= K?lauea =

K?lauea (English / ?ki?la??e?? / KEE @-@ low @-@ AY @-@ ? , also US / ?k?l??we?? / KIL @-@ ? @-@ WAY @-@ ? ; Hawaiian : [ti?l?w?w?j?]) is a currently active shield volcano in the Hawaiian Islands , and the most active of the five volcanoes that together form the island of Hawai?i . Located along the southern shore of the island , the volcano is between 300 @,@ 000 and 600 @,@ 000 years old and emerged above sea level about 100 @,@ 000 years ago . It is the second youngest product of the Hawaiian hotspot and the current eruptive center of the Hawaiian ? Emperor seamount chain . Because it lacks topographic prominence and its activities historically coincided with those of Mauna Loa , K?lauea was once thought to be a satellite of its much larger neighbor . Structurally , K?lauea has a large , fairly recently formed caldera at its summit and two active rift zones , one extending 125 km (78 mi) east and the other 35 km (22 mi) west , as an active fault of unknown depth moving vertically an average of 2 to 20 mm (0 @.@ 1 to 0 @.@ 8 in) per year .

K?lauea 's eruptive history has been a long and active one ; its name means " spewing " or " much spreading " in the Hawaiian language , referring to its frequent outpouring of lava . The earliest lavas from the volcano date back to its submarine preshield stage , samples having been recovered by remotely operated underwater vehicles from its submerged slopes ; samples of other flows have been recovered as core samples . Lavas younger than 1 @,@ 000 years cover 90 percent of the volcano 's surface . The oldest exposed lavas date back 2 @,@ 800 years . The first well @-@ documented eruption of K?lauea occurred in 1823 (Western contact and written history began in 1778) , and since that time the volcano has erupted repeatedly . Most historical eruptions have occurred at the volcano 's summit or its eastern rift zone , and are prolonged and effusive in character . The geological record shows , however , that violent explosive activity predating European contact was extremely common , and in 1790 one such eruption killed over 80 warriors ; should explosive activity start anew the volcano would become much more of a danger to humans . K?lauea 's current eruption dates back to January 3 , 1983 , and is by far its longest @-@ duration historical period of activity , as well as one of the longest @-@ duration eruptions in the world ; as of January 2011 , the eruption has produced 3 @.@ 5 km3 (1 cu mi) of lava and resurfaced 123 @.@ 2 km2 (48 sq mi) of land .

K?lauea 's high state of activity has a major impact on its mountainside ecology where plant growth is often interrupted by fresh tephra and drifting volcanic sulfur dioxide , producing acid rains particularly in a barren area south of its southwestern rift zone known as the Ka?? Desert . Nonetheless , wildlife flourishes where left undisturbed elsewhere on the volcano and is highly endemic thanks to K?lauea 's (and the island of Hawai?i 's) isolation from the nearest landmass . Historically , the five volcanoes on the island were considered sacred by the Hawaiian people , and in Hawaiian mythology K?lauea 's Halemaumau Crater served as the body and home of Pele , goddess of fire , lightning , wind , and volcanoes . William Ellis , a missionary from England , gave the first modern account of K?lauea and spent two weeks traveling along the volcano ; since its foundation by Thomas Jaggar in 1912 , the Hawaiian Volcano Observatory , located on the rim of K?lauea caldera , has served as the principal investigative and scientific body on the volcano and the island in general . In 1916 a bill forming the Hawaii Volcanoes National Park was signed into law by President Woodrow Wilson ; since then the park has become a World Heritage Site and a major tourist destination , attracting roughly 2 @.@ 6 million people annually .

= = Geology = =

= = = Setting = = =

Like all Hawaiian volcanoes , K?lauea was created as the Pacific tectonic plate moved over the Hawaiian hotspot in the Earth 's underlying mantle . The Hawaii island volcanoes are the most recent evidence of this process that , over 70 million years , has created the 6 @,@ 000 km (3

@,@ 700 mi) -long Hawaiian ? Emperor seamount chain . The prevailing , though not completely settled , view is that the hotspot has been largely stationary within the planet 's mantle for much , if not all of the Cenozoic Era . However , while the Hawaiian mantle plume is well @-@ understood and extensively studied , the nature of hotspots themselves remains fairly enigmatic .

