



Overview of Water and Related Resources

Part 2

Natural Resource & Socioeconomic Characteristics

An almost endless array of environmental and socioeconomic characteristics -- including climate, geography, geology, minerals, soils, agriculture, wildlife, recreation, archeology, commerce population and employment -- which affect the current and future availability and use of Oklahoma's surface and groundwater supplies.

CLIMATE

Climate, along with geography, has a profound influence on water resources and hydrologic characteristics in Oklahoma, which lies across two divergent climatic regions. The state's relatively long distance from the moderating effect of the oceans and an absence of mountains to the north often allows cold arctic winds to reach Oklahoma during the winter, which is normally short and mild. In the spring, large thunderstorms develop when warm, moist air from the Gulf of Mexico converges with colder northern, humid eastern and dry western air masses, often producing tornadoes and large hail. Summers in Oklahoma are usually long and hot, punctuated by droughts of varying degree and duration. Fall, though often wet, normally features mild days and cool nights. May ranks as the wettest month while January is the driest.

Annual rainfall (Figure 7) varies from more than 50 inches in the relatively warm and humid pine forests of the Ouachita Mountains in southeast Oklahoma to approximately 16 inches in the high plains of the western Panhandle where warm days and cool nights predominate. The state-averaged precipitation is 33.5 inches. The temperatures in Oklahoma (Figure 8) vary from approximately 54 to 62 degrees Fahrenheit from west to east with a state average of 60.5 degrees. Average snowfall accumulations range from less than five inches in the southeast to 25 inches in the northwest and Panhandle. The growing season, defined as the period between the average date of the latest freeze in the spring and the first freeze in the fall, ranges from 170 days in the Panhandle to 240 days in south central Oklahoma.

Official records show an all-time low annual rainfall total of 6.53 inches at Regnier in Cimarron County (1956) while, one year later, the record high of 84.47 inches was recorded at Kiamichi Tower in LeFlore County. High temperature readings of 120 degrees mark the official record at several reporting stations (Altus, Alva and Poteau, 1936; Tishomingo, 1943; and Tipton, 1994) while minus 27 degrees occupies the record low at Watts (1930) and Vinita (1905).

Only Texas, Kansas and Iowa report more tornado sightings than does Oklahoma. Although they can occur at any time, tornados most often appear during the spring months of April and May moving along cold fronts from the southwest to northeast. From 1950 to 1992, Oklahoma County has had the most tornado occurrences (72), followed by Kay (70) and Caddo (69).

Flooding has plagued Oklahomans throughout history, with the most frequent and damaging events occurring in the east. Some of the early catastrophic flooding events which affected Oklahoma, such as those in 1912 and 1913, occurred when the Mississippi River overran its banks. During the 1923 flood, the North Canadian River breached Lake Overholser Dam, inundating much of Oklahoma City. Perhaps the most widespread flood in modern Oklahoma history occurred in 1957. Virtually all railroad and highway bridges in the Cimarron River Basin were damaged or destroyed and hundreds of thousands of acres of agricultural land was inundated throughout the state.

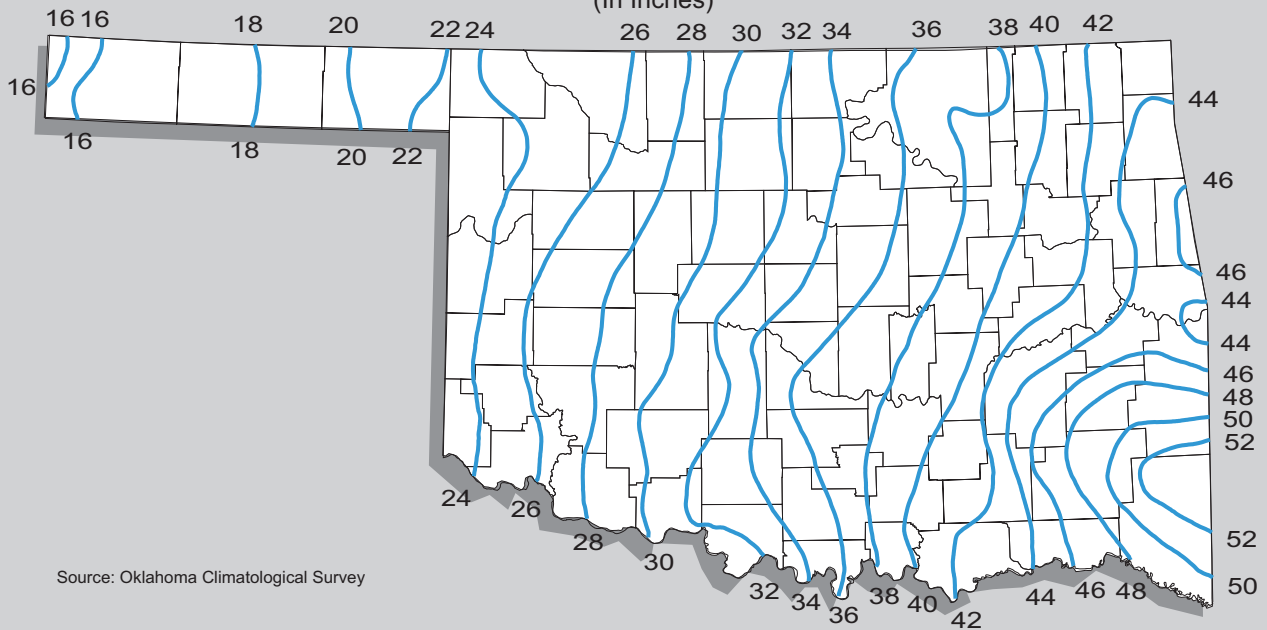
As Oklahoma developed, flood losses grew. The years between 1955 and 1975, during which the state suffered some \$167 billion in flood losses, were punctuated by the Enid flood of 1973 that caused \$78 million in damages and took nine lives. The City of Tulsa, a community ravaged by regular flooding, experienced one of the worst natural disasters in state history when 14 lives were lost and damages in excess of

\$180 million were incurred as a result of the 1984 Memorial Day flood.

