TESTIMONY OF DR. RICHARD C. ASTER,
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BEFORE THE SUBCOMMITTEE ON ENERGY AND NATURAL RESOURCES
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Chairman Lamborn, Ranking Member Holt, Members of the Subcommittee, thank you for inviting me to testify at this hearing on the mission of the U.S. Geological Survey (USGS) and the President's FY2012 budget proposal. I speak today on behalf of the Seismological Society of America (SSA), an international scientific society, founded in 1906, devoted to the advancement of seismology and its applications in understanding and mitigating earthquake hazards. SSA was founded to promote research in seismology, the scientific investigation of earthquakes and related phenomena, to promote public safety by all practical means, and to enlist the support of the people and the government in the attainment of these ends. SSA is the largest and most respected society of earthquake seismologists in the world and is aligned with numerous other scientific and engineering organizations to promote earthquake risk reduction worldwide.

The USGS is a science organization that provides impartial information on the health of our ecosystems and environment, the natural hazards that threaten us, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information. Some of the most important work of the Survey is accomplished within the new Natural Hazards Mission Area, which includes earthquakes, volcanoes, landslides and coastal and marine geology, amongst others. My focus in this testimony is on the USGS programs regarding earthquakes, and reflects concern about the reductions in the President's request for the Earthquake Hazards Program and the Global Seismographic Network.

While it might seem that earthquakes are confined to a small segment of the nation, the fact is earthquakes pose significant risk to 75 million Americans in 39 States. The USGS is the only Federal agency with responsibility for recording and continuously reporting earthquake activity nationwide and globally. The USGS, through its Earthquake Hazard Program, provides citizens, emergency responders, and engineers with the most accurate and timely information available from any source on where an earthquake occurred, how much the ground shook in different locations, immediate estimates on fatalities and economic, and on the likelihood is of future significant ground shaking. Because the seismic waves generated by earthquakes easily travel through the entire body of the earth, US Geological Survey rapid evaluations of earthquake size, damage, and other attributes, are the widely acknowledged worldwide standard for such information.

Earthquakes can generate destructive tsunamis that span international boundaries the same USGS seismographic monitoring system used for earthquake monitoring also provides vital information on tsunami generation, and is critical to informing tsunami warning systems operated by NOAA. Seismic monitoring and seismological science also provide key measurements of unrest on volcanoes, and are critical elements of the USGS Volcano Hazards Program that provides vital warnings to protect nearby populations and aviation.

The USGS is a world leader in earthquake science, data collection and dissemination. The global seismic monitoring systems supported by the USGS and its partners include two critical elements, the U.S.-based Advanced National Seismic System (ANSS; which has many components operated in association with U.S. universities) and the Global Seismographic Network. Additionally, USGS has the assigned Federal responsibility for monitoring and notification of seismic activity in the United States. The USGS fulfills this requirement via the ANSS. These seismic monitoring systems provide the fundamental and scientifically indispensible baseline information on the interior of the earth, and on its dynamic natural processes that drives scientific understanding and advance societal benefits. These networks are very efficient and cost effective data collection and processing systems; as was noted in the 2008-2009 USGS Director's Scientific Earthquake Studies Advisory Committee (SESAC), ANSS is the highest scoring major information technology capital investment made by the Department of the Interior. In the report, the top recommendation for the USGS to be able to continue to carry out its mission and continue to provide essential data products to dramatically lower earthquake effects, calls for the full funding of ANSS, (http://earthquake.usgs.gov/aboutus/sesac/reports.php).

At the forefront of the USGS' earthquake science capability is the National Earthquake Information Center (NEIC), located on the campus of the Colorado School of Mines in Golden, Colorado. The NEIC determines, as rapidly and as accurately as possible, the location and size of all significant earthquakes that occur worldwide. The NEIC disseminates this information immediately to concerned national and international agencies, scientists, critical facilities, and the general public. NEIC also collects and provides to scientists and to the public an extensive seismic database that serves as a solid foundation for scientific research, principally through the operation of modern digital national and global seismograph networks and through cooperative international agreements. The NEIC is the U.S. national data center and archive for earthquake information. As a research facility, the NEIC pursues an active program to improve its ability to locate earthquakes and to understand earthquake physics, geology, and effects.

To not only survive a strong earthquake, but to be able to thrive afterwards, is a function of the size of the earthquake, its proximity to densely populated areas, and the construction of the buildings affected by the quake. To this end, science directs the essential operation of networks of sensitive seismographs that provide the core data for the detection and rapid assessment of earthquakes, and the more detailed analyses that follow. Additionally, science directs research into the nature of the geological processes involved and impacts on people and infrastructure. Science is employed to

inform every recommendation to building codes to create more earthquake resilient buildings. Earthquake science and engineering saves lives, and the USGS is a cornerstone of US world leadership in this area.

A sobering issue facing the U.S. (as well as many other nations) is the increasing exposure to strong earthquake ground motion from earthquakes as the world economy and population grows, and the necessity of mitigating this hazard. USGS National Seismic Hazard Maps form the baseline probabilistic estimates for mitigation in the U.S.

In a poorly designed and built environment, the results of poor building practices can be catastrophic. A recent example of a too common situation worldwide is the January 12, 2010 Haiti earthquake, which claimed over 230,000 lives. The earthquake was magnitude 7, and events of this size occur roughly 20 times per year somewhere on earth. However, the Haiti earthquake struck a woefully unprepared nation and city with no seismic building codes, and the result has been tremendous loss of life, civic devastation, and severe societal disruption. A stunning counterexample to the devastation of the Haiti earthquake was the magnitude 8.8 Chile earthquake of February 27, 2010. This earthquake shook a much larger area than the Haiti earthquake (and released approximately 500 times more seismic energy), but resulted in approximately 500 fatalities, which is 0.2% of the number of fatalities in Haiti. Chile has building codes that compare favorably with high-risk regions of the U.S.

