

Divining Rod

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NMSU Student Studies Possible Benefits of Acequias

by Louie Calderon, NMSU University Communications

With water in New Mexico at a premium, the Rio Grande has long been depended on as an important water source for the Southwest. Stretching through the state's borders, the river supplies water to crops through acequias—irrigation canals, but these canals may be beneficial in more than just field irrigation.

Ciara Cusack, a range sciences master's student at New Mexico State University, was awarded a grant by the New Mexico Water Resources Research Institute to study other acequia benefits near Alcalde, New Mexico.

The benefits include the recharge of shallow groundwater that could supply the river during drier months and the sustainability and restoration of the native vegetation along the river bank.

"It's important to native riparian vegetation, water quality, quantity, and wildlife," said Cusack of her study.

Cusack, who has been working on the project for more than a year, has characterized a 10 km stretch of riparian vegetation through aerial photographs and random field sampling. She also analyzed soil samples for bulk density, moisture content, and texture.

From the sampling and images, the riparian species have helped Cusack estimate how much water is lost and how much seepage is going back to the river after



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Ciara Cusack takes a GPS reading at a sampling site near Alcalde, New Mexico.

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2008 Upcoming Meetings

- July 31-August 1 *New Mexico Water Law*, Marriott Pyramid North, Albuquerque, NM, www.cle.com/nmwater
- August 3-5 *4th Annual Practical Short Course on Water: Desalination, Process and Wastewater Issues and Technologies*, Texas A&M, College Station, TX, www.tamu.edu/separations
- August 12 *New Mexico Water Research Symposium*, Macey Center, New Mexico Tech, Socorro, NM, wrrri.nmsu.edu
- September 20-24 Arizona Hydrological Society and American Institute of Professional Geologists *2008 Annual Symposium: Changing Waterscapes and Water Ethics for the 21st Century*, Flagstaff, AZ, www.azhydrosoc.org
- September 24-26 Groundwater Resources Association of California *17th Annual Meeting – Groundwater: Challenges to Meeting Our Future Needs*, Costa Mesa, CA, www.grac.org/am08.asp
- October 20-22 *Surface Water Opportunities in New Mexico*, Embassy Suites, Albuquerque, NM, wrrri.nmsu.edu
- November 17-20 *AWRA 2008 Annual Water Resources Conference*, Sheraton Hotel, New Orleans, LA, www.awra.org/meetings/NewOrleans2008/

WRRRI Bids Sara Ash Farewell

Student assistant, Sara Ash, will leave the WRRRI in August after having worked for the institute for three years. Sara has been instrumental in providing technical support at the past several WRRRI conferences and symposia. She also contributed many research project articles to this newsletter and recently helped redesign it. We encourage you to look at WRRRI's modified webpage, which is one of several projects Sara has undertaken this summer.



Sara graduated with high honors from NMSU in May with bachelor's

degrees in philosophy and English. She earned a 4.0 grade point average and received numerous academic awards, including the Verna Newman Rule,

Jim Ferguson Ethics, and Alumni/Faculty Endowed Philosophy scholarships.

The philosophy department of the University of Southern California has accepted Sara into their Ph.D. program. Although excited to live in the L.A. area, she says she'll miss her family, the WRRRI crew, Hatch green

chile, and New Mexico's scenery and wildlife. 💧

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evapotranspiration—the transport of water from the earth’s land surface to the atmosphere.

“Currently the amount of water lost due to riparian evapotranspiration is poorly quantified along the northern Rio Grande,” Cusack said.

More accurate estimates of the return flow provided by the acequias and irrigation can be used to help with future management decisions.

While Cusack was gathering samples, she noticed an area along the river with Rio Grande Cottonwood that was growing near the acequia seepage. This observation is what led to her study of the possible benefits of acequias to native vegetation.

“Maintaining the riparian vegetation is important for both wildlife habitat and reducing the spread of non-native plants that have been slowly taking over the riparian areas previously vegetated by natives,” Cusack said.

Cusack said that more drought tolerant species such as the Russian Olive can contest the native plants, reducing habitat diversity.

