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***New partnership for Texas Water Savers with the Agricultural Extension Service to promote water conservation education***

The passage of Senate Bill 1 by the 75th Legislature last year signaled a sea change in Texas water policy. Slowly displacing the focus on traditional water supply development is the realization that water supply planning in the next century must rely on alternative water supplies.

Senate Bill 1 designates the Texas Agricultural Extension Service (TAEX) as the state agency responsible for water supply and conservation education within priority groundwater management areas--urban and rural areas "experiencing or expected to experience critical groundwater problems."

By disseminating information through its existing network of county agents and district extension directors, TAEX is positioned to amplify the water conservation message throughout Texas' 254 counties.

Once such areas are developed, Senate Bill 1 charges TAEX with initiating educational programs with the cooperation of the Texas Water Development Board, other state agencies, and existing water districts to inform residents of the status of the area's water resources and management options. including possible formation of or annexation into groundwater management districts.

In addition to this major educational function, TAEX will appoint a representative to the Drought Response and Monitoring Committee, which is under the purview of the Division of Emergency Management.

In a meeting of water conservation personnel representing state agencies, groundwater districts, river authorities, and large cities, consensus was reached on three items: (1) a web site to reside on the Texas Water Resources Institute web site will function as a clearinghouse for information on water education programs, (2) each entity will promote an existing effort or initiate a new one during May 1998, (3) educational curriculum to be developed would be aimed at high schools, where environmental education is less developed than at elementary and junior high school levels.

Bruce Lesikar, Extension Program Leader for Agricultural Engineering and Associate Department Head of the Texas A&M University Agricultural Engineering Department, is coordinator of the program, officially called the TAEX Water Supply and Conservation

Educational Programs. Bill Harris, TAEX Associate Director for Agricultural Sciences, has overall responsibility for the program. Both are based at Texas A&M University in College Station.

With funding from TAEX, Texas Water Savers will expand both its agricultural content as well as its mailing list to include county extension offices, extension district directors, and groundwater and irrigation management districts. In addition, the newsletter will describe existing TAEX water conservation education programs.

Articles dealing with the Water Supply and Conservation Education Programs will be designated with the distinctive "Texas Water Bank" logo.

A full-time horticulturist has been hired to work on the urban thrust of the program, which will focus on landscape irrigation. In addition, a turfgrass specialist and a rangeland management specialist will dedicate half their efforts to the program.

County family and consumer science agents will focus part of their efforts on in-home water conservation techniques and fixtures.

Principles from the TAEX Landscape Irrigation Auditing and Management course (Texas Water Savers, Spring 1995) will form the basis for irrigation water management techniques for commercial and industrial landscapes.

Volunteer-assisted urban programs, such as Master Gardeners, Agrifood Masters, and Yards and Neighbors, will afford extensive outreach and water education programming.

Water reuse will also play a role in both urban and rural programs. Lesikar plans to use the TAEX On-Site Wastewater Management Education Training Centers at Texas A&M University, El Paso, and Weslaco as demonstration sites for the use of on-site treated wastewater for irrigation.

In rural areas, the program will expand current water supply programs to deal with the use of treated wastewater and saline waters for irrigation, nutrient management and animal waste management as related to irrigation, and brush management as a means of increasing water supply. In this issue, Texas Water Savers will report on the Bexar County Master Gardeners' Pilot Evapotranspiration Study; the TEX\*A\*Syst wellhead protection program; and Target 2000, a voluntary environmental plan for the floral and nursery industry.

In future issues, Texas Water Savers will report on the Texas Star Farms demonstrations at high schools, and water reuse both from on-site wastewater systems, and updated Master Gardener and 4-H water conservation training.

### ***Corpus Christi plumbing code bans sprinkler irrigation on narrow vegetation strips***

Last June, the City of Corpus Christi amended the city's standard plumbing code requiring vegetative strips 5 feet wide or narrower to use drip or soaker-type irrigation rather than spray heads.

In addition, spray heads are prohibited on traffic medians wider than 5 feet if they will spray water onto paved areas when properly installed.

This ordinance applies to vegetative strips between the sidewalk and the curb or within 5 feet of a paved area in the absence of a curb. A paved area refers to either a parking lot, street, or road. Within parking lots, narrow strips of vegetation fall under the same restrictions.

### ***Watertalk: the electronic mailing list for Texas water professionals***

Texas Water Resources Institute offers an electronic mailing list--Watertalk--bringing breaking news about statewide water issues, water research, new publications, and the opportunity to interact with researchers, water managers, utility personnel and consultants.

