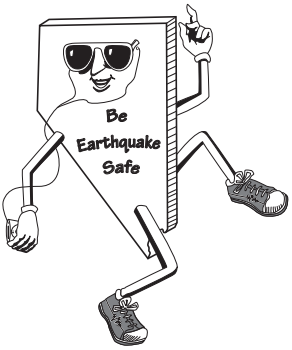
EARTHQUAKES IN NEVADA

and how to survive them



Beat the Quake!

in cooperation with
Nevada Division of Emergency Management

Nevada Bureau of Mines and Geology
Nevada Seismological Laboratory

Mackay School of Earth Sciences and Engineering
College of Science
University of Nevada, Reno

Special Publication E-16

Nevada's Earthquake Hazard

The State of Nevada is located in "earthquake country." It lies within the Basin and Range Province, one of the most seismically active regions in the United States. Along with California and Alaska, Nevada ranks in the top three states subject to the most large earthquakes over the last 150 years. Figure 1 shows the seismicity recorded in Nevada from the 1840s to 2008. Magnitude 3 and 4 earthquakes are commonly felt, but rarely cause damage. Minor to moderate damage can accompany a magnitude 5 or 6 event, and major damage commonly occurs from earthquakes of magnitude 7 and greater. Although earthquakes do not occur at regular intervals, the average frequency of earthquakes of magnitude 6 and greater in Nevada has been about one every ten years, while earthquakes of magnitude 7 and greater average once every 27 years.

Geologically young faults, which are the sources of earthquakes, can be found throughout the state (fig. 2). Although the largest historical earthquakes occurred some distance from population centers, no part of the state is far from a potential source of large earthquakes. Large earthquakes occurring along the borders of Nevada, such as the 1872 Owens Valley earthquake in California (magnitude 7¾–8), can also cause strong shaking and damage in Nevada.

Large earthquakes have occurred in Nevada in the recent past and more will occur in the near future. This pamphlet suggests simple, inexpensive steps that can be taken before, during, and after an earthquake to minimize personal injury and property damage.

Selected Earthquakes in Nevada[1]

Date	Magnitude	Location	Nearest Community[2]
1840s	7+	Western Nevada	Fallon?
Mar. 15, 1860	6.8?	Western Nevada	Virginia City
Dec. 27, 1869	6.7	Olinghouse	Wadsworth
Dec. 27, 1869	6.1	Carson City	Carson City
Jun. 3, 1887	6.3	Carson City	Carson City
Apr. 24, 1914	6.1	Reno area	Reno
Oct. 3, 1915	7.3	Pleasant Valley	Winnemucca
Dec. 21, 1932	7.1	Cedar Mountain	Gabbs
Jan. 30, 1934	6.3	Excelsior Mtns.	Mina
Dec. 29, 1948	6.0	Verdi area	Verdi
May 24, 1952	5.0	Lake Mead area	Boulder City
Jul. 7, 1954	6.6	Rainbow Mtn.	Fallon
Aug. 8, 1954	7.0	Rainbow Mtn.	Fallon
Dec. 16, 1954	7.2	Fairview Peak	Fallon
Dec. 16, 1954	7.1	Dixie Valley	Fallon
Sep. 22, 1966	6.0	Clover Mountain	Caliente
Sep. 12, 1994	5.9	Double Spring Flat	Gardnerville
Feb. 21, 2008	6.0	Town Creek Flat	Wells
May 25, 2008	5.0	Mogul	Mogul

[1]This is a partial list of significant, historical earthquakes in Nevada.
[2]Not necessarily the only communities affected by the earthquake.

