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Colorado River Basin August 2021 5-year Projected Future Conditions

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Glen Canyon Dam Adaptive Management Program Technical Work Group Meeting




October 12, 2021

Presentation Overview

- August 2021 5-year Probabilistic Projections
- Website Updates



Reclamation Operational Modeling Model Comparison

	<i>Colorado River Mid-term Modeling System (CRMMS)</i>		<i>CRSS</i>
	<i>24-Month Study Mode (Manual Mode)</i>	<i>Ensemble Mode (Rule-based Mode)</i>	
Primary Use	AOP tier determinations and projections of current conditions	Risk-based operational planning and analysis	Long-term planning, comparison of alternatives
Simulated Reservoir Operations	Operations input manually	Rule-driven operations	
Probabilistic or Deterministic	Deterministic – single hydrologic trace	Deterministic OR Probabilistic 35 (or more) hydrologic traces	Probabilistic – 100+ traces
Time Horizon (years)			
Upper Basin Inflow	Unregulated forecast, 1 trace	Unregulated ESP forecast, 35 traces	Natural flow; historical, paleo, or climate change hydrology
Upper Basin Demands	Implicit, in unregulated inflow forecast		Explicit, 2016 UCRC assumptions
Lower Basin Demands	Official approved or operational		Developed with LB users

Approach to 5-Year Probabilistic Projections

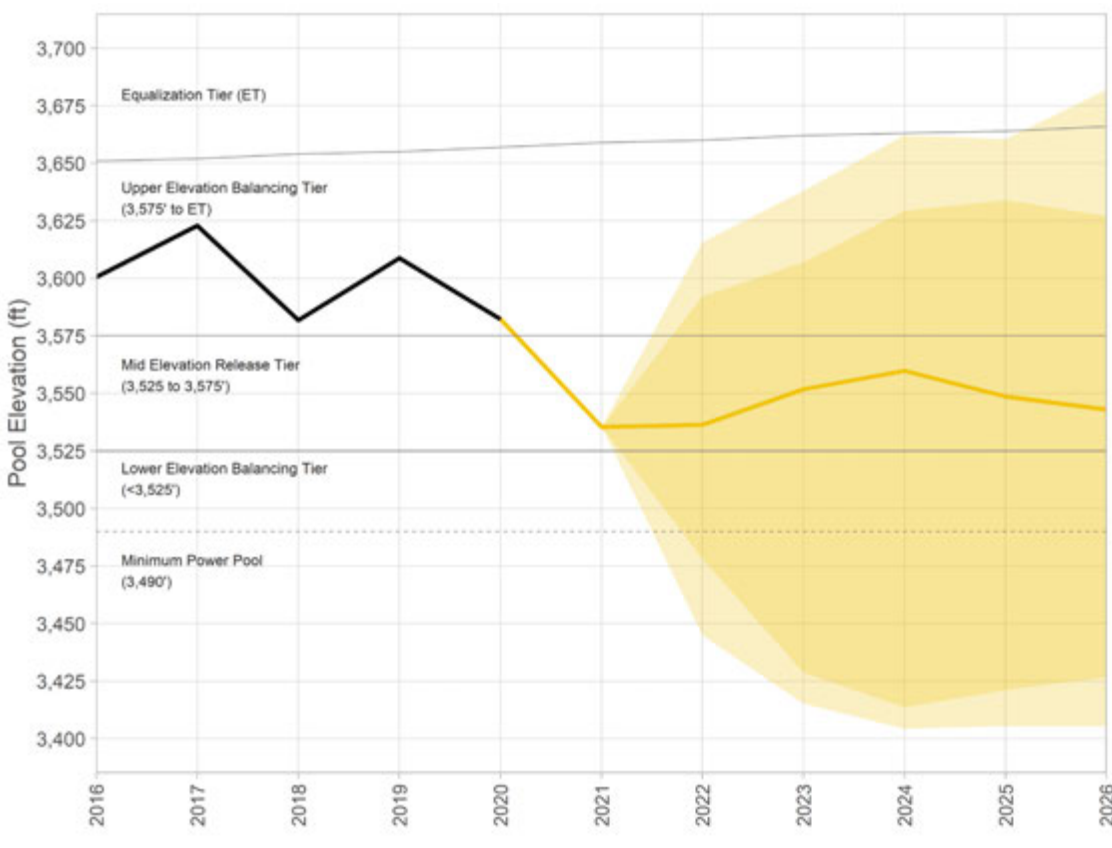
- Future hydrology produced by Reclamation by resampling a period of the natural flow record ... “Stress Test Hydrology”
 - Future inflow scenarios are generated using 1988 – 2019 data ... 32 years = 32 scenarios
 - In contrast to our prior approach, will not include the “Full Hydrology” (1906-2019) scenario
- Produced using Reclamation’s Colorado River Simulation System (CRSS)
 - Official “long-term” planning model- used to produce official projections, policy development and planning studies
 - Upper Basin water demand develop in coordination with the Upper Basin States and the UCRC
 - Lower Basin water demand develop in coordination with the Lower Basin States and Mexico
 - Operations consistent with the 2007 Interim Guidelines, Minute 323 and the Lower Basin DCP
 - In contrast to the June results, August results will not assume UB Drought Response Operations beyond 2021



