

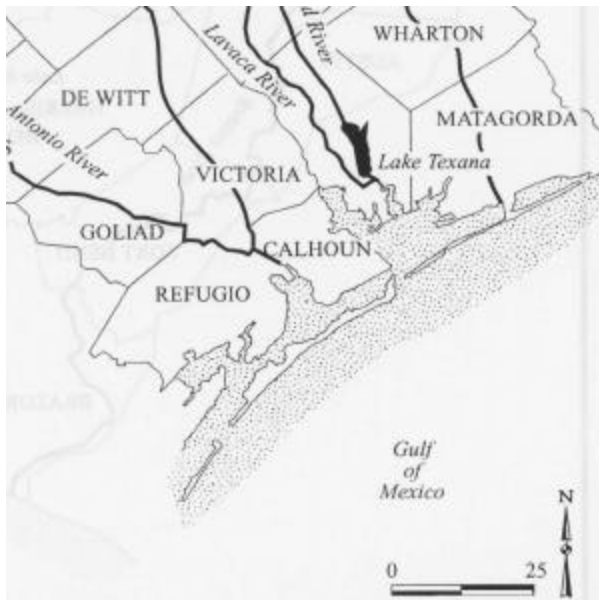


TWDB Funds LNRA Desalting Study

The Lavaca-Navidad River Authority (LNRA) has received unanimous approval for funding from Texas Water Development Board (TWDB) to conduct a site-specific study on the feasibility of using saline cooling water from a power plant as feedwater for what would be the largest desalination plant in the country.

The river authority will evaluate the suitability, reliability, and cost-effectiveness of an environmentally responsible process at Point Comfort for desalting seawater to provide a drought-proof supply for the Coastal Bend region, as well as for San Antonio and Corpus Christi.

The \$59,000 Senate Bill 1 contingency funding request was made on behalf of the Region P planning group. A draft of the study will be released this summer to the Region L and Region N Regional Planning Groups and to the TWDB. It is expected that neighboring Regional Planning Groups will incorporate desalination into their water management strategies.



The Point Comfort plant would be the largest in the country, producing 100,000 acre-feet of water annually. It would cost about \$400 million to build.

A large membrane plant in Tampa Bay, Florida is expected to achieve the milestone of processing saline water into potable water for about the same cost as fresh raw water, about \$2 per thousand gallons. That plant was built at a cost of \$95 million and will produce 25 million gallons per day or 27,000 acre-feet annually.

"The Point Comfort site had many of the same attributes of the Tampa Bay site, which initiated our interest in

desalination. The existing power plant is already pumping saline water for once-through cooling. The saline feedwater would be heated slightly in the heat exchange process in the power plant. Using heated saline water increases the efficiency of the membrane process," said Jack Nelson, general manager of the Lavaca-Navidad River Authority,

who has spearheaded this project.

San Antonio Water System (SAWS) and the City of Corpus Christi have both expressed strong interest in the results of the Point Comfort Study. SAWS' options might include the building of a pipeline or trading out fresh water for desalted seawater.

San Antonio Water System, in light of the need to reduce the city's dependence upon the Edwards Aquifer, was particularly interested in desalination as an alternative water strategy, according to Susan Butler, director of water resources planning.

Four neighboring river authorities, which might comingle river water with desalted seawater, were also present at an April meeting in San Antonio where Nelson pitched the idea of the desalting plant.

The study will closely examine the effects of discharge of reverse osmosis reject water into Matagorda Bay. Initial studies at Tampa Bay predicted no adverse effects from discharge of concentrated brine. The Tampa Bay project planners are also evaluating the possibility of reintroducing the concentrate into the plant's feedwater.

The LNRA is also considering purchasing the Central Power & Light Joslin power plant at Point Comfort. The Public Utilities Commission is forcing Central & South West Corp. of Dallas to divest itself of three power plants along the Gulf Coast as a condition of the corporation's merger with American Electric Power.

"While we were looking at the [power plant] purchase from a business point of view, we saw an opportunity from the water business perspective," Nelson said. "With the recent advances in membrane processing, we recognized the processing of cooling water as a viable water supply strategy."

In an article appearing April 5, 2000 in *The Wall Street Journal*, J.D. Beffort, a desalination expert and planner with TWDB, said, "If desalination works, Texas would have the ultimate sustainable water source: The Gulf of Mexico."

"If they can duplicate what they did in Tampa, this plant represents a real opportunity to develop a sustainable supply of water in a cost-effective manner, especially considering the slightly warmer temperature of the input feedwater," Beffort said.

Turner Collie & Braden will perform the study under contract, with George Ward of the University of Texas providing technical assistance.

The LNRA study will complement two other non-site-specific desalination studies in process in the Coast Bend area. The first study is examining desalination of brackish groundwater and surface water.

The second study develops a generalized model for the Texas Gulf Coast to quantify factors determining feasibility of sea water desalination: ambient salinity of feedwater,

intake structures, pre- and post-treatment, environmental issues associated with brine disposal, and distribution infrastructure. Both studies are due to be released early this summer, in time for Regional Planning Groups to incorporate the results into their water plans.

"After studying the Tampa Bay experience, we feel the basic reverse osmosis technology more or less costs the same wherever it is located. The real determinant is all those other factors, excluding siting," said James Dodson, deputy executive director of the Nueces River Authority.