Like other southern Great Plains states, Oklahoma has scorched under extended periods of drought. While determination of the onset and conclusion of drought is a rather subjective undertaking, the most serious episodes seem to impact the state in approximate 20-year cycles. Notable among them were the dry years that oc-

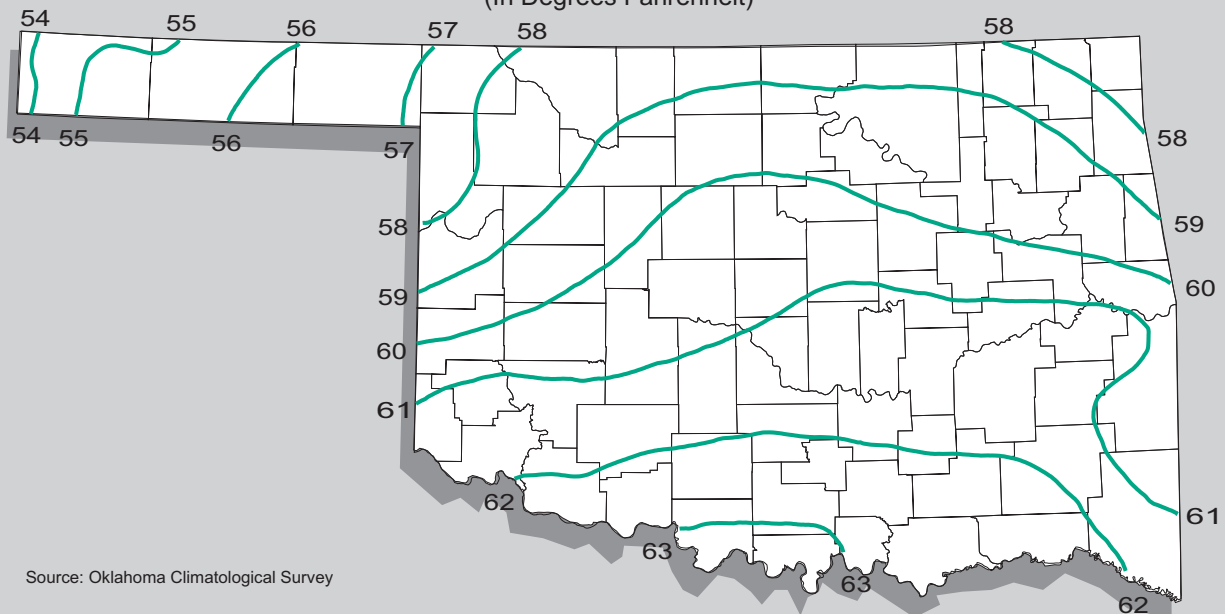
curred at the end of the century and again in 1910 and 1919. However, utilizing data gathered from long-term streamflow measurement stations established in the 1920's and 30's, the U.S. Geological Survey has identified four major droughts in Oklahoma history. The initial episode, which lasted from 1929 to 1941, is probably the most notable due to the major soil damage and wind erosion which resulted during the

Figure 7
AVERAGE ANNUAL PRECIPITATION 1961-1990
(In Inches)



Source: Oklahoma Climatological Survey

Figure 8
MEAN ANNUAL TEMPERATURE 1951-1980
(In Degrees Fahrenheit)



Source: Oklahoma Climatological Survey

Figure 9
 AVERAGE ANNUAL RUNOFF 1951-1980
 (In Inches)

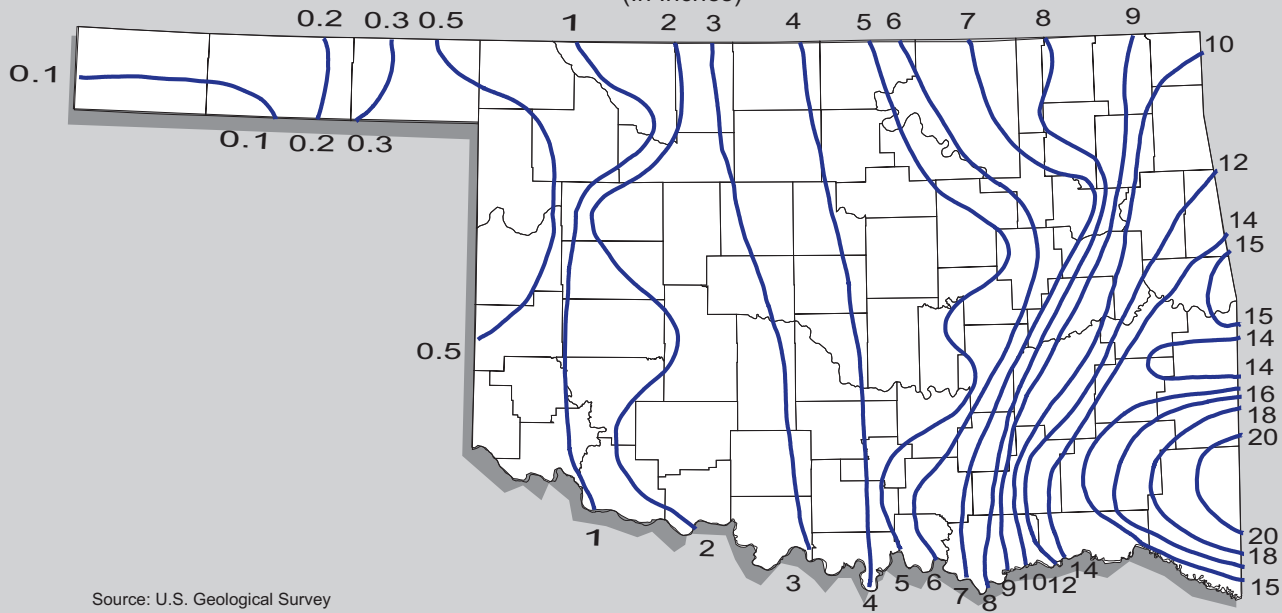
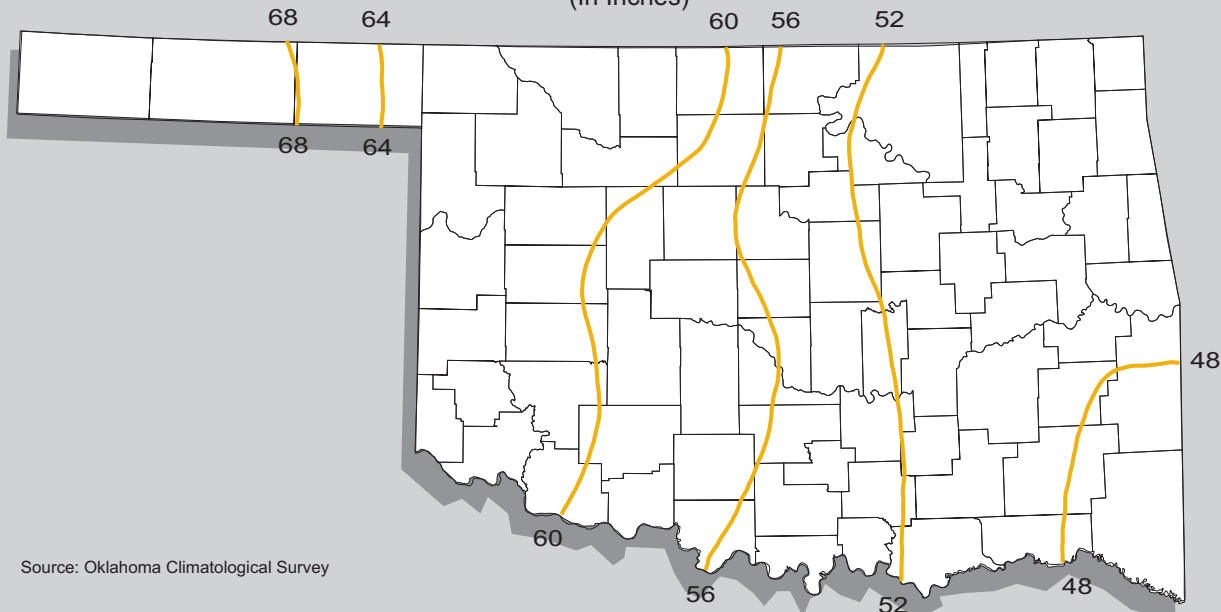


