

Colorado River Drought Response and System Sustainability

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YOUR WATER. YOUR FUTURE.

Colorado River System Storage

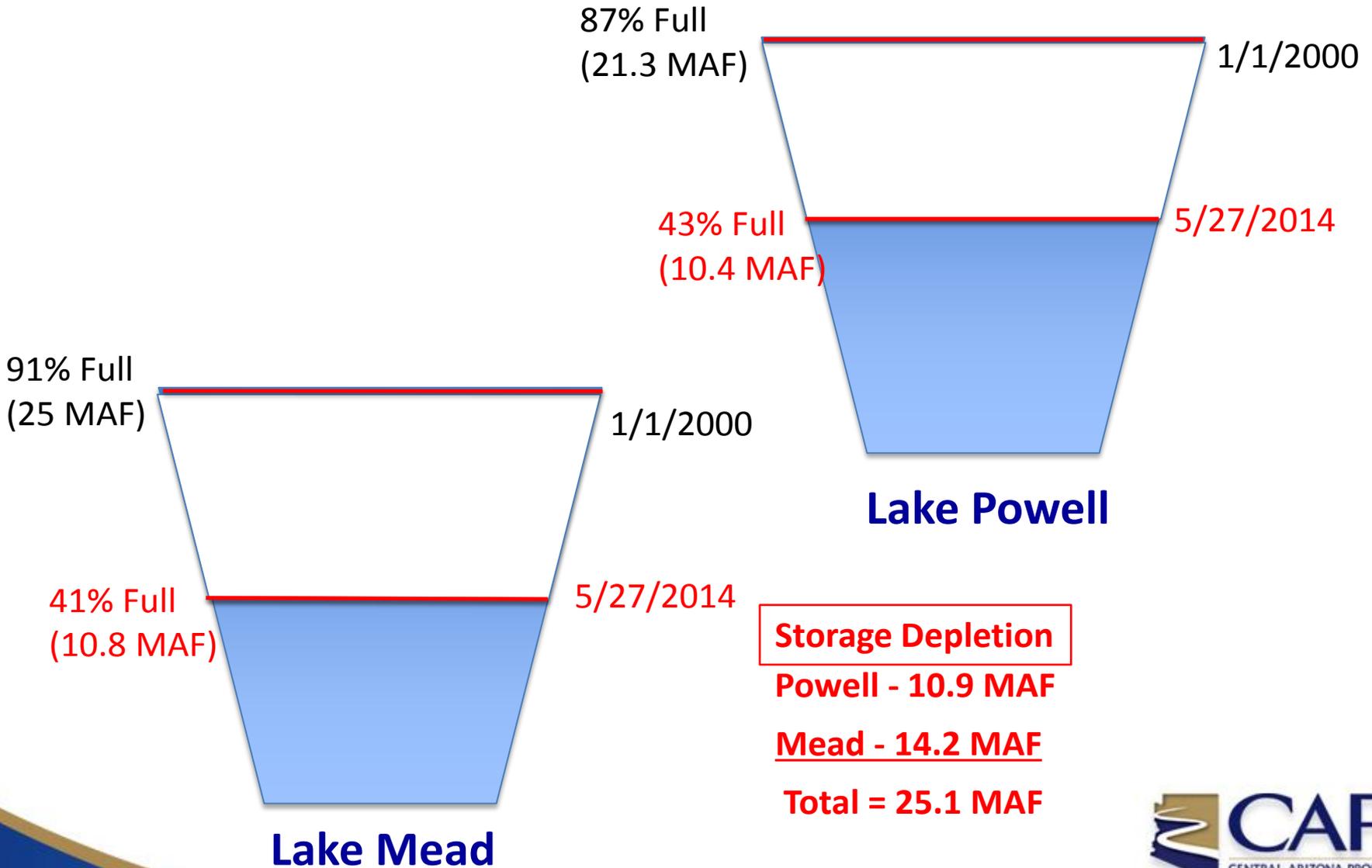
**Total System Capacity
60 MAF**

Lake Mead - 26 MAF



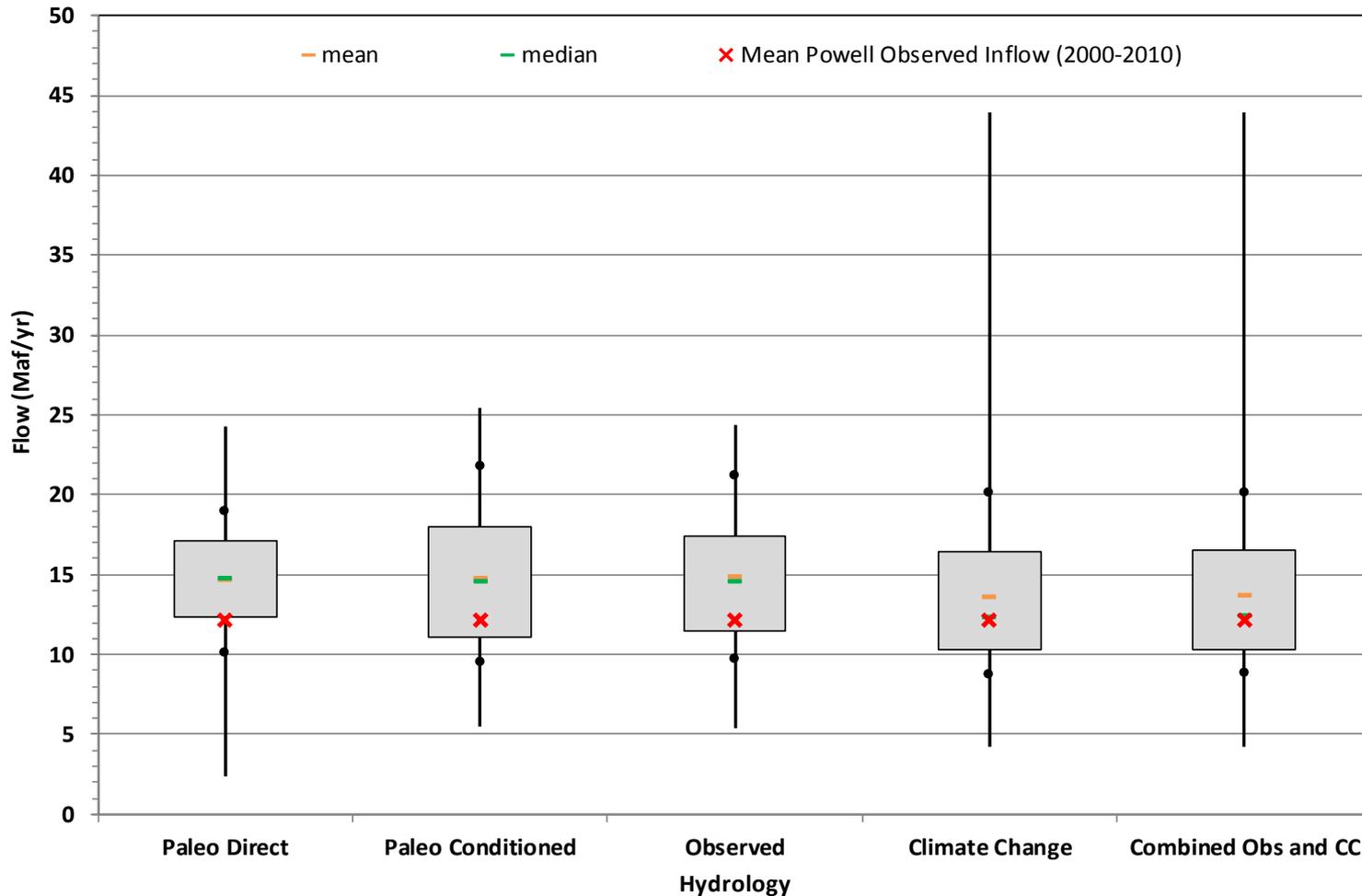
Lake Powell - 24 MAF

Colorado River System Storage

