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## Declining Residential Water Usage

### Introduction

In households across the U.S., water usage is declining slowly but steadily; a trend that is expected to continue for the next 15 years or even more. This is good news in light of the challenges some areas in the U.S. face when it comes to managing this essential resource. At the same time, it presents a challenge to water utilities, who must adapt their systems and rates to reduced consumption trends in order to cover fixed costs and maintain reliable service.

A 2010 study by the Water Research Foundation concluded that “a pervasive decline in household consumption has been determined at the national and regional levels.”<sup>1</sup> As reported in *Journal AWWA*, the study, which tracked trends in household water use in North America over the past 30 years, found that “a household in the 2008 billing year used 11,678 gallons less water annually [an approximate 13 percent decline] than an identical household did in 1978.”<sup>2</sup>

This finding is supported by American Water’s experience, which serves approximately 15 million people in more than 30 states and parts of Canada. The company reported in its 2010 Annual Report a declining trend in residential water usage for all of its regulated states to be in the range of 0.5 to 2 percent annually over the last ten years. Monthly analyses of residential sales across

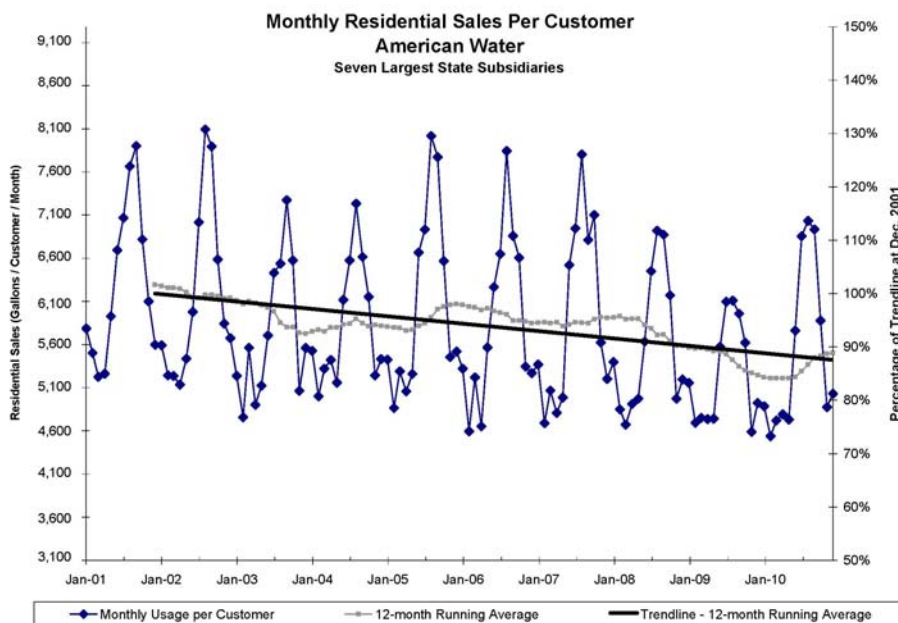


Figure 1

<sup>1</sup> Coomes et al. *North American Water Usage Trends Since 1992*, Water Research Foundation. 2010.

<sup>2</sup> Rockaway et al. “Residential Water Use Trends in North America,” *Journal AWWA*. February 2011.

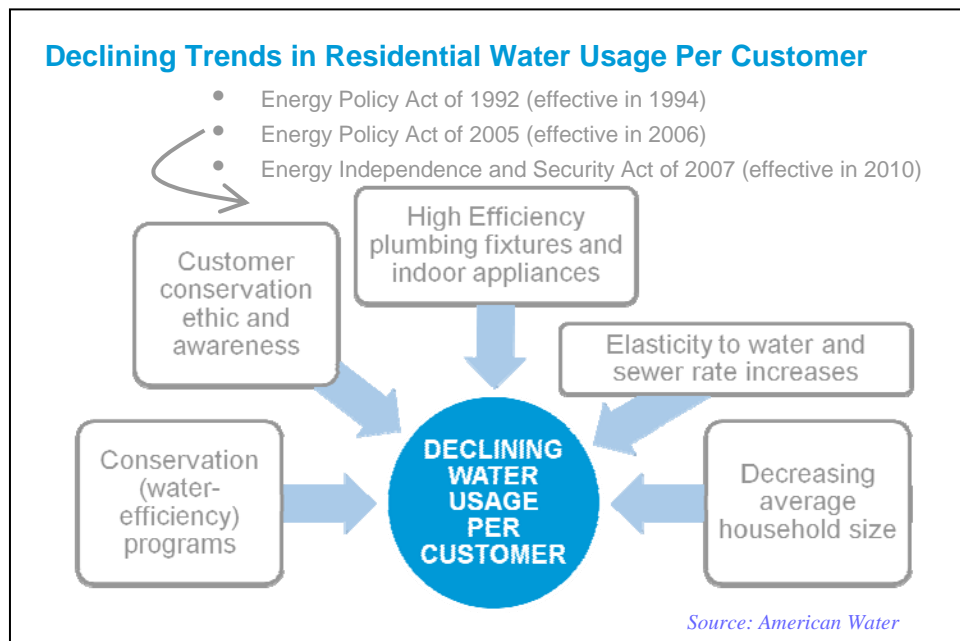
its largest state subsidiaries from 2001 to 2010 reveal an annual decrease of 1 to 2 percent (based on gallons/customer/month) (see figure 1). These subsidiaries provide service to a wide range of household demographics in climates that span from arid to water-rich, providing a broad base by which to assess water usage trends.

