



DIVINING ROD

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UNM student studies Rio Grande and riparian groundwater for presence of pharmaceutically active compounds

by Steve Carr, UNM Public Affairs Department

Have you ever wondered what exactly is in the water? Maceo Martinet, a graduate student in the Biology Department at the University of New Mexico did and was surprised by the results. Martinet's interest was first piqued by a report published in the journal *Environmental Science and Technology* in 2002. The article reported results from the first nationwide reconnaissance of the occurrence of pharmaceuticals, hormones, and other organic wastewater contaminants in 139 streams across 30 states.

"The report startled me because 80 percent of the streams sampled contained one or more of a suite of contaminants, which have a wide suite of origin, from residential, industrial, to agricultural," said Martinet.

"Based on the results of that report, I decided to look at what types of personal care products and pharmaceutical compounds are present along the Rio Grande."

Marinet set out to address two questions in his project: how is the Albuquerque Wastewater Treatment Plant (WTP) effluent altering the nutrient chemistry of the river and shallow alluvial groundwater, and what types and at what concentrations of personal care product compounds are present in Albuquerque's WTP?

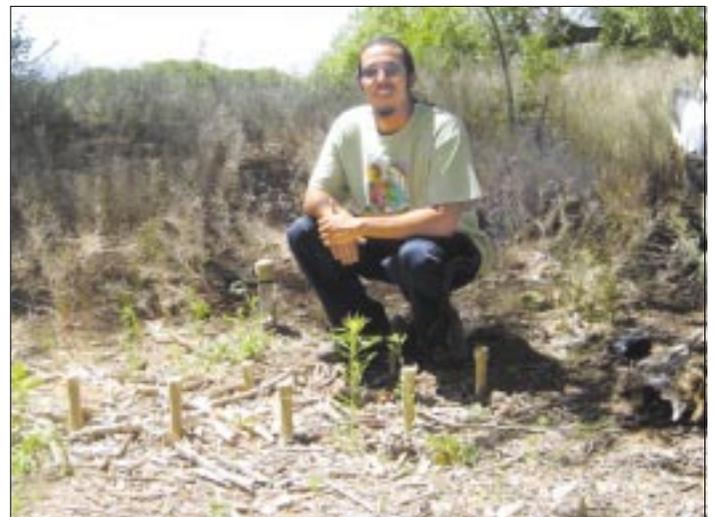
The effects of human activities on local, regional, and global biogeochemical cycles have become an issue of growing concern and increased research says Martinet in his research paper titled, "Presence of Pharmaceutically-Active Compounds in the Rio Grande and Riparian Groundwater."

The presence of such contaminants in our rivers is a result of human and veterinary use of pharmaceuticals and personal

care products (PPCP) from prescription drugs to fragrances and sunscreen agents, says Martinet. Martinet received funding for his research from the New Mexico Water Resources Research Institute's Student Research Grant program. Dr. Clifford Dahm from UNM served as Martinet's advisor on the project.

Marinet gathered samples using a syringe with an inline filter from five river sites upstream and downstream of the Albuquerque wastewater treatment plant discharge. He sent the samples to MWH Laboratories in California for analysis

(continued on page 2)



Maceo Martinet at the Hispanic Cultural Center research site, near a well network where the tracer injection experiment took place.

INSIDE

Student studies Gallinas Watershed
page 4

Student research grants announced
page 6

50th water conference program
page 10



(continued from page 1)

of a suite of 19 pharmaceuticals and endocrine disruptor compounds.

“With the financial help from WRRI, I was able to submit five samples to a lab in California,” said Martinet. “I sampled Albuquerque’s wastewater discharge effluent at three times, dusk, midday, and evening. I also sampled the shallow groundwater above and below the point of discharge about 30-40 feet from the bank of the Rio Grande. There were some interesting results that came back from the lab.”

Not only did the results indicate the presence of antibiotics and nonprescription drugs, insecticides, and other compounds, but the insecticide DEET, the anti-microbial ingredient triclosan, and several other fire retardant and plastic derived compounds were found in his test results at similar concentrations to those reported in the national reconnaissance study (Kolpin et al. 2002).

