

**Glen Canyon Dam Adaptive Management Work Group**  
**Agenda Item Information**  
**February 3-4, 2010**

---

---

Agenda Item

Basin Hydrology and Operations

---

---

Action Requested

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

---

---

Presenters

Rick Clayton, Glen Canyon Dam Hydraulic Engineer, Water Resources Group, Upper Colorado Region, Bureau of Reclamation

---

---

Previous Action Taken

√ N/A

---

---

Relevant Science

√ N/A

---

---

Background Information

The presentation is intended to provide pertinent information to AMWG members on the hydrology of the Upper Colorado River Basin and projected reservoir operations at Lake Powell/Glen Canyon Dam. Such information is provided to assist the AMWG in developing recommendations to the Secretary on the operation of Glen Canyon Dam, particularly when such recommendations are near-term in nature.

The presentation will cover current reservoir storage conditions in the Upper Colorado River Basin and drought status. The presentation will also cover the implementation of the *Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead* and the potential for equalization releases from Lake Powell in water year 2010.

# RECLAMATION

*Managing Water in the West*

## Upper Basin Hydrology and Projected Operations 2010

Adaptive Management Work Group  
February 3-4, 2010

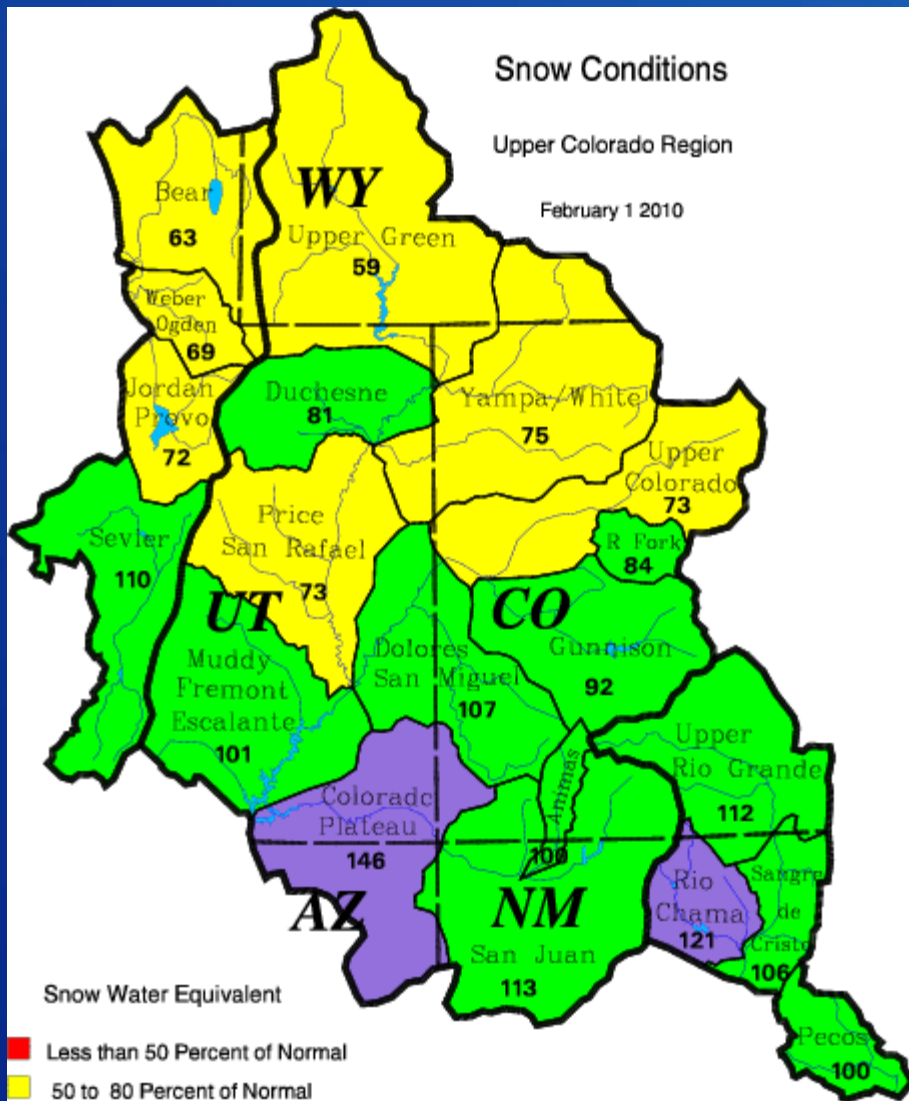


U.S. Department of the Interior  
Bureau of Reclamation

# Snow Conditions

Upper Colorado Region

February 1 2010



Snow Water Equivalent

- Less than 50 Percent of Normal
- 50 to 80 Percent of Normal
- 80 to 120 Percent of Normal
- 120 to 150 Percent of Normal
- Greater than 150 Percent of Normal

