POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER IN FLORIDA, MAY 1990

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Prepared by the
U.S. GEOLOGICAL SURVEY
in cooperation with the
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
and the
FLORIDA DEPARTMENT OF NATURAL RESOURCES
FLORIDA GEOLOGICAL SURVEY
Tallahassee, Florida
1992
ISSN 0085-0624

INTRODUCTION

This report defines the potentiometric surface of the highly permeable Upper Floridan aquifer of Tertiary age for May 1990 and describes changes in this surface from May 1985 to May 1990. The potentiometric surface is the level to which water will rise in tightly cased wells that tap the Upper Floridan aquifer. The surface is mapped by determining the altitude of water levels in a network of wells and is represented on maps by contours that connect points of equal altitude. The potentiometric surface was constructed from water-level data collected at more than 1,300 wells during May 1-29, 1990. Contours that represent the potentiometric surface and the water-level data shown on the hydrographs in figure 2 are referenced to sea level.

This report is the fifth in a series of map reports that describes the potentiometric surface of the Floridan aquifer system in Florida (Healy, 1962; 1975; 1982; Barr, 1987). Most of the data used in the preparation of this and previous map reports were collected as part of the continuing program of monitoring the ground-water resources of Florida in cooperation with the Florida Department of Environmental Regulation, the State water management districts, and local government agencies. Major features of the potentiometric surface of the Floridan aquifer system have previously been described by Cooper and others (1953) and Stringfield (1966), and more recently by Bush and Johnston (1988).

FLORIDAN AQUIFER SYSTEM

The Floridan aquifer system consists of a thick, hydraulically connected sequence of Tertiary carbonate rocks that extends throughout the southeastern United States in Florida, southern Alabama, southeastern Georgia, and southern South Carolina (Miller, 1986). The system consists of the Upper Floridan aquifer, middle confining and semiconfining units, and the Lower Floridan aquifer. According to Miller (1986), neither the boundaries of the (Floridan) aquifer system nor of its component (aquifer) zones necessarily conform to either formation boundaries or time-stratigraphic breaks.

Limestone and dolomite rocks that constitute the aquifer system generally range in age from middle Eocene to Oligocene in most of the State, although units of early Miocene age occur locally in the Floridan aquifer system in the central-coastal panhandle and in the Hillsborough and Pinellas County areas. Changing depositional environments, karst development, and other erosional processes during past geologic times have resulted in large variations in aquifer system thickness. Thickness of the unit in the panhandle varies from about 100 feet or less (Escambia and Okaloosa Counties) to greater than 2,300 feet (Wakulla County). Throughout the remainder of the State, thickness is variable, ranging from about 100 feet to more than 1,500 feet (Miller, 1986, pl. 28). More detailed descriptions of the Floridan aquifer system are in reports by Miller (1982; 1986).

Rocks that constitute the Upper Floridan aquifer generally crop out in a 50-mile-wide band along the western gulf coast from Wakulla County in the northern part of the study area to Hillsborough County in the southern part where the altitude of the top of the aquifer generally is less than 100 feet above sea level. The altitude of the top of the Upper Floridan aquifer in northeastern Florida ranges from near sea level to more than 500 feet below sea level. In northwestern Florida (Escambia County), the altitude of the top of the Upper Floridan aquifer ranges from 100 feet above sea level to more than 1,800 feet below sea level. The altitude of the top of the Upper Floridan aquifer is near or above sea level in an area along the gulf coast and most of central Florida between latitudes 30°N and 28°N. South of latitude 28°N, the altitude of the top of the Upper Floridan aquifer gradually decreases from near sea level to more than 1,100 feet below sea level.

POTENTIOMETRIC SURFACE

Data used to construct the May 1990 map of the potentiometric surface shown on the large map were obtained from published reports (Knochenmus, 1990; Murray, 1990; Meadows, 1991a, b). For the area generally south of latitude 27°N, no interpretation was made because of a lack of water-level data from wells open only to the Upper Floridan aquifer. Interpretations of the potentiometric surface in reports prior to this map series for the area south of latitude 27°N used potentiometric-surface measurements that are now considered to have been composite heads of the Upper Floridan aquifer and overlying flow systems.

Net changes in the potentiometric surface of the Upper Floridan aquifer that have occurred between May 1985 (Barr, 1987) and May 1990 are shown in figure 1. Small to moderate changes (rises and declines of less than 10 feet) have occurred in most of the study area. Changes are based upon both observed differences in water levels in individual wells and manual and computer techniques used to determine altitude differences between published potentiometric-surface contour lines. Net changes were determined solely by water-level differences in individual wells in areas where differences between contour lines indicated unreasonable net changes that could not be related to existing hydrologic conditions. Some isolated rises or declines, not representative of regional net changes in the potentiometric surface, are not shown in figure 1. Net declines of 10 feet or more have occurred in parts of Santa Rosa, Okaloosa, Suwannee, and Hillsborough Counties due to the pumping of ground water for public supply or crop irrigation. Santa Rosa, Okaloosa, and southeastern Hillsborough Counties also had the most extreme water-level declines depicted on the May 1985 map (Barr, 1987). Declines in the potentiometric surface, although small throughout most of the State, are the result of rainfall deficits and gradually increasing demands for almost all categories of ground-water supplies (Marella, 1986; 1990). Rises in the potentiometric surface in the panhandle and west-central parts of the State are due primarily to above normal rainfall (National Oceanic and Atmospheric Administration, 1986-90) and recharge.