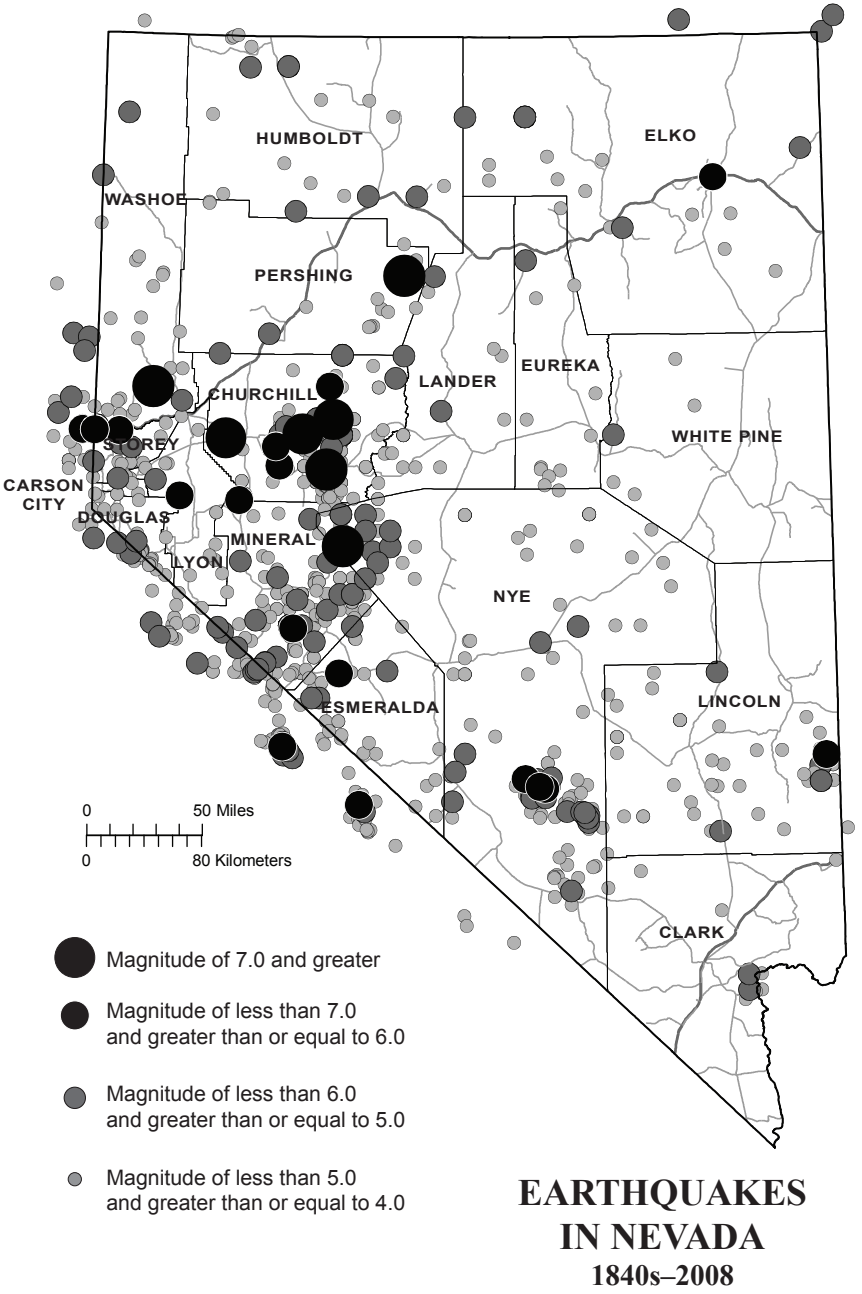


Figure 1. Earthquakes in the Nevada region recorded from the 1840s to 2008. (Nevada Seismological Laboratory)

Earthquake deaths and injuries are seldom caused directly by movement of the ground. Most frequently, injuries are caused by collapse of buildings; flying glass; falling debris; overturned bookcases, furniture, and appliances; and fires from broken chimneys, broken gas lines, and downed electrical lines. Preparing for earthquakes only takes a little time, foresight, and common sense. Imagine what would happen if the ground starts to shake, and then mitigate or prepare for the consequences of shaking.

By planning and practicing what to do before an earthquake occurs, you and your family can learn to react correctly and automatically when the first jolt or shaking begins. This can turn the tendency to panic into lifesaving action.

Following a large earthquake, it may be 72 hours or longer before outside emergency assistance can reach everyone, so any efforts towards mitigating seismic hazards and being prepared to be self-sufficient immediately afterward are prudent.

What to do before an earthquake

Have a battery-powered radio, flashlight, water, and first aid kit in your home. Make sure everyone knows where they are stored. Keep fresh batteries on hand.

Know the location of gas and water shut-off valves and the electric fuse or circuit breaker box. Make sure responsible members of your family learn how to turn them off. Keep crescent and pipe wrenches handy for an emergency. Shut off gas only if you smell a gas leak.

Remove heavy objects from high shelves and store them on the floor or bottom shelves. Do not hang heavy picture frames or mirrors over beds. Locate beds away from windows. Do not put hanging plants or light fixtures where they can swing and hit a window or come off their hooks.

Put brackets or plumber's strap around water heaters and gas furnaces and attach them securely to walls to keep natural gas hookups from breaking. Flexible gas connectors should be used. Bolt the supports to the floor. Block rollers on refrigerators, washers, and other heavy appliances.

Anchor securely to walls cupboards and high bookcases that might topple. Keep cupboards and cabinets latched.

Store containers of dangerous materials, such as flammable liquids and poisons, in a secure place where they cannot fall and break open.

