

Colorado River Shortage Briefing

Introduction



Clint Chandler

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Water Planning & Permitting Division

Arizona Department of Water Resources

May 18, 2016

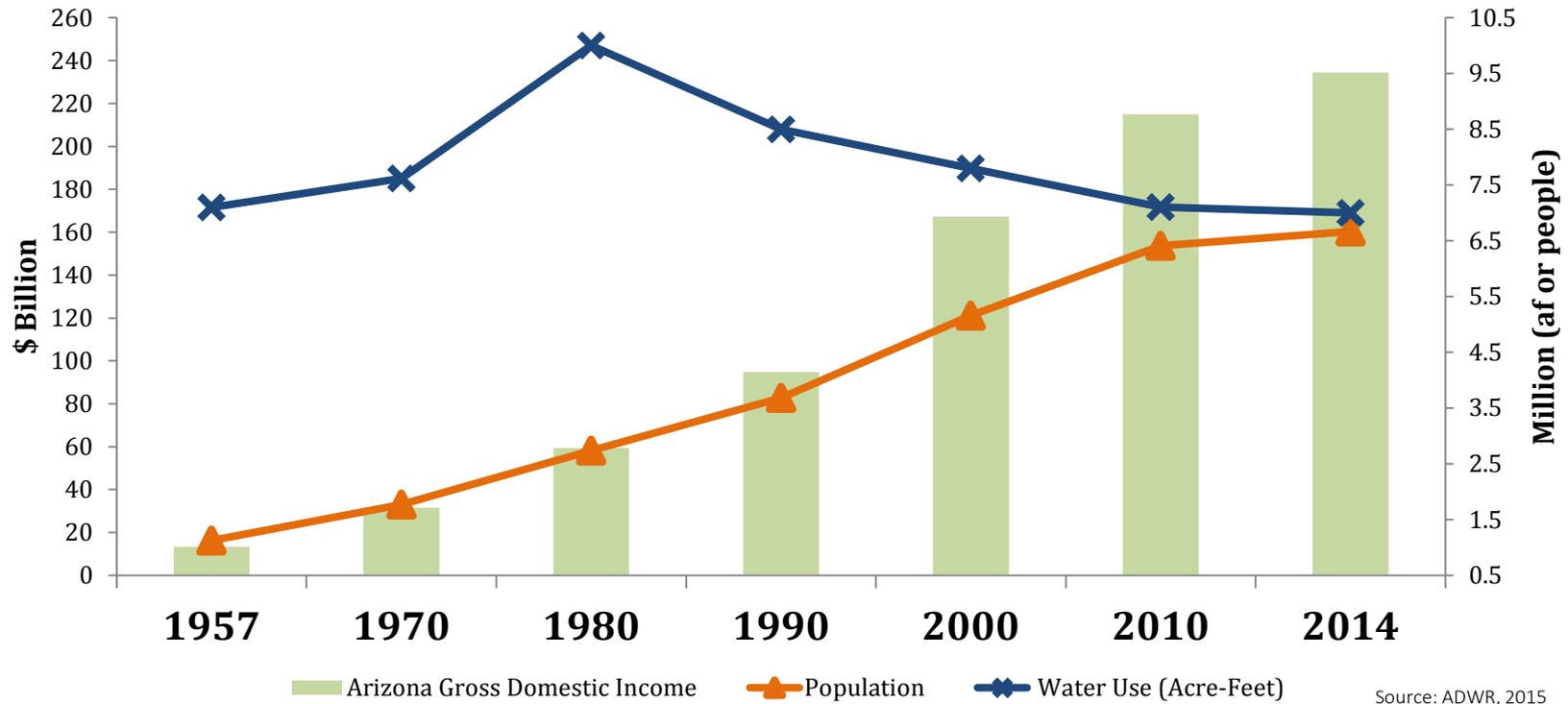
Actions that Have Contributed to Arizona's Water Management Success

- Salt River Project
- Yuma Irrigation Districts
- Colorado River Compact
- Central Arizona Project
- 1980 Groundwater Management Act
- Assured and Adequate Water Supply Program
- Underground Storage and Recovery Program & Arizona Water Banking Authority
 - Approx. 9 MAF of water stored for future use
- **Mandatory Water Conservation Requirements**
 - Within the five Active Management Areas
 - <10% water lost or unaccounted for water
 - Best Management Practices
- **Drought Preparedness Plan Requirements**



Arizona's Water Management Success

Arizona Water Use, Population, and Economic Growth (1957 - 2014)



| Timeframe | Total Water Use (in million acre-feet) | Population (in millions) | Gross Domestic Income (in billions) |
|-----------------------|---|-----------------------------|--|
| 1957 | 7.1maf | 1.1 | \$13.4 |
| 2014 | 7 maf | 6.7 | \$234.5 |
| Change from 1957-2014 | -1% | 493% | 1,652% |



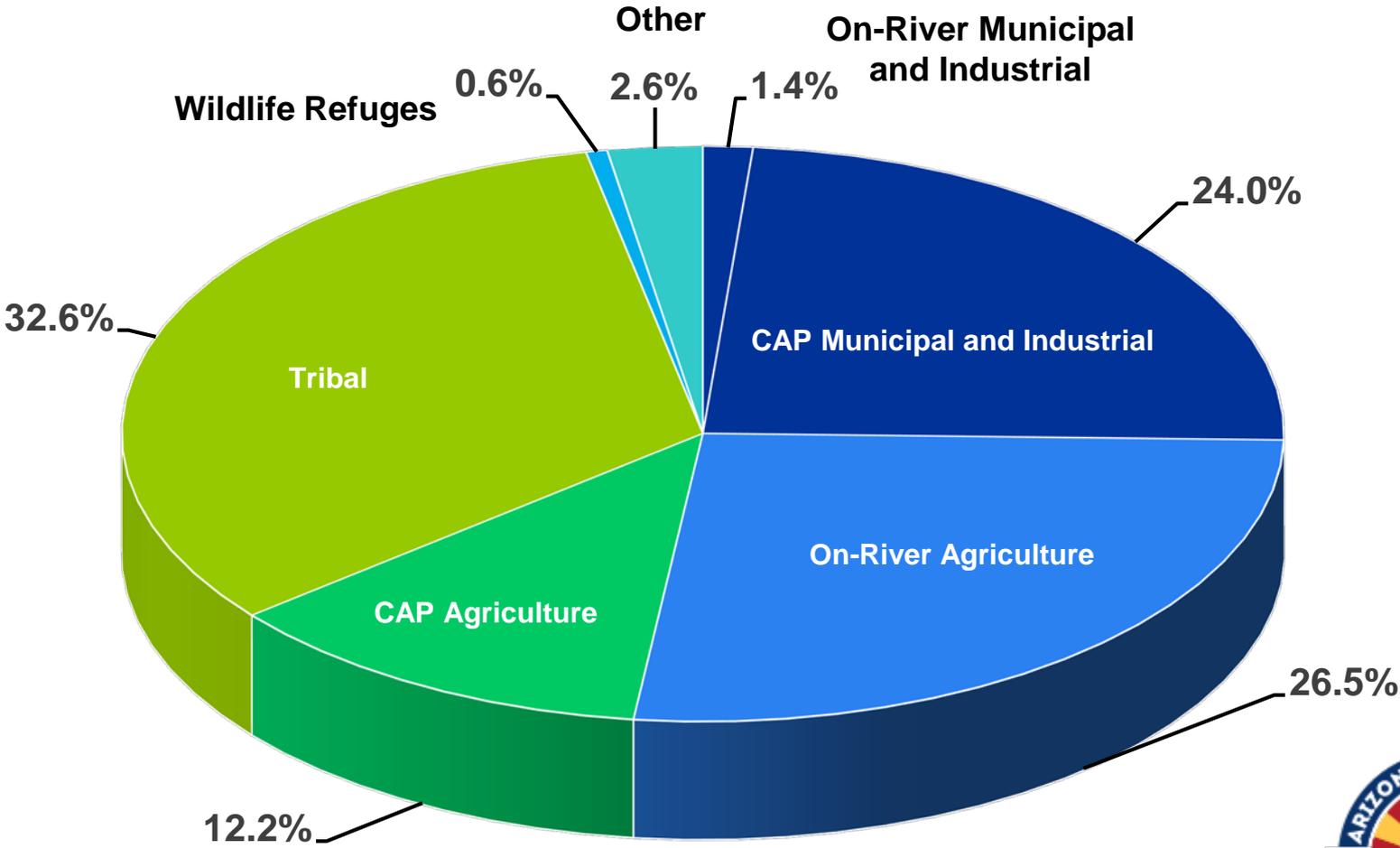
Arizona's Water Supply Annual Water Budget 2014

