Past, Present, and Future: Aquifer Storage and Recovery in Texas

Austin Geological Society

April 4, 2016

Matt Webb
Hydrologist
Innovative Water Technologies

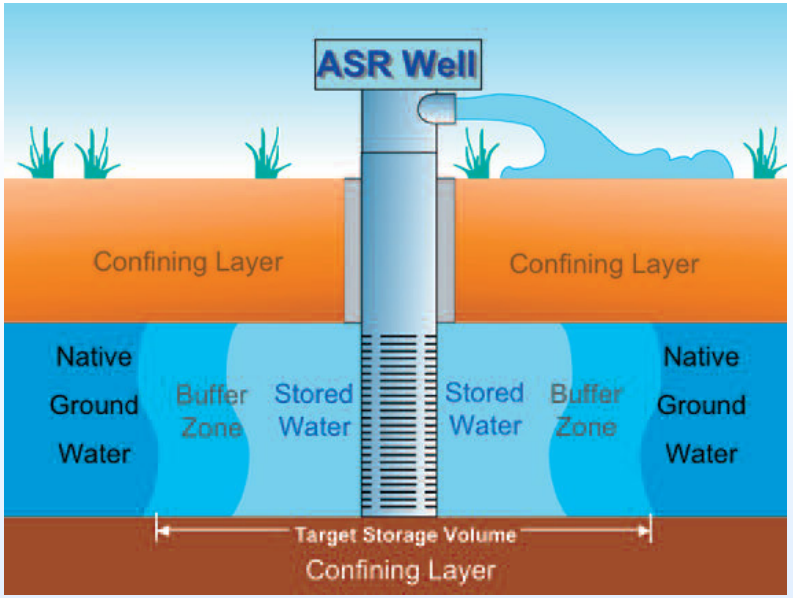
Texas Water Development Board

Texas Water Development Board

The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

What is ASR?

- Aquifer Storage and Recovery
  - Storage of water via a well into a suitable aquifer and recovery of that water during times of need for beneficial use
  - Source water can be reclaimed, groundwater, or surface water; surface is most prevalent
  - Must conform to EPA primary drinking water standards if native water is below 10,000 mg/L of total dissolved solids
  - Buffer zone, hydrologic modeling and purpose of use is critical to sizing of both well mechanicals and geological formation



Source: NGWA

Benefits (partial)

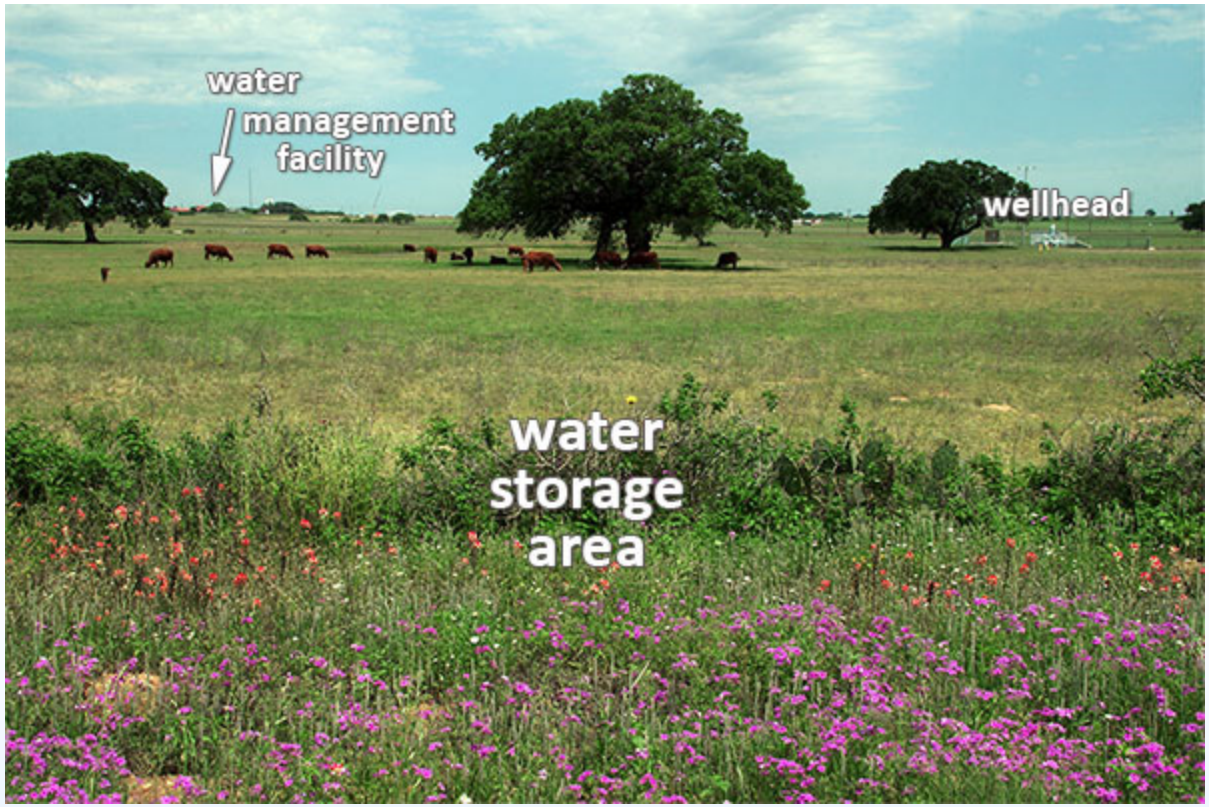
- Eliminates evaporative losses – Texas' story
  - Compare to 33.8M acre-feet of surface reservoir storage
  - Compare to 18.0M acre-feet total state demand in 2012
  - 7.2M acre-feet lost in average year (20% of storage, 40% of demand)
- Mitigates surface inundation effects
  - Mid-size ASR of 37k acre-feet would require 2,500 acre surface reservoir
- Maximize existing resources
  - Junior surface rights – Texas operates under prior appropriation
    - Get it while it's available
  - Transmission pipelines/Water treatment/Desalination plants
    - Run at average rather than peak in many cases
- Emergency supply
  - Hurricanes or surface water contamination

