

STATE OF ARKANSAS

ARKANSAS GEOLOGICAL COMMISSION

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WATER RESOURCES SUMMARY NUMBER 3

CHANGES IN GROUND-WATER LEVELS IN DEPOSITS
OF QUATERNARY AGE IN NORTHEASTERN ARKANSAS

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Introduction

This report is one of a series resulting from a cooperative program of water-resources investigations between the U. S. Geological Survey and the Arkansas Geological and Conservation Commission. It gives information about changes in ground-water levels from 1953 to 1961 in deposits of Quaternary age in the region west of Crowleys Ridge and north of the Arkansas River. Also, data are given on changes in water levels in deposits of Quaternary age east

of Crowleys Ridge between 1955 and 1962. The area discussed is on the Mississippi alluvial plain, a subdivision of the Coastal Plain of Arkansas. Except for Crowleys Ridge, alluvial deposits of Quaternary age blanket the surface of the area. The Quaternary deposits are less than 200 feet thick in most places and are the principal source of ground water in this part of Arkansas. Most of the water used is for irrigation, particularly rice irrigation.

ACKNOWLEDGEMENTS

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Water Levels in Deposits of Quaternary Age West of Crowleys Ridge and North of the Arkansas River

Figure 1, based on water-level measurements made in 194 wells, shows the altitude of ground-water levels in the spring of 1961 in deposits of Quaternary age west of Crowleys Ridge and north of the Arkansas River. The contours show a general slope of the ground-water surface from north to south over the area, except for the Grand Prairie region (fig. 2), which includes much of Arkansas, Lonoke, and Prairie Counties. Heavy pumping, particularly for the irrigation of rice, has caused the development of a large cone of depression in this area. As a consequence, ground water is moving into the Grand Prairie from all directions. The development of this cone of depression has been discussed in several previous publications (Engler and others, 1945; Counts and Engler, 1954).

Comparison of figure 1 with figure 2, a water-level map for 1953 published by Counts and Engler (1954, fig. 2), shows that the cone of depression in the Grand Prairie region has enlarged in a northwesterly direction.

A second area of lowered water levels extends from the northeastern side of the cone of depression in the vicinity of Clarendon to west of Crowleys Ridge. This area was described by Counts and Engler (1954, p. 3), and since that time the lowering of water levels has become more pronounced. Comparison of figures 1 and 2 shows that in the vicinity of Clarendon the 160-foot contour line has shifted approximately 10 miles to the northeast.

Figure 3 shows by crosshatching where ground-water levels generally have remained stable or changed in the area west of Crowleys Ridge and north of the Arkansas River between 1953 and 1961.

Figure 3 also shows the amount of change in ground-water levels in the area west of Crowleys Ridge as indicated by comparison of water levels measured in individual wells in 1953 and again in the spring of 1961. All the wells shown are screened in deposits of Quaternary age. The changes shown are net changes that reflect all conditions that have tended to change water levels in these deposits between 1953 and 1961. These conditions are natural recharge, natural discharge, and withdrawals of ground water by man.

The general lowering of water levels as shown in figure 3 is due, in part, to natural conditions such as deficient precipitation and recharge and,

in part, to the withdrawal of ground water by man. The use of ground water in Arkansas is steadily increasing and in 1961 an average of approximately 800 million gallons per day was pumped from the deposits of Quaternary age in the Coastal Plain. Most of this water was withdrawn from north of the Arkansas River.

In the Grand Prairie region the largest decline of water levels since 1953 has taken place along a line extending from Stuttgart in Arkansas County to Lonoke in Lonoke County. This is along the northwestern side of the cone of depression and amounts to as much as 9 feet. The average rate of decline has been about 1 foot per year. In Arkansas County the decline varies from 1 to 5 feet.

In an area including parts of western Cross and Poinsett Counties, ground-water levels declined from 5 to as much as 16 feet between 1953 and 1961. The greatest decline has taken place in southwestern Poinsett and northwestern Cross Counties.