Figure 10
 AVERAGE ANNUAL LAKE EVAPORATION 1961-1990
 (In Inches)



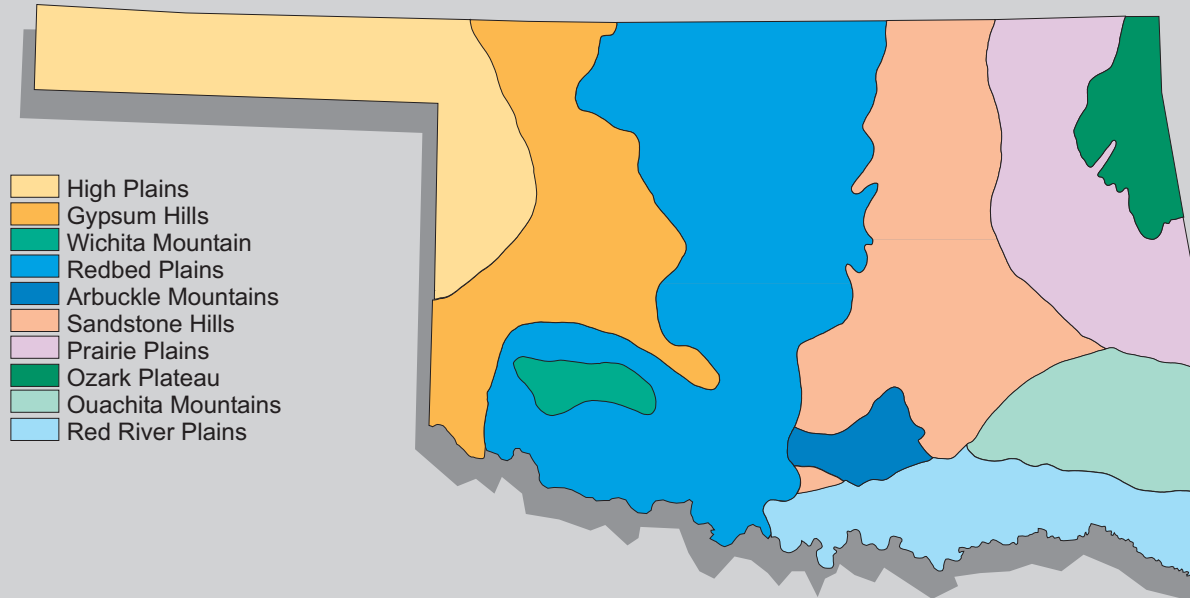
“Dust Bowl” period. The 1951-57 drought was less severe but more widespread, prompting many Oklahoma communities to improve and enlarge their water supplies. The entire state was again affected by the 1961-72 drought, although it was temporarily interrupted by a brief period of above average streamflow. The latest, and relatively least severe, drought occurred from about 1975 to 1982.

A study of drought conditions in Oklahoma from 1931 to 1971 indicate that drought occurred somewhere in the state 51 percent of the time, more frequently in the Panhandle and less frequently in northeast and south central areas. Eastern Oklahoma experienced short periods of drought, while the Panhandle averaged longer dry periods, again emphasizing the variability of

weather in eastern Oklahoma and the normal shortage of rainfall in the west.

The state’s abnormal rainfall pattern, coupled with evaporation enhanced by strong winds and percolation of water into the ground, results in an average annual runoff of .20 to 20 inches from west to east, respectively (Figure 9). Runoff, a measure of the amount of precipitation that flows over the surface, is the

Figure 11
PHYSIOGRAPHIC REGIONS



Source: *Atlas of Oklahoma*, Oklahoma State University

most telling factor regarding water availability. Evaporation (Figure 10) and percolation preclude immediate use of approximately 80 percent of Oklahoma's water. Average annual lake evaporation ranges from 48 inches in the extreme east to 65 inches in the southwest, numbers that far exceed the average yearly rainfall in those areas. Despite an often crucial need for water in the semi-arid west and significant development of surface sources in the humid east, an estimated 34 million acre-feet of unused water flows out of the state each year through Oklahoma's two major river basins.

GEOGRAPHY

From northwest to southeast, the Oklahoma topography slopes gently (about five feet per mile) while vegetation thickens as the country-side changes from semi-arid plains to woodlands and mountains. Elevations range from 4,973 feet on Black Mesa, the three-mile-long remnant of a basaltic lava flow in the northwest corner of the Panhandle, to 287 feet above sea level where the Little River enters Arkansas in the southeast. The state's varied physiography is presented in Figure 11.

The High Plains of western Oklahoma is actually a plateau region with a relatively dramatic, though gentle, eastward/

southeastward slope of 12 feet per mile in some areas. The altitude drops almost 3,000 feet from the summit of Black Mesa to western Woodward County, where it begins to level off somewhat to the southeast corner of McCurtain County. Resistant rock masses have been folded, faulted and thrust upward to form the state's three principal mountain systems -- the Wichita Mountains in the southwest, the Arbuckle Mountains in south central Oklahoma, and the Ouachita Mountains in the southeast. Sugar Loaf Mountain, eight miles west of Poteau, represents the highest relief in Oklahoma as it rises some 2,000 feet above the surrounding plains.

Southeast Oklahoma is marked by pine and mixed forests, but other large portions of the east are covered with hardwoods. A broad area of primarily oak forest, known as the "Cross Timbers," dominates a substantial section of central Oklahoma. Between these wooded areas and west of the Cross Timbers lie regions of tall-grass prairie, most of which have been converted to fertile farmland. As the land continues its upward slope west of the Cross Timbers, trees are less common and plains become the dominant feature.

The natural vegetation of Oklahoma can be divided into three major categories. In order of abundance, they are grass-

lands; savannahs and woodlands; and forests. A mixed-grass prairie covers most of western Oklahoma, which has been cultivated into one of the most productive wheat-producing regions in the world. While most of the Panhandle is shortgrass prairie, areas in the extreme west feature vegetation more commonly found in rugged plateau areas characteristic of the American west. Tall grasses are common in the north and east. Savannahs and woodlands, which include the Cross Timbers, are found throughout Oklahoma, except in the Ouachita Mountains and Ozark Plateau.

