Texas Water Savers
News of Water Conservation and Reuse in Texas

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From the editor

Biologist and pundit Barry Commoner said: (1) Everything is connected to everything else, and (2) There's no such thing as a free lunch.

The original observation applied broadly to the electrical power production, but the water reuse and conservation hand fits the Commoner glove just as snugly.

The quantity of water has remained virtually static, about 71 percent of the Blue Planet's surface, since the Earth was formed 4.5 million years ago. Schoolchildren thrill to imagine the water they drink could have been drunk by dinosaurs.

Scarcity is actually the problem of water needed being far from the water source. Movement of water from where it is abundant to where it is needed is the stock-in-trade of water resources management. Lubbock, for example, pumps its water 150 miles south from Lake Meredith.

The water infrastructure is capital- and labor-intensive--no free lunch. And when demand approaches the limit of conventional water supplies, nonconventional methods, such as desalinization, must be developed at a premium.

Water conservation is perhaps a misnomer: water is not "used up," but rather used and passed on. Wise water use will forestall, or even eliminate the need to resort to unconventional methods.

Industry has long suffered as the object of natural resource conservation movement scorn. But industry is ever more water-thrifty in terms of gallons of water per widget produced. Refinement of a barrel of oil, for example, requires 30 to 35 gallons of water, compared with 80 gallons 10 years ago. Industry even produces trivial amounts of water as a by-product--from combustion of hydrocarbons and electrolytically from water's two component elements.

And industry is the primary producer of treated wastewater. Already captured and heavily regulated, wastewater is the ideal commodity for irrigation, aquifer recharge, and nonpotable use ... and perhaps the key to living within the means of existing water supplies. After all, everything is connected to everything else.

Jan Gerston
Editor, *Texas Water Savers*

Plans avert water supply pinch

Leander, a community of 4,500 households in Williamson County about 20 miles northwest of Austin, suffered a dry spell in mid-July--about one-third of its customers were either without water or had very low water pressure for about three days. About 650 households boiled water because pressure problems can inhibit chlorine flow through the system.

The City of Cedar Park makes its watering schedule point--big time--with billboards. The city also informs customers about conservation with newsletters, school programs, warnings to homeowners; and xeriscape gardening classes.

The crisis was due primarily to the rupture of the pipe between Leander and its major water supplier, Chisholm Trail Special Utility District, complicated by the failure of the motor on a reserve well, a low supply of water, and excessive demand. Chisholm Trail SUD supplies about 60 percent of the city's water needs. The city responded to the water crisis with a mandatory seven-day watering schedule which allowed only 20 percent of the city's population to water each weekday, designated by home address. The conservation plan had teeth--violations were a Class C misdemeanor, punishable by a fine of up to $200.

According to Mayor Ken Craven, "barring hurricanes, the restrictions will continue until cool weather arrives. Citizens of Leander exhibited a high degree of awareness once the water shortage hit home," Craven said.

The City of Cedar Park stepped in to provide water to residents on the east side of the city. Cedar Park was able to lend a hand because of their own contingent interconnect with Austin. Cedar Park, in turn has an interconnect to Leander through the Block House Creek Municipal Utility District.

Leander's businesses were more than aware, taking a proactive stance. Throughout Leander, businesses willingly cut back on water use, said City Manager Brenda Wilson. Convenience markets limited themselves to essential uses. Schools adjusted athletic field

watering schedules to adhere to the conservation plan. The Diamond Shamrock Car Wash voluntarily closed operations sporadically over a two-week period in response to the water situation, according to Craven.

From time to time, trucks from Chisholm Trail Special Utility District would purchase gas at the Diamond Shamrock and tell the manager when water supplies were dangerously low. The carwash then took it upon itself to close the spigot for the day, according to the station manager. "People understood," he said.

The volunteer fire department even had contingency plans to use water from the city swimming pool and a well at the golf course in the event of an emergency.

Water utilities statewide have emplaced voluntary or mandatory water restrictions on their residential customers. The most stringent of these is illustrated by the El Paso County Water Authority. Although the guidelines are common, El Paso backs it up by ordinance with $50 to $200 fines against violators. El Paso's guidelines include:

1. Watering only three days per week, using an odd-even address schedule
2. Watering prohibited from 10 a.m. to 6 p.m. between April and September
3. Car washing is permiited only with a bucket or hand-held hose with a shut-off nozzle.
4. Bleeder lines for new evaporative coolers can be no larger than 1/8-inch in diameter.
5. Washing of sidewalks, driveways, and patios is prohibited.
6. High-volume customers--individuals or businesses using an average of 10,000 gallons or more per day--must submit a water conservation plan to the Water Authority.

