

Water Resources Research Center

College of Agriculture and Life Sciences, The University of Arizona

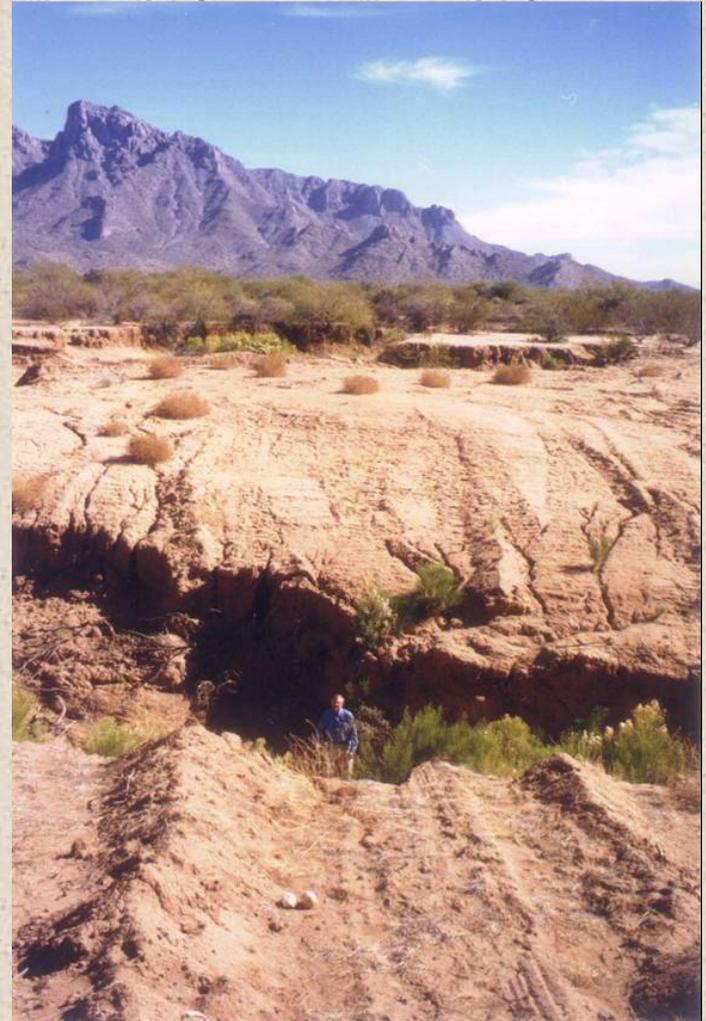
Groundwater Recharge as a Tool for Meeting Arizona Water Policy Objectives

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Growth in People and Economic Activity Resulted in Groundwater Overdraft Problem in some parts of Arizona

- Groundwater pumped from aquifers faster than it is replenished by nature
- Problem: declining water tables, with numerous associated implications: water quality, cost of pumping, land subsidence and fissuring.

