

Statement of
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2011 Floods and the Condition of the Nation's Flood Control Systems

Senator Boxer, Members of the Committee. It is a distinct privilege to participate in this important and timely hearing and I want to thank the Committee for the opportunity.

I am Gerald E. Galloway, a Glenn L. Martin Institute Professor of Engineering and Affiliate Professor of Public Policy at the University of Maryland where I teach and do research in water resources and natural disaster management. I came to that position following a 38 year career in the US Army and eight years service in the federal government, most of which was associated with water resources management. I served for three years as District Engineer for the Corps of Engineers in Vicksburg, MS and later, for seven years as a member of the Mississippi River Commission. I also serve as a consultant to a number of national and international government organizations. I am currently a member of the Governor of Louisiana's Advisory Commission on Coastal Protection, Restoration and Conservation. I am also a member of a WWF (UK) - China Ministry of Water Resources team that is reviewing flood risk management worldwide. In 1993 and 1994, I was privileged to be assigned to the White House to lead an interagency study of the causes of the Great Mississippi River Flood of 1993 and to make recommendations concerning the nation's floodplain management program.¹

The disastrous floods of 2011 severely impacted many parts of the country and once again brought into question the efficacy of our nation's efforts to reduce ever growing flood damages and to ensure the sustainability of our riverine and coastal natural resources. I would like to briefly comment on the flood experience of 2011 and then discuss the systemic issues that face the nation in dealing with the threat of floods, hurricanes and significant storm events.

The Floods of 2011

The floods of 2011 on the Mississippi and Missouri Rivers resulted in damage to people and property, but this damage was substantially less than it would have been had we not invested over the years in a robust flood damage reduction infrastructure.

The successful operation of the Mississippi River and Tributaries (MR&T) project in the Lower Mississippi Valley prevented substantial loss of life, billions of dollars in damages, and the disruption of critical components of our nation's energy production and international commerce. The MR&T was designed to handle a flood such as the one that occurred and performed well. The project represents an integration of multiple approaches to flood damage reduction and has been developed with a holistic, basin level approach and unity of command of its execution. In

its use, since its initiation in 1928, of setback levees and backwater storage, it also reflects the concept of providing “Room for the River” that was only recently adopted by the Dutch government.

The operation of the Missouri River dams also reflected the successful execution of a well designed plan to pass enormous volumes of water down this major river. Had the dams not been there, the losses in the Missouri basin would have been catastrophic. However, the difference between the MR&T project and the Missouri River dams is the difference between a comprehensive project and a series of dams sitting in the middle of a basin where there is no integration and where, over the years, the development of a systemic approach to dealing with floods and other water uses has been hampered by an inability of the states and the Congress to agree on what needs to be done and, as indicated in the previously mentioned 1994 report on the 1993 Midwest flood, a failure to develop a comprehensive approach to the water management of the Missouri basin as a whole.

The major flooding of most areas along East Coast should not have been a surprise to anyone familiar with the long-term flood histories of those regions. Most areas had seen the impact of major floods before or were known to be at risk to flooding from major events. New Jersey and the Federal government have been struggling with the Passaic Basin for over five decades, but have been hampered by unwillingness on the part of the many communities in the basin to agree on land use controls and project alignments that could have dramatically limited flood exposure.

The Nation’s Flood Control System - *There Is No Flood Control System*

Let me move to discussion of the nation's flood control system. What I am going to say is not new. In fact, these conclusions and recommendations have been part of study after study over the last half century.²

Other than the MR&T, the TVA, and the Miami (Ohio) Conservancy District, the nation essentially does not have flood control systems or flood damage reduction systems or flood risk management systems. There is no national plan, national goal or national objective for flood risk management.

I use the term flood risk management instead of flood control because a major transition in how to deal with floods is taking place across the globe and represents an international shift from a focus on reducing flood damages by controlling where floodwaters go to accepting the premise that floods are natural events and that, in the long run, only through use of a portfolio of both structural and nonstructural measures can flood damages be reduced or mitigated and the natural and beneficial functions of the floodplain maintained. Flood risk management also accepts that absolute protection from floods is not possible and that there always will be a residual risk, the possibility, no matter how remote, that one or more of the elements of the flood system may fail and cause losses.

