



U.S. Department of the Interior
U.S. Geological Survey

General Information Product 134

20 Cool Facts about the New Madrid Seismic Zone

Commemorating the Bicentennial of the New Madrid Earthquake Sequence December 1811–February 1812

1. First Mainshock Earthquake

The first in a series of major earthquakes occurred on December 16, 1811, at about 2:15 a.m. near present-day Blytheville, Arkansas. Estimated at magnitude (M) 7.7 (footnote 1), this event awakened people across much of what is now the eastern United States, up to about 900 miles away, including President James Madison in Washington, D.C. There were several large aftershocks that day, including the largest “Dawn” aftershock at about 7:15 a.m., estimated at M6.8–7.0.

2. First steamboat voyage interrupted

The maiden voyage of the first steamboat on the Mississippi River, the *New Orleans*, began in September 1811 on the Ohio River at Pittsburgh, Pennsylvania. It reached the Mississippi River the week before the December 16 earthquake. One morning the passengers woke to find that the island they had moored to the night before had disappeared because of liquefaction due to frequent earthquake shaking. (footnote 2)

3. Riverbanks caved, widespread flooding

According to reports of boat captains and others on the Mississippi River in December 1811, the earthquakes caused the river to fill with debris as the tree-covered river banks caved into the river. Other reports said the river flooded large tracks of land, created temporary waterfalls, and even ran backwards in some places. Today, similar bank failure, flooding, and river debris would affect bridge abutments, farm land and industries along the river, and barge traffic.

4. Second Mainshock Earthquake

The second of the three major earthquakes, estimated at M7.5, occurred on January 23, 1812, at about 9:15 a.m. Similar to the December 1811 earthquake, this event was also widely felt throughout the region. Damage occurred in an area of about 232,000 square miles.

5. Only 5,700 people lived in St. Louis in 1811

In 1811, the population of what is now the central United States was very sparse. Still considered to be the western frontier, there were only about 5,700 people in the St. Louis area at the time. Most historical reports (journals, letters, and newspapers) describing the earthquake shaking and its effects were written

by people who were located east of the Mississippi River. Today, about 11–12 million people live in the St. Louis–Memphis region.

6. Landslides

The New Madrid earthquakes caused extensive landsliding along about 125 miles of the bluffs on the east side of the Mississippi River north of Memphis. A repeat of these earthquake-triggered landslides today would affect eastern access to the Mississippi River, pipelines, and transmission towers located in this area.

7. Third Mainshock Earthquake

The third and probably the most widely felt of the three major New Madrid earthquakes occurred on February 7, 1812, at about 3:00 a.m. There were several destructive shocks that day, the last and largest estimated at M7.7. As a result, the town of New Madrid, Missouri, was severely damaged.

8. Homemade seismograph records quakes in Cincinnati

Dr. Daniel Drake, a physician in Cincinnati, Ohio, kept a detailed account of the New Madrid earthquake sequence and cataloged thousands of earthquakes. He reportedly used a pendulum-type seismograph that “marked the direction of undulation from south-southwest to north-northeast.” (footnote 3)

9. Widespread ground failure and sand blows

Important surface-deformation features caused by the 1811–1812 earthquakes are the Reelfoot fault scarp (an uplift of the land surface above the fault); Reelfoot Lake in western Tennessee; a large sand-blow liquefaction field in Arkansas, Missouri, and Tennessee; and the Big Lake and St. Francis sunken lands in northeastern Arkansas. The New Madrid earthquakes covered the region with sand blows, thousands of which remain today and can be seen as large, light-colored sandy patches in agricultural fields.

10. Reelfoot Lake forms

As a result of land subsidence and uplift from the February 7, 1812, earthquake, water from the Mississippi River flooded the area and formed Reelfoot Lake. This event added to reports of the Mississippi River flowing backwards.

11. Thousands of aftershocks

By March 15, 1812, an estimated 2,000 aftershocks had been felt, but it is likely that tens of thousands more were not felt or otherwise noted. At the time, many people were afraid to enter their homes for fear they would collapse. Damage from the largest of these shocks was reported from as far as about 300 miles away. Today, a robust aftershock sequence like this would impede rescue and rebuilding efforts throughout the region.