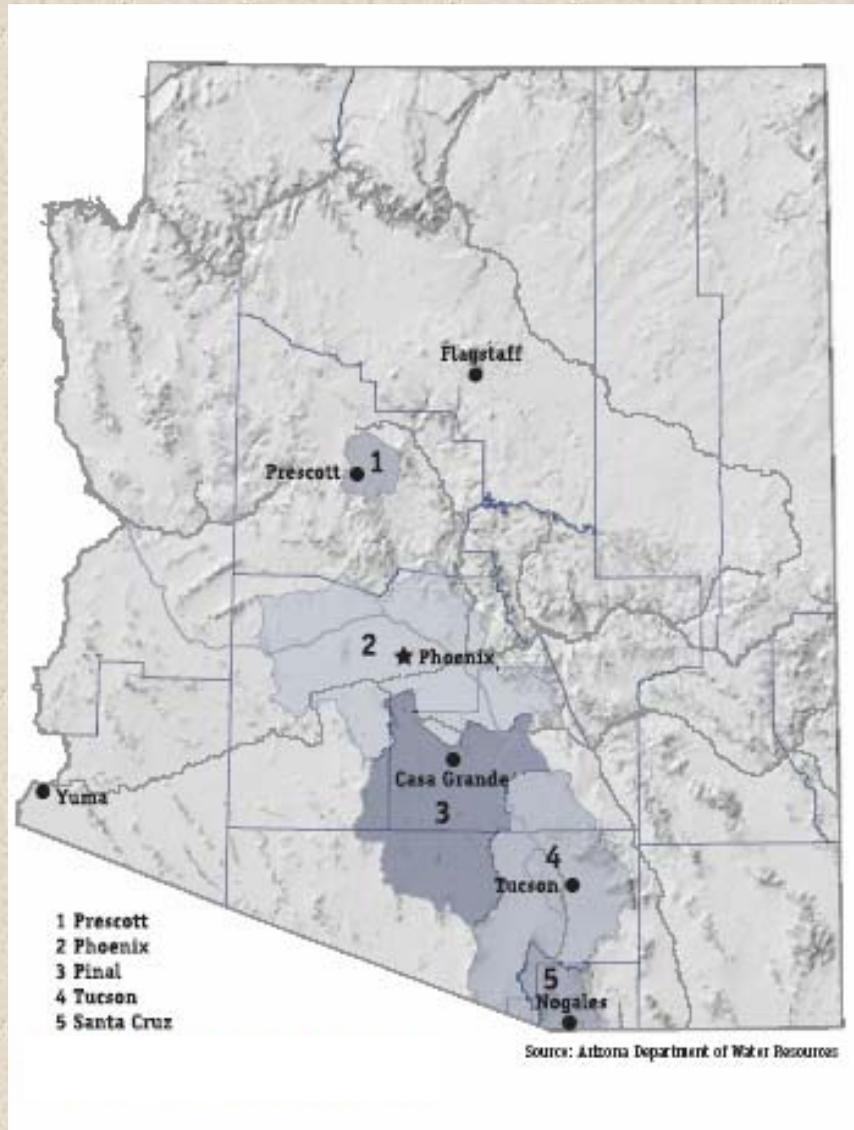


State's Response: 1980 State of Arizona Groundwater Management Act (GMA)

- Established areas where groundwater management was required – **Active Management Areas**, each with a statutory **management goal**
- GMA required the adoption of **Assured Water Supply Rules**, which require municipal growth to depend primarily on renewable supplies.
- **Conservation** programs for each water using sector and management plans are developed by the Arizona Department of Water Resources every 10 years.
- **No expansion of agricultural land** beyond what was irrigated during the late 1970s.

