

***Drill bit manufacturer cuts water use by 88%***

**Also achieves zero discharge to storm sewer**

In three years, a manufacturer of high-quality three-cone drill bits for the oil and gas industry has achieved a remarkable 88 percent reduction in water consumption per unit of product produced.

Security DBS of Dallas, a division of international giant Dresser Industries, first established its environmental engineering department in 1992. After organizing and gaining control of chemical and waste streams at the plant, the department set as one of its highest priorities water conservation, storm water pollution prevention, and reduction of disposal of water to the sanitary sewer.

"There had been no effort in place to protect the water system, to protect against storm water pollution, or to conserve water. Any effort would be better than none. But we didn't realize how much better," said John Fischer, then manager of Environmental, Health, Safety, and Quality Assurance at Security DBS.

These goals, the environmental engineering department learned, were complementary. By the end of 1996, Security DBS had reduced its water consumption to 14.4 million gallons, down from 32 million gallons in 1992, a 55 percent reduction overall. Per unit consumption dropped 88 percent, from 6,500 to 767 gallons per unit.



*Security DBS Maintenance Supervisor Les McDarty checks a valve at one of the plant's cooling towers.*

First, the plant adopted a policy of "zero discharge" to the storm water system. Poring through blueprints and revisions of the 50-year-old plant, the maintenance department partnered with the environmental engineering department to locate and shut off, piece by piece, water sources that drained to the storm sewer. "Having been constructed in stages, drawings were difficult to find and difficult to read," Fischer said. "It was something less than the Dead Sea Scrolls, but a task grandiose nonetheless."

To further reduce runoff, berms were shored up around trash compactors and scrap bins, and roofs were constructed over storage areas. The forging yard was cleaned up, and restrictions were issued against the storage of oil-contaminated soil.

Next on the agenda was water discharged to the sanitary sewer. Not even mop water, contaminated with debris, is dumped down the drain. Instead, it is stored with metal-working fluid waste, then hauled away for ultrafiltration.

Coincident with the survey of storm water discharge, the maintenance/engineering team uncovered and corrected several plumbing blunders and bad practices, then set about converting wasteful once-through cooling processes to circulation tank systems. By 1994, all discharges to the storm sewer, except for air conditioning condensate, had been eliminated. Water consumption was reduced to 1,036 gallons per unit from 6,500.

"The process water was essentially city water. Water was used, then just dumped down the drain," said Les McDarty, maintenance superintendent. "We converted all process water to recirculating systems rather than once-through."

At this phase, enjoying an 83 percent per unit reduction in water consumption and the resultant drop in their water bill, Fischer felt Security DBS had reached a point of diminishing returns. "We thought we could operate the facility with less water, but we believed we were running out of affordable ideas," Fischer said.

Fischer nonetheless called the Texas Water Development Board (TWDB) and asked to speak to someone in industrial water conservation.

Enter TWDB's conservation staff in the form of Bill Hoffman. Hoffman spent less than half a day touring the facility. Based on this tour and data provided by Security's maintenance staff, the TWDB conservation staff wrote an analysis of ways to save potentially 5 million gallons more per year.

The TWDB conservation staff first "eliminated the mysteries" by taking the guesswork out of determining the consumption of end users. For example, they explained how to accurately figure rates of cooling tower evaporation. Previous estimates of process cooling water use had been inaccurate.

"We found it helpful to learn where the most waste was taking place, where the 'biggest melon' was to take the slice from to conserve water," Fischer said. "The report clarified

water usage patterns, identified huge potential energy savings, and resulted in reduced chemical treatments."

Cooling tower overflow rates were found to be excessive. Aside from wasting water, disproportionate overflow prevented the cooling towers from maintaining the proper balance of chemicals, wasting chemicals and water, and resulting in improper blowdown.

TWDB also suggested ideas for water conservation education, lawn servicing, and storm water collection.

Security DBS is now looking at a potential savings of 22 million gallons of water annually beginning in the second half of 1997, Fischer said.

"TWDB's help was invaluable to Security DBS," Fischer said. "Their assistance was a great opportunity to demonstrate how industry and government can work together for the benefit of all concerned."

In the latest stage in the water conservation effort, a metalworking fluid recycling system is in place, resulting in a two-thirds reduction in water consumption. Now, this process water is recycled as much as three times before being hauled off for ultrafiltration.

Security DBS has joined 163 other Texas companies as Clean Industries 2000 members. These companies are responsible for more than 70 percent overall reduction in total hazardous waste in the state, according to Robert Borowski of the Texas Natural Resources Conservation Commission.

For the third year in a row, Dallas Water Utilities lauded Security DBS with its Blue Thumb Award, which recognizes industries which meet all industrial pretreatment requirements for removing pollutants from water and have turned in all reports in a timely manner to the utility.

Two substantial opportunities are still in the works. First is the capture of air conditioning condensate and for use as cooling tower makeup water. "This is an example of a perfect opportunity, because we already have access to the lines. The other would be to ultrafiltrate machine coolant water, then use that water source as either cooling tower makeup or process water.

Security DBS has the potential to conserve even more water than it already has. "We are far from out of ideas, and the technology is not a barrier," Fischer said.

"Environmental, health, and safety departments can go beyond compliance. A good environmental program is also a manufacturing as well as a marketing tool. Industry can save money with good environmental, health, and safety programs," Fischer said.

For more information, contact Bill Hoffman at (512) 463-7932. Fischer is now in a private consulting practice, and can be reached at (972) 401-0101.

### ***Water-smart landscaping references***

Two good books on water-smart gardening are *Xeriscape Gardening: Water Conservation for the American Landscape*, co-authored by Doug Welsh, a Texas Agricultural Extension Service (TAEX) horticulturist, and *Water Conservation in Landscape: Design and Management*, by Gary O. Robinette, past director of the Center for Landscape Architectural Education and Research.