12. It had happened before 1811

Research indicates that the 1811–1812 New Madrid earthquake sequence was preceded by at least two similar earthquake sequences in about 1450 AD and 900 AD, and that over the past 5,000 years or so,

other large earthquakes have also occurred in the region surrounding the main area of the currently active New Madrid seismic zone.

13. Archaeological age constraints on earthquake timing

Geologists and archaeologists use Native American artifacts buried in the upper Mississippi River Valley near earthquake deformation features, such as liquefaction sand blows, to help determine when large prehistoric earthquakes occurred.

14. First Disaster Relief Act

In 1814, Missouri Territorial Governor William Clark (of the Lewis & Clark Expedition) asked for Federal relief for the “inhabitants of New Madrid County.” In response, Congress allocated \$50,000 for recovery in 1815. This was the first disaster relief act in the United States. Today, a repeat of the New Madrid earthquake sequence would cause billions of dollars in damage, especially to older unreinforced brick buildings.

15. More quakes—M6.0 in 1843, M6.6 in 1895

The strongest earthquakes to occur in the NMSZ (footnote 4) since the 1811–1812 sequence happened on January 4, 1843, and October 31, 1895. The 1843 earthquake, estimated at M6.0 and located near Marked Tree, Arkansas, caused damage in Memphis. The 1895 earthquake, located near Charleston, Missouri, estimated at M6.3–6.6, caused extensive damage to chimneys, walls, and windows in homes, churches, and schools in the area; and caused damage to almost all the commercial buildings in downtown Charleston.

16. 1909—Seismograph installed at Saint Louis University

The first seismograph in the region (called a Wiechert) was installed at Saint Louis University in 1909. This instrument recorded its first earthquake on October 9 of that year.

17. Growth of seismograph network

In the 1930s, a seismograph was installed in Cape Girardeau, Missouri. It is the oldest continuously recording seismic station specifically installed to study the NMSZ. In 1974, installation began on a dense network of 50 seismic stations in and around the NMSZ. Today there are about 270 seismograph stations in the New Madrid cooperative network in the area between St. Louis and Memphis.

18. Another quake—M5.0 in 1976

A M5.0 earthquake occurred in Poinsett County, Arkansas, at the southern end of the NMSZ, on March 24, 1976. It was felt over 174,000 square miles and caused power outages, downed telephone lines, broken windows, and roof damage.

19. Will a damaging earthquake occur again

There is a 7–10% chance or probability that a quake of magnitude 7.0 or greater will occur in the New Madrid region within the next 50 years. The probability of a quake of magnitude 6.0 or greater occurring during the same time period is somewhere between 28 and 46%.

20. Most seismically active area east of the Rockies

The NMSZ is the most seismically active area of the United States east of the Rocky Mountains, according to information from the last 40 years of instrumental recordings. It experiences an average of 200 earthquakes (greater than M1.5) every year—most, however, are too small to be felt.

Footnote 1: An earthquake's magnitude (M) represents the size of the earthquake determined from seismographic observations.

Footnote 2: From J.H.B. Latrobe's First Steamboat Voyage on the Western Waters (1871). Hosted online by the Making of America digital library (University of Michigan) at <http://quod.lib.umich.edu>.

Footnote 3: From Daniel Drake's Natural and Statistical View, or A Picture of Cincinnati and the Miami Country, Illustrated by Maps (1815). Published in Cincinnati, Ohio, by Looker and Wallace.

Footnote 4: New Madrid Seismic Zone.

New Madrid Bicentennial Information <http://newmadrid2011.org>

USGS Earthquake Program <http://earthquake.usgs.gov>

USGS Earthquake Handbook <http://pubs.usgs.gov/gip/119>

New Madrid 20 Cool Facts Poster <http://pubs.usgs.gov/gip/134>

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Publishing support:

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Design and layout by Carol Quesenberry, Denver Publishing Service Center