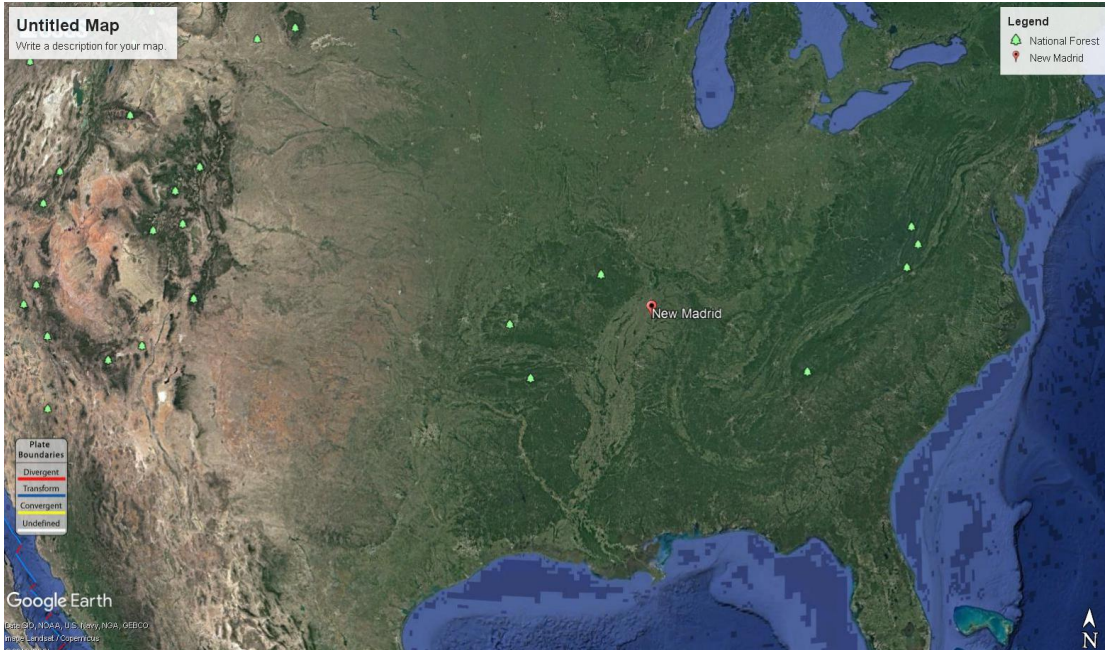


THE NEW MADRID EARTHQUAKES

Todd Rhoads, Blaze Eckman and
Jared Patene



WHAT HAPPENED? (INTRO)

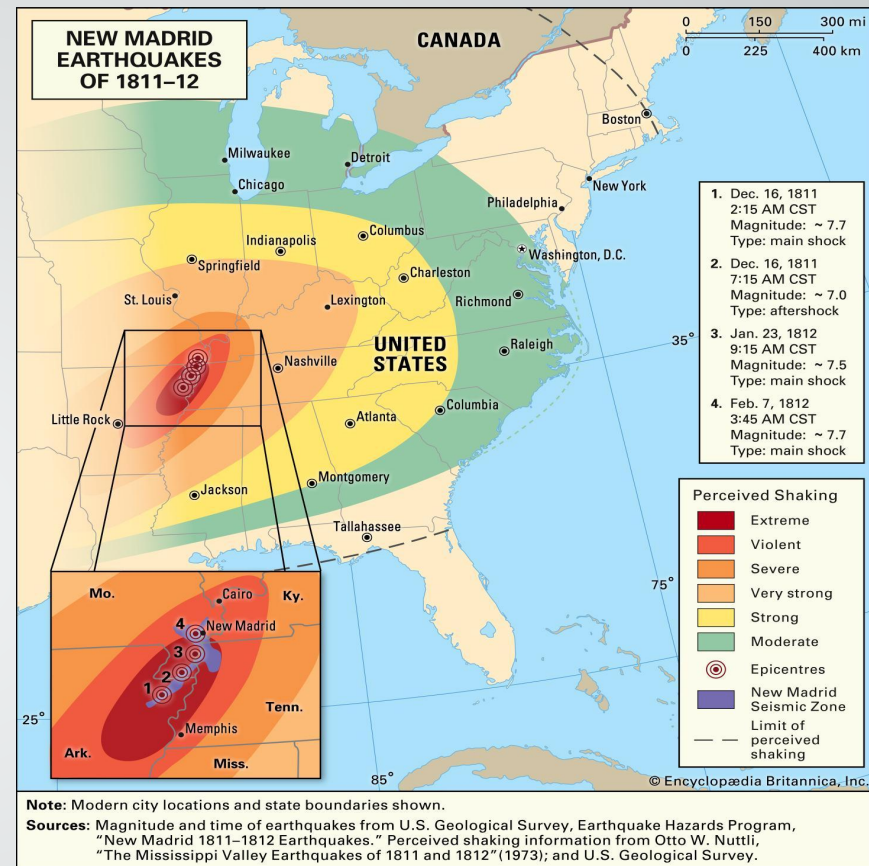
- There were a series of earthquakes in late 1811 and early 1812 in a region which spans from NE Arkansas to Southern Missouri known as the New Madrid Seismic Zone (USGS 2014)
- The shaking was felt all throughout the Eastern US (USGS 2014)
- These earthquakes would have been much more devastating had the area been more populated (USGS 2014)

