Mauna Ulu Eruption Guide

Hawai‘i Volcanoes
National Park

Venture through a landscape formed in a five-year eruption that re-created this land.

This trail tells the story of one of the longest known rift zone eruptions of Kīlauea. The well-marked trail crosses massive lava fields, skirts gaping fissures, and takes you to spectacular features formed by rapidly cooling lava flows.

Start/End: Mauna Ulu Parking Lot

Map: See center pages

Walking Distance: 2.5 miles (4 km) round trip

Estimated Walking Time: 2–3 hours round trip

Descent/Ascent: 210 feet (64 m)
Most of the route is easy but includes a 1/4-mile steep climb up Pu‘u Huluhulu cone.

Protect Fragile Formations: Surface patterns and delicate lava trees are made from fragile rock. Reduce your impact. Do not touch these formations.

For Your Safety and Health:

- stay on the trail
- carry drinking water
- wear sturdy walking shoes
- take protective gear for both sun and rain

Air Quality: Harmful gases from the active eruption are often blown into this area. Wind conditions can change quickly. Infants, young children, pregnant women, and hikers with cardiac or respiratory problems are especially at risk. If fumes cause physical distress, leave the area!

cover photo:USGS/D. SWANSON

Trailhead

Experience the eruption that built Mauna Ulu (growing mountain).

In the pre-dawn morning of May 24, 1969, residents and visitors were jarred awake by window-rattling earthquakes. A large fissure had opened up in a quiet forest along Chain of Craters Road. Soon red-hot lava burst forth to announce the start of a new eruption, the birth of Mauna Ulu (growing mountain).

In the five short years of this eruption, roads, cultural sites, and coastal grasslands were burned and buried in the lava's relentless flow to the sea. A succession of flows transformed vast forests into an eerie landscape of desolate lava fields.

Today Mauna Ulu looms over this surreal landscape, where lava trees stand after the surrounding flows drained away. Step off the pavement and into the past. Re-live the 1969–1974 Mauna Ulu eruption and witness how this sacred Hawaiian landscape continues to undergo rapid and extraordinary change.

USGS/D. SWANSON

Prior to the eruption, this road wound through a young ʻōhiʻa woodland and offered views into craters that have since disappeared.

Completed in the early 1960s, this short-lived highway was the original Chain of Craters Road. Most of the next six miles were unceremoniously covered by lava flows from 1969 to 1974.

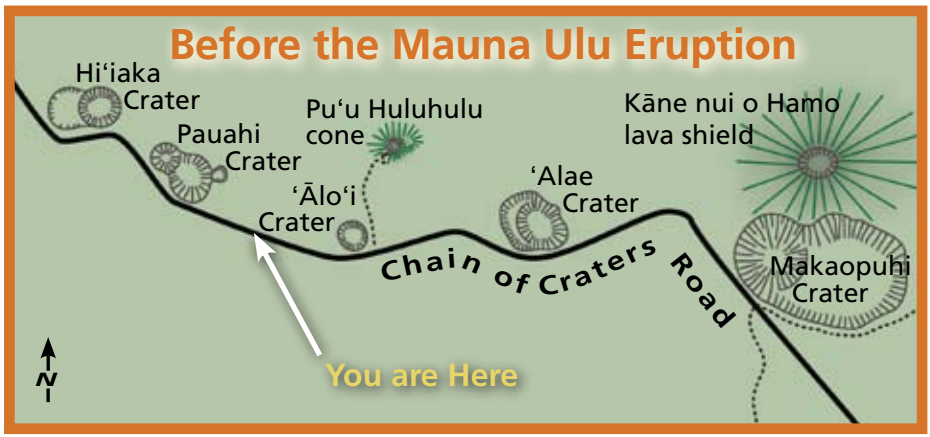
During the course of the Mauna Ulu eruption, five prominent pit craters were partially or completely filled with lava. Each crater is known by a historic Hawaiian name associated with fire or lava.

The floor of Hiʻiaka Crater was covered when it erupted in May 1973. Named for Pele's sister, Hiʻiaka is also known to nurture new forests after an eruption.

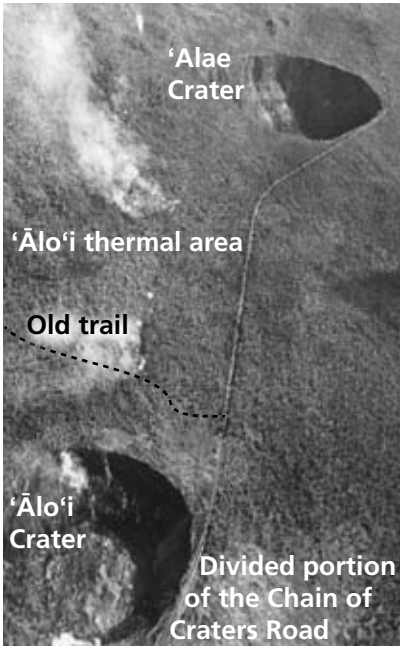
A short eruption occurred on the floor of Pauahi Crater in May 1973. A few months later, new fissures split the walls and lava flooded the crater's floor. Its name means "destroyed by fire."

ʻĀloʻi Crater, named for the favorite pig of Kahawali, chief of Puna, was filled during the eruption. When Kahawali refused to race with Pele, she (in the form of lava) chased him to the sea.

ʻAlae Crater was inundated with lava in the first half of the eruption. It was named for a black wading bird who kept the secret



of how to make fire from man. The demigod Maui fought ʻAlae Ula and retrieved the secret of fire for the people of Hawaiʻi.

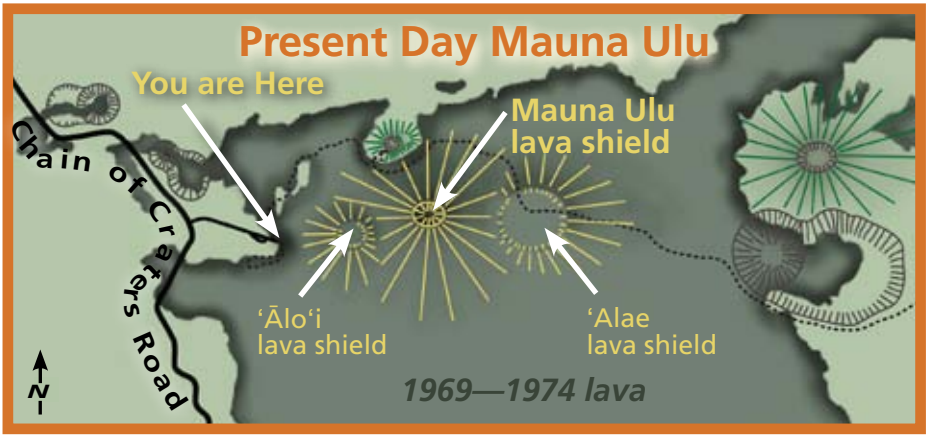


USGS/HAWAIIAN VOLCANO OBSERVATORY

Prior to the eruptions, the drive beyond this point wound through a wooded shrub forest. Due to the dangerously low visibility caused by steaming vents, the road was divided, as it skirted ʻĀloʻi Crater. A short hike from the crater overlook took you through a thermal area to the top of Puʻu Huluhulu (shaggy hill), the wooded hill in the distance. The popular trail led to the loftiest viewpoint for miles. Only a portion of the old trail, which you will be hiking as you climb Puʻu Huluhulu, survives.

