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Earthquakes

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Fact Sheet No. 10

Kentucky is affected by earthquakes from several seismic zones in and around the state. The most important one is the New Madrid Seismic Zone, in which at least three great earthquakes, each estimated to have been greater than magnitude 8 on the Richter scale, occurred from December 1811 to February 1812. Though the state was sparsely settled, these great earthquakes affected the whole Commonwealth of Kentucky. The strongest earthquake recorded in Kentucky is the Sharpsburg earthquake of July 27, 1980, in Bath County. The quake was magnitude 5.2 on the Richter scale and caused an estimated \$3 million in damage.

How earthquakes affect humans, buildings, and bridges depends on many factors. The most important factors are earthquake magnitude, the distance from the earthquake center—**epicenter**—and the geologic conditions at a site. Most damage during an earthquake is caused by **ground motion**. The larger an earthquake's magnitude, the stronger the ground motion it generates. The level of ground motion at a site depends on its distance from the epicenter—the closer a site is to the epicenter, the stronger the ground motion, and vice versa. Ground motion from a major earthquake in the New Madrid Seismic Zone is expected to be much stronger in western Kentucky than in central and eastern parts of the state.

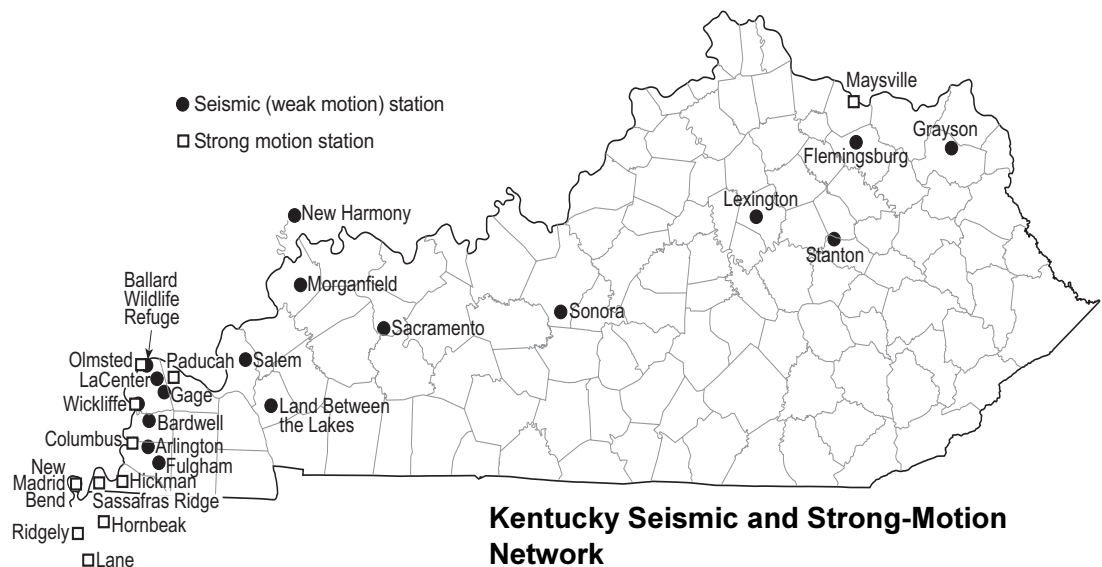
The local geology and soil also play very important roles in earthquake damage. Soft soils overlying hard bedrock tend to amplify the ground motions—this is known as **ground-motion amplification**. Amplified ground motion caused by loose lake deposits contributed to the heavy damages in Mexico City during the Mexico earthquake of September 19, 1985, and in the Marina district of San Francisco during the Loma Prieta earthquake of October 17, 1989. Soft sandy soils can be liquefied by strong ground motion—a process called **liquefaction**. Many communities in Kentucky are set on soft soils, especially those along the Ohio and Mississippi River Valleys. Those communities are prone to ground-motion amplification and liquefaction hazards. The strong ground motion can also trigger landslides—known as

earthquake-induced landslides—in areas with steep slope, such as eastern Kentucky.

Although we do not know when and where the next major earthquake will occur, we do know that an earthquake will cause damage, and the damage depends on many factors, such as earthquake magnitude, the distance from the epicenter, and local geology. Information on earthquake effects can be obtained by monitoring earthquakes and performing research. Such information is vital for earthquake hazard mitigation and risk reduction.

The University of Kentucky operates a seismic network consisting of 17 seismic stations and 10 strong-motion stations. The network is capable of monitoring any earthquake occurring in Kentucky with a magnitude larger than 2.0, as well as major earthquakes in the central United States. To view real-time recordings from the seismic stations of the statewide seismic network, visit the KGS Web site at www.uky.edu/KGS/geologichazards/eqaffect.html#SSMN. Scientists at the University of Kentucky have also conducted research on earthquake effects in different seismic zones and studied how they are affected by the local geology.

For more information on earthquakes in Kentucky, please contact the Kentucky Geological Survey at 859.257.5500 or the Department of Geological Sciences at 859.257.3758, both at the University of Kentucky.



Kentucky Seismic and Strong-Motion Network



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