Simply subscribe--both message-by-message and digest formats are available--and you'll get messages sent to your computer regularly about TWRI programs and research as well as breaking news. Watertalk is also a great medium for requesting information and communicating with colleagues. To subscribe, access Watertalk from the TWRI web site, <http://twri.tamu.edu>, then click the Watertalk icon on the right side of the home page and follow directions for your preferences.

For more information, call Ric Jensen at (409) 845-8571 or email [rjensen@tamu.edu](mailto:rjensen@tamu.edu).

### ***Meetings and Conferences***

**Land Use Law: Development, Regulation, and Environmental Issues**, February 26-27, 1998, Clarion Hotel, Fort Worth. Topics of this CLE seminar will deal with overcoming stringent and increasingly complex statutes, and zoning and growth ordinances. Call CLE International, (800) 873-7130 for more information.

**Texas Water Conservation Association 54th Annual Convention**, March 4-6, Fort Worth. Call TWCA, (512) 472-7216 for more information.

**Western Water Law, CLE International**, recommended for lawyers, real estate developers, agricultural and ranching professionals. Call CLE International, (800) 873-7130.

**The Rio Grande Valley's Future: Nonpoint Source and Water Quality Seminar**, March 9-14, Brownsville, TX, sponsored by Texas Natural Resource Conservation

Commission. Contact Diane Stallings, (512) 239-6333 or [dstallin@tnrcc.state.tx.us](mailto:dstallin@tnrcc.state.tx.us) for more information.

**Texas Section--American Water Works Association**, April 4-8, Moody Gardens Convention Center, Galveston, TX, including sessions on water conservation and reuse, wastewater and storm water, odor control, management issues, water quality, public involvement, and industrial issues. See [www.tawwa.org](http://www.tawwa.org) and [www.weat.org](http://www.weat.org) for more information.

**The Texas On-Site Wastewater Treatment Research Council annual conference**, May 20-22, Corpus Christi. Topics to include innovative on-site wastewater treatment systems, septic tanks and drainfields, public outreach and education, and soils.

**Annual University of California Reuse Research Conference**, June 4-5, Monterey, CA. For more information, call the WaterReuse Foundation, (916) 442-2746. **American Water Works Association Annual Conference and Exposition**, June 21-25, Dallas, TX. Email [rossiter@awwa.org](mailto:rossiter@awwa.org) or see [www.awwa.org/tandc/ace98/a98frame.htm](http://www.awwa.org/tandc/ace98/a98frame.htm) for more information.

### ***Austin Xeriscape School Feb. 7***

"Save time, money, and water by the yard" is the motto of Austin's annual one-day Xeriscape School.

This popular event will take place February 7 at the Lady Bird Johnson Wildflower Center. Another capacity crowd of 236 is expected this year. This annual event is sponsored by the City of Austin Environment and Conservation Services Department, the Xeriscape Advisory Panel, and the Xeriscape Garden Club.

### ***La Quinta, Houston partnership lauded by USBR***

Once again, Texas finds itself in the winner's circle of the annual U.S. Bureau of Reclamation Conservation and Reuse Awards.



In the Efficient Water Management category, San Antonio-based La Quinta Inns was lauded for an aggressive water conservation program and in-house utility information management system in more than 270 inns in 28 states.

La Quinta closely analyzes utility bills of each property, according to Jim Ackles, Director of Energy Management. The proprietary LQEnergy management information system flags

deviations from normal usage patterns. La Quinta's utility analyst works with inn general managers and local utilities to investigate high usage problems and to take corrective action.

Starting in October 1995, La Quinta implemented a program to retrofit its 35,000 existing rooms with 2.0 gallon-per-minute (gpm) faucets and 2.5 gpm showerheads. All new properties are built with pressure-assisted low-flow toilets, as well as the low-flow fixtures.

Through October 1997, the last month for which figures are available, the company reports a year-to-date average of 119 gallons per guest per day, a 5 percent drop from the 1996 average of 125 gallons per guest per day.

And the rate of water use continues to decrease. In 1997, although La Quinta has grown by 10 percent in number of properties and 7 percent in number of guests, company-wide water use has increased by only 5 percent over 1996, Ackles said.

La Quinta intends to continue identifying and implementing cost-effective water conservation practices, including annual testing of water-consuming equipment. In 1997, all showerheads were tested for proper flow and toilet tanks tested for flapper leaks with dye tablets. In addition, La Quinta monitors its irrigation water use. Ackles is working with irrigation specialist David Smith of the Texas Agricultural Extension Service to develop an irrigation auditing program.

