



# The FEMA National Earthquake Hazards Reduction Program

Accomplishments in Fiscal Year 2014



FEMA

## **Cover Photo**

*Napa, California, August 24, 2014 -- This building was damaged by the magnitude 6.0 that struck Napa and is in dangerous condition, resulting in a fenced off street and closed businesses in the area. Photo by Eilis Maynard, FEMA.*

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## I. Overview

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The National Earthquake Hazards Reduction Program (NEHRP), which was first authorized by Congress in 1977, coordinates the earthquake-related activities of the Federal Government. The goal of NEHRP is to mitigate earthquake losses in the United States through basic and directed research and implementation activities in the fields of earthquake science and engineering.



The four NEHRP federal agencies are the Federal Emergency Management Agency (FEMA), the National Institute of Standards and Technology (NIST), which is the lead agency, the National Science Foundation (NSF), and the United States Geological Survey (USGS). Under NEHRP, FEMA is responsible for developing effective earthquake risk reduction tools and promoting their implementation, as well as supporting the development of disaster-resistant building codes and standards. FEMA's NEHRP activities are led by the FEMA Headquarters (HQ), Federal Insurance and Mitigation Administration, Risk Reduction Division, Building Science Branch, in strong partnership with other FEMA HQ Directorates,

and in coordination with the FEMA Regions, the States, the earthquake consortia, and other public and private partners.

This report describes selected FEMA NEHRP accomplishments (HQ and Regional), followed by highlights from the States and U.S. territories and organizations which used FEMA support for NEHRP activities. Organizations receiving FEMA support include the four regional earthquake consortia - Cascadia Region Earthquake Workgroup (CREW), Central United States Earthquake Consortium (CUSEC), Northeast States Emergency Consortium (NESEC), and the Western States Seismic Policy Council (WSSPC) – as well as the Earthquake Engineering Research Institute (EERI), the Federal Alliance for Safe Homes, Inc. (FLASH), Outreach Process Partners, LLC (OPP), and the Southern California Earthquake Center (SCEC).

The accomplishments described in this report showcase how FEMA and its partners, working in collaboration, continue to make progress toward earthquake loss-reduction nationwide. Much of the work completed in FY 2014 is helping to reduce earthquake risk, and serving as the foundation for realizing effective long-term outcomes.

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## II. FEMA Headquarters and the FEMA Regions

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### Building Codes

The most important factor in reducing a community's risk from an earthquake is the adoption and enforcement of up-to-date building codes. Evaluating older buildings and retrofitting structural and non-structural components are critical steps. To survive and remain resilient, communities must also strengthen their core infrastructure and critical facilities so that these can withstand an earthquake or other disaster and continue to provide essential services. For many years, FEMA has supported seismic code development and promoted the adoption and enforcement of seismic codes through its participation in NEHRP.

### **Support for the 2015 International Codes Process**

The Building Science Branch helps to promote disaster-resilient communities through its support of national building code and standards organizations such as the International Code Council (ICC). This work is an important part of FEMA's overall mission to help the Nation prepare for and protect against natural and man-made hazards that pose a threat to life and property.

First released in 2000, the International Codes (I-Codes) are a set of construction codes that address building, fire, plumbing, mechanical, fuel gas, property maintenance, zoning, and energy efficiency. The 2015 I-Codes reflect the most advanced building science construction methods and practices to achieve resiliency, safety, innovation, and affordability in the built environment.

The Building Science Branch monitors the Nation's model building codes by reviewing proposed changes for the International Codes



*2015 IBC® and the Significant Changes to the IBC®, 2015 Edition.*

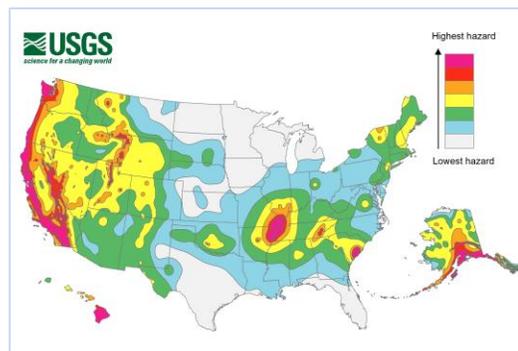
(International Building Code (IBC), International Residential Code (IRC), International Existing Building Code (IEBC), and others) to identify those which have a positive or negative impact on disaster resistance building performance. In FY 2014, Branch staff testified at code hearings to obtain favorable outcomes for those changes resulting in no loss of overall earthquake, flood, or wind-related disaster resistance provisions of the relevant I-Codes (including their equivalence with the minimum NEHRP Recommended Seismic Provisions). For the 2015 I-Codes, FEMA seismic-related testimonies had a success rate of more than 90 percent.

### **Updates in the 2015 NEHRP Recommended Seismic Provisions**

The NEHRP Recommended Seismic Provisions for New Buildings and Other Structures is a widely recognized seismic code resource document from FEMA. Since 1985, the NEHRP Provisions have played an important supporting role to national building codes and standards. The NEHRP Provisions serve as a research-to-practice platform for NEHRP, both in the

implementation of research results and as support for our most important and effective earthquake protection tool – earthquake resistant building codes. When States and communities adopt and enforce current national building codes, the built-in protection against loss of life and property damage from earthquakes helps to achieve NEHRP goals. This is the foundation for FEMA’s 30-year commitment to the NEHRP Provisions.

This role continues with the 2015 edition of the NEHRP Provisions as a seismic code resource focused on translating new research results for improving the ASEC/SEI 7 Minimum Design Loads for Buildings and Other Structures, now the national design standard that is directly referenced by the IBC – the model code adopted by all 50 States and most local communities. The new Provisions will provide more than 40 recommended technical changes developed and consensually approved by the Provisions Update Committee, Issue Teams, and member organizations of the Building Seismic Safety Council (BSSC). The major changes include a complete rewrite of seismic-response-history procedures, revised soil structure interaction for seismic design, a new alternative diaphragm design procedure, revised design requirements for seismically isolated structures and structures with damping systems, updated site coefficients and new requirements for foundations on liquefiable sites, adoption of new U.S. Geological Survey (USGS) seismic hazard maps for seismic design, strength design of foundations, update of modal analysis procedure, adoption of methodologies as alternatives for seismic qualification of new systems and components, and a revision of the intent of the Provisions. All of these changes will also be brought to the ASCE 7 Seismic Subcommittee to be considered for adoption into ASCE 7-16. The tentative FEMA publication date for the 2015 NEHRP Provisions is mid-2015.



2014 United States Geological Survey  
Seismic Hazard Map.

### **Promoting and Monitoring the Adoption of Building Codes**

The Branch promotes building code adoption in partnership with the ICC, standards groups, the design industry, and research institutes and through cooperative agreements with the Federal Alliance for Safe Homes (FLASH), the four Regional earthquake consortia, and the Earthquake Engineering Research Institute (EERI). Branch staff also works with other FEMA programs to integrate building codes and standards in the NFIP, as well into Grants policies and requirements.

The Branch uses the Building Code Effectiveness Grading Schedule, a tool owned by the Insurance Services Organization, to evaluate and score local building code departments on code adoption and enforcement for insurance credit every five years. FEMA has purchased the use of the data to track the rate of code adoption and report performance to FEMA, the Department of Homeland Security, and the Office of Management and Budget. A performance goal for the Branch is to increase the percent of communities in hazard-prone areas (earthquake, flood, and wind) that have adopted disaster-resistant building codes. In FY 2013, 57 percent of the communities in high-earthquake-, flood-, and wind-prone areas had adopted disaster-resistant building codes equivalent to the I-Codes. By FY 2014, this

percentage had increased to more than 60 percent.

### ***South Napa Earthquake***

At 3:20 a.m. on August 24, 2014, a magnitude 6.0 earthquake struck Napa Valley, California. Within hours, teams of researchers had gathered in donated rooms at a CalTrans field office to begin capturing data on the earthquake before it could be lost. An analysis of the data and subsequent findings will be further studied to help understand the failures in structures and infrastructure caused by the earthquake. FEMA supported the earthquake clearinghouse through its cooperative agreement with EERI. The clearinghouse was led by the California Geological Survey and EERI and included the USGS, the California Seismic Safety Commission, and the California Office of Emergency Services.



*Napa, Calif., August 24, 2014 -- This house suffered severe damage after an earthquake shook up Napa, California. Building inspectors are going door to door assessing damage done to homes and businesses in the city to ensure that residents stay safe from falling debris and unstable structures.*

Since the FEMA MAT program is not currently set up to handle earthquakes, FEMA's investigation of the South Napa earthquake is being done under a special project using ATC, funded by FEMA's NETAP. ATC is using data from a USGS strong-motion recording instrument located in downtown Napa to investigate every building within a 1,000 foot

radius, along with several other buildings of interest, and is using the ATC-38 methodology to compare their performance to the known ground motion and document mitigation performance. This data will be used to evaluate the performance of seismic retrofitting techniques used on several unreinforced masonry structures as well as non-structural components, which were responsible for the vast majority of damage and injuries. The data will also be used to help validate the new FEMA P-58, *Seismic Performance Assessment of Buildings*, and FEMA P-154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards*.

