



DIVINING ROD

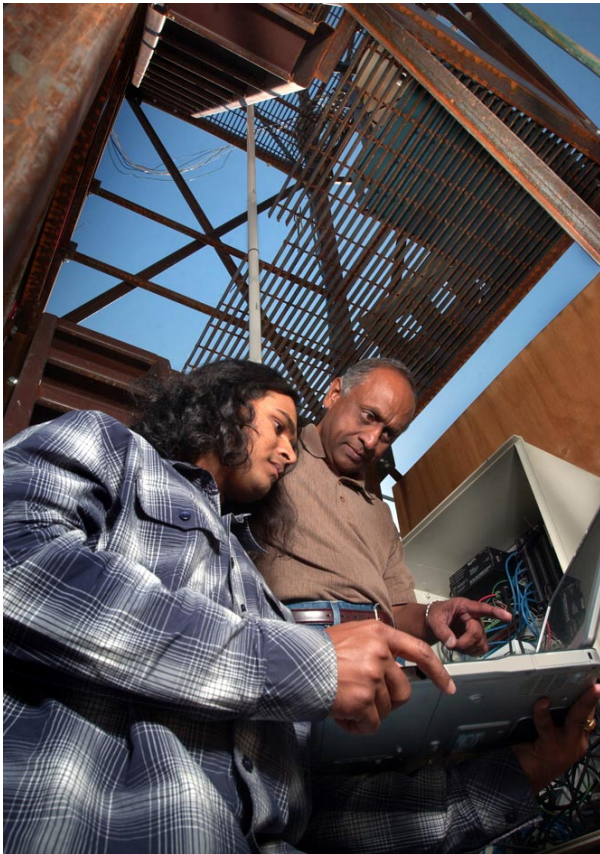
NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

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June 2007

Researchers develop low-cost, low-energy desalination process

by Karl Hill, NMSU University Communications



NMSU civil engineering professor Nirmala Khandan, right, and doctoral student Veera Ganeswar (John) Gude check the control center of their prototype water desalination project. Operational data can be downloaded onto a laptop computer. (NMSU photo by Ben LaMarca)

A low-cost water desalination system developed by New Mexico State University engineers can convert saltwater to pure drinking water on a round-the-clock basis – and its energy needs are so low it can be powered by the waste heat of an air conditioning system.

A prototype built on the NMSU campus in Las Cruces can produce enough pure water continuously to supply a four-person household, said Nirmala Khandan, an environmental engineering professor in NMSU's Department of Civil Engineering.

New Mexico and other parts of the world have extensive brackish groundwater resources that could be tapped and purified to augment limited freshwater supplies, but traditional desalination processes such as reverse osmosis and electrodialysis consume significant amounts of energy.

This research project, funded by the New Mexico Water Resources Research Institute, explores the feasibility of using low-grade heat – such as solar energy or waste heat from a process such as refrigeration or air conditioning – to run a desalination process.

Khandan said the project builds on a process, first developed by researchers in Florida, that makes distillation of saline water possible at relatively low temperatures – 45 to 50 degrees Celsius (113 to 122 degrees Fahrenheit) rather than the 60 to 100 C (140 to 212 F) required by most distillation processes.

The system utilizes the natural effects of gravity and atmospheric pressure to create a vacuum in which water can evaporate and condense at near-ambient temperatures. Two 30-foot vertical tubes – one rising from a tank of saline water and the other from a tank of pure water – are connected by a horizontal tube. The barometric pressure of the tall water columns creates a vacuum in the headspace.

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At normal temperatures, Khandan said, evaporation from the pure-water side will travel to the saline side and condense as the system seeks equilibrium. "That's nature," he said. "We want it to go the other way."

Raising the temperature of the water in the headspace over the saline column slightly more than that of the freshwater column causes the flow to go in the other direction, so that pure, distilled water collects on one side and the brine concentrate is left behind in a separate container.

A temperature increase of only 10 to 15 degrees is needed, Khandan said.

"That's the trick of this vacuum," he said. "We don't have to boil the water like normal distillation, so you can use low-grade heat like solar energy or waste heat from a diesel engine or some other source of waste heat."

Potentially a desalination system using this method could be coupled to a home's refrigerated air conditioning system, Khandan said.

"When you air condition a house, you are pumping the heat outside the house, and the heat is wasted into the atmosphere," he said. "We want to capture that heat and use it to power this desalination system."

