Aquifer Storage and Recovery in Texas

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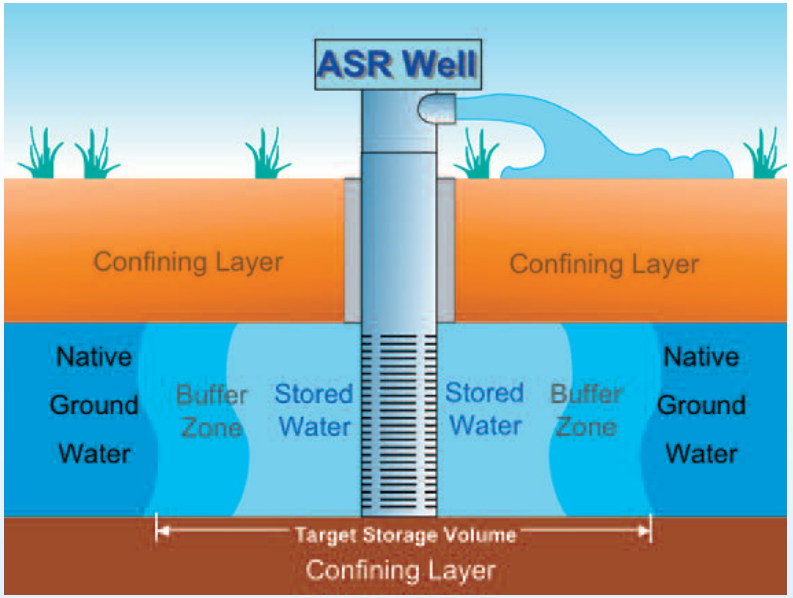
The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board's statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.

What is ASR?

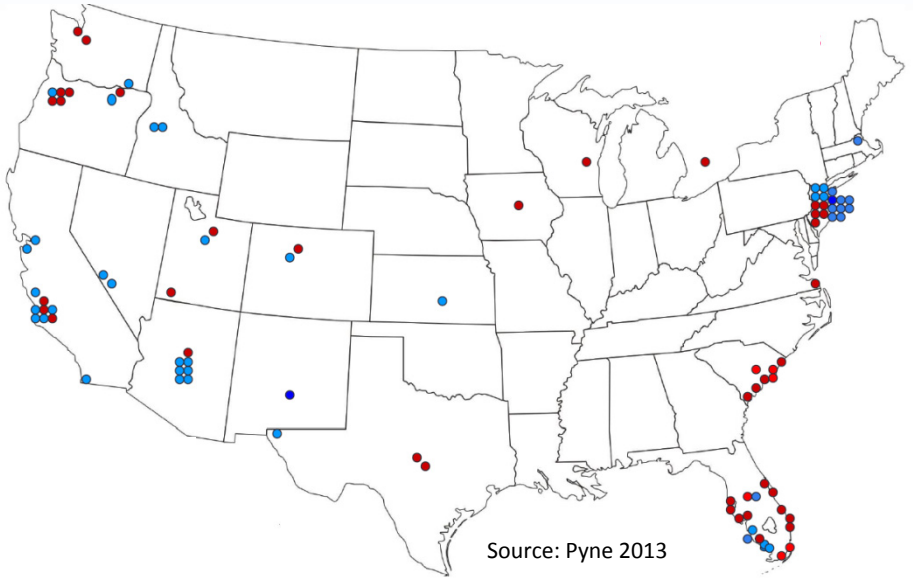
- Aquifer Storage and Recovery
  - Storage of water in a suitable aquifer and recovery of that water during times of need for beneficial use
  - Source water can be reclaimed, groundwater, or surface water; surface is most prevalent
  - Must conform to EPA primary drinking water standards if native water 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

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
  - Three in Texas
    - El Paso, Kerrville, San Antonio
  - N.M. only other documented in Region 6
  - Any new developments?



