

HALEMA'UMA'U

TRAIL GUIDE

HAWAII VOLCANOES
NATIONAL PARK

THE TRAIL—3.2 mi/5.15 km
During the next few hours, you will pass through a tree-fern forest and into the heart of one of the world's most active volcanoes. Your walk may begin either on the crater side of the Volcano House Hotel, or at Halema'uma'u. A variety of optional, longer routes may be added. You can obtain a map showing Kilauea summit hiking trails at the Visitor Center. This guide has been written with the starting point at Volcano House. It will serve as a guide to some of the geology, ethnobotany, and cultural history of the area. To find the plants that are listed, look for the identification signs along the trail. When starting at Halema'uma'u simply reverse the sequence in the booklet.

VOLCANOES OF HAWAII

Many millions of years ago, a hot spot developed in the mantle of the earth which underlies the crust. Because magma is more buoyant than solid rock, the magma rose through fissures, and surfaced on the ocean floor as lava. As repeated eruptions continued, a massive submarine volcano was built and eventually rose above the surface of the sea. Thus the Hawaiian Islands were born. The Pacific Plate, according to the theory of plate tectonics, is moving in a northwestward direction a few inches per year, carrying the islands along with it. The more or less stationary hot spot is the site of fitful activity, and so the islands vary

in size, as well as in distance from one another. Because of the movement of the Plate, the islands become increasingly older as we travel northwest along the Hawaiian Archipelago. The island of Hawaii, which is currently over the hot spot, is less than a million years old and still growing, while Kauai is approximately 6 million years old. Kure, an atoll 1500 miles to the northwest of Hawaii Island, is the last outpost of the Hawaiian Chain, and is about 35 million years old.

The island of Hawaii is the largest of the islands in the main group, over twice as large as all the rest of the Hawaiian Islands put together. It is composed of five separate volcanoes: Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea. Three of them, Hualalai, Mauna Loa, and Kilauea are considered active. Kilauea is the youngest and thus the most active. As eruptions of the volcanoes occur, the mountains are enlarged and reshaped, creating a landscape that is still-changing.

THE ARRIVAL OF LIFE

Winds, ocean currents and birds carried life to these islands. Where barren flows once existed, forests now grow. Over many millenia, the plants and other forms of life that made their way here (birds, insects, spiders, snails) became uniquely adapted to their new volcanic home. It has been estimated that a successful immigrant became es-

established here only once every 30,000 to 50,000 years. The native flora and fauna of Hawai'i is our most valuable asset, never to be replaced once it is destroyed. On an island like Hawai'i, where eruptions continue to dramatically change the landscape, older flows and forests are buried and reburied by lava flows and, occasionally, by explosive debris. In 1790, a series of explosive eruptions at the summit of Kilauea devastated the entire region surrounding the caldera. The forest you see growing so luxuriantly around you has grown back since that time.

THE KILAUEA CALDERA

The summit of Kilauea Volcano is crowned by a caldera. A caldera is formed when the magma reservoir inside the mountain shrinks in size, leaving the surface of the ground unsupported. The top of the mountain then caves in, leaving a basin shaped depression at the summit. The caldera may, during the course of hundreds of years, fill up, overflow, and then collapse again, as the magma reservoir goes through cycles of swelling and shrinking. Kilauea Caldera is about 3 miles across and 400 feet deep.

