ARIZONA WATER
IS DESALINATION IN ARIZONA'S FUTURE?

CITIZEN'S WATER ADVOCACY GROUP

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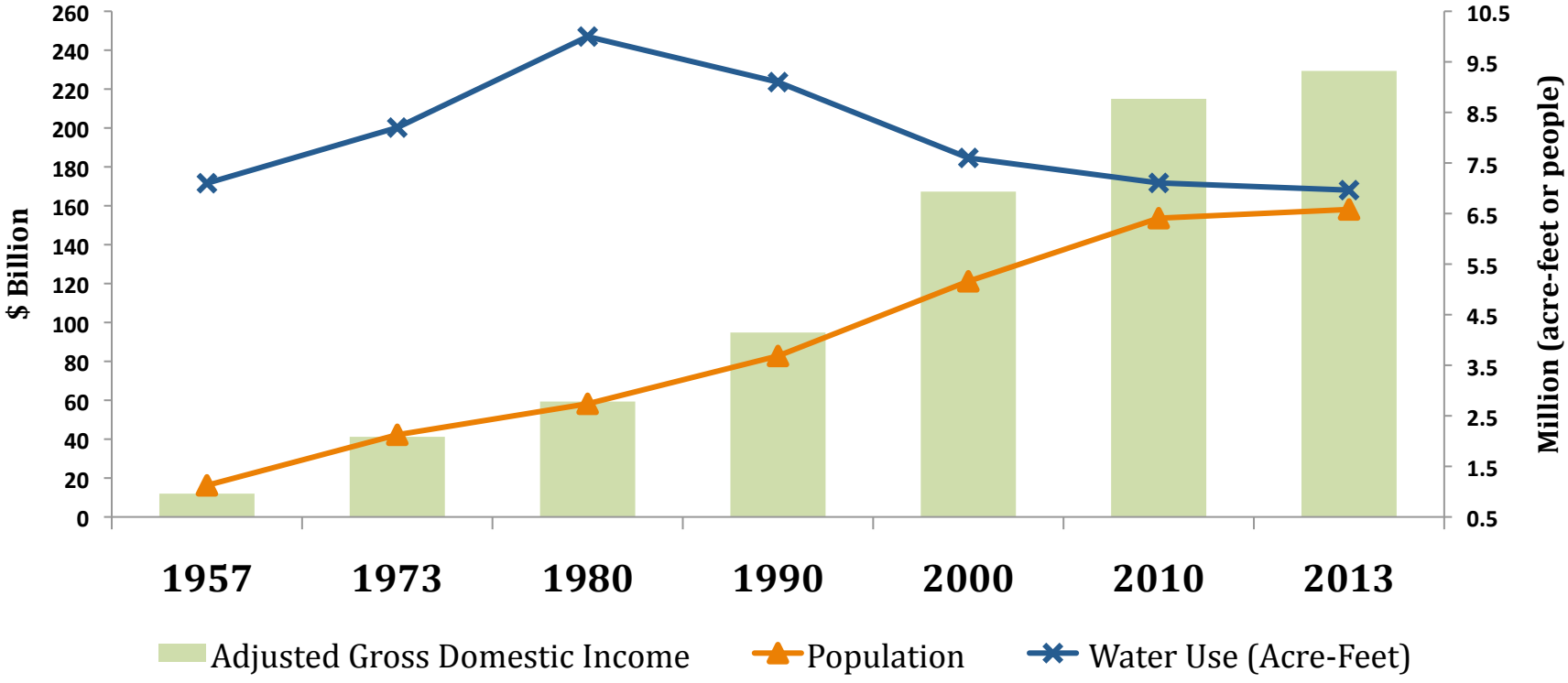
ARIZONA'S WATER MANAGEMENT SUCCESS



Time	Total Water Use (in million acre-feet)	Population (in millions)	Gross Domestic Income (in billions)
1957	7.1maf	1.1	$11.99
2013	7maf	6.58	$229.34
Change from 1957-2013	-0.1%	472%	1752%

ACTIONS THAT HAVE CONTRIBUTED TO ARIZONA'S WATER MANAGEMENT SUCCESS

- **Salt River Project**
- **Colorado River Compact**
- **Central Arizona Project**
- **Assured and Adequate Water Supply Program**
- **Underground Storage and Recovery Program & Arizona Water Banking Authority**
  - 8.9 MAF 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**