### **New Guidance and Tools**

The FEMA Building Science Branch owns the majority of the agency's publication portfolio, managing more than 220 multi-hazard publications for a variety of stakeholders, including homeowners, businesses, schools, non-profit groups, governmental and non-governmental organizations, engineering and design professionals, and building code officials. In FY 2014, more than 170,000 Branch publications were distributed to FEMA customers nationwide.

FEMA staff also published papers in conference proceedings; developed numerous flyers, web pages, guides and fact sheets to assist State and local officials, homeowners, design and construction professionals, and the public; and authored articles in technical and industry journals. FEMA earthquake publications are made available through the FEMA Publications Warehouse and online on [www.fema.gov](http://www.fema.gov). In FY 2014, the FEMA Building Science Branch produced more than eight new or revised earthquake publications and guidance, some of which are described below.

## **Reducing the Risks of Nonstructural Earthquake Damage**

The August 24, 2014 South Napa earthquake again demonstrated the seismic risk posed by a building's nonstructural components. In general, the components of a building's structural system that support the building and keep it standing – the frame, walls and roof – performed well in the South Napa earthquake. However, the nonstructural components of a building – the cladding, interior walls, ceilings, utilities and contents – were responsible for more than 90 percent of the damage.

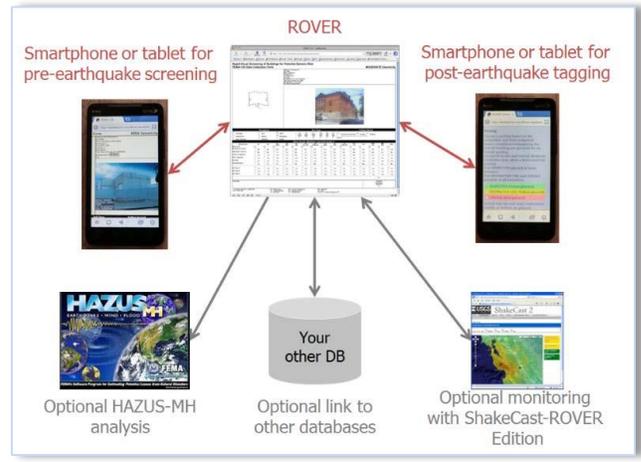
In 2014, FEMA completed an updated, interactive fourth edition of FEMA E-74, designed primarily for online use. FEMA E-74 includes information on the behavior of nonstructural components in earthquakes and the consequences of damage; survey and assessment procedures for nonstructural components in existing buildings; nonstructural hazard reduction programs for existing buildings and new construction; and detailed illustrations of possible earthquake damage and mitigation measures for a variety of nonstructural components. The updated fourth edition covers about 70 different examples of nonstructural components, compared to about 12 examples in the previous edition, and incorporates examples from three major earthquakes in Chile, New Zealand and Japan.

The new FEMA E-74 CD also includes the PDF version of FEMA E-74 and a training resource developed by ATC: instructor and student materials for 4- to 5-hour live training classes. This past year, thousands have been trained in FEMA E-74 via webinars and In-person training classes.

### **New ROVER 2 Software**

This year, FEMA released Version 2 of *Rapid Observation of Vulnerability and Estimation of Risk* (FEMA P-154 ROVER 2 CD), a free, mobile

software for pre-earthquake building screening for potential seismic hazards and post-earthquake rapid building evaluation for safe occupancy. ROVER uses the *de facto* international paper-and-clipboard standards developed by ATC: FEMA 154, *Rapid Visual Screening of Buildings for Potential Seismic*



*ROVER resides on a Windows or other web-accessible PC. Engineers, architects, and building professionals collect field data about buildings via a smartphone, tablet, or other mobile device with a data connection, via the device's web browser.*

*Hazards, A Handbook, 2nd Edition, and ATC-20-1 Field Manual: Postearthquake Safety Evaluation of Buildings, 2nd Edition.*

The new ROVER Version 2 includes many productivity-enhancing features. The updated software suite now works on any mobile device, such as Android, iPhone, iPad, and Windows Phone, with a web browser and active data connection. Version 2 requires no software on the mobile device other than a web browser and allows the user to transmit field data immediately to the software, which can reside in the user's office or virtually anywhere in the world. Version 2 also adds unlimited photos to the ATC-20 rapid and detailed post-earthquake forms. When a building that has been screened before an earthquake is evaluated after an earthquake using ATC-20, ROVER puts overlapping data in

the ATC-20 form: address, occupancy, number of stories and pre-earthquake photos.

The new ROVER Version 2 also improves photo handling, which is useful for high-resolution images, limited data rates and when large numbers of people are inserting data at the same time. In addition, the training material and user manual have both been updated and now include instructions on batch-loading a pre-existing database and instructions on the use of the RedROVER software, which exports ROVER data to Hazus-MH's Advanced Engineering Building Module. Additional guidance has been developed on how to get "ROVER Ready," i.e., how to be prepared to use ROVER either before or after an earthquake.

### ***Supporting Materials for the Current NEHRP Provisions***

An electronic product published in September 2014, *2009 NEHRP Recommended Seismic Provisions for New Buildings and Other Structures: A Compendium*, FEMA P-753 DVD, provides a convenient media designed to meet the broad needs and interests for the current edition of the NEHRP Provisions and its supporting documents. In addition to the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, 2009 Edition*, FEMA P-750, the new DVD includes the *2009 NEHRP Recommended Seismic Provisions: Design Examples*, FEMA P-751 CD, *2009 NEHRP Recommended Seismic Provisions: Training and*

*Instructional Materials*, FEMA P-752 CD, and the seismic design maps used in current ASCE/SEI 7-10 and IBC 2012 and IRC 2012.

### ***Updated Directory of Partners***

Developing and strengthening partnerships for building safer communities underlies all of the initiatives and activities carried out by FEMA in support of NEHRP. In 2014, FEMA updated its *Directory of FEMA Earthquake Partners*, an online resource that supports those partnerships by providing contact information for more than 300 organizations and individuals involved in earthquake mitigation.

### ***Customer Satisfaction Survey Results***

In 2012 and 2013, two customer surveys were performed jointly by CFI Group and Federal Consulting Group of the Department of the Interior to assess overall customer experience and satisfaction (value, use and other related activities) with the Branch's publications. The strong overall customer satisfaction scores of 82 and 84 found in the surveys are significantly higher than the average score of 67 for the services and products of other Federal agencies. In 2014, year 3 of the survey, the study focused on 18 non-technical publications. The survey results include the following:

- For the third year in a row, overall satisfaction among Branch customers was rated exceptional. In 2014, those who ordered at least 1 of the 18 publications posted a Customer Satisfaction Index (CSI) score of 83, a full 16 points above the overall government CSI score.
- CSI driver scores continue to perform at exceptional levels, with customers registering very favorable perceptions of Printing and Technical Quality,



Ordering Process, Technical Content and Value.

- Satisfaction with Branch publications is high across customers of all educational levels, as well as across different types of actions taken.

The survey project also provides data on where (by State and U.S. Territory) Building Science Branch resources are ordered by declared disasters.

### **New and Revised Earthquake Publications and Guidance**

- *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, Fourth Edition, FEMA E-74 CD, December 2012, printed August 2014
- *ROVER Version 2*, FEMA P-154 ROVER CD, September 2014
- *Homebuilders Guide to Earthquake Resistant Design and Construction*, FEMA P-232 CD, June 2006, printed May 2014
- *Evaluation of Earthquake Damaged Concrete and Masonry Walls*, FEMA 306/307/308 CD, May 1999, printed May 2014
- *Earthquake Home Hazard Hunt Poster*, FEMA V-528, September 2014
- *Drop, Cover and Hold On Poster* (English and Spanish Editions), FEMA V-529, September 2014
- *NEHRP Recommended Seismic Provisions for New and Existing Buildings: A Compendium*, FEMA P-753 DVD, September 2014
- *Home and Business Earthquake Safety and Mitigation: A Train-the-Trainer Course*, FEMA P-909 CD, June 2014
- *Multi-hazard Mitigation and Design Concepts: Wind, Flood, and Earthquake*

*Training Videos*, FEMA P-940 CD, March 2014

### **Outreach and Awareness**

Awareness and education campaigns, public messaging, and other outreach activities are essential tools for the FEMA mission to help the public prepare for and protect against natural disasters. FEMA conducts and supports a broad range of outreach activities for many audiences, from awareness day events and workshops at home building supply stores to Home Hazard Hunt interactive games for kids. Each year, FEMA also exhibits and presents at numerous hazard-related conferences and expositions across the United States. Some of the FEMA NEHRP outreach programs are described below.

### **National Building Safety Month**

National Building Safety Month is a public awareness campaign held each May for the last 34 years. Founded by the ICC, the Building Safety Month campaign focuses on public outreach and education to increase the overall safety and sustainability of buildings through the adoption of modern building codes and the promotion of code enforcement. For the 2014 Building Safety Month, FEMA hosted



community events and conducted an array of outreach activities in support of the 2014 theme, "Building Safety: Maximizing Resilience, Minimizing Risks."