Rome Avenue ASR

Source: Google Earth 2015

- Located in Tampa, Florida
- Storage in the Lower Floridan Aquifer
- Eight wells, 10 million gallon-per-day recovery

Twin Oaks ASR



Source: The Edwards Aquifer Website 2015

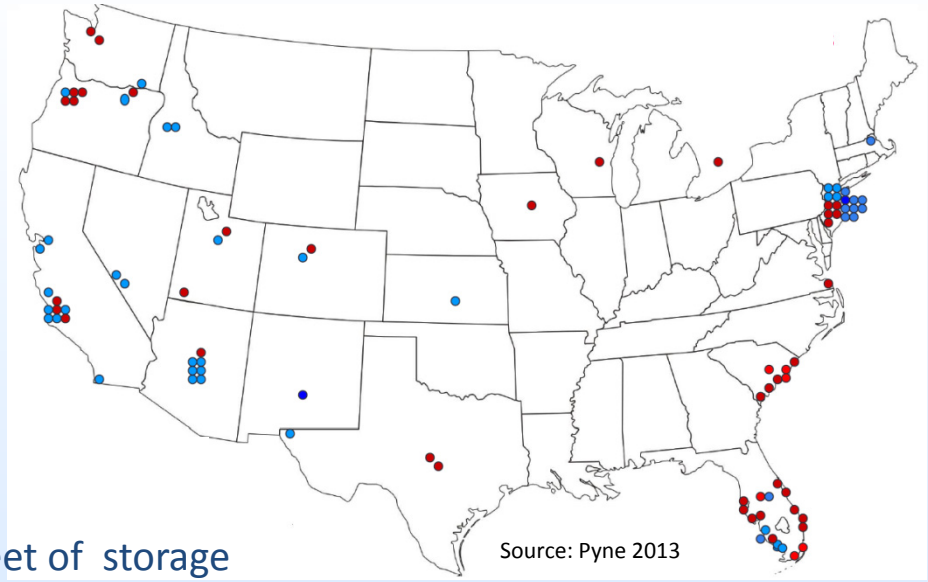
- Southern Bexar County
- San Antonio owns 3200 acres
- Leases land back to ranchers
- Cows walking on water

Limits/Challenges (partial)

- Requires appropriate geology
- Offers no flood control
- Offers no recreational benefits
- Hydraulic migration
  - Movement of stored water away from recovery well
  - Function of gradient, conductivity, and storage duration
  - Easier to manage with higher well counts
- Stored water protection – Texas applies Rule of Capture
  - Surface pumping right ownership – El Paso and San Antonio
  - Municipal ordinance - Kerrville
- Chemical interaction
  - Well plugging
  - Chemical mobilization – arsenic of particular note
  - Early-study formation geochemical testing highly recommended

