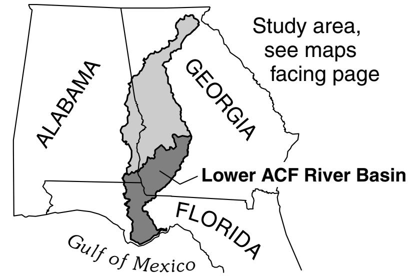
Effects of Impoundment of Lake Seminole on Water Resources in the Lower Apalachicola–Chattahoochee–Flint River Basin in parts of Alabama, Florida, and Georgia



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Environmental Protection Division
Geologic Survey Branch

Year Started 1999

Problem

Multiple uses of freshwater supplies in the lower Apalachicola–Chattahoochee–Flint (ACF) River Basin have been the concern of water managers in the States of Alabama, Florida, and Georgia for many years. Numerous studies have been conducted in an attempt to understand the complex relations that exist between hydrologic-system components and natural stresses, and to answer questions regarding the effects on those relations caused by human intervention. Although previous studies addressed important water-resource issues in the lower ACF River Basin, by design, none provided a mechanism for collecting real-time hydrologic data necessary to develop and maintain an accurate water budget for Lake Seminole and the stream-lake-aquifer flow system. None of these studies focused on investigating the hydrologic and hydrogeologic implications of impoundment of Lake Seminole by construction of Jim Woodruff Lock and Dam and the effect of the lake on other components of the flow system. In response to these needs, the U.S. Geological Survey (USGS) has entered into a cooperative agreement with the Georgia Department of Natural Resources to develop a water budget of the Lake Seminole area, to reasonably estimate the volume of water flowing into Florida before and after construction of the dam, and to monitor the effects of any sinkhole collapse beneath the lake.

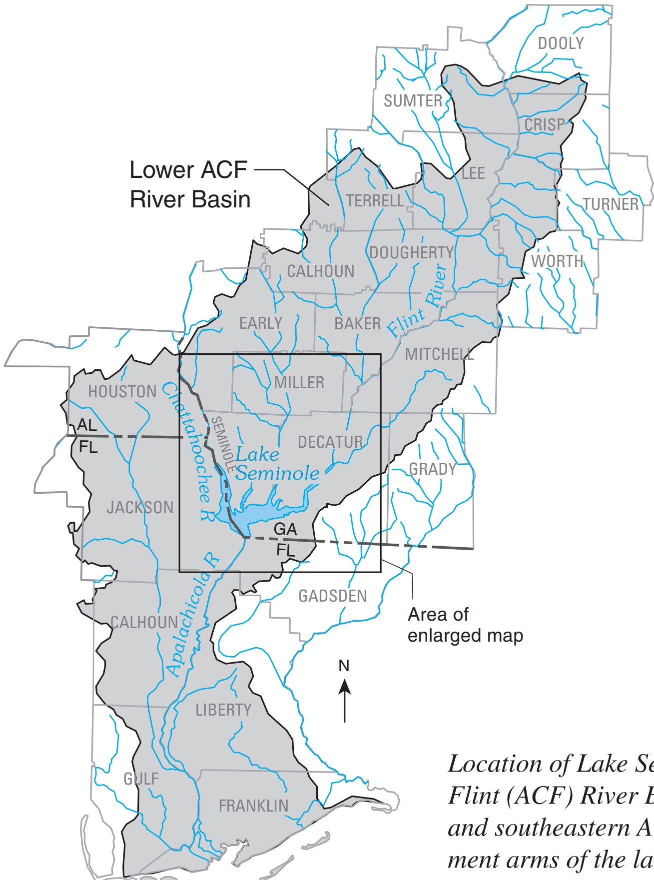
Objectives

- Develop a water budget for Lake Seminole that will result in reasonable understanding of the effect of the lake on the overall flow system in the lower ACF River Basin;
- Compare current (2001) and pre-Lake Seminole ground-water and surface-water flow to determine whether the volume of water flowing out of Georgia has changed significantly after construction of Jim Woodruff Lock and Dam and filling of the lake;
- Evaluate the possibility of a substantial amount of water entering the ground-water system from Lake Seminole, flowing beneath Jim Woodruff Lock and Dam, and entering Florida downstream of the dam; and
- Assess the likelihood of failure of dissolution features in the karst limestone of the lake bottom, such as sinkhole collapse, and the likelihood of sudden partial or complete draining of the lake. If these events are likely, then propose a data-collection system to monitor conditions that might lead to sudden draining of Lake Seminole.

