Individual Water Conservation

The Key to Solving the Water Shortage Crisis

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Dear Ms. Delle,

Following this letter contains my report, *Individual Water Conservation: The Key to Solving the Water Shortage Crisis.* Research for this paper proved to be extensive and somewhat overwhelming, as the subject is broad. Throughout the research process I found articles that I was certain I would use in my report but as the paper evolved I found myself needing to tailor my references to ensure a concise and cohesive report. While this was frustrating, I realize that it is part of the learning process.

The subject I chose is of great interest to me. Even though I knew that large amounts of water are wasted due to direct and indirect use, doing research for this report made me see this as a serious problem that needs to be addressed now. I believe that others will also see the urgency of this issue after reading my report. The reader will see the simplicity and effectiveness of conservation, and will be inclined to adopt these behaviors.

This assignment has been difficult and time-consuming. However, it has also been an educational and gratifying experience for me. I have learned much about the research and writing process that will help me with future projects, both academically and in the professional world.

Thank you for your expertise and time.

Sincerely,

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Executive Summary

Due to skyrocketing population increases, climate change, and over-use of our planet's freshwater supply, several regions across the globe are already experiencing water shortages. Shortage of this precious resource is expected everywhere, which will result in a serious crisis. While industry and business do contribute to this problem, solutions in changing their water habits are complicated and expensive.

Fortunately, there are solutions that are simple, affordable, and effective. By looking at individual water consumption, one can see the amount of unnecessary waste through inefficiency. This inefficiency comes from water use in the outdoor landscape, indoor use through appliances and fixtures, and indirect use from lifestyle choices. Simple changes in these practices can save significant amounts of water.

Despite the evidence, changing individual water consumption habits can be difficult for some. Examining attitudes and behaviors are a key to not only understanding the problem, but also in adopting conservation solutions. Through spreading awareness of the problem and setting an example through action, water conservation can and will become a responsible and sustainable way of life. Available freshwater sources can be saved through these solutions.

A Precious Resource in Danger

Water is the most valuable resource for all of life; without it, nothing could survive on this planet. Water is needed for drinking, food production, sanitation, and industry. Even though our planet is mostly made up of water, available freshwater constitutes less than one percent of the total (J. Byrd, personal communication, October 20, 2011). Alarmingly, this precious resource is in jeopardy.

Going Fast

This small percentage of available priceless water is being used up quickly. According to Jonathan Foley (2010), the director of the Institute on the Environment, Global freshwater consumption has more than tripled in the last 50 years (p. 54). Foley's team of scientists (2010), claim that humans consume 2,600 cubic kilometers of freshwater per year (p.56). It is estimated that if we exceed 4,000 cubic kilometers we will have reached an unsafe boundary or tipping point where the earth may not be able to sustain life (Foley 2010, p.55). To put human's water use in perspective, the average American uses 2,000 gallons of water a day, which is twice the average global use
(Water Footprint Calculator, 2011).

This high rate of consumption is due to the current world population of 7 billion which is expected to reach around 9 billion by the year 2025 (J. Byrd, personal communication, October 20, 2011). Climate change is another factor that is expected to magnify the problem of water scarcity for reasons like less snow pack, which could greatly affect our local supply of water. Between high consumption, population increases, and climate change, this is a problem that cannot be ignored.

Water depletion is a current problematic reality, as humans are taking more water than is being replenished. This is seen in the aquifers that are being diminished under Beijing and Delhi and the Midwestern United States. Consequences of the excessive use of water are also seen in the Colorado and Yellow Rivers, which no longer reach the ocean, as well as Lake Mead and the Aral Sea, which are now

largely desert (R. Park, personal communication, September 13, 2011). Waiting until this problem becomes a crisis in other areas is not an option if we want to continue having freshwater sources available. Our planet is facing a drastic shortage in available freshwater that will result in a serious global and local crisis if we do not start educating ourselves and others and start using water efficiently.

A large part of high water consumption comes from misuse through inefficiency. Many factors contribute to misuse, including dumping pollutants into water systems, inefficient irrigation practices, leaking and/or inefficient appliances, and wasteful lifestyle choices. There are possible solutions to avoiding water shortages that can be explored, such as the desalination of ocean water, harvesting water from melting glaciers, and imposing stricter regulations of efficient practices on big businesses. However, these possible solutions require large expenses and the focus of this report is to provide simple, affordable, and effective solutions that the individual household water consumer can practice to make a difference in water conservation.

Simple, Effective Solutions

Fortunately, many factors of water misuse can be addressed with relatively simple solutions by the individual. A key part in helping people realize how critical our water supply and usage is comes through understanding attitudes and behaviors about awareness and conservation. Because conservation is the most important and effective solution to the problem of water misuse, cultivating awareness and teaching others to live responsibly and sustainably is something we can all help each other with.