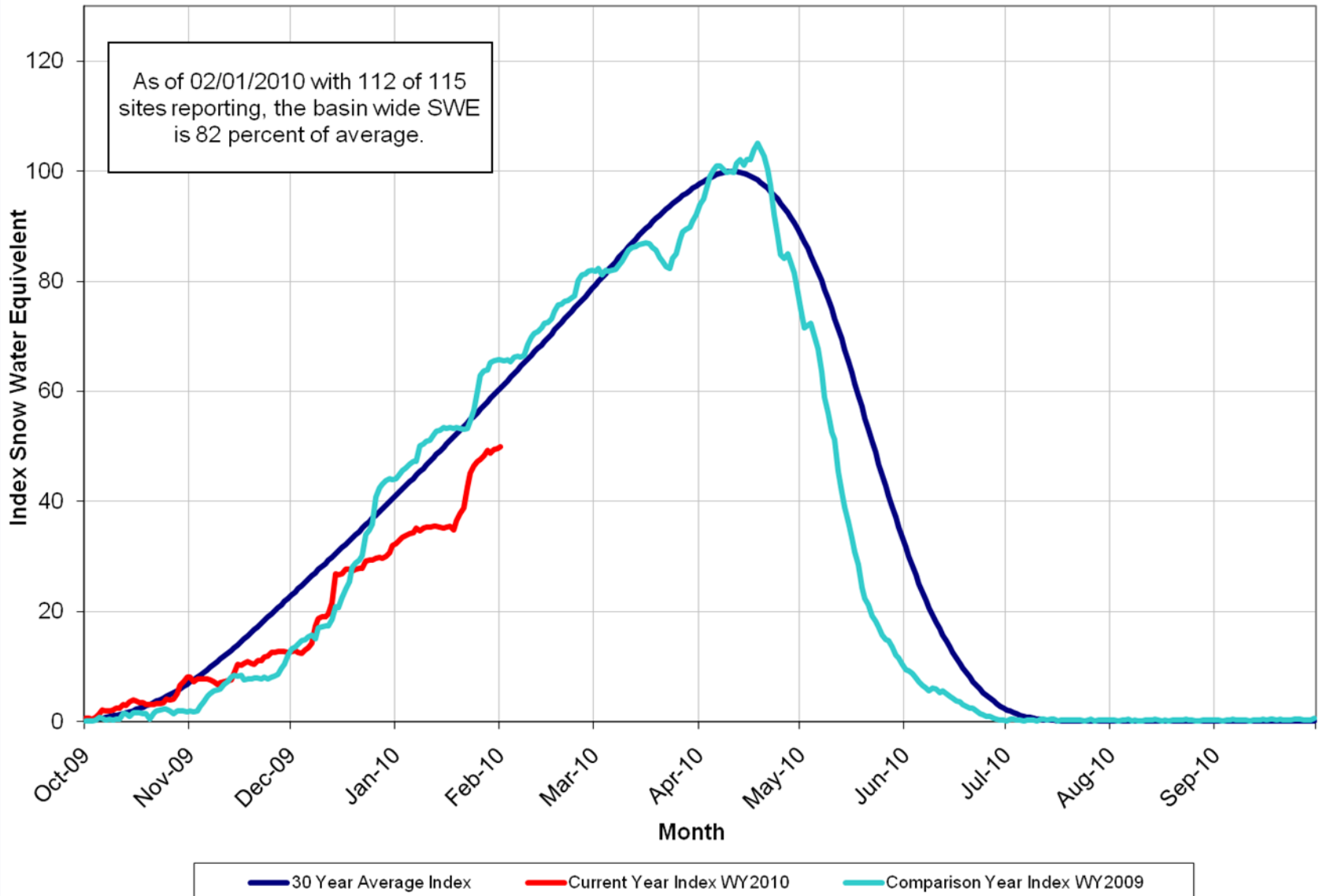
Upper Colorado  
**GIS**  
Region

Data Provided by the Natural Resource Conservation Service

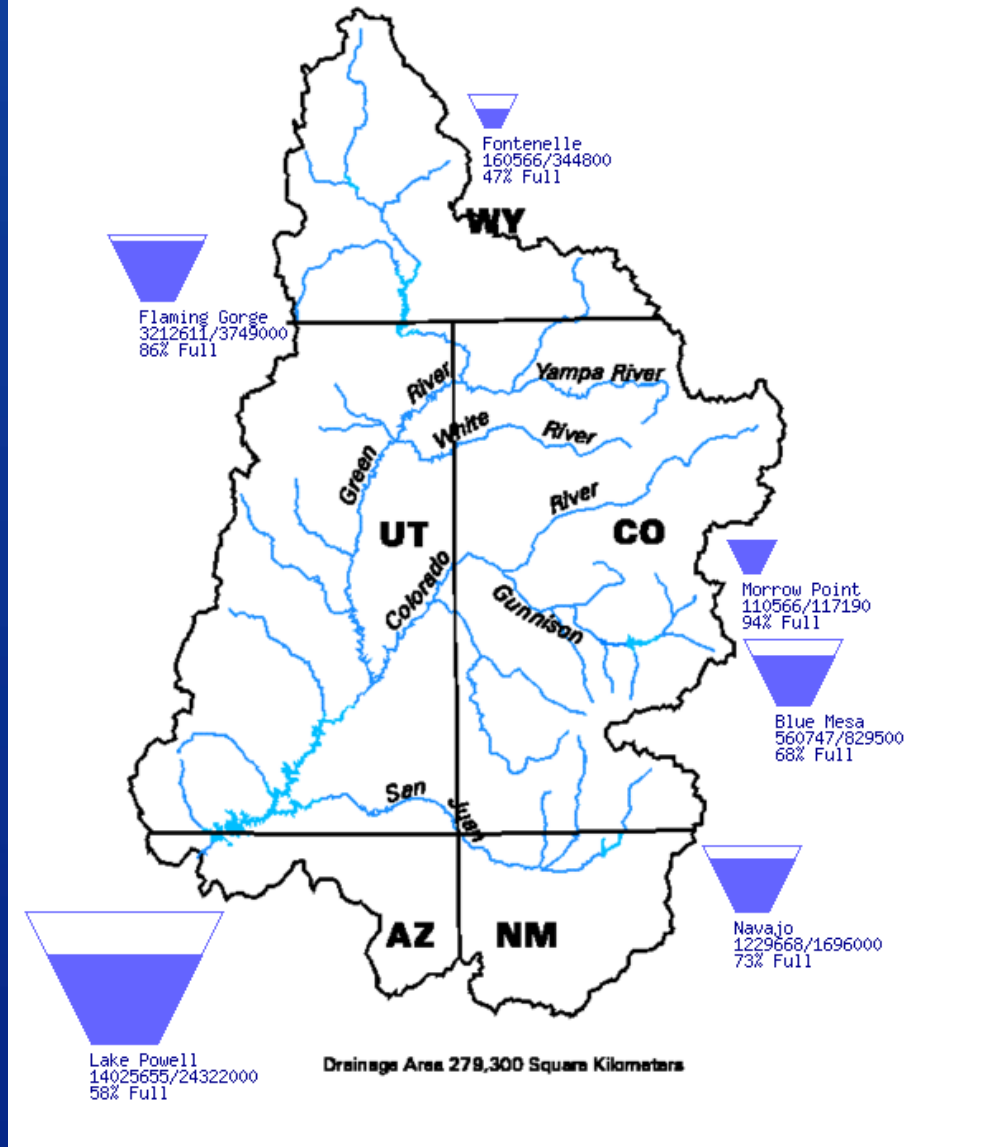
# RECLAMATION

# Upper Colorado River Basin Snotel Tracking

## Aggregate of 115 Snotel Sites above Lake Powell

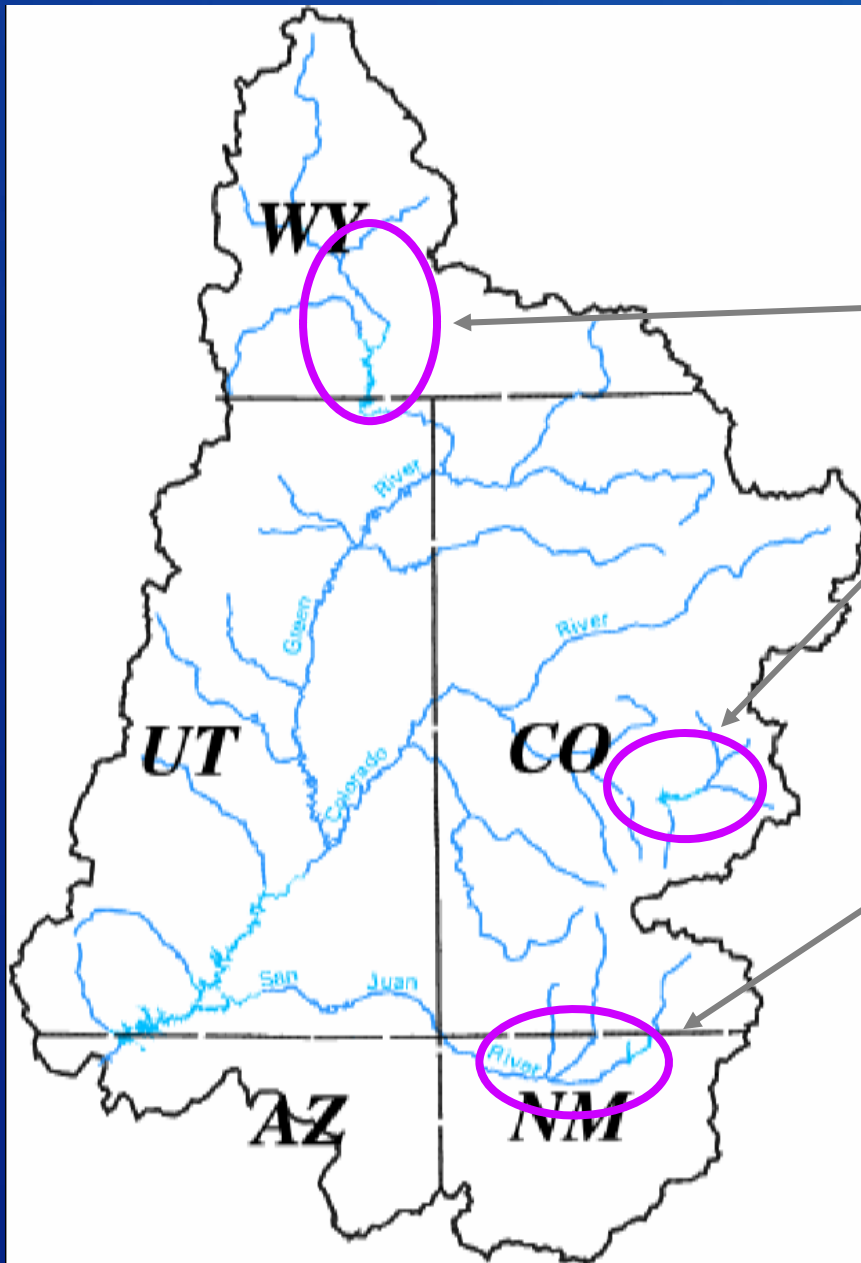


## Upper Colorado River Drainage Basin



# Projected Upper Basin Operations

January 24-Month Study (Most Probable)



## Green River at Flaming Gorge Reservoir

Apr-July Unreg Inflow = 770 kaf (65% avg)  
Delta Storage = 221 kaf  
Release = 508 kaf

## Gunnison River at Crystal Reservoir

Apr-July Unreg Inflow = 700 kaf (77% avg)  
Delta Storage = 322 kaf  
Release = 374 kaf  
Tunnel Diversion = 210 kaf  
Flow below Tunnel = 164 kaf

## San Juan River at Navajo Reservoir

Apr-July Unreg Inflow = 700 kaf (89% avg)  
Delta Storage = 319 kaf  
Azotea/NIIP Diversion = 216 kaf  
Release = 122 kaf

RECLAMATION



# Projected Upper Basin Operations

January 24-Month Study (Most Probable)

