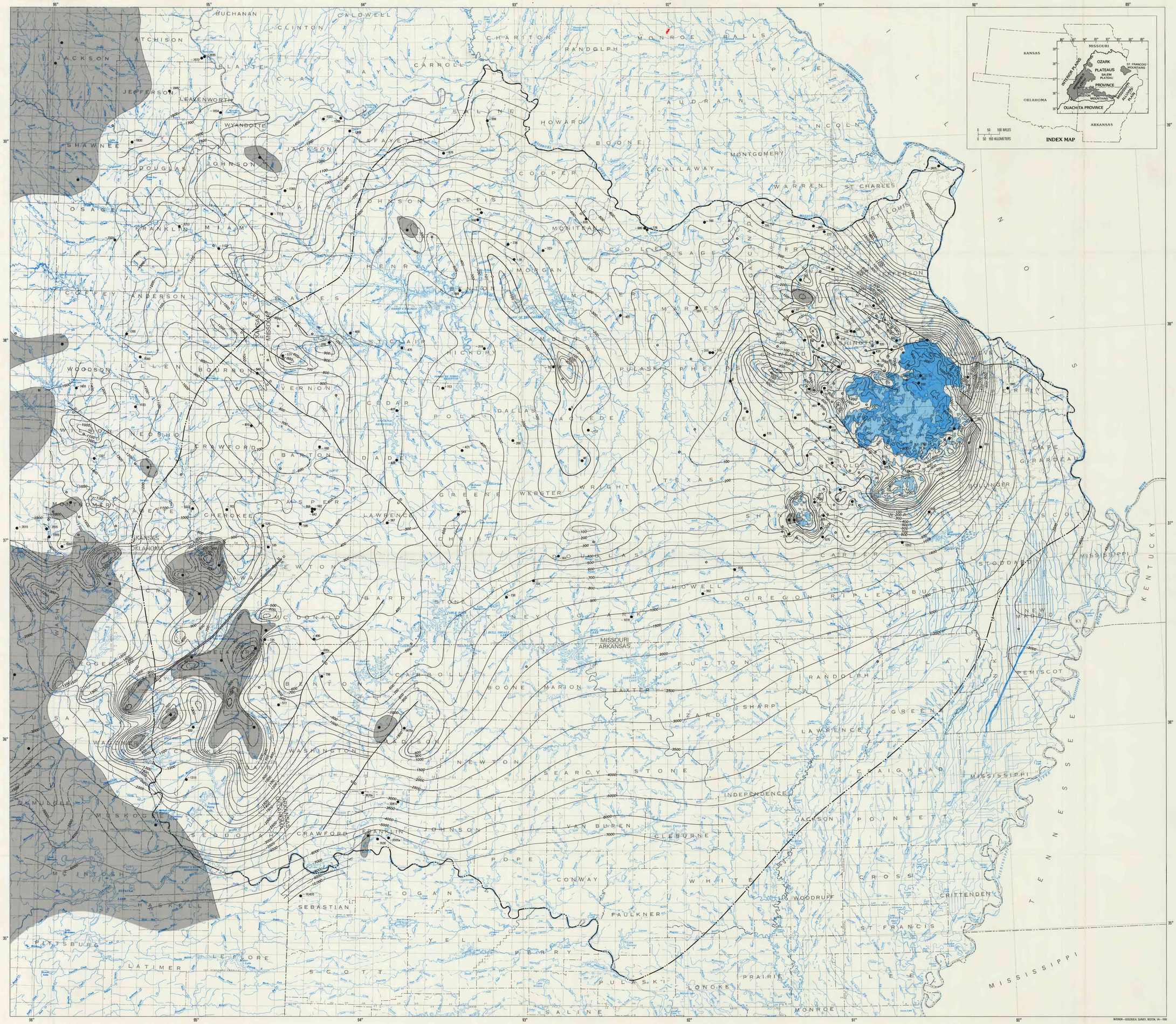
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA–711–C (SHEET 1 OF 2)



Base from U.S. Geological Survey
State base maps, 1:500,000: Arkansas, 1967; Kansas, 1983; Missouri, 1973; Oklahoma, 1972

SCALE 1:750 000

25 0 25 50 75 100 MILES
25 0 25 50 75 100 KILOMETERS

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1990

Altitude of top of St. Francois Aquifer

MAJOR GEOHYDROLOGIC UNITS IN AND ADJACENT TO THE OZARK PLATEAUS PROVINCE, MISSOURI, ARKANSAS, KANSAS, AND OKLAHOMA—ST. FRANCOIS AQUIFER

By
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1990

EXPLANATION

- **Outcrop area of the St. Francois aquifer**
- **Outcrop area of socks comprising geohydrologic unit older than the St. Francois aquifer**
- **Area where the St. Francois aquifer and stratigraphically equivalent units are missing in the subsurface**

- **Contact**
- **Fault**—U, upthrown side; D, downthrown side
- **Approximate boundary of Ozark Plateaus aquifer system**
- **Structure contour[1]**—Shows altitude of top of the St. Francois aquifer. Contours in areas of few control points are consistent with control points and contours on the maps of overlying and underlying geohydrologic units. Contours in outcrop areas are modified from 1:500,000 scale, Missouri State base map. Contour interval, in feet, is variable. National geodetic vertical datum of 1929
- **Structure contour[1] (Dashed)**—Shows altitude of the top of the next stratigraphically lower geohydrologic unit where the St. Francois aquifer is missing in the subsurface. Contour interval, in feet, is variable. National geodetic vertical datum of 1929
- **Control data point[1]**—Part of Central Midwest Regional Aquifer-System Analysis data base. Number is altitude, in feet, of top of the St. Francois aquifer (e means estimated). National geodetic vertical datum of 1929
- **Auxiliary control data point[1]**

[1]Lines and control points beyond the approximate boundary of the Ozark Plateaus aquifer system are for units stratigraphically equivalent to those that comprise the Ozark Plateaus aquifer system

INTRODUCTION

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 relationship among the primary geohydrologic units in the Ozark Plateaus province is discussed in Chapter A of this Hydrologic Investigations Atlas series. This chapter focuses on the St. Francois aquifer, a geohydrologic unit within the Ozark Plateaus aquifer system underlying the Ozark Plateaus province.