However, our record of strong ground motion recordings and scientific studies of damaged cities is highly incomplete, and we are far from fully understanding or acting on the threats posed to society by earthquakes. This is tragically demonstrated by recent events in New Zealand, which has similar building codes to those of high-risk regions of the U.S. A shallow earthquake of approximately the same size as the Haiti earthquake struck near New Zealand's second largest city, Christchurch, on September 3, 2010, and resulted in not one fatality. On February 21st of this year, as the city was still recovering from the 2010 event, a moderate-sized (magnitude 6.3) earthquake again struck Christchurch. This event was much closer to the city center than the 2010 magnitude 7 event, and produced unexpectedly (near record) accelerations exceeding 1.8 times that of gravity. The result was widespread destruction within the city, and the number of fatalities is expected to exceed 250. The shaking was so extreme during this earthquake that it is likely that a third or more of the major business district buildings will be total losses. The experience of this February's Christchurch earthquake tragically informs us that there is still much to learn through further research and forensic engineering about the potential for extreme ground motions and about their effects on the built environment. It is noteworthy that there is no scientific reason not to expect that shallow, high-acceleration earthquakes similar to the most recent Christchurch event cannot occur beneath cities in a number of seismically active regions of the United States, including Alaska, California, the Pacific Northwest, the intermountain west, and the Central US.

The USGS plays a critical role in earthquake preparedness and planning by working with communities to develop earthquake scenarios and exercises. Earthquake scenarios provide a means to visualize community impacts from earthquakes without actually having the event occur. Scenarios provide a basis for communities to define

their own level of acceptable level of risk and develop risk-reduction policies. Scenarios help answer questions like “Have we done enough?” and enable communities to identify appropriate actions to reduce their level of risk.

With the success of the Great Southern California ShakeOut in California in 2008, a scenario which simulated a 7.8 magnitude earthquake in Southern California and had a record 5 million participants statewide (repeated in 2009 and 2010 with 7 million and 8 million participants, respectively), other communities have taken the opportunity to increase awareness for earthquake hazards and implement their own “ShakeOut” operations. The Great Central US ShakeOut, scheduled for 10:15am on April 28, capitalizes on the bicentennial of the large New Madrid, Missouri, earthquakes of 1811-1812 to raise public awareness of earthquake hazards in the heartland and increase preparedness. The Central US ShakeOut encompasses 11 states (IL, IN, MO, KY, TN, OK, AR, MS, AL, GA, and SC) and already has 850,000 registered participants. Exercises of this scale aim to incorporate all levels of the community, from schools, to businesses to government, and highlight the appropriate steps to take to prepare for an earthquake and remain safe if an earthquake strikes.

In addition to activities performed by USGS staff, expertise in earthquake studies that exist outside the federal government is applied through a substantial program of grants, cooperative agreements and/or contracts with universities, state, regional and local government agencies, and private industry. Targeted research funding through the earthquake grants program has been key to the development of the USGS Seismic hazards maps, urban seismic hazards maps and the National Earthquake Information Center’s rapid response products used by emergency personnel and key decision makers to allocate emergency resources in the event of an earthquake. The President’s FY2012 budget calls for a $2 million cut to the External Research component of the Earthquake Hazards Program. This proposed cut eliminates 1/3 of the funding provided by Earthquake Hazards Program for competitive, peer-reviewed, external earthquake research grants and cooperative agreements with State governments, the academic community, and the private sector.

Proposed cuts to external grants and other programs would directly impact:

- The continued development of national and urban seismic maps that inform planners, builders, governments, and citizens.
- The operation of the Global Seismographic Network
- Cooperative agreements between the USGS and University and State partners in support of a prototype Earthquake Early Warning System in California that can provide up to tens of seconds of warning to areas of high vulnerability *before* strong ground motion begins.
- State geological survey mapping in support of earthquake loss reduction in the New Madrid Seismic Zone, a highly vulnerable region of the nation’s midsection that has experienced strong earthquakes.

- The use of LiDAR in the Pacific Northwest to identify faults under heavily forested landscapes, an activity that will greatly expand our understanding of the shallow earthquake hazard of that region.
- The Southern San Andreas Fault Evaluation project at the Southern California Earthquake Center, a 40-institution research consortium that the USGS funds in partnership with the National Science Foundation to better understand the timing and slip, and the attendant seismic hazard, of the San Andreas fault system.
- Critical funding for graduate students, postdoctoral researchers, and other young scientists necessary to maintain U.S. preeminence in this field, and to advance mitigation of earthquakes hazards in the U.S.

CONCLUSION

The USGS is a U.S. and world-leading science and science-driven agency dedicated to the furtherance of the understanding of our planet, its resources and how to best live and thrive on it. The USGS is an essential agency in ensuring that basic science results in applications that save lives.

In these difficult economic times, when budget decisions aren't between what to fund and what not to fund, but are instead centered on what to cut and what not to cut, we can't lose sight of the incredible progress that science has made to the nation and do all we can to ensure we continue to invest in science. The budget cuts proposed in the President's FY2012 budget hamstring core science programs within the Hazards Programs at the USGS, and undercut investment in future scientists that we hope will continue to both advance our scientific understanding and protect society from earthquakes. The students lost, the relationships severed, the data not obtained due to these cuts, cannot easily be reclaimed in the future. We ask this Committee to reconsider these cuts and press for restoration of the funding needed for the USGS to continue these valuable science and public safety programs.

Mister Chairman, this concludes my remarks. I will be pleased to answer any questions you or the subcommittee may have at this time.