Rio Grande Basin Initiative
OUTCOMES

Mexican students team with NMSU

Team studies long-term impacts of irrigation with treated wastewater

by Norman Martin

Three university students from Juárez, Mexico, are assisting scientists from New Mexico State University (NMSU) in measuring how treated industrial wastewater on Las Cruces' West Mesa affects natural vegetation, primarily Chihuahuan Desert mesquite and creosote.

The 15-month internship program for the undergraduates from the Universidad Autónoma de Ciudad Juárez began in July with laboratory analysis of vegetation from an 80-acre test site west of the city. The scientists' goal is a better understanding of the long-term impacts of applying the industrial wastewater containing high concentrations of salt and other nutrients from nearby food processing and light manufacturing plants.

"We're looking at this project as a prototype to evaluate the effectiveness of wastewater irrigation applications," said Geno Picchioni, an NMSU horticulturist who is coordinating the three-year project for the university and the Las Cruces Utilities Department. "We want to find the appropriate balance between irrigation efficiency and plant productivity, while preventing any environmental damage to the site or surrounding area."

The international student internship research program is funded through the City of Las Cruces and NMSU's Agricultural Experiment Station, along with grants from the Rio Grande Basin Initiative and the Southwest Center for Environmental Research and Policy.

"These students were selected for their academic skills and professional interest," said Mario Valenzuela-Vazquez, the students' mentor and a biology professor with Universidad Autónoma de Ciudad Juárez.

The internships open the door for more cooperative research between the two universities, said Valenzuela-Vazquez, who received his doctorate in agronomy from NMSU in 2001. Both communities share environmental and pollution problems, he said.

The students, who are specializing in biology, include Aldo Pinon of Delicias,

*See **Wastewater** on page 7*

Photo Courtesy of J. Victor Espinoza

Students from Mexico's Universidad Autónoma de Ciudad Juárez adjust irrigation sprinkler heads as part of a 15-month internship project assessing beneficial uses of industrial saline wastewater on Las Cruces' West Mesa.

Conserving in the Winter Garden

Pumping restrictions, limited water require efficient irrigation

by Jenna Smith

Efficient water use in the Rio Grande Basin is critical to conserving limited supplies. Limited water availability and pumping restrictions have impacted both urban and agricultural water users, necessitating the use of efficient methods for conserving water.

By 2008, agricultural producers will need to reduce their water use by approximately 80,000 acre-feet so that water supplies in South Texas last into the future and natural springs continue to flow.

Giovanni Piccinni, assistant professor of crop stress physiology at the Texas A&M Research and Extension Center at Uvalde, and a team of researchers are developing efficient irrigation practices and proper management techniques to help farmers produce the most crop with the least amount of water. Their work is supported in part by the Rio Grande Basin Initiative.

The Texas A&M Agricultural Research and Extension Center in Uvalde is one of the few centers in the nation with a state-of-the-art in-ground lysimeter facility capable of measuring crop water use.

"Utilizing accurate crop coefficients will help with current limited irrigation strategies. However, producers must know how much water to apply in the first place."

"Here in the Winter Garden, we produce crops 12 months out of the year, so we must have adequate water supplies for our entire growing season," Piccinni said. "Many of the crops we plant are already drought-tolerant, so efficient management practices are key to conserving our water sources."

Piccinni said that by monitoring plant population and row spacing, reducing tillage practices, utilizing water capture techniques such as furrow dikes and circled rows under center pivots, and using accurate crop coefficients, 25 percent of the water currently used in the region can be saved. Crop coefficients are used in evapotranspiration formulas to calculate the amount of water lost by a particular crop at a certain stage of maturity at an exact point in time.

To date, Piccinni and his team have identified accurate crop coefficients for corn and spinach and will have accurate

Photo Courtesy of Giovanni Piccinni

measures for both sorghum and onions within the next year.

"Utilizing accurate crop coefficients will help with current limited irrigation strategies," Piccinni said. "However, producers must know how much water to apply in the first place."

"We need tools for these producers to use so that they know the point to which their plants can be stressed before applying water."

Farmers irrigating with less water than the amount required to replace evapotranspiration losses will be able to adhere to limited irrigation schedules. Evapotranspiration is the maximum amount of water lost in a cropping system in a given time period from both plant transpiration and soil evaporation.

Crop yields may decrease to an extent, but the water saved can be used on additional crop acreage or can be sold, thereby producing maximum profits with two harvests and minimizing the costs of pumping and wasting excess water.

In collaboration with Thomas Marek and Don Dusek from the Amarillo Research and Extension Center, Piccinni has also developed an online potential evapotranspiration program in which farmers can use their typical planting dates and plant maturity stages to determine how much water will be needed by their crop.

"We have the data necessary to help conserve water, but we must be able to tell producers when to irrigate," Piccinni said. "We need tools for these producers to use so that they know the point to which their plants can be stressed before applying water."

