



June 18, 2024

Honorable Michael L. Parson
 Governor
 State of Missouri

2023 Seismic Safety Commission Report on the State of Missouri’s Earthquake Preparedness

Dear Governor Parson:

In 1995, the Missouri Seismic Safety Commission (MSSC) was established, consisting of 17 members -- 15 appointed professionals from architecture, planning, fire protection, public utilities, electrical engineering, mechanical engineering, structural engineering, soils engineering, geology, seismology, local government, insurance, business, the American Red Cross and emergency management, one Missouri House appointed member and one Missouri Senate appointed member to work with various levels of government to help Missourians take steps to prepare for and reduce the effects of an earthquake. The mission of the MSSC is to review Missouri’s current preparedness for major earthquakes and to make recommendations to mitigate their impact. This report summarizes the activities conducted by Commission’s Members during 2023 in executing that mission.

Missouri Seismic Safety Commissioners volunteer to serve until replaced by newly appointed representatives. The commission continues to struggle with appointing new members to the commission. The greatest need is to appoint new members to the vacant positions. The following is a list of currently serving commissioners – as you can see, there is large number of vacant positions:

Representing	Name	Term Ends
Electrical Engineering	Dr. Phillip Gould, PE	Term Expired July 1, 2012
Fire Protection	Mr. John Mallott	Term Expired July 1, 2020
Insurance	Vacant	
Local Government	Mr. Joel P. Evans	Term Expired July 1, 2020
Public Utilities	Mr. Daryl Sorrell	Term Expired July 1, 2022

Seismology	Dr. Eric Sandvol	Term Expired July 1, 2020
Soils Engineering	Dr. Raymond Bailey, RG, PE	Term Expired July 1, 2020
Planning	Vacant	
Soils Engineering	Dr. Brent Rosenblad	Term Expired July 1, 2022
Public Education	Vacant	
Mechanical Engineering	Jim Watkins	Term Expires July 1, 2026
American Red Cross	Vacant	
Geology	David Hoffman	Term Expires July 1, 2026
Business	Vacant	
Emergency Management	Vacant	
House Appointed Member	Rep. Donnie Brown	No Expiration
Senate Appointed Member	Senator Jason Bean	No Expiration

The State of Missouri has taken important steps to prepare for and reduce the effects of a major earthquake as reflected in the Strategic Plan for Earthquake Safety in Missouri, first published by the MSSC in 2007. The MSSC has continued to execute the strategies laid out in the updated strategic plan. This includes a number of initiatives:

- (1) Promote earthquake awareness across the state
- (2) Conduct evaluations of Critical Infrastructure
- (3) Sponsor the annual Earthquake Summit professional development conference
- (4) Sponsor the annual Earthquake Insight Field Trip

