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In This Issue:

Working Together for Texas Water

An important component of restoring and maintaining water quality is the Total Maximum Daily Load (TMDL) Program, authorized by and created to fulfill the requirements of Section 303(d) of the federal Clean Water Act. A TMDL is the maximum amount of pollution a water body can receive and still meet water quality standards. The U.S. Environmental Protection Agency provides funds to the Texas Commission on Environmental Quality and Texas State Soil and Water Conservation Board to support the development and implementation of TMDLs.

To date, TCEQ has adopted 64 TMDLs for 35 water bodies and EPA has approved 60 of these TMDLs. Fifty TMDLs have implementation plans in place to reduce the impairment. Currently, TCEQ is working on 13 TMDL projects for water bodies in which bacterial levels are too great for safe contact recreation, such as swimming and wading.

As part of the process of identifying bacteria in water samples and its pollution source, scientists from Texas A&M University, the Agricultural Research Center at El Paso and Texas A&M University-Corpus Christi are developing and refining bacterial source tracking or BST. The scientists are developing genetic and phenotypic “fingerprint” libraries from known animal and human sources. These known fingerprints are then compared to bacteria from unknown sources in water samples. These scientists have worked to determine sources of bacterial contamination in streams in Central Texas, the San Antonio area and along the Texas Gulf Coast.

Using BST to develop TMDLs and implementation plans is part of a holistic approach to improving the quality of water in Texas. We all contribute to the problem; we must all contribute to the solution.

C. Allan Jones

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Published by
Texas Water Resources Institute

Clint Wolfe
Managing Editor
Texas Water Resources Institute

Kathy Wythe
Editor
Texas Water Resources Institute

Courtney Swyden
Assistant Editor
Texas Water Resources Institute

Steven Keating
Art Director
Agricultural Communications

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for more information.

On the cover:
Composted Dairy Manure at Fort Hood.
Photo by Jerrold Summerlin

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Story by Kathy Wythe

PARTNERING WITH THE MILITARY

Agriculture uses compost to restore Fort Hood's training lands

Texas Agricultural Experiment Station researchers have partnered with Fort Hood personnel to identify a natural "weapon" to restore the facility's tank training areas—land and soils seriously eroded, compacted and stripped of the most desirable vegetation by the repeated pounding of 70-ton tanks.

After three years of studies, researchers with the Texas Water Resources Institute (TWRI) in College Station and the Blackland Research and Extension Center (BREC) in Temple have determined that composted dairy manure can increase soil fertility and vegetation cover on some of the Fort's 200,000 acres of training areas and stabilize eroded soils without excessive nutrients entering the streams.

Dr. Bill Fox, TWRI senior research scientist, and Dr. Dennis Hoffman, BREC senior research scientist, the pilot project's co-leaders, and over 20 other scientists and land managers have established more than 500 acres of research and demonstration sites on the fort's primary tank maneuver training area.

"We needed to know that the compost applied on Fort Hood's land is not causing nutrient problems in the water and demonstrate that nutrients in compost can be turned into something positive—growing grass and reducing soil erosion," Fox said.

"We've seen nothing to indicate runoff of nutrients into streams," Hoffman said. Hoffman and his team of researchers monitor the water quality for the project.

The studies also show that research plots with certain rates of compost responded with better vegetation coverage than those without the compost, Fox said.

"After two years of comprehensive work on multiple sites, our research has demonstrated that sites receiving 15 or more cubic yards per acre of compost along with re-seeding treatments have produced significant vegetation increases," Fox said.

The compost not only adds nutrients and organic matter to the training land's soil but it also improves the soil's structure, increases its water-holding capacity and aids in erosion control. To date, the project has trucked in more than 15,000 tons of compost from the North Bosque River Watershed where too much phosphorus from dairy manure runoff is impairing that watershed.

Tanks within two armored divisions at Fort Hood have left some of the training land eroded, compacted and stripped of the most desirable vegetation. Restoration of these lands provides maintenance of quality training lands for military personnel and maintenance and improvement of the natural resources.

“The unique character of this project,” said Fox, “is that two major environmental problems are being addressed at the same time. Excessive nutrients in one watershed are being used to fertilize nutrient-starved soil in another. Two ‘bads’ can make a ‘good.’”

Dr. Scott Keating, a TWRI associate research scientist, successfully developed a unique, heavy-duty compost spreader for the project that can handle the rough terrain of the training lands. The stainless steel spreader on a 40-ton axle has an increased capacity and higher discharge rate than other spreaders, Keating said.

“With the gullies caused by erosion and the tracks of heavy military equipment, a standard spreader would not do the job,” he said. Keating said there is interest from as far away as Canada about the spreader.

The group compared the percentage of change in ground cover, bare ground and litter (leaves and dead biomass on the ground) over time: 1) at the start of the project, 2) one year after compost was added, and 3) 18 months after compost treatment, which was also after one year of training on the site.

The amount of ground with no vegetation decreased from 50 percent to 32 percent one year after compost treatment and decreased even further to 24 percent 18 months after treatment. Fox attributed this decrease to the litter that remained on the ground after training maneuvers.

The research shows that it takes 12 to 18 months after compost and seed application to achieve significant changes in plant basal cover, Fox said. Preliminary analysis indicates that the treated sites are also more resilient after training exercises than before compost was added.

Along with studying the use of composted dairy manure on the training areas, researchers from the Experiment Station, Fort Hood’s Integrated Training Area Management (ITAM), Fort Hood’s Directorate of Public Works and U.S. Department of Agriculture-Natural Resources Conservation Service (NRCS) have studied the use of other conservation practices to heal the landscape for 12 years.

Hoffman and his team, working with Jerry Paruzinski of Fort Hood ITAM, and Rob Ziehr from NRCS have installed best management practices (BMPs) such as gully plugs, contour ripping, and sediment retention ponds. Results of water quality studies show that these BMPs play a significant role in reducing sediment loss from training areas into area streams and water bodies.

Their research shows that the ITAM/NRCS conservation practices have reduced stormwater runoff volume and intensity, reduced sediment loss from training areas by as much as 90 percent and improved the training areas’ sustainability, Hoffman said.

The compost project, federally funded through the NRCS, is an example of the military’s foresight and interest in the environment, saiD U.S. Rep. Chet Edwards, who has supported the program since 2003.

photo by Jerrold Summerlin

"This funding will help Fort Hood avoid environmental problems that could impose restrictions on training—training that is important to saving lives in theater," said Edwards. "Through this innovative program, Fort Hood is once again demonstrating its commitment to environmental stewardship, and by doing so, to the training that keeps our soldiers alive."

U. S. Rep. John Carter agreed. "The Fort Hood Revegetation Project is a necessary tool in enhancing the vegetative growth of the land while improving the training facilities at Fort Hood," Carter said. "This project is another example of the military working to protect the ecosystem surrounding its training areas."

Now the project is moving into its next phase—large-scale application and refining the specific recommendations of using the compost and grasses—and is bringing in two prominent researchers from Texas A&M to help with the project.

"Now that we know compost will not create a water concern, we are integrating this practice into our Critical Area Treatment (CAT) program to sustain training and our natural resources," said Paruzinski of Fort Hood ITAM.

"We will focus on the development of specific strategies for using the compost—how much and when we should use it and with what combination of other conservation practices currently used on the training areas," Fox said.

Dr. Fred Smeins, professor in the Rangeland Ecology and Management Department, will focus on developing better approaches to restoring vegetation on the training lands. Smeins will use a variety of plant materials along with the compost to see which species provide rapid cover for the soil in the training areas.

