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Hawaiian perspectives on wetland species.ppt
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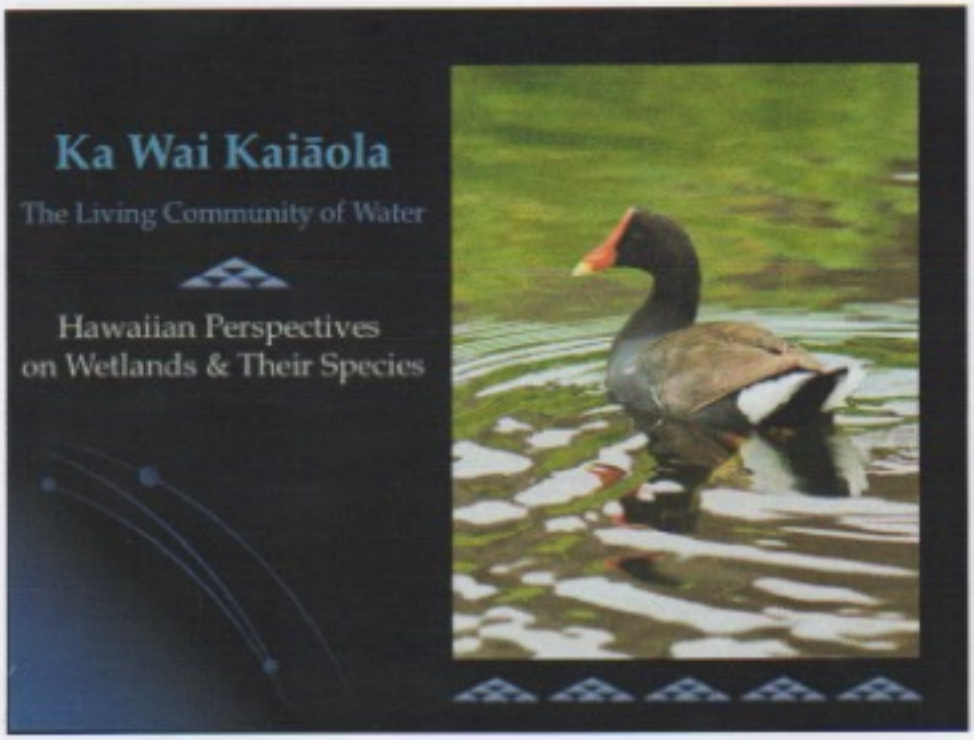


Hā'ale'ale ka leo ka 'alae, he māpuna leo polo'ai i ka la'i
He pule kānaenae i Ulupō, iulu pono la i Ulumawao
Kakali ka neke i ka nihi, ka ni'o o ka Wahinewai
E nihi ka hele nei e, e nihi ka hele nei e!

Whenever we gaze upon a vast expanse of Hawaiian wetland, we are looking at an ecosystem type that was fundamentally essential to ancient Hawaiian life. An abundance of wai, of freshwater, assured the people of sustenance through all seasons,

So that the word wai redoubled as waiwai, is the word for riches. The root of waiwai is also related to another, less-well-known meaning of wai, which is to retain. When water is retained upon the landscape, the conditions for life and abundance are met.

Of all the aspects of the Hawaiian natural world, the movement of water above, on and under us, has always been the driving factor governing life in these islands. Today I want to share some of the fundamental aspects of traditional Hawaiian perspectives on that vital envelope and how traditional oral information sources in chant and story point to an intimate and personal relationship between people, water, and wetlands, personified in the spiritual structure of the Hawaiian universe.

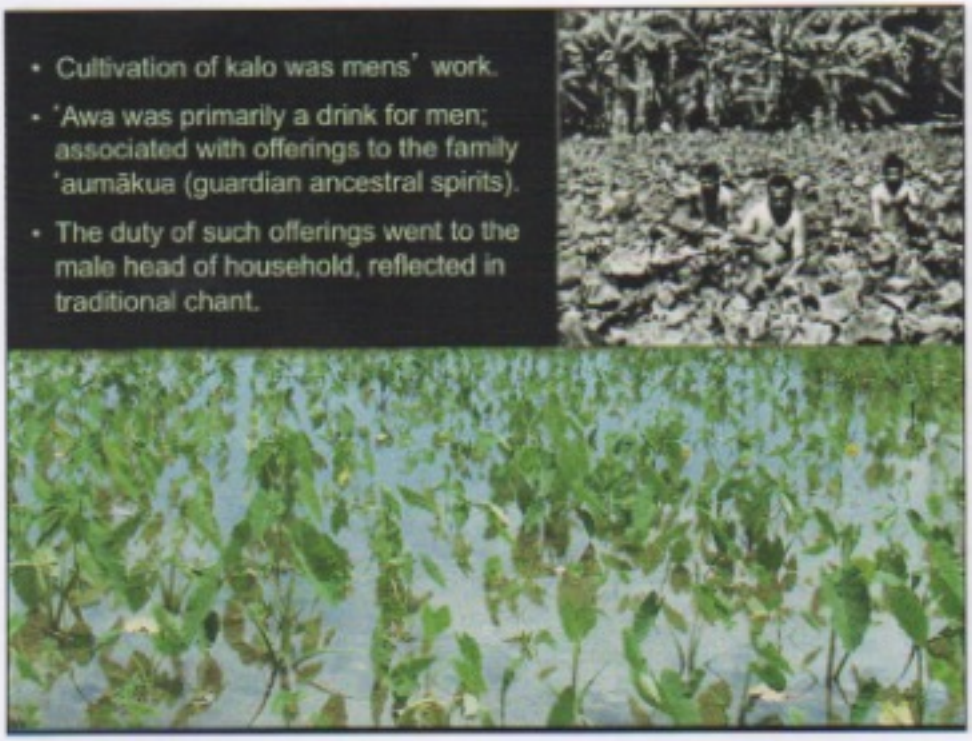
The role of freshwater in ancient Hawaiian life was so fundamental that the two major sources of freshwater – water from the ground (springs, wetlands, and streams) and water from the sky (clouds and rain) were attributed to two of the four major Hawaiian gods, and in turn, closely matched to the major food crops that each of them represented.

Kāne and his brother Kanaloa are the traditional creators of freshwater springs in Hawai'i. At the urging of Kanaloa (who needed the water to assuage his thirst for 'awa) a thrust of the staff of Kāne into the ground would immediately be followed by a gush of pure water in the form of a punawai, a freshwater spring. Such springs attributed to Kāne and Kanaloa are found throughout the islands, the spring at Punahou being perhaps one of the more famous.