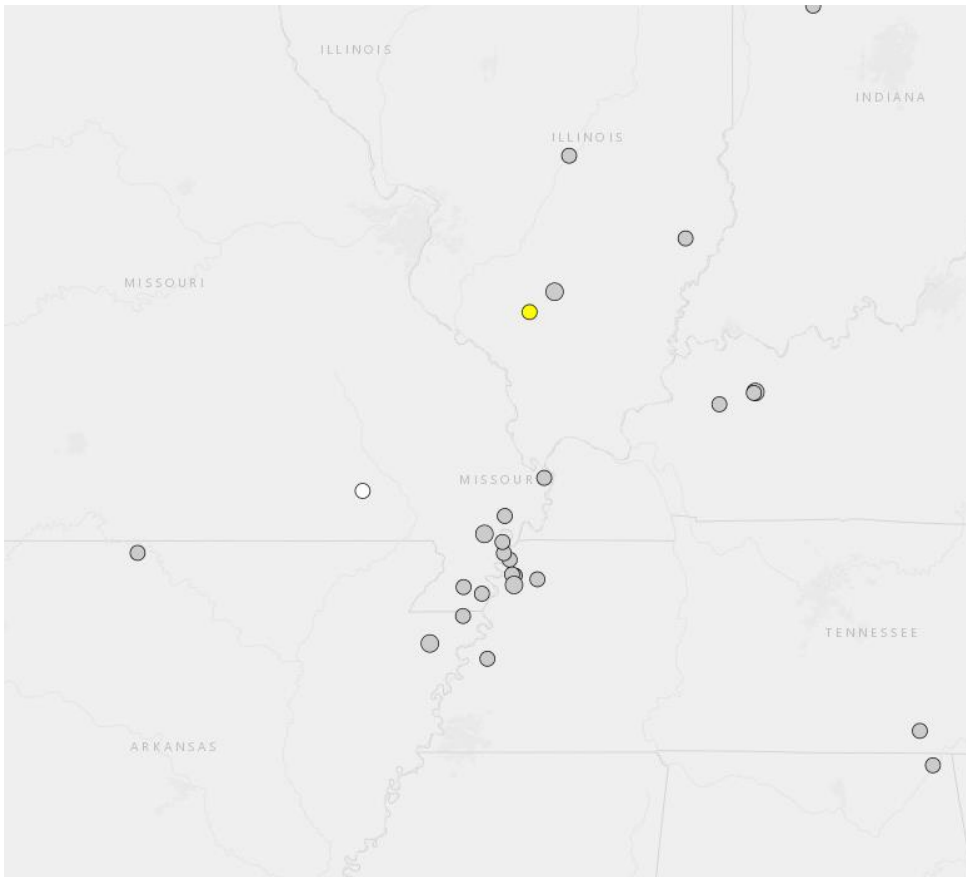


Figure 1. All earthquakes that have occurred in the State of Missouri over the past year (2023) and the surrounding regions. The yellow is the most recent earthquake that occurred. Many of these events are between Magnitude 1 and 2 with the largest being a magnitude 3.8.

Past earthquakes have caused great damage in the central region of the United States, and there is broad agreement in the scientific community that there is a continuing concern for a major earthquake that would put structures and communities in Saint Louis and most of southeast Missouri vulnerable to damage from severe ground shaking. Furthermore, the geology of the Mississippi embayment is very prone to liquefaction which can lead to catastrophic damage of buildings. An open file report from the United States Geological Survey has reaffirmed that there is significant reason to plan for a large seismic event in the New Madrid Seismic Zone. Figure 1 shows that even over the last year there have been a significant number of earthquakes across the New Madrid Seismic zone including a magnitude 3.8 that occurred near the Arkansas-Missouri border.

Objective 1: Increase Earthquake Awareness and Education

Strategy 1.1 - Promote Awareness among the general public.

- February 2023 was Earthquake Awareness Month in Missouri and was highlighted by presentations, media coverage, social media activities and demonstrations throughout the state.
- The MSSC's web site has permanently been moved to SEMA's domain providing Missourians access to earthquake information and updates on disaster preparedness

(https://sema.dps.mo.gov/earthquake_preparedness/seismic_safety_commission.php)

- In October the Great Central U.S. ShakeOut earthquake drill was held throughout the region, with more than 450,000 registered participants in Missouri.

Strategy 1.2 - Promote Awareness among key professionals in critical fields.

- **Earthquake Summit**

The 5th annual 2023 Earthquake Summit professional development conference was held in Portageville, with nearly 400 attendees. Prominent speakers included Lieutenant Governor Mike Kehoe, President Dr. Mun Choi of MU, and FEMA Region VII Administrator Andrea Spillars. This was the first year the Summit focused its approach more regionally, involving surrounding states and several speakers from those states. Speakers covered earthquake preparedness, response and recovery topics in the areas of transportation, emergency response, insurance, health care and mass evacuation.

