

# Kahuku Forest Trail Guide



Hawai'i Volcanoes  
National Park

## Peer into the depths of a nearby crater that shelters a lost world of Hawaiian life.

This trail crosses through pastures peppered with stately koa and 'ōhi'a trees and leads to the edge of a huge collapsed crater. From the crater's rim, you will look down into a natural forest refuge protected within the sheer walls of the pit. Your hike to the forested pit crater gives you a window into the past and a vision of the future for Kahuku's native forests.

**Start/End:** Lower Glover Parking Area

**Map:** See center pages, 12–13

**Walking distance:** 2.4 miles (3.9 km) round trip

**Estimated walking time:** 1–1.5 hours round trip

**Descent/Ascent:** 250 feet (75 m)

**Trail rating:** Moderate

### For your safety and health:

- stay on the trail
- avoid overhanging cliff edges at the crater
- wear sturdy walking shoes and take water
- beware of wasps and carry a first-aid kit
- take protective gear for both sun and rain
- take your cell phone to get help if needed

**Boot brushing:** Though Kahuku has endured drastic changes to its natural landscape, only a few non-native weeds have become a serious threat. Do your part to prevent further infestations—brush your boots before hiking this trail.

## Trailhead

Seemingly serene, the inviting landscapes of Kahuku mask its tumultuous origins.

You stand upon the broad shoulder of the world's largest volcano, restless Mauna Loa. Currently, it simmers quietly, but when the volcano re-awakens with its next fiery eruption, this landscape may be transformed in an instant. Kahuku has always been prone to volcanic eruption because it spans the Southwest Rift Zone of Mauna Loa. The rift zone traces a region of structural weakness where magma is able to intrude. Eruptions may occur anywhere along the rift at any time, so life on these slopes can change in a geologic flash.

Human activity has also shaped this landscape. By the mid-1800s, Kahuku was already recognized as one of the largest cattle ranches in Hawai'i, and ranching operations continued here until Kahuku became part of the park in 2003. Ranching profoundly altered the environment of Kahuku, creating the pastoral landscape you see here today.

This is the story of Kahuku's transformation. This land is now managed for the conservation of its exquisite natural resources. As you walk this trail, you will learn to recognize historical modifications to the landscape and gain an appreciation of what the future may bring.



USGS HAWAIIAN VOLCANIC OBSERVATORY

1

This part of Kahuku was once a vast wilderness, thick with vines and towering trees.

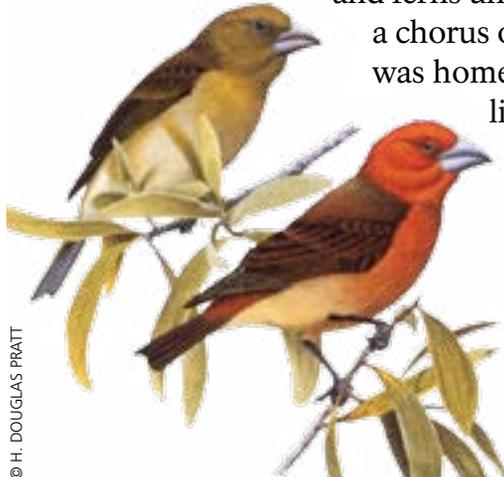
Each new lava flow from Mauna Loa remakes the land, and life begins again on barren rock. In Hawai'i, nature has perfected this process of recovery as native plants take hold and begin to grow almost as soon as the lava cools. In wet regions, one or two centuries will see volcanic desolation completely transformed into lush tropical rain forest.

Spared by lava flows for more than 1,500 years, deep fertile soils accumulated in this area, allowing the forests to grow to truly monumental proportions.



