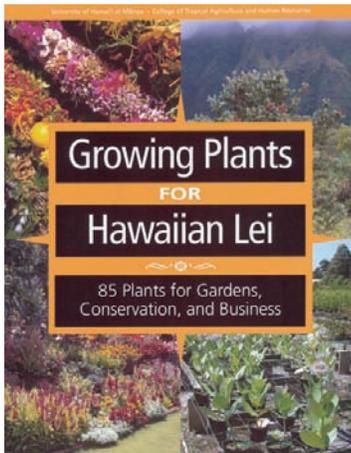


# Hawaiian Ecosystems and Culture

Why Growing Plants  
for Lei Helps to  
Preserve Hawai'i's Natural  
and Cultural Heritage



**College of Tropical Agriculture  
and Human Resources**  
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During the preparation of that publication, Puanani Onapali Anderson-Fung, then with the UH Mānoa Department of Botany, the UH Ecology, Evolution and Conservation Biology program, and 'Ahahui Mālama i ka Lōkahi (Hawaiians for the Conservation of Native Ecosystems), was contracted to prepare a background chapter on Hawaiian ecosystems biology and related cultural practices. To ensure the veracity of the latter element, she enlisted the collaboration of the co-author, Kepā Maly, cultural historian and resource specialist, an authority on Hawaiian cultural traditions. She also sought review by John Charlot, UH Mānoa Department of Religion, and Isabella Abbott and Charles Lamoureux, UH Mānoa Department of Botany.

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# Hawaiian Ecosystems and Culture

## Why Growing Plants for Lei Helps to Preserve Hawai'i's Natural and Cultural Heritage

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*Those who make lei can play a vital role in preserving both native plant communities and native Hawaiian culture.*

*Puanani O. Anderson-Fung and Kepā Maly*

For most people in Hawai'i today, making a lei and giving it to someone is a gesture of aloha (love and respect) that is a distinctive part of the islands' contemporary social culture. The Hawaiian lei (a garland, usually of plant leaves, flowers, or seeds) has come to be recognized around the world as an expression of greeting and farewell, honor, congratulations, and love. But few people are

aware that the lei and the plant materials it is made of have deeper meanings in Hawaiian culture—and this was especially so before the modern era. More than today's decorative social token, a lei and its making, giving, and wearing embody—in the Hawaiian cultural perspective—a profoundly felt personal and spiritual significance.

Nature provided the islands of Hawai'i with an extraordinarily rich assemblage of native organisms, and Hawai'i's native people formed a deeply spiritual relationship with these non-human inhabitants. This essay explores that relationship and summarizes the changes that have occurred both to Hawai'i's natural areas and to the human culture as it relates to them, changes that now threaten the integrity of the native plant communities with which Hawaiian culture is so deeply interconnected.

Those who make lei can play a vital role in preserving both native plant communities and native Hawaiian culture. This can be done simply by growing the plants needed for lei rather than gathering the materials from natural areas. We hope the following makes clear why this is such an important choice.



## Part 1

### A historical perspective on lei and native plant communities

The tradition of lei making was brought to the Hawaiian Islands by the Polynesian ancestors of those who would become the native Hawaiian people. As their culture developed over the centuries, so did the artistry and cultural significance of their lei.

In old Hawai‘i, lei could have important ceremonial functions, such as in religious offerings and for chiefly regalia, but lei were also enjoyed as personal adornment by Hawaiians of all levels of society. The ali‘i (chiefs) and the maka‘aināna (the common people who tended the land) all wore lei. Even the akua (gods, deities, spirits), it was believed, sometimes wore lei when they walked the land in human form. The following observation by the French botanist Gaudichaud, who visited the islands in 1819, paints a picture of Hawai‘i as a place where the lei was an integral part of everyday life:

“It is indeed rare to encounter one of the natives of this archipelago who does not have an ornamental plant on his head or neck or some other part of his body... [The] women ... change [the plants they wear] according to the seasons, [and for them] all the fragrant plants, all flowers, and even the colored fruits, serve as attire, one after another. ... The young girls of the people, those of the island of Hawai‘i especially, seem to be fond of the [kou, *Cordia subcordata*], a tree very abundant in all the cultivated areas... The young girls of the mountains, who live near the forests, give their preference to the flowers of the [*Erythrina* (wiliwili) and a species of *Canavalia*, called ‘awikiwiki], the lively color of which makes magnificent garlands. Such natural attire is much more rich, much more striking, than all the dazzling creations of the elegant European ladies.”

This account and others like it suggest that lei worn for personal adornment were fashioned from the favorite plant materials that were readily available and abundant in the lei maker’s environment. Unfortunately, in the period after Gaudichaud wrote, native plant materials gradually became more difficult to acquire, as the native forests receded into the uplands and Hawaiians began moving to cities and towns near the shore. Still, lei giving remained popular with Hawai‘i’s residents, an increasing number of whom were from diverse cultural groups that had come from various parts of the world. Soon lei were considered a “must-have” for many occasions in the new, cosmopolitan society, including such events as high school and college graduations, proms, retirement parties, and legislative openings. But it was largely the introduced ornamental plants, such as plumeria, carnation, pakalana, and pikake (jasmine), that met the increased demand for such ceremonial lei in Hawai‘i’s growing population.

This reliance on introduced plants for lei material began to change in the 1970s, when Hawai‘i began to experience a resurgence of interest in “things Hawaiian.” This long-overdue development is welcome, but one consequence has been that things made from native plants, including jewelry, furniture, and lei, have recently gained in popularity and acquired considerable prestige. To meet the demand for authentic Hawaiian products, many more people began to gather native materials from acces-



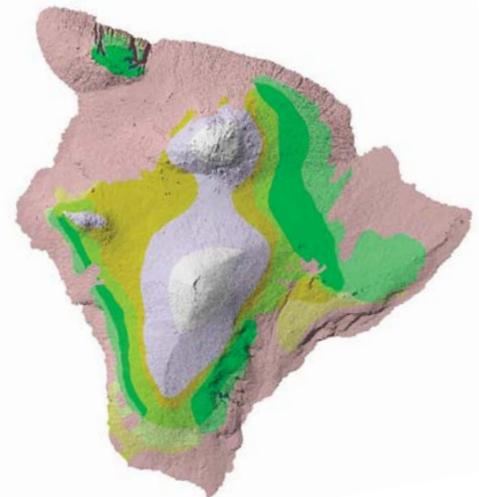
Areas colored ■ are now covered with non-native vegetation (maps courtesy of the Hawaiian Heritage Program).

**Loss of native vegetation due to human habitation of the Hawaiian Islands**

**Hawaiian Islands before humans**



**Hawaiian Islands today**



**Key to types of vegetation**

- Alpine desert
- Coastal dry shrubland and grassland
- Dry cliff
- Lowland dry forest and shrubland
- Lowland dry shrubland and grassland
- Lowland mesic forest and shrubland
- Lowland wet forest and shrubland
- Montane dry forest and shrubland
- Montane mesic forest and shrubland
- Montane wet forest and shrubland
- Subalpine dry shrubland and grassland
- Wet cliff
- Wetland
- Non-native vegetation

sible public lands. This brought much additional stress to native plant communities that were already greatly diminished and damaged by the activities of humans and the non-native plants and animals that have been brought to the islands.

Ironically, many of these gatherers were motivated by a well intentioned desire to do things in a “real Hawaiian way.” They did not realize the potentially serious environmental damage they were causing, or that their collecting was threatening the future of the very native species they sought to bring to the attention of others. Thus what has been referred to as “the flowering of the ‘Hawaiian Renaissance’ in the 1970s” contributed to an unfortunate “de-flowering” of our native forests.

Lei making was a very real part of this problem, as native plant materials were needed in large quantities for hula competitions, lei making competitions, Hawaiian award ceremonies, and other events. Many of those who routinely worked or spent their recreational time in Hawai‘i’s natural plant environments began to notice that extensive damage was being done to certain native species used in lei, and this often occurred just before major hula competitions. Eventually, some people began to publicly express concern for the health of native plant communities.

Many native Hawaiians and conservationists are now working together to educate people about the serious, irreparable damage that is done to native Hawaiian ecosystems when we continue treating them as “inexhaustible free resources.” Today’s lei makers can become an important part of the solution to the problem of loss of native plant ecosystems by growing the plants they need rather than taking them from the wild. Like all those who reap benefits from nature in Hawai‘i, lei makers owe it to themselves to learn more about Hawai‘i’s native plants and the effects of human actions on them. Through such learning, and guided by conscience, we each can choose to practice and promote only those actions that protect and preserve our natural heritage.

## Part 2

### Hawai‘i’s many native organisms and their relationship to human culture before 1778

The Hawaiian Islands have existed in the middle of the Pacific Ocean for millions of years, during which time nature has gradually covered them with a diverse assemblage of unique life forms. A group of human immigrants arrived in the islands from Polynesia hundreds of years ago, and eventually their descendents became intimately familiar with many of the species nature had provided the islands—especially the plants. Ultimately these people, who became known as the Hawaiian people, developed a deeply spiritual and loving relationship with Hawai‘i’s native plants and their habitats.

The emotional connection with nature felt by the Hawaiians was manifested in virtually every aspect of their lives. It was the guiding principle in their resource management ethics and practices, and it was always woven into their mo‘olelo (stories), ‘oli (chants), mele (songs), and their lei. Before exploring this relationship more fully, however, it is important that we begin by gaining some insight into the rich legacy of native species and plant communities that are found in the Hawaiian Islands—for this was the environment in which native Hawaiian culture evolved.



*Scientists believe that the earliest ancestors of Hawai‘i’s native species were carried to the islands by birds, strong winds, or ocean currents.*

## Hawai‘i’s first natives

When Hawai‘i’s early human immigrants began to explore their new homeland, they discovered that it was already inhabited by millions of other natives—not human natives, but other life forms including animals, plants, fungi, and limu, a Hawaiian category of organisms that included seaweeds and freshwater algae, mosses, liverworts, lichens, and certain small, delicate ferns.

