

# Railroad Commission of Texas



Victor G. Carrillo - Chairman

Elizabeth A. Jones – Commissioner

Michael L. Williams – Commissioner

# **Oil and Gas Waste Disposal Issues in East Texas**

**James Deyerle and  
Doug Johnson, PE  
Railroad Commission of Texas**

**East Texas Gas Producers Association**

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Carthage, Texas**

# Railroad Commission

- Exploration, production, storage, and transportation of crude oil, natural gas, and natural gas products
- Surface mining and reclamation
- Pipeline safety - intrastate
- Gas utilities
- Alternative energy – propane sales, service and distribution

# Presentation

- **Brief background information**
- **Applicable Statutes, Rules and Procedures:**
  - **Permitting**
  - **Compliance**
- **Objectives:**
  - **Safety and Pollution Prevention**
  - **Conservation and Fair Opportunity to Develop Resources**
- **Significant Issues:**
  - **Excessive pressure buildup**
  - **“Public Interest”**

# Significant Dates

- **1891 – RRC established**
- **1917 – first of a series of laws assigning RRC to administer O&G conservation laws**
- **1936 – first injection well permit issued**
- **1964 – first comprehensive set of statewide rules (previously “Circulars” or Statewide “Orders”)**
- **1968 – “No Pit” Order**
- **1981 – NEBS “discovery”**
- **1982 – rules amended to conform to SDWA, Texas is first state granted primacy**
- **2000 – 2010: exponential growth in shale gas development**

# Regulatory Background

- **There are over 392,000 oil and gas industry wells in Texas**
- **The first injection well in Texas was permitted in 1936**
- **There are have been over 100,000 wells permitted for injection**
- **Over 52,000 have current permits, approximately 32,000 are active**

# Regulatory Background

- **The RRC administers the Class II UIC program in Texas under authority delegated by EPA**
- **20% of UIC funding comes from EPA**
- **EPA oversight is ongoing to ensure that the RRC program is effective**
- **RRC program must be “equivalent” to EPA, but not necessarily identical.**

# **Statutory Authority**

**(Oil and Gas Division)**

- **Chapter 27 of the Texas Water Code:**
  - **Well is in the public interest**
  - **No harm to oil, gas, or other mineral formation**
  - **Both ground and surface water protected**
  - **Financial responsibility**
- **Various Chapters of the Natural Resources Code:**

# Railroad Commission Rules – Permitting

- **16 TAC 3.8 – Water Protection (pits, discharges, waste haulers)**
- **16 TAC 3.9 – Oil and Gas Waste Disposal into Non-productive Formations (Chapter 27 of the Water Code)**
  - 12,000 permitted (approx. 5000 active)
- **16 TAC 3.46 – Fluid Injection into Productive Formations (Natural Resources Code)**
  - 39,000 permitted (approx. 25,000 active)

# Objectives

- **Protect surface and groundwater, public health and safety**
- **Prevent waste and promote conservation**
- **Protect correlative rights to develop mineral resources**

# Shale Gas Plays, Lower 48 States



Source: Energy Information Administration based on data from various published studies.  
Updated: March 10, 2010

