

Colorado River 101

Change is the Only Constant

December 14, 2021

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Colorado River Programs Manager

What is CAP and Who is CAP?

Infrastructure (Federal Project)

- 336-mile aqueduct
- 14 pumping plants total lift ~3,000 feet
- Lake Pleasant/New Waddell Dam

Water Users

- Unique Water Delivery Contract
 - Available Arizona Unused Supply
- Diverse water users
 - Tribes, Cities, Agriculture



Colorado River 101 Framing Questions:

How did we get *here*?

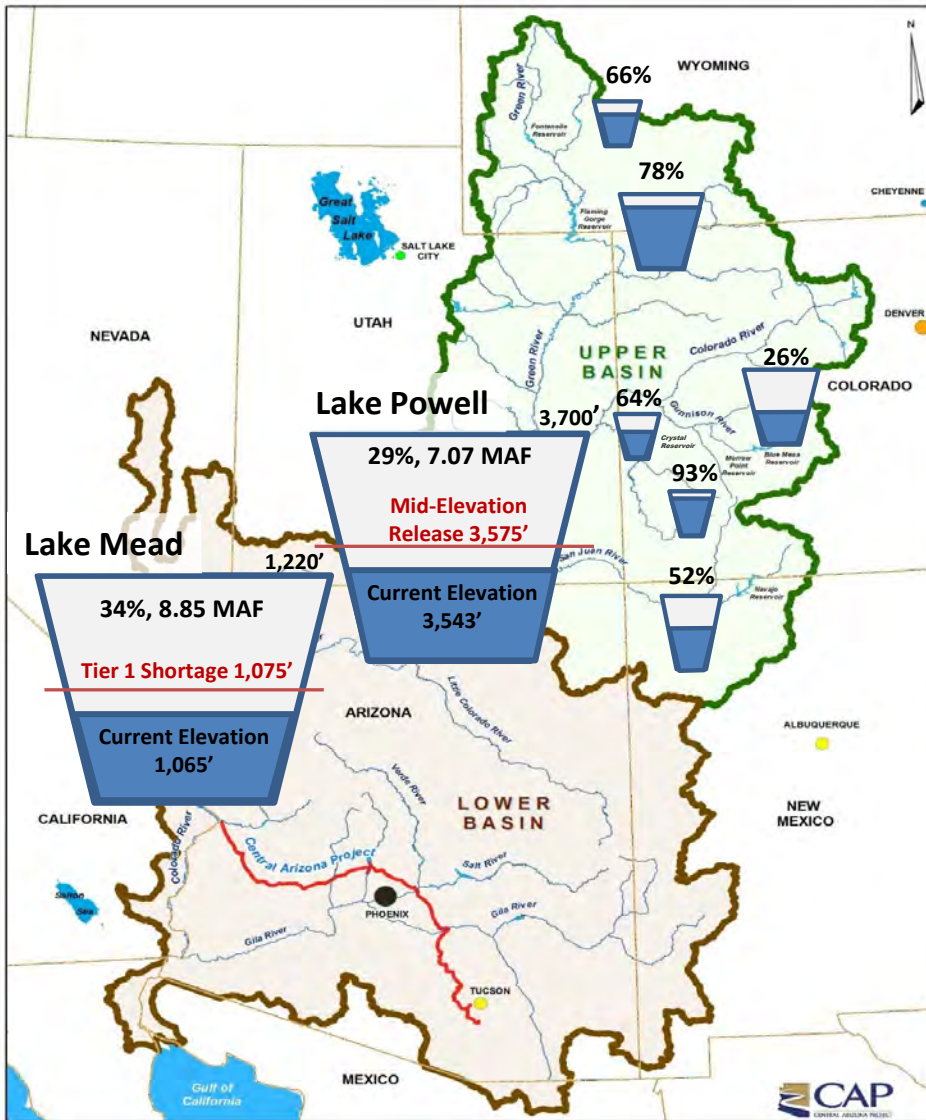
- Lower Basin will suffer Tier 1 and DCP reductions in 2022
- Additional DCP actions have been triggered (500 + Plan)
- DCP Upper Basin Drought Response Operating Agreement Provisions have been triggered
- Projections show significant risks of continued reductions going forward.

Where are we going?



Colorado River Water Supply Report

System Contents: 20.27 MAF
As of November 22, 2021



Reservoir Capacities (MAF)

Reservoir	Current	Change*	Maximum
Lake Mead	8.85	- 0.14	25.90
Lake Powell	7.07	- 0.13	24.30
Flaming Gorge Reservoir	2.91	- 0.01	3.75
Fontenelle Reservoir	0.23	0.00	0.34
Navajo Reservoir	0.88	- 0.01	1.70
Blue Mesa Reservoir	0.22	0.00	0.83
Morrow Point Reservoir	0.11	0.00	0.12
Crystal Reservoir	0.02	0.00	0.03

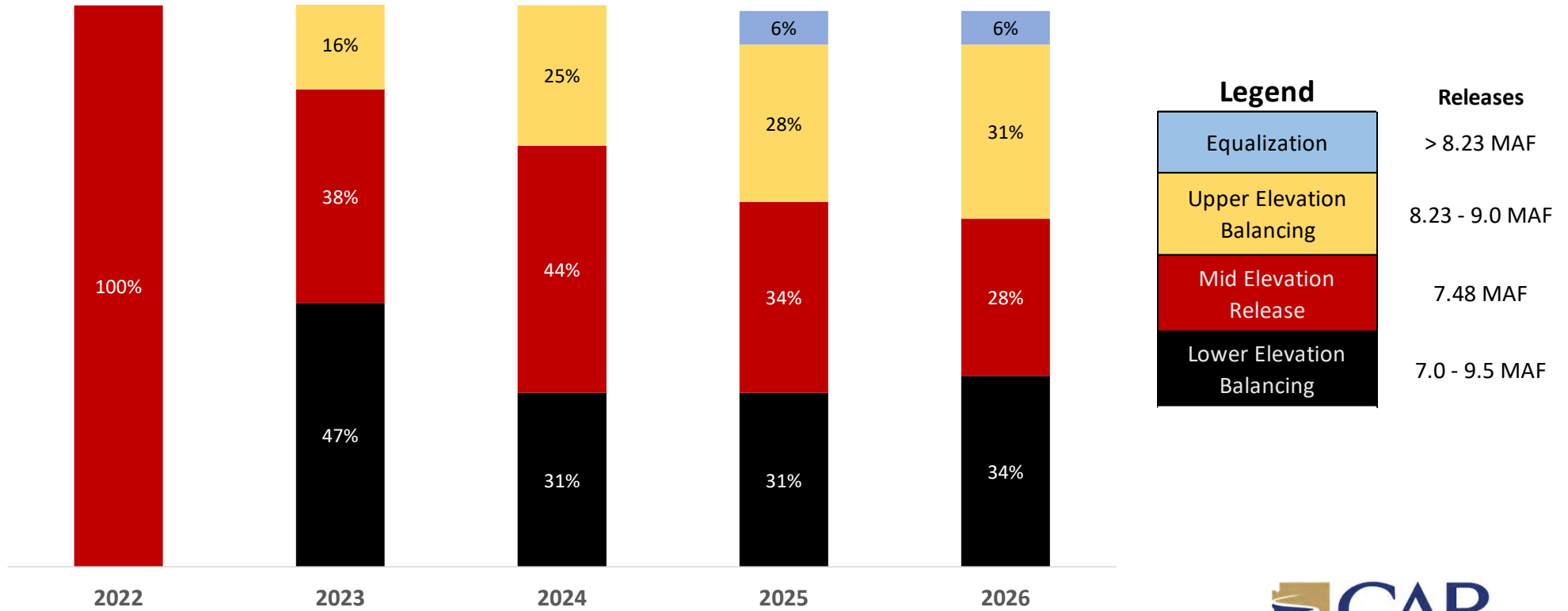
* With respect to previous month's report



YOUR WATER. YOUR FUTURE.

