

RECLAMATION

Managing Water in the West

Upper Colorado Region's Operations and Interactions

WestFAST Special Topics Webinar Series

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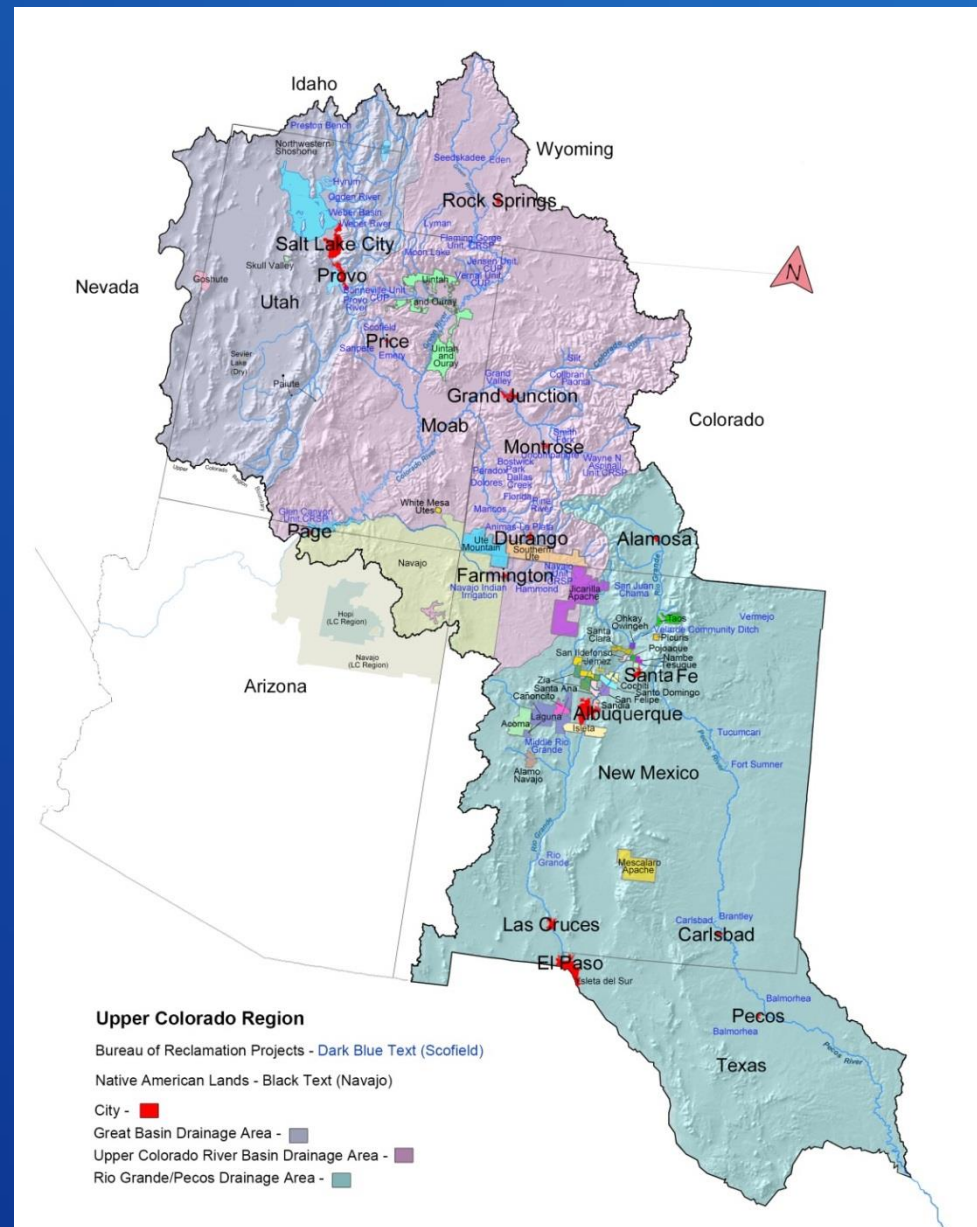
U.S. Department of the Interior
Bureau of Reclamation

