Rio Grande Basin Initiative

OUTCOMES

Improving irrigation efficiency

Increased demand requires conservation in Rio Grande Basin

The second year of a federally funded initiative to improve irrigation efficiency and water conservation in the Rio Grande Basin is now under way.

The Rio Grande Basin is one of the most productive agricultural areas in the United States, with irrigated agriculture claiming more than 85 percent of its water. Yet, population in the basin is expected to increase by 70 percent in the next 50 years, also increasing urban water use.

"International water delivery issues and the ongoing drought make the initiative timely," said B.L. Harris, director of the Rio Grande Basin Initiative and executive director of the Texas Water Resources Institute. "But from a long-term perspective, this project is an opportunity to implement conservation planning—not only to expand efficient use of available water resources, but also to create new water supplies."

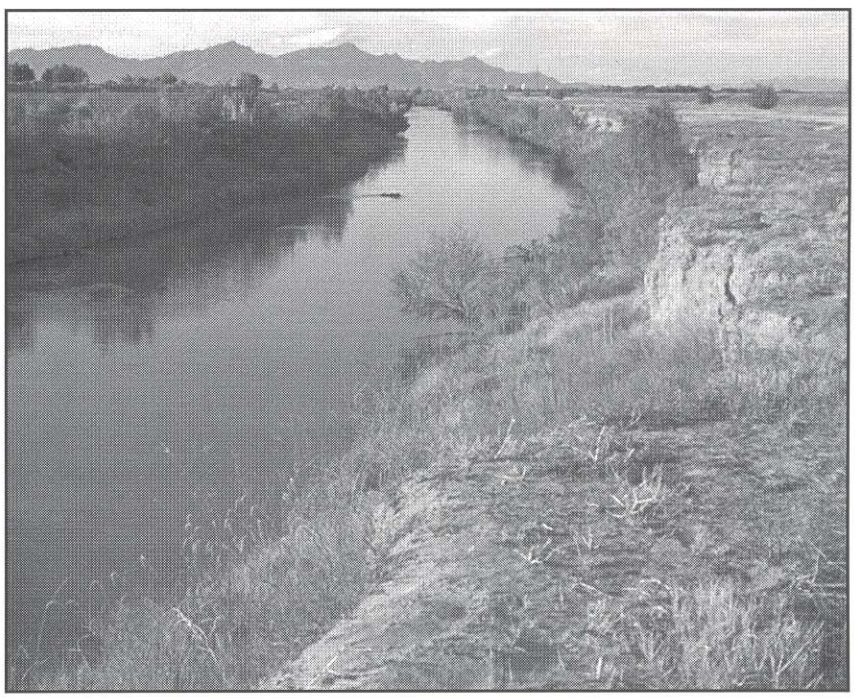
The Rio Grande Basin Initiative is a joint effort of the Texas A&M University System Agriculture Program and the New Mexico State University College of Agriculture and Home Economics. It is funded through the Cooperative State Research, Education, and Extension Service.

The Bureau of Reclamation, the Texas Water Development Board, the U.S. Department of Agriculture Natural Resources Conservation Service and other agencies are collaborating with Texas A&M and New Mexico State.

The focus of the initiative, which was initially funded in June 2001, is:

- Irrigation district rehabilitation
- Irrigation education and training
- Institutional incentives for conservation
- On-farm system management
- Urban water conservation
- Saline water use and wastewater reuse
- Water quality protection
- Satellite imagery and modeling

"It is essential that regional, state and federal agencies work together with local groups to make the most efficient use of available water," Harris said. "The Rio Grande Basin Initiative provides this opportunity."



More than thirteen million people depend on the Rio Grande River for irrigation, municipal and industrial water.

On-farm tools for saving water

Goal of research is maximum yield with limited irrigation

A Texas Agricultural Experiment Station researcher is helping growers in the Rio Grande Basin find long-term solutions for conserving water on the farm.