A model developed in the latter study could function as a tool for evaluating sites for desalination feasibility. "By plugging into the model, we can come up with the final estimate of the cost of water," said Dodson. "What we have been able to do is take the model and calibrate it using the Tampa Bay experience, and we have demonstrated the ability to come within 10 percent of the Tampa Bay cost."

HDR Engineering of Austin is lending its technical expertise to these studies, along with Malcolm-Pirnie for membrane technology and Jim Jensen of PB Water of Tampa, Florida, who helped design the Tampa Bay plant.

"This model is the prelude to the LNRA project: the LNRA project is a site-specific application of this generalized model," said Dodson.

Both Nelson and Dodson agree that desalination is a water management strategy whose time has come, from both time and economic perspectives.

"When we put together the [Lake Texana-to-Corpus Christi] pipeline, desalting was not feasible. Now the time has come for desalting. It would take about 20 years to build a reservoir, but only two to three years to put together a desalting plant," said Nelson. "Also the cost of maintaining reservoirs is increasing."

In the last interbasin transfer enacted before the passage of Senate Bill 1, a 101-mile pipeline delivers raw water from Lake Texana in the Navidad River basin to Corpus Christi in the Nueces River Basin.

The Gulf of Mexico would be the ultimate sustainable water source. Although Region N Regional Planning Group member Jerry Kane has some reservations about the efficacy of a desalting plant, he admitted, "Eventually this region could become a net water exporter. Water, in the future, will be a raw material more valuable than fuel. We must find a way to find and deliver it in a cost-effective manner."

Dodson agrees. "We have been saying for many years that desalination would be part of the water supply mix for this area," said Dodson. "The question is, when does it become a cost-effective part of the mix? The real issue is that the cost of all the other options is going up. The lines on the cost-effectiveness graph are about to intersect."

"There had always been a division of opinion over desalination since the beginning of the

pipeline proposal, but the City of Corpus Christi recognized they may need to rely on other water sources as well as the pipeline," said Dodson, formerly with the City of Corpus Christi.

"It's the ultimate drought-proof supply," said Nelson.

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Online Mag Offers Thoughtful Comment On Irrigation Efficiency

With its elegant layouts, stunning close-up photography, and sumptuously illustrated articles, it is tempting to lose oneself in the sheer visual luxury of this on-line treasure, but PlantHealthCare.com On-line magazine (<http://www.PlantHealthCare.com>) is serious business for the landscape professional.

Thought-provoking articles on irrigation efficiency were featured in two recent issues of the portable document format (pdf) PlantHealthCare.com On-line Magazine. In May's "Cracking Down on Water Waste," Bruce F. Shank writes about the how public perception of the long-debated toilet-to-tap program brings into sharp focus the great unmet potentials for saving water in landscape irrigation.

In most communities, installation of dual-pipe infrastructure for wastewater reuse would be cost-prohibitive, yet small changes in irrigation system design and operation could save as much as 25% of the fresh water consumed by a community. Simple solutions Shank recommends are representative placement of moisture sensors, installation of shut-off valves, seasonal controller changes, hydrozoning, fixing broken sprinkler heads, and choosing heads for optimum distribution uniformity.

The cost of a dual-piped system might be justified in communities which rely on growth to pay for infrastructure.

Shank makes the point that fiber optic cables weave their web across the country with little cost resistance, but the low cost of water lacks the big return on investment.

In March's "The Water Shortage Bomb: The Fuse is Shorter than We Think," Shank proposes that we have the ability to cut outdoor water use by one-third by adoption rational landscaping design, use of native and adapted plants, and selection of appropriate irrigation controllers and emitters, moisture sensors and rain shut-off switches.

Municipalities could rethink discarding effluent due to a perception of health dangers.

"Irrigation should be seen as part of the solution to water shortages, not the cause of them," Shank wrote.

Policy Study Assesses Feasibility Of Reuse In Mexico

The Houston Advanced Research Center, with funding from the US Environmental Protection Agency Region 6, has developed a study of the institutional, legal, and political implications of and challenges associated with wastewater reuse in the Texas-Mexico Border Region. The project examines the reuse of wastewater as a method for augmenting the total supply of water available for human use in this region.

The border region is home to highly productive manufacturing and agricultural interests, and population is expected to double in the next 30 years, with growth centers in several twin cities on either side of the border. As these border cities, for the first time, develop adequate municipal wastewater treatment facilities, the main concern will shift from threats to health and environment to reusing wastewater to help meet the demands of the growing population.

"Embarking on this study, we looked at all types of reuse--indirect potable, industrial, greywater reuse, irrigation--on both sides of the border," said Mitchell Mathis, senior research associate at HARC's Center for Global Studies. "As you might expect, the United States is far ahead of the Mexican side, but Mexico is starting to recognize the need to start reusing water. That is a big step forward."

To guide the project, a binational policy committee was created with representatives from the US. Environmental Protection Agency Region 6, the Comision Nacional de Agua, US and Mexican sections of the International Boundary and Waters Commission, Texas Water Development Board, the Texas Natural Resources Conservation Commission, and the North American Development Bank.

