

MĀLAMA 'ĀINA O MŌKAPU

(Protecting Mōkapu Lands)

"Fishponds (*loko i'a*), were things that beautified the land,
and a land with many fishponds was called a fat land (*'āina momona*)."

S.M. Kamakau, 1976:47



Mōkapu Fishponds, (1928. Marine Corps Air Station Kaneohe Bay Archives)

NU'UPIA PONDS WILDLIFE MANAGEMENT AREA NATURE TRAIL GUIDE

Marine Corps Air Station Kaneohe Bay, Mōkapu Peninsula

A guide to a one-mile hike through the Nu'upia Ponds

Wildlife Management Area at Mōkapu Peninsula, Kaneohe, O'ahu

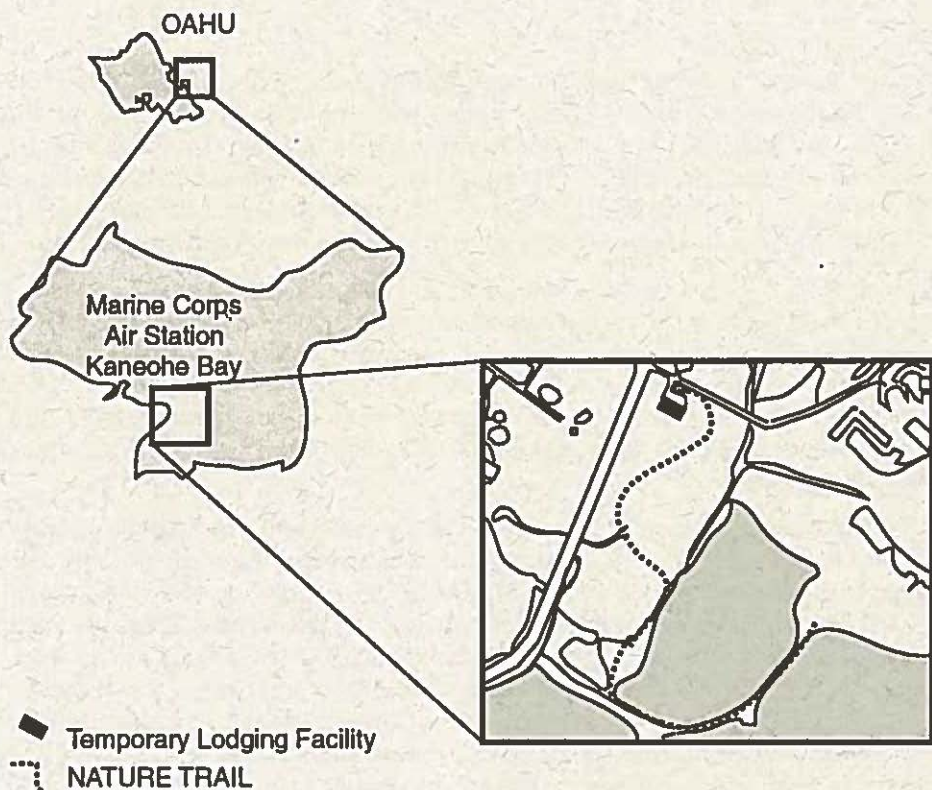
Aloha,

Welcome to the 482-acre Nu'upia Ponds Wildlife Management Area. The U.S. Marines at Mōkapu are proud of their award-winning achievements in wildlife conservation and historic preservation. The Marines manage the ponds as a protected wetland and endangered Hawaiian waterbird habitat in cooperation with the U.S. Navy, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the State of Hawai'i Department of Land and Natural Resources.

The trail will take us on a journey back in time into a past without a base exchange or commissary, a world without metal, electricity, or most of the foods you know. This was a civilization where all resources belonged to the gods, where the sea was both a highway and a farm, and where the word for freshwater (*wai*), when duplicated (*waiwai*), meant the same as "wealth." High chiefs (*ali'i nu*) were regarded as offspring of the gods, in charge of nearly everything on the island, as stewards for the gods.

Windward O'ahu is made up of two districts, Ko'olaupoko, and Ko'olauloa. Within each district are several pie-slice shaped land divisions called *ahupua'a*, which usually extend from mountain crests to beyond reefs, allowing access to the bounty of both land and sea. Linked to O'ahu by its fishponds, Mōkapu Peninsula was included as part of two *ahupua'a*: Kāne'ohe and He'eia. Prior to western contact in 1778 by Captain Cook, Ko'olaupoko supported one of the largest populations in the islands. Its residents maintained at least 30 fishponds along the Bay and hosted seasonal "courts" of O'ahu ruling high chiefs who stayed at Kailua. Kāne'ohe may have been O'ahu's most agriculturally productive *ahupua'a*, producing quantities of the staple food, taro.

