Arizona's Water Resources:

A Municipal Provider's Overview of
Arizona Water Resources

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Az Water Association

Pieces of the Arizona Water Puzzle

- How much do we have and who is using it?
- What is the legal frame work?
- What are the limits and constraints?
- How are our water resources “managed”?
- Where do we go from here?

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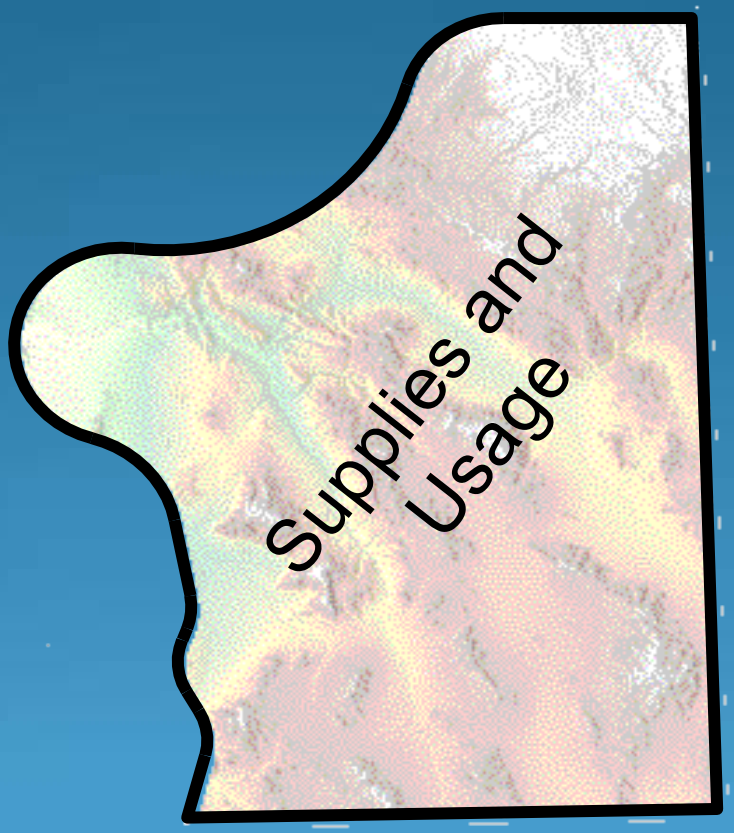
Arizona's Water:



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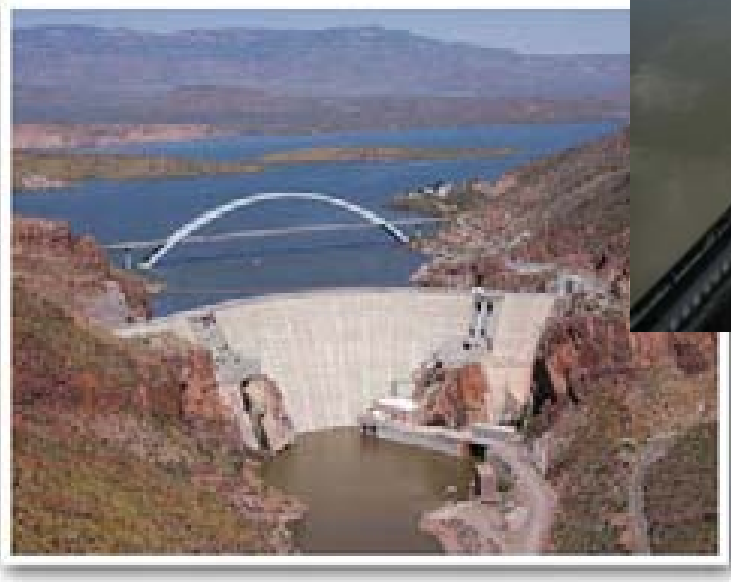
Where does Arizona's water come from?



Three basic sources:

1. Groundwater
2. Surface Water
3. Reclaimed Water

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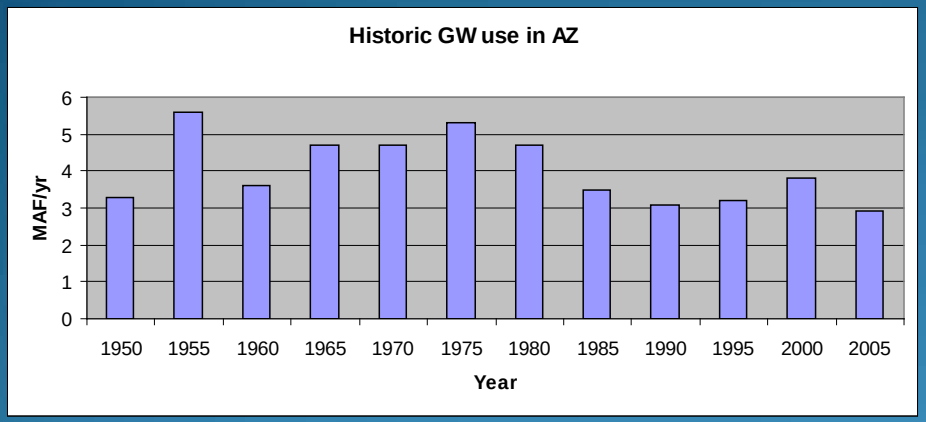
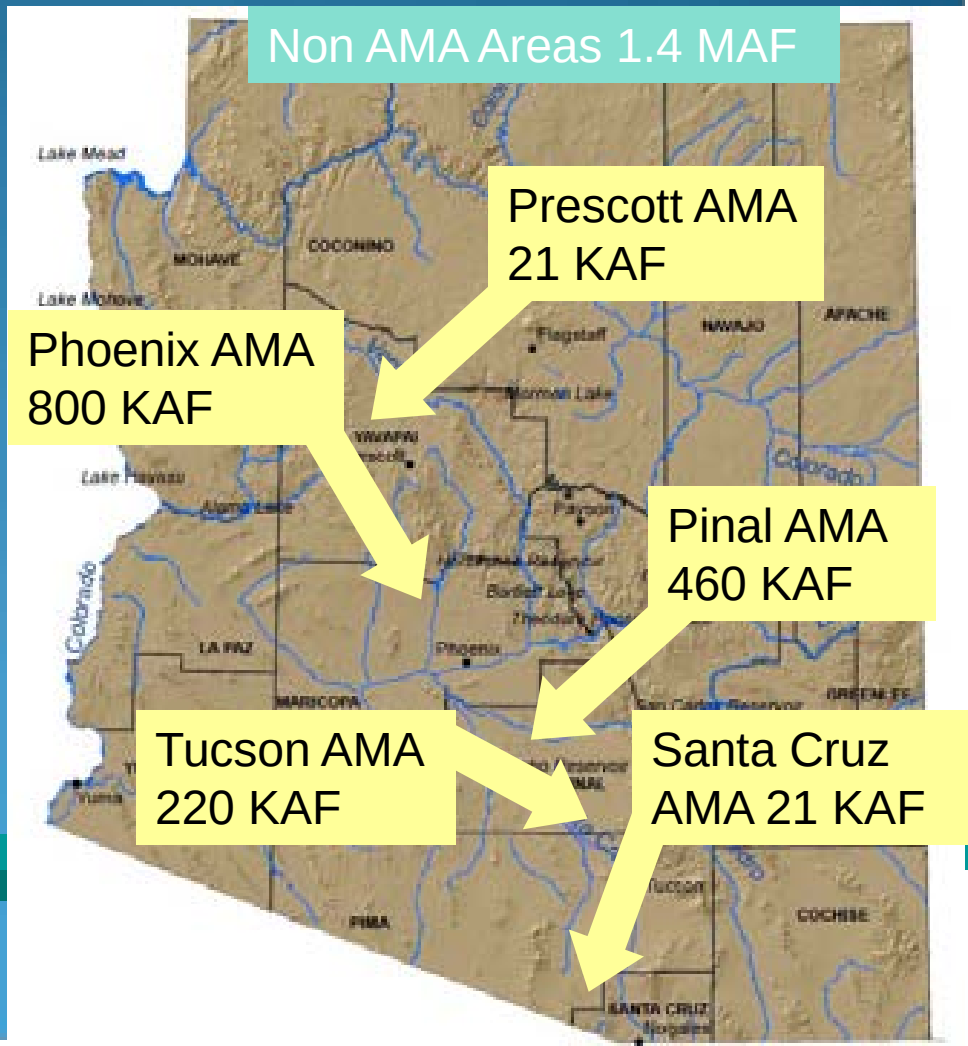
Groundwater Use in AZ



