



**Statement of Professor Upton Hatch
President-elect, National Institutes for Water Resources
to a hearing of
The Committee on Science and Technology, U.S. House of Representatives
Wednesday, July 23, 2008**

Mr. Chairman and Representative Inglis,

My name is Upton Hatch. I am the Interim Director of the North Carolina Water Resources Research Institute (NC WRRI), located at North Carolina State University. In addition, I am president-elect of the National Institutes for Water Resources (NIWR).

I appreciate this opportunity to participate in this hearing on proposed legislation, "National Water Research and Development Act," today by video conference. I am unable to provide this testimony in person because we are co-sponsors of the annual meeting of the Universities Council on Water Resources (UCOWR) today here in Durham, NC.

My academic degrees are from Dartmouth College (B.A.), University of Georgia (M.S.), and University of Minnesota (Ph.D.), all in economics, particularly resource economics with a specialty in water resource economics. I am currently involved in research on the effectiveness of water conservation measures, particularly drinking water, and have established water conservation as a major focus of NC WRRI's program.

I am testifying today on behalf of the National Institutes for Water Resources (NIWR), an organization composed of the fifty-four state water resources research institutes established under legislation enacted by Congress. The Water Resources Research Act of 1964 (42 USC Sec. 10301 et seq.) authorized the establishment of water resources research and technology institutes at land-grant universities throughout the Nation. There are institutes or centers in each of the 50 states, plus four territories.

In authorizing the water institutes, Congress intended that they:

- arrange for competent research that addresses water problems or expands understanding of water and water-related phenomena;
- aid the entry of new research scientists into water resource fields;
- train future water scientists and engineers; and
- distribute the results of sponsored research to water managers and the public.

Congress reauthorized the Act in 2006 in Public Law 109-471.

While the state WRRIs receive core funding through and partner with the U.S. Geological Survey (USGS), they also collaborate and undertake research with a diverse set of federal agencies, e.g., Environmental Protection Agency, Agriculture Department, Forest Service, Army Corps of Engineers, NASA, and the Energy Department.

Copies of the 2008 Executive Summary of the activities institutes established under provisions of the Water Resources Research Act has been provided to the Subcommittee with my prepared statement.

I understand this hearing is to develop legislation to better coordinate the federal government's role in "designing and implementing federal water research, development, demonstration, education, and technology transfer activities to address changes in water use, supply, and demand in the United States."

As you know, the National Science and Technology Council issued a report in September 2007 entitled "A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States." The interagency report was prepared by the Subcommittee on Water Availability and Quality (SWAQ). We strongly support the findings of this report.

In 2001 and 2004, two seminal National Research Council (NRC) reports ("Envisioning the Agenda for Water Resources Research in the Twenty-First Century" and "Confronting the Nation's Water Problems: The Role of Research") thoroughly examined the urgency and complexity of water resources issues facing the US. Among others, the following water resources challenges were cited as motivation for these studies:

- There is abundant evidence that the condition of water resources in many parts of the US and the world is deteriorating;
- Our institutions appear to have limited capacity to manage water-based habitats to maintain and improve species diversity and provide ecosystem services while concurrently supplying human needs;
- In some regions of the country, the availability of sufficient water to service growing domestic uses is in doubt, as is the future sufficiency of water to support agriculture in an increasingly competitive and globalizing agricultural economy;
- Demands for water resources to support population and economic growth continue to increase, although water supplies to support this growth are fixed and already fully allocated in most areas;
- Renewal and repair of the aging water supply infrastructure will require time and hundreds of billions of dollars;
- Frequency and magnitude of damages attributable to droughts and floods are increasing, providing evidence of increasing vulnerability to extreme climate and weather events;
- Threat of waterborne disease is constantly present, as exemplified by recent outbreaks of cryptosporidium.

This NRC report highlighted the Nation's need "to make a new commitment to research on water resources in order to confront the increasingly severe water problems faced by all parts of the country" and that "a new mechanism is needed to coordinate water research currently fragmented among nearly 20 federal agencies."

There are many critical areas where knowledge and information need improvement for better water resources management. The cited NRC reports developed a comprehensive list of 43 areas needing further scientific inquiry. Selected (unranked) examples are:

- Improve existing supply enhancing technologies such as wastewater treatment, desalinization, and groundwater banking;
- Understand the impact of land use changes and best management practices on pollutant loading to waters, ecosystem services, and biodiversity;
- Understand regional and national hydrologic measurement needs and develop a program that will provide these measurements;
- Understand and predict the frequency and cause of severe weather (floods and droughts);
- Understand global change and the associated hydrologic impacts;
- In all sectors develop more efficient water use strategies and optimize the economic return for the water used;
- Develop legal regimes that promote groundwater management and conjunctive use of surface water and groundwater;
- Develop adaptive management as a better approach to water resources management;
- Understand the role of the private sector in achieving efficient water and wastewater services; and
- Develop different processes for obtaining stakeholder input in forming water policies and plans.

