

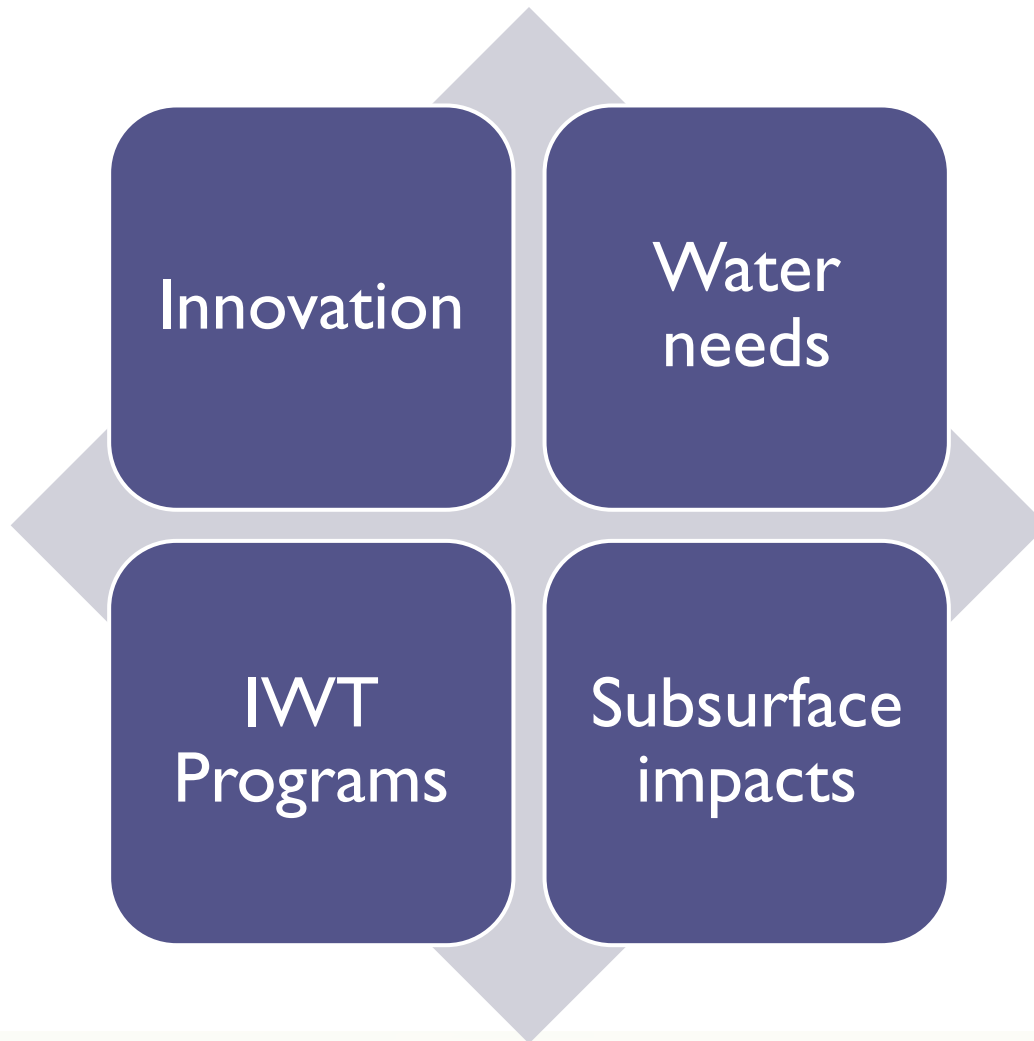
Innovative Water Technologies- Subsurface Impacts

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Texas Water Development Board

Presented at the Underground Injection Conference
Austin, Texas, January 2011



Innovative Water Technologies and the Subsurface





Innovation and water planning

Innovation

- ▶ “to make changes in something established, especially by introducing new methods, ideas, or products”
- ▶ State Water Plans
 - ▶ 1961-1997
 - ▶ 2001-2007 (75th TX Leg.-SB 1)





