

Louisiana Oil and Gas Symposium-April 2019

Shale and Chalk Plays in Louisiana

Shale and Chalk Plays in Louisiana
A Brief Historical Review
Current Activity Summary
Future Potential

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Shale and Chalk Plays in Louisiana- Summary

- **Haynesville Shale**
 - Dry gas
 - North Louisiana and Texas
 - DeSoto, Caddo, Sabine, Bossier, Red River Parishes
 - Panola and Harrison Counties
 - 40 rigs and over 100 active permits
 - 20,000' MD horizontal wells
- **Tuscaloosa Marine Shale**
 - Oil
 - E Central Louisiana and W Central Mississippi
 - Avoyelles, E and W Feliciana, St. Helena, Tangipahoa Parishes
 - Wilkinson, Amite, and McComb Counties
 - 1 active rig, completions peaked in 2015
 - 19,000' MD horizontal wells
- **Austin Chalk**
 - Oil and Gas
 - (Re)emerging Louisiana play (fracture stimulation)
 - Central Louisiana and Texas
 - Successful fracs applied in Eagle Ford offsets in Texas

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Shale and Chalk Plays in Louisiana- Geology

Recent USGS Oil and Gas Assessments in the Gulf Basin

PERIOD	EPICHI	AGE	GROUP OR FORMATION	GAS	OIL	SOURCE ROCK	
	FLI					Shale Coal	
TERTIARY	QUAT.	Calabrian	Undifferentiated	▲	●		
		Pliocene	Undifferentiated	▲	●		
	NEOGENE	Piacenzian	Undifferentiated	▲	●		
		Zanclean	Undifferentiated	▲	●		
		Messinian Tortonian Serravallian Langhian Burdigalian Aquitanian	Fleming	▲	●		
	PALEOGENE	Oligocene	Chattian	Catahoula Anahuac Frio	▲	●	
			Rupelian	Vicksburg	▲	●	
		Eocene	Priabonian	Jackson		●	■ ★
		Bartonian	Claiborne	▲	●	■ ★	
		Lutetian	Wilcox	▲	●	■ ★	
CRETACEOUS	UPPER	Maastrichtian	Navarro (Olmos-Escondido)	▲	●	■ ★	
		Campanian	Taylor (Anacacho/ San Miguel/ Ozan/Anzona)	▲	●	■	
	UPPER	Santonian	Austin/ Tokio/ Eutaw	▲	●	■	
		Coniacian	Austin/ Tokio/ Eutaw	▲	●	■	
		Turonian	Eagle Ford	▲	●	■	
		Cenomanian	Woodbine/ Tuscaloosa	▲	●	■	
	LOWER	Albian	Washita (Buda) Fredericksburg (Edwards/Paluxy) Glen Rose (Rodessa)	▲	●	■	
		Albian	Washita (Buda) Fredericksburg (Edwards/Paluxy) Glen Rose (Rodessa)	▲	●	■	
		Albian	Fredericksburg (Edwards/Paluxy) Glen Rose (Rodessa)	▲	●	■	
		Albian	Fredericksburg (Edwards/Paluxy) Glen Rose (Rodessa)	▲	●	■	
Aptian		Pearsall-James	▲	●	■		
Aptian		Pearsall-James	▲	●	■		
UPPER	Aptian	Hosston (Travis Peak)	▲	●	■ ★		
	Barremian	Hosston (Travis Peak)	▲	●	■ ★		
	Hauterivian	Hosston (Travis Peak)	▲	●	■ ★		
	Valanginian	Cotton Valley	▲	●	■		
	Berriasian	Cotton Valley	▲	●	■		
UPPER	Tithonian	Cotton Valley	▲	●	■		
	Kimmeridgian	Haynesville/ Bossier	▲	●	■		
JURASSIC	UPPER	Oxfordian	Smackover Norphlet	▲	●	■	
		Callovian	Louann Salt				
	MID.	Bathonian	Werner				
UPPER	UPPER	Hettangian	Eagle Mills				
		Rhaetian	Eagle Mills				
UP.	Norian	Eagle Mills					
UP.	Carnian	Eagle Mills					

