Figure 18.—Water-level declines in the Clayton aquifer, predevelopment to 1954.

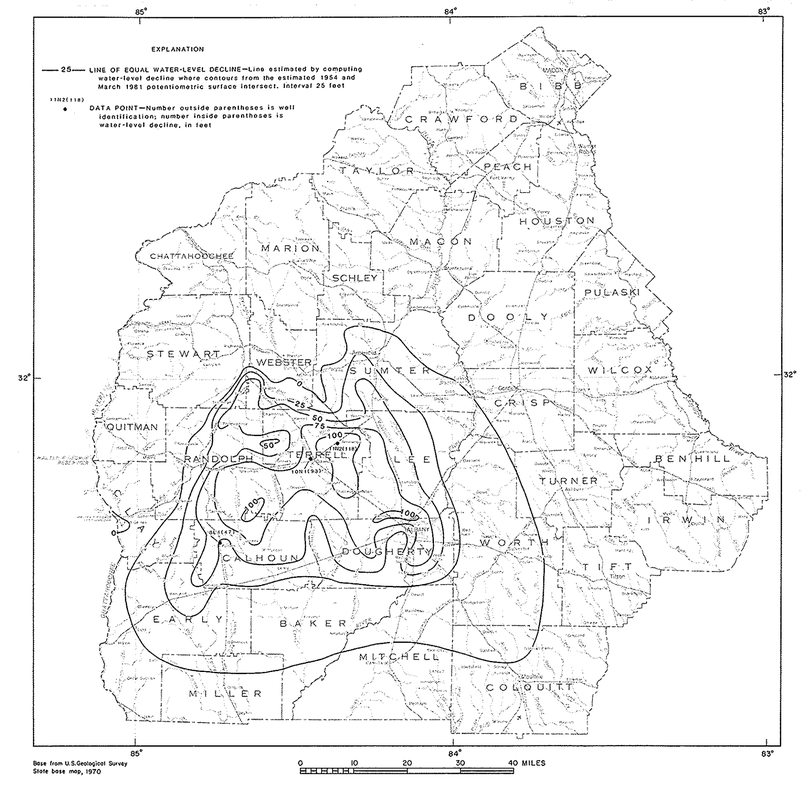

Figure 19.—Water-level declines in the Clayton aquifer, 1954-81.

LONG-TERM WATER-LEVEL DECLINES

During the early 1900's, with the exception of the Albany area, water levels in the Clayton aquifer remained generally steady as aquifer recharge and discharge maintained a natural equilibrium. Increased pumping in some areas, however, reduced compressive aquifer storage (Lohman, 1972, p. 8) and resulted in a corresponding decline in water level. By 1954, the water level had declined more than 25 ft below the predevelopment surface in parts of Dougherty, Calhoun, Terrell, and Lee Counties; 50 ft below at Dawson, Terrell County; and 100 ft below at Albany, Dougherty County (fig. 18). The water level declined 75 ft from 1954 to 1981 in parts of Dougherty, Calhoun, Terrell, Randolph, and Lee Counties, and more than 100 ft in areas of localized large-scale pumping (fig. 19). The decline from the predevelopment period to 1981 was about 150 ft at Dawson and 175 ft at Albany.

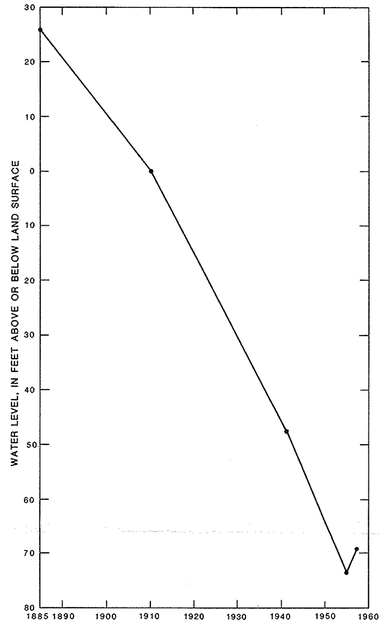

Figure 20.—Intermittent measurements of water levels in the Clayton aquifer at well 12L26 at Albany, Dougherty County, 1901-57.

