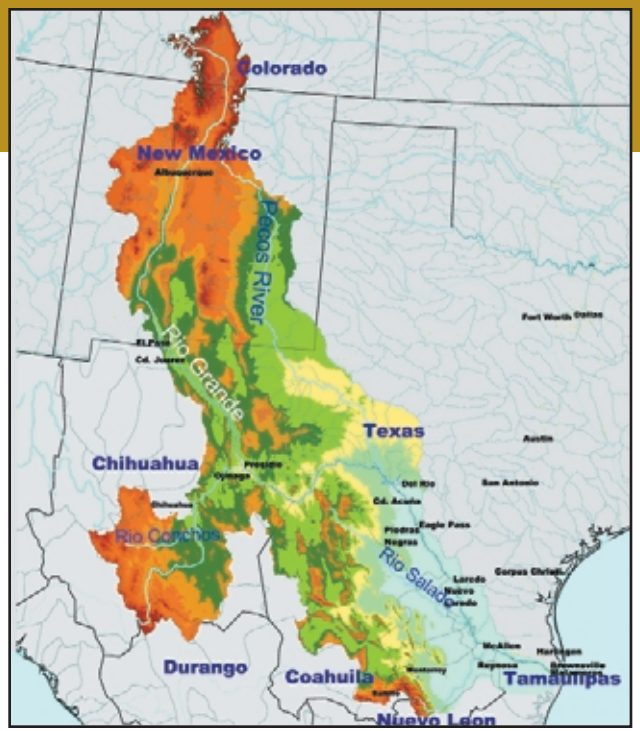
Rio Grande Basin Initiative

Progress & Accomplishments

may 2003

Rio Grande Basin Initiative
Progress and Accomplishments
May 2003



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.

Task Areas

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.

Irrigation District Studies

Working in collaboration with the Bureau of Reclamation, the Natural Resources Conservation Service, and the Texas Water Development Board, a team of economists and engineers with the Rio Grande Basin Initiative is evaluating irrigation district infrastructure needs and developing strategies for efficient water delivery.

Economists conduct analyses of proposed irrigation district renovations

Several development and evaluation phases are necessary before the water conservation projects authorized by Congress for the Rio Grande Basin may be funded. Texas Agricultural Experiment Station and Texas Cooperative Extension economists are collaborating with irrigation district managers, their consulting engineers, the Bureau of Reclamation, and the Texas Water Development Board to facilitate evaluation of proposed projects in the Lower Rio Grande Valley.

Economists developed a spreadsheet model to conduct the analyses. The results for one analysis documented an expected water savings of 138,019 acre-feet (45 billion gallons) from the proposed renovation projects in Harlingen Irrigation District Cameron County No. 1—more than twice the water used annually for agriculture in the district. Summaries of the analyses are provided to the irrigation districts to include in proposals to the State Energy Conservation Office, Bureau of Reclamation, Border Environment Cooperation Commission, and North American Development Bank. Economic analyses of water and energy savings for two irrigation districts have been completed, and analyses are planned for six or more districts in 2003.

NMSU team analyzes improvements for increasing irrigation efficiency

Economists and engineers with New Mexico State University collected data on the factors that affect water needs, water-use efficiency, and economic returns from water in Southern New Mexico's Rio Grande Basin. A spreadsheet based on the research reveals excessively long durations of irrigation and frequent over-watering of alfalfa, pecans, and cotton. Their study indicates a high correlation between on-farm irrigation efficiency and release-point water flow rates, which are largely determined by the nature of existing on-farm water handling structures. Low flow rates lead to excessively long irrigation durations, which result in over-irrigation.

Extension team completes GIS-linked databases and maps

A team of Texas Cooperative Extension engineers completed Geographic Information System-linked databases and district maps to support evaluation of proposed infrastructure projects and regional planning in the Lower Rio Grande Valley of Texas. The team used databases and maps to support improved management of irrigation district distribution systems.

Irrigation District Studies

Extension engineers assist with infrastructure evaluations

The Extension team also worked with Cameron County Improvement District No. 2 to demonstrate the procedures for conducting a total district evaluation of potential water savings from all types of renovation projects. The team verified canal ratings, analyzed the water head situation, and rated distribution network gates. According to the team, each of the unlined canals tested in the district is losing 47 to 188 acre-feet (15 to 61 million gallons) of water per mile to seepage each year. Additionally, the team conducted seepage-loss tests in Hidalgo County Irrigation District No. 2, where each of the unlined canal segments tested is losing 111 to 293 acre-feet (36 to 95 million gallons) of water per square mile to seepage annually.

Researchers quantify infrastructure needs in West Texas and Eastern New Mexico

In their study of estimated seepage losses from El Paso's Franklin Canal, Texas Agricultural Experiment Station researchers determined that as much as 2,000 acre-feet of water may be lost from the unlined canal each irrigation season. Identification of this 651-million-gallon water loss is necessary to justify the expense of canal-lining projects.

