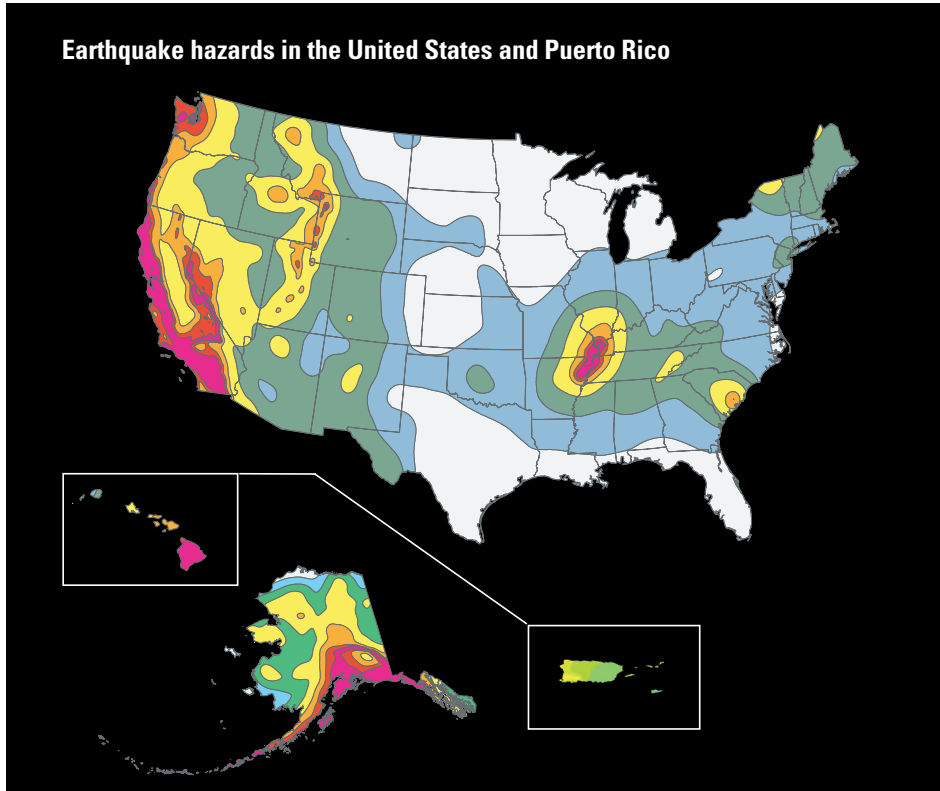




USGS Science Helps Build Safer Communities

Earthquake Hazards—A National Threat



This map shows relative shaking hazards in the United States and Puerto Rico. During a 50-year time period, the probability of strong shaking increases from very low (white), to moderate (blue, green, and yellow), to high (orange, pink, and red). Map not to scale. Source: USGS.

A Widespread Danger

Earthquakes are one of the most costly natural hazards faced by the Nation, posing a significant risk to 75 million Americans in 39 States.

The risks that earthquakes pose to society, including death, injury, and economic loss, can be greatly reduced by (1) better planning, construction, and mitigation practices before earthquakes happen and (2) providing critical and timely information to improve response after they occur.

As part of the multiagency National Earthquake Hazards Reduction Program, the U.S. Geological Survey (USGS) has the lead Federal responsibility to provide notification of earthquakes in order to enhance public safety and to reduce losses through effective forecasts based on the best possible scientific information.

Science Helps Prepare the Nation

The USGS supports regional, national, and global seismic-monitoring networks, studies why earthquakes occur and how they shake the ground, assesses the



The upper level of this two-level section of Interstate 880 in Oakland, Calif., collapsed during the magnitude 6.9 Loma Prieta, Calif., earthquake on October 17, 1989. Forty-one motorists were killed in the collapse (USGS photograph).

Earthquake Impacts

- More than 75 million Americans in 39 States face significant risk from earthquakes.
- The magnitude 6.7 Northridge, Calif., earthquake in January 1994 killed 33, injured 9,000, and displaced over 20,000 people.
- Repeats of historic U.S. earthquakes, such as the 1906 San Francisco earthquake or the 1811–1812 New Madrid earthquakes, could cause up to \$500 billion in damage.
- The Federal Emergency Management Agency has estimated future annual earthquake losses in the United States at \$5.6 billion a year.

