What's After Shale?

Bryan McDowell

Founder & Managing Partner

Sabata Energy Consultants, Midland, TX

Website
www.sabata.com

LinkedIn
www.linkedin.com/in/bpmcdowell
www.linkedin.com/company/sabata-energy

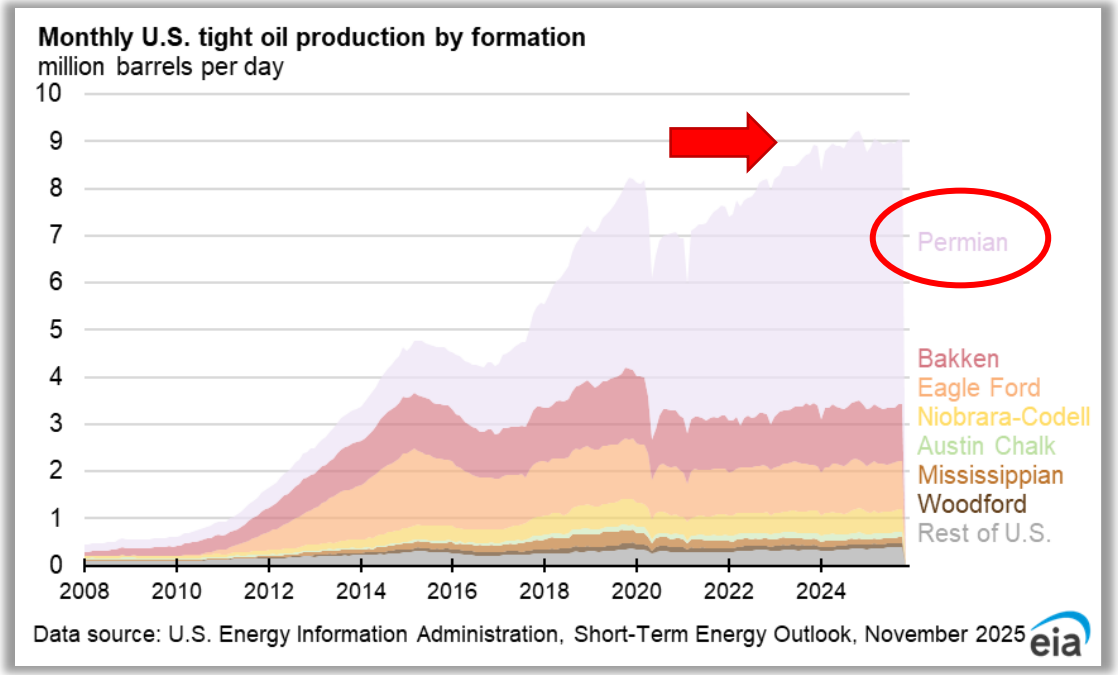
Phone
(432) 634-5051

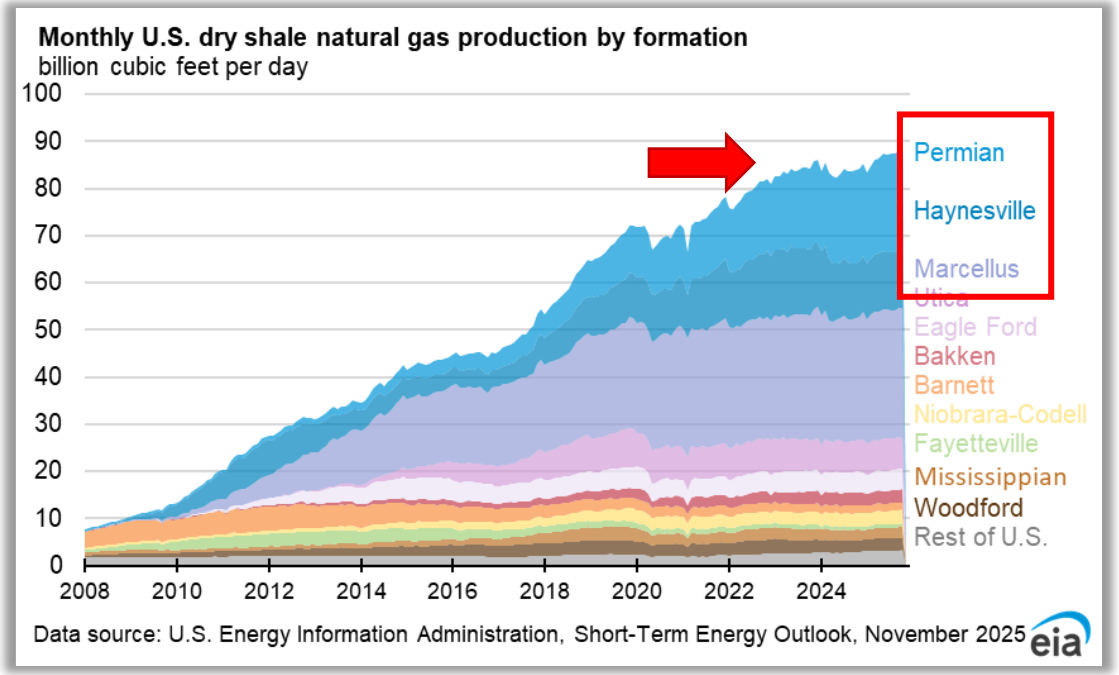
Email
bryan.mcdowell@sabata.com

Introduction

US Production Growth is Slowing…

Figures from EIA

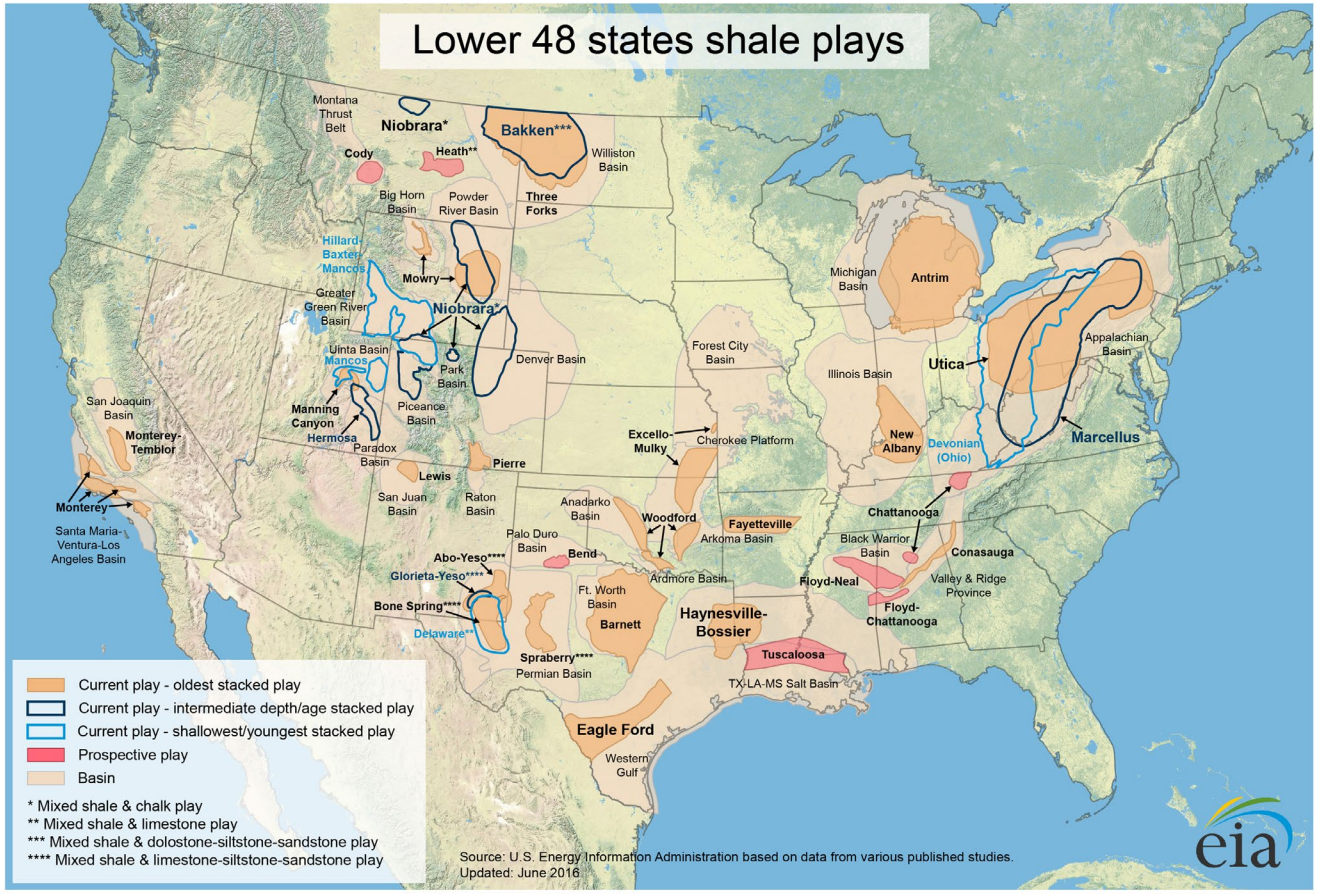




What's Next?

1. **Exploitation**
2. **Re-Entry**
3. **Exploration**

Figure from EIA (2016)



Strategy 1 - Exploitation

- **“Squeeze the asset harder”**

- **Ways to further exploit an existing acreage position:**
  - **Push to fringe areas** – Tier 2 and Tier 3 acreage
  - **Drill lower ROI targets** – Produce new benches above/below
  - **Consolidate and optimize** – Mergers, acquisitions, bolt-ons

- **Recent examples:**
  - **Permian Basin** – Devon/Coterra, Exxon/Pioneer, Diamondback/Endeavor, Oxy/Crownquest
  - **Other basins** – Catarus/SM, Chevron/Hess, Conoco/Marathon, Chesapeake/Southwestern

- **Low Risk, Low-to-High Costs**
  - Option #3 is especially expensive in the Permian

Strategy 2 – Re-Entry

- **Applying new understanding/technology in old areas**
  - “Remember that well we drilled in 2014?”
- **Driven primarily by D&C**
  - Basic geologic understanding plateaued in shales before COVID
- **Recent examples:**
  - Uinta Basin (Green River/Wasatch) – SM Energy, Quantum
  - Appalachian Basin (Utica Shale) – EOG
  - East Texas Basin (Haynesville) – Comstock, Expand
- **Moderate Risk, Moderate Cost**

Strategy 3 – Exploration

- **Test new intervals and/or new areas**

- **Recent examples:**
  - Barnett & Woodford Shales (Permian basin)
  - Cherokee Shale (Anadarko basin)
  - Mancos/Niobrara Shale (Uinta, Washakie, Piceance basins)
  - International – EOG, Continental

- **High Risk, Low Cost**
  - Largest potential for short-term or long-term profits
  - Two exit strategies – Build & Flip, Lease & Develop

Strategy 3 – Exploration

- Test new intervals and/or new areas

Let's Talk About This More…

  - International – EOG, Continental

- **High Risk, Low Cost**
  - Largest potential for short-term or long-term profits
  - Two exit strategies – Build & Flip, Lease & Develop

The Problems (with Exploration)

