

RECLAMATION

Managing Water in the West

Basin Hydrology, Operations and 2016 Hydrograph

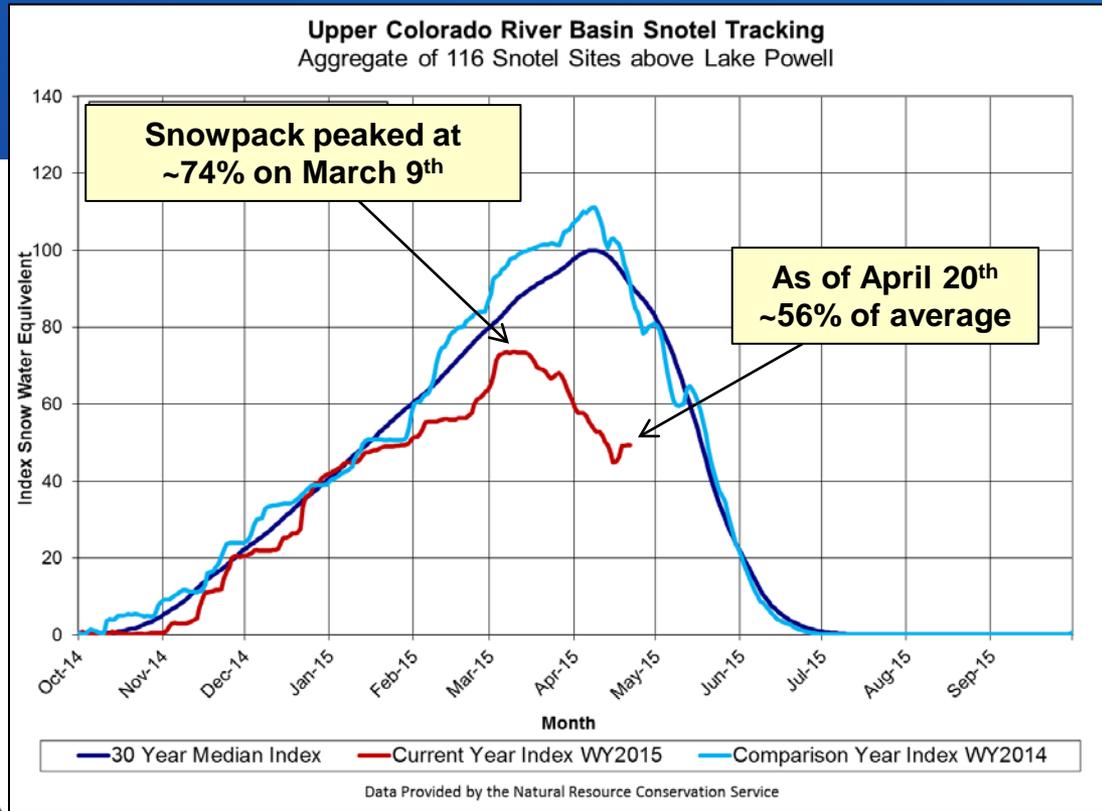
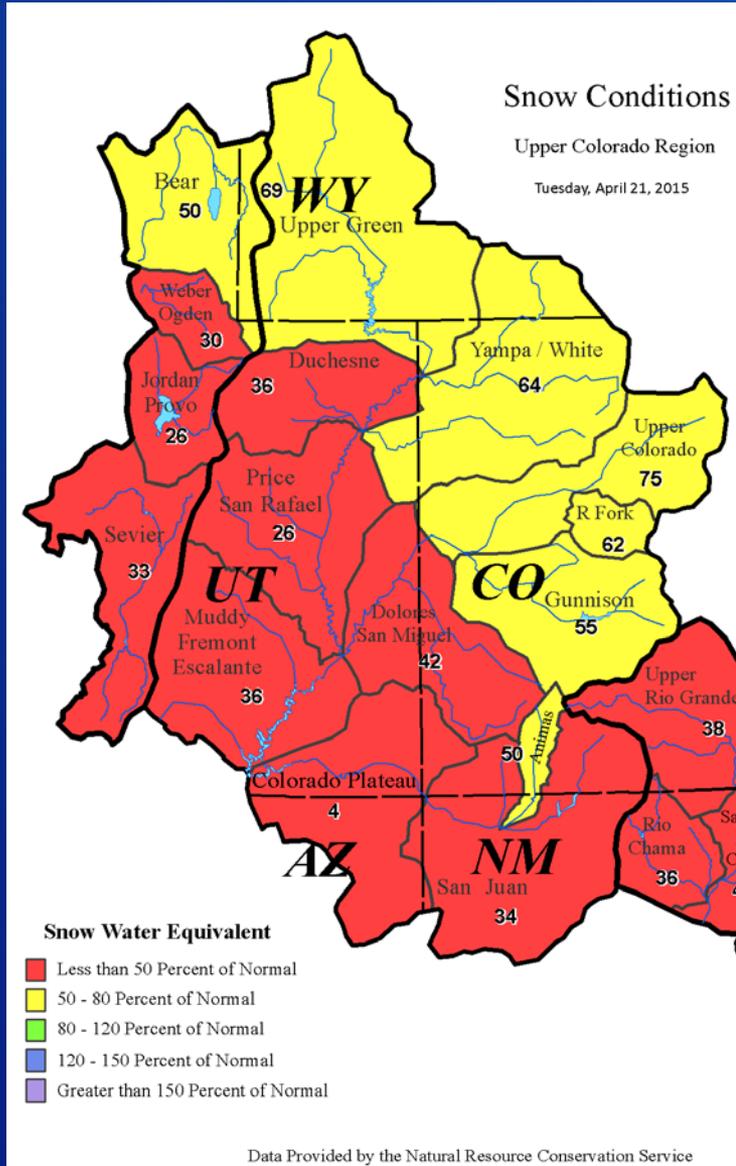
Glen Canyon Technical Work Group

