

An aerial photograph of a desert canyon landscape. A winding river flows through the canyon, leading to a large, calm reservoir. The surrounding rock formations are layered and eroded, showing various shades of red, orange, and brown. The sky is a mix of orange and blue, suggesting a sunset or sunrise. A semi-transparent orange rectangle is overlaid on the center of the image, containing white text.

# Beyond the Bathtub Ring: How to Think about Water in the Sun Corridor



# First, a brief history of the Colorado River

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## Part 1 Development

1905-06 Flood & the Salton Sea

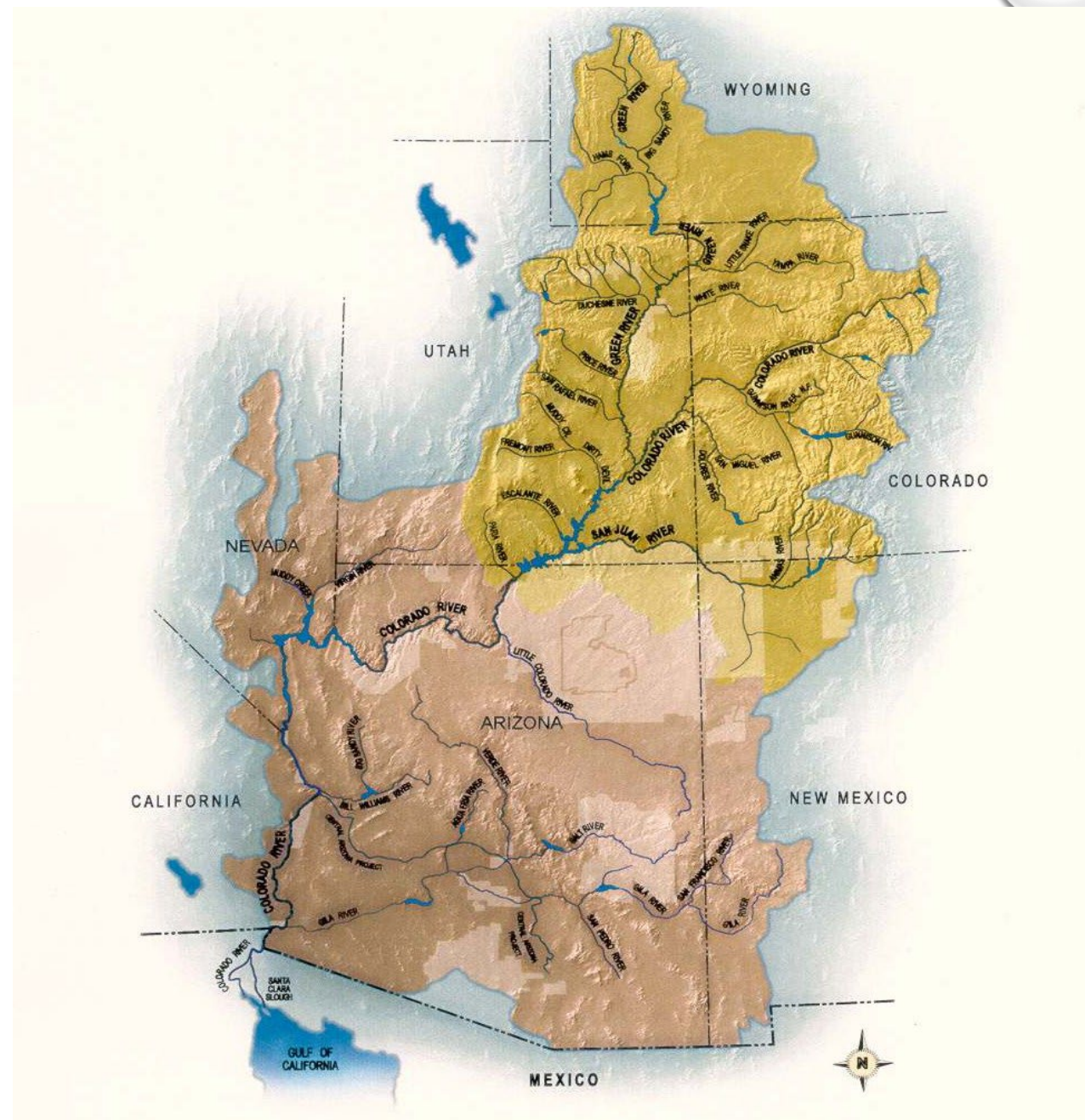
1922 Compact

1928 Boulder Canyon Project Act

1944 Mexican Treaty

1948 Upper Basin Compact

1956 Colorado River Storage Project Act



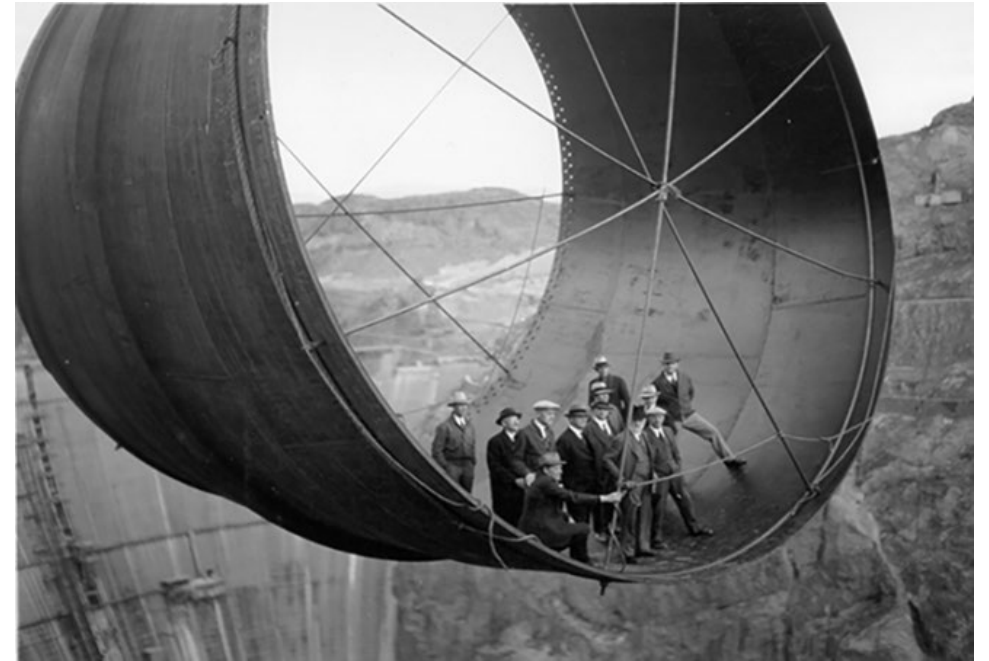
# Herbert Hoover and the 1922 Compact



- 7.5 maf to each basin;
- 1.5 maf for Mexico
- Upper Basin Obligation Not to Deplete below 75 maf over running 10 year period
- Honor Present Perfected Rights

## 1928 Boulder Canyon Project Act

- Authorized Hoover Dam/Lake Mead/All American Canal