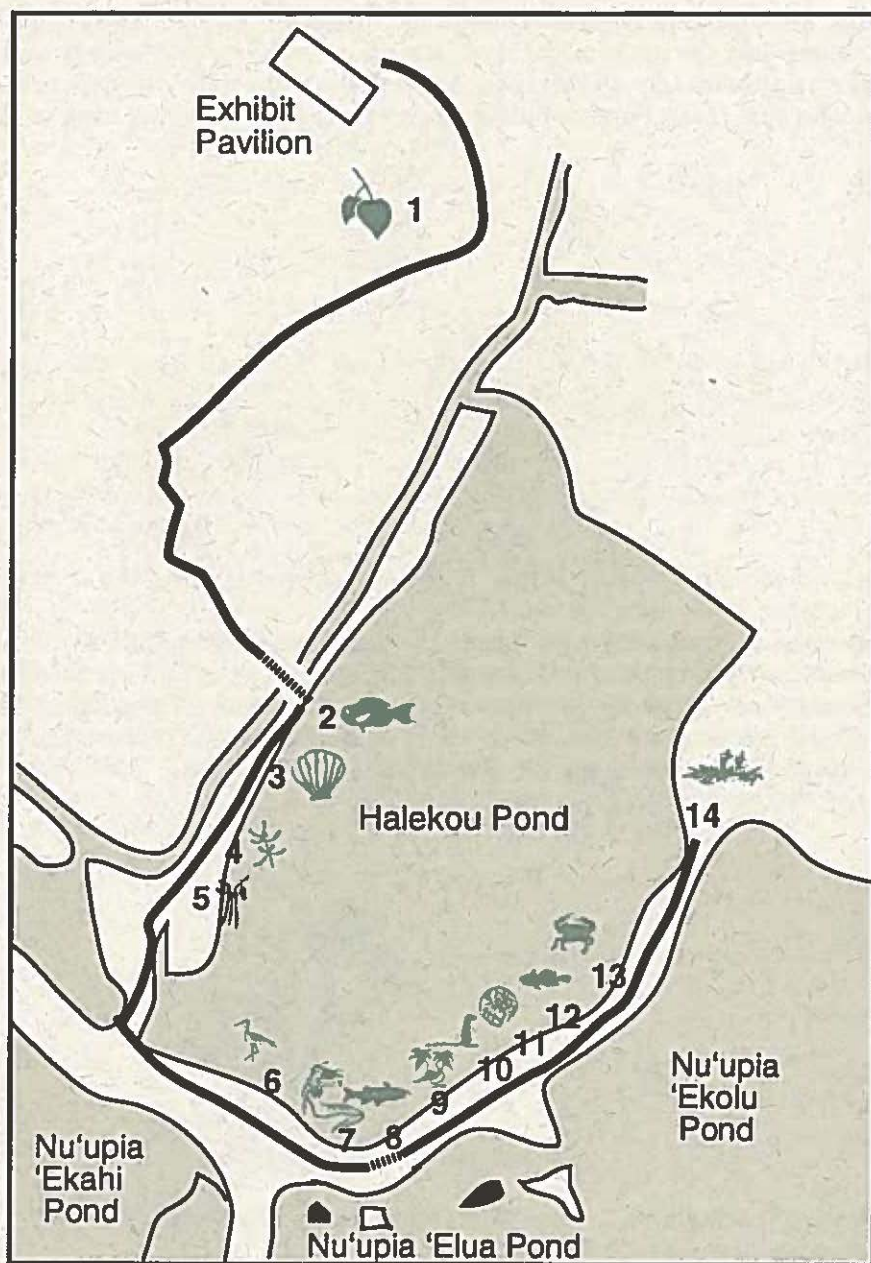
The people living at Mōkapu were self-sufficient; circulating seaweed, fish, feathers, salt, sweet potatoes and yams in exchange for taro, fruits, medicinal plants, timber, etc., from rich Kāne'ohe and He'eia uplands. Tending fishponds and saltworks, fishing offshore, caring for needs of the chiefs and their families, in harmony with their gods, kept them productively busy. As reminders of that early life, Mōkapu's fishponds remain as a haven and habitat for the endangered *kukuluāe'o*, a native Hawaiian black-necked stilt. These ancient ponds have also been declared eligible for listing in the National Register of Historic Places.



Hawaiian legend credits a boy of Mōkapu, Puniakalā'a, ("devoted-to-fish") with catching and taming a parrotfish, Uhumāka'ika'i, sometimes called the "parent of all fish," who then became his faithful companion. In the area of Keawanui on the He'eia shore of Mōkapu is a place famous for large schools of parrot fish (*uhu*) found there. Puniakalā'a's parents were Nu'upia and Halekou, for whom two Mōkapu fishponds are named.

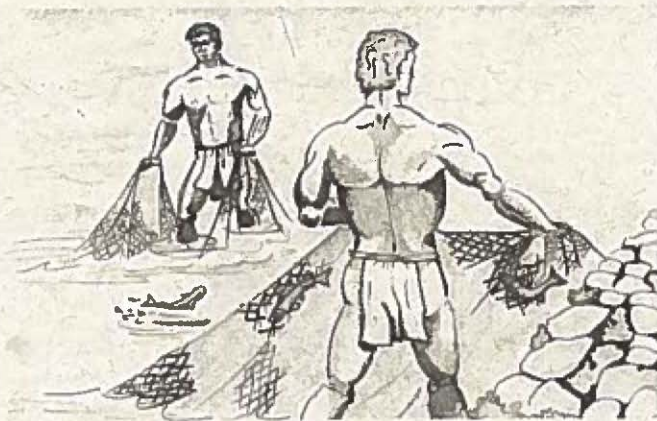
In other oral traditions, there are accounts of ancient navigators and seagoing chiefs, of supernatural fish, a *mo'o* fishpond guardian, and traditional gods of fishing. We'll talk about some of them as we go.

Nana i waele mua i ke ala, mahope aku mākou, na pōki'i.
He [or she] first cleared the path and then we younger ones followed. (2265)



E ho'ōki i ka ho'ino wale o hō'ino ia mai ke kumu. One should never go home without [some knowledge] lest his teacher be criticized. (291)

When Hawaiians used the ponds, they practiced *aloha* (respect), *laulima* (cooperation), and *mālama* (stewardship), which resulted in a desirable *lōkāhi* (balance). Please stay on the marked trail. It's an easy, level, one-mile round trip that will take approximately 45 minutes. We ask that you take away pictures and memories – and any trash (*ōpala*) found along the trail (!) – leaving only your footprints.



Halekou, mother of Puniakai'a who tamed the parrot fish, Uhumāka'ika'i, seems to have exhibited many of the traits Hawaiians found most desirable in woman-as-mother: she was ever generous to Puni and his friends, never lost faith in him, thought nothing too good for him, wept when he left home and cried tears of joy on his return. No matter what he asked, she loyally supported him.



"E Uhumāka'ika'i, come here ... Here I am, Puniakai'a, Bring all of the fish ..."
Hawaiian Fishing Legends, D. Kawaharada, 1992.