April 21, 2015



U.S. Department of the Interior
Bureau of Reclamation

Snow Conditions

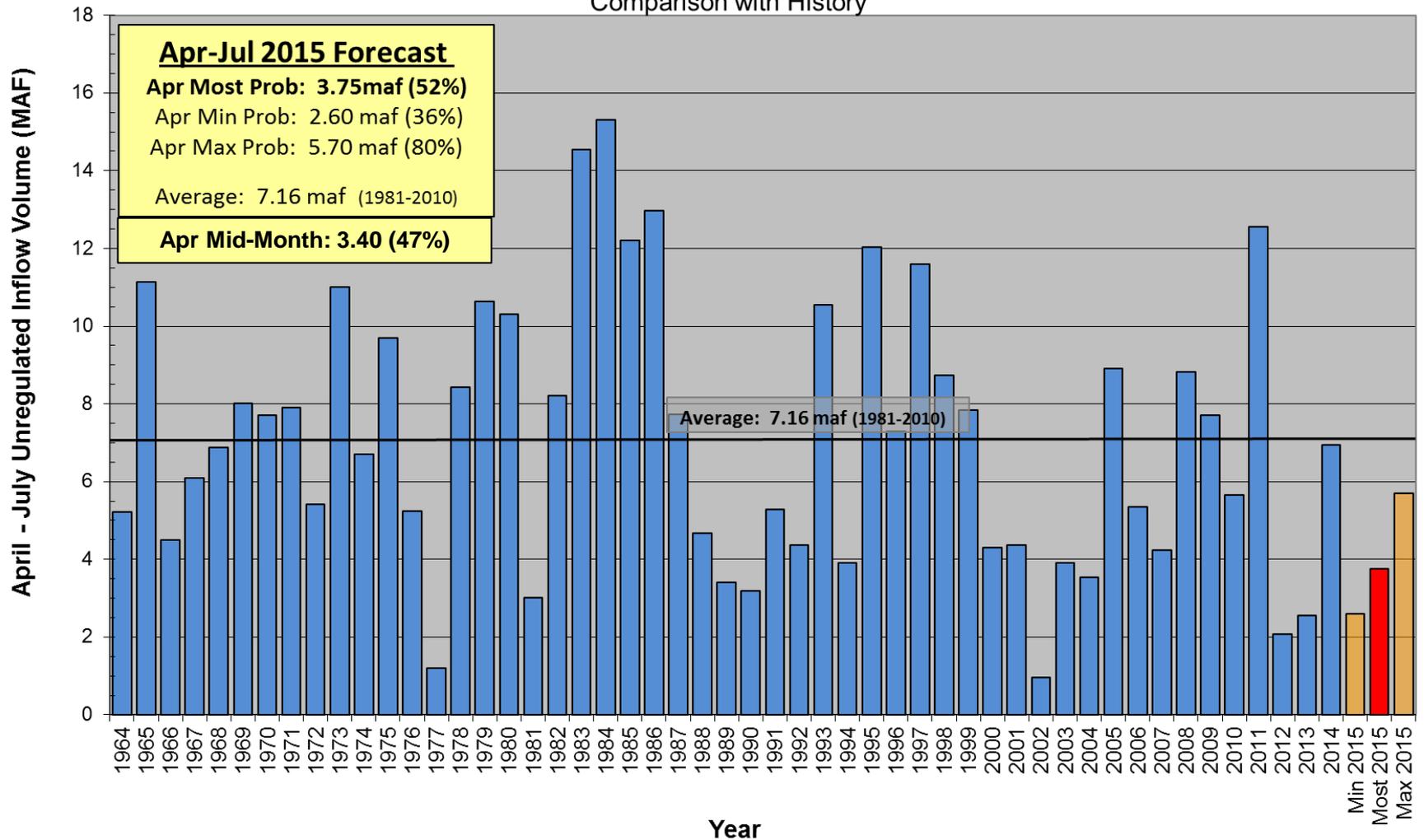


Lake Powell Unregulated Inflow

April - July 2015 Forecast

Issued April 2

Comparison with History



Lake Powell 2015 Operating Tier

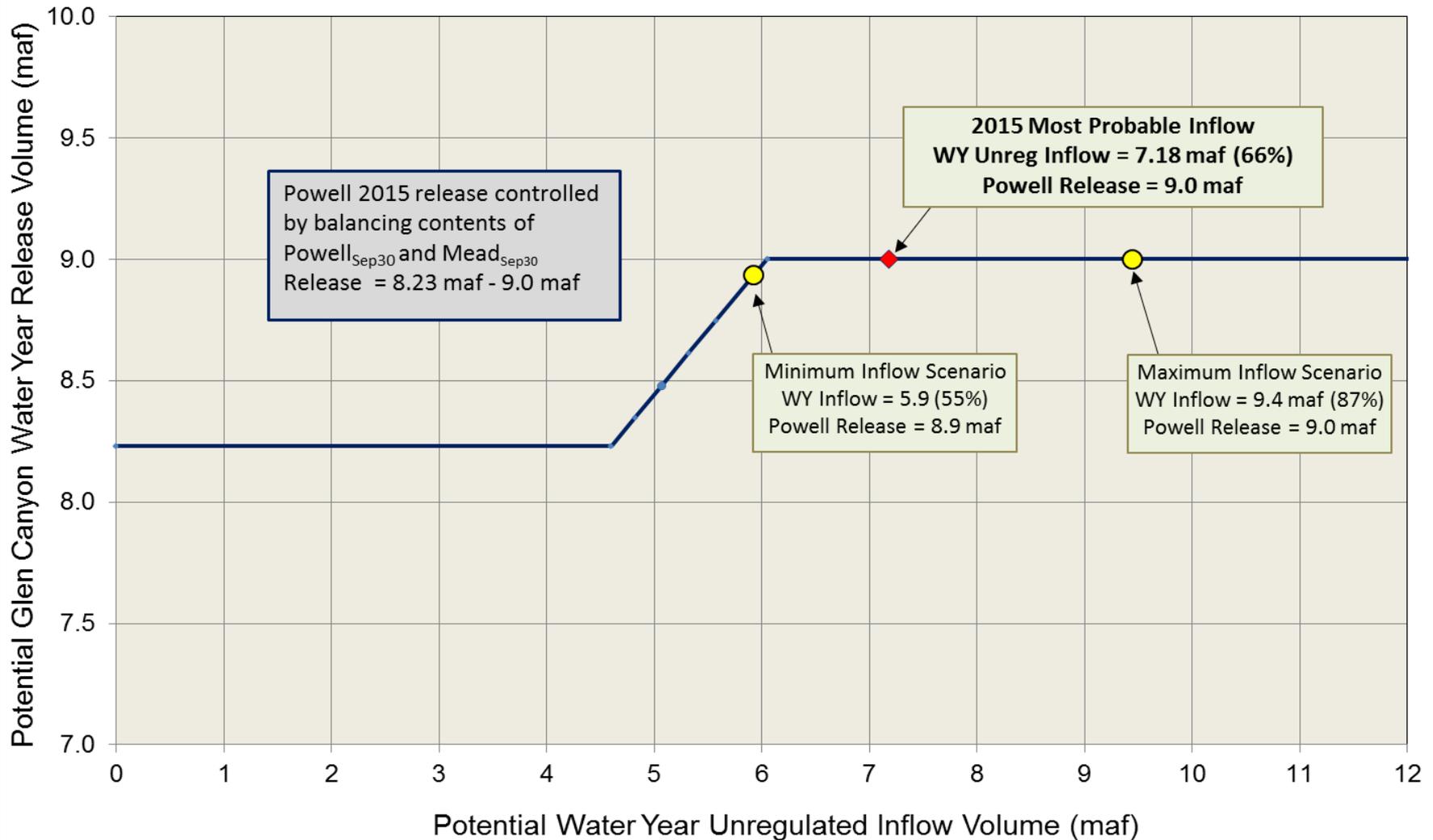
Upper Elevation Balancing

- Tier was set in August 2014
 - 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