Beginning in May 2014, FEMA supported the “Designing for Disaster” exhibition at the National Building Museum in Washington, D.C. The exhibition, which runs through August 2015, investigates how and where to build communities that are safer and more disaster-resilient. Activities at the National Building Museum sponsored by FEMA included the distribution of teaching kits to educators from the District of Columbia, Maryland, and Virginia during workshops in August. The kit teaches students in grades 7-9 about the tools used by design professionals to lessen the effects of natural disasters on structures, communities, and people.

A Presidential Proclamation for Building Safety Month was issued for the fourth time in 2014. The Building Science Branch championed the original effort for a Proclamation, which emphasized that building safety is a critical component of personal and public safety, and the collective responsibility of the Nation to implement effective codes and standards to sustain safe and resilient structures.

### ***ShakeOut***

On October 17, 2013, at 10:17 a.m. local time, more than 20 million people around the world participated in *Great ShakeOut Earthquake Drills*, an annual event held since 2008 to promote earthquake readiness by practicing “Drop, Cover and Hold On” and other aspects of emergency plans. In 2013, 44 States and U.S. Territories were officially involved, with 20 states/territories involved for the first time (American Samoa, CNMI, Delaware, Hawaii, West Virginia, USVI, and nine states of the Northeast).

The success of ShakeOut is due in part to direct financial support from FEMA NEHRP and the very active involvement and support from FEMA Preparedness, Regional staff, SCEC (as lead ShakeOut organizer globally), the

Earthquake Country Alliance, the USGS, the four Regional earthquake consortia, State Earthquake Program Managers, the private sector and many others. All FEMA Regional offices and FEMA Headquarters participated in ShakeOut this year.



*FEMA Corps members demonstrated the “Drop, Cover, Hold On” drill at the National Building Museum in Washington, DC.*

### ***20<sup>th</sup> Anniversary of the Northridge Earthquake***

In January 2014, FEMA participated in the Northridge 20 Symposium commemorating the 20<sup>th</sup> anniversary of the Northridge earthquake. Branch staff served on the Symposium Organizing Committee, co-organized and co-moderated the Wood Frame and Soft Story Buildings Session. The Symposium featured eight presentations on FEMA products and related work. Staff exhibited at the Symposium and distributed several hundred FEMA publications. FEMA Headquarters and Regional staff also participated in many other conferences and workshops, including the July 2014 10<sup>th</sup> National Conference on Earthquake Engineering, held in conjunction with the EERI Annual Meeting which commemorated the 50-year anniversary of the 1964 Alaska earthquake and tsunami. Staff served on the Conference Organizing Committee and moderated a Plenary Session on Mega-Disasters: Planning and Design for An Unsettled Planet, and a concurrent session on Tsunami Risk

Assessment, which featured four talks on the new FEMA Tsunami HAZUS module. The Symposium featured 12 presentations on FEMA products and related work. FEMA also shared a display booth with ATC and distributed its new popular Earthquake Program flash drives and hundreds of FEMA publications.

### **Cooperative Agreements**

FEMA works in close partnership with the States and organizations such as EERI, FLASH, SCEC and the four Regional earthquake consortia: NESEC, CUSEC, WSSPC, and CREW. The earthquake consortia are long-time partners of FEMA and play an invaluable role in coordinating multi-State response and recovery planning and in public awareness, education, and outreach. The consortia are also very active partners in the ShakeOut earthquake drills that take place across the United States.

An important focus of these cooperative agreements in FY 2014 was support to the States (see Section III of this report). FEMA coordinates with these grantees to help carry out local and Regional earthquake risk reduction, including mitigation planning, property inventory and inspection of critical facilities, updating building codes and zoning ordinances, outreach and education, and the development of multi-State groups in support of local earthquake and other multi-hazard initiatives.

### **Training**

FEMA is continually developing and updating training courses for its many audiences, conducting training in venues across the United States and via webinars, and sponsoring and hosting training. Training conducted, hosted or sponsored by FEMA NEHRP in FY 2014 reached more than 5,000 constituents. More constituents were trained independently through educational training tools developed by the Branch, such as *Multi-hazard Mitigation*

*and Design Concepts: Wind, Flood, and Earthquake Training Videos*, FEMA P-940 CD, March 2014, and *Home and Business Earthquake Safety and Mitigation*, FEMA P-909 CD, June 2014.



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*Multi-hazard Mitigation and Design Concepts: Wind, Flood, and Earthquake Training Videos*, FEMA P-940 CD.

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### **The National Earthquake Technical Assistance Program**

Through NETAP, the Branch supports training in earthquake mitigation topics at the State and local level. The courses are conducted by ATC, under contract to FEMA, and are designed for State and local building personnel, facilities managers, and other groups. Training topics are related to the mitigation of earthquake risk and include ATC-20, FEMA 154, FEMA E-74, FEMA P-646, FEMA P-807, and FEMA P-154 ROVER. NETAP-supported training is provided on site, with courses typically one day or less in duration, and via webinars. In FY 2014, in-person training was provided through NETAP via 80 courses to participants in 14 States and U.S. Territories.

### **Other Earthquake Training**

FEMA also supported earthquake training through its cooperative agreements with the four earthquake consortia. For example, CUSEC worked with FEMA and other partners, including the Insurance Institute for Business & Home Safety (IBHS), FLASH, and local emergency management, to develop and host a

Building Code Public Forum in October 2013 for approximately 80 local officials and public and building design professionals. Speakers included representatives from FLASH, IBHS, New Zealand, local government, the private sector, and CUSEC. Under contract with EERI, the Branch also sponsored four technical education seminars on Next Generation Attenuation (NGA) for Seismic Mapping in the West. The seminars were done in conjunction with the Pacific Earthquake Engineering Research Center, and were held in Salt Lake City, Long Beach, Seattle and San Francisco in November 2013.

## Regional Activities

The FEMA HQ staff works closely with their counterparts at the Regional level to support effective partnerships with the States and local communities to implement and execute NEHRP and multi-hazard risk reduction activities. On a day-to-day basis, FEMA Regional partners support local outreach, training delivery through NETAP and other venues, oversight and execution of cooperative agreements, disaster operations, and technical assistance on local projects. Their active involvement and support ensures that the NEHRP mission, building codes, standards and other building science principles are integrated in local mitigation planning, grant decisions, and other local activities.

In April 2014, FEMA HQ and Regional staff gathered in Denver with State earthquake program managers for the 2014 NEPM meeting. This important event, held every year, is largely a result of the commitment of FEMA



NEHRP, the States, and their partners. As in previous years, the NEPM provided an excellent venue for sharing knowledge, expertise, and best practices. Some of the activities carried out by the FEMA Regions in FY 2014 are described below.

In addition to ShakeOut, **Region I** held two NETAP trainings and emergency management sessions, and presented on earthquakes at a May 2014 conference hosted by the University of Massachusetts-Boston Center for Rebuilding Sustainable Communities after Disasters. EERI also started up a New England Chapter in 2014, which is great news for Region I.

In **Region II, Caribbean Area Division (CAD)**, a ShakeOut web page for the Virgin Islands was completed and Puerto Rico hosted a ShakeOut press conference with the FEMA CAD Director. The January 13, 2014 6.4 magnitude earthquake in San Juan generated a significant demand for earthquake awareness and outreach materials. In response to the earthquake, a Region II CAD monthly newsletter was devoted to earthquakes.

In 2014, the Catastrophic Plan for earthquakes in Puerto Rico was revised and the annual LANTEC exercise took place on March 26, 2014, at 10:05 a.m. As in previous years, Puerto Rico participated in the exercise.

In **Region III**, increasing state participation in ShakeOut was a tremendous effort and accomplishment. A new ShakeOut region, the Great NorthEast ShakeOut had 302,247 participants.

Although the primary hazard in Region III is flooding, earthquakes are now being recognized, in large part as a result of the August 2011 Mineral, Virginia earthquake. In March 2015, Region III will hold a meeting to evaluate earthquake risk assessment in the

Washington, D.C. and Maryland State Plans and provide recommendations, where required. This action comes about to instill a connection between the earthquake program and State Plans scheduled for review.

**Region IV** worked on a South Carolina ROVER project and a seismic safety for schools project. Volunteers from the Citadel in South Carolina coordinated with FEMA officials on a non-structural mitigation project that was rolled out in July. Other work in South Carolina included NETAP training for building inspectors (ATC-20/FEMA 154/ROVER, FEMA P-909, and FEMA E-74) and a week of school inventory work in Charleston County using ROVER. A summary best practices SOP for the ROVER project is being developed for the other FEMA Regions. In addition, successful outreach work was conducted in the southern Appalachian part of Alabama.

In 2014, **Region V** moved forward with ShakeOut activities. Illinois staff worked on a NETAP training class in suburban Chicago in January 2014, and there were ongoing response preparations in Indiana and Illinois and work on earthquake assessment teams.



**Region VI** collaborated with Preparedness staff on ShakeOut, with a focus on increasing school participation and generating publicity through newspapers. FEMA HQ staff presented on the Building Science role in NEHRP at the earthquake conference held in Dallas in February 2014.

ATC-20/FEMA 154 training was held on July 20 and July 25, 2014 in Arkansas and on June 10-

11 in Oklahoma. In addition, an outreach webinar on earthquakes and how to prepare for them for the general public was developed by FEMA, the USGS, CUSEC, and Oklahoma.

