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Greywater reuse future depends upon definition and agencies' rulings

A 25,000 gallon-per-day constructed wetlands wastewater treatment facility at San Antonio's Heritage Middle School supports the district's construction of a living classroom demonstration marsh, pond, and adjacent terrestrial habitat.

With all the talk of demand management, peak reduction, and groundwater depletion, a partial solution lurks literally right under the bathroom sink--greywater.
Reuse of greywater for landscape irrigation can replace 40 percent of residential potable water use for irrigation. Depending upon plant choice, climate, soil, and area, greywater could supply most or all landscape irrigation needs for a residence.

Wastewater from a household is divided into greywater and blackwater components. In general, greywater is wastewater drained from lavatories, showers, bathtubs, washing machines, and sinks not used for the disposal of hazardous or toxic ingredients or waste from food preparation. Blackwater is usually wastewater from the kitchen sink and toilet. Its higher nutrient, solids, and pathogen content demands more complex treatment. Estimates of daily per capita generation of greywater range from 40 to 60 gallons.
Bill Hoffman, chief of the Water Conservation Section of the Texas Water Development Board estimates greywater volumes in the state to increase from just over a half-billion gallons per day currently to more than 1.3 billion gallons per day in 2050.

The constructed wetland on-site septic facility can be incorporated as an attractice landscaping element, as at this house in Temple.

The great divide

"When combined with rainwater harvesting and good conservation practices, many homesteads in Texas have applied these technologies to develop an independent source of water for their homes," Hoffman said. Most large--and many small--

municipalities treat and reuse wastewater, a process demanding a large and complex infrastructure, and of course, sewer lines to carry effluent from where it is created to where it is treated. Another engineered system of pumps and pipes conveys the treated water to irrigated sites or cooling towers or other end users.
Greywater reuse scales this process down to the level of a single home or to a neighborhood. In simplified terms, greywater recycling involves filtering, treating, storing, and using nonpotable water generated by a household or business for reuse on site.

It's a natural

Canna lillies planted in a gravel medium form a filter for wastewater in this constructed wetland on-site septic facility.

The idea of greywater reuse outdoors evolved as a natural outgrowth of disposal of liquid effluent in a conventional on-site sewage system drainfield. A conventional on-site sewage system comprises a septic tank for settling out solids, a filter, pumps, a disinfection unit, and a drainfield for disposal of liquids.
With some reworking, the drainfield becomes a greywater irrigation system. What was before a disposal problem is transformed into a new water source. The components of a greywater reuse system for landscape irrigation are a storage tank; filter to remove particles such as lint; a disinfection system, commonly chlorine, for spray irrigation; a pump, when reliance upon gravity is not practical; and an application system.
According to 30 TAC §285, entitled On-site Wastewater Treatment, treatment and disposal of greywater is the same as blackwater, except in the case of laundry greywater. Chapter 285 applies to flows of 5,000 gallons per day or less. Larger flows undergo a separate permitting process by the TNRCC.
According to Chapter 285, so long as wastewater (blackwater and greywater) is treated to secondary quality effluent standards, it may be used for surface irrigation.

The TNRCC has written regulatory guidance which states that residential laundry washing machines may discharge directly onto the ground surface if the following conditions are met--

1. Discharge must not create a public health nuisance.
2. Area must be supported with plant growth and limited in access.
3. Water in which soiled diapers have been laundered may not be discharged.
4. Water may not pool nor run off.
5. A lint trap must be installed at the end of the discharge pipe.
6. The area must be supported with plant growth.

"Chapter 285 has two main purposes--to protect public health and to protect the environment," said Bruce Lesikar, Texas Extension Agricultural Service Engineering Program Leader and one of the state's leading experts on on-site sewage facilities and training. "The regulations are written to prevent on-site sewage facilities from causing a nuisance and from causing environmental damage, including prohibitions against runoff."

Heritage Middle School in San Antonio, faced with a student population of 1,500 and growing and looking at a four-mile sewer service connection, opted for a constructed wetland facility, and in the process, created "living classroom" demonstration marsh, pond, and terrestrial habitat area which has become a field trip destination for students throughout the school district.

"To use greywater for landscape irrigation, homeowners must properly size the reuse area based on water requirements of the landscape and time of year. Greywater can meet the water needs of a larger area in the winter," said Lesikar.

Reuse of greywater can be accomplished with one of five distribution strategies.

1. Low-pressure dosing system--a small-diameter pipe with a series of orifices set in a network of gravel-filled trenches for water storage until plants can use water.
2. Subsurface drip irrigation--a pressurized system using standard drip tubing with pressure-compensating emitters to apply wastewater beneath the soil.
3. Surface drip distribution system--drip lines covered with mulch to limit contact with the open air.
4. Bubblers--heads installed in a grid pattern in a lawn applying water to the soil surface.
5. Spray irrigation--used only with an effluent meeting secondary treatment standards, higher standards than demanded of subsurface irrigation because of the possibility of human or animal contact. The spray field is similar to a lawn irrigation system.