Innovation and regional water planning

Innovation

Regional Water Planning Guidelines

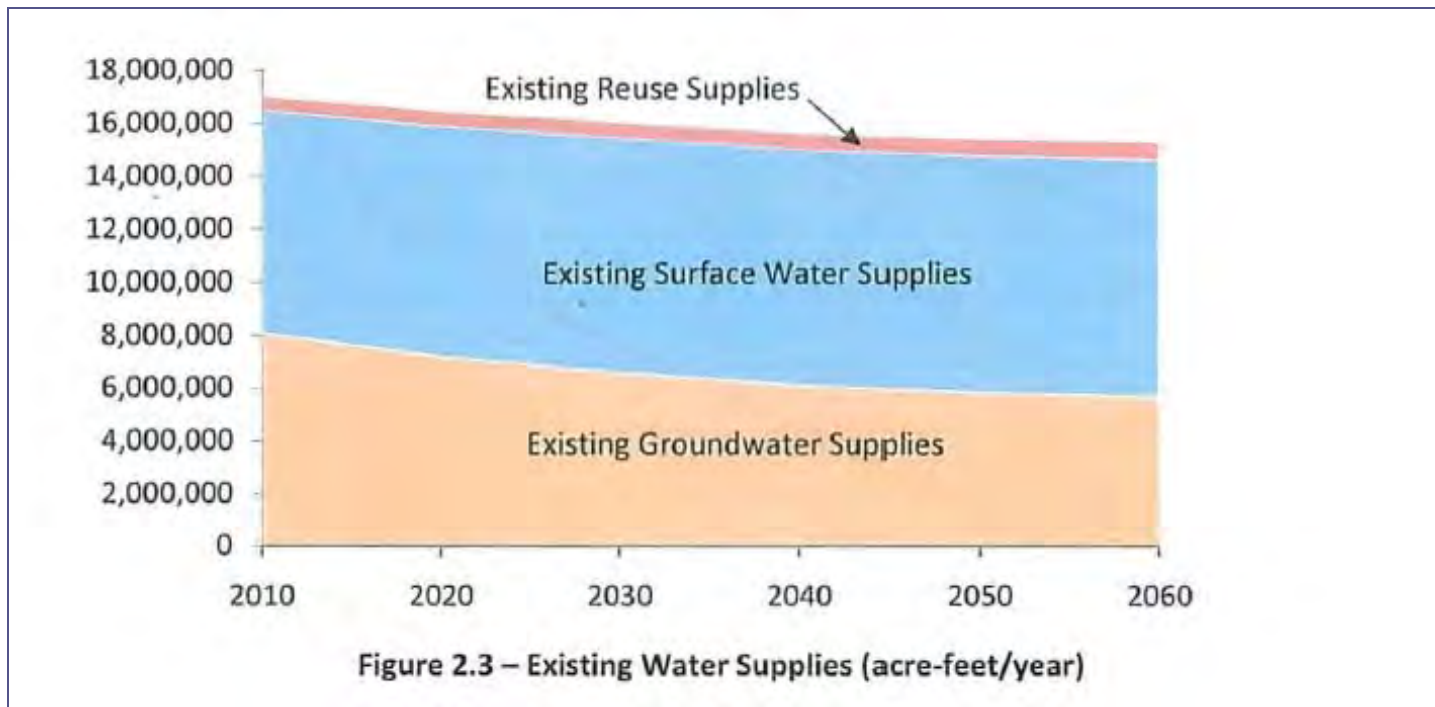
- ▶ Provide recommendations of water management strategies
 - ▶ Consider all potentially feasible water management strategies
 - ▶ including reuse and desalination