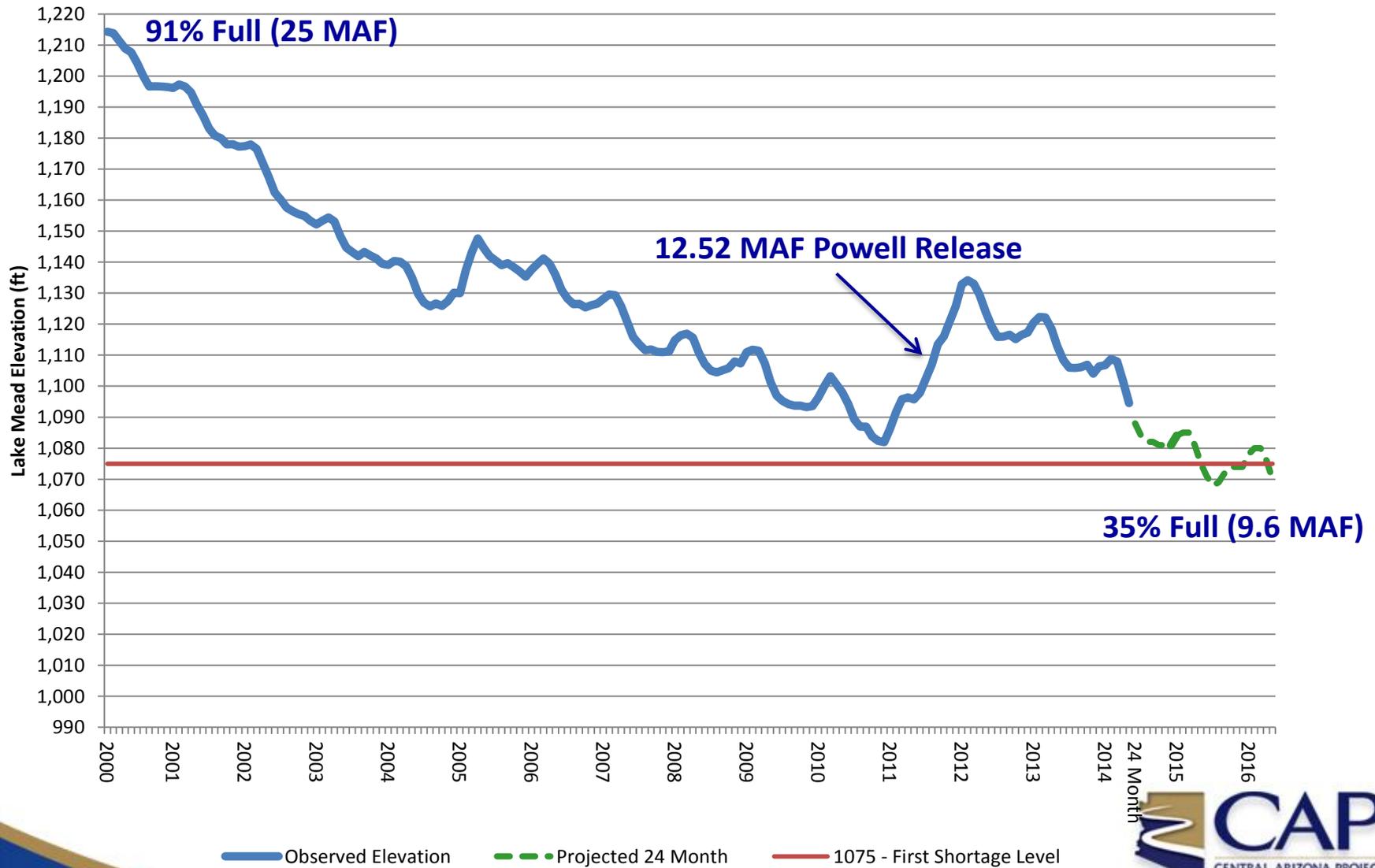


The Current Drought in Perspective

Annual (CY) Lees Ferry Flow



Lake Mead Since 2000



Shortage Sharing – '07 Guidelines

- Arizona and Nevada share Lower Basin shortages under the 2007 Guidelines
- Mexico voluntarily agreed in Minute 319 to accept reductions in its deliveries at the same elevations