CULTURAL HISTORY

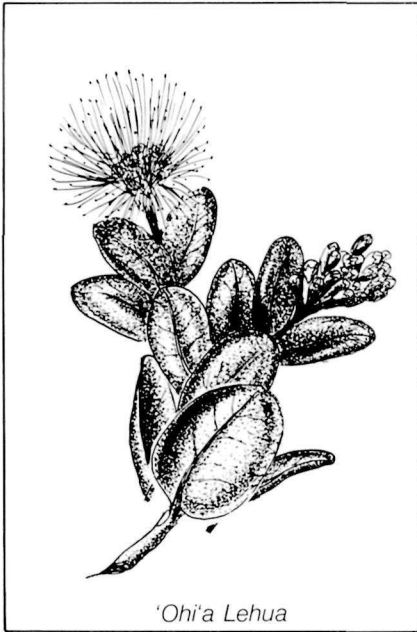
One Hawaiian tradition tells us that the islands were born as children to various creative forces of nature. Each island was inhabited by various spirits which took their form as parts of nature. When the first people arrived here, they were aware of the presence of a deity that lived at Kilauea. The god was called 'Aila'au (forest eater). His powers are said to have been limited to

Kilauea, as the lands of Puna and Ka'u were forested and rivers flowed through them. The time of quiet eruptions did not last for long. Pele, a daughter of Sky and Earth, came to Hawai'i from her distant homeland in Kahiki. She first landed on Nihoa, a small island in the north of the group. She found it unsuitable for her family and fires, so she moved southward. Each of the following islands were unsuitable, but then Pele reached Hawai'i Island. She landed at Keahialaka in the district of Puna. Parts of the east rift zone of Kilauea are said to have been formed as she moved along the land towards the summit of Kilauea. Here she was pleased and prepared a home for herself and her family. The following lines of an ancient chant, relate the activity of Pele at Kilauea:

WELA, A NOPU KE AHI O KA LUA.
AI KAMUMU, NAKEKE KA PAHOE-
HOE; WELA, A ILUNA O HALE-
MA'UMA'U; MALU KA PALI O
KA'AUAEA.

FIRES THAT BOIL FROM THE
DEPTHS OF THE PIT.
SHAKING THE STONE-PLATES
TILL THEY RATTLE;
IT'S FURNACE-HOT IN THAT
HOUSE-OF-FERN;
BUT THERE'S SHELTER AT
KA'AUAEA.

'Aila'au eventually fled in fear of the powers of Pele, and she settled into her new home. The surrounding lands changed as Pele moved her molten body. The people of Hawai'i learned to fear and respect the woman god. She was called ka wahine 'ai honua, the woman who devours earth.



'Ohi'a Lehua

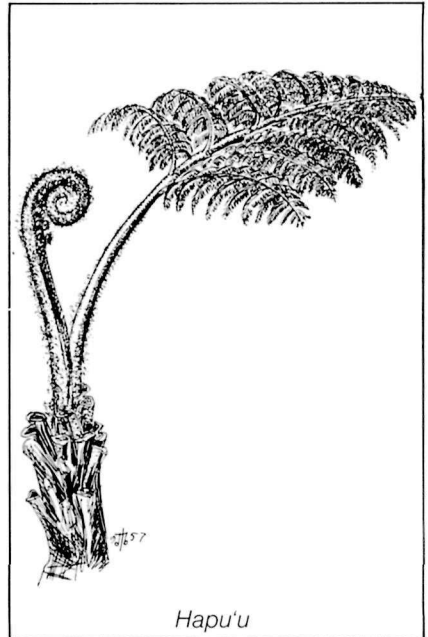
ALONG THE TRAIL

'OHI'A LEHUA (*Metrosideros polymorpha*). 'Ohi'a is the most common and widespread of the Park's native trees. A member of the myrtle family, flower colors range from a dark red to a light yellow. The apapane, a red native bird, can often be seen feeding on the nectar of the blossoms. The hard wood of the 'ohi'a was used for temple images and poles for temple structures. The 'ohi'a is also believed to be the embodiment of Laka, the goddess of the hula. The nodding of the branches and the adornment of lehua flowers served as teachers to the dancers who mimicked the movements of nature.

KAHILI GINGER (*Hedychium gardenianum*) and YELLOW GINGER (*H. flavescens*). Coming from the Himalayas and India respectively,

these plants with highly fragrant flowers have escaped cultivation and are a major concern. The aggressive, shade tolerant gingers crowd out specialized native species, and disrupt native ecosystems.