SHORT-TERM WATER RESOURCES CHALLENGES FACING THE STATE

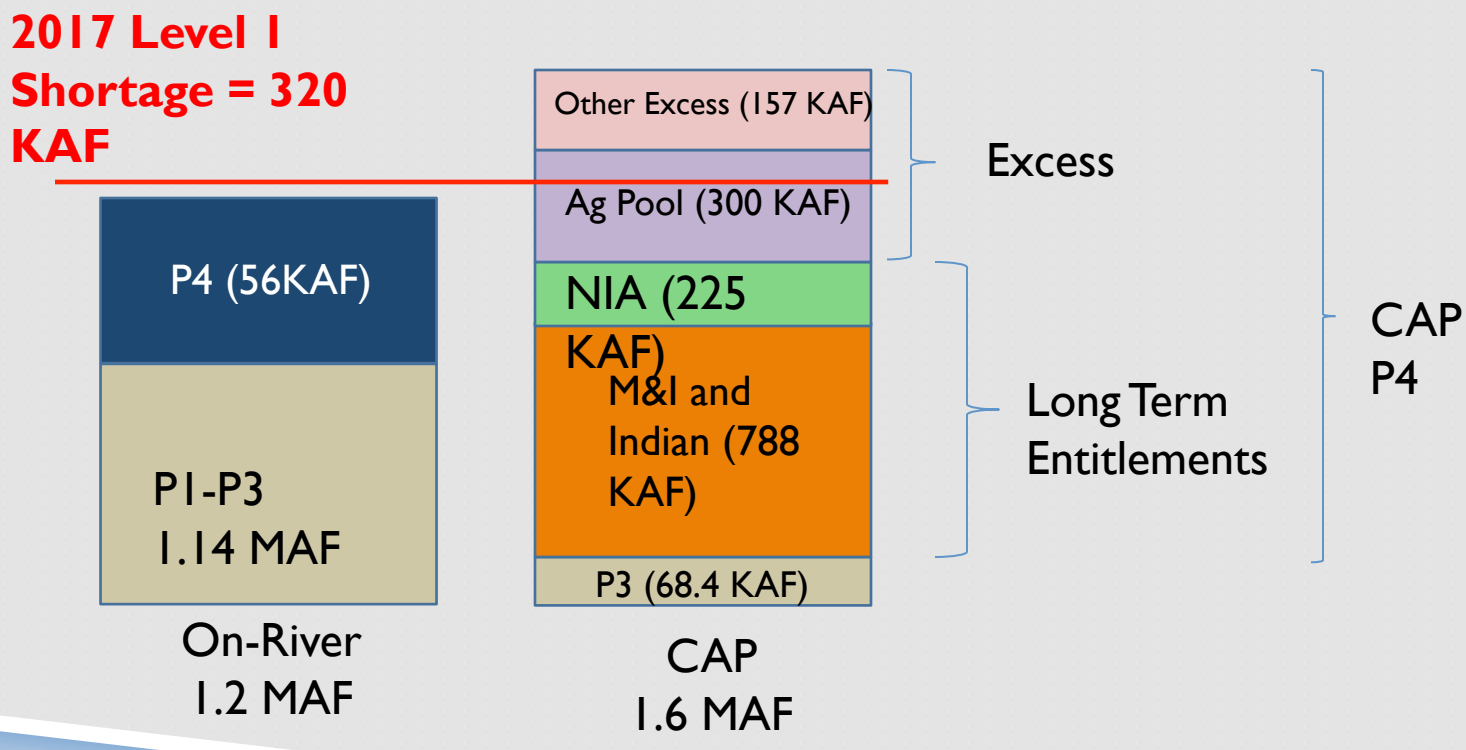
- **Communicating Arizona's Message**
  - Ultimately, the State of Arizona is not facing an immediate water crisis
  - Growing statewide imbalance identified between existing water supplies and demand projected in the next 25 years
- **Local Groundwater Management Issues**
  - Water Resources in rural areas of the state are more stressed
    - Primary water source is groundwater
    - Lack groundwater regulation
      - Willcox area
      - San Simon Valley Sub-basin
- **Shortage on the Colorado River System is likely**
  - 21% probability in 2016
  - 54% Probability in 2017
  - Lower Basin annual deficit

PROBABILITIES OF SHORTAGE ON THE LOWER COLORADO RIVER BASIN

	2015	2016	2017	2018	2019
Probability of any level of shortage (Mead ≤ 1,075 ft.)	**0**	**21**	**54**	**62**	**59**
1st level shortage (Mead ≤ 1,075 and ≥1,050 ft)	0	21	45	40	33
2nd level shortage (Mead <1,050 and ≥1,025 ft)	0	0	9	19	19
3rd level shortage (Mead <1,025)	0	0	0	3	7

From Bureau of Reclamation January 2015 CRSS modeling.

