
What It Means To Be Green

Water Conservation & Efficiency

Focus: Use Reduction Strategies & Technologies

Posted in: **Region**
By Andrew P. Borgese

Water. It is the essence of all life. It comprises two thirds of our bodies. Without it, we can survive for only a few days. Yet, when we think about green design and green buildings, we commonly envision images of solar panels, wind turbines and other energy related technologies. While there is no disputing the fact that excessive energy consumption is at the core of global environmental issues, a large and growing number of experts contend that the greatest environmental challenge of the 21st century will not be energy use and production. It will be focused on the far more critical problem of inadequate water supplies.

The World Health Organization reports that less than 1% of the world's freshwater (0.007% of all the water on earth) is readily available for human consumption. Current estimates indicate that the United States extracts more than 340 billion gallons of fresh water per day from our potable water resources. This amounts to more than 3,500 billion gallons per year more than we return back to the natural water system to recharge aquifers and other water sources. About 65% of this extracted water is then directly discharged into sanitary sewer and septic systems. Roughly 25% (85 billion gallons per day) of the U.S. daily water use is used for flushing toilets and urinals. While the majority of water used in this country is for power generation and farm irrigation, water use in and around buildings accounts for about 12% of U.S. water consumption.

Nowhere in the country is this water shortage more illustrative than in Las Vegas

where the level of Lake Mead which supplies 90% of the city's water has dropped more than 100 feet since 1990. Though the average temperatures and precipitation levels are different in Las Vegas than in other parts of the country, this should not be considered an isolated case. The U.S. General Accounting Office reported in 2003 that 36 states are likely to experience water shortages by 2013. Many areas in the country have already surpassed the allowable limits of how much water can be pumped from their aquifers and have had to resort to transporting water in from great distances in order to serve the needs of entire neighborhoods and communities. Imagine the enormous amount of energy that is required for that task.

The U.S. Environmental Protection Agency has sponsored a program called WaterSense which is aimed at protecting the nations water supply by promoting water efficiency and increasing the consumer market for water efficient products. Products that bear the WaterSense label are meant to help consumers identify water efficient products and programs. By using water more efficiently, we can preserve existing water supplies for future generations, save money, and protect the environment. Consider, for a moment, how saving water might also save energy. The treatment and delivery of water (340 billion gallons per day) to our homes and buildings consumes more than 56 billion kilowatt-hours per year. The numbers are staggering and, quite frankly, almost incomprehensible to most of us. What does this mean in simpler terms? The EPA phrased it this way: letting your faucet run for five minutes uses about as much energy

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as letting a 60 watt light bulb run for 14 hours.

Despite these overwhelming statistics, there is reason for optimism. For one thing, federal legislation was enacted as early as 1992 in the form of the Energy Policy Act which, among other things, mandated the use of water conserving plumbing fixtures to reduce water use in residential, commercial and institutional buildings. Another positive fact is that U.S. industries today use 36% less water than they did in 1950 due primarily to the stringent water reuse strategies incorporated into industrial and manufacturing processes. Perhaps the greatest reason to be optimistic is the fact that we have the resources at our disposal to change the status quo. Just as we've grown accustomed to wasting billions of gallons of water, one gallon at a time, we can learn to conserve billions of gallons of water, one gallon at a time.

The first and most common strategy is to install plumbing fixtures that minimize water use. However, be aware that not all fixtures are created equally. It is worth researching the performance of any new fixture through consumer feedback reports and through independent testing agencies. Not all these low-flow fixtures work effectively because when federal standards were implemented some companies simply modified their existing products to utilize less water without evaluating their performance. Most products that are on the market now have been redesigned to function effectively.

Adding a standard faucet attachment to a shower head called an aerator (which is

priced as low as \$3) and which pumps air into the water, can save about 2,500 gallons of water per person per year without causing a drop in water pressure. This should not be confused with some of the early low-flow showerheads which atomized the water into tiny, high pressure droplets that did not wet the body effectively and quickly cooled off through evaporation.