Hydrographs for selected wells in areas where regional ground-water withdrawals have had appreciable effects on water levels are shown in figure 2. One or two daily maximum water-level values for annual wet and dry seasons were used to create the hydrographs. Generally, one daily maximum water level in May and one in September were used. The hydrographs presented show net water-level declines in wells that are open to the Upper Floridan aquifer since the beginning of the record at each well for wells that are open to the Upper Floridan aquifer.

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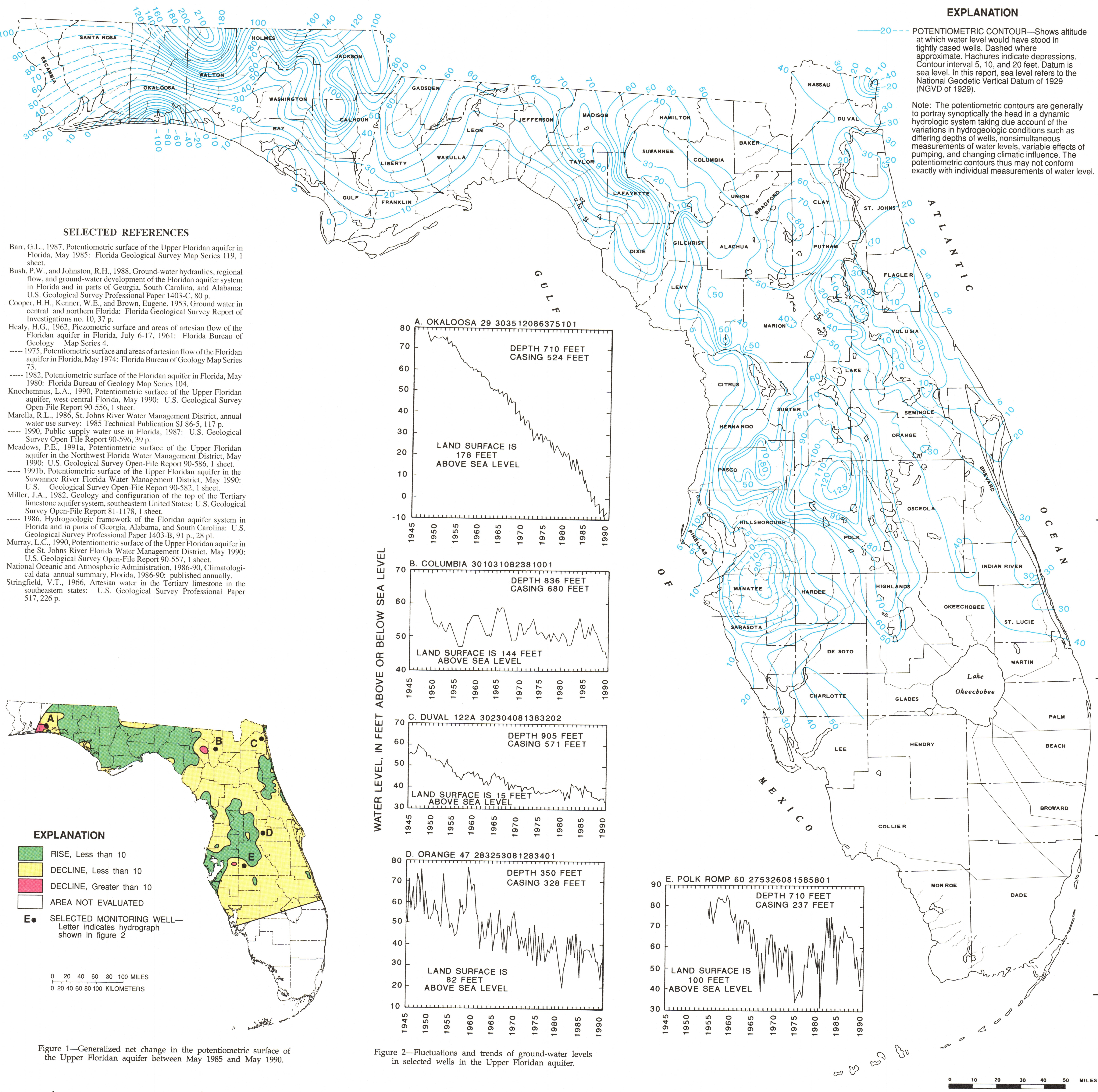

Figure 1—Generalized net change in the potentiometric surface of the Upper Floridan aquifer between May 1985 and May 1990.

Figure 2—Fluctuations and trends of ground-water levels in selected wells in the Upper Floridan aquifer.