Charting New Waters

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

Issued by the Participants of

The Johnson Foundation Freshwater Summit

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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.

Contributors

Summit Participants

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.

†These individuals participated in T*he Freshwater Summit*, but cannot formally endorse the *Call to Action* due to the policies of their respective organizations.

Frank H. Akers, Jr.
External Chair
Science Advisory Council
Mars, Incorporated

Deanna Archuleta*
Deputy Assistant Secretary
Water and Science
United States Department of Interior

Ann Bartuska*
Acting Under Secretary for Research,
Education and Economics
United States Department of Agriculture

Chuck Clarke
Chief Executive Officer
Cascade Water Alliance

Edward A. Clerico
Chief Executive Officer
Alliance Environmental, LLC

Elaine Dorward-King
Global Head of Health, Safety and Environment
Rio Tinto

Roger C. Dower
President
The Johnson Foundation at Wingspread

Cecilia V. Estolano
Chief Strategist for State and Local Initiatives
Green for All

Andrew Fellows
Mayor
City of College Park, Maryland

Richard D. Fox
Chairman of the Board and Chief Executive Officer
CDM

Paul Freedman
President
Water Environment Federation

Ray Gaesser
Past President
Iowa Soybean Association

Robert García
Executive Director and Counsel
The City Project

Peter Gleick
President and Co-Founder
Pacific Institute

Charles R. Gordon
President and Chief Executive Officer
Siemens Water Technologies

S. Curtis Johnson
Chairman
Diversey, Inc.

Helen P. Johnson-Leipold
Chairman of the Board
The Johnson Foundation at Wingspread

Kevin Knobloch
President
The Union of Concerned Scientists

David Kohler
President and Chief Operating Officer
Kohler Co.

J. Michael McGinnis†
Senior Scholar
Institute of Medicine of The National Academies

Patrick O'Toole
President of the Board
Family Farm Alliance
President
Ladder Livestock

Carter S. Roberts
President and Chief Executive Officer
World Wildlife Fund

William D. Ruckelshaus
Chair
Puget Sound Partnership Leadership Council
Former Administrator
United States Environmental Protection Agency

Jeffry Sterba
Chairman of the Board
PNM Resources

Nancy Stoner*
Deputy Assistant Administrator
Office of Water
United States Environmental Protection Agency

Nancy Sutley*
Chair
White House Council on Environmental Quality

Rebecca Wodder
President
American Rivers

Kate Wolford†
President
McKnight Foundation

Other Contributors

The following organizations participated in *The Johnson Foundation Freshwater Forum* deliberations and contributed invaluable information, perspective and insight on the myriad freshwater issues facing the nation. Their contributions helped make this *Call to Action* possible.

Academia/Research Institutions

Children's Hospital of Wisconsin/Medical College of Wisconsin

Colorado State University, Colorado Water Institute

Electric Power Research Institute

Institute for Agriculture and Trade Policy

The Institute for Public Health and Water Research

Institute of Medicine of the National Academies

Massachusetts Institute of Technology, Sloan School of Management

Michigan State University, Department of Agriculture, Food and Resource Economics

Michigan State University, Fisheries and Wildlife

Marshfield Clinic Research Foundation

Nicholas Institute for Environmental Policy Solutions, Duke University

University of California, Berkeley, Center for Law, Energy and the Environment

University of California, Berkeley, Department of Civil and Environmental Engineering

University of California, Santa Barbara, Bren School of Environmental Science and Management

University of Colorado, CU-NOAA Western Water Assessment

University of Georgia, Odum School of Ecology

University of Maryland School of Nursing

University of New England

University of Texas, Department of Mechanical Engineering

University of Wisconsin-Madison, Center for Limnology

University of Wisconsin-Madison, Center for Sustainability and the Global Environment

University of Wyoming, Department of Zoology and Physiology

Business/Industry

Alliance Environmental, LLC

Arizona Public Service Company

The Cadmus Group, Inc.

CDM

CH2M Hill

The Coca-Cola Company, Strategic Global Water and Environmental Initiatives

Conservation Strategy, LLC

Davidoff Communications

Diversey, Inc.

DuPont Crop Production Products

The Fertilizer Institute

Iowa Soybean Association

John Deere Water Technologies

Johnson Outdoors

Kohler Co.

LimnoTech, Inc.

Mars, Incorporated

Mithun

National Corn Growers Association

PNM Resources

Quarles & Brady LLP

Rio Tinto

S.C. Johnson & Son, Inc.

Siemens Water Technologies

Watermark Initiative, LLC

Government

California Energy Commission

Centers for Disease Control and Prevention, National Center for Environmental Health

City of College Park, Maryland

City of Milwaukee, Department of Public Works

City of Philadelphia, Office of Watersheds:
National Institute for Environmental Health Sciences

New York City Department of Environmental Protection,
Bureau of Water Supply

San Antonio Water System, Conservation Department

San Francisco Public Utilities Commission,
Water Quality Division

Tampa Bay Water

United States Army Corps of Engineers

United States Department of Agriculture

United States Department of Energy

United States Department of the Interior

United States Environmental Protection Agency

White House Council on Environmental Quality

Non-Governmental Organizations

Alliance for Water Efficiency

American Farmland Trust

American Rivers

Association of Metropolitan Water Agencies

Center for Resilient Cities

CERES

Charles River Watershed Association

The City Project

Clean Air-Cool Planet

Clean Water Action

Clean Water for North Carolina

Ducks Unlimited

Environmental Defense Fund

Environmental Justice and Climate Change Initiative

The Environmental Working Group

Family Farm Alliance

Future 500 Group

Green for All

National Heritage Institute

National Sustainable Agriculture Coalition

National Wildlife Federation

The Nature Conservancy

Natural Resources Defense Council

Pacific Institute

River Network

Union of Concerned Scientists

Water Environment Federation

Water Environment Research Foundation

WateReuse Foundation

Water Stewardship, Inc.

Waterkeeper® Alliance

West Atlanta Watershed Alliance

World Wildlife Fund

Foundations

The Johnson Foundation at Wingspread

The Joyce Foundation

The Kresge Foundation

McKnight Foundation

Walton Family Foundation

The Johnson Foundation Staff

Lynn Broaddus, Director, Environment Programs

Wendy Butler, Special Initiatives Coordinator

Cynthia Georgeson, Communications Consultant

Meridian Institute Facilitators

John Ehrmann, Senior Partner

Molly Mayo, Senior Mediator

Brad Spangler, Mediator

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For more information about *Charting New Waters: A Call to Action to Address U.S. Freshwater Challenges* please contact:

Lynn Broaddus, Ph.D., M.B.A.
Director, Environment Programs
The Johnson Foundation at Wingspread
33 E. Four Mile Rd.
Racine, WI 53402
(262) 681-3344
www.johnsonfdn.org

John Ehrmann, Ph.D.
Senior Partner
Meridian Institute
PO Box 1829
105 Village Place
Dillon, CO 80435
(970) 513-8340
www.merid.org

Graphic design by Ryan Kish and Michael Karter, Jasculca/Terman and Associates, Inc., Chicago, IL. Jasculca/Terman and Associates, Inc. also served as communications consultant for *The Freshwater Forum* and *The Freshwater Summit*.

Charting New Waters

Convening Report

Financing Sustainable Water Infrastructure

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Charting New Waters

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Financing Sustainable Water Infrastructure

Meeting Convened by

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American Rivers
Rivers Connect Us

Ceres

The Johnson Foundation AT WINGSPREAD
Conferences that Inspire Solutions

Contents

Executive Summary

Our nation's freshwater infrastructure faces a critical juncture. Largely built on systems developed during the 19th and early 20th centuries, our water infrastructure is aging, our technology outdated and our governance systems ill equipped to handle rising demand and environmental challenges. Additional strain is being placed on these systems from a variety of sources, including pressures from urbanization and changing climate conditions, such as increases in both droughts and extreme one-day precipitation events.

While these challenges are significant, they are not insurmountable. In fact, they can be viewed as drivers of much-needed change in how we finance and develop our water systems to meet future demands. New financing models and pricing flexibility, which are necessary to pay for new infrastructure and to support legacy systems, provide enormous opportunity for positive transformation necessary to keep pace with the rapid changes being experienced by counties, municipalities and investor owned utilities.

This report seeks to tackle these issues and deliver some recommendations on how to understand and confront the pressing need for more sustainable and integrated water infrastructure financing models. This report is the product of a meeting convened by The Johnson Foundation at Wingspread, in collaboration with American Rivers and Ceres, which brought together a group of experts to discuss ways to drive funding toward the infrastructure we need for the 21st century. Specifically, this group focused on the following questions:

- What new financing techniques can communities use to pay for integrated and sustainable infrastructure approaches?
- How can we direct private capital toward more sustainable water management projects?

The report finds that while options for more cost-effective, resilient and environmentally sustainable systems are available, they are not the norm. In fact, investment in inflexible and expensive "siloed" water systems is still pervasive, despite the fact that money available for financing water infrastructure is increasingly scarce.

Of equal concern is the inefficiency of the existing systems, which lose some 6 billion gallons of expensive, treated water each day due to leaky and aging pipes–some 14 percent of the nation's daily water use. This point is underscored by the fact that the American Society of Civil Engineers gives the nation's water systems a D-, the lowest grade of any infrastructure including roads and bridges.

The report also details the various financing mechanisms available to different water systems. While municipal bonds are the debt instrument of choice for utilities large enough to be able to attract capital from markets, the vast majority of water systems must rely on cash, state revolving loan funds, or other low-interest loan programs at the state and federal level. In fact, only about 1,500-2,000 of the roughly 52,000 water systems in the United States are large enough to issue their own bonds. Given these constraints, some systems are turning to private equity as a financing source.

There are, of course, numerous obstacles and challenges that stand in the way of transforming our water systems to ones that are more sustainable, resilient and cost-effective. One of the main impediments to change is the very nature of the systems themselves, where potable water, wastewater, stormwater, greywater and rainwater are not treated as part of an interconnected system, but rather as distinct, separately financed and regulated units.

In addition, the rate-paying public and locally elected officials must come to grips with the temporary nature of federal subsidies for infrastructure. Once these subsidies expire, ratepayers are left holding the bag for funding further maintenance, inspection and upkeep, which can be politically unpopular. Therefore, many jurisdictions are not able to fully recapture all relevant costs, leading to long-term financial shortfalls and suboptimal maintenance and upkeep of systems.

While these challenges and obstacles are formidable, the report makes clear that they are not insurmountable. Progress towards more sustainable, resilient and cost-effective systems is attainable, particularly if a long-term view is taken. While there is no silver bullet, the report outlines pathways that will improve chances of success. These include:

- **Recognize that local pressures will drive local solutions.** Our water systems are as diverse as the drivers of change that impact them. But solutions are emerging at the local level, including green infrastructure, closed loop systems and recycling. Financing models need to be developed that can support this type of local activity, which can then be scaled up.

- **Consumers should be given choices and options.** Today's water systems typically provide one product at a single price–focusing on potable water. While that has served us well, it is also true that potable water is the most expensive kind of water and is widely used for non-drinking purposes such as watering lawns, flushing toilettes and showering. Consumers should be given options that include differentiated rates for drinking water versus other types. Additionally, water systems should explore how to move beyond "minimum cost rates" in order to meet customer demands.

- **The financial health of our water systems is directly linked to their long-term sustainability.** Our nation's water systems need to embrace various financing changes in order to ensure long-term sustainability. These include full-cost accounting of water services; incorporating value-added services into the revenue picture to better align customers' perceived value with products delivered; improving the capture and dissemination of performance data to drive efficiency; and considering consolidation of certain systems to enhance efficiency.

- **Innovative financing models should be pursued to increase efficiency, add value to customers, and lower costs for providers.** These models should include: mechanisms to expand the pool of water service funding to non-traditional partners; increasing incentives and markets for distributed water services that include "low impact development," such as on-site treated wastewater for buildings; and other green infrastructure initiatives.

- **Alternative market-based solutions should be explored and evaluated for scalability.** These solutions could include: properly valuing and pricing ecosystems services, which provide enormous value yet are largely unaccounted for in the present system; developing securities to aggregate customer-financed projects such as greater "where it falls" water management; and creating private investment opportunities for efficiency gains from such things as retrofitting and closed-looped water systems in order to reduce system impacts and improve efficiency at both the building and neighborhood levels.

