Texas Water Savers
News of Water Conservation and Reuse in Texas

Volume 4, Number 3, Summer 1998

4-H curriculum immerses students in hands-on activities

Using an interactive Texas 4-H water education program, many young Texas are expected to ride the water knowledge wave as a means of fulfilling their state knowledge and skills objectives next fall.

Investigating Water, a fourth through sixth grade curriculum, is a collaboration of eight federal, state, educational, and regional organizations coordinated by the Texas 4-H program specialists.

Thorough in both breadth and depth, *Investigating Water* presents the water picture in a lively series of seven lessons followed by illustrative activities. The seven lesson focus on the chemical and physical properties of water, the hydrologic cycle, aquifers, watersheds and wetlands, water and soil, water and plants, water and animal life, ecosystems and pollution, and efficient water use.

Each lesson is accompanied by challenging questions for the teacher to pose to students. For example, an activity has a student building a wetlands model in a baking pan, then hypothesizing the ability of the wetlands to filter pollutants from water.

A table at the front of the book lists, for each learning experience, Texas Assessment of Academic Skills (TAAS) objectives, the curriculum area, and the domain (concepts, problem solving, and reading comprehension) of each lesson. TAAS objectives will be converted this summer to the new Texas Essential Knowledge and Skills (TEKS) objectives.

The 53 imaginative, varied activities are the heart of the curriculum, ranging from simple activities, such as comparing the buoyancy of carrots in fresh and salt water to demonstrate the salt water is denser than fresh, to the complex--using stakes, line levels, a compass, and graph paper to map and calculate the area of a small watershed. The experiments can be done with common household items.

The curriculum was developed by horticultural specialist Lisa Whittlesey of the Texas Agricultural Extension Service. Whittlesey field-tested every activity.

"One night I found myself tossing carrots into various concentrations of salt water. My house became my laboratory," Whittlesey said.

The wise water use lesson compares water use first by sector, then further breaks down domestic consumption by use--toilet, laundry, landscape--followed by a water wise scorecard.

Building a molecule that looks like Mickey Mouse helps students learn that water molecules are slightly polar, making water the "universal solvent" but also making it easier for them to pick up pollution and to leach nutrients from the soil.

Building two farm models in paint roller trays, one with dirt furrows running perpendicular and one parallel to the slope demonstrates the importance of contour plowing to conserve soil.

Although the curriculum is geared toward fourth through sixth grade, it was field tested in 80 urban and rural classrooms statewide during the past academic year on schoolchildren ranging from kindergarten to ninth grade. Now 4-H will promote the published curriculum at teacher conventions, through 4-H agents, and through press releases, according to Ron Howard, a 4-H youth and development specialist. A preliminary press release generated 60 requests for the curriculum.

State 4-H groups will also incorporate the activities into their after-school programs. "Club meetings with an environmental or ecological bent will plug right into these activities," said Howard.

"I think teachers will like this curriculum because they can use all or just part of it. The experiments are simple and the TAAS requirements are spelled out for them. Homeschoolers will like it too," said Howard. "The curriculum will hopefully create an awareness about water and give children some hands-on knowledge that will stay with them for life.

"We developed this curriculum because water, like soil, is all-too-common. We can see it wherever we go in Texas. People take it for granted, but it is one of the essentials of life," said Howard.

The Public Information and Education Committee of the Association of Texas Soil and Water Conservation Districts provided primary financial support for the projects. Other supporters were the US Department of Agriculture Natural Resource Conservation Service, Texas Alliance of Groundwater Districts, Texas Education Agency, Texas Natural Resources Conservation Commission, Texas State Soil and Water Conservation Board (TSSWCB), and South Plains Underground Water Conservation District. At TSSWCB, Tricia Davis, Clyde Gottschalk, and Gail Chandler coordinated the project.

To obtain a copy of the curriculum, contact the 4-H state headquarters at (409) 845-1211. For more information about the curriculum, call Ron Howard at (409) 845-2473 or r-

howard1@tamu.edu. For more information on the curriculum itself, contact Whittlesey at 845-8565 or l-whittlesey@tamu.edu.

Meetings and conferences

Resources Engineering Conference including a Ground Water Management Symposium, a Mini-Symposium on Hydrology and Hydraulics of Wetlands, and a **Mini-Symposium on Bank Stabilization Measures**, August 3-7, 1998 at the Peabody Hotel in Memphis. Practice areas include hydraulics, hydrology, irrigation and drainage, ground water, wetlands, and closely-related topics. Contact James Outlaw, University of Memphis (901) 678-4055 or e-mail jamie@ce5.gwi.memphis.edu.

TAN-MISSLARK (Texas Association of Nurserymen-Mississippi, Louisiana, Arkansas) Nursery, Garden, Landscape Supply Show, August 21-23, George R. Brown Convention Center, Houston. More than 750 exhibitors. Registration, $12 by August 7, $15 after August 7. Call TAN (512), 280-5182, for more information.

Water Conservation in Landscape Irrigation, August 21, George R. Brown Convention Center, Houston. Sponsored by Texas Natural Resource Conservation Commission, Texas Water Development Board, and Texas Turf Irrigator's Association. Call Gene Reagan, (512) 239-6858 or email greagan@tnrcc.state.tx.us, for more information.

Texas Water Monitoring Congress, September 21-23, Austin. Purpose of the Congress will be to formulate key water monitoring issues. Call Dee Lurry at (512) 873-3071 or dllury@usgs.gov.

