[AV]The Barnett Shale Oil Model of North Texas*

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Abstract

Initiation of the Barnett Shale gas play in 1981 ushered in a new era of understanding of source-rock resource plays. Over the years, as industry's knowledge base increased, many attempts were made to extend the shale play into the oil window. In the late 1980's, Mitchell made several unsuccessful attempts in Jack County, followed by Oryx's 1991 failed attempt in their horizontal Grant #1 in Montague County.

In 2000, Dallas production Inc. drilled and completed their Swint #1 in the Barnett Shale as an oil well in Montague County, and industry began to seriously consider the oil potential. However, the production data from the Swint#1 and unsuccessful attempts by industry to follow up on this producer only resulted in a short period of enthusiasm.

It was not until W. B. Osborne's successful recompletions and wells at St. Jo Ridge field in Southeast Montague County that industry really began to take notice. Mitchell Energy had internally proposed a Barnett Shale oil model in the late 1990's but, due to low oil prices and preocccupation with the gas play, never tested the idea. There were many lines of evidence that suggested the existence of a commercial oil play and the geologic conditions by which it might be successful.

In 2008, EOG drew industry attention with their entry into a Barnett Shale oil play. Since that entry, EOG has adopted the name 'combo play' for good reason. Their early analysis had indicated commerciality would be dependent upon oil production, associated gas and the significant volumes of Natural Gas Liquids (NGL's). It was because of the liquids' contribution that EOG almost immediately began construction of a 40 mmcfg/d natural gas processing plant.

With oil prices in excess of $60/BBL, the play has potential for being much more widespread than Mitchell's original model suggested. EOG's establishment of this combo play has created a new technological boom in the Barnett; however, like the gas play, it is not without risk.

The Barnett Shale Oil Model of North Texas

Presented by:

