

**Glen Canyon Dam Adaptive Management Work Group**  
**Agenda Item Form**  
**February 15-16, 2017**

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Agenda Item

Basin Hydrology and 2017 Dam Operations

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Purpose of Agenda Item

To increase understanding of water supply, forecasted hydrologic conditions, and projected reservoir conditions and operations for the current and upcoming water years.

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Action Requested

Information item only; we will answer questions but no action is requested.

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Presenter

Paul Davidson, Hydraulic Engineer, Bureau of Reclamation, Upper Colorado Region

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Previous Action Taken

By the Department of the Interior:

On December 15, 2016, Secretary Jewell signed the Record of Decision for the Glen Canyon Dam Long-Term experimental and Management Plan Final Environmental Impact Statement (LTEMP ROD). The LTEMP ROD describes how the monthly, daily and hourly operations for Glen Canyon Dam will be phased in through interim operations between January 1, 2017 and September 30, 2017.

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Relevant Science

N/A

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Summary of Presentation and Background Information

The presentation will cover information pertinent to AMWG members regarding the current water supply and forecasted hydrologic conditions within the Upper Colorado River Basin. Projected reservoir conditions and operations at Lake Powell/Glen Canyon Dam include the phase-in of LTEMP ROD base operations for the current and upcoming water years.

# RECLAMATION

*Managing Water in the West*

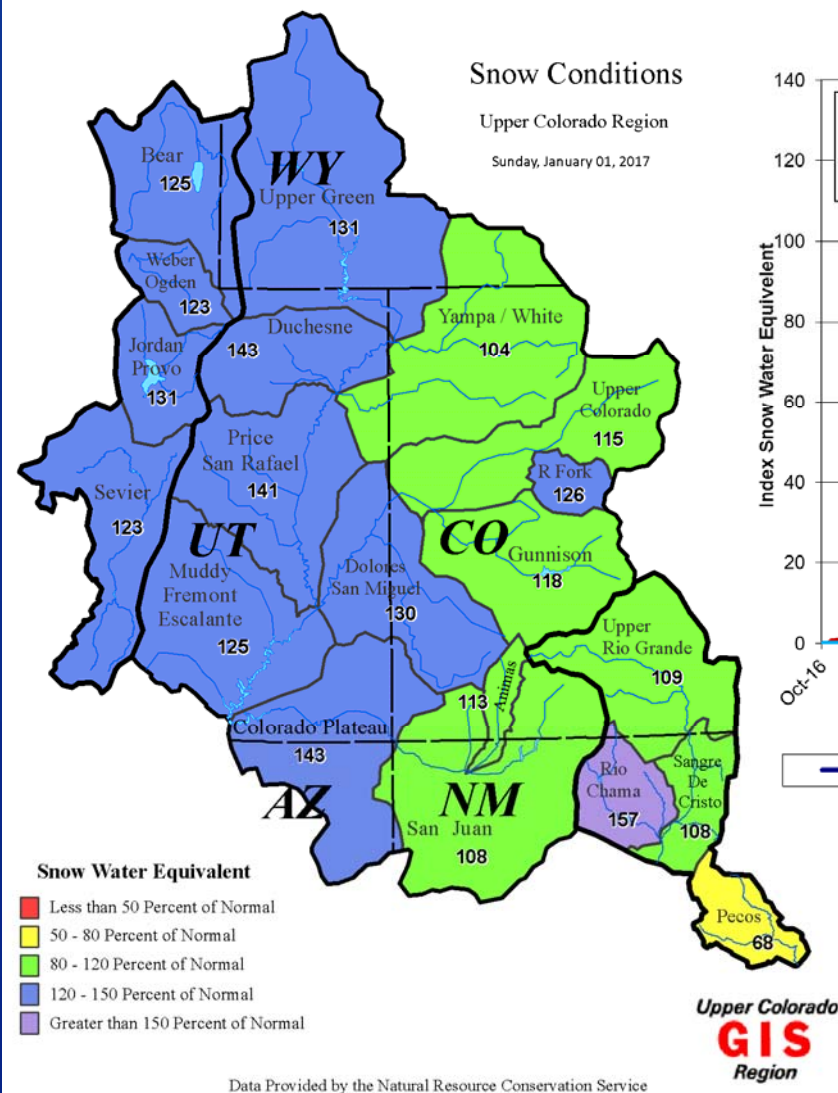
## **Basin Hydrology, and 2017-2018 Operations**

