

WATER RESEARCH AND TECHNICAL ASSISTANCE IN THE ESPAÑOLA BASIN, NM

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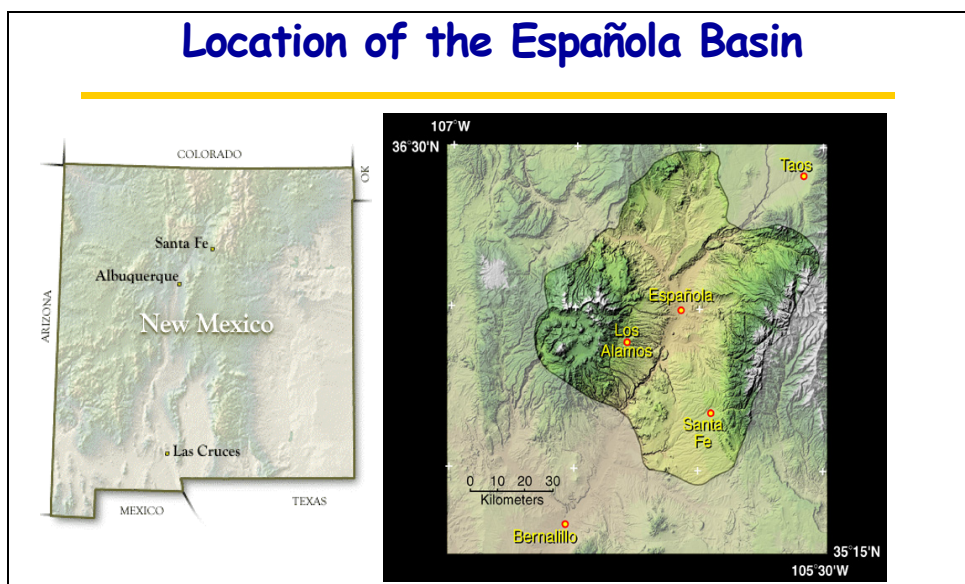
ABSTRACT

Since its early beginnings, Los Alamos National Laboratory (LANL) has provided technical assistance and educational outreach activities in Northern New Mexico. However, the recent drought conditions across the Southwest have highlighted the need to develop and communicate a scientific understanding of water resources, especially in the context of advancing sustainable growth and infrastructure security in Northern New Mexico. In reality, significant gaps exist in our basic scientific understanding of how much groundwater is available in the basin and its chemical quality.

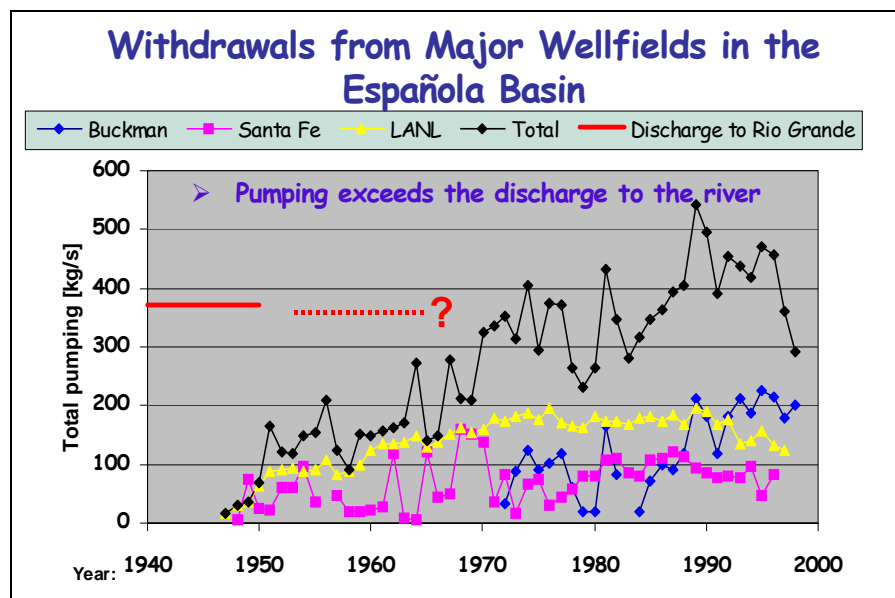
Numerous federal and state agencies, local governments, and pueblos have undertaken work in the areas of drought, hydrology and geology studies, water supply, wastewater collection and treatment, water quality, and water allocation in the Española Basin in northern NM. However, no comprehensive research and technical assistance office exists that draws together the information from these disparate activities in a comprehensive archival manner, promotes sharing information and collaborating on research efforts, and offers technical assistance. For example, the US Geological Survey recently formed an Española Basin Technical Advisory Group made up of a limited number of scientists performing geologic and hydrologic studies in the basin to share technical information, avoid duplication of research, and develop a research agenda for closing the gaps in our knowledge about the water resources in the basin. However, the hydrogeologic information is not readily available, nor is it widely communicated to those who might benefit from it. Therefore, in Jan. 2004 LANL implemented a Water Research Technical Assistance Office that intends to fill these gaps by archiving and sharing information; promoting relationships, collaboration, and partnerships among the agencies and communities within the basin; providing assistance; and strengthening education and economic development.

