

RECLAMATION

Managing Water in the West

Basin Hydrology, Reservoir Operations 2018 and 2019 Hydrograph

Adaptive Management Work Group

August 22, 2018



U.S. Department of the Interior
Bureau of Reclamation

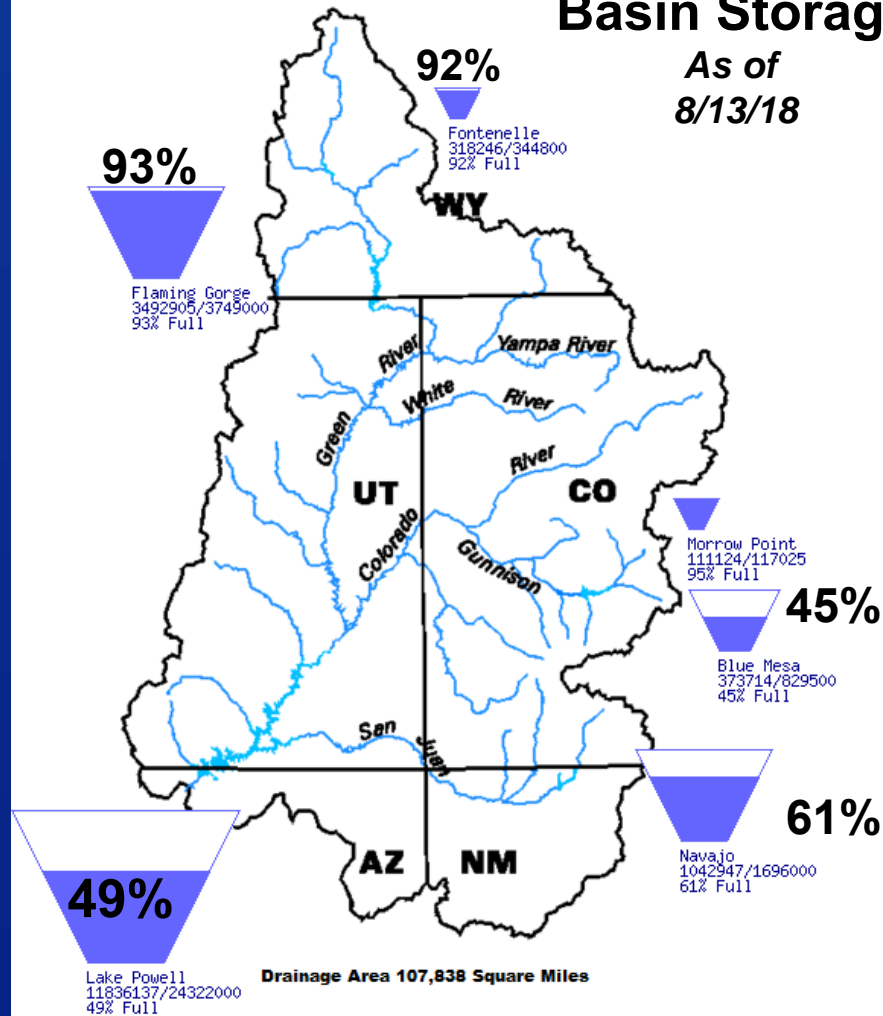
Upper Basin Storage

Data Current as of:
08/13/2018

Upper Colorado River Drainage Basin

Basin Storage

As of
8/13/18



Water Year 2018 Observed Inflow Issued August 1, 2018

Reservoir	WY 2018 Observed (KAF)	Percent of Average ¹
Fontenelle	997	138%
Flaming Gorge	1,118	114%
Blue Mesa	238	35%
Navajo	155	21%
Powell	2,607	36%

¹ Percent of average based on period 1981-2010.