Approximately one-fifth of Oklahoma's total land area is forested, especially in the east where rainfall is abundant and the rugged topography is not conducive to most agricultural uses. State forests contain 144 species of native trees with varied species reflecting the state's considerable geographic range. Varieties include short leafed and loblolly pine, sweet gum, pecan, cypress, mesquite, pinyon-juniper, several types of oak, cottonwood and walnut. The Ouachita Mountains are home to the largest forested area in the state.

In the early 1900's, Oklahoma's forests covered some 19 million acres, or 40 percent of the state's total land area. Since that time, many forested areas have been cleared for crop production and pasture-

land or have been inundated by large reservoirs. Although the amount of the state's land area covered by forests has dwindled considerably today, forests continue to provide substantial erosion control and protect the quality of Oklahoma's water resources. They also supply vital habitat for wildlife and enhance opportunities for tourism and recreation. In addition, the forest industry contributes enormously to the state's economy.

According to data compiled for the National Resources Inventory (1982-87), Oklahoma has a total area of 44,771,700 acres, with 43,964,600 land acres. This land area includes 14,546,100 acres classified as rangeland; 11,557,300 acres of cropland; 7,590,100 acres of pastureland; 6,504,900 acres of forest land; and 926,300 acres of urban and built-up land.

Osage is the state's largest county, covering 2,251 square miles; Marshall County, 371 square miles, is the smallest. Cimarron County, in the Panhandle, is the only county in the nation whose border is adjacent to four other states (Kansas, Colorado, New Mexico and Texas).

GEOLOGY

Most of the rocks that outcrop in Oklahoma are of sedimentary origin, consolidated from sediments deposited during the Paleozoic, Mesozoic and Cenozoic

Eras. The Paleozoic strata, consisting principally of sandstone and shale, cover about 75 percent of the state and they are as much as 40,000 feet thick in some areas. Most of the Panhandle region and some of western Oklahoma is covered by rocks of Tertiary age, represented in the Ogallala Formation. The oldest rocks in Oklahoma are the Precambrian granites and rhyolites formed more than one billion years ago. Precambrian and Cambrian igneous and metamorphic rocks underlie all of the state and provide the "floor" upon which all younger rocks rest.

The three principal mountain belts - southern Oklahoma's Ouachita, Arbuckle and Wichita Mountains -- were formed by folding, faulting, and uplift during the Pennsylvanian Period. North of these mountain uplifts lie the deep Anadarko and Arkoma basins, and still farther north, the relatively undisturbed shelf areas of Oklahoma.

Mesozoic sedimentary rocks of Oklahoma were deposited in a mixture of marine and non-marine environments. Shallow seas covered southern and western Oklahoma during some of the era's Cretaceous Period, resulting in the deposition of limestone and shale.

Since the beginning of the Tertiary Period, none of the state has been covered by sea water. Because Oklahoma's land

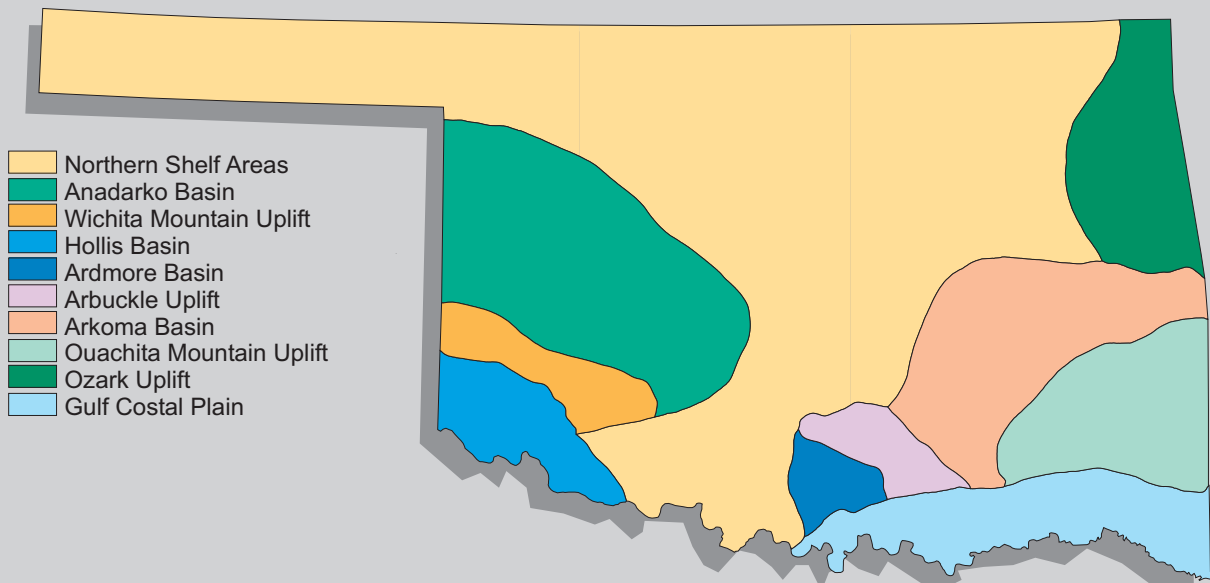
surface sloped down to the east and southeast, extensive deposits of Tertiary sand and gravel were washed in by large rivers flowing eastward from the newly formed Rocky Mountains.

The Quaternary Period through the present is characterized by erosion. Rocks and loose sediment at the land surface are being weathered to soil, then the soil particles are carried away to streams and rivers. In this way, hills and mountains are worn down and the sediment is either carried to the sea or at least temporarily deposited on the banks and in the bottoms of rivers and lakes.

Oklahoma's subsurface contains 10 major geological provinces (Figure 12). The Northern Shelf Area, the state's largest province extending over most of north Oklahoma and the entire Panhandle, is comprised of outcrops of sand, sandstone and shale, with a scattering of gypsum. The Anadarko Basin, in the west central region, contains large deposits of gypsum, shale and sandstone.

The Wichita Mountain Uplift is characterized by peaks of Cambrian granite and related igneous rocks that tower up to 1,100 feet above the surrounding terrain. This province also contains extensive outcrops of limestone, sand and shale. The adjoining Hollis Basin, in extreme southwest Okla-

Figure 12
MAJOR GEOLOGICAL PROVINCES



Source: *Atlas of Oklahoma*, Oklahoma State University

homa, contains outcrops of gypsum, shale and sandstone.

