



Oklahoma Geological Survey Coordination of Mid-Continent Carbon Management: Geological Assessments

Presented by:

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- Project Overview
- Project Background
- Current status of the project and accomplishment
- Community Engagement
- Summary and Next Steps

Project Overview

Objectives:

- Geological carbon storage opportunities in Oklahoma
- Risk management, monitoring, and hazard mitigation in carbon geological storage
- CM coordination (state and regional); and community engagement

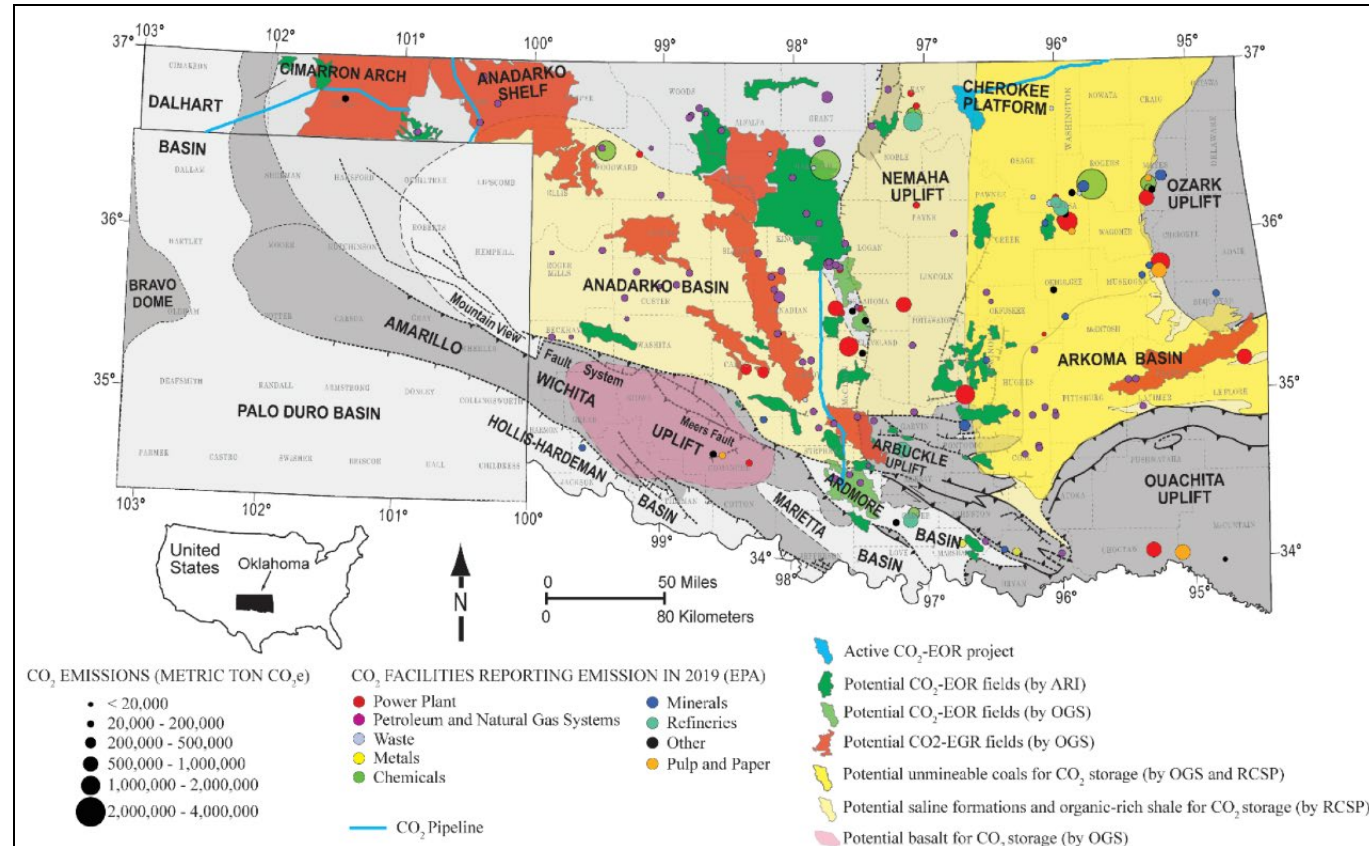
Duration: February 1, 2024 - January 31, 2026

Award: \$999,999 plus \$252,753 cost-share

Award#: DE-FE0032374 from FOA0002799

Primary expenditures:

- PI, Research Associate & Graduate Student salaries (~US\$54,500)
- Equipment for seismology, pressure monitoring, core investigation (~US\$49,000)
- Software for geoscience analysis
- Travel and additional support (~US\$1,000)
- F&A (IDC -55%) (~US\$30,000)



Project Overview



Personnel:

Lead PI:

- Dr. Nicholas Hayman: OGS Director & State Geologist

Education & Outreach Leads:

