HOW DEVASTATING CAN IT BE?

EXPLORING THE KĪLAUEA IKI ERUPTION

Grade 6 Meet at Kīlauea Visitor's Center 9:30-12:00 Noon

USGS Files

Essential Questions: Think about these questions as we go through the program.

1. What do you think happened inside Kīlauea Iki Crater in 1959 and what evidence is still present today?

2. How has the area changed over time?

3. Think about what kind of activity occurred here. Who is responsible for this activity? *Pelehonuamea (Pele).*

ʻōlelo noʻeau: **He ao walea i ka laʻi – A day enjoyed in the calm.**

Why do you think this saying was chosen to describe this area?

Brief History:

The 1959 eruption of Kīlauea Iki Crater was a relatively short-lived event, but it produced some of the most explosive and spectacular lava fountains (as high as 580m), the highest on record at that time. It yielded a cinder cone named Pu‘u Pua‘i or “gushing hill”. The eruption, which lasted about 5 weeks, was witnessed by many people, some who camped in the area for days to view this incredible event. Scientists were able to gain unbelievable insight and information about many secrets of Kīlauea from this fiery fountain display.

Determining the Facts:

Pu‘u Pua‘i cinder and spatter cone was formed during 17 episodes in a month of on-again, off-again eruptions that saw trade winds blowing cinder, spatter, and pumice from a single explosive vent along the southern end of Kīlauea Iki. When Kīlauea Iki erupted it produced massive amounts of molten lava, creating a lava lake 400 feet deep (over 6 million dump truck loads). Most of the lava later drained back into the vent opening that created Pu‘u Pua‘i, leaving a “bathtub” ring around the crater.

Additionally, the fire fountain sprayed large quantities of pumice and cinder into the air that rained down upon the rainforest, burying smaller plants alive while stripping others of their foliage and branches. This was enough material to fill 1.5 million dump trucks! All told, 1,250 acres of rainforest stretching 2.5 miles to the west-southwest of the active vent were covered. Scientists have determined that the trade winds at the time had carried the lighter pumice, Pele’s hair and smaller cinder pieces more than 12 miles away from the eruption site!

Location Map Inquiry:

Activity Sheet 1. Travel to the Devastation Trail parking area to introduce this section.

Complete this activity at the trailhead. Share answers**.**

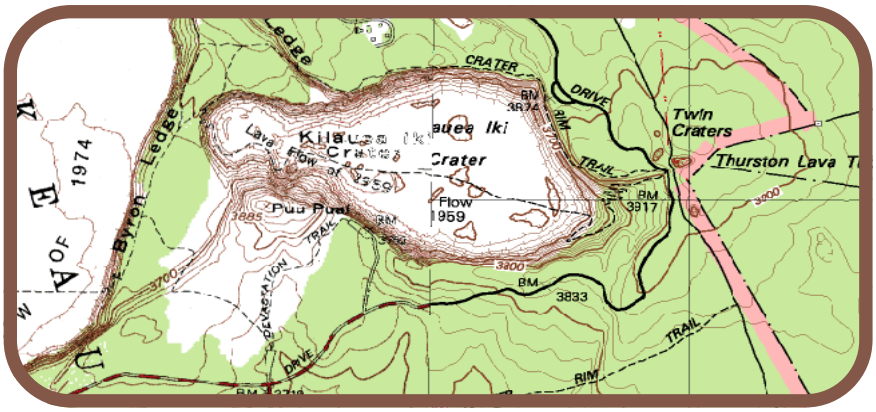

Photo Analysis:

Compare and contrast the photos below which were taken in the same area.

Use the larger laminated ones for discussion! There is one set for each group.

Are these the same trees we are looking at? How can you tell?

Speculate what might have taken place in these photos.

Can you guess the chronological order of the photos?

(Answers: upper left one was taken before the 1959 eruption, the center photo was taken only two years after the eruption and the color photo is more recent. That's an amazing recovery!)

Setting the Stage:

Begin walking on the unpaved trail to the left. This was the old Crater Rim Drive. Do NOT take the trail to the right! As we walk, look for **aerial roots** and **pioneer plants**. Think about how this area has changed over the last 50 years. Continue on this trail to where you have a good unobstructed view of the backside of Pu'u Pua'i cinder and spatter cone. Do not travel off this trail.

The eruption in Kīlauea Iki that built Pu'u Pua'i with lava temperatures of 1100° C (2012° F) and lava fountains up to 580 meters, devastated the area south-southwest of Pu'u Pua'i where we are now. Since then, that area has been left to regenerate on its own — a sort of experiment. You're now standing on a section of what was once a 200 year old forest (growing since the 1790 Halema'uma'u eruption) that was covered by the 1959 eruption. The area looks as if it is nothing but a carpet of bare cinders and bleached bones of dead trees poking through it.

