



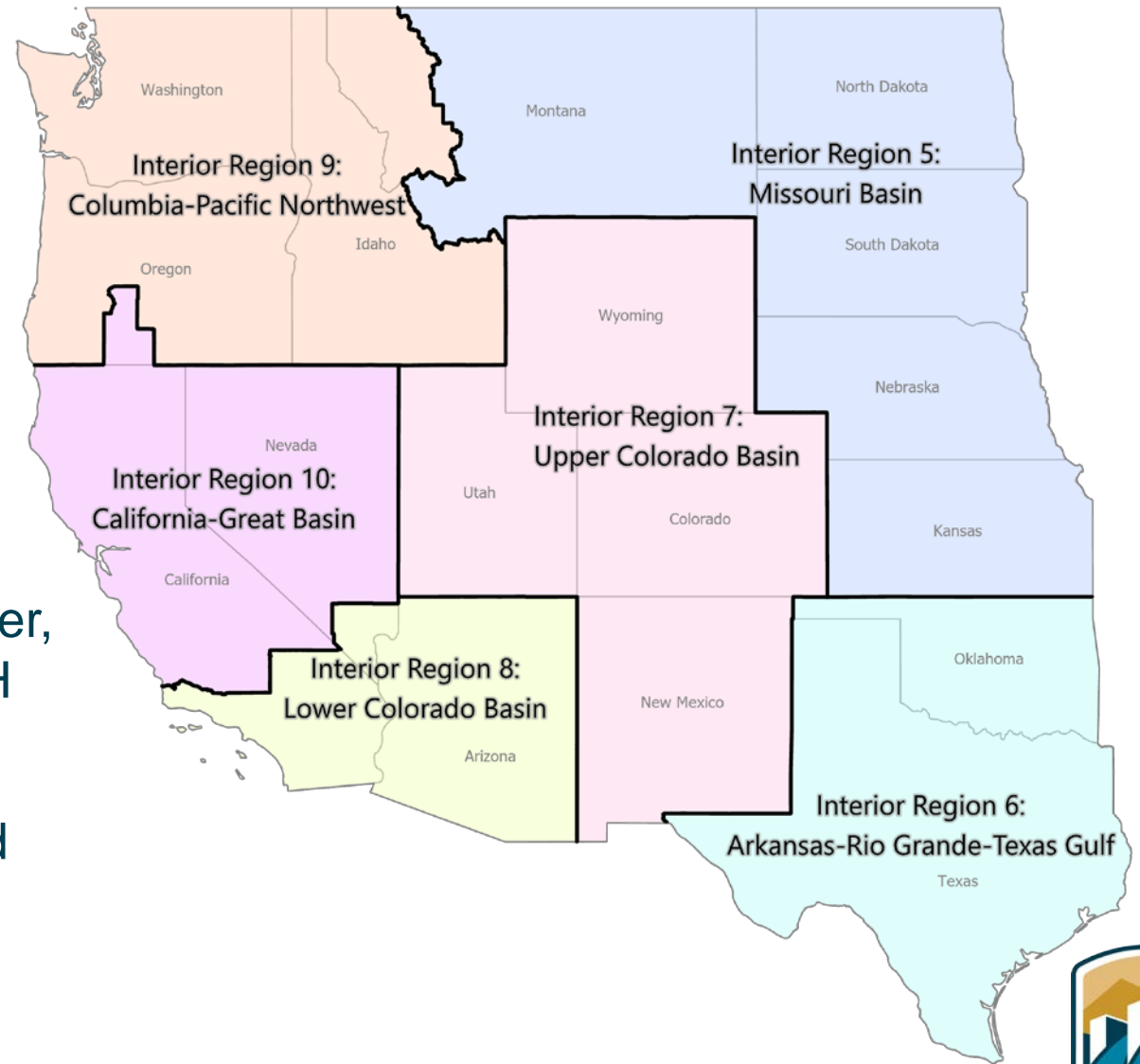
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Overview of Colorado River Reservoir Management

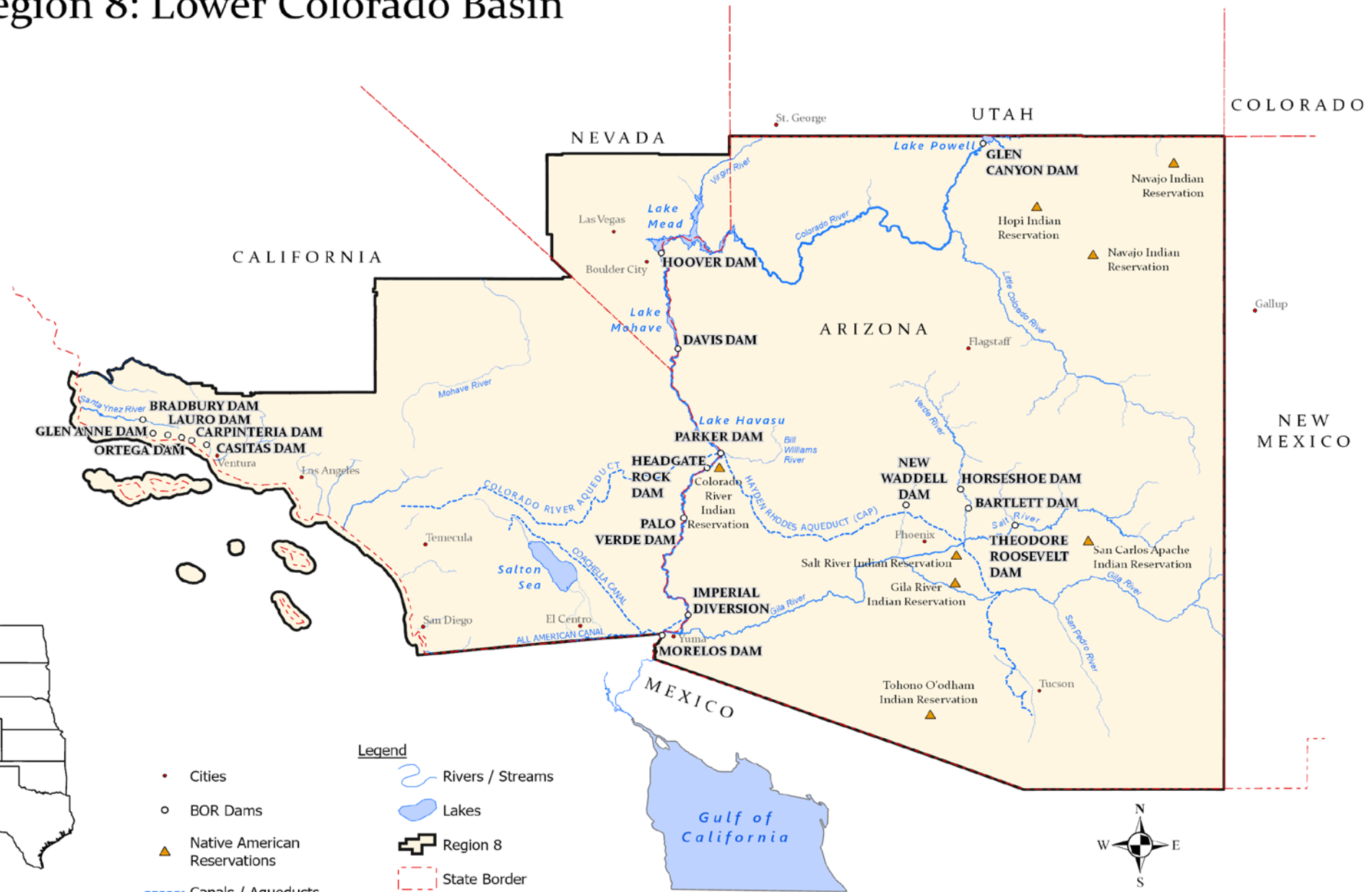
Water Education Foundation Lower Colorado River Tour
March 11, 2020