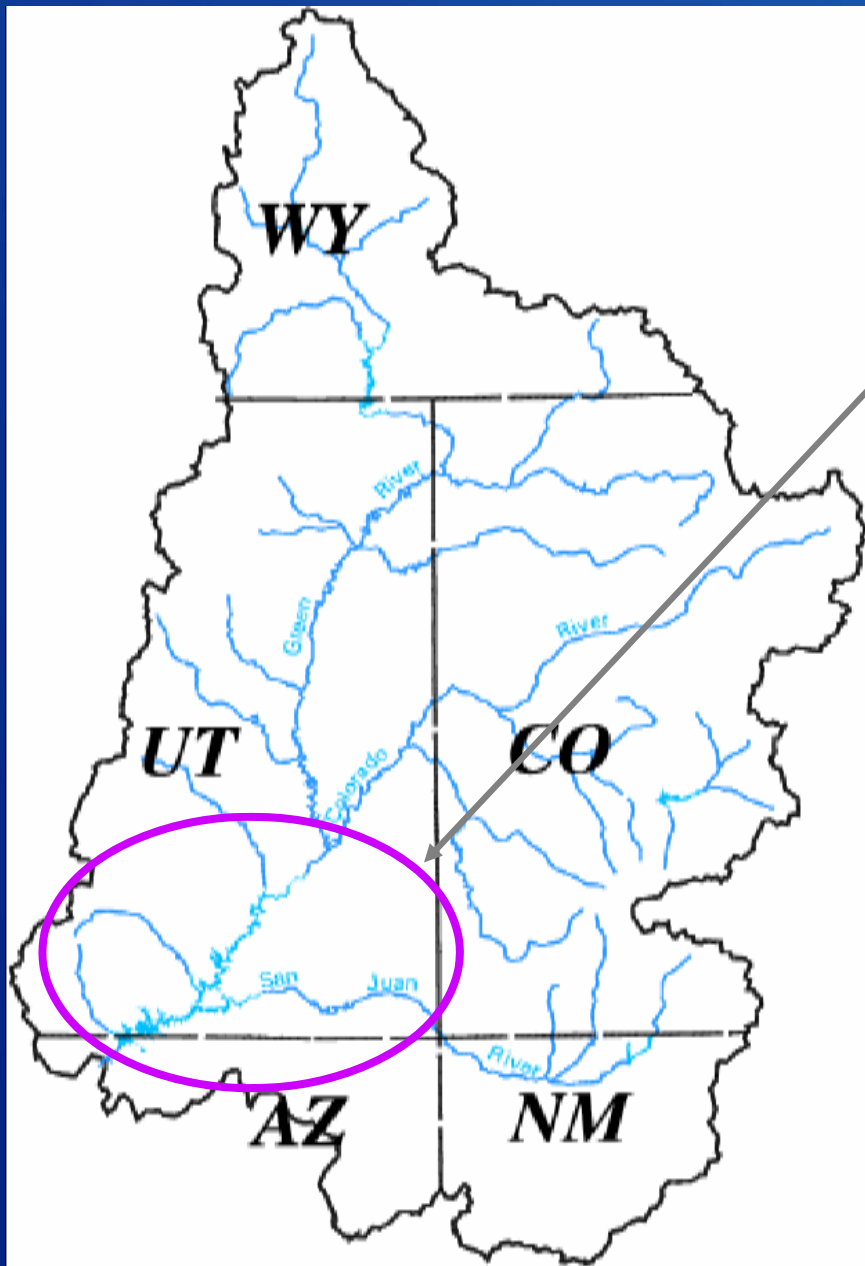
## Colorado River at Lake Powell

*Apr-July Unreg Inflow = 6.2 maf (78% avg)*

*Observed Inflow = 5.3 maf*

*Delta Storage = 2.3 maf*

*Release = 2.6 maf*



# Lake Powell & Lake Mead

## Operational Diagrams for 2010- August 24-Month Study

Lake Powell			Lake Mead		
Elevation (feet)	Operations According to Interim Guidelines	Live Storage (MAF)	Elevation (feet)	Operations According to Interim Guidelines	Live Storage (MAF)
3,700	<b>Equalization Tier</b> Equalize, Avoid Spills or Release 8.23 MAF	24.3	1,220	<b>Flood Control, 70R or ICS Surplus</b>	25.9
3,636 - 3,666 (2008-2026) <b>3,634.8</b>		15.5 - 19.3 (2008-2026)	1,200		22.9
<b>1/1/10 Projection</b>	<b>Upper Elevation Balancing Tier<sup>1</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	<b>15.4</b> <b>1/1/10 Projection</b>		<b>Domestic or ICS Surplus</b>	