This summary provides an overview of the main sections and themes contained in the report, but is not a substitute for the full breadth of depth offered in the following pages.

Report Process

The Johnson Foundation, in collaboration with American Rivers and Ceres, convened a group of experts at Wingspread to discuss ways to leverage public funding and incentives as well as private financing to drive innovation and resources toward more sustainable and integrated management of water resources in the United States. This meeting was set apart from similar efforts to discuss water infrastructure systems by the unique mix of expertise represented. Public and private water utility managers, investment managers, investors, municipal bond raters and underwriters, non-governmental organizations, foundations and other stakeholders gathered to discuss the range of issues being faced and begin to chart the pathways toward innovative and sustainable funding mechanisms that support the long-term sustainability of our water systems–both built and natural.

The needs of communities vary significantly even though their challenges are similar. There is not a consistent approach that will work for all, rather a range of options and tools that allow for customized approaches that meet a range of interests. The shift toward a more sustainable and economically viable future will not likely be driven primarily by sweeping legislation or legal mandates, but by thousands of local infrastructure investment decisions. If those decisions are going to result in a more sustainable future, utilities must look for a portfolio of financing alternatives at the same time they are developing alternatives for more resilient systems. The convening was designed around three elements of a facilitated dialogue process. Two virtual convenings and one in-person meeting were conducted during the summer of 2011 as follows:

- Webinar 1, July 26, 2011: "What is Sustainable Water Infrastructure?"
- Webinar 2, August 10, 2011: "Unpacking the Financing Options"
- In-person convening at The Johnson Foundation at Wingspread, Racine, Wisconsin, August 16–18, 2011

Commitments to action

A unique component of this meeting was that each of the participants offered to advance solutions to the issues brought forth in the conference by committing to specific actions. Those commitments are included in this report.

Background

As the nation's water infrastructure ages and populations grow beyond the capacity of existing systems, we will need to deploy hundreds of billions of dollars to repair and expand drinking water, wastewater, and stormwater infrastructure. Simultaneously, our water infrastructure needs to be more flexible and resilient to increasingly unpredictable climate conditions that are forecast to become even more volatile in the future. As with our transportation and energy infrastructure, the nation's water infrastructure is at a critical juncture. An increasing array of options are emerging for transitioning toward more cost-effective, resilient, and environmentally sustainable solutions. However, investment in expensive, inflexible "siloed" water systems remains the norm. Regardless of the kind of systems we design, money for water infrastructure will be tight. We will need to identify new financing alternatives and spend those funds on the most effective use of our limited resources.

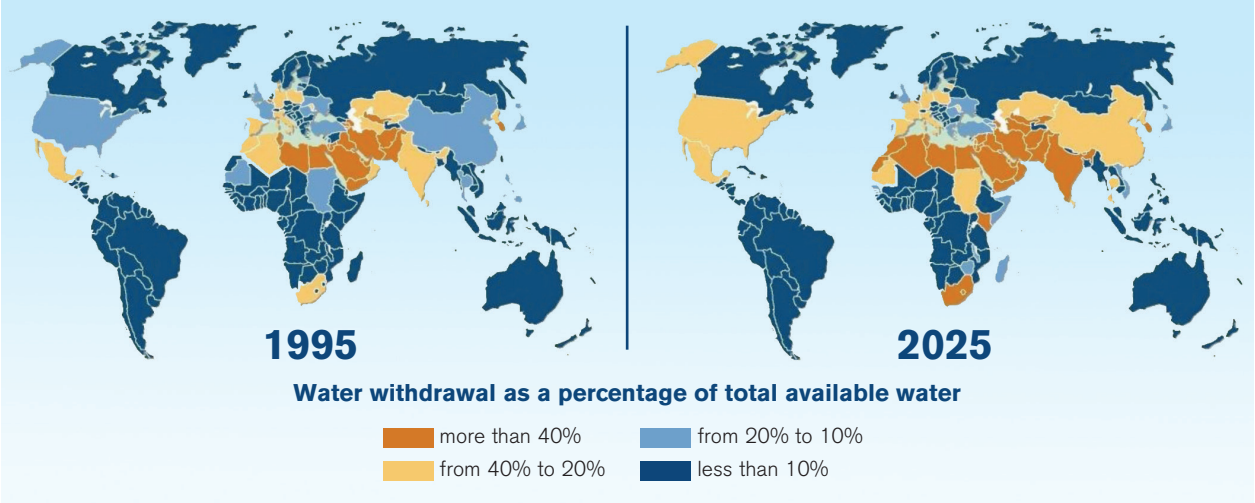
Through presentations, breakout session discussions and background materials, participants in the convening explored the fundamental underpinnings of the challenges we face. In order to identify lasting and more sustainable solutions, we first need to understand:

- The looming freshwater crisis
- The water industry and water sector, and how our infrastructure is managed
- What "sustainable" water infrastructure means
- Principles of financing water systems, including how funds are raised and deployed

A looming freshwater crisis

Many parts of the world face serious freshwater problems, and these are forecast to increase dramatically over the next 10 to 15 years (see Figure 1). Arid areas in the United States have long been challenged by scarce water, but population growth, competing economic uses, and dramatic changes in precipitation patterns are straining many areas to previously unknown levels.

Figure 1 **Average Sector Use: Domestic 10 percent, Industry 20 percent, Agriculture 70 percent**

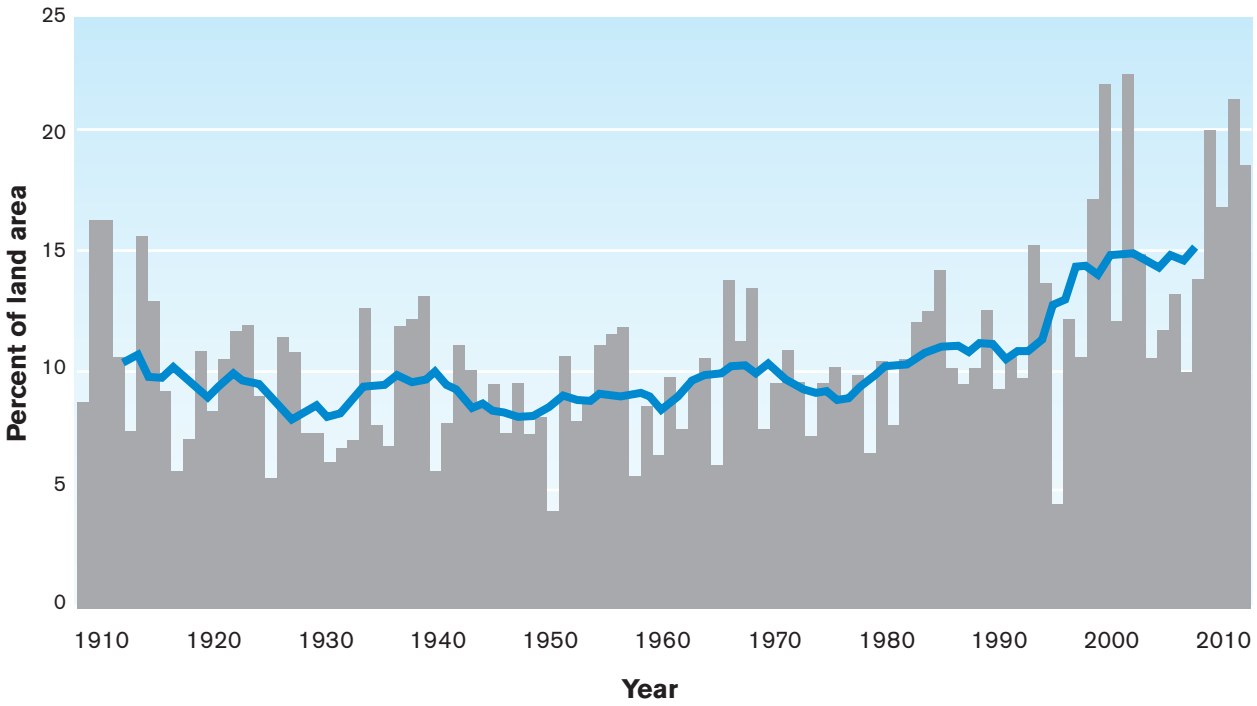


Source: World Meteorological Organization (WRO), Geneva, 1996, Global Environmental Outlook (GEO), 2000, United Nations Environment Programme (UNEP), Earthscan, London, 1999. Slides courtesy of Mark Shannon, Center of Advanced Materials for the Purification of Water with Systems (WaterCAMPWS), used with permission.

A USGS study that looked at tree rings over the past 500–1,000 years showed an unprecedented decline in snowpack in the Rockies since the 1980s as compared to the historical record. Snow "reservoirs" provide water for 70 million people in the West, thus precipitation shifts will have a major impact on a large swath of the economy.[1] Nationally, estimates suggest that by 2040 we may need from 29 to 62 percent more water to serve our growing population and higher energy demands.[2] (Energy uses more water, primarily for energy generation and cooling, than any other sector except agriculture.) And although technology and water efficiency efforts may flatten that curve, we will still need to be vigilant to avoid having clean water supplies become a serious constraint to economic growth.

Across the entire country, communities are struggling to meet increased water needs, to respond to longer and deeper droughts, and changes in snow and rainfall patterns, and also to limit damage from more intense storms. Over the past 100 years, the occurrence of extreme one-day precipitation events has increased (see Figure 2). Models for the Great Lakes, the drinking water source for 40 million people, suggest that raw sewage overflows into the lakes could increase by 20 to 50 percent as city sewers are increasingly overwhelmed by

Figure 2 **Extreme One-Day Precipitation Events in the Lower 48 States, 1910-2008**



The figure shows the percentage of the land area of the lower 48 states where a much greater than normal portion of total annual precipitation has come from extreme single-day precipitation events. The bars represent individual years, while the line is a smoothed nine-year moving average.

Source: U.S. EPA, "Climate Change Indicators in the United States," April, 2010, http://www.epa.gov/climatechange/indicators/pdfs/ClimateIndicators_full.pdf.

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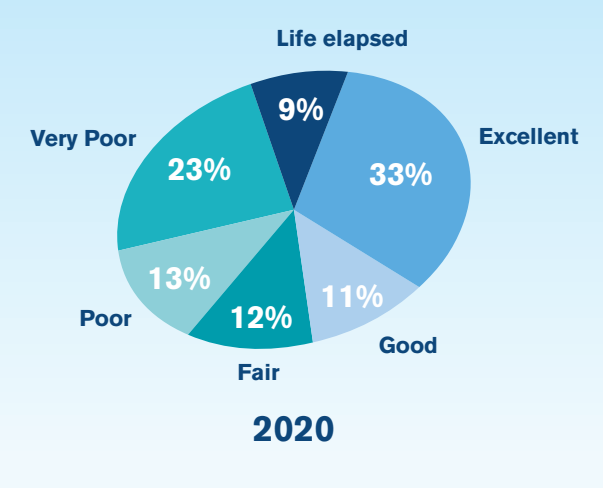
[2] Figures courtesy of Mark Shannon, Center of Advanced Materials for the Purification of Water with Systems (WaterCAMPWS).

more intense storms.[3] The U.S. EPA estimates that today between 1.8 and 3.5 million Americans get sick annually from recreational contact with sewage-contaminated waters from sanitary sewer overflows.[4] And if pathogens in sewage penetrate water treatment defenses the risks are much more serious, as Milwaukee experienced in 1993 when 400,000 were sickened and 80 people died from cryptosporidium in the city's drinking water.[5]

Added to these challenges is the fact that existing water infrastructure systems in the United States are rapidly aging, with many pipes and treatment plants already beyond their effective lives. The American Society of Civil Engineers (ASCE) gives the nation's water systems the lowest grade of all infrastructure, a D-, though bridges and roads get much more attention.[6] Ten years ago, EPA estimated that by 2020 the deteriorating age and condition of nearly half the water and sewer pipes in the United States would be considered "poor," "very poor," or "life elapsed" (see Figure 3). This is not only inconvenient and a strain on local ratepayers when replacement costs hit, but nationally, we lose over six *billion* gallons of expensive, treated water each day because of leaky, aging pipes. That represents 14 percent of the nation's daily water use. Even more worrisome, we are losing large elements of our natural or "green infrastructure" that provide hard-to-price but extremely valuable ecosystem services from flood storage to water supply and filtration, and that also serve as the basis for $730 billion in annual United States economic activity, according to the outdoor recreation industry.[7]

Figure 3 **Projected Percentage of Pipe by Classification, 2020**



Source: U.S. EPA, "The Clean Water and Drinking Water Infrastructure Gap Analysis," September, 2002, http://water.epa.gov/aboutow/ogwdw/upload/2005_02_03_gapreport.pdf.