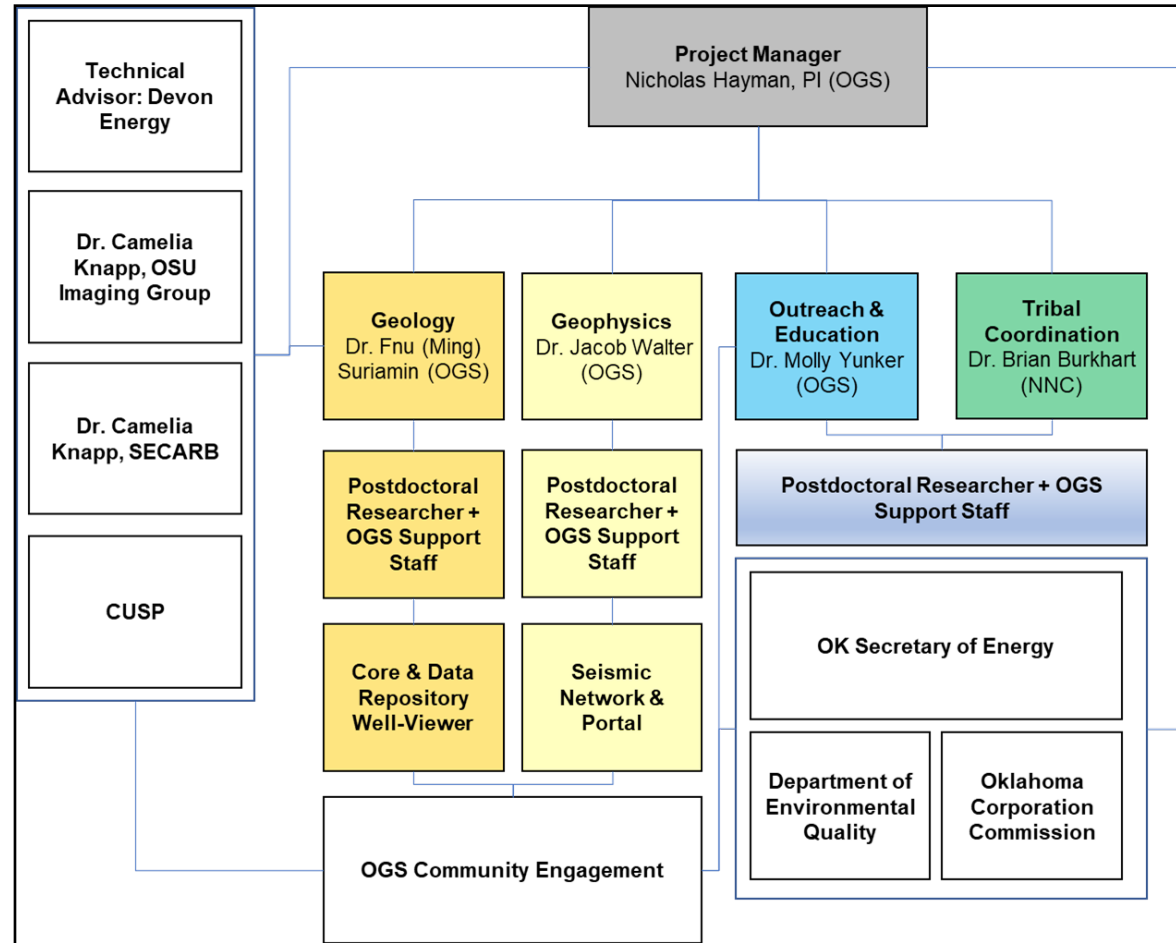
- Dr. Molly Yunker: OGS E&O
- Dr. Brian Burkhart: OU Philosophy & Native Nations
- Dr. Carrie Miller-DeBoer: Research Associate starting June 03, 2024 (US Citizen)

Technical Group:

