

## Rio Grande Basin Initiative

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### Progress & Accomplishments

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## Rio Grande Basin Initiative



### Progress & Accomplishments

## Task Areas

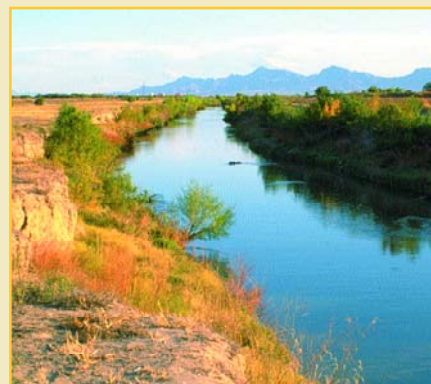
### Extension

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Texas Cooperative Extension

New Mexico State University  
Cooperative Extension Service

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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 growth in the basin is expected to double in the next 50 years, also doubling urban water use.

In 2001, a team of researchers, Extension specialists, and county agents from The Texas A&M University System Agriculture Program and the New Mexico State University College of Agriculture and Home Economics began working with local irrigation districts, agricultural producers, homeowners, and other agencies to address these issues through the federally funded Rio Grande Basin Initiative.

Funded through the United States Department of Agriculture Cooperative State Research, Education, and Extension Service, the initiative focuses on efficient irrigation and water conservation. It is administered by the Texas Water Resources Institute and the New Mexico State University Water Task Force.

## Irrigation District Studies

### Extension team supports irrigation district rehabilitation projects

A team of Texas Cooperative Extension engineers updated geographic information system (GIS) maps of 14 irrigation districts in the Lower Rio Grande Valley. The maps, which serve as a basis for rehabilitation and regional water planning activities, include canal and reservoir depths, shapes, and capacities. In addition, the team completed maps of El Paso, Elephant Butte, Hudspeth, and Redford irrigation districts, and the team provided eight other districts with assistance on GIS mapping projects. The engineering team also completed the first-ever analysis of the municipal water supply network in the Lower Rio Grande Valley.

### Seepage-loss tests document water savings from rehabilitation projects

Engineers with Texas Cooperative Extension conducted 18 seepage-loss tests in seven irrigation districts. Measured water losses ranged from 794 to 1690 acre-feet (259 to 550 million gallons) per mile for the unlined canals and 107 to 494 acre-feet (35 to 161 million gallons) per mile for the lined canals. Rehabilitation of these 55 miles of canals will save 15,000 acre-feet of water per year. Seepage-loss testing and other rehabilitation projects supported by the engineering team in 2003 saved irrigation districts at least \$750,000 in costs associated with completing project funding applications. Engineering support of district projects also helped the districts acquire \$26 million in external rehabilitation funds.



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## Irrigation Education and Training

### New facilities planned for the Irrigation Technology Center

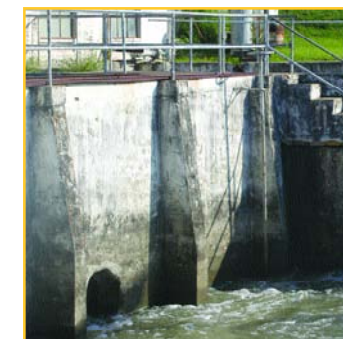
Testing facilities are being designed for the urban division of the recently established Irrigation Technology Center. Plans include a \$500,000 facility for determining turf and groundcover water requirements, with funding provided by a municipal water utility. Construction will begin summer 2004. The facility is expected to have a major impact on urban water conservation by providing data to be used in landscape and irrigation ordinances. Engineers with Texas Cooperative Extension are also designing a flow-meter test lab and sprinkler-testing lab.

### Local weather networks and TexasET Web site enhanced for the Texas Rio Grande River Basin

Texas Cooperative Extension engineers added five new weather stations in El Paso and two stations in the Lower Rio Grande Valley to support demonstration and research projects to improve on-farm and landscape water efficiency. The local networks are a part of the TexasET (evapotranspiration) Network and Web site. The Web pages provide weather data and irrigation recommendations, which allow users to irrigate more efficiently. The team is currently standardizing data collection methods with other ET networks in order to synchronize summary reporting.

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## Institutional Incentives for Efficient Water Use

### Distribution network model provides for correct sizing of new canals and pipelines

A prototype model for simulating water flow in irrigation distribution networks is being tested in cooperation with Hidalgo County Irrigation District No. 16. The model has a great potential to answer questions about flow and capacity requirements of various rehabilitation options, specifically for canal and pipeline improvement or replacement. Using the model, new canals and pipelines will be sized correctly and save millions of dollars compared to the typical over-capacity designs used in the region. The model will also help to quantify irrigation water demands, usage, and losses, reducing the need for expensive engineering crews to conduct field tests.