**Glen Canyon Technical Work Group**  
*February 15, 2017*

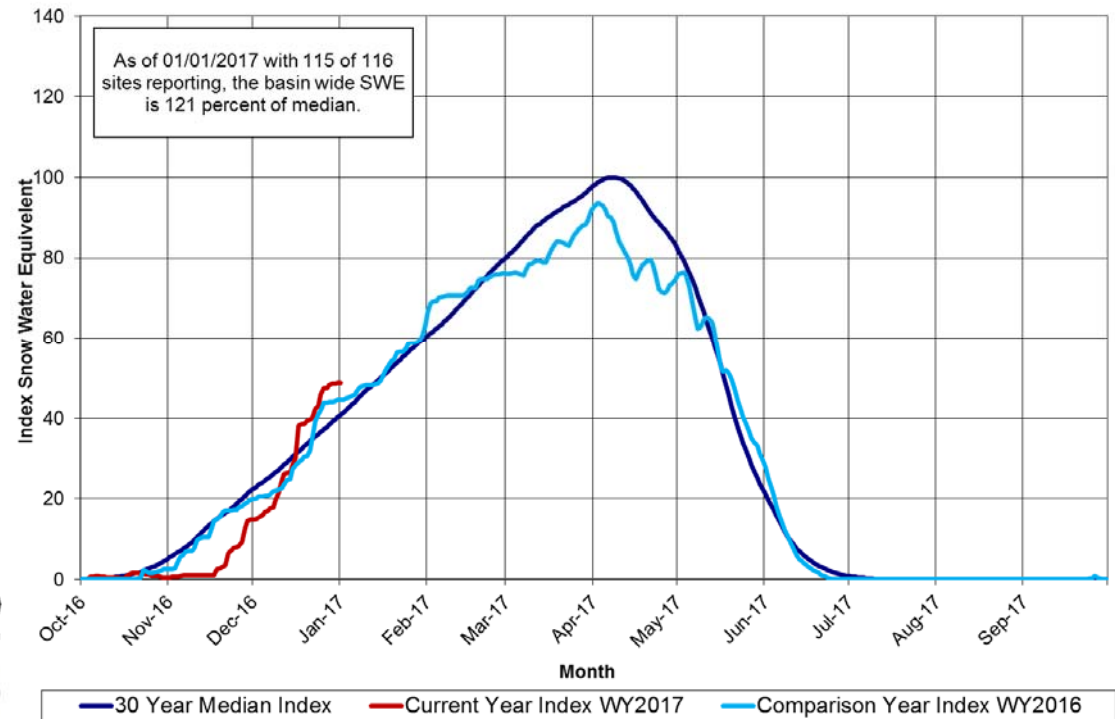


U.S. Department of the Interior  
Bureau of Reclamation

# Snow Conditions



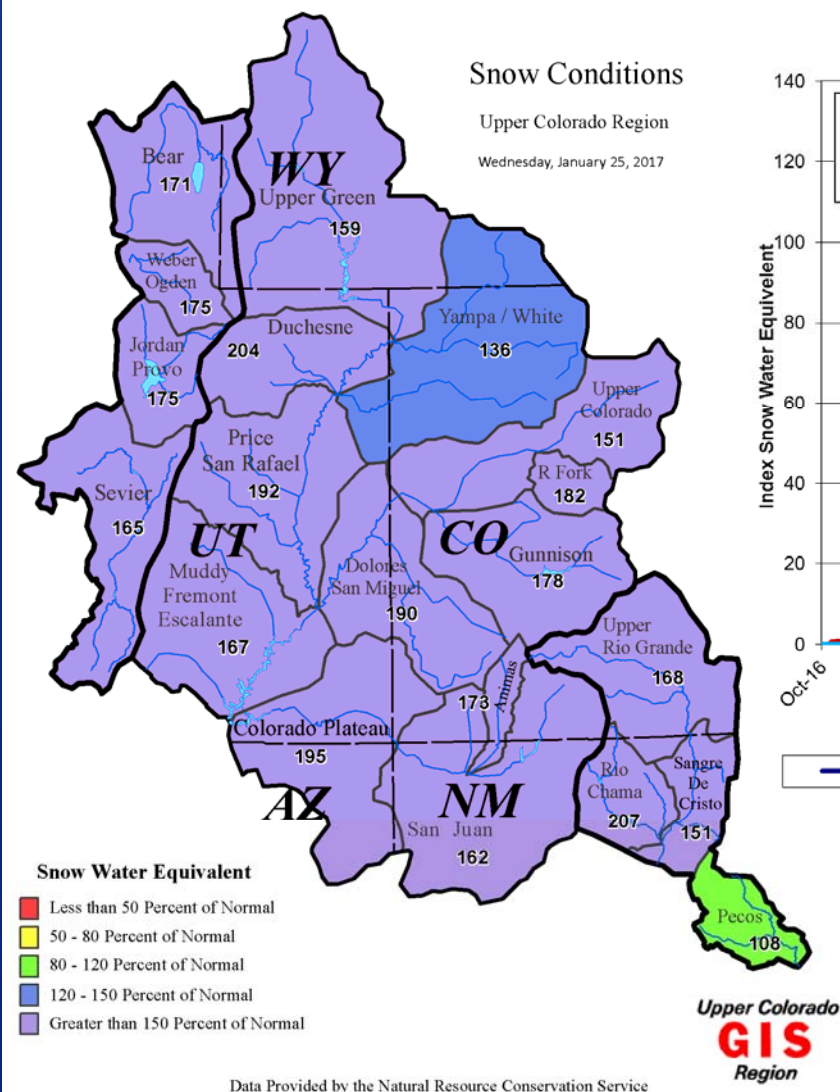
**Upper Colorado River Basin Snotel Tracking**  
Aggregate of 116 Snotel Sites above Lake Powell



