Geologic History

Rocks of every geologic period crop out in Oklahoma. At the conclusion of the Pleistocene Epoch, a series of sedimentary rocks consolidated from sediments deposited during the Paleocene. The oldest are Pre cambrian granites and gneiss formed about 1.00 to 1.8 billion years ago. Much later, during the Tertiary Period, a different group of granites, gneisses, and basalts formed about 100 million years ago. As the normal faulting subsided, the sedimentary rocks filled the rifts off the Central Lowland, as the Oklahoma City area. These sedimentary deposits consist of sandstone, shale, and limestone.

To the northwest of these sedimentary depo districts, paleo-cores have been identified that indicate the presence of Cambrian, Ordovician, Silurian, and Devonian Periods of the Precambrian. Thick limestones and dolomites are the most prominent of these formations. Many of these limestones and dolomites contain sandstone and shale as well. Fossils are common in these formations, including brachiopods, graptolites, corals, and crinoids being most numerous. The age of these formations was determined by radiometric dating. The oldest of these units is the Capitanian Stage, which is about 300 million years old. The youngest of these units is the Permian, which is about 225 million years old. The Permian is the last major geologic period before the beginning of the Mesozoic Era, which began about 225 million years ago.

The Mesozoic Era is divided into three periods: the Triassic, Jurassic, and Cretaceous. The Triassic is the first period of the Mesozoic and is characterized by the appearance of many new groups of animals and plants. The Jurassic is the second period of the Mesozoic and is characterized by the appearance of many new groups of animals and plants. The Cretaceous is the last period of the Mesozoic and is characterized by the appearance of many new groups of animals and plants.

The Quaternary Period is the most recent period of the geologic time scale. It is characterized by the appearance of many new groups of animals and plants, including the appearance of humans. The Quaternary Period is divided into two subperiods: the Pleistocene and the Holocene.

The Pleistocene is the most recent subperiod of the Quaternary Period. It is characterized by the appearance of many new groups of animals and plants, including the appearance of humans. The Pleistocene is divided into two periods: the Early Pleistocene and the Late Pleistocene.

The Early Pleistocene is the first period of the Pleistocene and is characterized by the appearance of many new groups of animals and plants. The Late Pleistocene is the second period of the Pleistocene and is characterized by the appearance of many new groups of animals and plants.

The Holocene is the most recent period of the Quaternary Period. It is characterized by the appearance of many new groups of animals and plants, including the appearance of humans. The Holocene is divided into two periods: the Recent and the Holocene.

The Recent is the most recent period of the Holocene. It is characterized by the appearance of many new groups of animals and plants, including the appearance of humans. The Holocene is divided into two subperiods: the Pleistocene and the Holocene.

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Dimensions of Oklahoma

Distance, shown in miles, calculated by A. J. Myers and D. L. Vodberg

Area: 69,951 square miles, or 44,055,000 acres

TOPOGRAPHIC MAP OF OKLAHOMA

Compiled by
KENNETH S. JOHNSON

(Updated 1979)
GEOMORPHIC PROVINCES OF OKLAHOMA

By

NEVILLE M. CURTIS, JR., AND WILLIAM E. HAM
MINERAL RESOURCES MAP OF OKLAHOMA
EXCLUSIVE OF OIL AND GAS FIELDS
Compiled by
KENNETH S. JOHNSON
(Updated 1979)
Giant oil field (ultimate recovery of more than 100 million barrels). Oklahoma's yearly production of about 100 million barrels of crude oil, valued at $1.1 billion, is 3 percent of the total United States annual output and makes Oklahoma fifth place on an oil-producing state. Oil is produced from approximately 72,000 wells in 59 counties.

Giant gas field (ultimate recovery of more than 1 trillion cubic feet). Annual Oklahoma gas production is 1.8 trillion cubic feet and has a value of $5.1 billion. Only two states produce more gas than Oklahoma each year. Of the 21,400 gas-producing wells, many also produce liquid hydrocarbons that can be separated from the gas in gas-processing plants.

Oil and gas are complex molecules of hydrogen and carbon believed to have formed from the decay of microaerobic organisms buried in mountain sediments of ancient seas. Deeper burial later created sufficient pressure to decompose the oil and gas out of the muds into more porous rocks such as sandstone, limestone, and dolomite. Virtually all of Oklahoma's oil and gas occurs in Paleozoic rocks, with Pennsylvanian and Ordovician formations being the most productive.

