

# Introduction



## **SUMMARY:**

- *Defines water conservation*
- *Defines water use efficiency, demand management and water conservation measures*
- *Distinguishes between conservation and curtailment*
- *Distinguishes between long-term conservation and short-term emergency management*
- *Discusses reasons for conserving, from a variety of perspectives*

## **WHAT IS WATER CONSERVATION?**

**G**rowing population, environmental concern, climate change, periodic droughts, and economic considerations all indicate the need for wise stewardship of finite freshwater resources. Water conservation is one tool that can be used effectively to meet challenging constraints and opportunities.

The reasons for conserving water and the ways to accomplish conservation will differ for water utilities, depending on geography, number of customers, rate of population growth, growth in water demand, and other factors. Not all options are appropriate for all situations, and utilities can choose the type and extent of measures that best fit their requirements.

Water conservation can be described as “any beneficial reduction in water use or in water losses” (American Public Works Association 1981). Ways to achieve water conservation include

- Technical measures (such as water-saving fixtures, efficient irrigation systems, and reduction of water losses in the system)
- Process or use changes (such as more efficient industrial processes, water reuse, and low water-use landscaping)
- Regulatory action
- Metering and pricing policies

- Public education to help people change behaviors to use less water without impacting life styles.

Water efficiency or water use efficiency refers to the accomplishment of a function, task, process, or result with the minimal amount of water feasible. It is also an indicator of the relationships between the amount of water needed for a specific purpose and the amount of water used, occupied or delivered (Vickers 2001). Water efficiency is a tool of water conservation that reduces water demand without changing the quality of the use.

The term *demand management* allows a contrast with supply-side management and source development. Demand management emphasizes the quantifying of results at the level of master meter reads for system-wide flows or at the customer billing level.

Conservation should be distinguished from *curtailment*, which means mandatory reduction in water use. Curtailment is only necessary during drought or emergency situations and requires measures that can achieve immediate results. Water conservation in contrast allows reduction in use without changing the level of customer service.

A water conservation *measure* is an action, behavioral change, device, technology, or improved design or process implemented to reduce water loss, waste, or use. Note that the value and cost-effectiveness of a water efficiency measure also involves its effects on the use and cost of other natural resources (for example, energy and/or chemicals) (Vickers 2001).

Conservation can be used to reduce both annual average demand and monthly, daily, or hourly peak demand. Peak and average demand have different effects on the need for capital facilities. Reducing average demand principally affects raw water storage requirements. Reducing peak demand reduces the costs for new treatment, conveyance, and distribution and can save millions of dollars by delaying or eliminating the need for additional reservoirs, wells, or treatment facilities.

Changes in indoor plumbing fixtures can reduce average demand, but will have little effect on summer peak demand. However, implementing seasonal pricing and low water-use landscaping can help reduce summer peak demand.

## WHY SHOULD UTILITIES EMPHASIZE WATER CONSERVATION?

The utilities that have put the most effort into water conservation to date are in arid regions and other areas where there are severe supply limitations. Benjamin Franklin's statement, "When the well runs dry, we know the worth of water" has unfortunately been proven true. Out of necessity, these utilities have worked toward technological advances, often accompanied by regulatory (legislative) mandates.

As a current example of water conservation through necessity, the San Antonio Water System (SAWS) must buy additional water at prohibitive costs from a neighboring utility with prior rights. The utility has found its investment in toilet replacements and other conservation retrofits to be the most cost-effective way to produce "new" water. The City of Santa Fe, New Mexico, had developers seeking permits but no additional water capacity, so these developers had to "find" water by retrofitting

older homes and buildings. The term *capacity buy back* has been coined for this process and is being widely used in Canada (Gauley 2002).

In fact, the results of these forced efforts demonstrate that water conservation is a cost-effective means of providing additional water. “The cheapest water you will ever find is the water you already have in your system,” is a maxim of the water conservation community.