Brown, L., Z. Sheng, N. Ronquillo, and L. S. Aristizabal. 2002. Benefits of lining the Franklin Canal in El Paso, Texas. *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002, p. D8.

Falkner, B. and G. Fipps. 2002. *Farm turnout flow recommendations for new outlets in Cameron County Irrigation District No. 2*. Texas Cooperative Extension.

Flahive, D. and G. Fipps. 2002. *Irrigation district database analysis*. Texas Cooperative Extension.

Huang, Y. and G. Fipps. 2002. *Thermal imaging of canals for remote detection of leaks: Evaluation in the United Irrigation District*. Texas Cooperative Extension.

Leigh, E. and G. Fipps. 2003. *Demonstration of the rapid assessment tool: Analysis of canal conditions in Hidalgo County Irrigation District No. 1*. Texas Cooperative Extension.

Leigh, E. and G. Fipps. 2002. *Flow measurement for rehabilitation planning*. Texas Cooperative Extension.

Leigh, E. and G. Fipps. 2002. *Seepage loss test results in Cameron County Irrigation District No. 2*. Texas Cooperative Extension.

Leigh, E. and G. Fipps. 2002. *Seepage loss test results in Hidalgo County Irrigation District No. 2*. Texas Cooperative Extension.

Irrigation District Studies

Popp, M. C., M. E. Rister, R. D. Lacewell, A. W. Sturdivant, and J. R. C. Robinson. 2002. *Identifying economics associated with water and energy savings forthcoming from irrigation districts' capital renovations in the Rio Grande Basin*. Texas Agricultural Experiment Station.

Rister, M. E., R. D. Lacewell, A. W. Sturdivant, J. R. C. Robinson, M. C. Popp, and J. R. Ellis. 2002. *Economic and conservation evaluation of capital renovation projects: Harlingen Irrigation District Cameron County No. 1—canal meters and telemetry equipment, impervious-lining of delivery canals, pipelines replacing delivery canals, and on-farm delivery-site meters*. Texas Water Resources Institute.

Rister, M. E., R. D. Lacewell, A. W. Sturdivant, J. R. C. Robinson, M. C. Popp, and J. R. Ellis. 2002. *Economic and conservation evaluation of capital renovation projects: Edinburg Irrigation District Hidalgo County No. 1—72' pipeline replacing delivery canal and multi-size pipeline replacing delivery canal*. Texas Water Resources Institute.

Rister, M. E., R. D. Lacewell, J. R. Robinson, J. R. Ellis, and A. W. Sturdivant. 2002. *Economic methodology for South Texas irrigation projects—RGIDECON (C)*. Texas Water Resources Institute.

Sheng, Z., J. P. King, L. Brown, and N. Ronquillo. 2002. Estimate of seepage losses from canals in the Paso Del Norte region using ponding tests. *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002, p. D39.

Sheng, Z., J. P. King, L. S. Aristizabal, and J. Davis. 2003. *Assessment of water conservation by lining canals in the Paso Del Norte region.* World Environmental and Water Resources Conference, Environmental and Water Resources Institute, ASCE, Philadelphia, PA, June 23-26, 2003.

Skaggs, R. 2003. *Developing Tools to Optimize Beneficial Use of Water in the Rio Grande Basin*. U.S. Committee on Irrigation and Drainage. International Conference on Irrigation and Drainage, Phoenix, Arizona, May 12, 2003.

Stubbs, M., R. D. Lacewell, M. E. Rister, J. R. Ellis, and J. R. C. Robinson. 2002. *Development and implications of irrigation district operating rules and water rights in the Rio Grande Basin*. Texas Agricultural Experiment Station.

Irrigation Education and Training

Texas Cooperative Extension and the Texas Agricultural Experiment Station developed and implemented an Irrigation Technology Center to evaluate and demonstrate high-performance technologies and cropping systems. Additionally, New Mexico Cooperative Extension Service collaborated with New Mexico Master Gardeners to establish several demonstration and research sites aimed at reducing water use in vegetable gardens.

Irrigation Technology Center established

The Texas A&M University System established the Irrigation Technology Center to coordinate its water programs throughout the state. Major center facilities include The Texas A&M University System Agricultural Research and Extension Centers in El Paso, Fort Stockton, Uvalde, and Weslaco. The center offers various educational programs, including short courses tailored for irrigation districts.

Extension team conducts educational programs as component of ITC

The Irrigation Technology Center conducted its first educational programs in Weslaco, Texas. Irrigation district managers attended short courses offered on the use of Geographic Positioning Systems and Geographic Information Systems designed to improve district management. Research conducted by Texas Cooperative Extension confirms that infrastructure improvements combined with training could result in water savings as high as 226,000 acre-feet (73 billion gallons) per year. Additional course offerings in Weslaco and El Paso included irrigation water management of commercial landscapes, landscape irrigation auditing and management, and electrical wiring for landscape irrigation.