Flood risk management does not set a universal standard for protection e.g. 100-year flood protection, but identifies and assesses the spectrum of hazards and their potential consequences, faced by a given region or community and develops a strategy that, within the resources

available, maximizes flood risk reduction. The national flood insurance program, intended as a mitigation option only, has become our de facto policy tool. While it has provided mitigation for many, it has had the unintended consequence of focusing our resources and energies on a single and minimal standard that in fact has increased risk rather than reducing it. It has also placed a glass ceiling on our thinking about the full spectrum of hazards society faces and a systems approach to dealing with them as a totality.

Since the early part of the 20th century, the federal government has been deeply involved in structural efforts to control floods but has been doing so on an individual project basis or within the context of protection of small watersheds. Over the last 50 years it has also encouraged, in its flood mitigation efforts, such nonstructural measures as land use planning, flood insurance, and flood-proofing to reduce the impact of floods on affected parties. If flood losses are an indicator of success, I would suggest that we are less than successful and that the picture ahead is grim unless we take steps to address the problems we now face. In spite of all of our efforts, the average losses per year continue to climb.

If you are willing to accept the information about climate change provided to you by the National Research Council in its Congressionally requested study (PL 110-161), *America's Climate Choices*³, and I am, then you will agree that the potential for flooding is increasing and that when coupled with population and infrastructure growth, the probability of significant increases in loss of life and economic and social coastal and riverine flood damages is quite real. A national level strategy is essential to marshal intellectual, economic and social resources to address these compelling issues.

Flood Challenges of Today

Let me highlight a few reasons why our current approach to flood risk management may not be up to the task it faces.

Exposure to Flooding

The United States faces significant flood risks and most people don't recognize this risk.

- The nation does not know its exposure to the risk of flooding. We have some idea of the number of structures in the 100-year floodplain but little information about the numbers within the remainder of the floodplain and although estimates place the figure between 4 and 7 million in the 500-year floodplain alone. We do not know accurately the exposure of federal facilities to flooding.
 - While technology would permit the development of such information - what properties are in the floodplain and at what elevation and subject to what level of flooding- little support is given to identification of property at risk and communication of this information to those who are at risk and to those who are responsible within the government for dealing with these risks.

- Three reasons are usually given for this failure to identify the exposure. First, such work requires resources and resources are not available. Second, development of exposure information would identify problems that cannot be easily solved and that would require resources that are not available. Third, bad news is not popular, so why create it. It would only slow development.
- The state of North Carolina, as part of the FEMA Map Modernization Program undertook to obtain LIDAR (high resolution topographic) data for the state so that when its flood insurance rate maps were developed they would be as accurate as possible. In parallel with flood insurance rate map modernization, North Carolina has also begun an effort to obtain locational data including first-floor elevation of all structures in the floodplain. By identifying this exposure, the state expects to substantially reduce potential losses and stave off development that would put people and property at risk. It can be done.
- Flooding is a problem in almost all parts of the nation. There are over 21,000 communities enrolled in the National Flood Insurance Program. Community leaders don't enroll the community in the program unless they recognize a flood risk. There are many areas outside of the enrolled communities that are also at risk to flooding and the pressures of development simply will increase these numbers.
- Many people who live in the floodplain do not understand or appreciate the risk they face until the water is on their property. The decision people make to move into a risk area is a function of the information they have available about the risk and how they individually perceive and understand that risk.
- We are not succeeding in communicating the information those in at-risk communities need to make management and personal decisions. Most floodplain residents and many public officials do not understand the language that is used to identify risk and the extent of the risk.
 - A 100-year flood is seen as a flood event that will occur only once in 100-year period instead of a flood that has a 1% chance of occurrence in any given year and for which there is a 26% chance of occurrence during the life of a 30 year mortgage.
 - Many floodplain residents do not understand that a major flood could occupy the entire floodplain, not just the 100-year floodplain. Where the river has once gone, it can also return. Confusion over what was subject to flooding during the 2011 events on the Missouri and Mississippi well illustrates this point
 - Because they are behind a local levee or a "certified" levee they believe they have no risk-they are protected. They do not understand that levees can overtop or fail. I am somewhat amazed to see objections by members of Congress to placing cautionary notes on flood maps that warn of the potential for levees to overtop or fail.

