

*The Johnson Foundation Freshwater Forum
Working Session #5: Examining U.S. Freshwater Systems and
Services: Public Health Threats and Solutions*

*December 15–16, 2009
Racine WI*

Meeting Highlights

Background

The Johnson Foundation Freshwater Forum (Forum) is designed to focus national attention on how the U.S. manages freshwater resources and services. Through a series of in-depth forums, The Johnson Foundation is working to build a platform of broad understanding, collaboration and cooperation around priorities for addressing the challenges that threaten our nation's freshwater resources and the health of our communities. The Forum will bring visibility to the complex issues facing the nation's freshwater resources, illuminate possible solutions and catalyze a wide range of actions that together will result in change.

A cornerstone of the Freshwater Forum will be The Johnson Foundation Freshwater Summit, to be held on June 9, 2010, at the historic Wingspread Conference Center. At the Summit, national leaders will convene to deliberate and highlight the priority goals the U.S. must meet to attain freshwater resilience by 2025. A national call to action on freshwater is expected to be issued at the end of the meeting.

To ensure that the deliberations at the Freshwater Summit are based upon the best possible information and options, The Johnson Foundation is convening a series of working sessions comprised of eminent scientists, policy makers, and practitioners of diverse perspectives. The outcomes of these sessions will inform discussions at the Summit and build the platform for creating a national agenda. The first session, "Impacts of Climate Change on Freshwater Resources and Services," focused on understanding the available science and relevant expertise at the intersection of climate change and freshwater resources. Participants explored what we know and where the gaps are in our understanding of the challenges emerging for freshwater

resources and how climate change does or does not exacerbate them.

The outcomes of the first working session informed The Johnson Foundation's determination of which freshwater issues are particularly urgent and ripe for our nation's leaders to address in the coming years. Working Session #2 focused on water infrastructure and the built environment; Working Session #3 concentrated on the intersection of freshwater with agriculture and food production; and Working Session #4 focused on reducing conflicts at the water-energy interface. The balance of this document provides highlights from Working Session #5, which focused on public health threats and solutions associated with freshwater systems and services.

Working Session #5 Overview

Working Session #5, Public Health Threats and Solutions, focused on illuminating public health implications of U.S. freshwater challenges and identifying solutions to address them. The discussion was specifically focused on achieving the following objectives:

- To better understand the public health implications of the freshwater challenges the U.S. is facing.
- To explore the public health risks associated with the potential solutions being considered to improve the health of our freshwater systems.
- To identify opportunities to address public health challenges linked to our freshwater systems and water services.

The detailed results of Working Session #5 captured in this meeting summary will inform a framework for actionable steps that The Johnson Foundation can carry forward into the Summit. Additionally, this document is intended to serve as a tool for sharing the content and results of the discussions at Working Session #5 with others who did not have the opportunity to participate in this gathering and for moving the national dialogue forward on these critical issues. The results are organized into following sections:

- Summary of Meeting Outcomes
- Freshwater and Public Health Challenges, Trends and Opportunities
- Potential Solutions to Freshwater-Public Health Challenges
- Conclusions

The meeting program and list of participants are included in Attachments A and B, respectively.

Summary of Meeting Outcomes

There are myriad public health challenges associated with water quality and water availability in the United States. Freshwater-public health challenges vary greatly in terms of what sphere of public health they affect, their acuteness and the approaches for addressing them. Among the challenges discussed by the group, was the need to develop better tools to assess and measure water-related human health impacts relative to other variables affecting human health, as well as development of better tools to protect human health such as improving capacity to analyze the effectiveness of new water treatment technologies. Another challenge is that current public health protection efforts are based on a contaminant-by-contaminant approach without consideration for the compounding effects of multiple contaminants or the holistic view of what is important for human health. For example, ecosystem services provided by freshwater add value for human health and should be accounted for in discussions about public health and water.

To catalyze change, it is critical to keep the public at the center of the dialogue about water and public health. Improved public education about the connections between water and public health is needed including ways in which water can make people sick and how clean and abundant freshwater supports good health. Education is critical to addressing freshwater-public health challenges currently facing the nation because if the public is not concerned about risks or rewards related to water quality or quantity, there will be no political will to address them.