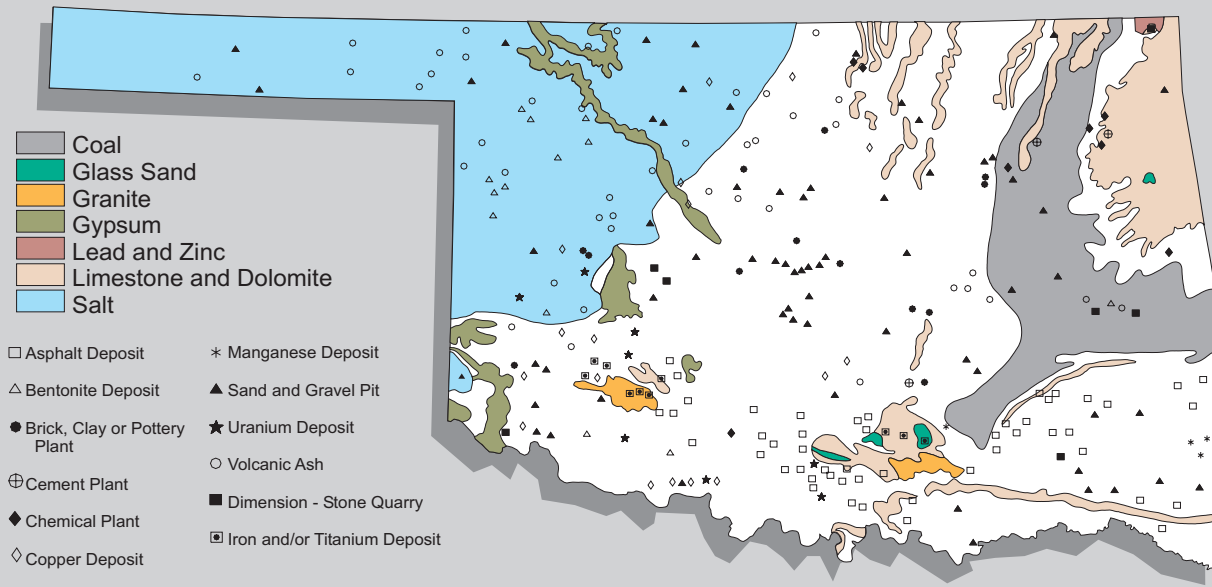
The Ozark Uplift, which occupies much of northeast Oklahoma, consists of deeply dissected Mississippian limestone and cherts. The Arkoma Basin, in the east central region, is comprised pri-

marily of limestone, sandstone and shale while tightly folded sedimentary rock types, Ordovician to Pennsylvanian in age, make up the adjacent Ouachita Mountain Uplift.

Along the Red River in southeastern Oklahoma, the Gulf Coastal Plain is com-

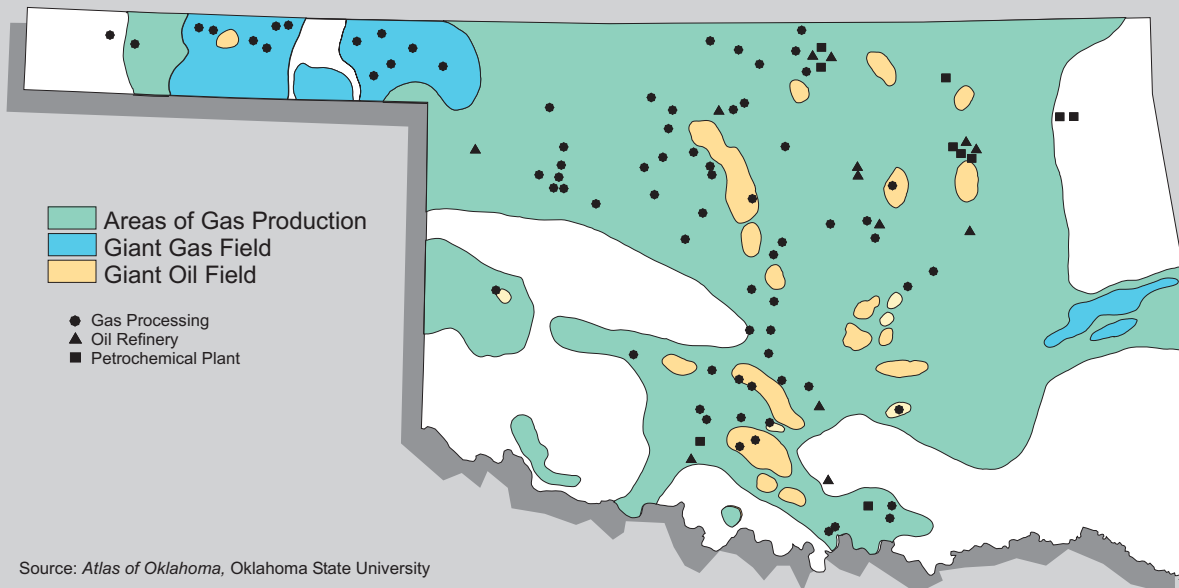
prised of shale, limestone, sandstone and large deposits of sand. The state's final two geological provinces are located entirely within state boundaries in southern Oklahoma. The Arbuckle Uplift contains primarily limestone and dolomite, Cambrian to Mississippian in age, along

Figure 13
MINERAL RESOURCES



Source: *Atlas of Oklahoma*, Oklahoma State University

Figure 14
PETROLEUM AND NATURAL GAS



Source: *Atlas of Oklahoma*, Oklahoma State University

with sandstone, granite and gneiss. The nearby Ardmore Basin consists of outcrops of Mississippian, Pennsylvanian and Permian shales with sandstones and thin limestones.

MINERALS

Oklahoma's primary mineral resources are oil and gas, with a number of other minerals produced on a smaller scale. Reflecting the worldwide escalation of oil prices, the total value of mineral production in Oklahoma reached a record \$11 billion in 1983, compared to approximately \$5.5 billion in 1993. About 95 percent of the 1993 value was derived from the production of fossil fuels while a wide variety of nonmetallic minerals (such as granite, gypsum, iodine, stone, sand and gravel) accounted for the remaining five percent. Figure 13 shows the general locations of mineral resources in Oklahoma.

Crude oil and natural gas (Figure 14) are the leading mineral commodities in the state. In the 17-year period from 1977-94, Oklahoma produced approximately 2.3 billion barrels of oil valued at \$51 billion and 33.5 trillion cubic feet of gas valued at \$59 billion. Oil and/or natural gas have been produced in every county in the state except Adair, Choctaw,

and Delaware Counties.

Coal is one of the primary resources in an 8,000 square-mile area of eastern Oklahoma. Coal beds in this region range in thickness from one to eight feet while overall coal resources total approximately 7.2 billion tons. Thick sequences of salt underlie most of western Oklahoma at depths of 30 feet to more than 30,000 feet. An estimated 20 trillion tons of salt reserves remain virtually untapped in the region. Current salt production occurs at a single solar evaporation plant in Woods County.

Other resources produced in the state are dolomite, limestone, granite, sand and gravel, glass sand, gypsum, clays and iodine. Dolomite and limestone deposits are located primarily in northeastern Oklahoma and in the Arbuckle and Wichita Mountains. Granite is quarried near Snyder and Granite in southwestern Oklahoma and near Mill Creek and Davis in the Arbuckles. Sand and gravel pits are located throughout the state. Glass sand, used in the manufacture of high-purity glass, is produced in the south central region. Gypsum outcrops in the west yield about 2.7 million tons of the mineral each year. Oklahoma is the only domestic producer of iodine; in 1993, the state's three iodine companies (located in northwest Oklahoma) produced about 2 million kilograms, approximately one-third of the

nation's iodine needs.

