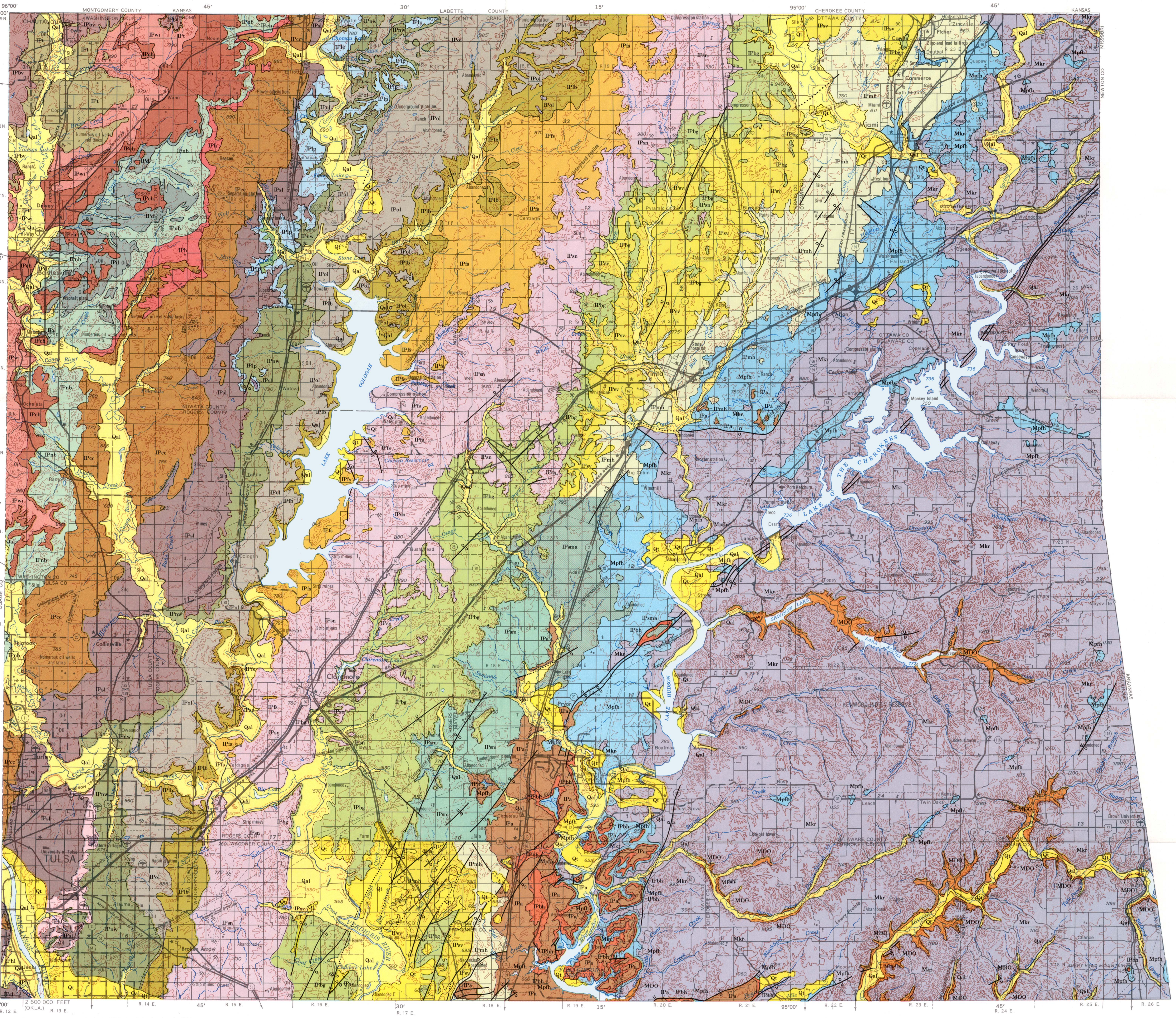


Base modified from Army Map Service 1:250,000 Series: Tulsa Quadrangle, 1958

Compiled by Melvin V. Marcher, U.S. Geological Survey, 1969

Scale 1:250,000

Contour interval: 100 feet
Supplementary contours at 50-foot intervals
Datum: Mean sea level