- **Earthquake Insight Field Trip**

This field trip is an educational and networking event for business professionals, risk managers, emergency planners, engineers, government officials, students, faculty, geoscientists, and others who are interested in earthquake hazards and earthquake risks in the central US. The route starts in St. Louis, and includes stops in Missouri, Illinois, Kentucky and Tennessee. Stops include evidence of past earthquakes, regional earthquake history, and engineered structures, utilities and critical national economic infrastructure exposed to the hazard.

The 2023 field trip was cancelled when its long-time leader passed away unexpectedly. But plans to continue the trip in coming years are under way, with leadership from the University of Missouri Geology Department and the Missouri Department of Natural Resources.

Objective 2: Reduce Earthquake Hazard Through Mitigation

Strategy 2.1 - Promote adoption/enforcement of technically sound & feasible building codes.

- Monitored and offered support for the establishment of local building standards.

Strategy 2.2 – Identify existing essential facilities and schools susceptible to EQ damage.

- **Critical Infrastructure Evaluation Program**

The Missouri Seismic Safety Commission is leading a very important program to improve earthquake safety and readiness of critical infrastructure in southeast Missouri. The Commission works with a structural engineer to conduct seismic evaluations of buildings identified as critical by local officials. These screenings:

- Are provided free of charge
- Help determine earthquake-readiness of critical facilities
- Provide preliminary recommendations to improve safety
- Can be used to prioritize structural retrofit or non-structural improvements

When this program began in 2013 the focus was on school districts in southeast Missouri, with 23 districts evaluated. In the past two years the program has expanded to include structures related to emergency response such as hospitals and emergency staging structures.

The earthquake threat to Missouri cannot be ignored. The Strategic Plan for Earthquakes in Missouri developed tangible, practical recommendations and procedures to prepare Missouri for future earthquakes as well as other hazards, such as tornadoes and strong storms, at the same time. An example of the kind of damage from Mw 7.0 earthquakes is shown in Figure 2. This is the kind of damage that can result from unreinforced masonry construction.



Figure 2. Examples of damage in the city of Antakya after the February 6th Gaziantep Mw 7.8 earthquake. The city of Antakya is built on young sediments with a shallow water table similar to the geologic setting found in the Mississippi embayment (courtesy AFAD, Turkey).

The MSSC has examined the 2023 earthquakes in Turkey, and possible implications for Missouri (Figure 2). The initial large quake happened at night, with most people in their homes, so the impacts for larger buildings such as schools was limited. It also happened during the winter, so housing has been a particularly difficult challenge to limit weather exposure. The 1811-12 New Madrid earthquakes also happened in winter. Most recent high-impact quakes near the U.S., such as Haiti and Puerto Rico, were in warmer climates, so people had more options to stay outdoors. Another parallel to New Madrid is the large aftershocks that have occurred in Turkey.

The MSSC has discussed the impacts of lack of building code follow-through. MSSC has examined the impact in Turkey of the existing building code not being enforced, often due to political considerations, and the corresponding tragic results. There are concerning parallels here in the state of Missouri.