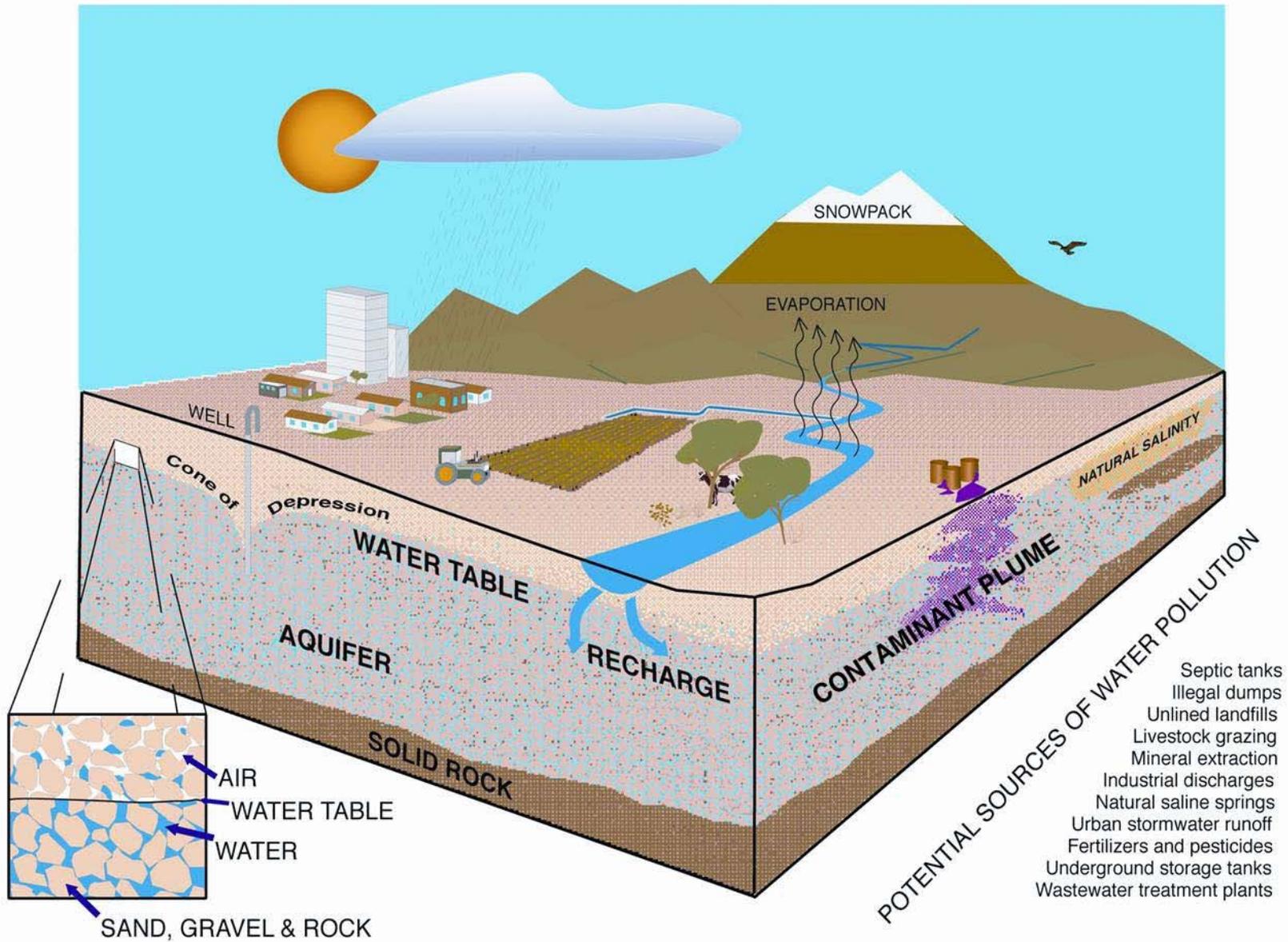


Active Management Areas in Arizona



Note: Management goals may differ by AMA





ADWR Recharge Program Mission and Goals

- **Mission:** To encourage the use of renewable water supplies, particularly Arizona's entitlement to Colorado River water, instead of groundwater through a flexible and effective regulatory program for the underground storage, savings and replenishment of water.
- **Goals of the Recharge Program:**
 - To promote the use of renewable water supplies
 - To provide for the efficient use of all water resources by allowing water to be "transported" by storing water in one location, but recovering a like quantity elsewhere;
 - To extend conjunctive management to reduce overdraft, through storing water to prevent further water level declines;
 - To utilize underground storage to accommodate seasonal demand for water; and
 - To augment the water supply.

http://www.azwater.gov/dwr/content/Find_by_Program/Recharge/recharge_programs.htm



Types of Storage Facilities

- Underground Storage Facilities (Direct Recharge)
 - Constructed Spreading Basins
 - Stream bed infiltration (managed recharge)
 - Well injection
- Groundwater Savings Facilities (Indirect or “in-lieu”)
 - Use of renewable water supplies in lieu of groundwater use, mostly by ag