3,575		9.5	1,145		15.9
	<b>Mid-Elevation Release Tier</b> Release 7.48 MAF; if Lake Mead < 1,025 feet, Release 8.23 MAF;		<b>1,098.5</b> <b>1/1/10 Projection</b>	<b>Normal Operations or ICS Surplus</b>	<b>11.3</b> <b>1/1/10 Projection</b>
3,525		5.9	1,075		9.4
3,490	<b>Lower Elevation Balancing Tier</b> Balance contents with a min/max release of 7.0 and 9.5 MAF	4.0	1,050	<b>Shortage 333 KAF<sup>2</sup></b>	7.5
3,370		0	1,025	<b>Shortage 417 KAF<sup>2</sup></b>	5.8
			1,000	<b>Shortage 500 KAF<sup>2</sup> and Consultation<sup>3</sup></b>	4.3
			895		0

<sup>1</sup> Subject to April adjustments that may result in balancing releases or releases according to the Equalization Tier.

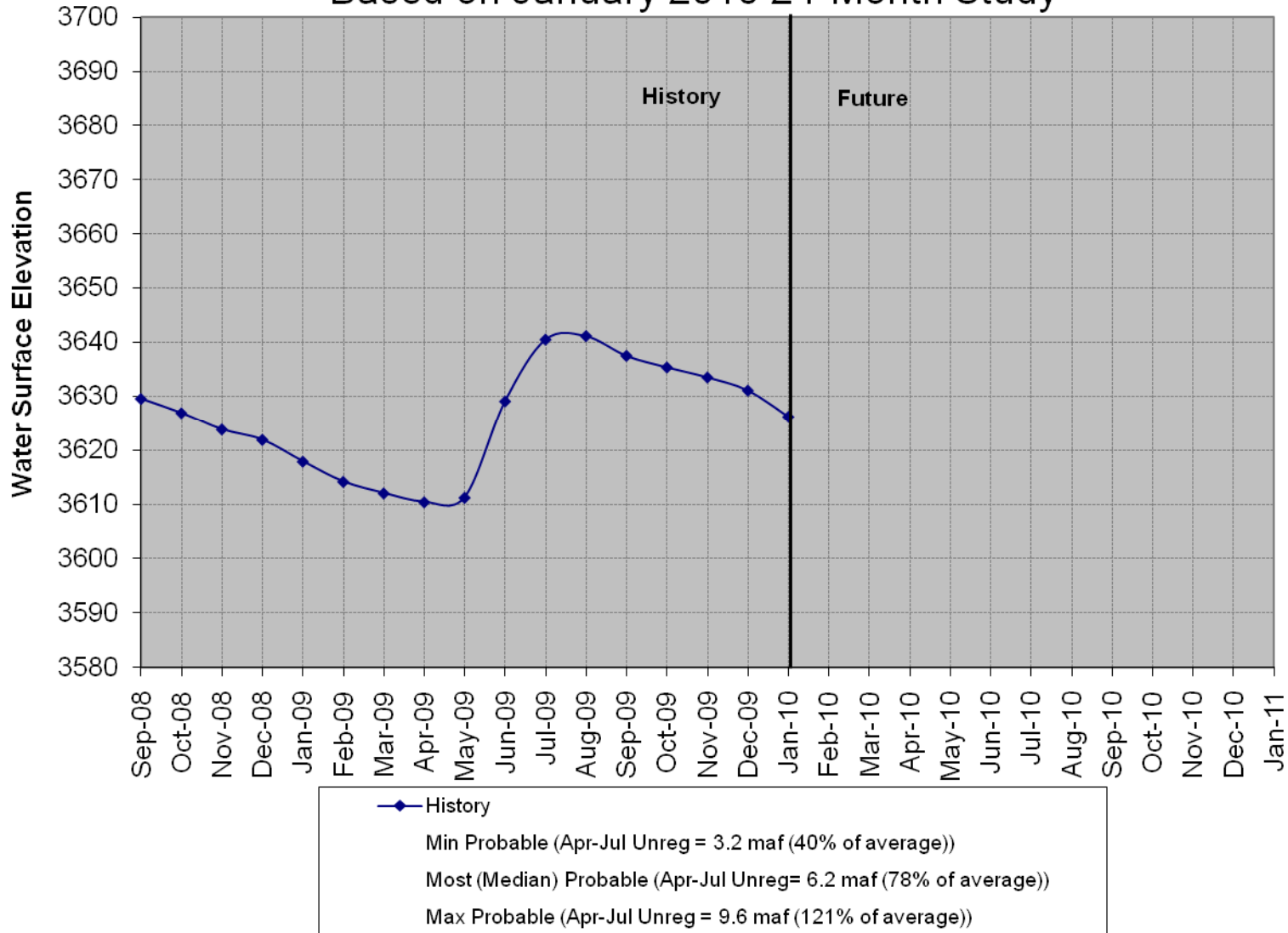
<sup>2</sup> These are amounts of shortage (i.e., reduced deliveries in the United States).