In **Region VII**, Missouri hosted an earthquake exhibit at the 2013 conference of the Missouri School Boards Association (October 3-6, 2013) and Regional staff presented at the Missouri Association for Museums and Archives on FEMA emergency mitigation and planning.

Regional staff worked with staff from Missouri and FLASH on the QuakeSmart Business Summit to coincide with the New Madrid Earthquake anniversary in February 2015. The event drew more than 100 attendees who were introduced to the QuakeSmart Business Toolkit (FEMA P-811) and the QuakeSmart Community Resilience Program.

The third Central United States ShakeOut was held on February 7th, to commemorate the bicentennial of the 1812 New Madrid earthquake. The drill spanned nine states with more than 2.9 million participants.

An important **Region VIII** activity was the “Fix the Bricks” campaign in Salt Lake City. One of the campaign events was a street fair in The Avenues neighborhood in Salt Lake City where most of the unreinforced masonry (URM) buildings are located. A YouTube video was produced by Region VIII staff for the campaign and the Structural Engineers Association of Utah completed an updated URM Guide for Homeowners.

Utah held its second Great Utah ShakeOut on April 17, 2013. Other activities and events of note in Utah included the passage of legislation related to the seismic safety of schools built before 1975, Hazard Mitigation Grant Program (HMGP) funding for a liquefaction project for Salt Lake County, and development of a trailer

with a Shake Table for middle schools and high schools.

Region VIII staff provided the FEMA briefing at the 2014 WSSPC Annual Meeting in Anchorage, Alaska. Staff also visited EERI in September with a Geo Platform expert to discuss the publication of Visio information on the Platform.

In **Region IX**, NETAP training was held in the Commonwealth of the Northern Mariana Islands, Hawaii, Guam, and Nevada. On March 5, Regional staff participated in a FEMA P-807 webinar and attended a Whole Community Preparedness Workshop in Region IX offices in April.

Region IX staff participated in the Cascadia Subduction Zone functional exercise on May 14, along with British Columbia, Washington, and Oregon, and attended a Steering

Committee meeting of California Earthquake Early Warning System. This work and project materials should have national applications and implications. In addition, staff attended a joint Nevada Seismic Council and the California Seismic Safety Commission meeting in August 2014. A topic on the agenda was the geology and paleo features of historic earthquakes on the California-Nevada border.

In addition to NETAP training, the **Region X** Preparedness Directorate helped support a 5-K Tsunami Fun Run in Canon Beach, Oregon at the end of September. The event, which is new to Region X and is coordinated by Oregon staff, featured exhibit booths and T-shirts and was aligned with NETAP training.

### III. FEMA Earthquake Assistance to the States and U.S. Territories

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#### ***Region I***

##### ***Maine***

In Maine FEMA 154 data (from Rapid Visual Screening for Buildings) was collected by student interns over the course of two summers. The students were trained on FEMA P-154 and provided electronic devices to record data. They coordinated with county and local officials, visited all jurisdictions in Maine, and collected data on critical public buildings in each. They then uploaded the data into a database, which was subsequently retrieved and used by NESEC to analyze potential damages statewide (Maine) using HAZUS. Lastly, analyses of the data were briefed by NESEC to the Director of the State Emergency Management Agency.

##### ***Vermont***

Vermont activities included the completion of soils mapping for the risk analysis project, planning for mitigation outreach, as well as the completion of NETAP training in November.

#### ***Region II and Region II Caribbean Area Division (CAD)***

##### ***New York***

New York did not receive earthquake assistance funds from FEMA in FY 2014; however, a number of planning, outreach, and educational activities were undertaken by New York.

##### ***Puerto Rico***

A primary focus in Region II CAD was the Blue Surge functional exercise held on May 21-23, 2013. The exercise, which was based on a catastrophic earthquake and tsunami in the Caribbean about 90 miles from Puerto Rico,

involved the participation of State, Territorial and Federal agency staff. The objectives for the exercise included the testing of operational coordination and communication, situational assessment, and the management of public and private resources and requests for resources.

Puerto Rico continued to be actively involved in ShakeOut activities. Activities included press releases, updates to the ShakeOut web page and the hosting of a ShakeOut press conference with the FEMA CAD Director.

##### ***U. S. Virgin Islands***

FEMA earthquake funding to the U. S. Virgin Islands was used to support and encourage participation in the Great U.S. Virgin Islands ShakeOut. Activities in FY 2014 included updated to the ShakeOut web page, press releases and media advisories, and updates to a calendar of ShakeOut related events.

#### ***Region III***

The District of Columbia and States in Region III (Delaware, Maryland, Pennsylvania, Virginia, and West Virginia) did not receive earthquake assistance funds from FEMA in FY 2014; however, a number of planning, outreach, and educational activities were undertaken by Region III States.

#### ***Region IV***

##### ***Alabama***

Alabama FY 2014 NEHRP and state funded activities included the New Madrid Capstone Earthquake Exercise, the ShakeOut campaign and drill, and planning for the FY 2015 ShakeOut campaign and drill.

During the New Madrid Capstone Earthquake Exercise, Alabama supported Mississippi and Tennessee by moving resources through the state, assisting evacuees in need of shelter and supporting mass care issues. The State Emergency Operations Center activation was a Level 1 and emphasized Situational Awareness and Pre-scripted Mutual Aid and Mobilization. Day two of the exercise emphasized Mobilization and Response; day three - Medical Surge and Evacuation with full EMAC Operations; day four - Mass Care, VOAD and Donated Goods; and day five - Demobilization and Recovery. A geographic information system supported the Common Operating Pictures during the entire Capstone Exercise.

Alabama had a very successful FY 2014 ShakeOut campaign and drill with over 11,000 Alabama residents participating.

### ***Kentucky***

In FY 2014, 429,919 participants in Kentucky registered for the 2013 October Great Central U.S. ShakeOut. With its earthquake assistance funds, Kentucky updated its Earthquake Program website, the Facebook Earthquake Program Page and issued a Governor's Earthquake Awareness Week Proclamation and press release.

### ***Mississippi***

Activities in Mississippi focused on increased outreach and participation in the Great Central U.S. ShakeOut and the CAPSTONE-14 Multi-State Exercise. Mississippi used speaking engagements, publication updates and distribution, websites, social media, press releases, print ads, and media events to encourage statewide participation in the ShakeOut Drill. Total participation in Mississippi for the 2013 ShakeOut was 226,552.

Mississippi's participation in the CAPSTONE-14 Multi-State Exercise resulted in improved coordination and communication regarding transportation routes, Emergency Management Assistance Compact (EMAC), and resource management. Additionally, overall communication within the state, State Emergency Response Team (SERT) coordination, and private sector coordination were all improved through their participation in CAPSTONE-14.



Additionally, Mississippi used funds for HAZUS analysis to determine vulnerabilities and shortcomings of existing data and modeling of one at-risk county.

### ***North Carolina***

North Carolina did not receive earthquake assistance funds from FEMA in FY 2014; however, a number of planning, outreach, and educational activities were undertaken by North Carolina.

### ***South Carolina***

During FY 2014, South Carolina continued to coordinate and collaborate with state and local government agencies, non-government organizations, and universities to increase the State's readiness for an earthquake. The South Carolina Emergency Management Division (SCEMD) participated in the Capstone-14 Multi-State Exercise as a supporting state to the New Madrid Earthquake States. This collaborative effort marked a critical milestone in the development and implementation of vital systems to greatly improve the collective response to earthquake disasters.

In partnership with the Citadel School of Engineering and FEMA, SCEMD conducted four

certified training classes. These classes were: FEMA 154 Pre-Earthquake Inspection process; ATC-20 Post-Earthquake Inspection Process; FEMA 74 Non-Structural Mitigation; FEMA P-909 Home and Business Earthquake Safety and Mitigation; and Rapid Observation of Vulnerability and Evaluation of Risk (ROVER) software. The educational focus was determining the seismic vulnerability of facilities pre-disaster and post-disaster. As part of the courses, students put their training into practice with several days of hands-on experience.

South Carolina also participated in the second annual Southeast ShakeOut Earthquake Drill on October 17, 2013 with approximately 238,000 South Carolinians participating. The Governor issued a Proclamation to coincide with the drill proclaiming the week as “SC Earthquake Awareness Week.” The South Carolina Earthquake Guide was awarded one of the ten “Notable State Document” awards for 2014. The award is conferred to recognize state governmental publications of outstanding merit and usefulness to the citizens of South Carolina.

### ***Tennessee***

During FY2014, Tennessee coordinated the design and development of the multi-state New Madrid Seismic Zone response exercise, CAPSTONE14. This regional exercise, which coordinated hundreds of responders from FEMA Region IV, V, VI and VII, developed the concept of State and local jurisdictional responders partnering with private sector assets to visually identify GIS-generated damage assessment information. This assessment information can then be shared through digital computer platforms and displayed so that decision makers at multiple levels can quickly determine where Mission-Ready-Packaged (MRP) equipment and personnel can be rushed to the most critically affected disaster sites. Tennessee hosted the IT

and GIS developers who generated the scenario and tools, which allowed the exercise to succeed.