Incidentally, reuse of greywater indoors within single residences is still forbidden by Texas, although greywater is used for toilet flushing in some commercial buildings.

The constructed wetland alternative

Standard "off the shelf" on-site sewage facilities for wastewater disposal--comprising a sewage tank and drain field--are effective only where soil type, soil depth and drainfield area are adequate to absorb the liquid effluent.

Constructed wetlands, with their showy flora, offer a pleasing aesthetic alternative on-site sewage facility where physical conditions (such as heavy clay or a perched aquifer) prevent the use of standard septic systems.

Incorporated into a landscape, a constructed wetland can be a desirable landscape element. In fact, one company, Washwater Garden, markets its off-the-shelf greywater

disposal device to turn waste into a "patch of lush, tropical flora, a stand of evergreens, or even a living privacy hedge."

A middle school class takes a field trip to the constructed wetland at Heritage Middle School in San Antonio. The constructed wetland is designed to treat 25,000 gallons per day of wastewater generated by the school.

Constructed wetlands mimic the natural wetlands process as a means of improving wastewater quality. In a typical installation, after solids settle out in a septic tank, liquid wastewater flows to one or two constructed wetlands cells where further treatment of the liquid wastewater takes place. Constructed wetlands, however, require a heavy dose of gardening-type maintenance to function properly.

The cells are shallow excavated earthen basins lined with an impermeable material and filled with a medium, such as gravel or chipped rubber tires. Aquatic plants grow within the medium. This arrangement, therefore, is sometimes called a rock-reed filter. Microbes living on the surface of the gravel and on plant roots break down and remove pollutants. The plants pump to their roots the oxygen needed for the biochemical breakdown. Further along in the cell or cells, nutrients are reduced.

After existing the cells, wastewater enters and soil absorption field for disposal. This treated wastewater could easily serve irrigation purposes using any of the strategies described above.

The plants must be able to survive in a saturated medium. Popular choices for hard-stem plants are blue flag iris, horsetail and cattail. Soft-stemmed plants commonly planted in the second cell are cannas, bulrushes, cattails, and common reed.

Health and esthetics--don't be a nuisance

Part of the habitat created by the constructed wetlands at Heritage Middle School is the marsh.

The TNRCC has jurisdiction on greywater use outside the house; the State Board of Plumbing Examiners within the home (30 TAC §285.80). Despite the fact House Bill 346 (73rd Legislature, 1993) established cooperation between the TNRCC and the Texas State State Board of Plumbing Examiners (TSBPE) to jointly determine rules governing greywater use, cooperation between the two organizations is still in its infancy.

The first greywater task to be tackled by newly appointed Administrator of

the TSBPE, Doretta A. Conrad, is to hammer out the definition of greywater with the help of the TNRCC and other state and professional groups. The definition hinges on where to draw the line between greywater and blackwater, Conrad said.

The second, more complex task is coordinating efforts between three diverse groups, each with a vested interest in the outcome of any rules--the plumbers, the on-site wastewater designers and installers, and irrigation professionals.

Conrad has already held some preliminary discussions with the TNRCC on-site sewage facility regulators, Texas Water Development Board personnel, Texas On-Site Wastewater Association officers, Texas Engineering Extension Service trainers, and some building officials.

"We all want to avoid confusion between various state licenses and agencies authorized to oversee the various aspects of greywater use in Texas," Conrad said.

"All of these folks are interested in coming together with the intention of developing some new rules and policies. There is a lot to be gained from this effort. I think its time is at hand. I think we have the attention of more folks now that we are are looking at Texas' drought conditions as well as the potential for conservation through reuse of on-premise water."

As an ancillary topic, Conrad also intends to address the issue of cistern use for capture and storage of greywater and rainwater.

A legitimate irrigation source

Although the idea of designed systems for reuse of greywater for irrigation is gradually going mainstream, many people have been informally reusing greywater for years. Many rural and some suburban homesteads route washing machine wastewater to a garden.

When discussing design features of a home, homebuilder Charles Hankins of Premier Custom Homes in San Antonio offers all his clients an auxiliary washing machine drain line for easy application of greywater from the washing machine. He said about 80 percent of his custom-home clients opt for this feature. Other wastewater from these houses is disposed of in an on-site sewage system.

Using Hankins' design, wastewater from the washing machine can be diverted for disposal to the on-site sewage facility, according to Frank Aguirre, a San Antonio septic system designer. Aguirre can be reached at (210) 490-9780.

OSSF installer Randy Bendele, Charles Hankins of Premier Custom Homes, and OSSF designer Frank Aquirre of The Outhouse Counselor confer about a new OSSF installation near San Antonio.

A new paradigm--the dual piped village

Certified on-site septic facility installer Randy Bendele, owner of Benke Septic Systems, Inc. bores a test hole with an auger as part of the permit process for a new residential OSSF on the outskirts of San Antonio.

Acceptance of greywater as a viable irrigation option may take hold because greywater provides a virtually drought-proof water supply for irrigation. During the drought of 1998, San Antonio real estate developer Wayne Haese paid attention when house foundations of his friends and neighbors cracked due to shrinkage of the surrounding soil.