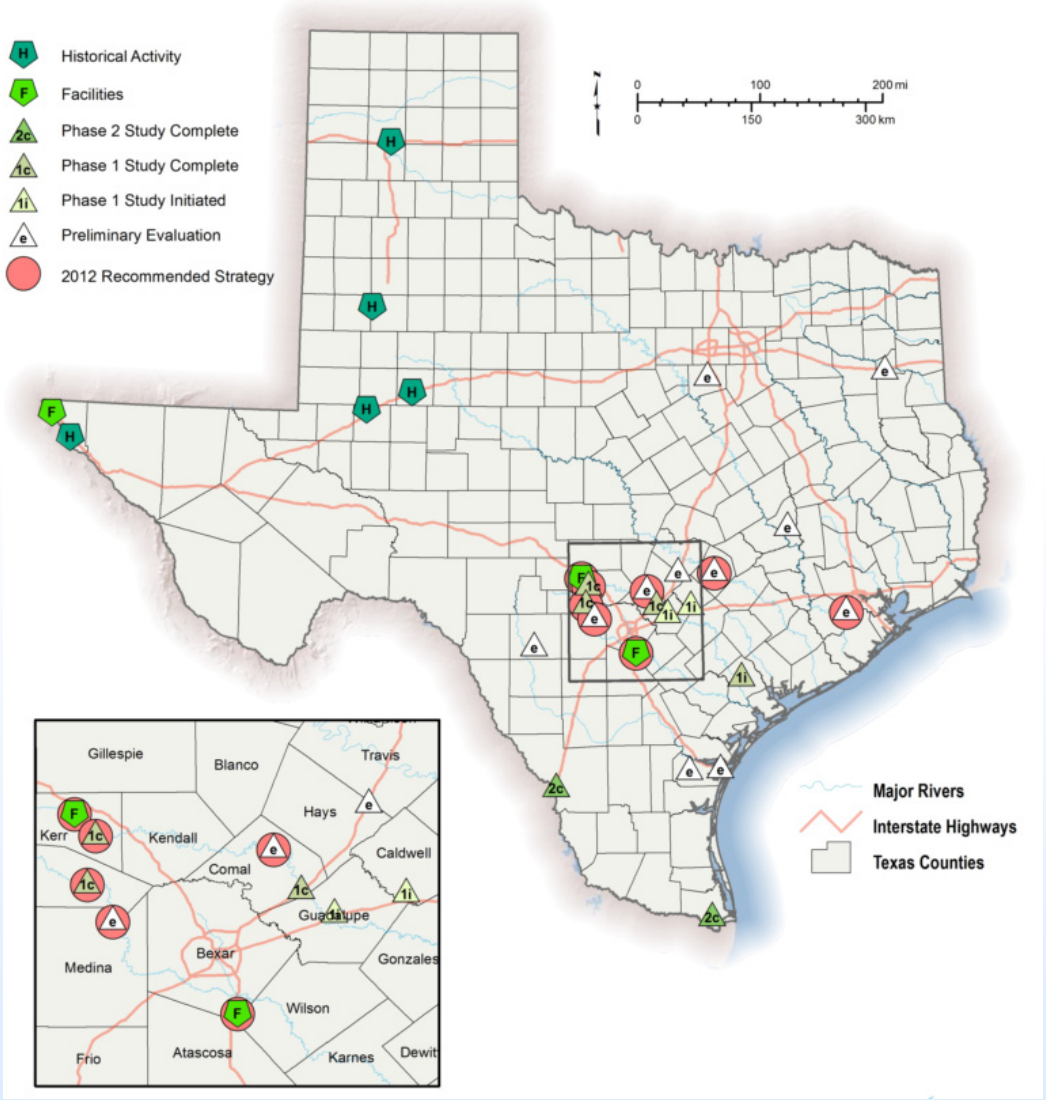
Where is ASR in the U.S.?