Source: Pyne 2013

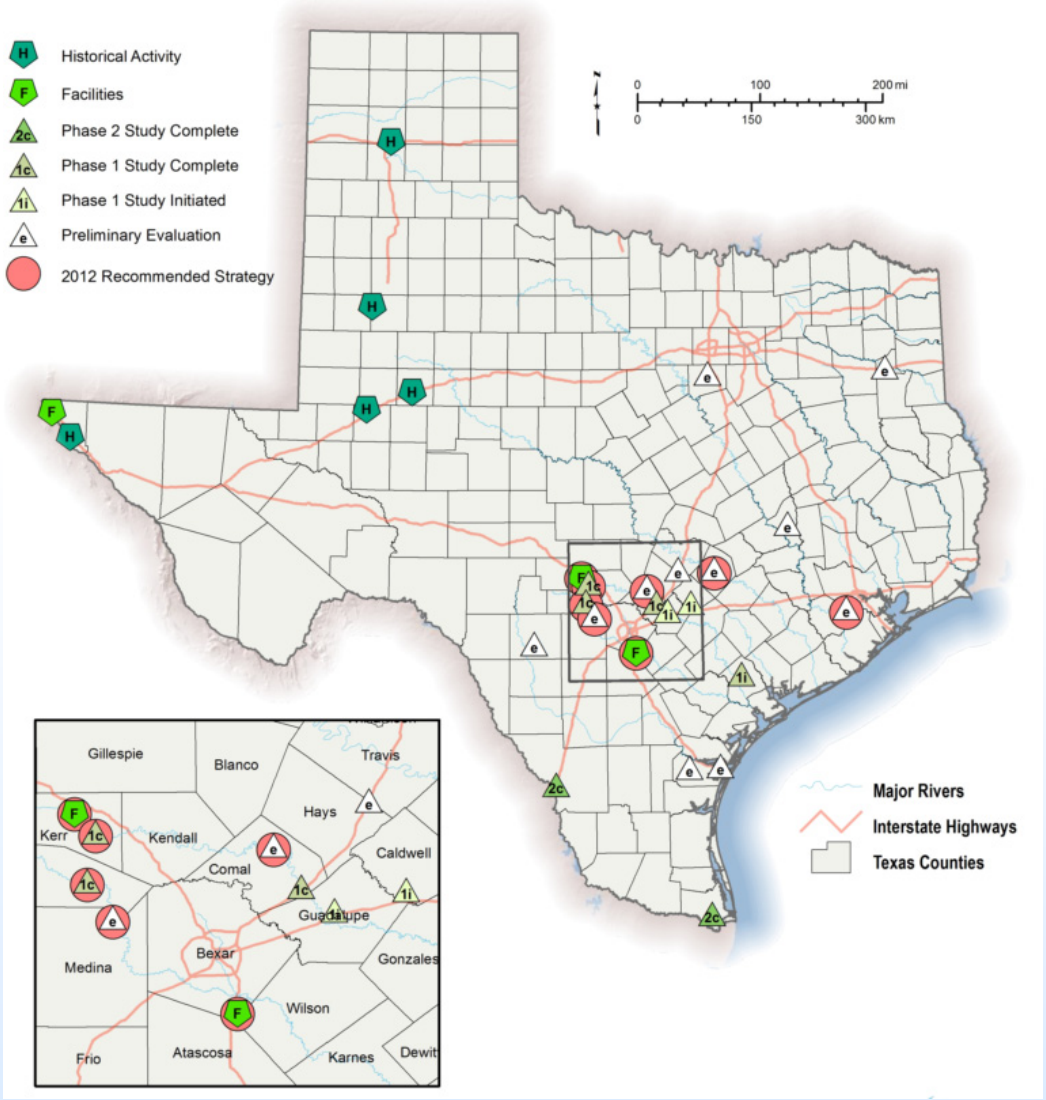
Benefits (partial)

