15th Century

Folks describe different 'phases' or 'periods' of human settlement and agricultural development in the Islands over time. Different people use different terms for each of these (some use varying timeframes, as well,) but they seem to generally fall into Settlement, Development, Expansion and ultimately Post-Contact.

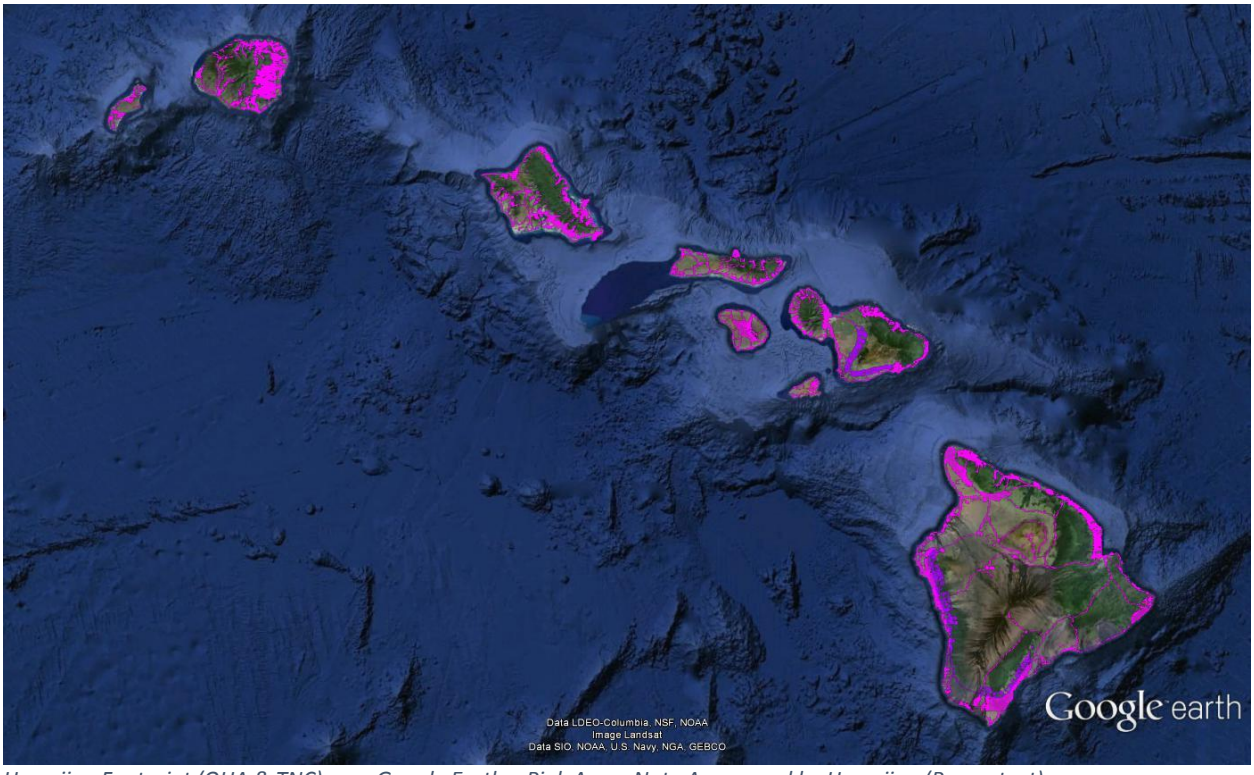
Settlement - AD 1000-1400

It is believed that initial Polynesian discovery and settlement of the Hawaiian Islands occurred between approximately AD 1000 and 1200. (Kirch) This effectively started the 'Settlement' phase.

The rich valley bottoms which later they would clear, terrace, and irrigate for wet-taro cultivation, were in their pristine state, dense jungle, probably covered mostly with the hau shrub which, where it runs wild, produces a dense, tight jungle. For this jungle the first settlers had no use.

What taro tops they had, they planted along the banks of the streams, as taro is still planted along the banks of irrigation and drainage ditches. If they had sweet-potato shoots, these were planted in sandy soil near their huts.

It is more likely, however, that the first settlers had little or nothing to plant. The plants and more settlers were probably brought by canoes sent back to the homeland. For generations, the small, slowly growing population clustered around shore sites near streams that supplied them with water. Such sites are best for inshore fishing.



Hawaiian Footprint (OHA & TNC) over Google Earth – Pink Areas Note Areas used by Hawaiian (Precontact)

Fishermen and their families living around the bays and the beaches, or at isolated localities along the coast where fishing was practicable, led a life that was materially simpler than that of planters who dwelt on the plains.

The food plants of Hawai‘i can be divided into three groups: those known as staple foods (the principal starchy foods – kalo (taro,) ‘uala (sweet potato,) ‘ulu (breadfruit,) etc;) those of less importance (to add nutrients and variety to the diet;) and those known as famine foods. (Krauss)

With such a small (but growing) population based on the family unit, society was not so complicated that it needed chiefs to govern or oversee the general population.

Kamakau states that there were no chiefs in the earliest period of settlement but that they came “several hundred years afterward … when men became numerous.”

Development- AD 1400-1650

Archaeological evidence indicates a chronology of household expansion (and, by inference, to population growth, as well as increased managerial presence and a desire to produce higher yields) starting about this time. Likewise, a formalization of governance was taking shape.

As the ancient Hawaiian population grew, land use and resource management also evolved. The traditional land use in the Hawaiian Islands evolved from shifting cultivation into a stable form of agriculture.