According to the EPA, 22 states have lost at least 50 percent of their original wetlands and seven states have lost over 80 percent of their original wetlands (see Figure 4). Wetland losses continue to climb despite efforts over the past thirty years to slow the pace. Many small streams–the capillaries of the watershed–are also routinely filled in or forced underground into pipes where they are not available to wildlife and unable to perform essential functions like slowing and storing rainwater and recycling excess nutrients. In addition, development in floodplains and engineered structures like riverbank hardening, levees, and floodwalls eliminate the natural ability of rivers to move within their floodplains and store floodwater.

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[3] U.S. EPA, *A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow (CSO) Mitigation in the Great Lakes and New England Regions (Final Report)*, (Washington, DC, EPA/600/R-07/033F, 2008).

[4] "SSO Fact Sheet: Why Control Sanitary Sewer Overflows?" U.S. EPA, July 21, 2003, accessed January 10, 2012, http://www.epa.gov/npdes/sso/control/index.htm.

[5] N.J. Hoxie, J.P. Davis, J.M. Vergeront, R.D. Nashold, and K.A. Blair, "Cryptosporidiosis-associated mortality following a massive waterborne outbreak in Milwaukee, Wisconsin," *American Journal of Public Health* 87 (1997): 2032-2035.

[6] American Society of Civil Engineers, accessed January 6, 2012, http://www.infrastructurereportcard.org.

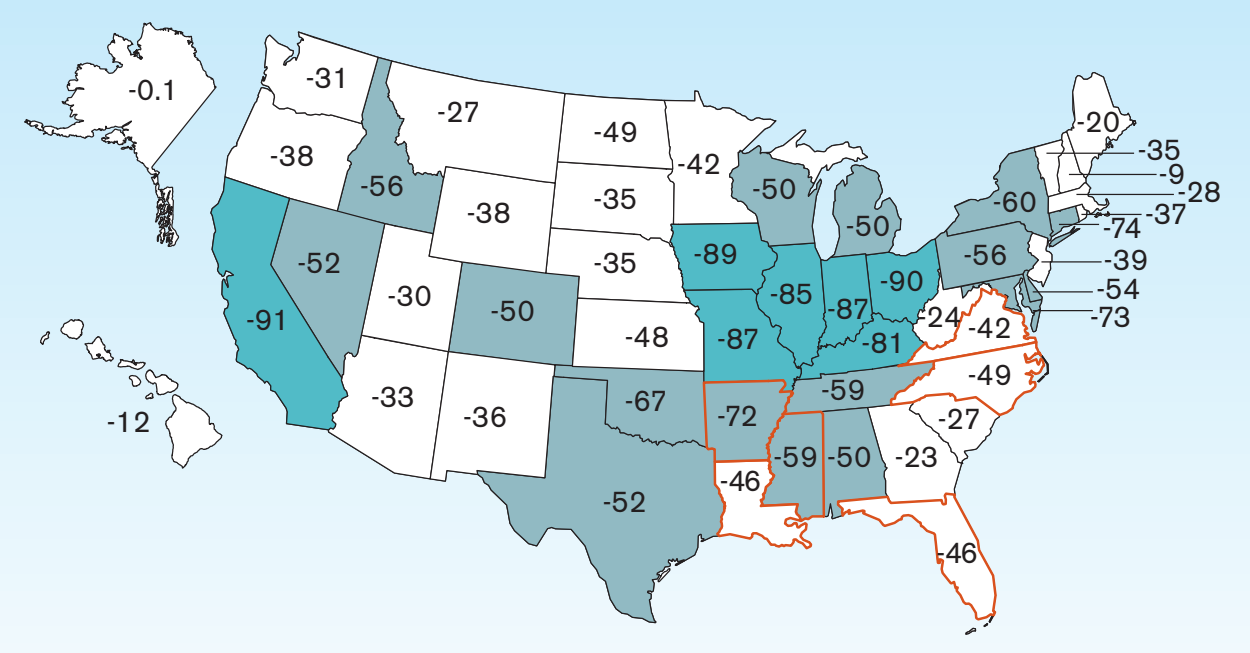
[7] Outdoor Industry Foundation, "The Active Outdoor Recreation Economy," Fall, 2006, http://www.outdoorindustry.org/images/researchfiles/RecEconomypublic.pdf?26.

Losing our natural infrastructure has costly impacts. As wetland losses have risen, the Army Corps of Engineers has increased flood control expenditures, but flood damages have risen faster.[8] The effect on aquatic fish and wildlife is also telling: In North America, 40 percent of freshwater species are extinct or at risk of extinction, and scientists have documented a 50 percent decline in populations of freshwater species over 30 years.[9]

Managing our water infrastructure

Our water infrastructure serves a number of purposes. Water supply, wastewater, and stormwater are the most recent divisions, though in reality it is all "one water" simply moving through our systems in stages of cleanliness and delivery. In this meeting, the conversation focused primarily on urban uses of water: residential, commercial, and industrial supply, wastewater treatment, and stormwater management. The agencies that oversee these responsibilities vary in their form, governance, ownership and structure. They include public as well as private systems, and public systems that are managed by private contract. Their jurisdiction may coincide with a municipality or they may be a special district that doesn't directly align with political boundaries. Oversight can be appointed or elected. They may supply directly to "retail" customers (homeowners, businesses, etc.) or supply to a wholesale customer which in turn redistributes, or both.

Figure 4 **Percentage of Wetlands Acreage Lost, 1780s–1980s**



Twenty-two states have lost at least 50 percent of their original wetlands. Seven states—Indiana, Illinois, Missouri, Kentucky, Iowa, California, and Ohio—have lost over 80 percent of their originial wetlands. Since the 1970s, the most extensive losses of wetlands have been in Louisiana, Mississippi, Arkansas, Florida, South Carolina, and North Carolina.

Source: Mitch and Gosselink, *Wetlands, 2nd Edition*, (Van Nostrand Reinhold, 1993).

[8] D. Hey, J. Kostel, and D. Montgomery, "An Ecological Solution to the Flood Damage Problem," in *Finding the Balance Between Floods, Flood Protection, and River Navigation*, ed. Criss and Kusky (Center for Environmental Sciences at Saint Louis University, 2009), 73-80. http://www.wetlands-initiative.org/images/pdf-docs/pulblications/FLOOD/research/eco_soln_flood_damage_problem.pdf.

[9] "Native Aquatic Species," Pacific Rivers Council, accessed January 6, 2012, http://pacificrivers.org/conservation-priorities/native-aquatic-species.

What do we mean by "sustainable" water systems?

Rather than re-hash the meaning of "sustainable" in the context of municipal water systems, we were able to build upon earlier efforts that addressed the components of sustainability.[10] Multiple themes emerge from among the reports. Our water infrastructure, designed in the 19th and early 20th centuries, no longer meets today's needs and challenges. Water management agencies have focused for over 100 years on the hardware of water and wastewater management: the pipes, pumps and reservoirs needed to move the drinking water, waste and stormwater through the system or store it until needed. These rigid systems were designed and operated based on the assumption of stationarity in our natural systems. Those assumptions are now seen as short-sighted and no longer match our understanding of nature. We need to transition from systems built around managing water under historical conditions of "certainty" to those built around flexibility to respond to unpredictable or rapidly changing conditions. First, we need to conceptualize our water infrastructure as an integrated system of natural water resource systems (green), and built/engineered pipes and treatment plants. We also need to move from an emphasis on centralized infrastructure to decentralized systems that are more resource and energy efficient, and scalable from the site to city level. We have to integrate all water systems to use the "right water for the right need" (e.g. watering landscapes with rainwater or non-potable water), reducing treatment costs and the length of pipe needed to fulfill specific water needs. We must start extracting the significant resources (nutrients and energy) found in wastewater rather than discarding them as waste. And finally, every dollar spent on water infrastructure must provide multiple benefits, such as lowering urban temperatures, increasing green space and parks, or creating local jobs.

Principles of sustainable water infrastructure

Basic principles for sustainable water infrastructure management:

1. **Adaptable**—Maximize flexibility and future adaptability to climate change and other conditions
2. **Watershed scale**—Plan and implement infrastructure at a watershed scale
3. **Natural infrastructure**—Protect and restore natural system functions
4. **Decentralize**—Integrate decentralized, distributed green infrastructure that replicates natural hydrology with built infrastructure
5. **One water**—Integrate drinking water, wastewater, and stormwater and fit the best water to the use
6. **Resource Efficiency**—Optimize conservation and efficiency investments before developing new supply or expanding treatment
7. **Multiple benefits**—Maximize the environmental, social, and economic benefit of every infrastructure dollar
8. **Pricing**—Price water, wastewater, and stormwater for ratepayers/customers to meet the total cost of sustainability requirements
9. **Full life cycle**—Plan, manage, and account for full life cycle infrastructure expenditures
10. **Asset management**—Apply best industry practices for repair/rehabilitation and replacement and innovative management
11. **Good governance**—Governing boards, city councils, and special utility boards should be designed to ensure sustainability and transparency

[10] R.D. Bolger, D. Monsma, and R. Nelson, "Sustainable Water Systems: Step One—Redefining the Nation's Infrastructure Challenge. A report of the Aspen Institute's Dialogue on Sustainable Water Infrastructure in the U.S.," May, 2009. Additional references can be found in Attachment A: Background Materials.

These are the realities of our fiscally-constrained and climate-altered world. We are at a turning point with our water infrastructure investment. We can either continue to build the equivalent of 1960s-era mainframe computers or move to laptops, tablets and cloud storage. (Refer to Attachment A for more background on sustainable water infrastructure.)

Understanding the financing of water systems

Water systems have two primary approaches to financing system improvements and maintenance: cash financing or debt financing. Cash financing is limited to the revenue at hand, which is usually from water rates, service fees, connection fees from new accounts, or taxes. Because water treatment and delivery is a capital-intensive endeavor, cash is usually insufficient to finance major system enhancements. Debt financing is the typical way that utilities raise upfront capital to invest in their systems. For systems large enough to sell debt on the capital markets, municipal bonds are the debt instrument of choice. Water utilities can issue revenue bonds that are backed by cash flows from water rates, fees or dedicated taxes, or they can issue general obligation bonds that are backed by the general tax-raising ability of the local government.

Systems whose capital needs are too small for the bond market typically rely on state revolving loan funds or other low-interest lending programs at the state and federal level. Only about 1,500-2,000 of the roughly 52,000 water systems in the United States are large enough to issue their own bonds (see Figure 5). For the rest, cash or federal or state loans and grants are the predominant means of financing system improvements.

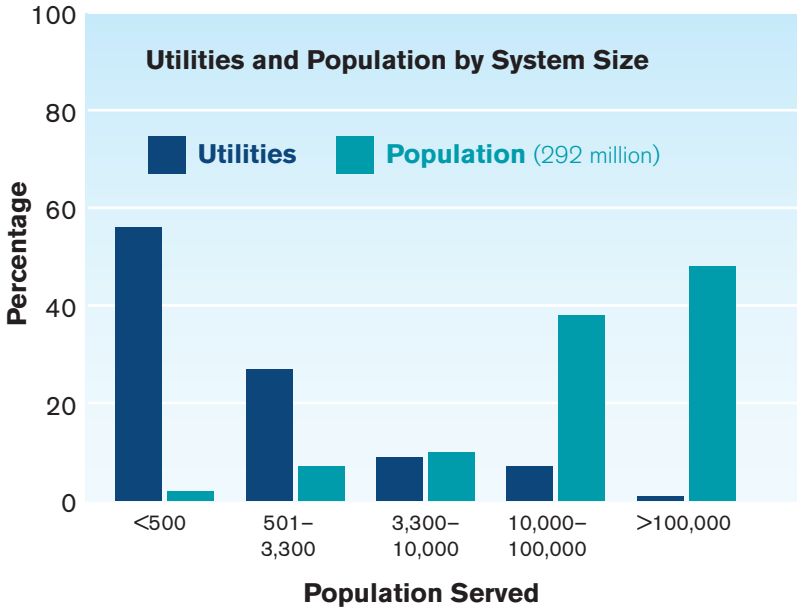
Because cash, public grants and low-interest loans are limited, and because smaller systems may be serving populations with lower income and operating at diseconomies of scale, their funding needs and solutions are very different from those of large water systems which deliver the majority of water in the United States. As funding needs and system disrepair become dire, many of these systems may have few options other than public-private partnerships or privatization.