During the drought of 1996, La Quinta's efforts saved more than 6 million gallons of water over previous consumption, for which the company was awarded the San Antonio Water System's award for Best Practices (Texas Water Savers, Fall 1997).

The partnership between the City of Houston Water Conservation Branch and the Housing Authority of the City of Houston won a 1997 Small Demonstration Project award. The two entities completed a pilot conservation project at Kennedy Place, a 60-unit low-income housing project, that decreased from twice the city's per capita rate to nearly half the city average (Texas Water Savers, Summer 1997).

A plumbing fixture retrofit project at Kennedy Place netted a 72 percent cut in water consumption and a 79 percent drop in water bills, said Pat Truesdale, manager of the Water Conservation Branch. Per capita consumption dropped from 164 gallons to 83. The project resulted in a saving of more than 1.3 million gallons at Kennedy Place, and the \$22,000 total cost was recouped in less than two months.

The 1997 Award is the second U.S. Bureau of Reclamation Award for the City of Houston Water Conservation Branch. In 1995, the City and the Houston Children's Museum were recognized with the Innovative Partnership Award for an interactive gameboard which heightened the public's awareness of water conservation and reuse.

Truesdale was also named 1996 Conservationist of the Year Texas Water Conservation Association.

### ***San Antonio reuse to serve irrigation, instream releases***

#### **Recycled water to supply 20 percent of San Antonio's demand**

San Antonio, the largest U.S. city totally dependent upon groundwater, broke ground on September 24 for a water recycling system that will eventually replace 20 percent of the city's current demand for Edwards Aquifer water with treated wastewater.

Recycled water will be used for irrigation, cooling tower operations, manufacturing processes, and other nonpotable uses, freeing up about 11 billion gallons of Edwards Aquifer water annually for potable use.



*At the groundbreaking for the San Antonio Water System's Water Recycling Project, a 44-inch-diameter purple pipe was signed by celebrants. Pipelines carrying recycled water are painted purple to distinguish them from potable water pipes.*

More than 250 people attended the ceremonial groundbreaking in September at the Leon Creek Wastewater Treatment plant south of the city. Many signed a 44-inch-diameter purple concrete pipe to mark the occasion.

The history of the San Antonio Water Recycling Project dates back to 1985, when the city council

passed a resolution to pursue recycling as part of an overall water planning process. Eight years later, the San Antonio Water System (SAWS) adopted a Conservation and Reuse Plan outlining a water recycling system. In 1994, SAWS started to develop the concept for a city-wide water recycling system. About a year and a half later, in a pilot project, water treated at the Leon Creek plant and stored at Lake Mitchell was delivered to Mission del Lago Golf Course.

The San Antonio Water Recycling Project will supply 35,000 acre-feet per year within the next 3 to 5 years for irrigation, instream flows, and industrial uses. User cost for reclaimed water is projected to be the same as for potable water.

Construction of the San Antonio Water Recycling Program will encompass two phases. Phase I, comprising the Salado Creek and Leon Creek infrastructures, will be built at an

estimated cost of \$81.4 million. The Salado Creek project will serve six golf courses, as well as Brackenridge Park, Trinity University, Brooks Air Force Base and Fort Sam Houston. The Leon Creek Infrastructure Project will serve customers such as the Sony manufacturing plant, Sea World, Fiesta Texas, Southwest Research Institute, the Hyatt resort, and Kelly and Lackland Air Force Bases.

The later Phase II, which will interconnect the two branches, will cost an estimated \$22.1 million.

Since recycling is equivalent to developing a new water source, all San Antonians stand to benefit from the decreased demand upon the Edwards Aquifer. The Recycling Project is funded by rate payers, and SAWS is currently seeking additional funding from the U.S. Bureau of Reclamation. SAWS used a State Revolving Fund loan from Texas Water Development Board to finance its bond offering.

SAWS calculates the cost to build, operate and maintain the water delivery system at \$400 per acre-foot, comparable to the current cost of delivering potable water from the aquifer. Average water bills for SAWS' 250,000 customers will increase about \$1.50 monthly.

Water is a contentious issue in San Antonio. The Comal and San Marcos springs create habitat for several endangered and threatened species. The springs also feed six downstream river basins. When aquifer levels drop, the spring flows also fall. To satisfy both the needs of downstream users and the requirements of the Endangered Species Act, the Texas Legislature created the Edwards Aquifer Authority in 1995 to regulate and manage water pumped from the Edwards.

The Edwards Aquifer Authority issues pumping permits to maintain total withdrawals from the aquifer at 450,000 acre-feet per year. By the year 2008, pumpage must be reduced to 400,000 acre-feet annually. By reducing demands on the Edwards Aquifer for nonpotable uses, the San Antonio Recycling project frees up water for potable use.