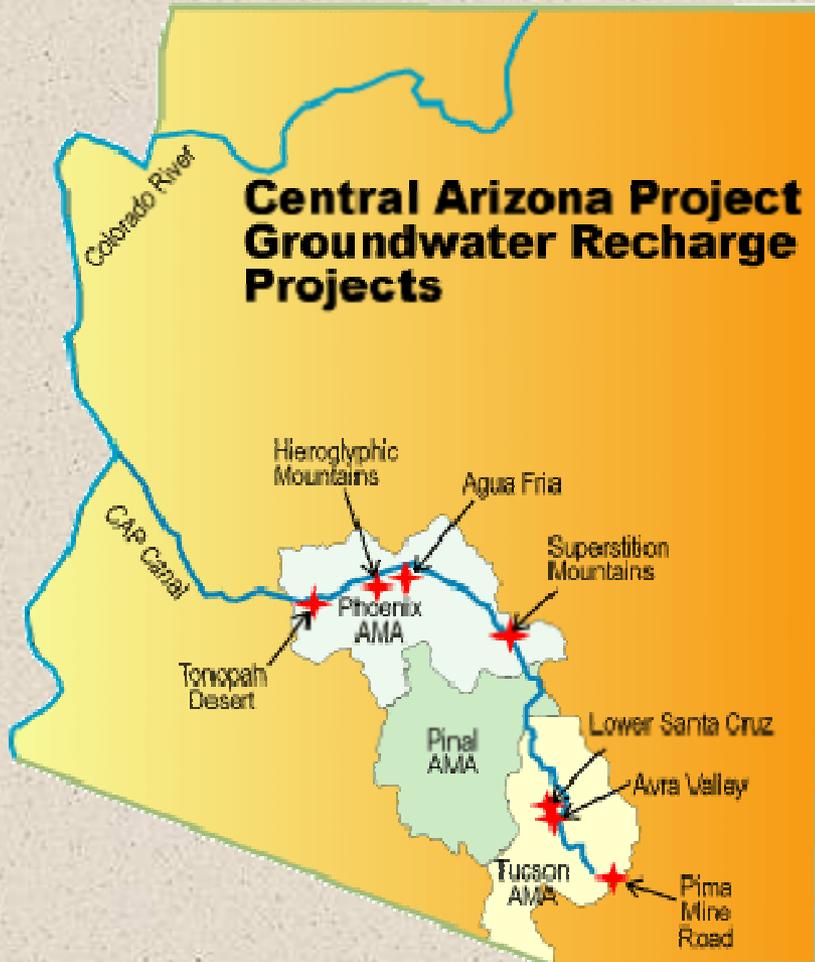


Storage and Recovery Permits and Accounting

- Facility Permit
- Storage Permits
- Recovery Permit
- Aquifer Protection Permit (not for CAP)
- Credits accrued for storage
 - Annual Storage and Recovery
 - Long-term storage account
 - “Cut to the aquifer”
- Recovery can occur outside area of hydrologic impact but must be inside AMA



