

Safer Communities

Initiative Component	FY 2001 Program Change \$(000)	Page Reference
Earthquakes	2,600	36
Volcanoes	500	37
Floods	4,000	37
Total	7,100	

“Thanks for putting the water stages on the web! We operate a fish farm adjacent to the Brunner Island Power Plant along the west shore of the Susquehanna River, just south (about 1 mile) of the York Haven Hydro Dam. We call the 800 number regularly during high water events to determine the approximate time we will need to run our dewatering pumps. Due to our location and water handling systems, we change from gravity discharge to pumped discharge whenever the river reaches cautionary stage at Harrisburg. Lately, we've been observing the Marietta station, thinking it might have a closer relationship to the farm. What do you think? Having up to the minute data available on the web has allowed me to track the river flows, forecasts, warnings, . . . from my computer at home as well as work. Even though the "flood anxiety" is always present during river rises, it helps a lot to have the information available so that we can plan our strategies accordingly. Thanks to all of you at USGS for maintaining the facilities that we who are impacted by the river rely upon for survival!”

Real Time Hazards

+\$7.1 million

Issue

The cost of natural disasters – earthquakes, volcanoes, floods – has skyrocketed in recent decades. The Nation's Pacific Rim is **earthquake** country. Both San Francisco and Anchorage have been hit this century by great earthquakes, and recent studies by USGS and others show that the Pacific Northwest is also vulnerable to large magnitude earthquakes. Earthquake hazards also exist in other parts of the United States such as the Mississippi River valley near St. Louis and Memphis. Overall, 39 States are exposed to significant earthquake risk. In the minutes following a damaging earthquake in an urban area, there is critical requirement for accurate information on the severity and distribution of strong ground shaking. Emergency managers, managers of transportation and utility networks, providers of public services and the public in general need this information quickly in order to respond promptly and effectively to the emergency. This information is also needed by building code officials to strengthen the earthquake provisions that guide building design and provide for safer communities and less expensive disasters.

Safe air travel is imperiled by the threat of crippling damage to aircraft from volcanic-ash clouds drifting at high altitudes, particularly in the North Pacific where heavily traveled air routes overlie Alaska's numerous active volcanoes. Lying along a 1,600-mile arc, Alaska's 40-plus **volcanoes** compose an active chain that has averaged two eruptions a year for the last 50 years. Repairing damage from these volcanoes has cost more than \$400 million in the last decade alone. Anchorage International Airport is the busiest cargo hub in the United States, and cargo and passenger air traffic in the North Pacific is steadily increasing. The airport's economic survival depends on rapid detection and notification of eruptions beneath Alaskan air routes.

Can real-time information help??

Early warning of volcanic eruptions in Alaska played a major role in reducing damage to aircraft from volcanic ash clouds: from \$160 million during the eruptions of Mt. Redoubt in 1989-90 to less than \$8 million during the eruption of Mt. Spurr in 1992. The warnings also prevented life-threatening situations for the airline passengers and crew.

More lives and property are lost due to **flooding** than any other natural disaster, and every State in the Nation is affected. The National Weather Service and the U.S. Army Corps of Engineers estimate that, in recent years, flood losses average more than \$5 billion per year, in part because communities have inadequate information about flood hazards or do not have access to timely warnings and forecasts. Less than half of the 18,000 communities that participate in the National Flood Insurance Program have adequate information to define the risk of flooding. The National Weather Service uses USGS streamflow data to provide flood forecasts at 3,100 locations, but there are still many communities in flood-prone areas that do not have advance warning of potential flooding. In a November 1998 report to Congress, "A New Evaluation of the USGS Streamgaging Network," USGS provided an update on how well the current USGS streamgaging network and data dissemination systems are meeting five critical Federal goals, including providing information on flooding. The report identified deficiencies in the ability of the streamgaging network to meet both the flood mitigation and flood warning needs of the Nation.

USGS Role

The USGS has the primary Federal responsibility for monitoring and issuing warnings concerning earthquakes and volcanoes and provides the streamflow and related hydrologic information needed by the National Weather Service to predict and monitor floods. In all of the USGS programs in these areas, hazards experts work closely with local, State, and Federal partners, in pursuit of the national goals of reducing the toll of natural disasters and building disaster resilient communities.

Current Program

The current USGS hazards program includes the study of earthquakes, volcanoes, landslides, floods, and geomagnetic storms, and activities within the individual hazards programs are varied. In addition to conducting research to understand the basic processes that produce hazard events, USGS documents where and how hazard events have occurred and develops models that assist in disaster response and mitigation planning. USGS also seeks to develop better monitoring techniques and faster, more reliable communication links, so that information is quickly available to all that need it during these crises.