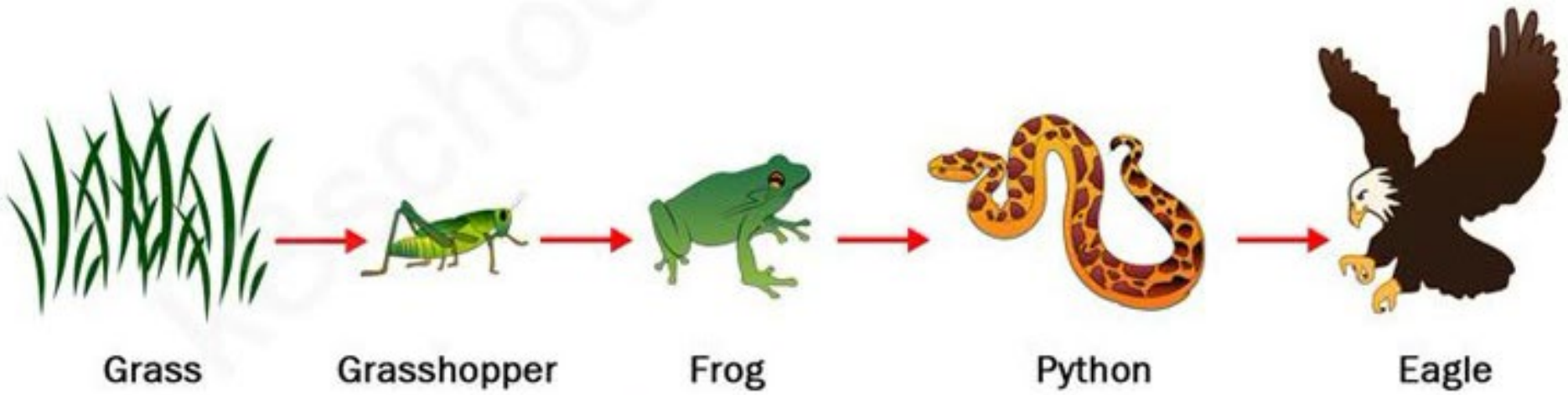
Problem #1 – Minimum Requirements

- **Exploration is a three-legged stool** at a minimum

- **Requirements:**
  - **Funding** – Tough but findable
  - **Expertise** – Lowest in decades
  - **Risk tolerance** – Ruined by shale

**** POLL ****

Problem #2 – Exploration Food Chain



Prospect Shops → **Deal Flow** → **Majors & Independents**

Problem #3 – Unique Datasets

			Data Availability		
			Tier 1	Tier 2	Tier 3
			On-Demand	On-Request	Dark
Data Ownership	Tier A	Public	Tier 1A	Tier 2A	Tier 3A
	Tier B	Private	Tier 1B	Tier 2B	Tier 3B

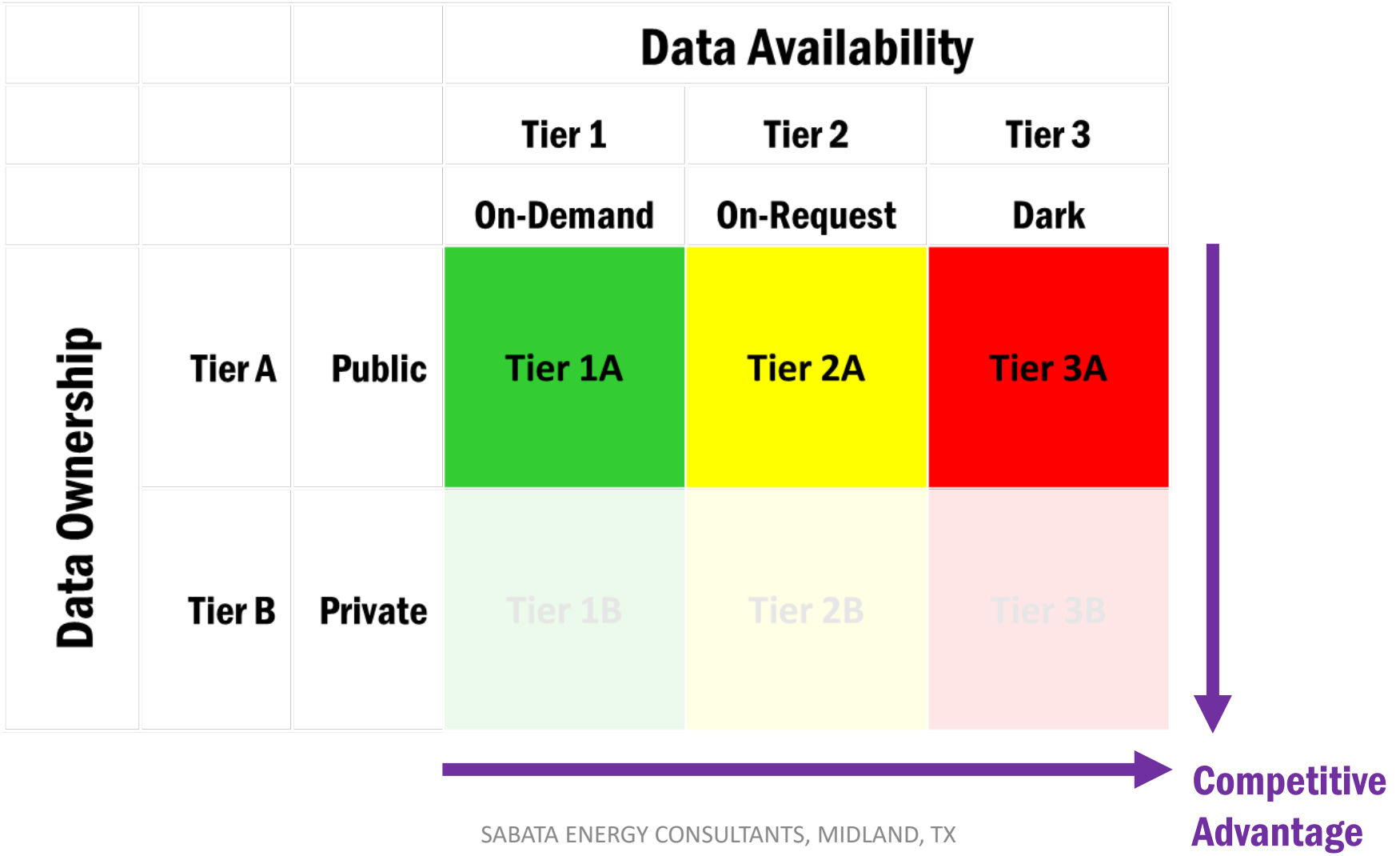
Competitive Advantage

Problem #3 – Traditional Data Vendors

			Data Availability		
			Tier 1	Tier 2	Tier 3
			On-Demand	On-Request	Dark
Data Ownership	Tier A	Public	Tier 1A	Tier 2A	Tier 3A
	Tier B	Private	Tier 1B	Tier 2B	Tier 3B

Competitive Advantage

Problem #3 – Regulatory Agencies



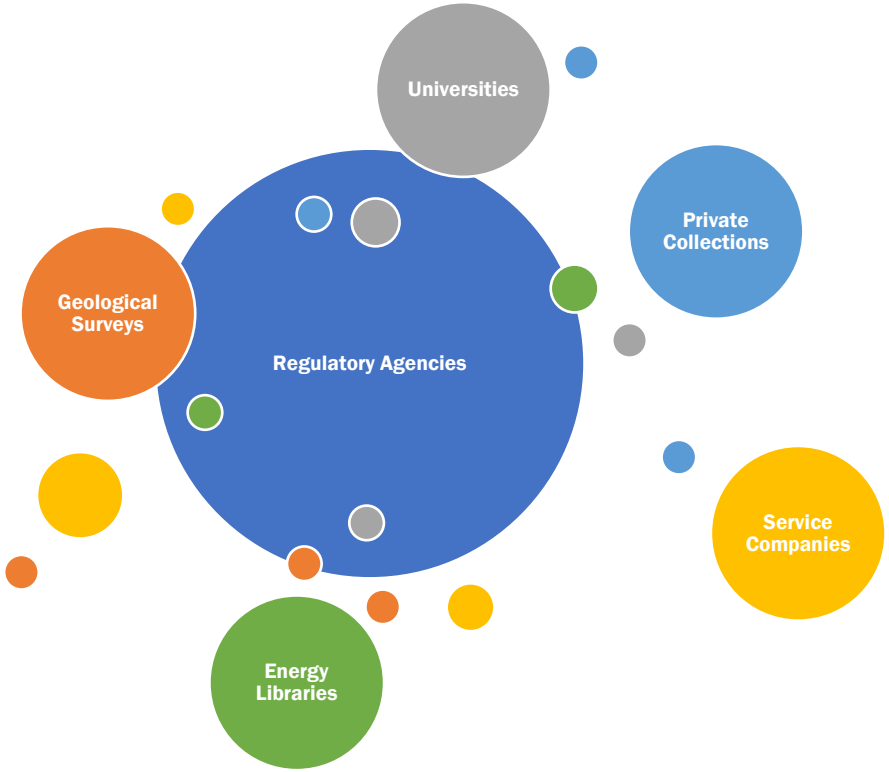
Problem #3 – Private Collections

			Data Availability		
			Tier 1	Tier 2	Tier 3
			On-Demand	On-Request	Dark
Data Ownership	Tier A	Public	Tier 1A	Tier 2A	Tier 3A
	Tier B	Private	Tier 1B	Tier 2B	Tier 3B