ALBANY AREA

Ground-water withdrawals from 1885 to 1955 resulted in the development of a cone of depression at Albany. A well owned by the Atlantic Ice Co. (12L26), tapping the Clayton aquifer at Albany, flowed in 1885, but by 1910 pumping caused the water level to decline 26 ft and the well ceased flowing (fig. 20). The water level continued to decline, and by 1955 the total decline in the well was 100 ft.

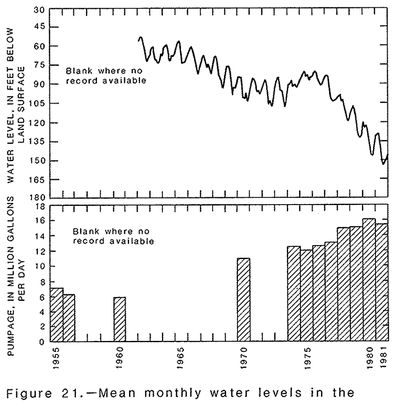

Figure 21.—Mean monthly water levels in the Clayton aquifer at well 13L2 at Albany, 1962-81, and average daily ground-water withdrawals by the city of Albany, Dougherty County, 1955-81.

During 1954-81, the cone of depression at Albany continued to expand and water levels in the Clayton aquifer north of Albany declined 100 ft (fig. 19). The decline corresponded to a general increase in ground-water withdrawal by the city of Albany during 1955-81 (fig. 21). Mean monthly water levels in well 13L2, located near the center of pumping at Albany, declined 69.2 ft from March 1962 to March 1981, with most of the decline occurring between 1977-81 (fig. 21). The accelerated rate of decline during 1977-81 corresponded to an increase in seasonal irrigation pumping.

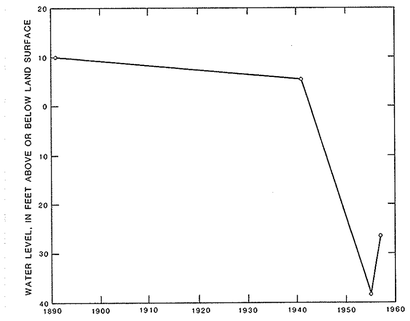

Figure 22.—Intermittent measurements of water levels in the Clayton aquifer at well 10L5, western Dougherty County, 1891-1957.

From 1891 to about 1943 in western Dougherty County, the potentiometric head in the Clayton aquifer was sufficient to produce a flow at well 10L5 (fig. 22). From 1891 to 1941, the water level in the well showed little decline. Between 1941-55, the water level declined at an accelerated rate, probably in response to increased pumping at Albany. The total decline in the well during 1891-1955 was 48 ft.

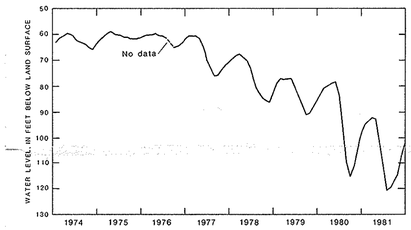

Figure 23.—Mean monthly water levels in the Clayton aquifer at well 11L2, western Dougherty County, 1974-81.

Between April 1974 and March 1981, mean monthly water levels in well 11L2 in western Dougherty County declined 32.6 ft (fig. 23). Prior to 1977, water levels in this well showed little seasonal fluctuation and only a slight decline. From March 1976 to March 1981, the seasonal fluctuations increased substantially and the decline in mean monthly water levels was 31.6 ft. The increased rate of decline and larger seasonal fluctuations were the result of increased irrigation pumping.

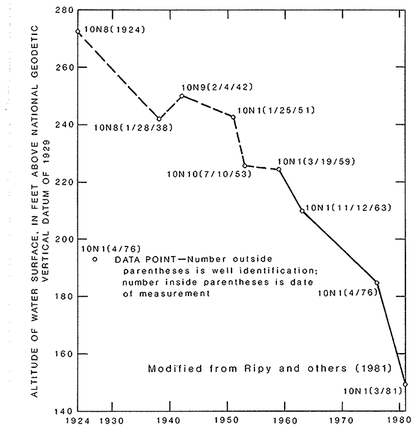

Figure 24.—Intermittent measurements of the altitude of the water surface in the Clayton aquifer at wells 10N1, 10N8, 10N9, and 10N10 at Dawson, Terrell County, 1924-81.

