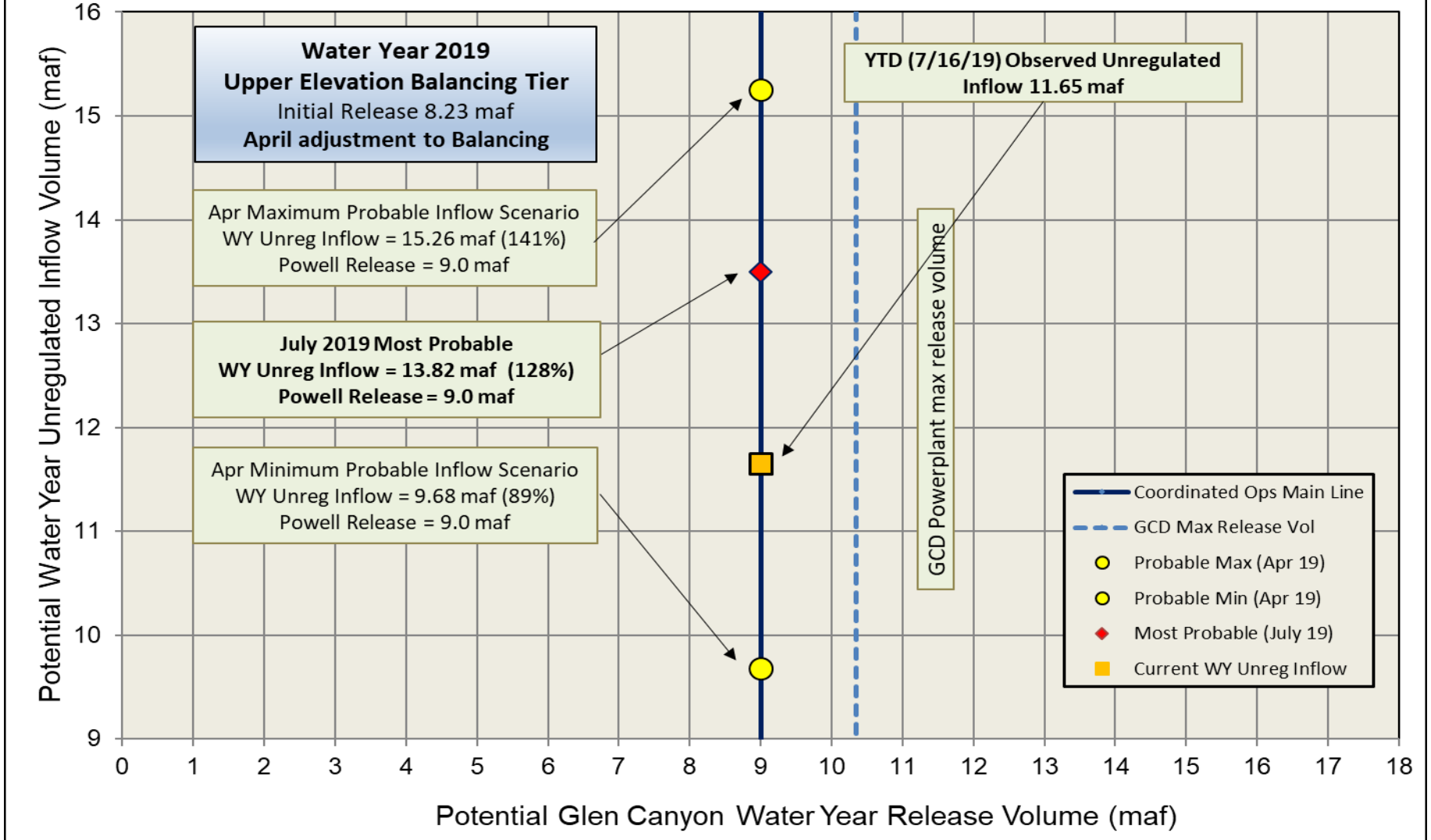
Potential Lake Powell Release Scenarios

Water Year 2019 Release Volume as a Function of Unregulated Inflow Volume
based on July 2019 24-Month Study Conditions



