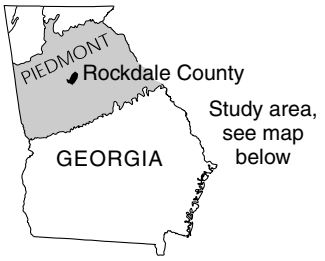
Ground-Water Resources and Hydrogeology of Crystalline-Rock Aquifers in Rockdale County, North-Central Georgia



Study Chief Lester J. Williams

Cooperator Rockdale County

Year Started 2001

Problem

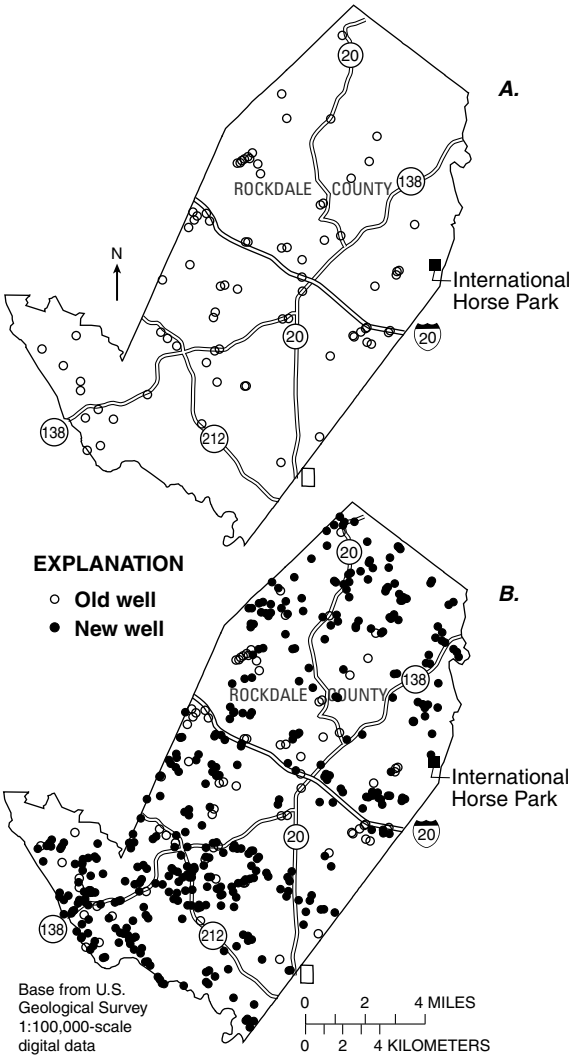
Ground water in crystalline rocks of the State has not been extensively tapped as a source of public drinking water. This source, however, may prove to be a valuable resource to communities wishing to supplement their existing surface-water supplies and augment the amount of available drinking water in rapidly-growing areas of north Georgia, such as in Rockdale County (map, right). Little information is available to evaluate fully the quantity and quality of ground-water resources in the area. Because geology is the principal control on the availability of ground water, the U.S. Geological Survey (USGS) is conducting this study, in cooperation with Rockdale County, to determine the rock types and geologic structures that influence ground-water availability. Ultimately, this information will increase the understanding of how ground water flows through complex crystalline-rock aquifer systems and provide critical information for the future development and management of this resource.

Objectives

- Evaluate the hydrogeology and ground-water resources of the study area.
- Provide baseline geologic and hydrologic information for a typical crystalline-rock aquifer setting in northern Georgia.
- Determine the hydraulic characteristics and storage potential of water-bearing zones/hydrogeologic units at various well sites.
- Define the best methods and approaches to characterize the availability of ground water in crystalline-rock areas.
- Develop a better understanding of crystalline-rock aquifer systems so that State and local water-management agencies can use this information when developing ground-water use policies.