## The number and nature of native species in Hawai‘i

When biologists talk about “non-human” natives, they refer to organisms that arrived in a place “naturally,” that is, without any help (deliberate or accidental) from human beings. Scientists believe that the earliest ancestors of Hawai‘i’s native species were carried to the islands by birds, strong winds, or ocean currents. Those that survived the trip and also managed to become established, produce offspring, and increase in number are the ancestors of today’s native Hawaiian species. These native organisms existed in Hawai‘i for millions of years before the first humans arrived.

How many native species are there in Hawai‘i? It has been estimated that there were approximately 8500 native species on land at the time the first humans arrived—and this includes only the mosses, ferns, flowering plants, mammals, birds, snails, insects, and spiders, not the fungi or the algae, for which reliable estimates of the number of native species are not yet available.

Remarkably, about 96 percent of these native species evolved in the islands and could be found nowhere else in the world! Biologists refer to native species that are found nowhere else as endemic species. The term *endemic* tells us the following things about a Hawaiian endemic species:

- Sometime in the ancient past, it arrived in these remote islands unaided by humans and became established.
- It managed to reproduce and spread.
- Over millions of years, some of its descendents underwent so many changes that they could be considered a new species distinct from the original, ancestral species.
- These new species cannot be found anywhere else in the world for two reasons—because they evolved in Hawai‘i, and they have not naturally dispersed to other parts of the world.

A second type of native species is the indigenous species, those native to an area but also native elsewhere. The word *indigenous* (when applied to living things other than humans) tells us three things:

- The species is native—it got here naturally, without help from humans.
- Since the time that it first arrived, it has not changed enough to be considered a new, different species.
- The species is pretty much the same in Hawai‘i as in other places where it is found (although slight differences may occur).

Even more remarkable is the fact that Hawai‘i’s 8150 endemic, land-dwelling species are thought to have evolved from only about 1000 original colonizing species. Thus about eight new species evolved from each one that successfully inhabited the islands. There is no other group of islands in the world where such a large number of new species evolved from such a small number of ancestral colonizing species.

A good example of the evolutionary principles just described is the group of plants named naupaka by the Hawaiians and internationally known as *Scaevola* (pronounced SKE-vole-uh) by botanists, who use a globally standardized system for naming plants. Each species in this group has flowers that look like “half-flowers,” and each is thought to have evolved from one of three ancestral species, which we call “A,” “B,” and “C” in the table below.



*Scaevola taccada*



*S. glabra*

Ancestral species	Hawaiian name, [descriptive notes]	Meaning of Hawaiian name	Scientific name
A	naupaka kahakai [the white-flowered “beach naupaka” common throughout Hawai‘i]	(naupaka of the seashore)	<i>Scaevola taccada</i>
B	ohe naupaka [yellow, tubular flowers; found in very wet forests on O‘ahu and Kaua‘i]	(naupaka with the tube-shaped flower)	<i>Scaevola glabra</i>
C	naupaka [a smaller, rarely encountered beach species with white flowers]	(no unique Hawaiian name is known)	<i>Scaevola coriacea</i>
C	naupaka kuahiwi [white flowers; occurs only on Kaua‘i and O‘ahu]	(naupaka of the mountains)	<i>Scaevola gaudichaudiana</i>
C	naupaka kuahiwi [white flowers; occurs on Moloka‘i, Lāna‘i, Maui, and Hawai‘i]	(naupaka of the mountains)	<i>Scaevola chamissoniana</i>
C	naupaka kuahiwi [purplish flowers; occurs on Kaua‘i, O‘ahu, and Moloka‘i]	(naupaka of the mountains)	<i>Scaevola mollis</i>
C	naupaka kuahiwi [purplish flowers; occurs only on Hawai‘i]	(naupaka of the mountains)	<i>Scaevola kilaueae</i>
C	naupaka kuahiwi [yellow flowers; occurs from Kaua‘i to Hawai‘i]	(naupaka of the mountains)	<i>Scaevola gaudichaudii</i>



*S. coriacea*



*S. gaudichaudiana*



*S. chamissoniana*



*S. mollis*



*S. kilaueae*



*S. gaudichaudii*

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*The native Hawaiian people developed a unique culture during the centuries that they lived in Hawai‘i prior to 1778.*

The most commonly encountered naupaka is the beach naupaka (*Scaevola taccada*), which is indigenous, meaning that it is considered to be the same as the *Scaevola taccada* found throughout tropical and subtropical Pacific and Indian Ocean coastal regions. It is thought to be the only species that resulted from the colonization of one of the ancestral species (“A” in the table), and thus we conclude that ancestor A was *Scaevola taccada*. A second ancestral naupaka (B) eventually gave rise to the endemic ‘ohe naupaka (*Scaevola glabra*), which has very distinctive, tubular, yellow half-flowers about an inch long. A third ancestor (C) is thought to have given rise to six endemic species—one coastal species, commonly known as the “dwarf naupaka” (currently listed as endangered) and five mountain species, all of which are commonly known as “mountain naupaka” or naupaka kuahiwi. Each Hawaiian island had, at most, three species of mountain naupaka, each with a different flower color—white, purple, or yellow. Thus the different species of mountain naupaka could be distinguished easily in the Hawaiian system of naming plants by also giving the flower color and the island on which it occurred.

So we see that both the Hawaiian plant experts of old and contemporary botanists used the same system—binomial nomenclature—for naming plants. One name (naupaka or *Scaevola*), indicates the group to which the species belongs. The second name (e.g., kahakai or *taccada*) indicates which particular naupaka is being referred to.

### **Effects of time, habitat diversity, and isolation on Hawai‘i’s native species**

The type of evolution demonstrated by the naupaka also occurred in many other groups of plants, birds, land snails, insects, and spiders (to name only the most well known examples). This is why many people consider the Hawaiian Islands to be the best place in the world to see and study evolution! Three factors, discussed further below, help to explain how so many species were able to evolve in Hawai‘i:

- There was lots of time for evolution to take place.
- There are many different types of habitats.
- The islands are isolated, and new species were rarely able to successfully colonize these islands.

#### **Time**

The native Hawaiian people developed a unique culture during the centuries that they lived in Hawai‘i prior to 1778. How many centuries is uncertain; archaeologists do not agree when humans first arrived in Hawai‘i. Some believe this occurred between 0 and 100 A.D., while others think it was later, between 600 and 700 A.D.

In contrast to the brief occupation by humans, Hawai‘i’s native plants and animals have inhabited these islands for *millions* of years. Scientists now believe that species could have been evolving in the archipelago for up to 70 million years—that’s 700,000 centuries during which native species could have been evolving, as compared with only 11–17 centuries for the evolution of a unique human culture! Of course, not all the species arrived 70 million years ago; ancestral, colonizing species continued to arrive at different times throughout the entire period.

## Habitat diversity

Most people who live outside of Hawai‘i probably think of these islands as having a very mild climate that varies little throughout the year. However, closer inspection reveals that each of our “high islands” (from Kaua‘i to Hawai‘i) contains many different types of habitats, and these habitats often have very different climates. The naturalist Sherwin Carlquist described this well:

Despite their small total area, the Islands have places which are desert dry and others which may be the wettest places on earth. Temperatures can go below freezing on high mountains, or can be above 90°F at sea level. Humidity can stand at virtually zero in alpine areas, yet be 100% nearly all of the time in wet mountain areas. In short, the Hawaiian Islands are a climatic showcase in which equable conditions co-exist with some of the most severe extremes in the world.

Habitats with very different climates can exist quite near one another, as do the Ka‘ū Desert and the lush tree-fern forests of Kīlauea on Hawai‘i.

Even a relative newcomer to the islands will notice the change in climate that occurs as they move from the wet windward coast of one of the islands, up into the cool mountains, and then back down toward the sea on the drier leeward side. An observant traveler will also notice a number of different habitats along the way, each of which is occupied by different types of plants and animals.

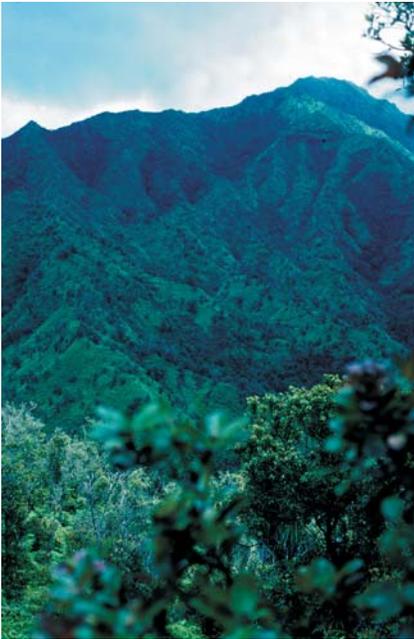
## Isolation

The Hawaiian Islands are the most isolated major group of islands in the world. They lie more than 2000 miles from the nearest continent (North America) and about 1000 miles from the closest Pacific atolls (to the south). This means that successful colonization by any immigrant species was probably a very rare event! As a result, Hawai‘i’s diverse habitats were colonized mostly by the offspring of the few species that had become established in the islands, and rarely by new species from elsewhere. Some of these populations were, just by chance, isolated from others (by such barriers as expanses of ocean or mountain ridges). Over time, these isolated populations of a certain species changed in different ways—generally in ways that made them better suited to the different habitats in which they had become established. Given enough time, some of these populations became so different from their ancestral species that they became distinct species.

An excellent example of the effects of time, habitat diversity, and isolation is provided by the group of birds known as the Hawaiian honey creepers. Scientists now believe that a single ancestral species arrived in the islands about 20 million years ago, and its descendents evolved into 47 new endemic species. These birds vary remarkably in the colors of their plumage and the shapes of their bills, which scientists theorize to be the result of different environments and food sources.

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*Most people who live outside of Hawai‘i probably think of these islands as having a very mild climate that varies little throughout the year.*



*Despite the small extent of land area in Hawai‘i, nearly all of the world’s major plant formation types can be found in the islands.*

## Evolution’s legacy: unique plant communities rich with native species

Evolution, combined with the physical characteristics of the Hawaiian Islands, eventually led to the formation of many unique native plant communities, each with its own characteristic sets of plants, birds, snails, insects, spiders, and other creatures. Biologists have named 106 unique plant communities still found in Hawai‘i. The following examples help to demonstrate how very different these special places are. Hawai‘i has:

- Dry, coastal herb-lands, with extremely hot, dry conditions, and plants like nama (*Nama sandwicensis*) in sandy areas and ‘ākulikuli (*Sesuvium portulacastrum*) on mud.
- Montane wet forests, on the windward sides of some mountains, between 4000 and 7200 ft elevation, with a warm, wet climate, frequent afternoon fogs, and lots of lehua (*Metrosideros*) and koa (*Acacia koa*) trees and hāpu‘u (*Cibotium*) tree ferns.
- Alpine dry shrublands on Maui and Hawai‘i, above 9850 ft elevation, with extremely dry, cold conditions and frequent frosts, and silversword (‘āhinahina, *Argyroxiphium sandwicense*) and na‘ena‘e (*Dubautia*), which grow on gravel and cinders.

