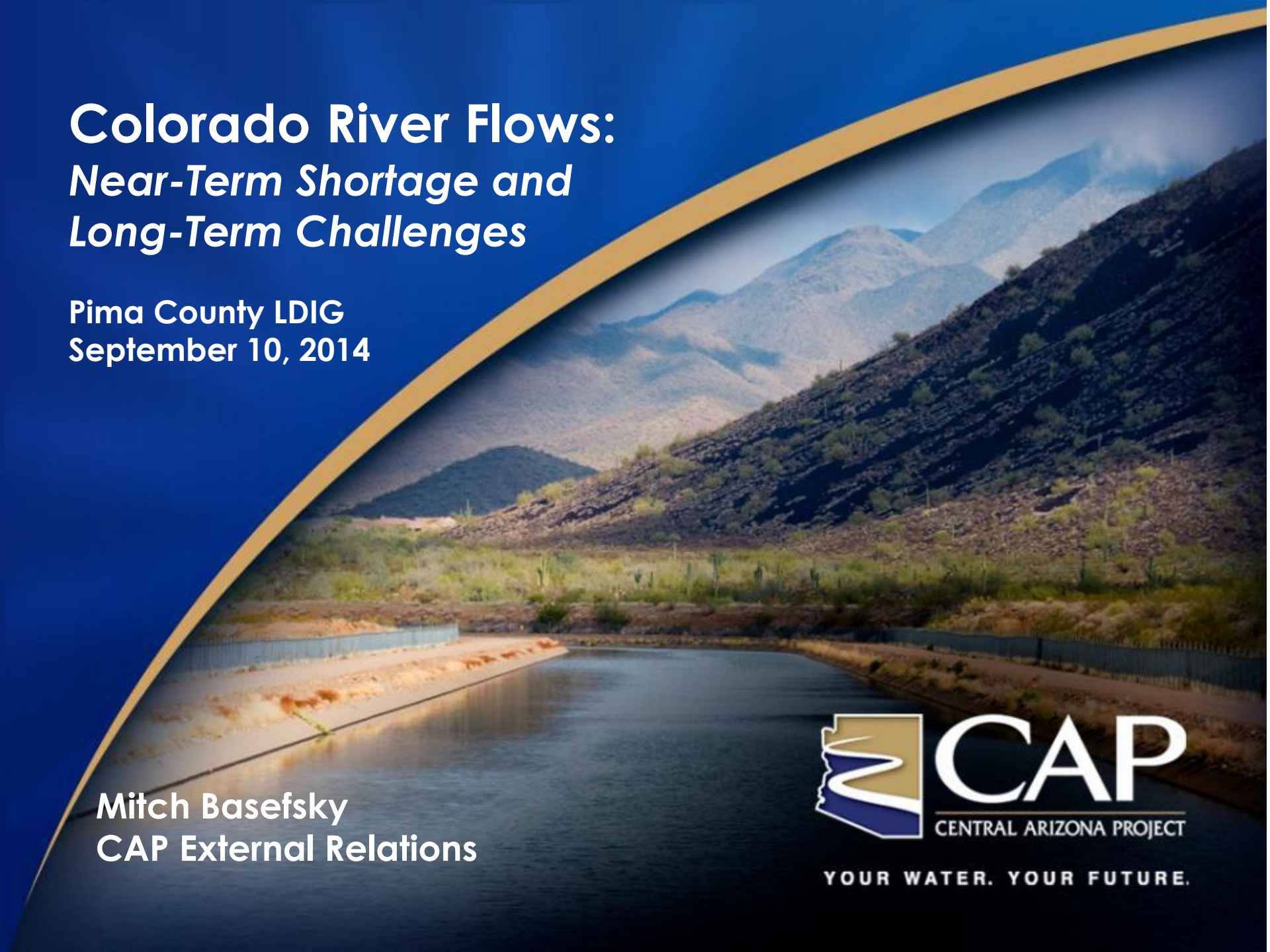
Colorado River Flows:
Near-Term Shortage and Long-Term Challenges

Pima County LDIG
September 10, 2014



Mitch Basefsky
CAP External Relations

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The Colorado River Basin

Drains Seven U. S. and Two Mexican States

Covers Approximately 240,000 sq. mi.

