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RECLAMATION

# Colorado River System Projections

Alan Butler

Salton Sea Summit

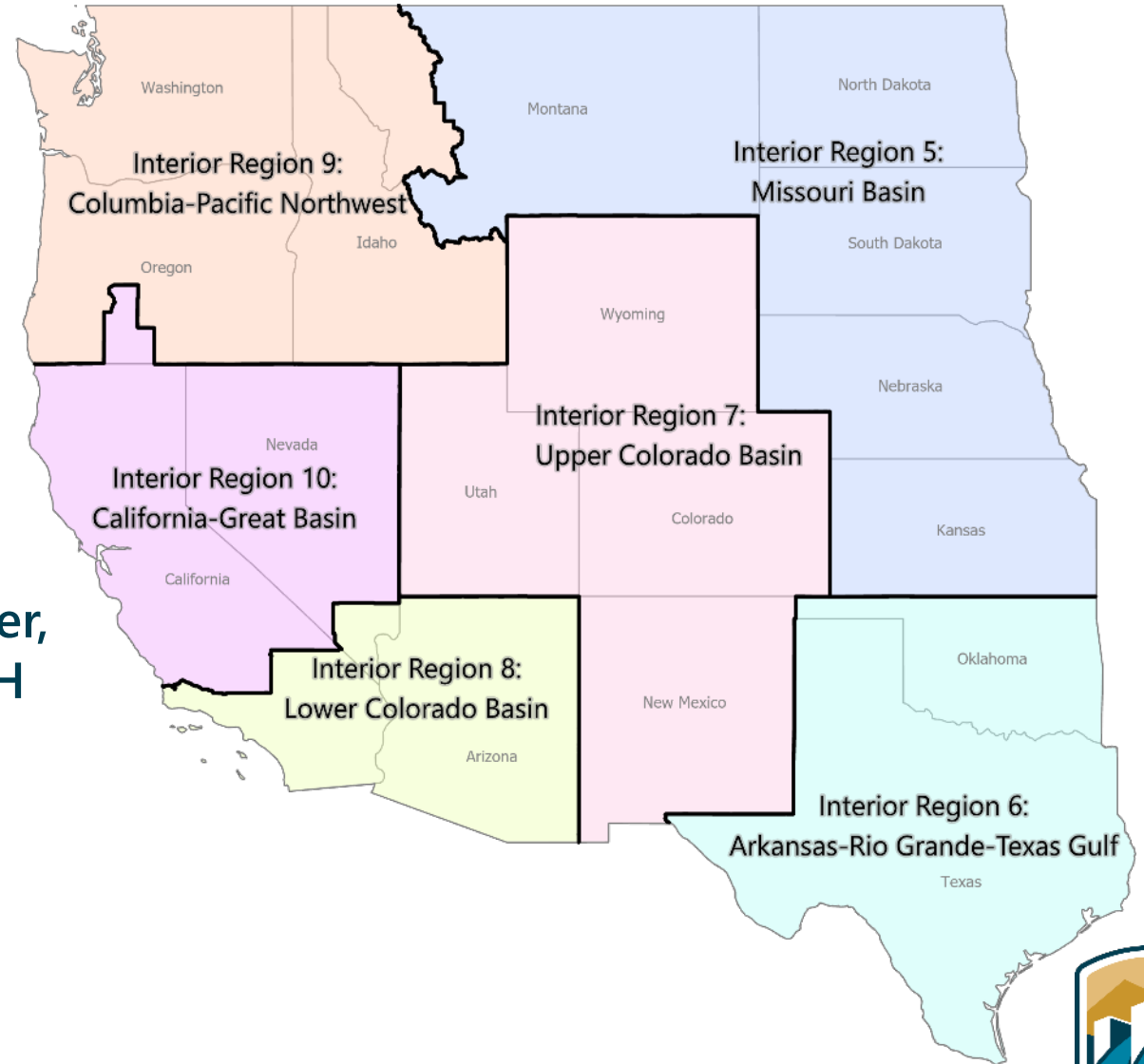
April 6, 2022





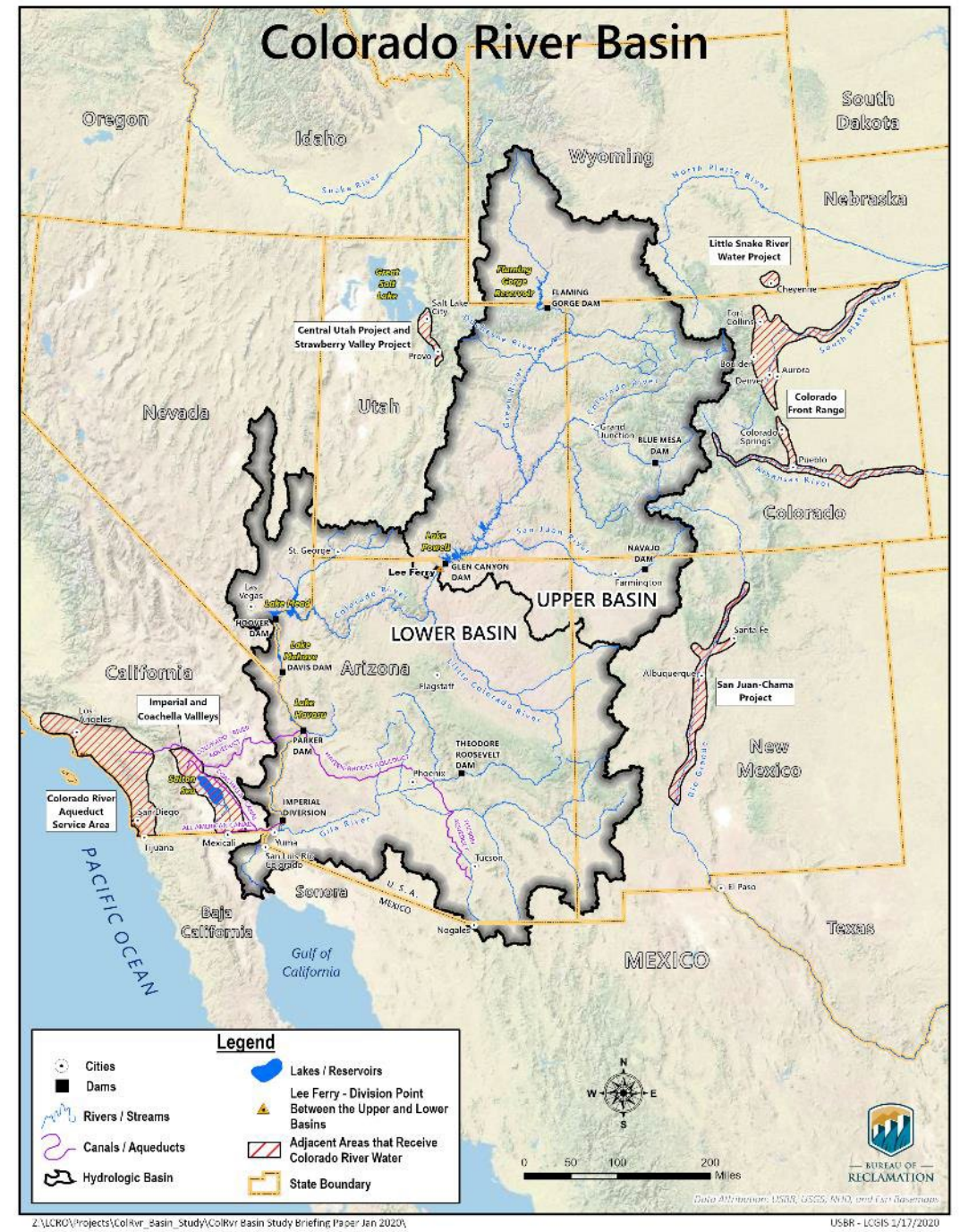
# U.S. Bureau of Reclamation

- U.S. Department of the Interior agency
- Established in 1902 in the 17 western United States
- Largest wholesaler of water in U.S., providing water to over 40 million people
- Provides water to irrigate 10 million acres of farmland, producing 60% of the nation's vegetables
- Second largest producer of hydroelectric power, with 58 powerplants producing 40 billion KWH
- Over 600 dams and reservoirs
- Includes Hoover, Davis, and Parker dams and infrastructure for water delivery on the lower Colorado River