In fact, the Texas Water Development Board requires cities, municipal water districts, water supply companies and water districts to sumbit three-tier conservation plans and emergency demand plans as a condition of receiving the loans, said J.D. Beffort, a planner with the Municipal/Industrial Water Conservation Unit of TWDB. More than 200 loan applications are on file with TWDB.

Utilities with voluntary or mandatory conservation plans include Brushy Creek Municipal Utility District, the City of Cedar Park, Jonestown Water Supply, the Cities of San Antonio and Austin, and Travis County Water Control and Improvement District. The most common water conservation measure is the odd-even landscape watering schedules.

Turfgrass is water-thrifty landscape element when watered according to its needs

"We have met the enemy and he is us."

Quoting satirical comic strip "Pogo," internationally recognized turfgrass scientist James Beard, of College Station, places the blame for turfgrass' "water hog" reputation squarely upon the irrigation practices of the caretaker, rather than the needs of the grass.

This "high water use" reputation is at the center of controversies about how much and where turfgrasses should be used in water-efficient landscapes. These controversies arise, in part, from our lack of ability to predict how much water turfgrasses, trees, shrubs, and flowers actually need in an urban landscape. From a research perspective, the urban landscape is a very complex system for heat and water vapor movement, physical processes that determine actual plant water use. Most research has been conducted on individual plants or large plots of grass isolated from influences of buildings, walls, or other landscape elements.

Most turfgrasses require 1 pound of nitrogen per 1000 square feet per year. Excessive fertilization incurs higher water needs.

What this means is that the position of that tree, shrub, or area of turfgrass in the landscape may be as important in determining water requirements as the choice of plant species or variety. For example, a shrub receiving reflected sunlight and heat radiated from a building wall may use twice as much water as that same shrub in a shaded location.

Many view the current interest by cities and homeowners as the "eliminate turfgrass" movement, although this need not be the case. For example, the Texas Agricultural Extension service's publication B-1584 on xeriscape suggests that turfgrasses be used as a planned element in the landscape. This same publication also stresses that efficient irrigation is a principal means to achieve landscape water conservation. The personal observations and research described in the following sections suggest that proper water management is critical to achieving a water-efficient landscape regardless of the plant materials used.

"Plants don't waste water, people do."

The adage, "Plants don't waste water, people do," is particularly applicable to turfgrass, according to Richard Duble, extension turfgrass specialist at Texas A&M University.

"By nature, grasses conserve water. Go back 100 years, observe which plants survived and thrived in 20 to 30 inches of annual rainfall, or even in areas that received less than 12 inches annually--grasses," Duble said. A drive across the virtually treeless Western plains drives the point home.

Duble even says, "If cities, such as San Antonio and Austin, want to limit water use, they should plant adapted grasses rather than trees and shrubs."

Across academia and the sod and turfgrass industry, experts and their peer-reviewed research speak in unison on one subject: grass irrigated in concert with its actual water-use requirements is not a water-waster. Of equal importance is the point that replacing turf with so-called water-thrifty plants may not conserve water in the long run. While this statement seems to contradict the Texas Water Development Board's report that lawns use four times as much water as the rest of the landscape, turfgrass experts maintain that it is not the plant that creates the water use, but rather the watering habits of individuals.

"It would be a mistake to replace grass with other plants with the intention of conserving water," notes Duble. Grass adapted to drought conditions, such as Bermuda, watered minimally, will thrive. We can go even further in water conservation with Buffalograss."

Buffalograss, a warm season and transition grass being researched for its exceptional drought-tolerant characteristics. In recent years there has been an upsurge of interest in improved Buffalograss as a low-maintenance turf for lawns, parks, golf course roughs and highway rights-of-way in semi-arid regions.

Grass need not be a water hog.

Emory Thomas, past president of the Texas Sod Producers Association, member of Texas Turfgrass Association and a sod turfgrass producer for 25 years explains that many misconceptions about turfgrass have arisen over the past six or seven years. These include the idea that St. Augustinegrass is one of the highest volume water users, and that Buffalograss is the most drought-tolerant.