Major Out of Basin Diversions to Colorado, New Mexico, Southern CA

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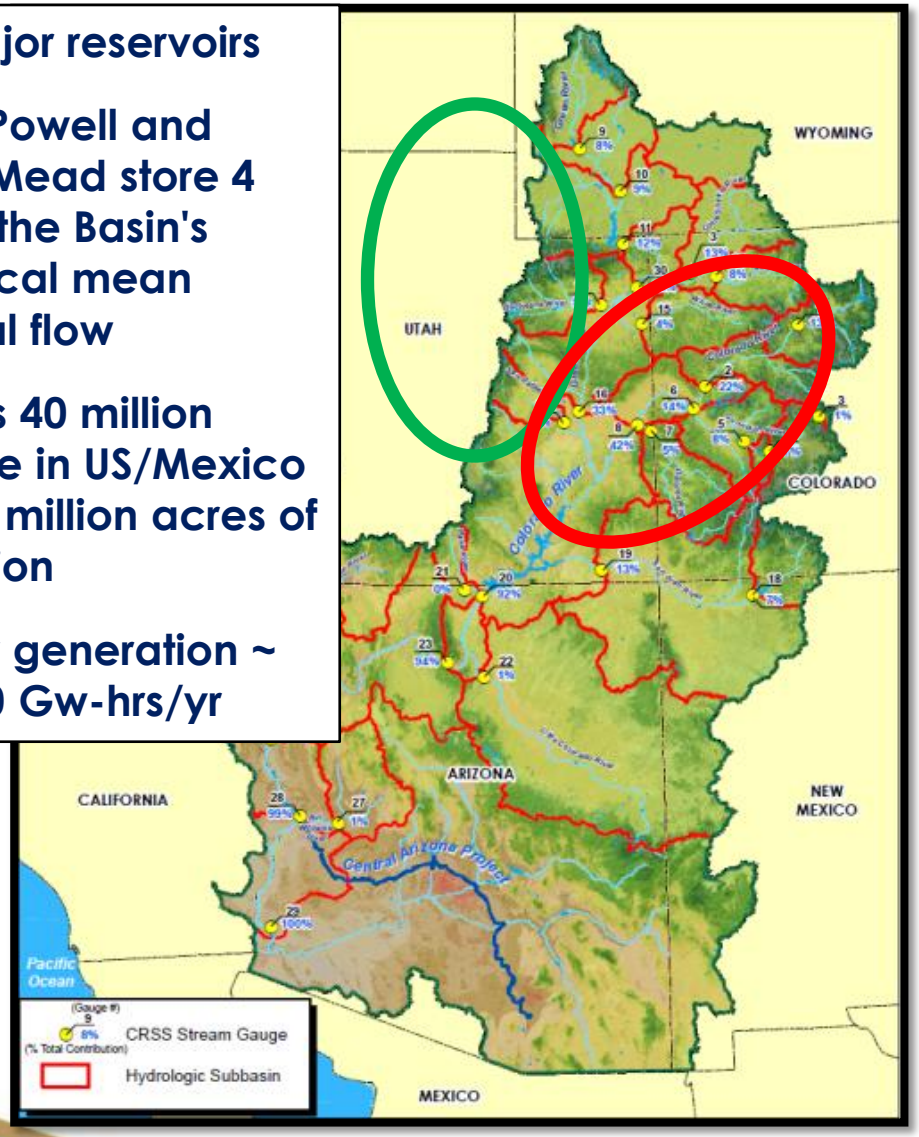
Physical Characteristics

10 major reservoirs

Lake Powell and Lake Mead store 4 times the Basin's historical mean annual flow

Serves 40 million people in US/Mexico and 4 million acres of irrigation

Power generation ~ 10,000 Gw-hrs/yr



92% of the Colorado River Basin's mean annual flow occurs above Lees Ferry (1906-2007)

Mean annual flow is close to 15.0 MAF, ranging from 5.6 MAF to 25.2 MAF

Upper Colorado and Green River are the most important tributaries: 75% of annual flow.