The 30-foot-tall NMSU prototype is powered by a solar panel. Khandan and his research assistant, civil engineering

doctoral student Veera Ganeswar Gude, have modified the process originally developed by Florida researchers to incorporate a thermal energy storage device that allows the system to operate around-the-clock, using stored energy at night. The Institute of Energy and Environment housed in the NMSU College of Engineering helped them instrument the system.

Their research on the system's capabilities has been presented at national and international conferences and their research continues.

As with any desalination process, the system leaves behind a brine concentrate that

must be disposed of, and some potential users may be put off by the unit's height, "but this technology could go to commercial scale pretty quickly," Khandan said. "The overall cost of desalination by this process can be very competitive."

The project is one of many research initiatives at NMSU aimed at addressing the critical needs of New Mexico and the nation. It has been presented at several meetings including the 3rd International Conference on Thermal Engineering: Theory and Applications in Amman, Jordan in May 2007.

Dr. Khandan has submitted a proposal to the National Science Foundation's Integrative Graduate Education and Research Trainee Program (IGERT) to develop an energy program that includes this project.



A photovoltaic module (in the foreground) captures the last rays of the sun to produce electricity, which is used to drive this desalination process (in the background). (Photo by N. Khandan)

CLE has approved 8.7 general continuing legal education credits for the 52nd Annual New Mexico Water Conference



52nd Annual New Mexico Water Conference

Beyond the Year of Water: Living within Our Water Limitations

November 29 - 30, 2007; Santa Fe La Fonda



Thursday Morning, November 29, 2007

8:15 Introduction by [Karl Wood](#), WRI Director
Welcoming Remarks by Santa Fe Mayor [David Coss](#)

8:45 Keynote Address: What Happens after the Year of Water? New Mexico Lt. Gov. [Diane Denish](#) (invited)

9:30 USGS Water Programs and Initiatives

[Mark Myers](#), Director, U.S. Geological Survey

10:00 Break

10:30 Update on the State of the State's Water
[John D'Antonio](#), NM State Engineer

11:00 New Mexico Indian Water Rights Settlements and Their Economic Impact on Tribes and Pueblos
Chairman [Joe Garcia](#), All Indian Pueblo Council

11:30 Preview of Legislative Water Issues 2008
New Mexico Representative [Andy Nunez](#), Chair, Committee on Agriculture and Water Resources

12:00 Lunch on Your Own

Thursday Afternoon, November 29, 2007

1:30 Demographics and Water Demand in New Mexico and the Southwest
[Adelamar Alcantara](#), Bureau of Business and Economic Research, University of New Mexico

2:00 Market Prices as Measures of Water Scarcity in New Mexico and the West
[F. Lee Brown](#), University of New Mexico

2:30 A Living River Fund
[John Horning](#), Forest Guardians

3:00 Break

3:30 Western Agriculture at Risk from Climate Change and Competing Water Demands
[Pat O'Toole](#), Family Farm Alliance

4:00 Panel Discussion: The Federal Perspective and Initiatives on Water

Moderated by [Karl Wood](#), WRI Director
[Mike Connor](#) for Senator Jeff Bingaman
[Zane Vaughn](#) for Senator Pete Domenici
[Tim Charters](#) for Congressman Steve Pearce
[Matt Miller](#) for Congressman Tom Udall
[Robert Cushing](#) for Congresswoman Heather Wilson

5:00 Reception hosted by Daniel B. Stephens & Associates

6:30 Dinner Banquet

Friday Morning, November 30, 2007

8:30 Climate Research and Applications Needs in Support of Climate Services
[Roger Pulwarty](#), National Oceanic and Atmospheric Administration

9:00 Governor's Task Force Report on Climate Change
[David Gutzler](#), University of New Mexico

9:30 Climate Change and Its Implications for New Mexico's Water Resources and Economic Opportunities
[Brian Hurd](#), New Mexico State University

10:00 Break

10:30 What to Do with Water Left Over after Needs are Met?
[Bob Grant](#), Grant Enterprises, Inc.

11:00 New Mexico's EPSCoR Proposal to NSF Regarding Climate Effects on Mountain Water Supplies
[Albert Rango](#), USDA-ARS-Jornada Experimental Range, New Mexico State University

11:30 Water Capital and Water Productivity – Ways to Address Fresh Water Availability Limitations
[Mike Hightower](#), Sandia National Laboratories