This report will explore and compare the amounts of water used in different types of landscaping, household appliances and fixtures, and lifestyle choices; as well as cost-comparisons between the different options. Solutions to saving water will be given for all local households, regardless of personal economic status. Attitudes and behaviors toward water conservation will also be explored to provide insight to the reasons people choose to conserve water or not. Realizing the simplicity and effectiveness of the solutions provided, as well as an understanding of attitudes and behaviors, will give the reader incentive to not only change their lifestyle, but encourage others to do the same.

A Look at Individual Water Consumption

The Grass is Greener

Looking at water use outside the home is a major factor in individual household water consumption. Sara Williams (2007) found that landscape use can account for 40%-70% of municipal water. In the continental United States, much landscape is in the form of turf grass or lawn. In fact, Cristina Milesi (2005) claims that this commonly seen manicured green lawn forms an area that is three times larger than any irrigated crop in the lower 48 states (Milesi, et al., 2005). Williams (2007) describes how turf lawn became conventional after gaining popularity in the prolific 1950's. It became a desirable high status symbol, due to the amount of maintenance required, and has since become ingrained in our society as the ideal look (Williams, 2007). The type of grass that has been most accepted and is most available to fit this ideal look is Kentucky bluegrass, which uses twice as much water as native grasses according to the recent studies by William Logan (2006). This is one of the more conservative estimates of water requirements for Kentucky bluegrass. Koski and Skinner (2003) from Colorado State University's extension office state that bluegrass and ryegrass can use up to 2.25 inches of water a week (Koski & Skinner, 2003).

Native grasses on the other hand, have adapted to living on the normal precipitation for that region. Koski and Skinner (2003) educate that there are different types of native grasses, many of which grow in a clumping as opposed to a spreading habit. However, they also state that certain grasses can be grown as turf such as Crested Wheatgrass, Buffalograss, and Blue Grama grass, and they only need 10-15 inches of water a year (Koski & Skinner, 2003). Buffalograss is a model example, as it can stay green for weeks without any water. According to a local nursery employee, the cost of native grass seed, like Blue Grama grass, runs around $13.49 a pound and takes one to two pounds of seed to cover 1000 square feet (L. Ahern, personal communication, November 4, 2011).

People changing their landscape from high water grass to native plants and grasses have a large impact on water use. McPherson and Haip (1989) provide a good example of landscape change in

Tucson, Arizona. Residents of Tucson started experiencing water shortages in the early 1970's and city officials focused on educating household consumers about water-efficient landscaping. This resulted in a 17.5% decrease in lawns in three years time with a 20.6% decrease in municipal water use (McPherson & Haip, 1989). Changing landscape from turf like Kentucky bluegrass to native plants and grasses has proven to be an easy and effective way to use significantly less water.

A House Run on Water

The outside use of water is one place to address consumption and conservation, but what of use inside the home? With sinks, toilets, showers, baths, dishwashers, and washing machines, the inside of a typical home uses large and unnecessary amounts of water, especially if the appliances are older. The Environmental Protection Agency (EPA) launched a WaterSense program in 2006 with the aim of educating the public about water efficient choices people could make in their homes by replacing older appliances with newer products marked with their WaterSense label. These products are assured to have been certified by a third party, must conserve at least 20% more water than other average products on the market, and must work as good, if not better, than those average products (Watersense products, 2011).

According to the EPA, toilets account for 30% of indoor household water use. A toilet that is older than 1992 can use between 3.5 to 5 gallons per flush, while newer highly efficient toilets use 1.28 gallons per flush, resulting in at least 60% less water used. Older sink faucets and shower heads use 2.2 to 2.5 gallons per minute, while WaterSense faucets use 1.5 gallons per minute. In comparison to a shower, taking a bath in a full bath tub can use 70 gallons of water. Dishwashers on average used 15 gallons per load if the appliance was made before 1994, while new efficient dishwashers use 5.8 gallons. It is also estimated that dishwashers use 1/6 of the water that hand washing uses. Washing machines use the most water in the home with older models averaging 41 gallons per load and highly efficient models using 28 gallons per load. (Watersense products, 2011.).

Leaking fixtures and appliances add up to major water waste as well. A faucet that leaks one drop

per second will add up to 3,000 gallons a year and a leaking toilet can waste 200 gallons a day. Based on this information, the EPA claims that, “if one in every 10 homes in the United States were to install WaterSense labeled faucets or faucet accessories in their bathrooms, it could save 6 billion gallons of water per year” (Watersense Fix a Leak Week, 2011).