To determine whether the lateral seepage from the acequias creates areas where restoration efforts of native

vegetation could be focused, Cusack planted Rio Grande Cottonwood pole cuttings at varying distances from the acequia, near the river, and in the open field.

Cusack compared the pole cuttings’ growth rates and water stress levels to measure the results of the water seepage absorption. To determine these stress

Cusack said restoration of riparian areas is important for water conservation, water quality, and for providing vital habitat requirements, reducing the spread of non-native vegetation.



Ciara installs soil water content and temperature probes (top) and plants cottonwood pole cuttings (left).

“This information can be used to determine possible acequia benefits and the overall water budget, which will help in future management decisions regarding

the region and the Rio Grande,” according to Cusack.

Cusack said she plans on completing her study in August. She received a bachelor’s degree in fisheries resources from the University of Idaho in 2004 and is scheduled to graduate from NMSU in 2009 with a master’s degree in range sciences. 💧

levels, Cusack took individual leaf measurements from the pole cuttings and weighed them to find how much water was being taken in.

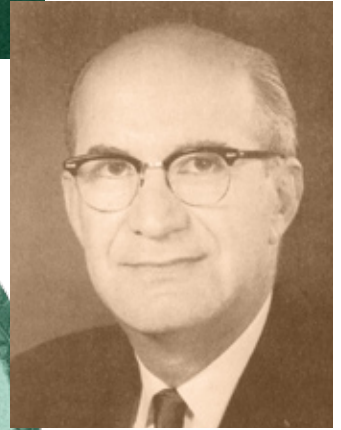
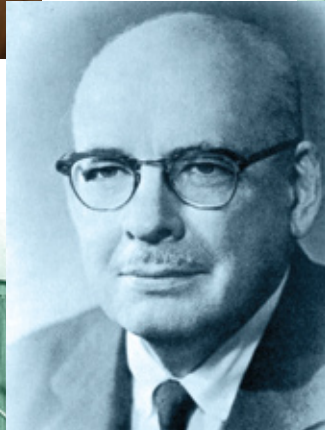
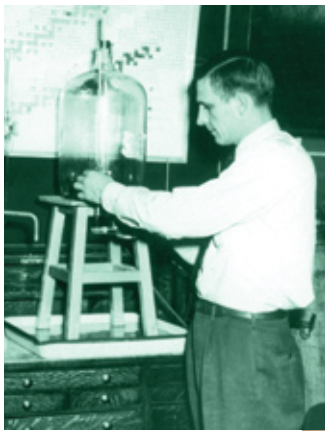
“This study has great importance to the agricultural region of northern New Mexico,” Cusack said. “Water conservation is becoming a more prevalent topic as increased development puts higher demands on the region’s water supplies.”

John Hernandez to Present 2008 Albert E. Utton Water Lecture

How many of these men can you identify?

Hint: They are men who made a lasting impact on the water management in New Mexico.

To find out, join us on October 21, 2008, when John W. Hernandez will give the 2008 Albert E. Utton Memorial Water Lecture, "100 Years of Water Management in New Mexico – Stories about the People Involved." The Utton Lecture is part of the 53rd Annual New Mexico Water Conference: Surface Water Opportunities in New Mexico, which will be held at the Embassy Suites in Albuquerque on October 20-22. If you are unable to attend the conference, you are welcome to join us for the luncheon and lecture on Tuesday. Please purchase tickets in advance at <http://wrri.nmsu.edu> or by calling WRRRI at 575-646-4337.



