

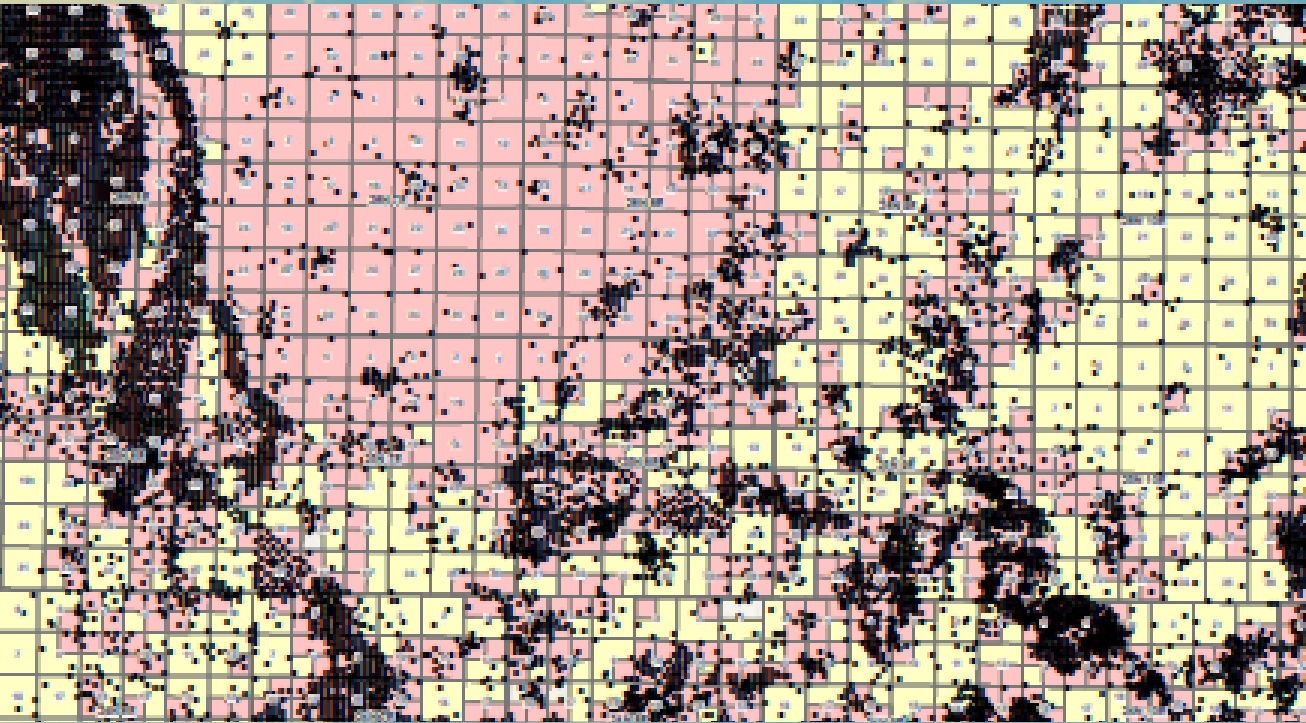


OSAGE NATION

Osage County, Oklahoma

SUMMER NAPE 2020

Oil and Gas Leasing Potential of Osage Nation



**Osage Minerals Council
Osage Nation**

Andrew Yates – Chair
Susan Forman
Mingo Gray
Mantha Harlan



Myron RedEagle – 2nd Chair
Talec Redson
Paul Revard
Everett Waller

July 27, 2020

Division of Energy and Mineral Development (DEMD)
Attn: Mr. Steven Manydeeds
13922 Denver West Pkwy, Suite 200
Lakewood, CO 80401

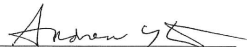
RE: Summer North American Prospect Expo (NAPE) August 11 – 27, 2020


Dear Mr. Manydeeds:

Pursuant to your letter request signed on July 14, 2020 the Osage Minerals Council and Chief Standing Bear are reaching out to you to confirm that the full Council approves and is desirous of having the DEMD use their marketing brochures, maps and atlases containing information about the Osage Minerals Estate for presenting resource development opportunities at the Summer virtual North American Prospect Expo from August 11-27, 2020. The DEMD has the Osage Minerals Council permission to present acreage available to lease, reserves, production, Seismic maps or other useful information to promote the Osage Mineral Estate for development.

An amended Resolution will follow our next Council meeting on August 7th, 2020.

Best regards,


Andrew Yates
Chairman Osage Minerals Council


Geoffrey M. Standing Bear,
Principal Chief of the Osage Nation

Cc: Janelle McLean, Janelle.McLean@bia.gov
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**RESOLUTION
OF THE
OSAGE MINERALS COUNCIL**

No. 4-323

WHEREAS,

1. The Osage Minerals Council, established pursuant to Article XV of the Osage Nation Constitution, is a governmental entity within the Osage Nation; and
2. The Osage Nation Constitution vests the Osage Minerals Council with the powers to administer and develop the Osage Mineral Estate in accordance with the Act of June 28, 1906, 34 Stat. 539, as amended, such powers with prior to ratification of the Osage Nation Constitution were vested in the "Osage Tribal Council; and
3. The Osage Minerals Council was elected to carry out the business of the Osage Mineral Estate and believes it to be in the best interest of said Estate and Headright holders to showcase the Osage Minerals Estate Acreage at the virtual NAPE this year in August.

THEREFORE, BE IT RESOLVED,

1. The Osage Minerals Council hereby approves sending a letter to Janelle McClean at the DEMD to showcase the Osage Minerals Estate at NAPE.
2. The Chairperson of the Osage Minerals Council is hereby authorized to sign this resolution and all supporting documents.