“One feature of this small data set that is curious is that the concentration of DEET in the shallow groundwater was roughly an order of magnitude greater than that coming out of the wastewater treatment plant, and that DEET in groundwater downriver from the treatment plant’s discharge was almost twice that of upriver,” said Martinet. “This indicates that potentially DEET could be concentrating within the soil matrix via absorption to clay or other minerals.”

According to the results, concentrations of the PPCP compounds were all in the parts per trillion range, except for DEET, which was found in the parts per billion range.

Martinet was also able to establish the fact that the [Albuquerque Wastewater Treatment Plant] is significantly altering the nutrient chemistry of the river and shallow riparian groundwater.

Martinet says in one study (Kummerer 2001), 80 different drugs were found in WTP, surface waters, groundwater, and drinking waters. Overall, he detected seven of 15 categories from the Kummerer study in his research.

Martinet was also able to establish the fact that the WTP is significantly altering the nutrient chemistry of the river and shallow riparian groundwater. As the Rio Grande passes the WTP, the waters become enriched in nitrate, phosphate, and ammonium. In his final report, he says little information is available on the effects the PPCP compounds have on organisms and processes, but new research suggests chronic exposure to certain PPCPs, even at low concentrations, can have biological effects on crustaceans, algae, and bacteria.

“I would love to do more work in addressing this question along the Rio Grande, but only if I can secure funding to pay for the analytical costs,” said Martinet. “I am looking for new grants, which can help me address this question of what is the occurrence of pharmaceuticals and health care products along the Rio Grande.”

Martinet, who is currently finishing work on his Ph.D. in biology with plans to pursue a teaching/research position at the university or community college level, said he is also interested in addressing the fate of PPCP compounds as they enter the shallow groundwater along the Bosque.

“I would like to investigate how far these various compounds travel in the groundwater (uptake length) until they are taken up via biological (microbial breakdown) or abiotic process (i.e., adsorption),” he said.



(continued from page 7)

times smaller than the pore size of the membrane – because they stick in the walls of the membrane, and it’s difficult to get them out, so they permanently clog the membrane,” Mehboob said. To keep his results focused on these smaller colloidal and dissolved particles, he allowed the Rio Grande samples to settle over a 24-hour period and pre-filtered them with a one-micron glass fiber tube to remove larger particle matter.

After testing, Mehboob analyzed both the permeates and the membranes for TOC, silica, and calcium concentration. He found some surprising results. Though previous studies found that calcium and silica promote membrane fouling, Mehboob’s tests showed that with Rio Grande water, dissolved calcium and silica had negligible effects. He found

that it was the particles in the colloidal range “that were clogging the membrane and forming layers on top,” he said. “I came to the conclusion that it is [colloidal] silt and clay that are responsible” for permanent membrane fouling. These results can guide future research and filtration designs specific to Rio Grande water, an important resource in New Mexico and the southwest.

Mehboob plans to continue his work in water treatment. “My end is to go into designing plants,” he said. Mehboob also said his research gives him a better understanding of how water treatment processes work, which will enable him to anticipate the results of his designs. “For every kind of design, you have to have some research background,” he said.



USGS recent publications

The U.S. Geological Survey has recently published several reports of interest to New Mexico water experts. Copies are available for inspection at the USGS District Office in Albuquerque (5338 Montgomery Blvd NE, Suite 400; 505-830-7923). The Water Resources Research Institute library also has the reports on file. They may be ordered from the USGS, Federal Center, Box 25286, MS 517, Denver, CO 80225. You may call 1-888-ASK-USGS for price information or go to <http://www.usgs.gov>. Complementary copies of the recent journal publications can be obtained by contacting Rika Lashley at rlashley@usgs.gov.

Simulation of Ground-Water Flow in the Basin-Fill Aquifer of the Tularosa Basin, South-Central New Mexico, Predevelopment through 2040 by G.F. Huff (SIR 2004-5197)

Effects of Reservoir Installation, San Juan-Chama Project Water, and Reservoir Operations on Streamflow and Water Quality in the Rio Chama and Rio Grande, Northern and Central New Mexico, 1938-2000 by J.B. Langman and S.K. Anderholm (SIR 2004-5188)

Use of Environmental Tracers to Estimate Parameters for a Predevelopment Ground-Water-Flow Model of the Middle Rio Grande Basin, New Mexico by W.E. Sanford, L.N. Plummer, D.P. McAda, L.M. Bexfield, and S.K. Anderholm (WRIR 03-4286)