| Water Source | Million Acre-Feet (MAF) | | % of Total |
|------------------------|-------------------------|--------------|-------------|
| SURFACE WATER | | | |
| Colorado River | | 2.8 | 40 % |
| CAP | 1.6 | | 23% |
| On-River | 1.2 | | 17% |
| In-State Rivers | | 1.2 | 17% |
| Salt-Verde | .7 | | |
| GROUNDWATER | | 2.8 | 40% |
| RECLAIMED WATER | | 0.2 | 3% |
| Total | | 7 MAF | |

Source: ADWR, 2015



Arizona's Colorado River Use



Sources: 2015 Reclamation Water Accounting Report and Central Arizona Project Water Delivery Report



Colorado River Shortage Update

- A Colorado River shortage declaration is increasingly likely over the next 5 years.
- U.S. Bureau of Reclamation predicts that shortage on the Colorado River is not likely to occur before 2018.
 - Currently there is a 10% probability of shortage in 2017.
- Some Arizona water users will be impacted by a shortage declaration.
- Cities, Yuma agriculture and other on-river Colorado River water users with Priority 4 entitlements or better will not see a reduction in deliveries during a Tier 1 shortage.



Arizona's Key Points

- Arizona will continue to be proactive to avoid a crisis.
- The choices that we made decades ago have prepared us for potential shortages on the Colorado River.
- Over the last two decades the Arizona Water Banking Authority has stored 3.4 MAF, more than two years' worth of Colorado River deliveries to Central Arizona in order to provide back-up supplies in times of shortage over the long term.
- ADWR, CAP and other Arizona water managers are closely monitoring the Colorado River and taking proactive steps to address the risk of Colorado River shortages and improve the health of the river system.



Topics of Discussion

- Update on the hydrology of the Colorado River System
- Arizona Plans in Action
- Reservoir Protection
- Colorado River Drought Contingency Planning
- Next Steps