Lava erupted within—or cascaded into—Makaopuhi Crater several times but filled only the deeper half of the giant pit. It was named "eye of the eel" for a lens of bluish lava that appeared on the lower crater wall.

At the center of the new landscape rises majestic Mauna Ulu—to many a creation of Pele, to all a monument of change.



The earth opened up, and lava burst forth to herald the arrival of Pele, the Hawaiian volcano deity.

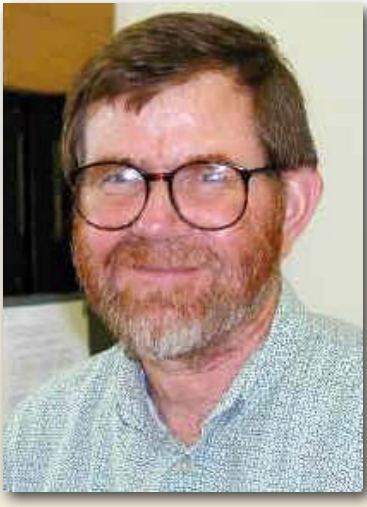
In late spring 1969, nearby residents sensed more earth tremors than usual, and scientists at the Hawaiian Volcano Observatory (HVO) knew an eruption was imminent. On the morning of May 24, they rushed to an area where the swarm of earthquakes had occurred. Soon a new fissure opened up through the forest, and clouds of steam rose through the trees. In three hours, the widening crack lengthened to over a mile.

Soon, a curtain of molten lava spewed along the entire fissure. Most flowed downhill, but globs of lava that fell on the upslope side of the fissures congealed and welded into a wall-like formation known as a spatter rampart.

By 11:00 p.m., activity waned. Like dissipating foam in a glass of soda, fresh lava that lingered in the fissure lost its gas content and shrank out of sight. Much of the lava nearby drained back into the cavernous crack, the last bits cooling and solidifying in place as it poured back over the rim. On the fissure's inner walls, iron and other minerals in the lava quickly oxidized in the residual steam and turned bright red and yellow.

USGS/D. SWANSON

Eyewitness account of the beginning of the eruption by Hawaiian Volcano Observatory volcanologist Don Swanson:


USGS/HAWAIIAN VOLCANO OBSERVATORY

"Oh no, not another one! That was my first reaction when the fissure opened through ʻĀloʻi Crater early on Saturday morning. We'd had three short eruptions during the previous nine months, and the small staff of HVO was thinly stretched and pretty tired. But as the crack spread westward for over a mile, adrenaline kicked in. The fissure system was erupting along its entire length, fountaining over 100 feet (30 m) high and building a one-sided spatter rampart. Lava spread through the forest and ponded against a small cliff a short distance downhill. Fountaining along these western fissures stopped that evening but continued weakly at the main vent, where Mauna Ulu later grew. Monday was quiet, and we thought that the eruption was over.

Tuesday afternoon, I drove down the road to where lava had covered it on Sunday. I got out and, hmmm, heard what sounded like a gurgling noise coming from upslope. Curious, I walked to the main vent, and my hair stood on end as I viewed lava in the fissure, roiling and bubbling, and rising toward the surface. I thought it might spill out in a few minutes, so I ran back to my vehicle and made a getaway. I jumped the gun a bit, though, because it wasn't until that evening that twin lava fountains began to play from the vent. This activity convinced us that the eruption was not going to be short-lived though we had no idea that it would last for another five years."

The earth shuddered as lava fountains roared skywards. Smoldering cinders rained down and blanketed the land.

Mauna Ulu grew over a new vent that sustained 12 towering fountains from May to December 1969. At times, the fountains reached 1,770 feet (540 m) high—500 feet (150 m) taller than the Empire State Building! It is said that this was Pele's brother, Keoʻahikamakaua, the spirit of molten fountains, wielding his spears of lava.

Wendell Duffield witnessed these events while working as a young volcanologist at HVO. With a sparkle in his eye, he tells you, "If you've never seen Kīlauea in full eruption, you're missing the thrill of a lifetime. The roar of a lava fountain imitates the sound of a full-throttle jet engine on a commercial airliner. The ground shakes in constant tremor, in a primeval form of deep-bass music created by molten rock surging through its tubular eruption pipe on a path to the surface. Fetid, sulfurous fumes escaping from lava sting the lining of the observer's throat and nostrils. Heat from lava, at about the temperature of molten iron, keeps the viewer at considerable distance."

USGS/J. JUDD

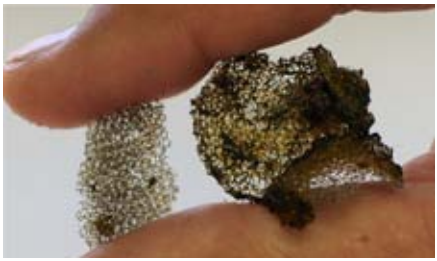
Most of the fountaining lava fell back to earth and merged with surface flows. Smaller, lighter bits of lava that solidified in-flight were blown for miles before raining down upon the forests, stripping trees of their leaves and igniting local fires. These airborne lava fragments, or solidified ejecta are known as tephra, and they fall in many fascinating shapes and sizes.

NPS/JAY ROBINSON

Cinders are ejecta whose profusion of gas bubbles solidified. They can be blown downwind for miles.

NPS/JAY ROBINSON

Pele's tears are droplets of flying lava that solidified into smooth-surfaced spheres or shiny black lava-drops.



NPS/DAVE BOYLE

Reticulite, "lava foam," is a light, delicate form of basaltic pumice, where most of the cell walls of each gas bubble has burst.

