RECLAMATION

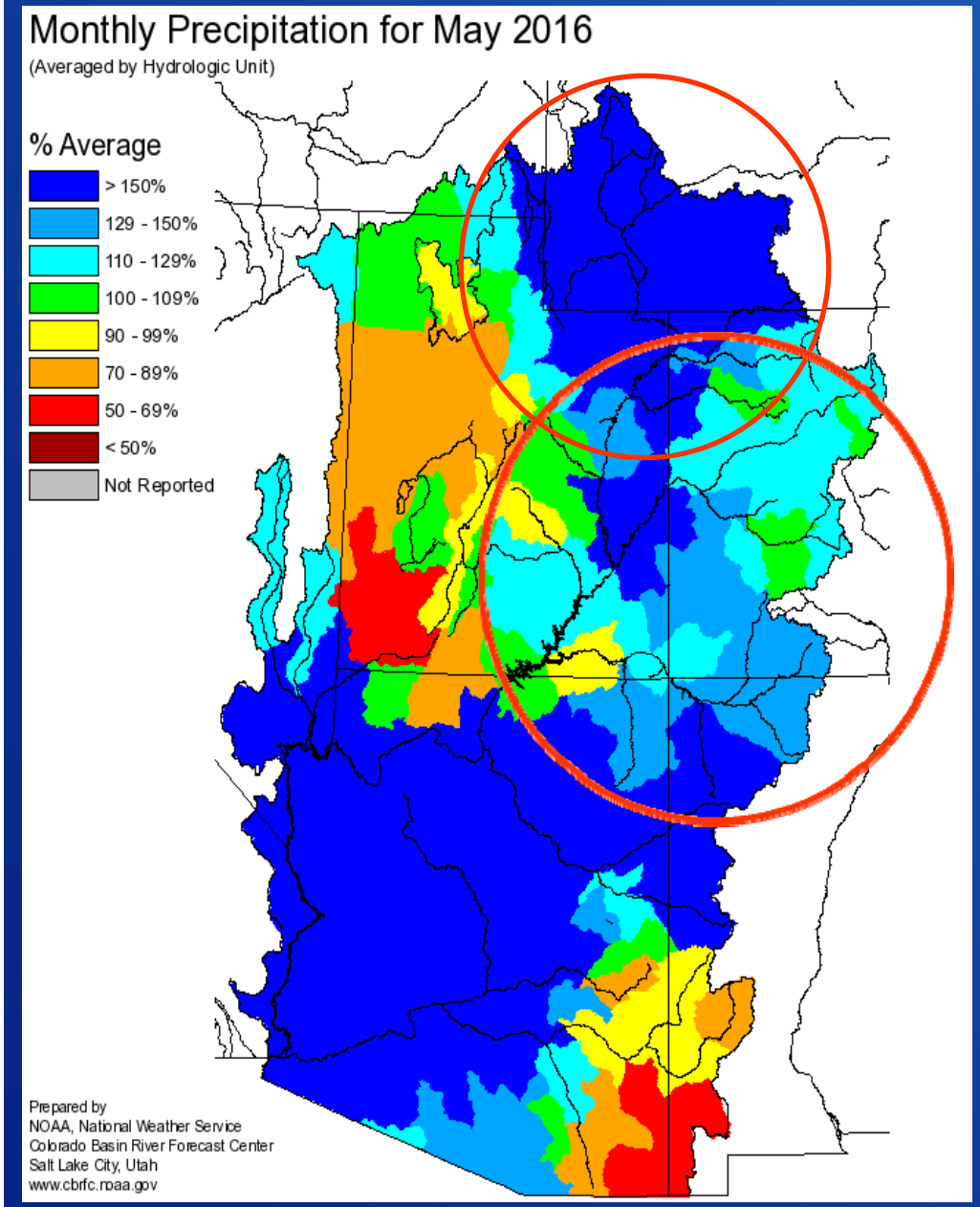
Managing Water in the West

Basin Hydrology, Operations and 2017 Hydrograph

Glen Canyon Technical Work Group

June 14, 2016

U.S. Department of the Interior
Bureau of Reclamation



http://www.cbrfc.noaa.gov/product/mapsum/mapsum.php?area=cbrfc

May was wet again!

- Slowed snowmelt
- Some additional snow accumulation
- Widespread rainfall throughout the basin