The results held true when American Water limited its analysis to winter-only consumption in service areas in the northern portions of the U.S. Because varying weather conditions in summer months can cause large fluctuations in outdoor water needs (lawn and garden watering, for instance, increases during hot, dry periods and is lower in cooler, wetter summers), it is particularly useful to study winter-only trends, when outdoor water usage is at a minimum.

The consistency of findings in both the Water Research Foundation study and American Water's own research indicates that several strong underlying factors are driving indoor residential usage patterns.

### Driving the Decline

According to the Water Research Foundation, the primary forces behind this drop are the increased use of water-efficient appliances and a decrease in the number of occupants per household.<sup>3</sup> Others factors to consider are price elasticity, a growing conservation ethic among consumers, and conservation programs implemented by utilities and other entities.



A few highlights:

**Water-efficient appliances:** Technological advances continue to improve the water efficiency of household appliances, driven by government mandates such as The Energy Policy and Conservation Act of 1992, which required the manufacture of water-efficient toilets, showerheads and faucet fixtures, and the Energy Independence & Security Act of 2007, which established similar high-efficiency standards for dishwashers and clothes washers. As a result, toilets manufactured after 1994 use 1.6 gallons or less per flush, compared to 3.5 to 7 gallons per flush

<sup>3</sup>Coomes et al., 2010.

for older models, while dishwashers manufactured after 2009 and clothes washers after 2010 are held to water efficiency requirements that could reduce usage by 54 and 30 percent, respectively. What's more, fixtures and appliances that surpass these requirements are increasingly prevalent in the marketplace thanks to consumer demand. These improvements correspond to a 35% decrease in water usage by a typical residential household in a new home constructed in 2011 compared to the same household in a non-retrofitted home built prior to 1994.

## Background – Flow rates from different appliances

Type of Use	Pre-Regulatory Flow*	New Regulatory Standards and Flows			WaterSense / ENERGY STAR Current Specification+
		New Standard (maximum)	Federal Standard	Year Effective	
Toilets	3.5 gpf	1.6 gpf	U.S. Energy Policy Act	1994	1.28 gpf
Clothes washers**	41 gpl (14.6 WF)	Estimated 26.6 gpl (9.5 WF)	Energy Independence & Security Act of 2007	2011	Estimated 22.4 gpl (8.0 WF)
Showers	2.75 gpm	2.5 gpm at 80 psi	U.S. Energy Policy Act	1994	No specification
Faucets***	2.75 gpm	2.5 gpm at 80 psi (1.5 gpm)	U.S. Energy Policy Act	1994	1.5 gpm at 60 psi
Dishwashers	14.0 gpc	6.5 gpc for standard; 4.5 gpc for compact	Energy Independence & Security Act of 2007	2010	5.8 gpc for standard; 4.0 gpc for compact

\* Source: *Handbook of Water Use and Conservation*, Amy Vickers, May 2001

\*\* Average estimated gallons per load and water factor (see calculations)

\*\*\* Regulation maximum of 2.5 gpm at 80 psi, but lavatory faucets available at 1.5 gpm maximum (see calculations)

+ Source: <http://www.epa.gov/watersense/> and <http://www.energystar.gov/websites>

ABBREVIATIONS USED:
gpf – gallons per flush, gpl – gallons per load, gpc – gallons per cycle, gpm – gallons per minute
WF – water factor or gallons per cycle per cubic feet capacity of the washer

Figure 3

**Price elasticity:** Non-essential outdoor water usage – from irrigation to car washing and swimming pools – is more responsive to water and sewer rate increases than is indoor water usage, which is primarily for consumption and hygiene. However, there is some price elasticity there as well, as households are more vigilant about fixing leaks under higher rates.<sup>4</sup> A recent industry study investigating the sensitivity of residential water demand to water price found that a 10% increase in price led to a 3.3% decline in customer demand.<sup>5</sup>

**Water conservation practices:** Whether as a cost-cutting measure or due to growing environmental awareness, American consumers are increasingly conscientious about conserving household water. Utilities, too, have been educating their customer bases about the importance of preserving the world's water supply. For its part, American Water became a promotional partner of the Environmental Protection Agency's WaterSense program in 2008, and all American Water subsidiaries have links on their websites to the EPA WaterSense site. The company has dedicated its 125<sup>th</sup> anniversary year (2011) to promoting the value of water and the need to protect it through a variety of national and regional educational programs reaching its customer base and the general public, including a series of public service announcements (PSAs) produced in conjunction with EPA WaterSense and the Student Conservation Association. American Water subsidiaries also offer conservation-related educational materials, and several subsidiaries have pilot or statewide conservation programs that include offering water-efficient fixtures by request or by rebates.