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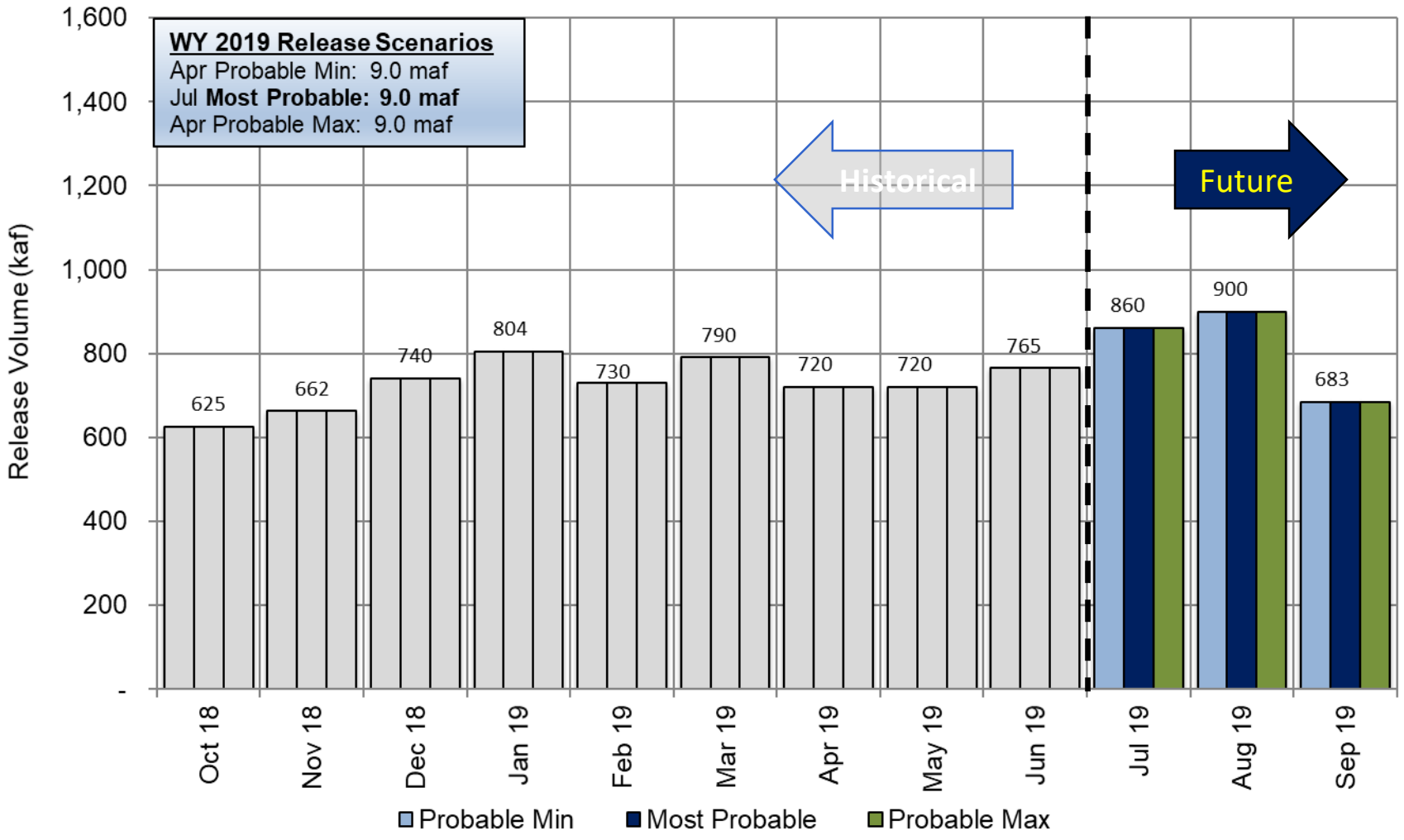
Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2019

Based on July 2019 modeling



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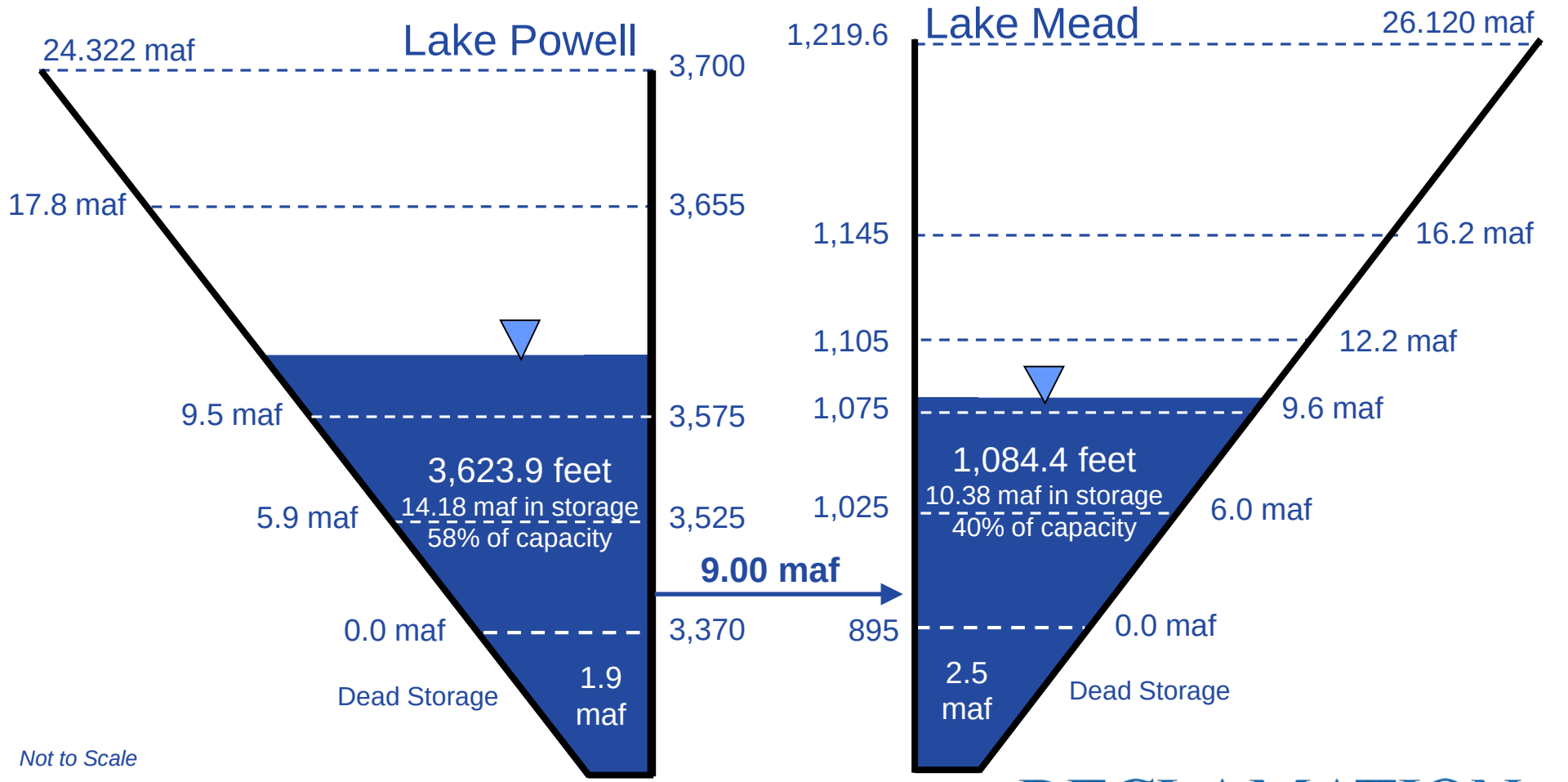
End of Water Year 2019 Projections