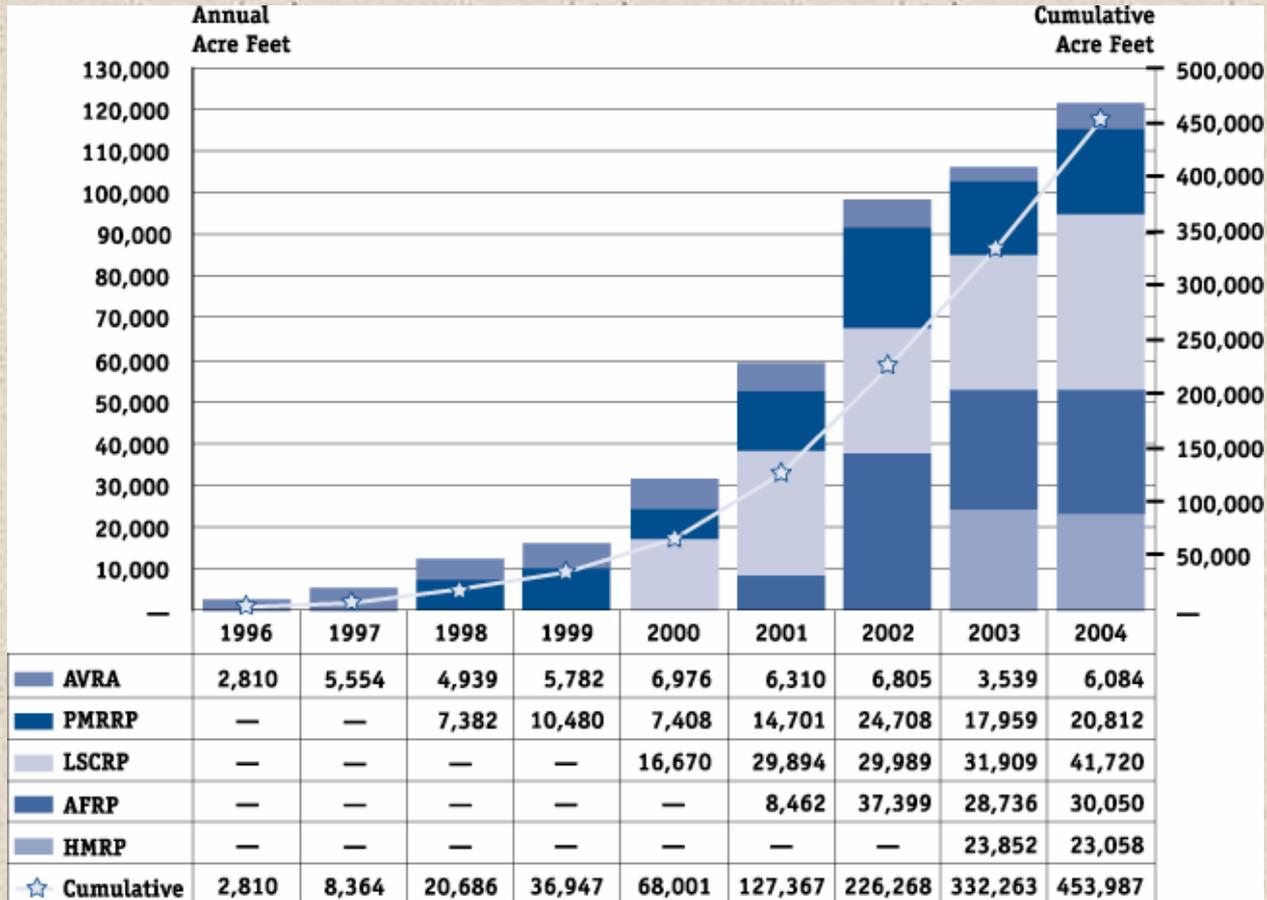
State Demonstration Recharge Facilities



- Temporary CAP tax for Pima and Maricopa Counties, 1991-1995
- Jump-started the state recharge program
- Tax extended for 20 years and included Pinal County for CAP repayment and water banking



State Demonstration Recharge Projects



Annual and Cumulative Storage at Demonstration Recharge Facilities, 1996 through 2004 Courtesy: Central Arizona Project

Granite Reef Underground Storage Project (GRUSP)



- Salt River Project
- 6 basins
- 210 acres
- 200,000 af annually permitted capacity
- Since 1994, over 850,000 af stored
- GRUSP partners: Chandler, Gilbert, Mesa, Phoenix, Tempe, Scottsdale and the Salt River Project (SRP).

Lower Santa Cruz Replenishment Project

-Every Recharge Project has a Story-



- 33 acres in Marana
- 51,000 af permitted capacity (originally 30,000)
- Cost effective recharge site