This presentation provides information regarding the Water Research Technical Assistance Office's recent activities, including development of a web-accessible database for information sharing and the development of educational materials on groundwater resources in northern New Mexico. Numerous partnerships and collaborations are currently in process. This presentation also examines several of the political and sociological obstacles that have been encountered during the implementation of these activities and presents a perspective on future challenges and research opportunities.

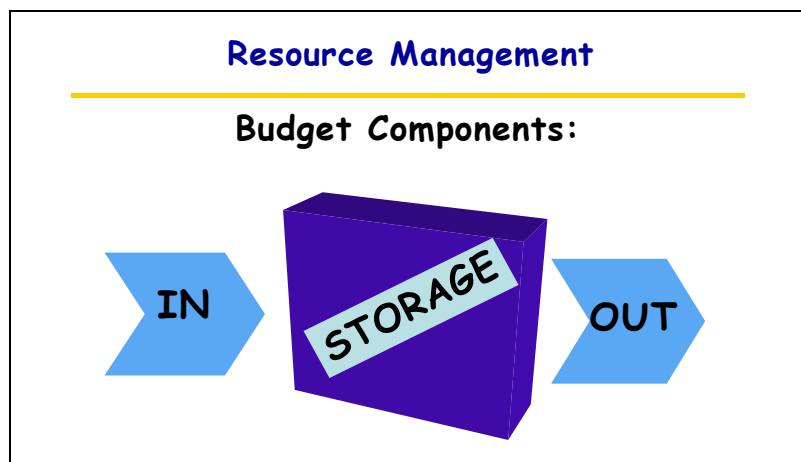
My name is Charles Nylander, and I am the Program Manager for the Groundwater Protection Program at Los Alamos National Laboratory. I am also managing the Laboratory's new Water Research Technical Assistance Office in Santa Fe. This presentation illustrates some of the challenges in communicating and collaborating regarding the scientific understanding of water resources in Northern New Mexico.



My presentation is focused on the Española Basin in Northern New Mexico. This slide illustrates the general geographical area of the basin. As you can see, the basin is bounded by the Jemez Mountains on the west, and the Sangre de Cristo Mountains on the east. The Rio Grande traverses the basin from north to south, and within the basin there are three major municipalities, i.e. Santa Fe, Española, and Los Alamos. All three municipalities depend on groundwater for their water supply (Santa Fe uses some surface water). A regional water plan for the Española Basin was recently prepared by the Jemez y Sangre Regional Planning Council, and has been approved by the Director for the Interstate Stream Commission. The regional water plan contains recommendations regarding the management of water resources in the basin, and indicates that given present water use trends and population growth, there will be a deficit of ~30,000 acre feet of water in the basin by the year 2060.

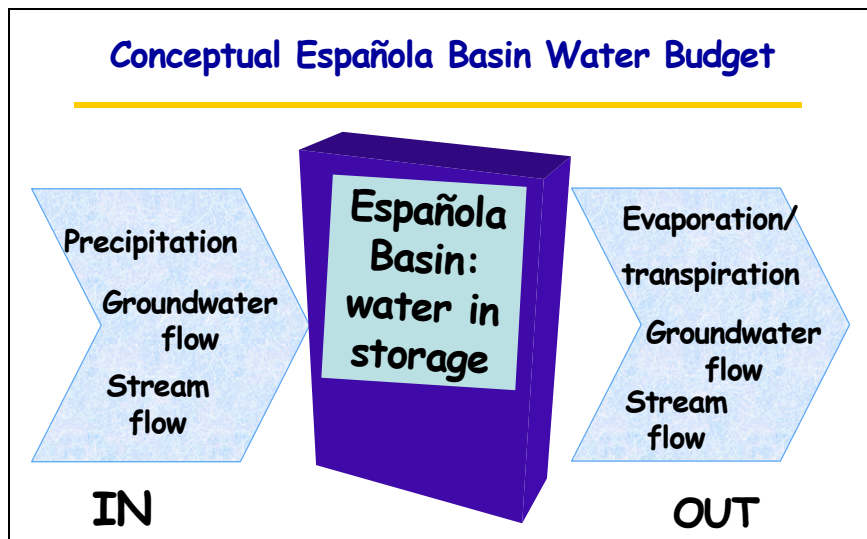


This slide illustrates the cumulative impact of groundwater withdrawals from the three major municipalities in the basin. The black line on the graph shows the combined withdrawals have exceeded the red line on the left side of the graph. This red line approximates the normal amount of groundwater that would discharge into the Rio Grande from springs, seeps, and baseflow. Because the combined pumpage has exceeded the amount of natural groundwater discharge, a segment of the Rio Grande is no longer gaining from groundwater discharge, but is now a losing segment on the river. The area I'm describing is the segment from Otowi Bridge downstream to the headwaters of Cochiti Reservoir.