- Eliminates evaporative losses – Texas' story
  - Compare to 33.8M acre-feet of surface storage
  - Compare to 18.0M ac-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 ac-feet would require 2,500 acre surface reservoir
  - Texas average; greater area likely needed on the coastal plain
- Maximize existing resources
  - Junior surface rights – Texas operates under prior appropriation
  - Transmission pipelines/Water treatment/desalination plants
    - Run at average rather than peak in many cases
  - Distribution pressure – Put an ASR well at the end of the line
- Emergency supply
  - Hurricanes or surface water contamination

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

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

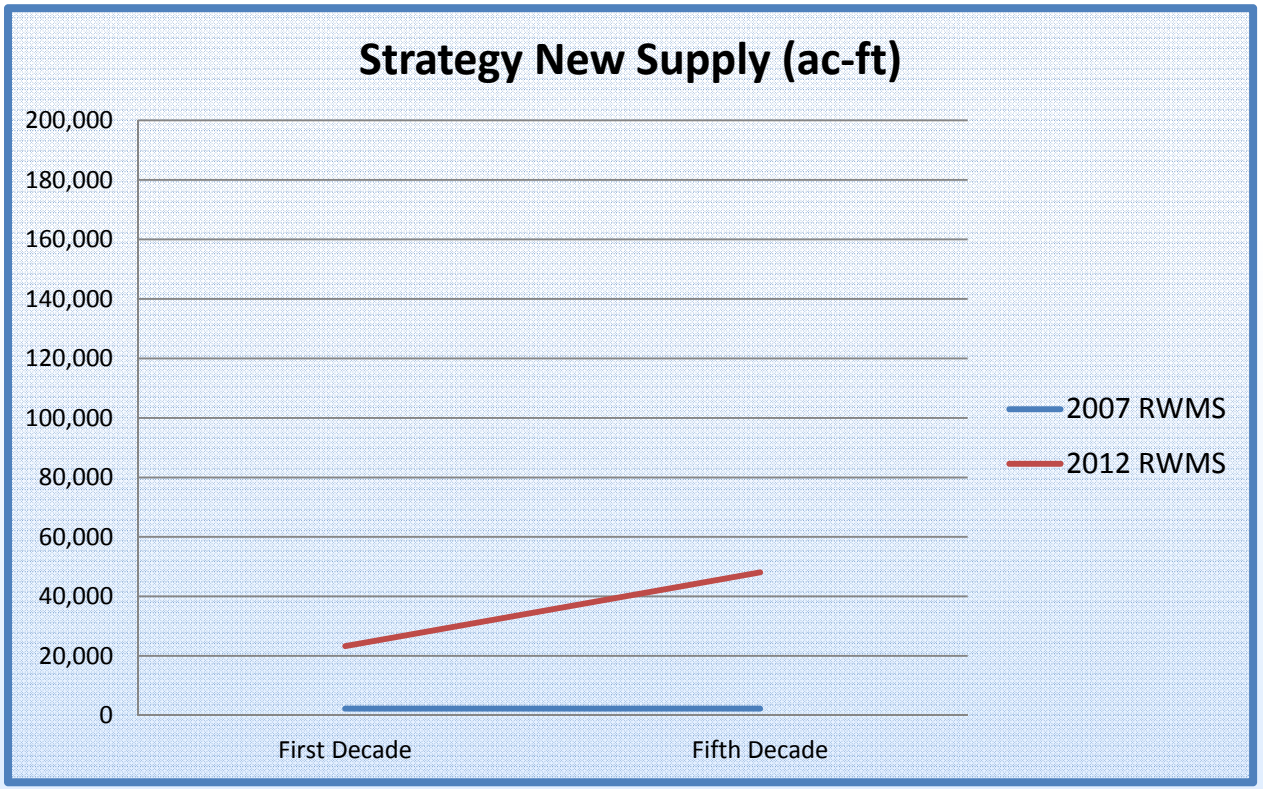
Growth in Interest*

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

* Excludes infiltration basin projects

