Hawaii Volcano National Park As One Of Earths Most Iconic Geologic Sites

Hawaii Volcano National Park is one of the most unique and breathtaking National Parks in the world. This geological wonder is home to several of the world's most famous and iconic volcanos. The National Park is composed of five separate volcanos: Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea. Three of the five volcanoes listed are labeled as active which by definition means that they have erupted at least once during the past 10,000 years (Volcano Discovery Corp 2015). Kilauea is a shield volcano that is considered to be one of the most active volcanoes in the world with sixty recorded eruptions since 1983. Since not all eruptions are recorded it is safe to assume that the actual number of eruptions must be far greater. In fact, the most recent eruption occurred on May 3, 2018 (NPS 2013). Shield volcanoes are tall and broad, with flat, rounded shapes and are formed by flows of low viscosity lava. This type of lava flows very quickly and reaches about 950 degrees. Another active volcano found in the National Park is Mauna Loa, which is the largest volcano in the world measuring 13,679 feet high and dips 3,100 feet below sea level (Softschools Corp 2007). Geologist estimate that this volcano has been erupting for over 700,000 years as it emerged from under the ocean 400,000 years ago. Mauna Loa is also a shield volcano that last erupted on April 15, 1984 and has erupted a total of thirty-three times since 1843 (Softschools Corp 2007). The last active volcano in the National Park is Hualalai. This shield volcano is the third most active volcano on the island, last erupting in 1801. There hasn't been a lot of activity from this volcano for over 2,000 years, however, geologists expect this volcano to erupt in the next century (Ken Rubin 2018). The other two volcanos in the national park are listed as either dormant or extinct. Kohala is the oldest volcano on the island and is considered extinct as it last erupted roughly 60,000 years ago. This volcano was once a shield volcano but due to erosion and other natural processes is now listed as a post shield volcano. Mauna Kea is listed as a dormant volcano as it last erupted about 3,600 years ago (NPS 2013). This volcano is also listed as a post shield volcano for the same reasons as Kohala.

Since three of the five volcanos are active, there is always the fear and possibility of an eruption occurring at any time. Dangers that occur due to an eruption include lava flows, emission of toxic gasses, acidic vaporized seawater, and layers of ash (Stanford Geology Department 2018). The lava flows can cause a magnitude of damage, as they can efface buildings and destroy infrastructure. Furthermore, the ash and deadly gasses pollute the air and cause respiratory issues. With all these risks being able to occur at any moment, geologists have taken numerous safety precautions to protect the 1,425,248 inhabitants of the Hawaiian Islands (Hawaii State Data Center 2019). Volcanologists have numerous methods to monitor volcanic activity in order to provide a warning to the public. In addition, volcanologists also look for other obvious signs that a volcano will erupt, for example prior to an eruption there is usually a series of earthquakes along with the release of gasses that can be measured and tracked.

When discussing volcanic eruptions, magma is an essential part of the eruption process. As defined by National Geographic, magma "is a mixture of molten and semi-molten rock found beneath the surface of the Earth" (National Geographic Society 2012). The most common type of magma associated with these Hawaiian eruptions is basalt, a dark igneous rock made up of primarily pyroxene and plagioclase. What makes Hawaiian magma unique is that it usually

contains a small percentage of dissolved water that allows for a better flow of the molten basalt (National Geographic Society 2012). Whenever one thinks of volcanos, usually the most popular aspect of these geologic wonders is the flow of lava. But how is lava formed? Extreme differences in the pressure, structure, and temperature in the mantel and crust of the Earth cause magma to form in different ways. Decompression melting is an essential process that causes hot material inside the volcano such as magma to rise via convection to areas of low pressure outside of the volcano. When magma exits the interior of the volcano and reaches the surface it is now categorized as lava (National Geographic Society 2012). Essentially, lava is formed by extreme pressure causing magma to exit the volcano.

Another geological feature that characterizes Hawaii is the Hawaiian-Emperor seamount chain. A seamount chain is essentially when a mountain rises from the bottom of the ocean's seafloor but never breaks the water's surface, therefore not forming an island. The relationship between the Hawaiian volcanoes and the Hawaiian-Emperor seamount chain is created through a 60° bend found within the chain (Alistair Riddoch 2014). This bend is one of a kind, as no other exists in any other seamount chain in the entire world. For this reason, geologists are fascinated by this bend and numerous investigations have occurred in order to understand this marvel. This topic is highly debated in geology, and we do not have a consensus in the scientific community, but rather several theories as to what may have caused the formation of the bend. The most generally accepted theory is that there was a tectonic shift that resulted in the creation of the bend. It's believed that roughly 47 million years ago there was a motion with the Pacific plate along with a shift of Hawaii's hotspot plumes. The plume shifted horizontally with the Earth's crust and gave rise to the other bend of the island chain (Alistair Riddoch 2014). As time progressed, the plume eventually shifted back up vertically close to its original position resulting in the 60° bend which we see today (Alistair Riddoch 2014).

When people think of American Volcanos, Yellowstone is always part of the discussion. Despite both Yellowstone and Hawaiian volcanos having formation origins from a hot spot, Yellowstone, also has rhyolite lava flows (Oregon State University 2016). As stated earlier, the magma seen in the Hawaii Volcano National Park lava flows are slow and not explosive. Yellowstone National Park contains a tremendous amount of high-pressured gasses, making the magma somewhat paste-like. This type of magma releases as it rises, and the gas expands rapidly resulting in the magma exploding into a rhyolite lava flow (Oregon State University 2016). Volcanologists feel Yellowstone's next eruption could explode with such power; it could rival the eruption of Mount St. Helens on May 18, 1980. Another difference between the two types of volcanos is that the Hawaiian volcanos are shield volcanos whereas Yellowstone is considered to be a super volcano. According to the USGS, a super volcano is "a volcanic center that has had an eruption of magnitude 8 on the Volcano Explosivity Index (VEI), meaning that at one point in time it erupted more than 1,000 cubic kilometers (240 cubic miles) of material" (USGS 2013). Essentially an eruption from Yellowstone could result in significant environmental changes to the global climate.

In summary, the Hawaii Volcano National Park is one of Earths most iconic geologic sites. This island is home to five of the most famous shield volcanos in the world: Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea. Of the five, Mauna Loa, Hualalai, and Kilauea are active. Whereas Kohala is extinct and Mauna Kea is dormant. These volcanos erupt dangerous but unique basalt lava that can wreak havoc on nearby surroundings but also hardens into a smooth igneous rock. The fear of eruptions is always a possibility, but innovative technology has allowed us to predict when an eruption may occur in order to take the proper course of action to

ensure the safety of the public. As a society, we must preserve these volcanos in order to not only better understand volcanos and their processes, but also to simply bask in their natural beauty. It’s no doubt why this area was listed as a UNESCO World Heritage site in 1987.