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Drought Resilience and Supply Portfolio Diversification:

Aquifer Storage and Recovery to Enhance Value of Stormwater and Direct Potable Reuse

WaterSmart Innovations, 2018

Overview

- Supply diversification with aquifer storage and recovery (ASR)
- Integrated water resources management
- Recent legislation & regulations reduces impediments
- Benefits & challenges

Supply Diversification with Aquifer Storage and Recovery (ASR)

Surface water susceptible to drought

- Greater diversions than ever before as populations/ demands grow
- Sedimentation slowly fills reservoirs
- Evaporation a big user

Annual net evaporation from Lakes Buchanan and Travis equals City of Austin water use

Groundwater sources may have challenges

- New supplies tend to be deeper, more remote
- Brackish groundwater challenges –
  - deeper reservoirs;
  - requires treatment to remove salts (TDS) and sometimes contaminations (e.g. nitrate, metals)

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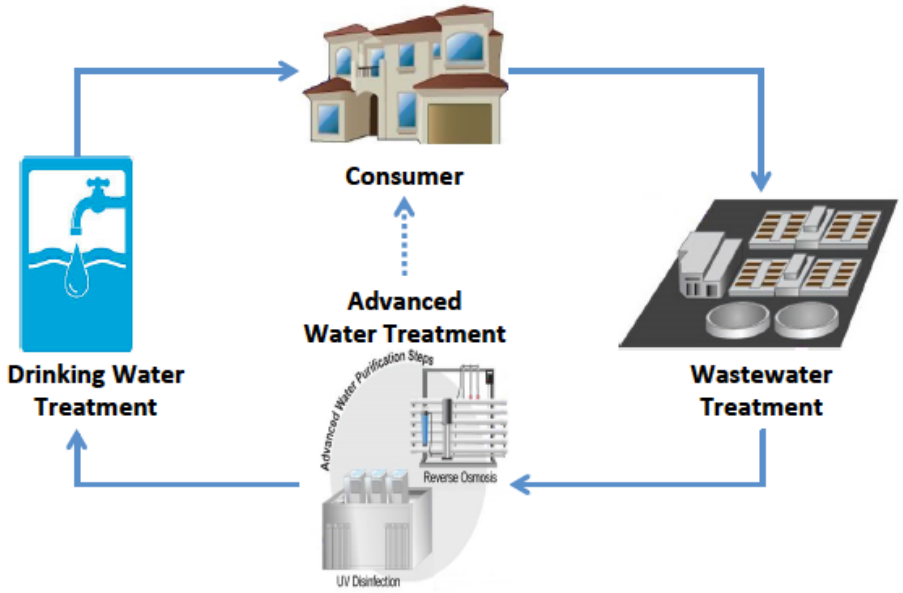
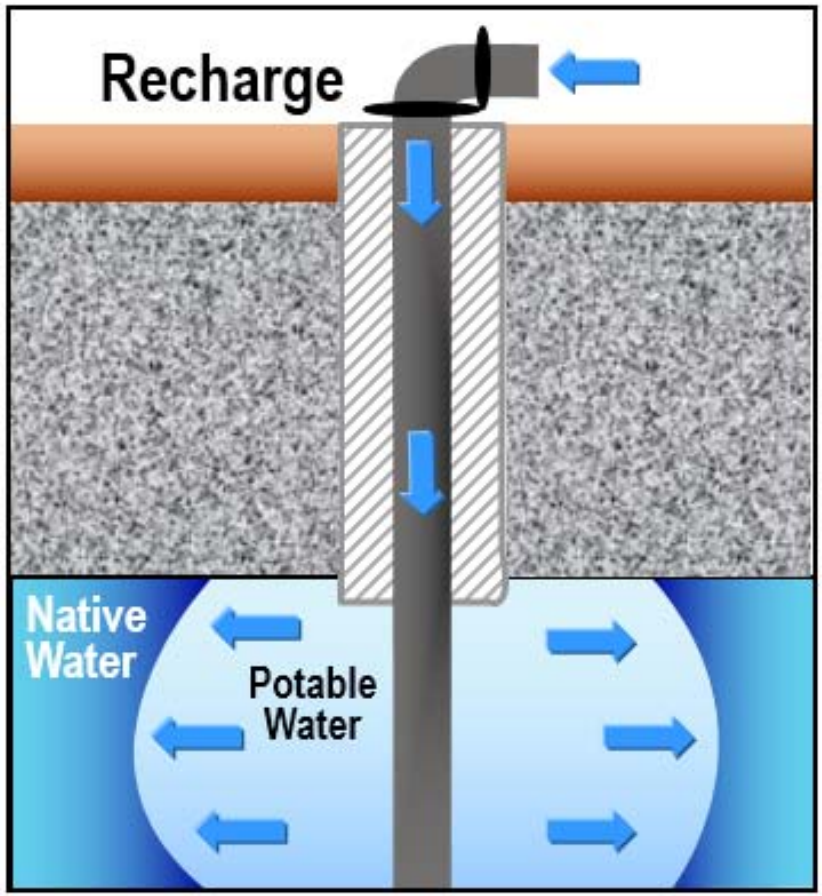
Need for drought resilience is the impetus for more innovative methods