In addition to listing challenges, the group envisioned characteristics of a resilient freshwater-public health system to which the U.S. should strive in coming decades. A resilient freshwater-public health system will:

- Support clean surface water and groundwater;
- Provide clean water to meet basic human needs;
- Prevent human illness and promote wellness simultaneously, recognizing the broad conception of public health as more than the absence of disease;
- Limit indirect adverse health effects;
- Be comprised of actors that understand the linkages between water systems and public health;
- Be informed by a robust water quality and quantity monitoring system;
- Create and enforce regulations that account for health protection of vulnerable human populations (e.g., children, the elderly and infirm);
- Support the ability of indigenous communities and vulnerable populations to practice subsistence lifestyles;
- Support the mental well-being of individuals and social systems; and
- Anticipate and prevent perturbations, and possess the flexibility to absorb and adapt to them.

The majority of the work session focused on generating ideas about potential solutions to the many freshwater-public health challenges in the U.S. Building on the commonly held view that

the dialogue about water and public health should be expanded beyond contaminant-by-contaminant or “illness-centric” conceptions, discussion of potential solutions was structured based on whether issues and solutions were related to social health, physical health, or mental health challenges. This approach was informed by the World Health Organization’s (WHO) long-standing definition of health as being "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."¹ Within each sphere of public health, participants considered the following dimensions of potential solutions:

- Drivers of challenges;
- Key stakeholders and roles;
- Necessary actions at difference scales;
- Barriers to solutions (regulatory or otherwise);
- Potential to address multiple problems;
- Success stories to scale up; and
- Messages to communicate to the public.

Freshwater and Public Health Challenges, Trends and Opportunities

Audrey Levine, National Program Director of the U.S. EPA Drinking Water Research Program, presented an overview of key freshwater availability and quality challenges in the U.S. and associated public health risks, as well as the existing regulatory and policy tools for addressing them. This section summarizes key points from her presentation and the subsequent plenary discussion about freshwater-public health challenges the nation faces.

Challenges

Dr. Levine began her presentation by outlining broad water resource management challenges confronting the U.S. water supply. She emphasized the need for better integration of sustainability measures to account for the fact that water is a finite and increasingly stressed resource. Water quality challenges in particular have the potential to cause adverse impacts on public health, namely from exposure to contaminants from a range of sources. The quality of freshwater supplies is threatened by urban, agricultural and industrial practices including but not limited to, inadequate or inappropriate stormwater management, water reclamation and reuse, and groundwater pumping and recharge practices. Water quality is also threatened by climate-induced stressors such as changes in temperature and salinity, and microbial ecology adaptations to changing water characteristics. Outdated and inadequate water infrastructure still leads to large-scale water quality problems from combined sewer overflows in many U.S. cities, and leaks can cause cross-contamination between drinking water pipes and sanitary sewers. Though generally considered less of a public health risk than water quality problems, inadequate water supply is an emerging public health concern in many parts of the country. Water availability stressors that can compromise the reliability of supply include competing

¹ <http://www.who.int/about/definition/en/print.html>

demands for water use (municipal, commercial and residential), geographic and seasonal variability, and infrastructure limitations such as insufficient storage capacity.

Dr. Levine went over key challenges specific to the adequacy of existing tools and paradigms for evaluating and managing water-associated health risks. For example, traditional approaches to toxicity testing are based on well-defined exposures and pathways, specific endpoints and single-chemical or pathogen dose response. However, humans are most likely being exposed to harmful compounds in more complex ways than the current chemical-by-chemical or pathogen-by-pathogen approach can detect. On the management side, the nation needs more robust water quality monitoring, modeling and mapping systems as well as continued improvement of treatment technologies, and increased compliance with, and enforcement of, existing policies and regulatory tools (e.g. Clean Water Act, Safe Drinking Water Act). In conclusion, Dr. Levine argued that the U.S. needs to establish a more holistic view of freshwater and public health that integrates water availability, environmentally-relevant exposures, and social science research. Such a holistic approach is needed to ensure that proper safeguards and metrics are in place to protect public health and ecosystems.

Building on Dr. Levine's presentation, the group re-emphasized some points and identified a number of additional freshwater-public health challenges the U.S. needs to address, including:

- Developing better indicators and metrics to measure public health that go beyond conventional risk assessment associated with contaminants, including methods for measuring:
 - Progress toward human health goals;
 - Downstream human and ecosystem health impacts caused by upstream activities;
 - Impacts of water on the health of communities in a broad sense; and
 - The effectiveness of new treatment technologies.
- Establishing a robust monitoring system for tracking the incidence of waterborne diseases.
- Assigning public health value to the ecosystem services water provides such as water purification, aesthetics and recreation.
- Reforming an inadequate and fragmented regulatory system, including adjustments to protect vulnerable and/or sensitive populations.
- Distinguishing water-based contaminant or toxin exposures from other exposure pathways, and incorporating new knowledge into regulatory frameworks.
- Reducing regulatory uncertainty so that water utilities have the confidence to pursue innovative long-term water projects.
- Catalyzing cultural change among water utilities away from fear of failure and toward innovation, through new mechanisms and incentives that encourage research and development and demonstration projects for new wastewater management and treatment methods.
- Reorienting research funding so that it is driven by public health concerns and outcomes rather than existing regulations.

