



Water Banking and Arizona's Framework for Groundwater Recharge and Recovery

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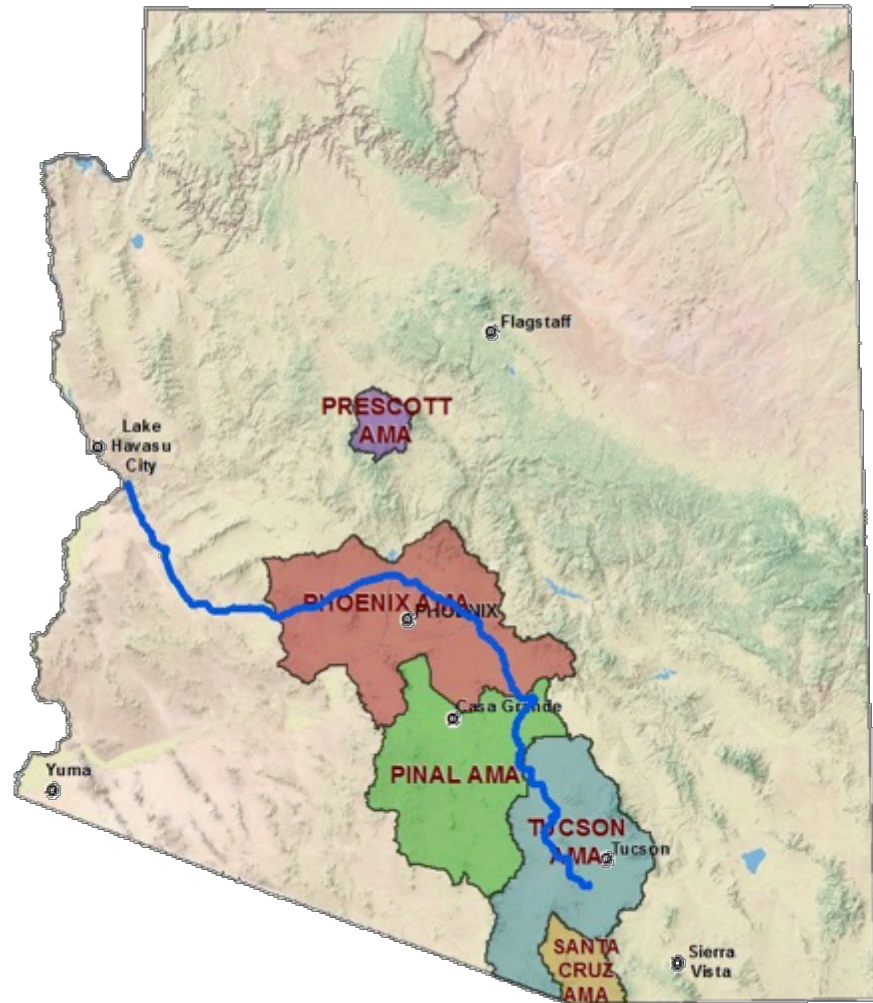


Kenneth Seasholes



Groundwater Management Act

- Created the Arizona Department of Water Resources
- Established Active Management Areas
 - ◆ Hydrologic boundaries
 - ◆ Stringent regulations
 - ◆ Long-range management goals
- ◆ Ensured completion of the Central Arizona Project (CAP)
 - ◆ In 1968, grand bargain struck for funding CAP:
Low priority in times of shortage



Surface Water/Groundwater Management Achievements

- Major strides have been made by the State and its water management partners in securing water supplies for the AMAs:
- Groundwater Management/Conservation
- Central Arizona Project (CAP)
- Assured Water Supply Program (AWS)
- Underground Storage and Recovery Program (Recharge Program)
- Arizona Water Banking Authority (AWBA)
- Central Arizona Groundwater Replenishment District (CAGRDR)
- Colorado River Management

Recharge and Recovery

- Arizona has developed an institutional and regulatory framework that has facilitated large-scale implementation of groundwater recharge and recovery.
- This has advanced several key policy objectives, including putting Arizona's full Colorado River entitlement to use by banking water for future shortages.
- Additional steps are required to ensure that the full benefit of Arizona's approach can be realized.

Recharge Policy

"Protect the general economy and welfare of this state by encouraging the use of renewable water supplies, particularly this state'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."

Underground Water Storage, Savings and Replenishment Act (1994; §45-801.01)

Terminology

- **Recharge** — Intentionally adding water to an aquifer, or preventing pumping by using an alternative supply
- **Storage** — [see Recharge]
- **Recovery**— Pumping stored water
- **Water Banking** — Recharging water for later use
- **Firming** —Recovering stored water to supplement a supply that has been reduced

Recharge Facility Types



Superstition Mountains Photo: CAP

Underground Storage Facilities (USF)

- “Direct” recharge
- Water is delivered to spreading basins, trenches, injection wells or natural channels



Drip Irrigation, MSIDD. Photo: Megdal

Groundwater Savings Facilities (GSF)

- “Indirect” or “in lieu” recharge
- Water is delivered to agricultural user that would otherwise have pumped groundwater

Recharge Funding (4-Cent Tax)

Actions by the Arizona Legislature

- **1990** – CAP is authorized to collect a property tax in Maricopa and Pima counties to fund construction of recharge facilities
- **1994** – Tax extended to Pinal County and modified to allow for CAP OM&R and federal repayment
- **1996** – Arizona Water Banking Authority created, and authorized to use tax proceeds, pursuant to CAP Board of Directors resolution, for water storage
- **2015** – Tax is extended until 2030, but drops to 3-cents in 2025
- **Throughout**, other storage and facility construction being undertaken by water providers and others