U.S. Bureau of Reclamation

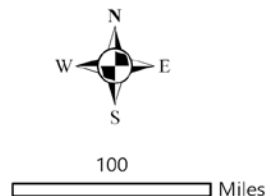
- U.S. Department of the Interior agency
- Established in 1902 in the 17 western United States
- Largest wholesaler of water in U.S., providing water to over 31 million people
- Provides water to irrigate 10 million acres of farmland, producing 60% of the nation's vegetables
- Second largest producer of hydroelectric power, with 58 powerplants producing 40 billion KWH
- Over 600 dams and reservoirs
- Includes Hoover, Parker, and Davis dams and infrastructure for water delivery on the lower Colorado River



Interior Region 8: Lower Colorado Basin

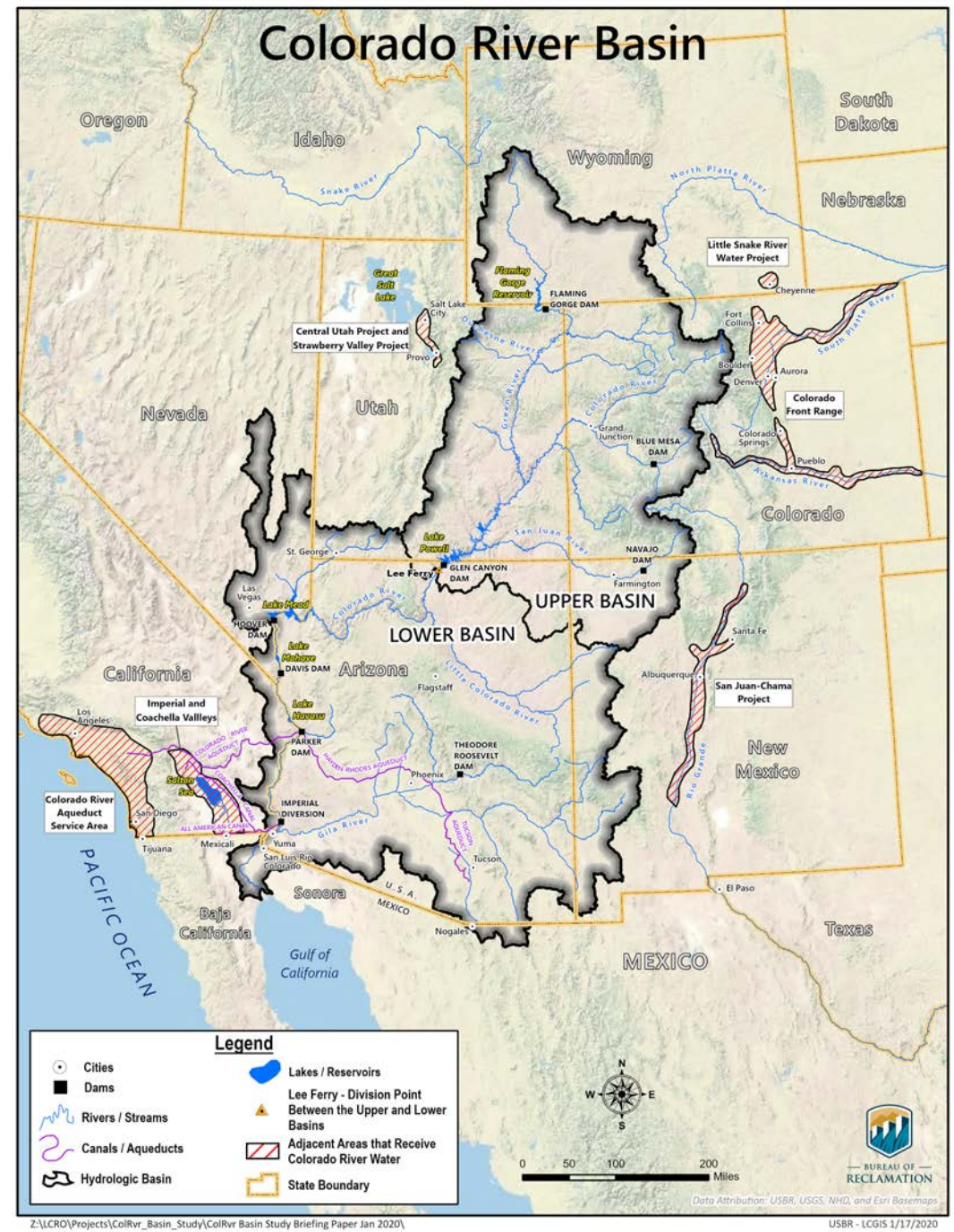


- Legend**
- Cities
 - BOR Dams
 - ▲ Native American Reservations
 - Canals / Aqueducts
 - ~ Rivers / Streams
 - ☪ Lakes
 - ▭ Region 8
 - - - State Border



