Arizona’s Water Resources:

A Municipal Provider’s Overview of Arizona Water Resources

Presented by:
Warren Tenney, Metro Water District
Tim Thomure, HDR Engineering
Pieces of the Arizona Water Puzzle

• How much do we have and who is using it?
  • What is the legal framework?
  • What are the limits and constraints?
• How are our water resources “managed”?
  • Where do we go from here?
Arizona’s Water:

Supplies and Usage
Where does Arizona’s water come from?

Three basic sources:
1. Groundwater
2. Surface Water
3. Reclaimed Water
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 – it's not just for AMA’s anymore

Historic GW use in AZ

- Tucson AMA: 220 KAF
- Phoenix AMA: 800 KAF
- Prescott AMA: 21 KAF
- Pinal AMA: 460 KAF
- Santa Cruz AMA: 21 KAF
- Non AMA Areas: 1.4 MAF
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

- **2005 Data**
  - Colorado River: 2.8 MAF
  - Gila River: 0.4 MAF
  - Salt/Verde River: 1.0 MAF
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 ~ 2.3 MAF
- 2007 - delivered ~ 1 MAF of water
  - 80% Ag in 1965 – 15% Ag in 2007
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
# Arizona Water Supply Annual Water Budget

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Million Acre-Feet (maf)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SURFACE WATER</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado River</td>
<td>2.8</td>
<td>37.8 %</td>
</tr>
<tr>
<td>\hspace{1cm}CAP \hspace{1cm}</td>
<td>1.6</td>
<td>22%</td>
</tr>
<tr>
<td>\hspace{1cm}On-River \hspace{1cm}</td>
<td>1.2</td>
<td>16%</td>
</tr>
<tr>
<td>In-State Rivers</td>
<td>1.4</td>
<td>18.9%</td>
</tr>
<tr>
<td>\hspace{1cm}Salt-Verde \hspace{1cm}</td>
<td>1.0</td>
<td>14%</td>
</tr>
<tr>
<td>\hspace{1cm}Gila &amp; others \hspace{1cm}</td>
<td>0.4</td>
<td>5%</td>
</tr>
<tr>
<td><strong>GROUNDWATER</strong></td>
<td>2.9</td>
<td>39.2%</td>
</tr>
<tr>
<td><strong>RECLAIMED WATER</strong></td>
<td>0.3</td>
<td>4.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7.4 maf</td>
<td></td>
</tr>
</tbody>
</table>
Water Use by Sector: 1940-2000
Tucson Active Management Area

<table>
<thead>
<tr>
<th>Year</th>
<th>Agricultural</th>
<th>Municipal</th>
<th>Industrial</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1945</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
How Is Arizona’s Water Used?

- Agriculture: 74%
- Municipal: 20%
- Industrial: 6%

2005 Data
Legal Framework
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
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......
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
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
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:
Water Management Tools

Physical Structures
Reservoirs & Canals

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

- Injection
- Spreading Basins
- In Channel
- Groundwater Savings Facilities
Water Management Tools

Non-Structural Methods
Watershed Management

- Range Management
- Riparian Restoration
- Urban Storm Water Management
Conservation

- Utility/Municipality Approaches
  - General Public Information
  - Education Training
  - Direct Assistance
  - Incentives
  - Ordinances
- Agricultural
  - Irrigation Efficiencies
Water Future
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?
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?
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