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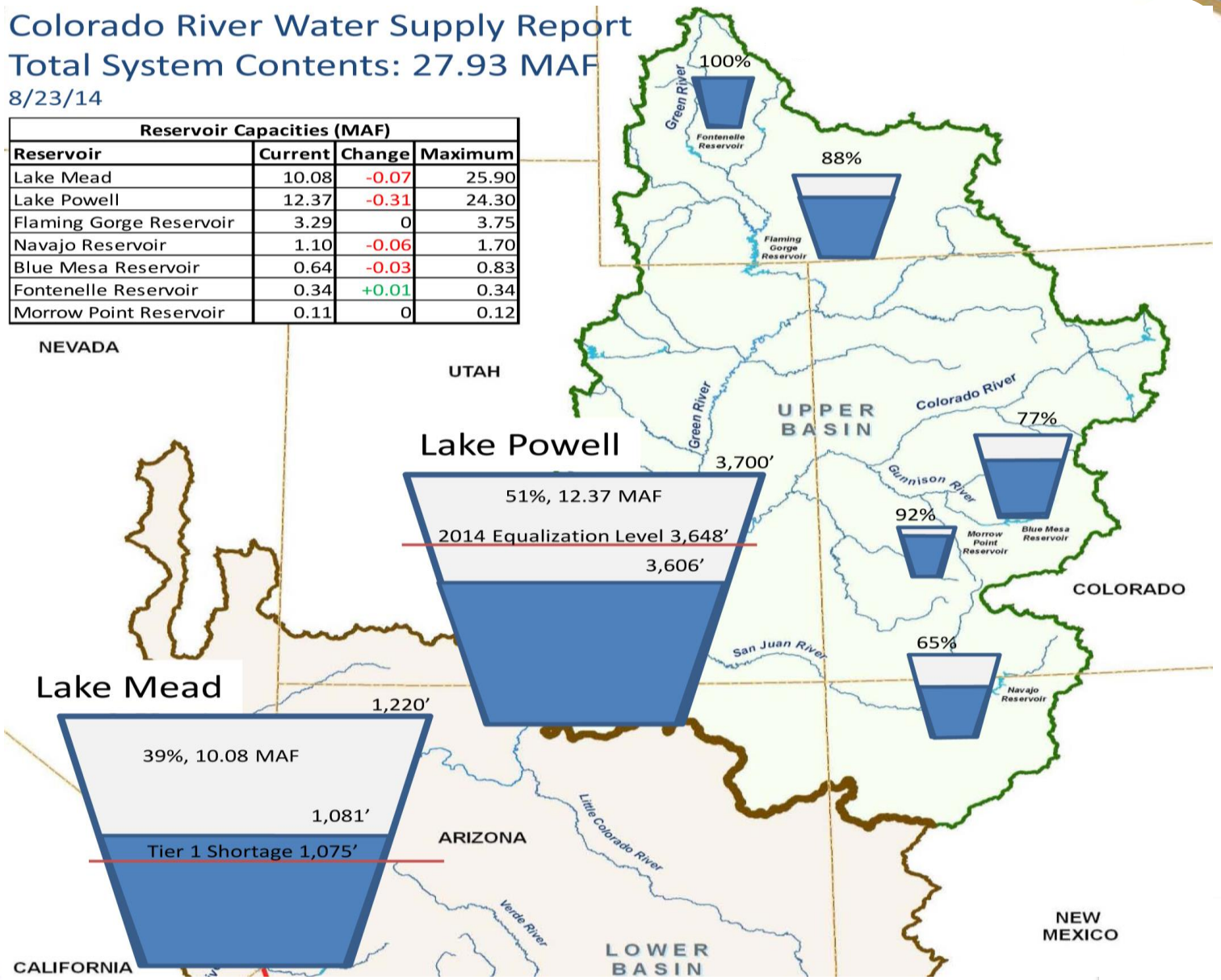