Texas River and Reservoir Management Society and the North Texas Limnological Group, October 1-2, University of North Texas. Theme of the conference is "The Integrity of Texas Rivers and Reservoirs--From Assessment to Management." Contact Jessica Franks, (940) 565-3414 or jfranks@jove.acs.unt.edu.

WEFTEC '98, Water Environment Federation, 71st Program for Professional Development, October 3-7, 1998, Orlando, Fla. Workshops include activated sludge for industrial waste, retrofitting urban areas to restore urban receiving waters, ultraviolet disinfection, watershed-based effluent trading, membrane technology. For information, call (800) 666-0206.

American Water Resources Association Conference on Water Resources and Symposia, November 15-19, 1998, Point Clear, Alabama. Contact AWRA, (703) 904-1225 or awrahq@aol.com.

25th Water for Texas Conference, December 1-2, Austin. The purpose of this conference is to identify ways and means to help urban and agricultural entities develop water management strategies. Call Jan Gerston, (409) 845-1852, for more information.

CONSERV 99, January 31-February 1999, Monterey, California. Contact Susan Miller at (303) 347-6181 or e-mail at smiller@awwa.org.

American Water Works Association/Water Environment Foundation Water Reuse Conference, January 30-February 2, 2000, San Antonio. Contact: Susan Miller at (303) 347-6181 or e-mail at smiller@awwa.org.

Water celebration draws Corpus Christi crowd

by Yolanda R. Marruffo
City of Corpus Christi Water Department

Corpus Christi's annual Water Utilities Week celebration drew a record crowd of 1,700 visitors. The City of Corpus Christi Water, Wastewater and Storm Water departments teamed up to invite the public to celebrate the "Wonderful World of Water" exhibit at the Corpus Christi Museum of Science and History.

Corpus Christi Water Department microbiologist Shin-Ichi Tokumo and citizens at the Water Utilities Week celebration.

Visitors took advantage of interactive exhibits featuring water quality testing and hands-on laboratory experiments. Exhibits included Water Lab Nuts; Wastewater Bugs; Pollution Preventors; When it Rains, it Drains; Splash and Dash; and Chlorine and pH Experiments for Kids. The Storm Water Department showcased confined space entry equipment and an EnviroScape display, which features a miniature city that shows how storm water pollution occurs. Visitors also took advantage of educational literature promoting water conservation and toured the city's award-winning Xeriscape garden.

Ed Garaña, Water Superintendent for the City of Corpus Christi, welcomed visitors and reflected on public awareness to protect and conserve water. A proclamation was read and certificates of merit were presented to 25 Boy Scouts who volunteered their time earlier in the day to the Storm Water Department's stenciling program. The stenciling program encourages volunteers to stencil the message "do not dump, drains to bay" on storm drain inlets. The Xeriscape Learning Center and Design Garden, located at the entrance of the Museum of Science and History, also attracted Master Gardeners and 20 high school seniors to participate in a monthly maintenance event held at the garden.

The event was highly publicized through television, radio and print media, and flyers were sent home with all elementary school students. Children's activities, including face painting, a water balloon throw, and blue thumb imprinting, resulted in great fun for everyone. More than 30 employees supported this Saturday event.

For more information, contact Yolanda Marruffo, (512) 857-1881.

Clay filter allows recycling of process water

Each time a chicken is processed, the poultry industry uses 5.2 to 10 gallons of water. Multiplied by the 4.5 billion chickens prepared for consumption every year, the chicken processing industry annually requires between 25 and 44 billion gallons of water. This heavy use of water represents a major cost for the poultry industry, especially since most of the water must be obtained from an outside source, and disposed after use. One way to reduce costs for the industry would be to recondition and reuse the water, rather than continually having to import fresh water.

Toxicologist Paul Herrera of Texas A&M University prepares a Salmonella *culture*.

One major concern of recycling water to process chicken carcasses is the threat of contamination of untreated carcasses by bacteria such as *Salmonella enteritidis* in the scalding and prechilling stages of processing. Current disinfectant methods include using chlorine, ozone, or organic acids. However, chlorine does not kill all water-borne bacteria, its effectiveness may be affected by conditions such as temperature and pH, and concerns have been raised about the toxicity carcinogenicity of compounds produced during chlorination. Problems also exist with ozone as a disinfectant because of its high cost and toxicity to humans. Treatment with organic acids often produces a carcass with an unacceptable appearance.

Bacterial filtration systems using clay may lead to a more effective water treatment system for the industry, which could end the practice of using and disposing of water, rather than recycling it. Earlier studies by others indicated that treated clays would remove pollutants. The A&M researchers applied that property to the use of treated clays to remove microorganisms.

Three Texas A&M University toxicologists with the Department of Veterinary Anatomy--Paul Herrera. Tim Phillips, and Robert Burghardt--have conducted experiments using a type of modified clay to control *Salmonella* transmittal in water. In these experiments, three types of phyllosilicate clays were exchanged with the cationic surfactant cetyl pyridium (CP). A suspension of *Salmonella* was added to samples of the clay and then

agitated. Results showed that the CP-exchanged clays reduced bacterial plate counts by 97.6%, 95.2%, and 98.1% vs. 16.6%, 16.9%, and 39.8% for the non-modified clays.

Analysis with electron microscopy shows that bacteria bind to the surface of the treated clays but not the untreated clays, thereby removing bacteria from solution. Bacteria bound to the clay particles were consequently found to be inhibited from reproducing.

Further analysis showed that temperatures between 77deg. and 98.6deg. greatly enhanced the anti-bacterial effects of the clays, while temperatures between 40deg. and 59deg.C failed to exert any significant effect on the *Salmonella*, suggesting that the clay filtration system would best treat water used in the scalding process.