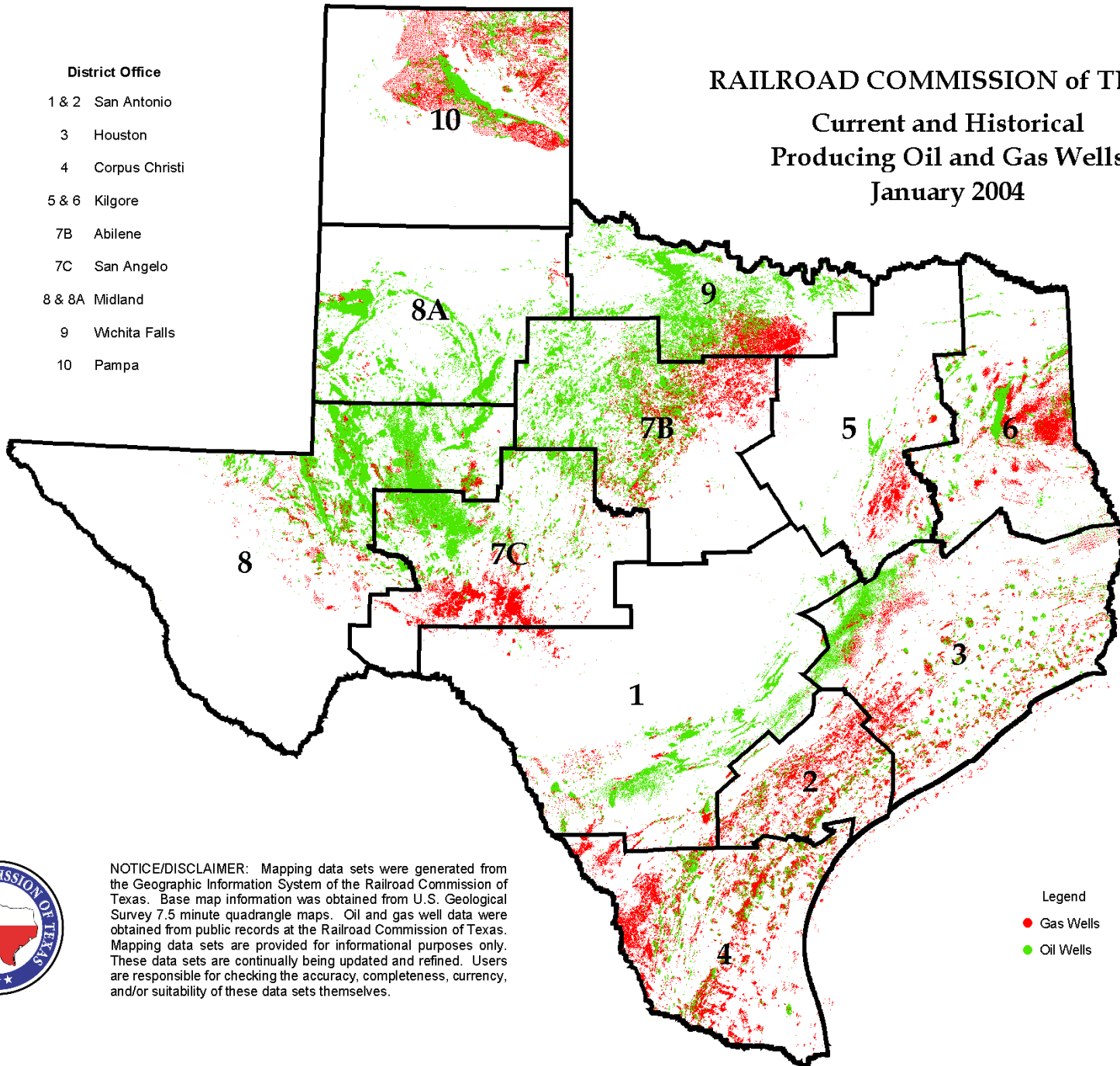


# RAILROAD COMMISSION of TEXAS

## Current and Historical Producing Oil and Gas Wells January 2004

### District Office

- 1 & 2 San Antonio
- 3 Houston
- 4 Corpus Christi
- 5 & 6 Kilgore
- 7B Abilene
- 7C San Angelo
- 8 & 8A Midland
- 9 Wichita Falls
- 10 Pampa



NOTICE/DISCLAIMER: Mapping data sets were generated from the Geographic Information System of the Railroad Commission of Texas. Base map information was obtained from U.S. Geological Survey 7.5 minute quadrangle maps. Oil and gas well data were obtained from public records at the Railroad Commission of Texas. Mapping data sets are provided for informational purposes only. These data sets are continually being updated and refined. Users are responsible for checking the accuracy, completeness, currency, and/or suitability of these data sets themselves.

### Legend

- Gas Wells
- Oil Wells

# Shale Gas Development Stats

(As of Late September 2010)

- **NEBS**

- 14,400 wells
- 3,175 permits
- 23 counties
- 5000+ sq. mi.
- 7 TCF produced

- **Haynesville**

- 296 wells
- 458 permits
- 10 counties

- **Eagleford**

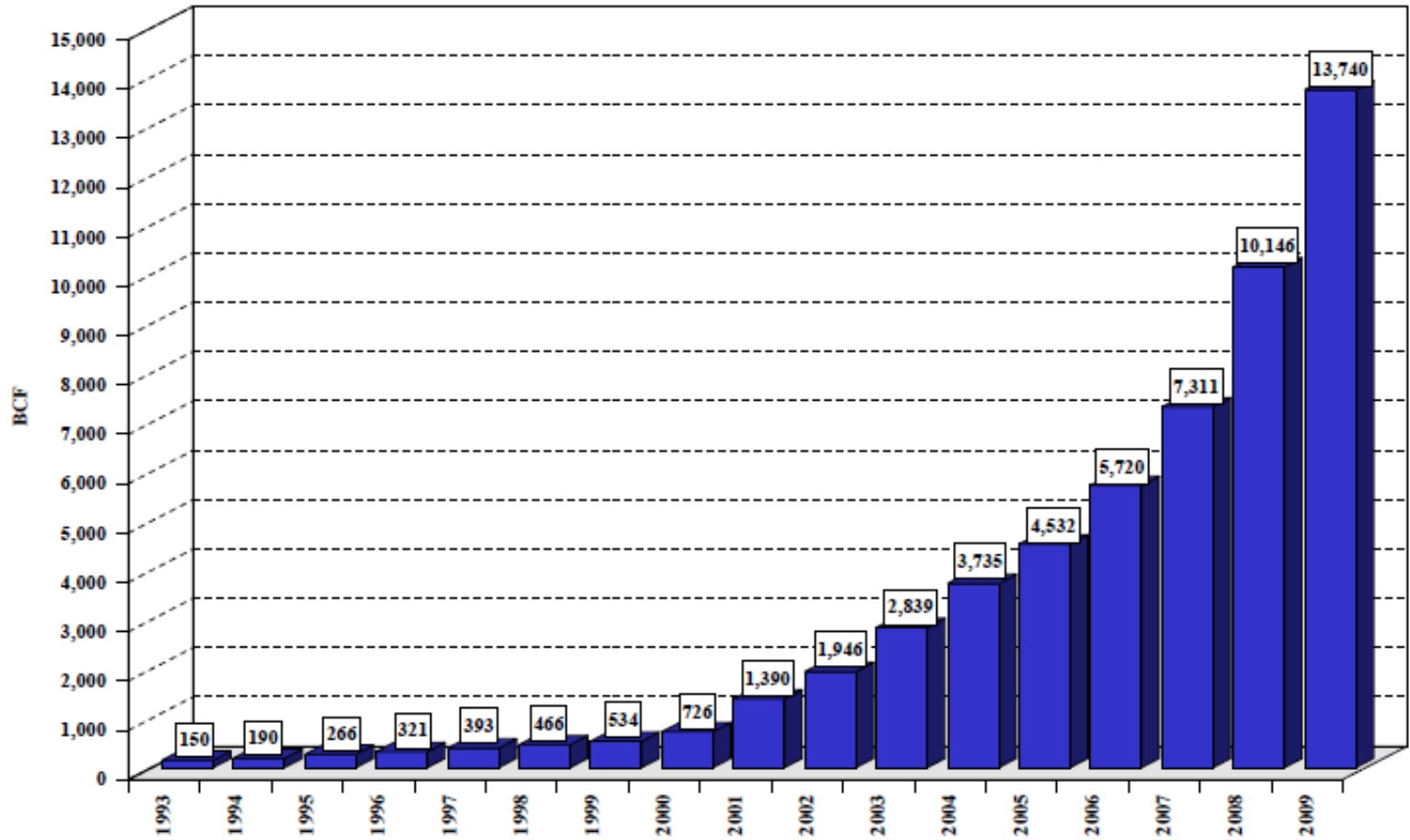
- 192 wells
- 690 permits
- 25 counties and counting