Potential Lake Powell Release Scenarios

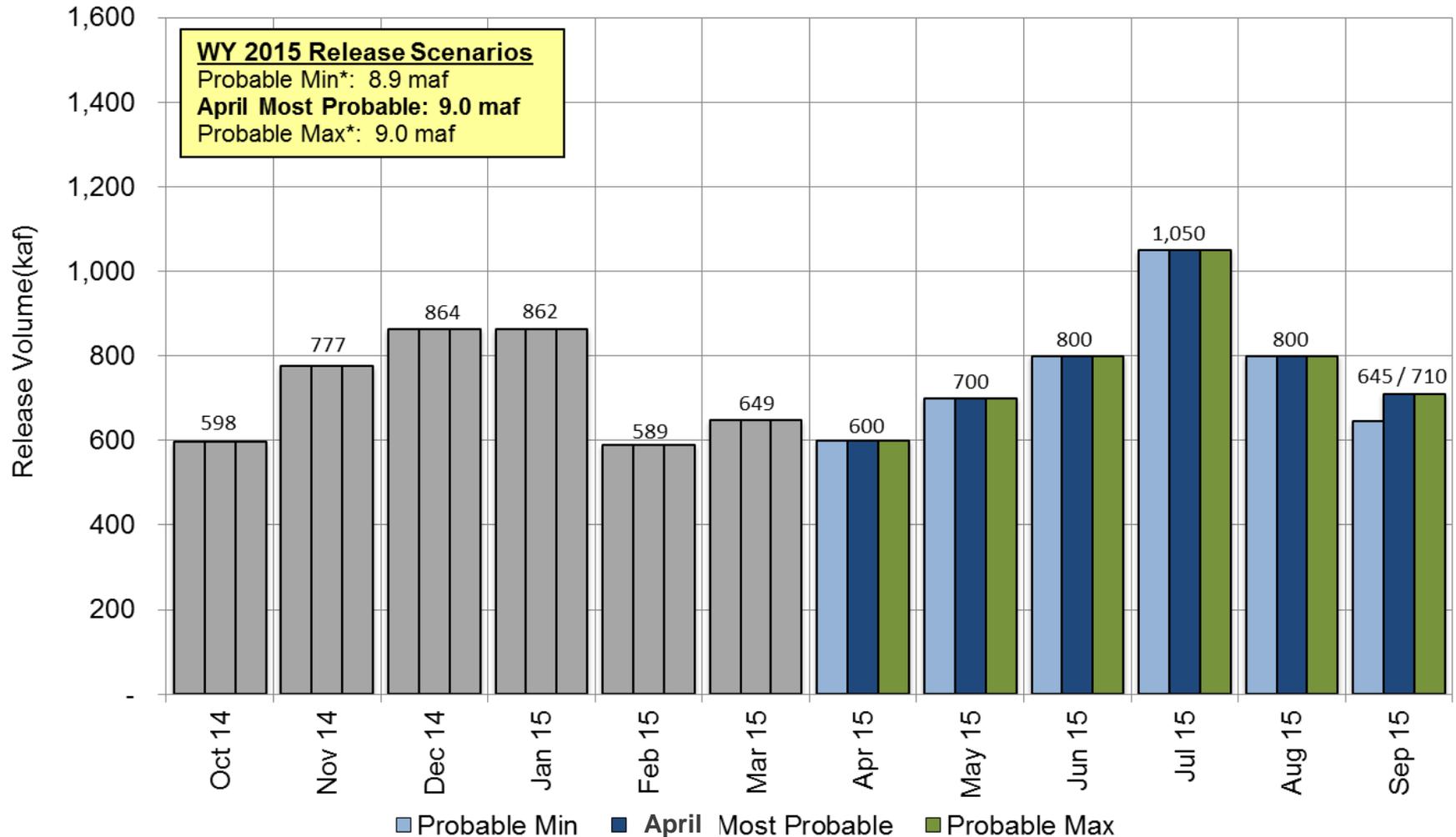
Water Year 2015 Release Volume as a Function of Unregulated Inflow Volume
based on April 2015 24-Month Study Conditions