K?lauea is one of five subaerial volcanoes that make up the island of Hawai?i , created by the Hawaii hotspot . The oldest volcano on the island , Kohala , is more than a million years old , and K?lauea , the youngest , is believed to be between 300 @,@ 000 and 600 @,@ 000 years of age ; L??ihi Seamount on the island 's flank is even younger , but has yet to breach the surface . Thus it is the second youngest volcano in the Hawaiian ? Emperor seamount chain , a chain of shield volcanoes and seamounts extending from Hawaii to the Kuril ? Kamchatka Trench in Russia .

Following the pattern of Hawaiian volcano formation , K?lauea started as a submarine volcano , gradually building itself up through underwater eruptions of alkali basalt lava before emerging from the sea with a series of explosive eruptions about 50 @,@ 000 to 100 @,@ 000 years ago . Since then , the volcano 's activity has likely been as it is now , a continual stream of effusive and explosive eruptions of roughly the same pattern as its activity in the last 200 or 300 years .

At most 600 @,@ 000 years old , K?lauea is still quite young for a Hawaiian volcano ; the oldest volcano on the island , the northwestern Kohala , experienced almost 900 @,@ 000 years of activity before going extinct . The volcano 's foreseeable future activity will likely be much like it has been for the past 50 @,@ 000 to 100 @,@ 000 years ; Hawaiian and explosive activity will continue to heighten K?lauea 's summit , build up its rift zones , and fill and refill its summit caldera .

= = = Structure = = =

K?lauea has been active throughout its history . Since 1918 , K?lauea 's only prolonged period of rest was an 18 @-@ year pause between 1934 and 1952 . The bulk of K?lauea consists of solidified lava flows , intermittent with scattered volcanic ash and tephra sourced from relatively lower @-@ volume explosive eruptions . Much of the volcano is covered in historical flows , and 90 percent of its surface dates from the last 1 @,@ 100 years . K?lauea built itself up from the seafloor over time , and thus much of its bulk remains underwater ; its subaerial surface is in the form of a gently sloping , elongate , decentralized shield with a surface area of approximately 1 @,@ 500 km2 (579 sq mi) , making up 13 @.@ 7 percent of the island 's total surface area .

K?lauea lacks a topographical prominence , appearing only as a bulge on the southeastern flank of the nearby Mauna Loa ; because of this , both native Hawaiians and early geologists considered it an active satellite of its more massive neighbor . However , analysis of the chemical composition of lavas from the two volcanoes shows that they have separate magma chambers , and are thus distinct . Nonetheless , their proximity has led to a historical trend in which high activity at one volcano roughly coincides with low activity at the other . When K?lauea lay dormant between 1934 and 1952 , Mauna Loa became active , and when the latter remained quiet from 1952 to 1974 , the reverse was true . This is not always the case ; the 1984 eruption of Mauna Loa started during an eruption at K?lauea , but had no discernible effect on the K?lauea eruption , and the ongoing inflation of Mauna Loa 's summit , indicative of a future eruption , began the same day as new lava flows at K?lauea 's Pu?u ???? crater . Geologists have suggested that " pulses " of magma entering Mauna Loa 's deeper magma system may have increased pressure inside K?lauea and triggered the concurrent eruptions .

K?lauea has a large summit caldera , measuring 4 by 3 @.@ 2 km (2 by 2 mi) with walls up to 120 m (400 ft) high , breached by lava flows on the southwestern side . It is unknown if the caldera was always there or if it is a relatively recent feature , and it is possible that it has come and gone throughout K?lauea 's eruptive history ; what is known is that it likely formed over several centuries , with its construction estimated to have begun about 500 years ago , and that its present form was finalized by a particularly powerful eruption in 1790 . A major feature within the caldera is Halema?uma?u Crater , a large pit crater and one of K?lauea 's most historically active eruption centers . The crater is approximately 920 m (3 @,@ 018 ft) in diameter and 85 m (279 ft) deep , but its form has varied widely through its eruptive history ; the floor of the Halema?uma?u Crater is

now mostly covered by flows from its most recent eruption , in 1974 .