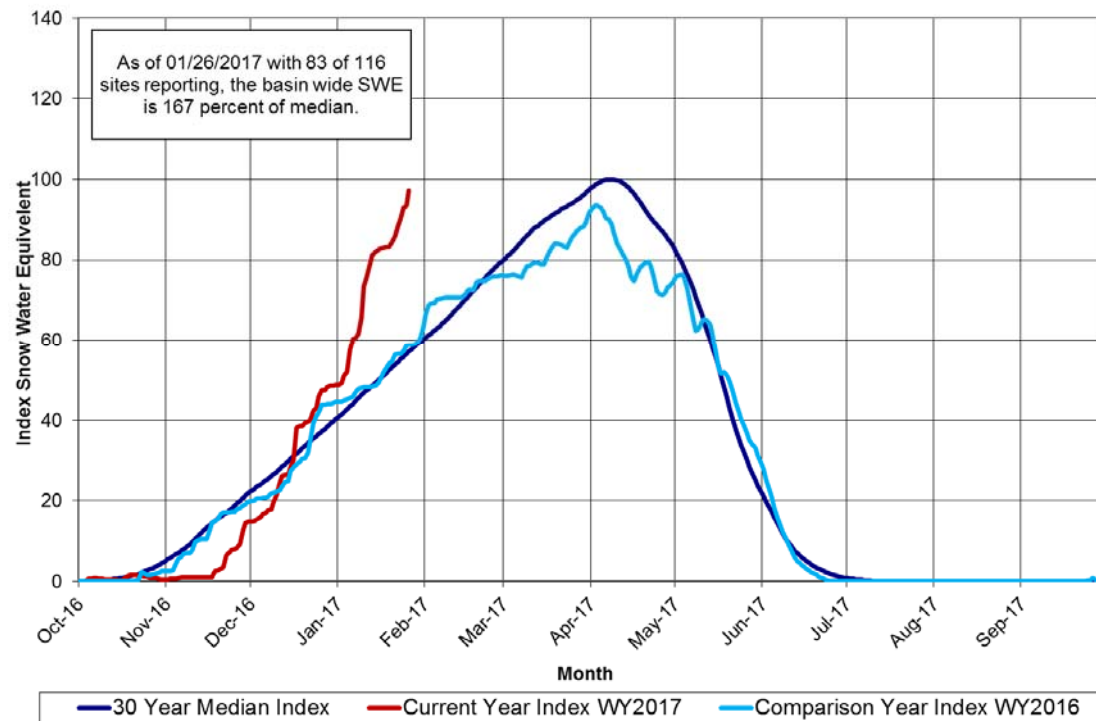
Data Provided by the Natural Resource Conservation Service

# RECLAMATION

# Snow Conditions



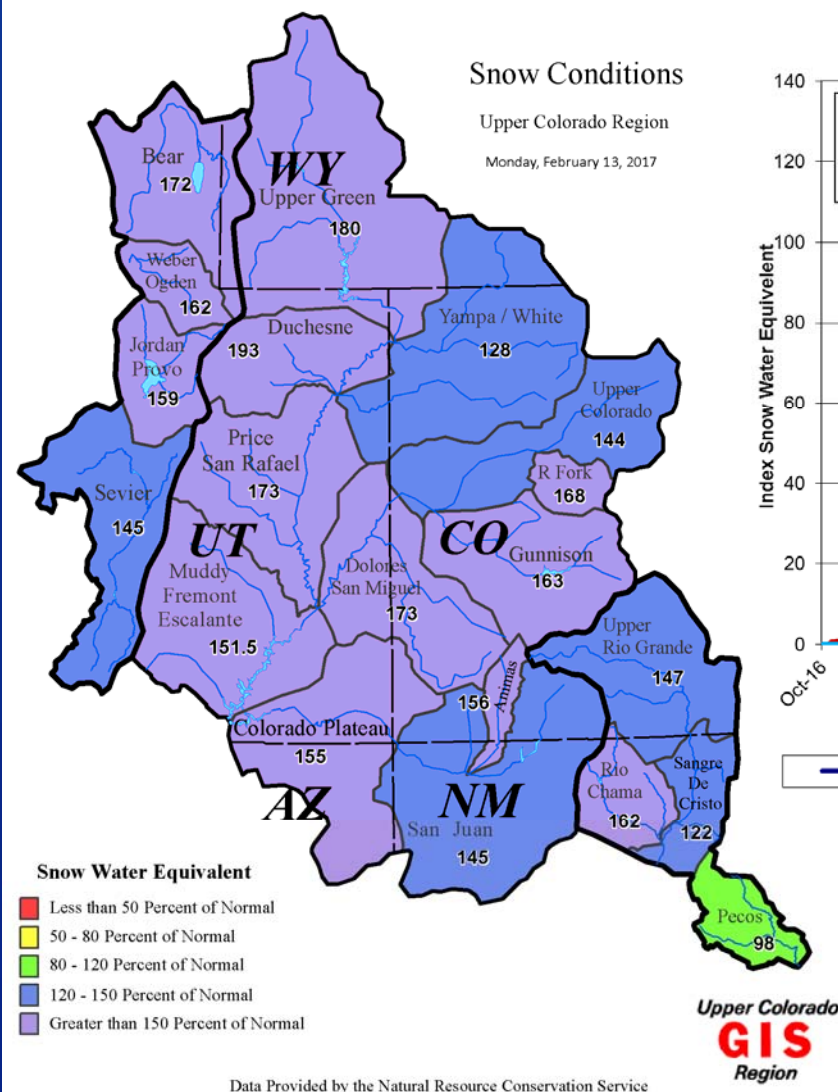
**Upper Colorado River Basin Snotel Tracking**  
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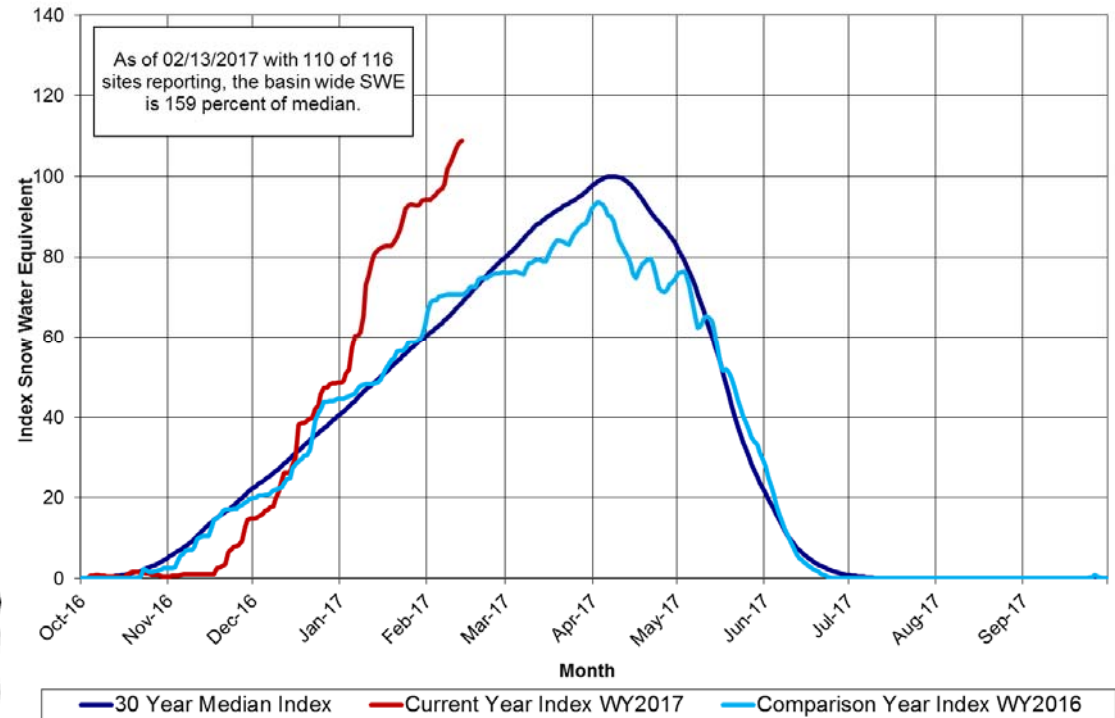
Data Provided by the Natural Resource Conservation Service