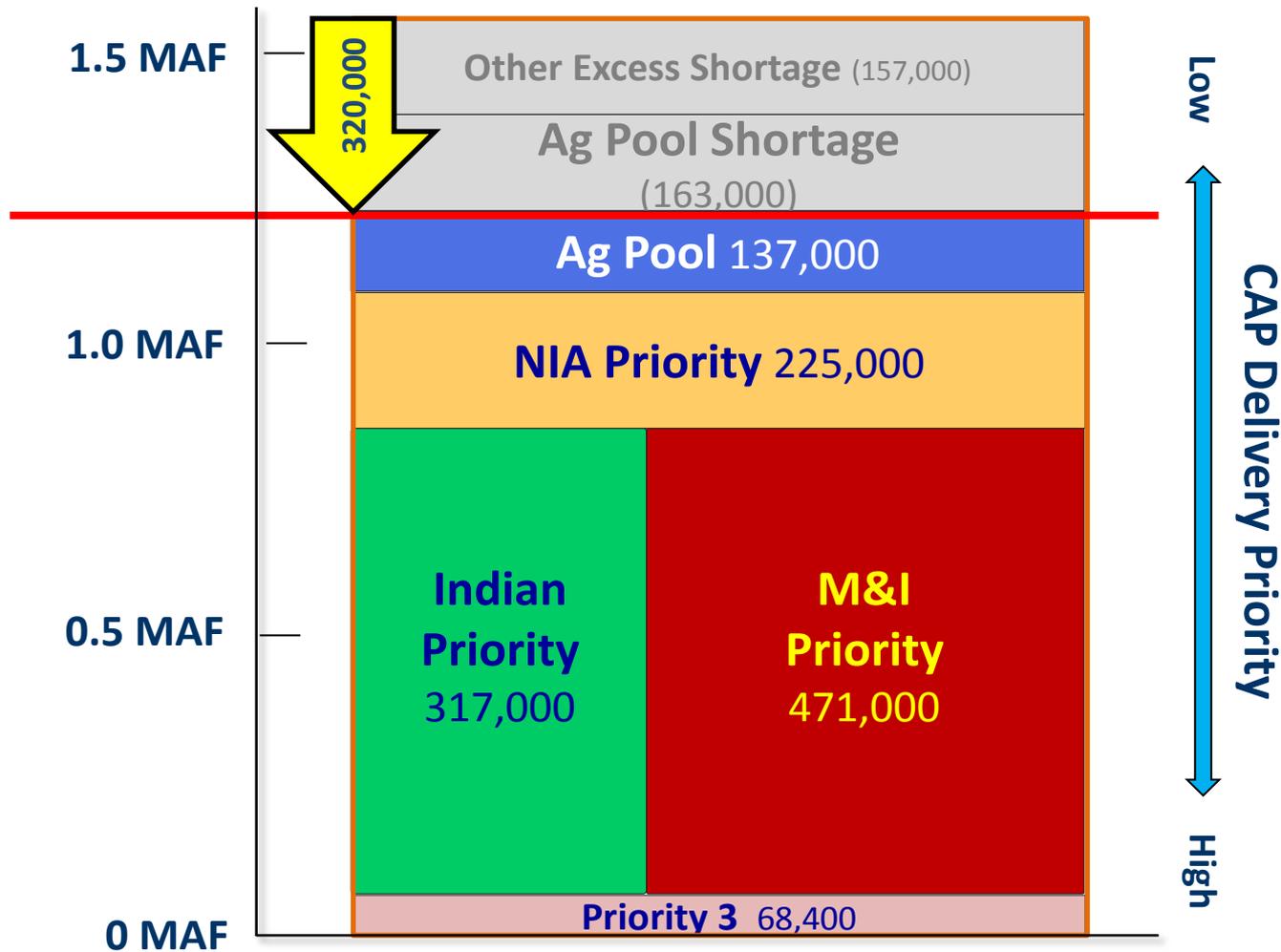
Lake Mead Elevation	Arizona Reduction	Nevada Reduction	Mexico Reduction
1075'	320,000 AF	13,000 AF	50,000 AF
1050'	400,000 AF	17,000 AF	70,000 AF
1025'	480,000 AF	20,000 AF	125,000 AF

