

Volcanoes

Learn about your community's risk from hazards created by volcanic eruptions. While you may be located far from a volcano, the ash from an explosive eruption could affect your area. Contact your local emergency management office, local American Red Cross chapter, or state geological survey or department of natural resources. Ask about the type of volcano hazards that could affect your area and what you can do to prepare.

AWARENESS MESSAGES

Why talk about volcanoes?

Volcanoes produce a wide variety of hazards that can kill people and destroy property. Volcanic eruptions fall into two broad types: (1) explosive and (2) quiet. Hazards from large explosive eruptions include widespread ashfall (fine glass particles), pyroclastic flows (mixtures of hot gases and pumice blocks), and massive lahars (volcanic mud or debris flows) that can endanger people and property nearby as well as tens to hundreds of miles away. Eruptions can even affect global climate. Hazards from quiet lava flows include igniting fires and producing chlorine-rich gas clouds where lava pours into the sea. Since 1980, as many as five volcanoes have erupted each year in the United States. Eruptions are most likely to occur in Hawaii and Alaska. In the Cascade Mountain Range in Washington, Oregon, and northern California, volcanoes erupt on the average of one to two or more each century.

Volcanic ash can affect people and equipment hundreds of miles from the volcano. Inhaling volcanic ash can cause serious respiratory problems for people with heart and lung ailments.

Explosive eruption columns pose a serious hazard to commercial aviation. The ash column can grow rapidly and reach more than 12 miles (19 kilometers) above a volcano in less than 30 minutes, forming an ash cloud. During the past 14 years, about 80 commercial jets have been damaged by inadvertently flying into ash clouds, and several have nearly crashed because of engine failure. Many federal agencies, including the U.S. Geological Survey, the Federal Aviation Administration, and the National Weather Service, are working together to issue timely warnings of airborne ash to airports and airline pilots.

What are volcanoes, and what causes them to erupt?

A volcano is a vent through which molten rock escapes to the earth's surface. Unlike other mountains, which are pushed up from below, volcanoes are built by surface accumulation of their eruptive products—layers of lava flows, ash flows, and ash. When pressure from gases within the molten rock becomes too great, gases drive the molten rock to the surface and an eruption occurs.

What damages can volcanoes cause?

In the past few thousand years, the volcanoes of the Cascade Mountain Range, which stretches from northern California into British Columbia, have produced more than 100 eruptions, most of them explosive. However, individual Cascade Range volcanoes can lie dormant for many centuries between eruptions, and the great risk posed by volcanic activity in the region is therefore not always apparent. When Cascade Range volcanoes do erupt, high-speed avalanches of hot ash and rock (pyroclastic flows), lava flows, and landslides can devastate areas 10 miles (16 kilometers) or more away, and huge mudflows of volcanic mud and debris (lahars) can inundate stream valleys at speeds of 20 to 40 miles (32 to 64 kilometers) per hour and travel more than 50 miles (80 kilometers) downstream.

Most eruptions at Hawaiian volcanoes are not explosive and are characterized by the relatively quiet outflow of very fluid lava. These quiet eruptions can produce spectacular lava fountains or lava flows that creep across the land at the relatively slow speed of 10 miles (16 kilometers) per hour or so. The speed at which lava moves across the ground depends on several factors, including the type of lava erupted, the steepness of the ground, and the rate of lava production at the vent. Because the temperature of the lava can be 1000° to 2000° F (538° to 1093° C), lava flows destroy everything in their path, often causing dangerous fires. While most lava moves slowly enough that people can get out of the way, wildland fires can advance rapidly. Before and during an eruption, many small earthquakes occur as molten rock forces its way through the upper parts of a volcano's interior. Such quakes often provide early warnings of changes in eruptive activity.

Volcanic eruptions can be accompanied by other natural hazards: earthquakes, mudflows and flash floods, rockfalls and landslides, wildland fires, and (given certain conditions) tsunamis.

How can I protect myself from the ill effects of a volcanic eruption?