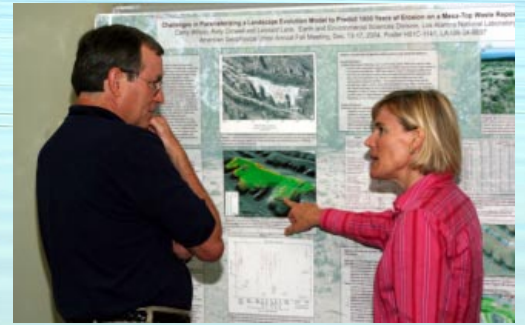
Register online at wri.nmsu.edu



2007 New Mexico Water Research Symposium

Abstracts for Presentations and Posters Due July 6, 2007

Submit abstracts and register for the symposium at <http://wrri.nmsu.edu/conf/tc07/symposium.html>



Macey Center
New Mexico Tech
August 14, 2007

New Home for NMSU's SCERP Office

Erin M. Ward, New Mexico director of the Southwest Consortium for Environmental Research and Policy (SCERP), is pleased to announce the relocation of the SCERP research consortium to the offices of WRRI in Stucky Hall. The move is designed to leverage the strengths of the two research centers while improving administrative efficiency for research and grant support.

"I see this as a win-win," says Ward. "It's a perfect match for the SCERP program, which will benefit from the Institute's excellent reputation, its infrastructure, and superb staff. Likewise, the move strengthens capabilities at WRRI by extending the Institute's reach into U.S.-Mexico border communities." The SCERP program is significant for obtaining federal authorization that allows U.S.-based researchers to spend U.S. research dollars in Mexico.

The SCERP consortium is an 18-year-old collaboration of five U.S. and five Mexican institutions of higher education whose original mission was to address problems faced by communities at the U.S.-Mexico border. Recently, the consortium increased its funding for projects in the areas of

water quality, water conservation, water planning, and mapping of groundwater resources in the border region.

The SCERP consortium has earned a number of community and research honors, including an award from the prestigious Charles Lindberg Foundation and the Smithsonian Institution in Washington. Recently, the Consortium was cited by EPA as one of the nation's top water research entities for

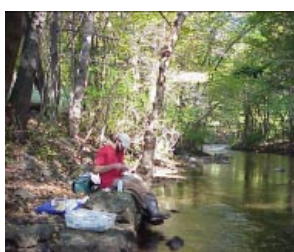
an arsenic-removal project conducted in Columbus, NM. SCERP has received the endorsement of New Mexico's border communities and the Border Trade Alliance (BTA), a U.S.-Mexico and U.S.-Canada trade organization. At NMSU, SCERP researchers are active in NMSU's Border and Water research clusters and sub-clusters.

Universities with membership in SCERP include Arizona State University, New Mexico State University, San Diego State University, the University

of Texas at El Paso, and the University of Utah. The consortium's Mexican partners are El Colegio de la Frontera Norte, Instituto Tecnológico de Ciudad Juárez, Instituto Tecnológico y de Estudios Superiores de Monterrey, Universidad Autónoma de Baja California, and Universidad Autónoma de Ciudad Juárez.



Erin Ward (left) and graduate student assistant Edgar Barrantes relocated with the SCERP program to the WRRI.



2007-2008 Student Water Research Grant Program deadline for proposals July 8, 2007

The New Mexico Water Resources Research Institute has announced the 2007-2008 Student Water Research Grant Program. This program encourages and supports graduate and undergraduate student research in disciplines relevant to water resources issues and assists New Mexico institutions of higher education in developing student research expertise and capabilities.

Proposals must have a faculty sponsor and students must be enrolled full-time in a degree program at one of New Mexico's six public education institutions (NMSU, UNM, NMT, ENMU, WNMU, or NMHU). The faculty sponsor is responsible for ensuring that the proposal has been processed according to their university's proposal submission policies and procedures.

WRRI's goal is to fund a minimum of two research projects at each New Mexico institution, with each award no greater than \$5,000 for the project period. It is anticipated that grants will start on August 15, 2007 with final reports due September 30, 2008.

To get more information on the program and to submit a proposal, go to <http://wrrri.nmsu.edu/research/rfp/studentgrants07/stgr.html>

WRRI students graduate

Three New Mexico State University students who work in WRRI's GIS lab completed degree programs in May 2007. They work alongside several other students in the lab under the direction of Dr. Bobby Creel, WRRI Associate Director.

Quita Ortiz has completed a master of applied geography degree. She successfully defended her thesis entitled "The Impacts of Land Use Change on Water Resources and Traditional Acequia Culture in North-central New Mexico" in April. Quita received an NMSU Research Mini-Grant for the project and will publish the results of her study in the next issue of *the Journal of Contemporary Water Research and Education*. She has worked on various WRRI mapping projects for the past four years.