New student assistant joins WRRI team

For the past five years, annual New Mexico water conference participants saw WRRI's student assistant, Michelle Cattaneo, busily video taping water conference presentations. Not only did Michelle assist with WRRI-sponsored meetings, she was instrumental in organizing the annual high school water essay contest, giving presentations to elementary and middle school students on water related topics, and serving as the institute's "go-to" person whenever we needed help. Michelle graduated in December 2004 with a bachelor's degree in animal and range sciences, is now pursuing a master's degree from NMSU in the same field, and is working as a graduate assistant in that department. We will miss Michelle's good nature, organizational skills, and baking!



Sara Ash

Our new student assistant, Sara Ash, was raised in Las Cruces and graduated with honors from Mayfield High School in 2004. She accumulated 33 AP (Advanced Placement) credits before beginning her college work at New Mexico State University. Sara is pursuing a Bachelor of Arts degree in English and minors in creative writing and philosophy as well. Sara's first article for the WRRI appears on page 4.

Like Michelle before her, Sara's duties at the institute include running errands around campus, shelving and cataloguing books in the library, editing publications, and helping out wherever she is needed.

In her spare time, Sara enjoys writing poetry, fiction, and creative non-fiction. She says she loves to sit and chat with her friends at local coffee shops, play Scrabble with her mom, draw with charcoal and oil pastels, and spend time with her boyfriend.

The WRRI is delighted to have Sara on board.



Highlands University student studies groundwater quality in the Gallinas Watershed

by Sara Ash, WRRI

Providing 95 percent of the water supply for Las Vegas, New Mexico, the Gallinas River originates in the Sangre de Cristo Mountains, where surrounding rock is primarily crystalline and weather resistant. On the lower end of the river, the water makes contact with permeable, sedimentary rock. According to New Mexico Highlands University student Thomas Evans, "The composition of stream water often reflects the composition of the drainage-basin geology with which the water has been in contact."

Hypothesizing that water quality deteriorates throughout the Gallinas Watershed due to differences in geology, Thomas Evans and his faculty advisor, Jennifer Lindline, analyzed water samples collected from the Gallinas Watershed for dissolved minerals, salts, metals, cations, and anions. With the help of a student research grant from WRRI, Evans collected seven surface water samples along the Gallinas River from natural springs and a local domestic well and gathered additional samples from Storrie and McCallister Lakes.

Evans sent his samples to Albuchemist Laboratories in Albuquerque, New Mexico to conduct tests for minerals, pH, conductivity, and total dissolved solids. At the New Mexico Highlands University laboratories, Evans tested water samples for hardness and alkalinity.

Tests determining water hardness measure the amount of calcium and magnesium salts present in the sample. Alkalinity tests, measuring the concentration of bases in water, detect how well the water samples neutralize acids. Conductivity tests measure the ability of an aqueous solution to conduct electrical current. Conductivity is directly proportional to the

Calcium, magnesium, sodium, chloride, sulfate, and bicarbonate concentrations, measured in mg/L, increased from the Upper Gallinas River to the Lower Gallinas River. Both iron and nitrate were found in the water samples, but concentrations remained well below safety guidelines in all samples.



Left: Spring discharging along Gallinas Canyon, southern boundary of the Las Vegas National Wildlife Refuge.

Below: Upper Gallinas River: Hermit's Peak trailhead.



concentration of total dissolved solids in the aqueous solution.

Hardness and alkalinity increased in samples collected further downstream on the Gallinas River. All samples were slightly alkaline. With increased concentrations of total dissolved solids in samples collected in the Lower Gallinas River, conductivity also increased. McCallister Lake demonstrated the highest level of conductivity.

Concentrations of all cations and anions were significantly higher in Storrie and McCallister Lakes. Evans believes this is due to evaporation effects. As water evaporates, soils dry
(continued on page 5)



out and salts appear. Precipitation causes runoff with high salt concentrations. Large amounts of natural stream drainage and landscape runoff at Storrie Lake dilute the salt concentrations, but at McCallister Lake there is insufficient water to do so.

According to Evans, the salt concentrations in McCallister Lake have “serious implications regarding the health and stability of the Las Vegas National Wildlife refuge...Increasing salt concentrations in the lakes and soils limit nutrient uptake by biota.”