Dan B. Steward

U.S. Active and Emerging Plays

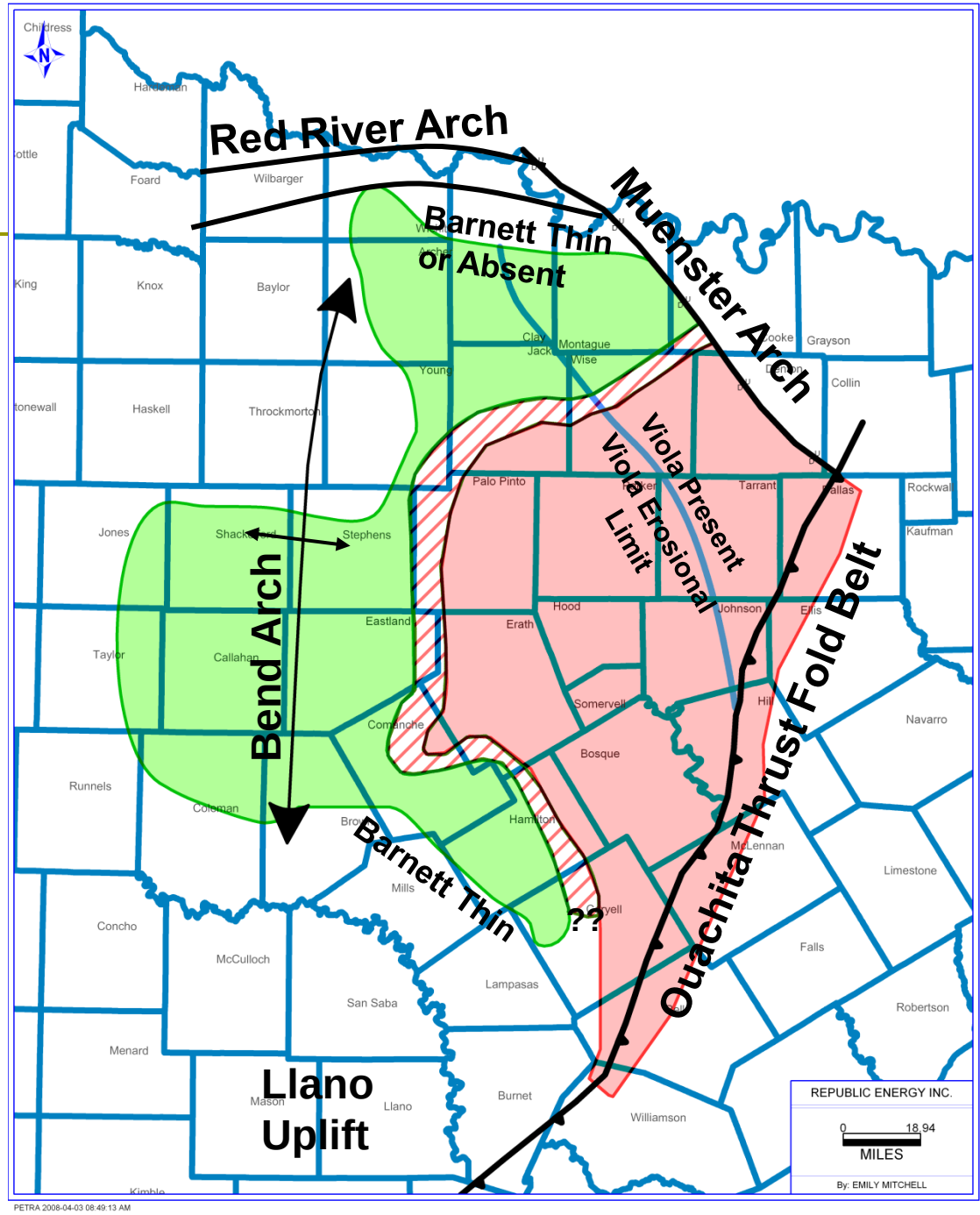
EMD/AAPG

April 12, 2011

North Texas Structural Provinces

with Estimated Extent of Oil & Gas Prone Areas in the Barnett

- Gas Prone
- Oil Prone
- Transition
- Viola Erosional Limit



Barnett Core in Faulted Area

Barnett Core Showing Minor Faults and Regional Fracture

Barnett Core with Regional Fracture

Early Barnett Oil Tests

1) Oryx - Grant #1H
(42-337-32883) SPUD 7/17/1991

2) MEC – JJ Wood #1
(42-337-30265) TEST 10/1989

3) Anadarko – Gaskins #A-1
(42-337-32938) SPUD 2/8/1993

4) Anadarko – Henderson #B1
(42-337-32937) SPUD 2/27/1993

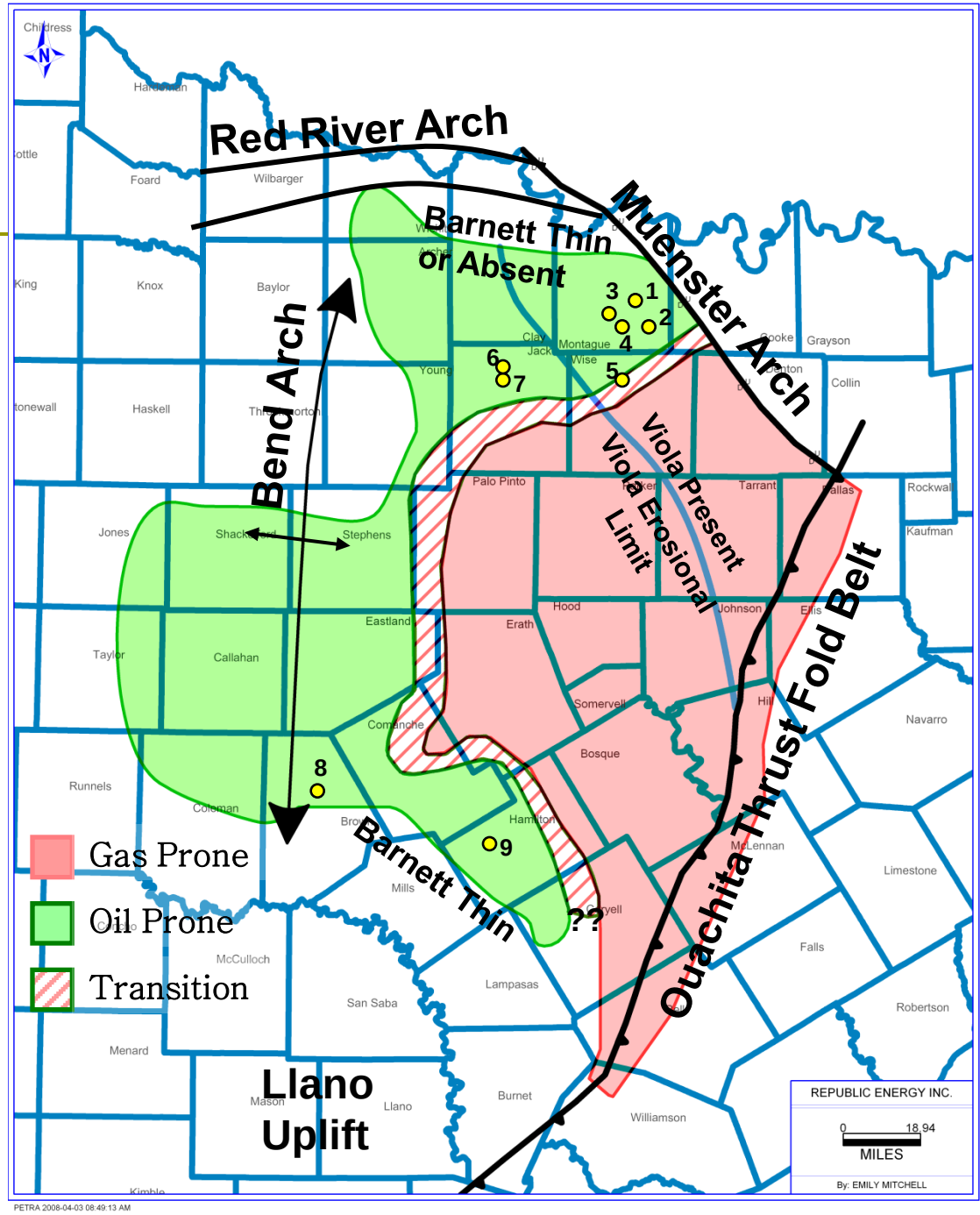
5) MEC – USA 237-21 #1
(42-497-34327) TEST 10/1999

6) MEC – Cherryhomes-Worthington #3
(42-237-37089) SPUD 1/20/1986

7) MEC – Lindsey Ranch #11
(42-237-34662) TEST 10/1982

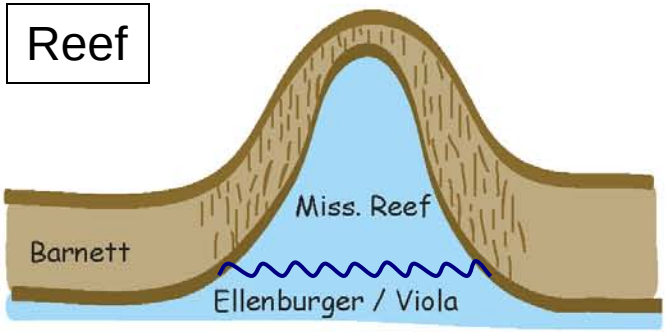
8) Explo - Mircham #3
(42-049-35282) SPUD 6/7/1990

