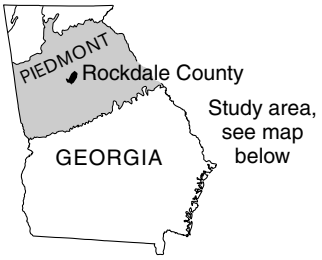
Ground-Water Resources and Hydrogeology of Crystalline-Rock Aquifers in Rockdale County, North-Central Georgia

Study Chief Lester J. Williams
Cooperator Rockdale County
Year Started 2001



Problem

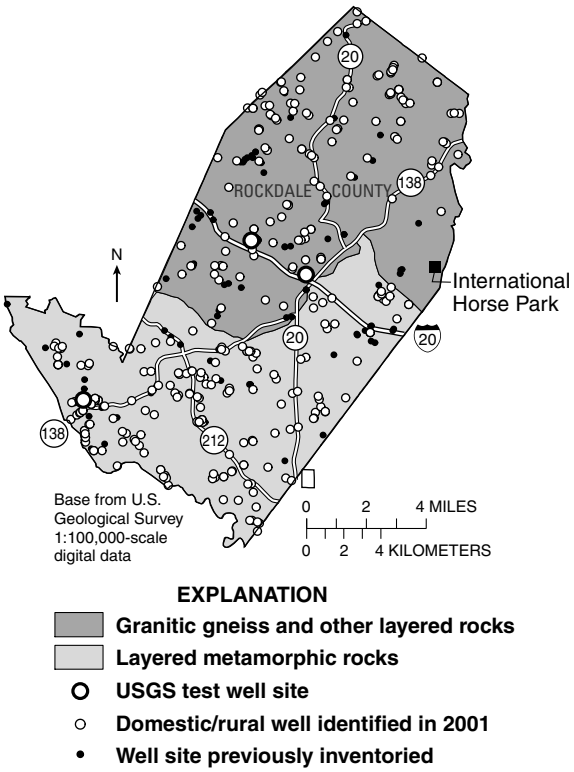
Until recently, it was widely accepted that little ground water was available from crystalline-rock aquifers of the Piedmont, and hence ground water was largely ignored as a viable water resource. Although ground water in the Piedmont may never be developed as a sole-source for a large municipality, this resource has been developed successfully as a dependable supplemental source for existing water supplies. If properly developed and managed, supplemental use of ground water can have great economic, environmental, and other practical benefits. Rockdale County is a high-growth area that plans to evaluate alternative sources of water to its existing surface-water supply. The county previously operated five wells that tapped into a productive granite gneiss unit; however, these wells are no longer used. The U.S. Geological Survey (USGS), in cooperation with Rockdale County, is evaluating ground-water availability and quality in crystalline-rock aquifers that underlie the area. Information from this project will be used for development of water resources. In addition, the ground-water studies in Rockdale County will allow the USGS to compile detailed information on rock types and geologic structures that tend to promote development of high-yielding water-bearing fractures. This information will help foster a better understanding of these aquifers and provide information for the future development and management of this resource.

Objectives

- Help define the best methods and approaches to characterize the availability of ground water in crystalline-rock areas. The USGS and others will use these methods for developing watersheds in similar geologic settings; and
- Provide baseline geologic and hydrologic information for a typical crystalline-rock aquifer setting in north Georgia. State and local water-management agencies will be able to use this information when developing ground-water-use policies for the region.

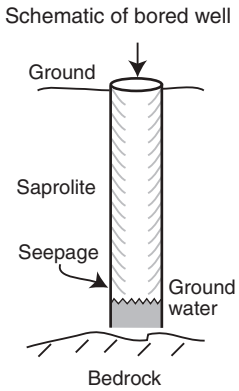
Progress and Significant Results, 2001

- Detailed record searches conducted at the Rockdale County Health Department and at the offices of two local well drillers provided information on more than 400 wells (primarily rural domestic) used to identify areas of Rockdale County that appear to have the greatest potential for ground-water development.
- A Geographic Information System (GIS) database is being developed to combine well data with existing geologic, topographic, hydrographic, and other geographic data. Approximately 50 percent of the GIS database was compiled during 2001.
- Initial geologic mapping and site reconnaissance were conducted in three smaller study areas in Rockdale County. In each of these areas, an unused water-supply well was identified for further subsurface and water-quality characterization.



The northern part of Rockdale County is underlain mostly by massive granitic gneiss and the southern part is underlain by layered metamorphic rocks composed of biotite gneiss, quartzite, amphibolite, and schist. The USGS is trying to determine the differences in hydrologic properties of these geologic units.

The familiar sign, which can be seen when entering Rockdale County from Interstate 20 eastbound, is made from a large slab of migmatitic-granite gneiss. The granite-gneiss formation is exposed across a large area of northern Rockdale County and forms the hilly terrain and pavement outcrops that characterize this part of the county. Photo by Lester J. Williams, USGS.



In parts of Rockdale County, ground water is obtained from large-diameter bored or dug wells. Ground water seeps into the well and collects at the bottom where it can be withdrawn (above, right). A bored or dug well is more susceptible to drought conditions than a deep drilled well. The sides of the bored well, shown in the photo above, are formed from saprolite derived from weathering of granite gneiss. Photo by Lester J. Williams, USGS.

The photos above show the wide variation in fracturing that can be observed in the granite gneiss formation. The top photo, looking east, is a road cut of an unfractured granite gneiss located north of the International Horse Park in Conyers, Georgia. Photo by Lester J. Williams, USGS. The bottom photo shows a jointed granite gneiss located along Highway 138 approximately 2.5 miles north of the International Horse Park. The jointed granite gniess exhibits well developed fracture openings that parallel gneissic layering. Photo by Ethan W. Williams.

A pavement outcrop of granite gneiss, north of the International Horse Park, is shown above. Wet areas on the pavement are the result of seepage of water from thin patchy soil areas following a recent rainfall. Photo by Ethan W. Williams.

The USGS, working with Dr. Randy Kath of the State University of West Georgia, has developed a system for digital collection of structural data using a handheld computer and a global positioning system receiver. The photo above shows structural data being entered at a quartzite-schist outcrop. Photo by Ethan W. Williams.