CERTIFICATION

I hereby certify the foregoing Resolution No. 4-323 was considered by the Osage Minerals Council at a duly called meeting in Pawhuska, Oklahoma, at which a quorum was present and the same was adopted by a vote of 8 in favor and 0 opposed; on this 17th day of June, 2019.


Chairman, Everett Waller

Attest:

Administrative Assistant, Lacey Reynolds

OSAGE NATION

Culture and History

Acquired in 1872 from the local Cherokee Nation, Osage County is also referred to as the Osage Nation Reservation, and currently the largest county in Oklahoma with approximately 1,470,938 acres, or 2,298 sq. mi. It is located in the North Central part of Oklahoma (see Figure 1).

The Osage are identified as a Dhegiha Siouan language speaking tribe along with the Omaha, Ponca, Kaw, and Quapaw. According to Osage and Dhegiha Siouan oral tradition, the origin of the Dhegiha Siouan Tribes is in the Ohio River valley. Those who would later become the Osage were the last remaining Dhegiha Siouan Tribe in the Cahokia/St. Louis area. In 1300 A.D. the Osage moved westward to focus primarily within the central and western portions of the state of Missouri. At the onset of the historic period, large groups of the Osage were located along the Missouri and Osage rivers. The Osage economy relied upon hunting and gathering, but they had a sizable agriculture and an extensive trading system. Osages ceded most of Missouri, over half of Oklahoma and Arkansas and half of Kansas to the Federal Government through five treaties beginning in 1808.

The Osage purchased the current Osage Reservation in what is now northeastern Oklahoma fee simple from the Cherokee and moved there in 1871. Grazing became economically important in the 1890s. Income mainly from grazing leases caused the Commissioner of Indian Affairs to call the Osages “the richest people on earth.” Petroleum income did not become a monetary factor until after Osage allotment in 1906–1907. By the 1920s the Commissioner’s comment had come closer to the truth.

Osage grass-leasing regulations made an easy transfer from grass to oil leasing. “Black Gold” became a national term when an Osage-bred, -trained, and -owned race horse by that name won the Kentucky Derby in 1924. Allotment brought a division of the Osage Trust Estate. This financial estate is held in trust by the United States and distributed to each living Osage. Income from grass and mineral leases were distributed quarterly on a per

capita basis to those who had been living in 1907. In addition, each shareholder, that is, one entitled to an equal share of the tribe’s mineral interests, was allotted just over 640 acres in Osage County, Oklahoma.

Osage prosperity attracted money-hungry outsiders. During this period of time, the so-called Reign of Terror, in which a number of Osages were murdered for their petroleum wealth, ended only when the newly formed Federal Bureau of Investigation (FBI) won a conviction in federal courts. The Osage Murders was the FBI’s first homicide case. The economic depression of the 1930s made the Osage once again poor, but happier. Since then, stereotypes and exaggerated stories about rich Indians and books about the murders have held the center stage in Osage-related literature. As a result, little has been said about the majority of the Osage people, who were busy giving their children the best education money could buy, who worked hard to produce beef for American tables, who firmly backed their nation in both war and peace. The Osage Allotment is full of firsts. Separation of mineral rights from surface rights by federal law first occurred in the Osage oil fields. Although the Osage people were not U.S. citizens during World War I, Osage men accepted the draft and volunteered for service in the highest percentage of any ethnic group of U.S. citizens. This was repeated during World War II.



Cover: The Osage Council, with other Osage Indians, who came to Washington in connection with gas and mineral rights on the Osage Nation in Oklahoma, Library of Congress, <https://lcn.loc.gov/93515475>.

Opposite: Osage camp, Library of Congress, <https://lcn.loc.gov/97506873>.

Right: Washington, DC, September 21, 2004 - Osage Nation One of the many Indian Nations marching to celebrate the opening of the National Museum of the American Indian. FEMA NewsPhoto/Bill Koplitz. https://commons.wikimedia.org/wiki/File:FEMA_-_11469_-_Photograph_by_Bill_Koplitz_taken_on_09-21-2004_in_District_of_Columbia.jpg

Prior to 2006 the Osage Minerals Estate was managed by the Osage Indian Tribe through the Osage Tribal Council and regulated by the Bureau of Indian Affairs. The Osage Tribal Council also had minimal governmental dealings with tribal affairs, education, health care, and other smaller matters. In 2004 a bill was passed in the US Congress, signed by President G.W. Bush, to pave the way to create the Osage Constitution. In 2006, the Osage Congress, Executive Branch, and the Legislative Branch were created to manage tribal welfare, programs, gaming, welfare, court and policing, and other governmental issues. This new Osage Constitution also created the Osage Minerals Council giving it power to approve mineral leases and look for other forms of development.

A new current of vitality enlivens the twenty thousand Osage people since the turn of the twenty-first century. More than ever before, Osages hold graduate degrees and the Osage language is being revitalized. Notable Osages include Vice President Charles Curtis, John Joseph Mathews, Gen. Clarence Tinker, and Maria and Marjorie Tallchief.

Learn more about Osage Nation:
<https://www.osagenation-nsn.gov/>



Above: The Osage Council, with other Osage Indians, who came to Washington in connection with gas and mineral rights on the Osage Nation in Oklahoma, Library of Congress, <https://lccn.loc.gov/93515475>.

Osage Oil & Gas Development History

The Osage Mineral Estate (OME) consists of approximately 1.5 million acres of mineral reserves originally set aside by Acts of Congress starting the Osage Allotment Act of 1906. The Osage Nation owns all minerals within the Osage County.

