# Charting New Waters

## A Call to Action to Address U.S. Freshwater Challenges

*Issued by the Participants of*

**The Johnson Foundation Freshwater Summit**

September 2010

The Johnson Foundation AT WINGSPREAD

*Conferences that Inspire Solutions*

It has been said there are two ways to achieve change — through crisis or through leadership. Freshwater is too important to our ecosystems, communities and national security to wait for a crisis.

In the fall of 2008, The Johnson Foundation at Wingspread initiated *The Freshwater Forum* with one goal in mind: to ensure the sustainability and resilience of our nation's freshwater resources. This series of conferences was unique and unprecedented, engaging a broad range of leading national experts to discuss critical dimensions of freshwater issues including; the impacts of climate change on freshwater resources, infrastructure and the built environment, agriculture and food production, the water/energy interface and public health.

These conferences set the stage for *The Johnson Foundation Freshwater Summit* held June 9, 2010, at which leaders from business, nongovernmental organizations, agriculture, academia, government, foundations and communities convened to develop a set of consensus recommendations to address U.S. freshwater challenges. From their diverse perspectives and collective insight, an important call to action toward sustainable and resilient U.S. freshwater resources has emerged.

The Johnson Foundation at Wingspread brings no preconceived ideas nor fixed agendas to this or any issue on which we focus. Our conferences are intimate and distinctive in the diversity of perspectives brought to the table. Dialogue is candid, collegial and authentic in an environment that fosters the trust and collaboration needed to identify innovative yet broadly supported solutions that have impact.


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# Preamble

*Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges* represents the culmination of an intensive collaborative effort that began in 2008.

Building on its long history of catalyzing environmental and community solutions and approaching issues without preconceived ideas or fixed agendas, The Johnson Foundation at Wingspread convened a wide range of experts in a series of working session conferences to better understand and bring national attention to the myriad challenges facing United States freshwater resources, and the most promising solutions to address them. Collectively entitled *The Johnson Foundation Freshwater Forum*, the sessions reached across disciplines and interest group affiliations and involved more than 100 experts who approach freshwater issues from different vantage points, including climate science, municipal water management, ecosystem protection, agriculture and food production, energy generation, manufacturing, public health and more. The questions posed to these experts revolved around what it will take to achieve a sustainable and resilient freshwater system by the year 2025, the approximate time it will take for today's children to enter adulthood. On June 9, 2010, leaders representing business, nongovernmental organizations, agriculture, academia, government, foundations and communities convened at *The Johnson Foundation Freshwater Summit* to build on the findings of *The Freshwater Forum* conferences and chart a new course for the future of U.S. freshwater resources.

Throughout *The Freshwater Forum* sessions, there was broad consensus among participants that our current path will, unless changed, lead us to a national freshwater crisis in the foreseeable future. This reality encompasses a wide array of challenges – water pollution and scarcity; competing urban, rural and ecosystem water needs; climate change; environmental and public health impacts; and a variety of economic implications – that collectively amount to a tenuous trajectory for the future of the nation's freshwater resources.

While the nation has made much progress over the past century in addressing freshwater challenges, many still persist. Some challenges are acute and obvious. The severe drought that struck the southeast in 2007 left Georgia, Alabama and Florida locked in an interstate conflict over the management of Lake Lanier.[1] In California's Central Valley, a drought, economic recession and legal rulings to reallocate water supplies to protect ecosystems resulted in water management decisions that contributed to lost jobs and revenue for the region's agriculture industry in 2009. Competition among agricultural, urban and environmental water uses in the Central Valley remains a contentious situation. The 1993 Cryptosporidium outbreak in Milwaukee – which contaminated the city's drinking water supply – left more than 400,000

residents ill and an estimated 69 people dead and resulted in an estimated $96.2 million in medical costs and productivity losses.[2] The U.S. Environmental Protection Agency (EPA) estimates that there are 240,000 water main breaks per year in the United States. System breaks tend to increase substantially toward the end of a system's service lifespan, which is evident in the Midwest where large utility breaks increased from 250 per year to 2,200 per year over a 19-year period.[3] In 2007, the Washington Suburban Sanitary Commission reported 2,129 breaks in Montgomery and Prince George's County, Maryland – a 90-year record.[4] The U.S. Geological Survey estimates that U.S. water distribution systems lose 1.7 trillion gallons of water per year at an estimated annual cost to the nation of $2.6 billion.[5]

## U.S. Faces Mounting Water Quantity and Quality Challenges

Climate change is altering water supplies, and scientists predict it will further exacerbate water quantity challenges such as drought, flooding and reduced snowpack storage. Under the business-as-usual scenario of demand growth, water supplies in 70 percent of U.S. counties may be threatened by climate change and one-third may be at high risk by 2050.[11] Meanwhile, on the water quality side, 50 percent of our rivers and streams; 66 percent of our lakes, reservoirs and ponds; and 36 percent of our wetlands are impaired for at least some designated uses, including many for fishing and swimming.[12]

Other challenges are more subtle and chronic. The increasing presence of endocrine-disrupting chemicals in our rivers and drinking water supplies is an emerging concern and the suspected cause behind 80 percent of male bass in the Potomac River now exhibiting female sex traits. More than 90 percent of the five million people in the Washington, D.C., metro area get their drinking water from the Potomac, yet we have a poor understanding of the concentrations and long-term human health impacts of endocrine-disrupting chemicals in drinking water.[6] The United States leads the world in number of crayfish species, but half are in jeopardy, and 40 percent of freshwater fish and amphibians are at risk.[7] The slow but steady depletion of the Ogallala Aquifer (i.e., the High Plains Aquifer), the main source of groundwater for irrigating crops in America's breadbasket, has already left parts of Texas without local water supplies.[8] Moreover, a 2003 survey by the U.S. General Accounting Office revealed that at least 36 state water managers expected to experience water shortages in their states by 2013.[9]

Meanwhile our growing population and changing environmental conditions continue to drive the nation toward inevitable and difficult freshwater management decisions. Many challenges will center on balancing municipal, rural and ecosystem supply needs. We must ensure the long-term viability of safe, affordable and efficient food production while also meeting municipal and industrial water needs. We need to reduce the water demands and impacts of energy generation while continuing to produce enough energy to sustain our economy. We must work to mitigate the causes of climate change and to adapt to its impacts on the hydrologic cycle, which pose serious risks to freshwater supply and quality across large areas of the nation.[10]

*Freshwater Forum* participants emphasized the broad scope and urgency of freshwater problems in the United States, while underscoring that we are dealing with 21st century freshwater problems using 20th century strategies and technologies, and falling short. On a more optimistic note, the *Forum* deliberations also made it clear that solutions to most, if not all, of our freshwater challenges are within reach. The Johnson Foundation believes this is indeed the case, and that those solutions are more likely to be found and implemented when smart, good-willed people with diverse expertise attack complex problems collaboratively. *The Freshwater Forum* affirmed this philosophy as participants from all sectors engaged in thoughtful discussion, identifying freshwater challenges as well as innovative solutions with the cumulative potential to set the nation on a new trajectory toward sustainable and resilient freshwater resources. It has been said there are two ways to achieve change – through crisis or through leadership. Freshwater is too important to our economic vitality, ecosystems, communities and national security to wait for a crisis, so The Johnson Foundation at Wingspread and our many partners and advisors have opted for leadership. Together we aim to harness the ingenuity and collective spirit that define the United States and direct it toward vigorously addressing the nation's freshwater challenges.

As the convenor of *The Freshwater Forum* and *The Freshwater Summit*, The Johnson Foundation is honored to present this *Call to Action to Address U.S. Freshwater Challenges*. The vision, principles and recommendations developed by the parties to this *Call to Action* were designed to bring overdue attention to our nation's freshwater challenges and catalyze action to address them. The *Call to Action* will also serve as a roadmap for the ongoing work of The Johnson Foundation, which is committed to using our time-honored convening expertise and facilities to support the work that lies ahead. The Foundation looks forward to continuing to support collaboration among the network of people that has coalesced around this process, and to helping forge new relationships in pursuit of sustainable and resilient U.S. freshwater resources.

# A Vision

*for Sustainable and Resilient U.S. Freshwater Resources*

Freshwater is as essential to human survival as the air we breathe. Since the origin of civilization, water has been a central element and unifying force of society, economy and culture. Major human population centers have always developed near abundant sources of freshwater – for example, "Mesopotamia" literally means "land between two rivers."