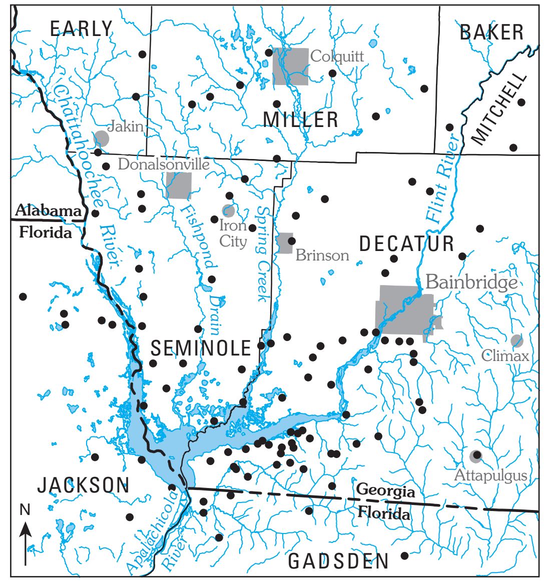
Progress and Significant Results, 2001

- Continued monitoring lake temperature, meteorological conditions, and ground-water levels near the lake. Lake-temperature profiles can identify seasonal springflow variation to impoundment arms and along the lake bottom.
- Completed sampling and chemical analysis of surface and ground water during 1-year period to evaluate lake-aquifer interconnection. Ground water and surface water have distinct chemical signatures that indicate complex inflow, outflow, and mixing processes.
- Assisted U.S. Army Corps of Engineers dye-tracing evaluation of leakage in the vicinity of the Jim Woodruff Lock and Dam by identifying temperature variations in dam pool and analyzing water samples at dye-collection sites beneath the dam. Preliminary results indicate that lake water mixes with ground water beneath and downstream of the dam.
- Compiled geophysical-log information from Florida and Alabama for developing hydrogeologic framework of Lake Seminole and vicinity.
- Began development of automated methods for water-budget calculations and flow-cell analyses.
- Developed ground-water model approach for evaluating pre- and post-impoundment flow and for computing ground-water inflow to and outflow from the lake.

Automated real-time weather station installed over water on piling to monitor atmospheric conditions at Sneads Landing, Florida. The weather station is part of the State of Georgia's Automated Environmental Monitoring Network accessed at URL: ***http://www.georgiaweather.net****.*



Base from U.S. Geological Survey
1:5,000,000-scale digital data



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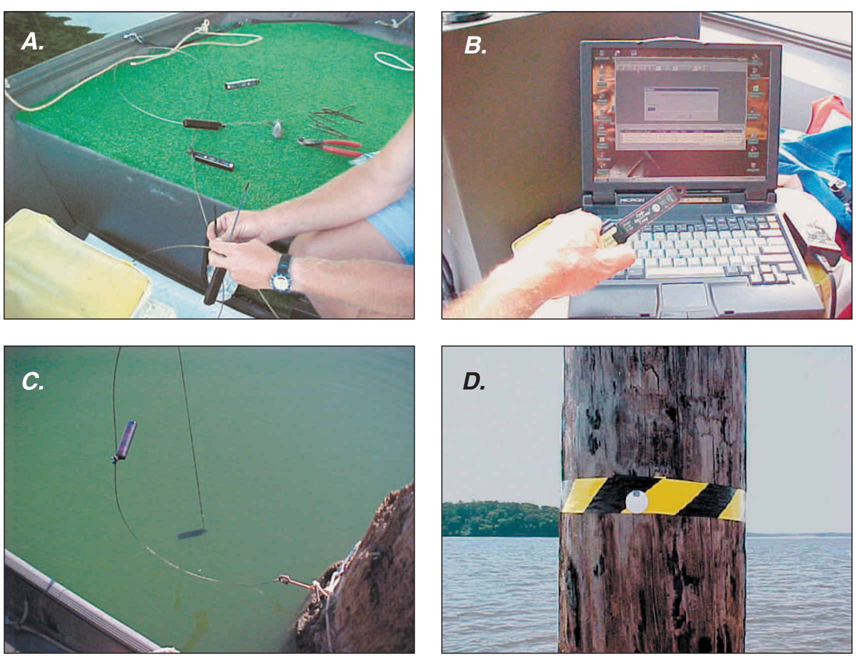
EXPLANATION

• **Ground-water well**

Location of Lake Seminole in the lower Apalachicola–Chattahoochee–Flint (ACF) River Basin in southwestern Georgia, northwestern Florida, and southeastern Alabama. The map above shows well network, impoundment arms of the lake on the Chattahoochee and Flint Rivers, Fishpond Drain, Spring Creek, and the Apalachicola River.



Deployment of temperature probes in Lake Seminole:

***(A)** attaching probes to weighted line at specified depths,*

***(B)** programming sampling interval and synchronizing start-up (launch) of probe,*

***(C)** probe array attached to cypress stump in lake, and*

***(D)** completed temperature-probe station marked with safety tape and medallion.*

Photos by Lynn J. Torak, USGS.