



DIVINING ROD

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

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Students busy working on water related projects

Twelve New Mexico undergraduate and graduate students are conducting water-related research funded by an increase to the WRRRI budget passed by the 2003 New Mexico Legislature and approved by the Governor. Two New Mexico Tech student research projects are described in this issue of the *Divining Rod*.

New Mexico Tech Doctoral Candidate Examines Natural Tracers In Snow

New Mexico Tech doctoral candidate Sam Earman currently is investigating the possible use of natural tracers, such as stable isotopes of oxygen and hydrogen, as a means of improving estimates of groundwater recharge attributable to snowfall and snowmelt.

“Although snow is recognized as an important contributor to the groundwater in New Mexico’s aquifers, our knowledge of what portion of the groundwater in various aquifers originated as snowmelt is not good,” Earman says.

Stable isotopes of oxygen and hydrogen are widely used in hydrogeology and other fields as natural tracers, but using these isotopes to study snow and snowmelt is not a widespread practice among hydrogeologists, although research in this specific area has increased over the past few years.

“Some of the methods currently used to estimate the contribution of snowmelt to groundwater recharge may yield values that are too low,” Earman says.

“Alteration of the stable isotope

(continued on page 2)



Above: Snow covers the high portion of a mountain range while the valley floor below is dry, illustrating the potential importance of snow to groundwater recharge. (Photo by S. Earman)



Inset far right: Precipitation collectors at a site outside Los Alamos, New Mexico. The different collector designs allow determination of the isotope signatures of fresh snow and infiltration water derived from snowmelt. (Photo by S. Earman) **Inset above right:** New Mexico Tech doctoral student Sam Earman. (Photo by Doug Oliver)



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signature of snow during snow metamorphism has the potential to cause groundwater recharge signatures to differ significantly from fresh snow signatures.”

“This study uses natural tracers – substances that are naturally present, rather than added – in snow and groundwater to get improved estimates of the importance of snow in groundwater recharge,” he adds.

A major portion of the research study involves using a network of stations set up in various mountaintops in New Mexico and Arizona with different types of precipitation collectors. Some of the collectors are designed to preserve the isotope signature of fresh snowfall, while others allow varying degrees of alteration and then maintain the isotope signature of the melted snow.

“Improving estimates of the proportion of groundwater recharge derived from snow will serve to improve estimates of total groundwater recharge,” Earman says. “In turn, these

improved estimates of groundwater recharge will allow water planners to make better decisions regarding our water resources.”

Earman’s ongoing research work in this area is funded in part by a New Mexico Water Resources Research Institute Student Research Grant. His faculty advisor is Dr. Fred M. Phillips.

*George Zamora
New Mexico Tech*

49th Annual New Mexico Water Conference

WRII has requested approval for **10.5 CLE** general credit hours



New Look for WRII Website



Doña Ana Branch Community College student Kim Castaneda recently redesigned WRII’s webpage.

“I’ve given the institute’s homepage a new look and added quite a few photos. I’ve tried to keep it user friendly,” said Kim.

The website will retain the information it previously had and has added some new features. “The Photo Gallery will be updated periodically with water-related scenes from around the state,” according to Kim.

Another new feature is a kids page with activities for young children and links to other water-related sites with activities for students.

Check out the WRII website (wrii.nmsu.edu) and let us know what you think.



New Mexico Tech Grad Student Set To Model Rio Puerco Basin

New Mexico Tech graduate student Robert Wyckoff has begun an extensive study of west-central New Mexico's Rio Puerco watershed that will use current data and computer models to better understand the shifting relationships between rainfall and runoff when considering variables such as climate, land use, and surface alterations.

"Semi-arid catchments in New Mexico, such as the Rio Puerco Basin, are susceptible to fluctuations in precipitation, occurring at time scales ranging from annual to daily amounts," Wyckoff explains.

"These rainfall variations in regions of low-water availability can result in dramatic shifts in basin hydrologic response, channel erosion, and vegetation distribution," he says.