He Milo ka lā'au, mimilo ke aloha. Milo is the plant; love goes round and round. Said of the milo tree when its leaves, blossoms or seeds were used by a kahuna who practiced hana aloha sorcery. (818)

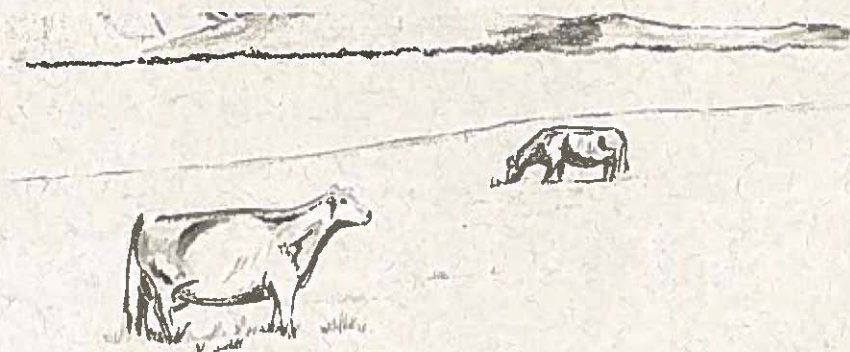
Stop 1 ... Under the spreading milo tree: gateway to the past ...



The shady *milo* trees above you are believed to have been brought to Hawai'i by its ancient Polynesian settlers. The wood was once much more common, prized by Hawaiians for foodbowls, containers, and canoe hulls. Surrounding parkland has been planted with species native to the Pacific. However, in the center of the park are alien golden shower and African tulip trees, together displaying blooms of Marine Corps colors, yellow and red.

As we head toward the trail, listen for wind through the needles of alien ironwood trees and, ahead, notice scrubland where farming and ranching took place early in this century, completely changing these windward lowlands. *Koa haole* plants were brought to Hawai'i to fatten cattle, and have since become a weed, crowding out native species in many places. Here, the *koa haole* and introduced grasses provide modern buffers between the ponds and developed areas. Archaeological studies indicate vegetation was sparse in this area in earlier times. The few native plants remaining, such as the *milo* and *hau* found here are, like the ancient ponds, increasingly valuable remnants of Hawai'i's legendary past.

As we approach Stop 2, buildings and roads will become less evident.



Pala ka hala, momona ka uhu. When the pandanus fruit is ripe, the parrot fish is fat. The sea urchin, a favorite food of the parrotfish, is fat during the season when the pandanus fruit is ripe. Feeding on fat sea urchin, the fish, too, become fat. (2588)

Stop 2 ... Ancient engineers, Hawaiian excellence: fish stories and little people ...

Halekou Pond to your left is separated from Nu'upia Pond by its coral and lava rock wall. Manpower required to build a fishpond such as this was easily obtained by an island or district high chief or by the *konohiki* (manager-chief) of an *ahupua'a*. People knew a fishpond was a community benefit. Thousands of commoners and lesser chiefs worked together many months, carrying and placing coral or lava rock to build the walls, under direction of a fishpond "architect" priest. Once built, fishponds filled food provision needs for all classes of society, with chiefs reserving exclusive rights to certain fish. Some of the most ancient fishponds were attributed to *Menehune*, Hawaii's legendary stone masons, who are said to have built huge temples and fishponds in a single night. Of all Polynesians, only Hawaiians developed engineering skills to build such fishponds and other remarkable water management systems.

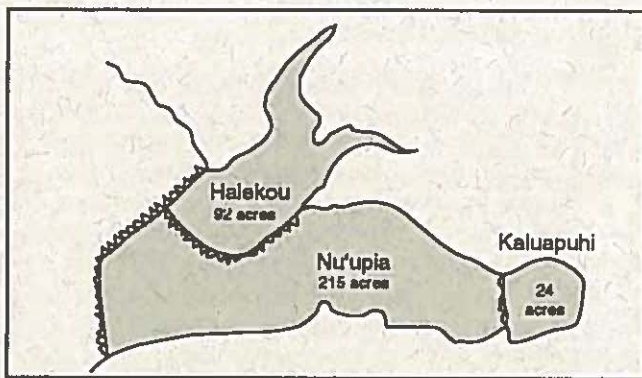
Notice new odors here; the green smell of live and decaying vegetation, and the scent of the sea. Pond walls are hard to see here, because alien mangrove trees have become established on and near the walls. Rampant growth of these trees represents the greatest threat to survival of the centuries-old fishpond walls; thus, the Marine Corps' efforts to bring them under control have intensified.



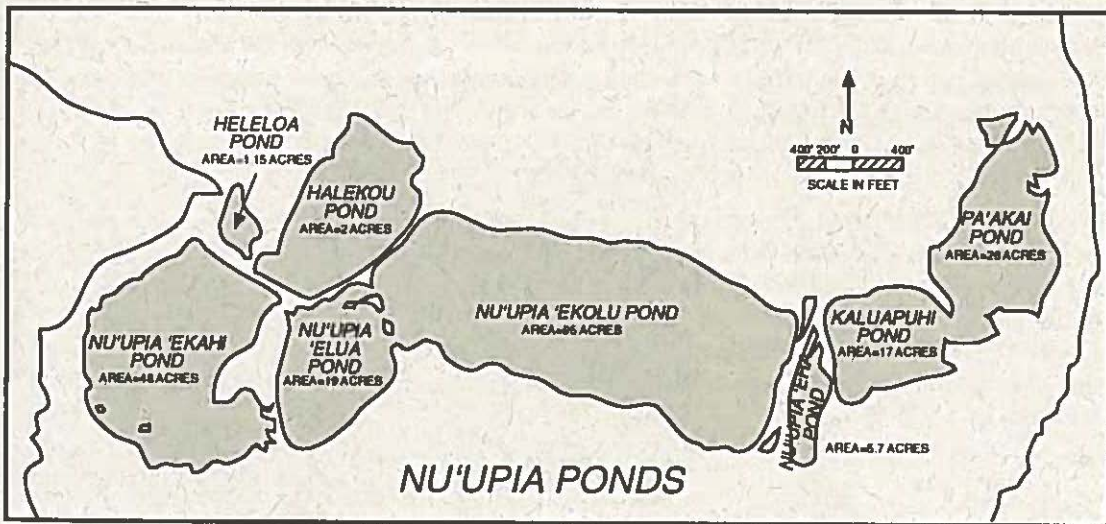
He pūko'a kani 'āina. A coral reef that grows into an island. A person beginning in a small way gains steadily until he becomes firmly established. (932)

In Hawaiian times, before contact with any non-Polynesians, Mōkapu had three large ponds: Nu'upia, Halekou, and Kaluapuhi.