WHEN AND WHERE DID THEY HAPPEN? (BACKGROUND)

There were 3 main shocks.

They were which all happened in the winter of 1811-1812:

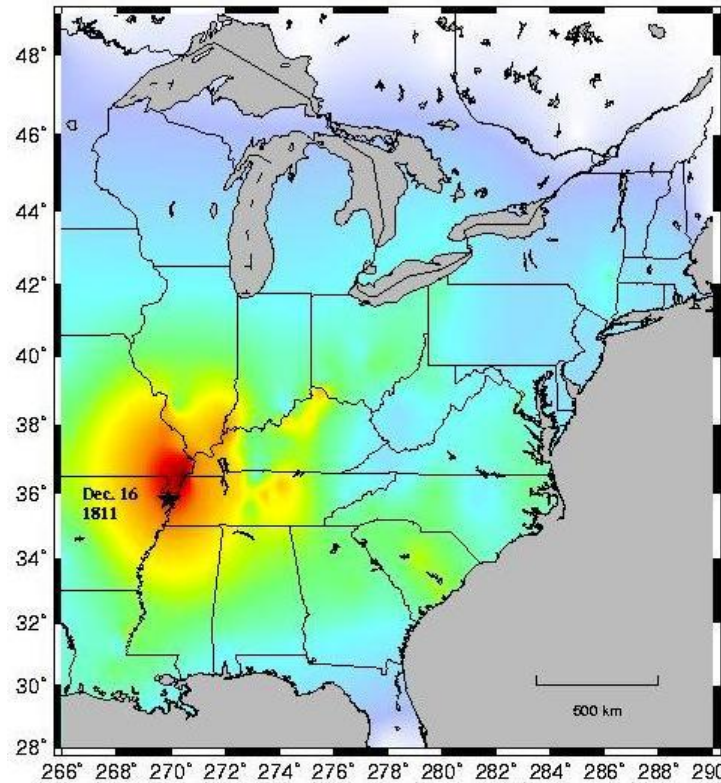
- A M7.5 - M7.7 in Northeastern Arkansas,
- A M7.0 - M7.3 in Missouri
- A M7.5 quake on the Reelfoot Fault in Missouri & Tennessee,
- There were also several large aftershocks (USGS 2014)



<https://www.britannica.com/event/New-Madrid-earthquakes-of-1811-1812>

HOW STRONG WERE THE EARTHQUAKES?

- Because the quakes happened before there were seismographs in the US, intensity can only be inferred from damage reports at the time. This causes estimates to vary between 7.0M – 7.7M depending on the specific earthquake and the source (USGS, 2014).



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very heavy
PEAK ACC. (g)	< 0.17	0.17-0.4	0.4-0.9	0.9-2.2	2.2-3.8	3.8-10	10-25	25-100	100-1000
PEAK VEL. (cm/s)	< 0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	116-1000
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

[Image Reference](#)

DAMAGE AND DEATH TOLL

- As the area was sparsely populated at the time, there was little damage to man made structures and ,according to some sources, few fatalities (Osage).
- Some sources say less than 100 deaths were reported, but it is impossible to know exactly how many people died due to illiteracy, remoteness of the settlements and delays in communication (Osage).
- Other sources estimate more than 1,000 deaths (HISTORY.COM)
- There is a discrepancy because it is unknown how many Native American deaths there were (Osage).
- The settlement of New Madrid was leveled (Osage)



<https://eos.org/research-spotlights/aftershocks-of-old-quakes-still-shake-new-madrid-seismic-zone>