Of the 13,000 acre-feet per year to be delivered by the Salado Creek Infrastructure, 4,900 acre-feet per year is earmarked for irrigation customers and 8,100 acre-feet per year for instream releases.

Throughout the planning of the project, San Antonio has encouraged public involvement. A Recycling Advisory Committee composed of representatives from neighborhoods, businesses, and environmental groups, has been involved with the decision-making process. SAWS conducted a neighborhood outreach for groups living in areas near where the 78-mile pipeline was to be laid.

More than 300 community members attended educational fairs and participated in an evaluation and ranking of 10 alignment alternatives.

San Antonio boasts a history of water recycling. Since the early 1960s, City Public Service (CPS) , the electric utility, has circulated treated wastewater from Calaveras and Braunig lakes in its cooling towers. Currently, CPS uses about 20,000 acre-feet per year of reclaimed water for cooling, with a contract to use a total of 40,000 acre-feet per year if needed.

A pilot project to test the efficacy of using reclaimed water for golf course irrigation was conducted on the 107-acre municipal Mission del Lago Golf Course.

Wastewater from the Leon Creek Treatment Plant south of the city is directed into Mitchell Lake for storage. Mitchell Lake and its 187-acre wetland area is a wildlife habitat for migratory fowl. Water from Mitchell Lake is treated to remove algae before it flows into a wet well for delivery to Mission del Lago Golf Course, which uses about 400 acre-feet per year for irrigation.

SAWS monitors water quality for irrigation in this pilot project. Nitrogen and phosphorus components of the wastewater are bound up in algal biomass in the lake. The wetland cells filter out the algae.

Mitchell Lake is a success story in itself. Spanish maps from the 1600s identify a wetland area where Mitchell Lake is located. Until the 1930s, Mitchell Lake served as the primary biological treatment area for the City of San Antonio. Until the 1980s, the lake continued to receive treated sludge and raw sewage whenever San Antonio's wastewater treatment plants were overwhelmed.

SAWS has been working since 1973 to turn Mitchell Lake and its 187-acre wetland area into a world-class habitat for migratory birds to promote environmental education and university-level research.

### ***Pilot turfgrass study uses ET rates to optimize irrigation practices***

#### **Bexar County Master Gardeners monitor citizen's turf conditions**

During the hot summer months, landscape irrigation accounts for as much as 60% of water use in San Antonio. As most people unintentionally over-water their lawn, this total can be reduced with appropriate irrigation methods.

In a Pilot Turfgrass Evapotranspiration (ET) Study, the Bexar County Master Gardeners, in partnership with the Bexar County Agricultural Extension Service, are gauging turfgrass response performance at about 64 homeowner sites, as well as at some commercial sites throughout the San Antonio area. The goal of the project is to find methods of irrigation management yielding the best results with the greatest ease of use for the homeowner.

The three major goals of the program are to conserve water by irrigating on the basis of ET data, to determine the best ET-based watering practices for San Antonio, and to utilize the results of this pilot project to develop a broad ET-based lawn watering



program. (Evapotranspiration refers to the amount of water lost to evaporation from the soil and transpiration from the plant.)



*This weather station at the SAWS Jones-Maltsberger pumping station in north-central San Antonio collects data from which ET rates are calculated.*

Volunteer participants were chosen on the basis of having relatively unmixed plots of turfgrass with a soil profile of 4 inches or more.

Participating homeowners were trained to recognize the signs of water stress--a footprint that remains when the grass is stepped upon, leaf blade curling, wilting, and discoloration, according to Karen Guz, County Extension Associate.

Homeowners were asked to follow Texas Agricultural Extension Services (TAEX) recommendations for lawn care, mowing at the recommended height, applying the recommended amount of fertilizer, and leaving lawn clippings on the lawn. Participants also allowed the San Antonio Water System (SAWS) to release to the ET staff information on water usage for the past two years and during the study for comparison and analysis. Homeowners rate their lawns on a scale of 1 to 4 based upon criteria supplied by ET Program coordinators. Four types of turfgrasses are rated: Bermuda, Zoysia, St. Augustine, and

Buffalo, Guz said.

After precisely gauging the application rates of their sprinklers using the catch-can method, homeowners apply the indicated amounts of water to their lawns by adjusting total application time. (The catch-can method uses a number of straight-sided containers to capture sprinkler output over a specified period of time. The captured amounts are averaged to determine sprinkler output per unit of time.)