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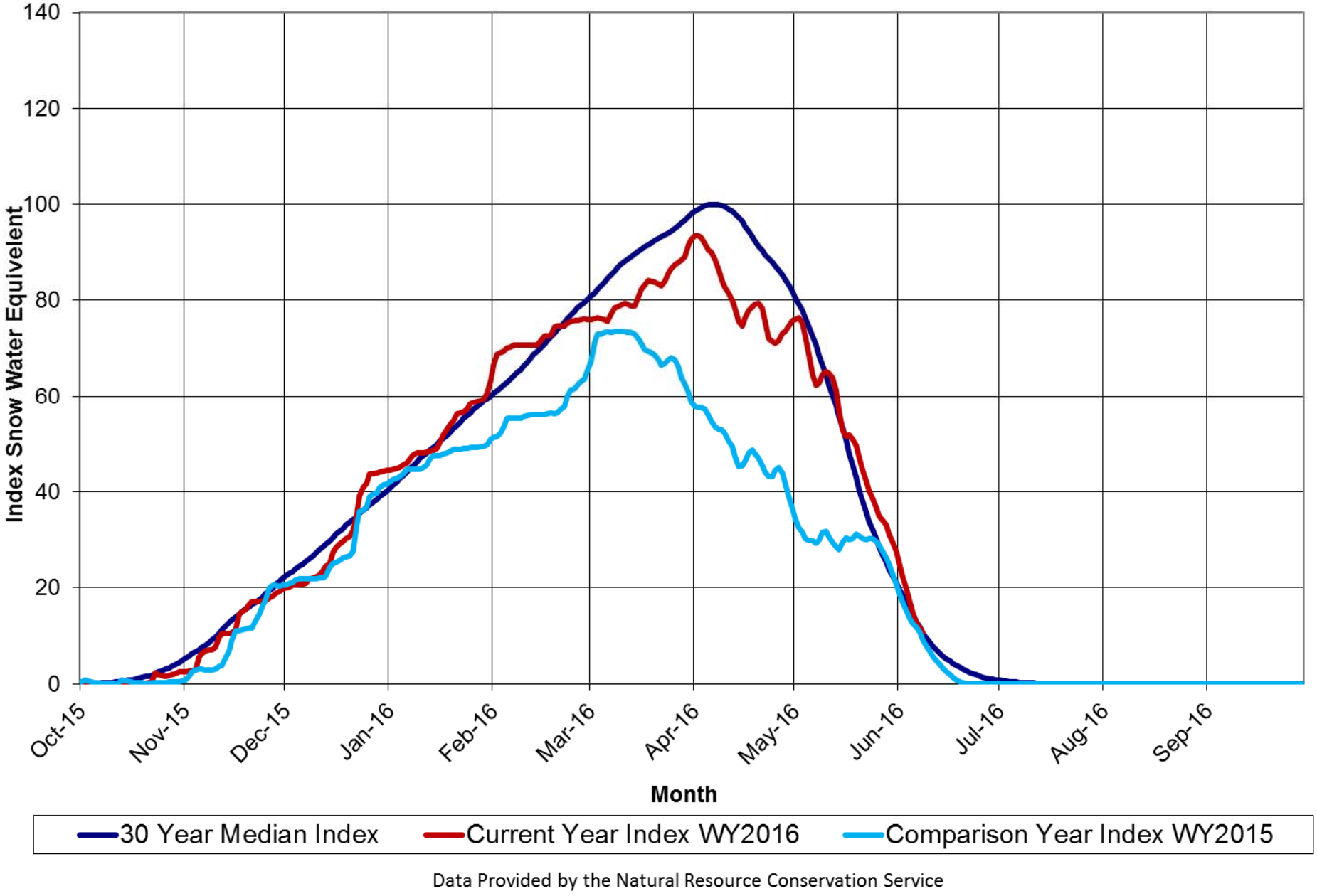
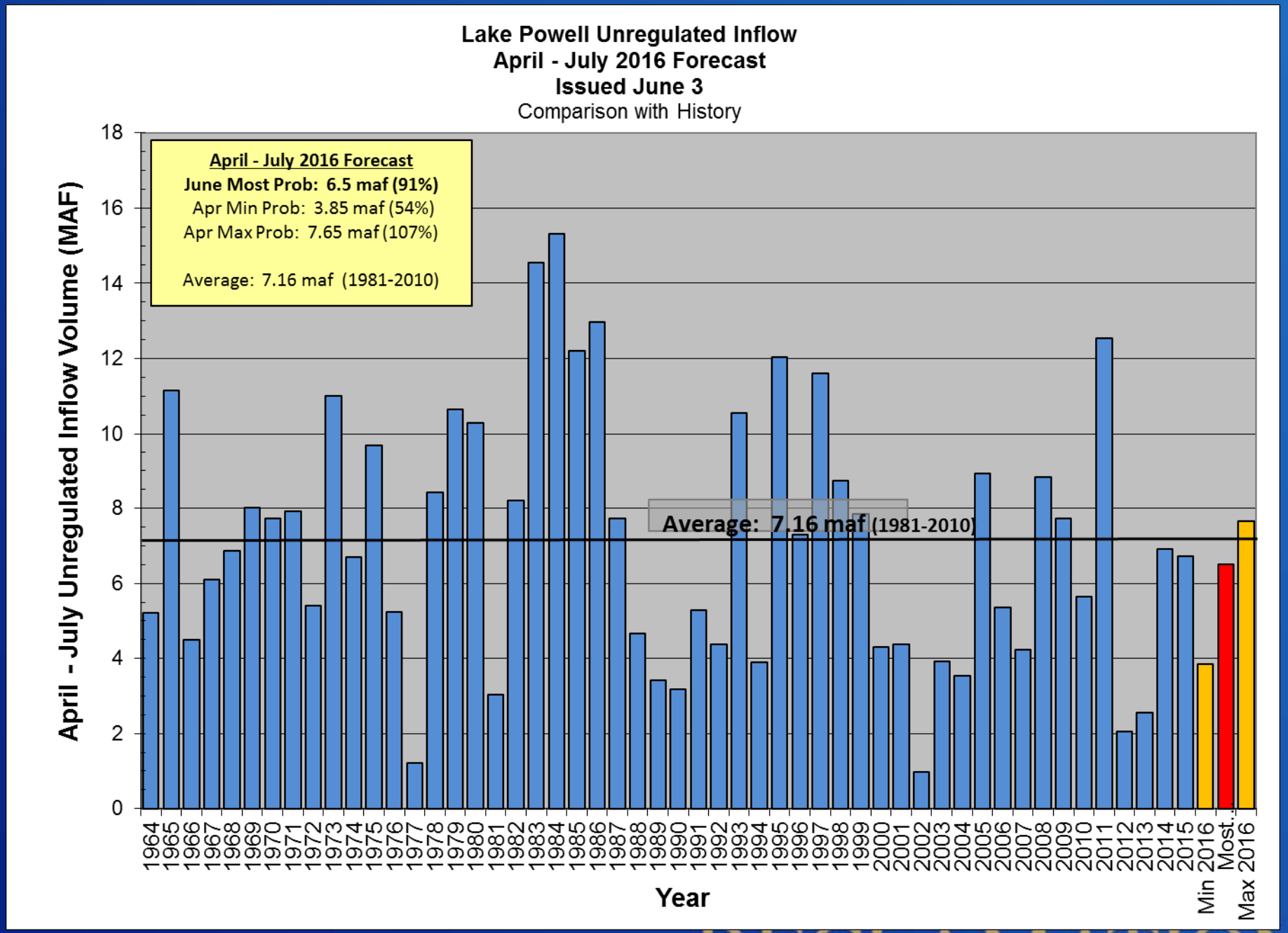
Upper Colorado River Basin Snotel Tracking

Aggregate of 116 Snotel Sites above Lake Powell



Data Provided by the Natural Resource Conservation Service



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Lake Powell 2016 Operating Tier
Upper Elevation Balancing