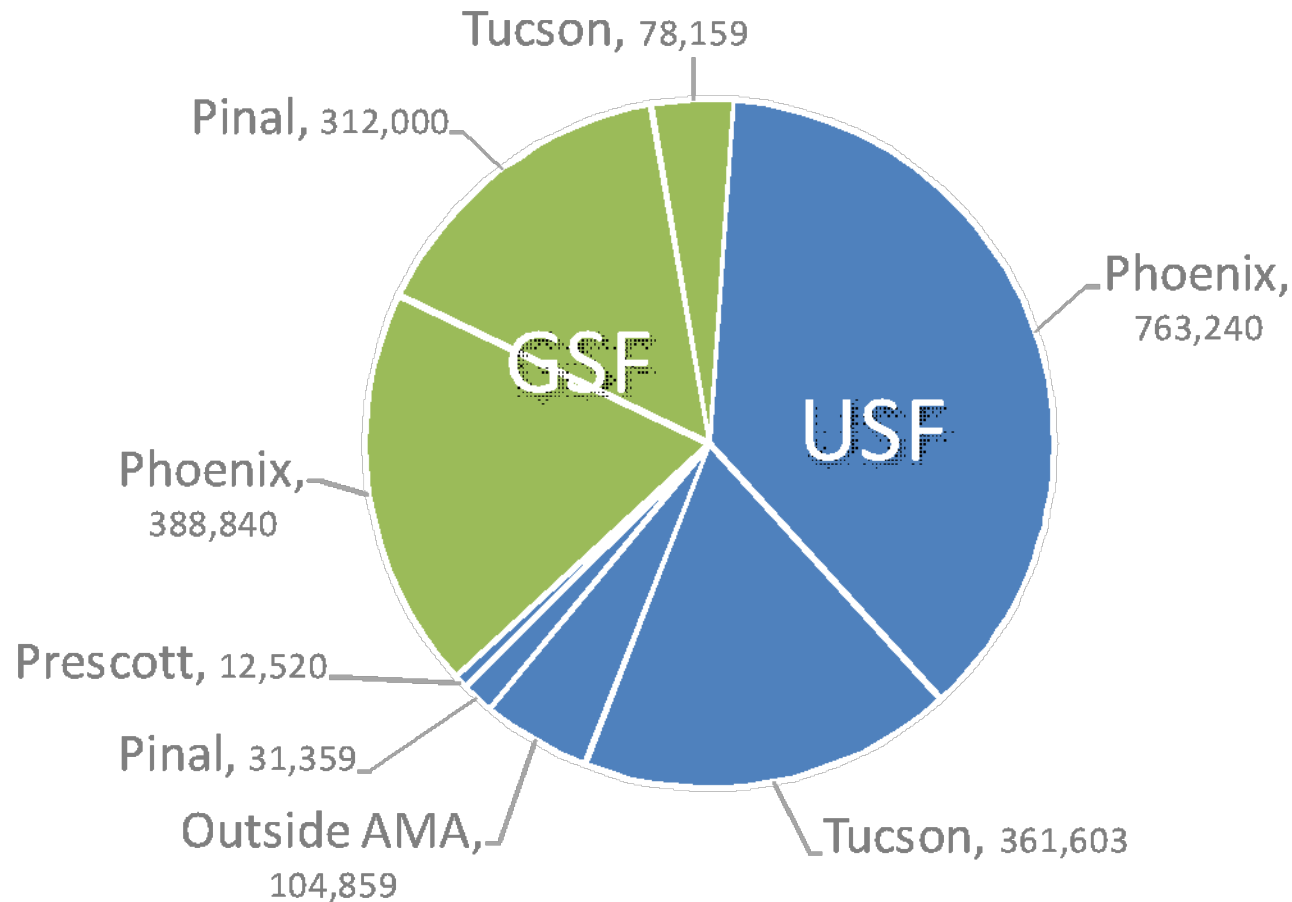
CAP Underutilization

- In 1993, CAP was deemed “substantially complete” but serious problems arose
 - Cost higher than expected
 - Lawsuits and acrimony
 - Agriculture took less than expected
 - Underutilization caused high O&M rates
 - Costs were pushing Ag districts towards bankruptcy

Solutions included: expanded recharge program, increased water banking & dedicated funding

Annual Recharge Capacity

Total = 2.0 MAF/year

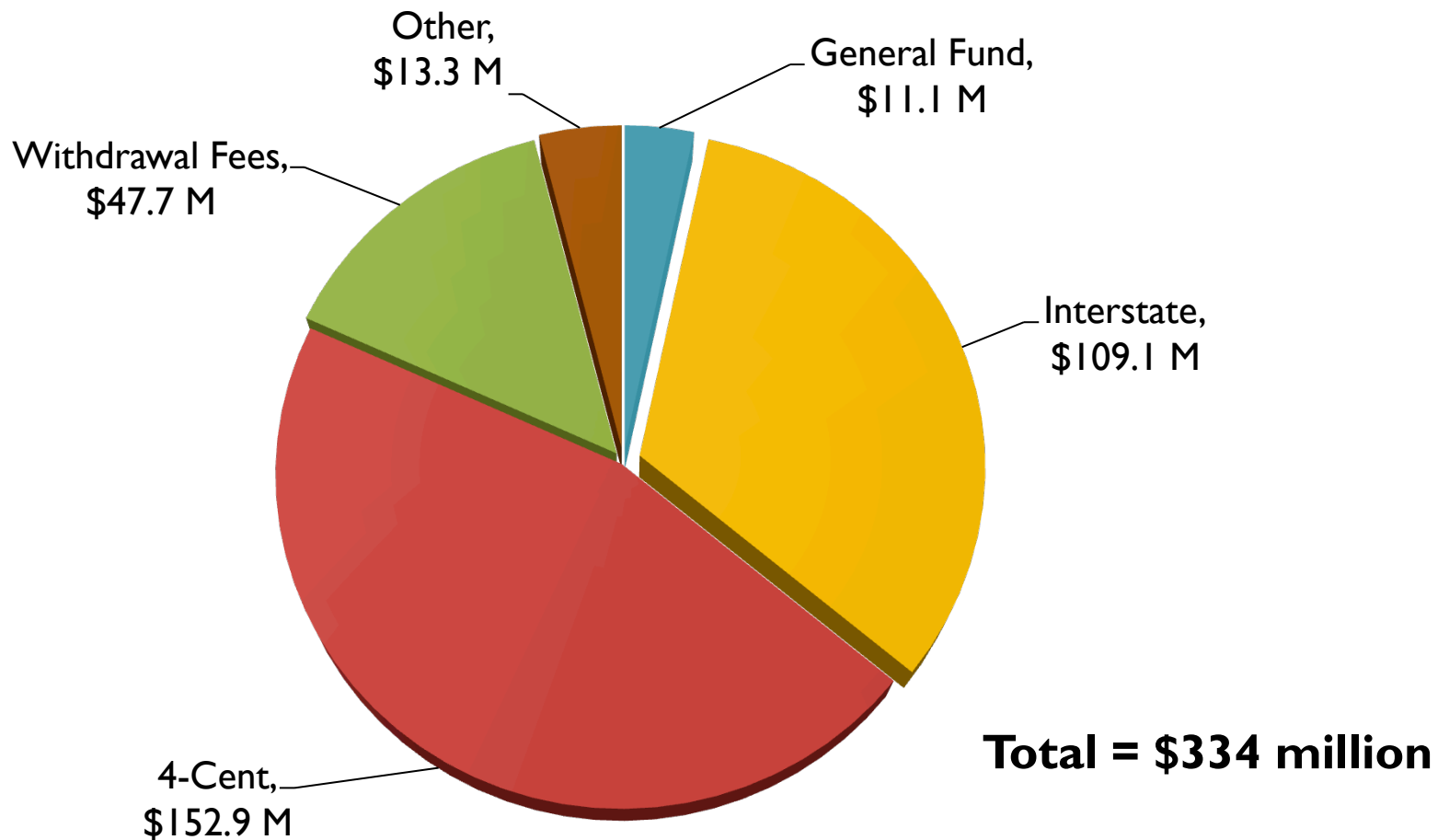


Source: ADWR Status Reports, 2/24/16
Permitted capacity, by facility type and AMA

Arizona Water Banking Authority

- Recharges for a variety of purposes
 - To mitigate the impacts of Colorado River shortages
 - To create water management benefits
 - To allow interstate storage
 - To help settle Indian water rights claims
- Each of these was in service to a larger policy objective—*full utilization of Arizona's Colorado River allocation*