K?lauea has two rift zones radiating from its summit , one leading 125 km (78 mi) out to the east , the other 35 km (22 mi) long and trending towards the southwest . Tectonic extension along both rift zones is causing K?lauea 's bulk to slowly slide seaward off its southern flank at a rate of about 6 to 10 cm (2 to 4 in) per year , centered on a basal décollement fault 7 to 9 km (4 to 6 mi) beneath the volcano 's surface . The eastern rift zone in particular is a dominant feature on the volcano ; it is almost entirely covered in lava erupted in the last 400 years , and at its crest near the summit is 2 to 4 km (1 to 2 mi) wide . Non @-@ localized eruptions , typical of rift zone activity , have produced a series of low @-@ lying ridges down the majority of the east rift zone 's length . Its upper segment is the most presently active section of the volcano , and is additionally the site of a number of large pit craters ; its lower extremity reaches down K?lauea 's submerged flank to a depth of more than 5 @,@ 000 m (16 @,@ 400 ft) . By contrast , the much smaller southwestern rift has been quiet since a rifting episode in 1974 , and to date has not been involved in the current eruptive cycle at all . The southwestern rift zone 's extremity is also underwater , although its submarine length is more limited . The southwestern rift zone also lacks a well @-@ defined ridge line or a large number of pit craters , evidence that it is also geologically less active than the eastern rift zone .

A prominent structure on K?lauea 's southern flank is the Hilina fault system , a highly active fault moving vertically an average of 2 to 20 mm (0 @.@ 1 to 0 @.@ 8 in) per year along the system . Its physiographic province is 500 m (1 @,@ 640 ft) deep , but it is unknown if it is a shallow listric fault or if it penetrates to the very base of the volcano . A number of cinder cones , satellite shields , lava tubes , and other eruptive structures also dot the volcano , evidence of its recent activity . K?lauea has some interactions with Mauna Loa , its larger neighbor and only other recently active volcano on the island ; interspersed lava flows and ash deposits belonging to its neighbor have been found on its flanks , and some of Mauna Loa 's flows are , in turn , blanketed in K?lauea tephra . In particular , the saddle between the two volcanoes is currently depressed , and is likely to fill over in the future .

All historical eruptions at K?lauea have occurred at one of three places : its summit caldera , its eastern rift zone , or its southwestern rift zone . Half of K?lauea 's historical eruptions have occurred at or near K?lauea 's summit caldera . Activity there was nearly continuous for much of the 19th century , capped by a massive explosive eruption in 1924 before petering out by 1934 . Recent activity has mostly shifted to K?lauea 's eastern rift zone , the site of 24 historical eruptions , located mostly on its upper section ; by contrast , the volcano 's southwestern rift zone has been relatively quiet , and has only been the site of five events to date .

= = Eruptive history = =

= = = Prehistoric eruptions = = =

Geologists have dated and documented dozens of major eruptions over the volcano 's long history , bridging the long gap between K?lauea 's oldest known rock and only extremely recent written records and historical observation . Historical lava flows from the volcano are generally recovered by scientists in one of three ways . The oldest flows , dating back 275 @,@ 000 to 225 @,@ 000 years , have been recovered from K?lauea 's submerged southern slope by ship @-@ towed remotely operated vehicles . These lavas exhibit forms characteristic of early , submerged preshield @-@ stage eruptive episodes , from when the volcano was still a rising seamount that had not yet breached the ocean surface , and their surface exposure is unusual , as in most other volcanoes such lavas would have since been buried by more recent flows .