At Texas Tech University in Lubbock, Richard Zartman and Cynthia McKenney tested the effects of reducing turf irrigation over a prolonged period on four grasses: one the "old standard" Bermuda (TexTurf 10 Bermudagrass) and three Buffalograsses.

They concluded that some irrigation is necessary for a good quality, aesthetically pleasing lawn of any type grass. "However, one should not use excessive quantities of added water." Zartman's offers this simple advice, "Grasses need not be waterhogs. The homeowner should just water enough to keep a decent stand of grass." Quantified, Zartman recommends irrigation in the amount of half the evapotranspiration, accounting for rainfall, to make up the difference. "The grass will really come out after the next rainfall." Evapotranspiration is the loss of water from the soil by evaporation and through the plant by transpiration. Evapotransporation rates vary according to turfgrass variety, soil, and climate conditions, and are available from county extension offices.

Recent studies by Texas A&M University turfgrass research associate Mark Hall also indicated that El Toro Zoysia, under minimum maintenance (no irrigation nor weed control and minimal fertilization) exhibited better density and crowded out weeds more effectively than Buffalograss. Turfgrass technology produces new varieties of turfgrasses in all species each year.

Texas Agricultural Extension Service (TAEX) suggests allowing drought-tolerant grasses, such as Buffalograss, Bermudagrass, Zoysia and St. Augustinegrass to go "off-color" during dry periods by reducing supplemental watering. Grasses will green-up again after the next rain or irrigation. According to the extension service, all grasses require a similar amount of water to maintain a lush, green appearance, but under water-stress conditions, adapted grasses exhibit better survivability.

Water grass only when water stress is evident

In a TAEX publication, "Landscape Water Conservation," Duble offers this rule of thumb, "The most important water conserving practice it to water only when grasses show symptoms of water stress." Water stress is indicated by curling or discoloration of the blade

To improve any grass' water-use performance, water infrequently but deeply to encourage longer, drought-surviving root systems. Frequent, shallow watering creates shallow roots that are prone to water-stress in times of drought or increased heat.

A landscape irrigation audit, such as the procedure developed by Texas A&M University, tailors turfgrass landscape irrigation by taking into account rainfall and turf water demand. At a college soccer field near Dallas, the irrigation audit projected an annual water savings of 2.44 million gallons for a projected cost savings of $7,320 for a playing field smaller than 3 acres.

Small seedlings grow into woody shrubs.

Zartman and McKenney found that while Bermudagrass prefers a moist topsoil, Buffalograss performs well under more limited irrigation by virtue of its root proliferation. Both required similar amounts of irrigation to maintain turf quality.

"I'm convinced that most of the water-savings attributed to so-called xeriscape landscapes is because most people are not familiar with many of these plants, so they accept the recommended low-water application rates. If the caretakers would water grass just when the plant needs it, they could save substantial amounts of water and still receive all the environmental improvement benefits that naturally come with grass," Thomas said.

Zartman concurs, saying, "Water use is all what the homeowner chooses to do. Water just enough to keep grass alive and to keep a decent stand." In fact, Zartman's research shows that full irrigation and half irrigation were judged to be equal in producing a quality turf.

Lost in the burgeoning popularity of xeriscape gardening, is the consideration of long-term water use through a plant's life expectancy.

Very little research has been done on water use over the life cycle of shrubs and trees, according to Dale Devitt, associate professor of horticulture at the University of Nevada, Las Vegas. When examining plant water use, a long-term perspective is crucial. Like a puppy with ominously big feet, a small water-sipping oleander sprig grows into a large, woody shrub.

Devitt performed studies on so-called low-water-use trees and shrubs in four desert locations. Publishing his findings in the peer-reviewed *Journal of Turfgrass Management,* Devitt found that just one oak tree required the same amount of irrigation as 1,800 square feet of low-nitrogen fertilized turfgrass. "The `desert' landscape approach emphasizes downsizing or eliminating turf and replacing it with so-called low-water-use trees and shrubs. The assumption is that [low-water-use] plants will use less water than the turf they replace; however, no consideration is given to the future use of water by large, mature woody plants."

In the end, it boils down to choice.

Devitt says that choosing from a list of low-water-use plant gives a "false sense of security."