RECLAMATION

Managing Water in the West

Management of Colorado River Reservoirs and Current State of the System

Daniel Bunk

BCOO River Operations Manager, Lower Colorado Region

Colorado River Shortage Briefing

May 18, 2016



U.S. Department of the Interior
Bureau of Reclamation



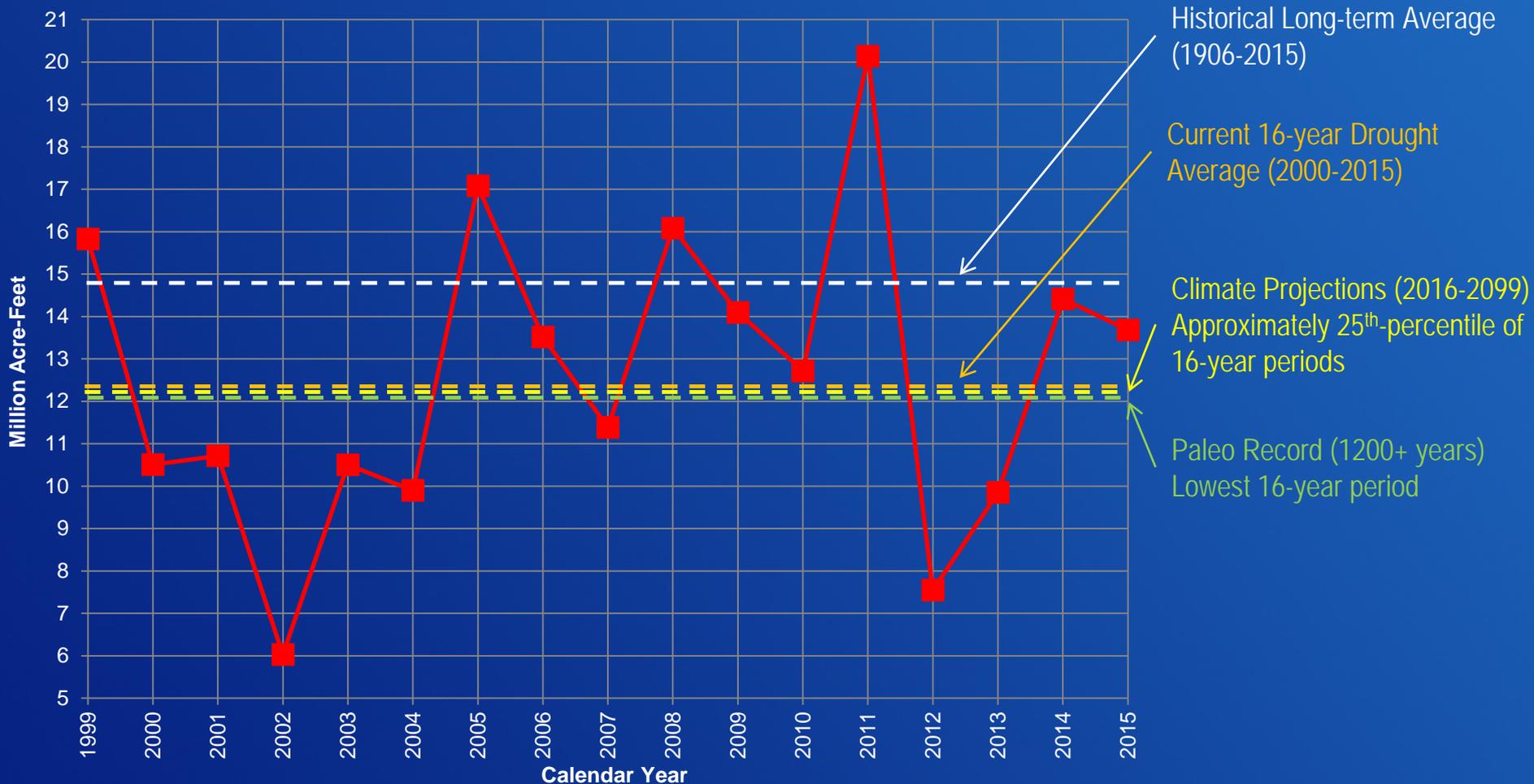
Topics

- Colorado River Overview
- Current Conditions
- Projected Operations

RECLAMATION

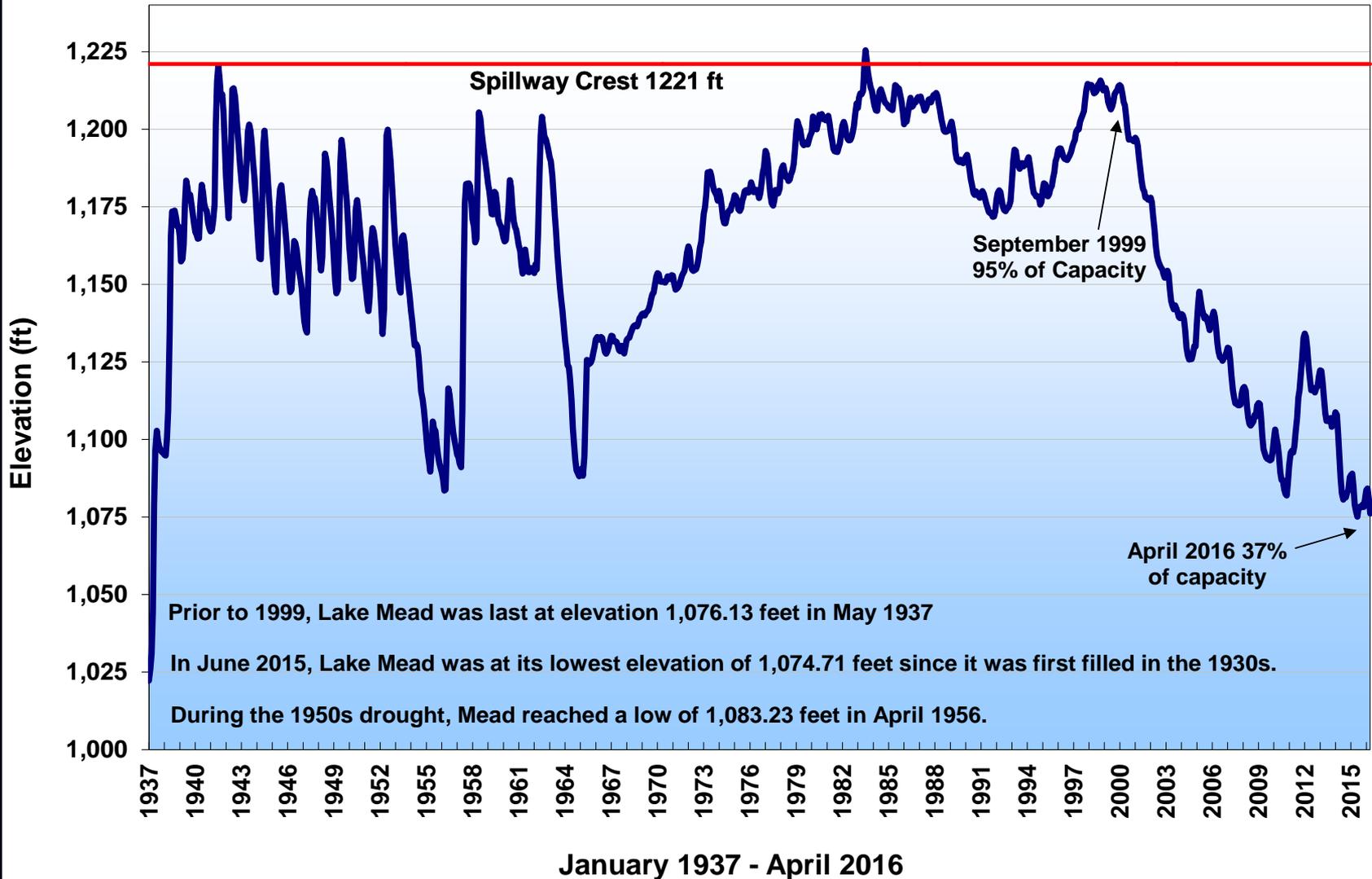
Current 16-year Drought (2000-2015)

Natural Flow at Lees Ferry



*2013-2015 natural flows are provisional

Lake Mead End of Month Elevation



Overview of the 2007 Interim Guidelines

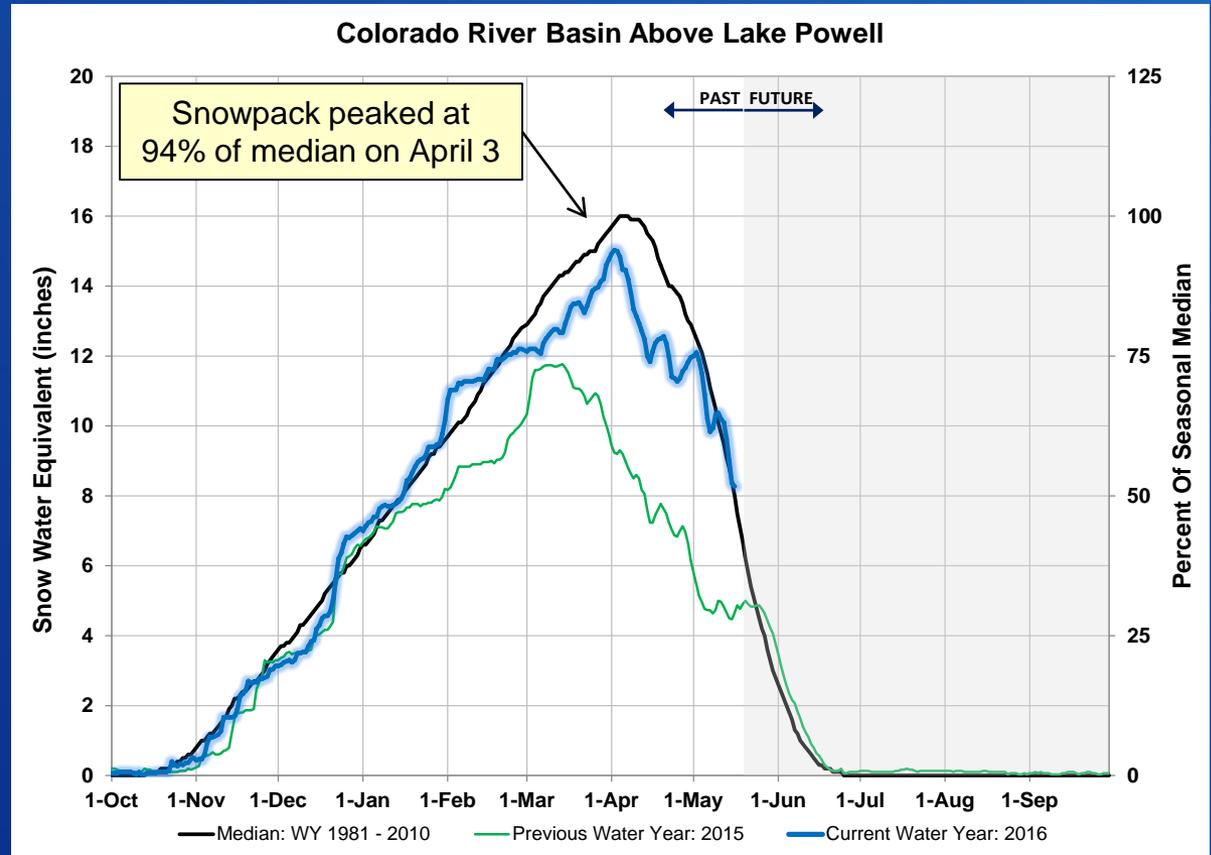


- In place for an interim period through 2026
- Provide for coordinated operations of Lake Powell and Lake Mead under a full range of reservoir conditions
- Encourage efficient use and management of Colorado River water through the ICS mechanism
- Establish guidelines for shortage in the Lower Basin

