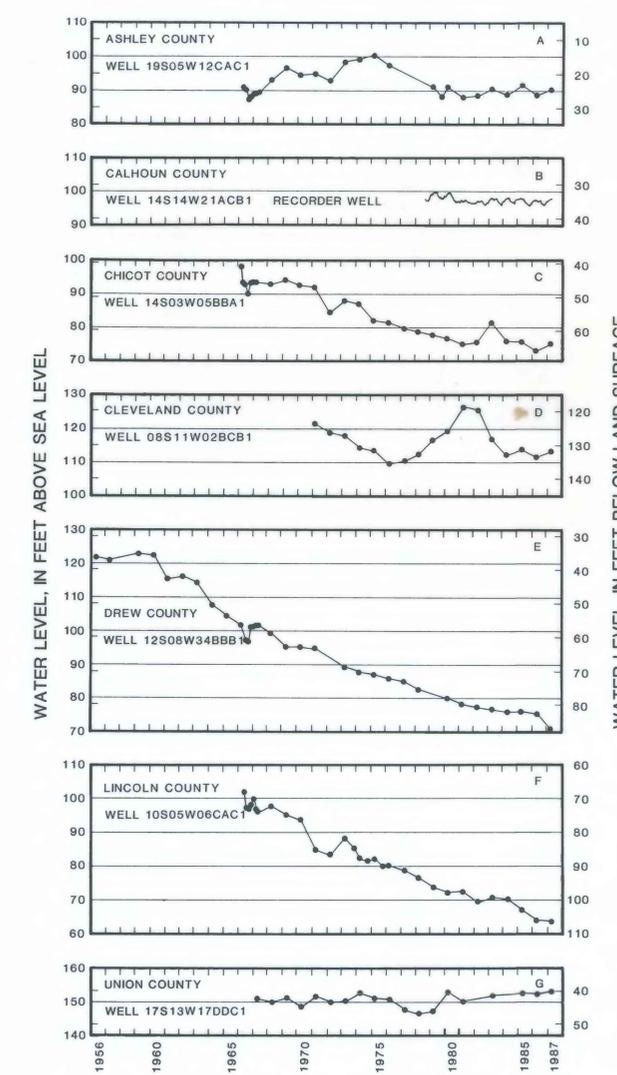


- EXPLANATION**
- OUTCROP OF COCKFIELD FORMATION—Generalized after Hosman (1982).
 - OUTCROP OF COCKFIELD FORMATION COVERED BY DEPOSITS OF QUATERNARY AGE—Generalized after Hosman (1982).
 - GEOLOGIC CONTACT—Dashed where approximately located.
 - POTENTIOMETRIC CONTOUR—Shows altitude at which water would have stood in tightly cased wells. Dashed where approximately located. Hatchures indicate depression. Contour interval 20 and 40 feet. Datum is sea level.
 - WELL FOR WHICH MEASUREMENT MADE IN SPRING 1980 WAS USED AS CONTROL
 - WELL FOR WHICH HYDROGRAPH IS SHOWN
 - WELL FOR WHICH MEASUREMENT FROM YEAR OTHER THAN 1980 WAS USED AS SUPPLEMENTARY CONTROL
 - GAGE FOR WHICH RIVER STAGE MEASUREMENT MADE IN SPRING 1980 WAS USED AS CONTROL



Base from U.S. Geological Survey State base map, 1967



INTRODUCTION

This map shows the generalized contours of the altitude of water levels in wells completed in the Cockfield Formation in southeastern Arkansas for 1980. Most water levels used in constructing the map were made in the spring of 1980. However, in parts of the State water levels from the spring of 1980 were unavailable. Where data indicated no long-term change in nearby water levels measurements from as early as 1952 and as late as 1983 were used. At a few locations the altitude of the water surface in a stream was used to define the potentiometric surface. Available water-level data limited the interpretation of potentiometric surface primarily to the area of occurrence of the aquifers south of the Arkansas River. Water-level data from Arkansas and adjacent states used in the construction of this map are from the ground-water file of the U.S. Geological Survey's National Water Data Storage and Retrieval System. This map was prepared as part of the Gulf Coast Regional Aquifer-System Analysis study.

