FORM AND COMPOSITION OF A PRESENT DAY HAWAIIAN GARDEN

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We certify that we have read this thesis and that, in our opinion, it is satisfactory in scope and quality as a thesis for the degree of Master of Arts in Geography.

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Dedication

I dedicate this work as an act of understanding to the Earth, my first mother and father, my first friend, my first teacher, my first love. O wau nō o Kekamapilihonua koʻu inoa.

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I thank the people at the University of Hawai‘i at Mānoa for supporting me in this opportunity to grow spiritually—allowing me to formally express innate potential as purpose. Mahalo to Kenneth Tokuno of the Graduate Division and Gail Koki of Financial Aid Services. I thank the people at the Geography Department for their affection toward me as expressed in their long support of my extended program which finally lead to this writing.

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Whatever misadventures I have faced have been of my own making. The wisdom of the many sustaining decisions, by the people acknowledged here, will be realized in better physical environments—landscapes that intentionally nurture us as we

become complete human beings. Finally, a special mahalo to the friends and neighbors of Nā Pueo Park. Mahalo ā nui.

Abstract

Twenty seven designs for a Hawaiian garden to replace a city parkscape were collected for spatial analysis in light of the Hawaiian renaissance and the increasing availabilty of native plants valued by Hawaiians. What constitutes a Hawaiian garden is discussed together with its historical antecedents. Gardens contained predominately native plant species that were of a utilitarian and cultural nature. Fifty percent open space, groves, clusters, groundcovers, collections and rows were common plant arrangements. Large rocks, protected places to sit and space to gather plant material were included. Most gardens required an increase in maintenance. The number of species ranged from 4 to 110.

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Chapter 1 ~ Introduction

Origins

Before I arrived in Hawai‘i, I had already seen the citizens of a city change their vegetation from introduced plants to native plants. When I was a small child in Tucson, Arizona, very few residences, businesses or public institutions used native plants for landscaping. It used to be that only exclusive neighborhoods in the foothills of the nearby Santa Catalina mountains and one wealthy neighborhood in the city maintained the desert as their distinctive signature. Tucsonans used to pump ground water to irrigate decorative landscapes that formalized the desert with European ideas at the expense of the natural vegetation. Ironically, since the 1870s, the University of Arizona maintained a world class cactus garden of rare and beautiful desert plants the size of a couple of city blocks while introduced trees were planted by other Tucsonans for shade, beauty and later to emphasize the semitropical climate for tourism as the city expanded.

Although the garden was virtually eliminated after the university acquired land east of it, to accomodate an expanding campus landscaped with introductions on either side of an extended mall of grass, the idea of landscaping with plants native to the locale survived and appreciation for the local vegetation grew. No longer was the desert seen as a vast wasteland but as an adaptation to nature, something wonderful in and of itself. Today, the newest campus buildings have been planted with desert plants, while the oldest--Old Main, has always been landscaped with a mixture of native plants and

colorful introduced bedding plants. Furthermore the beauty and uniqueness of this landscaping is now appreciated by the community as a whole and was perhaps instrumental in stimulating a whole new image of a garden landscape in the city. This cactus garden may have served as a model for converting horticultural plantings to desert landscapes that slowly began in the 1950s.

Another motivating force that supported the movement was the need to conserve water. It was seen as an economic necessity for continued growth by business people as well as environmentalists. Drought tolerant, water conserving native desert plants (and some drought-tolerent introductions) have become the new standard replacing thirsty Bermuda grass, eucalyptus, Japanese privet, mulberry, oleander, and pyracantha. Tucson's emerging desert landscape will probably contain for some time the relicts of the artificial oasis that I grew up in, giant Aleppo pines (*Pinus halapensis*) and Italian cypress (*Cupressus sempervirens*). The familiar introduced trees yet silhoutte the skyline as living testaments to the cultural process.

A third motivation has been the respiratory discomfort of some as a result of introduced pollens. During peak flowering periods, the major airborne introduced pollen numbers are reported on the news (Bermuda grass, mulberry, olive and ragweed).

Could a similar change happen here? Honolulu, originally irrigated with surface water from Nu'uanu valley and then groundwater, was initially planted with introduced trees for shade and beauty instead of the native species that would have originally

grown there. In time, the tropical plantings similar to those in Florida and the Carribean were used to attract tourists as in Tucson. Recently, unprecedented growth of interest in native Hawaiian plants, seems to follow a story similar to that of Tucson.

In contrast to the situation in Arizona, in Hawai'i there is another factor encouraging the use of endemic and indigenous plants in landscaping. This is the fact that there is a re-emergence of interest in the existing indigenous culture that has strong affinities to both native plants and those brought by the people many centuries ago. As the indigenous culture grows in self confidence and reasserts itself, an interest in tradtionally important plants emerges. There is the additional possibility that appreciation of Hawaiian culture may increase as members of the culture do the landscaping.

Collections Inspire Further Discovery

This chapter is about the growing interest in cultivating native plants in Hawai'i and the first attempts to create collections. There are few clear statements about Hawaiian organization of horticultural space, such as how they select, group, or arrange plants. Although books describing the different types of native plants (lei, medicine, forest, coastal and dye) are plentiful, there are few obvious references about arrangements by modern day Hawaiians. There are now several publications about growing Hawaiian plants for schools and homes but these focus on the plants themselves—not their relationships to each other nor their social environment. How to Plant a Native Hawaiian Garden by Ken Nagata (1992) gives a listing of 33 species to

include. Only Creating a Hawaiian Ethnobotanical Garden by Beatrice Krauss (1980), listing 55 species, suggests three designs for their arrangement.

Growing native Hawaiian plants: a how-to guide for the gardener by Heidi Leianuenue Bornhorst (1996) marks the beginning of popular books on how to actually grow named native plants from cuttings, seeds, air-layering and grafting. Her 78-page book includes more information than just native plant watering requirements, xeriscaping uses, transplanting techniques and their basic landscape maintenance. It also explains the plants' importance in Hawaiian culture. Prior to this publication, Bornhorst and Rauch (1994) wrote a 17 page horticultural research extension series entitled Native Hawaiian Plants for Landscaping, Conservation, and Reforestation.

A Native Hawaiian Garden: How to Grow and Care for Island Plants by Culliney and Koebele (1999) is an effort to “help stem the tide” of extinction of some of the rarest plants in the world. Their book is for the serious enthusiast and contains detailed instructions for growing 63 species of native Hawaiian plants.

One of the earliest attempts to create a “Hawaiian garden” was at Waimea Falls Park. This is an entertaining combination of Pacific botanical gardens with cultural performances (some with audience participation) located in a remote valley. The gardens contain 36 major botanical collections that focus on native Hawaiian plants, Polynesian introductions and plants of island ecosystems. Keith Wooliams, botanist at Waimea Falls Park, was familiar with the British Kew Gardens where species are

planted in beds. It appears that he copied the idea of beds of plants to present Hawaiian gardens to the public (Orr 2003). Recently, the Honolulu City Council selected the National Audubon Society to run the park, now re-named Waimea Valley Audubon Center, in order to provide the community with a more culturally and environmentally sensitive use of the Pacific plant resources and cultural sites.

Paul Weissich (2003), former director of the Honolulu Botanical Gardens, created another Hawaiian garden in the early 1970s. He planted species important to Polynesians at what is now Loʻi Kalo Mini Park, not far from the Bishop Museum, in order for visitors to take a field trip to the park and see several varieties of the ethnobotanically important Hawaiian plants. Today, there are mature plantings that have remained intact despite a period of abandonment. Local residents who remodeled vandalized restrooms into an attractive hale (shelter) for educational purposes now care for Loʻi Kalo.

Weissich rebuilt the loʻi walls and repaired the mākāhā (sluice gates) after locating the source of water to the fresh water pond or loko wai. Weissich planted a kapa section with wauke, ʻohe, and dye plants such as maʻo, ʻōlena and ʻukiʻuki; an edible plant section with kalo (24 kinds), kō, maiʻa, niu, ʻōhiʻa ʻai and ʻulu. He also planted hala, hau, ipu, kamani, kou, kukui, milo, noni and ʻūlei.

Rylan Yee (2003), in the 1980s, designed and oversaw the installation of native plant gardens at the Bishop Museum. He stated:

The theme of the plantings was "Gardens In Time" which represented groups of plants that were in Hawai‘i during different time periods in Hawaiian history. The gardens were placed in different areas on the grounds. Some of which still remain in place today. The "Hawaiian Culture" garden was only one of five.

The idea was generated by some of us at the Bishop Museum - primarily Wayne Gagné who . . . was a real force in Hawaiian natural history and its conservation. Wayne and I fleshed it out and we had substantial input from the research staffs of both natural history and anthropology. The gardens also incorporated many cultural artifacts like saltpans, historical pieces like the ballast stones and geological specimens such as the tree molds that were on the grounds or in storage.

We incorporated information from many different sources, both directly and indirectly so at the time, the plantings represented to the best of our knowledge what was known about Polynesian introductions as well as what was there prior to the Polynesian’s arrival. At the time, I was involved with the In Gardens of Hawaii project and had the opportunity to gather information from informants too. Although I personally did not speak directly with many Hawaiian people, I did speak with others who did.

We used the Museum grounds personnel and volunteers to help plant and maintain the plantings. I obtained plants from botanists and hikers who collected them from the wild, from botanical gardens such as the Honolulu Botanical Gardens, the National Botanical Gardens, and Waimea Falls Park and from and hobbyists who donated them and/or propagules (seeds and cuttings) to the Museum. We also propagated them from plants on the grounds.

The design of the different gardens and the placement was for the most part mine, but I had input from others including Horace Clay and James Hubbard who were some of the leading landscape architects in Hawai‘i at the time.

Today, the Bishop Museum is planning an ahupua‘a garden using native and Polynesian introduced plants to educate people. The garden will start with the beach plants and then the dryland forest species.

Other existing gardens on O‘ahu include the Beatrice H. Krauss Hawaiian Ethnobotanical Garden and the Anderson Hawaiian kalo collection at the university’s Lyon Arboretum in the back of Mānoa Valley. The Leeward Community College Native Plant Gardens were started in the early 1990's. They contain over 70 native plant taxa of dryland, coastal, mesic forest and Polynesian plants. Lili'uokalani Botanical Garden is devoted to native Hawaiian plants. Kanewai garden at the University of Hawai‘i at Mānoa and the Hawaiian gardens at Kamehameha Schools, Kapālama campus, are gardens devoted to native plants and canoe plants, defined in Chapter 3 ~ Changes in Concepts of Hawaiian Gardens.

On the island of Hawai‘i, the Amy B. H. Greenwell Ethnobotanical Garden in Kona focuses on the traditional Native Hawaiian uses of plants and land. The 12-acre garden includes a 5-acre remnant of the prehistoric agricultural Kona field system of the ahupua'a of Kealakekua. The garden layout illustrates the four vegetation types utilized by Hawaiians in the Kona region: coastal, lowland dry forest, food and fiber crops, and upland forest. Feature collections include banana, Hawaiian economic plants, native Hawaiian plants, sugarcane, and taro. Menehune Park in Waimea has native Hawaiian plants suitable for dry climate gardens.

On Maui, gardens featuring native plants and Polynesian introductions include the Wailea Point Seawalk, a 1/2 mile long walk that skirts the ocean side boundaries of the hotels and condominiums. The walk features littoral native species with some coastal shrub land areas. Plants include 73 species of endemic, native and Polynesian introductions. Kahului Public Library Hawaiian plant garden contains over 20 endemic and indigenous Hawaiian plants. It is devoted entirely to coastal and dry forest plants of Maui Nui (Maui, Molokaʻi, Lanaʻi, and Kahoʻolawe). There is also an extensive collection of Polynesian introduced plants.

On Kauaʻi there are two National Tropical Botanical Gardens. Allerton and McBryde Gardens' Hawai'i collections feature rare and endangered species with an emphasis on establishing conservation and research collections of native Hawaiian plants. Special collections include native Hawaiian plants and Polynesian medicinal plants. Limahuli Garden and Preserve is a 17-acre garden and forest preserve that include ancient taro terraces, plants introduced by early Polynesians and plantings of native Hawaiian species (University of Hawaiʻi 2003).

The Hawaiian gardens mentioned mainly present important botanical groupings for the purpose of education. But, are "Hawaiian gardens" just a collection of Hawaiian plants? These gardens inspired my research into understanding how these plants could be arranged in a culturally significant manner. I decided to conduct a survey of garden

designs by asking for the opinions of those who might reflect the Hawaiian culture in garden form, function and composition.

In Chapter 2, I begin by looking at the Hawaiian values with respect to nature, that have endured despite nearly 200 years of foreign influences, in order to provide a broader social context for this study. Then in Chapter 3, I explain how concepts regarding Hawaiian gardens have changed over time, finally being encouraged to include native plants by state legislation. My survey methods and results are discussed in Chapters 4 and 5, respectively. Chapter 6 draws conclusions from the findings about Hawaiian garden forms and prepares us for etiquette when using native flora.

Chapter 2 ~ Factors Influencing Contemporary Hawaiian Gardens

The renaissance of Hawaiian culture has changed the state of Hawaiian political affairs and is reflected in the study of Hawaiian cultural plants in the landscape by geographers. Hawaiians are now eager to express themselves and the cultivation of plants has taken on a political purpose. Like many indigenous cultures based on agriculture and gathering, they feel close ties to certain plants in the natural and cultural landscapes that the dominant industrial/urban cultures may not share (Wester 2003). The question I will address in this study is simply, “How do people of Hawai‘i’s indigenous culture select and arrange their plants in their space?” To do this, I used a small city park, as the study site and asked selected gardeners to design a Hawaiian garden on a map of the park. By comparing the completed maps I hoped to discover important aspects that would identify a modern day Hawaiian garden. I will also address “Why do we need this information now?” And “How and why have times changed to make this a relevant question?”

Objective

The objective of this research is to learn what are the important elements of a Hawaiian garden in terms of its contents, arrangements and functions. I want to know what is preferentially included, in order to identify what might help make a Hawaiian “sense of place”. The growing support, in the forms of appreciation, education for

conservation and politics, leads us to the popular cultivation of more and more native or culturally important plants. Now that native plants are commercially available, how would Hawaiians arrange these plants and for what purposes? Would it not be prudent to examine the basic character of a Hawaiian garden as laid out by Hawaiian gardeners?

Hawaiian Ethnoecology

"The term ethnoecology is increasingly used to encompass interdisciplinary studies that describe local people's interaction with the natural environment. These may include subdisciplines such as ethnobiology, ethnobotany, ethnoentomology and ethnozoology." (Martin 1995) Hawaiian ethnoecology, used to study the ecological wisdom of Hawaiian people, promises to give a holistic view of our knowledge of the environment, the basic goal of natural history.

For example, ʻAhahui Mālama I Ka Lōkahi (2003) is a group of people devoted to Hawaiʻi's native ecosystems who are informed by both scientific and cultural knowledge of plants and ecological systems.

> The ʻAhahui logo (designed by Sam Gon III and Mike Nahoʻopiʻi) below incorporates plants and animals from the land and the sea: on land (above) there is a nuku ʻiʻiwi vine, a mamo (a honeycreeper used for featherwork) and a carnivorous caterpillar. For the sea (below) there is a monk seal (ʻilio-holo-i-ka-uaua), a haʻukeʻuke (purple urchin), and a limu kala (important medicinal and protocol plant). Within is a family petroglyph, representing Hawaiian lifestyle and community. Above them is a triple circle, symbol of the three-fold mission of the ʻAhahui: stewardship, culture, and knowledge. The symbol is a closed oval, signifying the circle of ecological relationships between plants and animals, and between land and sea. Humans are embraced within this

relationship, and via cultural uses and spiritual links (e.g., via ‘aumakua) are part of the circle as well.

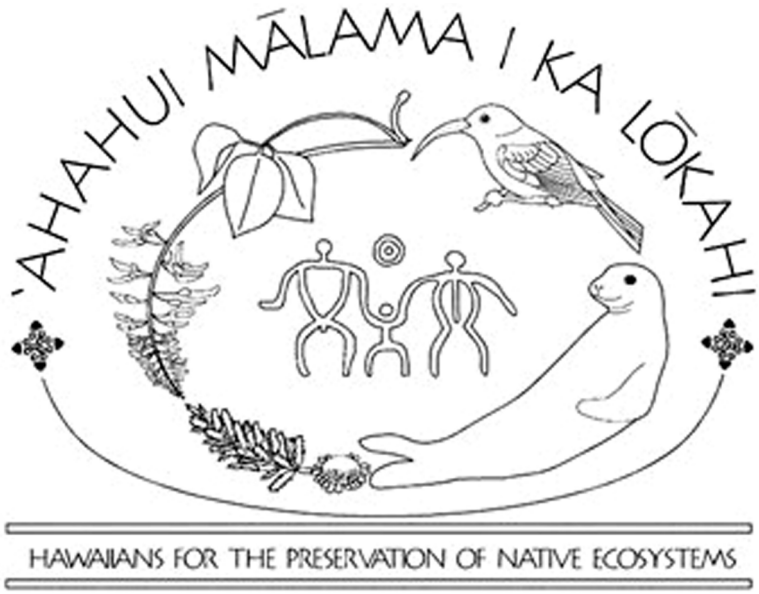

Figure 1 ~ Logo of 'Ahahui Mālama I Lōkahi

Their mission is to,

> Develop, promote and practice a native Hawaiian conservation ethic, grounded in ancient tradition, but relevant to our times, that is responsible to both Hawaiian culture and science, in order to protect Hawai‘i’s native cultural and natural heritage through research, education, and action.

Another organization and native Hawaiian plant nursery, Hui Kū Maoli Ola, is “dedicated to the perpetuation of Hawai‘i’s natural history and culture.” (Barboza Schirman 1999) This group reveals that its motivation is partly political by the use of Hawaiian flags and pidgin language on their showy full color plant signage at The Home Depot (see Figure 8, Chapter 3).

Although Hawai‘i is politically in the First World, the native people have been treated much like the people of the Pacific Islands in general. Some native Hawaiians

are aware of their land relationship and believe, as the former director of the Hawaiian Studies Department, Dr. Haunani Kay Trask does, and that “the fate of the earth rests in the fate of the Native people.” (Trask 1995)

The concept of a culture based on its relationship with land has very real relevance to the relationship that existed from very early times between the Hawaiian people, be they chiefs or commoners, and their homeland (Handy and Handy 1978). Handy and Handy (1978) explain, “The maka‘āinana were the planters and fishers who lived on (ma) the (ka) land (‘āina); the final na is a plural substantive.” They further state that the relationship between Hawaiians and land is abundantly exemplified in traditional mele, pule and in genealogical records that associate the ancestors, primordial and more recent, with their individual homelands, celebrating always the outstanding qualities and features of those lands (Handy and Handy 1978). The Handys use the example of the strong attachment to the land, despite modern dislocations, that the kama‘āina (child of the land) has for his or her place of origin. The identification with land was an essential reality everywhere (Handy and Handy 1978).

> To use Ka‘ū as a prime example of an organic relationship between the people and their land—one might say biological as well as psychological—is to recognize first the difficulty of life in its rugged environs, the exceptionally hard work involved in earning one’s sustenance from it, and the resulting awareness of the preciousness of living against such odds, which in turn renders precious the very features and forces of nature against which or in league with which one struggles for survival. This awareness on the part of the “children of the land” is very explicit in the myth of their gourd-vine origin and in all the lore which

> proudly identifies them with the dramatic and awesome activities of Pele, the volcano goddess, and her family, and links them personally with the majestic features of Pele's domain.

Another Hawaiian authority is botanist Isabella Aiona Abbott, who, in 1992, began the introduction to her general text on the traditional cultural uses of plants for Hawai'i with the following,

> The renaissance of Hawaiian culture that has been in progress since the 1970s has revived many indigenous traditions, including hula, music and chant, musical instruments, lei, and herbal medicine. In one way or another, all of these traditions are intimately related to plant life, and their resurgence has naturally called attention back to the old Hawaiian ways of gathering, cultivating, and using plants. As a consequence, some noble efforts have been made to protect the plant hertiage and to practice cultivation in the ancient manner, but so for these efforts have not enjoyed the same degree of public interest or support as other elements of the renaissance.

This thesis explores the potential of adding cultural dimension to the design of more or less uniquely Hawaiian gardens.

Hawaiians as Gardeners

Before European trade became a dominant economy, Hawaiians were gardeners (Krauss 1991, Abbott 1993) rather than farmers. Like horticulturists, they knew their plants intimately and individually rather than impersonally as commodities produced on a larger scale. Hawaiians picked what they needed from the plants they grew on parcels of land called 'ili (Handy and Handy 1978). "Except for kalo, Hawaiian crops were grown in small plots scattered about the house site in spots that best fit the ecology of the plant (Abbott 1992)." They didn't need to harvest annually and they used an informal system

of gift-exchange that usually linked fertile valleys from ridge to ridge and from the summit to the sea: the ahupua‘a: land division of local political autonomy.

To a casual observer, used to formal European gardens or the formal order of fields made for commercial agriculture, the Hawaiian garden may have seemed to lack any order. But this I argue was not the case, and care must have been given to the placement and ecological requirements of plants that they knew so well.

A combination of social stability, well developed cultural identity with the land, a comfortable mild tropical climate with tradewinds, rich, wide fertile valleys, plentiful rain and abundant natural resources from which to fashion themselves led to an intimate knowledge of their plants and the tending of them. It is not surprising that they adapted quickly to the foreign concepts of landscaping when it arrived (Krauss 1991).

Hawaiian Spatial Arrangement of Plants

Although there is a growing literature, including several books on native Hawaiian plants and those plants introduced or used by Hawaiians, there yet remains little printed information on the form that Hawaiian gardens took, i.e. the arrangements and use of space.

Knowledge of these arrangements, if they exist, would surely help make the existing “Hawaiian gardens” become better expressions of traditional Hawaiian culture. Future gardens would speak more clearly or in a voice yet unheard. Existing records of past gardens by Hawaiians, such as the landscaping by Queen Lili‘uokalani at

Washington Place or the 1894 protest garden at Uluhaimalama, would have cultural and historical significance and reflect assimilation of some western values and recently introduced plants. However, gardens of the common people also have their own traditions.

Timmons (2003) describes the Hawaiian relationship to nature in a booklet by The Nature Conservancy entitled, Last Stand, the Vanishing Hawaiian Forest.

> Ancient Hawaiians believed they were direct kin of the plants and animals that shared their world, and that both animate and inanimate things possessed spiritual power, or *mana*. They believed that beings with great mana could take on the form of other plants and animals, and that one's spirit might cycle through other living things after human death. In such a world, you could talk directly to the winds and rains and expect a response, or have as your ancestral guardian the ʻio, or Hawaiian hawk, watching over you from his perch in the forest.
>
> As the youngest descendents among living family, humans had the role of caretakers, while the plants animals, as the older sibling of the ʻāina, provided guidance. The saying goes: *He aliʻi nō ka ʻāina, he kauwā wale ke kanaka*. The land is chief, the human is but a servant.

To understand the connection between landscape and family, Kumu John Lake (Lake 2003) explains that, we have a natural family and a spiritual family (the landscape). Lake teaches, "When a Hawaiian was alone in nature, he was having a social experience (Lake 1999)." This means that the landscape is another social community that supports and teaches a person (Lake 2003). In a good family, each person nurtures the other, the same as in nature. When someone gets out of whack we scold that one and the landscape can scold us if we get out of whack. Each of us is just

one ingredient of the whole. Because each portion of either the natural or spiritual family has special characteristics that we value and appreciate, we name them accordingly. For example, we look at the characteristics of a child when naming the child. A name identifies what the child can do, its function. The same applies to the naming of places. For example, Waokanaka is a place named for inland inhabited regions (wao kanaka), below the uninhabited wao akua (god uplands) (Pukui et al. 1974).

As the population of urban environments increases, a greater proportion of the total population will have less landscaped space with which to interact. In order to help make Honolulu a sustainable city, the cost of maintaining those plantings can be met by deriving a greater value from the plant arrangements than we currently do. This new Information about how Hawaiians arrange plants may be added to community development and biological conservation by applying the concepts of mālama (stewardship and responsible behavior), ʻike kaiaola (ecological knowledge), and loina (values and practices).

The economy of the state supports the renaissance of Hawaiian cultural in order for Hawaiʻi to remain a cultural tourist destination. The increasing use of native plants in public and private settings begets the question, “Whose idea of beauty will we be subscribing to?” Shouldn’t we combine the change in flora with an understanding of the Hawaiian social values associated with these organisms and the subsequent concept of an interactive, interdependent spiritual family? The plants, their spatial arrangements

and the associated amenities may provide the setting for Hawaiian social experiences for locals and visitors alike.

Conflict over the new landscapes has already arisen. When I enthusiastically announced to Kumu hula John Kahaʻi Topolinski that Ala Moana Shopping Center

Figure 2 ~ Indigenous and Polynesian introduced plants at Ala Moana Shopping Center; kalo, 'ehukai, kī, mai'a, kukui, 'ulu and koa.

landscaping had been completely redone with native and Hawaiian plants in a continuum of mountain to ocean ecological zones, he said, “I don’t think so.” (Topolinski 2000) Topolinski was referring primarily to its commercial use and the fact that a Hawaiian garden is not just any assemblage of Hawaiian plants but is invested with a great deal of cultural meaning. He was telling me that a simple display in a shopping mall could not capture it, see Figure 2.

The assistant general manager of the shopping center, Ersel Kilburn, stated for a Honolulu newspaper, “We wanted to do something distinctly Hawaiian, something that would set us apart” (Tswei 2000). Perhaps commendable as an attempt to increase awareness of long neglected Hawaiian plants, this could also be interpreted as yet another attempt by the visitor industry to commodify Hawaiian culture and environments.

The question of appropriate display of Hawaiian plants is important. This is well illustrated with the niu or coconut. Dr. Abbott tells us,

> Since niu was revered as the body of the god Kū, planting it was men's work, and with few exceptions, trees and their fruits were kapu to women. Niu hiwa, which was used for ceremonial and medicinal purposes as well as for food, was kapu to women in its entirety, Niu lelo was forbidden to them as food, but its fronds and trunk were free for other uses. Women, who were the expert cordage makers, were not permitted to make 'aha cordage from niu husk; all such cordage was manufactured by men (Abbott 1992).

Moreover, niu trees are symbols of the erect male genitalia impregnating the earth. Kamakau (1992) writes the “destruction of coconut trees was a sign of war” and

”The coconut tree was a man, said the ancients, whose head was buried in the ground with his penis and testicles above; and a man must be of the rank of a nīʻaupiʻo (offspring of the marriage of a high-born brother and sister) chief to cut down such trees.” It is important to treat them with respect or else cause hurt. For example, Hawaiian language teacher, Keao NeSmith tells me that for him,

> Seeing kumu niu trimmed in public places is disturbing and analogous to what has happened to the Hawaiian people. Today, these trees are trimmed by the enforcement of foreign (haole) laws in order to make them safe. It's both castration of the tree itself and us as a people. Because niu is a symbol of a man-- a man already here, it is thus like castrating a people that belong to this land, people already here. Haole law allows this to happen.
>
> Although hotels at the beach do trim the trees in Tahiti, it is not always done on public lands. There is a general understanding that that is how it is. One takes a risk if one walks under these trees so people look at them as they walk by. Trimming the trees also makes them grow fast, so that if they do bear coconuts, they are harder and harder to harvest, as they are further and further away from the ground (NeSmith 2003).

Allowing niu to fruit on public land is an example of how Hawaiian ideas differ from the foreign ideas of using niu for decoration. Instead of being a structural ornament, niu would be allowed to blossom and fruit, always commanding respect, a being to look out for instead of ignored as you walk past. The culture likewise has been castrated according to NeSmith. It has been rendered harmless. Impotent in its inherent power to receive respect just as its plants have been neutered, deactivated and rendered safe.

According to Kahuna lāʻau lapaʻau (expert of plant medicine) Butch Richards (2003), who agrees with NeSmith, trimming, “Shrinks the head of the tree, resulting in its early death.” Richards asks, “Is there a designated time to face death? Trimming speeds the death of the plant. The base of the leaf knows when it is ready to drop, nobody else knows the time. Are pickers in control of the plant?” Richards says that the tree trimmers should trim their own hands to see what grows back because parts of plants are like parts of the human body. “If you take a hand for example, you have five fingers, you clip the nails but you don’t clip the fingers because they don’t grow back.”

He condemns trimmers for wearing spikes to climb the tree because of the permanent wounds that they leave in the trunks. He asks, “Who was here first, plants or people?” Richards suggests putting nets around the tree to catch the fruit for safety reasons.

To show cultural respect, it would be advisable to treat Hawaiian plants in a more culturally sensitive manner. In 2003, I met a man looking for native plants at The Home Depot, an important retail supplier, in order to produce bonsai. Wester (2003) observes that Japanese traditions of bonsai and very heavy pruning and shaping of trees has not yet been assimilated into Hawaiian gardens. How will bonsai with native plants be received by the Hawaiian community?

Polynesian Introductions "canoe plants"

"Polynesian introductions" or "canoe plants" (see Chapter 3 for more details) are familiar to most local people from schooldays and often used as definers of Hawaiian culture as they primarily comprise food plants that voyagers deemed fundamental to their society to bring with them.

> Apart from species introduced accidentally, plants brought by the settlers must have been ones important to them in their previous home. . . . Of the thirty six plants that are almost surely Polynesian introductions, only two—kukui and hau—now rate designation as invasive plants (weeds). . . . It was fortunate that they brought edible plants with them, for the indigenous and endemic flora of Hawai'i contain no plants suitable as dietary staples—that is, no plants high in carbohydrates and proteins. . . . As it happened, they made extensive use of the native flora, but mainly for purpose other than food (Abbott 1992).

The "canoe plants" have been part of the Hawai'i school curriculum since the 1978 Constitutional Convention, Article 10 (Education) Section 4 (Hawaiian Education Program),

> The State shall promote the study of Hawaiian culture, history and language.
>
> The State shall provide for a Hawaiian education program consisting of language, culture and history in the public schools. The use of community expertise shall be encouraged as a suitable and essential means in furtherance of the Hawaiian education program. [Add Const Con 1978 and election Nov 7, 1978] (Hawai'i State Laws 1978).

Because the Lyon arboretum was increasingly being asked for help in planning and executing Hawaiian ethnobotanical gardens by schools, Krauss (1980) wrote a

publication entitled Creating A Hawaiian Ethnobotanical Garden. Of the 55 species she lists, 17 (or 31 %) are “canoe plants.” This was followed by a book by Nagata (1992) to “guide the establishment of native gardens in schools throughout the State to stimulate awareness and appreciation of Hawaii’s rare and fragile environmental resources.” Nagata’s list of 32 species includes 3 (or 9 %) “canoe plants.”

> Such gardens furnish specimens for classroom instruction but, far more important, constitute a “living laboratory” where the student has the opportunity to observe the entire living plant, grown, wherever possible, in the manner in which the ancient Hawaiian cultivated it (Krauss 1980).

Europeans in Hawai‘i

Marin. Francisco de Paula Marin, an indefatigable collector of horticultual material, avid gardener, experimentor with two green thumbs and physician, began residing in Hawai‘i at the age of 19 in 1793 (Gast 1973) fifteen years after the first Europeans arrived in 1778. He was responsible for a large number of introductions.

> Close association with the Hawaiian people during the impressionable years of his youth and his personal relationship with Kamehameha unquestionably shaped Marin’s character and habits. The ancient Hawaiians had a surprisingly extensive knowledge of herbs. Herb doctors, called kahuna lapa‘au lā‘au, knew that various properties of many plants, and used a very large number of indigenous plants and animals in the treatment of assorted ailments. It is possible that Marin had schooled himself in the use of these plants (Gast 1973).

He planted potatoes and cotton in 1812 according to his journal. He planted a grape vineyard in 1814 on his harbor front land and another, in 1815, on his land just makai of present day Foster Garden on Vineyard Boulevard (Gast 1973). Since Marin

was also the king's interpreter, he acted as a middleman in provisioning ships. His enterprise and industry allowed him to sell both fresh and preserved meat to his customers. He was able to serve milk, butter, and cheese in addition to the wine produced by his vineyards at his "home away from home" for visiting seafarers. "It was in his use of plants, . . . rather than as an introducer of plants that Marin made his greatest contribution to early Hawaiian agriculture." (Gast 1973)

Missionaries. When the Congregational Church sponsored 100 missionaries to come to the Kingdom of Hawai'i between 1820 and 1850 (Office of Hawaiian Affairs 1994) in order to proselytize, they and those that followed also brought plants from their gardens. Marin greeted them when they first arrived.

