



**Testimony of Dr. Brian E. Haggard
Director, Arkansas Water Resources Center
On behalf of the National Institutes for Water Resources to the
Committee on Appropriations, Subcommittee on Interior, Environment
and Related Agencies, April 10, 2014**

Chairman Calvert and Ranking Member Moran:

I am Brian Haggard, Director of the Arkansas Water Resources Center at the University of Arkansas. Thank you for this opportunity to testify on behalf of National Institutes for Water Resources (NIWR), in support of the Water Resources Research Act program. The program is funded as part of the U.S. Geological Survey's budget. I specifically want to thank you for the Subcommittee's continuing strong support for the Water Resources Research Act.

This year is the 50th anniversary of the Act. In 1959, a Senate select committee was formed to investigate the adequacy of the Nation's water resources. As a result of its findings, a bill was introduced to create a national water resources research program designed to expand and provide more effective coordination of the Nation's water research. The bill authorized the establishment of water resources research institutes at land grant colleges in each state. On July 12, 1964, when President Lyndon B. Johnson signed the bill into law he said,

The Water Resources Research Act of 1964, which I have approved today, fills a vital need...it will create local centers of water research. It will enlist the intellectual power of universities and research institutes in a nationwide effort to conserve and utilize our water resources for the common benefit.

The Act authorized the establishment of Water Resources Research Institutes in each of the 50 states and Puerto Rico. Later, Institutes would be authorized in Washington D.C., Guam, the Virgin Islands, the Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands and American Samoa. The Institutes were created to fulfill 3 main objectives:

- to develop through research new technology and more efficient methods for resolving local, state and national water resources problems;
- to train water scientists and engineers through on-the-job participation in research; and
- to facilitate water research coordination and the application of research results by means of information dissemination and technology transfer.

Today the Water Resources Research Institutes, in partnership with the U.S. Geological Survey, continue to fulfill the three roles assigned by Congress in 1964. They have produced path-breaking research, innovative information and technology transfer programs, and have provided

training to over 25,000 students over their 50-year history. These Institutes also helped to further the U.S. Geological national water mission through water research and information transfer.

The Water Resources Research Act program is a state-based network of institutes dedicated to solving problems of water quantity (supply) and quality in partnership with universities, local governments and the general public and is the only federally authorized research network that focuses on applied water resources research, education, training and outreach. The institutes are a direct, vital link between federal water interests and needs and the academic expertise located within the states' research universities. It provides a mechanism for ensuring state, regional and national coordination of water resources research, the education of future water professionals, and the transfer of results and outcomes to state and federal water professionals. The matching requirements of the program ensure that states invest in water research and training.

The Water Resources Research Act established two grant components of the USGS Water Resources Research Institutes program, where federal funds cannot be used to pay indirect costs at the universities. The first component is the base grant program which is divided up equally among the institutes. The Act requires that each federal dollar must be matched by two non-federal dollars, and this is the strictest match requirement of any federal research program. Each Institute uses these funds to leverage research and/or student training through a state-wide competitive grants process. The National Institutes for Water Resources requests the Subcommittee to provide continued funding for the base grant program, which provides research grants focused on water supply and quality, technology transfer, professional education, and outreach to the water-user community by the Institutes. The base program provides seed grants, which are used to develop future research proposals and secure additional external funds.

The second grant component is a national competitive grants program, supporting research on water resources problems that are regional or national in nature. In 2012 this program received 46 applications, which underwent rigorous peer review from a national panel. The national review panel selected a total of six projects from Alabama, Iowa, Minnesota, New York, Oregon and West Virginia, addressing water supply and quality issues facing our Nation.

The Water Resources Research Act is what holds all of this together. The Institutes specialize in identifying problems within their states, developing solutions to those problems, and engaging with the public to implement those solutions. One of the Institute program's greatest strengths is that the research funded by each Institute is tailored to that state's needs, based on priorities set by consultation with an advisory panel. These funded projects are state focused but also address water issues relevant to our Nation. The following are several examples of research conducted by Institutes across the country.

My Institute, the **Arkansas Water Resources Center**, has sponsored research on the potential formation of disinfection by-products and nitrosamines during the treatment process in drinking water systems. These complex chemicals are potential carcinogens and regulated under the Safe Drinking Water Act. The results of these studies provide critical information to our water districts, which provide safe drinking water to the citizens of Arkansas. The seed grants provided by my Institute have facilitated additional research projects, focused on understanding

how treatment processes can be managed to reduce the formation of these complex chemicals and in the development of decisions support systems to help manage water supplies.

The **California Water Center** has sponsored research on citrus and avocado agricultural production problems using reclaimed municipal wastewater, because of drought and water shortages in arid regions. Reclaimed water can influence soil properties and crop production because it contains high concentration of dissolved salts and other elements like boron. The objective of the research supported by the Water Resources Research Act was to determine the effect of reclaimed water on soil infiltration and re-evaluate the guidelines for irrigation with respect to boron concentrations in soils cropped to citrus in the Riverside region. The results suggest that farmers might have to change irrigation practices or add gypsum to the soil if reclaimed water will be used for irrigation.