- No reductions to California under 2007 Guidelines

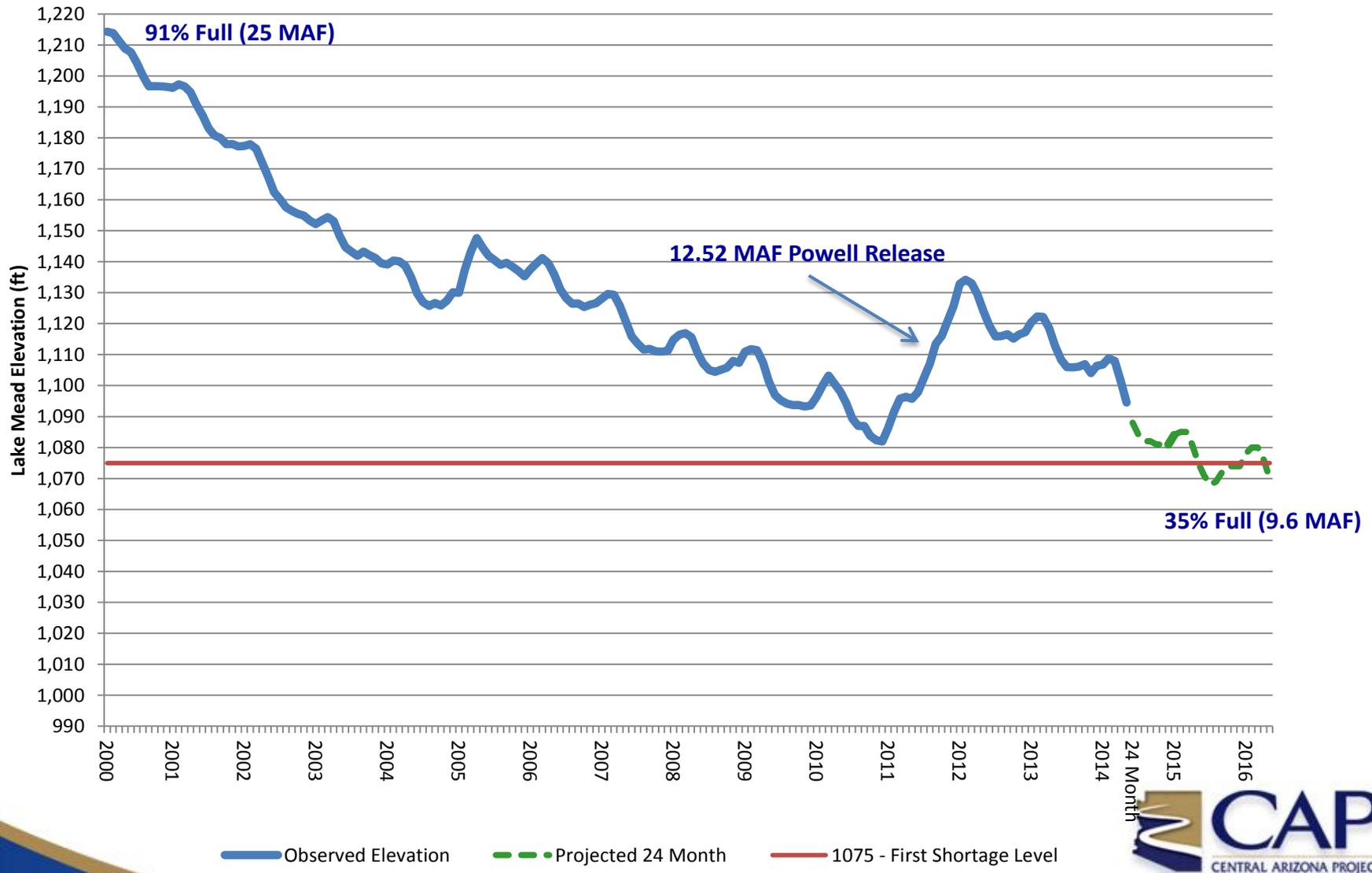
Shortage Impacts Under Guidelines

- No water for AWBA and other excess users
- Significant impacts to Ag Settlement Pool
 - Reduced under early shortages
 - Eliminated when shortage deepens and long-term CAP uses grow
- Some impact to NIA priority deliveries in deeper shortages as long-term CAP uses grow
- **No anticipated impact to CAP M&I or Indian priority**
- Possible recovery for on-river M&I or Indian NIA

2017 Level 1 Shortage



Lake Mead Since 2000



Water Budget at Lake Mead

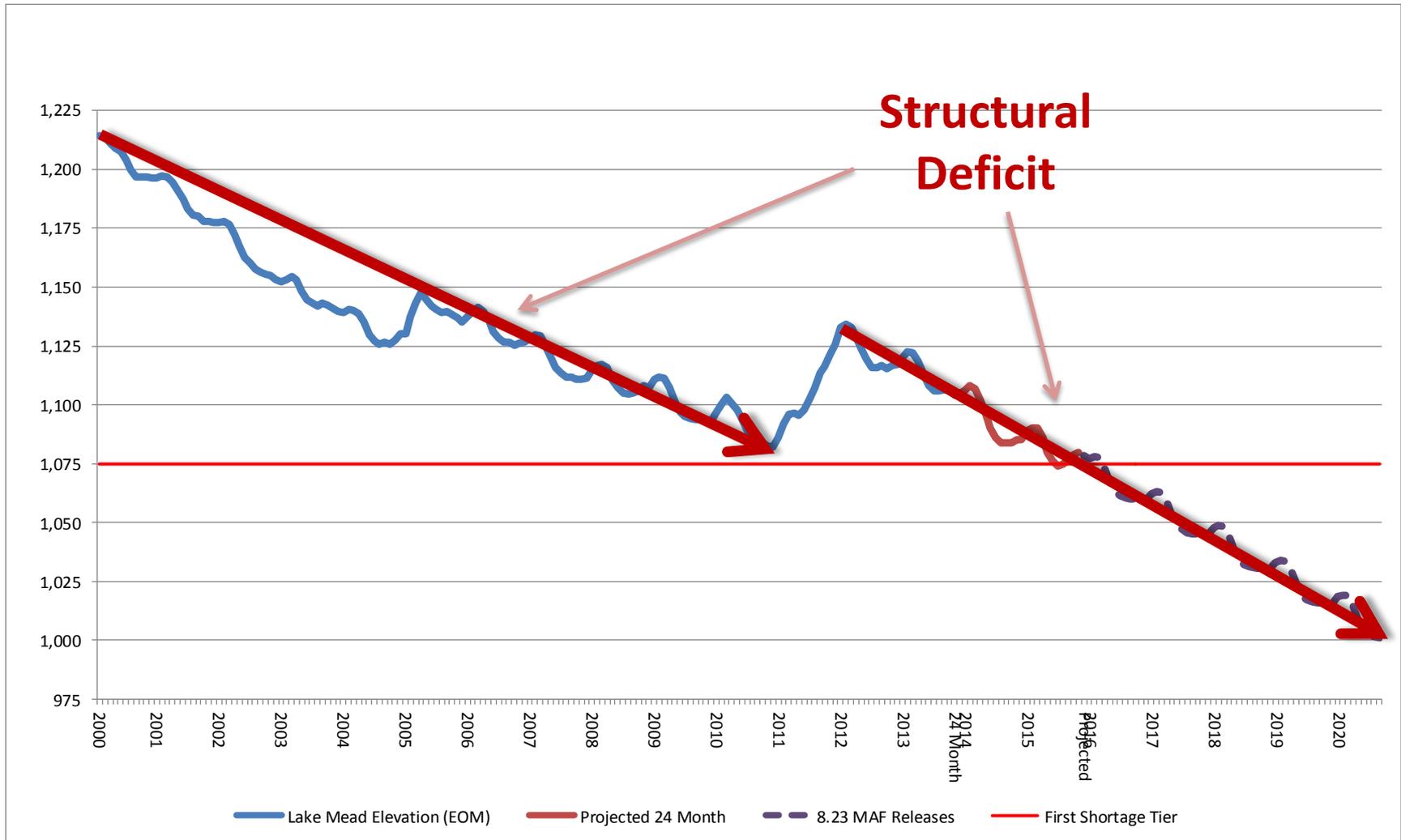
- Inflow = 9.0 maf
(release from Powell + side inflows)
- Outflow = - 9.6 maf
(AZ, CA, NV, and Mexico delivery
+ downstream regulation and gains/losses)
- Mead evaporation losses = - 0.6 maf
- Balance = - 1.2 maf

Given basic apportionments in the Lower Basin, the allotment to Mexico, and an 8.23 maf release from Lake Powell, Lake Mead storage declines about 12 feet each year