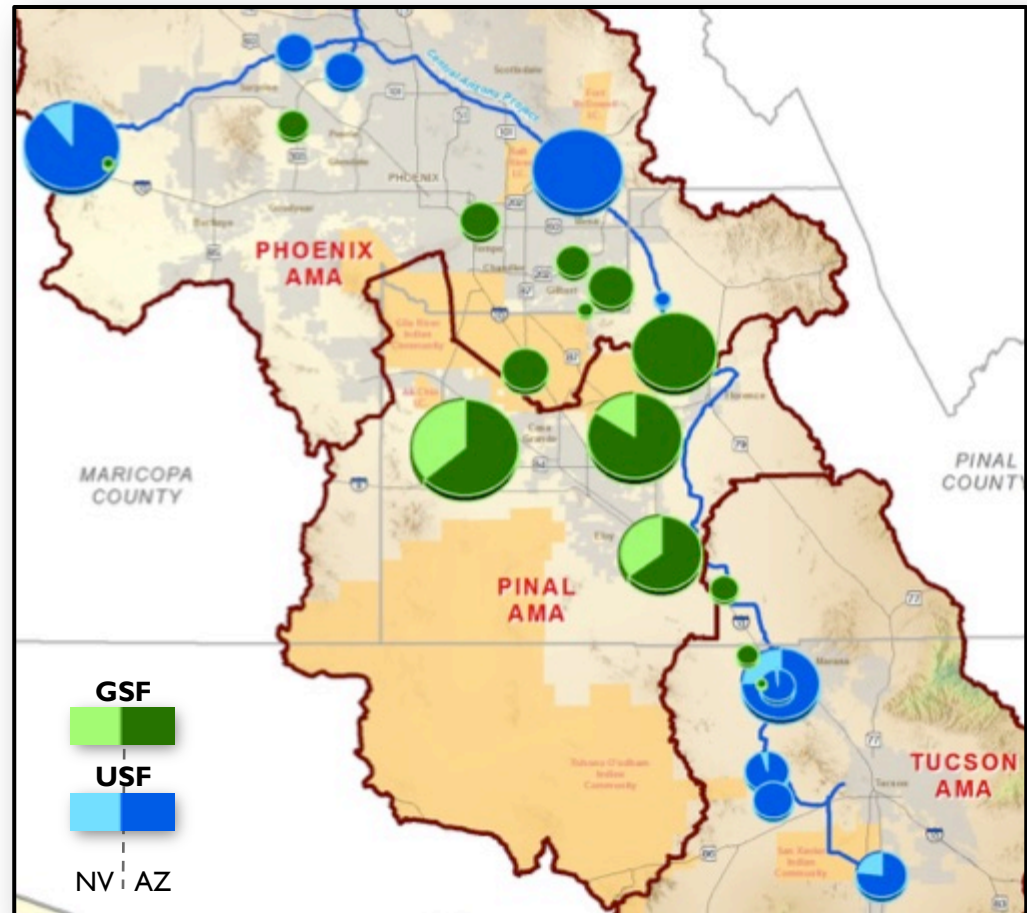
AWBA Expenditures



Through 2014, from AWBA 2014 Annual Report

AWBA Storage

- 4.0 MAF in storage
 - 3.4 MAF for AZ
 - 0.6 MAF for NV
- In the Phoenix, Pinal and Tucson Active Management Areas
 - 10 Underground Storage Facilities (USFs)
 - 14 Groundwater Savings Facilities (GSFs)



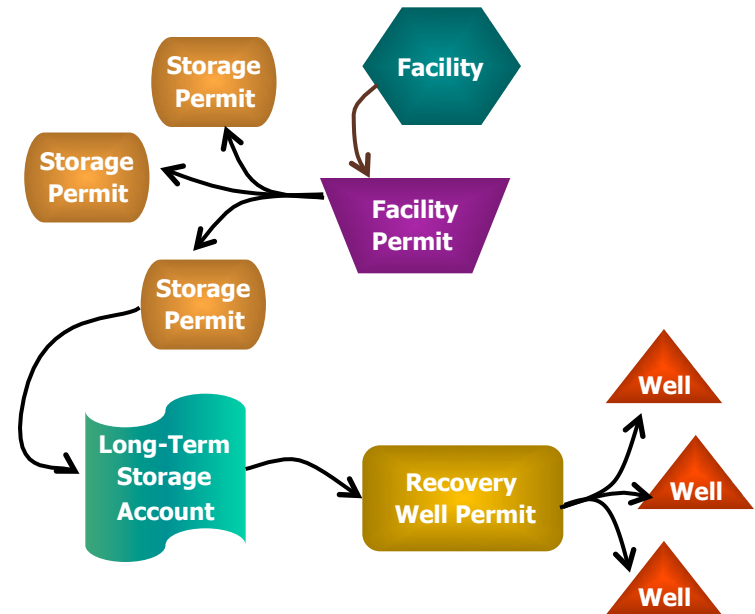
Recharge & Recovery Framework

Recharge & Recovery

- Arizona's recharge & recovery program uses a "paper water" accounting system that relies on a "mass balance" approach
 - Recharging a volume of water allows an equal, or nearly equal, volume to be recovered
 - Generally, anywhere within the same AMA
- Recharge & recovery can occur within the same year, or a Long-Term Storage Credit is issued for future use
 - Credits can be transferred among users, with some restrictions

Recharge & Recovery: ADWR

- The Arizona Department of Water Resources administers a system of permits and accounts
 - Allows storage and recovery while protecting other land and water users
 - Requires extensive monitoring and annual reporting
 - Stored water retains its legal character
 - i.e., recovered CAP water \approx 'wet' CAP water



Recharge & Recovery: CAP

- Colorado River water delivered via the CAP system has been the largest supply for recharge
- CAP owns & operates six recharge facilities
- CAP also has a significant role in recovery, particularly for water stored by the AWBA

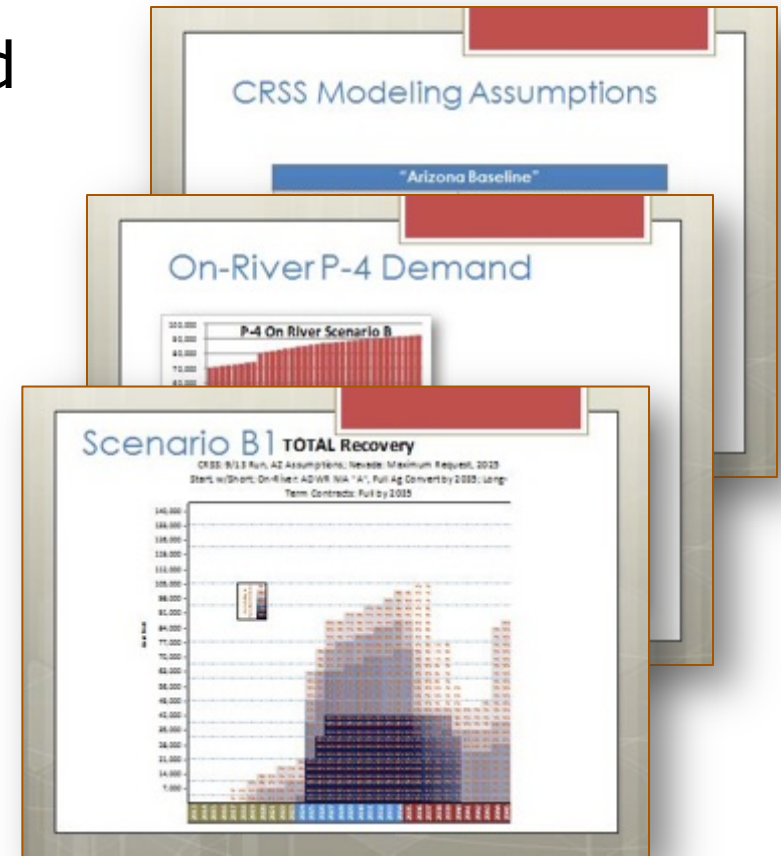
Recovery of AWBA Credits

- **When** will recovery be necessary?
- **Who** is responsible?
- **How** will it be accomplished?
- What are the **current efforts**?