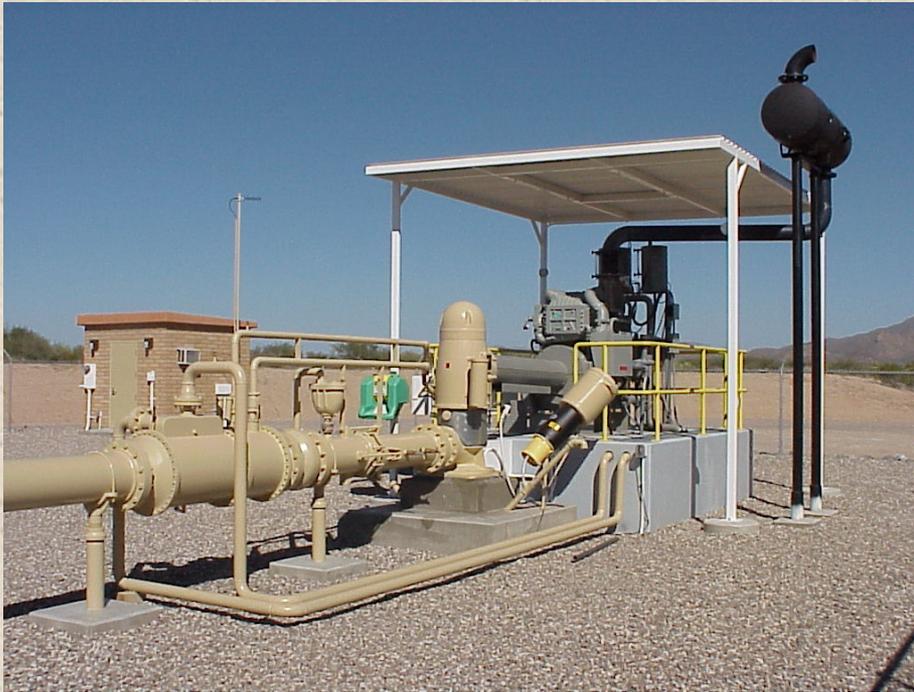
Agua Fria Recharge Project

- Combined stream recharge with basin recharge



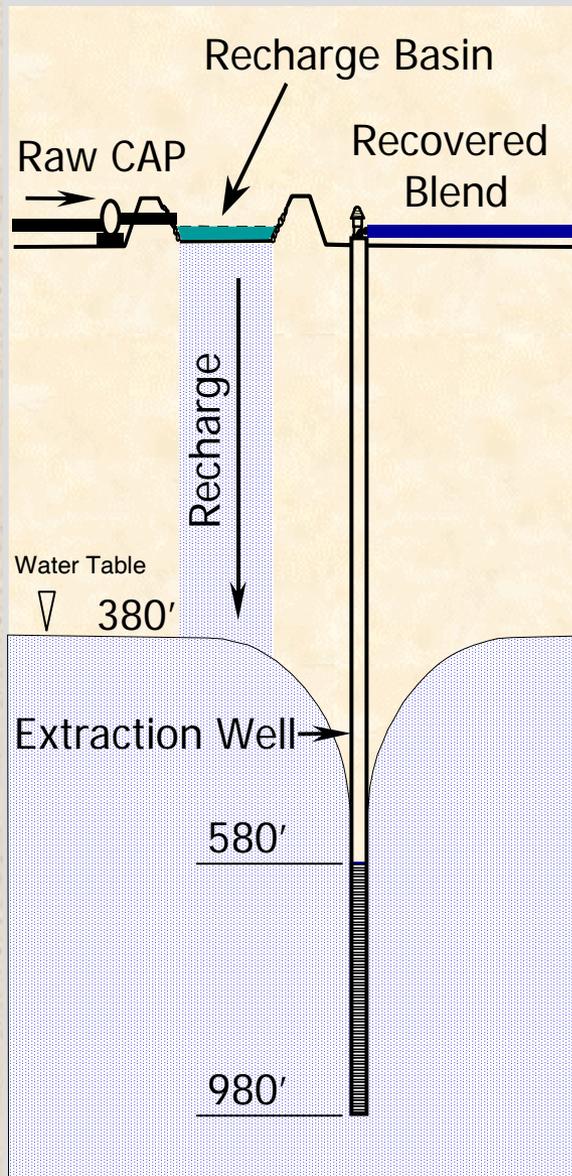
