



EXPLANATION

- Outcrop area of St. Francois confining unit
- Outcrop area of rocks comprising geologic units older than St. Francois confining unit
- Area where St. Francois confining unit 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—Shows altitude of top of the St. Francois confining unit. Contours in areas of few control points are consistent with control points and contours on maps of overlying and underlying geologic units. Contours in outcrop area are modified from 1:500,000 scale Missouri State base map. Contour interval, in feet, is variable. Hachures indicate depression in St. Francois confining unit. National Geodetic Vertical Datum of 1929.
- Structure contour (Dashed)—Shows altitude of the top of the next stratigraphically lower geologic unit where the St. Francois confining unit is missing in the subsurface. Contour interval, in feet, is variable. National Geodetic Vertical Datum of 1929.
- Control Data Point—Part of Central Midwest Regional Aquifer-System Analysis data base. Number is altitude, in feet, of top of St. Francois confining unit (e means estimated). National Geodetic Vertical Datum of 1929.
- Auxiliary control data point—Contours and control points beyond the approximate boundary of the Ozark Plateaus aquifer system are on units geographically 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 Feneman, 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 is based on a 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 hydrologic units in this area in more detail than is practical in the regional study. The stratigraphic relationship among the primary geologic units in the Ozark Plateaus province is discussed in Chapter A of this Hydrologic Investigations Atlas series. This chapter focuses on the St. Francois confining unit, a geologic unit within the Ozark Plateaus aquifer system underlying the Ozark Plateaus province.

ST. FRANCOIS CONFINING UNIT

DEFINITION

The St. Francois confining unit, the lower confining unit in the Ozark Plateaus aquifer system, is composed of Upper Cambrian shale, siltstone, dolostone, and limestone. The confining unit is represented by three geologic formations, the Davis Formation, and Derby and Doe Run Dolomites. These semipermeable rock units separate the underlying St. Francois aquifer (Chapter C) from the overlying Ozark aquifer (Chapter E). The St. Francois confining unit is named for its relative stratigraphic position and significance as the semipermeable barrier that hydrologically confines the St. Francois aquifer.

STRUCTURAL FEATURES

Where there are insufficient control data available to accurately determine the structural features of the St. Francois confining unit entirely on the basis of well logs, contours have been drawn so that the altitude of the top of the St. Francois confining unit is consistently at a lower altitude than the top of the overlying Ozark aquifer (for which there is a large quantity of control data). Similarly, contours on a map of the altitude of the top of the Basement confining unit have been used as a lower bound for the altitude of the top of the St. Francois confining unit and the intervening St. Francois aquifer.

Uplift of the Ozark dome at the east edge of the Ozark Plateaus province beginning in Early to Middle Ordovician time and subsequent erosion of younger rocks that once covered Upper Cambrian strata have caused the St. Francois confining unit to crop out in an approximately concentric pattern around the St. Francois Mountains (index map). The total outcrop area is about 400 square miles. The dip of the confining unit radially from the St. Francois Mountains is quite steep (as much as 150 feet per mile), except to the west where the rocks dip more gently into the subsurface. Throughout the western part of the province, the top of the St. Francois confining unit is characterized by a broad, gently sloping ridge broken by several small depressions and hills. The largest hill rises about 600 feet above the plateau in southeast Camden County, Missouri, and is associated with the anomalous Decaturville structure (McCoy, 1971, p. 22-23). At the western boundary of the Ozark Plateaus province, the confining unit dips more steeply into the subsurface. Units stratigraphically equivalent to the St. Francois confining unit are missing from two broad regions to the northwest and southwest of the Ozark Plateaus province. The eastern boundaries of these areas represent the western limits of deposition of sediments that form the St. Francois confining unit (Kurtz and others, 1975). The smaller isolated areas in the province where the confining unit is missing from the subsurface usually are coincident with corresponding areas where the underlying St. Francois aquifer is absent and are indicative of Precambrian islands that rose above the Cambrian seas during deposition of Davis and Derby and Doe Run sediments. It is likely that Precambrian islands also were present in the vicinity of the St. Francois Mountains at the time of deposition of the confining unit, but subsequent uplift of the Ozark dome and erosion have eliminated most of the evidence for these islands.

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

| PROVINCE | SOUTHERN MISSOURI | SOUTHEASTERN MISSOURI | NORTHEASTERN MISSOURI | NORTHERN MISSOURI | OKLAHOMA | ARKANSAS |
|-------------|-------------------|-----------------------|-----------------------|-------------------|----------|----------|
| PALEOZOIC | Pelee | Pelee | Pelee | Pelee | Pelee | Pelee |
| CAMBRIAN | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run |
| | Davis | Davis | Davis | Davis | Davis | Davis |
| PRECAMBRIAN | Doe Run | Doe Run | Doe Run | Doe Run | Doe Run | Doe Run |
| | Davis | Davis | Davis | Davis | Davis | Davis |
| BASIN | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run |
| | Davis | Davis | Davis | Davis | Davis | Davis |
| EQUIVALENT | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run | Doer Run |
| | Davis | Davis | Davis | Davis | Davis | Davis |



Altitude of top of St. Francois confining unit

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

By
Jeffrey L. Imes
1990