# Lower Colorado River “Water Master” Role

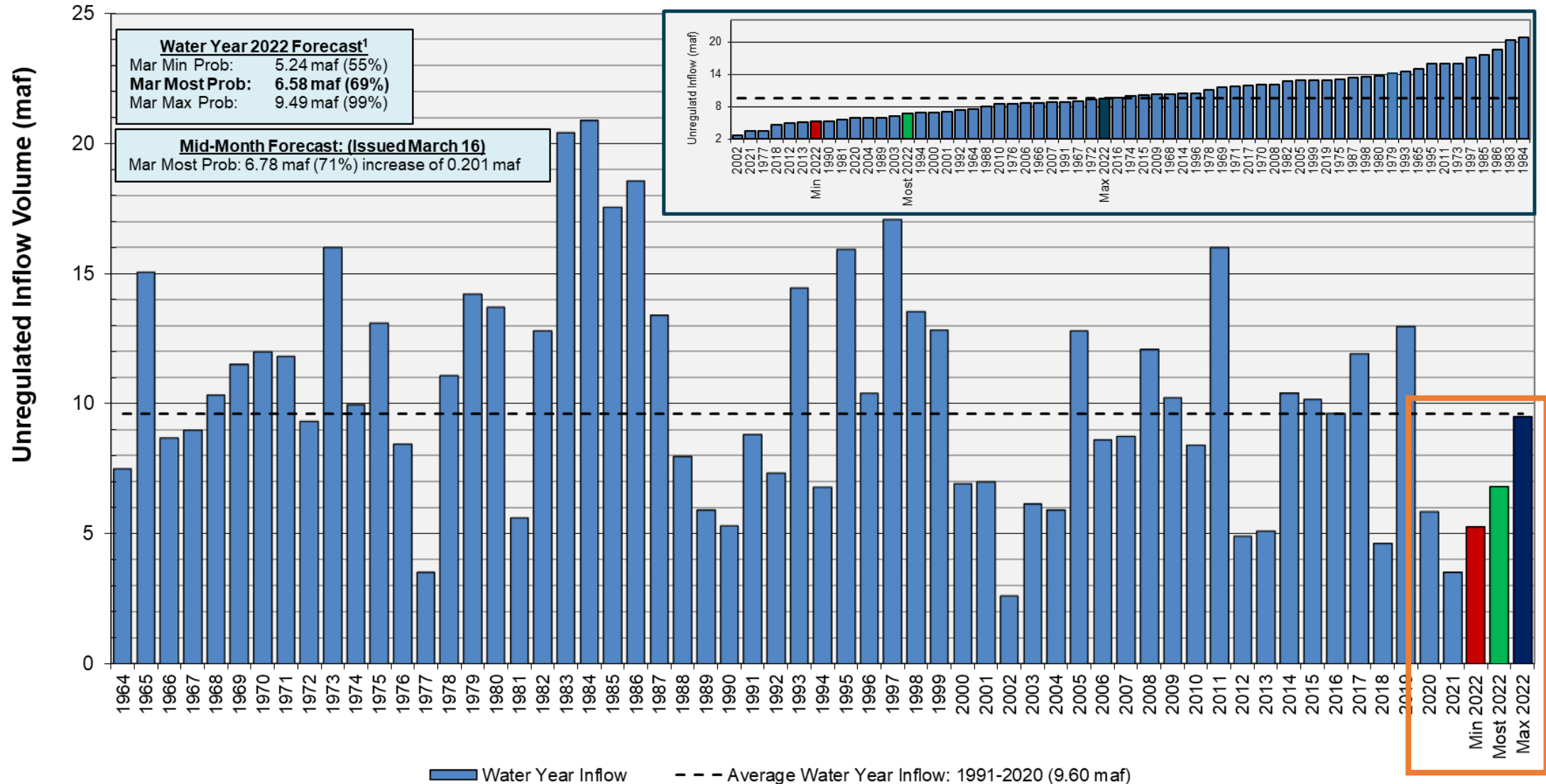
- Boulder Canyon Project Act of 1928 established the Secretary of the Interior as Water Master of the Lower Colorado River
- Mission of Boulder Canyon Operations Office: Implement the Water Master role for the Secretary of the Interior
  - Develop Annual Operating Plan for Colorado River Reservoirs
  - Schedule water releases from Hoover, Davis, and Parker Dams
  - Administer water entitlements
  - Approve U.S. water orders
  - Account for all water use



