Rio Grande Basin Initiative
OUTCOMES

Determining efficient project sites

Improvements save estimated 49,000 acre-feet of water yearly

by Jenna Smith

With water shortage issues still the major concern in the Lower Rio Grande Valley (LRGV), economists and irrigation engineers have been hard at work evaluating infrastructure renovations.

With more than fifteen project sites analyzed to date, results pinpoint the most cost-efficient sites for continued improvements. By targeting these project areas, irrigation district managers in the Valley can save water at the lowest costs possible.

Allen Sturdivant, extension associate at the Texas A&M Agricultural Research and Extension Center in Weslaco, and a team of Texas A&M University economists continue to work with irrigation managers and their consulting engineers to determine the costs of saving both water and energy associated with rehabilitation projects.

"Although the costs of saving water vary across projects, many are more economically attractive than other water saving procedures. The projects have been estimated to save a combined total of 49,000 acre-feet of water each year."

"We hope to improve aged water-delivery systems servicing municipal, industrial and agriculture users along the Rio Grande," he said. "By efficiently improving irrigation infrastructure, users minimize costs to achieve water gains."

Sturdivant and his team use RGIDECON©, a spreadsheet model with data input and calculations based on economic and financial principles which are consistent with capital budgeting. RGIDECON© can analyze up to five components at the same time within a given project.

By comparing costs associated with different infrastructure improvements at various project sites, irrigation district managers can direct their time and money to improving those areas with lower costs.

Among the fifteen new project sites analyzed in the Lower Rio Grande Valley, the Edinburg pipe project shows a $16 cost per acre-feet of water saved, a relatively low cost investment for saving water. On the more costly side, pumping

*See **Model** on page 7*

Center expands role in 2004

ITC begins new programs in irrigation research, education

by Jenna Smith

Promoting efficient irrigation and water conservation while maintaining profitable agricultural production and quality urban landscapes is the mission of the Irrigation Technology Center (ITC). Created in 2002 as a center of the Texas Water Resources Institute, ITC's role in water conservation and efficient irrigation is expanding in 2004.

Guy Fipps, professor and agricultural engineer with Texas Cooperative Extension, has recently been named director of ITC. Fipps coordinates with a team of specialists who will help complete many of ITC's ongoing projects, including two large-scale drip irrigation projections in South Texas, one comparing drip to furrow and the other looking at the long-term viability of drip irrigation with municipal wastewater.

"My responsibilities as director involve implementing and expanding existing ITC programs in irrigation," he said. "This includes designing ITC facilities in San Antonio, which include testing laboratories and training facilities covering 500 acres and the first ITC facility, a Turf ET (Evapotranspiration) site. This site will have 180 plots for accurately determining the water requirements of different turf grasses and groundcover."

"These programs are just the beginning. The vision and potential impact of the ITC is much larger. ITC will work to develop design and performance standards, create an equipment-testing verification program, and educate the industry and consumers about best irrigation practices."

Extension Associate Eric Leigh leads a beginners' Global Position Systems (GPS) short course offered in Weslaco through the Irrigation Technology Center.

The ITC is now managing the Texas A&M School of Irrigation that provides continuing education classes for irrigation professionals, Fipps said. The ITC will also coordinate individual and group training programs in agricultural irrigation.

ITC will continue developing international training programs with the Texas A&M International Agriculture Programs Office. Fipps said one example is the development of graduate level courses in urban and agricultural water demand for a university in Jordan. These classes will be taught jointly for the first time this summer by Jordanian and ITC instructors, and then by Jordanians.

Fipps and ITC are overseeing existing irrigation and conservation programs, including the Irrigation District Engineering and Assistance Program, and the TexasET Network and Web site.

TexasET provides daily evapotranspiration and weather summaries from 28 Texas stations and guidelines for use of this information for urban and agricul

tural irrigation. Efforts of the ITC in irrigation education and training are supported in part by the Rio Grande Basin Initiative.

"The Irrigation District Program offers research and educational services to help Texas districts conserve water," he said. "Conservation is achieved through improved management, district rehabilitation, and GIS-based mapping and management."

In order to accommodate for these expanding programs and responsibilities, ITC has redesigned its Web site to communicate to the public its role for the next several years. New to the Web site is an *Irrigation Literature* link, which lists national Extension publications by topic.

"These programs are just the beginning. The vision and potential impact of the ITC is much larger," Fipps said. "ITC will work to develop design and performance standards, create an equipment-testing verification program, and educate the industry and consumers about best irrigation practices. The ITC will also help strengthen existing research and Extension programs of the A&M System."