The amount of rise of water levels in deposits of Quaternary age west of Crowleys Ridge and north of the Arkansas River varies from 1 to 16 feet (fig. 3). The largest rise has taken place just east and south of Searcy in White County and may represent influence by the Red River.

Examination of the contours for 1953 and 1961 in the Marianna area (Lee County) shows an apparent rise in water levels of about 20 feet. The 20-foot figure probably is due more to inadequate contour control than to an actual large-scale rise in water levels.

Comparison of the 150-, 160-, 170-, and 180-foot contours in north-central Prairie County in figure 1 with the same contours in figure 2 reveals a southward shifting of these contours, together with a narrowing of the extreme northern part of the cone of depression. This indicates that water levels in this area have risen between 1953 and 1961, probably as a result of recharge from the White River, recovery from drought conditions of the period 1952 to 1956, and a possible reduction in pumpage because of acreage controls since 1955.

Throughout the remainder of the area west of Crowleys Ridge and north of the Arkansas River, the amount of rise rarely exceeds 5 feet and probably represents natural recharge rather than decreased pumpage.

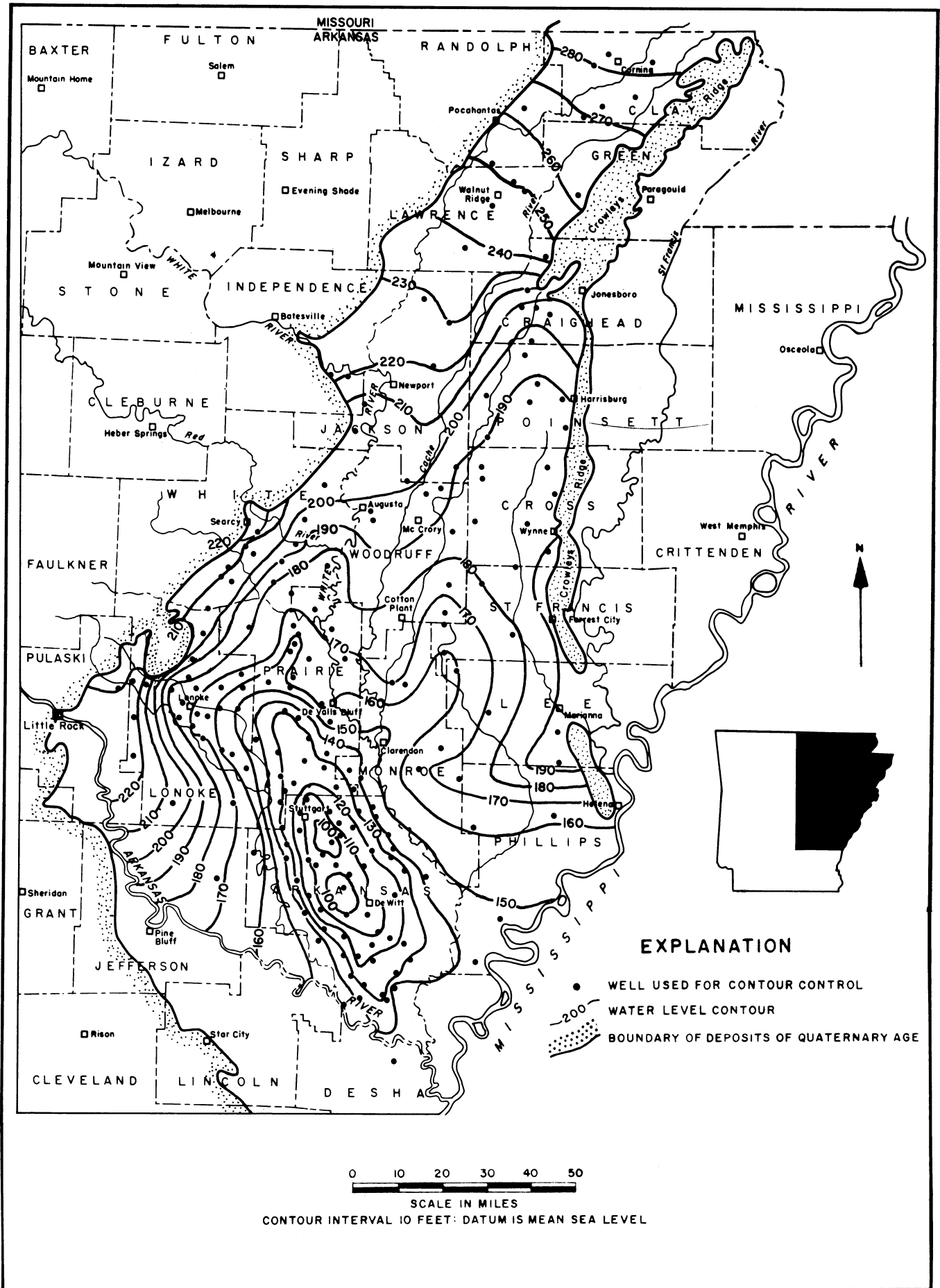


Figure 1. Map showing water levels in deposits of Quaternary age west of Crowley's Ridge, Spring 1961.