Other studies have shown that ecological, hydrological, and land alterations at watershed surfaces are intertwined to varying degrees depending on the amount of available rainfall in the area.

"In this study, which is still in the preliminary stages, we plan to investigate the hydrological dynamics associated with an observed increase in precipitation within the Rio Puerco watershed within the last 50 years," Wyckoff says.

Wyckoff and his research colleagues will begin by using a computer model employing soil, topography, land-use, and rainfall data to simulate evapotranspiration, runoff, and recharge in the basin.

"The Rio Puerco watershed and the corresponding stream network have been delineated using a basic Geographic Information Systems tool package, in conjunction with elevation

data provided by the United States Geological Survey," he says.

In addition, he has completed an investigation of the relationship between two climate indices and stream discharges at various gauges within the Rio Puerco Basin.

"We are also currently gathering radar, rain gauge, soils, land-use, stream discharge, elevation, and well data required to analyze a specific Rio Puerco flood event," Wyckoff adds.

Computer simulations will be conducted in the course of the study using the triangular irregular network (TIN) based Real-time Integrated Basin Simulator, which was developed at MIT.

A TIN provides an accurate approximation of elevation, while simultaneously reducing the computations required to quantify the rainfall-runoff mechanisms for a given watershed.

"However, prior to performing model runs, parameters describing hydrometeorological, soil, and energy conditions must be established," Wyckoff says. "Once calibrated, various model combinations will be performed in an effort to describe climatic and land-use efforts on stream discharge in the Rio Puerco Basin."

Wyckoff's research project, *Climate, Land-use Change, and Hydrologic Response—Modeling the Rio Puerco Basin*, is funded in part by a research grant from the New Mexico Water Resources Research Institute, and is being conducted under the direction of his faculty advisor, Enrique Vivoni, associate professor of hydrology at New Mexico Tech.

*George Zamora
New Mexico Tech*

Hydrometeorological and Hydrological Studies in the Rio Puerco



September 14, 2003

Photos by Enrique Vivoni



September 26, 2003



2004 National Competitive Grants Program awards announced

Eight proposals have been selected for funding under the Fiscal Year 2004 National Institutes for Water Resources (NIWR) and U.S. Geological Survey (USGS) National Competitive Grants Program. Abstracts of the proposals are available at <http://water.usgs.gov/wrri/04grants/national/nationalindex.html>

The program received 45 proposals requesting nearly \$7 million in federal funds. According to John Scheffter, Chief, USGS Office of External Research, many excellent proposals could not be funded given the approximately \$1 million available for the program.

Forward and Inverse Transient Analytic Element Models of Groundwater Flow

By: Shlomo Neuman, University of Arizona (WRRC, University of Arizona)

Collaborator: Paul Hsieh, U.S. Geological Survey, Branch of Regional Research, Western Region

Federal Funds: \$131,976 (3 years)

Pharmaceutically Active Compounds: Fate in Sludges and Biosolids Derived from Wastewater Treatment

By: David Quanrud, Wendell Ela, Robert Arnold, and Jon Chorover, University of Arizona (WRRC, University of Arizona)

Collaborators: Ed Furlong, National Water Quality Laboratory, and Gail Cordy, Hydrologic Investigations and Research Program, Arizona District Office, U.S. Geological Survey

Federal Funds: \$152,926 (3 years)

Institutional Re-arrangements: Forging "smart use" water policy coalitions at the intersection of geo-technical engineering with urban open space

By: Helen Ingram, University of California, Irvine (CWR, University of California, Riverside)

Federal Funds: \$70,767 (2 years)

Space-Based Monitoring of Wetland Surface Flow

By: Shimon Wdowinski, Falk Amelung, and Timothy Dixon, University of Miami (FWRRC, University of Florida)

Collaborator: Roy Sonenshien, Florida Integrated Science Center, U.S. Geological Survey

Federal Funds: \$158,687 (2 years)

Estimating Shallow Recharge and Discharge in Northeastern Illinois Using GIS and Pattern Recognition Procedure

By: Yu-Feng Lin, University of Illinois at Urbana-Champaign and Illinois State Water Survey; and Albert Valocchi, University of Illinois at Urbana-Champaign (IWRC, University of Illinois at Urbana-Champaign)

Collaborator: Randall Hunt, Wisconsin District, U.S. Geological Survey

Federal Funds: \$91,197 (2 years).