Dr. Tom Hallmark, professor in the Department of Soil and Crop Sciences, will study the compaction of the soil. "We'll be looking at what changes the plants are making in the soil," Hallmark said. "Some species may be better at relieving compaction than others."

Hoffman, working with others at BREC, NRCS and ITAM, will evaluate the effectiveness of vegetated buffer strips using compost to establish the vegetation along with contour ripping practices currently used.

Fox said the project will "ultimately end up with an integrated maintenance program that will allow Fort Hood to reduce erosion and maintain high quality training grounds."

Steve Burrow, chief of environmental programs, Fort Hood's Directorate of Public Works, agreed, saying the project is vital in providing long-term sustainable training capability for Fort Hood soldiers.

"We can now take what we have learned from this re-vegetation project and implement it into our land management strategy to maximize our resources, both natural resources and financial," Burrow said. "This allows Fort Hood to remain the Army's premier training installation."

"Our CAT program will integrate compost, seeding, ripping, land shaping, gully plugs, tank trail repairs, and rest to rehabilitate the damaged landscape and enhance training capabilities on Fort Hood," Paruzinski said. "Incorporating compost into CAT will increase our land sustainment and enabling training."

For more information on the project, visit: http://forthoodreveg.tamu.edu.

The compost spreader was custom designed and built by Dr. Scott Keating, a TWRI associate research scientist, to handle the rough terrain of Fort Hood's training lands.

Top photo: The heavy artillery traffic from Fort Hood's training leaves ruts and gullies on the land and heavily damages the soil and vegetation.

Bottom photo: A demonstration site treated with composted dairy manure to add organic matter and nutrients and then re-seeded with native grasses flourishes on a portion of Fort Hood's primary training areas.

Project wins environment award

The Fort Hood Range Revegetation Pilot Project, a joint project of the Texas Water Resources Institute and the Blackland Research and Extension Center, won the 2006 Texas Environmental Excellence Award for Agriculture. The award, sponsored by the Texas Commission on Environmental Quality and Gov. Rick Perry, was presented to the project staff at the agency's banquet in May.

The Texas Legislature created the awards in 1993 and TCEQ presents them to outstanding, innovative environmental programs in 10 diverse categories across the public and private sectors. The Governor's Blue Ribbon Committee, a group of leaders in public and private industry with expertise in environmental policy and practices, judge the applications.

Texas Agricultural Experiment Station Director and Vice Chancellor for Agriculture and Life Sciences Elsa Murano said, "I am so proud of the efforts of the Texas Water Resources Institute with in the Texas A&M Agriculture family for leading the way and being en example to all of us and our great state.

"I am proud of the creativity and drive it takes to develop and carry out a program such as this, which ultimately helps us preserve our precious natural resources for the future."

The Fort Hood project, federally funded through the U. S. Department of Agriculture-Natural Resources Conservation Service, was initiated in 2003 to assist Fort Hood in dealing with soil erosion and land degradation on the fort's training areas.

"As Texans, we understand and appreciate the importance of our state's natural resources," said Kathleen Hartnett White, TCEQ chairman. "These awards recognize the initiative and innovation of Texans who go above and beyond the call of duty to protect and enhance those resources."

U.S. Rep. Chet Edwards, who has supported the program with $2 million in federal funds since 2003, said of the award: "It is a privilege to be part of a program that is a model of collaboration and cooperation that is making a difference for our soldiers and our environment."

U.S. Rep. John Carter gave his congratulations for the award. "I applaud all of the partners in this project and am proud to support practices that will benefit not only Fort Hood's training capabilities, but also the environment," he said.

Story by Kathy Wythe

Texas Gold Rush

Scientists seek to understand and control golden alga

A free-floating microscopic alga is increasingly appearing in some Texas lakes and rivers, releasing its deadly toxins and wiping out millions of fish. Texas scientists have taken on the assignment of understanding the culprit and developing strategies for its control.

Golden alga, or *Prymnesium parvum*, was first identified in the Pecos River in 1985. Since that time, the alga with its signature golden-tea appearance has surfaced in most of the state's major river basins. Joan Glass, of the Texas Parks and Wildlife Department's (TPWD) Spills and Kills Team, said she witnessed 187 miles of dead fish along the Pecos River in 1988.

Although it can be present in waters without being harmful, the alga has caused fish kills in five of Texas' 25 major river systems. According to TPWD's statistics, the toxins from the organism have killed more than 25 million fish worth $10 million in the Canadian, Red, Brazos, Colorado and Rio Grande river basins.

In 2001, toxic blooms—explosive increases in the alga's population—killed more than 5 million fish at the Dundee State Fish Hatchery near Wichita Falls, with an entire year's production of striped bass lost. This fish kill and the others have caused major financial losses to Texas' fishing and recreational industries.

Golden alga is an enigma. Until recent research, little was known about the biology of the alga in natural inland waters, its toxins, the environmental requirements for its growth or the water quality conditions in the affected freshwaters before a toxic event occurs.

The alga is harmful when it out-competes other aquatic algae and blooms. It then begins to release toxins that affect gill-breathing animals, such as fish and clams. The toxins prevent exposed cells (cells without protective layers such as on the surface of gills and skin) from keeping out excess water and waterborne chemicals. In fish, this process leads to bleeding and lesions on the gills.

More than 13 entities are involved in golden alga research or monitoring in Texas. TPWD documents the status of golden alga in Texas waters on its Web site along with maintaining numerous informational Web pages about the alga and the current research.

Dr. David Sager, TPWD's Ecosystem/Habitat Assessment branch chief, said the department is conducting a statewide survey to determine the distribution of the alga. "The kills," he said, "are in central and western Texas, which is thought to be because of the higher salinity and pH of the water in these areas."

Sager said TPWD scientists have learned how to control golden alga in hatcheries and ponds using ammonium sulfate and copper compounds but "those controls don't work well in larger reservoirs."

Dr. Daniel Roelke of Texas A&M University, Dr. Bryan Brooks of Baylor University, Dr. James Grover of the University of Texas-Arlington and Richard Kiesling of the U.S. Geological Survey (USGS) are collaborating on projects to understand the environmental conditions that allow the organism to grow and cause fish kills. Once these conditions are understood, the researchers hope to develop a model to predict the environments that allow the alga to bloom and produce toxins and to determine cost-effective management options to prevent or disrupt the blooms.

Roelke, an associate professor in TAMU's Department of Wildlife and Fisheries Sciences, said the team used a three-pronged approach to study golden alga and its environment in a TPWD project completed recently. The research team conducted in-field experiments at Lake Possum Kingdom, performed laboratory experiments comparing lab and in-field samples and identified a biosensor to measure the alga's toxicity.

On the lake, the team floated 24 plastic enclosures or corrals filled with lake water, adding excessive nutrients of phosphorus, nitrogen and trace minerals; barley straw extract; enhanced populations of golden alga; and different combinations of the three additions.

The first finding, Roelke said, was that the barley straw extract, thought to be a natural algaecide based on research in other parts of the world, had no effect on limiting the alga's growth. "We hoped using the barley straw extract as a management tool would be the silver bullet we were looking for, but it didn't affect it at all," Roelke said.

"The second finding, which surprised everyone, was with the additional nutrients the exact opposite happened," Roelke said. When they spiked the enclosures with nutrients in excess of naturally occurring amounts in the lake, the alga grew but its toxicity was reduced, and, in many cases, was non-toxic.

Toxic golden alga, although not harmful to humans or most animals, has killed 25 million fish in Texas since 1985.
Photo courtesy of Texas Parks and Wildlife Department.