SOILS

Oklahoma soils are diverse, ranging from the rich limestone soils of the prairie to alluvial soils of river valleys to thin sandy and red clay soils. Seven of the eleven soil orders recognized in soil taxonomy -- Alfisols, Aridisols, Entisols, Inceptisols, Mollisols, Ultisols and Vertisols -- are found inside the state's borders (Figure 15). Within orders, soils are subdivided into groups, subgroups, families and, finally, into a soil series. In turn, soil series are grouped into associations which occur in a defined proportional pattern or on a unique landscape whose characteristics, such as climate, parent material and natural vegetation, are similar. Oklahoma soil surveys are made according to this type of soil classification system.

Alfisols are found throughout much of the state but are most prevalent in areas where surface organic matter is low and precipitation is high enough to develop subsoils with translocated clays. Aridisols are found only in the western parts of the Panhandle region. These soils are usually shallow or very sandy and hold only small amounts of available plant water.

Entisols are found throughout the state and are normally considered as

Figure 15
GENERALIZED SOILS

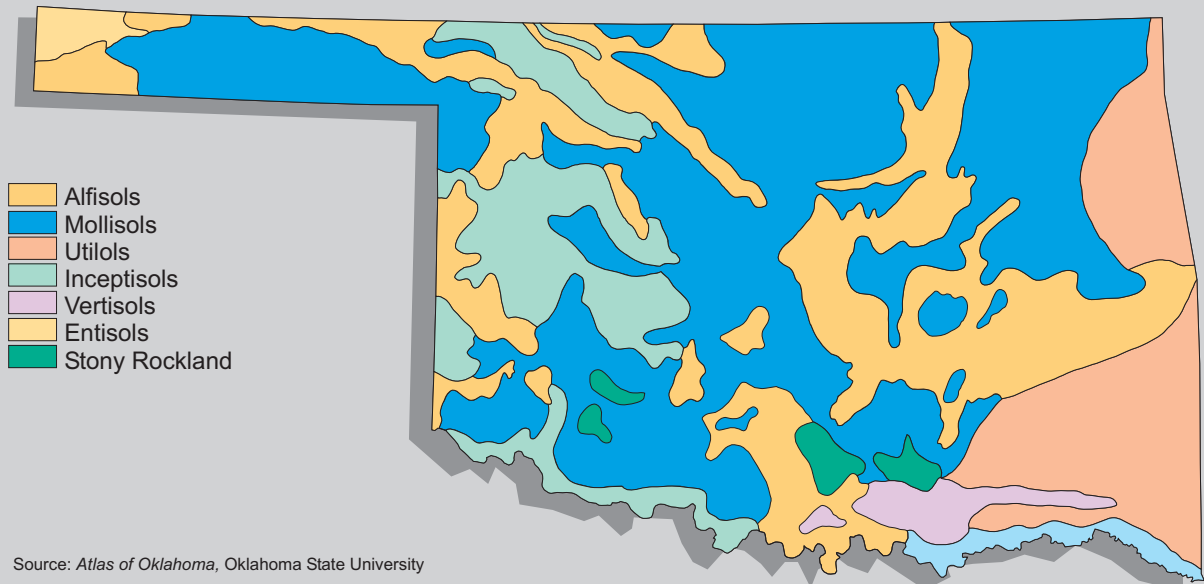
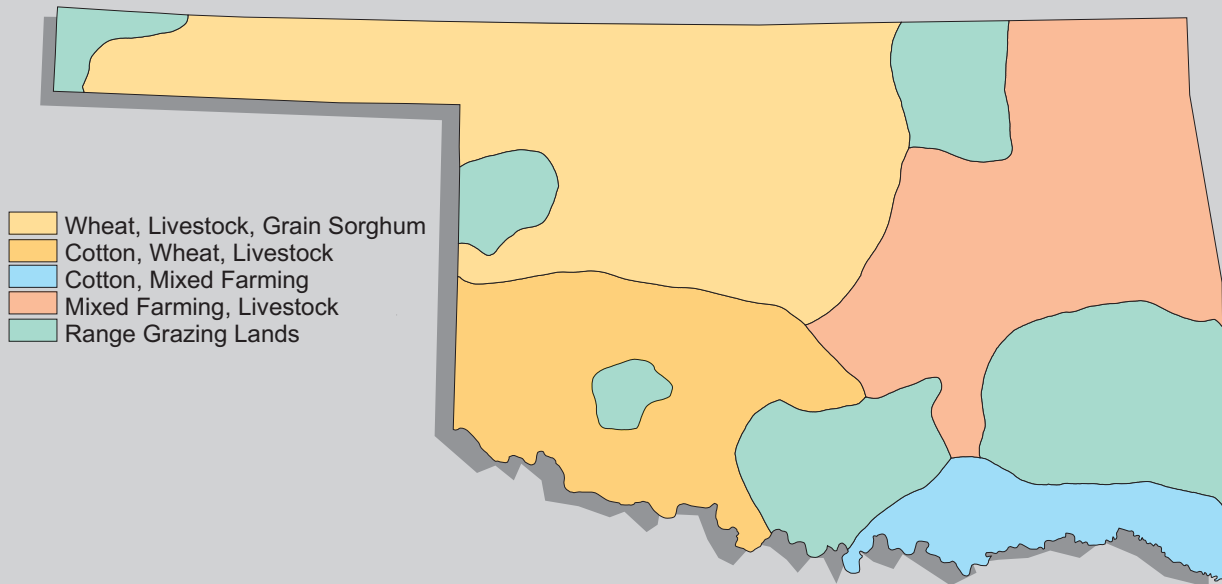


Figure 16
AGRICULTURAL REGIONS



Source: *Atlas of Oklahoma*, Oklahoma State University

“young” soils due to their position or stage of development. They occur either as recent depositional soils along floodplains or as shallow, slightly weathered soils on slide slopes and summits of landscapes. Inceptisols are soils where profiles have shown only weak horizon development. While found statewide, the largest concentrations occur in western Oklahoma.

Mollisols, Oklahoma’s most abundant soil order, normally have thick, dark surface horizons rich in organic matter. They are generally considered as grassland prairie soils found in northern, central and western Oklahoma. Ultisols, which occur only in the warm, humid climate of eastern Oklahoma, are highly leached and generally have low natural fertility with relatively high acid content. Vertisols contain high shrink/swell clays that form deep cracks upon drying. They are found primarily in prairie soil formed from limestones or in playa lakebeds in the Panhandle region.