The area now known as Honolulu was, a treeless barren plain that was also hot, dry and dusty. Deforestation and erosion were the natural results of Hawaiian agriculture (Kay 1994, Cuddihy and Stone 1990). When Laura Fish Judd arrived in March of 1828 by ship, she viewed the town from a ship's deck with a glass. After passing the grove of coconut trees at Diamond Head, she wrote in her diary,

> There**!** I see the town of Honolulu, a mass of brown huts, looking precisely like so many haystacks in the country, not one white cottage, no church spire, not a garden nor a tree to be seen save the grove of coconuts. The background of green hills and mountains is picturesque (Judd 1880).

In constructing landscapes of their former homes, these immigrant missionaries set up gardens and planted among other things, roses that had been bred and cultivated in Europe, primarily France.

The cultivar Archduke Charles, hybridized in 1837, is currently a common rose in older neighborhoods such as Kapālama and ʻĀlewa Heights. Recent research by members of the Honolulu Rose Society discovered its original name as they helped to restore the Mission Houses' orignal gardens. It is refered to in In Gardens of Hawaii (Neal 1965) as "a rose commonly grown in Hawaii, sometimes for hedges, called loke-wai-kahui (rose with changing color), has inner pink petals surrounded by outer red ones." Baronne Prevost 1842 and Louise Odier 1851 are two other rose cultivars that missionaries brought with them. Others are listed in Appendix D ~ Mission Houses' Rose Cultivars.

We know these grew well and were favorites because missionary letters mention the roses and how well they were doing (Chamberlain 1864). These letters became the source of the names and subsequent recent replanting of these species. Now sold at The Home Depot as "Hawaiian rose", Archduke Charles is prominently displayed framing the main sign at the Mission Houses Museum.

Roses were welcomed by Hawaiians. Evidence that the rose was adopted by Hawaiians appears in a missionary letter written by Maria Patton Chamberlain (1864) to her daughter Bella on March 15, 1864, "I hope your Malmason is blooming by this time.

Our garden is doing finely and the roses are blooming abundantly, but can you believe? The impudent school girls come in and steal them!"

Hawaiians called the rose "loke" and after the turn of the century many US songs based on the musical tradition of Hawai'i, called hapa haole (half foreign) mention the rose a lot (Jones 2003). The amalgamation of influences that develop the idea of an Hawaiian garden had begun. Loke-lani (heavenly rose) is either a double pink rose, now rare, or the Damask rose *Rosa damascena,* with fragrant pink flowers in clusters of 6 to 12, and valued as the chief source of attar of roses (Neal 1965).

> But the single Lokelani Rose bush at Ulupalakua Ranch recalls the days when it was called Rose Ranch after James Makee's wife, Catherine's favorite flower. A pink rambling rose, also known as the Damask rose, it immigrated to Maui with the Europeans and Spanish in the early 1800's. It flourished in the missionary gardens of Lahaina, in the lyrics of songwriters and in the meter of poets. Even Queen Kapi'olani wore Lokelani roses. The Lokelani rose was established as the official flower of Maui by the territorial legislature in 1923 (Moran 2003).

Sea captains. "Whaling ships began to arrive in 1819, and more than 100 sailed to Hawai'i in each year of the 1820s." (Cuddihy and Stone 1990) Honolulu, Lahina and Hilo were supply bases set up for the ships. Sea captains collected and shared plants from their ports of call. About 48 years after Judd arrived (1876), the visiting naturalist aboard the Challenger, Moseley (1892), wrote about these transported landscapes (Anderson 1954) of Honolulu,

> The business streets are very hot and dusty, but around the hotel and villa dwelling-houses on the east side of the town are pretty gardens, filled

> with the usual imported tropical garden plants, shrubs, and trees, which are maintained alive only by constant irrigation; hoses from the town supply-pipes being kept playing on them day and night. Twenty years ago, where these gardens now are, there was not a single tree, and now the gardens form only a small oasis in a dry parched desert, which extends along the coast east and west, and is soon reached on leaving the town in either of these directions.

Plantation Era Plant Introductions and Land Control

In 1819, Marin reported in his journal a significant agricultural achievement, the development of practical equipment to grind sugarcane and the production of twenty-five gallons of juice (Gast 1973). His success lead to the rise in the importance of new plant species for profit, status and watershed protection as we shall see later.

Handy and Handy (1978) write,

> The chief use for cane was as a food. In normal times it was a condiment, in famine times a “life saver.” Sugar cane is eaten between meals as a sweet, being especially liked by children. Chewing its tough fibers and pulp strengthens the children’s teeth and, according to Hawaiians, this use is one of the main reasons for planting sugar cane near most native homes where it is not too dry.

After 1820, the missionary children and grandchildren probably equally enjoyed chewing sugarcane. They insightfully planted sugarcane and went into business.

“Since 1825, some of the missionaries had been taking keen interest in the islands’ agricultural potenital, several of them raising sugarcane in Mānoa and other valleys behind Honolulu.” (Abbott 1992) The people who started profitable sugar

production and breeding became politically influential. They established increasingly vast plantations once they understood that they needed both abundant sunshine and water.

> During the American Civil War (1861-1865), Northerners couldn't get sugar from Southern plantations, and the price of sugar shot up 800 percent. Hawai'i planters knew an opportunity when they saw one. In 1857, there were five sugar plantations in the Islands. By 1878, there were 46 (Honolulu Board of Water Supply 2002).

Leeward parts of Hawai'i have high exposure to the sun's rays and the mountains receive much rain water from orographic precipitation—this combination allowed sugar to be grown profitably. Some water ditches were already in place for lo'i. Diversion tunnels were dug through the mountain ridges and flumes and more ditches were built to carry water to leeward sugarcane fields. Mills used water to process cane and water was also used to transport cane in flumes.

> As new ditches were built, old 'auwai deteriorated. Small farms gave way to large plantations. Populations shifted from windward to leeward. Diverting the water ultimately meant diverting everything (Honolulu Board of Water Supply 2002).

The Kingdom went to great lengths in order to achieve free access to US markets for the commodity on behalf of the plantation owners. Originally a joke by comedian Ku'i Lee in the 1960s, it's now commonly heard that "the missionaries came to do good and they did well." It has been argued that greed and coruption from sugar growing families brought down the Hawaiian government in the 1893 overthrow.

For the most part, these missionary children and grandchildren ran the government of the Republic they established, and later, the United States Territory of 1898. In the next eight years sugar production more than doubled the production of 1893, from 165,411 tons to 360,038 tons (Hawaiian Sugar Planters' Association 1929).

Landscapes of the Wealthy

These enriched recent immigrants to Hawai'i were more or less free to express their plant preferences and to establish plantings that reflected their power and status as govenors. The expression of power in the garden may include the power of people over nature and the power of particular people over other people (Francis and Hester 1990). These estate gardens probably had an influence on the modern concepts of Hawaiian gardens.

In an article entitled Power Gardens of Annapolis, Leone et al.(1989) open with,

> During the decade prior to the American Revolution, the wealthy merchants and landowners of Annapolis, Maryland, undertook remarkable steps to express their desire for political power; they lavished conspicuous expense on their homes in the city, and they build formal terraced gardens around them.
>
> Such acts are not uncommon among the elite of any city. But they were remarkable steps for the colonial Annapolitans because they consituted a web of complex ideological claims intended to impress fellow members of the gentry as well as passersby from all social strata (Leone et al. 1989).

The new rulers made the Hawai'i countryside productive for themselves by clearing it with steam powered machines. Over the next 50 years, this new found land, combined with an imported labor force and a strong sugar market, allowed for

ostentatious private and public displays of wealth and power, as was popular in the United States at the time, but in Hawai‘i, using new and showy introduced tropical plants many of which had distintive large colorful flowers. Although the dates of introduction for the species have yet to be compiled, the plants probably included African tulip tree, anthuriums, areca palm, bird of paradise, flame tree, gold tree, jacaranda, oleander, orchid tree, orchids, philodendrons, plumeria, royal palm, royal poincianna and sealing wax palm to name just a few of the thousands.

Adventives (Weeds)

In addition to the purposeful introduction of plants for ornament and agriculture, other plants were introduced accidently especially as the flow of people and commodities increased. During the last century, new weed species arrived at the rate of about five per year (Wester 1992). Looking into the scientific interest given to past, present and possibly future introductions of alien plants in Hawai‘i, Wester found that 813 species have naturalized in the last 200 years. Of these introductions, 21.8 percent were crops, 35.9 percent were ornamental and 42.4 percent were accidents (Wester 1992).

Exotic Trees for Water Harvesting

During the era of sugarcane plantations, exotic trees were introduced with the goal to replace the forest that had been destroyed by imported cattle grazing and

sandalwood harvesting in the early part of the nineteenth century (Woodcock 2003). The absence of the forest threatened the sugar industry's supply of abundant water.

> Since the reduction of the forest area has perceptibly diminished the flow of water for fluming, and has decreased and made irregular the rainfall, it is reasonable to expect that the removal of the entire forest would make the water conditions so precarious as to reduce greatly the productiveness of the plantations, if not to ruin them entirely. . . . The forest which remains is that which controls, nay, even in some case gives origin to, the water supply (Hall 1904).

One highly successful introduction is still visible even in urban Honolulu. The exposed treeless barren plain that was to become urban Honolulu was already changing because Father Bachelot, founder of the Roman Catholic mission, had planted the first algaroba or kiawe tree (*Prosopis pallida*) in 1837 as a seed (Hall 1904). Sixty-seven years later, Hall writes that there are 50,000 acres of this exotic tree fairly well distributed over the different islands with 20,000 acres on Oʻahu growing as "a narrow, almost continuous belt along the south and west coasts." Hall considers this tree a valuable asset for Hawaiʻi because 1) the wood is valuable for fuel and fence posts, 2) the pods are food for stock second to grasses and 3) the tree has no destructive enemies, tremendous powers of reproduction and extension. Because many mature trees still provide shade in public places like Kapiʻolani Park and the University of Hawaiʻi at Mānoa, kiawe trees may have also been a welcome addition to the Hawaiian landscape for the shelter they provided from the tropical sun.

Leading to the need for such introductions had been hopeful risk taking and management accidents. Since the beginning of the 19th century,

> various deleterious agents have worked so effectually toward the destruction of the woodland that every forest in the islands has been reduced, until it is now only a fragment of what it was orignally. . . . The principal causes which have brought about the destruction of the forests are stock, insects, grasses, fire, and clearing.
>
> The island of Molokai well illustrates this point. This island, 38 miles long by 8 miles wide, has a range of mountains over 4,000 feet high at its eastern end, drops to a low plain in the center, and rises to 1,380 feet near the western end. Originally all the eastern end well down to the central plain, and the highest part of the western end, were heavily forested. The plain was park-like, with scattering groves of trees. There is little at present even to indicate former conditions. All the western end is bare. The trees are gone from the plain, and also from the western and southern slopes of the mountains at the eastern end. Only a few thousand acres of the highest south slopes and the precipitous north slopes of the mountains are now covered by growing forest. Stretching around the living forest is a wide belt of leafless timber, which has died within the last decade, but has not yet fallen.
>
> Each of the other islands exhibits just the same conditions. More marked examples of declining forests can scarcely be imagined than exist in the districts of Hamakua and Kohala in Hawaii, and Kula in Maui, in which one may pass through thousands of acres of totally dead forest into equal areas of which the forest is in a dying condition, and from these into the small remant that yet remains thrifty.
>
> No estimate can be given of the ratio of the present forest to that of a century ago. . . . But it is certain that the present area, which may not be more than 20 percent of the islands, is but a small part of what existed at that time. This result has been brought about by perfectly evident causes working unretarded year by year (Hall 1904).

New Land Management as a Result of Plant Introductions

The new plant introductions would mean a change in the control of water and land. Land management practices would seek to produce profit from the exotic plants and animals. Fire and mechanical clearing was performed to encourage grasses for livestock or create space for plantations by missionaries and other foreigners. Their role was in clearing the forests as soon as they were able to take possesion of it. The missionaries were frustrated that the aliʻi held all the land and acted to bring about change. With the additional support from the growing business class they brought about a change in land tenure called the Māhele, a process of dividing the land and awarding private title to it (Abbott 1992). It began in 1848 and lasted until 1855 and left, aside from the aliʻi, many of the Hawaiian population dispossessed. Even more would be as American and European investors promptly began to buy or other wise acquire land titles from aliʻi and makaʻāinana alike (Abbott 1992).

Without the subsequent clearing of large areas of forest land, the products of islands would not, in 1904, exceed $25,000,000 a year (Hall 1904).

> All of these endeavors (crops and ranching), depended for land on the goodwill of the chiefs and for labor on the makaʻāinana but gave them little in return. Unquestionably, some of the merchants, missionaries, and merchant-missionaries believed that these commercial ventures served the interests of the Hawaiians by raising them from sloth and backwardness and introducing them to superior ways of life and work. Hawaiʻi needed the aggressiveness, tools, techinques, and products of the industrial revolution, just as it needed the modest attire, new foods, and reading that the missionaries had beeen espousing. So the rationale ran (Abbott 1992).

Protection of Native Forests

Up until the publication of USDA's The Forests of the Hawaiian Islands in 1904 (Hall 1904), the government of Hawai'i had given attention principally to the question of forest planting rather than to the preservation of the native plants of the forests. In 1882, an appropriation of $12,000 was made for forest work for the biennial period; later legislatures have continued this appropriation for the raising, distribution and planting of exotic trees (Hall 1904). Hall (1904) writes that in order to protect the water supply, i.e. the watershed needed for commercial interests,

> the problem must be solved by first protecting the native forests from the forces which are working their destruction, so that as far as possible nature may accomplish their reproduction, and then by judicious planting in those places where the forest is unable to replace itself.

These critical conditions stimulated reforestation efforts aimed at healing damaged lands and led to the establishment of a system of Forest Reserves, called for by Hall, to protect critical watersheds. A comprehensive forestry law was passed by the Territorial Legislature in 1903 whose provisions set aside "forest and water reserves". The first of the forest reserves was established in 1904. The 54 reserves on five islands totaled 1,196,000 acres in 1961 (Nelson and Wheeler 1963) and were renamed conservation districts in that year (State of Hawaii 1975).

> Hawaii now has nearly 2 million acres of forest—almost half the total area of the State. About 1.1 million acres of forest land can produce industrial wood. Including grassland suited for trees, nearly 1.4 million acres can grow useful timber crops. The commercial forest land lies almost equally

> within and outside the Forest Reserves. Two-thirds of the forests in the Reserves are publicly-owned, and three-fourths of the nonreserve forest are privately-owned. Private ownership is concentrated in relatively few large holdings (Nelson and Wheeler 1963).

Nevertheless, introduced trees were planted to hold soil water on the islands to provide for sugarcane growth and to be used as timber. "Exposed to erosion by overgrazing of both wild and domestic animals and by some unwise clearing, denuded lands became a danger to water suplies" (Nelson and Wheeler 1963) and lead to the establishment of a Bureau of Agriculture and Forestry in 1893 "by an Act of the Legislature of the Hawaiian Kingdom, to develop a conservation program and to help ranchers and plantation owners practice better land use" (State of Hawaii 1975).

> Early tree plantings were intended for fuelwood, windbreaks, and to re-establish cover on lands for watershed protection. Large quantities of fuelwood were needed to fire sugar mill boilers and for dometic use. Species were selected on the basis of rapid growth and little attention was given to eventual commercial value. But fortunately many different species were planted from which information is now being secured to guide future reforestation (State of Hawaii 1975).

Except for koa (*Acacia koa*) and ʻōhiʻa (*Metrosideros polymorpha*), native trees were felt inferior as lumber by foresters interested in making the forest profitable as well as protecting the water supply. Even so, a 1961 DLNR publication states, "Considering the low quality of ohia timber and its relatively slow growth, . . . forest management efforts should be directed toward replacing ohia with more valuable species (Nelson and Wheeler 1963)."

The Polynesian introduction, kukui (*Aleurites molucanna*) and the native koa were two of the first trees planted widely by the Division of Forestry as watershed cover. The extensive visible stands of kukui in the gullies of the Honolulu Watershed Forest Reserve resulted from those plantings begun in 1904 (Little and Skolmen 1989). Natives species generally would not grow well on degraded soils.

Exotic Tree Industry

During the period between 1961 and 1971 there was some effort to create a timber industry by replacing the native forests with monocultures of introductions since the forest species lacked great commercial value. It was felt by the Department of Land and Natural Resources (DLNR) that "economic and social growth in Hawai‘i and the Nation demands . . . use of all forest resources—water, forage, recreation and wildlife habitat as well as (introduced) timber (Nelson and Wheeler 1963)." Forestry was thus "making a transition from past custodial presevation to intensive development and mangement of the forest resource for consequently greater, long-run social and economic benefits." About 3,000 acres of commercial timber was being planted each year (Nelson and Wheeler 1963). As a result, in 1975, the DLNR's new forest management plan, despite acknowledging, "a sudden rise in public apprehension about environmental quality (that) has focused critical attention upon how forest are managed," "multiple use and sustained yield principles" continue as "the foundation for forest resource conservation" (State of Hawaii 1975).

Appreciation of Native Forests

Out of step with the Endangered Species Act of 1975, public awareness of earth ecology, and local Hawaiian reassertiveness, all focusing on native Hawaiian forests, the DLNR has seen fit only within the last ten years to have a moritorium on the planting of non-native species in the forests by Foresty except in cases of severe erosion. In these cases, non invasive species may be used (Pawn 2003).

In a newspaper article (TenBruggencate 2003) explaining the state's celebration of the "Year of the Hawaiian Forest" to mark the centennial of the forest reserve system, state forester Michael Buck is quoted, "Native Hawaiian forests are among the best watershed forests we have found, although some non-native species can make good watershed, too." According to the article, native forests are composed of open-canopy species such as koa that allow smaller trees, shrubs, low ferns and mosses to survive together. They act like a vast sponge that hoards water rather than letting it flow quickly to the sea (TenBruggencate 2003). The organic litter of a native forest protects the soil from raindrop splash facilitating infiltration and supplying a source of water for diversion even during the dry season. Due in part to native forest ecology, Hawai‘i has some of the purest groundwater in the world. With regard to vegetation, forests and erosion, Calder (1999) writes, "Benefits may result from the binding effects of roots which can prevent landslips on steep slopes and from the generally high rates of infiltration under natural forest which tend to minimize surface runoff.

Summary of Hawaiian Gardening

Despite the fact that their home lands were taken away and then dramactically replanted with new plants as part of a wider economy, Hawaiian culture retains a deep intimacy with plants. In the process of making lots of money with plantation crops by the new rulers, forests were denigrated and plans were made to replace them entirely. Although “prominent features of the landscape in many areas of the Hawaiian Islands are plantations of exotic trees that were established primarly in the 1920s and 1930s (Woodcock 2003)” and it was felt by Lyon (1923), that,

> The native trees are quite unable to tolerate interference from man and stock or to repel aggression of introduced plants. They quickly sucumb before the forces turned against them. They possess no ability to regenerate. They regain no lost ground.

Hawaiians are undergoing a second cultural renaissance and native plants are coincidentally being planted for the first time.

The next chapter explains what has been portrayed in old publications about the plants and stuctural elements of Hawaiian gardens. The opening section on tropical gardens provides us with a partial explaination as to the origins of our familiar Hawaiian landscapes and the following sections explains why Hawaiian gardens will be including more native plants in the future.

Chapter 3 ~ Changes in Concepts of Hawaiian Gardens

Hawai'i and the Tropical Garden

This section will explain the standard conventions of a "tropical garden" rich in introduced species that arose in Hawai'i and had influence far beyond the islands. These standards were popularized as images of Hawaiian gardens and were promoted together with the idea of the tropical holiday. The last chapter showed how various persuasive groups had an effect on contemporary Hawaiian gardens.

No publication was more influential in promoting the idea of Hawai'i as a lush garden paradise more than Paradise of the Pacific (now Honolulu Magazine). It began publishing in 1888, under King Kalākaua's royal charter (Napier 2003). In the teens or 20s it showed how modern Honolulu was, detailing its virtues. It contained sections on Hawaiiana, a travel supplement; Hawaii tourfax (touring facts) and the official travel bulletin of the Hawaii Visitors Bureau.

Paradise of the Pacific and Hawaii Farm and Home influenced public taste and were a source of much of this literature review. Articles were located via a listing in the landscaping references of a publication by The American Association of Architectural Bibliographers entitled Paradise Improved Environmental Design in Hawaii (Neil 1972).

The character of Hawaiian gardens has been a reflection of those in charge of their creation or purchase. What constitutes a "Hawaiian garden" has changed over the years. Holt (1953) wrote that the Hawaiian garden of his day was a hybrid product.

“From the early years following the arrival of Cook, until the present, gardens in Hawaii have steadily evolved, fusing elements from cultures both East and West with those more indigenously established.” He notes the “lavish natural endowment in terms of earth and climate” supporting “growth of every description” and encouraging, “from the first years of contact with the outside world, an unrivalled enthusiasm for importation of species which indicate any ability to adapt to local growing conditions.”

Captain George Vancouver left citrus and other semi-tropical fruits. The Spaniard Marin introduced more fruits, flowering trees and shrubs. Later, more trees, shrubs and vines were introduced. Dr. Hillebrand, whose home became the site of the present day Honolulu Botanical Garden, Foster Garden, imported numerous plants. Kauka (Doctor) Wilder “closed the era of intensive plant introduction at the end of the nineteenth century” with “varieties of plumeria, ti, ixora and other flora that are widely used in Hawaii’s gardens of today (Holt 1953).”

Thus, “the components of a Hawaiian garden are as polyglot as Hawaii’s people, as diverse as there are places in the world, and are homogeneous only with respect to the natural harmony they create in amalgamation (Holt 1953).”

In planning a Hawaiian garden for the Honolulu Academy of Arts in 1953, see Figure 3, Holt noted, “It was necessary to bear in mind that no acceptable definition of the Hawaiian garden exists. It is doubtful that any attempt has been made to form a

concept of what comprises the Hawaiian garden." This research has endeavored to form a concept.

Figure 3 ~ Hawaiian garden at the Honolulu Academy of Arts by John Dominis Holt.

Garden Generalities

For almost three quarters of a century, Neal's In Honolulu Gardens and In Gardens of Hawaii (1928, 1965) have been the primary floral guide for Honolulu and Hawaii, respectively. In her introduction Neal describes paradise,

> From green-blue waters along the shore to the tops of jagged palis, the Hawaiian Islands look like vast gardens. The multi-shaded green of lawns and trees is studded with brilliant colors, with the blossoms of hibiscus and oleander shrubs, with yellow or orange blossoms of bignonia vines, and with variegated leaves of crotons. Along avenues, flowering trees spill petals of pink and red and yellow and blue. Graceful coco palms and stately royal palms line streets and driveways. Plumeria trees offer up their French bouquets, and the pale green of kukui trees highlights the hillsides. At night the air is fragrant with the perfume of mock orange, night cestrum, lady-of-the-night, and miulana.

Plants have always played a vital role in Polynesian life . . . . Polynesians love flowers, and they have countless sayings, songs, and chants about them. Many fragrant flowers and leaves and some kinds of woods were sacred to the gods. . . . Lono, the Hawaiian god of agriculture, is invoked when rain is needed. His office is similar to that of St. Fiacre, the French patron saint of gardens.

Holt eloquently conjures his Hawaiian garden image for us:

Certain things are activated from the very core of human experience and the collected mass of acquired feelings allow memory to produce images, which, strangely, act as guides in the construction of what ultimately becomes a concept or a description. From this relatively formless mass certain criteria are delineated. These, measured against what has accumulated as established patterns or what we call facts, begin a process of elimination. That which began as a welter of feelings streaming from what has been popularly called the “unconscious” is gradually shaped into abstract quantities that are later translated into forms, masses and textures arranged to describe what has formed into a concept. This does not occur as accident or chance dictates. Specific reasons exist in the forming of concepts.

After describing the garden elements he selected, he describes his creation:

This is a garden of contrasting forms and textures. Each plant provides its shade of green ranging from the dark and somber tones found in the *Syngonium* and *Dracaena draco*, to the light yellow-green of Pala-palai fern. The mood it creates is one of quiet and reflection. It has not suffered meticulous arrangement nor has it been formed from mathematical calculation. It was not planned to assume the studied look or the neat grooming of the hair dressing and beauty salon crafts. There is a note of poetry in the casual placement of plant forms, perhaps one of melancholy. This is not a corner of the troubled world in which to fret or to generate a scintilla of inventive thoughts. Inspiration that comes here is of a reflective, more meditative sort. Here we are closer to nature than to the gadget-ridden colossus of modernity.

In an anonymous article in Hawaii Farm and Home from 1951 entitled *A Lei Garden*, the author writes that,

> the outstanding thing about the garden is that few things have been done the way the experts say they should be done. There has been no artistic arrangement in the plantings—yet the total effect is one of calmness and beauty. The gardener, Mrs. Keli'i, when she is at home she can most often be found in the midst of them somewhere, picking, planting or watering—and at all times, barefooted.

Hawaiians believe that plants are for people according to Watson (1973). He writes that,

> Hawaiians have a great capacity for enjoyment of living. They make gardening a joy, not a job. Hawaiians don't burden themselves with more garden than they can care for easily. They tend to feature a plant they like, and when they get tired of a plant, they replace it with something else they like.
>
> Most Hawaiians like a casual garden, but they know that even this kind of garden requires some tender loving care . . . and of course they are great believers in serendipity.

Writing about one of the most famous Honolulu gardens, the Marks Estate, Kimball (1954a) tells us that Loy Marks seeks to preserve the endemic plants. According to Kimball, Marks "feels that through lack of effort many native plants are being crowded out, and hopes through the medium of her own garden to arouse interest in this subject among other gardeners."

Kimball (1954b) wrote about the useful Robert McCorriston garden on the slope of Diamond Head. She writes that their Hawaiian style citrus orchard contained local pomelo, grapefruit, limes, lemons, oranges, mango, avocado and papayas.

Garden Specifics

Shade

Gardens have a feel to them. The garden Holt designed was located in a deeply shaded corner of the central court of the Honolulu Academy of Arts under a "large and ancient" mango tree. The concept of shade appears repeatedly in the literature. Malu is the Hawaiian word for shade, shelter, protection, peace, control, strength; shaded, peaceful, quiet, and safe; protected by taboo; reserved, held apart; taboo; the stillness and awe of taboo . . . (Pukui and Elbert 1986). The word appears in the name of Hoʻomaluhia [to cause to give peace, protect (Pukui and Elbert 1986)] Botanical Garden, which is the largest of the six Honolulu Botanical Gardens.

Karg (1940) writes that "many comfortable, rambling island homes" "are home-like and livable" because they "usually have large, green lawn spaces and huge, protective trees." In a 1953 article in Paradise of the Pacific, entitled *Hawaiian Garden*, that describes the Fred J. Mandel home in Kahala, the anonymous author writes,

> Benevolent through nature is, it takes love to make a garden, even in Hawaii. Planning does it. And planting. And tender care. And persistence. Then, presently, *that shade, that shelter, that peace and privacy* (my italics)—color and fragrance that is perfection. Wonderful, contrasting textures. Play of sunlight and shadow on wall, on lawn. The superb staging of your plants. Such sound effects as leaves

> whispering—or of water making a little song. The deliciously indescribable perfume of moist earth and other favorite essences, some most fragrant at certain hours.

In an anonymous article in Paradise of the Pacific from 1948, Hawaiian gardens are described as having dense plantings of exotic trees, shrubs and plants. W. Moir (1944) refers to the garden as your outdoor living room, see Figure 4. He began a lecture and article with, “You are all familiar with the basic principles of trying to make your garden a part of, or complement to, your home.”

Figure 4 ~ Hawaiian garden as an outdoor living room.

> Your garden is so similar to your interior rooms that by following the same general principles one soon double and trebles the living space. In Hawaii, this also leads to greater joy and health, for our gardens are useful all year round (Moir 1944).

Today, this concept has been abandoned by some new home builders who create large interior spaces, leaving little yard space for any type of a landscaped outdoor living room on the lot—a result perhaps of the 1) cost of land, 2) loss of contact with nature, 3) cost of maintenance, 4) time needed and 5) adaptation to air conditioned sterility.

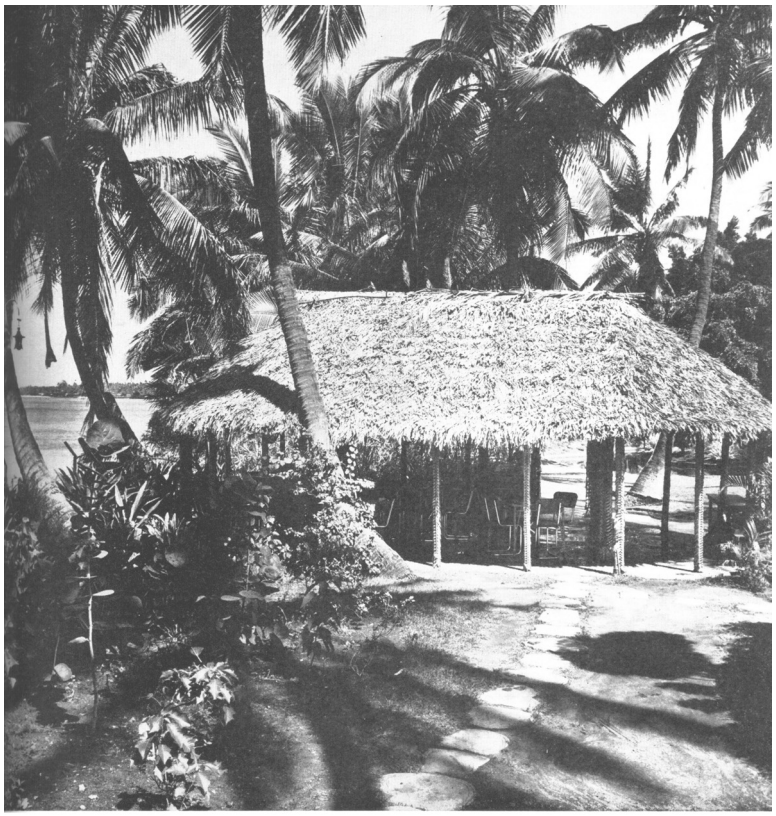

Figure 5 ~ Grass shack at Queen' s surf.

Fox (1931) wrote that there were three factors that influence Hawaiian gardens, 1) New England styles--since many of the residents are decendants of the New England missionaries or whalers, 2) Japan--as practically all of the paid gardeners are Japanese who have introduced their own way of laying stone and placing shrubs and 3)

Indigenous Hawaiian--from the cool and shady plantings of bananas, mangoes, and papaya trees surrounding the one-storied cabins with sloping grass roofs of the native Hawaiians, see Figure 5. “These cabins are so perfectly suited to the climate that they are adapted for more pretentious residences and the roof lines are copied in tile.” (Fox 1931)

> In many Hawaiian homes the garden is brought right into the house by means of green foliage plants that climb up the front steps, and ferns that drip from baskets swinging from the roof of the porch. These homes are open on all sides to the lush green garden, which is shaded with leafy trees and bordered by the street or the road.

Foliage

Another commonly mentioned attribute of Hawaiian gardens in the older literature is the interesting foliage. If gardens are shady it’s not possible to have many flowers as most flowers require for the most part sunshine. As a result, Hawaiian gardens, which utilize a lot of shade, also invoke the forms and colors and many shades of green in the available tropical foliage, see Figure 6.

Thompson (1941) writes that she believes that “one of the outstanding features of our garden, and our islands, too, is the green and the beautiful leaves of the plant world.” She explains, “Being tropical islands we need shade to neutralize the glare and to give coolness. In striving for this shade we must use masses which will thrive in this condition, and so we create the impression of green surroundings.”

> In thinking of our gardens I have found that color plays more of the part of an accent than of a mass. I believe we all live with a cool green garden

more easily than one given over to a great deal of color. But into this picture we throw accents of color to be enjoyed at their height of bloom.

Figure 6 ~ 'Ulu, a Polynesian introduction, with table and chairs.

Most of the plants which grow well here, indigenous and introduced, have such beautiful leaf value that I believe we have grown to think of these plants as the basic material with which to build our gardens. This makes our gardens primarily green, and it makes our gardeners leaf conscious (Thompson 1941).

Thrum (1913) describes the Moanalua Horticultural Gardens. At a distance an imported Japanese house is enveloped in foliage of intermingling breadfruit, kukui, eucalyptus, algaroba, jacaranda, palms, cypress, bamboo, ironwood, hau and other trees (Thrum 1913).