Evans concluded that water quality throughout the Gallinas watershed degenerates moving downstream due to differences in geology of the upper and lower portions of the river. From the beginning of the Gallinas River up to Montezuma Skating Pond, where water flows through crystalline rocks, water quality remained constant. Beyond Montezuma Skating pond to the Lower Gallinas River, water quality decreased. The river’s contact with

sedimentary rock in this region correlated to water quality degradation.

Dr. Jennifer Lindline comments that the data gathered from this research help “to evaluate natural contributions to water quality characteristics.”

“Continuing and growing demands for water necessitate that the Gallinas River be managed for water production and protection of water quality,” Evans affirms.

Upcoming Meetings

July 12-14 2005 UCOWR/NIWR Annual Conference, River and Lake Restoration: Changing Landscapes, Portland, ME
www.ucowr.siu.edu

July 21-22 2005 Water Law & Policy Briefing, Water Education Foundation, Hyatt Regency Islandia Hotel, Mission Bay, San Diego, CA www.watereducation.org

August 15-16 13th Annual New Mexico Water Law, CLE International, Eldorado Hotel, Santa Fe, NM www.cle.com

August 16 2005 New Mexico Water Research Symposium, Advances in Hydrology: Methods and Instruments, New Mexico Tech, Socorro, NM wrii.nmsu.edu

September 19-23 Riparian Assessment Workshop, New Mexico Riparian Council, Rancho del Chaparral Girl Scout Camp, Jemez Mountains, NM www.ripariancouncil.org

October 18-20 WRII’s 50th New Mexico Annual Water Conference, New Mexico Water: Past, Present, and Future or Guns, Lawyers, and Money, New Mexico State University, Las Cruces, NM wrii.nmsu.edu

October 26-27 16th Annual South Platte Forum, This Is a Hard-Working River, Longmont, CO www.southplatteforum.org

October 30-November 3 New Mexico Environmental Health Conference, Sheraton Old Town Hotel, Albuquerque, NM
www.nmehc.net

November 7-10 8th Biennial Conference of Research on the Colorado Plateau: Preservation and Restoration of Colorado Plateau Natural and Cultural Landscapes, Northern Arizona University, Flagstaff, AZ www.usgs.nau.edu/conf2005/

November 7-10 American Water Resources Association 2005 Annual Conference, Seattle, Washington www.awra.org

December 14-16 Colorado River Water Users Association 60th Annual Conference, Caesars Palace, Las Vegas, NV
crwua.com



STUDENT WATER RESEARCH AWARDS ANNOUNCED

The New Mexico Water Resources Research Institute (WRI) has announced recipients of the 2005-2006 Student Water Research Program. This program funds water-related research projects conducted by students at any of New Mexico's universities.

The program encourages and supports graduate and undergraduate student research in disciplines relevant to water resources issues and assists New Mexico educational institutions in developing student research expertise and capabilities. Students will begin research on these projects as early as May 2005 and will complete their projects by September 2006. The WRI monitors the student projects, and updates are available at the institute's website at wri.nmsu.edu/research/researchprogram.html. Congratulations to this year's recipients.

Eastern New Mexico University

Monica L. Enke, Department of Anthropology and Applied Archaeology

Cattails and Ostracodes: An Investigation of Prehistoric Water Management in the Chupadera Arroyo Basin, NM

New Mexico Highlands University

Simone-Camille Yelah Tar, Department of Natural Sciences

Groundwater Quality and Well Water Assessment in Las Vegas New Mexico Area

Justin Johns-Kaysing, Department of Natural Sciences

Surveying Health Risks Associated with Arsenic in the Gallinas Watershed

New Mexico State University

Maritza A. Macial-Corral, Department of Civil and Geological Engineering

Riparian Evapotranspiration Estimates on the Middle Rio Grande Using Remote Sensing

Prajwal Vikram, Department of Chemical Engineering

Modeling of Mass and Heat Transport in Membrane Distillation Process for Brackish Water Desalination

Cheryl Rosel, Department of Agronomy and Horticulture

Soil Recovery after Herbicide Treatment of Saltcedar Stands and Management Implications