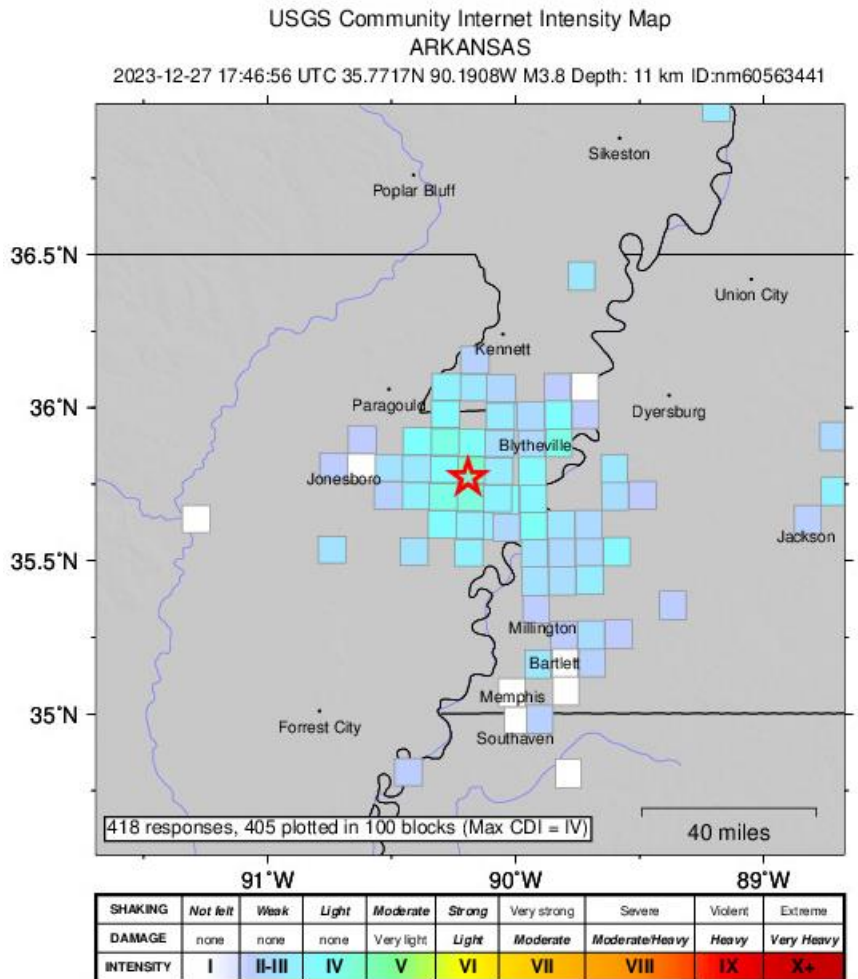


Figure 3. The shakemap for the 2023 December 27th M 3.8 earthquake that occurred in the northeastern corner of Arkansas near the Missouri border. This recent event serves as a reminder that this region is still active.

Objective 4: Improve Recovery

Strategy 4.3 – Promote funding and training of post-earthquake building inspection.

- The MSSC is once again collaborating with the SAVE coalition with Joe Leahy as the MSSC’s representative. SAVE trains hundreds of volunteers each year on post-disaster building safety evaluation. In addition to training more than 250 volunteers in 2023, SAVE leadership has conducted on-site leader training in Tennessee. Missouri is considered a national leader in its rapid building evaluation efforts, and SAVE has worked with Illinois and Tennessee this past year, learning from Missouri’s example as they seek to develop their own state programs.

Recommendation: Research innovative solutions to increase earthquake insurance coverage in Missouri

Missouri is at a crisis point. According to data from the Missouri Department of Commerce and Insurance (DCI), only 11 percent of homeowners in the highest seismic risk zone in southeast Missouri have earthquake insurance coverage. This is largely because, since 2000, premiums have increased an average of more than 800 percent, as insurers learn more about southeast Missouri's earthquake risk.

Without insurance coverage, many homeowners will be unable to rebuild after a major earthquake; this presents a fundamental recovery problem.

The MSSC supports current SEMA efforts to work with FEMA, DCI, insurers and reinsurers on innovative solutions to this crisis. **The MSSC also encourages state government to cooperative fully as these innovative solutions can significantly help the citizens of Missouri as well as people living across the entire New Madrid Seismic Zone.**

Major earthquakes in the central US are rare, but can affect a large geographical area, challenging the state resources to respond. The lessons learned from past U.S. earthquakes have demonstrated the significant burden placed on surviving families, businesses, utilities and state agencies. Preparation in the short term will yield significant reductions in fatalities, casualties, damaged structures, business failures, and state infrastructure losses from earthquakes. The same actions will also reduce the impact of other natural hazards. The MSSC will endeavor to continue making progress towards achieving the objectives presented in the Strategic Plan for Earthquake Safety during the next twelve months.

Respectfully submitted,



Eric Sandvol and Ray Bailey
2023 Chairman and Vice Chairman, Missouri Seismic Safety Commission