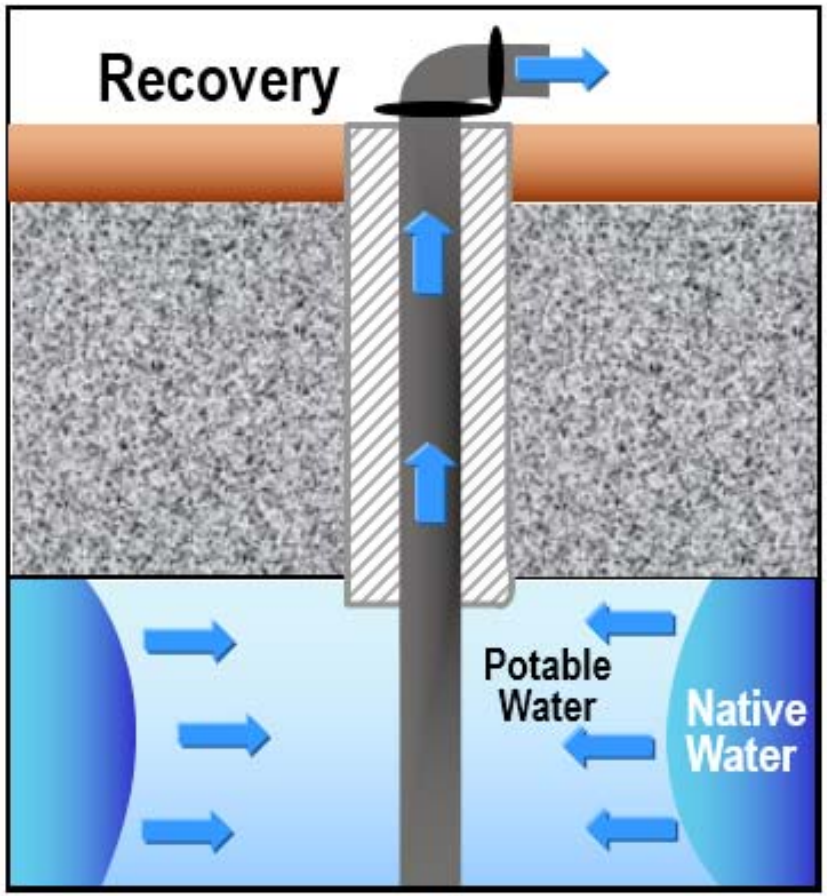
Demand side – conservation, tiered rate structures

