Testimony of Henry Vaux, Jr.
on the Water Resources Research Amendments Act (H.R. 5487)
Committee on Natural Resources, Subcommittee on Water and Power
U.S. House of Representatives
June 17, 2010

Chairwoman Napolitano and Ranking Member McClintock, my name is Henry Vaux, Jr. I am Professor, Emeritus of Resource Economics at the University of California, Berkeley. I am also Associate Vice President, Emeritus of the University of California System. I wish to thank you for the opportunity to appear before this Subcommittee at this hearing on the reauthorization of the Water Resources Research Act.

I should note that I chaired the 2004 panel appointed by the U.S. Geological Survey to review and evaluate the water resources research institutes for the period 1998-2002 and I currently serve on the panel appointed by the USGS to review the institutes for the period 2003-2007.

In addition, I should state that I was the chair of the National Research Council committee which wrote two reports dealing with the need for water resource research. These reports are entitled: *Envisioning the Agenda for Water Resources Research in the 21st Century* and *Confronting the Nation's Water Problems: The Role of Research.* I do not formally speak for the National Research Council or the University of California System.

I am honored to have the opportunity to appear today to discuss the Water Resources Research Act and to support H.R. 5487, reauthorization legislation offered by Representative Napolitano. The bill extends the authorization for appropriations for the two principal components of the Act for an additional five years through FY 2016. H.R. 5487 maintains the authorization for funding at current levels.

History

The Water Resources Research Act was first drafted in 1962. It stemmed from the 1961 report of the Senate Select Committee on National Water Resources. One of the report's five recommendations called for an "expanded and coordinated federal research program in relation to water and water resources." Specifically, the recommendation stated "the Federal Government should undertake a coordinated scientific research program on water. This should include both research into ways to increase available supplies, and ways to increase efficiency in the use of water required to produce manufactured goods and crops."

The sponsor of the Water Resources Research Act was Senator Clinton B. Anderson of New Mexico who was chairman of the Senate Interior and Insular Affairs Committee. Senator Anderson based his legislation on the perceived need for "widely dispersed research centers" to assist state and local water action agencies and officials."

The initial draft of the Water Resources Research Act was closely modeled on the Hatch Act of 1887 which created the state agricultural experiment station network. The draft bill provided for authorization of "$75,000 increasing to $100,000 a year for establishment of a water resources research institute at a land grant college or state university in each state, or higher educational institution designated by the state legislature for support of a multidisciplinary water research center."

The Water Resources Research Act was signed by President Johnson on July 17, 1964. The Act created a partnership between the Federal government, state governments and universities with water resources research institutes at land grant universities throughout the nation. The goals of the Act were:

- 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.

- To facilitate water research coordination and the application of research results by means of information dissemination and technology transfer.

The Water Resources Research Act was recodified in 1984 by Public Law 98-242 and has been reauthorized and modified the 101st, 104th, 106th, and 109th Congresses.

The state water research institutes, established under the authority of the Water Resources Research Act, have established an effective federal/state partnership in water resource, education and information transfer. These institutes are located at the land-grant colleges in each of the 50 states and four territories. They work with state and federal agencies and water resources stakeholders in their home states while acting as a network for the exchange of water resources research and information among the states.

Observations

The characteristics and recent accomplishments of the Water Resources Research Institute program testify to the strength and effectiveness of the program in assessing water problems from a state based perspectives.

- In FY 2009 the fifty four Institutes were provided $6.3 million in appropriated funds. Individual institutes each received $92,335 to conduct the program. The Institutes generated a total of $86.4 million from all sources to support their activities. Taken as a whole the Water Resources Research Institute program generated an estimated 18 dollars for each federal dollar appropriated. This is far in excess of the two to one cost share that is mandated under the Act and far larger than the matching funds generated by virtually any other federally supported research program.

- In FY 2009 non-federal agencies contributed $11.28 for each dollar appropriated to the program. The strength of the Water Resources Research Institute program is illustrated by the fact that non-federal entities, including state and local government, provide a majority of the financial support. The large non-federal contribution testified to the program's reputation for excellence in water research and education as well as to the program's productivity. It is also noteworthy that the non-federal program support remains strong.

