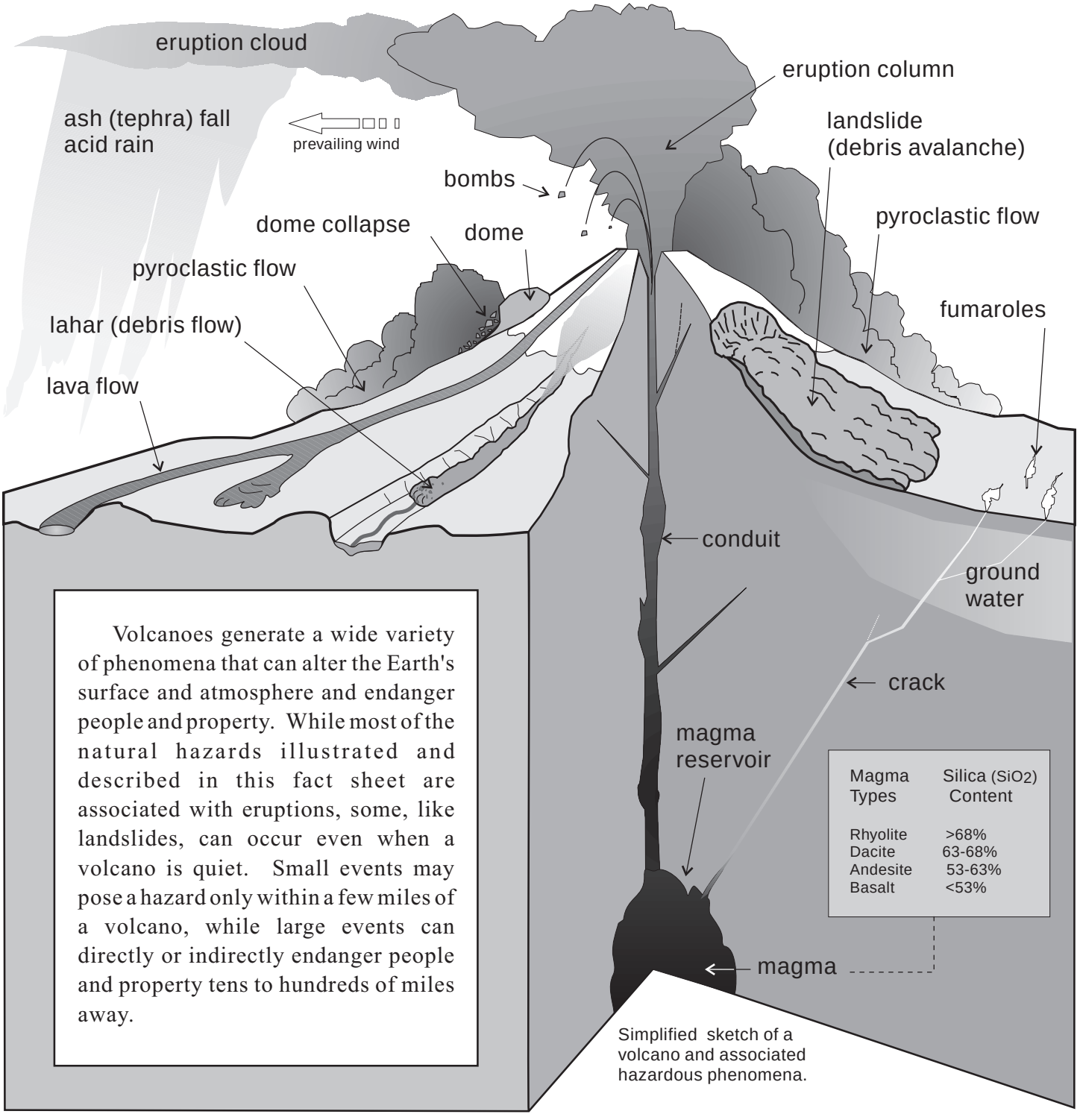
VOLCANO HAZARDS FACT SHEET

U.S. Department of the Interior
U. S. Geological Survey

Hazardous Phenomena at Volcanoes



Simplified sketch of a volcano and associated hazardous phenomena.

Volcanoes generate a wide variety of phenomena that can alter the Earth's surface and atmosphere and endanger people and property. While most of the natural hazards illustrated and described in this fact sheet are associated with eruptions, some, like landslides, can occur even when a volcano is quiet. Small events may pose a hazard only within a few miles of a volcano, while large events can directly or indirectly endanger people and property tens to hundreds of miles away.

ERUPTION COLUMNS AND CLOUDS

n e plosive eruption blasts molten and solid rock fragments **tephra** into the air with tremendous force. he largest fragments **bombs** fall back to the ground near the vent, usually within miles. he smallest rock fragments **ash** continue rising into the air, forming a huge, billowing **eruption column**. Volcanic ash is composed of fragments of rock, minerals, and glass that are less than millimeters . inch in diameter.