<sup>3</sup> If Lake Mead falls below elevation 1,025 ft, the Department will initiate efforts to develop additional guidelines for shortages at lower Lake Mead elevations.



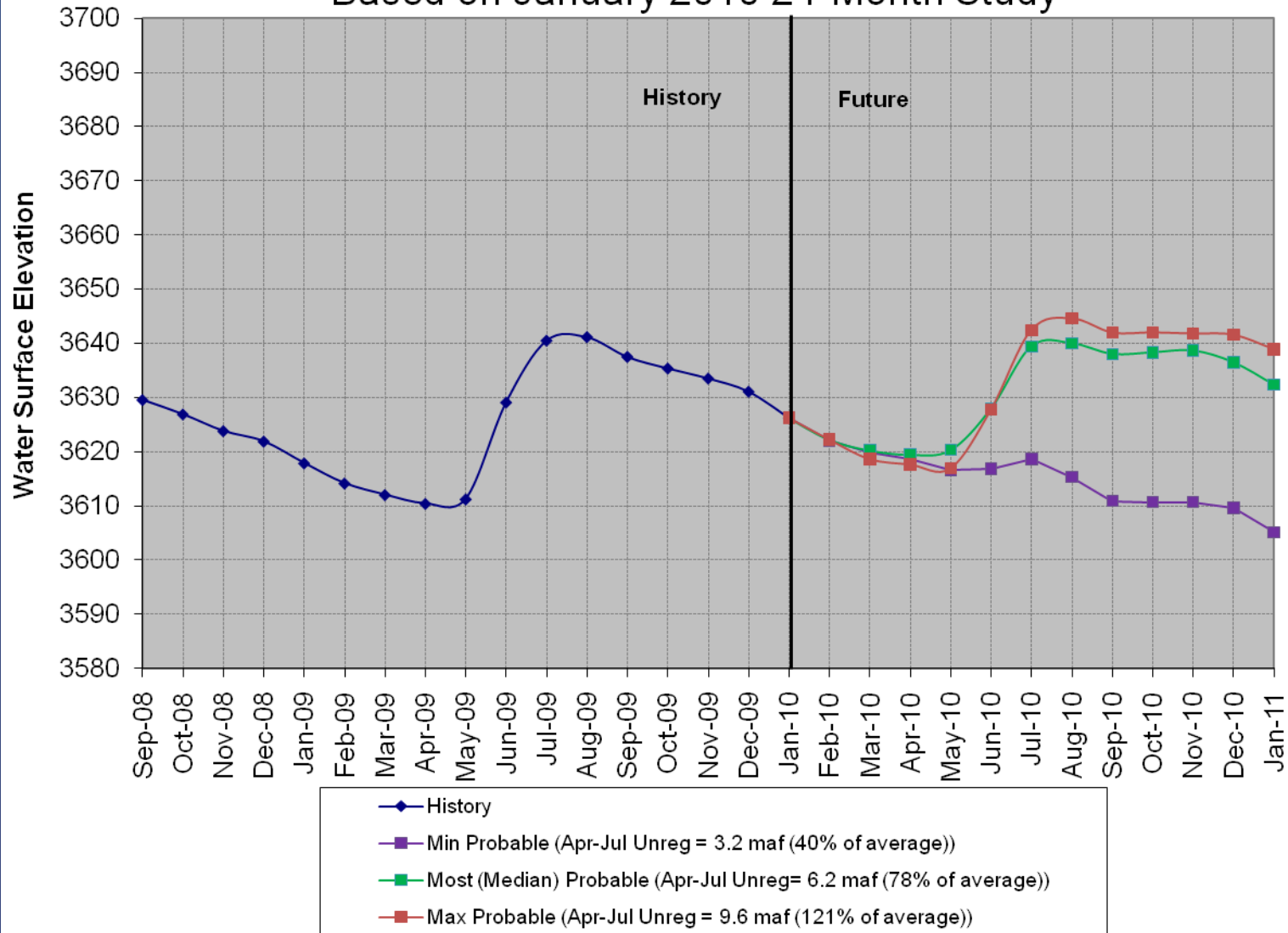
# Potential Lake Powell Elevations in Water Year 2010