- Most institutes maintain one or more advisory bodies comprised of local, state and federal water officials, representatives of water user groups and members of the interested public. Annually these groups develop research priorities and review the allocation of funds among various competing projects and priorities. In this way Institutes utilize the advice of those who are closest to the water problems to ensure that limited funds are spent on research that addresses the most pressing water problems and issues. This explains, in part, the programs success in attracting non-federal funds. However, the core federal funding is also critically important to the individual Institutes ability to attract additional financial support for research and education.

- The federal appropriation provides the "legitimacy" that allows the Institutes to attract non-federal funding. If this legitimacy is lost, external funding will erode very rapidly.

- The research funds awarded by the Institute program are awarded competitively. Peer review ensures that limited funds are awarded to support research of the highest quality. Many of the research programs conducted by the federal government do not entail peer review. These programs thus lack the "quality control" that is built in to the Institute program

- A significant portion of the institute funding supports information dissemination and technology transfer activities. This ensures that the results of Institute sponsored research are made available to water managers and users in a timely fashion and permits research findings to be implemented quickly and effectively.

- None of the federally appropriated dollars are used to pay institutional overhead or indirect costs. In the aggregate, the Institutes spend about 8 percent of their funds on administrative support. Few, if any comparable federally-funded research programs can boast of administrative costs this low.

- Last year nearly 1,000 students were trained in water resources under the auspices of the Institute program. Virtually every research project supported by the program involves students. Funds spent by the Institutes on research thus support the training of future water managers and professionals. Approximately two-thirds of the students trained are graduate students and the remaining one-third are undergraduates. These students will help to fill the growing demand for water leaders and professionals to meet the water resources management challenges of this century.

- I do feel compelled to make one disappointing observation. Initial grants to individual Institutes under the WRRA were $87,490 in 1966, the equivalent of $708,026 in today's dollars. Today, the base grant received by each institute totals $92,335. This program which has been successful in leveraging research funding, solving problems for various levels of government and the public and training students appears to be in jeopardy because dollar-wise, inflation is eroding the programs buying power to a fraction of its original power over the years. The federal commitment to this program is critical, given the increasing important of water to the nation's well-being.

- According to a 2008 survey of the program, the USGS states that over 70 percent of the federal funds provided to the Institutes are devoted to research while dissemination of research results accounts for about 15 percent of the federal funds.

The Need for New Water Science

I would like to talk about some of the issues the National Academy panel identified. As noted, I chaired to National Academy committee which wrote two reports dealing with the need for water resource research. I would like to discuss the findings of these reports: *Envisioning the Agenda for Water Resources Research in the 21st Century* and *Confronting the Nation's Water Problems: The Role of Research.*

Although our nation faces many difficult challenges in this first decade of the 21st century, the challenge of husbanding and managing our water resources is a long-term challenge that will be with us over the remainder of this century. Water scarcity will continue to intensify.

Our water supplies are basically finite although their occurrence varies over time. Long term observations of precipitation and run-off suggest that hardly any year is an average year. The extremes of flood and drought recur periodically and there is evidence to suggest that these extremes will become more frequent. There is also evidence to suggest that for many regions of the United States, the advent of climate change may entail some general decline and changing in the timing of precipitation and run-off. Continuing deterioration of water quality will also mean less water available for many important and valuable uses. Reversing the trends of water quality declines and enhancing the aggregate level of water quality in the U.S. will be necessary to avoid further erosion in the quantities of available supply. The general water supply picture that emerges for the future suggests water supplies will be less available then they were in the past. There is less likelihood that they would remain stable and virtually no possibility that they could be made to grow. Arrayed against such declining (or static) future levels of water supply are a number of factors which suggest that the demand for water may grow. These include:

- **Population Growth** - Some estimates suggest that U.S. population may grow by as much as 50% between now and 2050. Taken alone, a population increase of such magnitude will cause significant increases in the demand for water.

- **Expansion of Irrigated Agriculture** - The need to feed an increased domestic population as well as a global population that is projected to be 3 billion larger by the end of the century will be translated into growing demands for agricultural water everywhere. Though rain fed agriculture will play a very important role, there will be pressure to expand irrigated agriculture because it is more productive. In the U.S., for example, about one-third of the farm land is irrigated and that one-third accounts for 45% of the total production.