A unique technical approach to lawn irrigation is described in *Handbook for Using Water Efficiently in the Texas Panhandle*, published by the City of Amarillo in association with Texas Master Gardeners, TAEX, and the Texas Panhandle Irrigation Association.

Using the "Water Smart" method of lawn irrigation, homeowners first measure sprinkler output using the catch-can method. They apply one inch of water to their landscapes, then keep a log with a running total, adding the turf ET coefficient and subtracting rainfall. (The turf coefficient, derived from ET rate and turf type, is listed in a table.) When the running total reaches a deficit of 1 inch, it is time to irrigate the lawn with 1 inch of water.

For a more generalized approach, a table lists watering frequency, mowing heights, and fertilizer requirements for five turf type

Texas Water Development Board published *A Directory of Water Saving Plants and Trees for Texas*, as well as two pamphlets: *Saving Water Outside the Home* and *Lawn Watering Guide*, available for a nominal fee from TWDB, (512) 463-7955.

And TAEX has published two guides: *Landscape Water Conservation--Xeriscape*, with tips on design, watering, fertilization, and a plant list and *Landscape Development for Texas Coastal Areas*. To order TAEX publications, call TAEX Distribution and Supply at (409) 845-6573.

The Arizona Water Resources Research Center has developed a multi-media CD-ROM, *Desert Landscaping: Plants for a Water-Scarce Environment*. Not only does the CD-ROM feature more than 1,500 full-screen wide shots and close-ups, but the audio component pronounces both botanical and common names of plants. A plant selector helps users choose appropriate species based upon size and growth rate, soil and sun requirements, irrigation needs, and the plants' place of origin. It comes as a hybrid disk that runs on either Windows or a Macintosh. Computer requirements are a 486-based or faster PC with a recommended 8 megabytes of RAM. Cost of the CD-ROM is \$25. Call Gary Woodard at (520) 792-9591 or email woodard@ccit.arizona.edu for more information. *Desert Landscaping* is also sold at Desert FloralScapes in El Paso and Wild Ideas: The Store at the National Wildflower Research Center in Austin.

### ***AWWA announces conservation awards***

For the fourth year, the Texas Section of the American Water Works Association recognized utilities, companies, and others who have found innovative and effective ways

to conserve and reuse water. Awards were announced at the organization's annual meeting April 6-9 in Arlington.

Judging categories are divided into direct programs (those showing a quantitative reduction in water consumption) and indirect programs (projects such as education or demonstration programs). Each category has three divisions: large utilities, small utilities, and non-utilities. In addition, reuse projects are eligible for the Bob Derrington Award, in honor of the late director of Utilities for the City of Odessa.

### **Direct, Small Utility--City of Idalou**

When the City of Idalou, located 16 semi-arid miles east of Lubbock, built a new wastewater treatment plant, it decided to build a new city golf course for land application of the secondary treated effluent. The golf course's water hazards act as interconnected holding ponds. Water can be transferred from pond to pond to provide irrigation water where it is most needed. Wastewater is transferred through an effluent pump station to the city-owned golf course. Rich Oller of Oller Engineering, (806) 799-0075, designed the reuse system.

Savings based on pumping costs are estimated at as much as \$20,000 per year. The plant produces approximately 150,000 gallons per day.

### **Direct, Large Utility--Harlingen Waterworks System**

In 1988, Fruit of the Loom investigated the Rio Grande area as a potential site for a new production facility which would employ up to 2,000 people. Stringent process water requirements would have strained both the limited resources of the Rio Grande and the capacity of any treatment plant in the area. The Harlingen Waterworks System, the Chamber of Commerce, and the City of Harlingen hammered out a proposal to use a reverse osmosis (RO) plant to further treat city wastewater for industrial use by the garment manufacturer.

Construction of the RO plant began in 1989. Fruit of the Loom built their textile bleaching and dyeing plant adjacent to the RO facility. Two RO trains produce 2 million gallons per day. (The equivalent monetary value of similar water rights is at least \$1.5 million, if willing sellers could be found.) The Harlingen Waterworks system has built a 7.5-million ground storage tank to provide a buffer RO water supply. In the future, Harlingen Water Works hopes to reuse wastewater flow from the Fruit of the Loom plant to provide an additional source of water. Cloice Whitley, (210) 430-8154 is general manager of Harlingen Waterworks.

### **Direct, Non-Utility--United Services Automobile Association**

The USAA corporate offices are headquartered on a 280-acre campus in northwest San Antonio. After studying existing or potential options to conserve and reuse water of the Edwards Aquifer, the insurance company has substantially reduced its water consumption

by: (1) installing a computer-controlled irrigation system with a weather station and moisture sensors using evapotranspiration rates to determine the actual need for landscape watering, (2) converting to drought-tolerant landscaping, (3) installing low-flow plumbing fixtures, (4) adopting a new cooling tower treatment to increase cycles of concentration, and (5) reducing potable water use in kitchens through equipment modification and employee education. Summer landscape water use has been reduced approximately 60 percent, with additional measures estimated to save 19 million gallons of water per year. For more information, contact Phil Weynand, (210) 498-1132.

### **Indirect, Large Utility--Dowser Dan School Program**

The Dowser Dan School program, a 45-minute live theatrical presentation, reaches about 24,000 first through fourth graders annually. Each student also receives an education booklet, calendar, or game to reinforce water conservation concepts that can potentially save 480,000 gallons of water per day. The program is produced by three part-time staff members, and new show and educational materials have been developed each of the six years. Reaching children in their formative years encourages them to become water-wise citizens as they grow up. For more information on the program, contact Ximena Poch, (512) 499-2787.