Dr Marion Kelly noted there were three main technological advances resulting in food production intensification that started to evolve: (a) loko i‘a, walled fishponds, (b) lo‘i, terraced pondfields with their irrigation systems and (c) systematic dry-land field cultivation organized by vegetation zones.

Stabilization required a new form of land use and eventually the ahupua‘a form of land management was instituted (what we generally refer to as watersheds, today.) Ahupua‘a were not only a means to protect and manage resources, they served as a means of managing the growing population.

In addition, this movement toward a centralization of government allowed for development and maintenance of large projects, such as irrigation systems, large taro lo‘i, large fish ponds, heiau and trails.

To feed more people, farming became more developed and intensified. Only in Hawai‘i was there such an intensive effort to utilize practically every body of water, from seashore to upland forests, as a source of food, for either agriculture or aquaculture.

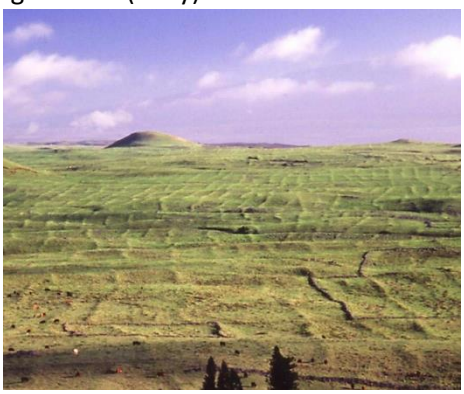
Hawaiians built rock-walled enclosures in near shore waters, to raise fish for their communities and families. It is believed these were first built around the fifteenth century.

The ancient Hawaiian fishpond is a sophisticated land and ocean resource management technique. Utilizing raw materials such as rocks, corals, vines and woods, the Hawaiians created great walls (kuapā) and gates (mākāhā) for these fishponds. (Kelly)

Another technological invention by Hawaiian Polynesians was the development of their extended stone-faced, terraced pondfields (loʻi) and their accompanying irrigation systems (ʻauwai) for the intensive cultivation of wetland taro (kalo.)

The terraces were irrigated with water brought in ditches from springs and streams high in the valleys, allowing extensive areas of the valleys to be cultivated. The irrigation ditches and pondfields were engineered to allow the cool water to circulate among the taro plants and from terrace to terrace, avoiding stagnation and overheating by the sun, which would rot the taro tubers.

An acre of irrigated loʻI kalo produced as much as five times the amount of taro as an acre of dryland cultivation. Over a period of several years, irrigated pondfields could be as much as 10 or 15 times more productive than unirrigated taro gardens, as dryland gardens need to lie fallow for greater lengths of time thin irrigated gardens. (Kelly)



There was systematic cultivation of dryland crops in their appropriate vegetation zones as exemplified by the Field Systems (notable systems are seen in Kona, Kohala, Kaupō, Kalaupapa and Kaʻū.) (Kelly) Archaeological evidence of intensive cultivation of sweet potato and other dryland crops is extensive, including walls, terraces, mounds and other features.

The fields were typically oriented parallel to the elevation contours and the walls (and perhaps kō (sugar cane) planted on them) would have functioned as windbreaks from the trade winds which sweep down the slopes. Configured in this way, the walls would also have reduced evapotranspiration and - with heavy mulching - retained essential moisture for the crops. This alignment of fields also conserved water by retaining and dispersing surface run-off and inhibited wind erosion and soil creep.

This was a period of tremendous significance in Hawaiian pre-contact history since, during this time

(1) the population underwent a geometric rate of increase
(2) virtually all habitable and arable lands were occupied and territorially claimed
(3) the territorial pattern of chiefdom (moku) and sub-chiefdom units (ahupuaʻa) appears to have been established and
(4) toward the end of this period the Hawaiian sociopolitical system was transformed from a simple, ancestral Polynesian chiefdom to a highly stratified society with virtual class differentiation between chiefs and commoners. (Kirch)

Expansion – AD 1650-Contact (1778)

A population peak (usually estimated at several hundred thousand) was reached around 1650 AD, more than 100 years before contact with Europeans.

It was at this population peak, or shortly before, that Hawaiians began to inhabit less favorable coastline areas and barren zones between the coast and upland agricultural sites and to develop extensive dryland agricultural systems in marginal regions. (Cuddihy)

Large-scale irrigation works and permanent field systems were developed during the expansion period. Settlements were intruding into increasingly marginal environments, including the interiors of leeward valleys and the higher elevation slopes. Population densities in the fertile windward valleys increased, although densities in tablelands and elsewhere were much lower.

Cultivation was characterized by a variety of non-irrigated root and tree crops grown for subsistence, each farmer having gardens in one or more vegetation zones. Each crop was cultivated in the zone in which it grew best.

Reverend William Ellis described the area behind Kailua town in Kona above the breadfruit and mountain apple trees as, "The path now lay through a beautiful part of the country, quite a garden compared with that through which they had passed on first leaving the town."

"It was generally divided into small fields, about fifteen rods square fenced with low stone walls, built with fragments of lava gathered from the surface of the enclosures. These fields were planted with bananas, sweet potatoes, mountain taro, paper mulberry plants, melons, and sugar-cane, which flourished luxuriantly in every direction."

There was extensive development of at least the mauka portion of the kula sub-zone, for sweet potatoes, wauke and probably also gourds. This development was accompanied rarely by permanent habitation and more often by temporary and seasonal habitation along the kula gardens.

