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HOT TOPIC ALERT

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Water: An Issue Everywhere

A Survival Issue

A person may live "off the grid," without electricity, telephone, or internet access, but no one can live *anywhere* without access to a water supply. Water access is emerging as a contentious topic in the United States. Increased development led to increased water demands, which strain the existing infrastructure. In parts of the country without large natural water supplies, climate conditions lend a special urgency to maintaining existing water supplies, and to finding new ones. Even areas that enjoy ample supplies now must look to future population needs with some trepidation.

In this Hot Topic Alert, we look at some of the issues surrounding water access and water use. We will examine some of the current issues around the water supply infrastructure. We will also look at desalination as a new water source, and consider conservation measures for households.

Era of Replacement

For most of us, our water is supplied by a community water system. A layperson may be justified in thinking that the system supplying his or her water is in fine shape—turn on the faucet, and clean water comes out. It's a feature of modern life that we take for granted.

A more expert view of community water systems shows that they should be viewed more appreciatively. In its 2013 Report Card for America's Infrastructure, the American Society of Civil Engineers (ASCE) gives the U.S. water supply infrastructure a "D" score. Water system components work from 15 to 95 years, depending on the part. Some of the water mains in U.S. cities were put in around the Civil War! Generally, water mains are not inspected until they fail, and they fail with some regularity: the ASCE says that there are an estimated 240,000 water main breaks in the U.S. every year. These breaks are disruptive—not only to the water supply, but to roads, buildings, and other infrastructure. Plus, breaks pose obvious complications for fire departments. Around 2.1 trillion gallons of fresh water disappear each year through aging, leaky pipes, faulty meters, and broken water mains.

Aging or inadequate infrastructure is not just for older urban water systems. For example, much of California's water supply is at risk from contamination, including the water used for farm irrigation. Most of California's water comes from the Sacramento-San Joaquin River Delta, which is protected by earthen levees constructed over the last 160 years. Generally, farmers built these levees as they were needed, so they were not

built to any consistent standard. As a result, earthquakes, record tides, and strong storms threaten the levee system. The aging infrastructure moving that water is also an issue—with conservation efforts, less water is moving through the pipes, allowing them to clog and fill with debris. With increasing demand and decreasing supplies, it's harder and harder to relocate the needed water.

An ongoing reliable water supply requires major coordinated efforts. Experts say that will involve replacing much of the nation's water infrastructure. The American Water Works Association asserts that we are now in the "Era of Replacement" of water systems. The Association estimates that repairing and upgrading the buried water infrastructure will cost $1 trillion over the next 25 years. But the changes are needed to replace worn-out systems and to accommodate population growth and migration. Infrastructure replacement will continue for decades as systems develop problems. Delay will only make matters worse, because aging systems are more prone to failure, and emergency repairs only increase overall costs.

Congress adopted the Clean Water State Revolving Fund in 1987 to provide financial assistance for water infrastructure projects. The Fund provides grants to state governments to capitalize loan programs (states also add funds), essentially creating a series of state programs. This diversified funding allows each state to select its own projects and award the necessary assistance. So far, water systems have received financial assistance of $105.4 billion, representing 34,900 loans, including the Central Green Streamway in Lenexa, Kansas. The Streamway combines a stormwater filtering system with a public recreational and educational waterway.

Learn more about the Central Green Streamway in Lenexa, Kansas.

The Water Resources Reform and Development Act of 2014 also authorizes federal assistance for infrastructure upgrade. The Act creates a five-year pilot "Water Infrastructure Finance and Innovation Act" (WIFIA) program to help finance drinking water and wastewater projects sponsored by state, local, or tribal governments. WIFIA is currently in its appropriations stage and is not yet distributing funds, but under the Act, the Environmental Protection Agency will provide credit assistance for up to 49% of the cost of eligible projects. The minimum cost of an eligible project is $20 million (or $5 million, if the project is in a rural area). The types of projects eligible for credit assistance include community drinking wa-

ter facilities, enhanced energy efficiency for water distribution or treatment, repair or rehabilitation of aging drinking water systems, or desalination or water recycling.

Federal programs offer a needed boost, but cannot solve the entire problem. Even though WIFIA may pay out $175 million over five years, Congress did not appropriate that amount. In addition, a ban on tax-exempt financing for other cost contributions eliminated an effective funding mechanism for state and local governments. The importance of our water infrastructure cannot be overstated. We cannot let the infrastructure collapse. Positive action is needed to address this growing problem.

History is Carved by Water

From early settlements near rivers to Roman aqueducts to our current infrastructure, history and water go hand in hand. Boston provided the first community water system in America in 1652. The water was carried in pipes made from bored-out logs. Philadelphia innovated by using iron pipes starting in 1804. Nationwide, durable cast iron pipes are still in use in 600 municipalities, but are often networked with later materials from repairs and expansions, including ductile iron, steel, vitrified clay, concrete, and PVC, among others.

Early on, U.S. cities also found ingenious ways to bring water to growing populations. The famous Croton Aqueduct, which carried water 41 miles to New York City, was completed in 1842. A part of the original Aqueduct, a bridge built to carry water across the Harlem River, has been repurposed as a pedestrian walkway between Manhattan and The Bronx.