After nearly twenty years of study and negotiation, the Memphis/Shelby County government approved strengthened commercial seismic building codes which was passed and recommended by Tennessee State government codes officials.

Tennessee also coordinated the establishment of a state-wide volunteer coalition (TNSAVE) to provide training and certification for post-disaster building assessment teams. With assistance from CUSEC and the Tennessee Emergency Management Agency (TEMA), this non-profit coalition is made up of nine state-wide associations representing engineers, architects, building codes officials and private-sector construction and builder’s groups. The TNSAVE goal is to provide trained volunteers who can respond to disasters for assessment within Tennessee and be used to support the post-disaster assessment needs of surrounding states through the EMAC process.



### ***Region V***

#### ***Illinois***

February is Earthquake Preparedness Month in Illinois. Preparedness and awareness activities were conducted in February and throughout the year, including news releases and publication updates and distribution. Work continued on the Earthquake School Hazard Hunt and was completed early in 2014.

Illinois participated in the February and October 2013 ShakeOut drills. Before each ShakeOut, Illinois encouraged participation

through a combination of mailings, personal contacts, websites and social media, print and radio ads, and media events. Registrants numbered 592,616 for the February ShakeOut and 526,134 for the October ShakeOut.

### ***Indiana***

Staff in Indiana participated with CUSEC on CAPSTONE-14 planning conferences, workshops and meetings, and worked with the Indiana Building Emergency Assessment and Monitoring to train for future events. In addition, staff and the Polis Center worked on the Indiana Earthquake Assessment for the 2014 State Mitigation Plan.

## ***Region VI***

### ***Arkansas***

Arkansas was able to create the INSPARK (INSPEct ARKansas) program to have a formalized systematic approach to managing building inspectors. Arkansas also hosted a successful Shake-Out event, continued the Arkansas Governor's Earthquake Advisory Council meetings and purchased earthquake related books for counties by request.

### ***Oklahoma***

NETAP training was provided to Oklahoma June 10-11, 2014. The courses provided were FEMA 154, ATC-20 and ROVER. These classes provided training to more than 100 (combined total of attendees) engineers, architects, emergency managers, and first responders in Oklahoma. Oklahoma continues to receive additional earthquake training requests. The training received excellent evaluations and generated more interest in the subject than ever before.

The scientific community has known for years that injecting waste fluid into deep disposal wells can, on rare occasion, result in

earthquake activity. However, in recent years Oklahoma, an area that historically averages an annual 1.5 earthquakes of magnitude 3 or greater, has provided evidence that the innovations, such as high-volume fracturing, that has spurred the U.S. oil and gas boom are causing the rate of earthquakes to spike. Oklahoma now averages 2.5 earthquakes with a magnitude 3 or higher every 24 hours. This drastic increase is a direct result of the large amount of waste created by activities such as fracturing. The Oklahoma Geological Survey released a report in April that states that the preponderance of evidence shows that it is "very likely" that the influx of seismic activity directly correlates to the subsurface injection of wastewater. Under the new directive, disposal well operators must prove that they are not injecting below the Arbuckle formation given the geological community's consensus that any disposal below it will risk inducing seismic activity. Since then, wells have begun the process to reduce their depth, and limit their injection rate.

## ***Region VII***

### ***Missouri***

The Missouri Seismic Safety and Geological Survey participated at the "Forces of Nature" event at the Columbia Public Schools Planetarium in Columbia, MO on Saturday, November 9, 2013. In addition, more than 400,000 people were registered to participate in the Missouri ShakeOut Drill in October 2014.

## ***Region VIII***

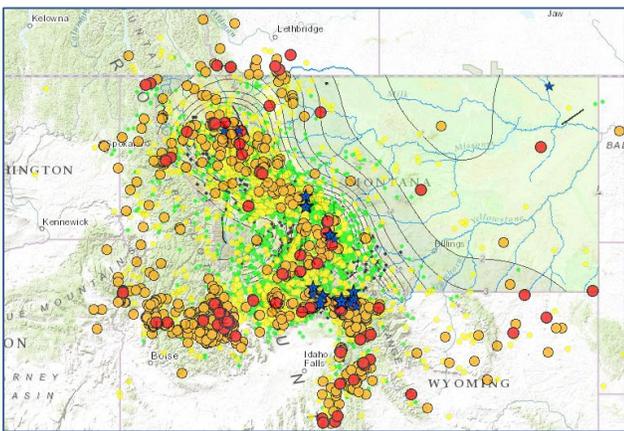
### ***Colorado***

Multi-hazard activities support earthquake project work in Colorado. FEMA NEHRP funds were used for a Statewide hazard analysis (by county) and for local hazard mitigation planning. Colorado also participated in the first

2014 Rocky Mountain ShakeOut on October 17, 2013.

### **Montana**

The Montana Bureau of Mines and Geology (MBMG) used its earthquake assistance funding to make Montana’s 1982-2014 earthquake catalog available as a data layer on MBMG’s Online Mapping Application, providing visual, easy and versatile access to Montana’s extensive historical earthquake record. Improved access to this data—including current seismicity—will enhance Montana’s earthquake and seismic hazard education and outreach efforts.



*A map of the Montana Bureau of Mines and Geology’s Online Mapping Application.*

Montana also participated in its first ShakeOut on October 23, 2013. More than 107,000 Montana residents, about 10 percent of the State’s population, participated in this inaugural event coordinated by the Earthquake Country Alliance (ECA), the Governor’s Office of Community Service, the MBMG, the State of Montana Disaster and Emergency Services, and the American Red Cross of Montana. The buy-in and participation of local groups was critical to the success of the ShakeOut drill, which was featured by nearly all major TV outlets in Montana as well as in print media and radio.

### **Utah**

FEMA and the Utah Department of Emergency Management (UDEM) are continuing their work on a joint FEMA Region 8 and State of Utah Catastrophic Earthquake Plan. Two years prior to the 2012 Great Utah ShakeOut, FEMA and the Utah Division of Emergency Management started gathering detailed data on the resource shortfalls of the State following a major earthquake. Meetings were held with representatives from city, county, state and federal agencies along with some private sector partners. The two year process developed the joint response plan that was exercised in the 2012 Full Scale Exercise and 2014 Earthquake Program Reports. The current planning process involves the same participants and will better define the short falls of the state following a major earthquake. The goal of this planning process is to have all of the initial FEMA “push packages” of needed resources immediately deployed into the disaster area.

### **Wyoming**

Wyoming participated in ShakeOut for the second year. This year, Wyoming had its own 'Great Wyoming ShakeOut' with a participation increase of more than 500 percent over 2013 (in 2013, Wyoming participated in The Great Rocky Mountain ShakeOut.) The success of this year's Great Wyoming ShakeOut was the direct result of more widespread promotional efforts. First, the drill was announced and promoted at a quarterly meeting to Wyoming's 23 County Coordinators and two tribes. Additionally, ShakeOut flyers were distributed and the drill was presented to school districts in face-to-face meetings with superintendents. The ShakeOut link was also on the Wyoming Office of Homeland Security's website and highlighted via social media, and a press release resulted in several follow-up interviews with media outlets around the state.

## **Region IX**

### **American Samoa**

Activities in American Samoa focused on education, outreach, training, drills, exercises, media campaigns, and regional collaboration. Island-wide participation in the Great American Samoa ShakeOut has continued with a focus on schools and government employees. American Samoa promoted ShakeOut and recruited 5,102 participants. To support public outreach, education, and awareness, posters, drill manuals, and earthquake preparedness presentations were developed, conducted and distributed during pre-ShakeOut events. “Drop, Cover, Hold On” signs, posters, and radio and newspaper advertisements were prominent throughout the year. These outreach materials explained earthquake safety tips, general seismic hazard terms, and served as a visual reminder of what to do in case an earthquake occurs. This form of earthquake mitigation and education has been a prominent tactic in public earthquake messaging in American Samoa.

### **Arizona**

More than 116,000 Arizonians participated in the Great Arizona ShakeOut, which was an 86 percent increase from the previous year. Arizona built a new promotional campaign using ShakeOut superhero kids to engage and excite the K-12 community. This campaign, coupled with the aggressive recruiting of schools, resulted in more than 84,000 K-12 students and faculty participating in ShakeOut 2013. Arizona media reporting of ShakeOut 2013 increased dramatically; more than 50 media outlets from around the State provided coverage. ShakeOut participation targeted high risk communities, schools, and government agencies. Regional outreach and networking also continued as ShakeOut partners and stakeholders expanded to include the Arizona Division of Emergency Management, Arizona

County Emergency Management offices, American Red Cross, EarthScope, municipal emergency management offices, State agencies and the K-12 community.

### **California**

On August 24, 2014 a magnitude 6.0 earthquake occurred in Napa which resulted in one death and caused more than \$87 million in public losses and led to a disaster declaration declared on Sept. 11, 2014. In response to the event the California Earthquake Clearinghouse provided a centralized coordination center



where engineers, geologists, seismologists, sociologists, economists, and other professionals could coordinate the gathering of information, maximizing the use of its resources and capabilities. After the Napa Earthquake, the Seismic Safety Commission conducted public hearings to assess seismic safety issues and investigate earthquake damage and reconstruction efforts.