Supply side – additional sources, additional treatment, desalination, storage

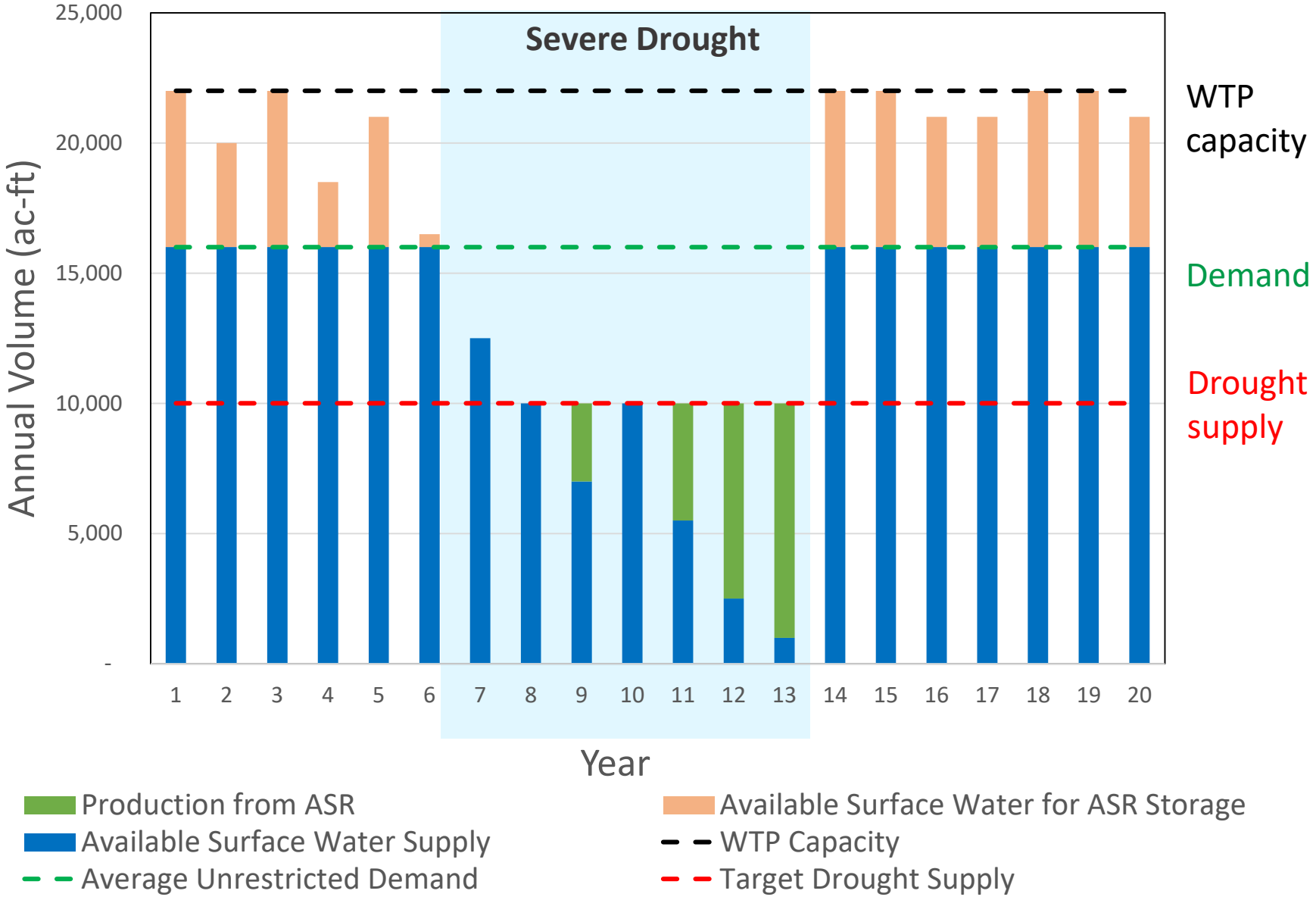


ASR - source water is stored underground and pumped out for use during droughts





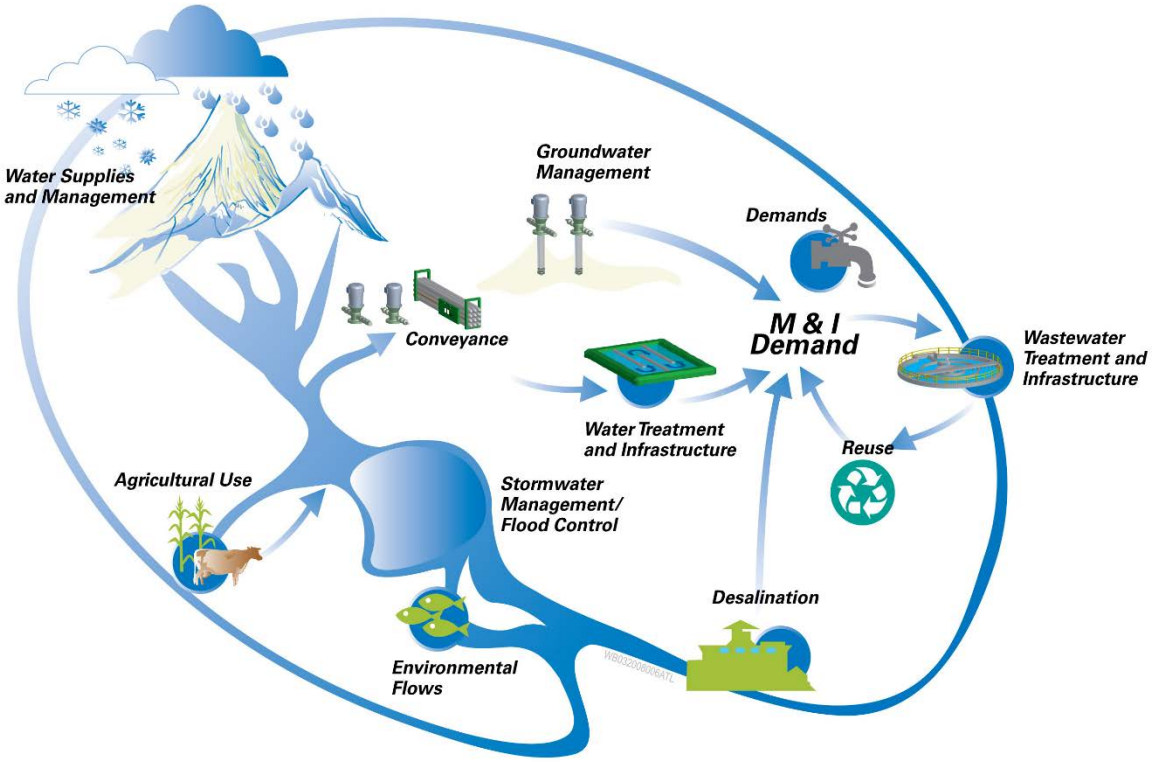
ASR storage helps meet drought demands



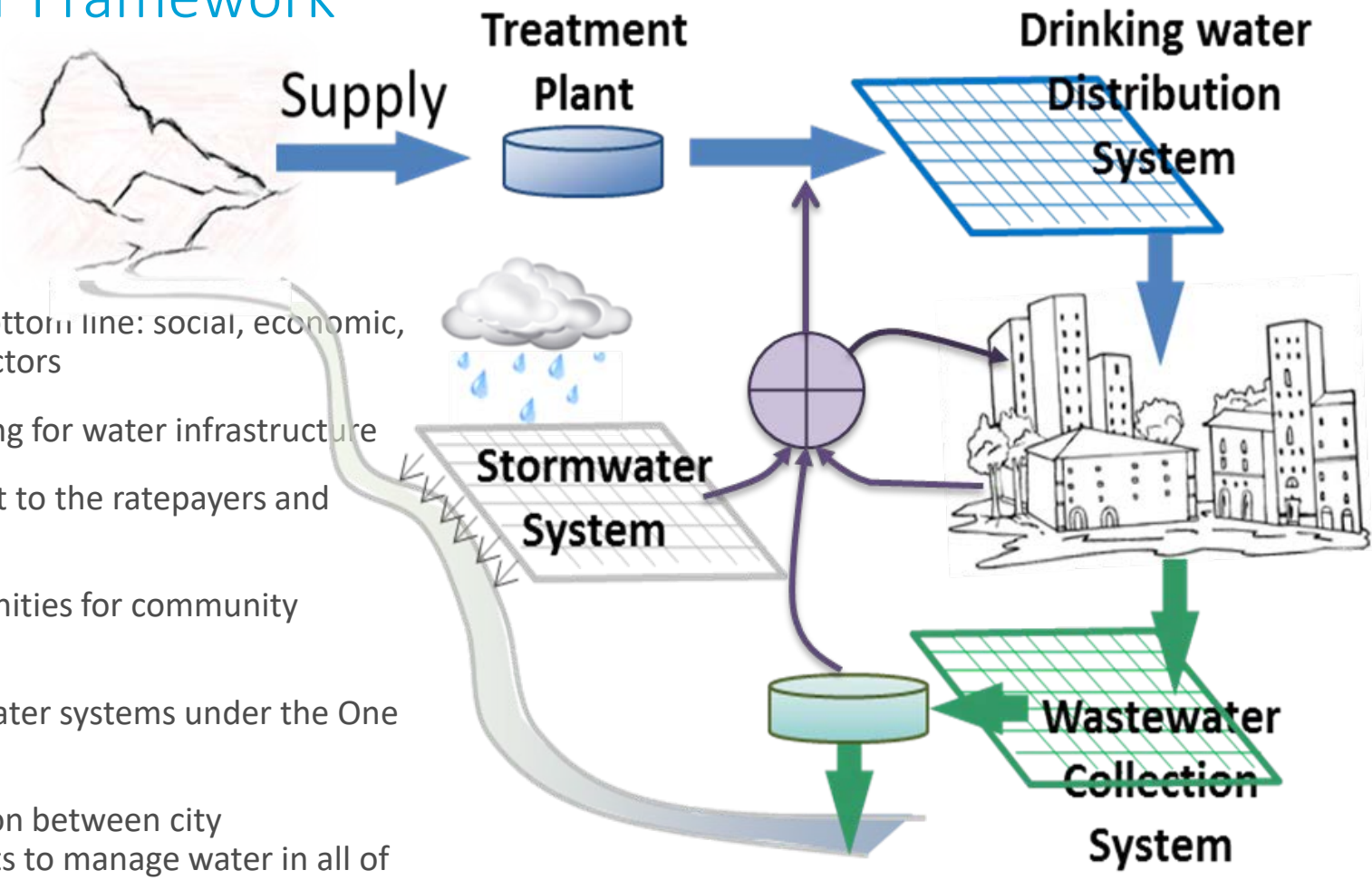
Integrated Water Management

Integrated Water Resources Management (IWRM)

- Consider all sources of water (wastewater, stormwater, seawater, and others)
- Sustainability and equity in water resources
- Accounts for all end users of water
- Consider water quantity and quality
- Stakeholders participation in the planning process
- Decisions made at local and river basin levels are in-line with broader national objectives
- Strategies integrate social, economical, and environmental goals