Eruption columns can be enormous in size and grow rapidly, reaching more than miles above a volcano in less than minutes. nce in the air, the volcanic ash and gas form an **eruption cloud**. Eruption clouds pose a serious hazard to aviation. uring the past years about commercial ets have been damaged by inadvertently flying into ash, and several have nearly crashed. arge eruption clouds can travel hundreds of miles downwind from a volcano, resulting in **ash fall** over enormous areas. sh from the ay , , eruption of ount St. elens was deposited over , square miles of the western nited States. With increasing distance downwind from a volcano, the ash particles become smaller and the thickness of the resulting layer decreases. inor ashfall can be a nuisance to people and damage crops, electronics, and machinery heavy ashfall can collapse buildings.

PYROCLASTIC FLOWS

igh speed avalanches of hot ash, rock fragments, and gas move down the sides of a volcano during e plosive eruptions or when the steep edge of a dome breaks apart and collapses. hese **pyroclastic flows**, which can reach ^{o} and move at miles per hour, are capable of knocking down and burning everything in their paths. more energetic and dilute mi ture of searing gas and rock fragments is called a pyroclastic surge. Surges move easily up and over ridges flows tend to follow valleys.

he ay , eruption of ount St. elens generated a horizontally directed series of e plosions that formed a lateral blast. his blast destroyed an area of square miles. rees feet in diameter were mowed down like blades of grass as far as miles from the volcano. he blast e hibited characteristics of both pyroclastic flows and surges.

LAVA FLOWS AND DOMES

olten rock **(magma** that pours or oozes onto the Earth s surface is called **lava**. he higher a lava s silica content, the more viscous it becomes. or e ample, low silica basalt lava can form fast moving miles per hour , narrow lava streams or spread out in broad sheets up to several miles wide. etween and , basalt lava flows erupted at ilauea Volcano in awaii destroyed nearly houses and severed the coast highway along the volcano s south flank.

n contrast, higher silica andesite and dacite lava flows tend to be thick, move slowly, and travel short distances from a vent. acite and rhyolite lava flows often form mound shaped features called **domes**. etween and , ount St. elens built a lava dome about , feet high and , feet in diameter.

LAHARS (DEBRIS FLOWS OR MUDFLOWS)

Lahars are mi tures of water, rock, sand, and mud that rush down valleys leading away from a volcano. hey can travel over miles downstream, commonly reaching speeds between and miles per hour. Sometimes they contain so much rock debris by weight that they look like fast moving rivers of wet concrete. lose to the volcano they have the strength to rip huge boulders, trees, and houses from the ground and carry them downvalley. urther downstream they simply entomb everything in mud. istorically, lahars have been one of the most deadly volcanic hazards.

ahars can form in a variety of ways, either during an eruption or when a volcano is quiet. Some e amples include the following rapid release of water from the breakout of a summit crater lake generation of water by melting snow and ice, especially when a pyroclastic flow erodes a glacier flooding following intense rainfall and transformation of a volcanic landslide into a lahar as it travels downstream.

VOLCANIC LANDSLIDES (DEBRIS AVALANCHES)

landslide is a rapid downslope movement of rock, snow, and ice. andslides range in size from small movements of loose debris on the surface of a volcano to massive failures of the entire summit or flanks of a volcano. Volcanic landslides are not always associated with eruptions heavy rainfall or a large regional earthquake can trigger a landslide on steep slopes. Volcanoes are susceptible to landslides because they are composed of layers of weak, fragmented, volcanic rocks that tower above the surrounding terrane. urthermore, some of these rocks have been altered to soft, slippery, clay minerals by hot, acidic ground water inside the volcano. t least five large landslides swept down the slopes of ount ainier during the past , years. he largest volcanic landslide in historical time occurred at ount St. elens on ay , .

VOLCANIC GASES

Volcanoes emit gases during eruptions. Even when a volcano is not erupting, cracks in the ground allow gases to vent to the surface through **fumaroles**. he most common volcanic gases are water vapor , carbon dio ide, sulfur dio ide, hydrogen sulfide, and hydrogen. Sulfur dio ide gas can react with water droplets in the atmosphere downwind and fall as acid rain, causing corrosion and adversely affecting vegetation. arbon dio ide is heavier than air and tends to collect in depressions, where on occasion it can accumulate in lethal concentrations and cause people and animals to suffocate. Sometimes, to ic concentrations of fluorine are adsorbed onto ash and ingested by livestock or leached into domestic water supplies.

arge eruptions in ect sulfur dio ide gas into the stratosphere, where it combines with water to form an aerosol of sulfuric acid. y reflecting solar radiation, the sulfur aerosols can lower Earth s average surface temperature by a few degrees ahrenheit. hese aerosols also hasten ozone destruction by altering chlorine and nitrogen chemical species in the stratosphere.

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