"People think that if they select plants from this list, they will be assured of reducing landscape water use." What is more critical to water conservation, according to Devitt, is "irrigating in parallel with the plant's water requirements." Proper irrigation, not choice from a list, is the key to a water-thrifty landscape.

In Devitt's opinion, the most efficient way to a waterwise landscape is allocating a quantity of water for landscape maintenance, and allowing individuals to select a landscaping plan to use that allocation. "What we'll encourage then is a natural evolution of urban landscaping, rather than mandatory rules."

Cultural practices make a difference.

Fertilization also plays a major part in water use. "Generally, the more fertilizer applied the greater the water use by grasses. Turfgrasses need to be fertilized to keep them healthy and competitive with weeds, but excessive fertilization leads to high water requirements, wrote Duble in *Landscape Water Conservation,* a TAEX publication. TAEX guidelines are a minimum of one pound of nitrogen per 1000 square feet per year for most grasses; two pounds for Bermudagrass.

Mowing also affects water use also. Mowing height and frequency should be set to cut off no more than one-third the height of the grass., or at heights of at least 2-$^{1}/_{2}$ inches Taller grass develops a deeper root system and is better able to store water and shade the soil surface. Also, grass heals better when cut with a sharp blade. .

"Clippings left on the lawn return nutrients to the soil and act as a mulch.

Thatch should be avoided. "A significant amount of water may be required just to wet the thatch layer," writes Duble in *Water Management in Turfgrasses*, a paper presented in July to the Texas Turfgrass Association.

As much as 50 percent of water used for landscape irrigation is lost though runoff and evaporation. Common sense would dictate monitoring water amount and sprinkler trajectory to that water does not land or run off into the street. In addition, a sprinkler

emitting large droplets loses less water to evaporation that a finer spray, but may be more inclined to run off.

In the end, given a finite amount of water, the landscaper is presented a myriad of choices for a waterwise landscape, with proper maintenance and cultivation the greatest influences on water use.

Duble can be contacted at (409) 845-4826. Zartman's telephone number is (806) 742-1626. TAEX literature can be obtained from the Texas Agricultural Extension Service, Texas A&M University System, College Station, TX 78711-3231. For information on landscape irrigation auditing and the Landscape Irrigation Auditing Management course, contact David Smith at (409) 845-5614.

Refreshing urban fountains not wasteful

by Ric Jensen
Information Specialist, TWRI

Background

During the long, hot, humid "dog days" of the Texas summer, there are only a few places most of us want to be--inside an air-conditioned home or car, near on in a swimming pool, or next to the cooling mists and sprays of a large water fountain.

Children cavort in the interactive fountain in the City of Bryan's Tiffany Park. Water is captured in a reservoir beneath the fountain to be continually recycled through the fountain's spray jets

"To most people," says Fred Patterson, the Bryan architect who designed a new interactive water fountain at the City of Bryan Tiffany Park, "there are a lot of benefits to having ornamental or decorative water fountains in an area. They are often a place for peaceful reflection and contemplation, they add art to a town or city, they make a statement, and they become a symbol a community can identify with."

Throughout Texas, a number of cities and communities have designed large and unique water fountains. For example, the Water Gardens cover roughly a block near downtown

Fort Worth. They include a cascade pool, a water wall, a quiet water pool, an aerated water pool set 40 feet below ground level, and an active water pool. In Las Colinas near Irving, a statue of rampaging mustangs towers over a fountain that runs through the Williams Square office complex. One of the items that makes the biggest impression to visitors at Texas A&M University is the fountain in front of Rudder Tower in the middle of campus. Downtown Houston is graced by the modern, artistic, fountains at Tranquillity Park.

However, a larger question remains for many of us when we think of fountains. Is the large amount of water that we see churning, bubbling and spouting being used wisely or is it being wasted? How much water could we provide to other uses and users if the fountains weren't there? These questions become especially meaningful to those of us who are struggling to constantly save water by limiting the amount we use on our landscapes, by taking shorter showers, and by washing our cars less often.

Bill Hoffman, who administers the water conservation programs for the Texas Water Development Board, says that, in general, water fountains are relatively water efficient. "Most, if not all, modern water fountains are designed to recycle water over and over again. This means that even though you may see a large amount of water running through a fountain or a water garden, the amount of `new' water a fountain actually uses is generally quite small. The main water use occurs when water has to be supplied to replace losses due to evaporation, but we aren't really sure of how significant those losses are."