Impact of Structural Deficit

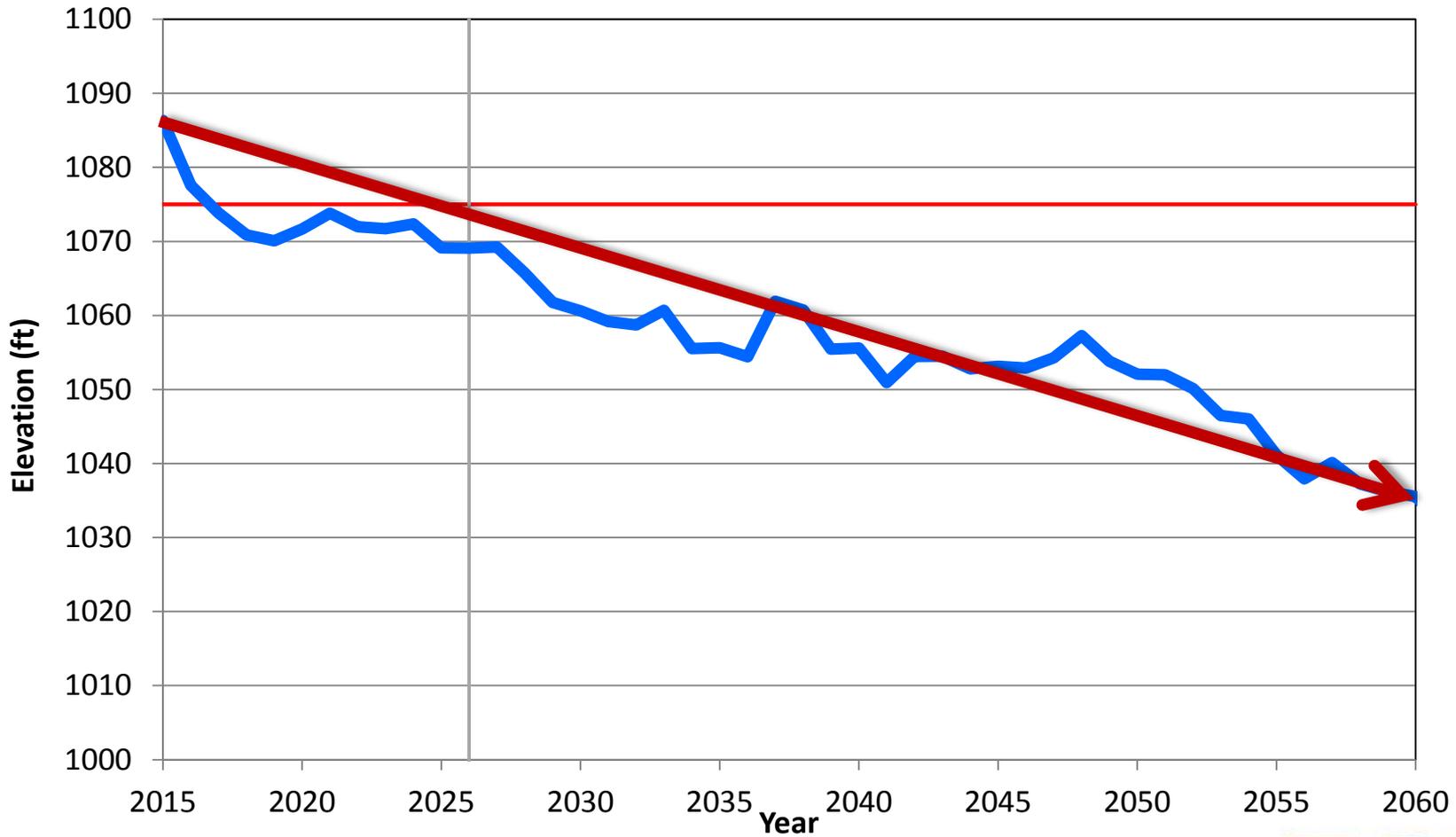
- Results in a decline of 12+ feet in Lake Mead every year when releases from Powell are “normal” (8.23 MAF)
- Undermines effectiveness of the 2007 Guidelines
- Drives Lower Basin to shortage
- CAP forced to bear obligations of others
 - Evaporation and other system losses
 - Lower Basin’s half of Mexican Treaty obligation
 - US failure to operate YDP

Near-Term Outlook



Longer-Term Outlook

Median Lake Mead January Elevation (Baseline CRSS Run)



Risk to All Colorado River Users

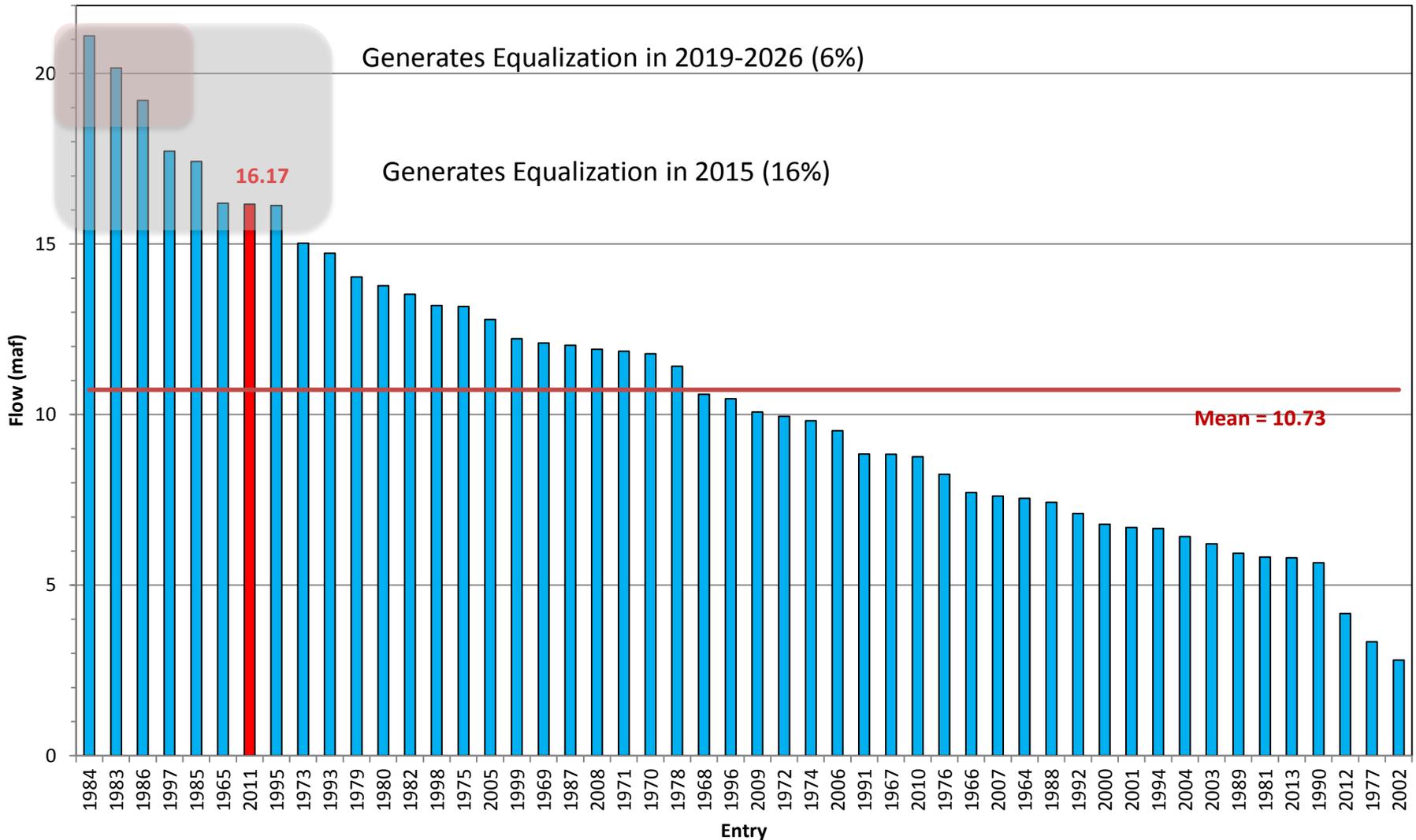
- Without equalization or corrective action, Lake Mead will fall below elevation 1000 in 5-8 years
- If Lake Mead is below elevation 1000:
 - Impacts SNWA ability to withdraw water
 - Less than 4.5 MAF left in storage in Lake Mead
 - Reduced power generation and efficiency at Hoover Dam, potential cavitation or vibration damage
- **What will the Secretary of the Interior do?**