- Section 5 Contract Authority
- Honor Present Perfected Rights





Arizona Gov. Benjamin Baker Moeur declares martial law in 1934

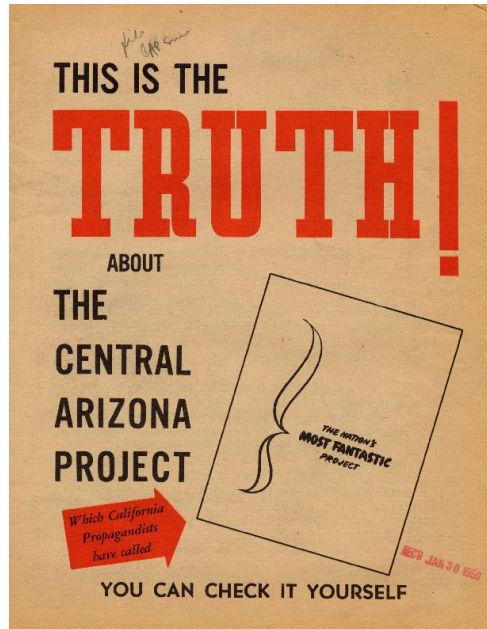






# 1968 Colorado River Basin Project Act and the Central Arizona Project

Article II(B)(3) of the decree of the Supreme Court of the United States in Arizona against California (376 U.S. 340) shall be so administered that in any year in which, as determined by the Secretary, there is insufficient main stream Colorado River water available for release to satisfy annual consumptive use of seven million five hundred thousand acre-feet in Arizona, California, and Nevada, diversions from the main stream for the Central Arizona Project shall be so limited as to assure the availability of water in quantities sufficient to provide for the aggregate annual consumptive use by holders of present perfected rights, by other users in the State of California served under existing contracts with the United States by diversion works heretofore constructed, and by other existing Federal reservations in that State, of four million four hundred thousand acre-feet of mainstream water,