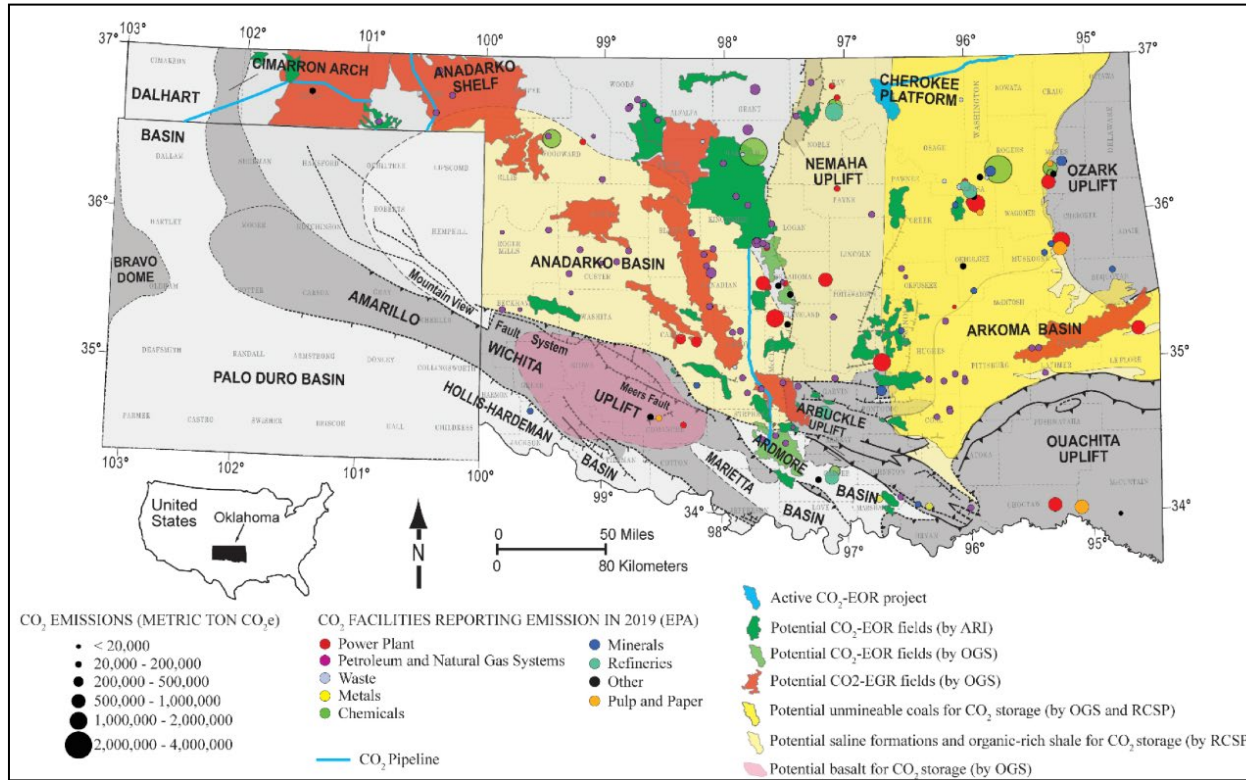
- Dr. Fnu “Ming” Suriamin: OGS Geology
- Dr. Jake Walter: OGS Seismology
- Dr. Hongyu Xiao: OGS Research Associate (pending foreign national approval)
- Dr. Dessy Sapardina: OGS Research Associate (pending foreign national approval)

Subaward to Oklahoma State University:

- Dr. Camelia Knapp: Seismic Imaging for CCSM.
- Magnolia McLaughlin: Graduate Student with Dr. Knapp