Over nine million people and organizations participated in the Great California ShakeOut. The California Office of Emergency Services (Cal OES), along with the Southern California Earthquake Center (SCEC) at the University of Southern California, and the California Earthquake Authority (CEA) promoted ShakeOut activities to demonstrate the ways people can protect themselves during earthquakes.

In 2014, Cal OES continued its coordination with California Earthquake Authority to implement an incentive program to help homeowners seismically retrofit their homes. The resources for this program, called the California Residential Mitigation Program

(CRMP), come from the CEA Earthquake Loss Mitigation Fund. The program, called the Bolt + Brace Program, focuses on helping the retrofit of wood-frame family dwellings and has been piloted in two California Communities, the Los Angeles neighborhood of Eagle Rock and the Rockridge neighborhood of Oakland.

On September 3-5, 2014, Cal OES and partner agencies participated in the 3rd International Earthquake Early Warning Conference, organized and sponsored by UC Berkeley, USGS, CalTech, the Moore Foundation, and the University of Washington. The three-day meeting brought together scientists, policy makers, engineers, social scientists and business representatives from public and private sector institutions to examine the state of the art in earthquake early warning today and to innovate new ways to push the technology forward.

### **Guam**

Since 2010, Guam has participated in the Great Guam ShakeOut with 38,000 residents pledging their support to become earthquake prepared. In FY 2014, that number increased to 67,963 residents.

Guam Homeland Security/Office of Civil Defense (GHS/OCD) continues to schedule Earthquake Preparedness outreach at schools, government agencies and private agencies to become better prepared for an Earthquake and other disasters.

Producing outreach materials, such as Earthquake Ready cards and brochures, has been beneficial in increasing awareness and education for the community. The Earthquake Preparedness Media Campaign continues to benefit the community to help them become earthquake prepared.

Guam's Earthquake Program received multiple NETAP trainings in FY14 to include FEMA E-74 *Reducing the Risks of Nonstructural Earthquake Damage*; FEMA P-749 *Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*; FEMA P-767 *Earthquake Mitigation for Hospitals*; and FEMA P-909 and Train-the-Trainer, *Home and Business Earthquake Safety and Mitigation*.

Guam worked closely with FLASH to produce and print Finn and Fern Earthquake and Tsunami Activity Book to include Guam's Tsunami Mikenna and Guinness Quake to promote earthquake preparedness.

### **Hawaii**

In 2013, more than 15,000 Hawaiians participated in the Great Hawaii's ShakeOut.

The focus of Hawaii's Earthquake Program included the activities of the Hawaii State Earthquake Advisory Committee (HSEAC), earthquake public outreach projects, awareness and resilience projects, and participation in the Great Hawaii ShakeOut. Hawaii's goal is to promote seismic safety, education, mitigation and awareness throughout the islands for citizens and tourists. To accomplish this, Hawaii has partnered with members of the scientific and technical community, including universities, scientists, engineers, planners, and others in county, State and Federal agencies.

Hawaii's public outreach program addresses earthquake risks by developing and disseminating outreach tools, publications, and presentations. The approach incorporates elements of outreach to the public as well as an effort to provide hazards awareness training to Hawaii's school teachers in the context of enhancement of their natural sciences curriculum.

## **Nevada**

Outreach in Nevada included the Great Nevada ShakeOut which has continued to increase in participation throughout Nevada from 116,000 in its inaugural year to over 560,000 participants in FY 2014. The Nevada Seismological Laboratory used the “Big Shaker” simulation truck to attract more attention to the ShakeOut event with additional promotion including distribution of earthquake educational materials, press releases, and media events throughout the state.

Additionally, Clark County completed an unreinforced masonry (URM) verification project for unincorporated Clark County in 2014, which included sending two student engineers from the University of Nevada, Las Vegas (UNLV), under the supervision of Clark County staff engineers, into the field to conduct this URM survey. Clark County partnered with the Earthquake Engineering Research Institute (EERI) to utilize additional funds through the National Earthquake Hazard Reduction Program (NEHRP) for this project. The project allowed Clark County to develop a more accurate listing of actual URM buildings in Clark County.

Nevada also supported a Pre-Disaster Mitigation project with the Clark County School District in 2014. With over 316,000 students and 37,000 employees, Clark County School District continues to be one of the fastest growing school districts in the United States and is the fifth largest school district in the Nation. In an effort to reduce the loss of life and property in such an event, Clark County School District applied for and was awarded Pre-Disaster Mitigation funding to install automatic seismic gas shut-off valves on gas lines leading into their schools and administrative buildings in two phases, with the second phase to be completed by February 2016.

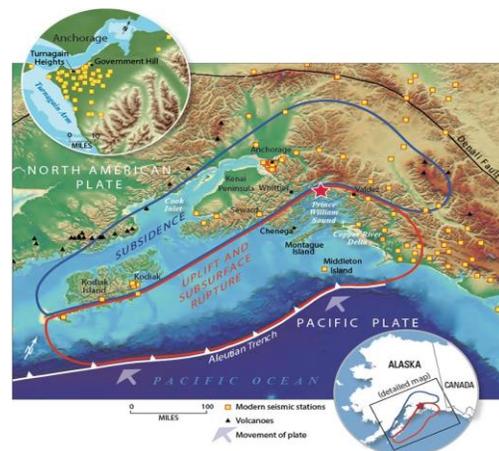
Finally, in August 2014, the Nevada Earthquake Safety Council had a very successful joint workshop with the California Seismic Safety Commission. There is an increased likelihood of an earthquake event happening somewhere along the Nevada-California border. Moving forward, participants envision working together on future projects for the benefit of both states with regard to earthquake safety.

## **Region X**

### **Alaska**

On October 9, 2013, Alaska received a delivery of FEMA 154 and E-74 from ATC at their Fall Preparedness Conference. There were about 80 people from tribal governments and other statewide jurisdictions in attendance for both courses. In late January/early February 2014, Alaska also began working with the Alaskan Seismic Hazards Safety Commission (ASHSC) on a Rapid Visual Screening (RVS) pilot study of Alaska K-12 schools.

Alaska also increased earthquake awareness and education for the 50th Anniversary of the Good Friday Earthquake (1964). The goal is to develop, plan and implement an earthquake and tsunami outreach campaign, culminating and extending beyond the 50<sup>th</sup> Anniversary in 2014.



*Map of southern Alaska showing the epicenter of the 1964 Great Alaska earthquake.*

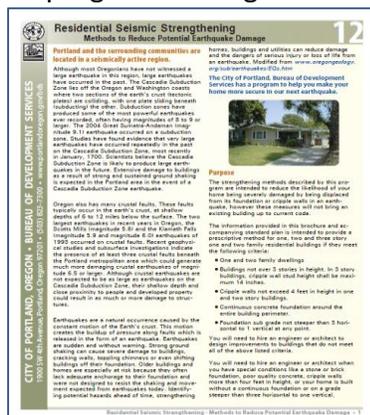
As part of the campaign, the Alaska Division of Homeland Security Preparedness and Planning Teams developed new outreach tools to showcase at different venues throughout Alaska. The tools are designed to demonstrate the effects of earthquakes and tsunamis, and to educate school children, citizens, and local jurisdictions on what they can do to mitigate their effects. Target outcomes are to maximize participation in the 2014 Great Alaska Shakeout by all Alaska school districts, State and local jurisdictions, businesses, and private non-profit organization, and to conduct outreach in as many at-risk communities as possible.

### Idaho

This year was the third Idaho ShakeOut and over 103,000 participants registered for the event. As part of the 2013 activities, Idaho developed a new version of the “Putting Down Roots in Earthquake Country” handbook. NETAP training focused on schools in seven school districts and 140 buildings.

### Oregon

The City of Portland, Bureau of Development Services, has developed a new Residential Seismic Strengthening Program to help residents make their homes more secure in the next earthquake. The program is designed to reduce the likelihood of severe damage to homes as a result of displacement from the foundation or crippling of walls in an earthquake. The program provides homeowners and contractors



*Residential Seismic Strengthening Methods to Reduce Potential Earthquake Damage Flyer*

with a simple guide to evaluate existing homes and determine if certain improvements will reduce the risk of earthquake damage.

Oregon has continually supported preparedness and outreach efforts to local communities. Oregon participates in the yearly ShakeOut exercise, with more than 271,000 Oregonians participating in the 2013 annual Drop, Cover and Hold On drill. In addition to preparedness initiatives, Oregon is working on long-term resiliency through the development of the Oregon Resiliency Plan. The Oregon Seismic Safety Policy Advisory Commission has assembled eight task groups of volunteer subject-matter experts from government, universities, the private sector and the public to develop the portfolio of chapters that make up the Resiliency Plan.

### Washington

Staff from Washington Emergency Management helped to deliver NETAP training in FEMA 154 RVS and ATC-20, Earthquake Mitigation for Hospitals (FEMA P-767), and Reducing Risks of Nonstructural Earthquake Damage (E-74). The courses were taught in Aberdeen, Spokane, Tacoma, and Everett and reached about 200 participants. Washington also held State and local tsunami workgroup meetings focused on the design and implementation of vertical evacuation safe havens along the Washington coast; tsunami public education Train-the-Trainer Courses; new public education products, evacuation and assembly area signage; NOAA/National Weather Service Updates; distribution of NOAA weather radios to low income families; training for hospitality industry employees; the Great Washington ShakeOut; and community evacuation drills.

