

The Abbreviated  
Water Conservation  
Working Handbook

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## I N T R O D U C T I O N

*The following pages comprise an abbreviated version of the more comprehensive Water Conservation Working Handbook. Used by Water Conservation Task Force Committees throughout the Edwards Underground Water District, the complete Working Handbook promotes the development and use of new technologies and practices that improve water use efficiency.*

*It is our hope that area residents will find the water conservation measures highlighted in this booklet both informative and useful. For a copy of the unabridged Water Conservation Working Handbook or for more information, please call the Edwards Underground Water District at 512-222-2204.*

WATER RATE STRUCTURES/GUIDELINES FOR NEW CONSTRUCTION  
XERISCAPE/RETROFIT OF EXISTING STRUCTURES  
LEAK DETECTION/WATER REUSE AND RECYCLING

PUBLIC AWARENESS AND EDUCATION/IMPLEMENTATION OF WATER CONSERVATION POLICIES AND PLANS

## WATER RATE STRUCTURES

Water resource management includes the enactment of a water pricing policy as a mechanism for water conservation, particularly during high use periods. A conservation-oriented pricing structure can provide an economic incentive both for the use of water-saving technologies and for the modification of water use habits. Included below are the most common pricing methods in use.

**Traditional rate forms** are based on average past costs of water use and include:

**fixed rate**—Customers are charged the same dollar amount per period, regardless of the quantity consumed. Used in areas where water use is not metered, fixed rates tend to encourage use.

**uniform rate**—The same rate per unit is paid by all utility customers, regardless of user class. Because the cost of providing water varies by user, over time uniform rates may subsidize some customers and penalize others.

**declining block rate**—This rate structure consists of a schedule of fixed charges per unit of consumption which decreases as the level of consumption increases. By signaling to the user that on a per gallon basis, the more water they use, the less the water costs, this rate form discourages water conservation.

**Conservation-oriented rate forms** are derived from average incremental costs associated with each service component and customer class and include:

**seasonal rate**—Usually across-the-board higher rates are imposed during the summer months, when demand increases due to outdoor water use. This rate structure can provide an inducement to conserve but may also unnecessarily penalize low demand users.

**excess use rate**—Uniform rates are charged for a base amount of water. This water use represents normal indoor water use and is usually established according to each customer's average consumption for the winter quarter. A higher rate is charged for consumption in excess of a percentage of this base. An excess use fee charged during the summer presents a clear economic signal to reduce outdoor water use during peak demand periods.

**increasing block rate**—Unit rates increase as use increases. This type of rate form varies from a summer one-step block (similar to an excess use charge) to multiple blocks. The method creates a rather obvious economic incentive for customers to reduce water use.

## GUIDELINES FOR NEW CONSTRUCTION

There is need for cities and communities to adopt water-conserving plumbing codes for new homes and public facilities. These codes have the positive effect of reducing interior water use and reducing the load on wastewater facilities. Many cities throughout the United States have adopted standard plumbing codes and others have adopted or are considering advanced plumbing codes.

**Example of Standard Plumbing Code for newly constructed homes and public facilities** (supported by the Uniform Plumbing Code, Southern Building Codes Congress and The Building Officials and Code Administrators):

- |                             |                             |
|-----------------------------|-----------------------------|
| ■ Tank-type water closets   | 3.5 gallons/flush or less   |
| ■ Flush-valve water closets | 3.0 gallons/flush or less   |
| ■ Tank-type urinals         | 3.0 gallons/flush or less   |
| ■ Flush-valve urinals       | 1.0 gallon/flush or less    |
| ■ Showerheads               | 3.0 gallons/minute or less  |
| ■ Kitchen/lavatory faucets  | 2.75 gallons/minute or less |

### **Texas Water Development Board plumbing standards:**

- Lavatory outlet devices limiting flow of hot water to a maximum of 0.5 gallons/minute or less
- Lavatory outlet devices limiting outlet temperature to a maximum of 110°F
- Automatic dishwashers using 10 gallons/load or less
- Recirculation equipment for swimming pools
- Insulation of all exposed hot water delivery pipes

An **Advanced Plumbing Code** incorporates a 1.6 gallons/flush or less toilet, resulting in an even more substantial daily water savings.

