

**POTENTIOMETRIC SURFACE MAP**

The potentiometric surface map indicates the altitude to which water would rise in tightly cased wells tapping the aquifers. The map is based on analysis of 204 water-level measurements made from March 15 to May 16, 1984 (Edds, 1984), prior to the beginning of the irrigation season. The potentiometric contours indicate the general directional flow pattern or gradient in the aquifer, with movement being down gradient, perpendicular to the contours.

The potentiometric surface gradient is generally towards the south except where affected by pumping. Three cones of depression centered in Columbia, Union and Jefferson Counties are a result of relatively large aquifer withdrawals in these areas (table 1). The effect of the large withdrawals in Arkansas and Prairie Counties is reflected in the northeasterly elongation of the cone of depression that is centered in Jefferson County. The actual magnitude of decline in the Sparta Sand in Arkansas and Prairie Counties at other times of the year may be greater than that indicated, because greater than 90 percent of this water is withdrawn during the summer months for irrigation, and the time lapse between the end of the pumping season and the spring measurements is sufficient to allow for recovery of the potentiometric surface in these two counties.

**SELECTED REFERENCES**

Edds, Joe, 1984, Ground-water levels in Arkansas, spring 1984; U.S. Geological Survey Open-File Report 84-171, 58 p.

Edds, Joe, and Fitzpatrick, Daniel J., 1984, Map showing altitude of the potentiometric surface and changes in water levels of the Sparta Sand and Memphis Sand aquifers in eastern Arkansas, spring 1983; U.S. Geological Survey Water-Resources Investigations Report 84-4233, 1 sheet.

Halberg, H. N., 1972, Use of water in Arkansas, 1970; Arkansas Geological Commission Water Resources Summary Number 7, 17 p.

Halberg, H. N., 1977, Use of water in Arkansas, 1975; Arkansas Geological Commission Water Resources Summary Number 9, 28 p.

Halberg, H. N., and Stephens, J. W., 1966, Use of water in Arkansas, 1965; Arkansas Geological Commission Water Resources Summary Number 5, 12 p.

Holland, Terrance W., and Ludwig, A. H., 1981, Use of water in Arkansas, 1980; Arkansas Geological Commission Water Resources Summary Number 14, 30 p.

Hosman, R. L., 1982, Outcropping Tertiary units in southern Arkansas; U.S. Geological Survey Miscellaneous Investigations Series, Map I-1405, 1 sheet.

Hosman, R. L., Long, A. T., Lambert, T. W., and others, 1968, Tertiary aquifers in the Mississippi Embayment; U.S. Geological Survey Professional Paper 448-D, 29 p.

Reed, J. E., 1972, Analog simulation of water-level declines in the Sparta Sand, Mississippi Embayment; U.S. Geological Survey Hydrologic Investigations Atlas HA-434.

**WATER USE**

Withdrawals from the Sparta Sand and Memphis Sand aquifers vary widely throughout their extent. Largest withdrawals occur from the Sparta Sand aquifer in Jefferson, Arkansas, Prairie, Union and Columbia Counties. Pumpage data for these counties between 1965 and 1980 are summarized in Table 1. As shown, withdrawals from these counties have generally been increasing, except for Union County, since at least 1965. Withdrawals in Columbia, Jefferson and Union Counties are used primarily for industrial and public supply. Withdrawals in Arkansas and Prairie Counties are seasonal for irrigation. Relatively minor amounts are withdrawn from the Sparta Sand or Memphis Sand aquifers elsewhere in Arkansas.