9) Quicksilver – J Christianson #3
(42-193-30258) TEST 9/2001

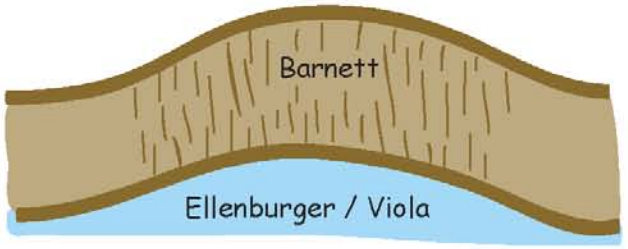


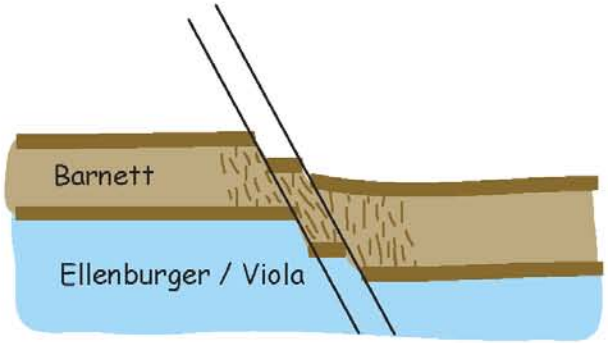
North Texas Structural Models

Reef

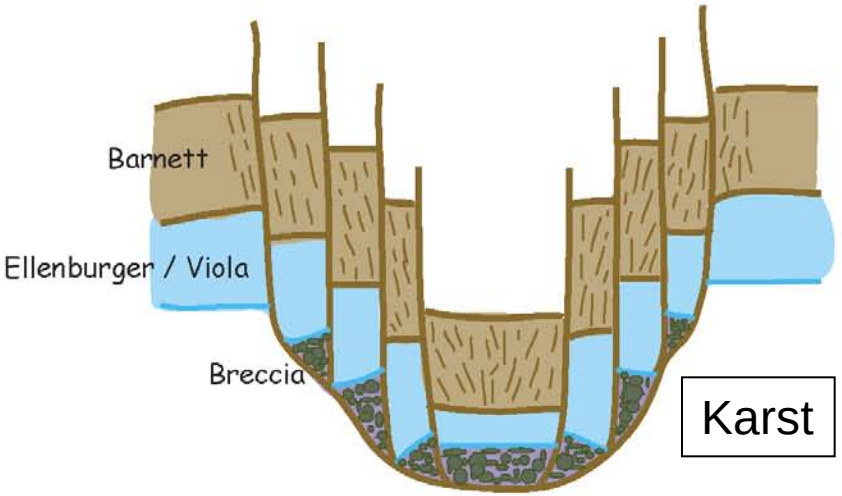


Anticline





Faults



Karst

Emily Mitchell

Mississippian Reef Examples

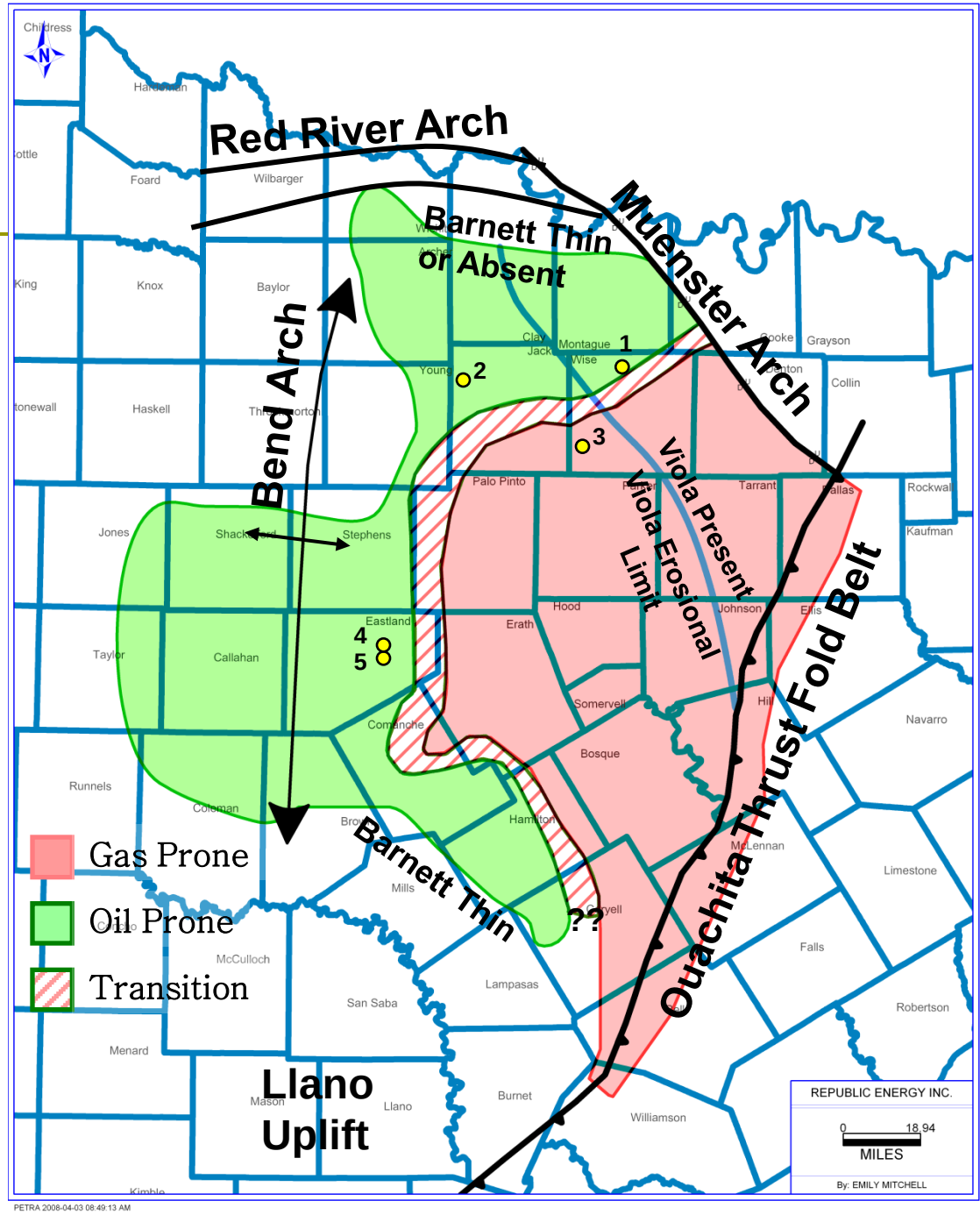
1) **Park Springs (Miss)**
   42,600 BO
   5.0 BCFG