### Program assists Elephant Butte irrigators

Cooperative Extension established a program in New Mexico to assist users in the distribution and conservation of irrigation water with Elephant Butte irrigators. The program assisted irrigators in evaluating the cost benefit of a water-metering program for producers and forming a community ditch association for smaller irrigators.

### New tools used for rehabilitation planning

A team of engineers with Texas Cooperative Extension developed and is testing a rapid-assessment tool rating system with United Irrigation District. The tool provides a quick and cost-effective means for prioritizing rehabilitation needs and estimating potential water savings. Additionally, the team verified that aerial thermal imaging is an effective means of leak detection in canals. Work is now continuing on further development of multi-band imaging techniques. This work will result in a system that can more effectively detect and quantify water loss in canals and pipelines.

### Prototype database system utilizes GIS

Antiquated databases used by irrigation districts in Texas impede efficient district operation and rehabilitation planning, and increase costs when hiring consulting engineering companies. A team of engineers with Texas Cooperative Extension is testing a prototype database system with Hidalgo County Irrigation District No. 2. The prototype merges the old database system with an integrated geographic information system. The combined management system will provide both cost and water savings through increased usability of water usage reports, identification of current and potential problem areas in the district, and improved maintenance tracking. It will also provide an easily accessible dataset for future district planning decisions.

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## On-Farm Irrigation System Management

### Salinity management for pecan orchards influence water use efficiency

Texas Cooperative Extension trained more than 100 producers in El Paso, Texas, on best-management practices, including application of foliar fertilizers for pecans and irrigation scheduling. Over-irrigation is a common problem in the area, causing water-logging, lack of oxygen, and increased soil salinity. Requirements have been reduced from 6 to 4 1/2 feet of water in more than 12,500 acres of pecan orchards in the El Paso area, saving 18,750 acre-feet of water, by monitoring water content in the soil and studying fluctuations in the water table.



### Homeowners measure water savings with drip irrigation

Projects conducted by Cooperative Extension in New Mexico helped homeowners evaluate the use of drip irrigation systems in their landscapes. Homeowners used water meters and soil moisture monitors to compare water usage and economy using drip irrigation, with all participants reporting significant water savings in the summer months.

### Producers and homeowners schedule irrigations, save water

More than 670 participants attended 12 educational programs in Uvalde County where water conservation practice demonstrations resulted in savings of over nine inches of water per acre on 550 acres. Producers and homeowners saved water and fuel costs by utilizing soil moisture sensors and data loggers to schedule irrigations. They also utilized evapotranspiration (ET) data from weather stations.



### Sorghum-sudan uses one-third to one-half as much irrigation water as corn silage

Specialists with Cooperative Extension in New Mexico identified the new water-saving crop sorghum-sudan for its ability to produce the same amount of forage as corn silage on one-third to one-half the amount of irrigation water. Sorghum-sudan may provide an alternative to other hay, haylage, or silage supplies by using less water than comparable corn silage, while producing a larger yield.

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## Urban Water Conservation

### South Texas residents educated on landscape water conservation and management

Master Gardener volunteers and the Edinburg School District installed and managed 12 turfgrass demonstration plots at three locations in the county—educating homeowners about landscape water conservation and water resource management. The plots compared three varieties of bermudagrass, two varieties of buffalograss, two varieties of St. Augustinegrass, three varieties of zoysia, and seashore paspalum. Extension faculty is delivering the information to the public through programs and presentations in the area.



### Homeowners willing to conserve, survey indicates

A survey conducted by Cooperative Extension in New Mexico indicates that most homeowners are influenced by water shortages and are willing to use less water on their landscapes. Extension identified this behavior as a possible strategy for reducing municipal water use in landscapes, encouraging cities to send a clear message to consumers that water shortages or droughts are to be anticipated especially if current water resources are not conserved.

### Educational materials promote water conservation in the home

Extension housing specialists worked with county agents to prepare and distribute more than 3,000 posters and 12,000 bill stuffers in the Lower Rio Grande basin to promote water conservation in the home. The materials highlight the top five water saving tips and provide an updated water conservation checklist for the home. Housing specialists also hosted two water conservation programs in the region with 28 participants.

### Extension programs help turf managers utilize sub-irrigation

Many turf managers throughout New Mexico are making plans to convert to sub-irrigation water-saving technology. Poor water distribution, high winds, and lack of sufficient irrigation water are the greatest challenges that turf managers face in the desert Southwest. Programs by Cooperative Extension in New Mexico demonstrate how sub-irrigation systems apply water laterally to the root zone, providing substantial water savings compared to sprinkler systems.

### Study identifies factors influencing existing water conservation programs

Professors at Texas A&M University and specialists with Texas Cooperative Extension surveyed 33 cities in the Rio Grande Basin of Texas and New Mexico to identify existing characteristics of water conservation programs and practices in urban areas. Results indicated that larger cities have higher per capita water consumption than smaller cities that do not have the resources available to implement water conservation programs. Selected conservation programs will be targeted that can save the most water for the resource costs.