Pōhaku (Rocks)

We will now see that in addition to plants, rocks too were spiritual entities. Certain stones were held as sacred partly because of their connection with god forms (Kanahele 1986). Although the literature does not mention them, there are many interesting and perhaps sacred rocks (pōhaku) present in the secluded shady courtyard garden at the Bishop Museum, storehouse of Hawaiian culture. Quite a number of the rocks have an added cavity to create a small water feature. Grounds foreman Boyd (2000) considers pōhaku to be an important Hawaiian garden element. Boyd told me that someone is looking into the history of each of the stones. "They are truly wonderful, their size, number and shape are powerful."

Other precious pōhaku are located in Waikīkī and Kūkaniloko, known as the "birthing stones". For example, Paemāhū is one of four stones at the western end of Kūhiō Beach Park, Waikīkī. The stones are believed to have been medical kāhuna from Tahiti that guarded this spot. Formerly they were in the sea (Pukui et al. 1974).

Pana Oʻahu is a book that records sacred sites and their stones on the island of Oʻahu (Becket and Singer 1999). The Kūkaniloko "site lies near what some might consider the piko (navel or center) of the island. Its location and importance in confirming the status of aliʻi" (aristocrats) "suggests the intimate connection between kānaka maoli and land in the traditional cosmology." (Becket and Singer 1999)

The following three stories about pōhaku tell us that large rocks are important to, and well known, by Hawaiian people. The following comes from accounts about a famous stone that was also appreciated by the Japanese Consul. Pōhakuloa, literally long stone, is either a large 9-foot (Green and Pukui 1936, Alexander and Dodge 1941) or 12-foot (Punahou School 1866) stone of the shape of a mammoth kalo (Punahou School 1866) or a mammoth kalo leaf (Alexander and Dodge 1941) believed to bless expectant mothers and endow children with strength and wisdom. It is the Fairy God of Motherhood and a Supernatural Stone, who took the form of a man of perfect physique with noble characters (Montano 1904).

> In ancient time women when they were to become Mothers made a pageant of love and ambition to this Stone (Pōhakuloa) giving a Mohai (offering) laying before this God a fish called Hilu an emblem of gentleness, graceful, and good disposition in the child. The fish Hilu was accompanied with the leaves of the Lama (a very hard wood used in building houses for the Gods), an Emblem of wisdom, ambition and brightness for the child, Lamalama a torch (a beacon light) (Montano 1904).

It was formerly outside the gate of Punahou School, Honolulu (Pukui et al. 1974) and would have been a lasting and fitting symbol of education for the school (Alexander and Dodge 1941). It was originally moved from Round Top to Punahou by King Kauikeaouli (Kamehameha III) either under the Supervision of Governor Kekūanaō‘a (father of Kamehameha IV and V) (Montano 1904), or by Governor Kuakini (Punahou School 1866, Alexander and Dodge 1941) and the high chief Paki father of Princess Pauahi Bishop in order to form half of the Mānoa road gateway in a pā‘āina (stone wall)

extending from Punchbowl across Punahou almost to Mōʻiliʻili to protect the cultivated mauka lands from the grazing cattle and horses. At first the Stone would not move.

> The first day the men dug hard, thinking that the second day would see it dislodged. But after they had left for home, the stone worked its way more firmly into the ground than before; on their return they were amazed to see that their labor had been in vain. They discussed the marvel and came to the conclusion that this was a kupua *(supernatural being possessing many forms)* stone. The chief consulted a kahuna. He said, "This is not a stone, it is a man. He is not to be forced, but coax him and he will go." The kahuna proposed that a feast be prepared consisting in black pig, black awa, green coconut, black fowl, red fish, and pink poi, and all the workmen and a number of others be invited to attend. After the feast the digging began again and the stone was soon out of the ground. This done, the question arose "Who shall lift it up and set it in place?" The chief Paki (father of Bernice Pauahi Bishop) was a very powerful man, said to have been seven feet in height. He took hold of the stone and lifted it upright. With men supporting it on either side, it moved of its own accord to the place prepared for it (Green and Pukui 1936, Alexander and Dodge 1941).

After the young King then seated himself upon the apex of the rock he gave a command, and stone, King and all, were raised upon the shoulders of the Hulumanu (multitude of people) and carried down to its place, with joy and please to carry their beloved King (Punahou School 1866, Montano 1904, Alexander and Dodge 1941).

Located about twenty-five feet west of the 1866 lower gate, it was finally broken up by blasting and hammers under Mr. Spooner, superintendent of grounds, 1854-1859 (Alexander and Dodge 1941), because it stood in the way of widening the road to Mānoa, and pieces were put into the nearby stone wall (Pukui et al. 1974). In the Annie Harris story (Green and Pukui 1936), part of it was removed to the Kapiʻolani Maternity

Home and that the remainder is still to be seen standing at the front gate of the Punahou campus.

It is claimed that the top of Pōhakuloa was cut off and given to the Japanese Consul, then residing in the home of Princess Kekaulike (sister of Queen Kapiʻolani) on Beretania Street as he wanted a stone for his Japanese fountain that he was erecting on the premises (Montano 1904). The residence has since become the Kapiʻolani Maternity Home and it is extraordinary that the Home, which is now Kapiʻolani Women's and Children's Hospital, should share a portion of Pōhakuloa (Montano 1904). Spokesperson Ota (2003) of the public relations department of the hospital has no knowledge of the stone. Hawaiian activist Lynette Cruz (2003) relates the following about other stones at the royal palace and in Nānākuli, respectively.

> Jim Bartels, some years ago, also wrote a piece on the rock in question, called the 'Paepaekapu o Liloa' stone. This, as you may have noticed, is a shaped stone, and Jim said it was the most sacred stone on the grounds. There's a reference to this stone in Ruling Chiefs of Hawaii. "The sacred slab of Liloa" was famous from Liloa's time down to the time of Kamehameha I.
>
> It was so sacred that no chiefs were permitted to step on the stone except for Liloa and one of his chiefs, Laea-nui-kau-manamana. It was used as a stepping-stone into Liloa's residence. The stone was brought here from the big island by Kalākaua. It was placed originally in front of the first palace. When construction started on the present palace, the stone was moved to somewhere else on the grounds.
>
> Eventually it was moved to the spot it's in now, in front of the Kanaʻina (old archives) building, next to the large stone with the Captain Cook

plaque on it. Abigail Kawananakoa took personal responsibility for the Paepaekapu stone and had people come in to plant ti around it so no one would step on it to look at the larger stone behind it, but as she is no longer affiliated with the friends of ʻIolani Palace, the group 'Sacred Times and Sacred Places' (STSP) has assumed responsibility for caring for the stone.

STSP has been caring for it and for the other two stones on either side of the steps of the Kanaʻina building for about six years. We cut the grass, clean the yellow leaves off the stones, water them and place ho`okupu there from time to time. We honor the Paepaekapu stone because for us, it's alive. Spirits of the ancestors, in particular Liloa, continue to reside in the stone. This is also true for the large stone with the plaque on it, although I'm not sure who's in that stone. From time to time the stones talk to different people.

The stone in Nānākuli is also a kupua, from what Gerry Jervis tells me. perhaps 30 or 40 years ago, when Nānākuli road and the areas around it were being developed and the land leveled for building homes, the contractor's bulldozer pushed the stone from the edge of the road to the other side of the lot. The next morning it was back in the same place. This went on for a week. Eventually the contractor decided to leave it in place near the road (since that's where it wanted to be) and poured a concrete slab around the stone (actually there are two stones) and leveled the lot around it. It's there today. Gerry knew this story because he lived across the street at the time, and all the neighbors knew about the stone, too.

Because of their spiritual importance, rocks are a relevant part of a Hawaiian garden. Other examples or rocks within a landscape include those at Kawaiahaʻo Church, Lanikūhonua, The Natatorium and Washington Place.

Native Plant Renaissance

Definitions

Although my approach to addressing Hawaiian gardening practices attempts to be holistic, it is important at the outset to define a few plant terms. The term “native” may be applied to plants but it also may refer to people but in a slightly different way. Marquesan voyagers, who discovered Hawai‘i at least 1700 years ago developed a culture based on the environment that they found that could now be described as “native” to Hawai‘i. However, a preferred term by some Hawaiian people for native people or indigenous people is kanaka maoli. Although this is defined as a full-blooded person by Pukui and Elbert (1986) it is not currently being used in that sense. A new term in the Hawaiian language for native or indigenous is ‘ōiwi (Kimura et al. 1996).

When we apply these terms to plants some caveats are required. “native” are those that arrived in Hawai‘i without the aid humans, either by 1) being stuck on or ingested by migratory birds 2) riding wind currents or 3) floating in the ocean currents. These plants are distinguished based on whether they have evolved into new species since arriving (and so are called endemic) or have remained in a form identical to the populations in some other place and from which they may have been derived (indigenous non-endemic).

> Over many million years, the isolation of Hawai‘i resulted in a native flora and fauna spectacular for their uniqueness. Biologists divide native plants and animals into two groups–those that are endemic (found in one place only) and those that are indigenous (found in more than one locale

> but established in a given place without human intervention). Ordinarily, indigenous plants easily outnumber endemics, but in Hawai‘i the reverse is true (Abbott 1992).

It is calculated that,

> From approximately 270 to 280 successful flowering plant colonists, evolution has led to at least 956 species of flowering plants, about 89% of which are endemic (Wagner et al. 1999).
>
> This is one of the highest ratios of endemic to indigenous plant species anywhere on earth. Against this background of botanical uniqueness, Polynesian introductions can be reckoned with a great deal of confidence (Abbott 1992).

The matter is further complicated by the fact that certain plants are associated with the native Polynesian culture. “Polynesian plants” (Polynesian introductions or “canoe plants”), are a group of approximately 35 plant species that were brought to Hawai‘i originally by either the first Marquesans or later by the people engaged in two way journeys between Hawai‘i and the islands of the South Pacific. These plants were fundamental to their agricultural system and formed the foundation of all Hawaiian gardens to come. The Polynesian plants can be treated as crops common throughout Melanesia and Polynesia. These are <u>not</u> generally referred to as “native” plants despite their close association with “native” people. For example, Hui Ku Maoli Ola (Barboza and Schirman 1999), the largest native plant wholesaler to The Home Depot calls the endemic and indigenous plants, “Native Hawaiian Plants” and the Polynesian plants, “Hawaiian plants.”

"Introduced plants" for the purposes of this discussion, are any plant species that are not native and not part of the Polynesian agricultural complex but were introduced after European contact. In post contact time, after 1778, new plants were introduced and new ideas assimilated that have become a very conspicuous part of the landscape. According to George Staples (2003), one of the authors of A Tropical Garden Flora (in press) there are 2,173 species commonly cultivated in Hawaiian gardens.

Another 10,000 species believed to be present in home and botanical gardens are listed as a separate checklist on an electronic database (Staples 2003). Some of these plants introduced in the last 200 years have been taken into close association with Hawaiian culture. They have been given Hawaiian names and are used often without recognition (or concern) that they are recent acquisitions.

The identity of the plants that fall into this category could not be determined with precision but would almost certainly include plants favored for use in lei (plumeria, green rose, crown flower), landscaping (laua'e), firewood (kiawe) etc. A possible name for this group of modern Hawaiian plants is "'auana plants."

Native Plants as Symbols of Native People

The native plants, never identified as useful in or belonging to tropical gardens, have become symbols of the Hawaiian people and their struggle to find an identity and place in contemporary society. It is not surprising that Hawaiian plants are surrogates for Hawaiians.

> Plants, as might be expected in an agricultual society, comanded a great deal of attention. The more useful the plant, the more attention it got. The hala, or pandanus, breadfruit, coconut, sweet potato, and taro were personified as kino lau, or body foms, of provident gods, and were featured in many myths and legends (Kanahele 1986).

Abbott (1992), in a chapter entitled, An Evolving Relationship to Land and Crops, writes that “Dr. Handy and his wife proposed that the Hawaiians’ relationships with their plants had a critical formative role in Hawaiian culture:”

> It is generally assumed that an oceanic people such as the Hawaiians lived mainly by fishing. Actually fishing occupied a very small part of the time and interest of the majority of Hawaiians. For every fisherman’s house along the coasts there were hundreds of homesteads of planters in the valleys and on the slopes and plains between the shore and forest. The Hawaiians, more than any of the 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 and Handy 1940).

Abbott taught that the plants of Hawai‘i before people came were the true Hawaiians. The Polynesians made extensive use of the native flora for purposes other than food but brought most edible plants with them except algae. Handy and Handy (1978) tell us that Hawaiians traditionally planted certain plants by, near or around their houses or dwellings. These include 1) a number of varieties of bananas (mai‘a), 2) sugar cane (kō) in clumps where there is good soil and moisture, 3) ti (kī), as the plants were believed to have a beneficent and protective psychic influence, 4) ‘ilima in order to have flowers at hand for making lei, 5) ‘olena for medicinal use, 6) hau for its practical uses

and 7) the native white, red and pink hibiscus (koki‘o ke‘oke‘o, koki‘o ‘ula, ‘akiohala) and ma‘o hau hele for the sake of the ornamental blossoms. According to Neal (1965) koki‘o ke‘oke‘o “was more accessible or more common than now, as many references are made to it in old Hawaiian songs and legends,” see Figure 25, Chapter 6.

Names, word meanings and literary illusions have links to plants and gardening activities. Because many Hawaiians seeking to understand their culture are second or third generation urban or suburban people, they are removed from that environment where their traditions sprang and thus have a need to understand more about plants and their cultivation (Wester 1999).

Handy and Handy (1978) describing Hawaiian horticultural tradition write:

> In the matter of shrewd observation of varieties and careful, conscious selection of mutants in the creation of subvarieties of their plants, the Hawaiians were true experimental horticulturalists. New varieties are still consciously created by selecting sports from bud or slip mutation. A variant sport, growing as a taro or banana shoot, or from a potato slip, is termed a keiki (child). If the mutant produces desirabe food, or is liked for its color, leaf form, or vigor, it is replanted and given a name, generally that of the growers or locality; and if it is really of value, it will be shared with friends. Thus, presumably, have the hundreds of named varieties of old Hawaiian taro and sweet potato, and the less numerous varieties of banana, sugar cane, and ‘awa, been originated.

Little (1969) predicts the current phenonmenon of renewed interest in native plants with an explaination,

> Distinctive names in the Hawaiian language for most native trees show that the first settlers were good naturalists. The Hawaiians mentioned trees in songs and legends. . . . Surely the modern inhabitants will take

> the necessary steps to save the rare and endangered trees from extinction and thus preserve their legacy.

Western Discovery

Modern inhabitants include settlers more recent than Hawaiians. Since the first European contact, botanists have studied the native plants. The Degeners (1970) write that “foreigners, ever since the time of Captain Cook, have been eager to collect plants peculiar to the Hawaiian Islands for study regarding their uses as perfumes, fibers, foods, dyes, medicines, ornamental and timber.”

> The strange animals and plants of islands have long attracted naturalists. Isolated islands far from continents have relatively fewer species, and these are different from those of other lands, often taking odd forms and sizes. These organisms, their adaptations to their surroundings, food relationships, and competition, are less complex and can be observed more easily. The Hawaiian Islands are among the most isolated in the world (Little 1969).

The native plants have however been in a realm seldom seen and often reserved for the experts at the exclusion of newcomers to the field of native plants. Sohmer, one of the authors of Manual of the Flowering Plants of Hawai‘i (Wagner 1999) writes,

> A certain amount of mysticism had crept into Hawaiian botany over the years—including the notion that a period of initiation was necessary before a novice botanist could be admitted into professional practice! This was not really true, but it made access to Hawaiian botany difficult for nonresident workers.

Extinction Rate Increases

Degradation began with the use of dry forest lands by Hawaiians when their populations began doubling every century and further increased when these lands were farmed and populated (Cuddihy and Stone 1990). The endemic plants on these coastal plains, lands between the coastal areas and the mountains, had been largely replaced except for a few pockets. Kirch (1982) wrote, “The extant biota of the Hawaiian Islands represents a sadly depauperate reflection of the archipelago’s flora and fauna prior to the advent of humans.” Most of the remaining native plant communities were either at the seashore or in the mountains. The seashore communities are partly composed of plants that are also found in other places whereas the forest plants are primarily unique to Hawai‘i.

Explained as an impossible wilful migration of plants into new habitats, rather than the complete death of the easy to get at plant habitats for human purposes, Cuddihy and Stone (1990) state,

> Urbanization, continually increasing human populations, and development of industries such as tourism have helped push the remaining native Hawaiian plant communities and the animals associated with them farther upslope and into increasingly smaller areas less likely to survive the 21st century without intensive management.

The causes for such a “holocaust” (Degener and Degener 1970) are:

> the introduction by accident and design of foreign plants, the introduction of foreign insects and plant disease, and the bull-dozing of vast areas of native vegetation to replace it with common foreign ornamentals so that

> about every tourist hotel in our islands is not at all in a Hawaiian setting but rather apes hotels in Bermuda, California and Florida.
>
> The most damaging and least excusable act of “civilized” man’s vandalism is the introduction of antelope, goat, mouflon, sheep, black-tailed deer and, in particular, axis deer to the delicate Hawaiian island vegetation that never developed a partial resistance to such herbivores by developing fecundity, unpalatability, poison or spines.

Perhaps Degener and Degener (1970) are referring to times 100 years ago or to some presummed public notion of what is Hawaiian flora when they write, “As familiarity breeds contempt, the average resident of the Islands thinks little about our native plants.”

Laws to Protect Plants

Ten years after statehood in 1959, political change took place. Liberal Democrats finally won control of the Legislature replacing conservative Republicans, who had ruled since the turn of the century (Borreca 1999). The Democrats moved into a new state capitol building, dramatically different from others, and began making progress for native plants with legislation. In **1970** (boldface years = timeline) the Hawai‘i State legislature (Hawai‘i State Laws 1970) created protected habitats, the **Natural Area Reserves System**, when it found and declared that

> (1) the State of Hawaii possesses unique natural resources, such as geological and volcanological features and distinctive marine and terrestrial plants and animals, many of which occur nowhere else in the world, that are highly vulnerable to loss by the growth of population and technology;

(2) these unique natural assests should be protected and preserved, both for the enjoyment of future generations, and to provide base lines against which changes are being made in the environments of Hawaii can be measured; . . .

(4) that a statewide natural area reserves system should be established to preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawaii [L 1970, c 139, pt of §1].

Plants being wiped out by people on the continental United States began receiving legal protection three years later. The "**Endangered Species Act of 1973**" was an act of the United States Congress (1973) "To provide for the conservation of endangered and threatened species of fish, wildlife, and plants and for other purposes" (Public Law 93-205-Dec. 28, 1973).

The Congress finds and declares that—

(1) various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and devlopment untempered by adequate concern and conservation;

(2) other species of fish, wildlife and plants have been so depleted in numbers that they are in danger of or threatened with extinction;

(3) these species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people; . . .

Two years later, in **1975**, the Hawai'i legislature, perhaps inspired by the Endangered Species Act, added **Chapter 195D Conservation of Wildlife and Plants** (Hawai'i State Laws 1975) acknowledging that the threatened organisms also posed a

threat to Hawaiian culture because of its relationship with the organisms. The legislature declared,

> Since the discovery and settlement of the Hawaiian islands by man many species of wildlife and plants that occurred naturally only in Hawaii have become extinct and many of the remaining species are threatened with extinction, primarily because of increase human use of the land and disturbance to native ecosystems.
>
> All indigenous species of wildlife and plants are integral parts of Hawaii's native ecosytems and comprise the living hertiage of Hawaii for they represent a natural resource of scientific, cultural, educational, environmental and economic value to future generations of Hawaii's people.
>
> To insure that continued perpetuation indigenous wildlife and plants and their habitats for human enjoyment, for scientific purposes, and as members of ecosystems, it is necessary that the State take positive actions to enhance their prospects for survival (Hawai'i State Laws 1975).

This State law prevented the collection of native plants that were on the Federal Endangered Species List in order to prevent further species loss. Thus it became prohibited to export, take, possess, process, sell or offer for sale, deliver, carry, transport or ship, by any means whatsoever, any such species (Hawai'i State Laws 1975). It became illegal to possess or grow many rare Hawaiian plants. A continental legal idea was applied to an island in the hope that this is all it would take to save the species.

It was assumed that species would do best if left alone in their own environments, as is the case generally on continents, rather than additionally be brought into cultivation. Collecting from wild populations on continents for commercial purposes

further degrades the habitats and reduces genetic variability. Due to the difference in physical scale involving cases of continental disruption versus Hawaiian island disruption, this idea simply was inadequate. Instead, the genetic variability needed to be collected before it vanished altogether and what was available could be allowed to flourish in captivity before being returned to its now protected home in the wild.

In **1991**, The Hawai'i State Department of Land and Natural Resources (DLNR), US Fish and Wildlife Service and the Nature Conservancy of Hawaii (1991) produced a report on the status of Hawai'i's natural hertige entitled Hawaii's Extinction Crisis: A Call to Action. The ten points of the "urgent" action plan are:

1. Protect essential habitat for native species.

2. Fund active, long-term stewardship of essential habitat on publicly-owned natural areas; National Parks and Refuges, State Forest Reserves, Natural Area Reserves, and Sanctuaries.

3. Provide strong incentives for private landowners to protect endangered species and native ecosystems on their property.

4. Halt the flow of new foreign pest species into Hawaii.

5. Increase public awareness of the extinction problem and public participation in the solutions.

6. Further integrate government and private citizen conservation efforts.

7. Expand intensive efforts to rescue species "on the brink."

8. Increase the effectiveness of conservation laws.

9. Increase scientific research and training focused on Hawai's conservation challenges.

10. Provide stable funding for essential conservation programs.

The reports states that non-native species and human disturbances are the threats.

> While Hawaii's early inhabitants relied heavily on Hawaii's natural resources for their survival, our survival today depends on saving what is left of our native ecosystems. We need to strike the proper balance between the needs of an island economy and growing population, and the presevation of Hawaii's limited natural resources.

Native Plant Fanciers Speak Up

Not trusting the government's abiltiy to get the job done based on its past performance, native plant fanciers agreed with the above ten points with the exception of furthering the integration of government and private citizen conservation efforts and increasing the effectiveness of conservation laws. Native plant fanciers began appealing to the public to help stop the "extinction crisis".

Only in the last decade, articles written by Heidi Bornhorst for the Honolulu Advertiser and Gregory Koob for Hawai'i Horticulture, educated and encouraged the public about using native plants in their gardens, and contributed to their interest, see Appendix C. Other works by Bornhorst followed (Bornhorst 1994, 1996). Koob also started an email list for anyone wishing to ask questions or give answers or thoughts on native plants. There are websites that support the efforts of people interested in knowing about or growing native plants and more plant articles by new authors.

Plant fancier Keith Robinson used bold tactics by growing native plants that were illegal to grow and then distributing their seed. Robinson's efforts may have helped to change the **1975** law (Hawai'i State Laws 1975) and allow more people to grow these plants. Thomas Boyd, Grounds Foreman, Buildings & Grounds at the Bishop Museum told me in December of 2001 how Robinson, who owns the Hawaiian island of Ni'ihau, also has a valley on Kaua'i and it was there that he brought one seed of a famous tomato-like endemic plant. He grew it in order to distribute its seeds. Boyd told me that the government wanted to throw Robinson in jail. His efforts, including a newspaper advertisement giving the 1,000 seeds away, helped push lawmakers in 1998 to change the 1975 state law that prohibited the possession of federally endangered species.

Contradicting part of Robinson's popularity as a hero (Boyd 2000), is a more complete picture by Koob (2003),

> Keith did give away seeds of *Solanum sandwicense* (*pōpolo 'aiakeakua—pōpolo eaten by the god*). He claimed the government wanted to throw him in jail because of his "illegal" work, but that was never the case, as far as I am aware. He did prove his point that native plants can be grown by the "common people" and not only by (what he gladly calls government and professional conservationists) "eco-nazis." No one ever doubted that, though.
>
> Keith has often called native plants "biologically incompetent" and dependent on kind-hearted souls such as himself for their survival. I personally like to think of native plants as pretty good survivors. Many are, after all, still around despite everything we've thrown at them. Unfortunately, the odds are pretty well stacked against anything native right now, but that's not the fault of the native plants, or animals. I pretty much lay the blame on people.

Keith will gladly point out a wild *Caesalpinia kavaiensis*, uhiuhi, on his property that he killed by girdling because of a fear that the government would condemn his land and take it way from him. He has left the dead tree standing there to make a point. I've seen it (as he proudly pointed it out to me), and I'm sure there are other people on this (*email*) list who have seen it as well. He did propagate that plant from seeds before killing it, and has since replanted some of the seedlings on his property, but generations of seeds were lost from that rare plant due to his action. There are many other private landowners, some big and some small, that do good things for endangered plants and animals without intentionally killing the very things they are trying to protect, just to make a point. They just don't make it into the papers or local lore as often as Keith does.

Many people from all walks of life, both professional and non-professional, worked to get the state law changed by using the system in place. The government heard the will of the people and made the appropriate changes. It took time, but it eventually happened. As a result more people have been in contact with endangered plant species that were previously unavailable. Keith's actions may have helped a little, but they were not a big part of the real work that it took to change that law. The real "poster child" of that law change was *Hibiscus brackenridgei*. It just didn't make a lot of sense that the state flower was off limits to most people when it could so easily be propagated by seeds and cuttings.

There are many sides to a story. Some just aren't as exciting as others, or they aren't presented in such a colorful way.

Before it became legal to grow endangered species, the **1992** Hawai‘i State legislature (Hawai‘i State Laws 1992), addressing public money and public contracts, passed §103-24.6 **Indigenous and Polynesian introduced plants; use in public landscaping**. This law provided:

(a) Wherever and whenever feasible, all plans, designs, and specifications for new or renovated landscaping of any building, complex of buildings, facilty, complex of facilities, or housing developed by the

> State with public moneys shall incorporate indigenous land plant species, as defined in section 195D-2 (*any plant species growing or living naturally in Hawaii without having been brought to Hawaii by man*), and plant species brought to Hawaii by Polynesians before European contact, such as the kukui, noni, and conconut; provided that suitable cultivated plants can be made available for this purpose without jeopardizing wild plants in their natural habitat; and provided further that wherever and whenever possible, indigenous land plants shall be used for landscaping on the island or islands on which the species originated.
>
> (b) Each plant or group of plants used pursuant to subsection (a) shall be clearly identified with signs for the edification of the general public.

Looking at the process to achieve the law's purpose, to increase the populations and public awareness of these plants, Laila Tamimi (1996), wrote her master's thesis on The Use of Native Hawaiian Plants by Landscape Architects in Hawaii. She found that the majority of landscape architects use native Hawaiian plants in their planting plans as a result of the **1992** law (Hawai'i State Laws 1992).

Finally in March of **1998**, under **Chapter 107 Threatened and Endangered Plants** (Hawai'i State Laws 1998) it became possible to sell threatened and endangered plant species from garden-grown stock. The intent of the law was the edification of the public. It was hoped that these plants would be labeled in public places according to Betsy Gagné, Executive Secretary of the DLNR (2003). These species required a license for the collecting, possesing, transporting, propagating, and outplanting from wild populations. The licenses could be issued by the board or its authorized representative

for propagation, education, cultural, or scientific purposes or to enhance the survival of the species. It states:

> (a) No person shall or attempt to take, sell, or offer for sale, deliver, carry, ship, transport, or export, any native threatened or endangered plant or parts thereof from any lands within the State of Hawaii, except as an authorized representative of the department and as provided for in this chapter.
>
> (b) No person shall outplant any threatened or endangered species on another landowner's property without the permission of the landowner and obtaining the appropriate license form the department, except as provided for in this chapter.
>
> (c) Horticultural activities within a controlled environment cannot be used to either justify or mitigate transplantation, removal, or destruction of wild plants or populations of both threatened and endangered plants.
>
> (d) No person shall sell threatened and endangered plants unless that plant species has been approved by the department for commercial use. (Hawaii State Laws 1998)

In **1999** (Hawai'i State Laws 1999a), the indigenous and Polynesian introduced plants law of **1992** (Hawai'i State Laws 1992) was strengthened by cutting and pasting it to a bill for an act relating to procurement (from public money and public contracts), Section 2 Chapter 103D of Act 149 (Hawai'i State Laws 1999b).

Plant Sales

The **1998** law that allowed the growing of endangered native plants by the general public quickly resulted in the appearance of about 15 species at plant sales. They are now sold with an orange label provided by the DLNR with a number and the following: "I am an endangered species grown from cultivated stock. This label allows

you to grow me in your garden. Do not plant me or my offspring outside your garden."

This label attemps to 1) prevent people from outplanting any threatened or endangered species on another landowner's property without the permission of the landowner and 2) prevent people from mixing genetic material from one unique population of a species with another, see Figure 7. In Hawai'i, populations may be endemic not only to island but also to valley. Mixing populations would destroy what took place over millions of years to create the differences. Hybridation, a subject of some concern, is permited only under cultivation. For example, offspring from a botanical garden such as Lili'uokalani are mixtures from the various islands' species.

Figure 7 ~Lei maker Marie McDonald buying 'uki'uki from Rick Barboza, co-owner of Hui Ku Maoli Ola, at Ho'omaluhia Botanical Garden. Hala pepe, an endangered species, is in the foreground with the orange labels required by law.

As a result of the **1998** law, there is a good deal of interest in the plants now by horticulturalists as the public increasingly buys these plants at plant sales held statewide by sponsoring groups associated with venues such as, Foster Botanical Garden,

Ho‘omaluhi‘a Botanical Garden, Lyon Arboretum, Neal Blaisdell Exhibition Hall, Thomas Square, Wahiawa Botanical Garden and Waimea Valley Audubon Center.

Figure 8 ~ Plant label at The Home Depot by Hui Kū Maoli Ola.

The plants then started appearing at commercial outlets such as Ko‘olau Farmers, Pat’s Island Delights and The Home Depot, the largest retail provider of these plants in the state. Now there are about 35 to 40 endangered species being sold. Matt Kapalikū Schirman, co owner of Hui Kū Maoli Ola, the primary native plant nursery for The Home Depot, tells me that their endangered plants bring in $15,000 yearly for the four stores (Schirman 2003). Their plants are displayed with large colorful information cards that include cultural uses, description, distribution, Hawaiian flags,landscape uses, photograph of flowers, plant care and a “tasty tid-bit”, see Figure 8 ~ Plant label at The Home Depot by Hui Kū Maoli Ola.

Others, perhaps, are now conserving these plants as part of a world wide conservation movement. Dennis Kim, a landscaper who grows native plants feels that like himself, many people have become aware of the danger of native flora and fauna becoming extinct and they have acted to prevent any further loss by bringing these organisms into cultivation as a means of preservation (Kim 2001). Native plant grower,

Figure 9 ~ Anna Palomino, of Ho'olawa Farms, grows loulu palms endemic to east Maui in her native Hawaiian plant nursery.

Anna Palomino, says, “Native Hawaiian plants are having to overcome years of botanical prejudice, including the definition of plant beauty as something colorful and big” (Kubota 2000). Palomino is quoted as saying,

> Native plants are more subtle in appearance, with small flowers and less vibrant colors. Frequently, their texture and form are unique and they

> possess a strong link with native wildlife and the Hawaiian lifestyle (Kubota 2000).

Kim, who admires and cultivates the native plants to nurture their commercial success, also respects the Hawaiians who first learned about the plants and utilized them to create a part of their culture. Perhaps too, this is a way for people to develop a new sense of Hawaiian identity since for Hawaiians it was not blood but behavior from knowledge passed from teachers that made you Hawaiian. This understanding of Hawaiian behavior is now known to more and more students of the culture. Cultivation of native flora is a practical means to preserve local heritage.

There is increasing interest in both the cultural and ecological uniqueness of this archipelago. In response to this interest and the **1999** procurement Act 149 (Hawai‘i State Laws 1999b) more horticulturalists are incorporating the native plants into their landscapes. Hawaii Landscape, the official publication of the Landscape Industry Council of Hawaii, is publishing more and more articles devoted entirely, or in part, to native Hawaiian plants. The March/April 2003 issue (Landscape Industry Council of Hawaii 2003) features six articles.

Philip Thomas (2003) of the Hawaiian Ecosystems at Risk project (HEAR), commenting via the native plant email list about the March/April issue wrote,

> Indeed, it's important to use native flora in landscaping, especially because of the educational value re: native species, water conservation (appropriate planting by zone/drought tolerance), and the fact that--almost by definition--native species are not invasive. It is more important,

however, to "rethink...landscaping needs in Hawaii" by using non-invasive species. Even if no native Hawaiian species were used in landscaping, at least if no invasive species were used, we would all be helping to preserve those precious few native species which still exist in their native habitats.