Hoffman added that he believes that fountains can be an efficient part of a city's water budget, as long as a few key factors are taken into consideration. "First, make sure that your fountain recirculates and reuses water. Then, check regularly to see that the individual components of the fountain are working properly. Most fountains have a float or water level controller. If that's malfunctioning, it's much the same thing as a broken float valve in a toilet.Third, conduct periodic checkups to look for leaks and cracks. Fourth, fountains that are most water efficient are those that do not send large amounts of spray into the air and display minimal surface areas--both these factors can lessen evaporative losses." Hoffman also recommends that water use at fountains be metered so that utility managers will know exactly how much water is actually being used. In cases where city departments other than the water utility manage the fountains, it may make some sense to bill them for water use. In some cases, Texas water suppliers are already planning to restrict water use by fountains when drought management plans have to be implemented.

An Innovative Fountain in Bryan

An example of how water fountains can be water-smart and meet multiple needs is a new structure built at the City of Bryan Tiffany Park in Bryan near Bowen Elementary School.

In this case, the fountain is shaped like a star. It is surrounded by six distinct landscape areas that represent trees, flowers, and shrubs found in different ecoregions of Texas.

The unique thing about this fountain is that it's meant to be interactive," Patterson says. "We designed it to make it easy for children to play and get wet in. We also wanted to make it water-efficient without necessarily showing the free-standing water above the ground surface. This fountain is a plus for the neighborhood and for the school in many ways."

Large jets spray the most water in the middle of the fountain, while less water spurts up toward the perimeter. Grates located near each jet allow water to be collected into a hidden star-shaped storage reservoir located beneath the surface. Water-level controllers pump more water when evaporative losses become significant and provide drainage when too much builds up after a storm. The water is treated by an automated system that injects chlorine and other chemicals for disinfection. Because the water is reused, signs are posted noting the water is "reclaimed." During the school year, water use in the fountain will be cycled so it is off when children are going to and from school. Otherwise, water will flow throughout most of the day.

For details, call Hoffman at (512) 463-7932.

TWDB offers training for institutional water saving

Although institutional, commercial and industrial customers are responsible for about half of Texas' nonagricultural water use, traditional water conservation programs have historically been aimed at residential users.

But the conservation staff of the Texas Water Development Board (TWDB) has focused efforts on the nonresidential water sector for the past 18 months. This effort was funded in part by the Governor's Office of Energy.

Water utilities, school maintenance personnel, hotels and even a zoo have benefited from the one-hour presentations, one-day workshops, and five-day intensive training courses.

Over 30 municipal utilities have benefited from one-day workshops and a five-day intensive analyst training. The five-day analyst training covered water use by cooling towers, plumbing fixtures. and landscapes. Participants learn to conduct of a water-use review--allocating how water is used on site, identifying areas for increased efficiency, and potential water and energy savings.

In conjunction with the Texas Association of School Administrator's maintenance and operations training around the state, the TWDB staff has presented 13 hour-long seminars on the need for water conservation. In addition, two one-day workshops were sponsored for school district energy and facility managers on analysis of water use, allocation of water, and opportunities for greater water use efficiency and savings.

In response to the dry weather in the Rio Grande Valley of south Texas, a one-day workshop was held for the large water users. Representatives from utilities, school districts, hotels, an industrial laundry, city government, housing authorities, and even a zoo attended.

TWDB hopes to conduct additional institutional workshops for the Texas Apartment Association and state facilities, including the Texas Department of Mental Health and Mental Retardation. Most recently, three workshops cosponsored by TWDB, the San Antonio Water System, and the Edwards Underground Water District targeted water use by hotels, hospitals, and schools in the San Antonio area.

The training programs are already showing results. From the five-day analyst training program, potential savings identified by the first three walk-through draft reports are in the range of 6 to 7 million gallon annually. Total identified possible savings from all walk-through will be even higher. In a case with a known two-year history, the Houston Independent School District (HISD) showed a cumulative savings of over $600,000 since 1993 for expenditures of under $50,000.

TWDB also cosponsored an Industrial Water Conservation and Reuse Conference with the Texas Chemical Council, Texas Natural Resource Conservation Commission, and the Environmental Solutions Program at the University of Texas at Austin which provided a format for large users, regulators, and researchers to discuss and plan how greater water use efficiency can be achieved in Texas. (See related article, page 7.)