Assessed 2007:
Tertiary Strata Fact Sheet 2007-3066

Assessed 2007:
Cretaceous-Tertiary Coal Beds Fact Sheet 2007-3039

Assessed 2003:
USGS Fact Sheet 2004-3114 and Digital Data Series DDS 69-H

Assessed 2010:
USGS Fact Sheets 2011-3046 and 2012-3003

Assessed 2001:
USGS Fact Sheet 2006-3146

Assessed 2010:
USGS Fact Sheet 2011-3020

Assessed 2002:
USGS Fact Sheets 047-03, 085-03, and Digital Data Series DDS 69-E

Assessed 2001:
South Florida USGS Digital Data Series DDS 69-A

Upper Cretaceous

- Austin Chalk
- Eagle Ford/TMS (source rock)
- Woodbine/Tuscaloosa

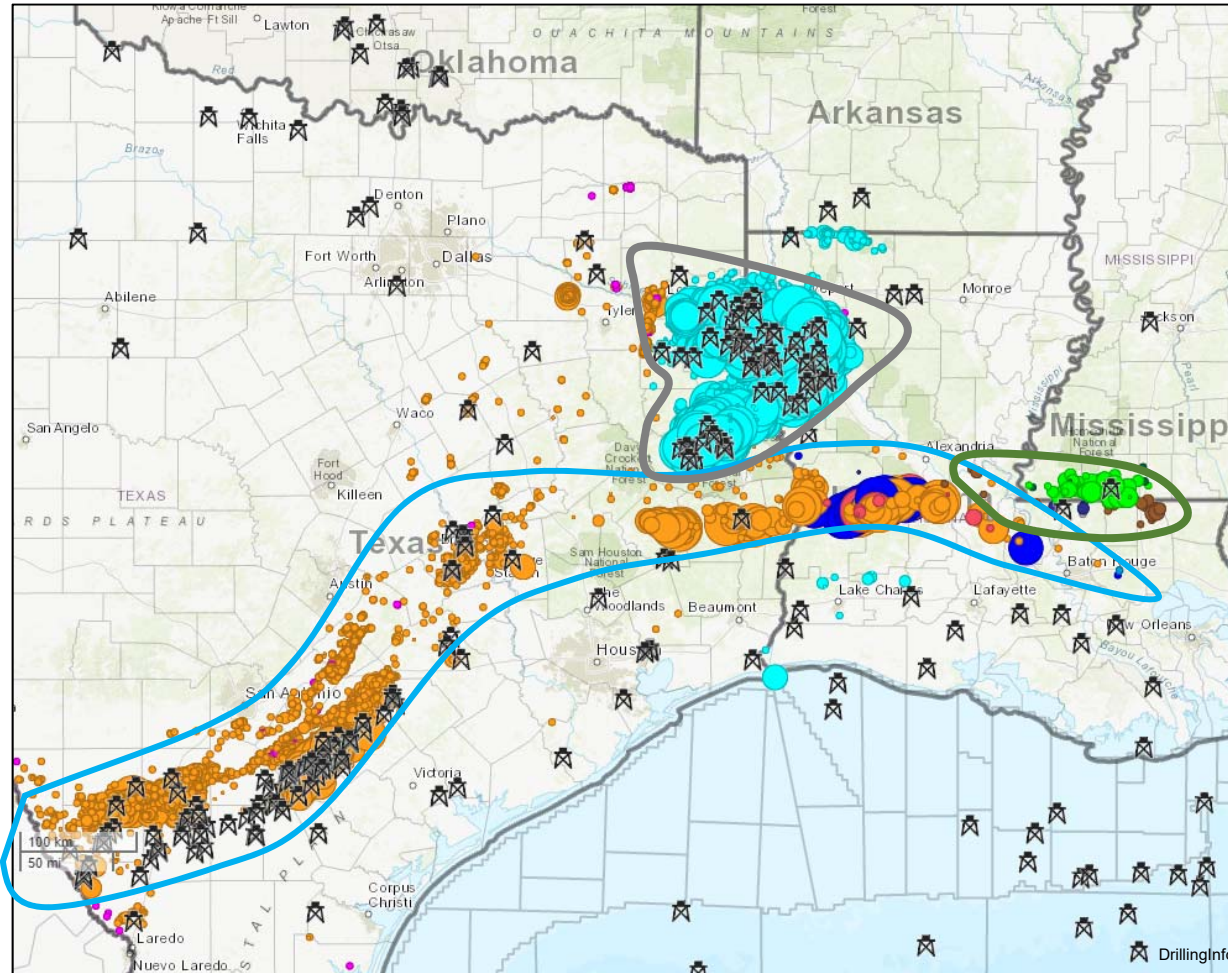
Upper Jurassic

- Haynesville (source rock)

PERIOD	EPICHI	AGE	GROUP OR FORMATION	GAS	OIL	SOURCE ROCK
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	Kimmeridgian	Haynesville/ Bossier	▲	●		

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Shale and Chalk Plays in Louisiana- Summary



Historical Completions LA-MS-TX

Haynesville Shale

- Horizontal
- Frac

TMS

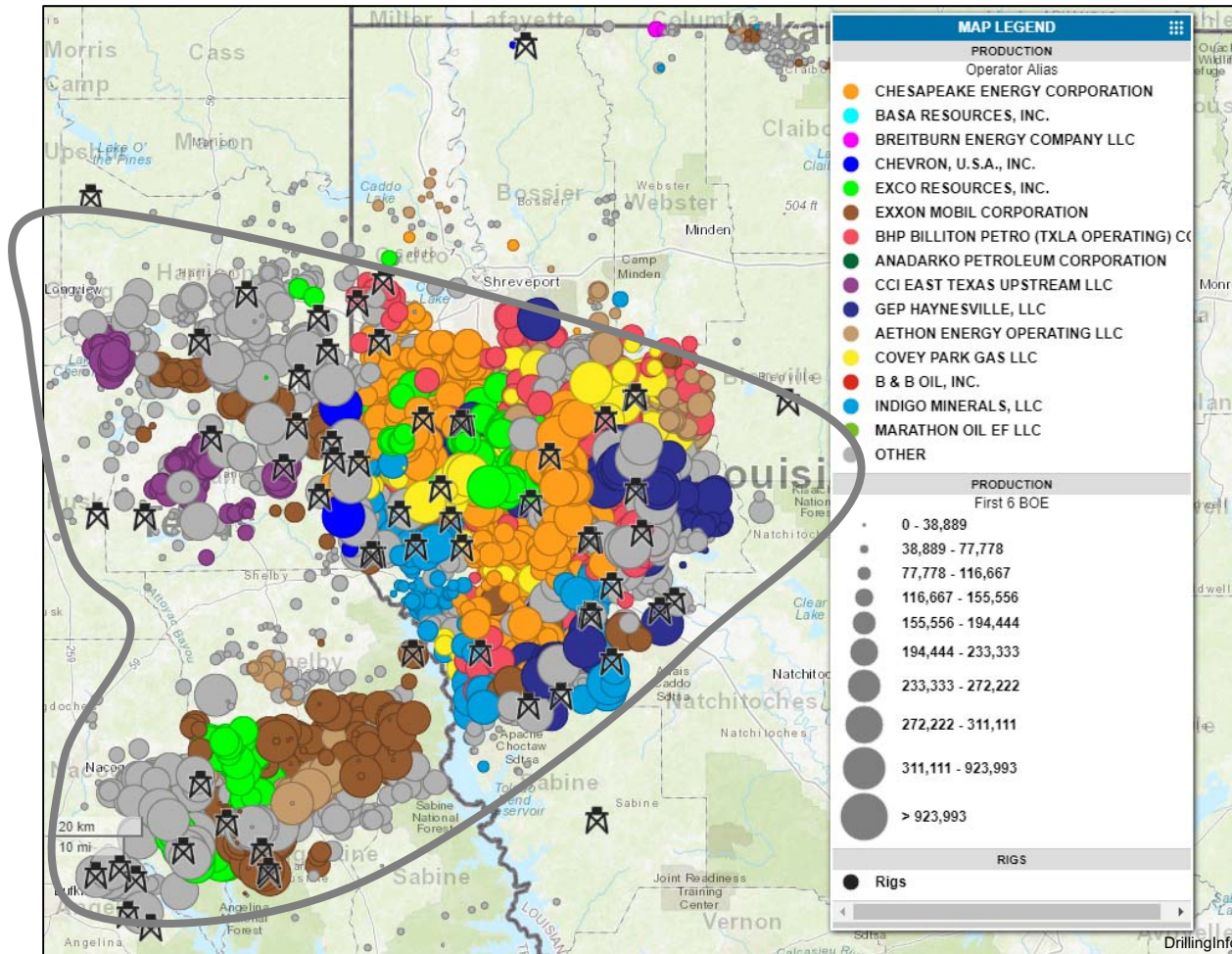
- Horizontal
- Frac

Austin Chalk

- Vertical
- Horizontal
- Frac

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Shale and Chalk Plays in Louisiana