Figure 10 ~ Dennis Kim, landscaper and native plant grower, with one of his designs using a Polynesian introduction, kalo and an indigenous plant, 'ahu'awa with rocks.

Political leadership and community participation are essential too. The fifty year old Conservation Council for Hawai‘i has been producing free conservation posters for school children since 1975. People at several organizations have been working on native plant selection, cultivation, propagation and publicity for more than a decade.

Dennis Kim and Heidi Bornhorst are two visible native plant horticulturalists who speak at native Hawaiian plant workshops and plant sales, see Figure 10.

At a 2002 Hoʻomaluhia Botanical Garden workshop, Kim stated that he has discovered for himself that “most natives are very subtle when you look at them and they work very, very well in symphony”. Native plants are no harder to grow than any other ornamental. He points out that 99.5 % of the plants around us are not native. He finds this to be an insult to both residents and visitors. The plants in Hawaiʻi hotels are the same as in almost any other tropical resort. Local residents have grown up with many common introductions not realizing that they are not native to Hawaiʻi.

This chapter described the Hawaiian gardens depicted in past publications as a tropical garden. Although native plants were only rarely included, there were other attributes such as shade, foliage and privacy that were repeated themes. Native plants were neither understood horticulturally nor thought of as highly desirable for a variety of prejudicial reasons (can not compete with introductions, difficult to grow, hard to obtain, lack of disease resistance, lack of showy flowers, not the garden norm, ugly and unprofitable) until recently. Because the plants were unfamiliar and illegal to possess they remained separate from the public, despite a few attempts to create collections, until recent events.

Chapter 4 ~ Methods

Study Site Location—'Ālewa Heights' Nā Pueo Park

An opportunity arose to address the question, "What are the important elements of an Hawaiian garden in terms of its contents and arrangements, its level of management and how the garden functions?" It happened when a group of Honolulu neighbors adopted a park and decided to make it more attractive. They chose the Hawaiian culture to guide plant selection, arrangements and amenities to be present.

Nā Pueo Park, established in 1992, was adopted by a few 'Ālewa Heights neighbors (Nā Hoanoho O Ka Pāka O Nā Pueo, The Neighbors of Owl Park) in August of 1999. The initial idea was to help the open space become a nice lawn and to eliminate weeds, particulally pua hilahila or sleeping grass (*Mimosa pudica*). Familar exotics such as bird of paradise (*Strelitzia reginae*), Christmas berry (*Schinus terebinthifolia*), eucalyptus (*Eucalyptus camaldulensis*), Formosan koa (*Acacia confusa*) , haole koa (*Leucaena leucocephala*), hibiscus (*Hibiscus rosa-sinensis*), ironwood (*Casuarina glauca*), Manila palm (*Veitchia merrillii*) and mulberry (*Morus alba*), are present. A mulching plan was proposed and approved by the City. More neighbors got involved by attending meetings that the adopting group held in a building at the park. From those meetings park improvements expanded to include native plants.

We wondered where we could arrange the plants so that the park could still retain its most functional space. What would be an appropriate design that would not

interfere with homeowner's view of the city below and yet provide interest in the park itself for neighbors walking along the large oval pathway? Then the question arose, in designing a new garden for a park, how would Hawaiians arrange plants in this park? How could we find out about modern day Hawaiian space?

Plain, simple and small, Nā Pueo Park became a useful focus for my design experiment to gather and analyze current "expert opinion" about what form an "Hawaiian garden" might have, and what plants and other elements might be used in it. What might be discovered for the specific might also apply to the general.

One way to find basic information would be to look at existing Hawaiian gardens and map the placement of the plants and other components like rocks, paths, water features, animals, etc. that were present. This was recommended by Marie McDonald, Figure 7, who suggested Hana, Maui and several other places to begin this discovery (McDonald 2002). However, this method has the disadvantage of variation between sites which makes it difficult to identify general principles as each garden would have characteristics imposed by the uniqueness of each particular site.

The approach adopted here was to use an existing city park as a basis, and to make a systematic collection of expert opinion of schemes to create a Hawaiian garden for analysis.

Selection of Informants

How Informants Were Found

I found my group of informants by referral from people knowledgeable about Hawaiian culture that I became aware of since 1989. I told them that I was not necessarily seeking professional designers or landscape architects but people who are both Hawaiian and gardeners. I asked them, “Who would you recommend as an expert Hawaiian gardener?” “I am looking for people who were raised Hawaiian or who were Hawaiian and grew plants. I am not necessarily looking for trained or professional landscape designers.” As I worked, my network of contacts was expanded and, I was able to identify main people who were potential informants.

The Informants

Although not a reproducible method, to qualify, each informant had to be recommended by at least two others who I judged to be well informed about Hawaiian culture from hula and language classes. Many people I talked to directed me to our major institutions, such as the Office of Hawaiian Affairs (OHA), the Bishop Museum, the Honolulu Botanical Gardens, Kamehameha Schools, Waimea Falls Park and Department of Architecture at the university. I also used informants from a new university course on Hawaiian medicinal plants.

The Criteria for Exclusion or Inclusion

I excluded (1) those that were only self-defined as experts, (2) those under 19 years old, (3) those who had no Hawaiian gardening or plant experience and (4) those

that were not Hawaiian by birth unless they had been raised Hawaiian or had Hawaiian teachers. This was not a complete or random sample of the population of expert Hawaiian gardeners because it was 1) confined to Oʻahu (persons from Kauaʻi, Molokaʻi, Maui, Lānaʻi and Hawaiʻi were not included), 2) limited by personal networks and 3) without the cooperation of some people. Nevertheless, the selection of informants spanned all classes of Hawaiian society from kānaka maoli to aliʻi.

I identified a total of 43 informants who met all criteria. Of these, 27 completed the task. Of the 16 who did not complete the task, one returned the map unfinished, one wanted to be paid, one initially agreed but later agreed to mediate a future community discussion of the other maps instead, one requested much historical research of the area that could not provided, three were too busy, one returned a very incomplete map, two ran out of time, two have not clarified why they did not complete the task and I was unable to contact four. A human subject protocol was unnecessary, as informants remain anonymous.

Myself as a Factor

I relied on fortune, instincts, empirical knowledge of plants and soils, and interest in botany to seek prospective informants. I have attended political functions, sovereignty meetings and performed hula for seven years in a hālau known for its traditional methods. I have studied Hawaiian language for two and a half years at the University of Hawaiʻi.

Strategy—Research Protocol

I presented the interviewees with a large (36 inches by 48 inches) map of Nā Pueo Park. I told them that one day the neighborhood would be looking at the collection of maps to select ideas for the actual park. I showed them a set of photographs of the park and various activities there to convey a message that the park was important enough to people that they had taken an interest in making the park nicer themselves. I asked them to draw a design of their choosing using pencil. I also asked them to label the things they chose to include. I provided the interviewees a set of green circular cardboard discs scaled to the map in a small plastic bag. The discs were labeled with diameters that corresponded to the scale of the map and could be used to quickly trace around for whatever item the gardener might decide to include. They were provided with identical maps of the site and asked to prepare a plan for the site. With everyone receiving the same map, the variable of scale was minimized.

Map

The base map was created using an irrigation plan blueprint from the Department of Parks & Recreation of Nā Pueo Park from 1992. I copied the blueprint using a computer assisted drawing program. Then Macromedia Freehand 8 was used to smooth lines. Non garden areas were shaded, the west park boundary was slightly expanded on one side, the driveway was shortened, mauka (mountain ward) slopes and the makai (ocean ward) drop-off were indicated, the drinking fountain and two concrete benches

were labeled, the park boundary line was thickened and colored and a border was added from prepared artwork.

In order to make the map appear less formal and friendlier, as it was printed on a large sheet of white paper, a few visuals were added to communicate the theme and stress the Hawaiian character of the garden that was sought, see Figure 11 ~ Map of Nā Pueo Park used by gardeners. Thus, the style of the map title, map description and compass rose were copied from the old maps of Hawai‘i in the map collection at Hamilton Library. Hawaiian language was used as much as possible to be hospitable. The Hawaiian artist, Douglas Po‘oloa Tolentino created a border. Pueo (owls) flying with a piece of maile (a plant) and pueo sitting in a koa branch in the map corners was the result.

The wording of the map reads, “Nā Māla Pua Hawai‘i O Ka Pāka O Nā Pueo ‘Ālewa Heights, Honolulu O‘ahu Hawai‘i” and “Palapala‘āina A Map of Nā Pueo Park Elevation 800 feet 1816 ‘Ālewa Drive, Honolulu, Hawai‘i.” There is a prominent place for the designer to sign and date the map as well as a scale in feet.

A Lesson in Hawaiian Thinking

In the beginning, once I had identified an “expert” Hawaiian gardener, I contacted them, explained that they were recommended as an “expert” and requested their help to design a Hawaiian garden. Few of the selected people felt they were “experts” themselves. This provided an important insight into Hawaiian thinking and the term

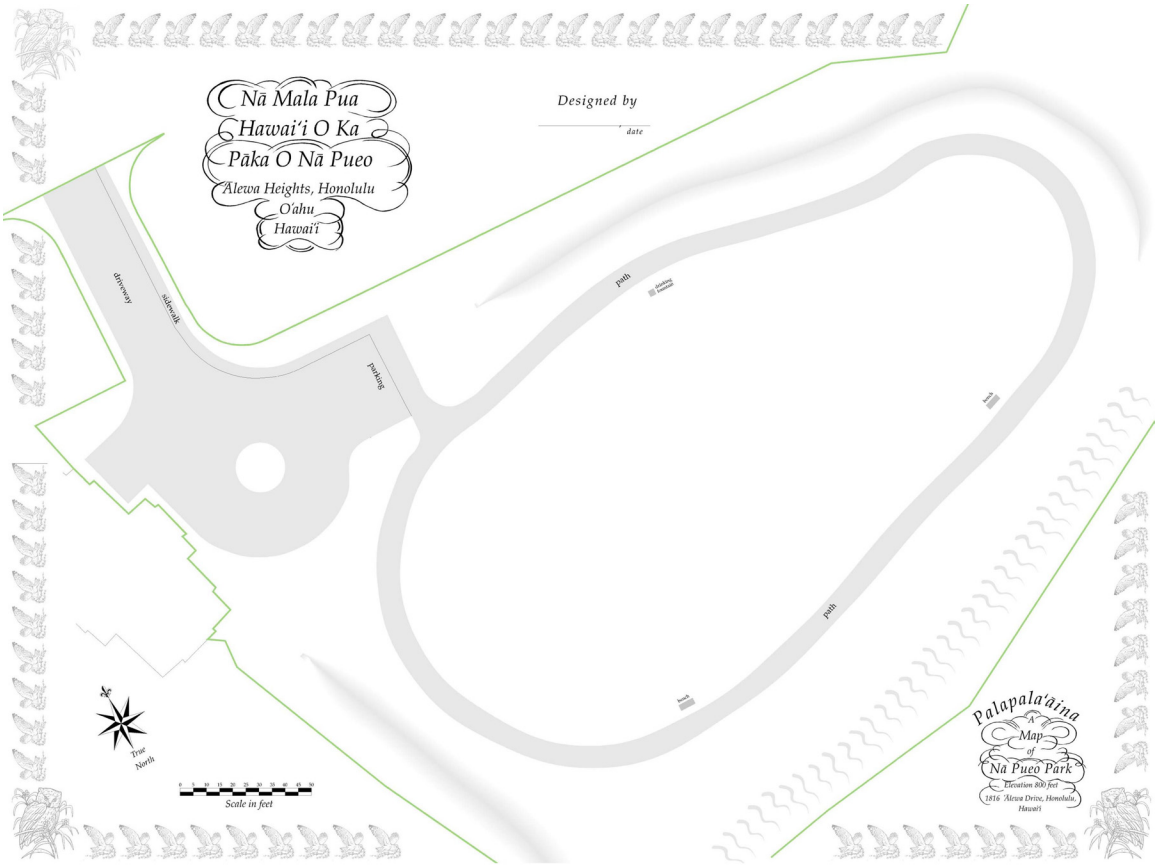

Figure 11 ~ Map of Nā Pueo Park used by gardeners.

expert" had to be redefined. There is also the cultural importance of humility and "humbleness in Hawaiian (and Asian) cultures. To accept the appellation "expert" would be vain. In a couple of initial cases, I assured them that they possessed the kind of knowledge and experience I was seeking to help with a design for a Hawaiian garden at the park where I volunteered.

After this rough beginning, I never used the term "expert" again. This is how I quickly learned to approach my informants using a request for help, "Could you please help me design a Hawaiian garden for a park?" Then I let them know that the design was entirely up to them.

Why this was a more culturally appropriate request may be explained by Paul Cox, director of the National Tropical Botanic Garden on Kauaʻi. According to Cox, indigenous people's thought processes differ from Eurocentric thought processes because they often require that someone needs to make a request for the specific knowledge if an answer is to come (Kelly 2001). I posed the specific question, "Could you please help me design a Hawaiian garden for a park?" in an open way. Gardeners were free to interpret the enquiry with their own cultural knowledge. The words, "help," "design," "Hawaiian garden" and "park" were to be interpreted by the gardener. Another way of decreasing the impact of my own cultural bias was to turn the tool (a friendly Hawaiian map) over to the gardeners to complete.

I knew the best way to collect valid data was to create a good relationship of cooperation and a sense of mutual benefit for the greater community. I stressed the idea that someday, people from everywhere would be able to visit the park and enjoy the final resulting design. This is why using Nā Pueo Park as a site was so useful.

Telephone Conversation

Most of my initial contacts were by telephone. I used a common approach to eliminate information bias when introducing my request. I wrote and kept to the following script:

> Aloha, my name is Kekama Galioto and I am writing about modern day Hawaiian gardens at the university. Could you please help me design a Hawaiian garden for a park? There's a park up by where I live and the neighborhood has decided to make it nicer. We would like to use

> Hawaiian culture as the look and feel for the park but don't know what that would be.

Then if I got a go ahead response I could continue with more detail:

> Can you design a garden on a large map of the park? For my research I will compare these maps and try to determine what, if any, sorts of elements repeat. I don't want to talk with you about your design, plants or what you would like to put in the park, but I'll answer your questions about the park.
>
> You will be anonymous in the thesis. I'm looking for form and composition in the designs. I have some photographs of the park to show you and some discs of different sizes matching the scale of the park that you can trace around for drawing your design. You don't have to use them. Could we meet sometime soon so I can show you the map and photographs?

The response would usually be something like, "Yes, come to my office" or "Can I meet you at the park?" Those people I saw at their office got an idea of the park from the three medium size books of photographs and the aerial shots of the park taken by a paraglider friend. Some of the people did not visit the park.

I presented my serious need as a simple, yet important request, rather than something threatening. I explained my interest in this idea to the informants with the following rational,

> The current focus of Hawaiian activity is not yet on gardens for the most part, as Hawaiians are busy with politics. Because I know that trees take time to grow, I have chosen to address a present, if not a future need. I am acting as a qualified student, in order to start a process of something that will probably be explored much further, and by those much better qualified, as the need is perceived.

Because Hawaiian decision making is often done collaboratively, on several occasions I was invited in the decision making process but explained politely that I could not help as I was interested in their ideas. In some cases the maps are collaborations, in one case a map is part of a Hawaiian class at Honolulu Community College. In two other cases a pair of people worked on the design together, which is a typical method of working and arriving at a solution in Hawaiian culture.

Final Group of Informants

Although, about 50 informants, including both sexes, were initially desired, I identified 43 people but was only able to obtain full data from 27 informants or groups of informants see Table 1 ~ Sources of Informants. My over enthusiasm or poor protocol with some individuals may have worked against a better selection. Sixteen needed several polite reminders to complete the map. Reminding someone of a favor was difficult for me because it seemed demanding and not Hawaiian or socially polite.

On the other hand, because the subject matter is new, unfamiliar and perhaps threatening, informants seemed to need encouragement and reassurance to proceed. About a third of the gardeners had doubtless created garden maps before. I did not ask if anyone was familiar with map making or reading or if they had ever laid out a garden design on paper. The map, 48 inches by 36 inches, allowed for fairly small garden inclusions to be drawn in. For many of my informants, gardens are not usually conceived

Table 1 ~ Sources of Informants

SOURCE	NUMBER OF MAPS	SEX	
		Male	Female
Bishop Museum	2	2	0
Friends	5	4	1
Government Agencies	3	3	0
Honolulu Botanical Gardens	3	1	2
Hula	2	1	1
Kamehameha Schools	2	2	0
Native Plant Growers	3	4	0
University of Hawai‘i	6	6	7
Waimea Falls Park	1	1	0
TOTALS	27	24	11

on paper but grow into a recognizable form over time, plant acquisition by plant acquisition.

I spent as much time as needed with the individual gardeners to explain how to complete a map. I usually began by showing photographs of the park and then suggesting that they could place scaled circular cutouts to represent plants or other objects they wanted on their map to scale for easy tracing and labeling at home. The purpose of this was to assist people to appreciate the scale of the map—especially those who might not be used to working on paper at different scales.

I told everyone right away that I couldn’t discuss plants with them nor was the design going to be judged in any way by myself. The design was theirs alone and they could do whatever they so pleased. I told them again that they would be anonymous in the thesis.

Sometimes this process took several meetings and each of these could last for more than an hour. In one case, the gardener came up to the park four times. There was an element of insecurity on the part of some of the gardeners and may be reflected in the designs that were never turned in and/or in the designs that are less complex than others.

Although it was time consuming, meeting and “talking story” with the gardeners was rewarding. I got to meet eleven new people and to interact with all about a favorite subject. I learned a lot incidentally from these conversations about the uses of plants for weaving, lei making, eating and dying kapa (felted cloth). I also learned about rocks, a history of introduced plants, garden aesthetics, Hawaiian forests, garden privacy, the importance of education, that ‘ulu trees welcome, about Lo‘i Kalo Mini Park, the need to propagate native plants, favorite plants, native plant pioneers and the inclusive nature of Hawaiian gardens producing a feeling of relaxation and comfort.

The hospitable nature of the gardeners may have affected the amount of time spent on their maps. It ranged from several hours for those who did formal layouts to an hour for others who drew the maps in front of me. Some of them did this on their free time and some used working hours to create their designs. The maps were returned in one of seven ways: four were brought to a third location, seven were brought back to the park, two were mailed back, two were done in front of me, four were picked up at their home, seven were picked up at their office and one was sent via email. In one case, a

map was returned the next day, in another, a year later. I recorded any information that the gardeners wished to share about their design on paper. I felt that imposing time constraints would only hamper the informants. I wanted them to express what was in their hearts and to have an enjoyable experience in creating a garden design.

Site Location

Nā Pueo Park is located at 1816 ʻĀlewa Drive Honolulu, Hawaiʻi in a small mountainside neighborhood called ʻĀlewa Heights, see Figure 12. Formerly called the Chinese Beverly Hills, it was one the first mountainside neighborhoods to be developed with the advent of the automobile in the 1920s according to Decker (1994). Prior to being developed for housing, the land had supported carnation, pineapple and cabbage farms.

This City and County of Honolulu park is situated on a leeward Koʻolau mountain slope in what would probably have been a summer-deciduous forest community consisting of wiliwili (*Erythrina sandwicensis*), sometimes with ʻohe makai (*Reynoldsia sandwicensis*) as an associate (Wagner et al. 1999, Pang 2001). Tree height of this community would not usually exceed 10 m, and the understory usually consisted of mixed native shrubs. This community has been extensively degraded through human impact (Wagner et al. 1999).

At the estate adjacent to the park, average yearly rainfall for the last nine years is 49.3 inches (1252 mm) (Brossy 2003) indicating a prior lowland mesic forest (Wagner et al. 1999). The precipitation at the ʻĀlewa Heights location, at 800 feet elevation, is

Figure 12 ~ Aerial view of Nā Pueo Park looking southwest. Downtown Honolulu is in the upper left of the photo and Nu'uanu Valley is to the left.

estimated to be about 40 inches per year based on data from Wilhemina Rise where the Honolulu Board of Water Supply has a raingage at the 1100 foot reservoir. There was also a gage for a number of years lower down on Matsonia Drive, which matches the Nā Pueo site better. This location averaged about 40 inches (1016 mm) annually. These rainfall estimates indicate a lowland dry forest (Wagner et al. 1999). Winter rainfall between October and March (hoʻoilo), is consistently responsible for more than two thirds of annual rainfall, except when tropical storms strike the islands during the summer period. There are persistant tradewinds (Lao 2001, 2003).

Most gardeners were interested enough in the neighborhood as well as the park that they made a trip to experience the conditions for themselves, see Figure 13. I took them on a tour, explaining what I knew of the geomorphology and soils. I explained that I had seen a video, taken by a neighbor, of the park being made so we know what was done to shape the surface. We know what was removed and what was brought in. People usually asked about rainfall, winds, irrigation, elevation and the use of the park.

Figure 13 ~ Nā Pueo Park showing concrete oval pathway.

I also told them about the community process we are in and how three of the mauka neighbors valued their view. We would sit down on the green benches in the shade or, in the case of windy or rainy weather, in their vehicle and look at the pictures. These showed the park and the people in the park walking, running, and working.

Chapter 5 ~ Results

Plants Used in Gardens

The results of my Hawaiian garden survey were determined after I received the maps back over a twenty six month period (July 2000 until September 2002). I took notes on any information that the gardeners wished to share about their design on paper. After I received a map, I listed the plants and extracted the other information, as handling the maps was cumbersome. Then, for each garden, I created a alphabetical plant list in the form of a table with the scientific name, the Hawaiian name, common name and its origin in Hawai‘i, see Appendix A ~ Garden Species. I numbered the maps in the order that they came back to maintain my association of a map being returned within the sporadic process of collecting them. The gardens are numbered in the order they were received. Data was entered using Microsoft Office's (2002) Microsoft Word® and Microsoft Excel® computer programs.

Two gardeners used scientific names, but in cases of uncertainty about Hawaiian or common names I consulted standard references, websites and a few of the gardeners by phone for clarification. Because a singular Hawaiian name can refer to several species, I sometimes used the following references together with verbal information from the garden designer: Hawaiian Dictionary (Pukui and Elbert 1986), Hawaiian Names for Vascular Plants (Porter 1972), In Gardens of Hawaii (Neal 1965), Ka Lei; The Leis of Hawaii (McDonald 1981) and Manual of the Flowering Plants of Hawai‘i (Wagner et al.

1999). Websites used to determine species were: Flora of the Hawaiian Islands (Smithsonian Institution 2003), Hawaiian Native Plant Genera (Carr 2003) and Hawaiian Native Plant Propagation Database (Herring, 2003). At the same time, I added new plant species to a comprehensive plant list, see Appendix B. Finally, I created a "growth form" category on the two plant spreadsheets as defined in the section, *Physical Structure in the Designs*.

In some cases plants were specified in great detail but in a few cases they were not at all. Grass, a non specific Poaceae species, was included for each garden although not mentioned by specific name for any garden. Gardeners included grass covered open spaces that were interpreted as lawn or indicated with a label such as "grass under trees", "lawn", "lawn meadow", "field area" and "grass to be used for all areas not paved". Of the 27 designs, 24 designers actually wrote down plant species, actual terms are indicated in boldface in Appendix A. The three gardeners who did not name plants created designs that revealed so much information that I did not exclude them from the infrastructural data analysis. I took the maps as they came and extracted as much objective data as possible.

Native Species Used in Gardens

The most commonly occurring 25 percent of the plants is presented in Table 2 ~ (Scientific and Hawaiian Names of the Top 25 % of Plant Species, with their Occurrence, Origin [endemic (end), indigenous (ind), introduced (intro), Polynesian (Poly)] and Plant

Form). All are native except for seven Polynesian introductions and one post contact introduction. Of these, the top 10 plant species were an unspecified Poaceae species, *Metrosideros polymorpha*, *Canthium odoratum*, *Dodonaea viscosa*, *Wikstroemia uva-ursi*, *Acacia koa*, *Cordyline fruticosa* varieties, *Hibiscus arnottianus* subsp. *arnottianus*, *Aleurites molucanna* and *Gossypium tomentosum*. The most frequent taxon in the table is Poaceae, which was used (arbitrarily) to identify plants designated without further specification as "lawn." Of the top ten plants, five are endemic, two are indigenous, two are Polynesian introductions and one is introduced, lawn grass. This was classified as an introduction as virtually all lawn grasses are. Of all the species chosen, the 25 most popular among designers were native except for seven Polynesian introductions and the introduced lawn grass.

Table 2 ~ Scientific and Hawaiian Names of the Top 25 % of Plant Species, with their Occurrence, Origin [endemic (end), indigenous (ind), introduced (intro), Polynesian (Poly)] and Plant Form

SCIENTIFIC NAME	OCCUR-RENCE	HAWAIIAN NAME	ORIGIN	PLANT FORM
Poaceae	27	mānienie	intro	herb
Metrosideros polymorpha	18	ʻōhiʻa lehua	end	tree
Canthium odoratum	13	alaheʻe	ind	shrub
Dodonaea viscosa	13	ʻaʻaliʻi	ind	shrub
Wikstroemia uva-ursi	13	ʻākia	end	shrub
Acacia koa	12	koa	end	tree
Cordyline fruticosa	12	kī	Poly/intro	shrub
Hibiscus arnottianus subsp. *arnottianus*	12	kokiʻo keʻokeʻo	end	shrub
Aleurites molucanna	10	kukui	Poly	tree
Gossypium tomentosum	10	maʻo	end	shrub
Hibiscus kokio	10	kokiʻo, kokiʻo ʻula	end	shrub

Osteomeles anthyllidifolia	10	ʻūlei	ind	shrub
Pritchardia hillebrandii	10	loulu	end	tree
Sida fallax	10	ʻilima	ind	shrub
Gardenia brighamii	9	naʻu, nānū	end	shrub
Nephrolepis cordifolia	9	kupukupu	ind	groundcover
Colocasia esculenta	8	kalo	Poly	herb
Erythrina sandwicensis	8	wiliwili	end	tree
Diospyros sandwicensis	7	lama	end	tree
Microlepia strigosa	7	palapalai	end	groundcover
Myoporum sandwicensis	7	naio	ind	shrub
Santalum freycinetianum	7	ʻiliahi	end	tree
Abutilon menziesii	6	koʻoloa ʻula	end	shrub
Artocarpus altilis	6	ʻulu	Poly/intro	tree
Hibiscus arnottianus f. *parviflorus*	6	kokiʻo keʻokeʻo	end	shrub
Hibiscus brackenridgei	6	maʻo hau hele	end	shrub
Notorichium sandwicensis	6	kuluʻi	end	shrub
Sapindus oahuensis	6	kaulu (lonomea)	end	tree
Sida fallax	6	ʻilima kukaha kai	ind	groundcover
Vitex rotundifolia	6	pohinahina	ind	groundcover
Waltheria americana	6	ʻuhaloa	ind	herb
Alyxia oliviformis	5	maile	end	shrub
Cordia subcordata	5	kou	ind	tree
Hibiscus clayi	5	kokiʻo ʻula	end	shrub
Hibiscus kokio subp. *saintjohnianus*	5	kokiʻo ʻula	end	shrub
Ipomoea batatas	5	ʻuala	Poly	groundcover
Jacquemontia ovalifolia	5	paʻuohiʻiaka	ind	groundcover
Musa acuminata hybrids	5	maiʻa	Poly	tree
Pandanus odoratissimus	5	hala	ind	tree
Pipturus albidus	5	māmaki	end	shrub
Saccharum officinarum	5	kō	Poly	shrub
Sesbania tormentosa	5	ʻohai	end	shrub

Numerous lei plants were used in the garden designs that included 56 % (14) of the top 25. The most frequently used plant was ʻōhiʻa lehua, it occurred in 18 of 24

gardens or 75 % of the time. Of the next 23 species, all commonly seen in traditional lei except for ten, loulu, kalo, lama, naio, ʻulu, maʻo hau hele, kalo ʻuhaloa, paʻuohiʻiaka and māmake. These lei plants are native except for kī, kukui, ʻuala, maiʻa and kō, all Polynesian introductions, see Table 2 and Figure 14 ~ Plant Species, Origin and Number. All the "popular" lei plants that are not native are presented in Table 3 ~ Scientific and Hawaiian names of Introduced (intro) and Polynesian (Poly) Lei Plants.

Table 3 ~ Scientific and Hawaiian names of Introduced (intro) and Polynesian (Poly) Lei Plants

SCIENTIFIC NAME	HAWAIIAN NAME	ORIGIN
Aleurites moluccana	kukui	Poly
Calotropis gigantea	puakaluna	intro
Canavalia cathartica	mauna loa	intro
Calophyllum inophyllum	kamani	Poly
Carthamus tinctorius	mamo	intro
Cordyline fruticosa	kī	Poly
Fagraea berteriana	pua kenikeni	intro
Jasminum sambac	pīkake	intro
Lampranthus glomeratus	ʻakulikuli lei, ice plant	intro
Nerium indicum	ʻoliwa, ʻoleana	intro
Pityrogramma austroamericana	goldenback fern	intro
Pityrogramma calomelanos	silverback fern	intro
Rosa chinesis var*. viridiflora*	loke lau	intro
Rosa sp. *Archduke Charles*	Hawaiian rose	intro
Saccharum officinarum	kō	Poly
Solanum capsicoides	kīkānia lei	intro
Stronylodon macrobotrys	jade vine	intro
Tagetes sp*.*	marigold	intro
Telosma cordata	pakalana	intro
Torenia asiatica	nani o Olaʻa	intro

The rose variety *Archduke Charles* was determined by Watanabe (2002), see Appendix D ~ Mission Houses' Rose Cultivars.

Since there is an 8 to 1 ratio of introduced to native plants available (Staples 2003, Wagner et al. 1999) and introductions are used in most gardens, the number of

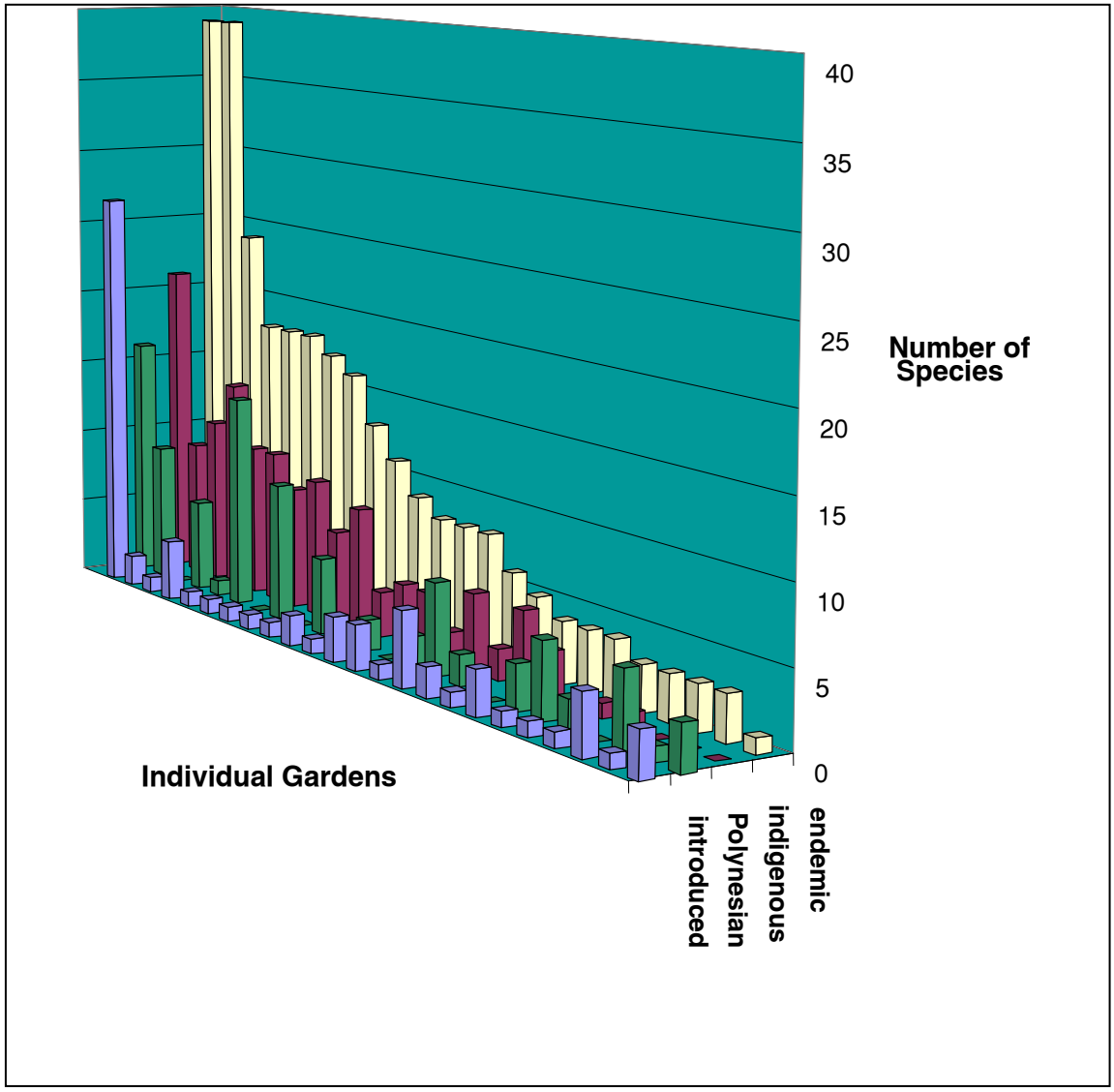

Figure 14 ~ Plant Species, Origin & Number

native plants used is notable. The dominance of endemic plants is shown in Figure 14 as yellow bars. Next abundant are indigenous plants (red) followed by the Polynesian

introductions (green) and finally the introduced (blue). The yellow and red bars together represent the native species. This chart was created from the 24 (of the 27) gardens that listed plant species.