# The Lower Basin Deficit...

## Mass Balance at Lake Mead

- Given current demands in the Lower Basin (including Mexico), and minimum objective release from Lake Powell, Lake Mead storage will continue to decline
  - Inflow = 9.0 maf  
(release from Powell + side inflows)
  - Outflow = - 9.5 maf  
(LB and Mexico apportionments + downstream regulation, gains and losses)
  - Mead evaporation loss = - 0.8 maf
  - Balance = - 1.3 maf

RECLAMATION

# Drought Contingency Planning



“When one tugs at a single thing in nature,  
he finds it attached to the rest of the world.”

- John Muir



# Colorado River Basin Storage

(as of July 10, 2022)

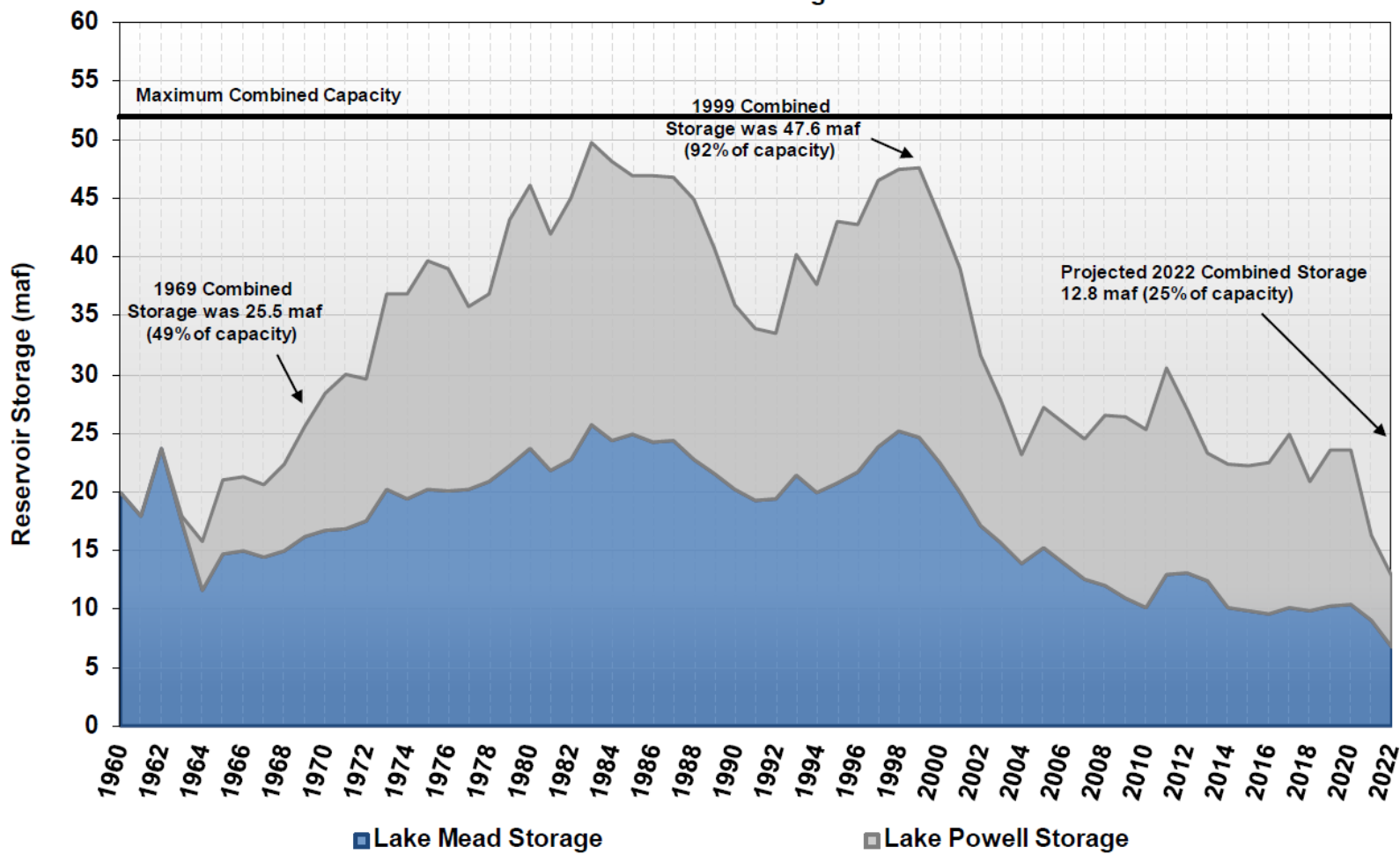
Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Lake Powell	28%	6.41	3,539.45
Lake Mead	27%	7.12	1,041.99
Total System Storage	35%	20.37	- - -