"In looking at the binational picture, there is a chasm in the development of wastewater reuse facilities between the United States and Mexico, " said Mathis, who holds advanced degrees in both economics and Latin American studies. "Even with new sewage treatment plants in Nuevo Laredo and Juarez, in many other cases Mexico lacks both the financial resources and basic infrastructure to treat wastewater at all, let alone, for reuse.

Despite these constraints, water reuse plans are being implemented in the Mexican part of the border, though on a much smaller scale than on the US side. For instance, Juarez, across the international border from El Paso, is starting to capitalize upon opportunities for reuse. Working around the constraint of absent infrastructure, the city has started a program in which pretreated industrial waste process water from industrial plants is transported by tanker truck to cement plants and car washes for reuse, rather than being discharged into the sewage collection system. Pretreatment is required by municipal regulation, and the city saw an opportunity to use this treated water to augment its supply of water for nonpotable uses."

The report, *HARC Wastewater Reuse in the Texas-Mexico Border Region: A Preliminary Study of Issues and Options*, is available at the HARC web site, <http://www.harc.edu>. For more information, contact Mathis at (281) 353-4023 or

mmathis@harc.edu.

The Houston Advanced Research Center (HARC) is a not-for-profit, university-linked organization managing research programs in energy and the environment and promoting economic development through technology transfer. Its policy arm, the Center for Global Studies, focuses its work on sustainability and the connections among resource constraints, economic growth, and environmental quality.

Science and Experience Make Water A Sound Investment

A water audit based upon good science is an investment that pays for itself in healthier turf and landscape plants with lower monthly water bills. Proper water use also results in reduced water and nutrient runoff.

Texas Water Savers welcomes a new sponsor, Texas Water Audits. Texas Water Audits can "make every drop count" on any type of landscape equipped with an automatic irrigation system. Customers include water utilities, parks and corporate complexes, hotels and motels, apartment complexes, and athletic fields.

Proprietor David Smith, formerly of the Texas Agricultural Extension Service, was the creator and proponent of many irrigation efficiency courses and programs, including Landscape Irrigation Auditing Management, Zoning Principles for Landscape Irrigation, and Irrigation Water Management of Commercial Landscapes. He also developed the popular School Athletic Field Education audits, which have been performed throughout the state.

Based on sound science, experience, and common sense, irrigation auditing is a three-step method proven to enhance irrigation system efficiency and to reduce overall water consumption. First, each zone is inspected for hardware problems, such as broken or misaligned sprinkler heads. Next, each zone is tested to determine actual application rate. Finally, a customized irrigation schedule tailored to climate, plant types, soil conditions, and microclimates is developed.

After field testing, each customer receives a comprehensive report documenting the current condition of the irrigation system and recommendations to improve irrigation practices.

With irrigation frequency and duration closely tailored to plant needs and soil conditions, customers can expect better nutrient retention within the root zone, and safer athletic competition due to fewer accidents caused by poor playing surfaces.

Texas Water Audits can be reached at (979) 255-0681 or tx-audit@myriad.net.

House Subcommittee Rejects Plumbing Fixture Repeal

In a remarkable turn of events, HR 623, known as the Knollenberg Bill, was rejected by the Subcommittee on Energy and Power by a one-vote margin.

HR 623 would have repealed the current national efficiency standards for plumbing fixtures, including the well-publicized 1.6-gallon-per-flush toilet.

It is estimated that 840,000 acre-feet annually is saved in Texas alone using the low-flush toilets. Since 1991, Texas' own plumbing standards mandated water-efficient plumbing fixtures. Now the state has been active in lending support to keeping the similar laws on the books for the country.

"The goal is to avoid have 50 different standards for toilets," said Carole Baker, chair of the Conservation and Reuse Division, Texas Section, American Water Works Association. If the national plumbing mandates were repealed, Texas' standards would remain on the books, but the cost of enforcement would escalate.

"It is highly unusual for a bill to be scheduled for subcommittee or committee consideration and not have the votes to pass, but that's what happened," said Baker.

Rep. Heather Wilson (R-NM) bucked the Republican trend and voted against the bill. Particularly noteworthy is that Tom Sawyer, the only Democrat on the subcommittee to have cosponsored the HR 623 in this Congress, voted against it.

Baker warned that the water conservation community still must be vigilant against the possibility of language repealing the plumbing fixture water conservation provisions of the 1992 Federal Energy Policy Act being added to another bill, such as appropriations bill.

Meetings and Conferences

Texas WaterWise Council, June 6 and July 13, Texas Nursery and Landscape Association headquarters. Information: Janet Reed at (512) 452-3363 or janet.reed@gsc.state.tx.us or <http://www.WaterWiseTexas.org>

American Desalting Association (ADA) North American Biennial Conference and Exposition, Aug. 6-9, South Lake Tahoe, Nev. Sessions include financing of the Tampa Bay seawater desalting plant, desalting and water planning, purification of brackish water using electronic water purification, membrane filtration as pretreatment. Information: ADA, (916) 442-9285 or <http://www.desalting-ada.org/confer.html>.

Restoration without Borders, Texas Society for Ecological Restoration, Aug, 11-13, Fort Davis. Sessions include arid lands restoration, community initiatives, and the border

region. Information: <http://www.cep.unt.edu/sertex.html>.