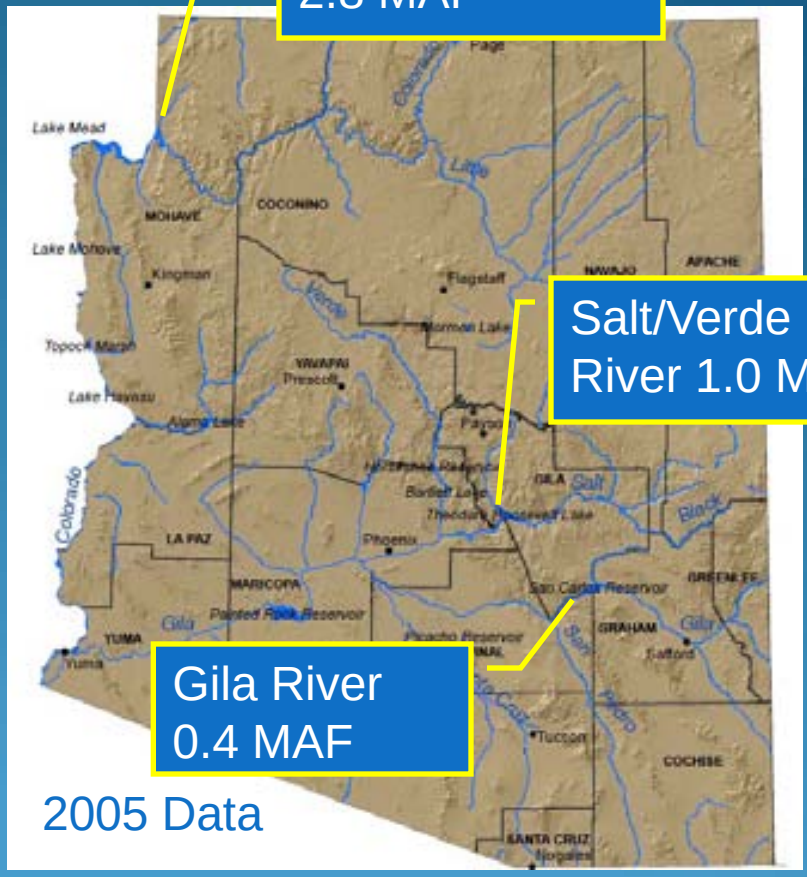
- Total GW Pumpage in 2005 was 2.9 MAF
- Accounts for approximately 40% of AZ's water supply
- Groundwater mining (overdraft) is a statewide problem – its not just for AMA's anymore

2005 Data



Surface Water

- History:
  - Pre-Hohokam irrigation system found in Tucson – 1200 BC
  - Hohokam developed first canal in Phoenix area in 800 AD
- AZ's largest source of renewable water
  - About 50% of AZ's water supply
  - Over 4 MAF per year
- Availability varies from:
  - year to year
  - season to season
  - place to place



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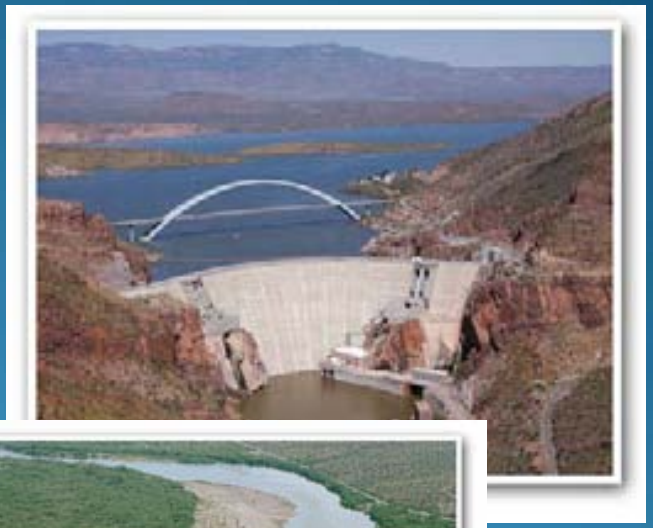
Salt River Project (SRP)

- 1902 – National Reclamation Act (Provided funding for SRP)
- 1903 – SRP established: 1st multipurpose reclamation project in the US (water & power)
- 1908 – Granite Reef Diversion completed
- 1911 – Roosevelt Dam Completed (later expanded in 1996)
- From 1925 – 1946 SRP built 5 more dams
  - 3 on the Salt River
  - 2 on the Verde River
  - Total capacity ~ 2.3MAF
- 2007 - delivered ~ 1MAF of water
  - 80% Ag in 1965 – 15% Ag in 2007