On March 16, 1896, Edwin B. Foster obtained an oil and gas lease covering the entire reservation. The lease was for a period of ten years and provided for the royalties to be paid to the Tribe as follows: For each gas well, \$50 per annum and 1/10 of all oil produced. The lease was later assigned to Phoenix Oil Company and thereafter an area of 60 sq. mi. was assigned to the Osage Oil Company. In January 1902, The Indian Territory Illuminating Oil Company was formed and took over all interest in the original lease and assignments thereof. The lease was renewed March 3, 1905, for an additional ten year period starting on March 16, 1906, but was restricted to an area of 680,000 acres in the eastern portion of the reservation. At this time the royalty was increased to \$100 per year on gas and 1/8 on all oil sold.

Leases were sold by sealed bid on April 11, 1912, and on September 29, 1913, the practice of lease sales by public auction was initiated. Upon the expiration of the Foster Lease on March 16, 1916, the various tracts under that lease, whose wells were producing less than 25 barrels of oil per well per day were awarded to the then operators. Tracts where wells produced an average greater than 25 barrels per well per day were sold at public auction on April 20, 1916.

The first commercial oil well was completed in the Osage Nation by the Phoenix Oil Company in the SW of Section 34, Township 27 North, Range 12 East, on October 28, 1897, for an initial production of 20 barrels of oil per day (BOPD) from the Bartlesville Sandstone. The first oil run from this well was in May, 1900, and sold for \$1.25 per barrel, less 25 cents for handling charges. Since that time more than one billion barrels of oil have been produced from the OME. There are estimates between 1.5 to 13 billion barrels of oil still remaining in the ground. Current production is about 1,000 BOPD

and 10MMCFPD. The Osage Minerals Council, created by the Osage Nation to administer and develop the Osage Mineral Estate, looks to maximize tribal resource exploration and development. Approximately, the total production of oil for Osage Nation is 1,389,243,497 barrels, and gas is 258,501,345 MCF.

Osage's Geology

The Osage Reservation lies in the heart of the Mid-Continent in northeast Oklahoma. It is situated on the Cherokee Shelf between the Nemaha faulting complex to the west and the Ozark Uplift to the east. The Nemaha Ridge and the Ozark Uplift are major pre-Mississippian structural elements with epigenetic (upheaval or depression) events which occurred intermittently during the Pennsylvanian Period. Episodes of widespread emergence and erosion created pre-Pennsylvanian and localized Paleozoic unconformities. Structural folding was accompanied by eustatic lowering of sea level as Late Mississippian and older Paleozoic (Ordovician) rocks were eroded and removed from shelf areas. Devonian-Silurian sediments overlapped Precambrian rocks and Mid Pennsylvanian rocks overlapped late Mississippian age rocks. Depositional environments and lithofacies patterns reflect marine encroachment and deltaic fluvial dominated units through the Pennsylvanian time. Compressive forces and localized orogenic episodes produced the productive folds and structures of the area.

Pennsylvanian age rocks are exposed at the surface in all but the extreme western part of the reservation where the Permian age rocks outcrop. They consist of mostly shale, sandstone and limestone with some redbeds in the western portion. The eastern part are mostly wooded hills and ridges composed of sandstone, while the western part is mostly grass covered limestone prairie upland. The stratigraphy of the subsurface has been identified by the drilling of over 45,000 wells combined with seismic data within the 2,000-5,000 ft or more of sedimentary rocks that overlie the pre-Cambrian basement, made up of granite, and other igneous and metamorphic rocks. The regional dip is westward at a rate of about 40 ft to the mile, interrupted by folds and some faults. Most production comes from anticlinal traps.

Oil and gas has been produced from over 30 formations including the Granite, Cambrian/Ordovician (Arbuckle dolomite), Mississippian limestone, shale and tripolitic chert (Chat) and Pennsylvanian sandstones (Bartlesville, Burbank/Redfork, Skinner, Cleveland and Layton sandstones and Big Lime and Oswego limestone). Osage Well Map shows the location and extent of oilfields in Osage County (see Figure 2). Figure 3 Oil Pool Map, shows the oil and gas fields on the Osage Indian Reservation and Figure 4 shows the Stratigraphic Column of main geological formations within Osage County.

Enhanced Oil Recovery

In 1920, Marland Oil Company was the first to discover the North Burbank Unit, located in Osage County, Northeastern Oklahoma. The North Burbank Unit has extensive history of activity, including primary depletion, produced gas cycling, and water and polymer flooding.

The first well was drilled by Marland Oil Company, which produced approximately 150 bbls/d. Consequently, more wells were drilled by Carter Oil Company and the field grew very rapidly in Osage County. The peak production for this field was mostly during 1922-1926 with a production rate of 121,700 bbls/d, and over 31 million barrels annually. The North Burbank Unit reserves were estimated at 824 million bbls of original oil-in-place. A total cumulative production of 332 million bbls of oil has been recorded to this date. This only accounts for 40% of the original oil in place. Another 10-20% of the recoverable oil remains below the subsurface.