Funding options

- Rates and charges
- Property taxes
- Fees (e.g. connection)
- Grants
- Insurance
- Customer services
- Private investment
- Debt-based capital financing

Following the economic downturn, the ease of financing capital improvement plans through the capital markets changed. The housing collapse took with it the bond insurers that protected investors from unexpected credit default of bond issuers, meaning that credit quality—including the ability to honor debt obligations by securing sufficient revenue—was more important than ever. In addition, the spread (or difference in interest rate) for AAA-rated issuers and AA or A widened significantly from before the

Figure 5 **One percent of the utilities serve 46 percent of the population**



Source: U.S. EPA, *EPA Factoids: Drinking Water and Ground Water Statistics for 2008*, (EPA/816/K-08/004, 2008).

downturn. Whereas AA-rated systems in 2008 that may have only paid 0.20 percent more to finance a capital improvement project than the highest-rated entities, in 2011 they were paying 1.0 percent more in interest. The spread in interest rates is even higher for issuers in some states–in 2010, some 1.8 percent higher for California systems, for example. For a typical bond issuance of several hundred million dollars, this higher interest brings significantly more cost to ratepayers. The increased spread is offset, however, by extraordinarily low market rates. Whether the spread between the least risky utilities and the rest will remain as wide after economic recovery is unknown. However, the increasing sensitivity of investors to hidden risks and the growing repository of tools available to investors to assess water risks suggest that utilities can expect to see increasing costs and scrutiny for capital financing.

Investor-owned utilities (IOUs)

While most water utilities in the United States are owned by local governments, around 20 percent of water is delivered and treated by investor-owned utilities. Many of these are publicly-traded companies, but some are privately owned. For these companies, the ongoing need to recover costs and build more efficient systems to manage costs remains the same as in the public sector. Unlike most utilities owned by local governments, IOUs must submit proposed rates to regulators in Public Utility Commissions. These regulators shape the operating environment, recoverable costs and return on equity for IOUs and are an important audience for enabling sustainable water management within regulated markets.

As the debt capacity of public systems comes against significant funding needs, some systems are turning to private equity or infrastructure funds to finance system improvements. Private capital can and does play very different roles in the water sector, a nuance that is often lost in the discussion around "privatization" of water assets. At one end of the spectrum, public water utilities can outsource management of some aspects of the system to the private sector–this is often done through a time-limited contract or may even be implemented through a lease of assets. For example, a public water utility may contract a large water services provider to manage the day-to-day operations of a water or sewage treatment plant. In many cases, private capital may have nothing to do with this arrangement, as the water services provider may be a publicly-traded company.[11] This arrangement is very different from the role that a private equity or infrastructure fund may play. A private equity fund may construct a water treatment plant using investor capital, with return to investors generated by water sales to a public utility. In some instances, a private equity or infrastructure fund may even wholly privatize a water system, so all assets and management responsibilities are in the hands of the fund. Privatization of public systems can meet the immediate needs of distressed systems, but the rate of return required by private investors is generally much higher than for municipal bond investors.

Whatever the source of financing, capital is never free. Ultimately the money invested in the system and the premium to the investor must be paid. Revenues from ratepayers will continue to be the primary source of repayment.

[11] Though often confused with each other, the private sector and private capital are not synonymous.

The Challenges We Face: Obstacles to Transforming Our Water Systems

As we think about a strategy for financing more sustainable water infrastructure systems, we need to do so with a clear understanding of the complex challenges the industry is facing and an understanding of the financing factors influencing the alternatives. By helping industry members and key stakeholders understand the challenges, we hope to generate more promising decisions and a new way of doing business. At the same time, we are beginning to shift the conversation with the capital investment community to help create a means of better informing their decisions and helping to remove financial hurdles to developing more resilient water systems. The group discussed a wide range of potential challenges.

A historically segregated approach to water management

Presently, most systems are managed as centralized and single-purpose water infrastructure, each focusing on one part of a whole: drinking water, wastewater and stormwater (see Figure 6). There is a growing consensus that such siloed systems are not effectively adapted to the challenges that the water industry will face in the 21st Century. Furthermore, they do not allow for an integrated approach to managing for mutual benefits and harnessing the value of the resources. Several negative consequences result, one of which is financial.

The cost of financing siloed systems

Because water systems are rarely integrated, many households and businesses are being serviced by two to three different water utilities. This means that the water-related debt burden for households and businesses may be multiples of the average system's long-term debt per household. If drinking water utilities' unmet capital needs are representative of the water sector as a whole, the upfront capital and resulting rate increases that will be sought as these systems age could accumulate to present real affordability challenges to customers. In recent years funding shortfalls have led to renewed calls for federal funding of infrastructure. The National Infrastructure Bank is one vehicle that has been proposed to allocate federal funding to leverage private capital. At present, however, the proposed fund does not address the need to prioritize sustainable and resilient infrastructure.

Increasing conservation, decreasing revenue, increasing costs

One trend that many utilities are seeing is decreased per capita use of water. For example,

Figure 6 **Siloed Systems**

Source: CollinsWoerman

starting in the 1960's, Seattle Public Utilities has periodically projected water demand and proactively responded by implementing conservation programs, including conservation pricing, to help offset future demand (see Figures 7a and 7b). Despite a near doubling of the population the projected increases have never materialized and total water use has instead *decreased* over the last twenty years. The Seattle experience is an extreme example of a trend observed in other regions. From a natural resource conservation perspective, this trend is beneficial. But it raises challenges for utilities faced with large fixed costs for infrastructure capitalization, growing per unit operating costs and decreasing revenues.

Full life cycle costs of water systems

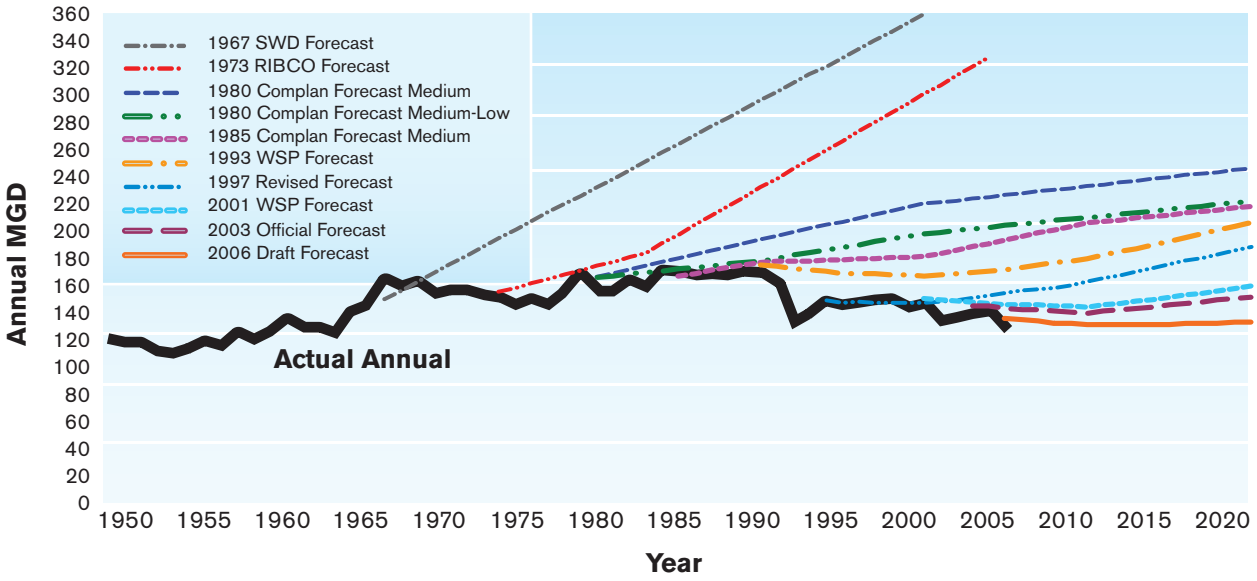
- Operations
- Maintenance
- Repair and replacement
- Growth/expansion
- System improvements consistent with industry standards
- Evolution and transformation

This covers drinking water, wastewater, and stormwater. Additionally, some participants highlighted the costs associated with un-captured externalities such as carbon emissions.

Lack of full-cost pricing

Another broad challenge for the full spectrum of water agencies is the need to recover costs for the regular maintenance and improvement of the system. In most cases, a substantial portion of the initial capital investment was heavily subsidized by federal grants, thus allowing utilities to provide service without passing on the infrastructure's full cost, much less the externalized costs of water withdrawal or pollutant discharge. Customers who have enjoyed these subsidies often do not understand why their water rates are suddenly increasing as new investments are made to maintain infrastructure. As a result, many utilities choose to defer maintenance, deploy capital investments, and instead forgo improving their systems' environmental performance while running operating deficits. Understandably, locally elected or appointed officials are often reluctant to accept a rate structure that would allow full recapture of all relevant costs, including the routine inspection and maintenance of the system. This leads to long-term financial shortfalls and equipment that is insufficiently maintained and updated.

Figure 7a **Long-Range Planning**
Water Demand and Past Forecasts for Seattle Public Utilities



Source: Seattle Public Utilities

Lack of continuous funding that covers long-term, full life cycle of our water systems

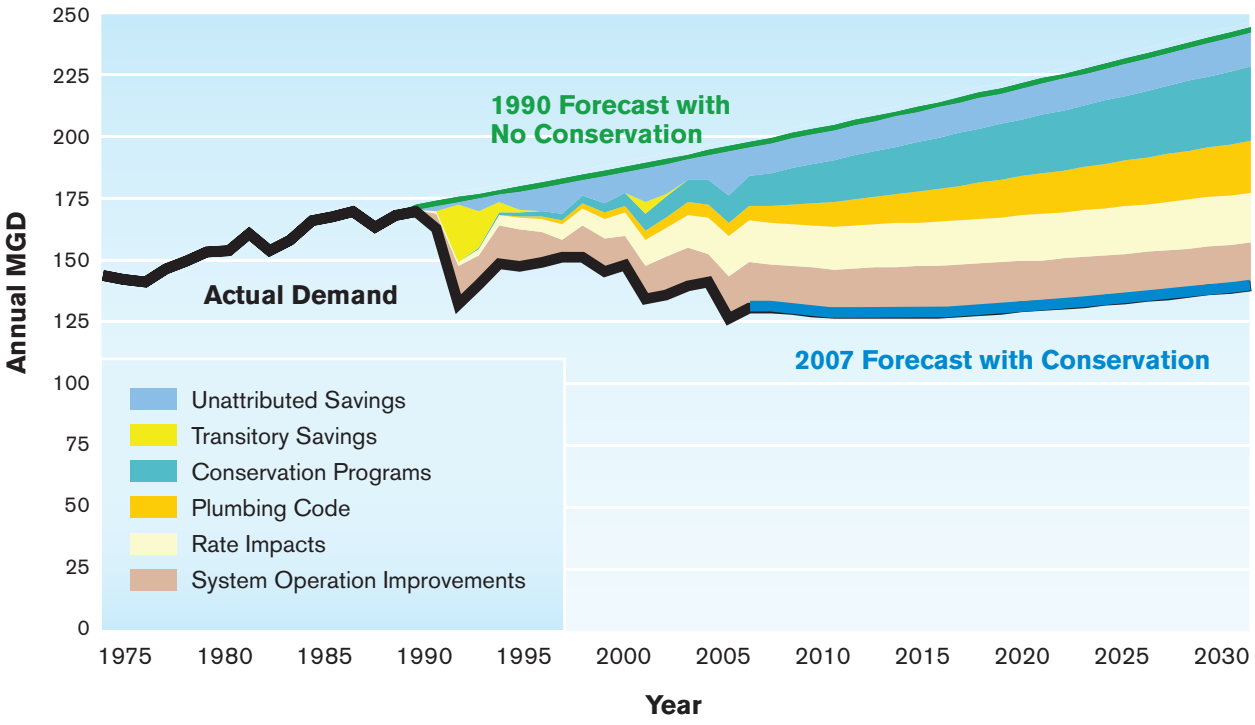
Cash flows from rates, fees and taxes often fall short of covering the full costs of the system. As a result, systems must seek debt financing to address both upfront capital and long-term maintenance. Within the sector, there is no expectation of utilities consistently matching revenues to the full cost of service delivery and system maintenance (including replacement and repair schedules, triple bottom line impacts and long-term asset management). Furthermore, the utilities are not expected to take system maintenance costs into consideration for long-term planning (see Figure 8). As a result, systems are chronically underfunded.