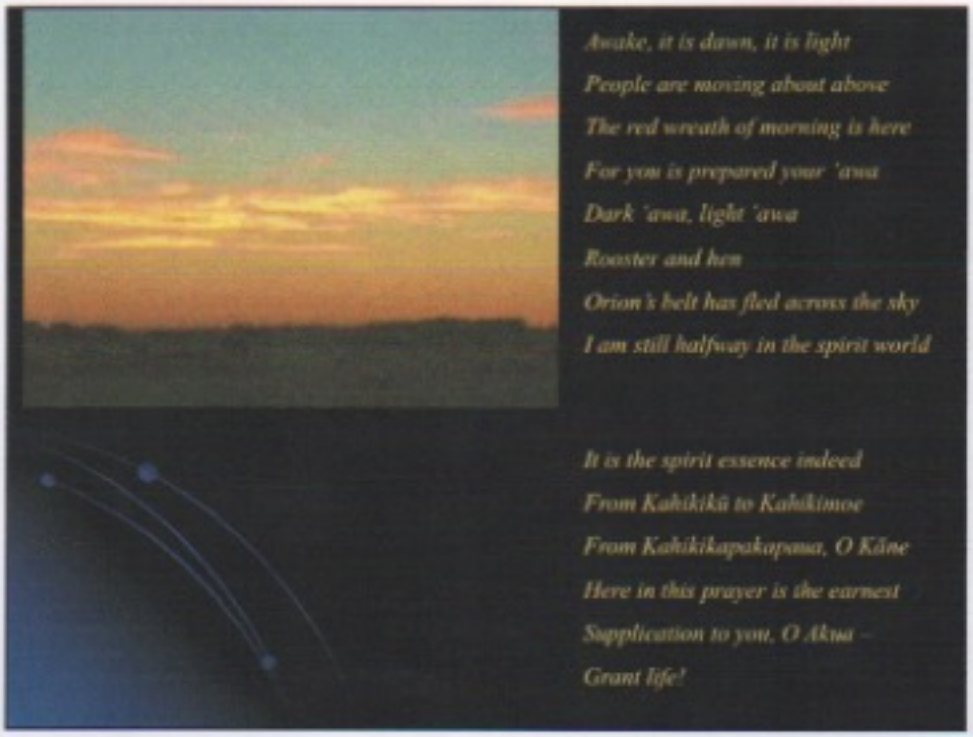
It is no accident that two of the major crops associated with springs, streams, and wetlands,
[***click for kalo and awa image]
kalo, and 'awa, are both sacred manifestations of Kāne.

And no accident that one of the native sedges of our wetlands, the ʻahuʻawa, is used in the making of ʻawa, the long fibers of the ʻahuʻawa being used as a strainer, separating the root fibers of the ʻawa from the liquid drink..

It is interesting that the ʻahuʻawa shows up in ʻōlelo noʻeau (wise sayings) with an unspoken kaona (hidden meaning) related to disappointment. Hoka is a word that means to strain debris from a liquid, as one might do when preparing ʻawa, but hoka also means frustration or disappointment, so the ʻahuʻawa, is associated with hoka, disappointment, and thus this saying would be voiced to indirectly tell someone that what they are trying to achieve is not likely to succeed.



The strong association of the god Kāne to kalo was also the basis for a strict gender association: only men could work the kalo fields. Similarly, 'awa was considered a drink primarily for men, both as a therapeutic treatment for sore muscles, and for ritual use dedicated to family 'aumakua (guardian ancestors). The chant for the predawn protocols of the male head of household reflects this ritual use of 'awa: [click to next slide]



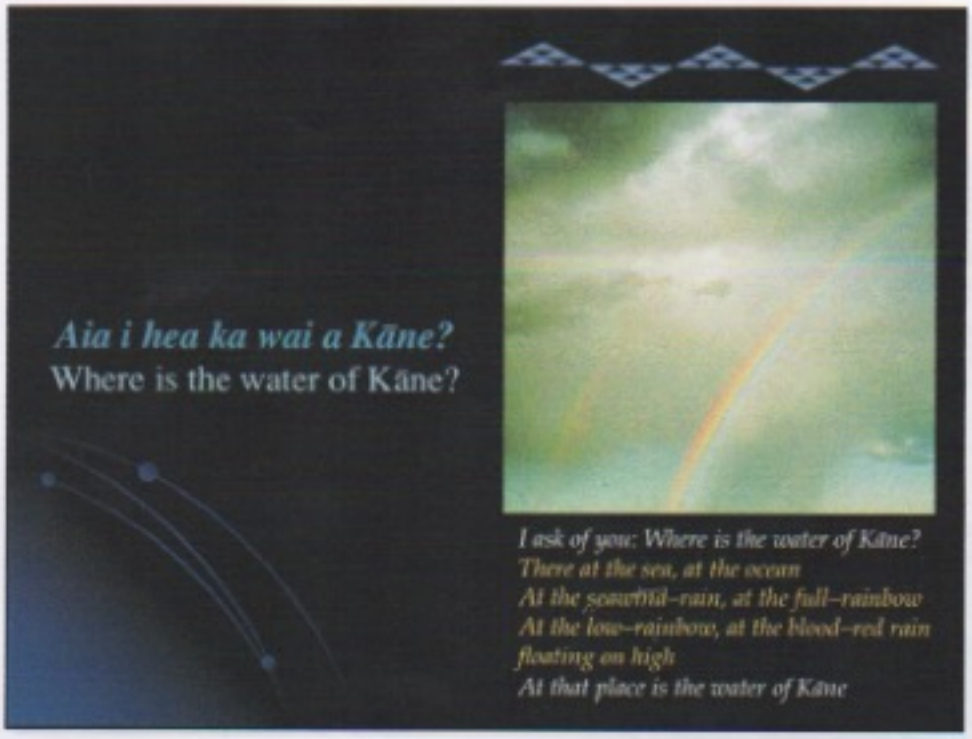
E ala ua ao, ua malamalama…

(complete the chant)

[at O ke aka no ia, click to finish second part of chant]

So the god of freshwater is also the god of the rising sun and thus of the early-morning prayers, and the water used to prepare the morning ʻawa to present to Kane is part of the routine of life in ancient Hawai ʻi.

That the god of freshwater is also the god of the sun is quite revealing, actually. Hawaiian perspectives are all about relationships, and that Kāne would be associated with both the sun and freshwater means that many of the major manifestations of water and sunlight are considered his hō'ailona, signs of the presence of the god.