Despite the small extent of land area in Hawai‘i, nearly all of the world’s major plant formation types can be found in the islands. This is particularly impressive considering that only about 20 percent of the land is still covered with “natural” plant communities (those that are not being actively managed by humans). The early Hawaiians were very much aware of the rich legacy of natural communities that surrounded them. They identified the various vegetation zones using some of the same criteria as today’s scientists: the elevation, moisture received, and types of plants most commonly found. David Malo demonstrated this in discussing the Hawaiian concept of *wao*, the inland (mountain) regions that were generally forested and usually uninhabited:

The belt below the *kuāmauna*, in which small trees grow, is called *kuāheha*, and the belt below the *kuāheha*, where the larger sized forest trees grow, is called *wao*, or *wao-nahele*, or *wao-eiwa*. The belt below the *wao-eiwa* was the one in which the monarchs of the forests grew, and was called *wao-maukele*, and the belt below that, in which again trees of smaller size grew was called *wao-akua*, and below the *wao-akua* comes the belt called *wao-kanaka* or *mau*. Here grows the *amau* fern and here men cultivate the land.

## The “natural” universe of the early Hawaiian people

These natural communities were more than just vegetation zones to the early Hawaiians. They were also the homes of their gods, and places where they could *feel* the vitality—*ke ola* (the life)—that flowed through the Hawaiian universe.

This universe of the early Hawaiians was made up of the honua (earth), the lani (sky), and all things upon, within, and between these places. To the Hawaiian mind, all of nature's embodiments—including rocks, trees, and bodies of water—were thought to possess *ola* (life). As a result, they were thought to be aware of—and able to interact with—one another. The lani fertilized the honua with its rains and mists, and as a result, life sprang forth from the earth. Similarly, Hawaiians believed that all life (*ke ola*) was perpetuated through the sexual interactions of its members.

The Hawaiian people considered themselves a part of this universe—not apart from it. Modern English dictionaries define nature as “the external world in its entirety.” Hawaiians had no equivalent word, despite the fact that they organized their universe into “paired opposites,” such as lani and honua (sky and earth) or uka and kai (mountain and sea).

In the traditional Hawaiian society, people were bound affectionately to the land that nurtured their families and, in most cases, had been their homeland for many generations. As they worked on, learned of, and loved their homelands, Hawaiians understood that the land was simultaneously transforming them, for each place was thought to develop a population with a distinctive general character and cultural style.

And, as Hawaiians responded to the universe around them, nature responded to humans. The Hawaiians believed that nature's many forms could be called upon for inspiration, guidance, assistance, reassurance, or for their life-giving powers. The ‘oli at right, recorded in one of the Hawaiian language newspapers of the 19th century, illustrates this principle. It describes the upland forest and evokes (calls upon to appear) a goddess of that forest and the materials that are to be made into a lei.

To the Hawaiian mind, humans were the *malihini* (newcomers) in this universe, which was the place where they would be born, live, die, and where their spirits would remain after death. As such, their universe had to be nurtured carefully and was never considered expendable. The Hawaiians further believed that everything in their universe was related and that they were the youngest members of this extended family. As a result, they treated the rest of nature with love and the kind of respect that should be afforded an elder family member.

Hawaiians also believed that people should learn as much as possible about the things that they loved. This attitude is at the heart of an ‘ōlelo no‘eau (wise saying), telling us that we should seek a deep knowledge of the things we love:

*Hana no‘eau ke aloha.*

Love is wise work.

(from John Charlot)

Thus it is not surprising that the Hawaiians developed so much scientific knowledge about the natural world around them. Simply stated, science happens whenever we explore nature for the purpose of understanding it better. We have described how early Hawaiians were keen observers of nature and were often just as accurate as modern scientists when it came to identifying, classifying, and naming the plants, animals, and vegetation zones around them. Moreover, they also employed what we now know as “the scientific method” to learn more about the things in their environment. This method involves three basic steps: careful observations are made; a simple, reasonable explanation for these observations is proposed (a hypothesis); and ex-



*E o ka wahine i loko o ka ohu...*

*I ae ka wahine nona ka lei*

*I uo ia e Hinaulu ohia*

*O ka hala me ka lehua i ka nahele...*

Respond, O woman who is there in the mists...

The woman for whom the lei was made speaks

Her lei was made by Hina of the ‘ōhi‘a grove

[It is made] of the hala and lehua of the forest...

(translated by Mary Kawena Puku‘i; chant in the collection of K. Maly)

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*Nature's many forms, from the skies and mountain peaks, to the watered valleys and plains, to the shore line and ocean depths, were considered to be embodiments of Hawaiian gods and deities.*

periments are designed to test the explanation. The results of the experiments indicate whether the investigator is on the right track.

Using this approach, Hawaiians developed a vast body of knowledge about the other species living in their environment. This included how different plant species and varieties were related to one another, where and how they were best grown, when they should be harvested, how they could be used, and how best to ensure an ample supply for current and future needs. Hawaiian natural medicinal therapy has been described as “very systematic” and “more scientific in many ways, at the time of discovery, than that of their European ‘discoverers’.” Hawaiians have also been called “true experimental horticulturalists” who developed hundreds of varieties of kalo (taro, *Colocasia esculenta*) and ‘uala (sweetpotato, *Ipomoea batatas*).

The intimacy of the relationship between the Hawaiians and their natural world went far beyond mere knowledge of the things around them: there was also a spiritual connection. The basis of this spiritual connection is beautifully and effectively communicated by one of the Hawaiian creation stories about the origin of the Hawaiian islands and its people. The story begins with a group of god-beings, or “creative forces of nature,” two of whom were Wākea (the expanse of the sky) and Papa, also known as Papa hānau moku (Papa the Earth Mother who gave birth to the islands) and Haumea nui hānau wāwā (Great Haumea, Woman Earth, born time and time again). The sexual unions of Wākea and Papa—with each other and with various other closely-related creative forces of nature—resulted in the birth of each of the Hawaiian islands. Hawai‘i, the largest of the islands, was the firstborn of these island children.

As the Hawaiian genealogical account continues, we find that these same god-beings came together again to populate the islands with people. The next-born child, however, did not survive and was buried. From the child’s body grew the first kalo plant, which was named Hāloa, the ancestor of all of Hawai‘i’s kalo plants. Their next child, whom they also named Hāloa, was the first human being to live on the islands, and from him all of the native Hawaiian people are descended.

Two aspects of the story are important to our discussion. First, the Hawaiians believed that all of nature (including humankind) is descended from a small group of closely related deities; Hawai‘i’s human and non-human natives were members of one extended family. Second, the Hawaiian people considered themselves genealogically subordinate to the land and the kalo, since humans were descendents of the child born after the islands and the first taro plant were born. Handy and Puku‘i explained this attitude, stating that “precedence or status was determined by genealogical seniority, not by generation or age, or by sex. Persons stemming from a genealogically elder branch outrank older generations of junior branches.” Thus to the Hawaiian the natural world was genealogically precedent, and the appropriate attitude toward it was one of love and respect.

An extension of the various Hawaiian beliefs about creation is the concept of kinolau (body forms of the gods). Nature’s many forms, from the skies and mountain peaks, to the watered valleys and plains, to the shore line and ocean depths, were considered to be embodiments of Hawaiian gods and deities. Puku‘i and Elbert described kinolau as “the many forms [that might be] taken by a supernatural body.” It is derived from the words kino, meaning “form or embodiment,” and lau, meaning “many.” Some believe that virtually every plant species known to the Hawaiians was considered kinolau of some spirit or deity. This concept helped to link the Hawaiian people to their gods.

Thus Hawaiians might call upon the kinolau of their deities as demonstrated in the closing of the ‘oli at right, below. The chanter speaks of the beauty of a waterfall and calls upon various nature forms for inspiration. Lau-ka-‘ie‘ie has been described as a “beautiful demigoddess who was transformed into an ‘ie‘ie vine.” The palai fern was a kinolau of Hi‘iaka, a sister of Pele. The kī, or ti plant, was “not regarded as the kinolau of any forest god,” and yet its leaves were considered essential for decorating the altar of Laka in the hālau hula (dancers’ house).

Kinolau could also be worn. Wearing a lei made of materials from a kinolau would allow Hawaiians to touch their gods in a literal sense, and be touched by them, since the plants were bodily forms of the akua. Sometimes, Hawaiians wore lei to show the akua their appreciation for the beauty of the plants that were their kinolau. Other times, these lei were worn in hopes of being enlightened or inspired by the deity.

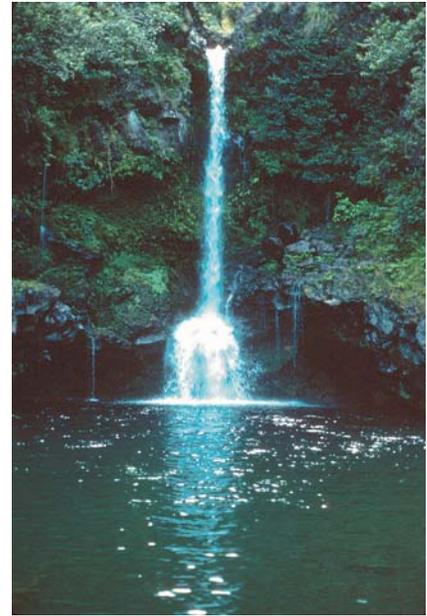
Kinolau were also placed on the altar (kuahu) of a hālau hula. Their presence on the kuahu was meant to honor the gods and goddesses of the hula and to inspire the haumāna (students) as they learned their art. Kūpuna (elder Hawaiians) born in the period between approximately 1885 and 1915 told us that the chants used in obtaining these offerings were so strong that the plants never wilted on the kuahu but remained green and fragrant. If any of the students broke one of the many strict rules of the hālau while in training, the plants would wilt, to show their disapproval. This example demonstrates that these kinolau (body form) offerings were not just decorative symbols but were powerful entities that were not to be taken lightly or treated with disrespect.