### **Bob Derrington Award--Houston Metro**

A water reduction program undertaken by the Houston Metropolitan Transit Authority in December 1994 resulted in a 35 percent reduction in water consumption (*Texas Water Savers*, Winter 1996). In the facilities' bus washers, rinse water is captured, fed through a sand filter, and stored for use in the "brush arch." Modification of the cooling tower piping saved 50,000 gallons per month. Instead of a once-through process using city water via a 1-inch line 24 hours a day, cooling tower water was routed to large air compressor aftercoolers to allow recycling of water. Regeneration of bus wash water softeners is performed now on an as-needed basis. Metro's water consumption dropped from 96.2 million gallons in 1994 to 61.9 million gallons in 1996. For more information, contact Carl Sanders, Metro's wastewater treatment plant operator, at (713) 635-0305.

### ***Meetings and conferences***

**Second Annual Water Conservation Conference**, August 14-15, Las Cruces, NM. Focus will be technical and policy issues of agricultural and urban water conservation, including reuse of wastewater; water management with modern technology; and salt, water, and fertilizer management. For information, contact Elvia Cisneros at the New Mexico Water Resources Research Institute, (505) 646-6049.

**Texas Waterwise Council annual meeting**, August 16 at the Dallas Convention Center, in conjunction with the Texas Association of Nurserymen Nursery, Garden & Landscape Show. On the agenda are election of officers and setting of objectives for the upcoming year. Lunch reservations (\$10) are due to president Marilyn Good (512) 280-5182 by August 1.

**Headwaters to Economic Growth: Market Solutions to Water Allocation in Texas**, August 22, Dallas, TX. Theme of the conference is the potential for free markets to efficiently allocate Texas' water. Call Darlene Pierce of the Federal Reserve Bank at (800) 333-4460, ext. 5267.

### ***Houston partnership nets 72 percent water use cut***

A 72 percent decrease in residential water consumption and a two-month return on investment is proof positive that retrofit works. A partnership between the City of Houston's Water Conservation Branch and the Housing Authority of the City of Houston (HACH) achieved a savings in water consumption of about 72 percent in a multifamily low-income family housing complex by replacing fixtures and repairing leaks.



*A City of Houston public works employee prepares an ultra-low flush toilet for installation in Kennedy Place complex, one facet of a retrofit and repair partnership between the city and the Housing Authority of the City of Houston.*

City of Houston and HACH employees replaced leaking 5-gallon flush toilets with 1.6-ers, repaired faucet leaks, and installed low-flow (2.2 gallons per minute) aerators at a 60-unit low-income multifamily housing development northeast of downtown Houston. To identify leaks during implementation, individual meters were installed at the main intake line of each unit, according to Pat Truesdale, manager of the City of Houston Department of Public Works Water Conservation Branch. Tenants were educated in water conservation practices during implementation of the program.

Taking into consideration the cost of fixtures, labor, and administration, the project costs totaled \$22,000, which was recouped in less than two months with water use decrease of more 1.3 million gallons per month at Kennedy Place.

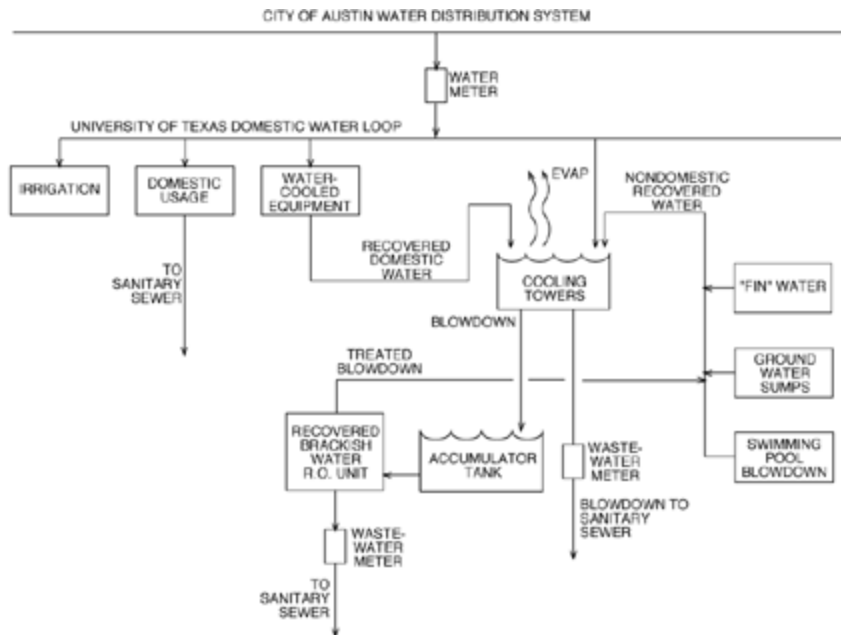
Built in 1982, Kennedy Place comprises 28 buildings with a total of 60 units and 264 residents. Outside water use is nil, as outside faucets have been removed and the water line is capped. Still, average per capita consumption at Kennedy Place before the retrofit project was 164 gallons per person per day, almost twice average of 83 gallons per day for Houston citizens.

After implementation of the project, daily water use dropped from 219 to 46 gallons per person per day. The complex's monthly water and wastewater bills dropped to \$1,810 after the project from \$8,644 before the project.

For more information, contact Truesdale at (713) 880-2444.

## ***UT recovery tops 1 billion gallons***

Carved into the pediment of a physical plant building at the University of Texas at Austin are the names of giants of thermodynamics, power generation, and electrical engineering--Carnot, Faraday, Watt, Hero, Newcomen--and within that building and others on campus, the campus water recovery system applies physical laws these scientists harnessed to create electricity to conserve water--and lots of it.



*Simplified schematic of the University of Texas water recovery system shows domestic and nondomestic recovered water routed to cooling towers.*

A university campus is like a small city, with its own power generation capability and groundwater wells, while at the same time being a large city utility customer, purchasing potable water from the city and disposing of wastewater in the sanitary sewer. In fact, the University of Texas is one of Austin's largest water utility customers.

About 16 years ago, UT physical plant personnel started installing a new plumbing infrastructure to capture once-through cooling water and using that water for cooling tower evaporative make-up.

