EXPLANATION

Gravel, sand, silt, and clay. Yields large amounts of water of good quality along the Arkansas River and probably will yield moderate to large amounts along the Canadian River.

TERRACE DEPOSITS Gravel, sand, silt, and clay. Yield moderate to large amounts of water of good quality locally along the Arkansas River; smaller amounts elsewhere.

SEMINOLE FORMATION Sandy shale, sandstone, and thin coal seams. Probably will yield only limited amounts of water of poor quality.

HOLDENVILLE SHALE Shale, thin sandstones, and minor limestones. Probably will yield

only limited amounts of water of poor quality.

WEWOKA FORMATION Shale, sandstone, and minor limestones. Probably will yield only limited amounts of water of poor quality.

WETUMKA SHALE Shale, minor sandstones, and minor limestones. Probably will yield only limited amounts of water of poor quality.

CALVIN SANDSTONE Shale and sandstone. Yields limited amounts of water of fair to

SENORA FORMATION Shale, sandstone, and thin coal seams. Yields limited amounts of water of poor quality.

STUART SHALE

Shale and minor sandstones. Probably will yield only limited amounts

of water of poor quality.

THURMAN SANDSTONE Sandstone and shale. Probably will yield only limited amounts of water of poor quality.

BOGGY FORMATION Shale, sandstone, and coal; includes Bluejacket Sandstone Member at base. Yields limited amounts of water of poor quality.

SAVANNA, McALESTER, AND HARTSHORNE **FORMATIONS** Psv Savanna Formation, shale, sandstone, and coal. Yields limited

amounts of water of poor quality. IPmh McAlester and Hartshorne Formations (undifferentiated), shale, sandstone, and coal. Yield limited amounts of water of poor

Psm Savanna and McAlester Formations (undifferentiated; T. 15 N., Rs. 18, 19 E.), shale and minor sandstones. Yield limited amounts of water of poor quality.

ATOKA, BLOYD, AND HALE FORMATIONS IPu Undifferentiated

IPa Atoka Formation, shale and sandstone. Yields limited amounts of water of poor quality. **P**bh Bloyd Formation, shale and limestone; and Hale Formation, limestone and sandstone. Probably will yield only small

amounts of water of fair to poor quality.

MISSISSIPPIAN ROCKS ABOVE CHATTANOOGA SHALE

Mp Pitkin Formation, limestone; Fayetteville Formation, shale and limestone; Hindsville Formation, limestone and shale; and

Moorefield Formation, limestone. Mkr Keokuk Formation, chert; Reeds Spring Formation, chert and limestone; and St. Joe "Group," limestone and marlstone.

Yield small to moderate amounts of water of fair to good quality.

MISSISSIPPIAN, DEVONIAN, SILURIAN.

AND ORDOVICIAN ROCKS, UNDIFFERENTIATED Mississippian and Devonian. Chattanooga Shale, shale. Devonian. Sallisaw Formation, limestone, sandstone, and chert; and Frisco Formation, limestone.