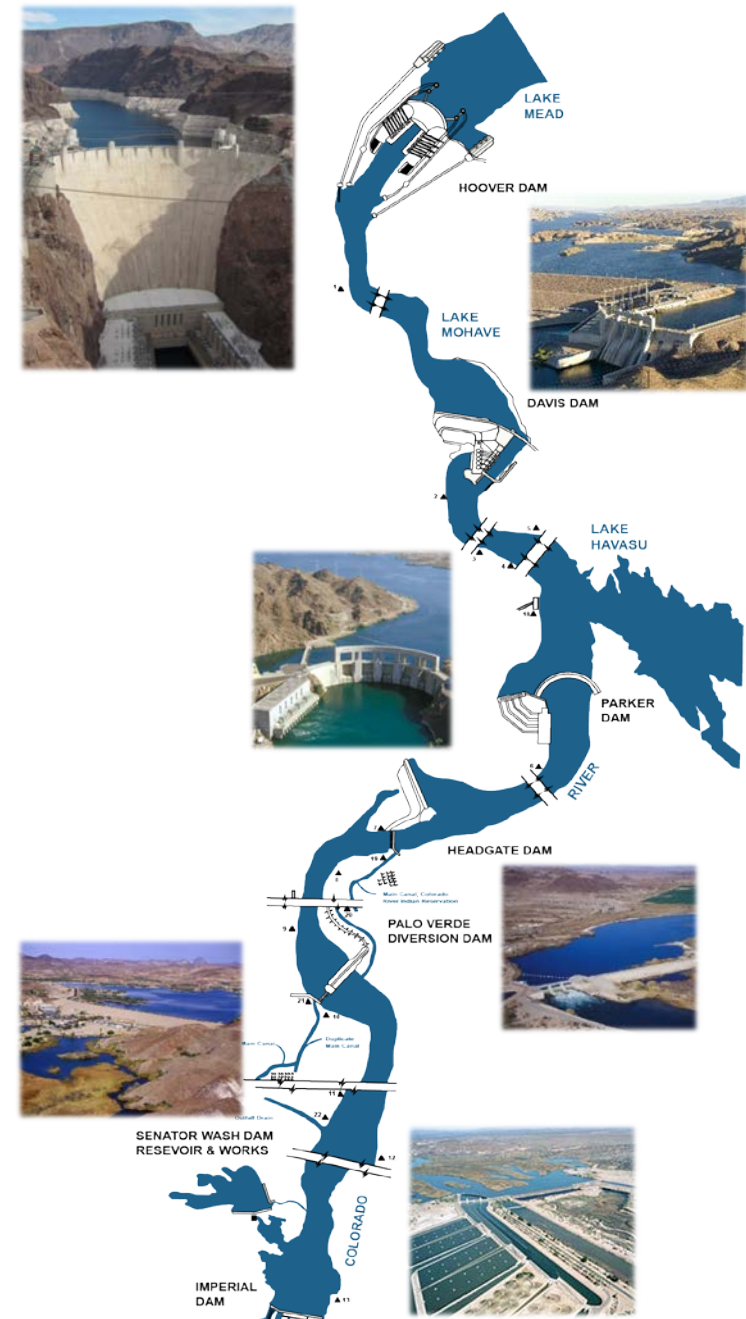
Colorado River Basin Hydrology

- 16.5 million acre-feet (maf) allocated annually
 - 7.5 maf each to Upper and Lower Basins
 - 1.5 maf to Mexico
- 16 maf average annual “natural flow” (from historical record)
 - 14.8 maf in the Upper Basin and 1.3 maf in the Lower Basin
- Inflows are highly variable year to year
- 60 maf of storage (about 4 times the annual average inflow)
- Operations and water deliveries governed by the “Law of the River”



Lower Colorado River Management Objectives

- Provide flood control and river regulation
- Meet U.S. water orders
- Meet water delivery and salinity goals under the 1944 U.S.-Mexico Water Treaty
- Generate hydropower
- Implement LCR Multi-Species Conservation Program
- Support recreational opportunities

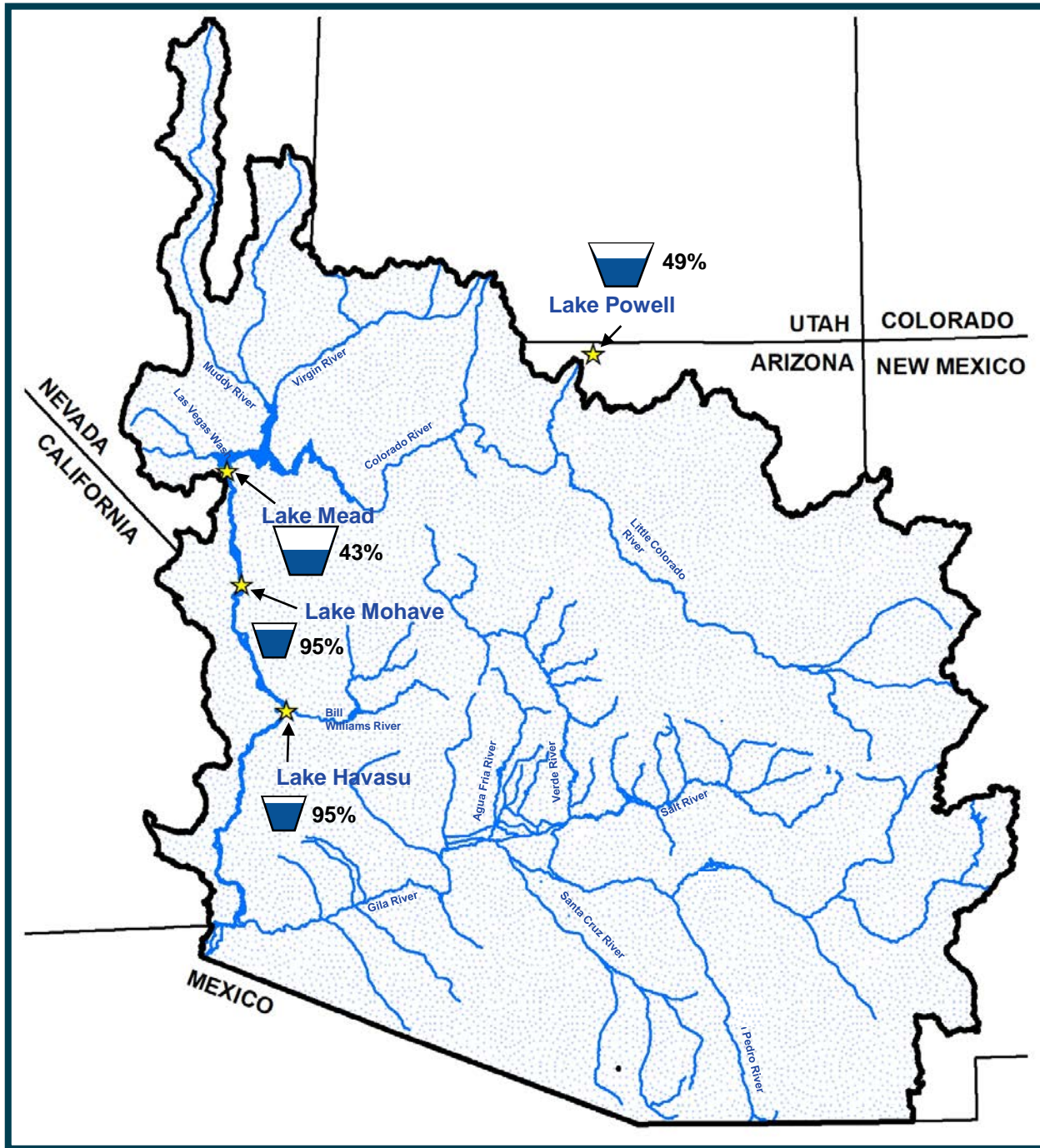


Lower Colorado River “Water Master” Role

- 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 contracts
 - Approve U.S. water orders
 - Account for all water use



Colorado River System Conditions as of March 9, 2020



Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Lake Powell	49	11.94	3,601.94
Lake Mead	43	11.36	1,095.78
Lake Mohave	95	1.72	643.83
Lake Havasu	95	0.59	448.40
Total System Storage	52	30.92	-
Total System Storage <i>(at this time last year)</i>	45	26.77	-