ST. FRANCOIS AQUIFER

DEFINITION

The St. Francois aquifer, the lowermost geohydrologic unit of the Ozark Plateaus aquifer system, is composed of Upper Cambrian strata, primarily sandstone, resting on a confining layer of igneous and metamorphic rocks of Precambrian age (see stratigraphic column and Chapter B). Geologic formations within the aquifer are the Lamotte Sandstone, Reagan Sandstone, and Bonneterre Dolomite. The St. Francois aquifer is named for the geographic region, the St. Francois Mountains, where the aquifer crops out and is widely used as a source of water for domestic and public supply. The approximate boundary of the Ozark Plateaus aquifer system (map) was determined from potentiometric-head and dissolved-solids concentration data in aquifers that overlie the St. Francois aquifer. Although geologic formations that comprise the St. Francois aquifer extend to the boundary of the Ozark Plateaus aquifer system, there is little hydrologic data available to verify that this same boundary represents the limit of lateral flow in the St. Francois aquifer. However, the relatively large permeability of the overlying St. Francois confining unit (Chapter D), which hydraulically separates the St. Francois aquifer from the Ozark aquifer (Chapter E), probably ensures that the boundary of freshwater flow in the St. Francois aquifer is nearly coincident with boundary of flow in the overlying aquifers.

STRUCTURAL FEATURES

There are insufficient control data available to accurately determine the structural features of the St. Francois aquifer entirely on the basis of well logs. Therefore, in areas deficient of data, contours have been drawn so that the altitude of the top of the St. Francois aquifer is consistently at a greater altitude than the top of the underlying Basement confining unit. Similarly, contours on a map of the altitude of the top of the Ozark aquifer (for which there is a large quantity of control data) have been used as an upper boundary for the altitude of the top of the St. Francois aquifer and the intervening St. Francois confining unit.

Beyond the relatively small outcrop area (590 square miles in the St. Francois Mountains) the St. Francois aquifer dips into the subsurface and is buried beneath younger water-yielding rocks. The aquifer dips most steeply to the east toward the Illinois Basin, and south toward the Mississippi Alluvial Plain where it is buried to a depth of more than 3,200 feet. To the west, the dip is more gentle and broken by a series of small basins and hills. The depth below land surface of the aquifer ranges from approximately 1,000 to 2,000 feet throughout much of the western part of the Ozark Plateaus province. The aquifer is missing from the subsurface at several isolated areas throughout the Ozark Plateaus province. In Missouri, northwestern Arkansas, southeastern Kansas, and the northeastern corner of Oklahoma the areas where the aquifer is not present are associated with prominent topographic highs on the surface of the underlying Precambrian rocks. Units stratigraphically equivalent to the St. Francois aquifer are missing from a broad region beyond the western limit of the Ozark Plateaus aquifer system. The eastern boundary of this region in Kansas and Oklahoma is indicative of the western limits of deposition of Reagan facies. The Lamotte Sandstone and Bonneterre Dolomite are not present in the extreme southwestern part of the Ozark Plateaus province because the western limit of Cambrian seas was farther east prior to Reagan Sandstone deposition (Kurtz and others, 1975).

REFERENCES

Fenneman, N. M., 1938, Physiography of eastern United States: New York, McGraw-Hill, 714 p.

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, New Mexico, Oklahoma, South Dakota, and Texas: U.S. Geological Survey Water-Resources Investigations Open-File Report 81–206, 28 p.

Kurtz, V. E., and others, 1975, Traverse in Late Cambrian strata: Missouri Division of Geology and Land Survey Report of Investigations 55, 112 p.

GENERALIZED STRATIGRAPHIC COLUMN SHOWING GEOLOGIC FORMATIONS THAT COMPRISE THE ST. FRANCOIS AQUIFER.

ERATHEM	SYSTEM	SOUTHERN MISSOURI	SOUTHEASTERN KANSAS	NORTHEASTERN OKLAHOMA	NORTHERN ARKANSAS	GEOHYDROLOGIC UNIT
PALEOZOIC		Davis Formation	Davis Formation	Davis Formation	Davis Formation	
	CAMBRIAN	Bonneterre Dolomite	Bonneterre Equivalent	Bonneterre Equivalent	Bonneterre Dolomite	St. Francois aquifer
		Reagan Sandstone	Reagan Sandstone	Reagan Sandstone	Reagan Sandstone	
		Lamotte Sandstone	Lamotte Sandstone	Lamotte Sandstone	Lamotte Sandstone	
		Precambrian igneous and metamorphic rocks				

CONVERSION FACTORS

Multiply inch-pound unit	By	To obtain SI unit
foot	0.3048	meter
mile	1.609	kilometer
square mile	2.590	square kilometer
gallon per minute	0.06308	liter per second
foot per second	0.3048	meter per second

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