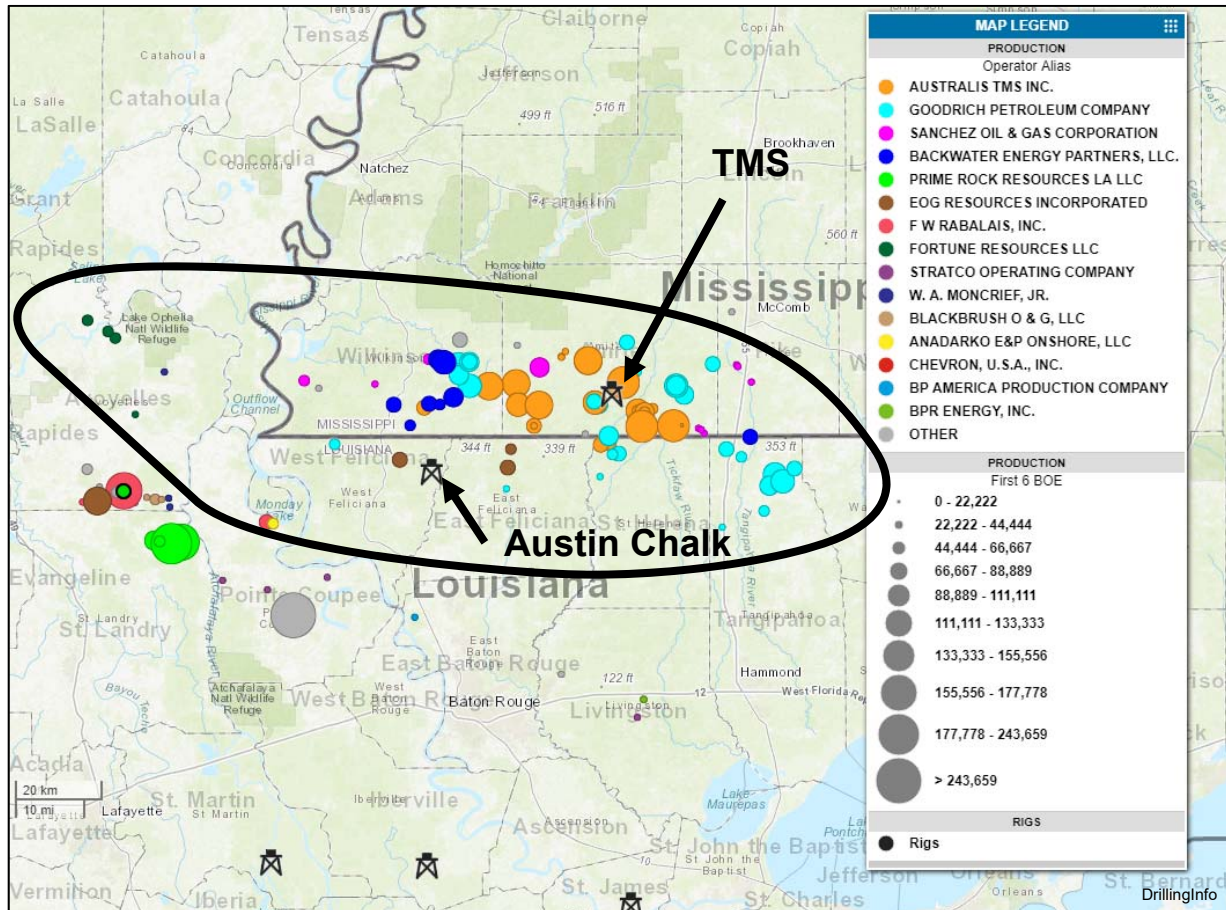


Haynesville Shale

- 2,390 (LA)
- 1,360 (TX)
- Dry Gas
- 1st 6 mos-250 MBOE

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Shale and Chalk Plays in Louisiana