Newer and more efficient appliances not only save water, but they save energy and money that would otherwise be spent on more energy and water. There are now many water-efficient options available and as such, they vary greatly in price. Efficient toilets at The Home Depot online start at $98, sink faucets start at $18, and showerheads start at $12. Front loading washing machines, which save much more water than top loading machines start at $809 and dishwashers at $269 (Home Depot Appliances, 2011). By comparison, a new toilet from The Home Depot that is not WaterSense certified starts at $79 and a top loading washing machine starts at $314. Efficient sink faucets, showerheads, and dishwashers are basically the same price as those that are new but not as efficient. The only water wise appliance that costs significantly more than its inefficient counter-part is the washing machine. A Home Depot employee asserts that the high cost is due to its high quality construction and motor (J. Sharon, personal communication, November 2, 2011).

A valuable study on how much water is saved by efficient fixtures and appliances comes from Tehran, Iran. This mega-city is on the brink of experiencing a water shortage crisis. A group of environmental engineers found that the best place to do a study on the impact of efficient appliances was on an apartment building, due to the fact that 70% of water consumption in the city of Tehran comes from household use (Bidhendi, et al., 2008). Rates were monitored on the previously installed water fixtures in a select apartment building. After these rates were determined, water saving devices were installed and monitored to give an accurate number on the amounts of water conserved. The results showed a savings around 20%, thereby proving that a significant amount of water could be saved for the city if these methods were adopted (Bidhendi, et al., 2008).

Virtual Water

Direct water usage inside and out of the home is a concrete concept, but a huge portion of water consumption comes from indirect use. This hidden use comes from our lifestyle; the types of foods eaten, products bought, and energy used. There has recently been an increase in the popularity of the carbon footprint, which gives an estimate of the amount of carbon (CO2) that an individual emits annually, but there has not been as much attention given to the water footprint. This footprint calculates the total amount of water used by the individual. According to National Geographic's website for calculating water footprint (Water Footprint Calculator, 2011), it takes 1,799 gallons of water to make one pound of beef. This includes every aspect of production, including the water used to grow the feed, as well as the water for processing and shipping the meat. While beef is the food that takes the most water to produce, other commonly eaten foods take large amounts of water as well. For example, it takes 468 gallons of water for one pound of chicken and 600 gallons to produce one pound of cheese. In contrast, vegetables, fruits, and whole grains use much less water to produce. One pound of wheat takes 132 gallons of water to produce; corn takes 108 gallons per pound, and soybeans 216 gallons. While this still seems like a lot of water, it is much less than the water required for making and processing meat and dairy (Water Footprint Calculator, 2011).

There are many other indirect uses of water besides the food we eat. National Geographic asserts that the other products that we buy can use enormous amounts of water, like the 713 gallons used to make one t-shirt. Energy consumption does not just use up the specific energy resource being harvested, but water as well. For example, it takes thirteen gallons of water to make one gallon of gasoline. Most people do not realize that the foods they eat, products they buy, and energy they use, make up the majority of their water footprint (Water Footprint Calculator, 2011).

Attitudes and Behaviors

Lifestyle choices affect both direct and indirect consumption of water and attitudes and behaviors affect lifestyle choices, both consciously and subconsciously. There are many things that affect people's attitudes about water use and conservation. Phoenix, Arizona, like the rest of the southwestern United States, is a desert climate without much water. However, this geographical fact does not necessarily encourage its residents to be aware of the amounts of water they use. Sharon Harlan and other professors (2009) conducted a study of surveys and metered water usage to reveal that households with higher incomes used significantly more water than those with lower incomes (Harlan, et. al.,2009). Higher income is often associated with higher education, so this study implies that people with high incomes in Phoenix must realize that there is not enough water to support its massive population, but they simply do not care to conserve water because they personally can afford it.

Australia is another arid place without much water. In fact, Australia receives the least amount of rainfall in comparison to the other continents (J. Byrd, personal communication, September 28, 2011). Many studies have been done and efforts made to ease the amount of water consumption in Australia. A recent study by Michelle Graymore and Anne Wallis (2010) focused on several previously overlooked factors that contribute to people's attitudes and behaviors about water use. In depth interviews of both high and low users of water were conducted to explore these factors which include, whether the source is ground or surface water, whether the person has previously lived with a water shortage, and the trust, or lack thereof, in the water authorities and government (Graymore & Wallace, 2010). What was found was that those who got their water from an underground source commonly believed that the water supply was unlimited, thus there was no need to conserve. Those who had lived with a water shortage at least once in their lives were more likely to conserve water on regular basis, and had more concern for the future welfare of others. Nearly everyone held a common belief that the authorities were lying, or at least over exaggerating about future water shortages (Graymore & Wallis, 2010).