Draft Summary of the 2011 Regional Water Plans

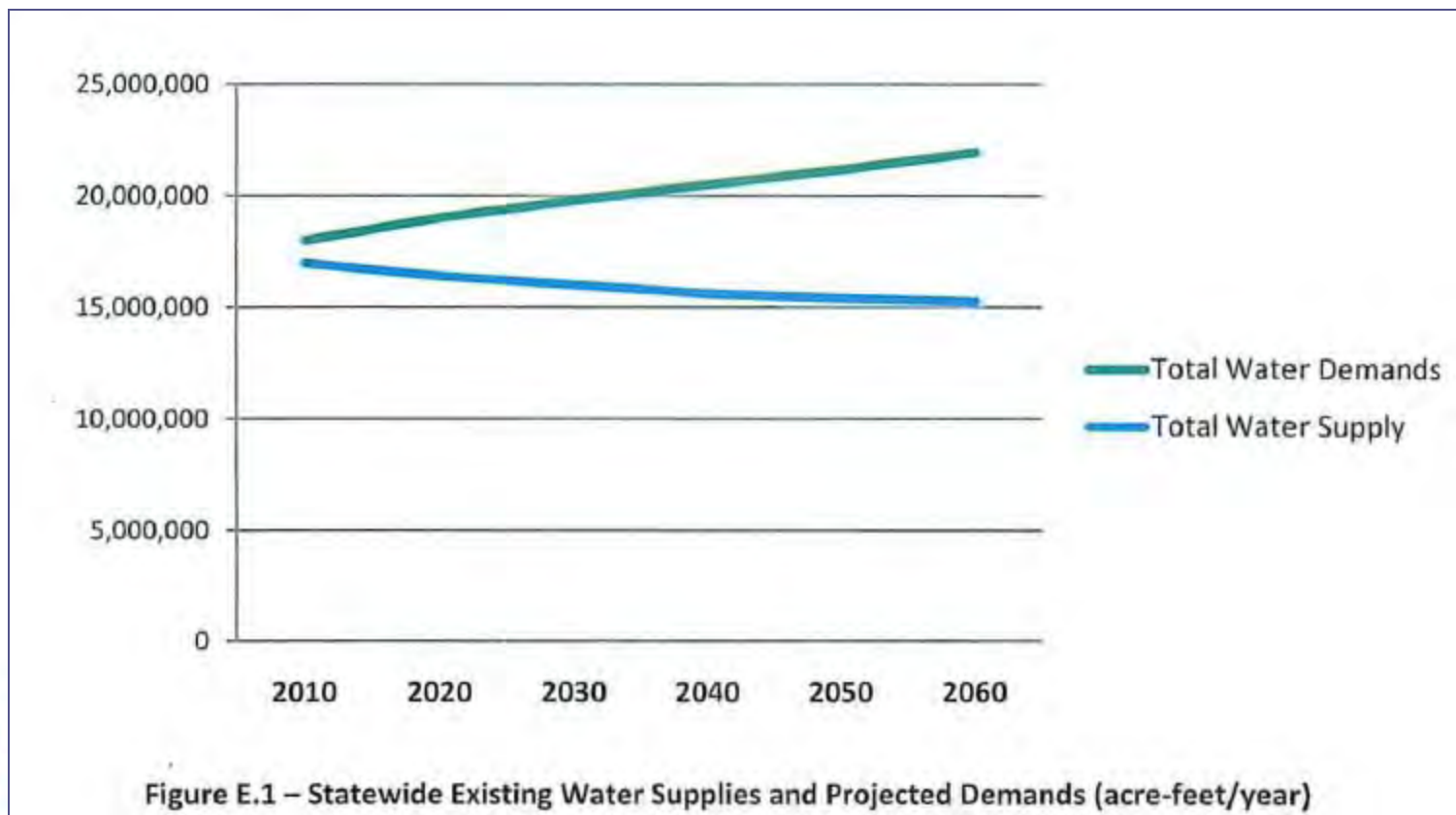
Water needs





Draft Summary of the 2011 Regional Water Plans

Water needs





Draft Summary of the 2011 Regional Water Plans

Water needs

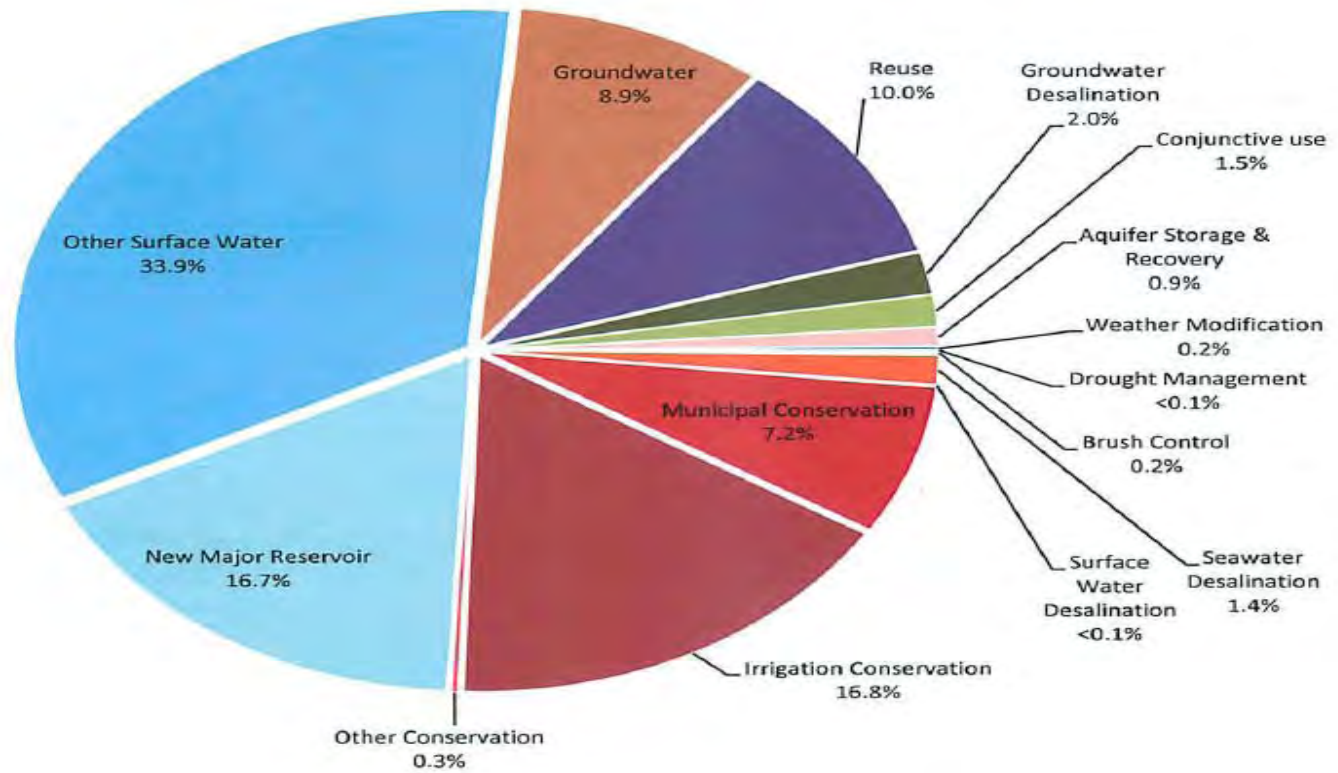


Figure 2.8 – 2060 Recommended Water Management Strategies - Relative Volumes



IWT-Focus areas

IWT
Programs

Water Science and Conservation

Innovative Water Technologies

- ▶ Desalination
 - ▶ Seawater
 - ▶ Brackish Groundwater
- ▶ Reuse
- ▶ Aquifer Storage and Recovery
- ▶ Rain Harvesting





IWT-Deliverables

<http://www.twdb.state.tx.us/iwt/>

**IWT
Programs**

RWH: Impact of roof material on water quality

Seawater Pilot Plant Studies

Assessment of Forward Osmosis

Advancing Water Reuse in Texas

Aquifer Storage Recovery in Texas

Technology Demonstration Projects

Brackish GW Desalination Guidance

Stormwater Harvesting Guidance

Rainwater Harvesting Guidance





Areas of subsurface interest

Subsurface
impacts

- ▶ Brackish Groundwater Desalination
 - ▶ Source Characterization
 - ▶ Concentrate disposal by injection wells

Aquifer Storage
Recovery

Water Reuse





Brackish Groundwater Desalination Source characterization

Subsurface
impacts

- ▶ Brackish Groundwater Manual for Texas Regional Water Planning Groups (TWDB, 2003)
 - ▶ 1,000 and 10,000 mg/L TDS
 - ▶ Over 2.7 billion acre-feet
- ▶ Cost of Water Desalination in Texas (TWDB White Paper, 2009)
 - ▶ \$410-\$847/acre-ft