Herrera can be contacted at (409) 862-4976 or p-herrera@tamu.edu.

Texas irrigation conference to focus on outdoor water use efficiency dialogue

The Texas WaterWise Council will play a major role in the Water Conservation in Landscape Irrigation Conference August 21 at the George R. Brown Convention Center in Houston. The seminar, a joint agency effort spearheaded by the Texas Natural Resource Conservation Commission, will be coincident with the Texas Association of Nurserymen-Mississippi, Louisiana, Arkansas (TAN-MISSLARK) Nursery Landscape and Garden Supply Show.

"Building Coalitions to Develop Appropriate Water Management Processes" is the title of a morning information session that the WaterWise Council will lead.

The session reflects the expansion of the WaterWise Council's intent to encompass both the irrigation and nursery industries.

In the afternoon, the WaterWise Council will serve on a panel to discuss cooperation between industry experts and municipalities and to analyze ordinance successes and failures.

For more information on the Texas Irrigation Seminar, contact Gene Reagan at (512) 239-6858 or email greagan@tnrcc.state.tx.us.

WaterWise Council surveys municipal water management ordinances

At the April meeting of the Texas WaterWise Council, held in Galveston in conjunction with the Texas Section-American Water Works Association Conference, President Marilyn Good presented a vision for the next WaterWise Council goal--landscape ordinance planning.

Armed with a vision of likely water scarcity in a state whose population is expected to double in the next 50 years, the Texas WaterWise Council has embarked on a project to

proactively lay the groundwork for landscape and irrigation ordinance guidelines and strategies.

Good introduced the idea of fostering coalitions of nursery and irrigation industry professionals, civic organization and homeowner associations to draft landscape ordinances preemptively.

In this manner, industry professionals would have input during the initial stages of the drafting of ordinances that may affect them. Currently, many landscaping and irrigation ordinances are prepared by consultants and adopted by city councils with little or no upfront input from industry experts. The reasoning goes that if professionals and interested organizations are involved early in the planning process, they can make a positive impact on the results, instead of being cast in the position of opposing a council-drafted ordinance. Often, once the process reaches the public hearing stage, it is too late to provide tangible input, said Good.

The idea is to address cultural practices, rather than immutable guidelines. At the June meeting, David Smith, irrigation specialist with the Texas Agricultural Extension Service, drafted a set of best management practices for irrigation designers and contractors for consideration by the WaterWise Council.

Jan Gerston, of Texas Water Resources Institute, has mailed to municipalities a questionnaire whose intent is both to compile existing ordinances and to learn concerns of municipalities without ordinances.

From the responses, the WaterWise Council will write guidelines for the facilitation of planning sessions at city council meetings.

For more information on the questionnaire, contact Gerston, (409) 845-1852. For more information on irrigation best management practices, contact Smith, (409) 845-5614.

WaterWise consumer video mailed to members

"Ride the WaterWise Wave," a 30-minute consumer-oriented videotape conceived of, created, and produced by the Texas WaterWise Council, has been mailed to Council members. Additional copies are available at $10 each.

With a voice-over by Austin sports announcer Wally Pryor, the tape first presents an easy-to-understand and richly illustrated overview of the hydrologic cycle (and the "hydro-illogical" cycle), then describes the importance of plants in preventing erosion, and finally takes the viewer through preferred landscaping and irrigation practices.

The videotape's message is targeted to the retail nursery consumer.

Slide images and scripting were provided by WaterWise Council members, with Brent Wiseman of the Texas Department of Agriculture compiling and digitizing images, then synchronizing text, images, and voice-over of the final product.

For more information, contact Marilyn Good at (512) 280-5182.

Landscape irrigation water-efficiency conference Aug. 21

On August 21, landscape irrigators, system designers, and equipment manufacturers will come together with municipal representatives for a dialog on the impact of water management decisions at the Water Conservation in Landscape Irrigation Conference.

Those whose livelihood depends on water consumption (manufacturers and irrigation system installers and designers) and water providers and regulators facing pressures to provide the resource, will have the opportunity to see how both can have a positive impact on water use in Texas at this joint conference, spearheaded by the Texas Natural Resource Conservation Commission.

The conference, coincident with the TAN-MISSLARK Nursery Landscape and Garden Supply Show, will take place at the George R. Brown Convention Center in Houston.

Two morning sessions will focus on, respectively, building coalitions to develop appropriate water management processes and statewide mandates to conserve water.

In the afternoon, three panel discussions are planned. First, manufacturers will discuss water-efficient equipment. In the second panel, irrigators and designers will deal with efficiency, working with local regulatory officials, and selling water-efficient systems. Third, representatives from municipalities and the Texas WaterWise Council will discuss working with technical experts and present stories of successes and failures.

For more information, call Gene Reagan at (512) 239-6658 or greagan@tnrcc.state.tx.us.

TWRI website compiles water supply and conservation education info

A new web site maintained by Texas Water Resources Institute is a clearinghouse for water supply and conservation education programs and projects of public and private entities.

Under the Senate Bill 1 mandate that the Texas Agricultural Extension Service's educational reach should include water supply education, the web site at http://tx-water-ed.tamu.edu links to relevant sites and has descriptions of other water education activities across the state.

Upcoming events are listed in a scroll box on the opening screen for easy access. Other direct links take the user to Senate Bill 1 information and to Texas Water Development Board and Texas Natural Resource Conservation Commission sites.