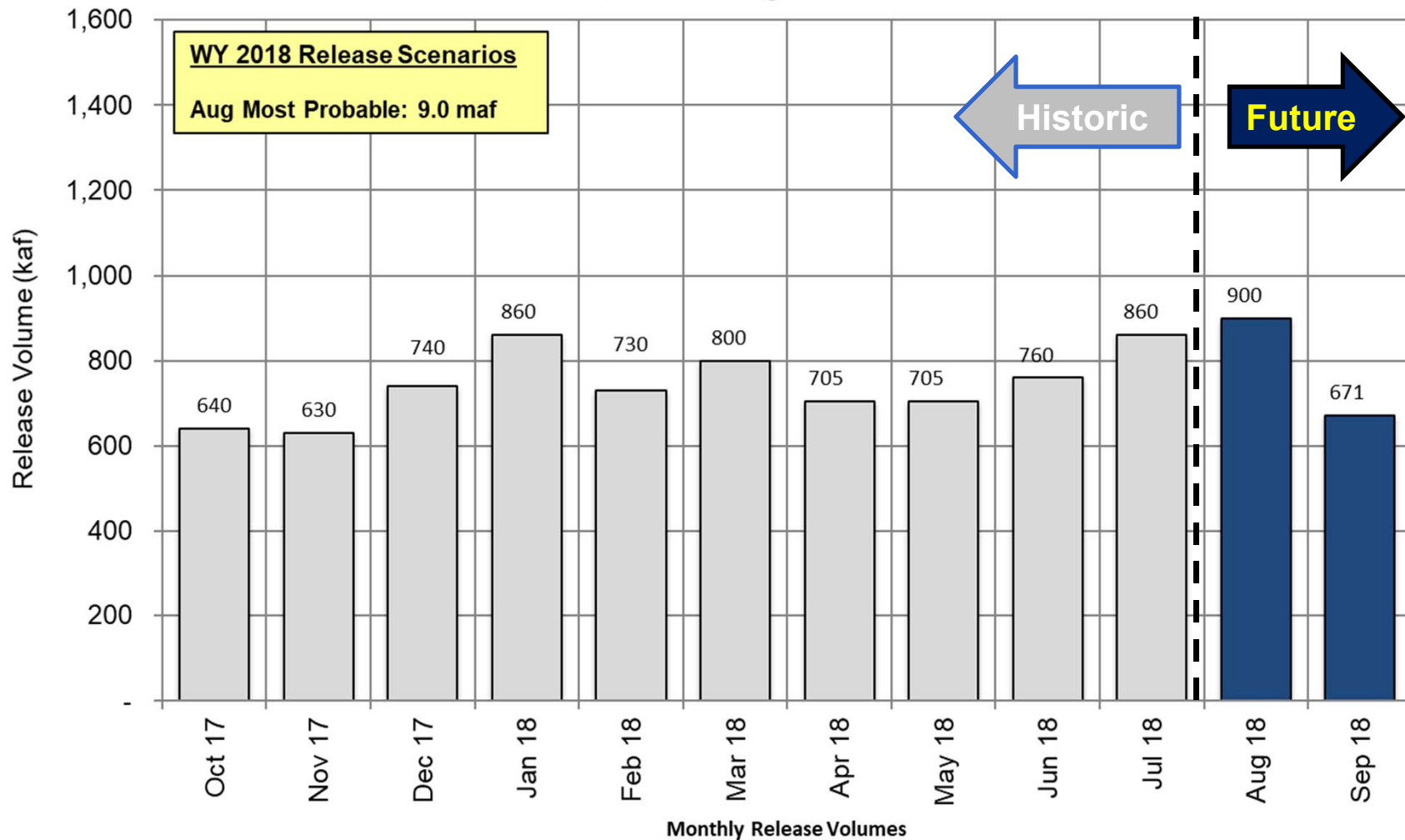
<http://www.usbr.gov/uc/water/basin/index.html>

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Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2018

Updated August 2018



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Reservoir Operations for Water Year 2019

