U.S. GEOLOGICAL SURVEY ATCHISON 96° (95° 94° 93° 92° 91° 90° 89° JEFFERSON ARKANSAS 0 50 100 KILOMETERS **INDEX MAP EXPLANATION** Post-Paleozoic sediments ST CHARLES Western Interior Plains confining system<sup>1</sup> Springfield Plateau aquifer<sup>1</sup> Ozark confining unit Ozark aquifer St. François confining unit St. Francois aquifer Basement confining unit Contact—Dashed where approximately located ---- Approximate boundary of the Ozark Plateaus aquifer system Drill-hole—Shown only in section A——A' Trace of geohydrologic section showing control points <sup>1</sup>Areas of lighter color tones represent unnamed units that are stratigraphi-ANDERSON cally equivalent to the designated geohydrologic units WOODSON CRAWFORD MONTGOMERY CHEROKEE 0.3048 1.609 meter kilometer SCALE 1:750 000 State base maps, 1:500,000; Arkansas, 1967; Kansas, 1963; Missouri, 1973; Oklahoma, 1972

DEPARTMENT OF THE INTERIOR

MAJOR GEOHYDROLOGIC UNITS IN AND ADJACENT TO THE OZARK PLATEAUS PROVINCE, MISSOURI, ARKANSAS, KANSAS, AND OKLAHOMA

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An investigation of the geohydrologic system in the Ozark Plateaus province (index map and Fenneman, 1938) has been made as part of the Central Midwest Regional Aquifer-System Analysis (Jorgensen and Signor, 1981), a major study of the regional aquifer system in parts of 10 States. The study is one of several by the U.S. Geological Survey that are designed to increase knowledge of the flow regime and geohydrologic properties of regional aquifer systems in the United States. Because a large quantity of fresh ground water is available in aquifers underlying the Ozark Plateaus province, a subregional project has been established to study the geohydrologic units of this area in more detail than is practical in the regional study. The stratigraphic and geologic relationships among the primary geohydrologic units in and adjacent to the Ozark Plateaus is depicted in this atlas (Chapter A). This is the first of a series of chapters (A–H) that includes maps of the altitude of the top, thickness, potentiometric surface, and percentage-of-shale content of individual geohydrologic units.

## THE OZARK PLATEAUS PROVINCE GEOHYDROLOGIC SYSTEM

The geohydrologic system in and adjacent to the Ozark Plateaus province can be divided into eight major regional units on the basis of relative rock permeability and well yields. These geohydrologic units consist of geologic units ranging in age from Precambrian (igneous and metamorphic rocks) to Quaternary (alluvial deposits). Boundaries between the geohydrologic units do not always conform to geologic time divisions or formation boundaries, but are chosen to delineate groups of rocks having similar hydrologic properties. Seven of the geohydrologic units are named on the basis of the physiographic area in which they are most widely used as a source of water or on their stratigraphic relation to other units. Five of the units, the St. François aquifer, St. François confining unit, Ozark aquifer, Ozark confining unit, and Springfield Plateau aquifer, collectively comprise the Ozark Plateaus aquifer system (stratigraphic column). The approximate location of the boundary of the mainly freshwater Ozark Plateaus aquifer system has been identified using potentiometrichead and dissolved-solids concentration data from the system's component geohydrologic

Geohydrologic units that comprise the Ozark Plateaus aquifer system crop out in a concentric pattern centered on the St. Francois Mountains (index map). The three lowest geohydrologic units crop out only in the immediate vicinity of the St. Francois Mountains. The Ozark aquifer is the largest aquifer, both in area of outcrop and thickness, and the most important source of freshwater in the Ozark Plateaus. The geohydrologic section, which trends across the Ozark Plateaus province from west to east, passing through the St. Francois Mountains, depicts the stratigraphic position and relative thicknesses of the units. A list of the geohydrologic units in and adjacent to the Ozark Plateaus province with brief descriptions of their lithologic and hydrologic properties is given below. One of the geohydrologic units, post-Paleozoic sediments, was not studied as part of this investigation. For information on this unit refer to Cushing and others (1970), and Emmett and Jeffery (1968 and 1970).

1. Basement confining unit (Chapter B): Igneous and metamorphic rocks of the Precambrian age. Rocks are virtually impermeable, but faults and fracture systems yield water to some wells in outcrop areas. Yields may range from 0 to 70 gal/min, but seldom exceed 10 gal/min.

2. St. Francois aquifer (Chapter C): Sandstone, siltstone, and dolostone of Late Cambrian age. Adequate yields for domestic and small municipal supply (100 to 500 gal/min). Rarely used beyond outcrop area because the overlying Ozark aquifer yields more water at a shallower depth. Lowermost unit of the Ozark Plateaus aquifer system.

3. St. Francois confining unit (Chapter D): Shale and dolostone of Late Cambrian age. Extends throughout most of the Ozark Plateaus province. Shale content ranges from 0 to 40 percent and decreases with distance from St. François Mountains. 4. Ozark aquifer (Chapter E):

Dolostone, limestone, and sandstone of Late Cambrian through Devonian age. Largest non-alluvial source of freshwater in the Ozark Plateaus province. Combined yield of several geologic units within the aquifer may exceed 1,000 gal/min. 5. Ozark confining unit (Chapter F):

Shale and limestone of Late Ordovician through Mississippian age. Thickness of the unit ranges from 0 to 1,500 feet, but usually is less than 150 feet. Although shale content may be as large as 100 percent, some areas contain little or no shale. 6. Springfield Plateau aquifer (Chapter G); Primarily limestone of Mississippian age. Usually a good source of water for small-yield (10

to 25 gal/min) wells, such as domestic and stock supply. Uppermost unit of the Ozark Plateaus aquifer system.

