EARTHQUAKE AWARENESS

Preparedness and Safety

Help your family survive; know what to do before, during and after a major earthquake.

BEFORE

Know how to turn off utilities, such as water, gas and electricity.

Use brackets to secure tall bookcases to walls. Move heavy or breakable objects to lower shelves.

Attach your water heater to the wall. If it tips, it could start a fire or gas leak and you could lose a valuable source of water.

Develop a family communication plan. Identify a relative living at least 100 miles away; everyone can call to "check in" to tell family you're safe. Put together an emergency kit, including a flashlight, first aid kit, radio, drinking water and blankets.

Hold earthquake drills to practice.
Drop, Cover and Hold On!

One such drill is the Great Central U.S. ShakeOut. More information is online at shakeout.org/centralus.

DURING

Stay where you are when shaking starts. If you are indoors, remain indoors. If you are outside, stay outside. Most injuries occur as people are entering or leaving buildings.

If you are inside: DROP to the ground. **COVER** yourself under a sturdy table or desk, and cover your face and head with your arms. **HOLD ON** to the sturdy object until the shaking stops. If you cannot get underneath a sturdy object, move away from things that can fall on you such as bookcases, china cabinets and any unsecured objects, as well as things that could break such as windows and mirrors.

If you're outside when the shaking starts: Move away from buildings, utility wires and anything large that may fall on you. Drop to the ground and cover your head with your arms.

If you're driving: Pull off the road and come to a stop as quickly as you safely can. Stay in your car. It offers protection from falling objects.

AFTER

Find your family or neighbors; check for injuries. Call 911 for help if necessary.

Do not use your telephone except for those emergency calls. Due to earthquake damage, it might be easier to text someone using your cellphone rather than to try calling them.

If you smell gas or hear a hissing sound, go outside and shut off the gas valve.

Be careful to avoid downed power lines or broken glass.

Gather your emergency supplies.

Wear sturdy shoes in areas covered with fallen debris and broken glass.

Turn on your radio for the latest emergency information.

Be ready for aftershocks.

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sema.dps.mo.gov

MISSOURI DEPARTMENT OF NATURAL RESOURCES
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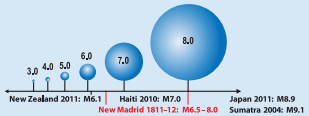
EARTHQUAKE AWARENESS

Science of Earthquakes

Become earthquake aware.

HISTORIC DAMAGING EARTHQUAKES IN THE NEW MADRID SEISMIC ZONE

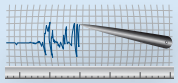
A series of major and moderate earthquakes occurred in the New Madrid Seismic Zone (NMSZ) between December 16, 1811, and March 16, 1812. Fifteen earthquakes with estimated magnitudes of 6.5 to 8.0 occurred during this time, including three to five quakes with estimated magnitudes of 7.5 or greater. Some of the earthquakes were felt more than 1,000 miles away.



In comparison, the 2010 earthquake in Haiti was magnitude 7.0, while the 2011 earthquake in Christchurch, New Zealand was magnitude 6.1. New Madrid was a sparsely populated frontier town in 1811; yet, there was loss of life and damage to buildings. The land was damaged so extensively that it was unusable for the subsistence agriculture of that day. Today, the potential for destruction and economic loss in the area is enormous.

EARTHQUAKE FREQUENCY AND PROBABILITY

It is impossible to predict when or where an earthquake might occur. The exact frequency of large earthquakes in the NMSZ is still being debated, but scientists agree that in addition to the 1811-1812 major quakes, two or more additional major earthquakes (estimated magnitude 7.0 or larger) occurred in the area during the past 2,000 years. Therefore, the probability exists for a future, large magnitude earthquake in the NMSZ. A large magnitude earthquake in the region could cause major damage in southeastern and eastern Missouri, northeastern Arkansas, southern Illinois, and western Kentucky and Tennessee. Significant damage could extend north of St. Louis along the Mississippi River valley, up the Ohio and Wabash river valleys into Kentucky and Indiana, and down the Mississippi River valley into Mississippi.

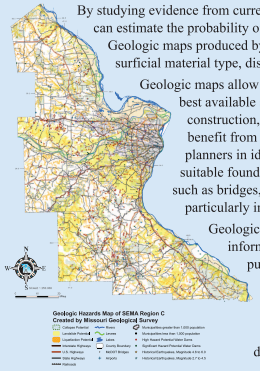


GEOLOGIC MAPS AND INVESTIGATIONS

By studying evidence from current, historic and prehistoric earthquakes, seismologists can estimate the probability of future earthquakes and the damage that may result. Geologic maps produced by the Missouri Geological Survey depict rock or surficial material type, distribution, properties and relative age relationships.

