Analysis of Colorado River Basin Storage Suggests Need for Immediate Action

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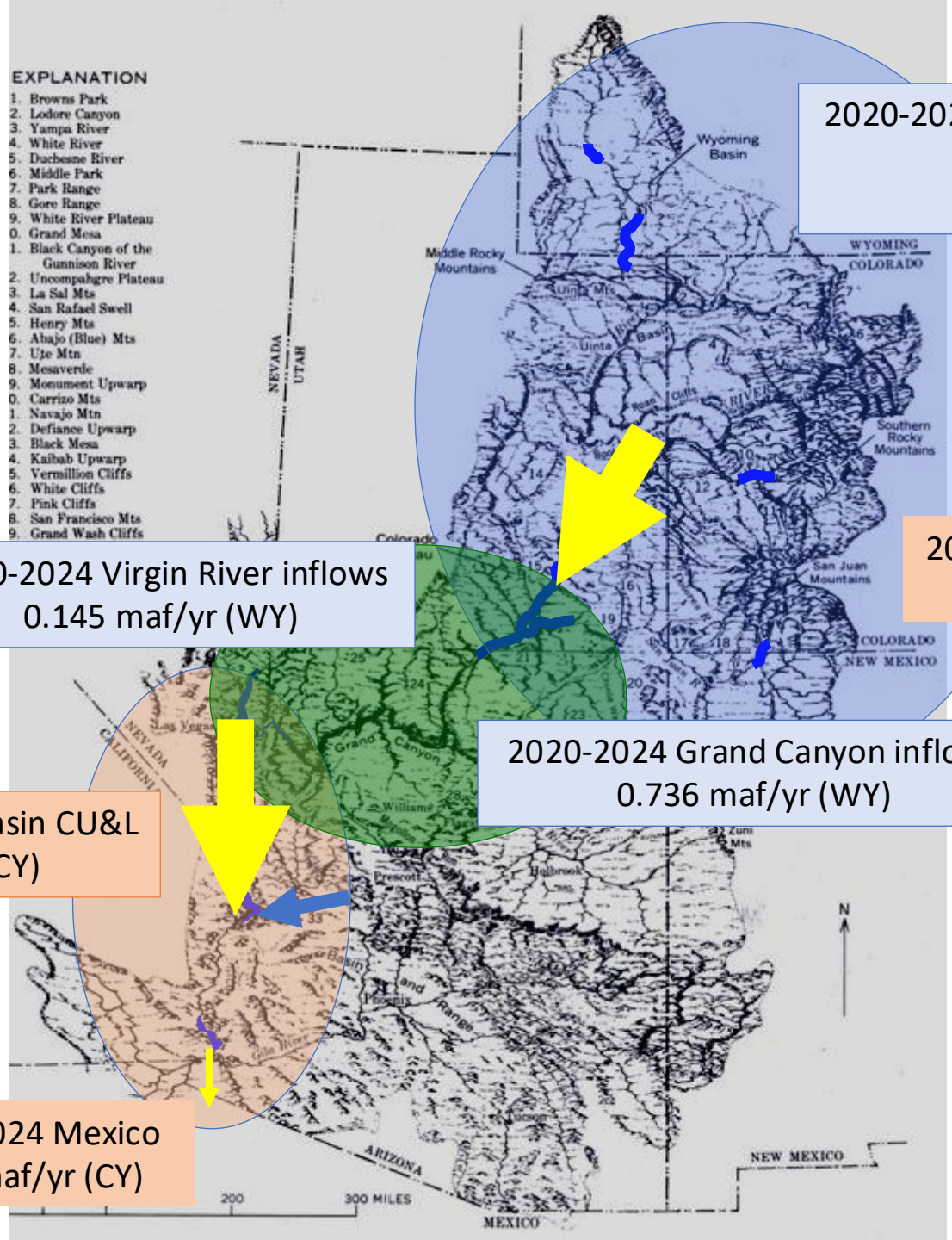
**with Sarah Porter*

photo: Freshwaters Illustrated

21st Century water budget (2020-2025)

Average inflow = 11.66 maf/yr (WY)
CU&L* = 13.16 maf/yr (CY)

inflow < use
Annual deficit = 1.5 maf/yr



2020-2025 Upper Basin natural flow
10.78 maf/yr (WY);
10.87 maf/yr (CY)

2020-2024 Upper Basin CU&L
4.40 maf/yr (CY)

2020-2024 Virgin River inflows
0.145 maf/yr (WY)

2020-2024 Grand Canyon inflows
0.736 maf/yr (WY)

2020-2024 Lower Basin CU&L
7.32 maf/yr (CY)

2020-2024 Mexico
1.44 maf/yr (CY)