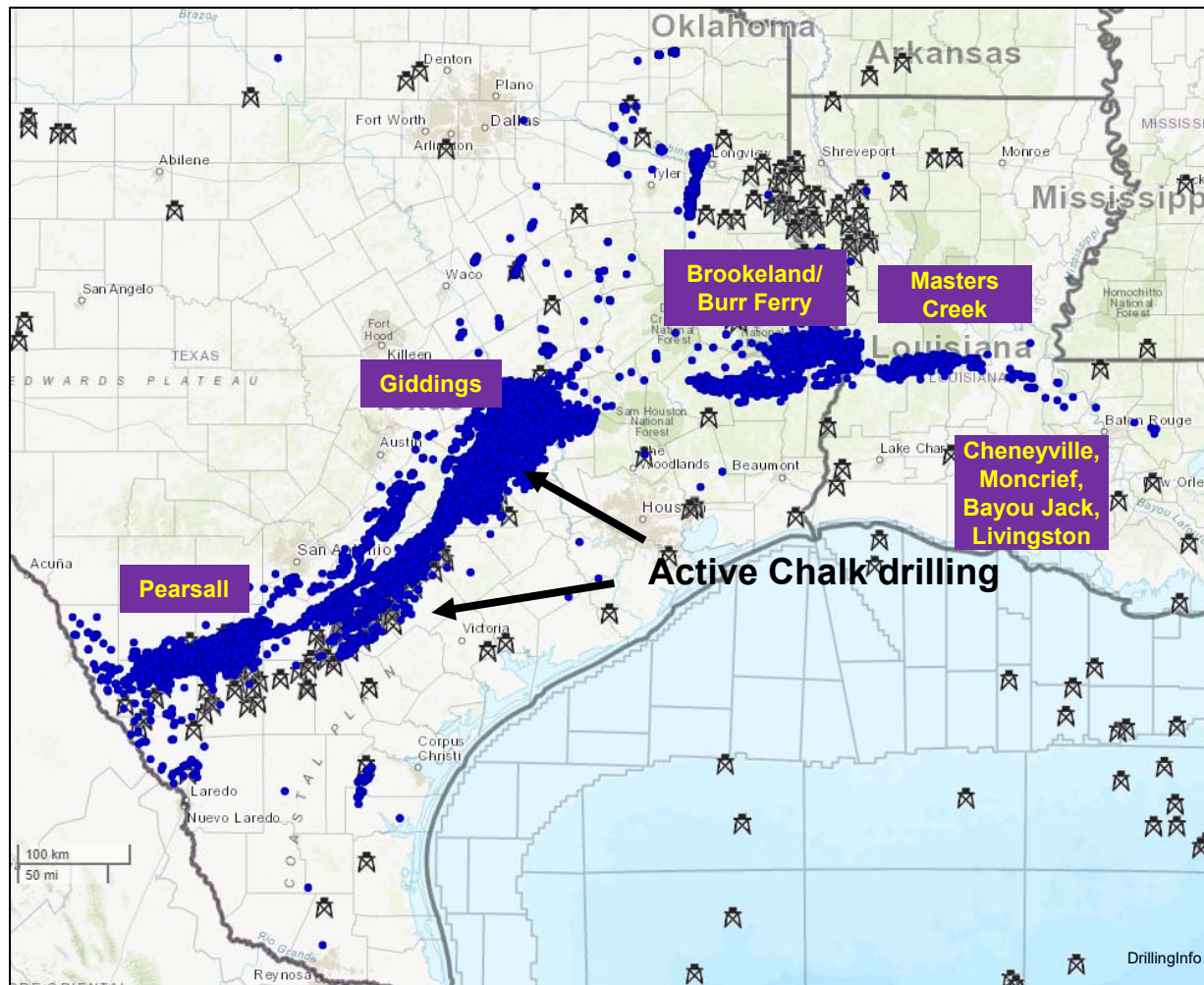


TMS Comps

- 250 (MS)
- 30 (LA)
- 1st 6 mos 120 MBOE

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Shale and Chalk Plays in Louisiana- Austin Chalk



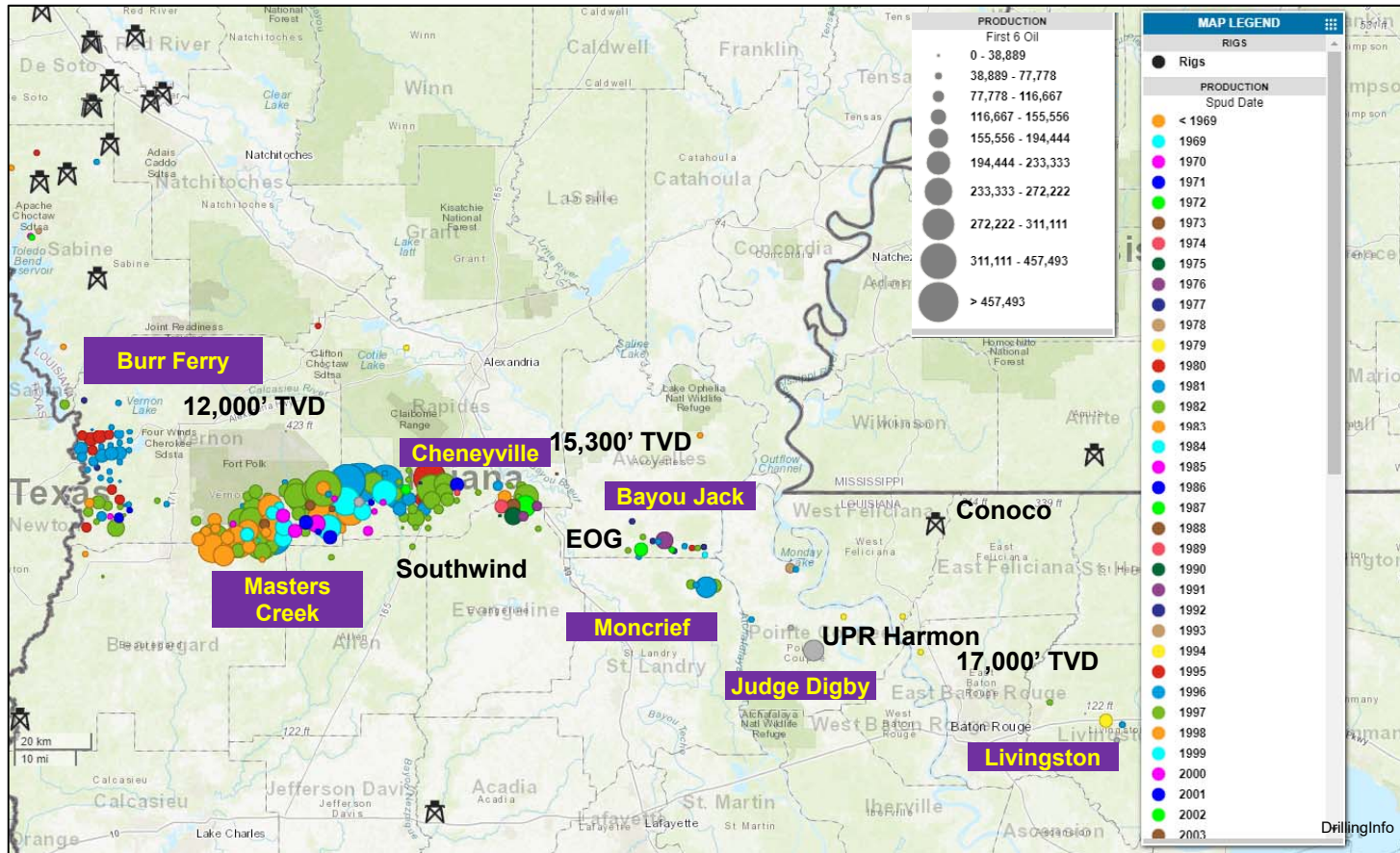
Austin Chalk Comps

- 21,500 (TX)
- 240 (LA)
- Historically exploited natural fractures
- Texas-recent development associated with Eagle Ford production in Karnes Co. and legacy Chalk production in Giddings Field in Washington and Lee Co.