### Extension demonstrations teach water conservation to elementary students

Extension agents in Edwards, Kinney, and Uvalde counties showed 509 fourth-grade students how to conserve more than 1,400 gallons of water each year by turning off the water while brushing their teeth. The fourth-graders were also taught types and sources of water pollution using *Investigating Water*, a school enrichment curriculum, and the Enviroscope Watershed model, a tool demonstrating how pollutants get into groundwater. The lesson not only created awareness to aid in behavior changes, it also provided actions to control and prevent water pollution. The number of correct answers regarding water conservation in the home nearly doubled on the post-test.



### SAFE program increases water salvage

Improving turf quality, reducing player injuries, and reducing water use and other inputs is the goal of the Sports Athletic Field Education (SAFE) program. Now in its fourth year, SAFE has expanded from one school district and one athletic field to six school districts and 20 athletic fields. An average of 1.5 acre-feet of water per field was saved through irrigation audits, and player injuries were reduced by more than 40 percent. In addition, athletic fields under the SAFE program have been exempted from Stage 2 water restrictions due to their proven conservation measures.

### Horticultural issues addressed in Far West counties

Horticultural specialists promoted water-smart principles and natural resource conservation to more than 3,500 El Paso and Hudspeth county residents. Volunteers joined with agents to host 100 presentations attended by more than 2,300 participants. Topics included xeriscaping, landscape water conservation and related water and natural resource topics. El Paso County Master Gardeners also contributed over 2,245 hours of service (a total benefit of over \$37,000), educating the public on water conservation and natural resource issues.



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## Environment, Ecology, and Water Quality Protection

### Saltcedar control increases water salvage in Pecos River

Water-thirsty saltcedar trees along the Pecos River may use as much as 7.7 acre-feet (2.5 million gallons) of water per acre per year. Aerial herbicide treatment to 3,900 acres of saltcedar helped salvage between 7,800 and 15,600 acre-feet of water. Estimates indicate that within the next year, 80 percent of total water loss from the Pecos River can be salvaged by saltcedar control. Nineteen presentations and events about the project were held throughout the year, including a saltcedar symposium attended by more than 200 participants from 10 states. Efforts continue in the installation of water quality monitoring stations along the river to determine effects of the Pecos River Project on river water quality.



### Conference identifies multidisciplinary approach to managing aquatic lands

The Cooperative Extension Service conducted the Aquatic Arid Lands Conference in Las Cruces, New Mexico. The conference addressed the breath of problems associated with managing aquatic resources and arid lands. According to Extension specialists involved in the conference, managing aquatic lands requires more than just management and biological applications, but needs a multidisciplinary approach.



### Field days improve water use efficiency on rangelands

Extension specialists are increasing water use efficiency on rangelands and reducing sedimentation in tributaries draining into the Rio Grande in Val Verde, Crockett, Presidio, and Pecos counties. A detailed soil morphology description for each site was published in October 2003. Field days on the sites also began in spring 2004 to educate producers on water conservation practices. Treatments to minimize runoff on the plots will also be implemented in 2004.

### Reduction in nutrient loadings saves money on fertilizer

An Extension specialist reduced potential nutrient loading in soil and water resources in Cameron, Hidalgo, Starr, and Willacy counties. Soil tests confirmed a fertilizer reduction of 869,883 pounds of nitrogen and 1,390,847 pounds of phosphorus. Proper fertilizer management resulted in \$553,612 in fertilizer cost savings, while increasing water use efficiency of cropping systems by up to 15 percent at the same time. An expanded soil testing campaign is planned for the 2004 CropMan model assessments, which will be used to determine water savings through efficient utilization.



### Extension specialists presented alternative policies to protect silvery minnow

Specialists with the Cooperative Extension Service discussed additional strategies for protecting the endangered silvery minnow at the Governor Summit in New Mexico. The current focus is on accruing additional water by taking water out of agricultural production. Specialists presented alternative policies for recovery, such as dam operation allowing flow-through dams that enable the minnow to continue downstream.

### Educational outreach teaches aquatic weed control

Extension specialists have successfully controlled hydrilla, water hyacinth, and water lettuce in the Rio Grande. More than 170 miles of canals stocked with grass carp or treated with herbicides killed the aquatic weeds, saving the Rio Grande Valley more than \$87,000 this year alone. Over the next four years, a half million dollars will be saved in this region. The reduction of these weeds also helped save approximately 16,000 gallons of water per day. The public is being informed of aquatic weed control techniques through Extension newsletters, management trainings, videos, and an AQUAPLANT Web site.



### Water usage decreased through Water for West Texans program

A 15 million gallon per day water savings by West Texas homeowners could be the result of the Water for West Texans program, which improves water conservation, water management, and water quality in the Rio Grande Basin. El Paso decreased its water usage to 140 gallons per day, but the addition of rainwater harvesting, in-home water conservation, and low water-use landscapes could reduce usage to 125 gallons per day over the next 10 years, resulting in 7.5 million gallons of water saved each day. Two workshops have already been held in the region this past year, and more workshops and seminars are planned in the near future to continue to raise water-awareness in a desert environment.