<u>Simple mass balance</u>

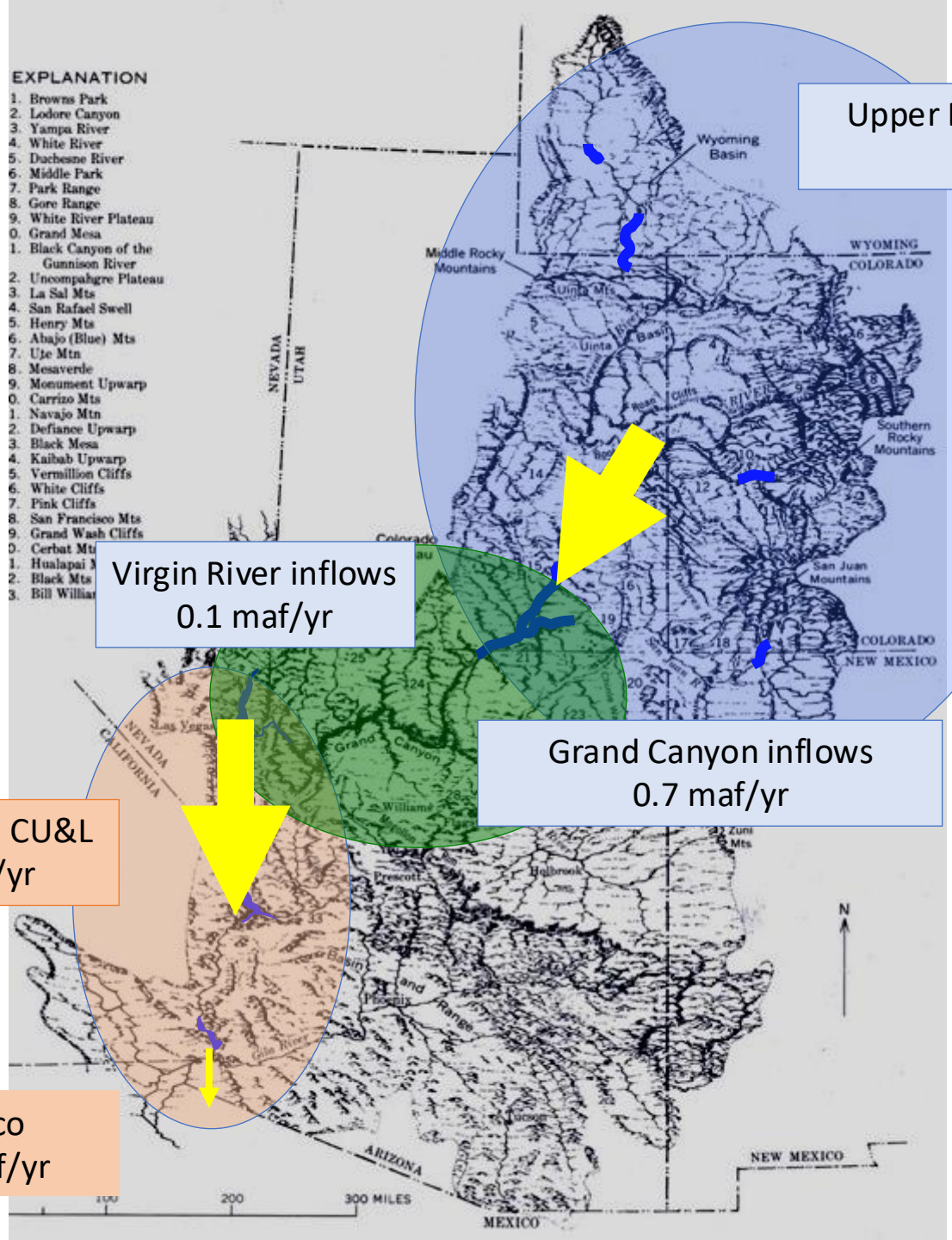
In – Out = Δ storage

** does not include riparian ecosystem evapotranspiration losses on Lower River (~0.4 maf/yr)*

A Plausible and Conservative Water Budget for 2025-2026

Average inflow = 9.3 maf
CU&L *= 12.9 maf

inflow < use
deficit ~3.6 maf



Upper Basin natural flow
8.5 maf/yr

Upper Basin CU&L
4.3 maf/yr

Virgin River inflows
0.1 maf/yr

Grand Canyon inflows
0.7 maf/yr

Lower Basin CU&L
7.2 maf/yr

Mexico
1.4 maf/yr

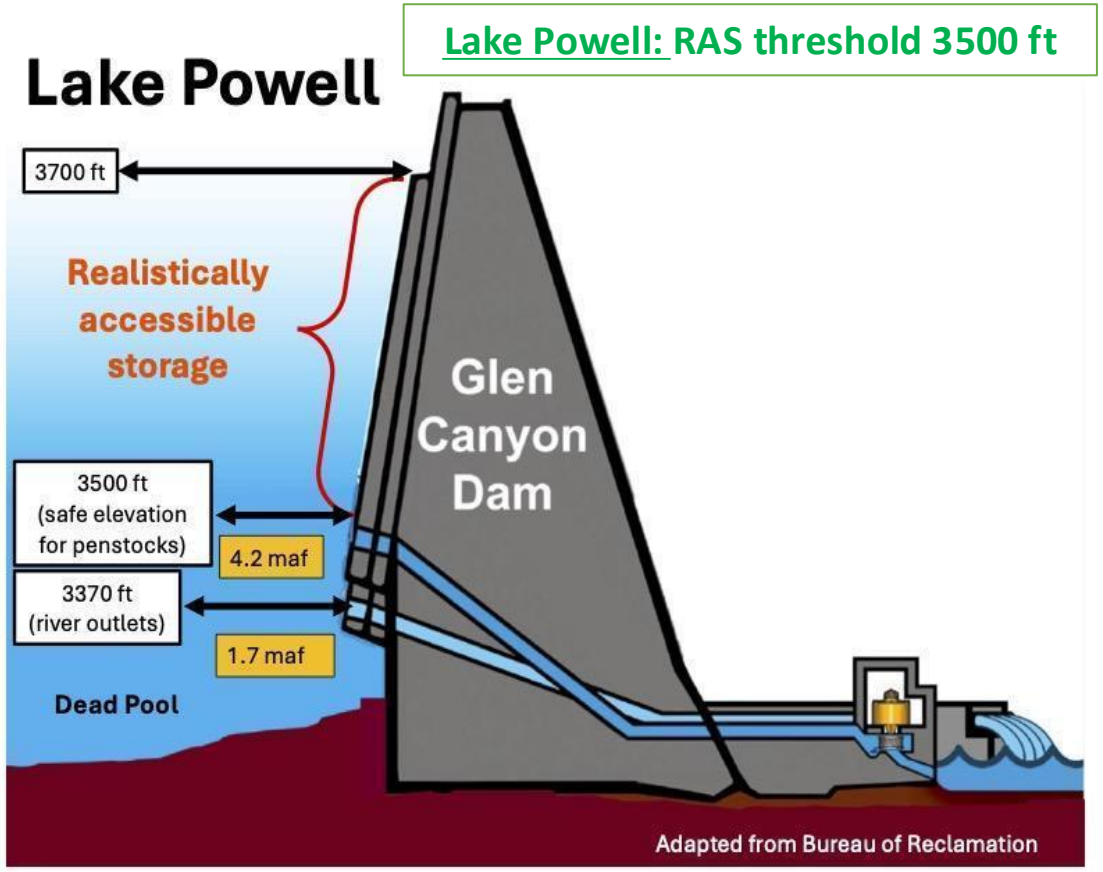
** does not include riparian ecosystem evapotranspiration losses on Lower River (~0.4 maf/yr)*

What If next year is as dry as last year and consumptive use is not reduced?