> "Three essential [freshwater] goals are dependable and safe supplies for people, protection and management of the environmental systems through which [freshwater] moves, and efficient water use."
>
> – GILBERT F. WHITE [13]

While these are widely understood truths, the United States has made only modest progress toward meeting the freshwater goals articulated by water management visionary Gilbert White more than 25 years ago. Though we have come a long way since the landmark freshwater legislation of the 1970s, we will never meet Gilbert White's three essential goals if we continue to follow our current trajectory.

We, the participants in *The Johnson Foundation Freshwater Summit*, see many opportunities to establish a more promising future for U.S. freshwater resources – a future that is sustainable and resilient. We see a future in which leaders in all sectors have the courage and tools to chart a new course that ensures access to clean freshwater for all Americans. We have a vision of institutions, organizations, communities and individuals who recognize that the health and safety of our natural and built freshwater systems warrant dedicated attention, investment and action. Streamlined and effective regulation and enforcement, collaborative problem solving, innovative local and regional strategies, technological innovation, integrated policy and management solutions, and co-beneficial strategies and outcomes are the hallmarks of the new course we see for freshwater management and resources in the United States.

## We envision a future in which:

- America's freshwater resources sustain our economic and social needs while enhancing environmental quality for future generations.
- Every region, state, town and citizen has enough water to meet their basic needs.
- Parents know the water coming from their taps will safely quench their children's thirst.
- Every child, urban or rural, has a clean stream in which to play.
- An abundance of fish and wildlife thrive in and around our streams, rivers and lakes.
- Grandparents can teach their grandchildren to fish, knowing both their bodies and souls will be nourished.
- And every person understands why a reliable supply of freshwater is critical for all our basic needs – from food production to electric power generation.

In this future, our sustainable and resilient freshwater resources reinforce America's preeminence as the land of opportunity, attracting new investment while providing an unparalleled quality of life.

# Principles for Action

The principles below represent truths held in common by *Freshwater Summit* participants. They illustrate why addressing our freshwater challenges should be a national priority, and what we need to consider when we take action so that our vision of sustainable and resilient freshwater resources for the United States will be realized.

# We must act now because…

## Healthy and livable communities need clean and adequate freshwater

Freshwater is the critical link between public health and quality of life. Access to clean and adequate freshwater is arguably the most direct path to improving public health, because water affects all domains of human health. How we manage the forests and lands around our source waters and the water systems and services that serve our communities directly affects the health of terrestrial freshwater ecosystems and the estuaries and marine ecosystems they feed, as well as our physical and mental health and spiritual well-being. Every U.S. community needs access to clean drinking water, as well as adequate surface and groundwater resources for municipal, industrial, agricultural, recreational and ecological uses. We must reinvent how our cities, towns and rural communities interface with freshwater, to sustain healthy and livable communities in the 21st century and beyond.

## Reliable freshwater supplies are critical to U.S. economic security

Adequate and reliable freshwater supplies are an essential underpinning of U.S. economic security. Energy generation, manufacturing, food production and many activities of daily life in America are dependent on access to freshwater. An estimated 41 percent of the nation's water withdrawals are being used for thermoelectric power generation, primarily coal, nuclear and natural gas.[21] These power plants fuel our economy, lighting cities and towns and powering our factories.

## Public Health Depends On Clean Water

When piped water came to the United States in the mid-19th century, instances of waterborne diseases such as cholera and typhoid fever escalated because contaminated water could be delivered to more people from a common source. Cholera epidemics in New York City in 1832 and 1849 killed 8,500 people. In 1891 typhoid fever in Chicago killed 2,000. The introduction of chlorine in the early 20th century and a range of water pollution acts from the 1940s to 1970s dramatically improved public health. Incidence of typhoid deaths dropped to near zero by 1940.[14]

## Water Scarcity Impacts Energy Generation

In the last decade, water availability has begun to impact the reliability of power. In 2008, drought forced the temporary closure of a nuclear plant in Browns Ferry, Alabama, and shutdowns were threatened across the Southeast that summer.[15] [16] The California Energy Commission created a policy in 2003 that discourages the use of freshwater for power plant cooling. Power plant developers are responding by proposing projects that require less or no water.[17]

## Population Growth Drives Water Demand

The nation's population is projected to increase to 392 million by 2050 – a 27 percent increase from the current figure of around 307 million.[18] Our farmers and ranchers will need to produce food for these new mouths. Meanwhile, trends in water consumption show that, as our population has grown, the amount of water required for public supply – municipal, commercial and industrial purposes – has increased as well. Between 1950 and 2005, our population doubled and our water use for public supply tripled.[19] However, as we have begun conservation measures, this gap is closing; between 2000 and 2005, our population increased 5 percent while public supply withdrawals increased by just 2 percent.[20]

Manufacturers are often water utilities' largest customers, with cooling, process uses, cleaning, sanitation and steam generation being the most common water uses. Another 37 percent of U.S. freshwater withdrawals go toward irrigated agriculture.[22] Agricultural communities are the foundation of a stable food supply and integral to the nation's economy and overall well-being. The United States agricultural sector is a net exporter of food, and provides a trade surplus that helps recover American dollars spent on imported goods. With global food demand predicted to double by 2030, continued production in the agricultural sector is critical to our long-term economic security, as well as global food security.[23] The traditions of Eastern water law and the Western doctrine of prior appropriation, and the differences between them, must be acknowledged and respected as we seek freshwater solutions. Tourism is another key driver of many of our nation's local economies, where vacationers go to fish, boat and swim in lakes, rivers and streams. Increasing water efficiency in all sectors and ensuring that freshwater needs vital to our economic security are met into the future at an acceptable cost should be national priorities. Our historically plentiful freshwater supply has afforded the nation an advantage in the global marketplace, and we must act now with urgency and focus to ensure we maintain that market advantage.

## Freshwater ecosystems have intrinsic value and are fundamental to our natural heritage and economic well-being

Healthy freshwater ecosystems and species provide goods and services for society, including water purification, food and other quantifiable benefits. They also represent part of the nation's natural heritage and have intrinsic value in and of themselves. U.S. freshwater biodiversity is exceptional on a global level. For example, the southeastern United States alone possess more than 600 native fish species.[24] Yet many of the nation's freshwater species have already been severely impacted or are threatened by human activities. For example, we have the most freshwater mussels species, but two-thirds are at risk of extinction and 10 percent may already be extinct.[25] Freshwater mussels have long offered value to humans as food and raw material for making tools and jewelry, and are now considered key indicators of water quality and ecosystem health as they are sensitive to pollution. But they also possess value within the ecosystems they help constitute, providing food for wildlife like muskrats and otters and acting as natural water purifiers. We must keep the intrinsic value of ecosystems and species in mind as we develop and implement laws, regulations, policies and technologies to manage, conserve, restore and protect freshwater ecosystems.

## Ecosystems can experience abrupt, nonlinear change

While ecosystem change is normally slow and incremental, scientific evidence suggests ecosystems can change abruptly, with significant detrimental effects on ecological and human well-being. Nonlinear changes occur when pressure on a particular ecosystem component crosses a threshold, sparking accelerated change that reverberates throughout the system. Human activity is reducing the resilience of many natural systems and increasing the possibility of crossing ecological thresholds. Although science can confidently say that ecological thresholds exist, it is extremely difficult to predict at what point they will be crossed and whether the subsequent effects will be reversible. We must take a proactive, precautionary approach to foster the resilience of our freshwater ecosystems and avoid crossing ecological thresholds.

# When we act, we need to…

- Take bold steps and make intentional investments to transform our current trajectory toward freshwater crisis into one toward sustainable and resilient freshwater resources.
- Support and empower visionary leaders at all scales of society that champion freshwater and facilitate collaboration across jurisdictions, disciplines and sectors to implement durable freshwater solutions.
- Design context-sensitive freshwater solutions that account for communities' sociopolitical, economic and environmental dynamics and leverage local people's sense of place, while adhering to relevant federal and state laws and policies.
- Consider the potential impacts of freshwater resource solutions on all people and places, including minority and low-income urban and rural communities, and avoid solutions that benefit one sector, group or place at the undue expense of another, including future generations.
- Seek robust co-beneficial solutions and triple-bottom-line outcomes that address environmental, economic and social equity challenges simultaneously in a cost-efficient manner.
- Generate sound science that accounts for the dynamic nature of freshwater systems and our emerging understanding of climate change impacts on water that can be shared in real-time to inform mitigation and adaptive management strategies.
- Employ inclusive, fair and transparent public participation processes, including respectful government-to-government consultation with indigenous peoples.
- Target performance-based incentives and standards toward different freshwater users and innovators to drive solution-oriented behavioral and technological change.
- Identify, share, replicate and scale-up the best freshwater solutions from across the nation.