Upper Basin Snowpack and Forecasted Inflow as of May 16

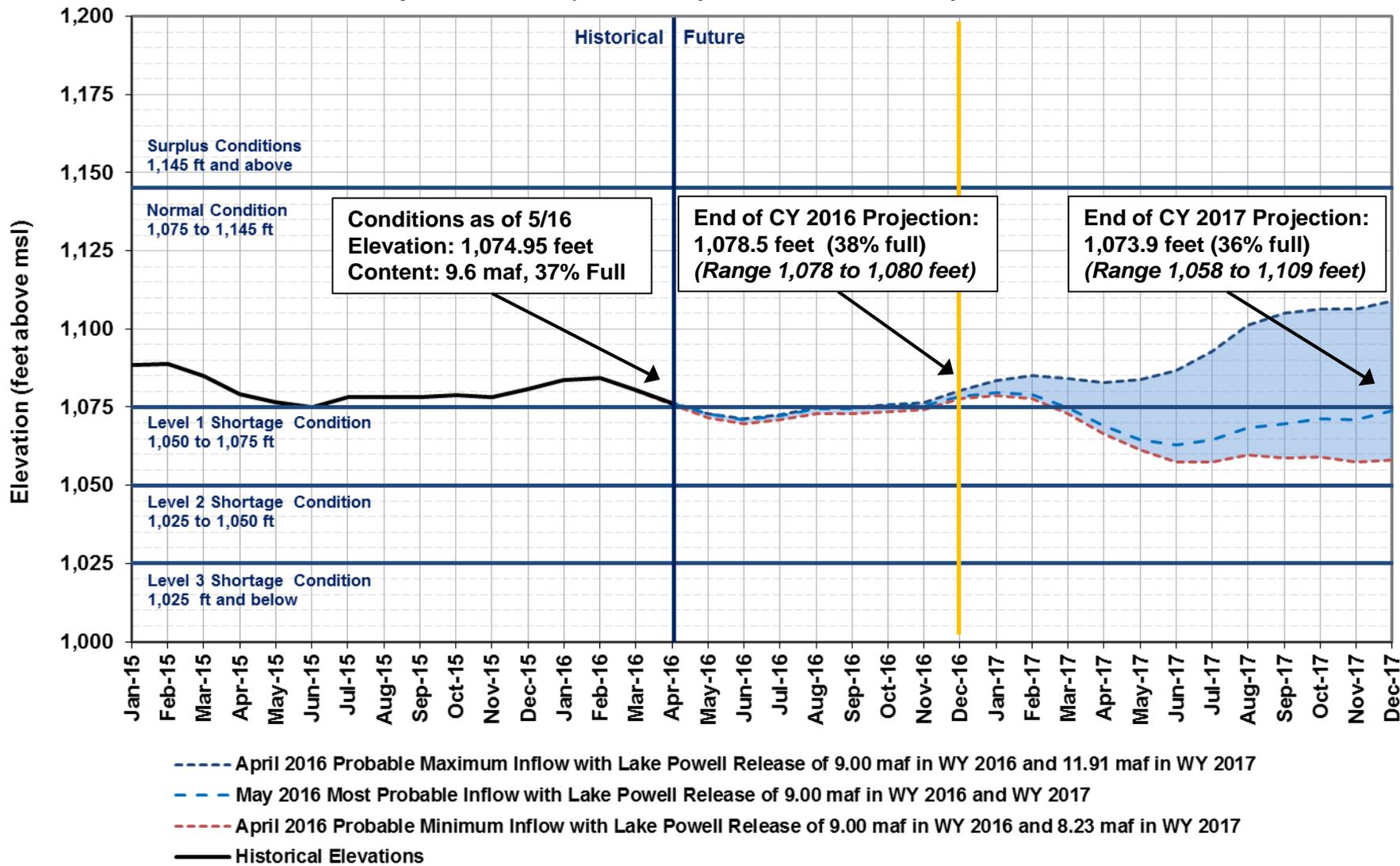
**Forecasted
2016 April-July
Inflow
84% of average**

**Forecasted
Water Year 2016
Inflow
85% of average**



Lake Mead End of Month Elevations

Projections from April and May 2016 24-Month Study Inflow Scenarios



Percent of Traces with Lake Mead Operating Condition

Results from April 2016 MTOM/CRSS^{1,2,3} (values in percent)

| Lake Mead Operating Condition | 2017 | 2018 | 2019 | 2020 | 2021 |
|--|-----------|--------------|-----------|-----------|-----------|
| Shortage Condition of any amount (Mead ≤ 1,075 ft) | 10 | 56 | 64 | 64 | 61 |
| <i>Shortage – 1st level (Mead ≤ 1,075 and ≥ 1,050)</i> | 10 | 56 | 46 | 40 | 33 |
| <i>Shortage – 2nd level (Mead < 1,050 and ≥ 1,025)</i> | 0 | <1 | 18 | 18 | 18 |
| <i>Shortage – 3rd level (Mead < 1,025)</i> | 0 | 0 | <1 | 6 | 10 |
| Surplus Condition of any amount (Mead ≥ 1,145 ft) | 0 | <1 | 4 | 8 | 12 |
| <i>Surplus – Flood Control</i> | 0 | 0 | 0 | 1 | 2 |
| Normal or ICS Surplus Condition | 90 | 44 | 32 | 28 | 27 |

¹ Reservoir initial conditions based on results from 30 simulations of December 31, 2016 conditions using the Mid-term Probabilistic Operations Model (MTOM).

² Each of the 30 initial conditions were coupled with 107 hydrologic inflow sequences based on resampling of the observed natural flow record from 1906-2012 for a total of 3,210 traces analyzed using the Colorado River Simulation System (CRSS).

³ Percentages shown may not be representative of the full range of future possibilities that could occur with different modeling assumptions.



Thank You

**For further information,
please visit our websites:**

**www.usbr.gov/uc/
www.usbr.gov/lc/**

RECLAMATION

Colorado River Shortage Briefing

Arizona's Plans in Action



YOUR WATER. YOUR FUTURE.

Ted Cooke
General Manager
May 18, 2016

Arizona's Plans in Action

Arizona is prepared to address Colorado River shortage under the 2007 Shortage Sharing Guidelines

- *Arizona Water Banking Authority Firming*
- *Statewide Drought Plan*
- *Mandatory municipal provider drought response plans*

New Voluntary Reservoir Protection Efforts

- *Lower Basin Pilot Drought Response Actions MOU (LB MOU)*
- *Pilot System Conservation Program (PSCP)*

Arizona's Plans in Action

- Over the last two decades the Arizona Water Banking Authority has accrued approximately 3.4 MAF of credits for instate use in times of shortage.
- Another .6 MAF has been stored on behalf of *Nevada*.
- Arizona water users also have stored water supplies as a component of their water planning efforts.

Arizona Water Banking Authority

- Provides shortage protection for Arizona's On-River P4 municipal and industrial users of Colorado River water
- Assists the State in the settlement of Tribal water rights claims by firming portions of CAP supplies provided in settlements
- Provides firming for CAP M&I priority water supplies during shortages

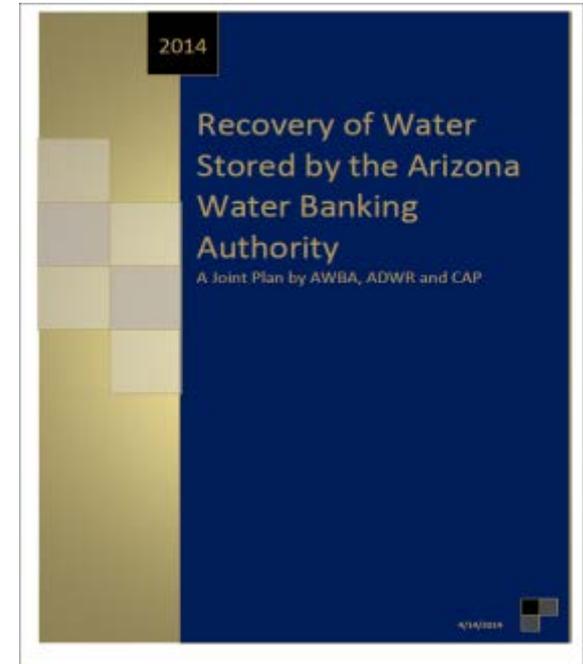


Recovery of AWBA Credits



- A firming requirement is triggered when reductions in Colorado River supplies impact deliveries to On-River P-4 water users and CAP for which the AWBA has a firming commitment
 - *On-River P4 uses*
 - *Indian Settlements*
 - *M&I Users*
- Based on current demand, it is unlikely that a Tier 1 shortage would require the AWBA to recover or distribute credits
- As demands increase over time that could change
- CAP is the AWBA's primary recovery agent

Preparing for Shortage & Recovery of AWBA Credits



Preparing for Shortage & Recovery of AWBA Credits

Central Arizona Project:

- Developing (with Reclamation) The CAP System Use Agreement
- Evaluating the development of recovery infrastructure at key sites
 - Ex: exploratory drilling at Tonopah Desert Recharge Project
- Exploring recovery opportunities and agreements with partners in each active management area (AMA)
 - Ex: Irrigation Districts, Municipal providers, Tribes
- Objective is to ensure there is sufficient capacity available in each AMA to meet future recovery needs



Preparing for Shortage & Recovery of AWBA Credits

Arizona Water Banking Authority:

- Developed firming arrangements with Gila River Indian Community
- Cooperation with CAP in the use of 4-cent funding to purchase credits at optimal locations
- Meeting the AWBA's firming responsibilities will require effective planning and continued coordination among everyone involved both on-River and throughout the AMAs



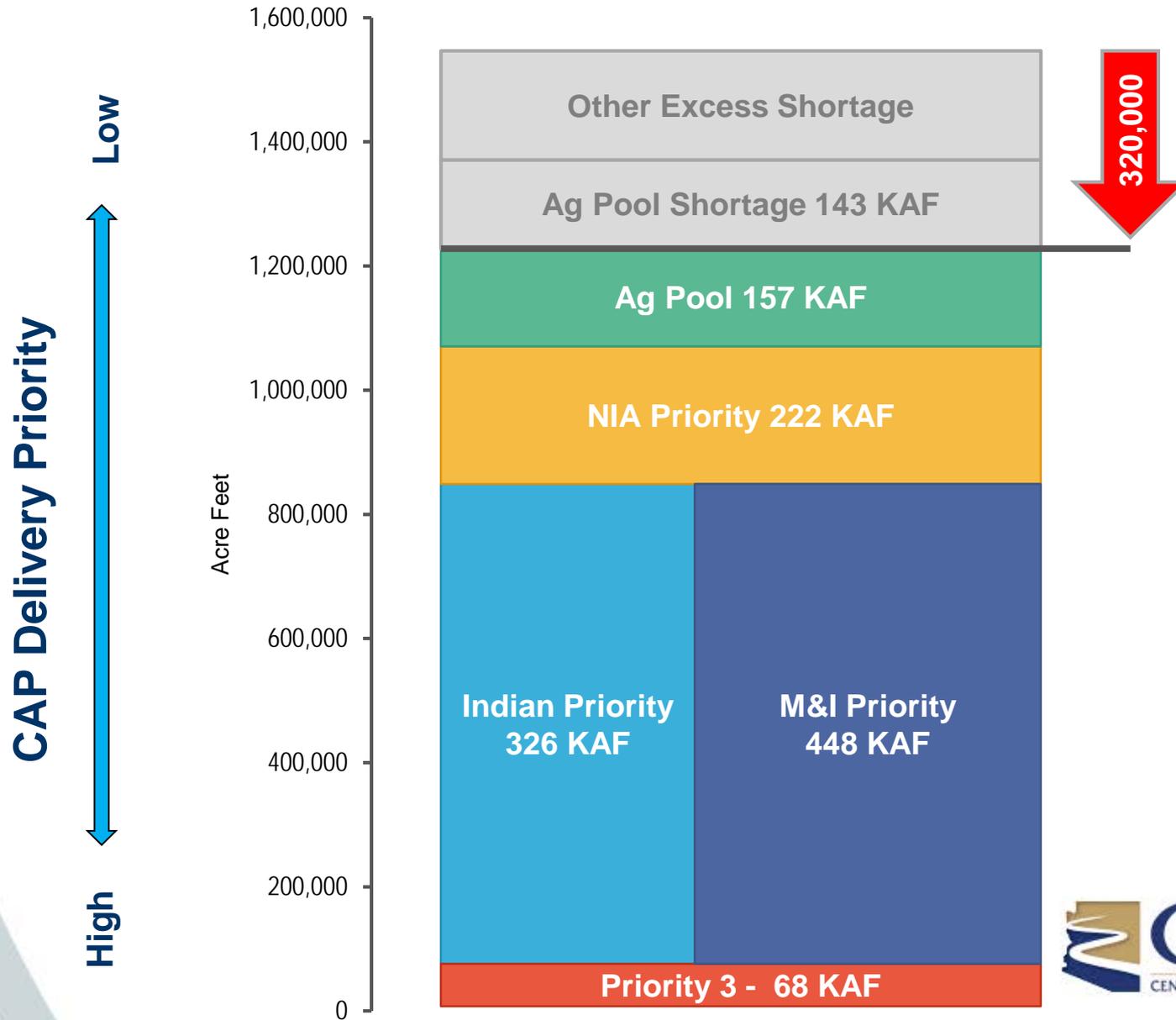
2007 Guidelines Shortage Sharing

- 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 additional reductions to California under '07 Guidelines

2007 Projected Tier 1 Shortage Impact



Colorado River Shortage Risk: Arizona/CAP Cooperative Programs

- **Storage and Recovery**

- 3.4 MAF of underground storage for future recovery for CAP cities, On-River communities, and Tribes

- **Lake Mead Reservoir Protection**

- Interstate plan targeting 740 KAF of new storage in Lake Mead
- CAP's share is 345 KAF by 2017

- **Innovative Conservation**

- Interstate funding to conserve +75 KAF to protect Lake Mead/Powell
- Conservation research grant program

- **Augmentation**

- Weather modification projects in the Upper Basin
- Local and binational desalination

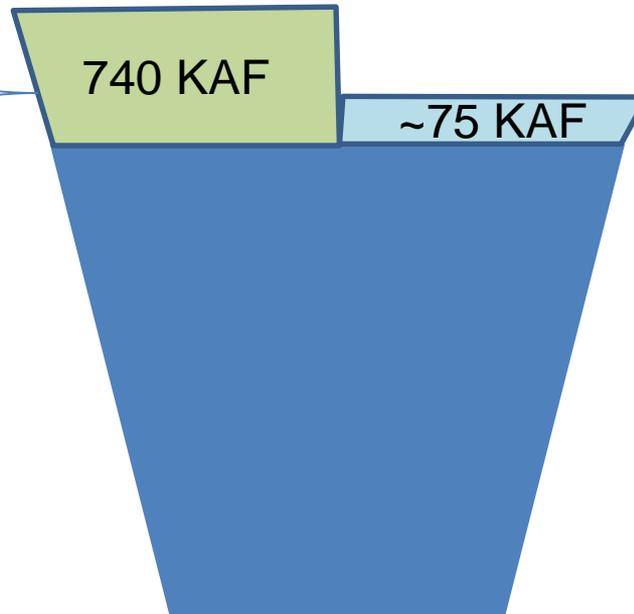
Lake Mead Protection Actions

2 Programs to Protect Lake Mead Elevations:

- **Lower Basin Pilot Drought Response Actions MOU (LB MOU)**
- **Pilot System Conservation Program (PSCP)**

LB MOU '14 – '17 Volumes:

CAP = 345 KAF
MWD = 300 KAF
BOR = 50 KAF
SNWA = 45 KAF



PSCP Phase 1 '15-'16:

Total funding = \$11 M
(\$8.25M LB/\$2.75M UB)
BOR = \$3M
CAP = \$2M
SNWA = \$2M
MWD = \$2M
Denver Water = \$2M

PSCP Phase 2 '16 –'17:

Total funding = \$7.5 M
(\$6.5 M LB/\$1.0M UB)
BOR = \$4M
CAP = \$1M
SNWA = \$1M
MWD = \$1M
Denver Water = tbd