Projected Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2015

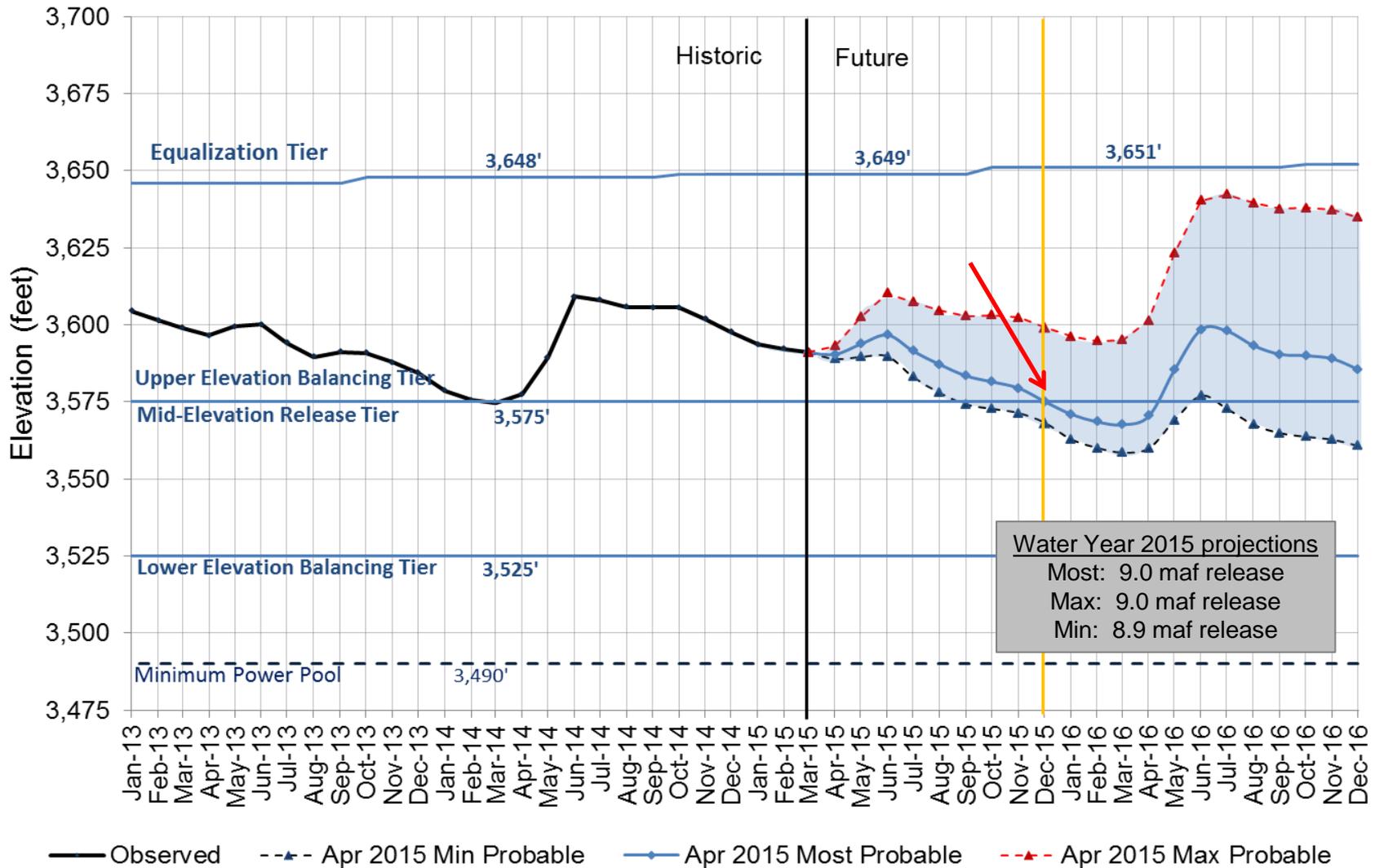
Updated April 2015



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

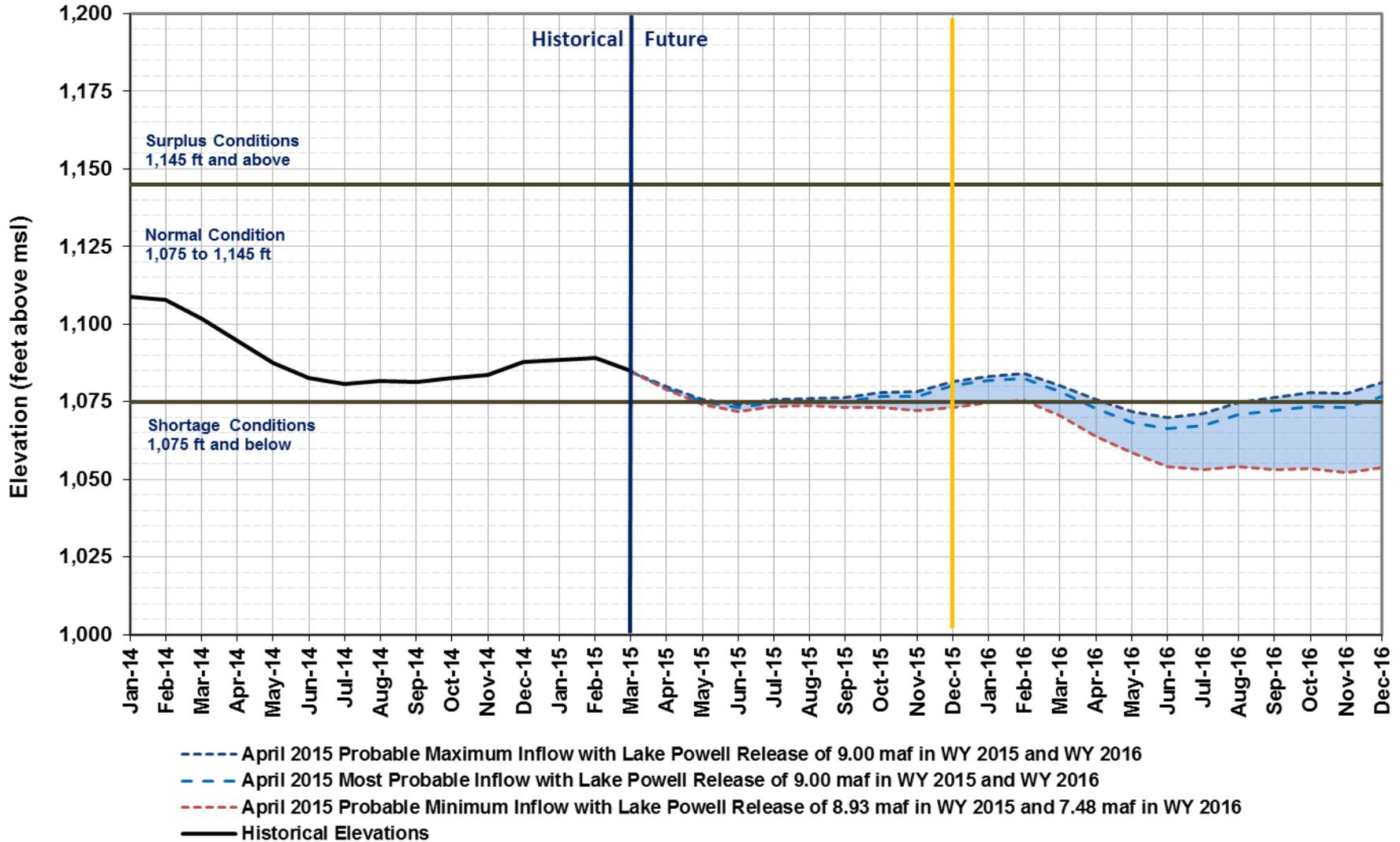
Lake Powell End of Month Elevations

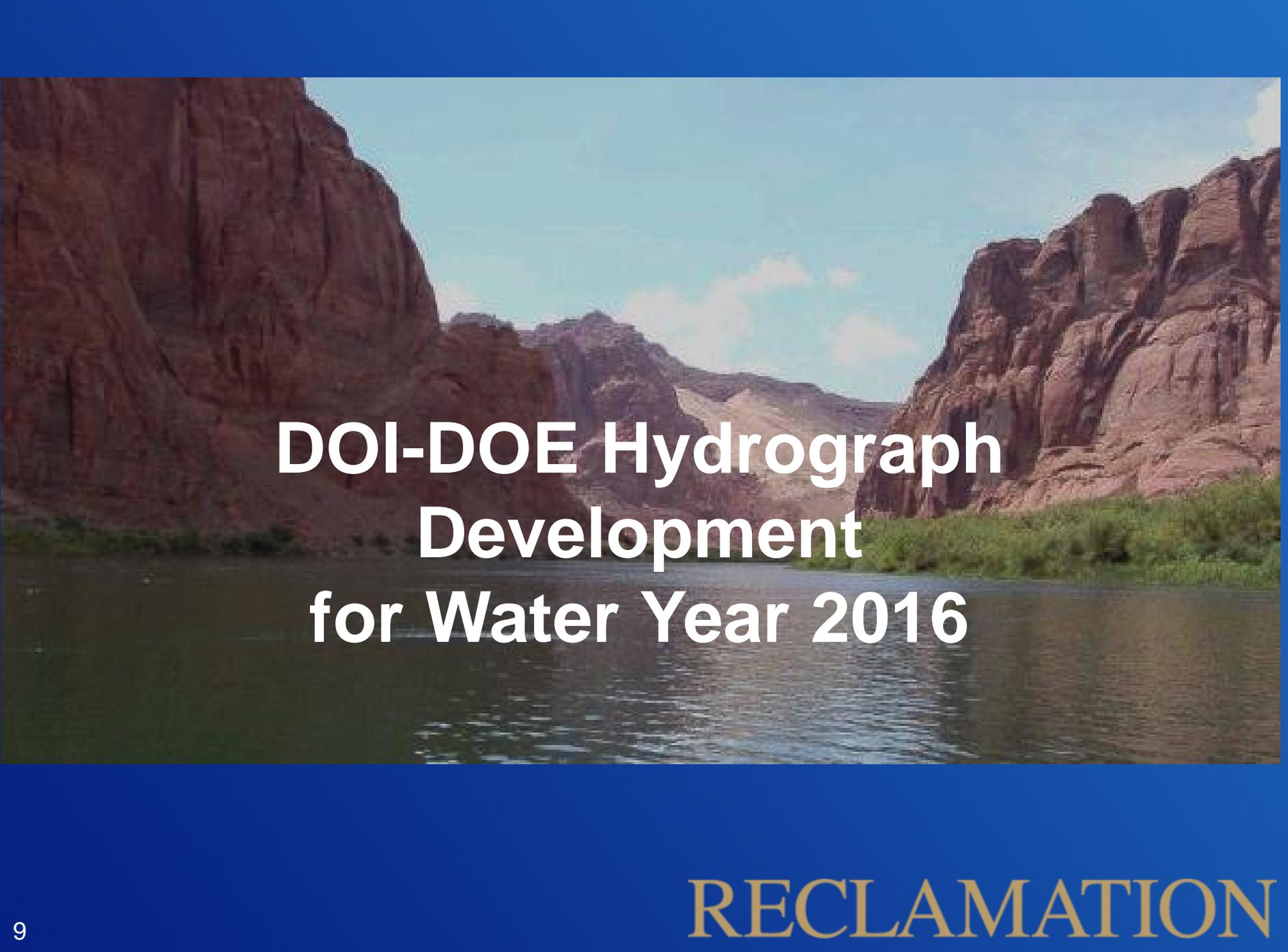
Historic and projected based on April 2015 modeling