Their distress convinced him that he was on the right track with "grayscaping," a term he coined to describe a house designed with separated waste streams and automated greywater irrigation system.

Haese is promoting Pallatium Villas as a subdivision with a difference. Houses in this subdivision are dual piped, with greywater and air conditioner condensate routed to a storage tank; blackwater to the sanitary sewer. From the storage tank, greywater is pumped to an automated pressurized dosed subsurface drip irrigation system, which also moistens the soil around the foundation to prevent cracking in expansive soils.

By adding fertilizer and pesticides to an in-line pressure tank, homeowners can use this system to automatically take over these onerous garden tasks.Two years' maintenance is included in the cost of a home, and Haese is attempting to negotiate a sewer fee rebate for grayscaped houses (since sewer charges are predicated on potable water use).

A community greywater recycling systems which would exploit conomies of scale and eliminate duplication of equipment would reduce the homeowners costs by about 50 percent, Haese estimates. Grayscaping was recognized by the San Antonio Water System with its 1998 Water Saver Too award. Haese can be reached at (210) 698-1902.

In San Diego, Calif., a city councilman is proposing a "Showers-to-Flowers" alternative to the proposed "Toilet-to-Tap" direct potable reuse plan. He proposed offering an incentive for greywater reuse in irrigation, such as a discounted fee to connect each home to city water and sewer systems. In a separate action, the San Diego County Water Authority is developing a program to offer incentives to developers to install separated waste streams in about 250 new houses.

Last year, the State of California approved a significant change in greywater standards, allowing the systems to be installed in commercial, industrial, and multifamily projects, as well as in single-family residences.

On-Site--a living laboratory

Heritage Middle School in San Antonio, faced with a student population of 1,500 and growing and looking at a four-mile sewer service connection, opted for a constructed wetland for on-site wastewater disposal.
The engineering firm of Malcolm Pirnie, Inc. designed a 25,000 gallon-per-day facility and in the process, created a "living classroom" demonstration marsh, pond, and terrestrial habitat area which has become a field trip destination for students throughout the school district.
The project presented challenges to engineer Mark Roetzel, including limited room available for treatment, the need for near-tertiary effluent water from the constructed wetlands, and perhaps the most difficult problem--system water balance in the semi-arid hot climate with an inactive summer usage period. The latter challenge was met with a on-site non-potable shallow groundwater well providing supplemental water.
Malcolm Pirnie, Inc. can be reached at (210) 828-6060.

Decentralized systems

A long-time and vocal proponent of small-scale wastewater reuse, Austin engineer David Venhuizen has designed several unconventional on-site sewage facilities.
Among his designs are the on-site wastewater treatment facility at the Barton Creek Arts Center, now under construction in the environmentally-sensitive Barton Creek watershed. Treated effluent from a theatre, restaurant, bed-and-breakfast, and several studios will be distributed over a drip irrigation field to maintain a native plant and wildflower habitat.
In another public project, Venhuizen has also designed a wastewater treatment

system for Canyon of the Eagles Park, to be built by the Lower Colorado River Authority on the shores of Lake Buchanan. Wastewater treated to a high quality using constructed wetland technology will be routed to a subsurface drip irrigation system to irrigate plantings along a nature trail and butterfly garden.
Venhuizen's philosophy on wastewater management is to treat and reuse wastewater close to the source using small-scale water reclamation systems. Venhuizen can be reached at (512) 442-4047.

Thinking globally

While use of greywater presents some logistical yellow lights, reuse not only provides a ready--and drought-proof water source--but reduces the amount of liquid to be handled by the on-site sewage system. Benefits of individual greywater reuse systems multiplied for an entire community could mean a decrease in the amount of both wastewater and potable water to be processed by central treatment plants and fewer disruptive infrastructure installations and capital plant improvements.

Working display demos low-flow showerheads

Americorps program assistant Monica Garcia used this working showerhead display to illustrate to South Texas residents water savings achievable with low-flow showerheads. The display was built by David Carney of the Agricultural Engineering Department of Texas A&M University.

El Paso interactive CD-ROM offers searchable reference on desert plants and growing conditions

El Paso Water Utilities (EPWU) recently introduced its new conservation tool which could change the appearance of its urban landscapes. ***Desert Blooms: A SunScape Guide to Plants for a Water Scarce Region*** is a compact disc (CD) intended to help residential gardeners in the El Paso, Las Cruces, and Ciudad Juarez area conserve water while designing beautiful, colorful landscapes.

Desert Blooms, with key information in both English and Spanish, features photographs of over 400 plants, trees, and shrubs, along with planting and maintenance techniques, efficient irrigation practices, and other useful tips. The plant information is indexed, enabling users to search by common or botanical names, plant type, light exposure, and water requirements. Users can also enter search criteria to find lists of plants meeting their specifications. Photos of each plant are displayed at a click of the mouse button.