### Extension specialists conduct acequia workshops, obtain valuable feedback

Specialists with Cooperative Extension in New Mexico conducted acequia hydrology workshops to elicit input from New Mexico acequia irrigators on hydrology research needs. The workshops provided feedback to acequia irrigators and direction for needed research and outreach, as well as additional information to water managers.

### Results of water well screenings to be printed in Spanish and English

Extension specialists conducted private water well screenings in Webb, Real, Edwards, and Kinney counties to screen water samples for the presence of bacteria, nitrate, lead, salt, and arsenic. Arsenic and nitrate contaminations were found to be minimal or absent in all the wells, and water wells designed for human consumption were targeted for bacterial contamination control. In addition, the Texas Cooperative Extension Soil and Water Testing Lab in College Station reported a 25 percent increase in water testing by landowners in these counties. Findings of the screening program and recommendations for managing individual water wells were presented at the Bi-National Natural Resources Conference in Laredo, where 200 publications were distributed to participants. Four publications and a youth education worksheet are being published in both English and Spanish to increase the audience benefiting from water well screenings in the basin.

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## Saline and Wastewater Management and Water Reuse

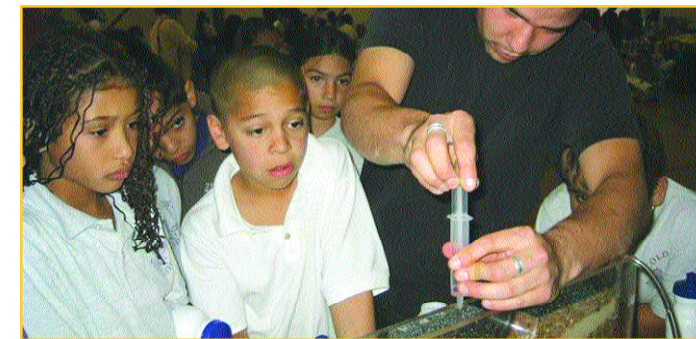
### Texas Cooperative Extension provides wastewater treatment training

Specialists with Texas Cooperative Extension taught short courses in El Paso and Weslaco that provide an overview of on-site wastewater treatment systems. They completed a video and corresponding training manual regarding subsurface drip dispersal systems in support of the course. Additionally, fact sheets in the On-site Wastewater Treatment Series have been revised for regional delivery in the Rio Grande Basin.

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## Basin-Wide Hydrology, Salinity Modeling, and Technology

### Database provides information on water resources

A team of Extension specialists and researchers have developed a linkage to the Rio Grande Basin Initiative through the Southern Region Water Quality Information System database. The database, which includes water quality, water conservation, and water policy-related resources as well as access to county-level water resource management information, is already receiving more than 6,000 hits per month. Viewers use basic and advanced GIS tools available on the site to download maps on watershed, stream and river, land use/land cover, and soils information. A searchable publications database, linked to the National Water Quality Web site, provides access to water quality information resources throughout the South. Extension faculty within the project area will be trained in the use of the new Web site as well as in the use of the GIS tools component and the database search functions.

### Extension project studies effects of drought on pecans

Determining pecan orchard physiological responses to restricted water conditions can assist in determining an irrigation model for optimum pecan production. The results of an Extension demonstration in New Mexico will allow better evaluation of the effects of long-term drought conditions and the influence of evapotranspiration on short-term climate variability and predictability.

### CropMan scheduled for use in additional research programs

The CropMan model is being demonstrated on sites in Hidalgo, Cameron, and Starr counties to improve real-time water management, maximize production and profit, increase irrigation efficiency, and identify limitations to crop yield. Agents are establishing a weather station in Starr County as well as coordinating demonstration activities with sugarcane, corn, sorghum, and cotton research programs in the Lower Rio Grande Valley. An analysis of growing season savings and a newsletter of CropMan results will be completed by May 2004.



Task Areas

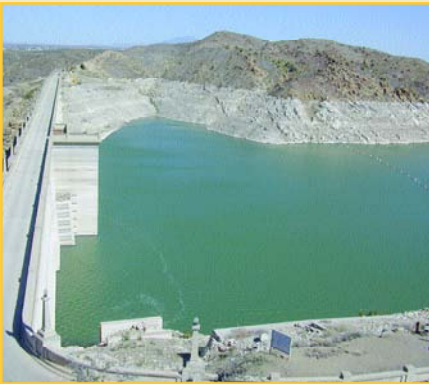
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Texas Agricultural Experiment Station

New Mexico State University Agricultural Experiment Station

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Irrigation District Studies

**Canal lining provides water savings in West Texas**

Texas Agricultural Experiment Station researchers estimated seepage losses of 10 to 20 percent from El Paso’s Franklin Canal. Using alternative canal lining strategies, studies on this canal and others in the area are being used to increase water delivery efficiency and extend limited water supplies. Average savings from lining 10 miles of canals in West Texas could provide water for as much as 1,000 acres of crops or 8,000 households.