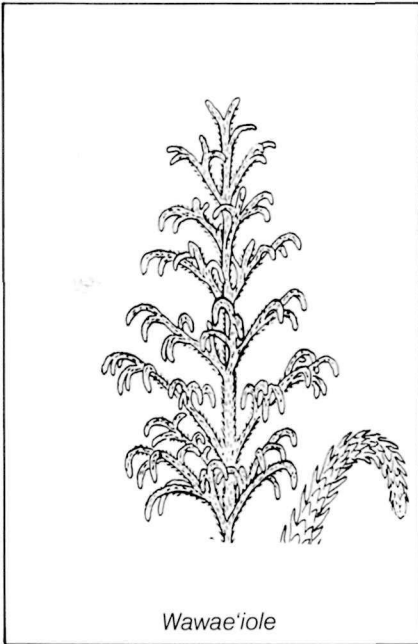
KUKAENENE (*Coprosma erodeoides*). A native relative of coffee, kukaenene is a small, woody, trailing shrub. The shiny black fruits were used to make a dye for kapa (bark cloth), and are a favorite food of the nene, our native goose. Al-



Hapu'u

though they are not poisonous, they are rarely eaten by man.

HAPU'U (*Cibotium* sp.). Hawai'i has 3 species of tree ferns, all of which are native. They grow up to 40 feet in height in shady, wet forests. One species, hapu'u pulu, has a silky



Wawae'iole

golden fiber growing at the bases of the fronds. Called pulu, the fiber was exported during the late 1800's for pillow and mattress stuffing. Another species, hapu'u 'i'i, has stiff blackish hairs at the bases of the fronds. The tree ferns contain a starchy core which is eaten by the many feral pigs inhabiting the Park. A trough is left where rainwater may collect and provide a breeding place for mosquitoes. The mosquitoes can transmit avian malaria, one cause of the decline and extinction of the native birds of Hawai'i.

WAWAE'IOLE (*Lycopodium cernuum*). The Hawaiian name for this clubmoss means "rat's foot." Like the moa (*Psilotum* sp.), it is a primitive plant which reproduces through spores. The wawae'iole is often used in flower arrangements and lei, though the picking of it in

native forests may unintentionally lead to the introduction of weeds. Weed seeds, carried on the soles of shoes or stuck to clothing, can be dispersed through the native forest by gatherers or hikers. It is a good idea to scrub the soles of your shoes and pick any "stickers" off your clothes before hiking in any relatively untouched area.

ILI'AHU (*Santalum* sp.). The sandalwood has pale yellowish leaves, which serve as an indication that the tree is a partial parasite. Its roots entwine with those of neighboring plants and obtain some nourishment from them. The flowers are tiny

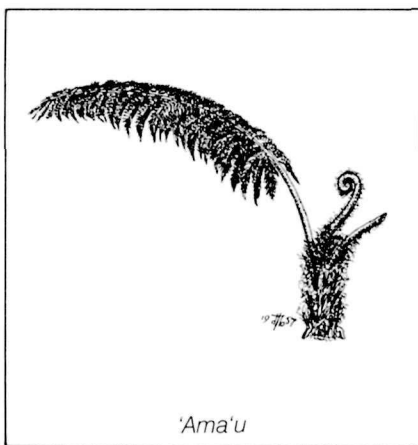


Ili'ahi

four-parted stars which grow in clusters. Sandalwood was a major export during the early 1800's. Life was disrupted here as a large part of the population went to the mountains in search of the trees which were cut and then carried to the shore to be shipped to China. Workers, seeing their families and lands neglected and wanting to end the hard labor of harvesting and transporting the wood, took to cutting and pulling up even seedlings of the plants. Though not common, sandalwood has made a comeback, and can be found at many areas throughout the State.

