



Volcano

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Why talk about volcanoes?

The United States is third in the world, after Japan and Indonesia, for the number of active volcanoes. 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. For the Cascade Range in Washington, Oregon, and California, volcanoes erupt on the average of one to two each century. Volcanoes produce a wide variety of hazards that can kill people and destroy property. Large explosive eruptions can endanger people and property hundreds of miles away and even affect global climate.

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, ashflows, and ash. When pressure from gases within the molten

rock becomes too great, an eruption occurs. Volcanic hazards include gases, lava and pyroclastic flows, landslides, earthquakes, and explosive eruptions.

Eruptions can be relatively quiet, producing lava flows that creep across the land at 2 to 10 miles per hour. Explosive eruptions can shoot columns of gases and rock fragments tens of miles into the atmosphere, spreading ash hundreds of miles downwind.

Lava flows are streams of molten rock that either pour from a vent quietly or explosively by lava fountains. Because of their intense heat, lava flows are also great fire hazards. Lava flows destroy everything in their path, but most move slowly enough that people can move out of the way. The speed at which lava moves across the ground depends on several

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factors, including the type of lava erupted, the steepness of the ground, and the rate of lava production at the vent.

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

Historically, lahars have been one of the deadliest volcano hazards. Lahars are mudflows or debris flows composed mostly of volcanic materials on the flanks of a volcano. These flows of mud, rock, and water can rush down valley and stream channels at speeds of 20 to 40 miles per hour and can travel more than 50 miles. Some lahars contain so much rock debris that they look like fast-moving rivers of wet concrete. They can occur both during an eruption and when a volcano is quiet. The water that creates lahars can come from melting snow and ice, intense rainfall, or the breakout of a summit crater lake. Large lahars are a potential hazard to many communities downstream from glacier-clad volcanoes, such as Mount Rainier in Washington.

Volcanic ash is actually fine, glassy rock fragments and can affect people and equipment hundreds of miles away from the cone of the volcano. Volcanic ash can contaminate water supplies, cause electrical storms, disrupt the operation of all machinery, and collapse roofs. Volcanic ash poses an ever-increasing threat to aviation safety as transportation expands throughout the Pacific rim. Airborne ash can diminish visibility, damage flight control systems, and cause jet engines to fail. Many federal agencies, including the [U.S. Geological Survey \(USGS\)](#), the [Federal Aviation Administration](#), and the [NOAA/National Weather Service](#), are working together to issue timely warnings to airports and airline pilots.

Volcanoes usually give warning that they will erupt. [USGS](#) scientists have developed a forecasting system to alert public officials and the general public to the fact that a volcano may erupt.

Learn about volcano risk in your community. Contact your local emergency management office, [American Red Cross chapter](#), or state geological surveys or departments of natural resources. Ask about the type of volcano hazards that could affect your area.

Awareness Information

Most eruptions at Hawaiian volcanoes are not explosive and are characterized by the relatively quiet outflow of very fluid lava. These eruptions can still be deadly, because the lava may be erupted in huge volumes, and on steeper slopes, fluid lava can rapidly travel many miles from its source. The island of Hawaii (the largest of the Hawaiian islands) experiences thousands of earthquakes associated with active volcanoes each year. Most of these are too small to feel, but about once a decade, a large quake shakes the entire island and causes widespread damage. 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.

In the past few thousand years, the volcanoes of the Cascade Range, which stretches from northern California into British Columbia, have produced more than 100 eruptions, most of them explosive. However, individual Cascades 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 Cascades volcanoes do erupt, high-speed avalanches of hot ash and rock (pyroclastic flows), lava flows, and landslides can devastate areas 10 or more miles away, and huge mudflows of volcanic ash and debris (lahars) can inundate valleys more than 50 miles downstream.

Plan for a Volcanic Eruption

Develop a Family Disaster Plan. Please see the **“Family Disaster Plan”** section for general family planning information. Develop a volcano-specific plan. Learn about volcanic activity in your community. While volcanoes are located in specific areas, ash may be carried some distance away during an explosive eruption. Contact your local emergency management agency, American Red Cross chapter, or state geological survey or department of natural resources.

If you are at risk from volcanic activity:

- Learn about your community warning systems and emergency plans. Different communities have different ways of providing warnings and different responses. Discuss volcanic activity. Many communities have sirens intended for outdoor warning purposes. Use a NOAA

Weather Radio with a tone-alert feature to keep you aware of watches and warnings while you are indoors.

- Talk to your insurance agent. Find out what your homeowner’s policy will or won’t cover in the event of a volcanic eruption.
- Develop an evacuation plan. (See **“Evacuation”** in the **“Family Disaster Plan”** section.) Everyone in your family should know where to go if they have to leave. Trying to make plans at the last minute

can be upsetting and create confusion.

