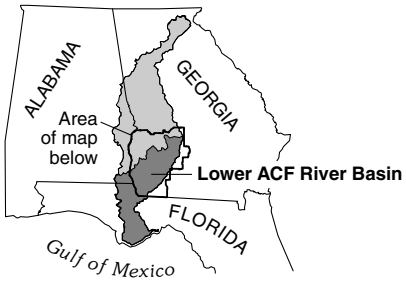
Hydrogeologic Assessment and Simulation of Stream-Aquifer Relations in the Lower Apalachicola–Chattahoochee–Flint River Basin



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Environmental Protection Division

Year Started 2000

Problem

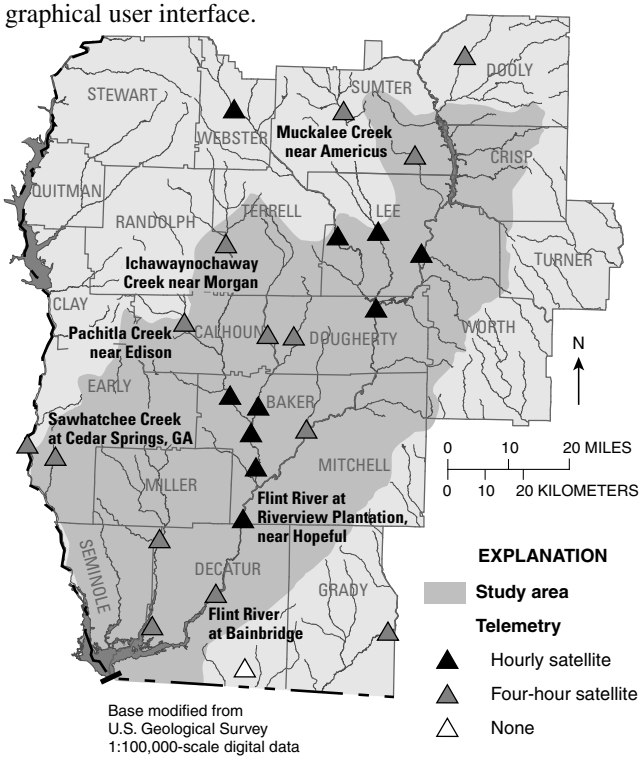
Current hydrologic information and ground-water flow modeling in the lower Apalachicola–Chattahoochee–Flint (ACF) River Basin (map below) are insufficient to describe effects of time-variant irrigation pumping on streamflow. Therefore, existing models cannot accurately predict ground-water or streamflow conditions during a growing season. The Georgia Department of Natural Resources, Environmental Protection Division (GaEPD) has implemented a hydrologic assessment of the Upper Floridan aquifer in southwestern Georgia to obtain new information 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 with GaEPD to develop a ground-water flow model that can account for stream-aquifer interaction and streamflow reduction because of 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 stream-aquifer system by evaluating 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.
- Synthesize newly collected and existing hydrologic data into a transient finite-element model of ground-water flow that can simulate seasonal ground-water levels, stream-aquifer interaction, and pumpage-induced streamflow reduction, and assess the sensitivity of streamflow to ground-water pumping.

Progress and Significant Results, 2002–03

- Collected new hydrogeologic data defining aquifer and semiconfining-unit thickness and extent, and evaluated results of aquifer-performance tests; incorporated new information into Ground-Water-Site-Inventory database.
- Compiled recent (post-1986) hydrogeologic information on aquifer and semiconfining-unit thickness and extent, hydraulic properties, and pumpage, from GaEPD records.
- Incorporated well coordinates from agricultural wells, obtained by GaEPD using global-positioning-system technology, into local database used for developing model inputs.
- Analyzed agricultural withdrawal data for spatial and temporal relations.
- Evaluated ground-water-level measurements, stream-discharge data, hydrograph-separation methods, and off-stream springflow for October 1999, April 2000, and August 2000 conditions to define ground-water flow to streams.
- Installed five real-time streamgaging stations and upgraded one station for water-quality and acoustic velocity metering.
- Added 12 sites to monitor-well network of hourly ground-water-level recorders and one real-time satellite station.
- Initiated application of USGS transient finite-element model, MODFE, and development of automated input/output graphical user interface.



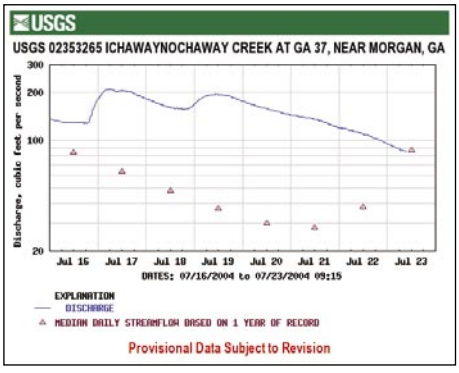
Streamflow gaging network in the lower Apalachicola–Chattahoochee–Flint River Basin and new/upgraded stations (labeled on map).

Chemigation/irrigation apparatus installed in well tapping the Upper Floridan aquifer southeast of Lake Seminole, Decatur County, Georgia. Well is 700 feet deep and was used in an aquifer-performance test. Photo by Lynn J. Torak, USGS.

Typical center-pivot spray-irrigation system used in the lower Apalachicola–Chattahoochee–Flint River Basin, southwestern Georgia. Photo by L. Elliott Jones, USGS.

Control panel and time totalizer for monitoring usage of center-pivot irrigation system. Photo by L. Elliott Jones, USGS.

Flowmeter installed in discharge line of irrigation system. Photo by L. Elliott Jones, USGS.



Real-time streamflow data-collection platform installed at station 02353265, Ichawaynochaway Creek at Georgia Highway 37, near Morgan, Georgia, and graph of data that can be accessed at http://ga.waterdata.usgs.gov/nwis/current/?type=flow&group_key=basin_cd