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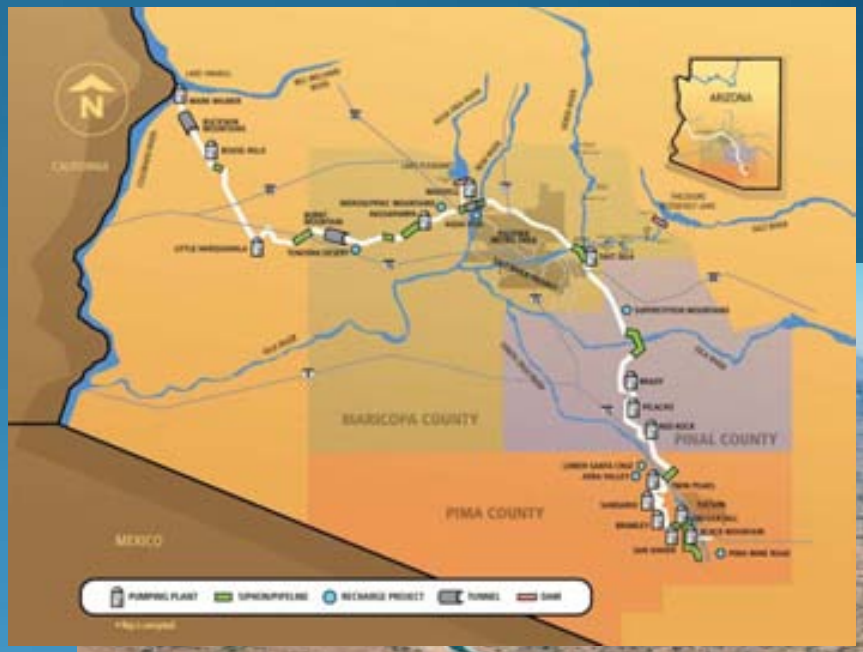
Central Arizona Project (CAP)

- 1928 – Boulder Canyon Project Act (Allocated Colo. River Water)
- 1946 – Formation of CAPA (Lobbying group for CAP)
- 1968 – Colorado River Basin Project Act (CAP Authorization)
- 1973 – Construction started
- 1993 – Project completion
  - 336 miles, 2,400' lift
  - 1.6 MAF/yr of deliveries (26% Ag in 2008)
  - Construction cost >$4 billion
  - Largest water transfer project ever constructed in the US



Reclaimed

- Long history of reuse in AZ
  - Grand Canyon – 1926
  - Phoenix/Peterson Farms – 1932
  - Tucson Reclaimed System - 1983
- Direct reuse accounts for ~ 2.5% of AZ's water supply (200 KAF)
  - ~ 70% for turf/ag irrigation
- In 2006, we directly reused about 20% of the effluent produced in AZ
  - Probably higher in 2008
- Remainder is recharged – directly & indirectly

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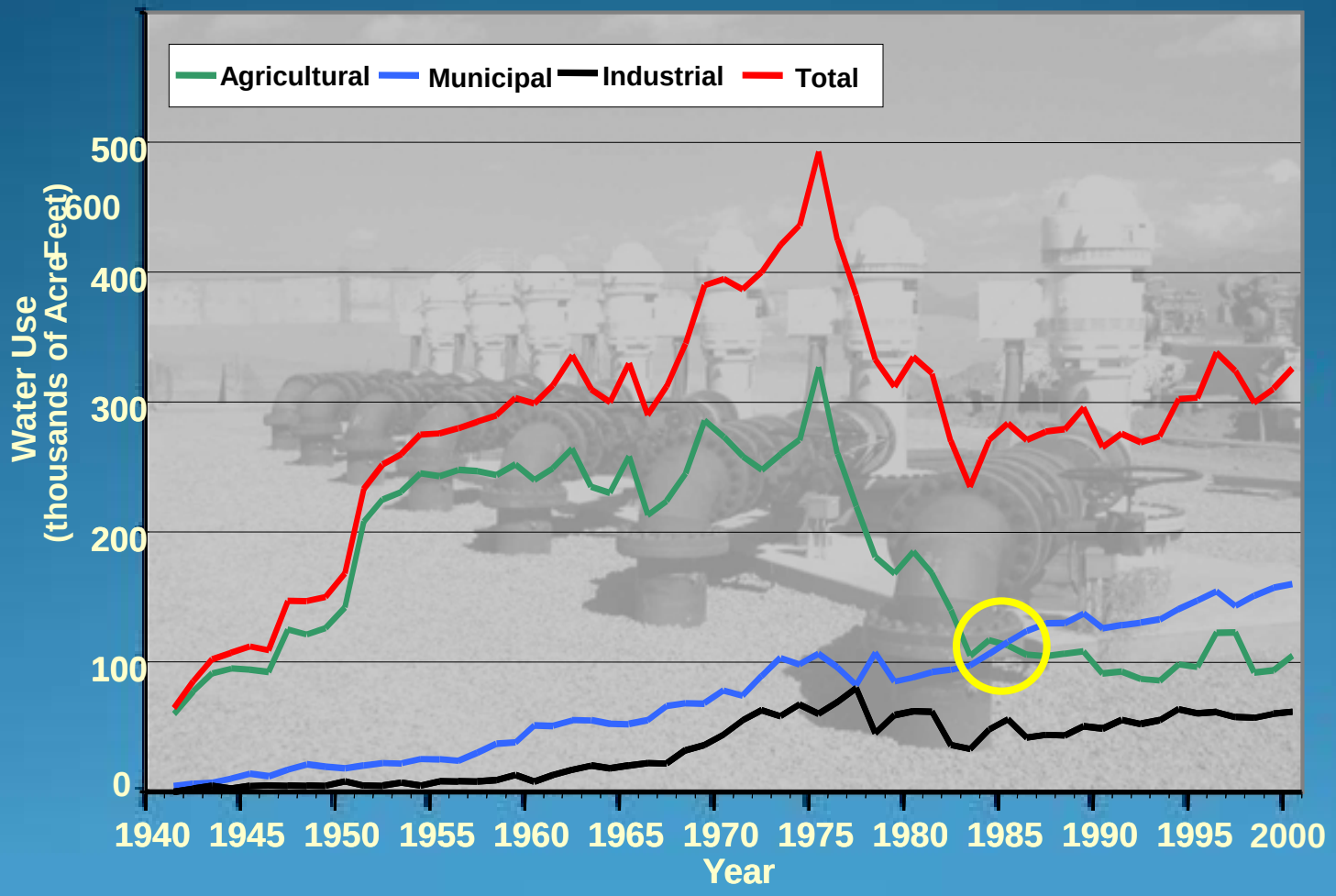
Arizona Water Supply
Annual Water Budget

Water Source	Million Acre-Feet (maf)	% of Total
SURFACE WATER		
Colorado River	**2.8**	**37.8 %**
CAP	*1.6*	*22%*
On-River	*1.2*	*16%*
In-State Rivers	**1.4**	**18.9%**
Salt-Verde	*1.0*	*14%*
Gila & others	*0.4*	*5%*
GROUNDWATER	**2.9**	**39.2%**
RECLAIMED WATER	**0.3**	**4.1%**
Total	**7.4 maf**	