**CONVERSION FACTORS**

For use of readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

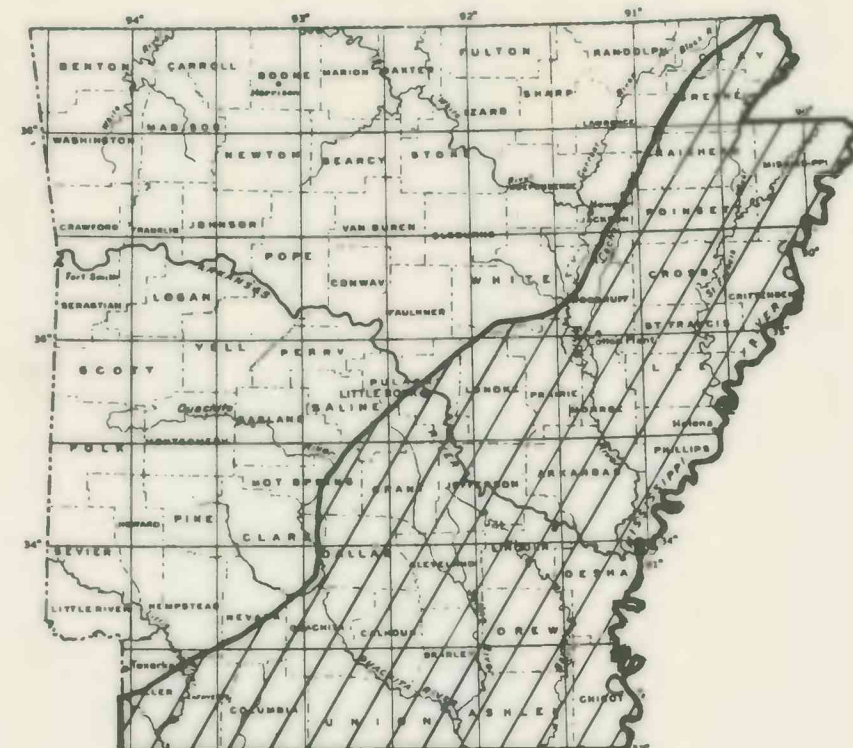
Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
million gallons per day (mgd)	0.04381	cubic meter per second (m³/s)

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. NGVD of 1929 is referred to as sea level in this report.

**WATER-LEVEL CHANGE MAP**

Changes in water levels over a 5-year period (1979-84) are illustrated by the water-level change map. Changes are based on net differences in water levels from 177 wells measured during spring 1979 and spring 1984. As shown, water levels decreased over most of the study area. Increases in water levels are seen within a small area of Jefferson County and in parts of south-central Arkansas.

Longer-term trends in water-level fluctuations are illustrated by the hydrographs of five wells that tap the Sparta Sand aquifer. Water levels generally declined over the period of record in two of these wells, located in Arkansas and Jefferson Counties. This decline is probably a result of generally increasing withdrawals for irrigation in these areas. Water-level fluctuations in the three wells in Columbia and Union Counties are more erratic, not showing any definitive trend over the period of record. These wells may be reflecting localized changes in withdrawals rather than any regional trend in water-level fluctuations.



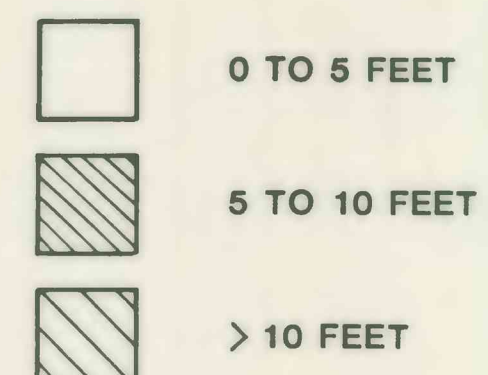
**EXPLANATION**

AREA OF STUDY

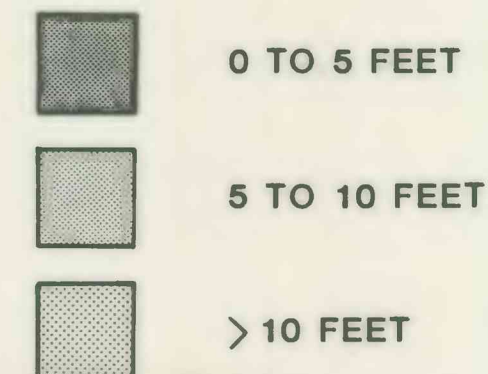
**WATER-LEVEL CHANGE MAP  
SPRING 1979 TO SPRING 1984**