- Some communities try to educate those at risk; others do not and discourage such obvious tools as delineation of the extent and height of historic floods or disclosure of a property's location in the floodplain. It is not good for the real estate market or development to highlight potential areas of flooding.
- The quality of the information provided to floodplain residents and public officials varies considerably by location. Most current flood insurance rate maps only identify the 100-year floodplain, although new maps will include the 500-year floodplain. FEMA, in its RiskMAP program, is working to provide indicators of actual risk but resource constraints will limit their ability to make these tools universal products.⁴

The Levee and Dam Challenge

Much of populated flood prone area across the nation sits behind an uncoordinated amalgam of federal, state and local levees, the conditions and integrity of which may not be known. The National Committee on Levee Safety estimates that there may be 100,000 miles of levees in the United States, only 14,000 miles of which are under some form of federal oversight.

As all of you know, the nation faces significant problems with maintenance and modernization of its aging infrastructure. The American Society of Civil Engineers, in its 2009 Report Card on American Infrastructure, assigned grades of "D-" to levees and "D" to dams and there is no indication that the picture is getting better.

The 1994 report on the Mississippi River floods of 1993 highlighted the lack of information about levee location and condition in the Missouri-Mississippi basin and the paucity of state involvement in the monitoring of levee construction and operation, but little has been done to deal with these issues. A 2006 study of levees and the national flood insurance program pointed out that there was limited knowledge of the condition and location of many of the levees that protect people and property. Following Hurricane Katrina, the Office of Management and Budget directed the Corps of Engineers to begin an inventory of levees and their condition, an effort which the Corps has initiated but largely confined to federal and federal related levees, which, as indicated earlier, represent only a small percentage of national levees. Title IX of the Water Resource Development Act of 2007 established the National Levee Safety Program and a Committee on Levee Safety and directed the submission of a report to the Congress within 180 days the passage of the act. A draft report of the National Levee Safety Committee was submitted to the Administration in January 2009 and has yet to be sent officially to the Congress. Since the report is on the Web, I am sure that members have had an opportunity to review it.

Since the 2006 report on levee policy, FEMA's flood map modernization program, the Corps levee inventory and other individual efforts have borne out the initial conclusion that there is a significant levee problem in the nation and that it is probably far worse than originally anticipated. The costs of inspection of levees are high and the costs of rehabilitation and bringing the levees to standards are even higher both at the federal state and local level. ASCE estimates the 5 year need is in excess of \$5 billion. So today hundreds of levees, whose integrity is in

question, are in place in front of communities and properties with little realistic hope of funding for inspection, repair or upgrade.

I would note that the impacts of the 2011 floods on the MR&T project levees and related structures and on the dam systems on the Missouri were high and will require significant resources to bring them back to the condition required to deal with future flooding.

ASCEs report card for dams indicates that over 1800 high hazard dams, dams whose failure would constitute a threat of loss of life, have been deemed unsafe and that hundreds more remain uninspected as a result of funding shortfalls. Dam failures can affect not only those immediately below the dams, but also can cause significant problems for those behind downstream levees whose design did not include passage of waters from a dam break.

Sharing Responsibility for Flood Risk Management

We are not treating flood risk management as a responsibility to be shared among federal state and local governments and individuals who are at risk. Over the years the federal government, with programs of the Corps of Engineers, FEMA and NRCS, has clearly taken a lead in dealing with flooding, not only in pre-flood activity but also in flood response and recovery.