Lake Mead End of Month Elevations

Projections from April 2015 24-Month Study Inflow Scenarios



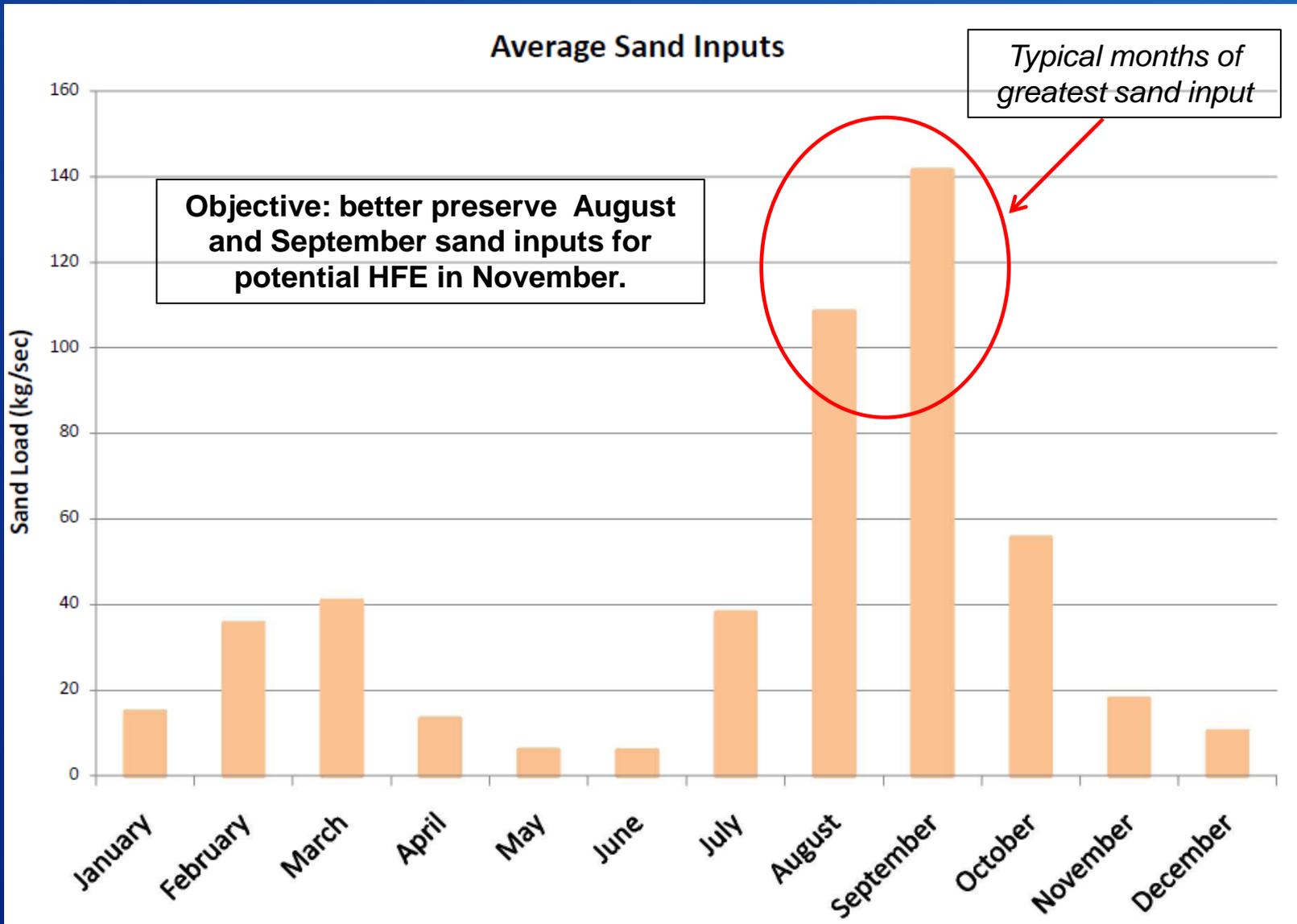


**DOI-DOE Hydrograph
Development
for Water Year 2016**

RECLAMATION

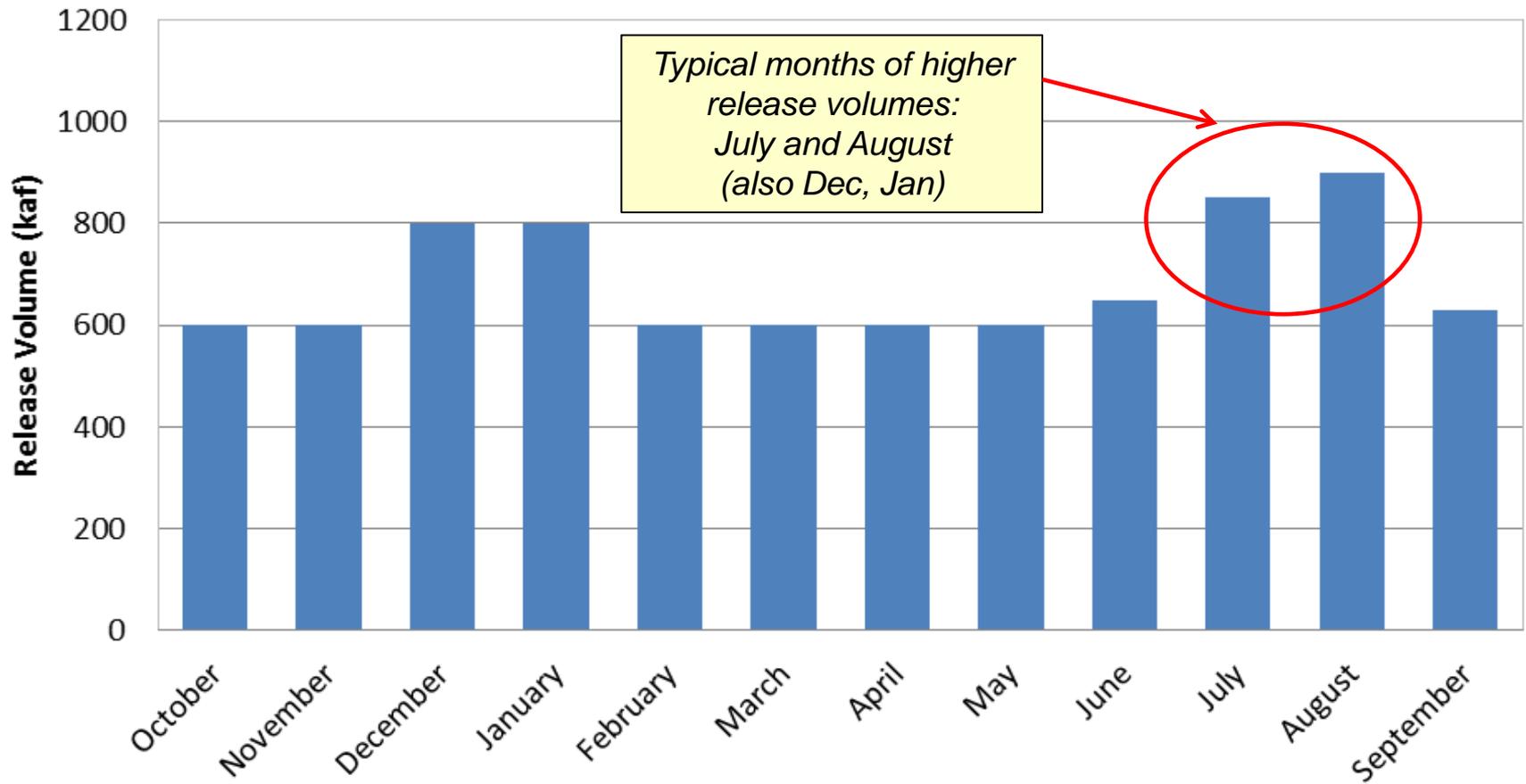
2016 Hydrograph Concepts

- Objective— retain sand inputs high in the system in anticipation of a potential fall HFE
- Target lower August through September releases
- Avoid shifting “extra” water to June (which cools temperatures at the mouth of the LCR)
- Move water from August to other equal value months for hydropower (Dec/Jan)
- Learn from past years’ experience