Upper Colorado Operations and Interactions

- Background
 - UC Region Geography
 - Colorado River Storage Project (CRSP) Facilities
 - Hydrology
- Reclamation's Role in Upper Basin CRSP Reservoir Mgt
- Operations of Major CRSP Reservoirs
- Interaction with other Entities
- Current Hydrology
- Major Ongoing Efforts in UC Region

UC Region Geography

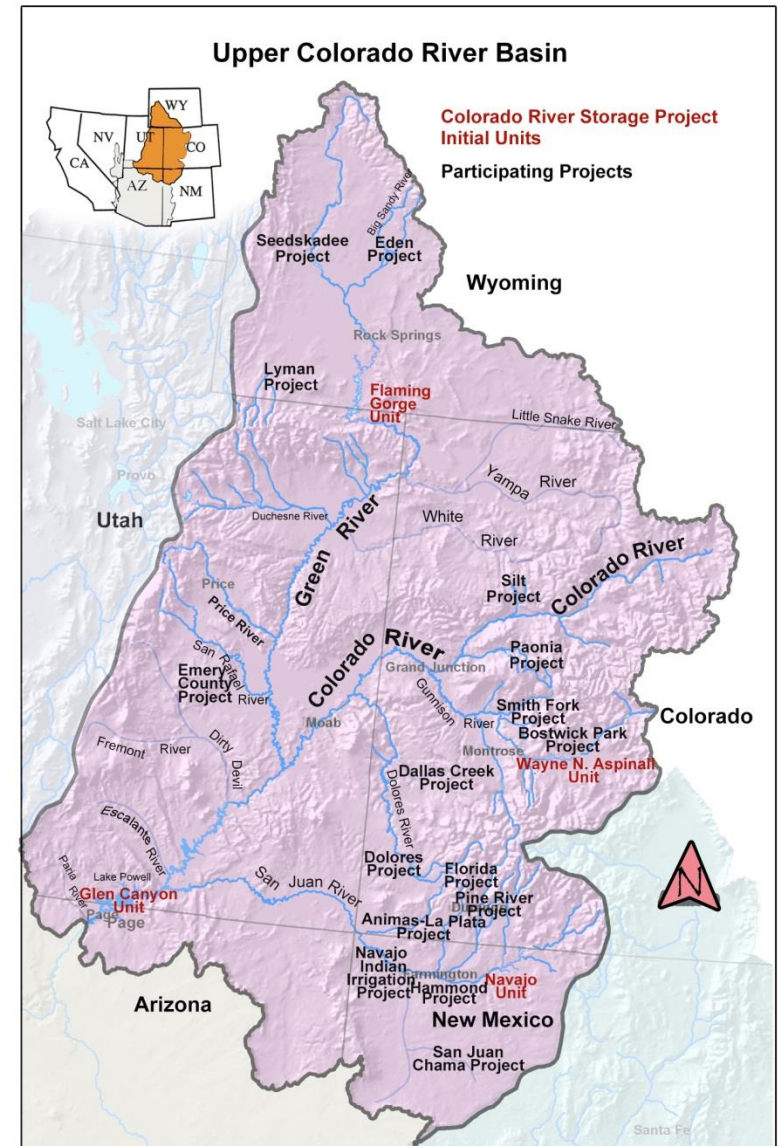
- Region Spans
 - *Three Basins*
 - *Great Basin*
 - *Upper Colorado*
 - *Rio Grande & Pecos*
 - *Six States*
 - *Arizona*
 - *Colorado*
 - *New Mexico*
 - *Texas*
 - *Utah*
 - *Wyoming*
 - *82 Projects and Programs*



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UC Region Geography

- Upper Colorado Basin
- Colorado River Storage Project Facilities
 - Initial Units vs Participating Projects
 - Initial Units
 - Flaming Gorge
 - Aspinall Unit
 - Navajo
 - Glen Canyon/Lake Powell