GEOLOGIC MAP

EXPLANATION

QUATERNARY

Qal — **ALLUVIUM**
Gravel, sand, silt, and clay. Yields moderate to large amounts of fair- to good-quality water along the Arkansas River and small to moderate amounts of fair- to good-quality water locally along the Verdigris and Neosho Rivers.

Qt — **TERRACE DEPOSITS**
Fine gravel, sand, silt, and clay. Yields moderate to large amounts of fair- to good-quality water locally along the Arkansas River.

PENNSYLVANIAN

IPbv — **VAMOOSA, TALLANT, AND BARNSDALL FORMATIONS**
Vamoosa Formation, shale, sandstone, siltstone, and thin limestone. Yields only small amounts of fair- to poor-quality water.
Tallant Formation, shale, sandstone, and thin limestone. Yields only small amounts of fair- to poor-quality water.
Barnsdall Formation, shale, siltstone, sandstone, and thin limestone. Yields only small amounts of fair- to poor-quality water.

IPt — **TORPEDO FORMATION**
Thin-bedded to massive medium-grained sandstone and shale. Yields only small amounts of fair- to poor-quality water.

IPwi — **WANN AND IOLA FORMATIONS**
Wann Formation, shale with thin sandstone and limestone. Yields only small amounts of fair- to poor-quality water.
Iola Formation, limestone and shale. Yields only small amounts of fair- to poor-quality water.

IPch — **CHANUTE FORMATION**
Thin- to thick-bedded, fine- to coarse-grained sandstone and shale. The thick-bedded, coarse-grained Noxie Sandstone Member at the base yields moderate amounts of fair- to good-quality water in Rs. 12, 13, and 14 E., T. 29 N. The upper part of the formation yields only small amounts of fair- to poor-quality water.

IPd — **DEWEY FORMATION**
(Mapped with the Chanute Formation south of Bartlesville)
Limestone and some shale. Yields only small amounts of fair- to poor-quality water.

IPnb — **NELLIE BLY FORMATION**
Shale and thin sandstone. Yields only small amounts of fair- to poor-quality water.

IPh — **HOGSHOOTER FORMATION**
(Mapped with the Nellie Bly Formation south of Bartlesville)
Limestone and some shale. Yields only small amounts of fair- to poor-quality water.

IPcc — **COFFEYVILLE AND CHECKERBOARD FORMATIONS**
Coffeyville Formation, shale and thin-bedded sandstone. Yields only small amounts of fair- to poor-quality water.
Checkerboard Formation, limestone and some shale. Yields only small amounts of fair- to poor-quality water.

IPsl — **SEMINOLE FORMATION**
Shale, sandstone, and thin coal beds. Yields only small amounts of fair- to poor-quality water.

IPhl — **HOLDENVILLE AND LENAPAH FORMATIONS**
(Map unit only in Tulsa County)
Holdenville Formation, shale and minor sandstone and limestone. Yields only small amounts of fair- to poor-quality water.
Lenapah Formation, limestone and shale. Yields only small amounts of fair- to poor-quality water.

IPlp — **LENAPAH FORMATION**
(Map unit only in Nowata County)
Limestone and shale. Yields only small amounts of fair- to poor-quality water.

IPnw — **NOWATA FORMATION**
Shale and minor sandstone and limestone. Yields only small amounts of fair- to poor-quality water.

IPol — **OOLOGAH FORMATION**
Thin-bedded limestone and some shale in the southern part of the area. North of Oologah, in western Rogers County, the map unit, IPol, includes the following formations: *Altamont Formation,* limestone and minor shale; *Bandera Formation,* shale and thin sandstone; *Pawnee Formation,* limestone and minor shale. Yields only small amounts of fair- to poor-quality water.

