



**WATER  
RESEARCH  
FOUNDATION™**

ADVANCING THE SCIENCE OF WATER®

# Water: Our Social Responsibility

conservation recycling diversifying sources climate change infrastructure desalination reuse storage sustainable supply

To everything there is a season. Yet water is eternal. We need water to drink. To grow our food. To support parks and gardens, wildlife, and wilderness. To power our lives. To provide for the businesses that employ millions. Yet, we face a looming water shortage. The U.S. population is expected to reach 450 million by 2050, an increase of 50 percent.

Our water consumption has climbed exponentially in the last decades. Water tables are falling in some of our key farming regions. Reduced rainfall and higher temperatures are drying up our lakes. The Colorado River, serving our nation's hottest, driest areas, rarely makes it to the sea.

**We have water to use, but none to waste** The Water Research Foundation (Foundation) is on the forefront of helping communities and suppliers adapt to a water-scarce world. Our work researching how to sustain our nation's water supply relates to evaluating how we source, save, use, and reuse water. We seek to find ways to conserve water, diversify water sources, protect water quality, and mitigate the impacts of climate change.

**Triple Bottom Line** Until recently, water suppliers and holders of water rights looked primarily at water quality and affordability when making water treatment and sourcing decisions. Today, they must also weigh management decisions, business plans, and other actions against a "triple bottom line" of economic, environmental, and social impacts. The Foundation has funded research into the practical applications of the triple bottom line concept in partnership with the Commonwealth Scientific Industrial Research Organization of Australia. It's part of our effort to ensure there is enough water for today and for tomorrow's generations.

To help the water supply community, industry, Congress, and others interested in how we sustain and protect our water, the Foundation has funded critical research on a variety of subjects. Issues being studied include:

**Diversifying Water Sources:** When demand for water is not fierce, communities can rely on a single source such as rainfall, snowmelt, or groundwater for their water. That becomes increasingly difficult as competing demands lead to water scarcity. Water source diversification—including reuse, desalination, conservation, and other sources—provides the framework for a number of different sustainability strategies.

**Outcome:** The Foundation's research is helping communities look at different water sources available and model the impact of various alternatives—helping them determine the best strategies to meet their water needs.

**Water Conservation:** Saved water is found water. If every consumer cuts back in small ways, communities can save millions of gallons. The residents of the Southwestern U.S. have been aware of water's scarcity since the area was settled. However, a nationwide push towards conservation began just in the past decade.

**Outcome:** The Foundation has elevated water conservation from a "nice to have" practice to a strategic imperative. Through our research, cities and states learned that conservation can be a financially rewarding alternative to building new reservoirs. Now we are analyzing conservation programs nationwide to uncover best practices, benefits, and barriers to success.

**Reducing Energy Use:** Water and energy are inextricably intertwined in a water-energy nexus. We consume massive amounts of energy to transport water, and we employ great amounts of water to create energy. Water utilities are among the biggest energy users in most cities.

Further, as water quality regulations grow more stringent, energy demand is likely to increase. Technologies such as membrane, ozone, and ultraviolet treatment are very effective, but energy intensive. Finally, as we search for new sources of water, we turn to water of lower quality—requiring, again, more treatment and more energy.

**Outcome:** The Foundation developed a software program to help utilities monitor how water treatment and energy consumption interact, helping them devise strategies to treat and deliver water more efficiently. One utility using this tool reduced energy use by 10 percent in one year. Further, we are interested in the tradeoffs between water quality, energy use, and greenhouse gas emissions, and in bringing those findings to policymakers' attention. Today, in partnership with a coalition of water utilities, we are developing a guide to help utilities measure and control their greenhouse gas emissions. The finished guide will be available to utilities worldwide.

**Sustainable Underground Storage:** When it comes to water, it is feast or famine for many communities. Water is plentiful during rainy seasons, while other seasons bring drought. Yet water demand is counter-cyclical, with the highest demand occurring when the least amount of water is available. We face a constant challenge of how to store water during times of plenty so that adequate resources are available in times of need.

**Outcome:** The Foundation is researching the planning and design of aquifer storage and recovery systems. These systems involve the recharge of treated drinking water into an aquifer during wet periods or when the raw water quality is the best—with recovery during dry periods or when the raw water quality is poor. We are also researching how to apply aquifer storage and recovery techniques to treated wastewater and storm water. Since we began this research, some 40 communities nationwide have implemented these programs.

**Water Recycling:** Not every water use demands pristine, drinking-quality water. For instance, treated wastewater can be used for agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a groundwater basin. Recycled water can be considered another water source, but the public is not always comfortable with its use.

**Outcome:** The Foundation has funded research not only to determine the water quality levels necessary for water reuse and the potential savings that could result, but also to help utilities communicate with the public over this potentially controversial issue.

**Desalination:** Ocean water and brackish groundwater are desalinated so they can be converted to drinking-quality

water for consumption or irrigation. However, large-scale desalination typically uses great amounts of energy as well as specialized, expensive infrastructure—making it very costly compared to the use of fresh water from rivers or groundwater.

**Outcome:** The Foundation has been on the forefront of researching the membranes necessary for desalination and how to reduce their cost. We also fund research that ranges from how to treat marginal quality, brackish waters to how to develop large-scale seawater desalination projects, from how to minimize the volume and impacts of desalination concentrates to how to manage salinity effectively.

**Climate Change:** One of the first symptoms of climate change is a wildly fluctuating water cycle. Already, in the Southwestern U.S., hotter winters have led to early snowmelt, so water used for drinking evaporates or runs off before seasonal demand peaks. In the Southeast, changing precipitation patterns have led to severe water shortages in Atlanta. The result: water supply constraints, while hotter weather bumps up demand.

**Outcome:** We are researching how, and in what ways, climate change will affect our water supply, and we are leading the way in finding practical solutions to these challenges.

**Water Infrastructure:** Reliable, well-maintained water mains and pipes are the backbone of a sustainable system. The U.S. government estimates it will cost as much as \$300 billion over the next 20 years to replace pipes, aging mains, and crumbling reservoirs. Since no community can afford the necessary investment all at once, the question is how to prioritize this vital work.

**Outcome:** Simply put, our research helps utilities know which pipe to renew, when to do it, and how best to do the job. We have developed models to help communities predict which pipes will need repair, and we have funded research into cost-effective, durable materials. We account for not only direct costs, but indirect costs to the public when making repair decisions.

**For more information about these studies and other efforts underway to sustain and protect our most valuable resource, contact:**

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