www.cap-az.com

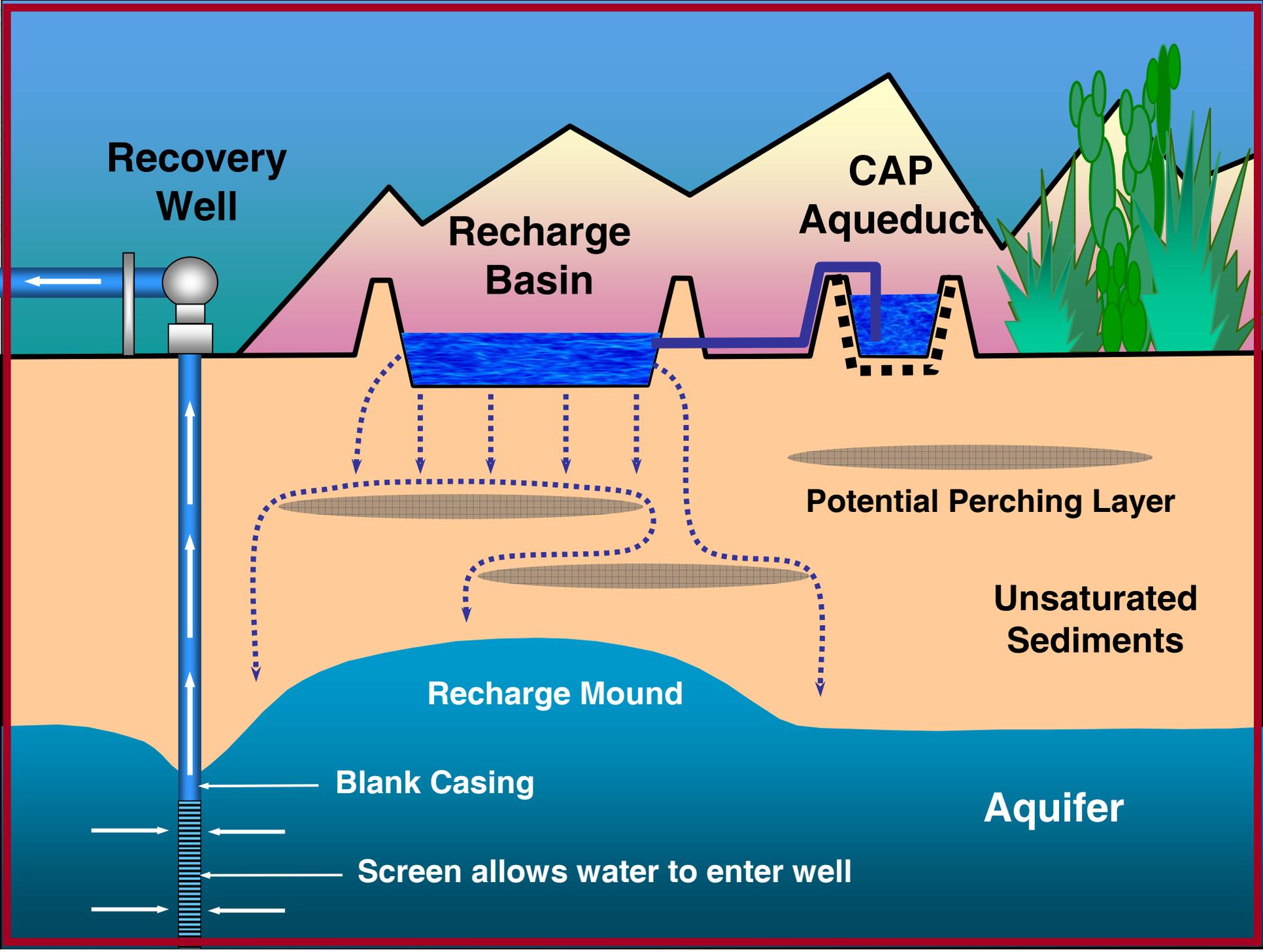
Central Avra Valley Storage and Recovery Project (CAV-SARP)