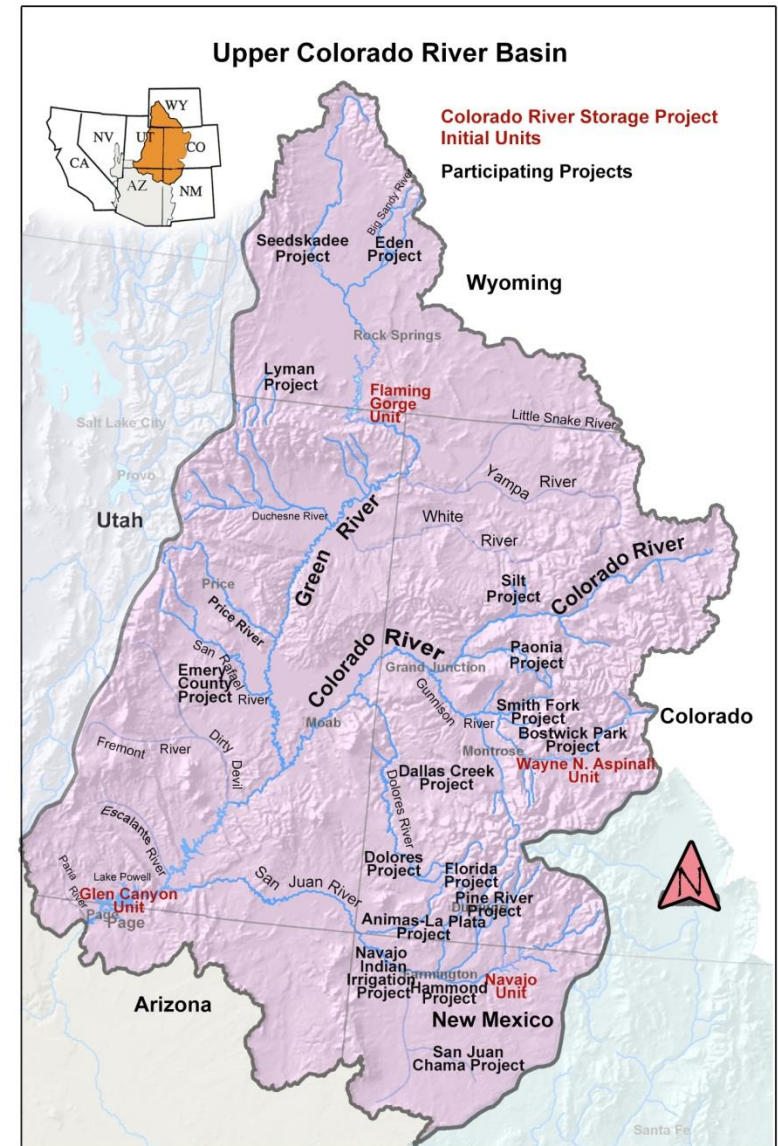


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UC Region Hydrology

- Upper Basin Supply Driven
- Water supply largely based on snow melt
- Most UB tributary users face shortage on a regular basis due to variability of supply, smaller local reservoirs & local water right calls
- Major reservoirs typically lower in basin than most users
- Upper Basin thus more supply driven vs. Lower Basin with a more steady supply delivered by Lake Powell is more Demand Driven



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Reclamation's Role in Upper Basin CRSP Reservoir Management

- Facilitative Water Management Role
 - Work within States' Water Right Systems
 - Manage CRSP Reservoirs Consistent with CRSP Act Purposes
 - Regulating the Flow of the Colorado River
 - Storing Water for Beneficial Consumptive Use
 - Enabling the Upper basin States to use their Compact Apportionments
 - Providing for the reclamation of arid & semi-arid lands
 - Control of floods and
 - Generation of hydro-power
- Contrast w/ role of Secretary of Interior as Water Master for the lower basin

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Operations of Major CRSP Reservoirs

- General Operations
 - Maintain storage high in system
 - Allows water to be available to the most users
 - Reduces evaporative loss
 - All inflow forecasts are from Colorado Basin River Forecast Center (CBRFC)
 - All upper CRSP reservoirs have environmental commitments
 - Upper Colorado & San Juan Recovery Implementation Programs (RIPs)
 - Reservoir Specific Records of Decision (RODs)