Since then, the University of Texas (UT) water recovery system has recycled more than a billion gallons of water for a savings of more than \$2.99 million in avoided water and wastewater fees (*Texas Water Savers*, Spring 1994). Total installed cost has been a modest \$300,000. And in each year of operation, the recovery pipe network has become ever more wide-ranging, making it economically feasible to add ever-smaller sources, according to Rusty Osborne, of the university's Utilities and Energy Management Department.

What started modestly enough as rerouting once-through cooling water for dormitory drinking fountains from a sanitary sewer drain to campus cooling towers has now grown to a campus-wide infrastructure of water recovery pipes connecting more than 200 pieces of equipment in 41 buildings. About 70 million gallons of water are recovered annually for use in chilling stations and power plant cooling towers as make-up water. Recovered water accounts for about 40 percent of cooling tower consumption.



Scanning electron microscopes, lasers, and centrifuges often have heavy cooling requirements. After cooling equipment, recovered water is collected via a dedicated standpipe passing through a core-drilled hole in the floor to a vented receiver in the basement of each building. All sources are hard-plumbed to prevent disposal of other wastes into the system. From there, recovered water is piped via recovered water mains in the steam tunnels to chilling stations, where the water absorbs heat from refrigeration condensers, and to cooling towers associated with the university's 95-megawatt power plant.

In fact, the chemical and petroleum engineering building, completed in the mid-1980s, became the first building in the world designed with a built-in, rather than retrofitted, industrial water recovery piping network, according to Osborne.

As the recovery web expands and city water costs rise, the return on investment has become more favorable. As a rule, payback for newly discovered sources is under one year. One lab, located near the recovery main and using 30 gallons per minute (gpm), showed a payback of only 6 weeks. Very little additional capital expenditure is needed as the infrastructure is virtually complete

So accepted has the recovery network become, that recovered water piping systems are now part of the UT general specifications for mechanical, electrical, and plumbing design. All bids on new or remodeled building projects must plan for water recovery piping networks.

Austin's escalating water rates further drove Osborne's quest for more previously wasted sources of water. In a departure from the once-through domestic recovered water contributions, the latest segment of the recovery project, still under construction, captures three new nondomestic sources of water: swimming pool blowdown, ground water, and air conditioning condensate, called "fin" water.

Swimming pool blowdown (or backwash) from the campus' three large swimming pools, once discharged to Waller Creek, is now used for evaporative make-up in cooling towers.

Groundwater seeping into the basements of below-grade structures and steam tunnels is routed via French drains to sumps in building basements since the 1940s. While not as high in quality as city water, it is adequate for make-up purposes.

"Water collects in building basement sumps during periods of seasonally high groundwater," Osborne said. "We tested for water quality and found it adequate for cooling tower make-up. Groundwater was collecting in tunnels and causing maintenance problems. Recovering that groundwater converted a liability into an asset."

"Fin water" is air conditioning condensate dripping from the fins of chilled water coils in the massive air handler units which heat and cool ambient air in buildings. "Chilled water from a central station circulates in air handler units. Moisture is wrung out of the air as it passes over those coils, then drips from the cooling fins," said Osborne.

Fin water is essentially distilled water--and there is a lot of it when it's needed most--during the humid summer. Osborne has measured 10 gpm from three air handlers in the chemistry building, Welch Hall.

Free from salts and minerals, fin water is 10 to 15 times higher in quality than city water. Fin water has the effect of increasing cycles of concentration in cooling towers, and the purity of fin water suggests use in a separate system for power plant boiler make-up.

In another first, the Student Services building was designed from the ground up to accommodate both fin water and recovered subsurface water. Several other campus buildings have since been retrofitted for fin water recovery.

In addition to displacement of city water by recovered water for make-up, the university also realizes a savings in the way in which make-up water is billed by the City of Austin.

The cost of city water consists of both water and wastewater components. In addition, the university is billed for metered discharge into the sanitary sewer from the cooling towers. In essence, the wastewater component was billed twice. Part of the project's overall cost savings is the result of segregation of water sources to allow the university to be billed for only actual metered wastewater discharge from the cooling towers into the sanitary sewer.

In other words, instead of paying the wastewater component charge up front for city water used for evaporative make-up, Osborne negotiated a contract with the City of Austin to pay wastewater fees on the actual metered discharge into the sanitary sewer.

In the near future, even cooling tower blowdown will not be exempt from recovery. (Blowdown is a portion of cooling tower water that is wasted to prevent contaminants from becoming too concentrated. Make-up water compensates for the discharge.) Under construction now is piping to divert blowdown to a reverse osmosis (RO) unit, where it will be cleaned up and returned to the nondomestic recovered water line. The more concentrated RO reject will be sent finally to the sanitary sewer.

Eventually, Osborne said, the university hopes to segregate recovered water into three streams: domestic and nondomestic recovered water (going to cooling tower makeup), and fin water (going to boiler makeup).

The UT project has received two water conservation awards. In 1996, the American Water Works Association Texas' Section Conservation and Reuse Division found UT to be the best non-utility, direct reuse program. That same year, the City of Austin recognized the UT with its annual Industrial, Commercial, and Institutional award for customers with exemplary water conservation projects.

Currently, recovered water accounts for more than 8 percent of total university consumption. Recently, the rate of increase of volume of recovered water has flattened,

apparently due to conversion of once-through cooling systems to recirculating and air-cooled systems.

The UT water recovery net continues to expand as researchers arrive with equipment requiring water cooling, existing buildings are retrofitted, and new building specifications mandate recovered water piping systems.

Rusty Osborne can be reached at (512) 471-5050.

### ***Subsidence District wins UCOWR award***

The Harris-Galveston Coastal Subsidence District has won a second national award for its water conservation public-private partnership, Learning to be Water Wise & Energy Efficient.

The Universities Council on Water Resources (UCOWR) recognized The Subsidence District with its Award for Education and Public Service in Water Resources. The award recognizes activities beyond the university classroom which contribute significantly to public awareness in the area of water resources development and use. The 100 university members of UCOWR throughout the world engage in education, research, public service, international activities, and policy development for water resources.