LOWER BASIN SHORTAGE TIERS AND VOLUMES



Arizona Priorities – 2.8 MAF Total

LONG-TERM WATER RESOURCES CHALLENGES FACING THE STATE

- **Long-term Challenges**
  - Growing statewide imbalance between existing water supplies and demand projected in the next 25 years
- **Driving Forces**
  - 15 year ongoing drought
  - Growth in population and increased water demand

ARIZONA'S EFFORTS TO ADDRESS CHALLENGES

- Arizona's Strategic Vision for Water Supply Sustainability
  - Identified strategies to guide Arizona in addressing future water needs, providing a stable economy for all water users.

- Colorado River Drought Planning

  ADWR Director Serves as Arizona's Principal on matters relating to the Colorado River
  - Memorandum of Understanding
  - Minute 319
  - Minute 320
  - Bypass Flows Work Group
  - Yuma Mesa Irrigation and Drainage District Pilot Fallowing Project

- Arizona/Mexico Desalination Declaration

ARIZONA STRATEGIC VISION FOR WATER SUPPLY SUSTAINABILITY

Purpose: ***Identify viable strategies to guide Arizona in addressing future water needs, providing a stable economy for our future – for all water users.***

- Uses existing information (CRBS, WRDC, Az. Water Atlas, Water Level Monitoring, AMA Assessments)
- Identify Local Options First
- Identify Priority Strategies

Conclusion: Ultimately, the State of Arizona is not facing an immediate water crisis

- Growing statewide imbalance between existing water supplies and demand projected in the next 25 years
- There are some local areas that require more immediate action
- The lack of an immediate problem increases the potential for inaction

ARIZONA'S STRATEGIC VISION
WATER SUPPLY OPPORTUNITIES

- **Non-Indian Agricultural (NIA) Priority CAP water**
- **Reclaimed Water/Water Reuse**
  - 50% of projected imbalance can be met with maximized use of reclaimed water
- **Groundwater in storage**
  - Potable, poor quality & brackish supplies
- **Water Supply Development**
  - Revised Watershed Management Practices
  - Weather modification
  - Rainwater Harvesting/Stormwater Capture (large-scale or macro)
- **Importation or Exchange of New Water Supplies Developed Outside of Arizona** (e.g., Ocean Desalination)

WHAT IS DESALINATION?

- Desalination: The process of removing dissolved salts from water, thus producing fresh water from seawater or brackish water.

- Generally two main types:
  - Evaporation- heat source used to boil water, energy intensive
  - Membrane
    - Electro-potential (dialysis)
    - Pressure (osmosis)