Flaming Gorge Annual Operations

- 2006 Record of Decision (ROD)
 - Modify operations to extent possible to achieve 2000 Upper Colorado River RIP Flow and Temperature Recommendations
- Process
 - Annual flow request submitted by Recovery Program
 - Reclamation reviews request with technical work group
 - Reclamation holds Public Working Group meetings to receive input on concerns and provide projected operations to stakeholders
 - Reclamation makes final decision based on request and ROD



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Flaming Gorge Annual Operations

- Spring Peak Flow
 - Target flow below the confluence with the Yampa set by May 1 Inflow forecast
 - Releases are coordinated with Yampa peaks
- Summer through Winter base flow
 - Target base flow set by monthly forecasts and actual conditions in combination with drawdown target at FG
- FG typically refills in the following year



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Aspinall Unit Operations

- Reclamation holds Public Working Group meetings to receive input, concerns and provide projected operations
- Black Canyon Decree – Federal Reserved Right
 - May 1 inflow forecast to Blue Mesa sets hydrologic categories and targets for Black Canyon NP for
 - » 24 hr Peak Flow &
 - » May 1 – July 25 Shoulder flows
 - Priority given to flood control
 - 300 cfs min flow
 - Decree operations to be coordinated with ESA requirements



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Aspinall Unit Operations

- ESA Requirements - 2012 ROD
 - May 1 forecast of inflow to Blue Mesa sets targets for
 - » Peak flow magnitude
 - » Peak flow duration
 - » Half bank duration
 - » All at Whitewater gage
- Generally meeting ESA flow targets results in decree targets being met but not always as Peaks and shoulder / half bank flows are not identical



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Navajo Operations

- Reclamation holds Public Working Group meetings to receive input, concerns and provide projected operations
 - ESA peak and base flow requirements
 - Contract water deliveries
 - Shortage sharing provisions amongst contractors



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Glen Canyon / Lake Powell Operations

- Generally
 - Coordination with Upper Basin Reservoirs
 - Upper Basin CRSP reservoirs store what they can and release based on requirements
 - Releases flow down to Lake Powell
 - Forecasted inflows and projected releases of Upper Reservoirs and of Powell are input monthly into Reclamation's 24-Month Study model to project elevations and storage



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Glen Canyon / Lake Powell Operations

- ESA Requirements

- 1996 ROD sets:

- » A general monthly pattern (Modified Low Fluctuating Flow – MLFF pattern)
 - » Allows for beach/habitat building (BHB) flows up to 45,000 cfs
 - » Min releases of
 - » 8,000 cfs 7:00 am to 7:00 pm
 - » 5,000 cfs 7:00 pm to 7:00 am
 - » Max release of 25,000 cfs
 - » Daily fluctuations
 - » Max ramp rates:
 - » 4,000 cfs/hr increasing
 - » 1,500 cfs/hr decreasing



- Adaptive Management Program & Work Group

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Glen Canyon / Lake Powell Operations

- 2007 Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead
 - Promulgated based on continuing drought and need for:
 - » low elevation operating guidelines for Powell and Mead
 - » operate Powell and Mead in a more balanced fashion
 - In place through end of 2025
 - 24-Month Study projects Upper & Lower Basin reservoir levels
 - August projection of Jan 1 Powell and Mead elevations determines:
 - » Powell Operating Tier &
 - » Powell water year release
 - » Whether Mead is in a Surplus or Shortage condition



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Glen Canyon / Lake Powell Operations

- 2012 High Flow Experiment Protocol
 - Provides for HFE releases through 2020
 - For beneficial effects on sediment build up in Grand Canyon
 - Releases 31,000 to 45,000 cfs from <1 – 96 hours duration
 - Magnitude and duration set by sediment input, resource conditions
 - Up to two HFEs per water year
 - » Oct - Nov & Apr - Mar
 - No change to annual release volume under the Interim Guidelines – water for HFE moved from other months
 - Consultation with Tribes and other agencies if HFE is planned
 - Monitor sediment inputs to system below GCD



