

Top of Rock of the Floridan Aquifer System in the Suwannee River Water Management District, Florida

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The Floridan aquifer system (Southeastern Geological Society, 1986) is Florida's principle artesian freshwater aquifer system. It extends from southern South Carolina southward through southern Georgia and eastern Alabama into Florida. In Florida, it functions as a potable water source for the region extending from the west-central Florida panhandle southward to the south-central peninsula. In this region the Floridan aquifer system provides the sole source of water for municipalities, rural homesteads, and agricultural operations (Bush and Johnson, 1988).

The Floridan aquifer system is largely contained within carbonate rock and occurs in strata of differing age and varying lithologic character. The formal geological units containing the aquifer in the SRWMD include the Middle Eocene Avon Park Formation, the Upper Eocene Ocala Limestone, the Lower Oligocene Suwannee Limestone, and the Lower Miocene St. Marks Formation (Miller, 1986). Although not part of the aquifer system, basal carbonates of the Miocene Penny Farms Formation of the Hawthorn Group may, in some parts of the District, be in hydrologic continuity with the underlying Floridan aquifer system. Deposition of the Eocene through Early Miocene units occurred primarily under temperate-to-warm shallow marine conditions. Most units are comprised of skeletal marine limestones with varying micrite and siliclastic content. Post depositional dolomitization of the original limestone has occurred in some areas, and rock color commonly can vary with local ground water conditions. The carbonates are generally overlain by variably thick Middle Miocene through Recent siliclastic sediments.

MAPPING METHODS

The map illustrates the structural top of the highly permeable carbonate rock containing the upper Floridan aquifer system in the Suwannee River Water Management District (SRWMD). It was produced at the Florida Geological Survey (FGS) under a cooperative contract with the SRWMD, and was funded by the FGS and the Department of Environmental Protection's Ground Water Quality Monitoring Program. Subsurface data were obtained from lithologic descriptions of well cuttings and cores on file at the FGS. The map reflects data available through 1990. Well data were manually reviewed for errors in interpretation or other inconsistencies.

Formational tops in the FGS database represent the subjective picks of a number of different workers over a period of many years. Every effort was made to insure reasonably consistent lithologic and paleontologic criteria for identifying the uppermost rock units of the Floridan aquifer system. In the northern and north central portions of the SRWMD, the overlying Hawthorn Group contains a basal carbonate unit which is most likely in hydrologic continuity with the Floridan aquifer system. When present, the top of this unit was used in constructing the map. Elsewhere in the District, only the structural tops of strata belonging to the Avon Park Formation, Ocala Limestone, Suwannee Limestone, or St. Marks Formation were used.

The original data were digitally extracted from the FGS Well File Database using software specifically written for the purpose by the senior author. This software permitted direct importation of the well locations and top of rock elevations into the Autodesk Incorporated program AutoCad, on IBM compatible computers. Well data were digitally plotted on individual county basemaps provided by the SRWMD, and later merged into a district map. Variation in the true positions of wells may affect the map's configuration. The well data points were hand contoured at 10 foot contour intervals, and the isolines were digitized into the basemap files using AutoCad.

The base grid for the map is the Florida State Plane Coordinate System (east), a Transverse Mercator projection. County boundaries and township and range grids were imported into AutoCad from the SRWMD ArcInfo system.

SHAPE AND EXTENT OF THE TOP OF THE FLORIDAN AQUIFER SYSTEM

The configuration of the structural top of the Floridan aquifer system has likely been influenced by a number of factors. These include regional structural features, the nature of the original depositional surface, karst activity, and post-depositional erosion by both submarine and subaerial agents. As shown by the map, the surface of carbonate rock comprising the Floridan aquifer system is a complex series of noses, troughs, pinnacles, and depressions.

The primary structural feature influencing the carbonates of the Floridan aquifer system in the SRWMD is the Ocala Platform (Scott, 1988), a broad, positive, dome-like platform centered under western Levy County. The crest of the platform trends northwest to southeast through the west-central part of the District. Middle Eocene carbonates of the Avon Park Formation occur near the land surface in a small area along the crest of this feature. Late Eocene Ocala Limestone comprises the uppermost rock unit over much of the platform in the western portion of the SRWMD, with younger Oligocene Suwannee Limestone carbonates and overlying younger unitslapping onto the flanks of the structure. These units generally

dip away from the crest of the platform into adjacent negative features in three predominant directions: west-southwestward into the Apalachicola Embayment, northeastward towards the Southeast Georgia Embayment, and southward into the South Florida Basin.

A broad, generally flat, gulfward sloping karst plain is developed on the structural surface of these overlapping Miocene, Oligocene and Eocene carbonates in the coastal portions of Jefferson, Taylor, Dixie, and Levy Counties. Elevations of the top of rock in this region lie at approximately mean sea level (MSL) near the coast, gently rising to about 50 feet above mean sea level inland in Gilchrist and Lafayette Counties. In the northern portions of Madison and Hamilton Counties the Oligocene Suwannee Limestone, comprising the top of the Floridan aquifer system in this area, rises gently northward toward Georgia. Here the elevation of the top of the Suwannee Limestone varies, in general, between sea level and about 80 feet above MSL.