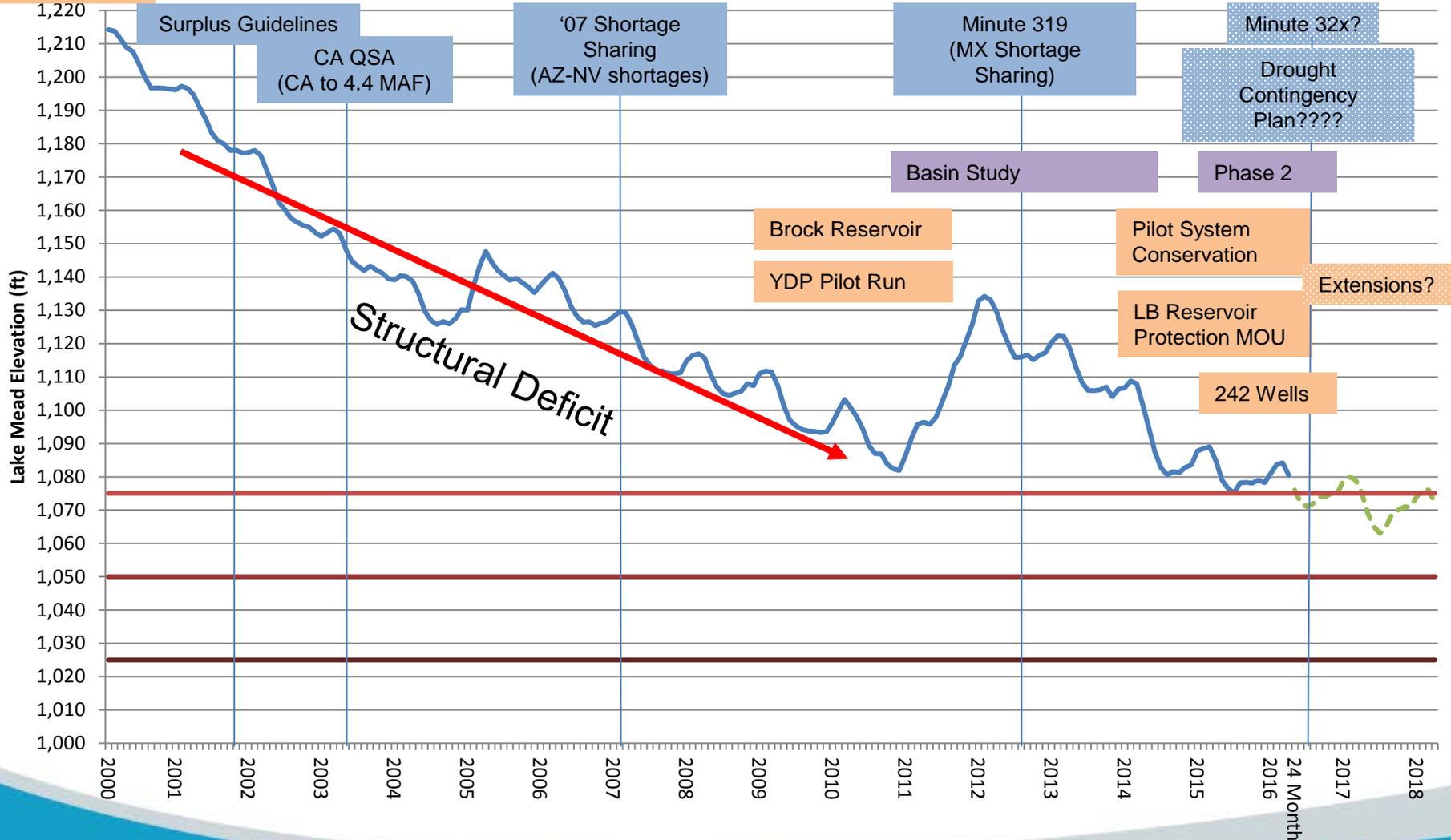
Colorado River Interstate Agreements and Projects to Address Declining Reservoir Elevations



Lake Mead Elevation

(EOM Jan 2000 – March '16 and Projected 24 Months)

AWBA 1996 – P



Lake Mead Protection Progress



- CAP's MOU target of 345 kaf will be completed by the end of 2016
- BOR and SNWA will have conserved more than 44 kaf of their MOU target by the end of 2016
- CAP with its Lower Basin PSCP partners will have conserved more than 50 kaf by the end of 2016
- The combined efforts will put more than 435 kaf by the end of 2016 or 5.5' in Lake Mead
- ❖ Mexico has a current balance of about 230,000 acre-feet of conservation storage in Lake Mead – another 3ft

Reservoir Protection Facts

- **Our collective efforts with the PSCP & MOU kept us out of Shortage in 2016 and will likely keep us out in 2017**
- **Extending those efforts will be needed to keep us out of Shortage in 2018**
- **What we have learned makes it clear that more is needed for long-term sustainability**

Questions



YOUR WATER. YOUR FUTURE.

