Rio Grande Basin Initiative
OUTCOMES

Identifying water needs for yards

Deep and infrequent irrigation key for efficient water use

A mature walnut tree sits on a lawn of St. Augustine grass, dotted with crape myrtles, rose bushes, ficus trees and dwarf yaupon hedges. The landscape, along with the sandy loam soil at the Texas A&M Research and Extension Center in Weslaco, makes it the ideal site for studying water requirements of a common residential landscape system, not just of individual plants.

Using sensors placed in 64 different areas and depths, Roger Havlak, extension program specialist for turfgrass and water management with the Texas A&M University Department of Soil & Crop Sciences, measured both potential evapotranspiration from weather stations and actual evapotranspiration. Potential evapotranspiration is the maximum amount of water lost in a cropping system in a given time period from both plants and evaporation. Actual evapotranspiration is the soil moisture loss of a landscaping system consisting of trees, turfgrass and shrubs.

"Plants are opportunistic. They will use as little energy as possible to maintain themselves. If homeowners irrigate lightly and frequently, and do not build water reservoirs deep in the soil, drought conditions that dry the topsoil could possibly injure or even kill the plants."

Havlak found that the top eight inches of soil lost the greatest fraction of soil water through plant absorption and evaporation. If the soil moisture content remained high, plants would utilize water in the top eight inches of soil, but, in a water-stressed environment, plants were capable of extracting water from as deep as 24 inches below the topsoil.

by Jenna Smith

Using sensors placed in 64 different areas and depths, specialists with the Texas A&M Department of Soil & Crop Sciences measured both potential and actual evapotranspiration of an entire landscaping system consisting of trees, turfgrass and shrubs.

"Plants are opportunistic," he said. "They will use as little energy as possible to maintain themselves. If homeowners irrigate lightly and frequently, and do not build water reservoirs deep in the soil, drought conditions that dry the topsoil could possibly injure or even kill

*See **Landscape** on page 7*

Acequias aid in aquifer recharge

Study shows multiple benefits from acequia irrigation

by Kevin Robinson-Avila

Alfredo Montoya, a grower whose family dates back eight generations in Alcalde, said he feels vindicated by a New Mexico State University (NMSU) study that shows traditional acequia (ditch) irrigation systems provide broad ecological and social benefits to local communities.

Sam Fernald, a New Mexico State University watershed management specialist, measures subsurface water levels and quality near the Alcalde acequia at New Mexico State University's Sustainable Agriculture Science Center.

"The knowledge of how beneficial acequias are has been passed down from generation to generation, but there's been little public recognition of it outside our communities," said Montoya, who is an Alcalde acequia commissioner. "The acequias help keep the countryside lush with vegetation and wildlife, and they help recharge underground water supplies and the Rio Grande. We've always known that, but now there's a scientific study that proves it."

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The study, conducted by researchers with the Agricultural Experiment Station, shows that seepage from acequia irrigation canals replenishes shallow aquifers, contributes to riparian vegetation growth and helps maintain surface water levels downriver, said Sam Fernald, a watershed management specialist directing the research.

"The study is continuing, but we've already confirmed these things," Fernald said. "We now know for sure that acequia seepage creates shallow groundwater flow that benefits aquifers and protects deep groundwater quality while flowing directly back to the river."

"There may be benefits to lining some ditches, but if irrigators are getting enough water through their canals, this study suggests it may be better to leave them just the way they are," Fernald said.

The research began in 2001 with funding from the Rio Grande Basin Initiative. The study is documenting interaction between surface and groundwater flows along rivers and irrigation canals in northern, central and southern New Mexico, Fernald said.

The study is most advanced in Alcalde, where Fernald and researchers at the NMSU Sustainable Agriculture Science Center drilled nine wells to measure

water flow and quality in three areas: along the acequia, out in the field where crops are and along the river bank. They used 2-inch-wide slotted pipes thrust 20- to 40-feet down. As water ran through the pipes, electronic indicators measured groundwater levels and quality.

"We did find a lot of seepage from the ditches, up to 10 to 12 centimeters per day," Fernald said. "But we also found that the water rapidly seeps into shallow groundwater, and a lot of it flows directly back to the river."

Final measurements are still being analyzed, but over the length of the acequia, about 5 percent of water running through the canals is seeping out and flowing back towards the river, Fernald said. "That doesn't seem like a huge amount at first glance, but add it up over a whole season and that's a lot of water returning to the river," he said.

In addition to recharging aquifers, the shallow subsurface flow from seepage also protects deep groundwater quality by washing away residue from

"We now know for sure that acequia seepage creates shallow groundwater flow that benefits aquifers and protects deep groundwater quality while flowing directly back to the river."

agricultural chemicals, nutrients and salts, Fernald said. And seepage along the acequias provides water for trees, shrubs and pastures to grow in areas far from the river, providing food for wildlife while improving rural aesthetics and land values.

Fernald is now organizing a second research site in Albuquerque, where soil and irrigation systems differ from those in northern New Mexico.