NPS/DAVE BOYLE

Pele's hair is thin, fragile threads of golden lava. Blasted skyward at hundreds of miles an hour, sticky lava is torn and spun into delicate threads.

Move aside the cinder to reveal the lava flow buried beneath it.

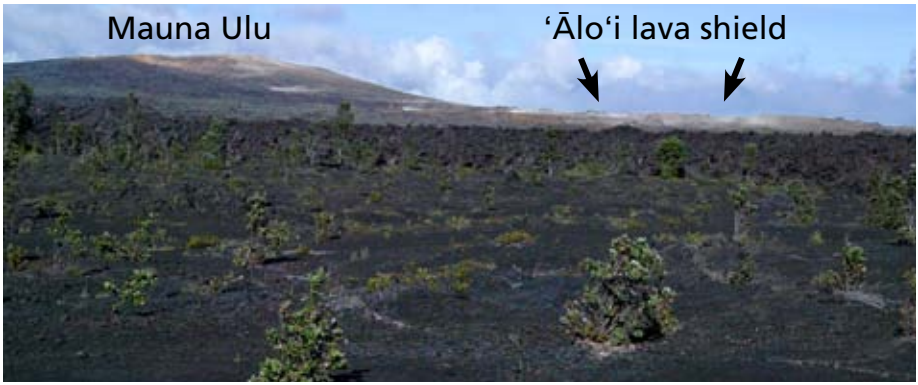
You might even find Pele's tears or tiny bits of Pele's hair. Remember to leave them where you find them so others can enjoy them, too.

The early eruptive episodes of Mauna Ulu offered unforgettable sights to awe-struck visitors.

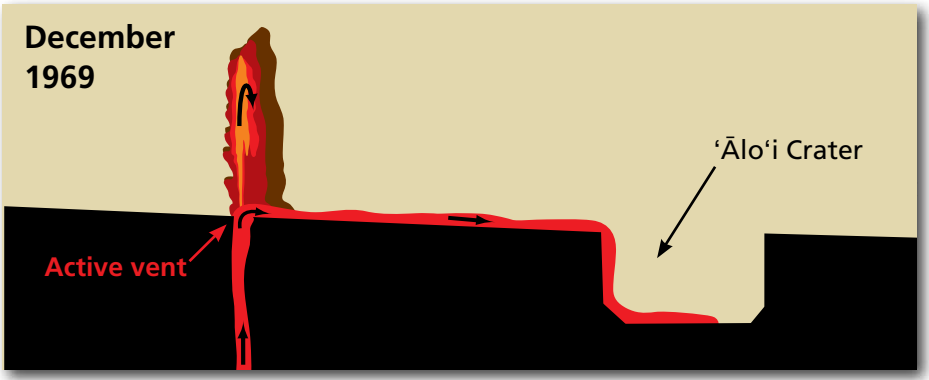
USGS/D. SWANSON

By early 1970, the fountaining vent had created the base of the growing Mauna Ulu lava shield. Overflows from the vent soon consumed the landscape and filled both ʻĀloʻi and ʻAlae Craters. Majestic lava falls plunged 80 feet (24 m) over ʻĀloʻi Crater's rim. As thin sheets of crust slid over the brink of the falls, thermal updrafts tore them from the flow's surface; they floated down like autumn leaves blowing in the wind.

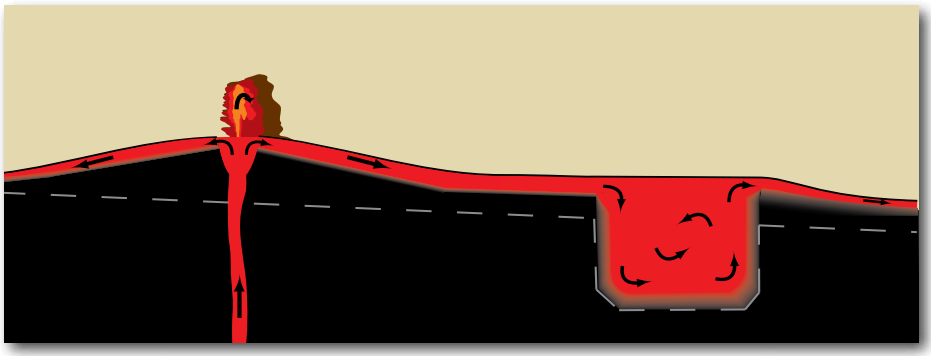
Lava lakes within the craters overflowed with each new surge from Mauna Ulu—adding layers and elevation to the surrounding terrain. The dimpled lava mound that grew above ʻĀloʻi Crater is visible to the discerning eye. It sits on Mauna Ulu's right flank and rises 260 feet (80 m) above the pre-eruption level.



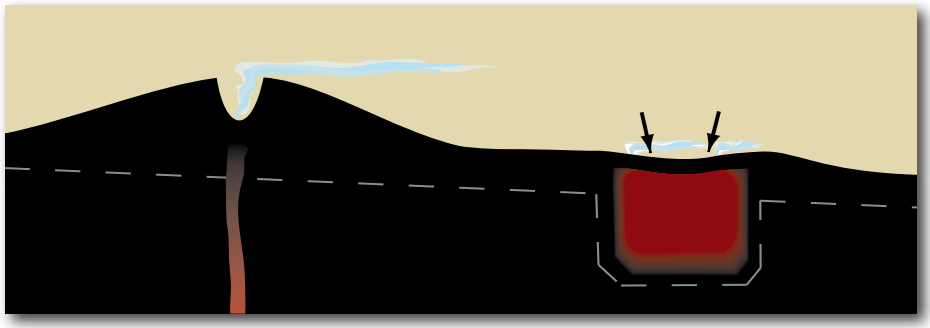
NPS/JAY ROBINSON



1) Lava erupting from the active vent cascaded into ʻĀloʻi Crater.



2) Between overflows of the vent, surface lava quickly cooled and built Mauna Ulu. During the lulls in activity, hot lava in ʻĀloʻi Crater remained molten beneath its insulating crust. With each new overflow of Mauna Ulu, lava joined the molten lake in ʻĀloʻi Crater, and caused it to overflow as well. Each overflow of ʻĀloʻi Crater added layers and elevation to the surrounding terrain.



3) After the eruption, lava withdrew from Mauna Ulu's crater. Hot lava in the old ʻĀloʻi Crater slowly cooled and contracted and the surface deflated to form a distinctive dimple on the top of the new shield.

The forest just ahead survived the eruption on higher ground.