**Research considers technology adoption, efficiency improvements, water marketing**

Research conducted by the Agricultural Experiment Station in New Mexico identified parameters that affect water needs, efficiency, and economic returns of agriculture and municipal landscape use. Causes of low irrigation efficiency include unleveled fields, soil types, small farm turnouts, unlined or poorly maintained ditches, over-allocated water rights, and lack of economic incentives, irrigation training, and irrigation scheduling. Development of data is still under way, but impacts of agricultural structure on technology adoption, efficiency improvements, and water marketing are being studied.

**Economists collaborate to develop economic analyses**

Texas Agricultural Experiment Station and Texas Cooperative Extension economists are collaborating with irrigation managers and their consulting engineers in the Lower Rio Grande Valley to determine the economic and financial costs of projected water and energy savings with the RGIDECON<sup>®</sup> model. These associated cost estimates are being calculated for the capital rehabilitation projects the irrigation districts are proposing to the Bureau of Reclamation, the Border Environment Cooperation Commission, and North American Development Bank. Fifteen federally authorized project components, with total estimated construction costs of \$42.2 million, have been analyzed. Using amortization procedures, these projects are estimated to save a combined 49,392 acre-feet of water (16 billion gallons) each year, with individual project components’ cost of saving water ranging from \$16 to \$119 per acre-foot.

**Energy balance methods and satellite imaging used to calculate evapotranspiration**

Satellite data and mathematical algorithms are being used by the Agricultural Experiment Station in New Mexico to analyze irrigation practices and develop tools that optimize beneficial water use in the Rio Grande. Initial calculations of evapotranspiration (ET) for pecan orchards and alfalfa have been produced using energy balance methods and satellite imaging. This new development can assist in formulating policy development and factors that will improve water efficiency.

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Institutional Incentives for Efficient Water Use

Survey concludes farmers lack conservation technology

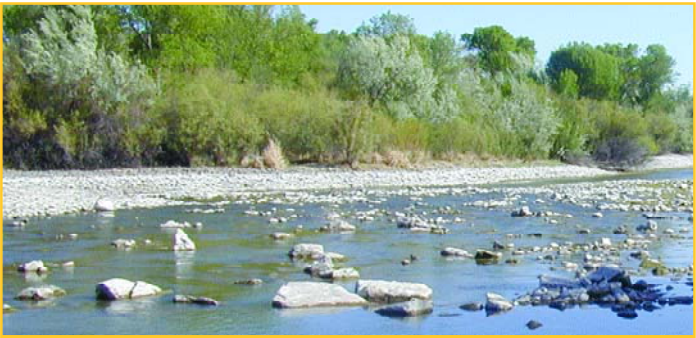
A farm-level survey on irrigation water use and conservation incentives conducted in Elephant Butte Irrigation District and El Paso County Water Improvement District No. 1 found that farmers in the region are using minimal technology methods to determine crop water needs. Despite a severe drought that occurred at the time of the survey, farmers intended to make few changes in their irrigation methods, and relied heavily upon temporary substitute water sources instead of conservation practices. Program activities to increase public awareness were modified to address the drought conditions and water-use conservation. An electronic database of historical, long-run irrigated acreage supplied by the Rio Grande was created in collaboration with the International Boundary and Water Commission to show the need for conservation management.

Model estimates economic values of water in alternative uses and locations

A model developed by the Agricultural Experiment Station investigates the economic impact of water supply changes on the Rio Grande. Preliminary findings show that irrigators along the middle Rio Grande are economically vulnerable to decreases in water availability. According to the findings, federal programs that cost-share groundwater pumping plants would reduce considerable farm economic damages from droughts. Further model research will focus on identifying economic consequences of institutional, policy, and management plans which alter the economic productivity of scarce water.

Survey shows irrigators’ response to water conservation barriers

A survey conducted by the Agricultural Experiment Station in New Mexico demonstrates how irrigators respond to barriers that keep them from conserving water. Most irrigators agreed that they need all the water they receive. When asked if the availability of water was reduced by 1 acre-foot, 84 percent of the irrigators responded that they would make no changes in their water management practice. If water availability was reduced by 2 acre-feet, 52 percent responded they would still make no changes in their water management practices. Additionally, survey results indicate that there is little change in willingness to conserve water, even if saved water could be sold at a higher price than it is worth in agriculture.



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On-Farm Irrigation System Management

**Deficit irrigation studies prove water savings for peppers**  
Researchers with the Texas Agricultural Experiment Station in Uvalde, Texas, are determining poblano pepper yield and fruit quality at deficit irrigation rates. Water savings from subsurface drip irrigations could result in 1,250 acre-feet (or 407 million gallons) per 1,000 acres of this potential new crop for Texas. More than 120 growers attended a field day that demonstrated subsurface drip irrigation technology and water savings.