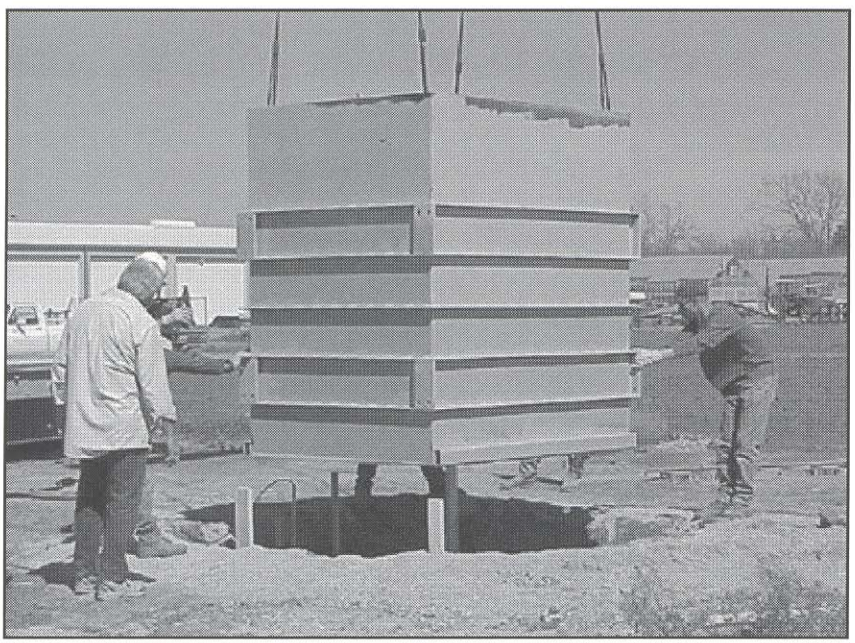
"The goal is to develop strategies for using limited irrigation water while achieving the maximum yield," said Texas A&M University Assistant Professor Giovanni Piccinni, who is determining coefficients regarding water use for crops grown in the Rio Grande Basin and the Winter Garden.

Crop coefficients are used in calculating the optimum amount of water needed by a crop—and, not a drop more.

"We've found that some crops yield well with only 75 percent replacement of their water needs," he said. "That saves 25 percent of the water."

Initially, Piccinni is working with corn, onions and cotton, and he's planting them in weighing lysimeters to determine their crop coefficients. Weighing lysimeters are large open-top boxes buried to ground level and filled with undisturbed soil. The boxes rest on scales, which measure changes in weight as crops grow in them and extract water from the soil.

At right, only a weather station and the top edges of the lysimeter are visible at ground level. Below, the lysimeters filled with soil are placed on a scale underground.



"Exact measurements of plant water use are determined by measuring weight losses," Piccinni said. "The lysimeters are sensitive to changes in weight as small as a coin the size of a quarter."

The research complements an existing weather station network that already delivers irrigation recommendations to the Texas High Plains. Because crop coefficients vary for different crops and stages of development, as well as for the region crops are grown in, construction of lysimeters in Uvalde, Texas, will enable Piccinni to provide crop coefficients for local conditions.

He said the existing model for potential evapotranspiration—a standard estimate of water requirements—is being calibrated with the new coefficients, and daily water requirements for crops will soon be widely available.

Weather stations in counties throughout the Rio Grande Basin will be used to extend site-specific irrigation recommendations based on the crop coefficients.

Eliminating water-wasting plants

Saltcedar removal saves 5 billion gallons in Pecos River

Herbicide treatments to saltcedar along the Pecos River may have saved five billion gallons of water, enough to supply the city of El Paso for two months, according to estimates from a project managed by Texas Cooperative Extension.

Saltcedar, a shrub planted along the Pecos River in 1925 to reduce soil erosion, is now known for its excessive water use. Since its introduction, saltcedar has dominated native vegetation along the river's banks and become one of the most prevalent water-loving plants in Texas.