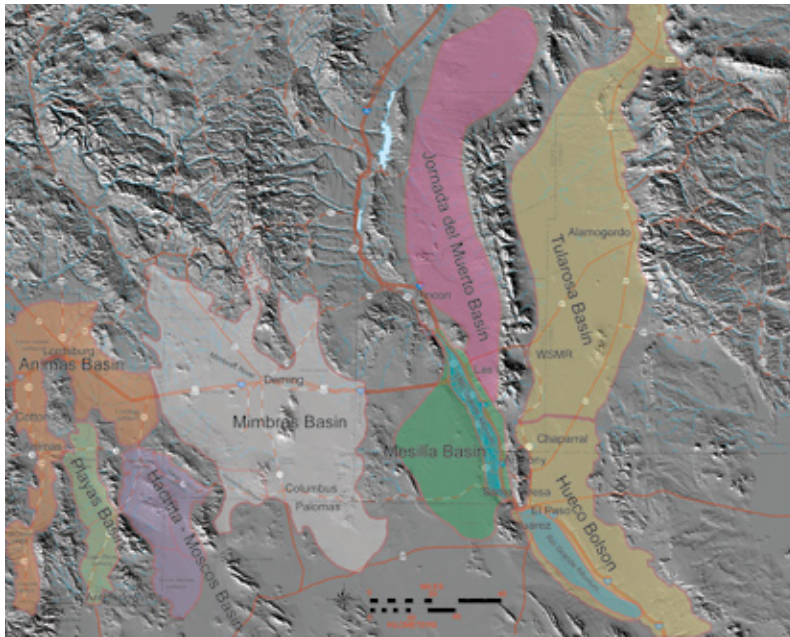
Transboundary Water Supplies Target of Institute's Research

Mario A. Montes, NMSU University Communications

Are the U.S. and Mexico running out of water along their border? Researchers don't know because little is known about the common underground basins both countries tap into. There is only speculation and theory on how large, how deep, what the directional flow, and what the quality of the water is. Most importantly, researchers don't have specific measurements on how fast the supply of underground water is being used.

"One of the greatest problems with water along the border in southern New Mexico is that we don't know much about our aquifers," said WRRI director Karl Wood, in describing the results of a 2002 field meeting with U.S. Senator Jeff Bingaman.

Researchers will now begin to find answers to these crucial questions regarding underground water supplies with a recent appropriation of \$500,000 from the "United States-Mexico Transboundary Aquifer Assessment Act" created by Senate Bill 214, which became law in late 2006. Bingaman and U.S. Senator Pete Domenici, were the New Mexico sponsors of the bill.



The Act authorizes \$50 million for fiscal years 2007 through 2016 to allow the Secretary of Interior and the U.S. Geological Survey to cooperate with the Arizona, New Mexico, and Texas Water Resources Research Institutes, state water resource agencies, and other relevant entities to conduct hydrogeologic characterization, mapping, and modeling programs for priority transboundary aquifers. The Mesilla and Hueco Basins are the designated priority aquifers in southern New Mexico, west Texas, and Mexico.

Even though the Act was passed in 2006, no funds were appropriated in fiscal year 2007 because of the continuing resolution. Some funds were appropriated for 2008, and this

has allowed the program to begin work in the Mesilla Basin aquifer. The funds are shared among the three states, USGS water science centers, and the three states' water resources research institutes. In future years and with sufficient appropriations for the program, the WRRIs can provide funds to state water agencies, Sandia National Laboratory, and other agencies, including counterparts in Mexico.

"We have three tasks that have been initiated this first year: First is to review previous work and existing information and assess the data gaps. Second, we will review and update previous hydrogeologic work that has been done in the

U.S. as well as explore its expansion into Mexico. The third task will initiate a review of previous groundwater modeling programs. We want to assess which model would be the best model to use for the whole basin, which includes the Mexican part," said Bobby Creel, WRRI's associate director.

The region is one of the fastest growing areas in the U.S. and Mexico with the El Paso region alone projected to get an influx of 65,000 people

by the year 2013 due to the military's Base Realignment and Closure figures. "Water is a major factor in the economic development of these areas," Wood said. Groundwater is used for all of the drinking water in southern New Mexico, all of Juarez, and half of the El Paso area. The use of groundwater for irrigation is also a factor due to the continuing drought that has affected these areas, he said.

When future allotments of the transboundary money are released, other underground water basins will be studied and more extensive analysis will be done on the priority aquifers, Wood said. 💧

Research Examines Non-Point Source Pollution for Regulation and Urban Planning

by Steve Carr, UNM

Researchers in the Economics Department at the University of New Mexico recently conducted studies focusing on non-point source pollution, a large contributor to declining water quality, and the regulatory mechanisms utilized to control the problem as it pertains to agriculture.



Recent UNM doctoral graduate Gwen Aldrich (left) confers with UNM Professor Janie Chermak.