IPlb — **LABETTE FORMATION**
Shale and thin sandstone and limestone. Yields only small amounts of fair- to poor-quality water.

IPfs — **FORT SCOTT LIMESTONE**
(Mapped with the Labette Formation south of Bird Creek in Tulsa County)
Limestone and shale. Yields only small amounts of fair- to poor-quality water.

IPsn — **SENORA FORMATION**
Shale with thin and lenticular sandstone, minor limestone, and coal. Yields only small amounts of fair- to poor-quality water, except for the Chelsea Sandstone Member near the base of the formation in Craig, Mayes, and Rogers Counties, which probably will yield small to moderate amounts of fair-quality water locally.

IPbg — **BOGGY FORMATION**
Shale, sandstone, and coal. Yields only small amounts of fair- to poor-quality water, except for the Bluejacket Sandstone Member at the base of the formation, which probably yields small to moderate amounts of fair-quality water locally.

SAVANNA, McALESTER, HARTSHORNE, AND ATOKA FORMATIONS
(IPsv, IPsm, IPmh, IPa, IPsma)

IPsv — *Savanna Formation,* shale and thin sandstone, limestone, and coal. Yields only small amounts of fair- to poor-quality water.

IPmh — *McAlester and Hartshorne Formations,* shale and some sandstone and coal. Except for the Warner Sandstone Member at the base of the McAlester Formation, these units yield only small amounts of fair- to poor-quality water. The Warner Sandstone probably will yield small to moderate amounts of fair-quality water locally.

IPa — *Atoka Formation,* shale, siltstone, sandstone, and thin limestone. Yields only small amounts of fair- to poor-quality water.

IPsm — *Savanna, McAlester, and Hartshorne Formations,* shale and some sandstone, limestone, and coal. Except for the Warner Sandstone Member at the base of the McAlester Formation, these units yield only small amounts of fair- to poor-quality water. The Warner Sandstone probably will yield small to moderate amounts of fair-quality water locally.

IPsma — *Savanna, McAlester, Hartshorne, and Atoka Formations,* shale, sandstone, siltstone, limestone, and coal. Except for the Warner Sandstone Member at the base of the McAlester Formation, these units yield only small amounts of fair- to poor-quality water. The Warner Sandstone probably will yield small to moderate amounts of fair-quality water locally.

IPbh — **BLOYD AND HALE FORMATIONS**
Bloyd Formation, limestone and shale. Yields only small amounts of fair- to poor-quality water.
Hale Formation, limestone and sandstone. Yields only small amounts of fair- to poor-quality water.

MISSISSIPPIAN

Mpfh — **PITKIN, FAYETTEVILLE, BATESVILLE, HINDSVILLE, AND MOOREFIELD FORMATIONS**
Pitkin Formation, limestone. Yields only small amounts of fair- to poor-quality water.
Fayetteville Formation, shale and thin limestone. Yields only small amounts of fair- to poor-quality water.
Batesville Formation, fine-grained sandstone. Yields only small amounts of fair- to poor-quality water.
Hindsville Formation, limestone and shale. Yields only small amounts of fair- to poor-quality water.
Moorefield Formation, limestone, shale, and siltstone. Yields only small amounts of fair- to poor-quality water.

Mkr — **KEOKUK AND REEDS SPRING FORMATIONS AND ST. JOE GROUP**
Keokuk Formation, chert and limestone. Yields small to moderate amounts of good-quality water.
Reeds Spring Formation, chert and limestone. Yields small to moderate amounts of good-quality water.
St. Joe Group, limestone and shale. Yields small to moderate amounts of good-quality water.