And what combination of water and sunlight is more striking than a rainbow? The classic chant about the waters of Kāne asks:
E ui aku ana au iā ʻoe: Aia i hea ka wai a Kāne?

Aia i kai, i ka moana I ke kualau, i ke ānuenue--I ka pūnohu, i ka ua koko I ka ʻālewalewa

Aia i laila ka wai a Kāne

The wisdom of this chant is that it acknowledges that the sun, from its rising to its setting, is the engine which drives the cycle of cloud formation that brings water to the earth.

In contrast, Lono was seen as the god of the winter rains, which allowed for cultivation in the drier arable lands. Lono presided over the seasonal cultivation of ʻuala (sweet potato) [***] and ipu (gourd). The season of Lono is the Ho ʻoilo, the Hawaiian "winter" or wet season, and is marked by the Makahiki, the start of the traditional Hawaiian year. Only during this time of year was cultivation of the rain-dependent crops of the leeward drylands possible, and sometimes the window for cultivation was very narrow.

Many of the heiau servicing agriculture in such zones were dedicated to Lono, and were heiau ho ʻouluua, heiau dedicated to bringing rain. Some of the chants to Lono indirectly request rains, through the calling of clouds. With such chants, the kahuna could evoke rain as needed, say, in famine times.

[***click to scroll translation of chant while the following is chanted]

Ou kino e Lono i ka lani, he ao loa, he ao poko, he ao ki ʻei he ao halo, he ao ho ʻopua i ka lani.

So important are these cloud signs in the heavens, that when you consult traditional Hawaiian sources, there are hundreds of names of cloud forms, clouds that prognosticate the coming weather, and which were studied intently, and named. Here are a few, examples: the ao pua' a, ao loa, ao manu, ao 'ilio' ula, ao 'oni 'o, ao pu' u lima, all, at their simplest level, visual features in the heavens formed of condensed water., but when combined with traditional knowledge systems, important hō 'ailona: indications of times to plant, times to avoid oceanic voyaging, times to prepare offerings to the fishing gods, times to set medicinal herbs to dry, times to store water…Sometimes attention to these hō 'ailona made the difference between life and death.

Thus the form and movement of the waters of earth and sky were acknowledged as the source of life in ancient Hawai ʻi, as today. As the gift of the gods, water was not considered a commodity to be bought or owned, but a profoundly sacred part of the natural and supernatural landscape in which people and all other living things resided.

Whether a mahi ʻai, a farmer, was from the lush wet valleys in which kalo was grown, or from the drier leeward areas where uala was the main staple, both looked to the many forms and signs of Kāne and Lono as the principal duo tied to water.

[***click to water bowl for blessing] Even today, the sanctity of water, and its role in both purification and healing, represent a continuity of the same reverence that ancient Hawaiians placed in water, a deeply spiritual substance that continues to evoke life, cleansing, and healing. You may have heard, for example, that one particularly valued source of water for blessings comes from the rainwater collected in the upturned leaves of kalo, and now you know that this water, called wai ʻapo, from the rains of Lono, and held in the body form of Kane, would be doubly blessed.

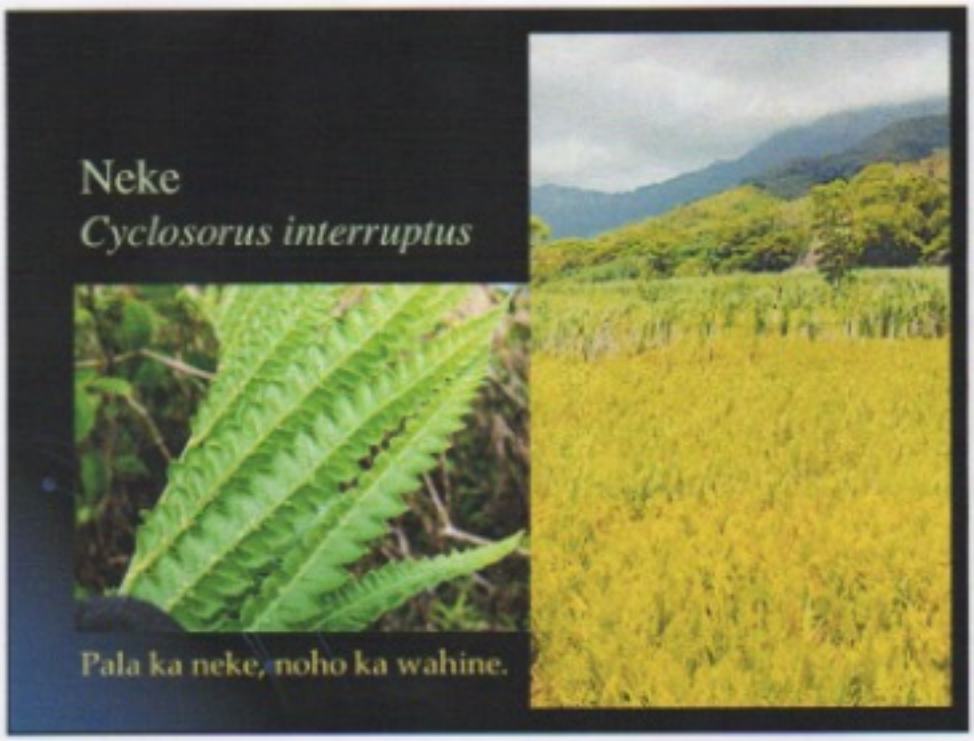
If the sources of water in springs or rainfall were considered sacred to major Hawaiian gods, streams, pools, and wetlands were also held sacred as the homes of mo ʻo, special water-related gods – guardians of wetlands and freshwater pools.

The Hawaiian historian Samuel M. Kamakau described the mo ʻo in great detail – here is a direct translation: The mo ʻo were not the house or rock lizards, or any of those little creatures with which we are familiar. No indeed! One can imagine their shape from these little creatures, but...the mo ʻo had extremely long and terrifying bodies, and they were often seen in the ancient days at such places as Maunalua, Kawainui, and Ihukoko at Uko ʻa ... There was no doubting them when they were seen. They lay in the water, from two to five anana in length... When given a drink of ʻawa, they would turn from side to side like the hull of a canoe in the water.