## Based on January 2010 24-Month Study



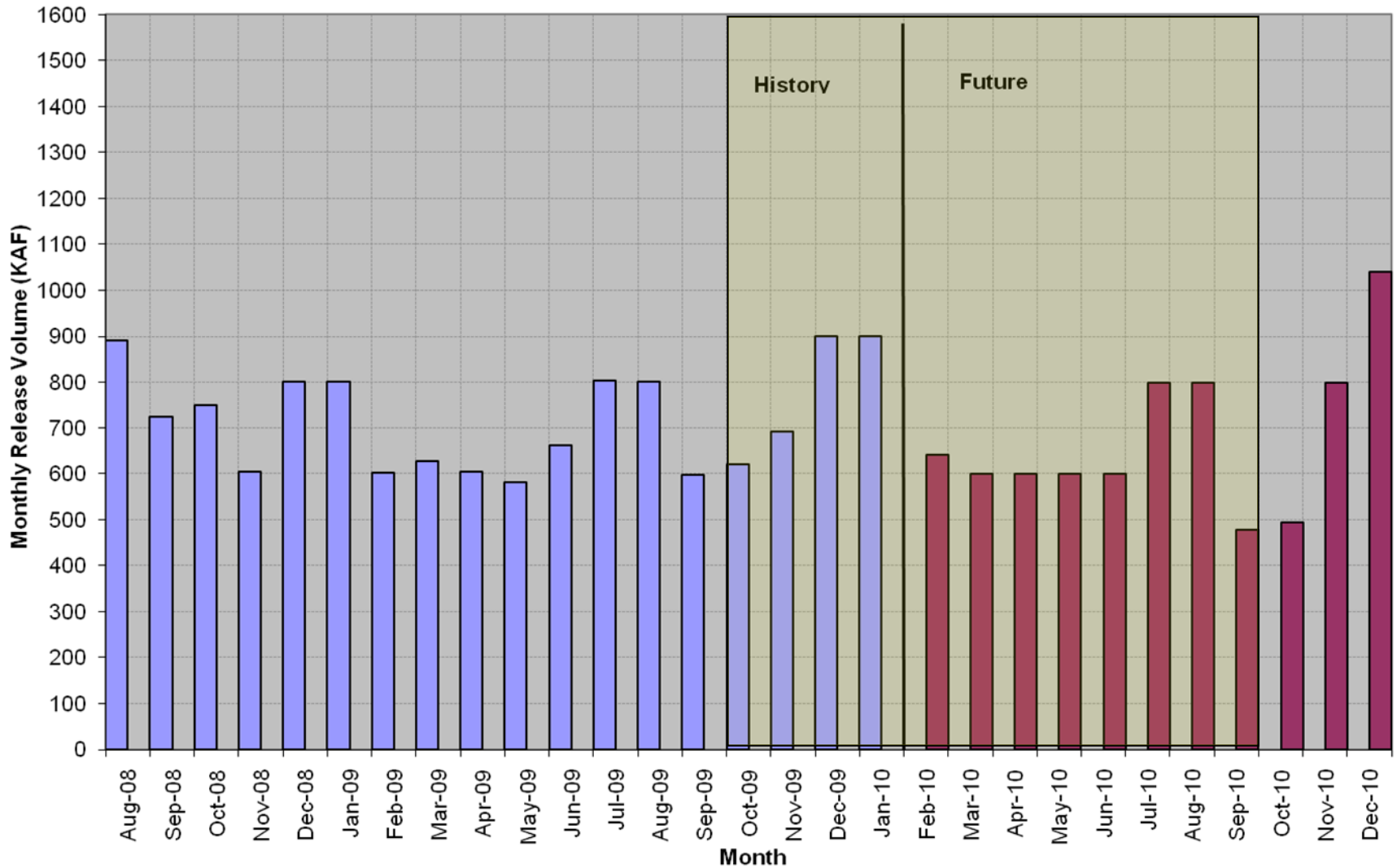
# Potential Lake Powell Elevations in Water Year 2010