DEVONIAN AND MISSISSIPPIAN / **ORDOVICIAN**

MDO — **CHATTANOOGA, FERNVALE, FITE, TYNER, BURGEN, AND COTTER FORMATIONS**
Chattanooga Formation, shale and minor sandstone. Yields only small amounts of fair- to poor-quality water.
Fernvale Formation, limestone. Yields only small amounts of fair- to poor-quality water.
Fite Formation, limestone. Yields only small amounts of fair- to poor-quality water.
Tyner Formation, shale and dolomite. Yields only small amounts of fair- to poor-quality water.
Burgen Sandstone, sandstone and minor dolomite and shale. Yields small to moderate amounts of good-quality water.
Cotter Formation, dolomite and minor sandstone. Yields only small amounts of fair- to poor-quality water.

PRECAMBRIAN

p€g — **SPAVINAW GRANITE**
Not known to yield water.

The stratigraphic nomenclature and age determinations used herein are those accepted by the Oklahoma Geological Survey and do not necessarily agree with those of the U.S. Geological Survey.

Contact

Fault — Dotted where concealed; U, upthrown side; D, downthrown side

INTRODUCTION

Urbanization, economic growth, and improved standards of living in rural areas of Oklahoma require ever-increasing amounts of water. Basic information on the availability and usability of water is needed in many parts of the State by planners and individual water users for development of this vital resource. Recognizing the need for such information on a regional basis, the Oklahoma Geological Survey requested the U.S. Geological Survey to make reconnaissance appraisals of the water resources, with special emphasis on ground water, in selected areas of the State. The Tulsa quadrangle, which includes about 5,600 square miles in northeastern Oklahoma, was selected for appraisal because of the need for information on the distribution and hydrologic characteristics of the various aquifers and for additional information on the area's surface-water resources as well as data on the chemical quality of both ground and surface waters. The Tulsa quadrangle is the second area in the State to receive such appraisal; the first was the Fort Smith quadrangle, which lies just to the south. The results of the appraisal of the Fort Smith quadrangle were published by the Oklahoma Geological Survey in 1969 as Hydrologic Atlas 1.

Information used to appraise the water resources of the Tulsa quadrangle was obtained in the field, taken from the U.S. Geological Survey reports and files, or obtained from other Federal agencies and from private industries. Information obtained in the field included well depth, depth to water, and, wherever possible, yield and well-construction data on about 380 wells. To supplement data on well yields obtained in the field, recovery tests were made on 47 wells. Information was obtained on about 60 springs. Records on about 200 wells, mainly in Delaware County, were provided by the U.S. Public Health Service. The Farmers Home Administration, the U.S. Soil Conservation Service, city officials, and many individuals provided useful information on the area's water resources. Particular acknowledgment is due D. C. Brockie, E. H. Hare, Jr., and P. R. Dingess of Eagle-Picher Industries, Inc., and K. H. Anderson, Missouri Geological Survey, who provided data on the Roubidoux and other unexposed formations in the northeastern part of the quadrangle and in adjacent parts of Missouri and Arkansas.

Because of their potential as a source of industrial and municipal water supplies, additional studies are needed to determine the capabilities of deeply buried formations, particularly the Roubidoux, in Craig, Delaware, Adair, and Cherokee Counties. Springs are a significant source of high-quality water but require additional study to assess their full potential.