Project Background

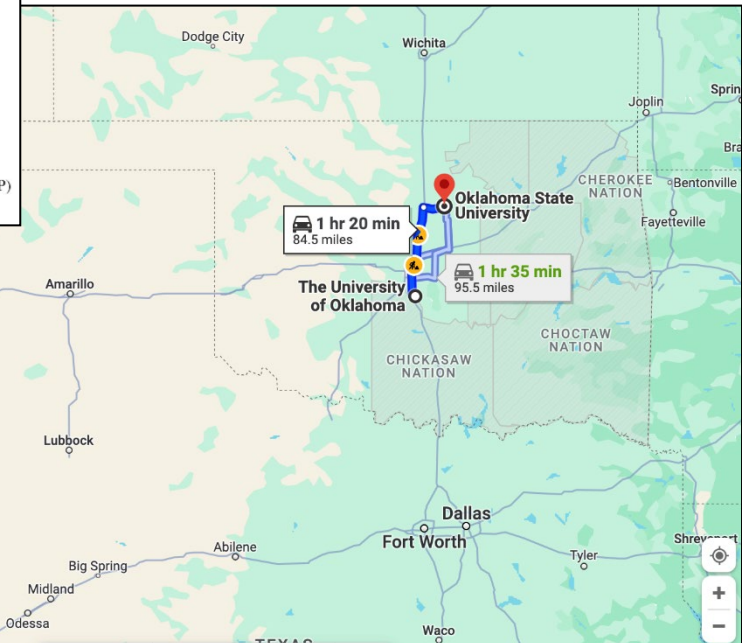


OGS offices at OU Norman campus, ~20 miles south of OKC

OPIC, ~3 miles north of main OU campus

Oklahoma State University, Stillwater, OK,

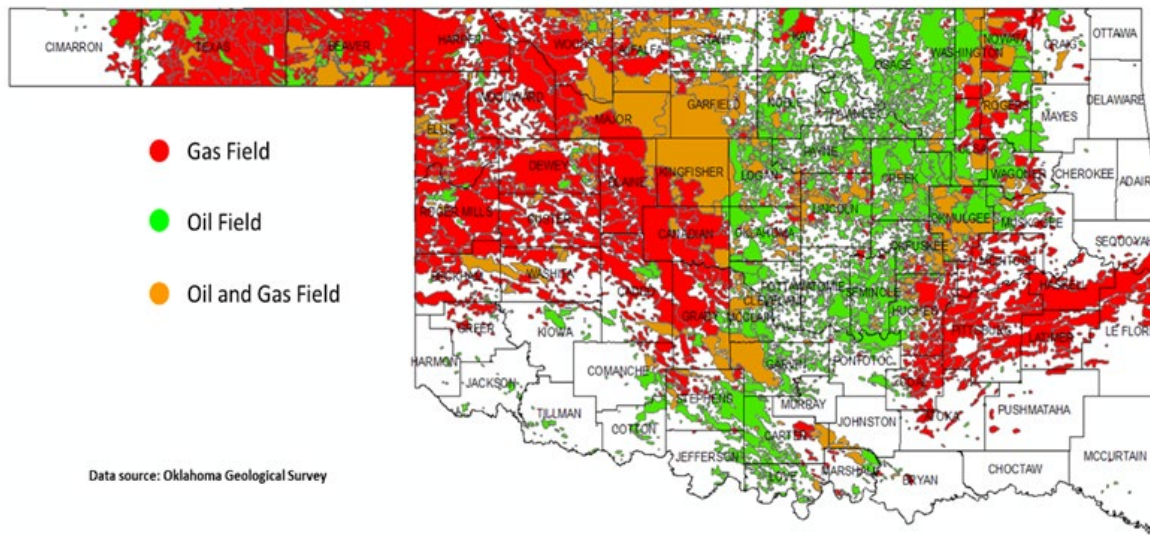
Communities statewide



Regional Assessment of the Geological CO₂ Storage

To assess the **Arbuckle Group** and **non-Arbuckle** reservoirs in Oklahoma suitability for CO₂ storage using existing borehole data, reports, and seismic data (if any); characterize their geological features, properties, and create 3D models to determine storage capacity and potential risks.

Oil and Gas Fields in Oklahoma



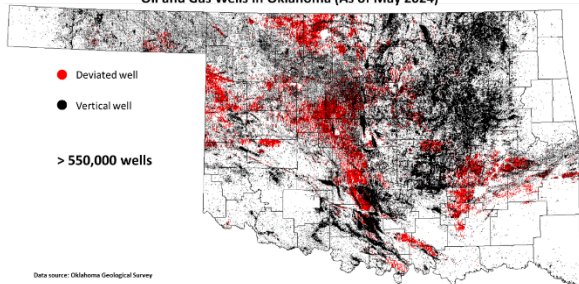
SYSTEMS/SERIES	ANADARKO BASIN, SW OKLAHOMA	ARBUCKLE UPLIFT, ARDMORE BASIN	ARKOMA BASIN, NE OKLAHOMA	OUACHITA MOUNTAINS UPLIFT
QUATERNARY	Alluvium and Terrace Deposits			
TERTIARY	Ogallala Formation			
CRETACEOUS	Dakota Group			
JURASSIC	Morrison Formation			
TRIASSIC	Dockum Group			
PERMIAN	Ochoan	Elk City Sandstone Doxey Shale		
	Guadalupean	Cloud Chief Formation Whitehorse Group El Reno Group	Garber Sandstone Wellington Formation	
	Leonardian	Hennessey Shale Garber Sandstone Wellington Formation	Garber Sandstone Wellington Formation	
	Wolfcampian	Chase Group Council Grove Group Admire Group	Pontotoc Group	Chase Group Council Grove Admire Group
PENNSYLVANIAN	Virgilian	Wabunsee Group Shawnee Group Douglas Group	Ada Formation Vamoosa Formation	Ada Fm. Vamoosa Douglas Wabunsee Shawnee
	Missourian	Ochelata Group Skiatook Group	Hoxbar Group	Hilltop Fm. Ochelata Group Skiatook Group