AGRICULTURE

Oklahoma agriculture is both rich and diverse, contributing significantly to the state’s economy. Agricultural products and activities range from cattle feedlots, ranches and large farms in the High Plains and Panhandle to heavily irrigat-

ed cotton and wheat in the southwest region, to the dairy and diversified farming of central Oklahoma and the timber and small farm operations in the southeast. The state’s generalized agricultural regions are delineated in Figure 16.

A recent study by Oklahoma State University measured the total economic impact of agriculture -- the state’s second leading industry, next to petroleum and natural gas -- to be \$6.1 billion annually. Chief agricultural products include beef cattle, sheep, hogs, poultry, milk, wheat, hay, sorghum and other grains, peanuts and cotton. Oklahoma is second in the nation in total wheat production, fourth in cattle/calf, fourth in pecans, seventh in peanuts and tenth in peaches. In 1994, the state boasted more than 70,000 farms and ranches (only a very minor decrease from 1981) averaging 486 acres in size and covering some 34 million acres. Associated earnings for these operations were approximately \$1.2 billion while the average realized net income per farm was \$18,540 in 1993. The average age of farm workers is 55, according to the 1992 Agricultural Census, and many supplement their primary incomes with off-farm work.

The state’s wheat crop, which vies with Kansas and North Dakota in total

yearly production, is centered primarily in the grassland area of northwest. The climate and long growing season of the southwest (in excess of 210 days) promotes dominance of cotton and grain in that region. Mixed farming -- especially corn, peanuts and assorted vegetables, in addition to primary cotton crops -- and livestock raising is a common source of supplemental income in the east. Rich soils and sufficient water supplies support grasses in range-grazing lands located throughout the state.

WILDLIFE

Oklahoma’s diverse climate and geography is again reflected in the state’s wide variety of fish and wildlife species, as well as in their habitats. The abundance of lakes, rivers, ponds, plains and forestland provide excellent fishing and hunting opportunities, as well as considerable aesthetic benefits, which contribute significantly to the state’s reputation as an outdoor haven for both residents and visitors. In addition, outdoor activities enabled through the comprehensive management and preservation of the state’s fish and wildlife resources by the Oklahoma Department of Wildlife Conservation and U.S. Fish and

Wildlife Service, in partnership with other agencies and the public, add millions of dollars each year to local and state economies in the form of licensing fees, purchases of fishing and hunting equipment, lodging expenses and retail sales.

Sportfish native to Oklahoma include largemouth, smallmouth, white and spotted bass; crappie; channel, flathead and blue catfish; sunfish; sauger; and paddlefish. Introduced species are also popular with fishing enthusiasts. The striped bass, a salt water native, has been stocked in Texoma (where it comprises the major sportfish species), Kaw, Keystone, Foss and Canton Reservoirs. Walleye were established in the 1960's while, more recently, the saugeye -- a cross between the walleye and sauger -- and a striped/white bass hybrid have flourished upon introduction to Oklahoma waters. The state also maintains seven put-and-take rainbow trout fishing areas: in the Illinois River below Tenkiller dam, in the lower Mountain Fork River below Broken Bow dam (where brown trout have also been introduced), in Lake Etling at Black Mesa State Park, below Carlton Lake at Robber's Cave State Park, at the Quartz Mountain Trout Area, the Blue River Public Fishing and Hunting Area, and in Lake Watonga.

Oklahoma is home to five big game species, including white-tail deer and wild turkey in all 77 counties. Mule deer and pronghorn antelope occupy much of the dry, open northwest and Panhandle regions while elk, recently introduced in the east, are found in the Wichita Mountains National Wildlife Refuge of southwest Oklahoma. Smaller upland game, especially bobwhite quail, are also prevalent and abundant pheasant populations thrive in the Panhandle. Prairie chickens, scaled quail, squirrels, rabbits, doves, ducks and geese are also favorites of hunters in Oklahoma who spend some 3.5 million hunter-days each year tracking and harvesting game species. The state's location on the Central Flyway, a migratory path extending from Canada to Mexico, is a boon to hunters and waterfowl enthusiasts alike. In addition, there are numerous public hunting areas and wildlife refuges where unique species of animals are preserved and enjoyed by campers and naturalists.

Habitat destruction is the single most serious threat to wildlife and plants although over-exploitation, disease, pollution and introduction of non-native species can also contribute to population declines. Through the federal Endan-

gered Species Act, passed in 1973, troubled species in Oklahoma receive special protection until they can be restored to a secure status in the wild. The U.S. Fish and Wildlife Service maintains a list of both endangered and threatened species in the nation while the State Department of Wildlife Conservation oversees a separate list of those species who reproduce, migrate or overwinter in Oklahoma.

Ten wildlife species in the state are officially listed by the federal government as endangered while nine are considered threatened. Currently listed endangered species -- those who face the immediate threat of extinction -- include the Ouachita rock-pocketbook mussel, American burying beetle, American peregrine falcon, whooping crane, interior least tern, red-cockaded woodpecker, black-capped vireo, Ozark big-eared bat, Indiana bat and gray bat. In addition, the Arkansas River shiner has been proposed for addition to the list as endangered. The bald eagle was recently reclassified from endangered to threatened status while the American peregrine falcon is being considered for complete removal from the federally-threatened and endangered species list.

RECREATION

Oklahoma has 58 state-owned parks, including 24 recreation areas and five resort lodges, that offer excellent opportunities for camping, fishing, hunting, hiking, bicycling, water skiing, site-seeing and countless other outdoor activities. These facilities and the abundant activities they support make tourism one of Oklahoma's top industries.

The state's five lodges are located at Lake Murray State Park, Quartz Mountain State Park and Resort on Lugert-Altus Reservoir, Lake Texoma State Park, Sequoyah State Park on Fort Gibson, and Roman Nose State Park and Resort on Lakes Watonga and Boecher. In addition, cabins are available at many state parks. Other popular recreation spots include Alabaster Caverns, one of the largest natural gypsum caves in the world; Little Sahara State Park, the state's only naturally occurring sand dunes; Black Mesa State Park, which contains numerous dinosaur fossils; Robber's Cave State Park, a former refuge for outlaws; and Spiro Mound Archaeological State Park, where earthen Indian mounds date to the year 1200.

South central Oklahoma's Chickasaw

National Recreation Area at Sulphur, one of the nation's first national parks (formerly Platt National Park), is still a popular attraction while Grand Lake, in the northeast, has been extensively developed by private interests. Grand Lake's wooded hills, scenic lake waters and luxurious vacation and retirement homes are unique in the southwest U.S.

The state boasts a panorama of scenery such as the Talimena Skyline Drive in the southeast. Southwestern Oklahoma's Wichita Mountain Wildlife Refuge, established in 1905, is one of only a handful of national refuges supporting wild buffalo herds. Mount Scott, in the Wichitas, is the state's best known peak. The recently established National Tallgrass Prairie Preserve, in Osage County, supports numerous plant and animal species unique to the rapidly diminishing prairie plains environment of the western U.S. Oklahoma is also home to much of the original U.S. Route 66, the nation's first continuous stretch of paved highway.