During the third year of the Great Washington ShakeOut, more than 864,000 Washingtonians registered for the drill - an increase of 150,606

participants from the inaugural Washington ShakeOut in 2012.

## IV. Regional Earthquake Consortia and FEMA Earthquake Partners

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### ***Cascadia Region Earthquake Workgroup***

CREW is a coalition of private and public representatives working together to improve the ability of communities throughout the Cascadia Region (Northern California, Oregon, Washington, and British Columbia) to reduce the effects of earthquakes and related hazards, such as tsunamis. Since the mid-1990s, CREW has created several publications, including scenarios, post-disaster recovery guides, and other educational materials accessible on CREW's website. CREW is composed of mostly volunteer representatives that help foster linkages between scientists, businesses, and government agencies on earthquake resiliency.

CREW supported Washington media partnerships with news outlets across the State for the 2014 Great Washington ShakeOut. CREW was able to position the Great Washington ShakeOut in the appropriate media markets, at the appropriate times, and at the best price. This resulted in media partners matching strategic investments made by CREW, and the production and airing brief segments with local television personalities promoting the Great Washington ShakeOut and encouraging viewers and listeners to register for the drill and take additional steps to become better prepared for earthquake disasters.

### ***Central United States Earthquake Consortium***

CUSEC FY 2014 accomplishments fell under the four organizational areas of public awareness and education, mitigation, planning and the

application of research. As part of its public awareness program, staff presented at two Arkansas Governors' Seismic Advisory Council meetings, and conducted a ShakeOut presentation and a Drop, Cover, and Hold On demonstration at Reel Foot Lake Tennessee State Park. Other outreach activities included a presentation on earthquake hazards to State Farm Insurance regional employees based on a New Madrid earthquake scenario and an Earthquake Safety and Preparedness for Schools webinar held in partnership with FEMA Region IV, USGS, and Louisa County Schools for school administrators and facility managers. The webinar focused on lessons learned for schools following the 2011 Mineral, Virginia earthquake. CUSEC also set up a display booth at Career Day at Georgian Hills Middle School in Memphis and discussed emergency management career options with the kids and school faculty.



ShakeOut continues to be CUSEC's largest investment effort. In FY 2014, CUSEC was the lead for both the Great Central US ShakeOut and the Great South East ShakeOut, which had a combined participation of nearly 5 million. CUSEC also organized the ShakeOut kickoff event at the National Building Museum in Washington, D.C. where a demonstration ShakeOut drill for media and attendees was conducted in partnership with FEMA.

Participating states included Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Mississippi, Missouri, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, Virginia, West Virginia and Washington D.C.

CUSEC was the lead organizer of the 2014 National Earthquake Program Managers meeting in Denver at FEMA Region VIII offices. This year's meeting was an important milestone in helping State Earthquake Program Managers to take ownership of their programs. A position paper developed at the meeting on the importance of State programs was submitted to the National Emergency Management Association (NEMA). NEMA adopted the paper and among other resolutions decided that NEMA should establish an earthquake subcommittee composed of State Directors and experts in the field to combat the challenges of NEHRP and develop solutions.

Additionally, the advancement of the building inspector program was achieved for the first time in the history of the NEHRP program. Traditionally a focused mitigation training effort with ATC-20/154, through the creation of the Building Inspector Resource Deployment (BIRD), CUSEC began developing Mission Ready Packages (MRP's) that were placed into a national database with the Emergency Management Assistance Compact (EMAC). The MRP's were also placed into a the Mutual Aid Support System (MASS) which provides a means to geospatially see the building inspector packages, as well as all other MRP's; greatly accelerating lifesaving efforts. This effort was highlighted at the White House Innovation for Disaster Response and Recovery Initiative Demo Day.

### ***Northeast States Emergency Consortium***

The Northeast States Emergency Consortium (NESEC) was established in 1991 and is located in Wakefield, Massachusetts. NESEC develops, promotes and coordinates comprehensive "all-hazards" emergency management activities throughout the Northeast. This includes all phases of emergency management: preparedness, response, recovery and mitigation. NESEC includes the member States of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont.



NESEC participated and supported a FEMA Region I initiative to regroup and revitalize the New England Hazus Users Group (NEHUG). Coordination meetings were held to develop and implement a revitalization strategy. NESEC with FEMA Region I have implemented a process to attract and engage a diverse group of regional stakeholders who are committed to collaborating for the integration and advancement of Hazus loss estimation software to support sustainable, disaster-resilient communities. A major goal is to use Hazus generated results for hazard mitigation planning and to meet the plan requirements of Disaster Mitigation Act (DMA) 2000.

NESEC participated for the first time ever in the national and international 2013 ShakeOut. This was the first year that NESEC states organized as an Official ShakeOut Region. NESEC, in partnership with FEMA, USC and state government coordinated recruitment across the entire region. The final numbers show that

290,000 people from across the Northeast US registered to participate in the 2013 Great Northeast ShakeOut.

NESEC, utilizing FEMA NEHRP State Assistance Support, initiated a statewide project in conjunction with the Maine Emergency Management Agency, to identify and analyze over 4,000 critical and essential facilities for earthquake and other hazard vulnerability and risk. This involved incorporating ROVER data as well using a “Virtual Survey” technique developed by NESEC. The results of this statewide collection of data will be used for mitigation planning purposes and to develop a rank order of seismic risk by county. This will lead to subsequent and more detailed analysis by county. This is the first of this level of Hazus analysis, focused on critical and essential facilities, ever conducted by NESEC in direct partnership with a state emergency management agency.

NESEC also completed a report for Maine Emergency Management titled “Location of Maine Dams in Relation to Potential Earthquake Ground Shaking Scenarios.” The results of this statewide collection of data will be used for mitigation planning purposes and to develop a rank order of seismic risk to essential facilities by county. This will lead to subsequent and more detailed analysis by county, contingent upon future funding.

In collaboration with the Vermont Geological Survey and the Vermont Emergency Management Agency, NESEC planned a meeting for up to 50 essential and critical facility managers with a focus on seismic risk and mitigation. The meeting is designed to raise public awareness of earthquake risk in northern Vermont through communicating the meaning of seismic hazards and risk via outreach to essential and critical facility managers. The meeting will include the following components:

- 1) Presentation of findings regarding seismic site classification, shaking amplification and liquefaction potential in mapped areas in Chittenden County, VT as presented on published maps and in reports;
- 2) Presentation by FEMA officials on FEMA 74, Earthquake Hazard Mitigation for Nonstructural Elements;
- 3) Direct follow up, within approximately 2 weeks of the meeting, with critical facilities participants to determine if they are considering implementing seismic hazard mitigation; and
- 4) Development of a brief report summarizing follow-up results.

### ***Western States Seismic Policy Council***

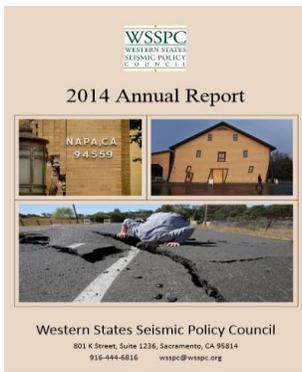
WSSPC was formed in 1979 to provide a regional and multidisciplinary forum to support and enhance seismic hazard mitigation by developing and adopting policy recommendations on seismic issues and advocating their implementation. WSSPC represents the directors of emergency management, geoscience, and seismic commissions of 13 western States, 3 U.S. Pacific Territories, a Canadian territory, and a Canadian province, for a total of 39 member agencies. WSSPC also coordinates with members of local government and building departments, insurance companies, and businesses to participate in the policy recommendation process by joining as Affiliate members.



In 2014, WSSPC held its annual meeting in Anchorage, Alaska, in conjunction with the EERI 50<sup>th</sup> anniversary of the 1964 Great Alaska earthquake and tsunami. At the meeting, the Tsunami Hazard Mitigation Committee; Engineering, Construction, and Building Codes

Committee; and the Basin & Range Province Committee met to discuss policy questions. At that meeting, WSSPC members adopted the following five policy recommendations:

1. Policy Recommendation 14-1: *Improving Tsunami Public Education, Mitigation and Warning Procedures for Distant and Local Sources*
2. Policy Recommendation 14-3: *Earthquake Monitoring Networks*
3. Policy Recommendation 14-7: *Earthquake Early Warning Systems*
4. Policy Recommendation 14-4: *Identification and Mitigation of Unreinforced Masonry Structures*
5. Policy Recommendation 14-5: *Earthquake Emergency Handbook for First Responders and Incident Commanders*



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*The Western States Seismic  
Policy Council (WSSPC)  
2014 Annual Report.*

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Additional education and outreach activities are conducted through the website, Annual Report, quarterly newsletter, and an interim monthly bulletin, new in 2014. The website was completely redesigned and social media platforms were integrated into the site.

## **Earthquake Engineering Research Institute**

EERI is the Nation's leading technical society dedicated to the reduction of risk from

earthquakes and is recognized as an authoritative voice for earthquake risk reduction information in the United States. EERI is a national nonprofit, multidisciplinary technical society of engineers, geoscientists, architects, planners, public officials and social scientists. More information on EERI is available at [www.eeri.org](http://www.eeri.org).