'AKIA (*Wikstromeria* sp.). These shrubs or small trees have a smooth brownish grey bark marked by leaf scars. The fruits are a bright orange and they are sometimes confused with the 'ohelo. The leaves of the 'akia have smooth edges, and the fruits contain one or two large seeds, while the 'ohelo has many tiny seeds and its leaves have toothed edges. The bark of the 'akia provided a fiber which was used to make cordage, and at least one species contains a poison which was used to stun fish in tide pools so they could be easily gathered.

'AMA'U (*Sadleria cyatheoides*). This fern looks much like the hapu'u, though the fronds are simple and unbranched. Young fronds are often tinged with red or pink as they unfurl. The 'ama'u also has a starchy core and the plant may grow to 10 feet in height. The crater Halema'uma'u is said to have gotten its name from a legendary event in which a deity took the 'ama'u fern as a body form to protect himself from

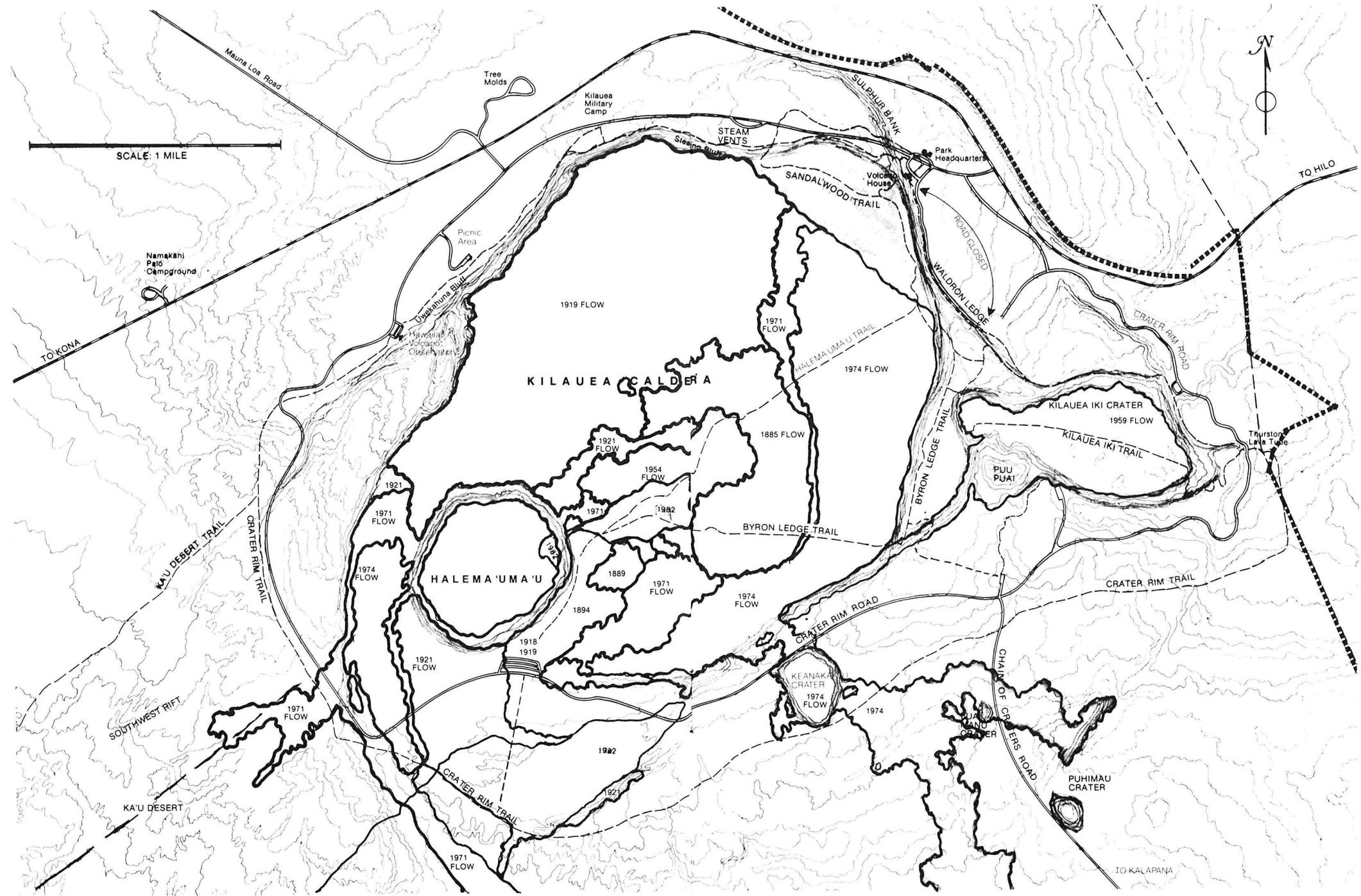


'Ama'u

the fires of Pele. Halema'uma'u means "house surrounded by the 'ama'u."

PUKIAWE (*Styphelia tameiameia*). Pukiawe is a very adaptable shrub, growing from nearly sea level upwards to 10,000 feet. Covered with many tiny greyish leaves, it bears small round dry fruits in clusters that range in color from white to burgundy. The fruits and young silvery shoots of the plant are used in lei. The smoke from a fire made of the wood purified chiefs so that they'd be able to mingle with the "common people" without harm to their life force or mana.