With your family, identify dangerous areas and places to take cover for each room inside your house. Point out hazardous areas outside as well, such as near a brick chimney or power lines.

Keep a few days of nonperishable food on hand in your home (canned goods are ideal) and enough water for each person for a week. If you take medicine regularly, have an extra supply on hand.

Devise a plan and choose a place for reuniting your family after an earthquake in the event that anyone is separated. Family members should know the locations of the nearest medical, fire, and police facilities.

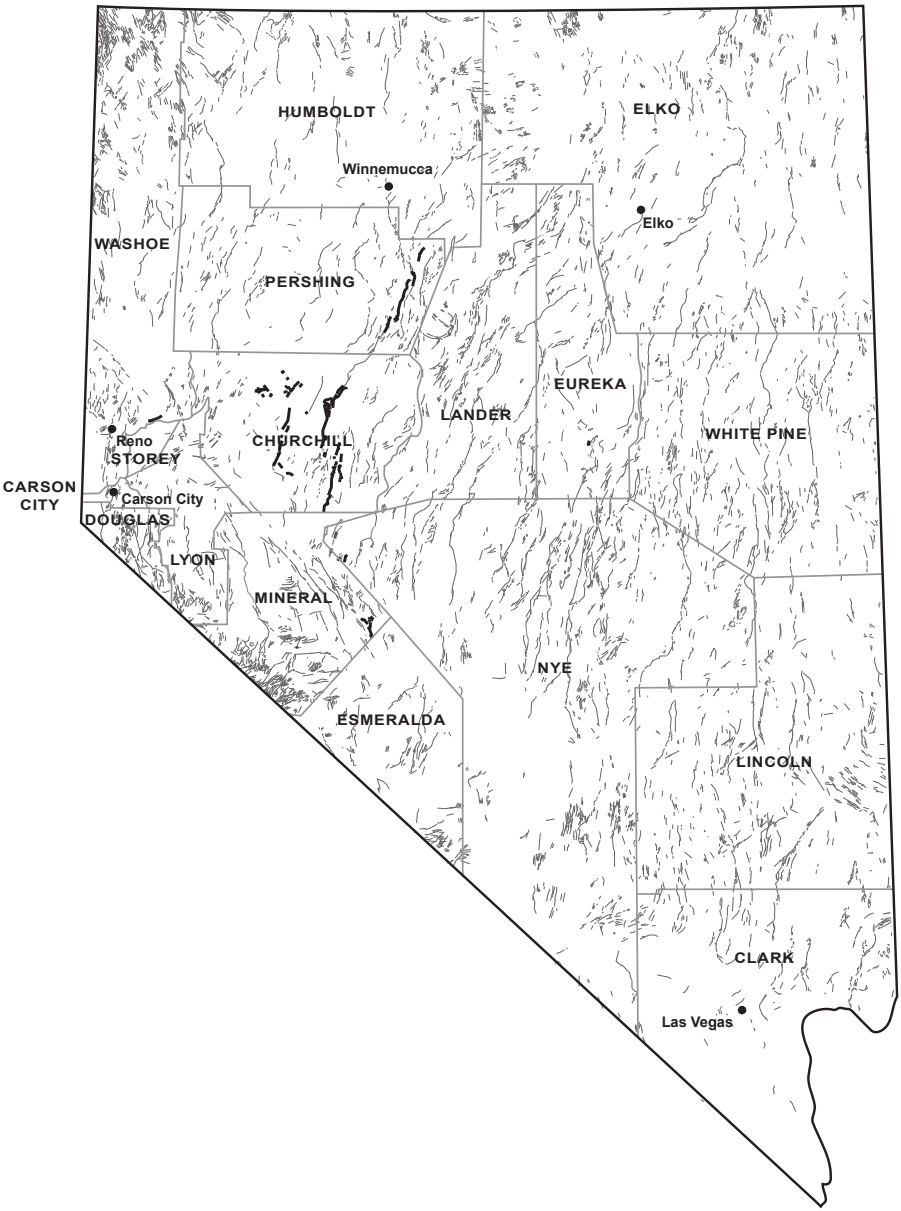


Figure 2. Active faults in Nevada; bold lines are historical earthquake surface breaks.

When building or remodeling a house, be sure to provide adequate bracing against horizontal forces. Make sure that the foundations are adequate and that the house is securely tied to the foundation. Add bracing to support chimneys and air conditioners, especially on rooftops. (For further information, see references on last page.)

Mobile homes can fall off their supports during an earthquake. To avoid this, leave the tires on or brace and tie the supports.