Under each of two protocols, volunteers irrigate to replace water lost to ET. For comparison purposes, each protocol includes two test sets, residents replacing 100% of soil moisture lost to evaporation and plant transpiration, and those in the deficit group who replace just 70%.

Homeowners using protocol A water once a week on the same day, replacing their prescribed amount of water (100% or 70%) lost to ET in the preceding 7 days.

Protocol B homeowners have a slightly more involved regimen to follow. These residents water their lawns when ET rates indicate the soil reservoir is depleted. In other words, irrigation is driven by the plant's need rather than by the calendar schedule. Both groups

of volunteers get their ET data from recorded telephone messages. This group also includes full and deficit replacement test sets.

At the study's midpoint in September, data analysis revealed an important result--there was no appreciable difference in perceived lawn quality between participants watering at 100% replacement of potential ET and those on the 70% replacement regimen. The study used one crop coefficient--warm season turf.

A weather station at the SAWS Jones-Maltsberger pumping station on the north side of Loop 410 collects data from which ET rates are calculated. The weather station shares the SAWS-donated land with an extensive turfgrass and low-water use landscape demonstration site.



*At the weather station site are demonstration plots of several types of turfgrasses and extensive gardens of low-water-use plants grown in San Antonio.*

(ET data from the Jones-Maltsberger site is relayed to the Texas Potential Evapotranspiration Website, [www.agen.tamu.edu/pet/](http://www.agen.tamu.edu/pet/), maintained by Guy Fipps of the TAEX.)

The ET Pilot Study was contracted by SAWS to the Bexar County Master Gardeners. SAWS funding helped purchase equipment, such as soil moisture sensors and individual rain gauges, and funded the Master Gardener staff position. The soil moisture sensors are used by the Master Gardeners to quantitatively measure soil moisture.

Interestingly, also at the study's midpoint, protocol A deficit irrigators (those replacing 70% of ET) averaged 3/4-inch soil reservoir refill at their once-a-week irrigation. At the same time, protocol B participants (those watering at 100% replacement in response to cumulative ET) received directives to apply 3/4-inch of water every 6 to 7 days. Now that cooler weather has arrived, protocol B is waiting longer between irrigation directives, Guz said.

The ET Pilot Study is advised by three Bexar County Extension Service staff members, Calvin Finch and Joe Taylor, Horticulture and Agriculture County Extension agents, respectively, and Guz. In addition, Master Gardener staff member Felipe Camacho, gathered data and worked with Master Gardener volunteer study monitors.

Bexar County Master Gardeners have adopted the ET Program as one of their community service projects. They serve as monitors, making regular visits to participating homes to check soil moisture levels and to determine how well grass at each site is responding to its regimen. Master Gardeners also address questions and homeowner concerns.



*Wilber Watje, Bexar County Master Gardener and volunteer monitor for the San Antonio Pilot Evapotranspiration Study, checks soil moisture with an inductive sensor.*

An ET advisory committee of Master Gardeners, landscapers, licensed irrigators, SAWS personnel, Fipps, and TAEX irrigation specialist David Smith meets to review data and give recommendations as to how to proceed. "The committee is an outside entity that critically examines the program to make sure we're drawing appropriate

conclusions and make appropriate plans," Guz said.

"In last year's drought, some San Antonians lost much if not all of their St. Augustine lawns. People seem to go to two extremes with St. Augustine grass in San Antonio" said Calvin Finch, Bexar County Extension Agent. "Either they give up or they water too much."

Appropriate irrigation, watering in accordance with the needs of the turfgrass, is thought to "drought train" grass by encouraging deeper roots.

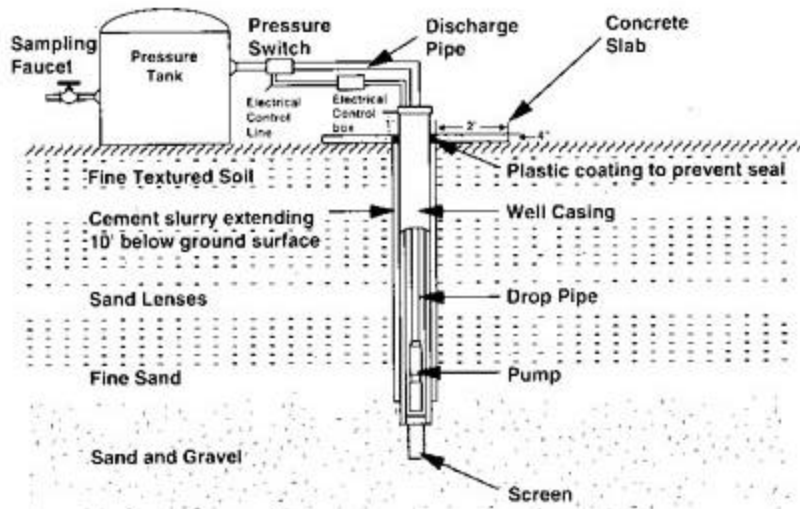
In the spring, the ET Pilot Study will continue with adjustments based on recommendations of the ET Advisory Committee. Specific amounts of water given to the various turfgrass varieties may be adjusted lower for the Buffalograss and Zoysia, which are reputed to be more drought-tolerant. Additional test sites are being sought for the spring season. In addition, another study may be initiated to collect data for other types of irrigation systems and for soil profiles of less than 4 inches.