These areas are examples of the need to improve our current understanding on the interdependence of water quantity and quality; the balance between human and ecological water uses; and the legal, institutional, and social factors that contribute to sustainable water resources management.

Why should the Federal government lay the funding cornerstone for water research? In the first place, water resources are defined by physical geography and not by state boundaries. The vast majority of water problems are of regional or national character. Even those of limited scope are usually very similar between states. Hence, research funding at the Federal level, with results transferred nationwide, is the only truly comprehensive and efficient approach. In the second place, water research epitomizes the economic concept of a *public good*. As such, state and local governments and private entities will not produce as much of it as is justified by the overall value of the results.

My own state of North Carolina, Mr. Chairman, is presently in the second year of an unprecedented drought, rapidly depleting our water supplies, halting our economy, threatening the sustainability of aquatic ecosystems, and increasing tensions among water users in our state and across the borders with South Carolina and Virginia. While

droughts are the result of a natural climate cycle, drought stresses and impacts reach a new height with every new drought as urban, industrial, and agricultural water demands rise steadily. North Carolina, as well as most US regions, is not well prepared to effectively manage these unprecedented water stresses. The main reasons for the lack of preparedness are symptomatic across the US and include:

- Lack of comprehensive knowledge and information on the interdependencies of natural processes and water uses;
- Narrow perspective on the part of water user groups acting to protect their short term interests with total disregard of long term risks; Lack of a shared and system-wide management vision and strategy;
- Lack of federal and state agency coordination and cooperation; Inflexible legal and institutional bureaucracies;
- Insufficient federal and state research investments for the development and implementation of innovative, adaptive, and integrated management technologies, systems, and processes; and
- Weakening of water resources research and education programs which are naturally suited to integrate knowledge across disciplines and create human resources qualified to develop sustainable solutions for our complex water resources challenges.

I would like to briefly comment on each of these areas.

Knowledge and information: There are many critical areas where knowledge and information need improvement for better water resources management. The above cited NRC reports developed a comprehensive list of 43 areas (listed above) needing further scientific inquiry. These areas exemplify the need to improve our current understanding on the interdependence of water quantity and quality; the balance between human and ecological water uses; and the legal, institutional, and social factors that contribute to sustainable water resources management.

While there is a lot to learn, a lot is already known and can significantly benefit water resources planning and management. However, making this knowledge and information meaningful for and accessible to those involved in decision making processes has proved to be another very serious challenge. Paradoxically, in spite of our information age, water resources policy makers, managers, and stakeholder groups are becoming ever more removed from current scientific and technological advances. There is thus a compelling need to establish and invest in effective information and technology transfer mechanisms.

Local vs. system-wide perspectives: Water stresses are often compounded by the efforts of individual stakeholders acting to safeguard their own local interests without regard for the long term risks of such actions. A local and short term perspective by each water user group sharing the resource cannot be sustainable and only serves to hasten the depletion of water reserves and the onset of disastrous impacts for *all*. The same “tragedy of the commons” scenario is likely to occur when water uses and impacts are planned and managed individually, without regard for their multiple temporal and spatial linkages. It

is thus imperative that the proposed Initiative take a holistic perspective in the development of a comprehensive national water strategy.

Federal and state agency coordination and cooperation: Water resources management falls within the mandates of several federal agencies including EPA, NASA, and NSF and various Departments such as Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, and Interior. Further complicating water management, monitoring and oversight responsibilities are found within different groups of these departments, for example, ARS, NOAA, CORPS, USGS, ATSDR, NIEHS, and USBR. In reviewing the existing federal coordination mechanisms, the 2004 NRC report concluded that “coordination among agencies has occurred only sporadically over the last several decades, despite repeated calls for more coordination.” As a result, the national water resources agenda among the federal agencies is fragmented and has a disciplinary rather than a broad and holistic scope. Furthermore, although the States adjudicate, administer, and regulate water rights and uses, federal and state agencies must work together to ensure harmonization of and compliance with federal and state laws in the management of transboundary water resources. However, the existing coordination and cooperation mechanisms, if any, have been ineffective, and more often than not turn water conflicts and disputes into costly litigious battles.