Instead, needed system improvements frequently are deferred as revenues are only sufficient to meet debt obligations and operational costs. In some places, growth itself was relied upon to finance the maintenance of the existing system, in the form of connection fees. When growth slowed, some utilities absorbed significant shocks to their revenue. The alternative–matching the full costs to maintain the system to consistent revenues–is so rarely practiced that the sector as a whole could benefit from guidance.

Lack of accounting for natural infrastructure or other ecosystems services

Our accounting systems have difficulty recognizing unconventional assets, particularly the natural assets that provide water storage, filtration, and delivery. This makes it difficult to include the value such assets provide on a utility's balance sheet, or to finance the acquisition or development of these assets. In many cases the acquisition and management of these assets are much more

Figure 7b **Impact of All Forms of Conservation Water Demand and Past Forecasts for Seattle Public Utilities**



Source: Seattle Public Utilities

economical than built infrastructure such as treatment plants and reservoirs; the most well-known case of this is New York City's purchase of forested upstream land that filtered the city's water at a tenth of the cost of a conventional filtration plant.

Investor expectations

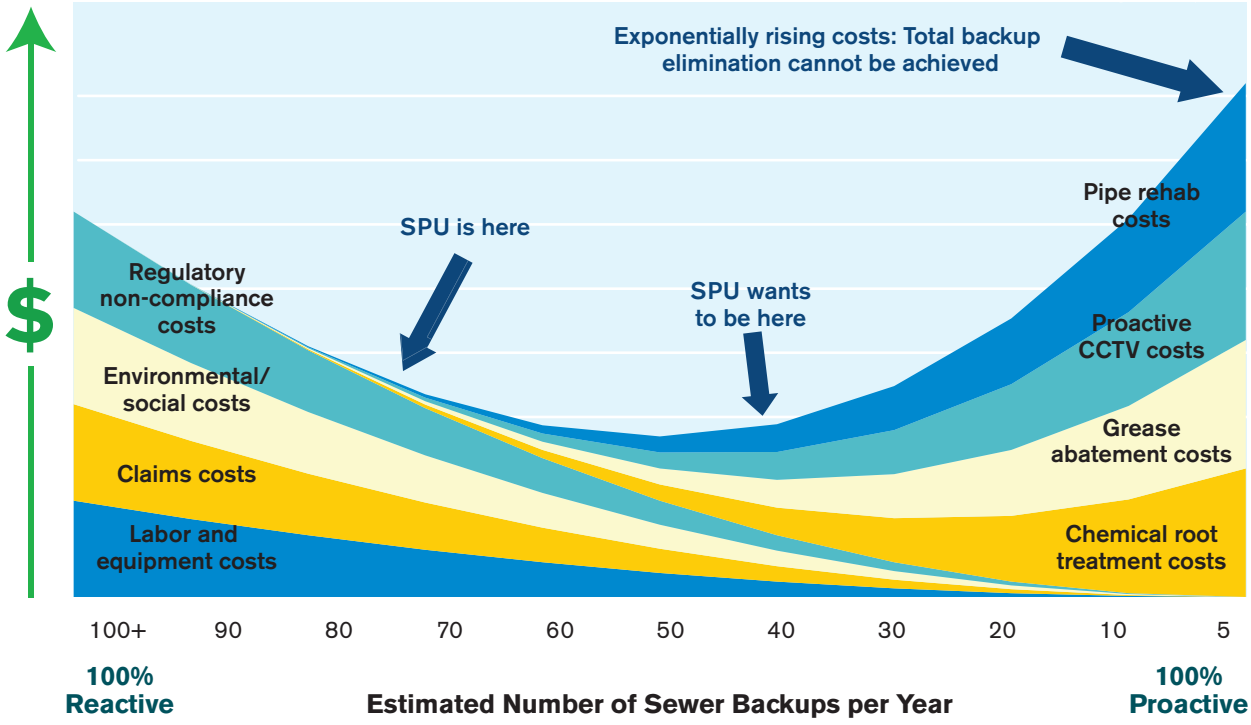
Whether public or investor-owned, utilities rely on capital markets to finance water infrastructure. While public water systems have traditionally been financed through the municipal bond market, the extraordinary needs of many systems are leading policymakers and utility directors to look beyond the bond market for much-needed capital. For investor-owned utilities, both shareholders and bondholders provide investment capital. Consequently, investor expectations shape the way both public and investor-owned utilities manage water.

Among those expectations are that the sector's revenue streams are secure because the service is essential and monopolistic, and that the sector is managed by risk-averse professionals using proven technology. These factors cause the sector to be viewed as low risk, which for public systems especially results in a low risk premium demanded by municipal bond investors. Participants at Wingspread discussed emerging trends that might cause these assumptions to break down over the long term.

Rates of return

Public systems looking for new financing streams beyond the tax-exempt bond market should recognize that equity investors will expect a higher rate of return. Eventually that higher premium has to be recovered, whether through rates, fees or taxes.

Figure 8 **An Example: Tying Together Service Levels, Lifecycle Costing, and the Triple Bottom Line**



Source: Seattle Public Utilities

Monopolistic, essential service provider

While utilities largely operate in a non-competitive environment, new technologies are emerging that could disrupt their historic status as monopolies. Onsite water filtration can allow water users to obtain high quality water and wastewater without any reliance on centralized water utilities. While this is an emerging trend, most utilities do not factor this variable into future demand projections. Even without disruptive technologies, demand for municipal water has dropped significantly over past decades. Yet many systems tend to linearly extrapolate historic demand to determine the necessary rate adjustments to repay capital programs. As the cost of utilities' services increase, water behavior and technologies are likely to adapt to force demand downward. For overleveraged systems, this inward demand shift can trigger a credit deterioration spiral. Utilities and investors should recognize these dynamic trends.

Risk aversion, dependable technology

One theme that was clear is that even though utility managers are very risk averse, rate-setting bodies may not be. Chronic deferred maintenance and under-investment are hidden risks that may not be reflected in the price paid for capital. Further, the challenges facing the sector will require new approaches, including decentralized and less proven technologies. This will require new skills, experimentation, and the acceptance that not everything will succeed. Increased innovation will need to become part of routine operations and should be rewarded appropriately.

Data-poor market

Investors have typically valued the traditional monopolistic, essential-service aspects of the water infrastructure sector. Very little data is available on the state of water systems or their sensitivities to declining water demand, volatile supplies, and variable costs of energy and other system inputs. As a result, the market does not factor the risk or resilience of the system into the prices. Instead, investor biases (for example, biases against water utilities in the Southwest or Great Lakes) trump the actual performance of these utilities. Even rating agencies are challenged to find material information on system performance since so few utilities collect that information. Consequently, the utilities that are at the top of their class in terms of risk management or system maintenance are unlikely to see more competitive cost of capital. Better data would help the market price more correctly and would help utilities manage their risks by benchmarking themselves against other systems.

Rate suppression

Americans pay around a dollar for ¾ ton of water delivered to their homes each day[12] and similarly low rates for sewerage services. Some cities have experienced significant rate increases in recent years, yet resistance to bringing rates in line with the real costs of services persists despite the relatively low cost of service. That is due in part to the reality that rate decisions tend to be short-term and politically influenced. Lack of political will to evolve our water systems and short political timelines can have a tendency to reinforce status-quo decision-making and put downward pressure on rates. Going forward, meeting public health and system performance needs while maintaining rates at 2 percent Area Median Household Income (a threshold commonly used by the EPA) will be increasingly difficult, especially if we continue to build systems in the same way. In the meantime, the negative impacts of suppressed rates are felt in several ways.

[12] Denver Water, "2010 Comprehensive Annual Financial Report," June 1, 2011, http://www.denverwater.org/docs/assets/ 6C28411A-E112-FBD9-E5A84D8D42B9A128/2010_annual_report.pdf.

Short-term management decisions and higher cost of capital

Ultimately, this resistance to higher water rates often results in utilities exhibiting less-than-optimal system maintenance and neglecting long-term needs until a crisis forces them to act. At that point, a rate increase can be justified as a response to pending system failures. Ultimately the artificial suppression of water rates can defeat the very intention of keeping water affordable. Financing system improvements in response to crisis can force systems to go to market when their weak financial condition demands a higher rate of return. Ratepayers then end up paying more for system repairs in the form of higher interest payments and may be paying for poorer services. Perversely, this crisis-response mode can make utilities eligible for emergency funding available from state or federal government that is offered at a lower cost than market, which perpetuates the problem of reactive system management and persistent underpricing.

Under-valued water distorts consumer behavior

Historically, low rates for water services in many instances have encouraged inefficient water use and excessive water treatment demand by consumers. At one ideological extreme, consumers see water as an unlimited "right" and feel it should be free–without regard for the cost of treatment and delivery.

Lack of public understanding and awareness

The general public, and ratepayers in particular, often don't have the right information to understand the full costs of providing their clean drinking water, sanitation, and stormwater services. In addition, water utilities do not necessarily invest in understanding what services their customers value most. As a result, they have been resistant to rate increases to cover more costs, and the expectation remains that water should be as inexpensive as it has been historically.

Limits of existing market instruments to fund decentralized systems

As utilities look beyond their own system to the built environment of the communities they serve, some are seeing that decentralized approaches may actually deliver higher value for their customers. For example, Philadelphia decided that a centralized stormwater system was less desirable for the city's residents than a network of green infrastructure that yielded the multiple benefits of flood control, water quality protection, temperature moderation, and recreational amenities or aesthetic enjoyment. Yet the existing markets for financing water systems are not adapted to financing decentralized, customer-financed interventions. In many ways the problem is similar to the financing of energy efficiency or distributed energy generation. The bond markets are traditionally used to finance development of centralized systems that are wholly owned by the issuing entity and secured by the revenues and physical assets of the system. When a utility wants to finance work with its customer base to develop a citywide network of green infrastructure on private land, the bond market may no longer be a viable option.

Variability in the systems

While the majority of the utilities represented at the conference served large urban municipalities with growing customer bases, they recognized that significant diversity exists in the industry. There is not a consistent need among utilities that allows for a one-size-fits-all approach to financing transitions to sustainable systems. As a result, more work remains to understand and address the unique financial needs of big versus small systems, the related challenge of urban versus rural systems, and systems that serve growing, versus declining populations.

Opportunities and Solutions: Sustainable Financing for Sustainable Infrastructure

Through presentations, plenary discussions, and small group sessions, participants explored incentives for funding sustainable water infrastructure, innovative financing options and mechanisms for transforming the industry. There was a recognition that near-term modest steps needed to be taken at the same time that the industry moves toward more transformative change. Discussion confirmed that utilities and resource planners across the country are using a range of mechanisms for financing capital investments in infrastructure and ecosystem restoration. Yet there is no silver bullet. No matter how water systems are financed, the primary challenge will remain: ensuring sufficient revenues to support repayment of the needed financing for capital improvements and resource intensive system upgrades.

