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Developing and Communicating Scientific Understanding of Water Resources to Advance Security: a Case Study in Northern New Mexico

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DEVELOPING AND COMMUNICATING SCIENTIFIC UNDERSTANDING OF WATER RESOURCES TO ADVANCE SECURITY: A CASE STUDY IN NORTHERN NEW MEXICO

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Water scarcity has been a source of conflict and threatens security in arid regions. A crucial first step is advancing water security is developing a scientifically sound and publicly accepted estimate of available water resources. Los Alamos National Laboratory is working within the Española Basin to promote a collaborative assessment and to improve communication of the scientific understanding of the water resource in the Española Basin.

The Espanola Basin, located in north central New Mexico, is a geologically-defined basin that contains a productive regional aquifer. The aquifer is recharged in the high mountains that form the boundaries and discharges to the Rio Grande, a through-flowing river that transects the basin from north to south. The basin depends almost entirely on groundwater to supply water to the three major municipalities, Santa Fe, Espanola, and Los Alamos (Figure 1). The regional aquifer also supplies water to numerous small towns and water associations and to six Native American Pueblos. The major industrial water user in the basin is Los Alamos National Laboratory, where about 410 million gallons/year are used for a variety of purposes, including cooling tower use (60%), operations, domestic use, and landscaping.

One example of the over use of water in the basin is provided by examining base flow in the Rio Grande, which is provided by discharge from the regional aquifer in the Española Basin. However, in the southern portion of the Española Basin the combined pumping from the regional aquifer by Santa Fe, Buckman well field, and Los Alamos has exceeded the estimated discharge from of the regional aquifer, thereby depleting base flow to this portion of the Rio Grande. Figure 2 shows that the total pumping over time from Santa Fe and Los Alamos exceeded the estimated discharge to the Rio Grande in about 1975.