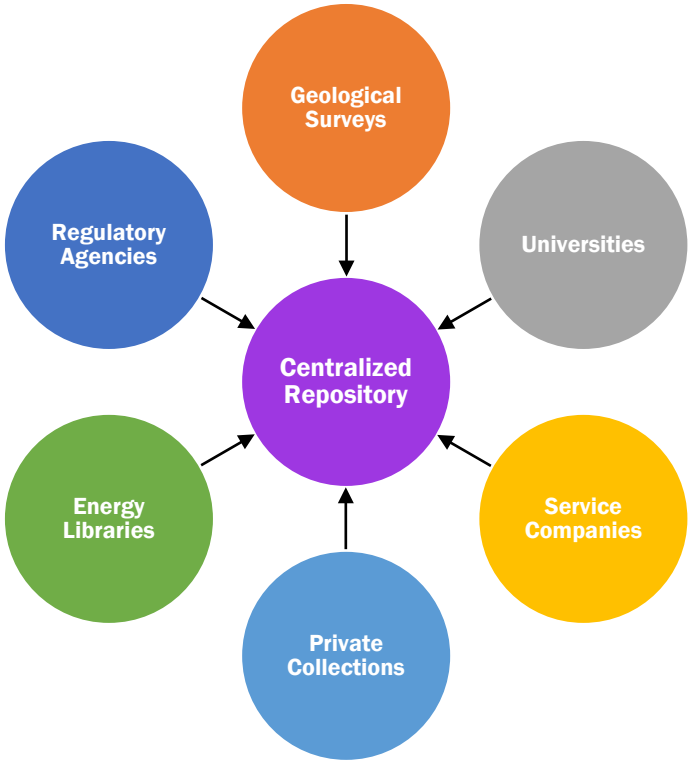
Competitive Advantage

Problem #4 – Data Deliverability

Usual Data Model



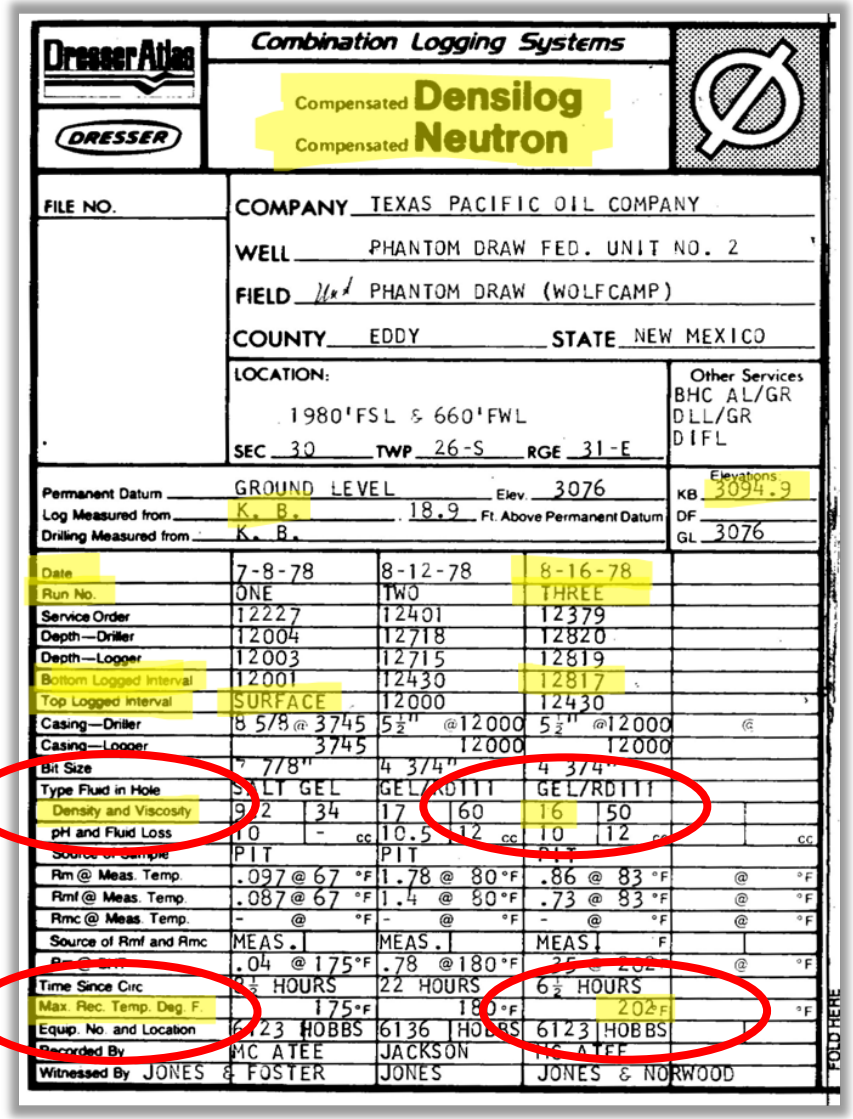
Ideal Data Model



Empirical Exploration

Empirical Exploration

- **Where's the best place to find oil & gas?**
  - It's <u>where you've already found it</u>
- **Millions of data points stranded on paper, TIFs, etc.**
  - Most data companies have given up adding new data
  - Focused on building SaaS instead
- **Well log headers a few key data fields:**
  - **Mud density** – Proxy for pressure
  - **Bottomhole temperature** – Proxy for maturity
- Not perfect, but you can generally <u>trust the trend</u>



Dresser Atlas / DRESSER

Combination Logging Systems

Compensated Densilog
Compensated Neutron

FILE NO.

COMPANY TEXAS PACIFIC OIL COMPANY
WELL PHANTOM DRAW FED. UNIT NO. 2
FIELD Wildcat PHANTOM DRAW (WOLFCAMP)
COUNTY EDDY STATE NEW MEXICO

LOCATION:
1980'FSL & 660'FWL
SEC 30 TWP 26-S RGE 31-E

Other Services
BHC AL/GR
DLL/GR
DIFL

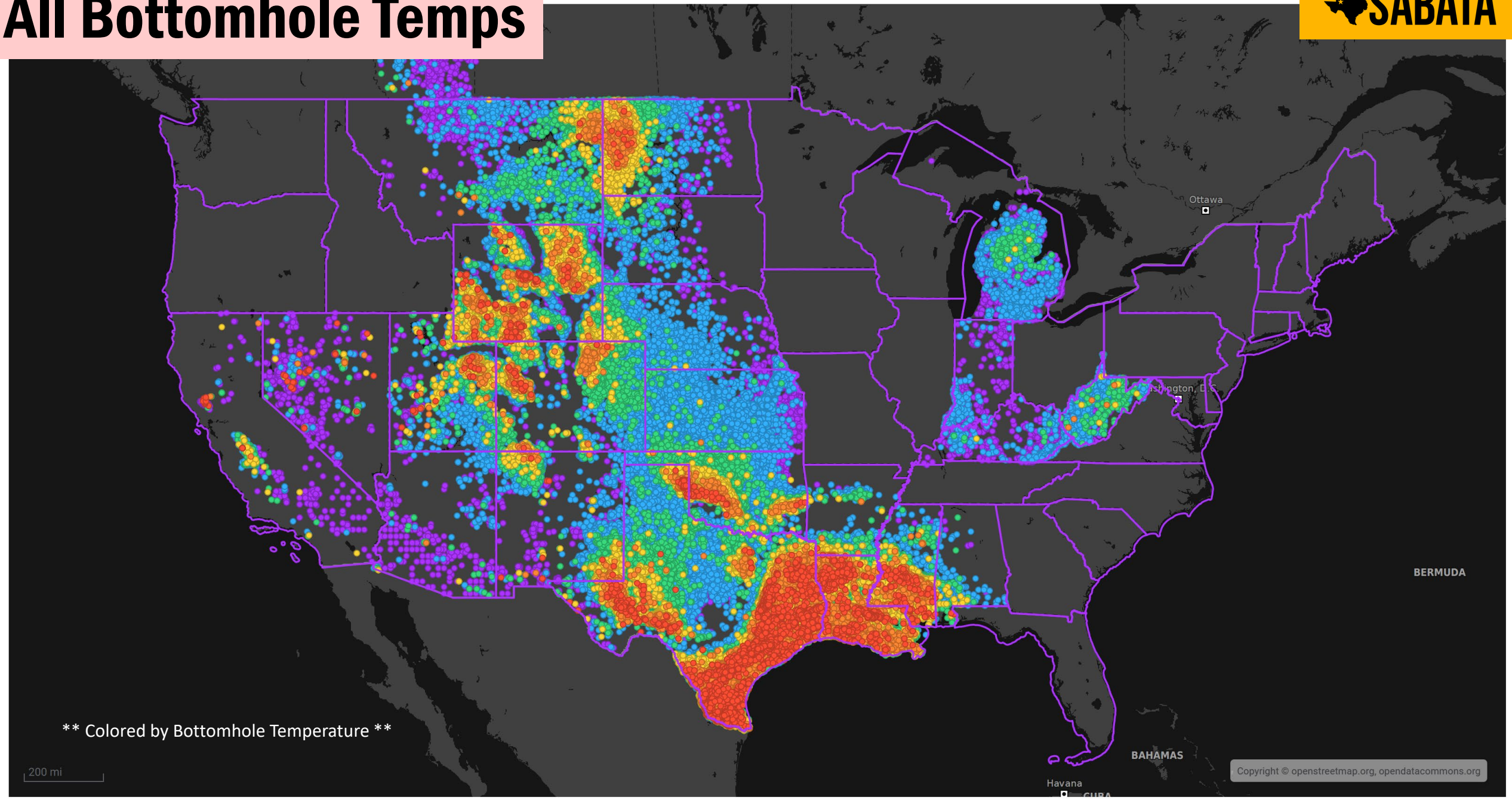
Permanent Datum GROUND LEVEL Elev. 3076
Log Measured from K. B. 18.9 Ft. Above Permanent Datum
Drilling Measured from K. B.

Elevations
KB 3094.9
DF
GL 3076

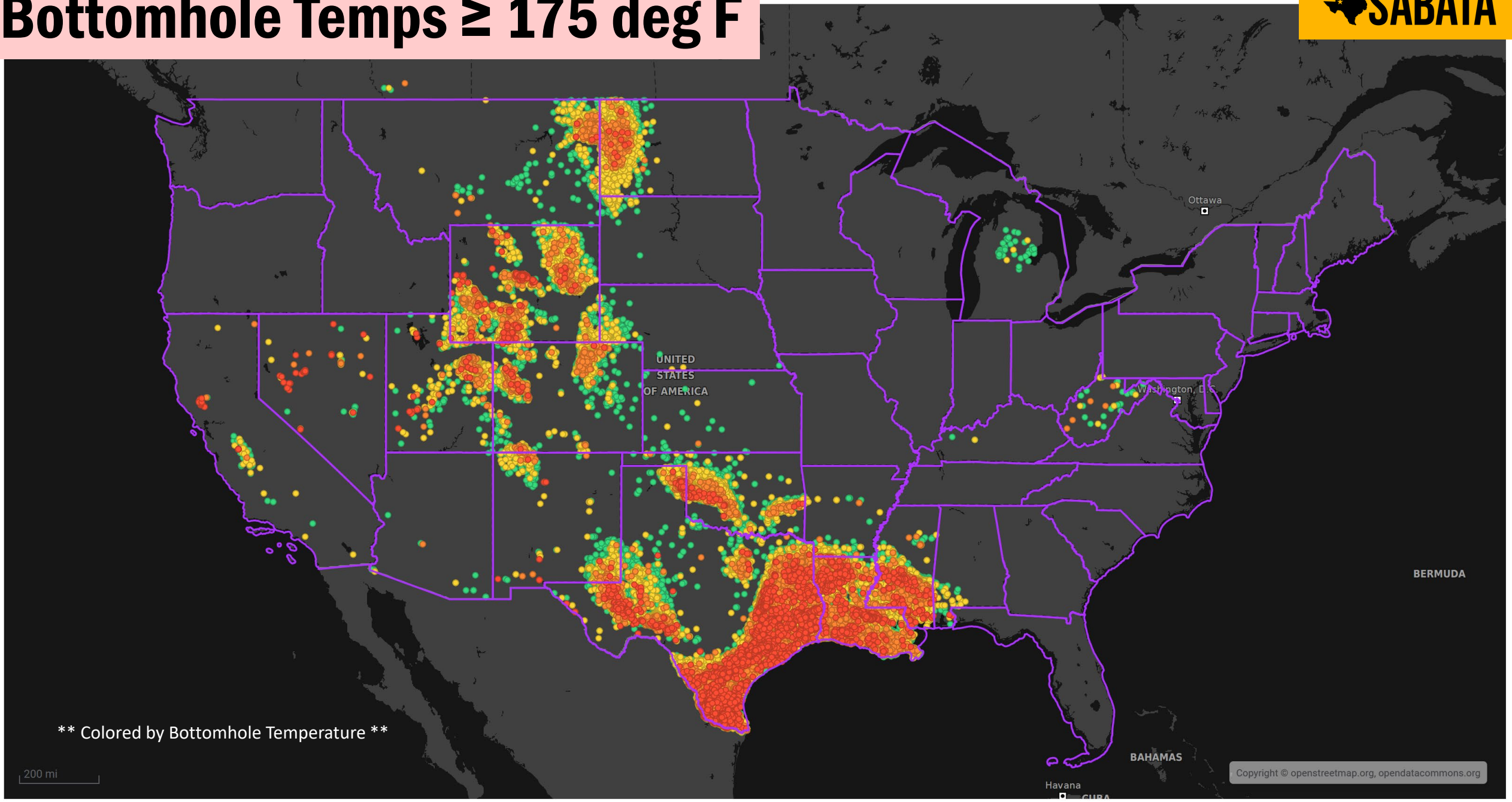
Date	7-8-78	8-12-78	8-16-78	
Run No.	ONE	TWO	THREE	
Service Order	12227	12401	12379	
Depth—Driller	12004	12718	12820	
Depth—Logger	12003	12715	12819	
Bottom Logged Interval	12001	12430	12817	
Top Logged Interval	SURFACE	12000	12430	
Casing—Driller	8 5/8 @ 3745	5½" @12000	5½" @12000	@
Casing—Logger	3745	12000	12000	
Bit Size	7 7/8"	4 3/4"	4 3/4"	
Type Fluid in Hole	SALT GEL	GEL/RDIII	GEL/RDIII	
Density and Viscosity	9.2 | 34	17 | 60	16 | 50	
pH and Fluid Loss	10 | - cc	10.5 | 12 cc	10 | 12 cc	cc
Source of Sample	PIT	PIT	PIT	
Rm @ Meas. Temp.	.097 @ 67 °F	1.78 @ 80 °F	.86 @ 83 °F	@ °F
Rmf @ Meas. Temp.	.087 @ 67 °F	1.4 @ 80 °F	.73 @ 83 °F	@ °F
Rmc @ Meas. Temp.	- @ °F	- @ °F	- @ °F	@ °F
Source of Rmf and Rmc	MEAS.	MEAS.	MEAS. F	
Rm @ BHT	.04 @ 175 °F	.78 @ 180 °F	.35 @ 202 °F	@ °F
Time Since Circ	8½ HOURS	22 HOURS	6½ HOURS	
Max. Rec. Temp. Deg. F.	175 °F	180 °F	202 °F	°F
Equip. No. and Location	6123 HOBBS	6136 HOBBS	6123 HOBBS	
Recorded By	MC ATEE	JACKSON	MC ATEE	
Witnessed By	JONES & FOSTER	JONES	JONES & NORWOOD	

