



# Projected Earthquake Damage Extent in States Bordering The New Madrid Fault Zone

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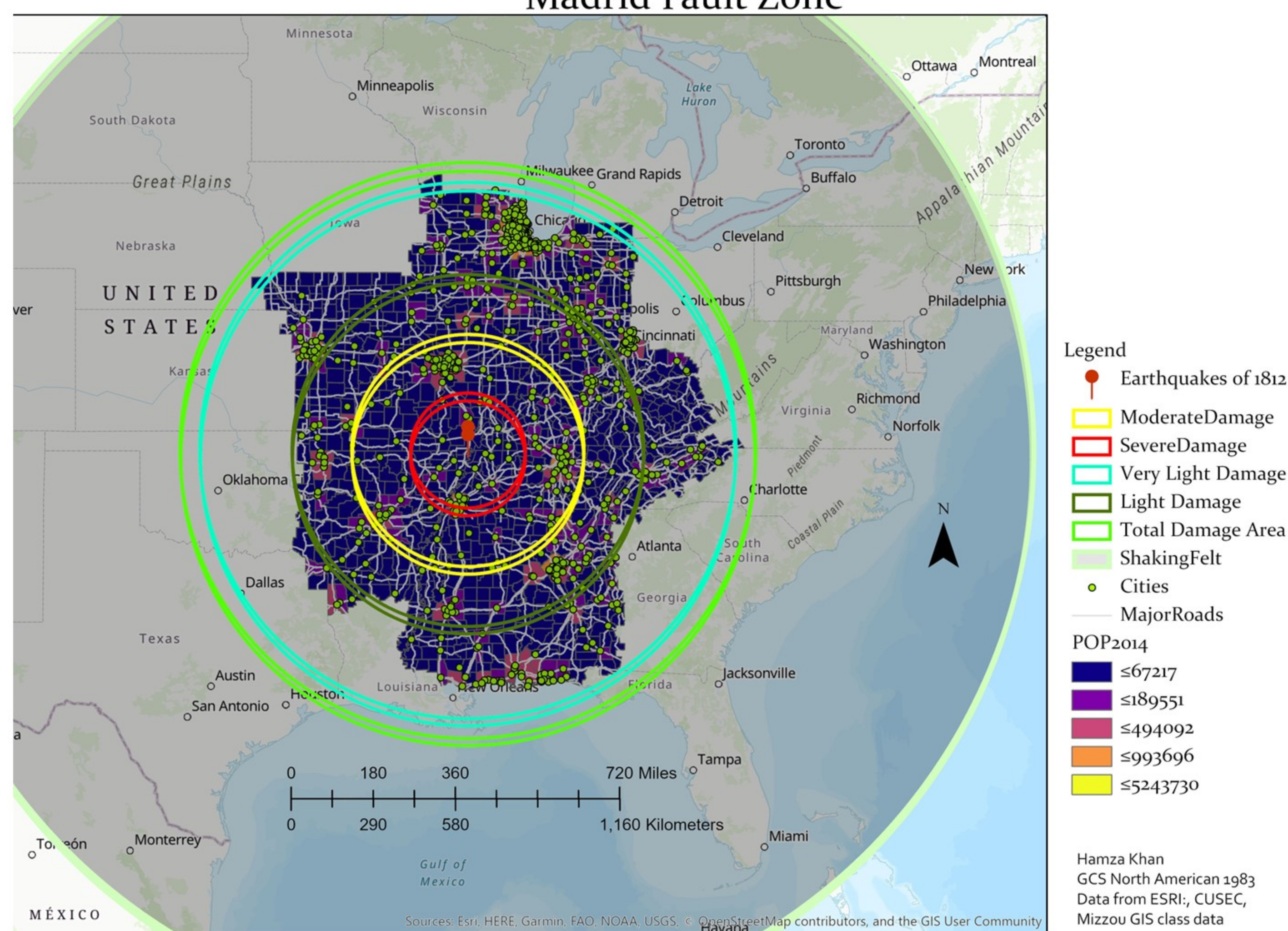
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## 1. Background:

In 1811-1812, a series of earthquakes rocked southeast Missouri, as well as the surrounding areas. These areas were estimated to have a magnitude between 7.0-8.0, making them some of the most powerful and dangerous earthquakes that shook the United States of America.