	Desmoinesian	Marmaton Group Cherokee Group	Deese Group	Marmaton Group Cabarrus Group Krebs Group
	Atokan	Atoka Group	Dornick Hills Group	Atoka Formation Johns Valley Shale
MISSISSIPPIAN	Morrowan	Morrow Group	Springer Formation	Union Valley Sausbee Jackfork Group
	Chesterian	Springer Formation	Springer Formation	Fifts Limestone Fayetteville Shale Hindsville Formation
	Meramecian	Chester Group	Goddard Formation Delaware Creek Shale	Moorefield Formation
	Osagean	"Meramec Lime"	Sycamore Limestone	Boone Group St. Joe Group
DEVONIAN	Upper	Woodford Shale Miss. Lime	Woodford Shale	Chattanooga Shale Sycamore Sandstone
	Middle			Arkansas Novaculite
SILURIAN	Lower	Haragan Fm. Henryhouse Fm.	Haragan-Bois d'Arc Formation Henryhouse Formation Clarita Formation	Sallisaw Fm. Frisco Fm. Pinetop Chert
	Upper	Hutton Group	Hutton Group	Quarry Mtn. Fm.
ORDOVICIAN	Upper	Sylvan Shale	Sylvan Shale	Sylvan Shale
	Middle	Viola Group	Viola Group	Viola Group
	Lower	Simpson Group	Bronde Formation Tulip Creek Formation McLish Formation Ol Creek Formation Joins Formation	Tyner Formation Burgin Sandstone
CAMBRIAN	Upper	Arbuckle Group	West Spring Creek Formation Knobblode Formation Cool Creek Formation McKenzie Hill Formation Butterfly Dolomite	Arbuckle Group
	Lower	Arbuckle Group	Signal Mountain Formation Royer Dolomite Fort Sill Limestone	Arbuckle Group
PRECAMBRIAN	Upper	Timbered Hills Group	T. H. Group Honey Creek Limestone Reagan Sandstone	Timbered Hills Group
	Middle	Granite, Rhyolite, and Gabbro	Rhyolite	
	Lower			
PRECAMBRIAN	Granite, Rhyolite, and Metasediments	Granite and Gneiss	Granite and Rhyolite	

