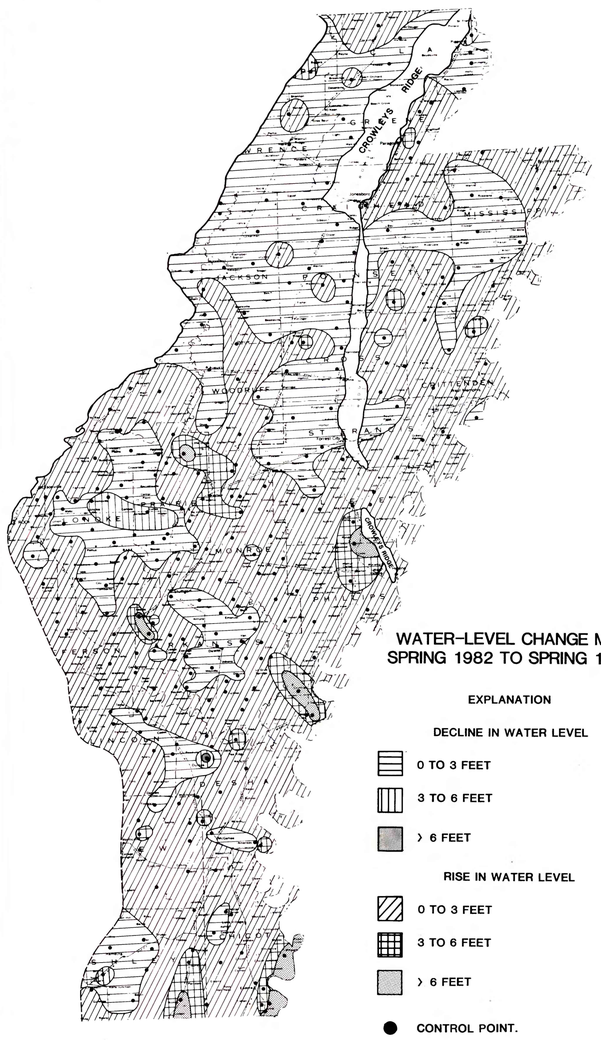
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

Prepared in cooperation with the
ARKANSAS GEOLOGICAL COMMISSION
and
ARKANSAS SOIL AND WATER CONSERVATION COMMISSION