1.8 billion BOE from Maverick County, Texas to Livingston Parish, Louisiana

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Shale and Chalk Plays in Louisiana- The Chalk Problem

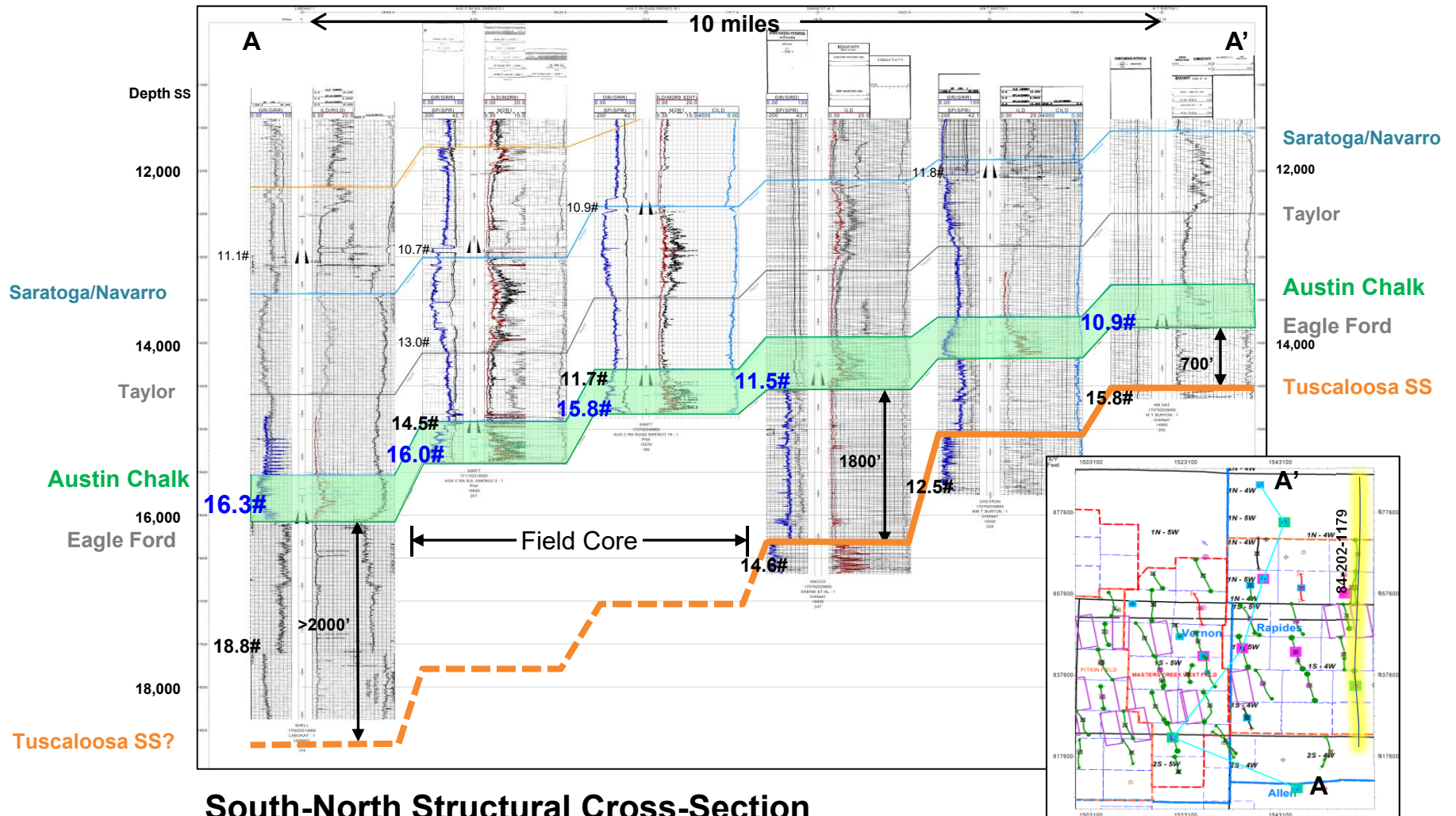


Historical Chalk Completions-first six months oil cumulative

- Perception-significant variation in well performance
- Significant number of 'big' wells in Masters Creek area (300 MBOE)
- Two mile laterals = 25,000' MD and greater; difficult and expensive

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Shale and Chalk Plays in Louisiana- Geology