This is the case with both traditional hard infrastructure and natural system designs. And it is especially true when considering the need to fund the full life cycle of sustainable systems. Given the tendency for systems to set rates and manage reserves to meet only near-term operating needs, the conference participants emphasized the imperative to plan for long-term needs (including aging, in-place systems) and begin to incorporate more resilient and flexible natural infrastructure elements. This shift in the culture of infrastructure planning must happen rapidly, as municipalities throughout the country face pressing needs.

Is there a way to harness the sense of acute urgency to inspire action? The following steps were identified as key elements of a roadmap toward more sustainable decision making and more resilient systems.

We need to change our expectations of how we manage water

The conversation made clear the fact that no single actor is going to catalyze change. Many players need to work together to realize a more sustainable vision for the future and design better alternatives, including:

- System "owners," whether they are shareholders, or customers and ratepayers.
- Capital providers (the capital markets, investors, state revolving funds)
- Sector leaders and norm setters (leading utilities and trade associations)
- Interested "outsiders" (disruptive innovators, consultants, service providers, and non-governmental organizations)

Solutions will be locally-driven

While there is no single solution for the distinct needs of communities, there are a growing set of tools that can be adapted to the needs of particular places. Participants agreed that the shift toward a more sustainable and economically viable future will not be driven by top-down mandates, but by thousands of local infrastructure investment decisions. These decisions will be forced by different pressures. In some places, the need to comply with strong water quality standards will spur innovation in distributed systems. In other instances, disruptive technologies like closed-loop water designs for buildings may be such a threat to water utilities' traditional business models that utilities will have to change their approach to service provision. Whatever the drivers, there are changes happening in the water sector that demand new financing

tools and renewed attention by investors on how well-prepared water systems are to face the sector's changing business environment.

A handful of cities were cited as models in integrated water management, including Seattle, Philadelphia, and San Francisco. In size and socioeconomics, these cities face different realities than many other water systems in the country. While these leadership utilities can chart a path forward, the solutions for smaller or less wealthy communities may be different.

Customers needs and values drive innovative and customized solutions

There is a difference between what people value about water and what their water service providers value. There is, however, agreement on what each group thinks is being provided: gallons of water at the lowest possible price. This shared definition of the product is a key factor that drives permanent under-investment in infrastructure. However, the spread in values creates an opportunity to price water based on its use–what the customer is willing to pay for such uses–and can create a new way of doing business for water service enterprises.

Nearly 200 gallons of water enters our houses each day. Most of the water we use is for keeping our lawns green, flushing, cleaning, and showering. Very little of it is actually used for drinking, the use that requires the highest standards for cleanliness. Users value each of those applications differently, and would probably pay different prices for each type of use. That small fraction that we drink, however, is what drives the cost of our water. Similarly most of what goes into the sewers is not sewage. But the cost of conveying and treating sanitary waste back to near-potable standards is what drives our bills.

Water service providers have been very good at delivering the most expensive goods (drinking water and sewage treatment) at minimum costs. Utilities strive to provide service (gallons of an undifferentiated product) at the lowest cost. And because water services have been provided relatively inexpensively and in an undifferentiated fashion, the infrastructure tends to be invisible to ratepayers until there is a problem: service is interrupted, basements get flooded, a boil order is issued, sewers overflow, etc.

But we are being charged too little for a product that is on average better than what we need. As long as costs are low, we will use it without differentiating or prioritizing among the various uses. When that small fraction of what we use makes every other use much more expensive, then different values might start to matter.

There is an opportunity in this era of increasing costs and infrastructure replacement needs to differentiate what customers are offered. Some may not wish to pay for irrigating lawns with drinking water, but would be willing to use a different source for a lower cost. Some may wish to pay a bit more for filtered water provided at the tap. Others may wish to secure insurance on their lateral connections so that they do not suffer (or inflict) sewage backups. Others might wish to invest in natural resource health in the areas their water comes from as insurance against future costs. Water "systems" should explore how to move beyond "minimum cost rates" to providing differentiated services based on what their customers value. This can be as straightforward as revisiting maintenance and construction activity based on the level of service customers want (as Seattle recently implemented), or it might be as complex as marketing other consumer goods. What is required, however, is that in an era of increasing rates, customers have the option to choose what they value and that providers begin to move from engineering economics to market economics.

Recognizing the link between financial strength and sustainability

Participants underscored that financing and good management of water systems are inextricably linked and should include these steps:

- **Recognize the full cost of water services as part of a solution for creating sufficient and more stable revenues.** Full life cycle pricing, a term for setting rates to reflect the true cost of current water services as well as future water supply and treatment needs, is the backbone of sustainable systems. Without stable and sufficient revenues, systems cannot deliver high quality services or environmental performance.
- **Building support among ratepayers and regulators to support financially viable systems.** Securing adequate rates or setting higher prices takes political will. If ratepayers are to willingly pay more for water, system managers must better understand what services their customers value and use that knowledge in messaging to regulators, political decision makers, and ratepayers. Ultimately, people will be more willing to pay increased rates if they understand the increased public benefits that will result.
- **Incorporating value-added services into revenue generation structures.** Most water systems still rely solely on volumetric pricing to generate revenues. When the economy softens or droughts persist, this business model puts systems at financial risk. In good times, volumetric pricing also encourages water systems to invest more in hard infrastructure to deliver more water than in tools to manage demand for water. By linking revenue to the value-added services, the rates will be based on an array of services provided and better align the system costs with the values customers are willing to pay for.
- **Improving performance data.** Both investors and water managers need better information to drive improved performance in the water sector. Capturing performance data and measuring against industry benchmarks (e.g., "non-revenue" water from leaks) would create a competitive environment critical to improving performance. Increased data transparency helps internal management decisions, public understanding of costs, and investor evaluation of risk, which should be a key driver for this data. Overall, better data would help encourage the hard questions while also providing better answers.
- **Changing the utility business model to be more resilient to the emerging business environment.** Historically, water utilities have functioned as monopolies with no competition in delivering water resources or treating wastewater. Additionally, in many places drinking water providers have been distinct from stormwater and wastewater treatment providers. But utilities' business environment is changing. Emerging technologies like closed-loop water designs can enable buildings, city blocks, and neighborhoods to be completely "off the grid." In the coming decades, those technologies may undermine the monopolistic structure of the sector and force utilities to approach their mission as service providers instead of movers of water.

Managing sustainable water systems

Managing for sustainability requires a more flexible, forward-thinking and integrated approach that considers the following factors:

- Adaptability
- Watershed scale
- Integration of natural systems
- Decentralized infrastructure
- Integration of drinking, waste and stormwater as "one water"
- Resource efficiency
- Multiple benefits across sectors
- Full life cycle management and pricing
- Asset management
- Good governance

- **Consolidating systems to achieve better economies of scale, better economies of scope, and improved system management.** Increased pressures on water quantity and quality, existing utility debt burdens, and significant capital costs for replacing aging systems may create greater efficiencies by consolidating water systems that can take the form of consolidating among multiple water utilities. Consolidation can also take place in a single service area by pursuing "one water" integration of drinking water, stormwater, wastewater, and flood control needs. In that environment, utilities that expand their mission to focus beyond drinking water and sewage services to watershed stewards can find new cost efficiencies and discover even higher-quality service by connecting with the range of values that water systems (built and natural) provide to the community. Integration of water utility services may also be a more stable business model in light of disruptive technologies on the horizon.

Innovative financing strategies

Transforming our water systems will require new financing tools. Participants identified several areas for focusing attention on developing more transferrable models.

1. Expanding the pool of water service funding

a. Water systems are more than pipes and treatment plants. In many places, water utilities are partnering with other city agencies to coordinate infrastructure plans, recognizing that roads, green spaces and buildings are all critical to effective water management. This more expansive definition of water systems expands the funding pool. For example, permeable roadways and alleys laid by departments of transportation reduce stormwater runoff and help stormwater agencies comply with water quality standards.

b. Industrial customers can also be partners in financing system improvements. For example, Chevron Energy and multiple California utilities, including East Bay Municipal Utility District, supported the financing of wastewater treatment system upgrades and developed innovative water re-use systems to reduce the load on the local wastewater service providers.

c. For many systems, water treatment and delivery is their sole source of revenues. Yet water and wastewater carry embedded energy and nutrients that can be new sources of revenue generation for water utilities. Developing systems to enable waste or energy recovery can give water utilities more diverse revenue sources.

2. Accounting and paying for ecosystem services

a. Ecosystems provide clean drinking water, often at a fraction of the cost of built infrastructure. Yet today those ecosystem benefits are not valued on utility balance sheets or reflected on income statements. The accurate valuation of the services those systems provide was recognized by participants as a "game-changer."

b. Watershed ecosystems provide highly cost-effective storage, filtration, and temperature regulation, and some utilities are considering how to account for ecosystem services to increase their balance sheet assets as a tool for expanding debt capacity to take on other capital improvements.

c. Watershed services are often physically separated from the communities that benefit most. Payment for watershed services is a growing area of interest to link payments from downstream beneficiaries to support natural ecosystem protection and restoration throughout a watershed. These approaches can cost magnitudes less than treatment plants and new supply development.

3. Implementing distributed water services

a. On-site stormwater management through "green infrastructure" and "low-impact development" designs is growing rapidly in the United States. Cities now realize that it's cheaper to capture and manage water where it falls than to pay billions to build large underground sewer tunnels to handle increasing runoff, and green roofs, rain gardens, and street trees also provide many other community benefits. Some developers are also integrating non-potable rainwater and on-site treated wastewater for building cooling, toilet-flushing, and irrigation. This represents a significant shift from centralized, publicly-controlled water management and offers both challenges and opportunities for financing.

b. At the same time, stormwater fees (e.g. based on total imperviousness area of individual properties) and credits for holding more stormwater onsite are opening up opportunities for private investment. In many cities, businesses that install green infrastructure are rapidly expanding, creating more need for capital. Developing securities to aggregate customer-financed projects–for example, removal of impervious surfaces–is a present-day challenge whose solution could lead to a secondary market for investments that provide a clear public value.

c. Similar private investments could also be developed for water efficiency retrofits and installation of closed loop water systems at the building and even neighborhood scale. Utilities have traditionally seen these as a threat to revenues, but these strategies can also be a powerful tool for sustainable system management.

Steps for Creating Change

While significant improvements can be made within existing institutions, transformative change will require intentional steps and practical tools that can be shared and transferred. The group identified a range of specific actions and tools that could help to advance change:

Building support among ratepayers and regulators to support financially viable systems

- Develop marketing tools for water providers to show the true value of water for their regulators and customers.
- Frame for elected officials and regulators what the "disruptive technology" future looks like and how business models, rate-setting, and financial strategies must change accordingly.
- Develop materials to help water utilities educate their public utilities commissions (PUCs) and city councils on full cost pricing and rate setting structures for sustainable water systems.
- Develop a primer for utilities to help them to learn more about how their customers value different water services so that utilities can develop new service models and market their services in a more targeted way.

Improving performance data

- Create a rating scale that offers a consistent standard for sustainability as it is applied to water utilities (similar to the LEED standard applied to buildings). Consider third-party accreditation to ensure credibility and accountability.
- Give credit rating agencies guidance on the right questions to ask utilities that drive toward financial, management, and water system sustainability.
- Recruit a group of leadership utilities to model "platinum" financial disclosure/reporting.
- Develop standard methods and metrics to value natural capital and triple bottom line benefits and to guide how to incorporate them into accounting systems.

Changing the utility business model to be more resilient to the emerging business environment

- Put forward a vision for "the 21st Century Water Utility" and promote this as the new standard for the industry.
- Present a methodology for utilities to undertake risk-based scenario planning for demand forecasting.
- Work with academic institutions, especially engineering schools, to align curriculum with latest sustainability practices.

Consolidating systems to achieve better economies of scale and system management

- Develop tools for co-managing, co-budgeting, and planning among water systems for "one water" integration.
- Convene regulatory agencies to examine ways that policy can help to remove impediments to "one water" management, full-cost pricing, etc., and better align regulatory tools.

Expanding the pool of water service funding

- Encourage a range of partnerships including public-private alternatives to address case-specific needs.
- Convene financial players engaged in distributed energy generation or energy efficiency finance to assess market/product potential for similar projects in the water sector.