Lack of investments in integrated and adaptive management: A striking finding of the 2004 NRC report was that over the last 30 years total funding in the areas of (1) water supply augmentation and conservation, (2) water quality management and protection, (3) water resources planning and institutional issues, and (4) water resources data collection have severely declined. As a result, long-term basic research and technology transfer in integrated and adaptive water resources planning and management have been neglected, and the majority of our water resources are managed by reactive, disciplinary, and inefficient methods and procedures. The main impediments in the use of modern management methods are: (1) inflexible bureaucracies that have evolved around the use of old management procedures and (2) inadequate training of agency personnel. Thus, a promising and largely unexplored strategy to address water scarcity is the modernization of the current management procedures through recent but proven scientific advances, transferred to professional practice through education and training.

Water resources research and educational programs: The other casualty of declining funding has been the weakening of our water resources research and educational programs. At a time when universities increasingly depend on “soft” funding, faculty positions and student support have migrated to other higher priority areas. In sharp contrast to the 60’s, 70’s, and early 80’s, very few academic programs can now claim significant expertise in water resources. This is not to imply that academic programs are shrinking. On the contrary, they are expanding, as they should, to cover much finer and very exciting frontiers of geophysical, environmental, and life sciences. In doing so, however, universities have lost their commitment to interdisciplinary education and are becoming over-specialized. An important role that water resources programs can play is to provide a scientific and policy framework for inter-disciplinary research, education, and technology transfer. Such a framework is necessary to create broadly educated

scientists, engineers and policy makers able to invent technological and institutional solutions for the nation's water resources and environmental challenges.

In this regard, the WRRRI provides a unique network to address the challenges of interdisciplinary research, education, and technology transfer. However, the institutes cannot fully realize their potential at the current low rate of federal and state investment. I hope that the Initiative proposed here will also address the need for sustainable and sufficient funding needed to reverse the continued weakening of our water resources programs.

The NRC report also notes the need for a systems approach to water resources research, to avoid the "myopia" of limited jurisdictions or agency missions. Universities have a unique ability and range of disciplinary expertise necessary to take the broad view of water issues and to probe their resolutions. Universities, and WRRRI in particular, are uniquely situated to facilitate information exchange between state and local government agencies, non-governmental organizations and the private sector, and whatever federal body might be designated to coordinate federally-sponsored research.

As the NRC report notes, "The Water Resources Research Institute system...provides an existing, well-organized mechanism for articulating state-based research needs and for bringing together water managers, stakeholders across a wide cross section of the public, and academic researchers and academic institutions throughout each state." As such, "...the institute system can provide an effective means of communication between, for example, a national-level research coordinating body and the state and regional water resources agencies." In addition to state and local agencies and non-governmental organizations, the institutes already have close ties to state-based offices of federal government agencies.

WRRRI welcomes the opportunity to work with this Committee and with this subcommittee to address water resource issues. WRRRI is uniquely positioned to assist in the proposed Initiative because:

- WRRRI program is *not limited by a policy-driven or regulatory mission* and thus can address the entire spectrum of water resources issues, including gaps between government agencies. By focusing on science, the program serves as an **objective broker** of information among a wide range of constituencies.
- University-based institutes are conducive to examining **long-term consequences** of policies and recognizing long-term problems, with access to expertise in *all water-related disciplines*.
- The WRRRI program can be more **flexible** in addressing emerging problems and more **adaptable** to local cultures, institutions of governance, and regional socio-economic and physical conditions.
- Institutes and academic researchers are more likely than mission-driven agencies to consider **institutional, in addition to technical, solutions**.
- NIWR is an **established network** of immense and geographically diverse capabilities on the cutting edge of virtually every facet of water resources. The network facilitates **regional** as well as state and local cooperation.

- The Institutes provide hands-on **educational opportunities** to develop the **highly trained workforce** necessary to build our national capacity for sustainable water resource management.
- **Technology transfer** programs at each Institute provide scientifically credible communication of research needs and results **upward** from the states and localities to federal agencies and **downward** from these agencies to users of research results.
- Institutes are **experienced in assessing priorities** for research, having established Technical Advisory Committees with representatives from virtually all interested agencies and non-governmental organizations.
- WRRRI Program provides information to increase the **efficiency** of federal water resources research investment by identifying research gaps and avoiding redundancies.
- WRRRI Program provides funding to fill research gaps to improve the **effectiveness** of water resources management.
- WRRRI Program includes a **quality-review process** (similar to GPRA requirements) with mandated reviews every three years. Institutes are held accountable for expenditures as well as for the quality and relevance of scientific results and the vigor of outreach programs.

Mr. Chairman, thank you for this opportunity to participate in today's hearing. I applaud and encourage efforts by our Federal and state elected leadership to develop new policies and programs to meet the water challenges we face in the Twenty-first Century. I know I speak for my fellow directors of the state water resources research institutes when I say we are anxious to work with you and other stakeholders to address the water challenges we face in the future through research, education and training, and information transfer and exchange.