### ***TEX\*a\*Syst protects groundwater with proper wellhead management practices***

On a farm in the Rolling Plains of west Texas, a rural family's drinking water supply was contaminated with fecal coliform. The source of the contamination may have been linked to the close proximity of a livestock holding pen to the water well. Waste from the

livestock pen may have migrated to the wellhead and contaminated the family's drinking water.

At another farm in the Rolling Plains, improperly stored gasoline threatened to contaminate yet another water well. A can of gasoline was stored too close to the water well. An accidental spill or leak of as little as 1 gallon near the well could have migrated down between the water well borehole and the well casing to contaminate up to one million gallons of drinking water.



In both cases, TEX\*A\*Syst provided educational assistance to help these families reduce the risk of groundwater contamination by increasing the separation distance between the water well and the source of contamination.

About 95 percent of the country's rural residents rely on groundwater to supply their drinking water and homestead needs. If improperly constructed or maintained, however, wells can allow bacteria, pesticides, fertilizers or oil products to contaminate groundwater.

TEX\*A\*Syst is a series of publications developed by the Texas Agricultural Extension Service in cooperation with several other state and federal agencies, including the Texas State Soil and Water Conservation Board. These publications are designed to help rural water well users to assess the potential for groundwater contamination on their lands, and to reduce the risk of contamination with the use of best management practices (BMPs). TEX\*A\*Syst is also designed to help Texas rural citizens learn more about the environment and existing policies and regulations related to groundwater protection.

The TEX\*A\*Syst bulletins and related materials are modeled on the national Farm\*A\*Syst groundwater protection program. The Farm\*A\*Syst program is a voluntary partnership between government agencies and farmers, ranchers, and rural homeowners with a goal of nonindustrial pollution prevention. Farm\*A\*Syst is jointly supported by the U.S. Department of Agriculture (USDA) Cooperative State Research Education and Extension Service, the USDA Natural Resources Conservation Service, and the U.S. Environmental Protection Agency. TEX\*A\*Syst is also supported by a Section 319 grant from the U.S. Environmental Protection Agency.

TEX\*A\*Syst is a valuable tool for rural residents who rely on groundwater for their water supplies. The TEX\*A\*Syst program consists of a series of bulletins highlighting common potential risks to rural water: pesticide and fertilizer storage and use, petroleum product storage and use, household hazardous waste management, wellhead protection, septic system management, and livestock housing and waste management.

Bulletins respond to concerns in a comprehensive, easy-to-understand format. An overview first discusses the nature of wellhead protection and potential risks of groundwater contamination. The overview is followed by comprehensive instructions on remedies for existing facilities and guidelines for building new storage facilities and modifying existing storage facilities, for spill containment and cleanup, container disposal, and other management practices. Following the narrative is an evaluation table to help agricultural producers and rural homeowners determine the level of risk of contamination associated with any structure located on or management practice following on their property.

Another bulletin helps rural citizens evaluate their soil type and subsurface geologic material based on each one's capacity to protect against accidental contamination. For example, sandy soils have large pore spaces, and the particles have relatively little surface area to adsorb contaminants, allowing rainfall to rapidly percolate through, carrying along dissolved contaminants. Contrast this to clayey soils with small pore spaces and a large amount of surface area which slows the movement of water through the soil profile and adsorbs more of the contaminants passing through.

Other topics, such as well construction, household hazardous waste management, and septic system management are covered in the bulletins. Well construction is particularly important. During construction, a well driller installs a steel or plastic casing to prevent collapse of the borehole. If improperly constructed or maintained, the space between the casing and the sides of the borehole can act as a direct channel for surface water and pollutants to travel down to the groundwater formation.

