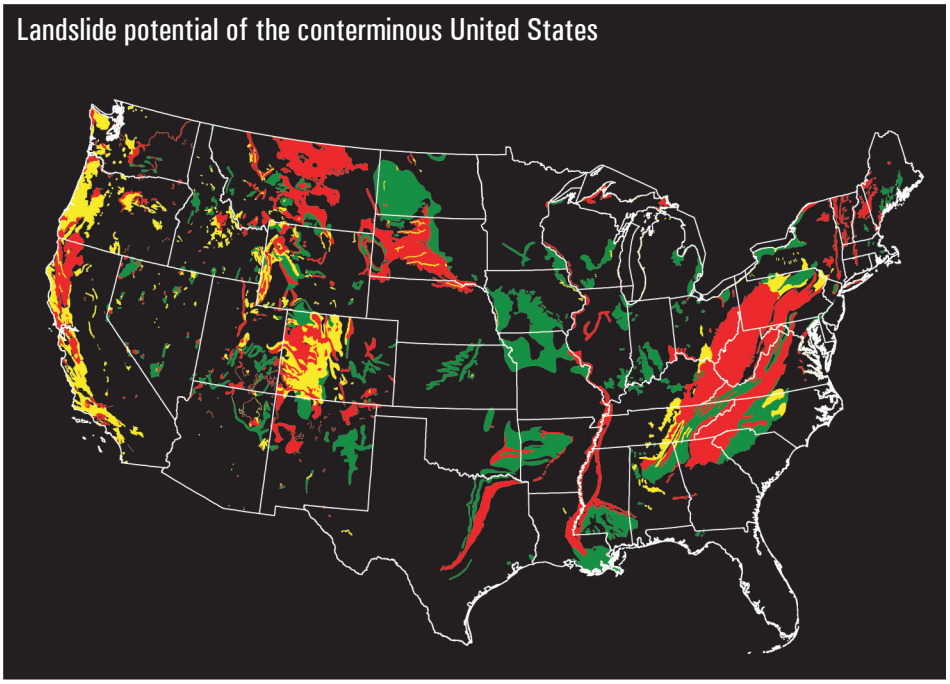
USGS Science Helps Build Safer Communities

Landslide Hazards — A National Threat



Landslide potential of the conterminous United States: Red areas have very high potential, yellow areas have high potential, and green areas have moderate potential. Landslides can and do occur in the black areas, but the potential is low. Map not to scale. Sources: the National Atlas and the USGS

A Nationwide Danger

Landslides occur and can cause damage in all 50 States. Severe storms, earthquakes, volcanic activity, coastal wave attack, and wildfires can cause widespread slope instability. Landslide danger may be high even as emergency personnel are providing rescue and recovery services.

To address landslide hazards, several questions must be considered: Where and when will landslides occur? How big will the landslides be? How fast and how far will they move? What areas will the landslides affect or damage? How frequently do landslides occur in a given area?

Answers to these questions are needed to make accurate landslide hazard maps and forecasts of landslide occurrence, and to provide information on how to avoid or mitigate landslide impacts.

The U.S. Geological Survey (USGS) develops methods to answer these questions to help protect U.S. communities from the dangers of landslides.

Landslide Impacts

- Cause damage in all 50 States, Puerto Rico, and the U.S. Virgin Islands
- Cost $3.5 billion per year, in 2005 dollars, in damage repair
- Cause between 25 and 50 deaths in the United States annually
- Reduce real estate values and tourist revenue
- Lead to lost human, industrial, agricultural, and forest productivity
- Cause damage to the natural environment

USGS Science Priorities

- Develop predictive models to examine the potential for large, slow-moving landslides
- Advance existing models for the occurrence of fast-moving debris flows
- Develop tools to predict the characteristics of debris flows generated from recently burned areas
- Advance the operation of the joint National Oceanic and Atmospheric Administration-USGS Prototype Debris Flow Warning System