The second method of recovering older rock is through the drilling of deep core samples ; however , the cores have proved difficult to date , and several samples from depths of around 1 @,@ 700 m (5 @,@ 600 ft) that suggested dates as old as 450 @,@ 000 years have since been found erroneous . More reliable paleomagnetic dating , limited to rocks dating from after K?lauea 's emergence from the sea , has suggested ages of around 50 @,@ 000 years . Exposed flows above

sea level have proved far younger . Some of the oldest reliably dated rock , 43 @,@ 000 years old , comes from charcoal sandwiched beneath an ash layer on a fault scarp known as Hilina Pali ; however , sampled dated from higher up the scarp indicate ash deposition at an average rate of 6 m (20 ft) per thousand years , indicating the oldest exposed flows , from the base of the feature , could date back as far as 70 @,@ 000 years . This date is similar to that of the oldest dated extant lava flow , a southwestern rift zone flow with an uncorrected radiocarbon dating of approximately 4650 BC .

The oldest well @-@ studied eruptive product from K?lauea is the Uw?kahuna Ash Member , the product of explosive eruptions between 2 @,@ 800 and 2 @,@ 100 years ago . Although it has since been largely buried by younger flows , it remains exposed in some places , and has been traced more than 20 km (12 mi) from the volcano 's caldera , evidence of very powerful eruptions . Evidence suggests the existence of an active eruptive center at this time , termed the Powers Caldera , 2 km (1 mi) away from the modern one . At least 1 @,@ 200 years ago , lava from the Powers Caldera overtopped its rim and solidified the structure ; this was followed by a period of very voluminous tube @-@ fed p?hoehoe flows from the summit . Following cessation of activity around 400 years ago , eruptions re @-@ centered on the eastern part of K?lauea 's summit , and concurrently activity increased at the northern end of the eastern rift zone .

= = = 1790 to 1934 = = =

The earliest reliable written records of historical activity date back to about 1820 , and the first well @-@ documented eruption occurred in 1823 , when the volcano was first put under observation ; although Native Hawaiians are thought to have first settled on the island around 1 @,@ 500 years ago , oral records predating European arrival on the island are few and difficult to interpret . One pre @-@ contact eruption in particular , a phreatomagmatic event in 1790 , was responsible for the death of a party of warriors , part of the army of Ke?ua Kuahu?ula , the last island chief to resist Kamehameha I 's rule ; their death is evidenced by a set of footprints preserved within the Hawaii Volcanoes National Park which are listed on the National Register of Historic Places . Kilauea has been the site of 61 separate eruptions since 1823 , easily making it one of the most active volcanoes on Earth .

During its observed history , the volume of lava erupted by K?lauea has varied widely . In 1823 K?lauea 's summit caldera was far deeper than it is today , but was in the process of filling up under nearly continuous summit eruption , with 3 km3 (1 cu mi) of lava erupted there alone by 1840 . The period between 1840 and 1920 saw approximately half that in eruptive volume , and in the thirty years between then and about 1950 , the volcano was unusually quiet and exhibited very little activity ; K?lauea 's eruptive volume has increased steadily since then , with present activity comparable to that of the early 1800s .

The length and origin these eruptions has also varied . Events last anywhere between days and years , and occur at a number of different sites . Half of all eruptions occur at or near K?lauea 's summit caldera . Activity there was nearly continuous for much of the 19th century , and after a reprieve between 1894 and 1907 , continued onwards until 1924 . There have been five historical eruptions at the volcano 's relatively southwestern rift zone , and 24 along its more active eastern rift zone , mostly along its upper section .

The volcano 's observed history has mostly been one of effusive eruptions ; however , this is a relatively recent occurrence . Prior to the arrival of the first Europeans on the island , K?lauea was the site of regular explosive activity , evidenced then by tribal chants referencing the volcano 's fickle nature , and today by geological records of an explosively active mode of past activity . Although explosive activity still occurs at the volcano , it is not as intense as it once was , and the volcano would become much more dangerous to the general public if it returned to its old phase of activity once more .

K?lauea erupted in 1823 and 1832 , but the first major eruption since the 1790 event occurred in 1840 , when its eastern rift zone became the site a large , effusive Hawaiian eruption over 35 km (22 mi) of its length , unusually long even for a rift eruption . The eruption lasted for 26 days and

produced an estimated 205 to 265 million cubic meters of lava ; the light created by the event was so intense that one could reportedly read a newspaper in Hilo at night , 30 km (19 mi) away .