What this study implies is that if you have always had water, it is easy to take it for granted. You

will likely assume that the water source will always be there. Also, those who had lived with a previous water shortage found it to be an unforgettable event that taught them the importance of water and prompted them to adopt responsible behaviors for the sake of everyone. This is true for me personally, as my well stopped producing water this past summer. The experience of having to buy my water and seeing how quickly it went made me adopt conservation efforts. Now that my well is producing water again, I am still in the practice of conserving water. Graymore and Wallis' (2010) study also touched on the belief that the authorities were lying about water scarcity. This seems to me to be a natural response to either the fact that people do not want to be told that they may need to change their behaviors and lifestyles, or the fact that something as dramatic as a water shortage is simply something that people do not want to hear because of the fear it creates. Also, I have found that it is difficult for people to live and act for the future because they are living in the moment, and there is a natural tendency to not want to fix a problem until it's broken.

Not seeing water conservation as an important issue because there is not currently a water shortage is factor that applies to many places, including our local area. With the population continuing to expand, the amount of water needed will increase dramatically. The effects of climate change will magnify this problem as the water supply becomes increasingly scarce. Already in our local area we are experiencing warmer and shorter winter seasons with less snow pack. Less snow pack in an area like ours means less available water year round, and with more people to support, shortage is practically inevitable.

Recommendations

Outdoors

While it is true that water conservation efforts are needed in business and industry, individual change will be most effective due to the ever increasing number of individuals in the population. A good place to begin change is outdoors. Research shows that switching from grasses that require a lot of water to native grasses will decrease the amount of water used in a landscape significantly. It may require some

time and effort, but the financial cost is quite low. If unable to change the landscape, then efficient watering practices are recommended. William Logan from Organic Lawn Care Basics suggests watering in the early morning or evening so that there is less evaporation. Also recommended is the use of a sprinkler with medium sized water droplets because a small water droplet is more likely to be carried off by wind or evaporation. Likewise, a large water droplet will flood the ground with more water than it can absorb causing runoff. To water most efficiently, Logan (2006) recommends that one should, "dampen the earth before watering deeply, and it will absorb more water and hold it longer. Do this by watering twice, with a pause between rounds to let the earth truly absorb the first round, so it can better absorb the second" (Logan, 2006). This will also encourage the grass to have deeper roots, which will decrease the frequency of watering.

Indoors

Indoor use of water is also an easy place to look at water consumption levels due to the number of water using fixtures and appliances within the home. Newer appliances, especially bearing the WaterSense label save at least 20% more water than older appliances and work just as well if not better. Most of these new appliances do not cost much more than the less efficient ones and almost all stores have reasonable payment plans. The energy and water saved will pay for itself after a short time. However, if you cannot afford new appliances and fixtures there are many things that can be done to reduce the amount of water used inside the home. Not letting the faucet run while washing hands, brushing teeth, and washing dishes will save a lot of water. Taking showers instead of baths will lessen the amount of household water use and taking shorter showers or showering less often will be even more beneficial. Also, running a dishwasher and washing machine only if they are completely full will save water. Another effective method of using less water is to either not flush the toilet every time or place a brick or other like object in the tank of the toilet to take up room and displace the extra water. It is easy to use less water in the home once you get used to it.

Lifestyle

Indirect water use is often not realized, yet it constitutes the majority of our water consumption. The foods people eat, products they buy, and energy they use take water to make and process. Just being aware of these hidden places that water is used can help one to think twice when deciding on different lifestyle choices. Eating more vegetables, whole grains, and fruits and less meat and dairy products will make one's water footprint significantly smaller. Being aware of the products you buy can help you to question whether that item is really a necessity or if you are just acquiring more stuff. The same applies to energy use; awareness of water consumption can inspire you to walk or ride a bike instead of driving your car. Since the indirect use of water and the water footprint calculation are not well known, spreading the word about them could bring a change in lifestyle with widespread effectiveness.

Be the Change

The best solution to our diminishing water supply is simple and effective: conserve water and teach others to do the same. Examining and exploring personal attitudes can help one to understand themselves and others on sustainable water use. It seems as though the idea of conservation for many feels like a sacrifice. People tend to have a hard time adopting a behavior like conservation not necessarily because they don't believe in it, but more often because they do not want to feel like they are the only one making an effort. But if people concentrate on bringing awareness and education about water availability and use, it will encourage others to view conservation as a logical and responsible way of life. Individual conservation is the best solution for ensuring a water supply for ourselves and future generations.

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