Geologic maps allow map users to make informed decisions utilizing the best available scientific data, thereby reducing uncertainty. All construction, public works and urban development projects can benefit from a geologic map. Geologic maps aid engineers and planners in identifying surface and rock materials that will provide suitable foundations for the construction of critical infrastructure such as bridges, dams, tunnels, pipelines and highways. This is particularly important in areas with earthquake risk.

Geologic mapping provides a strong scientific basis for making informed regulatory decisions that ensure protection of public and environmental health. Maps depicting geologic conditions such as subsurface faulting and permeability can be used by government agencies to identify areas susceptible to geologic hazards and better determine areas that are unsuitable for development.



THE COST OF KNOWLEDGE

Geologic maps and the information they provide have an enormous economic, societal and scientific value. Cost-benefit studies show that the value of a geologic map is 25 to 39 times the cost of producing the map, and developers and engineers can save about $50,000 per project when modern geologic maps are available. To put it simply, since 1993 the survey has expended an estimated $5 million in state and federal grants to produce state-of-the-art geologic map products. These efforts have the potential for producing nearly $200 million in economic value for the state of Missouri. Knowledge and preparation are crucial to earthquake preparedness. Information related to earthquakes and disaster preparedness is available at dnr.mo.gov/geology/geosrv/earthquakes.htm.

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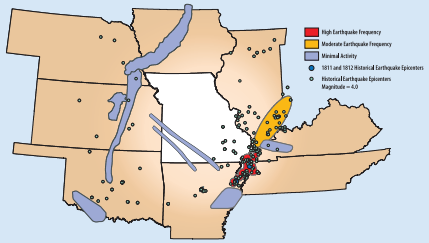
EARTHQUAKE AWARENESS

Earthquakes in Missouri

Learn about earthquake hazards in Missouri.

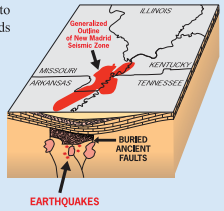
EARTHQUAKE ACTIVITY

More than 200 earthquakes occur in Missouri each year. Most are too small to be felt by humans and are only detected by machines. However, major earthquakes can occur, with three large earthquakes happening in 1811 and 1812 in the Bootheel of southeast Missouri.



EARTHQUAKES AND SEISMIC ZONES

A seismic zone is an area with multiple faults that is subject to frequent earthquakes. Earthquakes occur when pressure builds up on both sides of a fault. When the fault sides slip against one another, they cause a sudden release of energy, or earthquake.



The New Madrid Seismic Zone (NMSZ) is the most active earthquake region in the United States east of the Rocky Mountains and covers parts of Arkansas, Illinois, Kentucky, Missouri and Tennessee. While seismic zones in surrounding states can also affect Missouri, the primary earthquake hazard in the mid-continent is the NMSZ. The NMSZ is 125 miles long and contains multiple faults that extend from Marked Tree, Arkansas, to Cairo, Illinois. The faults are not visible at the surface, but are buried deeply below thick layers of sediment deposited by the Mississippi and Ohio rivers. Faults that are not visible at the surface are harder to study, making it difficult to understand the true nature of geology in the NMSZ.

EARTHQUAKE-RELATED HAZARDS

Most earthquake-related injuries and fatalities occur due to the strong ground motion, which results in destruction of man-made structures including buildings, bridges, roads and dams. Injuries and fatalities also can occur due to related effects, such as floods from dam failures, explosions and fires from gas pipeline breaks and dangers from broken power lines. Moving or falling objects such as shelves, furniture and broken glass may also cause injury and death. Transportation, communication, power, water supply and sewer systems may also be disrupted when earthquakes occur.

Unreinforced masonry is susceptible to collapse during extensive shaking.

Other hazards caused by earthquakes include ground fractures, landslides, uplifting or sinking of the ground and liquefaction. Liquefaction occurs when firm soil is shaken by the earthquake and liquefies, resembling quicksand that can flow up to the surface. Liquefaction causes sandblows (eruption of sand from underground layers), landslides, mud flows and sinking of the land, often causing structures to shift on their foundations. The sandy soils in southeast Missouri are very susceptible to liquefaction, posing a serious hazard to structures in the NMSZ. Additional hazards occur when steep slopes collapse, blocking and causing flooding or shifts in river channels.

Due to different geology in the central United States, earthquakes in the NMSZ can impact an area approximately 20 times larger than earthquakes in California and most other active seismic zones.

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