ITC conducts short courses on Global Position Systems

Extension specialists conducted two beginners' Global Position Systems (GPS) short courses April 27 and 28 at the Texas A&M Agricultural Research and Extension Center in Weslaco. The course, *Introduction to Real-Time Kinematic (RTK) Surveying*, covered GPS fundamentals, demonstrated surveying techniques and provided hands-on training with Trimble 5700 GPS Total Station equipment for mapping and surveying.

"We wanted to give the irrigation district personnel and other participants the opportunity to evaluate GPS technology and learn innovative ways for GPS to serve them," said Eric Leigh, extension associate with Texas Cooperative Extension.

GPS technology can measure, with centimeter-level precision, a given position on the earth's surface. Thus, location (x,y) and elevation (z) data can be quickly and accurately collected for use by mapping and design software packages, such as CAD and GIS programs.

Leigh said that participants gained a basic knowledge of the use and capabilities of a survey-grade GPS unit and many benefits of GPS technology in daily operations.

This course was presented by the Irrigation Technology Center with support from the Rio Grande Basin Initiative.

For more information on other GPS short courses, e-mail Eric Leigh at e-leigh@tamu.edu.

Visit the Irrigation Technology Center online at http://itc.tamu.edu.

Protecting El Paso's water supply

Researcher monitors pathogen levels in Rio Grande water

by Jenna Smith

Although the Rio Grande is a major source of drinking and irrigation water for counties in the El Paso area, limited research on waterborne pathogens has been performed.

For the first time, George Di Giovanni, associate professor of environmental microbiology at the Texas A&M Agricultural Research and Extension Center in El Paso, is monitoring *Cryptosporidium* and *Giardia* pathogen levels in Rio Grande water from El Paso to Fabens, using new molecular methods and a recently developed United States Environmental Protection Agency (USEPA) method.

Cryptosporidium and *Giardia* are two microorganisms responsible for numerous waterborne and foodborne disease outbreaks.

The water quality in the study area may be affected by several different sources, including agricultural return flows, urban runoff, waterfowl and effluents from local wastewater treatment plants. These potential sources are upstream from the American Diversion Dam and the head of the American Canal. Water diverted into the American Canal is used for irrigation and drinking water during the irrigation season, which typically runs March through October.

"We want to evaluate the levels of *Cryptosporidium* and *Giardia* in our water supply, because high levels of these pathogens may pose a risk to drinking water and safe agriculture," he said.

During the non-irrigation season, river flow in the El Paso area (right) is mostly treated wastewater discharges from the Sunland Park Wastewater Treatment Plant in New Mexico and the Northwest Wastewater Treatment Plant in El Paso.

"Under the recently proposed USEPA Long Term 2 Enhanced Surface Water Treatment Rule (LT2), drinking water treatment plants using surface water must adhere to treatment requirements based on levels of *Cryptosporidium* in their supply water."

Although Di Giovanni reports that *Giardia* is found at higher levels, *Cryptosporidium* is the focus of the USEPA LT2.

"*Cryptosporidium* is more difficult to disinfect with conventional treatment methods than *Giardia*," he said. "Also, because it is much smaller than *Giardia*, filtration procedures at treatment plants don't remove as much *Cryptosporidium*. Under LT2, if average *Cryptosporidium* levels in surface supply waters are found to be higher than 0.075 per liter, additional treatment beyond current conventional treatment will be required."

According to Di Giovanni, chlorination used in conventional wastewater treatment easily kills indicator organisms such as fecal coliform bacteria but not *Cryptosporidium* and *Giardia*. Effluent may be negative for indicators but still contain high levels of potentially infectious *Cryptosporidium* and *Giardia*.

Di Giovanni's research has revealed large seasonal differences in levels of *Cryptosporidium* and *Giardia* in Rio Grande water. Pathogen levels are much higher during the non-irrigation season than during the irrigation season.

Fortunately, during the non-irrigation season, drinking water plants use groundwater instead of Rio Grande water due to the low river flow and salinity, Di Giovanni said. During the irrigation season, releases from Elephant Butte reservoir and return flows increase the volume of river water, and lead to a 20-fold or greater decrease in levels of *Cryptosporidium* and *Giardia*.

"Our goal for this project is to determine the levels, animal and human sources, and health risks posed by *Giardia* and *Cryptosporidium* in river water," he said. "Not all species and strains of *Cryptosporidium* and *Giardia* from animals can cause disease in humans."

Di Giovanni believes that in the near future, upgrading conventional wastewater treatment plants with technologies such as ultraviolet treatment and advanced filtration methods could help further decrease pathogens in wastewater effluents.

During the irrigation season, reservoir releases and runoff from agricultural irrigation dilute river water, causing a 20-fold decrease in pathogens, especially Giardia.