NPS/DAVID BENITEZ

This land was dense with moss and ferns under a rich canopy alive with a chorus of countless birds. Kahuku was home to a stunning diversity of life, and from the ground up, these forests were unique, comprised of plants and animals found nowhere else on Earth. Thick-billed koa finches toiled ceaselessly to tear open the tough seed pods of their favorite trees. Nectar-feeding Hawaiian honeycreepers darted



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NPS/JAY ROBINSON

from branch to branch, inadvertently pollinating unique Hawaiian blossoms. Flightless ducks, speedy rails, and giant geese scurried through the undergrowth as the legendary flute-like calls of the yellow-plumed Hawai'i 'ō'ō rang through the trees.

This was the scene in Kahuku at the beginning of the ranching era as hard working paniolo (Hawaiian cowboys) gradually pushed up the mountainside. They cleared forests and planted nutritious grass for stronger, healthy herds of cattle. Unfortunately the new manmade pastures lacked the diversity and complexity that Hawaiian species needed to survive.



© H. DOUGLAS PRATT

While many plants and birds fell to extinction, others clung to life on inaccessible terrain and in deep craters. The trees that dot the pastures and the native life nestled on the periphery



© MELORA PURELL

of the fields, are the vestiges of primeval Hawai'i—priceless relics from a golden age of native forests. Has this paradise been lost forever or can our lofty Kahuku forests be recovered?

2

On these young slopes of Mauna Loa, old lava channels often look like eroded streambeds.

Today's Kahuku bears a superficial resemblance to the open rangelands of the American West. In the high cattle-country of Montana, you might expect a narrow ravine like this one to be a dry creek bed carved out by spring snow melt. However, this ravine, along with all other topographic features of these slopes, is volcanic in origin.

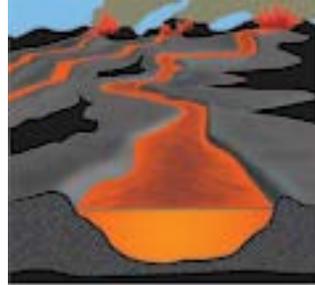
As Mauna Loa's countless outpourings of lava course down the mountain, they cover the land with a rocky expanse.

Open channels of lava tend to crust over and form insulated tunnels known as lava tubes.

When the eruption stops, the fluid lava within the tube drains out the end and—more often than not—the roof of the tube collapses.

Over time as the forest grows and soils form, collapsed lava tubes take on the appearance of “phantom waterways” like this one.

Appearances can be misleading, so remember: this is a young volcanic landscape where streams, ravines, and canyons have yet to develop through thousands of years of erosion.



NPS/JAY ROBINSON

3

Long live the mighty 'ōhi'a lehua.

The great trees of Kahuku have withstood the test of time. They have escaped repeated lava flows from Mauna Loa and, more recently, have survived a devastating onslaught by domestic cattle. Botanists suspect that 'ōhi'a (*Metrosideros polymorpha*) might live more than a thousand years. The average age of the trees in some Hawaiian forests makes them the oldest hardwood forests on Earth. The trees around you are living proof of the impressive resilience of native Hawaiian life.



NPS/JOHN STALLMAN

Remember that the big trees you see began their lives long ago, when this forest was intact. Trees that stand on bowed stilts wrapped their first roots around fallen nurse logs that have since rotted away.

Others teeter on exposed roots where the soil was hoofed out by cattle. Dead crowns are a grim reminder of the years of stress these trees have endured. Chomping and stomping by cattle resulted in increased exposure to drying wind and sun, all of which have negative impacts on native trees. While some are still in decline, many are now on the road to recovery.



NPS/JOHN STALLMAN

 **Hug a tree!** One of our slowest-growing tree species, most 'ōhi'a are surprisingly old. Kahuku's majestic specimens are irreplaceable. Go on, hug an 'ōhi'a tree. If you can't wrap your arms around it, the tree is *at least* 200 years old.

4

“He wa‘a he moku,  
The canoe is an island,  
the moku he wa‘a.  
the island is a canoe.”

Captain Clay Bertelmann, Makali‘i voyaging canoe

Koa reigns supreme as the largest native tree in Hawai‘i. Swift-growing and strong, koa has always been important in Hawaiian culture. Early European explorers reported grand convoys of double-hulled wa‘a (canoes), some over one hundred feet in length, deployed from Hawaiian shores. Today, artisans craft curly-grained iridescent koa into fine instruments and furniture.