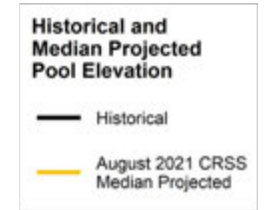
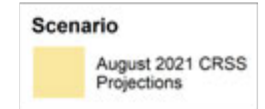
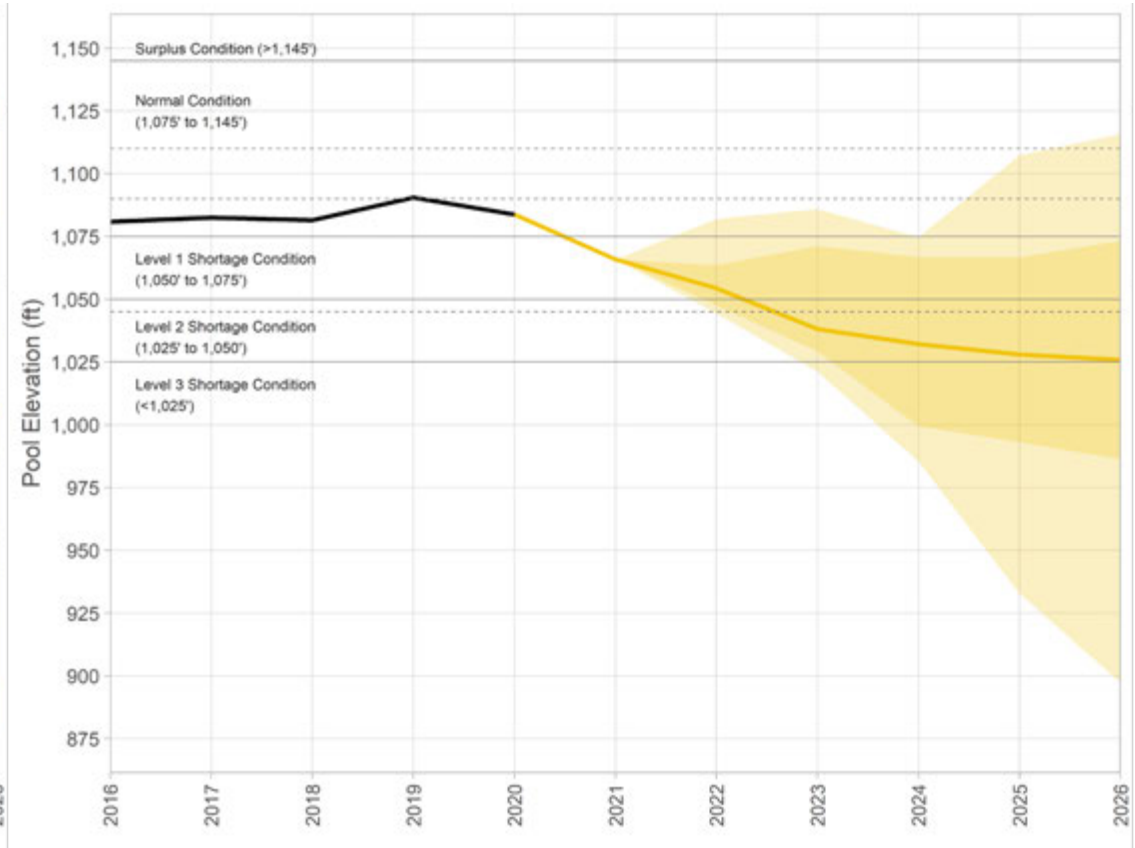
Lake Powell and Lake Mead End-of-December Elevation