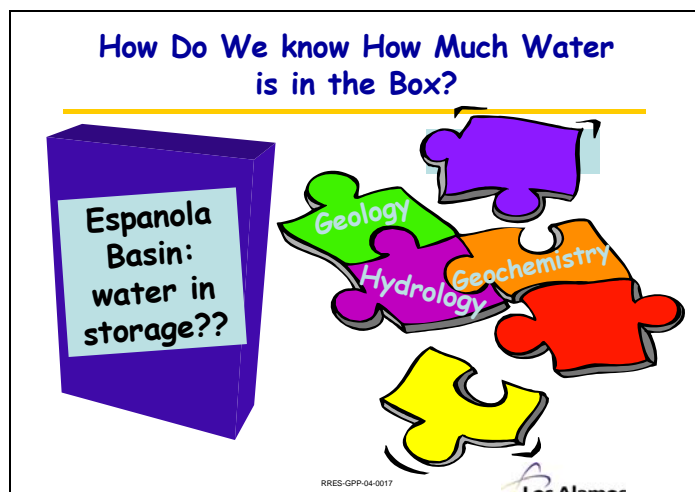


When one considers the basic aspects of resource management, we can illustrate three simple components of a budget. We have inputs, outputs, and something in storage. If you think about money as a resource, you can consider a checking account at the bank. You deposit money into the account, withdraw money from the

account, and hopefully have some amount of money on balance in the account. With water resources it is the same simple formula. Surface and ground water flow into a basin, some of the groundwater remains in storage, and both forms of water flow out of the basin (or regarding groundwater is removed through pumping).



If we use the previous illustration, we can depict the water resource budget components for the Española Basin. The inputs are in the form of precipitation, groundwater flow, and stream flow. The outputs are in the form of evaporation, transpiration from plants, groundwater flow (and pumpage), and stream flow. What remains in storage is by and large groundwater beneath the surface. However, how does one estimate the amounts in these three components in order to quantify the water resources.



To determine the quantity of water in storage in a basin, a rigorous amount of scientific data gathering and interpretation has to occur. The scientific data comes from various disciplines such as hydrology, geochemistry, geophysics, geology, etc. The multi-disciplinary data collection can be viewed as puzzle pieces, each fitting into a larger picture of scientific understanding of the quantity of groundwater storage in a basin, its chemical quality, and its sustainable yield. These scientific data are typically not easily obtained, and funding for scientific research is limited on both the state and federal level. So there is a continuing challenge to obtain the financial resources needed to fund scientific investigations and data gathering. Even though we are in the 21st century, there is a large gap in our scientific understanding of the basins in New Mexico and their water resources.

Threats to the Water We Share

Natural Water Quality

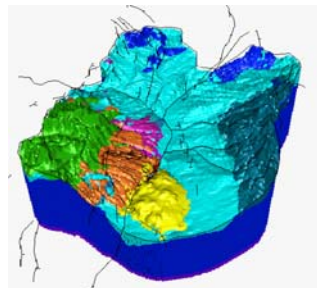
- 37 private and 8 public wells have uranium exceeding the EPA drinking-water standard. The source of uranium is natural mineral deposits in the Tesuque Formation (NMED Atlas).
- Some deep wells in the Pojoaque-Nambe area contain very high fluoride from altered volcanic deposits (NMED Atlas).
- Some wells near Chimayo have high dissolved solids, fluoride, and iron due to migration of deep water up along faults (EBTAG, 2004)

Anthropogenic Water Quality Impacts (NMED)

- Septic tanks have contaminated ground water with nitrate.
- Septic tank effluent also causes increased dissolved iron, manganese and sulfide to occur.
- Septic tanks have contaminated groundwater in Alcalde, Chamita, Chimayo, Cuyamungue, El Rancho, Española, Hernandez, Jacona, La Puebla, Las Placitas, Medanales, Nambe, Pojoaque, Quartaes, Santa Cruz, Santa Fe, Tesuque, and Velarde

In addition to the issues of water quantity, much of the groundwater resources of New Mexico and the Española Basin specifically are subject to natural and man-made water quality degradation. Groundwater in a basin can be naturally contaminated with salts and heavy metals. This is especially true the deeper the water is in the basin, a function of long residence time for the groundwater to interact with the natural minerals in the rocks. In addition, population growth and water use practices can result in man-made contamination. Municipal and industrial discharges of wastewater, domestic sewage disposal in septic tanks and cesspools, and agricultural practices can contaminate the precious groundwater resources that we depend on for water supply. In the Española Basin there are numerous issues with both natural and man-made groundwater contamination. Increasingly, regional planning for water supply and wastewater collection systems is being considered due to the degradation issues.