- Tier was set in 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 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)
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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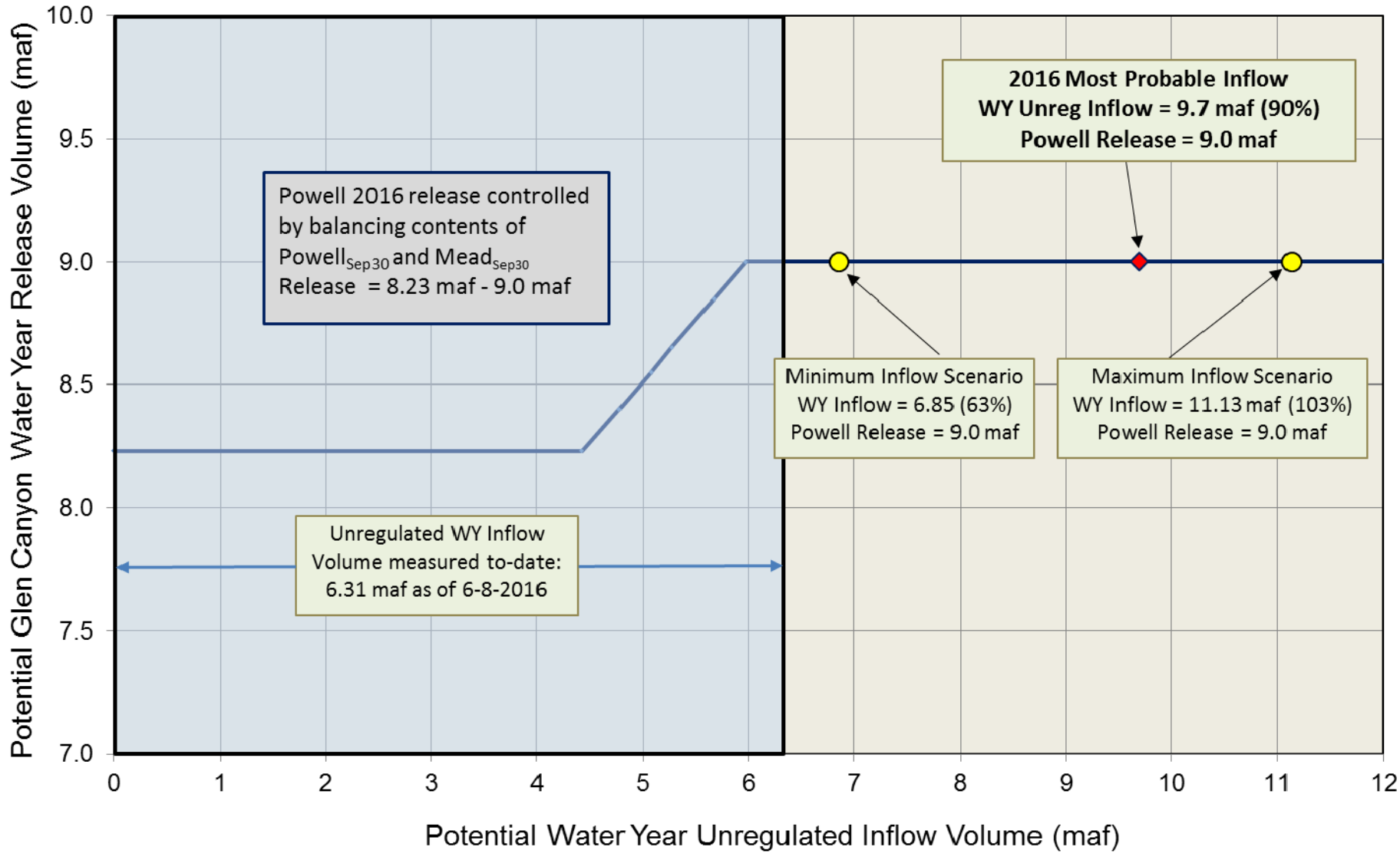
Potential Lake Powell Release Scenarios

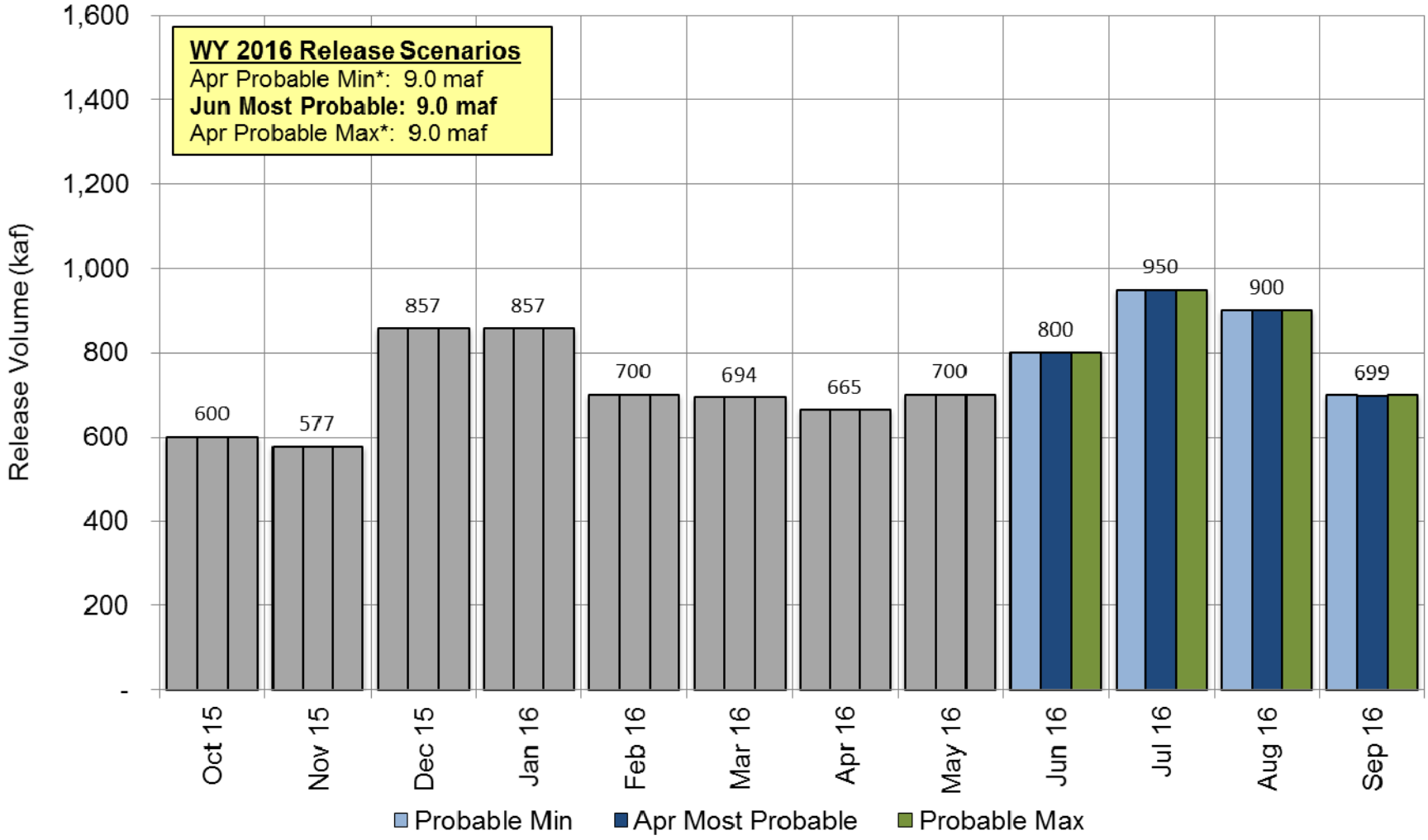
Water Year 2016 Release Volume as a Function of Unregulated Inflow Volume
based on June 2016 24-Month Study Conditions



Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2016

Updated June 2016



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

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End of CY 2016 Projection:
3,605.17 feet
(Range 3,576 to 3,627 feet)

End of CY 2017 Projection:
3610.26 feet
(Range 3,567 to 3,644 feet)

WY 2016 release projections
Most: 9.0 maf release
Max: 9.0 maf release
Min: 9.0 maf release

