Oct. 18, 2011

Hon. BARBARA BOXER, *Chair,*
Hon. JAMES INHOFE, *Ranking Member,*
U.S. Senate Committee on Environment and Public Works

Statement Submitted for the Record by Dr. Nicholas Pinter, Professor, Southern Illinois University for Hearings Entitled "A Review of the 2011 Floods and the Condition of the Nation's Flood Control Systems," before the Senate Environment and Public Works Committee, United States Senate, Washington DC, October 18, 2011.

Thank you Chairman Boxer, Ranking Member Inhofe and Members of the Senate Environment and Public Works Committee for holding these hearings and for the opportunity to provide these comments for the Commitee's record.

Madam Chairman, I am Nicholas Pinter, Professor of Geology and Environmental Resources and Policy at Southern Illinois University at Carbondale. In that capacity, I also serve as Director of the National Science Foundation-funded interdisciplinary doctoral program in Watershed Science and Policy. My research group has been working for more than 15 years on issues of river dynamics, flood hydrology, and floodplain management on large rivers in the U.S. and worldwide. Flooding this year again struck close to home, with all-time record flood peaks and extensive flood damage in the communities I serve along the Mississippi and Ohio Rivers of southern Illinois.

The spring and summer of 2011 have seen a sweeping range and number of disasters across the U.S. Flooding, in particular, has caused widespread damage along the Mississippi and Missouri Rivers as well as on rivers in New England and the Mid-Atlantic regions, and elsewhere in the country. These damages occurred despite past histories, studies, and measurements of flooding that span many decades to centuries and despite massive long-term investment in structural flood control and flood-risk mitigation in many areas.

A wide range of structural as well as non-structural flood-control strategies have been employed across the U.S. Although sometimes portrayed as systematic nationwide strategy, modification of our rivers and floodplains more typically represent a series of *ad hoc* experiments. The 2011 flood – and indeed every large U.S. flood – has shown that some of these experiments have been successes and some have been failures. Floods will strike

repeatedly in the future as they have this year and in the past, and how the nation fares depends very much on careful, objective, and critical evaluation of both the successes and failures during each and every flood.

When looking at the Mississippi, Missouri, and many other trunk rivers of the U.S., it is important to understand that these river systems have been so fundamentally altered that they are essentially man-made constructs. Their morphology and hydrology have little resemblance to those same rivers 100 to 200 years ago. Their channels have been narrowed to half or even a third of their natural size. Floodplains once tens of miles wide are now straight-jacketed into as little as one tenth of their original widths. My research group has compiled the largest database in the country, systematically documenting these changes for over 2500 miles of the Mississippi and Missouri and other rivers back in time 100 to 150+ years (a database now served up to all interested researchers by the U.S. Geological Survey). Strikingly, but perhaps not surprisingly, modern floods on these heavily modified rivers strongly and closely reflect the history and pattern of river and floodplain modifications – in places for the better, and elsewhere for the worse.

The focus of research in my lab for more than a decade has been to deconvolve the factors that make flooding larger or less severe, more or less frequent, and more damaging or less so over time. Such factors include storage of flood waters behind dams, runoff changes due to climate shifts and/or land-use change, floodplain protection by levees and floodwalls, changes in channel efficiency due to river navigation engineering, as well as broad questions regarding floodplain infrastructure and development. This research has been the subject of dozens of peer-reviewed scientific papers, but I will skip those details in favor of a few lessons clearly exemplified by the 2011 flooding.

One of the successes of the 2011 flood was the performance of the Lower Mississippi River flood-prevention system. The Lower Mississippi system was designed after catastrophic flooding 1927 by Gen. Edgar Jadwin, Chief Engineer of the U.S. Army Corps of Engineers. The "Jadwin Plan" raised and strengthened levees, added flood-control reservoirs on tributary streams, and designed bypass floodways. The mainline Mississippi levees constructed after 1927 were a major engineering success in 2011, holding even in areas where floods topped 1927 and 1937 record crests. The floodways designed by Jadwin also were successes during the 2011 flood. These floodways lowered flood levels by several feet and spared the population centers they were designed to protect. But unlike in the Bonnet Carre floodway, residents within the Birds Point-New Madrid floodway have built new structures, sought new development, and agitated and litigated against utilization of the floodway for its designed and authorized purpose. Birds Point residents and Missouri politicians have successfully pressured the Corps to wait longer and longer before activating the system, and flood levels in 2011 reached nearly 7 feet higher than Jadwin's original design and >1.7 feet higher than the current legal activation level before the Corps

crevassed the fuse levee at Birds Point to save Cairo, IL and other communities up to 40 miles upstream and downstream.