Earthquakes: The USGS is responsible for monitoring earthquakes throughout the United States. Under the National Earthquake Hazards Reduction program, the USGS, in cooperation with universities, States, and other Federal agencies, operates a National Seismic Network consisting of broad-band instruments located throughout the United States; operates and maintains regional seismic networks in areas with high earthquake activity; and through the National Strong Motion Program operates and maintains strong-motion recorders in 35 States and territories. Significant progress is being made to integrate the regional and national seismic networks into a National Seismic System with a seismic monitoring and data distribution system for the country. This will allow data to be shared across national and regional networks in real time and the coordination of rapid earthquake response at regional and national levels. The strong-motion data show the amplitude, frequency, and duration of ground and building motions caused by large earthquakes located near the recorders. The information is used in computer models and scale models of structures to test their performance under realistic earthquake shaking.

Volcanoes: The USGS monitors selected volcanoes with a combination of instruments and techniques to detect the rise of magma in the Earth's crust so that timely warnings of eruptions can be issued. Priorities for deciding which volcanic areas to monitor and the extent of monitoring are based on the likelihood, style, and magnitude of eruptions and on the potential impacts of volcanic activity on people and economic systems. USGS monitoring is conducted primarily at its four volcano observatories that collaborate as appropriate with universities or State and Federal agencies:

- Hawaiian Volcano Observatory (HVO) on the Island of Hawaii, where the most recent eruption of Kilauea Volcano, which began in 1983, still continues,
- Cascades Volcano Observatory in Vancouver, Washington, which monitors the volcanoes of the Cascade Range in Washington and Oregon (in partnership with the University of Washington) and northern California,
- Alaska Volcano Observatory (AVO), a cooperative effort of the USGS, the University of Alaska Fairbanks, and the State of Alaska Division of Geological and Geophysical Surveys. AVO monitors the volcanoes of Alaska, which threaten not only local

populations but also aircraft and travelers using the major air routes across the North Pacific. AVO also is responsible for disseminating warnings about dangerous eruptions and ash clouds from Kamchatkan volcanoes that may affect planes flying in U.S.-controlled airspace, and

- Long Valley Volcano Observatory in California, which focuses on the large Long Valley volcanic center where complex signs of volcanic unrest have recurred episodically since 1980. The USGS also supports seismic monitoring of the Yellowstone volcanic region in partnership with the University of Utah.

Floods: USGS operates more than 7,000 streamflow gages, more than half of which provides information to the National Weather Service, which in turn issues flood warnings when a river or stream reaches dangerous levels. Roughly two-thirds of these stations transmit data by satellite or radio to primary users of the information, and about 4,000 of these stations provide fast updates on streamflow over the Internet to farmers, homeowners, emergency management officials, and others who use this information to protect their homes and businesses. However, the gages are currently funded through a patchwork of cooperative agreements. Although the USGS currently operates real-time streamgages at more than 2,000 "service locations" for which NWS issues flood forecasts and warnings, nearly 800 such locations lack USGS streamflow data. In addition to monitoring streamflow, USGS documents flood events by determining water- surface profiles and areas of inundation, estimating by indirect means any high discharges that could not be directly measured and, in some cases, documenting the changes in the shape of the land or river channel associated with channel or floodplain erosion and/or deposition. These results are vital aspects of the Nation's flood information base, as they lead to improvements in the risk estimates for flooding.

FY 2001 Program Change

Earthquake Hazards Program +\$2.6 million – The USGS proposes to expand and modernize its earthquake monitoring in urban areas in the United States according to the plans developed for the USGS Real Time Hazards Initiative and for a national Advanced National Seismic System. New instruments will be installed along with fast transmission capabilities to enable nearly instantaneous estimates of earthquake location, magnitude, and assessment of damage. This information is crucial to saving lives, reducing injuries, and protecting critical infrastructure. After an earthquake, maps of the severity and distribution of ground motion are of primary importance to emergency managers and become the basis for recovery and redevelopment. The data are also needed to design and construct new structures. The Increase would allow a total of 150 new regional/urban seismic stations to be upgraded. Proposed locations for upgraded seismic monitoring are:

Can real-time information help??