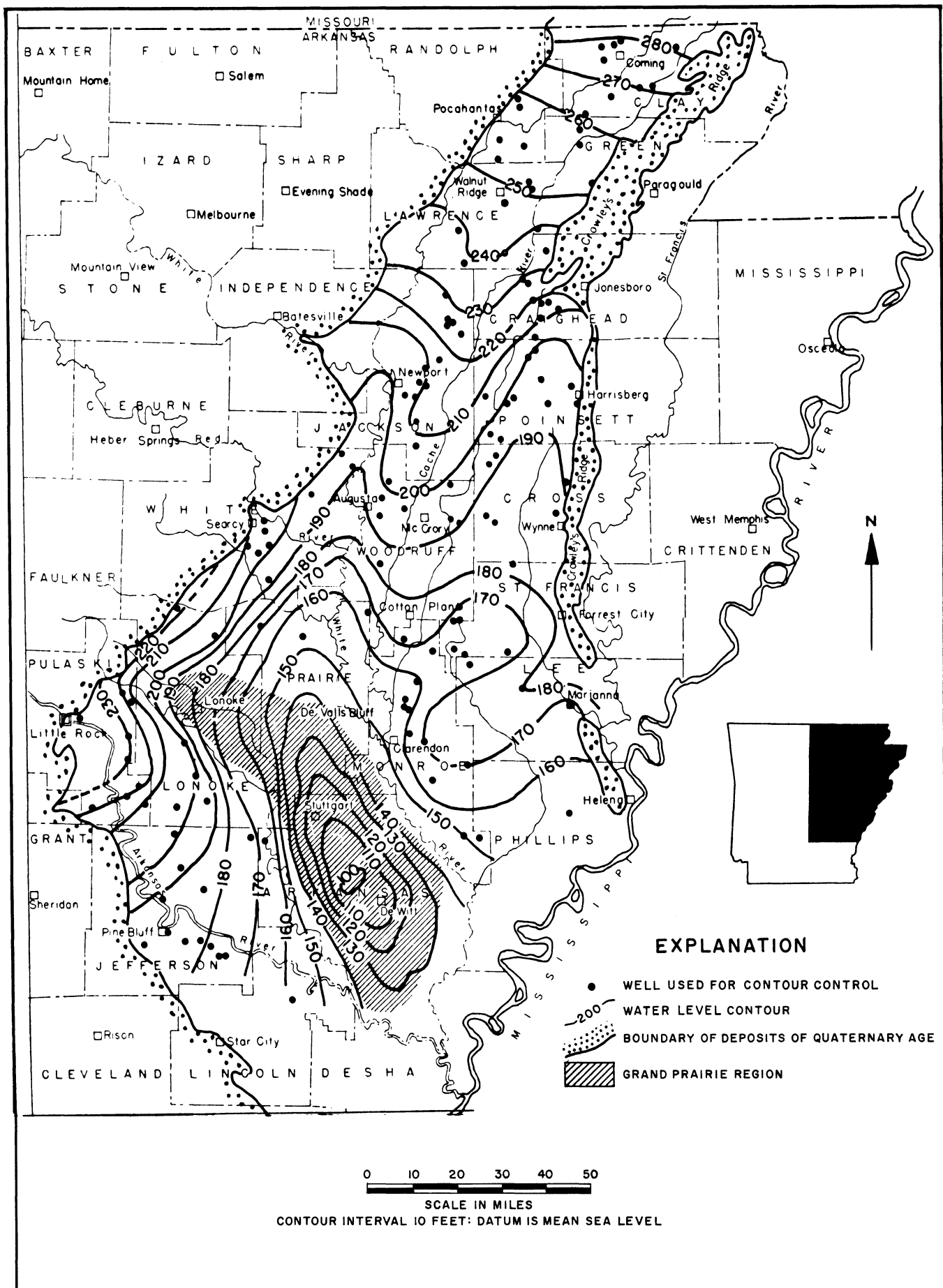


Figure 2. Map showing water levels in deposits of Quaternary age west of Crowley's Ridge in 1953 (after Counts and Engler, 1954).