Extension demonstration projects increase water-use efficiency in vegetable gardens

Master Gardeners and the New Mexico Cooperative Extension Service in eight counties along the Rio Grande River established 14 drip irrigation and mulch demonstration projects. Three off-the-shelf drip irrigation systems are being evaluated on the basis of the effects of accumulated salts in the soil and water-use efficiency. A horticultural specialist with the New Mexico Cooperative Extension Service also designed a water conservation training program for vegetable gardeners that promotes the use of mulching techniques to improve water-holding capacity in different soil types. Additionally, two irrigation demonstration sites were established at Santa Fe and Taos to provide hands-on training in efficient irrigation for vegetable gardens.

Institutional Incentives for Efficient Water Use

Researchers are identifying legal and institutional barriers that prevent irrigation districts and producers from investing in or creating incentives for water conservation. Extension specialists are providing technical assistance related to improved district water management and modernization.

Extension workshop series improves water measurement and management practices
A series of workshops conducted by the New Mexico Cooperative Extension Service in cooperation with Elephant Butte Irrigation District assisted irrigators with water measurement and management practices. Workshop topics included effective farm delivery processes, formation of community ditch associations to effectively manage water, drought response tactics, and water rights adjudication.

Irrigation districts receive technical assistance with GIS implementation
A team of engineers with Texas Cooperative Extension and the Texas Agricultural Experiment Station is assisting irrigation districts in the Lower Rio Grande Valley with in-house Geographic Information System capabilities. Through individual technical assistance and personnel training, irrigation districts are making progress on information collection and organization, database integration, and Global Positioning System mapping. Such capabilities will allow them to locate underground pipelines, measure irrigated acreage, resolve boundary disputes, and install pipelines based on elevation mapping. Additionally, the team is assisting irrigation districts in developing better methodology for rapidly detecting leaks in canals and pipelines.

Survey reveals interest among irrigators in water conservation incentives
Surveying is under way in Elephant Butte Irrigation District and El Paso County Water Improvement District No. 1 to gain new information related to crop and water management practices, water quality improvements, response to drought and efficiency improvements, and economic value of investments in water conservation and water quality improvements. Preliminary results from the team of economists indicate there is limited use of irrigation-scheduling methods, as well as a heightened interest in incentives that would promote water conservation. Elephant Butte Irrigation District and New Mexico State University are now working together to formulate policies and procedures targeted toward small-tract users that could more efficiently govern the future use, distribution, and trading of small-tract irrigation water. Guidebooks related to irrigation efficiency are also being developed for each district.

Institutional Incentives for Efficient Water Use

Booker, J. F., A. M. Michelsen, and F. A. Ward. 2002. *Transboundary instream flows: Perspectives from an international river basin*. Integrated Transboundary Water Management, Joint UCOWR, EWRI, NGWA, COE-IWR Conference, Traverse City, Michigan, July 23-26, 2002.

Huffaker, R., A. M. Michelsen, J. Hamilton, and M. Frasier. 2001. Western water allocation issues arising from the hierarchy of international, federal, state and local laws regulating water transfer. *Complexities With Transboundary Water Resource Management*, Water Resources Update.

Hurd, B. H., F. A. Ward, and L. DeMouche. *Some perspectives on the economics of surface and groundwater adjudication*. 2002 AWRA Summer Specialty Conference. Keystone, Colorado. July 1, 2002.

Robinson, J. R. C. 2002. *Alternative approaches to estimate the impact of irrigation water shortages on Rio Grande Valley agriculture*. Texas Water Resources Institute.

Ward, F. A. and A. M. Michelsen. 2002. The economic value of water in agriculture: Concepts and policy applications. *Water Policy*.

Ward, F. A., J. F. Booker, and A. M. Michelsen. 2001. *Addressing bottlenecks in a transboundary river basin: Institutions and the Rio Grande*. American Water Resources Association Annual Conference, Albuquerque, New Mexico, November 12-15, 2001.

On-Farm Irrigation System Management

Researchers are evaluating and demonstrating the benefits of improving on-farm irrigation system management. Extension specialists are delivering tools to help producers improve irrigation scheduling and maximize economic and efficient water use.

Researchers offer guide on efficient irrigation scheduling for sugarcane
Sugarcane growers in the Lower Rio Grande Valley could reduce water use and improve yields by 20 to 30 percent by adopting water-smart technologies and practices such as drip irrigation. A guide for efficient irrigation scheduling based on research from the Texas Agricultural Experiment Station is now available. Researchers identified crop coefficients for sugarcane using moisture balance based on soil moisture monitoring, degree days, and leaf-area index. Additionally, they determined sugarcane response to different soil moisture stress and nitrogen fertilization levels, and evaluated the effects of an electronic precipitator on sugarcane growth and yield.