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## XERISCAPE

As much as 40% of summer water use is applied to outdoor landscapes. By using low-water-use plants and more careful irrigation practices (xeriscape) this percentage could be greatly reduced. A large reduction in future landscape water demands could be achieved if the landscapes of all new homes and businesses were low-water-using. Additional savings could come from the phased conversion of existing landscapes.

A landscape water conservation program can provide incentives for low-water-using landscapes in new developments, help persuade people to convert to low-water-using landscaping and encourage everyone to water landscapes more carefully.

### Xeriscape Program Options

**demonstration gardens**—A popular method of promoting xeriscaping, demonstration gardens are usually planted on public property or around model homes. These gardens typically demonstrate a variety of types of attractive low-water-using plants and other water-saving techniques, such as proper irrigation and mulching.

**awards programs**—Well-publicized awards can be given for a variety of categories, such as "Outstanding Home Landscape" or "Outstanding Commercial Landscape." To qualify, xeriscape standards would need to be set as a guideline for all those wishing to enter their landscapes in the contest. Awards can be simple, creative

and inexpensive. Publicity through local radio, television and newspapers will encourage more entries. This type of program is best when announced early in the spring before individuals plant their landscapes.

**ordinances**—Ordinances could pertain to any of all of the features of xeriscape:

- low-water-using plants
- turf only on active-use areas
- preservation of existing trees and shrubs
- mulching of non-turf areas
- efficient irrigation system
- runoff minimization

**public education**—Both the general public and governmental entities need to be educated on what xeriscape is, its benefits and the need for everyone to incorporate xeriscape principles into their landscapes. This education can be accomplished by distributing brochures, sponsoring radio and television spots and, best of all, promoting a xeriscape demonstration garden. Additionally, a public information campaign can give a demonstration garden a high amount of publicity from start to finish, continuing with an on-going education program using your demonstration garden to its fullest.

## RETROFIT OF EXISTING STRUCTURES

### Water-Conserving Retrofit Devices

To reduce water demand, water utilities nationwide have undertaken programs to modify or retrofit showers and toilets in existing residential and commercial structures. When retrofit programs are put into place within a city, it is possible to save 8% of average water use inside a single-family unit, 20% in multi-family, 23% in schools and up to 62% in college dormitories. These findings are substantial and can be achieved through an active retrofit program.

Application	Device	Function	Water Savings	Estimated Unit Water Savings gpcd	Estimated Cost \$	Service Life Years
Toilet	Two displacement bottles	Reduces flush volume	0.5 gal/flush	2.3	0-0.20	5
Toilet	Water closet dam	Reduces flush volume	1.0 gal/flush	4.5	1.50-3.00	5
Toilet	Dual-flush	Variable-flush volume	3.5 gal/flush	15.7	15.00	15
Shower	Flow restrictor	Limits flow to 3 gpm	1.5 gpm	6.7	0.50	5
Shower	Reduce-flow shower head	Limits flow to 3 gpm	1.5 gpm	6.7	3.00-20.00	15
Shower	Reduce-flow shower head with cut-off valve	Limits flow to 2.5 gpm	2 gpm	8.0	5.00-20.00	15
Shower	Cut-off valve	Facilitates "navy shower"	—	—	2.50-5.00	15
Faucets	Aerator	Reduces splashing, enhances flow aesthetics, creates appearance of greater flow	—	0.5	0.50-2.00	15
Hot water pipes	Insulation	Reduces warm-up time	—	0.5	0.50/ft	25
Water hook-up	Pressure-reducing valve	Reduces available water pressure at fixtures and, hence, flow rate	—	3.0	85.00	25

