

# Report as of FY2007 for 2002NM1B: "Geographic Information System for Water Resources Research Planning"

## Publications

- Water Resources Research Institute Reports:
  - King, J.P., J.W. Hawley, J.W. Hernandez, J.F. Kennedy, and E.L. Martinez. 2006. Study of Potential Water Salvage on the Tucumcari Project, Arch Hurley Conservancy District: Phase I. A pre-appraisal-level study of the potential amount of water that may be saved, and the costs of alternative methods of reducing carriage losses from district canals. New Mexico Water Resources Research Institute Technical Completion Report 335, with plates and appendices on CD ROM, New Mexico State University, Las Cruces, New Mexico.
- Other Publications:
  - Ortiz, Marquita. 2007. The Impacts of Land Use Change on Water Resources and Traditional Acequia Culture in Northcentral New Mexico. Masters thesis, Department of Geography, New Mexico State University, Las Cruces, NM.
- Articles in Refereed Scientific Journals:
  - Creel, B.J., J.W. Hawley, J.F. Kennedy, and A. Granados-Olivas. 2006. Groundwater resources of the New Mexico-Texas-Chihuahua border region. *New Mexico Journal of Science*. 46:11-29.
  - Granados-Olivas, A., C. Brown, J. Greenlee, B. Creel, J.W. Hawley, J.F. Kennedy, O. Dena-Ornelas, and B. Hurd. 2006. Geographic information systems at the Paso del Norte region: The academic accomplishments and challenges for a transboundary water resources GIS cooperation. *New Mexico Journal of Science*. 46:45-56.
  - Kennedy, J.F., R.P. Langford, and J.W. Hawley. 2006. Using GIS and Remote Sensing to Reconstruct Late Quaternary and Early Holocene Paleo-Hydrography Using Climate Data and Modern Topography: An example from the Southwestern US. *Computers and Geosciences*. In press.
  - Kennedy, J.F., R.P. Langford, and J.W. Hawley. 2006. Estimating a Water-Balance Equation for a Playa in the Tularosa Basin of Southern New Mexico. *Computers and Geosciences*. In press.

## Report Follows

## **GIS Project**

### **Problem and Research Objectives**

The New Mexico Water Resources Research Institute has become the focal point for geographic information system (GIS) data and information concerning water resources in New Mexico. It combines database management with digital mapping into spatial-tabular data models. These models are powerful tools for representing and manipulating earth-science information.

As use of geographic information systems has grown and presented new opportunities, it also has raised a number of new issues and problems. Of increasing concern is the management of a growing collection of spatial data sets and applications programs. These data sets and programs are very expensive to produce but relatively easy to share, so there is a great incentive to avoid duplicating production efforts. The trend clearly is toward managing these elements in distributed spatial libraries.

The primary objective of the project is to increase availability and accessibility of water resource information to support water resource planning and management in the state. The first task provides spatial data library accessibility. This task maintains arrangements and establishes those necessary to provide access to spatial data maintained by other agencies and organizations. The second task, spatial data development, evaluates needs, establishes priorities, and undertakes development of spatial data that is otherwise unavailable. These efforts will be coordinated with cooperating agencies and organizations to ensure no duplication of effort and to establish guidelines for coverages and priorities. The principal investigators maintain, update as necessary, and make the data available to cooperating agencies and organizations through both formal and informal arrangements to facilitate water resource planning activities.

Bobby J. Creel, Associate Director of the WRRI, oversees the GIS laboratory and its programs. Currently six students are being trained in the lab, three undergraduates and three graduate students.

### **Methodology**

A number of cooperative data sharing agreements have been entered into with state, federal, and local agencies and organizations to facilitate access and to develop spatial data. Others will be pursued as necessary. Research funded by the NMWRRI in many cases results in the development of data that can be represented in a spatial form and thus can contribute to the state data pool. Projects that have such a potential are adjusted as necessary to meet this secondary purpose.