Working with the organisms in the laboratory, Grover, an associate professor in UTA's Department of Biology, found that the optimal growth of the alga occurred in higher temperatures and higher levels of salinity and light than is typical in Possum Kingdom and other Texas waters. The alga's toxicity, however, decreased under these optimal growing conditions but increased under the growing conditions found in Texas waters, Grover said.

"Winter conditions in Texas turned out to be conditions that, unfortunately, tend to promote toxicity," Grover said.

"It appears the organism is becoming more toxic under conditions that are not optimal for its growth, which implies the organism is getting stressed and releasing toxins," Brooks said.

Finally, in the project's third part, Brooks, director of the Ecotoxicology Research Laboratory at Baylor, performed bioassays with samples from the field and lab to identify toxic conditions caused by *P. parvum*. He discovered that the team could use fathead minnows as biosensors or the "canary in the coalmine" to alert researchers when the water conditions were toxic, Brooks said.

Texas Parks and Wildlife has funded the TAMU, Baylor, UTA, USGS team to continue its research at Lake Whitney where TPWD's scientists have been collecting samples for three years. Roelke said this project will look at "what other factors might cause toxic blooms and what factors might cause blooms to go away." The project will compare the amount of grazers, pathogens and salt content in Lake Whitney to Lake Waco where golden alga does not bloom to determine the roles these elements have in toxic bloom occurrences.

The research team will build a numerical model designed to measure many parameters and predict which environmental conditions allow the golden alga to grow and test potential management strategies, Roelke said.

The team is also collaborating on a federally funded research project at Lake Granbury, managed by the Texas Water Resources Institute. The lake has toxic golden algal blooms that are killing fish and elevated amounts of *E. coli* bacteria in some of the lake's coves. The team will investigate the distribution and dynamics of the alga in relation to *E. coli* as well as the linkages between water conditions, nutrients, dissolved organic matter and blooms.

Roelke and Dr. Steve Davis, assistant professor of wildlife and fisheries sciences at A&M, are producing a high-resolution spatial map of the lake to see if the blooms are occurring in the same places as *E. coli*.

Part of the golden alga research on Possum Kingdom Lake involved adding barley straw extract; excessive amounts of phosphorus, nitrogen and trace minerals; and enhanced populations of the alga to large volume enclosures floating in the lake.

"If we get strong correlative data of *P. parvum*, *E. coli* and dissolved organic matter, we can infer the cause," Roelke said.

In another project evaluating treatment options, the Brazos River Authority (BRA) began applying bales of wheat straw in the fall of 2005 to six coves where blooms occur in Lake Granbury and six coves in Possum Kingdom Lake in hopes of developing a cost-effective means to control or prevent the toxic blooms.

The BRA project, funded by the U.S. Environmental Protection Agency, is based on an English study of applying straw to areas where the alga have been in the past. The straw is submerged just below the surface of the water. The use of straw does not kill existing cells but prevents the growth of new algal cells.

Tiffany Morgan, project manager for the BRA study, said the river authority will continue monitoring the coves until August 2006, then start analyzing the data with a final report on the results by January 2007.

Sager said TPWD has funded projects investigating other aspects of the alga.

John La Claire of the University of Texas at Austin is developing a partial genome analysis of golden alga and is getting basic information needed for scientists to develop genetic probes that will be used to tell the amount of golden alga in water samples.

Dr. Chi-Ok Oh of the Department of Recreation, Park and Tourism Sciences and Dr. Robert Ditton of the Department of Wildlife and Fisheries Sciences of at Texas A&M University, studied the economic impacts of golden alga on recreational fishing at Possum Kingdom Lake. They estimated the total economic impact was a loss of $2.8 million and a 57 percent reduction in visitors from the 2001 fish kill.

Sager said TPWD is continuing its monitoring of water samples on Lake Whitney and has contracted with Dr. Ayal Anis of Texas A&M University-Galveston's Department of Oceanography to study water currents in Lake Whitney and how the currents spread the alga throughout the reservoir.

The ultimate mission for everyone is finding a management strategy to control the alga and stop the fish kills.

"It could take us years to find a good management strategy," Sager said. "But we are doing it as quickly as we can."

Texas A&M University graduate student Reagan Errera and undergraduate student Heather Thompson prepare to add elements to the large volume enclosures in Possum Kingdom Lake.

Story by Kathy Wythe

Natural Predator

Foreign beetle shows promise for controlling saltcedar

In the northern part of the Texas Panhandle and along the West Texas banks of the Colorado and Pecos rivers, Texas scientists are successfully introducing a foreign beetle to help control an invasive and exotic water-thirsty plant.

Saltcedar, or *Tamarix*, was introduced to the western United States in the 1800s from central Asia as an ornamental tree and planted along riverbanks for erosion control. Without a natural predator, the tree soon out-competed native plants and has now infested an estimated 500,000 acres of Texas streams and riverbanks.

Saltcedar is a big water user, withdrawing 3 to 4 feet of water per year depending on plant density, tree age and depth-to-water table. It also increases soil salinity and wildfire risk and crowds out native vegetation used by wildlife.

The Texas Riparian Invasive Plants Task Force has identified saltcedar among the "worst of the worst" invasive species in Texas.

Dr. Allan McGinty, professor and Extension range specialist at The Texas A&M University System Agricultural Research and Extension Center at San Angelo, initially organized the Upper Colorado River Saltcedar Control Task Force in February 2001 to manage the use of chemical herbicides and more recently the use of biological control.

Although researchers are using aerial sprays with herbicides as well as controlled burning to reduce saltcedar, its natural enemy, the saltcedar leaf beetle, or *Diorhabda elongata*, offers a low-cost, sustainable alternative. If established over time, a sufficient population of saltcedar beetles has the potential to shrink the saltcedar population, producing significant water savings, researchers said.

Dr. Jack DeLoach, an entomologist with the U.S. Department of Agriculture's Agricultural Research Service in Temple, has researched biological control of saltcedar for 20 years and has determined the saltcedar beetle feeds only on saltcedar and will not harm native plants or trees when introduced in the western United States.

The Saltcedar Biological Control Consortium, a group of federal and state agencies, private interests and universities, was formed by DeLoach in November 1998 to coordinate and promote the biological control program in the United States. He organized the Texas, New Mexico, Mexico Section of the consortium in March 2005 to coordinate research efforts in these areas. The Agricultural Research Service is the lead agency responsible for identifying and testing insects approved for biological control of saltcedar.

Consortium scientists are conducting laboratory and field research, which includes beetle taxonomy and behavior, host range, reproduction and overwintering success, climate-matching, release methods, saltcedar growth modeling and beetle dispersal. They are also measuring the impact of beetle feeding on plant survival and conducting remote sensing and vegetation and bird surveys.

The saltcedar beetle feeds on the invasive, water-thirsty saltcedar tree in the western United States. Researchers in Texas have identified a biotype from Greece that survives in west and northern Texas. Photos courtesy of USDA-Agricultural Research Service.

DeLoach, Dr. Jack Moran, ARS entomologist, and Dr. Allen Knutson, professor and Extension entomologist at the Texas Agricultural Research and Extension Center at Dallas, have successfully established field nursery sites for rearing saltcedar beetles from Greece in the Upper Colorado River watershed, near Big Spring, which has more than 22,000 acres of saltcedar.

After saltcedar beetles from China and Kazakhstan failed to survive in Texas, the research group imported a specific ecotype from Crete, Greece, which has overwintered successfully for three years. "It was a challenge to find a strain adapted to Texas," Knutson said.

In 2004, the Crete beetle population was established in the field at Big Spring in cooperation with Okla Thornton, wildlife biologist for the Colorado River Municipal Water District. The beetles defoliated three trees.

