Hydrogeologic Assessment and Simulation of Stream-Aquifer Relations in the Lower Apalachicola–Chattahoochee–Flint River Basin

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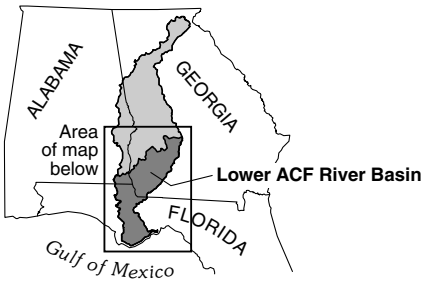
Year Started 2000



Problem

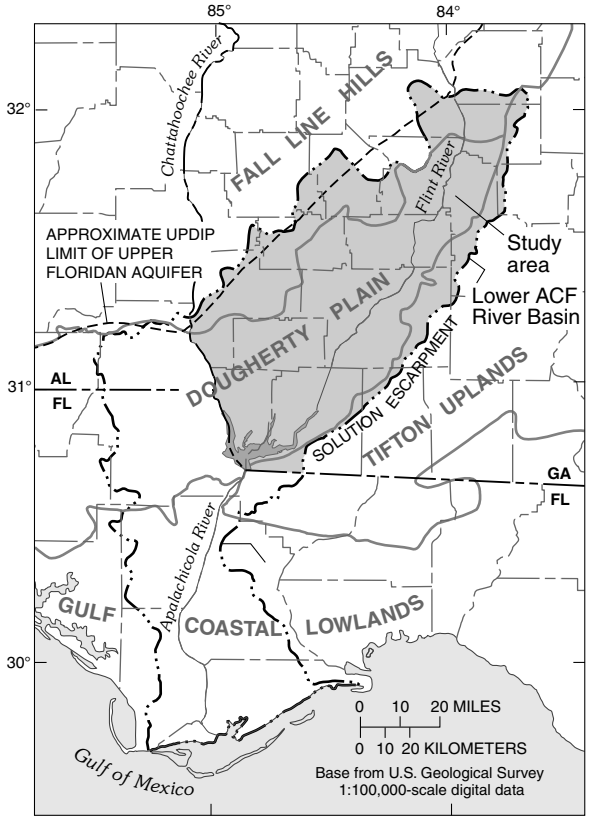
Current levels of hydrologic information and results of digital ground-water-flow modeling in the lower Apalachicola–Chattahoochee–Flint River Basin (map, facing page) are insufficient to describe effects of time-variant irrigation pumping on streamflow. Because of this, existing models cannot accurately predict ground-water or streamflow conditions during a growing season. The Georgia Department of Natural Resources is implementing a hydrologic assessment of the Upper Floridan aquifer in southwestern Georgia to obtain information on aquifer properties, pumping, ground- and surface-water levels, springflow, and streamflow. As part of this assessment and to further understanding of stream-aquifer relations and the effects of ground-water pumping on streamflow in a karst hydrologic setting, the U.S. Geological Survey (USGS) has engaged in a cooperative effort to develop a ground-water-flow model that can account for stream-aquifer interaction, especially streamflow reduction due to agricultural pumping. Information obtained from the model is vital for the State's management of ground-water resources and for providing early indications of low-streamflow conditions that would affect delivery of water to downstream, out-of-state users.