- **RRC Web Site:**

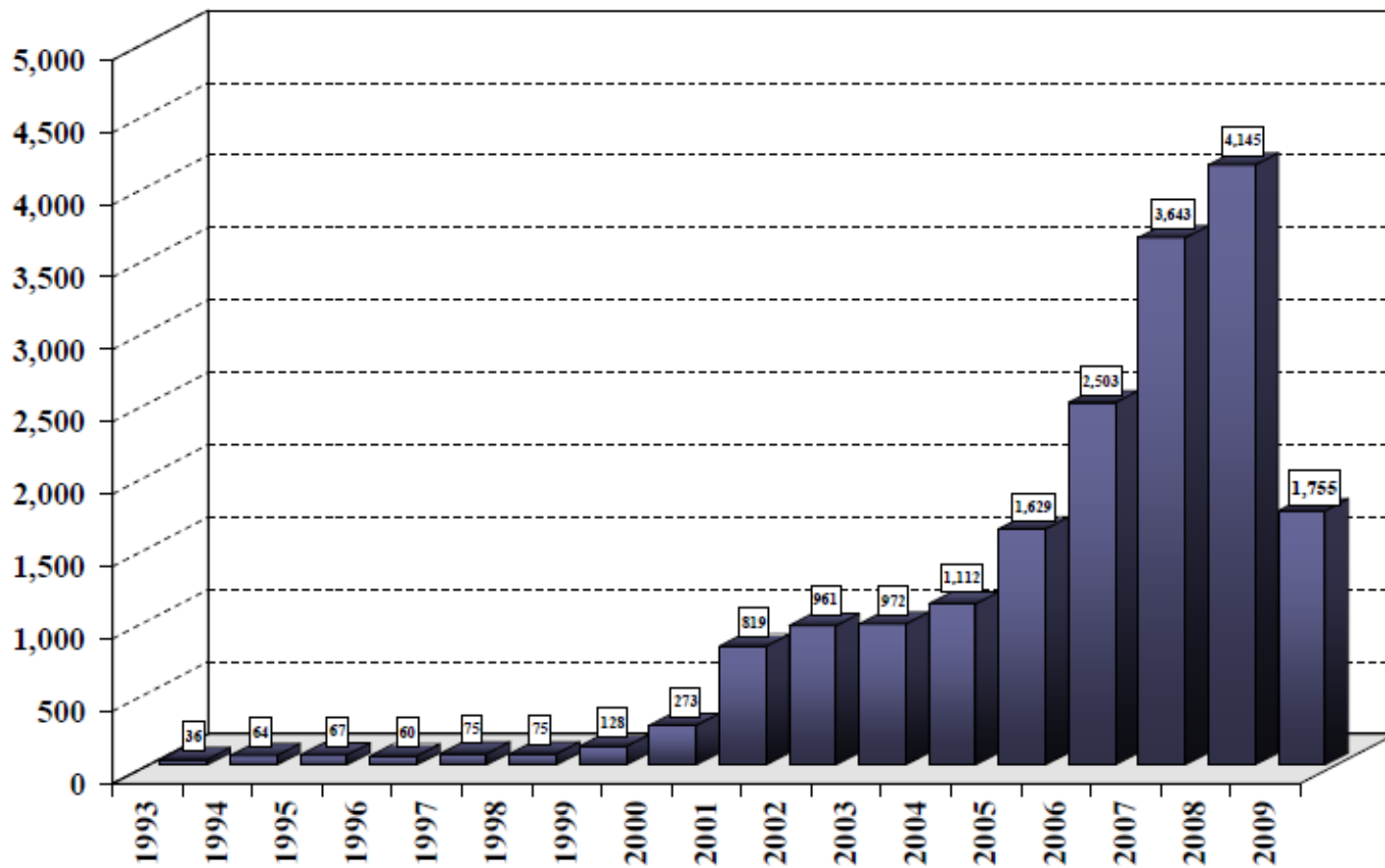
- [rrc.state.tx.us](http://rrc.state.tx.us)

“Land & Home Owner Information”