# Call to Action

We, the participants of *The Johnson Foundation Freshwater Summit*, collectively call on leaders in all sectors of society to address the myriad challenges facing the United States' freshwater resources. Together we are representatives from business, nongovernmental organizations, agriculture, academia, government, foundations and communities. We are collaborating in our commitment to harness American ingenuity and develop a suite of innovative, integrated freshwater solutions that cut across traditional boundaries and counteract the inertia that has developed around freshwater management due to fragmented decision-making frameworks and other institutional obstacles. We urge other leaders to join us and do their part to advance the implementation of sustainable and resilient solutions to the full range of freshwater challenges we face.

The time to lead is now.

# Recommendations

We believe concerted implementation of the following consensus recommendations will set the nation on the right course to realize our vision of sustainable and resilient freshwater resources for current and future generations of Americans. We encourage leaders and actors in different sectors to adhere to the Principles for Action stated above as implementation of these recommendations is pursued. While we strongly support bold action and would like to see rapid transformational change, we acknowledge the incremental nature of decision making in a democratic society, and our recommendations reflect that reality.

# Improve Coordination of Freshwater Management Across Scales and Sectors

## Challenges and Rationale

Our nation's overly complex system of freshwater governance hinders our ability to fix the full range of problems we face. It is imperative that our system of national standards and oversight allows for state and local actors to make and implement freshwater management decisions that make sense in terms of local watershed dynamics. At times their ability to do this is impeded by a lack of coordination among federal and state agencies, each of which is acting according to its legislative and regulatory mandates, but may not function effectively as a system. This lack of coordination can result in confusion at the state and local level, sometimes exacerbating the very problems they set out to solve. The missions and activities of the agencies, organizations and local-level actors dealing with freshwater issues need to be coordinated within and across different sectors and scales of governance. Such coordination will create the necessary foundation to design and implement durable solutions that align with the principles and recommendations in this *Call to Action*.

## Convene a U.S. Freshwater Resources Commission

We believe the nation would greatly benefit from a diverse, multi-stakeholder commission to clarify and streamline the responsibilities and roles of agencies at different levels of freshwater governance. We recommend that an appropriate entity convene a high-level freshwater resources commission with a focused mission, an explicit timeline with a clear start and end point for the completion of its work, and clear guidelines for reporting its findings. The overarching goal of

the commission should be to propose solutions that increase the integration and efficiency of the existing patchwork of jurisdictional authorities overseeing management of the nation's freshwater resources. Potential convening models that would impart authority and credibility to this cross-sector effort include a Presidential commission, a Congressional commission or a commission spearheaded by a private foundation or trust. Outlined below is a roadmap that we believe will be useful for convening and executing this much-needed collaborative effort.

The commission's charge should center on prioritizing opportunities and actions to address inefficiencies in the interplay between the different authorities and roles of federal, state, local and tribal governments in managing freshwater resources. We believe this analysis would be most effectively accomplished by a multi-stakeholder commission comprised of individuals from all levels of government (including tribal governments), nongovernmental organizations, businesses, the agricultural sector, water and energy utilities, academia, tribes and communities that collectively represent all sectors and the geographic diversity of the nation.

There are several specific tasks that we recommend the proposed commission execute as part of its charge. First, we recommend that the commission develop an integrated characterization of the water quality and quantity challenges facing the nation to create a platform for its examination of U.S. freshwater governance. The characterization effort should include: identification of gaps in data and monitoring capacity and recommendations for filling them; articulation of key challenges to supplying an adequate amount of freshwater for the multiple uses for which it is needed (energy and food production, ecosystem health, industry, municipal use, recreation, etc.); and overview of the current state of technology, infrastructure (structural and nonstructural), human and financial resource capacity available to implement and sustain workable solutions to key challenges.

With the aforementioned integrated characterization as a platform, we recommend that the commission's main purpose be to conduct an assessment of the current jurisdictional frameworks governing water quality and quantity management across geographic scales of governance and make recommendations about how to streamline intergovernmental interactions. The commission should examine current federal, state and local laws and regulations and other governing authorities for water quality and quantity management to identify barriers to and opportunities for: greater efficiency and effectiveness of water policy and management; reducing stovepipes and eliminating conflicts and redundancies; and creating new authority to address emerging freshwater issues where necessary. Moreover, we recommend that this freshwater resources commission make recommendations for improving statutory authorities and establishing alternative dispute resolution mechanisms to resolve water-related disputes between stakeholders. A review of federal laws governing water quality and quantity management to assess whether changes are needed to promote a risk-based approach to climate change adaptation and associated freshwater management challenges is also needed. We acknowledge that the commission's recommendations may include suggestions for legislative action by Congress. If that is the case, they should reflect a respectful balance between the role of federal, state and local authorities and actors.

We believe stronger linkages are needed between federal programs that provide important policy frameworks and guidance, and agencies and actors at different levels of governance. Water is managed at the local level, so it is critical that leaders and water users within watersheds have an active role in decision making about and implementation of freshwater solutions. Therefore, we recommend that the commission identify opportunities to manage national water programs to better support local, state, tribal and regional programs and reinforce the capacity to develop and implement effective policies. We also see a need to integrate water considerations into other closely related policy arenas such as energy efficiency and job creation.

The last element of the proposed freshwater resources commission's charge that we recommend is the articulation of an inspired vision for achieving durable solutions that perform successfully at the watershed scale, to frame the outcomes of the commission's work. We suggest that the vision be grounded by illustrative examples of cooperative conservation and innovation from different regions, states and watersheds.

## All Sectors Help Document Integrated Governance Approaches

We believe nongovernmental organizations (NGOs), academic research institutions and private-sector leaders must play an active, ongoing role informing policy makers, in parallel with efforts such as the proposed freshwater resources commission recommended above, about ways to streamline and integrate freshwater governance without compromising ecological, economic or social outcomes. We recommend that NGOs, academic researchers, business and agriculture leaders, and other parties contribute information about successful freshwater governance models from different regions and scales to a common online database that is accessible by all. These contributions should highlight approaches, models and success stories of streamlined and integrated regulation and enforcement, collaborative problem-solving, technological innovation, integrated policy and management solutions, and co-beneficial strategies and outcomes – the hallmarks of the new trajectory we see for freshwater management and resources in the United States. Cooperative Conservation America's website – a public forum for collecting and sharing the cooperative conservation stories, lessons, models and achievements of all Americans – provides a possible model for this effort.[27]

### Partnerships Drive Integrated Watershed Planning

The California Integrated Regional Water Management (IRWM) Planning process promotes integrated planning within the watersheds of the state in a systematic way to ensure sustainable water uses, reliable water supplies, better water quality, environmental stewardship, efficient urban development, protection of agriculture and a strong economy. IRWM is accomplished through partnerships of local water providers, county governments, flood control districts, NGOs and state agencies. State funding for the IRWM planning and implementation of projects was authorized by two state multi-billion-dollar voter-passed propositions. This funding has resulted in IRWM plans for most of the state and funding for projects such as recycled water, ecosystem restoration, stormwater best management practices and desalination.[26]

## State and Local Leaders Seek Collaborative Solutions

State and local decision makers – government and nongovernment – play a key role in the implementation of freshwater management laws and regulations and are often in the best position to integrate the interests of different stakeholders within a watershed. Since political boundaries typically do not align with watershed boundaries, we recommend that state and local leaders seek and seize opportunities to work across jurisdictions to find integrated and co-beneficial solutions that meet urban, rural and ecosystem needs. For example, an initiative entitled the Ag/Urban/Enviro Water

Sharing Work Group, funded by the Walton Family Foundation, has brought together a group of urban, agricultural and environmental leaders to identify innovative, balanced water sharing strategies for the Colorado River Basin.[28] This project and others like it may provide templates for cross-jurisdictional collaboration that could be applied to other Western watersheds. This type of approach will require many leaders to change from a competitive mindset to a collaborative approach in which parties come together to seek co-beneficial outcomes. The key to these types of efforts is the diversity and credibility of the participating stakeholders.