Total system storage was 41% of capacity, or 24.49 maf in storage, at this time last year.



# Lake Powell and Lake Mead End of Water Year Storage

Water Years 1960 through 2022





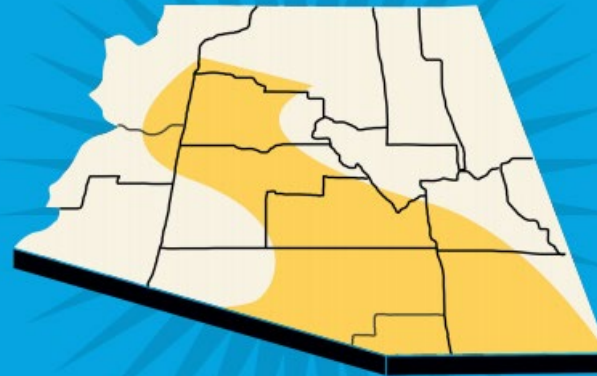
# Emerging Actions

- Expect deeper reductions than previously anticipated under Tier 2 or Tier 3 in 2023.
- Achieving an additional two million acre-feet in reductions in 2023 will be challenging.
- There will be a need to ramp up to additional reductions in 2024.
- The role of compensation for additional conservation or reductions is not clear.
- Actions need to result in wet water reductions.



# Return to Watering the Sun Corridor

A Perspective by  
Grady Gammage Jr.



Spring 2021

**ASU** Kyl Center for Water Policy  
at Morrison Institute  
Arizona State University



# Summary of Existing Sun Corridor Supplies

2011

Salt/Verde	800,000 Average Af/Yr
Other Surface Water	250,000 Average Af/Yr
Natural Groundwater Recharge	260,000 Average Af/Yr
Colorado River	1,500,000 Average Af/Yr
<b>TOTAL</b>	<b>2,810,000 Average Af/Yr</b>

2020

Salt/Verde	800,000 Average Af/Yr
Other Surface Water	150,000 Average Af/Yr
Natural Groundwater Recharge	344,000 Average Af/Yr
Colorado River	1,200,000 Average Af/Yr
<b>TOTAL</b>	<b>2,494,000 Average Af/Yr</b>