The volcano was active again in 1868 , 1877 , 1884 , 1885 , 1894 , and 1918 , before its next major eruption in 1918 ? 1919 . Halema?uma?u , then a small upwelling in the caldera floor , was topped by a lava lake that then drained , before refilling again , forming an enormous lava lake and nearly reaching the top edge of the caldera before draining once more . This activity eventually gave way to the construction of Mauna Iki , building up the large lava shield within the caldera over a period of eight months . The eruption also featured concurrent rift activity and a large amount of lava fountaining .

Activity in 1921 ? 1923 followed . The next major eruption occurred in 1924 . Halema?uma?u Crater , a fully formed pit crater after the 1919 event and the site of a sizable lava lake , first drained , then quickly began sinking into the ground , deepening to nearly 210 m (689 ft) beneath a thick cloud of volcanic ash . Explosive activity began on May 10 of that year , blowing rock chunks weighing as much as 45 kg (99 lb) 60 m (197 ft) out , and smaller fragments weighing about 9 kg (20 lb) out as far as 270 m (886 ft) , and , after a brief reprieve , intensified through a major blast on May 18 , when an enormous explosive event caused the eruption 's only fatality . The eruption continued and formed numerous eruption columns up to and beyond 9 km (6 mi) in height , before slowly petering down and ending by May 28 . Volcanic activity was soon confined to the summit , and ceased completely after 1934 .

= = = 1952 to 1982 = = =

After the Halema?uma?u event , K?lauea remained relatively quiet , and , for a time , completely silent , with all activity confined to the summit . It came alive again in 1952 with an enormous lava fountain 245 m (804 ft) high at the Halema?uma?u Crater . Multiple continuous lava fountains between 15 and 30 m (49 and 98 ft) persisted , and the eruption lasted 136 days . Eruptions occurred soon after in 1954 , 1955 , and 1959 , capped by a large event in 1960 , when fissure @-@ based phreatic eruption and earthquake activity gave way to a massive a 'a flow that overran multiple evacuated communities and resorts ; the resulting summit deflation eventually caused the ever @-@ active Halema?uma?u to collapse even further .

Following the event , eruptive events yearly and nearly continuous , a state of activity that remains today . 1967 ? 1968 saw a particularly large , 80 @-@ million @-@ cubic @-@ meter , 251 @-@ day event from Halema?uma?u Crater . This event was superseded the very next year by the marathon Mauna Ulu eruption , a large effusive eruption which lasted from May 24 , 1969 to July 24 , 1974 and added 230 acres (93 ha) of new land to the island . After eruptive activity had died down , there was a magnitude 7 @.@ 2 earthquake that caused a partial summit collapse , after which activity did not resume at K?lauea until 1977 .

The Mauna Ulu eruption of K?lauea began on May 24 , 1969 , and ended on July 22 , 1974 . At the time , Mauna Ulu was the longest flank eruption of any Hawaiian volcano in recorded history . The eruption created a new vent , covered a large area of land with lava , and added new land to the island . The eruption started as a fissure between two pit craters , ??lo?i and ?Alae , where the Mauna Ulu shield would eventually form . Both p?hoehoe and ?a?? lava erupted from the volcano . Early on , fountains of lava burst out as much as 540 meters (1772 ft) high . In early 1973 , an earthquake occurred that caused K?lauea to briefly stop erupting near the original Mauna Ulu site and instead erupt near the craters Pauahi and Hi?iaka .