**EXPLANATION**

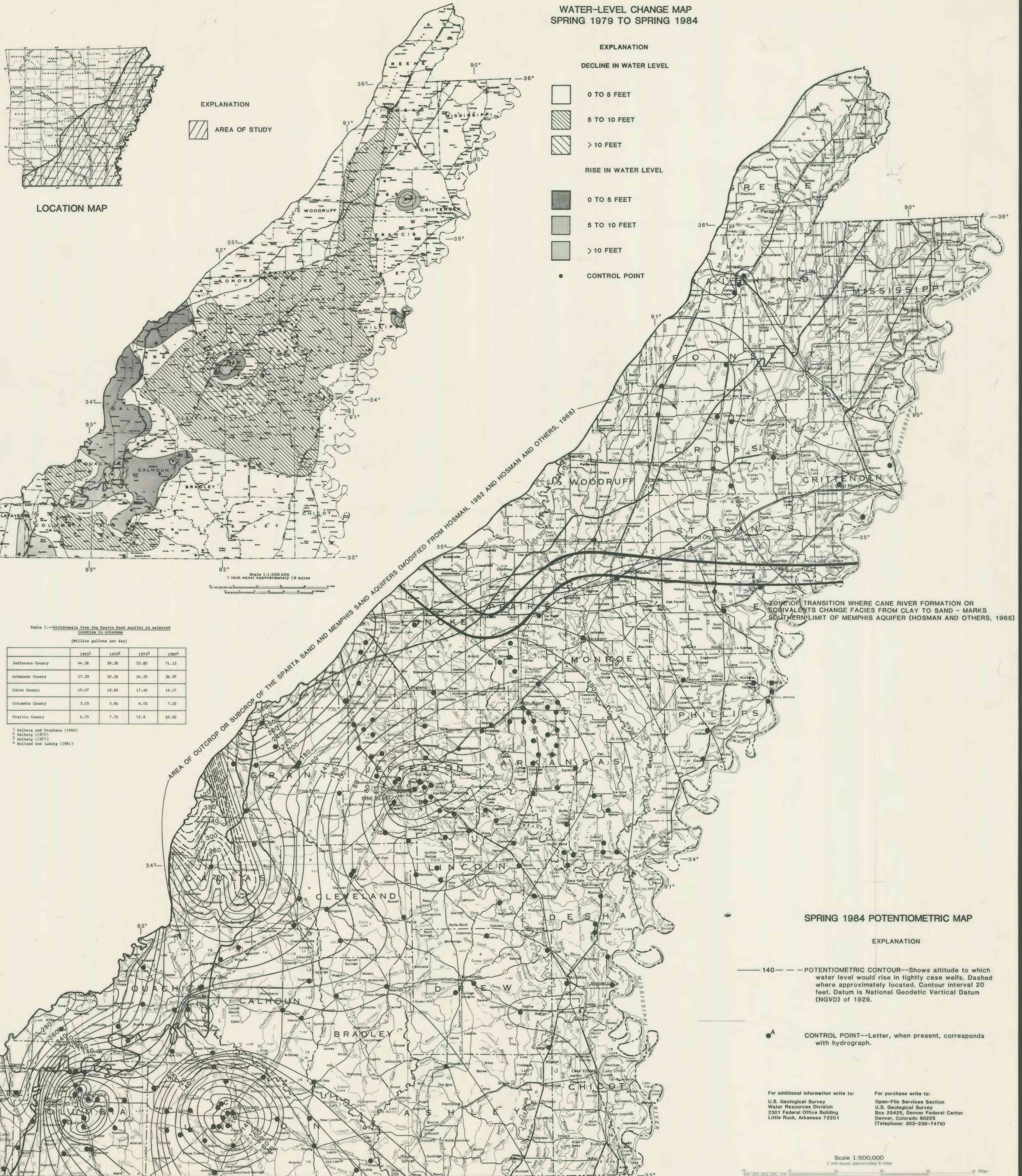
**DECLINE IN WATER LEVEL**



**RISE IN WATER LEVEL**



**CONTROL POINT**



**SPRING 1984 POTENTIOMETRIC MAP**

**EXPLANATION**

140 — — — POTENTIOMETRIC CONTOUR—Shows altitude to which water level would rise in tightly cased wells. Dashed where approximately located. Contour interval 20 feet. Datum is National Geodetic Vertical Datum (NGVD) of 1929.

CONTROL POINT—Letter, when present, corresponds with hydrograph.

For additional information write to:  
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Little Rock, Arkansas 72201

For purchase write to:  
Open-File Services Section  
U.S. Geological Survey  
Box 25428  
Denver, Colorado 80225  
(Telephone: 303-236-7476)

Scale 1:500,000  
1 inch equals approximately 8 miles  
0 10 20 30 40 50 Miles  
0 10 20 30 40 50 Kilometers

**MAPS SHOWING ALTITUDE OF THE POTENTIOMETRIC SURFACE AND CHANGES IN  
WATER LEVEL OF THE SPARTA SAND AND MEMPHIS SAND AQUIFERS  
IN EASTERN ARKANSAS, SPRING 1984**

By Joe Edds and Daniel J. Fitzpatrick