*There is **8.7 maf** of active storage in Lake Powell and Lake Mead below RAS threshold. If critical elevation in Lake Mead is 1035 ft, there is **10.9 maf** below RAS threshold.*

Lake Mead: RAS threshold =1035 ft
Lake Mead: RAS threshold = 1000 ft

Lake Powell: RAS threshold 3500 ft

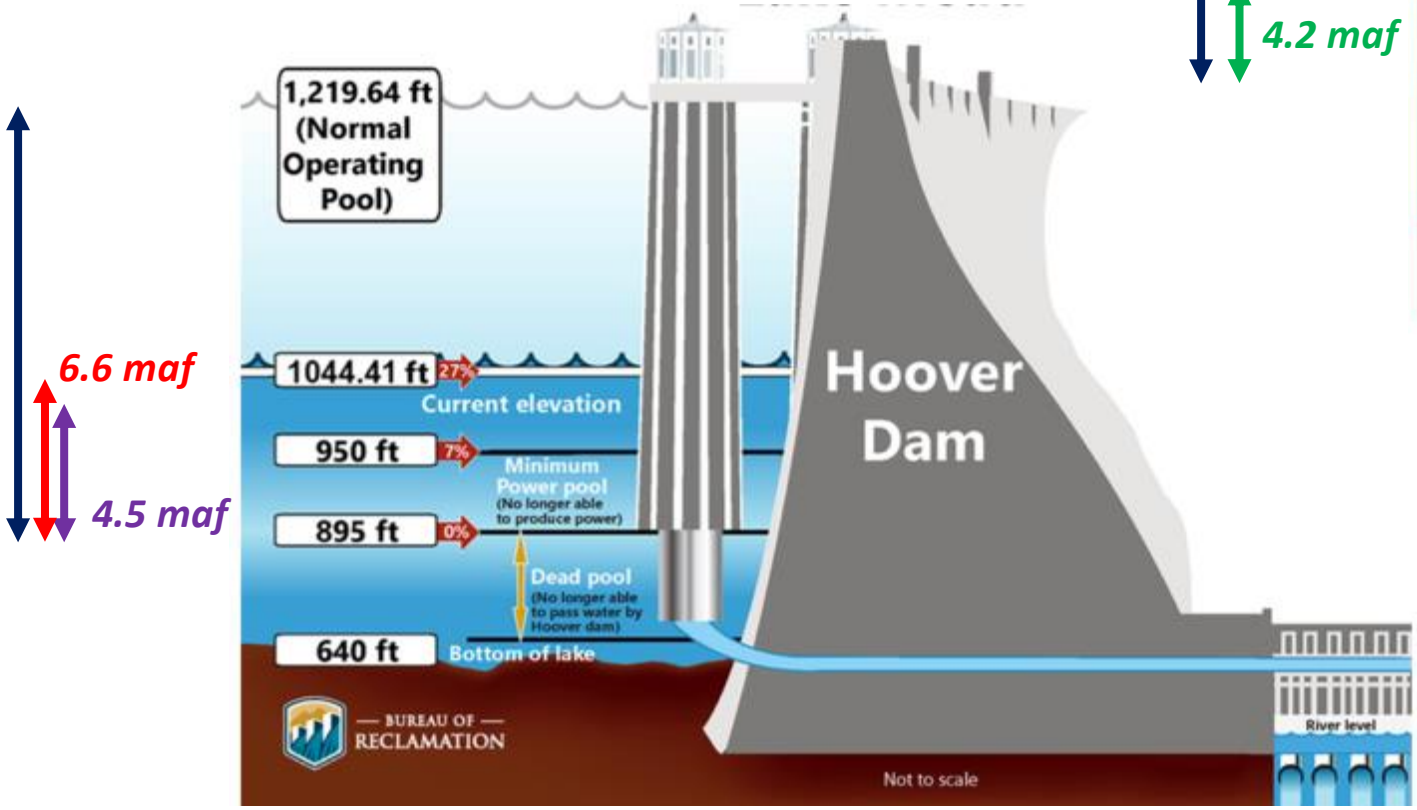


active storage

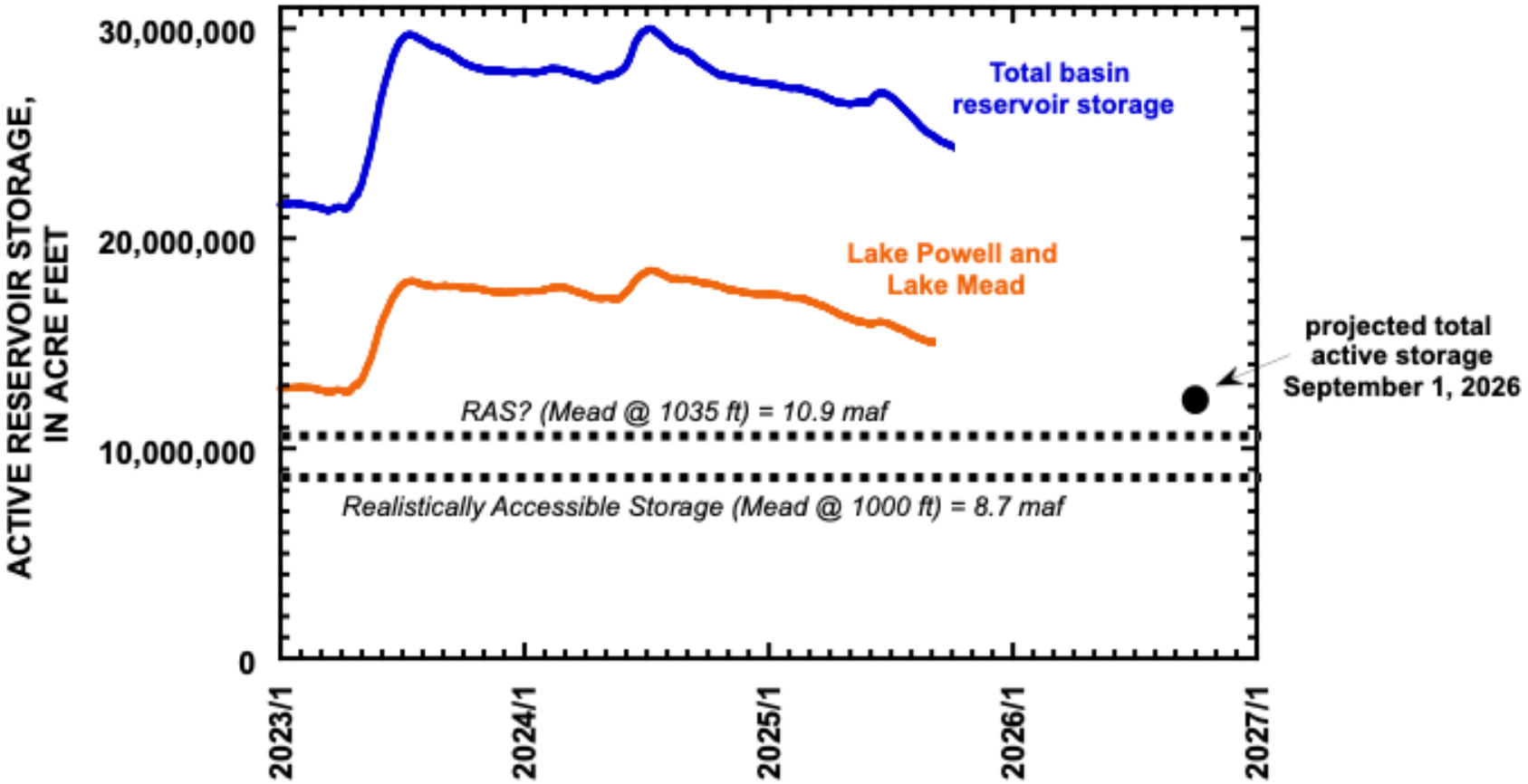
4.2 maf

6.6 maf

4.5 maf