Animal enclosures, probably for pigs, may date to this phase. The upland zones were under complete development by this time. Suitable caves were modified for refuge during times of warfare or social conflict. Caves located in the midst of garden features were intensively used for temporary shelter and work spaces. (Terry)

Post Contact – After 1778

At the time of Captain Cook's arrival (1778-1779), the Hawaiian Islands were divided into four chiefdoms: (1) the island of Hawai'i under the rule of Kalani'ōpu'u, who also had possession of the Hāna district of east Maui; (2) Maui (except the Hāna district,) Molokai, Lāna'i and Kaho'olawe, ruled by Kahekili; (3) O'ahu, under the rule of Kahahana; and (4) Kauai and Ni'ihau, Kamakahelei was ruler.

It was not necessarily a peaceful time. Island rulers, Ali'i or Mō'ī, typically ascended to power through familial succession and warfare. In those wars, Hawaiians were killing Hawaiians; sometimes the rivalries pitted members of the same family against each other.

"It is supposed that some six thousand of the followers of this chieftain (Kamehameha,) and twice that number of his opposers, fell in battle during his career, and by famine and distress occasioned by his wars and devastations from 1780 to 1796." (Bingham)

In addition to deaths in wars, epidemics of infections added to the decline in Hawai'i's population from approximately 300,000 at the time of Captain Cook's arrival in 1778 to 135,000 in 1820 and 53,900 in 1876.

Vancouver was appalled by the impoverished circumstances of the people and the barren and uncultivated appearance of their lands. "The deplorable condition to which they had been reduced by an eleven years war" and the advent of "the half famished trading vessels" convinced him that he should pursue his peace negotiations for "the general happiness, of the inhabitants of all the islands." (Vancouver, Voyage 2)

"By this time nearly a generation of the race had passed away, subsequently to their discovery by Cook. How much of their strength had been exhausted by wars and the support of armies, and how much by new and terrible diseases, it is not easy to estimate. The population was greatly diminished, and the residue unimproved in morals." (Bingham)

The cultivation of kula lands gradually decreased in extent and intensity, nevertheless remaining important to a decreasing population. Some kula lands were being converted to grazing beginning in the 1840s. Agriculture became industrialized.

The first commercially-viable sugar plantation, Ladd and Co., was started at Kōloa on Kaua'i. On July 29, 1835, Ladd & Company obtained a 50-year lease on nearly 1,000-acres of land and established a plantation and mill site in Kōloa.

At the industry's peak in the 1930s, Hawaii's sugar plantations employed more than 50,000 workers and produced more than 1-million tons of sugar a year; over 254,500-acres were planted in sugar. That plummeted to 492,000 tons in 1995.

Although sugar dominated the Hawaiian economy, there was also great demand at the time for fresh Hawaiian pineapples, and later canned pineapple. By 1931, pineapple production exceeded 12 million cases as a result of both expansion and improvements in productivity; production of canned pineapple peaked in 1957.

The Islands at the Time of Columbus (During the Development Phase - AD 1400-1650)

At about the time Christopher Columbus was crossing the Atlantic to America (1492 - he was looking for an alternate trade route to the East Indies,) exciting stuff was happening in the Hawaiian Islands. The political governance and land management system by Ali'i-ai-moku, was expanding and developing after two centuries since its inception, and there was a wake of progress taking place on our shores.

The Ali'i-ai-moku (Island rulers) across the chain were: Mā'ilikūkahi on O'ahu, Pi'ilani on Maui, 'Umi-a-Līloa on Hawai'i and Kukona on Kaua'i.

Māʻilikūkahi - Oʻahu

Māʻilikūkahi is honored as the first great king of Oʻahu and legends tell of his wise, firm, judicious government. He was born aliʻi kapu at the birthing stones of Kūkaniloko; Kūkaniloko was one of two places in Hawaiʻi specifically designated for the birth of high ranking children, the other site was Holoholokū at Wailua on Kauaʻi.

Soon after becoming aliʻi, Māʻilikūkahi moved to Waikīkī. He was probably one of the first chiefs to live there. Up until this time Oʻahu chiefs had typically lived at Waialua and ʻEwa. From that point on, with few exceptions, Waikīkī remained the Royal Center of Oʻahu aliʻi, until Kamehameha I moved the seat to Honolulu.

Māʻilikūkahi is noted for clearly marking and reorganizing land division palena (boundaries) on Oʻahu. Defined palena brought greater productivity to the lands; lessened conflict and was a means of settling disputes of future aliʻi who would be in control of the bounded lands; protected the commoners from the chiefs; and brought (for the most part) peace and prosperity.

Fornander writes, "He caused the island to be thoroughly surveyed, and boundaries between differing divisions and lands be definitely and permanently marked out, thus obviating future disputes between neighboring chiefs and landholders."

Kamakau tells a similar story, "When the kingdom passed to Māʻilikūkahi, the land divisions were in a state of confusion; the ahupuaʻa, the ku, the ʻili ʻaina, the moʻo ʻaina, the pauku ʻaina, and the kihapai were not clearly defined."

"Therefore, Māʻilikūkahi ordered the chiefs, aliʻi, the lesser chiefs, kaukau aliʻi, the warrior chiefs, puʻali aliʻi, and the overseers (luna) to divide all of Oʻahu into moku, ahupuaʻa, ʻili kupono, ʻili ʻaina, and moʻo ʻaina."