July 2019 24-Month Study Most Probable Inflow Scenario[1]

Projected Lake Powell Unregulated Inflow = 13.82 maf (128% of average)



Not to Scale

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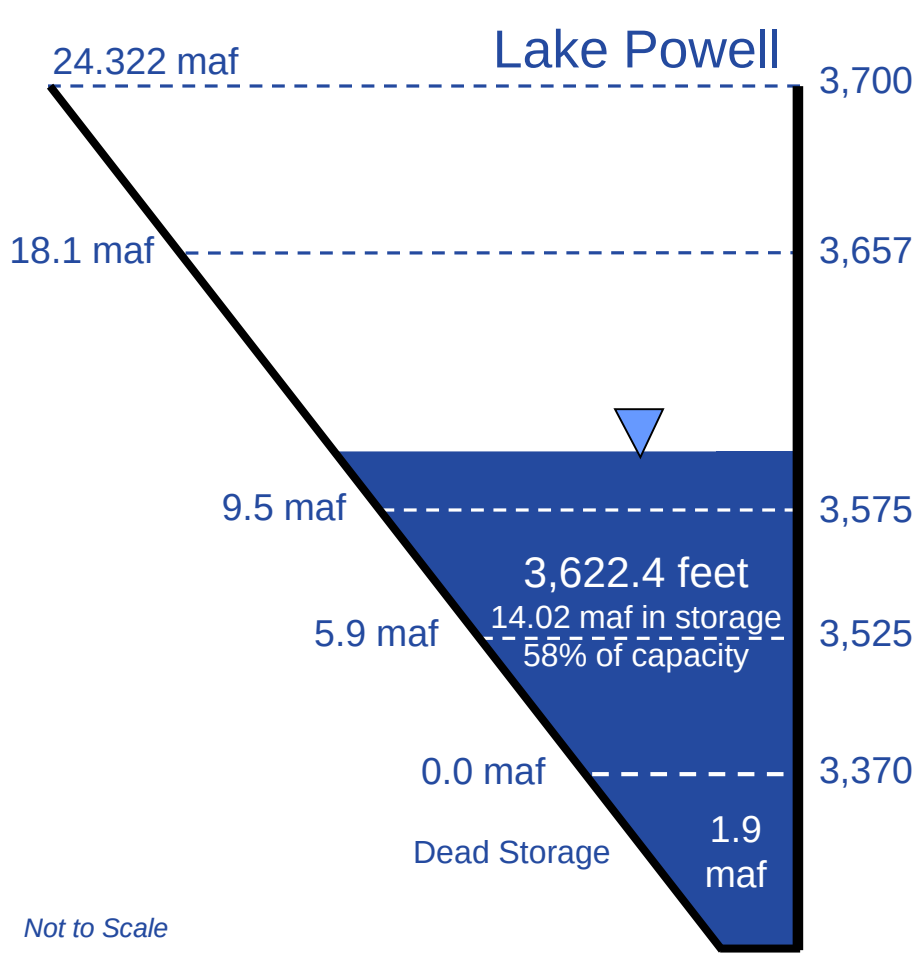
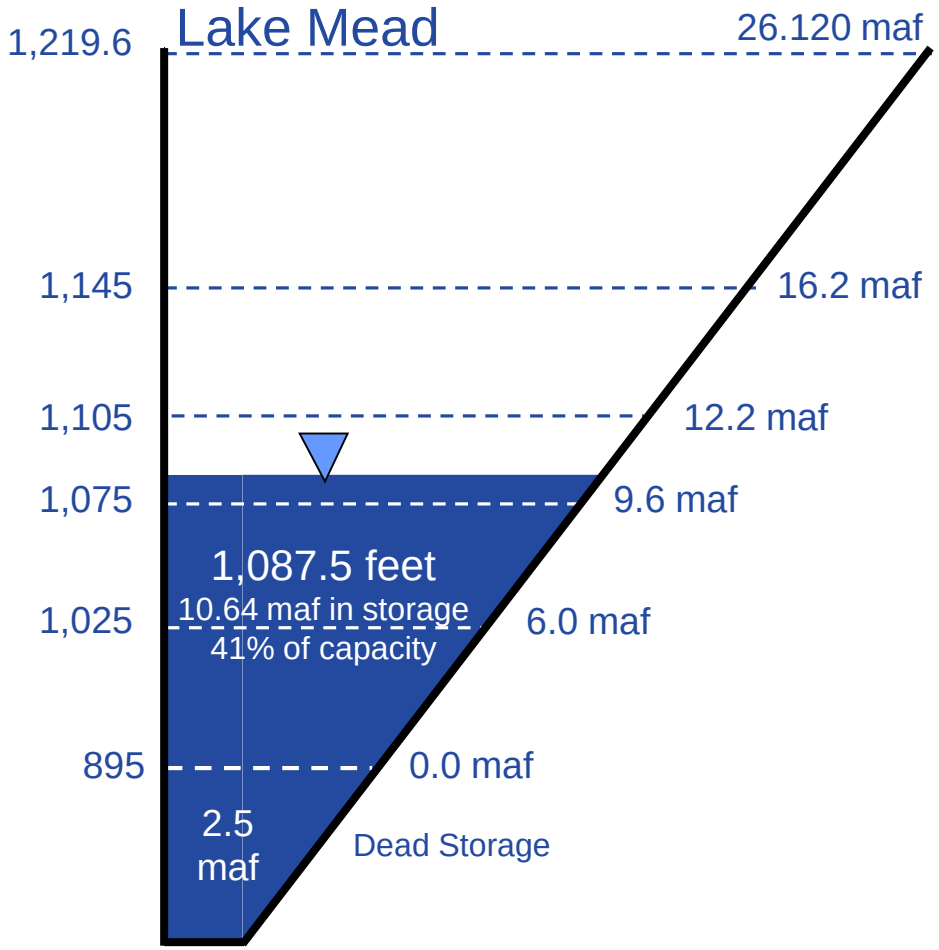
[1] *WY 2019 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 7/1/19.*