Realistically Accessible Storage (RAS) – storage above levels at which significant engineering, environmental, and political issues develop

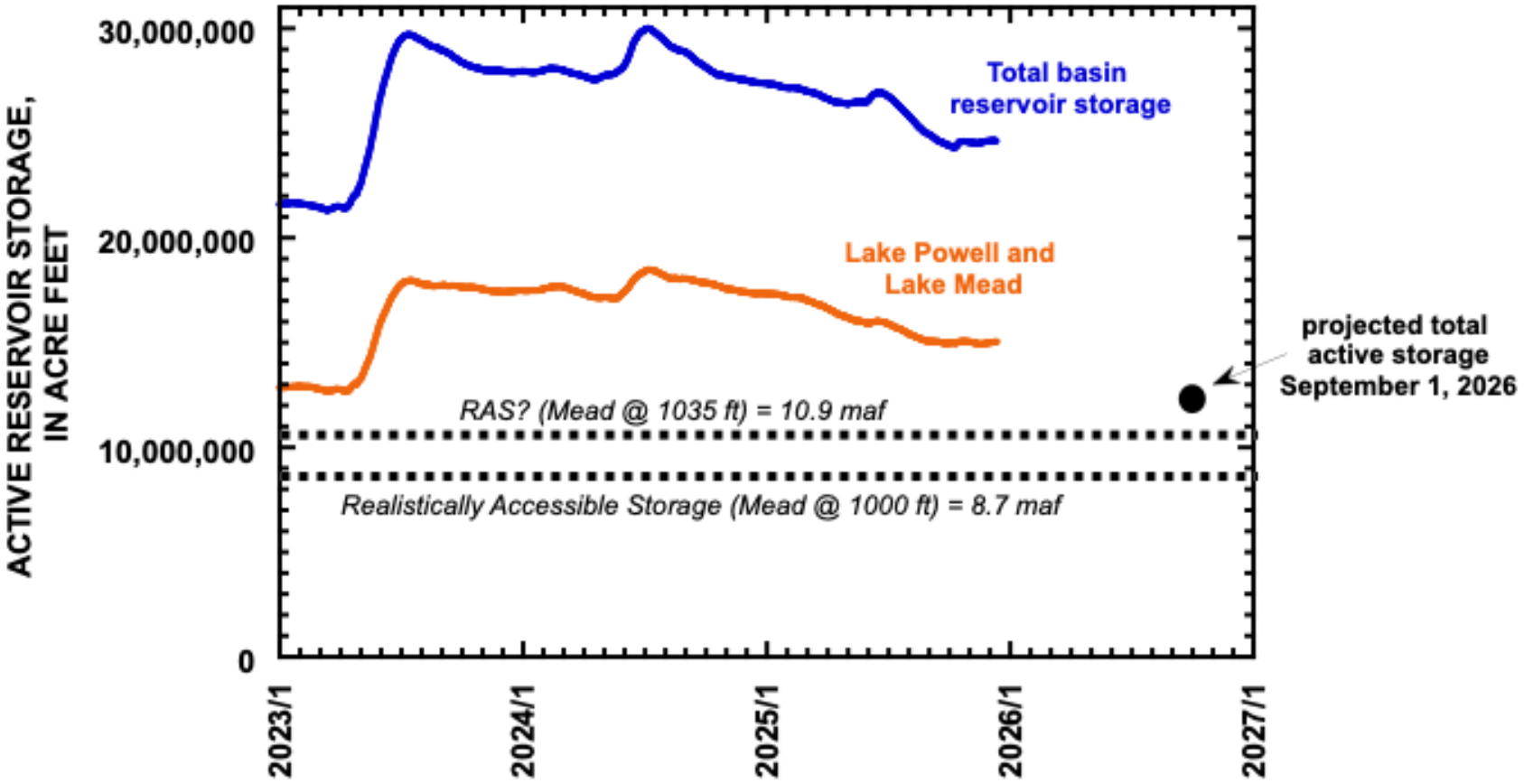


Scenario projection

Storage in early September 2026 would be less than record low of 21st century (mid-March 2023)

Realistically accessible storage in late summer 2026 would be less than 4 maf with ~6 mths of additional depletions before 2027 inflow season.

