

LANDSLIDES & DEBRIS FLOW

Landslides occur in all U.S. states and territories and can be caused by a variety of factors, including earthquakes, storms, volcanic eruptions, fire, and by human modification of land. Landslides can occur quickly, often with little notice, and the best way to prepare is to stay informed about changes in and around your home that could signal that a landslide is likely to occur.

In a landslide, masses of rock, earth, or debris move down a slope. Debris and mud flows are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or “slurry.” They can flow rapidly, striking with little or no warning at avalanche speeds. They also can travel several miles from their source, growing in size as they pick up trees, boulders, cars, and other materials.

Landslide problems can be caused by land mismanagement, particularly in mountain, canyon, and coastal regions. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Land-use zoning, professional inspections, and proper design can minimize many landslide, mudflow, and debris flow problems.

Before a Landslide

The following are things you can do to protect yourself, your family, and your property from the effects of a landslide or debris flow:

- To begin preparing, you should build an emergency kit (<https://www.ready.gov/build-a-kit>) and make a family communications plan (<https://www.ready.gov/make-a-plan>).
- Prepare for landslides by following proper land-use procedures - avoid building near steep slopes, close to mountain edges, near drainage ways, or along natural erosion valleys.
- Become familiar with the land around you. Learn whether debris flows have occurred in your area by contacting local officials. Slopes where debris flows have occurred in the past are likely to experience them in the future.
- Get a ground assessment of your property.
- Consult a professional for advice on appropriate preventative measures for your home or business, such as flexible pipe fittings, which can better resist breakage.
- Protect your property by planting ground cover on slopes and building retaining walls.
- In mudflow areas, build channels or deflection walls to direct the flow around buildings. Be aware, however, if you build walls to divert debris flow and the flow lands on a neighbor's property, you may be liable for damages.
- If you are at risk from a landslide, talk to your insurance agent. Debris flow may be covered by flood insurance policies from the National Flood Insurance Program (NFIP).

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Recognize Landslide Warning Signs

- Changes occur in your landscape, such as patterns of storm-water drainage on slopes (especially the places where runoff water converges), land movement, small slides, flows, or progressively leaning trees.
- Doors or windows stick or jam for the first time.
- New cracks appear in plaster, tile, brick, or foundations.
- Outside walls, walks, or stairs begin pulling away from the building.
- Slowly developing, widening cracks appear on the ground or on paved areas, such as streets or driveways.
- Underground utility lines break.
- Bulging ground appears at the base of a slope.
- Water breaks through the ground surface in new locations.
- Fences, retaining walls, utility poles, or trees tilt or move.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- The ground slopes downward in one direction and may begin shifting in that direction under your feet.
- Unusual sounds, such as trees cracking or boulders knocking together, might indicate moving debris.
- Collapsed pavement, mud, fallen rocks, and other indications of possible debris flow can be seen when driving (embankments along roadsides are particularly susceptible to landslides).

During a Landslide

- During a severe storm, stay alert and awake. Many deaths from landslides occur while people are sleeping.
- Listen to local news stations on a battery-powered radio for warnings of heavy rainfall.
- Listen for unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together.
- Move away from the path of a landslide or debris flow as quickly as possible. The danger from a mudflow increases near stream channels and with prolonged heavy rains. Mudflows can move faster than you can walk or run. Look upstream before crossing a bridge and do not cross the bridge if a mudflow is approaching.
- Avoid river valleys and low-lying areas.
- If you are near a stream or channel, be alert for any sudden increase or decrease in water flow and notice whether the water changes from clear to muddy. Such changes may mean there is debris flow activity upstream, so be prepared to move quickly.
- Curl into a tight ball and protect your head if escape is not possible.

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After a Landslide

- Go to a designated public shelter if you have been told to evacuate or you feel it is unsafe to remain in your home. Text **SHELTER** + your ZIP code to **43362** (4FEMA) to find the nearest shelter in your area (example: **shelter 12345**).
- Stay away from the slide area. There may be danger of additional slides.
- Listen to local radio or television stations for the latest emergency information.
- Watch for flooding, which may occur after a landslide or debris flow. Floods sometimes follow landslides and debris flows because they may both be started by the same event (<https://www.ready.gov/floods>).
- Check for injured and trapped persons near the slide, without entering the direct slide area. Direct rescuers to their locations.
- Look for and report broken utility lines and damaged roadways and railways to appropriate authorities. Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury.
- Check the building foundation, chimney, and surrounding land for damage. Damage to foundations, chimneys, or surrounding land may help you assess the safety of the area.
- Replant damaged ground as soon as possible since erosion caused by loss of ground cover can lead to flash flooding and additional landslides in the near future.
- Seek advice from a geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk. A professional will be able to advise you of the best ways to prevent or reduce landslide risk, without creating further hazard.