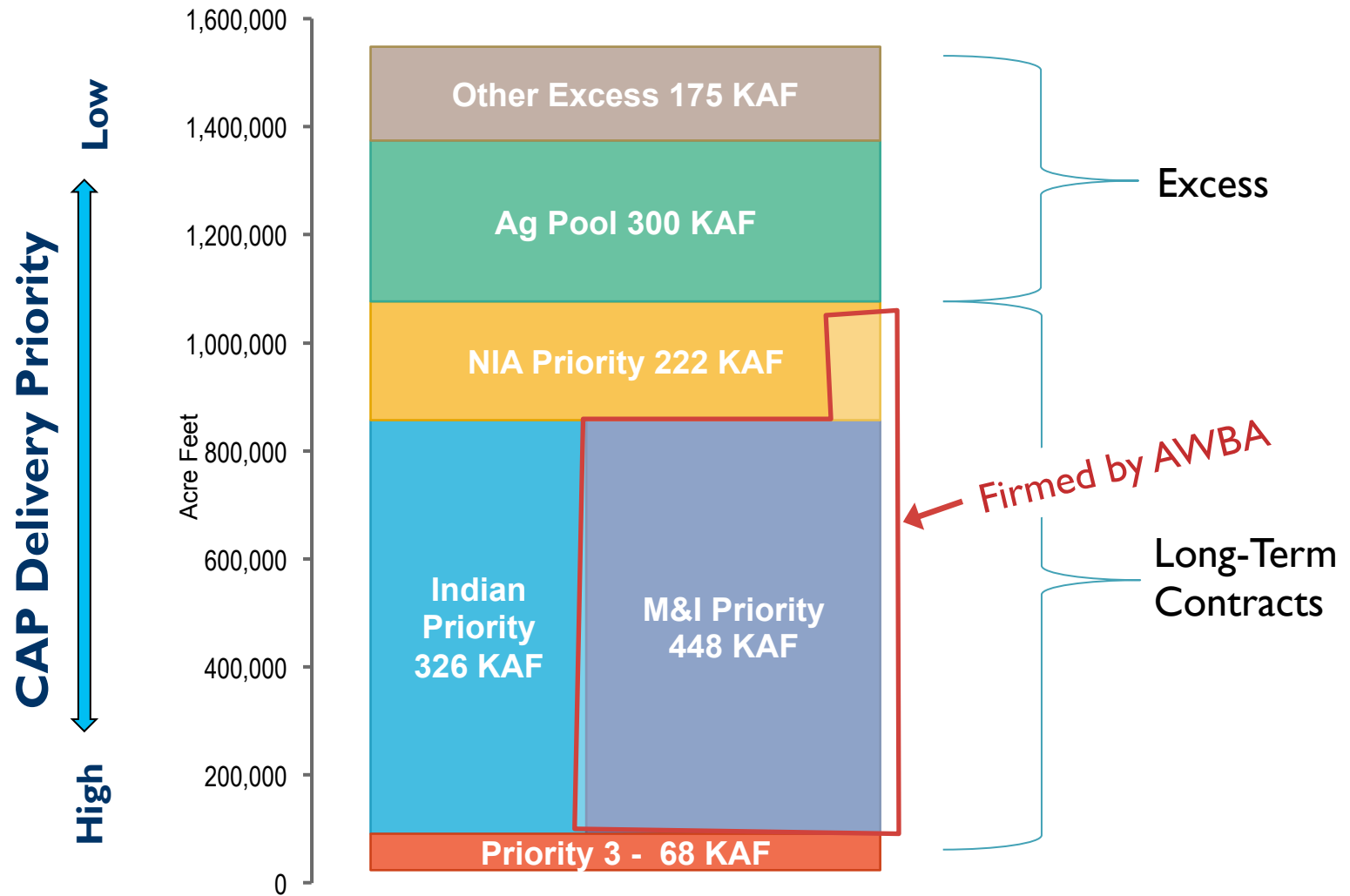
When?

Timing of Recovery

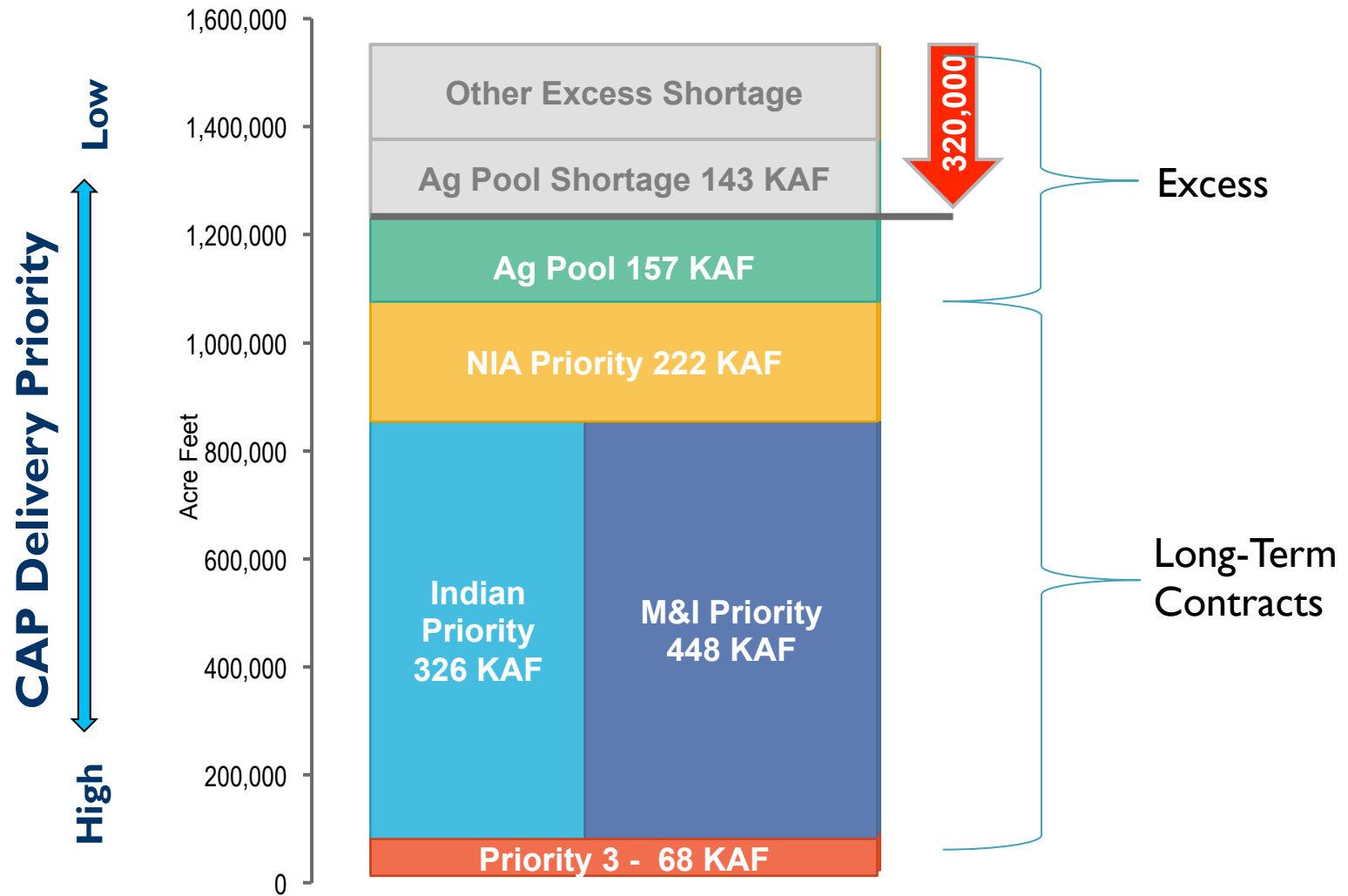
- Credits will be recovered when Colorado River shortages affect users that are firming by the AWBA
 - Intersection of supply & demand
 - Factors include: depth of shortage, available Colorado River supply, and rate of CAP long-term contract use