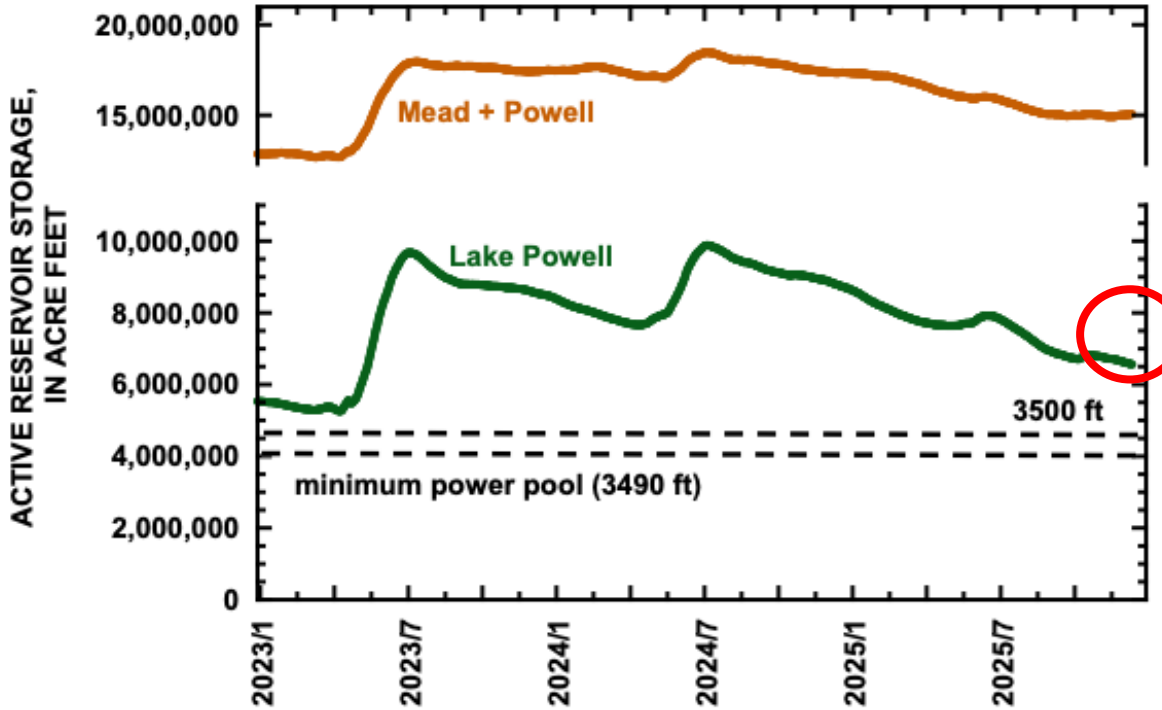
P+M active storage (1 S 2025) = 15.1 maf
P+M RAS (1 S 2025) = 6.4 maf
Basin-wide deficit = 3.6 maf
Deficit allocated to P+M = 2.7 maf
P+M RAS (1 September 2026) = 3.7 maf
P+M RAS >Mead 1035 ft = 1.5 maf



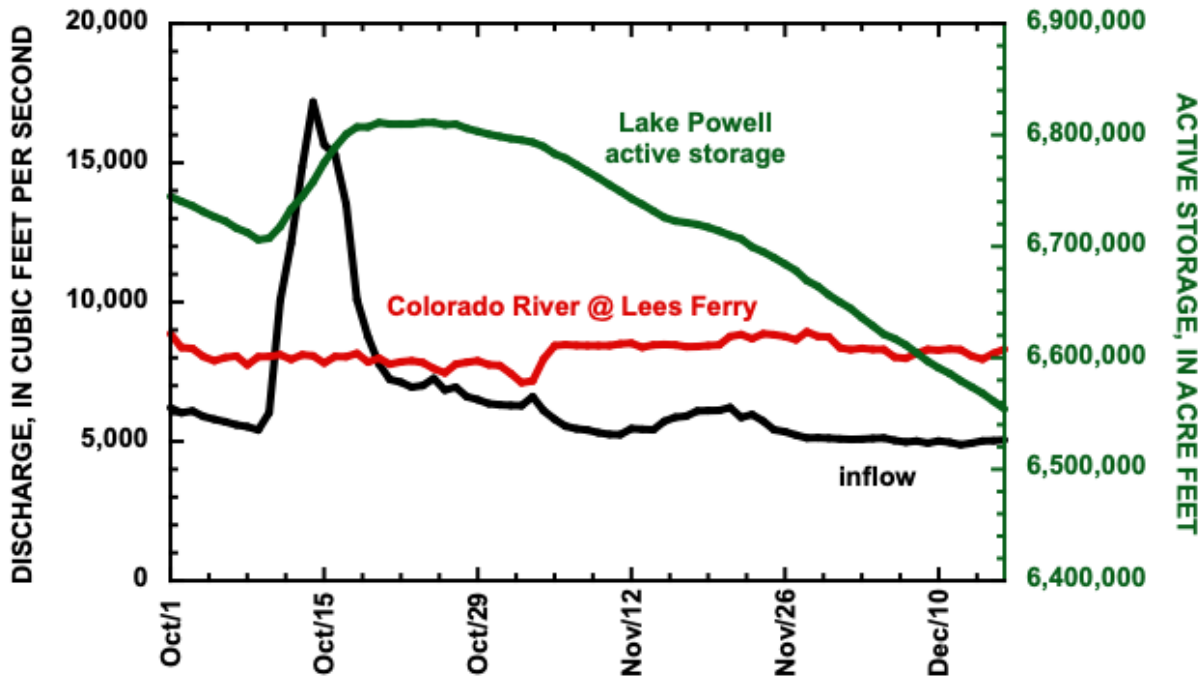
What was the effect of autumn rains?

Increased autumn inflows and reduction in Lower Basin demand delayed depletion of Powell+Mead storage by ~2.5 months.

General findings –
without continued reduction in consumptive use, it is likely that P+M storage will be less than record 21st century low **if Lees Ferry natural flow < 10.5 maf.**