Debris flows, triggered by a rainstorm, move into and above the Arapahoe Basin ski area in central Colorado in 1999. The rain led to debris flows along the Interstate 70 corridor in Colorado, from Georgetown to the Eisenhower Tunnel. (USGS photo/Ed Harp)

U.S. Department of the Interior
U.S. Geological Survey

Printed on recycled paper

Fact Sheet 2005-3156
December 2005

USGS Science Provides Solutions

The USGS Landslide Hazards Program strives to reduce loss of life and property from landslide hazards through improved understanding and effective mitigation. These goals are accomplished in three primary ways: (1) development of improved approaches for landslide hazard assessments; (2) post-disaster response; and (3) public information and outreach.

In response to requests by Federal or State governments, the USGS assesses landslide hazards and offers technical assistance and information for recovery efforts.

Public education and outreach on landslide hazard issues are performed through the USGS National Landslide Information Center, which maintains an informational Web site at http://landslides.usgs.gov/, generates fact sheets and other educational literature, and responds to inquiries from the public.

A Collaborative Strategy

USGS landslide researchers have partnered with local emergency-management, land-use planning and decisionmaking agencies, Federal and State land management agencies, State geological surveys, and universities.

These partnerships have been used to promote the use of hazard assessment approaches developed by the USGS; map and inventory landslides; perform hazards assessments; and monitor landslides in critical areas for urban growth, lifelines, and transportation.

For example, the National Oceanic and Atmospheric Administration and the USGS are conducting a pilot project in southern California to predict when flash floods and debris flows might occur in areas recently burned by wildfire.

A National Outlook

The USGS has developed a comprehensive national strategy for addressing the widespread landslide hazards facing the Nation.

This strategy, available at http://pubs.usgs.gov/circ/c1244/, identifies nine major elements of a potential expanded national program for landslide mitigation: research; hazard mapping and assessments; real-time monitoring; loss assessment; information collection, interpretation, dissemination, and archiving; guidelines and training; public awareness and education; implementation of loss-reduction measures; and emergency preparedness, recovery, and response.

The USGS helps the public, policymakers, and the emergency management community make informed decisions on how to prepare for and react to landslide hazards and reduce losses from future landslides.

Landslide Facts

- Landslides often accompany earthquakes, floods, storm surges, hurricanes, wildfires, or volcanic activity. They are often more damaging and deadly than the triggering event (examples: the 1964 Alaska earthquake-induced landslides and the 1980 Mount St. Helens volcanic debris flow).
- Human activities and population expansion are major factors in increased landslide damage and costs.
- The May 1980 eruption of Mount St. Helens caused the largest landslide in history—a rock slide-debris avalanche large enough to fill 250 million dump trucks to the brim traveled about 14 miles, destroying nine highway bridges, numerous private and public buildings, and many miles of highways, roads, and railroads. The debris avalanche also formed several new lakes by damming the North Fork Toutle River and its tributaries. These lakes posed hazards to downstream communities because of the possible failure of the dams, which could have resulted in catastrophic flooding.
- Although the National Flood Insurance Act covers certain damage from "mudflows," insurance against landslides is generally unavailable in most areas of the United States. As a result, many victims of landslides resort to litigation in order to recover damages.

A rockslide on Highway 20 in Washington State cuts off access to Diablo, Wash., Sunday, November 9, 2003. The rockslide destroyed parts of the roadway and guardrail, and boulders and debris in excess of 100 tons, including a 50-ton boulder, blocked both highway lanes. (Washington State Department of Transportation photo)

Homes lie damaged under this large earth flow in LaConchita, Calif., Saturday, March 4, 1995. On January 10, 2005, a portion of this area became a debris flow during heavy rain, destroying several homes and killing 10 people. (USGS photo/Robert L. Schuster)

This house was crushed by the LaConchita, Calif., earth flow, Saturday, March 4, 1995. (USGS photo/Robert L. Schuster)

For More Information

USGS National Landslide Information Center: 1-800-654-4966

http://landslides.usgs.gov/

http://www.usgs.gov/