# Lake Powell Water Year Unregulated Inflow<sup>1</sup>

Forecast as of March 16, 2022

Comparison with History

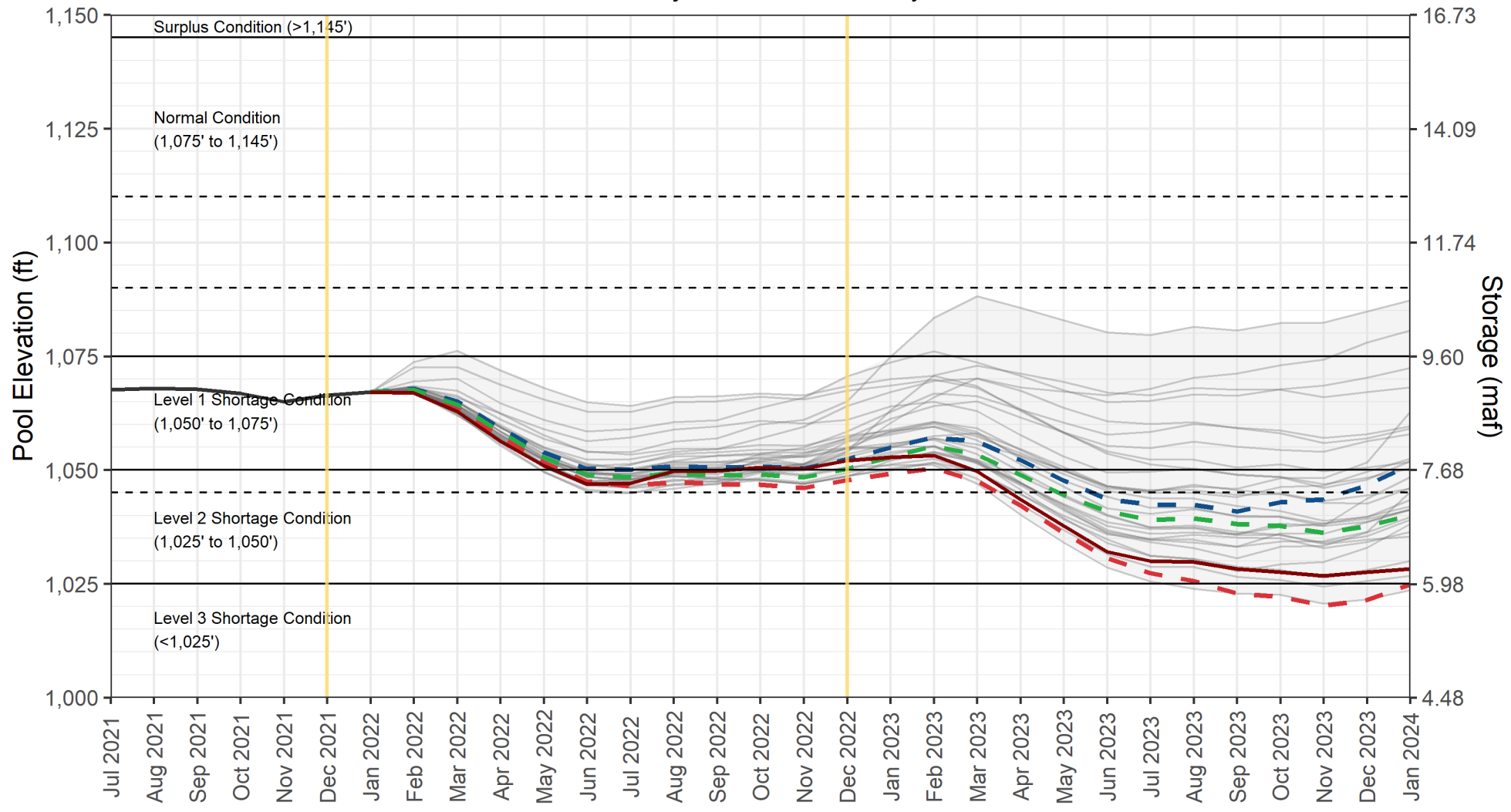


<sup>1</sup>Water Year 2022 statistics are based on the 30-year period of record from 1991-2020.