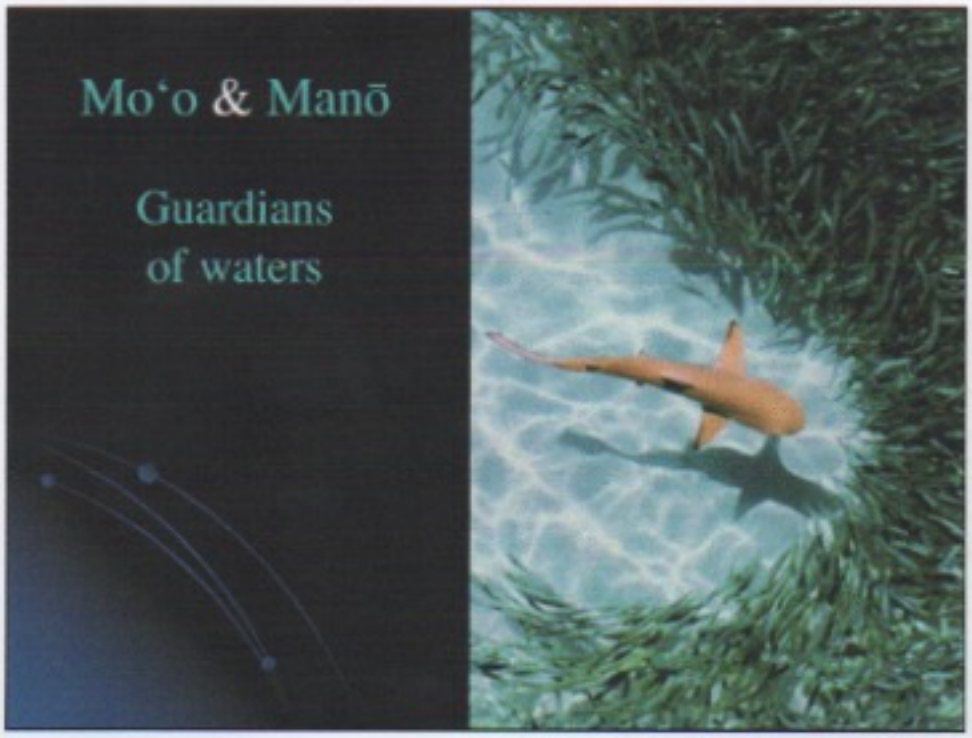
Leave it to Kamakau to describe a Hawaiian water creature from 12 to 30 feet in length, and then describe its behavior with given ʻawa to drink! These mo ʻo were cared for, and heiau were dedicated to them. They were considered the true kama ʻaina guardians of the resources of the wetlands in which they lived. The names of these mo ʻo were known all around the islands, and they were typically female: the names Hauwahine, Laniwahine, and Kihawahine reflect this.

[***click for picture of oopu alamoo] One of the ramifications of the mo ʻo tradition is that certain stream animals are considered kinolau of mo ʻo, and even carry this designation in their names. Our rarest endemic goby, *Lentipes concolor*, ʻo ʻopu hi ʻukole, also goes by the name ʻo ʻopu alamo ʻo.

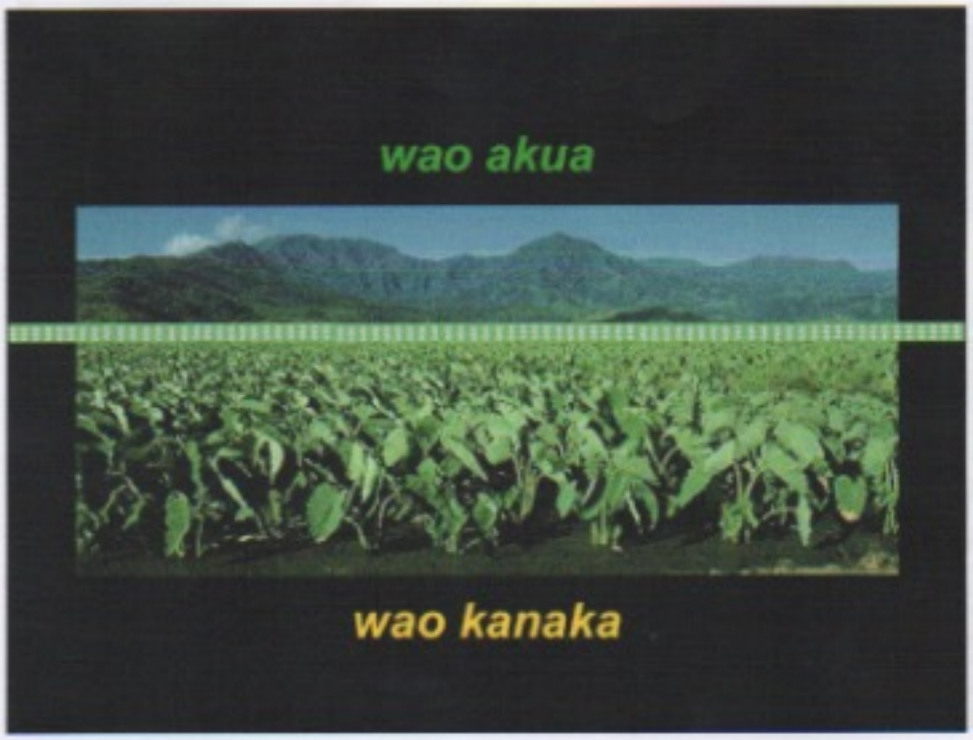
The modern tradition of laying a ti-leaf on a mountain pool' s surface before swimming stems from the offering to the mo ʻo of the pool – an acknowledgement of the sacred nature of personified wetlands, [***click for violent flood] as well as the humble acknowledgement of the dynamic mana inherent in mountain streams and pools.



It is interesting that in Hawaiian tradition, one of the signs that the mo'o of a wetland is present and active, is when wetland plants, such as the neke fern, go yellow. Whether this is due to seasonal senescence of cohorts of ferns, or perhaps pulses of nutrients or of anaerobic conditions in the mud below. Such is the tradition at Kawainui marsh here on O'ahu, where Kailua traditions tell us the mo'o goddess Hauwahine dwells.



Estuaries provide the connection between mo'o and manō (sharks), with the mo'o the fierce guardians of the freshwater wetlands, and the manō being the guardians of the sea. Where the two meet is where their relationships become clear. Many mo'o are the offspring of shark gods and mo'o, and stories speak of the amorous relationships of the two deities of waters. The mo'o 'Oua, guardian of Kuapā in Maunalua had a shark for a father and a mo'o mother, and he had a relationship with the shark goddess Māmala of Honolulu Harbor. Out on the Wai'anae side, Nanaue the shark god mates with the mo'o Ko'iahi of Makua Valley, and in this manner the spawning season of the ocean of Wai'anae is determined when the winter rains bring the freshwater of Makua Valley into the sea.