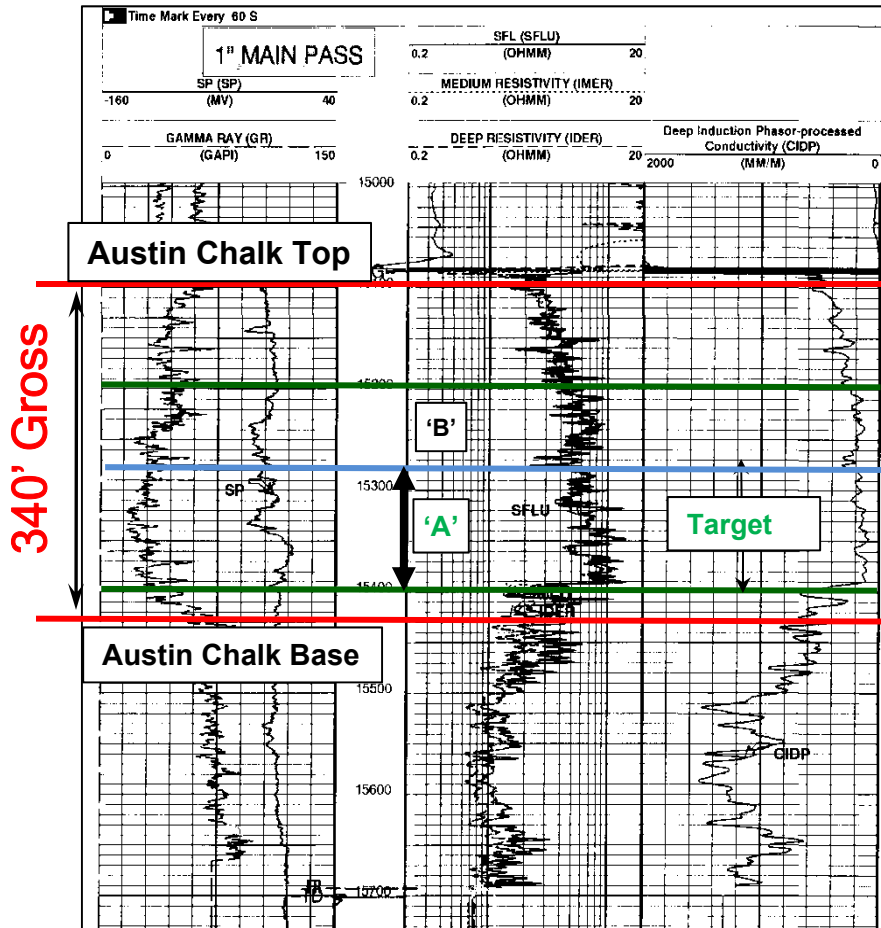
South-North Structural Cross-Section

- Austin Chalk maintains thickness
- Dramatic Eagle Ford thinning updip

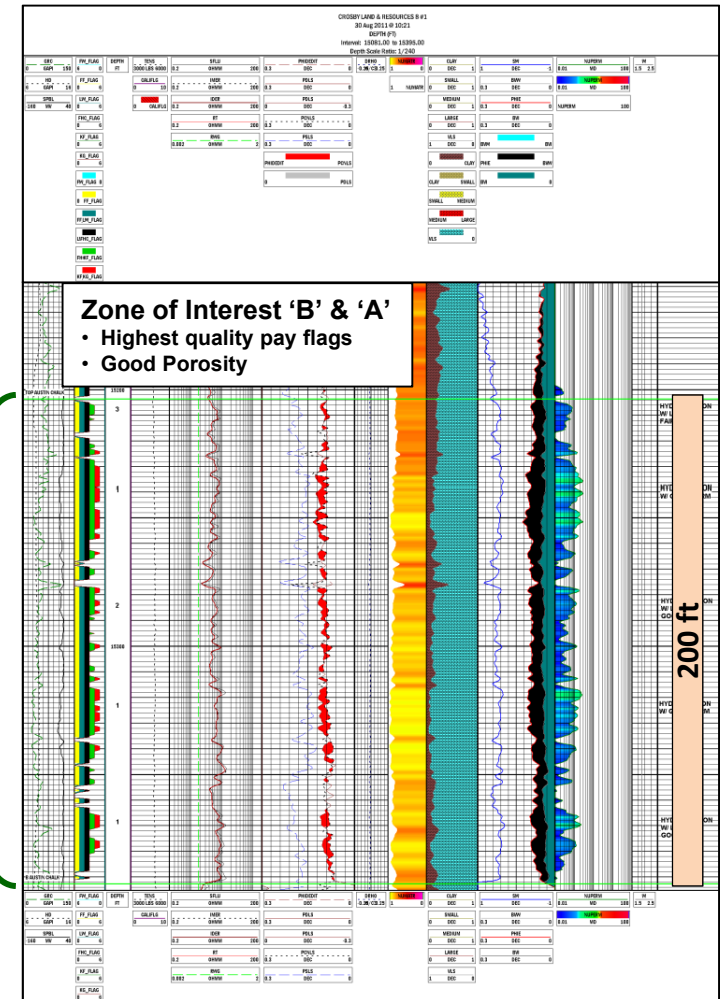
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Shale and Chalk Plays in Louisiana- Chalk Properties

Schlumberger 1" GR-SP-Induction Log



Austin Chalk Petrophysical Evaluation (Nutech)

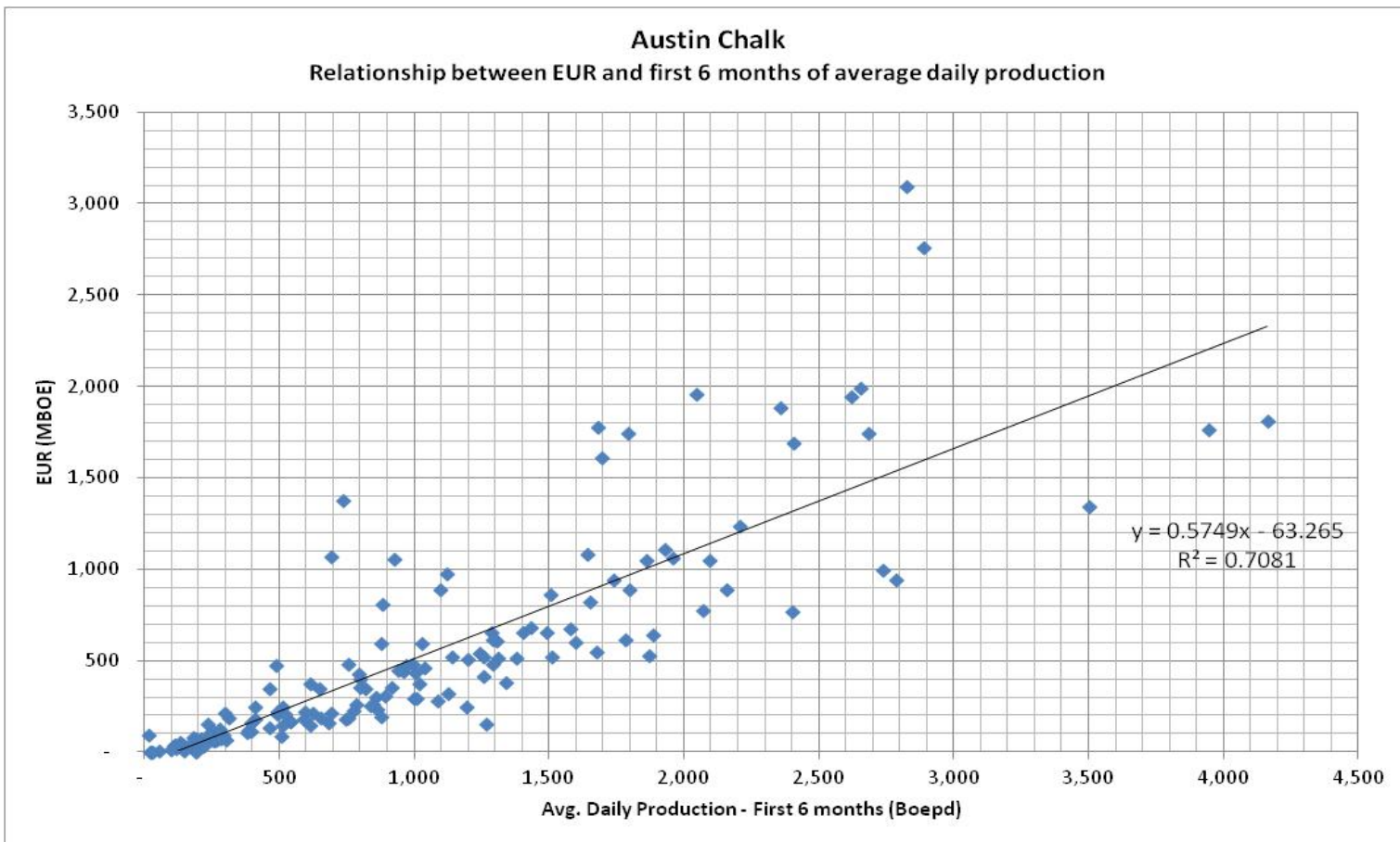


Chalk matrix: 9-12% Φ , 43% S_w

- Rock properties are consistent across the field
- Seven full Austin Chalk penetrations with full log suites