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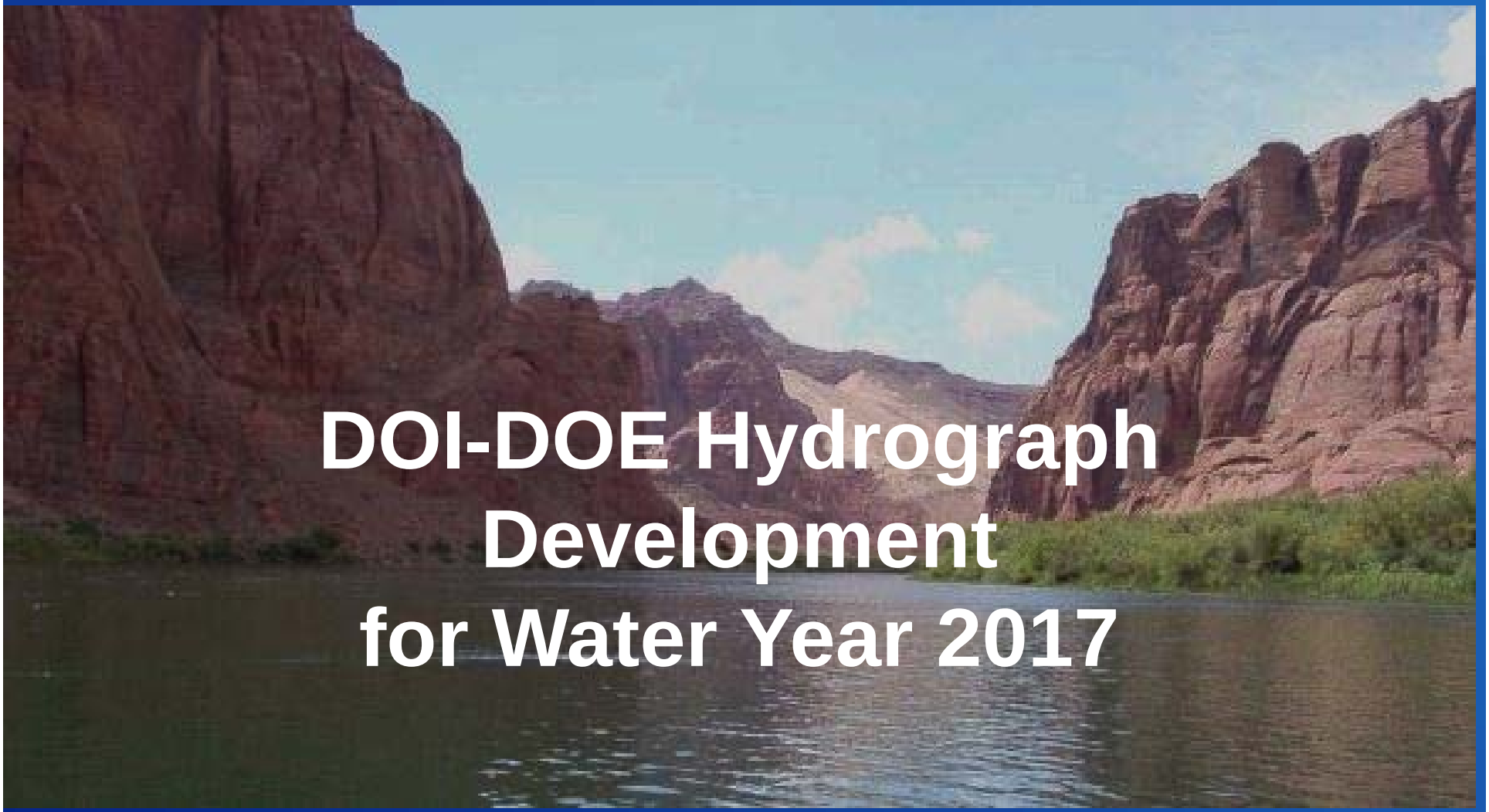

DOI-DOE Hydrograph Development for Water Year 2017

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Lake Powell 2017 Operating Tier Scenarios *Based on April and June 2016 modeling*

Inflow Scenario	Operating Tier Release Volume
Minimum Probable	Upper Elevation Balancing 8.23 maf
Most Probable	Upper Elevation Balancing 9.0 maf
Maximum Probable	Upper Elevation Balancing 11.91 maf

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2017 Hydrograph
Current Proposal

Annual Release Volume	June	August	September
less than 9.0 maf	600 kaf - 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf	900 kaf	700 kaf
9.5 maf – less than 10 maf	900 kaf	900 kaf	700 kaf
10 maf and greater	900 kaf or more	900 kaf or more	800 kaf or more

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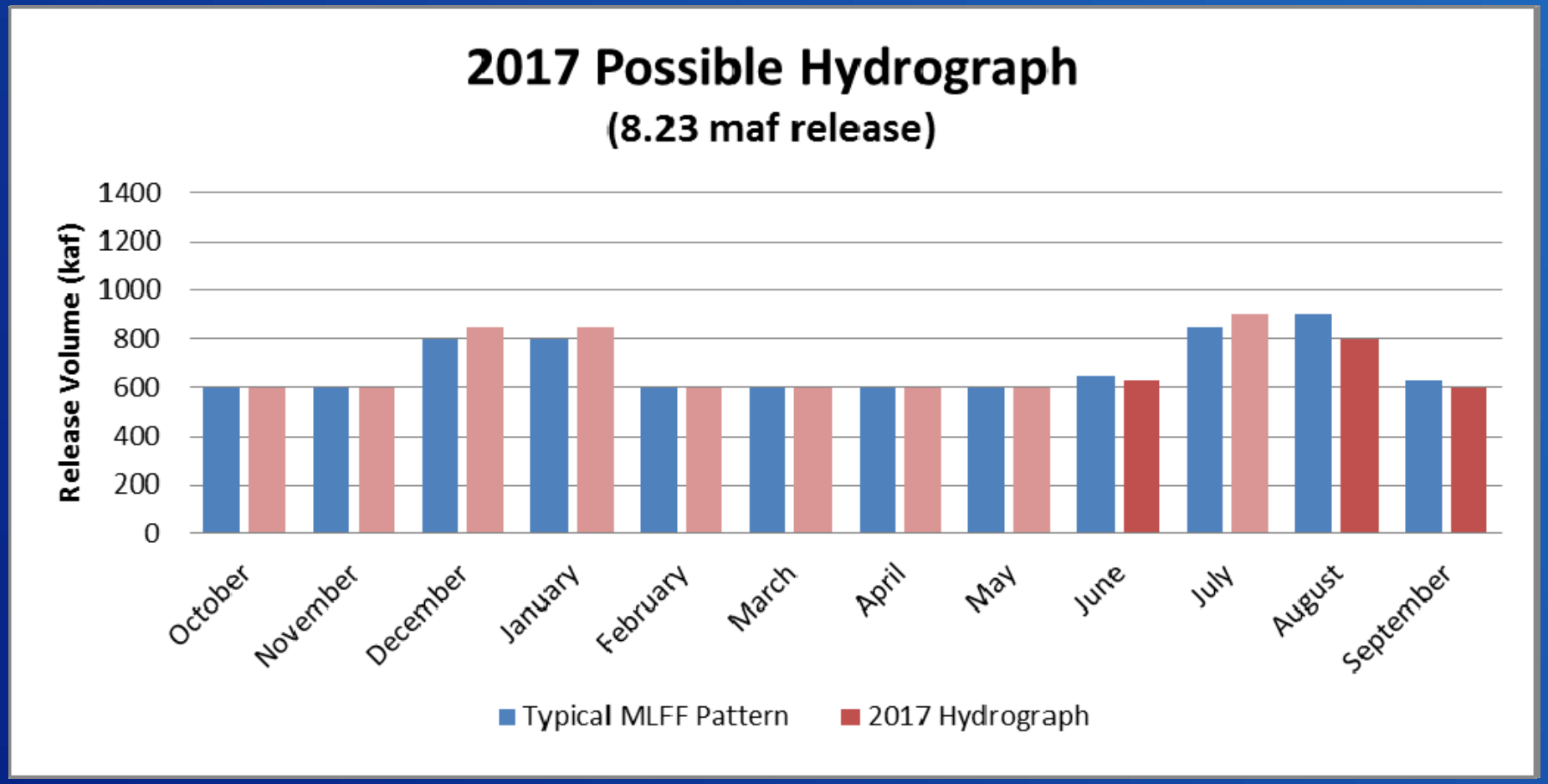
2017 Proposed Hydrograph
8.23 maf release



