

U.S. Geological Survey - Landslide Hazards Program

# Landslide Preparedness

## Landslide Warning Signs

- Springs, seeps, or saturated ground in areas that have not typically been wet before.
- New cracks or unusual bulges in the ground, street pavements or sidewalks.
- Soil moving away from foundations.
- Ancillary structures such as decks and patios tilting and/or moving relative to the main house.
- Tilting or cracking of concrete floors and foundations.
- Broken water lines and other underground utilities.
- Leaning telephone poles, trees, retaining walls or fences.
- Offset fence lines.
- Sunken or down-dropped road beds.
- Rapid increase in creek water levels, possibly accompanied by increased turbidity (soil content).
- Sudden decrease in creek water levels though rain is still falling or just recently stopped.
- Sticking doors and windows, and visible open spaces indicating jambs and frames out of plumb.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- Unusual sounds, such as trees cracking or boulders knocking together, might indicate moving debris.

## Areas that are generally prone to landslide hazards

- On existing old landslides.
- On or at the base of slopes.
- In or at the base of minor drainage hollows.
- At the base or top of an old fill slope.
- At the base or top of a steep cut slope.
- Developed hillsides where leach field septic systems are used.

## Areas that are typically considered safe from landslides

- On hard, non-jointed bedrock that has not moved in the past.
- On relatively flat-lying areas away from sudden changes in slope angle.
- At the top or along the nose of ridges, set back from the tops of slopes.

## What To Do Before a Landslide

- Do not build near steep slopes, close to mountain edges, near drainage ways, or natural erosion valleys.
- Get a ground assessment of your property.
- Contact local officials, state geological surveys or departments of natural resources, and university departments of geology. Landslides occur where they have before, and in identifiable hazard locations. Ask for information on landslides in your area, specific information on areas vulnerable to landslides, and request a professional referral for a very detailed site analysis of your property, and corrective measures you can take, if necessary.
- Watch the patterns of storm-water drainage near your home, and note the places where runoff water converges, increasing flow in channels. These are areas to avoid during a storm.
- Learn about the emergency-response and evacuation plans for your area. Develop your own emergency plan for your family or business.
- Minimize home hazards:
  - Have flexible pipe fittings installed to avoid gas or water leaks, as flexible fittings are more resistant to breakage (only the gas company or professionals should install gas fittings).
  - 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 flow and the flow lands on a neighbor's property, you may be liable for damages.

## What To Do During a Landslide

- Stay alert and awake. Many debris-flow fatalities occur when people are sleeping. Listen to a NOAA Weather Radio or portable, battery-powered radio or television for warnings of intense rainfall. Be aware that intense, short bursts of rain may be particularly dangerous, especially after longer periods of heavy rainfall and damp weather.
- If you are in areas susceptible to landslides and debris flows, consider leaving if it is safe to do so. Remember that driving during an intense storm can be hazardous. If you remain at home, move to

a second story if possible. Staying out of the path of a landslide or debris flow saves lives.

- Listen for any unusual sounds that might indicate moving debris, such as trees cracking or boulders knocking together. A trickle of flowing or falling mud or debris may precede larger landslides. Moving debris can flow quickly and sometimes without warning.
- If you are near a stream or channel, be alert for any sudden increase or decrease in water flow and for a change from clear to muddy water. Such changes may indicate landslide activity upstream, so be prepared to move quickly. Don't delay! Save yourself, not your belongings.
- Be especially alert when driving. Bridges may be washed out, and culverts overtopped. Do not cross flooding streams!! Turn Around, Don't Drown®!. Embankments along roadsides are particularly susceptible to landslides. Watch the road for collapsed pavement, mud, fallen rocks, and other indications of possible debris flows.
- Be aware that strong shaking from earthquakes can induce or intensify the effects of landslides.

## **What to Do if You Suspect Imminent Landslide Danger**

- Contact your local fire, police, or public works department. Local officials are the best persons able to assess potential danger.
- Inform affected neighbors. Your neighbors may not be aware of potential hazards. Advising them of a potential threat may help save lives. Help neighbors who may need assistance to evacuate.
- Evacuate. Getting out of the path of a landslide or debris flow is your best protection.
- Curl into a tight ball and protect your head if escape is not possible.

## **What To Do After a Landslide**

- 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.
- Check for injured and trapped persons near the slide, without entering the direct slide area. Direct rescuers to their locations.
- Help a neighbor who may require special assistance - infants, elderly people, and people with disabilities. Elderly people and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- 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.