Non-point source pollution is the largest contributor to water quality impairment, which suggests that further water quality improvements will require addressing non-point pollution problems. Numerous sources of non-point pollution exist, including runoff from agricultural, silvi-cultural, construction, and urban areas.

Water quantity and water quality are huge concerns in the arid southwestern United States. Water quality is affected by point and non-point pollution, while quantity is affected by increased demands including population growth, non-market uses, and declining supply.

Agriculture is the biggest culprit when it comes to non-point pollution. Sediment, nutrients, pesticides, salts, and pathogens all contribute to water quality issues according to the U.S. Environmental Protection Agency.

“Agriculture is the largest non-point pollution source we have,” said Professor Janie Chermak. “The problem is that because it’s not point-source, you can’t say ‘this is from A and this is from B.’ You can regulate by using a tax, which is to tax people on the input, or you can use a standard that says ‘you can use no more than x .’”

Funded by the New Mexico Water Resources Research Institute, the research titled, “Water Quality and Land Use: Implications for Regulation and Urban Planning,” focused on two aspects of non-point source pollution. Using a theoretical model, they examined the impact of regulatory mechanisms directed at agricultural non-point contributions. Under what conditions are taxes preferred over standards when farmers are assumed to be risk-averse? They then empirically examine which factors impact the probability that vacant land will be developed.

Regulating non-point source pollution is difficult, but a number of mechanisms have been proposed that focus on either standards or taxes.

“Other people have looked at this issue: given that we’re going to regulate, which method is better? Should we be using a tax or should we be using a standard,” said Gwendolyn Aldrich, who recently earned her Ph.D.

Aldrich, who conducted the research with Assistant Professor Jennifer Thacher and Chermak, said farmers are typically risk averse and wondered how that affected which mechanism should be used to try to mitigate the non-point pollution.

They found that the introduction of risk preferences substantially impacts results and that generic regulation is not appropriate.

“The preliminary results indicate that risk aversion does have an affect on which regulatory mechanism we should be using,

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and that's particularly true for certain types of inputs," said Aldrich. "Looking at a larger issue, I had an interest in conducting this research. By regulating the farmer, we're going to be decreasing their profits, which may actually cause some farmers to decide that farming isn't really worth it.

"If we're doing that, are those farmers going to sell that land, potentially to developers, and if we're increasing our urban land use in that area, what sort of implications might that have on water quality? We're mitigating agriculture but we might be causing an increase in the urban pollution."

After showing that the efficient mechanism choice varies, they examined the probability that vacant land will be developed. Using Albuquerque, New Mexico, as a southwestern case study, they empirically examined what factors impact development. They found a number of factors that are significant in the probability that land will be developed.

"You might try to mitigate pollution in one area, but you may actually be impacting and changing people's incentives or choices in what they do," said Aldrich. "They may sell their land, and it may become urban, which then means you just traded off one type of non-point source pollution for another."

"I think it really is safe to say that it isn't one size fits all," said Chermak. "It's very local and very characteristic specific as to what would be the best setup. Why do we end up developing certain pieces of land? Are there characteristics about land that it tends to have a higher probability of being developed? Higher profitability agricultural land is less likely to be developed.

"However, if we lower the profitability, guess what? The probability of development is going to increase, meaning the switch from agricultural to urban land will have an impact on non-point source pollution levels and thus water quality." 💧

7th Annual New Mexico Water Research Symposium

August 12, 2008, Macey Center, New Mexico Tech

The popular one-day symposium featuring oral presentations and posters summarizing current water-related projects will take place on Tuesday, August 12. The symposium is hosted by the WRI and co-sponsored by Sandia National Laboratories, Los Alamos National Laboratory, the New Mexico Interstate Stream Commission, the American Water Resources Association-New Mexico Section, and New Mexico's universities.

This year's poster and presentation abstracts are available online at <http://wri.nmsu.edu/conf/tc08/symposium.html>. You may register for the symposium at the same site.