- Discuss volcanoes with your family. Everyone should know what to do in case all family members are not together. Discussing volcanic eruptions ahead of time will help reduce fear and anxiety, and lets everyone know how to respond. Review landslide and mudflow safety and preparedness measures with your family.

Assemble a Disaster Supplies Kit

Please see the **“Disaster Supplies Kit”** section for general supplies kit information. Volcanic eruption-specific supplies should include the following:

- A pair of goggles and a throw-away breathing mask for each member of the household in case of ashfall.
- Disaster Supply Kit basics.
- Evacuation Supply Kit.

Media and Community Education Ideas

- If you live in a volcano risk area, publish a special section in your local newspaper with emergency information on volcanoes. Localize the information by including the phone numbers of local emergency services offices, the American Red Cross chapter, and local hospitals.
- Feature an interview with a representative of the U.S. Geological Survey, talking about how this group determines the likelihood of a volcanic eruption.
- Run a series on local volcanic hazards and how to recognize the warning signals of a possible volcanic eruption.
- Work with local emergency services and American Red Cross officials to prepare special reports for people who are disabled on what to do if an evacuation is ordered.
- Publish emergency evacuation routes.

What to Do During a Volcanic Eruption

- Be prepared for the hazards that can accompany volcanic eruptions, and know how to respond to reduce risk. Hazards include the following:
 - Mudflows and flash floods. Mudflows are powerful “rivers” of mud that can move 20 to 40 miles per hour. Hot ash or lava from a volcanic eruption can rapidly melt snow and ice at the summit of a volcano. The melted water quickly mixes with falling ash, with soil cover on lower slopes, and with debris in its path. This turbulent mixture is dangerous in stream channels and can travel more than 50 miles away from a volcano. Intense rainfall can erode fresh volcanic deposits to form large mudflows. If you see the water level of a stream begin to rise, quickly move to high ground. If a mudflow is approaching or passes a bridge, stay away from the bridge.
 - Landslides and rockfalls.
 - Earthquakes.
 - Ashfall and acid rain.
- Follow the evacuation order issued by authorities and put your disaster plan into action. Although it may seem safe to stay at home and wait out an eruption, if you are in a hazardous zone, doing so could be very dangerous. The advice of local authorities is your best advice for staying safe.
- Avoid areas downwind 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.

- If caught indoors:
 - Close all windows, 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 trapped outdoors:
 - Seek shelter indoors. Your safest place is indoors, away from various hazards.
 - If caught in a rockfall, roll into a ball to protect your head and neck. A tight ball will provide the best protection for your body. Your head and neck are more easily injured than other parts of your body.
 - If caught near a stream, be aware of mudflows, especially if you hear the roar of an approaching mudflow. Mudflows often accompany volcanic eruptions. Move quickly out of the path.
- Stay out of the area defined as a restricted zone by government officials. Effects of a volcanic eruption can be experienced many miles from a volcano. Mudflows and flash flooding, wildland fires, and even deadly hot ashflow can reach you even if you cannot see the volcano during an eruption.
- Avoid river valleys and low-lying areas. Trying to watch an erupting volcano up close is a deadly idea.
- Listen to 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 radio and local officials provide the most appropriate advice for your particular situation.

How to Protect Yourself During Ashfall

Volcanic ash is actually fine, glassy fragments and particles that can cause severe injury to breathing passages, eyes, and open wounds, and irritation to skin.

- Wear long-sleeved shirts and long pants.
- Use goggles to protect your eyes.
- Wear eyeglasses instead of contact lenses.
- Use a dust mask or hold a damp cloth over your face to help breathing.
- Keep car or truck engines off.

What to Do After a Volcanic Eruption

- Help a neighbor who may require special assistance — infants, elderly people, and people with disabilities. Elderly people and people with disabilities may require additional assistance. People who care for them or who have large families may need additional assistance in emergency situations.
- If possible, stay away from volcanic ashfall areas. The fine, glassy particles of volcanic ash can increase the health risk to children and people with existing respiratory conditions such as asthma, chronic bronchitis, or emphysema. Stay indoors, wear face masks designed to protect against lung damage from small particles, use eyeglasses instead of contacts, and protective goggles to protect eyes.
- When outside, protect yourself from the fine, glassy particles of volcanic ash.
 - Cover your mouth and nose.
 - Wear goggles to protect your eyes.
 - Wear eyeglasses instead of contact lenses.
 - Keep skin covered to avoid irritation from contact with ash.
- Clear roofs of ashfall. Ashfall is very heavy and can cause buildings to collapse, especially if made wet by rainfall. 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. Moving parts can be damaged from abrasion, including bearings, brakes, and transmissions.
- If you have a respiratory ailment, avoid contact with any amount of ash. Stay indoors until local health officials advise it is safe to go outside. Volcanic ash can cause great damage to breathing passages and the respiratory system.