Hydrogeology and Impact of Pumping on Shallow Water-Bearing Zones and the Upper Floridan Aquifer, South-Central Georgia

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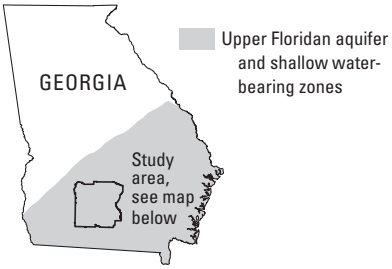
Cooperator Georgia Department of Natural Resources Environmental Protection Division

Year Started 2007



Problem

During the drought conditions of 2007, ground-water-level declines in south-central Georgia have resulted in numerous domestic wells "going dry," requiring pumps to be lowered or drilling of replacement wells. The cause of the declines is unknown but could be related to reduced recharge during the drought, increased pumping from the Upper Floridan aquifer, or a combination of both. Data from the Statewide ground-water monitoring network indicates that ground-water levels have declined more than 30 feet in the past 30 years (see graph, lower right). Additional data were needed to better define the geologic and hydrogeologic characteristics and the interconnection between the shallow water-bearing zones and the Upper Floridan aquifer.

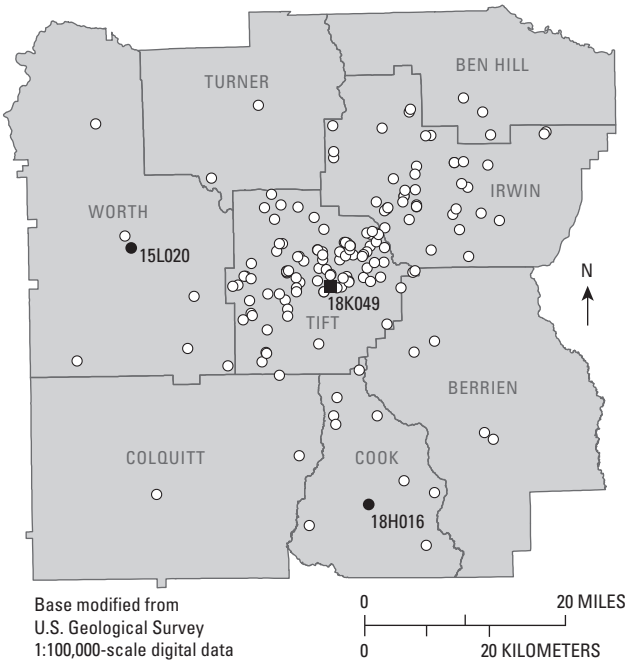
Objectives

The objective of this study is to define geologic and hydrologic characteristics and interconnection of the shallow water-bearing zones and the Upper Floridan aquifer. The study area includes eight counties in south-central Georgia (see map, upper right). Field work for this study includes:

- Inventory existing domestic and irrigation wells to provide aquifer data in areas of sparse data coverage.
- Collect core samples and install test wells at selected sites.
- Evaluate paleontology and stratigraphy of core samples.
- Collect borehole geophysical logs in new and existing wells to further define the stratigraphy and hydrogeologic characteristics of the area.
- Conduct aquifer tests in selected wells to determine hydraulic properties and aquifer interconnection.
- Install continuous water-level recorders to establish fluctuations and trends in the shallow water-bearing zones.

Progress and Significant Results, 2006–2007

- Compiled drilling and well-construction information for domestic and irrigation wells.
- Mobilized and started coring at the 18K049 test-drilling site in Tift County.
- Collected borehole geophysical logs from existing wells.
- Prepared field maps and began field well inventories during December 2007.