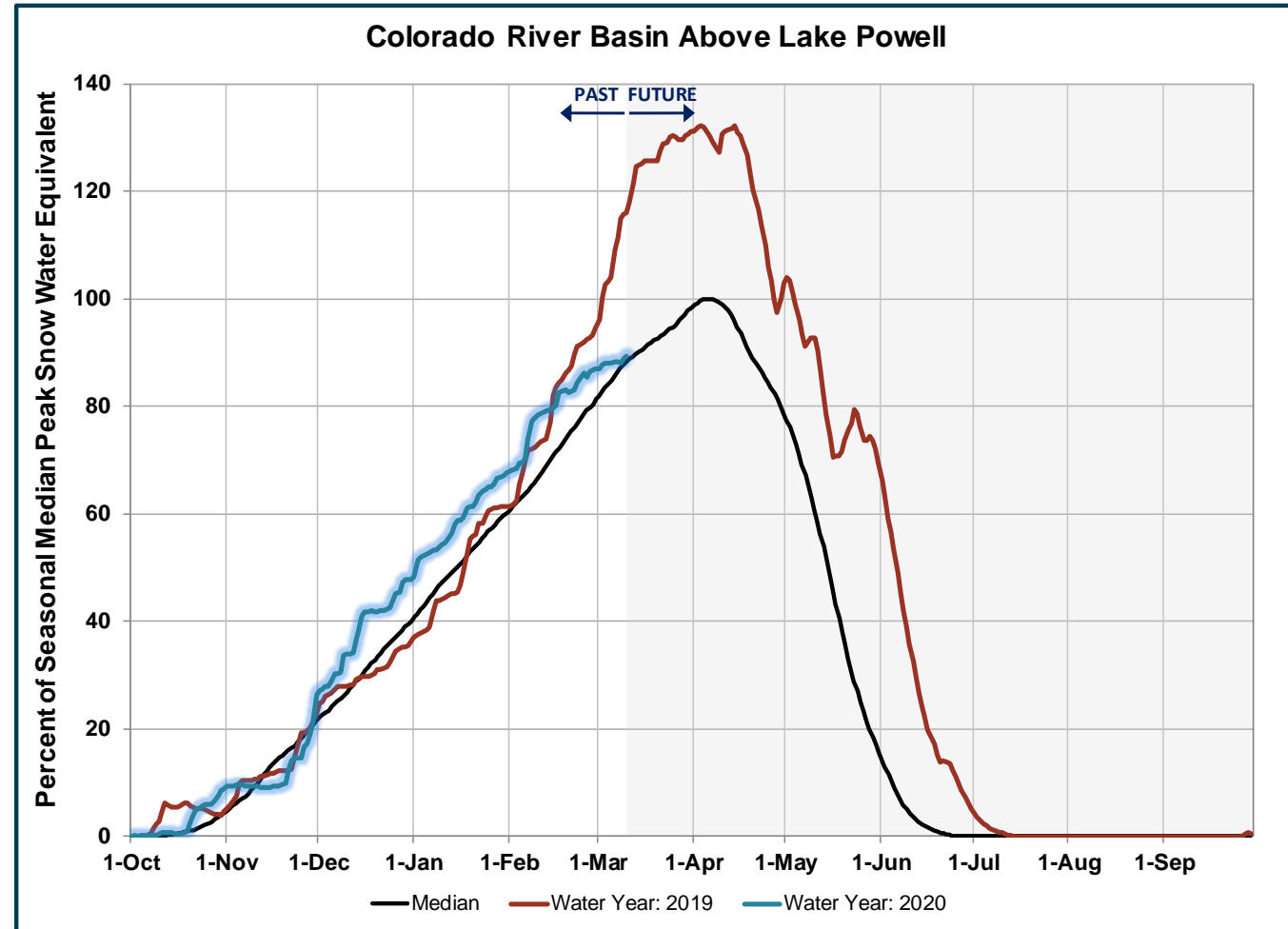


Water Year Snowpack and Precipitation as of March 10, 2020¹

Colorado River Basin above Lake Powell

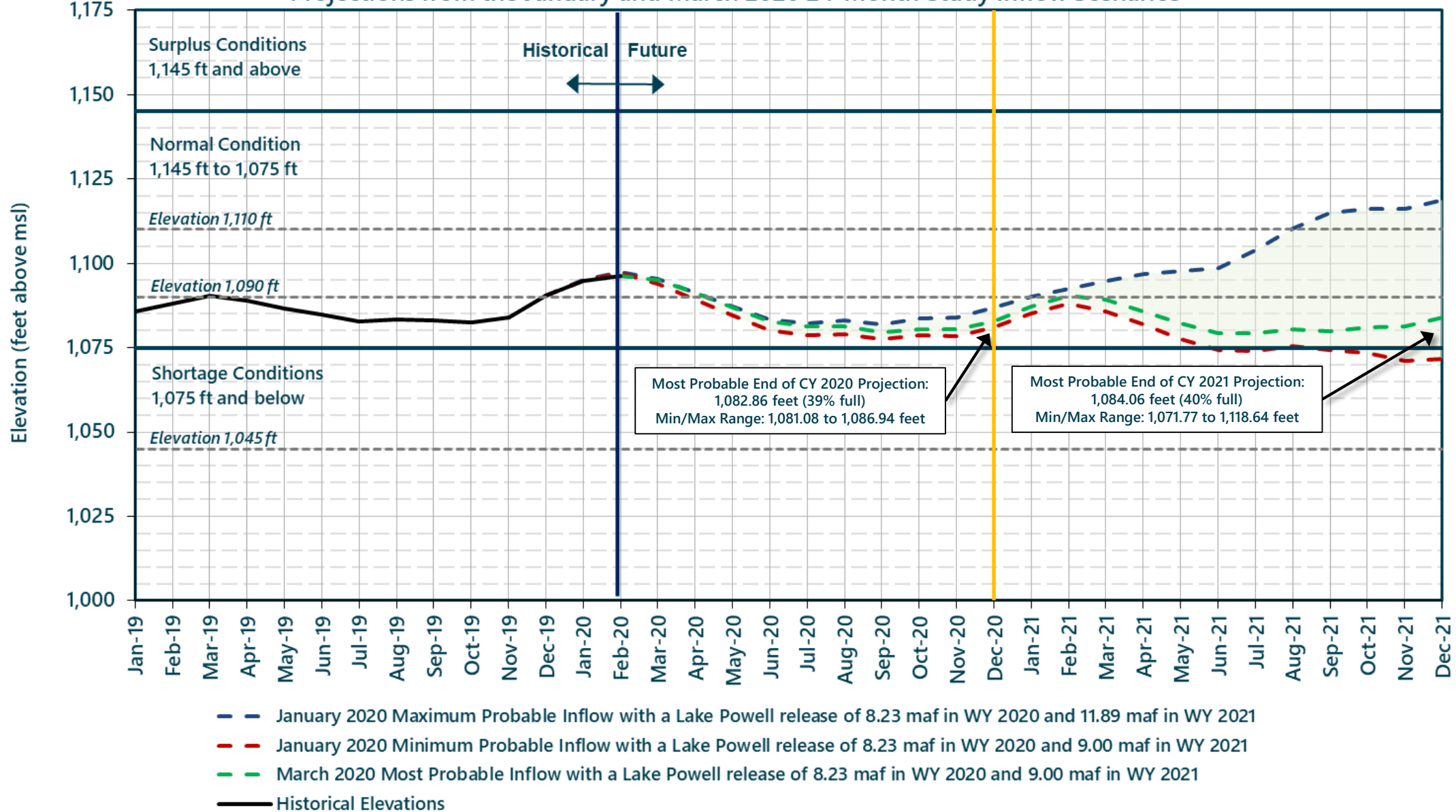
Water Year 2020
Precipitation
(year-to-date)
88% of average