"I just wanted to say "Thank You" for having your web site made available to everyone on the Internet. As a member of the Caltrans Bridge crew here in San Bernardino county, information on the recent quakes such as the 7.1 we had last weekend was found right here at your site within a few minutes of signing on. After being "tossed" out of bed I ran to my computer to find out where and how BIG the quake was. We were able to call the nearest maintenance yard which was Barstow. We could tell them where to go out and inspect the area affected by the quake and report back to us. Knowing that the quake happened in a remote area by looking at the real-time map, we had our crew stand by until we got word from the Barstow Maintenance Crew that there was little damage to our bridges. **I can't tell you how much time and money was saved knowing where to look by having this site at our finger tips. Great work.**

County Bridge Crew

- **Seattle, Washington:** 20 strong motion detectors and 10 regional seismometers will be installed,
- **Anchorage, Alaska:** 10 strong motion detectors and 10 regional seismometers will be installed, and
- **San Francisco Bay Area, California:** 30 strong motion detectors and 10 regional seismometers will be installed. This is an initial piece of a multi-year program in the San Francisco Bay Area, which will ultimately constitute 1,000 strong motion detectors and 300 seismometers.

Other cities proposed for modernization may include Salt Lake City, Utah (20 strong motion detectors and 10 regional seismometers), Memphis, Tennessee (10 strong motion detectors), and Reno, Nevada (10 strong motion detectors and 10 regional seismometers).

Volcano Hazards Program +\$0.5 million – Long-term operation of real-time volcano monitoring in Alaska is needed to help mitigate volcanic risk to aviation. From FY 1996 to 2000 with funding from the Federal Aviation Administration of \$2 million annually, the USGS has installed, operated, and maintained seismic monitors at 20 active volcanoes in Alaska’s distant and relatively inaccessible Aleutian Islands for the purpose of rapidly providing information about impending volcanic activity to the aviation community so that encounters with ash clouds can be averted. The proposed increase would enable the USGS to expand this real-time volcano monitoring capability to an additional high-risk Alaskan volcano.

Hydrologic Networks and Analysis

+\$4.0 million – The proposed FY 2001 increase would enhance the USGS ability to provide real-time streamflow data for flood forecasting as well as providing information for flood hazard mitigation. The increase would add streamgaging stations to the network to address the current shortfall of 980 locations where NWS does not have adequate streamflow data, upgrade the instruments at existing stations, provide backup computer and communication systems for reliable data delivery, increase the amount of time-critical data collected during major floods and droughts, and provide new technology for collecting streamflow data and new methods for analyzing and disseminating flood and drought hazard data. The increase will allow USGS to:

Can real-time information help??

Your animated map of daily stream flow conditions for the contiguous 48 states for the past 30 days is a real eye opener! In particular, it shows how terribly dry conditions continue to be in the western portion of North Carolina, while the rest of us have been momentarily restored by the hurricane season. At a national policy level, this should be a very valuable tool to keep legislators and their staffs informed as to what the RELATIVE conditions are - as they go about their business of allocating scarcer federal dollars for agricultural and other aid programs.... USGS map products and on-line web sites provide exceptional value for my tax dollar because they empower all of us to do far better work than we could do on our own.

Conservation Commissioner, Massachusetts

- Build 50 new streamgaging stations or reactivate former stations that will provide data for enhancing flood warning and forecasting capabilities.
- Upgrade 100 existing streamgaging stations by flood hardening existing stations, adding or upgrading telemetry and other instruments, or extending stage-discharge ratings to the 200-year flood level.
- Develop and operate an improved flood and drought information system for serving both real-

time and historical streamflow data and information. The first phase of the implementation would ensure the reliable delivery of real-time river stage and discharge data via the World Wide Web.

- Conduct systematic surveys of major floods and droughts to document the magnitude and extent of the event and the causal factors.
- Develop new technology for measuring streams and rivers during floods and improve the statistical and deterministic methods for assessing flood and drought hazards. The new methods and data will be used for regional evaluations of flood frequency. These analyses will provide new information for Flood Insurance Rate Maps and help communities determine appropriate floodplain management and other mitigation measures.

Can real-time information help??

This has been a great tool. During the Floyd troubles we heard many rumors that Rocky Mount dam had just broken. We were working in Tarboro so this was a big concern for many during this time. We were able to check the levels and see this was not the case. Also lost communication with relatives near Roanoke River. But because we could see the river was not at flood stage from this service you have provided we felt better.

Concerned citizen, North Carolina

Partners and Customers

The USGS works closely with scientists in other agencies; public-safety officials at the Federal, State, and local levels; government land managers; business leaders; the media; land developers and planners; educational institutions; and citizens' groups. Information is disseminated through briefings, workshops, maps, scientific publications, videos, digital databases, web sites, newspaper articles, and interviews with news and education media. During crises, USGS personnel work directly with authorities responsible for public safety.

Products

The USGS provides science-based solutions to real problems that people face before, during, and after a natural disaster. Reliable information, available when people need it, saves lives and property and empowers people to protect themselves and their communities.