Growers participate in demonstrations for irrigation efficiency and scheduling
More than 450 growers attended demonstrations conducted in Regan, El Paso, Hudspeth, and Glasscock counties regarding improved irrigation systems and scheduling, as well as water use efficiencies for alfalfa and pecans. Adopted practices include injection of phosphoric and sulfuric acid through irrigation systems, installation of subsurface drip irrigation systems, and increased soil moisture monitoring for more efficient irrigation.

Researchers develop water conservation methodologies for citrus production
Researchers in Kingsville, Texas, have made significant progress in developing water conservation methodologies for South Texas citrus production using flood, micro-spray, and drip irrigation systems. They also have developed fertilization recommendations and determined crop coefficients that apply to various citrus irrigation systems.

Crop enterprise budgets include analyses of irrigation costs
Economics plays a crucial role in on-farm water conservation. Texas Cooperative Extension has updated annual crop enterprise budgets for application to the 2003 growing season. These budgets include an evaluation of irrigation costs and price analysis, providing growers with insight on implications for their operations. Additional budgets were utilized by the Texas Department of Agriculture in implementing the $10 million Congressional disaster appropriation for irrigated cropland—resulting in $25 per acre for holders of irrigation rights.

Researchers identify crop water requirements
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. Combined with existing potential evapotranspiration models, the crop coefficients indicate how much water a crop requires at each growth stage. Preliminary results indicate that crops at several stages yield well with only 75 percent moisture replacement— a 25 percent savings in irrigation water.

Scientists extend water sources for vegetable crops

Researchers with the Texas Agricultural Experiment Station in El Paso, Texas, are developing methods for irrigating vegetables with partially treated wastewater. Specifically, the research is identifying how to combine reclaimed water with subsurface irrigation technology to safely grow spinach and other crops. Texas could reuse as much as 25 percent of its municipal wastewater, a five-fold increase over today's levels, within 50 years.

Assadian, N. W., C. Moore-Vogel, Z. Sheng, U. F. Figueroa, and M. Palomo. 2002. Heavy metal distribution in open canals in the upper Rio Grande basin. *Soil and Sediment Contamination*.

Assadian, N. W., 2002. Impacts of Rio Grande river management on heavy metal distribution in the upper Rio Grande basin. In *Program and Absts*. 105th Annual Meeting of the Texas Academy of Science. Texas A&M International Univ., Laredo, TX., February, 28- March 2, 2002. p. 92

Bevacqua, R. F., 2002. On-farm evaluation of irrigation management tools. In: C. Runyan (ed.). *Rio Grande Initiative*. Water Task Force Publ. 1, New Mexico St. Univ.

Bevacqua, R. F., and D. M. Van Leeuwen. 2002. Plant and soil nitrogen monitoring techniques for chile pepper and watermelon. *HortTechnology*.

Bevacqua, R. F., and D. M. Van Leeuween. 2002. Planting date effects on stand establishment and yield of chile pepper. *HortScience*.

Bevacqua, R. F., and R. Phillips (eds.). 2001. *Drip irrigation for row crops*. Coop. Ext. Serv. Circ. 573, New Mexico St. Univ.

Bevacqua, R. F., and T. R. Cardenas (eds.). 2002. *Onion production and marketing in New Mexico*. Coop. Ext.Serv. Circ. 577, New Mexico St. Univ.

Bevacqua, R. F., and T. R. Cardenas. 2002. *Nitrogen monitoring techniques for vegetable crops*. Coop. Ext. Serv. Circ. 579, New Mexico St. Univ.

Enciso, J., D. Porter, P. Colaizzi, and G. Fipps. 2002. *Irrigation of forage crops*. Texas Cooperative Extension.

Enciso, J., D. Porter, P. Colaizzi, and G. Fipps. 2002. *Installing a subsurface drip irrigation system*. Texas Cooperative Extension.

On-Farm Irrigation System Management

Enciso, J., B. Thompson, W. L. Multer, and B. L. Unruh. 2003. *Optimum design capacities for subsurface drip irrigated cotton*. 2003 Cotton Beltwide Conference. Nashville, TN. January 6, 2003.

Enciso, J., W. L. Multer, and P. Colaizzi. 2002. *Salinity management with subsurface drip irrigation*. 2002 ASAE International Conference. Chicago, Ill. July 28, 2002.

Garcia, M., L. B. Fenn, and N. W. Assadian. 2003. The impact of urea additions on salinity in biosolids-amended soil. In *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Kipgen, V., L. B. Fenn, and N. W. Assadian. 2003. Salt movement and leaching in biosolids-amended soil. In *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Mendoza, C., L. B. Fenn, and N. W. Assadian. 2003. Nitrogen transformations and movement in biosolids-amended soils. In *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Mendoza, C., N. W. Assadian, C. Moore-Vogel, and L. B. Fenn. 2002. Nitrogen transformations and movement in biosolids-amended soil. In *Conf. And Abst. Book*. Annual Biomedical Research Conf. For Minority Students. Hyatt Regency, New Orleans, La., November 13-16, 2002.