7. Western Interior Plains confining system (Chapter H):

Shale, limestone, sandstone, and coal deposits of Mississippian and Pennsylvanian age. formations. Dissolved-solids concentration may exceed 10,000 milligrams per liter. 8. Post-Paleozoic sediments:

Sand, gravel, and clay deposits of Cretaceous, Tertiary, and Quaternary age. Abundant source of water along major rivers and the Mississippi Alluvial Plain. Yields may exceed

## **REFERENCES**

Cushing, E. M., and others, 1970, Availability of water in the Mississippi embayment: U.S. Geological Survey Professional Paper 448-A, 13 p. Emmett, L. F., and Jeffery, H. G., 1968, Reconnaissance of the ground-water resources of the Missouri River alluvium between St. Charles and Jefferson City, Missouri: U.S. Geological Survey Hydrologic Investigations Atlas HA-315. \_\_\_\_\_ 1970, Reconnaissance of the ground-water resources of the Missouri River

alluvium between Miami and Kansas City, Missouri: U.S. Geological Survey Hydrologic Investigations Atlas HA-344. Fenneman, N. M., 1938, Physiography of eastern United States: New York, McGraw-Hill, Jorgensen, D. G., and Signor, D. C., 1981, Plan of study for the Central Midwest Regional Aquifer-system Analysis in parts of Arkansas, Colorado, Kansas, Missouri, Nebraska,

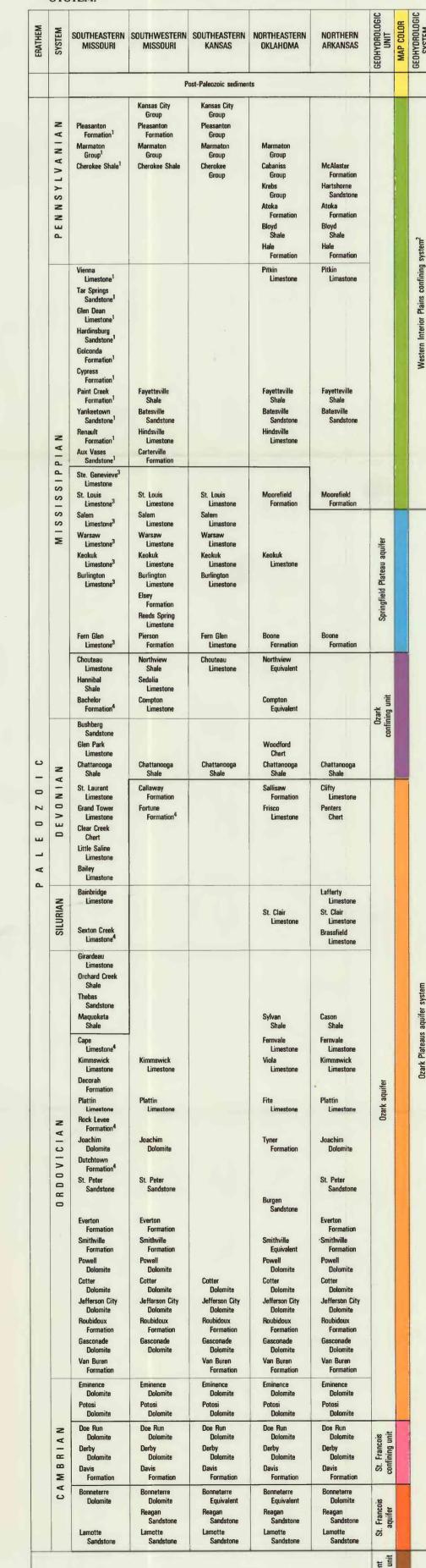
## **STRATIGRAPHY**

Resources Investigations Open-File Report 81–206, 28 p.

Geologic units that underlie the Ozark Plateaus province in the four-State area have been grouped according to their relative regional hydrologic properties. The stratigraphic column identifies the geologic units that belong to the Western Interior Plains confining system and to each major aquifer and confining unit within the Ozark Plateaus aquifer system. Hydrologic divisions do not conform to geologic time lines, and in some instances, a particular geologic unit may be assigned to different geohydrologic units in different parts of the province because of regional facies changes.

New Mexico, Oklahoma, South Dakota, and Texas: U.S. Geological Survey Water-

GENERALIZED STRATIGRAPHIC COLUMN SHOWING GEOLOGIC UNITS THAT COMPRISE GEOHYDROLOGIC UNITS AND SYSTEMS WITHIN THE AREA DEFINED BY THE BOUNDARY OF THE OZARK PLATEAUS AQUIFER



of the confining system.

The Western Interior Plains confining system also includes younger geologic units wast of the map area. <sup>3</sup>Geologic unit in southeastern Missouri that is stratigraphically equivalent to geologic units in the Springfield Plateau aquifer, but not part of

Precambrian igneous and metamorphic rocks

<sup>4</sup>Unit follows usage of the Missouri Division of Geology and Land Survey.

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