Texas Water: 2000 and Beyond, Sept. 30-Oct. 2, 2000, College Station. Sessions include water on the Texas-Mexico border; the present and future status of water in seven regions; Texas water resources strategies and events. Information: Jim Norwine, kfjrn00@tamuk.edu, or <http://www.tamui.edu/water2000>.

Compost Topsoil On Highway Rights-Of-Way Benefits Two Watersheds



Compost is sprayed on a steep highway right-of-way on Texas 195 south of Killeen at a demonstration attended by state officials, dairymen, and commercial dirt and loam operators

By forging a cooperative partnership, two state agencies have hit upon a symbiotic solution to two vexing environmental problems: organic pollution of a river basin and erosion and runoff from highway rights-of-way.

Pollution of the North Bosque watershed from runoff from Erath County feedlot-style dairies had become a

particularly challenging problem, with dairy farmers, City of Waco officials, and the Brazos River Authority clashing over proposed methods of reducing algae-causing nitrogen and phosphorus levels in the North Bosque. The US Environmental Protection Agency designated the North Bosque a polluted river in 1990.

In this mutually beneficial partnership, the Texas Natural Resource Conservation Commission (TNRCC) helps to promote commercial composting of dairy and poultry feedlot wastes. The Texas Department of Transportation (TxDOT) promotes the use of the composted material on highway rights-of-way.

The brainchild of Scott McCoy, TNRCC program specialist and self-described state composter, dairy manure from Erath County and poultry litter from Gonzales County is composted with wood chips at a commercial facility at high temperatures to kill weed seeds and pathogens, then applied to highway rights-of-way.

A series of compost demonstrations have so impressed TxDOT officials in effectively controlling erosion, reducing runoff and encouraging vegetation, that the highway agency has written a compost specification for highway rights-of-way. Now, compost-enhanced topsoils are an TxDOT approved alternate installation practice. The Fort Worth District has mandated compost specification for rights-of-way.

In one dramatic successful use, a right-of-way in Big Spring with a 4-to-1 slope has been barren since it was built in 1968, but has supported a cover of grasses and plants since a compost application last year.

At a demonstration south of Killeen on Texas 195 in April attended by about 150 people, operators applied compost to a steep right-of-way from two hopper trucks which blow compost through long hoses using compressed air. Two types of compost were applied: one with a poultry litter component, one with cattle manure. Both were fortified with seven types of grass and flower seed.



TNRCC's Scott McCoy, creator and proponent of the highway right-of-way composting program, examines some of the cattle-manure-based compost to be applied at a demonstration.

TNRCC Commissioner John Baker said, "Using compost on highway rights-of-way not only reduces runoff, but also provides a beneficial use for large volumes of organic matter. The program shows signs of becoming a great success and holds the promise of a sustainable market for composted manure, which will help watersheds such as the North Bosque."

"In the North Bosque watershed, dairies are generating so much waste that excess applications are impacting the watershed. Using composted material on highway rights-of-way gives us a method of applying that waste outside the watershed, and to do a lot of good in that process, as there is no question but what animal wastes are good for reclaiming challenged soils. Composted material is the best way to get a quick vegetative cover, which will serve to reduce erosion and runoff from these bare cut areas," said Baker. "This is a win-win solution, resulting in less nonpoint source pollution in two different watersheds."

Compost applied to both sandy and clay soils helps retain water. In fact, in extreme cases, compost can hold up to 300% of its own weight in water, as well as promoting infiltration. Runoff studies on a variety of Texas soils show runoff is reduced by the application of compost.

In one test conducted by McCoy, an area composted with varying depths of compost was subjected to a simulated 2.5-inch rainfall. The 1-inch depth section showed a runoff of 1.4 inches, while the 4-inch application showed a runoff of only 0.6 inches.



A.J. Wallace and Walter Struckman of Eco Mulch drag horses and spray manure-based compost on a steep highway right-of-way.

The TNRCC is now proposing a plan to use federal grant funds to stimulate the market for composted manure generated in the North Bosque watershed.

"From a dairy industry standpoint, we are excited about TxDOT involvement. We think it's a good business opportunity. Several dairy producers' groups have put together composting operations, although we're

still concerned about the economics of being able to produce and transport this material. Some compost operations are looking for private markets in addition to this TxDOT opportunity. We are also excited that the state is actively interested in trying to stimulate a market for this product," said James Terrell, executive Director of the Texas Association of Dairymen.

The Texas Department of Transportation envisions decreased maintenance costs as districts across the state adopt compost as the standard cover for Texas' 1.3 million acres of highway rights of way, said John W. Johnson, Commissioner of the Texas Transportation Commission.

Highway contractors have an incentive to use compost, because 5% of their payment is withheld until 70% of the right-of-way is vegetated.

TNRCC is now working with other agencies such as Texas State Soil and Water Conservation Board and US Department of Agriculture's Natural Resource Conservation Service to develop further beneficial uses for compost.

"I can't help but think of compost as the `silver bullet'," said Kathey Ferland, chief of the pollution prevention division of TNRCC.

Cooling Tower Audits Slated for Houston, San Antonio

Cooling towers, those sometimes obvious, sometimes well camouflaged industrial hulks, can be huge water wasters. Now the two of the largest cities in Texas--Houston and San Antonio--are seizing the opportunity to help customers more efficiently operate their cooling towers with utility-sponsored audits.