A brochure, "Money Down the Drain: A Water Conservation Guide for Business and Commercial Operations" is available from the Board to assist utilities and their larger users in conducting water management programs and reviewing water use at their sites. A guide is also being prepared to assist utilities in establishing programs for their commercial and institutional customers.

For additional information about institutional, commercial and industrial programs, water use reviews, and other technical assistance contact John T. Sutton, TWDB, (512)463-7988.

USBR Awards Subsidence Dist.

The U.S. Bureau of Reclamation gave the 1995 Water Conservation Award in the Educational Mentor category to the Harris-Galveston Coastal Subsidence District.

From among 45 entries, The Subsidence District was recognized for its innovative water conservation partnership with public and private water suppliers to bring to fifth graders the message of water conservation. "The program combines an educational curriculum that teaches how to consume less water and energy by combining high-efficiency plumbing equipment and new water-smart habits, " said Carole Baker, Director of Public Information for the Subsidence District.

The "Learning to be Water Wise & Energy Efficient" youth education program combines a water and energy conservation curriculum with a home conservation kit. The curriculum conveys the conservation message via 10 lessons with hands-on activities. A major component of the program, the conservation kit, brought the message home, literally.

The kit contains a high-efficiency shower head, bathroom and kitchen faucet aerators, and water monitoring devices. Parents and students sign a letter of commitment before receiving the water kit. Sponsors for the retrofit kits are local water districts and water authorities, municipalities, and private industry. Students also bring home the message of altering water-wasteful habits, influencing parents and siblings.

Clark Elementary School fifth graders figure the amount of water sent down the drain as part of the Harris-Galveston Coastal Subsidence District's "Learning to be Water Wise and Energy Efficient" youth education project. Their teacher is Wendy Orr. The pilot project was a partnership between the district and water and energy utilities. Each student took home a conservation kit with a high-efficiency shower head, bathroom and kitchen aerators, and other water-saving devices. The program, which won this year's U.S. Bureau of Reclamation 1995 Water Conservation Award in the Educational Mentor category, has saved more than 400,000,000 gallons to date.

In the Fall of 1991, the Subsidence District funded a study by Roger Durand of University of Houston--Clear Lake titled "Effectiveness of Retrofit in Single Family Residences and Multi-Family Projects." He found that installation of these three retrofit devices achieved average monthly water savings of 1400 gallons. In telephone surveys 97 percent of respondents indicated they were "very satisfied" with all three water-conserving devices.

The program was offered to 55,000 fifth-grade students in Harris, Galveston, and Fort Bend Counties during the past academic year. "The fundamental assumption underlying this program is that schoolchildren can influence their parents' water and energy use patterns quickly and effectively," said Baker.

The curriculum is broken down into ten lessons, incorporating math, language, and group dynamics skills and optional art activities. "Shower Flow: Friend or Foe," for example, uses a shower flow test bag to help figure the amount of water flowing from a shower in a fixed amount of time. In "The Great Grass-Growing Activity," students use a lawn watering gauge to measure the rate of flow and length of time to effectively water a lawn.

The Subsidence District is a state entity charged with planning the reduction of ground water withdrawals to control subsidence in the Harris and Galveston County areas. Subsidence is so severe a problem that in recent history, two neighborhoods had to be abandoned when they were permanently flooded as a result of subsidence.

Reduction of ground water pumpage is effected through a combination of conservation and conversion to surface water use. The first option, however, is preferable, because development of surface water supplies and infrastructure is an expensive, long-term proposition.

In addition to the long-term effect on positive water use habits of students and their families, "Learning to be Water Wise & Energy Efficient" is an educational program that shows immediate, tangible benefits in the reduction of ground water pumpage. Combined with the students' awareness of water use habits, the program figures to make a significant impact on water use in the District. In fact, Baker estimates that in the next five years, the program in the fifth-grade-level students' homes will conserve 4.5 billion gallons of ground water. Current water savings attributable to the program are 365 million gallons annually.

Industrial reps cull out major water issues

About 45 representatives of public agencies and industry got down to the nitty-gritty about industrial water conservation and reuse in Austin last month.

