

Geologic Hazard Assessments Subactivity

Program	1999 Estimate	Uncontrol. & Related Chgs	Program Redirect	Program Changes	FY 2000 Budget Request	Change from 1999
Earthquake Hazards	48,560	1,075	-7,120	1,600	44,115	-4,445
Volcano Hazards	19,759	354	-2,845	-250	17,018	-2,741
Landslide Hazards	2,370	60	-237	0	2,193	-177
Global Seismographic Network	3,831	42	-392	0	3,481	-350
Geomagnetism	1,849	50	-296	400	2,003	154
Total Requirements \$000	76,369	1,581	-10,890	1,750	68,810	-7,559

Note: The Program Redirect column reflects the redirection of funds to the Integrated Science, Science Support, and Facilities activities.

Landslide Hazards

Current Program Highlights

Hazard Investigations — The focus is on landslide hazards in 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 studies 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. 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.

Process Research and Forecasting — 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.

Emergency Response and Preparedness — 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.

Information Dissemination — 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 Landslide Roster (an international roster of about 2,000 landslide experts), and Landslide Dams of the World (about 450 entries). 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.

Recent Accomplishments

Response to the El Niño Winter 1997-1998, Landslide Monitoring — USGS scientists responded to requests for emergency landslide assistance during the wet El Niño winter of 1997-1998. In response to a request from Sonoma County (CA) officials and the Federal Emergency Management Agency (FEMA), the USGS installed a real-time landslide monitoring system on the Rio Nido landslide which threatened about 140 homes. The system was completely functional within five days with Internet access to real time data. USGS trained county employees in the maintenance of the equipment and interpretation of the data. Within a few weeks the monitoring effort was turned over to Sonoma County. A similar effort was mounted to monitor the movement of a large rock mass actively moving above a massive landslide (4000 feet long) in Fremont, California. This monitoring effort, in cooperation with the City of Fremont, will provide a warning for residents in the path of the landslide.

During January through March 1998, USGS landslide scientists were stationed at a Disaster Field Office (DFO) established by FEMA near Sacramento, California. USGS scientists provided advice and technical assessments of the possible distribution and severity of landslide outbreaks during each El Niño storm episode in northern California. During these assignments, USGS personnel worked closely with officials from the California Office of Emergency Services and the California Department of Transportation. Advice from USGS scientists was used to stage and deploy emergency response equipment and personnel.

Response to the El Niño winter in 1997-1998 — Southern California. Following landslides caused by El Niño storms in southern California, aerial photography surveys were taken over all of the effected areas in southern California. These photography surveys have been used to identify the locations of landslides triggered by the storms. The survey data are being combined with topographic and geologic information and with recorded rainfall levels, to develop landslide susceptibility criteria for areas of southern California. Of particular concern in southern California are areas burned by wildfires and their susceptibility to massive debris flows that travel through natural drainage features at great speeds. These maps will be used by emergency response officials to predict problem areas in future storms. The information will also be used in cooperative work between the California Division of Mines and Geology and the USGS in the development of landslide susceptibility maps.

Landslide Hazard Assessments in Seattle — USGS landslide experts are working in partnership with the City of Seattle and private interests in the region to develop probabilistic landslide hazard maps for Seattle and the transportation corridors of the Puget Sound Regional Transit Authority. This work involves analyzing a historic landslide database provided by the city of Seattle. USGS personnel are using Geographic Information System (GIS) techniques to relate landslide occurrences to rock and soil types, slope angles, and rainfall amounts. The resulting maps (or GIS layers) show landslide probabilities as a function location (geology and topography) and meteorological conditions. This information is crucial to Seattle as the city begins to develop a light rail system for commuter use.

National Landslide Information Center Outreach — The National Landslide Information Center (NLIC) provides information to a broad technical and lay audience that includes private consultants in geology and civil engineering, emergency management officials, community planners, and private citizens. The NLIC has produced a documentary-style video of the landslide outbreak in California due to the El Niño winter. This video shows the types of landslides caused by the heavy rains and the destruction of homes and highway routes that resulted. The video discusses mitigation and avoidance practices that can be used by the general public to reduce losses due to landslides. In addition, the NLIC has prepared a document on the technical classification of landslides and landslide processes for use by the engineering and planning communities.

Landslide Hazards in the Eastern United States — Episodes of heavy rain, usually associated with hurricanes, have caused outbreaks of hundreds of debris flows in Madison County, Virginia, in 1995; in Nelson County Virginia, in 1969; and in Ashe County, North Carolina, in 1940. The USGS personnel have been investigating these outbreaks using detailed field mapping and analysis of aerial photographs. A report has been completed on the cause and effects of the Madison County debris flows; detailed mapping is complete in Nelson County, and fieldwork continues in North Carolina. State and local officials can use this information in development planning and in emergency response to future hurricanes.

Studies of Landslides Caused by Hurricane Mitch in Honduras — In October 1998 Hurricane Mitch dumped up to six feet of rain as it moved inland on Honduras, Nicaragua, and Guatemala. The heavy rainfall during one week caused severe flooding and triggered widespread landslide activity. Within a month, USGS geologists had prepared a national-scale landslide susceptibility map showing those areas of Honduras with low, moderate, and high hazard. USGS personnel traveled to the stricken areas to advise officials involved in relief and reconstruction efforts on the avoidance and mitigation of future landslide hazards.