In an effort to rein in one of the more flagrant water-wasting end uses, the City of Houston's Water Conservation Program recently initiated a cooling tower audit program

with the goal of saving 375 million gallons annually, or 5% of the total savings expected to be achieved by the city's water conservation programs.

Cost Containment Engineering, Inc. has been retained by the City of Houston to conduct cooling tower audits. According to Pat Truesdale, the City of Houston's water conservation manager, the program is projected to yield a high cost-benefit ratio: for every \$1 spent on the program, the City expects to realize \$18.60 in reduced water and wastewater costs.

Cooling tower customers are eligible for a wastewater credit, as much of the water delivered to the customer is lost to evaporation in the cooling process rather than sent to the sanitary sewer. In Houston, utility personnel have identified cooling tower customers by the wastewater credit on water bills, and will flag the biggest consumers. David Frashier of Cost Containment Engineering estimates that about 50% of City of Houston cooling tower customers would be good audit candidates.

In Houston, the average cooling tower account uses 500,000 gallons per month, and Frashier projects a realistic goal of improving the efficiency of 250 towers by 25%. On the high end, the George R. Brown Convention Center uses 4.5 million gallons per month of cooling tower makeup.

Cooling towers are installed to serve large cooling and refrigeration applications, such as food processing and electronics components plants, and to serve air conditioning units in large buildings. Cooling tower water absorbs heat from the refrigerant fluid in a closed system. The water then returns to cascade through the cooling tower to lose heat. Much water is lost to evaporation in the process.

According to Frashier, potential audit clients include chemical plants, refineries, office buildings, manufacturing plants, schools, universities, government buildings, hospitals, and multifamily dwellings.

In addition to evaporative loss, however, much water is discharged as blowdown, an amount of water intentionally wasted to control salt and other contaminants which would cause corrosion, fouling, and scaling.

First, the Houston cooling tower audit engineers will seek to achieve increased cycles of concentration by recommending more appropriate chemical treatment and automating blowdown disposal with a conductivity meter.

Second, leaks and malfunctioning equipment will be identified. Some smaller systems may be suitable for replacement with air-cooled systems.

Although large cooling towers are generally more efficient and usually more actively managed than small towers, there is still room for improvement. Also, the consulting engineers may introduce operators to the possibility of using rainwater or air conditioning condensate as makeup water.

The City of Houston's Water Conservation Program's budget for this project is \$208,000 over the first three years, and Truesdale expects more efficient cooling tower operation to save a potential 1,150 acre-feet annually.

San Antonio Water System (SAWS) recently issued a request for proposals for cooling tower audits. SAWS is first targeting 129 general class customers eligible for sewer credits due to evaporative loss, as the City of Houston has done. These 129 customers account for a combined monthly average consumption of more than 54 million gallons or about 1,992 acre-feet annually.

For purposes of estimating water savings. Ed Wilcut, SAWS conservation planner responsible for industrial conservation programs, figures that if all 129 businesses increased from three to four cycles of concentration, SAWS could realize an annual savings of 239 acre-feet, or 12% savings. Cooling towers in San Antonio run between 2.5 and 4 cycles of concentration.

Wilcut estimated that there are as many as 500 cooling towers in the SAWS service area.

"We wrote the RFP such that the consulting engineer would be paid a flat rate for every audit conducted, creating an incentive for the engineer to find more towers to audit than just the identified evaporative credit customers," Wilcut said.

The cooling tower audit will provide the customer with a detailed engineer's report specific to that tower, including recommendations for more efficient operation for achieving water and energy savings, capture of blowdown water for reuse in other applications, and leak identification.

"The other advantage we envision for this program is that as SAWS learns of new technology and efficient cooling tower operation strategies, we may be in a position to recommend an ordinance for effective cooling tower operation," he said.

Frashier can be reached at (210) 509-0825. Truesdale can be reached at (713) 837-0423 or ptruesda@pwe.ci.houston.tx.us. Wilcut can be reached at (210) 704-7531 or ewilcut@saws.org.

State Irrigation Survey To Indicate Pilot GIS Study

Statewide agricultural irrigation data has historically been updated every five years in a comprehensive county-by-county survey. For future surveys of the millennium, however, the Texas Water Development Board (TWDB) thinks advanced technology may yield more accurate--and more easily obtainable--results.

The Natural Resource Conservation Service (NRCS) of the US Department of Agriculture will conduct the 2000 survey using established processes to ensure complete

coverage and consistent data for regional and statewide water supply planning needs inherent in Senate Bill 1 requirements.

For future five-year-interval or annual surveys, however, the TWDB Research Division staff is recommending a significant upgrade in technology and methodology. Using geographic information system (GIS) data bases, aerial mapping, remote sensing of irrigated land and crop types, and statistically valid samples of irrigation meters would yield more accurate data, according to Dan Beckett, Director of the Research Division in the Office of Planning.

At their February meeting, the TWDB approved a cooperative undertaking with the National Resources Conservation Service (NRCS) of the U.S. Department of Agriculture to conduct the 2000 irrigation survey. The previous irrigation survey was finished in April 1995 by NRCS.