DAWSON AREA

Water levels in the Clayton aquifer at Dawson in Terrell County are affected primarily by changes in local and regional pumping. A plot of the altitude of the water surface in adjacent wells tapping the Clayton aquifer at Dawson during the period 1924-81 is shown in figure 24. Increased regional pumping caused water levels in the Clayton aquifer at Dawson to decline 122 ft over the period 1924-81. The rate of decline increased after 1976, corresponding to an increase in seasonal irrigation pumping and the growth of the cone of depression at Albany. By March 1981, the 150-foot contour depicting the Albany cone of depression had expanded north of the city of Dawson (fig. 17).

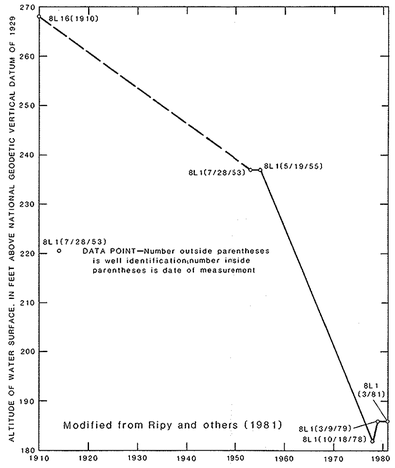

Figure 25.—Intermittent measurements of the altitude of the water surface in the Clayton aquifer at wells 8L1 and 8L16 at Edison, Calhoun County, 1910-81.

EDISON AREA

Water levels in the Clayton aquifer at Edison in Calhoun County are affected primarily by changes in regional pumping. A plot of the altitude of the water surface in adjacent wells tapping the Clayton aquifer at Edison during the period 1910-81 is shown in figure 25. Water levels in the Clayton aquifer at Edison declined 31 ft between 1910-53 and 51 ft between 1953-81, largely because of increases in regional pumping.

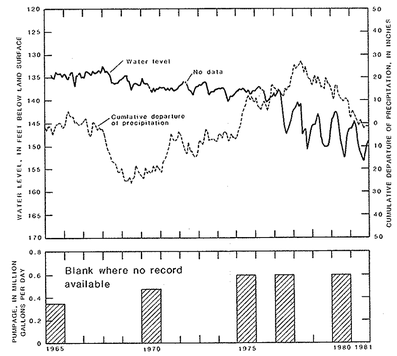

Figure 26.—Mean monthly water levels in the Clayton aquifer at well 7N1, the cumulative departure of precipitation at National Weather Service station 092450, and average daily ground-water withdrawals by the city of Cuthbert, Randolph County, 1965-81.

CUTHBERT AREA

Water levels in the Clayton aquifer near the outcrop area at Cuthbert in Randolph County are affected primarily by changes in the rates of pumping and precipitation. Increased regional pumping caused water levels in the Clayton aquifer at Cuthbert to decline about 20 ft during 1954-81 (fig. 19). A hydrograph of water levels in the Clayton aquifer at well 7N1 at Cuthbert shows that mean monthly water levels declined 3.2 ft from March 1968 to March 1976 and 6.5 ft from March 1977 to March 1981 (fig. 26). Declines during 1965-75 corresponded to a general increase in ground-water withdrawals in the Cuthbert area.

At National Weather Service station 092450 at Cuthbert (See location, fig. 17.), significant departures from normal precipitation occurred during 1968-69, 1971-78, and 1978-81 (fig. 26). A period of lower-than-normal precipitation occurred from 1968 to mid-1969, during which water levels in the Clayton aquifer showed a slight decline. The period from mid-1969 to mid-1978 was one of greater-than-normal precipitation, yet water levels in the aquifer continued to decline. This probably indicates that regional pumping has a greater influence on water levels in the aquifer than precipitation. Water levels in the Clayton aquifer declined at an accelerated rate from 1977 to 1981, corresponding to a significant increase in seasonal irrigation pumping and to lower-than-normal precipitation from 1978 to 1981.