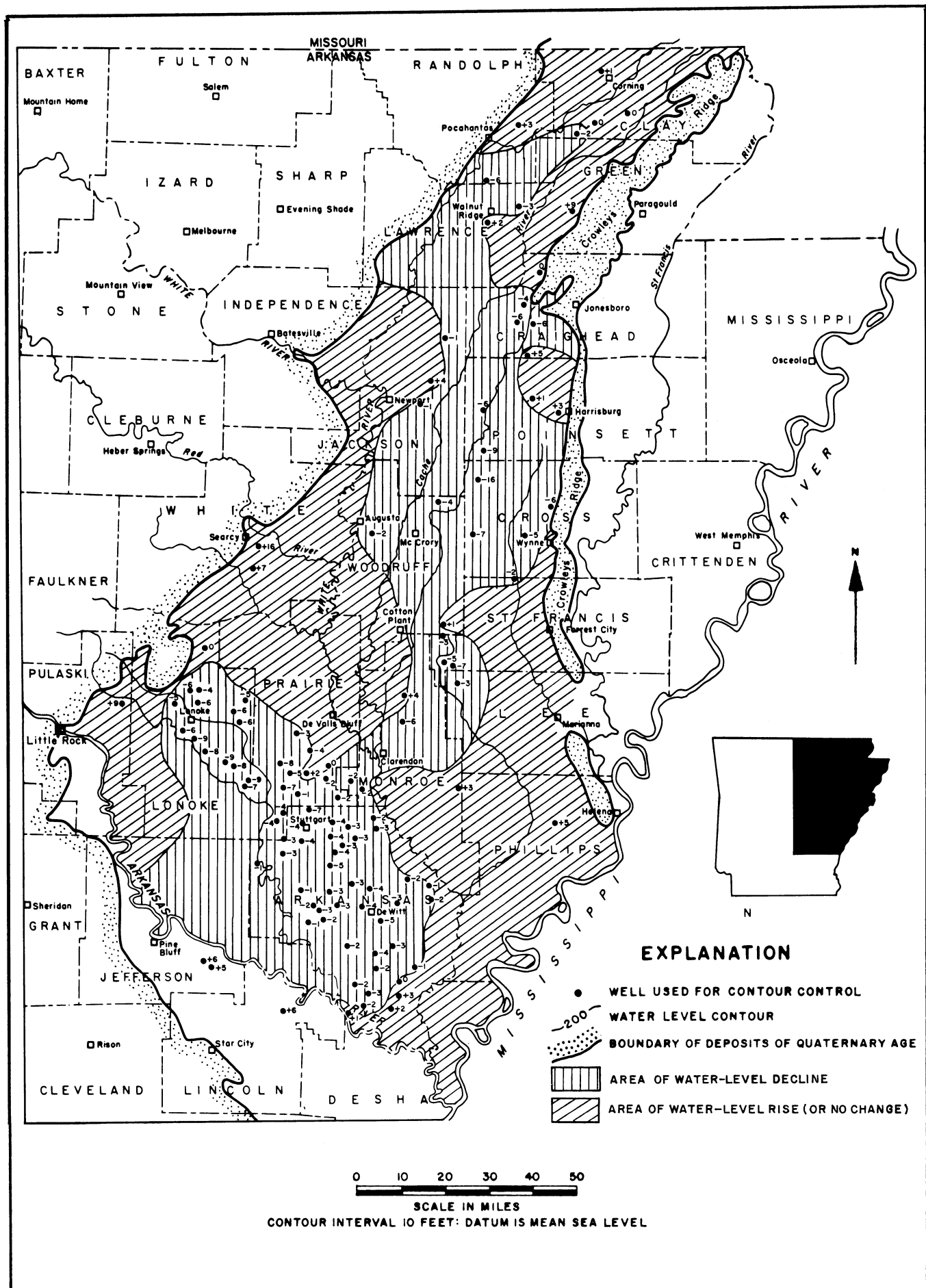


Figure 3. Map showing net changes in water levels in deposits of Quaternary age west of Crowley's Ridge between 1955 and 1961.

Water Levels in Deposits of Quaternary Age East of Crowleys Ridge

Figure 4, based on water-level measurements made in 132 wells, shows the altitude of ground-water levels in the spring of 1955, in feet above mean sea level, in Quaternary deposits east of Crowleys Ridge. The contours show a general slope of the ground-water surface to the south and southwest.

Figure 5, based on water-level measurements made in 81 wells, shows the altitude of ground water levels in the same area in the spring of 1962.

Comparison of figures 4 and 5 reveals a general net rise in ground-water levels in the area east of Crowleys Ridge between 1955 and 1962. There are exceptions in a few very small areas

embracing isolated parts of Greene, Mississippi, and St. Francis Counties. These exceptions may be due to poor contour control in portions of these counties. Generally, practically all contours show a pronounced shift to the south and southwest in 1962 with reference to their positions in 1955, indicating an overall areal rise in water levels.

The low water levels in 1955 probably are due to deficient precipitation and recharge plus increased pumpage for irrigation in the early to middle 1950's. Arkansas entered a prolonged period of drought in 1952. The drought reached its maximum intensity in 1954 and was broken in mid-January 1956 (U. S. Weather Bureau, 1953-1957).

