Modified Mercalli Intensity for Scenario Earthquakes in Evansville, Indiana

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Evansville has experienced minor damage from earthquakes several times in the past 200 years. Because of this history and the fact that Evansville is close to the Wabash Valley and New Madrid seismic zones, there is concern about the hazards from earthquakes. Earthquakes currently cannot be predicted, but scientists can estimate how strongly the ground is likely to shake as a result of an earthquake. Earthquake-hazard maps provide one way of conveying such estimates of strong ground shaking and will help the region prepare for future earthquakes and reduce earthquake-caused losses.

The Evansville Area Earthquake Hazards Mapping Project has produced a series of maps that show the hazards from earthquakes in the region. Included in this array of products are scenario-hazard maps, which predict ground shaking from two hypothetical earthquakes: (1) a magnitude 7.7 earthquake in the New Madrid seismic zone, and (2) a magnitude 6.8 earthquake in the Wabash Valley seismic zone. These earthquakes are believed to be the largest probable earthquakes that could impact the Evansville region.

The results from the scenario ground-motion modeling are displayed below in terms of Modified Mercalli Intensities (MMI); the translation from ground-motion measurement to a description of earthquake intensity allows for an analysis of likely damage. Modified intensities range from MMI V (moderate shaking with light levels of expected damage) to MMI IX (violent shaking with heavy damage). For both scenarios, the strongest shaking is expected along the Ohio River valley, where thick, soft sediments amplify earthquake waves. While both scenarios predict at least some damage across the broader Evansville region, the level of damage is greater for the magnitude 6.8 Wabash Valley earthquake due to the proximity of Evansville to the earthquake source (25 miles versus 100 miles for New Madrid). For the Wabash Valley scenario, the type of predicted damage ranges from collapse of poorly built masonry structures along the Ohio River Valley to broken windows, dislodged brick work, and cracks to poorly designed or older structures outside of the river valley. For the New Madrid magnitude 7.7 scenario, light damage is expected outside of the river valley, including broken windows and glazing and cracked plaster. Within the Ohio River valley, poorly designed masonry structures and adobe houses could be cracked and damaged, and weak chimneys may be broken.

These scenario ground-shaking maps complement probabilistic seismic-hazard maps produced by the Evansville Area Earthquake Hazard Mapping Group and provide government officials, city planners, and emergency response personnel with the information they need to prepare for possible future earthquake-caused ground shaking in the Evansville area.

Earthquake Sources

Earthquakes in the images on the left are taken from the USGS earthquake catalog for the National Maps, which has data concerning earthquakes that have occurred from 1574 to 2006. Earthquakes in the image on the right are obtained from the catalog produced by the Center for Earthquake Research and Information at the University of Memphis. It contains instrumentally observed earthquakes from 1974 to 2006. The blue lines are the locations of the scenario earthquakes.

Modified Mercalli Intensities

For the New Madrid scenario, the strongest shaking is expected along the Ohio River valley, where thick, soft sediments amplify earthquake waves. While both scenarios predict at least some damage across the broader Evansville region, the level of damage is greater for the magnitude 6.8 Wabash Valley earthquake due to the proximity of Evansville to the earthquake source (25 miles versus 100 miles for New Madrid). For the Wabash Valley scenario, the type of predicted damage ranges from collapse of poorly built masonry structures along the Ohio River Valley to broken windows, dislodged brick work, and cracks to poorly designed or older structures outside of the river valley. For the New Madrid magnitude 7.7 scenario, light damage is expected outside of the river valley, including broken windows and glazing and cracked plaster. Within the Ohio River valley, poorly designed masonry structures and adobe houses could be cracked and damaged, and weak chimneys may be broken.

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