Over time, they were subdivided into eight smaller ponds. The two largest remaining segments of Nu'upia and Halekou are visible from the trail. These ponds are *loko kuapā*, fishponds defined as being "made by building a wall on a reef," differing from mere fish traps, *loko 'umeiki*, and from such fishponds as *loko pu'uone* – located near the sea but inland of sand dunes, and *loko wai* – which were freshwater ponds. (For a partial list of types of fish "farmed" by Hawaiians in seaward fishponds, see pages 14 and 18).



Acreage by Mc Allister, 1933



Stop 3 ... Reclaimed lands, ancient sites, sailors home from the sea ...



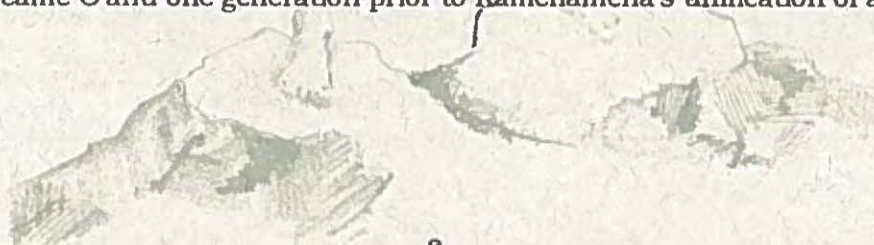
This channel drains to Kāne'ohe Bay from the Station golf course. Look across the water and you can see traces of the former landfill located there, another example of how the uses of Mōkapu lands have even changed its physical configuration since Hawaiian times, only 200 years ago.

As we cross over the bridge, you may see crabs present in the waters, descendants of those living here in earlier times. You can see clamshells, as well, in the soils at your feet on the fishpond side of the channel. They are indicators of the nature of a former channel archaeologists believe was located here before the fishponds were built, which allowed for heavier flushing of the waters than occurs here now.

Beyond the golf course which this channel drains – on the north shore, beyond Pu'u Hawai'i Loa with "Kansas Tower" on its crest – are dunes listed in the National Register of Historic Places as the Mōkapu Burial Area. A 1946 fisheries map (based on one dated 1913) shows the peninsula's north shore divided into Mōkapu, Heleloa and Kua'a'ohe lands and fisheries.


Oral tradition holds that Kua'a'ohe was birthplace of an ancient Hawaiian navigator, Paumakua, whose father is said to have brought the first Menehune, Hawai'i's "little people," from a distant land called *Kahiki*. Many O'ahu events are dated geneologically from the time of Paumakua. Other sources credit the legendary navigator, Hawai'i Loa, whose name is memorialized on Mōkapu by the hill (*pu'u*) bearing his name, with bringing *Menehune* to these islands. Perhaps of even more ancient vintage is a Mōkapu reference to the "wooden bowls of Maui-ki'iki'i (Crested Maui)," a ruler of the distant past, to whom another site at Mōkapu may refer: Ki'i Point, on Ulupa'u Crater.

A powerful 16th century O'ahu king, Pele-io-holani, made his home at the juncture of Kāne'ohe Bay and Nu'upia Fishpond at Malaea on Naonealaa lands, where a war was averted when Pele-io-holani was able to dissuade Hawai'i Island's Alapa'i-nui-a-Ka-uaua from aggression. At least one reference calls the cliffs of Mōkapu's Ulupa'u crater, "Kahekili's Leap," perhaps in memory of a Maui king of that name who overcame O'ahu one generation prior to Kamehameha's unification of all the islands.

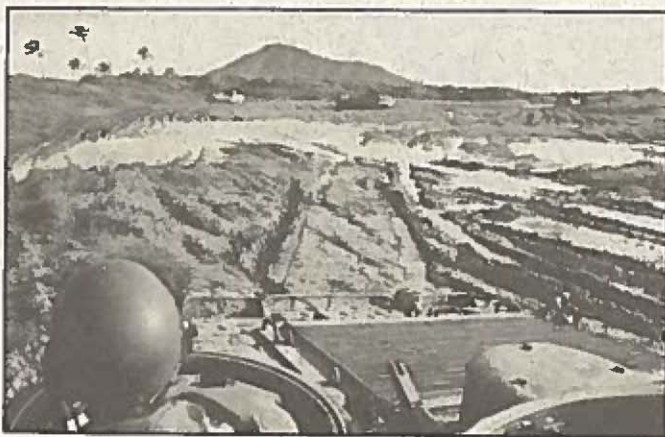


E 'ai i kekāhi, e kāpī kekāhi. Eat some, salt some. Said to young people: Eat some now and save some for another time. (252)

Stop 4 ... Fresh water, salt, and pickles ...

 Hawaiians knew fishponds must be less than three feet deep to allow for sunlight penetration of silt-filled waters, providing energy for algae to grow on the fishpond floor. Algae, the food of herbivorous fish, is the base of the fishponds' food chain. Since sunlight evaporates water from shallow ponds, fresh water from rain and runoff is also essential to keep ponds from becoming too salty. Even though many inhabitants can adapt to wide seasonal fluctuations in salinity, diffused fresh water intrusion through the fishpond floor may be inadequate to keep the ecosystem in balance during a long, hot summer, due to high levels of evaporation caused by heat and wind. Just beyond this stop, fresh water runoff is channeled through Station storm drains; meets marine waters; and delivers such nutrients as nitrogen and phosphorous. These are derived primarily from decomposing vegetation and other organic materials generated by land use discharges.

A succulent-type, alien creeping plant found along the trail is commonly called "pickleweed" (*'ākulikuli-kai*) because of its dill pickle taste. This alien plant, introduced more than 100 years ago, often over-grows mudflat areas used by Hawaiian stilt for nesting and feeding. Before nesting season, Marine Corps personnel use Assault Amphibian Vehicles (AAVs) to clear pickleweed from the endangered Hawaiian stilt nesting grounds, while creating "moat and island" terrain to discourage access by four-legged or four-wheeled predators.