HYDROGEOLOGIC SETTING

The aquifers in the Cockfield Formation of Eocene age generally consist of discontinuous fine to medium sand which is interbedded with silt, clay, and lignite. Most sand beds, which serve as aquifers, are found near the bottom of the Cockfield Formation. A few beds of sand from the bottom of the overlying Jackson Group in south-central Arkansas may be in contact with and included with the aquifers in the Cockfield Formation. Total thickness of the Cockfield Formation generally ranges between 100 and 400 ft near its outcrop area but reaches 625 ft in thickness in northeastern Chicot County.

The nonmarine sediments of the Cockfield Formation are underlain, and for much of the area overlain, by fine-grained sediments of marine origin. The Cockfield is everywhere underlain by the glauconitic, calcareous, and sandy marl, limestone, or carbonaceous clay of the Cook Mountain Formation. Throughout much of the eastern and northern part of the study area the Cockfield is overlain by the silt clays of the Jackson Group.

The Cockfield crops out over much of south-central Arkansas. In much of the outcrop area the Cockfield is covered by terrace deposits and alluvium of Quaternary age. The terrace deposits may attain a thickness of 40 ft. As much as 60 ft of alluvium covers the outcrop of the Cockfield in some of the larger river valleys. The Mississippi River Valley alluvial aquifer overlies a portion of the Cockfield in eastern Ashley County to a depth of as much as 125 ft. In the areas of outcrop water table conditions commonly occur at shallow depth. The deeper parts of the aquifers and the complete thickness of aquifers outside the outcrop area are under artesian conditions. The clays and silts of the underlying Cook Mountain Formation and the overlying Jackson Group confine the aquifers in the Cockfield Formation outside the outcrop area.

Most recharge to aquifers in the Cockfield occurs by infiltration of rainfall on the upland outcrop areas and by inflow from the overlying alluvium. Most discharge is to rivers in outcrop areas, adjacent geologic units where the Cockfield aquifers are confined, and to wells.

The quality of water from the aquifers in the Cockfield Formation generally is suitable for most uses. Most wells in the Cockfield yield water with less than 500 milligrams per liter (mg/l) of dissolved solids and soft water (less than 50 mg/l hardness as calcium carbonate). Locally, however, the dissolved-solids concentration is as much as 2,000 mg/l and hardness as much as 600 mg/l. The contours of water levels did not consider the salinity of the water.

Water withdrawals from the aquifers in the Cockfield Formation in Arkansas in 1980 were 7 Mgal/d (Holland and Ludwig, 1981). The largest use (and the only use for much of the study area) was for domestic and stock use. A few industrial, municipal, and public supply systems also tap the aquifer. Pumpage from aquifers in the Cockfield in the vicinity of Greenville, Mississippi, amounted to about 16 Mgal/d (Wasson, 1981). Yields to most wells are probably small, less than 30 gal/min, but properly constructed wells screened to the full thickness of the aquifers will often yield 100 to 500 gal/min.

WATER LEVELS

Water levels fluctuate seasonally in response to pumpage or to natural variation in the relative rates of ground-water recharge and discharge. Ground-water levels in and near the outcrop (see hydrographs A, B, and G) generally fluctuate 3 ft or less annually and show no long-term changes in water levels. Some wells (see hydrographs C, E, and F) outside the outcrop area show long-term declines in water levels. The regional flow in the Cockfield aquifers as indicated by the potentiometric surface is generally away from the outcrop areas and to the south and east.

In and, in some places, near the outcrop area, most ground-water flow in the Cockfield aquifers is of a local nature. In these areas ground water moves in the general direction of the slope of the land surface and toward rivers. Gradients on the potentiometric surface are steepest (10 to 50 ft/m) in the outcrop areas where topographic relief is high. Gradients are lowest (1 to 10 ft/m) in outcrop areas where topographic relief is low and in areas outside the outcrop. A cone of depression caused by pumpage near Greenville, Mississippi (Wasson, 1981), extends into Chicot County, Arkansas.

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CONVERSION FACTORS

For use of readers who prefer to use metric (International System) units, rather than the inch-pound units used in this report, the following conversion factors may be used:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
gallon per minute (gal/min)	0.0630	liter per second (L/s)
million gallon per day (Mgal/d)	0.04381	cubic meter per second (m ³ /s)
foot per mile (ft/mi)	0.4905	meter per kilometer (m/km)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level of 1929."

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GENERALIZED POTENTIOMETRIC SURFACE OF THE AQUIFERS IN THE COCKFIELD FORMATION, SOUTHEASTERN ARKANSAS, SPRING 1980

By D.J. Ackerman