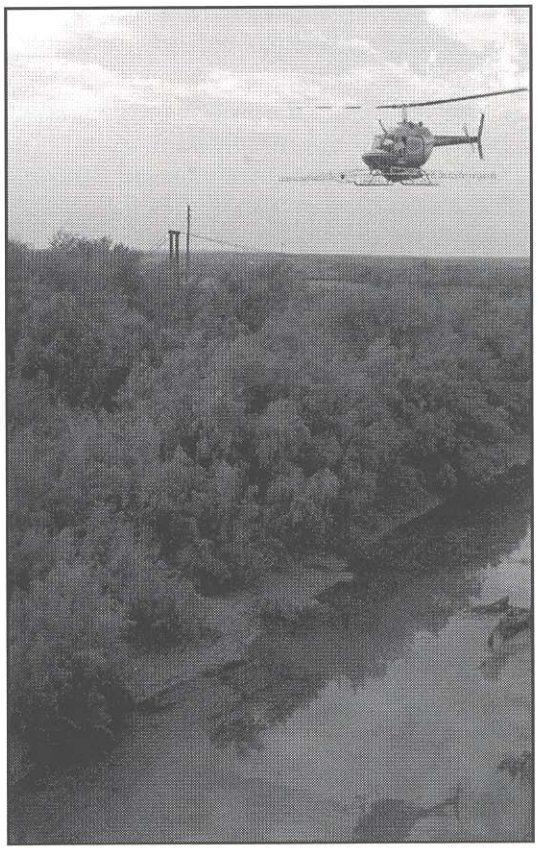
Charles Hart, associate professor and Extension range specialist in Fort Stockton, Texas, and Larry White, professor and Extension range specialist in College Station, Texas, are using groundwater-monitoring wells to measure saltcedar water use. Their studies show that each acre of saltcedar uses about 18 million gallons of water per year—resulting in a potential five billion gallons in water savings from treatment to the Pecos River banks.

Hart said developing saltcedar control methods that conserve water are among the objectives of the Rio Grande Basin Initiative. Because the Pecos River flows into the Rio Grande, current activities to control saltcedar are already allowing more water into the river. However, Hart said funds from the initiative allow for an increased emphasis on the Rio Grande this year. Two groundwater-monitoring well sites have been established on the Rio Grande to begin measuring the shrub's water use.

These wells, like those on the Pecos River, constantly measure changes in water depth and will help Hart and White calculate water use before beginning saltcedar treatment.

Collaborators include the International Boundary and Water Commission, U.S. Department of Agriculture Natural Resources Conservation Service, Texas General Land Office, Red Bluff Water and Power Control District, Texas Department of Agriculture, Texas State Soil and Water Conservation Board, and the Upper Pecos Soil and Water Conservation District.

Hart said future plans include refining estimates of the treatment cost per acre foot of water conserved and refining estimates of changes in water quality due to saltcedar removal. He said preliminary estimates of water quality indicate that saltcedar removal may also decrease the salinity of the water.



A helicopter applies herbicide to saltcedar along the Pecos River. Saltcedar, a shrub planted along the Pecos in 1925 to reduce soil erosion, is now known for its excessive water use.

Researcher's Report

Economists analyze irrigation district improvement projects

Guest Columnists:
Ed Rister and Ron Lacewell

South Texas irrigation districts have an extensive system of engineered networks—including 24 major pumping stations and lifts, 800 miles of large water mains and canals, 1,700 miles of pipelines, and 700 miles of laterals that deliver water to agricultural fields and urban areas. Yet, key components are more than 100 years old, outdated and in need of repair.

Recognizing the seriousness of the water crisis in South Texas, Congress has authorized water conservation projects for irrigation districts relying on the Rio Grande River for supply of agricultural irrigation, and municipal and industrial water. However, several phases of development, evaluation, funding appropriation and other financing are necessary before any of these projects may begin.