## Water Utility Perspective

Decreasing demand and increasing system-operating efficiencies can have numerous benefits to utilities, including

- Decreasing reliance on development of new sources to meet demand, important because high-quality surface and groundwater supplies are becoming harder to find at reasonable costs. Debt service for new sources can be postponed.
- Downsizing or delaying capital facilities for new water supply, transmission, storage, and treatment.
- Reducing operation and maintenance costs that depend on demand (pumping and chemical costs, for example), providing public health and economic benefits.
- Reducing energy costs of operation and reducing resulting carbon emissions.
- Addressing community values and expectations by developing and implementing conservation measures that make sense for the local area. The general public is becoming increasingly aware of the need to use natural resources wisely.
- Improving supply reliability, which can reduce frequency and duration of water use curtailment in droughts.
- Providing confidence to the public by improving their perception that the utility is taking all possible steps before major expansions and incurring more costs.
- Demonstrating water-use efficiency to regulatory agencies.
- Relying on conservation measures instead of developing new supplies may also have a few disadvantages for the utility if not properly addressed in advance:
- Conserving water can reduce revenues through reduced water sales, unless sufficient advance planning has been done and rate structures revised to be revenue neutral. When designing future rates, utilities should take into account projected lower revenues, the costs of the conservation program, and cost savings resulting from lower operating costs and deferred capital facilities. Information on customer response to rate changes and other conservation measures, based mostly on income level, is available for some areas and can guide a utility in designing rates that maintain stable revenues and assign proportionate costs to high water users (Chapter 3, Pricing).
- In some locations, especially in the western United States, conservation could threaten the “use it or lose it” doctrine of water law and water rights.
- Conservation programs, particularly rebate programs, can be expensive and should be designed carefully to be cost effective for the individual utility.
- Short-term drought savings may be more difficult to achieve and the amount of water that can be saved by water rationing reduced, if water conservation reduces the “slack” in the system. However, if the conservation ethic is a part of

the community, in part due to utility conservation programs, customers seem to be more receptive to requests to reduce water use.

- Public works staff may express concern that reducing indoor water use may lead to increased sewer system maintenance. Such problems have not been documented, however, probably because sewer velocities remain essentially the same at lower flows. A 2009 Canadian study is addressing this concern.

## Wastewater Utility Perspective

Lower residential water use and decreased industrial/commercial consumption will result in reduced wastewater flows. This helps wastewater utilities by saving energy (i.e., pumping costs), decreasing the amount of treatment chemicals, and possibly reducing capital costs for additional treatment and collection facilities. These savings are typically realized for systems with separate stormwater and sewage collection facilities.

## Stormwater Management Perspective

As homes have been built more densely, water recharge areas have decreased or have been eliminated, and flooding problems have increased. Outdoor water conservation programs can decrease stormwater runoff problems.

When sprinklers are adjusted to avoid spraying onto streets and other hard surfaces, and adjusted to avoid puddling and over-watering, nonpoint source pollution is reduced. Run-off loaded with herbicides and pesticides traveling through stormwater systems to streams and rivers can be lessened. Where rains occur during the warm irrigation season, use of rain sensor devices stops irrigation runoff from adding to the stormwater stream during rain events.

Rainwater harvesting, where not prohibited by local codes, helps stormwater management by utilizing rainwater on-site.

## Customer Perspective

Water conservation benefits the customer through lower annual water and sewer costs. Customers may also experience lower energy bills because of decreased use of energy needed to heat water for showers, faucets, dishwashers, and clothes washers. Septic tanks may function better without excessive flows. Industrial customers may have lower pretreatment costs as a result of reduced water use.

Concerns about the environment may also be important to many customers. There is a growing interest in *sustainability* to ensure the needs of existing and future generations are met and that habitats and ecosystems are protected (US Environmental Protection Agency 1992).

## Legislative Mandates

Many utilities are establishing water conservation programs in response to federal, state, or local regulatory requirements. In some cases, regulatory agencies are requiring utilities to institute water conservation programs before authorizing the develop-

ment of new water sources, renewing permits for existing sources, or the construction of capital facilities.

