

Earthquakes (PART FOUR)

An earthquake is what people experience when there has been a significant and catastrophic release of strain energy that has accumulated in the earth's crust. This strain energy can be built up in the earth's crust by various physical geologic processes. However, the process that causes most earthquakes and the process that is of greatest concern here in Arkansas, is plate tectonics. The earth's crust is made up of a group of large sections called tectonic plates. These tectonic plates are in constant motion, although rather slow motion in normal human terms. Right now, as you are hearing me, the North America Continent is being pushed westward by the opening up of the Atlantic Ocean. North America is getting further away from Europe by just a few centimeters each year. Resisting this motion is the Pacific Plate, the largest tectonic plate on the planet. This puts the North American continent in a squeeze and generates earthquakes along major fault zones. One of those fault zones is in northeast Arkansas and the boot heel of Missouri. As the strain energy builds up it deforms the Earth's crust elastically. When that strain energy is strong enough to overcome the friction along an existing fault plane or is strong enough to fracture and displace fresh rock and we feel it, we call it an earthquake. The actual earthquake we feel is the elastic rebound of the Earth's crust to a more relaxed condition.

Arkansas is at great risk of experiencing a large damaging earthquake in the not too distant future. Recent studies suggest that this threat is as great today as at any time in the last hundred years. Each day that goes by brings us one day closer to a catastrophe the like of which we have not seen in modern times in Arkansas. In today's modern society, Arkansas is even less resistant to the potential for damage than it was in the early 1800s. Although current understanding supports the view that great earthquakes are not very likely to occur for several hundred years, large damaging shocks are, in fact, due.

Earthquakes occur in the Earth's crust at a place called the focus. Because we live on the surface we locate earthquakes by way of an epicenter which is the place on the Earth's surface directly over the actual earthquake. Because the release of energy in an earthquake emanates from a surface of rupture rather than a point source, the energy waves are quite complex. They become even more so as the waves propagate through the Earth's crust due to the variation of the physical properties of the rock layers, reflection and refraction of the waves, the topography of the surface, and the interference of the wave trains on each other. Earthquakes release their energy in the form of different wave types. These energy waves travel at different speeds and temporarily deform and shake the earth's crust in different ways.

Although we have mapped thousands of faults in the rocks of Arkansas, none of them are currently active, nor have they been at any time in the last thousands to millions of years. In many places in the world you can see the earthquake producing fault.

The effort to assess the seismic risk in the Mississippi Valley is, however, hampered because the faults and other geologic structures related to earthquakes there have been deeply buried over hundreds of millions of years by thick layers of sediment. Therefore, few clues to the causes of earthquakes in the NMSZ can be found at the Earth's surface. To unmask these hidden geologic structures related to earthquakes, scientists are using geophysical techniques, such as mapping variations in the strength of Earth's magnetic field. A magnetic map of the central Mississippi Valley region made by geophysicists with the USGS shows with exceptional clarity a major buried feature known as the Reelfoot Rift. Most earthquakes in the central United States occur within this northeast-trending structure, which formed more than 500 million years ago.

The potential for the recurrence of such earthquakes and their impact today on densely populated cities in and around the seismic zone has generated much research devoted to understanding earthquakes. Without being able to locate earthquakes we would not know really where the potentially damaging faults lay.

As there is nothing we can do to stop or prevent earthquakes our only hope is to understand them and the forces that they produce, and to be mentally and materially ready when one does occur.

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U.S. Census Bureau 2005 Population Estimates for Arkansas

2005 Population of Arkansas 2,779,154

COUNTY	POPULATION	HOMES	LARGEST CITY	POPULATION
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The orange print denotes that that county is in the northeast quarter of the State.

CLAY	16,578	8,633	Piggott	3,777
GREENE	39,401	17,083	Paragould	18,540

MISSISSIPPI	47,911	22,573	Blytheville	22,906
CRITTENDEN	51,882	21,665	W. Memphis	28,014
LEE	11,545	4,975	Marianna	5,910
PHILLIPS	24,107	10,959	West Helena and Helena	17,186
DESHA	14,358	6,818	Dumas	5,520
CHICOT	13,027	6,098	Lake Village	2,791
TOTALS	218,807	98,804	*****	104,644

RANDOLPH	18,465	8,565	Pocahontas	6,151
LAWRENCE	17,153	8,219	Walnut Ridge	4,388
CRAIGHEAD	86,753	37,301	Jonesboro	57,435
POINSETT	25,349	11,337	Trumann	6,304
CROSS	19,237	8,297	Wynne	8,187
ST. FRANCIS	27,902	10,043	Forrest City	13,364
MONROE	9,302	5,203	Clarendon	2,072
ARKANSAS	20,073	9,795	Stuttgart	10,420
LINCOLN	14,262	5,080	Star City	2,138
DREW	18,693	8,672	Monticello	9,146
ASHLEY	23,178	10,886	Crossett	6,097
TOTALS	280,340	123,398	*****	112,102

SHARP	17,397	9,542	Cherokee Village	4,648
JACKSON	17,601	8,074	Newport	7,459
WOODRUFF	8,098	4,157	Augusta	2,759
PRAIRIE	9,113	3,894	Des Arc	2,001
JEFFERSON	81,700	35,176	Pine Bluff	53,905
CLEVELAND	8,903	3,941	Rison	1,271
BRADLEY	12,192	5,948	Warren	6,442
UNION	44,186	20,971	El Dorado	20,849

GRAND TOTALS	698,337	313,905	*****	311,880
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The counties listed above are the three most eastern from the north to the south parts of the State.
 The population of this area is equal to 25% of the total population of Arkansas .

Estimates of Damage from an Earthquake on the Southern Portion of the New Madrid Fault Zone (NMFZ)

Arkansas from North to South three most Eastern counties	Richter Magnitude	
	6.0	7.0
Effects on People		
Percentage Feeling Quake	100%	100%

Serious Injury	753	15,879
Fatalities	169	3,546
Displaced	106,309	197,375

Northeast ¼ of the State of Arkansas Eastern most three counties	Richter Magnitude	
	6.0	7.0
Effects on People		
Percentage Feeling Quake	100%	100%
Serious Injury	718	15,529
Fatalities	0/163	3473
Displaced	100,799	181,770