Essential in the construction of voyaging canoes, koa was guarded with religious fervor in pre-contact Hawai‘i. Trees with massive trunks sailing straight as an arrow up from the forest floor were felled with strictly observed ritual protocol, and made into the vessels that would sustain the Hawaiian people on their voyages across the sea.

Respect for finite resources is mandatory for survival on the high seas. For Hawaiians, the island provided koa. Koa, in turn, provided wa‘a, which supported their way of life. The wa‘a and the island alike were viewed with metaphysical reverence.

A long history of logging has left Kahuku depleted of its largest koa. Once cut for profit, these trees are now protected for their intrinsic value, and Kahuku’s grand koa are growing back.

 **Native life persists within the remade landscape.** Look for native koa bugs in leaf litter under koa trees. Also found on ‘a‘ali‘i, juveniles resemble lady bugs but adults are emerald green.



5

The memory of cattle fades away,  
but mouflon sheep are not out of  
the woods yet.



NPS/JAY ROBINSON

Domestic cattle were removed in the spring of 2010, but other introduced ungulates, or hooved animals, still roam these pastures. Historically, European pigs, goats, sheep, donkeys, and cattle have been set loose upon the island, all with grave consequences to native environments. The accurate term for these barnyard animals living in the wild is “feral.” Feral animals are inherently detrimental in

Hawai‘i because they have no natural role to play in the island ecosystems they invade. Natives, like hāpu‘u (Hawaiian tree ferns), face an uncertain future in the shadow of these threats.

One of the most damaging animals in Kahuku is the mouflon, a wild European sheep released here in 1968. Cattle primarily graze at ground level, but mouflon are browsers, clipping off whatever is within reach and even stripping bark from trees.

Mouflon are also more selective in their eating habits. Unfortunately they will go out of their way to target some of the most endangered plants in Hawai‘i. Nimble mouflon also congregate on steep rocky terrain, browsing the fibrous fern fronds in areas that cattle usually avoided. Mouflon eat away at what remains of this forest. Centuries-old hāpu‘u will likely disappear from this land if mouflon remain in Kahuku.



NPS/JAY ROBINSON

6

“Ua mau ke ea o ka ‘āina i ka pono.”  
*The life of the land is perpetuated through conscientious actions.*

State of Hawaii motto, a conservationist interpretation

Throughout the 1900s, ranchers compensated for the lack of streams, rivers, or lakes by building catchment reservoirs. All across the ranch, pipes fed the collected water to tanks like this one to help sustain the growing herds. However, cattle ranching itself was severely impacting the water cycles of the island.

Hawaiian rain forests act like great green sponges. They soak up and retain torrential rains and enhance the recharge of underground aquifers. Without forest cover and dense understory vegetation, heavy rains lead to destructive floods.



NPS/JAY ROBINSON

Such floods and ensuing water shortages created serious problems for the booming sugar cane industry in the early 1900s. By that time, much of the mountains’ slope had been denuded by grazing cattle and the importance of healthy forests had become painfully obvious across the islands. To protect



NPS/JAY ROBINSON

their business interests, powerful sugar cane companies spurred the development of the State Forest Reserve System to secure reliable water sources. Fences were built and free-ranging cattle were removed from large tracts of native forest.

In the distance, about two miles farther east, you may notice a distinct wall of trees. That is the edge of one of the largest intact native forests in Hawai‘i—the Ka‘ū Forest Reserve. Unlike the skeleton of canopy trees found here on Kahuku lands today, the reserve was protected from the ravages of grazing animals for more than half a century. Infested with feral pigs, it is by no means pristine, but it remains one of the last strongholds for some of the world’s rarest birds.