You need to know the volcanic hazards associated with active and potentially active volcanoes where you live and where you visit. You must determine the varying degrees of your own risk and take actions to stay safe and protect your property.

Learning your community's warning system, developing and practicing a household evacuation plan, and being prepared to shelter-in-place should be important parts of your plan.

What is the best source of information in case of a volcano watch or warning?

Local radio or television stations are the best sources of information in a volcanic eruption situation.

Volcanoes usually give warning that they will erupt, and U.S. Geological Survey (USGS) scientists have developed a forecasting system to alert public officials and the general public of such warnings. The USGS Volcano Hazards Program, in collaboration with federal, state, and local government agencies, universities, and the private sector, operates five volcano observatories to reduce the risk from volcanic activity. The five observatories are the Alaska Volcano Observatory, the Hawaiian Volcano Observatory, the Cascades Volcano Observatory, the Long Valley Caldera Observatory, and the Yellowstone Volcano Observatory.

ACTION MESSAGES

Be Prepared for a Volcanic Eruption

Protect Yourself

CORE ACTION MESSAGES

- **Determine your risk.**
- **Prepare household members.**
- **Keep goggles and dust masks handy.**

For general preparedness, every household should create and practice a [Family Disaster Plan](#) and assemble and maintain a [Disaster Supplies Kit](#). In addition, every household should take volcano-specific precautions and plan for and practice what to do if a volcano erupts.

If you are at risk from volcanic activity, you should:

- **Learn about your community's warning systems and emergency plans.** Different communities have different ways of providing warnings and different response plans.
- **Keep handy a pair of goggles and a dust mask for each member of your household in case of ashfall.**
- **Develop an evacuation plan for volcanic eruptions** and make sure all members of your household know and practice it. (See "[Evacuation, Sheltering, and Post-disaster Safety](#)") Be sure to include your animals in your evacuation plan. Making plans at the last minute can be upsetting and wastes precious time.
- **Discuss volcanoes with members of your household.** Discussing volcanic eruptions ahead of time helps to reduce fear and lets everyone know how to respond.
- **Review landslide and mudflow safety and preparedness measures with members of your household.** (See "[Landslides](#)")
- **Talk to you insurance agent.** Find out what your homeowners' policy will or will not cover in the event of a volcanic eruption.

What to Do During a Volcanic Eruption

CORE ACTION MESSAGE

- **Evacuate or take shelter.**

You should:

- **Listen to a local station on a portable, battery-operated radio or television for updated emergency information and instructions.** If the electricity is out, this may be your main source of information. Local officials will give the most appropriate advice for your particular situation on local media.

- **Follow any evacuation orders issued by authorities, and put your Family Disaster Plan into action.** Although it may seem safe to stay at home and wait out an eruption, if you are in a hazard zone, doing so could be very dangerous. The best way to stay safe is to take the advice of local authorities.
- **If indoors, close all window, doors, and dampers** to keep volcanic ash from entering.
- **Put all machinery inside a garage or barn** to protect it from volcanic ash. If buildings are not available, cover machinery with large tarps.
- **Bring animals and livestock into closed shelters** to protect them from breathing volcanic ash.
- **If outdoors, take shelter indoors.** Your safest place is indoors, away from various hazards.
- **Stay out of designated restricted zones.** Effects of a volcanic eruption can be experienced many miles from a volcano.
- **Avoid low-lying areas, areas downwind of the volcano, and river valleys downstream of the volcano.** Debris and ash will be carried by wind and gravity. Stay in areas where you will not be further exposed to volcanic eruption hazards. Trying to watch an erupting volcano up close is a deadly idea.
- **If you are caught in an ashfall:**
 - Wear a dust mask designed to protect against lung irritation from small particles.
 - Protect your eyes by wearing goggles. Wear eyeglasses, not contact lenses.
 - Keep as much of your skin covered as possible.