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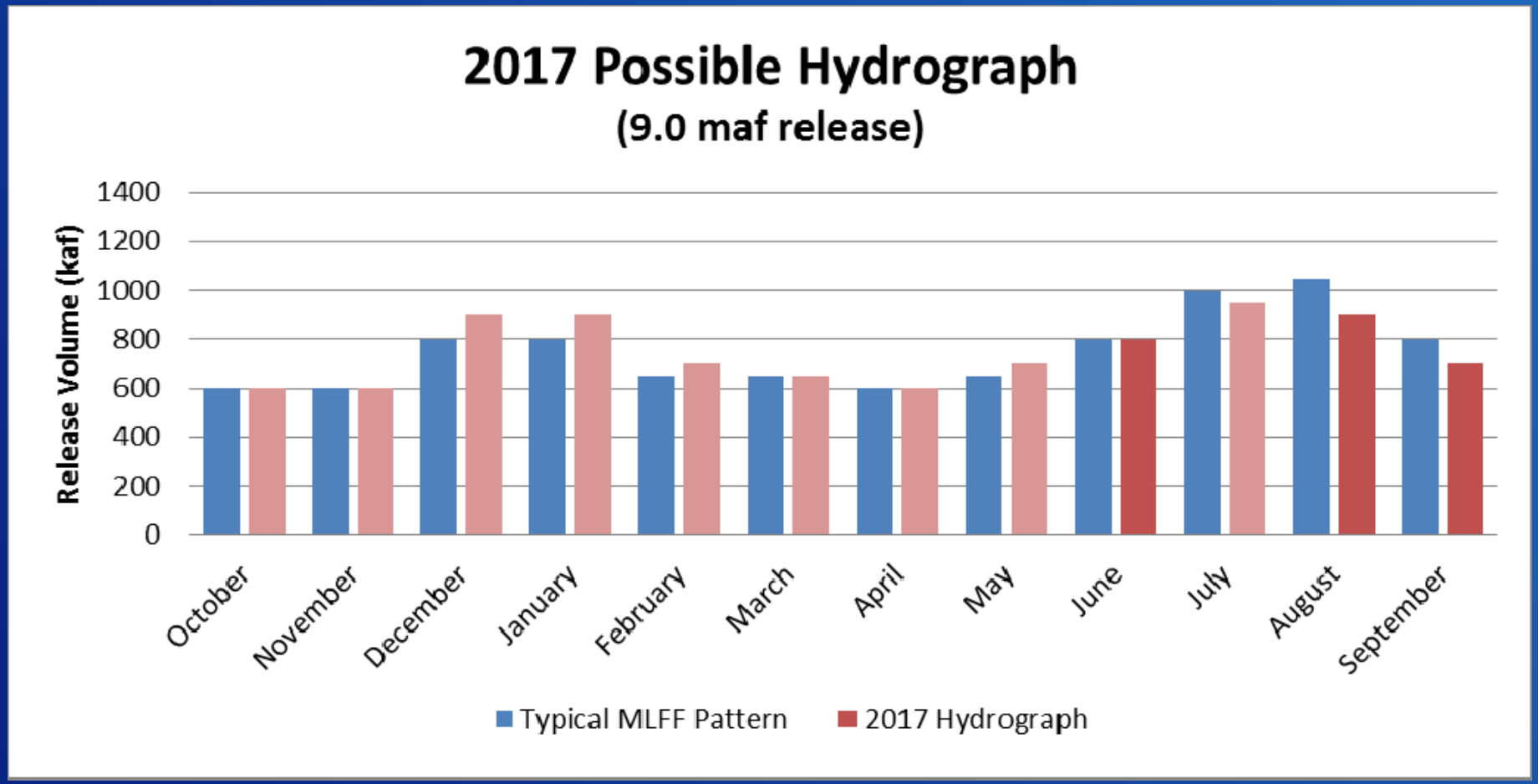
2017 Proposed Hydrograph
9.0 maf release