What is commonly referred to as the ʻahupuaʻa system' is a result of the firm establishment of palena (boundaries.) This system of land divisions and boundaries enabled a konohiki (land/resource manager) to know the limits and productivity of the resources that they managed.

Ahupuaʻa served as a means of managing people and taking care of the people who support them, as well as an easy form of collection of tributes by the chiefs. Ultimately, this helped in preserving resources.

The ahupuaʻa boundaries reflected the pattern of land use that had evolved as the most efficient and beneficial to the well-being of the ʻohana, as the population expanded throughout previous centuries.

This pattern of land use and the boundaries were adopted and then instituted by the ruling chiefs and their supervisors to delineate units for the annual collection of the Makahiki Harvest Season offerings to them as the land stewards of Lono, God of Agriculture. (McGregor & MacKenzie)

Piʻilani - Maui

According to oral tradition, Piʻilani unified the entire island of Maui, bringing together under one rule the formerly-competing eastern (Hāna) and western (Wailuku) multi-district kingdoms of the Island. In the

1500s, Chief Piʻilani (“stairway to heaven”) unified West Maui and ruled in peace and prosperity. His territory included Nā Hono a Piʻilani, the six West Maui bays, a place he frequented.

Piʻilani's prosperity was exemplified by a boom in agriculture and construction of heiau, fishponds, trails and irrigation systems. Famed for his energy and intelligence, Piʻilani constructed the West Maui phase of the noted Alaloa, or long trail (also known as the King’s Highway.)

His son, Kihapiʻilani laid the East Maui section and connected the island. This trail was the only ancient pathway to encircle any Hawaiian island (not only along the coast, but also up the Kaupō Gap and through the summit area and crater of Haleakalā.)

Four to six feet wide and 138-miles long, this rock-paved path facilitated both peace and war. It simplified local and regional travel and communication, and allowed the chief’s messengers to quickly get from one part of the island to another. The trail was used for the annual harvest festival of Makahiki and to collect taxes, promote production, enforce order and move armies.

Missionaries Richards, Andrews and Green noted in 1828, “a pavement said to have been built by Kihapiʻilani, a king … afforded us no inconsiderable assistance in traveling as we ascended and descended a great number of steep and difficult paries (pali.)” (Missionary Herald)

Piʻilanihale Heiau in Hāna, Maui is Hawaiʻi’s largest heiau that is still intact. Standing over 40-feet high, the stone platform is 289-feet by 565.5-feet; Piʻilanihale Heiau is a stepped lava rock platform the size of nearly two football fields.

This wall contains the most unusual feature of the Heiau, the immense retaining wall that fills a gully between the two ridges comprising the Heiau foundation. According to Cordy, this wall is unique in Hawaii: “it is built of superbly fitted stones ..... and has four [terraced] steps up its face.”

In addition to serving as a heiau, some archaeologists believe this structure may also be the residential compound of a high chief, perhaps that of King Piʻilani. The royal compound probably would have included the king's personal temple. The literal translation of Piʻilanihale is "house (hale) [of] Piʻilani."

ʻUmi - Hawaiʻi Island

ʻUmi-a-Līloa (ʻUmi) from Waipiʻo, son of Līloa, defeated Kona chief Ehunuikaimalino and united the island of Hawaiʻi. He then moved his Royal Center from Waipiʻo to Kona. At about the time of ʻUmi, a significant new form of agriculture was developed in Kona; he is credited with starting it. Today, archaeologists call the unique method of farming in this area the ʻKona Field System.ʼ

The Kona Field System was planted in long, narrow fields that ran across the contours, along the slopes of Mauna Loa and Hualālai. As rainfall increases rapidly as you go up the side of Hualālai, the long fields allowed farmers to plant different crops according to the rainfall gradients.

In lower elevations all the way to the shore, informal clearings, mounds and terraces were used to plant sweet potatoes; and on the forest fringe above the walled fields there were clearings, mounds and terraces which were primarily planted in bananas.

This intensive agricultural activity changed farming and agricultural production on the western side of Hawai'i Island; the Kona field system was quite large, extending from Kailua to south of Honaunau

In the lower reaches of the tillable land, at elevations about 500-feet to 1,000-feet above sea level, a grove of breadfruit half mile wide and 20 miles long grew. Sweet potatoes grew among the breadfruit. Above the breadfruit grove, at elevations where the rainfall reached 60-70 inches or more, were fields of dry land taro.

The Kona Field System was described as "the most monumental work of the ancient Hawaiians." The challenge of farming in Kona is to produce a flourishing agricultural economy in an area subject to frequent droughts, with no lakes or streams for irrigation.

Kukona - Kauai

Kukona (7th aliʻi ʻaimoku of Kauai,) whose name in Hawaiʻi became a symbol of the very highest ideals of chivalry in battle, was born in Kōloa and fought his defining battle at Poʻipū. He was born and led during the 1400s.

During the 15th century, an ambitious chief of Hawaiʻi who had already conquered three other islands, tried to seize Kauaʻi. He was accompanied into battle by the combined armies and chiefs of Maui, Molokai and Oʻahu. The war is known as the War of Ka-welewele. The much smaller forces defending Kauaʻi, led by Kukona and his son Manokalanipo, soundly defeated the invaders after leading them inland and then surrounding them at the shore.