Piccinni's additional component of water conservation in the Winter Garden includes using remote sensing to detect canopy temperatures in the field. When plants are stressed, by disease or water shortages, they register a higher canopy temperature than the surrounding air temperature.

If diseases, such as root rot in cotton, can be identified two to three weeks before they actually appear, steps can be taken to salvage the crop or halt irrigation applications if the crop is expected to die. If water shortages are the problem, farmers will be able to single out those areas of a field needing additional water instead of irrigating the entire field.

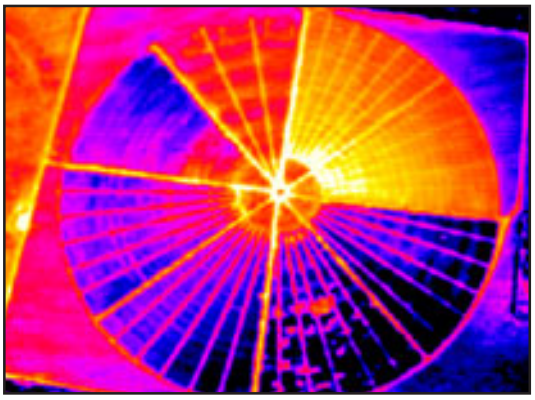

Photo Courtesy of Giovanni Piccinni

An infrared aerial picture shows various crops planted under a center pivot irrigation system. The bright red on the southeast corner represents disease development in a full irrigated cotton crop.

The next step for Piccinni is participating in on-farm research with area farmers. This opportunity will allow him to calibrate the irrigation scheduling model he is working with and adjust it to fit the needs of producers. Twelve farmers have already agreed to participate in the study.

"Teaching and showing farmers how this model applies to their individual situations is very effective," Piccinni said. "Using these field demonstrations, we hope that neighboring farmers will understand how to conserve water through efficient irrigation strategies."

Meeting West Texas' water needs

Program combines new technologies to protect water supply

by Jenna Smith

For the first time, a water conservation program combining all current technologies to protect water supplies is underway in the semiarid and arid, desert region of West Texas.

Mike Mecke, extension specialist with Texas Cooperative Extension and the Texas Water Resources Institute, is introducing a new program, *Water for West Texans*, to counties stretching from San Angelo west to El Paso and from Andrews south to Del Rio.

Annual rainfall averages 18 inches in San Angelo and 8 inches in El Paso. And, the population of Texas is expected to double by 2050. West Texans are taking a more active role in protecting their water resources, Mecke said.

"We must manage and conserve our water resources while not harming our neighbors and the environment," said Mecke. "In order to accomplish this, we must create water awareness and improve the knowledge and actions of our residents."

Annual rainfall averages 18 inches in San Angelo and 8 inches in El Paso. And, the population of Texas is expected to double by 2050.

Components of the *Water for West Texans* program include educational demonstrations and presentations, workshops and seminars, applied research programs, and collaborative efforts with agencies and planning groups on issues facing the region. Among these issues is the need for a watershed protection plan for the Pecos River, a greatly depleted western river winding 418 miles through the semiarid region of New Mexico and Texas to its confluence with the Rio Grande River.

More efficient irrigation, coupled with lower water-use crops for agriculture, can help save thousands of acre-feet annually while lowering farmers' overhead costs in the process.

The *Water for West Texans* program will include assessment of physical features of streams, communication with stakeholders and landowners, and monitoring of water quality. A watershed protection plan is being developed to help determine current and future management measures needed to protect both water quantity and quality.

The Rio Grande Basin Initiative provides opportunities to expand

Photo Courtesy of Big Bend National Park

irrigation efficiencies and water conservation, said Mecke.

Sustainability is also a key issue in the region, and the program aims to assist residents in maintaining a permanent water supply at an affordable price. In order to show residents other avenues for creating a lasting water supply, Mecke is establishing rainwater harvesting demonstration sites at various locations throughout the region. These sites capture rainwater in cisterns or rain barrels, which can then be used for irrigation, livestock, or even drinking water once treated.

Saltcedar brush control measures will help to increase the amount of water salvaged by removing water-thirsty vegetation along the banks of West Texas rivers, namely the Pecos and Rio Grande, allowing an increase in water yield, restoring riparian habitats and improving water quality. Also, desalination initiatives of brackish groundwater will also help to increase availability of water in the region.

"West Texas has no extra water to waste or pollute. Therefore, it is imperative to understand the importance of water conservation and irrigation efficiency in both agricultural enterprises and on urban landscapes and to develop new alternatives to meeting appropriate water demands now and in the future."

More efficient irrigation, coupled with lower water-use crops for agriculture, can help save thousands of acre-feet annually while lowering farmers' overhead costs in the process. Seminars, workshops and demonstration sites on landscape conservation will provide the tools necessary to send the water conservation message home to both rural and urban residents, Mecke said.

Photo Courtesy of Juan Enciso

Cotton irrigated near Fort Stockton with this high-quality drip irrigation system produced four bales per acre last year .