Three economic measures are required in this federal legislation as part of the evaluation of proposed projects:

- Number of acre-foot of water saved per dollar of construction costs.
- Number of British Thermal Units (BTU) of energy saved per dollar of construction costs.
- Dollar of annual economic savings per dollar of initial construction costs.

Texas Agricultural Experiment Station and Texas Cooperative Extension economists are collaborating with Rio Grande Basin irrigation district managers, their consulting engineers, the Bureau of Reclamation, and the Texas Water Development Board to facilitate evaluation of the proposed projects.

Proposed Capital Improvement Projects

- Meters for monitoring in-system flows and improving management of system operations
- Lining for open delivery canals and pipelines to reduce leaks, improve flow rates and increase head at diversion points
- Pumping plant replacement

The economists have developed a spreadsheet model, Rio Grande Irrigation District Economics (RGIDECON), to carry out the analysis. The spreadsheet's calculations are attuned to economic and financial principles consistent with capital budgeting procedures—enabling them to compare projects with different economic lives. As a result, RGIDECON is capable of providing valuable information for prioritizing projects in the event of funding limitations.

Results of the analysis could be compared with economic values of water to conduct a benefit/cost analysis. Methodology is also included in the spreadsheet for appraising the economic costs associated with energy savings. There are energy savings both from pumping less water forthcoming from reducing leaks and from improving the efficiency of pumping plants.

The RGIDECON model will also accommodate "what if" analyses for irrigation districts interested in evaluating additional capital improvement investments in their water delivery infrastructure.

The data required for analyzing the proposed capital improvement projects are assimilated from several sources. Extensive interactions with irrigation district managers and engineers are being used in combination with the Rio Grande Regional Water Planning Group Region M report and other studies to identify the information required for the economic investigations.

The RGIDECON model applications will provide the basis for Texas Water Resources Institute reports documenting economic analysis of each authorized irrigation district project. An executive summary of the economic analysis of each authorized project will be provided to the irrigation districts for inclusion in their project report, which will be submitted to the Bureau of Reclamation for evaluation prior to being approved for funding

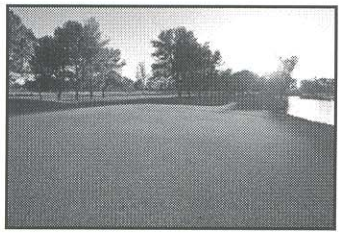
Continued on page 8

Every drop counts

Pasture grasses considered for urban landscapes

A project in Ward County may encourage homeowners to supplement their traditional grasses with low-maintenance pasture grasses.

Ward County Extension Agent Pascual Hernandez said pasture grasses like King Ranch Bluestem, Texoka Buffalograss, Blue Grama, and Alkali Sacaton offer low-maintenance alternatives to homeowners in the desert grassland.



"The place for pasture grasses in urban landscapes is not in high traffic or shaded areas," he said. "But we're examining the possibilities of using these grasses for ground cover in areas that could benefit from infrequent irrigation and mowing."

Hernandez is leading a result demonstration to identify which pasture grasses are best suited for urban landscapes, as well as which pasture grasses are best adapted for irrigation with saline water.

"Both urban homeowners and agricultural producers alike recognize the value in these demonstrations," he said. "We'd like to more efficiently use the saline water found in many of our shallow wells."

Wastewater series offered in Spanish

On-site Wastewater Treatment Systems, a series of seventeen fact sheets and bulletins, is now available in English and Spanish through the Extension Resource Center.

Traditional septic tank systems and technologies like evapotranspiration beds, gravelless pipes, leaching chambers and sand filters are described in the series. Other topics include maintenance procedures and water conservation measures.

Extension Agricultural Engineer Bruce Lesikar is the author of the series. He said providing educational materials that describe residential wastewater treatment is an objective of the Rio Grande Basin Initiative.

"Wastewater treatment protects our water resources," he said. "And, it provides another source for meeting the water needs of the Rio Grande Basin."