Munoz, S., L. B. Fenn, and N. W. Assadian. 2003. Monitoring dissolved and extractable calcium to predict soil pH. In *Proceedings*. New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Robinson, J. R. C., H. Zang, and S. Fuller. 2002. Weekly price-shipment relationships for South Texas onions. *Journal of the Rio Grande Valley Horticulture Society*.

Robinson, J. R. 2002. *Weekly price-shipment relationships for South Texas onions*. Presented at Rio Grande Valley Horticulture Society, Weslaco, Texas, January 22, 2003.

Romero, I., L. B. Fenn, and N. W. Assadian. 2003. Effects of calcium additions on nitrogen mineralization in biosolids-amended soils. In *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002, p. F1.

Romero, I., N. W. Assadian, C. Moore-Vogel L. B. Fenn. 2002. Effects of calcium additions on nitrogen mineralization in biosolids-amended soil. In *Conf. And Abst. Book*. Annual Biomedical Research Conf. for Minority Students. Hyatt Regency, New Orleans, La., November 13-16, 2002.

Sanchez, L., L. B. Fenn, and N. W. Assadian. 2003. Copper and zinc movement in biosolids-amended soils. In *Proceedings*. New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Moore-Vogel, C., L. B. Fenn, and N. W. Assadian. 2003.The influence of heavy metals on nitrogen transformations and leaching in biosolids-amended soils. In *Proceedings*, New Mexico Water Research Symposium, Socorro, New Mexico, August 13, 2002.

Wiedenfeld, B., G. Fipps, and P. Colaizzi. 2003. *Irrigation of sugarcane in Texas—A grower's guide*. Texas Cooperative Extension and Texas Water Resources Institute.

Urban Water Conservation

Researchers and Extension specialists are evaluating and implementing strategies for increased landscape water conservation and reuse of municipal effluent in urban settings. Additionally, they're providing education for homeowners and other urban water users focusing on improved in-home and landscape water usage.

Extension specialist and agents promote water conservation behaviors in the home
A Texas Cooperative Extension specialist prepared posters and coordinating bill stuffers for counties in the Lower Rio Grande Valley of Texas to promote water conservation behaviors in the home. The project also offers 12 sets of sink faucet demonstration models that show how to repair leaky faucets.

Study identifies model approaches for urban water conservation
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 city water conservation programs and practices, and to analyze barriers to the adoption of water conservation programs. A technical publication is under way that will incorporate the attributes of model programs, ordinances, and incentive programs.

Research plots and field days improve urban water conservation in New Mexico
Through research plots and field days, the New Mexico Cooperative Extension Service is demonstrating new techniques and models for urban water conservation. A recently established research plot demonstrates how irrigation methods and root zone materials affect water use and water movement in sloping and flat turf areas. Another workshop helps golf course superintendents and turf managers coordinate irrigation and turf performance more efficiently.

Researcher develops guidelines for selecting salt-tolerant crape myrtles and roses
Sales of popular ornamentals such as roses and crape myrtles represent a significant portion of the $7.98 billion in annual green industry sales in Texas. A Texas Agricultural Experiment Station researcher is identifying varieties of crape myrtles and roses that are most tolerant of saline irrigation water. Continuing field and greenhouse studies are helping landscapers select popular ornamentals that are well suited for irrigation using saline and poor-quality waters.

Urban Water Conservation

Survey identifies consumer choices for water conservation landscape
Researchers and extension agents developed and tested a public perception survey of homeowners in Las Cruces, New Mexico, to determine the factors that influence consumer choices for water-conserving landscapes. Preliminary results indicate that respondents are willing to try a desert landscape if it contains trees and is well planned. Additionally, a professor at New Mexico State University is meeting with local water conservation program leaders and land-use planners to gather information on total residential landscape area and program characteristics. Information collected will assist in identifying four study communities and specific sampling areas within each community.

Web site compares water use of common shrubs
The water use of native and introduced landscape shrubs is available on a Web site created by the Texas Agricultural Experiment Station. Researchers identified the actual water use of common shrubs from planting through the first full growing season, and recorded growth rates relative to soil moisture availability.

Water conservation programs target school children
Water conservation programs were targeted for public school teachers and students in Hudspeth, Hidalgo, Brewster, and Jeff Davis counties. Nine schools and two after-school programs used the Water Wise Guys curriculum to teach water conservation methods in the home. Post-tests revealed that 97 percent of students understood the water cycle and learned strategies to reduce home water use. A water conservation booth used in schools and at a livestock show demonstrated how to save 50 to 70 percent of shower water by installing water-saving showerheads.