ARCHEOLOGICAL AND HISTORIC RESOURCES

Oklahoma has 844 archeological and historic properties currently listed in the National Register of Historic Places. These resources -- i.e., the buildings, sites, structures and objects which represent human activity throughout what is now the State of Oklahoma -- illustrate the rich and diverse heritage inherent to the state's past.

There are approximately 14,000 recorded archaeological resources located throughout Oklahoma's, but it is estimated that this figure represents only about 10 percent of the number of such resources that exist. The locations of these sites indicate that prehistoric and early historic civilizations and groups occupied many areas of the state. Woods County is home to possibly one of the oldest dated sites known in North America, the Burnham site. Also in northwest Oklahoma are the Cooper and Waugh sites in Harper County, the only bison kills directly associated with the 10,000-year-old Folsom culture. At Caddo County's Domebo site exists one of the best documented Southern Plains mammoth kills associated with the 11,000-year-old Clovis culture. Spiro Mounds, located south of Sallisaw, is a nationally renowned ceremonial center which was used by one of the most advanced known societies in the eastern U.S.

between A.D. 800 and 1400. It is Oklahoma's only prehistoric archaeological site open for public visitation.

Approximately 20,000 historic resources have been recorded in both rural and urban Oklahoma, including early nineteenth century log buildings, territorial commercial buildings, bridges, oil well sites, parks designed by the Civilian Conservation Corps and World War II landmarks. Well-known properties listed on the state's National Register are the Creek Council House in Okmulgee, Maple Ridge Historic District in Tulsa, the Nancy Taylor #1 Oil Well near Haskell, the Pioneer Woman in Ponca City, the Skirvin Hotel in Oklahoma City, the Fort Sill Historic District at Fort Sill, and the Washita Battlefield near Cheyenne.

Coordination of historic and archeological resource identification, evaluation and preservation is accomplished at the state level through efforts of the Oklahoma Historical Society, Oklahoma Archeological Society and Oklahoma Anthropological Society. However, these organizations receive valuable assistance from numerous state and federal agencies, local governments, nonprofit organizations and individuals.

COMMERCE

Lower establishment costs, plentiful natural resources (including available land and water), an abundance of labor and lower living costs have attracted business and industry to Oklahoma in recent years, spurring rapid and highly diversified social and economic growth. As part of the nation's "Sunbelt" region, Oklahoma can expect further development and growth if it can continue to offer the water, land, energy and capital needed by new residents and industries without compromising its social and environmental standing.

The Oklahoma economy, once largely dependent upon agriculture and the oil and gas industry, has recently expanded its base to include manufacturing and business services. Making up the gross state product are manufacturing; wholesale and retail trade and services; finance, insurance and real estate; state, local and federal government and education; transportation and communications; mining (including oil and gas); research, printing and publishing; agriculture; and tourism. Major commodities include non-electrical machinery; petroleum and coal products; food products; fabricated metal prod-

ucts; glass, rubber and plastic products; and transportation equipment.

From 1987 to 1993, manufacturing employment in Oklahoma grew by 7.1 percent while the national rate decreased by 5.2 percent. Oklahoma's two industrial centers, Oklahoma City and Tulsa, account for more than one-half of the state's manufacturing employment of 167,900, according to 1993 figures. In 1994, the state boasted 3,858 industrial firms.

Oklahoma's top manufacturing sectors, in order of production, are: transportation equipment; petroleum and coal products; non-electrical machinery; food processing; and electronic and electrical equipment. In the service sector, telecommunications represents the area of fastest growth.

POPULATION, EMPLOYMENT, LABOR AND INCOME

Throughout Oklahoma history, the state's population has experienced sudden upward and downward fluctuations, primarily due to variations in the social and economic climate. Following slight growth in the 1960's that continued through the early 1980's, the state experienced a small decrease in population, primarily due to a decline in the oil industry. In recent years, that trend has leveled off with most urban areas experiencing population growth at the expense of rural Oklahoma, which has shown a slight decrease. While only 19.2 percent of the population lived in urban areas in 1910, 67.7 percent lived in urban areas during the 1990 census.

The Oklahoma population has increased from 258,657 in 1890 to 3,258,100 in 1994, ranking it below Connecticut but above Oregon in total population by state. Currently, the Tulsa and Oklahoma City metropolitan areas account for more than one-half of the state's population while Norman recently surpassed Lawton as the state's third largest city. According to 1994 estimates, the state's five largest counties, by population, are Oklahoma, Tulsa, Cleveland, Comanche and Canadian; the five smallest are Cimarron, Harmon, Harper, Roger Mills and Ellis. Based on projections from the Oklahoma Department of Commerce, the state's population is expected to reach 3,426,000 in 2000 and 3,717,500 by 2020.

Oklahoma has traditionally experienced a higher percentage of employed persons -- or conversely, a lower unem-

ployment rate -- than the national average. This is an indication of the generally healthy condition of the state's economy and its relative immunity to short-term fluctuations in the national economy. Except for the late 1980's, when the average state unemployment rate was slightly higher than the national average, Oklahoma has enjoyed a very stable employment base. In 1993, Oklahoma's average unemployment rate was six percent (1,432,000) of the total labor force (1,524,000) employed. This is below the national unemployment rate of 6.8 percent for the same year.

Although Oklahoma boasts a favorable overall employment ratio (averaging about 4.5 in mid-1995, compared to a national average of about 6.0), certain regions and counties sustain much higher unemployment rates than others. Southeastern Oklahoma historically suffers high unemployment rates while rates in the northwest are nominal -- a variation explained, in part, by the nature of industry in each region. While the southeast's manufacturing and mining industries are sensitive to drop-offs in demand and register subsequent layoffs, farmers in the northwest are forced to remain in agricultural pursuits due to their large personal capital investments, even despite downward trends in the market. Population densities also influence the unemployment rate because they determine the size of the labor force. For example, southeast Oklahoma's higher concentration of people causes available labor to exceed demand, resulting in a higher unemployment rate than in the sparsely populated northwest, where there is more of a balance between labor and demand.

In 1993, the highest employment (covered) was recorded in wholesale and retail trade, which employed 289,145; service industries, which employed 278,679; and public administration, which employed 217,273. These three industries accounted for two-thirds of the average monthly employment for 1993.

In terms of income, Oklahoma ranks somewhat below the national average of \$20,131, with a 1993 per capita personal income of \$17,035. Coinciding with the pattern of employment across the state, personal income is lower in the southeast and higher in metropolitan areas and the west. Due to its small population base and high farm incomes, Cimarron County had the highest 1992 per capita income (\$22,801) while Washington County, with extensive employment in the oil and gas industry, had the second highest income (\$21,107).