Recovery Well

- Proposition 200
 - The Water Consumer Protection Act
- Annual Storage and Recovery
- Some long-term storage
- No large-scale treatment facility needed



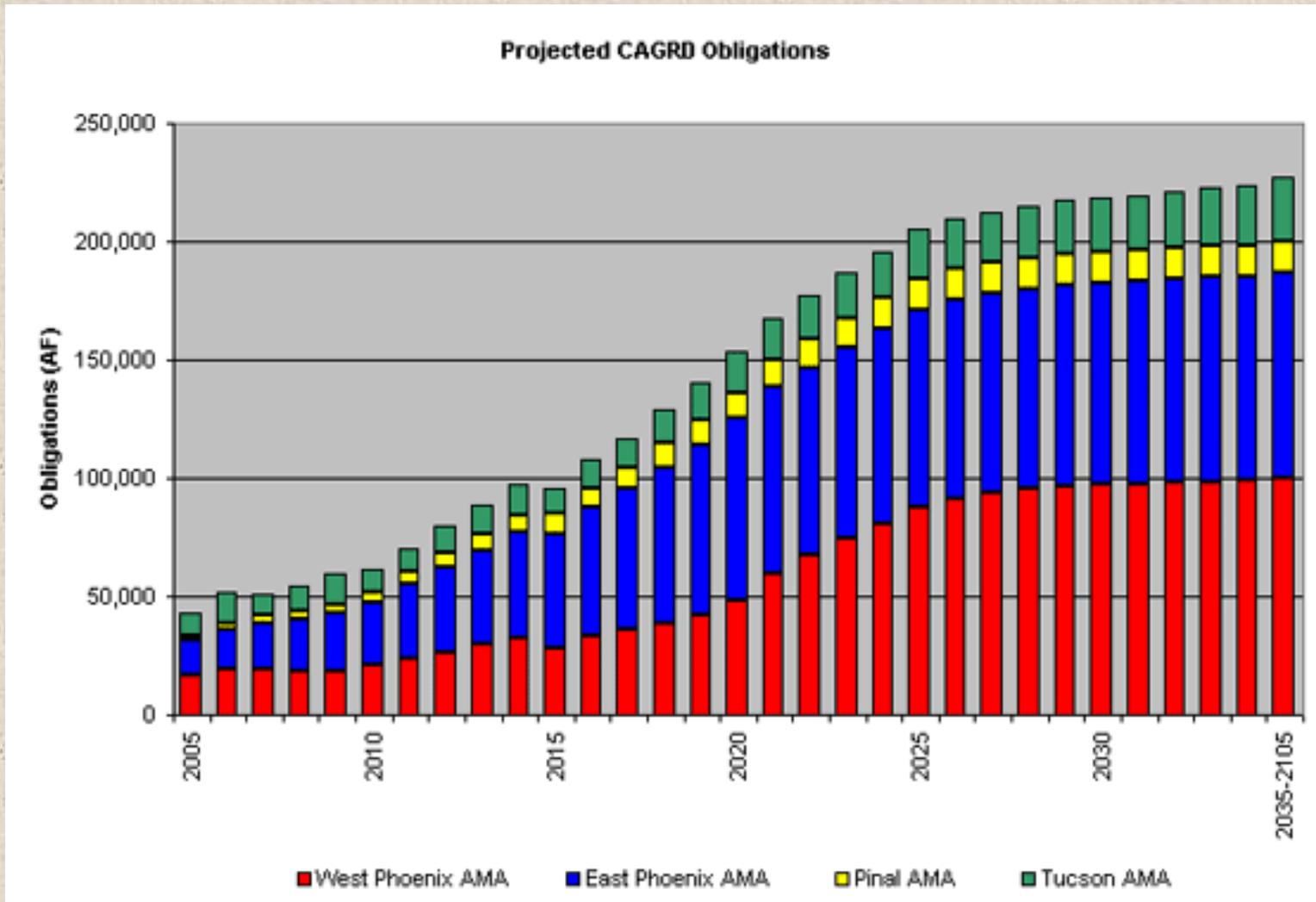


Central Arizona Groundwater Replenishment District - 1993

- Use excess CAP water to satisfy AWS rules
- Recharge at USFs, GSFs, and extinguishment of recharge credits
- 3yr after-the-fact replenishment
 - Replenishment Obligation:
 - 500 acre feet in 2000
 - 20,000 acre feet in 2004
 - >225,000 obligation projected for 2035 based on membership through 2015



CAGR D Projections



Arizona Water Banking Authority - 1996

- Full utilization of Colorado River allocation
- Storing CAP water to lessen the impact of drought (“firming”)
- Supporting settlement of Indian water claims
- Providing for interstate banking of Colorado River water
- 2.2 million acre feet through 2004
- 60% at GSFs
- Recovery program and costs yet to be established



Effluent Recharge

- **Effluent recharge** Aquifer Protection Permit issued by the Arizona Department of Environmental Quality (ADEQ).
- Recovered effluent may be used for irrigation of golf courses, landscaping, and non-food crops.
- Can also be used for potable water use under certain conditions. Major issue for Tucson and other metropolitan areas.
- As of December 2005, there are 44 active USF permits for effluent recharge in and around the Pinal, Prescott, Tucson, and Phoenix Active Management Areas. In addition, there are three active GSF permits for indirect effluent recharge, all in the Phoenix AMA, with a total annual capacity of 135,840 acre-feet.



Marana High Plains Effluent Recharge Project

- Outgrowth of an old stormwater recharge project
- U.S. Bureau of Reclamation and Arizona Water Protection Fund funding, originally two-year pilot permit
- Many challenges



Educational sign at recharge facility
Marana High Plains

Projects to Enhance Arizona's Environment

Sweetwater Wetlands

- Wetlands and eight infiltration basins
- Lush bird habitat
- Educational information



Aerial map of the Sweetwater Recharge and Storage Facility. (Courtesy of NCSWS - ASU)

Projects to Enhance Arizona's Environment

Lower Santa Cruz Managed Recharge



- outfall and riparian habitat
- Many parties on the facility permit
- 50% credits for amount that infiltrates
- Two segments

“Accidental” Recharge

Sampling of Outstanding Issues

- CAGRD membership growth and replenishment obligations, including size and location of replenishment
- AWBA firming targets
- AWBA recovery plans and cost
- “Paper water” vs. “Wet water”
- Water quality
- Long-term implications of recharge



Current Related Research/Extension Work

- Chapter in soon-to-be released book
- Paper on the CAGRD for Law Symposium, October 5-6
- Use of effluent to meet municipal water demands (NATO workshop in October and Tucson water resources report)
- *Arroyo* on Recharge
- In-depth look at groundwater savings program



Concluding Remarks

- Innovative policy used to:
 - Manage groundwater supply
 - Assure full use of Colorado River water allocation
 - Protect against shortages during drought
 - Enable affordable use of CAP water

When the well's dry, we know the worth of water.

– *Benjamin Franklin, Poor Richard's Almanac, 1746*