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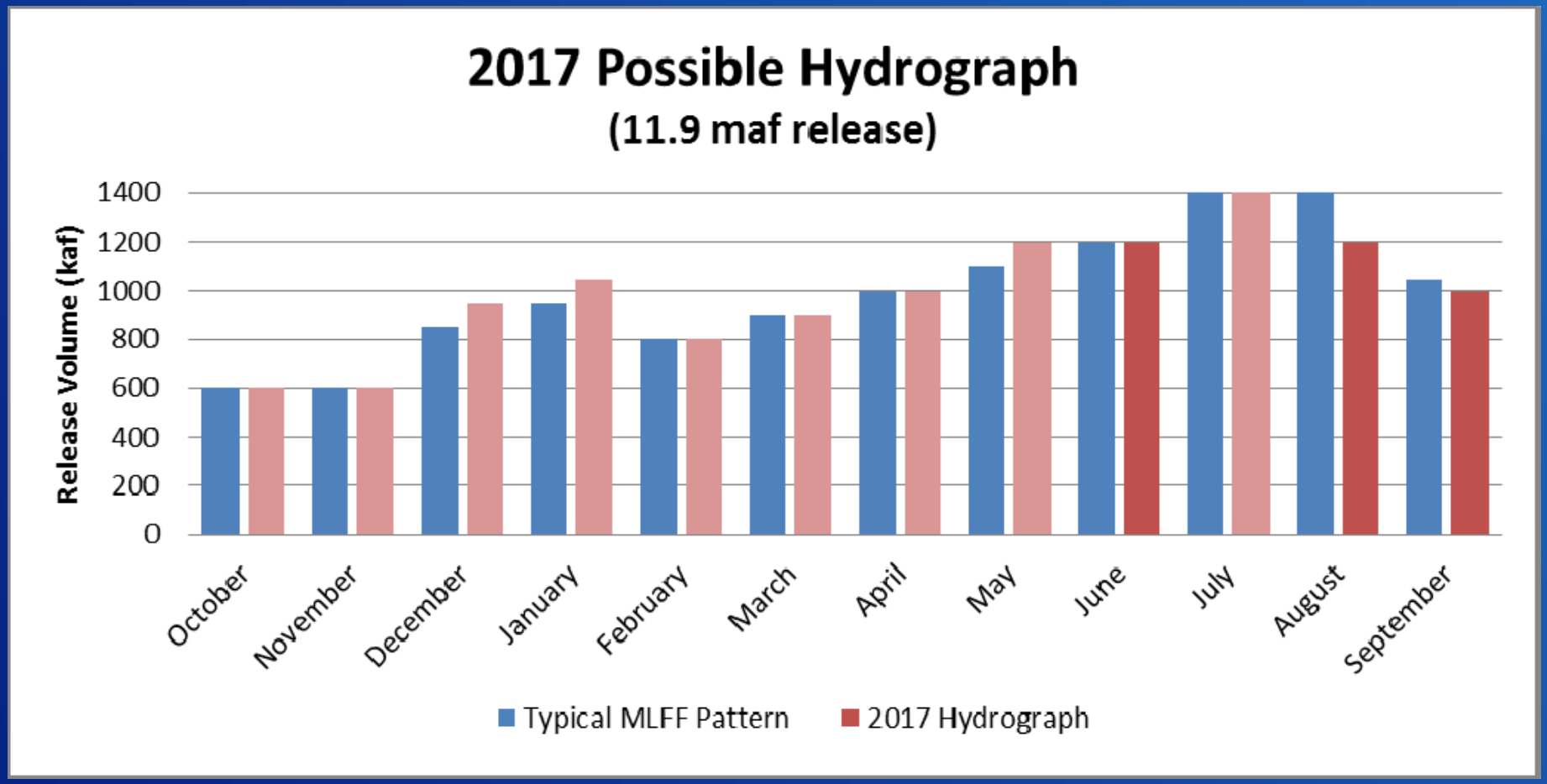
2017 Proposed Hydrograph
11.9 maf release

- Lots of water to move: limited flexibility, minimal difference.



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2017 Hydrograph Next Steps

- Continue to coordinate with TWG and AMWG member agencies
- TWG present to AMWG August 24-5 with motion for approval to recommend to Secretary

Questions?

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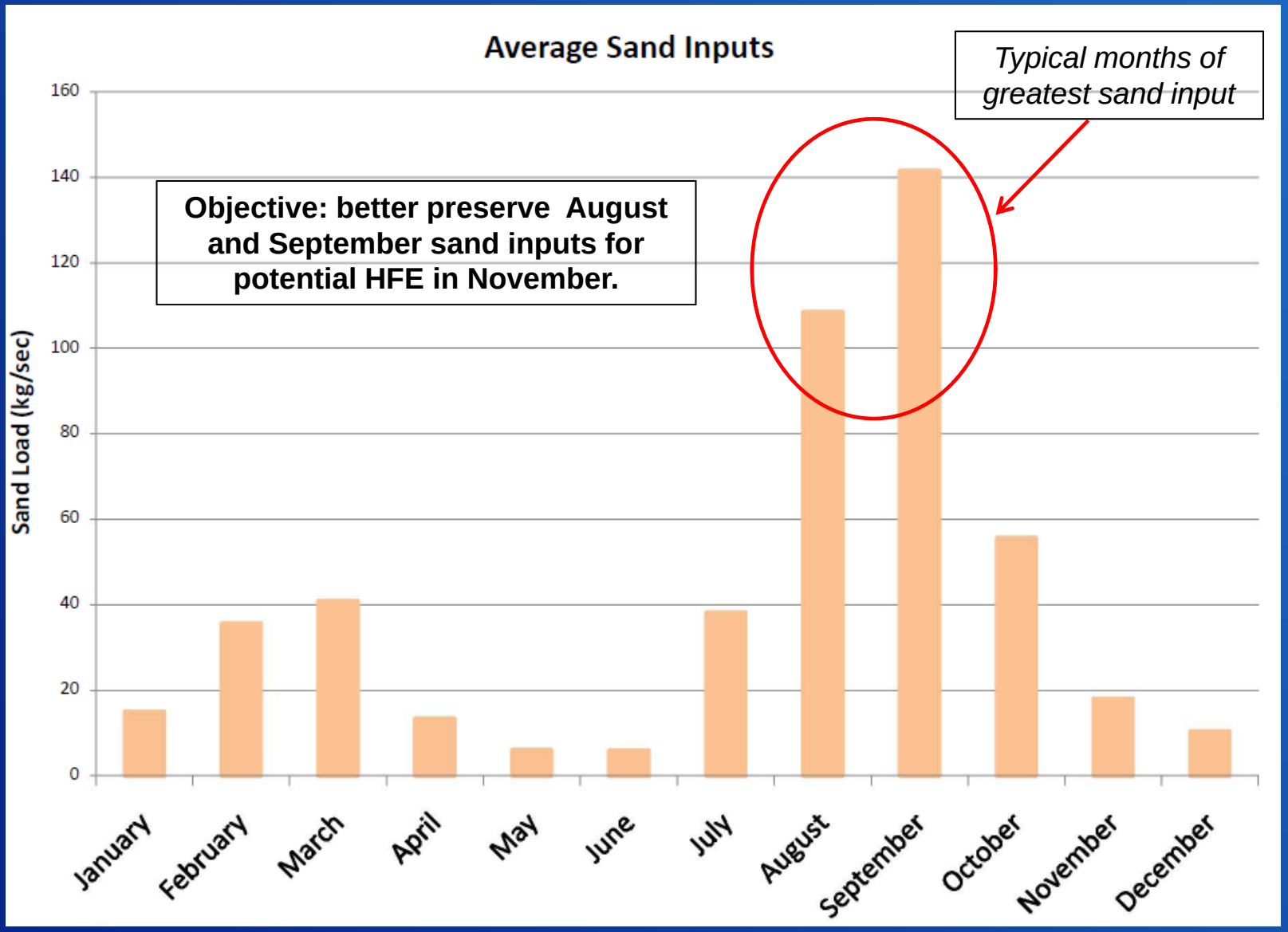
2017 Hydrograph Concepts

- Objective – enhance resources in the canyon while maintaining hydropower objectives and same annual release volume