The award was presented to the district's public information director, Carole Baker, at the joint annual meeting of UCOWR and the American Water Resources Association in July at Keystone, Colorado.

The Subsidence District has been the recipient of two other prestigious awards for the "Learning to be Water Wise & Energy Efficient" program. Last year, the program was singled out for the Texas 1996 Governor's Award for Environmental Excellence for Education. In 1995, the U.S. Bureau of Reclamation lauded the program with its Water Conservation Award in the Educational Mentor Category (*Texas Water Savers*, Fall 1995).

Baker and assistant Susan Brown are now instructing school districts statewide, as well staff of the Texas Natural Resource Conservation Commission, on the merits of this valuable educational and conservation program. The Learning to be Water Wise & Energy Efficient program combines a curriculum teaching water efficiency and conservation with the distribution of high-quality plumbing equipment for installation in students' homes. The flexible curriculum, developed by the National Energy Foundation, conveys the conservation message through 10 hands-on activities, with lessons incorporating math, language, art, science and group dynamics skills.

To fund the program, Baker coordinated the recruitment of public and private sponsors from throughout The Subsidence District's jurisdiction to purchase the \$28 home plumbing and educational packages distributed to schoolchildren. More than 400 sponsors, including municipal utility districts, river authorities, corporations such as Texas Instruments, and several civil engineering firms have participated. Sponsorship of

more than \$2.6 million to date has been generated. After securing sponsorship, Baker matched schools and sponsors.

Last year's UCOWR Education and Public Service Award was given to John Sweeten and Bill Harris of Texas A&M University for their initiatives to establish three Hydrologic Unit Area Awards and one water quality demonstration project in Texas.

### ***TWDB awards grant; two new sponsors sign on***

The Texas Water Development Board awarded Texas Water Resources Institute a \$10,000 grant for the development and production *Texas Water Savers*.

Thanks to this grant, this summer issue and the Fall 1997 issue will be larger and contain more photographs and graphics. Production costs of *Texas Water Savers* are funded from memberships and sponsorships listed on pages 2 and 3 of this newsletter.

In 1994, a grant from Texas Water Development Board funded the first year of production of this newsletter.

Texas Water Resources Institute also welcomes two new sponsors, Camp Dresser & McKee and Turner Collie & Braden, and one renewing member, the City of Houston Water Conservation Division.

Gold and Silver members and sponsors are recognized in each issue and are invited to serve on the editorial advisory board of *Texas Water Savers*. For more information on sponsorship, please call editor Jan Gerston, (409) 845-1852.

### ***Houston's Truesdale named Conservationist of the Year***

City of Houston Water Conservation Manager Pat Truesdale was selected as 1996 Outstanding Water Conservationist of the Year by the Texas Water Conservation Association (TWCA). Truesdale was presented the award at the Association's 53rd Annual Convention in Austin.

Robert Wagner, TWCA president, said, "In the past four years, Pat Truesdale has taken a minimally effective conservation program and turned it into an exemplary program earning awards at the state and national level. The City of Houston program has also been described by Texas Natural Resource Conservation Commission as a model for the rest of Texas."

Truesdale's accomplishments meriting the award include a pilot retrofit partnership with Housing Authority of the City of Houston which reduced



*Pat Truesdale, City of Houston Water Conservation Manager, shown here with a public works employee, was named Texas Water Conservationist of the year by the Texas Water Conservation Association.*

water consumption at an apartment complex by 72 percent; a capital improvement program to repair leaks in city pools, fountains, and irrigation systems; and an education program for the greater Houston service area.

Previously, the City of Houston won the Leadership in Water Conservation Award for Innovative Partnership from the U.S. Bureau of Reclamation for an interactive gameboard (*Texas Water Savers*, Winter 1995).

In accepting the award, Truesdale recognized the dedication and contribution of her staff and thanked Public Works Deputy Director Fred Perrenot for his support over the past four years.

The City of Houston is the fourth largest municipally owned water system in the United States. The city pumps an average of 350 million gallons per day to retail and wholesale customers. This average daily pumping has remained constant over the last four years, despite continual annexation and addition of new wholesale customers.

### ***TAEX to lead water program mandated by Senate Bill 1***

The 75th Texas Legislature budgeted \$600,000 for Water Supply and Conservation Educational Programs to the Texas Agricultural Extension Service (TAEX).

Taking the lead in this program, TAEX is charged with coordinating and extending existing efforts of other agencies, counties, and municipalities to craft regional water programs as mandated by Senate Bill 1.

The focus of the education effort will be county-based, relying on the network of county agents already in place, and will address both urban and rural concerns, said Bill Harris of TAEX. TAEX will coordinate efforts of Texas Natural Resource Conservation Commission, Texas Water Development Board, and the Texas State Soil and Conservation Board, the Natural Resource Conservation Service, as well as university faculty.

In six urban areas--Houston, Dallas, Fort Worth, San Antonio, El Paso, and Austin--year-long demonstrations will concentrate on landscape irrigation and auditing, management of turfgrasses, and drought mitigation. Specially trained volunteers, such as Master Gardeners and Agrifood Masters, will expand existing county conservation education efforts.

Educational workshops for professionals are also planned: for installers, courses on the fundamentals of irrigation system hydraulics; for landscape managers, irrigation water management for industrial and commercial landscapes.

On-Site Wastewater Management Education Training Centers will serve as demonstration sites for alternative disposal, such as the use of wastewater for landscape irrigation.