Modified after Cardott, 2017

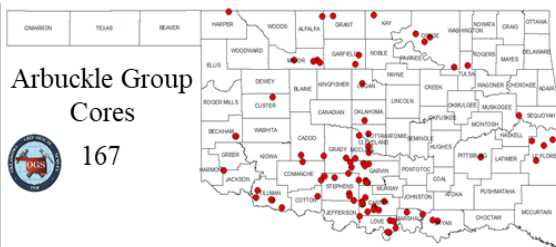
Arbuckle Reservoir Assessment

- What have been completed/on progress?
 - Data Collection: Well Logs, Seismic Info, Maps, Cores
 - SCO_2T – 80% (Map: Lithology, Structure, Isopach, Porosity, Pressure, Temperature, Permeability)
 - $G_{\text{CO}_2} = A \times h \times \phi \times \rho \times E$
 - Sites Selection (2 sites)

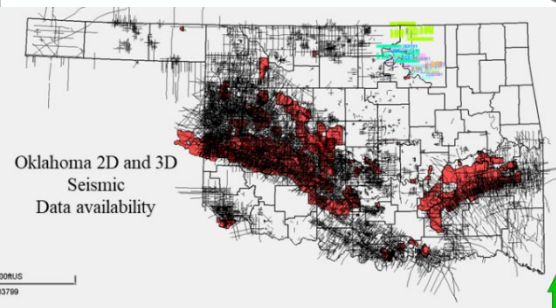
Oil and Gas Wells in Oklahoma (As of May 2024)



Data source: Oklahoma Geological Survey

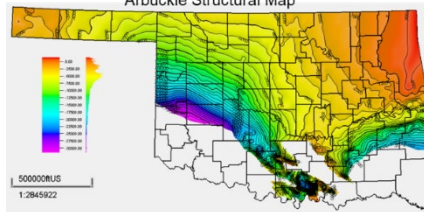


Arbuckle Group Cores
167

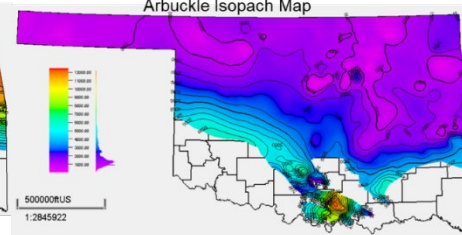


Oklahoma 2D and 3D Seismic Data availability

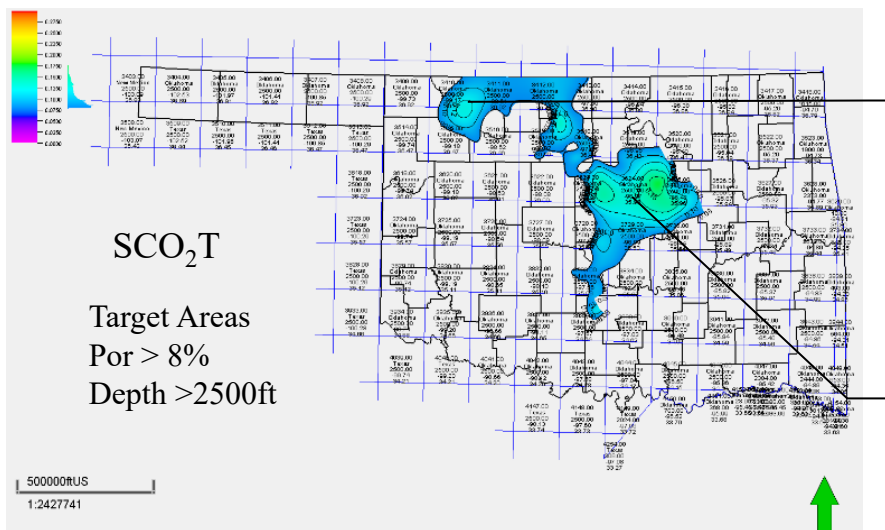
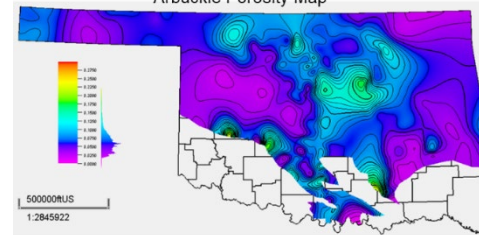
Arbuckle Structural Map