Jessica Hamel, Department of Microbiology & Biology

*Rapid Detection of Human Fecal Contamination Using *sIgA* as an Indicator*

New Mexico Tech

Meinhard Bayani R. Cardenas, Department of Earth and Environmental Science

Numerical Modeling Investigation of Fluid Flow above and below Sediment-Water Interfaces

Alex J. Rinehart, Department of Earth and Environmental Science

Hydrometeorological Field Studies during the North American Monsoon in the Valles Caldera National Preserve

Sue White, Department of Environmental Engineering

Investigation of Transpiration Water Loss from Pinyon-Juniper Forests

University of New Mexico

Lydia Zeglin, Department of Biology

Water Quality along the Middle Rio Grande of New Mexico

Jennifer Follstad Shah, Department of Biology

Mycorrhizal Colonization in Cottonwood and Salt Cedar Stands along the Middle Rio Grande

Chelsea Crenshaw, Department of Biology

Human Impacts on Nitrate Dynamics in Hyporheic Sediments Using a Stable Isotope Tracer



UNM student conducts research on filtration of Rio Grande

by Sari Krosinsky, UNM Public Affairs Department

In a state with limited water resources, water treatment can have an important role to play in fully utilizing the resources we do have. Khalid Mehboob, who received an M.S. in civil engineering with an emphasis in environmental engineering at the University of New Mexico in May, recently completed research on the effects of calcium and silica on the filtration of water from the Rio Grande.

Membrane treatment, a technology still in its infancy, is a multi-billion dollar industry used for a wide range of purposes, from drinking water to industrial processes. Though filtration is commonly used, fouling or clogging can pose a serious problem by reducing the effectiveness of membranes and raising the cost of water treatment. Microfiltration membranes, the type used in Mehboob's research, can rapidly lose 90 to 95 percent of their permeability due to fouling.

"Membrane treatment depends a lot on the type of source water you have," Mehboob said. Because different water sources will have different effects on membranes, each water source must be tested to understand accurately the fouling effects of that source on different membranes. Mehboob



Khalid Mehboob

"I came to the conclusion that it is [colloidal] silt and clay that are responsible" for permanent membrane fouling.

chose the Rio Grande for his source water because, though the effects of calcium and silica on membranes have been studied with

lake water and artificial samples, no research had been done studying these effects on the kind of river water found in the Rio Grande. His results may provide background research for the river's future filtration projects.

Mehboob was one of 13 state university students who received a one-year research grant from the New Mexico Water Resources Research Institute for fiscal year 2003-2004. The initial year of this grant program was funded by an increase in appropriations to the institute by the state legislature. The grants support research by undergraduate and graduate students at New Mexico's six public universities. The awards for FY 05-06 are listed on page 6.

Because effects can vary for different membranes with the same source water, Mehboob tested four types of microfiltration membranes – Cellulose Acetate, Polyethersulfone, Polypropylene, and Polyvinylidene

Fluoride – in a dead end filtration cell. Microfiltration membranes are the oldest and least expensive types of membranes and have the largest pores – 4 - 0.02 μm – which makes it possible to operate them at low pressures—for this experiment, 10 and 20 psi. Mehboob tested three types of source water: deionized water with controlled amounts of calcium and silica added in proportion to the amounts found in the Rio Grande, Rio Grande water, and Rio Grande water with calcium and silica added to confirm the results from the unmodified river water. Prior to testing, samples were analyzed for pH, calcium concentration, silica concentration, and Total Organic Compound (TOC) concentration. Results were later compared with the composition of the treated water. Flux was continuously monitored at one-minute intervals throughout testing.

Previous studies found that particles that are just on the surface and larger than the pore size can be cleaned out. "But the major problem that is irreversible and cannot be treated is from the particles which are very small – twenty, thirty

(continued on page 2)



WRRI senior hydrogeologist John W. Hawley honored with Earth Science Award

State Senator Carlos R. Cisneros and Dr. John W. Hawley were each recipients of the Second New Mexico Earth Science Achievement Award earlier this year. The awards are co-sponsored by the New Mexico Bureau of Geology and Mineral Resources and the State Energy, Minerals and Natural Resources Department and are presented to individuals who have made outstanding contributions to advancing or facilitating the role of geoscience in areas of education, research, public service, and public policy in New Mexico. The first recipients were Dr. John W. Shomaker and State Representative Joe Stell. This year's presentations were made by Dr. Daniel H. López, President of New Mexico Tech and Secretary of the Energy, Minerals and Natural Resources Department, Joanna Prukop.