"In 2005, this population increased dramatically and defoliated about 200 trees and dispersed across about two acres," Knutson said, whose research is funded in part by a Texas Water Resources Institute's Soil and Water Research Grant. A total of 5,200 beetles were released at 18 new sites in 2005.

Dr. Joaquin Sanabria, assistant research scientist at Blackland Research and Extension Center in Temple, is modeling the dispersal of the saltcedar beetle and the defoliation it causes at Big Spring as part of a Texas State Soil and Water Conservation Board (TSSWCB) project.

"At this time we are using two types of models on the Big Spring data, diffusion (physically based) and statistical models," Sanabria said. The models will help determine how far and how fast the beetle moves and what factors affect the dispersal and the severity of the salt cedar defoliation by the beetle, he said.

Through the Big Spring project, Knutson and DeLoach said they have developed several recommen-

dations for releasing and establishing beetles at new locations. The best way to establish nursery sites, Knutson said, is to cut the saltcedar down to 2 to 3 feet above the ground during the winter, so beetles can feed on fresh new shoots the following spring. In addition, beetles should be released at new sites as early in the spring as possible.

DeLoach said through the scientific studies they hope they can get a higher percentage of beetles established at future sites.

Jeremy Hudgeons, Knutson's graduate student in Texas A&M's Department of Entomology, has discovered that repeated defoliation by the beetles may cause the tree to use up its stored energy to grow new leaves, causing a "slow starvation" of the tree and eventually death.

Knutson said the project is now moving from the research stage to the implementation stage.

During the spring and summer of 2006, the team will work with Extension agents to distribute the beetles to selected sites in six counties along the Upper Colorado River. "The goal is to establish a nursery site in each county that would serve as a source of beetles for distribution to ranchers and land owners within that county," he said. "Currently, beetles are in very short supply so we need to increase their numbers for re-distribution to new sites."

"If the beetles overwinter well, they could disperse naturally and defoliate over 100 to 200 acres at Big Spring this summer," DeLoach predicted.

Knutson said another objective is to integrate biological control with the herbicide spray programs for saltcedar control on the Pecos and Colorado rivers. Through the Pecos River Ecosystem Project, approximately 75 percent of saltcedar on the river in Texas has been treated with herbicides, according to Charles Hart, professor and Extension range

Researchers hope these saltcedar trees, defoliated by a saltcedar beetle, after repeated defoliation, will die. Saltcedar trees, introduced in the United States in the 1800s, take water away from native plants, deposit salt in the soil and increases the risk of wildfires.

specialist in Fort Stockton.

Knutson and DeLoach are working with Dr. Mark Muegge, associate professor and Extension entomologist at the Texas A&M Extension Center in Fort Stockton, to establish beetles along the Pecos River. "We have two sites on the Pecos River where we will evaluate the use of beetles for controlling re-growth from trees not entirely killed by herbicide and for suppressing saltcedar in areas where herbicide could not be used," Knutson said. "There is concern that these pockets of surviving trees will serve as sources of seeds that will be carried downriver and re-infest areas where saltcedar has been killed by herbicide."

Farther north at Lake Meredith on the Canadian River, researchers have successfully established saltcedar beetles imported from Posidi in northern Greece, Dr. Jerry Michels with The Texas A&M University System Agricultural Research and Extension Center at Amarillo, said.

Michels, professor of entomology, and Vanessa Carney, research associate, are working with the U. S. Department of Interior's Bureau of Reclamation, National Parks Service and the Canadian River Municipal Water Authority to establish the saltcedar beetle at Lake Meredith, which has approximately 6,000 acres of saltcedar.

In the spring of 2004, these researchers introduced about 2,000 beetle eggs into contained tents. The eggs produced about 150 adults in the spring. This initial population grew to over 1,500 by August 2004. They opened the tents in the fall to allow for natural establishment of the population.

"By the end of August 2005, we had probably thousands of beetles successfully established at significant distances from the initial release site," Michels said, including some at one kilometer from the original release site. The beetles seem to be following the saltcedar infestations to the northeast, along the course of the Canadian River, rather than concentrating in specific areas, he said.

Michels and his team are currently monitoring the beetles as they break dormancy and begin to feed again on saltcedar. "We are hoping that this summer will be a really good year and then we will move them around to different areas," Michels said, whose project was partially funded by a TWRI grant in 2004 and 2005.

"If the beetles increase at Lake Meredith as they have in other areas of the United States, we can expect significant defoliation to begin in one to three years," Michels said, adding that these estimates are based on good climate conditions for the beetles.

The Lake Meredith team is also monitoring 40 sentinel saltcedar trees, looking at their growth, seed production, soil type, percent ground cover, vegetative abundance and types of woody plants around these saltcedar. The scientists will use this data as a baseline in a comparative study to assess both the saltcedar's impact and extent in the area, along with the efficacy of the biocontrol agents in the future.

Michels said that saltcedar changes the soil structure, adding more salinity. When saltcedar is controlled, "we hope we get more favorable vegetation," he said.

DeLoach said he and Tyrus Fain of the Rio Grande Institute in Marathon and Patrick Moran of ARS in Weslaco are hoping to work with Mexico to control saltcedar along the Rio Grande, which has the highest concentration of saltcedar in Texas. DeLoach and Moran are currently doing open-field research at a release site near Kingsville on a related tree, athel (also an exotic *Tamarix*), grown in Mexico as an ornamental tree and a windbreak, to determine the amount of damage the saltcedar beetle may have on it.

The predicted water savings from controlling saltcedar could be enormous. Texas A&M University studies have shown that along the upper portion of the Pecos River, where there are an estimated 14,000 acres of saltcedar, an acre of dense saltcedar consumes an estimated 1 million gallons or about 3 to 4 feet of water per acre each year. With more than 22,000 acres of saltcedar in the Colorado River basin, the Colorado River Municipal Water District estimates that saltcedar consumes enough water in the district to meet the annual needs of the city of Odessa.

Complete eradication of the saltcedar is not the goal; reaching a balance is.

"We want the beetle and the plants to stay at low numbers," DeLoach said. Once populations of the beetles are established, they are self-sustaining and no additional releases, and hopefully no additional controls, will be necessary.

Getting the saltcedar back into the right balance is going to take time.

"We estimate that four to five years of repeated defoliation by beetles will be necessary to kill small saltcedar trees," Knutson said, "but, in the meantime, the saltcedar is not using as much water because it doesn't have the full canopy of leaves and other plants begin to grow in its place."

DeLoach agreed, saying that even without the death of the tree, the saltcedar uses only 5 percent to 10 percent of the water it previously used before beetle defoliation.