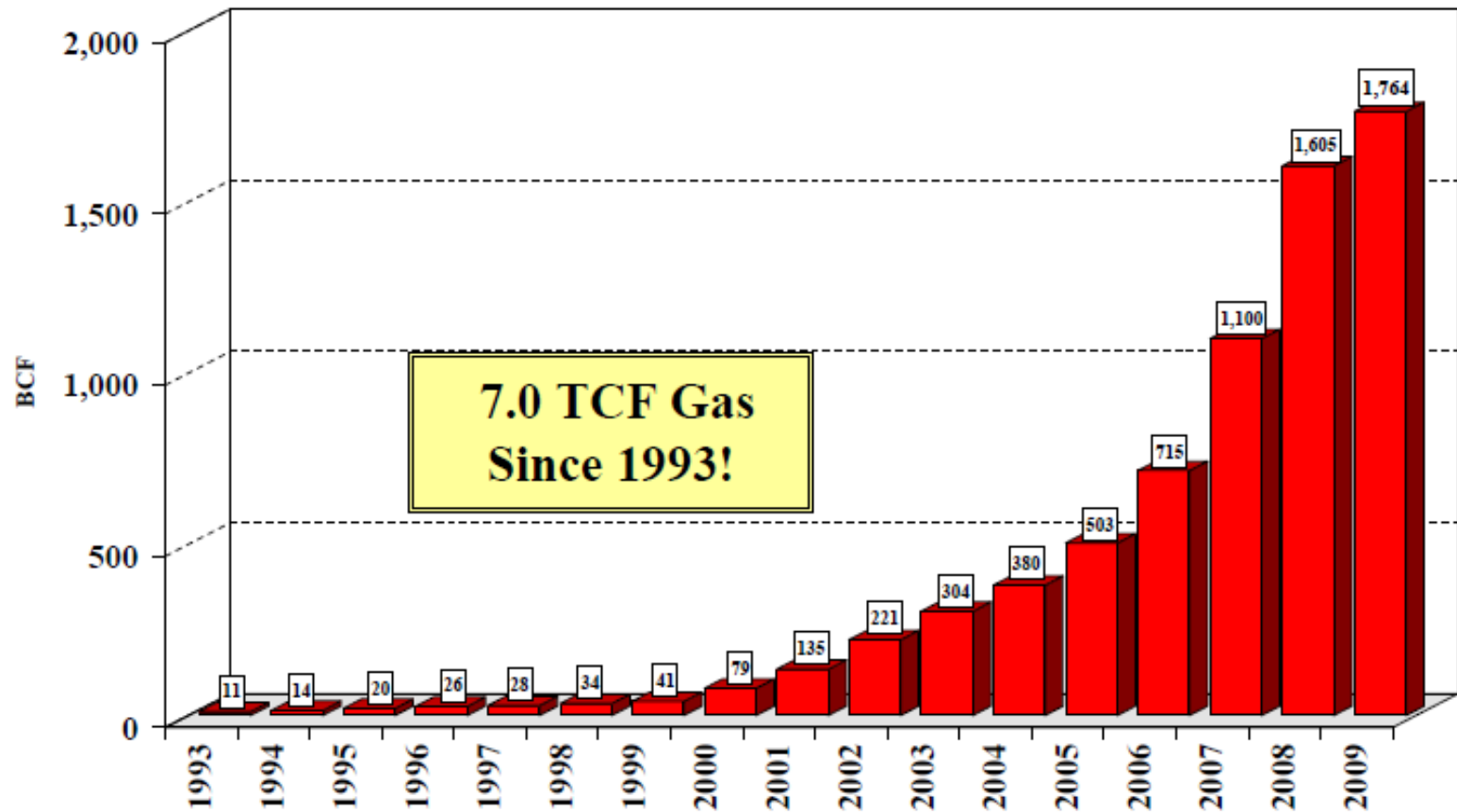
Newark, East (Barnett Shale) Well Count  
1993 through 2009



**Newark, East (Barnett Shale)  
Drilling Permits Issued  
(1993-2009)**



Newark, East (Barnett Shale)  
Gas Well Gas Production  
1993 through 2009



# Barnett Shale Waste Management

- **Subsurface disposal:**
  - 2004 – disposal well permitting policies changed to encourage disposal in Ellenburger (now 120+ wells)
  - “Injection/Disposal Well Permitting Manual”
- **Surface waste management:**
  - Re-use and recycling
  - Centralized collecting pits
  - Land farming (low chloride drilling mud)
  - “Surface Waste Management Manual”

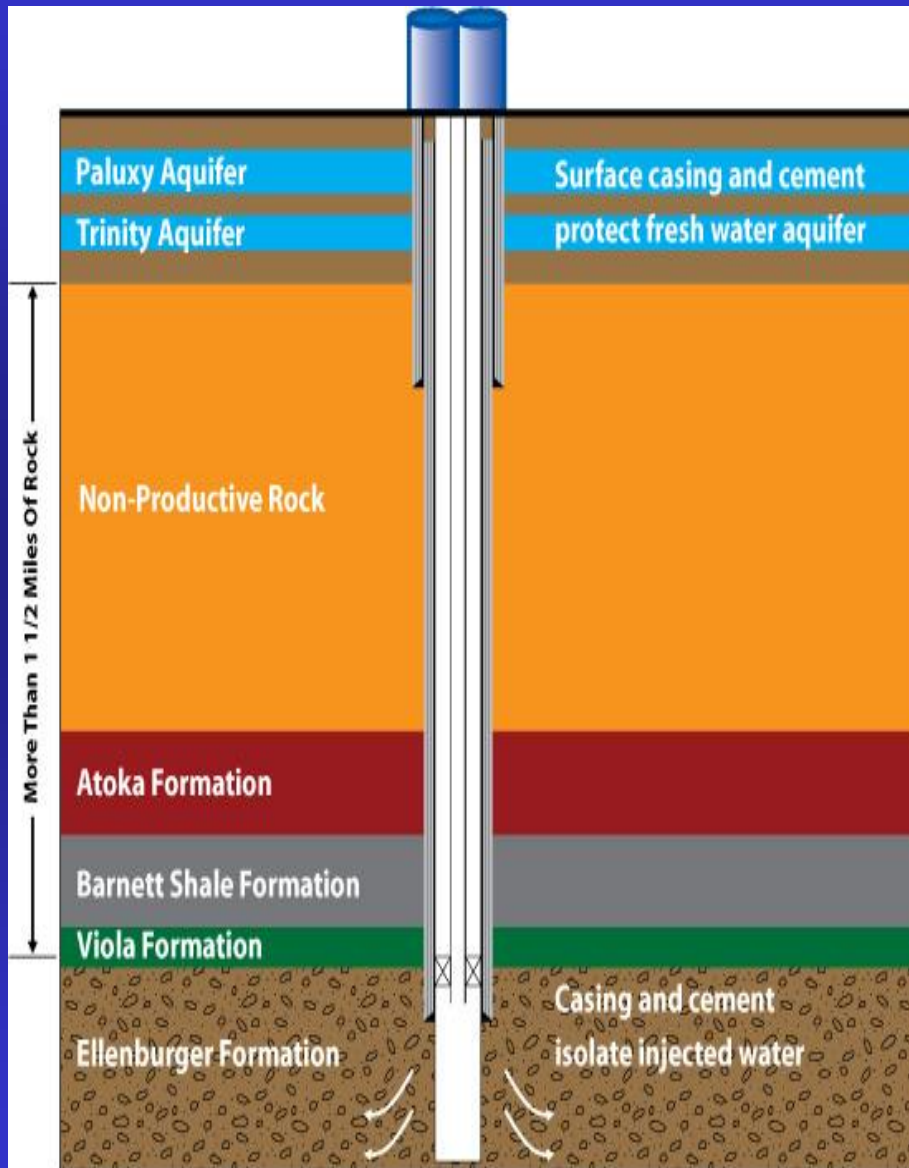
# Over 160 Commercial Disposal Wells (350 Total) in the Barnett Shale Area