2) **J.W. Loving 12**
   80,000 BO
   0.068 BCFG

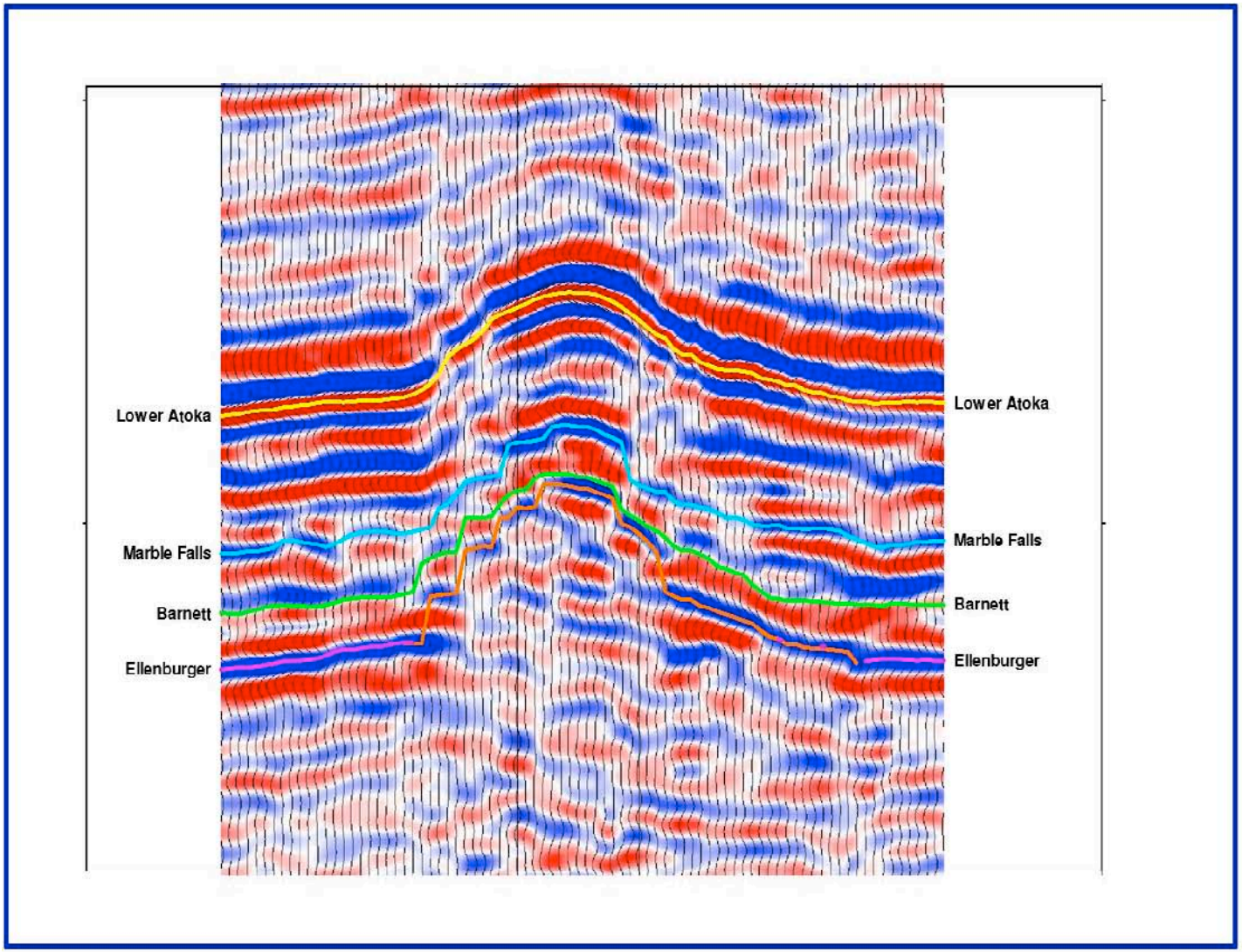
3) **M.F. Stewart A-1 & A-2**

4) **Richey (Miss)**
   721,000 BO
   1.2 BCFG

5) **Missy (Miss)**
   2,707 BO
   1.13 BCFG



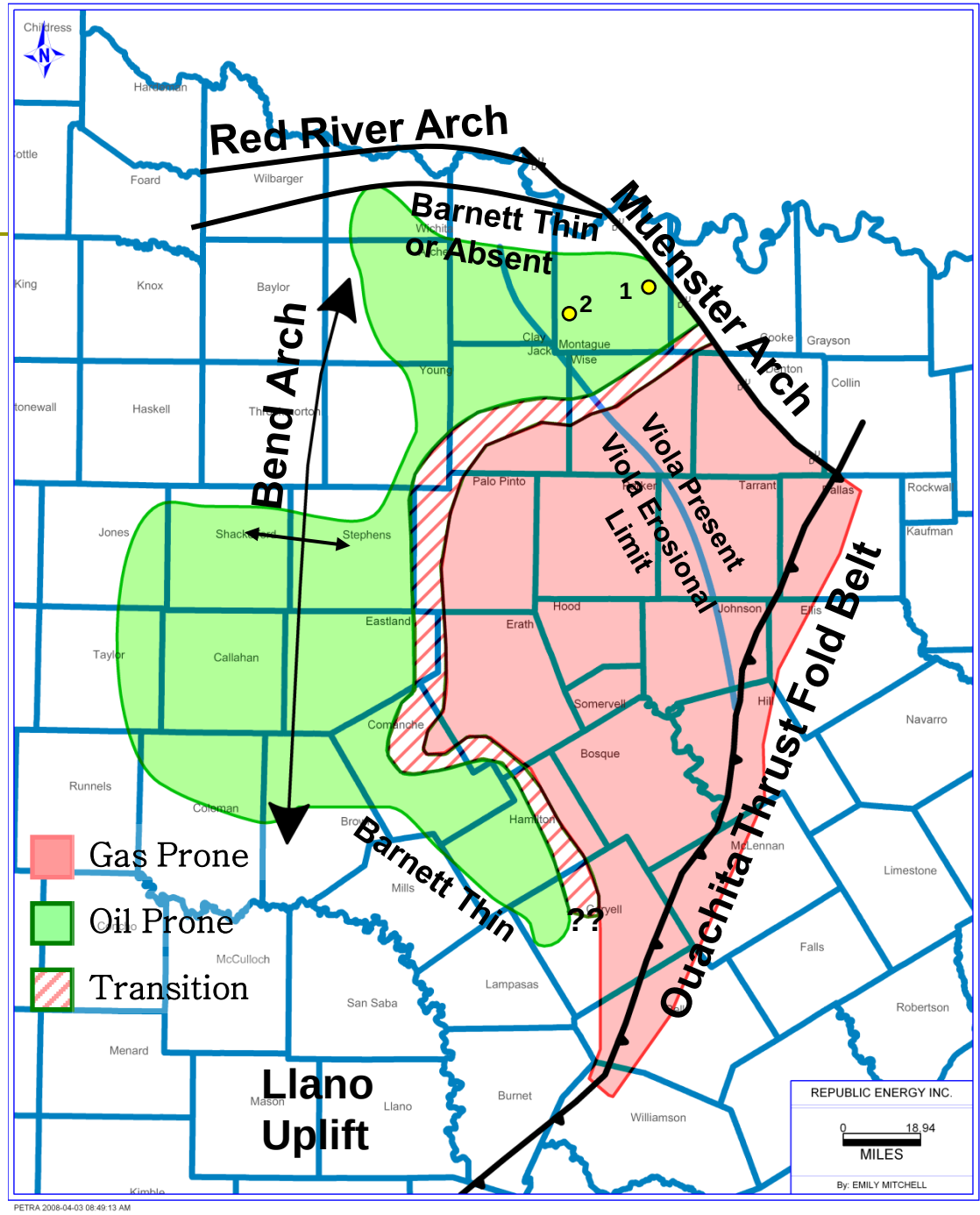
Reef Example



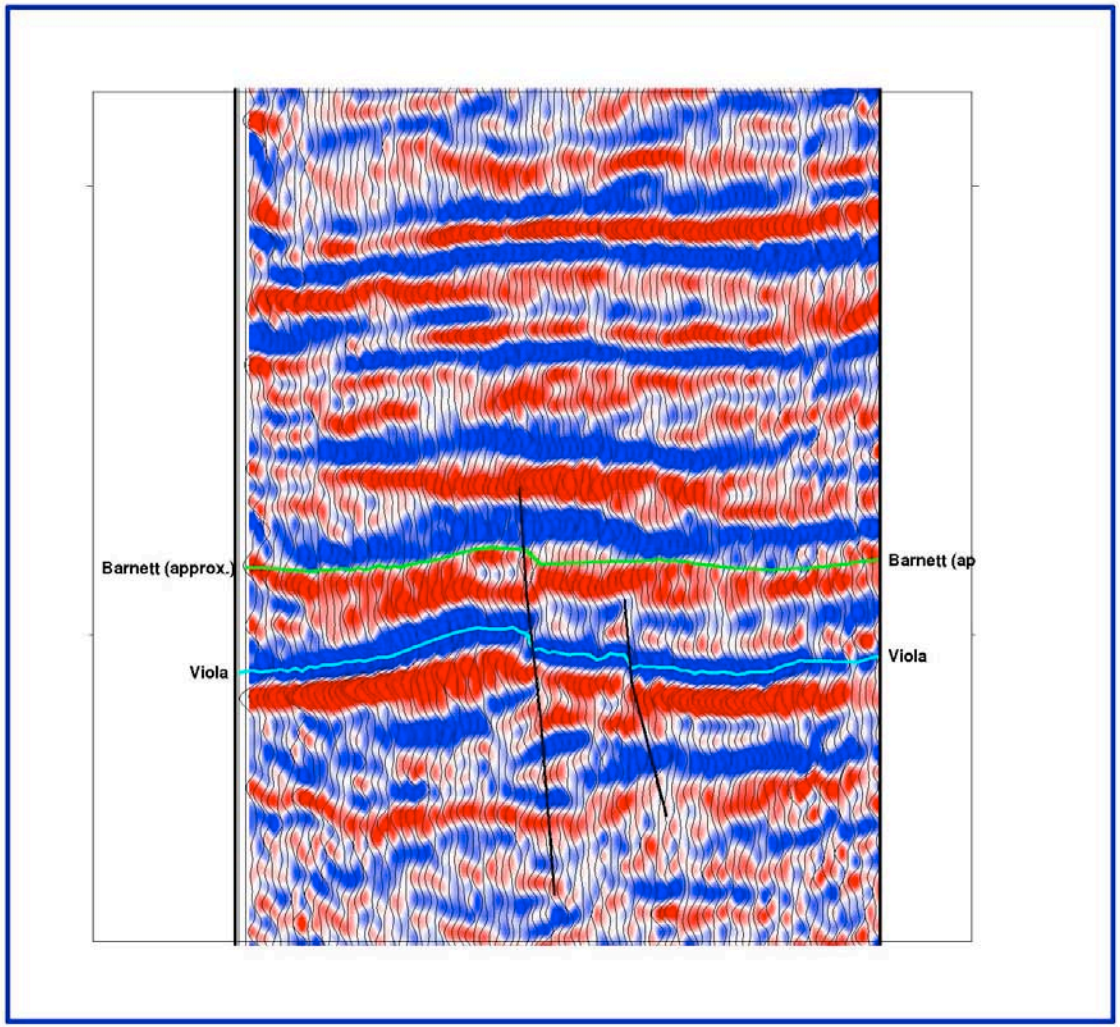
Anticlinal Structures

1) St. Jo Ridge (Barnett Shale)