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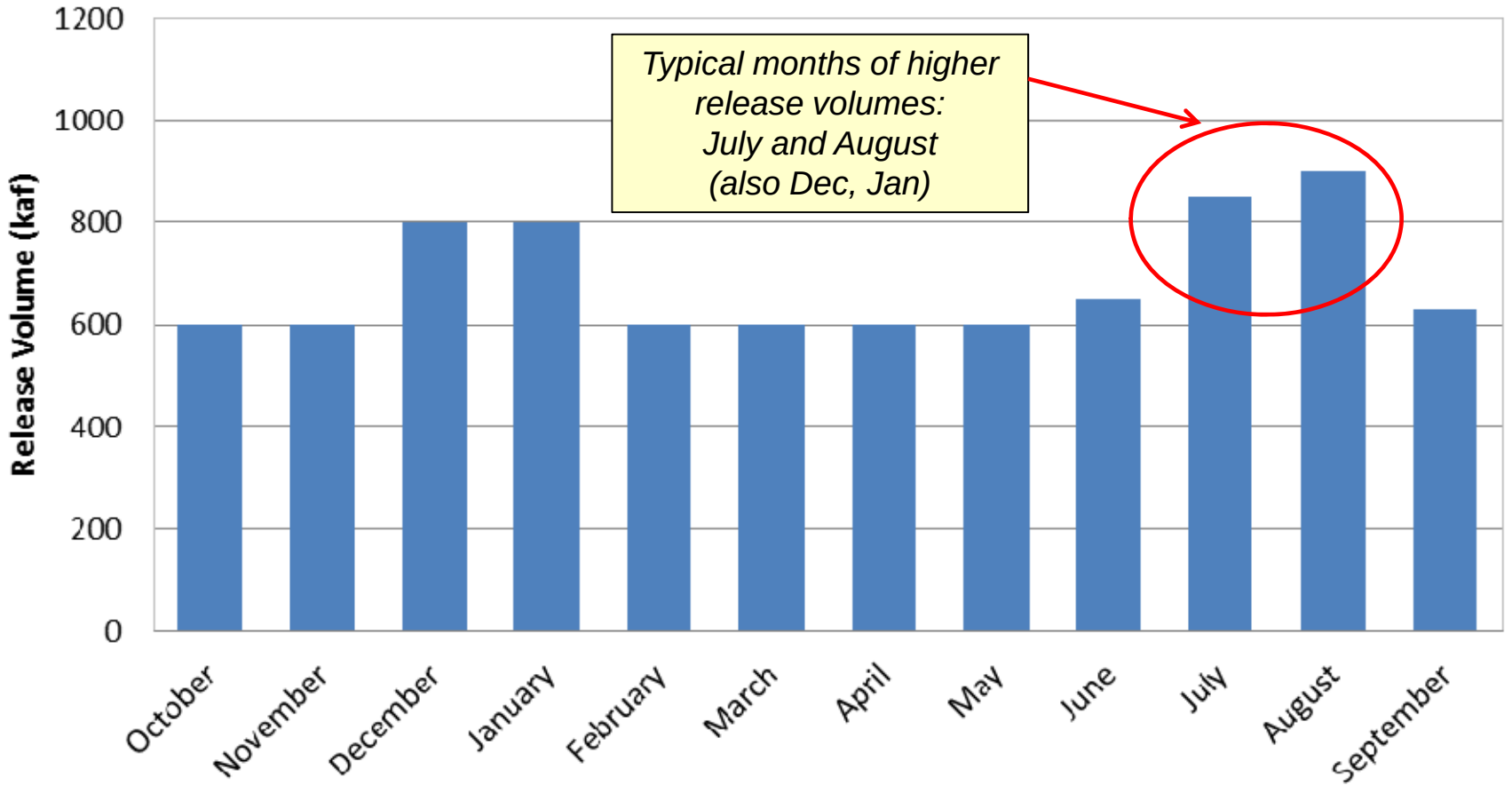
Typical Annual Release Pattern

8.23 maf year



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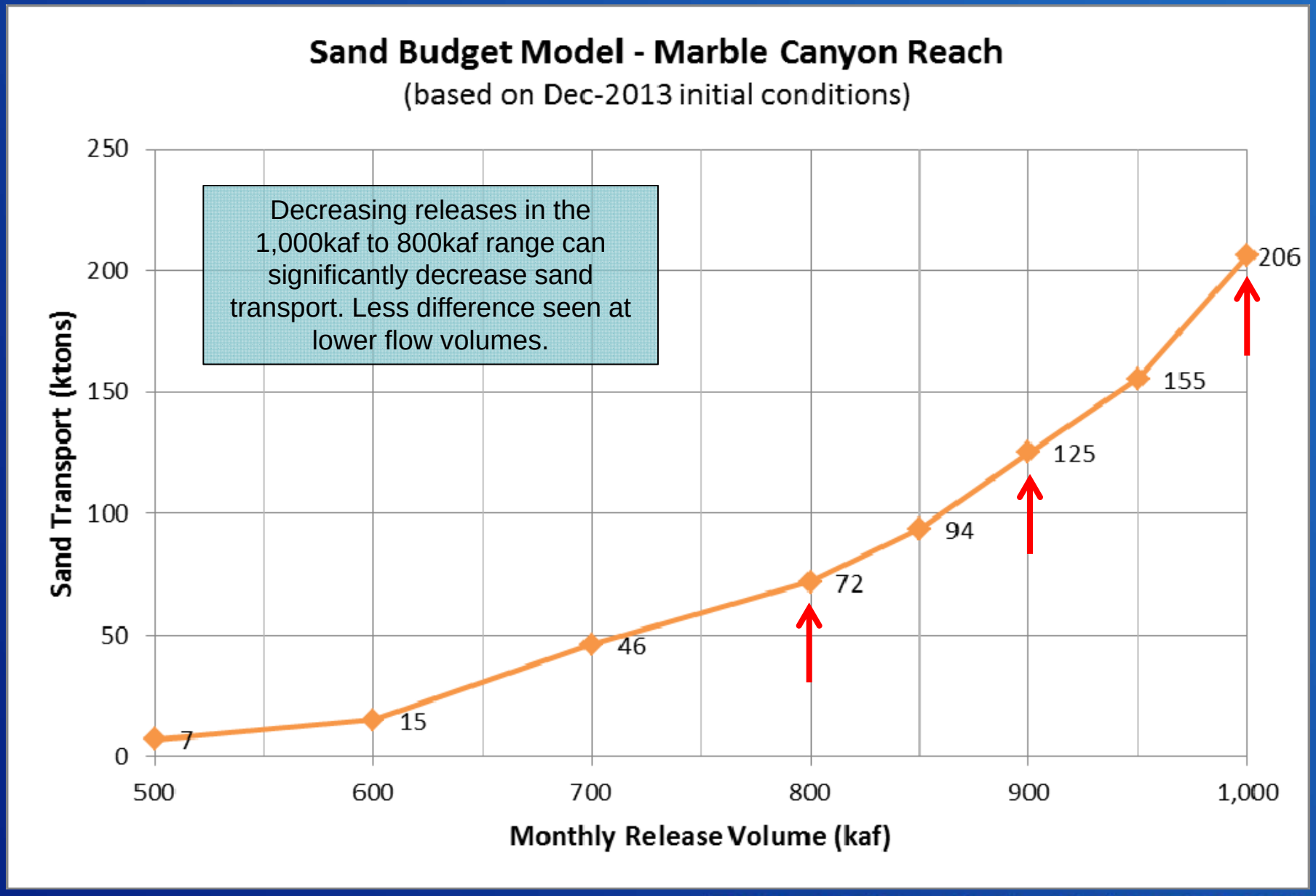