FOLD HERE

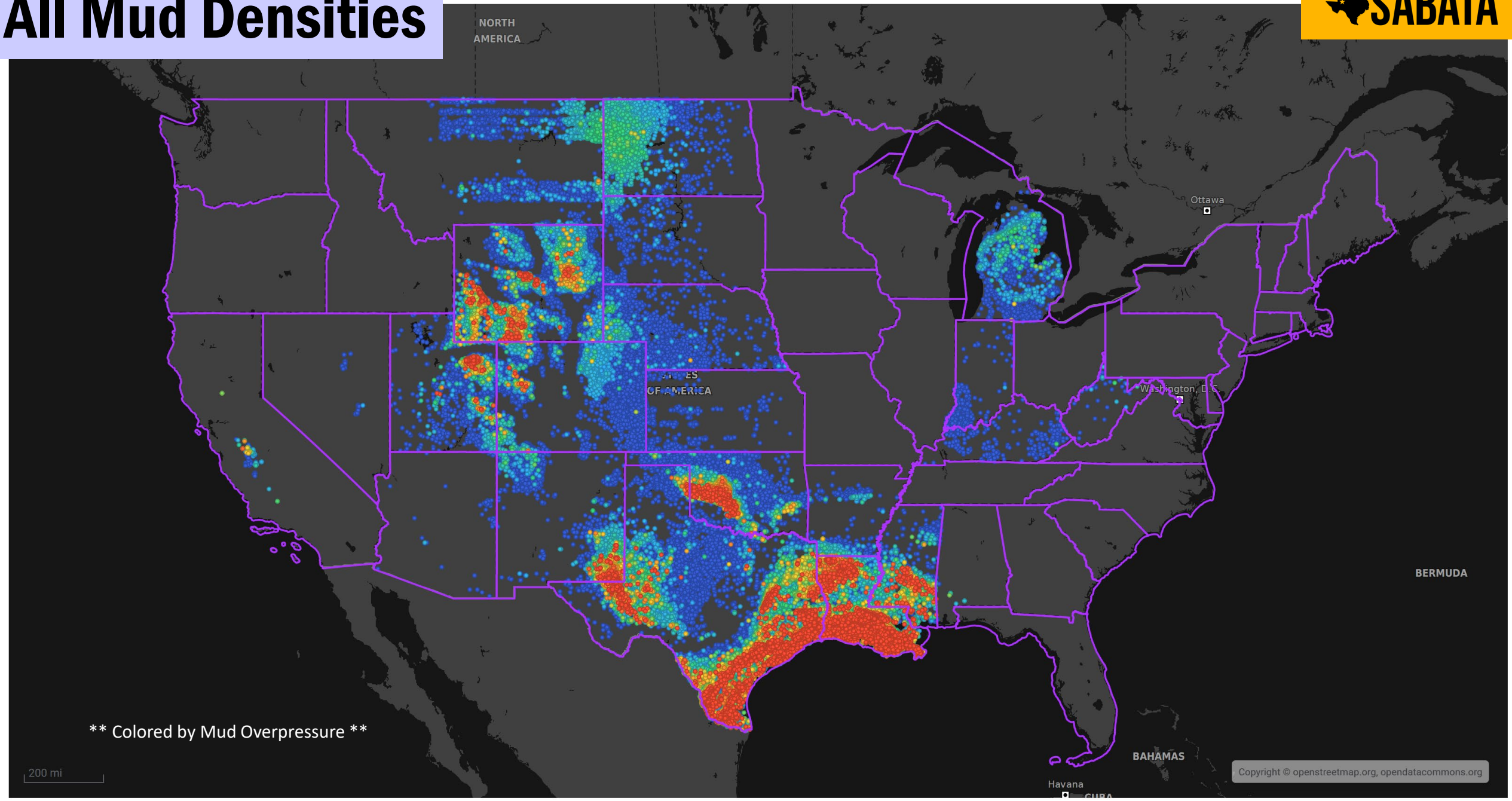
All Bottomhole Temps



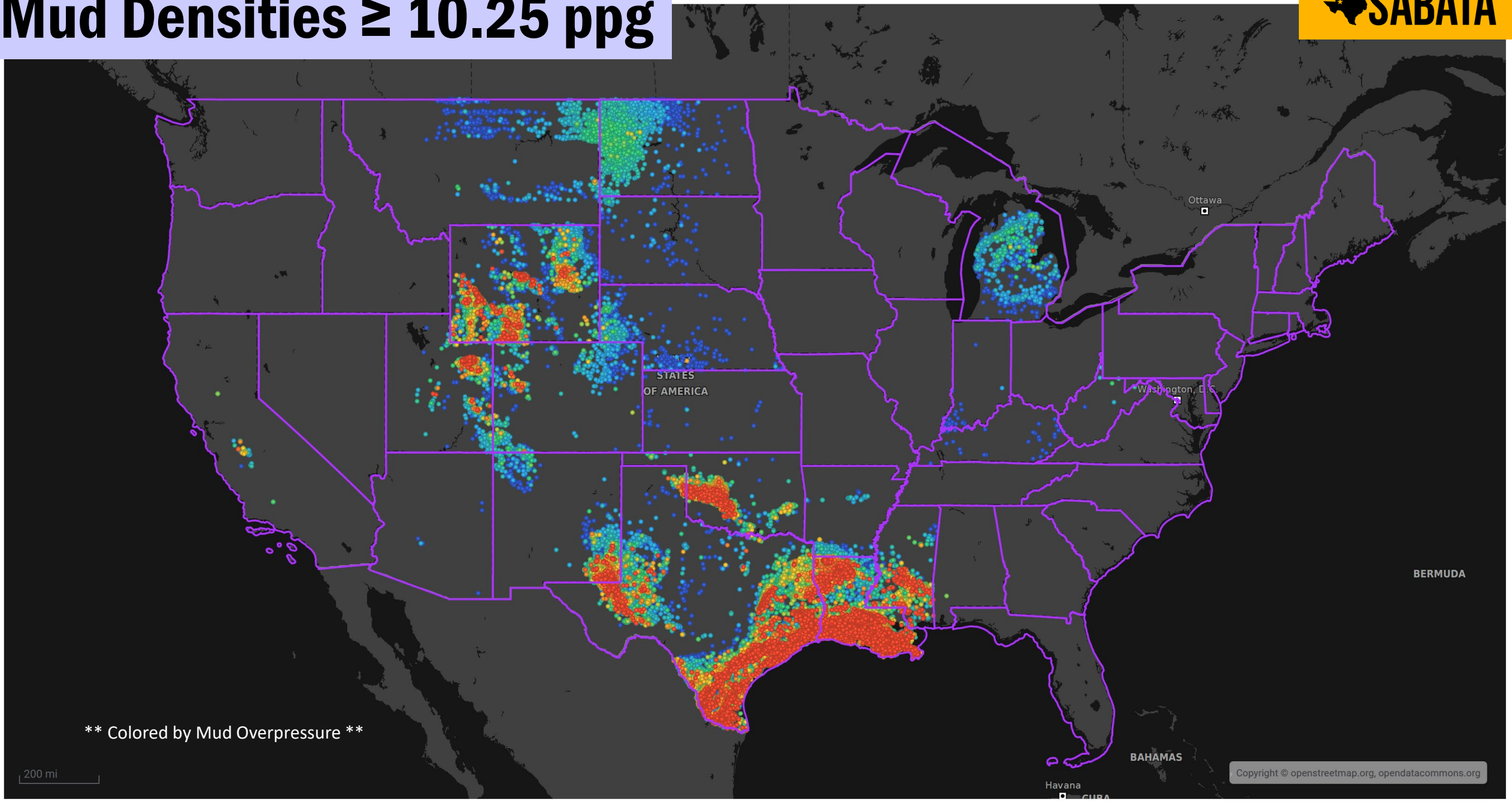
Bottomhole Temps ≥ 175 deg F

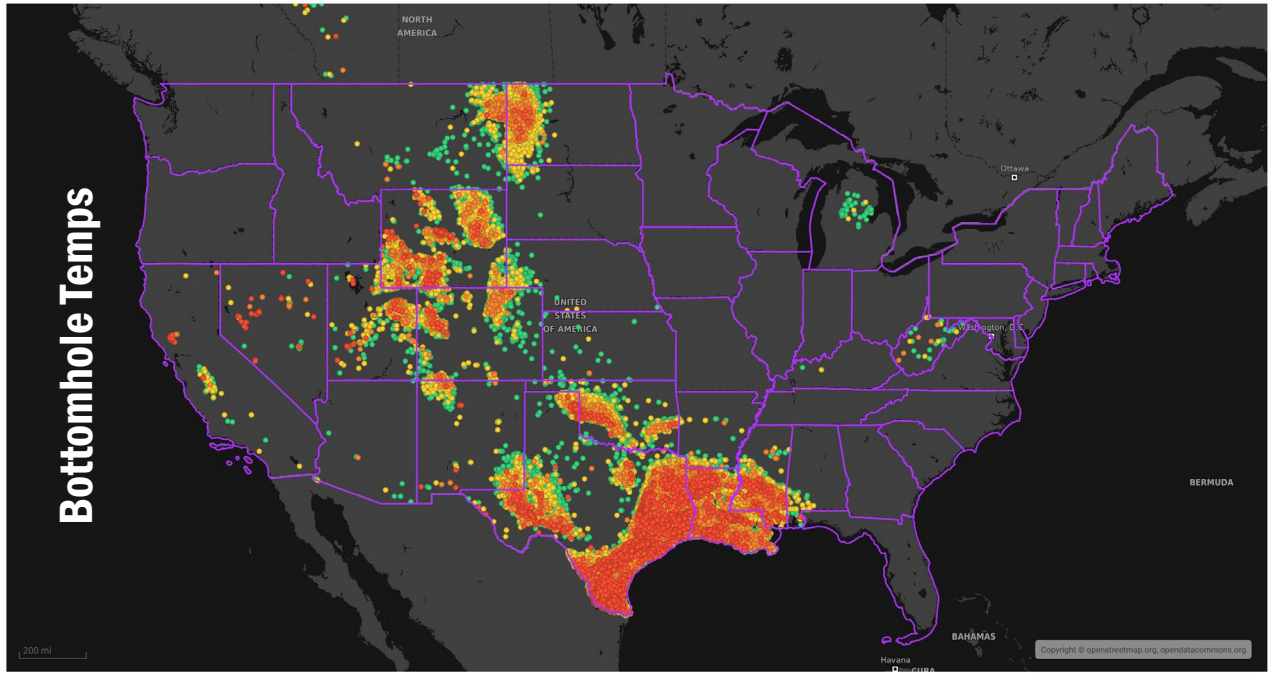


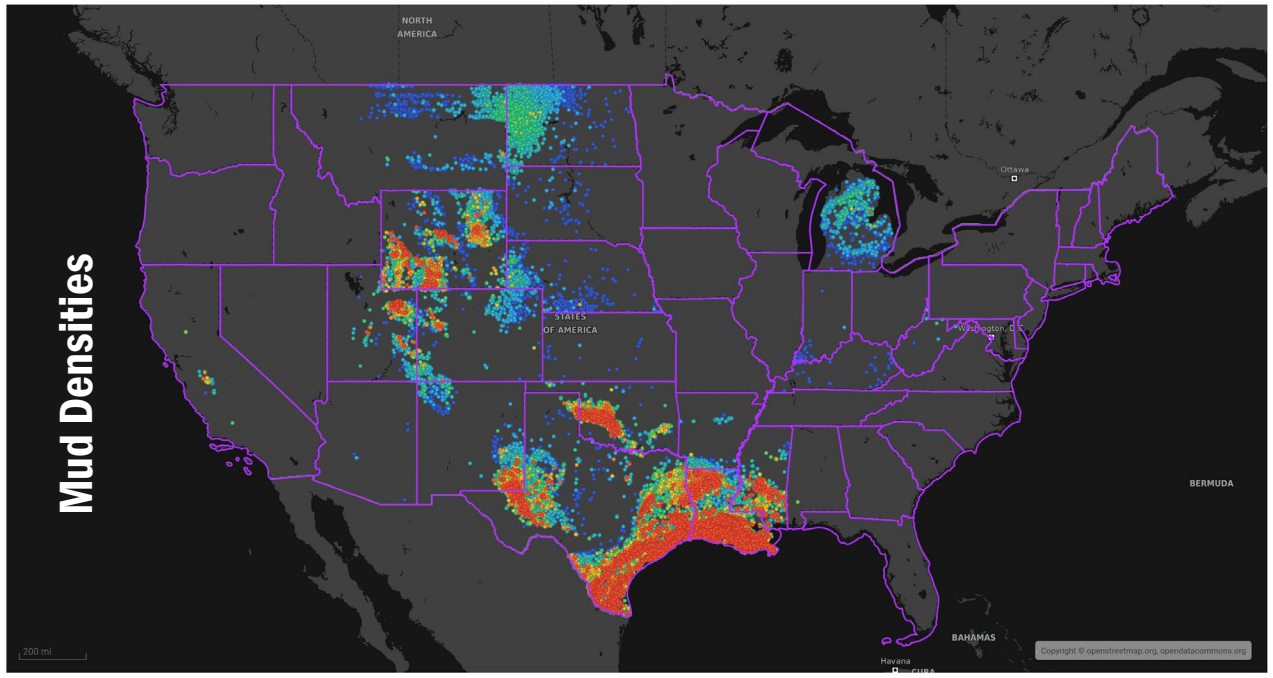