No authentic record of the first discovery of oil in Oklahoma is available, but early settlers found oil springs in northeastern Oklahoma and reported a burning swamp northeast of McLaster. In 1869 a well drilled for salt near Salina, Mayes County, accidentally produced oil, which was then sold as lamp oil. Of wells drilled in search of petroleum, the first commercial well (one that makes a reasonable profit above the cost of drilling, equipping, and producing) was completed at Bartlesville, Washington County, in about 1899. The earliest recorded production of oil in Oklahoma was 20 barrels in the year 1901.

Detailed data are available on oil and gas exploration in Oklahoma since 1933, but unfortunately records on the number of wells drilled during the boom years prior to that time are incomplete. Therefore, the total number of wells drilled in the state in search of oil and gas is uncertain, but the figure probably greater than half a million. Of these wells, about 80,000 currently produce oil and (or) gas. Daily average production of oil is 6 barrels per well. In 1977 the total value of oil and gas produced in the state was more than $16 billion and accounted for about 95 percent of the state's total mineral production. As of January 1978, cumulative production was 11.6 billion barrels of oil and 406 trillion cubic feet of gas and had a total value of more than $30 billion.

On February 27, 1979, Mississippi River Transmission Exploration Co. announced that its 1 Sunders well in Beckham County was producing gas from a depth of 23,030-24,001 feet. The well established a new depth record for production in Oklahoma and flowed 9 million cubic feet of gas per day from rock of the Hunton Group. Beckham and Washita Counties, in the deep part of the Anadarko Basin, continue to be the area of deepest drilling in Oklahoma, and other wells will probably be productive at depths greater than the current State record of 24,054 feet. Beckham County is also the location of the world's deepest borehole. In 1974 the Lone Star 1 Rogers well was drilled to a total depth of 24,441 feet and thus claimed the depth record from a Washita County well, the Lone Star 1 Baden, which had been drilled to a total depth of 20,000 feet in 1972.

**GENERALIZED OIL AND GAS MAP OF OKLAHOMA**

Compiled by

John F. Roberts and William E. Harrison

(Updated 1979)
Precipitation is the source of virtually all ground water in Oklahoma. Average annual precipitation ranges from about 16 inches in the western Panhandle to as much as 60 inches in the southeast part of the State. Part of this precipitation seeps into the soil and eventually percolates into openings in the underlying bedrock. These openings store and transmit water that is later removed from wells or is discharged through springs and seeps to help maintain the flow of streams. Oklahoma’s major ground-water aquifers are stream deposits (alluvium, terrace deposits, and the Ogallala Formation), limestones, sandstone, and gypsum. These aquifers are estimated to contain more than 300 million acre-feet of water, enough to cover the State to a depth of 7 feet. Large areas of the State, shown on the map, are underlain mainly by shale that yields only enough water for household use. Ground water provides about 80 percent of the water used for irrigation. Part of the precipitation falling on the land surface runs off to form streams and rivers. Runoff ranges from about 0.3 inch per year in the Panhandle to nearly 20 inches in the southeast. The entire State is drained by the Arkansas and Red Rivers and their tributaries. Each year approximately 13 million acre-feet of water flows into the State through the streams, 22 million acre-feet is added by precipitation, and 10 million acre-feet flows out of the State. Most streams have erratic flows, and many smaller ones go dry or nearly dry each year. Consequently, reservoirs, lakes, and ponds have been constructed throughout the State to provide a dependable supply of water and for other purposes. The State contains approximately 1,200 lakes with an area of 10 acres or more and an estimated 100,000 farm ponds of less than 10 acres. Storage capacity of the 21 largest reservoirs is nearly 11 million acre-feet. The largest reservoirs are Lake Tenkiller, with a capacity of about 3 million acre-feet, and Kiamichi Reservoir, with a capacity of about 2.4 million acre-feet. Reservoirs and lakes provide for flood control, generation of electricity, recreation, and water supply. About 90 percent of all water used by cities and industries is taken from surface-water sources. Completion of a series of locks and dams on the Arkansas and Verdigris Rivers provide for barge navigation from the Mississippi River to the Tulsa area.

All natural waters contain various minerals dissolved from rocks that the water moves over or through. The mineral content of ground water from stream deposits, limestones, and sandstone is typically low to moderate, and the water is suitable for most purposes. Water from gypsum is highly mineralized but is suitable for irrigation of some crops. Water in streams within Oklahoma is generally highly mineralized and is of the quality that must be used. The mineral content of water in streams draining the eastern part of the State is generally low. Highly mineralized water, used for nearly any use, is present beneath fresh water in all parts of the State at depths ranging from less than 100 feet locally to as much as 3,000 feet in the Arbuckle Mountains.