In this field, significant reserves are currently available for post-secondary production (Li and Schechter, 2014). The North Burbank Unit is currently under a CO₂ recovery phase from the Pennsylvanian Burbank Sandstone member of the Cherokee Shale Formation at 3,000 ft of depth (Zornes and Cornelius, 1986). This demonstrates that the 100-year-old field has excellent

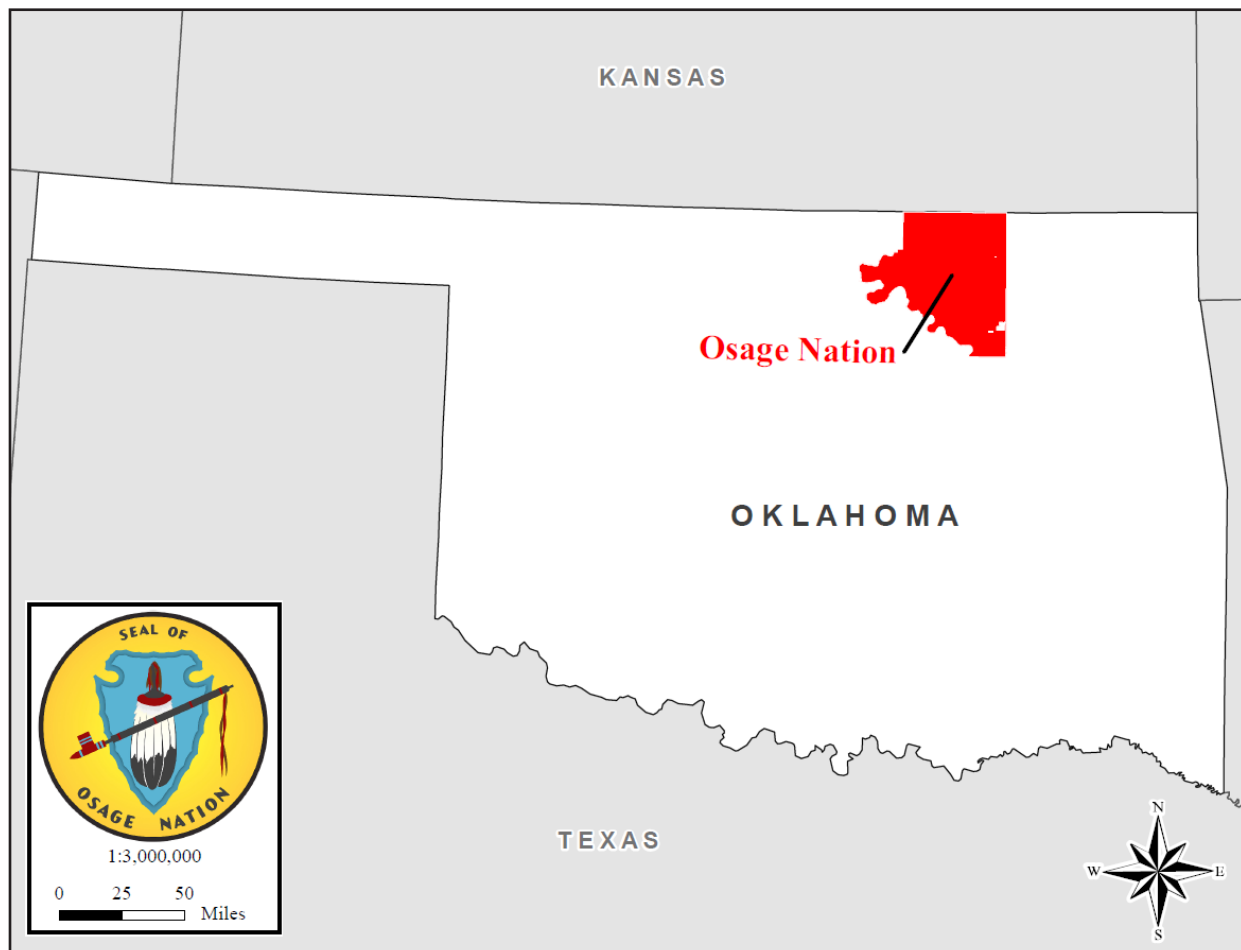


Figure 1: Location of Osage County in Oklahoma.

CO2 enhanced oil recovery (EOR) targets. The first CO2 volumes injected into the field came from a Fertilizer Plant in Coffeyville, Kansas approximately 64 miles away (see Figure 5). From 2013- 2016 Chaparral Energy injected around 30,000 Mcf of CO2 per day into the field. The average oil recovery increase by CO2 flooding was 11% (Li and Schechter, 2014).

As a result of the CO2 enhanced oil recovery this field has been able to maintain a steady production of 3,000 bbls/d (Wilmoth, 2017). In 2017, Perdure Petroleum

acquired all the assets on the North Burbank Unit from Chaparral Energy. Other fields around the area promise to have the same potential for enhanced oil recovery methods that can stimulate future production rates.

Seismic Data

Seismic data exists both in 2D and 3D format covering portions of Osage County, which shows the available 2D and 3D seismic data available in Osage County (see Figure 6). There are approximately 385 miles of 2D data available as well as approximately 351 sq. mi. of 3D