All Mud Densities



Mud Densities ≥ 10.25 ppg







Look Familiar?

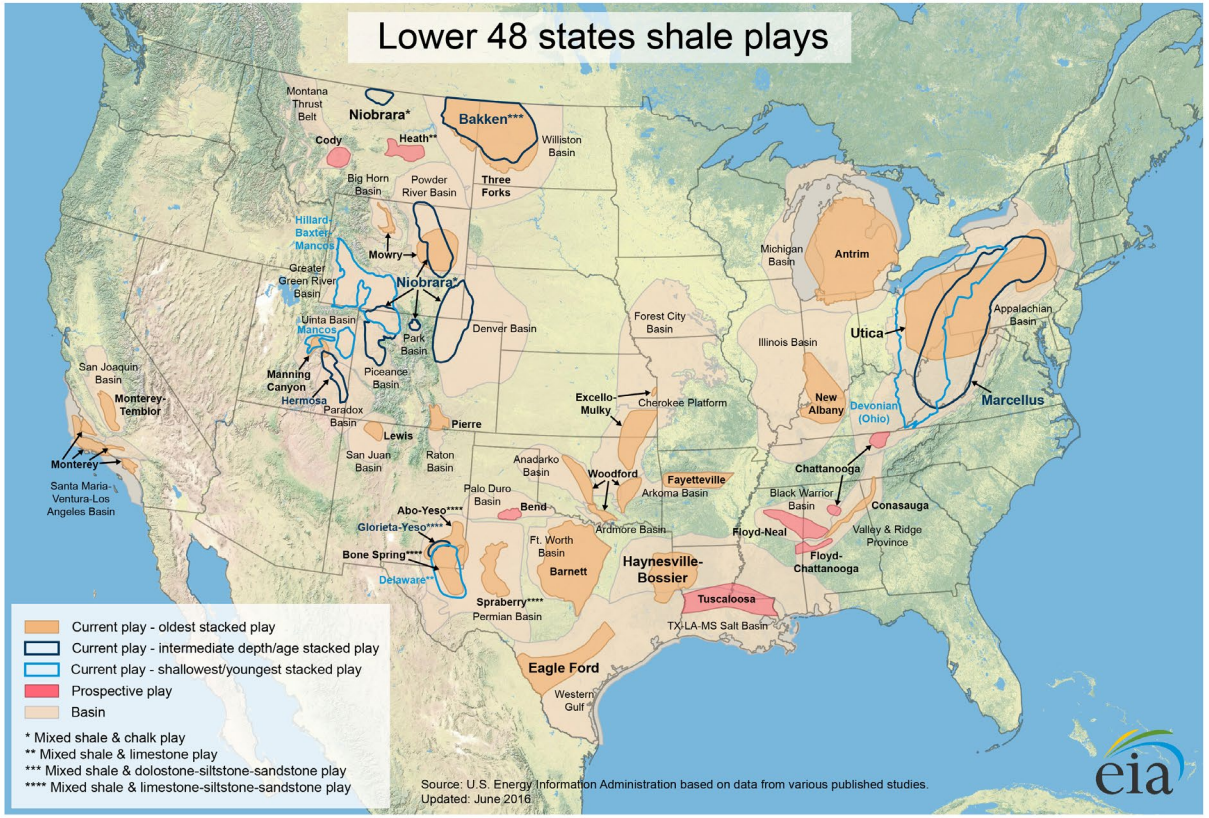
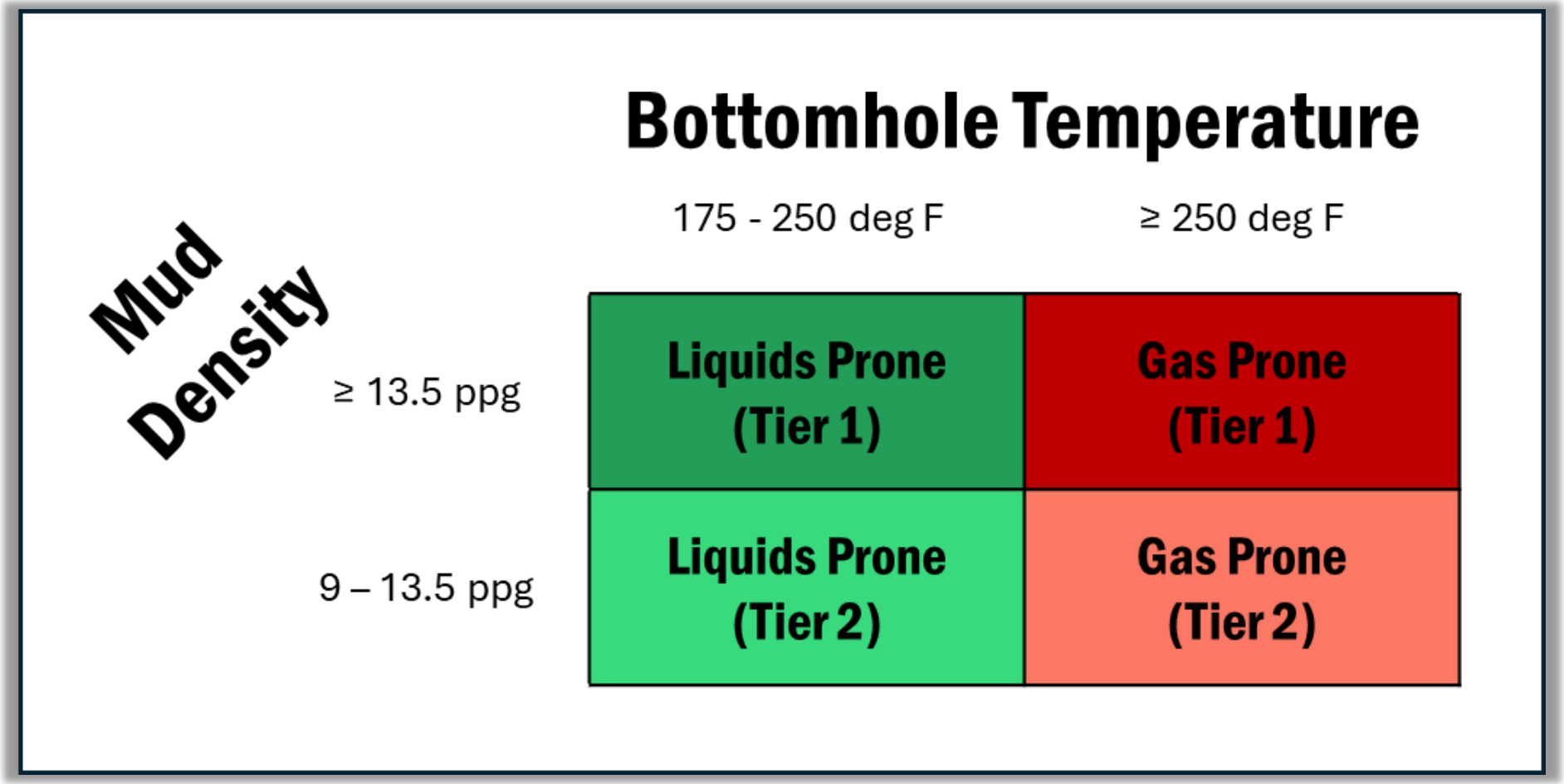
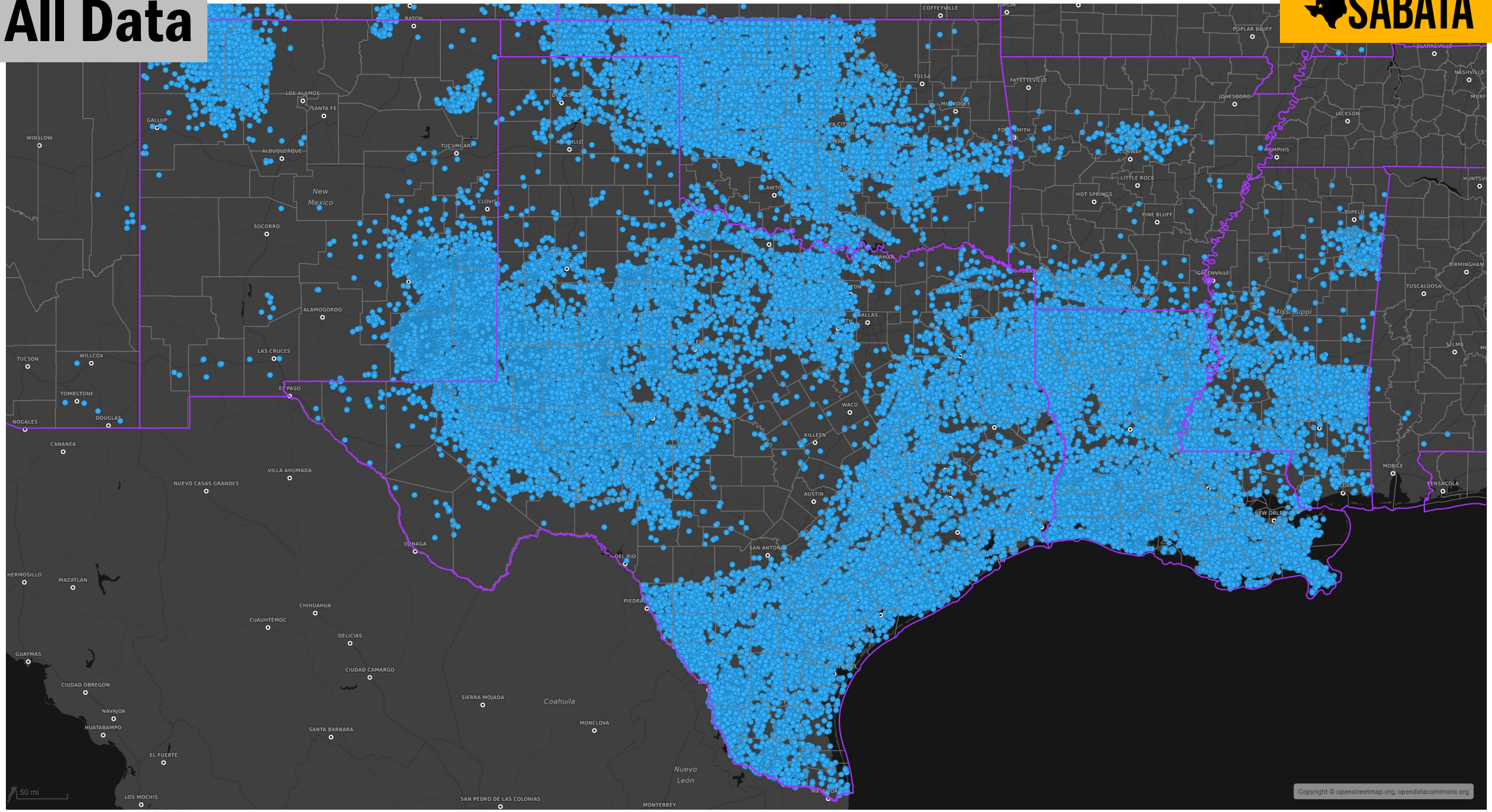