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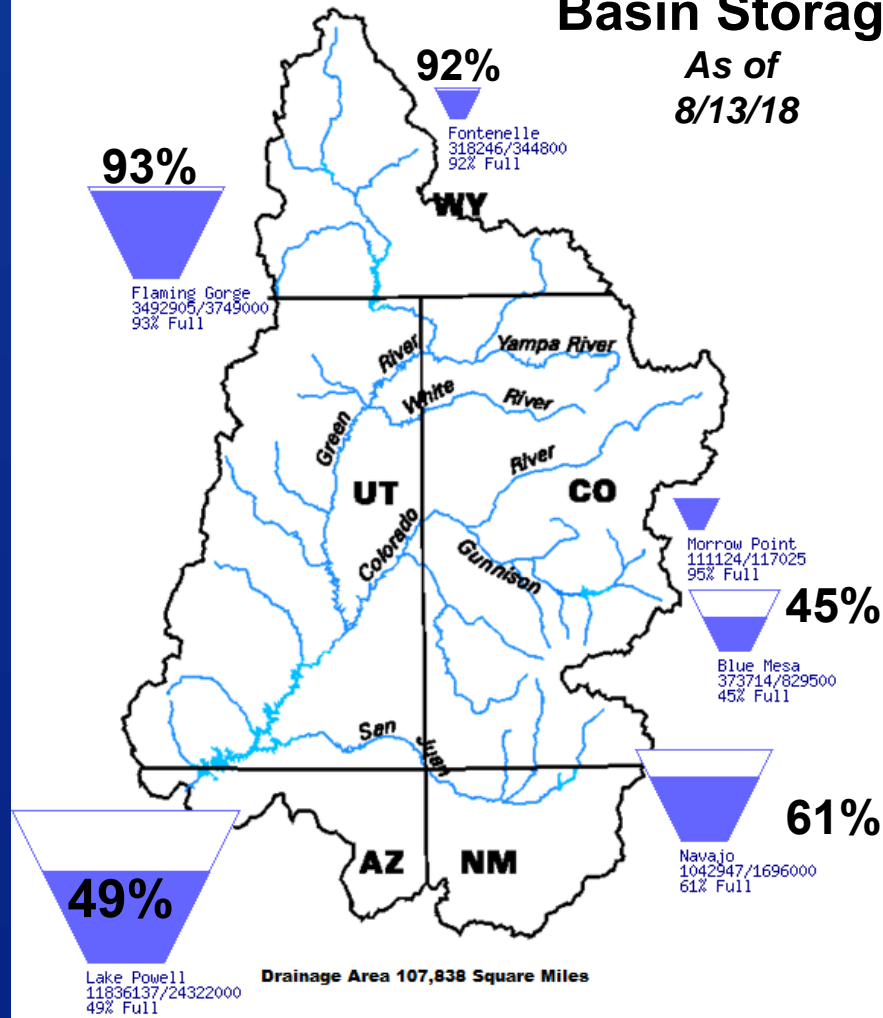
Upper Basin Storage

Data Current as of:
08/13/2018

Upper Colorado River Drainage Basin

Basin Storage

As of
8/13/18



Water Year 2019 Forecasted Inflow Issued August 1, 2018

Reservoir	WY 2019 Forecast (KAF)	Percent of Average ¹
Fontenelle	1,040	96%
Flaming Gorge	1,320	91%
Blue Mesa	760	80%
Navajo	745	69%
Powell	8,100	75%

¹ Percent of average based on period 1981-2010.

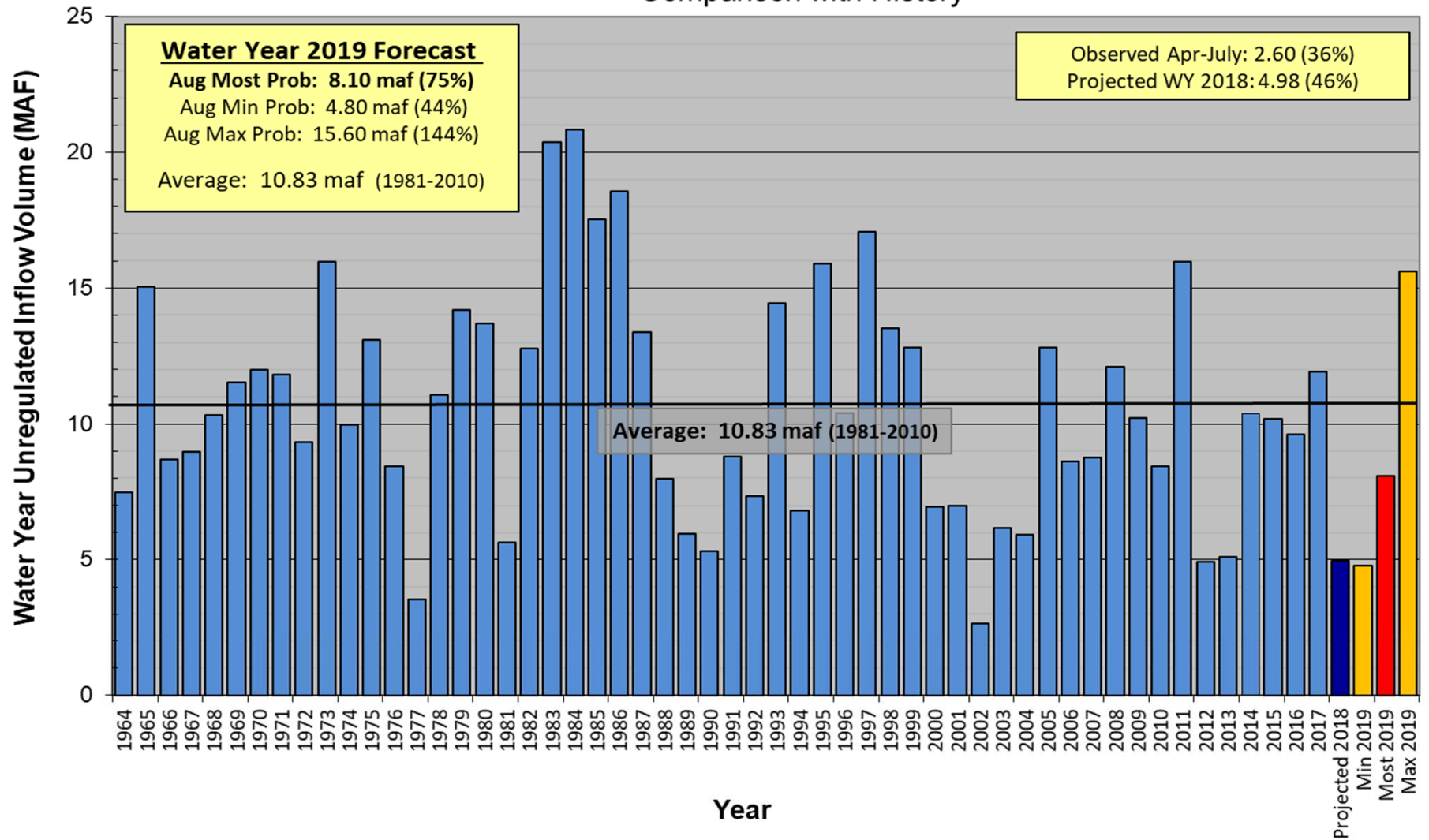
<http://www.usbr.gov/uc/water/basin/index.html>