Water for West Texans will involve residents, stakeholders and water personnel in Texas, New Mexico and Chihuahua, Mexico. Texas Cooperative Extension and the Texas Water Resources Institute will help develop and assist in water programs at all levels to assure that a clean water supply for agricultural, urban, industrial, wildlife and aquatic habitats is maintained.

"West Texas has no extra water to waste or pollute," said Mecke. "Therefore, it is imperative to understand the importance of water conservation and irrigation efficiency in both agricultural enterprises and on urban landscapes, and to develop new alternatives to meeting appropriate water demands now and in the future."

Experts tapped for fall lectures

Speakers cover salinity, policy and perceived water value

Three nationally recognized water experts highlighted the fall lectures of a series hosted regularly by New Mexico State University's Water Task Force, Water Resources Research Institute and the Department of Civil and Geological Engineering. The series is also sponsored in part by the Rio Grande Basin Initiative.

Fred Phillips, a hydrology professor at the New Mexico Institute of Mining and Technology, addressed the salinity of the Rio Grande.

River Salinity

The Rio Grande is 75 times saltier in El Paso, Texas, than at its headwaters in Colorado. A New Mexico State University water seminar Sept. 30 provided some of the answers to just how that brackish water gets into the river.

"The basic problem is that total dissolved salts go in the Rio Grande from about 40 parts per million in the Colorado headwaters to around 3,000 parts per million by the time the river gets past El Paso," said Fred Phillips, a hydrology professor at the New Mexico Institute of Mining and Technology. "This is a progressive increase along the river."

One of Phillips' goals is to better understand where the salt is coming from. "This water quality degradation creates a lot of problems for water users, especially in down river irrigation," he said.

In addition, El Paso needs the river water for drinking, municipal and industrial uses.

Conventional wisdom has put the source of salt at the door of irrigated agriculture.

But Phillips has found that much of the salt may come from brine inflows in underground fault zones. Using geochemical fingerprinting techniques, he has discovered high concentrations of salty groundwater at several points along the river.

Assistant Interior Secretary Bennett Raley addressed the State of New Mexico's water policy.

State Water Policy

Assistant Interior Secretary Bennett Raley addressed the State of New Mexico's water policy Oct. 5.

"We're pleased that such an outstanding leader participated in our lecture series," said Task Force coordinator Craig Runyan.

"As assistant secretary for Water and Science, Bennett Raley is responsible for overseeing the Bureau of Reclamation and the U. S. Geological Survey. Both

agencies are critical to future use of water in New Mexico."

Before being tapped for the Interior post, Raley served as special assistant attorney general for New Mexico's State Engineer's office and Interstate Stream Commission, in federal court litigation in the Rio Grande and Pecos River basins. He also was general counsel for the Northern Colorado Water Conservancy District, one of the premier reclamation projects in the United States, Runyan said.

Ronald Linsky, executive director of the National Water Research Institute, discussed the perceived value of water.

Value of Water

Ronald Linsky, executive director of the National Water Research Institute in Fountain Valley, California, discussed the perceived value of water, or more specifically the lack of it, at a New Mexico State University water lecture series Oct. 19.

"Water is perceived as being a free resource or nearly free, which has unfortunately perpetuated the myth that water has little or no value," Linsky said. "The perception is that it can be abused or misused with little or no consequences. This is wrong."

In the past, classic cost-benefit analysis simply didn't take into consideration the value of treating and improving water quality from removing chemical contaminants to producing desalinated ocean water, he said. "We need to start linking the real cost of technology with the products created or produced," Linsky said.

Wastewater

Continued from page 1

Adelaido Hernandez of Chiapas and Dulse Chavez of Delicias. "It's been a great opportunity to put into practice what we've learned in class," Chavez said. "Hopefully, it will encourage others to participate."

"Our intent is to provide these international students with environmental research opportunities and practical experience that they wouldn't otherwise have," Picchioni said. "Meanwhile, they're certainly augmenting our research in vegetation and soil sampling."

While on campus, the students are under the supervision of NMSU laboratory instructor Michaela Mattes.

Conventional wastewater treatment is costly, Picchioni said. The experimental design and research plot, which was developed by the City of Las Cruces and is being studied by NMSU, uses appropriate technology in a cost-effective way to treat wastewater, he said. A primary concern is salt, which is introduced in manufacturing, because high levels inhibit plant growth.

Program coordinators hope that the collaboration with NMSU will allow the students from Mexico to apply many of the same environmentally friendly techniques in their own country as their biology careers progress.

OUTCOMES

Increasing Irrigation Efficiency in the Rio Grande Basin through Research and Education

Through Extension and research efforts, the Texas A&M University System Agriculture Program and the New Mexico State University College of Agriculture and Home Economics are implementing strategies for meeting present and future water demand in the Rio Grande Basin. These strategies expand the efficient use of available water and create new water supplies. This federally funded initiative is administered by the Texas Water Resources Institute and the New Mexico State University Water Task Force with funds from the Cooperative State Research, Education, and Extension Service.

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