The **Virginia Water Resources Research Center** collaborates with the Virginia Department of Environmental Quality in developing a publicly-accessible website to serve as a reference for stormwater Best Management Practices in the Commonwealth of Virginia. The project is guided by a 25-member clearinghouse committee comprised of stakeholders from across all major watersheds in Virginia. This information is used statewide to manage urban stormwater.

The **Idaho Water Resources Research Institute** is working with the Bureau of Reclamation to develop a more thorough understanding of the economic value that is provided to the Treasure Valley through the management of the Boise River. This research is being used to help predict how water demand and use will be affected by changes to the region's population, economy, and climate. This understanding will provide a method to assess the cost effectiveness of investments in water management infrastructure, and aid in managing one of Idaho's most important water resources.

The **Minnesota Water Resources Center** has worked to evaluate the source of sulfate in the St. Louis River Estuary, and its relation to methyl mercury content in fish that are elevated above regional background levels. The study suggests that mercury fate in this important estuary mostly controlled by upstream inputs of sulfate from mining rather than internal release from sediments stored in the estuary. The amount of organic matter in the bottom sediment also plays a role in the extent of mercury methylation across this estuary. These results are being used by regional resource managers to consider how management water influenced by mining and habitat restoration efforts influence mercury accumulation in fish. This seed grant led to follow up work by the state and the U.S. Army Corps of Engineers, as well as a model to predict methylation potential from organic matter, sulfate and mercury for the management mine discharges to water.

Researchers at the **Utah Center for Water Resources Research** have developed a new decision support system platform, called Crop-Water Monitoring and Information System. This system integrates state-of-the-art monitoring and forecasting algorithms (based on readily available satellite imagery) to provide information about crop water needs and growing conditions at the farm and irrigation system level. Farmers and irrigation system operators use this information to predict and manage irrigation timing, amount and delivery, while improving crop productivity. This platform will provide even more useful information to water managers as additional geospatial data are implemented using Landsat and other sources such as MODIS Terra.

Oklahoma has just endured three years of historic drought that resulted in billions of dollars in agricultural losses, forcing agricultural producers to look for help in crop and livestock management. In 2010, a team of researchers from supported by the **Oklahoma Water Resources Research Institute** started enhancing the capabilities of the Oklahoma Mesonet to provide real-time drought information; the Mesonet is a statewide system of 120 environmental monitoring stations that report data online from soil moisture sensors. This project developed on-line maps that are updated daily to show the amount of water that's available to plant roots, as well as the potential for groundwater recharge. The benefit is a better understanding of water resources and the potential for a sophisticated water budget for Oklahoma.

One of the most serious water-quality problems in the Appalachian coal mining regions is acid mine drainage (AMD), where high levels of acid and iron can create long stretches of "dead" streams. The **Ohio Water Resources Center** at the Ohio State University discovered that adding certain bacteria to acid mine drainage speeds oxidation and removes the iron, a discovery that could lead to an inexpensive, efficient and sustainable solution to treating these waters.

Combining historic aerial photography with long-term stream discharge data, the **New York State Water Resources Institute** analyzed the role that land-cover plays on peak stream flows against the backdrop of our changing climate. Using four watersheds in which agricultural land transitioned to forested land, researchers found that the effects of land-cover in New York's humid, temperate regions are not always consistent with standard hydrologic intuition. For example, an increase in forested land resulted in little change or even increased peak flows in some cases. Thus, underscoring the importance of a research program focused on state needs.

Researchers supported by the **Kentucky Water Resources Research** are benefitting from technological advances that continue to make electronic equipment smaller and more cost effective to use when collecting important data. In this case, they used pressure sensors (acting as strain gages) to measure water velocity and light dependent resistors to measure the suspended sediment concentrations in the flowing waters. The results show that sensor output can be used to make reasonably accurate estimates of water velocity and sediment concentration, combined to quantify sediment transport. The development of these low-cost sensors will allow this monitoring network to be expanded with minimal capital costs, providing widespread water quality information across Kentucky.

For five decades the Water Resources Research Institutes have provided significant research results and impacts to our Nation, and proved successful at bringing new water professionals into the work force. **NIWR recommends the Subcommittee provide \$8,800,000 to the USGS for the Water Resources Research Institute Program for FY 2015.** The water institute directors recognize the fiscal challenges facing the Nation and Congress, but we want to support the *USGS Coalition request that Congress appropriate at least the \$1.2 billion requested for the USGS in FY 2015*, a level that will support critical programs that improve the nation's environment, health, safety, quality of life, and future economic growth.

Thank you, on behalf of all the Institute directors, for the opportunity to testify and for the Subcommittee's strong support of the Water Resources Research Act program. It is appreciated.