USGS Science Priorities

The USGS is working to answer:

- Which faults are the most likely to produce damaging earthquakes?
- What controls the time between earthquakes on a given fault?
- What keeps one earthquake small and lets another grow to hundreds of miles?
- What controls the interactions among earthquakes?
- What determines how damaging ground shaking will be at a particular location from a given earthquake?
- What is the cost-effectiveness of different mitigation technologies?

hazard level across the Nation, promotes loss-reduction measures using these results, and provides crucial scientific information to help emergency responders when earthquakes occur.

The USGS is gathering data for expanded urban hazard assessments on a local scale to understand how varying soil conditions affect the shaking and damage within cities and at critical lifelines. The USGS is also conducting research to better understand how these hazards change with time.

Although earthquakes occur less frequently in the Eastern United States, studies show that urban areas in the East could face devastating losses because severe shaking would affect a larger area than a similar earthquake in the Western United States. Also, most structures in the Eastern United States are not designed to resist earthquakes.

Population density is also high in the Eastern United States, and residents are

not as well prepared for earthquakes as communities in the West.

In Alaska and the Pacific Northwest, the effects of a destructive earthquake can extend well beyond local impact by potentially creating far-reaching tsunamis and resulting in economic losses that could exceed any that have occurred from previous earthquakes or tsunamis.

The USGS Is Networking

The USGS and university and State Geological Survey partners have begun to install and operate the Advanced National Seismic System (ANSS), a national network of sophisticated shaking monitors placed both on the ground and in buildings in urban areas.

ANSS stations will provide better data crucial for finding cost-effective seismic-design solutions for homes, buildings, bridges, and other structures.

In cities where ANSS is in place, such as Los Angeles, the USGS has begun

producing maps within minutes of an earthquake showing the distribution and severity of ground shaking in or near the urban center. These “ShakeMaps” form the basis for emergency response by cities, States, Federal agencies, and critical lifeline operators.

The USGS will continue to improve on existing earthquake monitoring, assessment, and research activities, with the ultimate goal of providing new products that facilitate more effective mitigation and response.



This business in Seattle was heavily damaged during the magnitude 6.8 Nisqually, Wash., earthquake on February 28, 2001. About 400 people were injured during the earthquake (FEMA photograph/Kevin Galvin).



A vehicle, seen near the left edge of this image, was crushed under this collapsed storefront in Paso Robles, Calif., during the magnitude 6.5 San Simeon, Calif., earthquake on December 22, 2003. Two people were killed trying to get out of the store during the earthquake (FEMA photograph/Dane Golden).

Earthquake Facts

- The largest recorded earthquake in the United States was a magnitude 9.2 earthquake in Prince William Sound, Alaska, on March 28, 1964.
- In 1985, a swimming pool at the University of Arizona in Tucson lost water from sloshing, or a “seiche,” caused by a magnitude 8.1 earthquake in Michoacan, Mexico, 1,240 miles away.
- Alaska is the most earthquake-prone State and one of the most seismically active regions in the world, experiencing a magnitude 7 earthquake almost every year and a magnitude 8 or greater earthquake every 14 years (on average).
- In the United States, there are an average of six magnitude 6 or greater and 57 magnitude 5 or greater earthquakes each year.
- Twenty-six urban areas in the United States are at risk of significant seismic activity:

Albuquerque, N. Mex.	Fresno, Calif.	Salinas, Calif.
Anchorage, Alaska	Las Vegas, Nev.	Salt Lake City, Utah
Boise, Idaho	Los Angeles, Calif.	San Diego, Calif.
Boston, Mass.	Memphis, Tenn.	San Francisco-Oakland, Calif.
Charleston, S.C.	New York, N.Y.	San Juan, P.R.
Chattanooga-Knoxville Tenn.	Portland, Oreg.	Santa Barbara, Calif.
Eugene-Springfield, Oreg.	Provo-Orem, Utah	Seattle, Wash.
Evansville, Ind.	Reno, Nev.	Stockton-Lodi, Calif.
	Sacramento, Calif.	
	St. Louis, Mo.	

For More Information

<http://earthquake.usgs.gov/>
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