Two other students who have been employed at the WRRI for the past year graduated with bachelor's degrees in geography this spring. Susanna Glaze graduated with a B.A. in history and a B.S. in geography with a minor in GIS. She presented a project entitled "Rio Grande Basin Initiative: Interactive Mapping for New Mexico" at the Joint Rio Grande Basin Initiatives 2007 Annual Conference in South Padre Island in May 2007. Susanna has been awarded an NMSU Graduate Student Research Grant that will allow her to continue working with Dr. Creel during her master's program in applied geography.



From left: Casey Gomez, Quita Ortiz, and Susanna Glaze.

Casey Gomez majored in geography and earned minors in GIS and wildlife sciences. While at the WRRI, he worked on the U.S.-Mexico Geospatial Database mapping the border aquifers for the binational water aquifer project. Casey also assisted with deploying the Microsoft SQL and ESRI SDE. He hopes to find a GIS-related position, possibly with the federal government.



ENMU Students Receive WRRI Grants for Water Research

by Erin Griffith, Communications Services, ENMU

Two graduate students from Eastern New Mexico University are currently working on projects sponsored by the New Mexico Water Resources Research Institute. Nicole Harings and Irene Roselli are pursuing an M.S. in biology with emphases in aquatic ecology and animal behavior.

behaviors. I have already learned so well what needs to go into a good experiment and how a real research project works,” said Harings, who received her B.S. from the University of Wisconsin Stevens Point.

Harings is studying tadpole shrimp and their effectiveness as a biological control agent against mosquito larvae. The tadpole shrimp are being tested in three conditions: a control where the shrimp are

With the results of her study, Harings will be able to determine how well the tadpole shrimp will be able to deplete mosquito larvae in different conditions. In addition, the study might help researchers to know how plausible and economically efficient it will be to use tadpole shrimp against mosquito larvae.

Because of the seasonal conflict, part of the grant money went to helping Harings bring in mosquitoes for her study.

“Because I have to store tons of mosquitoes in the building, whenever anyone gets a mosquito bite, even if it wasn’t here, they blame me,” Harings said.



Irene Roselli was born and raised in Belen, New Mexico. Before arriving at ENMU for graduate work, she earned a bachelor’s degree from New Mexico Tech in biology.

Still in the data collection phase of their studies, both Harings and Roselli have already learned a large amount not only from their projects but also from applying for the grant.

“Writing and obtaining the grant was very helpful because it shows people in the future that I am capable of doing so,” said Roselli, who received her B.S. in biology from New Mexico Tech.

“It requires a lot of time and patience to sit and observe an organism for a long period of time to learn their typical

placed in water with no mosquito larvae, in water previously occupied by mosquito larvae, and in water with mosquito larvae present.

“I wanted a project that I could do in a lab, and we have a lot of tadpole shrimp in our area. Whether or not it turns out that the tadpole shrimp prefer the mosquito larvae, the experiment is worthwhile,” Harings said.



Roselli’s field site is located at the Melrose Migrant Trap in Melrose, New Mexico.

Roselli is studying *Daphnia* (water fleas) and their reproductive habits when confronted with a predator. She is using the *Daphnia* as a model organism to see the habits of organisms when they are being preyed upon and how it affects the prey population.

“I am testing in areas of high predators, low predators and a control with no predators. With the results we will be able to see the survivorship strategy for the *Daphnia* and use the results to compare with other invertebrate and even vertebrate prey species,” Roselli said.

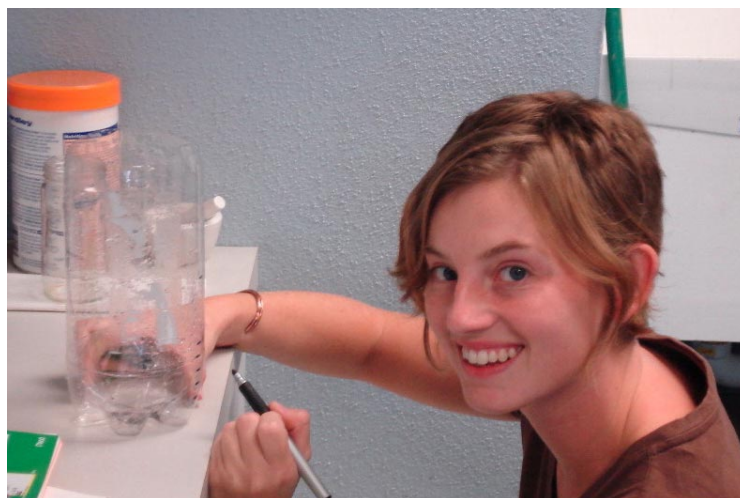
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While she has not started analyzing her data yet, the trend Roselli sees is that *Daphnia* produce a larger amount of

“Because I have to store tons of mosquitoes in the building, whenever anyone gets a mosquito bite, even if it wasn’t here, they blame me,” - *Nicole Harings*



Nicole Harings plans to defend her master’s thesis in June 2007. She is originally from Stevens Point, Wisconsin.

eggs more quickly when in an area of high predators, indicating that they allocate more energy to reproduction in that setting.