Compiling information is an on-going process. For more information, or to ad a link or a page to the website, contact Jan Gerston at (409) 845-1852 or jan@twri.tamu.edu.

Dallas AWWA conference nets 10,400 attendees, more than 1000 exhibitors

The American Water Works Association Annual Conference and Exposition, the drinking water industry's largest event, took place June 21-25 in Dallas. Announced attendance was 10,400 with a record 1,004 exhibitors.

Reynolds processes alumina with captured rainwater

Almost 50 years ago, Reynolds Metals built the Sherwin Alumina plant on the north shore of Corpus Christi Bay. At that time, no public water supply existed in San Patricio County, so Reynolds also built a 35-mile pipeline to the Nueces River to tap the then-abundant waters of Lake Corpus Christi.

Tom Ballou of Reynolds Metals near Corpus Christi stands among the flourishing reeds in a constructed wetlands built as an experiment to handle domestic effluent from the plant. "We built a maze of sandy clay, planted about two dozen sprigs of cane and cattail, then replumbed and just started discharging effluent to see what effect it would have on the plants," said Ballou.

All went well for 40 years. Then the 1990s presented a new set of water resources and other environmental challenges to the company. Not only were tailings storage beds filling up, but the growing population of the region was straining the supplies of Lake Corpus Christi and Choke Canyon Lake.

Reynolds Metals explored alternatives to the public water supply to deal with both challenges, taking advantage of both characteristics of the refining process and the local climate.

The processing of bauxite (earth materials from which aluminum is refined) does not demand high-quality water, but cannot use salt water. "The Bayer process used in the Sherwin Alumina plant can use rainwater, even if after it has run across the ground. It can also use treated wastewater," said Tom Ballou, Environmental Quality Superintendent.

Climatologically, south Texas is a semi-arid area. Rain occurs in large thunderstorm events which present both a hazard and an opportunity. Under the National Pollutant Elimination Discharge System (NPDES), industries must control stormwater runoff from industrial facilities, a particular problem in this area plagued with episodic rainfall.

Containing and controlling stormwater with dikes, ponds, and ditches not only achieves the pollution control objective, but also provides a bountiful water supply, according to Ballou. So, for the past several years, Reynolds has set about building impoundment earthworks. At last count, 28 acres of reservoirs an average of 8-feet-deep for Nueces River water and stormwater basins with a total capacity of 800 acre-feet.

"We're dredging and digging ditches and building more dikes and dams around drying beds. We've got pumps in strange-looking places when the weather is dry," Ballou said.

"The pay out on stormwater capture is extended. Sometimes we don't get the neat 2-year return on investment the accountants are looking for. But pollution prevention has its own benefit, in terms of protecting the environment and avoiding fines. If we are losing chemicals in stormwater runoff, we could be in violation of environmental laws." Reynolds is a zero-discharge facility.

The spring of 1992 was extraordinarily wet. The Sherwin Plant ran continuously for 93 days from captured rainwater, and with reduced demands on public water supply for about 8 more months.

"If you looked at our water purchases in 1992, you'd have thought we'd shut the plant down," Ballou said.

"I've examined water purchased for the last 15 years. Our water use is driven not by plant production but by rainfall," said Ballou.

"Most refineries (and we are a refinery, even if what we're refining is dirt rather than crude oil) need a fairly constant supply of water. What has helped us has been the ability to capture water that falls on the site," Ballou said.

The Sherwin Plant, one of only three similar alumina plants still operating in the United States, produces aluminum oxide, which is shipped to other plants to be refined into aluminum or into into aluminum hydrate (used as a desiccant and in the manufacturing of fireproofing materials).

Another "found" source of process water trickled from the tailings storage beds. Tailings, called red mud, present a problem throughout the alumina industry. The Sherwin Alumina plant uses the Bayer process, in which a chemical slurry is pumped around an endless loop, serving as both extraction and transport media for process chemicals.

The Bayer process refines out organic components and many trace elements necessary to support plant growth, although materials break down with time

Over the years, different ideas have been tested in an attempt to return the tailings to a more soil-like condition so that vegetation would grow on the impoundments.

After several pilot experiments, Reynolds has hit upon a win-win solution to the environmental challenge.

Originally, water deposited along with the tailings percolated down through about 18 feet of tailings, was collected, and recycled back to the surface as a dust control agent. But chemical analysis revealed that percolating water was flushing retained process materials out of the old tailings.

Not only was the reclaimed water continuing to inhibit the plant growth, it was probably more valuable as process water. Beginning in 1985, fresh water was substituted for dust control, with the percolating water redirected to the plant for recovery of dissolved materials.

"When that water comes out the bottom of the red mud tailings, it is perfect process water for our plant. It's chemically superior to what we get from Lake Corpus Christi," said Ballou. "The red mud acts as an ion-exchange bed. When relatively pure water, such as rainwater, trickles through, we recover trace minerals--alumina and sodium. So over time, we still continue to recover some process material. Recover a little bit today, a little bit tomorrow, and over the course of 20 years you have quite a lot of stuff...and the sodium recovered is that much less we don't have to buy from Occidental!"

In 1987, another dust control measure was tried. Rows of hay bales were laid across the impoundments. Not only did dust collect on the hay bales, but as the hay decomposed, it enriched the tailings with organic materials. Volunteer plants began to take root along the bales.

Two other experiments yielded results surpassing expectations. In 1992, a team of experts from the U.S. Soil Conservation Service (now U.S. Natural Resource Conservation Service), the Texas Agricultural Extension Service, and Texas A&M University-Kingsville experimented with the application of treated municipal wastewater biosolids on a 25-acre plot. Three local cities hauled treated wastewater and sewage sludge to the site for distribution through a simple irrigation network. Nutrients deposited near the surface promote plant growth and create wildlife habitat, while percolating water again is returned to the plant for process water.