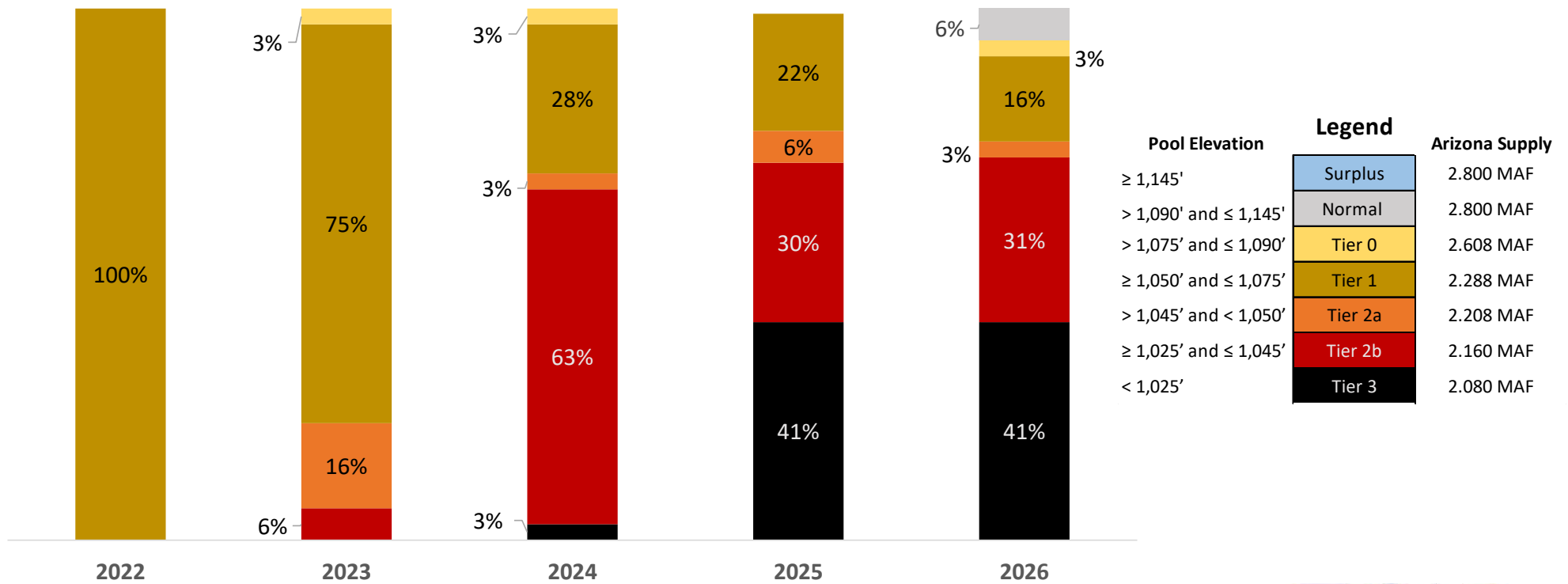
Powell 5-Year Release Probabilities for 2022-26: August 2021 CRSS Model Run (No DROA 2022 +)

Stress Test Hydrology 1988 - 2019



Mead 5-Year Operations Probabilities for 2022-26: August 2021 CRSS Model Run

Stress Test Hydrology 1988 - 2019



Four Themes Today:

1. *Mass Balance Drives the System*

- Hydrology first and foremost

2. *History Reflects Episodic Adaptive Management to Address Risks*

- Law of the River was born out of conflict and has adapted to changing circumstances

3. *The River Community Moves Towards Shared Values and Cooperation*

4. *Scarcity (real or perceived) Drives Innovation or Conflict*

- Water managers continue to **choose innovation (DROA & 500+)**

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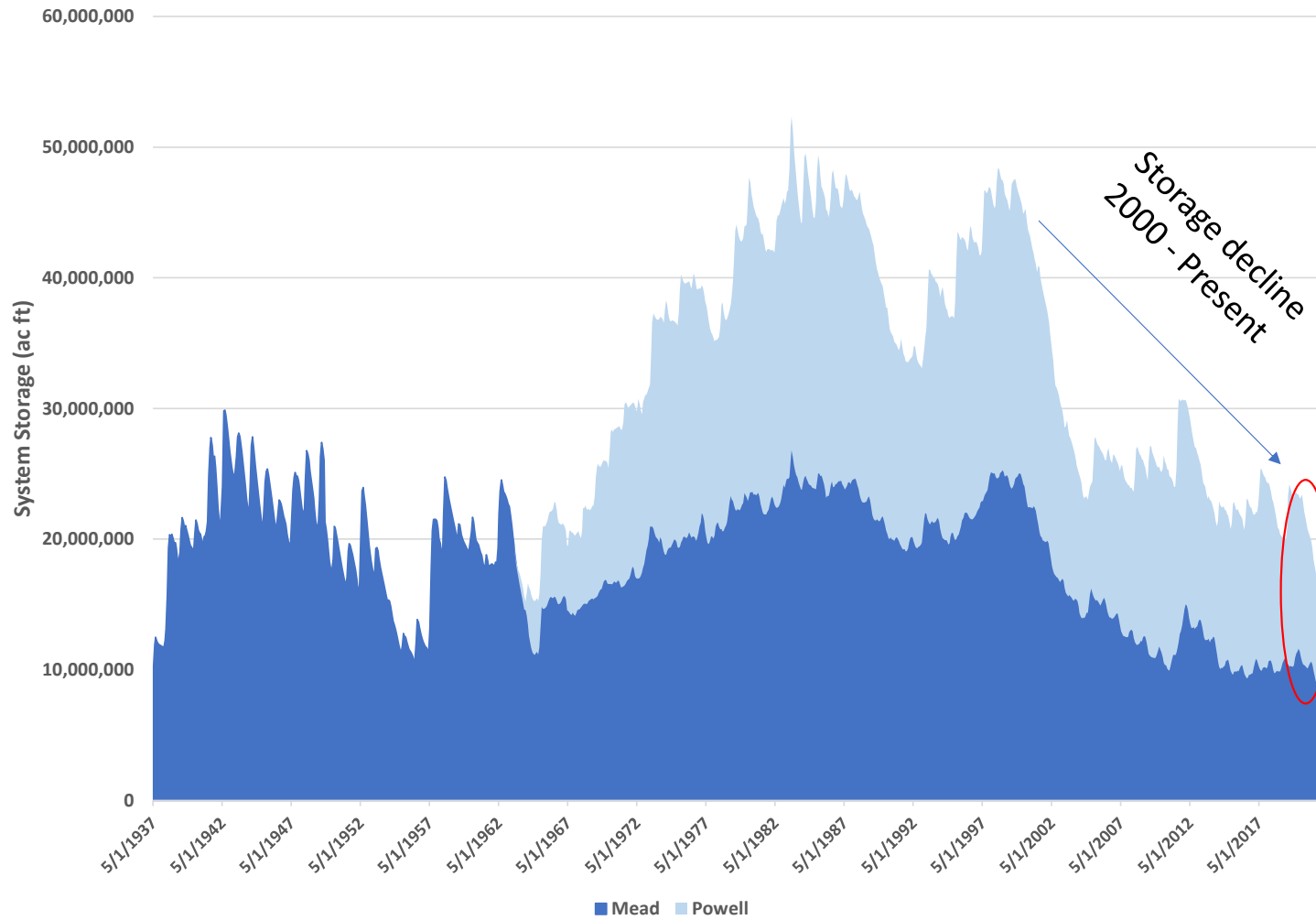
Four Themes Today:

1. *Mass Balance Drives the System*

- Hydrology first and foremost
 - Snow Matters
 - Timing Matters
 - Temperature Matters
 - Highly Variable



Combined Storage - Lake Powell & Lake Mead (EOM)

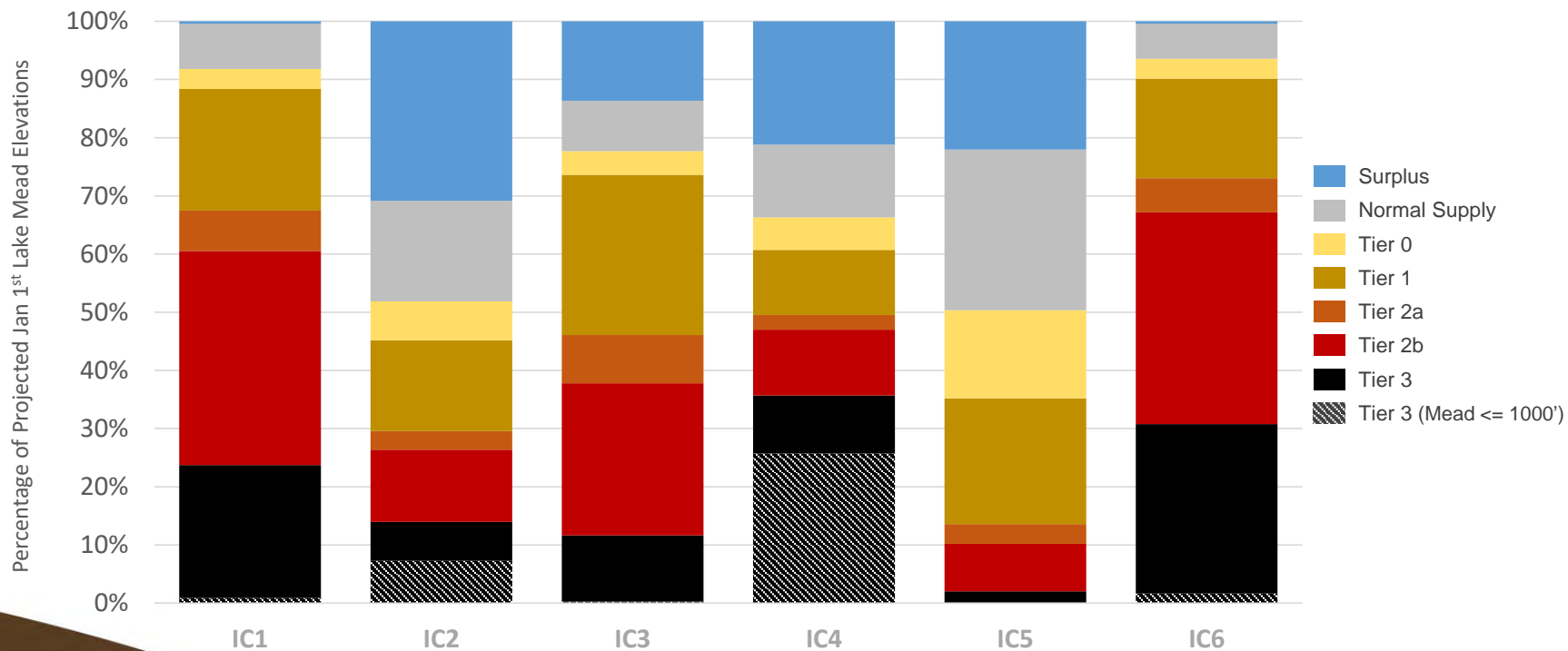


Influence of Hydrology on Lake Mead Tier Occurrence

(Arizona Reconsultation Committee 11/30/21*)

Scenario	Hydrology	Upper Basin Demand	Arizona On-River Demand	CAP Utilization
IC #1	Stress Test	Guidelines Period UB Use Extended	0.1% Growth	Medium
IC #2	Paleo-Conditioned	2016 UCRC Upper Basin Growth	0.2% Growth	Medium
IC #3	Pluvial-Removed	Guidelines Period UB Use Extended	0.1% Growth	Medium
IC #4	Downscaled GCM	2016 UCRC Upper Basin Growth	0.2% Growth	Fast
IC #5	Pluvial-Removed	Upper Basin Guidelines Period Average	On-River Guideline Average	Medium
IC #6	Stress Test	2012 Basin Study Current Trends Growth	0.2% Growth	Fast

Tier Occurrence During Projection Period



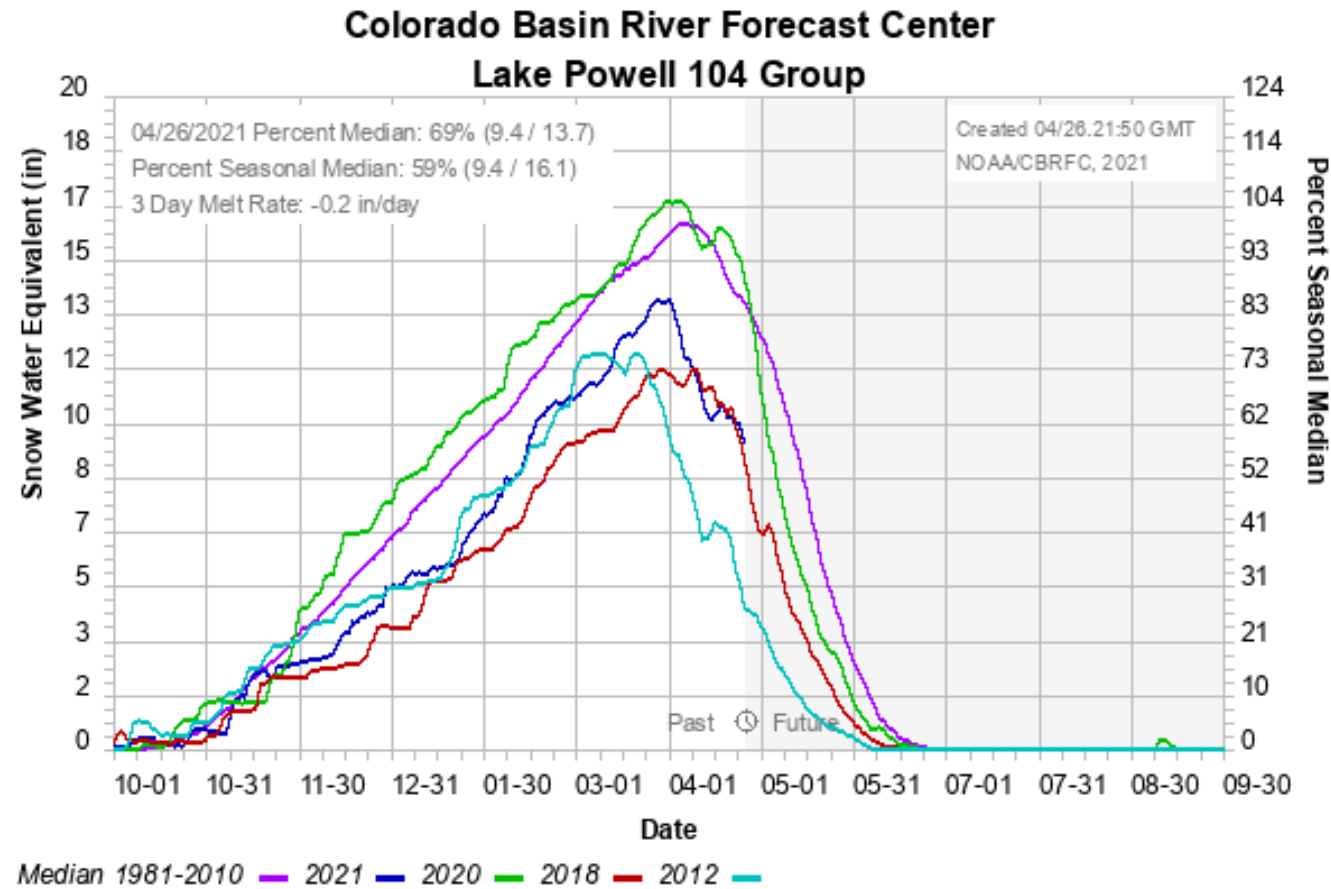
• <https://www.cap-az.com/water/water-supply/protecting-cap-reliability/arizona-reconsultation-committee/>