Physical Structure in the Garden Designs

(1) Use of Space

My survey of the maps showed marked variation in the space filled with plants. Remembering what was said about the park by the designer and referring to my notes, I subjectively divided the gardens into groups, or design types, broadly based on how the space was filled. I found three major types of garden designs, which provided a rough estimate of the park area to be planted. Then, I used them to group all the designs, see Table 4 ~ Three Design Types Based on Use of Space.

Table 4 ~ Three Design Types Based on Use of Space

	TYPE OF DESIGN		
	Filled	Perimeter	Ends
Occurrences	17	6	4
Percent	63 %	22 %	15 %

Although 63 % of the designers (17 out of 27) told me that they took into account the view plane of the immediately adjacent mauka residents, 63% of the informants created what I term a filled design. They filled the park with plants using the lawn as well as areas outside its oval pathway. In these designs, the proper spacing of plants appears to be important. In some cases, trees with either open canopies, single trunks or of a summer deciduous habit were used so as to keep the view plane open.

Five (18.5 %) of the designers left the park primarily open in the central lawn for play by writing on the maps, “keep grass for athletic playing field”, “open active grass play area”, “climbing rocks, children’s bike path”, “children playground” and “existing mown grass field mostly to remain.” Four (15 %) of the informants used trees and shrubs at both “ends” of the park perhaps to frame the view. They augmented forested areas in the two places where trees currently block the view and also used medium and low shrubs in the periphery.

(2) Plant Forms (Tree, Shrub, Groundcover, Herb)

Then, using plant forms instead, I looked at the physical structure of the gardens. To do this, I assigned each species to one of four growth form categories: tree, shrub, groundcover or herb (Wester 2003), see Table 5 ~ Plant Forms and Definitions Used.

Table 5 ~ Plant Forms and Definitions Used

PLANT FORMS	
TREE	A large woody perennial plant, usually having a permanent, woody, self-supporting single main stem or trunk, ordinarily growing to a considerable height, and usually developing branches at some distance from the ground.
SHRUB	A woody perennial plant, with several permanent stems branching from or near the ground that is shorter than a typical tree, less than 6’ tall.
GROUNDCOVER	A low growing ($\leq$ 2’), usually herbaceous plant, often of a creeping habit, for covering the ground in place of grass.
HERB	A flowering plant whose erect stem above ground does not become woody and that is valued for its medicinal properties, flavor, scent, flowers or leaves. With the exception of grass, herbs are not used in mass plantings.

Next, I subjectively identified physical garden classes based on the percentage of the four plant forms rather than the use of space, see Table 6 ~ Classes of Gardens Based on Plant Form Percentages Including Type of Garden, Number of Species and Garden Number. (I made a colored pie chart of each garden using the percentage of plant forms in each. I subsequently grouped the charts and identified four different garden classes.) Some of the 24 gardens were composed mainly of trees (67-83%) or shrubs (52-75%). Others were more structurally mixed, using shrubs in combination with herbs to create a low more open aspect, with few trees. Yet another group used shrubs and trees in combination. For a perspective on plant forms in each garden see Figure 15 ~ 24 Gardens Arranged by Garden Classes Based on Plant Form Percentage.

A large number of species in a garden usually meant that many herbs and shrubs were included in the design—the shrub and herb dominant class. The gardens with the fewest species were primarily composed of tree species. Table 6 also includes the garden types, the number of species present and the garden number associated with plant form percentages. Half of the gardens that were classified as tree dominant were also an “ends” garden type. Two thirds of the tree and shrub dominant gardens were also a “filled” garden type. Half of the shrub dominant gardens were also a “perimeter” garden type. Finally, all of the gardens that were classified as shrub and herb dominant were “filled” garden types.

Table 6 ~ Classes of Gardens Based on Plant Form Percentages Including Type of Garden, Number of Species and Garden Number

PLANT FORMS, PERCENT				TYPE	SPECIES	GARDEN #
Tree	Shrub	Groundcover	Herb			
Tree Dominant Class						
83	0	0	17	ends	6	21
75	25	0	0	perimeter	4	16
75	25	0	0	filled	4	19
67	33	0	0	ends	6	12
50	20	30	0	filled	10	5
Tree and Shrub Dominant Class						
56	**22**	11	11	ends	9	15
46	**36**	18	0	filled	11	6
44	**44**	6	6	filled	16	3
38	**38**	7	17	filled	29	9
37	**52**	11	0	filled	19	25
36	**36**	16	12	filled	25	4
36	**36**	7	21	perimeter	42	10
35	**36**	29	0	perimeter	14	27
Shrub Dominant Class						
25	**75**	0	0	filled	12	8
11	**67**	22	0	perimeter	9	7
33	**59**	8	0	filled	12	2
26	**59**	9	6	filled	35	14
42	**58**	0	0	perimeter	12	13
32	**52**	16	0	perimeter	25	11
Shrub and Herb Dominant Class						
17	**44**	9	**30**	filled	102	23
17	**43**	9	**31**	filled	58	17
20	**41**	15	**24**	filled	41	26
13	**41**	8	**38**	filled	21	20
18	**38**	18	**26**	filled	34	18
Unspecified Plant Forms						
n/a	n/a	n/a	n/a	ends	n/a	1
n/a	n/a	n/a	n/a	filled	n/a	22
n/a	n/a	n/a	n/a	filled	n/a	24

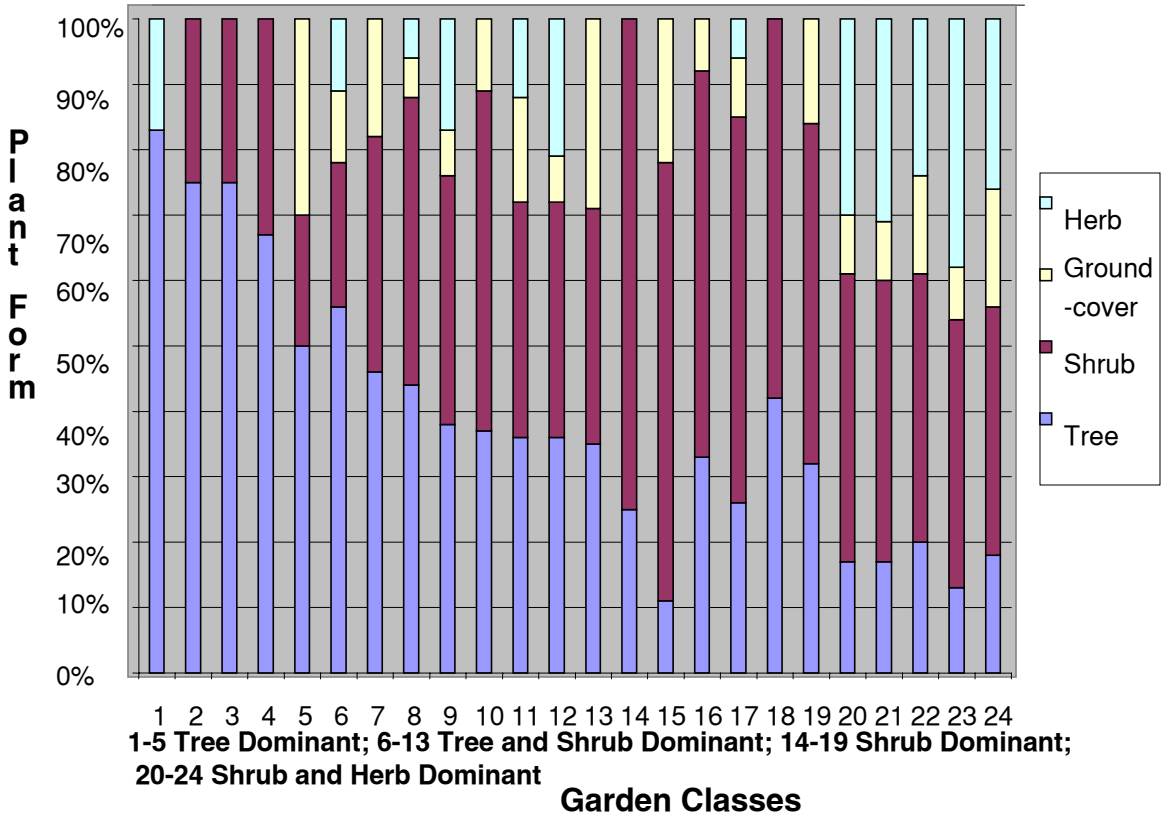

Figure 15 ~ 24 Gardens Arranged by Garden Classes Based on Plant Form Percentage

(3) Plant Form Abundance Graph

I also graphed the plant form data for the gardens three-dimensionally, see Figure 16 ~ Plant Form Abundance for 24 Gardens Showing Number of Species of Each Growth Form. The data was ranked by trees, the red columns in the figure. This also shows graphically how the number of plant forms was distributed for each garden.

Structures and Arrangements

It was immediately evident that in the gardens were a number of features that related to garden use and some, not all, would require maintenance. These were amenities (benches, view areas), plant arrangements (rows, clusters and hedges),

structures (rocks, walls and mounds) and materials (rock, concrete, mulch and gravel). These are represented in another spreadsheet.

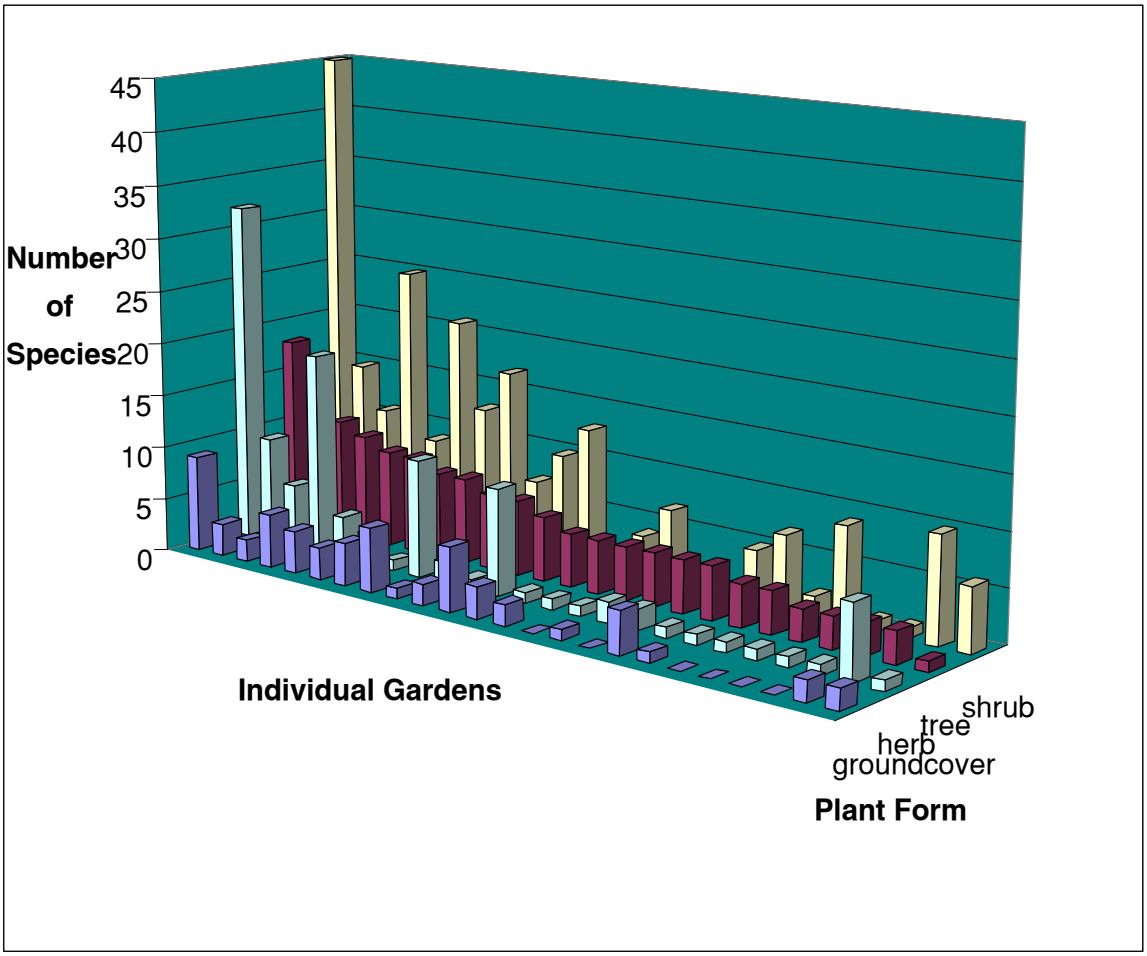

Figure 16 ~ Plant Form Abundance for 24 Gardens Showing Number of Species of Each Growth Form

Occasionally there is overlap between amenities and plant arrangements. For example, what I distinguish as the amenities of *tree canopies*, *flowering trees* and *fruit trees* overlaps my classification of plant arrangement of *tree groves* because groves also provide tree canopies and may consist of flowering and or fruit trees. The amenity of

having a canopy doesn't tell how many trees are present. Sometimes the canopy belongs to singular trees but at other times is part of a grove.

Another example of the overlap between categories is my amenities of *lawn*, *resting areas* and *educational settings* with my plant arrangements of *mass planting*, *enclosures* and *collections of plants*, respectively. A lawn is also a mass planting and the educational settings are often collections of plants.

(1) Amenities

Of the items classed as amenities (1) lawns, (2) shade, (3) resting areas (usually) placed in shaded or sheltered locations (4) aesthetic consideration (these are evidenced by the preservation of the view plane and inclusion of flowering trees) and (5) lei plants (many gardens appear to have the functional aspect of supplying lei flowers). I will briefly discuss the amenities that appeared greater than 18 % of the time. These top twelve amenities are listed in Table 7 ~ Amenities, the 12 Most Popular, With Their Occurrence in Percent. I included open areas and lawns as amenities in all designs, whether indicated directly or not.

Although all garden designs had trees, the location of native palm trees at the mauka (mountain ward) border of one garden would not provide elemental protection and little privacy screening from the mauka residences and thus I did not consider the garden to have the amenity of "tree canopies." I believe that trees were used for protection or as a screen from the sun, wind, rain and observation from the residents of

mauka house lots. The suggestion that palms be placed at the mauka edge could serve a couple of alternate functions, while permitting a “view” they would also be a decorative screen to hide the backs of the mauka homes.

Table 7 ~ Amenities, the 12 Most Popular, With Their Occurrence in Percent

OCCURRENCE, %	AMENITY
100	Lawns
96	Tree canopies
74	Resting areas
74	Flowering trees
52	Paths or trails
41	Fruit trees
33	Benches
33	Gathering places
26	Springs (Punawai)
18.5	Gazebos or pavilions
18.5	Lookouts
18.5	Educational settings

Resting areas and flowering trees were included in 74 % of the designs. Paths or trails occur 52 % of the time. Ninety six percent of the gardeners (or 26 out of 27) planted trees in the areas that could be planted with trees without seriously impinging on the view. Introduced trees already existed at either end of the park and more trees were added inside of these groves, which did not block the view any further.

Of the gardeners who included a shade amenity, 74% also provided shady resting areas and places to sit. Resting areas typically had some sort of structural protection from the elements and places to sit. They are usually tree sheltered seats

that include rock benches, rock walls and picnic table benches. These results fit the themes of shade and protection already identified as aspects of Hawaiian gardens.

Some of the trees commonly planted for their flowers were endemic, see Table 8 ~ Flowering Tree Species, an Amenity Grown for Their 1) Attractive Blossoms, 2) Use in Lei Making, or 3) Framing a View, With Their Occurrence in Designs, Flower Color and Hawaiian Name. I called some of my informants to check ask them if they had chosen the trees for the flowers before defining my amenity of "flowering trees," a tree category in which the flowers of the tree are desired more than the shade of the tree. Flowering trees of the same species were frequently used to frame the view.

Some of the trees included might have multiple uses. The flowers, seeds and leaves of kukui are used for lei making and its canopy also provides shade. The other trees used to frame the view were hala, kamani, lonomea, loulu, manele and niu. Fruit trees, known primarily for their edible fruits, were included 41 % of the time.

Paths or trails occurred 52 % of the time. Benches, sitting structures for at least two people, are included in 33 % of the designs. Gathering places are areas that have presumably been designed to promote social interactions as evidenced by the presence of picnic areas, gazebos, pavilions, lookouts, community gardens, play and exercise equipment and hale (structures). Examples were included in a third of the gardens.

Table 8 ~ Flowering Tree Species, an Amenity Grown for Their 1) Attractive Blossoms, 2) Use in Lei Making, or 3) Framing a View, With Their Occurrence in Designs, Flower Color and Hawaiian Name

SCIENTIFIC NAME	#	HAWAIIAN NAME	FLOWER COLOR	LEI MAKING	FRAME VIEW
Metrosideros polymorpha	18	ʻōhiʻa lehua	red, orange, yellow, white	yes	yes
Acacia koa	12	koa	yellow	yes	yes
Aleurites molucanna	9	kukui	white	yes	yes
Erythrina sandwicensis	8	wiliwili	white, green, orange	yes	yes
Cordia subcordata	5	kou	orange	yes	yes
Hibiscus tiliaceus	2	hau	yellow	no	no
Kokia drynarioides	2	hau heleʻula	red	no	yes
Thespesia populnea	2	milo	yellow	no	no
Cassia javanica x *C. fistula*	1	rainbow shower	pink and yellow	no	no
Fagraea berteriana	1	pua kenikeni	white	yes	no
Jacaranda acutifolia	1	jacaranda	purplish blue	no	no
Plumeria obtusa	1	melia	white, yellow, orange, pink, red	yes	no
Tabebuia aurea	1	unknown	yellow	no	yes

Many gardeners were aware of a fresh water spring (punawai) in the back of the park that flows during rainy periods in the summer and winter and twenty-six percent created a focus around it using rocks, lined ditches and native wetland plants.

Gazebos or pavilions were included in 18.5 % of the designs. These are structures with roofs and are also counted in the “gathering places” amenity. The suggested lookouts also counted in the “gathering places” amenity, are paved structures with railings at the makai (sea ward) edge of the park that provide a place to visit in order

to get a magnificent view of Nu‘uanu valley and beyond. They occurred in 18.5 percent of the gardens. See Figure 12 ~ Aerial View of Nā Pueo Park looking southwest.

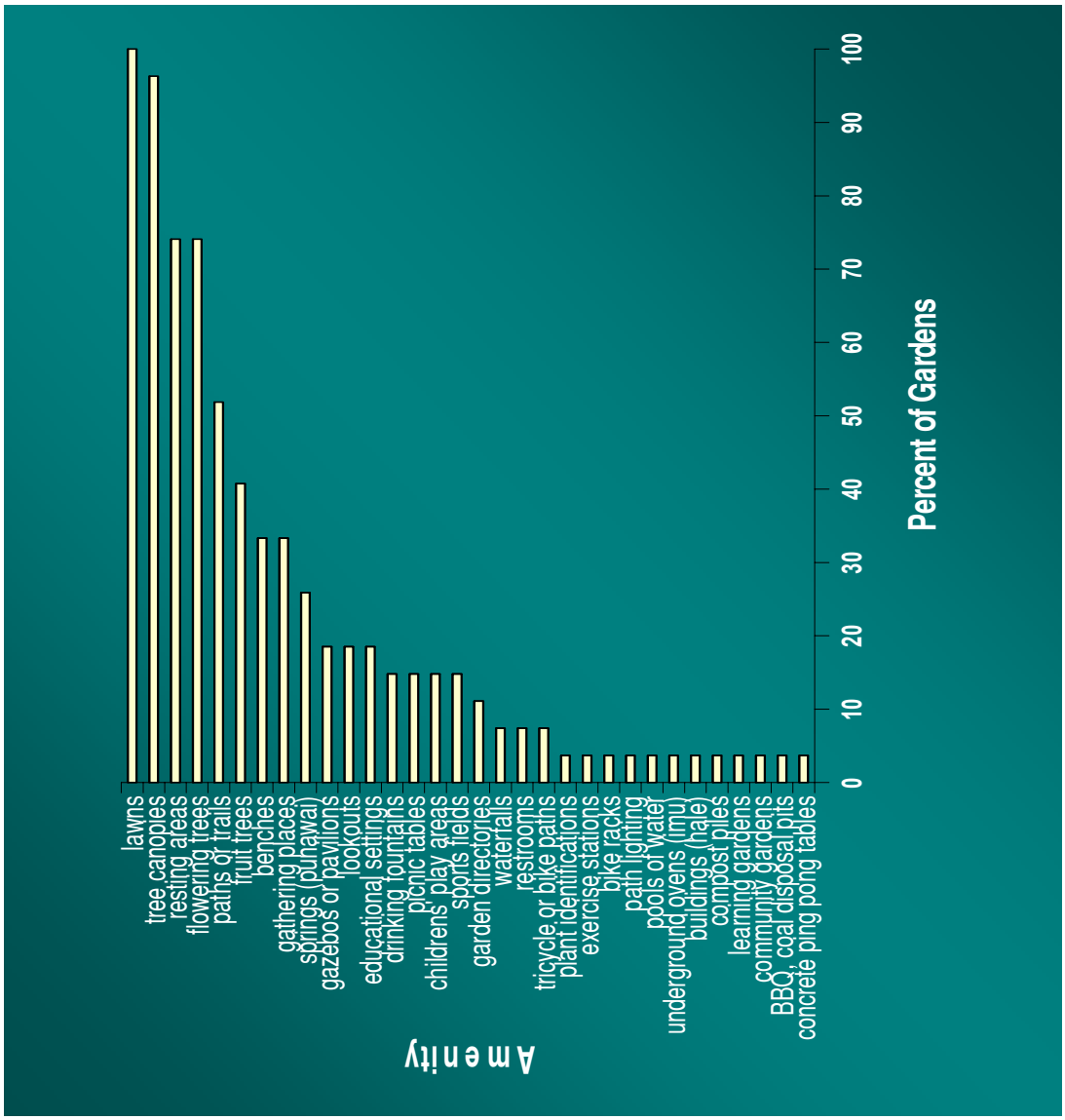

Figure 17 ~ Amenities, % Occurrence in Garden Designs

Finally, it was evident that many designers intended their gardens to have an educational function. Some informants specifically stated this and others made their intention clear from the inclusion of labels, signs and directories with information about

Hawaiian culture. The amenity of “educational settings” (18.5%) was an element frequently included in gardens. These were places that encourage learning typically about the plants. The most elaborate design includes a greenhouse for plant replacement and several hale for cooking, eating and teaching according to the designer, see Figure 17 ~ Amenities, % Occurrence in Garden Designs.

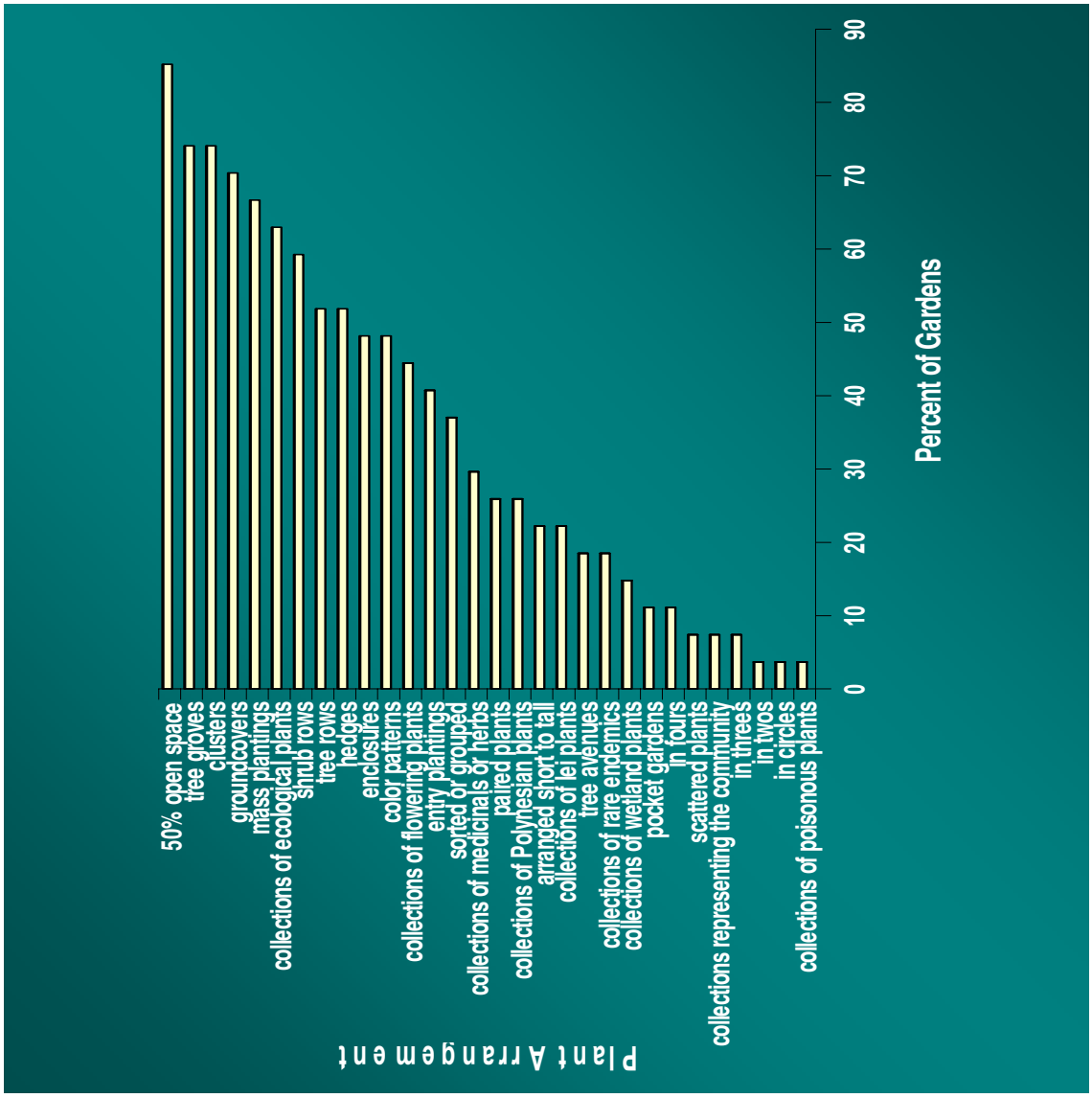

Figure 18 ~ Plant Arrangements, % Occurrence in Garden Designs

(2) Plant Arrangements (Hoʻonohonoho māla pua māla ʻai)

Plants were placed in several combinations of proper, desired or convenient order, see Figure 18 ~ Plant Arrangements, % Occurrence in Garden Designs. The top eleven arrangements are presented in Table 9 ~ Plant Arrangements, the 11 Most Popular, With Their Occurrence in Percent. Eighty five percent of the designs had an arrangement of at least 50 % open space. This means that at least half of the available space was not planted and left as lawn. This is strengthened by four designers (15 %) who specifically indicated that the lawn area should be left open for playing sports.

Table 9 ~ Plant Arrangements, the 11 Most Popular, With Their Occurrence in Percent

PERCENT OCCURRENCE	PLANT ARRANGEMENT
85	50 % open space
74	Groves
74	Clusters
70	Groundcovers
67	Mass plantings
63	Collections of habitat plants
59	Shrub rows
52	Tree rows
52	Hedges
48	Enclosures
48	Color patterns

The next most common plant arrangements were “groves” or irregular groupings of trees. These occurred in 74 % of the designs as did “clusters” of shrubs. Groundcovers (70 %) are plants that act as an eye pleasing horizontal canvas. They are used to cover large areas with low-lying plant growth that, unlike lawn, is not to be trod upon. Mass plantings (67 %) are areas larger than clusters that are planted with the

same species. Collections of habitat plants (63 %) are those arrangements that specify natural arrangements of plants in appropriate places.

The next arrangement is “shrub rows” (59 %), the occurrence of several plants in a continuous unbroken line. Similarly, “tree rows” (52 %) is the placement of several trees in a continuous unbroken line. Hedges (52 %) are often attractively shaped shrub rows of considerable length which may be used to 1) absorb sound, 2) create privacy, 3) define spaces and 4) screen undesirable views. Enclosures (48 %) are any arrangement of plants that create protection from the elements and some amount of privacy within the park. They did not need to provide a canopy or seating although some did both. The last arrangement is “color patterns” (48 %), the use of plants with differing leaf or flower color to create visual drama by highlighting the color contrast of plants to each other.

(3) Structures

Physical structures as defined here are made of soil, rock or plants, see Table 10 ~ Structures, the 5 Most Popular, With Their Occurrence in Percent and Figure 19 ~ Structures, % Occurrence in Garden Designs. In decreasing order the most common is “borders”, shorter than hedges and used to separate foot traffic on the path from the plantings and lawn. Plant borders occur in 30 % of the designs.

Two informants suggested shaping the terrain into a little hill or pu‘u in order to display plants and create interest on the gently sloping ground. Mounds are included in 26 % of the gardens. They came in several diameters, 15, 35, 50 and 65 feet. One

mound measured 85 x 45 feet. A raised circular bed supported by rocks had a 9-foot diameter.

Table 10 ~ Structures, the 5 Most Popular, With Their Occurrence in Percent

PERCENT OCCURRENCE	CONSTRUCTION
30 %	Borders of plants
26 %	Mounds or raised beds
22 %	Walls or terraces
18.5 %	Large rocks
15 %	Rock groupings

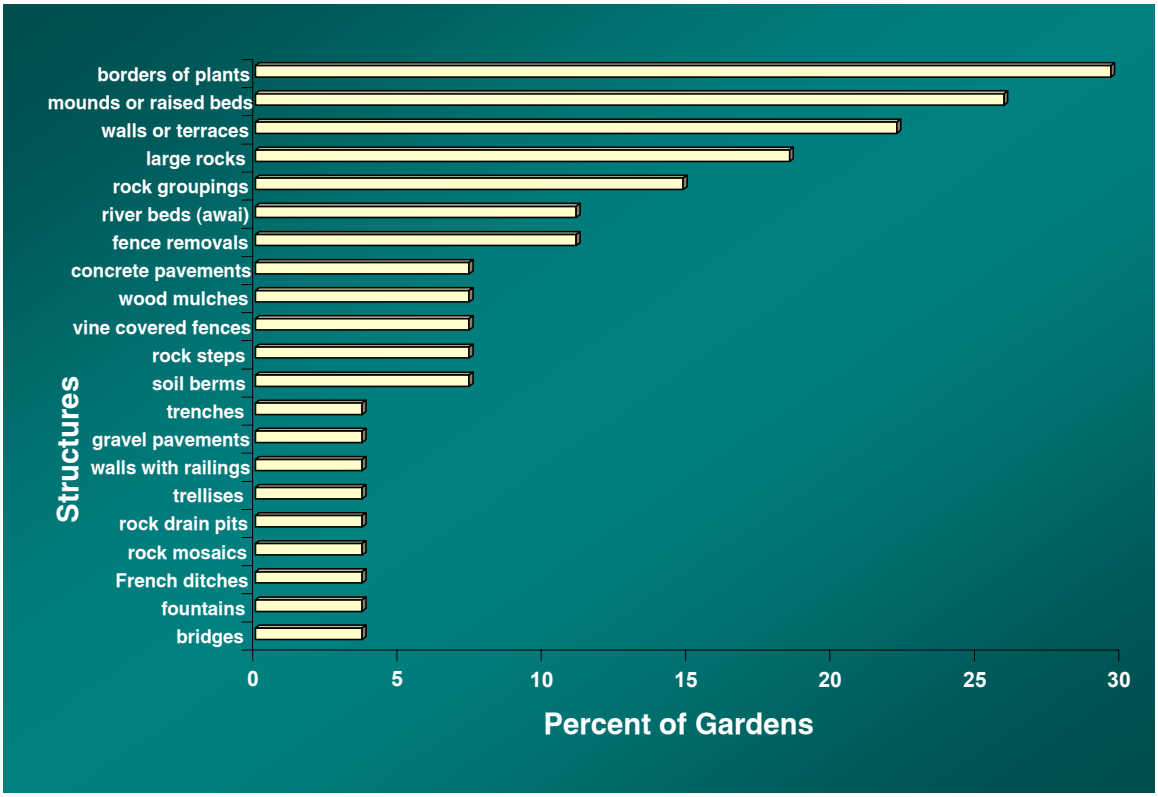

Figure 19 ~ Structures, % Occurrence in Garden Designs

One of the designers located three large circular mounds so that people can go around the whole thing. He wanted them multidimensional so the plantings could be seen from different angles. He planted the middle garden with species that would be

found around a house. He told me that he arranged his threatened and endangered species in a staggered pattern to avoid symmetry. Although mounds or pu‘u lepo may be included for aesthetic value, there may also be other reasons for their inclusion. Interestingly, there are eleven Hawaiian words for mound in the Hawaiian Dictionary.