gpcd = gallons per capita per day; gpm = gallons per minute

### XERISCAPE/RETROFIT OF EXISTING STRUCTURES

### LEAK DETECTION/WATER REUSE AND RECYCLING

### PUBLIC AWARENESS AND EDUCATION/IMPLEMENTATION OF WATER CONSERVATION POLICIES AND PLANS



## LEAK DETECTION

Every water system loses water due to leakage. The amount lost varies from system to system. Although constructing a completely leak-free system would be impractical, the losses from many systems can be reduced significantly. Many leaks are easy to find. They surface as damp areas or puddles over water mains or cause visible damage such as collapsing a section of street. A large number of leaks, however, are not so easy to locate and repair. Many leaks soak into the ground or become lost to the system in a variety of other ways. Leak detection programs help to reduce the percent of water lost and save substantial amounts of money for a utility.

### How to Conduct a Leak Detection Program

Leak detection can range from a one-time effort to a continuous survey conducted by a full-time staff. The choice of what program to use will depend on the possible extent of the leakage problem and the resources available to conduct the program.

The most common method for detecting leaks is by listening for them. Water leaving a pipe under pressure makes a hissing sound

which can be heard through the use of special listening equipment. This equipment varies in price and accuracy. Accuracy can become very important when digging up streets in order to locate the leak in order that it may be repaired.

**full-time coverage**—This program involves a full-time crew to cover the entire system. A leak detection crew systematically covers each main on a set schedule and covers the entire service area once every one to three years. Suspected leaks are identified by a mark on the pavement and a repair order is prepared. This program works best on larger water supply systems. Smaller systems usually can be covered by a periodic coverage program.

**periodic coverage**—This program consists of a survey of the entire system on a periodic basis. It works best on a small system where full-time coverage cannot be justified. In this program the agency or city uses the services of a consultant or expertise of another agency to perform the same type of survey as was described in the full-time coverage program, but the service is not full-time.

## WATER REUSE AND RECYCLING

### Definitions

**wastewater reclamation**—the treatment or processing of wastewater to make it reusable.

**water reuse**—the use of processed wastewater for a variety of applications. Water reuse implies the existence of a pipe or other conveyance facilities, including pumping for delivering the reclaimed water.

**wastewater recycling**—capturing and redirecting the effluent back into the use scheme.

### Categories of Reclaimed Water

**agricultural reuse**—Water used for agricultural purposes is, primarily, for crop irrigation. The state of Texas requires reclaimed water to be, at a minimum, a disinfected secondary effluent. Such water cannot be used for irrigation of food chain crops or crops used for dairy cattle food. The major advantage of using reclaimed water for agricultural purposes is the degree of treatment required. Although agricultural reuse is a form of wastewater effluent disposal, it has little effect on reducing a city or community's water supply dependency.

**nonpotable urban reuse**—Alternatives for reuse in the category of nonpotable urban reuse include landscape irrigation of parks, golf courses and cemeteries, makeup water for recreational ponds and dual water distribution. A dual distribution system provides a potable supply system for residential drinking, cooking and bathing and a nonpotable system of reclaimed water for use in residential lawn watering and toilet flushing. The dual distribution system is not usually economically feasible, but in the future, such systems may be used nationwide.

**industrial recycling**—Reclaimed water can be used by industries for cooling tower makeup, boiler feed water or as process water. Water quality requirements depend on the industry and its specific use. In general, advanced treatment that includes softening, filtration and phosphorous removal is required to provide the necessary water quality.

**indirect potable reuse**—Indirect potable reuse uses reclaimed water to either recharge groundwater systems or blend with raw water in a reservoir for use as a potable supply. The Texas Department of Health requires treatment for potable quality before groundwater injection. Following years of underground flow, the water can be extracted for potable use. Groundwater recharge and recovery is currently performed in Texas.