## NGOs and Academia Coordinate to Support Co-Beneficial Solutions

NGOs and institutions of higher learning can play a key role in helping build relationships that bridge traditional divides to create innovative water management solutions that also address national priorities, such as healthy communities and job creation. First, we recommend that NGOs and academic institutions evaluate how they are structured internally with respect to addressing freshwater challenges, with the goal of breaking down disciplinary silos. We also encourage identifying and establishing mechanisms for enhanced coordination of research and policy development efforts, as well as interdisciplinary collaboration among organizations and institutions to advance freshwater solutions. Lastly, we recognize the important role the nongovernmental and academic sectors play in voicing support for the dedication of sufficient human and financial resources to address freshwater challenges, and strongly encourage them to play that role in helping to implement the recommendations contained in this *Call to Action*.

## Communities Share Co-Beneficial Solutions

Healthy freshwater ecosystems are an essential underpinning of community parks, open spaces and gathering places, and the value they offer in this regard is best understood and prioritized at the local level. However, we must recognize that mechanisms for the protection of local water resources often originate at the federal or state level. We recommend that local communities draw on federal and state guidance and tools to plan for, manage and communicate about their water supply and quality needs, while designing strategies to achieve co-beneficial outcomes that are adapted to the place. We encourage community leaders to explore innovative, decentralized water quality and quantity solutions that can be implemented at the neighborhood, site and individual building scale. Communities should also proactively seek and share existing models and tools that will help advance co-beneficial solutions to locally specific freshwater needs and challenges. In the future, we envision that models and success stories of integrated, co-beneficial solutions will be easily accessible via the type of database recommended in this *Call to Action*.

### Local Knowledge Can Inform Innovative Solutions

The firsthand experience of local people working on the ground daily to address freshwater challenges offers a valuable resource that can be tapped for innovative solutions. Whether it is scientists and agricultural leaders collaborating through the U.S. Fish & Wildlife Service's Partners for Fish and Wildlife Program in Wyoming's Little Snake River watershed to sustain wildlife and natural resource needs alongside compatible agricultural uses and recreational opportunities;[29] or architects and builders working with public officials and private investors in New York City to design and install on-site water re-use and stormwater treatment technologies for a residential high-rise;[30] people with hands-on experience can offer valuable insights and be helpful partners to policy makers in all sectors. Solutions to our freshwater challenges will have a greater chance of success if they are rooted in local knowledge and American ingenuity.

# Enhance Effectiveness of Existing Regulatory Tools for Freshwater Management

## Challenges and Rationale

During the late 1960s and early 1970s, when many of our regulatory water quality frameworks were established, the health of many of our freshwater resources had reached crisis levels. The tools developed at that time effectively addressed many of those acute challenges, and prescriptive standards were developed predominately to address point-sources of pollution. In 2010, the emerging and increasingly complex freshwater challenges we face are pushing the boundaries of the original frameworks. The lack of effective alternatives results in existing regulatory tools being used in some cases to address freshwater problems to which they were not intended to be applied. The limitations of existing regulatory, enforcement and decision-making mechanisms often do not afford stakeholders an opportunity to seek constructive, co-beneficial solutions. Improving existing regulatory tools, along with development of appropriate market-based and voluntary approaches, promises to generate broader engagement across sectors in solution implementation. In short, we need 21st century tools to address our 21st century freshwater problems.

In parallel with the implementation of a commission to explore ways to enhance coordination and streamlining of freshwater governance, we recommend that the near-term steps outlined below be taken to enhance the effectiveness of existing regulatory tools in addressing the freshwater challenges facing the nation. Participants in *The Freshwater Summit* may have different views on how to approach the opportunities outlined below, but we collectively recognize them as ripe opportunities nonetheless.

## U.S. Environmental Protection Agency Make Near-Term Improvements to Key Freshwater Policies

We recommend that federal agency leaders within the EPA identify near-term opportunities for improving implementation of the Clean Water Act (CWA) and related policies, and base proposed improvements on sound science and data. Building on the basic tenets of the CWA, the EPA should promote and encourage the formation of integrated watershed-based management strategies and partnerships. We recommend that the Agency seek opportunities to expand the application of successful cross-jurisdictional governance models (e.g., river basin commissions) that can be adapted to different authorities, create opportunities for local-level leadership and innovation, improve planning and monitoring, and establish inter-jurisdictional dispute resolution mechanisms. In light of current understanding about the important linkages between surface water, groundwater and drinking water sources, we also recommend that the EPA explore the relationship between the CWA and the Safe Drinking Water Act and identify opportunities to achieve greater operational efficiency between these two critical freshwater laws.

We recommend that the EPA increase financial and technical assistance to states to build capacity for improving the effectiveness of CWA implementation at the state level. Assistance should include provision of necessary assistance to states to facilitate understanding of numeric nutrient criteria for water quality. The Agency should also identify and disseminate best practices for reducing nutrient loading and addressing emerging contaminants, while working to remove barriers to rapid and widespread adoption so that best practices become common practice. In particular, collaborative and science-based efforts to address nonpoint sources of these pollutants should be emphasized. The EPA needs to also create the right conditions for the testing and evaluation of new pollution control technologies and strategies in order to accelerate innovation and reduce financial, environmental and other risks to investors and communities.

### Task Force Creates Cohesion Among Stakeholders

The Great Lakes hold 84 percent of North America's surface freshwater, according to the EPA. Within the United States, 11 federal agencies, eight U.S. states, 40 tribal nations, several major metropolitan areas, and numerous county and local governments together govern the Great Lakes. In 2004 President Bush created the Great Lakes Interagency Task Force to provide strategic direction on federal Great Lakes policy, priorities and programs. The EPA, the lead agency, works with state governors and mayors to facilitate regional collaboration. Goals include cleaner water and sustainable fisheries.[31]

We also recommend that the EPA update CWA-related regulations that oversee stormwater flows by adopting recommendations provided by the National Research Council (NRC) in their 2009 report, *Urban Stormwater Management in the United States,* that are consistent with this *Call to Action*.[32] For example, the EPA could develop guidelines about how to design and calculate site-based impervious area fees to facilitate broader implementation of this cutting-edge approach, which is already driving innovative stormwater solutions in cities like Philadelphia and Washington, DC. The NRC's recommendations are particularly useful because they

recognize the complexity involved in treating and regulating stormwater due to the variable nature of flows and spatial distribution of control points, as well as interrelated impacts on water quality, biological integrity and habitat function of receiving water bodies.

## U.S. Department of Agriculture Seek Improvements to the Next Farm Bill and Improve Implementation of the 2008 Conservation Title

As the EPA does with the CWA, the U.S. Department of Agriculture (USDA) has opportunities to improve the effectiveness of programs and policies under the Food, Conservation, and Energy Act of 2008 (Farm Bill) in the near-term. We recommend that the USDA make adjustments to its rulemaking and implementation of the 2008 Farm Bill Conservation Title programs to increase their effectiveness in catalyzing environmental stewardship and watershed-scale environmental outcomes, and recognize efforts these programs have taken in that direction.

### Source Water Protection Less Costly Over Long Term

Studies have shown that in the case of groundwater, protecting source water from contamination is on average 30 to 40 (and up to 200) times cheaper than dealing with the consequences of contaminated groundwater.[33] For example, when water supply in Burlington, North Carolina, became contaminated with the agricultural pesticide atrazine, the city chose to pursue source water protection rather than treatment. The pollution was traced to its source, and the city provided farmers with subsidies to assist them in shifting to alternate pesticides and pest control practices. This cost the city around $30,000 total in lab analyses and subsidies to farmers, while treating for atrazine would have cost the city $108,000 annually.[34 35]

We support the creation of the Mississippi River Basin Initiative (MRBI) and the movement to advance and incentivize water monitoring as a tool for measuring performance and informing the planning process. We encourage creation of more such mechanisms that: target conservation funds toward impaired watersheds and are science-based; involve diverse watershed stakeholders familiar with local watershed conditions; and model interagency and cross-jurisdictional collaboration in support of locally led watershed initiatives. Furthermore, we encourage the creation of mechanisms that: incentivize suites of successful nutrient reduction strategies through cost-sharing; provide cost-share to farmers and groups for conducting water monitoring and other procedures to measure environmental performance of conservation practices; and include targeting and environmental performance measurement in grant-making criteria. In addition to targeting disbursement of conservation resources toward impaired watersheds, we recommend that the USDA link stronger accountability mechanisms to conservation funding. Initiatives such as the Conservation Effects Assessment Program should be continued and expanded to ensure that practices and approaches supported by USDA funding achieve the environmental outcomes intended.