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Lake Powell Unregulated Inflow

Water Year 2019 Forecast (issued August 1)

Comparison with History



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Lake Powell & Lake Mead Operational Table

Operational Tiers for Water/Calendar Year 2019¹

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; 3,586.55 ft	15.5 - 19.3 (2008-2026)	1,200 (approx.) ²	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	22.9 (approx.) ²
Jan 1, 2019 Projection	If Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf		1,145		15.9
3,575		9.5	1,105	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf 1,079.50 ft	11.9
	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf		1,075		Jan 1, 2019 Projection
3,525		5.9		Shortage Condition Deliver 7.167 ⁴ maf	9.4
	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf		1,050		7.5
3,490		4.0		Shortage Condition Deliver 7.083 ⁵ maf	5.8
3,370		0	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 and will be documented in the 2019 AOP.

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Lake Powell 2019 Operating Tier

Upper Elevation Balancing

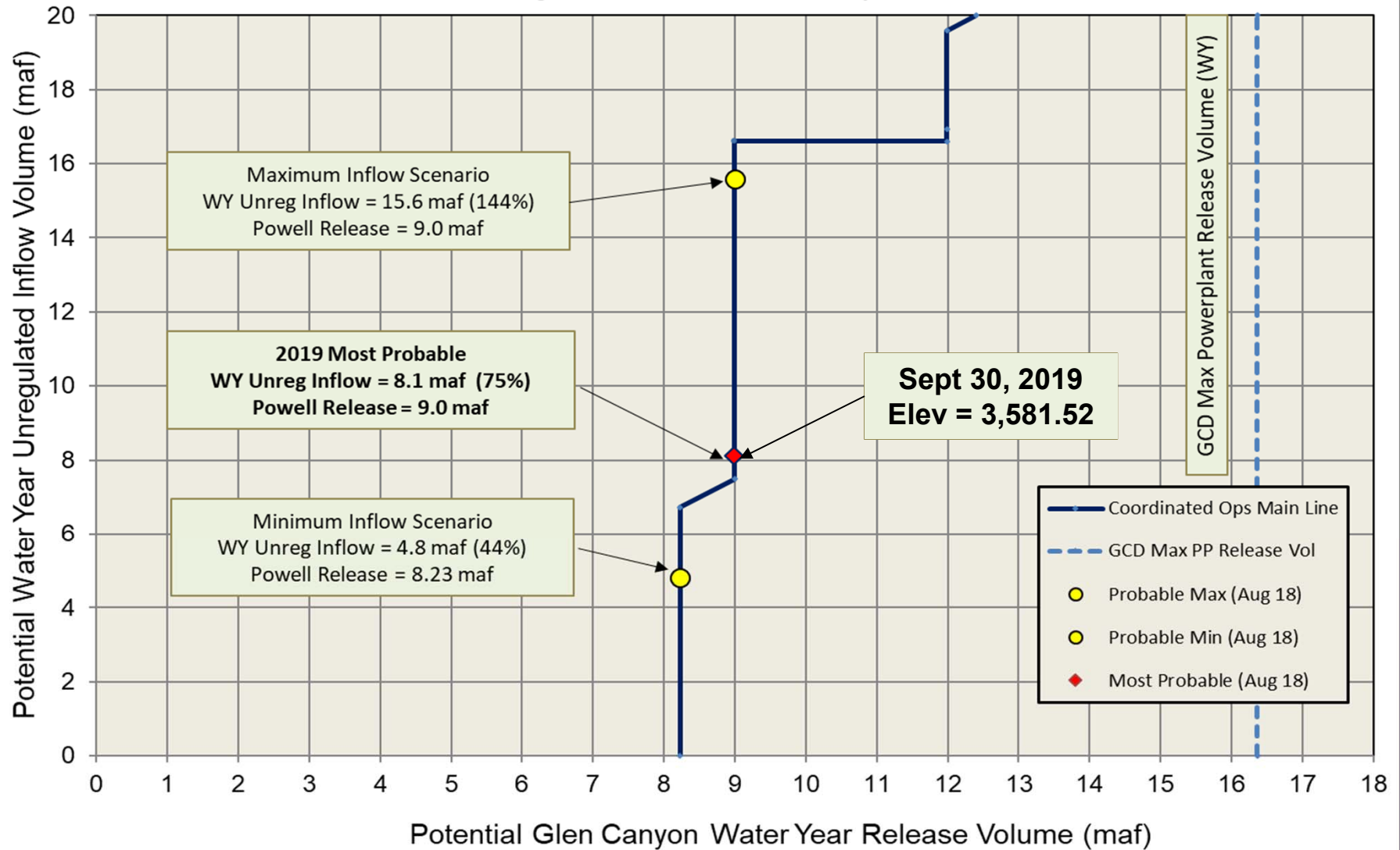
- Tier is set in August 2018
 - Start with 8.23 maf release
- Use April 24-Month Study projections of end of water year storage to potentially adjust
 1. Stay with 8.23 maf
 2. Balancing: 8.23 - 9.0 maf
 3. Equalization: > 8.23 maf