© JACK JEFFREY

Iconic symbols of unique Hawaiian wildlife, these birds have survived only in limited areas where cattle were wisely excluded. In the Ka‘ū Forest Reserve, tiny orange Hawai‘i ‘ākepa still flit



© JACK JEFFREY

between the buds of ancient ‘ōhi‘a, and finely adapted ‘akiapōlā‘au still mine koa trees for tasty grubs. ‘Akiapōlā‘au use their beaks like Swiss army knives. They peck into koa with their tough bottom bill, and pluck out larva using their flexible upper bill.

The national park’s vision for Kahuku is that these rare birds will find safe haven here as the forests are restored. Their survival is tied to the health of native forests, just as our survival is tied to the health of the watershed as a whole.

 **Extend your hike, see the restoration for yourself.**

Young koa and other native seedlings thrive in exclosures freed from hooved animals. Branch out from this trail and discover successful restoration already in progress. Turn to the last page for directions to Exclosure A (Montane Wet-Mesic Forest).

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

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

-  Improved Dirt Road
-  4WD Road (closed to vehicles)
-  Kahuku Forest Trail
-  0.3 miles (0.5 km) Distance indicator and trail distance
-  Historic Water Tank (non-potable, do not drink)

**TRAIL STOPS**

Numbered posts indicate stops described in this guide.




7

“Hahai no ka ua i ka ululā‘au.”  
*Rain always follows the forest.*

Hawaiian proverb

Hawaiian people cherish these upland forests for spiritual reasons and for the practical role they play in the collection of fresh water. As it relates to fresh water, no other tree is more revered in Hawaiian culture than the majestic ‘ōhi‘a lehua.

The function of the ‘ōhi‘a is to ‘ohi, or to gather. These amazing trees are specially adapted to collect the moisture of the morning dew and the traveling mists and bring this precious water to the earth. Forest vegetation will actually wring moisture from low-drifting clouds, significantly contributing to the total precipitation in the region. This phenomenon is known as “fog drip” or “cloud drip.”



NPS/JAY ROBINSON

Dew drops cling to the delicate lehua blossoms and the small fuzzy leaves of the ‘ōhi‘a. Without these trees, moisture in the rolling fog never falls to the ground. Since ancient times, intuitive Hawaiians have observed that an entire climate system is fundamentally tied to the forest in subtle ways, providing fresh water that sustains the life of the islands.



NPS/STEPHEN GEIGER

 **Look at the forest from a Hawaiian perspective.**

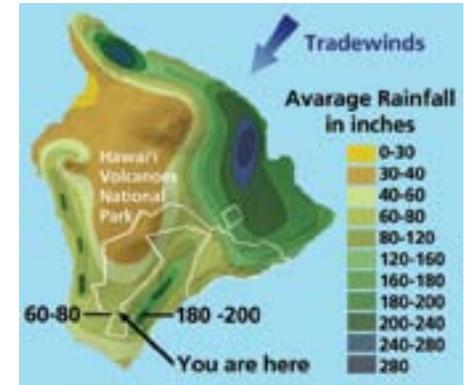
Each tree plays an important role in gathering moisture from the rain, mist, and fog. A daily watering from cloud drip makes a difference. Notice that the grass is always greener under an ‘ōhi‘a.

8

“Hiki mai ka mālie,  
*Good weather comes,*  
 a hiki mai no ka ‘ino.”  
*and bad weather comes, too.*

Hawaiian proverb

In Hawai‘i, weather is based on your location. While you explore Kahuku, the weather may vary depending on your elevation and relation to the rain-bearing trade winds. To the east, rain forests thrive. If you move west, rainfall diminishes, and a very different landscape emerges: dryland forest.



Usually, wetter environments host greater diversity of life. Wet places in Hawai‘i can be a little “too wet” for plants and animals to endure. So, in these islands, the greatest diversity was not found in the rain forests but on the dry sides. Forests that receive less rainfall than a rain forest but don’t suffer extended dry periods are called “mesic forests.” Most forests in Kahuku qualify as mesic, yet they range locally from quite wet to quite dry.

Each climate zone hosts a distinct assemblage of plants and animals finely adapted to that particular location. Striking variations in climate make Kahuku one of the most diverse regions of the island, home to both wet and dry lands—good weather and bad weather, too.