Now, I'd like to talk a bit about Hawaiian modifications of natural wetlands, and need to start with the context in which that occurred.

In the ancient Hawaiian universe, the world was divided into a

***dichotomy: the realm of people,

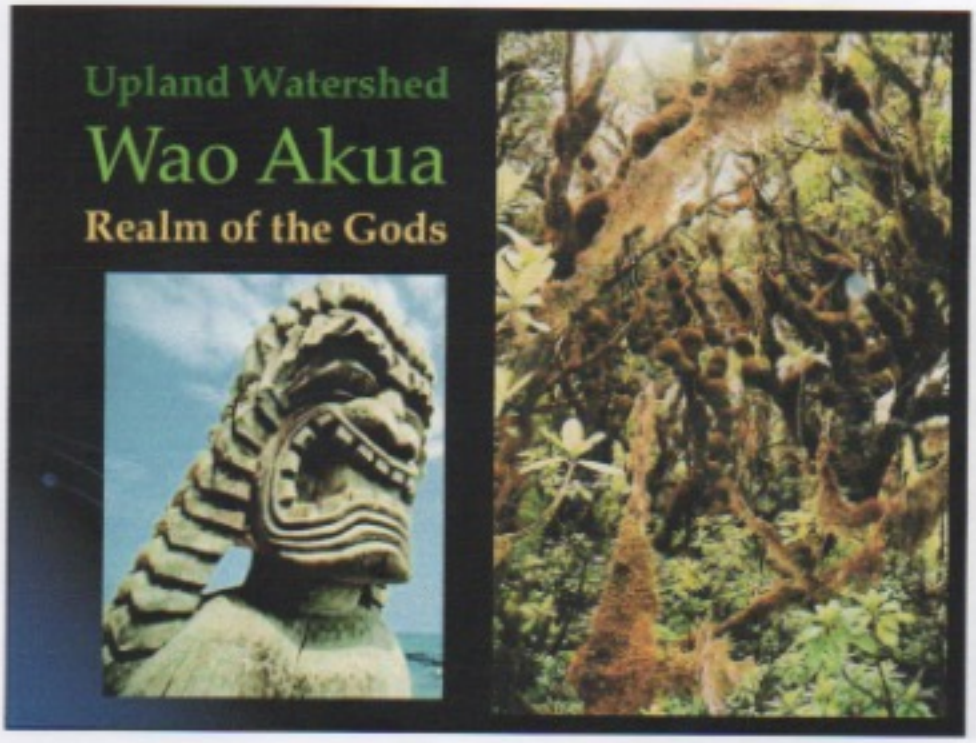
***the wao kanaka, occupied the lowlands, where that which grows is the result of human effort.

***Above this comfortable lowland zone was the wao akua,

the realm of the gods, where human effort had nothing to do with the verdant growth of native forest,

and where conditions were often wild and elemental.

The wao kanaka is where people were every day, and where their activities modified the landscape. The areas of modification and displacement can be referred to as the Hawaiian ecological footprint. That footprint was quite apparent in the lowlands, and particularly well pronounced in wetlands.



In contrast, in the upland watershed, as part of the Wao Akua, all things living in the native forest were connected to the akua. Trees, for example, are the kinolau of Kū, another of the major Hawaiian gods; god of war, of leadership, and of governance. The strength of trees, their erect nature, their steady persistence through the seasons, all match the characters of their governing akua.

The common person did not visit the Wao Akua without good reason, And in ancient times, if the purpose of the entry was to take a large ʻōhiʻa tree for the purpose of creating one of the great temple images of Kū, the sacrifice demanded was one of the people entering the wao akua. This was the extremely high kapu with which the Wao Akua was treated.

Only small parties led by specialists with knowledge of the forest and its resources could enter, and only after rigorous and ceremonial entrance protocols.

Only small parties led by specialists with knowledge of the forest and its resources could enter the wao akua, and only with purposeful, positive intent, and after rigorous ceremonial protocols.

So where was the Hawaiian footprint, and how did it affect wetlnds? The hydrological context of the footprint is demonstrated well on O'ahu, which offers moisture conditions from

***very dry, in the leeward south and west regions,

***to very wet, as in the summit crest of the Ko'olau mountain range.

***Moderately dry, and mesic areas are shown here by their colors.

***Elevation of the island exceeds 4,000 feet only in a small part of the Wai'anae range, but approached 3,000 feet along the remainder of both Ko'olau and Wai'anae summit crests. Because of the tall summits, high rainfall areas, particularly in the eastern Ko'olau mountain range fed numerous continual perennial streams, bringing both water and nutrients to the lowlands.

***Large coastal and lowland wetlands, shown in light blue, brought life-giving water to otherwise dry areas, and created very rich estuarine breeding grounds for nearshore marine fish.

A large part of the footprint was comprised by areas of cultivation for the two major staple crops of Hawai'i:

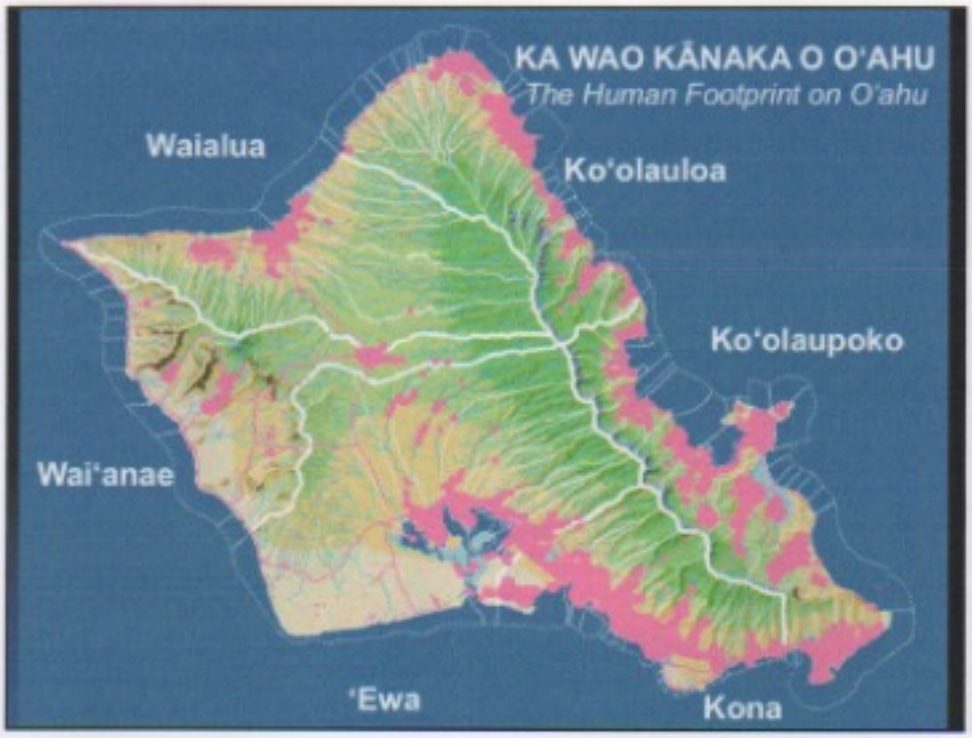
kalo (taro) and 'uala (sweet potato). We mapped the combinations of topographic, climatic, and soil conditions