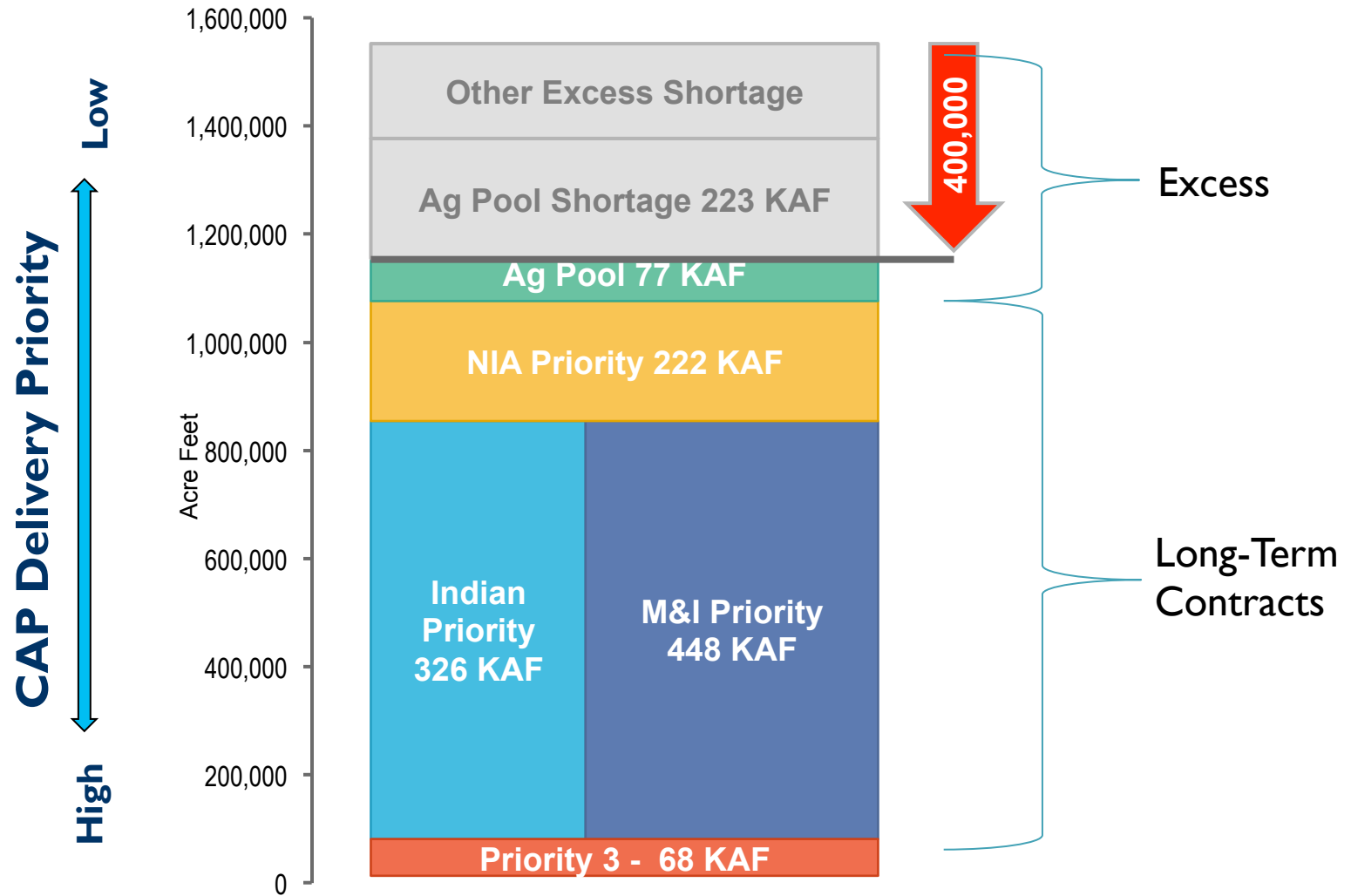
Shortage Impacts



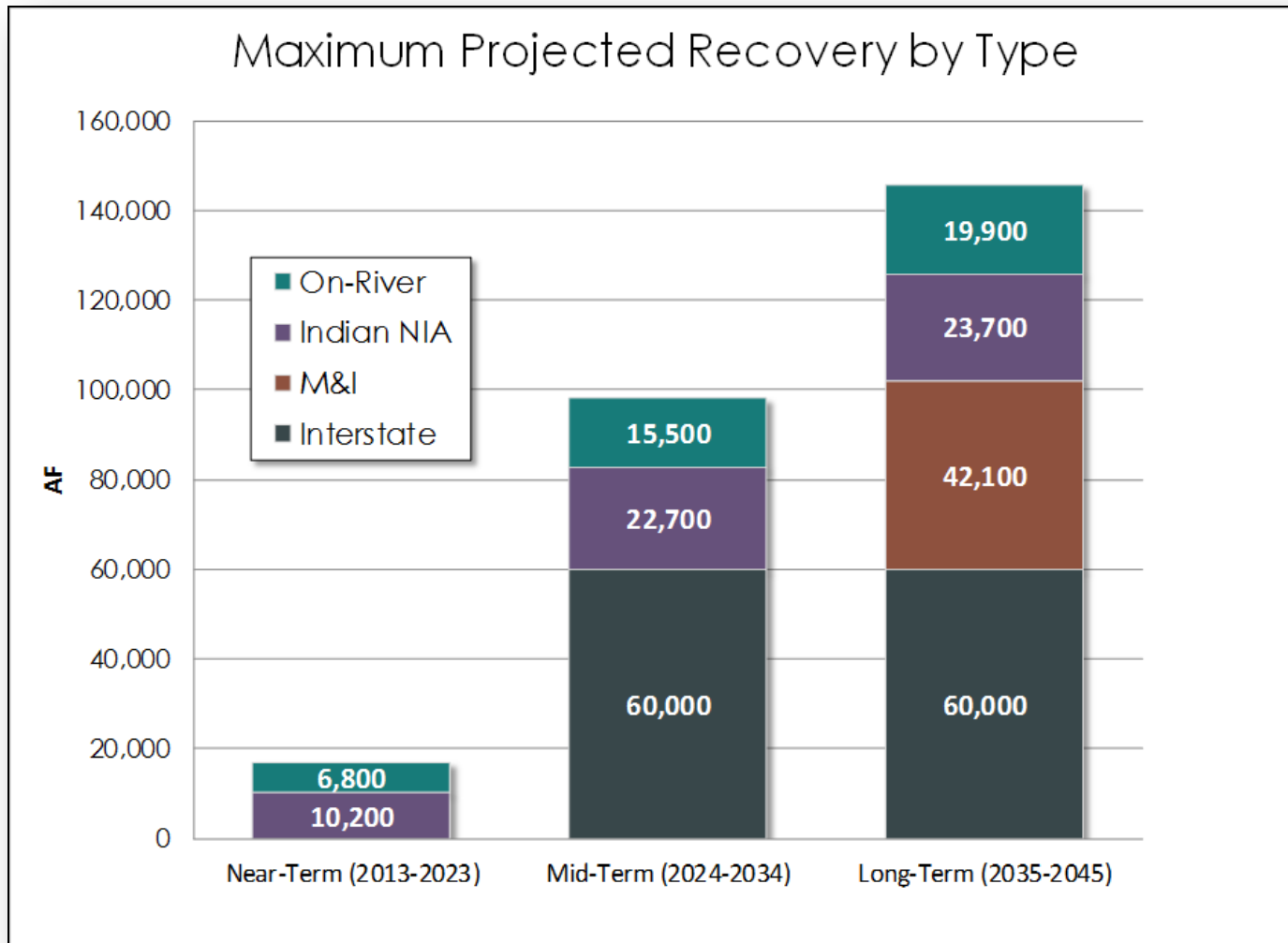
Shortage Impacts



Shortage Impacts



Recovery Needs



Joint Recovery Plan, 2014

Who?