Accounting and paying for ecosystem services

- Convene a group of utilities, practitioners, and academics to look at methodologies for valuing natural capital and implementing projects.
- Engage FASB (Financial Accounting Standards Board) and GASB (Government Accounting Standards Board) in the discussion of accounting practices and a process for putting natural capital assets onto utility balance sheets.
- Build off of existing demonstration projects by creating and supporting additional pilot ecosystem services payments systems that capture and compensate for a broader suite of ecosystem services benefits such as downstream flood protection, water storage upstream, water quality improvements, etc.

Participants also recognized the need to share success stories across the sector to enable transformative change. In particular, sharing experiences and successful innovations through publications and other communication materials was seen as an important role for trade associations and NGOs.

Commitments

Each of the participants demonstrated their commitment to advancing solutions to the most pressing issues brought forth in the conference by committing to specific actions.

Gary Breaux, Assistant General Manager and CFO, Metropolitan Water District of Southern California

Transfer the use of PPP to develop recycling projects and waste-to-energy projects, and the use of Joint Power Authority (JPA) structures to manage watersheds, develop water supplies and implement recycling projects. Share these learning with other organizations such as the Association of California Water Agencies (ACWA).

Lynn Broaddus, Environment Program Director, The Johnson Foundation at Wingspread

Work to disseminate the results of this conference and to convene subsequent meetings to further the recommendations in this report.

Chuck Clarke, Chief Executive Officer, Cascade Water Alliance

Work on developing the financial tools to determine ways to bring "alternative assets" on to the books of water companies.

Janet Clements, Senior Economist, Stratus Consulting

Use triple bottom line and ecosystem services expertise to train others on how to integrate into utility/organization management, and contribute to efforts to explore valuing non-traditional assets.

Helen Cregger, Senior Vice President, Public Finance Investment Banking, Piper Jaffray & Co.

Encourage best practices in full cost pricing, capital planning and debt financing.

Chris Crockett, Deputy Commissioner, Philadelphia Water Department Planning and Environmental Services Division

Work on issues related to stormwater marketing, the development of a LEED/WEED program and new financial disclosure metrics. I will also explore integrating the "one water" approach into academic curricula.

Martha Davis, Executive Manager for Policy Development, Inland Empire Utilities Agency

Take the discussion from this convening and use it to help inform the development of the 2013 California Water Plan Update and the development of the southern California 5 County Regional Stormwater Initiative and initiate a water-wastewater-renewable energy initiative.

Disque Deane, Jr., Co-Founder and Chief Investment Officer, Water Asset Management, LLC

Determine ways to use WAM's access to capital to develop alternative water markets.

Michael Deane, Executive Director, National Association of Water Companies

Work with the American Water Works Association to investigate the feasibility and benefit of the development of a LEED/WEEDs protocol for the water industry.

Harriet Festing, Director of Natural Resources, Center for Neighborhood Technologies

Develop national partnerships with some of the participants involved in the dialogue in order to further specific initiatives. Test the concept of a LEED/WEED program in Illinois.

Emily Gordon, Senior Associate, State and Local Initiatives, Green For All

Produce national report exploring the number and types of jobs that would be created by a significant investment in our stormwater infrastructure. Disseminate report broadly and assist with the development of strategies to help deepen public understanding of the job and economic impact of investing in our water infrastructure.

Ed Harrington, General Manager, San Francisco Public Utilities Commission

Work with water utility and other interested parties to further the discussion of Natural Resources Accounting—that is having the value of natural capital put into governmental financial reporting. The initial focus will be discussions with the Governmental Accounting Standards Board and expanding the knowledge of the issue through the Government Finance Officers Association.

Patty Healy, First Vice President, Bayern LB

Make final report available to municipal bond analyst community through national and local industry functions. Provide auxiliary support to peers' work on issues discussed at convening with GASB. Connect with banks regarding energy sustainability financing ideas that may be applicable to the water industry.

Bill Holman, Director of State Policy, Nicholas Institute for Environmental Policy Solutions, Duke University

Assist by matching knowledge resources to discern barriers and opportunities for "one water" integration with special attention focused to the regulatory agencies (PUCs).

Kirsty Jenkinson, Director, Markets and Enterprise Program, World Resources Institute

Continue to participate in sustainable water financing discussions with The Johnson Foundation, American Rivers, Ceres and other parties, and connect those discussions with WRI's work on global and U.S. water risk.

David LaFrance, Executive Director, American Water Works Association

Work with the National Association of Water Companies to investigate the feasibility and benefit of the development of a LEED/WEEDs protocol for the water industry.

Sharlene Leurig, Senior Manager, Insurance Program, Ceres

Help utilities to engage GASB/FASB on natural asset valuation and to develop a leadership standard for performance-based disclosure in bond financing. Continue to engage municipal bond investors and credit rating agencies on credit factors related to sustainable water management.

Peter Malik, Director, Center for Market Innovation, Natural Resources Defense Council

Promote the Philadelphia example of stormwater pricing and management by blogging, writing a piece for *Environmental Finance*, and through additional speaking and writing engagements.

Scott Miller, Environmental Sustainability Manager, The Russell Family Foundation

Act as conveyor of intelligence gained from the Johnson Foundation proceedings and to other water funders and help them discuss next steps.

Betsy Otto, Vice President, Conservation and Strategic Partnership, American Rivers

Help convene a meeting on valuing and accounting for the myriad water benefits and services provided by natural ecosystems. Provide support to EPA for including smart financing strategies in updated stormwater regulations. Continue to work with The Johnson Foundation, Ceres, and groups represented at the Wingspread conference to advance some of the most promising ideas and strategies discussed for driving toward more sustainable water infrastructure management.

David Rankin, Vice President and Director of Programs, Great Lakes Protection Fund

Use the results of this convening to help shape Protection Fund programming. I will share these results with our project teams working in this space, interested applicants, funders and other key audiences working on freshwater issues. The Fund is particularly interested in testing innovative models for what water utilities will become.

Adam Rix, Managing Partner, TurningPoint Capital Partners, LLC

I will contact my political network and inform civic leaders of the outcomes from this convening. Additionally, I plan to educate utilities on the value of skunk working and will encourage corporations and corporate investors to bolster the evolution of the water infrastructure network.

Eric Sandler, Director of Finance/ Treasurer, San Diego County Water Authority

Work with utility finance officers and other relevant stakeholders regarding the valuation and recognition of ecosystem assets. Knowledge transfer regarding best practices for the deployment of private capital to develop public water infrastructure--specifically with respect to a fair and efficient allocation of risk and return. Work with interested parties to better characterize potentially disruptive developments to the existing landscape of public water utility management in the U.S.

Attachment A: Background Materials

The following background and concept document and excerpts from the materials below were circulated to the group in preparation for the convening:

Regional Plan Association. *America 2050: An Infrastructure Vision for 21st Century America.* 2008. http://www.america2050.org/AM2050Infra08sm.pdf

Bolger, R., D. Monsma, R. Nelson. *Sustainable Water Systems: Step One–Redefining the Nation's Infrastructure Challenge. A report of the Aspen Institute's Dialogue on Sustainable Water Infrastructure in the U.S.* May, 2009. http://www.aspeninstitute.org/sites/default/files/content/docs/pubs/water_infra_final.pdf

Additionally, the following optional readings are also available for further background.

Water Environment Research Federation–New Paradigm for Water
http://www.westcas.org/PDF/A_New_Paradigm_for_Sustainable_Water_Infrastructure.pdf

Baltimore Charter for Sustainable Water Management (2007)
http://sustainablewaterforum.org/baltimore.html

Sustainable Infrastructure Management by Dr. Valerie Nelson,
Coalition for Alternative Wastewater Treatment
http://sustainablewaterforum.org/new/white4.pdf

Charting New Waters
www.johnsonfdn.org/chartingnewwaters

Fitch Ratings Revenue Special Report–2011 Water and Wastewater Medians
http://www.stlmsd.com/aboutmsd/organization/rateproposal/Exhibit-MSD-67H-Fitch-WaterWastewater-Medians-2011.pdf

National Federation of Municipal Analysts Recommended Best Practices
in Disclosure for Water and Sewer Transactions
http://data.memberclicks.com/site/nfma/DG.BP.rbp_water_sewer.doc.pdf

Attachment B: Concept & Background

Convening on Financing Sustainable Water Infrastructure Systems

July – August, 2011

Purpose:

The Johnson Foundation, in collaboration with American Rivers and Ceres, will convene a group of experts at Wingspread to discuss ways to leverage public funding and incentives as well as private financing to drive innovation for more sustainable and integrated management of water resources in the United States.

Background:

As the nation's water infrastructure crumbles and populations grow beyond the capacity of existing systems, we will need to deploy hundreds of billions of dollars to repair and expand drinking water, wastewater, and stormwater infrastructure. Local governments currently fund 98 percent of all water and wastewater infrastructure and will rely on the capital markets to finance this critical infrastructure. Yet, as the debt capacity of cities and utilities declines, we will need to adapt our mechanisms for assessing the financial resilience of water systems and deploy financing vehicles that will bring new resources to the development of reliable systems. As capital markets are buffeted by global economic and debt concerns, private financing may be constrained and increasingly expensive.

This is not simply a funding crisis, however. As with transportation and energy, the nation is at a critical juncture. We can either transition toward cost-effective, resilient, and environmentally sustainable solutions or continue to sink investment in expensive, inflexible "siloed" water systems. In other words, money for water infrastructure will be tight and what we spend it on will be more important than ever.

Achieving more sustainable water systems in this century means reconsidering the designs we've been using for the past 200 years. Ironically, a more sustainable approach means reinvesting in our beleaguered natural infrastructure systems, whose damage and disrepair puts added strain on our built infrastructure. We will need to restore damaged watersheds and boost the stock of urban green spaces and green infrastructure that can serve as primary water supply and treatment and help traditional gray infrastructure–dams, canals, pipes and treatment plants–perform optimally. Similarly, we must capitalize on what more cities are learning, that restored floodplains offer far cheaper flood storage and risk management.

The price we pay for water should reflect full life cycle infrastructure costs, the increasing marginal cost of new supplies, and the way we account for the costs of our water infrastructure must internalize rising energy costs. Finally, we must maximize the supply we gain from conservation, efficiency and integrated water system designs to minimize the financial burden of new water storage and diversion projects.

The shift toward a more sustainable and economically viable future will not be driven primarily by legal mandates, but by thousands of local infrastructure investment decisions. If we are to build that sustainable future, utilities building more resilient systems must be able to differentiate themselves in the capital markets, and investors must price-in and reward resilience. We can rise to this enormous challenge because this vision is in the mutual interest of utilities, cities, water users, investors and the environment.

At Wingspread, our goal will be to explore and begin to chart the pathways toward markets and innovative funding mechanisms that support and enable sustainable water systems. Admittedly, this is an enormous topic with many complex elements–accounting for ecosystem services, pricing for the true cost and value of water, and the interplay of municipal services with private capital markets–and we will work to focus our discussion on the most promising and urgent opportunities. These issues were highlighted frequently during the yearlong discussion that culminated in The Johnson Foundation's "Charting New Waters" report, and the Foundation is committed to continuing to move the dialogue forward.

The Johnson Foundation at Wingspread approaches issues without preconceived ideas or fixed agendas. A distinctive feature of the Foundation's convening model is that it promotes candid, yet collegial, conversation among those with divergent ideas and perspectives. This model fosters the trust and collaboration needed for innovative solutions that can also be broadly supported.

A three-step process format

To address the issues proposed, we have designed three elements of a facilitated dialogue process. Two webinars will be held in advance of the meeting to balance convenience with the value of face-to-face conversation. The events are scheduled for summer 2011 as follows:

- Webinar 1, July 26, 2011
- Webinar 2, August 10, 2011
- In-person convening at The Johnson Foundation at Wingspread, Racine, Wisconsin, August 16–18, 2011

Participants are asked to commit to all three companion events. The conversations will be progressive–designed to build off of one another and the information previously presented.

Guiding questions:

We seek to address this question during the course of this convening:

How can we drive funding toward the new infrastructure we need in the 21st Century? There are two key elements to this question:

- What new financing techniques can communities use to pay for integrated and sustainable infrastructure approaches?
- How can we direct private capital toward the right kinds of water management projects?