Carbonaceous Material Fractions in Sediments and Their Effect on the Sorption and Persistence of Organic Pollutants in Small Urban Watersheds

By: Charles Werth, University of Illinois at Urbana-Champaign (IWRC, University of Illinois at Urbana-Champaign)

Collaborators: Peter Van Metre and Barbara Mahler, Texas District, U.S. Geological Survey

Federal Funds: \$170,956 (3 years)

Development of Water Use Benchmarks for Thermoelectric Power Generation in the United States

By: Ben Dziegielewski and Tom Bik, Southern Illinois University (IWRC, University of Illinois at Urbana-Champaign)

Federal Funds: \$94,245 (2 years)

Groundwater sustainability in a humid climate: Groundwater pumping, groundwater consumption, and land use change

By: Madeline Gotkowitz and David Hart, Wisconsin Geological and Natural History Survey (WRI, University of Wisconsin)

Collaborators: Charles Dunning, Wisconsin District, U.S. Geological Survey

Federal Funds: \$69,246 (2 years)



Upcoming Conferences

July 13-15, 2004 Riparian Restoration in New Mexico: Building a Common Vision. Office of Environmental Affairs, San Juan Pueblo, Ohkay Hotel Casino Resort, San Juan Pueblo, NM

July 15-16, 2004 Water Law & Policy Briefing, Hyatt Regency Islandia Hotel, Mission Bay, San Diego, CA

August 10, 2004 New Mexico Water Research Symposium, Macey Center, New Mexico Tech, Socorro, NM

August 16-17, 2004 12th Annual Super-Conference on New Mexico Water Law. CLE International, La Fonda, Santa Fe, NM

August 31-September 2, 2004 Water Conservation: Protecting Our Most Value Treasure. New Mexico State University & New Mexico Water Conservation Alliance, Old Town Sheraton, Albuquerque, NM

August 31-September 3, 2004 The Utton Transboundary Resources Center Conference, Hyatt Regency Tamaya, Santa Ana Pueblo, NM

September 21-22, 2004 49th Annual New Mexico Water Conference. Water Desalination and Reuse Strategies for New Mexico. Ruidoso Convention Center, Ruidoso, NM

October 13-15, 2004 SAHRA Conference, Marriott, Albuquerque, NM

October 18-20, 2004 New Mexico Environmental Health Conference, Sheraton Old Town, Albuquerque, NM

October 22-22, 2004 Desalination Conference 2004 El Paso, Managing Concentrate in the Desert. Marriott-Airport Hotel, El Paso, TX

November 4-5, 2004 The Endangered Species Act. CLE International, Hilton El Conquistador Resort, Tucson, AZ

WRI publishes digital hydrogeologic framework model for the Mesilla Basin

With the long-term goal of developing a state-of-the-art hydrogeologic model of the Mesilla Basin and contiguous parts of the southern Jornada del Muerto Basin, John W. Hawley and colleagues have produced a report that takes another step forward.

The Lower Rio Grande Water Users Organization and the NM Interstate Stream Commission provided funding for this project. Its intent is to present the best available hydrogeologic information that will provide a sound basis for ongoing modifications and updates of the existing groundwater-flow model for the Lower Rio Grande-Mesilla Basin area.

The report emphasizes the hydrogeologic framework of the Rio Grande rift-basin and river-valley fills that collectively form the major aquifer systems, and how basin-fill composition and structural-boundary controls influence groundwater flow and geochemical/geothermal conditions.

Geographic Information Systems (GIS) methodology (ARC/INFO[®] platform) is used to portray and integrate the major framework components of aquifer-system lithology and stratigraphy, basin boundaries, and internal basin structure. Of special importance are 17 new hydrogeologic cross sections and a map of the basal topography of basin-fill deposits in the binational—tri-state Mesilla Basin area.