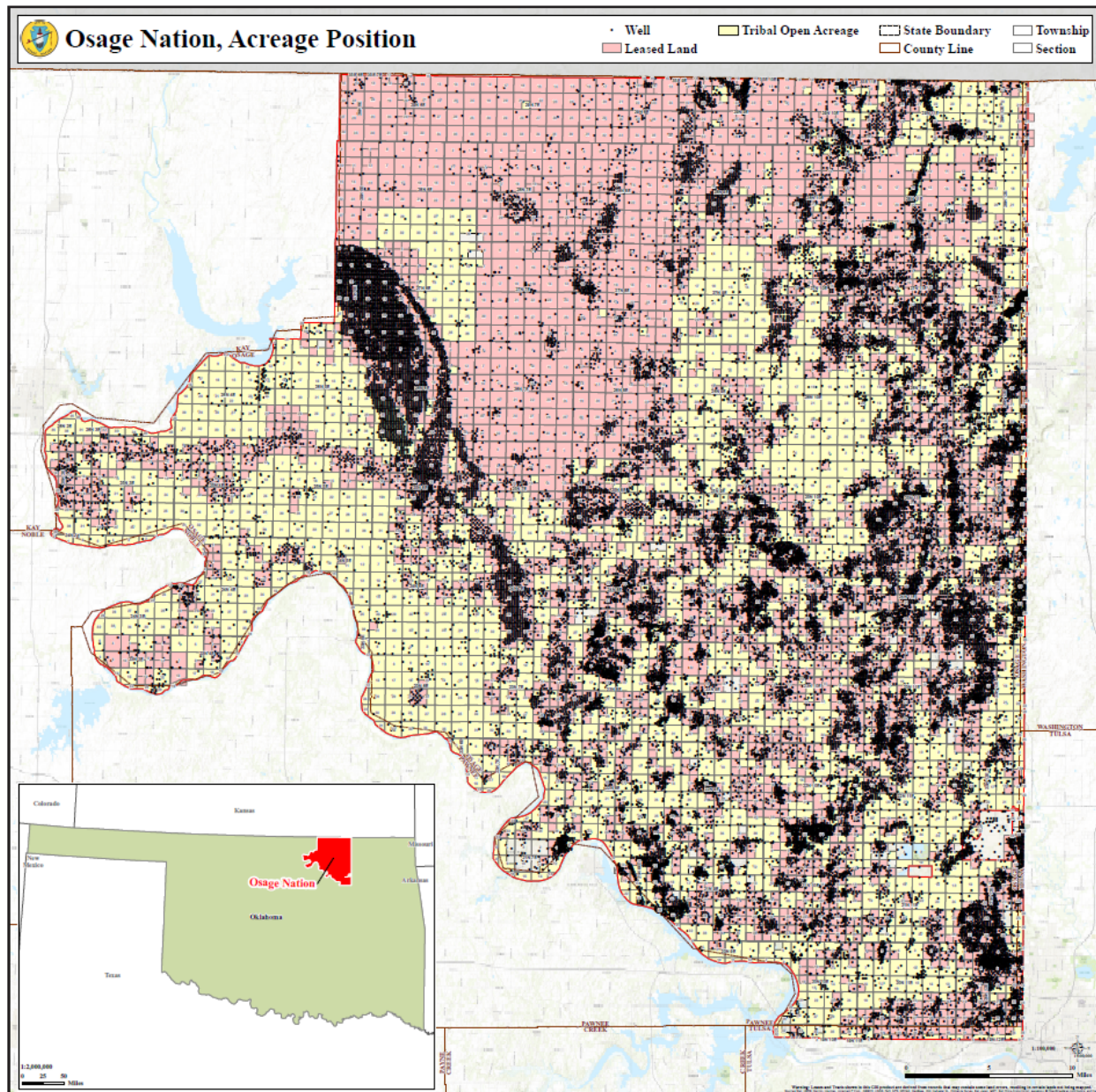


Figure 2: Osage County Map Showing Over 45,000 Wells Drilled

data. Figure 7 is a seismic vertical profile showing the quality of the data both in the sedimentary rocks and the underlying basement rocks. This data is available for preview at the Division of Energy and Mineral Development offices in Lakewood, CO, with prior approval of the Osage Tribal Council.

Leasing

Please contact the Osage Nation Agency for any leasing questions. View the map of Tribal open acreage in Osage County (see Figure 8).

