

At the Cameron County Irrigation District No. 2 in San Benito, sluice gates inside the concrete structure control water flowing through the main canal into the district. Photo by Danielle Supercinski, TWRI.



Rio Grande project partnerships

Water quality and quantity issues in the Rio Grande are nothing new for the Rio Grande Basin. However, the continued activities and projects by several universities and local, state, and federal agencies to help solve these problems are not widely known or understood.

Irrigated agriculture in the basin consumes more than 85 percent of the region's water, and water must be diverted from agricultural irrigation to meet growing municipal demands. With the population expected to double in the next 50 years, the urban water demands will increase proportionately.

Texas Water Resources Institute (TWRI), part of Texas A&M AgriLife, facilitates, manages and/or is involved in several projects throughout the Rio Grande region to help better manage available water, improve water quality, and meet present and future water demands. Researchers, Extension personnel, and others are partnering to help irrigators and urban residents better manage the region's water resources.

Rio Grande Basin Initiative

Conserving water and maintaining water quality in the Lower Rio Grande Valley are essential issues as population growth and urban water demands increase. Since 2001, the *Efficient Irrigation for Water Conservation in the Rio Grande Basin* project, also known as the Rio Grande Basin Initiative (RGBI), has focused on meeting present and future water demands through irrigation water conservation measures. RGBI efforts focus on efficiently using available water resources, creating new water supplies, and expanding educational programs. This project has successfully documented more than 4 million acre-feet of water savings.

RGBI is a joint effort between The Texas A&M System and New Mexico State University, working through Texas AgriLife Research, Texas AgriLife Extension Service and New Mexico Cooperative Extension Service and Agricultural Experiment Station. The project is funded by the U.S. Department of Agriculture's Cooperative State Research, Education and Extension Service, and administered through TWRI.

In one area of the project, RGBI researchers assist irrigation districts with managing aquatic and riparian vegetation, primarily non-native species like hydrilla, water lettuce, water hyacinth, saltcedar, and giant cane. Non-native vegetation causes many problems with irrigation water, including clogging canals, limiting flow, and excessive usage. Demonstrations using an integrated pest management approach have been instituted in the Rio Grande Valley where triploid grass carp

were introduced to control hydrilla. In addition, beetles and wasps are used to control giant cane and saltcedar. Standard mechanical and chemical practices are also used.

Rio Grande farmers rely on irrigation canals to water their crops, but they are losing water from cracks that allow water to seep out to areas that do not need irrigation. Seepage from on-farm water conveyance losses range from 10-30 percent. Unimproved delivery canals and conveyance systems cause significant losses of water, which reach as much as 60 percent of the total flow in the system. Water salvaged by lining major canals saves an estimated 10-30 percent, or 30,000 to 90,000 acre-feet of water per year. Measurements of seepage losses by canal segments help prioritize those canals where limited federal and state funds should be used for improvements.

RGBI economists have developed economic models to help guide capital irrigation system rehabilitation projects and water treatment and pricing alternatives. These include the following:

- RGIDECON© is used to perform economic analysis of capital rehabilitation projects, in collaboration with the U.S. Bureau of Reclamation.
- CITY H2O ECONOMICS© analyzes and reports on the economic life-cycle costs of a new municipal surface-water treatment facility, in collaboration with McAllen Public Utility Water Systems.
- DESAL ECONOMICS© considers all financial and economic aspects to provide a life-cycle cost value that allows an accurate comparison with other desalination plants analyzed with the same technique and other water sources as well.

With the success of RGBI, various partnerships have been established. There are now numerous additional water conservation and water quality projects developed in the Lower Rio Grande Valley of Texas with the same primary focus of meeting present and future ⇨

water demands while sustaining water quality through efficient use and protection of water resources.