On pickleweed patrol.

A related native succulent, *'ākulikuli*, is also found here, which was occasionally used by Hawaiians as an edible, cooked green vegetable. Where pickleweed sends out erect shoots, notice how the *'ākulikuli* hugs the ground and displays tiny, pink blossoms.



D. Drigot

He po'i na kai uli, kai ko'o, 'a'ohe hina pūko'a. Though the sea be deep and rough, the coral rock remains standing. (905)

Stop 5 ... Transifion zone: a case of confused identity ...



Modern managers of Mōkapu's ponds have problems undreamed of in ancient times. Today, native plants fight a constant war against modern introduced plants for sunlight and space to grow. Mangrove, valuable on its home turf, is but one example.



D. Drigot

Although it may provide the only shade around, the Florida red mangrove is a significant pest. Intentionally introduced to Moloka'i at the turn of the century to reduce coastal erosion, it now clogs channels between ponds and reduces circulation. Mangrove also is established on pond walls where it can pull them apart. It degrades sediment and water quality, creates cover for predators, and encroaches onto mudflats preferred by

nesting endangered Hawaiian stilts. Kāne'ohe Marines fight a never-ending battle with these trees.

The ponds had little vegetation surrounding them until recently. About 80 percent of mangrove growth has ocured in the last 15 years. Where it once grew so thick that the channel was completely hidden from the path, weeks of work costly in manpower and dollars has noticeably thinned mangrove density here.



Clearing mangrove from fishpond wall

D. Drigot

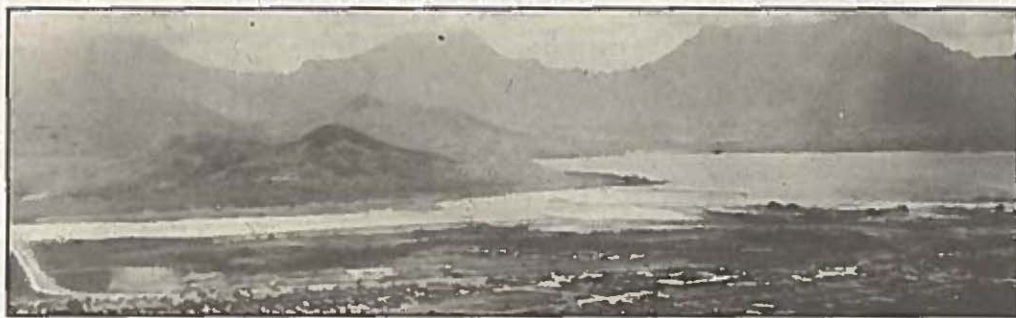


Photo #2477, U.S. Army Museum of Hawai'i, August 19, 1945

Okī kilohana ka pali o Waiāloha. Straight and tall is the cliff of Waiāloha.
Said in admiration of a tall, well-formed person. (2465)

Stop 6 ... Long-stemmed Beauties ... *Kukuluāe'o*, the endangered

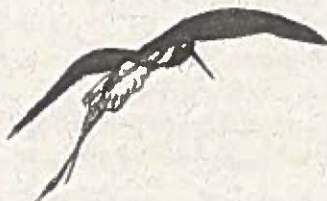


Hawaiian stilt

The Hawaiian name for Mōkapu's prized resident describes the bird as "one standing tall." Nattily dressed in black with white breasts, their distinctive long, pink legs give them a graceful, elegant look. The Nu'upia Ponds Wildlife Management Area is one of a few remaining breeding areas for these shoreline browsers, which nest between mid-February and late August.



In Hawaiian times, long-legged persons were often humorously referred to as "āc'o." The birds' erect stature identifies them with one of the major gods, Kū, sacred to many human activities and, as Kū-ūla-kai, he is sacred to fishermen.



If you are on the trail here by Halekou loko during nesting season, you will hear the stilts' distinctive cry of alarm. Hearing an intruder, the stilts will dive and screech at any potential predator. The rest of the year the stilts are visible, but not as loud and less aggressive. They prefer to nest close to water on bare ground, surrounded by little or no cover. At Nu'upia, the Marine Corps has improved nesting habitat by constructing artificial nesting islands and by clearing dense vegetation adjacent to the ponds.

He kino pāpālua. A dual-formed person. Said of a supernatural being having two or more forms, or of one who is "possessed" by intoxicants. (694)

Stop 7 ... Mo'o monsters, Hawaiian sea sirens, or guardian goddess ...



According to legend, many Hawaiian water resources were guarded by *mo'o*, dragon-like demi-gods having powers to change their body forms at will, sometimes appearing as beautiful women, or as frightening and awesome creatures. Myth often describes reptilian bodies for *mo'o*, but they could apparently take other fearsome forms, as well. Across the Bay in the He'eia pond, the *mo'o* Meheanu is said to have appeared as a beautiful woman, and as a frog, lizard, or eel.

The north shore Waialua fishpond complex, Lokoea and 'Uko'a, were said to have been home for a shark god named Niukala; and for shark gods paradoxically named Puhī'ula (red eel) and Laniwahine. In other descriptions, the *mo'o* Laniwahine appears either as a lovely woman or in lizard form. At Mōkapu, Kaluapuhi, the "eel pit" fishpond of our complex located near Kailua Bay, is said to be home for such a *mo'o*, about whom we know too little.

The traditional role of *mo'o* was as guardian for a specific water resource area, whether spring or fishpond. The nearby Kailua freshwater fishponds, Kawai Nui and Ka'elepulu, were guarded by the *mo'o* Hauwahine, and her unidentified companion. There is a rich oral tradition for Hauwahine's special protection of the young, the old, and the poor of her area, and her commitment to enforcing justice when chiefs became arrogant.