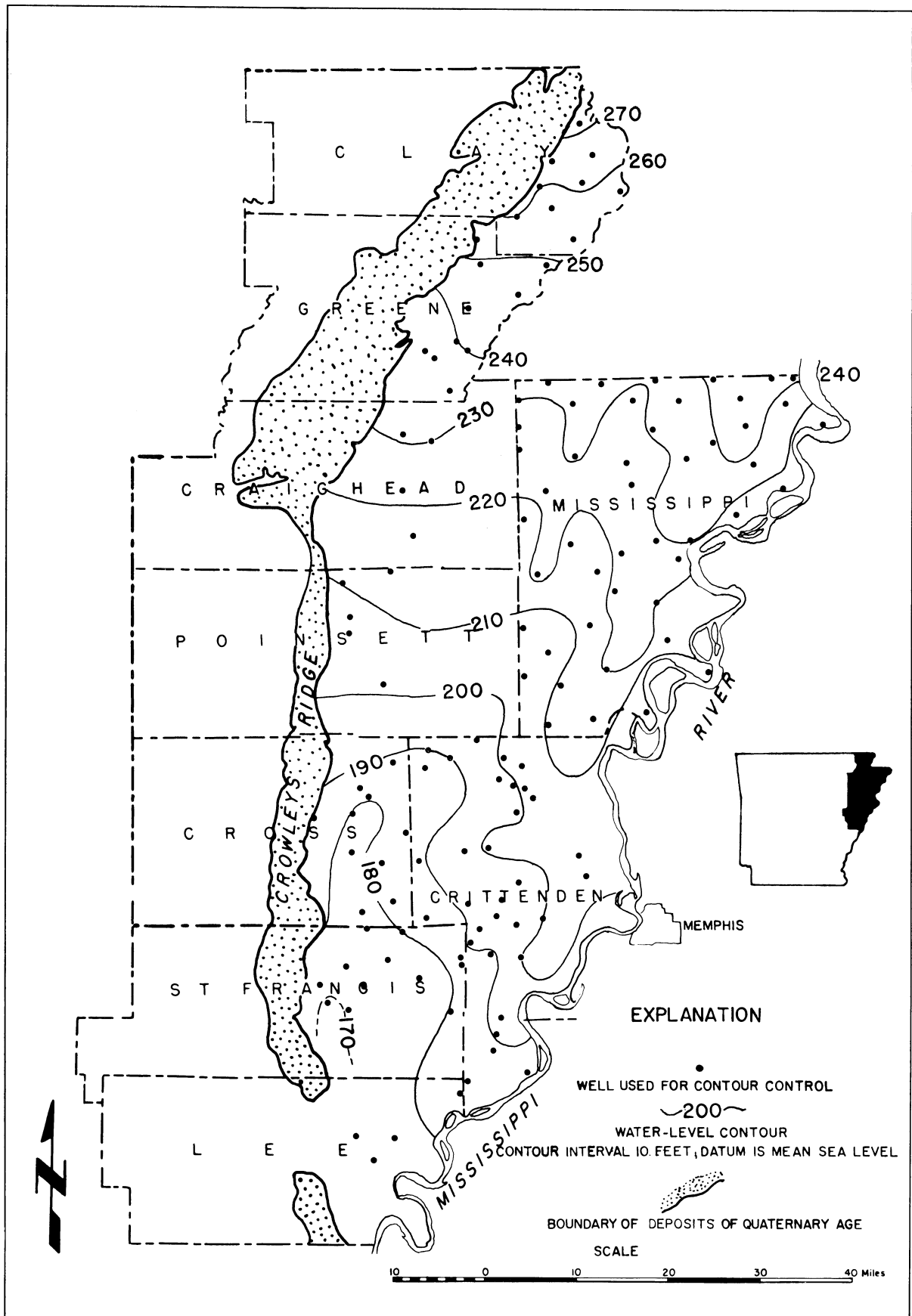


Figure 4. Map showing water levels in deposits of Quaternary age east of Crowleys Ridge, Spring 1955.