The NMWRRI maintains a GIS laboratory consisting of computer workstations; data storage devices; input/output devices (color plotter, digitizer, etc.); software for mapping and analysis (ARC/Info); database development and visualization; and network systems. The laboratory is connected via fiber to the New Mexico State University computer network and thereby to the Internet. The NMWRRI also maintains an Internet web server site through which both spatial and tabular water resource data can be provided.

### **Principal Findings and Significance**

Various research activities are supported by the system for water resources planning in the state. The New Mexico Interstate Stream Commission provides grants to regional groups to support water resources planning. NMWRRI continues to be utilized by the NM Interstate Stream Commission to provide GIS mapping products for use in their plans and in public outreach. NMWRRI has helped many regional groups with GIS mapping products for use in their plans and in public outreach efforts.

Additionally, support has been given to the New Mexico/Texas Water Commission and various public entities of southern New Mexico for their planning activities. GIS mapping support is also provided to the Lower Rio Grande Water Users Organization.

Several presentations utilizing the products of the database management system were made: A presentation on the NM/TX/CH border groundwater mapping system project, which is supported by the Hewlett Foundation and the New Mexico Environment Department, was given at the Southwest Environmental Research and Policy (SCERP) annual meeting in Rio Rico, AZ, in May 2006 and at the SCERP sponsored GIS Summit in El Paso, TX, in April 2006. A similar presentation was made to the Paso del Norte Water Task Force meeting in August 2006.

Marquita Ortiz, a graduate student at New Mexico State University and WRRI's GIS Technician received an NMSU Cluster Mini-Grant award for her project entitled, *The Impacts of Land Use Change on Water Resources and Traditional Acequia Culture in North Central New Mexico*. She worked with co-investigators from several departments to examine and interpret land use changes in the Black Mesa Reach of the Rio Grande in northern New Mexico. Marquita employed GIS, remote sensing, and aerial photography to study the land use changes. She presented her project at the UCOWR annual meeting in Santa Fe, New Mexico, in July 2006. The presentation will appear as an article in UCOWR's journal, "Journal of Contemporary Water Research and Education." Marquita also presented a poster at the 2007 New Mexico Water Research Symposium in August 2006 for her project entitled, U.S.-Mexico Geospatial Database Based on Aquifer Boundaries. Marquita's co-authors on the poster included Casey Gomez, an undergraduate student in the GIS lab, and Hugo Rojas, a collaborator from Centro de Información Geográfica Instituto de Ingeniería y Tecnología Universidad Autónoma de Ciudad Juárez.

Another student in the GIS lab, Susanna Glaze, an undergraduate geography/GIS student received a GREG Award from the Office of the Vice President for Research at New Mexico State University. She has worked for the past year in the WRRI GIS lab.

Several presentations were made during the reporting period including the following:

1. John W. Hawley: Neogene basin-fill aquifer systems of the bi-national Paso del Norte Region—Advances in characterization of their depositional history and hydrogeologic framework. New Mexico Tech Hydrology Colloquium, October 16, 2006, Socorro, NM
2. John W. Hawley: Neogene basin-fill aquifer systems of the bi-national Paso del Norte Region—Advances in characterization of their depositional history and hydrogeologic framework. Geological Society of America, October 23, 2006, Philadelphia, PA
3. John W. Hawley: Neogene basin-fill aquifer systems of the bi-national Paso del Norte Region—Advances in characterization of their depositional history and hydrogeologic

framework. University of Illinois Geoscience Colloquium, November 10, 2006, Urbana, IL (with John Kennedy and Marquita Ortiz)

This sophisticated mapping and geo-spatial database management system, originally designed to support WRRI-funded research activities, is now being used for external research grants (e.g., Creation of a Digital Hydrogeologic Framework Model of the Mesilla Basin and Southern Jornada del Muerto Basin; creation of maps for the purpose of water planning funded by the New Mexico Interstate Stream Commission; and pesticide management planning in the state funded by the New Mexico Department of Agriculture) by water resources management and planning agencies in the state. A research grant resulted in the creation of a regional geographic information system to support water planning in the Paso del Norte borderland area of the southwestern United States.

This is an ongoing project with new data continually being added to the database and assistance being given to produce specific GIS products upon request. Continued funding is anticipated from annual state appropriations as well as pending agency awards.