

# EARTHQUAKES

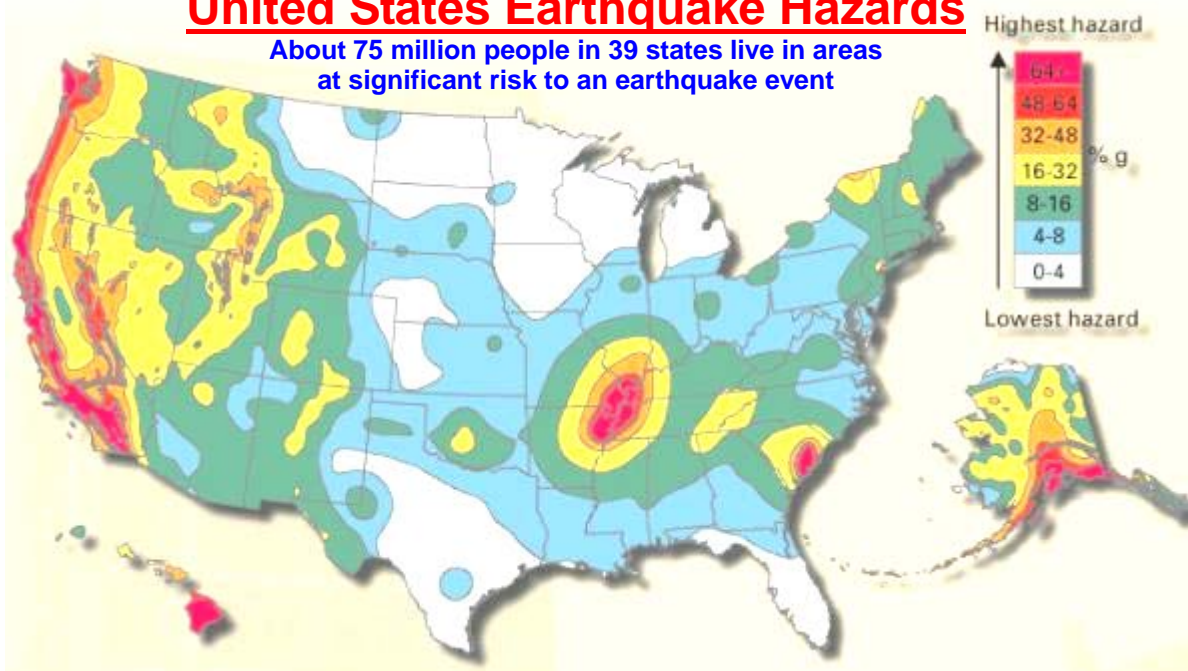
An **earthquake** is a sudden slip on a fault that is caused by stress buildup in the crust. It is most often caused by the tectonic movement of crustal plates but can also be precipitated by volcanic or magmatic activity. An earthquake releases energy in the form of seismic waves that can cause shaking and damage over large distances.

Earthquakes can cause significant loss of life and major economic damage. Events in Alaska, California and Hawaii that precipitated landslides, tsunamis and fires caused the highest casualties. The largest magnitude earthquakes in the contiguous U.S. occurred in New Madrid, Missouri in 1811 and 1812. Both coasts are susceptible to earthquakes. The 1886 Charleston earthquake caused 60 deaths and destroyed 90% of the homes. The 1994 Northridge earthquake caused 61 deaths and \$44 billion in damage with an additional \$30 billion in federal and private insurance losses, making it one of the costliest natural disasters in United States history.

The **Congressional Hazards Caucus** encourages all citizens and communities to be aware of earthquake hazards and take appropriate steps to reduce their vulnerability to earthquakes.

### United States Earthquake Hazards

About 75 million people in 39 states live in areas at significant risk to an earthquake event



**USGS Earthquake Hazard Map for the United States:** This 2008 map shows earthquake ground accelerations (horizontal) having a 2 percent probability of being exceeded in the next 50 years for a firm rock site condition. Localized shaking hazards have significant variability due to amplification effects of site geology. As such local mitigation plans must be based on detailed local hazard surveys and mapping. For more information on National Seismic Hazards Mapping, visit <http://earthquake.usgs.gov>

### What You Can Do To Prepare For An Earthquake

#### BEFORE:

- Ensure that heavy household items like shelves and bookcases are secured properly.
- Identify safe places in each room and ensure that all household members know emergency plans.
- Have an emergency kit that includes first aid supplies, flashlight, radio, batteries, food, and water.

#### DURING:

- If indoors, take cover under a piece of heavy furniture or against an inside wall and hold on.
- If outdoors, move into the open, away from buildings, street lights, and utility wires.
- If in a moving vehicle, stop quickly and stay in the vehicle until the shaking stops.

#### AFTER:

- Once the shaking stops move to a safe and open area, avoiding damaged buildings and roadways.

The **Congressional Hazards Caucus** is co-chaired by Senators Mary Landrieu (LA), Ben Nelson (NE), Lisa Murkowski (AK) and Representatives Dennis Moore (KS), Jo Bonner (AL) and Zoe Lofgren (CA). The Caucus helps individuals, businesses, and communities better prepare for and mitigate the costs of disasters. The Caucus seeks to foster dialogue on steps that government and citizens can take to lessen the severity of these disasters. To learn more about the Caucus, visit: [www.hazardscaucus.org](http://www.hazardscaucus.org).

## Protecting Yourself and Your Community

**MAKE A PLAN:** Making a plan of how to reduce risk over time and what to do in the event of an earthquake can make a tremendous difference.

**EDUCATION:** Take the time now to become aware of the earthquake risk to you and your community.

**ZONING AND LAND-USE:** Your community can make sure that new buildings are not constructed on or near land that may be subject to liquefaction, landslides, faulting, or tsunamis.

**BUILDING CODES:** Building codes are one of the most powerful mitigation tools that can be adopted by a community in anticipation of a seismic event.

**RETROFITTING:** Before the next strong earthquake in your area, ensure that homes and buildings meet the recommended standards for earthquake safety.

**Earthquakes can cause more than just shaking. Communities must also prepare for:**

**Aftershocks** that follow the main shock and may cause additional damage

**Tsunamis** that can cause destruction to low-lying coastal areas.

**Fires** that are sparked by leaking natural gas or other flammable materials.

**Landslides** that are triggered by earthquakes or aftershocks.



### Learning From Past Failures

After the 1994 Northridge earthquake damaged the 188 Freeway (left), replacement columns with more vertical and wrapping rebar (right) were installed. Source: CalState Northridge



### The Trans-Alaska Oil Pipeline: Mitigation Works!

The pipeline survived the 2002 Denali earthquake because of careful engineering to meet stringent earthquake design specifications. Source: USGS

## Earthquake Terms

**Aftershock:** Earthquakes that follow the main shock over a period of weeks, months, or years. The larger the main shock, the larger and more numerous the aftershocks.

**Epicenter:** The point on the surface vertically above the point in the crust where a seismic rupture begins.

**Liquefaction:** When water-saturated sediment loses strength and acts like a fluid because of earthquake shaking.

**Magnitude:** A number based on maximum recorded motion that characterizes the relative size of an earthquake.

## Resources

National Earthquake Hazards Reduction Program (NEHRP)

<http://www.nehrp.gov/>

USGS Earthquake Hazards Program

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

Federal Emergency Management Agency: Mitigation

<http://www.fema.gov/plan/prevent/earthquake/index.shtm>

Earthquake Engineering Research Institute (EERI)

<http://www.eeri.org/site/>