 **Watch for signs of transition.**

‘Ōhi‘a grow happily in both wet and dry conditions, but many Hawaiian trees are more particular. The shiny leaves of ‘ōlapa flash as they dance in a breeze, a sure sign that you have entered into a wetter region.



NPS/JAY ROBINSON

## 9

## Volcanic activity creates a window into the past and a vision for the future.



© HERB KANE

Hawaiians identify flowing, molten lava as “The Pele.” Volcanic activity, formations, and features are seen as the living body of the volcano goddess Pelehonuamea (Pele, creator of land.)

This pit crater actually originated underground. Earthquakes heralded the powerful movements of Pelehonuamea as she displaced subterranean rocks and fractured the earth in preparation for the formation of a new crater. At some unknown moment in time, the ground gave way in the forest, and this impressive crater was born.

Such are the mysterious ways of Pelehonuamea, who often works in secret. She may toil deep underground where there can be no witnesses. At other times, she may reveal herself ferociously, announcing her presence in a spectacular eruption.

It’s probable that native Hawaiians knew of the existence of this crater before Europeans arrived here. It was rediscovered in



### Listen to the sounds of the ancient Hawaiian rain forest.

The voices of nectar-feeding birds and unseen native insects echo from the crater. Perhaps you’ll spot a bright red ‘i‘iwi with its sickle-shaped bill—an uncommon sight in most parts of the park.



© JACK JEFFREY

the 1960s, when most of the forest here was bulldozed to create pasture. Thankfully, the forest below remained protected within the sheer cliffs.

While the surrounding environment steadily declined, life in the crater flourished in isolation. This is the case with native environments throughout Hawai‘i today, they persist in places that humans and introduced animals were unable to reach. Here, the 250-foot (76 m) vertical walls of the crater made entry by pigs and cattle impossible, and impractical for humans.

Park biologists first glimpsed into the crater in 2003 and were astounded by the ecological diversity they could see below. Although they suspected that this was the only untouched forest left in Kahuku, nothing could have prepared them for what their first surveys revealed.

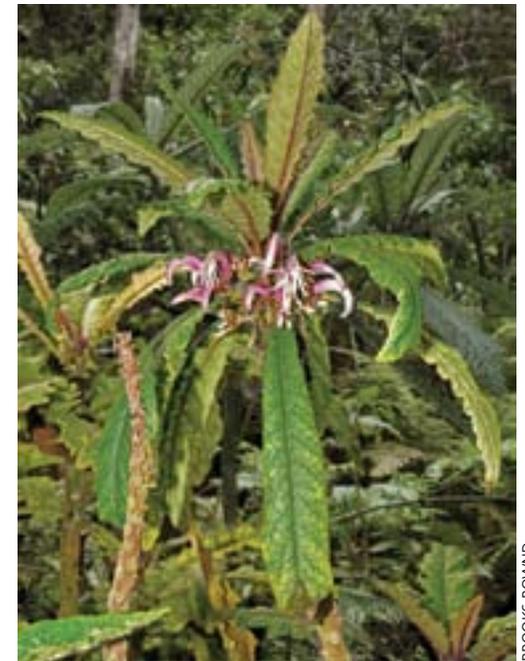
They discovered that a true lost world has survived within this natural refuge.

This time capsule from antiquity holds a whole assemblage of native insects, rare ferns, giant “mintless mints” and prehistoric-looking hāhā (*Cyanea stictophylla*).

Only 20 of these hāhā are known to exist in the wild, and not one, but two, were discovered living within this crater. With a full complement of native Hawaiian species, this

crater has given biologists valuable insight into what Kahuku was like before all of the human-caused transformations occurred.

Today, park staff work with renewed hope to secure a future for these precious plants in Kahuku’s forests.