- In 2013, Pyne reported 133 fields in the U.S.
  - First in Wildwood, N.J. in 1969; still in operation
- Texas Past and Present
  - Experiments in El Paso and Amarillo from the 40's
  - Early application in NW Texas from 60's to 80's
  - Three currently in Texas
    - El Paso – 1985
      - Hueco Bolson Aquifer
      - Wells and spreading basins
    - Kerrville – 1998
      - Lower Trinity Aquifer
      - Two-well system
    - San Antonio – 2004
      - Carrizo-Wilcox Aquifer
      - 29-well system
      - Just surpassed 100,000 acre-feet of storage



Source: Pyne 2013

Map of ASR in Texas (2014)

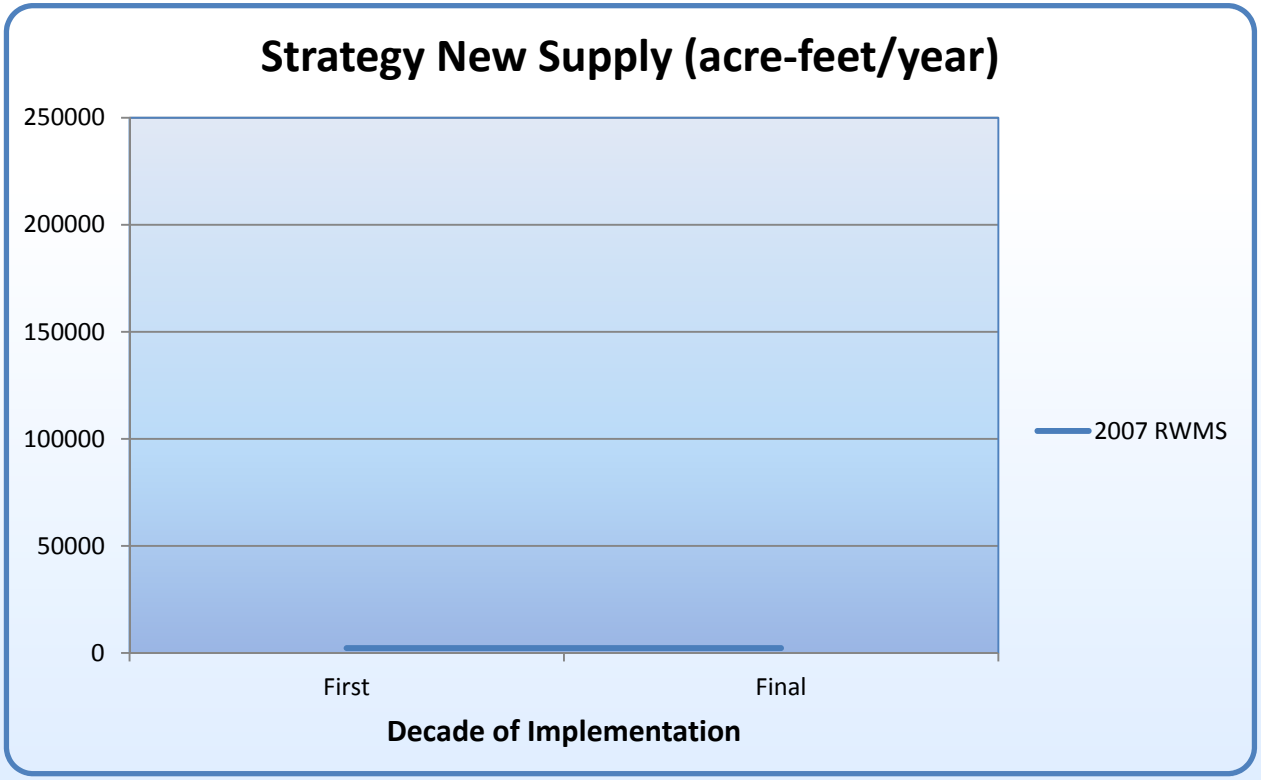


Technical Note 15-04
Aquifer Storage and Recovery in Texas: 2015

- Published in June 2015
- Snapshot as of December 2014
- Descriptions of benefits, challenges and regulatory requirements
- 27 historical, current, and proposed ASR programs
- Program map and associated tables
- Project summaries, evaluation maturity, funding
- Updated periodically to incorporate new information
- Available at www.twdb.texas.gov
  - Innovative Water\ASR TWDB Documents\Technical Reports