Note that the fishpond coral wall is visible after this Stop. It is very fragile and easily damaged. When in use by Hawaiians, walls required constant rebuilding with coral and sediment from the ponds, thus strengthening the walls, filling cracks through which fish might escape, and making a more stable walking surface for the people managing the ponds. If you notice coral pieces that have broken from the walls, please leave them.

Incidentally, just past this stop eels might be seen under the bridge, usually in their fish form, but if you see a beautiful woman on the bridge, combing her long hair with a comb made of turtle shell ...

Stop 8 ... A fine-kettle of fish: Loko Nu'upia residents ...



Today, Nu'upia Ponds support a variety of fish that are especially adapted to a constantly changing environment:

'ama'ama — The mullet, like many fish in Hawaiian waters, has several names, depending on its stage of development. Mullet was considered among the choicest of herbivorous (plant eating) fish for fishpond cultivation. Still present in the Nu'upia Ponds, *pua'ama* (the "bud" of the 'ama'ama, mullet fry), are important in the diet of Hawaiian stilts. If you watch the pond surface, you are likely to see mullet jumping. Mature O'ahu mullet, *'anaeholo*, migrate seasonally around the island from Pu'uoloa at 'Ewa where they breed, to Kaipapa'u near Kahuku, and back again. Hawaiians call them "fish fetched by the wind" and "sea pigs." Large schools are known to pause off Mokumanu Island before continuing on to Lā'ie.

mollie — These omnivorous (eats anything) fish were introduced to freshwater streams in the early 1900's, probably as a control for mosquito larvae, as were the tilapia, below.

tilapia — An introduced omnivorous (eats anything) fish, these aggressive, highly adaptive fish have replaced mullet as the most common fish in the ponds. Stilts also eat tilapia juveniles, and they must compete with tilapia for all young fish in the ponds.

'o'opu-kai — Various species of bottom-living goby fish are found throughout Hawai'i. Rather small fish, they are considered very tasty by Hawaiians. Those found in the Mōkapu ponds usually sit on the bottom, preying on small fish and crustaceans.

awa — The white, delicious milkfish is nearly as popular as the mullet, and both were farmed by Hawaiians and the later Chinese pondkeepers.

awa 'aue — The lady fish are inshore fish which were also bred in ponds where they remained smaller, but became fatter, than those in open waters.

moi — The threadfin shad were reserved for use by the chiefs, forbidden to commoners. Not a common fish, on O'ahu, Mōkapu and Ka'ena Pt. waters are famed for them, but not these ponds. Appearance of a large school of *moi* was an omen of disaster to a ruling chief.

pāpio — This is the name for young *ulua*, or crevally, which becomes very large in offshore waters. Kailua Bay is famous for its *ulua*.

kākū — The barracuda was the enemy of pondkeepers. It is reputed to be vicious toward other fish, growing four to six feet long, with a large appetite. A valued open ocean fish, pondkeepers hated them when they entered the ponds.

He 'uala ka 'ai ho'ōla koke i ka wi. The sweet potato is the food that ends famine quickly. It matures in a few months. (946)

Stop 9 ... Keepers of the ponds ...



This is Nu'upia, once the largest of the ponds, from which today's collective name for the fishpond complex comes. A literal translation of *nu'upia* is "heap of arrowroots." This starchy plant, used for food, was reportedly cultivated by Hawaiians on lands adjacent to the fishponds in former times, but is not found here today. Ethnobotanists say *pia* was usually grown around wetland taro gardens called *lo'i*. Studies show no evidence that either taro or arrowroot were cultivated on the peninsula, but have shown that sweet potatoes and yams were grown.

Pia is also a name for a type of sweet potato, while *pi'a* is a name for a type of yam. Future archaeological testing may identify other species of plants grown on Mōkapu in former times, and help to explain the name. Another less complicated possibility is one mentioned earlier: that the ponds were simply named for the legendary pondkeepers living here — Nu'upia and his wife, Halekou.

Before lands were privatized in 1848 through a process called the Great Māhele, planting rights could be claimed by anyone, but private land ownership was unknown. The stated intent of the Māhele was to introduce private ownership of property by a series of quit claims between the king and 251 chiefs. Lands were also assigned to the government and some commoners. The alien practice of buying and selling land resulted in most commoners failing to receive awards, and many who did soon lost their lands, while newcomers acquired many acres.

The most desirable lands had water and were usually highly productive. They were symbolic of power, natural and supernatural. Significantly, following his conquest of O'ahu, King Kamehameha I did not redistribute Mōkapu to other ali'i. By the time of the Māhele, however, while Kamehameha III retained Kaluapuhi Pond, most of Kāne'ohe *ahupua'a* was granted to Queen Kalama, his wife.

Alien diseases decimated the windward Hawaiian population prior to 1850, and Mōkapu fishponds fell into disuse. Formerly indentured Chinese laborers eventually leased Nu'upia ponds, and may be responsible for subdividing the ponds to produce mullet and milkfish for Honolulu markets.

Now, the Marines are primary keepers of the ponds, charged with a federal mandate to protect these treasures of the past, while ensuring America's military readiness into the future.

Stop 10 ... Predators ... Beware!



Ancestral Hawaiian stilts arrived in these islands long ago from North America and over time evolved into a new sub-species. When Hawaiians arrived about two thousand years ago, their introduction of dogs, rodents and pigs was detrimental to ground-nesting birds such as stilts. However, water engineering projects of Hawaiians such as fishponds and flooded taro gardens actually may have increased numbers of waterbirds, despite the new

threats. Modern era introduction of cats and mongooses, replacement of taro *lo'i* with crops less favorable to water-dependent wildlife, and in-filling of many old fishponds with dredge spoils for land development have collectively presented survival problems for stilts. Many other waterfowl and migratory bird species have also been impacted by habitat loss and predator introductions.

Domesticated cats and dogs, and those that have become feral (wild), remain constant threats to these and other endangered birds. Predator control is constantly enforced by Marine Corps Air Station game wardens. On an annual basis, Mōkapu game wardens impound about 150 dogs, 250 cats, and 300 mongooses!



D. Drigot

Stop 11 ... *Mākāhā*: Hawaiian grates and Chinese gates ...