2) Dallas Production Inc.
Swint #1

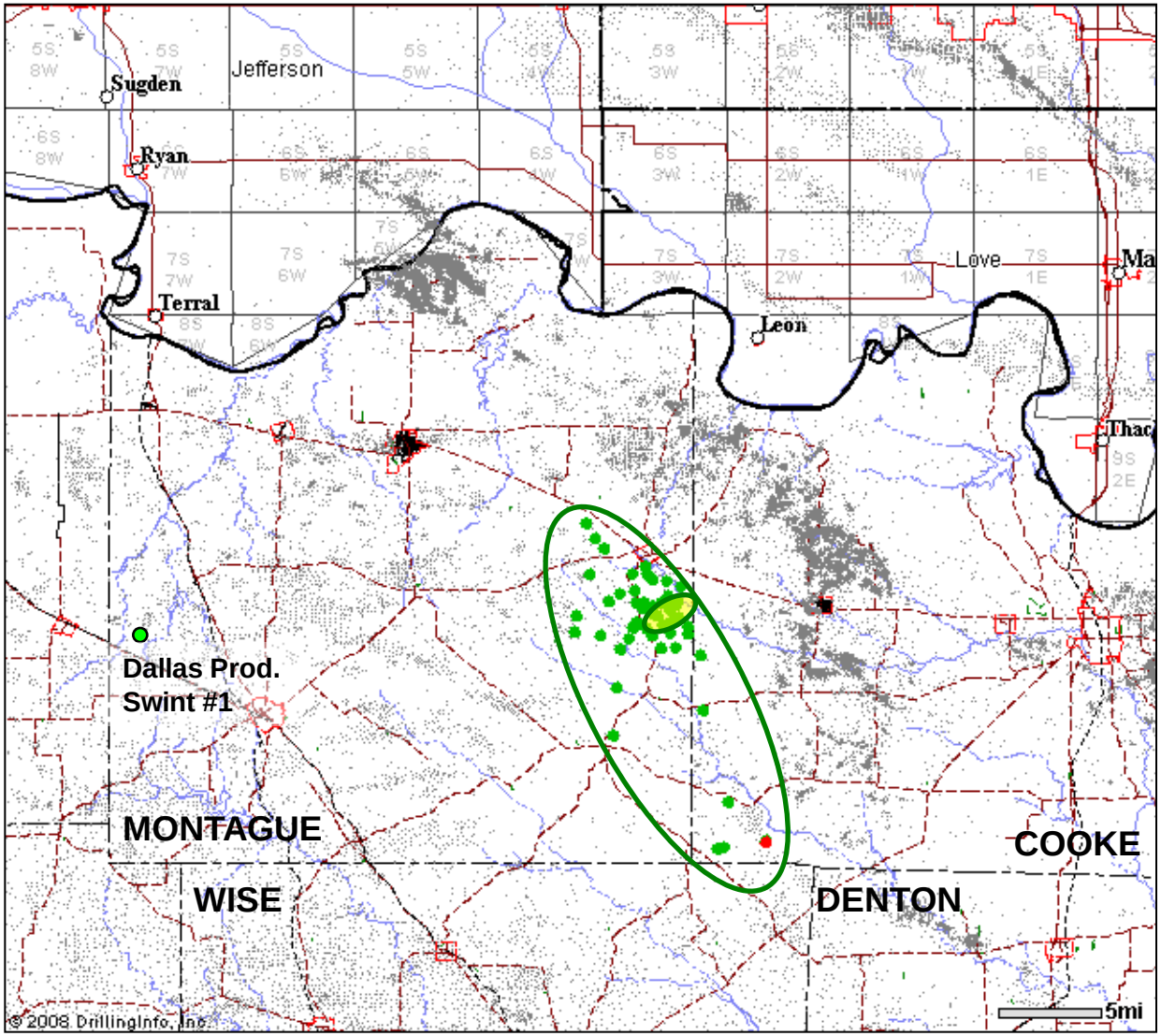


Anticline with Fault Example



Map Source: DrillingInfo,Inc.
Prepared by: Emily Mitchell

Montague County Structure Example



Est. St. Jo Ridge Structure

St. Jo Ridge Production

St. Jo Ridge (Barnett Shale) Producers

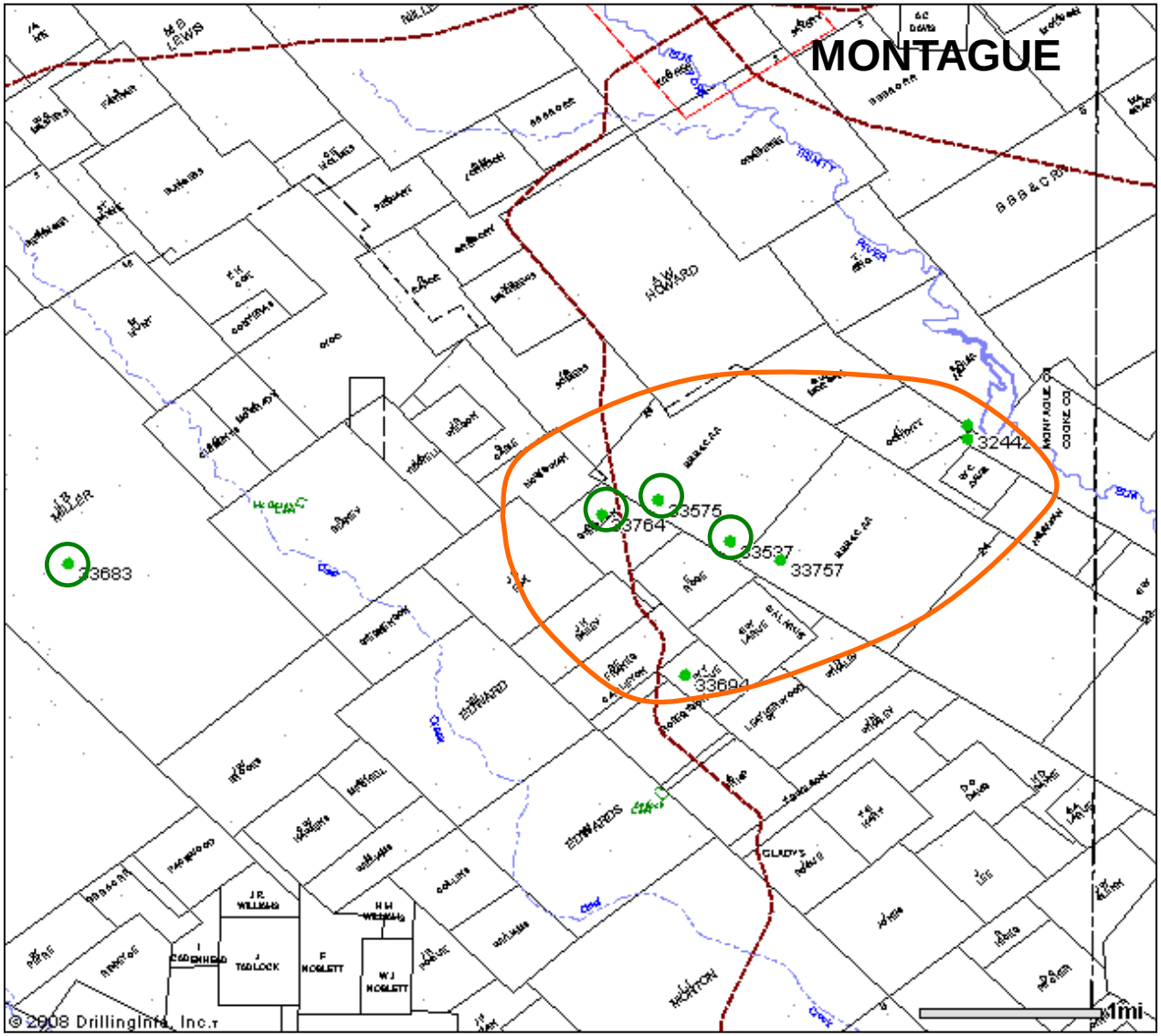
Cumulative Production: 800,000 BO & 4.1 BCFG from 46 wells

5 wells account for 366,600 BO & 1.2 BCFG or 45% of the oil production.