Recovery Roles

- **ADWR**—administers the regulatory framework for recharge & recovery
- **AWBA**—manages the distribution of its credits, consistent with firming requirements, location and sources of funding
- **CAP**—serves as a designated recovery agent for the AWBA; works with the AWBA and partners to turn credits into firming water
- **Recovery Partners**—entities that agree to recover credits to make up for reduced deliveries of CAP water

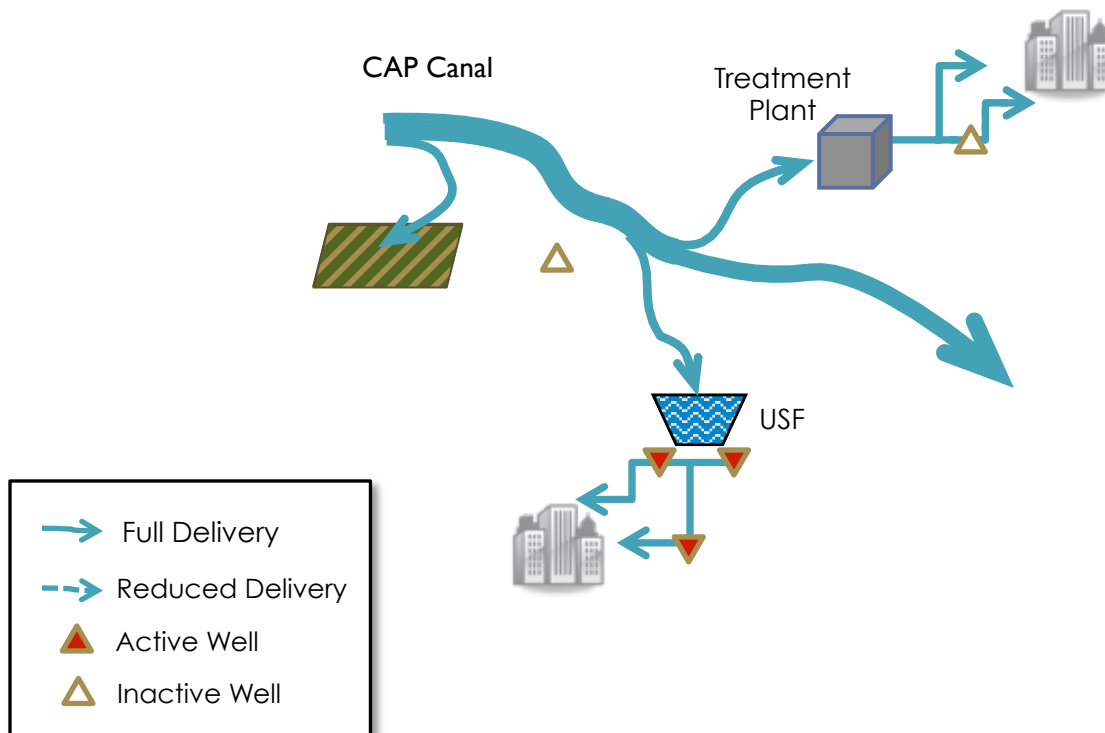
How?

Recovery Methods

- Recovery can be accomplished a variety of ways, including pumping water directly into the CAP canal
- Preferred methods involve partnerships with CAP customers that agree to accept some of their order in the form of previously stored water

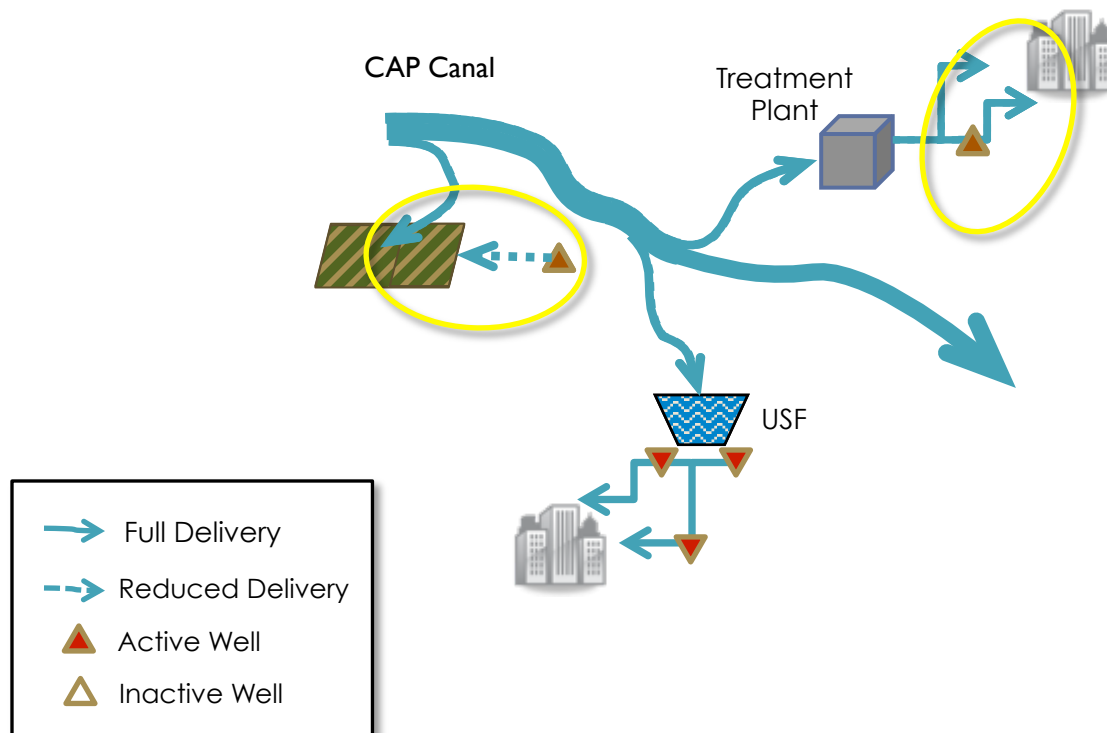
Normal Deliveries

Sufficient Project Water is available for full deliveries to CAP customers.