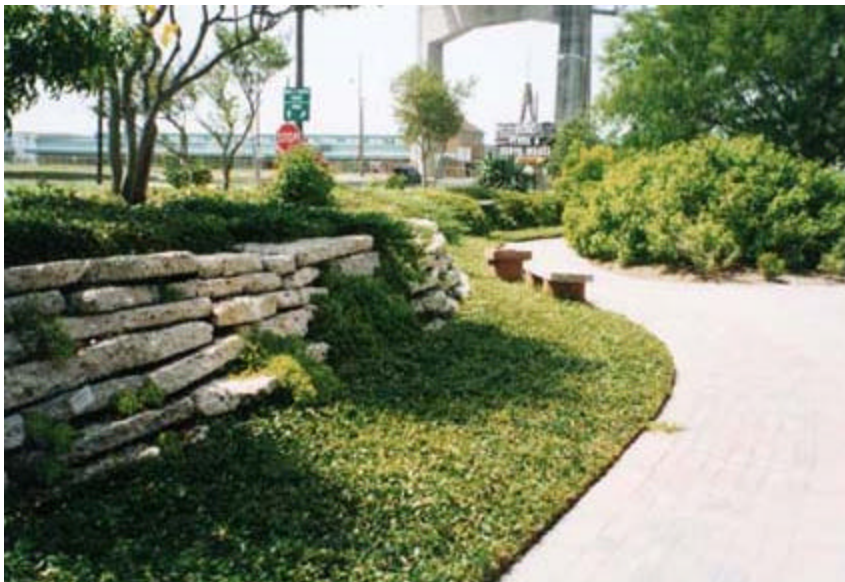
Efforts targeted to rural water consumers will deliver information on the purpose of groundwater conservation districts, expanding technology transfer about irrigation conservation practices, such as low-energy precision application (LEPA), brush management, and well construction.

Leaders of the program will also investigate the use of wastewater irrigation of nonedible crops.

A one-month media blitz tentatively scheduled next summer will kick off the conservation campaign, Harris said.

### ***Water-thrifty landscapes: low maintenance, attractive, and easy on the environment***

Attractive water-smart landscapes, popularly called Xeriscapes, require less time, fertilizer, and water than traditional landscapes. But water-smart landscaping is a two-part process: planting low-water-use plants, then maintaining them according to their needs.



*Unique to the Xeriscape Learning Center and Design Garden in Corpus Christi is the 4-foot-high berm of "native" stone, actually stacked blocks of broken sidewalk diverted from a landfill. The berm serves as a buffer between the demonstration garden and the roadway.*

Less well-known but equally important is the fact that Xeriscapes also lessen nonpoint source pollution by reducing landscape-related pollutants in runoff.

"Xeriscaping means not just minimum water, but minimum labor, minimum fertilizer, and minimum time," said Bryan-College Station Master Gardener Elmer

Krehbiel. "It's a great idea, but it's difficult to get people to believe they can really save water. And it's also difficult to get people to believe Xeriscapes are not just cactus and sagebrush."

Water-wise gardening is as much a method of gardening as the choice of plants. The classic definition of Xeriscape is a quality landscape that conserves water and protects the environment. It is a *method*, not a style of gardening.

"People can over-irrigate a Xeriscape just as easily as a traditional landscape," said Anai Padilla, water conservation manager of El Paso Water Utilities.

(The word "Xeriscape" is capitalized here because it is trademarked by Denver Water Utilities. Coined from the Greek *xeros*, meaning "dry," and *landscape*, it has come to mean "quality, water-efficient landscaping.")

As public demand increases for more drought-tolerant and native landscape plants, growers and nurseries began to offer a greater variety of acceptable trees, shrubs, and perennials.

Recognizing that between 40 percent and 60 percent of the water used in Texas cities is for landscape irrigation, Texans--cities, gardening clubs, schools, cooperative partnerships, nurseries, and the Master Gardeners--are finding a myriad of ways to promote water-thrifty landscaping.

### **Master Gardeners**

Volunteer Master Gardeners are trained by the Texas Agricultural Extension Service county agents to educate and advise citizens on gardening practices. In effect, Master Gardeners extend the range of the county extension agent. The Texas Master Gardener Program training includes environmental horticulture, including composting and water-smart gardening, according to Doug Welsh, statewide master gardener coordinator and extension horticulturist. On their own, or in partnership with municipal or other entities, Master Gardeners share their expertise with citizens to fulfill their volunteer commitment.

The Bexar County Master Gardeners play a key advisory role in the Watersaver Landscaping Rebate Program. San Antonio Water System (SAWS) offers a rebate of between \$100 to \$500 for approved "Watersaver" landscapes. Utility customers wishing to install a qualifying landscape first submit plans for review by Master Gardeners . Once approved, homeowners have one year to install the landscape following the approved plan. After installation, Bexar County Master Gardeners conduct an on-site inspection and inform SAWS if the landscape qualifies for the rebate.

In response to the drought of the 1990s, Smith County Master Gardeners in Tyler coined the catch phrase, "When in *drought*, Xeriscape." To demonstrate the seven principles of xeriscaping, the Smith County Master Gardeners built an indoor interpretive garden at the East Texas State Fair in September with plants donated by local growers. Now this group is seeking funding for a permanent outdoor demonstration garden while they maintain adaptive rose and perennial varieties in Tyler's heritage garden.

Nueces County Master Gardeners provided technical assistance and volunteer labor in the planting and on-going maintenance of the Corpus Christi Xeriscape Coalition's demonstration garden.

## **Corpus Christi**

In water-short Corpus Christi, the Xeriscape Coalition, a partnership of city departments and local nonprofit organizations, built an the award-winning interactive Xeriscape Learning Center and Design Garden which is the cornerstone of a multidimensional outreach program.

The foundation for Xeriscape garden development was a brainstorming group of 75 local gardening professionals who met in 1991. Their task was to break up the concept and the practice of xeriscaping to make it palatable to the public, according to Yolanda Maruffo of the Corpus Christi Water Department. The resulting garden, at the entrance to the Corpus Christi Museum of Science and History, is a condensed capsule of Xeriscape principles. About 150,000 residents and tourists visit the museum annually.