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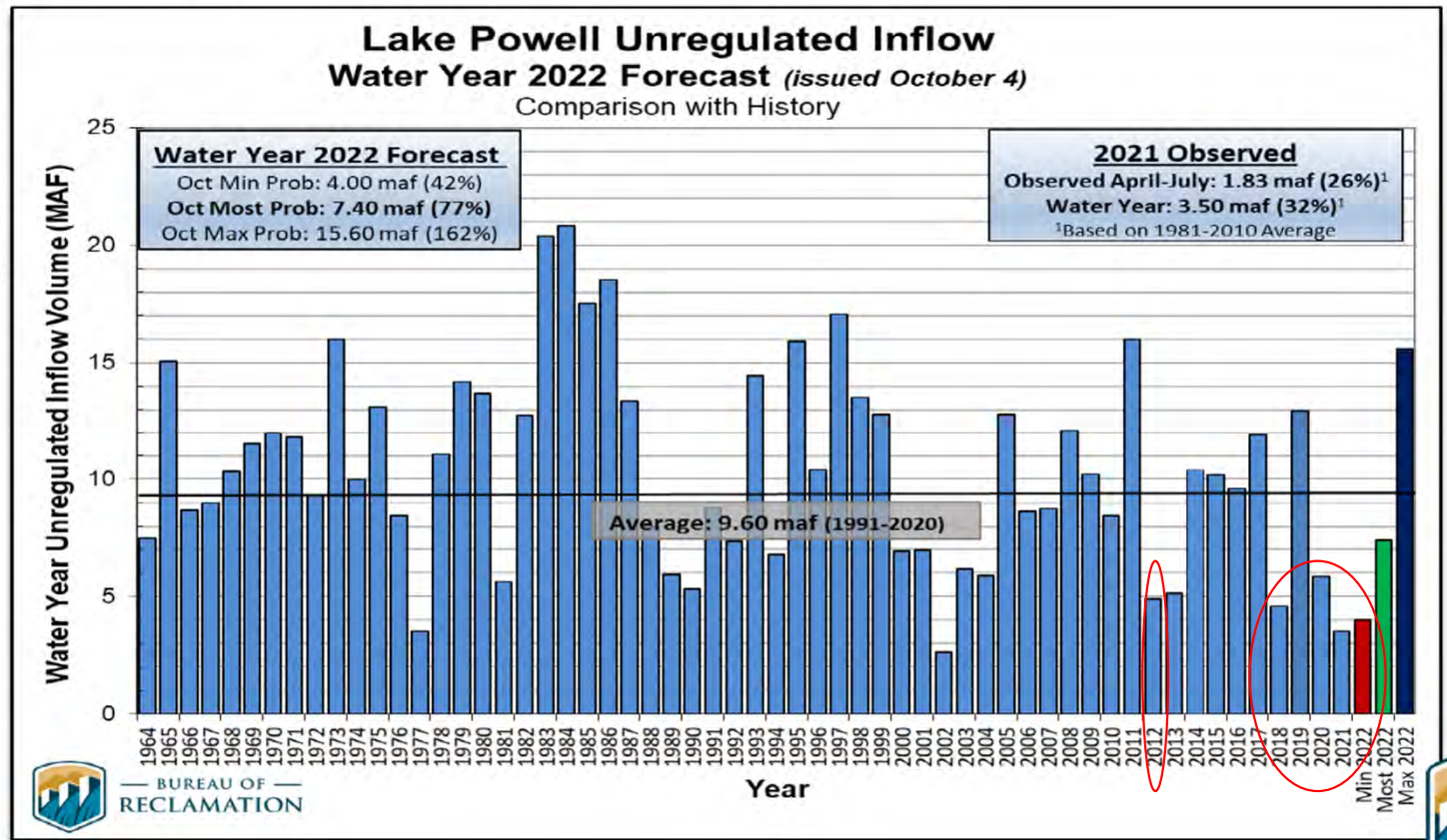
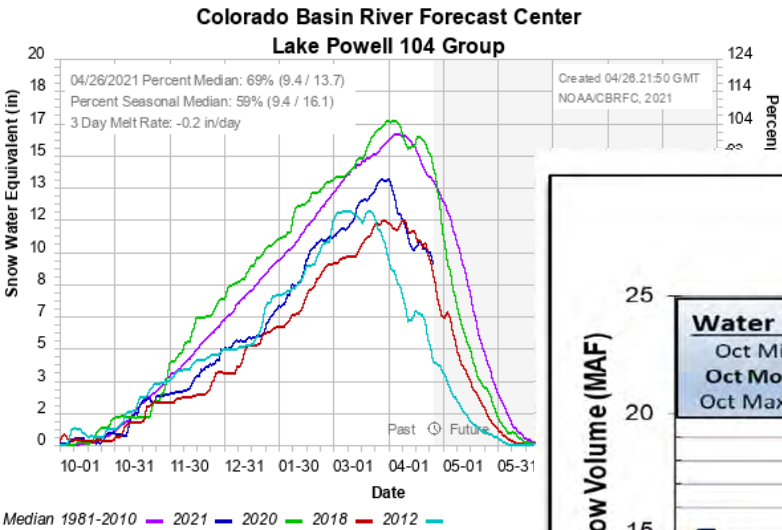
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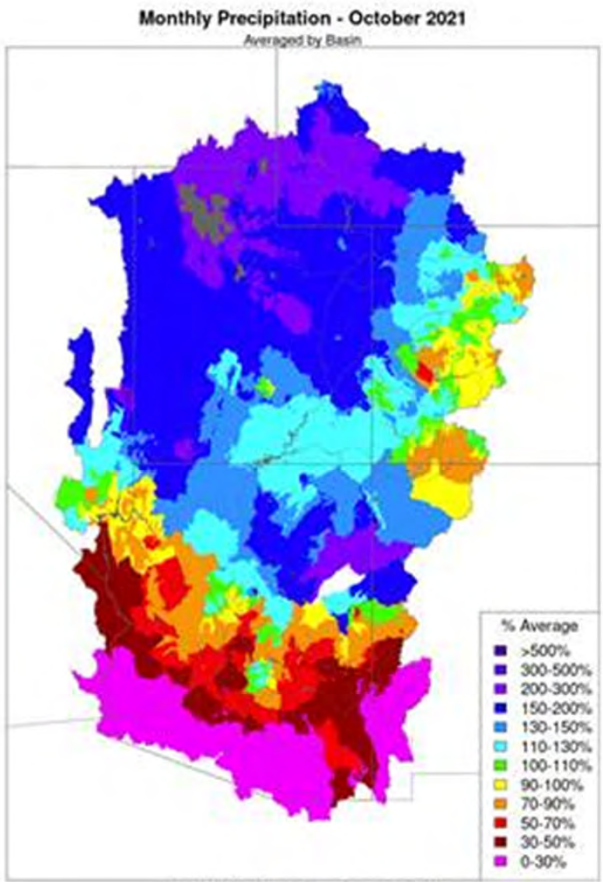
- Snow Matters
- Timing Matters
- Soil Memory Matters



