

POTENTIOMETRIC SURFACE OF THE
FLORIDAN AQUIFER IN FLORIDA, MAY 1980By
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INTRODUCTION

The configuration of the potentiometric surface of the Floridan aquifer in May 1980 is shown on the large map. The surface is shown by contours that connect points of equal altitude of water levels in wells that tap the aquifer. The criteria used to contour the potentiometric surface of the Tertiary limestone aquifer system in the southeastern United States as described by Johnston and others (1981) also apply to the Floridan aquifer, which areally comprises 65 percent of that system. The contours are intended to portray the average potentiometric surface of the upper part of the Floridan aquifer as it occurred in May 1980 (Johnston and others, 1981). In some areas, the water levels in wells that penetrate only the upper part of the aquifer differ from water levels in wells that penetrate the full thickness of the aquifer. Such differences in water levels are especially evident in recharge areas and in discharge areas. These differences are accentuated where local semiconfining beds are present and where considerable pumpage of ground water and spring discharge occur. Where such differences exist, the contours represent the best estimate of the average potentiometric surface of the upper part of the Floridan aquifer. The potentiometric surface of May 1980 is based on water levels measured in 1,818 wells in Florida. The water levels and the potentiometric surface are referenced 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. In this report, NGVD of 1929 is used, and this datum is understood when the term altitude is used.

This map, the third of a series (see Healy 1962, 1975), was prepared as an integral part of the continuing program of monitoring the ground-water resources of the State in cooperation with the Florida Department of Environmental Regulation, the Water Management Districts, and local agencies. Salient features of the potentiometric surface of the Floridan aquifer have been described by Cooper and others (1953), Stringfield (1966), and Healy (1975). Earlier maps of the potentiometric surface of the Floridan aquifer were prepared by Gunter and Ponton (1929) and by Stringfield (1936).

THE FLORIDAN AQUIFER

As defined by Parker and others (1955, p. 189), the Floridan aquifer consists chiefly of limestone ranging in age from middle Eocene to Miocene. The aquifer ranges in thickness from about 500 feet in north-central Florida (Citrus and Levy Counties) to about 2,000 feet in northeast Florida (Duval and Nassau Counties). The top of the aquifer is at or near land surface in northwest Florida in Holmes, Jackson, Walton, and Washington Counties; in the middle Gulf coastal area from Pasco County northward to Wakulla County; and in central and north-central Florida in Sumter, Lake, Marion, Alachua, Columbia, Suwannee, Hamilton, and Madison Counties (Vernon, 1973). In extreme northwest Florida (Escambia and Santa Rosa Counties), the top of the Floridan aquifer is more than 1,000 feet below NGVD of 1929. Detailed descriptions of the Floridan aquifer including maps of the bottom, top, and thickness are in Miller (1981a; 1981b; 1981c), respectively.

POTENTIOMETRIC SURFACE

The large map was prepared from water-level information collected in south Florida and from four May 1980 potentiometric surface maps of the Floridan aquifer of the St. Johns River area and vicinity (Schiner and Hayes, 1980); southwest Florida (Yobbi and others, 1980); northwest Florida (Rosenau and Milner, 1981a), and the Suwannee River area (Rosenau and Milner, 1981b). Data for southern Florida south of Lake Okeechobee was furnished by F.W. Meyer of the U.S. Geological Survey in Miami.

More detail in the potentiometric surface on the May 1980 map reflects better distribution and a greater number of water-level measurements used in preparing the potentiometric surface. The 1961 map was prepared from water-level measurements made in 683 wells (Healy, 1962) and the May 1980 map was prepared from measurements made in 1,818 wells in Florida (Johnston and others, 1981).

Comparison of the potentiometric surface shown on the large map (May 1980) with that of the 1961 map (Healy, 1962), the first of the three maps in this series, shows that the potentiometric surface has not changed appreciably from 1961 to 1980 except in areas of considerable withdrawals of ground water from the Floridan aquifer. An exception to the depressions in the potentiometric surface in areas of ground-water development is in the coastal part of Bay County where the depression shown on the 1961 map does not occur on the 1980 map, indicating a rise in water levels during 1961-80. In this area, ground water was formerly used for industrial and public supplies, but in 1967 surface water became the source for these water supplies and pumping of ground water greatly decreased. In west-coastal Florida, a depression of more than 20 feet has developed in Manatee County since 1961 due to the large increase in pumping in the intervening years and concurrent deficiencies in precipitation.

Changes in the potentiometric surface during 1961-80 are shown in figure 1. The changes shown represent combined effects of pumping and climatic influences on the potentiometric surface of the Floridan aquifer. Figure 1 was developed in three phases. First, the change in potentiometric surface between 1961 and 1980 was calculated using water-level measurements from wells measured during both years, as well as direct comparisons between the potentiometric surfaces contoured on the two maps. These changes were then grouped into increments of change: less than 10 feet, 10 to 20 feet, and greater than 20 feet. Finally, these changes were plotted and evaluated on the basis of local detailed information.