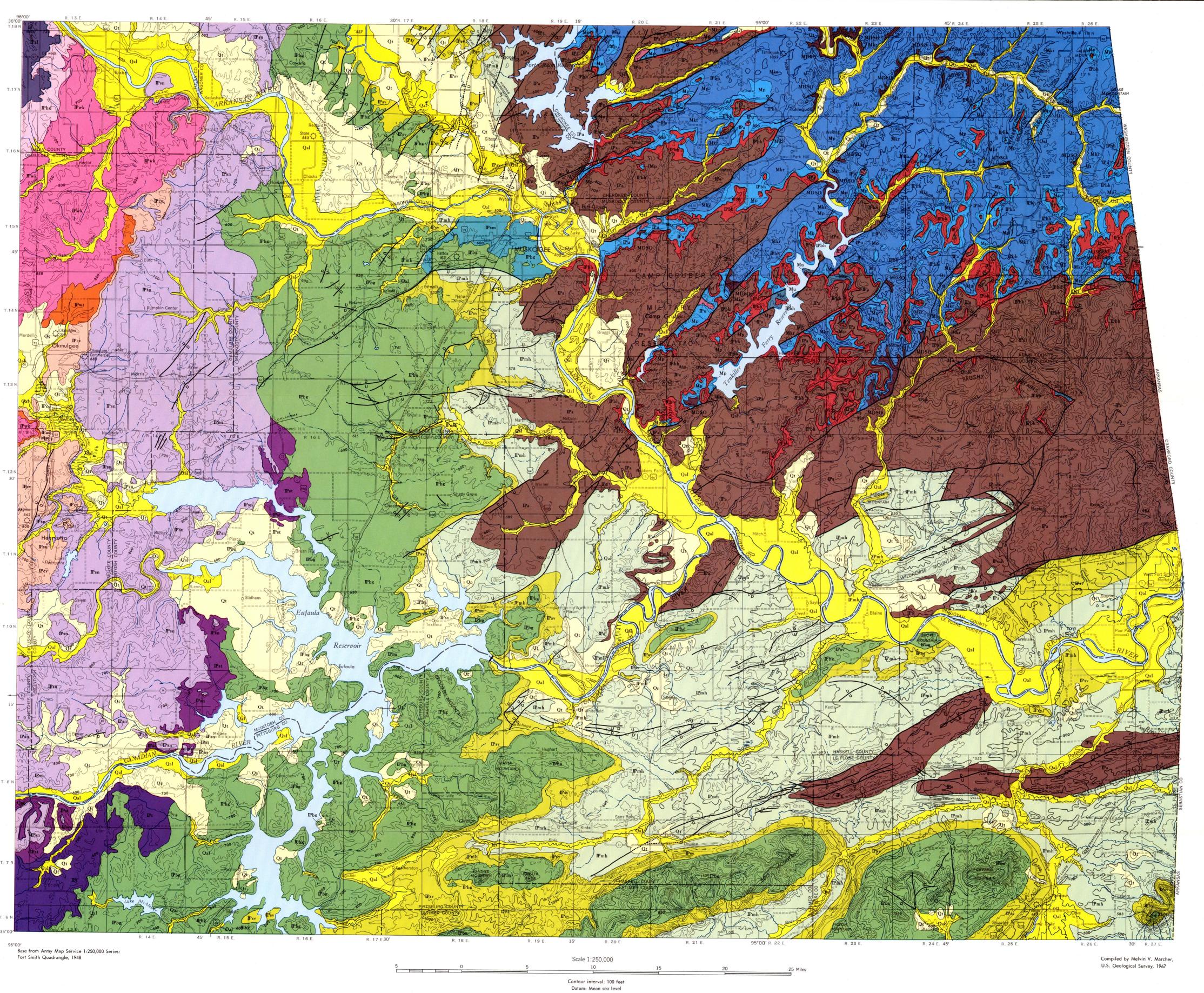
Silurian. Quarry Mountain Formation, limestone; Tenkiller Formation, limestone; and Blackgum Formation, limestone and dolomite.

Ordovician. Sylvan Shale, shale; Fernvale Limestone, limestone: Fite Limestone, limestone; Tyner Formation, shale, sandstone, dolomite, and limestone; Burgen Sandstone, sandstone and minor shales and limestones; and Cotter Dolomite, dolomite.

Limestone, dolomite, and sandstone units may yield small to moderate amounts of water of fair to good quality; shale units probably will yield only limited amounts of water of poor to fair quality.

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.

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



GEOLOGIC MAP

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 to provide planners and individual water users with adequate data for orderly development and wise usage 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, with special emphasis on ground water, in selected areas of the State where hydrologic knowledge is limited or is not readily available to potential water users. Accordingly, the Fort Smith quadrangle, which includes about 6,300 square miles in east-central Oklahoma, was selected for appraisal because ground-water conditions in much of this area were little known and because of the need for more information on the distribution and water-yielding capabilities of the various ground-water aquifers.