- Common Challenges
  - High energy requirements
  - Brine concentrate disposal

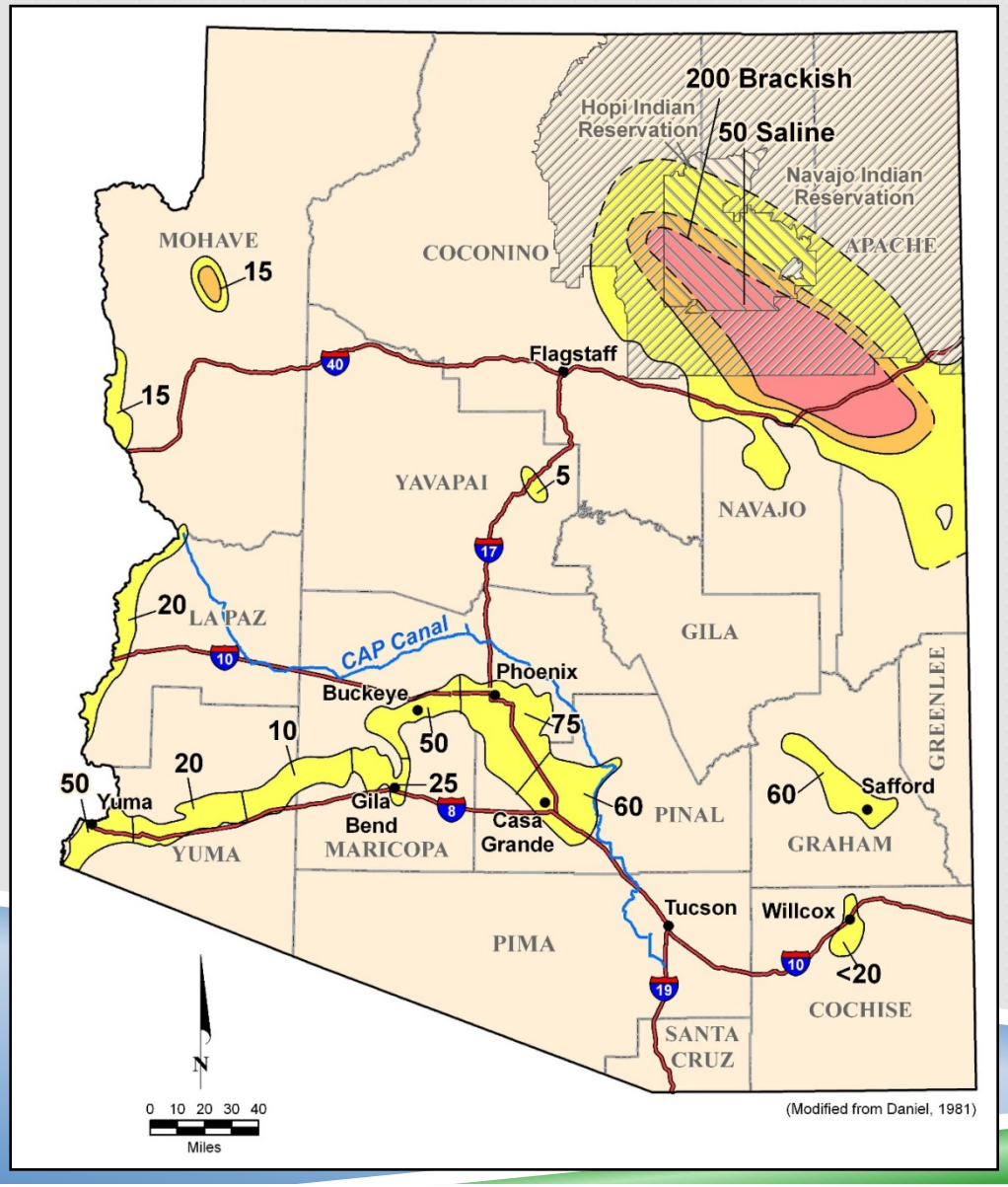
DESALINATION: BRACKISH GROUNDWATER

Brackish groundwater – TDS 1,000 -10,000 mg/l

- Advantage: can be as much as 50% less costly than ocean water desalinization
- Disadvantages: limited supply, not completely renewable
- Arizona estimated supply over 600 MAF (less than 1,200ft bls)
- Main areas identified
  - Buckeye 50 MAF*
  - Wellton-Mohawk 30 MAF*
  - Yuma Proper 50 MAF*
  - Coconino 200 MAF
  - Total 330 MAF

**Agricultural drain water – can be considered semi-renewable with surface water irrigation*

AREAS OF BRACKISH GROUNDWATER



EXPLANATION

20 Millions of Acre-feet Brackish Groundwater in Storage

Total Dissolved Solids, in mg/L

- 1,000-5,000
- 5,000-10,000
- >10,000

Source: Montgomery & Associates

DESALINATION: OCEAN WATER

Ocean water – TDS 35,000 mg/l or higher

- Advantages: unlimited supply, drought proof
- Disadvantages: higher treatment cost
- Main areas identified
  - Gulf of California (Sea of Cortez)
    - Direct Importation or Exchange for Colorado River water
  - Pacific Ocean – California
    - Exchange for Colorado River water
  - Pacific Ocean – Mexico
    - Direct Importation or Exchange of Colorado River water

DESALINATION: INDUSTRIAL WATER

Industrial water

- Opportunities for industrial uses
  - Power plants
  - Cooling towers
  - Microchip manufactures
- TDS of the industrial blow-down water is dependent on the number of cycles and can be in the 25,000 - 29,000 mg/l range

DESALINATION: IS IT THE SOLUTION TO SECURING WATER SUPPLIES FOR ARIZONA'S FUTURE?

Strategic Vision concluded that an imbalance between supply and demand could manifest itself in as little as 25-30 years

- Maximized reclaim use could eliminate 50% of the projected imbalance
- Other strategies such as watershed management, macro rainwater harvesting and weather modification can contribute
- Still an imbalance requiring importation into Arizona
- Over 600 MAF of brackish groundwater estimated in Arizona
- Ocean desalination nearly unlimited drought proof supply

DESALINATION: WHAT WILL IT COST?

Brackish groundwater (can be 50% less than ocean desalination)

- 2007 TX North Cameron Regional Project: 2.5 mgd plant at $1.40/1,000gal
- San Antonio TX 27 mgd $1,000/AF

Ocean desalination

- 2012 Reclamation Study
  - Gulf of CA $2,100/AF
  - Pacific Ocean CA $1,850-2,100/AF
  - Pacific Ocean MX $1,500/AF
- San Diego 54 mgd $2,326.58/AF
- 2009 Binational Study (AZ & Sonora)
  - Canal $1,182.84/AF
  - Pipeline $1,456.55
- Current CAP prices
  - Before treatment $146.63/AF
  - After treatment $1,629.26/AF
- Bottled water
  - $4,150,038.34/AF

QUESTIONS?

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PROTECTING
ARIZONA'S WATER SUPPLIES
for ITS NEXT CENTURY