# RECLAMATION

# Snow Conditions



**Upper Colorado River Basin Snotel Tracking**  
Aggregate of 116 Snotel Sites above Lake Powell



Data Provided by the Natural Resource Conservation Service

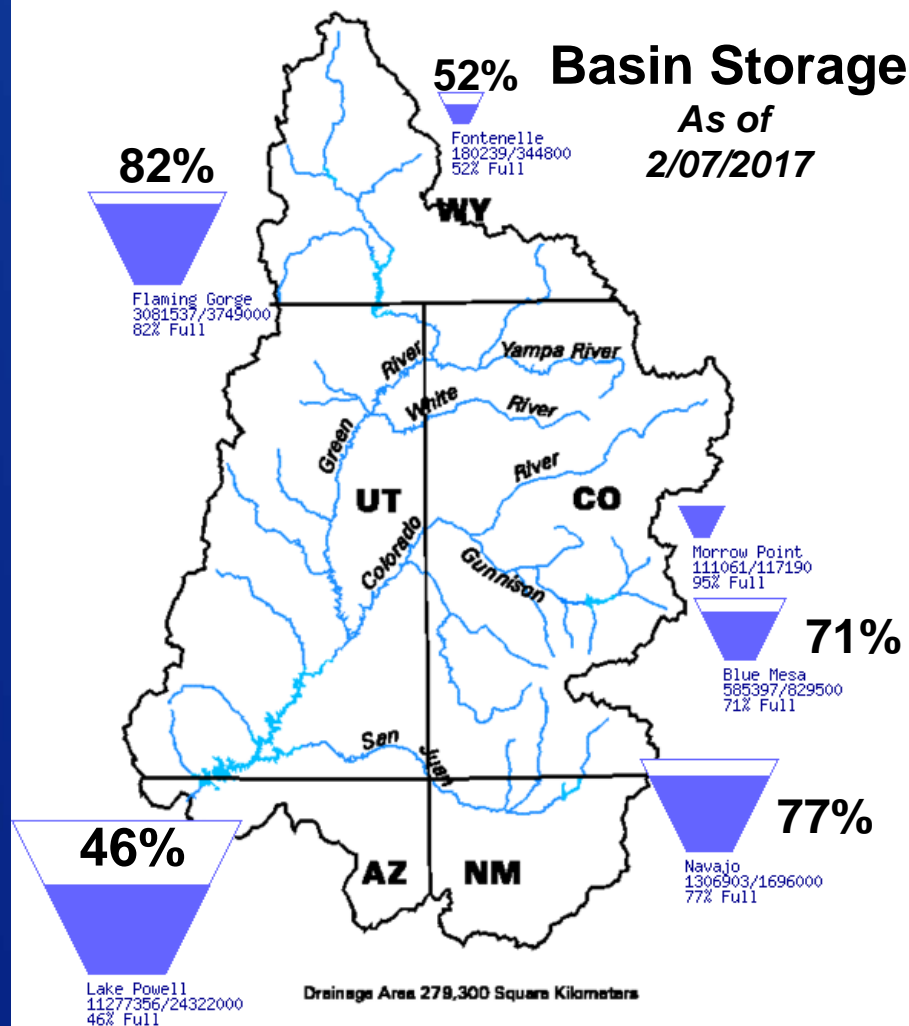
# RECLAMATION



# Upper Basin Storage

Data Current as of:  
02/07/2017

## Upper Colorado River Drainage Basin



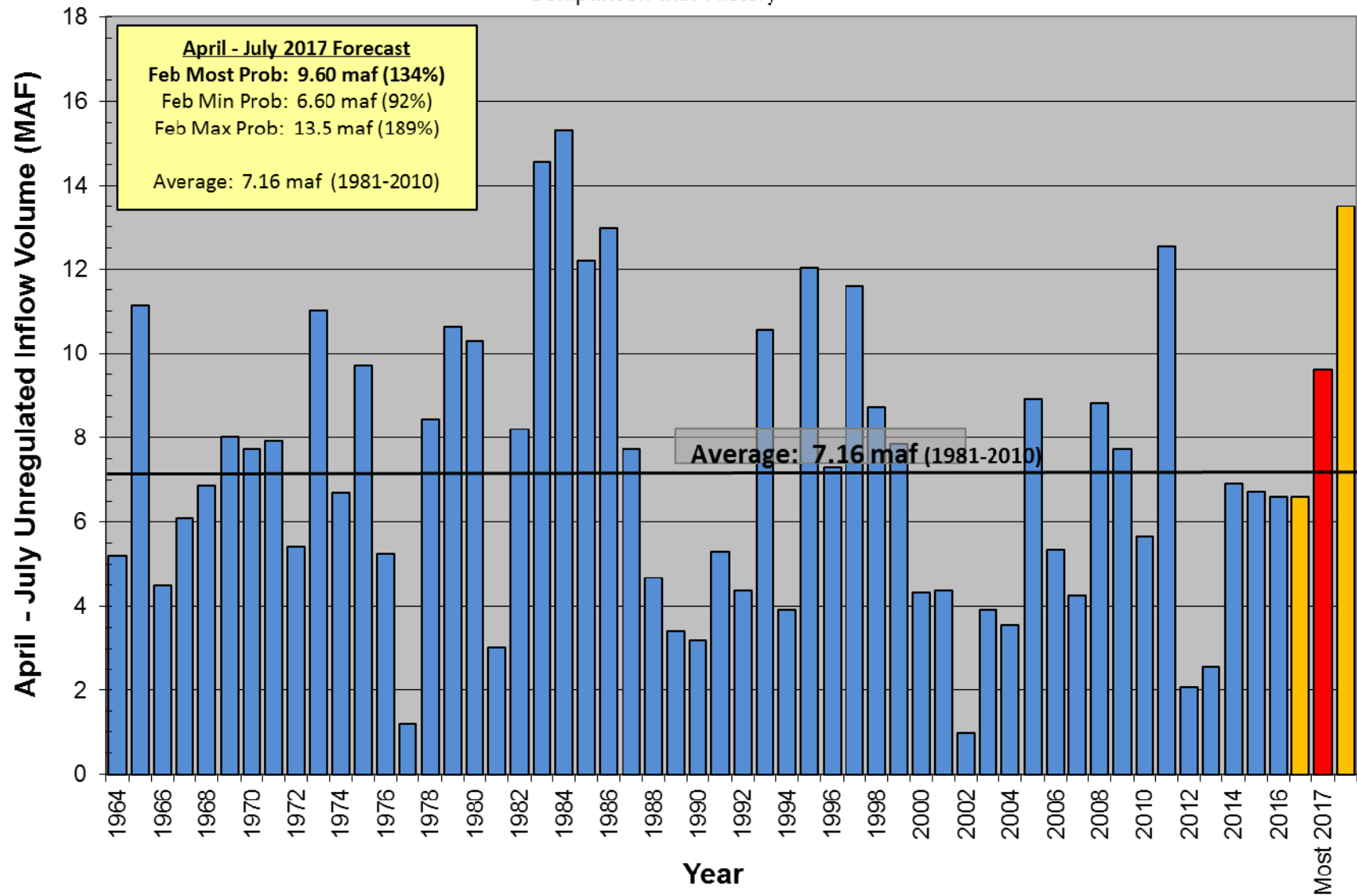
## April to July 2017 Forecasted Inflow Issued February 02, 2017

Reservoir	A-J Forecast (KAF)	Percent of Average <sup>1</sup>
Fontenelle	1200	166%
Flaming Gorge	1650	168%
Blue Mesa	925	137%
Navajo	880	120%
Powell	9,600	134%

<sup>1</sup> percent of average based on period 1981-2010.

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

**Lake Powell Unregulated Inflow  
April - July 2017 Forecast  
Issued February 1st  
Comparison with History**



\* Water Year 2017 forecast: 13.2 maf (122%)

**RECLAMATION**

# Lake Powell 2017 Operating Tier

## Upper Elevation Balancing

- Tier was set in August 2016
  - 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) <sup>1</sup>
3,700	<b>Equalization Tier</b> Equalize, avoid spills or release 8.23 maf	24.3