Growth in Interest*

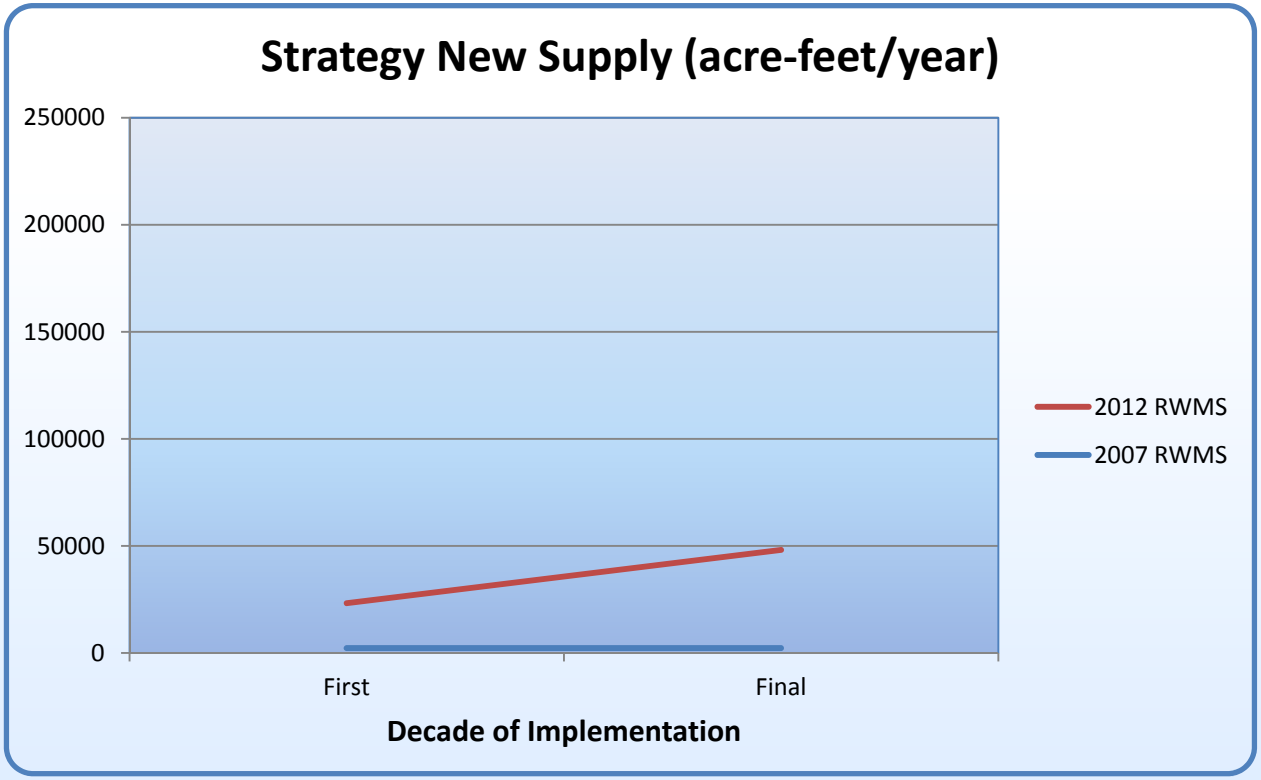
- 2007 State Water Plan - one ASR project as a Recommended Water Management Strategy (RWMS)
  - 2,240 acre-feet first decade of use; 2,240 acre-feet final decade