Current Snowpack
101% of median

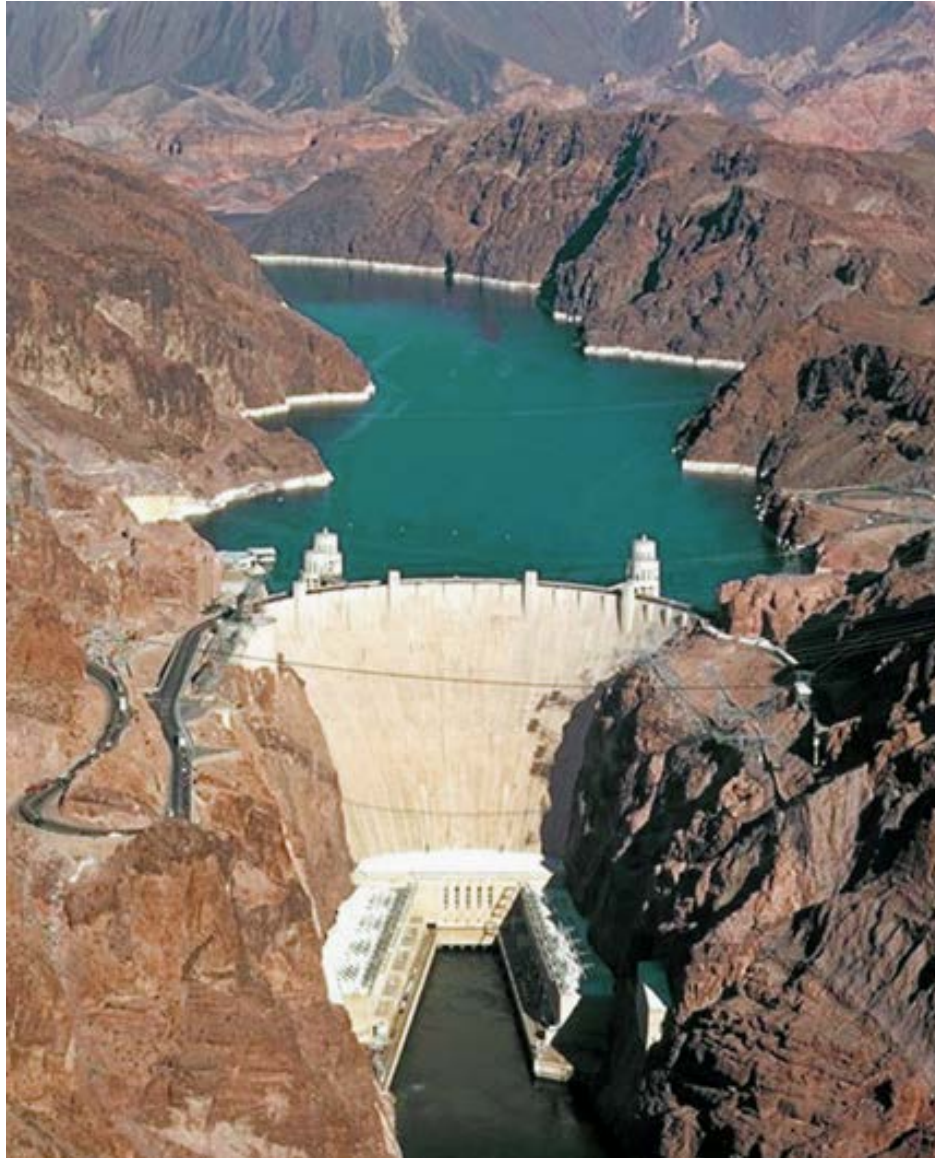


Lake Mead End of Month Elevations

Projections from the January and March 2020 24-Month Study Inflow Scenarios



Colorado River Drought



Lake Mead near Hoover Dam in 2000



Lake Mead near Hoover Dam in 2016



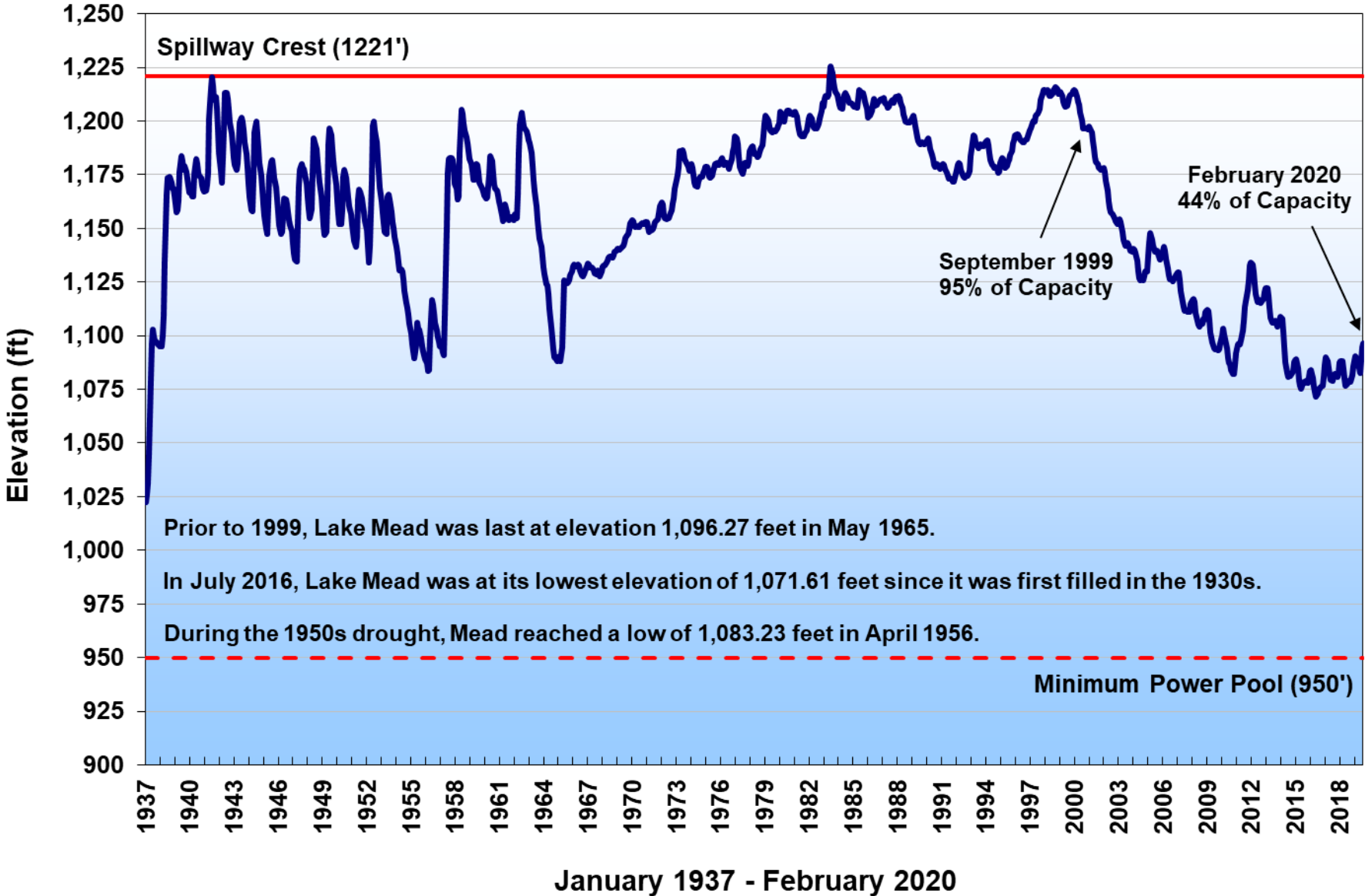
Colorado River Drought

- 2000-2018 is the driest 19-year period in over 100 years of historical records
- Only five years of above-average inflow have occurred in the last twenty years
- Tree-ring reconstructions show more severe droughts have occurred over the past 1,200 years (e.g., drought in the mid 1100s)
- The 2020 April through July runoff forecast is 80% of average¹ as of March 3, 2020
- Not unusual to have a few years of above average inflow during longer-term droughts (e.g., the 1950s)