ULUHE (*Dicranopteris linearis*). A creeping fern with wiry stems that can form dense thickets, uluhe can be recognized by its fronds which repeatedly branch by twos. Because of its growth habit, uluhe is a healer of scars left on the landscape by landslides or by trees falling in the forest. As larger plants return, the uluhe is shaded out. The dense growth of the uluhe often conceals cracks in the ground—a very good reason for staying on the trail!

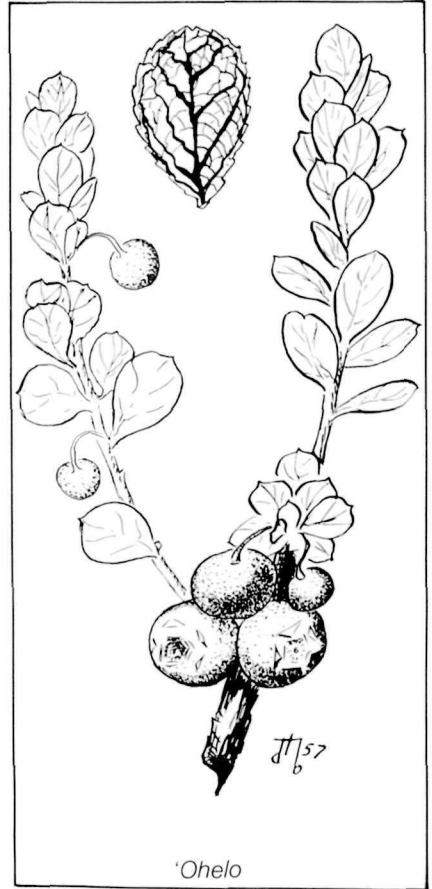


PA'INIU (*Astelia menziesiana*). A native lily whose leaves are covered with silver hairs and bears orange fruits, pa'iniu prefers to grow in shady wet forests, usually as an epiphyte on large trees. Epiphytes use trees for support, obtaining their nourishment from bits of decayed matter caught in the bark, as well as from rain and the air. Pa'iniu is common at certain locations around Kilauea, and lei made of the silvery leaves were taken home by visitors as a sign that they had been to the volcano.

'A'ALI'I (*Dodonaea* sp.). 'A'ali'i can grow either as a shrub or as a small tree up to 30' tall. Its most noticeable feature is its papery winged pods which grow in clusters and redden as they ripen. The pods were used in lei, and also as a red dye. It is abundant in the drier areas of Puna and Ka'u.