**Quality of watermelons not affected by limited irrigation**  
Drought and limited irrigation does not affect the quality or lycopene content of watermelons, according to a study by researchers with the Texas Agricultural Experiment Station in Uvalde, Texas. This information will be valuable for the development of watermelon varieties that tolerate drought and have maximum health benefits for consumers. Approximately 19,300 acres of watermelons are grown in the southern border regions of Texas. A 25-percent reduction in water application would result in 6,000 acre-feet of savings.

**Researchers identify efficient irrigation scheduling for sugarcane**  
Sugarcane producers in the Lower Rio Grande Valley could reduce water use by 30 percent by scheduling irrigations based on evapotranspiration and adopting efficient practices such as drip irrigation. Weather data used by the Texas Agricultural Experiment Station calculates water evapotranspiration levels for sugarcane fields. Researchers identified crop coefficients for sugarcane using moisture balance based on inflows from irrigation and rainfall, soil-moisture monitoring, and drainage outflows.

**Lysimeters used to determine crop coefficients in the Lower Rio Grande Valley**  
Researchers with the Texas Agricultural Experiment Station are using weighing lysimeters to determine crop coefficients for corn, spinach, and onions in the Lower Rio Grande Valley. This data, and that from other experiments, such as evaluating physiological responses to different irrigation regimes, demonstrate a 25-percent reduction in water use. Growers can save six-to-eight inches of water per acre per year without depleting yields.

**Researchers determine favorable irrigation frequencies for cabbage and onion crops**  
Texas Agricultural Experiment Station researchers in the Lower Rio Grande Valley established cabbage and onion plots to determine irrigation frequencies that optimize growth, yield, and quality while also gaining irrigation efficiency. Several objectives being addressed include how irrigation frequencies influence soil moisture and root distribution, the quantitative effects on yield, and the physiological response of these crops to irrigation timing and rates. Frequent, light irrigations may increase water-use efficiencies and result in more uniform produce and quality. It is anticipated that frequent, light irrigations will result in a 15- to 25-percent increase in crop water-use efficiency. Similar studies using melons are also under way.

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Urban Water Conservation

Researcher identifies salt-tolerant crape myrtle and rose species

Sales of popular ornamentals such as roses and crape myrtles represent a significant portion of the \$7.98 billion in Texas’ annual green industry sales. A Texas Agricultural Experiment Station researcher is focusing on the tolerance of roses and crape myrtles to poor quality water, searching for specific varieties that can survive the harsh Rio Grande Basin. Environment. *Rosa manetti* and the *Rosa* X ‘Dr. Huey’ hybrid as the most salt-tolerant of the rose species, and *L. fauriei* and the *L. indica* X *L. fauriei* hybrid as the most salt-tolerant crape myrtle species.



Survey identifies landscape preferences

A survey conducted by the Agricultural Experiment Station in New Mexico identified public perception on landscape preferences and consumer attitudes toward water conservation. Most respondents strongly agreed that having an attractive landscape is mostly preferred. According to the researchers, demonstration gardens might help develop consumer appreciation for drought-resistant vegetation among those consumers who feel there is not enough variety or who feel desert plants create an unattractive landscape.



Web site highlights water use of South Texas native shrubs

The water use of popular native shrubs in xeriscaping is available on a Web site created by the Texas Agricultural Experiment Station in Uvalde. Of the twelve species of native trees and shrubs used in the experiment, Woolly Butterfly Bush was found to need the least amount of water, only 0.04 gallons of water per day. Crape myrtles, on the other hand, one of Texas’ most widely used landscaping trees, require the most water, 0.21 gallons per day. A manuscript describing water use amounts and patterns is being prepared for public use.



Water budgets structured to conserve urban landscape water use

Researchers at Texas A&M University collected water requirements of a common residential landscape system for 800 homes in the Weslaco area. From May through October, monthly water use increased 2- to 4-fold compared to winter months when little outdoor water was used. Forty-three to 59 percent of homes using more than the estimated water budget could have saved 69 to 95 acre-feet of water if they had not over-watered their landscapes. Researchers will continue efforts to use evapotranspiration, landscaping coefficients, and landscape size to derive realistic water budgets for residential landscapes and greatly reduce landscape water use. Results will be built into Extension educational programs to significantly increase irrigation efficiency.

Research demonstrates efficiency of sub-irrigation

Research conducted by the Agricultural Experiment Station in New Mexico demonstrated an improved water use efficiency using sub-irrigation on establishing turfgrass from seed. Even under extreme conditions of late seeding and record heat, sub-irrigation used less water. During the summer of 2003, establishment turfgrass received a total of 12.32 mm/day for sprinkler, 7.52 mm/day for subsurface, and 15.22 mm/day for drip irrigation.