### Six plants commonly placed on the altar of the hālau hula

Hawaiian name	Scientific name	Diety of which the plant was kinolau
lama wood	<i>Diospyros</i> species	Laka (a female deity)
lehua	<i>Metrosideros</i> species	Kūka‘ōhi‘alaka (a male Laka deity)
halapēpē	<i>Pleomele</i> species	Kapo and Laka
palai (palapalai) fern	<i>Sphenomeris chinensis</i>	Hi‘iaka
‘ie‘ie	<i>Freycinetia arborea</i>	Lau-ka-‘ie‘ie
maile	<i>Alyxia oliviformis</i>	the four Maile sisters

While our generations are far removed from the time of the kapu and kāmāwai (restrictions and laws) of the akua, restrictions which were released, or “put to sleep,” by the po‘e kahiko (ancient people), it is important to remember the severity of these rules in old Hawai‘i and the strictness with which they were practiced. The repercussions of breaking the rules of the gods, whether in the forests or in other areas of Hawaiian life, were extremely serious and potentially lethal. Here is an example, provided by Mary Kawena Puku‘i:

Kapo established a school for the hula, ritual dance-drama. Her nature was dual...This Kapo was a goddess whose temper was violent and vengeful. But when worshipped by dancers and chanters, this same person was the gentle Laka, the spirit of the wild wood. Yet when the kapu of seclusion was disregarded by a student or teacher during the period of devotion to hula training in the halau, the loving Laka quickly



*...Ke lele la ka wai o Kawaikapu  
E iho mai i na pali  
E iho mai e Lau-ka-‘ie‘ie  
Lau-ka-palai, pili me Lau-i-o-uka e  
E iho mai  
E hooulu ia!*

...The water leaps from Kāwaikapu  
It descends from the cliffs  
Descend O Leaf-of-the-‘ie‘ie  
Leaf-of-the-palai, who are related to the  
Leaf-of-the-upland-ti-plants  
Descend!  
Inspire!

(translated by Mary Kawena Puku‘i; chant in the collection of K. Maly)

*Noho ana ke akua i ka nahelehele.  
 I alai ia e ke kiohuohu, e ka ua koko,  
 O na kino malu i ka lani,  
 Malu e hoe.  
 E hooulu aku ana ia ulu kupu,  
 Ia ulu noho, ia ulu kini o e akua,  
 Ulu i ke kapa kanaka.  
 Kahea ke akua kiai pali,  
 E wikiwiki, e holoholo, e na kaa loa,  
 Maile, ki ke 'kua ke ano mai.  
 E ulu, e ulu, i ko kahu  
 Ia ka hookapuhi noa.*

The gods dwell in the woodlands.

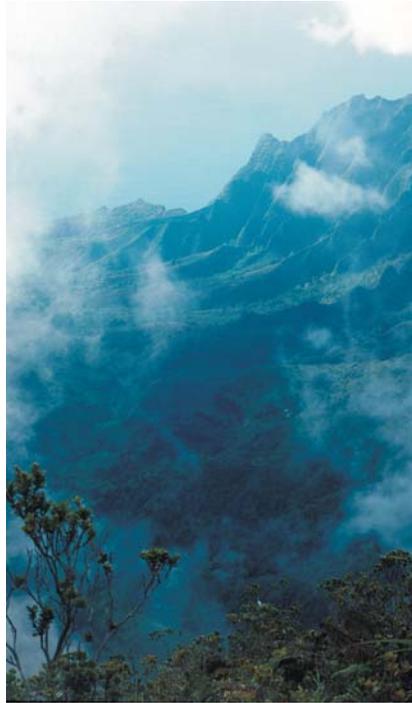
Hidden away in the mist, in the low-  
 hanging rainbow.

O beings sheltered by the heavens,  
 Clear our path of all hindrance.

We call to [the gods of] growth to inspire us,  
 To the [woodland] dwellers for inspiration,  
 to the hosts of gods for inspiration,  
 To be given to the dwelling place of [us]  
 human beings.

The guardian god of the hills calls  
 To hasten to hurry, to speed along the way,  
 The maile and ki thickets are the dwelling  
 places of these revered ones.  
 Inspire us, inspire and dwell on your altar,  
 Give us the lithe freedom of an eel.

(Puku'i 1936 in Barrere et al. 1980)



changed into vengeful Kapo and smote the culprit. So was the hula respected in the olden times; it was beneficent when rules were kept, yet deadly when they were not.

The forests, as the home of the akua, were seen as awesome and profoundly spiritual places. One did not enter them, or take from them, without first asking permission, and respectful behavior was always shown to all of the beings that lived there. The prayer (pule) at left is an excellent example of the awe and reverence felt by the Hawaiians for their forests. It is called a *pule pale* (protection prayer), for protecting the way to the forest from evil of every kind.

What offering can one leave in such revered places? To the Hawaiian mind, the greatest offering one could make was that of voice. This is because the spoken word was “considered to be the highest form of cultural expression in old Hawai‘i.” But ‘oli were more than something that one “gave.” They were a link—a spiritual connection—to the place and the dieties that lived there. In the words of the renowned kumu hula Winona Beamer, “The chants were so haunting, they seemed to flow like clear streams of consciousness from the deep green heart of the forest primeval.”

Because of our emphasis here on plants for making lei, our examples of how the Hawaiians accorded love and respect to natural places are centered on Hawai‘i’s forests. Of course, other natural places were also accorded the same love and respect as that seen in the ‘oli on the next page. And, in any of these special places, a lei might be fashioned to allow the wearer to carry a bit of that beloved place with them for a while. This is demonstrated in the ‘oli describing the wind-blown lowlands of Ka‘ū and speaking of a woman who gathers flowers to make into a lei (p. 190, right column).

Ke aloha ‘āina, the love of the land, that is so apparent in these ‘oli, permeated Hawaiian experience, and this love compelled the Hawaiians to continually deepen their knowledge of the land and its many non-human inhabitants. Hawaiians called themselves *kama‘āina*, literally “children of the land,” a word that not only means “native born” but is also used to describe one that is intimately familiar with something or someone.

This Hawaiian knowledge of their homeland, this intimate familiarity, was also deeply emotional. Just as we become aware of and responsive to the emotions of our closest loved ones, so Hawaiians felt for their loved ones. The difference is that Hawaiians extended this love to many of the non-human inhabitants of their universe, for the Hawaiians and their emotions were one with the world around them.

The following ‘oli offers us a glimpse into the way the old Hawaiians felt for their environment. It is said to have been composed at the time that hula originated on the island of Moloka‘i. It was offered before the chanter took a small piece of the

lehua tree (*Metrosideros* species) to place upon the hula altar. In it, the chanter likens her love for the lehua tree to the type of affectionate love a woman might feel for her husband.

*Ku'u ipo mau no me he kane la,  
He ipo na'u ka lehua iluna, lehua ilalo,  
Pupu weuweu e Laka e.*

My loved one, dear as a husband,  
A sweetheart to me are the lehuas above and below,  
In the leafy bower of Laka.

(Manu 1899, in Barrere et al. 1980, translated by Mary Kawena Puku'i)

With this insight, we can better appreciate the deep affection that is expressed in the following song written by Princess Likelike. Here the composer shares her family's affection for their estate at 'Āinahau, in Waikīkī, O'ahu.

*Nā ka makani aheahe i pā mai makai  
I lawe mai i ke onaona līpoa  
E ho'oiipo ho'onipo me ke 'ala ku'u home,  
Ku'u home, ku'u home i ka 'iu'iu.*

Wind blowing gently from the sea  
Brings the fragrance of līpoa seaweed,  
Love and delight and perfume for my home,  
My home, my home in paradise.

(from Elbert and Mahoe 1970: 30)

As we try to comprehend the many dimensions of the Hawaiian relationship to nature and the way they were simultaneously integrated into every aspect of Hawaiian life, we can find reassurance in the following words from Mary Kawena Puku'i, for they acknowledge that it is indeed a very difficult task. Still, we believe it is worth the effort, as the insights gained by exploring the Hawaiian relationship with nature can guide us to attitudes and practices that are much healthier for humans and the environment in Hawai'i today.

It is hard for the modern intellectually [rigid] and extroverted mind to sense the subjective relationship of genuine Hawaiians to Nature, visible and invisible. But...without some comprehension of this quality of spontaneous being-one-with-natural-phenomena which are persons, not things, it is impossible for an alien (be he foreigner or city-hardened native) to understand a true country-Hawaiian's sense of dependence and obligation, his "values," his discrimination of the real, the good, the beautiful and the true, his feeling of organic and spiritual identification with the 'aina (home-land) and 'ohana (kin). (Handy and Puku'i 1972)



*Kiekie Kau hanohano i ka makani  
He ipu kai Pohina na ka Aeloa  
He umauma i pa ia e ka Maaa  
Ea ka Unulau o Maaounulau  
Inu aku no i Nunuweuweu  
Ka wahine kaili pua o Paiahaa  
Alualu pua hala kai o  
Kamilopaekanaka . . .*

Majestic Ka'ū, glorious in the winds

Pōhina is like a dish that catches the  
A'eloa breeze

Its chest is struck by the Ma'a'a Wind

The Unulau wind rises up, it is the  
Ma'aounulau

Drinking at Nunuweuweu

The woman who gathers the flowers at  
Paiaha'a

Has gone to gather the hala clusters at  
Kamilopaekanaka . . .

(Taken from *Ka Hoku o Hawai'i*, December 17,  
1911; translated by K. Maly)

## Hawaiian practices and ethics that affected natural resources

The deep emotional ties between Hawaiians and the natural world did not prevent them from altering their environment, for the Hawaiian relationship to nature was based as much upon practicality as it was on intellectual and spiritual insight.

### Hawaiians' alterations of native plant communities

Virtually anything in the Hawaiian environment could be taken or moved, if the cause was pono (right, appropriate) and the right prayers and offerings were made. For example, as we have already seen, the taro plant was believed to be genealogically superior to its human “cousins.” It was also a kinolau of the Kāne, a deity that has been described as “the leading god among the great gods.” Even so, taro was pulled up, cooked, and mashed almost every day in old Hawai‘i.