Kukona captured all four chiefs of Hawaiʻi, Oʻahu, Maui and Molokai. He had the opportunity to kill them all and assume leadership over the islands. However, he preferred peace and allowed them to return safely home with a promise that they never again make war on Kauaʻi.

As noted by Fornander: "The war with the Hawaiʻi chief, and the terrible defeat and capture of the latter, as well as Kukona's generous conduct towards the four chiefs who fell into his hands after the battle, brought Kauai back into the family circle of the other islands, and with an eclat and superiority which it maintained to the last of its independence."

This peace lasted for four hundred years; the peace was called ka lai loa ia Kamaluohua (The Long Peace of Kamaluohua – named for the captured Maui chief who, while Kukona was sleeping, stated to the others, "Let us do no hurt to Kukona, because he has been kind to us. Here we are in his hands, but he has not put us to death. Let us then treat him kindly." (Malo))

What about Puna?

The Islands were at peace, the population was growing and new intensified means of feeding the subsistence society were being developed.

However, in Puna, there was a disturbance in the forest …

The native Hawaiian ʻōhiʻa (Metrosideros polymorpha) is the most abundant tree in the Hawaiian Islands, comprising about 62 percent of the total forest area. The name Metrosideros is derived from Greek metra, heartwood, and sideron, iron, in reference to the hard wood of the genus. Known as ʻŌhiʻa Lehua, the species is found on all major islands and in a variety of habitats. (Friday and Herbert)

ʻŌhiʻa lehua is typically the dominant tree where it grows. Although the species is little used commercially, it is invaluable from the standpoint of watershed protection, esthetics, and as the only or major habitat for several species of forest birds, some of which are currently listed as threatened or endangered.

ʻŌhiʻa is a slow-growing, endemic evergreen species capable of reaching 75- to 90-feet in height and about 3-feet in diameter. It is highly variable in form, however, and on exposed ridges, shallow soils, or poorly drained sites it may grow as a small erect or prostrate shrub. Its trunk may range in form from straight to twisted and crooked. Because the species can germinate on the trunks of tree ferns and put out numerous roots that reach the ground, it may also have a lower trunk consisting of compact, stilt-like roots. The hard, dark reddish wood of ʻōhiʻa lehua was used in house and canoe construction and in making images (kiʻi), poi boards, weapons, tool handles, kapa beaters (especially the rounded hohoa beater), and as superior quality firewood.

ʻŌhiʻa lehua, though of a very nice color, cracks or ‘checks’ too easily to be useful for calabash making. The foliage served religious purposes and young leaf buds were used medicinally. The flowers and leaf buds (liko lehua) were used in making lei.

To Hawaiians of old, the gods were everywhere, not only as intangible presences but also in their myriad transformation forms (kino lau) and in sacred images (kiʻi). Most of the large images were carved from wood of the ʻōhiʻa lehua, an endemic species that is regarded as a kino lau of the gods Kane and Kū.

The materials used in large part depended on the resources available nearby and whether a hale was for aliʻi or makaʻāinana, but in either case, hardwoods were selected for the ridgepoles, posts, rafters, and thatching poles. Hardwoods grew abundantly in Hawaiian forests, in terms of both number of species and the count of hardwoods as a whole.

ʻŌhiʻa lehua grew on all the major islands and was widely used in housebuilding. Canoe decking, spreaders, and seats were commonly made of ʻōhiʻa lehua, as well as for the gunwales.

ʻŌhiʻa lehua was one of the five primary plants represented at the hula altar (ʻōhiʻa lehua, halapepe, ʻieʻie, maile and palapalai.) The hālau hula, a structure consecrated to the goddess Laka, was reserved for use by dancers and trainees and held a vital place in the life of an ahupuaʻa.

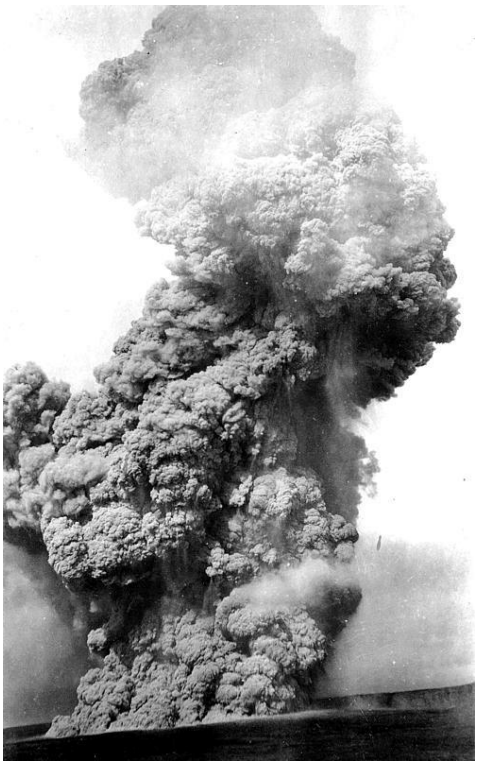
Inside a hālau hula was an altar (kuahu), on which lay a block of wood of the endemic lama, a tree whose name translates as "light" or "lamp" and carried the figurative meaning of "enlightenment." Swathed in yellow kapa and scented with ʻolena, this piece of wood represented Laka, goddess of hula, sister and wife of Lono.

A number of other deities were also represented on the altar by plants: ʻōhiʻa lehua for the god Kukaʻōhiʻa Laka (named for a legendary ʻōhiʻa lehua tree that had a red flower on an eastern branch and a white one on a western branch); halapepe (Pleomele aurea) for the goddess Kapo; ʻieʻie for the demigoddess Laukaʻieʻie; maile representirig the four Maile sisters, legendary sponsors of hula; and palapalai fern, symbolic of Hiʻiaka, sister of the volcano goddess Pele and the benefactor of all hula dancers.