Cabrera, R. I. 2003. Evaluating and promoting the cosmopolitan and multipurpose Lagerstroemia. *Acta Hort*.

Cabrera, R. I. 2002. Managing high fertility and salinity issues in greenhouse rose production. *Book of Abstracts, XXVI International Horticultural Congress*.

Cabrera, R. I. 2002. Salinity tolerance in greenhouse roses. *Bulletin of the International Cut Flower Growers Association*. September issue. pp. 21-24.

Cabrera, R. I. 2002. Can nitrogen source moderate greenhouse rose response to increasing salinity? *Bulletin of the International Cut Flower Growers Association*. August issue. pp. 25-29.

Harris, J. 2003. *Water Conservation Checklist for the Home*. Texas Cooperative Extension.

Lesikar, B. 2003. *Sealing ponds and lakes with bentonite*. Texas Cooperative Extension.

Environment, Ecology, and Water Quality Protection

Researchers and Extension specialists are working together to protect the environment, ecology, and water quality of the Rio Grande Basin. Their research and educational programs include irrigation systems that reduce the occurrence of pathogens in soils and crops, methods for improved aquatic weed and riparian brush control, and restoration of riparian habitats.

Saltcedar treatment increases available water 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. Herbicide treatment led by range specialists with Texas Cooperative Extension cleared 3,500 acres of saltcedar. Their estimates indicate that saltcedar control has salvaged more than 36,000 acre-feet (almost 12 billion gallons) of water in the Pecos River. Because saltcedar pumps salts from the ground, through the plant, and deposits them in the soil, saltcedar treatment is also helping to control salinity in the river.

Human natural resource use balances native species and agricultural use

New Mexico researchers seeking to conserve native species while retaining agricultural and other water uses established a series of monitoring stations in the Middle Rio Grande Conservancy District's Socorro Division. The research will help identify fish fauna and food habits of the endangered Rio Grande silvery minnow in irrigation drains. Preliminary results indicate that even during the off-year irrigation season, many delivery ditches remain wet and appear to offer good conditions for supporting fish.

Demonstrations improve rangeland watershed management

Rangeland ripping and contour furrow demonstrations conducted by Texas Cooperative Extension in Crockett, Val Verde, Ector, Glassock, Presidio, Pecos, and Upton counties focused on water conservation techniques for rangelands. One hundred twenty-five ranchers took part in field days conducted at the demonstration sites, learning techniques for harvesting rainfall to increase rangeland efficiency. Ranchers in Webb County took part in a workshop and three field days aimed at creating healthier rangeland watersheds. Pre- and post-tests indicated that all participants made significant practice changes, including utilizing water infiltration methods, managing for native grasses, and addressing water quality issues.

Conference explores sustainable use of water resources

Experts in sustainable water use, aquatic ecosystems, genetics, and species conservation explored water issues from social and ecological perspectives at the Aquatic Resources in Arid Land Conference hosted by the College of Agriculture and Home Economics at New Mexico State University. Conference participants formulated policy statements on the concurrent use of water to benefit human society and the conservation of arid land aquatic ecosystems.

Environment, Ecology, and Water Quality Protection

Scientist studies risks of pathogen found in Rio Grande irrigation water
Despite the Rio Grande's critical role in agriculture and as a potable water supply for the region, few studies have been conducted to evaluate its microbial quality. A researcher with Texas Agricultural Experiment Station is collecting fundamental data on the human heath risks posed by the pathogen *Cryptosporidium* in Rio Grande River irrigation water. The current detection rate of four percent is consistent with previous studies on the presence of the pathogen in other U.S. surface waters, indicating that the occurrence in Rio Grande irrigation water may not be above average. Samples are being further analyzed using DNA genotyping to identify the source of contamination, whether human or animal.

NMSU research identifies water usage of weeds in irrigation canals
Researchers with New Mexico State University collaborated with Elephant Butte Irrigation District to map and identify dominant plant species in the district's canals, laterals, and sub-laterals. Using Geographic Information Systems and geographic positioning equipment, researchers established a framework for data management and map generation that enables them to identify water usage of invasive and noxious weeds in irrigation canals. Greenhouse studies also were conducted to compare water use of aquatic weeds in sandy soils and sandy loam soils. Researchers are developing a management plan for irrigation canals and ditches based on their identification of water loss in canals due to such vegetation.

Extension specialists conduct water-screening workshops
Extension specialists conducted workshops in Uvalde, Kinney, Edwards, Kimble, Real, and Webb counties to screen water samples for the presence of bacteria, nitrate, lead, and salt. The average nitrate concentration for screened samples was 2.5 parts per million; the average salinity concentration was 1,447.1 parts per million; and the average lead concentration was 2.5 parts per billion. Ninety-six samples were contaminated with fecal coliform. Two hundred fifty well owners participated in the workshops, receiving analyses of their water samples along with treatment instructions.