'OHELO (*Vaccinium* sp.). There are several different varieties of 'ohelo found here at Kilauea. The most common is a small bush with serrated leaves that bears clusters of juicy berries ranging in color from



yellow to red. The 'ohelo is the embodiment of Hi'iaka, one of the sisters of Pele. Its fruits are considered sacred to Pele, and even today there are those who will not eat the fruit or even pass thru the Kilauea area without making an offering of 'ohelo to Pele.

In 1824, the high Chiefess Kapi'olani came to Kilauea with a group of Hawaiian and missionary companions. She was a devout Christian convert and wanted to break the power that Pele had over the Hawaiian people. Standing near a lake of molten lava, Kapi'olani called out to Pele saying that the people of Hawai'i would no longer worship her and the other ancient gods. Kapi'olani ate 'ohelo berries, sang Christian hymns, and claimed that the true God would care for herself and her people. The chiefess and those who had gathered with her were not swallowed up by the earth, and so the Hawaiians believed that it was a sign that Pele had acknowledged the power of a greater God. In this way the 'ohelo and Kapi'olani helped the missionaries convert people in Hawai'i to the Christian faith, though even today there are those who are devout believers in Western or Eastern religions who also make pilgrimages to Kilauea to give offerings to Pele.

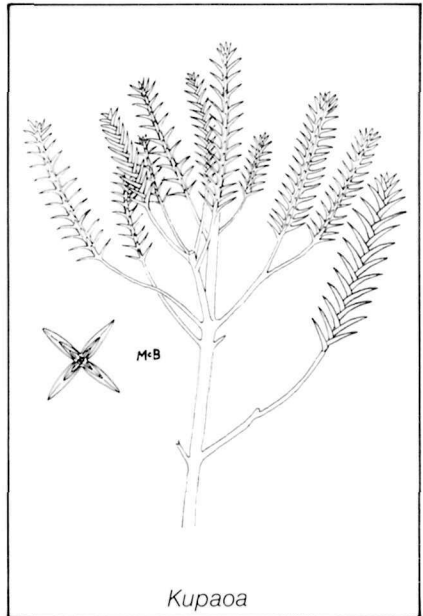
KUPAOA (*Dubautia* sp. or *Railliardia* sp.). Kupaoa, a shrub, is a composite and is related to the silversword. The flowers may either be white or yellow and have a pleasing fragrance. Its leaves are stiff, pointed and a shiny bright green. Its name implies a lasting fragrance, and parts of the plant were used in the old days to scent kapa (bark cloth).

THE CALDERA FLOOR

Once on the caldera floor, you are nearly 500' below the clifftop of Ka'auea, and inside the crater of one of the world's most active volcanoes. The caldera was once

much deeper, but during the last few hundred years has been nearly filled by eruptions at Halema'uma'u as well as from fissures on the caldera floor. The caldera is bounded by arc-shaped faults formed during different episodes of collapse of the summit. The path to the floor from the Volcano House goes through an area where blocks did not quite make it to the main floor of the caldera. The terraces that are found at locations around the summit are also places where large fault blocks partially fell into the pit.

A magnitude 6.7 earthquake in November 1983 caused numerous rockfalls on the caldera walls, destroyed sections of trail and severely damaged roads in the Park. Evidence of the destruction can be seen along the path to the caldera floor.



PAHOEHOE AND 'A'A LAVA

During eruptions, lava may assume two different physical forms, with gradations in between. The most common type on the caldera floor is pahoehoe, which has a smooth, billowy, or ropy surface. The product of hot, gassy eruptions, pahoehoe is very fluid as it flows. 'A'a, the other type of lava, is either formed during cooler eruptions, or, more often, as a pahoehoe flow moves over the ground, it cools very slightly, and loses gas along the way. The lava then becomes more sticky and viscous, it begins to move more slowly and the crust breaks up. An 'a'a flow will have a clinkery surface, but a solid, dense interior.