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Environment, Ecology, and Water Quality Protection

**Study examines microbial content of Rio Grande**  
A study evaluating microbial quality of the Rio Grande is gauging the need to move towards different irrigation practices to reduce potential risks to human health. Twenty-seven samples suggest that current levels of microbes in the river do not present a risk to food crops nor is the current level of microbes above average for U.S. surface waters. Results have been posted on the El Paso Web site and were presented to the Fort Bliss International Officer School Students this past November.

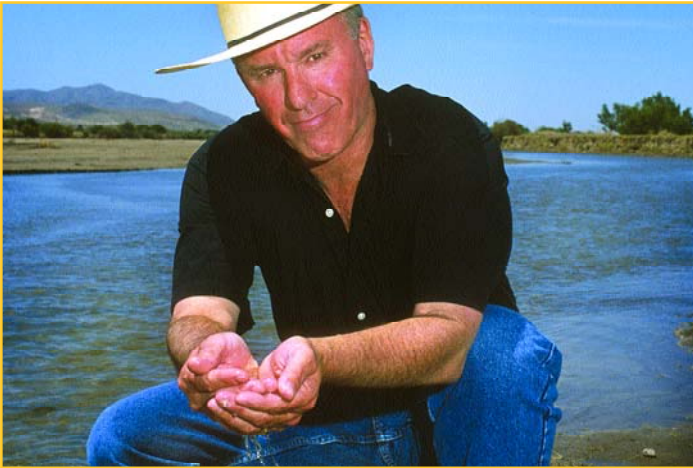
**Research documents benefits of acequia**  
Research by the Agricultural Experiment Station in New Mexico indicates that 11 centimeters of water seep from the Alcalde Acequia each day under normal flow depths. Water level measurements in transects of wells on the Alcalde show that within one month of the beginning of the irrigation season, acequia seepage creates a 1-meter layer of new shallow groundwater flowing over the deeper groundwater towards the Rio Grande. Water quality data confirm that this thick layer of shallow groundwater originates from the acequia and may contribute to many benefits including protecting deep groundwater from contamination by agricultural chemicals, recharging deep groundwater in the locations where there are extractions for drinking water, providing delayed return flow to the river, and supporting riparian vegetation along the ditch banks.

**Online index lists threatened species in the Rio Grande Basin**  
An online searchable bibliography of threatened and endangered species in the Rio Grande Basin as well as a CD-ROM is available to residents in the Lower Rio Grande Valley. Agriculture and urban development dominate land use in this region and their expansion has altered habitats for native wildlife. Further studies will evaluate the net effect on wetland birds of replacing irrigation canals with pipelines in the Valley and will be completed by May 2004.

**Researchers estimate water requirements for the silvery minnow**  
Estimates by the New Mexico Agricultural Experiment Station show that the actual water requirements for the silvery minnow are higher than the amount of water needed to keep a river wet. Little is known about the silvery minnow, but research has shown that its eggs and larvae can be transported downstream. This research may affect recent recovery efforts focused on keeping the middle Rio Grande wet, even during a drought.

**Rio Grande bank filtration monitored with lagoon ponds**  
Researchers at Texas A&M University are using lagoon ponds as source water to monitor the use of bank filtration as a source water clean up strategy along the Rio Grande. Data collection is under way and will be compiled into a manuscript for release this summer. A paper on irrigation water and risk assessment was presented at the American Society for Microbiology meetings in May 2003, and a manuscript discussing this research will also be available later this year.

**Database catalog vegetation in Elephant Butte irrigation canals**  
Researchers with New Mexico Agricultural Experiment Station are developing a library database identifying vegetation along the Elephant Butte irrigation canals. Researchers are using the database to identify the spread of invasive weed species in the area, to determine the water demands of common weeds, and to develop effective management practices along the canal system while saving water.







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Saline and Wastewater Management and Water Reuse

Scientists develop guidelines for using saline irrigation on various landscape plants

A research project is under way in the middle Rio Grande Basin to improve guidelines for using saline and reclaimed water for irrigating urban landscapes as well as developing practical ways to reduce salt problems. Drought conditions in the region have caused a number of parks, schools, and golf courses to be connected to reclaimed water or saline water wells for irrigation sources. Soil factors that affect salt accumulation on various landscape plants were identified, and findings indicated that light mulch over bare soil improves water penetration and salt leaching. A technical bulletin describing the sensitivity of broadleaf trees was published, and results from palm species, evergreens, conifers, deciduous trees, and grass species were documented. A potential new objective is being considered with NMSU in response to pecan growers' concerns over increasing salt problems.

Model demonstrates effects of wastewater application

A model using intensive chemical analysis is being developed by the New Mexico Agricultural Experiment Station to show the effects of wastewater application. The model estimates the uptake of wastewater contaminants by vegetation, providing the inputs needed to calibrate the model for application to the native vegetation of the Chihuahuan Desert. The final model will estimate maximum allowable wastewater and nutrient loading per wastewater application, frequency and depth of irrigation, and maximal irrigation per year. Determination of these best management practices will minimize leaching of inorganic contaminants and maximize biomass production and vegetation removal of contaminants.