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

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Potential Lake Powell Release Scenarios

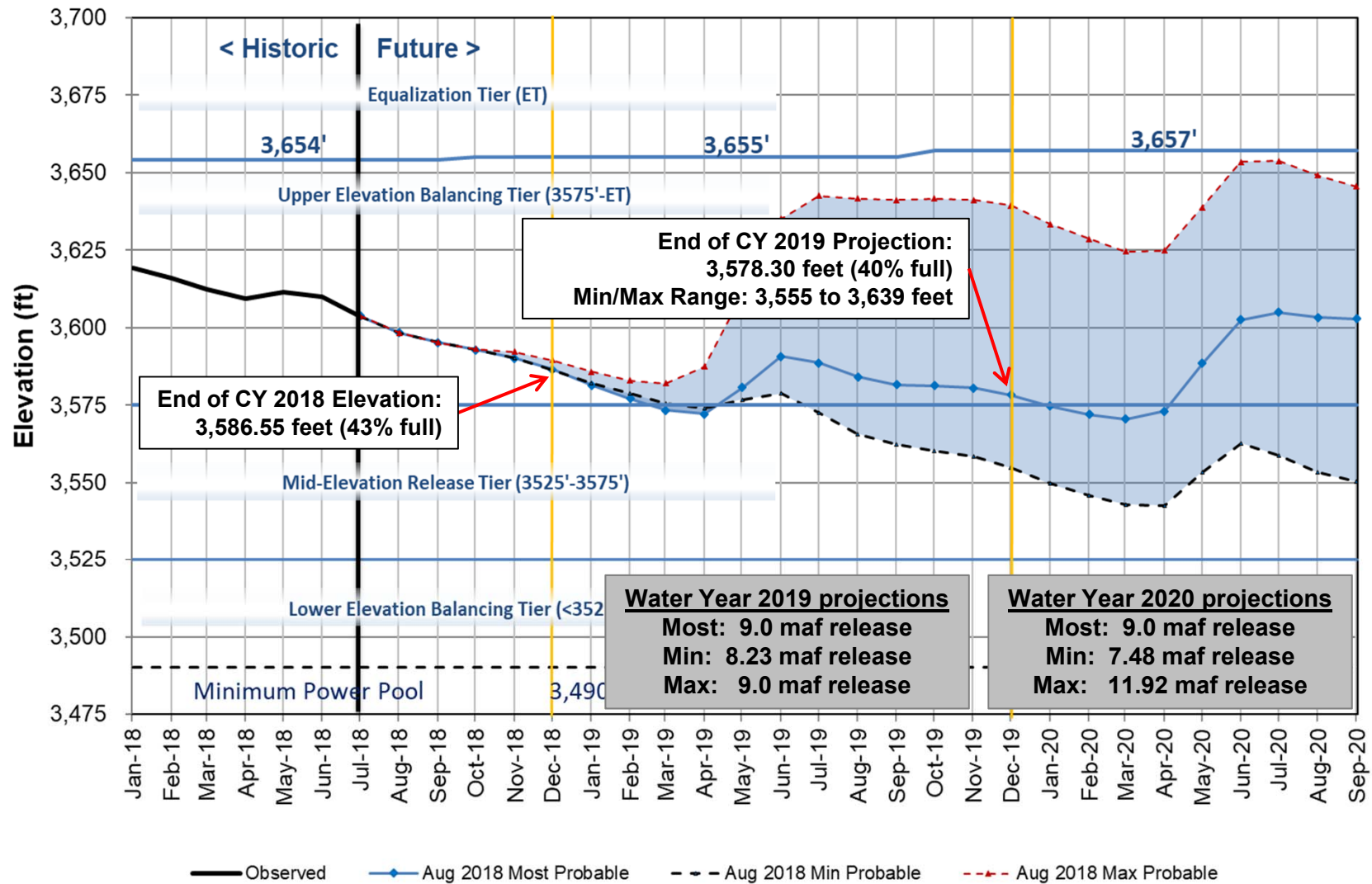
Water Year 2019 Release Volume as a Function of Unregulated Inflow Volume
based on August 2018 24-Month Study Conditions