“The project has been great; I’ve learned a lot, from how to write a grant, as well as how to carry out a large experiment in a lab,” Roselli said.

After receiving their master degrees, Harings and Roselli wish to pursue a Ph.D. program. Harings is potentially looking at New Mexico State University. Upon receiving Ph.D.s, Roselli is interested in becoming a professor, while Harings would like to work with a non-profit organization as a conservationist biologist.

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Española. His project was entitled “Watershed Watch.” Joe has participated in science fairs since 3rd grade. He credits his mother and Mr. Schraeder of the New Mexico Department of Game and Fish for their encouragement and assistance in his project.

Second place in the Junior Division went to Jessica Rhodes of Las Cruces. She is an 8th grader at Sierra Middle School’s science magnet program. Jessica’s science teacher, Mr. Wibe encouraged her project, and she is thinking about studying science in college. Her project was entitled, “Got Water? The Effectiveness of Solid and Liquid Desiccants in Extracting Water.”

2007 Upcoming Meetings

June 9: Middle Rio Grande Water Assembly, UNM, Albuquerque, NM (www.WaterAssembly.org)

June 25-27: 2007 AWRA Summer Specialty conference – Emerging Contaminants of Concern in the Environment: Issues, Investigations, and Solutions, Vail Cascade Resort, Vail, CO (awra.org)

August 6-7: New Mexico Water Law, Marriott Pyramid North, Albuquerque, NM (www.cle.com)

August 14: 2007 New Mexico Water Research Symposium, NM Tech, Socorro, NM (<http://wrri.nmsu.edu/conf/tc07/symposium.html>)

August 27-29: Symposium on the Settlement of Indian Reserved Water Rights Claims, Hyatt Regency, Albuquerque, NM (<http://www.westgov.org/wswc/meetings.html>)

August 29-Sept 1: SAHRA, Tucson, “Sustainable Water, Unlimited Growth, Quality of Life: Can We Have It All?” (<http://www.sahra.arizona.edu/>)

October 13-18: New Mexico Environmental Health Conference, Hotel Albuquerque at Old Town (<http://www.nmehc.net/>)

November 7-9: NWRA annual conference, Hyatt Regency Albuquerque (<http://www.nwra.org/>)

November 12-15: 43rd AWRA Annual Water Resources Conference, Embassy Suites Hotel, Albuquerque, NM (awra.org)

November 29-30: 52nd WRI Annual Water Conference, La Fonda, Santa Fe, NM (<http://wrri.nmsu.edu/conf/conf07/conf.html>)



Students garner awards for water-related projects at the New Mexico science fair

The 2007 New Mexico Science and Engineering Fair was held at New Mexico Tech on April 13-14. The Fair accepts the top exhibits from the six regional science fairs in the state. Its objectives are to recognize and reward excellence in science, mathematics, and engineering projects carried out by junior high and high school students from throughout the state. Winners at the state level compete in the Intel International Science and Engineering Fair held in a major city every May. The 2007 Intel International Science and Engineering Fair will be held in Albuquerque.

The New Mexico WRI presented awards to students in the Senior Division made up of students from grades 9 through 12, and the Junior Division for grades 6 through 8. This year, 165 students competed in the Senior Division and 271 in the Junior Division.



Keely Goodgame

In the Senior Division, Keely Goodgame, a senior at San Jon High School, received the first place award

and \$100 for her project, entitled “An Economical Arsenic Filtering Device.” Keely’s aim was to develop an economical way to filter arsenic from drinking water specifically for impoverished people in third world countries. Her goal was to treat contaminated drinking water down to the 10 ppb arsenic level set by the EPA.