El Morillo Drain Diversion Canal

The *El Morillo Drain Project*, established in 1966, has improved water quality in the Lower Rio Grande by diverting salt water from the Rio Grande through the El Morillo Drain to the Gulf of Mexico. Each year, the El Morillo Drain keeps 200,000 tons of salt out of the Rio Grande. Without the El Morillo project, the salinity levels in the Rio Grande would be far above federal regulation levels and would detrimentally affect the agricultural industry, fish and wildlife habitat, and the drinking water source for many Rio Grande Valley residents. However, the El Morillo Drain is in dire need of repair and improvement. Ideally, the system needs a complete renovation in addition to annual maintenance, but the economics of this task are beyond available funds. Therefore, through the RGBI, a team of economists led by Dr. Ed Rister and Dr. Ron Lacewell with Texas AgriLife Research and AgriLife Extension Service, have worked to assess the value of the El Morillo Drain to show local cities and residents the benefit received from the drain's existence. Annual benefits are estimated to be from \$40 million to over \$100 million. Through this economic analysis, the project helps decision makers evaluate value and alternatives for a source of funds to repair and maintain the El Morillo Drain over the years.

Arroyo Colorado Watershed Protection

The Arroyo Colorado has a history of poor water quality, and the Texas Commission on Environmental Quality (TCEQ) has listed it as an impaired water body since the state began its surface water quality testing program. The Arroyo Colorado is not a normal stream; it is modified for flood control and dredged for commerce. These physical changes contribute significantly to its water quality impairments. Because of the extreme reductions in pollutant loading needed for water quality improvement, the following five Arroyo Colorado

watershed protection projects are currently under way:

Implementation of the Arroyo Colorado Watershed Protection Plan, with funding by TCEQ, is administered by TWRI and directed by the Arroyo Colorado Watershed Partnership in collaboration with multiple local entities. The project focuses on implementation activities and deliverables outlined in the watershed protection plan. Project personnel seek additional funds to sustain water quality improvement efforts. To date, the collaborative partnership involves more than 700 individuals, federal and state agencies, cities, and numerous non-governmental organizations.

Education of Best Management Practices in the Arroyo Colorado Watershed, funded by the Texas State Soil and Water Conservation Board (TSSWCB) and administered by TWRI and AgriLife Extension, educates agricultural producers on better land management to reduce nonpoint source pollution. The project promotes associated programs, implementing best management practices (BMPs) to protect water quality. This three-year project, scheduled to end March 2009, has reached more than 5,000 valley residents. See related story on pages 22 & 23.

The Integrated Farm Management Program, funded by the U.S. Environmental Protection Agency and administered by TWRI and AgriLife Extension, is a new three-year program. It will build on the already successful education program in the Arroyo Colorado Watershed to train agricultural producers on BMPs in production, nutrient, irrigation, and pesticide management.

Assessment of Agricultural Nonpoint Source Pollution in the Arroyo Colorado, with funding from the TSSWCB, is administered by TWRI, AgriLife Research and Texas A&M University—Kingsville. They are analyzing water quality of agricultural field runoff and drainage waters to determine efficacy of BMPs, to assess using the drainage ditches as a natural wetland system and to provide data for calibration of the SWAT (Soil Water Assessment

Tool) model for estimating future loading into the river. In cooperation with TSSWCB and USDA-Natural Resources Conservation Service (NRCS), AgriLife Research scientists are also building a map indicating installed BMPs to target education and implementation needs. Given the rapid land use changes in this watershed, this project developed a revised land use/land cover map for the Arroyo Colorado to help support the SWAT model. The final map will be available on the Arroyo Colorado Web site.

AgriLife Research is conducting the *SWAT Model Simulation of the Arroyo Colorado Watershed project*. This project, also funded by TSSWCB and administered by TWRI, is simulating the current pollution loadings using the SWAT computer model, which will help with reassessment of needed load reductions. Additionally, the updated model (projected to be completed by March 2009) can simulate load reduction scenarios for a suite of BMPs specified by the TSSWCB.

