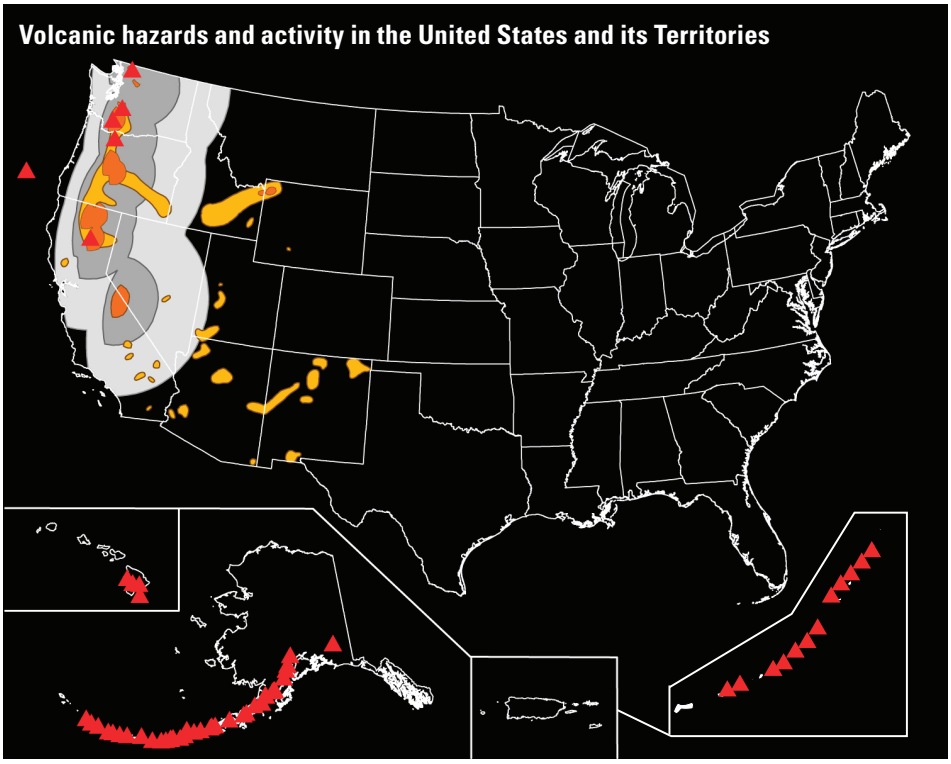
USGS Science Helps Build Safer Communities

Volcano Hazards—A National Threat



The red triangles are volcano locations. Dark-orange areas have a higher volcanic hazard; light-orange areas have a lower volcanic hazard. Dark-gray areas have a higher ash fall hazard; light-gray areas have a lower ash fall hazard. Information is based on data during the past 10,000 years. Bottom, from left to right: Hawaii, Alaska, Puerto Rico, and the Commonwealth of the Northern Mariana Islands. Map not to scale. Sources: the National Atlas and the USGS

An Explosive Danger

When the violent energy of a volcano is unleashed, the results are often catastrophic. The risks to life, property, and infrastructure from volcanoes are escalating as more and more people live, work, play, and travel in volcanic regions.

Since 1980, 45 eruptions and 15 cases of notable volcanic unrest have occurred at 33 U.S. volcanoes.

Lava flows, debris avalanches, and explosive blasts have invaded communities, swept people to their deaths, choked major riverways, destroyed bridges, and devastated huge tracts of forest.

Noxious volcanic gas emissions have caused widespread lung problems. Airborne ash clouds have disrupted the health, lives, and businesses of hundreds of thousands of people; caused millions of dollars of aircraft damage; and nearly brought down passenger flights.

Volcano Impacts

- About 11 percent of the world's active volcanoes are located in the United States. Many of them lie below active air traffic routes.
- From 1973 through 2003, about 100 encounters of aircraft with airborne volcanic ash have been documented. About 20 percent of the reported encounters involved significant damage to engines and airframes. In eight encounters, damage was so severe that in-flight engine failures occurred.
- Mount Rainier volcano in Washington State is one of the Nation's most dangerous volcanoes. More than 100,000 people live in areas near Rainier that have been buried by volcanic debris flows during the past few thousand years.