# Lake Mead End-of-Month Elevations

CRMMS Projections from February 2022



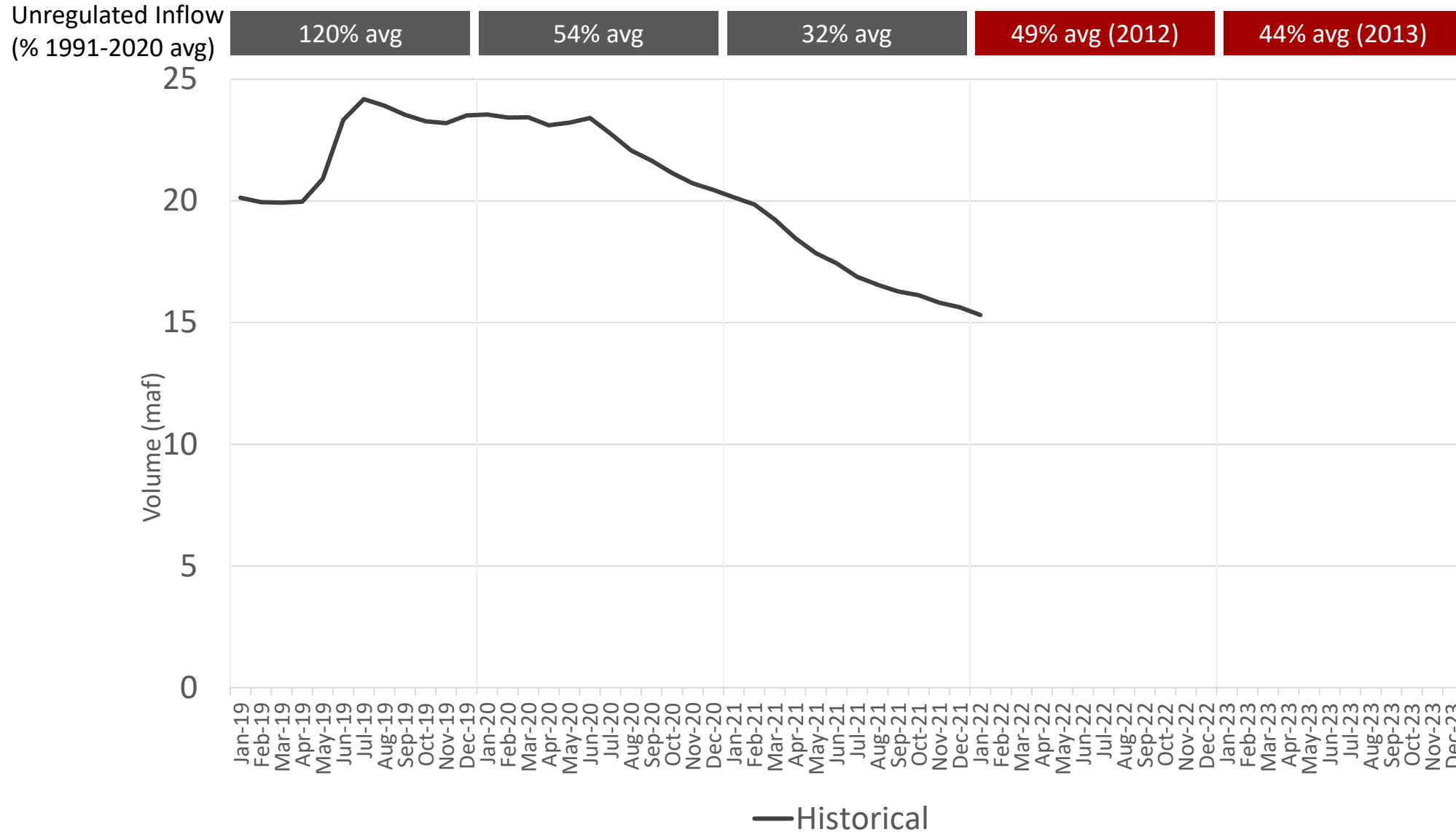
- - 24-Month Study Minimum Probable
- - 24-Month Study Maximum Probable
- - 24-Month Study Most Probable
- Historical
- CRMMS-ESP Projections (30 projections)
- CRMMS-ESP (2012-2013 sequence)
- CRMMS-ESP Projections Range





# Lake Powell and Lake Mead Combined Storage

## Projection based on 2012-2013 sequence



# Lake Powell and Lake Mead Combined Storage

## Projection based on 2012-2013 sequence

Unregulated Inflow  
(% 1991-2020 avg)