What distinguishes the ancient Hawaiians from the people who live in Hawai‘i today is not that they did not alter native ecosystems or remove native species, it is the manner in which they did these things. In Hawaiian society prior to 1778, large-scale environmental disturbance was generally limited to that needed for survival. Gathering and other smaller-scale removals of native plants and animals was strictly controlled.

The Hawaiian people removed large areas of lowland native vegetation to build the structures and cultivate the plants they needed for survival. Had they not done so, they would almost certainly have perished or been restricted to small populations. Among the thousands of plant and animals species native to Hawai‘i, there are few that could support a human population for very long.

The Hawaiians also cleared some lowland areas with fire to encourage the growth of certain useful plant species such as pili grass (*Heteropogon contortus*), which was favored in many areas for thatching houses. The lower reaches of the inland forests (wao) were modified both by harvesting and by planting. Native plants and animals were removed when Hawaiians gathered and harvested in order to make such things as lei, medicine, and canoes. Native plants were displaced when Hawaiians planted species important to their way of life—introduced species like kukui, ‘awa, and wild yams were commonly planted in suitable areas, as was the native ‘olonā (*Touchardia latifolia*), an endemic plant used to make cordage. It has been estimated that only areas above about 2500 ft elevation were left relatively undisturbed by the early Hawaiians.

### Limitations on gathering in ancient Hawai‘i

Gathering was not always the “free-for-all” that many people today seem to believe it is or should be. In old Hawai‘i, gathering was strictly controlled by three main factors: the values and beliefs of the Hawaiian people; their strict, often specialized, gathering protocols; and their system of land use, which limited the area from which people could collect.

### Gathering ethics and beliefs

The Hawaiian people followed protocols when they gathered and harvested from native ecosystems. These required that the gatherers prepare themselves spiritually before setting out and that they maintain an appropriate mental attitude before, dur-

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*What distinguishes the ancient Hawaiians from the people who live in Hawai‘i today is not that they did not alter native ecosystems or remove native species, it is the manner in which they did these things.*

ing, and after collecting the desired materials. The physical process of gathering always involved going about one's business quietly, asking permission, giving thanks, and treating the plants or animals to be collected—and everything else in their environment—with respect.

Every aspect of the gathering process, whether mental or physical, spiritual or practical, was reflected in a single guiding principle: “treat all of nature's embodiments with respect.” The overall effect of this attitude was to minimize the impact of gathering on native ecosystems.

“Entry chants” were offered to ask permission of the forest or other plant community for entry and to protect the collector from misfortune. The chants were an expression of the gatherer's respect for and good intentions toward all of the beings that lived there, including the akua, plants, animals, rocks, streams, etc. Similarly, chants were offered before any plant was collected, out of respect for the plants themselves and for the akua to whom those plants were dedicated.

A quiet demeanor not only displayed the appropriate attitude of respect, but it allowed the collector to be alert to signs that were “bad omens.” For example, some signs might indicate that a particular plant should not be picked for medicinal purposes, as it might make the medicine bad. Other signs might indicate that this was not the right time for collecting anything at all, and that the collector should turn around and go home.

Plants and plant parts were removed carefully, and one never took more than was needed. Ferns were broken carefully at the base of the frond, taking care not to uproot the plant. Besides showing appropriate respect for the plant, this conservation ensured that the plant would survive and remain healthy, so that it could produce more fronds later. Similarly, other plant parts were removed in ways that minimized the impact to the plant.

According to a kupuna (Hawaiian elder) we interviewed, these kinds of respectful procedures were still taught by the “oldsters” of her homeland when she was young. Raised in a Hawaiian-speaking family on Hawai'i in the 1920s and '30s, she was told frequently that “when you go into the mountains to pick the liko of the lehua tree...remember, the tree has feelings, too.” She was told to pick “gently,” and to remove only a few liko (young leaves) from each tree, so that the tree was left “looking beautiful and healthy.” She added that “you would never denude or harm the tree, as you see people doing today!”

Gathering typically was spaced out in some way, taking a little here and a little there, as expressed just above. According to several other kupuna, the reasoning behind this practice was that it prevented the other plants of the type being collected from becoming lili (jealous) and squabbling among themselves. Ecologically, of course, this practice helped to ensure that no area was completely stripped of a certain plant species and that harvesting could be sustained.

Most people would agree that these gathering principles embody appropriate treatment of those we love and respect. For example, when we enter the home of a friend today, we usually ask permission; we try not to impose on their hospitality or damage their home. So it was that Hawaiians approached gathering from native ecosystems—good manners and plain common sense guided their behavior.

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*The physical process of gathering always involved going about one's business quietly, asking permission, giving thanks, and treating the plants or animals to be collected—and everything else in their environment—with respect.*

### Gathering protocols and specialization

Every member of Hawaiian society was trained to gather correctly, according to well established protocols. Compliance was not optional—it was mandatory! Wanton disregard for the established procedures, or mistakes made while carrying them out, could bring misfortune to the collector as well as to the person who received the product made from the gathered materials. An improper (negative or unclean) mental attitude could also have bad consequences. With certain protocols, even death could result if they were not followed correctly. Thus great care was always taken to strictly follow the protocols one had been taught.

Certain important activities required special knowledge and were carried out only by specialists. The most highly trained of these were the kahuna (experts), who served in roughly the same capacity as the professional specialists of contemporary society, such as medical doctors and certified arborists, for example. The kahuna received extensive training and learned to master very elaborate technical and religious protocols.

When gathering materials for such important purposes as carving a new canoe or making powerful medicine, choosing the right plant was vitally important. Not only did it need to have the right physical characteristics, but its spiritual characteristics were important as well, and the gatherer had to be specially trained or gifted to perceive these qualities in the plant. Thus specialists had to collect the plant materials needed for important purposes, because complex, specialized protocols had to be carried out correctly, and special sensitivity was required to select plants with the right qualities.

For example, only the kahuna kalai wa'a (canoe carving expert) could select and harvest the tree needed for a new canoe, only the kahuna lā'au lapa'au (literally "curing-plant expert") had the expertise to gather plants to prepare certain medicines, and only a kahuna expert in religion could gather the plants required for certain very important religious offerings.

Many other activities were considered important enough to warrant "specialized collectors," but they did not require a kahuna. For example, when religious offerings were needed for the altar of the hālau hula, one or a few well trained individuals were sent to the uplands to collect the appropriate plant materials.

The practice of having specialists collect materials for certain uses continued into the first half of the 20th century. One kumu hula (hula teacher) told us that when she was being trained as a dancer in the 1930s, her hālau had one person whose job it was to make lei for the entire group: "It was the lei maker's job to go to the forest and collect materials for lei. Our job was to learn the dances and the chants—nothing more. We weren't expected to do everything, like some of these young people are today."

### Gathering boundaries

Hawaiians of old could not gather wherever they pleased. Their system of land management required that they gather only within the boundaries of their own ahupua'a—the land division in which they resided.

When their boundaries are drawn on a map, ahupua'a are usually somewhat wedge-shaped, because the boundaries extend from the uplands to the sea, "thus including fishing rights, cultivable lands, upland timber and planting zones, and areas of valuable bird-catching privileges in the higher mountains." Each ahupua'a



had a specific name and fixed boundaries. Those who lived in it were generally allowed access to all of its various natural resources, and gathering outside the boundaries of one's ahupua'a was, with certain exceptions, not permitted. According to the testimonies of Hawaiians who lived under the ahupua'a system during the reign of King Kamehameha the Great (who died in 1819), ahupua'a boundaries were taken very seriously. Outsiders found gathering beyond the boundaries of their own ahupua'a without permission might be chased, punished, perhaps even killed by the rightful residents.

Hawaiians carefully monitored the quantity and condition of the natural resources in their ahupua'a. Where resources were plentiful, they were judiciously harvested. Where plants were not sufficiently abundant, harvesting might be restricted and the plants left to increase on their own, or additional plants might be cultivated. Important species, such as kalo (taro) and 'olonā (used for cordage), were carefully tended.

Political structures also served to protect ahupua'a resources. Each ahupua'a was placed under the control of a konohiki (headman), who was in charge of the land and fishing rights and was responsible for maintaining the resources of the ahupua'a. The konohiki answered to an ali'i 'ai ahupua'a (chief who controlled the ahupua'a resources), who answered, in turn, to an ali'i 'ai moku (chief who claimed the abundance of the entire district).

However, Hawaiian mo'olelo (stories) tell us that not all ali'i were ethical or competent when it came to taking care of the people and resources in their ahupua'a. Some ali'i did not remain in position for very long, as political control often changed. And, some areas were less strictly controlled than others. Thus the ultimate responsibility for taking care of the natural resources of an ahupua'a rested with the families that lived there, generation after generation.

### **Part 3** Introduced organisms and cultural change since 1778

Soon after Captain James Cook arrived in the Hawaiian Islands in 1778, Hawai'i became known throughout the world. It was not long before people from many distant lands arrived and settled in the islands. Each cultural group brought with them new species of organisms and different ideas about how to treat the land and its resources. All of these "new additions" profoundly affected both nature and culture in the islands.

#### **Changes in nature: introduced species**

Since 1778, newcomers have brought thousands of plant and animal species to Hawai'i. We use the term "introduced" to refer to these species, whether they were brought deliberately or accidentally. These species are also referred to elsewhere as "alien," "exotic," "adventive," or "non-native." The first introduced plant species to reach Hawai'i were brought by the Polynesian ancestors of the native Hawaiian people. We call these "Polynesian introductions"; they are sometimes also called "canoe plants." We call the species introduced after 1778 "post-Cook introductions."

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*Ultimate responsibility for taking care of the natural resources of an ahupua'a rested with the families that lived there, generation after generation.*

Many of the plant species introduced during the post-Cook period were immediately adopted into the lei-making culture, which welcomed the new fragrances, colors, shapes, and textures that the new plants brought to their craft. However, other introduced plants (and animals too) are now a threat to the existence of the native plants traditionally used in the Hawaiian arts of hula and lei making. We can help save these plants and the ecosystems where they grow if we understand why and how they are being threatened.