GEOLOGIC SETTING

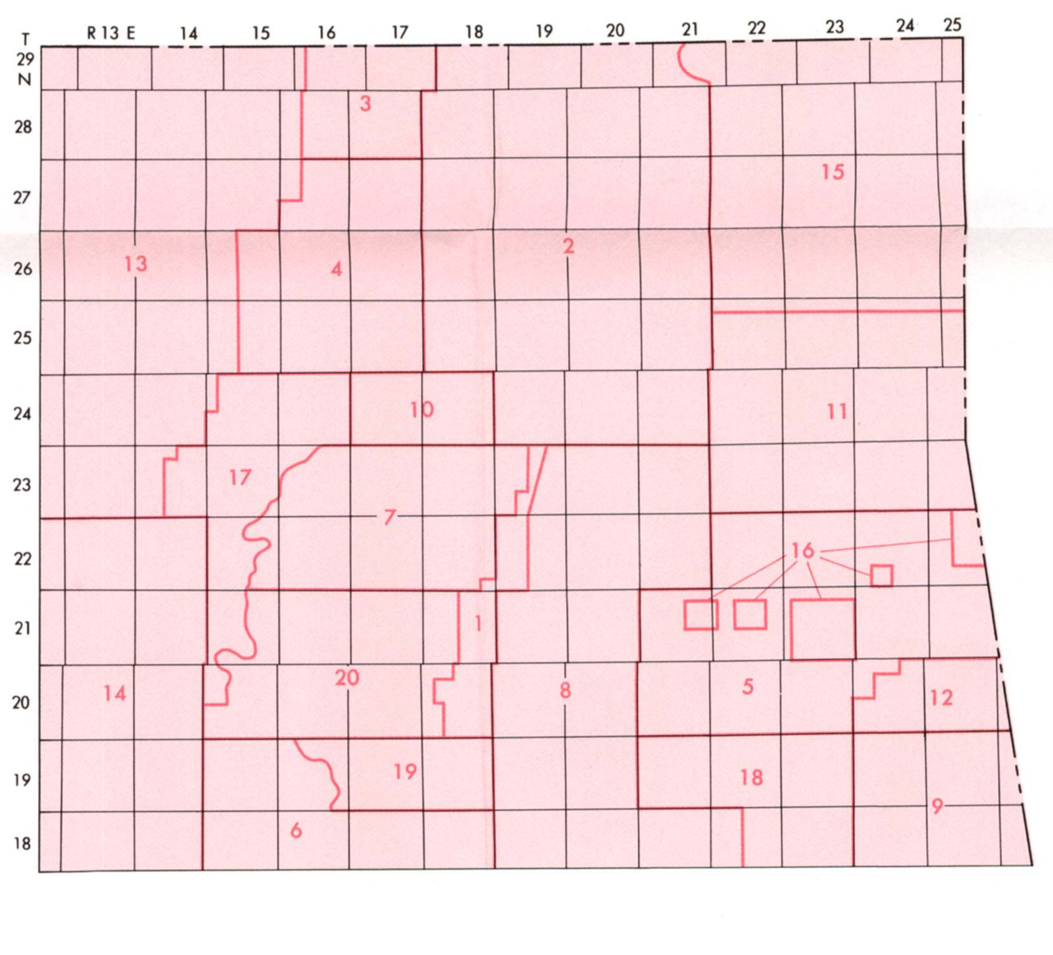
The area east of the Neosho River is part of the Ozark Plateau, which extends from northeastern Oklahoma across southern Missouri and northern Arkansas. In Oklahoma, uplift of the Ozark Plateau has brought formations of Mississippian age to the surface, and erosion has produced a rather rugged topography characterized by deep V-shaped valleys separated by narrow flat-topped ridges. Downcutting by Spring and Spavinaw Creeks and the Illinois River has exposed rocks of Devonian and Ordovician age. The oldest exposed rock unit is the Spavinaw Granite of Precambrian age that crops out a short distance downstream from Spavinaw Lake.

West of the Neosho River, the Mississippian rocks pass beneath formations of Pennsylvanian age. Regional dip is toward the west or northwest so that from a feather edge at the western margin of the Ozark Plateau, Pennsylvanian formations thicken westwardly to about 2,000 feet in Washington and Tulsa Counties. Erosion of the Pennsylvanian rocks has produced a gently rolling surface interrupted by low east-facing escarpments and isolated buttes capped by resistant sandstone.