<sup>4</sup> Coomes et al., 2010.

<sup>5</sup> Olmstead et al. *Managing Water Demand: Price vs. Non-Price Conservation Programs*. July 2007.

### Benefits of Reduced Usage

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By 2013, it is estimated that 36 states will face serious water shortages.<sup>6</sup> Therefore, a decline in per-household water usage is crucial if the nation is to meet the water needs of a growing population.

The water industry, too, reaps certain benefits from this trend. Less water use means less need to divert water from supply sources, leaving more water for passing flows or drought reserve. It leads to reduced power consumption, chemical usage, and waste disposal, which not only lowers operating costs but also provide environmental benefits such as reduced carbon footprint and waste streams.

At times of declining customer usage, operators can seize the opportunity to optimize management of existing water supplies, treatment facilities, and pump stations. For systems that rely on multiple sources of supply, this may translate into operational cost savings by minimizing use of water from higher-cost sources.

Other opportunities include more efficient and effective pumping and treatment. More available storage means operators can schedule more pumping at off-peak times, thus reducing electricity demand charges. Less demand also means less strain on certain process equipment, allowing operators to stretch out scheduled maintenance.

Utility planners need to base capital projects on the most current information and consider downsizing or postponing supply development projects when customer demand projections reflect an anticipated decline in usage. At the same time, they must continue to factor in peak-day demand, which, driven by hot, dry weather spells and other short-term events, may or may not follow the same declining trend as average-day consumption. Because it is peak-day demand that determines capital infrastructure needs such as treatment and pumping capacity, it is essential that utilities understand their own peak usage patterns.

### The Challenge

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The downside for the water utility industry is that reduced usage creates a revenue decline while a number of fixed costs continue to rise. These range from water utility capital needs – infrastructure renewal, reliability, and regulatory projects, for instance – to operating costs such as plant maintenance, customer services needs, IT support, and security.

“Pricing that recovers the costs of building, operating and maintaining the systems is absolutely essential to achieving sustainability,” reports the Water Research Foundation. “Drinking water and wastewater utilities must be able to price water to reflect the full costs of treatment and delivery.”<sup>7</sup>

For water utilities that are regulated by public service commissions, the challenge, therefore, is to work with regulators to be progressive in establishing rates that allow appropriate investment in the pipes and plants that ensure reliable service.

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<sup>6</sup>U.S. Government Accountability Office. *Natural Resources, Energy, and the Environment Challenges for the 21st Century*. February 2005.

<sup>7</sup> Coomes et al, 2010.

### Solutions

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Despite the financial challenges it presents, water utilities are wise to not just accept but embrace the declining usage trend, if simply because it's the right thing to do. As stewards of the nation's water supply, conservation of this vital resource must continue to be a key message and operational focus. Rather, utilities must meet the challenge of reduced demand by building that 1% to 2% decline into its long-term planning.

The value of water is another key message utilities must continue to underscore. It is essential that customers understand that, at about a penny or less a gallon, the clean, quality water delivered to their tap is a bargain, especially compared to other common household utilities.

Investor-owned water utilities also need to work with regulators for a more progressive rate structure so that revenues are not entirely dependent on fluctuations in sales. Revenue balancing, where rates provide for surcharges or refunds based on fluctuations in sales, is one tool to consider. Another would be to increase the fixed charge on the customers' utility bill to recover a greater portion of the utilities fixed costs, thereby reducing exposure to sales volatility. For utilities operating on a basis of decoupled revenue streams, water saved through conservation can be viewed as more cost effective than adding capacity via expansion of water delivery infrastructure.<sup>8</sup>

### Conclusion

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Based on the average life expectancy of appliances, it is estimated that the replacement of old fixtures with new, more efficient models will continue to affect water usage trends for another 10 to 15 years.<sup>9</sup> Other drivers are likely to continue into the foreseeable future. Looking forward, water utility managers and operators will need to adapt their business planning to accommodate the historic declining trend of 1 to 2% annually, while also watching for signs of its leveling off.

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<sup>8</sup> Massachusetts Institute of Technology, Mission 2012: Clean Water: <http://web.mit.edu/12.000/www/m2012/finalwebsite>

<sup>9</sup> Naumick, Gary A., P.E., *Trends in Residential Water Usage and its Impact on Water Utility Financial Planning*, AWWA Utility Management Conference, February 10, 2011.