USGS/HAWAIIAN VOLCANO OBSERVATORY

When lava swept through the forests, the long night of burning began. Smoke billowed from trees as they crackled from the consuming heat. The earth shook from underground explosions of trapped methane gas. Occasionally the methane blasts broke through the surface with the deafening shock of a detonating land mine. Rock fragments from the blast tore through branches and shredded leaves on nearby trees. The air was filled with the skunky odor of unburned, underground organic gases, freshly turned soil, and the metallic odor of rock dust.

This forested island, surrounded by a sea of lava, was spared and became a kīpuka (an island of life, or older land surrounded by a younger flow). Since the Mauna Ulu eruption, the kīpuka has become an important source of life for new plants to become established on the fresh lava.

USGS/HAWAIIAN VOLCANO OBSERVATORY

Linger in the shade of the shaggy-barked ‘ōhia trees. Maybe you will catch a glimpse of an ‘amakihi. Its stout, curved beak is designed to probe for insects, as well as to sip nectar from red ‘ōhia blossoms.

© JACK JEFFREY

Lava flowed up to the kīpuka like a bulldozer, pushing and churning a wall of clinkery ʻaʻā.

USGS/HAWAIIAN VOLCANO OBSERVATORY

Once flowing lava cools into volcanic rock, it is called either pāhoehoe or ʻaʻā, based on its distinctive texture. The folded, ropy, or smooth form of lava you've been walking on is pāhoehoe. The crumbled and jagged lava that forms the wall to the right of the trail is ʻaʻā. Both types of rock have the same mineral composition, yet cooled in different ways.

A variety of factors determine whether lava becomes ʻaʻā. If a flow is slightly cooler, loses sufficient gas, crystallizes, or has otherwise become sticky, it loses elasticity and fractures instead of stretching. ʻAʻā can also form when forced to move faster, such as a flow that is pushed from behind by an upslope surge or a flow encountering a steeper slope.

USGS/HAWAIIAN VOLCANO OBSERVATORY

Since molten lava can solidify into either type of rock at any time, what do you call flowing lava before it cools? Ask a traditional Hawaiian, and you might be told, "We call her Pele."

"Pāhoehoe" is the Hawaiian word for lava rock that has a smooth, folded, or ropy surface.

USGS/HAWAIIAN VOLCANO OBSERVATORY

As fluid lava flows along a flat or gentle slope, it often solidifies into pāhoehoe. These flows advance as a series of small lobes and toes that continually expand and break out from the cooling crust along its leading edges. The surface texture of pāhoehoe varies widely, displaying a variety of fascinating shapes.

One of the most intriguing textures encountered is "ropy pāhoehoe." The numerous folds, wrinkles, and ropey surface form when the thin, partially solidified crust of a flow is slowed or halted. The lava below continues to move forward and drags the mailable crust along. As it is compressed and driven forward, the flexible crust wrinkles and develops folds like a squeezed accordion.

USGS/HAWAIIAN VOLCANO OBSERVATORY

NPS/DAVE BOYLE

Look for green olivine crystals.

These tiny gems are commonly found in Kīlauea lava. The hard crystals remain after the surrounding rock has eroded. You can find them in the patches of sand along the trail.

The hill to the right is a product of older volcanic activity, side-swiped by the Mauna Ulu flows.

The small wooded hill on the right is an old spatter rampart built during an eruption that covered this region with fresh lava over 500 years ago. Ash from a distant summit eruption and pioneer plants have since created enough soil to support a young forest.

USGS/R.I. TILLING

But on the night of November 10, 1973, the eruption cycle was repeated. At 9:45 p.m., lava erupted from the walls of Pauahi Crater and ponded into a swirling lava lake.

By 11:00 p.m., more fissures opened up, extending about a mile towards Pu'u Huluhulu (those fissures lie along the treeline to your left). Lava gushed out and covered the area once again. The flows backed up on this side of the old rampart and took off in the direction you've passed through.

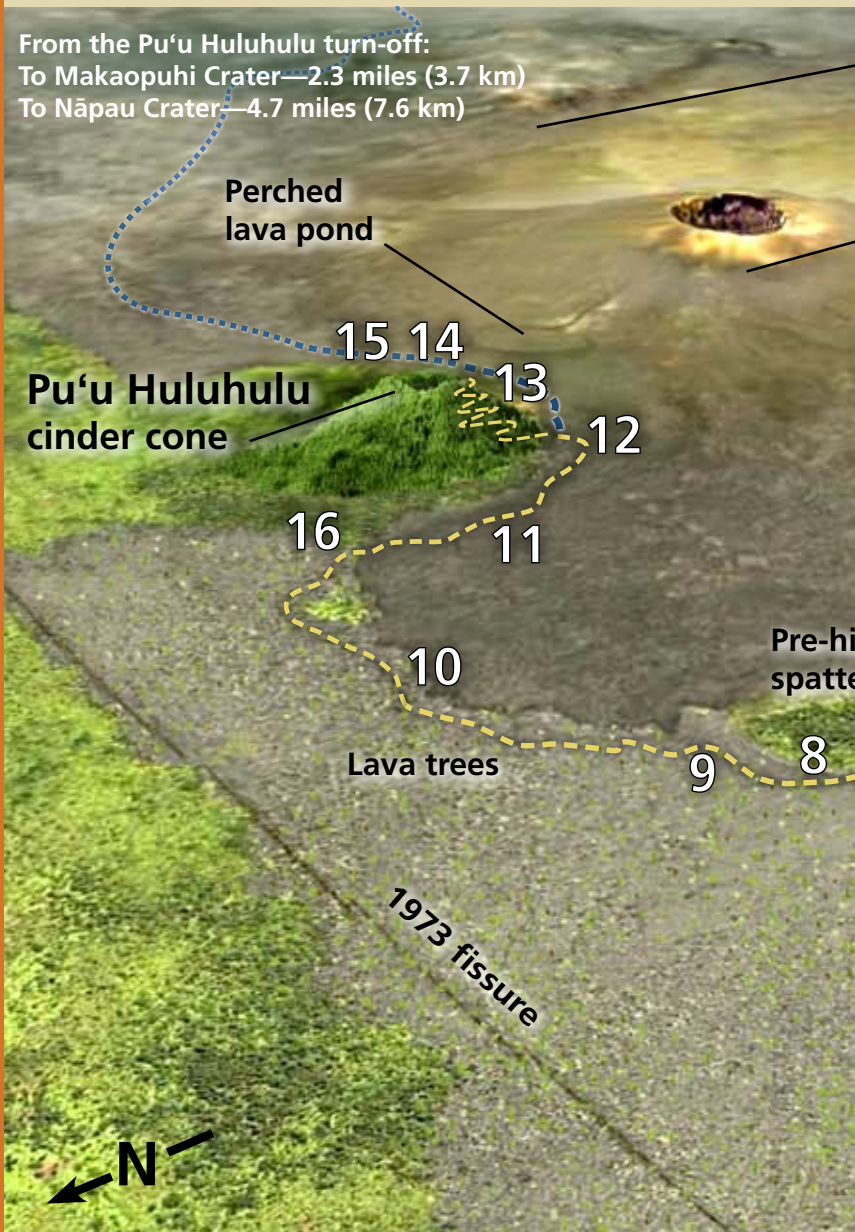
USGS/HAWAIIAN VOLCANO OBSERVATORY

By sunrise the next morning, all activity from the new fissures had ceased. Lava drained away under the crust, and the entire surface deflated about 5 feet (1.5 m). The crest of the flood that surged through this area is dramatically recorded on the side of the old rampart like a great, black bathtub ring.