One Water Framework

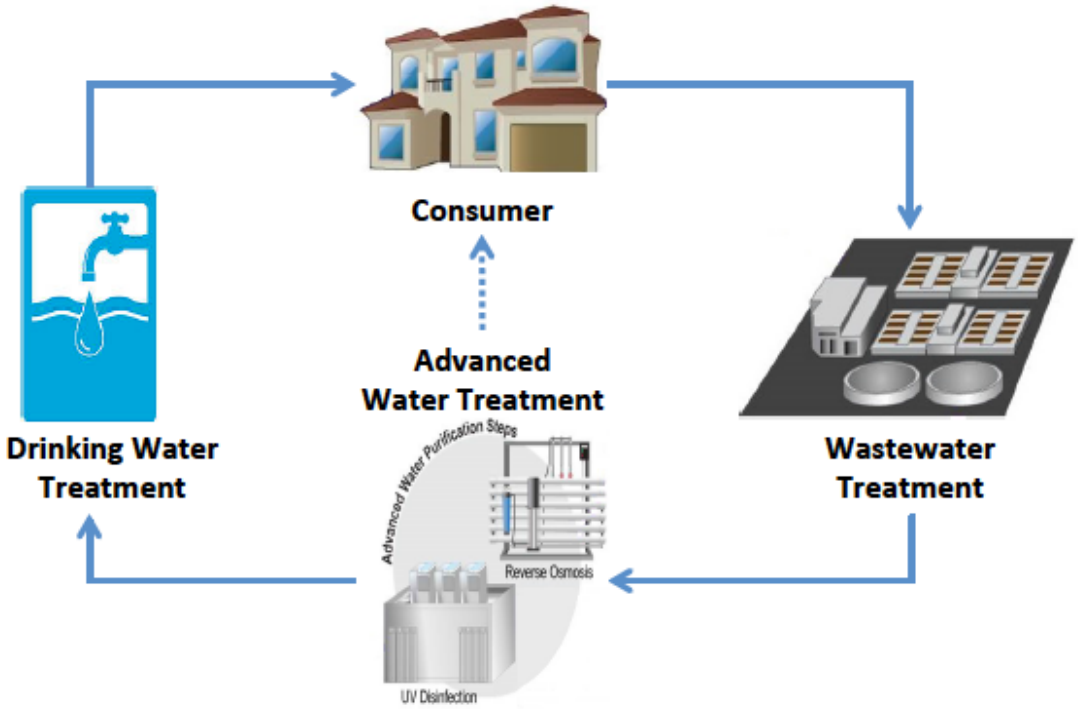


- Focus on triple bottom line: social, economic, environmental factors
- Long term planning for water infrastructure
- Maximizes benefit to the ratepayers and utilities
- Provides opportunities for community engagement
- Jointly manage water systems under the One Water framework
  - ❖ Collaboration between city departments to manage water in all of its forms

ASR can be coupled with Reuse under One Water

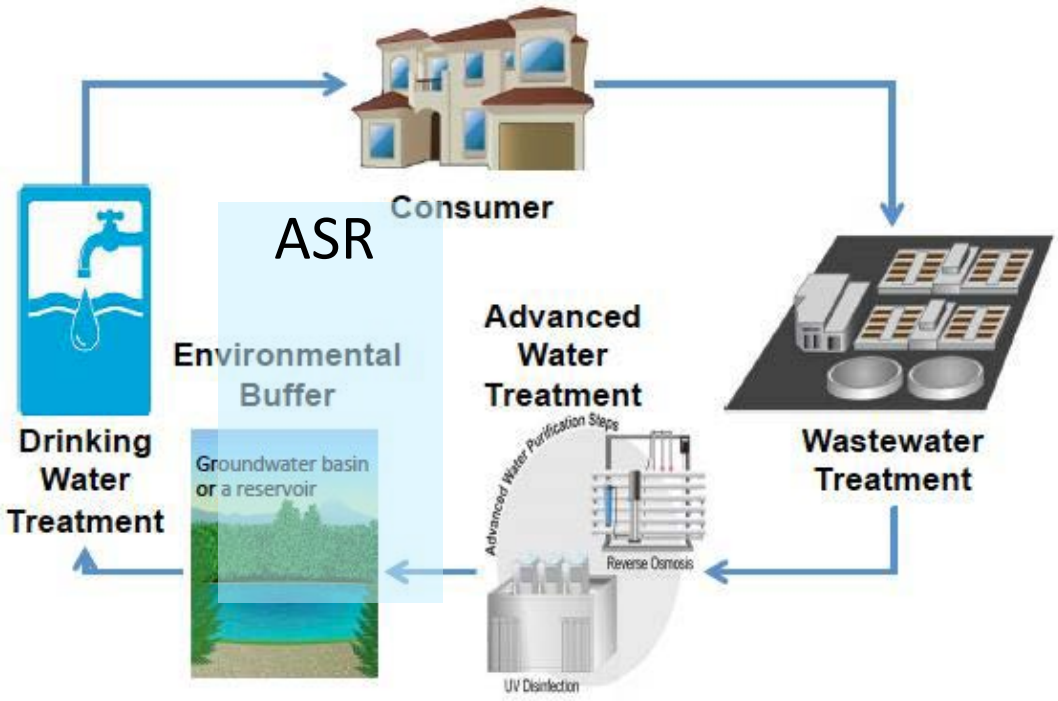
There are challenges to Direct Potable Reuse (DPR)

- Public acceptance challenges
- For drought management, DPR is only used intermittently
- Regulatory framework and permitting
- Operations requires highly skilled staff
- Operator certification program for potable reuse currently under development



ASR enhances Direct Potable Reuse as drought supply

- Becomes Indirect Potable Reuse (IPR)
- No public acceptance challenges
- Reduces capital and O&M costs due to smaller facilities
- Potential to replace treatment processes