John Hawley is a familiar face to the New Mexico water community after his decades of work in the state, including 20 years at New Mexico Tech, where he is now Emeritus Senior

Environmental Geologist. At the awards ceremony, held at the rotunda of the State Capitol building, he was honored for "...His technical expertise in the geology and hydrogeology of New Mexico, combined with his professional and scientific integrity and contributions to public service and policy, [earning] him the unequivocal respect of his peers, colleagues, and clients. This award is made for his outstanding contributions advancing the role of Earth science in areas of applied science and education in New Mexico."

"John developed the framework for our understanding of geologic deposits and water-bearing units within individual basins throughout New Mexico," said New Mexico Tech President Daniel H. López at the award presentation.

"Because of John's work eliminating time and effort to locate new wells, we were able to locate a gold mine – water of high quality was found," said Governor Everett Chavez of Santa Domingo Pueblo.



Left to right: John W. Hawley, Carlos Cisneros, Joanna Prukop, and Daniel H. López.

"A lot of what he has done, which people do not know, has been pro bono. He has always been available to do that for our tribes. I cannot put into words our deep gratitude for his help."

Since retiring from the New Mexico Bureau of Mines and Mineral Resources in 1997, John has been employed on a part-time basis with the WRRI. He also operates Hawley Geomatters, a consulting service in environmental and groundwater geology of the New Mexico region. John's work with WRRI involves development of GIS digital-hydrogeologic framework models that support state-of-the-art water-resource management. Currently, he is finishing an addendum to last year's publication "Creation of a Digital Hydrogeologic Framework Model of the Mesilla Basin and Southern Jornada del Muerto Basin." The addendum will include modeling of the Rincon Valley and adjacent areas of Doña Ana, Sierra and Luna Counties and was developed in collaboration with former WRRI GIS Coordinator, Dr. John Kennedy, and NMSU student assistants Marquita Ortiz and Sean Carrasco.



Santo Domingo Pueblo members helped celebrate Dr. Hawley's 2005 Earth Science Achievement Award. Left to right: Christopher Chavez, Governor Everett Chavez, John's wife, Diane Hawley, John Hawley, and Lt. Gov. John Nieto. Photo by Dr. Paul Bauer.



Deadline: July 15, 2005

for submission of abstracts for presentations and/or posters at the **2005 New Mexico Water Research Symposium**

The one-day symposium, *Advances in Hydrology: Methods and Instruments*, will be held August 16, 2005 at the Macey Center on the NM Tech campus in Socorro.

A new topic has been added to those announced in the Call for Abstracts: **reservoir evaporation.**

Abstracts must be submitted online at www.wrri.nmsu.edu.

WRRI publishes new report and addendum

The following two reports are available on-line via the WRRI website at wrri.nmsu.edu. Hard copies of the reports are available by calling the institute at 505-646-4337 or ordering the reports on-line.

WRRI Technical Completion Report No. 334
Effects of Salinity and Suspended Sediment on Physical Properties of the Egg of the Rio Grande Silvery Minnow (*Hybognathus amarus*) by David E. Cowley, Janelle Alleman, Ryan R. McShane, Patrick D. Shirey, and Rossana Sallenave (13 pp.)

WRRI Technical Completion Report Addendum to No. 332
Digital Hydrogeologic Framework Model of the Rincon Valley and Adjacent Areas of Doña Ana, Sierra and Luna Counties, NM (an addendum to: Creation of a Digital Hydrogeologic Framework Model of the Mesilla Basin and Southern Jornada del Muerto Basin) by John W. Hawley, John F. Kennedy, Marquita Ortiz, and Sean Carrasco (addendum on CD)

CLE has approved 12.4 general credit continuing legal education credits for the 50th Annual New Mexico Water Conference

50th Annual New Mexico Water Conference Hotel Information

A number of conveniently located hotels have rooms available for participants. Check wrri.nmsu.edu/conf/conf05/conf.html for a map of hotels. The following is a list of hotels and conference rates, excluding taxes.