In places on the caldera floor, escaping gasses speed up the aging and breakdown of the lava flows. The reddish orange lines that border cracks are evidence of the oxidation of iron in the lava. Over millions of years, the solid, black lava flows become the red soil that is prominent on the older islands. Also noticeable at places where gasses are escaping are crusty white areas; deposits of salts, sulfates, and opaline.

PIONEER PLANT LIFE

The caldera is a good area to see how life returns to lava flows. Seeds blown in by the wind are deposited in cracks and take root. The spores of ferns and the tiny seeds of the 'ohi'a are often the first to gain a foothold in shady, damp cracks. The lava is porous and brittle, so roots are able to penetrate the rock easily. These plants, along with

other species, are the beginning of future forests. If no new lava flows cover the area, generations of plants will grow, die, and grow again.

SPATTER RAMPARTS

The spatter ramparts on the floor of the central caldera were built by a series of eruptions. At approximately 8:30 a.m. on April 30, 1982, geologists at the Hawaiian Volcano Observatory noted an increase in the level of seismic activity being recorded on their seismographs. The activity indicated the possibility of an eruption at the summit of Kilauea. The trails through the caldera, and parts of the Crater Rim Road were closed. At 11:37 a.m., only 3 hours after the initial burst of seismic warning, a fissure opened on the caldera floor in the same general area of the May 31, 1954 eruption. Hot fluid lavas poured out of a 1/2 mile long fissure, and the volcano was in eruption. A crack also opened on the northeast wall of Halema'uma'u and a small outbreak occurred there. Lava fountains sometimes reached heights of 50 to 60 feet above the vents. The erupting lava added to the already existing spatter ramparts, the low lying black "hills" along the trail. Almost 1 million cubic meters of lava moved across the caldera floor.

During the early morning hours of May 1, the eruption ended. More than 45,000 people came to Kilauea during the 19 hours of fiery spectacle.

Parts of the old Halema'uma'u to Byron Ledge trail were buried under the April 1982 lava flow. It is par-

ticularly important, in the area of that flow, to stay on the marked trail. The lava was very hot and gassy, so a surface that appears to be solid may only be the surface of a lava tube or gas bubble.

EXPLOSIVE DEBRIS

The ground in the caldera that is covered with rock fragments and debris is pre-1924. The ejecta resulted from the 1924 series of steam explosions. At that time there was a major collapse of the summit and magma came into contact with ground water. Major explosions resulted which continued for 2 weeks. An eight ton boulder was thrown out of Halema'uma'u and landed near the road across from the parking lot. A rock fell on a photographer and seriously injured his leg. He died enroute to a hospital from loss of blood, the only known fatality of an eruption since the 1790 steam explosions killed part of an Hawaiian army in the Ka'u Desert.

HALEMA'UMA'U

Traditionally, Halema'uma'u is believed to be the dwelling place of Pele and her family. The ancient people of Hawai'i approached the crater with great respect. Times and traditions have changed somewhat, but it is still important for modern day visitors to approach the crater with caution.

From 1823 to 1924, Halema'uma'u contained a lava lake which continually rose and fell. The 1924 series of explosions disrupted the activity there, and there hasn't been such a prolonged series of eruptions since. The crater of Halema'uma'u is considered by many to be the main vent

of Kilauea volcano, though eruptions often occur at other places as well. Halema'uma'u is approximately 300' deep and 3,000' across.

We hope that you have enjoyed this walk. If you have any questions, feel free to stop by the Kilauea Visitor Center. The staff there will be happy to help you.

THE RIMS OF CRATERS ARE WEAK. THE WARNING SIGNS AND FENCES HAVE BEEN ERECTED TO PROTECT YOU. HERE, AND IN ALL AREAS OF HAWAII VOLCANOES NATIONAL PARK, PLEASE STAY ON THE TRAILS!

revised August 1985

FOR MORE INFORMATION

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FIELD NOTES

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