Mauna Ulu Eruption Map

To preserve Hawai'i Volcanoes National Park for the enjoyment of present and future generations, do not collect or disturb natural, cultural, or historical features.

Please help protect your park . . .
take only photographs and inspiration,
leave only footprints and goodwill.



AHU

Ahu (stacked rocks) mark the trail across the lava flows. Please do not disturb them or build new ones.

TRAIL STOPS

Ground markers on lava or numbered posts in the forest indicate stops described in this guide.

‘Alae lava shield

Mauna Ulu lava shield

‘Āloi lava shield

Hiking route followed by the Mauna Ulu Eruption Guide

Nāpau Trail (hiking beyond Mauna Ulu requires a permit, available at Kīlauea Visitor Center)

istoric
er rampart

‘A‘ā lava

Tephra field

1969 fissure

7

6

3

Pāhoehoe lava

Kīpuka

5

4

1

2

Trailhead

To Chain of Craters Road 0.5 miles (0.8 km)

The same flow that spared the kīpuka at stop 5 inundated the forest that grew here.

Kīlauea erupts lava that is typically around 2,150°F (1,165°C), just a few hundred degrees hotter than its solidifying point. Exposed lava quickly cools and solidifies.

When lava flowed through the forest, it hardened around the cool tree trunks. As the flow receded, it left behind these fragile molds known as "lava trees."

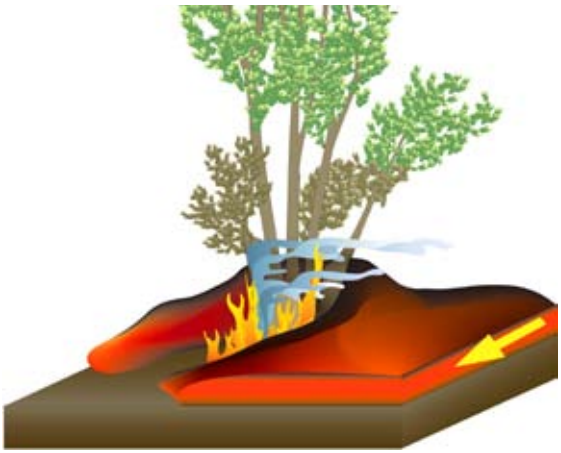
USGS/HAWAIIAN VOLCANO OBSERVATORY

A Hawaiian story tells of a time when Pele created lava trees from people. The goddess had lost a hōlua sled race against Papalauʻahi, the one-time chief of the district of Puna. In a fit of jealous vengeance, she chased after him in the form of lava. Unfortunately the great flood of lava also overran several chiefs and innumerable onlookers—all of whom became pillars of stone. E nihi ka hele (Walk carefully—pay close attention to your actions).

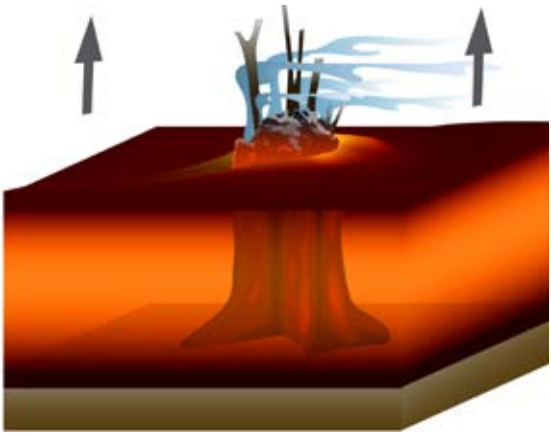
The next small lava tree is nature's archive. It is on the right about 35 steps farther along the trail. Climb up and look inside the hollow centers to see where molten lava captured the delicate imprint of the burning wood.

NPS/JAY ROBINSON

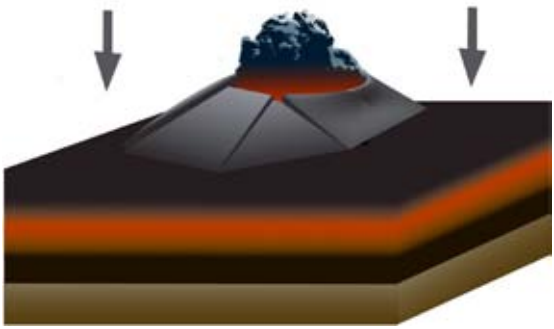
1 When lava flows through a forest, it swirls around tree trunks and quickly solidifies. Moisture in the wood and gas bubbles in the rocks form excellent insulation against complete incineration.



2 As the level of the surrounding flows rises, the trees remain encased in molds of lava. Soon a thick crust forms on the surface of the flow.



3 After the main surge has passed, molten lava beneath the rigid crust drains away downslope, and the entire flow deflates. The crust fractures as it drops around the molds, exposing a landscape of fragile new lava trees.



During the five-year eruption, Mauna Ulu grew to stand about 400 feet (121 m) tall.

USGS/R.I. TILLING

Eruptions in Hawai‘i often form large, shallow domes called “lava shields.” A shield grows through a series of high-volume, short-lived overflows that don’t travel far from their source. During each active phase, lava flows in thin sheets that overide previous layers. The new layers quickly cool and harden during lulls in activity. Lava shields, like Mauna Ulu, attain their greatest thickness around the main vent.

USGS/C. HELIKER

In 1984, fountains built a cone during the Pu‘u ‘Ō‘ō eruption.

The forested hill to the left of Mauna Ulu is Pu‘u Huluhulu (shaggy hill), a volcanic cone that predates the new lava shield by over 500 years. Pu‘u Huluhulu is a pile of cinder, spatter, and ash that rained down from high, gas-charged fountains. With no flows to carry away the ejecta, each fountain added to its height.