Figure from EIA (2016)

Exploration Tiering (aka “Goldilocks Zones”)



All Data


SABATA
COFFEYVILLE
JOPLIN
POPLAR BLUFF
CLARKSVILLE
NASHVILLE
MURF
RATON
LOS ALAMOS
SANTA FE
GALLUP
WINSLOW
ALBUQUERQUE
TUCUMCARI
DUNCAS
TULSA
FAYETTEVILLE
JONESBORO
JACKSON
MUSKOGEE
FORT SMITH
MEMPHIS
CONWAY
LITTLE ROCK
HUNTSVI
HOT SPRINGS
PINE BLUFF
TUPELO
BIRMINGHAM
TUSCALOOSA
GREENVILLE
SELMA
New Mexico
CLOVIS
SOCORRO
ALAMOGORDO
LAS CRUCES
EL PASO
TUCSON
WILLCOX
TOMBSTONE
DOUGLAS
NOGALES
CANANEA
DALLAS
WACO
KILLEEN
AUSTIN
SAN ANTONIO
DEL RIO
OJINAGA
Mississippi
MOBILE
PENSACOLA
NEW ORLEANS
VILLA AHUMADA
NUEVO CASAS GRANDES
HERMOSILLO
MAZATLAN
CHIHUAHUA
CUAUHTEMOC
DELICIAS
CIUDAD CAMARGO
GUAYMAS
CIUDAD OBREGON
NAVAJOA
HUATABAMPO
EL FUERTE
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Coahuila
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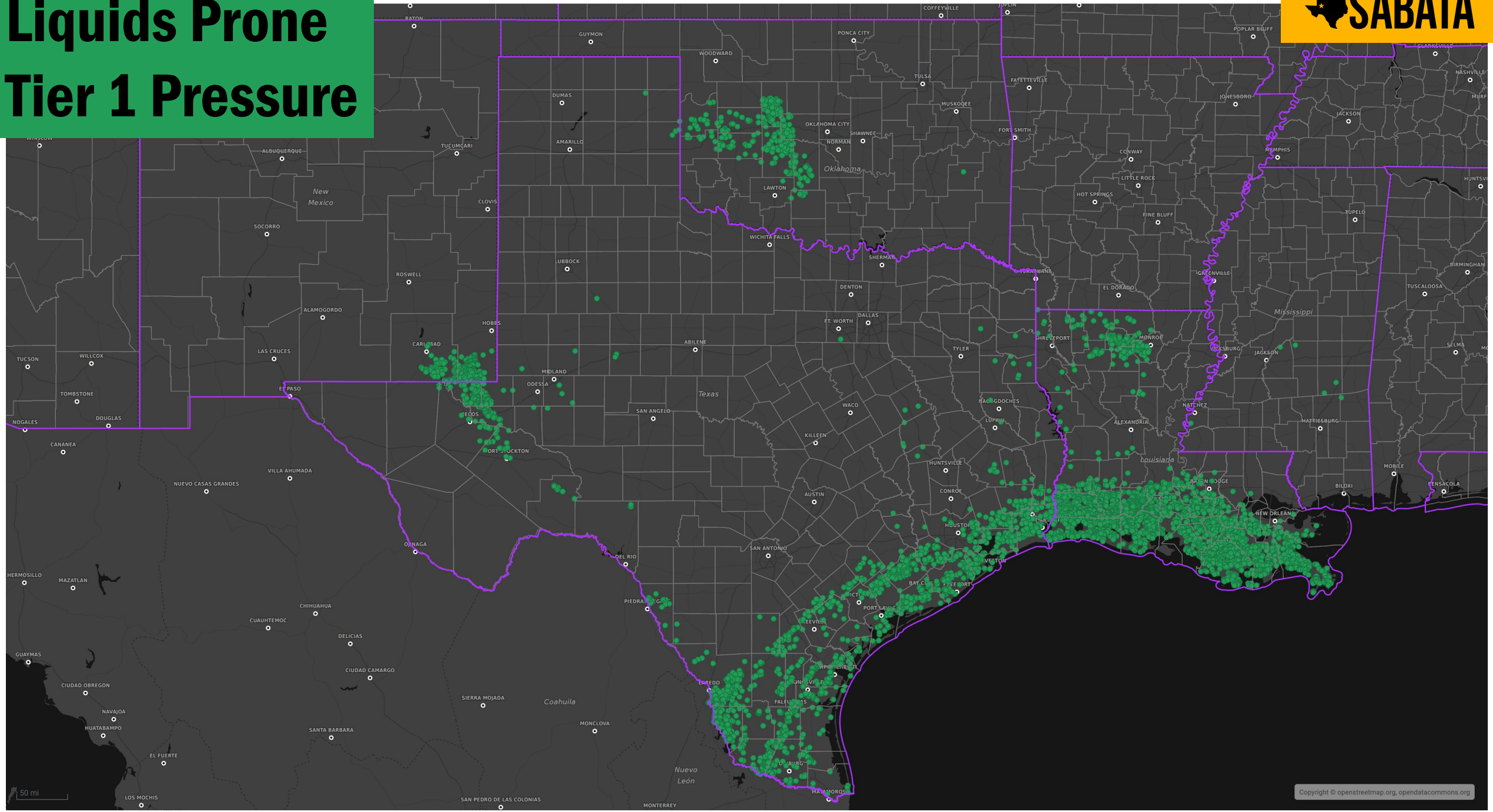
Liquids Prone
Tier 1 Pressure

SABATA



Gas Prone
Tier 1 Pressure

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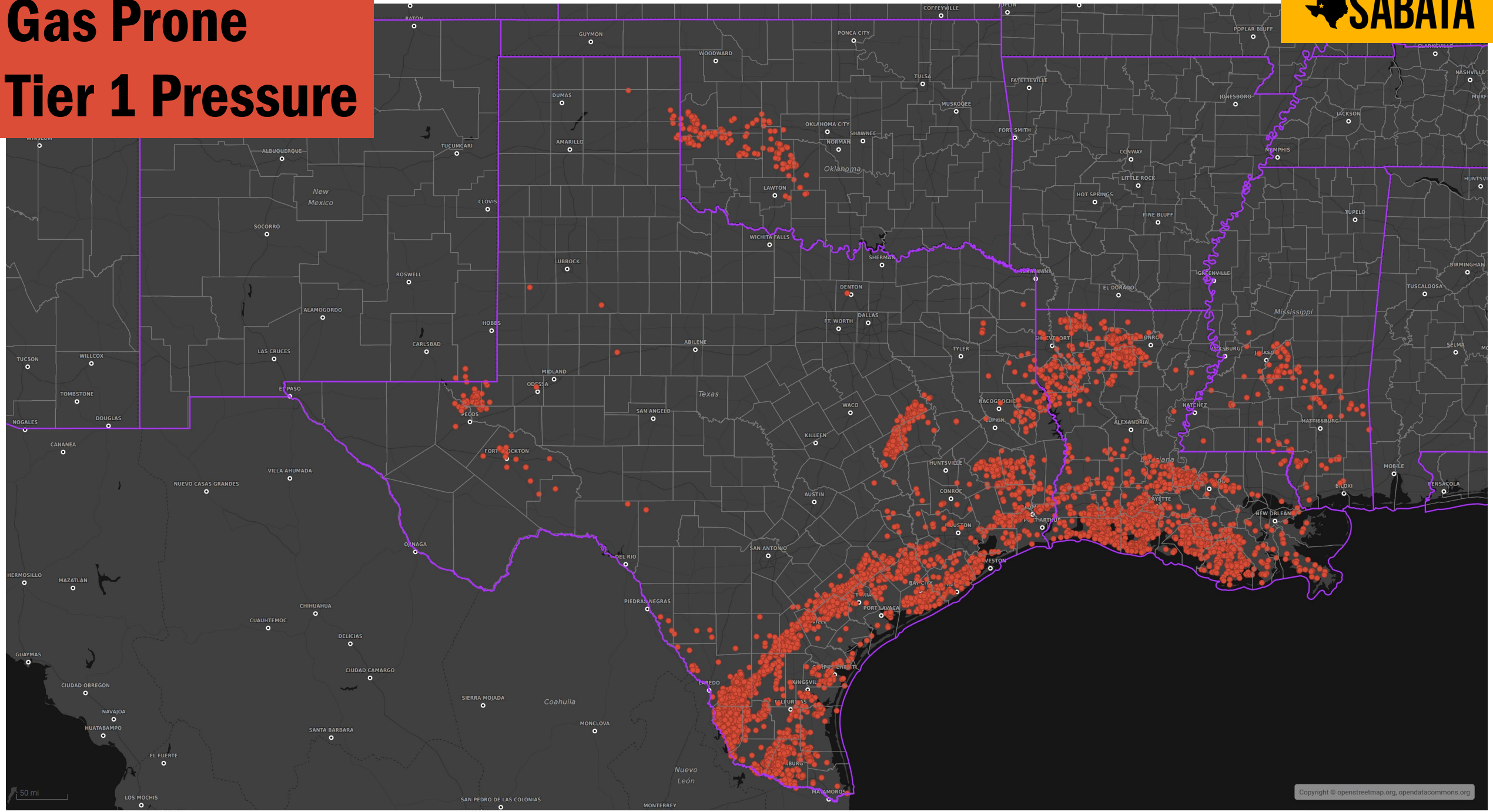