RECHARGE

The Clayton aquifer is recharged by precipitation along parts of an irregular and discontinuous 200-mi^2 outcrop belt that extends from the Chattahoochee River valley in Clay and Quitman Counties northeastward to the Flint River valley in Schley and Sumter Counties (fig. 8).

In the Chattahoochee River area, recharge to the aquifer has increased since the impoundment of the Walter F. George Reservoir in 1963 (Stewart, 1973). The recharge water enters the aquifer where it is exposed and has a lower head than water in the reservoir.

South of the outcrop belt, in the Albany area, Dougherty County, the Clayton aquifer probably receives recharge through leakage from the underlying Providence aquifer, as indicated by water-quality analyses. (See section on Water Quality.) Water from the Providence aquifer, under greater hydraulic pressure than water in the Clayton aquifer, moves upward through the Clayton-Providence confining zone into the Clayton aquifer. In the Albany, Dawson, and Leary areas, declining water levels in the Clayton aquifer have increased this naturally occurring head difference, thereby increasing the amount of water moving from the Providence into the Clayton.

Under predevelopment conditions, water from the Clayton aquifer had a greater hydraulic pressure than water in overlying units and moved upward into sandy units within the Wilcox confining zone. Water-level declines and resulting head changes in the Clayton aquifer in the Albany, Dawson, and Leary areas, however, have reversed the direction of movement, and the Clayton aquifer now probably is locally recharged by water from the Wilcox confining zone.

DISCHARGE

Discharge from the Clayton aquifer is to streams in the outcrop area. Immediately south of the outcrop area, water under greater head than that in overlying units moves upward into sandy layers within the Wilcox confining zone and discharges into streams. However, in the Albany, Dawson, and Leary areas, the head has been decreased by pumping and the upward flow has been reversed. In these areas, ground water may now be moving downward from the Wilcox confining zone into the Clayton aquifer.

A similar situation occurs at Americus, Sumter County, where the head in the underlying Providence aquifer has been decreased by pumping. Here, water from the Clayton aquifer, under higher head than water in the Providence aquifer, may move downward through the Clayton-Providence confining zone into the Providence aquifer.

FLOW THROUGH MULTIAQUIFER WELLS

Idle multiaquifer wells near Albany, Dougherty County; Dawson, Terrell County; and Leary, Calhoun County, are conduits through which water enters the Clayton aquifer. In 1979, flowmeter tests were made in eight idle city wells at Albany (Hicks and others, 1981, p. 20). Tests at one of the wells (12L6, Appendix A; fig. 7) indicated that water from the Providence aquifer was moving through the well into the Clayton aquifer at a rate of 12 gal/min, and from the Claiborne aquifer at a rate of 46 gal/min. During 1979, the Clayton aquifer received an estimated 1.1 Mgal/d of recharge water through 25 multiaquifer wells in Albany (Hicks and others, 1981, p. 20). A similar test conducted in an idle Dawson city well (10N18, table 2) in 1981 indicated that the Clayton aquifer was being recharged through the well by the underlying Providence aquifer at the rate of 178 gal/min (D. W. Hicks, U.S. Geological Survey, oral commun., 1982). The greater discharge rate at Dawson probably results from a higher head differential.

A multiaquifer well at Americus, Sumter County, probably acts as a conduit through which water from the Clayton aquifer is discharged into underlying Upper Cretaceous aquifers. City well 5 (12Q2, Appendix A; fig. 7) taps the Clayton aquifer and the underlying Providence, Cusseta, and Blufftown aquifers of Late Cretaceous age (table 1). Water-level declines in the Cretaceous aquifers (Clarke and others, 1983) have resulted in head differentials that facilitate the potential for downward flow in the well. It is therefore likely that water from the Clayton aquifer is discharged through the well into the underlying Cretaceous aquifers.

HYDROGEOLOGY OF THE CLAYTON AQUIFER OF SOUTHWEST GEORGIA.

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Cartography by Willis G. Hester