## PUBLIC AWARENESS AND EDUCATION

### Elements of a Public Awareness Program

**newspapers, newsletters**—Agencies should develop good relations with the local newspapers, learn the papers' special areas of interest and become acquainted with the reporters assigned to water stories in the area. Many agencies have their own newsletters or bulletins which are good methods to disseminate information on current activities in the area of water conservation.

**TV and radio PSA's**—TV and radio stations are often required to provide free public service programming to the community which they serve. Local agencies, water purveyors, etc., can prepare public service announcements (PSA's) to help the station fulfill its requirement.

**utility bill inserts**—Organizations that use envelopes to mail their bills often promote water conservation through the use of small notices included in the bill. Water agencies that use a postcard for billing can have a water conservation message printed on the postcard.

**brochures**—Usually a brochure includes the reasons for implementing a conservation program, why something should be done, how to do it, what the benefits will be and where to get more information on the program.

**public speaking**—Presentations and speeches to local civic groups and others can help promote water conservation programs.

**xeriscape demonstration gardens**—Xeriscape demonstration gardens can be a useful tool in educating the residents of your community on the principles and practices of installing and maintaining a low-water-demanding landscape.

### Public Education Methods

**films and tapes**—Many films and VHS-tapes on water conservation are available for use in the classroom. These materials are developed specifically for certain grade levels and are an excellent way to educate our school children not only on water conservation but generally about the Edwards Aquifer.

**written materials**—A successful water conservation education program requires effective written materials. Many educational materials on water conservation are available and are of high quality. Most of these do not deal specifically with water conservation, but the importance of water in our lives, which is the basis for water conservation.

**classroom presentations**—Many times the distribution of printed materials and/or the showing of water conservation-related films can be augmented with a presentation or discussion on water conservation.

**field trips or tours**—Similar to the classroom presentation, a field trip or tour of a water treatment plant, dam or other water-related facility can be an excellent way to augment an educational program.

## IMPLEMENTATION OF WATER CONSERVATION POLICIES AND PLANS

Many cities, water utilities and water districts in Texas have instituted or will soon be instituting water conservation plans and programs. The effectiveness of these programs often depends upon the ability of the city, utility or district to establish and enforce water conservation measures. This has become even more important since many cities, utilities and districts that apply for financial assistance to the Texas Water Development Board (TWDB) for the construction of water storage, water supply or wastewater facilities will be required to implement water conservation and drought contingency programs before TWDB loan funds can be released.

All cities, water utilities and water districts in Texas that sell and distribute water have the ability to adopt non-regulatory water conservation measures, such as (1) education and information programs, (2) a leak detection program and (3) recycle/reuse programs. However, the ability of cities, water utilities and water districts to require and enforce regulatory measures, such as (1) water-saving plumbing codes, including universal metering and mandatory plumbing fixture retrofit programs, (2) water-saving landscaping requirements, (3) water conservation-oriented rate structures and (4) drought contingency regulations, is dependent upon the authority conferred upon them by the Texas Legislature or the Texas Constitution.

General law and home rule cities have the broadest enforcement authority. They may enforce water conservation regulations in the same manner as with other ordinances and regulations, including issuing citations and making arrests.

Most water districts have the authority to employ or deputize peace officers to enforce state laws and district regulations within the jurisdiction of the district, including issuing citations and making arrests. Water districts with the above authority may impose a maximum fine of \$200, or 30 days in jail, or both, for each violation of district regulations, with the exception of a Water Improvement District, which may impose a \$100 fine, or 30 days in jail, or both.

Water utilities and some water districts, such as Underground Water Conservation Districts, are more restricted in their authority to enforce regulations. They are limited to court injunction and must file suit in a court of law to force mandatory compliance with municipal and residential water conservation regulations. All other cities, water utilities and water districts have the court of law option available in addition to other enforcement capabilities.

In addition, all cities, water utilities and water districts have the authority to include water conservation measures in their water supply contracts and, thus, enforce the provisions through termination of water service.