Bolstered by the overwhelming success of the pilot study, Reynolds and the San Patricio Municipal Water District have worked out an agreement to pipe dewatered sludge and secondary treated wastewater from the Aransas Pass wastewater treatment plant about 8 miles away for remediation of Reynold's vast red mud beds. San Patricio MWD just received a $3 million loan from Texas Water Development Board for construction of the pipeline and associated pumping facilities.

Tom Ballou can be reached at (512) 777-2352 or tballou@lanmail.rmc.com.

Texans explore RO, wastewater supply options

The **South Central Desalting Association (SCADA)**, a new affiliate of the American Desalting Association (ADA), was kicked off at the ADA's Spring Technology Transfer Workshop May 1 in Corpus Christi. The mission of the organization, which will serve desalting interests in Texas, Oklahoma, and Louisiana, is to create a framework for making appropriate decisions on the future direction of desalting for the region. For more information, contact Cloice Whitley, Harlingen Water Works System, (956) 430-6154.

A **Joint AWWA-WEAT (American Water Works Association/Water Environment Association of Texas) Chapter** has been founded in San Antonio. "The first meeting will focus on the global perspective of utilization of water resources in the Bexar metro area," said Barbara Lackey of San Antonio Water System, one of the founding members. For more information, contact Lackey at (210) 704-7124 or Bill Davis of Black & Veatch at (210) 225-7643.

About 100 people participated in the **1998 Texas Water Reuse Conference** in San Antonio on May 28. The conference was sponsored by the Texas Water Development Board, along with participating agencies U.S. Bureau of Reclamation, Texas Section-American Water Works Association Conservation and Reuse Division, San Antonio Water System, Texas Natural Resources Conservation Commission (TNRCC), and the Water Environment Association of Texas.

Louis Herrin of TNRCC discussed Chapter 210 rules for wastewater reuse and Chapter 217 rules for wastewater reuse and water recycling (formerly known as wastewater treatment) plants respectively.

Treated wastewater is the only water source that (1) grows with population and economic development, (2) is drought-proof, and (3) is an "alternative" water sources that exists today. Today, about 150 million gallons per day (mgd) of water is recycled in Texas.

Warren Samuelson of TNRCC spoke of the seven-fold increase in on-site sewerage facility permit applications in a five-year span, owing in part to the population shift from cities to rural and suburban areas.

A panel discussion comprising attorneys Mark Jordan, Roger Nevola, and Michael Booth focused on water rights issues and reuse, emphasizing that reuse makes sense because most surface water firm yield has been allocated, and the cost of new surface construction is three times the cost of reuse strategies. Nevola espoused the "four corners" doctrine, promoting multiple reuse for diverse purposes by the same user within geographic boundaries before discharge, including bed-and-banks transfer.

Tom Soto of the State Comptrollers Office discussed a property tax exemption and a sales tax exemption on water conservation equipment.

Representatives from Largo, Fla.; Irvine Ranch, Calif.; and San Antonio Water System discussed their potable and nonpotable reuse projects. Alan Plummer boiled down the essence of the morning's discussion--data collection, guidance documents, graywater reuse regulations, and rules for supplementing potable with reclaimed water are needed.

Texas conservation and reuse awards announced

For the fifth year, the Conservation and Reuse Division of the Texas Section, American Water Works Association recognized utilities, companies, and others who have found effective ways to conserve and reuse water. Awards were announced at the Texas Section's annual conference in April in Galveston. John Sutton, Texas Water Development Board, chaired the awards committee.

Bob Derrington Water Reclamation

Award--Motorola-Austin

The 1997 Bob Derrington Water Reclamation Award, in honor of the late director of utilities for the City of Odessa, was presented to Motorola's Austin semiconductor fabrication plant for its reject reclaim reverse osmosis process (RRRO), which saves 73.6 million gallons per year of potable water and subsequent wastewater treatment.

The RRRO system is designed to be added on to any existing main RO system, saving valuable floor space, said Dana Lyon, plant services chemical engineer.

The Motorola silicon wafer fabrication plant uses a continuous stream of more than 600 gallons per minute (gpm) of ultrapure water (UPW) to rinse the wafers after cleaning and etch steps. A reverse osmosis (RO) system removed over 99% of the city water dissolved and suspended solids, but results in a reject stream of 150 to 200 gpm, which was wasted to the sewer. In addition, the reject stream was discharged at considerable pressure, about 100 pounds per square inch gauge (psig), which had to be dropped across a pressure control valve, a significant waste of energy.

The RRRO add-on takes advantage of the main RO reject pressure to drive the reject water through a nanofiltration membrane, which produces a water more suited to RO feed water than potable water.

Water exiting nanofiltration at about 30 psig flows (rather than is pumped) back to raw water storage for recycling to feed the main RO system.

The RRRO system operation and maintenance costs are minimal. The nanofilter membranes are cleaned on a routine basis with the main RO system. Each RRRO can be taken out of service while the main RO system is still running.

Motorola has filed a patent application for the RRRO system design, which was developed by Lyon and Jeff Covington of Motorola.

The RRRO system can easily be added to most high-capacity medium and high pressure RO systems, and allows the owner to reclaim 50% to 60% of the reject stream, if the existing RO recovery is in the 75% to 80% range. This performance affords a payback of less than an year in most cases. Call Lyon, (512) 933-8354, for more information.