As the next Farm Bill is being developed, the USDA should work with Congress to strengthen and improve its effectiveness in addressing freshwater conservation, in line with recommendations throughout this *Call to Action*. This should include expanded support for 2008 Farm Bill initiatives such as the Agricultural Water Enhancement Program and the Cooperative Conservation Partners Initiative that facilitated such targeting, collaboration and monitoring efforts as the MRBI. Expanded support for the Conservation Innovation Grant program, which partners the USDA with leaders in academia and business to develop, pilot and disseminate innovative solutions to conservation challenges, should include increased emphasis on freshwater quality and usage challenges. Increased financial and technical assistance should be provided to help farmers overcome prohibitive costs and other barriers that hinder the implementation of operational changes aimed at freshwater conservation. Additional funds should also be directed toward capacity building at the

watershed scale, including development of local leaders in collaborative conservation, so that more local people are equipped to spearhead the formation of multi-stakeholder conservation efforts at the watershed scale, and strengthening of coordinating infrastructure to facilitate watershed planning, implementation and monitoring and evaluation needed to achieve environmental performance.

## White House Council on Environmental Quality Complete Update of Principles and Guidelines for Federal Water Resources Projects

We acknowledge the ongoing interagency effort, led by the White House Council on Environmental Quality (CEQ) and Office of Management and Budget, to modernize the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Principles and Guidelines). The current Principles and Guidelines for federal water resources projects were originally established in 1983, and the time has come to update them so that environmental factors are considered as thoroughly as economic factors.

# Promote Efficient, Environmentally Wise Water Management, Use and Delivery

## Challenges and Rationale

The nation's leaders should launch a full-throttle effort to research, develop and demonstrate innovative and environmentally wise freshwater practices and technologies for efficient water use, alternative water supply sources and advanced water treatment. Just as efficiency is being heavily touted as a key tactic in the energy sector, efficient water use and delivery should be promoted as the frontline tactic for conserving and extending existing water supplies. We also need to raise awareness about the inextricable link between water and energy. Estimates vary, but somewhere between 10 and 20 percent of our nation's energy supplies go to the treatment, movement and use of water. Conversely, vast amounts of freshwater are necessary for energy resource extraction and electricity generation. By integrating water and energy management and policy, the nation can simultaneously improve the efficiency of use of both critical resources.

A key concept that underlies efficient and environmentally wise water management is "the right water for the right use." Potable water is currently dispersed for many uses in this country that do not require it, such as certain industrial applications, watering lawns and washing cars, to name a few. Freshwater is a finite resource, and to meet growing demand, we need to develop policies that enable us to continue providing safe drinking water while also allowing and facilitating the use of nonpotable water in situations where it is available and safe to use for the intended purpose. Moreover, we need to develop accepted methods for practices such as water accounting (e.g., water footprinting) so that major water users in different sectors are able to accurately track and minimize their impact on freshwater resources through smarter allocations and other mitigation measures.

## Businesses Implement and Report on Freshwater Best Practices

We recommend that the business sector take a variety of steps to help put the nation on a path to sustainable and resilient freshwater systems. First, businesses should understand and report on their water inputs, outputs and activities, and seize opportunities to enhance mitigation of water quality and quantity impacts (e.g., water accounting). We also suggest that companies enhance understanding of water use efficiency along supply chains to identify opportunities and take action to measurably improve efficiencies. In addition, we recommend that businesses voluntarily share innovative and successful private-sector models for water conservation, efficiency, re-use and stormwater management. We also strongly recommend that business leaders actively collaborate with government and other stakeholders to develop and promote sustainable freshwater solutions.

## Agricultural Producers Collaborate with Other Sectors to Enhance Freshwater Management

Farmers and ranchers own and operate a significant portion of the nation's land and often hold senior water rights, which means that they have a deeply vested interest in a dependable and quality supply of freshwater. We recommend that leaders from government agencies and other sectors collaborate with agricultural producers to develop and implement on-farm water efficiency and runoff and drainage management improvements. As noted in examples in this report, improving their operational efficiency with conservation practices is an important factor agricultural producers can control to increase their profitability, which results in them having a wealth of practical knowledge about successful on-farm improvements. Key ways farmers and ranchers can help their bottom line and maintain future production opportunities while improving watershed health include minimizing the loss of nutrients and soil, improving energy efficiency, optimizing yield and optimizing the effectiveness of nutrient and pesticide application to reduce excess. If arranged as cost-sharing partnerships, or through other creative incentives, these cross-sector collaborations could also help producers defray the implementation costs of operational changes and create models that could be shared and scaled up across the nation.

## Governments and Utilities Invest in Development and Implementation of Measures to Increase Efficient Water Use

We recommend that governments and utilities ramp up investment in research and development of new and emerging practices and technologies that improve demand-side water efficiency and reduce pollutant discharge. They should develop and promote pilot demonstration projects focused on monitoring and evaluating the effectiveness of innovative water efficiency and re-use practices and technologies according to performance-based, triple-bottom-line criteria for success. Examples of promising areas for investment include smart water meters, high-efficiency irrigation technologies and techniques, water efficiency programs, such as the EPA's WaterSense program, innovative distributed water supply and treatment systems, and direct water re-use. Rigorous performance-based evaluation of water efficiency practices and technologies will help decision makers determine which are worthy for widespread deployment.

### Farmers Work with Water District to Improve Efficiency

Since 1996, the Panoche Water and Drainage District in California's Central Valley has facilitated implementation of high-efficiency irrigation systems within the district's boundaries by making low-interest loans available to farmers for the purchase of gated pipe, sprinkler, and drip irrigation systems. Partially funded through state grants and loans, the program has helped farmers invest approximately $5 million dollars in new irrigation systems, and 70 percent of the district's cropland is now irrigated with high-efficiency equipment.[36]

To facilitate widespread adoption of successful water efficiency measures, we also recommend that government agencies and utilities develop incentives modeled after successful household energy efficiency programs. Along with incentives to act, clearer messaging is needed to raise awareness about the inextricable relationship between water efficiency and energy efficiency, which could help drive down water demand and therefore energy demand.

## Governments and Utilities Increase Efficiency of Water Delivery and Implement Environmentally Wise Supply Enhancement Strategies

Demand for management improvements must be balanced with supply enhancement strategies to help provide the right mix of solutions for varying circumstances across the nation. Reused and recycled water are potentially effective means of expanding our supply and limiting the energy needed to treat and transport water. We recommend that local governments and utilities with authority over water supply management take action to reduce policy and public perception barriers to water recycling and re-use by educating the public about the purposes and safety of reused and recycled water.

With U.S. cities losing approximately 20 percent of their water to leaks and suffering 1.2 trillion gallons of wastewater spills each year, we recommend that governments and utilities prioritize the rehabilitation of existing water storage and distribution facilities.[37] Rehabilitation measures should focus on maximizing delivery efficiencies, upgrading old piping and distribution systems and re-regulating reservoirs to minimize operational waste. In cases where construction of new supply infrastructure such as a dam is deemed necessary based on an alternatives analysis, careful attention must be devoted to avoiding, minimizing and/or mitigating ecosystem or other impacts.

Along these lines, we recommend adopting federal policy that supports the evaluation of new water supply enhancement projects in watersheds with inadequate storage capacity. Development of such projects, along with opportunities to increase beneficial use and provide operational flexibility, must be weighed against the ability to avoid, minimize and mitigate potential ecosystem impacts. We suggest that such a policy ought to encourage state and local co-leadership with stakeholders in the area for the planning and implementation of such projects, and call for the consideration of new and emerging supply enhancement strategies in the design phase. Additional groundwater supplies should be developed with sensitivity to the safe-yield and recharge parameters of the particular aquifer, ecosystem impacts and energy required for pumping. Conjunctive management of surface and groundwater supplies should be encouraged, including development of groundwater recharge projects that can be employed to take advantage of times of high surface flow.

We also recommend that government agencies, utilities and other relevant actors develop pilot demonstration projects to evaluate the effectiveness of emerging supply-side freshwater practices and technologies. New and promising supply-side improvements include ecosystem restoration and engi-

neered wetlands, enhanced flood management, improved technology to treat brine-impaired waters, stormwater recharge, direct and indirect water re-use and cutting-edge drinking water treatment and disinfection systems. Pilot projects will help decision makers determine which new supply-side approaches are worthy for broad-scale implementation.

