

Geologic Hazard Assessments Subactivity

Subactivity	FY 2000 Estimate	Uncontrol. & Related Changes	Program Changes	FY 2001 Budget Request	Change from FY 2000
Earthquake Hazards	43,893	+867	+2,600	47,360	+3,467
Volcano Hazards	17,181	+284	+250	17,715	+534
Landslide Hazards	2,580	+48	0	2,628	+48
Global Seismographic Network	3,464	+33	0	3,497	+33
Geomagnetism	1,993	+43	0	2,036	+43
Total Requirements \$000	69,111	+1,275	+2,850	73,236	+4,125

Landslide Hazards

Current Program Highlights

The Landslide Hazards Program helps reduce losses and casualties from landslide hazards through better understanding of the causes and mechanisms of ground failure. It is estimated that landslide-related fatalities average from 25 to 50 per year in the U.S. and that direct and indirect economic costs to the nation range up to \$2 billion per year. Although landslides occur in all regions and States, the Pacific Coast, the Rocky Mountains, and the Appalachian Mountains are particularly susceptible. Globally, landslides cause billions of dollars in damages and thousands of deaths and injuries each year.

USGS landslide hazards investigations focus on the urban environment, landslide hazards to infrastructure, and landslides that occur in association with other natural disasters such as earthquakes, volcanic eruptions, floods, and wildfires. These investigations are the essential first step in the development and implementation of strategies that reduce threats to life and property. They are conducted in partnership with Federal, State, and local land-management and emergency-response agencies.

Landslide hazard assessments provide the scientific basis for land use and emergency planning decisions, cost-benefit analyses of possible loss reduction measures, and determination of insurance risk. For example, studies of landslide susceptibility and hazard are providing much needed information to reduce landslide losses in three regions of the country that have significant landslide problems: the San Francisco Bay region, California, the Seattle/Puget Sound region, Washington, and the Blue-Ridge of central Virginia. The USGS is cooperating with local partners of the Federal Emergency Management Agency's (FEMA) Project Impact in Seattle, Washington, and Oakland, California.

Applied research concentrates on understanding landslide processes, development and deployment of instrumentation to monitor threatening landslides, forecasting the onset of catastrophic movement, and possible future landslides. Research into processes and forecasting methodologies is prioritized toward landslide types that produce enormous losses in the United States such as those landslides related to steep slopes, heavy rains, and vegetation loss due to wildfires or other mechanisms.

USGS scientists respond to landslide emergencies and disasters nationwide. Federal, State, and local agencies are assisted through landslide site evaluations and recommendations of strategies for reducing ongoing and future damages from landslides. For foreign disasters, the USGS works with the Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA) in responding to appeals for technical assistance from affected countries.

The USGS provides timely information through the National Landslide Information Center (NLIC). This center communicates with the public and media about ongoing emergency responses and provides information to the external user-community through fact sheets, books, reports, and press releases. The NLIC maintains several databases: the Landslide Bibliography (more than 9,000 entries), the International Landslide Experts Roster of about 2,000 entries, and Major Landslide Events of the U.S. (part of the USGS National Atlas). The NLIC also has real-time measurements from ongoing landslide monitoring projects available for viewing via the Internet. They are used to forecast landslide movement or changes in an individual landslide's behavior.

The USGS is engaged in the preparation of a comprehensive plan to address landslide hazards in the U. S. in response to the following directive contained in the House Report which accompanied the FY 2000 Interior Appropriations bill:

“... the Survey is directed to develop by September 15, 2000, a comprehensive strategy, including the estimated costs associated with addressing the widespread landslide hazards facing the Nation. The preparation of this strategy should include the involvement of all parties having responsibility for dealing with the problems associated with landslides.”

Recent Accomplishments

Real-time landslide monitoring -- Quick response and continuing monitoring efforts by the USGS have served as a catalyst and model for the deployment of a permanent monitoring and warning system by the Colorado Department of Transportation as part of the mitigation efforts. Following the DeBeque Canyon, Colorado, landslide in April 1998, USGS monitoring has provided data essential to better understand and identify the potential significant hazards posed by this unique feature to Interstate-70, the Colorado River, and a major railroad corridor. A large study for mitigation of this hazard is being funded by the Federal Highway Administration, and includes cooperative efforts by the Colorado Department of Transportation, the Colorado Geological Survey, the USGS, and a private consultant.

Similarly, monitoring at Rio Nido, California, and US Highway 50 (east of Placerville, California) and at Woodway, Washington (near Seattle), is providing key information for dealing with landslide hazards in those areas. Using real-time data collected during landslide activity, USGS scientists have determined relations that distinguish slow movement from the onset of catastrophic failure of landslides along Highway 50, California. This represents a considerable advancement in the ability to provide short-term forecasts of hazardous landslide activity.

Regional assessments of landslide hazards -- In the San Francisco Bay region, California, USGS scientists are preparing a digital spatial database of the locations of about 90,000 existing landslides mapped in the ten-county San Francisco Bay region. Preliminary databases

for two counties, Santa Cruz and Alameda, have been released and a landslide susceptibility map based on these data is being prepared for the city of Oakland in conjunction with FEMA's Project Impact. USGS scientists have also compiled and analyzed inventory maps of debris flows resulting from the February 1998 El Nino storms for two parts of Alameda County, California.

In the Seattle, Washington, region, USGS scientists have developed a prototype susceptibility map for shallow landslides and are working with the city of Seattle to extend the map to the entire city. The USGS has also developed preliminary precipitation intensity-duration thresholds for occurrence of landslides in Seattle and a preliminary map of landslide probability calculated from Seattle's database of historic landslides. The maps will aid the city in its emergency response and landslide mitigation efforts. The thresholds can form the basis of a landslide warning system for the city.

In the Blue Ridge of central Virginia, USGS scientists developed digital mapping (GIS) techniques to depict debris-flow hazards based on detailed field examination, mapping, and analysis of debris flows triggered by the storm of June 27, 1995, in Madison County, Virginia. The USGS is now working in conjunction with several counties to develop maps that show potential debris-flow hazards in the Blue Ridge of central Virginia. Ongoing studies of prehistoric debris-flow deposits in the area are allowing the USGS to determine the average recurrence times of debris flows. The information on average recurrence will be utilized in preparing maps of debris-flow susceptibility in terms of likely probability of occurrence.

Response to landslides from Hurricane Mitch -- USGS scientists participated in post-Hurricane Mitch landslide reconnaissance in Honduras and neighboring countries and provided technical advice to USAID and Honduran government agencies concerning existing and future hazards from landslides. The information was used in making decisions about reconstruction and relocating populations in affected areas. A map of landslides in Tegucigalpa, Honduras, was completed and mapping of landslides in southern Honduras is underway. Technical advice and recommendations regarding mitigation of landslide hazards were provided to the World Bank. USGS also worked with the US Army Corps of Engineers in developing a plan for the excavation of a critical channel at the toe of the El Berrinche landslide in Tegucigalpa.