More than 700,000 copies of the publications have been distributed since 1998.

http://texaserc.tamu.edu


Sistemas individuales para el tratamiento de aguas negras

Cámara de percolación

Bruce Lesikar, Juan Enciso y Russell Persyn

Ventajas

District Management System on the Web

Irrigation district managers in the Rio Grande Basin who are implementing a District Management System (DMS) can now find technical assistance online at http://dms.tamu.edu.

DMS is a decision support system for irrigation districts in scheduling, managing and conserving water resources. It incorporates geographical information system capabilities, crop growth and irrigation scheduling models, routing models and weather networks.

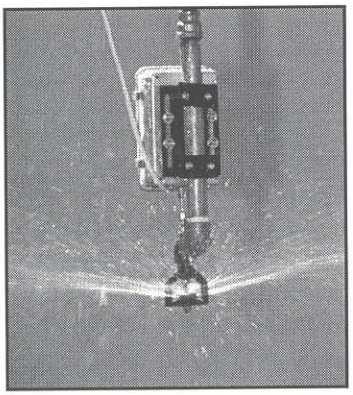
"The Web site is being expanded to include additional GIS slide shows, related studies, class schedules, help sheets and other GIS information," said Eric Leigh, Extension associate in Weslaco, Texas.

"Wastewater treatment protects our water resources. And, it provides another source for meeting the water needs of the Rio Grande Basin."

"Both urban homeowners and agricultural producers alike recognize the value in these demonstrations. We'd like to more efficiently use the saline water found in many of our shallow wells."

Irrigation Technology Center needed, study says

The Irrigation Technology Center (ITC) is not only needed to conserve water in Texas, but it will also generate income to the state through its activities, according to a recently released study.



Extension Agricultural Engineer Guy Fipps, said the goal of the ITC is to help the irrigation industry become more efficient by developing design standards and testing for equipment, researching the most effective irrigation techniques, and educating industry and consumers about best irrigation practices. Seed money for the center is being provided by the Rio Grande Basin Initiative.

The study, conducted by Beach Ramirez Inc. of Houston, confirmed the need for the ITC. Since its programs could lead to significant water savings from irrigation, the ITC is expected to be a key factor in meeting Texas' future water demands, according to the study.

http://itc.tamu.edu

Soil testing reduces nutrient runoff

Growers in four South Texas counties are adopting nutrient management programs that save money and protect water resources. The management programs rely on the growers' use of soil testing to determine how much fertilizer is necessary based on nutrient levels in the soil.

Extension Soil Fertility Specialist Mark McFarland coordinated the soil testing demonstrations in conjunction with Extension agents in Cameron, Hidalgo, Starr and Willacy counties. He said when producers apply more fertilizer than a crop can use, the remaining nutrients can be lost to runoff. Losses of nutrients like nitrogen and phosphorus in runoff can lead to nutrient pollution of water resources. Growers involved in the demonstration rely on irrigation water from the Rio Grande.

"Preliminary analyses show that by using a nutrient management program based on soil testing, growers could reduce potential loadings of nitrogen and phosphorus into the Rio Grande by 1.3 million pounds," McFarland said. "At current prices, that amounts to over $323,000 in fertilizer cost savings."

The program is expanding this year to encourage more growers to adopt this best management practice.

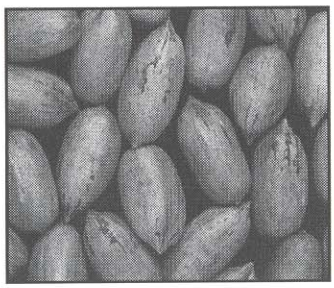
Irrigated pecan guide now available

The Texas Water Resources Institute, in association with the Texas A&M University Agricultural Research and Extension Center in El Paso, Texas, recently published a 12-page report with soil and water guidelines for irrigated pecans.