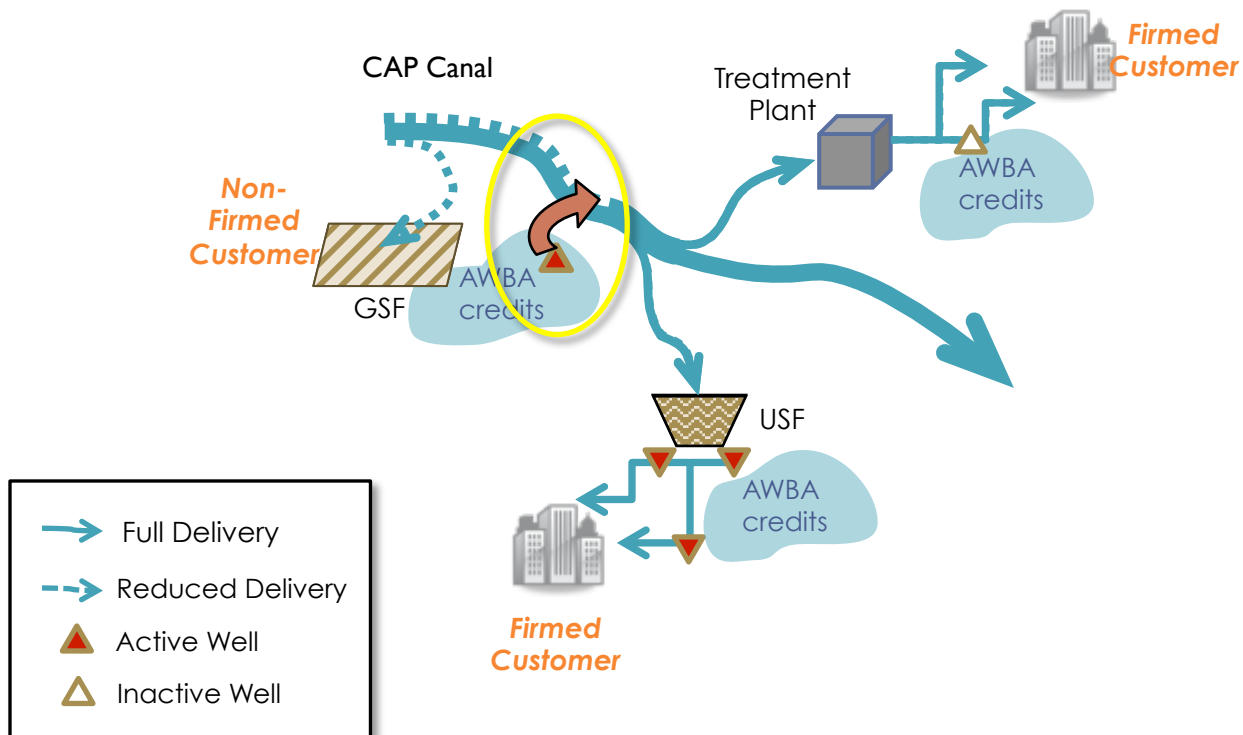
Shortage Without Firming

Deliveries to CAP customers are reduced based strictly on their CAP priority and shortage formula defined in Arizona Water Settlements Act. Users are left on their own to make up reductions.



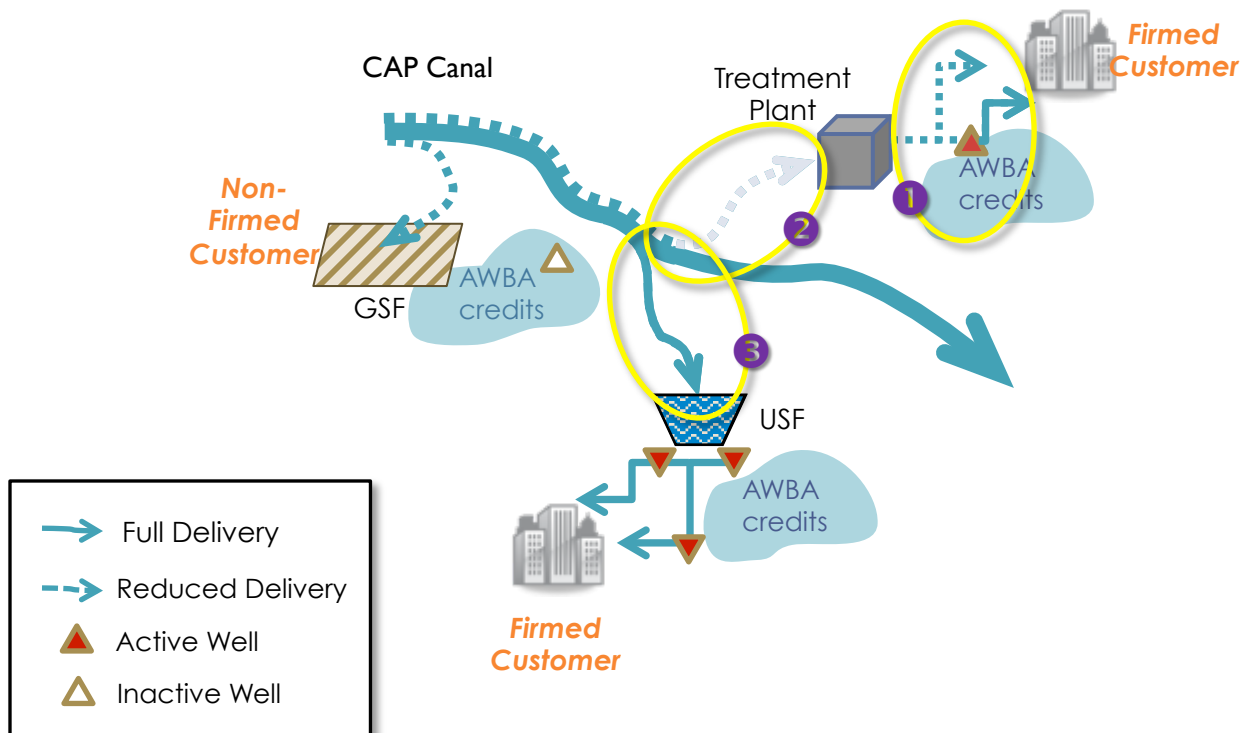
Direct Recovery

Stored water is pumped from recovery wells and then returned directly to the CAP system to firm CAP customers.



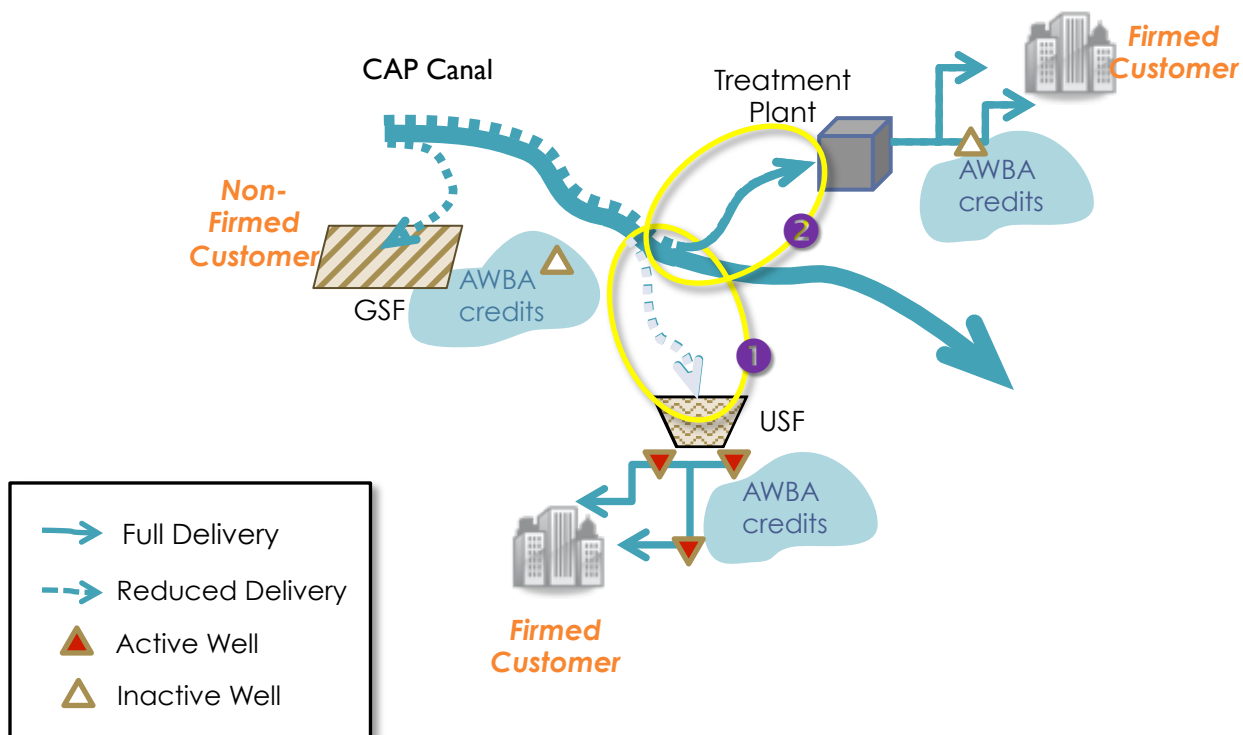
Indirect Recovery

Stored water is pumped and delivered from recovery wells¹ to fulfill a portion of a CAP customer's order that would have otherwise been directly delivered.² The CAP water that was not physically delivered is available to firm other customers.³