End of Calendar Year 2019 Projections

July 2019 24-Month Study Most Probable Inflow Scenario[1]

Based on a Lake Powell release of 9.00 maf in WY 2019 & WY 2020





Not to Scale

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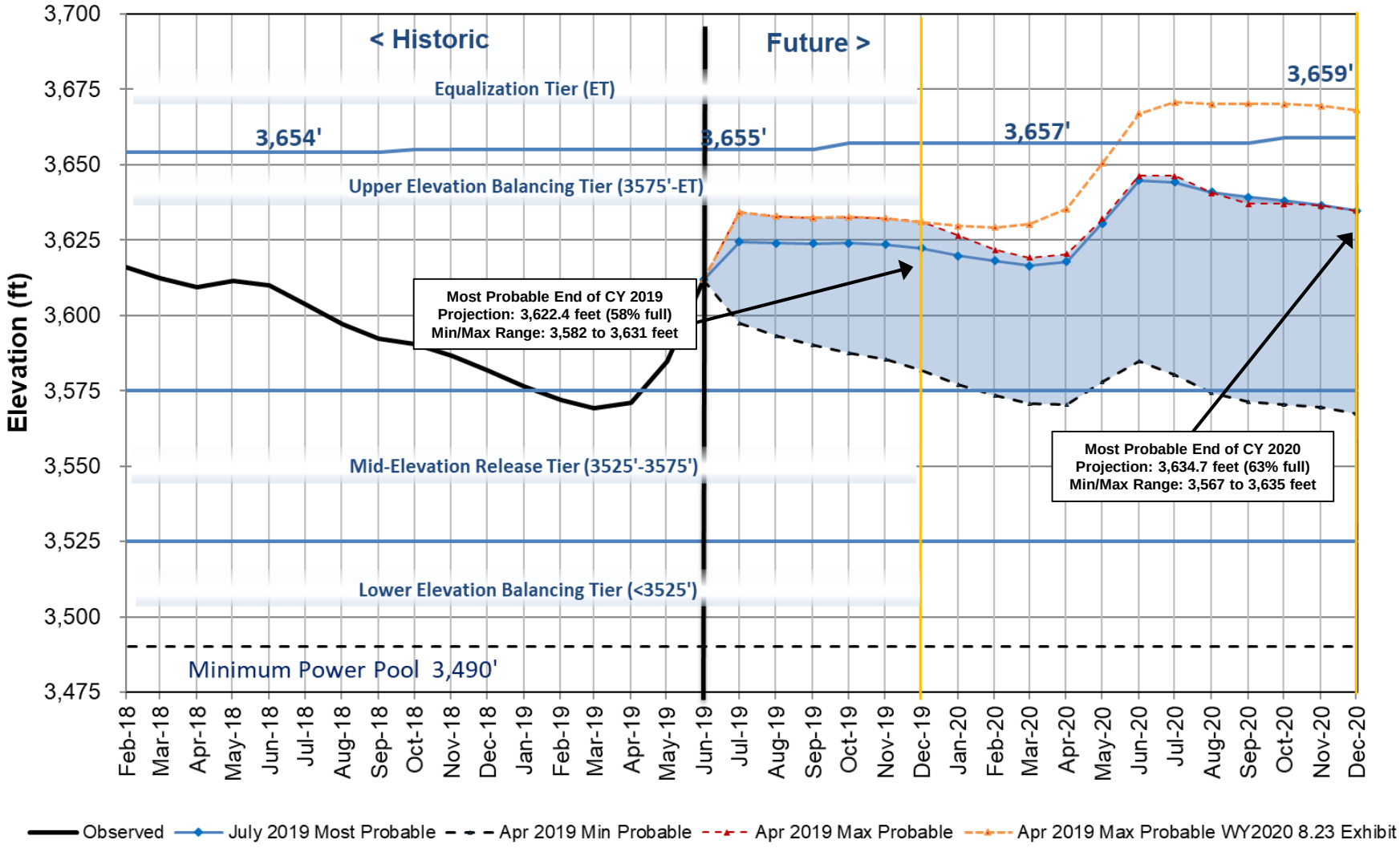
Lake Powell End of Month Elevations

Historic and Projected based on July 2019 Modeling



Water Year 2019 Projections	Water Year 2020 Projections
Jul Most: 9.00 maf release	Jul Most: 9.00 maf release
Apr Min: 9.00 maf release	Apr Min: 8.72 maf release
Apr Max: 9.00 maf release	Apr Max: 12.84 maf release

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Lake Powell 2020 Operating Tier Scenarios

Based on April and July 2019 24-Month Study

Inflow Scenario	Operating Tier/ Release Volume
April Minimum Probable	Upper Elevation Balancing 8.72 maf
July Most Probable	Upper Elevation Balancing 9.00 maf
April Maximum Probable	Equalization 12.84 maf