The 100-page report comes with a CD-Rom containing a number of plates. Contact the WRI at 505-646-4337 for a copy of the report or view the report online at wri.nmsu.edu.



John Hawley, right, and John Kennedy, second from right, recently completed the next phase of creating a comprehensive digital hydrogeologic framework model of the Mesilla Basin. Many NMSU students have worked on the project since the late 1990s. Two of those students are shown here: Quita Ortiz, left, graduated with a B.S. in geography in 2004 and Sean Carrasco, second from left, graduated in 2003 also with a B.S. in geography. Both assisted in the creation of digital surface geology maps and subsurface hydrogeologic cross-sections and with the creation of the GIS hydrogeologic framework model.



49th Annual New Mexico Water Conference

Water Desalination and Reuse Strategies for New Mexico

Ruidoso Convention Center
September 21-22, 2004

Preliminary Program

Monday afternoon, September 20, 2004

Tularosa Basin National Desalination Research Facility -
hosted by Sandia National Laboratories

Participants will learn about the conceptual design of the facility; its testing and education features; the facility construction and initial testing schedule; results of the five water supply wells - depths, water quantity and quality; and take a short walking tour of the site and water supply wells.

12:00

Luncheon

High school essay competition

1:30

Albuquerque Water Reuse Initiatives

[John Stomp](#), City of Albuquerque

2:00

Strategies for Produced Water Handling in New Mexico

[Robert Lee](#), Petroleum Recovery Research Center, NM Tech

Tuesday, September 21, 2004

7:30 a.m. Registration

8:30 Opening Remarks

[Karl Wood](#), Director, WRRI

[Leon Eggleston](#), Mayor of Ruidoso

8:45 New Mexico's Brackish Water Program as It Relates to the State Water Plan

[John D'Antonio](#), Office of the State Engineer

9:30 National Perspective on Saline Aquifers

[Kevin Dennehy](#), Program Coordinator, USGS Office of Ground Water

10:00 Break

10:30 Regional Issues and Hydrologic Characteristics

[John Shomaker](#), Shomaker and Associates

11:00 Groundwater Hydrology in New Mexico

[Rick Huff](#), USGS

11:30 Tularosa Basin National Desalination Research Facility

[Mike Hightower](#), Sandia National Laboratories

2:30

Produced Water Treatment Program: A Cooperative Effort

[Rick Arnold](#), NMSU Agricultural Science Center/Farmington

3:00

Break

3:30

Panel: Water Rights Issues of Produced Water

moderated by [Bill Hume](#), Office of the Governor

[Mark Fesmire](#), New Mexico Oil and Gas Conservation Division

[Bill Real](#), PNM

[Paul Saavedra](#), Office of the State Engineer

[Frank Yates, Jr.](#), Yates Petroleum Corp.

4:30

Open Forum for Questions and Comments

6:00

Dinner Banquet



Wednesday, September 22, 2004

- 8:00 a.m. Water Quality Issues
Concentrate Management Regulations
[Karen Menetrey](#), NM Environment Department
The Science of Concentrate Management
[Anthony J. Tarquin](#), UTEP
Graywater Use in New Mexico
[Gary Beatty](#), NM Environment Department
- 9:00 El Paso's Wellhead Desalting Program
[John E. Balliew](#), El Paso Water Utilities
- 9:20 White Cliffs Mutual Domestic Water Users
Association Reverse Osmosis Water
Treatment System
[Eddie Livingston](#), Livingston Associates, P.C.
- 9:40 El Paso's Desalination Efforts
[Bill Hutchison](#), El Paso Water Utilities
- 10:00 Break
- 10:30 California Desalination Projects
[Jerry Johns](#), California Dept. of Water Resources
- 10:50 Yuma Desalting Plant
[Mike Norris](#), Bureau of Reclamation