Water Use by Sector: 1940-2000

Tucson Active Management Area



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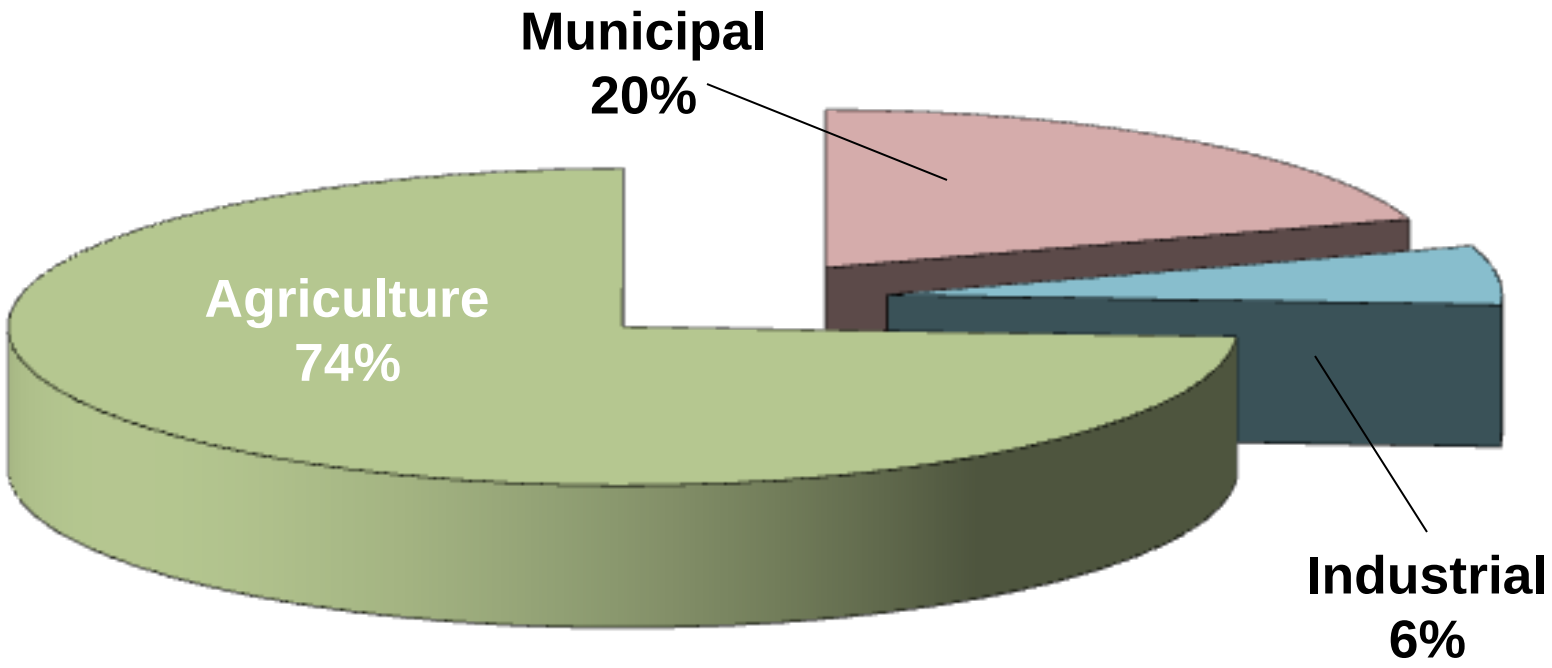
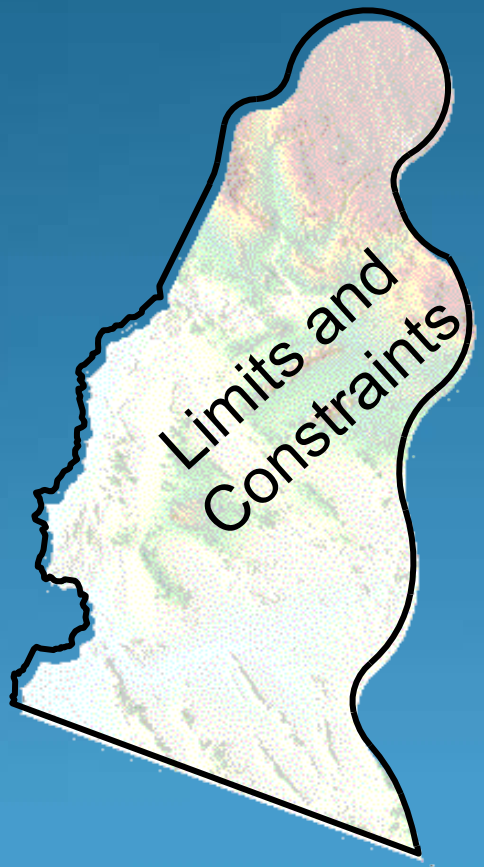
How Is Arizona's Water Used?



2005 Data

Legal Framework



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Three Types of Water In Arizona

- Surface Water
- Groundwater
- Reclaimed Water

Surface Water

- "Regulated" by:
  - Contracts
  - Courts
- Prior Appropriation
- First in Time

Colorado River Water

- "Regulated" by:
  - Federal Laws
  - 7-Basin State* Agreements
- Beneficial Use
- Entitlement held by the State

* Arizona, California, Nevada Colorado, Wyoming, New Mexico Utah, *and* Mexico

Groundwater

- "Regulated" by:
  - 1980 Groundwater Management Act
- Beneficial Use
- Continually Changing

Reclaimed Water

- "Regulated" by:
  Courts
- Owner - entity that treats the wastewater

Federal Role in Arizona

- Bureau of Reclamation Projects - 1902
- Funding For:
  - Major Dams (SRP + Lake Pleasant)
  - Conveyance Features (SRP, CAP, Yuma area)
- Management and Coordination:
  - Colorado River (USBR)
  - US-Mexico coordination
- Limited Role w/Groundwater

ARIZONA - Surface Water Resources

- Doctrine of Prior Appropriation (1919)
- Surface Water Rights permitted by the State