- The biggest challenge is wise use of the floodplain -land use. State and local governments have responsibility for land use management yet, in many cases, do little to stem development in high risk areas. They would rather seek federal aid for flood infrastructure development when there is a problem than limit unwise development. Communities see development as increased revenue rather than increased risk. I compliment the State of California for the passage of Assembly Bill 70 in 2007. This bill indicates that when a community makes an unwise decision to allow development in a flood risk area, it must also be ready to assume some of the liability that would result if the flood system were to fail.
- As indicated earlier, in most cases until recently, states have been absent from the management and oversight of levees and have varied involvement in oversight of dam safety.
- Individual land owners must also share in responsibility for flood risk management. Although purchase of flood insurance is *mandatory* for essentially all federally backed mortgages for property in the 100-year floodplain, the abysmal participation in the program-somewhere near 25%-indicates that floodplain residents don't see a need to carry their share of the responsibility. The same could be said for those that live in the floodplain but outside the 100-year area even though they can participate in the program at preferred, lower rates. Their participation is equally low.

Watershed Planning

We are not dealing with flood issues on a watershed basis. A flood related project in one community can cause problems upstream if the river is constricted by the project and/or can cause damages downstream by increasing the volume of water in the river. While engineers are capable of determining the impacts of such projects on upstream and downstream regions these studies must be undertaken within the context of the watershed as a whole so that interrelationships are clearly defined. Unfortunately, even though watershed studies are frequently authorized by the Congress, it is rare to see appropriations follow to ensure that decisions on individual projects are taken within this watershed context. Funding for comprehensive planning for the Red River Basin of the North and the area around the junction of the Missouri, Illinois and Missouri rivers has been limited in spite of the demand for and funding of projects in those areas.

In 2009, former Congressman James Oberstar, chairman of the House Transportation and Infrastructure Committee, noted that:

Today, the diverse water resources challenges throughout the United States are often studied, planned and managed in individual silos, independently of other water areas and projects. Generally, this has resulted in local and narrowly focused project objectives with little consideration of the broader watersheds that surround the project. There are 24 Federal agencies with water responsibilities and this does not count the land management agencies with related responsibilities. Policy is ad hoc, implementation is decentralized, coordination is fragmented, and communication is non-existent or fails to connect.

National Objectives

Since 1983, federal water resource studies have been guided by Principles and Guidelines (P&G), a document prepared by the US Water Resources Council and signed by President Reagan that established that the Federal objective of water and related land resources project planning would be to “contribute to national economic development consistent with protecting the Nation's environment...” Almost since their publication, the P&G have been under criticism for their failure to consider public safety, social costs and environmental impacts and an apparent bias against nonstructural approaches. As you know, the Water Resources Development Act of 2007 directed the Secretary of the Army, not later than 2 years after the date of enactment of the Act, to issue revisions to the P&G for use by the Secretary in the formulation, evaluation, and implementation of water resources projects. The Act instructed the Secretary to ensure that the revision addressed the use of best available economic principles and analytical techniques, including techniques in risk and uncertainty analysis, the assessment and incorporation of public safety, assessment methods that reflected the value of projects for low-income communities and projects that use nonstructural approaches to water resources development and management, the assessment and evaluation of the interaction of a project with other water resources projects and programs within a region or watershed, the use of contemporary water resources paradigms, including integrated water resources management and adaptive management, and evaluation methods that ensure that water resources projects are justified by public benefits.

We are approaching four years since enactment of WRDA 2007. The Administration has indicated that it is working on the revisions and that it is broadening the applicability of the proposed revisions to include all federal agencies, not just the Corps of Engineers, but no revision has been forthcoming. Revision of the P&G is important step in coming to grips with the national flooding challenge.

Federal Leadership.

Executive Order 11988, Floodplain Management and EO 11990, Protection of Wetlands, were issued by President Carter in 1977 and defined the responsibilities of federal agencies with respect to support of federal activities in the floodplain and the protection and preservation of wetlands. EO 11988, in its implementation guidance, includes language that restricts the development of critical facilities -hospitals, public safety activities, water treatment facilities, etc. in the floodplain - requiring that they either locate outside of the 500-year floodplain or be protected against a 500-year flood. The executive orders also call on the federal agencies to ensure that the programs they support and/or that they carry out themselves are in consonance with wise use of the floodplains and protection of wetlands. It is important that federally supported activities in the floodplain reflect an understanding of the risks in the floodplain, the benefits of ecosystem goods and services provided within the floodplain and coastal areas and do not create exposure that would add to growing flood losses.