# Climate Change Assumption (2011 = -15%)

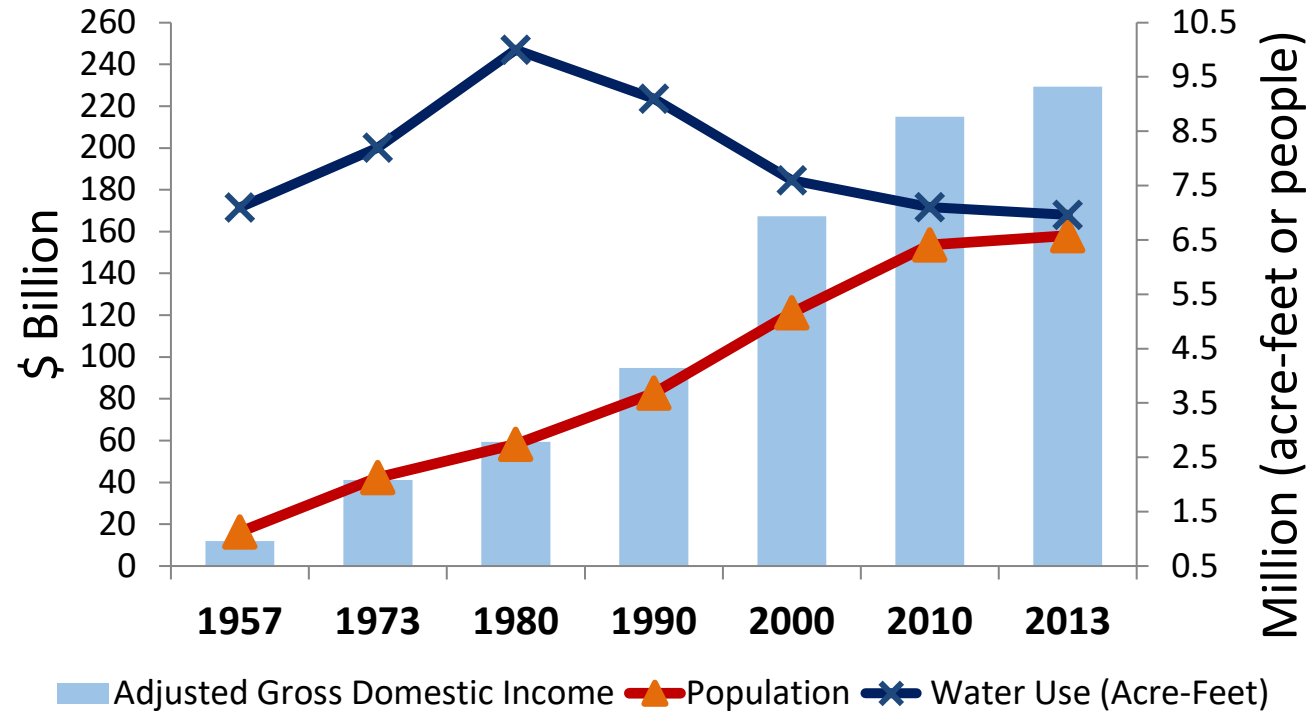
	2020 Supply Estimates (AF)
Climate Change Reduction	2,494,000
-20%	1,995,200
-25%	1,870,500
-30%	1,745,800