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Lake Powell End of Month Elevations

Historic and Projected based on August 2018 Modeling



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2019 Projected Release Scenarios

Based on August 2018 24-Month Study Inflow Scenarios

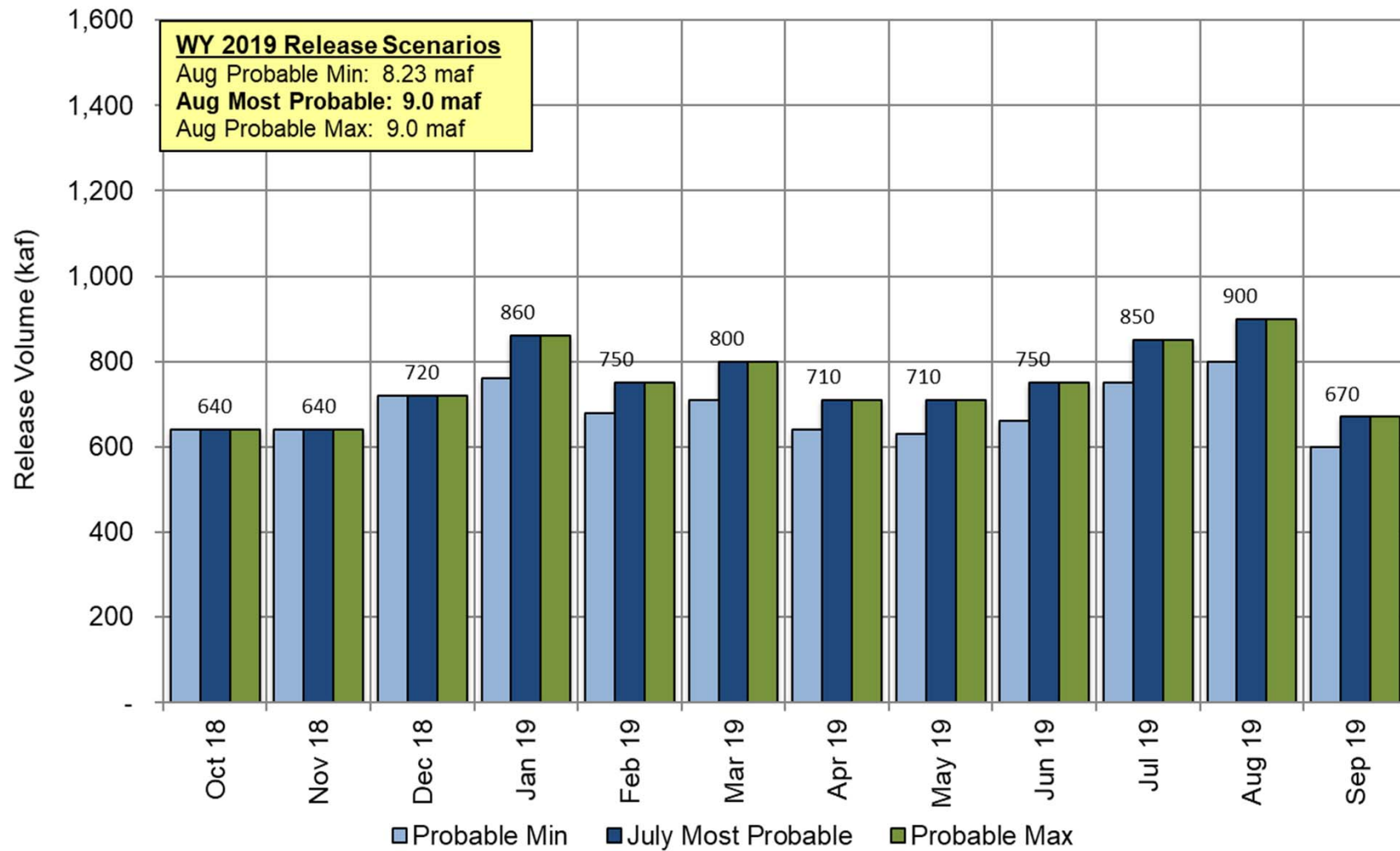
Powell Inflow Scenario	WY 2019 Release Projection
Probable Minimum	Upper Elevation Balancing Tier 8.23 maf release
Most Probable	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release
Probable Maximum	Upper Elevation Balancing Tier w/ Projected April shift to Balancing 9.0 maf release