The current study will include a pilot study in four or five counties in which NRCS personnel will use aerial photos and remotely sensed data to identify irrigated crop types and will incorporate extensive estimates of local water use based upon groundwater and irrigation district data and weather data.

For each of Texas' 254 counties, NRCS will provide (1) a completed county map with irrigated acreage data, (2) a data form containing county average estimates of irrigation water applied by crop type, and (3) data on irrigation systems and efficiencies. Data will be gathered using conventional methods.

The advanced methods data will be correlated with the conventional data, then evaluated by TWDB and NRCS staff.

"With the support of NRCS, it is the goal of the TWDB staff that by using this technology, the TWDB will be able to be responsible for the actual data collection of irrigation surveys in the near future," said Beckett.

*Beckett can be reached at
(512) 936-0857 or dan.beckett @twdb.state.tx.us.*

Drought Hits Texas For Fourth Year In Past Five

Texas has experienced drought in four of the past five years, and the state is heading into another hot summer with predictions of another drought, despite indications of a weakening La Niña in the Pacific.

"We've been getting significant rainfall lately in many parts of the state. But our spring rains have been inconsequential, not enough to make a dent in the drought," said George Bomar, meteorologist with the Texas Natural Resource Conservation Commission.

"What the state needs is a minimum of 8 to 12 inches of rain rather quickly--over a few

days or just a few weeks--to quash this drought."

The mature La Niña effect in the Pacific has been exacerbated by the most dynamic sunspot activity in two decades. Historically, there has been a correlation between solar flares and drought. Bomar said the residual effect of the current La Niña could persist until 2001, although lately it has shown signs of weakening, as evidenced by recent rains.

* Moderate to extreme drought conditions exist in eight of the state's 40 climatic regions according to the current Palmer Drought Severity Index (PDSI). Exceptions exist in the High Plains (near normal) and the Low Rolling Plains (incipient dry spell) regions.

* According to the Texas Water Development Board, the 77 monitored reservoirs in the state were at 74.1% of capacity, the lowest percentage of total capacity in 23 years of record-keeping and the sixth consecutive month of record low reservoir levels.

* Reservoirs in the Trans-Pecos region are averaging just 26% of capacity. Reservoirs in East Texas and North Central Texas are at 89% and 81% of capacity, respectively.

* The Lower Rio Grande region is experiencing its sixth straight year of drought. Amistad reservoir on the Rio Grande was at 43% storage capacity and Falcon Reservoir at 24%. Agricultural irrigation in this region started in earnest in March.

* San Angelo has entered Phase IV of its drought plan, restricting all outdoor watering and limiting car washing to commercial facilities.

* The Edwards Aquifer Authority imposed mandatory watering restrictions for San Antonio and neighboring areas to the north and east when the J-17 monitoring well fell below 650 feet above mean sea level the first week of May. Outdoor water is restricted to the hours from midnight to 10 a.m. and 8 p.m. to midnight.

* San Antonio Water System (SAWS) issued modified drought restrictions to comply with Edwards Aquifer Authority rules. Stage I drought restrictions, initiated in May, mandate one-day-per-week outdoor watering schedule based upon address. "We learned from our 1996 experience that the even/odd numbered watering schedule put a strain on the water mains in the delivery system," said Calvin Finch, SAWS Water Conservation Director.

* In response to drastic declines in river flows, the Guadalupe-Blanco River Authority has issued a widespread public awareness campaign for water conservation. Measured at Victoria, the Guadalupe River flow was 21% of the April norm. Normally, rainfall and runoff supply most of the river's flow, with springflows contributing 20% to 30%. This year, the situation is almost reversed, with springflows from Comal Springs are currently supply 77% of the water in the Guadalupe River, with releases from Canyon Reservoir providing 20%. Dramatic declines in inflows to Canyon Lake, however, prompted GBRA to reduce the reservoir release from 90 cubic feet per second (cfs) to 70 cfs.

* In 2000, the drought has cost Texas farmers \$96 million, according to Agricultural Extension Service economists. Texas farmers and ranchers lost another \$223 million in the fall of 1999. The 1996 drought resulted in \$2 billion in producer losses, while the 1998 drought caused \$2.1 billion in losses.

* Texas ranchers have spent an additional \$154 million in supplemental feed and water expenses as of February since the summer of 1999. Compounding that financial stress is the situation ranchers find themselves in of not being able to participate in an improved cattle market as herd liquidations in 1996 and 1998 have severely decreased cattle inventory.

SAWS Study OKs Recycled Water In Cooling Towers

San Antonio Water System Recycled Water Centers release 130,000 acre-feet of water annually downstream. Now, 35,000 acre-feet per year is available to commercial and industrial customers. Most of this resource is used for landscape and golf course irrigation (*Texas Water Savers*, Winter 1998).

In an effort to extend the usefulness of this resource to a second end use--industrial cooling towers--San Antonio Water System completed a pilot study to assess the feasibility of using reclaimed water as cooling tower make-up water, thereby relieving some of the strain on the Edwards Aquifer.

The SAWS Commercial Conservation staff then introduced the concept and results to industrial customers at a series of workshops conducted at Trinity University.

It is worth noting that the San Antonio's electric utility, City Public Service, has been using reclaimed water in its cooling towers for almost 40 years, and currently consumes 40,000 acre-feet annually.