Autumn rains delayed drawdown of Lake Powell by ~ 6 weeks

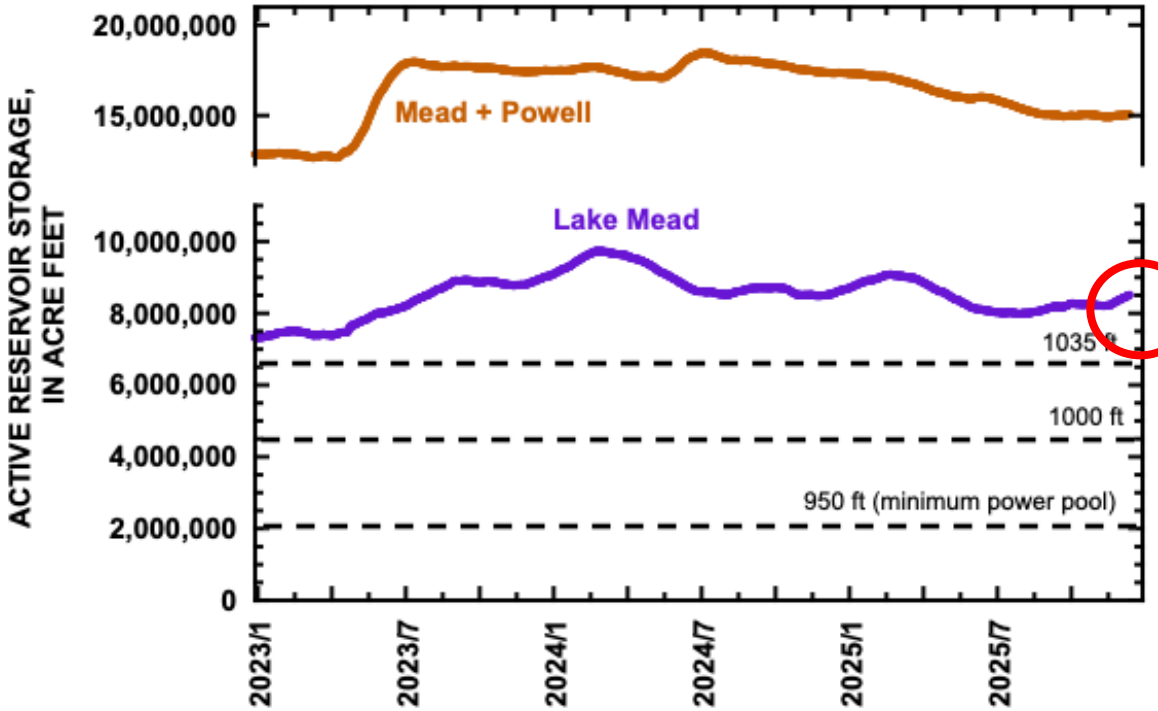


<u>Lake Powell (*current conditions**)</u>

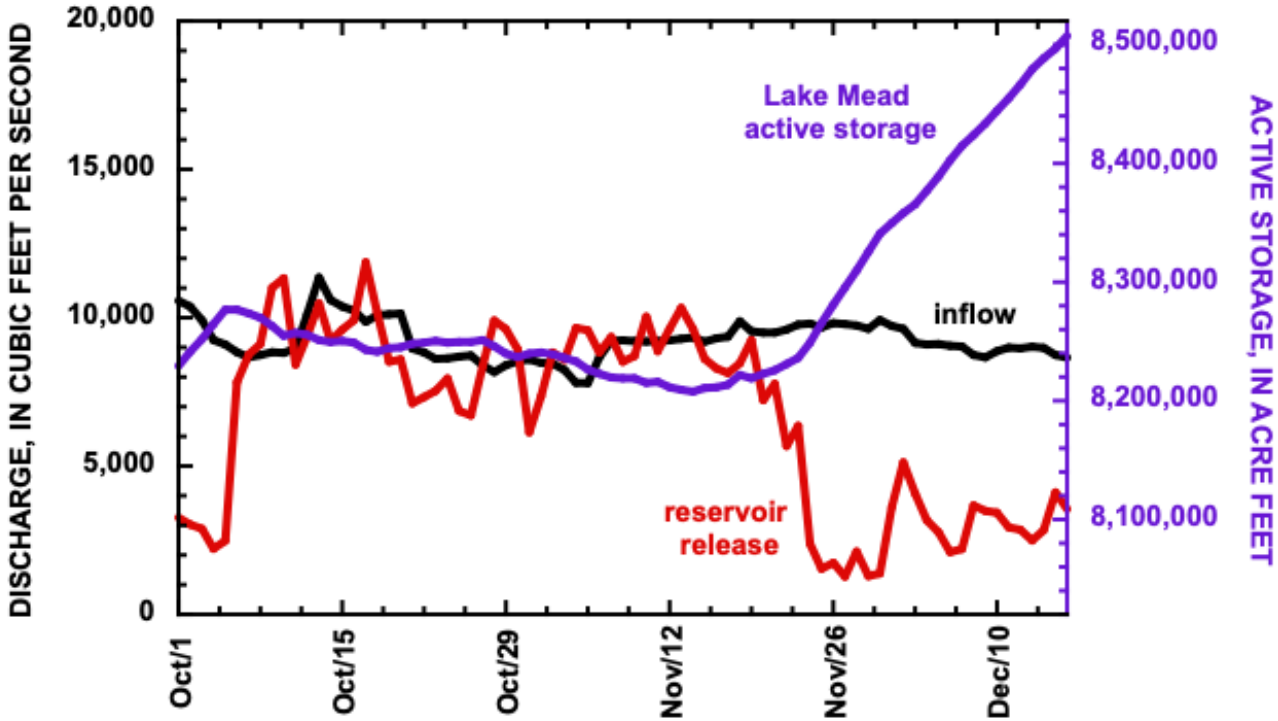
lowest since spring 2023 and dropping every day

- above 3500 ft = 2.333 maf (RAS)
- above minimum power pool = 2.807 maf
- active storage = 6.561 maf **(elevation 3541.66 ft)**