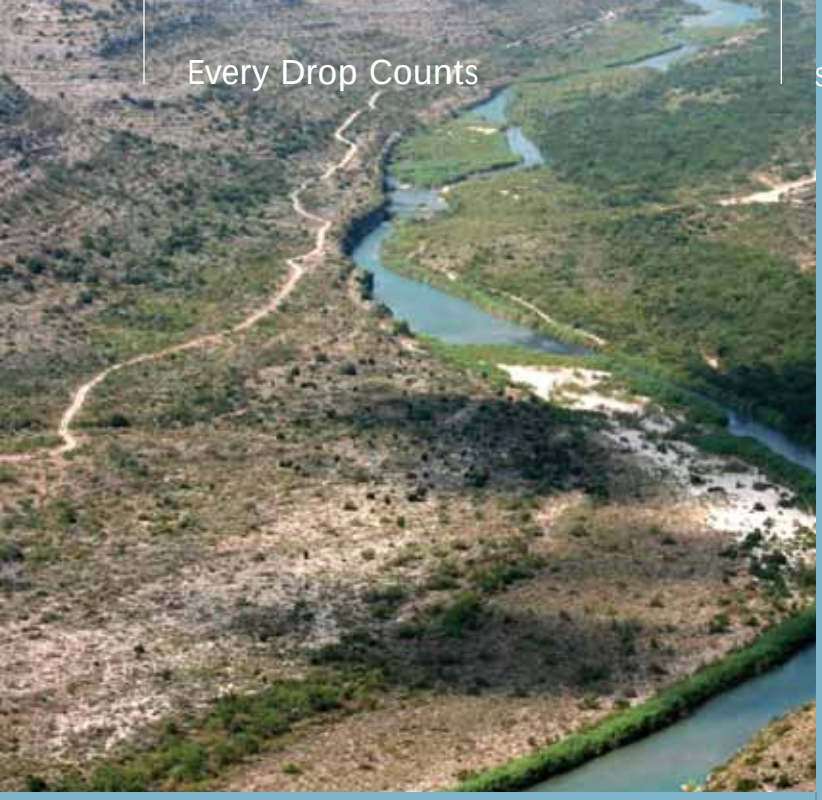
DeLoach predicted that saltcedar could be under control in Texas in five years "if everything goes well," referring to a site in Nevada where 50,000 to 60,000 acres are successfully in control five years after the first release. "All of this (defoliation after initial introduction) is at no cost and no damage to non-targeted plants," he said. "We think long-term, it's the way to go."

"No single person can do this research and implement biological control given the size of the saltcedar problem in Texas," Knutson said. "Fortunately we have a lot of people from many different agencies and organizations working together to accomplish this goal."

For more information on the TWRI-sponsored research, visit http://twri.tamu.edu/soil_water_grants/2005. A *Saltcedar Control* brochure is available at http://tcebookstore.org/tmppdfs/9714005-L5444.pdf.

An overview of the entire program is available as *Saltcedar Biological Control Consortium: Texas, New Mexico, Mexico Section, First (Organizational) Meeting: Minutes, Reviews of Research, Resource Guide* at http://bc4weeds.tamu.edu/weeds/rangeland/saltcedar.html#literature.

Saltcedar trees have been defoliated by its natural predator, saltcedar beetle from Crete, Greece, in fields near Big Spring.



Story by Danielle Supercinski

Every Drop Counts

Rio Grande initiative expands efficient irrigation, water conservation

Since its inception in 2001, the Rio Grande Basin Initiative (RGBI) has achieved significant water savings and accomplishments. A joint effort of Texas A&M Agriculture and New Mexico State University College of Agriculture and Home Economics, the initiative's nine research and education tasks address efficient irrigation and water conservation.

"The Rio Grande Basin Initiative has been very valuable because it has provided an opportunity to bring together all the things we know about water conservation into one package through research and development of new water practices," said B.L. Harris, RGBI project director and associate director of the Texas Water Resources Institute. "This research is coupled with an effective educational program to demonstrate and train people to implement the best and most appropriate practices to conserve water."

Roughly 160 Texas and New Mexico RGBI participants collaborating with local irrigation districts, agricultural producers, homeowners, 19 external agencies and other universities are dedicated to expanding efficient use of available water resources and creating new water supplies for the Rio Grande Basin.

Working in cooperation with irrigation districts, economists and engineers have developed evaluation tools to guide irrigation districts in water-use efficiency infrastructure and cost-of-saving-water analysis. The Rio Grande irrigation district economics tool (RGIDECON©), the rapid assessment tool (RAT) and geographic information systems (GIS) are three of the main tools developed during the RGBI's 5-year history.

To assist producers with irrigation scheduling, researchers have established on-farm monitoring of crop water use. They have taken extensive soil samples to determine nitrogen content with soil depth, rooting depth and other soil properties necessary for adapting the Crop Production and Management Model (CroPMan) to the area. CroPMan also allows producers to assess economic trade-offs of allocating limited water resources between various crops at varying crop growth stages.

Water is the primary factor limiting the production of many crops in the Lower Rio Grande Valley of Texas, and researchers have found using improved furrow irrigation techniques and scheduling for sugarcane production can save 10 percent to 15 percent of irrigation water or between 20,000 and 30,000 acre-feet.

RBGI researchers created the Precision Irrigators Network (PIN), which incorporates growers into the research process by demonstrating water saving,

efficient irrigation techniques and installing soil moisture monitoring sensors. Researchers estimate that on a "typical" 100-acre field, water savings using PIN can amount to 6 to 8 inches of water per acre per year, or 163,000 to 217,000 gallons per year. Based on 620,000 acres of irrigated land in the Rio Grande region alone, PIN can save 311,000 to 413,000 acre-feet of water per year.

The use of flexible, plastic polypipe and water-metering devices to replace inefficient and leaky ditches and siphon tubes has steadily increased in the Lower Rio Grande Valley and in nearby Mexico. Three demonstrations conducted in Tamaulipas, Mexico showed that irrigation could be reduced by 30 percent by using polypipe.

Extension specialists have conducted in-home water conservation demonstrations in 45 households to determine the amount of water a typical family of four uses. Extension specialists provided them with in-home water audits and educational materials as well as lists of recommended behaviors and fixture changes. In some cases, they installed water-conserving fixtures. Preliminary results show that educational interventions can reduce water use by 25 percent.

RGBI funding also focuses on coordinating basinwide activities related to the Pecos River, a major tributary of the Rio Grande. The project is documenting how much water can be saved by large-scale saltcedar management programs. To date, scientists have treated more than 13,000 acres of saltcedar within the basin with herbicides. Current research indicates that potential water salvaged from saltcedar is at least 2 feet per acre per year. Assuming this minimum amount of salvage, more than 26,000 acre-feet of water has been salvaged from these saltcedar control programs.

Because increased use of soil testing as a standard best management practice will improve overall production economics and provide added protection for critical and limited water resources, Extension specialists conducted a four-county soil-testing program. Projected fertilizer savings based on soil tests were an estimated 1.7 million pounds of nitrogen and 2.3 million pounds of phosphorus. These reductions in fertilizer application represent a reduced threat for nutrient contamination of surface and groundwater resources. The total economic impact from the project was estimated at $1.0 million based on average per-pound costs for nitrogen and phosphorus.

Researchers in El Paso used genetic typing to determine that the levels of certain bacteria in river water are much higher during the non-irrigation season than in the irrigation season. Researchers will use these data to assess the human and animal health risks associated with using winter return flows and will help develop strategies that can safely extend municipal and agricultural water supplies.