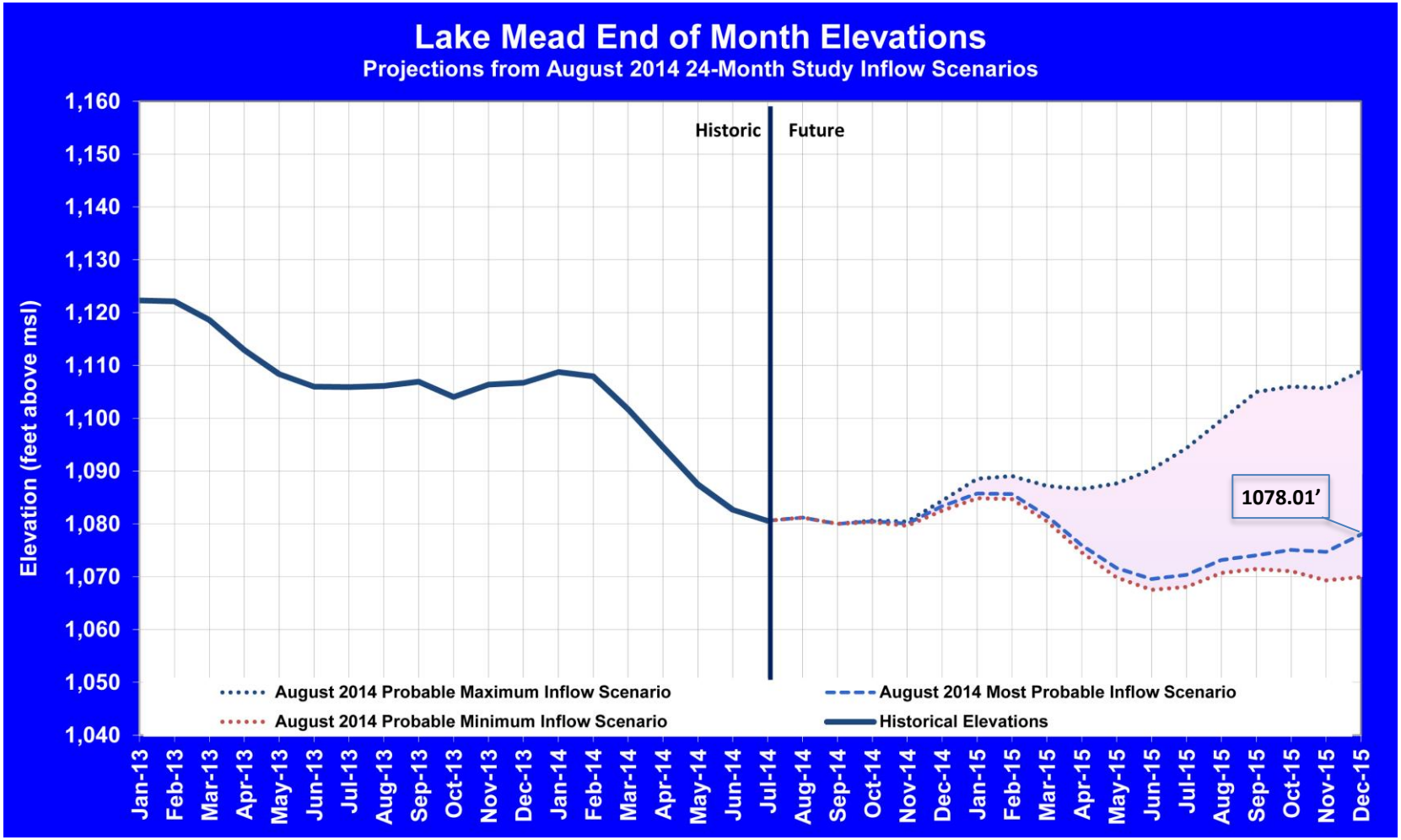
Colorado River Water Supply Report
Total System Contents: 27.93 MAF
8/23/14