"SunScape means teaming up with nature and gardening naturally in harmony with our Chihuahuan Desert surroundings," said Anai Padilla, EPWU water conservation manager. "We hope that people will find this CD-ROM useful in creating water-wise landscapes. Water-efficient plants can provide all the aesthetic qualities of traditional landscaping without loss of color, texture, or diversity."

In addition to the plant information, the CD also contains the local water conservation ordinances and an overview of regional water resources, and information intended to increase public awareness of the limited water in the area and to stimulate conservation.

EPWU received a grant from the Bureau of Reclamation to develop the CD-ROM. In cooperation with the Texas Agricultural Extension Service, New Mexico State University, University of Texas at El Paso, Texas A&M University System, and Texas Forest Service, EPWU coordinated its development.

EPWU had four main goals for this CD-ROM--

1. To increase awareness of the region's limited water resources. The water utility's last survey indicated that residents do not know where their water comes from and are not familiar with landscape water restrictions.
2. EPWU felt the need to educate the public in the best landscape techniques and solutions to fit its desert environment, but also to comply with its conservation ordinance. It is estimated that landscape comprises anywhere from 40% to 60% of

residential water use. Often during its educational presentations, EPWU staff found that customers wanted to learn more about landscaping. "City residents have a great opportunity to achieve our conservation goal if they design and maintain efficient landscapes," Padilla said.

3. The utility also needed to achieve a high market penetration; therefore, the information on the CD-ROM is available in both English and Spanish and the program was designed to work on both Mac and IBM computer platforms.

Desert Blooms can be ordered by calling the Water Conservation Department of El Paso Water Utilities at (915) 594-5508 or by e-mail to ajpadilla@epwu.org. Retail price is $12.00 plus tax, shipping, and handling. It is marketed through retail outlets and is available for use in libraries.

McAllen studies indirect potable reuse

The City of McAllen in the Lower Rio Grande Valley has embarked upon the second phase of a study of indirect potable reuse, which could potentially provide between 10 and 30 percent of the city's water supply.

With funding from the Texas Water Development Board, U.S. Bureau of Reclamation, Electric Power Research Institute, and the City of McAllen, the utility will compare a conventional microfiltration pretreatment to the Zenogem membrance bioreactor process to produce reverse osmosis (RO) feedwater.

Phase I of the study, performed by the engineering firm CH2M Hill, evaluated two processes: a conventional microfiltration process to produce RO feedwater from treated wastewater and a membrane bioreactor to process raw, untreated, wastewater ahead of the RO process.

The objectives of Phase II will be to see if the Zenogem membrane can consistently produce suitable-quality RO feedwater and produce effluent which meets advanced secondary wastewater treatment standards, therefore potentially eliminating the need for the RO process.

Phase II of the study is expected to last eight months. Following its completion, the City of McAllen will decide whether to build a 4-million to 5-million gallon/day plant. Phase II will examine the cost-effectiveness of recycling wastewater effluent for indirect reuse and will compare the quality of treated wastewater to raw water from the Rio Grande. The cost of this Phase II pilot project is $350,800.

McAllen is studying storage of the treated wastewater for a retention period of at least 30 days in a reservoir, then commingling the treated wastewater with raw water from the Rio Grande prior to water treatment. The main purpose of reverse osmosis will be to lower total dissolved solids (TDS) to an acceptable and/or comparable level to Rio Grande water.

Public reaction to the idea is mixed, as has been the experience in many cities in which indirect potable reuse has been considered. For example, San Diego, Calif. is promoting an alternative to the city's proposed "Toilet-to-Tap" plan because of perceived public distaste for the project.

A study conducted by the McAllen engineering firm Perez, Freese and Nichols projected

that this highly agricultural region will need 12 percent more water by the year 2050. "We are trying to utilize an unused resource," said William Bart Hines, McAllen Utility Manager.
Bart Hines can be reached at (956) 972-7150
Allie Johnson of the McAllen Monitor *contributed to the preparation of this article.*

H-axis washer rebate update

San Antonio Water System (SAWS) and Bexar County Metropolitan Water District have joined with the San Antonio electric utility, City Public Service, to offer a rebate to customers purchasing horizontal-axis clothes washing machines.
These high-efficiency machines use 40% less water than conventional appliances, but can be more expensive. SAWS customers are eligible to receive a $100 rebate on water bills and an additional $100 rebate on electrical bills for any brand of high-efficiency washer. In the first three months of the program, more than 350 SAWS customers purchased the machines.
The City of Austin Water and Wastewater Department was the first utility in the nation to offer a rebate on the horizontal-axis machines. Austin, in cooperation with an appliance vendor, arranged for a volume purchase of the Gibson Tumble Action Washer. Rebates of up to $250 combined water and electricity (or $200 for water and natural gas), bring the cost of the washer down to as little as $389 for Austin customers.
Since March, the city gave rebates to 464 customers who purchased these appliances under the city's WashWise high-efficiency clothes washer program.

Bexar County Master Gardeners roll out the (rainwater) barrel

Dee Emory is one of a group of Bexar County Master Gardeners who outfit, paint, and distribute these rain barrels.