- **Protecting the Environment** - Past water development practices have entailed the transfer of water from environmental uses to municipal, industrial and agricultural uses. It is unlikely that this practice can continue for long without incur major and highly costly damages in the form of lost environmental services and reduced environmental amenities. There is some evidence to suggest that we may have to allocate more water to environmental purposes - not less - if we are to protect environmental services and amenities.

- The trends of growing demands and static or declining supplies of water mean that water scarcity will intensify over the coming decades. As a consequence, competition of limited supplies of water will intensify and conflicts over the allocation of available supplies will also increase. Professor William Jury and I have recently completed work concluding that the ease or difficulty with which we adapt to this intensifying water scarcity will depend critically upon our willingness to invest in additional science. Properly focused, such an investment will considerably help identify ways to ameliorate water scarcity and reduce conflict over water allocation and use.

The State of Federally Funded Water Research

Today, the annual federal investment in water resources research is approximately $700 million in constant 2000 dollars. This figure is the same in real terms as the annual federal investment in water research in FY 1975. Thus, we face an intensifying water scarcity in circumstances in which there has been little change in the magnitude of federal water research funding over the past 35 years. In other words, support for water science has not kept pace with population growth, growth in gross domestic product or growth in federal budget outlays for at least the last four decades. This has occurred despite the fact that the productivity and value of water has increased even while the challenges of managing limited waters effectively and efficiently have grown.

The topical balance of the federal water research portfolio has changed significantly since the period 1965-1975 in ways that make it inconsistent with today's water research priorities. Specifically, research on water demand, water law and other institutional topics and research on water supply augmentation and conservation currently receive a smaller proportion of total water research funding then they did 30 years ago. The NRC Committee concluded that these topics currently appear to be underfunded. In addition, the current water portfolio is heavily weighted

toward short-term research. Longer-term research, necessary to help address the water problems of the future and to help support the applied research that will need to be done a decade hence, is significantly underemphasized in agency water research budgets. For all of these reasons the NRC Committee concluded that we are obtaining less for the annual $700 million in federal water research than we should.

The major explanation for this state of water research is not necessarily that the funding is inadequate. The explanation lies more importantly with the fact that federal research is largely uncoordinated. This means that the President and Congress lack information about:

- The size and shape of the entire federal water research portfolio;
- Measures of magnitude and effectiveness of individual elements in the portfolio;
- Any sense of national priorities of water research;
- Guidance about what might be an appropriate balance among research elements.

Conclusion

In partnership with the U.S. Geological Survey the Water Resources Research Institutes have the capability to provide important support to the states in their long-term water planning, policy development, and resources management efforts. They support research on all topics related to water resources and the management of water resources and are the only education program training the next generation of water specialists and professionals. The Institutes' outreach and information transfer activities are vital tools of understanding for stakeholders in the water resources community. In sum, the nationwide network of water institutes, in collaboration with the USGS, provides an efficient and effective method to meet the diverse water resources needs in different parts of our country.

In closing, I believe the Water Resources Research Act merits reauthorization and I endorse Representative Napolitano's bill to accomplish that objective. The Water Resources Research Institutes are well situated to guide, foster and facilitate the application of the scientific expertise at the nation's universities which is needed to firmly resolve the perplexing questions surrounding the many challenges we face. Because the Institute are decentralized and based in the states, while at the time same time they are well-integrated through a national network, they are well equipped to address both the fundamental scientific issues and implications of those issues to each area of the country. The record of the Institutes in collaborating with state and local officials and representatives of the private sector also suggests that they are uniquely positioned to seek out and identify the concerns of water managers and users. This will help to ensure that the research questions are appropriately focused which is essential to the conduct of good science.

I urge the Natural Resources Committee to take timely action on Representative Napolitano's legislation to reauthorize the Water Resources Research Act program. The Water Resources Research Institutes have been enormously productive. The Institutes have unique capabilities to

contribute to efficient and responsive research on water resources research challenges. The Institutes can and do significantly strengthen the ability of states and regions to anticipate and solve long-term problems by fostering collaboration among the nation's best water scientists and between those scientists and the water managers and users who need their help.

I am gratified for your support for water resources research and I trust you will continue that support in the future.

Thank you.