Growth in Interest*

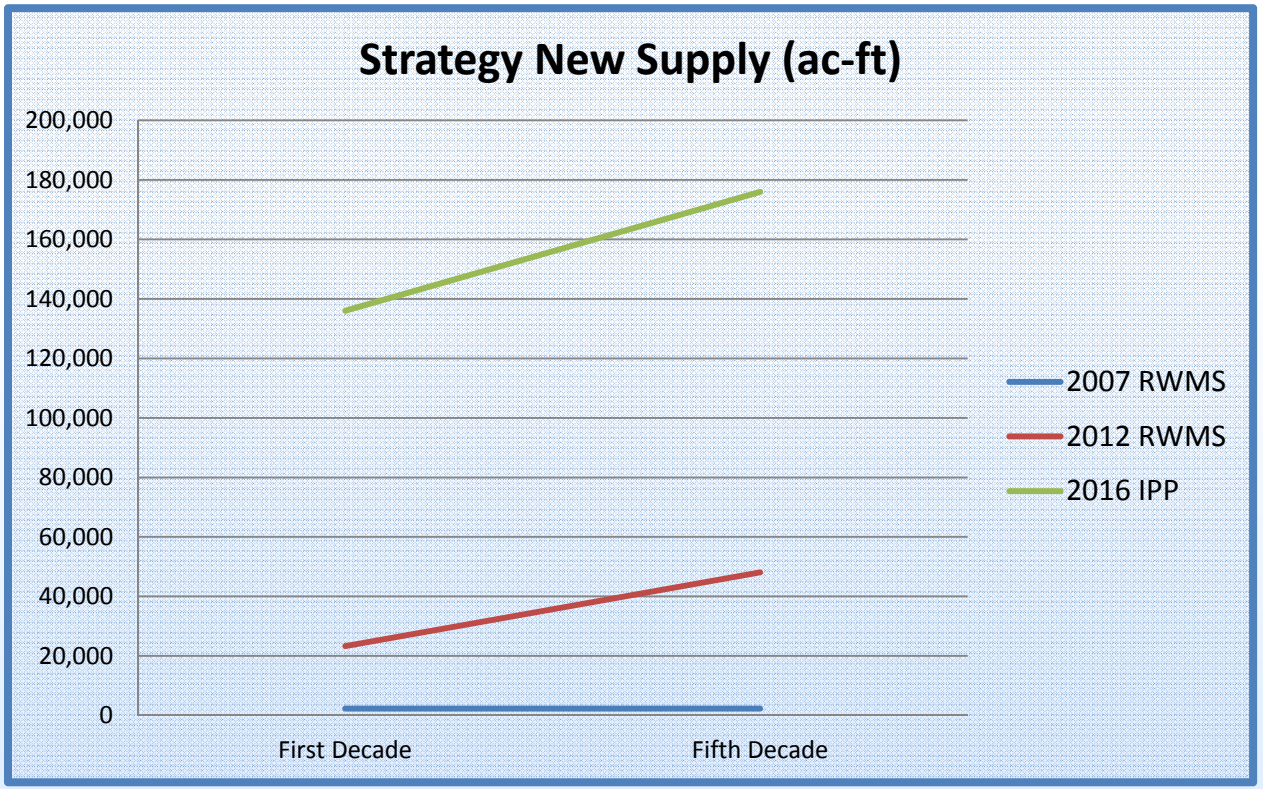
- 2012 State Water Plan – eight ASR RWMS projects
  - 23,260 ac-ft first decade of use; 48,084 ac-ft fifth decade



* Excludes infiltration basin projects

Growth in Interest*

- 2015 Initially Prepared Plans – 15 ASR RWMS projects
  - Preliminary and subject to change
  - 135,992 ac-ft first decade of use; 175,992 ac-ft fifth decade



* Excludes infiltration basin projects

Development Funding

- House Bill 1, Rider 25, 2015
  - $1,000,000 from General Revenue Fund to TWDB for one-for-one matching funds grant
  - For ASR projects/studies or other innovative storage approaches that improve operational efficiencies
  - Competitive grant application process; awarded 3:
    - $285k for Victoria district
    - $282 for Edwards Aquifer district
    - $433 for Corpus Christi district

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