USGS Science Priorities

Apply National Volcano Early Warning System report recommendations:

- Monitor hazardous U.S. volcanoes at levels appropriate to the threats posed
- Establish a 24-7 volcano watch office
- Provide rapid event notification during escalating unrest and eruptions, aiming for a 5-minute warning of major explosive
- Continue research into how volcanoes work
- Integrate real-time ground-based, airborne, and remote-sensing techniques
- Coordinate volcano-monitoring resources across agencies and institutions

Mount St. Helens in Washington State explosively erupts on Sunday, May 18, 1980. The eruption led to 57 deaths. (USGS photo/ D.A. Swanson)

Tools for Today

The U.S. Geological Survey (USGS) is responsible for issuing timely warnings of potential volcanic disasters to affected communities and civil authorities.

USGS scientists, with State, Federal, and academic partners, operate five volcano observatories that monitor volcanic activity in Hawaii, the Cascade Range, Alaska, Long Valley in California, Yellowstone National Park, and the Northern Mariana Islands.

After 25 years of intense research on restless volcanoes in the United States and around the globe, the USGS has greatly advanced its ability to evaluate volcanic risks and hazards. In the process, the USGS has helped save tens of thousands of lives and has developed a suite of new volcano-monitoring tools. Many of these tools allow large amounts of data to flow in realtime from remote volcanoes to observatories for analysis and interpretation.

The USGS can now better anticipate volcanic hazards in time for civil authorities, communities, and the aviation sector to take preparatory actions—but only if a volcano is adequately monitored with instrument networks in place before unrest develops.

Preparing for Tomorrow

Volcanic eruptions herald their coming over periods of days to years with detectable signals of unrest. Many human risks associated with eruptions can be drastically reduced through the use of hazards assessments, response planning among scientists, State, and local authorities, and proper monitoring and technology.

In 2005, the USGS released the first ever comprehensive and systematic review of the 169 U.S. volcanoes. The report establishes a framework for a National Volcano Early Warning System (NVEWS). The framework calls for enhanced instrumentation and monitoring at targeted volcanoes, and a 24-7 volcano watch office to improve the ability to provide rapid, reliable hazard warnings.

The NVEWS report ranks the most dangerous U.S. volcanoes that pose a threat to human lives, property, and aviation safety and also discusses monitoring gaps at each volcano. Alaska, California, Washington State, Oregon, Hawaii, Wyoming, and the Commonwealth of the Northern Marianas have dangerous volcanoes with either significant monitoring gaps or no monitoring in place. The report can be accessed online at http://pubs.usgs.gov/of/2005/1164/.

To help keep communities safe, it is essential to monitor hazardous volcanoes so that the public knows when unrest begins and what hazards can be expected.

The USGS helps the public, policymakers, and emergency managers make informed decisions on how to prepare for and react to volcano hazards and reduce losses from future volcanic eruptions and debris flows.

Volcano Facts

- The United States is one of the most volcanically rich countries in the world, with 169 active and dormant volcanoes.
- Of the 55 volcanoes that pose the biggest threat to the United States, approximately half are significantly undermonitored.
- Volcanoes account for approximately 5 percent of all tsunamis in the past 250 years.
- Mauna Loa, in Hawaii, is the world's largest active volcano.
- The Cascade Range—home to more than a dozen large, active volcanoes—extends more than 1,000 miles from Mount Baker in northern Washington to Lassen Peak in northern California. Although Cascade volcanoes do not often erupt (on average, about two erupt each century), they can be dangerous because of their violently explosive behavior, their permanent snow and ice cover that can fuel large volcanic debris flows (lahars), and their proximity to various critical infrastructure, air routes, and populated areas in Washington, Oregon, and California.
- Erupting Cascade volcanoes are more prone than other U.S. volcanoes to explosive volcanic activity, resulting in pyroclastic flows. These are hot, often incandescent mixtures of volcanic fragments and gases that sweep along close to the ground at speeds up to 450 mph. Pyroclastic flows occurred in the 1980 eruption of Mount St. Helens.
- During the 1980 Mount St. Helens eruption, in which 57 people died, the total volume of the ash produced equaled an area as wide and long as a football field and about 150 miles high.

This house in Kalapana, Hawaii, is burned by approaching lava from Kilauea Volcano on Sunday, April 22, 1990. Most of Kalapana was destroyed by lava flows between 1986 and 1990, with 180 homes lost. (USGS photo)

For More Information

http://volcanoes.usgs.gov/

http://www.usgs.gov/