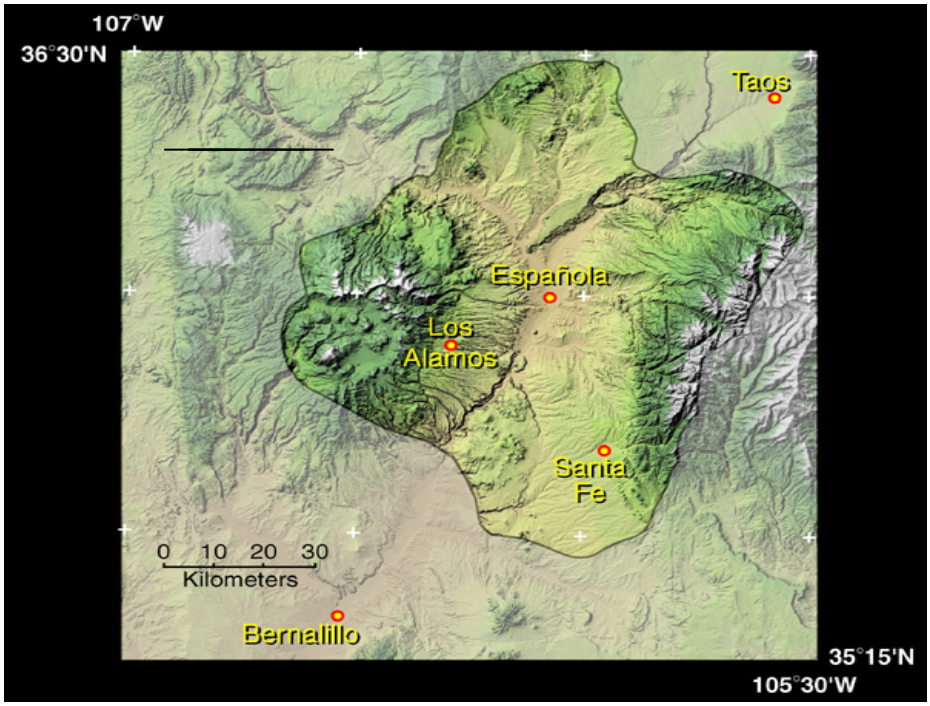

Figure 1: Espanola Basin Outline

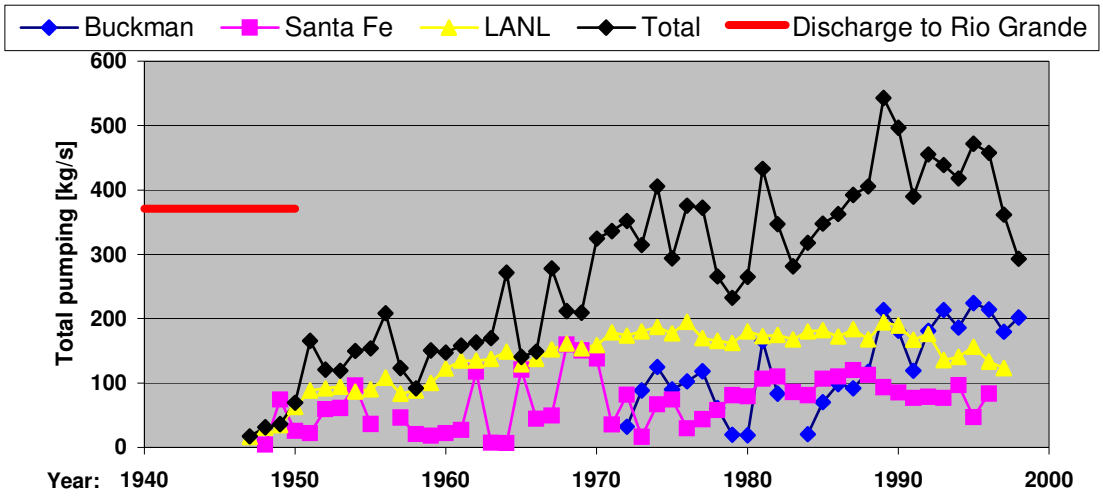

Figure 2: Total Pumping from the Regional Aquifer in the Southern Espanola Basin

Water resource, water quality, land use, and other land management decisions must be based on estimates of the amount of water available. Numerous governmental entities at the federal, state, regional, tribal, and local levels share responsibility for making decisions related to water resources in the Española Basin. A partial list includes the following: U.S. Geologic Survey; Los

Alamos National Laboratory; U.S. Department of Energy; U.S. Park Service; U.S. Forest Service; NM State Engineers Office; NM Environment Department; NM Energy, Minerals, and Natural Resources Department; Santa Fe, Los Alamos, Rio Arriba, and Sandoval Counties, City of Santa Fe, Pueblos of Santa Clara, San Ildefonso, Pojoaque, Tesuque, Cochiti, Jemez, and Nambe; Jemez y Sangre Regional Water Planning Council; East Rio Arriba and Santa Fe/Pojoaque Soil and Water Conservation Districts; Domestic water users associations; Acequia (irrigation) associations. Water resource decisions made by these organizations may be viewed as fitting into the following broad categories:

1. Determining the adequacy of available water resources for current inhabitants.
   Example: In April 2002, the City of Santa Fe established mandatory water use restrictions under a Stage 3 water shortage emergency.

2. Determining whether to allow new water uses such as residential subdivisions or industrial plants.
   Example: Under Sandoval County's subdivision ordinance, developers of proposed subdivisions must fire a consultant to conduct a hydrology study of the affected area.

3. Determining the consequences of water use patterns in one part of the Basin for inhabitants of other parts of the Basin.
   Example: Los Alamos National Laboratory (LANL) has conducted a study of whether LANL activities may have an impact on the Buckman wellfield, which is a source of drinking water for Santa Fe.

4. Assessing water quality issues and trends.
   Example: The New Mexico Environment Department is pursuing an analysis of water quality in the Upper Rio Grande watershed; this study may result in the establishment of Total Maximum Daily Loads (TMDLs) for selected parameters, in order to protect and improve regional water quality.

The water needs within the Española Basin cannot be addressed until a scientifically-based evaluation of the available resource is completed. However, quantifying the Española Basin water resource is an effort that must be conducted collaboratively with all the governmental entities. In the highly charged political environment and the diverse cultural needs, there is no single entity that would be trusted to provide an impartial water resource estimate.
A collaborative geologic and water resource assessment of the Española Basin has begun that includes the following organizations:

- City of Santa Fe
- Jemez Y Sangre Water Planning Council
- Los Alamos National Laboratory
- New Mexico Bureau of Geology and Mineral Resources
- New Mexico Office of State Engineer
- Santa Fe County
- Summer of Applied Geophysical Experience (SAGE)
- U.S. Geological Survey

- University of New Mexico
- U.S. Bureau of Indian Affairs

These organizations are working together as the Española Basin Technical Advisory Group (EBTAG)with a goal of improving the understanding of the three-dimensional hydrogeologic and geologic frameworks of the basin as a requisite step toward better management of its ground water. The objectives of EBTAG are to:

- Act as a clearinghouse for ideas and directions of study
- Develop strategies for integration/coordination of technical studies to reach common goals
- Identify common priorities for needed work and coordinate funding strategies
- Provide a focal point for communication and information transfer between the technical groups and between the technical groups and the users of the information.

The EBTAG could provide a model on which to base collaborative efforts toward making water resource decisions.