Corrected August 2021 CRSS Projections with 1988-2019 Resampled Hydrology

Lake Powell



Lake Mead



Comparison of Corrected August 2021 Without UB DRO and June 2021 Projections with UB DRO

Chance of Reaching Critical Reservoir Elevations, Stress Test Hydrology

	Run	2022	2023	2024	2025	2026
Lake Mead less than 1,025 feet	June 2021	0%	17%	44%	58%	63%
	August 2021 Corrected	0%	25%	44%	59%	63%
	Difference	0%	+8%	0%	+1%	0%
Lake Mead less than 1,000 feet	June 2021	0%	0%	9%	21%	23%
	August 2021 Corrected	0%	0%	13%	19%	22%
	Difference	0%	0%	+4%	-2%	1%
Lake Powell less than 3,525 feet	June 2021	79%	30%	25%	30%	34%
	August 2021 Corrected	88%	53%	41%	44%	41%
	Difference	+9%	+23%	+16%	+6%	+7%
Lake Powell less than 3,490 feet	June 2021	0%	5%	17%	16%	22%
	August 2021 Corrected	3%	34%	25%	28%	34%
	Difference	+3%	+29%	+8%	+12%	+12%

All results computed as the chance of falling below the threshold in any month in the calendar (water) year for Lake Mead (Lake Powell).



Upper Basin – Lake Powell

Percent of Traces with Event or System Condition

Results from Corrected August 2021 CRSS without Upper Basin Drought Response Operations (values in percent)

Event or System Condition	2022	2023	2024	2025	2026
Equalization Tier (Powell ≥ Equalization [EQ] Elevation)	0	0	0	6	6
<i>Equalization – annual release > 8.23 maf</i>	0	0	0	6	6
<i>Equalization – annual release = 8.23 maf</i>	0	0	0	0	0
Upper Elevation Balancing Tier (Powell < EQ Elevation and ≥ 3,575 ft)	0	19	25	28	25
<i>Upper Elevation Balancing – annual release > 8.23 maf</i>	0	19	25	28	22
<i>Upper Elevation Balancing – annual release = 8.23 maf</i>	0	0	0	0	3
<i>Upper Elevation Balancing – annual release < 8.23 maf</i>	0	0	0	0	0
Mid-Elevation Release Tier (Powell < 3,575 and ≥ 3,525 ft)	100	34	44	31	34
<i>Mid-Elevation Release – annual release = 8.23 maf</i>	0	0	0	6	9
<i>Mid-Elevation Release – annual release = 7.48 maf</i>	100	34	44	25	25
Lower Elevation Balancing Tier (Powell < 3,525 ft)	0	47	31	34	34

Notes:

¹ Modeled operations include the 2007 Interim Guidelines, Lower Basin Drought Contingency Plan, and Minute 323, including the Binational Water Scarcity Contingency Plan.

² Reservoir initial conditions on December 31, 2021 were simulated using the August 2021 Most Probable 24 Month Study.