More than just a plant-and-label garden, this 3/4-acre public garden features interactive exhibits in two gazebos. The Water Story gazebo educates visitors about the hydrologic cycle, water treatment and conservation, the story of storage and delivery of water from the Nueces River Basin with a lighted topographic map, and the history and future of water supplies in south Texas.

In the Children's Gazebo, an interactive display allows children to operate an old-style water pump and to compare their weight with a volume of water of equal weight.

Visitors can visualize ideas for home gardening from displays comparing mulching, composting, and soil preparation, as well as tips on planning a Xeriscape garden. Backyard fencing options complete a new exhibit there. Within the museum, the Council has developed a public reference section, including a manual detailing the more than 100 varieties of plants in the garden.

The latest addition to the garden is a unique 150-foot long, 4-foot-high curvilinear berm planted with water-thrifty vegetation. The berm incorporates stacked broken sidewalk concrete, which would otherwise have found its way to a landfill, as a design element. The concrete sidewalk blocks substitute for native stone, which is unavailable in Corpus Christi.

Outreach is another facet of the community's Xeriscape gardening program. Since 1992, a speaker's bureau has provided more than 200 presentations, and information booths are set up at home and garden events. The Xeriscape Coalition has also helped local schools develop gardens. Maintenance of the gardens is a hands-on teaching experience for youth groups and adult volunteer groups, as well as for the Master Gardeners.

The city offers a one-page flier on the seven Xeriscape principles to introduce the subject. More detailed is the "Xeriscape-to-Go" planning literature with design principles and graph papers to help citizens realize their gardening plans.



The Xeriscape Learning Center and Design Garden was a finalist in the 1997 Clean Texas 2000 program, and was recognized this year as a Texas Grown garden by the Texas Department of Agriculture. The Xeriscape Coalition was a recipient of a Texas Section-American Water Works Association 1994 Water Conservation and Reuse Award.

The \$177,000 cost of the garden was funded primarily with corporate and government grants.

## **Austin**

The City of Austin each year sponsors a one-day Xeriscape School. So popular is this event that each year it has moved to a larger venue: first Zilker Botanical Gardens, next Lower Colorado River Authority headquarters, then Austin Convention Center, and this year, yet another capacity crowd of 236 at the National Wildflower Research Center. The school includes sessions at beginner and advanced levels on design, soils, maintenance, mulch, and compost, with hand-on demonstrations of irrigation. The event is jointly sponsored by the City of Austin Water Conservation Program, the Austin Xeriscape Advisory Board, and the Austin Xeriscape Garden Club. Dick Peterson of the city's Planning, Environmental, and Conservation Services Department is the Xeriscape Project Coordinator.

A 13-year Austin tradition is the fall Xeriscape Tour, which will take place October 4. Past tours have attracted crowds of nearly 2,000 for the one-day tour of exemplary Xeriscapes. Tour stops include winners of the Xeriscape Recognition Award in the residential, commercial, and demonstration/education classes. This year's awards will be announced August 20.

Award guidelines are stringent; in fact, the city checks water use records of entrants and disqualifies those landscapes using more than 30,000 gallons per month, regardless of landscaped area. "The intent of the program is to teach people to be good stewards of the environment."

Austin's "Xeriscape It!" rebate program, initiated in 1993, offers residential water customers up to \$150 rebate (water bill credit) for installing sodded buffalo grass and drought-tolerant shrubs or ground covers in areas that receive at least six hours of direct sunlight per day.

The city has released a videotape, *Xeriscape: Gardening for Austin*, available for \$6.82 for City of Austin water customers and \$19.78 for out-of-city customers. Call (512) 499-2199 to obtain an order form.

Opportunities to learn about xeriscaping abound outside the realm of city government also. About 75 to 100 gardeners attend monthly meetings of the Xeriscape Garden Club. Both Austin Community College and University of Texas offer adult education courses in water-wise landscaping. Farther afield, the independent school districts of Lake Travis

and Round Rock also offer community education courses in this most popular subject. Peterson teaches the course at Lake Travis.

In concert with the Lower Colorado River Authority, the City of Austin produced an unusual Xeriscape brochure distributed at public libraries and plant nurseries. The popular brochure includes design tips and a suggested plant list. The seven Xeriscape principles are described.

Starting in 1991, Austin has conducted a two-phase research project. The first phase concluded that Xeriscapes use 43 percent less water than traditional landscapes on lots smaller than 9,000 square feet. The second phase, funded by a matching grant from Texas Water Development Board, determined Xeriscapes correlate with a 30 percent savings for lots of any size.

## **El Paso**

In El Paso, the Texas Agricultural Extension Service (TAEX) presents public workshops, and individual Master Gardeners prepare programs on water-smart landscaping as part of their 50-hour public service commitment. Utility customers may also request a list of suggested plants from TAEX or the El Paso Utilities.

At the Centennial Museum at the University of Texas at El Paso, the nine-session Sunscapers course teaches water-smart landscaping within the larger context of conserving natural resources and living in the desert.

For the past 22 years, the El Paso Utilities has recognized a single outstanding water-smart landscape, alternating each year between commercial and residential installations. The contest was started by the El Paso Council of Garden Clubs.

The Texas law requiring Xeriscape landscaping of public buildings and roadside parks (Senate Bill 514) indirectly helped the Xeriscape education effort in El Paso. Low-water use plants surviving in the harsh environment of the freeway catch the attention of residents, leading to calls to El Paso Utilities for information about those and other hardy plants.

While working as a horticulturist at the Agricultural Research and Experiment Center in El Paso, Padilla designed a walk-through Xeriscape garden with plant adapted to the desert.

Sometimes questions on drought-hardy plants come from the most unlikely place. In fact, El Paso Water Utilities conservation manager Padilla relates the anecdote of a radio disk jockey challenging the audience to identify the yellow flower along the freeway right-of-way. It was Spanish broom. But another caller had beaten Padilla to the phones on that one.