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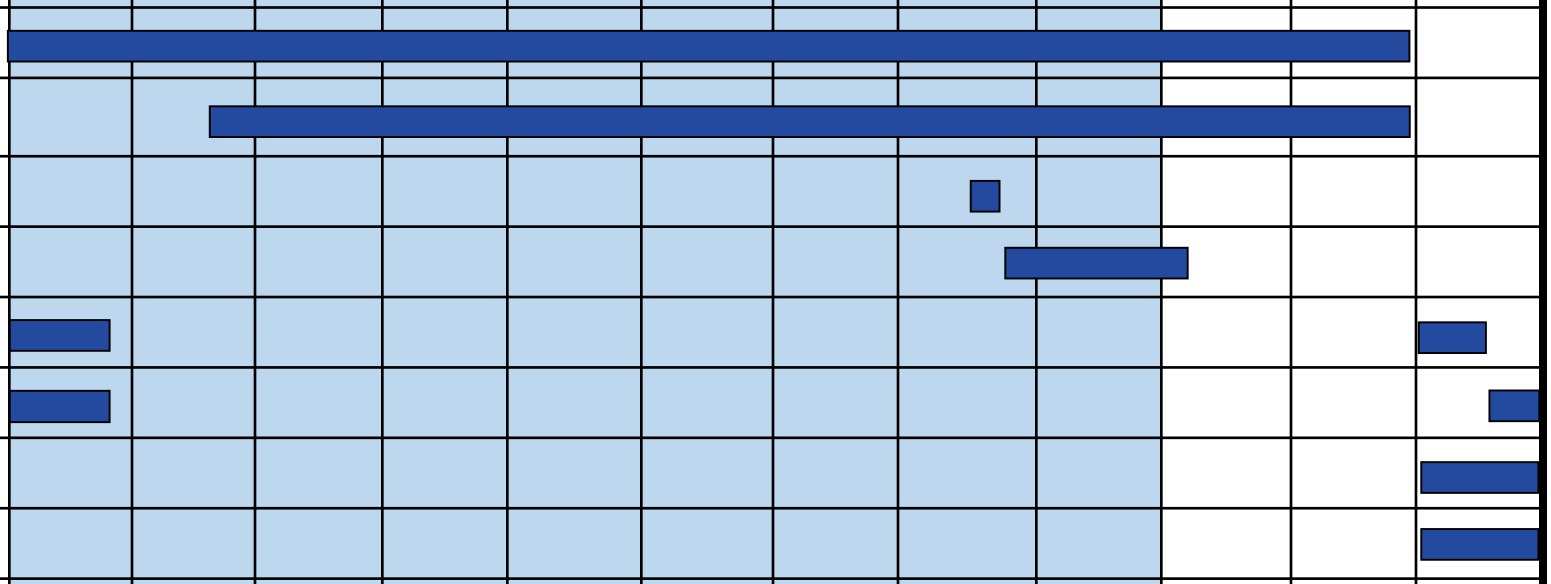
Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2019



Unit Number	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019	
Units Available	5	7	6	6	6	5	5	5	5	5/6	6	5	
Capacity (cfs)	**16,000**	**19,700**	**19,400**	**19,300**	**15,700**	**18,600**	**18,600**	**15,300**	**15,300**	**15,600**	**19,000**	**15,400**	
Capacity (kaf/month)	1,050	1,300	1,190	1,190	1,070	1,140	1,110	1,100	940	1,090	1,180	990	
Max (kaf) [1]	625	662	740	804	730	790	720	720	765	860	900	683	**9.0**
Most (kaf) [2]	625	662	740	804	730	790	720	720	765	860	900	683	**9.0**
Min (kaf) [1]	625	662	740	804	730	790	720	720	765	860	900	683	**9.0**

1 Projected release, based on Apr 2019 Min and Max Probable Inflow Projections and 24-Month Study model runs.
2 Projected release, based on July 2019 Most Probable Inflow Projections and 24-Month model runs.

Last Updated July 22, 2019.

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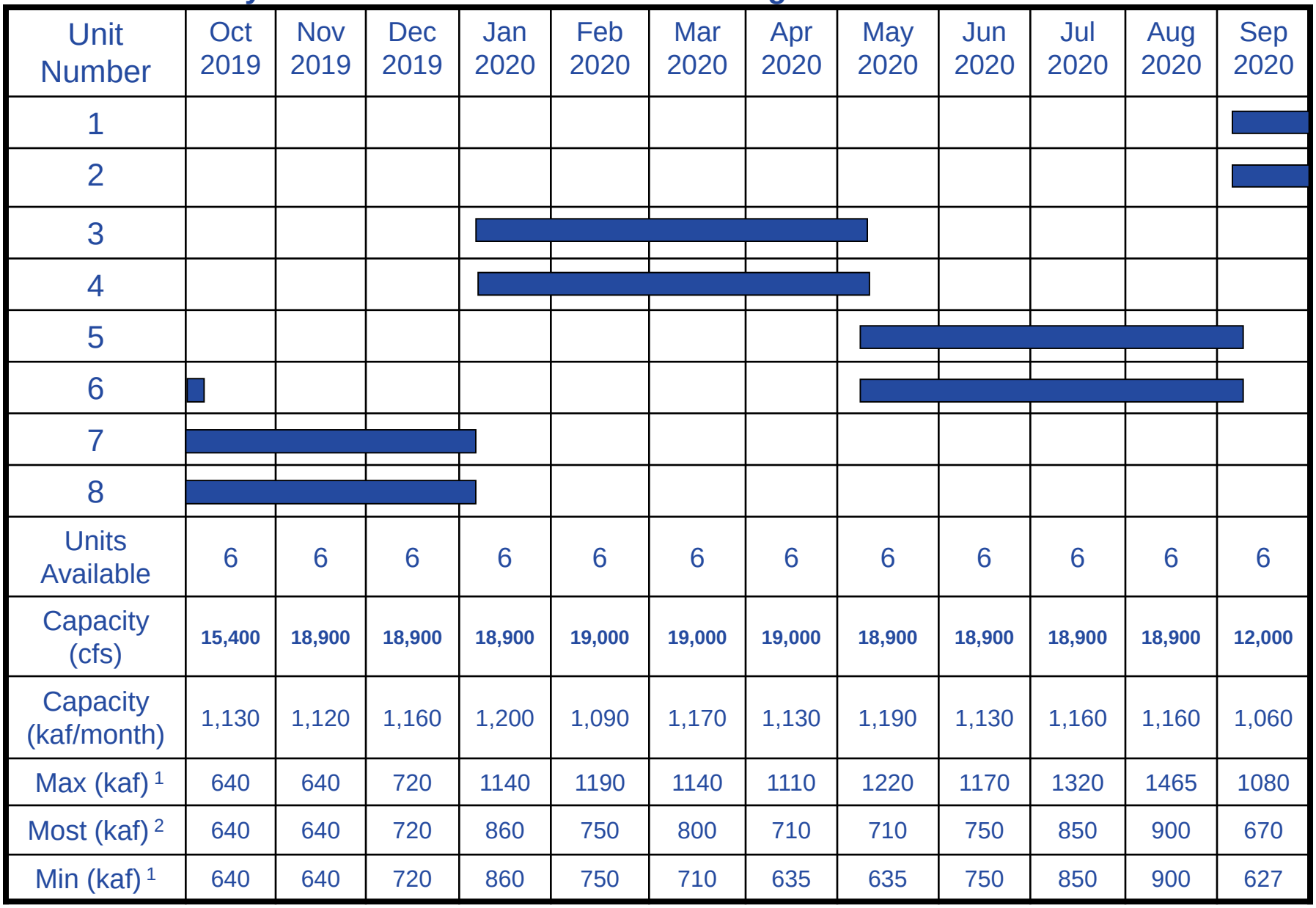
Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2020