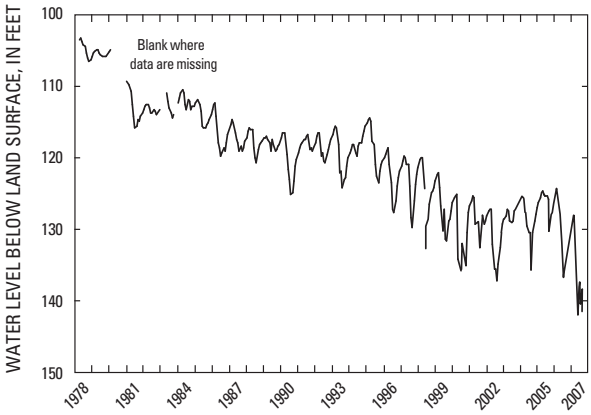


EXPLANATION

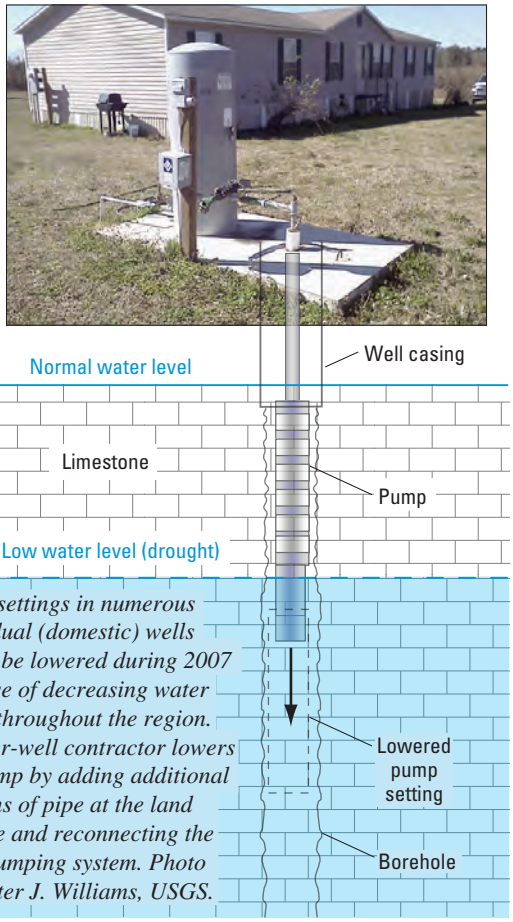
○ **Water level fell beneath pump setting or bottom of well during 2007 drought**

● 15L020 **Recorder well and number/geophysical log**

■ 18K049 **Test drilling/core site began 2007**



(Top) Location of eight-county study area in south-central Georgia and (bottom) monthly mean water level for well 18K049.

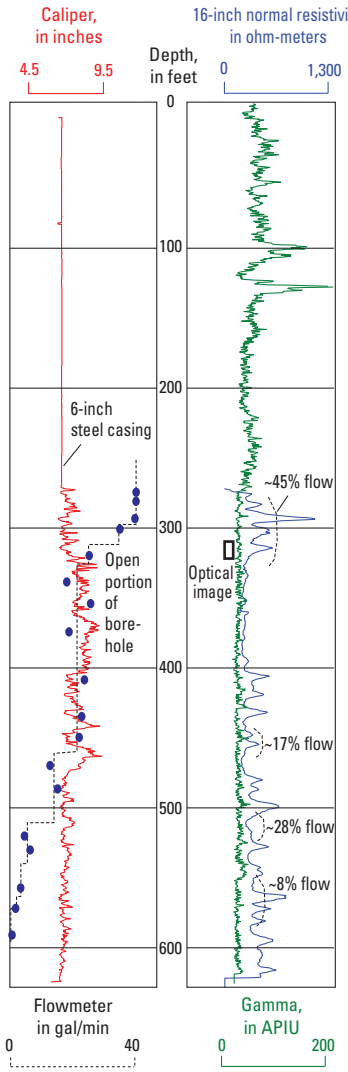


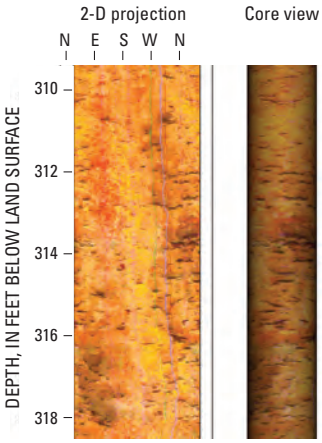
Pump settings in numerous individual (domestic) wells had to be lowered during 2007 because of decreasing water levels throughout the region. A water-well contractor lowers the pump by adding additional sections of pipe at the land surface and reconnecting the well-pumping system. Photo by Lester J. Williams, USGS.

(A) Typical well-to-pond system consisting of a single well with a discharge pipe to a pond.

(B) Typical center-pivot system consisting of a well connected to a sprinkler system.

Permitted agricultural wells provide a large source of information on aquifer water levels. Permit holders work with the USGS to provide water levels in many of these wells. Measurements are made during the nongrowing season when the wells are not pumping. (A) Submersible pump installations, such well-to-pond systems, are easy to access; whereas, (B) turbine installations require accessing the well through a port at the base of the well or through the vent pipe. Photos by Lester J. Williams, USGS.





Above: Optical televiewer image from well 18K049 showing a porous section of water-bearing limestone in the open portion of the borehole. Left: Borehole geophysical logs of well 18K049 are used to determine the lithologic and hydrologic characteristics of geologic units. The flow-meter log indicates that water is derived from four main zones in this well.

[~, approximately; %, percent; gal/min, gallon per minute; APIU, American Petroleum Institute Units]

Rock core samples are collected at selected sites to enable assessment of the interconnection between the shallow water-bearing zones and the Upper Floridan aquifer. The photo shows the drilling crew from the Georgia Environmental Protection Division extracting core samples from the Tift County drilling site during November 2007. Photo by Lester J. Williams, USGS.