- Developing effective communication tools to raise awareness and improve basic understanding of freshwater-public health connections and terminology among decision makers, policy makers, health professionals and the public.
- Identifying or establishing a readily accessible and unbiased brain trust on freshwater issues to which decision makers can turn for good information.

In addition to enumerating a range of challenges, the group identified emerging freshwater-public health trends to be aware of, as well as high-level opportunities or strategies to address freshwater and public health issues.

Trends

- Increasing recognition of the need to integrate understanding of all water-related systems to truly understand their impacts on public health.
- Movement toward the measurement of health outcomes (e.g., cases of illness, burden of disease) rather than process or intermediate surrogate measures;
- Tendency for the public health community and policy makers to become hyper-focused on the “contaminant of the day”;
- Deteriorating water infrastructure leading to water supply contamination;
- Pharmaceuticals in drinking water associated with public health risks;
- Increased hydrologic cycle extremes (e.g., intense rainfall, severe drought) and water scarcity due to climate change, which is likely to lead to heated debates over the cost of drinking water, drinking water boundaries and privatization.

Opportunities

- Link freshwater-public health issues to other prominent public policy issues to gain public and decision maker attention (e.g., health care, economy, and climate change).
- Utilize social networking technology for public education and building political will to address freshwater-public health issues.
- Highlight examples of real human health impacts of freshwater problems to raise public awareness and build political will to address them.
- Establish demonstration projects to facilitate public understanding of new approaches and technologies as well as broad-scale implementation.
- Expand conceptions of public health to include wellness, and tie in the role of freshwater.
- Stimulate public dialogue about the true value of water.
- Develop methods to extract and separate contents of wastewater from sewer system for beneficial uses (ex. nutrients for local agriculture).
- Develop better monitoring technologies and build out monitoring infrastructure.
- Reduce “wasted” water by implementing re-use and recycling in innovative ways.

Potential Solutions to Freshwater-Public Health Challenges

Finding and implementing solutions to public health threats associated with freshwater systems and services is critical because water is essential to human life and should be a positive, not detrimental, driving force for a healthy U.S. society. While freshwater challenges are greater in some parts of the U.S. than others, overall the country is facing many current and impending freshwater-public health challenges. Decision makers and the public must be made aware of the potentially severe human, ecosystem and economic consequences of inaction. Fundamentally, there needs to be a more widespread sense of urgency to act quickly and a louder collective voice calling for change.

Following on the WHO definition of health, the potential solutions identified during the work session are organized according to the following dimensions of public health to illustrate the diverse implications of freshwater quantity and quality problems for human health:

- Social health;
- Physical health; and
- Mental health.

While these categories were utilized for organizational purposes, the group recognized that human social, physical and mental health, are highly interrelated. The specific freshwater-related social, physical and mental health challenges and associated potential solutions described below represent priority issues raised and discussed during the work session breakout groups. They reflect several key areas on which the U.S. should consider focusing problem-solving attention, but are not intended to be comprehensive or exhaustive.

Social Health – Dwindling surface and groundwater supplies is a current and growing problem throughout the U.S., with many people and communities dealing with water-related stress on a daily basis. Such stress could eventually lead to broader social unrest such as water supply conflicts and mass migration in more extreme cases. Water scarcity is largely the result of extreme withdrawal rates from surface reservoirs and underground aquifers, as well as inefficient use of water in most sectors of society. Nationwide action including technology development, policy making and public education and dialogue, is needed on multiple fronts to reverse damaging water use trends and mitigate future social health impacts of water scarcity.

Water conservation and use efficiency should be promoted as critical priority strategies for mitigating the social health impacts of water scarcity. New water efficiency technologies being developed for the industrial and residential sectors, such as smart water meters, should be highlighted through demonstration projects. In addition, the research and development process could incorporate assessment of public health, environmental and social justice impacts of new technologies, similar to an environmental impact statement. Technologies found to be truly effective in terms of cost, water savings and public health outcomes should then be promoted through incentives for implementation.