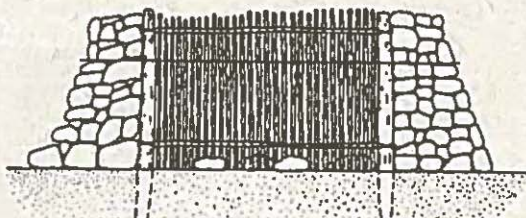
A. Landgraf

These two wooden beams sticking out of the wall were part of a *mākāhā*, a sluice gate through the pond wall. The channel formed here by the width of the wall was once much deeper than it is now. *Mākāhā* served three main functions: they allowed

juvenile fish to enter from the sea while keeping adult predators out, they regulated the flow of water between ponds and sea, and they allowed efficient harvesting. This gate was probably built in recent years by Chinese companies commercially leasing the ponds, while two other gates along the trail are older, but probably not of early Hawaiian construction.

Hawaiian gates were long pieces of wood woven together in immovable, fixed structures more properly called "grates." These allowed entry by juvenile fish and kept in those that grew fat in the ponds, but kept predators out. In either case, fish would congregate at the barred openings where they were easily caught by nets.

To harvest fish, Chinese pond keepers would lift the gate and allow an inflow of water through the channel connecting Nu'upia with Halekou attracting a rush of fish. Only those fish needed at the time were taken with scoop nets. Hawaiian grates retained fish attracted by tidal flow and salinity changes. The same technique applied to the gates or grates that opened through walls separating ponds from the sea. Fish were harvested by fishfarmers utilizing hand-held nets or, if a large quantity of fish were required, by long nets used to encircle fish, similar to inshore ocean fishing techniques.



Wehe i ka mākāhā i komo ka i'a. Open the sluice gate that the fish may enter. (2923)

C. Summers, 1964

Stop 12 ... Ancient fishponds, modern times ...

Centuries before Euro-American contact with people of the Pacific, Polynesians had learned how to construct fishtraps, simplifying protein food production for growing populations. Only Hawaiians carried the concept to an art form, allowing actual fish farming in ponds. By linking fish production to other agricultural pursuits, both inland and seaward fishponds relieved fishermen from seasonal *kapu* (restrictions) placed on harvesting some species of fish from the ocean.

Fishponds became identified with land activities, rather than with the sea. While Mōkapu's fishponds were seaward "farms," their use for storing food was also valuable, especially when the island king (*mo'i*) and his entire court was in residence at nearby Kailua. Then the ponds fulfilled roles similar to today's refrigerators, pantry shelves and freezers, supplementing other food preservation techniques by salting and drying. Fresh fish were available as needed, regardless of weather and ocean conditions. An immortalized famous runner of the area was Ulunui, who was sent to fetch wriggling dining choices from windward fishponds for such notable *ali'i* (chiefs) as Kakuhihewa of O'ahu, Lonoikamakahiki of Hawai'i, and Ali'i Wahine (Chiefess) 'Oha'i-kawili-'ula of Kaua'i, while in residence at Kailua or Waikiki.

Fish "farmed" at Mōkapu probably included mullet, perhaps saltwater *'o'opu-kai*, and other possible species such as *awa* and *awa 'aia*. There would have been *'opae* (shrimp) species and, perhaps, *limu* (seaweed/algae).

Carnivorous fish present today, such as *pāpio*, *āholehole* (silver perch), and *moi* were probably not cultured in Mōkapu's too-shallow fishponds; those present today swim in and out freely. It is uncertain that *uhu* or *kākū* were ever farmed. Pending future archaeological study, the only known records of Mōkapu historic fish production related to two Chinese firms that regulated O'ahu market supply of the herbivorous fish species, *awa* and *'ama'ama*, from the turn of the century until the 1950s.

Located near a *mākāhā* to prevent poaching, the traditional pondkeeper's guard house (*hale kia'i*) was reportedly located near the present Station H-3 entry gate.

Stop 13 ... Living downwind, and at the edge ...

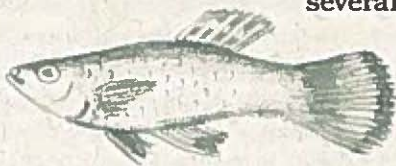


Essential to fishpond ecosystems are their unpretentious edges:



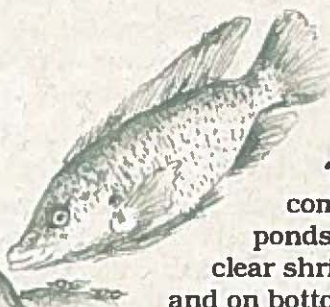
Hu'a — Soap-like bubbles build up along fishpond walls, the natural result of wind blowing over the surface of the pond water. Surface wavelets mix air bubbles into the water and the bubbles become coated with protein substances, creating a floating foam.

Limu — Seaweeds existing at the edges of the ponds provide a home for several small invertebrates, and a meal for several species of fish. Most *limu* found here today are not species eaten by people, but are vital to the ecosystem.



Pipipi — This neritid snail is often found on rocks at the water's edge feeding on algae. Black peppercorn-sized, they are difficult to see.

Papa'i — Swimming crabs common to all Hawaiian coastal waters are also residents of the ponds. Their back legs have evolved into two efficient paddles, making them the most agile of crabs. They eat algae and various animals caught with their large claws.



'Ōpae-huna — The most common shrimp in Mōkapu's ponds is the glass shrimp, a tiny clear shrimp that lives along the edges and on bottoms of the ponds. They feed on small pieces of animal and algal material.

Pinao — A native red dragonfly, these insects feed at the pond surfaces. Such water insects are a food source for stilts.

Moena Limu — Mullet and many other fish raised by Hawaiians in saltwater and brackish ponds are plant-eating fish. They feed on a thin algal mat composed of microscopic algae (primarily diatoms and blue-green algae) and small particles of debris. This mat is the base of the Hawaiian fishponds' food chain.

Hānau ka 'āina, hānau ke ali'i, hānau ke kanaka. Born was the land, born were the chiefs, born were the common people. The land, the chiefs, and the commoners belong together. (466)

Stop 14 ... Mālama 'āina: stewardship of the land ...