Taking the Salt Out

Over 70% of the earth's surface is water, but 96% of that is salt water in the oceans. Untreated salt water is not drinkable, nor can it be used for irrigation, which accounts for 80% of U.S. water consumption. Is it possible to make that water more useful?

It is not only possible, but it is a routine practice in some countries. Saudi Arabia, for example, gets more than 70% of the water used in its cities from desalination. Desalination and water recycling have been slow to catch on in the United States, but is gradually becoming more common. The largest desalination plant in the Western Hemisphere is now under construction in Carlsbad, California, which is scheduled to begin operations in November 2015.

Desalination is relatively expensive compared to other methods of treating water. Reverse osmosis—the usual method for taking the salt out of water—costs about $2,000 per acre foot (roughly the amount of water a family of five uses in a year). Authorities expect the Carlsbad plant will increase the average water bill in the San Diego area by $5 to $7 per month. Desalination also causes environmental issues. The

process creates waste that is usually pumped back into the ocean. This waste contains a much higher salt content than the sea water, and can harm marine life. Desalination plants also require a large amount of electricity to operate.

Proponents of desalination have attempted to address these concerns. Wastewater from the Carlsbad project will be diluted to reduce its salinity. The project will also use solar power to generate its electricity.

While the cost of desalination remains high, the cost of transporting enough water to a dry area may be even higher. Desalination is not a complete solution to water supply problems, but it can be an important supplement to other sources.

Warming and Water

News outlets across the country consistently report on California's drought that has been over the state since 2011. Questions arise over whether or not global warming contributed to the cause of the drought. Most climate scientists think the drought was not caused by warming, but agree that global warming has made it worse. Drought is part of the natural climate cycle, due to natural weather patterns that push atmospheric moisture away, and natural factors are the major cause of the current drought. Warmer temperatures, however, evaporate more atmospheric moisture, increasing drought conditions. Current estimates are that warming has increased the severity of the drought by 25 to 30 percent.

Conserving at Home

California's drought continues to take a toll on the state. Experts anticipate the "El Niño" phenomenon will ease the drought, but will not end it. While California experienced droughts before, this event is one of the worst on record. The severity of the drought, as well as the length of time it has been going on, led the state to impose new water conservation rules. These new rules proved very effective in promoting water conservation: water use in California has dropped by 31.3%. The goal was to reduce water use by 25%, so Californians seemingly understand what is at stake.

California's situation is exceptional. But many other parts of the country also face water issues. Much of the western quarter of the U.S. is experiencing conditions that range from "abnormally dry" to "exceptional drought." Abnormally dry areas also extend through the southeast, and parts of New England are also unusually dry. New water laws include a 2014 plumbing efficiency law in Texas, and a similar requirement starting in 2016 in Colorado. Water conservation measures may soon become the norm nationwide.

Regardless of location, though, water conservation will always lead to lower utility bills. The average person uses approximately 80-100 gallons of water every day. The largest use of that water is to flush the toilet, followed by showering and bathing. Showering with a standard-flow showerhead uses five gallons per minute, while a full bath can use up to 36 gallons of water.

The U.S. Environmental Protection Agency estimates that home water usage can be reduced 15 to 20% by conservation measures "without major discomfort." To encourage household conservation, the EPA established the WaterSense program. WaterSense is similar to the EnergyStar program for home energy efficiency. The WaterSense label appears on products that meet water efficiency standards—among other requirements, the products will be 20% more water-efficient than average products of that type. As further encouragement, many water utilities offer rebates for consumers who purchase and install WaterSense products.

At the state level, utilities may offer other appliance-related incentives. California water utilities offer separate rebates to commercial and residential customers who purchase qualifying products. For example, a residential customer of a participating utility who purchases a high-efficiency clothes washer may receive a rebate of $150.

Many water utilities run programs to reduce landscape and yard use. The Southern Nevada Water Authority pays customers $1.50 per square foot for removing grass from their yards and replacing it with desert landscaping. The Albuquerque Water Utility Authority offers "xeriscape rebates" of $1 per square foot of high-water use landscape featuring plants that are adapted to dry conditions. The potential water savings from these outdoor conservation measures are substantial. Lawn and garden watering accounts for nearly one-third of all residential water use. Up to 50% of that water is wasted through evaporation or runoff.

Water conservation helps ease current water supply issues, but also reduces future demands. Conservation at home will limit stress on the water supply infrastructure from population growth, and will help ensure a continued reliable water supply for everyone. And the water bill savings are another nice bonus.

An Unconventional Way to Conserve

A lush, verdant lawn comes with a cost. Watering lawns and gardens accounts for a large portion home use. In drier areas such as the American southwest, many question whether the traditional American lawn is a good thing.

Xeriscaping responds to these concerns. A Denver task force coined the term (derived from the Greek "xeros" meaning "dry," and "-scaping" from "landscaping") to describe landscaping that prioritizes water conservation. Xeriscaping relies on careful planning and design, soil analysis, plant selection, and maintenance. There is no "one size fits all" plan.

While the southwest and west are early adopters of xeriscaping techniques, experts encourage property owners in other areas to consider this environmentally friendly option as well. Conservation conscious gardeners and homeowners throughout the country are embracing the model to create different—but equally beautiful—types of gardens and lawns.

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