Dallas Production Inc., Swint #1 Cumulative Production: 25,915 BO & 141 MMCFG

Map Source: DrillingInfo,Inc.
Prepared by: Emily Mitchell

Detail Map of St. Jo Ridge Structure with Key Wells

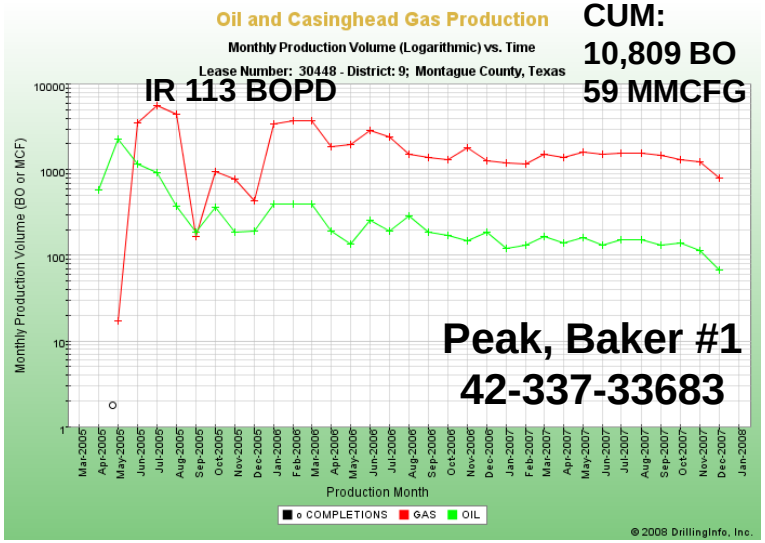


Est. St. Jo Ridge Structure

Wells with Production of Interest

Source: DrillingInfo,Inc.
Prepared by: Emily Mitchell

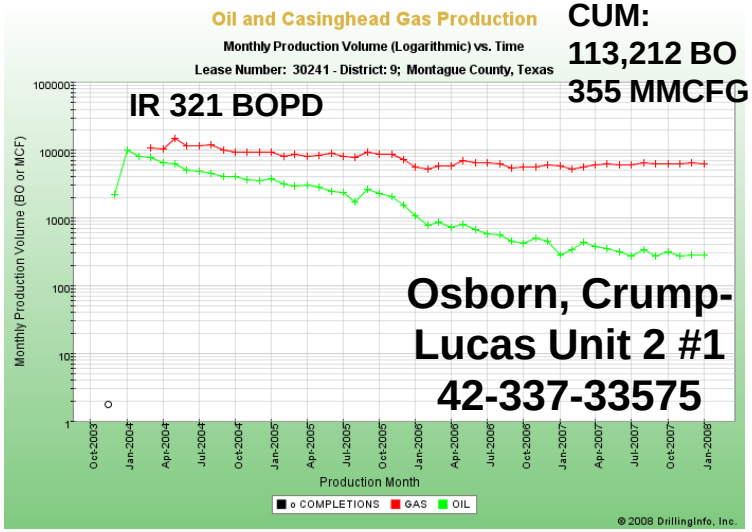
Production Rates & Declines for Selected St. Jo Ridge (Barnett Shale) Oil Producers



CUM:
10,809 BO
59 MMCFG

IR 113 BOPD

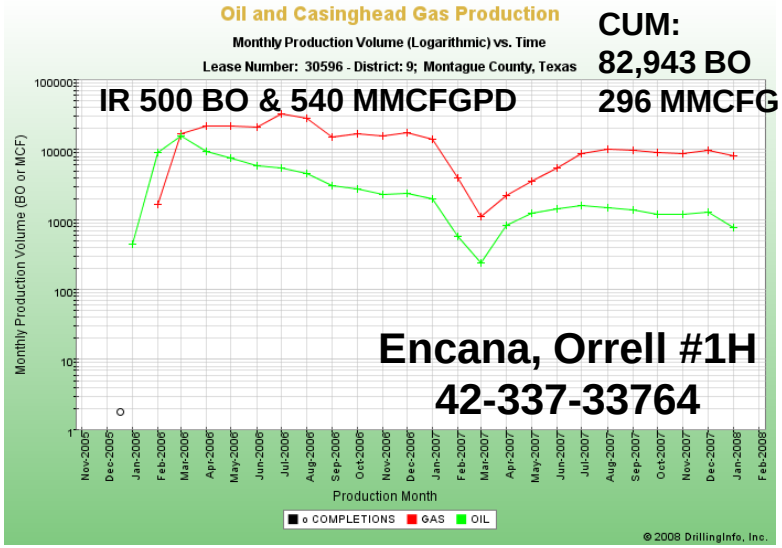
Peak, Baker #1
42-337-33683



CUM:
113,212 BO
355 MMCFG

IR 321 BOPD

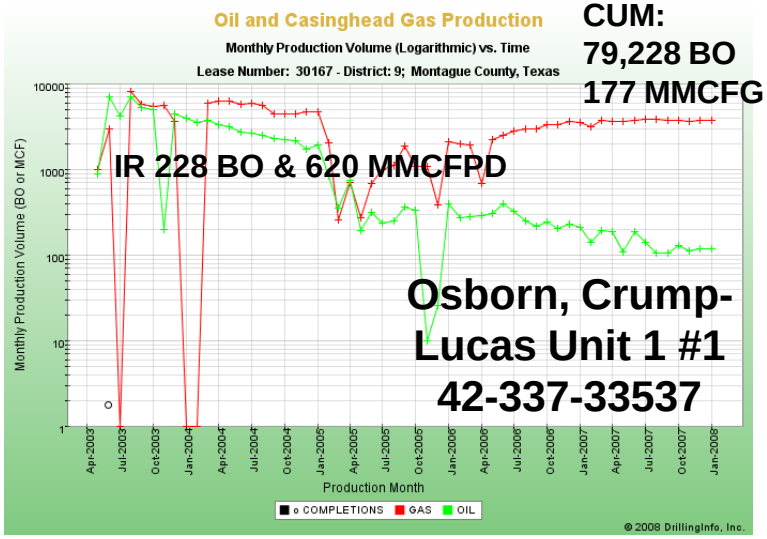
Osborn, Crump-
Lucas Unit 2 #1
42-337-33575