Access to a sufficient supply of clean freshwater is a cross-cutting public health issue that affects all dimensions of the health of communities – physical (biological), social (cultural and economic), and mental. Facilitating equitable access to water, including for low-income or remote communities, should be considered a priority in all parts of the nation. Communities and utilities should explore policies and mechanisms to limit instances in which water supply is cut-off. Utilities should seek models for how to structure rates such that low-income communities are able to afford a sufficient water supply. For example, it may be possible to apply models such as the Low Income Home Energy Assistance Program (LIHEAP) to help vulnerable individuals and families gain access to water. A holistic approach combining community-based policies and state and/or federal subsidies may be a workable solution to ensure equitable access to freshwater.

Fostering public dialogue about the implications of water scarcity for public health could help build public understanding and trust of information coming from recognized and credible sources. For example, if constituents understand why certain conditions demand extreme measures such as water rationing and associated enforcement, utilities and public officials will be better positioned to do what is necessary to protect social health. Key messages that could help catalyze public dialogue on the issue of water scarcity and social health include:

- Water scarcity is a real and current problem in communities across the U.S.;
- Freshwater impacts all segments of society and all segments of society impact water;
- Human health and ecosystem health depend on an adequate water supply;
- Water scarcity degrades overall water quality, which in turn effects public health; and
- The security and resilience of the nation’s freshwater supply is a national security issue.

Physical Health – Contamination of water supplies and waterborne disease are widely recognized threats to public health. However, the links between freshwater supplies and public health risks are not as well understood as they need to be among water and public health experts or the general public.

Public health researchers and officials needs better risk assessment tools to more fully understand the public health effects of both acute and chronic exposure to contaminated water. A greater amount of research is required throughout the public health sector to improve understanding freshwater impacts on the physical health of humans and ecosystems. Such knowledge should be considered a national security issue and be funded commensurately. For example, funding is needed for epidemiological research on water-related community and population level vectors and effects. Funding should also be devoted to improving innovative monitoring systems that support epidemiological research, as well as development of methods and tools for detection, measurement and quantification of public health threats and outcomes.

A wide-spread water-related threat to physical health is the fact that human fecal matter still gets into the U.S. water supply through leaking sewers, illicit discharges and combined sewer overflows. It will take more than small fixes to existing infrastructure to remedy this long-

standing problem. Potential solutions include rebuilding the nation's infrastructure in a sustainable manner geared toward public health protection, using a combination of centralized and decentralized water distribution and treatment systems. A range of engineering and management innovations aimed at completely removing food and fecal matter from sewers are under development, though these technologies will not be widely available in the near-term. Another important systemic change would be to stop using treated or potable water for transporting waste, including biological waste. It is also possible to capture and use energy generated from sanitary waste, which would make these innovations more sustainable over time².

Pharmaceuticals and endocrine disrupting chemicals in the drinking water supply are emerging threats to physical health that need to be addressed. A multi-pronged solution strategy is probably needed to address these issues. Utilities and public agencies need to be more forthcoming about the challenges and needs related to these issues. More extensive research is needed to better understand endocrine disrupting chemicals, and engineering solutions are needed to eliminate them from water supplies. A credible spokesperson will also be necessary to affect cultural and behavioral change related to the use and disposal of pharmaceuticals, among both everyday citizens and farmers who utilize pharmaceuticals to keep livestock healthy. A key message is that the link between water quality and health is definitive so we must be vigilant about understanding, detecting and monitoring new and emerging contaminants, while recognizing there will always be new ones ahead. Wellness should also be promoted in an effort to reduce dependence on pharmaceuticals.

Mental Health – Human psychological well being requires a healthy environment and the ability to meet one's basic human needs and pursue one's interests. Stress is a primary contributor to mental illness. Having a sense of confidence about and control over one's environment and ability to meet essential needs is an important foundation for humans' ability to regulate stress. When people are not able to access an adequate amount of freshwater for drinking, cooking, bathing and/or recreating, they often suffer mental distress. People also need to trust that the water they are able to access is clean and will not harm them. As with the other dimensions of public health, promotion of mental health related to water issues requires effective communication of good information from credible sources. The importance to our collective mental health of having access to adequate safe drinking water from household taps as well as freshwater in the natural environment must be conveyed in more effective manner.