Educational programs demonstrate aquatic weed control
Hydrilla and water hyacinth have infested the Rio Grande and its irrigation canals from Falcon Dam to Brownsville, reducing flow in the river and restricting the amount of water delivered to farms and cities. Growers and irrigation district employees attended demonstrations on the use of grass carp and herbicides for aquatic weed control. Related educational materials, including the poster *Invaders Attack the Rio Grande Valley*, were developed for use at the demonstrations and distributed to county Extension offices.

Environment, Ecology, and Water Quality Protection

Growers adopt nutrient planning techniques to reduce runoff into Rio Grande
Growers in Cameron, Hidalgo, Starr, and Willacy counties are adopting nutrient management programs that could reduce potential loadings of nitrogen and phosphorus into the Rio Grande by as much as 1.3 million pounds and increase water use efficiency. The growers participated in a research and demonstration project launched by Texas Cooperative Extension and Texas Agricultural Experiment Station aimed at increasing the use of soil testing for better nutrient and water management.

Aquatic weed programs reach classrooms
Programs led by New Mexico State University are incorporating lessons about aquatic weeds and the use of Geographic Information Systems into classrooms. A roving water trailer, which gives students a visual representation of the canal system, is a key element in the programs. A demonstration site at the Alcalde Science Center illustrates total seepage from acequias under normal flow conditions. Ongoing meetings with the Alcalde Acequia Association make the research immediately available to local irrigators.

Dozier, M., and M. McFarland. 2002. *Typical contaminants and problems of drinking water: Lead*. Texas Cooperative Extension.

Dozier, M., and M. McFarland. 2002. *Typical contaminants and problems of drinking water: Iron and mangenese*. Texas Cooperative Extension.

Dozier, M., and M. McFarland. 2002. *Typical water quality problems and treatment alternatives*. Texas Cooperative Extension.

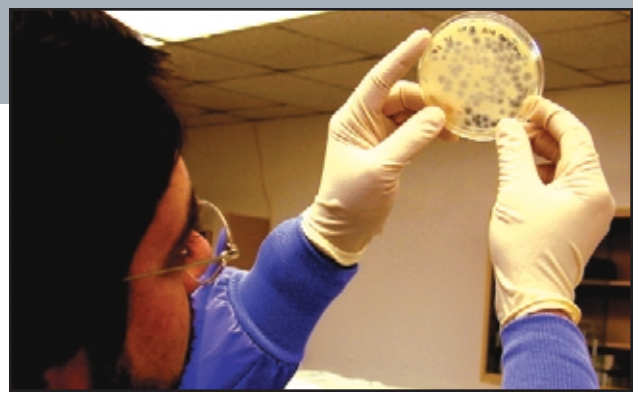
Duncan, V. K. 2002. *Identification and detection of problem and noxious weeds on irrigation canals will lead to effective weed management programs and increase water for irrigation: Water consumption by yellow and purple nut sedge under greenhouse conditions*. WERC Fellowship Report. New Mexico State University.

McFarland M., and M. Dozier. 2002. *Shock chlorination of wells*. Texas Cooperative Extension.

Endley, S., E. Johnson, and S. D. Pillai. 2003. A simple method to screen cilantro and parsley for fecal indicator viruses. *J. Food Protection*.

Endley, S., L. Lu, E. Vega, M. He. Hume, and S. D. Pillai 2003. Male-specific coliphages as an additional fecal contamination indicator for screening fresh carrots. *J. Food Protection*.

Hart, C. R. 2003. *Saltcedar biology and management*. Texas Cooperative Extension.



Hart, C. R. and A. McDonald. 2003. *Pecos River ecosystem monitoring project*. Texas Cooperative Extension.

McDonald, A. et.al. 2003. *Rangeland recovery through water conservation/concentration*. Texas Cooperative Extension.

Mecke, M. 2002. *Water agencies, groups and environmental resources for West Texans*. Texas Cooperative Extension.

Hart, C. 2002. *Pecos River ecosystem project*. Texas Cooperative Extension. Video.

Pillai, S. D., and G. D. Giovanni. 2003. Microbial sampling. *Encyclopedia of Water Science*.

Pillai, S. D., and J. Totten. 2003. Molecular methods for microbial detection and characterization. *Concise Encyclopedia of Bioresource Technology*. A. Pandey (ed).

Schulze-Makuch, D., R. Bowman, and S. D. Pillai 2003. *Removal of biological pathogens using surfactant-modified zeolite*. U.S. Provisional Patent.

Saline and Wastewater Management and Water Reuse

Researchers and Extension specialists are providing targeted research and educational programs regarding soil salinity, saline water use, and wastewater treatment and reuse.