Direct, Large Utility--Lower Colorado River Authority

The Lower Colorado River Authority (LCRA) won top honors in the Direct Program for a Large Utility for its three-pronged Water Conservation program, which uses three primary tools available to a utility to achieve water use efficiency: education, improved infrastructure, and a volumetric billing structure.

More than 70% of the water diverted from the Colorado River is used for rice irrigation. In drought years, LCRA experiences shortages in meeting irrigation water demand. By carrying out an effective agricultural water consrvation program, LCRA can avoid water shortages for irrigation customers in the future.

LCRA initiated agricultural water conservation efforts in the mid-1980s by helping fund the Less Water, More Rice program developed by the Texas Agricultural Experiment Station, which delivered the water conservation message to rice irrigators.

From 1987 to 1996, LCRA carried out the Irrigation Canal Rehabilitation Project. LCRA regraded canals and removed brush and vegetation from about 210 miles of canal, replaced about 300 water control structures; and modified pump utilization schedules. Before this project, canal losses were about 1.7 cubic feet per second (cfs) per mile of canal. Following implementation, loss has been reduced to about 0.7 cfs per mile of canal.

In 1989, LCRA instituted the Volumetric Pricing and Billing Project. The purpose of the project was to assess the technical and economic feasibility of delivering and billing individual irrigation customers by volume of water used rather than per acre served. From 1989 to 1997, LCRA invested about $1.3 million for improving water delivery systems, structure standardization, installing electronic measuring devices, and customer education.

As a result of the combined effect of the three programs, LCRA enjoys a water savings of about 60,000 acre-feet annually. For more information, contact Jobaid Kabir, (512) 473-4076.

Indirect, Large Utility--San Antonio Water System

San Antonio Water System (SAWS) places a high premium on community participation and advisement. Its Citizen's Committee on Water Policy issued a Framework for Progress, adopted by both the Board of Trustees and the San Antonio City Council, which included a strong recommendation that SAWS should incorporate significant public involvement in its planning and evaluative process.

And done that SAWS has. On the conservation side, the Community Conservation Committee, appointed in February 1997, was organized in response to the drought of 1996 and the need to deepen and broaden residential conservation programs. There was also a perceived need to expands SAWS programs to include commercial customers.

The mission of the Community Conservation Committee is to (1) represent all segments and interests of the community, (2) provide a clearinghouse of ideas and projects representing the diversity of the community, (3) submit recommendations to the SAWS board for permanent long-range conservation programs, and (4) help to ensure that conservation measures are implemented in all areas of the community.

More than 85 volunteers representing business and neighborhood associations, school districts, trade organizations, environmental and civic groups are divided into four working groups: business/industry, institutions, civic/social/environmental, and government/military. More than 50 meetings of the entire committee and separate working groups took place in the past year, according to Chris Brown, SAWS conservation manager.

One significant action stemming from committee recommendations is the implementation of a commercial conservation fee, based on meter size, which is applied to all nonresidential customers starting in April. Expected to generate about $20 million over 10 years, the fee is intended to accomplish water conservation among nonresidential users.

Among programs these fees will fund are a water saver recognition and certification program for businesses exhibiting water-efficient practices on a scale exceeding that of their competitors. These fees will also fund retrofits which previously were available only to residential customers. Estimated water savings from implementation of the new Commercial Conservation Programs alone is 10,000 acre-feet annually, or about 15% of current nonresidential use. For more information, contact Chris Brown, (210) 702-7258.

Direct, Nonutility--La Quinta Inns

San Antonio-based La Quinta Inns, Inc. took top honors in the Direct Program for a Nonutility for its far-ranging corporate water conservation program. In 1997, conservation measures facilitated a 9.5% reduction in per guest water consumption, for a corporate-wide overall reduction of 76.5 million gallons compared with the previous year.

La Quinta's aggressive water conservation program, managed by Jim Ackles, director of energy management, comprises several components: utility bill analysis, water-conserving equipment retrofits and new equipment specifications, building use audits, and employee awareness programs.

Since 1995, La Quinta has continually expanded the reach of its energy- and water-conservation program within its solely-owned chain, which now numbers 270 inns in 28

states, with 40 new properties built annually. That year, La Quinta implemented a program to retrofit its 35,000 guest rooms with low-flow faucet aerators and showerheads. All new properties use pressure-assisted low-flow toilets as standard equipment. Ackles said the improved performance of these low-flow fixtures justified their higher initial cost. The corporation implemented a program of annually testing all toilets using dye tabs and all showerheads using the 5-second test bag.

La Quinta developed an in-house utility management information system, LQEnergy, that allows for analysis of about 1,200 utility (electricity, water, and gas) expenses each month, and flags deviations from normal use. The system provides exception reporting for potential high-use problems. La Quinta's utility analysts work with general managers and utilities to investigate high consumption and to take corrective action. Often, the LQEnergy highlights a problem through analysis before the inn manager is aware of a problem. Call Ackles, (210) 302-6570, for more information.

Indirect, Nonutility--High Plains Underground Water Conservation District

A pilot education program using the Learning to be Water Wise & Energy Efficient school water conservation curriculum and home retrofit kits garnered the Indirect Program for a Nonutility Award for the High Plains Underground Water Conservation District No. 1.

For this pilot program, about 385 fifth and sixth grade students in selected schools in High Plains' 15-county service area participated in the 1997 program. Due to the cost of each Water Wise student kit, the district selected schools for participation based on groundwater use trends, impact of drought conditions in the area, and recommendation of progressive science teachers. Retrofitting of students homes would save an estimated 11,000 gallons per year per student. During the 1997-1998 school year, 455 students participated in the program.