Bexar County Master Gardeners take water seriously, but they don't mind having a little fun in the process. The organization collects, converts, and sells barrels converted from 55-gallon bulk storage drums for harvesting rainwater.
The Master Gardeners collect plastic 55-gallon drums from H.E.B. supermarkets. Some barrels are sold as-is, with a lid and hoop clamp. Others are fitted with a hose faucet and aluminum screen. Other barrels undergo a complete transformation with fanciful designs at the hands of an artist, as well as the hose fitting, according to Master Gardener Dee Emory, pictured, left.
It is suggested the barrels be set on bricks (to allow gravity flow) under a raingutter downspout. Water-soluble fertilizer can be added to the rainwater, or "compost tea" can be brewed by placing a shovel or two of compost in a cloth bag and suspending it in the collected rainwater.
Demand has outstripped supply. More than 50 barrels have been constructed, and there is a waiting list. The

rainbarrel project was the idea of Master Gardener Robin Arnold.
For more information, call the Bexar County Master Gardeners at (210) 225-5848.

Water Smart works in concert with Texas communities to promote efficient water use

It's official. Gov. George W. Bush proclaimed January 1, 1999 Water Smart Challenge Day. Citing characteristic erratic rainfall patterns bringing both drought and floods to the state in the same year, Bush urged all Texans to resolve in 1999 to be Water Smart by taking common-sense measures to help conserve this vital resource.
Water Smart is a state project dedicated to raising awareness of water supply issues affecting Texas communities and to promote efficient water use and water conservation habits.
Water Smart, sponsored by the Texas Water Development Board (TWDB) and the Texas Natural Resource Conservation Commission, has an immediate goal of addressing short-term problems, but its message of efficient water may reap long-term benefits.
Water Smart grew out of the drought of 1996, when dwindling water reserves threatened community life and economic activity in the Lower Rio Grande Valley. The program was revived in the Valley in 1998. In October, it was introduced in other areas of the state where small water utilities experienced emergency conditions because of increase demand during the drought of the past summer.

These areas include five counties in the Houston area, 13 counties in northeast Texas (around Tyler) and 7 counties in north central Texas, around the Dallas-Fort Worth area. Plans are to expand Water Smart incrementally into other regions of the state as resources become available and to make it a permanent program throughout Texas.
During the drought of 1998, 307 water systems in Texas experienced problems related to enormous customer demand and inadequate supplies. More than half these systems were in North, Northeast, or East Texas, areas which normally receive ample rainfall. These problems have resulted in either voluntary or mandatory water rationing, and in some cases, notices that customers should boil water due to low water line pressures.
Water Smart's plan is to amplify the water-efficiency message already being promulgated by local utilities with promotional materials for use by utilities and the media. Consultant Linda Fernandez and John Sutton of the TWDB water conservation department can help local communities customize the program to fit their needs.
The state produced printed material about specific water supply issues affecting communities, and has provided more general data on conservation practices and techniques for inside and outside the home.
In addition, state agencies have been able to allocate some funds to place public service

announcements in various media outlets, pay production costs for billboard space, and purchase promotional items such as T-shirts, bumper stickers, and decals. Water Smart also supplies radio scripts with indoor and outdoor conservation tips.
Some companies have made major financial commitments to Water Smart efforts. The Association of Water Board Directors, whose more than 500 members represent water districts throughout Texas, is investing $15,000 in the campaign. And Aquasource, an investor-owned water utility serving communities across Texas, is committing $50,000 to reproduce Water Smart materials in its service areas.
For more information on this campaign, contact Sutton at jsutton@twdb.state.tx.us or (512) 463-7988.
Text of the Governor's Proclamation can be read at http://www.governor.state.tx.us/news_speeches/proclamations/1-99-water.html.

WaterWiser posts residential water use survey

WaterWiser, the water efficiency clearinghouse of the American Water Works Association, has posted the 1998 Residential Water Use Summary on its web site, http://www.waterwiser.org/wtruse98/main.html.
The survey reflects the most recent data obtained through the AWWA Research Foundation's Residential End Use Survey, as well as information from other surveys. Data was collected from 1,188 homes at 12 North American sites in this updated study.
WaterWiser (http://www.waterwiser.org), run by AWWA in cooperation with the US Environmental Protection Agency and the US Bureau of Reclamation, offers a myriad of water efficiency information.
The Books page is a comprehensive list of books, documents, standards, policy, and proceedings with abstracts and ordering information. The Links are a broad compilation of water efficiency and related sites, such as the Texas Agricultural Extension Service Xeriscape Program, and water-saving tips from Florida, Washington, Georgia, and Vancouver and a sampler of conservation programs from metropolitan areas.
Of special interest is the on-line conference and its archived messages.
New to the site is the practice drip calculator offering the "drip-per-minute" method and the "bucket-and-stopwatch" method to calculate gallons wasted per day, month, or year.