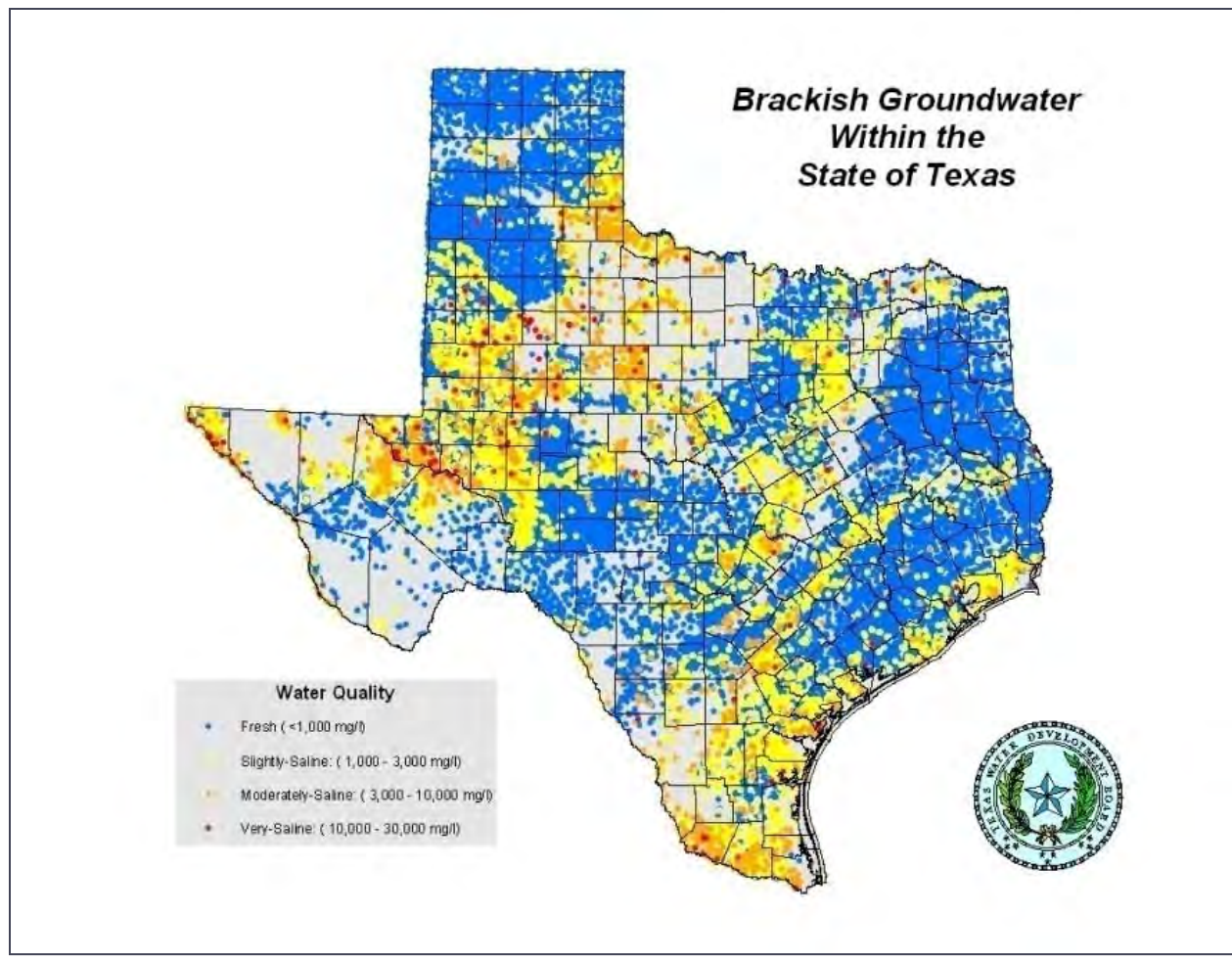


	1,000 mg/L	3,000 mg/L	10,000 mg/L
Fresh	Brackish		Saline
Fresh	Slightly-saline	Moderately-saline	Very-saline



Brackish Groundwater Desalination Source characterization

Subsurface
impacts





Brackish Resources Aquifer Characterization System

Subsurface impacts

- Characterize brackish portion of aquifers up to 10,000 mg/L TDS
- Collect well information statewide
- Research and develop methods of data analysis
- Build database and GIS
- Build models to estimate aquifer productivity
- Develop parameter-screening tool
- Publish and broadcast results