## All Sectors Help Develop a Skilled Workforce to Support Water Management, Use and Delivery

The nation will need a skilled workforce to carry out the construction, operation and maintenance for more efficient and sustainable water management, use and delivery systems. We recommend that leaders from all sectors contribute to a comprehensive assessment of long-term workforce needs and job opportunity projections in the water industry. Based on the results of that assessment, we must develop the resources to fill identified gaps in our workforce, including investment in training programs that will help develop the skills needed to support emerging water management practices, such as green infrastructure, water re-use technology and other innovative approaches.

Developing a workforce with these skills will help create jobs and bolster community economies by providing livable wages and promoting healthy neighborhoods. Furthermore, these investments will promote healthy alternatives for young people joining the workforce. For example, strengthening and expanding the Civilian Conservation Corps and other vocational programs will create "green-collar" jobs for youths. Collaboration between governmental and nongovernmental leaders in communities across the nation will be critical to anticipate training needs, advocate for training resources and encourage hiring provisions that will ensure a diverse high-quality workforce is available to help achieve the vision outlined in this *Call to Action*.

*Photo by Eddee Daniel*

# Ensure Freshwater Decision Making Is Based on Sound Science and Data

## Challenges and Rationale

The selection of appropriate freshwater management, conservation, efficiency and water supply enhancement strategies depends on good data. This is true in all sectors, yet fundamental data about our freshwater resources is incomplete, inconsistent, unreliable and unavailable in real time for informed decision making. With today's remote sensing and satellite technology, powerful computers and high-speed internet connections, we should be able to collect even the most difficult-to-obtain data and share it in real time. There are a number of poorly understood freshwater issues for which we require more research and better data so that we can identify effective and durable solutions. These include the availability and use of surface and groundwater, concentration and health implications of emerging contaminants such as endocrine disruptors in our waters, climate change impacts on freshwater systems, and outdoor water consumption and residential water use. In the meantime, we must continue to act using the best-available science and adapt our management strategies as better information becomes available. Lack of funding for basic research and water monitoring is a key hurdle. We need to invest in freshwater research and data collection that informs decision makers at a level commensurate with the challenges we face.

## Federal Agencies and Congress Expand and Sustain Freshwater Research and Data Collection

We recommend that federal agencies, especially those within the U.S. Department of the Interior, expand existing nationwide freshwater quality and quantity monitoring and data

collection networks and outfit them with cutting-edge technology that enables rapid data analysis and real-time data sharing. The installation of additional stream gauges, water meters, groundwater monitoring wells and better estimates of consumptive use are of paramount importance for the effective management of available water supplies.

Congress should ensure adequate and sustained funding for full implementation of key activities mandated in the SECURE Water Act of 2009, including the Water Availability and Use Assessment to be conducted as part of the U.S. Department of Interior's WaterSMART Initiative and the National Water Census, as well as the U.S. Geological Survey's National Streamflow Information Program and streamgaging network, and the creation of a National Groundwater Resources Monitoring Program and Brackish Groundwater Assessment.

We recommend that all federal programs that fund water projects or research establish performance measures that require data-driven documentation of municipal, agricultural, environmental restoration and academic projects. Such performance measures will ensure freshwater data is collected from federally funded projects and investment in enhanced data is sustained over time. Lastly, we recommend that CEQ explore and identify opportunities for the National Academies to investigate and advance the nation's understanding of particularly critical or vexing freshwater resource challenges, such as the relationship between water and energy and potential co-beneficial solutions that will reduce demand for and use of both.

## NGOs and Academic Institutions Help Develop Freshwater Monitoring and Data Collection Tools

We recommend that NGOs and academic research institutions research and develop metrics for measuring progress toward sustainable and resilient freshwater resources that encompass the triple-bottom-line indicators of ecosystem health, economic impact and social equity. NGOs and academic institutions should also collaborate with government agencies to ensure freshwater monitoring and data collection networks are functioning properly and collecting useful data.

### Retail Coalition Funds Water Quality Monitoring

Agriculture's Clean Water Alliance (ACWA) is a membership organization comprised of agricultural retailers that apply a portion of their dues to water quality monitoring on agricultural lands in Iowa's Des Moines Lobe. Founded in 1999 to address nitrates in Iowa's Raccoon River, ACWA has partnered with downstream utility Des Moines Water Works, the Iowa Soybean Association, and, more recently, the Nature Conservancy in Iowa to conduct three-tier water monitoring (138 sites) to understand the land/water interface and seek performing solutions. Since 2004, ACWA has devoted more than $1 million to water quality data collection and a tile drainage denitrifying bioreactor demonstration project.[38]

In addition, they should collaborate with business leaders to help develop an accepted methodology for water accounting and contribute to the advancement of our understanding of the water/energy nexus.

## Businesses Share Freshwater Data and Innovative Water Management Practices

A clearer understanding of the water inputs and outputs of different commercial and industrial activities will enable better water management decision making in all sectors. We recommend that businesses and trade associations establish policies that encourage the voluntary sharing of data and information about innovative freshwater use and management practices that increase the water efficiency or reduce overall water demand or water quality impacts of business operations. We also recommend that business leaders engage in and support efforts to develop accepted methodologies for water accounting and reporting. In addition, we encourage utilities and other water technology firms to advance research and development of smart meter technology that tracks water use in real time and facilitates data collection and sharing with consumers and decision makers.

# Employ a Long-Range Adaptive Approach to Freshwater Resources Planning and Management

## Challenges and Rationale

The context-specific nature of freshwater management decisions and shifting hydrological patterns create challenges that cut across sectors and industries. Watershed hydrology is extremely complex, and the dynamics within every watershed are different. In addition, many of the most serious impacts of climate change will manifest as changes in the hydrologic cycle. As the effects of climate change alter familiar patterns of evapotranspiration, rainfall, snowmelt and in-stream flows, trend projections and fixed water management regimes based on the historical record will become increasingly ineffective. To ensure sustainable and resilient freshwater resources and systems for the future, we must implement risk-based approaches that anticipate the range of potential change and employ flexible and adaptive management strategies that allow decision makers to integrate new knowledge and respond to disruptions or risks as they materialize over time.

## Businesses Increase Resilience to Uncertain and Variable Freshwater Supplies

We recommend that businesses develop a better understanding of the impact on their supply chains from increasing vulnerability to extreme weather events and long-term change in water supply. We also recommend that businesses closely monitor freshwater inputs, outputs and activities (i.e., water accounting) and establish mechanisms to allow for the adjustment of operations to adapt to shifting freshwater resource conditions.

## Agricultural Producers Implement Adaptive Management Strategies

Adaptive management at the farm and local watershed scale is considered a key strategy for sustaining agricultural production and improving water quality. The deliberate and

iterative annual process of planning, implementing, evaluating and adjusting management strategies for crop and livestock production is an important pathway to optimized production and natural resource conservation in the agricultural sector. These strategies will become increasingly important as the impacts of variable climate on the already complex and variable land/water interface are felt by agriculture. For example, water demand for agriculture, primarily irrigation, will increase in some regions due to higher temperatures, prolonged dry periods and severe drought. There will be less water stored in snowpack and more water in the form of rainfall in some regions, so runoff will come at farmers and ranchers sooner in the season when it may not be useful and may even present a threat. Water demand for the hydration of farm animals will also increase in areas with rising temperatures. To respond to existing complexities and the spatial and temporal variability of the land/water interface, and to prepare for added climatic variability and uncertain impacts, we recommend that farmers and ranchers across the nation implement an adaptive management approach in their operations, building on best practices and success stories from different parts of the country.

## Utilities Increase Resilience to Uncertain and Variable Freshwater Supplies

We recommend that water and energy utilities develop more adaptive and conservative approaches to long-term planning and freshwater management to account for increased uncertainty and potential variability of water supplies over time due to the effects of climate change. For example, water utilities should consider maintaining natural flow regimes as an alternative for assisting ecosystem and species adaptation to climate change.

Furthermore, we recommend that utilities work with government planners and other stakeholders to ensure that future energy supplies are both low-carbon and low-water, particularly in regions of current and projected water stress. New water and energy infrastructure should be engineered so that it is adaptable to climate change impacts while not inhibiting ecosystem adaptability.