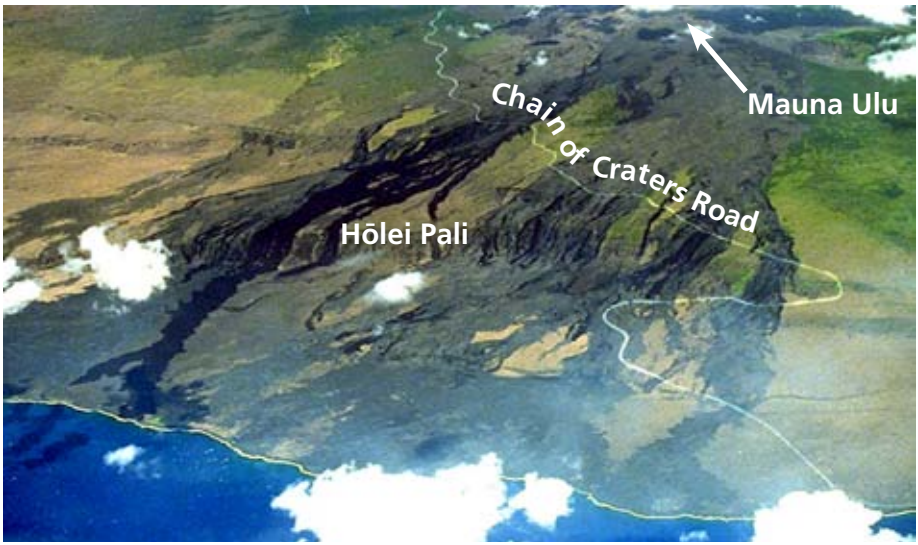
If Mauna Ulu lava shield continued to erupt and grow, it may have completely surrounded and buried the older Pu‘u Huluhulu cone.

Pele flowed seven miles (12 km) to the sea, the realm of her alienated sister, Nāmakaokaha‘i.

USGS/R.I. TILLING

Throughout the eruption, vast floods of lava flowed to the sea, devastating everything in their path. Park visitors on the coastal road were entranced as lava streamed down the 700-foot (220 m) cliffs of Hōlei Pali. Flows from the Mauna Ulu eruption covered 40 miles^2 (95.5 km^2) of the island, nearly the same area as greater Honolulu—from Pearl Harbor to Hanauma Bay—from the mountain to the sea.

When Pele and Nāmaka met at the ocean’s edge, the sisters renewed their endless battle. Voluminous acidic clouds billowed skyward as lava boiled the sea. Over 150 acres (0.47 km^2) of new land were added to the island during the five-year eruption.



USGS/HAWAIIAN VOLCANO OBSERVATORY

Despite the care that scientists take around hot lava, sometimes their worst nightmares come true.

Scientists from the Hawaiian Volcano Observatory (HVO) frequently collect hot lava samples throughout the course of an eruption. The molten sample is quickly cooled and taken back to the lab for further analysis. The composition of each lava sample can give scientists insight into the magma's parents, its journey to the surface, other magma it mixed with, where it resided, and for how long ite passage took. They can also determine how hot it was when it erupted. From this information, scientists can make inferences regarding the volcano's internal plumbing.

USGS/D. SWANSON

In order to collect the samples, geologists wear heat-resistant clothing and walk up to the edge of a flow. With a geologist's hammer or other tool, they extract a molten glob and quickly back away to a safer location. On one occasion, this process went terribly wrong for young Jeffrey Judd (left), his story follows.

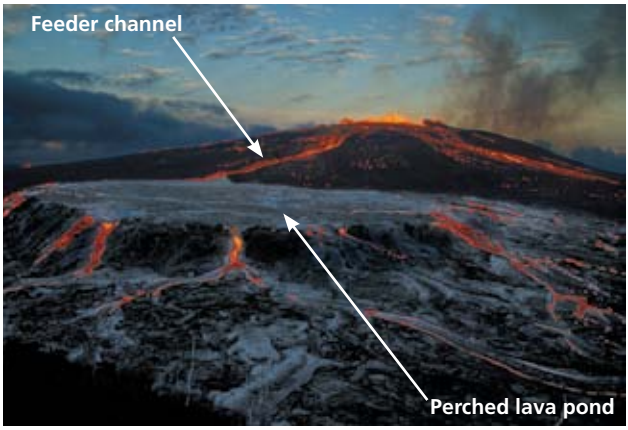
Personal account of a lava sampling accident by former HVO geology technician Jeffrey Judd:

NPS/JAY ROBINSON

"I had been working with HVO for a few years, and at 22, nothing could have been more exciting. Every day brought some new adventure. Now and then, during the Mauna Ulu eruption, we'd be able to walk right up to some of the smaller fountains. The ground shook and the roar was deafening, but with the wind at our backs, the fumes and the cinder blew away from us.

One day, I was assigned to drive out as far as I could and then hike about a mile out to collect fresh lava samples with two visiting geologists. I sat our guests down in a safe place while I edged out on new crust that was forming on the side of an active lava channel. I was leaning out to scoop up a sample with my pick, when all of a sudden my boot poked through the crust and my right leg followed to about my knee. I fell backwards as flames blasted from the hole around my burning leg. I immediately yanked it free and pounded out the flames, but my other clothes were also catching on fire from the hot crust I was rolling around on. Burned, cut up, and bleeding badly, I hiked out, made a call on my two-way radio and was evacuated to the Hilo hospital. I was treated for second- and third-degree burns and released from the hospital after three weeks with only minor permanent damage. You know, that was a horrible experience, but I wouldn't have missed it for the world. Those were the best years of my life!"

Streams of lava coursed from the summit in Mauna Ulu's last growth spurt before the eruption waned.



USGS/R. HOLCOMB

Walk over to see the perched lava pond on the flank of Mauna Ulu. It formed when lava pooled upon the relatively flat plateau between here and Mauna Ulu. As lava surged down its feeder channel, the lake inflated from beneath. Great slabs of crust detached from the edge, slid onto the rim, and cooled. The pond built up and outwards and fed lava that welled out from beneath the edges of the pond's crust to steam down over the pond's levee.

The summit of Mauna Ulu was distinguished by a large crater that contained a great, agitated lake of molten lava. Within the pond, lava circulated beneath a thin and malleable crust. It often degassed along the outer edges and splashed up the walls of the crater. At other times, lava fountains danced for hours at the center of the lake and reflected off the glassy surface of the undulating cladron's crust.