Native Hawaiians consider the tree and its forests as sacred to Pele, the volcano goddess, and to Laka, the goddess of hula. ʻŌhiʻa lehua blossoms, buds and leaves were important elements in lei of both wili and haku types.

ʻAilāʻau

In the 15th century, while the rest of the Islands were expanding in production, Puna was subjected of devastation. What was not said at the time of OHA's acquisition of Wao Kele o Puna was its significant role in the reforestation of the native forest … at the time of Columbus and the rule of Māʻilikūkahi, Piʻilani, ʻUmi and Kukona were ruling in their respective chiefdoms.



The longest recorded eruption at Kīlauea, arguably, was the ʻAilāʻau eruption and lava flow in the 15th century, which may be memorialized in the Pele-Hiʻiaka chant. It was the largest in Hawaiʻi in more than 1,000-years.

The flow was named after ʻAilāʻau, who was known and feared by all the people. ʻAi means the "one who eats or devours." Lāʻau means "tree" or a "forest."

ʻAilāʻau was, therefore, the forest eating (destroying) fire-god. Time and again he laid the districts of South Hawaiʻi desolate by the lava he poured out from his fire-pits. (He was the fire god before Pele arrived at Hawaiʻi Island.)

He was the god of the insatiable appetite; the continual eater of trees, whose path through forests was covered with black smoke fragrant with burning wood, and sometimes burdened with the smell of human flesh charred into cinders in the lava flow.

‘Ailā‘au seemed to be destructive and was so named by the people, but his fires were a part of the forces of creation. He built up the islands for future life. The flowing lava made land. Over time, the lava disintegrates and makes earth deposits and soil. When the rain falls, fruitful fields form and people settled there.

‘Ailā‘au still poured out his fire. It spread over the fertile fields, and the people feared him as the destroyer giving no thought to the final good. He lived, the legends say, for a long time in a very ancient part of Kīlauea, on the large island of Hawai‘i, now separated by a narrow ledge from the great crater and called Kīlauea Iki (Little Kīlauea).

The ‘Ailā‘au eruption took place from a vent area just east of Kīlauea Iki. The eruption built a broad shield. The eastern part of Kilauea Iki Crater slices through part of the shield, and red cinder and lava flows near the center of the shield can be seen on the northeastern wall of the crater.

The eruption probably lasted about 60 years, ending around 1470 (based on evaluation of radiocarbon data for 17 samples of lava flows produced by the ‘Ailā‘au shield - from charcoal created when lava burns vegetation.) The ages obtained for the 17 samples were averaged and examined statistically to arrive at the final results.

This large volume of lava covered a huge area, about 166 square miles (over 106,000-acres) – larger than the Island of Lāna‘i. From the summit of the ‘Ailā‘au shield, pāhoehoe lava flowed 25-miles northeastward, making it all the way to the coast. Lava covered all, or most, of what are now Mauna Loa Estates, Royal Hawaiian Estates, Hawaiian Orchid Island Estates, Fern Forest Vacation Estates, Eden Rock Estates, Crescent Acres, Hawaiian Acres, Orchid Land Estates, ‘Ainaloa, Hawaiian Paradise Park and Hawaiian Beaches. (USGS)

Hawai‘i Lava Flow (University of Idaho)

After a time, ‘Ailā‘au left these pit craters and went into the great crater and was said to be living there when Pele came to the seashore far below. When Pele came to the island Hawai‘i, she first stopped at a place called Keahialaka in the district of Puna. From this place she began her inland journey toward the mountains. As she passed on her way there grew within her an intense desire to go at once and see ‘Ailā‘au, the god to whom Kilauea belonged, and find a resting-place with him as the end of her journey.

She came up, but ʻAilāʻau was not in his house - he had made himself thoroughly lost. He had vanished because he knew that this one coming toward him was Pele. He had seen her toiling down by the sea at Keahialaka. Trembling dread and heavy fear overpowered him.

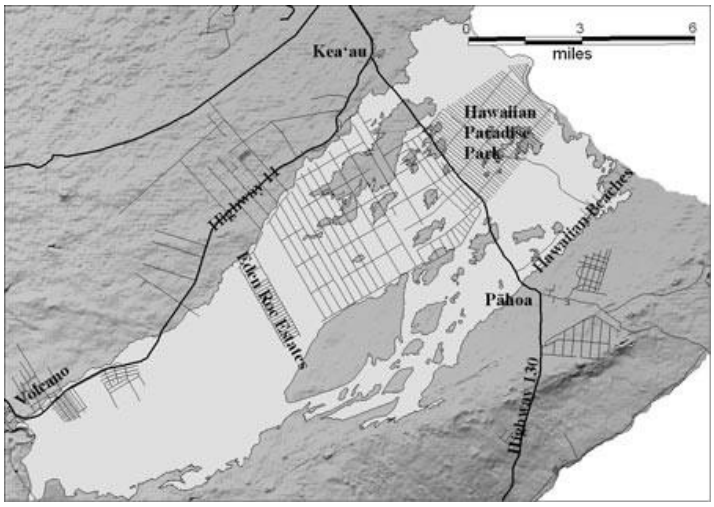
He ran away and was entirely lost. When he came to that pit she laid out the plan for her abiding home, beginning at once to dig up the foundations. She dug day and night and found that this place fulfilled all her desires. Therefore, she fastened herself tight to Hawaiʻi for all time.