WATER-RESOURCES INVESTIGATIONS REPORT 84-4264



WATER-LEVEL CHANGE MAP SPRING 1982 TO SPRING 1983

EXPLANATION

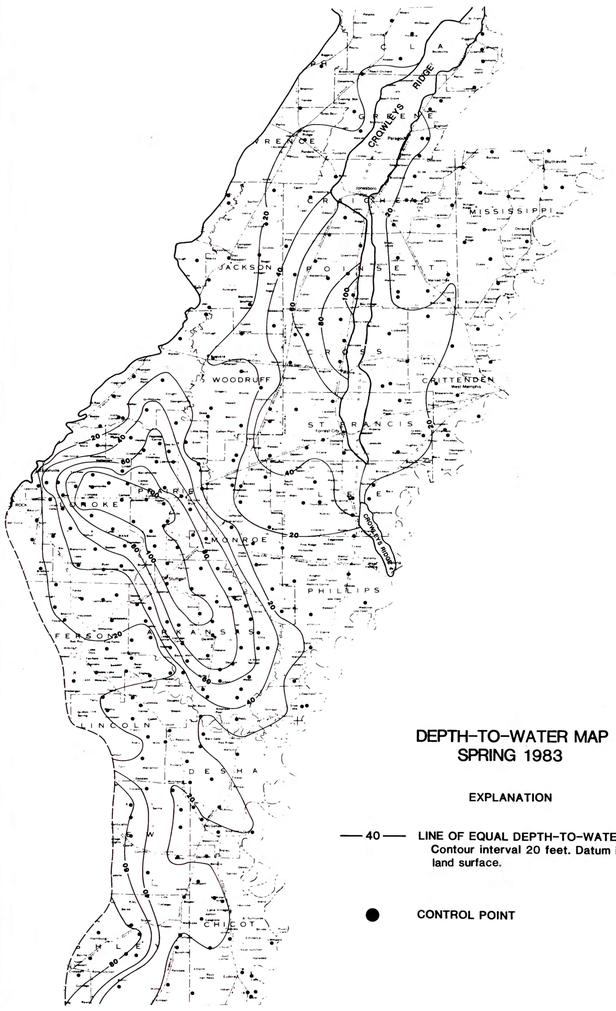
DECLINE IN WATER LEVEL

- 0 TO 3 FEET
- 3 TO 6 FEET
- › 6 FEET

RISE IN WATER LEVEL

- 0 TO 3 FEET
- 3 TO 6 FEET
- › 6 FEET

● CONTROL POINT.



DEPTH-TO-WATER MAP SPRING 1983

EXPLANATION

—40— LINE OF EQUAL DEPTH-TO-WATER--Contour interval 20 feet. Datum is land surface.

● CONTROL POINT

INTRODUCTION

The Mississippi River Valley alluvial aquifer is a major source of water for most of eastern Arkansas. Agriculture, the major user, is largely dependent on withdrawals from the aquifer for irrigation. On the average, an estimated 3.5 billion gallons per day are withdrawn for agricultural purposes (Holland and Ludwig, 1981). Much smaller withdrawals also occur for industrial, public supply and domestic purposes.

The continual monitoring of water levels in the alluvial aquifer is essential for optimum aquifer management, and thus the continuation of the aquifer as a major water supply for eastern Arkansas.

The U.S. Geological Survey with the cooperation of the Arkansas Geological Commission has been monitoring water levels annually in the Mississippi River Valley alluvial aquifer within the State of Arkansas. This report, prepared in cooperation with the Arkansas Geological Commission and the Arkansas Soil and Water Conservation Commission, presents water-level data through hydrologic maps of the potentiometric surface and water-level changes. The potentiometric surface map is based on water levels collected in the spring of 1983. The water-level change map is based on a comparison of water levels collected in the spring of 1982 and 1983. This report includes that part of the Mississippi River Valley alluvial aquifer from which substantial quantities of water are withdrawn within the State of Arkansas (see location map).

AQUIFER DESCRIPTION

The Mississippi River valley alluvial aquifer is comprised of both alluvial floodplain and terrace deposits of the Quaternary period. The flood-plain deposits generally grade from gravel and coarse sand in the lower part, to silt and clay in the upper part. Lithology of the terrace deposits are similar to those in the flood plain (Boswell and others, 1968). Deposit thickness ranges from less than 50 feet, to greater than 250 feet. The thinnest deposits generally are found near the Fall Line, (the physiographic boundary between the Coastal Plain and the Interior Highlands) and increase eastward. The area underlain by the aquifer is divided within the study area by Crowleys Ridge which acts as a barrier to the movement of ground water in the aquifer. The ridge extends from north of the Missouri-Arkansas state line, to Helena, Arkansas. It is an erosional remnant of Cretaceous and Tertiary strata that are much less permeable than the alluvial sand and gravel (Boswell and others, 1968).

The aquifer generally is partly confined, although heavy pumpage in some areas has resulted in water levels declining below the bottom of the confining bed. Yields of wells from the aquifer generally range between 1,500 and 3,000 gal/min, with the greater amounts occurring in the alluvium material.

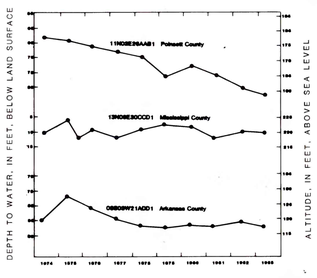
The chief source of recharge is precipitation; either through infiltration from the surface, or through flow from adjacent areas having more favorable recharge conditions. Recharge also occurs from streams and lakes during periods of high water.