## Based on January 2010 24-Month Study

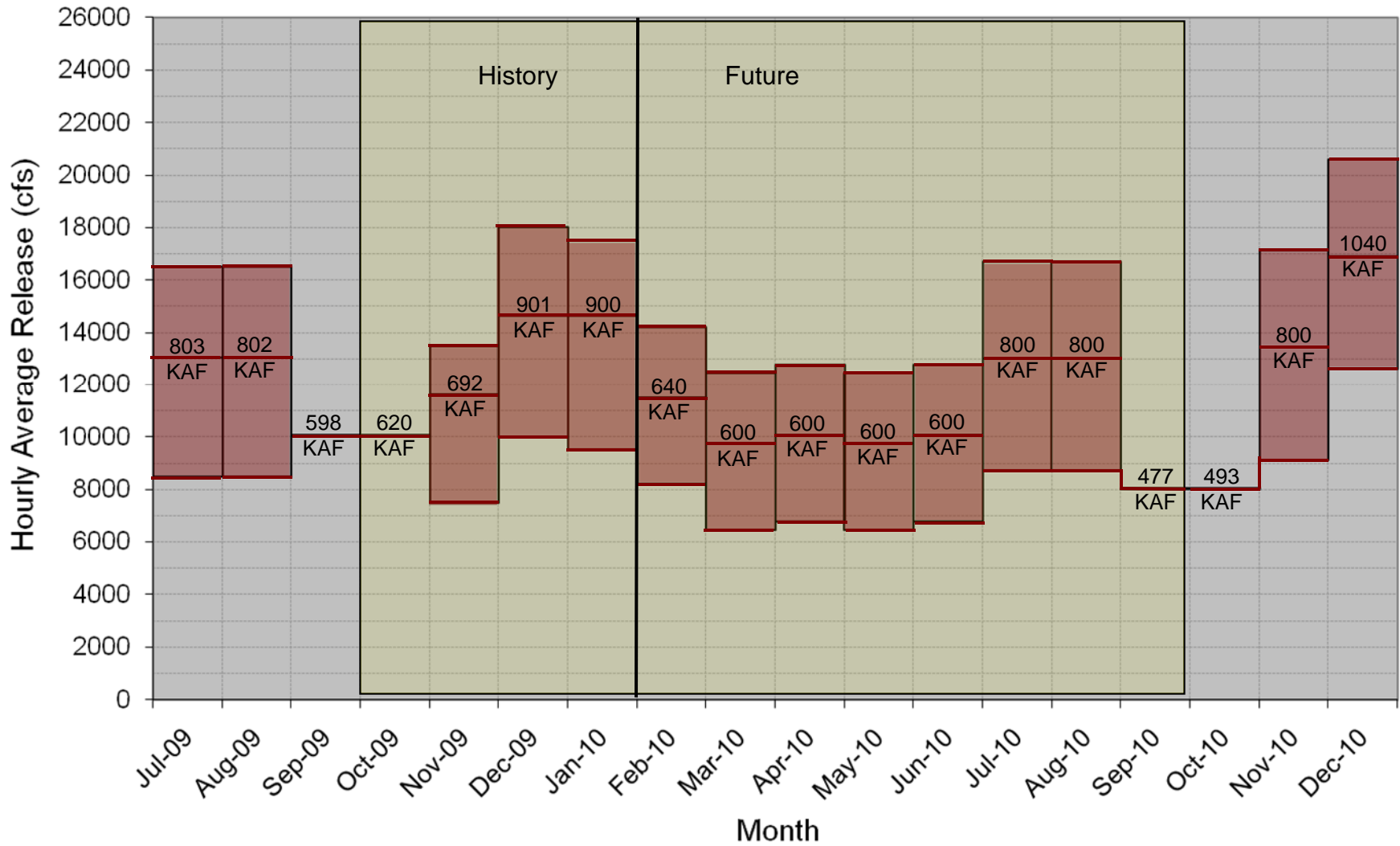


# Glen Canyon Dam Monthly Release Distribution

Annual Release 8.23 MAF (January-2010 Most Probable)



# Glen Canyon Daily Fluctuation Range Based on Jan 24-Month Study (Most Probable)





# Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2010

Unit Number	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	Jun 2010	Jul 2010	Aug 2010	Sep 2010
1		■										
2		■										■
3					■							
4					■							
5	■											■
6	■											■
7	■											
8						■		■				
Units Available	5	5	7	7	5	6	6	6	7	7	8	5
Estimated Capacity (cfs)	20K	20K	28K	28K	20K	24K	24K	24K	28K	28K	32K	20K

## Glen Canyon Power Plant Planned Unit Outage Schedule for Water Year 2010 (updated 1-21-2010)

Unit Number	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Apr 2010	May 2010	Jun 2010	Jul 2010	Aug 2010	Sep 2010
1												
2												
3												
4												
5												
6									<b>Capacity Limited to ~2850 cfs</b>			
7												
8												
Units Available	5	6	6.5	7	5	4	6	5.5	6.5	6.5	6.5	6.5
Capacity (1000-cfs)	19.3	23.4	23.4	27.3	19.7	15.8	23.7	22.6	26.5	26.5	26.5	26.5
Min (KAF)					640	600	600	800	800	1050	950	477
Most (KAF)	620	692	901	900	640	600	600	600	600	800	800	477
Max (KAF)					850	800	1131	1150	1200	1250	1050	595

Rick Clayton  
rclayton@usbr.gov  
(801)524-3710

RECLAMATION