Conclusions

Throughout Working Session #5, public education, communications and messaging were emphasized as critical pieces of the solution to many of the nation's freshwater-public health challenges. The existing lack of transparency, credible information and sense of urgency about water-related public health issues are impediments to raising awareness and catalyzing broad

² Water Environment Research Federation, March 2009. "Energy Opportunities in Wastewater and Biosolids"

change. A significant part of the problem is that leaders in different sectors do not recognize the breadth and severity of the water quality problems we are facing today in the U.S. To many leaders, crumbling infrastructure and associated water quality issues are still perceived as a serious public health risk primarily in developing countries. Unfortunately, that perception does not align with the reality of the looming freshwater crisis in the U.S.

A nationwide public education and dialogue campaign about the existing and potential public health impacts of freshwater quantity and quality problems may be the most promising near-term strategy to overcome these impediments and motivate decision makers in all sectors to take action. Such a campaign could focus on what actions are needed on freshwater issues to protect health, prevent disease and promote wellness. A successful campaign would require an education and communication network comprised of partners operating in all sectors and scales of society. To design and deliver such a campaign, the public health sector would have to build capacity from within on water issues (e.g., health threats and risks, regulations, technological and policy solutions) so that challenges and proposed solutions are articulated in an understandable, consistent and credible manner to citizens. Water industry players and other stakeholders that have influence over policy making and emergency management would also need to contribute to information sharing and education.

The campaign would need to design messages and package information for a range of different target audiences. Message development should be informed by social-psychological research about how behavior is influenced and changed, as well as other successful public messaging campaigns such as those discouraging smoking or promoting recycling. A powerful hook that links freshwater and public health to things that are relevant and motivational to the U.S. public would also be crucial. Community values, national security, health care costs, economic well being and/or social justice are potential hooks to consider. Information sources for the campaign would need to be well-known and highly credible, and the messengers trusted figures in U.S. society. Examples of strong messenger candidates include nurses, doctors, school teachers and children speaking to their parents. Finally, while the campaign and the messages that comprise it would need to convey a serious tone and sense of urgency, the message must not polarize the American public.

During the working session, one of the breakout groups developed a sample national call to action to illustrate the urgency with which the U.S. ought to be addressing water infrastructure problems adversely impacting public health. This type of statement could serve as the catalyst for a national education and dialogue campaign. Though very basic and only representing the work of a small number of participants at this particular meeting, this is the type of message The Johnson Foundation anticipates will emerge from the Freshwater Summit in June 2010. The breakout group suggested the following language:

- *We call on our nation's leaders to use the opportunity presented by climate change mitigation and adaptation to protect and improve the public's physical, social and mental well being through redesigning and rebuilding our nation's water quantity and quality systems. National initiatives should focus on upgrading and improving the following system elements:*

- *Water infrastructure;*
 - *Monitoring;*
 - *Regulation;*
 - *Research;*
 - *Public education and information sharing; and*
 - *Incentives for water management institutions to innovate.*
- *Recommended short-term actions include the following:*
- *On research – recognizing that the existing amount and subject areas of water research are inadequate, convene a diverse set of experts representing all dimensions and scales of freshwater and public health issues to jointly create a prioritized list of research needs;*
 - *On regulation – establish a National Office of Water to integrate the interests and efforts of all of the disparate agencies and actors dealing with freshwater and public health issues, and ensure the office’s engagement in climate change policy negotiations; and*
 - *On public education and information sharing – re-energize public education efforts focused on freshwater and public health.*

Ultimately, The Johnson Foundation Freshwater Forum and Summit aims to generate a sense of urgency about U.S. freshwater issues and catalyze action on a national scale. This working session outlined the range of freshwater-public health challenges the U.S. faces, as well as several potential solutions for addressing them. To ensure the resilience of our freshwater systems vis à vis public health, actors at all scales must work to raise awareness and catalyze change throughout society through their activities and messaging. To truly motivate social change, any initiative must involve contributions from all relevant stakeholders, and actions must be coordinated across scales and executed with an incremental adaptive management approach to allow for adjustments and enhanced effectiveness over time.

The Johnson Foundation Environmental Forum

Working Session #5: Examining U.S. Freshwater Systems and Services: Public Health Threats and Solutions

December 15-16, 2009

Racine, WI

Objectives:

- To better understand the public health implications of the freshwater challenges the U.S. is facing.
- To explore the public health risks associated with the potential solutions being considered to improve the health of our freshwater systems.
- To identify opportunities to address public health challenges linked to our freshwater systems and water services.

Outcomes:

- Working definition of freshwater resiliency with respect to public health;
- Recommendations for a national agenda to address the most urgent threats and promising solutions to water-related public health risks;
- Methods of effectively communicating the link between freshwater challenges and public health to key audiences;
- Topics to consider for future work sessions; and
- Topics to consider for the 2010 Johnson Foundation Environmental Summit.