BROOKS ROWND

10

## Discover value and hope in the changing landscape.

When bulldozers cleared this land, areas of steep difficult terrain were left untouched, while trees, roots, and rocks were heaped into great piles. Amazingly, the rudely transplanted logs and ferns frequently resprouted and regenerated themselves. Such is the case with the jumbled mass of hāpu‘u before you.

Despite the bulldozing, the elements of a healthy forest have miraculously hung on in places like this. Here and there, park biologists have discovered rare tree species persisting in these scattered groves. Park staff collect fruits from rare and common plants throughout Kahuku and germinate the seeds in greenhouses. Throughout the park, native seedlings are usually planted in the same region where the seeds were originally collected. Accordingly, Kahuku plants get planted in Kahuku.

This method helps stabilize threatened populations of rare species and ensures that valuable genetic diversity is also conserved. In this way, park biologists can accelerate the regeneration of the native forest without changing its natural composition. In doing so, they perpetuate a biologically rich and wholly Hawaiian landscape.

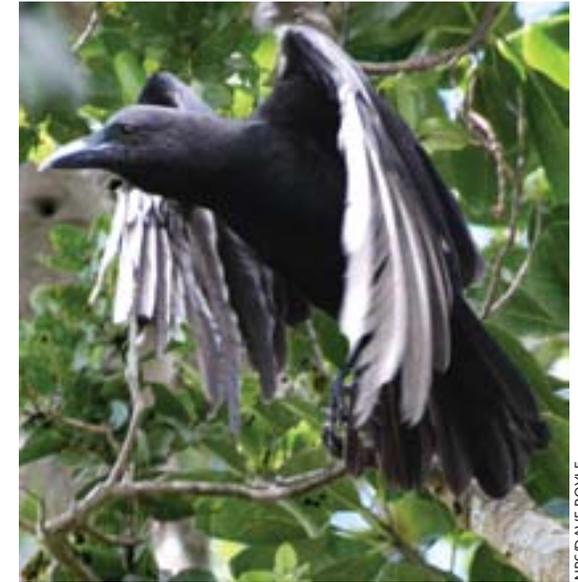


NPS/SIERRA MCDANIEL

11

## ‘Alalā may sow the seeds of a brighter future for Hawaiian forests.

‘Alalā, Hawaiian crows, once frolicked in untouched Kahuku forests. We call them crows, but ‘alalā are actually a dwarf form of raven. More than any other species of crow or raven, ‘alalā are most at home in deep forests rather than on open rangeland and savanna. The social ‘alalā also spends a lot of time cavorting on the ground and depend on a dense understory to evade predators. As recently as the 1960s, large flocks of ‘alalā were seen in Kahuku.



NPS/DAVE BOYLE

Across the island, their forest world changed forever as the understories of native forests were cleared with heavy machinery and replanted with alien grass.

Today, no ‘alalā remain in the wild. Around 70 of these endangered birds still survive in captive breeding facilities. As captive flocks grow, Kahuku is being considered as potential habitat for their future release. These birds play an important role in the maintenance and health of Hawaiian forests. As our largest native fruit-eating forest birds, ‘alalā are the last birds capable of ingesting the large fruits of some of our rarest plants and subsequently dispersing their seeds. Returning ‘alalā to the wild may prove vital to the survival of many other Hawaiian species and to the long-term recovery of our forests.

## Conclusion

Watch as the natural landscape of Kahuku re-emerges through careful stewardship.

It is easy to take a landscape for granted, as if it has always remained the same, but sometimes it's not what you see, but what's missing that's really important. The inviting green fields here belie the true character of Kahuku and give a misleading impression of the island. Before the introduction of hooved animals, the Hawaiian Islands were thick with many distinct types of forest. The wide prairies and desert-like plains you see in Hawai'i today mask a deeper, greener past.

Pastures are a stark contrast to the lush forests that once existed here, and the thought of repairing almost two centuries of environmental degradation often seems an insurmountable task. Part of what has been lost is gone forever. Extinct birds and plants will never return despite our passionate restoration efforts. It took generations of effort to convert this land into something suitable for cattle ranching, and the fact is that we cannot simply turn back time.