Walls or terraces are large rocks and rock groupings and were included in 22 % of the designs. Large rocks (pōhaku nui) by themselves are another “construction” category. They occurred in 18.5 % of the gardens or five designs. These boulders or outcroppings measured 5, 7, 8 and 9 feet in diameter. Some of these massive objects were indicated as rocks measuring 9 feet x 4 feet and 20 feet x 10 feet. Large rocks were grouped in 15 % of the designs but also occurred by themselves. Rocks are also used in the circular entrance planter in 18.5 % of the gardens.

(4) Materials

Materials generally specified for build structure were rocks, concrete, wood mulch and gravel. These materials were used to create benches, entrance markers, mosaics, steps, terraces, things for children to climb, walls and to define water features. Concrete was used for paths and lookouts. Wood mulch and gravel were used as paving materials. They are displayed in Figure 20 ~ Materials, % Occurrence in Garden Designs.

Level of Maintenance

One of the most important aspects of a garden is its maintenance. Irrigation, trash removal, grass cutting and shrub pruning currently exit at Nā Pueo Park. Almost

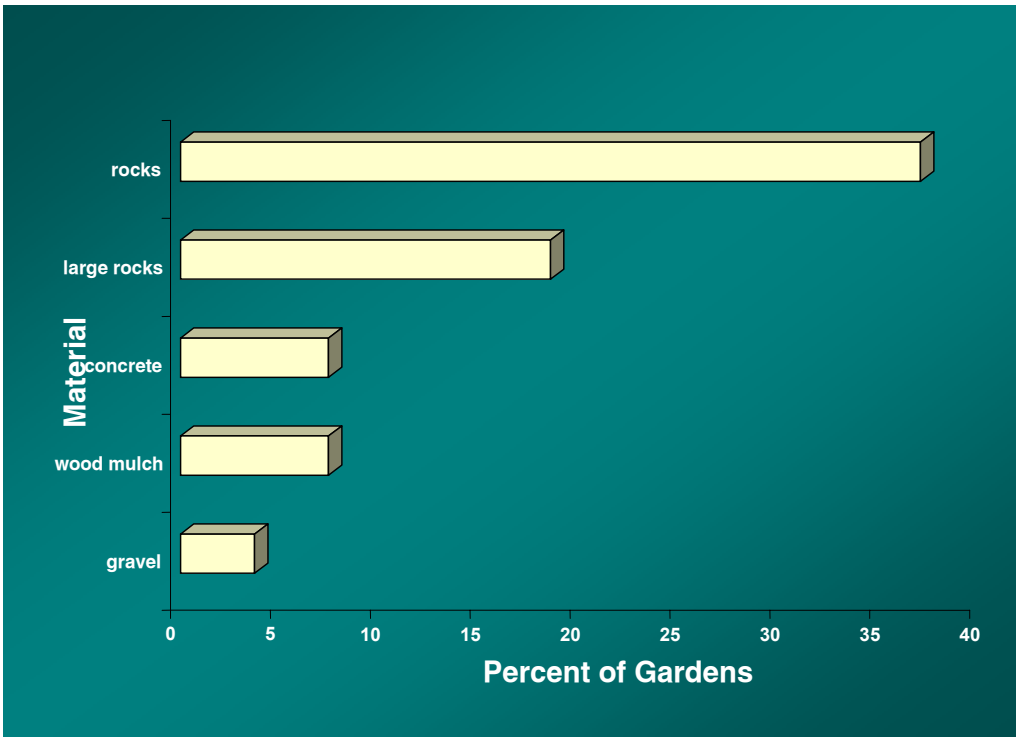

Figure 20 ~ Materials, % Occurrence in Garden Designs

all of the designs required more maintenance than the present garden. Sixty-three percent of the designers created designs that would appear to require the staffing by city botanical gardens, see Figure 21 ~ Maintenance Level, % Occurrence in Garden Designs. I determined this by roughly taking into account the number of individual plants and the number of species. I felt that more than 10 species, which occurred in 67 % (16 of 24) designs, would result in maintenance greater than a city park. More plants mean

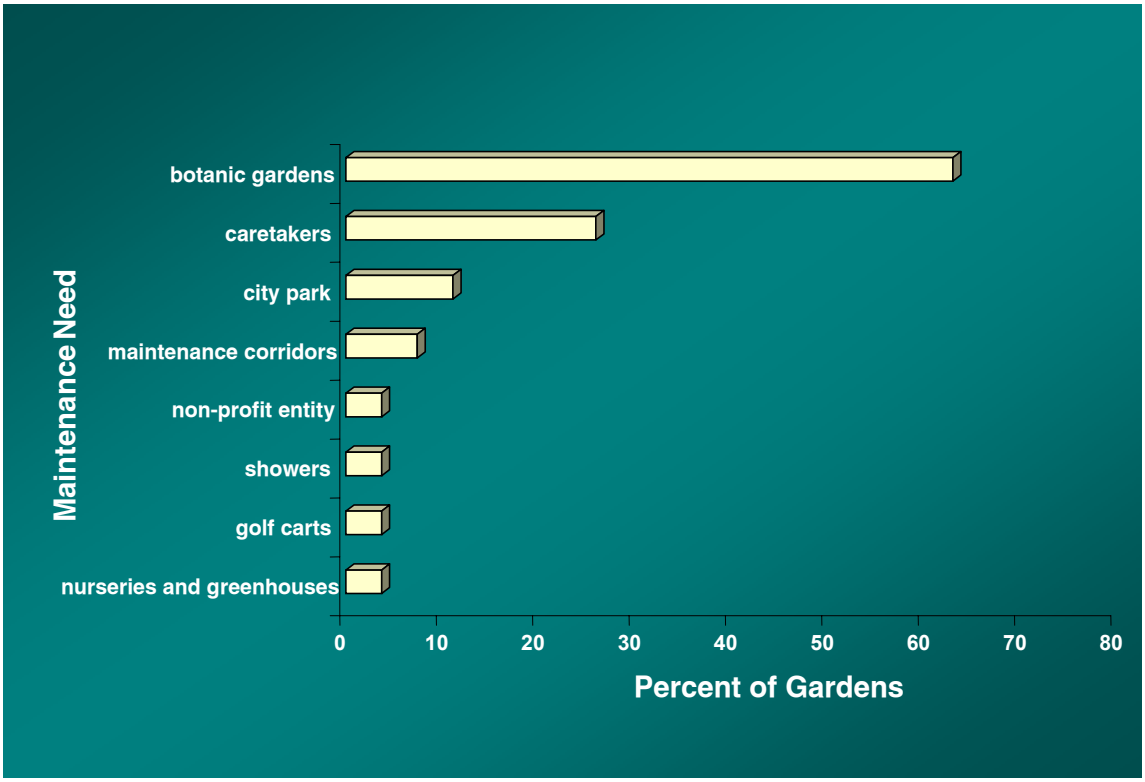

Figure 21 ~ Maintenance Level, % Occurrence in Garden Designs

more maintenance and knowledge for replacement, culling and care (watering, mulching, fertilizing and integrated pest management) especially during the initial period of plant establishment. Fully 26 % of the designs would need daily caretakers. The resulting need for maintenance did not escape the designers and one of them proposed that a non profit entity be created to look after and run the park. Not all of the gardens expected additional money to be spent on maintenance and there were a few examples of gardens that would require little additional maintenance. Only one garden indicated that a species was to be kept trimmed.

The most complex garden named 102 species: 17 trees, 45 shrubs, 9 groundcovers and 31 herbs. This fantastic garden included two imu, several hale (with

thatch roofs and 3 foot rock walls), a comfort station with showers and a plant nursery. The designer confirmed that it could be understood as a living repository of all familiar plants. The plant inclusions, arrangements and their placement indicate a thread to be followed. It presents a history of plant. This design's purpose is primarily educational and would function as a living classroom illustrating the important plants used in Hawaiian culture. The planting plan sets out plants in a readable manner for students.

Useful Types of Plants

Species specified by designers frequently included plants used for fiber, medicine, food, wood or lei making. Other cultural uses include ceremonial, construction, container, dye, fishing, hula, kapa, kapa tools, music, tools, utensils and weapons. Keeping in mind that several plants can be used for more than one purpose, I found that, of the 183 species, 56 % (102 species) could be used for lei plants, 36 % (65 species) could be used for medicine, 8 % (14 species) could be used for wood, 7 % (13 species) could be used for food, and 5% (9 species) could be used for fiber. Eleven percent (21 species) were of undetermined use.

I assigned the plants to categories based on what the gardeners had said about the plants, my own knowledge about their uses from my Hawaiian teachers, a check list from the Bishop Museum's Amy Greenwell Ethnobotanical Garden, and a handout from Lapa'au Kanaka Maoli presented by Dr. Kekuni Blaisdell in a university class. The lei plants are desired for their flowers, leaves and natural backing materials. The food

plants are the staples of the Hawaiian diet and the medicinal plants are noted for their healing or soothing properties. The occurrence of lei plants in the designs is one of the findings discussed next in the concluding chapter.

Chapter 6 ~ Summary of Results and Conclusions

Summary of Results

As Hawaiians begin to speak for themselves regarding Hawaiian gardens, knowledge that has been overlooked, but not forgotten, will become more obvious. By cooperating in this research and by providing reasonably detailed maps, the designers have given a good deal of data demonstrating that Hawaiians have a distinctive conception of horticultural matters. Future gardens will be more interactive and no longer a decorative prop. Plants and their placement will remind us of important values that we use in our families as well as in the spiritual world.

The most common plant species favored by informants were native species and many were also lei making species. With the exception of ʻilima, kokiʻo keʻokeʻo, kokiʻo ʻula, ʻakiohala and maʻo hau hele planted near homes for lei making (Handy and Handy 1978), native plants would not have been part of traditional Hawaiian gardens. I observed that 66 % (or 121) of the species were native and that many of the species selected could be used for lei making suggesting an enduring Hawaiian garden concept of utility. The physical structure of the designs suggests a respect for the neighbors of the park by the preservation of the city. In contrast, the desire of many designers to preserve view planes appears to be a departure from the traditional nature of Hawaiian gardens that tend to be inward looking, and function as a sheltered haven for household activity.

I found the gardens could be conveniently divided into four garden dominant classes. I called them: tree, tree and shrub, shrub and shrub and herb although trees were included in all gardens. If the design was more complex then the number of plant form categories increased. This shows that there is wide diversity of opinion about the form of a Hawaiian garden and includes some introduced elements. However, the inclusion of lawns, tree canopies, resting areas, flowering trees, paths or trails, fruit trees, benches gathering places, springs etc. suggest that the gardens were intended to have a recreational, social and educational function that reflects Hawaiian values.

Plant arrangements in terms of open space, groves, clusters, ground covers, mass plantings etc. suggest formal structures, which are not known to be a part of pre-contact gardens. These may reflect an adoption of non Hawaiian garden styles introduced in the last two centuries along with flowering trees, lawn and ground covers.

Materials (rocks, concrete, wood mulch, gravel and soil) selected by the designers for the park structures are commonly used in gardens world wide. In these gardens, the common structures like borders, mounds, walls, large rocks and rock groupings maybe simply functional (to mark plant-use boundaries) but may also have spiritual significance reflecting Hawaiians' intimate connection with nature and the idea that spirits reside in rocks (Koga 2003, Cruz 2003).

The inclusion of mounds, large rocks and rock groupings would enhance the hillside natural setting of the park and actually recreate what had been at the site before

the park was made. A home video, shot by Norman Borthwick as the park was created, shows that many small hills and large rocks were scooped up and hauled out of the construction site using heavy equipment.

Based in part on the number of useful plants, 63 percent of the garden designs appear to create maintenance needs that would require at least part time staffing. I also found that, although the gardens may need more management and plant care, the concepts of plant care that I learned in this study do not include cutting and pruning and suggest low maintenance by comparison to formal gardens.

Insight into Hawaiian Conceptions

This study attempted to determine the plants that are important to contemporary Hawaiians and how the plants may be placed in a proper, desired or convenient order on the human landscape. The garden designs provided by informants range from park-like, with no additional infrastructure, to designs with a great deal of botanical and structural interest. Many of the native plants used are rarely seen in public places and reflect an interest to help save and repair the natural ecosystems, forests in particular, by increasing awareness of their high biological diversity. The use of these plants may also reflect the laws that have been changed that allow for them to be bought. Conserving the culture means conserving the plants (Hawai‘i State Laws 1975). The intent of the law (Hawaii State Laws 1992, 1999b) that now permits the growing of native plants and

requires the labeling of native plants around new public buildings, is for the edification of the public regard the plants but it will also help preserve the culture.

Landscape Elements

Native Plants

Many native plants were used despite the more common practice by most people of using introduced plants. The results show a preponderance of native plants including flowering trees, arranged in groves bordering the view in combination with shrubs and groundcovers.

Lei Plants

The abundance of lei plants in gardens is a major difference from most other public gardens. Planting lei species may be intended to increase public awareness of native plants but it also represents a tradition that gardens should be utilitarian reflecting the Polynesian love for flowers and contrasts with western public gardens where a “no pick” rule is strictly enforced. Thirty six percent (15 of 42) of the most commonly occurring 25 % of the species have fragrant plant parts (flowers, leaves and fronds) see Table 2, Chapter 5.

Social Places

The value of the garden as a place to socialize is illustrated by the fact that many informants included places to sit, places to walk and things to do with others in a sheltered naturalistic environment. More like outdoor living rooms, and unlike the present day park, the designs harken back to the articles in Paradise of the Pacific that talk

about shade, protection, leaf color, and usable space for living. The designs provide trees for shade and protection to create settings for outdoor living with lawns as play surfaces like the Hawaiian gardens popularized in Paradise of the Pacific and frequently depicted in similar publications. Many designs provide protected spaces for sitting on benches to rest—space that most anyone would recognize and appreciate.

What is different about this space is that it is meant to occupy the attention and efforts of people by being attractive and pleasing not merely appreciated from a distance like many purely ornamental gardens. It is space in which lei are to be made, fruit are to be picked and savored, flowers are to be smelled to refresh memories and the water features included are to be heard, seen moving and felt. The rocks may provide additional spiritual companionship to that of the plants; a heightened sense of social warmth.

One designer created a utilitarian area and wrote his notes for me.

> Develop this area as a utilitarian area by planting introduced fruit trees that were brought to the islands many years ago, such as mango, lychee, dragon's eye etc. along with recently introduced material. This area will allow future generations to know about these fruit trees many of which have been destroyed during the redevelopment of our urban landscapes, and allow the users to experience the fruit. The city would probably object to this recommendation due to liability concerns relating to harvesting fruit, but what is a park for?

Because these gardens seem to be designed to inspire, please the eye and be incorporated into one's daily activities as well as provide a social venue, they might be

gardens where you might be inclined to stay all day visiting in familiar conversation ("talking story" or wala'au) and planning new activities with others. Social venues are useful places because a person in Hawaiian culture is surrounded by social links that extend not just to one's contemporary kin and friends but through time from one's ancestors, plants included, through oneself, continuing to future descendants. For example, two informants included the endemic lehua 'ahihi (from Moana Lua Valley) that was used in the popular sovereignty song, "Aloha 'Oe" by Queen Lili'uokalani to refer to Hawaiian people (Lili'uokalani 1999).

We can perhaps see reflected in these sheltered and practical designs something of the common local custom of setting up shelters with table and chairs for spending the day outside celebrating or just enjoying a day off from work. The fanciest of these temporary camps are usually comprised of rented white rainproof open air tents, sometimes decorated with a roof skirting, under which are arranged tables and chairs together with a stage and food tables. The simplest camps consist of a privately owned set of smaller diameter pipes and fittings for the support structure and a simple blue or grey tarp together with some tables, chairs and mats for lounging. Such temporary structures in the garden announce a garden party of some important sort that is weather proof. Such locally common temporary structures may be a fix it response to the lack of a permanent structure.

Although some of the garden plans focus on children and their education with regard to cultural plant use, many of these gardens could be perceived as an educational place, using friendly natural settings to further support appreciation of Hawaiian culture. Few such Hawaiian gardens presently exit. The horticultural settings within the gardens may be seen as a tool for both the conservation and the political expansion of Hawaiian culture.

One of the beneficial objectives of this study was to document the current state of Hawaiian thought with regard to garden design. The Hawaiian garden form is not yet a recognized type. There are several books on Hawaiian garden plants and gardens of Hawaiian plants but they focus on the growing of Hawaiian plants and give little attention to other factors that create a Hawaiian garden space. Most informants had never been asked to design a garden or given designing a garden much thought, in particular to a garden this size and for a city park. In contrast, most smaller, personal or private gardens take shape over time and are not usually planned out all at once. Despite the unfamiliar request, I believe these maps still show there is transfer of the informal conception of private spaces to public areas. These create garden spaces different form prevailing conventions of public space.

Rocks

One of the important common features in the park designs were groupings of large rocks (pōhaku nui). Besides the three definitions for pōhaku in the dictionary (Pukui

and Elbert 1986), there 49 types of pōhaku defined separately. The use of obvious boulders or groups of rocks, to simulate outcroppings, in the park and in the circular entrance planter tells us that Hawaiians appreciate rocks and like to see them. Pōhaku may have been included because “certain stones were held as sacred partly because of their connection with god forms. One such stone was Kānepōhakukaʻa—stone form of god Kāne (Kanahele 1986)”.

Most people in contemporary western societies do not see rocks as homes for spiritual entities or as having much symbolic meaning. However, the use of a sacred rock in a garden, such as that outside the state archives building at ʻIolani Palace, marks the building as important, and in this case, is home to Hawaiian chief Līloa, the fifteenth-century progenitor of the dynasty of great chiefs on Hawaiʻi Island (Cruz 2003). Flowers and lei are placed on such rocks. In China and Japan rocks also considered to contain a spiritual entity. It is possible that the cultural roots of all these traditions could be traced to the same source.

Mounds and Walls

The results show that many garden plans specified mounds and walls as constructions. These features can also be seen in important Hawaiian places such as on the grounds of ʻIolani Palace where there is a burial mound, see Figure 22, that has a 1.5 foot high brick wall with an iron railing on top of it and in Waikīkī, at the corner of Kalākaua and Kapahulu Avenues, where a recently constructed burial mound is

encircled by a similar wall. Perhaps these ideas came from familiarity with the palace grounds or other similar formal gardens—or maybe they just reflect the world wide fashion in landscape design to use organic working forms and to create varied topography and provide visual interest.

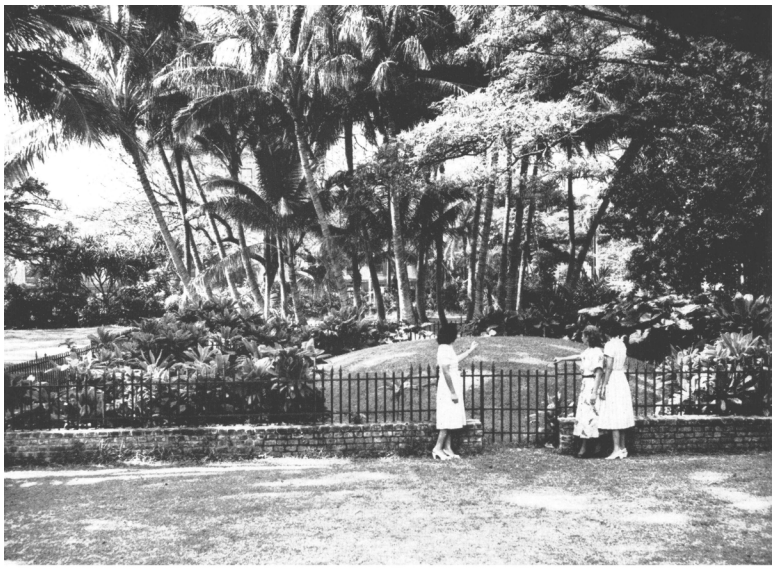

Figure 22 ~ 'Iolani Palace burial mound surrounded by kī and enclosed by a brick wall built by King Kalākaua, iron railing was added later. Niu are in the background.

The truth may be deeper than the copying of mounds and walls at importance Hawaiian places. Hawaiians still believe rocks have power and rock constructions—heiau—were very important places, many of which are preserved today. “Heiau were erected and maintained to meet the larger needs of society and were tended by special priests (Abbott 1992). Heiau ranged from elaborately constructed stone platforms to simple earth terraces (Pukui and Elbert 1986).

These sacred sites served as the connection between the people and their gods (Becket and Singer 1999). To assure themselves that they were fulfilling their responsibilities as caretakers of all that their gods has created for the welfare of all the people, Hawaiians maintained constant contact with their gods through their sacred sites, where they delivered chants and made offerings (Becket and Singer 1999). Heiau types include 1) heiau hoʻōla for treating the sick, 2) heiau hoʻoulu iʻa for good fishing, 3) heiau hoʻoulu ua for insuring rain, 4) heiau hoʻoulu ʻai for increasing food crops, 5) heiau kālua ua for stopping rain, 6) heiau maʻo for bringing food, 7) heiau poʻo kanaka for offering human sacrifices and 8) heiau wai kaua for services to bring success in war (Pukui and Elbert 1986).

Western Elements

Certain elements of modern landscape architecture such as tree canopy placement, tree rows and avenues, shrub clusters and plant borders may be concepts acquired by modern Hawaiians. The traditional Hawaiian gardens were probably informal and naturalistic. This contrasts to garden conventions derived from Egypt, Greece, Persia and Rome where highly structured geometrical shapes were created. Neither the landscape architects nor some of the garden designers may know why they used certain elements of modern landscape architecture on a deeper level.

Gardens as Spiritual Space

Generally, I believe gardens are meant to be places for safe, pleasurable diversion; including human romance. They can represent a comfortable understanding of a human-to-nature set of "give and takes" that cycle to perpetuate the whole. They can be places of healing or renewal derived from activity ranging from direct engagement, such as pleasurable gardening and social interactions, through contemplation of the whole and relaxation from a stroll, to motionless meditation, affecting the body, mind and soul respectively. Gardens, as portions of nature, are a ritualized emotional venue.

Hawaiians have an intimate and emotional relationship with nature (Abbott 1992).

> Before 1819, Hawaiians of all walks of life prayed every day to a number of gods and for a variety of reasons. Since plants, animals, the landscape, and society itself were deeply imbued with religious significance, many prayers were offered in the field or the forest . . .

Furthermore, Ito (1985), writing in Person, self, and experience: exploring Pacific ethnopsychologies, says that the Hawaiian concept of self is grounded in emotional social relations with humans, spirits and nature. Hawaiians view themselves as bound together by emotional bonds that support and protect each member (Ito 1985).

> Traditionally, all Hawaiian relationships could be expressed as bonds of kinship. . . . The maka'ainana 'commoners' most probably felt kinship with the gods, goddesses and spirits affiliated with their village land and their occupational and craft skills. Hawaiians felt kinship with the environment through the various natural forms of the gods and goddesses. Each of the gods and goddesses had multiple forms and natural transformations called kino lau (Ito 1985).

Hawaiian grammar may also give an insight to the way Hawaiians think about gardens. This may become clearer from a brief look at the Hawaiian language. Hawaiians do not have a word for “have” instead the language divides everything in the world into two categories and has two sets of possessives to use with them; “o—category” things and “a—category” things.

According to Hopkins (1992), the author of a Hawaiian language text used at the University of Hawai‘i, an o-category entity is something that possesses the people or thing in it by (number 2 of) the following rule:

“O—category” things:

> 1. If you have no control over possessing something, it is an “o” thing: for example, older relatives, siblings, emotions, body parts. Note that nonliving things have no choice about owning things so they usually possess everything with “o”-possessives.
>
> 2. If you can get in, on, under, behind, or wear something, it is an “o” thing: for example, buildings, means of transportation, chairs, clothes.

By contrast,

“A—category” things are described as follows.

> Anything that does not fall into 1 or 2 above is an “a” thing. We talk about possessing “a” things by substituting ā for o in the possessives . . . There are many “a” things: for example, husband, wife, children, grandchildren, teacher, student, book, food (Hopkins 1992).

The point is that park space is an “o” category thing and possesses the people in or on it according to a Hawaiian way of thinking. If you are at the park, you belong to the

park, it doesn't belong to you. In other words, the park controls or determines human behavior.

Until recently, Judeo-Christians have generally felt that nature was something that needed to be controlled lest they starve or be killed for food by one of its wild animals. A hundred years ago many Americans viewed wilderness landscapes negatively because they represented inhospitable country lacking in life sustaining farms, orchards and a domesticated nature. Clearing and planting crops was a sign of civilization in the United States as people migrated westward. The great rivers of the western United States were tamed by dams built to supply water for urban and agricultural growth. Vast agricultural fields of crop plants represented the intelligent control of nature for humankind. Gardens were often displays of human power instead of displays of nature's power (Pollan 2001).

I believe by contrast, Hawaiians enjoyed "wilderness" both as a place of respect and as a safe, enjoyable place in which to lose one's self. Perhaps the Hawaiian word "lilo" (be lost, gone, pass into the possession of; to relinquish; to become, turn into; taken) best describes the feeling of being swept up or possessed by nature. Pollan (2001) writes about being overwhelmed or possessed,

> "The experience of the sublime is all about nature having her way with us, about the sensation of awe before her power—about feeling small." vs. "the satisfaction of having our way with nature; the pleasure of beholding the reflection of our labor and intelligence in the land. . . . Filling us with a sense of *our* power (Pollan 2001)."

Hawaiian cultural values are quite different than those of the west with respect to being in a natural setting. Instead of a competitor, Hawaiians find nature to be a reassuring and supportive element that they willingly submit themselves to as to a lover. This nature culture has been described as

> . . . a people who knew healing in herb and flower; saw gods in rock and water, tree and earth; infused poetry into stream and mountain; read meanings, natural and mystic, from cloud and ocean current (Pukui et al. 1972) . . .

and has yet to consider the garden "a place where nature is controlled to serve at, and for, human pleasure." (Francis and Hester 1990)

Public and Private Hawaiian Space

What are the traditions of public space that Hawaiians are familiar with as opposed to those of private space? After Kamehameha the Great united the entire island chain by 1810, Honolulu was the seat of Hawaiian government and home to most of the government buildings. In addition, the city contains the oldest cemeteries and a royal mausoleum where formal ceremonies take place annually. All of these places would have been familiar to the informants. Perhaps the gardeners intended to use various elements from these formal Hawaiian spaces (large pōhaku, lawns, mounds, stone walls with railings and trees), having been invited to mark the park as Hawaiian space. To what extent do these post contact ceremonial spaces represent something in

pre-contact culture such as heiau, and to what extent was it acquired from western pattern?

For example, although all the designs had lawns and 85 % of the informants included at least 50 % open space, this is something not peculiar to Hawaiian gardens, see Figure 23. Is the inclusion of open park-like space in Hawaiian gardens traditional, since some of the early drawings of Hawaiian villages show open spaces in settlements,

Figure 23 ~ Bishop Museum's Amy Greenwell Botanical Garden on the island of Hawai'i showing Polynesian introductions, 'ulu, kī, and kukui with lawn area.

or is it a more recently adopted concept? One of the earliest precedents for open space is the dedication of Kapiʻolani Park as the first public park in the Kingdom on King Kamehameha Day in 1877 by King Kalākaua who named it after his Queen. Kalākaua declared,

> Certainly no better use can be made of some portion of our new prosperity than in creating on this breezy plain a resort and place of innocent refreshment for all who wish to leave the dust of the town streets.

> I was greatly struck even in my winter journey in the United States, with the large spaces set apart in and near cities for public grounds and the care and expense put upon them, and could well imagine the beautiful appearance thy would present when clothed in their summer dress. If we cannot vie in expense and in artificial adornment with the parks of Europe and America, I see yet no reason why we should not undertake to do what is proportionate to our means. Nor do I fear that the generosity and taste of this community will fail to accomplish a most creditable result.
>
> What has been done in the few months that our Association has been in existence, so that today we have these commodious premises for the celebration of this anniversary, that you have been able to make such a course, such walks and drives and the outlines of a future park, when time shall have assisted you, claims my admiration, and gives me assurance that we have secured a new feature of attraction to the capital of my Kingdom (Sheldon 1877).

Lester Inouye, a landscape architect of recent Waikīkī public improvements (Kuhi‘o Beach and Kapi‘olani Bandstand, a modern interpretation of the original Victorian bandstand located on an artificial island), felt that the park size was too big and impersonal for the gardeners. He felt that a “house of their own” would have been the right choice (Inouye 2002). Although there are advantages to his suggestion, each house lot would be different from the next both in size, location, climate, aspect, neighbors and existing flora. Inouye points out that because the two and a half acre park is a public space larger than more familiar private house lots to the designers, using a park is a shortcoming of the methodology. The same private garden may have been more personal and productive. It’s interesting to ponder what would the public space in pre-contact Hawaiian settlements have been like.

There are several traditions of gardens ranging from private to public space. These include cemeteries, country homesteads, estate gardens, government buildings, home gardens, public gardens, public parks and royal residences, see Figure 24 ~ Amy Greenwell Botanical Garden. Certain elements included in informants designs like rock walls with railings, pavilions, gazebos, fountains and low lighting have probably bled into the designs and been copied from the fancy gardens created by, and derived from, the mixture of elite Hawaiians with elite foreigners.

Figure 24 ~ Amy Greenwell Botanical Garden showing Polynesian introductions 'awa, koa, kī and lawn area.

For example, after I expressed a desire to examine a private estate that I had heard about, I was invited to look at Lanikūhonua “where the heavens meet the earth”, a private eleven-acre Hawaiian cultural estate with expensive formal gardens at a remote leeward beach with sacred pools. Within the gardens, there are an impressive 700 coconut trees, trimmed at a cost of $50,000 annually, two grass covered hula mounds, sacred rocks, a hālau with tiled roof, very large lawns and gardens of primarily introductions. These include crotons, fan palms, plumeria, royal poincianna and sea grape, used to screen the house and buildings from the lawns and beach.

In 1984, PBR Hawaii, a city planning company, supervised landscaping at Lanikūhonua that used native plants and Polynesian introductions between the beach and lawns (Taylor 1995). I saw ʻākia, hala, ʻilima, kī, milo, naupaka, niu and pōhuehue. They constructed the second grass covered hula mound dedicated to the sole use of hula hālau (dance schools). A kahu (caretaker) lives on the grounds that are home to peacocks, chickens and a few pet dogs. At this site of Hawaiian space and formality, golf carts are used to bring the necessities out to the lawns for dining. Part of the space is left intentionally as it had been found at the time of its original development by Alice Kamokila Campbell in 1939. This garden, or others like it, may have been the source for some of the ideas included in the garden designs.