Chances for Equalization

- Equalization trigger under the 2007 Guidelines goes up every year
 - For 2015, requires 17 MAF in storage in Lake Powell
 - By 2019, almost 18 MAF
 - By 2026, more than 19 MAF
- Current storage in Lake Powell is 10.8 MAF
- Powell inflow required for equalization in 2015:
 - 6.2 MAF (storage increase) + 9.0 MAF (release to Lower Basin) = **15.2 MAF**

Powell Inflows (1964 – 2013)

Lake Powell Unregulated Inflow



When Lake Mead is at 1,000'

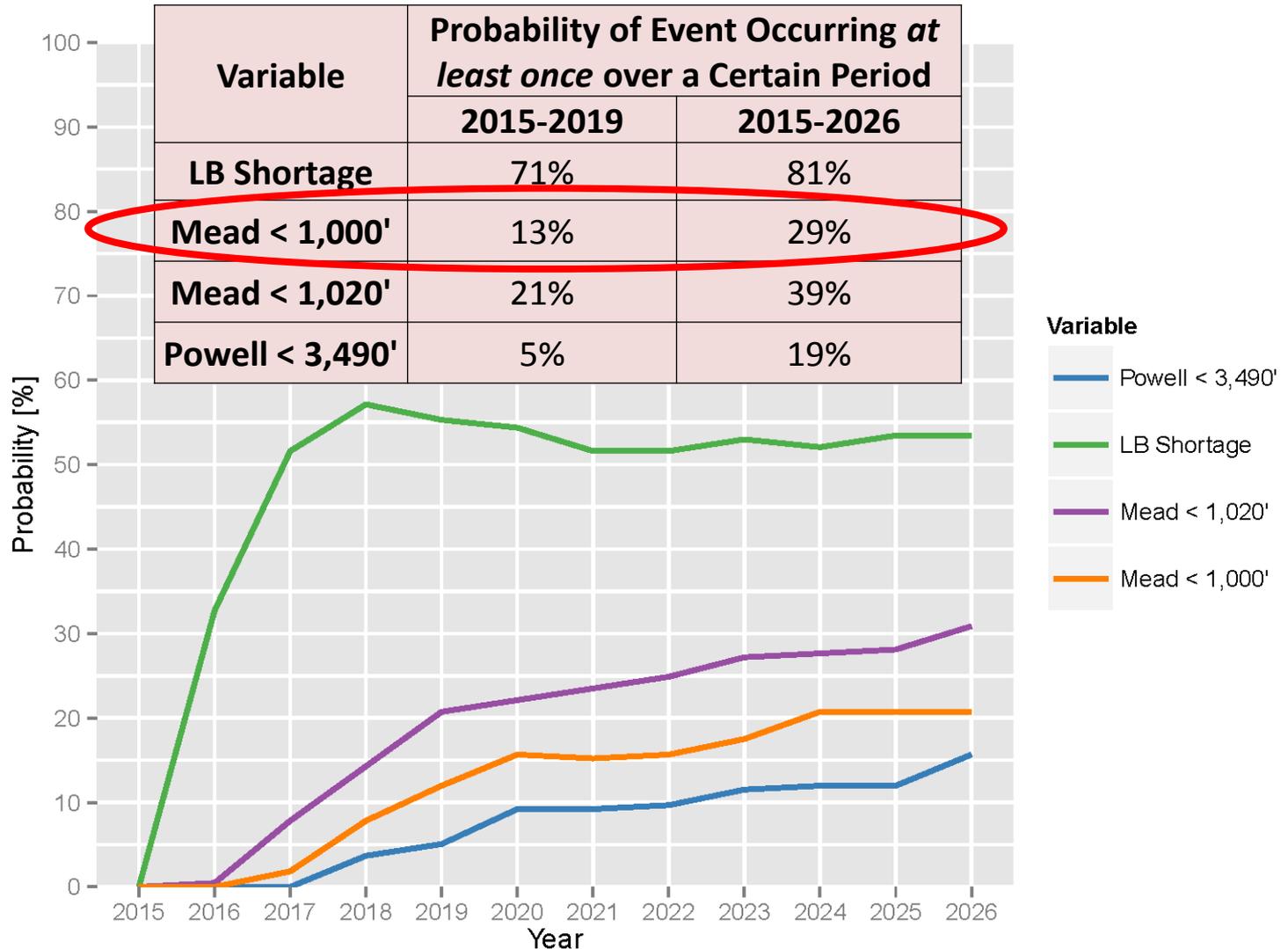
- Lake Mead storage ~ 4.4 MAF
- Lake Powell
 - < 3490' 75% of time (below power pool)
 - < 3525' 84% of time (at or near power pool)
 - Storage ~ 4.0 to ~ 5.93 MAF respectively
 - Requires significant volumes, > 20 MAF, to reach equalization elevations