Osage Nation Agency

osageminerals.org

<https://www.bia.gov/regional-offices/eastern-oklahoma/osage-agency>

(918) 287-5700

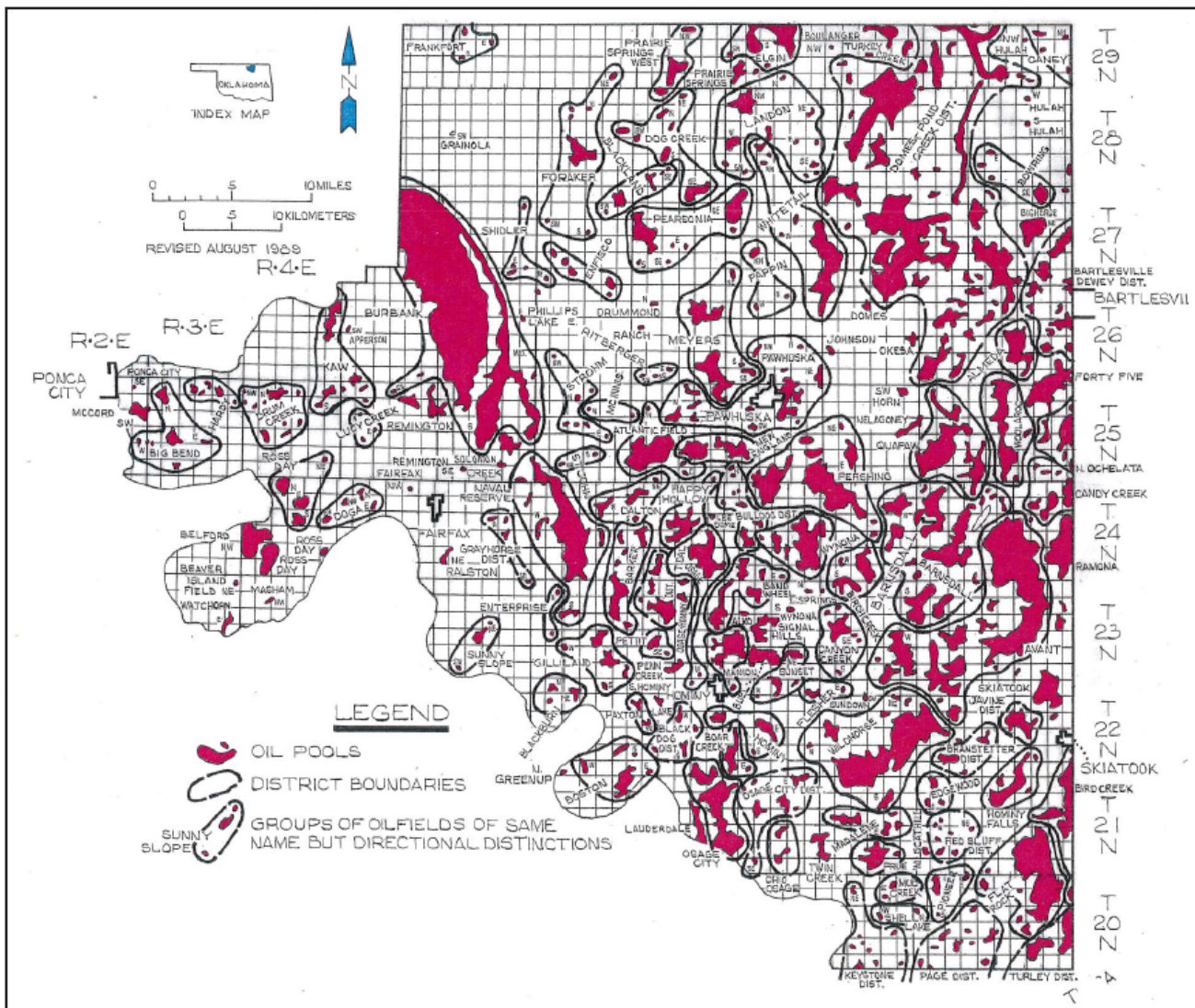


Figure 3: Oil Pools in Osage County, Oklahoma.

	System	Series	Group/Formation	Member
Ma				<i>Informal in Italic</i>
~299	Pennsylvanian	Virgilian		Campbell SS
				Ragan SS
			Wabaunsee	Crews SS
				Ebert SS
				Burlingame LS
				Newkirk SS
				Pawhuska LS
				Hoover SS
			Shawnee	Elgin SS
				Carmichael SS
			Oread LS	
			Endicott SS	
		Douglas	Lovell SS	
			Haskell LS	
~304				Tonkawa SS
			Ochelata	Avant LS
			<i>(Barnsdall, Wann, Iola, Chanute)</i>	Osage Layton SS
				Cottage Grove
			Skiatook	Hogshooter LS
			<i>(Dewey, Nellie Ely, Coffeyville, Seminole)</i>	Layton SS
			Checkerboard LS	
			U Cleveland SS	
			Cleveland SS	
		Marmaton	Big Lime	
			Labette SH	
			Oswego LS	
			Prue SS	
		Cherokee	Verdigris LS	
		<i>(Seneca, Eclogg, Savanna)</i>	Skinner SS	
			Pink LS	
			Red Fork SS	
			<i>Eurhank SS</i>	
323	Mississippian	Chester	Mayes	
		Meramec		
		Osage	Boone	<i>Miss Chat</i>
~347			St. Joe	<i>Miss Lime</i>
		Kinderhook		
			Chattanooga SH	
359	Devonian		<i>(Woodford)</i>	Misener SS
444			Sylvan SH	
			Viola	
	Ordovician			Fite LS
			Simpson	Tyner
				Burgen SS
			Arbuckle	
486	Cambrian			
540	Pre-Cambrian		Reagan Sandstone <i>(Timbered Hills)</i>	
			Spavinaw Granite	
			Washington County	
			Rhyolite	

Figure 4: Osage County Stratigraphic Column.



Figure 5: CO2 Pipeline from Coffeyville, Kansas to the North Burbank Unit in Osage County.