Earl Beaver of Monsunto, St. Louis makes a point regarding obstacles faced by industry when implementing water conservation measures. Beaver was one of 35 participants from industry and government in the Industrial Water Conservation and Reuse Conference at the University of Texas on July 25, 1995.

In two concurrent break-out sessions, participants culled from a storm of ideas the eight most important industrial water conservation issues facing Texas, how solutions can be accomplished, and who will address each problem.

Bill Hoffman, chief of the Municipal/Industrial Water Conservation Unit of the Texas Water Development Board, emphasized the importance of taking the long-range view. "The next major water infrastructure will be costly to develop," said Hoffman. "The best dam sites for surface water have already been built," Hoffman said. "And groundwater is already fully developed or even suffering from overpumpage in some areas."

One break-out group explored research, information, education issues and questions. Refining ideas and eliminating redundancy, moderator Vincent Torres, manager of the Environmental Solutions Program at the University of Texas, led the group to consensus on four issues:

1. Educating and making the stakeholders more aware of the true science, economics, and real risks of alternatives and decisions related to water-use efficiency.

To effect a solution, a task force comprising industry, TWDB, and Texas Natural Resource Conservation Commission representatives will compile a database and determine the most effective means to communicate the real factors related to water-use efficiency.

2. How do industrial users respond to changes in full-cost accounting of water?

   Full-cost accounting considers factors other than the upfront cost of purchase of water or disposal of wastewater. Other factors include location, infrastructure and community issues. This method would measure water savings adjusted for output, or "bang for the buck."

   Organizations involved will be the TWDB, Texas Water Resources Institute, Environmental Solutions Program, University of North Texas, Koch Refining, TNRCC, and the City of Austin.

3. Development of a process for establishing water efficiency programs based on documented successes and failures.

   There is a great deal of interest in implementing successful water conservation programs, but no comprehensive source of information exists today. The task force will create a database of successful-and unsuccessful-programs. From this information, industry can tailor processes and establish successful programs based upon proven examples. The group addressing issue 1 above will also tackle this topic.

4. What are the organizational issues for water reuse?

   Eliminating organizational or regulatory barriers to "cross-fence" use is the focus of this issue. The task force addressing item 2, above, will double up on this issue.

The break-out session moderated by Becky Cobos of the City of Austin Water and Wastewater, addressed regulation, incentives, and policies.

1. Hazardous waste rules discourage water reuse within a facility.

   The State of Texas and the Texas Chemical Council should take primary positions, in concert with the federal Environmental Protection Agency. In addition, in response to a solicitation from the federal government, TWDB and other organizations will submit opinions and proposed solutions.

2. Water rights.

   Water rights holders, educated about water conservation, can aid conservation efforts through formal and informal agreements. Also, because water rights are

covered by administrative code, policy makers should separate water conservation from water rights in the regulatory process.

3. To establish incentives for water reuse.

   State and federal tax incentives, possibly tied to federal water policy (such as the Clean Water Act), may boost the attractiveness of water reuse to industry. At the state level, staff can develop policies and provide support for education and public recognition of the problem.

4. The effect of conservation on discharge permit limits.

   Addressing in-stream water quality protection, allowing for flexibility in applications of rules, and calculation of mass limit based on nonconservation flow are issues to be addressed by the EPA and TNRCC.

The keynote speech of Dan Wittliff, TNRCC Chief Engineer, focused on the dependence of the continued economic growth in Texas upon the availability of water. Wittliff cited a 1980 study that revealed the most critical resource in Texas was not minerals, not energy, but water. "Water separates haves from have nots," he said. "That's intuitive in West Texas. Eventually water will become an issue in East Texas, too."

Wittliff noted that the public is sometimes suspicious of industry as being part of the water problem, not part of the solution. "Except in West Texas," he quipped, "where they're just glad to have company.

"Industry cannot do anything without the support of the community," said University of North Texas economist Michael Niewsiadomy. "If the community believes industry is causing a problem, then it is a problem."

Task forces formed during the break-out groups will deal with the problems of public education and of regulations that permit an accommodation of industry, while adhering to the rule of causing no harm to neighbors.

"We need to study the true science, true economics, and true risks of water use," said Earl Beaver of Monsanto.

To solve problems, creative solutions must be appropriate to the region and must address the natural diversity of Texas. In other words, one size doesn't fit all.

For more information about the conference, contact John Sutton of the Texas Water Development Board, (512) 463-7988.