Lower Colorado River Basin Drought Contingency Planning

Clint Chandler

Assistant Director

Water Planning & Permitting Division

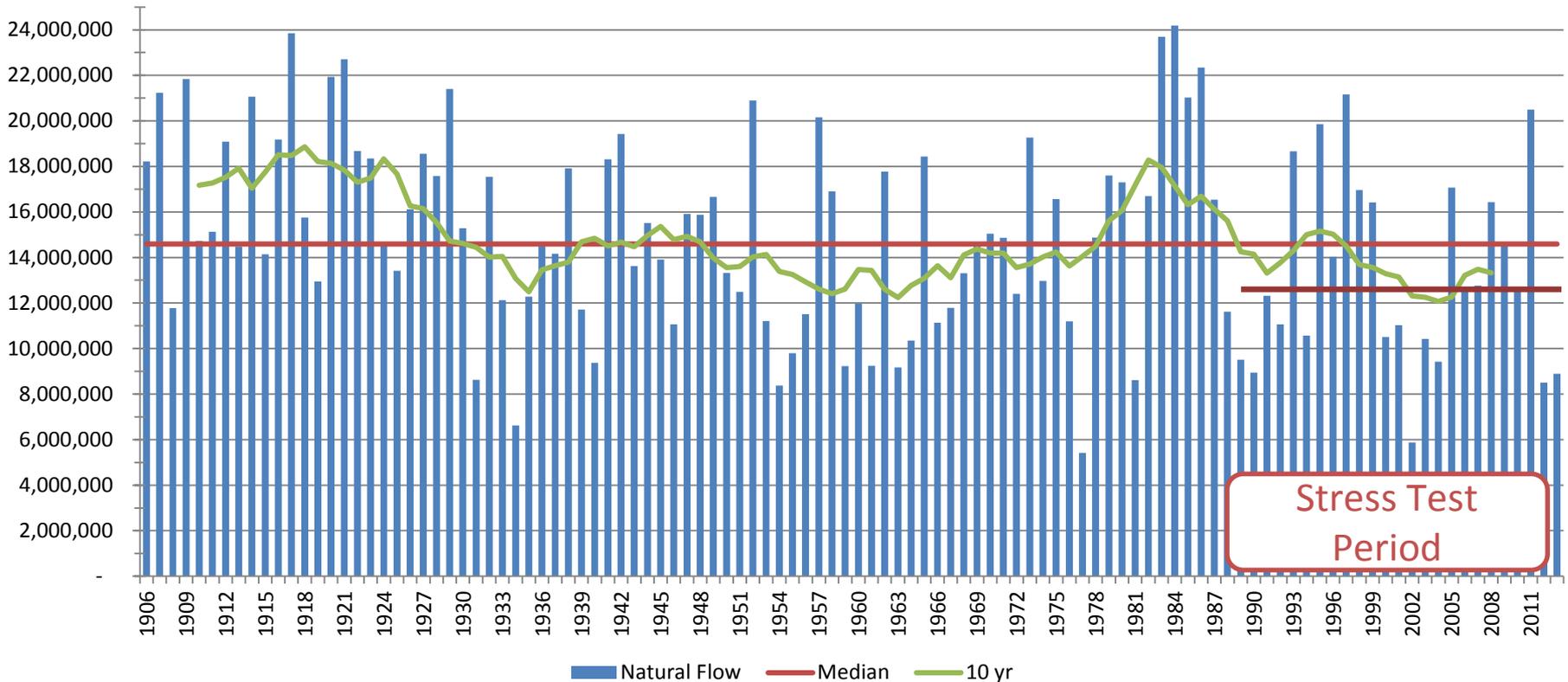
Arizona Department of Water Resources

May 18, 2016



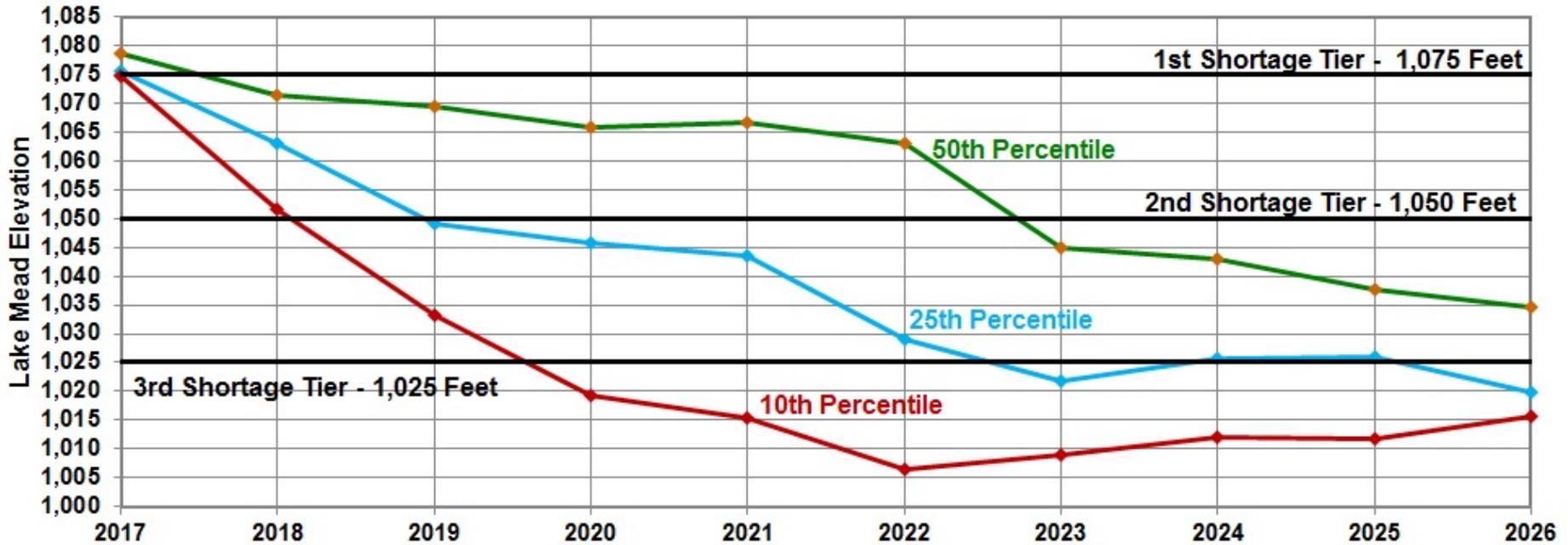
Observed Hydrology & “Stress Test”

Natural Flow at Lee Ferry (1906 - 2013)



Lake Mead – Selected Percentile Elevations

Stress Test Hydrology – “No Action”

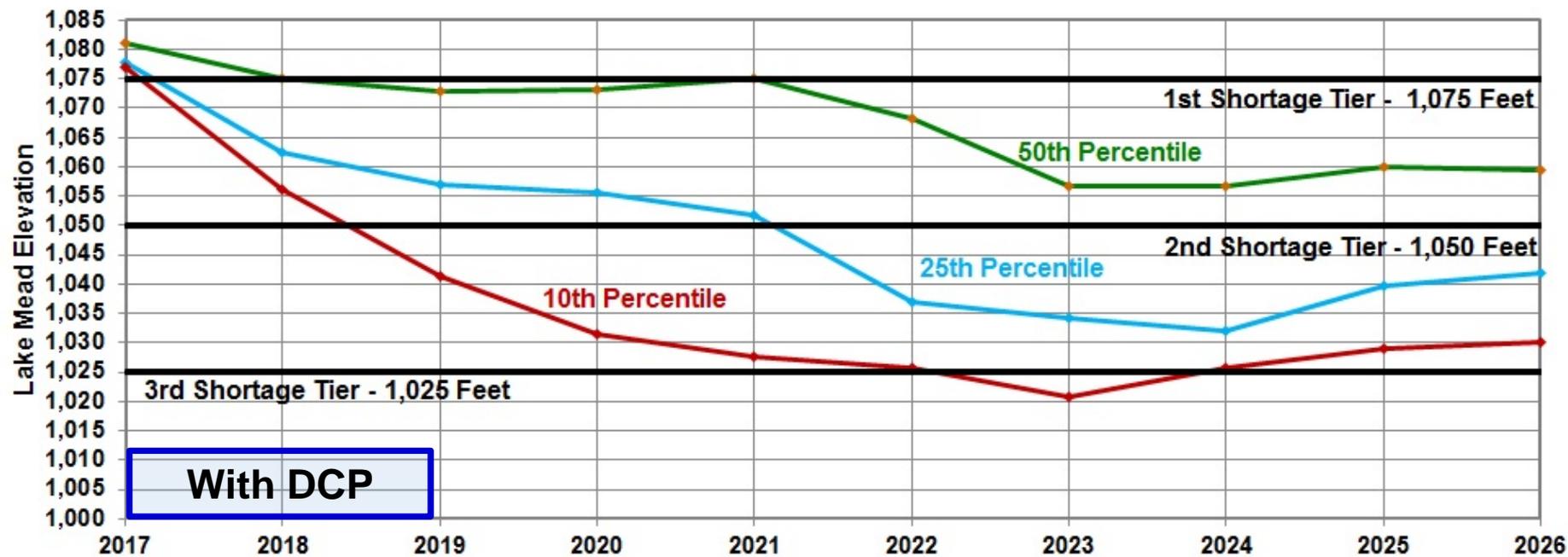
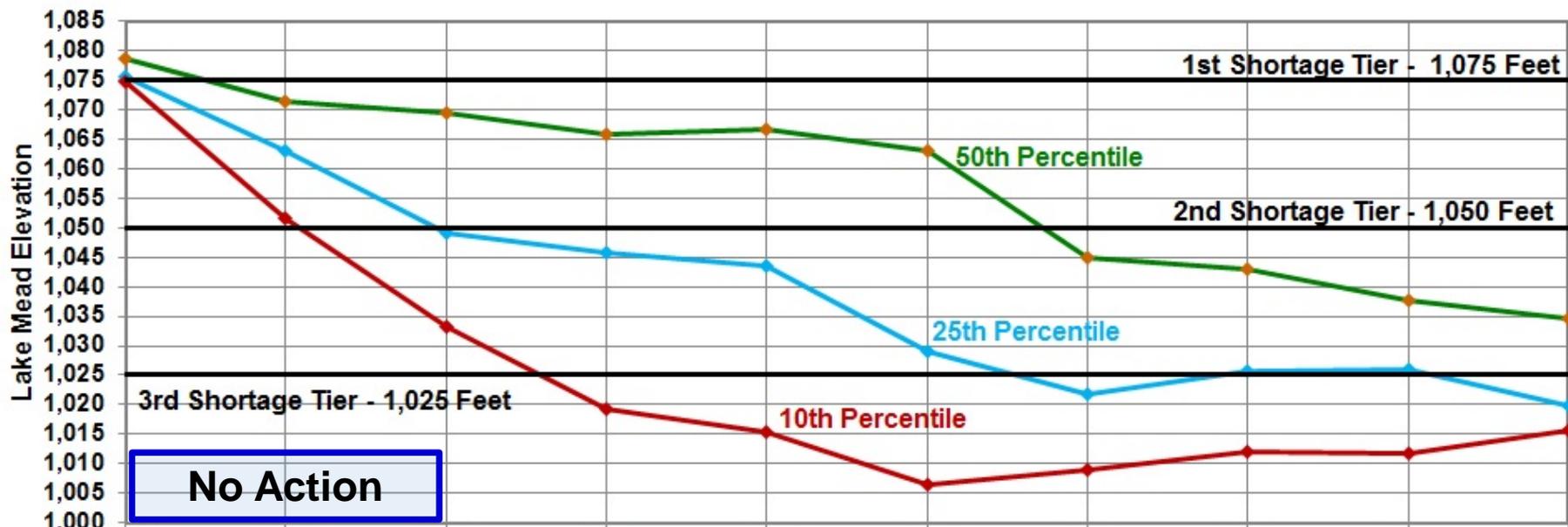