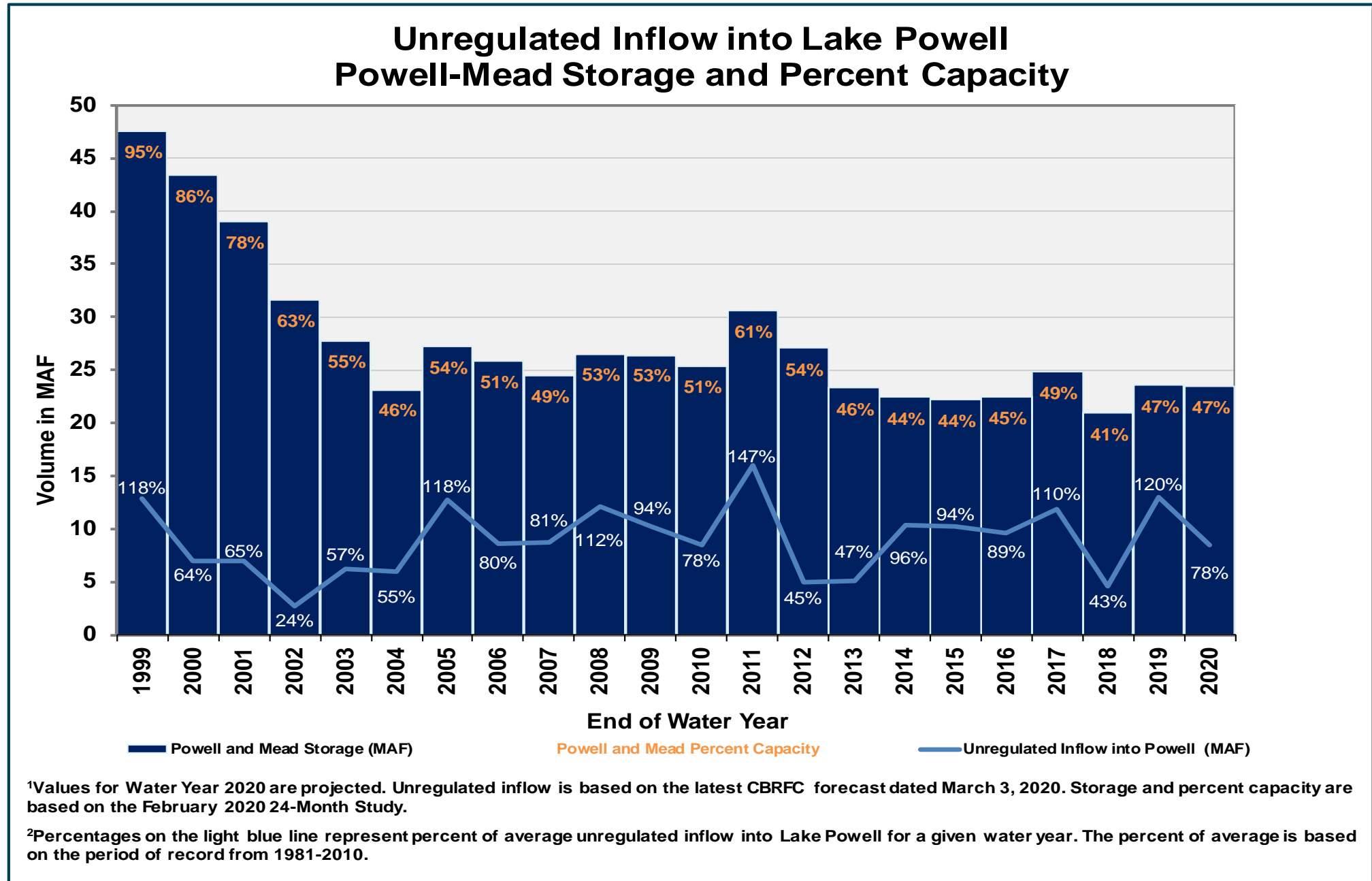
¹ Percent of average is based on the period of record from 1981-2010.



Lake Mead End of Month Elevation



State of the System (Water Years 1999-2020)^{1,2}



Impetus for the 2007 Interim Guidelines



- Five years of unprecedented drought
- There had never been a shortage in the Lower Basin and there were no shortage guidelines
- Operations between Lake Powell and Lake Mead were coordinated only at the higher reservoir levels referred to as “equalization”



2007 Interim Guidelines¹ - A Robust Solution

- Operations specified through the full range of operation for Lake Powell and Lake Mead
- Encourage efficient and flexible use and management of Colorado River water through the ICS mechanism
- Strategy for shortages in the Lower Basin, including a provision for additional shortages if warranted²
- In place for an interim period (through 2026) to gain valuable operational experience
- Basin States agree to consult before resorting to litigation

1. Issued in Record of Decision, dated December 13, 2007; available at: <http://www.usbr.gov/lc/region/programs/strategies.html>