"Existing pecan orchards in the Southwest were established on every soil imaginable, using all types of water," said Seiichi Miyamoto, author of the publication and professor of soil and crop sciences at Texas A&M. "Soil and water management programs are a tool to make the best use of these resources for improved production."

The publication also describes how to balance soil and water management programs and how to complete a cost-and-return analysis.

http://twri.tamu.edu



"Preliminary analyses show that by using a nutrient management program based on soil testing, growers could reduce potential loadings of nitrogen and phosphorus into the Rio Grande by 1.3 million pounds."

Best practices for turf irrigation

SAFE program improves field quality and reduces water use

Improving the quality of athletic fields and reducing water use are just two benefits of the Sports Athletic Field Education (SAFE) program organized by Texas Cooperative Extension.

Now in its third year in El Paso County, the SAFE program is expanding to include football and soccer fields at 16 schools and a county park. School administrators, coaches and field maintenance crews are involved in the program, receiving site-specific irrigation recommendations from Extension specialists and agents.

Athletic fields managed through automatic irrigation systems often receive three to seven times the recommended amount of water annually. Automatic irrigation systems with design flaws, hardware problems and improper run times also result in poor field conditions and low-quality turfgrass.

"The heart of the SAFE program is water conservation," said Ray Bader, Extension agent for natural resources in El Paso, Texas. "But we work with field management staff and administrators to help develop site-specific management protocols that make efficient use of resources in establishing high-quality turfgrass in athletic fields."

Though Extension faculty with the SAFE program are concentrating on irrigation of football and soccer fields, the water-smart practices are applicable to all athletic fields.

Through an irrigation audit, they work with school districts to inspect athletic fields and test irrigation systems. Then they develop recommendations for field maintenance and irrigation scheduling.

These recommendations also include fertilization programs based on soil test results, turfgrass species, environmental conditions and field use, integrated pest management practices, and the best mowing height and frequency for each field based on the type of sports field, turfgrass species and available mowing equipment.

Another recommendation, which school officials said had a tremendous impact, is aeration of the fields. Field audits indicated that many fields were in need of soil aeration to create a less compact growing condition for turfgrass and a safer playing surface for athletes.

Del Valle High School is one of sixteen schools participating in the Sports Athletic Field Education

Officials said that since maintenance crews began implementing the recommendations, injuries at participating schools have decreased 40 percent.

Bader said the percent change in irrigation water used at participating schools ranged from 32 to 48 percent. He said the average savings was 17 inches of water per season.

"We've saved thousands of gallons of water through efficient irrigation while improving field quality."

Counties across Texas are involved in Extension's SAFE program. Funds from the Rio Grande Basin Initiative are helping to expand its reach in El Paso County.

Continued from page 4

appropriations from Congress.

Investigations are currently under way for Harlingen Irrigation District #1 and Hidalgo Irrigation District #1, and studies of Cameron Irrigation District #2 and La Feria Irrigation District #3 will begin soon.

Guest columnists Ed Rister and Ron Lacewell are professors of agricultural economics at Texas A&M University. Other collaborating economists are John Robinson and John Ellis.

Rio Grande Basin Initiative Outcomes
Summer 2002, Vol 1. No. 1

Outcomes is published quarterly
by the Texas Water Resources Institute.

B.L. Harris, Project Director,
Executive Director,
Texas Water Resources Institute

Rachel Alexander, Editor

Send comments or subscription requests to
Outcomes Editor, Texas Water Resources Institute,
2118 TAMU, College Station, Texas, 77843-2118.
Call (979) 845-1851
or e-mail riogrande@tamu.edu.

Visit our Web site at
http://riogrande.tamu.edu

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture under Agreement No. 2001-34461-10405 and Agreement No. 2001-45049-01149.

Texas Water Resources Institute
1500 Research Parkway, Suite 240
2118 TAMU
College Station, Texas 77843-2118

Nonprofit Org.
U.S. Postage
PAID
College Station
Texas 77843
Permit No. 215