that provided for the highest potential for the two crops. For kalo, the optimum combination is plentiful water, low elevation warm settings, and gentle slope

For uala, the critical condition is winter rainfall sufficient to support growth of the vines, but not so heavy as to leach nutrients from the soil.

Older soils typically had insufficient nutrients, so younger substrate age was another factor.

When we apply the agricultural model to O'ahu,
we can see that the largest part of this part of the footprint
(shown here in kalo purple and 'uala red)
occupied the areas near the coast,
extending into valleys where sufficient freshwater flow
created ideal conditions for the flood terrace cultivation of kalo, for example.
Complementing this were somewhat drier areas (shown in red) receiving sufficient rainfall to support uala (sweet potato) and other drier agriculture.



The major agricultural areas, and the loko i'a [fishponds] formed the heart of the final ecological footprint

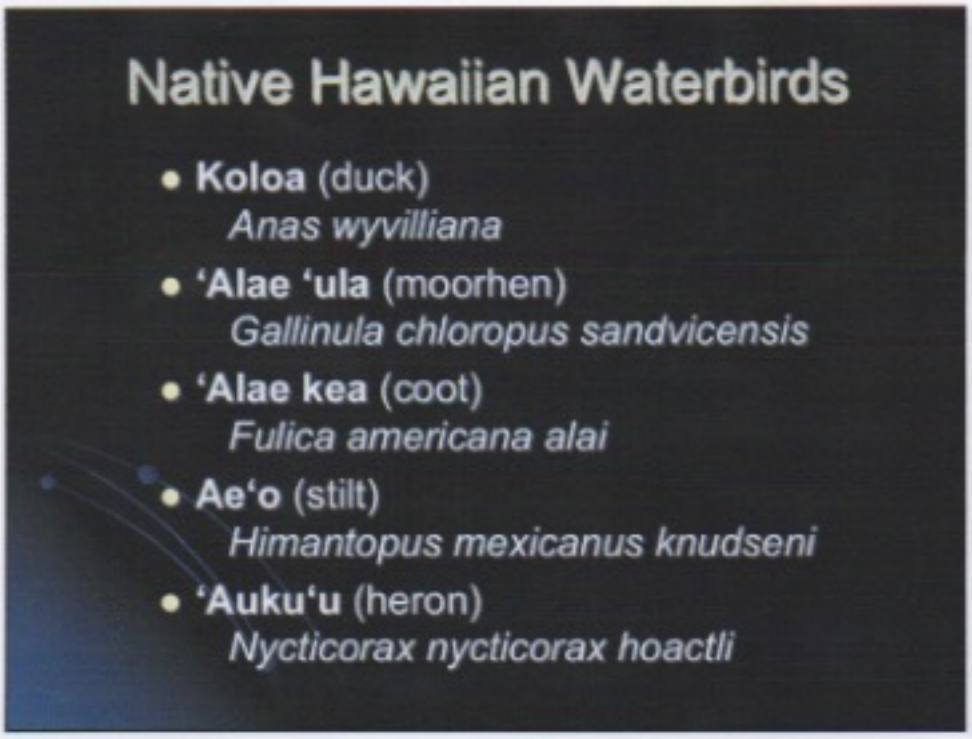
for the Hawaiian population of pre-contact O'ahu.

Ecosystem Type	Original extent (acres)	Footprint (acres)	Percent Affected
Wetlands	12,712	7,914	62.3%
Lowland Dry Forest & Shrubland	122,505	28,253	23.1%
Lowland Dry Shrubland & Grassland	39,660	4,752	12.0%
Lowland Mesic Forest & Shrubland	125,863	11,500	9.1%
Lowland Wet Forest & Shrubland	63,553	942	1.5%

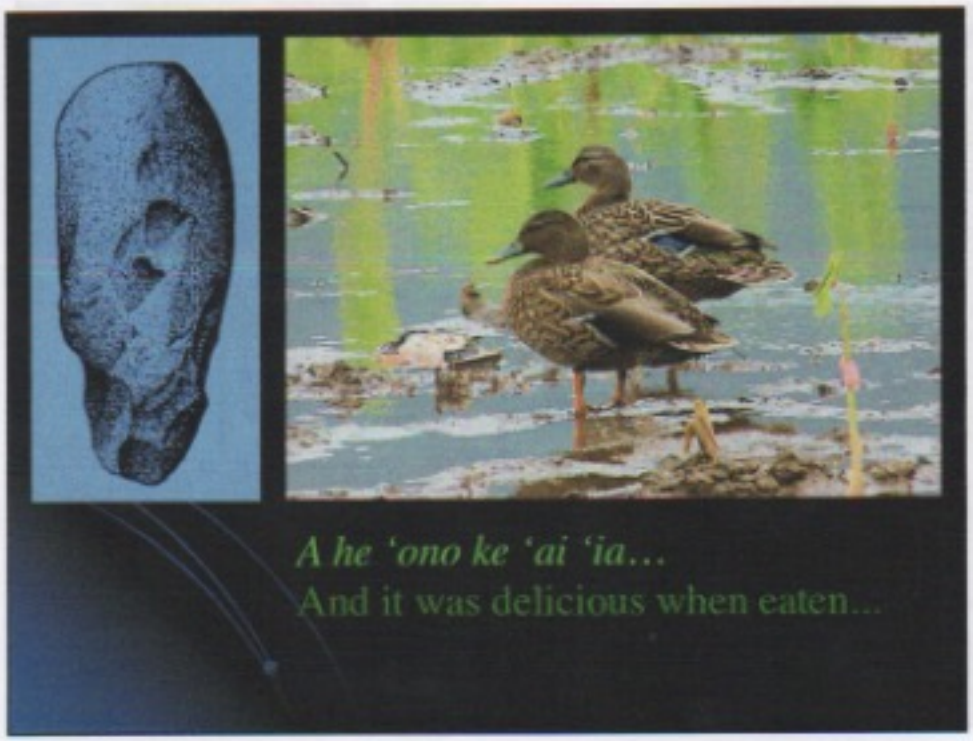
The analysis of this footprint indicate that largest impacts were in ***wetlands that were converted into lo'i kalo agriculture and loko i'a,
with over half of the wetlands converted.