Unit Number	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020	
Units Available	6	6	6	6	6	6	6	6	6	6	6	6	
Capacity (cfs)	**15,400**	**18,900**	**18,900**	**18,900**	**19,000**	**19,000**	**19,000**	**18,900**	**18,900**	**18,900**	**18,900**	**12,000**	
Capacity (kaf/month)	1,130	1,120	1,160	1,200	1,090	1,170	1,130	1,190	1,130	1,160	1,160	1,060	
Max (kaf) [1]	640	640	720	1140	1190	1140	1110	1220	1170	1320	1465	1080	**12.84**
Most (kaf) [2]	640	640	720	860	750	800	710	710	750	850	900	670	**9.00**
Min (kaf) [1]	640	640	720	860	750	710	635	635	750	850	900	627	**8.72**

1 Projected release, based on Apr 2019 Min and Max Probable Inflow Projections and 24-Month Study model runs.
2 Projected release, based on July 2019 Most Probable Inflow Projections and 24-Month model runs.

Last Updated July 23, 2019.

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2020 Annual Operating Plan

Lower Colorado Basin Projected Operations

Water Year 2019

Colorado River Basin Storage
(as of July 21, 2019)

Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Lake Powell	57	13.88	3,621
Lake Mead	40	10.32	1,084
Total System Storage	55	32.75	-
Total System Storage ***(at this time last year)***	*50*	*29.92*	-

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Lake Powell & Lake Mead Operational Table

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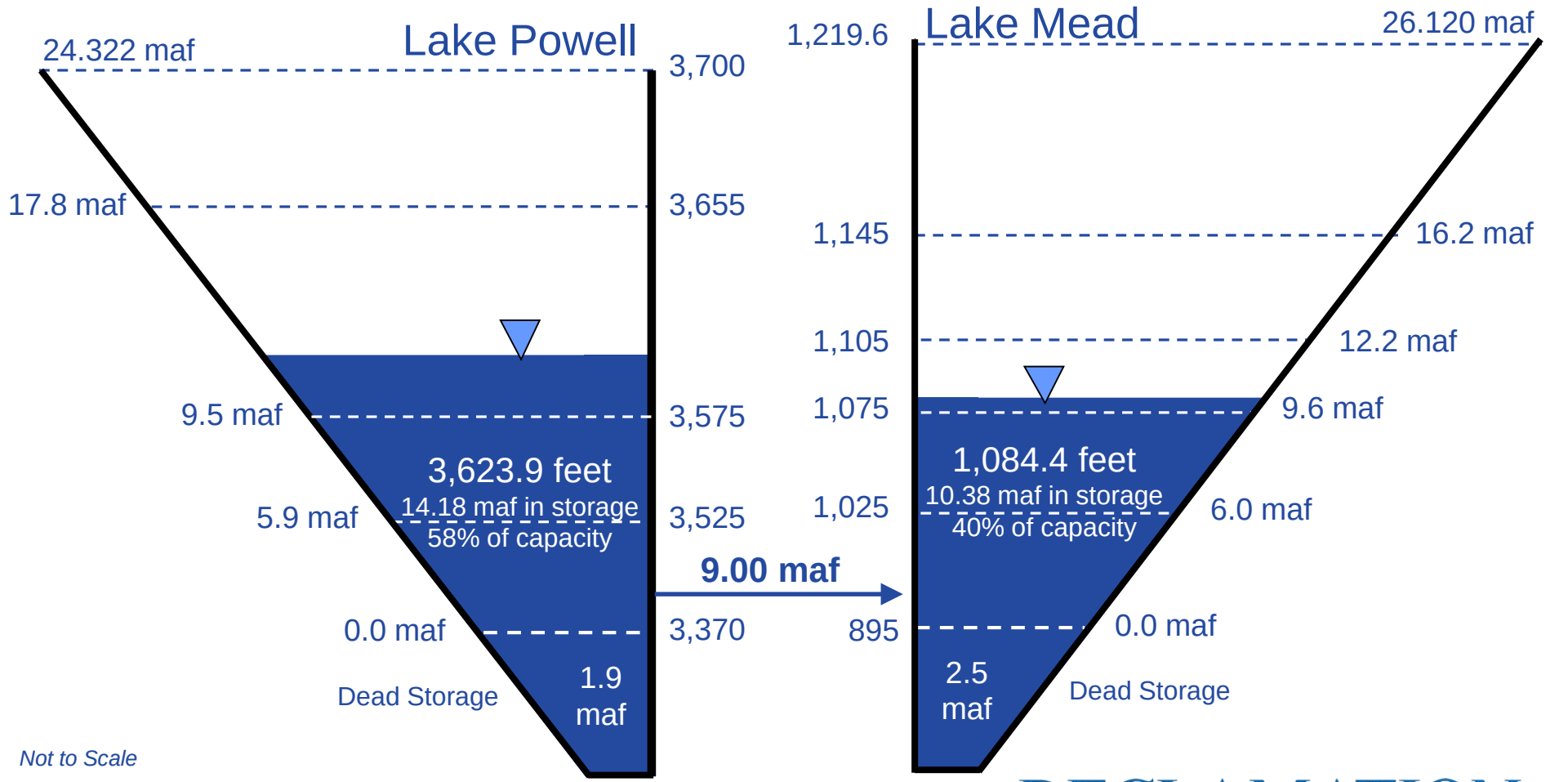