WATER LEVEL CHANGE MAP

The net changes in ground-water levels between spring 1982 and spring 1983 are illustrated. Of the 290 wells monitored, 167 showed a net increase over 1982 levels, while 123 wells showed a net decrease.

Water levels generally declined in areas within the two cones of depression in Cross, Arkansas and Poinsett Counties. Water levels generally rose in the eastern part of the study area along the Mississippi River, and south and west of the White River. Some exceptions to these generalities exist and are indicated.

In much of the study area water levels have been generally declining for several years. The hydrographs show this trend for three wells completed in the alluvial aquifer in Poinsett, Mississippi, and Arkansas Counties.



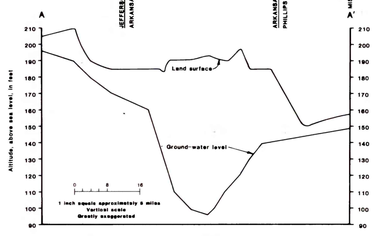
DEPTH TO WATER MAP

The depth to water below land surface for spring 1983 is illustrated. Water levels are shallowest near the Mississippi River to the east and the Fall Line to the west, and are deepest within the areas most heavily affected by pumping.

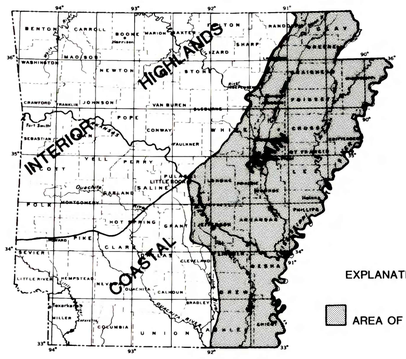
POTENTIOMETRIC SURFACE MAP

The potentiometric surface map indicates the altitude to which water would rise in tightly cased wells at any given point in the aquifer, as of March 14 to April 29, 1983. Measurements were made prior to the beginning of the pumping season. The potentiometric contours indicate the general directional flow pattern in the aquifer with movement being perpendicular to the contours. The gradient of the potentiometric surface in the aquifer is generally in a south and southeasterly direction, except where heavily affected by pumping. Two major cones of depression are evident. These two areas, one centered in Arkansas County and the other in Poinsett and Cross Counties, are areas where large quantities of water are being withdrawn for irrigation.

Cross section A-A' across Jefferson, Arkansas and Phillips Counties also illustrates the effects of pumping on the potentiometric surface. Water levels decrease from a high in the western part of Jefferson County, to a low near the center of Arkansas County, then increase to the bank of the Mississippi River. The broad low area is due to long-term pumping from a large number of irrigation wells in Arkansas County.



Cross section from Jefferson County to Phillips County, Arkansas.



LOCATION MAP

EXPLANATION

AREA OF STUDY

SPRING 1983 ALLUVIAL POTENTIOMETRIC MAP

EXPLANATION

—200— POTENTIOMETRIC SURFACE CONTOUR--Shows altitude of potentiometric surface. Contour interval 10 feet. Datum is National Geodetic Vertical Datum (NGVD) of 1929.

A———A' TRACE OF HYDROLOGIC SECTION.

● CONTROL POINT (WELLS).

△ CONTROL POINT (STREAM GAGING STATION).

SELECTED REFERENCES

Boswell, E. H., Cushing, E. M., and Hosman, R. L., 1968, Quaternary aquifers in the Mississippi embayment: U.S. Geological Survey Professional Paper 448-E, 15 p.

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

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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)
inch (in)	25.4	millimeter (mm)
mile (mi)	1.609	kilometer (km)
gallons per minute (gal/min)	0.06308	liter per second (L/s)
billion gallons per day (billion gal/d)	0.00004381	cubic meter per second (m^3/s)

MAPS SHOWING ALTITUDE OF THE POTENTIOMETRIC SURFACE AND CHANGES IN WATER LEVELS OF THE ALLUVIAL AQUIFER IN EASTERN ARKANSAS, SPRING 1983

By Joe Edds and Daniel J. Fitzpatrick