In southern New Mexico, Fernald is studying surface and groundwater flows between the Rio Grande and bosques

Fernald is studying interaction between surface and ground-water flows along rivers and irrigation canals in northern, central and southern New Mexico.

along the riverbank. Researchers installed 67 wells at a bosque on the NMSU Chihuahuan Desert Rangeland Research Center to measure water level and quality.

"The bosque acts like a riparian sponge that filters and cools the water before flowing back to the river," Fernald said. "That helps downriver users who plan to treat water for drinking, and it benefits fish that need cool water to survive."

In Alcalde, Cooperative Extension Service is already disseminating research results.

"This is important, because accurate measurements of return flow to the river and other acequia benefits must be considered when policy-makers evaluate agricultural water use," said Steve Guldan, Alcalde science center superintendent.

Montoya said the research could help growers maintain the traditional acequia system. "It comes at an opportune time when there's fierce competition for water in the state," he said. "It demonstrates that acequias benefit local communities, not just agriculture."

Identifying new water sources

Arid regions look to water efficiency of subsurface drip

by Jenna Smith

A popular irrigation practice made its way into the United States from Israel in the early 1970s. For the first time, however, subsurface drip irrigation, characterized by a closed, low-pressure system, is being pumped using a recycled water source.

A team of researchers at the Texas A&M Agricultural Research and Extension Center in El Paso, Naomi Assadian and George Di Giovanni, along with Texas Cooperative Extension Specialists Juan Enciso and Jaime Iglesias, is evaluating a blend of reclaimed and untreated wastewaters as alternatives to Rio Grande water for a subsurface drip irrigation system on spinach.

"In the future, there should be minimal costs for using lower quality wastewaters for agricultural purposes. Farmers could provide an important recycling service for themselves and for local communities."

Assadian said there are plenty of opportunities and consistent supplies of wastewater from urban and rural communities for crop irrigation. However, wastewater may contain microbial and chemical constituents that may be harmful to soil and plants, and

Research Technician Nick Ronquillo prepares columns, where the irrigated vegetables are monitored. For the first time, subsurface drip irrigation is being pumped using a recycled water source.

may potentially affect food safety.

The water used in this study was collected from a wastewater treatment plant in El Paso. The untreated wastewater was high in nitrogen, and the reclaimed wastewater was high in sodium.

Both types of water underwent conventional wastewater and recycled treatments. About 33 percent of the operating costs of the treatment plant are spent removing nitrogen from these recirculated wastewaters.

"Instead, nitrogen-rich water could be diverted for irrigation," Assadian said. "Nitrogen is an important macronutrient for plants."

Subsurface drip irrigation involves an underground network of hoses with holes, or emitters. Water is released through these emitters at a specific rate, allowing plant roots the first opportunity at water.

"Compared to surface irrigation, subsurface irrigation methods decrease water losses from wind, evaporation or leaching," Assadian said. "We can also control how much and how often water is administered, and keep water application contained in targeted areas. More importantly, for reclaimed wastewaters, it has the potential to minimize pathogen movement to the soil surface."

"Crop selection will also be an important factor in successful use of alternative irrigation water sources."

Initial installation costs of subsurface drip irrigation systems are high, so most current users in the desert Southwest are small landscapers and homeowners.

Assadian said that subsurface drip irrigation will become a more valuable and common irrigation delivery system as water availability decreases and water prices rise in the El Paso region.

"Crop selection will also be an important factor in successful use of alternative irrigation water sources. Crops such as spinach and asparagus are sodium-loving plants," Assadian said. "By planting these types of crops, we may help draw salts from the soil to reduce salt accumulation."

She said the project demonstrates the potential for a win-win situation between urban communities and agriculture in the Rio Grande Basin.

Spinach is being grown in columns, where the moisture content is weighed and measured. Spinach is the perfect test plant for re-claimed water use, because it is eaten both raw and cooked.

Communities could supply essential water and nutrients for crop production, and, in turn, agriculture eliminates a costly waste stream for communities. Because agriculture uses less fresh water for irrigation, more is available for other uses.

"In the future, there should be minimal costs for using lower quality wastewaters for agricultural purposes," Assadian said. "Farmers could provide an important recycling service for themselves and for local communities."

Every drop counts

The Texas Water Resources Institute and the New Mexico State University College of Agriculture and Home Economics will hold the third annual Rio Grande Basin Initiative Conference April 4-7, 2004 in Las Cruces, New Mexico.

Fifty percent of homeowners reported having a Southwest, desert-type landscape, but when asked how they could help reduce water use in the Las Cruces area, more than 80 percent of residents said they would use desert plants in their yards.

Publication describes Elephant Butte policies

A publication describing the Lower Rio Grande Valley's water resources and New Mexico's Elephant Butte Irrigation District practices is now available through New Mexico Cooperative Extension.

Interpreting the Elephant Butte Irrigation District for Water Users assists water managers, producers and all other water users in understanding the policies that govern water use and distribution throughout the irrigation district as well as water rights issues.