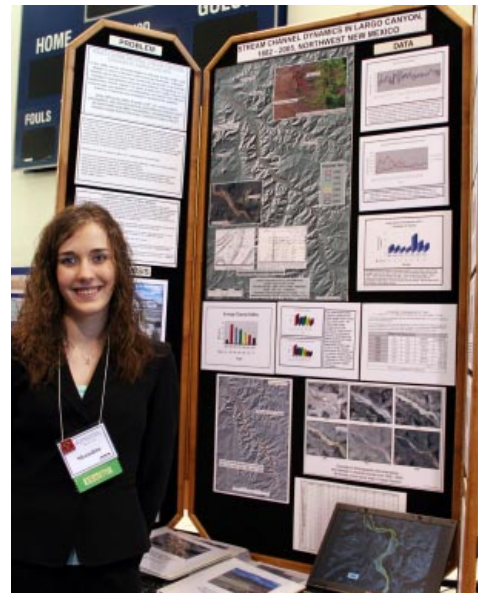
Keely first conducted experiments to determine whether iron oxide, titanium oxide, As Proactive B, As Proactive, or ViroMine pellets would treat water contaminated with arsenic at the 100 ppb level. She conducted the tests at acidic, neutral, and basic pH levels to ensure that contaminated water could be effectively treated at all ranges. According to Keely, “The Proactive B media effectively removed the arsenic at all pH levels tested.”

She then developed three different prototype filters that she placed in two-liter bottles filled with arsenic contaminated water. Using the Proactive B media, Keely was able to treat the contaminated water below the 10 ppb level using one of the filters, which is a small device that fits into the inside of a water bottle cap. “The cost of the filter I made is only five cents per two liters for water at the 100 ppb contamination level,” Keely said. “This is really inexpensive, and it has many uses. People in third world countries can use this to filter their water, but it could also be used by travelers, hikers, and military personnel where there is no reliable way to treat water.” According to Keely, the filter can be reused, but if carelessly thrown away, the arsenic will not leach back into the ground.

Keely plans to conduct more research on water contaminated with higher levels of arsenic as well as competition for binding sites with

germicidal water tablets. She hopes to attend the University of Arizona, Texas Tech, or Oregon State University to study environmental engineering for her undergraduate degree, after which she will go to law school with an emphasis on environmental law. Keely has been conducting science projects since 1st grade with her father’s encouragement.

The WRI awarded a tie for second place and \$50 each in the Senior Division to Shandiin Copland and Brittni Romero.



Shandiin Copland

Shandiin Copland is a junior at Kirtland Central High School and has been participating in science fairs for five years. Her project, entitled “Stream Channel Dynamics in Largo Canyon, 1882-2005, Northwest New Mexico,” involved analyzing imagery of arroyos in Largo Canyon over a 125 year period.

According to Shandiin, arroyo channels began to erode and become deeper and wider in the 1880s. She believed that there would be a correlation

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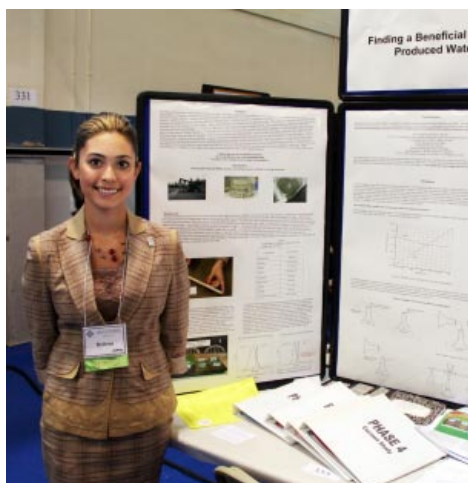
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between channel size and the changes in precipitation, homesteading, and livestock numbers in Largo Canyon.

Using 1882 survey data and 70 years worth of aerial photography, Shandiin used GIS software to analyze arroyo changes. "I obtained all of the imagery from the Bureau of Land Management," Shandiin said. "They taught me how to use the ArcGIS software, so I was able to do all of the analysis myself." She used the survey points from the 1882 survey data to determine the changes that had taken place at those specific points in the arroyo over time.

Between 1882 and 1935, there was a large number of sheep in Largo Canyon, approximately eight homesteads, and erratic precipitation. During this period, there was a measurable increase in the arroyo channel. However, after 1935, the number of sheep in the area declined drastically, and the arroyo channel decreased in width and depth. "There was definitely an association between the livestock and homesteads and the size of the arroyo channel," Shandiin said.

Shandiin plans to attend Colorado State University to eventually become a veterinarian.



Brittini Romero

Brittini Romero, a junior at Socorro High School, presented Phase IV of an

ongoing project, "Finding a Beneficial Use for Produced Water." According to Brittini, produced water can cost approximately \$2/barrel to dispose of and can add over \$20 to the cost of producing one barrel of oil. Brittini's aim was to find an economical way to treat produced water, so that it can be used as an alternative water source in New Mexico.