Lake Mead Elevation Response After Falling Below 1,000'

Hydrology	Average Years to Reach Threshold Elevation		
	1,025 ft	1,050 ft	1,075 ft
Observed	7.1	14.3	15.2
Climate Change	10.8	12.5	14.6
Combined	9.5	13.2	14.9

Hydrology	Number/Percent of Futures Below 1,000 ft by 2026	Number of Futures Not Reaching Threshold Elevation by 2060		
		1,025 ft	1,050 ft	1,075 ft
Observed	18/105 = 17%	0	5	6
Climate Change	46/112 = 41%	14	24	31
Combined	64/217 = 29%	14	29	37

Current Baseline Projections (Obs. + Climate Change)



What will the Secretary Do?

Option 1

Allow Lake Mead to continue falling below elevation 1000, potentially to dead pool

Option 2

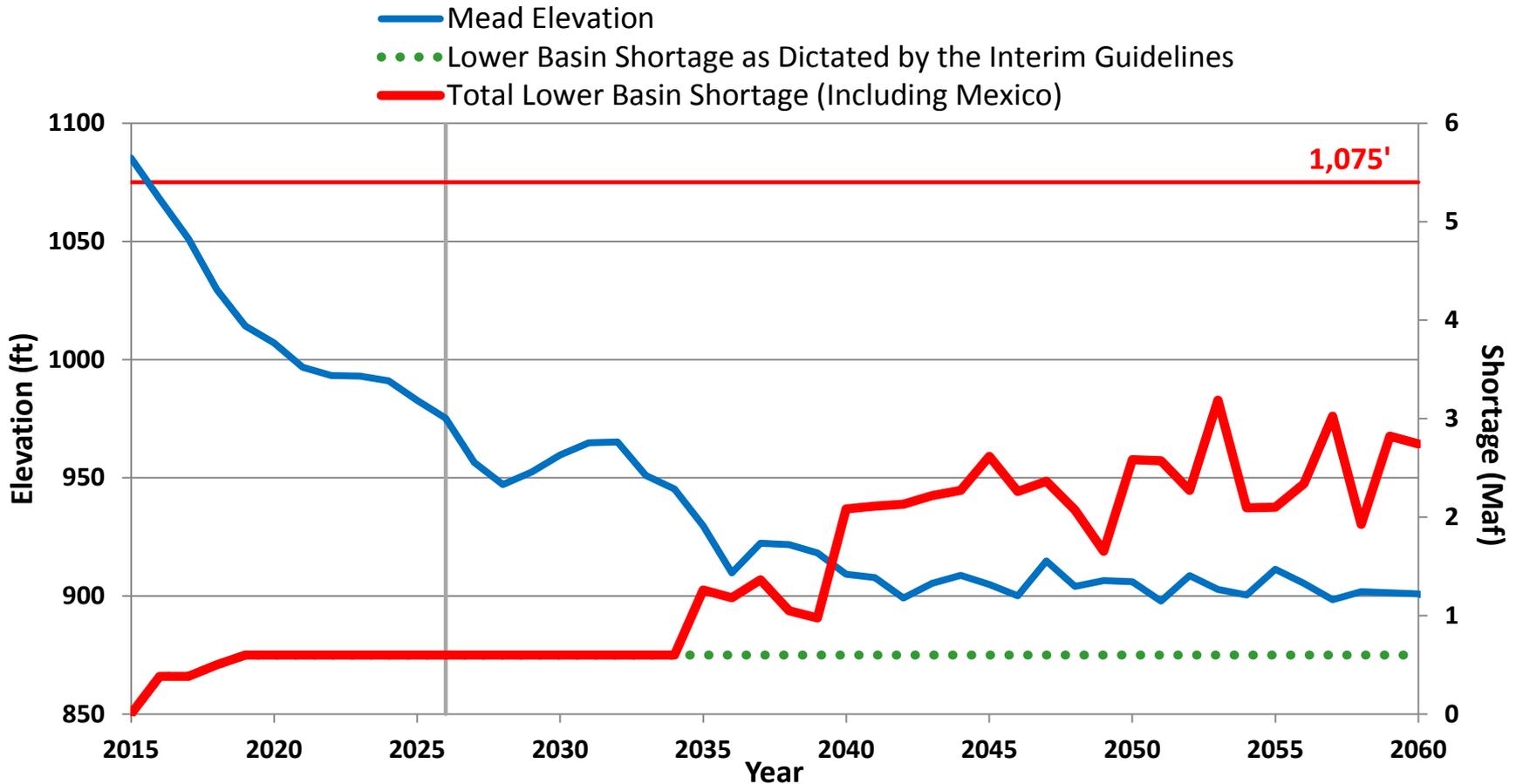
Take emergency action to protect elevation 1000

Option 1 – Allow Lake Mead to Fall

- Secretary continues making all scheduled deliveries until there is insufficient water available
- When orders exceed available supply, Secretary follows Law of the River priority system
 - CAP and post-1968 users reduced first
 - Pre-1968, non-PPR users reduced next
 - PPRs and federal reserved rights reduced last
- When Lake Mead reaches dead pool, deliveries are limited to run of the river—i.e., annual inflow

Option 1 – Allow Lake Mead to Fall

Baseline: 10th Percentile



Option 1 - Consequences

- Southern Nevada may be unable to withdraw any water below elevation 1000
- Diversions for CAP M&I and Indian users are reduced to zero, along with on-river P4 users
- Mead reaches dead pool in at least 10% of traces, forcing additional reductions of 1 MAF or more
- Hoover powerplant capacity is reduced from installed rating of 2079 MW to:
 - 1046 MW at elevation 1000
 - 696 MW at elevation 950

Option 2 – Protect Elevation 1000

- Secretary intervenes to protect level of Lake Mead, reducing Lower Basin diversions as needed
- Secretary applies discretion in determining who gets water, regardless of priority, e.g.:
 - Nevada allotted 230 KAF to meet health and safety needs
 - CAP allotted 950 KAF to meet core municipal needs and U.S. tribal responsibilities
 - Other uses reduced as necessary