3,636 - 3,666 (2008-2026)	<b>Upper Elevation Balancing Tier<sup>3</sup></b> 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	<b>Mid-Elevation Release Tier</b> Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5
3,525	<b>Lower Elevation Balancing Tier</b> 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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# Lake Powell 2017 Operating Tier Scenarios

*Based on January 2017 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 9.0 maf

# LTEMP Monthly Release Volumes

Month	7.00	7.48	8.23	9.00	9.50	10.50	11.00	12.00	13.00	14.00
OCT	480	480	640	640	640	640	640	640	640	640
NOV	500	500	640	640	640	640	640	640	640	640
DEC	600	600	720	720	720	720	720	720	720	720
JAN	660	720	760	860	920	1040	1100	1230	1350	1470
FEB	590	640	680	750	810	920	970	1080	1190	1300
MAR	620	675	710	800	860	970	1030	1150	1260	1370
APR	550	600	640	710	760	870	920	1020	1120	1220
MAY	550	600	630	710	760	860	910	1020	1120	1220
JUN	580	630	660	750	800	910	960	1060	1170	1280
JUL	650	710	750	850	900	1020	1080	1200	1320	1440
AUG	700	760	800	900	970	1090	1160	1280	1410	1540
SEP	520	565	600	670	720	820	870	960	1060	1160

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## 2017 Hydrograph (9.0 MAF)