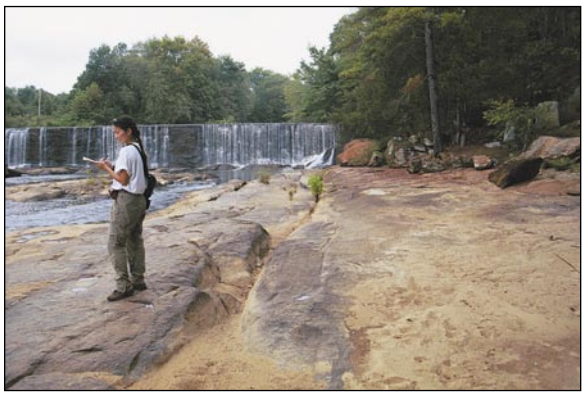
Progress and Significant Results, 2002–03

- Compiled data on approximately 450 wells (primarily rural domestic) including field confirmation of well location, casing diameter, well yield, casing depth, total depth, and static/pumping water level.
- Obtained geophysical logs from 19 wells to characterize the lithology, fracture, and yield characteristics of various rock units throughout Rockdale County.
- Collected ground-water samples from three wells to characterize water quality.
- Completed detailed geologic mapping throughout much of Rockdale County and began subsurface correlation with geophysical log data; hydrogeologic units and storage capabilities are being compiled from these data.
- Identified likely high-yielding water-bearing zones/hydrogeologic units in several parts of Rockdale County.
- Currently compiling a geographic information system database to combine well data with existing geologic, topographic, hydrographic, and other geographic data.



Although well inventories are time consuming and require a site visit, it is the only available means to obtain accurate location and water-level data for area wells. Depth, yield, and water level are obtained from wells. Map (A) shows wells inventoried during previous studies. Map (B) shows approximately 450 wells inventoried during this study.

Water-quality sampling—*Samples were collected from three wells to determine water quality. A pump is set into the well to collect the samples. Water-quality properties are monitored during the process of purging the well prior to sampling. Photo by Lester J. Williams, USGS.*

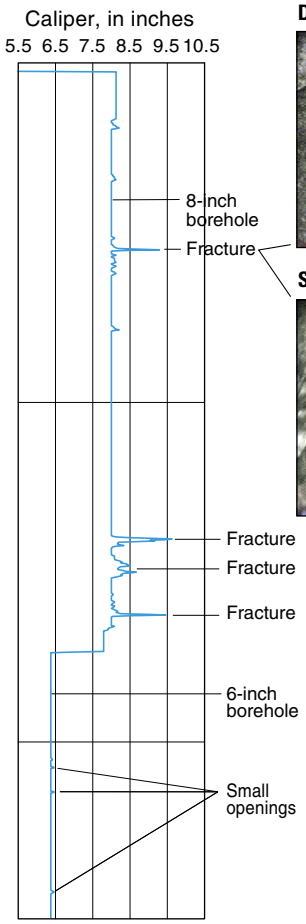


Geologic mapping—*Rock types, joints, fractures, and other water-bearing features are mapped by walking along roads, riverbeds, power lines and other access points. The above photo shows a prominent set of joints aligned parallel to the streambed of the Yellow River near Milstead, Georgia. Photo by Lester J. Williams, USGS.*

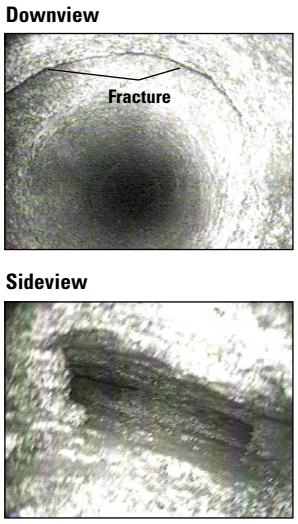
Well refurbishment—*Photos of an air-rotary drilling rig used to refurbish and clean out an old (unused) water-supply well in Conyers, Georgia. Photo A was taken after about 30 minutes (reddish color is iron scaling), and Photo B was taken after approximately 4 hours of development. The refurbishment was necessary to prepare the open portion of the borehole for logging and down-hole camera surveys. The drilling rig was air-lifting approximately 250 gallons of water per minute at the end of refurbishment. Photo by Lester J. Williams, USGS.*

Borehole geophysical logging—*Borehole geophysical tools and down-hole cameras provide the most effective means to study the nature of water-bearing openings.*

Above, USGS employees calibrate a three-arm caliper tool. The caliper tool (right) measures diameter by pressing mechanical arms out against the borehole wall. Geophysical tools measure the physical properties of the rock surrounding the well. Photo by Lester J. Williams, USGS.



A caliper log is the simplest log to interpret. Peaks show where the borehole is enlarged and indicate sections of the borehole where a fracture opening may be present.



Down-hole camera images of a fracture formed parallel to rock layering at a depth of 73 feet.