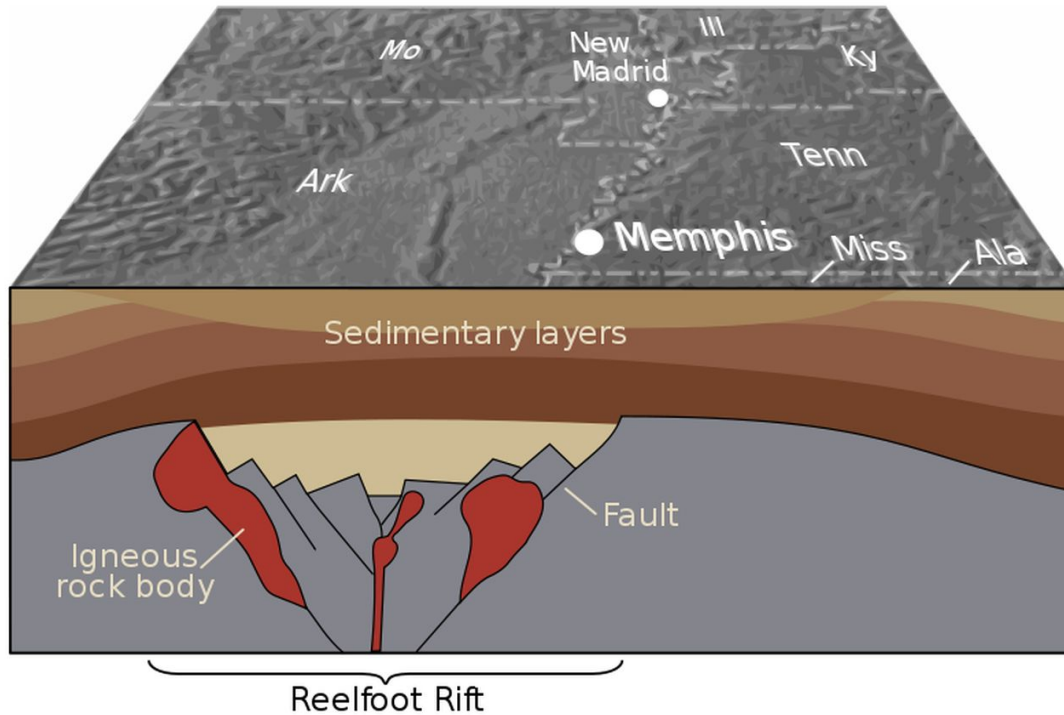


Photo Credit : Wikipedia

Cause

The earthquakes happened as a result of pressures built up in the Reelfoot Rift

- The Reelfoot Rift is a subterranean rift zone
- It's made of many faults in the Earth's crust
- The faults are poorly understood (Rafferty)

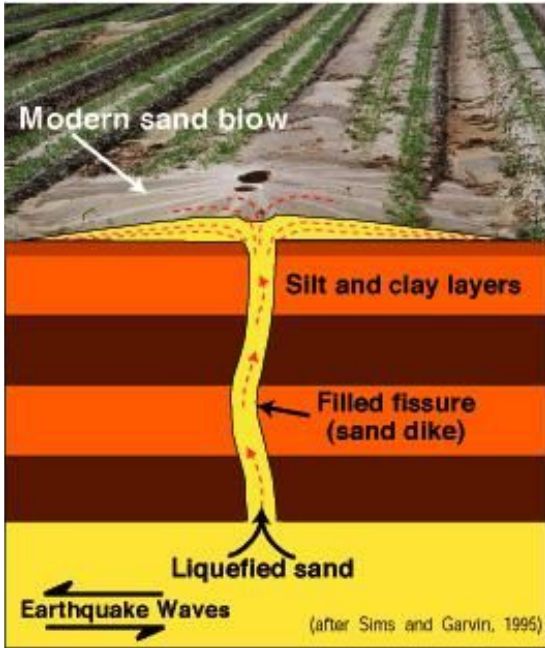


- Left entire forests were leveled by the intense shaking and subsequent flooding from the Mississippi River (*Young*)

Right – Many ships were destroyed as the Mississippi River heaved to-and-fro during the earthquake (*Missouri Life*)

-The Feb. 07 1812 quake caused the Mississippi river to flow backwards for a few hours (History.com).

THE PHYSICAL DESTRUCTION



- Liquefaction is when wet, sandy soil becomes unstable during an earthquake
- Liquefaction occurred in many areas during the New Madrid earthquakes due to the wet sandy soil next to the Mississippi river
- Pressure builds within the sand from all of the seismic waves.
- This pressure is eventually released, like a geyser, creating huge holes in the sand called "Sand Blows"

(showme.net)

WHAT IS A SANDBLOW?



EYE WITNESS

"The screams of the affrighted inhabitants running to and fro, not knowing where to go, or what to do — the cries of the fowls and beasts of every species — the cracking of trees falling and the roaring of the Mississippi ... formed a scene truly horrible.