It is only when we look deeper into this landscape that we may find glimmers of hope for our forests. The seeds of the future lay waiting. Watchful hikers may notice native trees and ferns pushing up through the pasture grasses. You may find pulelehua, Kamehameha butterflies, fluttering across your path.

CHARLENE MEYERS

Throughout Kahuku, resilient native life awaits the chance to multiply as the forests grow more rich and abundant. We have only to create the proper opportunities, and that process is already well underway.



NPS/DAVE BOYLE

Now managed as a refuge for its priceless living resources and free from the pressures of alien grazers, the native life of Kahuku is expected to rebound wonderfully. The splendor of Kahuku emerges from the natural rhythm of wind, rain, and lava flows. On each visit, you will witness only a moment in this process of continual change.



NPS/SIERRA MCDANIEL

The recovery of native forests is a vision shared by all at Hawai'i Volcanoes National Park. Park staff devote their working lives to protect this special place, but it takes all of us to make the vision become a reality. We can all be caretakers of this special place. Your awareness and participation can help ensure that the Kahuku forest will be protected and cherished for generations to come.

 **Volunteer your time—plant a native tree in Kahuku.**

Essential restoration work is carried out with the assistance of The Friends of Hawai'i Volcanoes National Park. Contact the Friends at (808) 985-7373, or visit: [www.fhvn.org](http://www.fhvn.org)



NPS/DAVE BOYLE

# Ungulate-free Enclosures Map

## Visit the ungulate-free enclosures.

Enclosures help biologists study restoration over the broad range of rainfall and elevation in Kahuku. More than six native plant species have regenerated naturally at these sites since they became protected from cattle, pigs, goats and mouflon. Restoration methods developed in these enclosures may one day be applied to the landscape as a whole.

### A Montane Wet-Mesic Forest



LANAYA DELLY  
'io

From stop 6, turn uphill and continue for 0.5 miles (0.8 km). Turn right and hike east for another 0.3 miles (0.5 km). This area has had a shorter history of ranching, so greater native diversity has survived. Endangered species have been planted in the forest fragments within the enclosure.