### Polynesian introductions

About 33 species of plants were brought to Hawai‘i by the ancient Polynesian people. These plants coexisted with the Hawaiian people throughout their history in the islands and were an integral part of their culture and everyday life. The most well known of these species are listed here. Plants used primarily for food and medicine are listed in the left column. The common Hawaiian name is given first, followed by the common English name and, in parentheses, the scientific name.

#### Some well known Polynesian introductions

‘ape	elephant’s-ear plant ( <i>Alocasia macrorrhiza</i> )	‘auhuhu	no English name ( <i>Tephrosia purpurea</i> )
‘awa	kava ( <i>Piper methysticum</i> )	‘awapuhi kuahiwi	shampoo ginger ( <i>Zingiber zerumbet</i> )
kalo	taro ( <i>Colocasia esculenta</i> )	ipu	bottle gourd ( <i>Lagenaria siceraria</i> )
kō	sugarcane ( <i>Saccharum officinarum</i> )	kamani	Alexandrian laurel ( <i>Calophyllum inophyllum</i> )
mai‘a	banana ( <i>Musa x paradisiaca</i> )	kī	ti ( <i>Cordyline fruticosa</i> )
noni	Indian mulberry ( <i>Morinda citrifolia</i> )	kou*	no English name ( <i>Cordia subcordata</i> )
‘ōlena	turmeric ( <i>Curcuma longa</i> )	kukui	candlenut tree ( <i>Aleurites moluccana</i> )
pia	Polynesian arrowroot ( <i>Tacca leontopetaloides</i> )	milo*	portia tree ( <i>Thespesia populnea</i> )
‘uala	sweetpotato ( <i>Ipomoea batatas</i> )	niu*	coconut ( <i>Cocos nucifera</i> )
uhi	edible yam ( <i>Dioscorea alata</i> )	‘ohe	bamboo ( <i>Schizostachyum glaucifolium</i> )
‘ulu	breadfruit ( <i>Artocarpus altilis</i> )	wauke	paper mulberry ( <i>Broussonetia papyrifera</i> )

\*These species may have existed naturally in Hawai‘i before humans arrived.

### Post-Cook introductions

Approximately 9000 new species of flowering plants were introduced to Hawai‘i from all over the world during the 216-year period between 1778 and 1994. Some, including plumeria, carnation, ginger, pīkake, pakalana, pua kenikeni, and pua male (*Stephanotis*), quickly became favorites of island residents and staples of the lei industry. Many were also embraced by native Hawaiians, who incorporated them into their culture. The song, Moloka‘i Nui a Hina, on the next page, provides an example of this adoption of post-Cook introductions into Hawaiian culture. Here, the author speaks of his love for his sweetheart and his homeland, Moloka‘i. The flowers of two introduced plant species, the kukui (*Aleurites moluccana*, a Polynesian introduction) and the crown flower (*Calotropis gigantea*, a post-Cook introduction), are romantically linked to the singer.

### Effects of introduced plants and animals on native ecosystems

Unfortunately, not all of Hawai‘i’s introduced plant species have had a positive influence on life in the islands. Many have had very negative effects on native ecosystems; fortunately, most species popular with lei makers are not threats to native ecosystems.

The word ecosystem refers to a plant community, together with all of the other organisms that live there and all elements of the physical environment, including rocks, soil, minerals, water, etc. It comes from the Latin word *oeco*, meaning “household.” Thus, an ecosystem can be thought of as a house (which is provided by the plants) and everybody in it. Technically, ecosystems can be of almost any size (e.g., the world ecosystem, or the ecosystem on a leaf), but we will be talking about classes of ecosystems like forests, shrub lands, and grasslands.

Of the 9000 plant species that humans introduced to Hawai‘i, 861 (about 10 percent), have become naturalized, meaning that they established themselves in our natural areas and are reproducing successfully without any help from humans. Some populations are not spreading, but most continue to increase in size. Of the 861, 29 are Polynesian introductions and 832 are post-Cook introductions.

Today, almost half (47 percent) of the flowering plant species found in nature here are naturalized introductions. In contrast, before 1778 only about 3 percent of the flowering plant species that occurred in nature were not native. (Hawaiian ecosystems are currently home to 956 native and 861 introduced plant species. Before 1778 there were about 1060 native species and 29 naturalized introduced species.)

Ten percent of Hawai‘i’s naturalized plant species are considered “serious pests of native ecosystems,” and all of these approximately 86 pest species are post-Cook introductions. This number will only increase with time, because some species already present will become pests after they have had a few decades to spread, and other introduced plant species continue to pour into the state.

While many of the serious pest plants only invade native plant communities that have been disturbed, about a third (28) of the 86 are capable of invading native ecosystems that are “intact” (undisturbed). These few species, if left alone, can cause irreparable damage. One particularly dangerous introduction is *Miconia calvescens* (the velvet tree), a species that now covers about 70 percent of the vegetated area on the island of Tahiti. Without intervention by concerned humans, it could do the same thing here in Hawai‘i.

The serious plant pests that require some kind of disturbance in order to become established in a native ecosystem have two advantages over native species. Most of the pest species are naturally suited to colonizing disturbed areas, while most native forest species are not well suited to responding to disturbance, because they evolved in environments where disturbances (like the falling of a dead tree) were relatively rare. Also, many more forces disturb native ecosystems today than before 1778. These forces include more frequent—and more destructive—visits by human beings, and by another formidable group of pests: terrestrial, plant-eating mammals.

Ecological studies have demonstrated that when vegetation is removed from a native rain-forest, either by human collectors or by herbivorous animals, the amount of light that reaches the forest floor increases. One result of this change is that the native species (adapted to lower light levels) are often replaced by introduced plant species adapted to higher light levels. This can occur whether the vegetation that has been removed is from the upper forest story (the tree canopy), the middle, or the lower story of the forest. For example, when pigs eat hāpu‘u tree fern (*Cibotium* species) in native forest, the fern fronds (leaves) are removed from the middle story of the forest. This allows more light to reach the understory, and certain weedy introduced plants are able to colonize the forest in these areas. Similarly, studies have shown that weedy plant species can invade openings created in the soil by herbivores or humans, but they do not invade adjacent areas without such openings.



*Ua nani nā hono a Pi‘i-lani, i ke kū  
kilakila i ka ‘ōpua.*

*‘O ku‘u pua kukui, aia i Lani-kāula,  
‘o ka hene wai ‘olu lana mālie.*

*Ua like nō a like la—me ku‘u one  
hānau, ke po‘okela i ka piko o nā  
kuahiwi,*

*me Moloka‘i nui a Hina, ‘āina i ka  
wehiwehi, e ho‘i nō au e pili.*

*E ka makani ē, e pā mai me ke  
aheahe, ‘auhea ku‘u pua kalaunu.*

How beautiful are the bays of Pi‘i-lani,  
that stand majestically by the billowy  
clouds.

My *kukui* flower is at Lani-kāula, where  
water flows with cool and soothing rustle.

Alike—the sands of my birth, the tops of  
all mountains,

and Hina’s great Moloka‘i, festive land,  
may I return to stay.

O wind, blow gently, heed, my crown  
flower.

(Elbert and Mahoe 1970)

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*Many land-dwelling herbivores have been introduced to Hawai‘i since 1778.*

Many land-dwelling herbivores have been introduced to Hawai‘i since 1778, and some of them have become feral (surviving and reproducing in the wild without any help from humans). Native ecosystems are seriously threatened by many of them, especially pigs, goats, cattle, domestic sheep, mouflon sheep, axis deer, and mule deer.

The hooved plant-eaters kill and damage native plants in three ways. They deliberately remove native plants for food and other purposes, such as making birthing beds for piglets. They remove native plants from the soil incidentally when doing things like creating wallows and digging for earthworms or roots to eat. They physically impact native plants by trampling them or girdling trees (removing bark, which weakens and often kills them).

These animal pests help to increase the abundance and distribution of certain introduced plant species. They do this directly by carrying seeds on their bodies or by feeding on weedy plant species, such as strawberry guava and banana poka, and spreading the seeds throughout the environment when they defecate. They do this indirectly when they make openings in the vegetation and the soil that provide the right kinds of disturbances that plant pests need to become established. This space taken up by the non-native invader plants is space lost to native plants. The cumulative effect of introduced plant and animal pests is a serious, continual decline in the abundance and distribution of our native plant species.

### **Changes in human culture that affect Hawai‘i’s native ecosystems**

In the 1800s, Hawai‘i became populated by people from many different cultures, and many of these immigrants attached little importance to the spiritual value of the land and its natural flora and fauna. Members of these cultural groups sought instead to maximize the economic yield that could be generated by Hawai‘i’s lands. This philosophical change, and a switch to a cash economy, led to changes in land use that reduced native ecosystems to a small fraction of their former extent. This, and a huge increase in the size of the human population, together with the abandonment of the “environmentally friendly” gathering practices employed in old Hawai‘i and the emergence of a new attitude of “unbridled entitlement,” brought widespread devastation to Hawai‘i’s native ecosystems.

#### **Changes in land use**

We have mentioned how the Hawaiians had removed native vegetation from large areas in the lowlands and modified the lower forests by planting and harvesting there. After 1778, many additional factors greatly accelerated loss of Hawai‘i’s native ecosystems.

Cattle, goats, sheep, and European pigs were introduced, and their populations were deliberately allowed to increase. This alone caused the loss of extensive areas of native vegetation on all islands. Other new activities included exploitation of sandalwood (*Santalum freycinetianum*, for trade) and firewood (for whaling ships), cultivation and production of sugarcane and pineapple, logging of koa (*Acacia koa*) and lehua (*Metrosideros* species), ranching, real estate development, and planting of forests with introduced tree species.

By the early 1900s, virtually all of the native vegetation of the Hawaiian Islands that had existed at lower and middle elevations was gone—in chilling fulfillment of a prophecy uttered by Kalaunuiohua (a chief of Hawai‘i island who tried to conquer all of the Hawaiian Islands many generations before the birth of Kamehameha the Great, but who was defeated in his attempt to take Kaua‘i):

*O ka lā‘au o ke kula e noho ana i ka ‘āina, o ka lā‘au o ka ‘āina e nalowale aku ana.*

The trees of the plains will dwell on the land; the trees of the native land will vanish.

