

## LANDSLIDES AND MUDFLOWS

Landslides and mudflows usually strike without warning. The force of rocks, soil, or other debris moving down a slope can devastate anything in its path. Take the following steps to be ready.

### Get a ground assessment of your property.

Your county geologist or county planning department may have specific information on areas vulnerable to landsliding. Consult a professional geotechnical expert for opinions and advice on landslide problems and on corrective measures you can take.

### Minimize home hazards.

Plant ground cover on slopes and build retaining walls. In mudflow areas, build channels or deflection walls to direct the flow around buildings.

Remember: If you build walls to divert debris flows and the flow lands on a neighbor's property, you may be liable for damages.

### Learn to recognize the landslide warning signs.

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.

You hear a faint rumbling sound that increases in volume as the landslide nears.

The ground slopes downward in one specific direction and may begin shifting in that direction under your feet.

### **Make evacuation plans.**

Plan at least two evacuation routes since roads may become blocked or closed.

Develop an emergency communication plan.

In case family members are separated from one another during a landslide or mudflow (this is a real possibility during the day when adults are at work and children are at school), have a plan for getting back together.

Ask an out-of-state relative or friend to serve as the “family contact.” After a disaster, it’s often easier to call long distance.

Make sure everyone knows the name, address, and phone number of the contact person.

Mudflow is covered by flood insurance policies from the National Flood Insurance Program. Flood insurance can be purchased through a local insurance agency.

Stay away from the slide area.

There may be danger of additional slides.

Check for injured and trapped persons near the slide area.

Give first aid if trained.

Remember to help your neighbors who may require special assistance — infants, elderly people, and people with disabilities.

Listen to a battery-operated radio or television for the latest emergency information.

Remember that flooding may occur after a mudflow or a landslide.

Check for damaged utility lines.

Report any damage to the utility company.

### **If inside a building:**

Stay inside.

Take cover under a desk, table, or other piece of sturdy furniture.

### **If outdoors:**

Try to get out of the path of the landslide or mudflow.

Run to the nearest high ground in a direction *away* from the path.

If rocks and other debris are approaching, run for the nearest shelter such as a group of trees or a building.

If escape is not possible, curl into a tight ball and protect your head.

Check the building foundation, chimney, and surrounding land for damage.

Replant damaged ground as soon as possible since erosion caused by loss of ground cover can lead to flash flooding.

Seek the advice of a geotechnical expert for evaluating landslide hazards or designing corrective techniques to reduce landslide risk.

Mitigation includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Investing in preventive mitigation steps now, such as planting ground cover (low growing plants) on slopes, or installing flexible pipe fitting to avoid gas or water leaks, will help reduce the impact of landslides and mudflows in the future. For more information on mitigation, contact your local emergency management office.

A sinkhole occurs when groundwater dissolves a vulnerable land surface such as limestone, causing the land surface to collapse from a lack of support. In June 1993, a 100-foot wide, 25-foot deep sinkhole formed under a hotel parking lot in Atlanta, killing two people and engulfing numerous cars.

Landslides occur when masses of rock, earth, or debris move down a slope. Landslides may be very small or very large, and can move at slow to very high speeds. Many landslides have been occurring over the same terrain since prehistoric times.

They are activated by storms and fires and by human modification of the land. New landslides occur as a result of rainstorms, earthquakes, volcanic eruptions, and various human activities. Mudflows (or debris flows) are rivers of rock, earth, and other debris saturated with water. They develop when water rapidly

accumulates in the ground, such as during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or “slurry.” A slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. A slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way.

Landslides occur in every state of the union and its island territories. California, West Virginia, Utah, Kentucky, Tennessee, Puerto Rico, Ohio, and Washington have the most severe landslide problem.

### **EMERGENCY INFORMATION**

- 1.** Acres of property may be damaged and buildings and homes destroyed by landslides. Landslides can provoke associated dangers such as broken electrical, water, gas, and sewage lines, and disrupted roadways and railways.
- 2.** Landslide warning signs include cracks opening on hillslopes, evidence of slow, downhill movement of rock and soil; tilting of trees, poles, or walls; or visible changes such as the formation of sags and bumps in the slope.
- 3.** Landslide, mudflow, and debris-flow problems are often caused by land mismanagement. Improper land-use practices on ground of questionable stability, particularly in mountain, canyon, and coastal regions, can create and accelerate serious landslide problems. Land-use zoning in partnership with professional inspections and proper design can alleviate many problems associated with landslides, mudflows, and debris flows.

Financial aid is an immediate need of disaster victims. Financial contributions should be made through a recognized voluntary organization to help ensure that contributions are put to their intended use.

Before donating food or clothing, wait for instructions from local officials. Immediately after a disaster, relief workers usually don't have the time or facilities to setup distribution channels, and too often these items go to waste.

Volunteers should go through a recognized voluntary agency such as the American Red Cross or Salvation Army.

They know what is needed and are prepared to deal with the need. Local emergency service officials also coordinate volunteer efforts for helping in disasters.

Organizations and community groups wishing to donate items should first contact local officials, the American Red Cross, or Salvation Army to find out what is needed and where to send it. Be prepared to deliver the items to one place, tell officials when you'll be there, and provide for transportation, driver, and unloading.

### **DID YOU KNOW. . .**

The most expensive landslide in U.S. history occurred in Thistle, Utah, in spring, 1983. It reached 1 1/2 miles from top to bottom and ranged in width from 1,000 feet to about 1 mile.

Total costs attributable to the landslide exceeded \$500 million.

Landsliding in the United States is estimated to cause an annual loss of about \$1.5 billion and at least 25 fatalities.

The Loma Prieta earthquake in October 1989 triggered thousands of landslides throughout an area of 5,400 square miles.

In addition to causing at least tens of millions of dollars of damage to houses, other structures, and utilities, landslides blocked many transportation routes, greatly hampering rescue and relief efforts.

Mudflows tend to flow in channels, but will often spread out over a floodplain. They generally occur in places where they have occurred before.

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