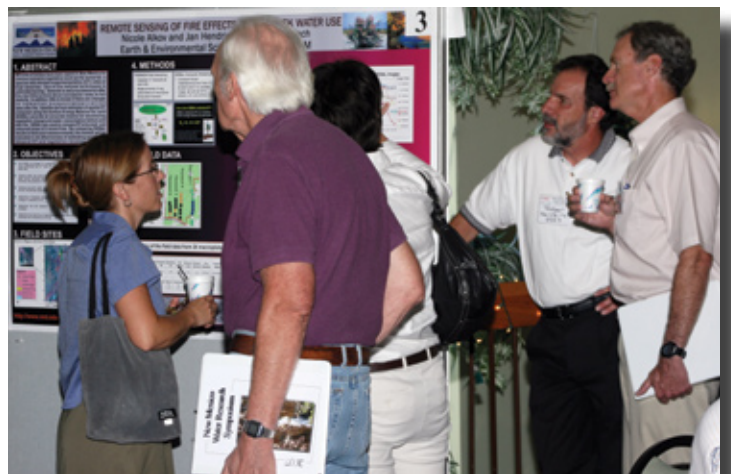


photo by Stephen Nowaczek

Meet the Researchers



Janie M. Chermak
Prof. of Economics, UNM
Email: jchermak@unm.edu

Research Focus

natural resource and environmental economics (emphasis in water and energy), applied microeconomics, and experimental economics

Education

Ph.D. mineral economics, 1991, Colorado School of Mines
M.S. mineral economics, 1988, Colorado School of Mines
B.A. geology, 1979, Western State College, Gunnison, CO

Experience

Janie Chermak joined the faculty at UNM in August 1995 and is now full professor in the Department of Economics. Prior to coming to UNM, she was an assistant professor of economics at the Naval Postgraduate School in Monterey, CA, from 1992 to 1995. She was also a Visiting Scholar at Rutgers University during the fall

of 2001 and a postdoctoral research associate at the Colorado School of Mines in the early 1990s.

Courses Taught

Graduate courses in Natural Resource Economics, Natural Resource Modeling, Economic Theory, Mathematical Economics, Interdisciplinary Water Resources I and II: Basin Survey and Modeling; Undergraduate courses in Industrial Organization, Principles of Microeconomics, Natural Resource Economics, Society and the Environment, and others

Recent Projects

National Parks Service, "Valuation of Riparian and Aquatic Resources, Black Canyon of the Gunnison National Park" 2006-2009.

National Drought Mitigation Center, "Drought, Risk, and Mitigation Information System" 2007-2008.

American Water Works Association Research Foundation, "Setting Water Utility Investment Priorities: Assessing Customer Preferences and Willingness to Pay" (co-PI) with J.A. Thacher and B. Thomson; 2008-2010.

United States Department of Agriculture, "Strategic Behavior, Incentives, Heterogeneity, and Invasive Species Management" (PI) with K. Grimsrud, J. Thacher, and K. Krause; 2005-2008.

Sandia National Laboratories, "Fully Integrated System Dynamics Toolbox for Water Resources Planning" (PI) with D. Brookshire, J. Thacher, and K. Grimsrud; 2004-2006.

Los Alamos National Laboratory, "The ZeroNet Project" 2004-2005.

Recent Publications

"Water Quality and Land Use: Implications for Regulation and Urban Planning" with G.A. Aldrich and J.A. Thacher. Technical Completion Report, New Mexico WRRI, 2008, in press.

"A Two-Agent Dynamic Model with an Invasive Weed Diffusion Externality: An Application to Yellow Star Thistle in New Mexico" with K. Grimsrud, J. Hansen, K. Krause, and J.A. Thacher, *Journal of Environmental Management*, forthcoming.

"Conceptual Issues of Benefit Transfers and Integrated Modeling" with D. Brookshire, in *Environmental Value Transfer: Issues and Methods*, Eds. S. Navrud, R. Ready, and O. Olvar in the Kluwer Academic Publishers series entitled "The Economics of Non-Market Goods and Resources," April 2007.

"Fully Integrated System Dynamics Toolbox for Water Resources Planning: Economic Components" with D. Brookshire, J. Thacher, and K. Grimsrud, Sandia National Laboratories, 2006.

"Water Prices in New Mexico" with J.K. Hansen, prepared for the Office of the State Engineer, 2006.