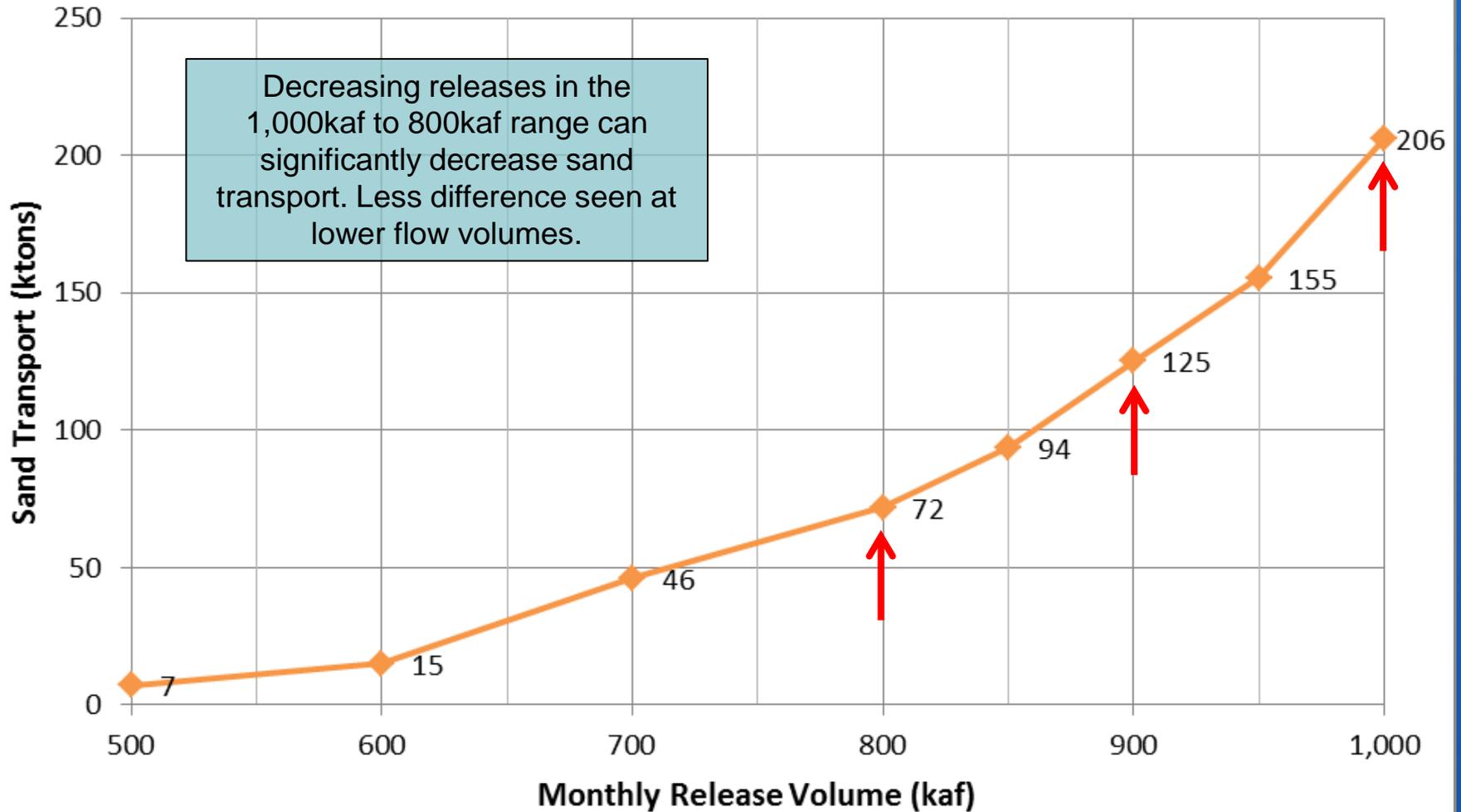
Typical Annual Release Pattern

8.23 maf year



Sand Budget Model - Marble Canyon Reach

(based on Dec-2013 initial conditions)



Lake Powell 2016 Operating Tier Scenarios

Based on April 2015 modeling

Inflow Scenario	Operating Tier Release Volume
Minimum Probable	Mid-Elevation Release 7.48 maf
Most Probable	Upper Elevation Balancing 9.0 maf
Maximum Probable	Upper Elevation Balancing 9.0 maf

2016 Hydrograph

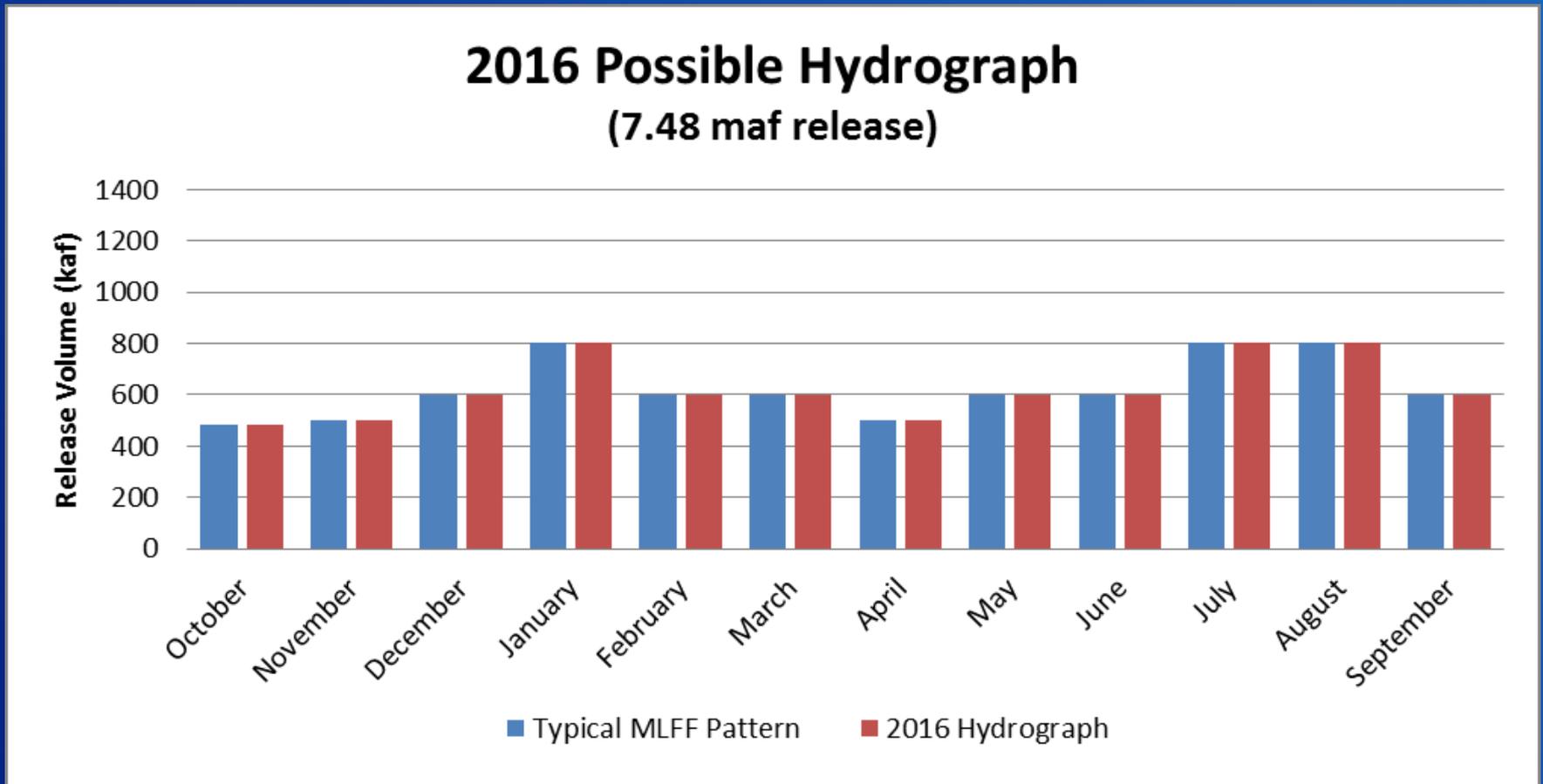
Current DOI-DOE Proposal

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 (was 850)	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

