



WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN PUERTO RICO

GROUND-WATER ISSUES

Water demands in Puerto Rico are met by a combination of surface and ground water, with ground water being more important in the north-central and southern coasts. Surface water is being used to capacity in many areas throughout the island, so that additional water demand needs to be met by developing ground-water resources. Ground-water sources supply 22 percent of the total water used in Puerto Rico. Of the total ground water used (246 million gallons per day), 40 percent is used for irrigation, 30 percent for public supply, 23 percent for industry, 6 percent for rural domestic supplies, and 1 percent for livestock. Public supplies provide ground water to about 640,000 people. The major ground-water issues in Puerto Rico are:

- Increasing demands,
- Contamination by hazardous wastes, and
- Saline-water intrusion.

GEOLOGICAL SURVEY PROGRAMS

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the field of geology, hydrology, and cartography. The mission of the Water Resources Division of the USGS in Puerto Rico is to develop and disseminate information on the Nation's water resources. The activities of the Water Resources Division in Puerto Rico are conducted by scientists, technicians, and support staff in San Juan.

Hydrologic stations are maintained at selected locations throughout Puerto Rico to record data on stream discharge and stage, reservoir and lake storage, ground-water levels, spring discharge, and the quality of surface and ground water. Water-resources data are stored in the USGS National Water Data Storage and Retrieval System data base. These data are used by water planners and others involved in decisions that affect Puerto Rico's water resources.

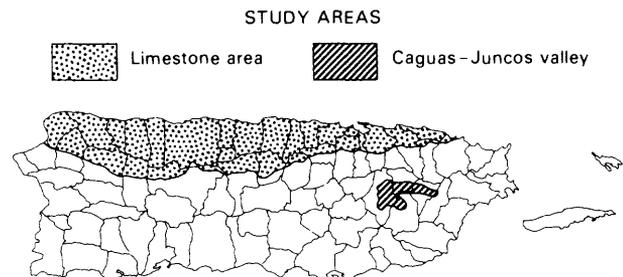
During 1987, the USGS, in cooperation with Commonwealth agencies, maintained a network of 68 observation wells in Puerto Rico for monitoring fluctuations in water levels. Water-level measurements from wells are used to monitor ground-water trends; however, they need to be integrated with other hydrogeologic observations and ground-water investigations to be most relevant and useful.

Since 1958, the USGS has conducted about 100 hydrologic investigations in Puerto Rico and has published more than

200 abstracts, articles, books, and maps. During fiscal year 1988, the USGS entered into agreements with 11 Federal and Commonwealth agencies involving 14 hydrologic investigations in Puerto Rico, 8 of which include studies of ground-water quantity and quality. These investigations provide information needed to answer hydrologic questions that are specific to the island's principal ground-water issues. Additionally, some of the investigations provide information on islandwide and nationwide hydrologic problems. Three USGS projects that address specific ground-water issues in Puerto Rico are discussed in the following sections.

Ground-Water Resources of the North Coast Limestone Area

Population growth along the north-central coast and in the San Juan metropolitan area has increased the demand for water. Surface-water supplies in these areas currently are used at near capacity. Water in the aquifers of the north-coast limestones is the primary source for new development. Information on ground-water movement, areas of ground-water recharge and discharge, chemical quality of ground water, and the development potential of the aquifer system is needed by Commonwealth officials to manage these water resources. A cooperative study to meet these needs began in 1984 between the USGS and several Commonwealth agencies under the leadership of the Puerto Rico Department of Natural Resources (PRDNR) and the Puerto Rico Industrial Development Company. Fifteen exploratory wells have been drilled. Hydrogeologic and water-quality data have been collected from these and other wells. Maps showing the extent, thickness, structure, and water quality of the aquifers are being compiled. Ground-water-flow models are being constructed to define the water budget and to investigate the extent of saline-water intrusion into the aquifers. The results of this study will be used by water managers to plan future ground-water development.



Ground-Water Resources of the Caguas-Juncos Valley

The cities of Caguas and Juncos lie in an interior valley in the central part of the eastern mountains of Puerto Rico. This valley is part of the drainage area for the Lago Loiza, a major source of water for the San Juan metropolitan area. The rivers that feed the Lago Loiza are also the sources of public water supply of the area, creating a conflict in water allocation and priority. Therefore, Commonwealth officials needed to determine the potential for developing ground-water resources in the Caguas-Juncos valley. This project, which started in 1985, is a cooperative study between the USGS, the Puerto Rico Aqueduct and Sewer Authority (PRASA), and the PRDNR. Data have been collected for preparation of computer models that will simulate ground-water-flow patterns and improve definition of water budgets. The results of the study will be used by Commonwealth officials to plan ground-water development and management of the water resources of the Caguas-Juncos valley.

Specific Storage, Islandwide

The availability of ground-water resources from shallow artesian aquifers in Puerto Rico is difficult to assess owing to unique physical conditions. Hydrologists interpreting well-test data for near-surface artesian aquifers commonly compute values of specific storage several magnitudes larger than values considered appropriate, but several magnitudes smaller than the specific yield of water-table aquifers. Depending on which values of specific storage are applied to estimates of ground-water availability, vastly different results will be obtained. Owing to this problem, the USGS, in cooperation with the PRASA, has begun a laboratory study of "intermediate storage values," the physical conditions that cause them, and their implications for ground-water availability. Results of this study will help assess the long-term capabilities of shallow artesian systems in Puerto Rico and will be applicable to other areas where aquifers exhibit intermediate values of specific storage.

GROUND-WATER MANAGEMENT

The principal agencies responsible for ground-water management in Puerto Rico are the Department of Natural Resources (PRDNR), the U.S. Environmental Protection Agency (EPA), the Environmental Quality Board (PREQB), and the Department of Health (PRDH). The PRDNR is responsible for planning and regulating the use, improvement, conservation, and development of the water resources of Puerto Rico. The EPA is responsible for implementing ground-water quality standards, but delegates the implementation of many of its programs and regulations to Commonwealth agencies. The PREQB is responsible for the regulation of industrial, domestic, and agricultural discharges, as well as the handling and disposal of hazardous

waste. The PRDH regulates the quality of drinking water. All of these agencies use ground-water data and the results of ground-water studies provided by the USGS. During fiscal year 1988, the following Federal and Commonwealth agencies entered into interagency or cooperative cost-sharing agreements with the USGS to conduct ground-water investigations in Puerto Rico:

Puerto Rico Aqueduct and Sewer Authority
Puerto Rico Department of Natural Resources
Puerto Rico Environmental Quality Board
Puerto Rico Industrial Development Company
Puerto Rico Planning Board
University of Puerto Rico Center for Energy and Environmental Research

SELECTED REFERENCES

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- Torres-Gonzalez, Arturo, and Wolansky, R.M., 1984, Planning report for the comprehensive appraisal of the ground-water resources of the north coast limestone area of Puerto Rico: U.S. Geological Survey Open-File Report 84-427, 32 p.
- U.S. Geological Survey, 1984, National water summary 1983—Hydrologic events and issues: U.S. Geological Survey Water-Supply Paper 2250, 243 p.
- 1985, National water summary 1984—Hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, 467 p.
- Zack, Allen, Rodriguez-Alonso, Teresita, and Roman-Mas, Angel, 1988, Puerto Rico ground-water quality: U.S. Geological Survey Open-File Report 87-749, 6p.

Information on technical reports and data related to ground water in Puerto Rico can be obtained from:

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