Resources for on-site septic treatment, irrigation

Texas On-Site Insights newsletter is published by the Texas Water Resources Institute, (409) 845-1851. Full-text newsletter articles and photos are posted on web site http://twri.tamu.edu.
The Texas On-site Wastewater Research Treatment Council web site, http://towtrc.tamu.edu, posts training and certification information, general council background, and the text of Texas Administrative Code 285, On-Site Wastewater Treatment. In addition, the site has subscription information for SepticTalk, an on-line discussion about on-site wastewater issues.
Constructed Wetlands for On-Site Septic Treatment: A Guide to Selecting Aquatic Plans for Low Maintenance Micro-Wetlands, Pineywoods Resource Conservation and Development, US Department of Agriculture's East Texas Plant Materials Center and the

Forest Resources Institute. Single printed copies available from the Pineywoods Resource Conservation and Development, (409) 568-0414. Additional copies are $1 each. Also available at http://Plant-Materials.nrcs.usda.gov:90/pmc/ETPMC/etbrconwet.html

On Site Wastewater Treatment Systems: Constructed Wetlands, written by Texas Extension Agricultural Service Engineering Program Leader Bruce Lesikar is downloadable from http://agpublications.tamu.edu/pubs/ewaste.

"Wastewater Reuse and Greywater Systems for Landscape Irrigation," Lesikar, et. al, *6th Annual Texas On-Site Wastewater Treatment Research Council Conference*.

"Subsurface Drip Distribution Systems and Greywater Systems," Lesikar, et. al., *Proceedings, 7th Annual National Onsite Wastewater Recycling Association.*

Wastewater Wetlands and Man-Made Marshes, (showcasing rock-and-reed filters), videotapes, and The New Garden Journal, The New Garden, P.O. Box 6121, San Antonio, TX 78209.

The City of Austin Water Resources Initiative, has an extensive collection of fact sheets on on-site disposal systems, a map of general land types in the Austin area, abasic flowchart with steps for selecting an on-site wastewater treatment system, and a list of frequently asked questions, all accessible from http://www.ci.austin.tx.us/wri/altern.htm.

SAWS recognizes 12 businesses with second annual Water Conservation Best Practices Awards

San Antonio Water System recognized 12 businesses with Water Conservation Best Practices Awards.

"We began this event last year to acknowledge the water-saving effort of our business community and to encourage others to follow the fine and often innovative examples," said Chris Brown, SAWS Water Conservation Director.

The Energy/Water Conservation Management Team of **Northside Independent School District** saved 200 million gallons over the course of 7 years with their Energy/Water Management Program. All district facilities are regularly audited for water use, and facilities personnel are trained to report leaks. After recommendations of the team, the district has begun using drought-tolerant landscaping and air-cooled, instead of water-cooled, chillers at all new facilities.

Rainwater Collection over Texas has implemented a successful education program offering workshops and classes on rainwater harvesting at the National Wildflower Research Center, the Austin Home Builders Show, and the San Antonio Building Coalition.

Destiny Homes has implemented site- developed practices to conserve the native habitat in residential communities. Instead of leveling the entire building area and bringing in new landscaping after the homes are built, Destiny Homes incorporates the natural topography of the land into site development, saving 35% of water use over a conventional development. By working directly with truck drivers and equipment operators to use only the future driveway as the construction entrance, this builder was able to significantly decrease tree damage and soil compaction caused by most construction equipment.

The multifaceted program implemented by **Hyatt Regency Hill Country Resort** has resulted in savings of 5 million gallons in 1996. Guests are given the option of daily

laundering of linens, and a card in each room also offers suggestions for conserving water, such as turning off water while brushing teeth. At meetings and in restaurants, drinking water is provided only by request. Landscaping features drought-tolerant plants. Irrigation of the golf course is based upon evapotranspiration. Under construction is a water tower for storage of cooling tower blowdown, later to be used for irrigation. Pool splashout is channeled to landscaped areas. In kitchens, vegetables are cleaned in tubs, rather than under running water and dishwater is recycled through the disposal. An employee committee works to raise conservation awareness among employees.

Raytheon Aircraft Services installed a closed-loop automated recycled pretreatment system to collect water and chemicals used to strip and paint aircraft. Solids are removed from the water, then clean water is stored for recycling back into the system. Only a small amount of evaporative makeup is needed, and no pollutants are discharged into the sanitary sewer. Raytheon saved 91,000 gallons of water in 1997 in this manner.

HEB Grocery Co. saves between 350,000 and 650,000 gallons per year per store by installing water-conserving landscape design standards, detailed in a company manual, Landscape Design Guidelines, for new retail stores. The guidelines include specific recommendations for site planning, turf irrigation, soil preparation, mulch, and suggested low-water-use plants.

Quality Equipment Co. and **Chaparral Ford, Inc**. both installed wash racks to recycle water used to clean vehicles. Contaminants are separated from wash water, which is recycled back into the system. The new design saves between 15,600 and 18,000 gallons per month of potable water.

In addition, the SAWS Water Conservation Department recognized four entities with Watersaver Too awards, which recognize ongoing efforts in water conservation.

Habitat for Humanity volunteers build affordable homes for low-income families. Habitat installed 40 drought-tolerant and wildscape yards for clients.