Scientists develop research-based guides for saline irrigation

Scientists with the Texas Agricultural Experiment Station are developing guides based on their research of landscape irrigation with saline water. They've identified the soil factors that affect salt accumulation in irrigated turf and also evaluated the salt tolerance of landscape plants under different irrigation regimens. Research recommendations are now available as technical reports and educational CDs. The research indicates that in El Paso, Texas, irrigators of golf courses, parks, school grounds, and apartment complexes can save $1,900 to $2,730 annually per acre of turf by using reclaimed or saline water—a savings that can often cover the cost of upgrading landscape management to control potential salt problems.

Researcher develops management-based model for land application of wastewater

A study under way at New Mexico State University is evaluating management strategies that use wastewater in irrigation. Plant and soil samples taken during the 2002 growing season helped monitor the location of deposited nutrient and salt ions following wastewater application. Field data will be used in a plant nitrogen and salinity model designed to assist in the evaluation of irrigation management scenarios.

Texas Cooperative Extension provides wastewater treatment training

Specialists with Texas Cooperative Extension taught short courses in El Paso and Weslaco that provides 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.

Ornelas, D., and S. Miyamoto, 2002. *Sprinkler conversion for minimizing foliar salt damage*. Texas Agricultural Experiment Station.

Lesikar, B. 2002. *Aerobic treatment units and spray dispersal*. Texas Cooperative Extension. Video.

Lesikar, B. 2002. *Subsurface drip dispersal of domestic wastewater*. Texas Cooperative Extension.

Lesikar, B. 2002. *Subsurface drip dispersal systems*. Texas Cooperative Extension. Video.

Miyamoto, S., and J. White. 2002. *Foliar salt damage of landscape plants induced by sprinkler irrigation*. Texas Agricultural Experiment Station and Texas Water Resources Institute.

Saline and Wastewater Management and Water Reuse

Miyamoto, S., and J. White. 2002. *Foliar salt damage of landscape plants induced by sprinkler irrigation* (CD series for landscape managers). Texas Agricultural Experiment Station.

Miyamoto, S. 2002. *Salinity problems of the middle Rio Grande Basin*. Texas Agricultural Experiment Station.

Miyamoto, S., 2002. *Landscape irrigation with water of elevated salinity: Guidelines for planners, managers and supervisors*. Texas Agricultural Experiment Station.

Sheng, Z., and A. M. Michelsen. 2001. *Wastewater Reuse Strategies in the El Paso del Norte Region*. American Water Resources Association Annual Conference, Albuquerque, New Mexico, November 12-15, 2001.

Basin-Wide Hydrology, Salinity Modeling, and Technology

Researchers are suggesting alternative water management strategies based on models that monitor the hydrology and movement of salts, and detail drought occurrence in the Rio Grande Basin. Additionally, Extension specialists are offering educational programs aimed at increasing irrigation efficiency by increasing the use of evapotranspiration and crop-water stress data in irrigation scheduling.

Model identifies water use of irrigated pecan trees

A researcher with New Mexico State University is predicting the water use of pecan trees in Mesilla Valley by using satellite imagery to identify patterns in the stress, stage, and leaves. Satellite imagery can also predict how pecan trees would acclimate to limited water. This ability to predict water use is promising. Because leaf area development is tied to total water availability and is predictable, potential nut yield at various irrigation levels is also predictable.

Crop management model implemented in three LRGV counties

A team of Extension specialists and agents collaborated to develop sites in Hidalgo, Cameron, and Star counties for demonstrating use of the CroPMan model for improving real-time water management. The CroPMan model also helps agricultural producers maximize production and profit, and identify limitations to crop yield. Several growers in the three counties have become involved and will evaluate the model in 2003.

Researchers compare irrigation district water requirements using SWAT

A team of researchers with the Texas Agricultural Experiment Station is comparing water requirements for irrigation districts under existing management with water requirements for irrigation districts that have implemented water conservation measures. They've modified the Soil and Water Assessment Tool (SWAT) to simulate water requirements using a Geographic Information System, cropping practices, and historical allocations. The model generates daily, monthly, and annual outputs.

Web-based GIS provides natural resource information for Texas counties

Work is under way to develop interactive, Web-based Geographic Information Systems for the 14 counties in Texas along the Rio Grande. A prototype for El Paso County is now complete and includes query capabilities for searching environmental and socio-economic data. Available information includes hydrologic unit boundaries, water quality monitoring stations, elevation models, county infrastructure, and census data. The Geographic Information System allows for specialized analysis and production of high-quality cartographic information.

Sanderson, R. *Improving irrigation efficiency through precision agriculture*. Improving Irrigation Efficiency in Agriculture Conference. Las Cruces, New Mexico. March 20-21, 2002.

Santhi, C., R. S. Muttiah, J. G. Arnold, and R. Srinivasan. 2003. *A modeling approach for planning and management of irrigation districts in Lower Rio Grande Valley.* 2003 ASAE Annual International Meeting, Las Vegas, NV, July, 2003.

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

MKT 3525
2,000 Copies

Rio Grande Basin Initiative

Progress and Accomplishments

may 2003