As the main water provider for southern New Mexico and West

Texas, Elephant Butte Reservoir must receive a specified amount of water each year to meet the needs of its water users. This publication addresses the ways in which the reservoir is supplied and how the irrigation district manages the reservoir water supply.

Project conference set for April in New Mexico

The Texas Water Resources Institute and the New Mexico State University College of Agriculture and Home Economics will hold the third annual Rio Grande Basin Initiative Conference April 4-7, 2004 in Las Cruces, New Mexico.

B.L. Harris, project director for the Rio Grande Basin Initiative and associate director of the Texas Water Resources Institute, said the purpose of the meeting is to promote communication among project participants in Texas and New Mexico, and to promote collaborative linking with other agencies.

"Accomplishments will be highlighted, and interactive discussions for future plans will be a focus," he said. "Better integration, project activity prioritization and expanded collaboration are goals of the meeting."

http: //spectre.nmsu.edu:16080 /rio_grande

Homeowner survey to reduce urban water use

Homeowners moving toward a water-conserving landscape and working with a reduced water budget would be satisfied with flowers, healthy leaves and plant robustness, according to a survey of Las Cruces homeowners available from the New Mexico Agricultural Experiment Station.

The survey investigates landscape preferences and attitudes of residential homeowners in hopes of reducing urban water use.

According to the survey, more than 50 percent of homeowners reported

having a Southwest, desert-type landscape, but when asked how they could help reduce water use in the Las Cruces area, more than 80 percent of residents said they would use desert plants in their yards.

Respondents to the survey also admitted that water shortages in the area would cause them to decrease personal water use, followed by environmental concerns, high water bills, water rate increases and city regulations.

Landscape

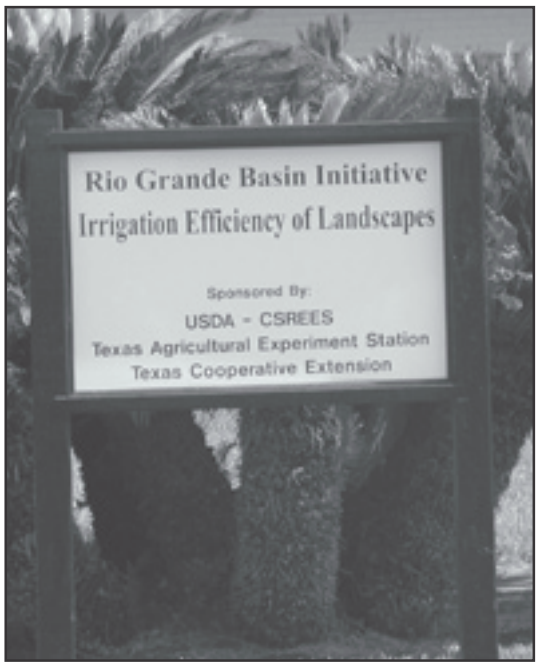
Continued from page 1

the plants. Thus, deep and infrequent irrigation is recommended."

Havlak said system zoning is another useful tool for water conservation. It involves applying water in different zones, separated by water requirements of the plants and application methods. Because water loss rates are normally different among plants in landscapes, he said, this approach is also recommended.

Havlak used the ratio of actual evapotranspiration to potential evapotranspiration to calculate the landscaping coefficient for the Weslaco landscape. Landscaping coefficients remained less than 1 during the study with monthly coefficients ranging from 0.51 to 0.67.

"We are already working with several municipalities to analyze and compare homeowner water consumption rates to weather station potential evapotranspiration rates to determine the number of homeowners possibly overwatering their landscapes as well as the potential savings that may be realized if potential evapotranspiration was used," he said. "This could certainly be a useful tool for municipalities to use in their day-to-day assessments for conserving water."



The potential evapotranspiration value from the weather station was an excellent predictor of water loss rates within the Weslaco landscape system. However, because of the differences among plant varieties and soil types throughout Texas, Havlak and the turfgrass staff at Texas A&M plan to introduce an additional five to ten sites within the next five years.

"We plan on setting up a site at the Texas A&M University Riverside Campus by April 2004 so that we can begin collecting data on that site prior to summer," he said. "We also hope to locate sites in West Texas and New Mexico, both located within the Rio Grande Basin, in the near future."

Havlak has given talks nationwide to water users and to agencies within the turfgrass industry. Local weather stations and county extension offices can also provide homeowners with information on proper irrigation techniques.

The Texas Evapotranspiration Network can be accessed at http://texaset.tamu.edu.

The turfgrass site at Texas A&M is http://aggie-turf.tamu.edu.

Increasing Irrigation Efficiency in the Rio Grande Basin through Research and Education

Through Extension and research efforts, the Texas A&M University System Agriculture Program and the New Mexico State University College of Agriculture and Home Economics are implementing strategies for meeting present and future water demand in the Rio Grande Basin. These strategies expand the efficient use of available water and create new water supplies. This federally funded initiative is administered by the Texas Water Resources Institute and the New Mexico State University Water Task Force with funds from the Cooperative State Research, Education, and Extension Service.

Rio Grande Basin Initiative Outcomes
February 2004, Vol 3. No. 1

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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.

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