* Excludes infiltration basin projects

Growth in Interest*

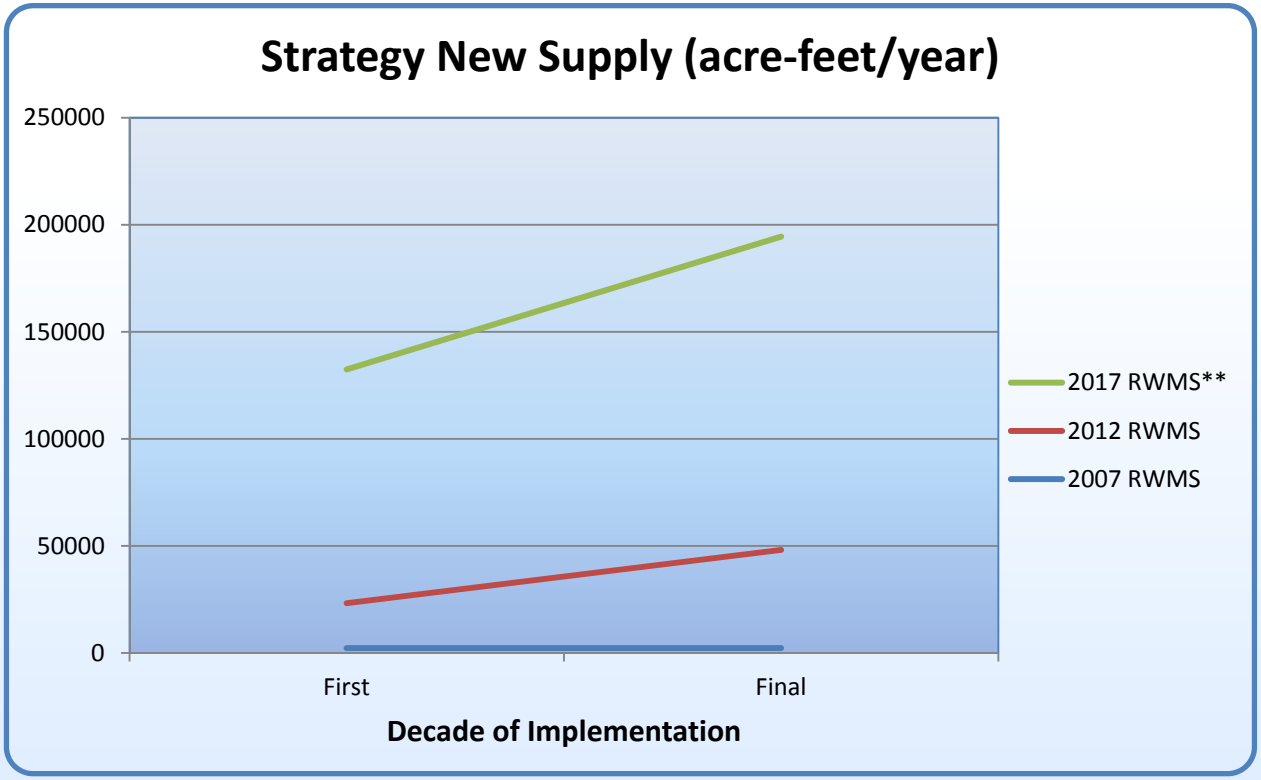
- 2012 State Water Plan – eight ASR RWMS projects
  - 23,260 acre-feet first decade of use; 48,084 acre-feet final decade



* Excludes infiltration basin projects

Growth in Interest*

- 2017 Preliminary State Water Plan– 17 ASR RWMS projects
  - Currently available for public comment, subject to change
  - 132,415 ac-ft first decade of use; 194,497 ac-ft final decade



* Excludes infiltration basin projects

** Preliminary as of March 2016

Growth in Interest*

- 2007 - one ASR project as a Recommended Water Management Strategy (RWMS)
  - 2,240 acre-feet first decade; 2,240 acre-feet final decade
- 2012 – eight ASR RWMS projects
  - 23,260 acre-feet first decade; 48,084 acre-feet final decade
- 2015 Initially Prepared Plans – 17 ASR RWMS projects
  - Preliminary and subject to change
  - 12,415 acre-feet first decade; 194,497 acre-feet final decade
  - Final decade supply of 87x the 2007 State Water Plan
  - Final decade supply of 4.0x the 2012 State Water Plan
- Interest is strong

* Excludes infiltration basin projects

Development Funding

- House Bill 1, Rider 25, 2015
  - $1,000,000 from General Revenue Fund to TWDB
  - One-for-one matching grant funds
  - For ASR projects/studies or other innovative storage approaches that improve operational efficiencies
  - Competitive grant application process
  - Six applications, three awarded
    - $285k for Victoria district
    - $282 for Edwards Aquifer district
    - $433 for Corpus Christi district

Rider 25 Project Summary

- Victoria Groundwater Conservation District
  - Source – Guadalupe River
  - Storage target – Evangeline portion of Gulf Coast Aquifer
  - Permitting, testing, and operation of an ASR well
  - Project completion May 2018
- Edwards Aquifer Authority/New Braunfels
  - Source – Primarily Edwards Aquifer
  - Storage target – Brackish section of Edwards Aquifer
  - Wireline core hole and monitor well
  - Geophysical, geochemical and hydraulic evaluation
  - Project completion May 2017
- Corpus Christi ASR Conservation District
  - Source – Nueces, Navidad, and Colorado Rivers
  - Storage target – Chicot or Evangeline Aquifers
  - Multiple exploratory boreholes
  - Geophysical, geochemical and hydraulic evaluation
  - Field scale numerical groundflow model
  - Project completion March 2019

Texas Water Development Board

Matt Webb

Innovative Water Technologies
matthew.webb@twdb.texas.gov
512.463.6929