...At first, the Mississippi seemed to recede from its banks, and its waters gathering up like a mountain, leaving for the moment many boats, which were here on their way to New Orleans, on bare sand, in which time the poor sailors made their escape from them."

...The river falling immediately, as rapid as it had risen, receded in its banks again with such violence, that it took with it whole groves of young cotton-wood trees, which ledged its border.

...The river was literally covered with the wrecks of boats and 'tis said that one was wrecked in which there was a lady and six children, all of whom were lost. (Gallagher)."

RAFTS OF TREES ON THE MISSOURI

Eliza Bryan, Survivor of All Three New Madrid Earthquakes

Photo Credit: *Missouri
Life*

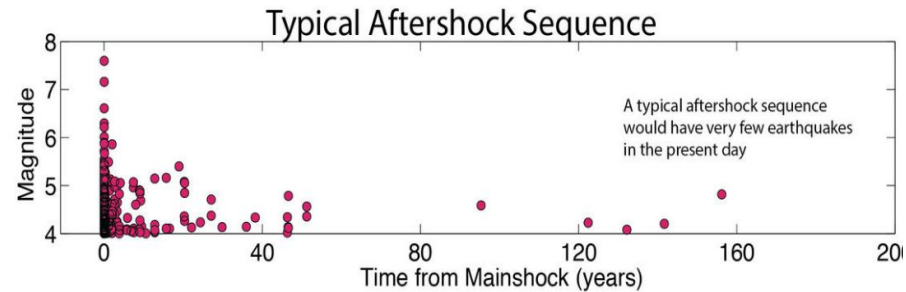
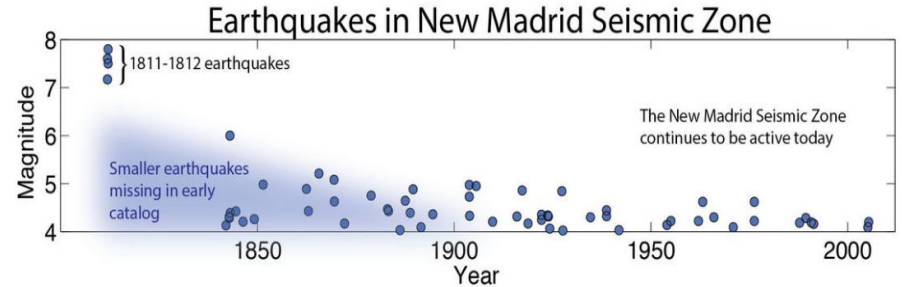
WHAT DOES THE FUTURE LOOK LIKE?

According to a USGS study, if we compare typical aftershocks to those from the New Madrid quakes, we can see that stress is continuing to build up (USGS 2014).