Arbuckle Isopach Map



Arbuckle Porosity Map



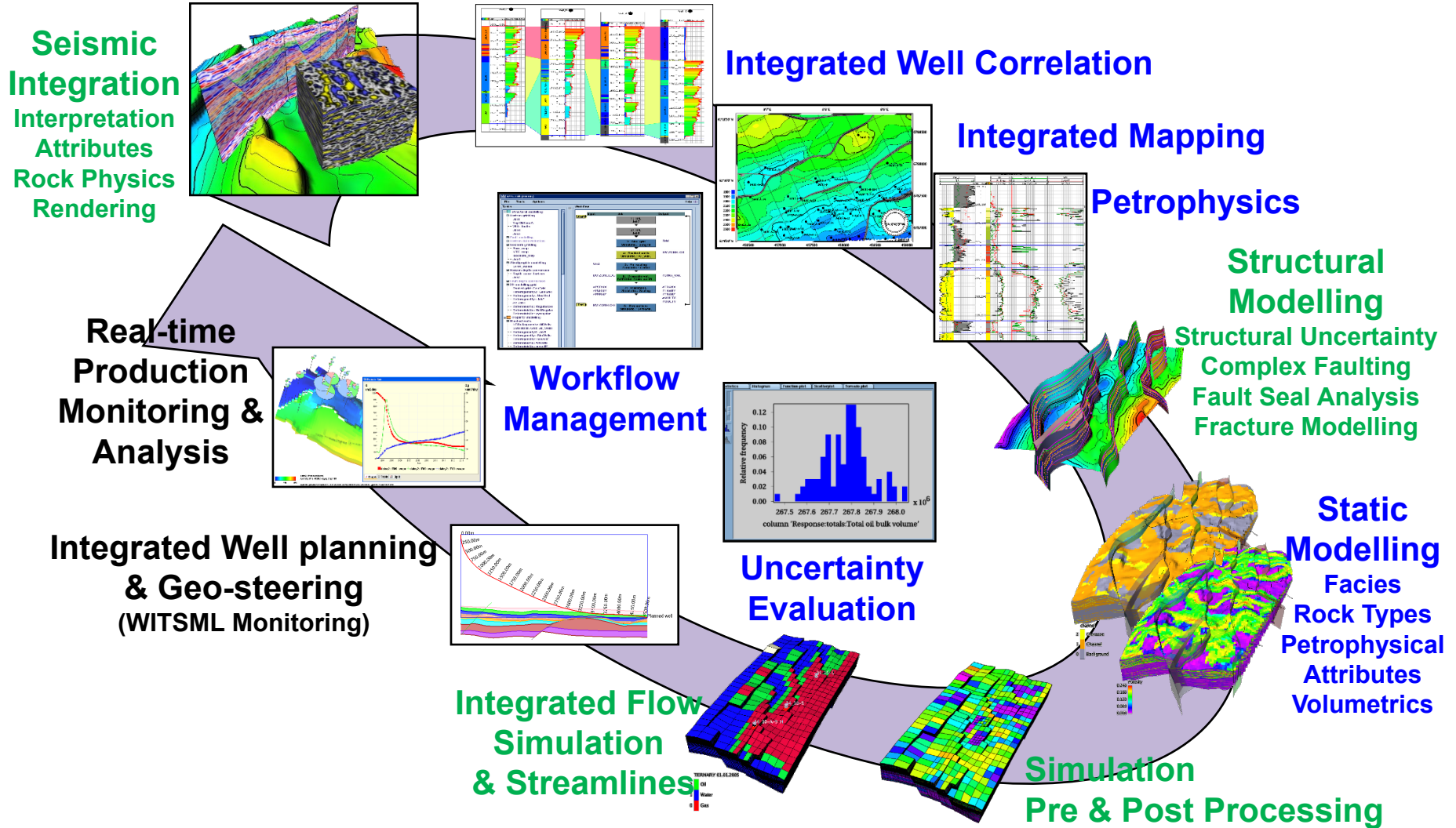
SCO_2T

Target Areas
Por > 8%
Depth > 2500ft

Area 1
Gross thickness 500-1000ft
~80 wells penetrated ABCK
No Core

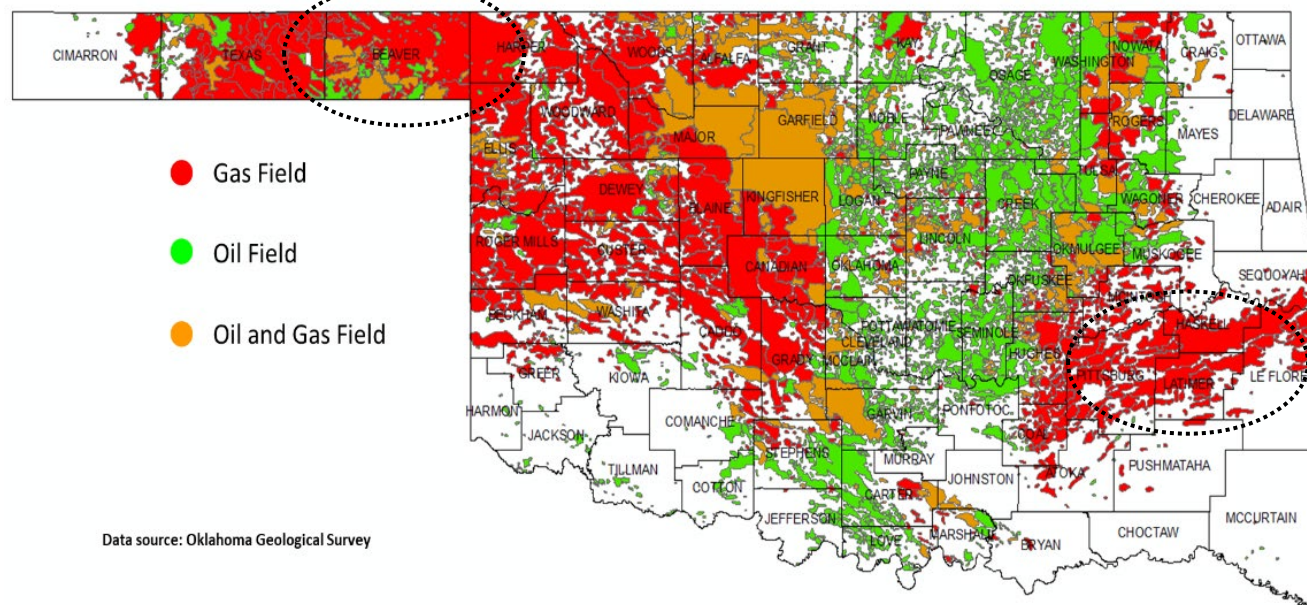
Area 2
Gross thickness 500 - 1000ft
~120 wells penetrated ABCK
No Core

3D Geological Modeling



- What have been completed?
 - Data Collection (well logs, formations' top, formations' type log, OPIC core information)
 - Oil and gas reservoirs catalog (Area, Lithology, Net Thickness, Porosity, Temp, Pressure)
200 reservoirs

Oil and Gas Fields in Oklahoma



67 reservoirs - NPV including:

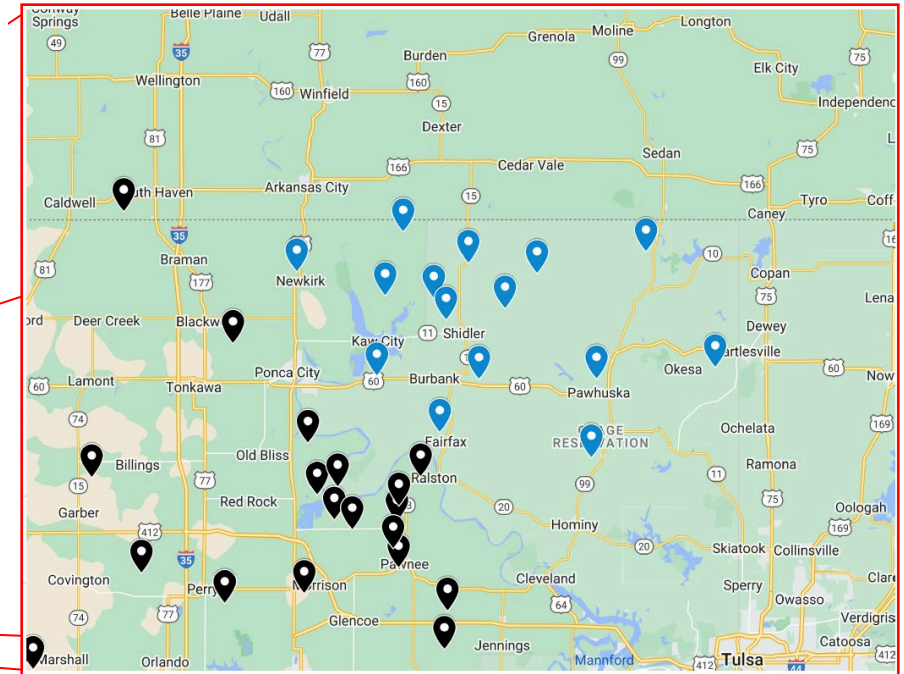
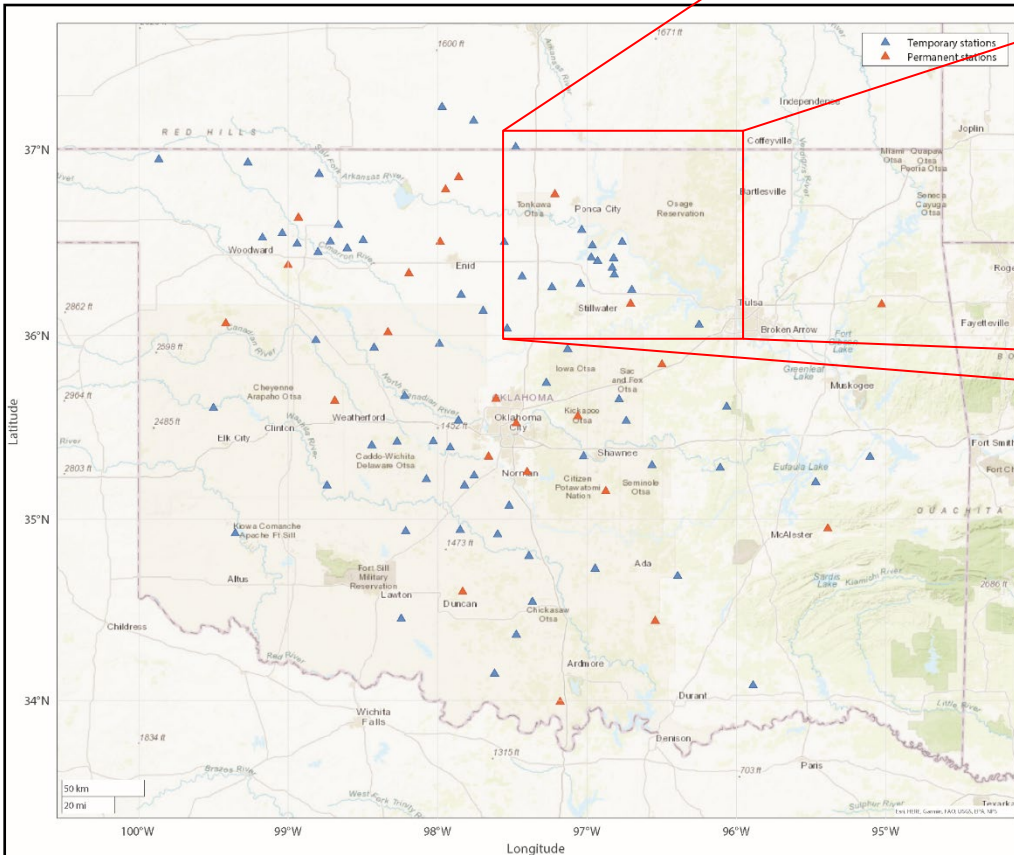
- 12 Pennsylvanian;
- 4 Virgilian (Tonkawa–Mocane Laverne gas area-Beaver: 21B ft³);
- 4 Missourian;
- 18 Desmoinesian;
- 21 Atokan (Red Oak-Red Oak-Norris-Latimer – 28B ft³; Spiro-Kinta-Haskell – 38B ft³);
- 10 Springer

- Research Plan
 - Sites Selection (2 sites based on mainly pore volume and available data)

Monitoring & Hazard Mitigation

Seismic & Well-Pressure Monitoring strategies and test runs, data-portal development

Pressure Monitoring (downhole instruments) & seismic network deployment into areas with deployment tailored to understanding CCS monitoring (Osage Nation).



Purchased 15 downhole instruments

Community Engagement

Current & Planned Engagement:

- General Geoscience Outreach – 574 contacts (Q1- to date)
 - <https://www.facebook.com/OKgeology/>
- Assisting with deployment of seismic network by facilitating collaborations with local organizations & agencies (Q3)
- Women in STEAM Conference, October 8 (Q4)
 - Developing interactive CCS models and activities
- Fall Stakeholder Workshop (Q4)



SMART Goals Progress

- Developing agenda, venue and date options for fall stakeholder workshop (Action 1)
- Developing program outlines, CCS models and activities for educational institutions and K12 teachers; identifying event opportunities (Action 2, 3)
- Developed stakeholder questionnaire; awaiting final IRB approval (Action 4)
- Exploring collaboration opportunities with OK Career Tech (Action 5)
- Arranging professional development opportunities with OU Office of Advocacy & Education, OU Native Nations Center, Unlearning Racism in Geoscience, and OU Accessibility and Disability Resource Center (Action 7, 8, 9)



Summary & Next Steps

Summary:

1. OGS thanks the DOE and NETL - first FECM DOE award in many years
2. OGS - good example of a state survey to conduct regional assessments, monitoring, & community engagement
3. The ...2799 award - build up OGS capacity for longer term objectives.
4. Project Management: Finalize contract, fiscal-effort plan, mandatory updates, finalize meeting schedules
5. Hired 3 postdoctoral researchers
6. Completed Sites Selection (Arbuckle and Non-Arbuckle)
7. Purchased equipment and completed deployment
8. Generated initial community engagement plans
9. YTD spending: US\$134,647.29 (Federal) + US\$56,765.73 (Cost Share)

Immediate Next Steps:

1. Start sites characterization and assessment
2. Continue seismic monitoring in the state of Oklahoma in general and in the Osage Nation in particular
3. Fall 2024 workshop