Month	LTEMP Release, (kaf)	BOR/WAPA Planned Release, (kaf)	Recommended 2017 Hydrograph, (kaf)
OCT	640	601	600
NOV	640	750	600
DEC	720	898	900
JAN	860	880	900
FEB	750	715	700
MAR	800	720	650
APR	710	620	600
MAY	710	646	700
JUN	750	750	800
JUL	850	850	950
AUG	900	900	900
SEP	670	670	700
TOTALS	9,000	9,000	9,000

## Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2017

Unit Number	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017
1												
2												
3												
4												
5												
6												
7												
8												
Units Available	6	6	6	6	5	5	6	7	7	7	7	6
Capacity (cfs)	21,000	21,000	19,700	19,750	16,100	16,100	19,700	23,300	23,300	23,300	23,300	19,700
Capacity (kaf/month)	1,310	1,280	1,180	1,270	920	1,090	1,250	1,430	1,390	1,430	1,450	1,210
Max (kaf) <sup>1</sup>	601	750	898	880	730	696	637	638	750	850	900	670
Most (kaf) <sup>2</sup>	601	750	898	880	715	720	620	645	750	850	900	670
Min (kaf) <sup>1</sup>	601	750	898	880	730	696	637	638	750	850	900	670

1 Projected release, based on Jan 2017 Min and Max Probable Inflow Projections and 24-Month Study model runs

2 Projected release, based on Feb 2017 Most Probable Inflow Projections and 24-Month Study model runs

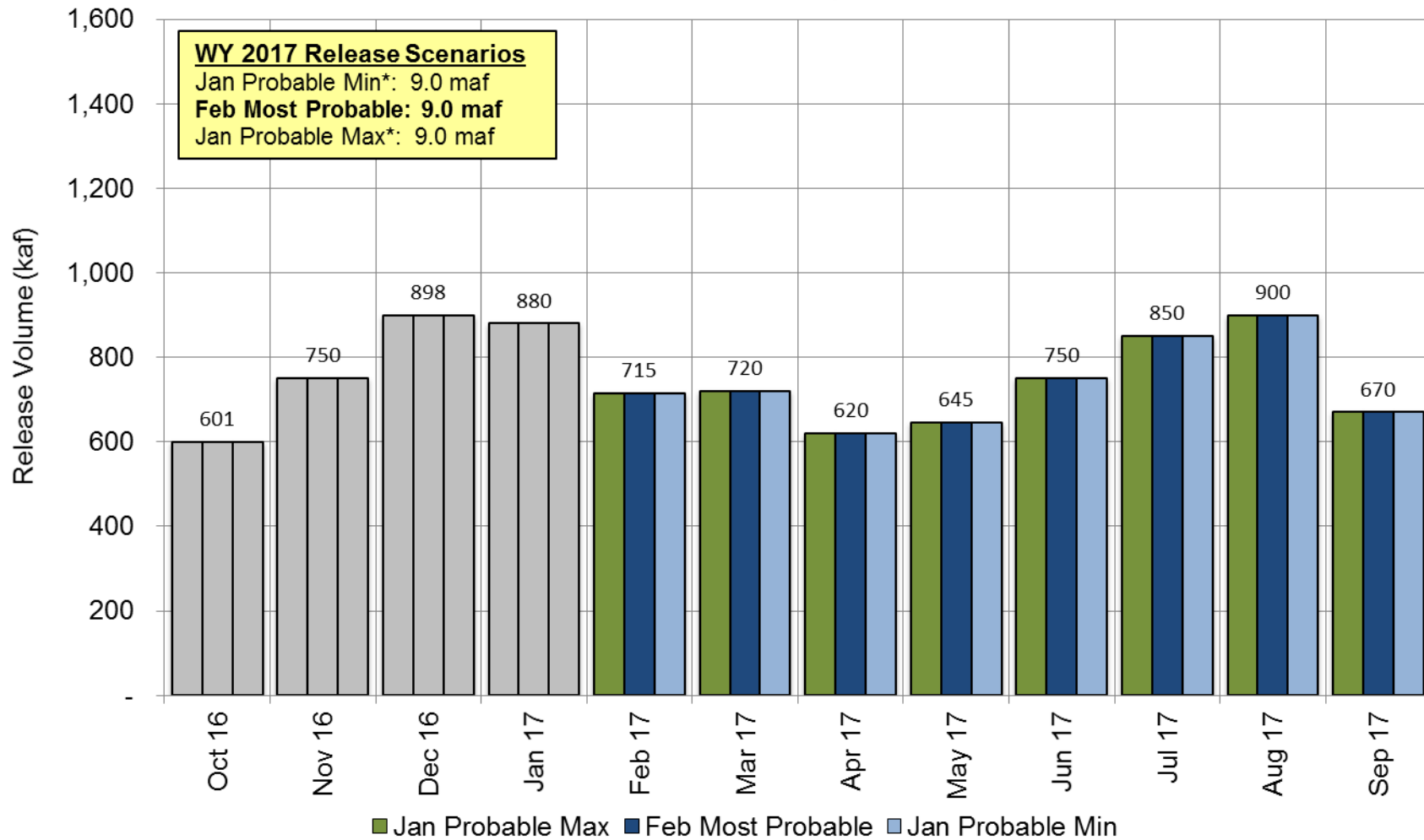
(updated 2-14-2017)