## Water Use in the Sun Corridor (in Million Acre Feet)





## Water Demand & Growth (1957 – 2013)



Source: Arizona Dept. of Water Resources

Chart 6: Residential GPCD Trends, 2005 to 2018<sup>36</sup>

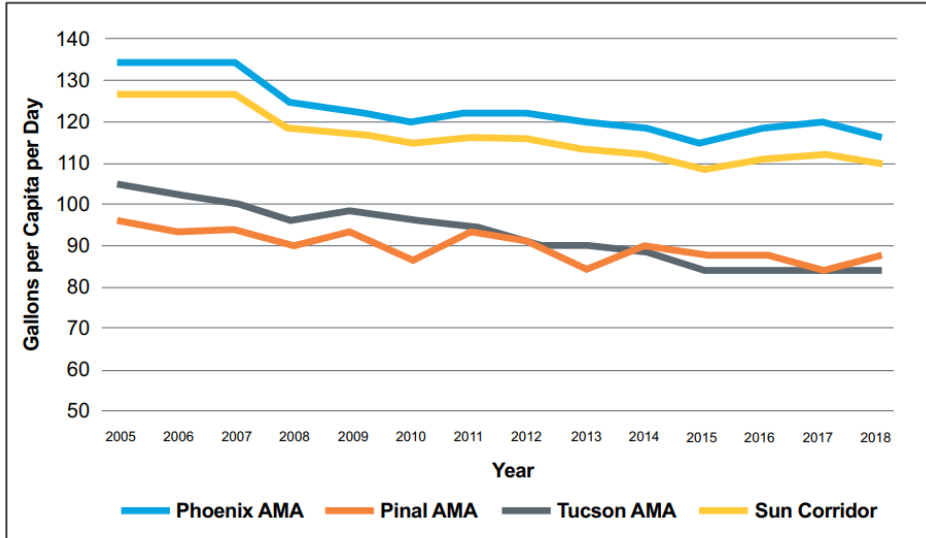
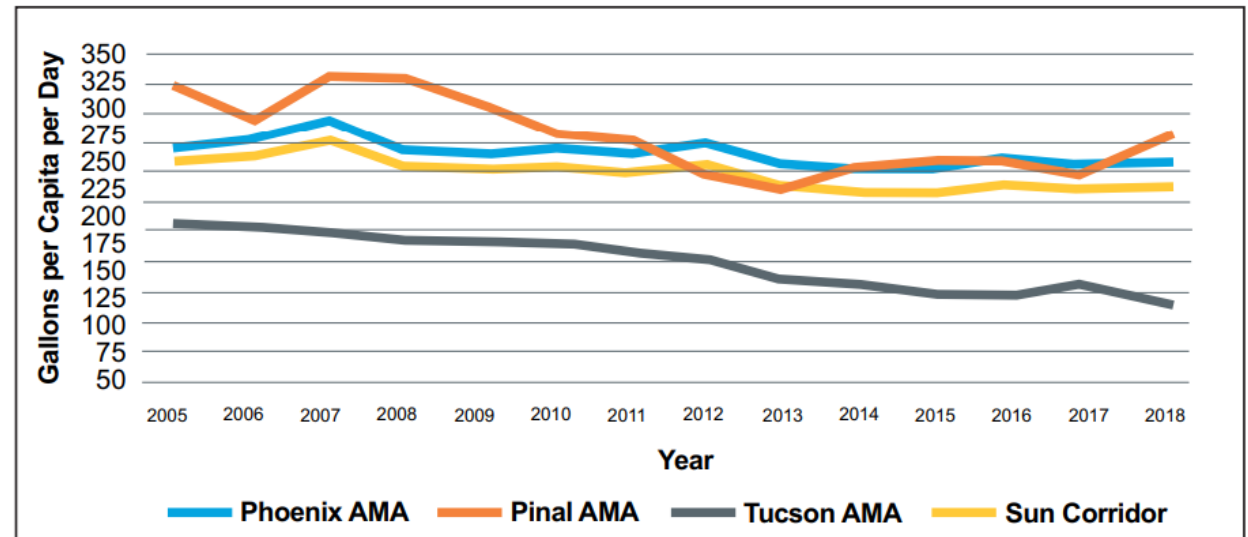
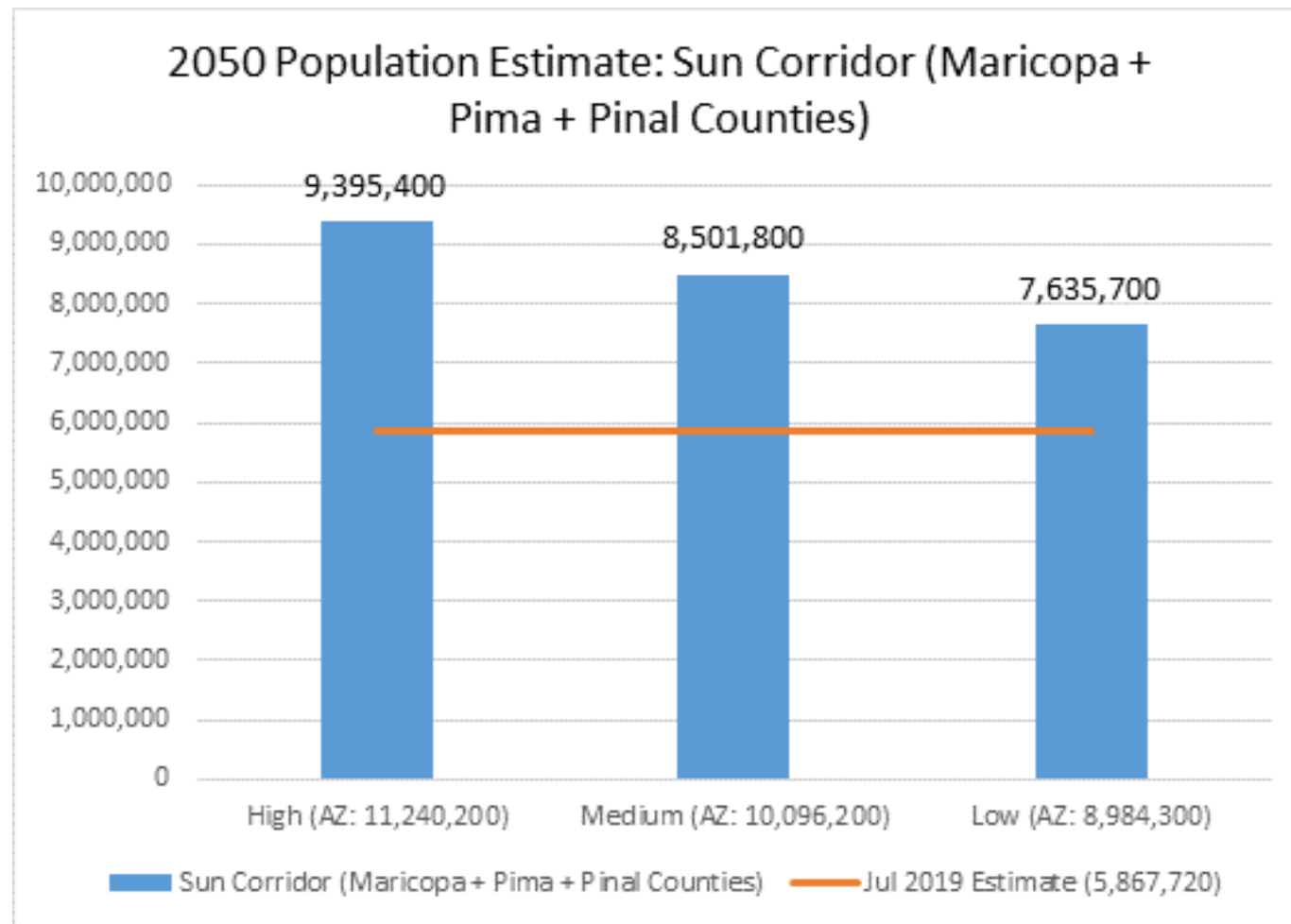