Toilets have been redesigned to offer a variety of water efficient options including: gravity-flush models (which operate with 1.28 gallons per flush or "gpf"); pressure-assist models (1.0 gpf); dual-flush models which offer two different flush volumes – one for solid waste and another, lower-volume flush for liquid waste; and of course, composting toilets which don't use any water at all.

Urinals which are used predominantly in commercial building (but have recently found their way into some residential applications) have been available in waterless models since the 1990's. However, due to a poor track record of some of these waterless models, they have been redesigned as ultra-low-flush urinals that use one fourth the amount of water as a conventional urinal.

Faucets can be purchased or modified with inexpensive aerators similar to those used on shower heads. More significant savings can be realized by installing a foot, or knee operated control so that users can turn the water on and off without the use of their hands. Another innovation developed by the Sloan Valve Company consists of a graywater system that collects wastewater

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from a sink and sends it to the fill valve of a toilet next to it.

A demand-controlled hot water circulator is a system designed to eliminate the tremendous amount of water wasted while we wait for hot water to exit from the faucet in bathroom and kitchens. With this system, a user activates a small pump, either by pressing a button or by tripping an occupancy sensor that quickly delivers hot water. The cold water that had been sitting in the hot water pipes is returned to the water heater instead of running out the tap and down the drain. Another solution to this problem of waiting for the hot water is to install small diameter cross-linked polyethylene (PEX) tubing from each fixture directly to the hot water heater via a central manifold. Much less water is wasted because less water is held in the tubing, and hot water reaches the fixture that is calling for it much more quickly.

Clothes washers have been available for some time now as front loading (also called horizontal-axis, or H-axis) machines and many of these also have a water re-use option. On average, they use one half to one third as much water as conventional top loading machines. The market share of these washing machines has gone from 9% in 2001 to 29% in 2006. The water usage of these machines is based on a water factor (WF) rating. The water factor is the number of gallons used for a full wash and rinse cycle per cubic foot of drum capacity. Assuming average usage, a reduction in the water factor by 1 unit (for instance, from nine to eight) will save about 1,000 gallons per year.

The design of dishwashers has resulted in a dramatic decrease in water and energy use over the last few years. Some models use as little as 3 gallons of water for a full cycle and have water saving features that control wash conditions including water use based on how dirty the dishes are.

The choices and decisions about landscaping can dramatically affect the amount of water needed for irrigation. Most outdoor water use is for lawns which, nationwide, consist mainly of variations of Kentucky bluegrass which was cultivated from a species native to the British Isles and requires about 40 inches of rain annually to prosper. Reducing the amount of lawn, therefore, is the easiest way to make an impact. Landscaping with native and climate-adapted plants which require little or no irrigation, and often referred to as xeriscaping, can also make a noticeable difference. Water efficient irrigation such as drip irrigation systems can save up to 75% of the water typically used for landscape irrigation. Drip irrigation systems are also more effective since they deliver water directly to the root systems of plants as opposed to a conventional system which is often misdirected applying large quantities of water to streets, sidewalks and buildings and allowing for evaporation of water before it can effectively be absorbed by any vegetation.

Reducing household water use not only helps to preserve this depleting resource, but it saves energy and consequently reduces greenhouse gas emissions and helps to address the issue of climate change. The more we learn about these green issues: sustainable sites, water efficiency, energy efficiency, materials and resources, and

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indoor environmental quality, the more we can appreciate the fact that they are all connected and dependent on one another.

As you can see, there is ample opportunity to improve our ability to conserve water in many ways and throughout many of our daily activities. Conservation, on one level, is already being mandated by governmental agencies. On another level, some decisions are, for now, left to us. We can either be proactive and responsible stewards of our water resources, or we can stand by idly while our current patterns of behavior continue to squander and deplete one of the basic ingredients of life that has sustained our very existence. From the perspective of a concerned and informed citizen, and father of children who will inherit this earth, this seems like less of a choice than it is a moral imperative.

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