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2015 Hydrograph
Monthly Release Objectives

Annual Release Volume	June	August	September
less than 9.0 maf	600 kaf - 650 kaf	800 kaf	600 kaf
9.0 maf – less than 9.5 maf	800 kaf		700 kaf
9.5 maf – less than 10 maf	900 kaf		700 kaf
10 maf and greater	more than 900 kaf		800 kaf or more

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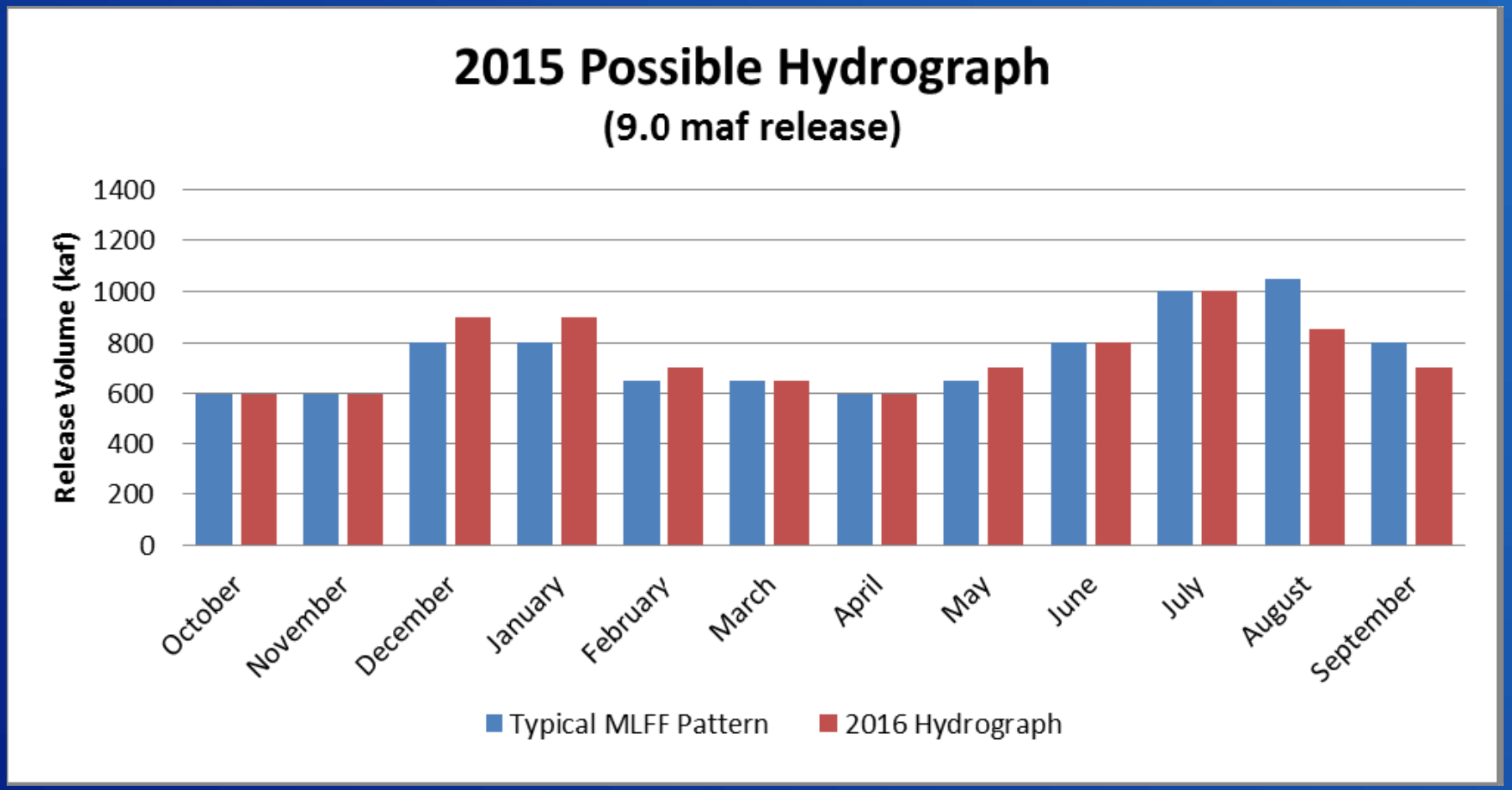
2016 Possible Hydrograph

9.0 maf release – initial consideration

presented at Feb AMWG meeting



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Screening Tool Analysis

Typical MLFF

Month	Number of Days	Monthly Volume (kaf)	Temper-ature at RM61	Total Sediment Transport (MT)	Total Hydropower Value (1000$)
October	31	600	11.4	14,614	15,858
November	30	600	10.6	15,869	15,343
December	31	800	10.0	41,620	20,972
January	31	800	9.9	41,620	19,536
February	28	600	10.3	18,941	14,716
March	31	600	10.8	14,614	14,322
April	30	600	11.3	15,869	13,209
May	31	600	11.9	14,614	13,779
June	30	650	12.4	21,119	16,079
July	31	850	12.4	63,078	26,415
August	31	900	12.1	77,431	28,169
September	30	630	12.1	18,875	17,863
Total	365	8230	annual	358,266	216,262
			Jul-Nov	189,867	
			Aug-Sep	96,306	

Proposed 2016 Hydrograph

Month	Number of Days	Monthly Volume (kaf)	Temper-ature at RM61	Total Sediment Transport (MT)	Total Hydropower Value (1000$)
October	31	600	11.4	14,614	15,858
November	30	600	10.6	15,869	15,343
December	31	850	10.0	63,078	22,502
January	31	850	9.9	63,078	20,919
February	28	600	10.3	18,941	14,716
March	31	600	10.8	14,614	14,322
April	30	600	11.3	15,869	13,209
May	31	600	11.9	14,614	13,779
June	30	630	12.4	18,875	15,633
July	31	900	12.3	77,431	27,806
August	31	800	12.3	41,620	24,729
September	30	600	12.2	15,869	17,069
Total	365	8230	annual	374,474	215,885
			Jul-Nov	165,404	
			Aug-Sep	57,489	

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