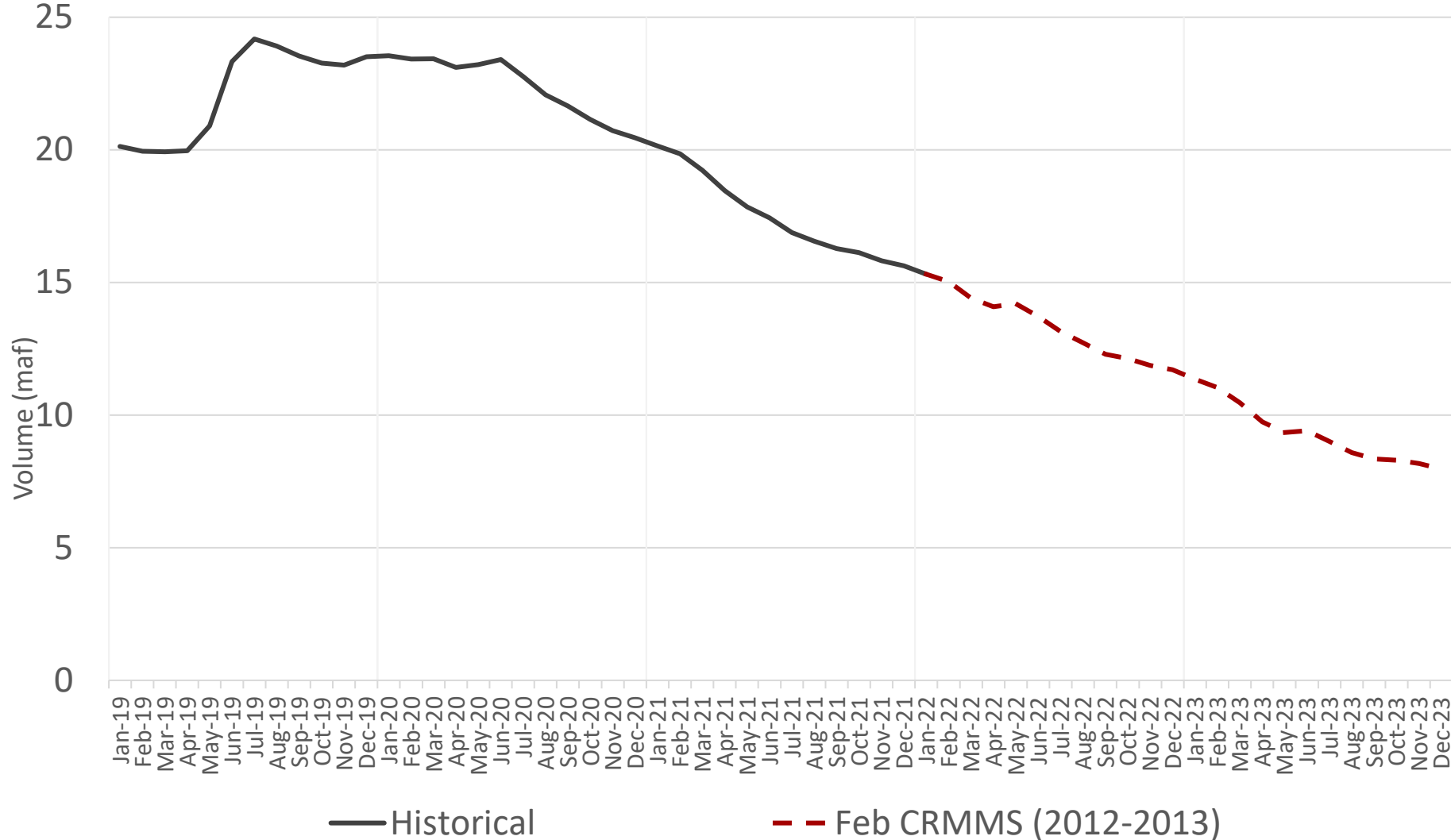
120% avg

54% avg

32% avg

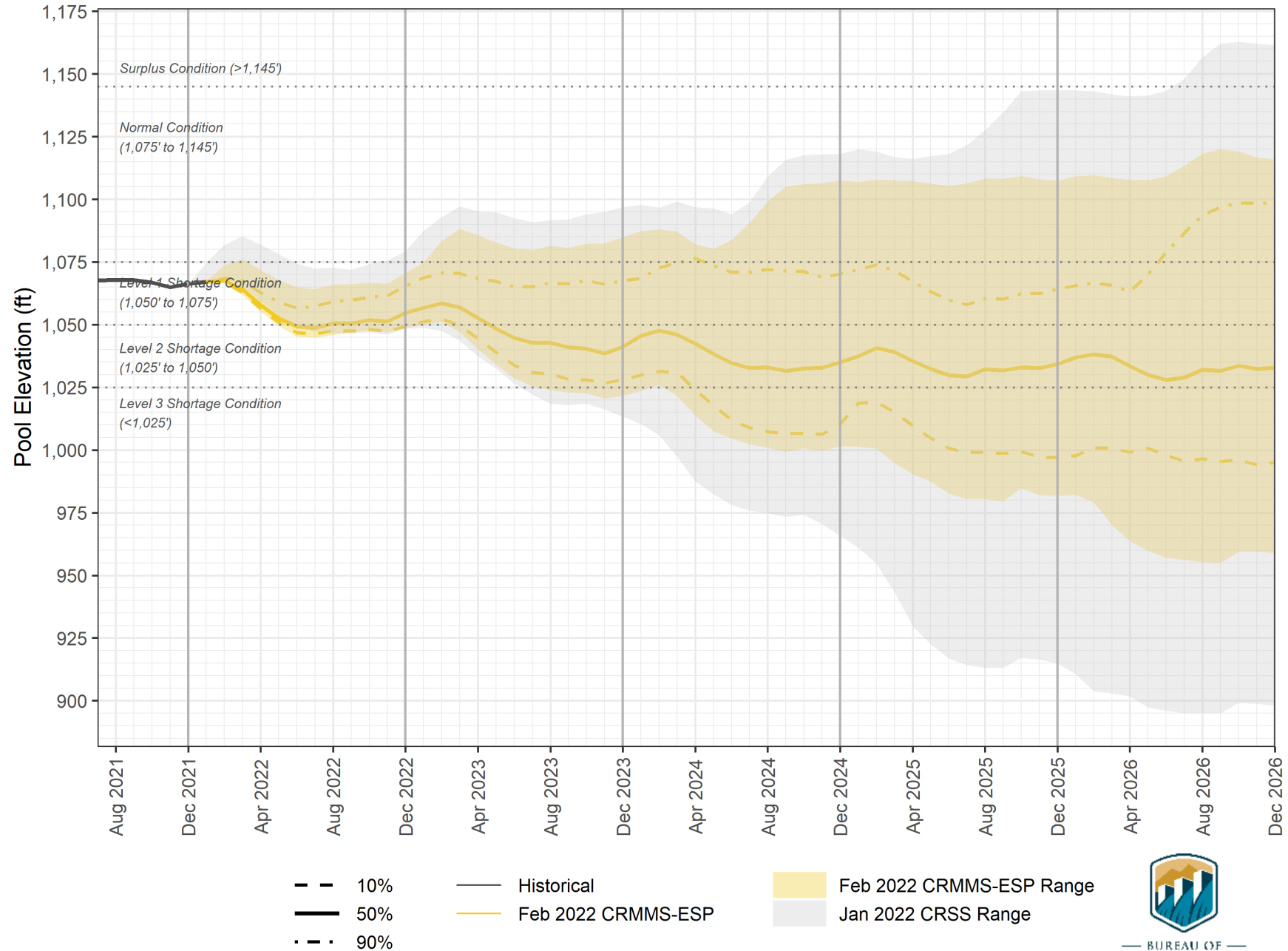
49% avg (2012)