Reservoir Capacities (MAF)			
Reservoir	**Current**	**Change**	**Maximum**
Lake Mead	10.08	-0.07	25.90
Lake Powell	12.37	-0.31	24.30
Flaming Gorge Reservoir	3.29	0	3.75
Navajo Reservoir	1.10	-0.06	1.70
Blue Mesa Reservoir	0.64	-0.03	0.83
Fontenelle Reservoir	0.34	+0.01	0.34
Morrow Point Reservoir	0.11	0	0.12



24-Month Study - August 2014



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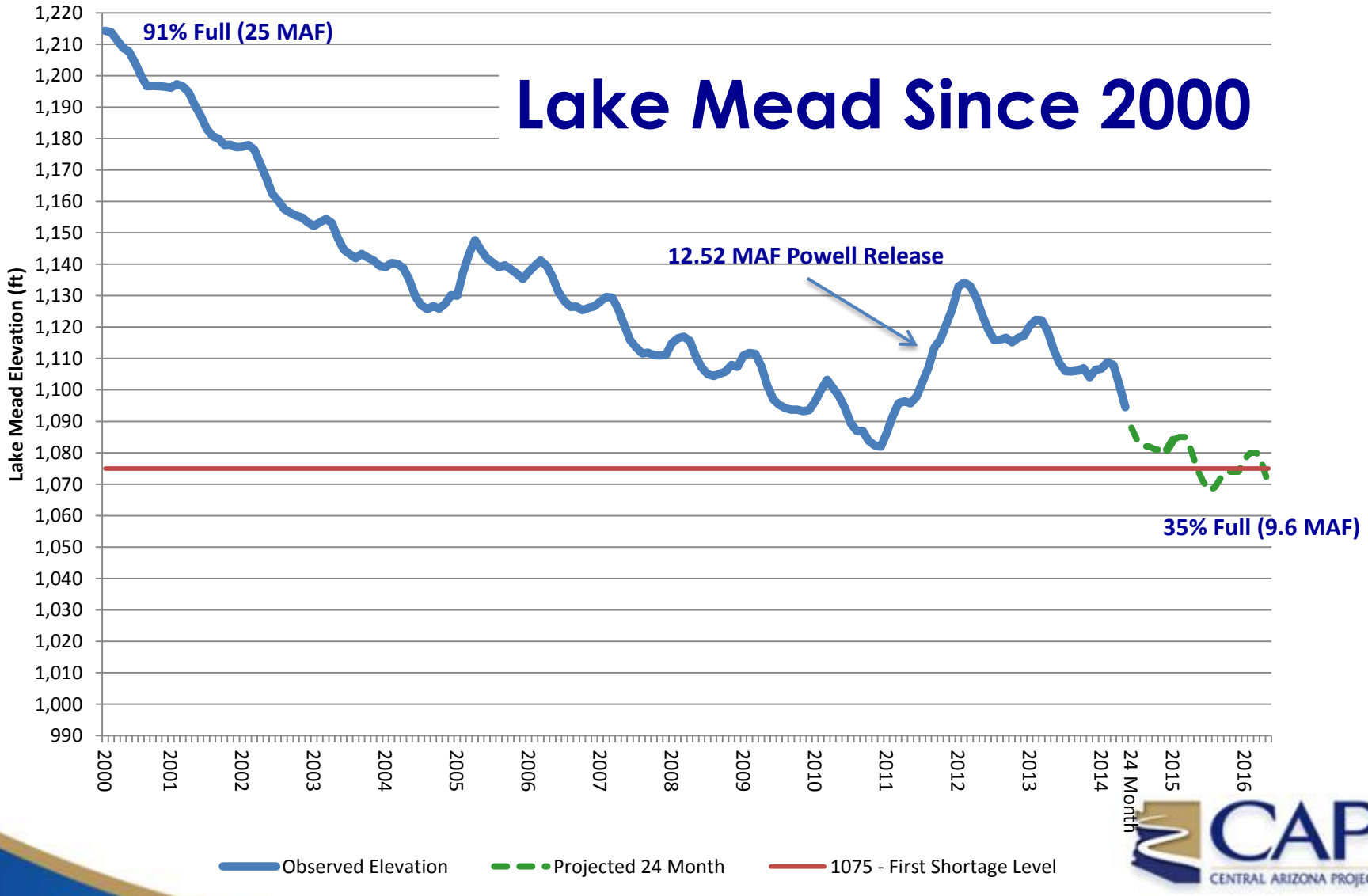
What is driving shortage?