Trees

Generally western gardeners think of trees in terms of categories: shade, fruit and ornamental. Or we may have favorite trees that remind us of our childhood days and choose to plant these species later in life to perpetuate past memories. In addition to these common foreign conventions, Hawaiians may have additional reasons for tree selection. The Hawaiian word kumu means both tree and teacher (Pukui and Elbert 1986). It is interesting to speculate that the particular trees in the park were chosen because they teach, inform and comfort us as well as provide the utility of shade and protection from the elements.

For example, the lei species ʻōhiʻa lehua occurred in three quarter of the designs. Planting kumu lehua is not just for lei making. It also has important symbolic meaning as lehua is probably the most common of all the plants mentioned in any Hawaiian song or chant book. These trees may have been suggested to teach us about the many Hawaiian proverbs and poetry that use lehua as tree, flower, location, climate, beauty and natural indicator. Kumu lehua are included in the garden designs perhaps because they are providing beauty, romance, love, rain and the many story characters and places to which they are connected. Red lehua is the flower of Hawaiʻi (Neal 1965) and was probably used in a design to remind people of the island of Hawaiʻi (Akina 2003).

Pukui (1983) includes 41 Hawaiian proverbs and poetical sayings about kumu lehua. Lehua in these references refer to an attractive person, an expression of

admiration for an outstanding person, unequaled in beauty, wisdom, or skill, a fragrance, a petite person, as pretty as a small, flower-laden tree, a pretty girl, an association with rain, an association with fishing for aku and an expert in catching fish.

For Hawaiians, trees are strong, wise and elder relations. Just what those messages are would be known by the aware or determined by the learning observer. Those who can see, see, and those learning to see, will be able to see more. Repetition reinforces knowledge for both. To put it another way, a word to the wise is sufficient. The natural behavior of lehua, as a life form, permeates Hawaiian perceptions about its beauty, hidden meanings, lei making material, role as protector from the elements and role as social participant with people and gods. Open canopied native trees allow other plants to grow underneath. Their evolution with native species of birds and other life forms as habitat may also have been a reason for their inclusion, (see Figure 1 ~ Logo of ʻAhahui Mālama I Ka Lōkahi).

Lei Plants and Nature Consciousness

What is clear is the number of plants used for lei (56% of species chosen); see Figure 25, for lei plants kokiʻo keʻokeʻo and kī. In recent years, people who make lei have been encouraging themselves and others who study these plants, to grow their own materials rather than to go into the forest and pick depleted plants. Many times during the course of the year lei are made to celebrate Hawaiian culture. Lei Day, May 1st, and the Merrie Monarch Festival, previously mentioned, are two examples when scarce

native materials are in especially great demand. The hālau (schools of Hawaiian dance) that perform often gather plant materials as part of the understanding of the dance.

Figure 25 ~ Amy Greenwell Botanical Garden showing pā pōhaku (rock walls), koki'o ke'oke'o and kī.

Often there are requests from conservationists of these sources that care is taken for the areas by not picking too much and by giving back to the land something in return. The gardens may answer the need by providing easy access to the same material; the gardens protect the forests from unsustainable harvesting. In return, it is culturally expected that the pickers will give back to the garden in the form of tending.

Punawai (Freshwater Spring)

It is not surprising that 26 % of the gardeners paid attention to the punawai in the park to create a water feature with native wetland plants or kalo because fresh water is so important to the culture of Hawai‘i. The word for fresh water is wai. The name of these islands contains this word and the word for wealth in Hawaiian is waiwai.

Work Yet to be Done

The 27 maps contain a wealth of data that this study began to analyze. I would like to take these maps around on visits with members of the Hawaiian community that I know and others that would be interested in seeing the maps. From these visits I would learn from the reactions of the people viewing the designs new things about the culture with respect to plants and garden settings. I can only imagine the interesting stories that the collection would stimulate and that I would possibly hear. Such an appealing project could be audio visually documented to reach wider audiences.

Another thing that would be productive is to translate the English terms that I used in my data analysis into Hawaiian to see where these Hawaiian terms and their associated meanings might direct me. Researching individual plants would also produce interesting information. I could also go back to the informants and ask them better questions now that I have completed this phase of research.

Most importantly, the maps could be studied by a native speaker, or at least a student of the Hawaiian language, for writing another thesis—in Hawaiian. Maps will be placed in the Hawaiian Collection at Hamilton Library on the campus of the University of Hawai‘i at Mānoa (Hori 2003). Much more information could be revealed by matching the language with the culture.

An important realization from this study is that Hawaiian people are open to talking about their garden preferences. This willingness to share information with a

member of an institute of another culture means that it is all right to do so. In Hawaiian terms, talking about gardens is a hiki thing. Hiki means “can, may; to be able; ability; possible (Pukui and Elbert 1986).” There are also hiki ‘ole things, these are things that are “impossible or can’t do.” At the start of this study, it was unclear how Hawaiians would response to a request for cultural information about their plants. By waiting until the right time and place, I received an affirmative response when I asked Kumu Topolinski if I could write about his home garden.

At a hula retreat I once asked him, “How can I help Hawaiians?” Topolinski responded, “Make Hawai‘i more Hawaiian.” With this in mind, I am encouraged by the change in laws regarding plants, the general understanding that Hawaiian political affairs have not yet been fully addressed, the popularity of old and new sovereignty songs and the presence of more native plants. Based on the 81 % (34 of 42) native origin of the most popular plants selected in this study, I expect more research into the orchestration of space by Hawaiians as more native plants are used for landscaping.

It is inescapable that landscapers would overlook the myriad of ways that Hawaiian culture depended on, and still depends on plants (Abbott 1992) and the rich social relationships that Hawaiians have with plants, especially at this time of cultural renaissance. In addition to whatever happens politically, something new as Hawaiian landscapes of native plants, will most likely be eagerly embraced. We can look forward

to the expression of Hawaiian political power in these new horticultural landscapes and a more Hawaiian Hawaiʻi.

Appendix A ~ Garden Species

This appendix lists species for the 23 (of the 27) garden designers that specified plants. Gardens 1, 22 and 24 did not list plants. Terms that informants used are boldfaced. Other names for the plants are listed and included are at least two vernacular names (Hawaiian and common). Species origin is abbreviated, as follows: endemic (end), indigenous (ind), introduced (intro) and Polynesian (Poly). Native plants are comprised of the endemic and indigenous plants combined. See Chapter 3, *Native Plant Renaissance, Definitions*. Gardens numbers indicate the order in which the maps were returned.

Garden 2

SCIENTIFIC NAME	FAMILY NAME	HAWAIIAN NAME	COMMON NAME	ORIGIN
Aleurites moluccana	EUPHORBIACEAE	**kukui**	candlenut tree	Poly
Broussonetia papyrifera	MORACEAE	**wauke**	paper mulberry	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Hibiscus arnottianus	MALVACEAE	**koki‘o ke‘oke‘o**	native white hibiscus	end
Hibiscus kokio	MALVACEAE	koki‘o ‘ula	**native red hibiscus**	end
Nephrolepis spp.	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Osteomeles anthylldifolia	ROSACEAE	**‘ūlei**	native rose	ind
Pandanus odoratissimus	PANDANACEAE	**hala**	hala tree	ind
Pritchardia spp.	ARECACEAE	**loulu palm**	fan palm	end
Samanea saman	FABACEAE	‘ohai	**monkeypod** tree, rain tree	intro
Strelitzia reginae	MUSACEAE	unknown	**bird of paradise**	intro
Wikstroemia spp.	THYMELAEACEAE	**‘ākia**	‘ākia	end

Garden 3

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Calophyllum inophyllum	GUITIFERACEAE	kamani	Indian laurel	Poly
Canthium odoratum (***Psydrax odoratum***)	RUBIACEAE	alahe‘e	alahe‘e	ind
Cassia javanica* x *C. fistula	FABACEAE	unknown	rainbow shower tree	intro
Cordia subcordata	BORAGINACEAE	kou	kou	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti drawf cvs.**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dianella sandwicensis	LILIACEAE	‘uki‘uki	‘uki‘uki	end
Erythrina sandwicensis	FABACEAE	wiliwili	wiliwili	end
Gardenia brigamii	RUBIACEAE	nānū, nānū	nānū, nānū	end
Gossypium tomentosum	MALVACEAE	ma‘o	native cotton	end
Myoporum sandwicensis	MYOPORACEAE	naio	false sandalwood	end
Nototrichium sandwicensis	AMARANTHACEAE	kulu‘ī	kulu‘ī	end
Plumbago zeylanica	PLUMBAGINACEAE	‘ilie‘e	plumbago	end
***Pritchardia* sp.**	ARECACEAE	loulu	fan palm	end
Sapindus oahuensis	SAPINDACEAE	kaulu (lonomea)	lonomea	end
Tabebuia aurea	BIGNONIACEAE	unknown	yellow tabebuia	intro
Wikstroemia uva-ursi	THYMELAEACEAE	‘ākia	‘ākia	end

Garden 4

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Acacia koa	FABACEAE	**koa**	koa	end
Boerhavia repens	NYCTAGINACEAE	**alena**	boerhavia	ind
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	end
Cocos nucifera	ARECACEAE	niu	**coconuts**	Poly
Colocasia esculenta	ARACEAE	kalo	**wet and dry taro**	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti leaf**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dicranopteris linearis	GLEICHENIACEAE	**uluhe**	uluhe	ind
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gardenia brigamii	RUBIACEAE	**nānū**	nānū	end
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end
Heteropogon contortus	POACEAE	**pili grass**	pili grass	ind
Ipomoea batatas	CONVOLVULACEAE	ʻuala	**sweet potato**	Poly
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa all colors**	ʻōhia all colors	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**, palai	palapalai	ind
Musa paradisiaca	MUSACEAE	maiʻa	**bananas**	Poly
Nestegis sandwicensis	OLEACEAE	olopua	olopua	end
Phymatosorus grossus	POLYOPODIACEAE	**lauwai**	lauaʻe, maile scented fern	intro
Pritchardia hillebrandii	ARECACEAE	**loulu palms**	fan palm	end
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end
Sesbania tomentosa	FABACEAE	**ʻohai**	ʻohai	end
Sida fallax	MALVACEAE	**ʻilima**	**mānele**	end

Styphelia tameiameiae	EPACRIDACEAE	**pūkiawe**	pūkiawe	end
Thespesia populnea	MALVACEAE	**milo**	milo	Poly
Waltheria americana	STERCULIACEAE	**ʻuhaloa**	ʻuhaloa	ind
Wikstromea uva-ursa	THYMELACEAE	**ʻakia**	ʻakia	end

Garden 5

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa**	koa	end
Aleurites moluccana	EUPHORBIACEAE	**kukui**	candlenut tree	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Diospyros sandwicensis	EBENACEAE	**lama**	ebony	end
Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	**kokiʻo keʻokeʻo**	white hibiscus	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**, palai	palapalai	end
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Pandanus odoratissimus	PANDANACEAE	**hala**	hala tree	ind
Phymatosorus grossus	POLYOPODIACEAE	**lauwaʻe**	lauaʻe	intro
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end

Garden 6

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Aleurites moluccana	EUPHORBIACEAE	**kukui normal**	normal leaf candlenut tree	Poly
Aleurites moluccana	EUPHORBIACEAE	**kukui oval**	oval-leaf candlenut tree	Poly
Aleurites remyi	EUPHORBIACEAE	**kukui remyi**	narrow-lobed leaf candlenut tree	Poly
Arachis pintoi cultivar *golden glory*	FABACEAE	unknown	**glory bean**, perennial peanut, pinto peanut	intro
Calophyllum inophyllum	GUITIFERACEAE	**kamani**	Indian laurel	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Hemigraphis colorata	ACANTHACEAE	unknown	**hemigraphis**	intro
Hibiscus arnottianus f. *parviflorus*	MALVACEAE	koki‘o ke‘oke‘o	small flowered white **hibiscus**	end
Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	koki‘o ke‘oke‘o	white **hibiscus**	end
Hibiscus arnottianus var. *punaluuensis*	MALVACEAE	koki‘o ke‘oke‘o	white **hibiscus** tree	end
Saccharum officinarum	POACEAE	**Hawaiian kō**	sugar cane	Poly
Samanea saman	FABACEAE	‘ōhai	**monkeypod**, rain tree	intro

Garden 7

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Bonamia menziesii	CONVOLVULACEAE	unknown	Hawaiian bonamia	end
Cocculus trilobus	MENISPERMACEAE	huehue **huihui**	unknown	ind

Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	end
Hibiscus waimeae	MALVACEAE	kokiʻo keʻokeʻo, kokiʻo kea	fragrant white hibiscus	end
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Notorichium sandwicensis	AMARANTHACEAE	**kuluʻī**	kuluʻi	end
Pritchardia hillebrandii	ARECACEAE	**loulu**	fan palm	end
Psydrax (Canthium) odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	end
Vitex rotundifolia	VERBENACEAE	**pōhinahina**, pōlinalina	beach vitex	ind

Garden 8

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa trees**	koa	end
Cordyline fruticosa	LILIACEAE	kī	**ti varieties**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Hibiscus arnottianus f. *parviflorus*	MALVACEAE	kokiʻo keʻokeʻo	**Hawaiian hibiscus** small flowered white hibiscus	end
Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	kokiʻo keʻokeʻo	**Hawaiian hibiscus** white hibiscus	end
Hibiscus brackenridgei	MALVACEAE	maʻo hau hele	**Hawaiian hibiscus** yellow hibiscus	end
Hibiscus clayi	MALVACEAE	kokiʻo ʻula	**Hawaiian hibiscus** red Kauaʻi	end
Hibiscus kokio	MALVACEAE	kokiʻo ʻula	**Hawaiian hibiscus** red hibiscus	end
Hibiscus kokio subsp. *saintjohnianus*	MALVACEAE	kokiʻo ʻula	**Hawaiian hibiscus** orange, orangish red, yellow	end

Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa lehua trees**	ʻōhiʻa	end
Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	end
Syzygium malaccense	MYRTACEAE	**ʻōhiʻa ʻai**	mountain apple	Poly

Garden 9

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Acacia koaia	FABACEAE	**koaiʻa**	koaiʻa	end
Aleurites moluccana	EUPHORBIACEAE	**kukui**	normal leaf candlenut	Poly
Alyxia oliviformis	APOCYNACEAE	**maile**	maile	end
Bidens amplectens	ASTERACEAE	**koʻokoʻolau**	koʻokoʻolau	end
Canthium odoratum	RUBIACEAE	**ʻalaheʻe**	alaheʻe	end
Chamaesyce spp.	EUPHORBIACEAE	**ʻakoko**	ʻakoko	end
Chenopodium oahuense	CHENOPODIACEAE	**ʻāweoweo**	lamb's quarters	end
Cladium jamaicense	CYPERACEAE	**ʻuki**	sawgrass	ind
Cocculus trilobus	MENISPERMACEAE	**huehue**	huehue	ind
Cuscuta sandwichiana	CUSCUTACEAE	**kaunaʻoa**	dodder	end
Cynodon dactylon	POACEAE	**mānienie**	Bermuda grass	intro
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi kumakua**	ʻaʻaliʻi	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end
Heteropogon contortus	POACEAE	**pili**	pili grass	ind
Lipochaeta integrifolia	ASTERACEAE	**nehe**	nehe	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa lehua**	ʻōhia	end
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Nothocestrum latifolium	SOLANACEAE	**ʻaiea**	ʻaiea	end

Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind
Pandanus odoratissimus	PANDANACEAE	**hala**	hala tree	ind
Pleomele halapepe	AGAVACEAE	**hala pepe, leʻie**	hala pepe	end
Plumbago zeylanica	PLUMBAGINACEAE	**ʻilieʻe**	leadwort	ind
Reynoldsia sandwicensis	ARALIACEAE	**ʻohe makai**	ʻohe	end
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end
Sapindus oahuensis	SAPINDACEAE	**lonomea**	soapberry	end
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	end
Sporobolus virginicus	POACEAE	**ʻakiʻaki**	seashore rush grass	ind
Wikstromea uva-ursa	THYMELACEAE	**ʻakia**	ʻakia	end

Garden 10

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa**	koa	end
Aleurites moluccana	EUPHORBIACEAE	**kukui**	normal leaf candlenut	Poly
Argemone glauca	PAPAVERACEAE	**pua kala**	pua kala	end
Artocarpus altilis	MORACEAE	**ʻulu**	breadfruit	Poly
Bidens amplectens	ASTERACEAE	**koʻokoʻolau**	koʻokoʻolau	end
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind

Cibotium glaucum	DICKSONIACEAE	**hāpuʻu**, hāpuʻu pulu	tree fern	end
Cocos nucifera	ARECACEAE	**niu**	coconut	Poly
Colocasia esculenta	ARACEAE	kalo	**taro**	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti varieties**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dioscorea alata	DIOSCOREA	**uhi**	uhi	Poly
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gardenia brigamii	RUBIACEAE	**nānū**	nānū	end
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end
Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	**kokiʻo keʻokeʻo**	white hibiscus	end
Hibiscus brackenridgei	MALVACEAE	**maʻo hau hele**	state flower	end
Hibiscus kokio	MALVACEAE	**kokiʻo ʻula**	red hibiscus	end
Hibiscus tiliaceus	MALVACEAE	**hau**	hau	ind
Ipomoea batatas	CONVOLUVLACEAE	ʻuala	**sweet potato**	Poly
Jacquemontia ovalifolia	CONVOLVULACEAE	**paʻuohiʻiaka**	paʻuohiʻiaka	ind
Lipochaeta integrifolia	ASTERACEAE	**nehe**	nehe	end
Metrosideros polymorpha	MYRTACEAE	ʻōhiʻa lehua	**ʻōhia all colors**	end
Musa acuminata hybrids	MUSACEAE	**maiʻa**	**banana**	Poly
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind
Pandanus odoratissimus	PANDANACEAE	**hala**	hala tree	ind
Piper methysticum	PIPERACEAE	**ʻawa**	kava	Poly
Plantago princeps var. *anomala*	PLANTAGINACEAE	**lau-kāhi** kuahiwi, ale	plantago	end
Pritchardia martii H.	ARECACEAE	**loulu**	fan palm	end
Psychotria spp.	RUBIACEAE	**kōpiko**	kōpiko	end

Saccharum officinarum	POACEAE	**kō**	**sugar cane**	Poly
Santalum ellipticum	SANTALACEAE	ʻiliahi, īliahialoʻe	**coastal sandalwood**	end
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end
Schizostachyum glaucifolium	POACEAE	**ʻohe**	**Hawaiian bamboo**	Poly
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	ind
Sida fallax	MALVACEAE	**ʻilima papa**	ʻilima papa ku kahakai	ind
Solanum americanum	SOLANACEAE	**pōpolo**	pōpolo	Poly
Syzygium malaccense	MYRTACEAE	**ʻōhia ʻai**	mountain apple	Poly
Tacca leontopetaloides	TACCACEAE	**pia**	pia	Poly
Waltheria americana	STERCULIACEAE	**ʻuhaloa**	ʻuhaloa	ind
Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 11

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind
Charpentiera spp.	AMARANTHACEAE	**pāpala**	pāpala	end
Cordia subcordata	BORAGINACEAE	**kou**	kou	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Diospyros hillebrandii	EBENACEAE	**lama hillebrandii**, ēlama	Hawaiian ebony	end
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi kumakua**	ʻaʻaliʻi	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gardenia brigamii	RUBIACEAE	**naʻu**, nānū	naʻu, nānū	end
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end

Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	**kokiʻo keʻokeʻo**	**various native hibiscus**	end
Hibiscus brackenridgei	MALVACEAE	**maʻo hau hele**	**various native hibiscus,** state flower	end
Hibiscus ***clayi***	MALVACEAE	kokiʻo	**various native hibiscus,** red hibiscus Kauaʻi	end
Hibiscus kahilii	MALVACEAE	kokiʻo	**various native Hibiscus**	end
Hibiscus kokio	MALVACEAE	kokiʻo, kokiʻo ʻula, kokiʻo ʻula ʻula	**various native hibiscus**	end
Hibiscus kokio subsp. ***saintjohnianus***	MALVACEAE	kokiʻo ʻula	**various native Hibiscus,** orange and yellow Kauaʻi	end
Hibiscus waimeae	MALVACEAE	kokiʻo kea	**various native Hibiscus,** fragrant white	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhiʻa	end
Metrosideros polymorpha var. *tremuloides*	MYRTACEAE	**lehua ʻāhihi**	creeping lehua	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**	palapalai	ind
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**ʻokupupu**, okupukupu, kupukupu	sword fern	ind
Nestegis sandwicensis	OLEACEAE	**olopua**	olopua	end
Notorichium sandwicensis	AMARANTHACEAE	**kuluʻī**	kuluʻī	end
Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind
Phyllostegia grandiflora	LAMIACEAE	**kāpana** (**Koʻolau**)	kāpana	end

Pittosporum confertiflorum	PITTOSPORACEAE	**hōʻawa Palikea**	hōʻawa	end
Sida fallax	MALVACEAE	**ilima papa**	flat ʻilima	ind
Sida fallax	MALVACEAE	**ilima kula**	ʻilima growing on the plains, kukula	ind
Vitex rotundifolia	VERBENACEAE	**pōlinalina**, pōhinahina	beach vitex	ind

Garden 12

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa**	koa	end
Artocarpus altilis	MORACEAE	**ʻulu tree**	breadfruit	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti, green spoon**	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia **all colors**	end
Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind

Garden 13

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa**	koa	end
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end

Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	koki‘o ke‘oke‘o	**native hibiscus**, white hibiscus	end
Hibiscus kokio	MALVACEAE	koki‘o ‘ula	**native hibiscus**, red hibiscus	end
Metrosideros polymorpha	MYRTACEAE	**‘ōhi‘a all colors**	‘ōhia	end
Osteomeles anthyllidifolia	ROSACEAE	**‘ūlei**	native rose	ind
Santalum freycinetianum	SANTALACEAE	**‘iliahi**	sandalwood	end
Sapindus oahuensis	SAPINDACEAE	**lonomea** (kaulu)	kaulu	end
Wikstroemia uva-ursi	THYMELAEACEAE	**‘ākia**	‘ākia	end

Garden 14

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon menziesii	MALVACEAE	**ko‘oloa‘ula**	red 'ilima	end
Acacia koa	FABACEAE	**koa**	koa	end
Achyranthes splendens	AMARANTHACEAE	ewa hina	ewa hina	end
Alyxia oliviformis	APOCYNACEAE	**maile**	maile	end
Canthium odoratum	RUBIACEAE	**alahe‘e**	alahe‘e	ind
Chenopodium oahuense	CHENOPODIACEAE	**‘āweoweo**	lamb’s quarters	end
Cordia subcordata	BORAGINACEAE	**kou**	kou	ind
Cynodon dactylon	POACEAE	**mānienie**	Bermuda grass	intro
Dianella sandwicensis	LILIACEAE	**‘uki‘uki**	‘uki‘uki	ind
Dodonaea viscosa	SAPINDACEAE	**‘a‘ali‘i**	‘a‘ali‘i	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gardenia brighamii	RUBIACEAE	**na‘u**, nānū	nānū	end
Gossypium tomentosum	MALVACEAE	**ma‘o**	native cotton	end

Hibiscus arnottianus* f. *parviflorus	MALVACEAE	kokiʻo keʻokeʻo	small flowered white hibiscus	end
Hibiscus arnottianus* subsp. *arnottianus	MALVACEAE	kokiʻo keʻokeʻo	white hibiscus	end
Hibiscus arnottianus* var. *punaluuensis	MALVACEAE	kokiʻo keʻokeʻo	white hibiscus tree	end
Hibiscus brackenridgei	MALVACEAE	**maʻo hau hele**	state flower	end
Hibiscus clayi	MALVACEAE	kokiʻo ʻula	red Kauaʻi	end
Hibiscus kokio	MALVACEAE	**kokiʻo ʻula**	red hibiscus	end
Hibiscus kokio* subsp. *saintjohnianus	MALVACEAE	kokiʻo ʻula	orange hibiscus	end
Hibiscus waimeae	MALVACEAE	kokiʻo keʻokeʻo, kokiʻo kea	fragrant white hibiscus	end
Kokia drynarioides	MALVACEAE	**hau heleʻula**	hau heleʻula	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia **all colors**	end
Munroidendron racemosum	ARALIACEAE	unknown	**munroidendron**	end
Myoporum sandwicensis	MYOPORACEAE	**naio papa**	false sandalwood	end
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Osteomeles anthyllidifolia	ROSACEAE	**ʻūlei**	native rose	ind
Pittosporum confertiflorum	PITTOSPORACEAE	**hōʻawa Palikea**	hōʻawa	end
Pritchardia hillebrandii	ARECACEAE	**loulu**	fan palm	end
Sapindus oahuensis	SAPINDACEAE	**lonomea**, aulu, kaulu	Oʻahu soapberry	end
Sesbania tormentosa	FABACEAE	**ʻōhai**	ʻōhai	end
Sesuvium portulacastrum	AIZOACEAE	**ʻākulikuli**	ʻākulikuli	ind
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	ind

Vitex rotundifolia	VERBENACEAE	**pōhinahina**, pōlinalina	beach vitex	ind
Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 15

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Acacia koa	FABACEAE	**koa**	koa	end
Broussonetia papyrifera	MORACEAE	**wauke**	paper mulberry	Poly
Colocasia esculenta	ARACEAE	**kalo**	taro	Poly
Curcuma longa	ZINGIBERACEAE	**ʻōlena**	turmeric	Poly
Cynodon dactylon	POACEAE	**grass**	Bermuda grass	intro
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Ipomoea batatas	CONVOLULACEAE	**ʻuala**	sweet potato	Poly
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia **all colors**	end
Musa paradisiaca	MUSACEAE	**maiʻa**	banana	Poly
Saccharum officinarum	POACEAE	**kō**	sugar cane	Poly
Touchardia latifolia	URTICACEAE	**olonā**	olonā	end

Garden 16

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Aleurites moluccana	EUPHORBIACEAE	**kukui**	normal leaf candlenut tree	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia **all colors**	end
Notorichium sandwicensis	AMARANTHACEAE	**kuluʻī**	kuluʻī	end
Pritchardia hillebrandii	ARECACEAE	**native loulu**	fan palm	end

Garden 17

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon menziesii	MALVACEAE	koʻoloaʻula	**abutilon**, red 'ilima	end
Alphitonia ponderosa	RHAMNACEAE	**kauwila**, kauila	kauila	end
Alyxia oliviformis	APOCYNACEAE	**maile**	maile	end
Argemone glauca	PAPAVERACEAE	**pua kala**	pua kala	end
Artemisia mauiensis	ASTERACEAE	**ʻāhinahina artemesia**	ʻāhinahina	end
Bidens asymmetrica	ASTERACEAE	**koʻokoʻolau**	Diamond Head bidens	end
Brighamia insignis	CAMPANULACEAE	**ālula** , ʻōlulu	cabbage on a bat	end
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind
Cladium jamaicense	CYPERACEAE	**ʻuki grass**	ʻuki grass, Pele grass, volcano grass	ind
Colocasia esculenta	ARACEAE	kalo	**taro**	Poly
Cordyline fruticosa	LILIACEAE	kī	**ti plants varieties**	Poly
Curcuma longa	ZINGERBIACEAE	**ʻōlena**	ʻōlena	Poly
Cynodon dactylon	GRAMINACEAE	mānienie	Bermuda grass	intro
Cyperus laevigatus	CYPERACEAE	**makaloa**	makaloa	end
Dianella sandwicensis	LILIACEAE	**ʻukiʻuki**	ʻukiʻuki	ind
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Gardenia brigamii	RUBIACEAE	**nānū**	nānū	end
Geranium arboreum	GERANIACEAE	**nohoanu**	nohoanu	end
Gnaphalium sandwicensium	ASTERACEAE	**ʻenaʻena**	ʻenaʻena	end
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end
Heliotropium anomalum var. *argenteum*	BORAGINACEAE	**hinahina**	hinahina	end
Heteropogon contortus	POACEAE	pili	**pili grass**	ind

Hibiscus arnottianus f. *parviflorus*	MALVACEAE	kokiʻo keʻokeʻo	**native hibiscus** small flowered white hibiscus	end
Hibiscus arnottianus subsp. *arnottianus*	MALVACEAE	kokiʻo keʻokeʻo	**native hibiscus** white hibiscus	end
Hibiscus clayi	MALVACEAE	unknown	**native hibiscus** red Kauaʻi	end
Hibiscus kokio	MALVACEAE	kokiʻo, kokiʻo ʻula, kokiʻo ʻula ʻula	**native hibiscus**, red hibiscus	end
Hibiscus kokio subsp. *saintjohnianus*	MALVACEAE	kokiʻo ʻula ʻula	**native hibiscus** orange	end
Hibiscus waimeae	MALVACEAE	kokiʻo keʻokeʻo, kokiʻo kea	**native hibiscus** fragrant white hibiscus	end
Ipomoea batatas	CONVOLULACEAE	**ʻuala**	sweet potato	Poly
Lysimachia daphnoides	PRIMULACEAE	**kolokolo kuahiwi**, lehua, makanoe,	kolokolo kuahiwi	end
Marattia douglasii (Presl)	MARATTIACEAE	**pala**, kapuaʻilio	mule's foot fern	end
Mariscus hypochlorus	CYPERACEAE	**ʻahuʻawa**	ʻahuʻawa	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia **all colors**	end
Metrosideros polymorpha var. *tremuloides*	MYRTACEAE	**lehua ʻāhihi**	creeping lehua	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**	palapalai	end
Morinda citrifolia	RUBIACEAE	**noni**	noni	Poly
Notorichium sandwicensis	AMARANTHACEAE	**kuluʻī**	kuluʻī	end
Piper methysticum	PIPERACEAE	**ʻawa**	kava	Poly
Pipturus albidus	URTICACEAE	**māmaki**	māmaki	end
Plantago major	PLANTAGINACEAE	**laukahi kuahiwi**	plantain	intro

Pleomele halapepe	LILIACEAE	**hala pepe**	hala pepe	end
Pritchardia martii H.	ARECACEAE	**loulu oʻahu**	loulu hiwa	end
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end
Scaevola gaudichaudiana	GOODENIACEAE	**naupaka kuahiwi**	mountain naupaka	end
Sesbania tomentosa	FABACEAE	**ʻohai**	shrub	end
Sida fallax	MALVACEAE	**ʻilima kukaha kai**	ʻilima	ind
Silene lanceolata	CARYOPHYLLACEAE	unknown	**native silene**, catchfly	end
Solanum americanum	SOLANACEAE	**pōpolo**	glossy nightshade	ind
Sophora chrysophylla	FABACEAE	**māmane**	māmane	end
Sphenomeris chinensis	LINDASAEACEAE	**palaʻā**, palaʻe	lace fern	ind
Stronylodon ruber	FABACEAE	**nuku ʻiʻiwi**	nuku ʻiʻiwi	end
Styphelia tameiameiae	EPACRIDACEAE	**pūkiawe**	pūkiawe	ind
Tacca leontopetaloides	TACCACEAE	**pia**	pia	Poly
Touchardia latifolia	URTICACEAE	**olonā**	olonā	end
Viola chamissoniana subsp. *Chamissoniana*	VIOLACEAE	pāmakami; ʻolopū	**violet**	end
Vitex rotundifolia	VERBENACEAE	**pōhinahina**, pōlinalina	beach vitex	ind
Waltheria americana	STERCULIACEAE	**ʻuhaloa**	ʻuhaloa	ind
Wikstroemia monticola	THYMELAEACEAE	**ʻākia**	ʻākia tree	end
Zingiber zerumbet	ZINGIBERACEAE	**ʻawapuhi**	shampoo ginger	Poly

Garden 18

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon menziesii	MALVACEAE	**koʻoloaʻula**	red 'ilima	end
Acacia koa	FABACEAE	**koa**	koa	end
Adiantum capillus-veneris	PTERIDACEAE	**ʻiwaʻ iwa**, ʻiwaʻiwa hawai, ʻiwaʻiwa kahakaha	lace fern	ind
Alyxia oliviformis	APOCYNACEAE	**maile**	maile	end
Artemisia mauiensis	ASTERACEAE	**ʻāhinahina**	ʻāhinahina	end
Asplenium nidus	ASPLENIACEAE	**ʻēkaha**, ʻēkaha kuahiwi, ʻākaha, ʻēkahakaha	bird's-nest fern	end
Bidens cosmoides	ASTERACEAE	**poʻolā nui**	large sun head	end
Broussonetia papyrifera	MORACEAE	**wauke**, poʻaʻaha	paper mulberry	Poly
Cibotium glaucum	DICKSONIACEAE	**hāpuʻu** pulu	tree fern	end
Colocasia esculenta	ARACEAE	kalo **elepaio**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **lauloa eleele-ula**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **mana eleele**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **mana uliuli**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo ***mana ulu***	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo ***manini kea***	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **piko kea**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **piko uaula**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **uahiapele**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo ***ulaula kumu***	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **ulaula moano**	**taro**	Poly
Colocasia esculenta	ARACEAE	kalo **ulaula poni**	**taro**	Poly
Cordyline fruticosa	LILIACEAE	**kī**	ti	Poly
Cuscuta sandwichiana	CUSCUTACEAE	**kaunaʻoa**	dodder	end