In contrast to river design and engineering on the Lower Mississippi, a sweeping failure was apparent upstream as the 2011 crest approached Cairo, IL. On that stretch of the Mississippi, the Corps has constructed thousands of river "training" structures to facilitate barge traffic. Those structures have had the unintended effect of raising flood levels up to 15 feet – an effect confirmed by extensive scientific research in the U.S. and internationally but denied by local Corps engineers who built these structures. Over 40,000 feet of "wing dikes" and "bendway weirs" were added to the river in the three years prior to the great flood of 1993 alone, contributing significantly to record crests in 1993, 1995, 2008, and again in 2011. The Corps continues to build new "training" structures today. The U.S. entrusts the management of U.S. rivers to its Army engineers, but this organization has a documented history of sometimes denying its own mistakes. By trumpeting both successes and failures as triumphs, regardless of their outcome, the Corps unfortunately guarantees that U.S. river management fails to improve over time.

Looking forward, climate research tells us that we need to prepare for even more intense precipitation in the future. When climate research in The Netherlands predicted a 12.5% increase in flood volumes later in the 21st century, the Dutch government responded with an aggressive and forward-thinking policy of "Room for the Rivers," investing heavily in giving rivers more room to safely convey flood flows. At present, the U.S. remains on the opposite path – continuing to constrict our river channels and allowing steady encroachment onto our floodplains. In a 2005 paper in the journal Science entitled "One step forward, two steps back on U.S. floodplains," I discussed how, within 5-10 years after the great Midwestern floods of 1993, floodplain construction had renewed with a vengeance, including over $2 billion in new infrastructure built in the St. Louis area alone on land that was under water in 1993. Despite safeguards of programs like the National Flood Insurance Program, local political and development interests manage to circumvent the spirit and often the letter of the law, leaving U.S. taxpayers on the hook for spiraling flood damages in the future.

But 2011 has brought signs of hope even on the seemingly intractable question of floodplain development. Near the confluence of the Mississippi and Ohio Rivers in southernmost Illinois, the town of Olive Branch was catastrophically flooded when its levee failed on May 2 of this year. The Olive Branch area has a population of just over 800 and is located in one of the most economically depressed areas of the state. After its levee broke, Mississippi River water swept in and inundated over 200 structures, many 6 feet deep or deeper. As of today, many of those structures remain uninhabitable, businesses have closed, mountains of sandbags litter the landscape, and many residents are still living with friends, relatives, and even illegally in the upper floors of condemned structures. Large

floods on the Ohio and/or Mississippi River have struck the area 19 times between 1844 and 2011, with the most severe flooding in 1927, 1937, 1973, and in 1993. This year, however, the residents of Olive Branch have pulled together and said, "enough is enough." The community has resolved to relocate to an all-new town site entirely up and off the floodplain. Southern Illinois University has been working with Olive Branch to plan its relocation and navigate the many bureaucratic, social, and economic hurdles that stand in its path. The grassroots support within the community has been remarkable, with over 90% of local property and business owners signing up for the Olive Branch buyout application to FEMA (an application with a benefit-to-cost ratio well above 5). Olive Branch is seeking to re-energize a process that has seen limited progress, and none at this scale, since the town of Valmeyer, IL moved off the floodplain in 1993. Valmeyer is 2 hours up the road, and its residents and leaders have been helping Olive Branch this year. Against a national backdrop of politicians and big-money developers putting ever more at-risk infrastructure onto floodplains elsewhere, these small town residents and leaders are doing the right thing, making "room for the river" and saving U.S. taxpayers the substantial costs of repeated disaster payouts. Olive Branch still faces numerous challenges in its plans, but its community spirit and common-sense wisdom about flood risk point to the correct future path for the U.S. as a whole.

Thank you for considering these concerns and recommendations.

Sincerely,

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