"Urban Water Pricing: A Historical Perspective and the Challenges for the Future," Proceedings of the 50th Annual New Mexico Water Conference, New Mexico WRRI, 2005. 💧

Research Focus

natural resource and environmental economics, health economics, public economics, modeling, and estimating preferences

Education

Ph.D. economics, 2003, University of Colorado, Boulder
M.A. economics, 1999, University of Colorado, Boulder
B.A. economics and history, 1995, University of California, Davis
Dissertation: *Modeling and Estimating Preferences over Treatment Programs for Depression*

Experience

Jennifer Thacher joined the faculty at UNM in 2003 after completing her dissertation at the University of Colorado at Boulder. Besides working as a graduate assistant while earning her degrees, she has worked as a statistical consultant.

Courses Taught

Graduate course in mathematical tools and economic models; Undergraduate courses in microeconomics, and environment and society

Recent Projects

American Water Works Association Research Foundation, "Setting Water Utility Investment Priorities: Assessing Customer Preferences and Willingness to Pay" (PI) with J. Chermak and B. Thomson; 2008-2010.

US Forest Service, Region 3, "A Continuing Research Agenda into Understanding Behavioral and Economic Responses to Forest Restoration in the Southwest" (co-PI) with R. Berrens (PI); 2006-2007.

United States Department of Agriculture, "Strategic Behavior, Incentives, Heterogeneity, and Invasive Species Management" (co-PI) with J. Chermak (PI), K. Grimsrud, and K. Krause; 2005-2008.

US Forest Service, Region 3, "Public Attitudes, Beliefs, and Values towards National Forests and National Forest Management" (co-PI) with R. Berrens (PI); 2005-2007.

Recent Publications

"Building Social Capital in Forest Communities: Analysis of New Mexico's Collaborative Forest Restoration Program" with T. Prante, D. McCollum, and R. Berrens, forthcoming in *Natural Resources Journal*.

"Intra-Regional Amenities, Wages, and Home Prices: The Role of Forests in the Southwest" with M. Hand, D. McCollum, and R. Berrens, forthcoming in *Land Economics*.

"Interactive Physical and Economic Model for Exploring Riparian Restoration Options: Application to the Middle Rio Grande" with M. Weber and V. Tidwell, Sandia National Laboratories Report SAND2008-0250, January 2008.

"Relating Environmental Attitudes and Contingent Values: How Robust are Methods for Identifying Heterogeneous Groups?" with G.A. Aldrich, K. Grimsrud, and M. Kotchen, *Environmental and Resource Economics*, 37(4): 757-775, 2007.



Jennifer Thacher
Assistant Prof. of Economics, UNM
Email: jthacher@unm.edu

"Evaluating Coasean Bargaining Experiments with Meta-Analysis" with T. Prante and R. Berrens, *Economics Bulletin*, 2007.

"Faculty Compensation at UNM: Is the Reward System Equitable?" with M. Binder, J. Chermak, J. Gilroy, and K. Krause, UNM Provost Report, January 2007.

"Integrated Modeling and Ecological Valuation: Applications in the Semi-Arid Southwest" with D.S. Brookshire, L.A. Brand, M.D. Dixon, K. Benedict, J.C. Stromberg, K. Lansey, D. Goodrich, M. McIntosh, J. Grandy, S. Stewart, C. Broadbent, and G. Izon. EPA, NCEE, NCER Valuation for Environmental Policy: Ecological Benefits. Conference Proceedings, 2007. ♦

NMSU Student Investigates Potential Salt Contamination of Aquifers

by Sara Ash, WRRRI

New Mexico State University (NMSU) doctoral student Elena Sevostianova points to an array of sensors scattered across a table in the soil physics laboratory. She's in the process of calibrating six different types of sensors, purchased with the help of a WRRRI student research grant, to determine which one will best measure how salinity affects soil moisture content.



Elena Sevostianova holds a green-seeker, used to monitor changing turfgrass conditions during the growing season.

Her study is part of a long-term research project on turfgrass conducted near NMSU's golf course. For about four years, researchers have applied potable (0.6 dS/m), moderately saline (1.5 dS/m), and saline water (3.5 dS/m) to a variety

of cool season and warm season grasses to determine which species are most tolerant to salinity. Soil salinity measurements were taken at 10 cm, 20 cm, and 60 cm below the surface.