= = = 1983 - present = = =

The most recent major eruption at K?lauea has also proved to be by far its eruption of longest @-@ known duration . The current K?lauea eruption began on January 3 , 1983 , along the eastern rift zone . The vent produced vigorous lava fountains that quickly built up into Pu?u ???? cone , sending lava flows down the volcano 's slope . In 1986 , activity shifted down the rift to a new vent , named K?pa?ianah? , where it took on a more effusive character . K?pa?ianah? built up a low ,

broad volcanic shield , and lava tubes fed flows extending 11 to 12 km (about 7 mi) to the sea . Between 1986 and 1991 , Chain of Craters Road was cut , and the community of Kapa ? ahu , the village of Kalapana , and the subdivisions of K?lapana Gardens and Royal Gardens were lost to the lava . A black sand beach at Kaimu was also engulfed . In 1992 , the eruption moved back to Pu?u ???? , but continued in the same manner , covering nearly all of the 1983 ? 86 lava flows and large areas of coastline . As of December 2012 , the eruption had produced 4 km3 (1 cu mi) of lava , covered 125 km2 (48 sq mi) of land , added 202 ha (499 acres) of land to the island , destroyed 214 structures , and buried 14 @.@ 3 km (9 mi) of highway under lava as thick as 35 m (115 ft) .

In December 2014 , the June 27 flow from the ongoing eruption threatened to enter the town of Pahoa , and to cut Highway 130 , the only route into and out of Lower Puna . As a result , work was begun to reopen Chain of Craters Road , initially as a one @-@ lane gravelled surface , and to make Railroad Avenue and Government Beach Road usable as emergency routes . However the flow stopped just short of entering Pahoa , and by March 2015 the threat to the town was much reduced .

= = = Volcanic Explosivity Index = = =

The Global Volcanism Program has assigned a Volcanic Explosivity Index (VEI) to all except five of K?lauea 's ninety @-@ five known eruptions of the last 11 @,@ 700 years . The eruption of 1790 has a VEI of 4 . The eruptions of 1820 , 1924 , 1959 and 1960 have a VEI of 2 . The eruptions of 680 , 1050 , 1490 , 1500 , 1610 , 1868 , four eruptions in 1961 and the current eruption since 1983 have a VEI of 1 . The other seventy @-@ four eruptions have a VEI of 0 .

= = Ecology = =

= = = Background = = =

Because of its position more than 2 @,@ 000 miles from the nearest continental landmass , the island of Hawai?i is one of the most geographically isolated landmasses on Earth ; this in turn has strongly influenced its ecology . The majority of the species present on the island are endemic to it and can be found nowhere else on Earth , the result of an isolated evolutionary linage sheltered from external biotic influence ; this makes its ecosystem vulnerable both to invasive species and human development , and an estimated third of the island 's natural flora and fauna has already gone extinct .

K?lauea 's ecological community is additionally threatened by the activity of the volcano itself ; lava flows often overrun sections of the volcano 's forests and burns them down , and volcanic ash distributed by explosive eruptions often smothers local plant life . Layers of carbonized organic material at the bottom of K?lauea ash deposits are evidence of the many times the volcano has wrought destruction on its own ecosystem and that of its neighbor Mauna Loa , and parts of the volcano present a dichotomy between pristine montane forest and recently buried volcanic " deserts " yet to be recolonized .

K?lauea 's bulk affects local climate conditions through the influence of trade winds coming predominately from the northeast , which , when squeezed upwards by the volcano 's height , results in a moister windward side and a comparatively arid leeward flank . The volcano 's ecology is further complicated by height , though not nearly as much as with its other , far taller neighbors , and by the local distribution of volcanic products , which make for varied soil conditions . The northern part of K?lauea is mostly below 1 @,@ 000 m (3 @,@ 281 ft) and receives more than 75 in (191 cm) mean annual rainfall , and can mostly be classified as a lowland wet community ; further south , the volcano has squeezed out much of the precipitation and receives less than 50 in (127 cm) mean annual rainfall , and is considered mostly a lowland dry environment .