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Basin-Wide Hydrology, Salinity Modeling, and Technology

Potential water savings of 28 percent reported for pecans

Potential water savings of 28 percent are being reported by the New Mexico Agricultural Experiment Station on closed-canopy pecan orchards. According to the research, maximum daily evapotranspiration (ET) flux for a closed-canopy pecan orchard is 8 millimeters per day, or a yearly ET average of 142 centimeters. Environmental losses and leaching requirements have not been subtracted from the 28 percent; however, a yearly irrigation efficiency of 72 percent is estimated for pecans. The seasonal water use was 4 percent lower in 2001 and 12 percent lower in 2002 than previously reported values.

SWAT model estimates water and cost savings in LRGV

Texas A&M University researchers used a calibrated Soil & Water Assessment Tool (SWAT) model capable of simulating regional water savings under three key management scenarios in all irrigation districts in the Lower Rio Grande Valley. Sugarcane, a water-intensive crop, was replaced with corn, creating a water savings of 53,425 acre-feet per year. This amounts to \$1.1 million in water-cost savings per year. Surface water application was improved by 20 percent, resulting in 189,865 acre-feet per year of water savings and \$3.9 million a year in water-supply cost. Over 925 miles of canals in the region were targeted with improved conveyance efficiency. In addition, 157,310 acre-feet of water were saved per year and \$3.3 million in costs were saved per year.



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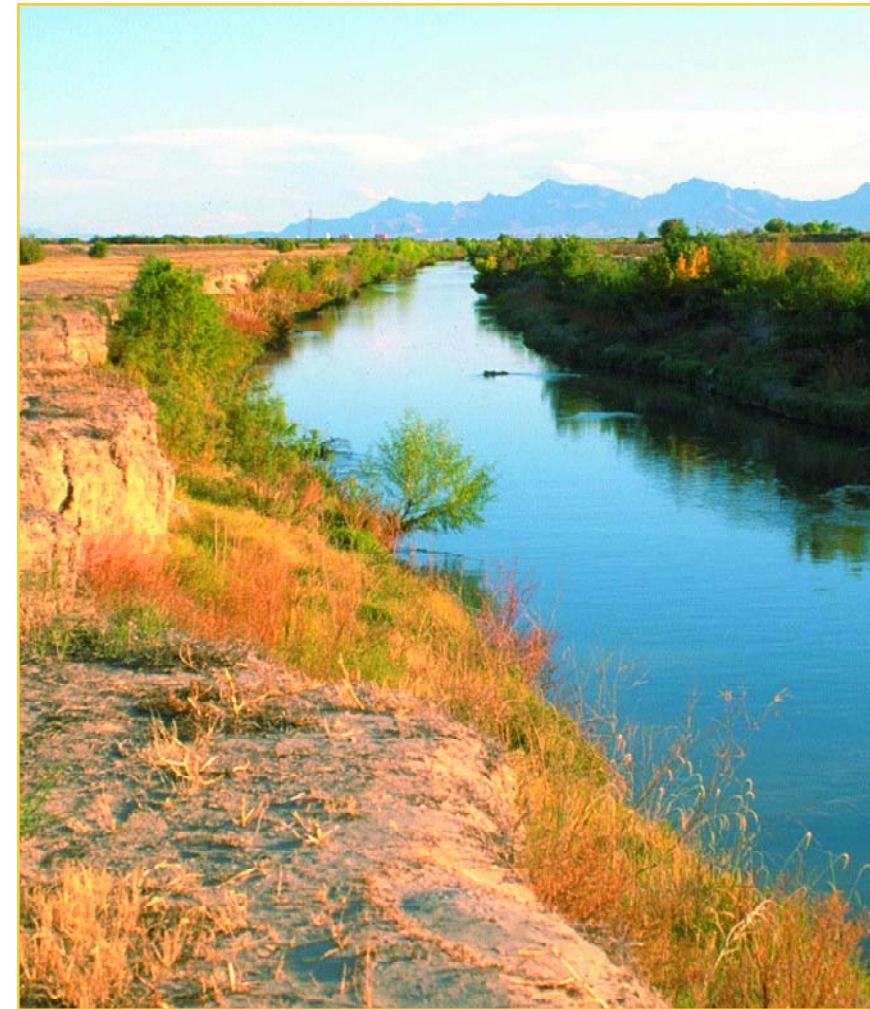
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## Partners

- Cooperative State Research, Education, and Extension Service
- Texas Cooperative Extension Service
- Texas Agricultural Experiment Station
- Texas Water Resources Institute
- New Mexico State University Cooperative Extension Service
- New Mexico State University Agricultural Experiment Station
- New Mexico State University Water Task Force



Rio Grande Basin Initiative