CUM:
82,943 BO
296 MMCFG

IR 500 BO & 540 MMCFGPD

Encana, Orrell #1H
42-337-33764



CUM:
79,228 BO
177 MMCFG

IR 228 BO & 620 MMCFPD

Osborn, Crump-
Lucas Unit 1 #1
42-337-33537

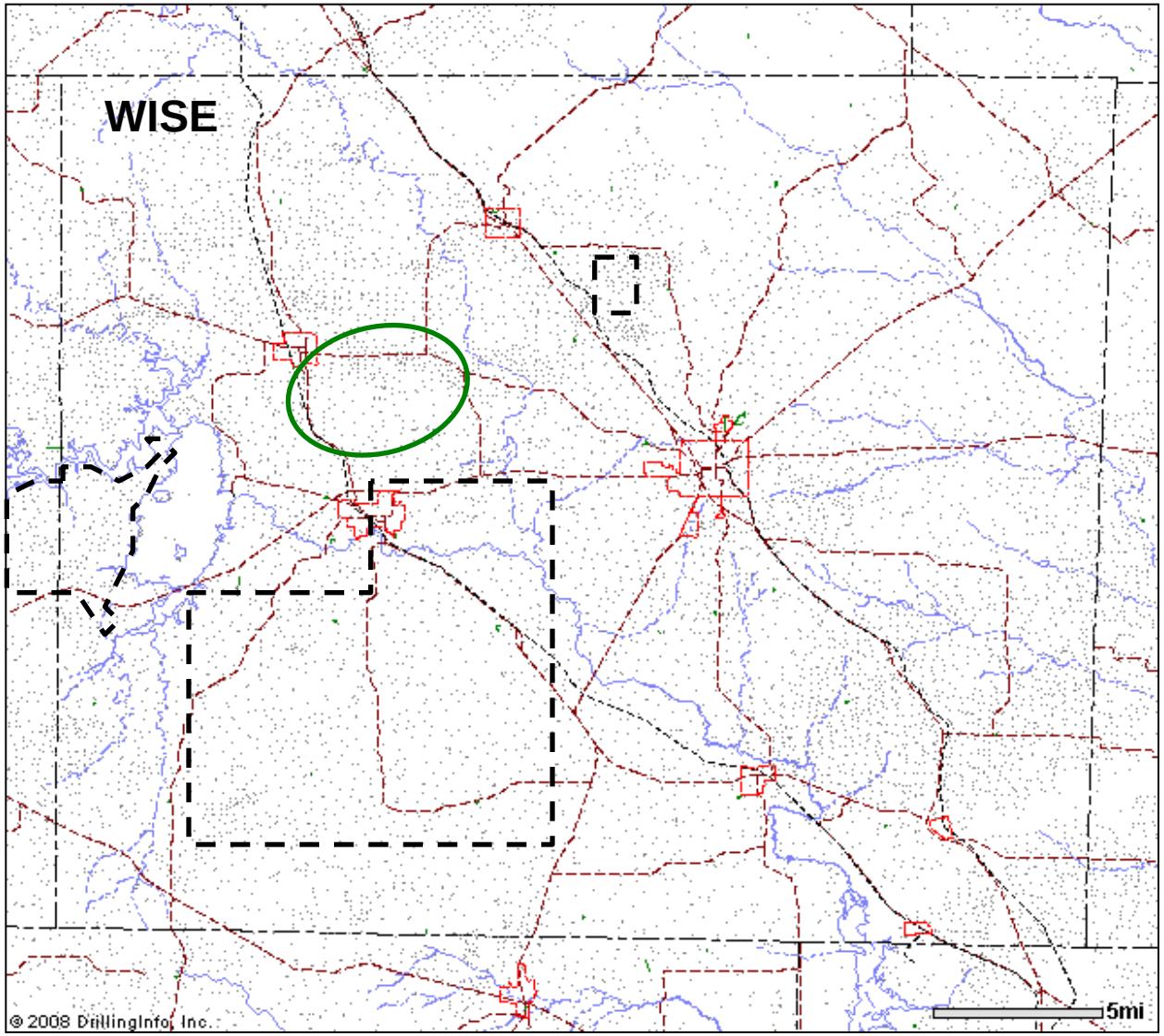
Map Source: DrillingInfo,Inc.
Prepared by: Emily Mitchell

Karst Example

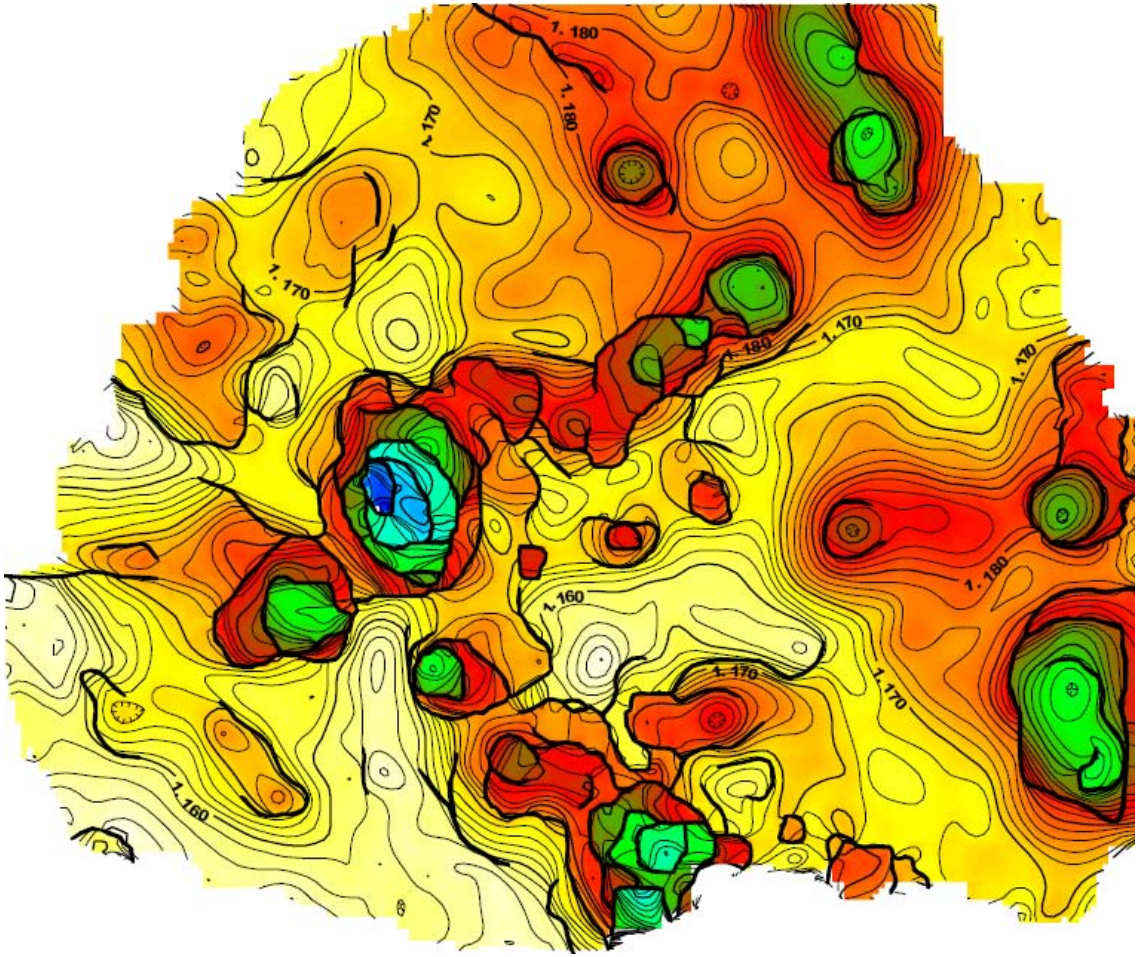
Boonsville (Basal Atoka) Area - Karst Chimney Production