Interestingly, the reclaimed water contains ammonia, phosphate, and nitrate, which act as natural corrosion inhibitors. "Recycled water has some 'value-added features' over potable Edwards Aquifer water in the form of natural corrosion inhibitors," said Paul Pukorius, of Pukorius & Associates, Inc., the water consultant contracted by SAWS for the pilot study.

Betz Dearborn, a chemical treatment company, conducted fouling and corrosion tests using a mobile pilot cooling tower system with monitoring instrumentation. From test results, Betz Dearborn engineers concluded that recycled water gives acceptable results in cooling towers, and that galvanized steel and mild steel corrosion rates would drop significantly. Good control of scale is possible with conventional scale-control polymers at normal feedrates.

Pukorius also noted that holding the chlorine residual throughout the system effectively solves biological problems, including *Legionella*.

Legionella bacteria can cause respiratory ailments known as Legionnaire's disease.

"Recycled water is best anywhere you have evaporative losses," Pukorius said.

Customers already receiving reclaimed water for landscape irrigation, such as Trinity University, are the best prospects from a cost-effectiveness standpoint for converting cooling towers to reclaimed water. In these cases, a lateral connection from the purple-pipe reclaimed water main to the customer already exists.

Trinity University had already installed 10,000 feet of purple pipe at its 117-acre campus for landscape irrigation purposes when the university decided to extend the reclaimed infrastructure to serve cooling towers, said Jim Counce, Assistant Director of Crafts and Utilities.

"To be honest, we probably could not have justified building a distribution system for the cooling towers alone, but since we were already on-line for landscape irrigation, reclaimed water in the cooling towers was a viable option," said Counce,

Trinity now uses reclaimed water in three cooling towers (4000-ton, 900-ton, and 350-ton, respectively) totaling 53 acre-feet of water consumption per year. The university has no storage, but receives reclaimed water at 45 pounds per square inch pressure from the purple mains.

For the pilot study, conducted by Betz Dearborn, an instrumented cooling tower simulated the real operating conditions in six separate evaluations. The tests monitored for chemical concentrations, pH, corrosion, and cycles of concentration, fouling, and biological activity. *Legionella* bacteria was found in low levels in just two of the six tests, one of which used fresh water. Chlorine is an effective biological control agent.

The results of the survey indicate that SAWS recycled water is acceptable for replacement of Edwards Aquifer water for cooling tower makeup. SAWS recycled water is less corrosive than Edwards Aquifer water, despite the fact it contains higher levels of dissolved solids. Reduction in corrosivity is a beneficial result of the presence of orthophosphate and nitrate, the study found.

There is virtually no change in the volume of water needed, whether the cooling tower uses recycled water or water from the Edwards Aquifer. The study found five cycles of concentration to be optimum. The study results indicate that chemical treatment regimes show similar costs using both types of water.

"The results of this study point very clearly to cooling towers as an appropriate end use"
--Ed Wilcut, SAWS

The SAWS commercial conservation program is funded by a conservation fee based upon meter size. It is worth noting that although SAWS charges the same rate for reclaimed water as for potable water, SAWS does have policies that make reclaimed

water service feasible.

"SAWS is hoping to stimulate a customer base for industrial use of reclaimed water, and the results of this study point very clearly to cooling towers as an appropriate end use," said Ed Wilcut, a conservation planner with SAWS.

Other potential uses of reclaimed water are as aggregate washwater in cement plants, as process water in textile, bleach and dye operations, refineries, and other manufacturing processes.

Wilcut can be reached at (210) 704-7531 or ewilcut@saws.org, Counce at (210) 999-8432.

Sun City Georgetown Bullish On Saving Water

Sun City Georgetown has garnered two Texas awards for its voluntary effort to conserve water.

The Consulting Engineers Council of Texas awarded Turner Collie & Braden (TC&B) its 1999 Engineering Excellence Award for the water conservation plan developed for Sun City Georgetown in the special projects category.

The plan also won a Water Conservation & Reuse Award for a nonutility in the indirect category from the Texas Section, American Water Works Association (AWWA) and the

Watermark Award for communications excellence from AWWA and the Water Environment of Texas.



Sun City Georgetown espouses attractive waterwise landscapes as a part of its overall award-winning water management strategy.

About a year ago, the City of Georgetown, from whom the retirement community purchases its water, informed the management that water use was greater than originally planned. Voluntarily, Del Webb Georgetown's management resolved to study water use and conservation options.

"Del Webb has a history of being environmentally responsible, and we aim to be mindful of how natural resources are used at our developments," said Todd Janssen, vice president for land development. "We left a legacy of being a good neighbor in the areas in

which we built planned communities."

Del Webb contracted with TC&B for a water conservation plan. After three or four months of research and data gathering, examining infrastructure, and soliciting the input of the City of Georgetown along the way, TC&B created a conservation plan under the direction of project manager Bill Couch of the firm's Austin office. Connie Hinojos was

the graduate engineer. The plan was implemented in November; Del Webb management will analyze its effectiveness throughout the next two years.