EERI supported FEMA NEHRP through its FY 2014 Cooperative Agreement. Projects ranged from direct programming efforts to support for projects at selected states with high seismic risk. Some of the FY 2014 highlights are as follows.

EERI held a series of day-long technical seminars on the PEER NGA-West2 project, <https://eeri.org/cohost/registration/images/eeri/pdf/2013-technical-seminar-brochure.pdf>. The program, focusing on important ground motion hazard issues, provided engineers and scientists with an update on the most recent findings of the NGA-West2 project and its impact for the earthquake engineering community.

EERI published an Oral History for Ugo Morelli who had a long, consequential and productive career at FEMA and predecessor agencies from 1971 through retirement from the FEMA earthquake program in 2003, [https://www.eeri.org/wp-content/uploads/store/oral\\_histories/morelli.pdf](https://www.eeri.org/wp-content/uploads/store/oral_histories/morelli.pdf).

EERI organized the 10<sup>th</sup> U.S. National Conference on Earthquake Engineering (10NCEE) in July 2014 in Anchorage, Alaska, during the 50<sup>th</sup> anniversary year of the great Alaska earthquake and tsunami, <http://10ncee.org/>. Over 1100 earthquake professionals participated in the four day program and proceedings include more than 800 technical papers that were presented at the conference. EERI also organized and ran the 10<sup>th</sup> Annual Undergraduate Seismic Design Competition at the 10NCEE, with 200 students from 28 universities participating. [http://slc.eeri.org/SDC2014\\_2015.htm](http://slc.eeri.org/SDC2014_2015.htm)

EERI awarded the FY 2014 NEHRP FEMA-EERI Graduate Fellowship to Clinton Carlson, a Ph.D. candidate in Civil Engineering at the University of Michigan, Ann Arbor, <https://www.eeri.org/wp-content/uploads/August13.pdf>. Carlson is conducting research on the impact of ground motion modification techniques on ground motion characteristics and on the responses of subsequent seismic analyses.

EERI also supported projects for FEMA in four states: Alaska, California, Nevada, and Utah. In Alaska, EERI contracted with an engineering firm to use Rover for seismic safety evaluations in Mat-Su School District. There were multiple projects in California, but none more timely than the support for the California Earthquake Clearinghouse where EERI serves a vice-chair. With FEMA NEHRP support EERI was able to establish and manage the South Napa Earthquake Clearinghouse that served more than 100 responders and researchers over a three day period. The California Geological Survey partnered with EERI in running the field clearinghouse. EERI also built and runs a virtual clearinghouse for the South Napa earthquake at <http://www.eqclearinghouse.org/2014-08-24-south-napa/>.

## ***Federal Alliance for Safe Homes***

FLASH entered into a cooperative agreement to assist FEMA NEHRP to achieve its strategic goals and delivered a number of projects during this reporting period.

FLASH continued to promote the FEMA *QuakeSmart Business Toolkit*, FEMA P-811 DVD, the *QuakeSmart® Community Resilience Program* and the nonstructural assessment program. FLASH created the resilience program to provide additional guidance to business owners and managers including business continuity information, planning and budgeting tools, and mitigation strategies. Businesses participating in the program receive a QuakeSmart recognition package to announce their completion of the program. FLASH designed and oversaw the creation of a new website, [www.quesmartcommunity.org](http://www.quesmartcommunity.org), to provide brand identity for the resiliency program and to showcase the *QuakeSmart Business Toolkit* and additional FLASH resources.



FLASH designed and held in-person training events entitled *Business Preparedness Summits* to promote the *QuakeSmart* program. The summits were hosted in partnership with private-sector, nonprofit and government organizations. The summits were held in Riverside and San Mateo, California showcasing the *QuakeSmart Business Toolkit* and *Community Resiliency Program* to walk business owners through the process of “Identifying Risk”, “Developing a Plan” and “Taking Action”

to prepare and mitigate their businesses. More than 130 businesses participated in the summits.

FLASH trained 125 volunteers on the *Construction Manager's Guide for Wind Mitigation* based on FEMA P-804 and FEMA P-499, and the *Construction Manager's Guide for Flood Construction* based on FEMA P-805 and FEMA P-312. These resources are specifically designed for nonprofit organizations engaged in long-term recovery.

Additionally, FLASH partnered with Clemson University and developed graduate level curriculum to teach residential building codes to construction, civil engineering and architectural disciplines, including a focus on the purpose and application of residential building codes, as well as the role of codes in disaster-preparedness. Presently, the course is being offered at Clemson and more universities are committed to using it whole or in modules. The course is promoted through the website, <http://www.flash.org/buildingcodecourse/>.

FLASH continued to administer the Texas State Collaborative (TSC). The members of the collaborative are a wide ranging, diverse group including code officials, flood plain managers, state and local government officials, meteorologists, non-profit disaster response and re-building organizations, leading insurers, reinsurers and design-build professionals. In partnership with the TSC members, FLASH completed and distributed Leadership Toolkits for Texas' ten most populous cities to educate leaders on the top hyperlocal weather perils of the jurisdictions and highlighting weaknesses or strengths of their current building code in light of those perils. The information is now available at [www.texasstatecollaborative.org](http://www.texasstatecollaborative.org).

## ***Outreach Process Partners***

OPP provides contract support for FEMA NEHRP's national outreach efforts and serves as a partner for NEHRP state assistance through activities such as publication development and printing, video and PSA production, ShakeOut event support, graphic design and website development. OPP also provides metrics and measurement capabilities for FEMA NEHRP's earthquake-related outreach efforts, with a focus on FEMA.gov analytics, FEMA Library downloads, GovDelivery tracking and media coverage analysis. This data is used to develop recommendations to further advance the use of FEMA publications and technical guidance, and the implementation of building codes.



OPP developed the FEMA School Hazard Hunt Game/Poster for Windows and MAC computers to create an interactive tool which engages young children to learn about earthquake hazard mitigation. To further encourage earthquake preparedness in schools, OPP also redesigned the Drop, Cover, Hold On Poster for classrooms to highlight the appropriate action to take during an earthquake. Additionally, OPP redesigned the Home Hazard Hunt poster (FEMA 528) to help families identify potential risks within their home and provide recommendations to address these risks.

In FY 2014, OPP also produced the *Seven Design and Construction Features Important to Seismic Performance* animation. This animation provides property and business owners with an overview of the importance of understanding seismic risk as well as the adoption and implementation of building codes with appropriate seismic design and construction

standards. These publications are all available in the FEMA Library.

## ***Southern California Earthquake Center***

SCEC, headquartered at the University of Southern California, was founded in 1991 with a mission to, gather data on earthquakes in Southern California and elsewhere; integrate information into a comprehensive and physics-based understanding of earthquake phenomena; and communicate understanding to society at large useful knowledge for reducing earthquake risk.



an NSF + USGS center

FEMA provides support to SCEC for national ShakeOut coordination and for leading the Earthquake Country Alliance in California. *Great ShakeOut Earthquake Drills*. SCEC created the ShakeOut.org website and registration system in 2008 for the first ShakeOut drill in southern California. Beginning in 2010, more States, territories and countries began to join the ShakeOut, with websites replicated by SCEC in partnership with State and local agencies who recruit participants. With the involvement of many partner organizations, ShakeOut has since expanded to include 44 states and U.S. territories, plus four other countries.

ShakeOut is now an infrastructure for providing earthquake information to the public and involving them in community resiliency, teaching people life-saving response behavior while fostering a sense of community that facilitates further dialogue. Participants receive monthly ShakeOut newsletters and more

frequent content via social media, and are encouraged to seek additional training. In addition to registered participants, millions more see or hear about ShakeOut via broad news media coverage (including late-night talk shows) that encourages additional dialogue about earthquake preparedness. In the near future, this ShakeOut infrastructure will be used for educating Californians about the new Earthquake Early Warning system being developed, with plans for yearly tests to be held on ShakeOut Day.

### ***Earthquake Country Alliance***

The ECA is a California-based public-private partnership of people, organizations, and regional alliances, each of which are committed to improving preparedness, mitigation and resiliency. ECA's mission is to support and coordinate efforts that improve earthquake and tsunami resilience. To participate, *visit* [www.earthquakecountry.org/alliance](http://www.earthquakecountry.org/alliance).

SCEC created the Earthquake Country Alliance (ECA) in 2003 and continues to play a pivotal role in developing and sustaining this statewide (as of 2009) coalition with similar groups in the Bay Area and North Coast. Participants develop and disseminate common earthquake-related messages for the public, share or promote existing resources, and develop new activities and products. SCEC develops and maintains all ECA websites and has managed the printing of the "Putting Down Roots" publication series throughout the state. This past year a special "Northridge Earthquake Virtual Exhibit" was added to the ECA site with "Northridge Near You" animations created by SCEC UseIT interns, and interviews with people who experienced the Northridge earthquake across southern California. Similar "Near You" animations were also made for the Loma Prieta 25th anniversary ([www.earthquakecountry.org/lomaprieta](http://www.earthquakecountry.org/lomaprieta))

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