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Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2019

Based on August 2018 modeling



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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	
1													
2													
3													
4													
5													
6													
7													
8													
Units Available	6	8	6	6	6	8	6	5	8	8	8	6	
Capacity (cfs)	16,500	23,700	21,900	21,900	21,900	21,900	21,900	18,350	29,200	29,200	22,200	20,100	
Capacity (kaf/month)	1,080	1,410	1,240	1,230	1,110	1,260	1,190	1,100	1,630	1,680	1,680	1,240	
Max (kaf) ¹	640	640	720	860	750	800	710	710	750	850	900	670	9.0
Most (kaf) ²	640	640	720	860	750	800	710	710	750	850	900	670	9.0
Min (kaf) ¹	640	640	720	760	680	710	640	630	660	750	800	600	8.23

1 Projected release, based on Aug 2018 Min and Max Probable Inflow Projections and 24-Month Study model runs

2 Projected release, based on Aug 2018 Most Probable Inflow Projections and 24-Month Study model runs

(updated 8-9-2018)

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Percent of Traces with Event or System Condition

Results from April 2018 MTOM/CRSS^{1,2,3,4,5} (values in percent)

	Event or System Condition	2019	2020	2021	2022	2023
Upper Basin – Lake Powell	Equalization Tier	2	15	17	20	24
	<i>Equalization annual release > 8.23 maf</i>	2	15	17	20	22
	<i>Equalization annual release = 8.23 maf</i>	0	0	0	0	2
	Upper Elevation Balancing Tier	96	51	53	52	45
	<i>Upper Elevation Balancing annual release > 8.23 maf</i>	76	44	44	43	35
	<i>Upper Elevation Balancing annual release = 8.23 maf</i>	19	6	8	9	9
	<i>Upper Elevation Balancing annual release < 8.23 maf</i>	0	1	1	0	1
	Mid-Elevation Release Tier	3	34	21	16	18
	<i>Mid-Elevation Release – annual release = 8.23 maf</i>	0	0	0	1	2
Lower Basin – Lake Mead	<i>Mid-Elevation Release – annual release = 7.48 maf</i>	3	34	21	15	16
	Lower Elevation Balancing Tier	0	<1	8	11	13
	Shortage Condition – any amount (Mead ≤ 1,075 ft)	N	52	64	68	65
	<i>Shortage – 1st level (Mead ≤ 1,075 and ≥ 1,050)</i>	0	51	43	38	29
	<i>Shortage – 2nd level (Mead < 1,050 and ≥ 1,025)</i>	0	1	21	23	24
	<i>Shortage – 3rd level (Mead < 1,025)</i>	0	0	<1	6	12
	Surplus Condition – any amount (Mead ≥ 1,145 ft)	0	0	3	6	10
	<i>Surplus – Flood Control</i>	0	0	0	1	2
	Normal or ICS Surplus Condition	100	48	33	26	25

**These projections will be updated
in August to reflect current
hydrology**

¹ Reservoir initial conditions based on results from 35 simulations of December 31, 2018 conditions using the Mid-term Probabilistic Operations Model. MTOM uses the April 3, 2018 unregulated inflow forecast from the CBRFC.