The mudflat area before you is one of the three most important areas in the state for breeding and nesting Hawaiian black-necked stilt. Loss of wetland habitat through encroachment by alien plants, unchecked siltation in abandoned fishponds, and urban demands for dredged and filled shorelines, complicated by predation unknown in pre-contact times, are collectively responsible for drastic declines of the Hawaiian stilt population.



R.J. Shallenberger

Stilt nest

Waterbird populations are systematically counted several times a year by teams of state and federal environmental personnel. Recent counts have shown that Mōkapu's stilt population is growing! Between 1982 and 1992, the baseline stilt count has increased from 60 to over 160 birds.

Other kinds of birds also frequent this area. For example, visitors may see 'iwa (great frigate bird) majestically soaring overhead; 'auku'u (black-crowned night heron) patiently waiting on the shore for dinner to appear in nearby waters; 'uilli (wandering tattler) bobbing along water's edge in search of invertebrates; 'akekeke (ruddy turnstone), one of several annual migrants from Alaska; and *kolea*, a migratory winter resident from the arctic which has a solid place in pan-Pacific mythology.

Mōkapu Marines will proudly continue to protect these remnant ancient fishpond treasures as precious biological and cultural resources in the years to come.

Ua hala nā kūpuna, a he 'ike kōli'uli'u wale nō kō keia lā, i na mea i ke au i hope lilo, iō kikilo. The ancestors have passed on; today's people see but dimly times long gone and far behind. Place Names of Hawai'i, M.K. Pukui, S.H. Elbert & E.T. Mookini

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D. Drigot

Archaeologist supervises work protecting ancient walls.

GLOSSARY OF HAWAIIAN WORDS

- āholehole*. Silver perch-like fish. *Kuhlia sandvicensis*.
ahupua'a. Land division usually extending from mountain into sea.
'āina. Land, earth.
'akekeke. Ruddy turnstone. *Arenaria interpres*.
'ākulīkuli. Coastal herb. *Sesuvium portulacastrum*.
'ākulīkuli-kai. Tropical American, low succulent. *Batis maritima*.
ali'i. Chief, chiefess, king, queen, noble, royal.
aloha. Love, affection, compassion; greeting, regards, beloved, etc.
'ama'ama. Mullet. *Mugil cephalus*.
'anaeholo. O'ahu migrating mullet. *Mugil cephalus*.
'auku'u. Black-crowned night heron. *Nycticorax nycticorax hoactli*.
awa. Milkfish. *Chanos chanos*.
awa 'aua. Ten-pounders, ladyfish. *Elops hawaiiensis*.
hale kia'i. Guard house, watchtower.
hau. Polynesian tree. *Hibiscus tiliaceus*.
hu'a. Foam, bubbles.
'iwa. Great frigatebird. *Fregata minor palmerstoni*.
kākū. Barracuda. *Sphyrnaidae*.
kapu. Taboo, prohibition, restriction; sacred, forbidden, etc.
koa haole. *Leucaena leucocephala*.
kolea. American golden plover. *Pluvialis dominica fulva*.
konohiki. Headman of *ahupua'a*; manager-chief.
kukuluāe'o. Hawaiian stilt (also, *ae'o*). *Himantopus mexicanus knudseni*.
laulima. Cooperation, work together.
limu. General name for seaweed/algae.
lo'i. Wetland taro garden, irrigated terrace.
lōkāhi. Unity, agreement, accord; be in agreement.
loko. In, inside, within; character, pond, lake, pool.
loko i'a. Fishpond.
loko kuapā. Fishpond built on the reef.
loko pu'uone. Pond near the shore.

loko 'umeiki. Fishtrap.
loko wai. Fresh water pond.
Māhele. Land division of 1848.
mākāhā. Sluice gate, as of a fish pond.
mālama. Take care of, keep, preserve; caretaker; stewardship.
Menehune. Legendary race of small people; stone masons at night.
milo. Polynesian coastal tree. *Thespesia populnea*.
moena līnu. Algal mat.
moī. Threadfin fish. *Polydactylus sexfilis*.
mo'i. King, sovereign, ruler, queen.
momona. Fat
mo'o. Reptile, lizard, dragon; water spirit; enchanter.
nui. Big, large, great, important.
'o'opu-kai. Saltwater goby fish. *Gobiidae*, *Eleotridae*.
'ōpae. Shrimp. General name for shrimp.
'ōpae-huna. Glass shrimp. Perhaps *Leander* sp. or *Palaemonella* sp.
'ōpala. Trash, rubbish, refuse, litter.
papa'i. Swimming crab.
pāpio. Young ulua, Crevally or jack. *Carangidae*.
pia. Polynesian arrowroot. *Tacca leontopetaloides*.
pia. Polynesian white sweet potato ('Uala-pia). *Ipomea batatas*.
pi'a. Polynesian yam. *Dioscorea pentaphylla*.
pinao. Hawaiian dragonfly.
pipipi. Neritid snail. *Nerita picea*, *nerita neglecta*.
pua'ama. Mullet fry. *Mugil cephalus*.
pu'u. Hill, peak, mound, bulge, bump.
'uala. Polynesian sweet potato. *Ipomea batatas*.
uhu. Parrotfish. *Scarus* species.
'ulili. Wandering tattler. *Heteroscelus incanus*.
ulua. Certain species of crevally or jack. *Carangidae*.
wahine. Woman, lady, wife, etc.
wai. Freshwater, liquid excepting seawater (kai).
waiwai. Goods, property, wealth; to enrich.

*He mau maka laha 'ole. Faces that are rare. Said by members of the royal court in speaking of their chiefs with appreciation for the privilege of serving. The faces of the ali'i were rarely seen. (810)**

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* Note: Numbered Hawaiian sayings throughout the brochure are from *'Ōlelo No'eau, Hawaiian Proverbs & Poetical Sayings*, collected, translated and annotated by Mary Kawena Pukui, 1983.



Mōkapu Fishponds, 1975. Marine Corps Air Station Kaneohe Bay Archives

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