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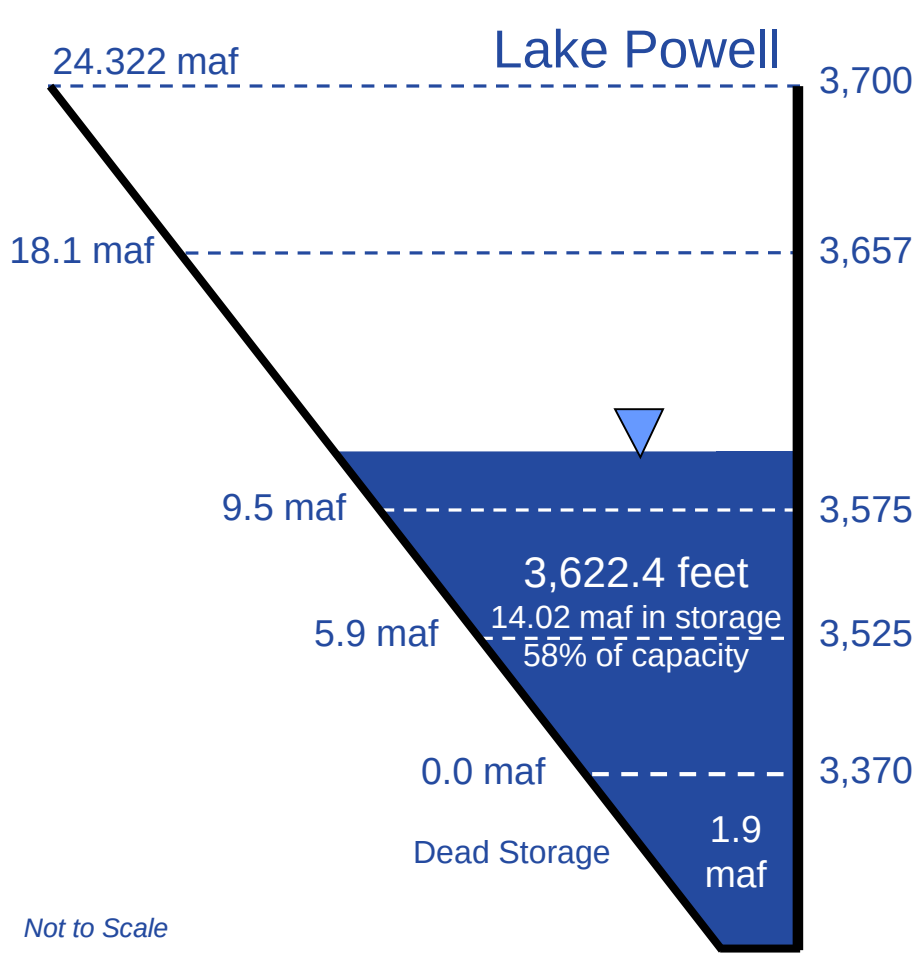