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Glen Canyon / Lake Powell Annual Operations

- Monthly
 - CBRFC forecast received and 24-Month Study model run
 - Federal Family Call – to present forecasts/operations/issues
- Interim Guidelines Operations:
 - August – Run 24-Month Study – Min, Probable and Max scenarios
 - » Determine operating tier & release volume for upcoming water year
 - » Allocate releases amongst months consistent with MLFF pattern
 - Apr – Run 24-Month Study – Min, Probable and Max scenarios
 - » If in Upper Elevation Balancing Tier – may adjust to Equalization Tier

Lake Powell & Lake Mead

Operational Diagrams and Current Conditions

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 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)	1,200 (approx.) ²	Domestic Surplus or ICS Surplus Condition Deliver > 7.5 maf	22.9 (approx.) ²
3,610 06/21/15		12.72 06/21/15	1,145		15.9
3,575	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5	1,105	Normal or ICS Surplus Condition Deliver ≥ 7.5 maf	11.9
3,525		5.9	1,075 06/21/15	Shortage Condition Deliver 7.167 ⁴ maf	9.61 06/21/15
3,490	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf	4.0	1,050	Shortage Condition Deliver 7.083 ⁵ maf	7.5
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.

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Glen Canyon / Lake Powell Annual Operations

- HFE Operations
 - July – September - Monitor sediment inputs into Grand Canyon below GCD for Fall HFE
 - October – Determination of conducting HFE
 - October - November – Conduct HFE if approved
 - December – February - Monitor sediment inputs into Grand Canyon below GCD for Spring HFE
 - January – Run 24-Month Study – Min, Probable and Max scenarios
 - Mar-Apr - Conduct HFE if approved
- Annual Operating Plan (AOP)
 - 1st Consultation - May
 - 2nd Consultation – July
 - Final Consultation - September

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Interactions With Other Entities

- AOP meetings – Open
- Work Group meetings - Open
- Basin States Technical Committee
- Major Interaction with other Federal Agencies
 - Monthly Fed Family calls – Operational updates/coordination
 - Lower Colorado Region's Operations - Daily coordination
 - CBRFC – Daily exchange of forecast and operational info
 - USGS – Daily receipt of gage data
 - NRCS – Regular receipt of snow data
 - Western Area Power Administration - Daily coordination on reservoir / powerplant operations
 - FWS – Recovery Program Operations
 - NPS – Glen Canyon, Flaming Gorge, Aspinall Operations
 - Grand Canyon Monitoring and Research Center - GCMRC – monitoring for HFES

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Current Hydrology

- Snowpack peaked at 74% of average on March 9 ~ 1 month early
- Outlook based on April – July Forecast of UB runoff above Powell
 - April Most Probable was 3.75 maf at 52% of average
 - Had a very wet May
 - June Most Probable was 5.0 maf at 70% of average
 - June mid-month was 6.0 maf at 84% of average
- Still in Continuing Drought – 16th year beginning in 2000
- April Projections were Powell would release 7.48 maf in WY 2016
 - Would likely have put Lower Basin in shortage condition
- Current projections are Powell will release 9.0 maf in WY 2016
 - Lower Basin shortage condition unlikely for 2016
- August 24-Month Study projection determines 2016 release volume