# RECLAMATION

# Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2017

Updated February 2017

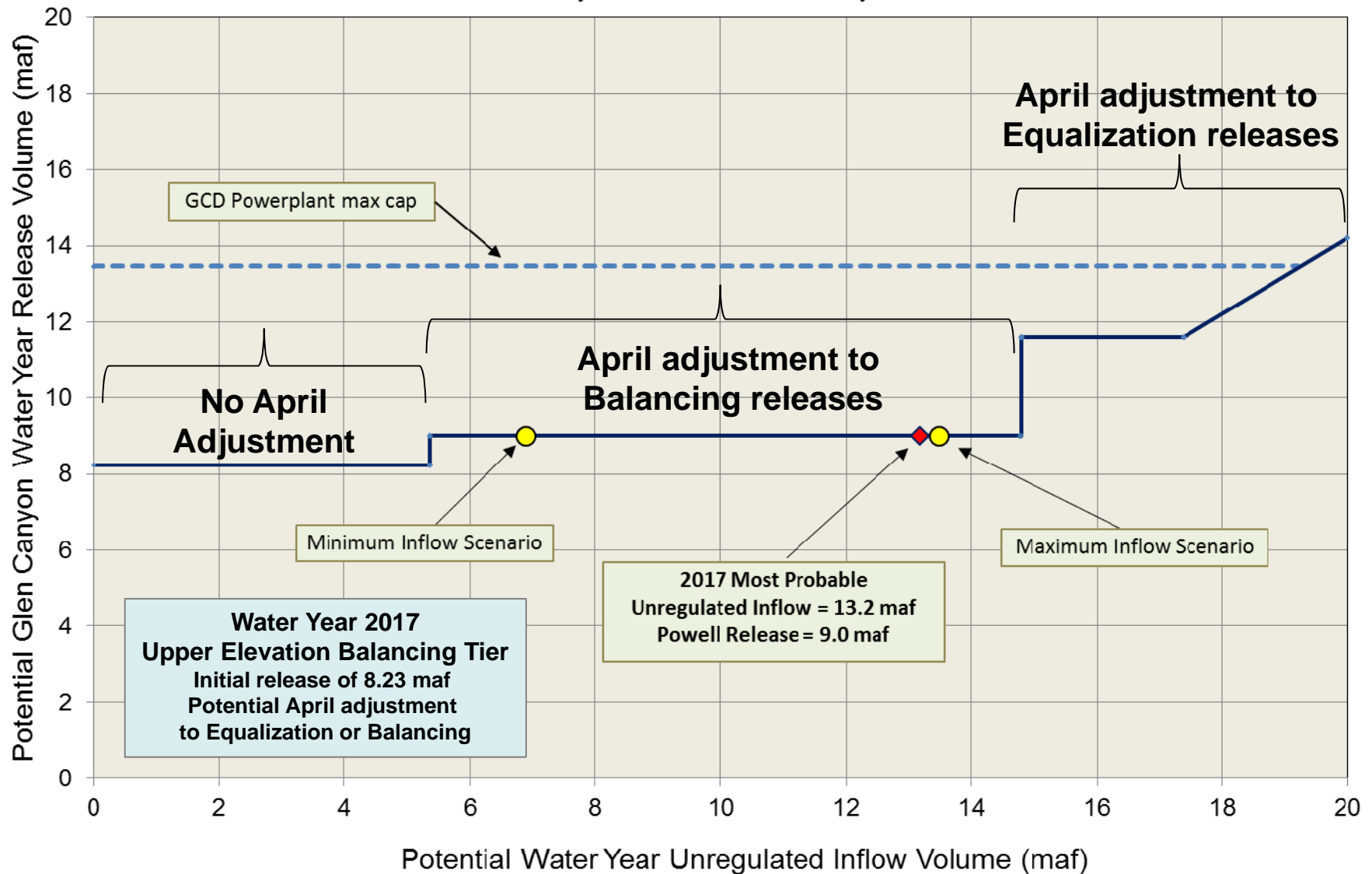


\* Probable Min and Max annual release volume is based on April Min and Max inflow forecasts