Long-term fluctuations and trends of ground-water levels in the areas where major changes have occurred are shown by hydrographs in figure 2. The hydrographs reveal that water-level trends in the Floridan aquifer have been downward prior to 1961 at Jacksonville (well Duval 122A), north of Fort Walton Beach (well Okaloosa 29), in southeast Polk County near Mulberry (well 753-158-311), and near Orlando (well Orange 47) in Orange County. In these areas, declines have also continued from 1961 to 1980. However, in the Panama City area in Bay County, ground-water levels have risen nearly 50 feet in well Bay 7 during 1961-80 because of the change from a ground-water source to a surface-water source for industrial and public supplies.

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EXPLANATION

Net decline in feet.

< 10

10-20

> 20

Area where levels have risen because of cessation of pumping for industrial and public supply.

Selected monitoring well.
Hydrograph shown in figure 2.

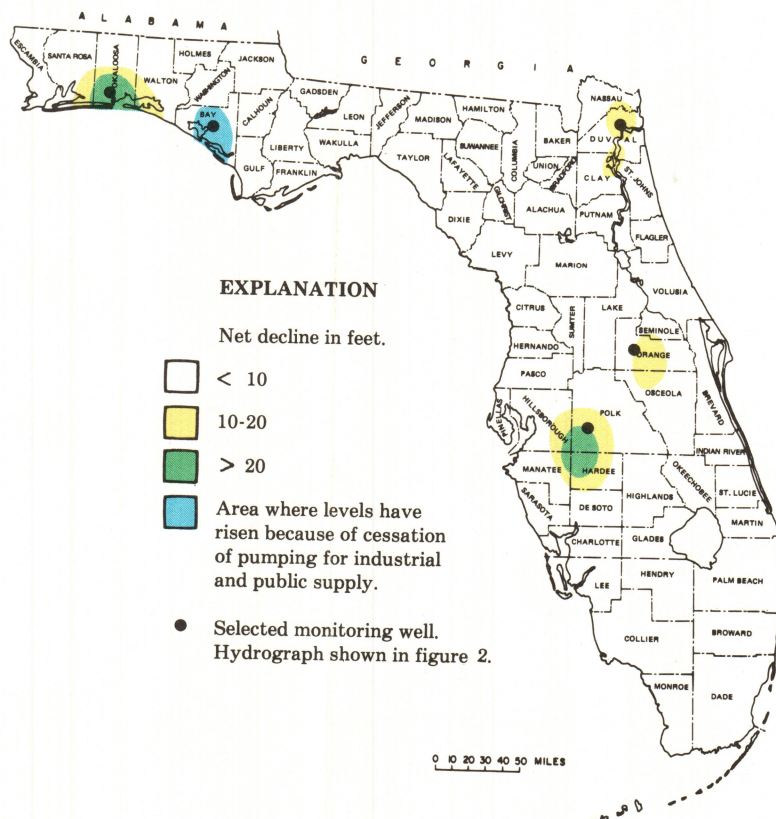


Figure 1.—Changes in the potentiometric surface of the Floridan aquifer in areas of heavy withdrawals of ground water, 1961-80.