³ Stress Test Hydrology uses 32 hydrologic inflow sequences that resamples the observed natural flow record from 1988-2019 for 32 traces analyzed.

⁴ Percentages shown in this table may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

⁵ Percentages shown may not sum to 100% due to rounding to the nearest percent.

Lower Basin – Lake Mead

Percent of Traces with Event or System Condition

Results from Corrected August 2021 CRSS **without Upper Basin Drought Response Operations** (values in percent)

Event or System Condition	2022	2023	2024	2025	2026
Surplus Condition – any amount (Mead ≥ 1,145 ft)	0	0	0	0	0
Surplus – Flood Control	0	0	0	0	0
Normal or ICS Surplus Condition (Mead < 1,145 and > 1,075 ft)	0	6	3	0	9
Recovery of DCP ICS / Mexico's Water Savings (Mead >/≥ 1,110 ft)	0	0	0	0	0
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,090 and > 1,075 ft)	0	6	3	0	3
Shortage Condition – any amount (Mead ≤ 1,075 ft)	100	94	97	100	91
<i>Shortage / Reduction – 1st level (Mead ≤ 1,075 and ≥ 1,050)</i>	100	78	28	25	16
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,075 and > 1,050 ft)	100	78	28	25	16
<i>Shortage / Reduction – 2nd level (Mead < 1,050 and ≥ 1,025)</i>	0	16	63	34	34
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,050 and > 1,045 ft)	0	13	3	3	13
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,045 and > 1,040 ft)	0	3	13	9	0
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,040 and > 1,035 ft)	0	0	9	6	0
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,035 and > 1,030 ft)	0	0	25	13	9
DCP Contribution / Mexico's Water Savings (Mead ≤ 1,030 and ≥/> 1,025 ft)	0	0	13	3	13
<i>Shortage / Reduction – 3rd level (Mead < 1,025)</i>	0	0	6	41	41
DCP Contribution / Mexico's Water Savings (Mead </≤ 1,025 ft)	0	0	6	41	41