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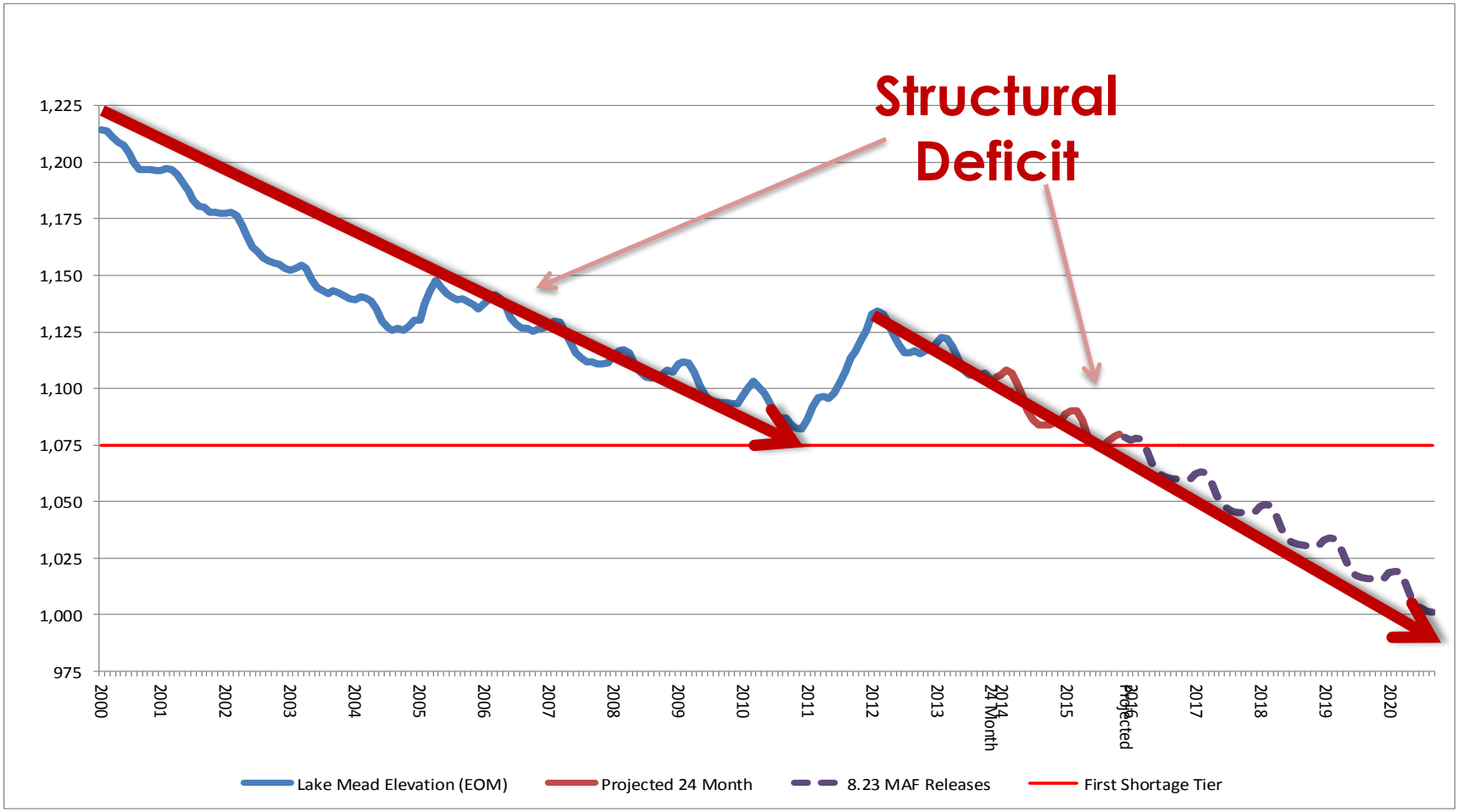
Water Budget at Lake Mead

- 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

Structural Deficit: Net Effect



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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