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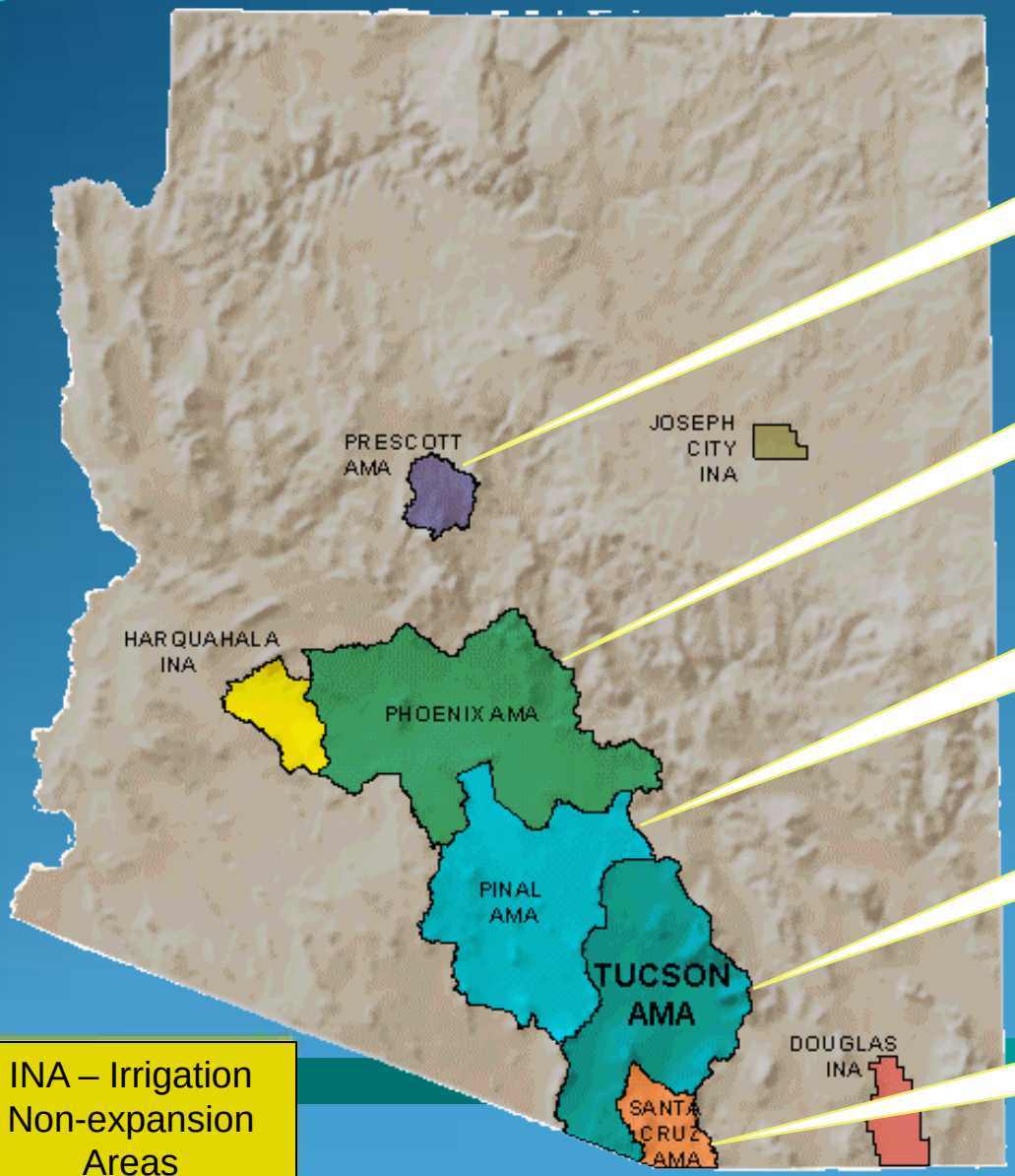
Surface Water Management in Arizona

- ADWR issues permits
- Water Rights managed by Court Decrees:
  - Ex. Kent Decree – Salt River Valley
- On-going State-wide Water Rights Court Case – "The Adjudication"
  - Started in 1970s – still going……

Groundwater Management Areas



Goals

Prescott AMA:
safe-yield by 2025

Phoenix AMA:
safe-yield by 2025

Pinal AMA:
preserve agriculture as long as feasible while preserving groundwater for future needs (1,000 feet depth to water limit)

Tucson AMA:
safe-yield by 2025

Santa Cruz AMA:
maintain safe-yield, prevent long-term water table declines

INA – Irrigation Non-expansion Areas

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The 1980 Groundwater Code - AMAs

- Protects Groundwater
- Protects the Economy
- Protects Existing Uses

The 1980 Groundwater Code

Wells - Policy Framework

- Well Owners' Protection –
  - Minimal impacts to surround wells
- Exempt Wells
  - Wells pumping less than 35 gpm are exempt for regulations, but are protected from other wells
- Aquifer Management

The 1980 Groundwater Code

Assured Water Supply Policy Framework

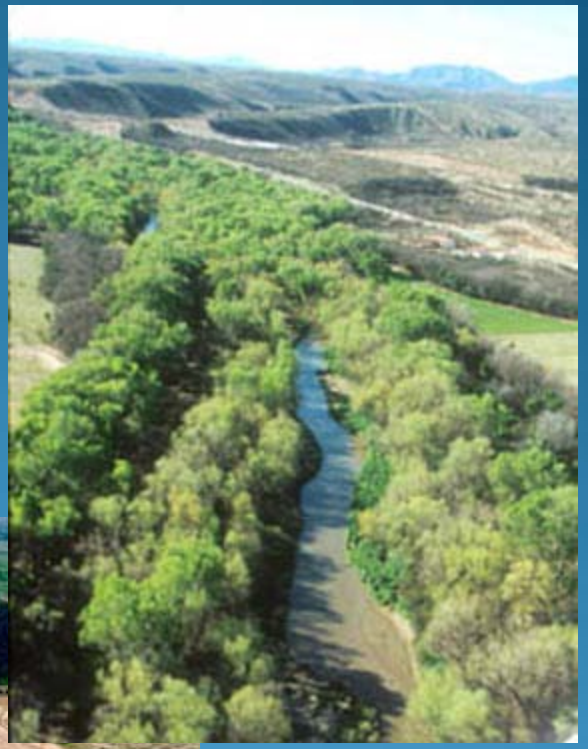
- Consumer Protection – Demonstration of Sustainable Development
  - Physical and legal available water supply
- Site-specific Determination
  - Projection of water demands for a development
- State Makes A Regulatory Determination
  - Permit or Modify Application

Reclaimed Water

- Reclaimed water is always available
- Arizona's only growing water supply
- Supports riparian habitats, in-stream flows, & recharge
- Resource is owned by the generator

Reclaimed Water

- Use Options
  - Direct Non Potable Reuse
  - Indirect Potable Reuse
  - Direct Potable Reuse
- Perceptions vs. Risk