2016 Proposed Hydrograph

7.48 maf release

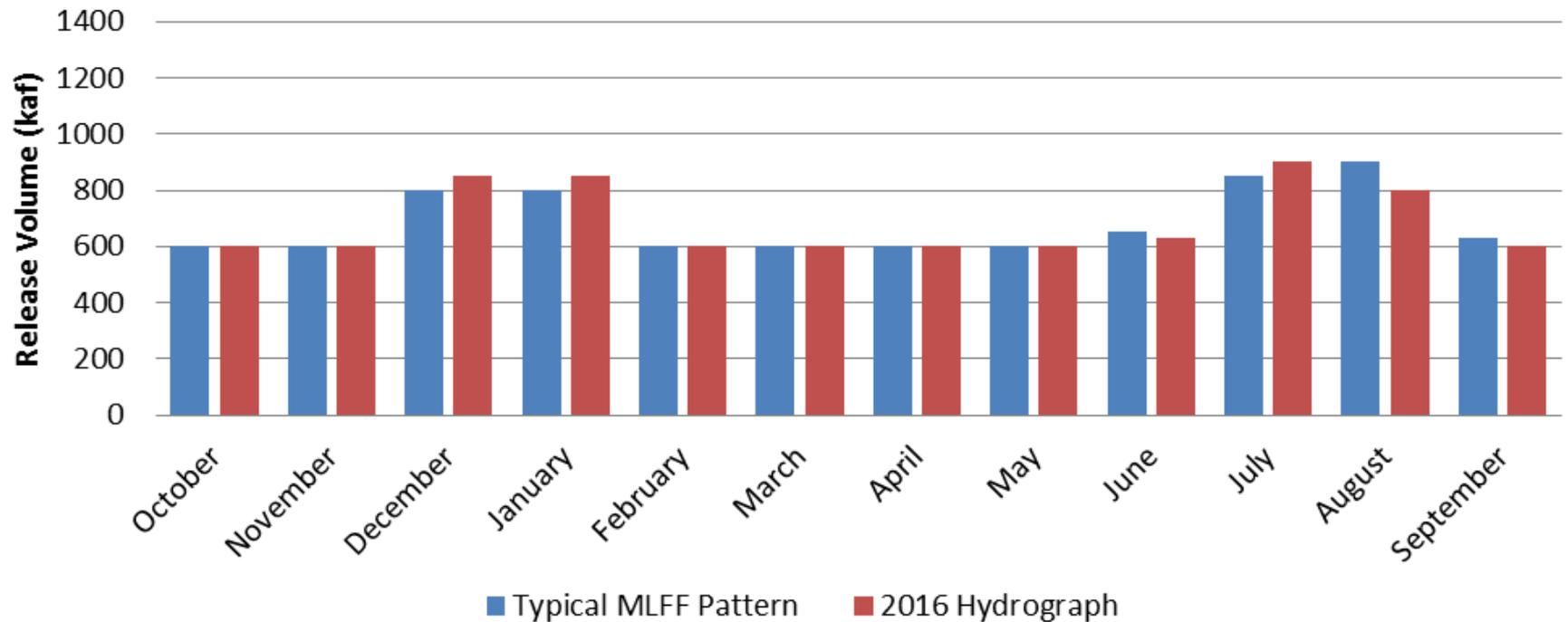
Release is already low in June, Aug and Sep, no difference