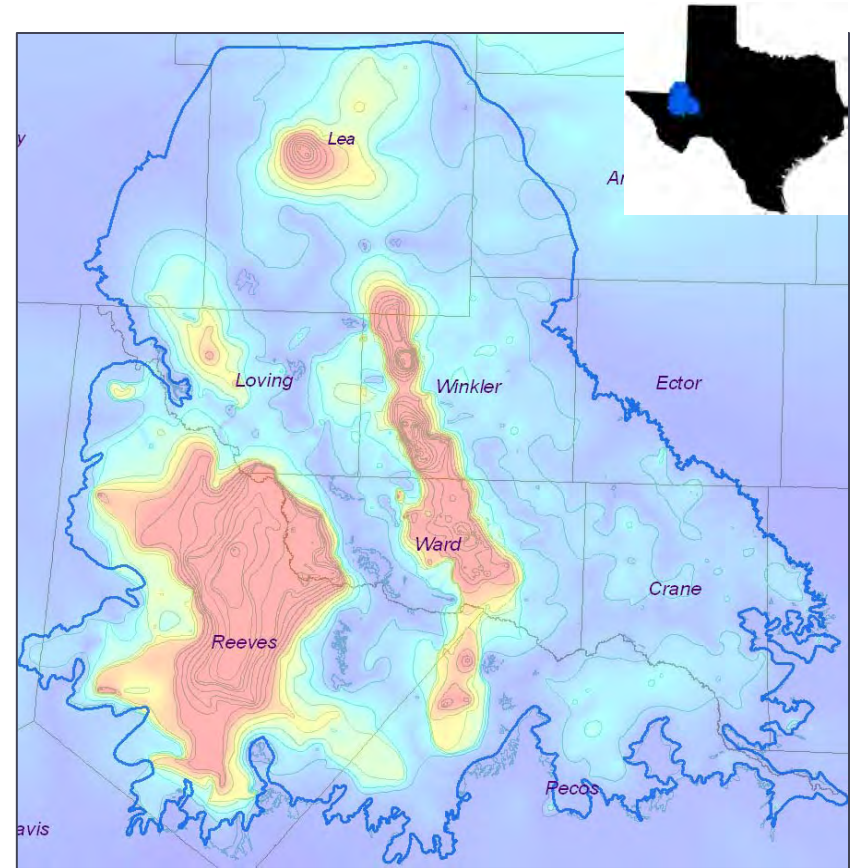




Brackish Resources Aquifer Characterization System

Subsurface impacts

- Pecos Valley Aquifer chosen as pilot study area
- Three contracts awarded for data collection and model support



Pecos Valley Aquifer, Depth to Bottom

Shallow 
Deep



Awarded contracts

Subsurface
impacts

Variable Density
Modeling

INTERA

Geophysical Log
Collection

Bureau of
Economic Geology

Digital Bibliography
Texas Geology

INTERA





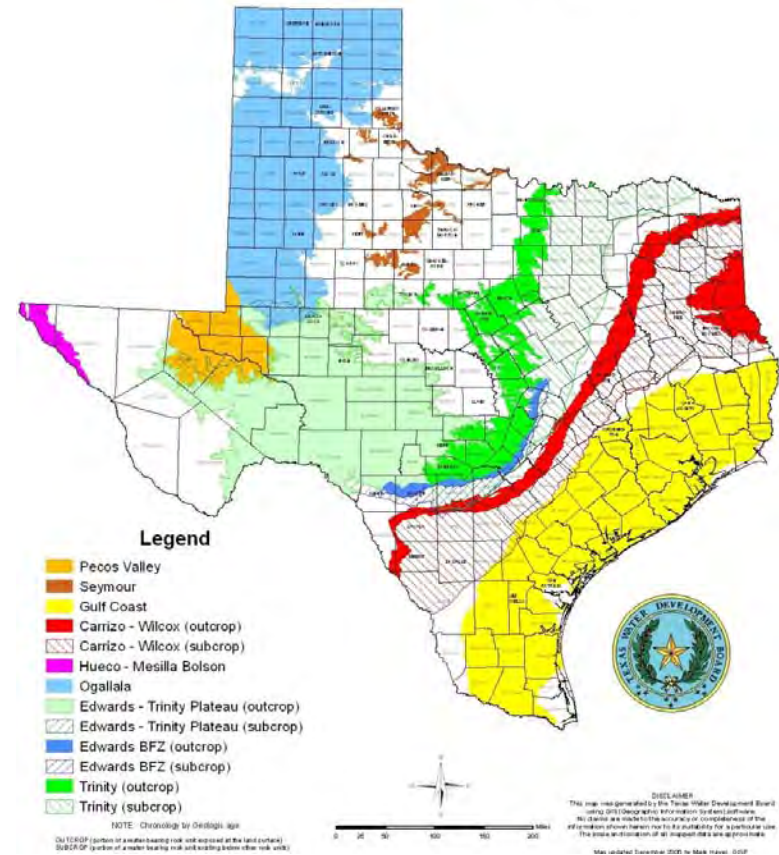
Future Work

Subsurface
impacts

- Extend to all aquifers in Texas
- Integrate the BRACS Groundwater Database
- Web access to BRACS data
- Report on methodology and results
- *Provide more accurate estimates of the brackish resource in Texas*