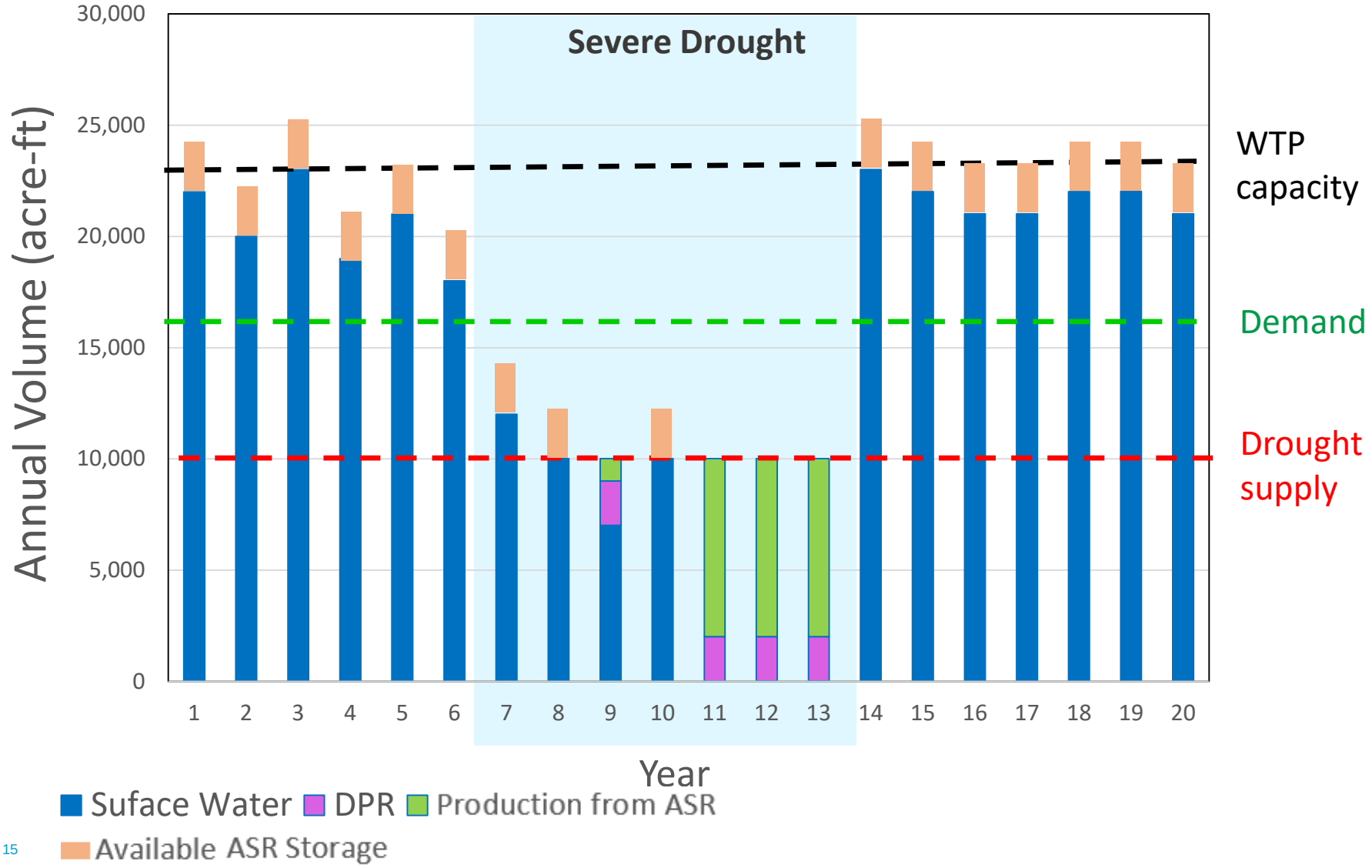


ASR can be an effective water management tool

- Increase available water supply
- Reduce dependence on aquifers for new supply
- Reuse treated wastewater
- Limit evaporation from supply water
- Maximize existing infrastructure or water rights
- Conservation management
  - Further reduce diversions during drought
  - Store excess water during floods
- Few impacts to land use or other environmental systems

ASR is a management tool for engineered storage but does not "create" water

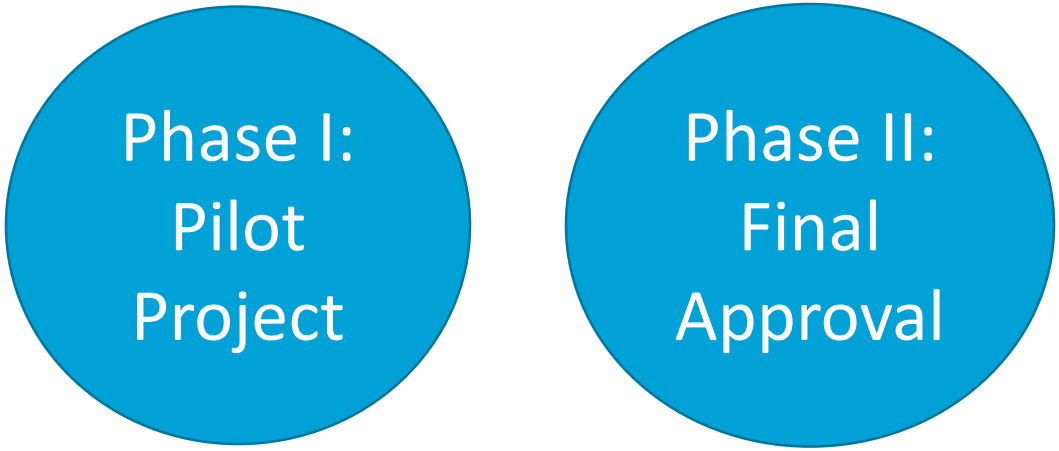
Reduce treatment plant size and store excess reuse



Recent Legislation and Regulations in Texas

84th (2015) Texas Legislature rule changes simplify ASR permitting

- Streamlines permitting by removing requirements for two-phase project approval by the TX Commission on Environmental Quality (TCEQ)