- 11:10 National Desalination Efforts
[Tom Jennings](#), Bureau of Reclamation
- 11:30 Roadmap for National and International
Desalination Research
[Tom Hinkebein](#), Sandia National Labs
- 12:00 Closing Remarks
[Karl Wood](#), Director

Water Conference Hotel Information

A block of rooms has been reserved at the Hawthorn Suites Resort, located next to the Convention Center, for conference participants. The rate for a single queen room is \$58.45 and \$75 for double occupancy, excluding taxes. The rate for a king suite is \$69 for a single, \$79 for double occupancy, excluding taxes. The rate includes a hot buffet breakfast. These rates are the discounted government rates offered by the hotel. The cutoff date for the block of rooms is **August 20, 2004**. Call the Hawthorn Suites Reservation Department at (866) 211-7727 to book your room. Participants must mention that they are attending the **New Mexico Water Conference** to get the conference negotiated rates.

Tularosa Basin National Desalination Research Facility Breaks Ground

The Tularosa Basin National Desalination Research Facility is officially underway. A groundbreaking ceremony was held June 29, 2004 in Alamogordo. The facility design and construction is a joint effort by the Bureau of Reclamation and Sandia National Laboratories. It will be a national center for research in the desalting of brackish groundwater found in inland states.

Senate Fellow Erik Webb, on loan from Sandia National Laboratories to the Senate in Washington, D.C., spoke at the event representing Sen. Pete Domenici, the prime supporter of the research facility development. "The facility will deal with improving water quality and quantity." Webb said the facility will take on desalination concepts designed and assembled elsewhere and then test them. The first project will be the testing of a U.S. Navy expeditionary force system developing small-scale mobile desalination units for use in emergency situations like those that might occur in Afghanistan where people are sometimes left without fresh water.

Following the U.S. Navy project, two technologies being developed under Department of Energy funding are on line to be tested at the facility. But not every project coming into the facility will need to be government related, Webb said. Legislation is in process to allow the facility to create commercial partnerships to test new commercial desalination technologies and systems. Webb said, "The first gallon of water comes out of the ground in February."

A tour of the facility site is scheduled for September 20, in conjunction with WRRI's annual water conference.



Right to left: Alamogordo Mayor Carroll; Mark Limbaugh, Bureau of Reclamation; Les Sheppard, Sandia National Labs; Manuel Lujan, Laguna Construction; Gov. Roland Johnson, Laguna Pueblo; Eric Webb, Senate Congressional Staff; Roy Phares, Laguna Construction.



Conference Registration Form

To attend the 49th Annual New Mexico Water Conference, please complete one form for each person attending. Mail form with check or payment information to NMWRRI-Water Resources Research Institute, MSC 3167, Box 30001, Las Cruces, NM 88003-8001.

For the Early Bird rate of \$150, registration must be received by July 31, 2004. Registration from August 1 until September 15 is \$200. After September 15 and at the door, registration is \$225. The registration fee will be refunded if written notice of cancellation is received by September 15th. A \$25 cancellation fee will be charged.

The registration fee includes the day-and-a-half conference, all breaks, lunch and dinner on Tuesday, and a copy of the proceedings on CD to be published after the conference.

Please check the following:

- Registration \$150 received by July 31, 2004 (Early Bird)
- Registration \$200 from August 1 to September 15, 2004
- Registration \$225 after September 15 and at the door
- Full-time** student registration \$60
- Luncheon ticket(s) for guest(s) \$20/guest
- Dinner ticket(s) for guest(s) \$30/guest
- I will be attending the Monday afternoon tour.
- Check enclosed
- Purchase order enclosed, No. _____
- Bill my credit card: (Visa, MC, Discover)
Card No. _____
Expiration date _____

Name _____ City _____ State _____ Zip _____
 Affiliation _____ Phone No. _____ Fax No. _____
 Mailing address _____ Email address _____

Information on WRRI's Homepage

Check the WRRI's homepage (wrri.nmsu.edu) for updated information about the conference. You may also register for the conference using our homepage by choosing the Water Conference link and following the instructions. Purchase order or payment must be received by mail to confirm registration.

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