- Clay – 1 (42)
- Comanche – 1 (0)
- Cooke – 7 (40)
- Denton – 3 (5)
- Erath – 2 (3)
- Grayson – 0 (16)
- Hamilton – 2 (0)
- Hill – 3 (3)
- Hood – 16 (13)
- Jack – 15 (53)
- Johnson – 28 (23)
- Montague – 21 (74)
- Palo Pinto – 10 (35)
- Parker – 15 (17)
- Somervell – 5 (5)
- Tarrant – 4 (6)
- Wise – 31 (22)
- Total = 164 (357)

# Disposal vs Treatment

- **427 million barrels injected since 2007**
  - “Online queries”: H-10 data by field, well, operator, etc
  - Compared to approximately 12 million barrels treated (Fountain Quail)
  - Centralized frac flow-back collection pits to dilute/re-use flow-back in sequential frac jobs (uncertain cumulative throughput volume)
  - RRC permit not required for brine pipelines or flow lines, but must not leak.

# Ellenburger SWD Wells



## Monitoring & Testing

- Drilling & Completion
  - Casing
  - Cementing
  - Tubing
  - Packer
- Testing Prior to Service
  - Cement Bond Log
  - Pressure Testing
- Operations
  - Continuous Monitoring
  - Annual Integrity Testing
- Reporting
  - Prior to Placing in Service
  - Monthly
    - Injection Date
    - Pressure
    - Volume

# Permitting Requirements Generalized

- **Base of Useable Quality Groundwater**
- **Notice and Hearing Opportunity**
- **Area of Review**
- **Geologic Requirements**
- **Surface Casing**
- **Production Casing**
- **Cement criteria**
- **Tubing/Packer**

# Notice & Hearing

- **Surface owner**
- **Adjacent landowners (Commercial Disposal)**
- **Operators within 1/2 mile**
- **City clerk if in city limits**
- **Published in newspaper**
- **Protest – considered in public hearing**

# Area Of Review

- **Applicant for a disposal well permit must provide the data of record for wells that penetrate the proposed injection zone within (at least) one quarter (1/4) mile – expanded when appropriate.**
- **Confirm wells have been plugged (or cased and cemented) in a manner that will prevent the movement of fluids into strata other than the authorized injection or disposal zone.**
- **Tabulated data keyed to a corresponding map.**

# Geological Requirements

- 1. Verify that the proposed injection zone is adequately isolated by relatively impermeable strata to confine injected fluids to the proposed injection interval.**
- 2. Proposed injection interval must be isolated from overlying usable quality water by a sufficient thickness of relatively impermeable strata (accumulative total of at least 250 feet of clay or shale).**

# Completion Requirements:

## Three “Degrees” of Separation Between Injection Stream and Groundwater

- **1st Degree – Surface casing set through entire interval deemed to have useable quality groundwater and cemented to ground surface**
- **2<sup>nd</sup> Degree – Long string casing with at least 400 – 600 feet of cement above injection interval**
- **3<sup>rd</sup> Degree – Tubing set on a mechanical packer within 100 feet of the top of the injection interval**