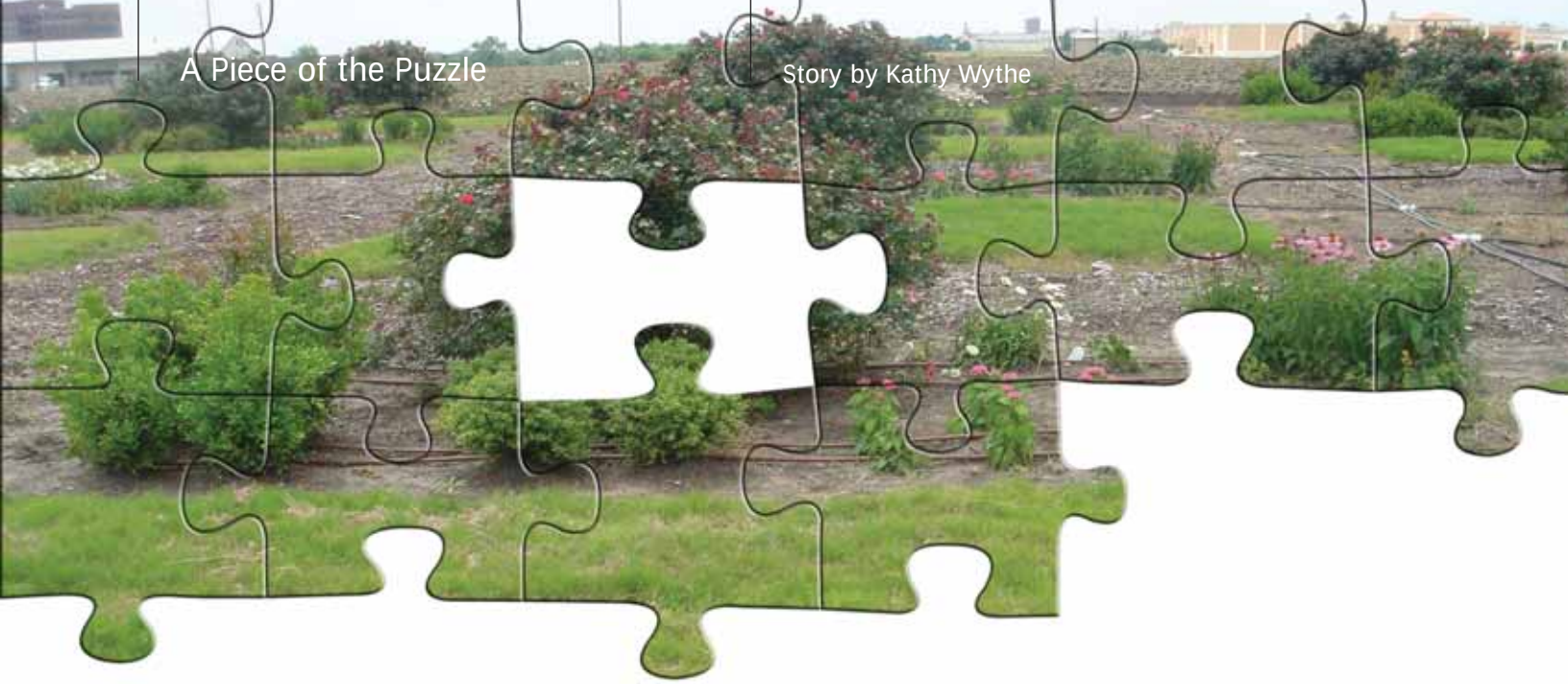
Since Texas presently reclaims about 5 percent of its wastewater with the potential to reclaim greater quantities, further research is being focused on salty groundwater, graywater and concentrate as alternative water sources for irrigation in rural and urban areas. The research strategy is to remove salts prior to irrigation to levels acceptable for salt-tolerant crops. RGBI researchers have evaluated more than 70 different landscape plant species for salt-tolerance. In El Paso, the urban landscape area irrigated with moderately salty reclaimed water has increased from 150 acres to 325 acres during the past seven years.

"One of the keys to a project of this type is widespread and collective collaboration," Harris said. "Water management districts, ag producers, municipal water users and others involved on both sides of the border working collaboratively is an absolute must."

The RGBI is federally funded, administered by the Texas Water Resources Institute, in collaboration with New Mexico State University, and funded through the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service.

For more detailed information regarding the RGBI and its progress and accomplishments, go to http://riogrande.tamu.edu.

Story by Kathy Wythe



A Piece of the Puzzle

Transporting dairy compost helps in water quality solutions

Transporting dairy manure from Central Texas dairy farms and turning it into marketable, quality compost is a "piece of the puzzle" in finding solutions to improve water quality in the North Bosque River and Leon River watersheds.

Approximately 148 dairies with more than 98,000 cows operate in these two watersheds. Studies have shown that excess manure applications to land near dairies contribute to impaired water quality in the basin. High phosphorus levels in water can cause excessive growth of algae and other aquatic plants, which then rob the water of oxygen, leading to fish kills.

For the past three and a half years, Texas Water Resources Institute (TWRI), Texas Agricultural Experiment Station and Texas Cooperative Extension staff have helped composters produce higher quality composted dairy manure and market it to public entities. These researchers also educated the public in various counties on the many uses for composted dairy manure and demonstrated applications within and outside the watershed.

These efforts significantly increased the quality, understanding, use and marketing of dairy manure compost, according to Cecilia Wagner, project manager for the TWRI/Experiment Station/Extension Dairy Compost Utilization project, which ended in April.

The marketing project is part of a larger plan developed by the Texas Commission on Environmental Quality (TCEQ) and the Texas State Soil and Water Conservation Board (TSSWCB) to produce composted dairy manure to encourage the transport of dairy manure out of the watersheds.

Since 2000, the state board has provided incentive payments to commercial haulers to transport approximately 960,000 tons of raw manure from dairies to compost facilities, according to this project's reports. About 450,000 cubic yards of compost from the watersheds were sold from that manure, with 71

percent exported out of the Bosque River watershed.

In a complementary program, TCEQ provided incentive payments to public entities to purchase dairy compost. In 2004, the incentive rebate payment was expanded to private agricultural producers and compost distributors through the Upper Leon Soil and Water Conservation District Compost Rebate Program. The rebate, offered through the Upper Leon Conservation District, led to the use and distribution of more than 3,000 cubic yards of composted dairy manure, Extension program specialist Wagner said.

Both programs were funded through a Clean Water Act Section 319(h) Grant from the U.S. Environmental Protection Agency and are scheduled to end August 2006 or when the incentive funds are depleted.

TCEQ provided funds to TWRI and Extension for the education and marketing component of the plan.

Extension worked with compost producers in the area to produce uniformly high quality compost. Because of the project, the majority of these dairy compost producers have joined the U.S. Composting Council's Seal of Testing Assurance Program.

"Dairy compost producers' knowledge of sound production practices, record keeping and testing has vastly increased," said Dr. Mark McFarland, Department of Soil and Crop Sciences professor and Extension soil fertility specialist. "The quality and consistency of composted material improved substantially over the life of the project."

Through the application demonstrations, fact sheets, news articles and workshops, compost customers learned about dairy compost. In addition, the project contracted with Ron Alexander and Associates to help conduct marketing activities.

Extension conducted more than 15 dairy compost use demonstrations as part of the project.

In one demonstration, the Santo Independent School District in Palo Pinto County, working with Scott Mauney, Extension agent, and Dr. Jim McAfee, Extension turfgrass specialist, used dairy compost as part of a sports management plan to successfully

Dr. Cynthia McKenney of the Texas Agricultural Research and Extension Center at Dallas discusses the use of dairy manure compost to establish newly constructed landscapes at the center's annual turf and ornamental field day.

restore the district's football field. The density and amount of grass across the field increased and grass texture was softer than in years before.

Extension conducted other demonstrations in Comanche, Erath, Stephens, Coryell, McLennan, Somervell and Tarrant counties.

Practice verification studies refined recommended use rates of compost on common turfgrass varieties, landscapes, forages, and row crops. Additionally, Extension specialists evaluated soil and water quality following various dairy compost erosion control applications to ensure environmental sustainability.

In some of the verification studies, researchers evaluated non-traditional uses for dairy compost.

Researchers at the Texas Agricultural Research and Extension Center at Dallas evaluated using dairy compost to establish landscapes at new construction sites. Post-construction landscaping is usually approached from only the plant-selection viewpoint; and little effort is devoted to the severely disturbed soil, said Dr. John Sloan, assistant professor in the Department of Soil and Crop Sciences.

Following three years of data collection by Sloan and ornamental horticulturalist Dr. Cynthia McKenney, the Dallas researchers concluded that adding dairy manure compost during establishment improves the long-term performance of ornamental and turf plants typically used in new urban landscapes.