Outcomes

As a result of the series of events, we anticipate the following outcomes:

1. Create the opportunity for a diverse range of financial and policy experts to share expertise, familiarizing each other with respective issues and concerns, build understanding of diverse perspectives and build partnerships.
2. Explore sustainable water infrastructure financing alternatives.
3. Identify priority issues and possible solutions. Understand the range of perspectives and identify where common ground, divergent views and strong agreement exist.
4. Catalyze action for future efforts by identifying leadership organizations and larger groups dedicated to ongoing coordination and cooperation.
5. Agree on whether there is value in creating a body for ongoing policy coordination and cooperation.

Key stakeholders

We are targeting a diverse range of perspectives for this conversation with a target toward individuals and organizations that are in a position to design and affect change, including the following groups:

- Investors–pension funds and advisors, socially-responsible and faith-based investors, retail funds, private equity
- Public policy groups
- Experts on sustainable water
- Experts on water infrastructure financing
- Municipal utilities
- Investor-owned utilities
- Utility regulators
- Financial advisors
- Credit rating agencies and assurance providers

Attachment C: Wingspread Meeting Program

Day 1: August 16, 2011

12:00 p.m.
Buffet Luncheon

3:30 p.m.
Gathering and Orientation to Accommodations
Wendy S. Butler, Special Initiatives Coordinator
The Johnson Foundation at Wingspread

4:00 p.m. Plenary Session
Welcome to The Johnson Foundation at Wingspread
Lynn E. Broaddus, Director, Environment Programs
The Johnson Foundation at Wingspread
Participant Introductions

4:45 p.m.
Agenda Review, Goals and Groundrules
Molly Mayo, Facilitator, Meridian Institute

4:50 p.m. Opening Presentation
Reframing the Water Infrastructure Issue and Its Financing Dimensions

Betsy Otto, Vice President, Conservation and Strategic Partnerships, American Rivers

Sharlene Leurig, Senior Manager, Insurance Program, Ceres

Kick-off and overview proposed goals and outcomes for our time together. Frame our priority challenges and opportunities.

5:40 p.m. Plenary Discussion
Group discussion of the sustainable infrastructure issue and its financing dimensions.

Outcomes: *refine assumptions and definitions, identify priorities for discussion.*

6:45 p.m. Day 1 Wrap-up
Discussion of priorities for Day 2

6:50 p.m. Hospitality

7:15 p.m. Dinner

8:30 p.m. Evening Hospitality

Day 2: August 17, 2011

Breakfast will be available from 6:30 a.m. to 8:15 a.m. in the Living Room of the Guest House.

8:30 a.m. Plenary Session
Welcome and Agenda Review
Facilitator

8:40 a.m. Reflections on Day 1

8:50 a.m. Presentations
Case Studies on Financing Sustainable Water Infrastructure
What new mechanisms are water systems employing to finance resilient water infrastructure?

- **Financing Stormwater Controls**
  Chris Crockett, Deputy Commissioner, Planning and Environmental Services Division, Philadelphia Water Department and Peter Malik, Director, Center for Market Innovation, NRDC
- **Incentive Ratemaking for Investor-Owned Utilities**
  Matt Diserio, Co-Founder and President of Water Asset Management (possible joint presentation with John Bohn, Former Commissioner, California Public Utilities Commission)
- **Discuss additional innovative case examples**

10:15 a.m. Break

10:30 a.m. Plenary Discussion
Discuss lessons from case studies. Identify small group topics to dig into options for directing capital to "good" infrastructure investments.

Outcomes: *identify priority obstacles and opportunities that we want to explore further. Agree on breakout group topics.*

11:15 a.m. Introduce Breakout Session
Clarify guidance and desired outcomes for breakouts. Break and move to small group discussions.

11:30 a.m.
Small Group discussions to identify obstacles & opportunities

12:30 p.m. **Small Groups break for Luncheon**

1:15 p.m. **Continue Small Group discussions**

2:15 p.m.
Presentations: Reports from Small Groups

3:15 p.m. **Break**

3:30 p.m. **Plenary Discussion**
Open discussion of opportunities identified in breakout groups.

5:30 p.m.
Day 2 Wrap-up and planning for Day 3 Agenda

6:00 p.m. **Leisure**

6:30 p.m.
Hospitality and Tour of Wingspread (optional)

7:00 p.m. **Cookout**

8:30 p.m. **Evening Hospitality**

Day 3: August 18, 2011

Breakfast will be available from 6:30 a.m. to 8:15 a.m. in the Living Room of the Guest House.

8:30 a.m. **Plenary Session**
Welcome, Agenda Review & Reflections on Day 2
Facilitator

9:00 a.m. **Plenary Discussion**
Identify the range of opinions in the group about what is needed to catalyze change. How can the ideas of this group help to inform other efforts? Discuss how to best leverage the ideas and resources of the group to create momentum toward more sustainable infrastructure investments.

10:30 a.m. **Break**

10:45 a.m. **Plenary Discussion**
Who are the key players and partnerships needed for leadership and action?

11:30 a.m. **Plenary Discussion**
Commitments and Next Steps

12:00 p.m. **Wrap-up**

12:30 p.m. **Luncheon**

Attachment D: Meeting Participants

John Bohn
Former Commissioner
California Public Utilities Commission
220 Montgomery St., Penthouse 10
San Francisco, CA 94109
914-671-8475
jbohn@globalnetpartners.com

Gary Breaux
Director of Finance
East Bay Municipal Utility District
375 Eleventh St.
Oakland, CA 94607
925-708-4430
gbreaux@ebmud.com
www.ebmud.com

Chuck Clarke
Chief Executive Officer
Cascade Water Alliance
Suite 440
11400 SE 8th St.
Bellevue, WA 98004
425-453-1555
cclarke@cascadewater.org
www.cascadewater.org

Janet Clements
Senior Economist
Stratus Consulting
1881 Ninth St., Suite 201
Boulder, CO 80521
303-381-8000
jclements@stratusconsulting.com
www.stratusconsulting.com

Helen Cregger
Senior Vice President
Public Finance Investment Banking
Piper Jaffray & Co.
1200 17th St., Suite 1250
Denver, CO 80202
303-820-5856
helen.x.cregger@pjc.com
www.piperjaffray.com

Chris Crockett
Deputy Commissioner
Planning & Environmental Services Division
Philadelphia Water Department
1101 Market St.
Philadelphia, PA 19107
215-520-5058
Chris.Crockett@phila.gov

Martha Davis
Executive Manager for Policy Development
Inland Empire Utilities Agency
6075 Kimball Ave.
Chino, CA 91708
mdavis@ieua.org
www.ieua.org

Disque D. Deane, Jr.
Co-Founder and Chief Investment Officer
Water Asset Management, LLC
509 Madison Ave., Suite 804
New York, NY 10022
212-754-5132
d.deane@waterinv.com
www.waterinv.com

Michael Deane
Executive Director
National Association of Water Companies
Suite 850
2001 L St., NW
Washington, DC 20036
202-669-0641
michael@nawc.com
www.nawc.org

Matthew J. Diserio
Co-Founder and President
Water Asset Management, LLC
Suite 804
509 Madison Ave.
New York, NY 10022
212-754-5132
m.diserio@waterinv.com
www.waterinv.com

Harriet Festing
Director of Natural Resources
Center for Neighborhood Technologies
2125 W. North Ave.
Chicago, IL 60647
773-269-4042
hfesting@cnt.org

Emily Gordon
Senior Associate, State and Local Initiatives
Green For All
Suite 600
1611 Telegraph Ave.
Oakland, CA 94612
510-271-9822
emily@greenforall.org
www.greenforall.org

Ed Harrington
General Manager
San Francisco Public Utilities Commission
1155 Market St., 11th Floor
San Francisco, CA 94103
eharrington@sfwater.org

Patty Healy
First Vice President
Bayern LB
560 Lexington Ave.
New York, NY 10022
917-843-6178
phealy@bayernlbny.com
www.bayernlb.com

Bill Holman
Director of State Policy
Nicholas Institute for Environmental Policy Solutions
Duke University
Box 90335
Durham, NC 27708
bill.holman@duke.edu

Kirsty Jenkinson
Director, Markets and Enterprise Program
World Resources Institute
10 G St., NE
Washington, DC 20002
202-729-7748
kjenkinson@wri.org
www.wri.org

David LaFrance
Executive Director
American Water Works Association
6666 Quincy Ave.
Denver, CO 80235
dlafrance@awwa.org

Peter Malik
Director, Center for Market Innovation
Natural Resources Defense Council
40 W. 20th St.
New York, NY 10011
212-727-2700
pmalik@nrdc.org

Richard Metcalf
Director, Corporate Affairs
Laborers' International Union of North America (LiUNA)
905 16th St., NW
Washington, DC 20006
202-942-2249
rmetcalf@liuna.org
www.liuna.org

Scott Miller
Environmental Sustainability Manager
The Russell Family Foundation
PO Box 2567
Gig Harbor, WA 98335
scott@trff.org

David Rankin
Vice President and Director of Programs
Great Lakes Protection Fund
Suite 880
1560 Sherman Ave.
Evanston, IL 60201
847-425-8196
drankin@glpf.org

Adam Rix
Managing Partner
TurningPoint Capital Partners, LLC
Suite 113
1053 Grand Ave.
St. Paul, MN 55105
651-600-3477
arix@turncappartners.com
www.turncappartners.com

Eric Sandler
Director of Finance/Treasurer
San Diego County Water Authority
4677 Overland Ave.
San Diego, CA 92123
858-522-6671
ESandler@sdcwa.org
www.sdcwa.org

Doug Scott
Managing Director, U.S. Public Finance Group
Fitch Ratings
Suite 2010
111 Congress Ave.
Austin, TX 78701
512-215-3725
douglas.scott@fitchratings.com
www.fitchratings.com

Facilitator

Molly Mayo
Senior Mediator
Meridian Institute
PO Box 773
Talkeetna, AK 99676
907-733-8340
mmayo@merid.org
www.merid.org

Planning Partners

Fay Augustyn
Conservation Associate
American Rivers
Suite 1400
1101 – 14th St. NW
Washington, DC 20005
faugustyn@americanrivers.org

David Gordon
Policy Associate
Nicholas Institute for Environmental Policy Solutions, Duke University
P.O. Box 90335
Durham, NC 27708
973-801-9654
david.r.gordon@duke.edu
www.nicholasinstitute.duke.edu

Sharlene Leurig
Senior Manager, Insurance Program
Ceres
99 Chauncy St.
Boston, MA 02111
617-247-0700
leurig@ceres.org

Betsy Otto
Vice President, Conservation and Strategic Partnerships
American Rivers
Suite 1400
1101 – 14th St., NW
Washington, DC 20005
202-243-7033
botto@americanrivers.org
www.americanrivers.org

The Johnson Foundation at Wingspread

Roger C. Dower
President
The Johnson Foundation at Wingspread
33 E. Four Mile Rd.
Racine, WI 53402
262-681-3331
rdower@johnsonfdn.org
www.johnsonfdn.org

Lynn Broaddus
Director, Environment Programs
The Johnson Foundation at Wingspread
33 E. Four Mile Rd.
Racine, WI 53402
262-681-3344
lbroaddus@johnsonfdn.org
www.johnsonfdn.org

Wendy Butler
Special Initiatives Coordinator
The Johnson Foundation at Wingspread
33 E. Four Mile Rd.
Racine, WI 53402
262-681-3321
wbutler@johnsonfdn.org
www.johnsonfdn.org

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The Johnson Foundation at Wingspread, based in Racine, Wisconsin, is dedicated to serving as a catalyst for change by bringing together leading thinkers and inspiring new solutions on major environmental and regional issues. Over the course of 50 years, The Johnson Foundation at Wingspread has inspired consensus and action on a range of public policy issues. Several organizations have roots at Wingspread, including the National Endowment for the Arts, National Public Radio, the International Criminal Court and the Presidential Climate Action Plan. Building on this legacy, The Johnson Foundation at Wingspread has set a new, strategic mission designed to achieve greater, more sustained impact on critical environmental issues. Launched as part of this new direction is Charting New Waters, an alliance of leading organizations calling for action to avert the looming U.S. freshwater crisis.

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