Do not locate buildings for human occupancy within 50 feet of active faults where surface fractures secondary to the fault may occur.

Employers should check offices and factories to make sure employees are out of danger from falling objects. Keep exit ways clear so that they will not become cluttered with debris and will be usable after an earthquake.

Teachers should check classrooms for potential hazards, such as heavy displays or aquariums, and make sure they are away from areas where students will be taking cover.

What to do during an earthquake

Your actions are critically important. Act immediately when you feel the ground or building shake, keeping in mind that the greatest danger is falling debris. Don't worry about being embarrassed if you take cover under a desk or table.

Stay calm.

As a general rule, don't run in or out of buildings. If indoors, drop, cover, and hold; if outdoors, stay outdoors. Many injuries occur as people enter or leave buildings. If indoors, wait for shaking to stop, then cautiously move outside.

If you are outdoors, stay in the open, keep away from buildings, electric wires, and trees.

If you are in a tall building, do not attempt to evacuate. Seek safety where you are. Stay out of elevators. Do not be surprised if the electricity goes out, and elevator, fire, and burglar alarms go off. Expect to hear noise from breaking glass and falling objects.

If you are in school, get under a desk, facing away from windows. If you are on the playground, stay away from buildings.

If you are in a moving car, safely stop the car and remain inside. Avoid stopping near or under buildings, overpasses, and utility wires.

If you are in a crowded place, stay calm and urge others to do the same; take cover under sturdy furniture. In an auditorium, crouch on the floor between chairs and cover your head.

If in a steep canyon or near a steep slope, watch out for rock falls and landslides.

What to do after an earthquake

Check yourself and people nearby for injuries. Provide first aid if needed.

Check for fires and fire hazards. Check burning wood stoves and stove pipes. Put out fires immediately if you can. Approach chimneys with caution and inspect for damage. Do not use fireplaces unless the chimney is undamaged and without cracks.

Check gas, electric, and water lines; if damaged, shut off valves. Turn off appliances. Do not light matches or candles. Check for gas leaks by odor only. If a gas leak is detected, open all windows and doors, leave immediately, and report to authorities.

Do not touch power lines, electric wiring, or objects in contact with them.

Turn on the radio for emergency instructions. Do not use the telephone unless there is a severe injury or emergency.

Wear sturdy shoes to protect against shattered glass and debris.

Do not flush toilets until sewer lines are checked.

Open closet doors and cupboards cautiously—objects may fall outward on you.

Stay out of damaged buildings. Collapses can occur without much warning and there are dangers from gas leaks, electric wiring, and broken glass.

Be reassuring and helpful to children and others who may suffer psychological trauma from the earthquake. Do not spread rumors. Rumors can be misleading to people and waste critical resources.

Check on your neighbors, especially the elderly and disabled.

Identify emergency water supplies, such as the water heater.

If driving immediately after an earthquake, watch for hazards created by the earthquake such as fallen objects, downed electric wires, or blocked roadways.

EXPECT AFTERSHOCKS. They may cause additional damage.

Further reading

Living with Earthquakes in Nevada, Craig M. dePolo, Lucy M. Jones, Diane M. dePolo, and Susan L. Tingley, 2000, Nevada Bureau of Mines and Geology Special Publication 27.

Earthquakes, Bruce A. Bolt, 2003, W.H. Freeman and Company.

Peace of Mind in Earthquake Country, Peter Yanev, 1991, Chronicle Books.

Earthquakes in Nevada: 1852–1998, Diane M. dePolo and Craig M. dePolo, 1999, Nevada Bureau of Mines and Geology Map 119.

Earthquake Protection, Andrew Coburn and Robin Spence, 2002, John Wiley.

International Handbook of Earthquake and Engineering Seismology, William H.K. Lee, Hiroo Kanamori, Paul C. Jennings, and Carl Kisslinger, 2002, Academic Press.

Earthquake Engineering Handbook, Wai-Fah Chen and Charles Scawthorn, editors, 2003, CRC Press.

For further information on faults, earthquakes, and emergency management in Nevada:

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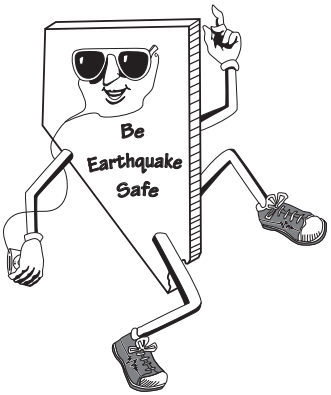

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Cover Photograph
Large fault scarp created during the 1954 Dixie Valley earthquake (photo by Karl V. Steinbrugge).