5 wells
Cumulative Production of 265,000 BO & 3.2 BCFG

3-D seismic data sets that encountered numerous karst features

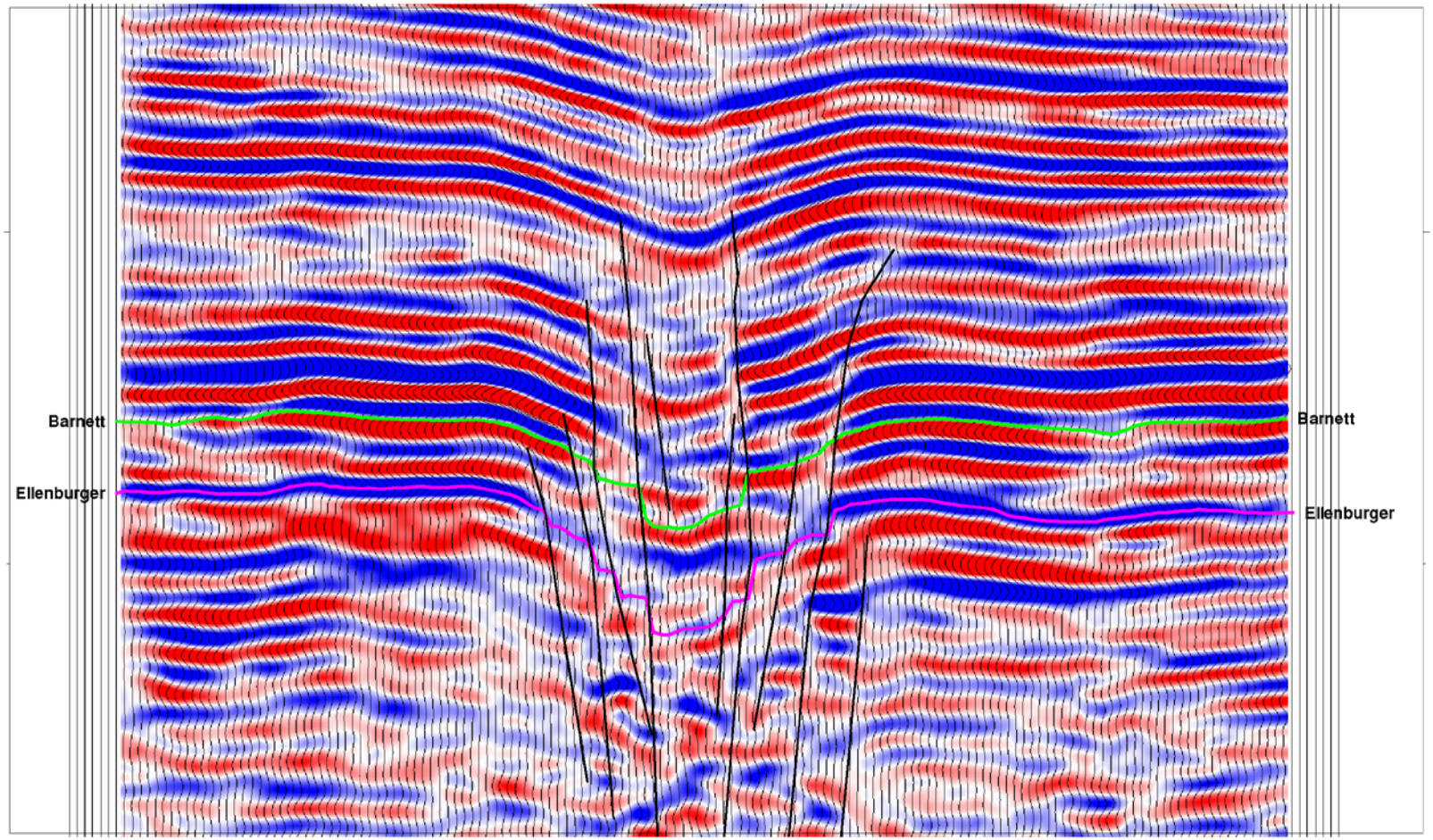


3D Seismic Coverage Featuring Extensive Karst Formation in the Ellenburger

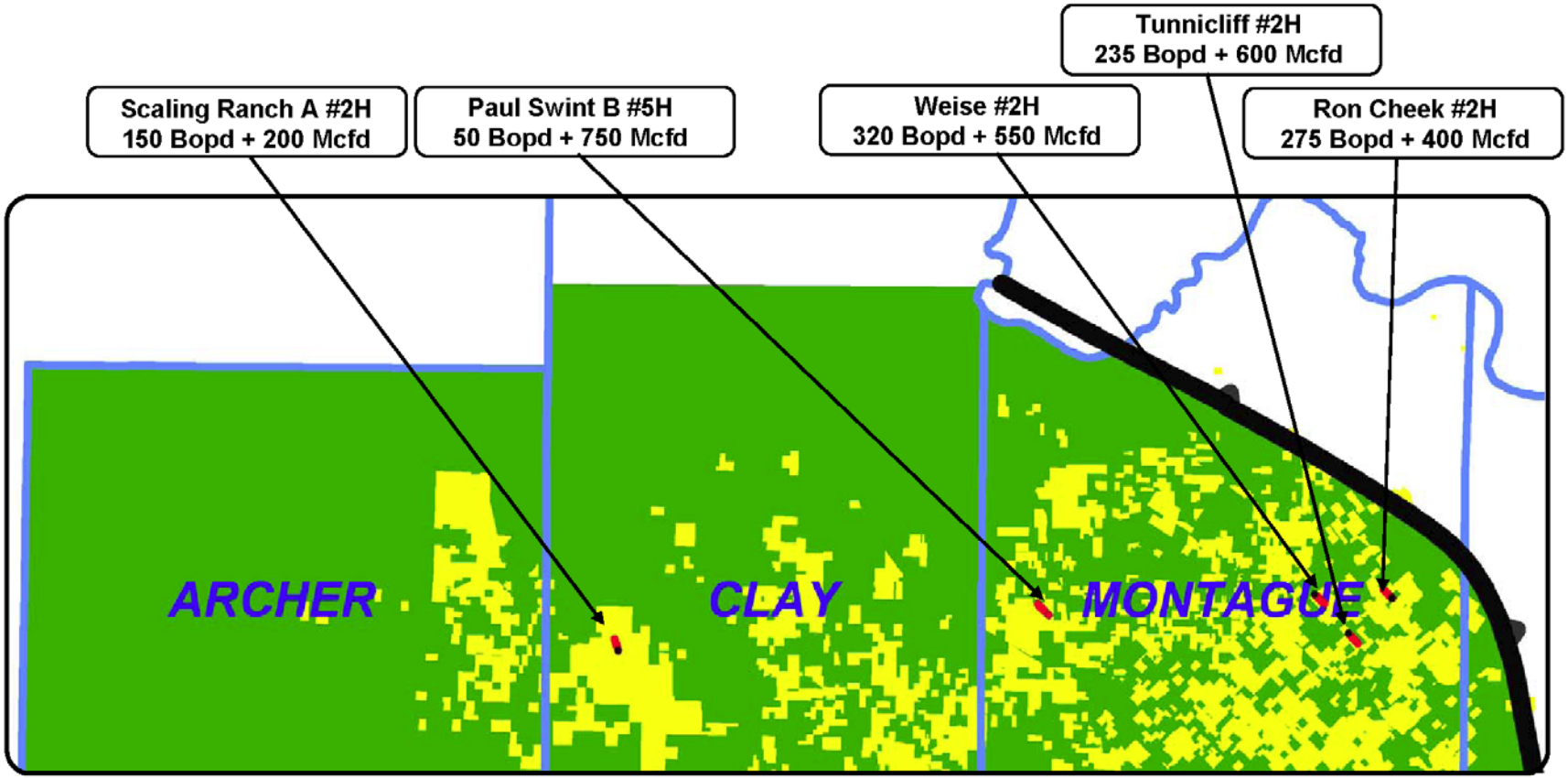


Structure on top of the Ellenburger

Karst Chimney Example



EOG Resources
Barnett Shale Oil Play



Oil Play Concerns

- Stimulation
- Drilling Cost
- Product Pricing
- Estimated Recovery efficiencies short term/long term
- Resource play or typical fracture play?

Acknowledgements

Republic Energy Op.

Brad Curtis

Emily Mitchell