Today, cattle pastures occupy about 50 percent of Hawai‘i’s total land area, while plantations and urban areas occupy another 30 percent. The remaining 20 percent is occupied by native and non-native plant communities, but only about a third of this land, roughly 6 percent of Hawai‘i’s total land area, is still covered by relatively undisturbed native forest. And, as our native ecosystems have continued to shrink, our human population has more than quadrupled since 1778.

### Changes in population density

In old Hawai‘i, simple technology provided all the needs of a completely self-sufficient economy. Today, the islands are very much dependent on food imported from other places. This dependency, combined with modern technology, makes it possible for the islands to support a much larger human population.

Estimates of the number of native Hawaiians living in the islands at the time of Captain Cook’s arrival vary, but most modern authorities estimate that there were between 200,000 and 300,000 people in Hawai‘i at that time, compared to a population of over 1,210,000 people in the state in 2000.

### Changes in gathering practices

After the Hawaiian religion ceased to be widely practiced, the ancestors having chosen to “let the old gods sleep,” subsequent generations of Hawaiians often did not experience or learn the gestures of respect that were part of the old belief system. Chanting and other gathering protocols that treated the elements of the natural world as living, spiritual forces were not passed on in many families.

As the accessible forests were replaced with buildings, pastures, farming systems, and trees imported from other countries, not only were native ecosystems lost, but those that remained became more remote and difficult to access. Thus elders were often unable to accompany young people into native plant areas to teach them how to gather properly.

With the demise of the ahupua‘a system of land and resource management, and with the emigration of many Hawaiian families away from their ancestral lands, few remained to monitor and care for the land’s natural resources, and many resources were lost due to neglect. Many people began to gather edible or useful plant materials wherever they pleased, usually in the areas that were easiest to get to. Because many collectors did not leave anything behind for future use, some resources were completely and permanently exhausted in certain areas.

Irresponsible gathering is, unfortunately, still a common practice these days. Over the years, both of this section’s authors have witnessed forest damage by individuals and groups who were gathering lei materials. We have seen pala‘a and palapalai

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*With the demise of the ahupua‘a system of land and resource management, and with the emigration of many Hawaiian families away from their ancestral lands, few remained to monitor and care for the land’s natural resources, and many resources were lost due to neglect.*

ferns that were ripped from hillsides and forest floors—roots and all—exposing bare soil. We have seen branches brutally torn from lehua trees, merely to acquire a few liko (young leaves), ‘o-pu‘u (buds), or pua (flowers), and then discarded carelessly along the trail.

In alarming numbers, people are collecting far more than they need, walking down the trails with plastic grocery bags, even large garbage bags, stuffed with plant materials. The cumulative effect of such non-traditional methods of collection of lei materials is irreversible.

In the pre-Cook period, no one would have dared to hana ‘ino i ka nahelehele (desecrate the wild growth) in this way, because of the Hawaiian belief that if they did so the spirits would punish them and misfortune would befall both the gatherer of the lei materials and the person to whom the lei was given.



### “Modern” changes in attitude

One of the sad aspects of our modern society is that so many of its members now seem to possess an attitude of “entitlement” that is virtually unbridled and usually unearned. One outgrowth of this attitude that affects Hawai‘i’s ecosystems is the belief that we humans “have a right” to collect from nature. Those who espouse this view attribute their “entitlement” to several causes, including such ideas as “because I’m a native Hawaiian,” “because native Hawaiians do it,” “because I’ve lived here for so-many years,” “because I pay my taxes,” and “if I don’t gather them, someone else will.”

While the authors sympathize with the desire to hold fast to cultural tradition, and we have personally experienced the Hawaiian loss of property and privilege and culture to outside influences, we believe that the rationalizations just expressed are inappropriate for two reasons. First, the activities they justify can only bring about greater damage to our native ecosystems and the plant species that we wish to preserve for judicious, sustained gathering. Second, these attitudes are completely incompatible with Hawaiian ethics and values regarding the use of scarce or cherished resources. In the following paragraphs, these reasons are considered more fully.

### Hawaiians believed that one must work for the privilege of taking

A fundamental tenet of Hawaiian belief was the ethical conviction that one must work for the privilege of taking. Hawaiian children were brought up with many ‘olelo no‘eau (wise sayings) that conveyed the same message as the following one:

*Aia no ka pono—o ka ho‘ohuli i ka lima i lalo,  
‘a‘ole o ka ho‘ohuli i luna.*

That is what it should be—to turn the hands palms down [and work for what you need], not palms up [expecting to be given what you need].

In the case of resource management, the right to use or collect resources was predicated by the responsibility taken in caring for it. An excellent example of this principle is the Hawaiian rules used to determine water rights, where the amount of water allowed to flow into a farmer’s fields was proportional to the amount of time he and his family spent building and maintaining the dams and ditches that provided the water. Put simply, “no work, no water.”

Hawaiians were fiercely protective of scarce resources and fervently believed that those who had not worked to take care of a resource had no right to use it. In dryland areas without irrigation systems, for example, planters were so protective of their precious water resources that anyone who tried to steal water risked being killed.

### Hawaiians considered themselves kahu (caregivers) to native ecosystems

The early Hawaiians considered themselves as caregivers of their land and its natural resources and of the gods and spirit entities that lived there. In modern terms, a kahu is roughly equivalent to a “steward,” a person who actively protects and manages an area with the intention of keeping it as healthy and productive as possible for as long as possible—maintaining it as a sustainable resource. In Hawaiian religion, however, the word kahu implies an intimate and confidential relationship between the god and the guardian or keeper. Thus kahus were “honored attendants” who considered it a great privilege to serve the native plant communities that they loved and with whom they maintained a deeply personal, spiritual relationship.

The chant at right provides a glimpse into the relationship between kahus and their native ecosystems. It is a pule pale (protection prayer) used to protect the chanter from evil when travelling through the forest. In it, the chanters reaffirm that it is their duty to serve as kahus (caregivers).

## Part 4 Hawai‘i’s natural and cultural future

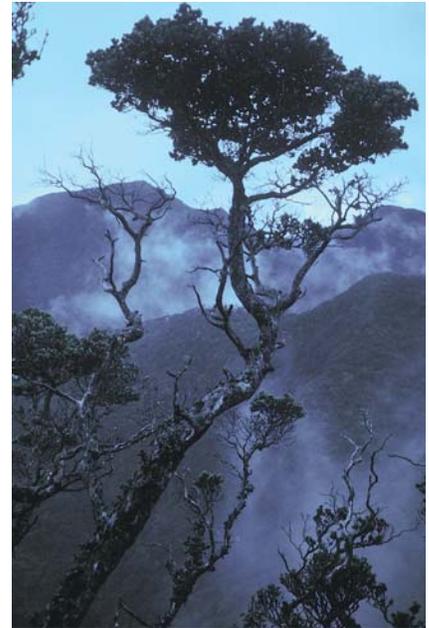
Each of us can help reverse the damage done by recent generations of “less enlightened” gatherers by implementing the following three recommendations, each of which is based solidly on both Hawaiian ethics and our scientific understanding of the environmental circumstances of these times.

### How to preserve our native ecosystems

#### 1. Grow what you need, instead of gathering from nature, and substitute introduced plants for native plants.

An obviously effective way to maintain native ecosystems is by not gathering from them! The native plants we need can be grown, and introduced plant species can be substituted for natives we cannot grow in sufficient quantity.

A wonderful modern example of this idea was provided by kumu hula Auntie Mā‘iki Aiu Lake, who gathered the young, supple branches of banyan trees and made them into lei of what she called “hālau maile” (maile for the hula troop). She used these lei for performances in which she considered the real maile unnecessary. This innovation is welcome, because populations of the native maile vine (*Alyxia oliviformis*) have been dangerously depleted by over-picking. (However, since banyan is a serious pest tree in Hawai‘i, we strongly advise against planting any more; please gather only from the many existing trees, as Auntie Mā‘iki did.)



*E noho ana ke akua i ka nāhelehele  
I ālai ‘ia e ke kī‘ohu‘ohu, e ka uakoko  
E nā kino malu i ka lani  
Malu e hō e  
E ho‘oulu mai ana ‘o Laka i kona  
mau kahu  
‘o mākou nō, ‘o mākou nō,  
‘o mākou nō*

The gods dwell in the woodlands

Hidden away by the mist in the low-  
hanging, blood-red rainbow

O beings sheltered by the heavens

Confer upon us your protection

Laka inspires her kahu

It is us! It is us! It is us!

(Source: oral tradition; translated in part by Puku‘i (in Tatar 1989) and in part by the authors; similar published versions can be found.)

This idea was practiced by the ancient Hawaiians too. For example, when they discovered that the ‘olonā plant (*Touchardia latifolia*) growing in their forests made very strong cordage, they decided to cultivate it in lower forests to ensure an ample supply. The ethic underlying this practice is reflected in the old Hawaiian ‘olelo no‘eau:

E kanu mea ‘ai o nānā keiki i ka hai.

Plant edible food plants lest your children look with longing at someone else’s.

(Puku‘i 1983)

It has been said that the Hawaiian scholar Mary Kawena Puku‘i lived her life in keeping with this advice. Instead of plants, she “cultivated and gathered” books and other materials that provide us with an abundant supply of information regarding the Hawaiian culture. We hope that the words of this ‘o-lelo no‘eau can inspire modern Hawai‘i’s inhabitants to plant native Hawaiian plants, so that our children do not “look with longing at someone else’s.” This phrase can be interpreted in two ways. It could mean that our children will “look with longing at someone else’s native Hawaiian plants or cultural knowledge” because they do not have any of their own. More ominously, it could mean that they will “look with longing at someone else’s non-Hawaiian plants and culture” because native plants or culture no longer exist. Of course, there is nothing wrong with adopting things that are not Hawaiian. What is unacceptable is not having a choice.

In planting native species, however, care should be taken to obtain plants from growers who acquire their plants ethically and without harming native ecosystems. Also, certain native plants should not be planted in certain areas, for eco-genetic reasons, and knowledgeable nurseries provide appropriate instructions and precautions on their plants’ labels. Much knowledge on native plant propagation, ecology, and cultivation has been collected recently due to the revival of interest in the subject, and a subset of the “green” industry (landscapers and plant nurseries) is devoted to encouraging the use of Hawaiian native species.