However, during the nonirrigation season, groundwater is used by drinking water plants, because salinity levels in the river are too high. Pathogen levels are the highest during this time as well.

"Hopefully, we will have feasible routine pathogen monitoring methods for treatment plants," he said.

"Water quality regulations are still trying to catch up with science on the occurrence of waterborne pathogens and protection of our water resources. Significant advances have been made in drinking water treatment, but additional preventive measures are needed at wastewater treatment plants to protect water quality."

Communicating outcomes

Ag irrigation improvements save estimated 26,000 acre-feet

by Jenna Smith

Welcoming rains hit drought-stricken New Mexico as project personnel arrived for the third annual Rio Grande Basin Initiative Conference, April 5-7, 2004, in Las Cruces. It was fitting that the week provided numerous discussions and agency input on water issues while at the same time, the Las Cruces area experienced more rainfall than it had received in the last 10 years.

Texas Agricultural Experiment Station Researchers Keith Owens, Raul Cabrera and Daniel Leskovar (from left to right) meet during a conference session.

Project participants from New Mexico State University (NMSU) and Texas A&M University System (TAMUS) participated in the three-day event, which brought together agency representatives, Congressional staffers, irrigation district managers, specialists, researchers and administrators.

"We want to see outcomes, accomplishments and numbers of gallons of water saved," said B.L. Harris, project manager of the Rio Grande Basin Initiative and associate director of the Texas Water Resources Institute, during opening remarks. Linking economists, engineers and other professionals will help quantify the work being done and detail the project benefits to the people in the basin, he said.

Researchers and Extension specialists within the project evaluated past efforts associated with the goals of the Rio Grande Basin Initiative. Harris said that many water-saving gains have been made through the Initiative this past year, from both a research and Extension perspective.

"One water program for residents in West Texas has already decreased El Paso's water usage to 140 gallons per household per day," he said. "By implementing additional practices such as rainwater harvesting, in-home water conservation and low water-use landscapes, that number could be reduced to 125 gallons of water per day. This results in 7.5 million gallons of water saved each day."

"Xeriscaping is a water-saving technique that we are trying to educate homeowners on how to implement into their landscapes," he said. "We have found water-usage amounts of several South Texas native shrubs and trees, indicating those plants with the lowest and highest water usage amounts. By creating a new low-water landscaping trend among homeowners, millions of gallons of water can be saved each year."

The Rio Grande Basin Initiative has completed its third year, and continues to increase its involvement in Rio Grande counties as well as with cooperating agencies and entities. Work in agricultural irrigation across both states has helped save more than 26,000 acre-feet of water this past year alone, Harris said.

"We are working at a steady, realistic pace," Harris said. "There is no doubt that we can continue to achieve the goals we set out to accomplish at the project's start, not to mention tackle new water issues and conservation concerns that may arise."

Obtain a copy of the accomplishments report distributed at the conference at http://riogrande.tamu.edu.

Model

Continued from page 1

plant improvements at the San Benito I Irrigation District cost $119 per acre-feet of water saved.

By comparing costs associated with different infrastructure improvements at various project sites, irrigation district managers can direct their time and money to improving those areas with lower costs. Other irrigation districts that have been analyzed in the most recent study include Harlingen, San Juan, Brownsville and San Benito II.

"Although the costs of saving water vary across projects, many are more economically attractive than other water saving procedures," he said. "The projects have been estimated to save a combined total of 49,000 acre-feet of water each year."

RGIDECON© reports combined costs within a project, incorporating as many as six different measures into the final cost analysis. Measures may include initial construction costs, operating cost changes, current and historical water and energy savings, and expected useful life.

Three additional criteria measures such as water saved per dollar of cost, energy saved per dollar of cost and annual water savings per initial costs are also calculated for each project.

"We hope to improve aged water-delivery systems servicing municipal, industrial and agriculture users along the Rio Grande. By efficiently improving irrigation infrastructure, users minimize costs to achieve water gains."

Sturdivant said that irrigation district managers, policymakers and agency representatives are using the results of the analyses to rebuild irrigation infrastructure within the region and save water at the lowest cost.

Renovations are targeted at the more cost efficient project sites, such as the pipelines of the Edinburg and Brownsville irrigation districts, which average a $21 and $28 per acre-feet of water cost.

"The Lower Rio Grande Valley must continue to address the present and future water supply imbalance," he said. "Therefore, efforts to identify and financially support the most cost-effective projects should be a priority for all stakeholders."

Though originally built for projects in the Rio Grande Valley, RGIDECON© has a flexible design that can be used to analyze the capital investment alternatives of saving water and energy in other regions.

Copies of the reports produced by the economics team are available online at http://twri.tamu.edu.

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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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