AWWA revises water conservation policy

The American Water Works Association's Board of Directors has approved the following revised policy statement on water conservation--the first since 1993.

"AWWA strongly encourages water utilities to adopt policies and procedures that result in the efficient use of water, in their operations and by the public, through a balanced approach combining demand management and phased source development. To this end, AWWA supports the following water conservation principles and practices:

1. efficient use of sources of supply;

2. appropriate facility rehabilitation or replacement;

3. leak detection and repair;

4. accurate monitoring of consumption and billing, based on metered usage;

5. full-cost pricing;

6. establishment of water-use efficiency standards for new plumbing fixtures and appliances and encouragement of conversion of high-water-use plumbing fixtures to more efficient design;

7. encouragement of the use of efficient irrigation systems and landscape materials;

8. development and use of educational materials on water conservation;

9. public information programs promoting efficient practices and water conservation by all customers;

10. integrated resource planning;

11. water reuse for appropriate uses; and

12. continued research on efficient water use practices.

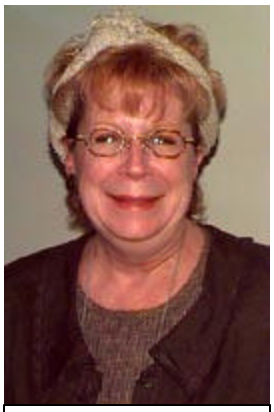
Schoolkids home in on conservation

In a year, the *Learning to be Water Wise & Energy Efficient* programs statewide save enough Texas water to fill the the Houston Astrodome almost four and a half times over. An estimated 238 million gallons of water per month are saved by this youth education project that combines a curriculum teaching water efficiency and conservation with the distribution of high-quality plumbing equipment. And more schools adopt the program each year.

It all started in Fall 1991, when the Harris-Galveston Coastal Subsidence District, along with Texas Water Development Board and Harris County Municipal Utility District #55 funded a study," Effectiveness of Retrofit in Single Family Residences," to assess the cost-effectiveness of retrofit plumbing devices with respect to water and energy savings, to determine user satisfaction with the

High Plains Underground Water Conservation District Information/Education Director Carmon McCain shows discusses the Ogallala Aquifer and the need to conserve groundwater during the teacher/student orientation day at Friona Elementary School.

devices, and to provide useful information to other Texas utilities. The study was performed by Roger Durand of University of Houston-Clear Lake, The Subsidence District is a government entity that regulates groundwater pumpage along the Gulf Coast to control subsidence.



Carole Baker, public information director of the Harris-Galveston Coastal Subsidence District.

Study results indicated that installation of three retrofit devices--showerhead, kitchen aerator, and bathroom aerator--resulted in a monthly water savings of more than 1,400 gallons, or 18 percent of average water use.

The fundamental assumption underlying this program is that schoolchildren can effectively influence their families' water and energy use patterns. Students perform plumbing tests at home, then use the results in classroom activities.

The *Learning to be Water Wise & Energy Efficient* program fit right in with the District's desire for an aggressive water conservation project for grade school students, said Carole Baker, public information director for The Subsidence District and the driving force behind the program statewide.

In 1993, the Subsidence District introduced a pilot program involving 100 students at a Houston elementary school. Since then, the program has expanded almost logarithmically across the state, with more than 170,000 retrofits installed statewide as of May 1998, the end of the current school year.

A total of almost 100,000 schoolchildren in Galveston, Harris, and Fort Bend counties have received the kit, and their teachers have incorporated the curriculum into math, language, art, science and group dynamics exercises.

Cost of the kits, which at the time was about $28, was underwritten by more than 400 sponsors, including municipal utility districts, river authorities, municipalities, and private companies within The Subsidence District's jurisdiction.

The retrofit kits include low-flow faucet aerators, a showerhead, toilet tank dye tablets, toilet fill-cycle regulators, and water-savings calculation cards. New kits include *Living Wise: A Conservation Entertainment Experience*, an interactive

Information/Education Assistant Lynn Moseley, during the teacher/student orientation day at Friona Elementary School. The overhead shows Dennis the Menace and his dad backpacking in the woods. The cut line is "Does God Know He Left The Water Running?"

water conservation quiz and instructional tool framed in an entertaining package.

Three Texas entities introduced pilots in the 1997-98 school year: El Paso, Corpus Christi, and the High Plains Underground Water Conservation District No. 1 in Lubbock.

El Paso Water Utilities is the only Texas city to form a cooperative partnership with an electrical utility, El Paso Electric. About 600 sixth grade students received *Learning to be Energy Wise* kits with compact fluorescent bulbs, as well as the plumbing retrofit kits.

Students at Lubbock-Cooper Elementary School begin examining their Learning To Be Water Wise *kits.*

"The two schools chosen for introduction of the kits had student populations drawn from low income areas with high homeowner occupancy rates," said Anai Padilla, water conservation manager for El Paso Water Utilities. "This population was chosen because people were of an economic background such that they could not participate in other utility programs, such as toilet rebates, but they were homeowners."

A kickoff fair at each school introduced the kits. The low-flow and high-flow showerheads were hooked up side-by-side to allow tactile comparison of the flow. El Paso Electric brought a safety exhibit, including an eye-catching demonstration that emitted sparks, and a scale model of transmission lines.

To derive quantitative data for the El Paso School Board, one teacher collected the replaced showerheads, and Padilla's crew tested each to come up with an average flow rate for the replaced units. On average, the old showerheads used 4.25 gallon per minute (gpm), although some were as high as 10 gpm. The low-flow replacements use 2.5 gpm.