² Each of the 35 initial conditions were coupled with 110 hydrologic inflow sequences based on resampling of the observed natural flow record from 1906-2015 for a total of 3,850 traces analyzed.

³ Percentages shown may not sum to 100% due to rounding to the nearest percent.

⁴ Percentages shown may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

⁵ The chance of a Lower Basin Shortage in calendar year 2019 is negligible.

2019 Critical Elevations

Based on August 2018 24-Month Study Inflow Scenarios

- The August 24-Month Study projection of end of water year (September 30, 2019) elevation is 3,581.52 ft.
- This is 6.52 ft above the trigger elevation 3,575 ft, which will move Glen Canyon annual releases to balancing between 8.23 and 9.0 maf.
- Reclamation will be carefully watching the progression of the snow accumulation season and the end of month elevation.
- We will update stakeholders with information as soon as it is available.

Questions?

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Water and Power Management Division
Water Management Group

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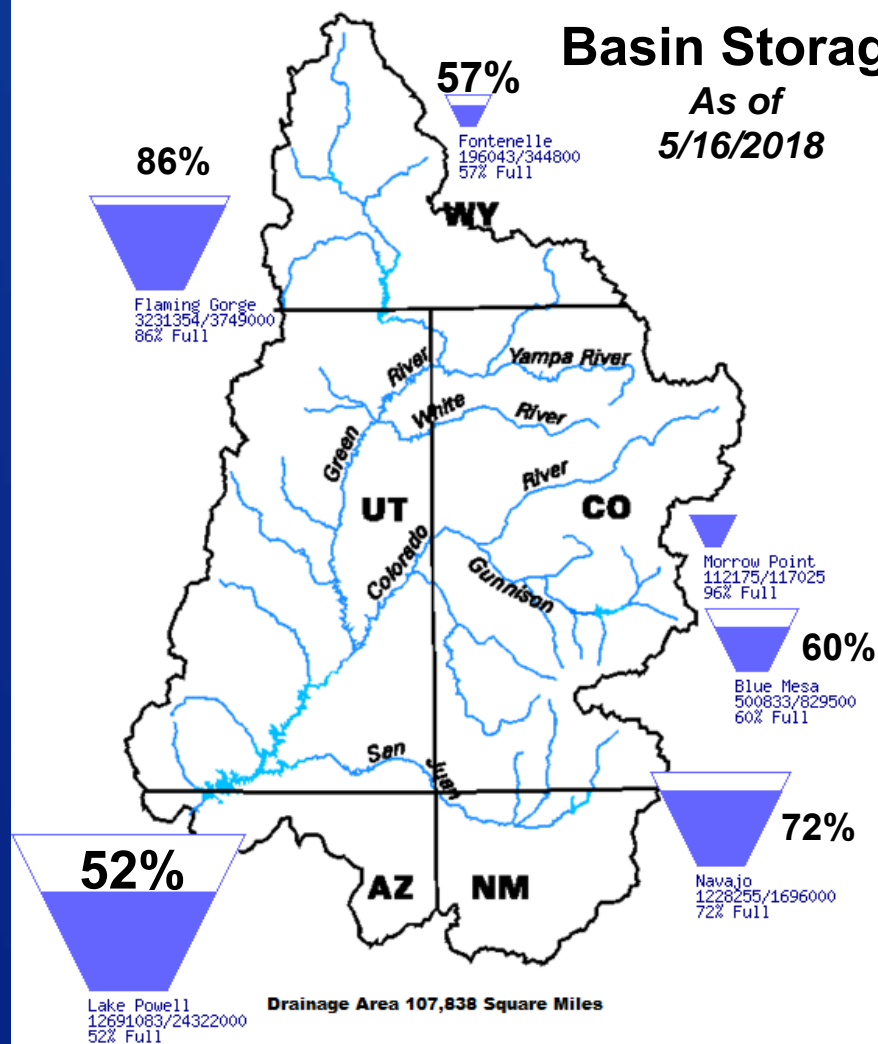
Upper Basin Storage

Data Current as of:
05/15/2018

Upper Colorado River Drainage Basin

Basin Storage

As of
5/16/2018



2018 April to July Inflow Forecast Issued May 2, 2018

Reservoir	A-J Forecast (KAF)	Percent of Average ¹
Fontenelle	900	124%
Flaming Gorge	1,000	102%
Blue Mesa	350	52%
Navajo	200	27%
Powell	3,000	42%

¹ percent of average based on period 1981-2010.

<https://www.usbr.gov/uc/water/basin/index.html>

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