Day's End Lodge
 755 N. Valley Dr.
 (505) 524-7753
 \$35 one bed; \$40 two beds

Hilton Hotel
 705 S. Telshor Blvd.
 (505) 522-4300
 \$89.00 single or double

Holiday Inn Express
 2200 S. Valley Dr.
 (505) 527-9947
 \$89.75 two queen beds

Comfort Suites
 2101 S. Triviz
 (505) 522-1300
 \$70 single, double, triple or quad
 Cut-off date: September 27, 2005
 Mention you are attending the NM Water Conference

Ramada Inn The Palms (formerly Holiday Inn de Las Cruces)
 201 E. University Ave.
 (505) 526-4411
 \$65 single or double
 Cut-off date: September 27, 2005
 Mention you are attending the NM Water Conference



NEW MEXICO WATER: PAST, PRESENT, AND

Tuesday Afternoon, October 18, 2005

Tour of Elephant Butte Dam, hosted by the Bureau of Reclamation, in conjunction with the 100th anniversary of the *Rio Grande Project*. Tour buses will be located at the west parking lot of the Fulton Athletics Center on the New Mexico State University campus (see map at: wri.nmsu.edu/conf/conf05/tour.html) and will leave at **1:00 p.m.** The tour buses will return at about 5:00 p.m. A reception at the Fulton Athletics Center will immediately follow the return of the tour buses. Parking is available at the Fulton Athletics Center. **Due to security concerns, tour participants MUST register for the tour.**

Wednesday Morning Session, October 19, 2005

- 8:15 Opening Remarks: [Karl Wood](#), Water Resources Research Institute, Director
[President Michael Martin](#), New Mexico State University
- 8:30 **ALBERT E. UTTON MEMORIAL WATER LECTURE**
Prior Appropriation Law and Future Water Allocation: Preserving Water for Future Generations
[Charles T. DuMars](#), Law and Resource Planning Associates, P.C.
- 9:15 **TRIBUTE TO RALPH STUCKY, FIRST WRRI DIRECTOR**
[John Hernandez](#), New Mexico State University
[Bobby Creel](#), Water Resources Research Institute
- 9:45 Break
- 10:15 **THE BUREAU OF RECLAMATION: THE LAST 103 YEARS AND THE NEXT 47**
[John W. Keys, III](#), Commissioner, Bureau of Reclamation
- 11:00 **WATER POLICY IN NEW MEXICO: FROM THE CONSTITUTION AND EARLY STATUTES TO TODAY'S DEMANDS AND TOMORROW'S NEEDS**
The History of New Mexico Water: The Inside Story, [G. Emlen Hall](#), University of New Mexico School of Law
Protecting Priority Water Rights While Meeting New Demands, [Joe Stell](#), New Mexico Representative
- 12:00 Lunch on Your Own

Wednesday Afternoon Session, October 19, 2005

- 1:30 **WATER USE PROJECTIONS: MEETING FUTURE DEMAND**
Long Term Demographic Uncertainty and Water Demand in New Mexico, [Jim Peach](#), Department of Economics and International Business, New Mexico State University
Urban Water Pricing: A Historical Perspective and the Challenges for the Future, [Janie Chermak](#), Department of Economics, University of New Mexico
- 2:15 **AGRICULTURAL WATER USE**
Irrigated Agriculture Values and Issues in Water Resources Management, [Darryll Olsen](#), The Pacific Northwest Project, Washington
Institutional Barriers to Water Transfers: Challenges and Opportunities
[Frank Ward](#), Department of Agricultural Economics and Agricultural Business, New Mexico State University
- 3:00 Break



FUTURE OR GUNS, LAWYERS, AND MONEY

3:30 **INSIDE NEW MEXICO PANEL DISCUSSION**
ECONOMIC DEVELOPMENT AND LAND USE: HOW DO WE CONTINUE TO GROW WHILE LIVING WITHIN OUR “WATER MEANS”?