2. Mexico water deliveries are not directly affected by these guidelines

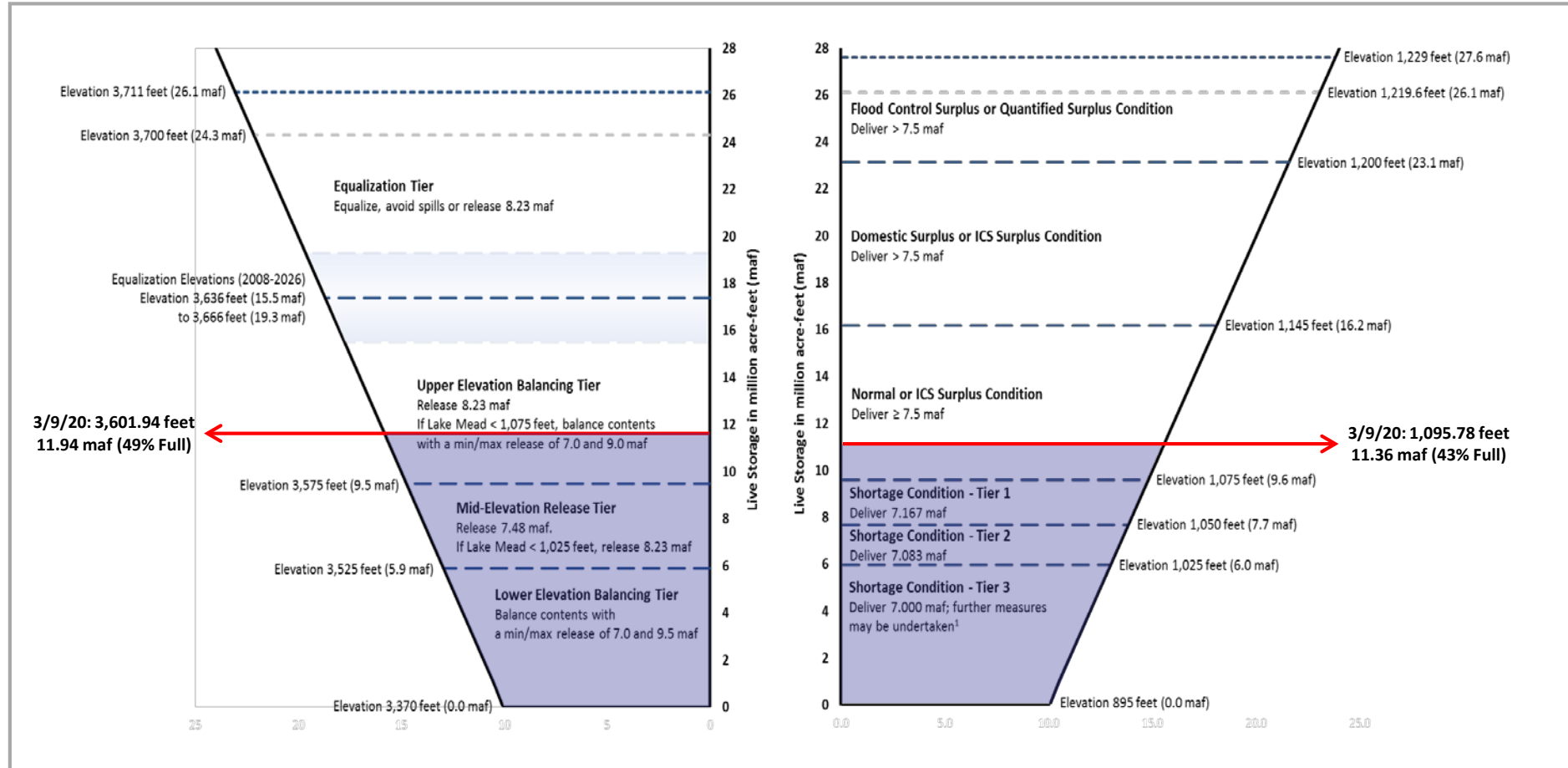


Lake Powell & Lake Mead Operational Diagrams

(According to the 2007 Interim Guidelines)