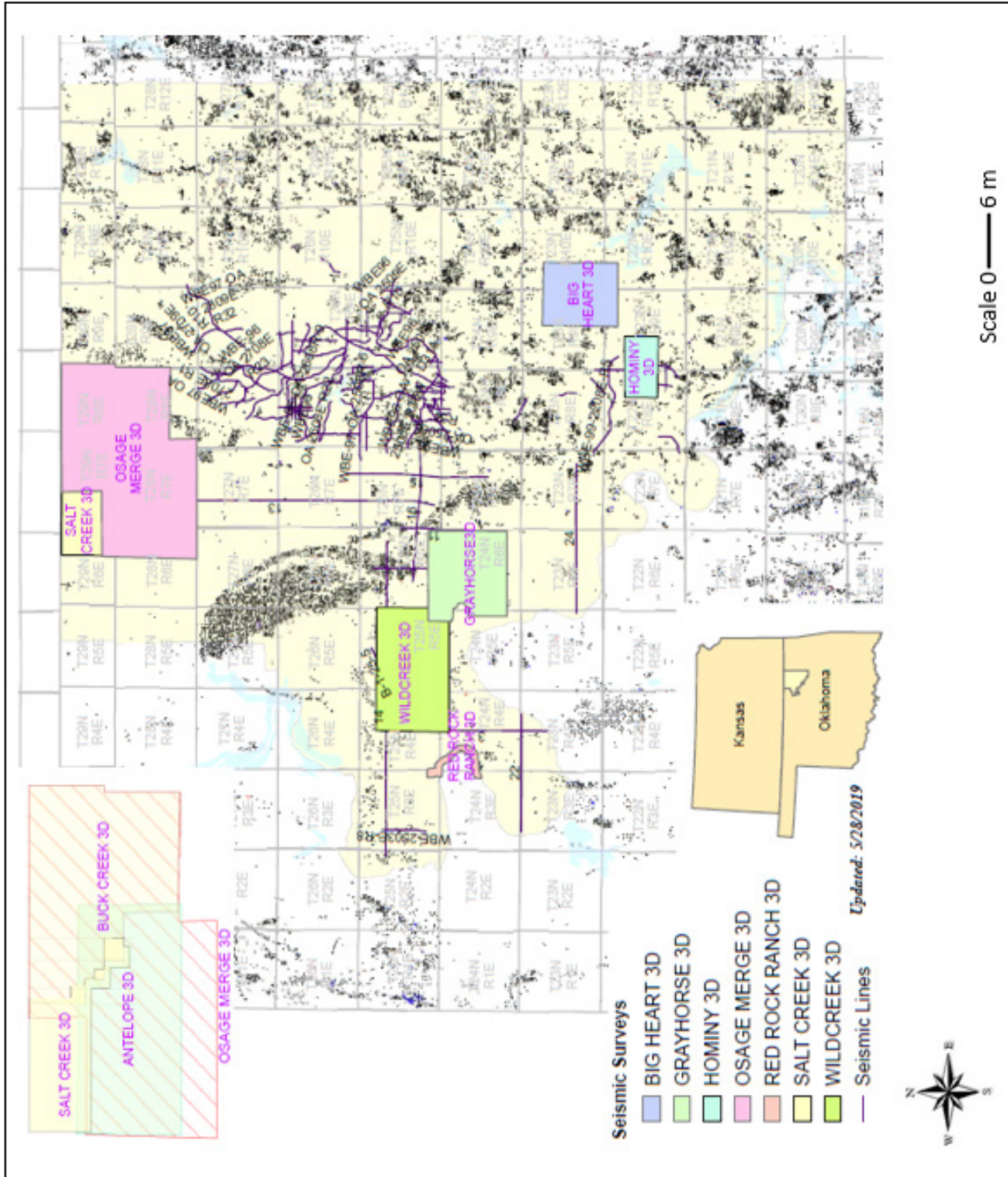


Figure 6: Available 2D and 3D seismic data.

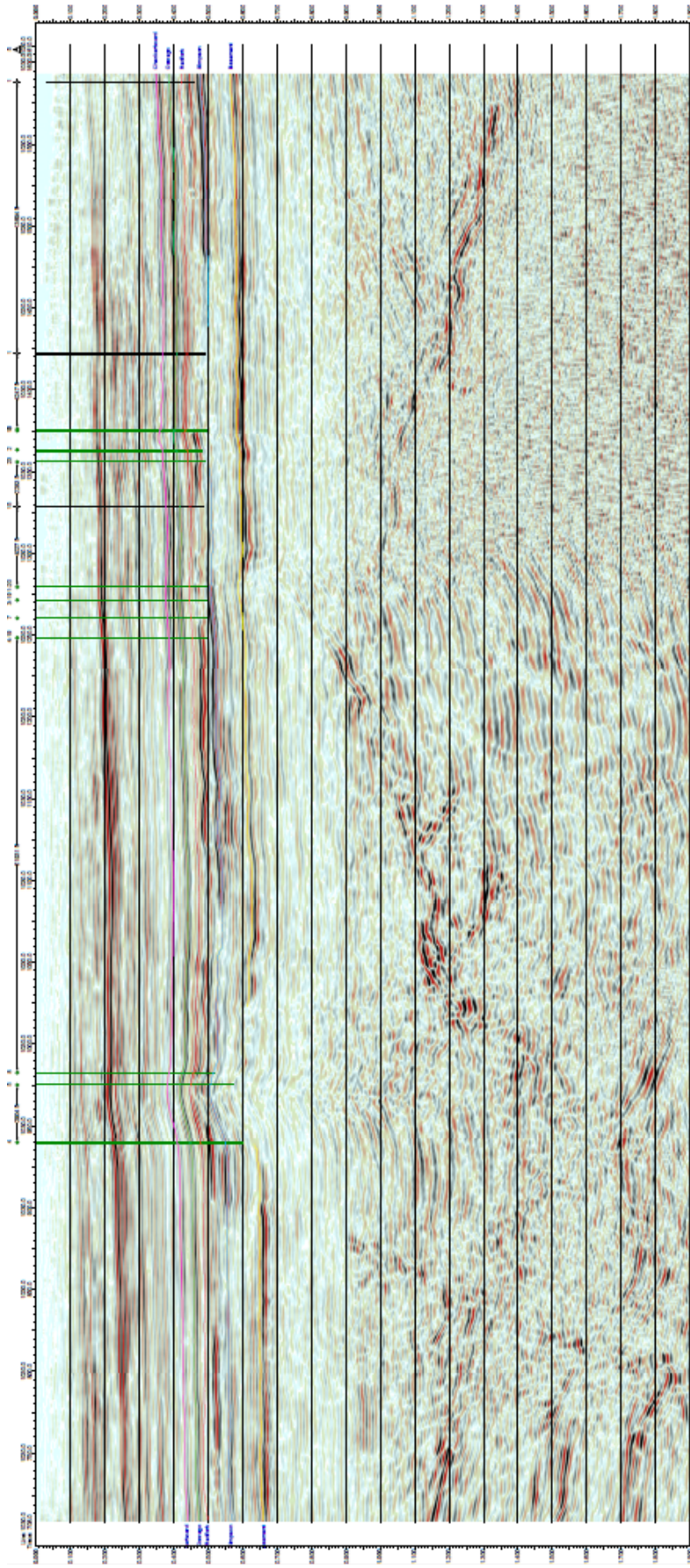


Figure 7: Vertical Profile of the Buck Creek, Antelope and Pearsonia 3D Shots.