Some of the grasses did not survive, but researchers have continued working with the remaining species. "The cool season grasses can be very sensitive," says Elena. "Warm season grasses are more tolerant to drought and salinity." Seashore paspalum, a warm season grass, has proven to be quite tolerant and done very well throughout the study.

Elena notes that more than 70 percent of all groundwater in New Mexico is saline. If this water could be put to use for turfgrass irrigation, it would ease the burden on scarce potable water sources. While finding a grass tolerant to drought and salinity is important for irrigating with non-potable water, switching to saline waters is not as simple as that.

"Here, we don't have to worry about groundwater contamination because the water is very deep," Elena says. "If the groundwater is shallow, then irrigation with non-potable water could be a problem." As salts accumulate in the soil, they may contaminate groundwater sources. "It is a very vulnerable system," she adds. How salts accumulate and move through soil profiles is not well understood, so Elena plans to use sensors to monitor salinity.

Using an extractor in the soil physics lab, Elena has been calibrating sensors and developing retention profiles for two different types of soil. This process has been slow. "Working with sensors needs patience," Elena says. "Each sensor has limitations and advantages. We want to use sensors for measuring soil water content. However, there is a concern about the influence of soil salinity on the sensor readings."

Once Elena has found the sensor that will allow her to measure both salinity and moisture content well, she will install the sensors at 10 cm, 50 cm, and 500 cm in the turfgrass plots established near NMSU's golf course and will collect salinity readings daily. Data will also be collected

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Elena uses an extractor to develop a retention profile for a soil sample.

from irrigated bare soil plots and from undisturbed non-irrigated areas. The salinity data she collects—along with other information about the soil, including the soil type and types of chemicals and salts in the soil—will be put into HYDRUS, a computer modeling system that predicts the movement of solutes through soil profiles.

“We hope to find out exactly what is going on below the surface, exactly how the salts move through soil,” Elena says. Her findings will help determine the feasibility of using non-potable waters for landscape irrigation.

Elena is from Russia, where she received a B.S. from St. Petersburg State University in 1990. She obtained an M.S. in horticulture from NMSU in 2004. After completing her Ph.D., she hopes to find a research position. ♦

53rd Annual New Mexico Water Conference Surface Water Opportunities in New Mexico

October 20-22, 2008, Embassy Suites, Albuquerque, NM

Hotel Information

The conference will be held at the Albuquerque Embassy Suites. A block of rooms has been reserved at the hotel for conference participants. The rate for a single or double room per night is \$129 plus taxes. The block of rooms is available on a first-come, first-serve basis, and the cut-off date is *Saturday, September 20, 2008*. Individual reservations can be made by calling Embassy Suites Hotel at 1-800-362-2779. To receive the conference rate, identify yourself with New Mexico Water Resources. Guests can make reservations online at <http://www.embassysuitesalbuquerque.com> and enter the group/convention code NMW to receive the group rate.

Registration Information

For the Early Bird best rate of \$175, registration and payment must be received by September 12, 2008. Registration from September 13 through October 6 is \$225. After October 6 and at the door, registration is \$250.

You can register for the conference using WRRI’s homepage: <http://wrri.nmsu.edu>. Choose the Water Conference link and follow the instructions. Purchase order or check must be received by mail to confirm registration. Check WRRI’s homepage for updated information about the conference.

The New Mexico MCLE Board has approved 8.9 continuing legal education credits for the 53rd Annual New Mexico Water Conference.



WRRRI Updates Its Website and the Newsletter Goes Digital

Take a look at the WRRRI website update. We hope you find it very user-friendly. Let us know if you have any suggestions for the site. Our thanks go to our student assistant, Sara Ash, who completed the website update for the institute.

Beginning with its next issue, the *Divining Rod* will be published primarily online at the New Mexico WRRRI website: <http://wrrri.nmsu.edu>. A very limited number of hard copies will be available.

Please contact Peggy Risner at 575-646-4337 or email her at prisner@wrrri.nmsu.edu to make sure we have your correct email address. We will send email alerts announcing when a new issue of the *Divining Rod* is available online.



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