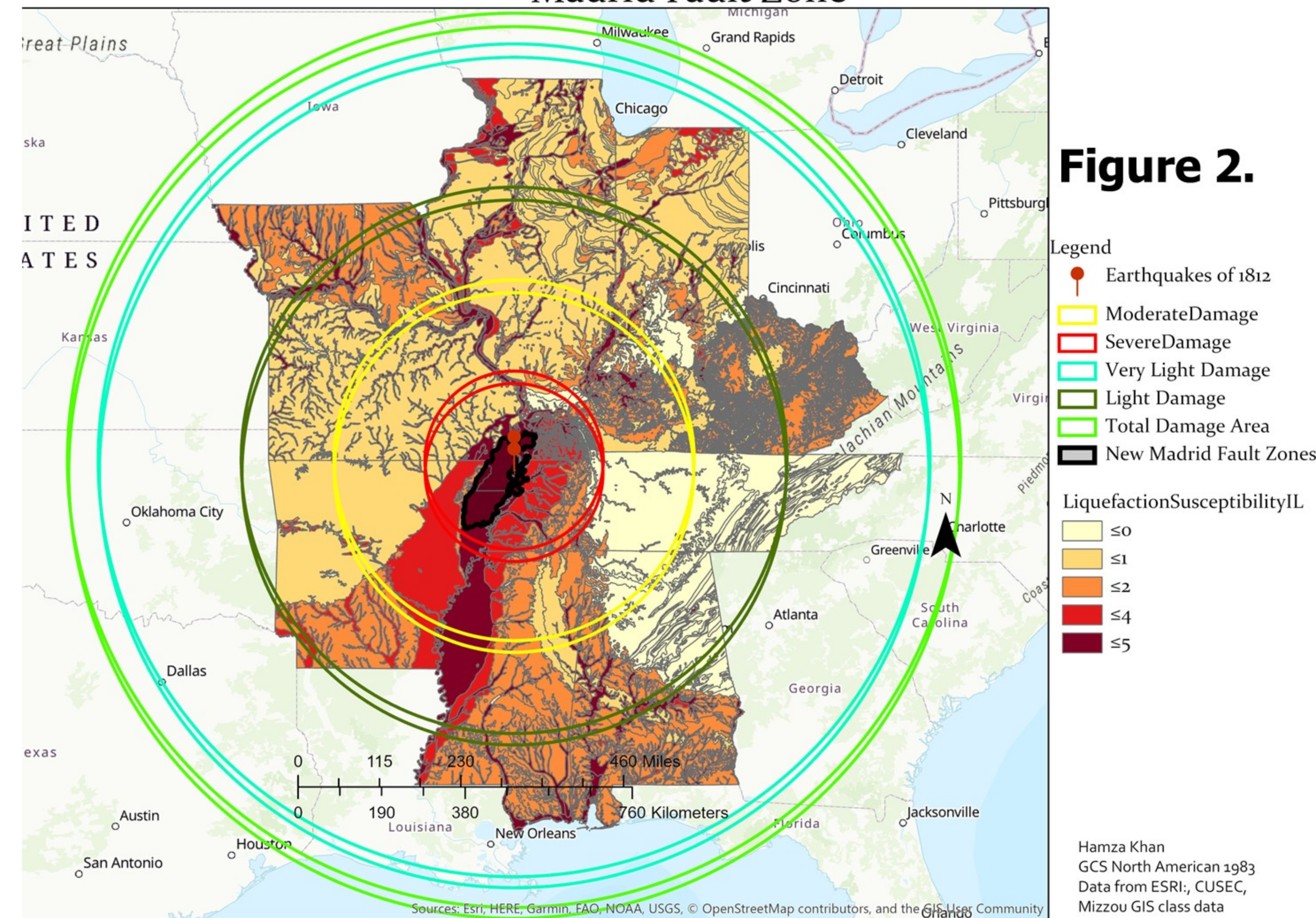
These seismic waves caused damage in an area of 600,000 kilometers ("Earthquakes of 1811-1812.") and the tremors could be felt in Hartford, Connecticut. It caused large amounts of land to be lifted, as well as causing the Mississippi river to flow backwards. It completely wiped out the town of New Madrid, Missouri, while severely damaging St. Louis and Memphis. Over the four-month period, hundreds of people perished.