Objectives

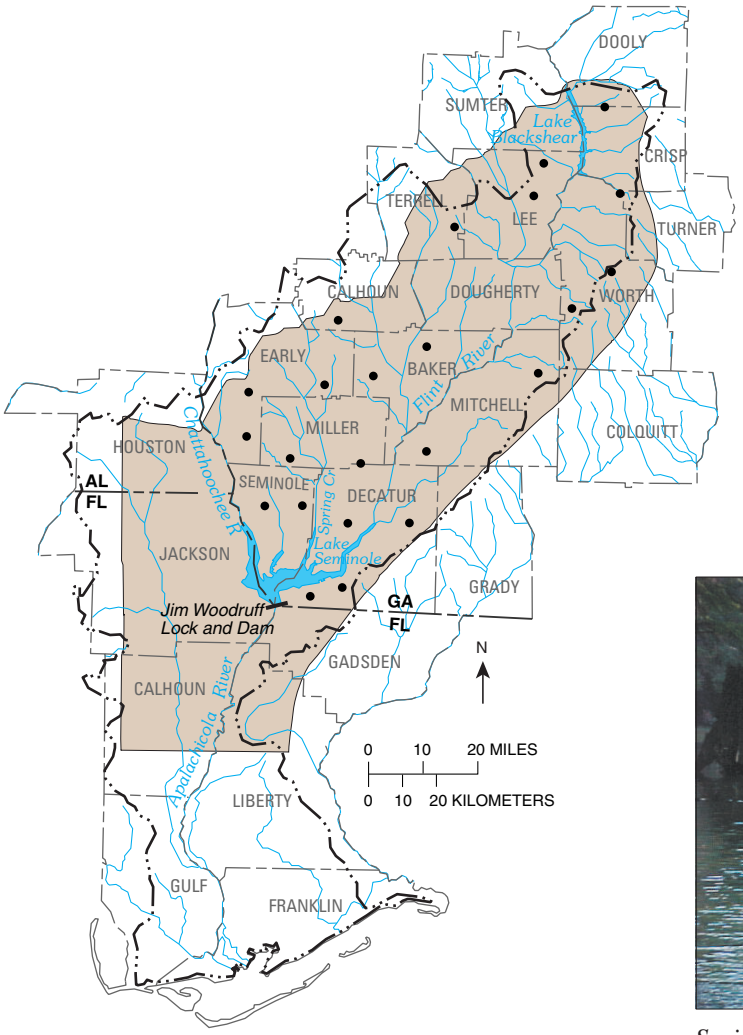
- Develop new data for the Upper Floridan and surficial aquifers through evaluation of well-drilling and aquifer-test information;
- Obtain accurate locations of pumped wells for municipal, industrial, and irrigation purposes;
- Collect and compile ground-water level, stream-seepage, and off-stream spring-discharge data; and
- Develop a transient finite-element model of ground-water flow that incorporates newly collected and existing hydrologic data, having ability to simulate seasonal ground-water levels, stream-aquifer interaction, and pumpage-induced streamflow reduction.

Progress and Significant Results, 2001

- Located 25 sites for test boring, geophysical logging, well drilling and installation, and aquifer testing; 23 sites were found suitable for drilling and aquifer testing (map, facing page).
- Compiled existing hydrogeologic information into digital form and assembled structure-contour maps of Upper Floridan aquifer and surficial units. Maps enabled development of hydrogeologic framework.
- Prepared well data for entry to Ground-Water Site Inventory (GWSI) database.
- Initiated development of graphical user interface (GUI) for processing data into model inputs and for depicting model results.
- Estimated ground-water contribution to streamflow for selected reaches during three periods of low flow during 1999–2000 using hydrograph separation techniques.



Study area, boundary of the lower Apalachicola–Chattahoochee–Flint (ACF) River Basin, and physiographic divisions of the Coastal Plain Province.



Base from U.S. Geological Survey
1:100,000-scale digital data

Location of test sites for drilling and aquifer testing in the lower Apalachicola–Chattahoochee–Flint (ACF) River Basin, and extent of existing digital model of Upper Floridan aquifer.

EXPLANATION

Area of existing Upper Floridan model

Lower ACF River Basin boundary

Test site

Springflow discharge measurement on Spring Creek, near Brinson, Georgia. Photo by Lynn J. Torak, USGS.

Discharge measurement using acoustic Doppler current profiling at headwater of Apalachicola River at Chattahoochee, Florida, downstream of Jim Woodruff Lock and Dam. Photo by Lynn J. Torak, USGS.

Typical center-pivot spray irrigation system in use in lower Apalachicola–Chattahoochee–Flint River Basin, southwestern Georgia. Photo from Flint River Water Planning and Policy Center.