Federal Coordination of Floodplain Management Activities

Many of the previously mentioned studies on previous floods and floodplain management have addressed a seeming lack of coordination among federal activities in dealing with flood issues and recommendations have been made for various mechanisms to affect the coordination that was once provided by the US Water Resources Council.

I am most pleased to note that federal agencies have recently reinstated a Federal Interagency Floodplain Management Committee comprised of senior Administration officials from those departments having responsibility for flood related activities and that the committee has been actively seeking to address many of the challenges mentioned above.

Actions That Need To Be Taken

What then needs to be done to reduce the risk to the nation from flooding? I would offer several recommendations:

- The Congress and the Administration need to recognize and fully implement the risk-based approach to dealing with floods. It is very clear that the nation cannot afford to do everything for everybody and that the resources at federal state and local level should be applied where the risk is greatest. I compliment the State of Louisiana for its determination in its recent plan for coastal protection and restoration that the same level of protection could not be provided to all areas within the coastal threat area. The plan

does not abandon those who may not receive the highest level of protection but indicates that the support may be in a different form than structures.

- Congress and the Administration, in collaboration with the states, need to develop a National Floodplain Management Act that defines the goals and objectives for flood risk management and the responsibilities that should be carried out at federal, state, and local level and by individuals in dealing with the flood challenge.
- Immediately following Katrina, everyone was behind development of a national levee safety program, yet today, over six years since that event and nearly three years since the completion of the report of the National Committee on Levee Safety, nothing has been done at the national level to address these levee safety problems or to deal with the recommendations of the Committee. Congress needs to act, with or without Administration support, on the recommendations of the National Committee on Levee Safety. There are actions that need to be taken now
- The Congress and the Administration must come to grips with the infrastructure challenge. Doing nothing increases the problem and puts more people at risk each day. If levees, dams and floodwalls and other related structures are to remain part of the national approach to dealing with flooding, then resources must be identified and provided to ensure that what is in place will in fact do the job that is intended. This may well mean that the choice becomes one between repair or removal of some structures that currently exist. Any efforts should include definition of the long-term resource responsibilities of those who own, operate, and maintain existing and proposed flood risk reduction infrastructure. Every day that funding is postponed the problem grows larger and transfers more of the resource burden to those who will come after us.
- In authorizing and funding future flood risk reduction measures, the Congress must take these actions within the context of watershed development so that the full implications of any new projects on its watershed as a whole and on existing or proposed infrastructure will be fully recognized and addressed. Authorizing funds for watershed studies but not appropriating funds for their execution is of little value
- The Congress should seek Administration completion of the revisions to the existing Principles and Guidelines.
- Given the significance of the continuing growth in flood damages and the potential future increases in these damages, it is imperative that the Administration and Congress and the states work together to address the many challenges that I have mentioned. The shift from flood control to flood risk management is a reality as is the absence of resources to properly address the infrastructure problems the nation now faces. Unless action is taken, we are ignoring the risk to those who live in the floodplain and allowing them to believe that they are safe when they are not.

Thank you again for the opportunity to participate in this hearing.

¹ Interagency Floodplain Management Review Committee, Executive Office of the President. 1994. Sharing the Challenge: Floodplain Management into the 21st Century. Washington, GPO. (available at <http://www.floods.org/Publications/free.asp>)

² U.S. Army Corps of Engineers. 1995. Flood Plain Management Assessment of the Upper Mississippi and Lower Missouri Rivers and Their Tributaries. St Paul Engineer District, US Army Corps of Engineers
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³ NRC (National Research Council), Committee on America's Climate Choices. 2011. America's Climate Choices. Washington, DC: National Academies Press.

⁴ NRC (National Research Council), Committee on FEMA Flood Maps. 2009. Mapping the Zone. Washington, DC: National Academies Press.