Discussion:

1. **What signs of previous activity are still evident?**
2. **How has this area changed over time? What signs of life do you see?**
3. **What are pioneer plants (3 W's) and which ones do you think appeared first in the devastated area?**

Point out examples of natives like ʻōhiʻa, ʻamaʻu, hāpuʻu, ʻōhelo and kupukupu, as well as alien invasive species like knotweed, Morella faya, and himalayan ginger.

4. **Find aerial roots along the way? Where do you see them?**

What caused them to grow there and what is their function?

5. **What lava products do you see?**

Point out examples that may include various types of tephra such as cinder, ash, Pele's tears, Pele's hair, and pumice. Remind students to "leave no trace."

Analysis:

Field Lab - Activity 2.

In this activity, you will have a chance to think like scientists. Stay in the area by the back side of Puʻu Puaʻi to begin the Activity 2 Worksheet. You will back-track towards the parking area as you complete these activities in your groups. Groups can start in different locations, not all at the same place. Before students begin working in their groups, ask them what a hypothesis is and ask for a few examples.

Monitor the time to allow for discussion and the closing (see below). The groups should only spend about 10 minutes at each of the 3 locations.

In Closing:

Putting it all together-

When the Field Lab is completed, bring the program to a close with these final thoughts:

Describe what you observed of this place.

How does tephra size and distance from an actual eruption site affect forest re-growth at Devastation Trail? *(Restate the evidence from the activity)*

So, do you think the 1959 eruption was *devastation* or *creation*? Why?

What is a good name for this trail?

Making the *Climate Change Connection:*

Discuss:

Eruptions can add to the problems of climate change because they destroy oxygen-making forests. Trees are our best natural defense against carbon-based global warming. They not only produce the oxygen we breathe, but also absorb huge amounts of carbon that cause global warming. In addition, the poisonous gases emitted during eruptions add to the processes that cause global warming.

Brainstorm these questions:

What could be the effects of climate change here in the park?

What can you and your ʻohana (family) do to help ease the impact of climate change and reduce your carbon footprints?

Links / Resources:

http://hvo.wr.usgs.gov/gallery/kilauea/caldera/srb980819038_caption.html

http://hvo.wr.usgs.gov/kilauea/history/1959Nov14/

http://volcanoes.usgs.gov/images/pglossary/index.php

Activity Sheet 1:

Study the map to answer the questions below. Need calculators!

Names in Group _____

1. **How long ago did Kīlauea Iki last erupt?** ***(Yes, you need to do some math!)*** _____

2. **If the solid green area represents vegetation, what do you suppose the white area represents?**

_____

Do you suppose this might change over time?_____ **Why?**_____

3. **How tall is Pu'u Pua'i in feet?**_____

Hint: Take the elevation (which is in feet) shown near the intersection of Crater Rim Drive and the Devastation Trail parking area and subtract it from the elevation shown for Pu'u Pua'i.

Now, convert it's height to meters using the chart below._____

4. **If lava fountains of the 1959 eruption were as high as 580 meters, how tall were they in feet?**

_____

5. **Find the Devastation Trail parking area trailhead on the map. Devastation Trail goes to the right but is not where we will be going today. Mark the trail to the left with an X. It is the southern segment of the Uwēaloha (Byron Ledge Trail) and is the trail you will be hiking today.**

Metric Equivalent Chart

What is known	Multiply by:	Converted Answer:
Feet	0.31	Meters
Inches	2.54	Centimeters
Miles	1.61	Kilometers
Meters	3.28	Feet
Centimeters	0.393	Inches

Other formulas:

$^{0}C = (^{0}F - 32) / 1.8$

$^{o}F = (1.8 \times C^{o}) + 32$

Activity 2 – Field Lab Analysis

Names in Group _____

Revisit "Determining the Facts". Let's see if the scientific evidence is true. Because of time constraints, we will collect (3 pieces) random samples of cinder from 3 different sites along the devastated area. You will take measurements in **centimeters** and an average (median) size will be determined (yes, more math!). All data will be recorded on the chart below. Be ready to share your answers!

SITE	**Site 1 - Pu'u Pua'i**	**Site 2 - ½way to parking area**	**Site 3 - Parking area**
Average Cinder Size	cm	cm	cm
Sample 1			
Sample 2			
Sample 3			
Lava products (ash, cinder, reticulite, Pele's Tears, etc.)			
	Site 1	Site 2	Site 3
Make observations of Tree Density and Height. Record findings. (Heavy, medium, sparse)			

1. Do your findings support or refute the scientists' observations that smaller cinder, pumice etc. blew further away from the eruptive site?

_____

Why or why not?_____

2. Write a scientific hypothesis to support your findings:_____

_____

3. After viewing the devastated area, list some of the types of tephra and other volcanic products that you have seen:

_____

4. Pu'u Pua'i has a series of cracks across its surface. What do you supposed is causing them?

_____

5. Write a hypothesis to explain your finding about tree density and height in the 3 sites:

_____