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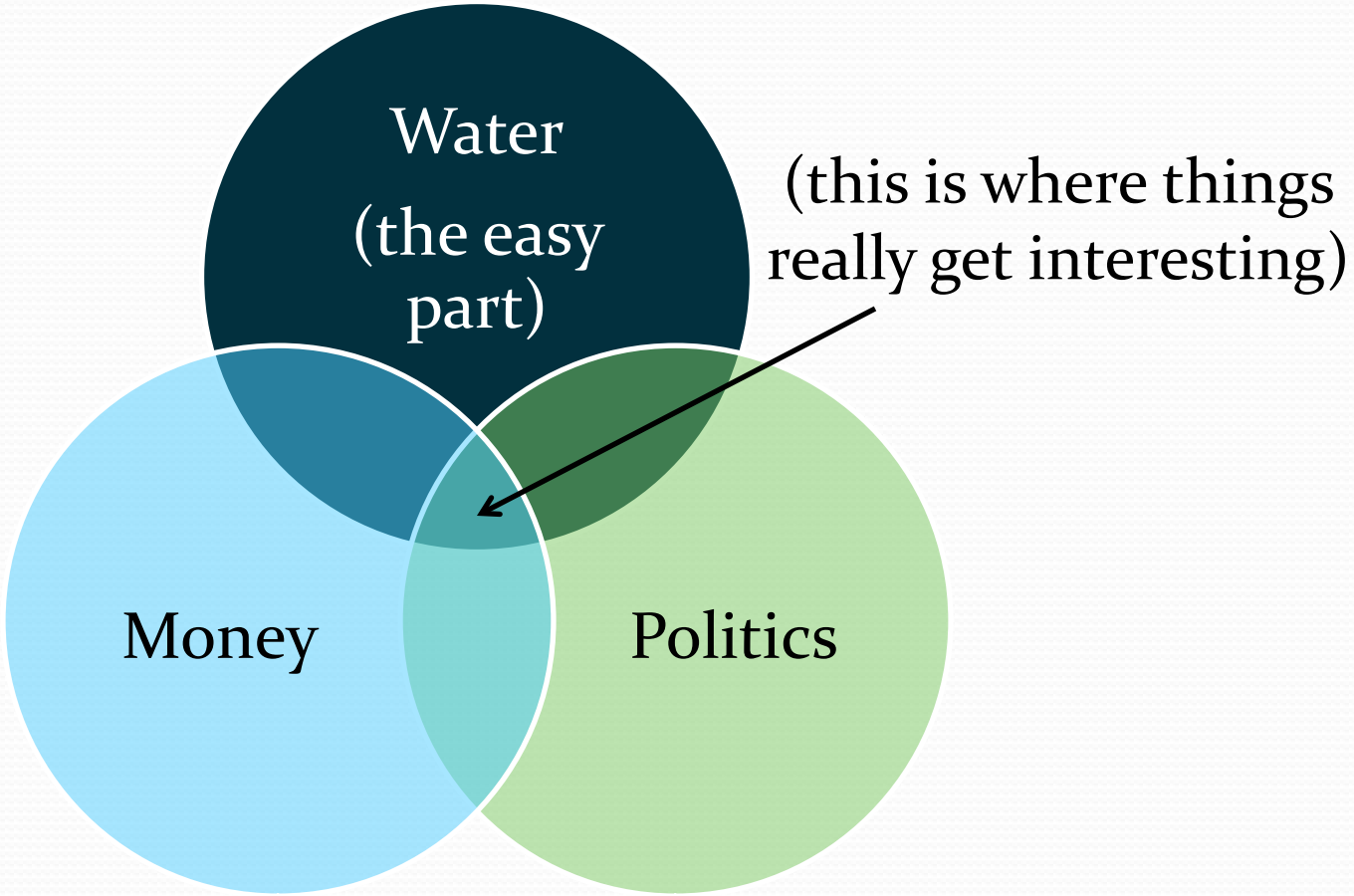
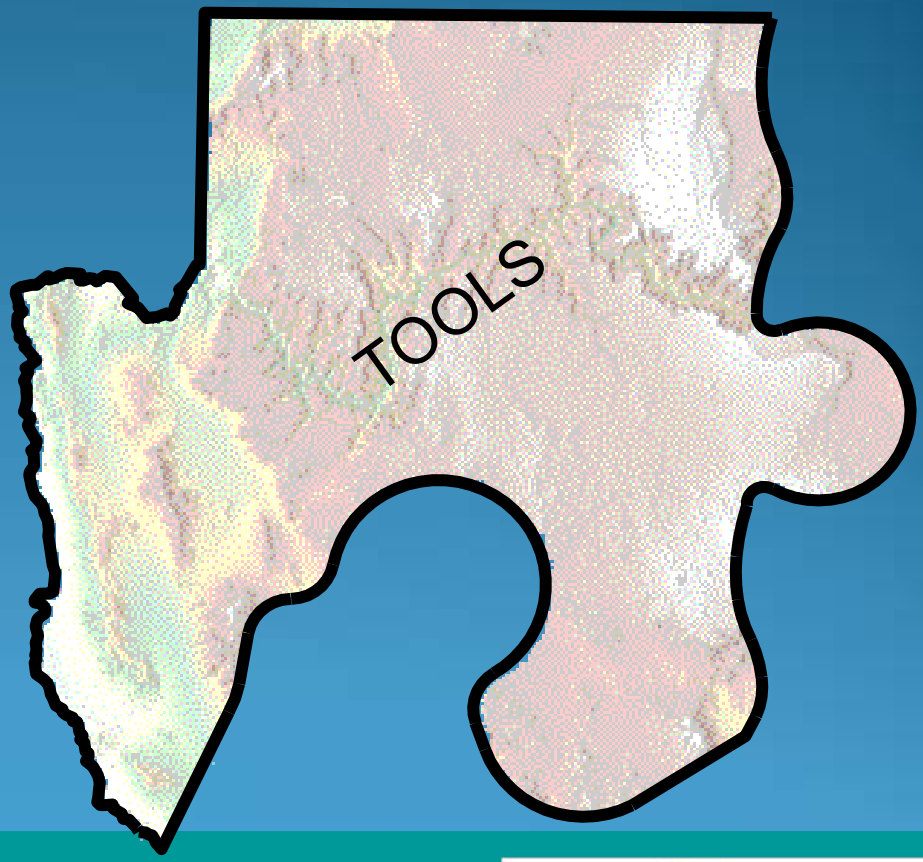
Constraints for Water Resources

- Laws, rules, regulations
- Finding water
- Raising money
  - To buy water
  - To build infrastructure
- Politics (not always a bad thing)


Water
(the easy part)
(this is where things really get interesting)
Money
Politics

Water Management:



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Water Management Tools

Physical Structures

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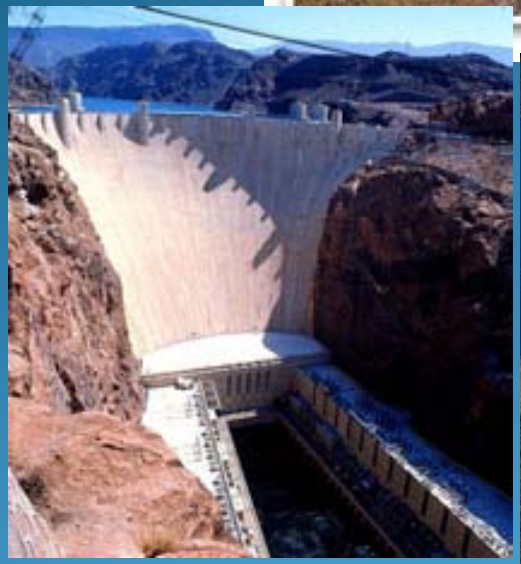
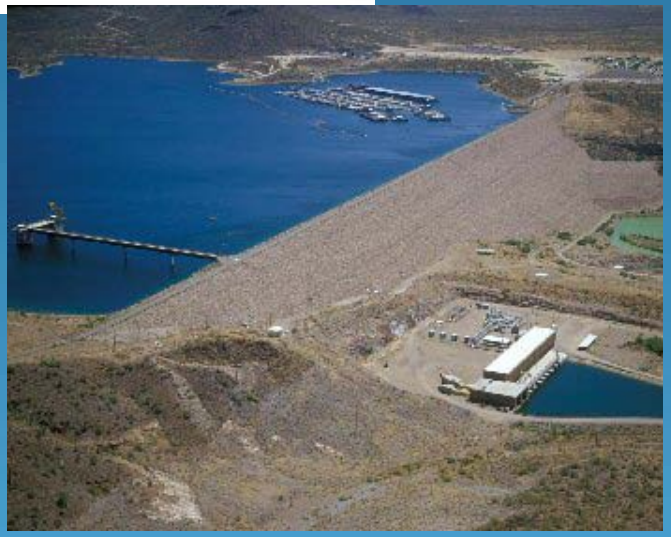
Reservoirs & Canals