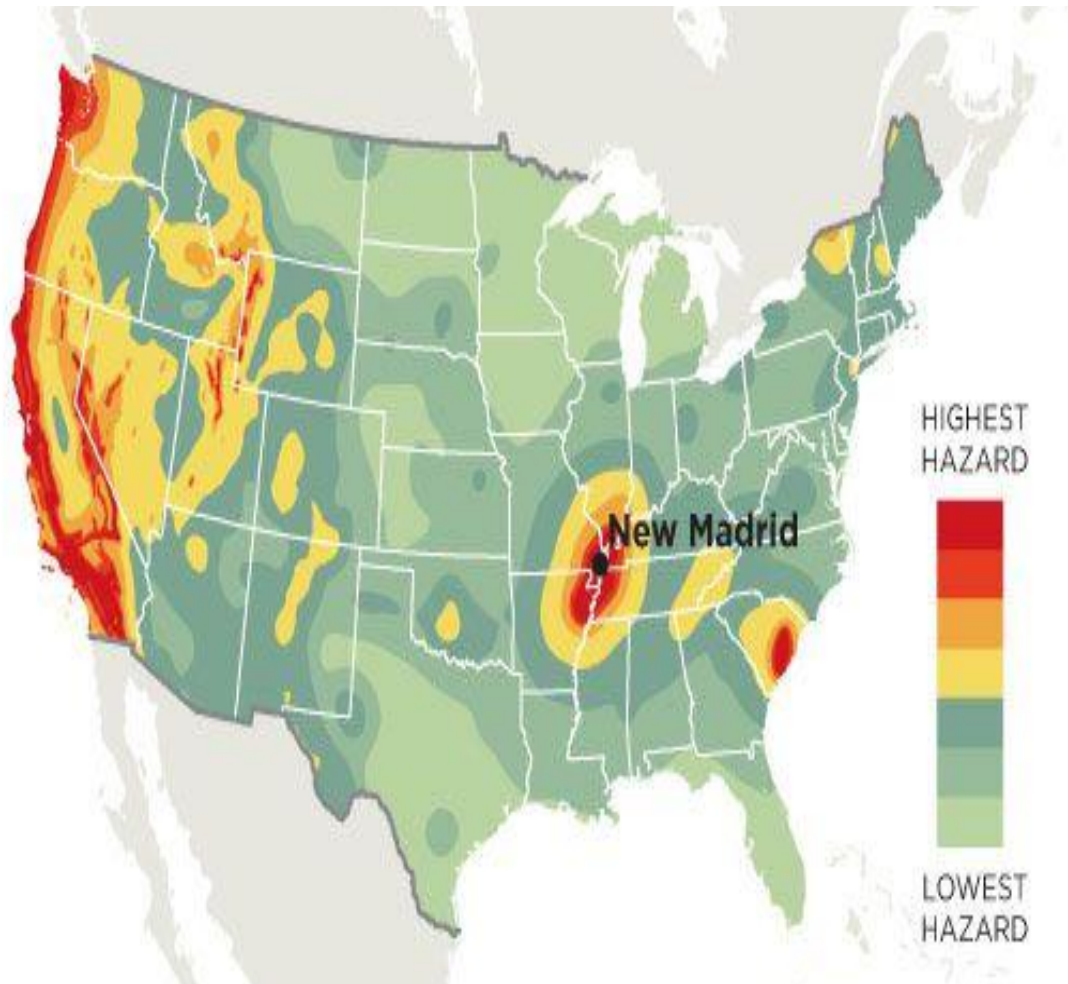
The chance of a 6.0M earthquake within the next 50 years in 25% - 40% (cusec.org)

<http://www.usgs.gov/media/images/a-timeline-earthquakes-new-madrid-seismic-zone>https:

A timeline of earthquakes in the New Madrid Seismic Zone



(Public domain.)



- The USGS seismic hazard map shows that the New Madrid seismic area has one of the highest hazard levels in the country
- The New Madrid area is expected to have another eventually as tension is building
- Such an event would cause unprecedented damage in the area as the area is now populated by millions (cusec.org)

[\(https://www.smithsonianmag.com/science-nature/the-great-midwest-earth-quake-of-1811-46342/\)](https://www.smithsonianmag.com/science-nature/the-great-midwest-earth-quake-of-1811-46342/)

CONCLUSION

- The exact magnitude of the quakes can only be inferred
- The quake changed the landscape of the affected areas
- The New Madrid earthquake did a relatively small amount of damage to humans due to the sparse population at the time
- The New Madrid Seismic Area is still vulnerable to earthquakes and should prepare accordingly as a modern earthquake could potentially kill millions



RESOURCES

1. Rafferty, John P. "New Madrid Earthquakes of 1811–12." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., 16 Jan. 2019, www.britannica.com/event/New-Madrid-earthquakes-of-1811-1812.
2. "Summary of 1811-1812 New Madrid Earthquakes Sequence." *U.S. Geological Survey*, earthquake.usgs.gov/earthquakes/events/1811-1812newmadrid/summary.php.
3. "The Great Midwest Earthquake of 1811." *Smithsonian.com*, Smithsonian Institution, 1 Dec. 2011, www.smithsonianmag.com/science-nature/the-great-midwest-earthquake-of-1811-46342/.
4. Osage - *Encyclopedia of Arkansas*, www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?entryID=2218.
5. Gallagher, Jim. "A Survivor Describes the Great Quake of 1811." *Stltoday.com*, *STLtoday.com*, 1 Aug. 2015, www.stltoday.com/news/local/a-survivor-describes-the-great-quake-of/article_83ac1f82-7cd2-5d20-b570-74efc8355aee.html.
6. "The New Madrid Earthquakes of 1811-1812." *Missouri Life*, 8 Feb. 2018, www.missourilife.com/new-madrid-earthquakes-1811-1812.
7. "Earthquake Causes Fluvial Tsunami in Mississippi." *History.com*, *A&E Television Networks*, 13 Nov. 2009, www.history.com/this-day-in-history/earthquake-causes-fluvial-tsunami-in-mississippi.



RESOURCES

8. "Sinking Sand, Sand Boils, LIQUEFACTION." Earthquake Possibility: New Madrid Zone 7.7 Magnitude FEMA Report, showme.net/~fkeller/quake/liquefaction.htm.
9. "Home." CUSEC, cusec.org/new-madrid-seismic-zone/.