Arkansas Geological Survey
Bekki White, Director and State Geologist

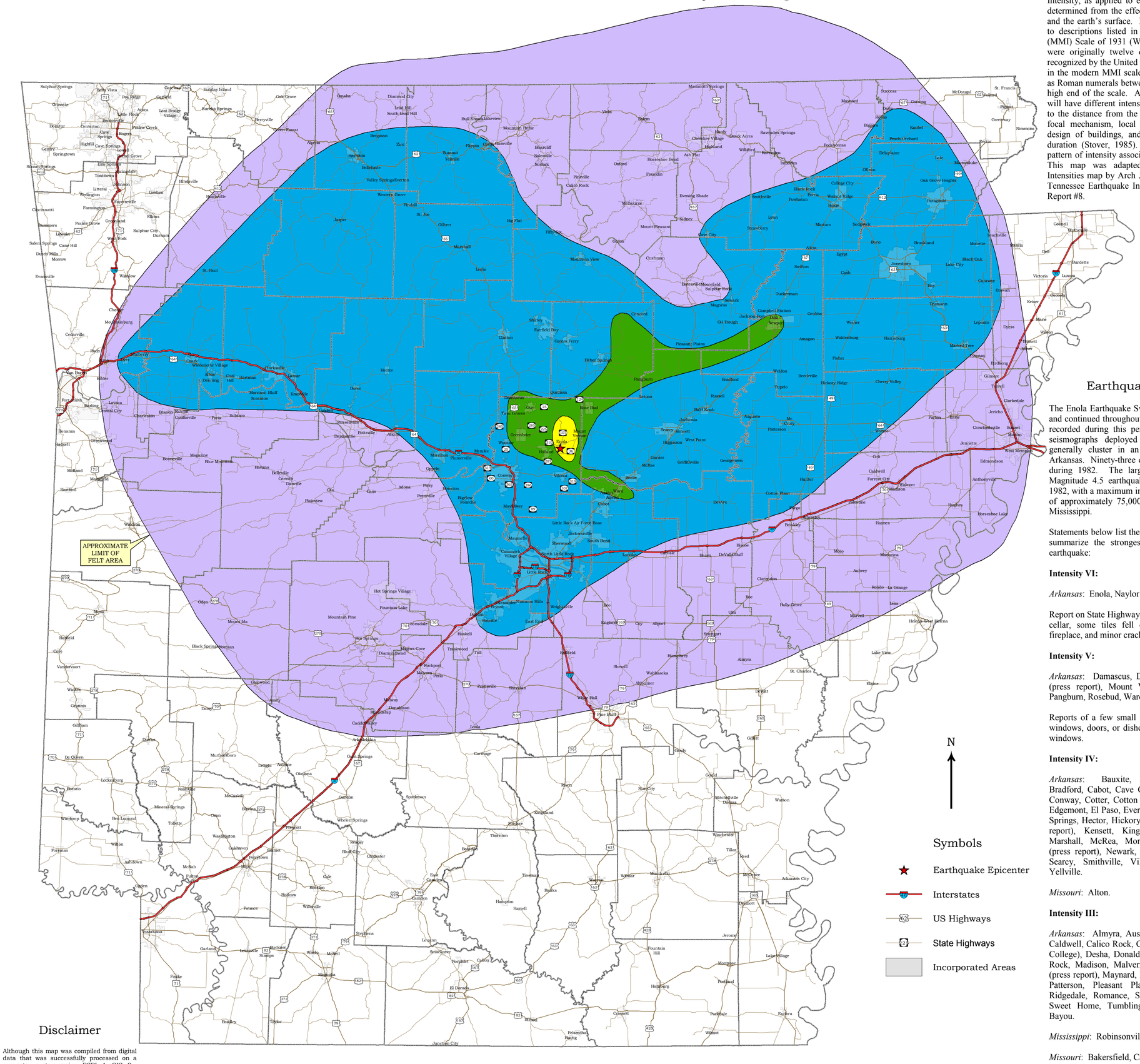
GH-EQ-MMI-AR-0001

Modified Mercalli Intensities

Enola Earthquake Swarm

Seismic Event: Magnitude 4.5

20 January 1982 @ 6:33 PM CST



INTENSITY	I	II	III	IV	V	VI	VII	VIII	IX	X+
SHAKING	None	Weak	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
DAMAGE	None	None	None	None	Very Light	Light	Moderate	Moderate Heavy	Heavy	Very Heavy
MAGNITUDE	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7+

About the Map

Intensity, as applied to earthquakes, represents a quantity determined from the effects on people, man-made objects, and the earth's surface. Intensities are assigned according to descriptions listed in the Modified Mercalli Intensity (MMI) Scale of 1931 (Wood and Newman, 1931). There were originally twelve discreet steps, but only ten are recognized by the United States Geological Survey (USGS) in the modern MMI scale. Intensity ratings are expressed as Roman numerals between I at the low end and X+ at the high end of the scale. An earthquake in a populated area will have different intensities at different localities, owing to the distance from the focus of the earthquake, type of focal mechanism, local geological conditions, structural design of buildings, and the earthquake magnitude and duration (Stover, 1985). MMI maps illustrate the areal pattern of intensity associated with individual earthquakes. This map was adapted from the Modified Mercalli Intensities map by Arch Johnson and Ann Metzger, in the Tennessee Earthquake Information Center (TEIC) Special Report #8.