## **2. Support efforts to preserve our native ecosystems.**

Those who use native plants should help care for the native ecosystems that are the plants’ natural home. One way to do this is by supporting or joining the efforts of agencies and organizations that are working to eradicate harmful plant and animal species from native ecosystems.

## **3. E nihi ka hele... Go carefully, giving thought to what is pono (right).**

Most people who love native plants are eventually drawn to “visit them in their homes.” As we hope to have shown, it is more important now than ever to cause as little disturbance as possible to native ecosystems when we travel through them. In so acting, we are not only following the recommendations of modern ecologists, but we also heed advice that has been part of Hawaiian culture for centuries, as Hawaiians urged their loved ones to travel cautiously and respectfully in the forests with the words, “e nihi ka hele.” This simple phrase means that one should “travel quietly and unobtrusively, with careful observances of taboos [prohibitions].” Hawaiians complied readily with this advice, in part because of the ethics of their cultural

upbringing, and in part because of their belief that misfortune would befall one who behaved otherwise. Here, for example, is an excerpt from a verse found in an old Hawaiian dictionary:

*E hoopono ka hele i ka uka o Puna,  
E nihi ka hele, mai hoolawehala,  
Mai noho a ako i ka pua o hewa,  
O inaina ke akua, paa ke alanui,  
Aole ou ala e hiki aku ai.*

Behave correctly while traveling in the uplands of Puna;  
Walk with caution, do not cause offense;  
Do not tarry and pick the flowers incorrectly,  
Lest the gods become angry and conceal the path,  
And you have no way out.

(In a dictionary by Andrews, cited by N. B. Emerson and translated by the authors.)

Similar advice was offered by Hi‘iaka (the sister of Pele, powerful goddess of Hawai‘i’s volcanoes) to her traveling companions in ancient times, and by loving supporters of Queen Kapi‘olani when she embarked on a journey to the then unknown and mysterious lands of California and England in 1887.

Today, our environmental “taboos” are self-imposed, arising from our Earth-husbandry conscience, from our knowledge of what is necessary and right and of the precious resources that are at risk if we fail in our stewardship of Hawai‘i’s unique ecological heritage.

## How to gain a fuller appreciation of Hawaiian culture

Growing plants for lei not only helps to preserve native forests (by reducing the amount of gathering that takes place there) but it also allows the growers to participate in many more aspects of Hawaiian culture than can be experienced simply by making lei.

### Hawaiians loved to grow things, and they loved the things they grew

When we grow plants for lei, we are participating in the activity that was at the very heart of Hawaiian culture. A well known ‘o-lelo no‘eau describes the way Hawaiians felt about the plants in their care with these words:

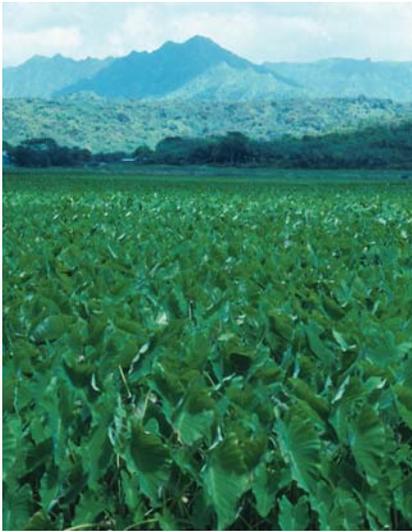
*He keiki aloha na mea kanu.*

Beloved children are the plants.

(Puku‘i 1983)

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*Today, our environmental “taboos” are self-imposed, arising from our Earth-husbandry conscience, from our knowledge of what is necessary and right and of the precious resources that are at risk if we fail in our stewardship of Hawai‘i’s unique ecological heritage.*




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*The practice of tending plants—especially the cultivation of kalo (taro)—was at the very core of Hawaiian culture and identity.*

It has been stated that the practice of tending plants—especially the cultivation of kalo (taro)—was at the very core of Hawaiian culture and identity. We agree with this idea, and with the following characterization of the Hawaiian lifestyle:

“The Hawaiians, more than any other Polynesians, were a people whose means of livelihood, whose work and interests, were centered in the cultivation of the soil. The planter and his life furnish us with the key to his culture.” (Handy et al. 1972)

### **Cultivating *lei* plants brings these sources of inspiration closer to us**

Another very important reason to grow lei materials is that it brings these sources of beauty and inspiration closer to us. While this clearly is not exclusively a Hawaiian idea, it undeniably was a fundamental part of Hawaiian thinking. As we have seen, Hawaiians valued plants for the inspiration that these “fellow beings” could impart.

When the lei plants being grown are native species, this idea gains additional significance, because native plants were once considered body forms (kinolau) of the Hawaiian gods. Thus, by growing native plants we respectfully recall and are inspired by the depth of the relationship that once existed among these plants, the akua, and our Hawaiian ancestors or, genealogy aside, our Hawaiian predecessors in stewardship of these islands.

### **We function as kahu to native ecosystems**

When we grow plants for lei instead of simply harvesting materials from our native forests, we become a vital part of the solution to—rather than remain a part of—the problem of native ecosystem degradation and loss. Those who choose to assist in the conservation of native ecosystems in this way are taking an important step toward fulfilling the role of kahu, or “honored attendant.” In addition, in so doing we practice the fundamental Hawaiian belief that one must work for the privilege of taking.

### **Native species conservation for the future of Hawaiian culture**

One perspective often shared with us by many of our Hawaiian kūpuna has been the belief that each native species that becomes extinct diminishes the Hawaiians as a people, because a part of their family has been lost to them forever. For this reason, many Hawaiian elders have been caring for endangered and rare Hawaiian plants in their homelands for decades, since long before the passage of the first Federal Endangered Species Act in 1973.

It is not just *native species* that are important to Hawaiians, however. *Intact native ecosystems* are critically important to Hawaiian culture, for just as these lands are the natural home of native Hawaiian species, they also made up the natural environment in which native Hawaiian culture grew. The Hawaiian culture evolved in the context of an intimate relationship among the people, the earth, and the other inhabitants of the islands’ ecosystems. Anyone who wishes to “understand” Hawaiian culture or “truly know” what it is to be Hawaiian must also become familiar with the natural environments that were the nurseries of Hawaiian culture.

“No one can comprehend the so-called “lore” and “beliefs” relating to [Hawaiian religion] without knowing a great deal about the aspects and features of the locale and natural environment with which [their gods and deities] are identified. Equally, persons and ‘ohana [family] in their human relationships can be comprehended only in the context of natural setting and “lore” *in terms of the psychic relations subsisting between Nature and its phenomena, ancestral and nature spirits, and native mankind in old [Hawai‘i].*” [Italics as in original text.] (Handy, Handy, and Puku‘i 1972)

The type of “understanding” described here is the type of spiritual, visceral insight that can only be acquired by forming emotional ties to a natural phenomenon, such as a native plant community. Many years spent teaching about and working in Hawai‘i’s natural ecosystems have led the authors to the conclusion that there is a vital spiritual power emanating from a native Hawaiian ecosystem that is much less felt in a predominantly non-native counterpart ecosystem.

If our native ecosystems become extinct, Hawaiian culture will be irrevocably damaged, for young people will no longer be able to experience the feelings that emanate from truly native Hawaiian places. A mutual dependency thus exists today between Hawaiian ecosystems and Hawaiian culture. By working to save native ecosystems, Hawaiians help to preserve their culture.

## Native Hawaiian species conservation for humanity

The Polynesian ancestors of the Hawaiians brought various religious beliefs with them to Hawai‘i centuries ago. However, nature played a very important role in shaping the religion that ultimately developed. Hawaiian kumu hula Winona Beamer stated that “[her family’s beliefs were] based on the beauty of nature, the power of nature, the complexity, the puzzlement, the moods. All the love and the truth and the beauty — those three words go hand in hand. That was our religion.”

Many conservation ecologists have admitted similar feelings, stating that native ecosystems are their religion; that is, that these places form the spiritual center of their personal religious culture. Feelings such as these are what has motivated many conservationists to devote their lives to the study of native ecosystems and to choose to investigate the kinds of questions that they hope will provide the answers they need to better preserve native ecosystems and maintain the associated native cultures.

Our ability to appreciate and cherish native ecosystems is determined mostly by two factors: having been taught to respect them, and having been able to spend time in them. It has little to do with ethnicity or career, except that some cultures and professions are more likely than others to teach people respect for nature and to provide them with experience in native plant communities. The vitality and power of native ecosystems is evidenced by their ability to touch human souls throughout human history. This power transcends culture and can linger to nurture humans for a lifetime, as suggested by this excerpt from a song about native Hawaiian rainforests:

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*Our ability to appreciate and cherish native ecosystems is determined mostly by two factors: having been taught to respect them, and having been able to spend time in them.*




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*Hawaiians believe that the spirits of those who lived before are still present on the land, and that the spirits of their akua live in the forests and other natural areas.*

*I laila ho‘i no ko‘u pu‘uwai.  
 Ua maluhia ho‘i au i ke‘āpona mai.  
 A i ko‘u mau ala hele loa,  
 ‘Oia mau nō ke akahai pū me ia‘u.*

It is there that my heart belongs.  
 I am safe in the warmth of that embrace.  
 No matter where I may roam,  
 I carry that gentleness with me.

(by P. Anderson-Fung and K. Maly)

Hawaiians believe that the spirits of those who lived before are still present on the land, and that the spirits of their akua live in the forests and other natural areas. Thus, preserving native ecosystems not only provides a continuity of experience for humans from one generation to the next—by providing them the opportunity to experience the same feelings for nature—it also provides a place for people to go to feel the presence of their ancestors.

Hawai‘i’s native ecosystems can be symbolized by an intricately crafted quilt that has been tattered by the actions of human beings. Adopting the spirit of the Hawaiian relationship to nature, we leave you with this suggestion:

*E hono pū kākou i ko kākou kapa moe welu  
 i‘olu‘olu ka hiamoe ‘ana o nā pua i ka poli o nā kūpuna*

Let us all together mend our tattered quilt,  
 so that our children too may sleep in the embrace of our ancestors.

(P. Anderson-Fung and K. Lopes)



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