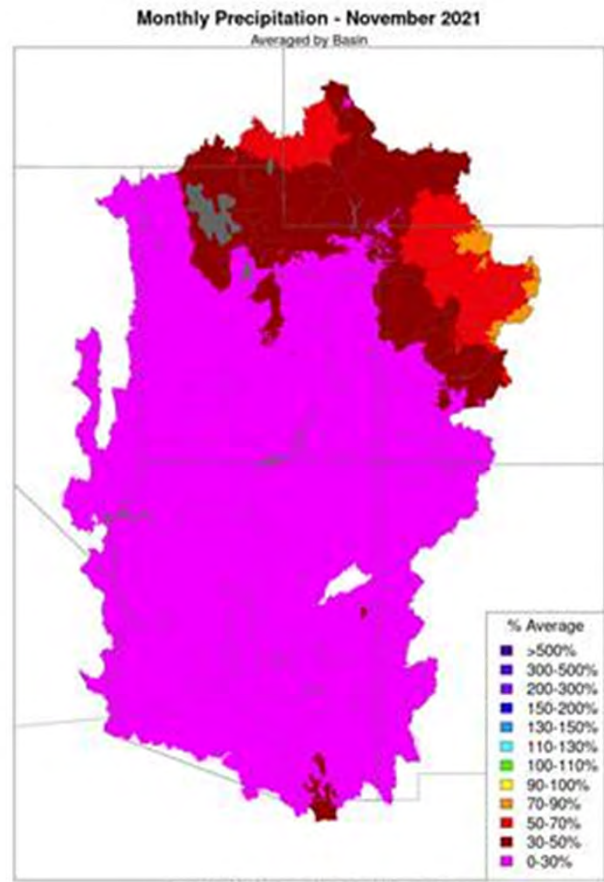
Snow Matters, Timing Matters & Soil Memory Matters



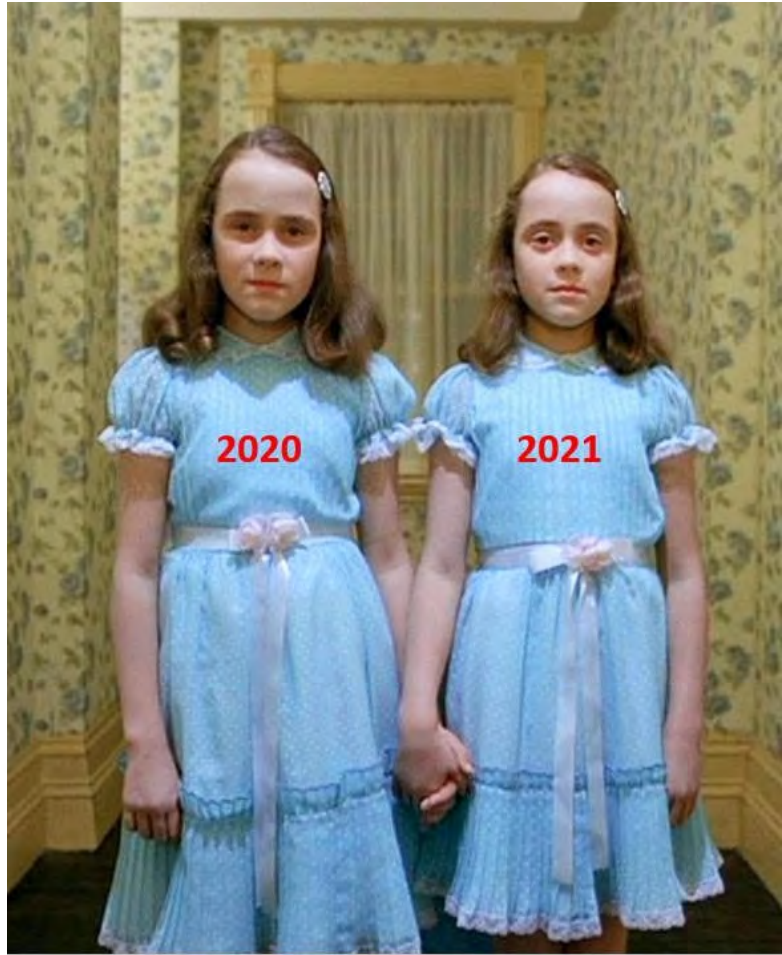
Monthly Precipitation – Oct. & Nov. 2021



Prepared by NOAA, Colorado Basin River Forecast Center
Salt Lake City, Utah, www.cbrfc.noaa.gov



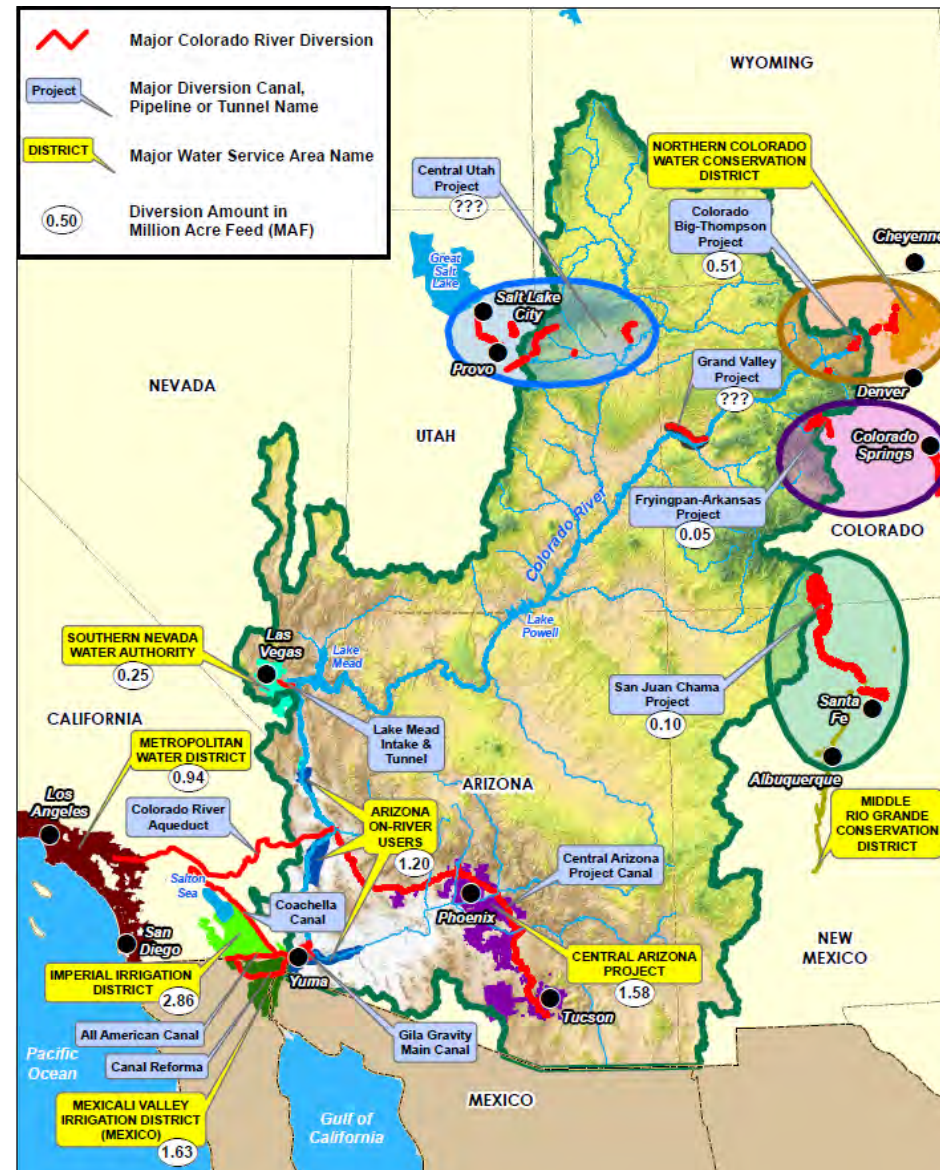
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The Built System:

1. Lower Basin System (extreme summary):

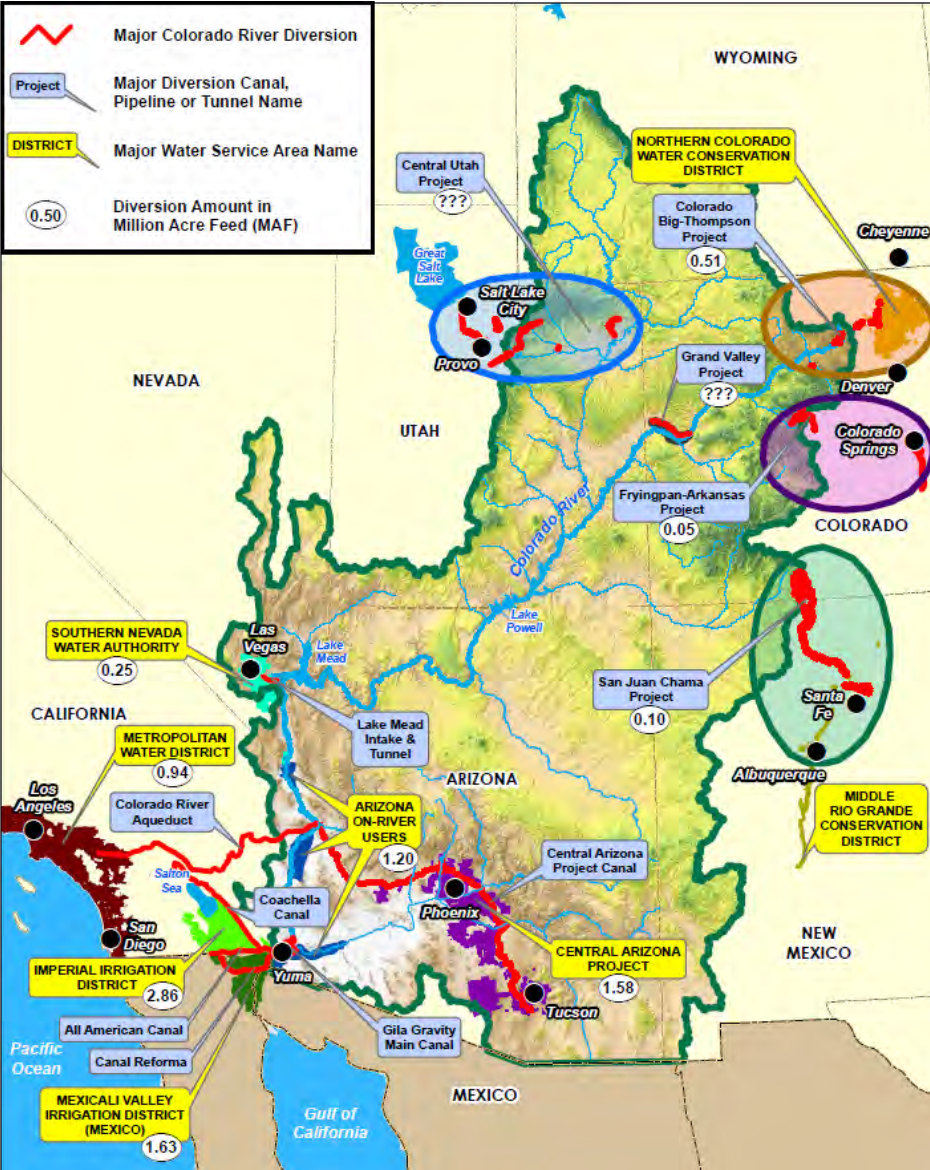
- Yuma Project
- Boulder Canyon Project Act
 - Hoover Dam/Lake Mead
 - Imperial Dam/All American Canal
- Parker Dam & Colorado River Aqueduct
- Davis Dam
- Colorado River Basin Project Act
 - Central Arizona Project
- Salinity Control Act – Title I
 - 242 Wells
 - Yuma Desalting Plant
 - Main Outlet Drain Extension
- Mexico
 - Mexicali & Tijuana



The Built System:

2. Upper Basin System (extreme summary):

- Colorado River Storage Project Initial Units
 - Glen Canyon Dam
 - Flaming Gorge Dam
 - Navajo Dam
- Colorado Big Thompson Project
- Fryingpan-Arkansas Project
- San Juan Chama Project
- Central Utah Project



The Built System: Powell & Mead + Everything Else



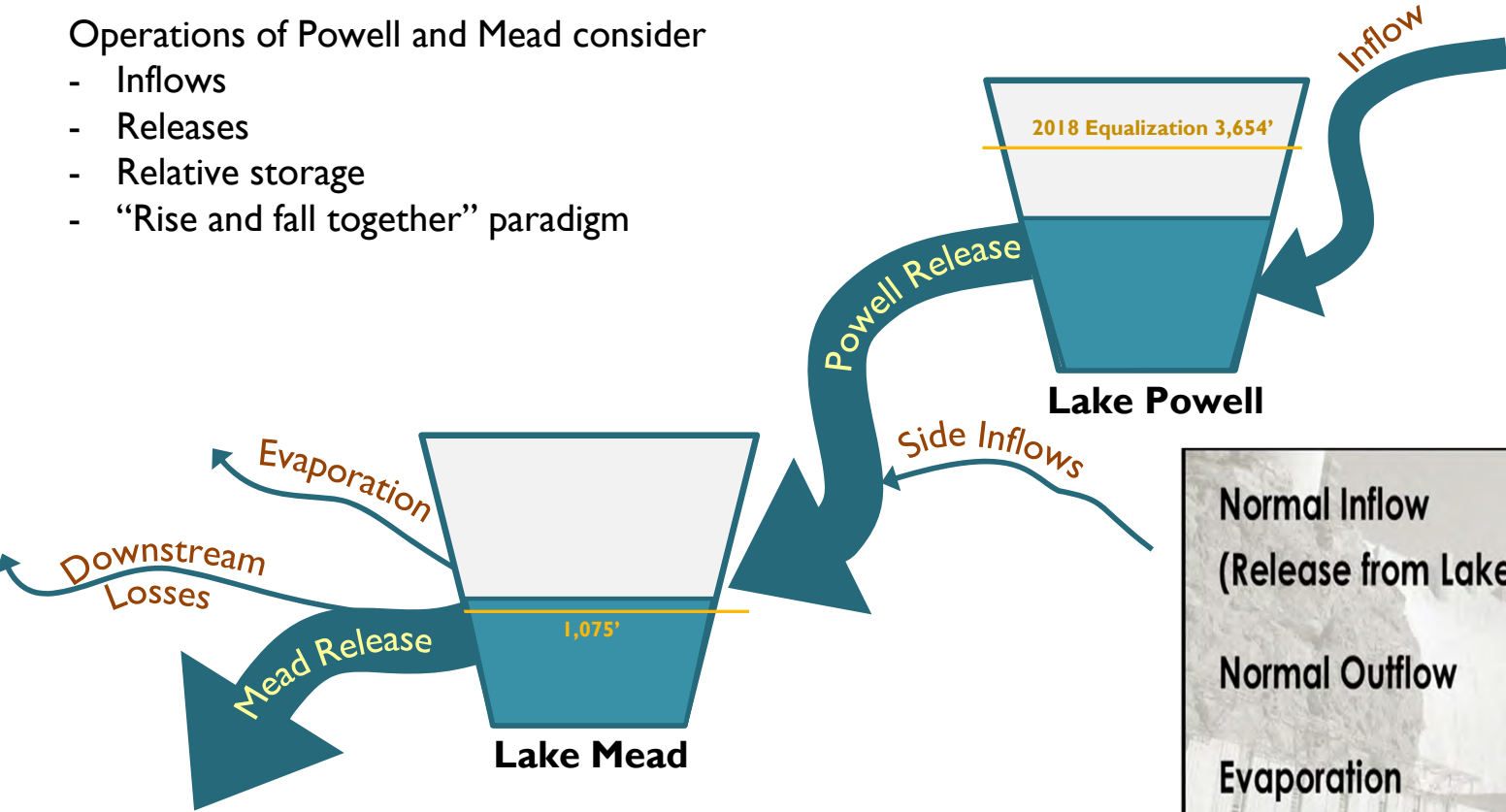
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Mass Balance Drives The System:

Operations of Powell and Mead consider

- Inflows
- Releases
- Relative storage
- “Rise and fall together” paradigm



Normal Inflow (Release from Lake Powell plus smaller rivers)	9.0 MAF
Normal Outflow	9.6 MAF
Evaporation	0.6 MAF
Balance	-1.2 MAF

Approximately 12 foot decline in normal year

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- Water managers continue to **choose innovation (DROA & 500+)**



Law of the River Born Out of Conflict – Adaptive & Innovative

1922 Colorado River Compact

- Imperial Irrigation District vs. Everybody
- Fall Davis Report and Companion Legislation
- Compact Negotiations & Arizona Conflict

Compact Innovations

- “Promote Interstate Comity” with commitments to work collaboratively
- Recognizes Binational nature of the Colorado River and path for Treaty with Mexico
- Creates space for development and management outside of prior appropriation (equitable apportionment)



Law of the River Born Out of Conflict – Adaptive & Innovative

1944 Water Treaty with Mexico

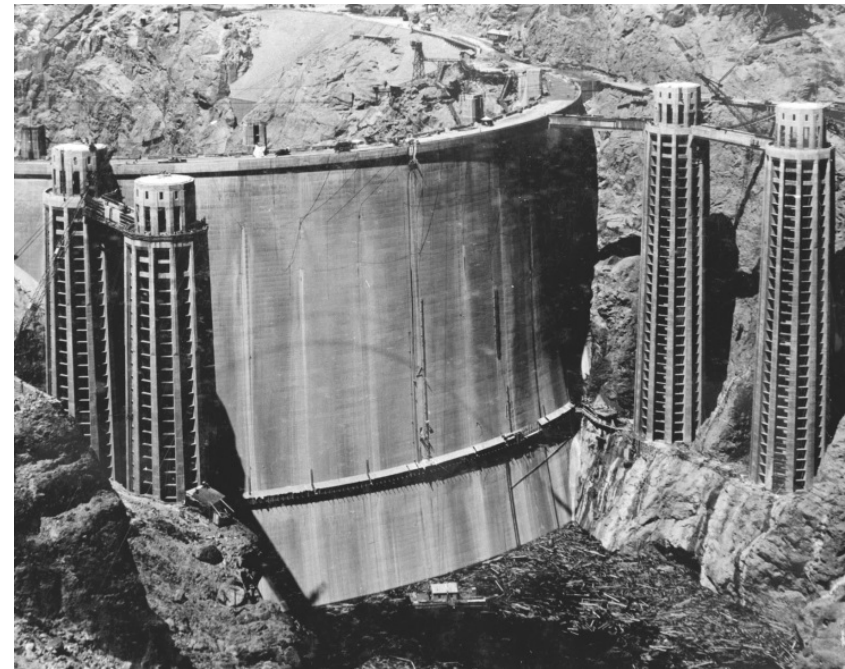
- Conflict due to U.S. upstream development
- U.S. needed to resolve water supply uncertainty with Mexico PRIOR to additional upstream development: CRSP & CBRP

Treaty Innovations

- Concept of shared risks and shared opportunities between Mexico and the U.S.: drought and surplus provisions
- Recognizes Binational nature of the Colorado River and need for cooperation/collaboration
- Creates unique binational agency to implement the Treaty: IBWC with Mexico and U.S. sections



Signing of 1944 Treaty



Law of the River Born Out of Conflict – Adaptive & Innovative

1948 Upper Colorado River Basin Compact

- Resolves apportionments among Upper Division States
- Necessary to resolve uncertainty among Upper Division PRIOR to additional development: CRSP & CBRP

Compact Innovations

- Collaboration among the Upper Division States to address shared risks, obligations and opportunities
- Creates unique interstate water agency to implement the Compact: Upper Colorado River Commission



Law of the River Born Out of Conflict – Adaptive & Innovative

1964 Arizona v. California Decree

- Resolves enduring conflict between Arizona and California: Ended ERA of Conflict
- Necessary to resolve uncertainty PRIOR to additional development: CBRP & Central Arizona Project,

Decree Innovations

- Enshrined the Federal role established in the Boulder Canyon Project Act
- Guidance for implementing surplus and shortages
- Framework for transparency and accounting



Law of the River Born Out of Conflict – Pivot to Shared Values and Cooperation

1969 National Environmental Protection Act

- Structured Decision Making and Stakeholder Engagement

1973 Endangered Species Act

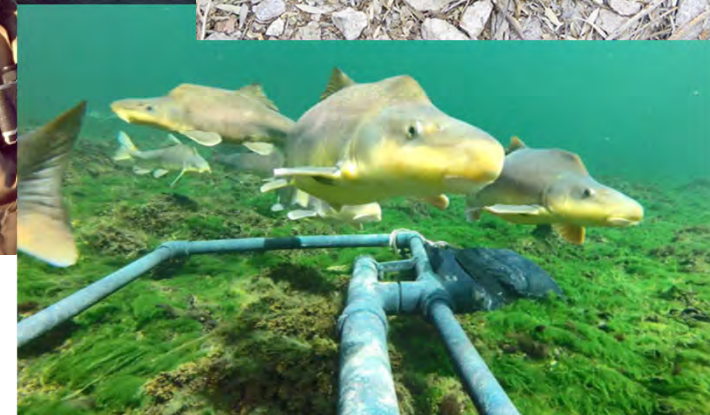
- More than Engineers in the Federal Space