44% avg (2013)



# Lake Mead End-of-Month Elevations

## February 2022 CRMMS-ESP Projection with Range of Uncertainty from January 2022 CRSS





# Summary of 5-Year Projections: February 2022

In February 2022, Reclamation switched from using the Colorado River Simulation System (CRSS) to using the Colorado River Mid-term Modeling System (CRMMS) to provide the 5-Year Probabilistic Projections.

CRMMS uses unregulated Upper Basin streamflow forecasts provided by the Colorado Basin River Forecasting Center (CBRFC). The CBRFC generates these forecasts using a technique known as Ensemble Streamflow Prediction (ESP). This technique generates multiple time series, i.e. traces, of forecasted streamflow. Forecasts are created using the Sacramento Soil Moisture Accounting hydrologic model, which is initialized with current basin conditions for soil moisture and snowpack and forced with a set of historical time series of precipitation and temperature that matches the model calibration period (currently 1991 through 2020). This process results in a 30-member ensemble for monthly streamflow forecasts with temperature and precipitation that match the 1991-2020 climatological period.

## Key Results

Event or System Condition	2022	2023	2024	2025	2026
<b>Lake Powell</b>					
Mid-Elevation Release Tier (Powell < 3,575 and ≥ 3,525 ft)	100%	43%	50%	33%	43%
Below Minimum Power Pool (Powell < 3,490 ft in any month)	N	23%	27%	27%	23%
<b>Lake Mead</b>					
Shortage Condition – any amount (Mead ≤ 1,075 ft)	100%	100%	93%	93%	93%
Shortage / Reduction – 3rd level (Mead < 1,025 ft)	0%	0%	3%	30%	40%



# Lower Basin – Lake Mead

## Percent of Traces with Event or System Condition

### Results from February 2022 CRMMS-ESP (values in percent)

Event or System Condition	2022	2023	2024	2025	2026
<b>Surplus Condition – any amount (Mead <math>\geq</math> 1,145 ft)</b>	0	0	0	0	0
Surplus – Flood Control	0	0	0	0	0
<b>Normal or ICS Surplus Condition (Mead <math>&lt;</math> 1,145 and <math>&gt;</math> 1,075 ft)</b>	0	0	7	7	7
Recovery of DCP ICS / Mexico's Water Savings (Mead $>/\geq$ 1,110 ft)	0	0	0	0	0
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,090 and $>$ 1,075 ft)	0	0	7	3	0
<b>Shortage Condition – any amount (Mead <math>\leq</math> 1,075 ft)</b>	100	100	93	93	93
<i>Shortage / Reduction – 1<sup>st</sup> level (Mead <math>\leq</math> 1,075 and <math>\geq</math> 1,050)</i>	100	87	23	17	27
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,075 and $>$ 1,050 ft)	0	87	23	17	27
<i>Shortage / Reduction – 2<sup>nd</sup> level (Mead <math>&lt;</math> 1,050 and <math>\geq</math> 1,025)</i>	0	13	67	47	27
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,050 and $>$ 1,045 ft)	0	13	10	13	7
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,045 and $>$ 1,040 ft)	0	0	10	3	3
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,040 and $>$ 1,035 ft)	0	0	27	10	7
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,035 and $>$ 1,030 ft)	0	0	10	10	3
DCP Contribution / Mexico's Water Savings (Mead $\leq$ 1,030 and $\geq$ 1,025 ft)	0	0	10	10	7
<i>Shortage / Reduction – 3<sup>rd</sup> level (Mead <math>&lt;</math> 1,025)</i>	0	0	3	30	40
DCP Contribution / Mexico's Water Savings (Mead $</\leq$ 1,025 ft)	0	0	3	30	40