Along the western margin of the Ozark Plateau the gently dipping rocks are broken by faults trending northeast-southwest. Rocks of the Ozark Plateau also are broken by faults, chief of which is the Seneca fault extending about 60 miles southwest across the area from near Wyandotte in Ottawa County to near Pryor in Mayes County. Most of the faults apparently were formed during middle Pennsylvanian time as a result of uplift of the Ozark Plateau coincident with downwarping of the Arkansas Valley syncline south of the Tulsa quadrangle.

1. Blythe, J. G., 1957, The Atoka formation on the north side of the McAlester basin: Univ. Oklahoma unpub. Ph.D. dissertation, 142 p.
2. Branson, C. C., Huffman, G. G., and Strong, D. M., 1965, Geology and oil and gas resources of Craig County, Oklahoma: Oklahoma Geol. Survey Bull. 99, 109 p.
3. Cade, C. M., III, 1952, The geology of the Marmaton Group of northeastern Nowata and northwestern Craig Counties, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 49 p.
4. Faucette, J. R., 1954, The geology of the Marmaton group of southern Nowata County, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 66 p.
5. Gore, C. E., Jr., 1951, The geology of a part of the drainage basins of Spavinaw, Salina, and Spring Creeks, northeastern Oklahoma: Univ. Tulsa unpub. M.S. thesis, 79 p.
6. Govett, R. W., 1959, Geology of Wagoner County, Oklahoma: Univ. Oklahoma unpub. Ph.D. dissertation, 182 p.
7. Gruman, W. P., 1954, Geology of the Foyil area, Rogers and Mayes Counties, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 99 p.
8. Huffman, G. G. [and others], 1958, Geology of the [south and west] flanks of the Ozark uplift, northeastern Oklahoma: Oklahoma Geol. Survey Bull. 77, 281 p.
9. Huffman, G. G., Langton, J. M., and Hancock, J. M., Jr., 1966, Geology of northern Adair County, Oklahoma: Oklahoma Geol. Survey Circ. 68, 50 p.
10. Lohman, Clarence, Jr., 1952, Geology of the Whiteoak area, Craig and Rogers Counties, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 89 p.
11. Miser, H. D. [and others], 1954, Geologic map of Oklahoma: Oklahoma Geol. Survey and U.S. Geol. Survey, scale 1:500,000.
12. Montgomery, J. H., 1950, The pre-Chattanooga strata of the Illinois River valley, northeastern Oklahoma: Univ. Tulsa unpub. M.S. thesis, 60 p.
13. Oakes, M. C., 1940, Geology and mineral resources of Washington County, Oklahoma: Oklahoma Geol. Survey Bull. 62, 208 p.
14. ____1952, Geology and mineral resources of Tulsa County, Oklahoma (includes parts of adjacent counties): Oklahoma Geol. Survey Bull. 69, 234 p.
15. Reed, E. W., Schoff, S. L., and Branson, C. C., 1955, Ground-water resources of Ottawa County, Oklahoma: Oklahoma Geol. Survey Bull. 72, 203 p.
16. Slocum, R. C., 1955, Post-Boone outliers of northeastern Oklahoma: Oklahoma Geol. Survey Circ. 35, 44 p.
17. Sparks, B. J., 1955, The geology of the Marmaton group of northwestern Rogers County, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 66 p.
18. Starke, J. M., Jr., 1961, Geology of northeastern Cherokee County, Oklahoma: Oklahoma Geol. Survey Circ. 57, 62 p.
19. Stringer, R. S., 1959, Geology of the Krebs group, Inola area, Rogers and Mayes Counties, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 63 p.
20. Tillman, J. L., 1952, Geology of the Tiawah area, Rogers and Mayes Counties, Oklahoma: Univ. Oklahoma unpub. M.S. thesis, 65 p.

INDEX TO GEOLOGIC MAPPING



RECONNAISSANCE OF THE WATER RESOURCES OF THE TULSA QUADRANGLE, NORTHEASTERN OKLAHOMA

Melvin V. Marcher and Roy H. Bingham

1971

Cartographer: Marion E. Clark, Oklahoma Geological Survey