"Some science teachers already have an environmental unit on their curriculum. The *Learning to be Water Wise & Energy Efficient* program plugged right into it. Some teachers are into calculations, quantitative savings, others just into the environmental awareness component," Padilla said. "With this compartmentalized program, the teacher can select and expand the lessons to fit with their plans.

"It all depends upon the creativity of the teachers. These teachers, even with limitations, can make magic. If you provide the kit, they can do more magic," Padilla said.

In the High Plains Underground Water Conservation District's 15-county service area, a total of 850 fifth and sixth graders and their families are estimated to have saved more than 9 million gallons per year, or between 10,000 and 11,500 gallons per year per student, said Carmon McCain, public information director for the District.

During the summer months, science teachers statewide learn about the program in the Teaching Environmental Science courses offered by the Texas Natural Resource Conservation Commission (TRNCC).

"We show teachers how to motivate students to be conservation experts. Students learn, then bring the message home to parents, creating a mushrooming effect. It has been widely and happily received wherever we've placed it," said TNRCC's Eunice Hefty, director of this summer educational program. "Much of the information within the program is adaptable to any community."

The Learning to be Water Wise & Energy Efficient *kits include low-flow plumbing fixtures, toilet dye tablets and flow restrictors, and a student manual.*

"When we present the program, teachers want to know, `Can we do this school-wide?'" said Hefty.

The Teaching Environmental Science program is offered at 11 Texas universities in the summers. Call Hefty at (512) 239-0043.

In the drought-plagued Rio Grande Valley, the kit is making an entrance in several venues. In Weslaco, the Texas Agricultural Extension Service will work with Americorps volunteers to bring the Water Wise message to the homes to Rio Grande families. Baker, along with Hefty and Bill Hoffman of Texas Water Development Board, conducted a seminar for teachers in Edinburg.

Even the U.S. Environmental Protection Agency (EPA) may be getting into the act. After passing an initial screening process, The Harris-Galveston Coastal Subsidence District has been asked to send a formal proposal for EPA line item funding. If the proposal is approved, The Subsidence District will work in conjunction with McAllen Independent School District, according to Ken Williams of the regional wellhead protection program of EPA Region 6 in Dallas. Such endorsement helps to ensure continued funding on a federal level.

As with TNRCC, adaptability was a key issue. "Transferability was what appealed to the EPA about this program. What is important to the EPA is that we think this approach is transferable to other regions along the U.S.-Mexico border," Williams said. "We look at the *Water Wise* program in the context of increasing overall knowledge about water n the area. Schoolchildren take the knowledge home and share it with their families."

For more information, visit the Learning to be Water Wise & Energy Efficient *website at http://www.getwise.org, or call Christian Scheder at 1-888-GET-WISE.*

Austin is first h-axis volume purchaser

The City of Austin is the first partner in Pacific Northwest National Laboratories' volume purchase agreement for high-efficiency Gibson tumble action washers under the Energy Star Partnerships Program.

After city and manufacturer rebates, cost of the horizontal-axis clothes washers is as low as $299. Customers can expected to save between $40 and $70 per year on their utility bills.

The City of Austin is offering a rebate of $150 for customers with electrical water heaters and $100 for gas water heaters. Utility customers who take advantage of a volume clothes washer purchase by June 30 receive an additional $30. Two local vendors agreed to take delivery of truckload quantities of the clothes washers, and the City of Austin publicized the appliances and incentives in utility bills.

A manufacturer's rebate of $100 is valid until July 31. A total rebate of $280, therefore, brings the net cost to as little as $299. Retail cost is $579.

The high-efficiency horizontal-axis clothes washer uses between 50 and 60 percent less water per load than a vertical-axis machine. Clothes tumble through water in the bottom of a drum filled less than halfway with water, in contrast to the full tub required by top-loading machines.

The Energy Star Partnership is a Department of Energy initiative to pull advanced, highly efficient technologies into the marketplace. One method of such market transformation is the organization of volume purchases of energy-efficient new technologies, with the expressed purpose of effecting a significant increase in market share by making purchase of new technologies economical.

Under this Department of Energy initiative, Energy Star will broker the agreement between cities and suppliers, package financing and funding alternatives, assist with drafting the request for proposal and designing a promotional plan.

For more information, contact Tony Gregg at (512) 499-3557.

Austin offers rebate for home rainwater harvesting demo sites

In an effort to encourage the use of harvested rainwater for irrigation, the City of Austin is offering a rebate of up to $500 for demonstration sites at residential and commercial properties.

The city budget allocated $44,000 for a rainwater harvesting demonstration incentive program. All systems must be for non-potable uses only, and must adhere to local building codes. Various methods of rainwater harvesting will be evaluated on suitability, accessibility, esthetics, design, and potential water savings. Rebates are for 30 percent of the cost up to a maximum of $500. Projects should be scheduled for completion by September 30, 1998.

The goal of the incentive program is to provide educational sites that introduce the concept of on-site rainwater harvesting to Austin citizens. Participants agree that their systems must remain operational for five years. Further, they agree to record water collection and use for five years and to open the site for at least one of two proposed public tour dates before September 30, 1999.

The rebate application form contains a simplified calculation method for optimum tank size intended to reduce peak-day water use during dry summer months. Tanks should be designed to provide an estimated 20-year life span. Non-ultraviolet-resistant tanks must be enclosed.

For more information, contact Dick Peterson at (512) 499-3514.