**16 December 2025*



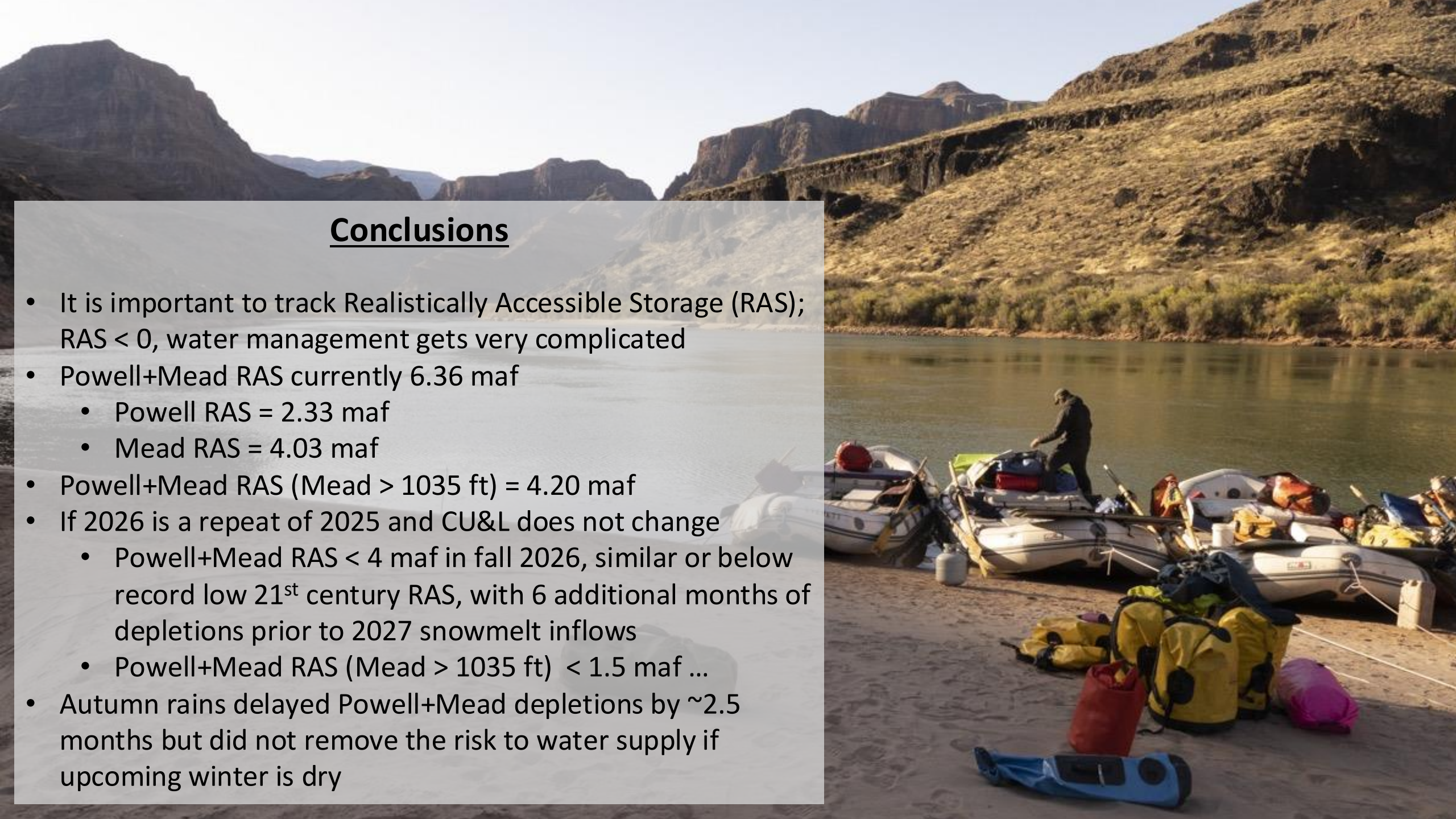
Autumn rains reduced demand in Lower Basin, allowing releases from Hoover Dam to be significantly decreased, resulting in 259,000 af of recovery since November 24.



Lake Mead (*current conditions**)

- above 1035 ft = 1.869 maf
- above 1000 ft = 4.032 maf (RAS)
- above minimum power pool = 6.501 maf
- active storage – 8.507 maf **(elevation 1061.11 ft)**