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Shale and Chalk Plays in Louisiana- Normalizing Production

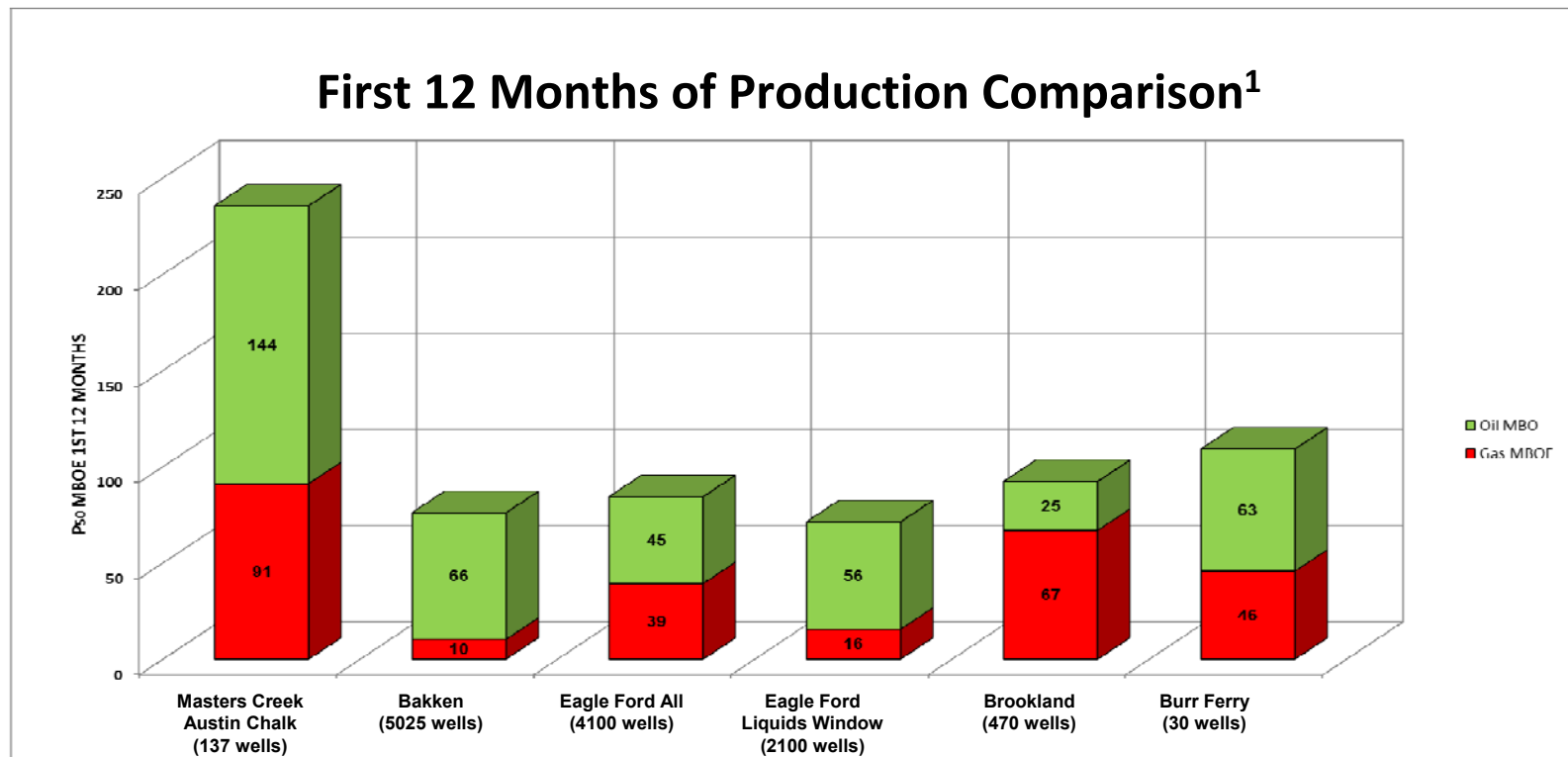


Average first six months daily oil production is a good predictor of EUR

- Quickly normalize production
- Longer times (12 months) improve the correlation

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Shale and Chalk Plays in Louisiana- What Chalk problem?



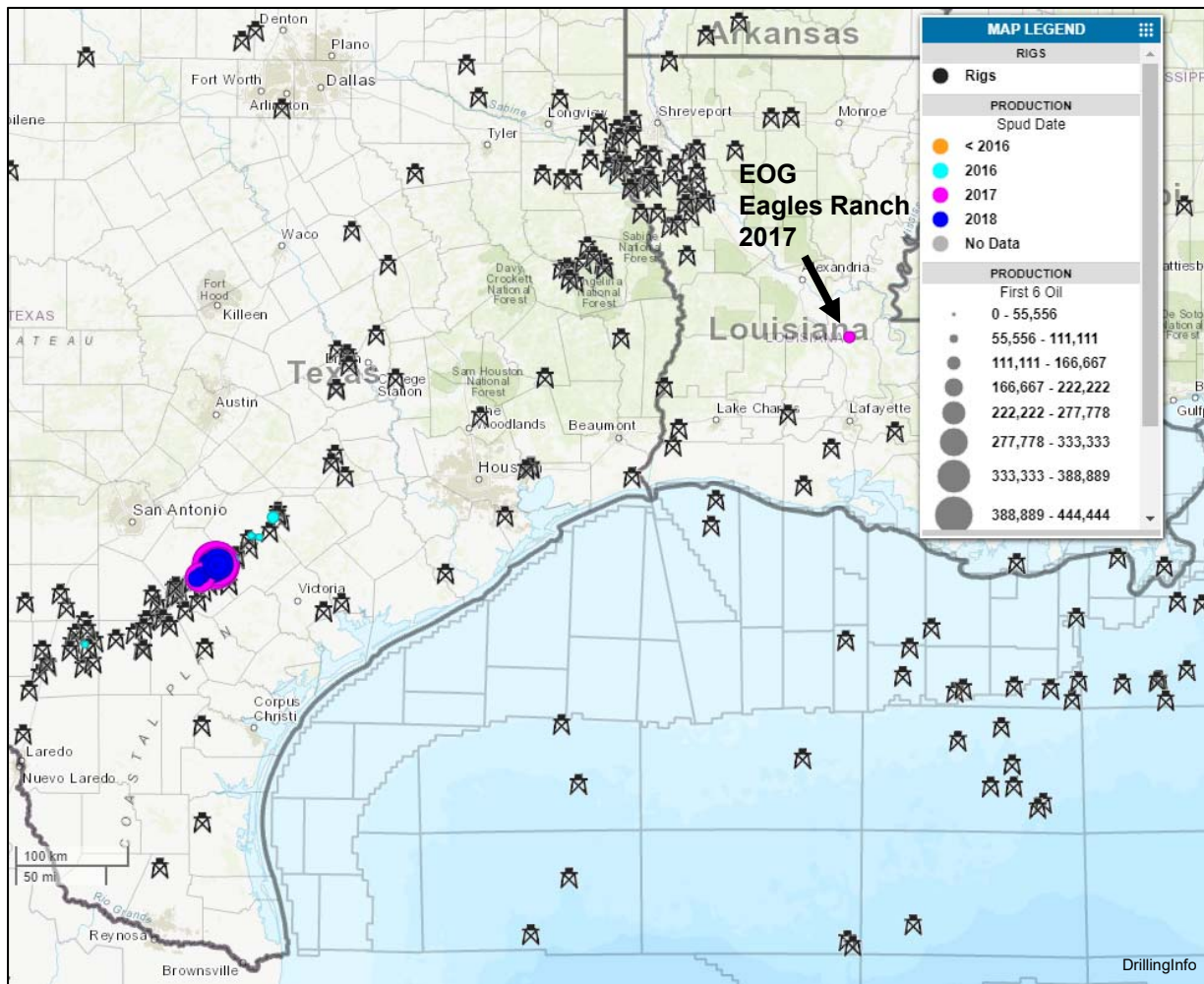
Where would you rather be?