Major Aquifers of Texas





Brackish Groundwater Desalination Concentrate Disposal

Subsurface
impacts

$$Q_{feed} \times C_{feed} = Q_{product} \times C_{product} + Q_{concentrate} \times C_{concentrate}$$

$$Recovery(R) = \frac{Q_{product}}{Q_{feed}}$$

$$C_{concentrate} = \frac{C_{feed} - R \times C_{product}}{1 - R}$$

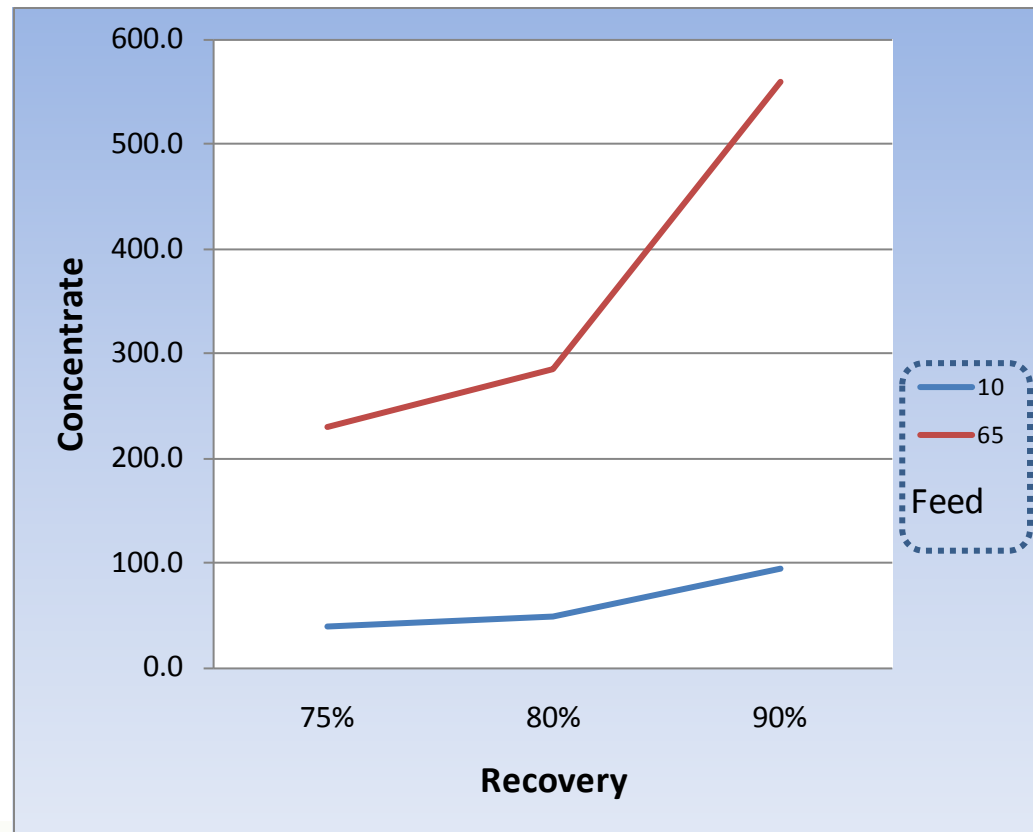




Brackish Groundwater Desalination Concentrate Disposal

Subsurface impacts

$$C_{concentrate} = \frac{C_{feed} - R \times C_{product}}{1 - R}$$





Brackish Groundwater Desalination Concentrate Disposal

Subsurface impacts

- ▶ Pass the Salt Study (TWDB)
 - ▶ Feasibility of using Class II well for disposal of desalination concentrate
- ▶ Roadmap for Permitting a Class II injection Well for dual Class I & II (CDM & SAWS)





Innovative Water Technologies and the Subsurface