USGS/HAWAIIAN VOLCANO OBSERVATORY


USGS/R. HOLCOMB

Periodically, Mauna Ulu overflowed and added new layers to its mass. It gained significant height during February 1970, but by October 1971, all activity ceased; many thought the eruption had ended. But to everyone's surprise, lava reappeared in Mauna Ulu four months later and the eruption continued with sustained activity into 1974. Typically the eruption fluctuated between weeks or months of feeble activity, interrupted by vigorous overflows that lasted for days.


USGS/R. HOLCOMB

Enthusiastic visitors scrambled up a makeshift trail to a viewing platform (right) on the crater's rim to see the wondrous lake below. One morning, rangers discovered that the platform was missing, along with part of the crater's walls. It all had collapsed into the cauldron overnight. Fortunately, the area had been closed, and no one was injured.

By mid-summer 1974, Mauna Ulu had grown to over 400 feet (120 m). When another eruption occurred at the summit of Kīlauea, lava in Mauna Ulu disappeared and was replaced by heavy clouds of volcanic gas. After a few months, the fumes cleared to reveal a pile of rubble steaming at the bottom of a 100-foot- (30 m) deep pit. The Mauna Ulu eruption had ended.

Scientists ran for their lives as Mauna Ulu's fountains turned toward Pu'u Huluhulu.

USGS/H. POWERS

Prior to the eruption, this view overlooked an expansive forest that surrounded Pu'u Huluhulu on all sides. The horizon was unobstructed and the vast blue pacific rose beyond the island's shores (right). Its popularity prompted the Civilian Conservation Corps to construct this lookout platform in 1934.

USGS/H. SCHMINCKE

Pu'u Huluhulu stood nearly 300 feet (91 m) above the surrounding land when the eruption first began. By the time the eruption ended, this cone was dwarfed by its new neighbor, Mauna Ulu.

This viewing area became the primary observation point for scientists from the Hawaiian Volcano Observatory (HVO). When the heat became unbearable, they would seek cover behind the rock wall. One day, two geologists had an unforgettable experience.

The crater inside this old cone protects rare native plants. Feral pigs ravage the nearby forests but can't get into this crater, due to its steep inner walls. Treasures like 'ōhā—rare outside the crater—find sanctuary within its protective walls.

NPS/DAVE BOYLE

A shift in the fountain chased geologists from their observation perch by HVO geologist Wendell Duffield:


ANNE DUFFIELD

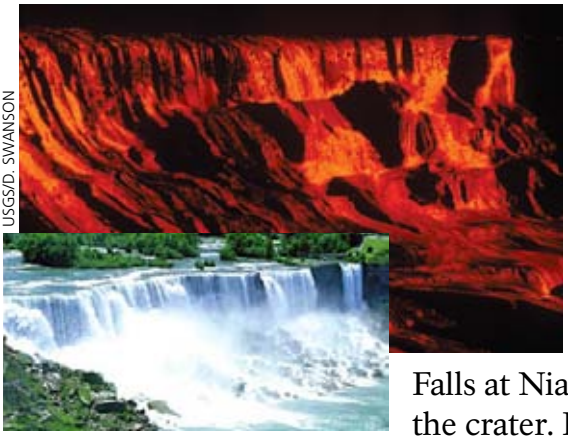
"We loved studying lava fountains high enough to stir our sense of awe, but not so high as to seem dangerous. Daytime viewing brought a variety of sights and sounds, and nighttime presented the two-tone spectacle of bright orange, swordlike shafts of lava stabbing upwards into the black of night.

One fine day a visiting geologist from Germany and I were standing on this overlook, studying fountains on Mauna Ulu. The fountains were peaking straight up to a few hundred feet, a bit above our vantage point. Suddenly, an unannounced obstruction blocked the fountain's pipe and with no recognizable warning, we found ourselves squarely in the fallout zone. Inch-wide pieces of hot rock and still-molten clots were targeting the overlook, and we were close to the bull's-eye.

Without hesitation or discussion, wasting no time trying to explain what was happening while "fire" was falling all around us, we ran directly away from the offending, now horizontal, fountain. We scampered, not down the series of switchbacks along the trail, but rather, crashed through the tangle of rain forest in the opposite direction. We were wearing hardhats, like those at construction sites, and the clots of hot, pasty cinder ricocheted off our helmets with unmistakable pings, clunks, splats, and thwacks. Was Pele reminding us that we study Kīlauea at her whim?"

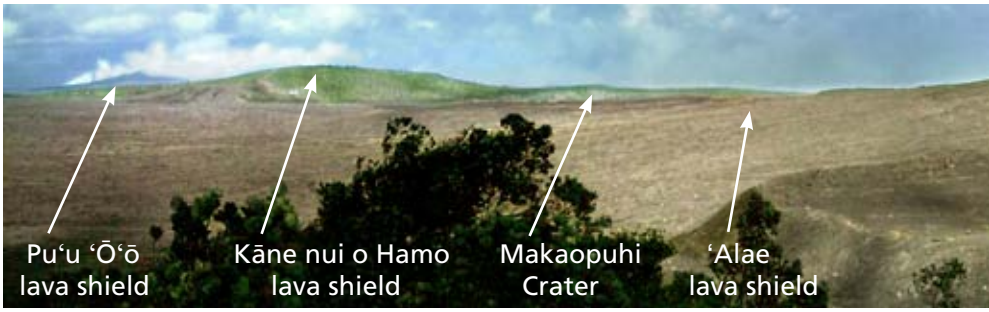
The Mauna Ulu eruption transformed the Chain of Craters to include a chain of lava shields.

Prior to this eruption, ʻAlae Crater was 0.25 mile (0.5 km) wide and over 425 feet (130 m) deep. It sat just left of where Mauna Ulu rises today; but during the night of August 4, 1969, lava filled it nearly to its rim. Four hours later, hundreds of earthquakes shook violently, a fissure opened across the crater floor, and most of the liquid lava in the crater drained away. In 30 extraordinary minutes, the lake level dropped as 13 million yards^3 (10 million m^3) of lava drained underground to emerge three miles (4.8 km) downrift in Nāpau Crater.

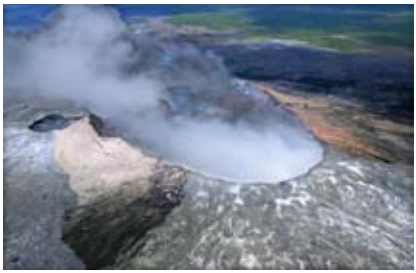


USGS/D. SWANSON

A day later, one of the most memorable spectacles of the eruption occurred when a huge lava falls cascaded into ʻAlae Crater. These falls were wider and higher than the American Falls at Niagara. They soon refilled the crater. By 1974 the eruption had built its third great lava shield, rising 295 feet (90 m) above the rim of the entombed crater.