In the first phases of her project, Brittini determined that, by removing hydrocarbons and reducing the salt content of produced water to 1,800 ppm, the water could be used for irrigation. She found that a nanotechnology membrane was marginally successful in treating produced water to the 1,800 ppm level. She then used a computer model to determine the necessary pore size distribution of the nanotechnology membrane to effectively treat produced water. The model showed that tighter restrictions for pore size were necessary to treat effectively, but reduced water flux across the membrane would increase the cost of treatment.

In Phase IV of her project, Brittini conducted a cost analysis with other uses for produced water to reduce the cost of oil and gas production as well as water treatment and to provide an alternative source of water for New Mexico. New Mexico Tech is currently building an RO method that will treat produced water and will be cost effective. Brittini showed in Phase I of her project that treated produced water can be used for irrigation, but the cost of transporting the water from where it is produced and treated to where it will be used can be rather high. "A much better solution," according to Brittini, "would be to use the water near the source."

Potash is mined in New Mexico near places of oil and gas production. Brittini conducted several experiments to determine if treated produced water could be used in place of the brackish water currently used in potash mines. She found that treated produced water

can be used, so long as all of the hydrocarbons have been removed. Produced water may be used cost effectively by potash miners, because they are near oil production facilities.

Brittini has participated in science fairs since kindergarten, and she plans to study pre-medicine at New Mexico Tech and attend Georgetown University's medical school. She hopes to be a pediatrician.



Joe Abeyta

In the Junior Division, first place and \$100 was awarded to Joe Abeyta, a 7th grader at McCurdy Mission School in

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Jessica Rhodes



NMSU Graduate Student Investigates Fish Abundance in Desert Sinkholes

by Sara Ash, WRRI

At the Bitter Lake National Wildlife Refuge near Roswell, New Mexico, over 70 sinkholes of different shapes and sizes are scattered across the land. These isolated oases created by groundwater erosion provide habitat for fish, invertebrates, amphibians, and other wildlife. Between sinkholes, there are extreme differences in depth, temperature, salinity, dissolved oxygen and fish populations.

This disparity prompted Kristin Swaim, a graduate student at New Mexico State University, and her faculty advisor Wiebke Boeing, a professor of fishery and wildlife sciences at NMSU, to explore the relationship between abiotic factors and fish abundance.

“Some of the sinkholes are only a few hundred meters apart, but there is a big difference in fish population,” Kristin said. “We hypothesized that abiotic factors would be more influential on fish populations.”

Funded by a WRRI student research grant, Sigma Xi, and T&E, Inc., Kristin placed minnow traps in several sinkholes in the refuge in the summer of 2006 to capture Pecos pupfish, the species most commonly found in the sinkholes.

“We set the traps out in the evening, come back the following morning, and mark the fish,” Kristin said. “If we collect 200 to 300 fish, it is good to see about 30 marked fish in the next sampling period.”

She then calculates the fish population using the Lincoln-Peterson and Schnabel methods. The length and weight of individual pupfish are also measured to determine the health of each population.

Along with estimating the fish population, Kristin measured a number of abiotic variables in each of the sinkholes. A Hydrolab, a long probe with

a computer attached, was used to measure temperature, salinity, conductivity, and dissolved oxygen. Some water samples were taken and sent to the Soil, Water, and Agricultural Testing Laboratory on the NMSU campus to be analyzed. Total depth, Secchi depth—a measure of water clarity—and area of the sinkholes were also measured. Using this data, Kristin

with Pecos gambusia, we would only find 7 or 30. There was a large difference. There is some sort of predatory or food availability factor at work.”

Kristin was unable to collect any data on the Pecos gambusia, because the mesh in the minnow traps was too large. She is working on rigging the traps with smaller mesh to capture and gather data on them this summer, when she samples again to confirm her findings from last year.

In November 2006, Kristin presented her research at the International Center for Arid and Semi-arid Land Studies’ conference on Water in Arid and Semi-arid Lands. She will also present in June at the North American Benthological Society’s Annual Meeting in Columbia, SC.



Kristin Swaim holds a Pecos pupfish.

did a multiple regression to find correlations.

From last summer’s data, Kristin found that the presence of other species of fish, chlorophyll-a (an indicator of phytoplankton biomass), total depth, and dissolved oxygen had the most significant impacts on the health and abundance of the pupfish. While most sinkholes only have Pecos pupfish in them, some provide habitat for both Pecos pupfish and Pecos gambusia.

“Where the Pecos gambusia were present, the pupfish populations went way down,” Kristin said. “In most sinkholes we would find anywhere from 100 to 1,000 pupfish, but in the sinkholes



Kristin collecting pupfish out of a minnow trap at Bitter Lake National Wildlife Refuge.