### Decreasing Snowpack in The West

In western states, water managers have traditionally relied on snowpack in mountain ranges to melt throughout the spring and summer and supply water. But a 2005 study showed that snow runoff in the Colorado River decreased 2 percent during the 20th century, and predicted a 10 percent reduction by 2050.[39]

## Government Agencies Adopt Adaptive Freshwater Management Policies that Promote Resilience

We recommend that federal, state and local government water management agencies review relevant policies and regulations to identify whether changes can be made to allow managers on the ground the flexibility to adapt management actions to respond to changing hydrologic conditions. State and federal water management agencies should also undertake water monitoring to detect emerging trends in water quality, quantity and timing of flow regimes and hydroperiods to inform rapid response and adaptation decisions at the local level. In addition, agencies should actively develop policies to reduce risks associated with more frequent and extreme weather events, including drought management plans, plans for displacement and management of water quality problems due to flooding, and water allocation schemes that are flexible in the event of unexpected extremes.

## Communities Increase Resilience to Local Hydrologic Changes

We recommend that local government officials and community leaders develop a thorough understanding of the potential effects of climate change on their watersheds, as well as viable strategies for adapting local land use and water resource planning to increase community resilience to significant hydrologic changes. Planning areas that community leaders should consider evaluating and adjusting in light of potential climate change impacts include floodplain delineation, and securing and sustainably managing water supplies.

# Account for the Full Cost of Water, and Invest in Sustainable Water Infrastructure

## Challenges and Rationale

Most people in this country do not know how much it actually costs to obtain, treat and deliver their water and wastewater. This lack of awareness underlies a general sense of entitlement and unwillingness to pay higher costs for water services or support local utilities' efforts to upgrade aging water infrastructure despite its integral role in supporting healthy and livable communities. Poor public understanding about the full cost of water services persists in part because water and wastewater utilities lack adequate mechanisms to track the full cost of their own services. We must understand and be able to account for the full cost of water services delivered by these utilities and structure water pricing in ways that encourage conservation before we can alter public perception that water should remain inexpensive.

Upgrading aging infrastructure or replacing it with better management alternatives could increase the ability of communities and watersheds to adapt to and cope with current demand as well as changing climatic conditions. Yet, we are facing an investment gap of more than $540 billion by 2019 for infrastructure upgrades to ensure safe drinking water and wastewater treatment.[40] The brunt of these costs falls on municipalities, many of which simply cannot afford to repair or rebuild failing water infrastructure. This is because most water customers do not pay enough to cover the costs of the services they are provided, which causes shortfalls for water utilities that make upgrades cost prohibitive. Together we must highlight the importance of properly functioning water systems and spur much-needed investment to repair, rebuild and expand the nation's structural and nonstructural freshwater infrastructure.

## Water Utilities Collaborate with Other Sectors to Develop Full Cost-of-Service Accounting

We recommend that all water suppliers aim to account for their complete operating costs so that they have accurate data about the cost of municipal drinking water, stormwater and wastewater services and can communicate it to customers. In the near-term, we recommend that water and wastewater utilities draw on the asset management model to develop full cost-of-service accounting methodologies and systems that enable utility managers to incorporate capital replacement costs and federal subsidization into water service rates in the near term. Utilities should seek input and advice from NGOs, academics and business leaders in this effort to ensure the methodologies and systems are valid and viable in the marketplace. In the longer term, we see a need for the development of methodology to incorporate external costs of water treatment and delivery, namely ecosystem impacts, into full-cost accounting schemes.

Full cost-of-service accounting will allow for the evaluation and establishment of new pricing signals that can better reflect the true costs of water and/or facilitate application of market mechanisms for driving conservation and innovation. Full-cost pricing is one of several market signals that can be used to incentivize conservation and efficiency behaviors among consumers and help reduce peak demand. Regardless of the particular market signals that are used, they will be more effective if implemented within an accounting structure where consumers have a clear understanding of the full cost of service. As utilities shift toward recovering the full costs of water and wastewater services, we strongly urge them to institute appropriate mechanisms to ensure the affordability of water among low-income or disadvantaged populations, and that water prices do not become cost-prohibitive for industrial and commercial activities essential to the nation's economy.

### Utility Changes Rate Structure, Conserves Water

Some water utilities are decoupling revenue from quantity of water sold. In 1991, Irvine Ranch Water District in Orange County, California, instituted an allocation-based rate structure in which households pay a base price for a set allocation. Those who exceed the allocation are penalized with rates up to eight times higher than the base, while those within the allocation receive a discounted rate. The result is low usage and low rates. To meet its revenue needs the utility separated fixed and volumetric charges and distributed operating costs across all customers. It also separated out capital costs, which are covered through property taxes and connection fees.[41]

## Water Utilities Decouple Revenues from Volume of Service

Water utilities servicing municipalities typically recoup fixed costs based on volume of water sold. The more water sold, the greater the net revenue. As a result, there is an institutional disincentive for utilities to promote water conservation. Decoupling water utility costs so that fixed costs are fully recouped, but are not spread across a declining base of sales, would motivate utilities to proactively and aggressively promote water conservation and efficiency among their customers. Decoupling would allow utilities the flexibility to fully cover costs while also rewarding customers for conservation rather than raising rates to compensate for decreased revenues resulting from conservation. We recommend that water utilities work with municipalities, and their respective public service commissioners and customers, to adapt existing models for decoupling revenues to the water and wastewater sectors such that they can develop water pricing schemes that promote conservation. In the near term, while more sophisticated accounting and pricing mechanisms are under development, we recommend that water utilities consider existing models for incentivizing advantageous consumer behavior, such as seasonal block rates employed by cities such as Los Angeles, Seattle, Salt Lake City, Santa Fe and San Antonio, where the price of water increases for each unit used during dry months.

## Public Agencies, Utilities and Private Investors Collaborate to Expand Infrastructure Investment Options

Action is needed to expand the range of investment options available to meet immediate and long-term infrastructure upgrades. We recommend a combination of conventional and market-based approaches in the near term to fill the gap in available financing, with the goal of transitioning to predominantly market-based approaches over the long term. Full cost-of-service water pricing is a critical step to increase the financial capacity of utilities and municipalities to maintain and develop infrastructure, but additional options must be developed in parallel for this effort to be successful.

### Partnership Employs Soft Path Strategies

The Christina Basin Clean Water Partnership is an alliance of federal, state, local and nonprofit watershed organizations in Delaware and Pennsylvania. Since 1994 they have worked to restore the historically industrial, 565-square-mile watershed to potable, fishable and swimmable status.[42] [43]

Although it relies on voluntary action, the partnership has successfully implemented a variety of soft path strategies, including working with local farms to reforest riparian zones along streams, restoring stormwater wetlands, and encouraging residents to use rain barrels and native plants in landscaping. In 2003 the partnership received a $1 million grant from the EPA, which ranked it first among the 176 watershed groups considered.[44] [45]

First, we recommend repairing or upgrading existing infrastructure where possible, to maximize re-use of resources and minimize new construction costs. When evaluating the costs of repairs or upgrades, decision makers should assess whether fixing existing infrastructure will reduce costs and increase system efficiency over the long term. We recommend that urban and rural municipalities proactively seek to establish appropriate partnerships to create innovative financing alternatives for assessing and meeting their infrastructure needs. Projects should be prioritized for capital investment according to where water infrastructure is most inadequate or presents the greatest threat to public health, or the potential for maximizing efficiency is the greatest, including in low-income communities where economic factors limit the viability of conservation efforts. In addition, assessments of water storage and distribution infrastructure should be conducted with an eye toward changes in the hydrologic cycle likely linked to climate change, particularly in the West. In cases where urban or rural water infrastructure systems are in need of major upgrades or completely new systems are necessary to serve developing areas, structural and nonstructural systems should be designed in a context-sensitive and environmentally responsible manner.

As we transition to market-based systems for financing the full cost of water services, we also have to consider the immediate investment needed to address aging and inadequate infrastructure systems. The existing gap in capital exceeds the capacity of any single solution. State revolving fund programs, water banks and dedicated trusts have been explored as flexible financing options to help municipalities with low-interest loans, extended loan terms, grants and other programs to spread out or relieve the costs. The EPA's Clean Water State Revolving Fund Program and Safe Drinking Water State Revolving Fund Program are two existing financing options for municipalities. State revolving funds (SRFs) have a long-term track record of offering loans with flexible terms and at low interest rates, as well as opportunities for partnerships with other funders. Historically, SRFs have had extremely low default rates and high impact on a project basis, but their impact on water quality nationally has not been optimized due to underfunding and a lack of creativity. We recommend that the implementation of the Clean Water and Safe Drinking Water SRFs be improved, the application process streamlined and awards targeted toward projects that align with the principles and recommendations in this *Call to Action*.