= = = Ecosystems = = =

Much of K?lauea 's southern ecosystem lies within the Hawai?i Volcanoes National Park , where a ? e ferns , ??hi?a trees (Metrosideros polymorpha) , and hapu ? u of the genus Cibotium are common . The park hosts a large variety of bird species , including the ' apapane (Himatione sanguinea) , the ' amakihi (Hemignathus virens) , the ' i 'iwi (Vestiaria coccinea) , the ? ?ma ? o (Myadestes obscurus) , the ?elepaio (Chasiempis sp .) , and the endangered ' akepa (Loxops coccineus) , ' akiapola 'au (Hemignathus munroi) , n?n? (Branta sandvicensis) , ?ua?u (Pterodroma sandwichensis) , and ?io (Buteo solitarius) species . The K?lauea coast also hosts three of the nine known critically endangered hawksbill sea turtle (Eretmochelys imbricata) nesting sites on the island .

Some of the area alongside K?lauea 's southwestern rift zone takes the form of the unusual Ka?? Desert . Although not a " true " desert (rainfall there exceeds the maximum 1 @,@ 000 mm (39 in) a year) , precipitation mixing with drifting volcanic sulfur dioxide forms acid rain with a pH as low as 3 @.@ 4 , greatly hampering regional plant growth . The deposited tephra particulates make the local soil very permeable . Plant life in the region is practically nonexistent .

K?lauea 's northern lowland wet forest ecosystem is partially protected by the Puna Forest Reserve and the Kahauale`a Natural Area Reserve . At 27 @,@ 785 acres (11 @,@ 244 ha) , Wao Kele in particular is Hawai?i 's largest lowland wet forest reserve , and is home to rare plant species including h?pu?u ferns (Cibotium spp .) , ?ie?i.e. vines (Freycinetia arborea) , and k?piko (Psychotria mariniana) , some of which play a role in limiting invasive species ' spread . ?Ope?ape?a (Lasiurus cinereus semotus) ?io (Buteo solitarius) , common ?amakihi (Hemignathus virens) , and nananana makaki?i (Theridion grallator) live in the trees . There are thought to be many more as @-@ yet @-@ undocumented species within the forest . Wao Kele 's primary forest tree is ??hi?a lehua (Metrosideros polymorpha) .

= = Human history = =

= = = Ancient Hawaiian = = =

The first Ancient Hawaiians to arrive on Hawaii island lived along the shores , where food and water were plentiful . Flightless birds that had previously known no predators became a staple food source . Early settlements had a major impact on the local ecosystem , and caused many extinctions , particularly amongst bird species , as well as introducing foreign plants and animals and increasing erosion rates . The prevailing lowland forest ecosystem was transformed from forest to grassland ; some of this change was caused by the use of fire , but the main reason appears to have been the introduction of the Polynesian rat (Rattus exulans) .

The summits of the five volcanoes of Hawaii are revered as sacred mountains . Hawaiians associated elements of their natural environment with particular deities . In Hawaiian mythology , the sky father W?kea marries the earth mother Papa , giving birth to the Hawaiian Islands . K?lauea itself means " spewing " or " much spreading " in Hawaiian , referencing its high state of activity , and in Hawaiian mythology K?lauea is the body of the deity Pele , goddess of fire , lightning , wind , and volcanoes . It is here that the conflict between Pele and the rain god Kamapua?a was centered ; Halema?uma?u , " House of the ?ama?uma?u fern " , derives its name from the struggle between the two gods . Kamapua?a , hard @-@ pressed by Pele 's ability to make lava spout from the ground at will , covered the feature , a favorite residence of the goddess , with fern fronds . Choked by trapped smoke , Pele emerged . Realizing that each could threaten the other with destruction , the others gods called a draw and divided the island between them , with Kamapua?a getting the moist windward northeastern side , and Pele directing the drier Kona (or leeward) side . The rusty singed appearance of the young fronds of the ?ama?uma?u is said to be a product of the legendary struggle .

This early era was followed by peace and cultural expansion between the 12th and late 18th century . Land was divided into regions designed for both the immediate needs of the populace and

the long @-@ term welfare of the environment . These ahupua?a generally took the form of long strips of land oriented from the mountain summits to the coast .

= = = Modern era = = =

The first foreigner to arrive at Hawaii was James Cook in 1778 . The first non @-@ native to observe K?lauea in detail was William Ellis , an English missionary who in 1823 spent more than two weeks trekking across the volcano . He collated the first written account of the volcano and observed many of its features , establishing the premise for future explorations of the volcano .