These are the words in which the legend disposes of this ancient god of volcanic fires. He disappears from Hawaiian thought and Pele from a foreign land finds a satisfactory crater in which her spirit power can always dig up everlastingly overflowing fountains of raging lava. (Westervelt)

The ʻAilāʻau flow was such a vast outpouring changed the landscape of much of Puna. It must have had an important impact on local residents, and as such it may well be described in the Pele-Hiʻiaka chant. Hiʻiaka, late on returning to Kilauea from Kauaʻi with Lohiau, sees that Pele has broken her promise and set afire Hiʻiaka's treasured ʻōhiʻa lehua forest in Puna. Hiʻiaka is furious, and this leads to her love-making with Lohiau, his subsequent death at the hands of Pele, and Hiʻiaka's frantic digging to recover the body.

The ʻAilāʻau flows seem to be the most likely candidate because it covered so much of Puna. The timing seems right, too - after the Pele clan arrived from Kahiki, before the caldera formed (Hiʻiaka's frantic digging may record this), and before the encounters with Kamapuaʻa, some of which probably deal with explosive eruptions between about 1500 and 1790. (Information here is from USGS and Westervelt.)

Wao Kele o Puna's Role in Reforesting Puna

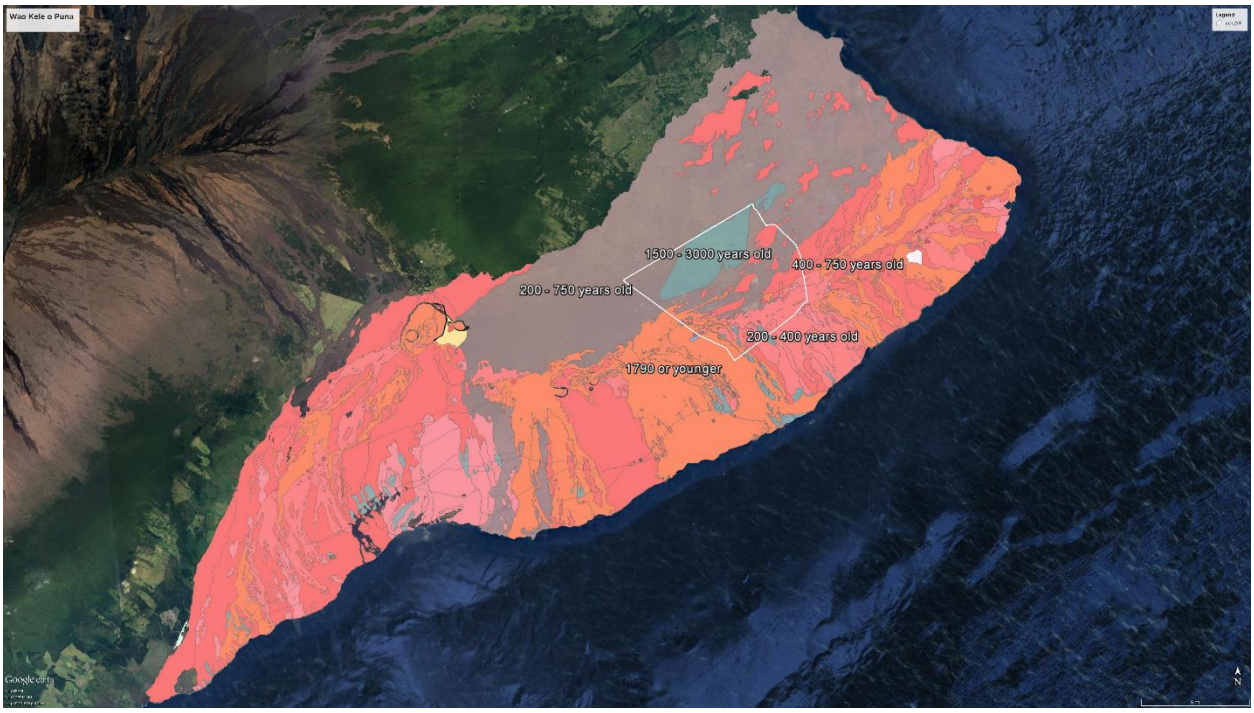


ʻAilāʻau Flow (light color) (USGS)