For more information on TEX\*A\*Syst, contact Mark McFarland, Extension Specialist, (409) 845-2425 or Dennis Hoffman, Texas Agricultural Experiment Station, (254) 770-6562. TEX\*A\*Syst bulletins can be ordered without charge from Texas Agricultural Extension Service Publication and Supply Distribution, P.O. Box 1209, Bryan, TX 77806-1209, (409) 845-6573 or fax (409) 862-1566.

TEX\*A\*Syst publications can also be read on the World Wide Web at <http://agcomwww.tamu.edu/agcom/publish/extpubs/ENVIRON.HTM>.

TEX\*A\*Syst titles and order numbers are: Introduction, B-6023; Reducing the Risk of Ground Water Contamination by Improving Wellhead Management and Conditions, B-6024; Reducing the Risk of Ground Water Contamination by Improving Pesticide Storage and Handling, B-6025; Reducing the Risk of Ground Water Contamination by Improving Fertilizer Storage and Handling, B-6026; Reducing the Risk of Ground Water Contamination by Improving Petroleum Product Storage, B-6027; Reducing the Risk of

Ground Water Contamination by Improving Hazardous Waste Management, B-6028; Reducing the Risk of Ground Water Contamination by Improving Household Wastewater Treatment, B-6029; Reducing the Risk of Ground Water Contamination by Improving Livestock Manure Storage and Treatment Facilities, B-6030; Reducing the Risk of Ground Water Contamination by Improving Livestock Holding Pen Management, B-6031; Reducing the Risk of Ground Water Contamination by Improving Milking Center Wastewater Treatment, B-6032.

### ***Target 2000: greening of the floral industry***

Texas is currently ranked third in the nation among producers of floral and nursery crops. With an annual value of more than \$750 million, this industry is the state's fifth leading agriculture commodity, as well as the fastest growing segment of Texas agriculture.

On a per-unit basis, however, the nursery and floral industry uses more water than any other form of agriculture. Coupled with the fact that greenhouse and nursery crops are dependent upon relatively high concentrations of fertilizers and pesticides, high water use can mean not only depletion of a natural resources, but potential ground- and surface water contamination from irrigation runoff.

Target 2000, a program of the Texas Agricultural Extension Service (TAEX), is an environmental plan for the nursery and floral industry, said Don Wilkerson, program director. The program provides growers with research-based information on industry practices with the aim of reaching five stated goals by the year 2000:

1. Reduce water consumption to 1990 levels
2. Reduce current fertilizer and pesticide use by 50%
3. Lower current energy consumption by 25%
4. Reduce current solid wastes from agricultural plastics by 75%
5. Develop applications for municipal wastes and composted materials for the production of floral and nursery crops.

Target 2000 is looking at innovative methods of irrigation management and technology to reduce the amount of water applied to nursery and floral crops, as well as methods of capturing and reusing runoff.

"The Texas Association of Nurserymen (TAN), the Dallas Arboretum, and many individual growers have endorsed Target 2000 goals," said Wilkerson.

"The Environmental Committee of the Texas Association of Nurserymen has embraced as its goals the Target 2000 goals," said TAN's Marilyn Good. TAN's efforts to help its members achieve those goals include publication of a best management practices index tailored to specific types of nursery and greenhouse operations, production of a Green and Growing newsletter (included in TAN's magazine in reproducible form) for the landscaping and nursery retailer trade, and active participation the Texas WaterWise Council. An ongoing project and continuing challenge, Good said, is addressing the reduction of plastic waste.

Pending state legislation uses 1990 as the benchmark year for developing guidelines for water consumption by commercial agriculture. Nursery/floral producers are investing in water management technology in anticipation of this mandate.

"In agronomic crops, the industry has developed straightforward guidelines on when and how much water to apply. In the nursery industry, there is not a lot of quantitative information on the amount and duration of crop irrigation," Wilkerson said.

Greenhouse and nursery crops are also dependent upon relatively high rates of fertilizer and pesticide use. Research, however, indicates excessive levels of soluble fertilizer are applied because these materials do not represent a major cost of production. The long-term use of agricultural fertilizers has created significant concern about the vulnerability of surface and ground water to nitrate contamination.

"Through a judicious and quantitative approach to the use of fertilizer, pesticides, and water, producers can achieve increased profitability and better crop quality, while reducing environmental impacts," said Wilkerson.

Capture and recycle technology is effective in reducing the volume of fertilizer required to produce a quality crop. The end result is that runoff is captured, filtered, treated, and reused. Using this system, the same nutrient solution is recycled instead of being discarded or running off.

Since 1991, Turkey Creek Farms of Houston, a wholesale nursery for container and greenhouse plants, has operated an irrigation wastewater treatment system capable of treating 1.2 million gallons per day. (Texas Water Savers, Summer 1995). Captured irrigation runoff is first filtered to strain out organic matter. The water then passes through a series of activated carbon chambers before being exposed to ultraviolet light to kill pathogens.