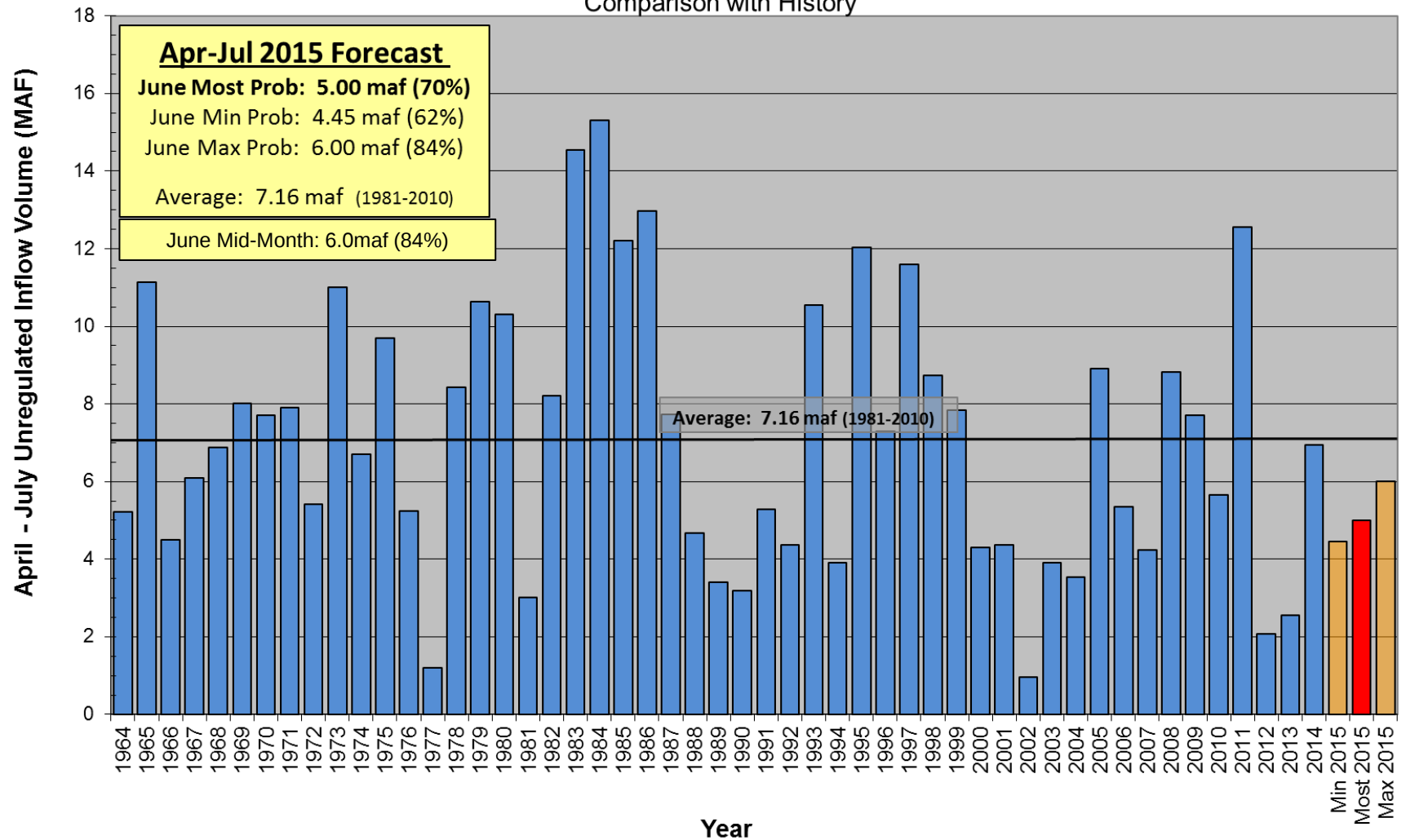
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Lake Powell Unregulated Inflow