Liquids Prone
Tier 2 Pressure

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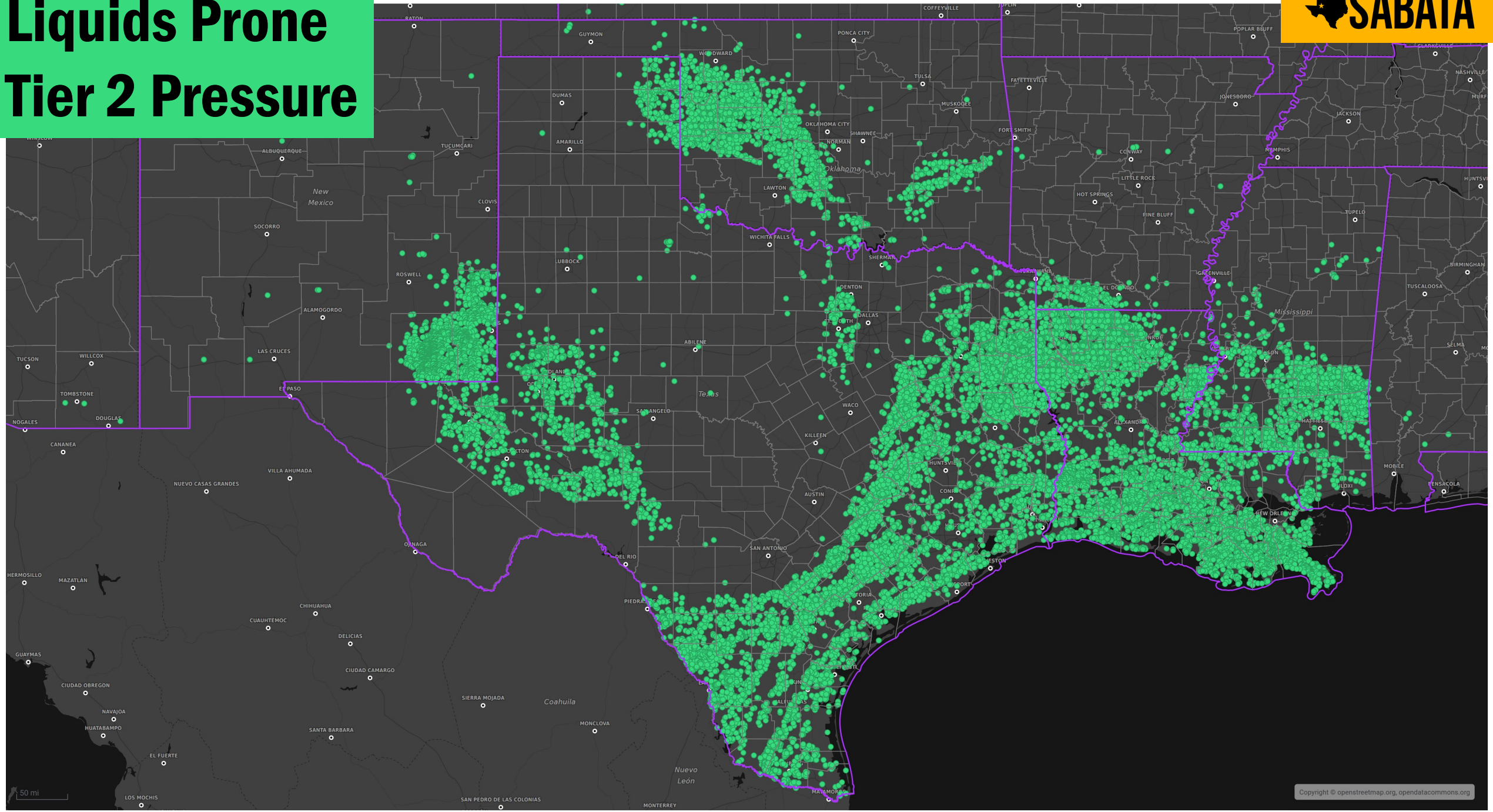
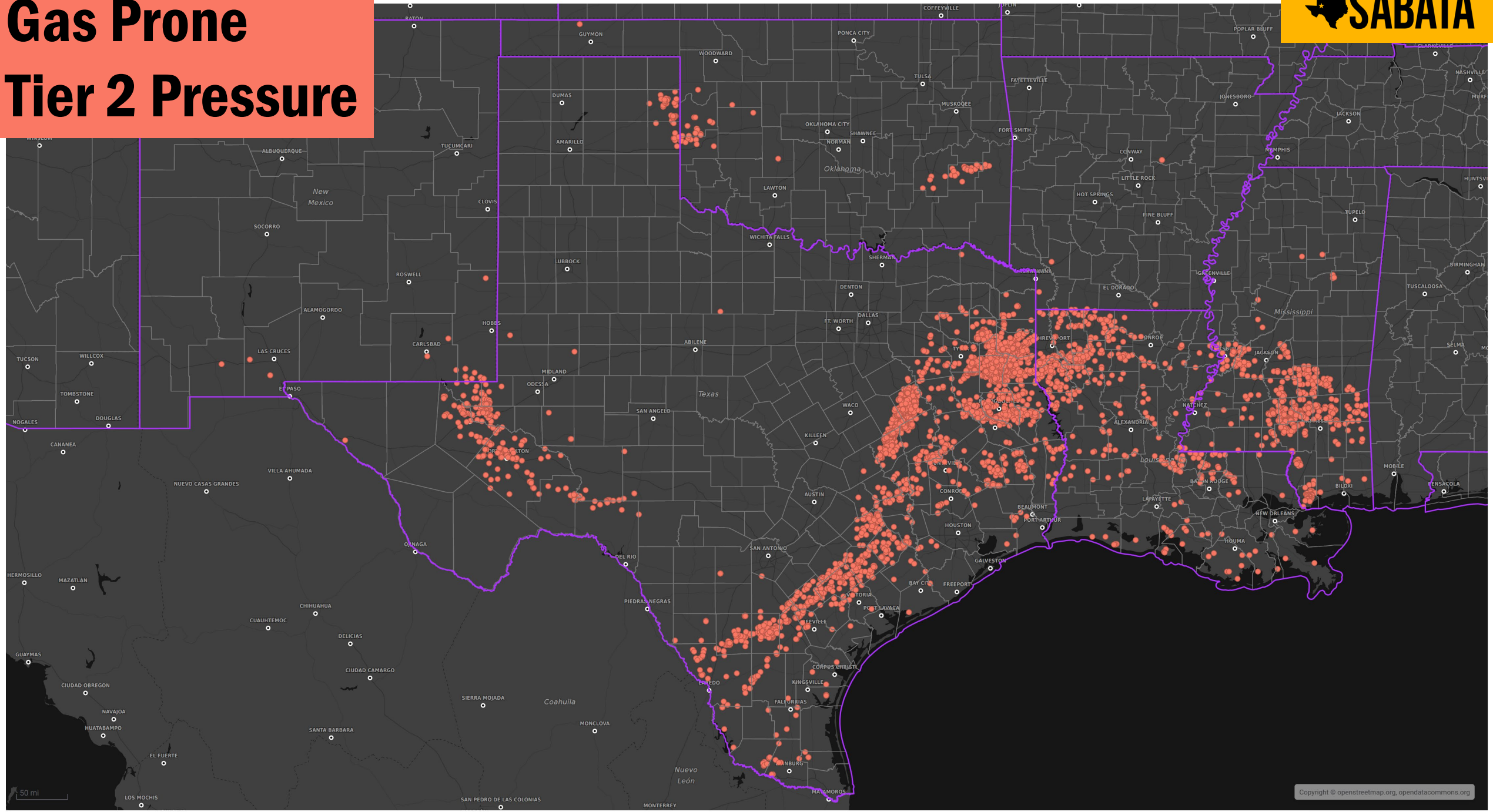
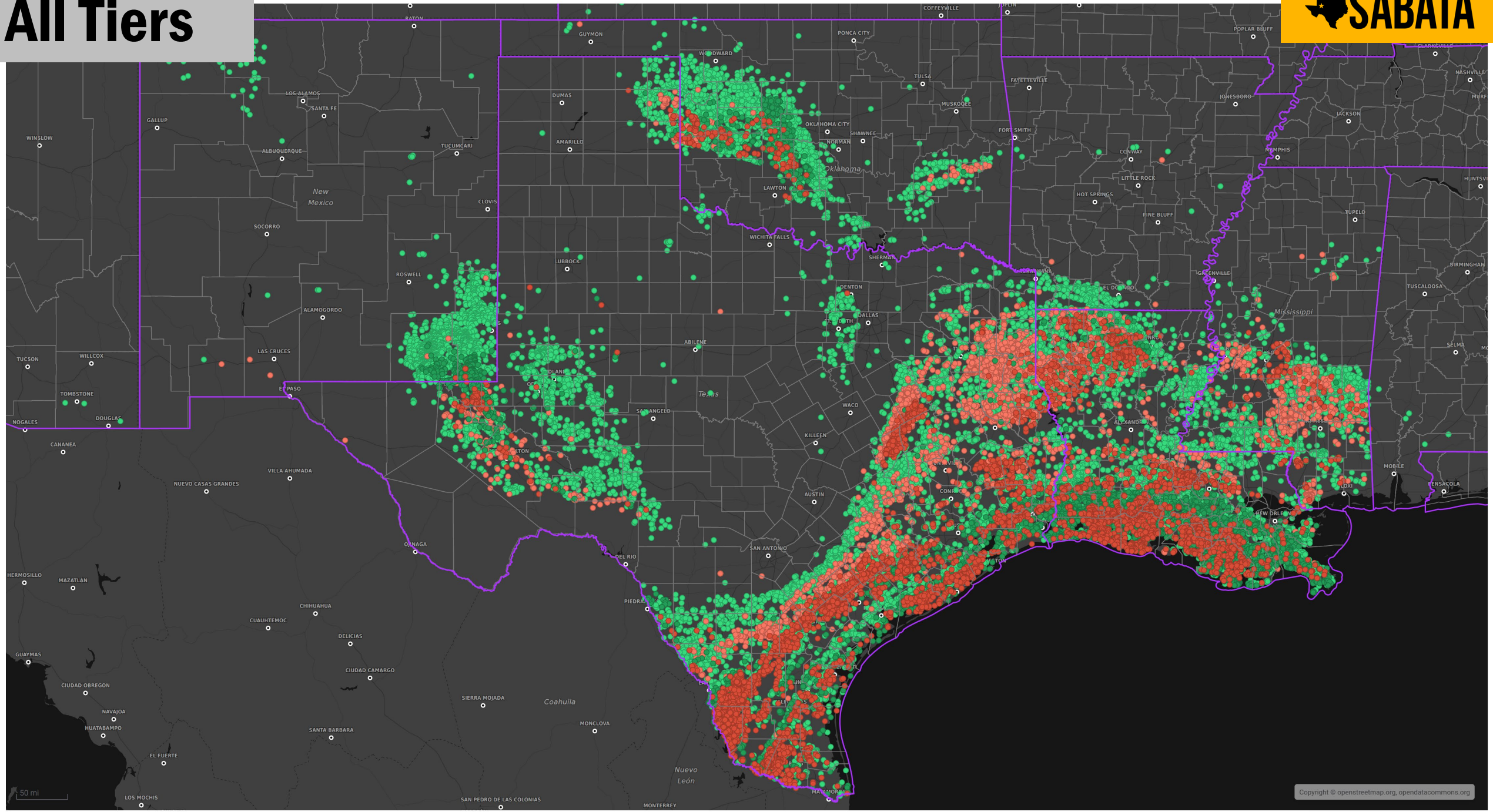