Credit Exchange Recovery

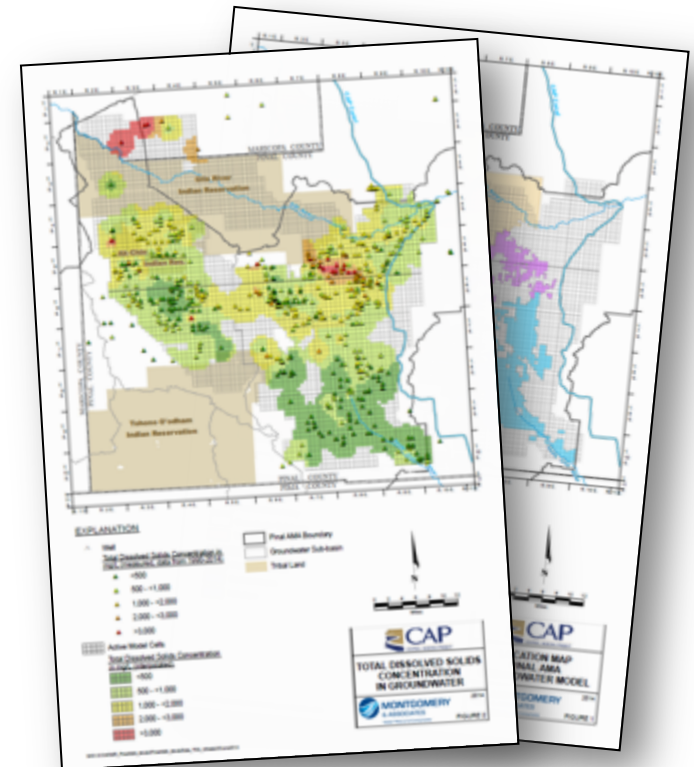
A CAP customer with a scheduled delivery to an Underground Storage Facility agrees to receive a portion of their order as previously accrued storage credits. The CAP water that was not physically delivered¹ is available to firm other CAP customers.²



Current Efforts

Recovery Plan Implementation

- Technical studies
 - Analysis of direct recovery from the Tonopah Desert Recharge Project
 - Wellfield design; energy transmission; water treatment
 - Water quality modeling in the Pinal AMA
 - Well capacity analysis in the Pinal AMA
 - Potential infrastructure partnership in the Tucson AMA



Recovery Plan Implementation

- Discussions with potential partners
- Development of draft partner agreements
- Coordination within CAP
 - Operations, Engineering, Planning, Legal, Communications, and Maintenance
- Coordination with AWBA and ADWR
 - Credit transfer and accounting procedures
- Coordination with Reclamation
 - Discussion of framework to reconcile legal/contractual issues



CAP/Reclamation Issues

- The CAP is a federal project, so recovery requires consideration of both Arizona and Reclamation law, plus a number of key owner/operator agreements
 - Basin Project Act (1968)
 - Master Repayment Contract (1988)
 - Operating Agreement (2000)
 - Arizona Water Settlements Act (2004)
 - Repayment Stipulation (2007)
 - Tribal contracts and M&I subcontracts (various)

CAP/Reclamation Issues

- CAP and Reclamation staff have been developing a comprehensive framework that reconciles the various legal authorities
 - Looks at CAP system as a whole
 - Adopts priorities for CAP system use
 - Addresses firming, wheeling and exchanges
- The major elements are being written into a draft "CAP System Use Agreement"

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CAP System Use Agreement

- “Firming Water” is available to satisfy reductions to contract orders due to shortage or unplanned outage
 - Includes tribal contracts and non-tribal subcontracts
- Sources of firming water are identified
 - All methods are recognized
- CAP can deliver firming water without a separate wheeling agreement

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CAP System Use Agreement

- Agreement contemplates new exchanges, including subcontractors exchanging with a 3rd party, for firming and non-firming purposes
- Implements a concept proposed by Phoenix, Tucson and Metro
 - Phoenix recharges some of its water in Tucson now
 - Later, Tucson/Metro recovers Phoenix credits in exchange for a reduced CAP delivery in Tucson
 - The exchanged CAP water is delivered to Phoenix

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CAP System Use Agreement

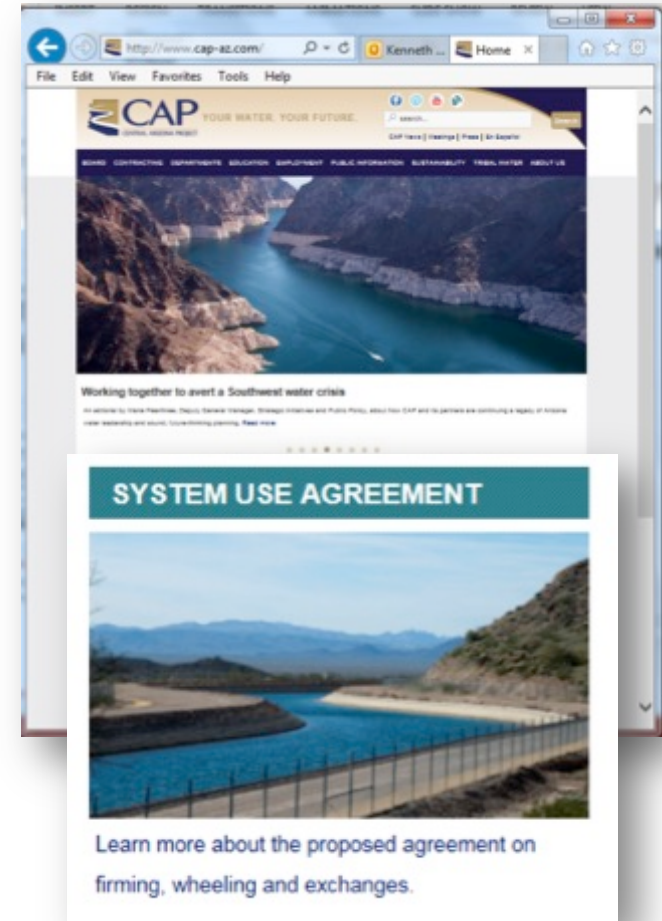
- Supplemental Agreements
 - Recovery partners enter into a Recovery Exchange Agreement
 - Recipients of Firming Water may need to enter into a Firming Agreement
 - For subcontract exchanges, there is an Exchange Agreement, and an Implementation Agreement

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CAP System Use Agreement

- The draft Agreement is undergoing refinement by CAP and Reclamation staff
 - A public workshop was held, and separate consultation with Tribes is being undertaken by Reclamation
- Finalizing and approving the Agreement is critical for recovery, and will provide important new system flexibility

www.cap-az.com



Conclusions

Conclusions

- Arizona has used storage and recovery to achieve important policy objectives
- The creation of the AWBA, with funding to support it, facilitated Arizona putting its entire Colorado River allocation to full use
- Storage of significant water to mitigate future shortage conditions for M&I priority CAP water users, although the AWBA has not yet met all of its targets

Conclusions

- For 2017, the most probable (median) projection from the February 24 month study shows Lake Mead 2 ½ feet above the first shortage trigger (1,075')
 - There is a >50% chance of shortage in 2018
- Prolonged shortage conditions (drought + “structural deficit”) could affect M&I and Indian water deliveries. So, plans for recovery of stored water are important

Questions?