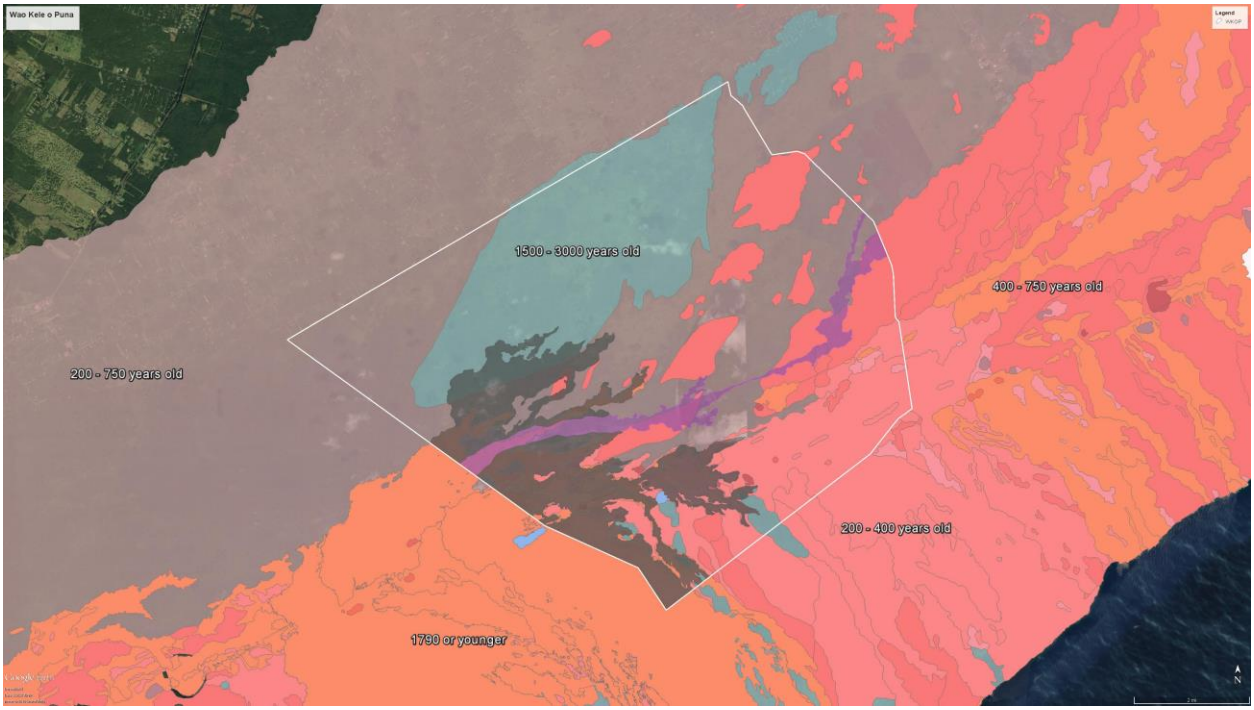
ʻŌhiʻa is the first tree species to establish on most new lava flows. As the entire portion of eastern Hawaiʻi Island is a volcanic area, lava flows occasionally cover areas of forested land. Thus, while some forests are covered with lava, other forested areas serve as 'seed banks' and help to bring growth back life to the lava-impacted area.

Mapping of the ʻAilāʻau lava flow clearly illustrates the positive role Wao Kele o Puna played in the subsequent reforesting Puna, following the ʻAilāʻau eruption.

The above illustration was a revelation … although not as apparent in this context (more detail will illustrate the real impact on the next page), the above image shows the wide, devastating swath of lava flow through Puna (the lighter tone in the image). Effectively, the ʻAilāʻau eruption and flow covered over 100,000-acres of land with lava, wiping out the native ʻōhiʻa forest that grew there. While the flow devastated a huge swath in this section of Puna, several kīpuka formed and saved portions of the Puna forest from the flow. The largest was within what we now know as the Wao Kele o Puna parcel (as noted in the next image).



The Brown marking notes the ʻAilāʻau Flow – the Blue the Kīpuka and the white line outlines the Wao Kele o Puna Boundary



A closer look of the same image – in addition the 1977 (dark brown) and 2014 (pink) flows of the Puʻu ʻŌʻō erupton are noted

Rapid ʻŌhiʻa Death

There is a new disturbance in the forest ...

Rapid ʻŌhiʻa Death is posing the greatest threat to Hawaiʻi's native forests. A newly identified disease has killed large numbers of mature ʻōhiʻa trees in forests and residential areas of the Puna, Hilo and Kona Districts of Hawaiʻi Island.

Pathogenicity tests conducted by the USDA Agriculture Research Service have determined that the causal agent of the disease is the vascular wilt fungus; although a different strain, this fungus has been in Hawaiʻi as a pathogen of sweet potato for decades.

It is not yet known whether this widespread occurrence of ʻōhiʻa mortality results from an introduction of an exotic strain of the fungus or whether this constitutes a new host of an existing strain. This disease has the potential to kill ʻōhiʻa trees statewide.

The disease affects non-contiguous forest stands ranging from 1 to 100 acres. As of 2014, approximately 6,000 acres from Kalapana to Hilo on Hawaiʻi Island had been affected with stand showing greater than 50% mortality. The disease has not yet been reported on any of the other Hawaiian Islands.

Crowns of affected trees turn yellowish and subsequently brown within days to weeks; dead leaves typically remain on branches for some time. On occasion, leaves of single branches or limbs of trees turn brown before the rest of the crown of becomes brown.

Recent investigation indicates that the pathogen progresses up the stem of the tree. Trees within a given stand appear to die in a haphazard pattern; the disease does not appear to radiate out from already infected or dead trees. Within two to three years nearly 100% of trees in a stand succumb to the disease.

The fungus manifests itself as dark, nearly black, staining in the sapwood along the outer margin of trunks of affected trees. The stain is often radially distributed through the wood.

Currently, there is no effective treatment to protect ʻōhiʻa trees from becoming infected or cure trees that exhibit symptoms of the disease. To reduce the spread, people should not transport parts of affected ʻōhiʻa trees to other areas. The pathogen may remain viable for over a year in dead wood.

UH scientists are working to protect and preserve this keystone tree in Hawaiʻi's native forest. However, the reality remains, there is a possibility that the ʻōhiʻa population on Hawaiʻi Island may be lost to Rapid ʻŌhiʻa Death (Lots of information here is from Abbott and CTAHR.)