TC&B explored technologies revolutionary to building and landscaping industry for both domestic and outdoor conservation, including--

- * Soil moisture sensors for each zone hardwired to the master irrigation valve. Several "vacation getaway" residences have been fitted with separate domestic and irrigation meters so the effectiveness of the soil moisture sensors can be analyzed.
- * Injection of polymers, which absorb and gradually release water into the soil of newly constructed speculative residences.
- * Installation of waterwise and drought-tolerant landscapes which require less irrigation while preserving the community's esthetic appeal.
- * Fitting more recently built residences with rain sensors tied directly to irrigation controllers to avoid unintentional irrigation of lawns during rainy periods.
- * Testing of imported loam to ensure that soil being placed on all lots was best suited to soil moisture retention and release, with assistance from Williamson County Extension Agent Ronnie Leps.
- * Eventually, irrigating all four of the planned Sun City golf courses with reclaimed water from the City of Georgetown.
- * Initiation of a "Water Ambassadors" Program, in which residents are trained in conservation methods to serve as resource persons in their neighborhoods. Ambassadors, for instance, can offer advice on customizing sprinkler irrigation schedules in response to season and turf maturity and determining if an irrigation system is working properly.
- * Installation of low-flow devices on all indoor plumbing fixtures.

The Water Ambassadors undergo a series of three 4-hour classes, plus a refresher course, team-taught by Del Webb's corporate landscape architect and commercial irrigation and turf maintenance companies and TC&B.

"If we could have any one big influence on water use, it would be educating people on when and how much to water their lawns," Janssen said.

An environmental fair for Sun City residents on March 29 featured seminars on turf management, irrigation operation and maintenance, and water-wise plant use.

Interestingly, another water conservation plan, developed by Montgomery-Watson for the City of Houston, received last year's special projects award.

Janssen can be reached at (512) 930-6704, Couch and Hinojos at (512) 472-4519.

National Irrigation Survey Finds Rate Of Increase Of Irrigated Acreage Has Slowed; Texas Agriculture With Less Than 1% Rise

The 1999 Irrigation Survey, published in the January/February 2000 issue of *Irrigation Journal*, showed an increase in irrigated acreage of 0.8% nationally last year. Although the number of irrigated acres increased, the rate of increase has slowed. For instance, 1998 showed a 1.44% increase, almost double that of the past year. A total of 63,967,484 agricultural acres are irrigated, according to the survey.

Gravity and sprinkler methods dominate with 95.4 percent of the market; low flow accounts for a mere 4.6%.

Statistics compiled by Guy Fipps of the Texas Agricultural Extension Service, show Texas with 6,459,000 irrigated acres, an 0.92% increase from 1998. Of that total, 4,050,000 acres--62%--was sprinkler-irrigated. Gravity-flow irrigation accounted for 35% of irrigated acres, and low-flow irrigation was used on less than 2% of irrigated acreage.

Low-flow irrigation includes surface microspray, surface and subsurface drip-trickle, and buried perforated tape.

Cotton, of course, is king, with about 2,000,000 irrigated acres, followed by corn (1,100,000 acres), wheat (900,000 acres) forage crops (750,000 acres), rice (250,000 acres), and nuts and vegetables (each with less than 250,000 acres).

The survey can be downloaded in portable document format from the *Irrigation Journal* web site, <http://www.greenindustry.com>.

Irrigation accounts for 60% of Texas' water use. Agricultural water used peaked in 1974 at 13.1 million acre-feet per year. Current use is about 10 million acre-feet/year, according to the Texas Department of Agriculture.

The High Plains, the most intensively irrigated part of the state, contains almost 70% of all irrigated land in Texas. In some counties, irrigated land accounts for more than 50% of the county area.

It is worth noting that agricultural irrigation is about to enter a period of flux, according to a report entitled, *The Future of Irrigated Agriculture*. According to the report, competition for increasingly scarce water supplies to serve urban and environmental needs means that less water will be available for irrigation. As Texas' population balance shifts to urban areas, higher valued urban uses of water will crowd lower-valued agriculture demands for fixed supplies.

Survey Reveals Wide Range Of Opinions On Water Management Strategy Options

Results of a survey conducted by the Texas Agriculture Program of members of the 16 regional water planning groups reveal a diversity of opinion on the feasibility and preference of various water demand and supply strategies.

Each regional planning group member was asked to rank the preference and feasibility of each of 20 alternative water strategies. Not surprisingly, reuse of treated wastewater scored high on both scales almost across the board. Industrial water reuse was also rated highly. In regions heavily vested in ranching, brush control was popular.

Regional planning group members were asked to rank feasibility and preference of 20 water management strategies that they perceived should be considered for their region's needs. Sixty-five percent of regional planning group members replied to the survey.

The report's introduction serves as a primer on the history of four eras of Texas water planning: reservoir planning and construction, environmental and conservation awakening, reallocation and demand management, and regional water planning.

The survey and report were conducted as part of the statutory obligation of Texas Agricultural Extension Service to conduct educational programs about Texas water planning, as mandated in Senate Bill 1. It was written by Ronald Kaiser, Bruce Lesikar, C. Scott Shafer, and Jan Gerston of the Texas Agriculture Program.

The report is available in pdf format at <http://tx-water-ed.tamu.edu/strategies.html>. For a hard copy, contact Gerston at jan@twri.tamu.edu or (979) 845-1852.