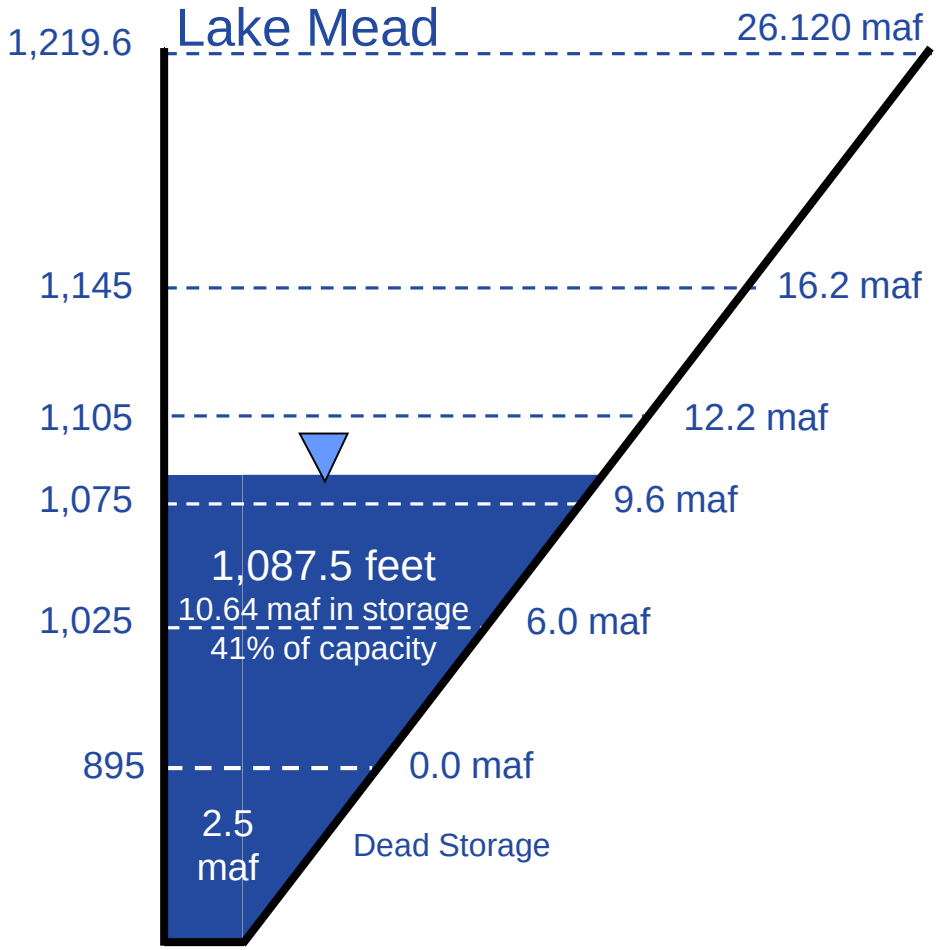

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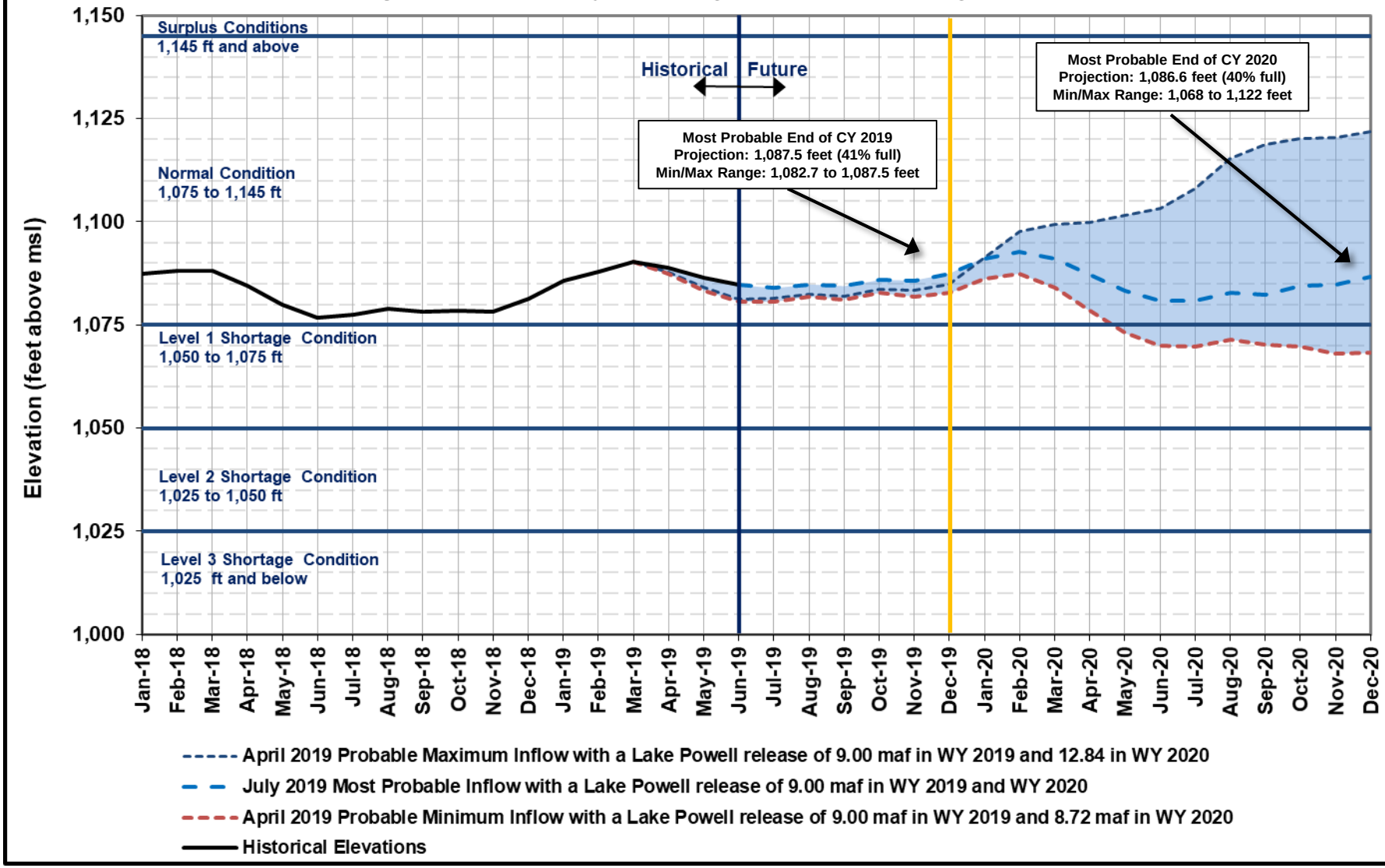
Lake Mead End of Month Elevations

Projections from the April and July 2019 24-Month Study Inflow Scenarios



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Lower Basin Side Inflows – WY/CY 2019[1,2]

Intervening Flow from Glen Canyon to Hoover Dam

	Month in WY/CY 2019	5-Year Average Intervening Flow (KAF)	Observed Intervening Flow (KAF)	Observed Intervening Flow (% of Average)	Difference From 5-Year Average (KAF)
HISTORICAL	October 2018	82	100	123%	19
	November 2018	54	67	125%	13
	December 2018	51	52	101%	<1
	January 2019	83	106	128%	23
	February 2019	91	126	138%	35
	March 2019	57	201	354%	144
	April 2019	49	118	240%	69
	May 2019	30	107	358%	77
	June 2019	17	70	415%	53
PROJECTED	July 2019	80			
	August 2019	100			
	September 2019	91			
	October 2019	82			
	November 2019	54			
	December 2019	51			
	WY 2019 Totals	784	1,218	155%	433
	CY 2019 Totals	784	1,185	151%	401

[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 2014-2018.

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Additional Operational Data
Provisional CY 2019 Totals

- **Mexico Excess Flows**
  - ➢3,815 af (through 7/21)

- **Brock Reservoir Total Storage**
  - ➢71,182 af (through 7/14)

- **Senator Wash Total Storage**
  - ➢62,225 af (through 7/18)

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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 May 2019 was 38,575 AF at 2,758 ppm
- Provisional drainage flows to the Colorado River
  - From the South Gila Drainage Wells January through June 2019 was 21,937 AF at 1,665 ppm
  - From the Yuma Mesa Conduit January through June 2019 was 3,608 AF at 1,430 ppm

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Second Consultation

July 25, 2019

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