So wetlands were hugely important in ancient Hawai'i, and heavily utilizied. But what is interesting from a habitat and ecosystem function standpoint, is that even if the human footprint displaced over half of the ancient wetlands, it did so in a manner that conserved much of the ecosystem function, maintaining natural processes as semi-wild systems. It turns out that the conversion of wetlands and flat valley bottoms into lo'i resulted in a net increase in wetland habitat during pre-contact Hawaiian history. Native wetland species were the direct beneficiaries of this expansion of habitat.

Perhaps one of the most interesting examples of this benefit of widespread wet kalo agriculture for wetland species is seen in the endangered water fern called 'ihi'ihilauakea – *Marsilea villosa*. Found in only a few ephemeral pool habitats on O'ahu and Moloka'i today, it was described as a common taro patch plant in the 1800s and early 1900s. The decline of traditional kalo agriculture led to the destruction of habitat for 'ihi'ihilauākea, which now requires legal protection. Being a well-known plant in ancient Hawai'i, there are legends about the plant, considered the kinolau of a beneficent goddess of the same name, who also lends her name to a small crater near Hanauma Bay today. No accident that this is one of the few wild sites where 'ihi'ihilauākea can still be found today.

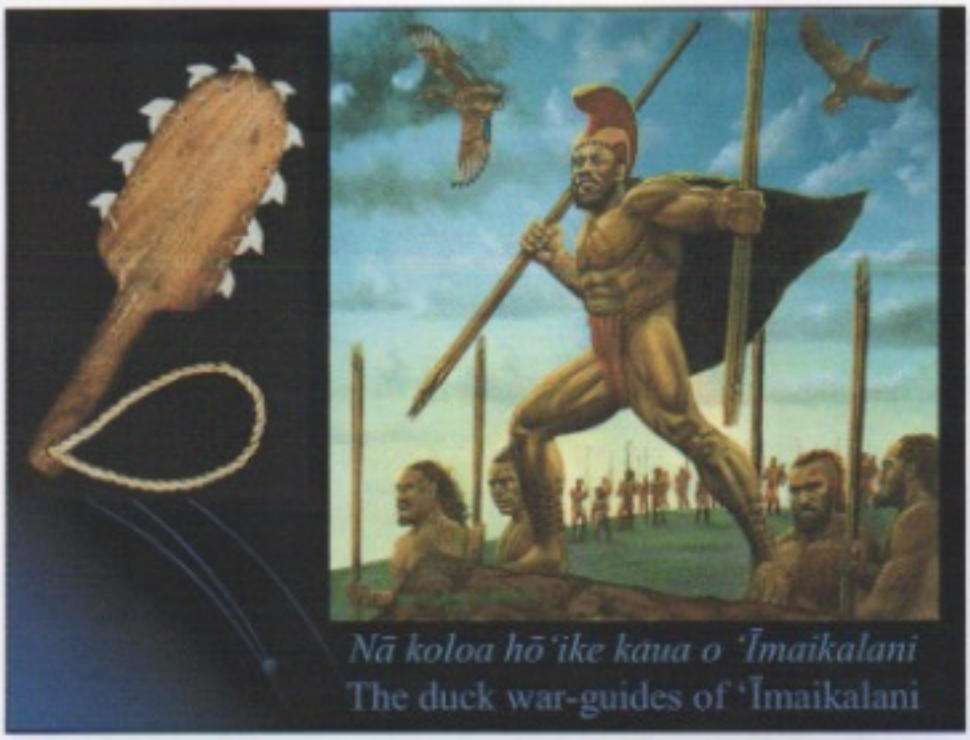


Of course, the Hawaiian waterbirds were also beneficiaries of cultivated Hawaiian wetlands, and each was well-known to Hawaiians, their significance well-documented in chant and story.



Koloa, or Hawaiian duck is closely related to the migratory mallard, with which it hybridizes readily.

Nearly all birds were eaten as food, and koloa was no exception. Special cooking stones were heated in fire, and placed in the body cavity to ensure that the inside was adequately cooked when the bird was placed in the imu.