- Salt & Verde Reservoirs and System
- Colorado River & CAP
  - Powell
  - Mead
  - Pleasant

Recharge

- Injection
- Spreading Basins
- In Channel
- Groundwater Savings Facilities

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Water Management Tools

Non-Structural Methods

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Watershed Management

- Range Management
- Riparian Restoration
- Urban Storm Water Management

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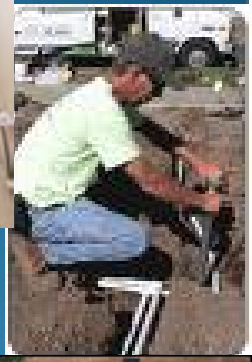
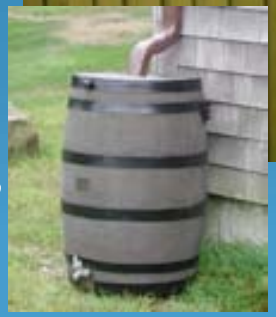
Conservation

- Utility/Municipality Approaches
  - General Public Information
  - Education Training
  - Direct Assistance
  - Incentives
  - Ordinances
- Agricultural

  Irrigation Efficiencies





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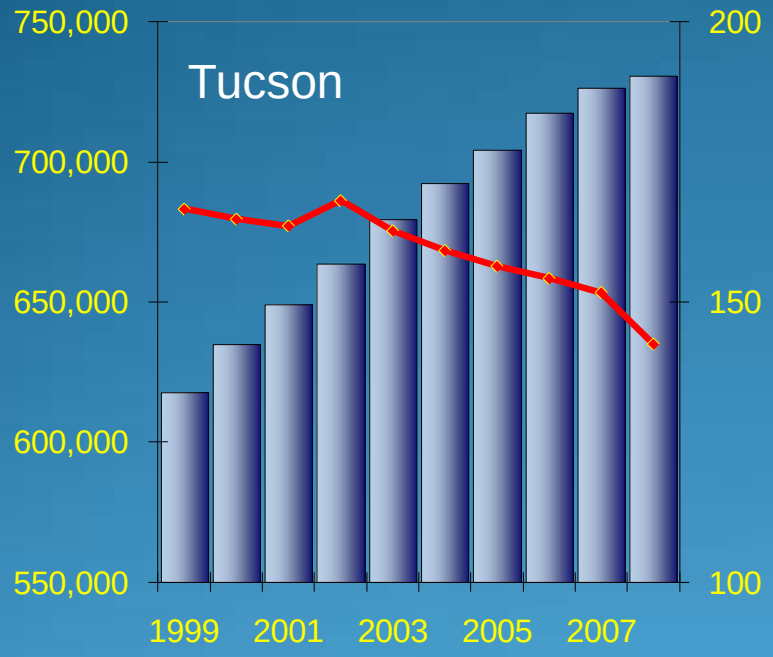
Population vs. GPCD



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Water Future

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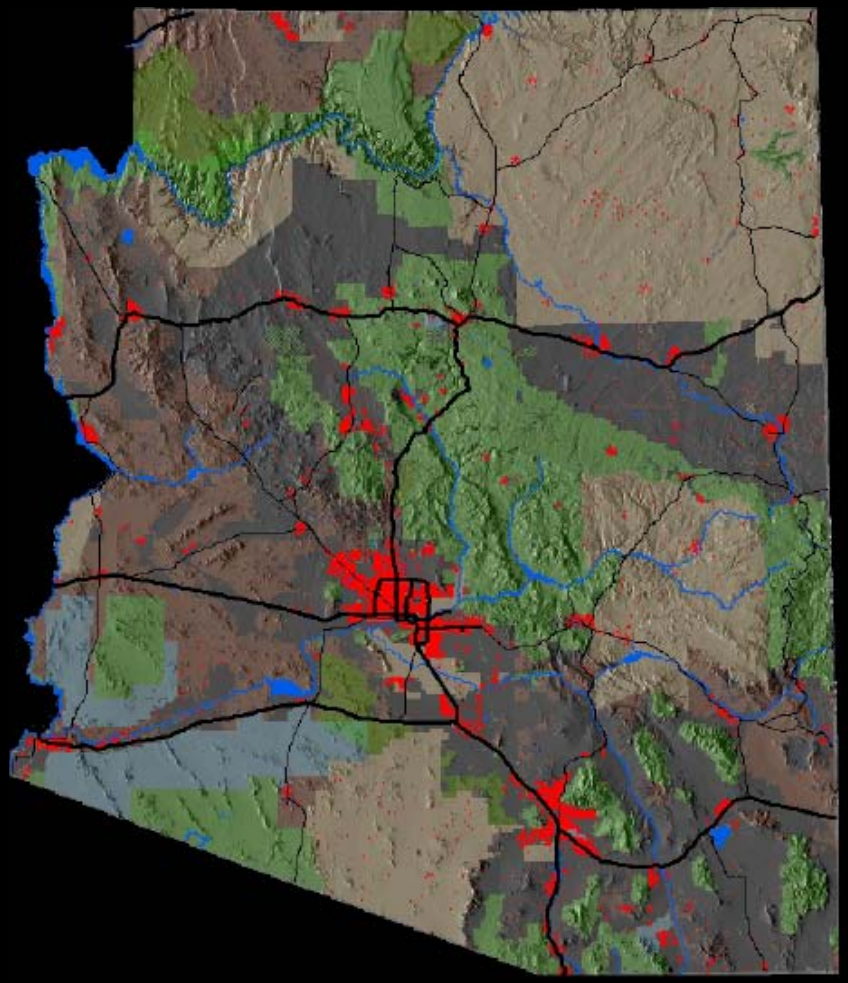
Arizona's Municipal Water Future

Questions for the near and long-term:

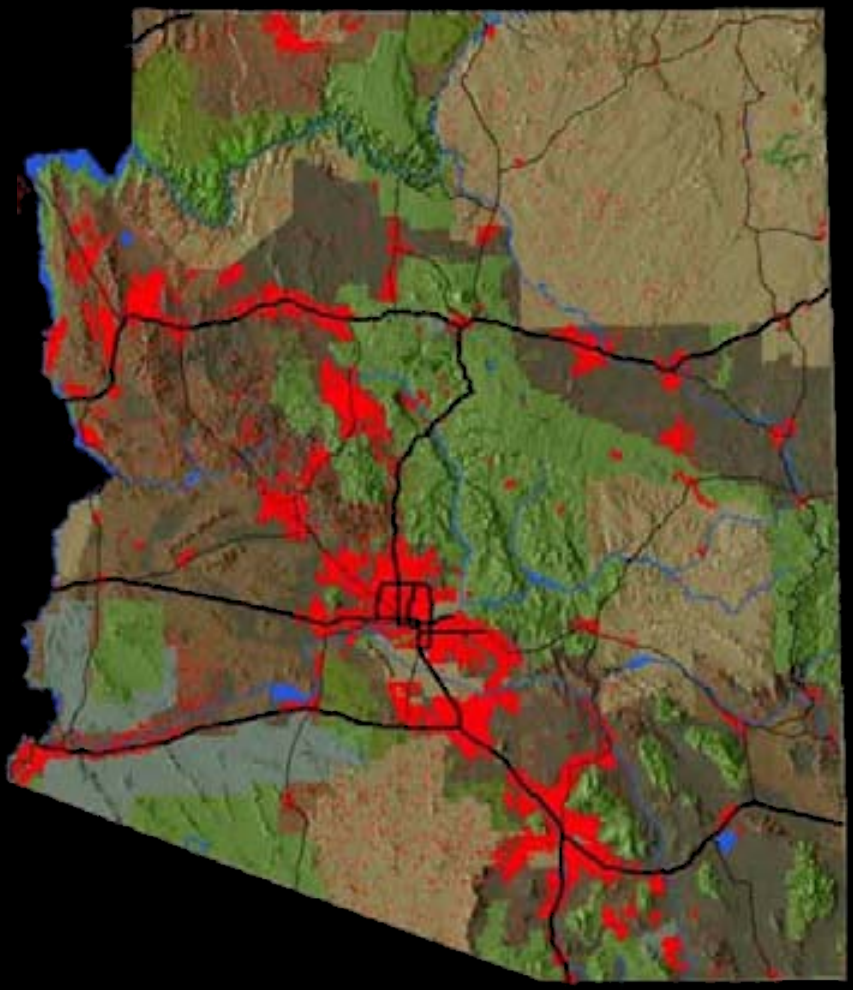
Where will our water be used?

Where will it come from?

When will we run out?



2010



2050

(MAG Projections)

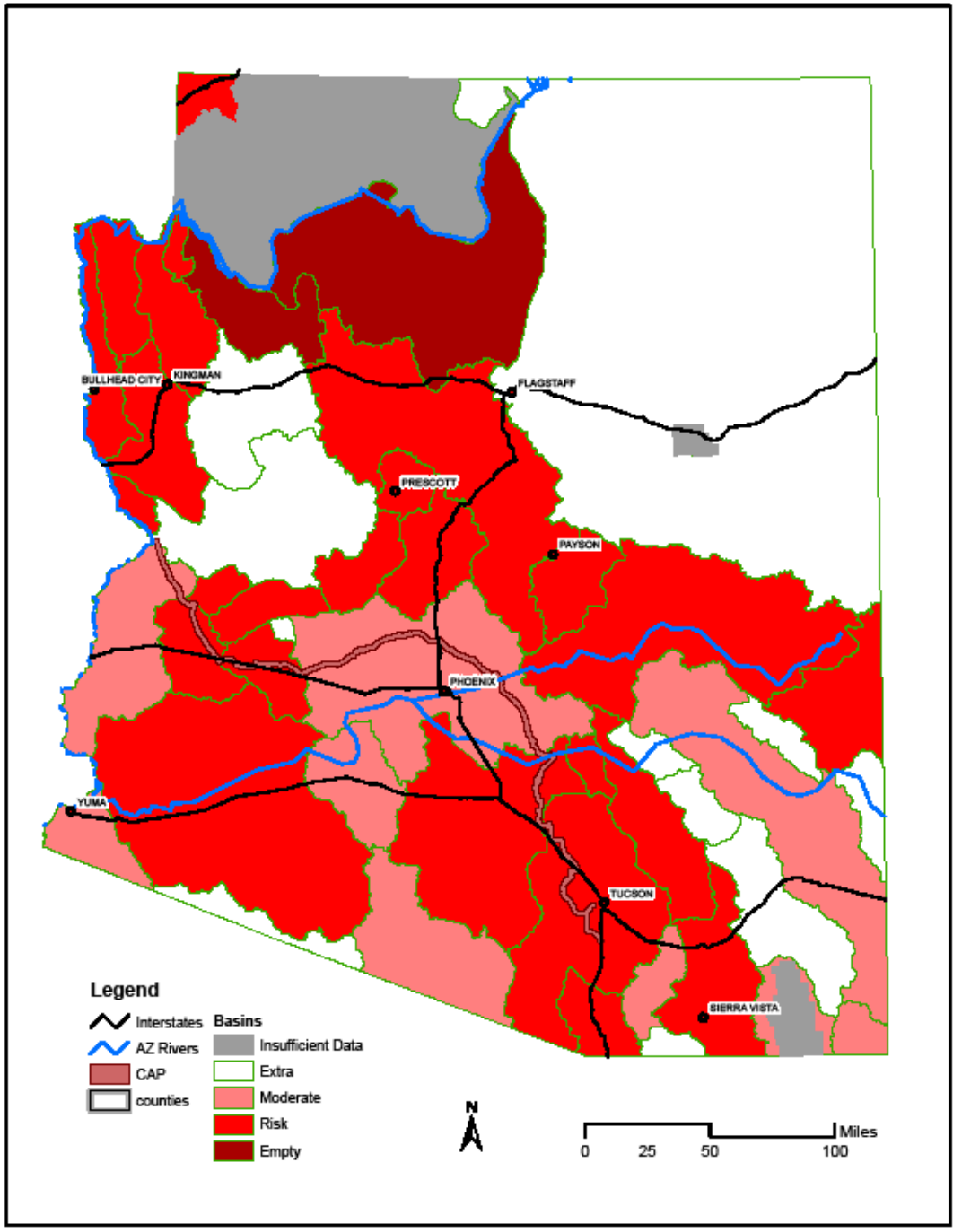
Groundwater Availability

Extra: water still available after 200 years

Moderate: some water, but not a lot

Risk: about to run out

Empty: overdraft will occur if not carefully managed



Augmenting the State's Supplies: The "Next Bucket"(s)

Surface Water Transfers

Groundwater Transfers

Reclaimed Water

Desalination

- Sea Water
- Brackish Water

What supplies are out there?

Arizona's Municipal Water Future

Answers

~~Questions~~ for the near and long-term:

Where will our water be used?

State-wide, but 85% in Maricopa, Pinal, and Pima

Where will it come from?

Groundwater, Surface Water, Recycling, and Beyond

When will we run out?

When we decide to ***stop planning*** and ***fail to invest*** in our water infrastructure