Planning for Water Resources



Water Quantity

- Jemez y Sangre Regional Water Planning
- EBTAG

Water Quality

- North Central New Mexico Economic District
- EBTAG

Collaboration is the most effective way to acquire timely scientific data to enhance and improve the basis for water management decisions

RRES-GPP-04-0017
LA-UR-04-2674

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However, planning for either water supply or wastewater collection and treatment infrastructure is challenging on a regional scale. In addition, collaborating on scientific studies and data collection is also challenging. In both cases, governmental jurisdictions, management agencies, and research agencies are typically used to competing for scant resources, and not necessarily taking advantage of partnerships and collaborations. The information on this slide illustrates some successful processes to collaborate. The Jemez y Sangre Regional Planning Council successfully collaborated to produce the Jemez y Sangre Regional Water Plan. The Española Basin Technical Advisory Group (EBTAG) lead by the U.S. Geological Survey in Denver has succeeded in creating a 3+ year running collaboration of federal and state agencies, academic institutions, and local governments in assembling collaborative scientific research in the basin. While the North Central Economic Development District has fostered successful collaborations on regional wastewater planning in the basin.

Collaboration is not Easy

- Communicating between organizations is not that easy
- Effectively communicating with "the public" is also not easy
- Cultural and traditional users of water feel threatened
- Western water law constrains allocation
- Federal law has profound effect on local water resources
- Drought conditions exacerbate the problems and lead to insecurity

There are many challenges and issues associated with collaboration. Most agencies and governmental entities are used to a "mission" orientation, and sharing information can be frustrated. Depending on organizational missions, bureaucracy occurs and bureaucracies tend to become "inwardly focused" and "territorial" and can be possessive of data and information. In most public meeting settings, it becomes apparent that it is a challenge to communicate scientific information, and the public senses a lack of communication. Trust becomes an issue. In addition, there exist a myriad of cultural and traditional values regarding water, and it is quite normal to sense that water-related issues are threatening to traditional value systems. Our western water law places constraints on water use and allocation, and the adjudicatory processes are long and drawn out. Federal laws on threatened and endangered species can complicate water resource management decisions, and of course the current drought heightens the anxiety level of all stakeholders in regard to water issues. There have to be new approaches to encourage collaboration.

Water Research Technical Assistance Office



Offering technical assistance and identifying collaboration opportunities between federal and state agencies, municipal and county governments, pueblos, universities, and the public from an anticipated readily accessible Santa Fe County office location in Santa Fe.

In an attempt to foster collaborations and partnerships, the Laboratory has opened a new Water Research Technical Assistance Office in a joint effort with Santa Fe County. This new office will focus the Laboratory's resources for providing technical assistance, scientific information, and education utilizing an extensive outreach approach. The new office will also promote collaborations on much-needed scientific research in the Española Basin, and provide a program development function to seek out funding for the needed research. As a research and development laboratory, Los Alamos National Laboratory can provide a facilitator function for regional planning and collaboration, without the criticism that can arise from being a regulatory or management agency with an "agenda."

Anticipated Outcomes and Impacts

We anticipate that our efforts will:

- Fill the scientific information "gaps" so as to enable better water resource management decisions;
- Strengthen the partnerships and collaborations among all entities who reside in the Española Basin;
- Provide technical service and assistance to those entities with water-related problems and issues; and
- Promote education of local students and residents regarding water science and management, and support water-related economic development.

The Laboratory's Water Research Technical Assistance Office has the potential to provide numerous anticipated outcomes and impacts. In the next few months, a comprehensive database will be constructed that will serve as a clearinghouse for water-related information concerning the Española Basin. This database will be web-accessible and promote the communication of scientific data to residents within the basin. In addition, a lengthy video film is being produced regarding groundwater in Northern New Mexico, and when it is available in September 2004 it will serve as an educational tool for communicating the basic information on groundwater hydrology in the basin. Such attributes will underscore the critical function that the Water Research Technical Assistance Office will serve. Through these efforts and activities, the Laboratory hopes to improve communication and collaboration regarding the scientific understanding of water resources in New Mexico, and promote regional collaboration in the Española Basin.

Continued Support for this Effort



The Water Research Technical Assistance Office will assist this regional collaboration by:

- Serve the role of facilitator
- Meeting organization, logistics, and documentation
- Prepared analysis of scenarios and options
- Clearinghouse of data and information
- Analysis of needs and referral

For further information please contact Charlie Nylander, Water Research Technical Assistance Office at 665-4681, or by email at nylander@lanl.gov.