Gas Prone
Tier 2 Pressure



All Tiers


BATON
GUYMON
WOODWARD
PONCA CITY
COFFEYVILLE
POPLAR BLUFF
LOS ALAMOS
SANTA FE
GALLUP
DUMAS
AMARILLO
TULSA
FAYETTEVILLE
MUSKOGEE
JONESBORO
JACKSON
WINSLOW
ALBUQUERQUE
TUCUMCARI
OKLAHOMA CITY
SHAWNEE
NORMAN
FORT SMITH
CONWAY
MEMPHIS
Oklahoma
New Mexico
LAWTON
LITTLE ROCK
HOT SPRINGS
CLOVIS
PINE BLUFF
TUPELO
SOCORRO
WICHITA FALLS
SHERMAN
LUBBOCK
ROSWELL
DENTON
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ALAMOGORDO
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SELMA
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EL PASO
Texas
WACO
NOGALES
DOUGLAS
SAN ANGELO
ALEXANDRIA
KILLEEN
CANANEA
VILLA AHUMADA
NUEVO CASAS GRANDES
MOBILE
PENSACOLA
AUSTIN
OJINAGA
SAN ANTONIO
DEL RIO
HERMOSILLO
MAZATLAN
PIEDRAS
CHIHUAHUA
CUAUHTEMOC
DELICIAS
GUAYMAS
CIUDAD CAMARGO
CIUDAD OBREGON
SIERRA MOJADA
Coahuila
NAVAJOA
MONCLOVA
HUATABAMPO
SANTA BARBARA
EL FUERTE
Nuevo León
50 mi
LOS MOCHIS
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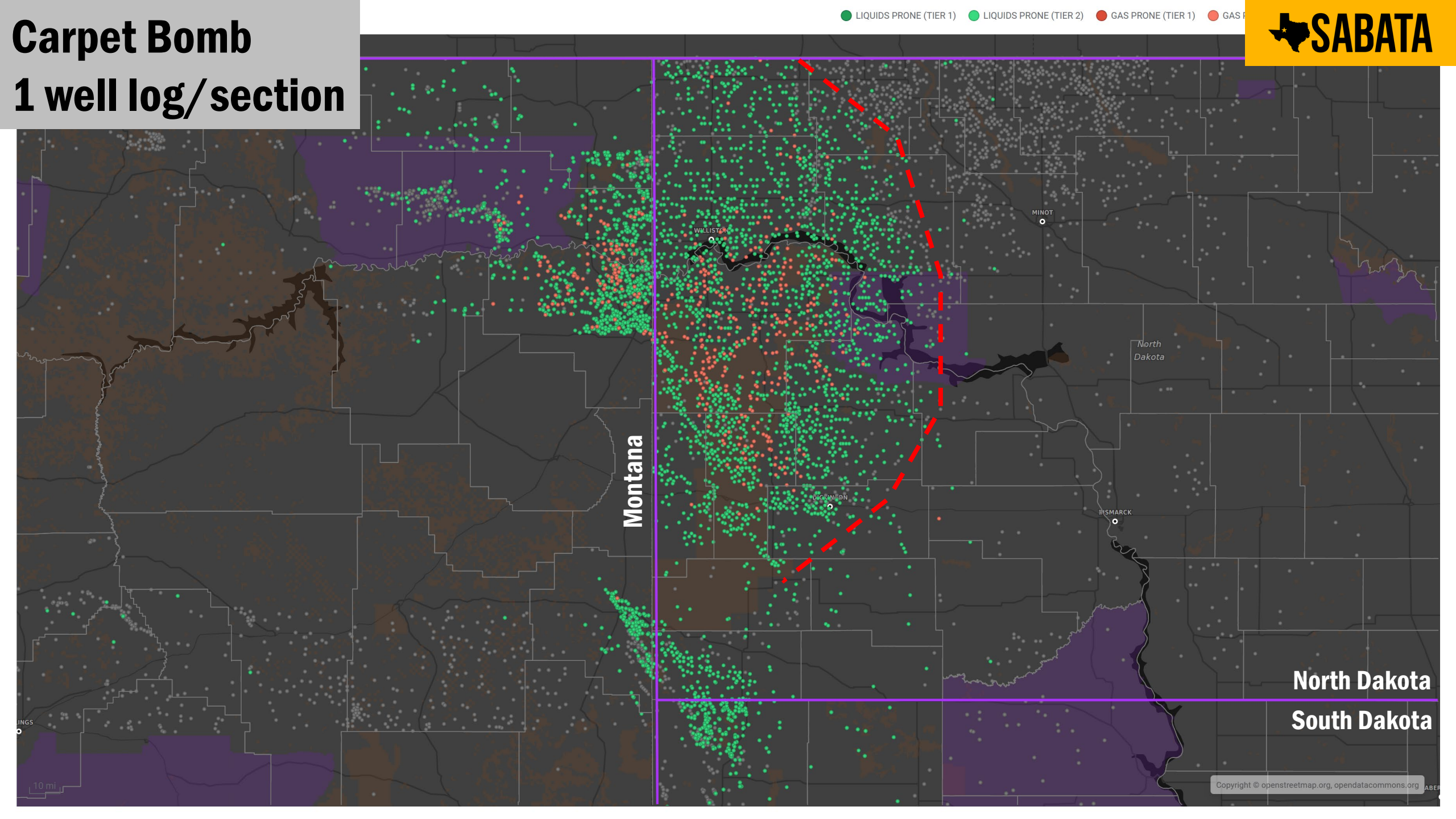
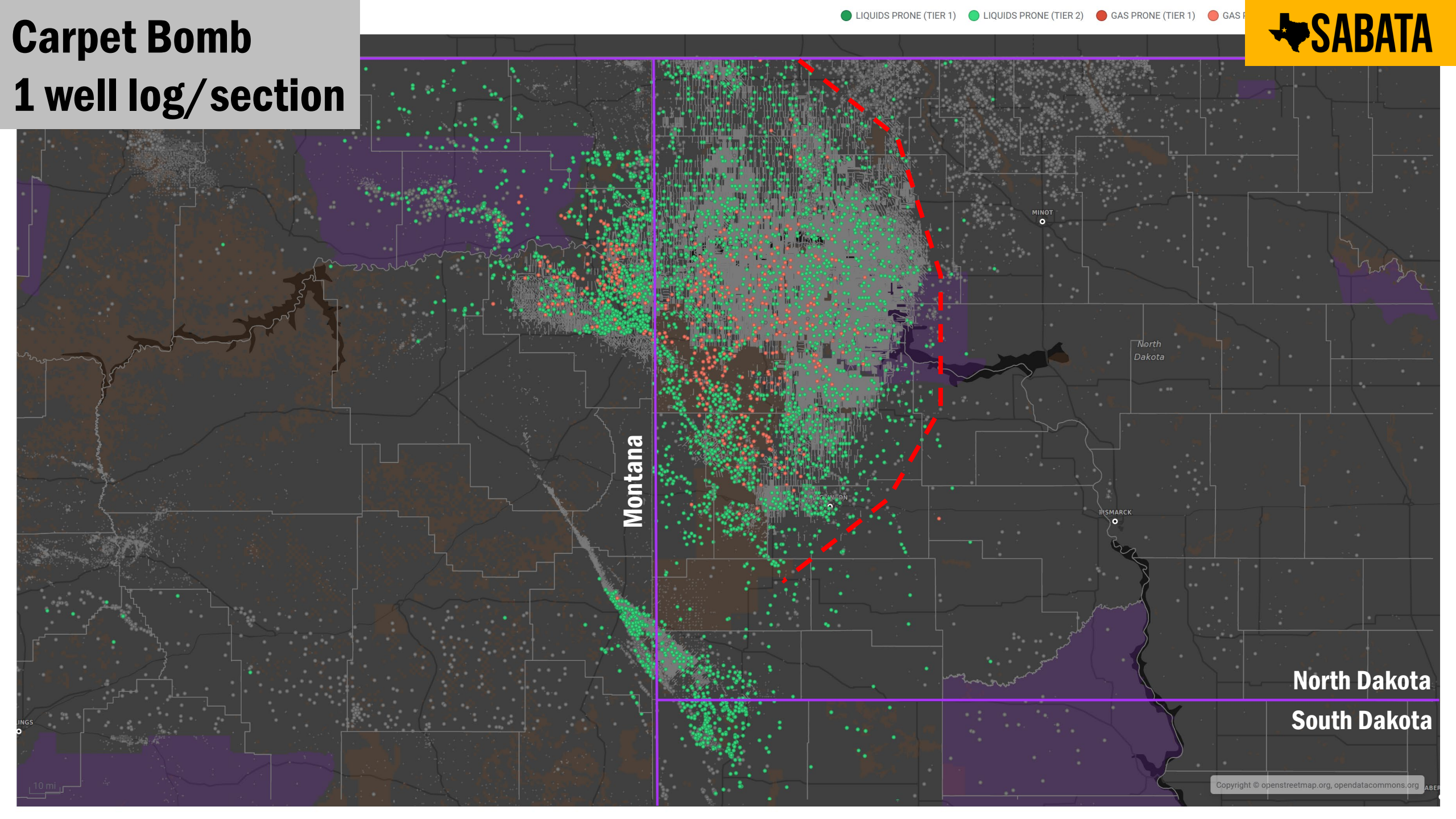
Blind Test – Bakken Play

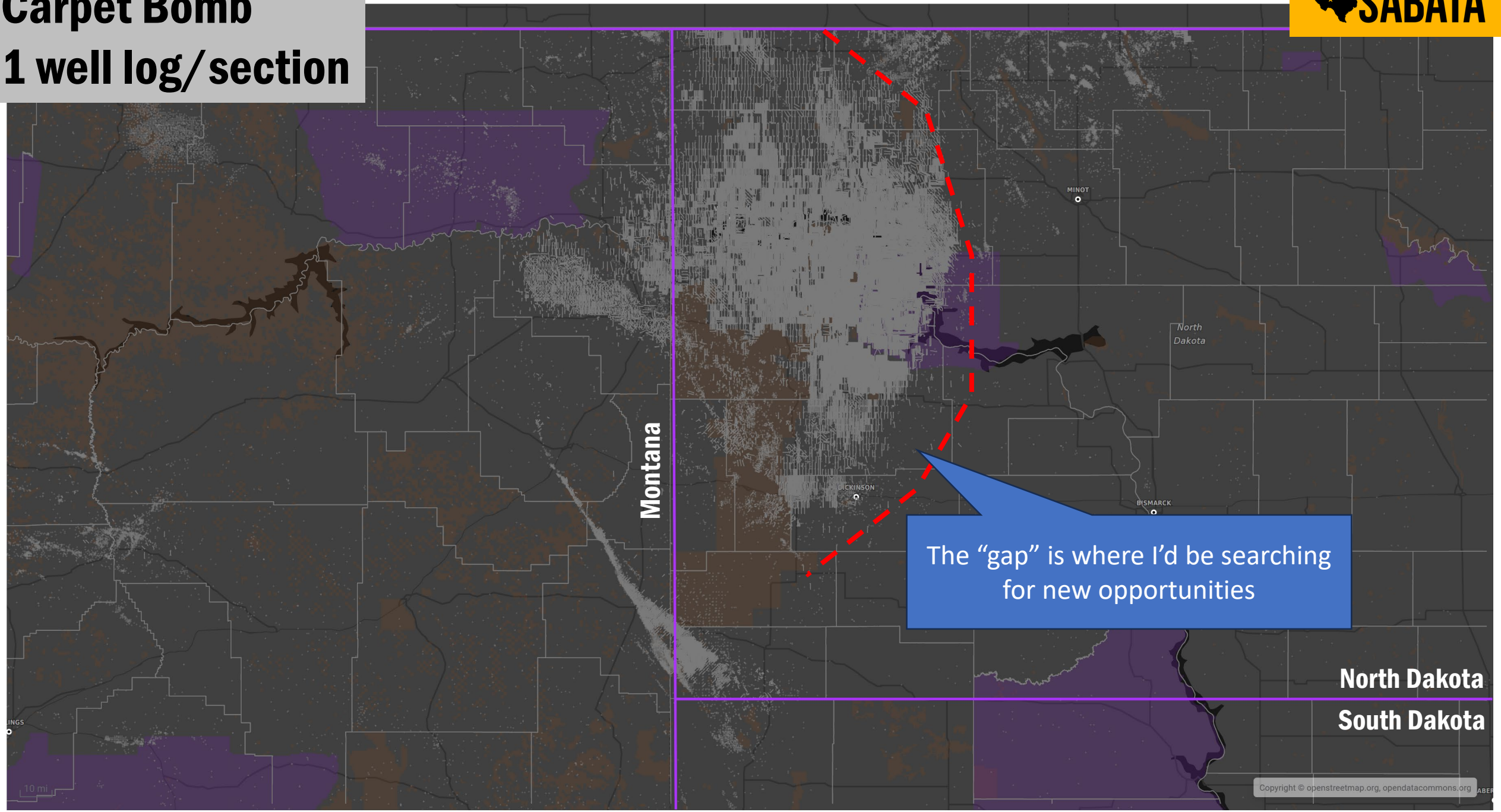
Carpet Bomb
1 well log/section



Carpet Bomb
1 well log/section



Carpet Bomb
1 well log/section



Final Thoughts

- The shale party isn’t over…

- Now we have to decide…
  - Do we look for an afterparty?

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