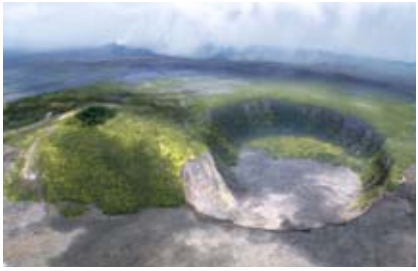
Notice that the brass plaque on the wall points to both ʻAlae and ʻĀloi Craters, which no longer exist, yet does not indicate the most prominent feature, Mauna Ulu. It was installed in the 1930s by the Civilian Conservation Corps, long before this eruption occurred. It identifies the same view, from another time.



USGS/HVO

In the distance, you may be able to spot Puʻu ʻŌʻō (left), a cone that formed in the early years of the current eruption. It has experienced several collapses and has slowly buried itself beneath a lava shield of its own making.

The tree-covered summit of Kāne nui o Hamo lava shield is pitted by a forested crater. Next to the lava shield is Makaopuhi, the largest pit crater on Kīlauea. Lava from Mauna Ulu partially fill it in 1972 and 1973.



USGS/J. KAUAHIKAUA

USGS/J. KAUAHIKAUA

The summit crater of Mauna Ulu is over 100 feet (30 m) deep. Steam rising from within warns that hot rock still resides close to the surface. Sensitive instruments on its upper flank continuously monitor the Puʻu ʻŌʻō eruption.

NPS/JAY ROBINSON

16

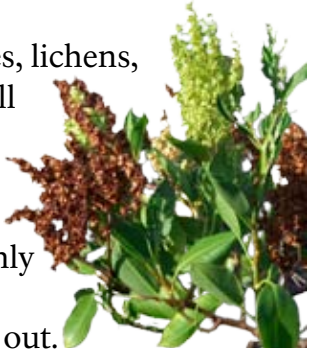
Some of the first species that colonized these new flows will be the first to move on as the forests return.

To Hawaiians, Pelehonuamea is a force of both destruction and creation of the land. However it is the great Lono (god of vitality) and her sister Hiʻiakaikapoliopele (Hiʻiaka in the bosom of Pele) who bring new life to the barren flows.

Within a few months, animals arrive as the first pioneers on new Hawaiian lava flows. These endemic critters included a wingless cricket and a large wolf spider. The nocturnal lava crickets don't sport the equipment necessary to make the cricket sound. Perhaps they lost the ability to call for mates because hungry lava spiders could easily find their noisy cricket ancestors. Only "crickless" crickets survived to pass along their "crickless" genes.

The dark lava cricket is found nowhere else in the world except on the young flows of Hawaiʻi Island. They abandon a lava flow when vegetation covers it—within 20 to 100 years. Creatures of such specific needs would soon disappear without frequent eruptions to renew their habitat.

Soon to follow were algae, ferns, ʻōhiʻa trees, lichens, and mosses—in that order. In 15 years, small shrubs crowded the cracks and crannies as the original colonizers were joined by pūkiawe, ʻaʻaliʻi, kūpaoa, and ʻōhelo. Some species, like pāwale oictured right, only grow on the active volcanoes of this island; they disappear as other plants crowd them out.



ALL PHOTOS NPS/JAY ROBINSON

Conclusion

Haʻina ʻia mai ana ka puana (the story is told). The powerful forces that created this landscape will reshape it in the future.

Until the eruption of Mauna Ulu, activity on Kīlauea had been confined to the summit caldera or to short-lived rift eruptions. But Mauna Ulu erupted for years and pumped out enough lava to pave a road to the Moon. Molten rock filled two craters, built three lava shields, and created new land along the coast.

Then, in 1983, the Puʻu ʻŌʻō eruption began seven miles farther out on the East Rift Zone and soon surpassed Mauna Ulu in many ways. Yet Mauna Ulu still holds a special place in the memories of those who witnessed the spectacular events.

Today when we come to Mauna Ulu, we see a steaming landscape of destruction and twisted rock. We also discover a fragile and surreal beauty—a place where life regenerates on the volcano's raw flows. In the future, as in the past, the earth will tremble, and molten lava will cover all you see. An awesome power constantly recreates this land. It is Kīlauea—a force of constant change.

USGS/D. SWANSON

Eruption photographs courtesy of:

USGS, Hawaiian Volcano Observatory

References

- Swanson, D.A., Duffield, W.A., Jackson, D.B., and Peterson, D.W., 1979, Chronological narrative of the 1969–71 Mauna Ulu eruption of Kilauea Volcano, Hawaii: *U.S. Geological Survey Professional Paper 1056*, 55 p.
- Tilling, R.I., Christiansen, R.L., Duffield, W.A., Endo, E.T., Holcomb, R.T., Koyanagi, R.Y., Peterson, D.W., and Unger, J.D., 1987, The 1972–74 Mauna Ulu eruption, Kilauea Volcano, in Decker, R.W., Wright, T.L., and Stauffer, P.H., eds., *Volcanism in Hawaii: U.S. Geological Survey Professional Paper 1350*, v. 1, chap. 16, p. 405–469
- Duffield, Wendell, 2003, *Chasing lava: A geologist's adventures at the Hawaiian Volcano Observatory*: Mountain Press Publishing Co., 224 p.
- Hazlett, R.W., 2002, *Geological field guide: Kilauea Volcano*: Hawai'i National Park, HI, Hawai'i Natural History Association, 162 p.
- Westervelt, W.D., 1916, *Hawaiian legends of volcanoes*: Rutland, VT, Charles E. Tuttle Co., 210 p. [reprinted 1963].

For more information

To read more about Kīlauea Volcano and other historical eruptions, go to the USGS, Hawaiian Volcano Observatory, Web site: **hvo.wr.usgs.gov**

To learn more about Hawai'i Volcanoes National Park, visit our Web site: **www.nps.gov/havo**

For books, videos, DVDs and other materials about Hawai'i Volcanoes National Park, visit the Hawai'i Natural History Association bookstores in Kīlauea Visitor Center and Jaggar Museum, or shop online at: **www.hawaiinaturalhistory.org**

Printed on recycled paper with soy-based ink

Written by Randy Ashley and Jay Robinson
Produced by the Interpretive Planning and Media Development Branch
Hawai'i Volcanoes National Park
03/2010