Agricultural Water Conservation Demonstration Initiative

In September 2004, the Harlingen Irrigation District partnered with Delta Lake Irrigation District, AgriLife Extension, Texas A&M-Kingsville, Rio Farms, Texas Citrus Mutual, TSSWCB, NRCS, and Lower Rio Grande Valley agricultural producers to begin a large-scale, 10-year *Agricultural Water Conservation Demonstration Initiative (ADI)*. Funded by the Texas Water Development Board, ADI gathers comprehensive data to evaluate the impact of on-farm water conservation techniques on crop productivity, irrigation water-use, and available water supplies, providing education to agricultural producers. ADI includes constructing a meter calibration facility, maximizing the efficiency of flood irrigation, demonstrating the effectiveness of major irrigation technologies, and showcasing how to implement beneficial findings from field demonstrations to irrigation districts and producers. ➔

The Texas Water Resources Institute has five Arroyo Colorado projects under way to help improve the water quality of the arroyo. Photo by Brad Cowan, Texas AgriLife Extension Service



Impacts of biological control of giant reed in the Lower Rio Grande Valley

Giant reed, *Arundo donax*, was introduced to the Rio Grande area in the 1800s. It has since absorbed large quantities of water, greatly increases potential for flood damage, and may impact homeland security. As a non-native plant, *Arundo* growth is difficult to control and suppresses native vegetation in wetland habitats, forming dense thickets lining Lower Rio Grande Basin waterways.

Dr. John Goolsby, USDA–Agricultural Research Service, has ongoing experiments with three biological control agents that feed on the giant reed. In a project funded by RGBI, Dr. Georgianne Moore, Texas A&M University, is working with Goolsby to study effects of these agents on the growth and water consumption of the giant reed. Impacts of biological control on transpirational water loss from giant reed in the Lower Rio Grande Valley will contrast growth rates and transpiration of plants infected with the three agents and will study development and use of new scaling methodology to estimate transpiration in a natural stand.

Economists evaluate the potential annual gross benefits of giant reed control using assumed levels of values of various factors contributing to the comprehensive assessment. Future research efforts are intended to improve identifying and assessing contributions to this program’s economic-benefit calculations and the accuracy of such calculations. Current efforts better specify and increase the accuracy of the estimated range of annual water savings.

The RGBI project has leveraged funds from contributing agencies and organizations. It has brought more than \$3 million to the Valley from 2001 to present. More than \$2.7 million is anticipated to be spent on additional programs between now and 2010, when the project ends. ADI is contributing \$3.8 million more to the project.

Additional Rio Grande Basin Federal Initiatives

One project is led by Sul Ross State University and involves all five universities of the Texas State University System (TSUS). This initiative complements RGBI efforts and, due to careful collaboration and joint activities, duplication is minimized. TSUS’s Sustainable Agricultural Water Conservation in the Rio Grande Basin addresses conservation issues in the basin and possible solutions to the area’s ongoing water struggles with groundwater and surface water. Project objectives focus on general biological assessment, GIS, database compilation, and Web-accessible ARCIMS. This project is creating a basinwide perspective for integrated management and sustainable use of water resources.

Another federal initiative led by the University of Texas at Austin was the Rio Grande – Rio Bravo Studies, which has recently ended. It focused on developing GIS-based water resource tools for the basin area shared between Mexico and the United States. UT cooperated with the National Water Commission of Mexico to develop a geodatabase to build hydrologic information systems for supporting hydrologic analysis and modeling. The information will help develop bi-national cooperation between Mexico and the United States concerning water in the Rio Grande Basin. It will also provide accurate and reliable data necessary for analysis and resolution of water resources issues.

Participants of all these projects communicate regularly. They meet during the year to review ongoing efforts and plan for collaborative activities. 💧

Rio Grande Basin Initiative

<http://riogrande.tamu.edu>

Arroyo Colorado

<http://arroyocolorado.org/>

Agricultural Demonstration Initiative

<http://www.hidcc1.org/node/6>

Texas State University Projects

<http://www.rivers.txstate.edu/rg/>

University of Texas Projects

<http://www.crwr.utexas.edu/riogrande.shtml>



As shown looking into Mexico from the U.S. side of the Rio Grande in Rio Grande City, agriculture is prevalent on both sides of the border. Water from the Rio Grande is essential for agricultural irrigation systems in the valley.
Photo by Danielle Supercinski, TWRI