Sloan said that the increased performance is primarily due to the greater levels of soil fertility and improved soil physical properties, such as increased water infiltration and reduced soil compaction. The group recently received additional funding from TCEQ to continue the study for an additional three years in order to assess the long-term benefits of dairy manure compost.

Scientists with TWRI and the Blackland Research and Extension Center in Temple are also studying the use of dairy compost to help restore damaged training lands at Fort Hood. *(See Fort Hood story in this issue on page 2.)*

"These programs are all pieces in the puzzle to restoring and protecting the Bosque River Watershed," Wagner said.

"We've seen the use of dairy manure compost increase in several markets," she said. "While we have not seen the market develop to the extent desired, we believe, as with most markets, it will continue to grow with time."

"Most importantly," McFarland said, "results from these projects have increased tremendously our understanding of the most effective and environmentally sound uses of dairy manure compost and will support future growth and development of the composting industry both in the region and statewide."

For more information on the project, visit http://compost.tamu.edu.

As part of a verification study within the Dairy Compost Project, Extension staff monitor runoff from vegetated plots during simulated rainfall. Two different treatments–erosion control using a 50/50 mix of compost, and woodchips and application of inorganic fertilizer–were applied to the plots and the quality and quantity of the runoff water was compared.

Saving an underground reservoir

Story by Kathy Wythe

Saving an underground reservoir

Scientists partner to document efficient use

A visitor to the Central and Southern High Plains of the United States can gaze upon field after field of crops and rangelands for cattle—the sources of a significant part of the region's agricultural economy. Though the area has few rivers and lakes, underneath it lies a supply of water that has provided groundwater for developing this economy.

This underground water, the Ogallala Aquifer, is a finite resource. The amount of water seeping back into the aquifer is much less than the water taken out, especially in the southern half of the aquifer, which spreads out from western Kansas to the High Plains of Texas.

"Water levels are declining 2 to 4 feet per year over the south half of the aquifer," said Nolan Clark, a research engineer with the U. S. Department of Agriculture's Agricultural Research Service (ARS).

"If all the water is removed, then the regional economy is gone," Clark said. "We have already seen isolated areas that have no irrigation water remaining and the economy has been crushed."

The region produces about 4 percent of the nation's corn, 25 percent of the hard red winter wheat, 23 percent of the grain sorghum, and 42 percent of the fed beef. Agricultural irrigation use accounts for 90 percent of the groundwater withdrawals in many areas of the Ogallala Aquifer region. A growing livestock industry accounts for another 3 percent, Clark said.

Because the economy and viability of the agricultural industries and rural communities are so dependent on the aquifer, scientists at the ARS, Texas A&M University, Kansas State University, Texas Tech University and West Texas A&M University joined forces in 2003 to develop water conservation technologies and policies to sustain the aquifer.

Sustaining Rural Economies Through New Water Management Technologies, the ARS-University Ogallala Aquifer Initiative funded by Congress, seeks "solutions to the complex water problems and challenges being faced in West Texas and Western Kansas," according to the project's description. Since 2003, Congress has appropriated approximately $8.5 million to multiple projects. More than 60 scientists and engineers from ARS and the universities are involved in the initiative.

Clark, one of the project's leaders, said the initiative's research projects are centered on seven research priorities. Accomplishments to date include:

ECONOMIC ASSESSMENTS AND IMPACTS (MICRO and MACRO)

- Calculated from regional economic models that the projected total present value of irrigation over 60 years is $19.3 billion or $990 per acre.
- Determined that if no water management strategies are implemented in 60 years, the saturated thickness of the Ogallala Aquifer will decrease by an average of 48 percent, with a range from 0 percent to 90 percent. Water use would drop from 18.32 million acre-feet to 4.26 million acre-feet.

IRRIGATION AND PRECIPITATION MANAGEMENT

- Demonstrated that tillage influences crop productivity and water use by as much as 25 percent.
- Determined that genetic variations in crops create more than 50 percent variation in transpiration efficiency, meaning that within the same crop species, some varieties can produce twice as much.
- Released early versions of planning models that helped determine the best crop and number of acres planted based on water availability and market grain prices.

photo by Shelby Axtell, Texas Tech University

IRRIGATION SYSTEMS AND TECHNOLOGIES

- Demonstrated that subsurface drip irrigation systems increased seed germination by 50 percent when used in a modified bed system and at deficit irrigation levels.
- Demonstrated through laboratory tests the practicality of developing a prototype variable rate irrigation nozzle for center pivot systems.

PRODUCTION SYSTEMS

- Demonstrated the feasibility of selecting plants with higher transpiration efficiencies that produce more biomass with less water.
- Showed that integrating limited stocker cattle grazing into crop rotations increases net profitability by $45 per acre.
- Identified forage sorghums that have similar digestibility and yield as corn silage, but require 40 percent less irrigation water.

HYDROLOGY / CLIMATOLOGY

- Compiled existing relevant hydrologic and climatological data into a GIS format and corrected errors.
- Developed Web interfaces to distribute hydrologic and climatological data.
- Used GIS data to show and understand water flow in crops and soils.

TECHNOLOGY TRANSFER EDUCATION AND TRAINING

- Developed a logo for recognition and use in information sources.
- Developed a Web site for information management and internal communication. (http://ogallala.tamu.edu)
- Provided two irrigation scheduling schemes for producers that are accessible on the Internet. (www.oznet.ksu.edu/mil & http://txhighplainset.tamu.edu)

CAFO AND PROCESSING INDUSTRY WATER ISSUES

- Determined that southwestern dairies require an average of 60 gallons of water per cow per day for a dry lot system and 95 gallons of water per cow day per day for freestall.
- Determined that beef cattle consume 9 to 10 gallons per day per animal with more consumed in the summer. An additional one-third gallon per head is consumed for steam flaking the corn and an additional 5 gallons is used in the winter for overflow watering.

"Most areas have sufficient water for the next 10 to 20 years," Clark said, "but to impact the long-term, we must begin changing now to provide a sustainable economy for the future."

photo by Shelby Axtell, Texas Tech University

Story by Courtney Swyden

Be Water Smart

Conservation program incorporates rain gardens

WaterSmart, a water conservation program, uses a unique approach to protect and conserve water quality and quantity in upper Texas Gulf Coast urban landscapes.

Part of the Texas Coastal Watershed Program (TCWP), WaterSmart is creating rain gardens as just one method of demonstrating how water conservation can function in an attractive landscape.

In December of 2005, the first demonstration WaterSmart rain garden was established at the Bay Area Courthouse Annex in Clear Lake City in partnership with Harris County Precinct 2. The rain garden, which filters stormwater coming from the annex's roof and sidewalks, has generated much interest from businesses and homeowners.

John Jacob, team leader of TCWP, said, "We are having a major impact with early adopters—those who are willing to make a switch to more sustainable landscaping practices now.

"We need many, many more of these early rain-garden adopters to be able to start to reach all the rest of the homeowners and groundskeepers who manage landscapes," he said.

Chris LaChance, WaterSmart Program coordinator, said rain gardens are a new concept to many people, although other parts of the country (Michigan, the northeast, Pacific Northwest) have been using them for several years. "When the light bulb goes off, they realize it's a win-win situation. They can create a beautiful addition to their landscape, help protect water quality, recharge groundwater and add habitat for wildlife," she said.

The WaterSmart program brings information about runoff pollution and water conservation to the attention of homeowners, garden clubs, environmental groups and city planners, and addresses coastal issues. Texas Cooperative Extension and Texas Sea Grant provide the leadership for the program. And a grant from Houston Endowment provides funding.

LaChance said there are other water conservation methods that can function in attractive landscaping such as edible landscapes, or even adding shrubs or vines.