Kristin hopes to graduate with her master’s degree this fall and to get a job with a federal agency. Prior to beginning her master’s degree, she worked for the USGS for four years and enjoyed it. “I hope to do something like that again,” she said. “I would like to do more research on stream restoration and conservation, because that is going to be really important in the future.”



USGS Reports Available

Water-Level Data for the Albuquerque Basin and Adjacent Areas, Central New Mexico, Period of Record Through 2004 by R.K. DeWees (OFR 2006-1281). From April 1982 through September 1983, a network of wells was established to monitor changes in groundwater levels throughout the Albuquerque Basin. This network consisted of 6 wells with analog-to-digital recorders and 27 wells where water levels were measured monthly. As of 2004, the network consists of 234 wells and piezometers. This report presents water-level data collected by USGS personnel at 155 sites through 2004. Water-level and other data for 71 sites are collected by other agencies. Water-level data for 8 of the 155 sites measured by the USGS were not available for this report. (<http://pubs.usgs.gov/of/2006/1281/>)

Analysis of the Magnitude and Frequency of Peak Discharges for the Navajo Nation in Arizona, Utah, Colorado, and New Mexico by Scott D. Waltemeyer (SIR 2006-5306). The most recent publication for estimating magnitude and frequency of floods for the Navajo Nation and surrounding region was completed in 1997 (Thomas and others, 1997). This report presents updated estimates of the magnitude and frequency of peak discharges at gaging stations based on 13 additional years of data collected since the Thomas and others investigation and improved equations for estimates of magnitude and frequency of peak discharges at ungaged

sites. The report also presents new and updated basin and climatic characteristics using an improved geographical information system (raster modeling) and the National Elevation Dataset. (<http://pubs.usgs.gov/sir/2006/5306/>)

Ground-Water Hydrology and Water Quality of the Southern High Plains Aquifer, Cannon Air Force Base, Curry County, New Mexico, 1994-2005 by J.B. Langman, S.E. Falk, F.E. Gebhardt, and P.J. Blanchard (SIR 2006-5280). This report describes the ground-water hydrology and water quality of the Southern High Plains aquifer at Cannon AFB. Description of the aquifer is based on available results of USGS ground-water monitoring from 1994 to 2005 of Cannon AFB monitoring wells at Landfill 5 and the Sewage Lagoons and associated background wells. Also, ground-water altitude data are presented for a 3-mi radius around the base to examine the hydrologic properties of the aquifer at Cannon AFB in relation to the regional aquifer properties. To assist future planning efforts for use and protection of the aquifer, this report provides Cannon AFB environmental managers a summary of hydrologic data collected at Landfill 5 and the Sewage Lagoons, an overview of the Southern High Plains aquifer at Cannon AFB, the possible anthropogenic influences on the aquifer from past and current operations, and differences in water quality that may be attributed to natural influences. (<http://pubs.usgs.gov/sir/2006/5280/>)



52nd Annual New Mexico Water Conference Hotel Information

A block of rooms has been reserved for conference participants at the La Fonda in Santa Fe. The rate for a single or double room per night will be at the prevailing Federal Government per Diem for Single Occupancy plus prevailing taxes, currently 14.625%. The current per diem is \$83/night; however, the per diem for this conference will be established by September 5. This group rate will be honored two days pre- and post-conference, based upon availability. The cutoff date for the block of rooms is **Wednesday, October 31, 2007**. Individual reservations can be made by calling La Fonda's Reservations Department at 1-800-523-5002 and then choosing #1. Make reservations online at: <http://www.lafondasantafe.com/email-group.htm>. To receive the conference rate, identify yourself as a participant of the New Mexico Water Conference. La Fonda has provided us with exceptionally good rates, and we encourage you to make your reservations early.





Conference Registration Form Beyond the Year of Water: Living within Our Water Limitations

November 29-30, 2007

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Registration Fees

Please check the following:

- Registration \$175 received by Oct. 15 (Early Bird)
- Registration \$225 from Oct. 16 - Nov. 16
- Registration \$250 after Nov. 16 and at door
- Full-time student registration \$75
- Dinner ticket(s) for guest(s) \$50/guest
- Vegetarian Meal

The registration fee includes all conference functions including the dinner banquet and a copy of the proceedings on CD to be published after the conference. The registration fee will be refunded if written notice of cancellation is received by November 16, 2007. A \$25 cancellation fee will be charged.

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Register Online

Check WRRI's Homepage for updated information about the conference. You can also register for the conference at wri.nmsu.edu. Choose the Water Conference link and follow the instructions.

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