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Website Updates

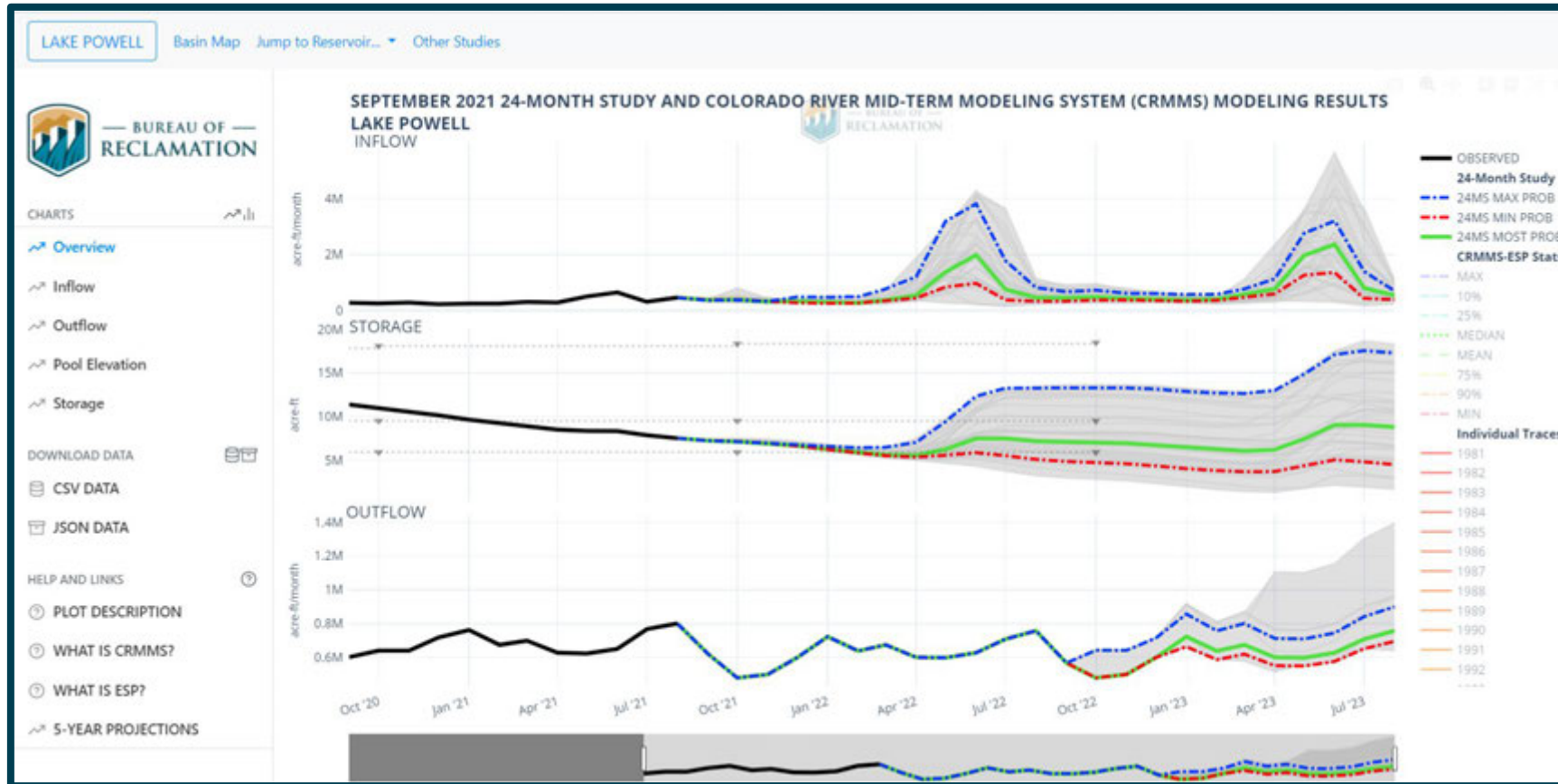


The screenshot displays the Bureau of Reclamation website interface. At the top left is the Bureau of Reclamation logo, and to its right is the text "BUREAU OF RECLAMATION". Further right are social media share icons for Facebook, Twitter, LinkedIn, and Pinterest, along with a search bar. Below this is a navigation menu with five items: "Water & Power", "Resources & Research", "About Us", "Recreation & Public Use", and "News & Multimedia". The main content area features a large background image of a dam and the heading "Lower Colorado Region". Below the image is a breadcrumb trail: "Reclamation Home / Lower Colorado Region / Lower Colorado River Operations / Colorado River Projections". On the left side, there is a sidebar menu with a "LOWER COLORADO REGION" header and several sub-items: "LC Region Home", "Area Offices", "About Us", "Programs & Activities", "Water Operations", "Facilities", "Photos & Features", "Employment", "Links", "Site Index", and "Contact Us". The main content area is titled "Colorado River System Projections Overview" and includes a "QUICK LINKS" section with the following items: "Colorado River System Projections Overview", "24-Month Study Projections", "2-Year Probabilistic Projections", and "5-Year Probabilistic Projections". Below this is an "Introduction" section with the following text: "Reclamation's Upper and Lower Colorado Basin Regions generate a set of standard projections of Colorado River Basin system conditions at regular intervals to determine reservoir operations and assist with planning. Each set of projections serves a specific purpose and focuses on either annual or mid-term (1- to 5-year) time horizons. Standard projections currently extend

<https://www.usbr.gov/lc/region/g4000/riverops/coriver-projections.html>



CRMMS visualization tool demo



<https://www.usbr.gov/lc/region/g4000/riverops/crmms-2year-projections.html>



Questions

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5-year projections available at:

<https://www.usbr.gov/lc/region/g4000/riverops/crss-5year-projections.html>



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