LBDCP Water Use Reductions

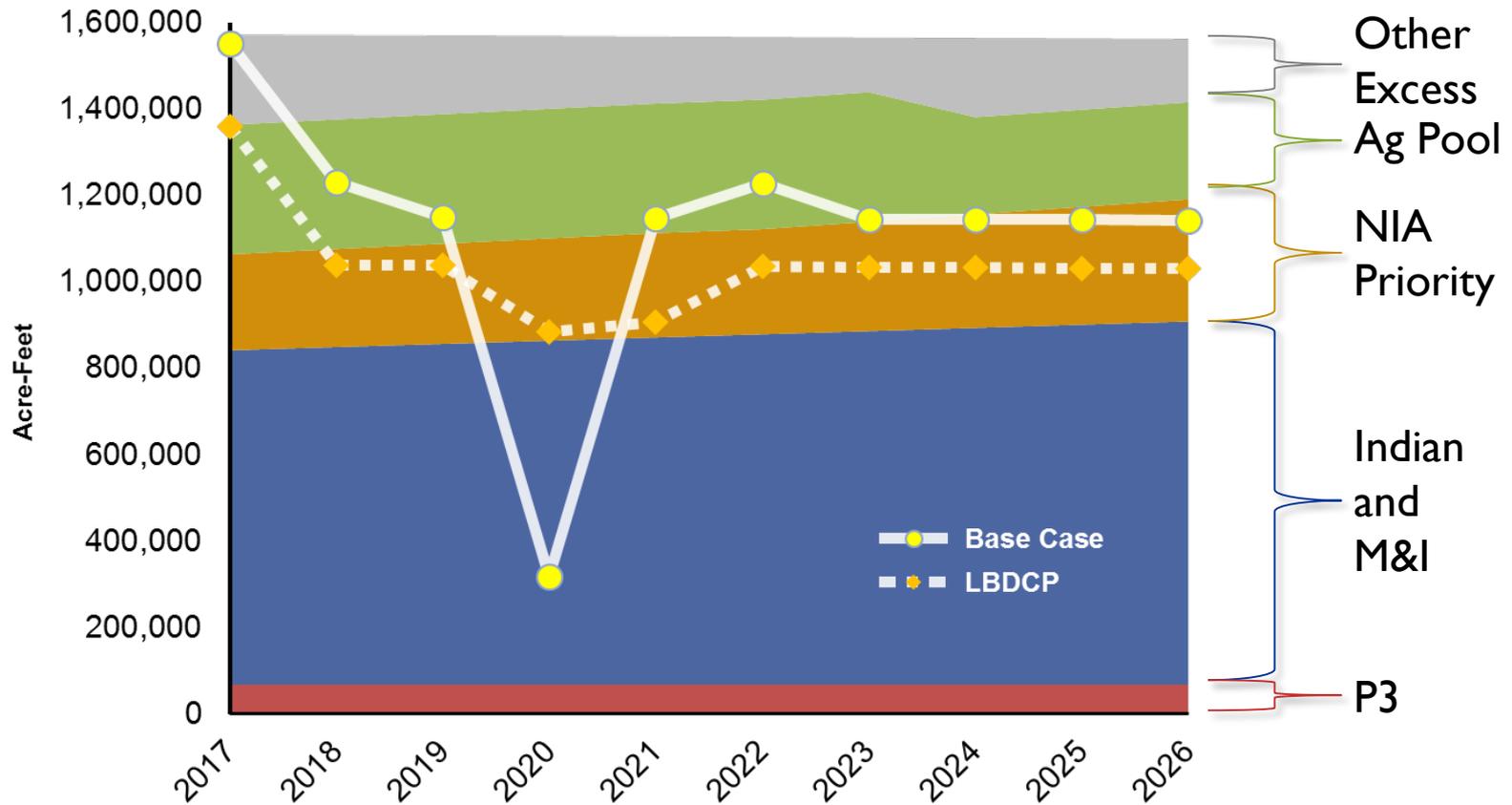
| Lake Mead Elevation | AZ [2007] | AZ [Plan] | AZ TOTAL | NV [2007] | NV [Plan] | NV TOTAL | CA [2007] | CA [Plan] | CA TOTAL | BOR | TOTAL |
|---------------------|-----------|-----------|----------|-----------|-----------|----------|-----------|-----------|----------|------|--------|
| 1090-1075 | 0 | 192K | 192K | 0 | 8K | 8K | 0 | 0 | 0 | 100k | 300k |
| 1075-1050 | 320K | 192K | 512K | 13K | 8K | 21K | 0 | 0 | 0 | 100k | 633k |
| 1050-1045 | 400K | 192K | 592K | 17K | 8K | 25K | 0 | 0 | 0 | 100k | 717k |
| 1045-1040 | 400K | 240K | 640K | 17K | 10K | 27K | 0 | 200K | 200K | 100k | 967k |
| 1040-1035 | 400K | 240K | 640K | 17K | 10K | 27K | 0 | 250K | 250K | 100k | 1,017k |
| 1035-1030 | 400K | 240K | 640K | 17K | 10K | 27K | 0 | 300K | 300K | 100k | 1,067k |
| 1030-1025 | 400K | 240K | 640K | 17K | 10K | 27K | 0 | 350K | 350K | 100k | 1,117k |
| <1025 | 480K | 240K | 720K | 20K | 10K | 30K | 0 | 350K | 350K | 100k | 1,200k |

Revised on 11/18/15 to include US and TOTAL reductions

Lake Mead – Selected Percentile Elevations Stress Test Hydrology – “No Action” and With DCP



Consecutive Dry Years Example



Lower Colorado River Basin Drought Contingency Discussions Next Steps

- Complete demand, hydrology and distribution scenario modeling to frame range of impacts.
 - NIA Pool, tribal entities, agricultural pool, other excess water users
 - On-River participation decreases impacts
- Discussion regarding the voluntary reductions in Arizona and development of Arizona consensus
- Arizona legislation, communication and messaging



Drought Contingency Planning Tribal Outreach

- 17 tribes in Arizona have Colorado River water entitlements or claims from the mainstem or through CAP allocations
- In February, Reclamation invited tribes with entitlements to discuss:
 - status of current drought
 - ongoing drought response actions
 - interest and potential involvement in drought contingency planning
- 15 meetings conducted¹; 2 to be scheduled²
- Follow-up meetings arranged upon request
- Reclamation is committed to working closely with tribes as discussions unfold

¹Ak-Chin Indian Community, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort McDowell Yavapai Nation, Fort Mojave Indian Tribe, Gila River Indian Community, Havasupai Tribe, Pasca Yaqui Tribe, Quechan Indian Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai Apache Tribe

²Hopi Tribe, Navajo Nation

Up-to-Date Arizona Information Sources

- **ADWR's website: azwater.gov**
- **CAP's website: cap-az.com**
- **Central Arizona Water Conservation Board Meetings**
- **Arizona Water Banking Authority Commission Meetings**
- **Groundwater Users Advisory Council Meetings**

Please send follow up questions to:

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info@cap-az.com



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