Sustainable water infrastructure depends on more than just funding and well-engineered systems. Research in the United States has shown that effective staffing, consistent public support for sufficient funding, better asset management systems, performance measurements and rewards, and more stakeholder involvement and transparency are critical to effective water infrastructure management. In cases where increased private involvement or changes in public operations created significant cost savings, it is typically because specific improvements were identified and implemented in one or more of these areas. We recommend that municipalities strive to optimize triple-bottom-line outcomes by balancing investment in hard infrastructure with investment in these important human capital aspects of sustainable water infrastructure. Communities should establish partnerships with academic, vocational, NGO and business programs to harness the full benefit of the workforce opportunity represented by water infrastructure investments. This type of strategy has the potential to generate socio-economic co-benefits by creating job opportunities in maintenance, operation and facility support for local workers, youth, and small and disadvantaged businesses.

# Educate the Public About Freshwater Challenges and Solutions

## Challenges and Rationale

Ultimately, many freshwater solutions will be ineffective if they are not reflected in the attitudes and everyday choices of Americans. For example, a 2009 Gallup survey indicated that drinking water pollution was the top environmental concern among the public, yet water customers typically cry out against even minimal rate increases needed for investment in new water projects.[46] At the heart of this challenge is a lack of awareness about where water comes from, where wastewater discharges go and the significant planning and investment that goes into maintaining the quality and volume of flow. To address this challenge, we must make information about freshwater resources publicly available and easily accessible, and ensure that water-related public participation processes are inclusive, fair and transparent. It is time we make freshwater a public education priority, raise awareness and change constituents' behavior on a broad scale, as we did with litter in the 1970s and seat belts in the 1980s.

## Water Utilities Inform Customers about Freshwater Challenges and Solutions

We recommend that water utilities build on successful examples of using residential water bills as a public education vehicle to provide useful, motivational information to customers. Key topics to cover include water use, water pricing and the links between water and energy. At a minimum, every water and wastewater customer should be individually metered, and monthly bills should show comparison data against the average usage, previous year usage and neighbors' use. As water and wastewater utilities shift toward full cost-of-service pricing, we recommend they utilize bills and customer mailings to explain the need for and methods for setting full cost-of-service rates. Utilities should also leverage growing consumer awareness of the cost-saving and carbon emission reduction benefits of energy efficiency to help elevate water conservation and efficiency as another high-priority national goal.

## Municipal Governments and Community Organizations Develop Freshwater-Oriented Public Messaging

We strongly recommend that municipal governments and community-based organizations develop place-based messaging that focuses public attention on water efficiency and conservation. To ensure sustainable and resilient freshwater resources for future generations of Americans, today's constituents must recognize the value of investing in safe, reliable and efficient water infrastructure for their communities – whether they are urban or rural. They must see the potential long-term benefits of implementing innovative freshwater management policies, such as basing stormwater rates on impervious surface area. Most importantly, they must understand how their own behavior impacts freshwater resources and what they can do to minimize their personal water footprint. Local governments and community organizations should draw from case examples such as the Los Angeles River, where public education programs are in place to introduce the public, including low-income communities, to the benefits of conservation and sustainable freshwater management practices.

## National NGOs Launch a Widespread Education Campaign about Freshwater Resources

We recommend that leaders in the NGO community initiate a national campaign to educate the public about where their water comes from, what the embedded delivery costs are and how they can protect and conserve this valuable resource. We need to disseminate understandable information about the freshwater challenges we face and help individuals understand how those challenges are connected to the day-to-day choices we make.

### Investment in Drinking Water Systems Lagging

Bottled water sales in the United States reached 8.82 billion gallons in 2007, worth $11.7 billion, making the U.S. market for bottled water the largest in the world.[47] Over 20 years, Americans will likely spend $234 billion on bottled water. Also in 2007, EPA calculated that we need to invest $334.8 billion over 20 years in drinking water infrastructure.[48]

# Develop and Validate Methods for Freshwater Ecosystem Services Markets

## Challenges and Rationale

Ecosystem services are the tangible and intangible benefits that our rivers, streams, lakes and wetlands produce and provide for human beings. These freshwater systems provide food, water delivery mechanisms, water purification, waste disposal, carbon sequestration and recreation to name a few such services. It is intuitively obvious that these services have value, and that their loss due to degradation and destruction of freshwater ecosystems represents a cost. The challenge we face is in understanding more fully the services these freshwater ecosystems provide and how to assess the value of those services. We also lack the institutional mechanisms to account for and internalize the full costs of activities that impact freshwater ecosystems.

## Leaders from All Sectors Collaborate to Build Understanding and Tools to Support Freshwater Ecosystem Markets

We recommend that government, the private sector, NGOs, landowners and academics collaborate to create the tools and methodologies needed to develop a better understanding of freshwater ecosystem valuation and, where appropriate, ecosystem services markets. This foundational knowledge will support the effort to design effective governance structures to manage, monitor and provide decision support systems for institutionalizing the economic and social values of freshwater ecosystem services. These systems should take into consideration the water supply, distribution and water quality improvement values offered by natural systems. They also should be designed to encourage multiple water resources benefits (e.g., a single investment in riparian buffers could support water quality, ground water recharge and habitat protection). The market-based systems should not be

punitive nor penalizing. As we develop and refine methods to locate, quantify and assign value to the ecosystem benefits of freshwater conservation actions, the prospect of establishing payments and stable markets for water-related ecosystem services will become ever more attainable.

While freshwater ecosystem services markets promise to generate environmental benefits, the potential social and economic impacts must also be assessed. We recommend that NGOs and academic research institutions evaluate the social and economic impacts of existing market-based natural resource conservation approaches to determine how to ensure that the environmental, social and economic impacts of existing and emerging markets and payment schemes are fair and equitable, and that they include effective conflict resolution and negotiation mechanisms. For these market mechanisms to be successful, they will require trusted governance structures, which will also benefit from a collaborative design approach.

### USDA Facilitate the Development of Freshwater Ecosystem Services Markets

Section 2709 of the 2008 Farm Bill charges the USDA with facilitating the participation of farmers, ranchers and forest landowners in emerging environmental services markets, and calls for the agency to develop metrics and market infrastructure to incorporate these markets into federal programs. The Farm Bill also directs the agency to build on existing activities and information, and consult with state and federal agencies and other relevant stakeholders to develop environmental or ecosystem services markets. We support the USDA's efforts to advance the development of ecosystem services markets and encourage the agency to draw lessons from existing and emerging market and payment schemes (e.g., water quality trading, carbon offset programs and species banking). We recognize that market development efforts are underway in the Chesapeake Bay, the Mississippi and Ohio River Basins and a number Farm of the Future project sites. Furthermore, we recommend that the USDA review relevant federal and state legal and regulatory frameworks to ensure they support fair and effective freshwater ecosystem service markets and payments. The Department should work with landowners to clarify property, management and use rights for freshwater services and areas of land that may be managed to provide those services. We also suggest that the USDA collaborate with experts from other sectors to pilot bundled or layered ecosystem service markets to evaluate whether they can reduce transaction costs while achieving multiple service benefits.

### Assigning Value to Ecosystem Services

Healthy ecosystems perform multiple critical services for humans that have an economic value. These include providing drinkable water, breathable air, food, a stable climate, biodiversity to inspire medications, physical buffers against storms and flooding and space for recreation and tourism. Ecosystems also recycle waste and pollinate food crops.

One way to understand how much an ecosystem service is worth, is for economists to calculate how much it would cost to restore the natural system or to build a mechanical system to perform the same service. Worldwide, markets exist for carbon, biodiversity, wetlands and water quality.

# Commitments to Action

As the issuers of this *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges*, we consider it important to demonstrate our own commitment to advancing the vision and recommendations presented herein. At *The Johnson Foundation Freshwater Summit* on June 9, 2010, each of us committed our respective organizations to specific actions to lead the nation toward a future of sustainable and resilient freshwater resources. The full list of commitments that we have made is available as a printed addendum to the *Call to Action* and can also be accessed on the Web at www.johnsonfdn.org/chartingnewwaters. We strongly encourage other leaders across the United States to join us in making achievable commitments to concerted action for the nation's freshwater resources.

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The following individuals participated in *The Johnson Foundation Freshwater Summit* on June 9, 2010 and are the issuers of *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges*.

*The federal agency participants in *The Freshwater Summit* took part to help inform the deliberations. The findings and recommendations in this *Call to Action* are being delivered by the non-federal participants for the consideration of leaders and senior decision makers in all sectors of American society.

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## Endnotes


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