1974 Colorado River Basin Salinity Control Act

- Formal venue for Basin-wide collaboration and engagement

1992 Grand Canyon Protection Act

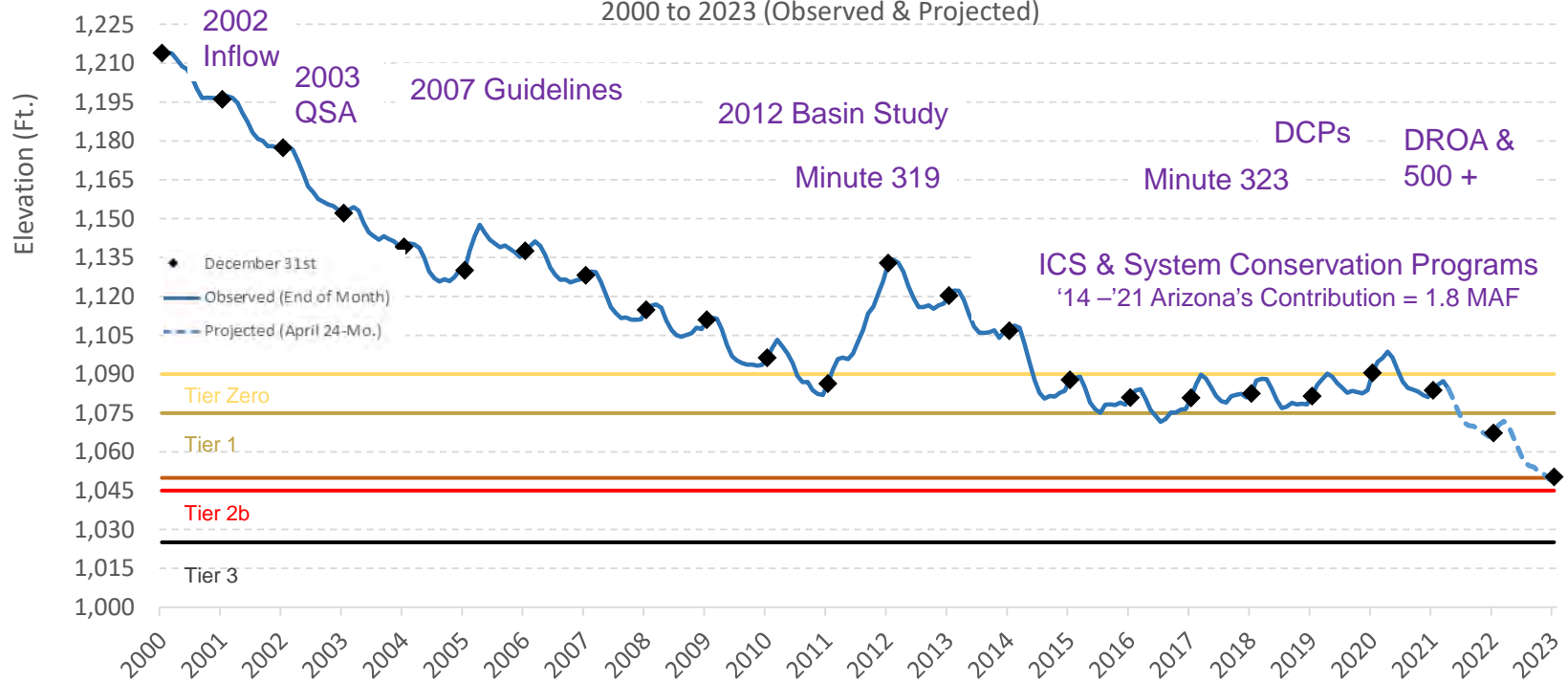
- Structured and inclusive engagement on Glen Canyon operations (AMWG)



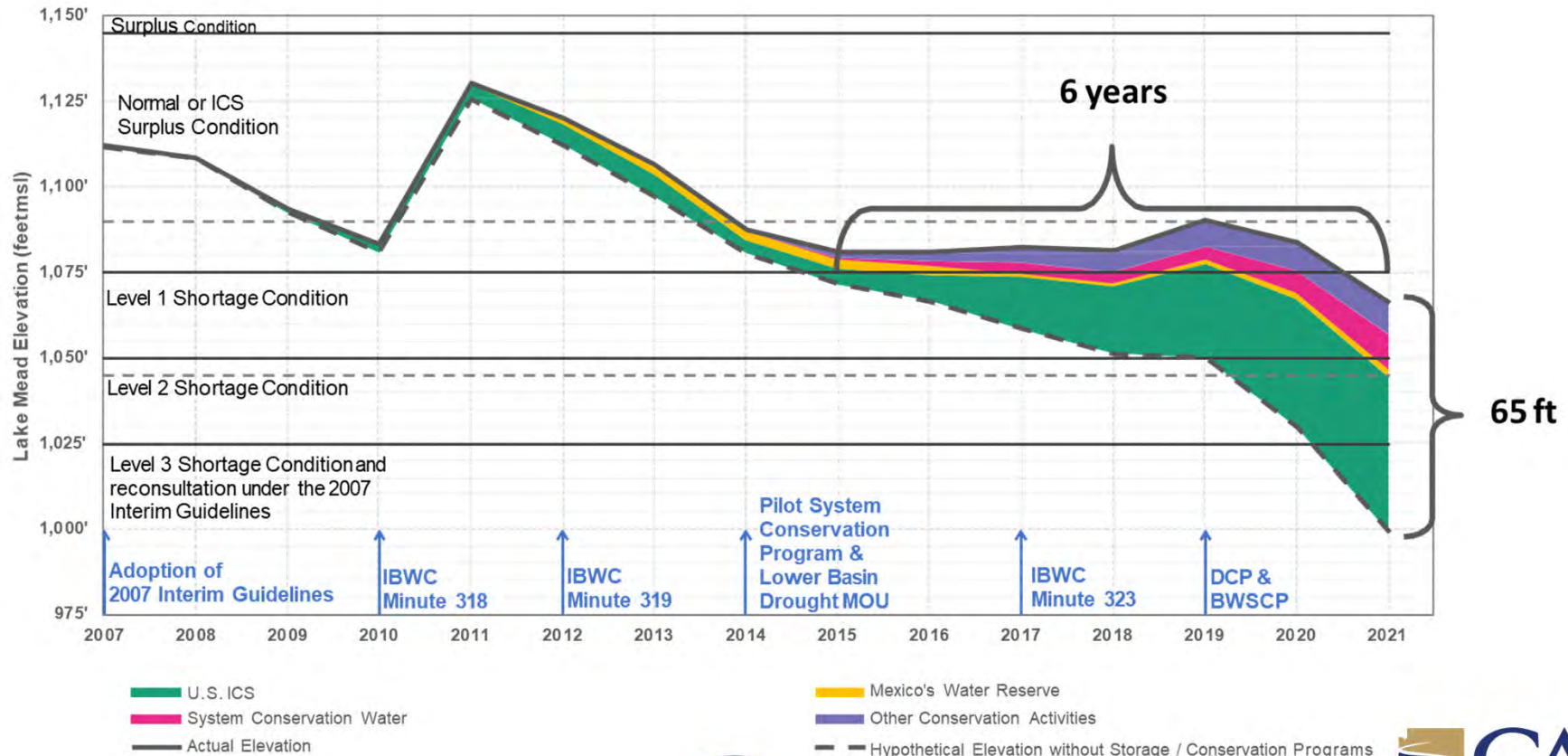
Scarcity Drives Collaboration & Innovation

Lake Mead Elevation

2000 to 2023 (Observed & Projected)



Scarcity Drives Innovation - Role of Conservation



Scarcity Drives Innovation: Examples

Minutes 319 & 323

- Shared risks and opportunities
- Water exchange and conservation
- Joint investment in environmental values

2003 QSA

- Water exchanges/transfers & 4.4 Plan

2007 Guidelines

- Policy incentives for conservation and storage in Lake Mead
- Explicit and formal linkage between Powell and Mead operations
- Transparent and certain operating regime
- Incentives led to conservation infrastructure (Brock Reservoir & YDP Pilot Run)

Drought Contingency Plans

- Coordinated among Upper and Lower Basin along with Mexico (323)
- Additional contributors in Arizona (tribal participation)
- Adaptive Management Triggers (DROA & 500 + Plan)





Photo courtesy of Jim Geisbush - taken at CAP Check 12