

LANDSLIDES

Congressional Hazards Caucus Alliance Factsheet

Landslides are a destructive geologic hazard with significant impacts on society. In an average year in the United States, landslides cause the deaths of 25 to 50 people and economic losses of at least \$2 billion.¹ State and local entities take significant responsibility for landslide mitigation, but lack of national coordination hinders sharing of information and best practices. A cooperative national landslide partnership program could reduce landslide losses through strengthened federal, state, local, academic, and private partnerships.

CAUSES AND RISKS

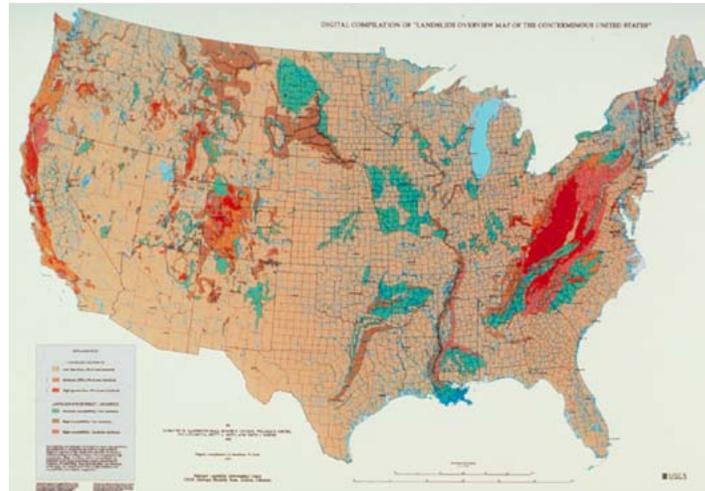
Landslides affect all 50 states and U.S. territories, though the Pacific Coast ranges, the Rockies, the Appalachians, Alaska, and Hawaii bear the most severe risk. Landslides can range in speed from several feet per second to barely perceptible hillside “creep.” Large, fast-moving landslides occur infrequently but are often fatal.

All landslides occur due to slope instability. Scientists identify areas susceptible to landslides by locating old landslide features and modeling interactions between slope characteristics such as soil type, bedrock type, slope angle, vegetation, and water table height.

Landslides are often triggered by intense short-term rainfall or long-term ground saturation, but can also occur due to runoff after disturbances such as wildfires. Although basic landslide mechanisms are well understood, the role of these triggers is complex. For this reason, most landslide hazard assessments determine susceptibility and historic incidence rather than probabilistic risk.

Pilot projects that monitor rainfall, water table height, and soil moisture show promise for providing early warning of movements in existing landslides and high-risk areas.

[1] This figure is likely an underestimate, as it is derived from the last nationwide estimate of landslide losses made in 1985. Source: US Geological Survey Landslides Hazards Program. “Landslides 101”. (2014) <http://landslides.usgs.gov/learn/l101.php>. Modified December 18, 2013. Accessed April 1, 2014.



Above: The U.S. Geological Survey (USGS) last published a landslide hazards map of the entire United States in 1982. The map is outdated for some areas and not applicable on a local scale, highlighting the need for a modern national landslide inventory. A digital version of the map can be viewed at: <http://landslides.usgs.gov/hazards/nationalmap/>

Note: Red and orange areas represent areas of highest landslide incidence. Green areas represent areas of moderate susceptibility but low incidence. Credit: NOAA/NDGC, USGS (<http://www.ngdc.noaa.gov/hazrdimages/picture/show/1546>)

A NATIONWIDE LANDSLIDE INVENTORY?

There is currently no comprehensive national landslide inventory program. Federal expertise could guide such an effort, but substantial resources are required to assess landslide hazards with the detail necessary for local planning.

A number of state geological surveys have landslide inventory programs of some kind, though techniques are not standardized across states and completeness varies by state.

State landslide inventories can be accessed online from the USGS Landslide Inventory Pilot Project (<http://landslides.usgs.gov/research/inventory>) and state geological surveys (www.stategeologists.org).

FEDERAL POLICY AND RESPONSE

USGS LANDSLIDE HAZARDS PROGRAM (LHP)

The U.S. Geological Survey (USGS) Landslide Hazards Program (LHP) has an annual budget of approximately \$3.5 million per year. The program's major initiatives include:

- Active landslide monitoring in pilot areas
- Research on landslide mechanisms
- Hazard assessment partnerships in high-risk areas
- Disaster response support
- Post-wildfire debris flow early warning in cooperation with NOAA/NWS in southern California
- USGS National Landslide Information Center

DISASTER RESPONSE AND RISK MITIGATION

The Federal Emergency Management Agency (FEMA) is responsible for landslide emergency response, disaster relief, and long-term risk reduction.

RESEARCH FUNDING

The National Science Foundation (NSF) and NASA provide funding for academic research on landslides.

ADDITIONAL RESOURCES

USGS Circular 1244: "National Landslide Hazards Mitigation Strategy- A Framework for Loss Reduction"

pubs.usgs.gov/circ/c1244

National Research Council: "Partnerships for Reducing Landslide Risk: Assessment of the National Landslide Hazards Mitigation Strategy"

dels.nas.edu/Report/Partnerships-Reducing-Landslide-Risk-Assessment/10946

USGS Landslide Hazards Program

landslides.usgs.gov

State Geological Surveys (via Association of American State Geologists)

stategeologists.org

CURRENT AND FUTURE NEEDS

A NATIONAL LANDSLIDE MITIGATION STRATEGY

Existing proposals for a national strategy are still applicable to current challenges in landslide hazard mitigation (see USGS Circular 1244). Key areas for strategic focus include:

Basic Research and Real-Time Monitoring

Continue research into landslide triggers and develop monitoring for early warning.

National Landslide Inventory/Hazard Mapping

Implement national standards for landslide hazard mapping and risk assessment.

Loss Assessment and Information Sharing

Create systems to share information and track landslide damages and casualties across the country.

Loss Reduction and Public Education

Improve awareness of landslide hazards and mitigation best practices among decision makers, professionals, and the general public.

The 2004 National Research Council report *Partnerships for Reducing Landslide Risk* supports a national landslide loss reduction strategy. The report discusses key needs for implementation of a national strategy, stressing the need for multi-sector partnerships at all levels.

FUNDING FOR NATIONAL LIDAR MAPPING

LiDAR (Light Detection and Ranging) has emerged over the past decade as an invaluable tool for accurate landslide hazard assessment. Scientists can use high-resolution maps produced by LiDAR to identify existing slides and landforms that are at high risk for sliding.

The USGS Center for LiDAR Information Coordination and Knowledge catalogues available data online at: <http://lidar.cr.usgs.gov>.

Prepared by Stephanie Tubman
American Geosciences Institute
geofellow@agiweb.org