Graywater Recycling, Inc. designed the patent-pending Grayscaping, a dual-plumbed construction technique to collect and reuse graywater for irrigation and to maintain a moisture level around a foundation.

Land developer **Bitterblue, Inc.** required the use of native plants and drought-tolerant turf, while saving existing vegetation whenever possible. No clearing or construction is undertaken in greenbelts or drainage areas.

Miller Leasing Co., Inc. replaced turfgrass with several inches of river pebbles. The conversion demonstrates a changing concept of landscaping to include a medium which requires no additional irrigation.

USBR to fund desalting research

Through the Water Desalination Research & Development Program, the Bureau of Reclamation is forming partnerships with private industry, universities, institutes, local communities, and other Federal laboratories to address a broad range of desalting and water treatment needs.

The primary goal of this program is to develop more cost-effective, technologically efficient, and implementable means to desalinate water.

The goal of the membrane process research is to increase ease of operation of membrane-based desalting and water treatment systems.

Nontraditional desalination research will focus on the economics and thermodynamic efficiency of alternative techniques.
Funding for water recycling and reuse research will be directed at innovative methods of treating municipal, industrial, or agricultural wastewater in a cost-effective manner.
More information can be found at http://www.usbr.gov/water/desal.html or contact Kevin Price, Bureau of Reclamation Technical Service Center, (303) 445-2260 or kprice@do.usbr.gov.

Irrigation conference promotes information exchange among irrigation industry, regulators

Almost 200 irrigation contractors and designers, manufacturers, distributors, and state and local government officials gathered at the Landscape Water Conservation Conference August 21 in Houston.
Rendering a picture of Texas' water future in the year 2050, Keynote Speaker Bill Hoffman of Texas Water Development Board told of a predicted unmet irrigation demand of more than 16 percent, and cited conserved water and reuse the most effective ways to meet the shortfall.
Senate Bill 1, passed by the Texas legislature in 1997, mandates the formation of water conservation districts and the preparation of conservation plans for some water suppliers, said John Warden, chief of the Water Quantity Division of Texas Natural Resource Conservation Commission.
Synthesizing the ideas of the irrigation industry and the exigencies of the state's water resources, Marilyn Good, president of the Texas WaterWise Council, focused her address on "Building Coalitions to Develop Appropriate Water Management Practices."
Good encouraged industry professionals to be proactive in the ordinance-setting process. Without such involvement early in the rule-making process, cities may impose ordinances without input from those who would be most affected.
"The goal of the Texas Water Wise Council is to establish best management practices for adoption by irrigation designers and contractors for the purpose or promoting urban water conservation through efficient design and consumer education," Good said.
(A list of draft landscape irrigation BMPs is at http://irrigation.tamu.edu. See article on page 11.)
Perhaps the most intrinsic benefit of the conference was the opportunity for dialog between the regulators and the regulated, between government officials and industry.
"The fruits of the conference are already appearing," said conference organizer Gene Reagan, administrator of the TNRCC irrigator licensing program. "Several contractors reported meeting with local ordinance officials to share ideas or to develop new ordinances."

25th Water for Texas Conference focused on water planning strategies for Senate Bill 1

Almost 370 regional planning group members, water managers, state and local officials, lawyers, and civil engineering firm employees gathered December 1-2 in Austin for the 25th Water for Texas Conference. The meeting's theme, water management strategies for

Senate Bill 1, reflected the conference's mission to convey to regional planning group members information and concepts to help them make the best planning decision for their regions, said Texas Water Resources Institute (TWRI) Director Wayne Jordan.
Jordan attributed the high level of interest in this meeting to the grass-roots planning effort mandated by Senate Bill 1.
The meeting was cosponsored by the Texas Water Conservation Association, the Texas Agricultural Extension Service, and the Texas Agricultural Experiment Station.
Delivering the keynote and luncheon addresses were Sen. Buster Brown, the author of Senate Bill 1 and Rep. Ron Lewis, author of the House version of the bill. Administrators of state water resources agencies, including Craig Pedersen, Texas Water Development; Ken Peterson, Texas Natural Resource Conservation Commission (TNRCC) ; Larry McKinney, Texas Parks and Wildlife Department; and Bill Harris, Texas Agricultural Extension Service presented overviews of their agencies' work in SB 1-related activities.
Speaking about their work to develop water availability models, Ralph Wurbs of Texas A&M University and David Maidment of the University of Texas explained how computer models incorporating river flows, return flows, reservoir storage, and existing water rights, are the tools that will determine the balance of water available for future water rights and environmental purposes. Wurbs developed the Water Rights Analysis Package, the model chosen by the TNRCC to update water availability for Texas' 22 river basins. Maidment created a three-dimensional graphic interface for river basin visualization.
Other sessions dealt with alternative water supplies, such as rainfall enhancement; water policy, including interbasin transfers and the implications of Senate Bill 1 on water reuse; and agricultural irrigation, which touched on the evidence that conservation techniques do not always guarantee a decrease in water consumption.
Two sessions addressed urban water conservation, including efficient water use in landscape and turf irrigation, youth programs, industrial and commercial workshops, and urban partnership projects. Representatives of state agencies, a river authority, and the Sierra Club focused on environmental needs.
A proceedings, edited by Ric Jensen of TWRI, is available for $25. Many papers presented at the conference can be viewed on the TWRI website (http://twri.tamu.edu). For more information, call TWRI at (409) 845-1851or e-mail twri@twri.tamu.edu.