April - July 2015 Forecast

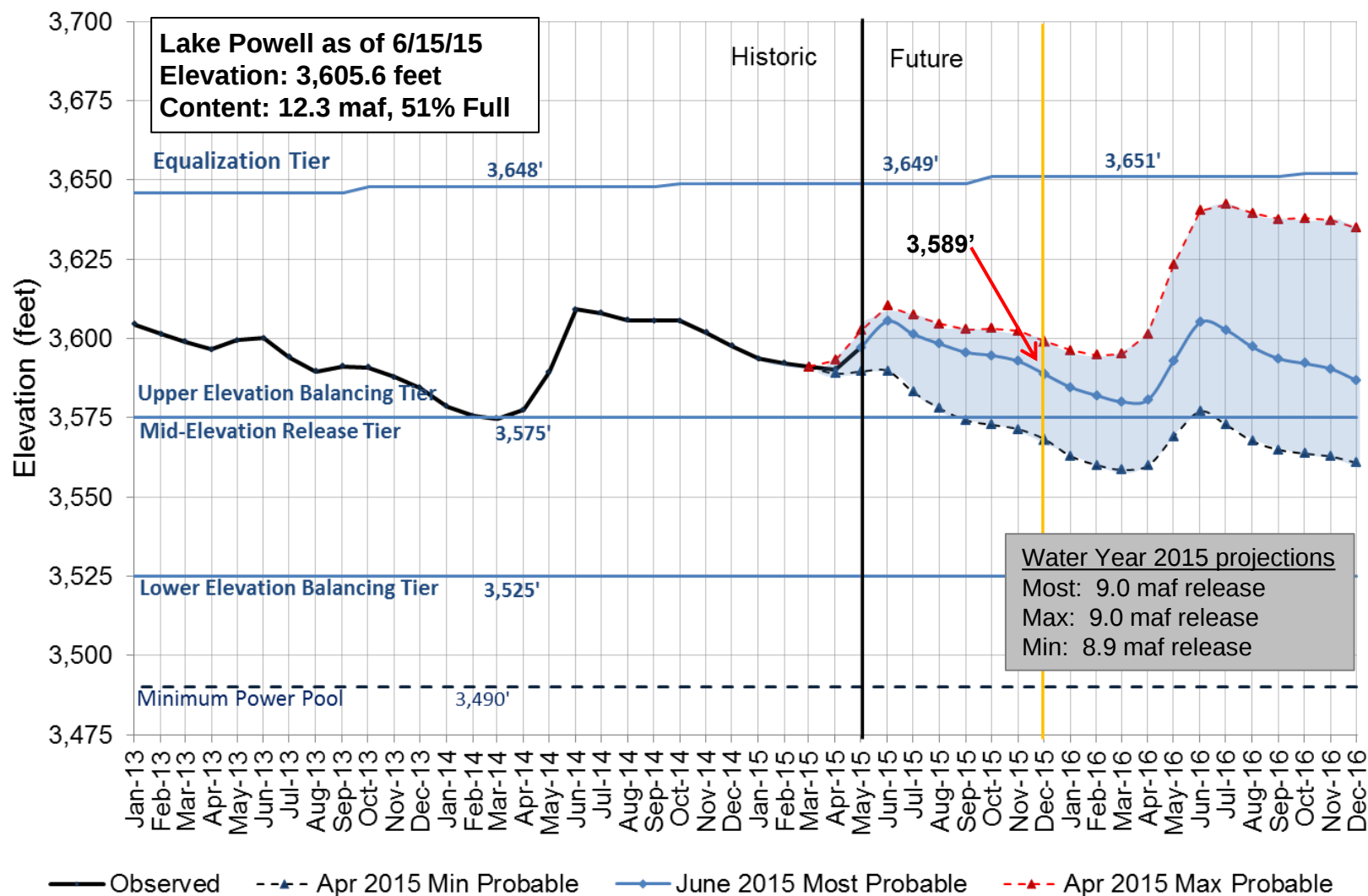
Issued June 3

Comparison with History



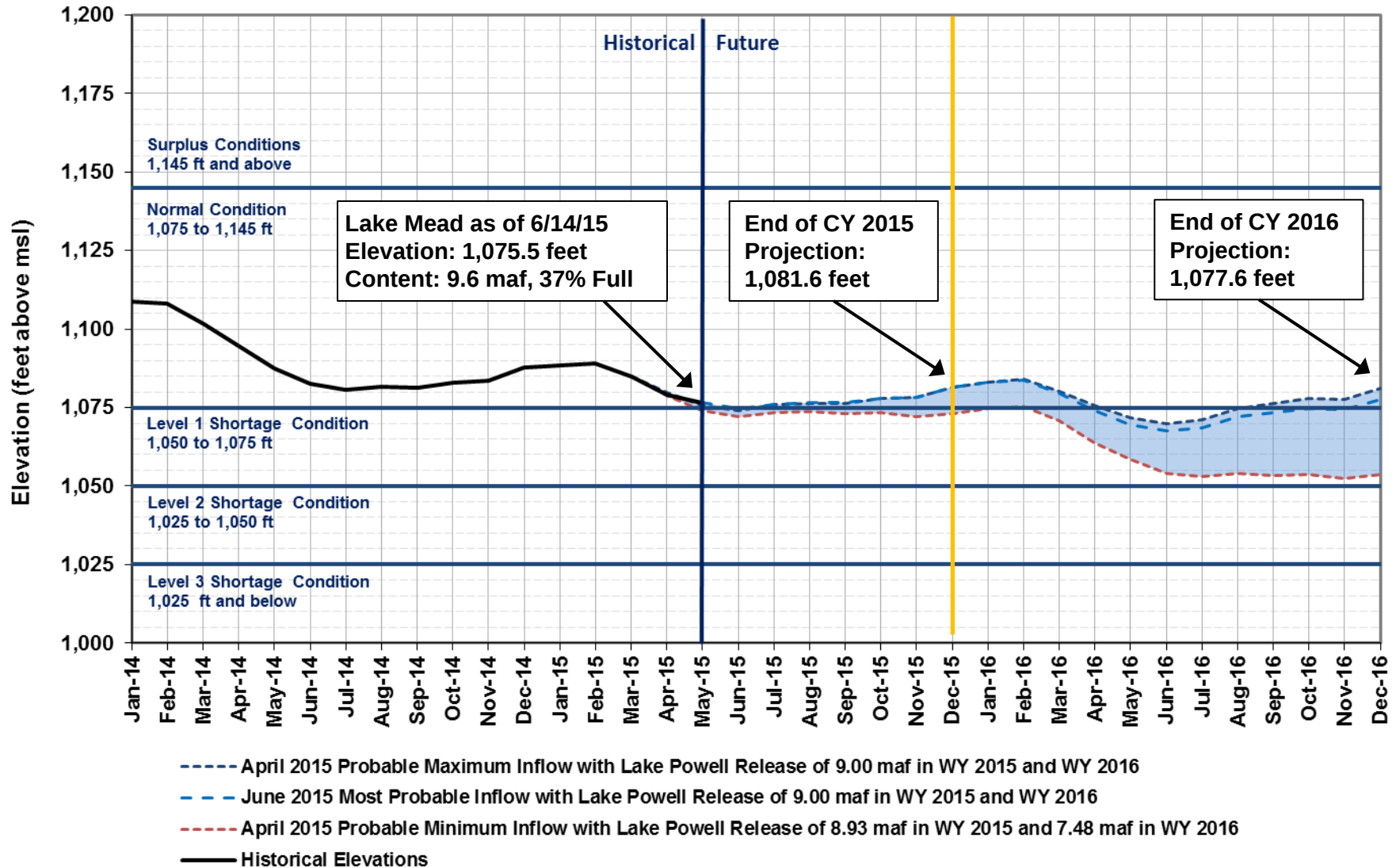
Lake Powell End of Month Elevations

Historic and projected based on June and April 2015 modeling



Lake Mead End of Month Elevations

Projections from April and June 2015 24-Month Study Inflow Scenarios



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Major Ongoing Efforts in Upper Basin

- Drought Contingency Planning w/ UB States
 - Augmentation/Weather Modification
 - Demand Management
 - Extended Operations
- Pilot System Conservation Program
 - Test concepts for Demand Management
- Larval Trigger Study Program at Flaming Gorge
 - Shift spring peak releases to match razorback larval emergence
- HFEs at Glen Canyon
- Long Term Experimental Management Plan (LTEMP)
 - Reanalysis of Glen Canyon Dam operations
- Lake Powell Pipeline with State of Utah
 - Analyze impacts of and contract for water delivery to St. George

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Upper Colorado Operations and Interactions

Thanks and Questions

Additional Resources

- www.usbr.gov/uc/water/
- www.usbr.gov/uc/rm/
- www.usbr.gov/uc/envdocs/
- mmwilson@usbr.gov,
- 801-524-3709