Target 2000 reaches the nursery and floral industry through TAEX newsletter and bulletins and at industry meetings, most recently at the Texas and Southwest Greenhouse Growers Conference.

Since floral and nursery crops are grown for their aesthetic characteristics, no level of insect infestation is acceptable. Integrated Pest Management (IPM) techniques based upon an understanding of pest biology techniques are the key elements in a successful production program.

For more information on Target 2000, visit the web site at <http://aggie-horticulture.tamu.edu/greenhouse/environ/2000.html> or contact Don Wilkerson, TAEX, at (409) 845-7341.

### ***Partners Project develops seminar for businesses***

The most extensive Texas WaterWise Council project to date has been the Partners Project. Municipalities signing on as partners agree to promote water conservation and

more efficient use of water through public information campaigns, and to promote retail businesses displaying the WaterWise logo.

For businesses to qualify to use the logo, employees were required to have attended one of six WaterWise seminars presented by the Texas Association of Nurserymen statewide in February and March 1997.

The slide show and seminar script were developed by the WaterWise Council, with extra attention by Kim Fuller, formerly with the Texas Department of Agriculture Texas Grown Program; Janet Reed, Texas General Services Commission; and John Sutton, Texas Water Development Board.

Also for the Partners, the Council developed a model landscape illustrating how placement and selection affects water use. This model has been used in publications of the Texas Association of Nurserymen.

To date, seven municipal partners--Arlington, Austin, College Station, Dallas, El Paso, Fort Worth, and Houston--and 111 business partners have joined. The Council aims to double membership this year.

Leading the list of goals for the new year is expansion of the Partners Project, starting with conversion of the slide show to videotape targeted to the retail customer. Copies of the videotape will be made available to business Partners for educating their clientele. Brent Wiseman of the Texas Department of Agriculture Texas Grown program is heading up the videotape effort.

The Council, through its representatives, has placed articles in the nursery trade press and provided information for a revised education of *The Central Texas Gardener* to be published by Texas A&M University Press.

The WaterWise Council has an extensive collection of books, videotapes, magazines, papers, and posters on water-wise gardening, which it is in the process of cataloging. Included in the collection is literature from similar blue-green partnerships in Georgia, New York, Mississippi, and California. The Council is considering applying for a grant to complete this project and to fund other educational efforts.

### ***Charter membership extended to December***

The Texas WaterWise Council, a public-private partnership of water management agencies and the "green" industry, has extended its charter membership period until December 31, 1998.

The mission of the Texas WaterWise Council is "to promote water conservation practices in Texas through a public-private partnership that fosters awareness of the value of sound water management." Monthly planning council meetings are open to any interested party.



Charter members join with initial dues of \$250. After one year, the annual dues of charter members become that of the membership category they chose: active member, \$75; individual member, \$25; or educational member, \$10. As of press time, the WaterWise Council reports 35 charter members, 32 active members, and 1 each individual and educational member.

Agencies, businesses, or individuals wishing to become charter members can send dues, along with this application, to the Texas WaterWise Council, 1660 W. Bay Area Blvd., Friendswood, TX 77546.

### ***Texas Section AWWA Conservation and Reuse Awards***

For the fifth year, the Texas Section--American Water Works Association is accepting entries for the annual Water Conservation and Reuse Awards to recognize water and power utilities, industry, and government agencies for innovative and successful methods of water efficiency, conservation, and reuse.

Direct and indirect programs are evaluated separately on conservation activity that best supports and promotes efficient use and reuse of water, and can include completed projects or projects in the initiation or implementation phases. The divisions are large utility, small utility, and non-utility.

Entries are evaluated on conservation activity that best promotes efficient use and reuse of water. Entries will be judged on innovation, implementation, execution, benefits and results, transferability, and program evaluation.

For the third year, the Texas Section will recognize reuse projects with the Bob Derrington Award, in honor of the late Director of Utilities for the City of Odessa from 1978 until his death in 1990. Last year the Houston Metropolitan Transit Authority won this award for its Water Use Reduction program.

Awards will be presented in April at the Texas Section Annual Conference in Galveston. Entries should be mailed to John T. Sutton, Texas Water Development Board, AWWA Conservation and Reuse Committee, P.O. Box 13231, Austin, TX 78711. For information, call John at (512) 463-7988 or e-mail [jsutton@twdb.state.tx.us](mailto:jsutton@twdb.state.tx.us).