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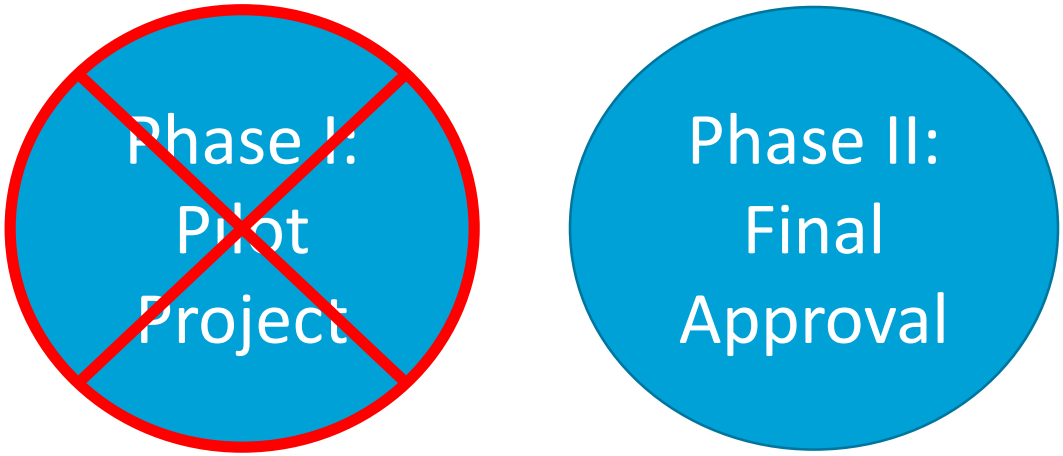
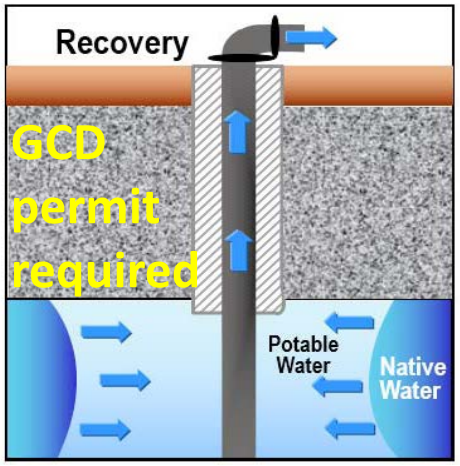


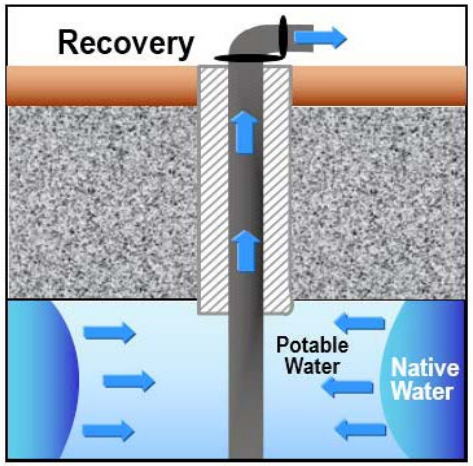
Piloting may still be necessary for technical reasons

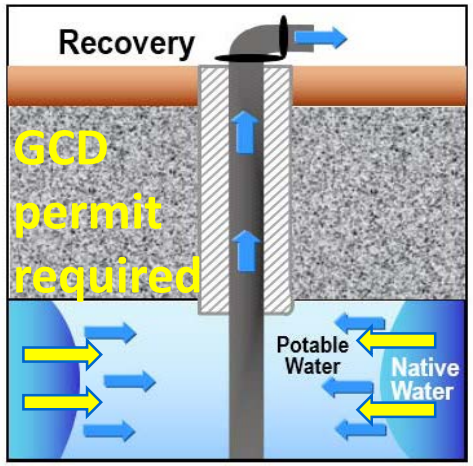
84th (2015) Texas Legislature rule changes simplify ASR permitting

- Streamlines permitting by removing requirements for two-phase project approval by the TX Commission on Environmental Quality (TCEQ)
- Limits the authority of a Groundwater Conservation District (GCD) to permit ASR wells to only wells with recovery that exceeds stored amount (pumps native groundwater)