# RECLAMATION

## Potential Lake Powell Release Scenarios

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

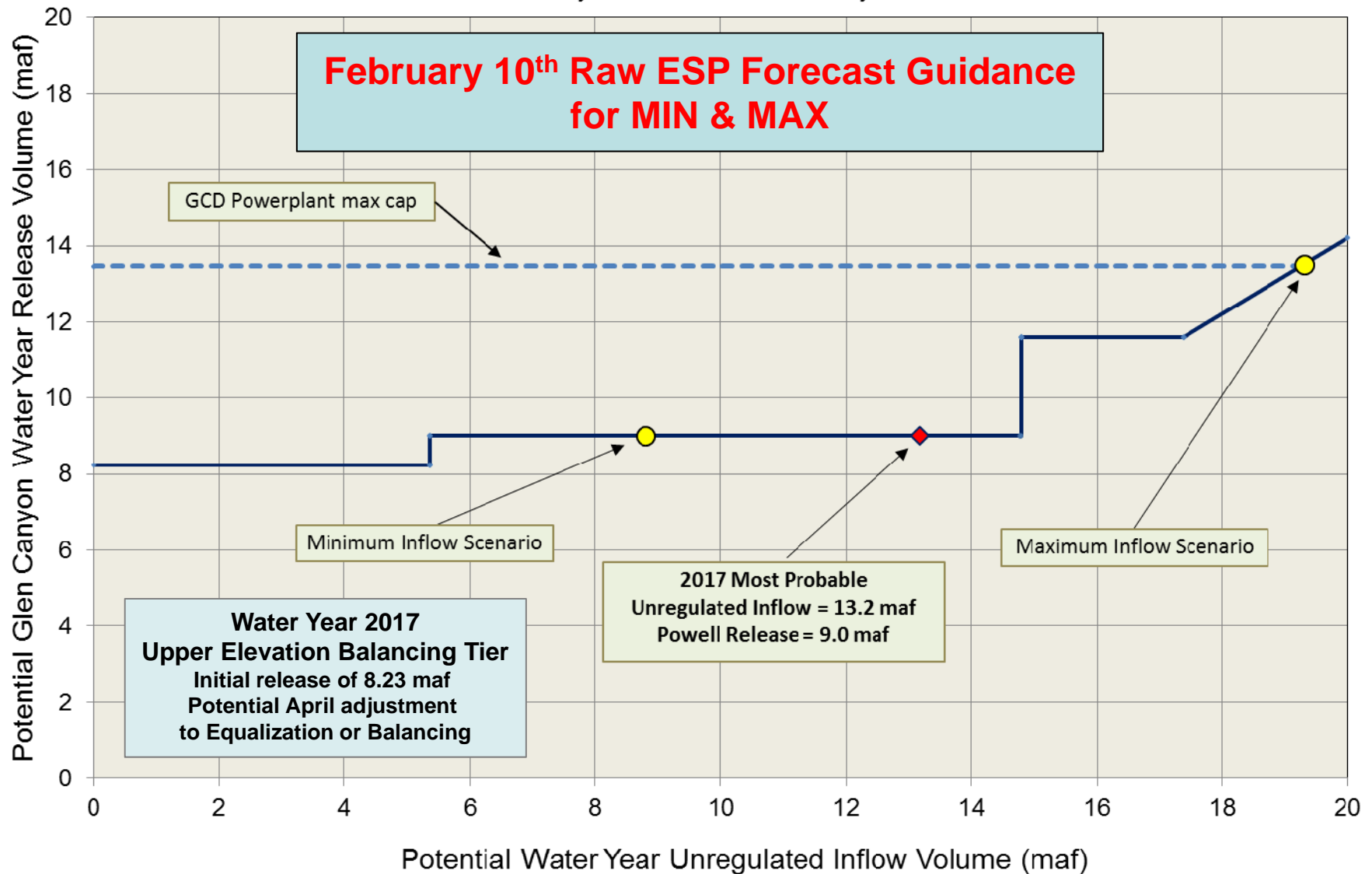


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## Potential Lake Powell Release Scenarios

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



# RECLAMATION

**End of CY 2017 Projection: 3,636 feet**  
*(Range 3,586 to 3,640 feet)*

**End of WY 2018 Projection: 3,651 feet**  
*(Range 3,566 to 3,640 feet)*

Water Year 2017 projections

Most: 9.0 maf release  
Max: 9.0 maf release  
Min: 9.0 maf release

Water Year 2018 projections

Most: 9.0 maf release  
Max: 12.1 maf release  
Min: 9.0 maf release

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End of CY 2017 Projection:  
1,078.0 feet (38% full)  
*Range: 1,073 to 1,078 feet*

The diagram features a vertical yellow line. To its left, a text box contains the 2017 projection data. An arrow points from this box to the yellow line. To the right of the line, another text box contains the 2018 projection data. An arrow points from this box to the yellow line. The entire background is blue.

End of CY 2018 Projection:  
1,074.6 feet (37% full)  
*Range: 1,064 to 1,108 feet*

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# Water Year 2018 Operations

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## Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2018

Unit Number	Oct 2017	Nov 2017	Dec 2017	Jan 2018	Feb 2018	Mar 2018	Apr 2018	May 2018	Jun 2018	Jul 2018	Aug 2018	Sep 2018
1		Possible HFE										
2												
3												
4												
5												
6												
7												
8												
Units Available	5	7	7	7	5	5	5	6/8	8	8	8	7
Capacity (cfs)	16,100	23,300	23,300	23,300	16,000	16,000	16,000	19,800	26,900	26,900	26,900	23,300
Capacity (kaf/month)	1,060	1,390	1,430	1,290	920	990	1,040	1,510	1,600	1,660	1,660	1,470
Max (kaf) <sup>1</sup>	640	640	720	1,230	1,080	1,150	1,020	1,020	1,100	1,200	1,300	966
Most (kaf) <sup>2</sup>	640	640	720	860	750	800	710	710	750	850	900	670
Min (kaf) <sup>1</sup>	640	740	720	860	760	710	640	640	750	850	900	680

**12.1**

**9.0**

**8.8**

(updated 2-14-2017)

<sup>1</sup> Projected release, based on Jan 2017 Min and Max Probable Inflow Projections and 24-Month Study model runs

<sup>2</sup> Projected release, based on Feb 2017 Most Probable Inflow Projections and 24-Month Study model runs

# RECLAMATION

# LTEMP Monthly Release Volumes 2018 based on February modeling

Month	7.00	7.48	8.23	9.00	9.50	10.50	11.00	12.00	13.00	14.00
OCT	480	480	640	640	640	640	640	640	640	640
NOV	500	500	640	640	640	640	640	640	640	640
DEC	600	600	720	720	720	720	720	720	720	720
JAN	660	720	760	860	920	1040	1100	1230	1350	1470
FEB	590	640	680	750	810	920	970	1080	1190	1300
MAR	620	675	710	800	860	970	1030	1150	1260	1370
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JUN	580	630	660	750	800	910	960	1060	1170	1280
JUL	650	710	750	850	900	1020	1080	1200	1320	1440
AUG	700	760	800	900	970	1090	1160	1280	1410	1540
SEP	520	565	600	670	720	820	870	960	1060	1160

MOST & MIN

MAX

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# Questions?

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Hydraulic Engineer, Glen Canyon  
Reclamation, Upper Colorado Region  
Resource Management Division  
Water Resources Group

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