### B Montane Dry-Mesic Forest



© JACK JEFFREY  
'amakihi

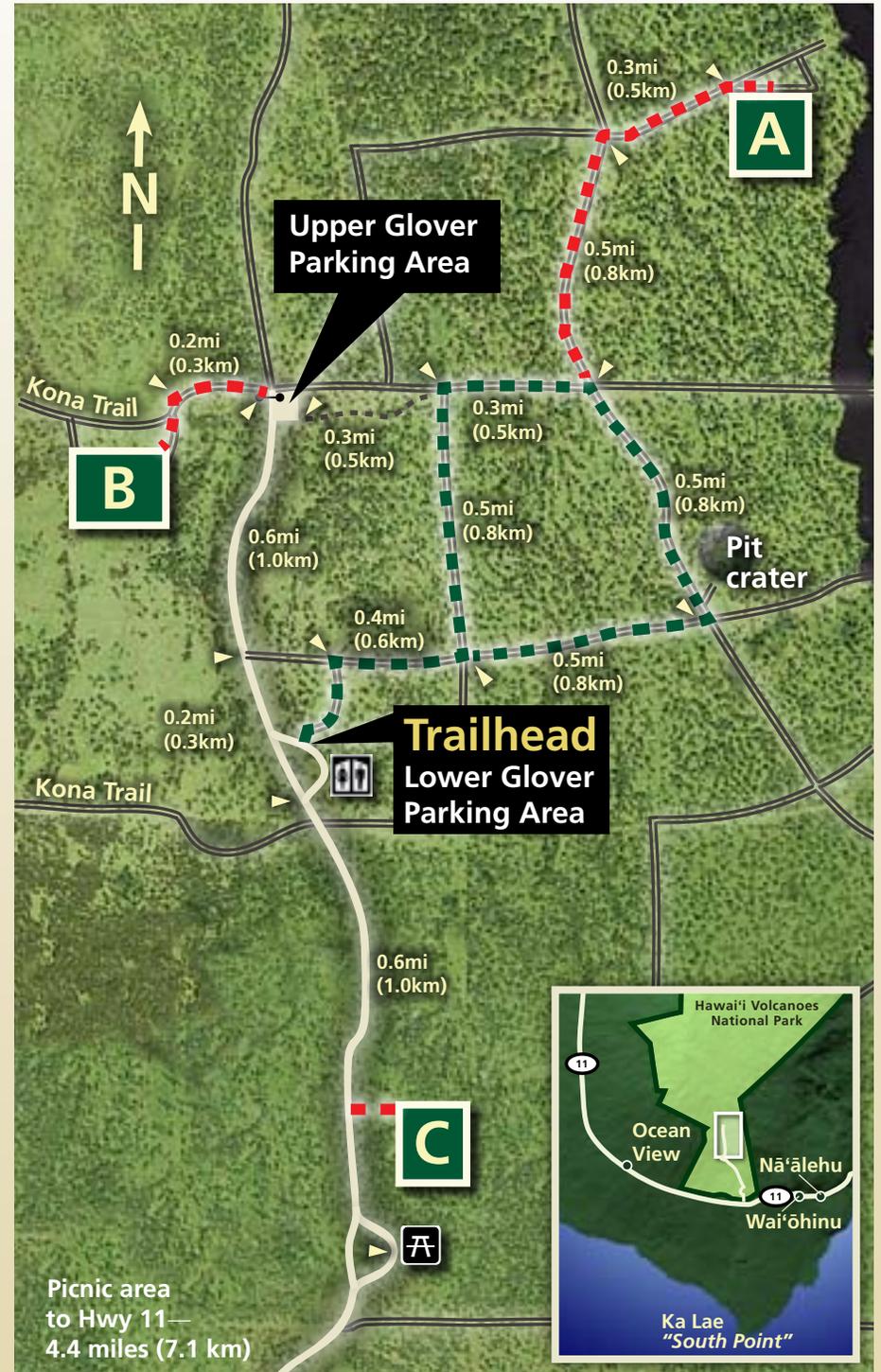
From the Upper Glover Parking Area, hike the Kona Trail west for 0.2 miles (0.3 km). Follow the signs to the enclosure. The western region of Kahuku is much drier than the east. This enclosure is just dry enough to include one dryland forest species—naio, the “false sandalwood.”

### C Lower Montane Mesic Forest



© JACK JEFFREY  
'apapane

From the parking area, look for the trail signs and walk east for just 0.1 miles (1.6 km). When the layer of pasture grass was removed, thousands of koa sprouted from seeds that lay dormant in the soil. This indicates that without ungulates, koa forests could be quickly replenished.



## Hawaiian proverbs from

- *‘Ōlelo No‘eau, Hawaiian Proverbs and Poetical Sayings*  
by Mary Kawena Pukui

## For more information

- *Hawaiian Natural History, Ecology, and Evolution*  
by Alan C. Ziegler
- *Hawai‘i’s Plants and Animals, Biological Sketches of  
Hawai‘i Volcanoes National Park* by Charles P. Stone  
and Linda W. Pratt
- *Islands in a Far Sea: The Fate of Nature in Hawaii* by  
John L. Culliney
- *Conservation Biology of Hawaiian Forest Birds:  
Implications for Island Avifauna* by Thane K. Pratt,  
Carter T. Atkinson, Paul C. Banko, James D. Jacobi,  
and Bethany L. Woodworth



To learn more about Hawai‘i Volcanoes National Park  
visit: [www.nps.gov/havo](http://www.nps.gov/havo).

To read more about Mauna Loa and historic eruptions,  
visit the USGS Hawaiian Volcano Observatory at:  
[hvo.wr.usgs.gov](http://hvo.wr.usgs.gov).

## To help restore the forest

Contact the Friends of Hawai‘i Volcanoes National  
Park at [www.fhvn.org](http://www.fhvn.org) or call (808) 985-7373.

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