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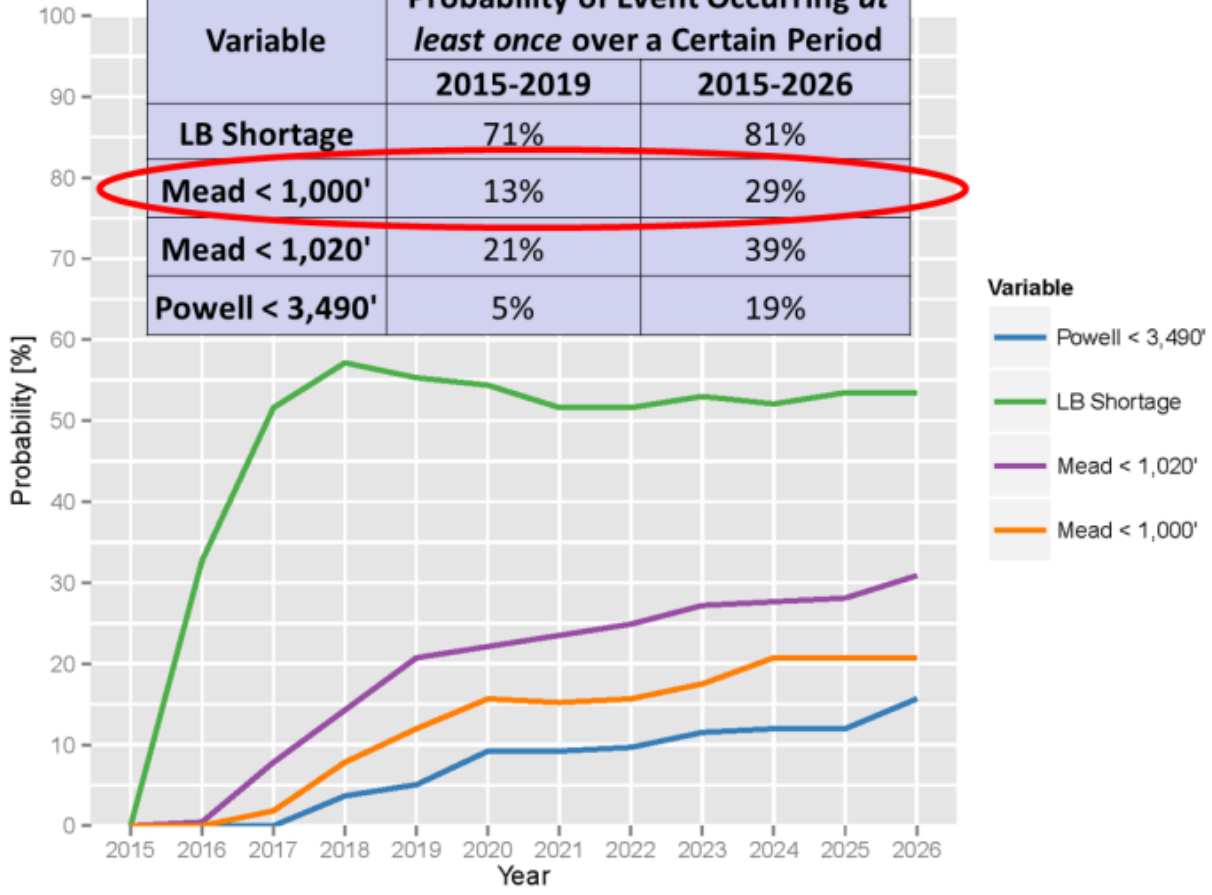
Risk to All Colorado River Users

Without equalization or corrective action, Lake Mead could fall below elevation 1000 ft in 5-8 years

Variable	Probability of Event Occurring *at least once* over a Certain Period	
	2015-2019	2015-2026
LB Shortage	71%	81%
Mead < 1,000'	13%	29%
Mead < 1,020'	21%	39%
Powell < 3,490'	5%	19%



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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 3

Take proactive action to reduce Mead dropping

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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 first reduced to zero
- 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

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Option 1 - Consequences

Southern Nevada may be unable to withdraw any water below elevation 1000 ft

Less than 4.5 MAF left in storage in Lake Mead:

- Diversions for CAP M&I and Indian users are reduced to zero, along with on-river P4 users

Mead reaches dead pool

Reduced power generation and efficiency at Hoover Dam, potential cavitation or vibration damage

- Drops from 2079 MW to 696 MW at elevation 950'

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Option 2 – Protect Elevation 1,000'

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 allowed 230 KAF to meet health and safety needs
- CAP allowed 950 KAF to meet core municipal needs and U.S. tribal responsibilities
- Remaining available water distributed to other users

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Option 2 - Consequences

Secretarial discretion has replaced the Law of the River

2-6 MAF in reductions to users other than SNWA and CAP

- Agricultural users bear most reductions
- Additional reductions to Mexico could lead to increased international tension

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Lake Mead Elevation Response After Falling Below 1,000 ft by 2026

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

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Option 3 - 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"

Core components:

- Create funding mechanism ($100M+ per year)
- Implement conservation/augmentation projects
- State backstop if funded projects do not generate at least 600 KAF
- U.S. action to reduce system losses by 150-200 KAF

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Potential Cost of Proactive Plan

Reduced annual CAP diversions

- Impacts CAP Excess Water, potentially NIA
- Increased fixed OM&R rates for all CAP customers

Annual payment 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

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Adaptation Strategies

Storage

CAP and Arizona Water Bank stored water underground for future recovery during shortages (3.7 MAF – more than twice of CAP's annual diversions from the Colorado)

Conservation/Efficiency

Brock Reservoir water savings (100 KAF/year)

Tamarisk Management

Minute 319 agreement with Mexico to share shortages with U.S. during droughts

Augmentation

Weather Modification pilot for Upper Basin (2006-present)

Conducted desalination studies for Lower Basin

- Potential partnerships for Seawater Reverse Osmosis with Mexico and other U.S. Users