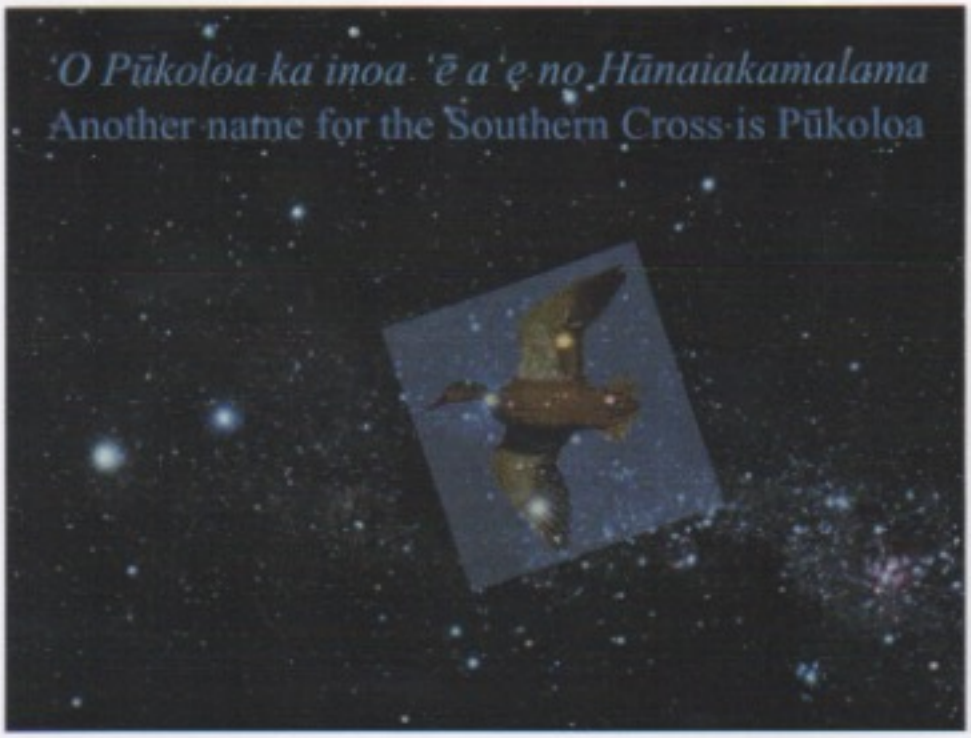


Nā koloa hō'ike kaua o 'Īmaikalani
The duck war-guides of 'Īmaikalani

Koloa were prominent in the story of one of the chiefs of Hawai'i. 'Īmaikalani, an ali'i of Ka'ū District in the time of 'Umi-a-Liloa, was a powerful and fiearsome warrior. This beloved son of Ka'u is still revered today by his Ka'u descendants. He was very powerful in his battle prowess and greatly feared by his enemies. Stories related that he could throw ten ihe [the Hawaiian short spear], 5 in each hand like lightning raining down in a thunderstorm of death. He could also split a man in two with one swing of his club. But what Kamakau, Hawaiian scholar, noted was remarkable:

"He had special koloa that flew about, and told him from which direction an enemy approached, whether from the front, at the back, or on either side.· All depended on the cries of the birds.

They acted as his aerial surveilance in battle letting him know where the enemy was. He was also assisted by retainers, two on each side that supplied him with his weapons as needed with 40 more retainers for additional support.



The koloa also finds its way into the night sky in the form of a constellation. Although the Southern Cross is mainly known as Hānaiakamalama, an alternate name is Pūkoloa, which means "Duck-like" It is not too hard to see why.

Thomas G Tamrua koloa in flight.

The 'alae'ula in Hawaiian tradition was the keeper of the secret of fire-making.

Maui saw them roasting bananas to eat, but when he tried to get near them, they detected his approach and scattered the ashes of the fire. Finally he caught the smallest of the 'alae, named 'Alae-huapī, and demanded to be taught firemaking, but the bird deceived him, telling him that the secret of fire is to rub the stalks of the kalo (taro) together. When that didn't work, she told Maui that it is the stalks of ki (ti) that he must use. Maui tries again, and fails. He is so angry that he is about to throttle the bird, who, realizing she will die unless she gives Maui the knowledge of fire, and tells Maui the answer in the form of a riddle: that he will find fire in water (wai). Maui puzzles over this, but not for long, and realizes that the "wai" referred to is in the plant called waimea, *** also known as olomea; a native tree with a very light wood. When the wood is dry and rubbed with a hardwood, it ignites. The larger stick laid underneath was called the *'aunaki*, and the one grasped firmly and rubbed on the under stick was called the *'aulima*.

Thus Maui was able to pull the secret of fire from the secretive 'alae. Maui kept his promise to release the bird alive, but before he did, he took the bird and rubbed her forehead hard on the 'aunaki -- rubbed it until the feathers came off and the skin was rubbed raw. From that day, the 'alae have borne the red forehead of that fateful encounter with Maui, and mankind has had fire and all of its benefits.

The voice of the 'alae'ula is seldom heard and therefore taken as a sign. Some families consider it an ill omen, but one chant to Kamehameha referred to the 'alae as the voice of the chief who is most compelling in council.

'Alae kea, or 'Alae ke'oke'o, receives its name for its white head shield. There is mention of the 'alae ke'oke'o as an 'aumakua form, that is a kinolau, one of many physical manifestations that an ancestral god can take to interact with living decendants.

The 'auku'u, our native heron, is also considered an 'aumakua form by some families, but one connotation of the 'auku'u is not complimentary.

The saying 'auku'u kia'i loko, heron watching the pool, refers to a shady character casing the situation and up to no good.

Finally, the ae'o, or Hawaiian stilt represents one of those interesting coincidences where the english word stilt and the Hawaiian word for stilt are identical.

An alternate name for the ae'o is kukulu ae'o.

Emily miller aeo kauai

and Kukulu ae'o is also an alternate name for the tree called 'o*he makai*, whose light, strong branches were used to makes stilts, used in special ceremonial dances to lift the performers above the audience.

So, the Hawaiian stilt, kukulu ae' o, and is tied by name to this lowland tree, used to make stilts.

We must be sure not to neglect Hawaiian wetland insects. Many people might be familiar with the giant Hawaiian dragonfly, called pinao. It is a large relative of the green darner, but is larger than any of the dragonflies of North America, making it the largest dragonfly species of the United States. It graces the skies of Hawai'i and did not escape notice in ancient times; there is a heiau, a temple, on Kaua'i that is named Pinao. Not surprisingly, the heiau is situated next to a spring that still flows today.

***the freshwater spring is important to the pinao, for its larvae are aquatic. Hawaiians call these naiads lohelohe. And because they grow into the largest dragonfly in the united states, the lohelohe are also quite hefty insects in their own right, stalking the bottoms of large freshwater pools in every stream, feeding on anything smaller than them. It is quite a surprise to many people, then, that the lohelohe are also an appropriate offering on the kuahu hula, the shrine to the goddess Laka that is maintained by the kumu hula, the teacher of dance. But two elements bring logic to this act. ***First, lohe means to attend, listen, pay attention, and to redouble that important element of learning (lohelohe), makes it doubly appropriate. It is the nature of the lohelohe to sit silently and watchfully in their pool. If you've ever watched them hunt, they sit perfectly still until a movement or vibration catches their attention, then they immediately reposition themselves toward the object of their attention, and wait further. This kind of disposition is exactly what a kumu hula requires of their students: silent observation, and total-bodied attentiveness.

Furthermore, when the lohelohe eats, it is an amazing explosive extension of special grasping mouthparts, that quickly apprehend their prey. ***The word for such grabbing, 'apo, is related to the word *** 'a'apo, which means to quickly learn, to readily and rapidly understand the meaning of something.

So, for the kumu hula, the lohelohe symbolizes the perfect student, attentive, and quick to grasp and understand what is being taught.

So I hope these vignettes out of Hawaiian tradition help you appreciate the deep spiritual and cultural significance of water, wetlands, and the plants and animals that live in them.

Mahalo for your kind attention.