2016 Proposed Hydrograph

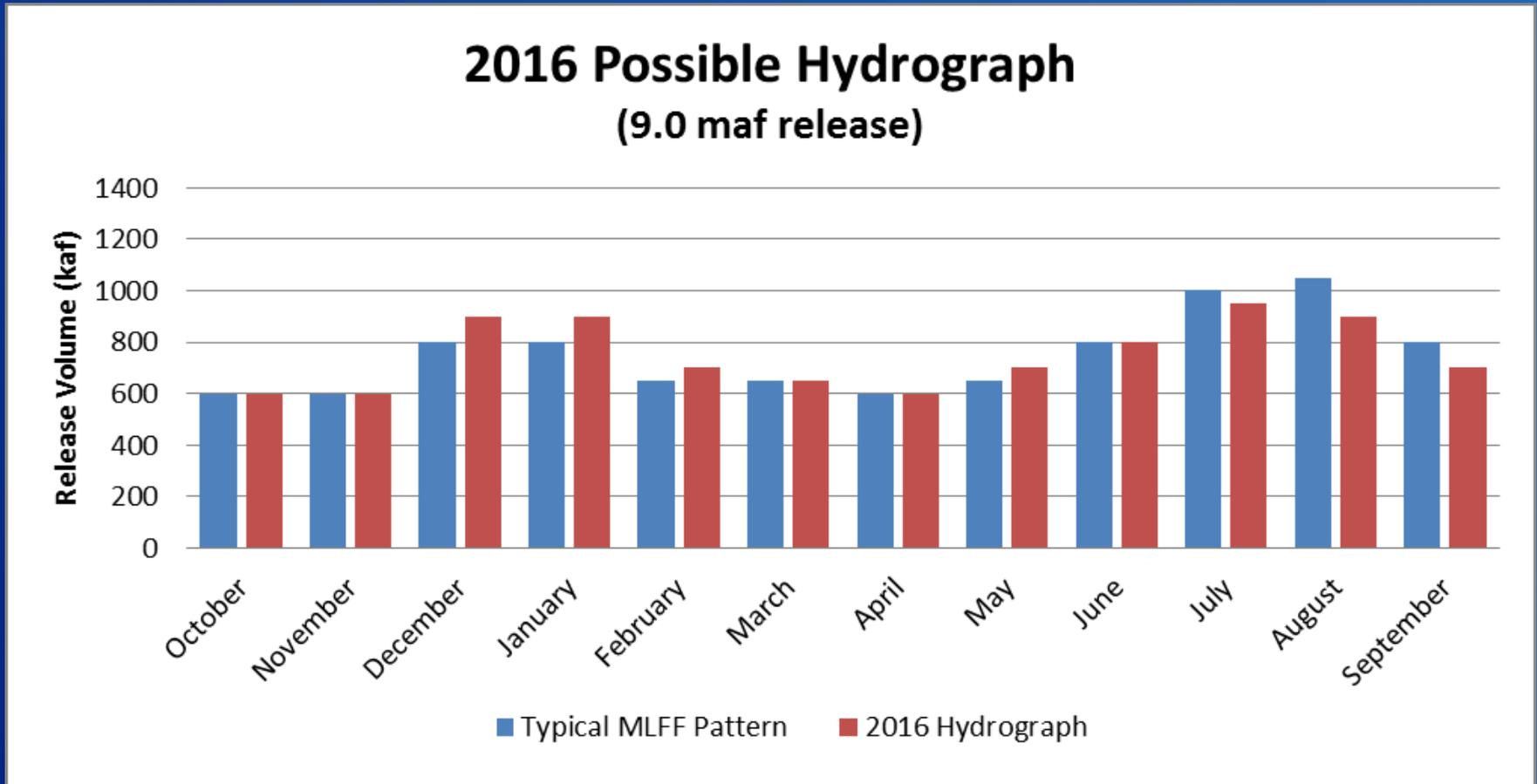
8.23 maf release

2016 Possible Hydrograph
(8.23 maf release)



2016 Proposed Hydrograph

9.0 maf release



Screening Tool Analysis

Typical 9.0 MLFF					Modified 9.0 year Proposal				
Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)	Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)
Oct	600	14,614	15,858	11.4	Oct	600	14,614	15,858	11.4
Nov	600	15,869	15,343	10.6	Nov	600	15,869	15,343	10.6
Dec	800	41,620	20,972	10.0	Dec	900	77,431	23,762	10.0
Jan	800	41,620	19,536	9.9	Jan	900	77,431	22,102	9.9
Feb	650	25,345	15,906	10.3	Feb	700	33,365	17,096	10.3
Mar	650	19,397	15,459	10.8	Mar	650	19,397	15,459	10.8
Apr	600	15,869	13,209	11.3	Apr	600	15,869	13,209	11.3
May	650	19,397	14,825	11.8	May	700	25,355	15,871	11.7
Jun	800	45,598	19,428	12.1	Jun	800	45,598	19,428	12.1
Jul	1000	113,929	30,588	12.1	Jul	950	94,279	29,197	12.2
Aug	1050	136,707	32,491	11.9	Aug	900	77,431	28,169	12.1
Sep	800	45,598	22,360	11.8	Sep	700	27,671	19,715	12.0
Total	9000	535,564	235,977		Total	9000	524,310	235,210	
									-767 hydropower diff
	Annual	535,564			Annual	524,310			-11,254 sed diff (annual)
	Jul-Nov	326,718			Jul-Nov	229,864			-96,854 sed diff (Jul-Nov)
	Aug-Sep	182,305			Aug-Sep	105,102			-77,203 sed diff (Aug - Sep)

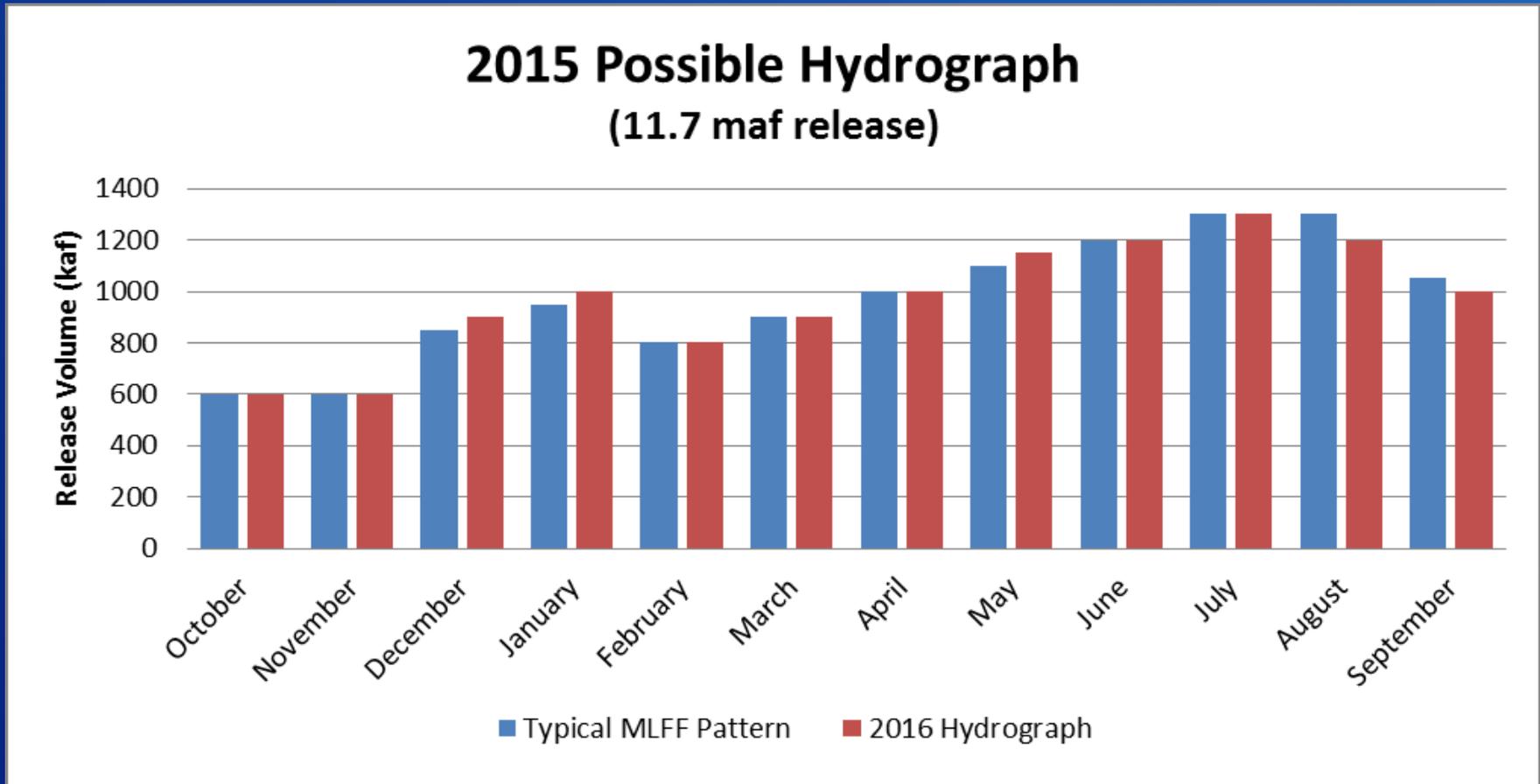
Screening Tool Analysis

Original 9.0 maf year Proposal (Presented at Feb AMWG)					Modified 9.0 year Proposal				
Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)	Month	Monthly Volume (kaf)	Total Sediment Transport (MT)	Total Hydropower Value (1000\$)	Temp at RM61 (deg C)
Oct	600	14,614	15,858	11.4	Oct	600	14,614	15,858	11.4
Nov	600	15,869	15,343	10.6	Nov	600	15,869	15,343	10.6
Dec	900	77,431	23,762	10.0	Dec	900	77,431	23,762	10.0
Jan	900	77,431	22,102	9.9	Jan	900	77,431	22,102	9.9
Feb	700	33,365	17,096	10.3	Feb	700	33,365	17,096	10.3
Mar	650	19,397	15,459	10.8	Mar	650	19,397	15,459	10.8
Apr	600	15,869	13,209	11.3	Apr	600	15,869	13,209	11.3
May	700	25,355	15,871	11.7	May	700	25,355	15,871	11.7
Jun	800	45,598	19,428	12.1	Jun	800	45,598	19,428	12.1
Jul	1000	113,929	30,588	12.1	Jul	950	94,279	29,197	12.2
Aug	850	63,078	26,728	12.2	Aug	900	77,431	28,169	12.1
Sep	700	27,671	19,715	12.0	Sep	700	27,671	19,715	12.0
Total	9000	529,607	235,159		Total	9000	524,310	235,210	
									51 hydropower diff
	Annual	529,607				Annual	524,310	-5,297	sed diff (annual)
	Jul-Nov	235,161				Jul-Nov	229,864	-5,297	sed diff (Jul-Nov)
	Aug-Sep	90,749				Aug-Sep	105,102	14,353	sed diff (Aug - Sep)

2016 Proposed Hydrograph

11.7 maf release (unlikely)

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



2016 Hydrograph Next Steps

- Consider Feedback from TWG
- Continue to coordinate with DOI-DOE agencies
- Present to AMWG in May for review
- Draft motion to TWG in June
 - TWG discuss and make recommendation to AMWG in June
- TWG present recommendation to AMWG in August for approval

Questions?

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