Chart 9: Sun Corridor Urban Water Use Trends<sup>38</sup>





Population as per Census July 2020 (6,121,084)



# Sun Corridor Theoretical Carrying Capacity

2011

	<b>Water Supply</b>	1,800,000 AF	2,000,000 AF	2,200,000 AF
<b>Per capita use</b>	<b>Approximate Population</b>			
200 GPCD (0.22 AF/year)		8,182,000	9,100,000	10,000,000
150 GPCD (0.17 AF/year)		10,588,000	11,765,000	12,941,000

2020

	30% climate change reduction	25% climate change reduction	20% climate change reduction
<b>Total Supply</b>	1,745,800 AF/y	1,870,500 AF/y	1,995,200 AF/y
<b>Municipal Supply*</b>	1,556,800 AF/y	1,681,500 AF/y	1,806,200 AF/y
	<b>Approximate Population</b>		
<b>220 GPCD (~0.25 AF/Year)</b>	6,317,370 pop	6,823,390 pop	7,329,420 pop
<b>200 GPCD (~0.22 AF/Year)</b>	6,949,100 pop	7,505,730 pop	8,062,360 pop
<b>175 GPCD (~0.20 AF/Year)</b>	7,941,840 pop	8,577,980 pop	9,214,120 pop

# How to Think About Water Challenges in the Sun Corridor

Water is Like Money



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## Current Supply/Demand Balance (living on “cash flow “)

- The Message of Return to Watering: **20-25 years of growth** based on current usage trends
- Demand management to stretch that horizon
  - Elimination of farming in the Sun Corridor
  - Further changes to urban landscaping
  - Greater re use of effluent
  - Changes in density of development



# Short Term Ways to Increase Supply

- SRP changes in management of the Verde (Removing Horseshoe, changing Bartlett) could yield as much as **100,000 AF/year**.
- Mainstem Colorado River transfers (currently pending Cibola to Queen Creek). Fierce political opposition from on-River users.
- Importation of groundwater from remote basins in Western Arizona.



# Using Savings Account When Necessary (Banked Groundwater)

- The account currently has **12 MAF** in the bank (Current urban use is about 1.6 MAF)
- That savings represents about **7.5 years** worth of total urban use
- In reality, it could sustain up to **20-30 years** with continuing, though reduced, deliveries of Colorado River, Salt and Verde and safe yield ground water
- But once used up, it is gone. And it is unlikely we'll add much to the account for the next few years.



# Long Term Augmentation

- Cloud seeding

There's evidence it could work to increase snowpack. Unknown side effects?

- Mississippi diversions

Possible, but a long shot— way too many hurdles.

- Ocean desalinization— In Mexico or California.

It is time to get really serious about this.

It will take decades to implement, but having a long term solution in the works is necessary to reassure people who want to invest in Arizona.



# **The Dilemma of the Sun Corridor: It is all About Choices**



