TWS welcomes sponsor: Water Management Specialists

Water Management Specialists of Houston, a new sponsor of *Texas Water Savers* newsletter, has more then 18 years' experience in irrigation system design, consulting and landscape irrigation audits. The proprietor is Kurt Hall.
In addition, the company provides training authorized by the Texas Natural Resource Conservation Commission in irrigation certification and also teaches continuing education courses to certified irrigators. Hall can be reached at (281) 493-4896

Council seeks comment on irrigation BMPs

Realizing that a water-wise landscape will result in reduced water usage only if irrigation is efficient and properly applied, the Texas Water Wise Council is seeking comment on

the following proposed best management practices (BMPs) for irrigation designers and contractors drafted by David W. Smith of the Texas Agricultural Extension Service. The draft BMPs have been published for comment in *Irrigation Business and Technology* and the Texas Turfgrass Irrigation Association newsletter. In addition, a copy was distributed to all licensed irrigators with the Texas Agricultural Extension Service's irrigation school schedule.

Proposed WaterWise Best Management Practices
for Irrigation Designers and Contractors

Goal: To establish best management practices (BMPs) for adoption by irrigation designers and contractors for the purpose of promoting urban water conservation through efficient design and consumer education.
Proposed BMPs:

1. Install water conservation devices on automatic systems including rain shut-off devices, flow meters and/or soil moisture sensors for more precise control.
2. Design with "water management efficiency" in mind
    - a. Use "matched precipitation rate" nozzle for individual zone.
    - b. Consider soil infiltration rate, slope, and design precipitation rate when selecting sprinkler heads to reduce the potential for runoff.
    - c. Install low-angle heads to avoid high wind and dirt.
3. Install low volume irrigation in long narrow strips, small irregular-shaped areas and landscape beds to reduce evaporation losses and to avoid applying water on hardscapes such as patios, decks, sidewalks, parking areas, and roadways.
4. Provide the customer an "as-built" plan of the irrigation design that specifies the location and specifications of all application devices, pipelines, wiring, control valves, backflow prevention devices, and rain shut-off equipment.
5. Ensure that all valves in boxes have a device allowing them to be located by metal detectors.
6. Provide the customer with a design performance report of the irrigation system that includes individual zone precipitation rates in inches per hour.
7. Provide the customer with a "landscape water conservation" recommendation guide for promoting efficient water use. Topics include the importance of hydro-zoning plant material, maintaining proper operation of system components and determining irrigation run times from plant water requirements and zone precipitation rates.

Comments can be e-mailed to dw-smith@tamu.edu or faxed to (409) 845-3932. Smith can be contaced at (409) 845-5614.

Results of landscape ordinance presented at Water for Texas

At the 25th Water for Texas Conference in Austin December 1-2, Marilyn Good of the Texas Association of Nurserymen presented a paper, "Toward a Model for Developing

Effective Landscape Ordinances" analyzing the results of a landscape irrigation ordinance survey conducted by the council of all Texas cities. Survey results confirmed the Council's assumption that a model *method*, rather than a model ordinance would be most helpful, since no one model could serve the diverse needs of the state.
Other WaterWise Council news--

- A presence on the Internet is the next volunteer project undertaken by the WaterWise Council. Developing content for a web site are Jim McCabe, Sensible Technologies; Brent Wiseman, Texas Department of Agriculture; and Jan Gerston, Texas Water Resources Institute. This committee is also looking into the possibility of obtaining a domain name.
- In a related action, Texas Water Development Board's John Sutton and Marilyn Good of the Texas Association of Nurserymen, will investigate the establishment of a trademark of the WaterWise name and logo.
- A committee headed by Don Legacy of J-V Dirt and Loam will devise a comprehensive plan for creating a series of information sheets on water-wise landscaping. Members and partners will be able to distribute the sheets at public events or to their customers.
- Dick Peterson, City of Austin, presented a paper at November's Irrigation Conference in San Diego entitled, "Out with Xeriscape, In with WaterWise."

Council awaits news of EPA Section 319 grant

To amplify its landscaping water-wise message across the state, the Texas WaterWise Council has applied for an Environmental Protection Agency (EPA) Section 319 grant. The WaterWise Council is still awaiting word of the grant award as of press time. Components in the grant proposal were--

1. Expansion of the Partner's Project. (Partners are businesses and municipalities who agree to participate in a cooperative effort to reduce peak water use. Business partners' employees undergo a water-wise training seminar.)
2. Development of an interative website.
3. Development of a database of printed water-wise information.
   In Texas, EPA 319 grants are earmarked for means and methods to reduce non-point source pollution in surface water. Award of the grants is tied to total maximum daily load restrictions in Texas rivers.