Notes:

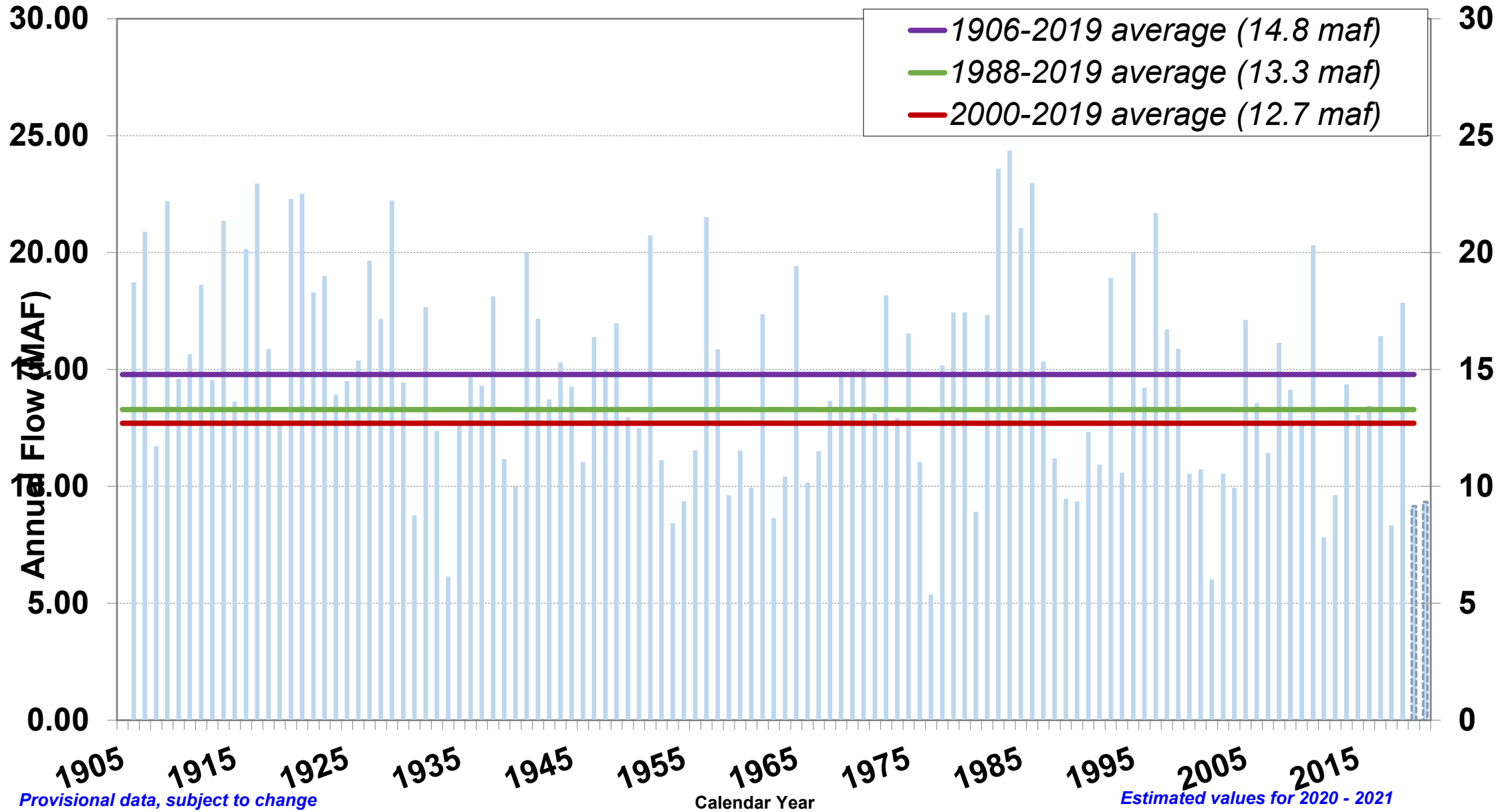
<sup>1</sup> Modeled operations include the 2007 Interim Guidelines, Upper Basin Drought Response Operations, Lower Basin Drought Contingency Plan, and Minute 323, including the Binational Water Scarcity Contingency Plan.

<sup>2</sup> Reservoir conditions for 2022-2026 were simulated using the February 2022 CRMMS in ensemble mode using the CBRFC unregulated inflow forecast ensemble dated February 3, 2022 (CRMMS-ESP).

<sup>3</sup> Percentages shown in this table may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

<sup>4</sup> Percentages shown may not sum to 100% due to rounding to the nearest percent.

# Colorado River at Lees Ferry, AZ - Natural Flow





# Thank you

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