Federal agencies encourage conservation by sponsoring programs, developing guidelines, and linking water conservation programs to federal grants for water and wastewater facilities. To further support of water conservation, federal actions have changed plumbing and appliance codes by requiring the use of low-flow plumbing fixtures and water-efficient appliances such as dishwashers and clothes washers. (Maddaus et al. 2001).

Federal agencies that are active in water conservation are the US Environmental Protection Agency (USEPA), US Army Corps of Engineers (USACE), US Department of Interior (DOI), Bureau of Reclamation (USBR), the Department of Housing and Urban Development (HUD), and the Federal Energy Management Program (FEMP), Water Efficiency section. The US Geological Survey (USGS) collects and maintains water use data. Appendix A lists federal and state agencies with regulatory authority or other relation to the field of water conservation.

## Environmental Perspective

Water conservation can make more water available for environmental uses, such as river floodplains and wetland wildlife habitats, and in-stream flows for fish. A conservation program accommodates the concerns of environmental groups by demonstrating that the utility has explored all available options before developing a new water source. A utility that fails to make this effort faces almost certain opposition to its decisions by environmental groups, as well as by regulators and utility customers. Conservation allows the utility to demonstrate environmental awareness and responsibility.

## HOW TO BEGIN

A small or medium-sized utility should designate one “point person” as Water Conservation Coordinator. This person will likely have other related duties within the utility. A team should be designated within the utility to plan and work with this coordinator to implement the conservation program. More information on staffing and coordination is provided in Chapter 6.

The greater the available budget for a water conservation program, the more that can be accomplished. An absolute minimum budget, for example \$1,000, should be set aside for the program. A major goal in the beginning months or years of a program is to establish confidence in the program from the utility and/or municipal administration in order to have additional funds budgeted each year according to need. Chapter 3, Funding, discusses possible funding sources aside from the general utility budget.

Key partners will be the utility’s finance, public affairs, and customer service departments. Finance will be able to provide information to assist in preparing the utility water use profile (Chapter 2). Access to billing data will assist later in documenting water use before and after water conservation measures at a customer level. The public affairs and customer service departments will also assist in outreach to water customers. At the same time, the water conservation program will benefit customer services in providing positive responses to customer complaints.

If the motivation to begin a water conservation program is regulatory, the local regulatory agency should be consulted for specific requirements. Find out what assistance these agencies provide for small and medium-sized utilities. Assistance may include cost-share funding for water conservation measures that have shown quantitative demand reductions. Chapter 4 reviews some of the measures that have proved successful around the US that can be used to quantitatively reduce demand.

If the motivation to begin the water conservation program is for public approval, the utility should focus initially on a strong public information component. Chapter 3 gives tips on approaches to public information, and Appendix C provides some sample materials. Because public information does not always translate into changed customer behavior, many utilities reserve their strongest public information efforts for drought periods.

Overall, a strong public information program is essential for creating a strong community response toward water conservation. The utility should retrofit its own facilities and demonstrate a good example to the public.

If the motivation to begin the water conservation program is finding a more economical alternative to costly new water supplies, a more detailed analysis than is possible in this guidebook will be required. Chapter 6 will suggest sources of information to make these cost-effectiveness comparisons among different alternatives.

This guidebook identifies references to obtain more technical information or pursue more detailed methodologies. However, for the most part, a utility will not need to consult other documents or hire specialists to establish a conservation program.

The worksheets in Chapter 2 produce a utility water use profile and are a good baseline of information that can be carried forward as the program develops. A more detailed approach is presented in AWWA's *M52 Water Conservation Programs—A Planning Manual*.

Based on progress previously made in the water conservation field, including technological advances, better data on savings, and better documentation methodologies, establishing a water conservation program is currently easier than in the past. Even if the program cannot fully reduce the demand to the degree required, a utility can “chip away” at the demand, and with the opportunity to prove itself and with increased funding, can accomplish far more.