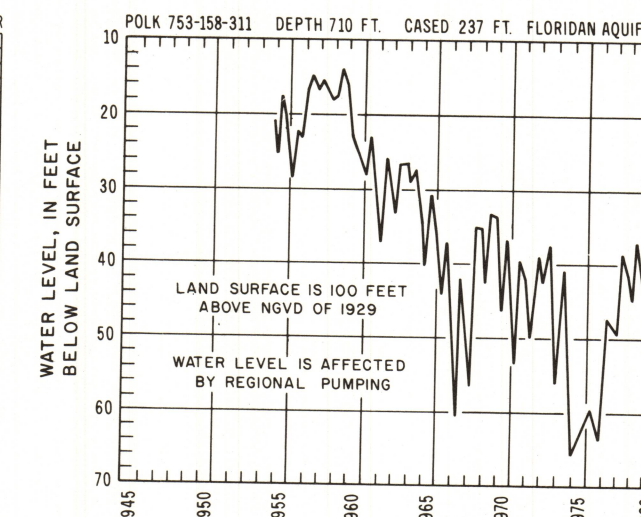
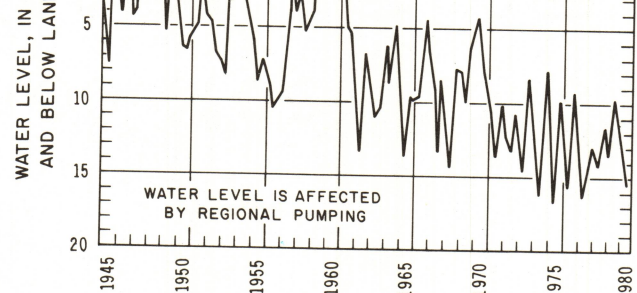
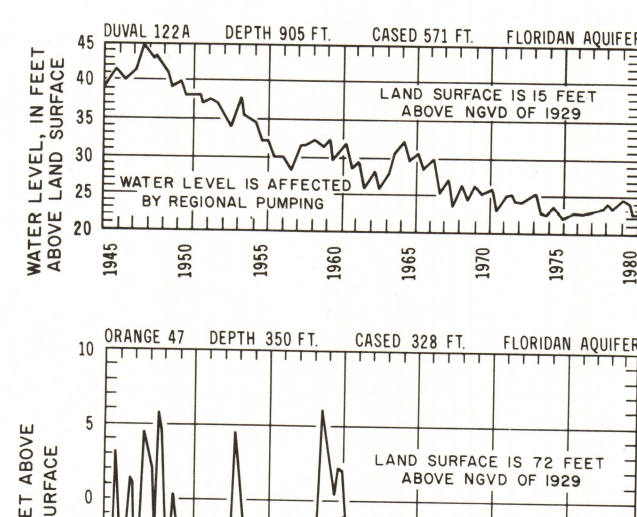
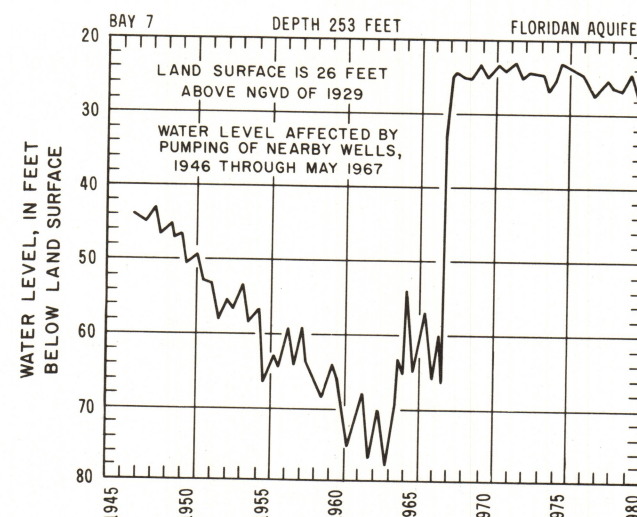
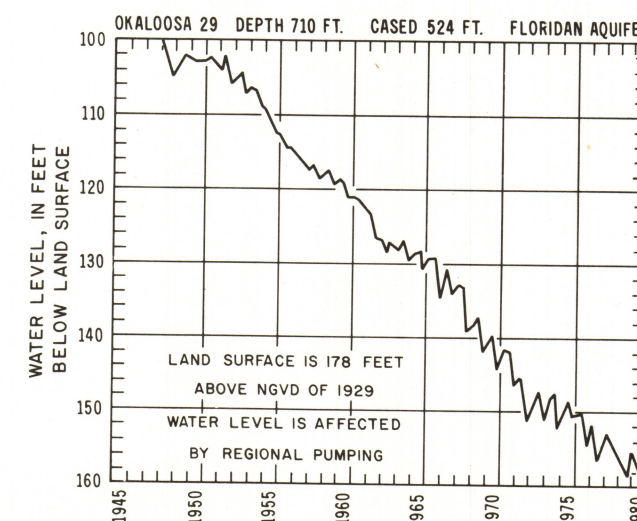


Figure 2.—Fluctuations and trends of ground-water levels in selected wells in the Floridan aquifer in areas of greatest change (modified from Healy, 1980).

EXPLANATION

POTENTIOMETRIC CONTOUR.—Shows altitude at which water level would have stood in tightly cased wells that penetrate the Floridan aquifer, May 1980. Hachures indicate depressions. Contour intervals 10 and 20 feet (National Geodetic Vertical Datum of 1929). Additional field work conducted in the area north and northwest of Lake Okeechobee in Glades County since the May 1980 water-level measurements were made and the map prepared indicate that some of the wells measured either do not penetrate the Floridan aquifer or are open to overlying aquifers in addition to the Floridan. Therefore, the altitude of the potentiometric surface in Glades County may be higher than indicated on the potentiometric map.

Note: Potentiometric contours are generalized to portray synoptically the head in a dynamic hydrologic system taking due account of the variations in hydrogeologic conditions such as different depths of wells, nonsimultaneous measurement of water levels, variable effects of pumping, and changing climatic influence. Potentiometric contours thus may not conform exactly with individual measurements of water levels.