According to the TCWP Web site, residential and commercial landscapes on the upper Gulf Coast of Texas consume at least 50 percent of municipal water supplies during the summer months. In addition, runoff from highly maintained landscapes pollutes sensitive bays and bayous.

Jacob said, "Residential and commercial landscapes are a major source of polluted runoff in our bays and bayous, and they are perhaps the 'lowest hanging fruit' that we can pick in addressing this area."

Rain gardens can be created by taking advantage of naturally low-lying areas that collect water. Rain gardens help divert the flow of excess water from roofs, driveways, parking lots, and lawns, while offering a low-maintenance way of gardening. This site is ready to be excavated and planted with water-loving plant species.

The program's Web site explains that rain gardens are made from a shallow depression in the landscape at least 10 feet from a building. The sod is removed and excavated to create a shallow, bowl-like area. Compost and sharp sand is added to the soil and planted with a mixture of native or non-invasive adapted trees, shrubs, grasses and flowers that can tolerate temporary wet conditions. A layer of mulch prevents weed growth and aids in filtration.

These low spots fill with water during periods of heavy rain, helping to reduce water runoff by capturing, soaking up and filtering excess water from roofs, driveways, parking lots and lawns.

She said that rain gardens can be simple or complex. No rain garden is too small or too large, and cost and size is really site specific. People need to understand deed restrictions and landscape ordinances to allow for any variance that might need to be obtained before installation. People must also understand that it is important to "call before you dig" to be sure that no utility lines are present, LaChance said.

Supplemental grants from entities such as Texas General Land Office's Coastal Management Program, Galveston Bay Estuary Program and others allow LaChance to install demonstration gardens; coordinate workshops; consult with communities, homeowners, and environmental groups; and offer presentations to a wide variety of audiences.

Minimal grass cover and maximum use of native and adapted plants produce a WaterSmart landscape that requires less water, little or no fertilizers and pesticides, and is easy to maintain. The WaterSmart

This rain garden has been designed to fit naturally with the landscape and was planted with water-loving plant species. These plant species create a landscape that will collect water and aid in diverting the flow of runoff water.

program's goal is to provide a tool that will help people landscape in a way that is low maintenance, beautiful and does not negatively impact the environment.

"The next phase of the WaterSmart program will add a new component to the existing program, landscaping for wildlife, called Habitat Highways," said LaChance.

Jacob said that the WaterSmart program will be needed for a long time because people will want to continue to water and fertilize lawns. "We will need to help them minimize the impacts," he said.

For more information, visit TCWP's WaterSmart Landscapes Web site at: http://www.watersmart.cc/.

Awards

Dr. Ed Smith, director, Texas Cooperative Extension (far left) and Dr. Elsa Murano, vice chancellor and dean for Agriculture and Life Sciences, and director, Texas Agricultural Experiment Station (far right) present a Partnership Award to Kenny Zajicek, fiscal officer; Aubrey Russell, chairman; and Joe Freeman, state district II field representative, all from Texas State Soil and Water Conservation Board, during the Texas A&M Agriculture Conference in January. The award recognizes agencies and organizations that collaborate with Extension to enhance the outreach and impact of Extension for the people of Texas. TWRI nominated the board for its work together.

Story by Kathy Wythe

Cooperating for Cleaner Water

The Leon River TMDL Process

The Texas Commission on Environmental Quality (TCEQ), working with a local stakeholder group and others in the Leon River Watershed, is developing a Total Maximum Daily Load, or TMDL, for bacteria, one of the first TMDLs for bacteria in the state.

In 2002, the TCEQ determined that the water quality for 44 miles of the Leon River between Proctor Lake and Lake Belton contained elevated bacteria concentrations that impair the water for contact recreation such as wading and swimming. This TMDL plan will budget how much bacteria pollution from point sources (like wastewater treatment facilities) and nonpoint sources (runoff from land) can occur in a single day and still maintain water quality standards.

Kerry Niemann, TCEQ project manager, said current estimates are that the impaired segment needs roughly 20 percent to 25 percent reduction to meet water quality standards for contact recreational use.

The federal Clean Water Act requires states to identify impaired segments of water on its 303(d) list (a list of water segments that do not meet water quality standards) and to develop a TMDL for each pollutant that impairs any segment, according to TCEQ documents. TCEQ has adopted 63 TMDLs with EPA approving 60 of those to date.

TCEQ contracted with James Miertschin & Associates to develop the Leon River TMDL. The company is using a water quality model to mimic the hydrologic conditions on the impaired segment of the river.

The Leon River Bacteria TMDL Advisory Group, which represents various interests in the watershed, has had five public/stakeholders meetings. More than 130 landowners attended a meeting in Comanche and more than 60 attended two meetings in Hamilton.

According to Bob Whitney, Comanche County Extension agent, “landowners are the key to developing and implementing this TMDL. In the last several meetings, we have seen tremendous participation by local citizens who want to understand and be a part of any watershed plans.

“They make their living here on the land and no one wants clean water more than they do. It is important for those of us in government to recognize that these landowners will be the ones who spend their own money to make this TMDL happen.”

Researchers with the U.S. Department of Agriculture-Agricultural Research Service are collecting water quality data during run-off events.

Researchers with the U.S. Department of Agriculture-Agricultural Research Service are collecting water quality data during run-off events on an impacted creek and a non-impacted creek.

Niemann said the TMDL report should be finalized by August 2006. After the TMDL is reviewed internally and a public meeting held, then the TCEQ commissioners and EPA will examine it for approval. Once the TMDL is approved, TCEQ will work with the stakeholder advisory group to develop an implementation plan to reduce the bacteria. An implementation plan outlines steps necessary to reduce pollutant loads through regulatory and voluntary activities, according to TCEQ's Web site.

For the nonpoint source pollution, different agencies and private interests will develop projects to help producers voluntarily reduce the nonpoint pollution.

Extension agents from all four counties affected by the TMDL will be working with TCEQ to involve agriculture producers and other interested groups in developing allocation and implementation plans, Whitney said.

The Texas Water Resources Institute (TWRI), Texas Cooperative Extension and U.S. Department of Agriculture-Agricultural Research Service (ARS) are already implementing a 319(h) project on the Leon River.

The project, The Impact of Proper Organic Fertilizer Management in Production Agriculture, will assess the effectiveness of best management practices using organic fertilizer and then will educate farmers on the proper use of organic fertilizers, such as animal manures.

According to Clint Wolfe, TWRI's manager of the project, researchers and Extension specialists will implement organic fertilizer management practices on cultivated and pasture fields to demonstrate the importance of using the correct method, timing and application rate. Extension will demonstrate the water quality difference between Resley Creek, an impacted water body, to Mustang Creek, a non-impacted creek.

For more information about the TMDL program, visit TCEQ's Web site at: www.tceq.state.tx.us/implementation/water/tmdl/ or TWRI's news article about TMDLs at: http://twri.tamu.edu/newsarticles.php?view=2004-05-07.

For the TWRI/Extension/ARS project, visit http://twri.tamu.edu/ipofm/.

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Commission honors Fort Hood project

Fort Hood Revegetation Project, a project of the Texas Water Resources Institute and Blackland Research and Extension Center, recently won the 2006 Texas Environmental Excellence Award for Agriculture. Larry R. Soward and Kathleen Hartnett White, (third from left) Texas Commission on Environmental Quality commissioners; present the award to Elsa Murano, director of Texas Agricultural Experiment Station and vice chancellor for Agriculture and Life Sciences, Texas A&M University; and Col. Victoria Bruzese, Fort Hood Garrison commander (see story on page 5).