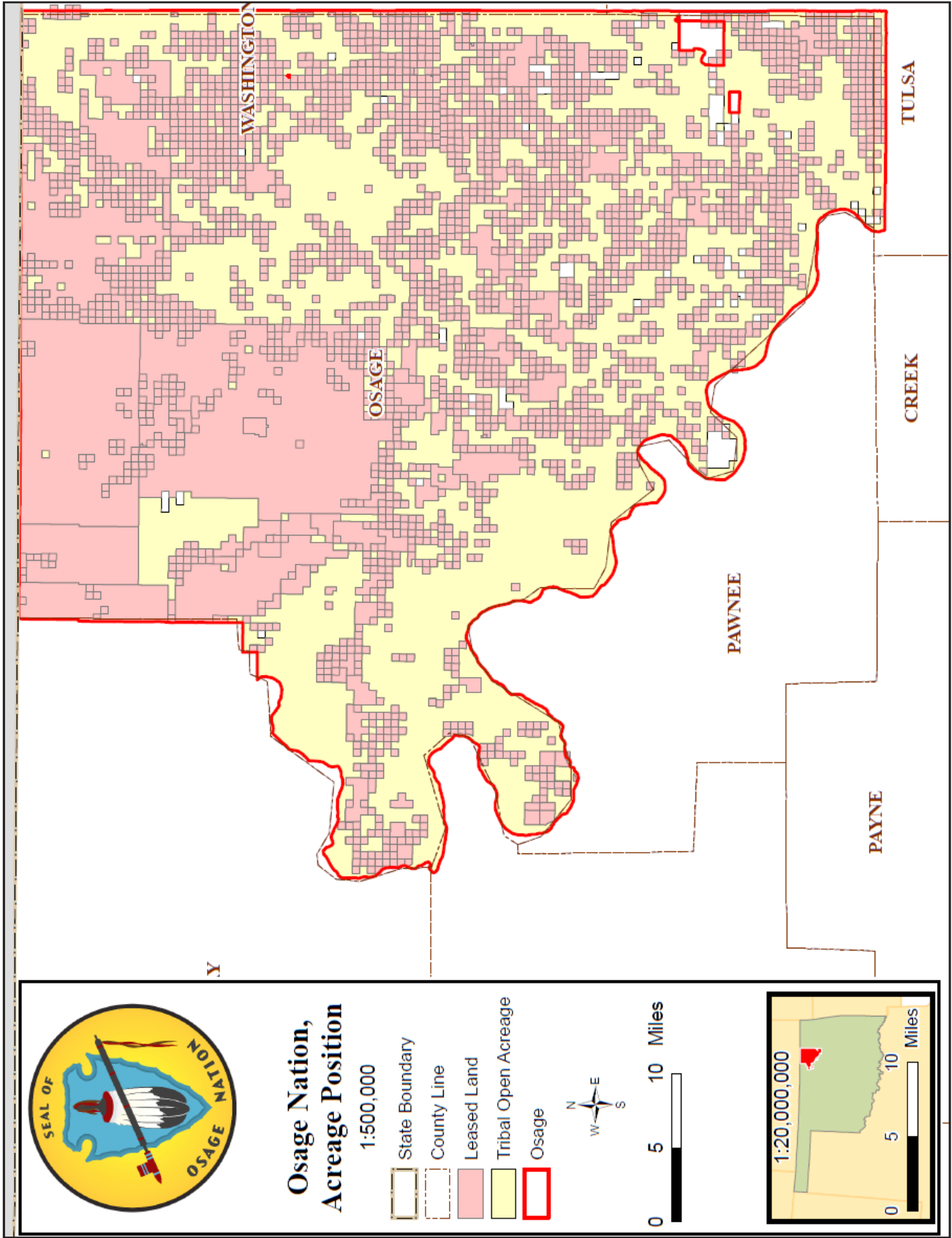


Figure 8: Osage County Acreage Distribution Map.

References

- D.R. Zornes, A.J. Cornelius. An Overview and Evaluation of the North Burbank Unit Block aPolmer Flood Project, Osage County, Oklahoma. 1986. Society Of Petroleum Engineers.
<<https://www.onepetro.org/conference-paper/SPE-14113-MS>>.
- W. LI, D.S. SCHECHTER. Using Polymers to improve CO2 Flodding in the North Burbank Unit . March 2014.
<<https://pdfs.semanticscholar.org/2090/7f9ab1238bc68b9e398b6f3047c6f1e83b55.pdf>>.
- Wilmoth, Adam. Oklahoma City-based Chaparral Energy to focus on STACK development. Friday April 2017.



CONTACT INFORMATION

For more information about the Osage Nation and access to geologic data, please contact:

Osage Nation Agency

<https://www.bia.gov/regional-offices/eastern-oklahoma/osage-agency>

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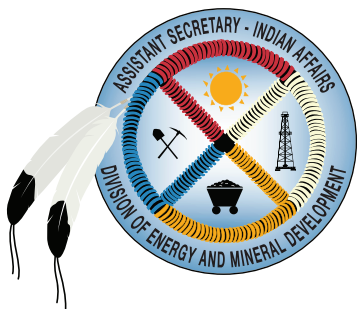


Division of Energy and Mineral Development

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Office of Indian Energy and Economic Development
Division of Energy and Mineral Development



Above: The Osage Council, with other Osage Indians, who came to Washington in connection with gas and mineral rights on the Osage Nation in Oklahoma, Library of Congress, <https://lccn.loc.gov/93515475>.

Back cover: Osage camp, Library of Congress, <https://lccn.loc.gov/97506873>.



Osage Camp