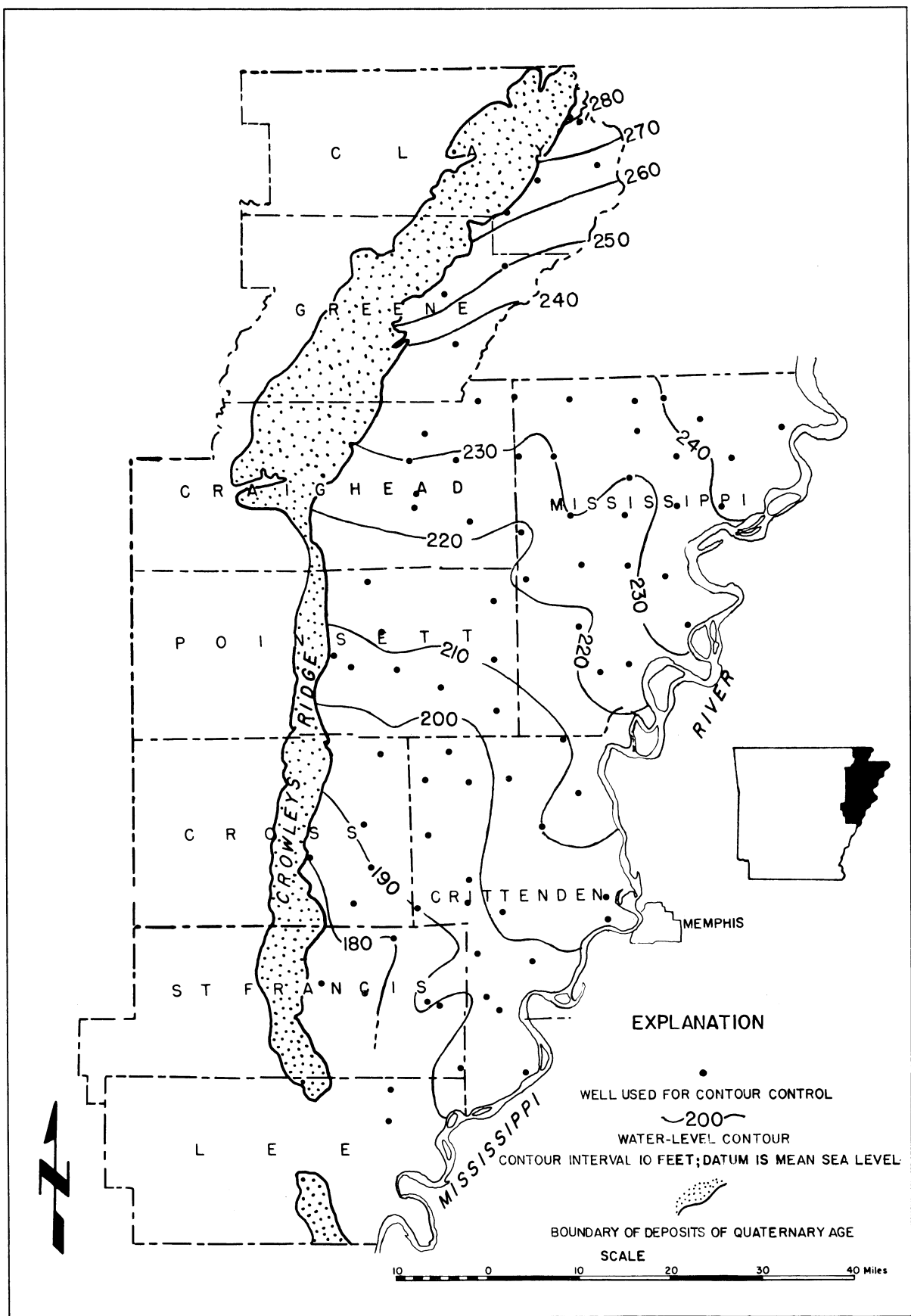


Figure 5. Map showing water levels in deposits of Quaternary age east of Crowleys Ridge, Spring 1962.

REFERENCES

- Counts, H. B., and Engler, Kyle, 1954, Changes in water levels in deposits of Quaternary age in eastern Arkansas from 1938 to 1953: Arkansas Univ. Agr. Expt. Sta. Rept. Ser. 42, 11 p., 3 figs.
- Engler, Kyle, Thompson, D. G., and Kazmann, R. G., 1945, Ground-water supplies for rice irrigation in the Grand Prairie region, Arkansas: Arkansas Univ. Agr. Expt. Sta. Bull. 457, 56 p., 1 pl., 10 figs.
- U. S. Weather Bureau, 1953, Climatological data Arkansas, ann. summ. 1952, v. 57, no. 13.
- U. S. Weather Bureau, 1954, Climatological data Arkansas, ann. summ. 1953 v. 58, no. 13.
- U. S. Weather Bureau, 1955, Climatological data Arkansas, ann. summ. 1954, v. 59, no. 13.
- U. S. Weather Bureau, 1956, Climatological data Arkansas, ann. summ. 1955, v. 60, no. 13.
- U. S. Weather Bureau, 1957, Climatological data Arkansas, ann. summ. 1956, v. 61, no. 13.

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