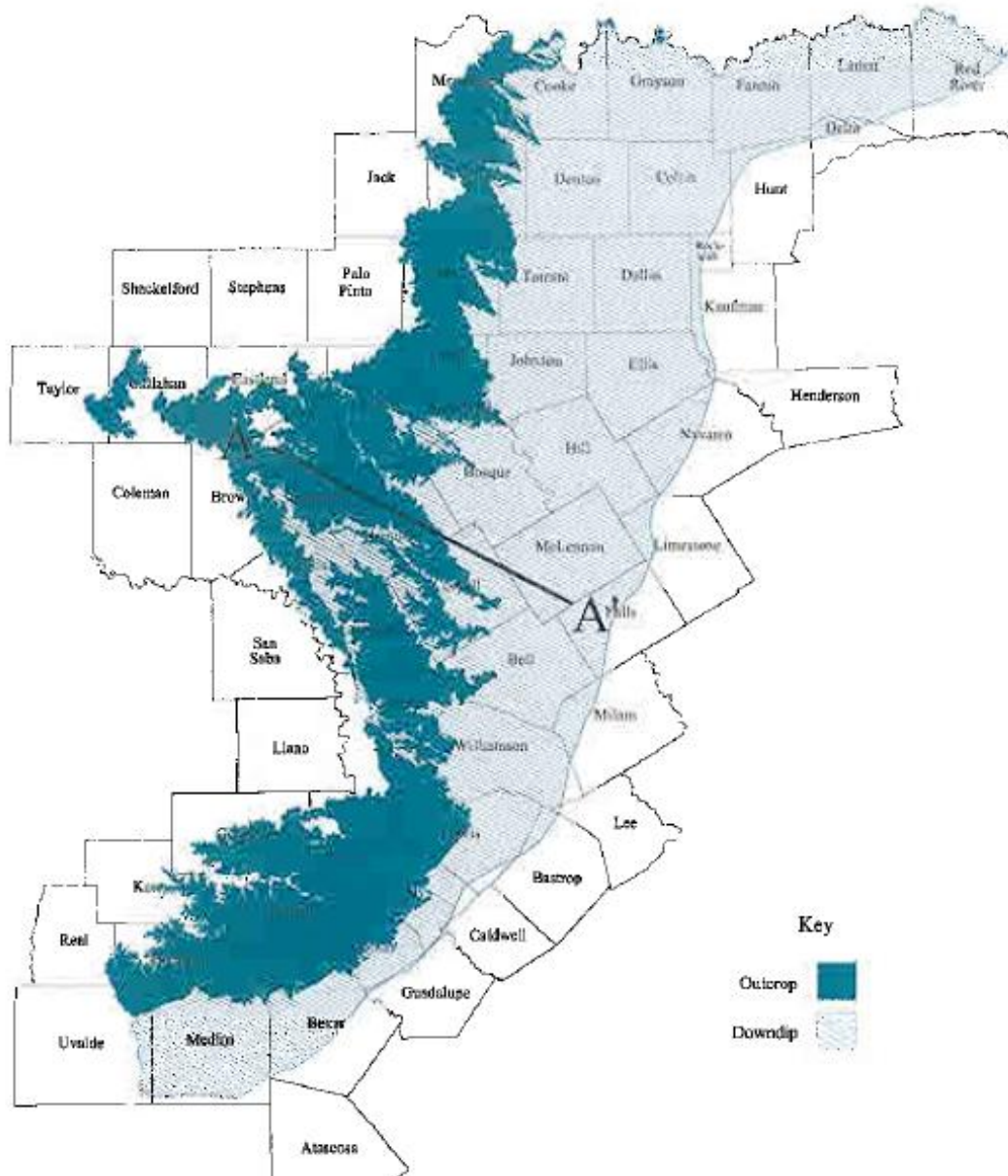
# Post-Permitting

- **Annual Monitoring reports must be filed on every injection/disposal well to report activity, status, and monitoring**
  - 46,000 reports are received annually and reviewed by staff and automated programs
- **Initial and periodic Mechanical Integrity Tests must be performed to check for leaks**
  - RRC staff review 15,000 – 18,000 tests each year