Protection Volume Analyses: “Absolute Protect” 1,000’

Hydrology	Lake Mead Elevation 1,020’			Lake Mead Elevation 1,000’		
	Maximum in any year (MAF)	First Year that Maximum Occurs	Average through 2026 (MAF)	Maximum in any year (MAF)	First Year that Maximum Occurs	Average through 2026 (MAF)
Observed	2.1	2019	0.74	1.9	2019	0.49
Climate Change	6.1	2025	1.7	6.0	2025	1.8
Combined	6.1	2025	1.5	6.0	2025	1.6

¹Volumes are in addition to Shortages per the 2007 Interim Guidelines

Option 2 - Consequences

- Secretarial discretion has replaced the Law of the River
- Diversions by users other than SNWA and CAP are reduced by 2 to 6 MAF
 - Primary reductions to agricultural users
 - Additional reductions to Mexico lead to increased international tension

Proactive Alternative

- Based on principal that all Colorado River water and power users share risk
- Structural deficit must be reduced by 600-900 KAF per year to “bend the curve”
- Potential components:
 - Target volume (e.g., 600 KAF)
 - Funding mechanism (\$100M+ per year)
 - Joint system conservation/augmentation projects
 - States backstop if joint projects do not meet target
 - U.S. action to reduce system losses (100-200 KAF)

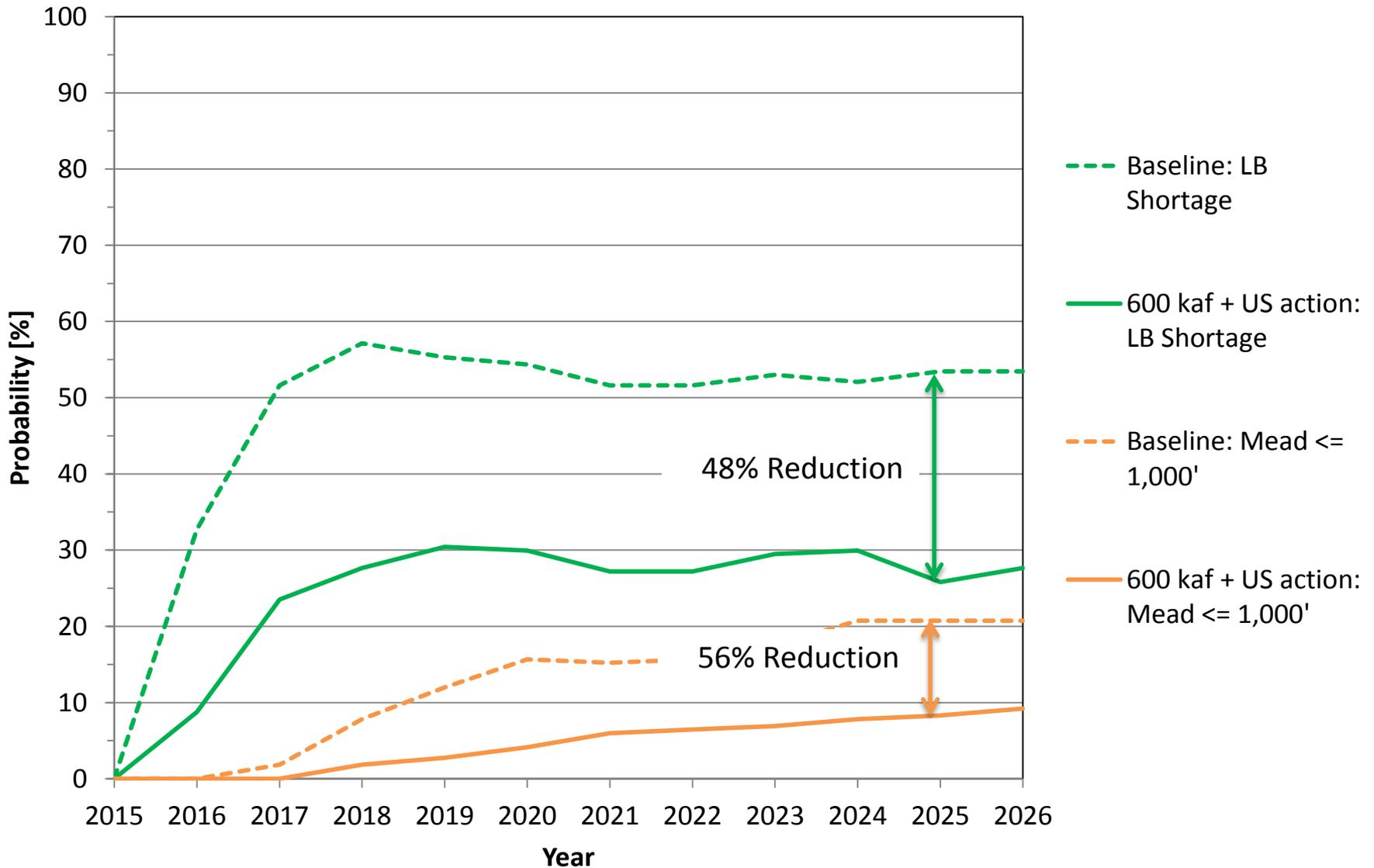
Potential Cost of Proactive Plan

- Annual CAP diversions reduced
 - Impacts CAP Excess Water, potentially NIA
 - Increased fixed OM&R rates for all CAP customers
- Annual funding for conservation/augmentation projects (\$20M+)
- For comparison purposes, \$20M per year might be sufficient to generate
 - 10,000 AF from ocean desalination
 - 65,000 AF from brackish desalination

Benefits of Proactive Plan

- Preserves the Law of the River
- Provides greater certainty and predictability to all water and power users
- Reduces probability of Mead falling below elevation 1000 by 2026 from 29% to 12%
- Reduces likelihood of non-hydrologic supply reductions to CAP
- Increases chances of success when new operating guidelines are negotiated with Upper Basin in 2020
- Reduces likelihood of protracted litigation

Benefits of Proactive Plan



Current Status

- CAP and ADWR are working with Basin States and Reclamation to prepare a “Drought Response and Sustainability Plan”
- Ongoing efforts
 - Expand weather modification and tamarisk removal
 - System conservation pilot agreement
 - Long-term augmentation studies
- Basin States report to Secretary of the Interior anticipated in July

Questions?



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