Unique among Texas cities, El Paso is on a permanent three-day per week watering schedule. And the city has some clout--violations of water conservation ordinances are Class 3 misdemeanors. One exception to this rule is the new landscape water permit. Residents may request this permit, which allows a waiver from the three-day schedule for 30 days to allow establishment of new landscaping.

## **Dallas**

Dallas Water Utilities and its customer cities sponsored six "Introduction to Xeriscape" seminars taught by local Xeriscape expert Bonnie Arnold Reese, the owner of Beautiful Landscapes, a business specializing in do-it-yourself projects.

The six different seminars include instruction on Xeriscape design, selection of quality native and adapted plants, maintenance, environmentally friendly pest management, disease control, fertilizing, mowing, and mulching.

Culminating the water-wise program year are the Xeriscape Awards and tour. This year's tour on June 7 included not only the six 1997 winners, but also six winners from previous years. The Xeriscape programs are coordinated by Janell Mirochna, head of community relations for Dallas Water Utilities.

## **Bryan**

"A garden of drought-hardy plants is also a historical record. In the late 1800s and early 1900s, irrigation did not exist, and settlers used plants that would thrive without irrigation," said Master Gardener coordinator Welsh. "The demonstration garden adjacent the historic Carnegie Library in Bryan is a bit of history in itself. "This demonstration garden is an opportunity to go `back-to-the-future.' It is, in essence, a period historical restoration of a settler's garden," Welsh said.

The Bryan Xeriscape (*Texas Water Savers*, Summer 1995) was financed with donations from the Master Gardeners and two other local garden clubs, cost-sharing by the City of Bryan, and a fund drive in the Bryan Independent School District.

## **Amarillo**

In Amarillo, a demonstration garden has recently been integrated with an existing recycling center. Located adjacent to a solid waste transfer area, the recycling area had been a "bit of an eyesore," according to Duane Strawn, the Parks Department landscape architect who designed the demonstration garden. The site now contains native and drought-tolerant landscaping, as well as recycling bins for oil, oil filters, tin, aluminum, glass, and newspaper. Boulders used as design elements were reclaimed from the city's landfill. Three city departments cooperated to build and maintain the demonstration garden in Amarillo, according to Kathy Hawkins of the Public Works department. The Parks Department prepared and planted species purchased with a grant from the Panhandle Regional Planning Commission. The Street Department paved a walkway

through the garden and concrete pads for the roll-off bins, and the Public Works Department now maintains the site.

## **Houston**

In its second edition, the free City of Houston *Guide to Water Wise Gardening* has been distributed to almost 1,600 citizens, and the city is planning a fall bill insert promoting the booklet.

The City of Houston is also planning an historical and educational plant exhibit for the E.B. Cape Center there.

### ***WaterWise Council conducts seminars for nursery employees***

A slide show and script produced by the Texas WaterWise Council was so well received at regional nursery employee training seminars that the Council is looking into converting the presentation to videotape with voice-over.

The slide show, covering basics of the hydrologic and "hydro-illogical" cycles, development and treatment of water, categories of water use, and water quality issues, was presented at seven regional Texas Association of Nurserymen employee seminars.

The videotape is a pilot, designed for the Council's business partners. The Council hopes to expand and develop a videotape for homeowners.

The non-profit Texas WaterWise Council, an organization the nursery industry and water managers, promotes water conservation practices through public/private partnerships

The WaterWise Council draws its charter members from cities, water conservation districts, nurseries, and irrigation suppliers. Twenty-four entities have joined as charter members, including several garden clubs.

Public partners agree to promote water-wise gardening through public information campaigns. Business partners and their employees receive training in efficient use of water in landscaping, and, in return, can promote themselves using the WaterWise Council logo.

A general meeting of the WaterWise Council will be 11:00 August 16 at the TAN/MISLARK (Mississippi, Louisiana, Arkansas) conference in Dallas August 15-17. Call Marilyn Good at Texas Association of Nurserymen, (512) 280-5182, for more information.

### ***Rainwater harvesting references***

In response to positive reader response to the article on rainwater harvesting in the spring issue of *Texas Water Savers*, following is a collection of rainwater harvesting resources.

*Texas Guide to Rainwater Harvesting* is an excellent primer, manual, and list of sources about rainwater harvesting in the Southwest. It was developed by Center for Maximum Potential Building Systems under the direction of Gail Vittori and funded by Texas Water Development Board. A companion videotape, *Rainwater Harvesting for Texas* is also available in both Spanish and English. Request single copies from Texas Water Development Board, ATTN: Patsy Waters, P.O. Box 13231, Austin, TX 78711-3231; by e-mail, [pwaters@twdb.state.tx.us](mailto:pwaters@twdb.state.tx.us); or by fax (512) 463-9893.

A videotape, *Rainwater Collection Systems*, is the story of three families from Texas Hill Country who collect rainwater for all their household needs, including drinking water. The video is narrated by John Dromgoole, host of the PBS series, *The New Garden*. The tape is available for \$29.95 plus \$3.00 shipping and handling from Morris Media Associates, Inc., 4306 Wildridge Circle, Austin, TX, 78759. Texas residents are requested to add 7.25% sales tax.

The American Rainwater Catchment Systems Association (ARCOSA) was formed in Austin in 1994 to promote rainwater catchment systems in the United States. Members are professionals working in academia, city, state, and federal government. Contact ARCOSA, P.O. Box 685283, Austin, TX 78768-5283 or email Dennis Lye at [Lye.Dennis@epamail.epa.gov](mailto:Lye.Dennis@epamail.epa.gov). The ARCOSA web site is at <http://www.nku.edu/~biosci/ARCOSA.html>.

Hari Krishna, first president of the Austin chapter of ARCOSA has donated proceedings of the International Conferences on Rainwater Harvesting to the Texas Natural Resource Conservation Commission (TNRCC) library. Libraries can request the proceedings through interlibrary loan, and employees of state agencies can check out the proceedings directly from TNRCC.