Previously

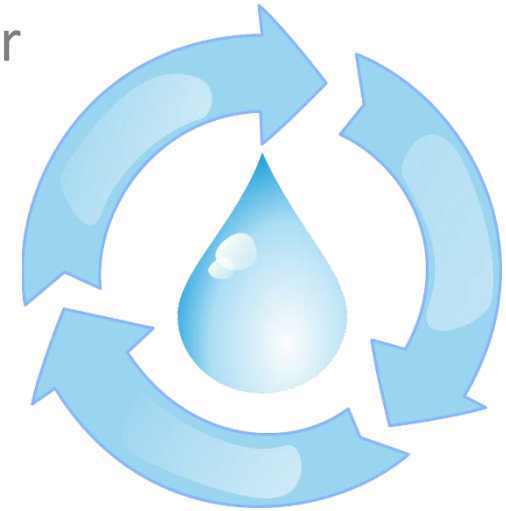




Post-2015

84th (2015) Texas Legislature rule changes simplify ASR permitting

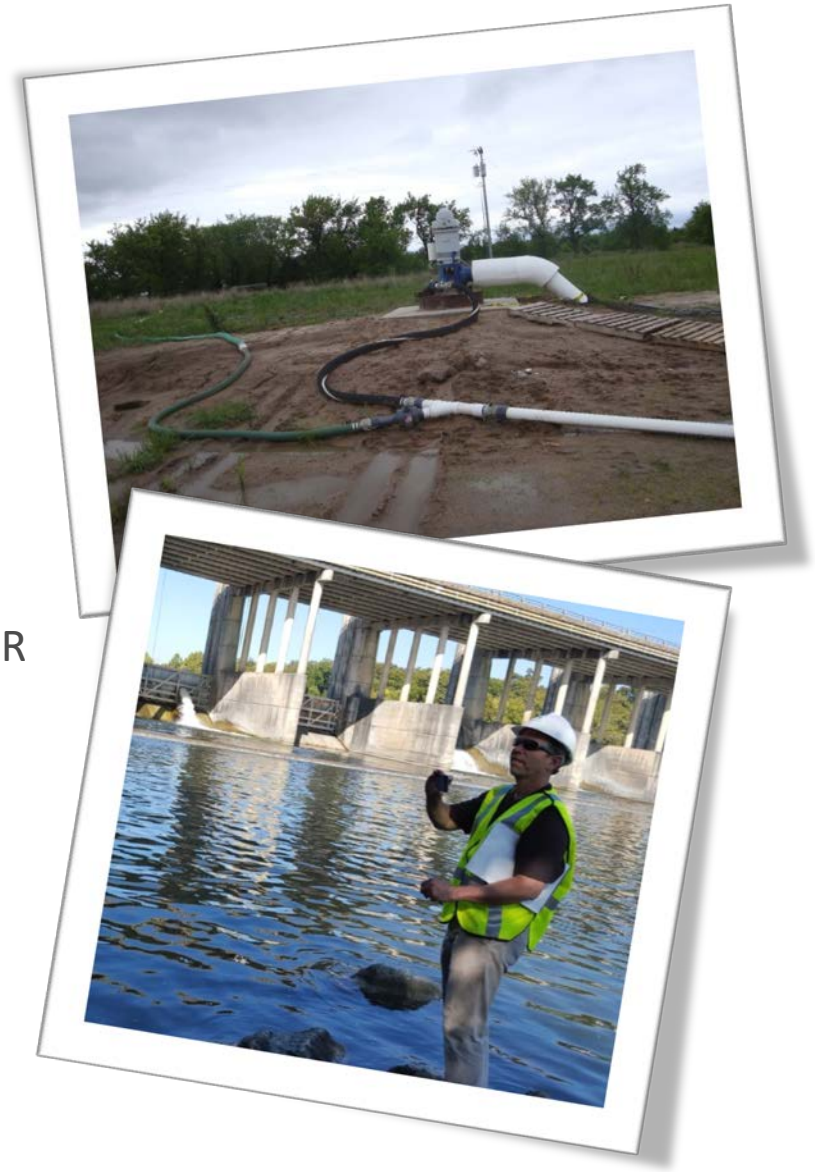
- Streamlines permitting by removing requirements for two-phase project approval by the TX Commission on Environmental Quality (TCEQ)
- Limits the authority of a GCD to permit ASR wells to only wells that recovery exceeds stored amount
- Eliminates the need to amend existing water rights for projects using appropriated surface water
- Allows consideration of non-drinking water storage

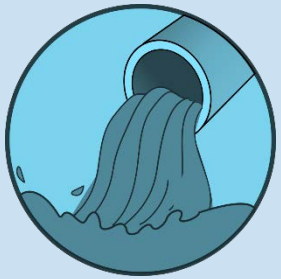


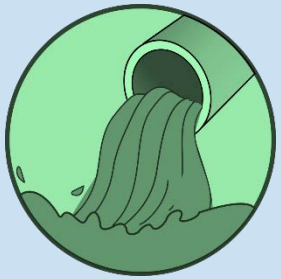
Benefits & Challenges

ASR feasibility is dependent on many factors

- Aquifer suitability and hydrogeology
- Source water
  - Quality
  - Availability
- Infrastructure:
  - ASR facilities
  - Conveyance infrastructure from source to ASR to distribution system
  - Adaptability of existing infrastructure
  - Additional treatment facilities
- Costs of recoverable water compared to alternative supplies



Strategy	Benefits	Challenges
Surface Water & ASR 	• Quicker to implement • Low cost • Maximize available treatment facilities and infrastructure	• Susceptible during extended droughts • Competing users for source water • Requires time to fill storage • Requires pilot testing and suitable geology
Reuse & ASR 	• Maximize available WWTP facilities • Can be used in addition to existing surface water sources • Can be coupled with DPR in extreme droughts	• Moderate cost • Possible public acceptance issues • Requires time to fill storage • Requires pilot testing and suitable geology

Strategy	Benefits	Challenges
Stormwater & ASR 	• May support flood management and green infrastructure goals • Maximize available treatment facilities and infrastructure	• Quality could be poor depending on land uses • Susceptible during extended droughts • Diffuse nature could raise challenges for collection • Requires pilot testing and suitable geology

Questions?

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