“Civilized people should be able to dispose of sewage in a better way than by putting it in the drinking water”
-Theodore Roosevelt, 1910

Unless a request is made to the contrary, presentations and discussions in the sessions will be recorded.

Tuesday, December 15, 2009

11:30 – 1:30 p.m.

Buffet Luncheon
Guests should feel free to tour the grounds

Guest House

1:45 p.m.	<u>Gathering and Orientation to Accommodations</u> Lynn E. Broaddus, Director, Environmental Programs The Johnson Foundation at Wingspread	Guest House
2:00 p.m.	Plenary Session <u>Welcome to The Johnson Foundation at Wingspread</u> Lynn E. Broaddus, Director, Environment Programs Roger C. Dower, President The Johnson Foundation at Wingspread	The House
2:10 p.m.	<u>Conference Goals, Agenda Review and Introductions</u> Molly Mayo, Facilitator Meridian Institute	
2:30 p.m.	<u>Introductory Presentations</u> Overview presentations of the priorities that define the challenges at the nexus of freshwater and public health. Presenters: <ul style="list-style-type: none"> • Audrey D. Levine, USEPA • Lynn Broaddus, The Johnson Foundation at Wingspread, summary of cross-cutting public health issues raised at previous work sessions. 	
3:30 p.m.	Break	
3:45 p.m.	<u>Plenary Discussion: Freshwater Resilience and Public Health</u> Facilitated discussion of the public health implications of the freshwater challenges the U.S. is facing. Participants will be asked to frame the priority public health challenges linked to our freshwater systems and services and prioritize for discussion. Outcome: Identification of the priority challenges and a framework for discussion of potential solutions.	
5:30 p.m.	<u>Day 1 Wrap-up</u> Brief highlights of Day 1 and discussion of priority topics for Day 2.	
6:00 p.m.	Adjourn Day 1	
6:30 p.m.	Hospitality/Tour of Wingspread	Wingspread
7:00 p.m.	Dinner	Wingspread
8:30 p.m.	Hospitality	Guest House

Wednesday, December 16, 2009

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

The agenda for Day 2 will be refined based on the results of Day 1.

8:30 a.m.	Plenary Session	The House
8:45 a.m.	<p><u>Welcome and Agenda Review</u> Molly Mayo, Meridian Institute</p> <p><u>Plenary Discussion: Synthesis of Top Priorities Identified During Day One</u> Using the ideas generated from the Day 1 plenary discussion as background, the group will discuss in more detail the priority public health challenges associated with water and some of the more complex issues.</p> <ul style="list-style-type: none"> • What are the drivers of increasingly complex public health challenges linked to our water systems? • How does overall ecosystem health link to public health challenges? <p><i>Outcome:</i> List of priority challenges</p>	
10:15 a.m.	Break	
10:30 a.m.	<p><u>Breakout Sessions: Opportunities and Solutions, Gaps and Needs</u></p> <p>Participants will break into small groups to identify opportunities and options to address challenges identified in the plenary sessions. How can freshwater systems be better managed as tools for securing and maintaining public health, especially in light of a changing climate and changing energy markets?</p> <p>Breakout discussions will focus on the following dimensions:</p> <ul style="list-style-type: none"> ○ Most promising or highest priority solution options ○ Key challenges to developing or scaling up priority options ○ Strategies to overcome key challenges ○ Low-hanging fruit or steps that can provide solutions to multiple problems ○ Gaps in our understanding ○ Needs to fill gaps 	The House
12:00 noon	Luncheon	Wingspread
12:45 p.m.	<p><u>Plenary Discussion: Solutions</u></p> <p>Reports from breakout sessions and facilitated group discussion of the opportunities to address public health problems associated with water.</p> <ul style="list-style-type: none"> • How can freshwater systems be better managed as tools for securing and maintaining public health, especially in light of a changing climate and changing energy markets? • What are the most promising solutions to the public health issues we are currently facing relative to water systems and services and is there an opportunity to adopt them more broadly? • How can the compounding effects of energy, carbon and other secondary impacts be considered in solutions? • How can The Johnson Foundation Environmental Forum or other mechanisms be best used to advance solutions? <p><i>Outcome:</i> Identification of policy opportunities, private sector and NGO initiatives and messaging for public awareness.</p>	The House

2:30 p.m.

Next Steps and Final Round of Comments

3:00 p.m.

Work session adjourns

Attachment B: List of Participants

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