OKLAHOMA GEOLOGICAL SURVEY

Information used to appraise the water resources of the Fort Smith quadrangle was obtained from field and laboratory studies and from published and unpublished records of State and Federal agencies. Special acknowledgment for providing useful information is due the U. S. Army Corps of Engineers, U. S. Public Health Service, U. S. Soil Conservation Service, U. S. Geological Survey Conservation Division, and Oklahoma Water Resources Board. The cooperation and assistance of many individuals who provided useful information are also gratefully acknowledged. Additional specific acknowledgments are given at appropriate places in the atlas.

In some parts of the Fort Smith quadrangle, wells readily yield of rock in which a well is completed. In general, alluvium is the most in local areas and then, in order of decreasing favorability, weathered chert, limestone, sandstone, and siltstone, with shale the least favorable.

several hundred gallons of water per minute suitable for most purposes, whereas in other parts, supplies of water sufficient for daily household use are difficult to obtain and much of this water is of poor quality. Differences in well yield and water quality are controlled mainly by the type favorable type of rock for large well yields, followed by terrace deposits

The geologic map shows the distribution of the various rock formations and briefly describes the rock types within each formation and the water-yielding characteristics. This map shows that alluvium along the Arkansas and Canadian Rivers and terrace deposits in Tulsa and Wagoner Counties, which constitute the most favorable sources of ground

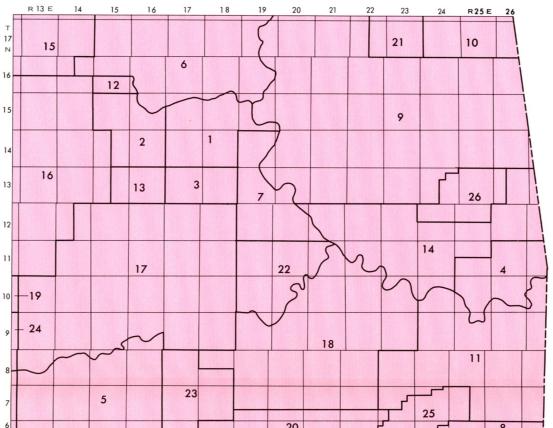
water, underlie about 6 percent of the area. About 8 percent of the area, in Adair and Cherokee Counties, is underlain by weathered chert and limestone, which are moderately favorable for ground-water supplies. The remaining 86 percent of the area is underlain by shale, siltstone, and sandstone, which are least favorable sources of water. The relation between geology and availability of ground water is described in greater detail on sheet 2.

In addition to rock type, geologic structure also affects the occurrence of ground water, particularly in the northeastern part of the area where springs and some of the wells of larger yield apparently obtain water from rocks broken by faulting. In some places faults are the conduits through which saline or other highly mineralized waters move and are discharged at the surface.

Streamflow records show that minor streams in the area go dry or nearly dry almost every year. Drying up of these streams is related to the type of rock underlying each drainage basin because, during dry parts of the year, streams are fed from water stored in the rocks. If the rocks are of a type that has limited storage capacity, such as shale, siltstone, and sandstone, they are quickly drained and there is no water available to maintain streamflow. More information on streamflow is given on sheets 2 and 4.

The chemical quality of both ground and surface waters is related to rock type. Alluvium yields ground water of the best quality and shale the poorest, whereas other rock types yield water with a quality somewhere between. Ground water that has been in contact with coal beds is usually highly mineralized and, in some places, unfit to drink. Coal mining and oil- and gas-field development may adversely affect the water quality locally. Sheet 3 presents additional information on the chemical quality of ground water, and sheet 4 gives similar information

Because of the limited availability of water from bedrock in much of the area, additional studies are needed to determine the true potential of alluvium along the Canadian River from the Arkansas River to Eufaula Reservoir and along the Arkansas River between its junction with the Verdigris River and Tulsa. Little is known about the hydrology of terrace deposits adjacent to Eufaula Reservoir and along the Arkansas River in Wagoner and Tulsa Counties, and additional study is needed. Springs are a significant potential source of water in Adair and Cherokee Counties and deserve additional study.



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