Earthquake Description

The Enola Earthquake Swarm began on January 12, 1982, and continued throughout the year with over 19,000 events recorded during this period by a temporary network of seismographs deployed in the area. The epicenters generally cluster in an area near the town of Enola, Arkansas. Ninety-three events were felt by local residents during 1982. The largest event of the swarm was a Magnitude 4.5 earthquake that occurred on January 20, 1982, with a maximum intensity of VI and felt over an area of approximately 75,000 km² in Arkansas, Missouri and Mississippi.

Statements below list the reported intensities, locations and summarize the strongest effects of the Magnitude 4.5 earthquake:

Intensity VI:

Arkansas: Enola, Naylor.

Report on State Highway 36 of hairline cracks in a concrete cellar, some tiles fell off a tile-lined well, a cracked fireplace, and minor cracks at the seams of sheetrock walls.

Intensity V:

Arkansas: Damascus, Drasco, Greenbrier, Guy, Holland (press report), Mount Vernon, Newport (press report), Pangburn, Rosebud, Ward.

Reports of a few small objects were overturned and fell; windows, doors, or dishes were rattled and a few cracked windows.

Intensity IV:

Arkansas: Bauxite, Beebe, Bee Branch, Bigelow, Bradford, Cabot, Cave City, Choctaw, Clinton, Concord, Conway, Cotter, Cotton Plant, Des Arc, Dogpatch, Dyer, Edgemont, El Paso, Everton, Fox, Harriet, Harrison, Heber Springs, Hector, Hickory Ridge, Higden, Huntsville (press report), Kensett, Kingston, Lepanto, Leslie, Litona, Marshall, McRea, Morrilton, Mountain View, Naylor (press report), Newark, Pindall, Quitman, Reyno, Rosie, Searcy, Smithville, Vilonia, Walnut Ridge, Wilburn, Yellville.

Missouri: Alton.

Intensity III:

Arkansas: Almyra, Austin, Batesville, Brandy, Brickeys, Caldwell, Calico Rock, College Station, Conway, (Hendrix College), Desha, Donaldson, Guion, Imboden, Keo, Little Rock, Madison, Malvern, Mammoth Spring, Mayflower (press report), Maynard, Melbourne, Oil Trough, Palestine, Patterson, Pleasant Plains, Pocahontas, Prim, Pruitt, Ridgedale, Romance, Sheridan, Shirley, Sulphur Rock, Sweet Home, Tumbling Shoals, Swifton, Viola, Wolf Bayou.

Mississippi: Robinsonville.

Missouri: Bakersfield, Caufield.

Intensity II:

Arkansas: Glenwood, Mount Pleasant.

Missouri: Koshkonong, Myrtle.

Felt: (indicates that the available data is not sufficient for assigning an intensity value)

Arkansas: Black Rock, Durham.

Adapted from Stover, C. W., 1985, United States Earthquakes, 1982, United States Geological Survey: United States Geological Survey Bulletin 1655, 141 p.

Modified Mercalli Intensity Scale

I Not felt.

II Felt by persons at rest, on upper floors, or favorably placed.

III Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.

IV Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing automobiles rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frame creak.

V Felt outdoors; direction estimated. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.

VI Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books and other items fall off shelves. Pictures fall off walls. Furniture moved or overturned. Weak plaster and *Masonry D* cracked. Small bells ring (church, school). Trees, bushes shaken (visibly, or heard to rustle).

VII Difficult to stand. Noticed by drivers of automobiles. Hanging objects quiver. Furniture broken. Damage to *Masonry D*, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in *Masonry C*. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.

VIII Steering of automobiles affected. Damage to *Masonry C*; partial collapse. Some damage to *Masonry B*; none to *Masonry A*. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX General panic. *Masonry D* destroyed; *Masonry C* heavily damaged, sometimes with complete collapse; *Masonry B* seriously damaged, and damage to *Masonry A*. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs and underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.

X+ Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly. **XI.** Rails bent greatly. Underground pipelines completely out of service. **XII.** Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

Masonry A: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

Masonry B: Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.

Masonry C: Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.

Masonry D: Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Adapted from Association of Bay Area Governments (ABAG), On Shaky Ground, 2003, Retrieved January 28, 2008 from http://www.abag.ca.gov/bayarea/eqmaps/doc/mmi.html.

References

Association of Bay Area Governments (ABAG), On Shaky Ground, 2003, Retrieved January 28, 2008 from http://www.abag.ca.gov/bayarea/eqmaps/doc/mmi.html.

Johnson, A., and Metzger, A., 1982, The Central Arkansas earthquake swarm—Part 1, 12th January to 12th July 1982: Tennessee Earthquake Information Center (TEIC), Special Report, no. 8, 84 p.

Stover, C. W., 1985, United States Earthquakes, 1982, United States Geological Survey: United States Geological Survey Bulletin 1655, 141 p.

Wood, H. O., and Neumann, Frank, 1931, Modified Mercalli Intensity Scale of 1931: Seismological Society of America Bulletin, v. 21, no.4, p. 277–283.

Disclaimer

By
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2009

Date: 20 February 2009 | Scale: 1 : 850,000 | Digital Compilation: Jerry W. Clark