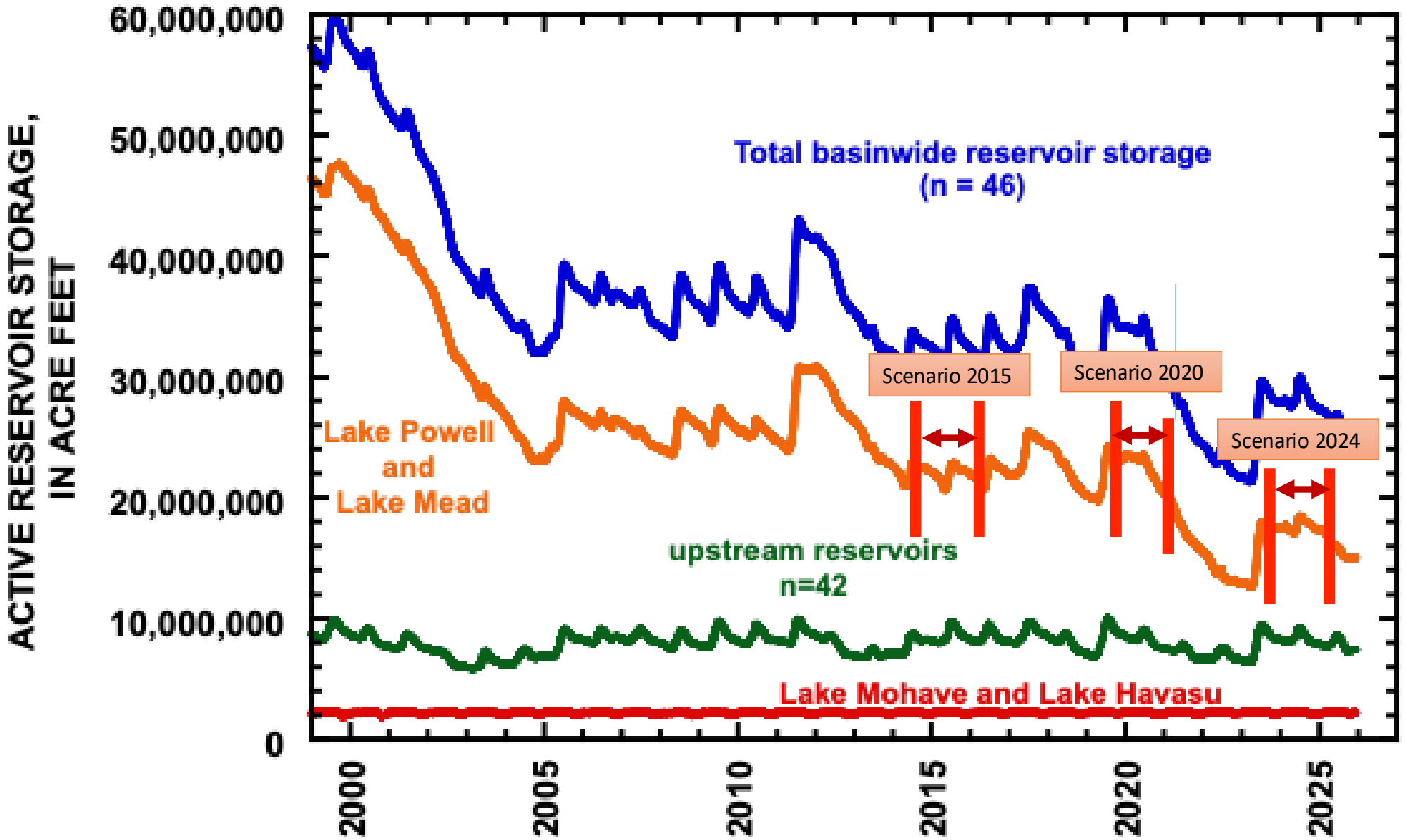
**16 December 2025*

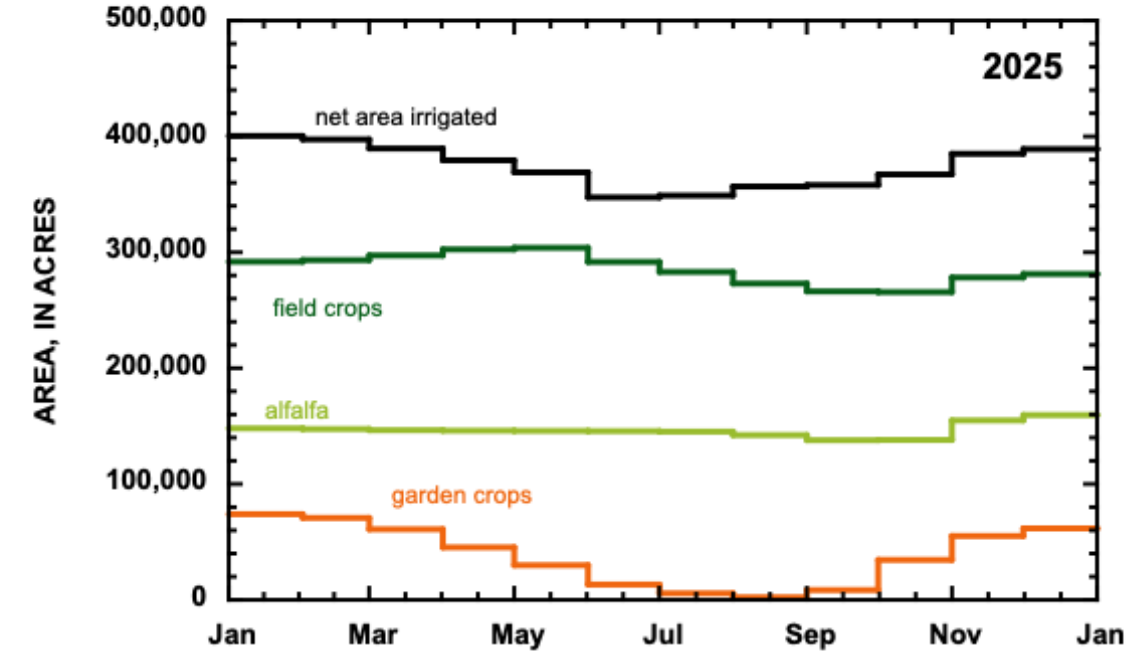


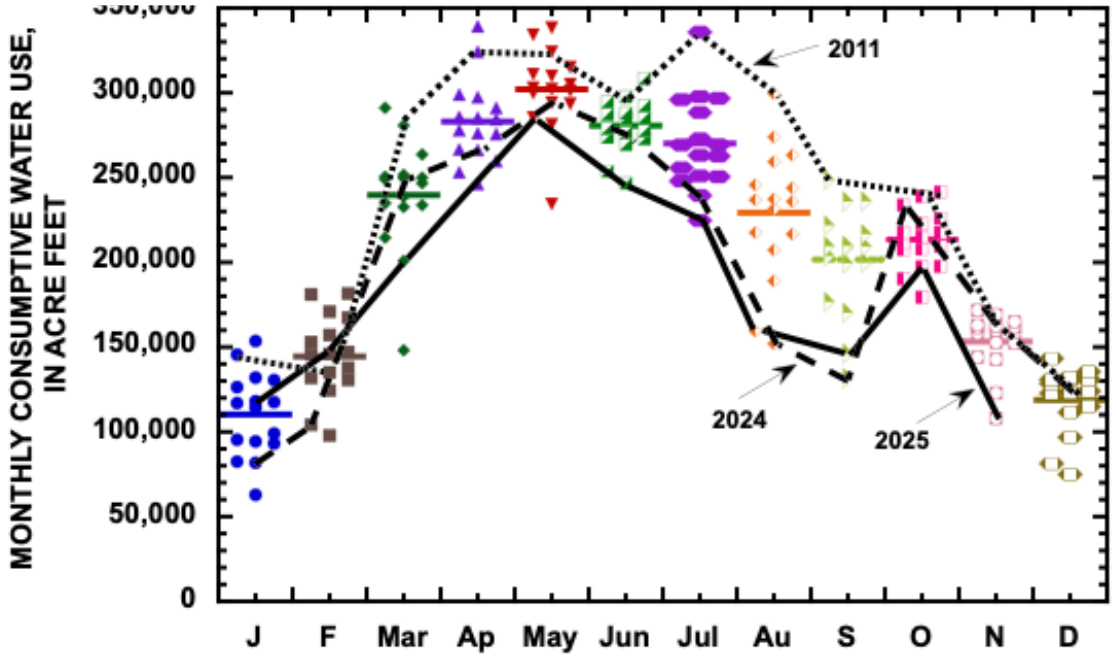
Conclusions

- It is important to track Realistically Accessible Storage (RAS); RAS < 0, water management gets very complicated
- Powell+Mead RAS currently 6.36 maf
  - Powell RAS = 2.33 maf
  - Mead RAS = 4.03 maf
- Powell+Mead RAS (Mead > 1035 ft) = 4.20 maf
- If 2026 is a repeat of 2025 and CU&L does not change
  - Powell+Mead RAS < 4 maf in fall 2026, similar or below record low 21st century RAS, with 6 additional months of depletions prior to 2027 snowmelt inflows
  - Powell+Mead RAS (Mead > 1035 ft) < 1.5 maf …
- Autumn rains delayed Powell+Mead depletions by ~2.5 months but did not remove the risk to water supply if upcoming winter is dry

extra


ACTIVE RESERVOIR STORAGE, IN ACRE FEET
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
2000
2005
2010
2015
2020
2025
Total basinwide reservoir storage
(n = 46)
Lake Powell
and
Lake Mead
upstream reservoirs
n=42
Lake Mohave and Lake Havasu
Scenario 2015
Scenario 2020
Scenario 2024





Consumptive use of the Imperial Irrigation District

- Highest water use (Ap – Jul) when area of garden crops is declining to zero
- Lowest water use (N-F) when area of garden crops is largest
- High variability in Jul-S water use; 2024 and 2025 are very low use in those months relative to other years