One of the earliest and most important surveyors of K?lauea was James Dwight Dana , who , staying with the missionary Titus Coan , studied the island 's volcanoes in detail for decades first @-@ hand . Dana visited K?lauea 's summit and described it in detail in 1840 . After publishing a summary paper in 1852 , he directed a detailed geological study of the island in 1880 and 1881 but did not consider K?lauea a separate volcano , instead referring to it as a flank vent of Mauna Loa ; it was not until another geologist , C. E. Dutton , had elaborated on Dana 's research during an 1884 expedition that K?lauea came to be generally accepted as a separate entity .

The next era of K?lauea 's history began with the establishment of the Hawaiian Volcano Observatory on the volcano 's rim in 1912 . The first permanent such installation in the United States , the observatory was the brainchild of Thomas Jaggar , head of geology at the Massachusetts Institute of Technology ; after witnessing the devastation of the 1908 Messina earthquake near Mount Etna in Italy , he declared that something must be done to support systematic volcanic and seismic study , and chose K?lauea as the site of the first such establishment . After securing initial funding from MIT and the University of Hawaii , Jaggar took directorship of the observatory and , whilst its head between 1912 and 1940 , pioneered seismological and observational study and observation of active volcanoes . After initial funding ran out , the Observatory was successively funded by the National Weather Service , the United States Geological Survey (USGS) , and the National Park Service , before settling on the USGS , under whose banner the observatory has been operating since 1947 . The main building has been moved twice since establishment , and today is positioned on the northwest rim of K?lauea 's caldera .

= = Tourism = =

The volcano became a tourist attraction from the 1840s onwards , and local businessmen such as Benjamin Pitman and George Lycurgus ran a series of hotels at the rim , including Volcano House which is still the only hotel or restaurant located within the borders of the Hawai?i Volcanoes National Park . In 1891 , Lorrin A. Thurston , grandson of the American missionary Asa Thurston and investor in hotels along the volcano 's rim , began campaigning for a park on the volcano 's slopes , an idea first proposed by William Richards Castle , Jr. in 1903 . Thurston , who owned the Honolulu Advertiser newspaper , printed editorials in favor of the idea ; by 1911 Governor Walter F. Frear had proposed a draft bill to create " Kilauea National Park " . Following endorsements from John Muir , Henry Cabot Lodge , and former President Theodore Roosevelt (in opposition to local ranchers) and several legislative attempts introduced by delegate Jonah K?hi? Kalaniana 'ole , House Resolution 9525 was signed into law by Woodrow Wilson on August 1 , 1916 . It was the 11th National Park in the United States , and the first in a Territory ; a few weeks later , the National Park Service Organic Act was signed into law , creating the National Park Service and tasking it with running the expanding system . Originally called " Hawaii National Park " , it was split from the Haleakala National Park on 22 September 1960 . Today the park , renamed the Hawai?i Volcanoes National Park , is a major conservatory agency and tourist attraction , and , since 1987 , a World Heritage Site .

In its early days tourism was a relatively new concept , but grew slowly before exploding with the advent of air travel around 1959 , the year Hawai?i became a state . Today tourism is driven by the island 's exotic tropical locations , and K?lauea , being one of the few volcanoes in the world in a more or less constant state of moderate eruption , is a major part of the island 's tourist draw . Today

, K?lauea is visited by roughly 2 @.@ 6 million people annually , most of whom proceed up the volcano from the recently revamped Kilauea Visitor Center near the park entrance . The Thomas A. Jaggar Museum is also a popular tourist stop ; located at the edge of K?lauea caldera , the museum 's observation deck offers the best sheltered view on the volcano of the activity at Halemaumau Crater . The Volcano House still provides the nearest lodging , and the nearby Volcano Village the most numerous ; visitors associated with the military can find lodging at the Kilauea Military Camp . A number of hiking trails , points of interest , and guided ranger programs exist , and the Chain of Craters Road , Hilina Pali Road , and Crater Rim Drive provide access .