- Masters Creek Austin Chalk vs resource plays and other chalk fields
- Not cherry-picked, driven by data quality (vertical vs. horizontal wells, comp dates)
- Updated through 2016

1- Per well comparison - P₅₀ case (IHS)

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Shale and Chalk Plays in Louisiana

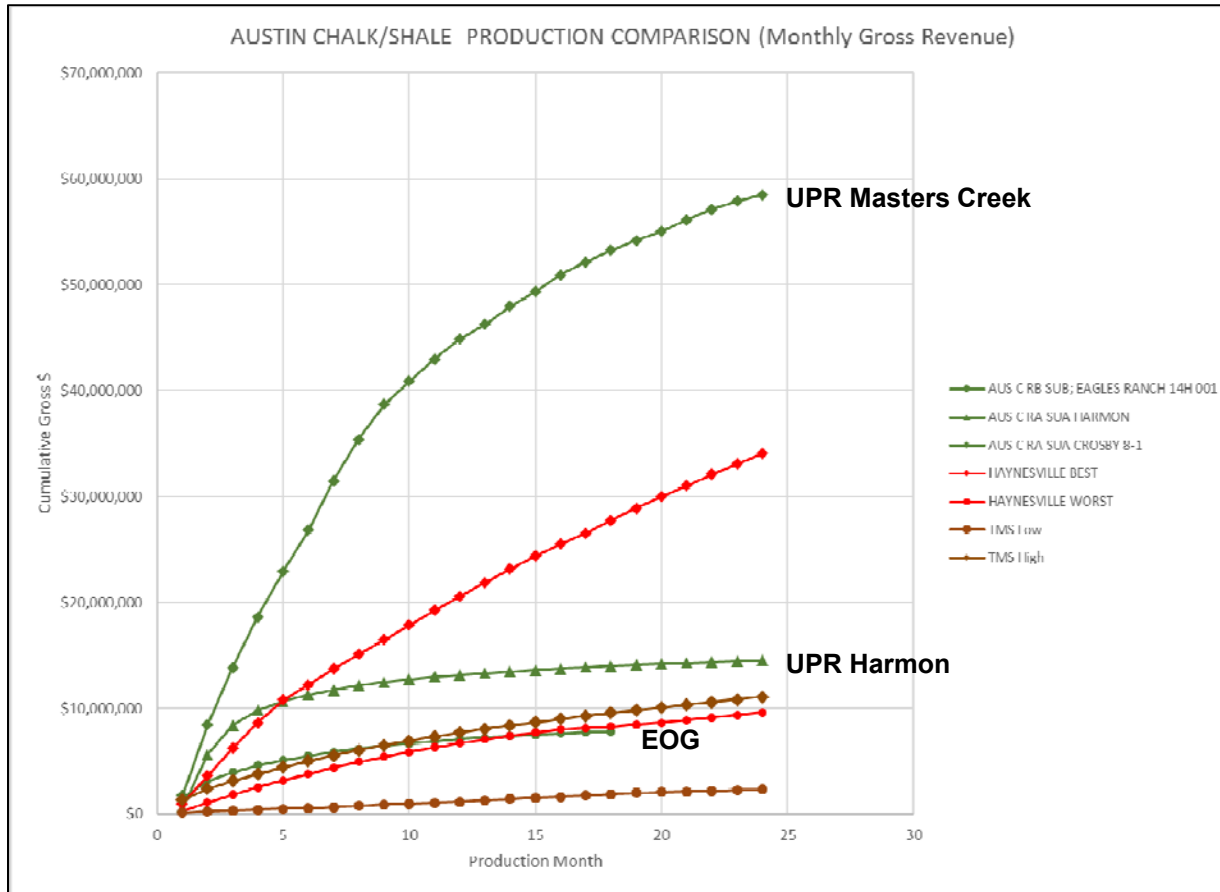


Austin Chalk EOG

- 2016 no frac or bad rocks
- 2017 frac-Karnes Co
- Outstanding results
 - 50 MBO 30 day
 - 400 MBO cum
- Make the Chalk repeatable
- Take it to Louisiana
 - 96 MBO Cum

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Shale and Chalk Plays in Louisiana



Cumulative Gross Revenue High and Low Cases

- Austin Chalk
- TMS
- Haynesville

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Shale and Chalk Plays in Louisiana

Shale and Chalk Plays in Louisiana

- Austin Chalk is an Emerging Play
 - Fracture Stimulation
- Austin Chalk Has Proven Upside
 - Masters Creek Analog
 - Large Resource Players Have Committed
 - Significant lease positions
- Early Results
 - EOG well is so-so
- Will there be a secret key?