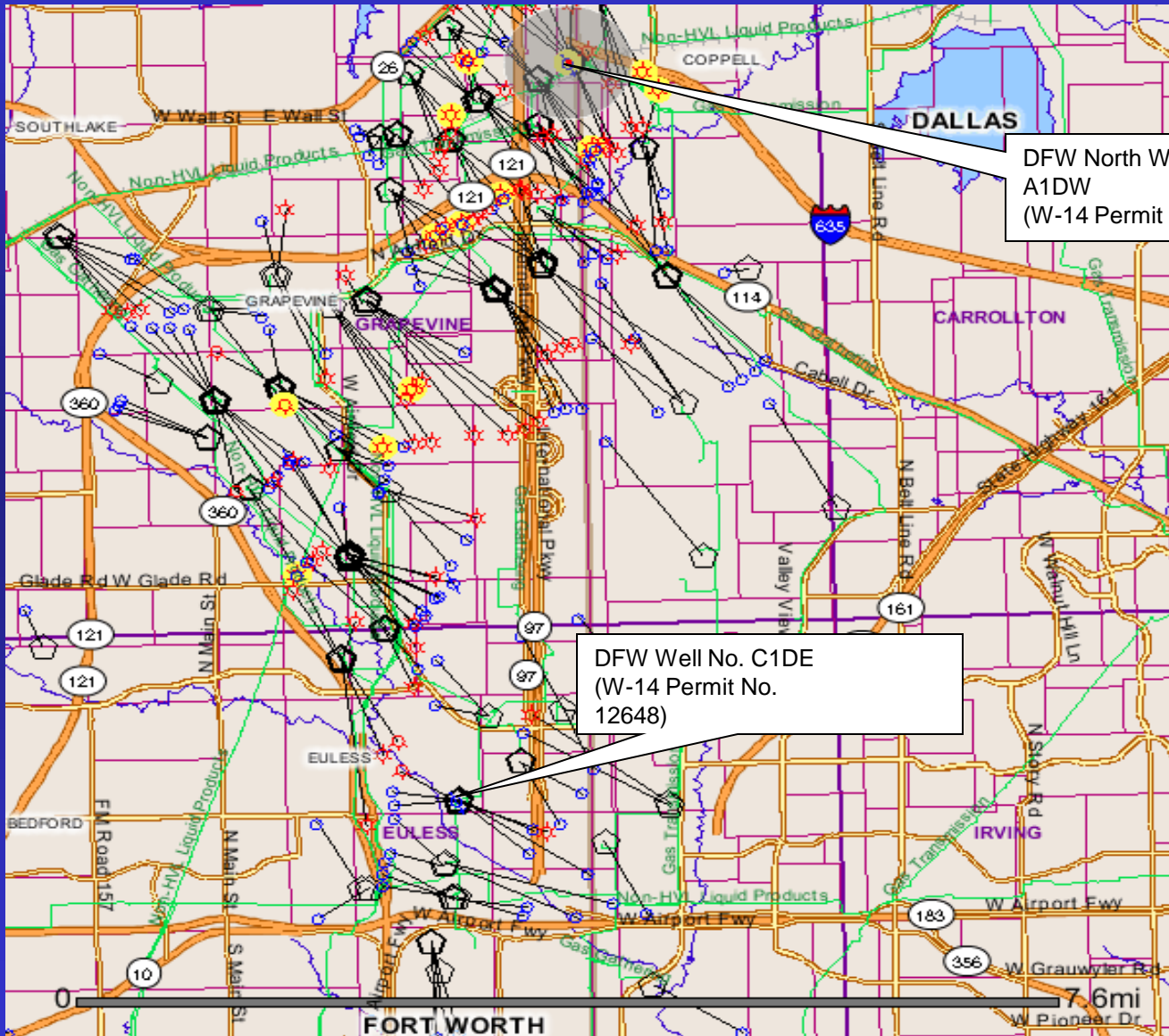
# Barnett Shale Issues

- **Urban environment**
  - **Concerns about:**
    - Air emissions
    - Water use
    - Traffic impacts
    - Effect on property values
- **Induced Seismicity**
- **Communication between Ellenburger and Barnett through faulting/fracturing**

# Trinity



# DFW SWD Wells



DFW North Well No.  
A1DW  
(W-14 Permit No. 12518)

DFW Well No. C1DE  
(W-14 Permit No.  
12648)

# What is Known and Unknown

- **Very rare**
  - 1:1x10<sup>6</sup> Inj-well yrs
- **No harm observed**
- **Lawrence – Berkeley  
Nat'l Lab Web Site**
- **Observed for decades**
- **Where it will or will not occur**
- **Extent of possible harm**
- **Probability of occurrence at any given local**

## DOE – LBL Web Site

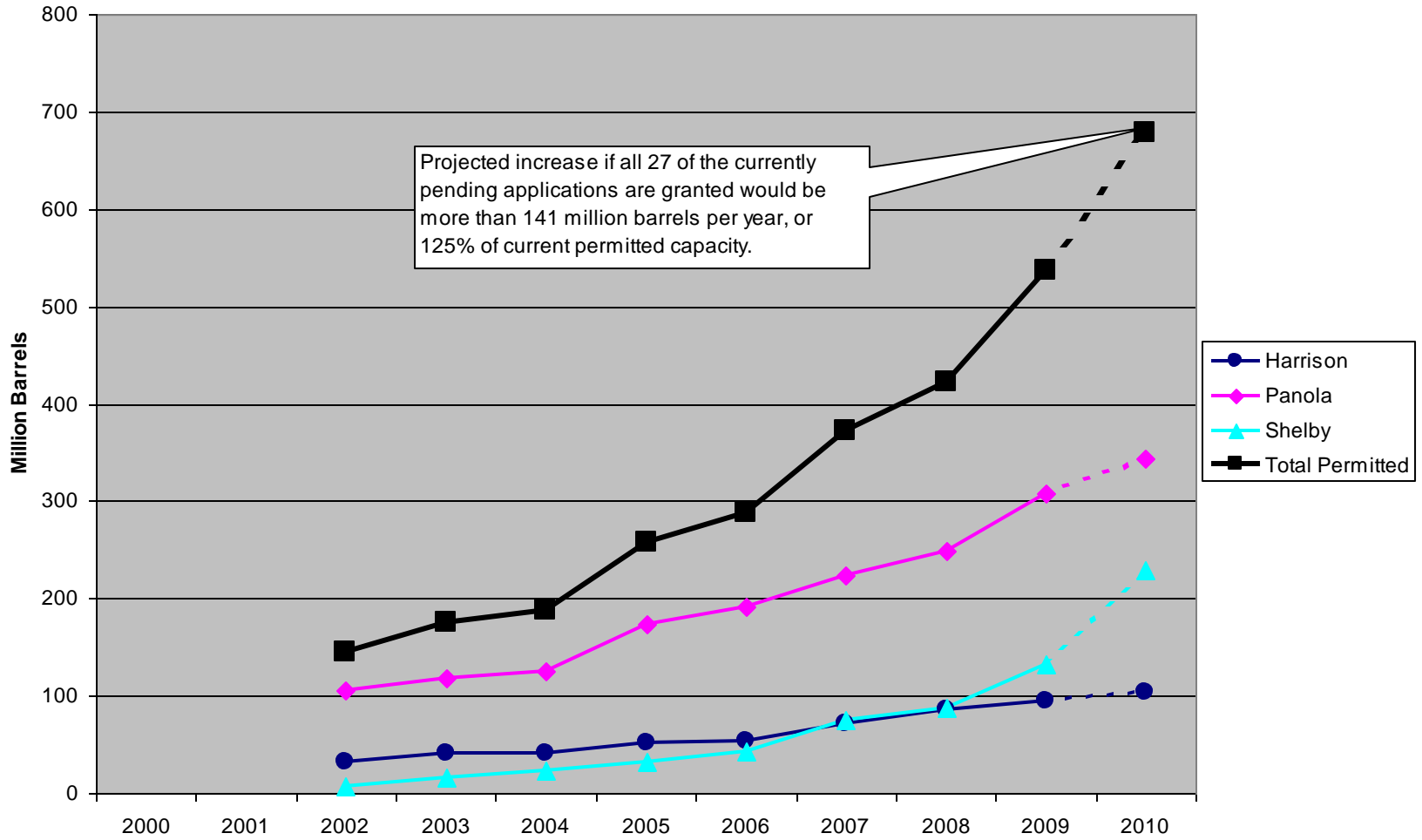
**“Therefore oil and gas induced seismicity has been dealt with successfully and is well understood. In that last several years induced seismicity is receiving more attention not because it is a hazard (although some recent cases in Texas have drawn attention to it), but as in the case of geothermal it can be used to trace the success of inducing permeability.”**