Elevations on the highly irregular structural surface in the central portion of the SRWMD typically range between 10 and 100 feet above MSL. The shallow crest of the Ocala Platform extends eastward in the SRWMD to an approximate line extending from eastern Hamilton County, through central Columbia County and western Union and Bradford Counties, into northeasternmost Alachua County. Northeastward from this line, the elevation of the structural top of the Floridan aquifer system declines markedly from approximately 50 feet below MSL at the eastern edge of the Ocala Platform to depths in excess of 370 feet below MSL in eastern Baker County, as it dips into the trough of the Jacksonville Basin of the Southeast Georgia Embayment. The Suwannee Limestone is absent in this region, and Ocala Limestone comprises the top of rock along the eastern flank of the platform.

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REFERENCES

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EXPLANATION

Contour Line (Relative to MSL)

Contour Interval = 10 Feet

Well or Core Location

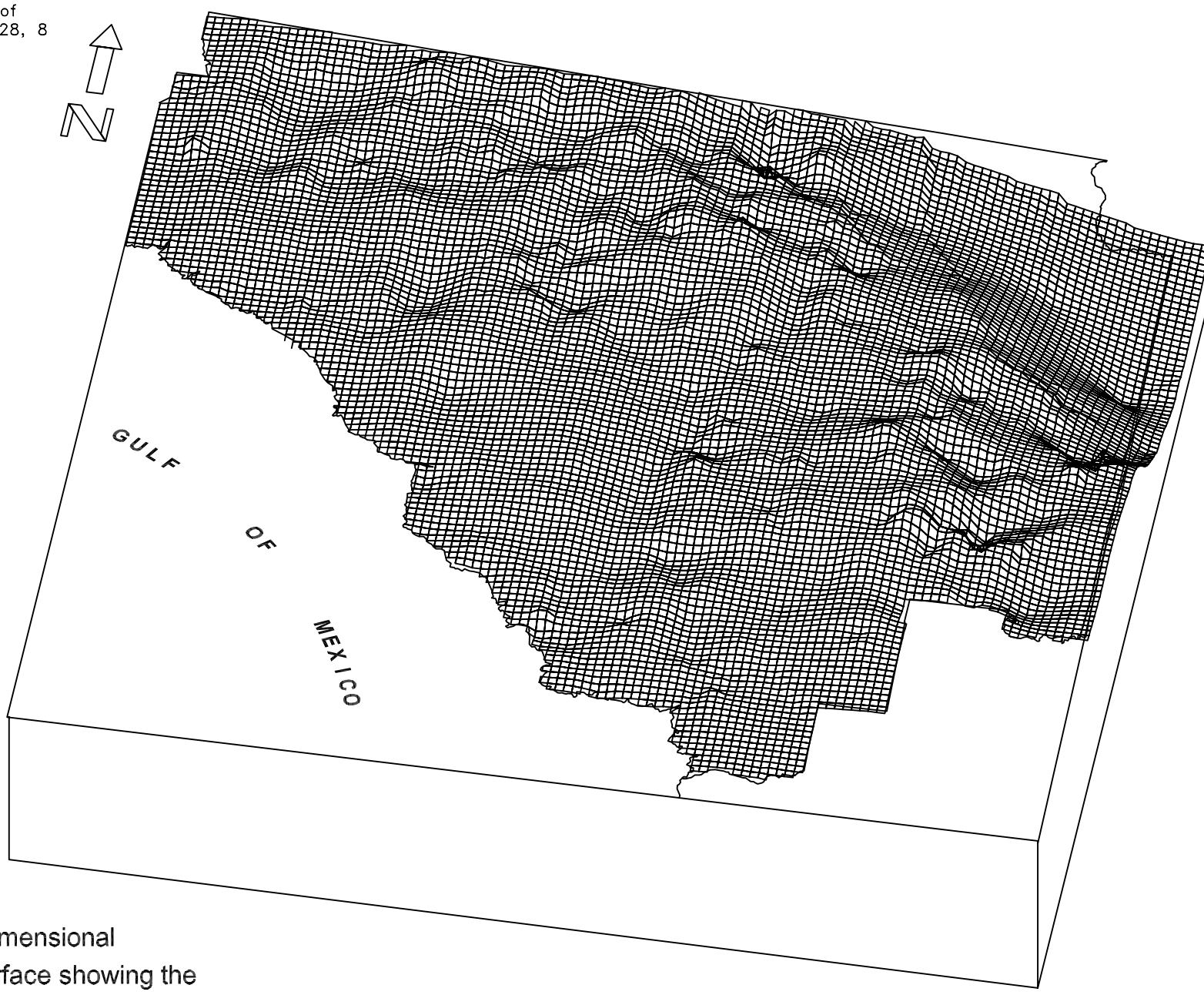
County Boundary

SRWMD Boundary

SCALE

MILES

KILOMETERS



Three dimensional
mesh surface showing the
shape of the top of rock surface
of the Floridan aquifer system.