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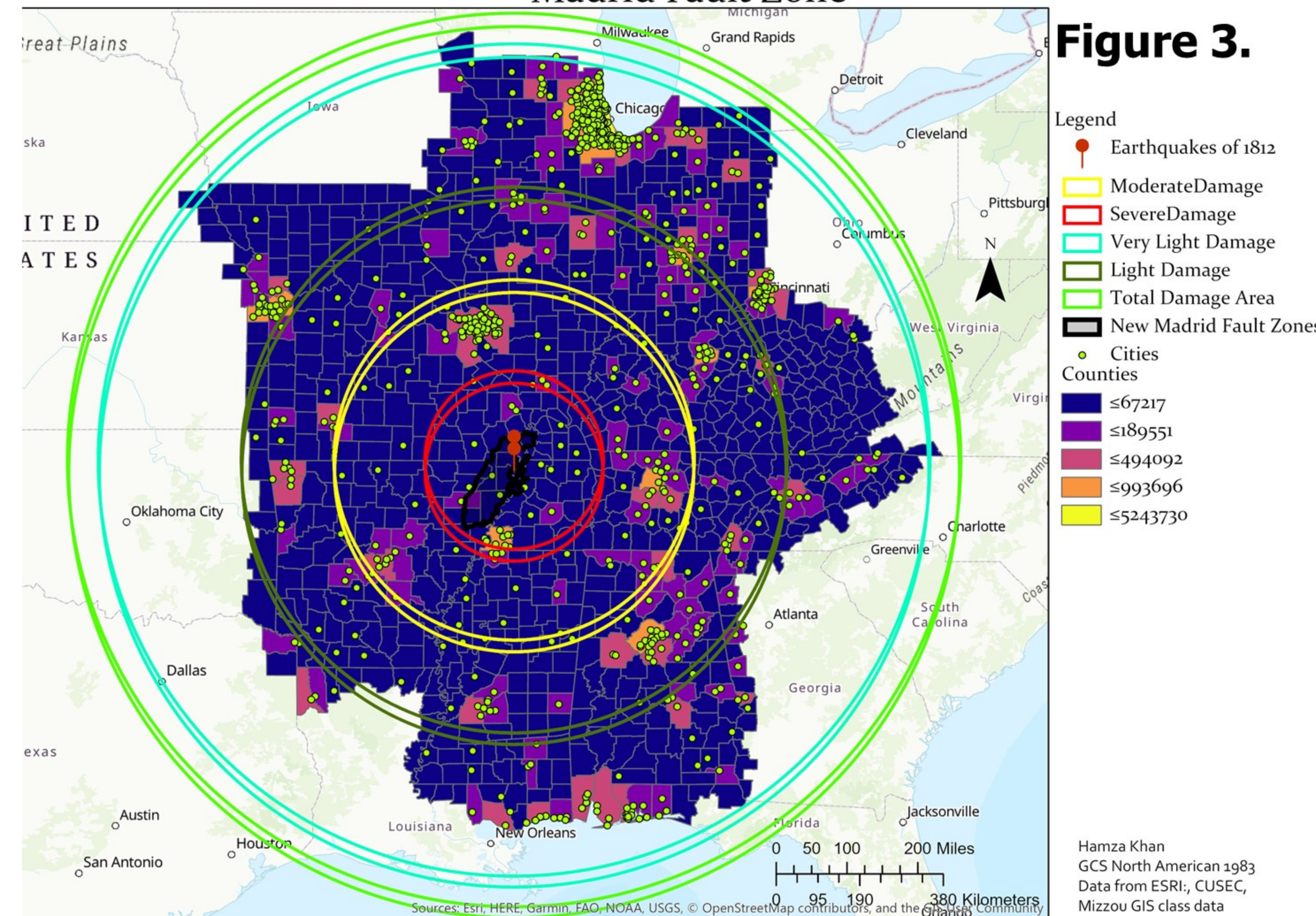


**Figure 1.** The extent of tremors felt throughout the continental US during the 1811-1812 earthquakes, as well as the extent of damage spread throughout the area surrounding the New Madrid Fault Zone.

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## 2. Methods and Findings

Using mainly a *Geographic Information System* (GIS) program (ARCGIS Pro) to compile and analyze data and research from multiple seismological and geologic sources, Figures 2 & 3 show the levels of liquefaction in the surrounding areas of the *New Madrid Fault Zone* (NMFZ), as well as the population of counties and cities in the areas that were damaged in 1811-1812. In Figure 2, a large portion of the surrounding areas is prone to liquefaction, which is what occurs when partially saturated soil loses its structural integrity due to shaking. Figure 3 shows the larger populated areas within the damage zones, such as St. Louis, Memphis, Little Rock, and other cities.

When comparing the liquefaction susceptibility to the populated counties and cities, a large portion of the major cities fall in saturated soil areas due to being closer to a major river and having a history of easier transportation. This causes a larger issue to rise, as levees and dams can become damaged and a breach may occur flooding residential and commercial areas.

The *Mid-American Earthquake* (MAE) Center has conducted extensive risk assessment on the NMFZ and have concluded "model results indicate extensive infrastructure damage, casualties, economic loss, and local flood risk". However, the MAE specified certain risks such as casualties being "86,000, including 3,500 fatalities" and nearly 715,000 damaged buildings. A majority of the eleven million living within the moderate area buffer will be displaced due to loss of utilities such as water and electricity according to the Mid-America Earthquake Center.

## 3. Conclusions

- Scientists at the MAE estimate that the chance of a magnitude 6.0 earthquake in the next 50 years is 25-40%, while a magnitude 7.0-8.0 is around 7-10%.
- The government should push for stronger building codes that are more resistant to damage from earthquakes. This can attempt to subdue the sheer amount of damage from a large earthquake at the New Madrid Fault Zone.
- If a seismic event were to occur, this information is pertinent to avoid as many casualties, fatalities, and as much property damage as possible.

## References

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## Acknowledgements:

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