Lake Powell

Lake Mead

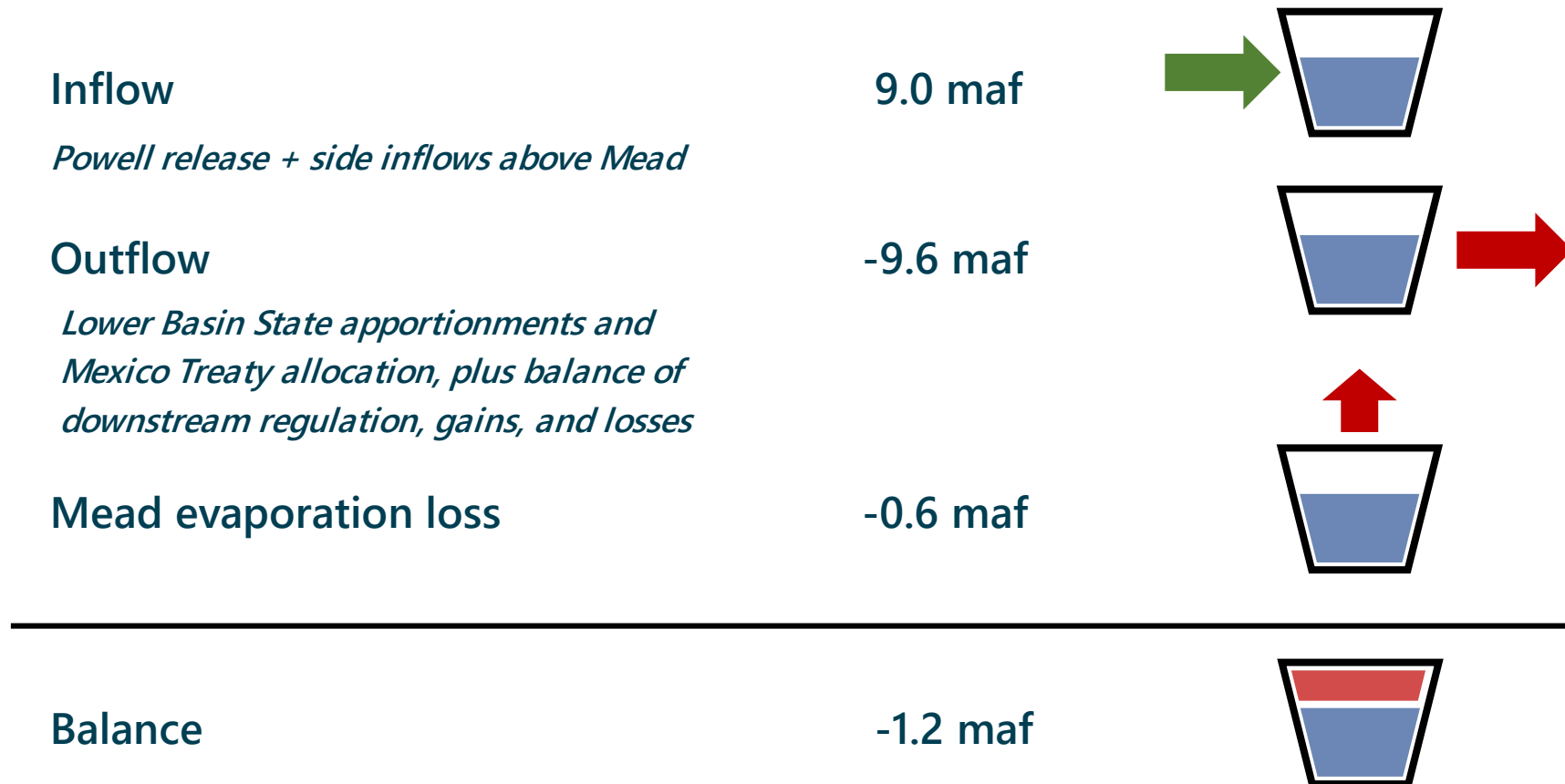


¹ Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

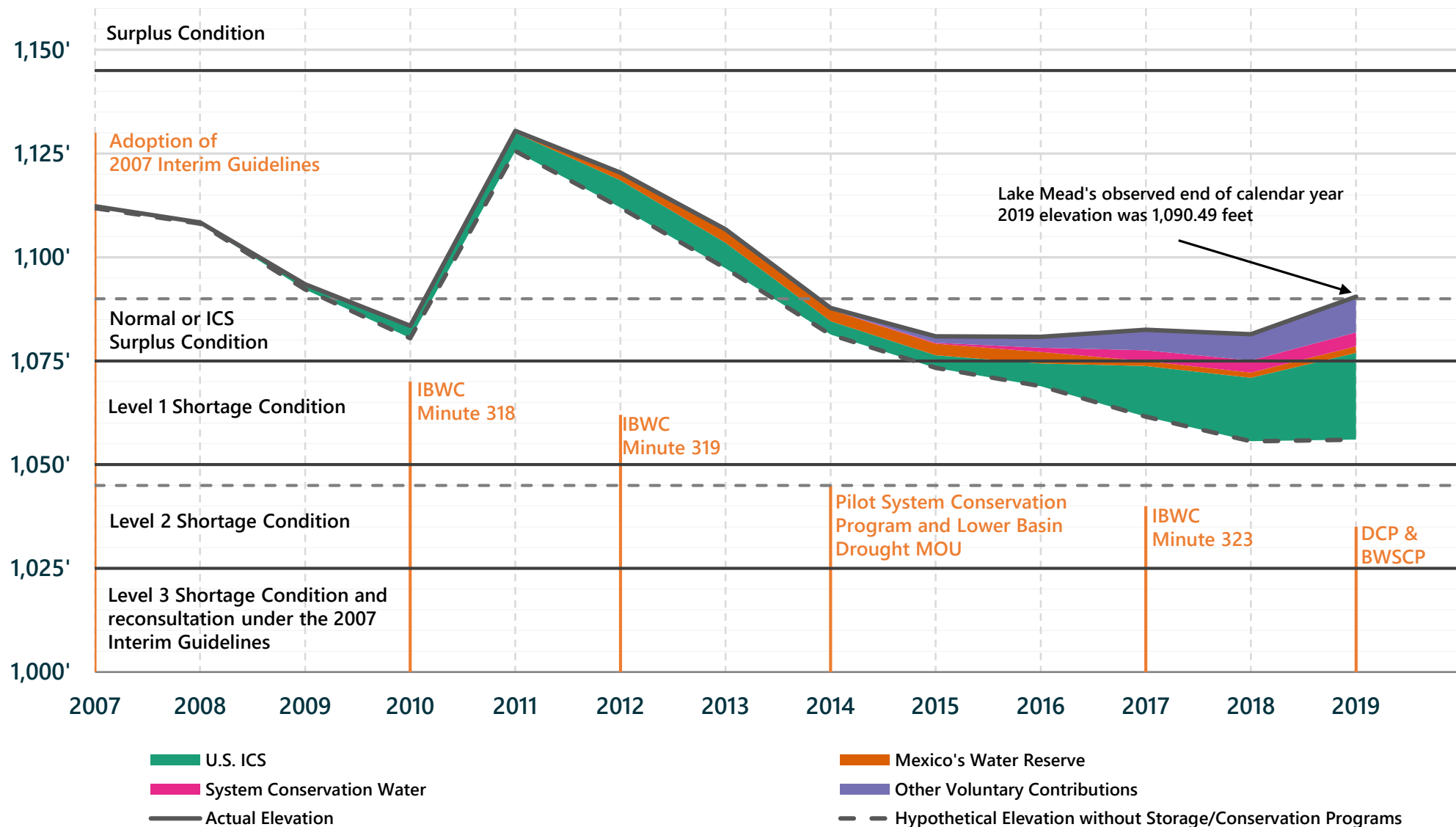


Water Budget at Lake Mead

Given current water demands in the Lower Basin and Mexico, and a minimum objective release from Lake Powell (8.23 maf), Lake Mead storage declines by about 1.2 maf annually (equivalent to about 12 feet in elevation).



Lake Mead Storage and Conservation 2007-2019

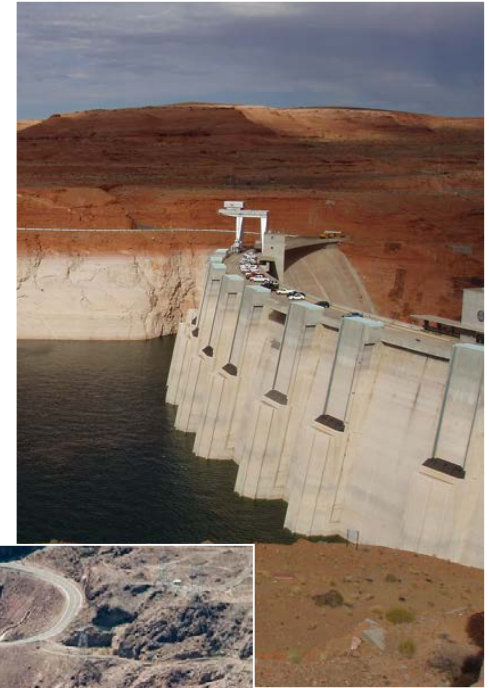


End of calendar year 2019 balances of U.S. ICS and Mexico's Water Reserve, system conservation water, and other voluntary contributions to Lake Mead are provisional and subject to change.



Colorado River Drought Contingency Plans

- Implemented on May 20, 2019 and in place through 2026
- Actions are in addition to the 2007 Interim Guidelines
- Goal is to reduce the risk of Lake Mead and Lake Powell reaching critically low elevations (1,020 feet and 3,490/3,525 feet, respectively)
- Key Elements:
 - Requires additional water savings contributions by Lower Basin States
 - Allows for additional flexibility for water storage and recovery to incentivize conservation
 - Provides for Drought Response Operations and Demand Management in the Upper Basin
 - Triggers Mexico's Water Scarcity Contingency Plan



2007 Interim Guidelines, Minute 323, Lower Basin Drought Contingency Plan, and Binational Water Scarcity Contingency Plan Total Volumes (kaf)

Lake Mead Elevation (feet msl)	2007 Interim Guidelines Shortages		Minute 323 Delivery Reductions	Total Combined Reductions	DCP Water Savings Contributions			Binational Water Scarcity Contingency Plan Savings	Combined Volumes by Country <i>US: (2007 Interim Guidelines Shortages + DCP Contributions)</i> <i>Mexico: (Minute 323 Delivery Reductions + Binational Water Scarcity Contingency Plan Savings)</i>					Total Combined Volumes
	AZ	NV	Mexico	Lower Basin States + Mexico	AZ	NV	CA	Mexico	AZ Total	NV Total	CA Total	Lower Basin States Total	Mexico Total	Lower Basin States + Mexico
1,090 - 1,075	0	0	0	0	192	8	0	41	192	8	0	200	41	241
1,075 - 1050	320	13	50	383	192	8	0	30	512	21	0	533	80	613
1,050 - 1,045	400	17	70	487	192	8	0	34	592	25	0	617	104	721
1,045 - 1,040	400	17	70	487	240	10	200	76	640	27	200	867	146	1,013
1,040 - 1,035	400	17	70	487	240	10	250	84	640	27	250	917	154	1,071
1,035 - 1,030	400	17	70	487	240	10	300	92	640	27	300	967	162	1,129
1,030 - 1,025	400	17	70	487	240	10	350	101	640	27	350	1,017	171	1,188
<1,025	480	20	125	625	240	10	350	150	720	30	350	1,100	275	1,375

The Secretary of the Interior will take affirmative actions to implement programs designed to create or conserve 100,000 acre-ft per annum or more of Colorado River System water to contribute to conservation of water supplies in Lake Mead and other Colorado River reservoirs in the lower basin. All actions taken by the United States shall be subject to applicable law, including availability of appropriations.



The Colorado River: Operations and Current Conditions

For further information please visit

<https://www.usbr.gov/lc/riverops>



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