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

[Karyn Stockdale](#), Trust for Public Land

[Tom Phillips](#), Bureau of Land Management

[John Stomp](#), City of Albuquerque

[James Rivera](#), Pueblo of Pojoaque

[Janet Jarratt](#), Middle Rio Grande Conservancy District Farmer

[David Steinborn](#), Real Estate Developer

6:00 Dinner at Corbett Center
 Entertainment by [Baxter Black](#), Cowboy Poet

Thursday Morning Session, October 20, 2005

8:15 **WATER QUALITY: THE LOOMING CRISIS**
The Two Q's: The Connection between Water Quality and Water Quantity
[Ron Curry](#), New Mexico Environment Department
Creating Effective Source Water Protection through Regional Collaboration
[Matt Holmes](#), New Mexico Rural Water Association

9:15 **A LOOK AT THE COMPACTS AND ARE THEY WORKING?**
History of the Compacts, [Phil Mutz](#), retired, Office of the State Engineer
Current Challenges, [Estevan Lopez](#), New Mexico Interstate Stream Commission

10:15 Break

10:30 **WATER MANAGEMENT IN NEW MEXICO**
Active Water Resource Management, [John D'Antonio](#), Office of the State Engineer
Active Water Resource Management in the Lower Rio Grande: Adapting to Basin Requirements, [Phil King](#),
 New Mexico State University
Adjudications: Getting to “Finished,” [Jerald A. Valentine](#), Third Judicial District Court
Indian Water Rights Settlements, [Stanley Pollack](#), Navajo Nation

12:00 Luncheon at Corbett Center
PERSONAL REFLECTIONS ON THE WRII PROGRAM
[Tom Bahr](#), Former WRII Director

1:30 **WATER MARKETS: HOW DO WE ENCOURAGE MARKET DEVELOPMENT WHILE PROTECTING THE PUBLIC?**
How Voluntary Transfers Can Be Structured to Address Community, Environmental and Other Third Party Concerns,
[Bonnie Colby](#), Department of Agricultural and Resource Economics, University of Arizona
Water Market Development in New Mexico and Western States: The State's Role, [Ari Michelsen](#),
 Texas Agricultural Experiment Station, Texas A&M

2:30 **WATER DEVELOPMENT: IS THERE REALLY “NEW WATER” OUT THERE?**
Regional Trends in the Use and Reuse of Impaired Waters, [Mike Hightower](#) and [Rich Kottenstette](#),
 Sandia National Laboratories and [Larry Webb](#), City of Rio Rancho
Municipal Water Reuse, [Ed Archuleta](#), El Paso Water Utilities

3:00 **ENVIRONMENTAL AND ECOLOGICAL ISSUES: HISTORY AND FUTURE OF ESA, NEPA, AND THE CLEAN WATER ACT**
[Sterling Grogan](#), Middle Rio Grande Conservancy District

3:30 Adjourn



Conference Registration Form

To attend the 50th Annual New Mexico Water Conference, please complete one form for each person or register on-line at: wrri.nmsu.edu and choose the Water Conference link. To register by mail, send this form and check or payment information to NMWRRI, NMSU, MSC 3167, P.O. Box 30001, Las Cruces, NM 88003-8001. Make checks payable to NMWRRI.

For the Early Bird best rate of \$175, registration and payment must be received by September 2, 2005. Registration from September 3 through October 12 is \$225. After October 13 and at the door, registration is \$250. The registration fee will be refunded if written notice of cancellation is received by October 12, 2005. A \$25 cancellation fee will be charged.

The registration fee includes all conference functions and a copy of the proceedings on CD to be published after the conference.

Please check the following:

- Registration \$175 received by September 2 (Early Bird)
- Registration \$225 from September 3 through October 12
- Registration \$250 after October 12 and at the door
- Full-time** student registration \$75
- Luncheon ticket(s) for guest(s) \$20/guest
- Dinner and entertainment ticket(s) for guest(s) \$45/guest
- I will be attending the Tuesday afternoon tour and reception.
- I will be attending the dinner banquet on Wednesday evening. Please let us know if you will be attending as seating is limited and we would like to make dinner tickets available for as many non-conference guests as possible. Guest tickets are available on a first come basis.

Name _____

Affiliation _____

Mailing address _____

City _____ State _____ Zip _____

Phone No. _____ Fax No. _____

Email address _____

Check enclosed

Purchase order enclosed, No. _____

Please bill my credit card: (Visa, MasterCard, Discover)

Card No. _____

Expiration date _____

Signature _____

Information on WRRI's Homepage

Check WRRI's Homepage for updated information about the conference. You can also register for the conference using our Homepage at wrri.nmsu.edu. Choose the Water Conference link and follow the instructions. Purchase order or payment must be received by mail to confirm registration.

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