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Current Efforts and Next Steps

CAP and ADWR working with Basin States to prepare a "Drought Response and Sustainability Plan"

Work with Arizona Colorado River users and CAP customers to develop components of a proactive plan to shortage

Outline policy and cost implications of plan with CAP Board and Stakeholders

Prepare an implementation strategy

Basin States report to Secretary of the Interior

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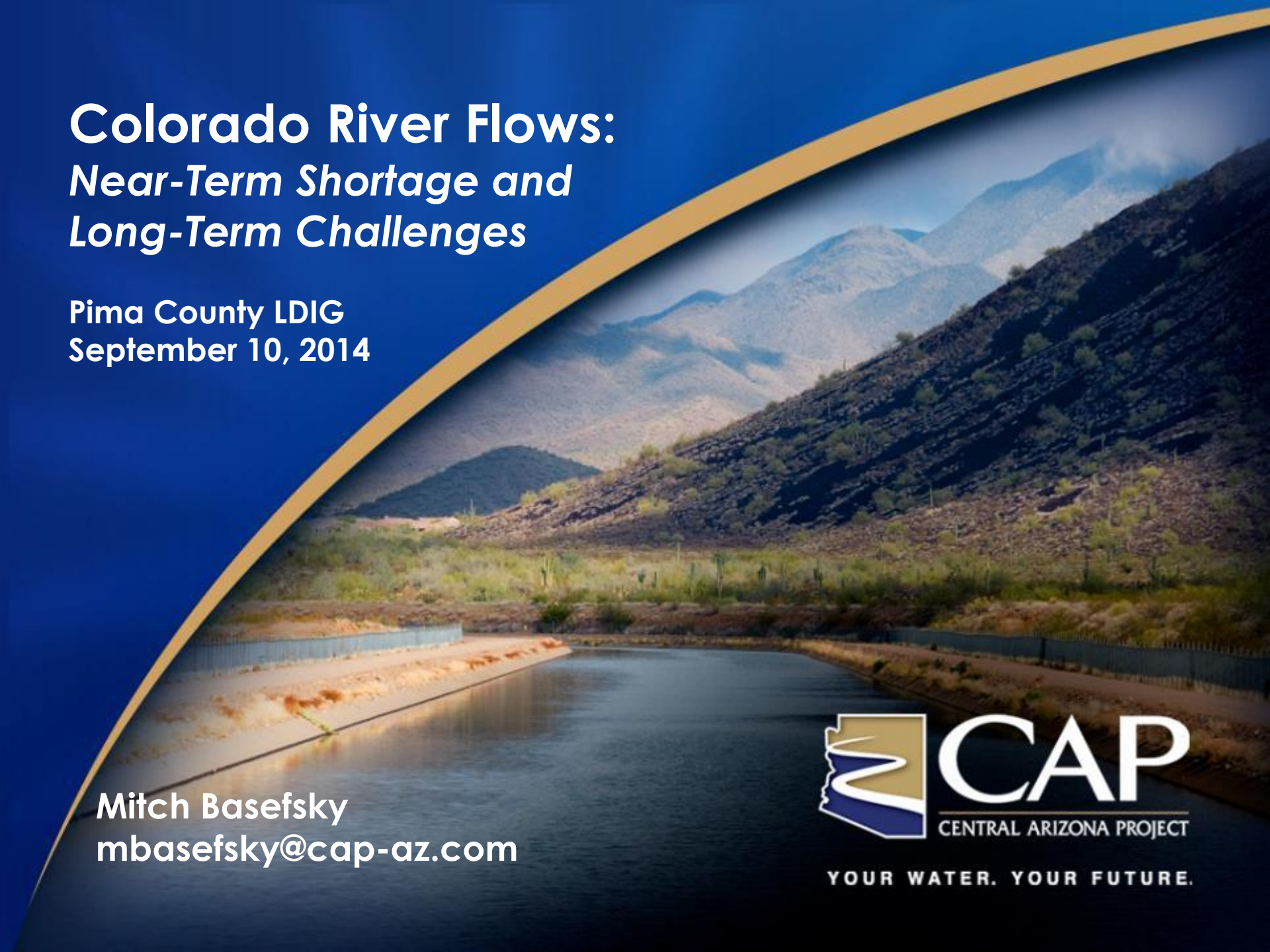

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