What to Do After a Volcanic Eruption

CORE ACTION MESSAGES

- **Stay inside.**
- **Protect your lungs and eyes.**

You should:

- **Stay indoors and away from volcanic ashfall areas if possible.** The fine, glassy particles of volcanic ash can increase the health risks for children and people with respiratory conditions, such as asthma, chronic bronchitis, or emphysema.
- **Whether you are indoors or outdoors:**
 - Wear a dust mask** designed to protect against lung irritation from small particles
 - Protect your eyes by wearing goggles. Wear eyeglasses, not contact lenses.**
 - Keep as much of your skin covered as possible.**
- **When it is safe to go outside:**
 - Clear roofs of ashfall.** Ash is very heavy and can cause buildings to collapse, especially if made wet by rain. Exercise great caution when working on a roof.
 - Avoid driving in heavy ashfall.** Driving will stir up volcanic ash that can clog engines and stall vehicles. Abrasion can damage moving parts, including bearings, brakes, and transmissions.

- **Keep animals away from ashfall and areas of possible hot spots.** Wash animals' paws and fur or skin to prevent their ingesting or inhaling ash while grooming themselves.

Media and Community Education Ideas

- Ask your local newspaper or radio or television station to:
 - Do a series on the dangers of volcanic eruptions, ashfalls, floods, etc.
 - Do a story featuring interviews with local officials about land use management in low-lying areas.
 - Highlight the importance of staying informed about local conditions.
 - Run public service ads about how to protect lives in the event of a volcanic eruption.
 - Feature an interview with a representative of the U.S. Geological Survey, talking about how this group determines the likelihood of a volcanic eruption.
 - Do a series on local volcanic hazards and how to recognize the warning signs of a possible volcanic eruption.
 - Publicize emergency evacuation routes.

Help the reporters to localize the information by providing them with the local emergency telephone number for the fire, police, and emergency medical services departments (usually 9-1-1) and emergency numbers for the local utilities and hospitals. Also provide the business telephone numbers for the local emergency management office, local American Red Cross chapter, and state geological survey or department of natural resources.

- Work with officials of the local fire, police, and emergency medical services departments; utilities; hospitals; emergency management office; and American Red Cross chapter to prepare and disseminate guidelines for people with mobility impairments about what to do if they have to evacuate.

Facts and Fiction

Fiction: Volcanoes erupt with regularity.

Facts: Volcanoes generally experience a period of closely spaced eruptions followed by long periods of quiet. Most volcanoes show no regularity, and thus on the basis of past history alone cannot be considered "overdue" or "ready to blow."

Fiction: Volcanoes are unpredictable, erupting at any time without warning.

Facts: Volcanoes usually give warning signs that they are going to erupt weeks to months or more in advance. Although we cannot predict when a volcano will start to be restless, once activity begins, scientists can make general forecasts about how soon an eruption will occur. A more difficult challenge for volcanologists is forecasting the size of an impending eruption.

Fiction: Lava flows are the most significant hazards from volcanoes in the United States.

Facts: Although this is true in Hawaii, the hazards differ at the more than 150 volcanoes in other parts of the United States. Principal hazards outside Hawaii include: (1) Volcanic ashfall resulting from explosive-style eruptions. Volcanic ash, the shattered remnants of volcanic rock, rises into the atmosphere, where it is a hazard to aircraft and affects large areas downwind when it falls back to earth. Where it falls in sufficient quantity, it can cause difficulties for vehicles, machinery, and utilities, and can be injurious to human health. (2) Volcanic mudflows (lahars) resulting from the sudden melting of snow and ice

during eruptions. Lahars can inundate river valleys tens of miles distant, destroying bridges, highways, and other types of development, as well as endangering people.

Fiction: Earthquakes cause volcanic eruptions.

Fact: Earthquakes indicate a geologically active landscape, but they are not the cause of volcanic eruptions. In rare cases, large tectonic earthquakes have triggered eruptions of nearby volcanoes that have been poised to erupt anyway. In the case of Mount St. Helens, a flurry of earthquakes under the volcano suggested potential eruptive activity.