- [http://esd.lbl.gov/research/projects/induced\\_seismicity/](http://esd.lbl.gov/research/projects/induced_seismicity/)

# Haynesville – Bossier Issues

- **Carrizo – Wilcox aquifer**
- **Densely drilled area**
- **No Ellenburger analogous zone in Sabine Uplift**
- **If proceeds as NEBS, enormous quantity of waste to manage (including significant amounts imported from Louisiana)**
- **Expectation for operators to assess the problem and find the solution**

### Cummulative Permitted Disposal Capacity for Harrison, Panola, and Shelby County



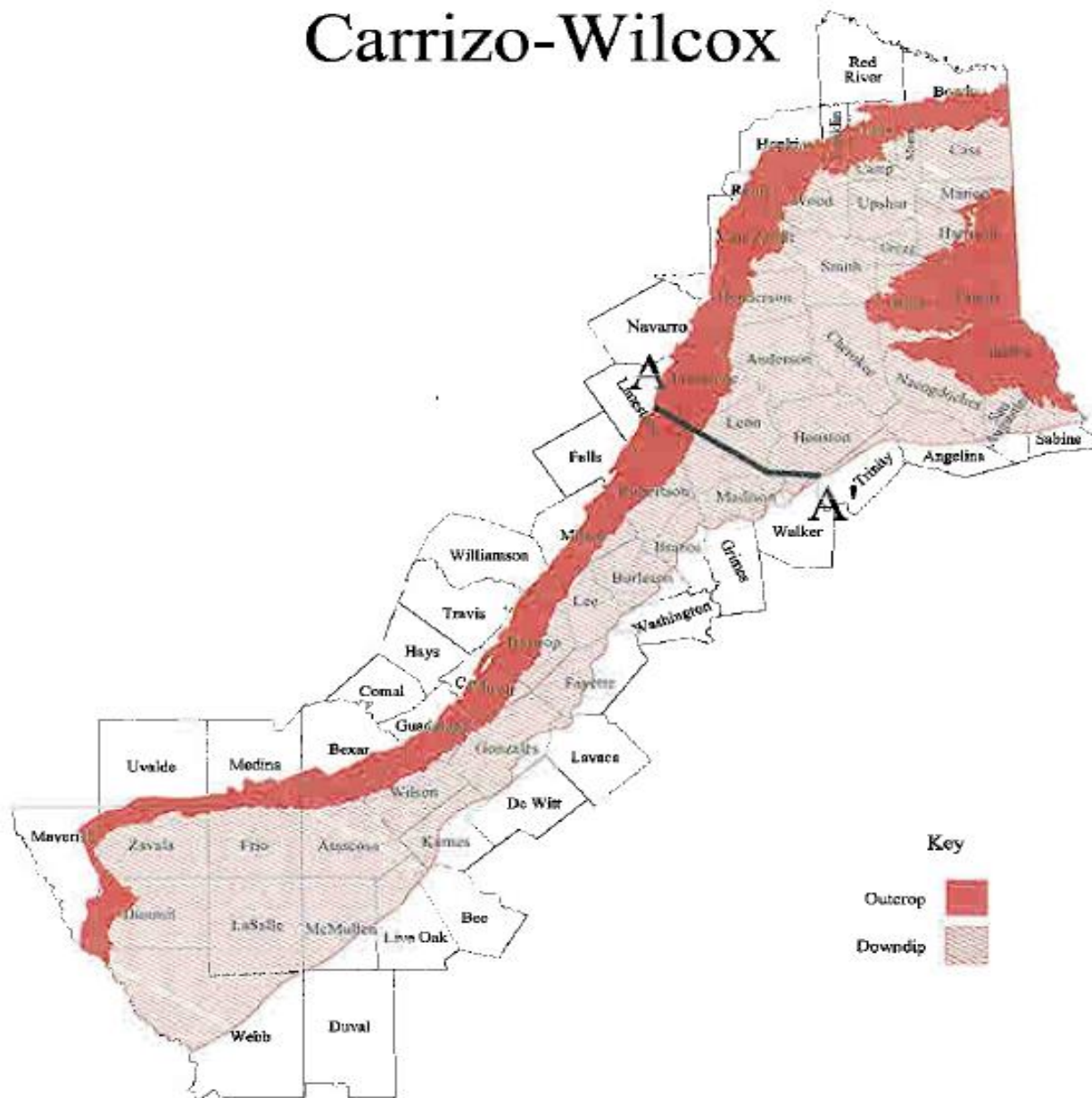
# Top Ten Counties by Number of Commercial Disposal Wells

- **Panola = 39**
- **Wise = 32**
- **Jefferson = 29**
- **Johnson = 29**
- **Shelby = 28**
- **Martin = 26**
- **Howard = 24**
- **Rusk = 24**
- **Upton = 24**
- **Montague = 21**

# Eagleford Issues

- **Carrizo – Wilcox aquifer**
  - Much deeper useable quality groundwater than most other areas of Texas
  - Not as densely drilled as Barnett and Haynesville areas
- **Still early in the development cycle**
  - Less known about what future challenges will develop

# Carrizo-Wilcox



**Thank you!**

**Questions?**