Cynodon dactylon	POACEAE	**lawn**	Bermuda grass	intro
Dodonea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Hibiscus tiliaceus	MALVACEACE	**hau**	hau	ind
Ipomoea batatas	CONVOLVULACEAE	**ʻuala**	sweet potato	Poly
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhia all colors	end
Microlepia strigosa	DENNSTAEDTIACEAE	**Palapalai,** palali	palapalai	ind
Morinda citrifolia	RUBIACEAE	**noni**	noni	Poly
Munroidendron racemosum	ARALIACEAE	unknown	**munroidendron**	end
Musa acuminata hybrids	MUSACEAE	**maiʻa**	banana	Poly
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Peperomia spp.	PIPERACEAE	**ʻalaʻala wai nui**	peperomia	end
Piper methysticum	PIPERACEAE	**ʻawa**	kava	Poly
Pipturus albidus	URTICACEAE	**māmaki**	māmaki	end
Plantago pachyphylla	PLANTAGINACEAE	**laukahi kauahiwi,** ale	plantago	end
Plumbago zeylanica	PLUMBAGINACEAE	**ʻilieʻ e**	plumbago	ind
Saccharum officinarum	POACEAE	**kō**	sugar cane	Poly
Sesbania tomentosa	FABACEAE	**ʻohai**	ʻohai	end
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	ind
Sida fallax	MALVACEAE	**ʻilima kukaha kai**	ʻilima	ind
Vitex rotundifolia	VERBENACEAE	**pōhinahina**, pōlinalina	beach vitex	ind
Waltheria americana	STERCULIACEAE	**ʻuhaloa**	ʻuhaloa	ind
Wikstromia uva-ursi	THYMELALEACEAE	**ʻākia**	ʻākia	end
Zingbiger zerumbet	ZINGIBERACEAE	**ʻawapuhi**, ʻawapuhi kuahiwi	shampoo ginger	Poly

Garden 19

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Acacia koa	FABACEAE	**koa**	koa	end
Canthium odoratum	RUBIACEAE	**alahe‘e**	alahe‘e	ind
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	Intro
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Metrosideros polymorpha	MYRTACEAE	**‘ōhi‘a lehua**	‘ōhia	end

Garden 20

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Aleurites moluccana	EUPHORBIACEAE	**kukui**	normal leaf candlenut tree	Poly
Artocarpus altilis	MORACEAE	**kumu ‘ulu lā‘au**	breadfruit, kumu lā’au ‘ulu	Poly
Bidens amplectens	ASTERACEAE	**ko‘oko‘olau**	ko‘oko‘olau	end
Carthamus tinctorius	ASTERACEAE	**pua mamo**	safflower, false saffron	intro
Cladium jamaicense	CYPERACEAE	**‘uki**	‘uki grass, Pele grass, volcano grass	ind
Coprosma ernodeoides	RUBIACEAE	**kūkaenēnē**	kūkaenēnē	end
Cordyline fruticosa	LILIACEAE	**la‘ī**	**ti leaves**	Poly
Curcuma longa	ZINGERBIACEAE	**‘ōlena**	‘ōlena	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dodonaea viscosa	SAPINDACEAE	**lā‘au ‘a‘ali‘i**	‘a‘ali‘i	ind
Jacquemontia ovalifolia	CONVOLVULACEAE	**pa‘uohi‘iaka**	pa‘uohi‘iaka	ind
Metrosideros polymorpha	MYRTACEAE	**‘ōhi‘a lehua**	‘ōhia **all colors**	end
Morinda citrifolia	RUBIACEAE	**noni**	noni	Poly

Oxalis corniculata	OXALIDACEAE	**ʻihi**, ʻihi ʻai, ʻihi ʻawa, ʻihi maka ʻula	yellow wood sorrel	Poly
Phymatosorus grossus	POLYOPODIACEAE	**lauaʻe**	lauaʻe, maile scented fern	intro
Pipturus albidus	URTICACEAE	**māmaki**	māmaki	end
Plantago major	PLANTAGINACEAE	**laukahi**, kūhēkili	broad-leaved or common plantain	intro
Scaevola gaudichaudiana	GOODENIACEAE	**naupaka mauka**	mountain naupaka	end
Sida fallax	MALVACEAE	**ʻilima āhiu**	flat ʻilima, ʻilima ʻāhiu	ind
Styphelia tameiameiae	EPACRIDACEAE	**pūkiawe**	pūkiawe	ind
Vaccinium reticulatum	ERICACEAE	**ʻōhelo**, ʻōhelo ʻai	ʻōhelo	end
Verbena litoralis	VERBENACEAE	**haʻuōwī**, ōwī, oī, haʻuoi	verbena	intro
Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 21

Scientific Name	**Family**	**Hawaiian Name**	**Common Name**	**Origin**
Acacia koa	FABACEAE	**koa**	koa	end
Aleurites moluccana	EUPHORBIACEAE	**kukui**	candlenut tree	Poly
Artocarpus altilis	MORACEAE	**ʻulu**	breadfruit	Poly
Colocasia esculenta	ARACEAE	**kalo**	taro	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Jacaranda acutifolia	BIGNONIACEAE	unknown	**jacaranda**	intro
Schinus molle	ANACARDIACEAE	unknown	**California pepper tree**	intro

Garden 23

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon grandiflolium	MALVACEAE	**royal ilima**	royal ʻilima	intro
Abutilon menzezii	MALVACEAE	**koʻoloa ʻula**	red ʻilima	end
Abutilon pictum	MALVACEAE	aloalo huamoa, aloalo Pele	**lantern ʻilima**, bell ʻilima, egg ʻilima	intro
Adiantum capillus-veneris	PTERIDACEAE	ʻiwaʻiwa, ʻiwaʻiwa hāwai	**maiden hair fern**	ind
Aleurites moluccana	EUPHORBIACEAE	**kukui**	candlenut tree	Poly
Aloe barbadensis	LILIACEAE	**ʻaloe**, pānnini ʻawaʻawa	aloe	intro
Alyxia oliviformis	APOCYNACEAE	maile kaluhea	**maile**	end
Alyxia oliviformis f. *sulcata*	APOCYNACEAE	maile lau nui	**maile big leaf**	end
Alyxia oliviformis f.*angusta*	APOCYNACEAE	maile lau liʻi	**maile little leaf**	end
Argemone glauca	PAPAVERACEAE	**pua kala**, kala,	pua kala	end
Artemisia mauiensis	ASTERACEAE	**ʻāhinahina**	ʻāhinahina	end
Artocarpus altilis	MORACEAE	**ʻulu**	breadfruit	Poly
Asplenium nidus	ASPLENIACEAE	**ʻēkaha**, ʻēkaha kuahiwi	bird's-nest fern	ind
Astelia menziesiana	LILIACEAE	**paʻiniu**, kaluaha, puaʻakuhinia	paʻiniu	end
Bidens amplectens	ASTERACEAE	**koʻokoʻolau**	koʻokoʻolau	end
Broussonetia papyrifera	MORACEAE	**wauke**	paper mulberry	Poly
Canavalia cathartica	FABACEAE	**maunaloa pink, purple**	maunaloa	intro
Canavalia galeata	FABACEAE	**ʻāwikiwiki**, puakauhi	ʻāwikiwiki	end
Canthium ordoratum	RUBIACEAE	**alaheʻe**, ʻōheʻe	alaheʻe	ind
Capsicum frutescens	SOLANACEAE	nīoi, nīoi pepa	**chilipeppers**	intro
Chenopodium oahuense	CHENOPODIACEAE	**ʻāheahea, ʻāweoweo**	ʻāweoweo	end
Cibotium glaucum	DICKSONIACEAE	**hapuʻu**, hapuʻu pulu	hapuʻu	end

Cocos nucifera	ARECACEAE	**niu**	coconut	Poly
Colocasia esculenta	ARACEAE	**kalo**	taro	Poly
Columbrina oppositifolia	RHAMNACEAE	**kauila**, kauwila	kauila	end
Cordia subcordata	BORAGINACEAE	**kou**	kou	ind
Cordyline fruticosa	LILIACEAE	kī	**dwarf ti**	intro
Cordyline fruticosa	LILIACEAE	kī	**ti**	Poly
Curcuma longa	ZINGIBERACEAE	**ʻōlena**, lena mālena	ʻōlena	Poly
Cuscuta sandwichiana	CUSCUTACEAE	**kaunaʻoa, kaunaʻoa kahakai**, kaunaʻoa lei	dodder	end
Cynodon dactylon	POACEAE	**mānienie**	Bermuda grass	intro
Dioscorea alata	DIOSCOREACEAE	uhi	uhi	Poly
Diospyros sandwicensis	EBENACEAE	**lama**	Hawaiian ebony	end
Diplazium arnottii	POLYPODIACEAE	**hōʻiʻo**	hōʻiʻo	end
Dodonea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi large shrub	ind
Euphorbia tirucalli	EUPHORBIACEAE	unknown	**pencil plant**, pencil shrub	intro
Fagraea berteriana	LOGANIACEAE	**puakenikeni**	ten cents flower	intro
Gardenia brighamii	RUBIACEAE	**naʻu**, nānū	native gardenia	end
Gardenia jasminoides	RUBIACEAE	kiele	**gardenia**	intro
Gossypium tomentosum	MALVACEAE	**maʻo**, huluhulu	Hawaiian cotton	end
Heliotropium anomalum var. *argenteum*	BORAGINACEAE	**hinahina rosette**, kīpūkai, hinahina kū kahakai	hinahina	ind
Hibisbus waimeae	MALVACEAE	**kokiʻo keʻokeʻo waimea**, kokiʻo kea	fragrant white	end
Hibiscus arnottianus f. *parviflorus*	MALVACEAE	**kokiʻo keʻokeʻo parviflorus**	small flowered white	end
Hibiscus arnottianus subsp. *arnotttianus*	MALVACEAE	**kokiʻo keʻokeʻo**	native white hibiscus	end
Hibiscus arnottianus subsp.	MALVACEAE	**kokiʻo keʻokeʻo**	native white hibiscus	end

immaculatus		**immaculatus**		
Hibiscus arnottianus subsp. *punaluuensis*	MALVACEAE	**kokiʻo keʻokeʻo punluuensis**	native white hibiscus	end
Hibiscus brackenridgei	MALVACEAE	**maʻo hau hele**	Hawaiʻi state flower	end
Hibiscus clayi	MALVACEAE	**kokiʻo ʻula clayi**	deep red flower Kauaʻi	end
Hibiscus furcellatus	MALVACEAE	**ʻakiohala**, ʻakiahala, hau hele wai	ʻakiohala	ind
Hibiscus kokio subsp. *kokio*	MALVACEAE	**kokiʻo ʻula**	native red hibiscus	end
Hibiscus kokio subsp. *saintjohnianus*	MALVACEAE	**kokiʻo ʻula yellow**	native orange hibiscus	end
Hibiscus kokio subsp. *saintjohnianus*	MALVACEAE	**kokiʻo ʻula yellow**	native yellow hibiscus	end
Hibiscus syriacus	MALVACEAE	ʻakiahala,	**rose of Sharon**, blue hibiscus	intro
Hippobroma longiflora	GOODENIACEAE	pua hoku	**Star of Bethlehem**	intro
Ipomoea batatas	CONVOLVULACEAE	**ʻuala**	sweet potato	Poly
Ipomoea pes-caprae subsp. *brasiliensis*	CONVOLVULACEAE	**pōhuehue**, puheuhue	beach morning glory	ind
Jacquemontia ovalifolia	CONVOLVULACEAE	**paʻuohiʻiaka**	paʻuohiʻiaka	ind
Jasminum sambac	OLEACEAE	pīkake pupupu	**double pīkake**, rose pīkake	intro
Jasminum sambac	OLEACEAE	pīkake lahilahi	**single pīkake**, lei pikake	intro
Kokia drynarioides	MALVACEAE	**hau hele ʻula**	tree hibiscus	end
Lampranthus glomeratus	AIZOACEAE	**ʻakulikuli lei, cream, white, yellow, pink, rose pink**	ice plant, white, yellow, pink, lavender, orange	intro
Lipochaeta integrifolia	ASTERACEAE	**nehe coastal tea**	nehe	end

Manihot esculenta	EUPHORBIACEAE	manioka	**Tapioca,** manioka, cassava	
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa lehua, mamo, all colors, ʻōhiʻa ʻula, liko lehua**	ʻōhiʻa, **white Lanai, pink, red, orange, yellow, mustard**	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**, palai	palapalai	end
Musa acuminata hybrids	MUSACEAE	**maiʻa**	banana	Poly
Myoporum sandwicensis	MYPORACEAE	**naio**	naio	ind
Nephrolepis biserrata var*. furcans*	NEPHROLEPIDACEAE	hiʻuiʻa	**fish tail fern**	int
Nephrolepis cordifolia	NEPHROLEPIDACEAE	kupukupu	**sword fern**	ind
Nerium indicum	APOCYNACEAE	ʻoliwa, ʻoleana	**oleander**	intro
Notorichium sandwicensis	AMARANTHACEAE	**kuluʻī**	kuluʻī	end
Pandanus odoratissimus	PANDANACEAE	**hala, varigated hala**	hala tree	ind
Pelea anisata	RUTACEAE	**mokihana**, mokehana	mokihana	end
Pipturus albidus	URTICACEAE	**māmaki**, māmake	māmaki	end
Pityrograma austroamerican	PTERIDACEAE	unknown	**goldenback fern**	intro
Pityrograma calomelanos	PTERIDACEAE	unknown	**silverback fern**	intro
Plantago aristata	PLANTAGINACEAE	**laukahi**	**bracted plantain**	intro
Plantago lancelata	PLANTAGINACEAE	**laukahi**	**narrow-leaved or English plantain**	intro
Plantago major	PLANTAGINACEAE	**laukahi**	laukahi	intro
Plantago princeps	PLANTAGINACEAE	**laukahi kuahiwi, ale**	plantain	end
Portulaca molokiniensis	PORTULACACEAE	**ʻihi**	ʻihi	
Pritchardia hillebrandii	ARECACEAE	**loulu**	fan palm	end
Psilotum nudum	PSILOTACEAE	**moa**, moa nahele	moa, upright wisk fern	ind
Rosa chinensis var. *viridiflora*	ROSACEAE	**pualokelau**, lokelau	green rose	intro
Rosa sp.	ROSACEAE	**lokelani**	double pink rose,	intro

			Damask rose, common red rose	
Saccharum officinarum	POACEAE	**kō**	sugar cane	Poly
Sadleria cyatheoides	BLECHNACEAE	**ʻamaʻu**	ʻamaʻu	end
Santalum freycinetianum	SANTALACEAE	**ʻiliahi**	sandalwood	end
Scaevola gaudichaudiana	GOODINACEAE	**naupaka kuahiwi**	mountain naupaka	
Scaevola sericea	GOODINACEAE	**naupaka kahakai**, nalpaka kaio	naupaka	ind
Schizostachyum glaucifolium	POACEAE	**ʻohe**	bamboo	Poly
Sesbania tormentosa	FABACEAE	**ʻōhai red and orange**	ʻōhai	end
Sida fallax	MALVACEAE	ʻilima	**black coral ʻilima**	end
Sida fallax	MALVACEAE	ʻilima kukaha kai	**double ʻilima, true ilima**	end
Sida fallax	MALVACEAE	**ʻilima kū**	ʻilima on the plains	end
Solanum americanum	SOLANACEAE	**pōpolo**	pōpolo	Poly
Solanum capsicoides	SOLANACEAE	**kīkānia lei**	cockroach berry	intro
Sphenomeris chusana	LINDASAECEAE	**palaʻā**, palaʻe	lace fern	ind
Strongylodon macrobotrys	FABACEAE	**blue jade vine**	jade vine	intro
Styphelia tameiameiae	EPACRIDACEAE	**pūkiawe**	pukiawe	end
Syzygium malaccense	MYRTACEAE	**ʻōhiʻa ʻai**	mountain apple	Poly
Tacca leontopetaloides	TACCACEAE	**pia**	pia	Poly
Tagetes sp.	ASTERACEAE	ʻokole ʻoiʻoi	**marigolds**	intro
Telosma cordata	ASCLEPIADACEAE	**pakalana**	Chinese violet	intro
Thespesia populnea	MALVACEAE	**milo**	milo	Poly
Torenia asiatica	SCROPHULARIACEAE	nanioolaʻa, nanioʻōlaʻa	**Olaʻa beauty**	intro
Tournefortia argentea	BORAGINACEAE	tree heliotrope	**beach heliotrope**	intro
Vigna marina	FABACEAE	nanea, **sea bean**	beach pea	ind
Waltheria americanum	STERCULIACEACE	**ʻualoa**, hiāloa, kanakaloa	ʻualoa	end

Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 25

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon menziesii	MALVACEAE	**koʻoloaʻula**	koʻoloaʻula	end
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind
Cynodon dactylon	POACEAE	**mānienie**	Bermuda grass	intro
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Erythrina sandwicensis	FABACEAE	**wiliwili**	wiliwili	end
Gardenia brigamii	RUBIACEAE	**naʻu**, nānū	naʻu, nānū	end
Hibiscus arnottianus subsp. *arnotttianus*	MALVACEAE	**kokiʻo keʻokeʻo arnottianus**	native white	end
Hibiscus arnottianus f. *parviflorus*	MALVACEAE	**kokiʻo keʻokeʻo parviflora (waiʻane)**	native white	end
Hisbiscus arnottianus f. *punaluuensis*	MALVACEAE	**kokiʻo keʻokeʻo punaluuensis**	native white	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhiʻa	end
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu fern**	sword fern	ind
Osteomeles anthylldifolia	ROSACEAE	**ʻūlei**	native rose	ind
Pittosporum sp.	PITTOSPORACEAE	**hōʻawa**	hōʻawa	end
Plumbago zeylanica	PLUMBAGINACEAE	**ʻilieʻe**	leadwort	ind
Pritchardia hillebrandii	ARECACEAE	**loulu**	fan palm	end
Sapindus oahuensis	SAPINDACEAE	**lonomea,** kaulu	lonomea	end
Sapindus saponaria	SAPINDACEAE	**mānele**	ʻohe	ind
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	end
Tetraplasandra hawaiensis	ARALIACEAE	**ʻohe**	ʻohe	end

Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 26

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Abutilon menziesii	MALVACEAE	**koʻoloaʻula**	**koʻoloaʻula**	end
Acacia koa	FABACEAE	**koa**	koa	end
Aleurites moluccana	EUPHORBIACEAE	**kukui**	candlenut tree	Poly
Aloe barbadensis	LILIACEAE	panini ʻawaʻawa	**aloe**	intro
Artocarpus altilis	MORACEAE	**ʻulu**	breadfruit	Poly
Bacopa monnieri	SCROPHULARIACEAE	**ʻaeʻae**	bacopa	ind
Bidens amplectens	ASTERACEAE	**koʻokoʻolau**	koʻokoʻolau	end
Calotropis gigantea	ASCLEPIADACEAE	puakauluna	**crown flower purple and white**	intro
Canthium odoratum	RUBIACEAE	**alaheʻe**	alaheʻe	ind
Cheirodendron trigynum	ARALIACEAE	**ʻōlapa**, lapalapa	ʻōlapa	end
Cibotium glaucum	DICKSONIACEAE	**hapuʻu**, hapuʻu pulu	hapuʻu	end
Colocasia esculenta	ARACEAE	**kalo**	taro	Poly
Cordia subcordata	BORAGINACEAE	**kou**	kou	Poly
Cordyline fruticosa	LILIACEAE	**kī**	ti	Poly
Curcuma long	ZINGIBERACEAE	**ʻōlena**, lena	tumeric	Poly
Cynodon dactylon	POACEAE	mānienie	Bermuda grass	intro
Dianella sandwicensis	LILIACEAE	**ʻukiʻuki**	ʻukiʻuki	ind
Dodonaea viscosa	SAPINDACEAE	**ʻaʻaliʻi**	ʻaʻaliʻi	ind
Gossypium tomentosum	MALVACEAE	**maʻo**	native cotton	end
Hibiscus arnottianus subsp. *arnotttianus*	MALVACEAE	**kokiʻo keʻo keʻo**	native white hibiscus	end

Hibiscus brackenridgei	MALVACEAE	**maʻo hau hele**	Hawaiʻi state flower	end
Hibiscus kokio	MALVACEAE	**kokiʻo ʻula**	red hibiscus	end
Ipomoea pes-caprae subsp. *brasiliensis*	CONVOLVULACEAE	**pōhuehue**	beach morning glory	ind
Jacquemontia ovalifolia	CONVOLVULACEAE	**paʻuohiʻiaka**	paʻuohiʻiaka	ind
Mariscus hypochlorus	CYPERACEAE	**ʻahuʻawa**	ʻahuʻawa	end
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa**	ʻōhiʻa	end
Microlepia strigosa	DENNSTAEDTIACEAE	**palapalai**, palai	palapalai	end
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Nephrolepis cordifolia	NEPHROLEPIDACEAE	**kupukupu**	sword fern	ind
Notorichium humile	AMARANTHACEAE	**kuluʻī**	kuluʻī	end
Osteomeles anthylldifolia	ROSACEAE	**ʻūlei**	native rose	ind
Phymatosorus grossus	POLYYPODIACEAE	**lauwae**, lauaʻe, lawae	maile-scented fern	intro
Pipturus albidus	URTICACEAE	māmaki, **māmake**		end
Pritchardia hillebrandii	ARECACEAE	**loulu**	fan palm	end
Psilotum nudum	PSILOTACEAE	**moa**, moa nahele	moa, upright wisk fern	ind
Sida fallax	MALVACEAE	**ʻilima**	ʻilima	end
Solanum americanum	SOLANACEAE	**pōpolo**	pōpolo	Poly
Sophora chrysophylla	FABACEAE	**māmane**	māmane	end
Sphenomeris chinensis	LINDSAEACEAE	**palaʻā**, palapalaʻā	lace fern	end
Tectaria gaudichaudii	ASPIDIACEAE	**ʻiwaʻiwa lau nui**	large leaved maiden hair fern	end
Vitex rotundifolia	VERBENACEAE	**pōhinahina**, pōlinalina	beach vitex	ind
Waltheria americana	STERCULIACEAE	**ʻuhaloa**	ʻuhaloa	ind
Wikstroemia uva-ursi	THYMELAEACEAE	**ʻākia**	ʻākia	end

Garden 27

Scientific Name	Family	Hawaiian Name	Common Name	Origin
Bacopa monnieri	SCROPHULARIACEAE	**ʻaeʻae**	bacopa	ind
Cynodon dactylon	POACEAE	mānienie	**grass**	intro
Gardenia brigamii	RUBIACEAE	**nānū**, naʻu	nanu	end
Hibiscus kokio	MALVACEAE	kokiʻo ʻula	**native Kauaʻi hibiscus red flower**	end
Jacquemontia ovalifolia	CONVOLVULACEAE	**paʻuohiʻiaka**	paʻuohiʻiaka	ind
Metrosideros polymorpha	MYRTACEAE	**ʻōhiʻa red**	ʻōhiʻa	end
Myoporum sandwicensis	MYOPORACEAE	**naio**	false sandalwood	end
Neomarica gracilis	IRIDACEACE	unknown	walking **iris**, apostle plant	intro
Plumbago zeylanica	PLUMBAGINACEAE	ʻilieʻe	**native white plumbago**	end
Plumeria obtusa	APOCYNACEAE	pua melia	**Singapore plumeria**	intro
Pritchardia sp.	ARECACEAE	**loulu palm**	fan palm	end
Sapindus oahuensis	SAPINDACEAE	**lonomea**, kaulu	lonomea	end
Sapindus saponaria	SAPINDACEAE	**mānele**	mānele	ind
Sida fallax	MALVACEAE	**ʻilima papa**	beach ʻilima	end
Wikstromia uva-ursi	THYMELALEACEAE	**ʻākia**	ʻākia	end

Appendix B ~ All Species

This appendix lists all the species for the 23 (of the 27) garden designers that specified plants. Names for the plants are listed and include two vernacular names (Hawaiian and common). Species' origin is abbreviated as follows: endemic (end), indigenous (ind), introduced (intro) and Polynesian (Poly). Native plants are comprised of the endemic and indigenous plants combined. See Chapter 3, *Native Plant Renaissance, Definitions*.

#	SCIENTIFIC NAME	FAMILY NAME	HAWAIIAN NAME	COMMON NAME	ORIGIN
1	*Abutilon grandiflolium*	MALVACEAE	royal ʻilima	royal ʻilima	intro
2	*Abutilon menziesii*	MALVACEAE	koʻoloaʻula	red 'ilima	end
3	*Abutilon pictum*	MALVACEAE	aloalo huamoa, aloalo Pele	lantern ʻilima, bell ʻilima, egg ʻilima	intro
4	*Acacia koa*	FABACEAE	koa	koa	end
5	*Acacia koaia*	FABACEAE	koaiʻa	koaiʻa	end
6	*Achyranthes splendens*	AMARANTHACEAE	ewa hina	ewa hina	end
7	*Adiamum capillus-veneris*	PTERIDACEAE	ʻiwaʻ iwa	ʻiwaʻiwa hawai, ʻiwaʻiwa kahakaha	ind
8	*Aleurites moluccana*	EUPHORBIACEAE	kukui	normal leaf candlenut tree	Poly
9	*Aleurites moluccana*	EUPHORBIACEAE	kukui	oval-leaf candlenut tree	Poly
10	*Aleurites remyi*	EUPHORBIACEAE	kukui	narrow-lobed leaf candlenut	Poly
11	*Aloe barbadensis*	LILIACEAE	ʻaloe, pānnini ʻawaʻawa	aloe	intro
12	*Alphitonia ponderosa*	RHAMNACEAE	kauila	kauila	end
13	*Alyxia oliviformis*	APOCYNACEAE	maile	maile	end
14	*Arachis pintoi*	FABACEAE	unknown	glory bean	intro

15	*Argemone Glauca*	PAPAVERACEAE	pua kala	pua kala	end
16	*Artemisia mauiensis*	ASTERACEAE	ʻāhinahina	artemisia	end
17	*Artocarpus altilis*	MORACEAE	ʻulu	breadfruit	Poly
18	*Asplenium nidus*	ASPLENIACEAE	ʻēkaha, ʻēkaha kuahiwi, ʻākaha, ʻēkahakaha	bird nest fern	ind
19	*Astelia menziesiana*	LILIACEAE	paʻiniu	paīniu	end
20	*Bacopa monnieri*	SCROPHULARIACEAE	ʻaeʻae	bacopa	ind
21	*Bidens amplectens*	ASTERACEAE	koʻokoʻolau	koʻokoʻolau	end
22	*Bidens asymmetrica*	ASTERACEAE	koʻokoʻolau	Diamond Head bidens	end
23	*Bidens cosmoides*	ASTERACEAE	poʻolā nui	large sun head	end
24	*Boerhavia repens*	NYCTAGINACEAE	alena, nena	boerhavia	ind
25	*Bonamia menziesii*	CONVOLVULACEAE	unknown	bonamia	end
26	*Brighamia insignis*	CAMPANULACEAE	ālula	cabbage on a bat	end
27	*Broussonetia papyrifera*	MORACEAE	wauke	paper mulberry	Poly
28	*Calophyllum inophyllum*	GUITIFERACEAE	kamani	Indian laurel	Poly
29	*Calotropis gigantea*	ASCLEPIADACEAE	puakauluna purple & white	crown flower	intro
30	*Canavalia cathartica*	FABACEAE	maunaloa	pink purple maunaloa	intro
31	*Canavalia galeata*	FABACEAE	ʻāwikiwiki, puakauhi	ʻāwikiwiki	end
32	*Canthium odoratum*	RUBIACEAE	alaheʻe	alaheʻe	ind
33	*Capsicum frutenscens*	SOLANACEAE	nīoi nīoi pepa	chili peppers	intro
34	*Carthamus tinctorius*	ASTERACEAE	pua mamo, mamo	safflower, false saffron	intro
35	*Cassia javanica* x *C. fistula*	FABACEAE	unknown	rainbow shower tree	intro
36	*Chamaesyce* spp.	EUPHORBIACEAE	ʻakoko	ʻakoko	end
37	*Charpentiera* spp.	AMARANTHACEAE	pāpala	pāpala	end
38	*Cheirodendron trigynum*	ARALIACEAE	ʻōlapa, lapalapa	ʻōlapa	end

39	*Chenopodium oahuense*	CHENOPODIACEAE	ʻāweoweo	lamb's quarters	end
40	*Cibotium glaucum*	DICKSONIACEAE	hāpuʻu, hāpuʻu pulu	tree fern	end
41	*Cladium jamaicense*	CYPERACEAE	ʻuki	ʻuki grass, Pele grass, volcano grass	ind
42	*Cocculus trilobus*	MENISPERMACEAE	huehue	huehue	ind
43	*Cocos nucifera*	PALMAE	niu	coconut	Poly
44	*Colocasia esculenta*	ARACEAE	kalo	taro	Poly
45	*Colubrina oppositifolia*	RHAMNACEAE	kauila, kauwila	kauila	end
46	*Coprosma ernodeoides*	RUBIACEAE	kūkaenēnē	kūkaenēnē	end
47	*Cordia subcordata*	BORAGINACEAE	kou	kou	Poly
48	*Cordyline fruticosa*	LILIACEAE	kī	ti varieties, dwarf	Poly/intro
49	*Curcuma longa*	ZINGERBIACEAE	ʻōlena	turmeric	Poly
50	*Cuscuta sandwichiana*	CUSCUTACEAE	kaunaʻoa	dodder	end
51	*Cynodon dactylon*	POACEAE	mānienie	Bermuda grass	intro
52	*Cyperus laevigatus*	CYPERACEAE	makaloa	makaloa	end
53	*Dianella sandwicensis*	LILIACEAE	ʻukiʻuki	ʻukiʻuki	ind
54	*Dicranopteris linearis*	GLEICHENIACEAE	uluhe	false staghorn fern	ind
55	*Dioscorea alata*	DIOSCOREACEAE	uhi	yam	Poly
56	*Diospyros hillebrandii*	EBENACEAE	lama, ēlama	Hawaiian ebony	end
57	*Diospyros sandwicensis*	EBENACEAE	lama	Hawaiian ebony	end
58	*Diplazium arnottii*	ASPLENIACEAE	hōʻiʻo	hōʻiʻo	end
59	*Dodonaea viscosa*	SAPINDACEAE	ʻaʻaliʻi, ʻaʻaliʻi kumakua	ʻaʻaliʻi	ind
60	*Erythrina sandwicensis*	FABACEAE	wiliwili	wiliwili	end
61	*Euphorbia tirucalli*	EUPHORBIACEAE	unknown	pencil plant, pencil shrub	intro
62	*Fagraea berteriana*	LOGANIACEAE	puakenkeni	ten cents flower	intro
63	*Gardenia brigamii*	RUBIACEAE	nānū	nanu	end

64	*Gardenia jasmioides*	RUBIACEAE	kiele	gardenia	intro
65	*Geranium arboreum*	GERANIACEAE	nohoanu	nohoanu	end
66	*Gnaphalium sandwicensium*	ASTERACEAE	ʻenaʻena	ʻenaʻena	end
67	*Gossypium tomentosum*	MALVACEAE	maʻo	native cotton	end
68	*Heliotropium anomalum* var. *argenteum*	BORAGINACEAE	hinahina, kīpūkai, hinahina kū kahakai	hinahina	ind
69	*Hemigraphis colorata*	ACANTHACEAE	unknown	hemigraphis	intro
70	*Heteropogon contortus*	POACEAE	pili	pili grass	ind
71	*Hibiscus arnottianus* subsp. *arnottianus*	MALVACEAE	kokiʻo keʻokeʻo	white hibiscus	end
72	*Hibiscus arnottianus* f. *parviflorus*	MALVACEAE	kokiʻo keʻokeʻo	small flowered white	end
73	*Hibiscus arnottianus* var. *punaluuensis*	MALVACEAE	kokiʻo keʻokeʻo	white hibiscus tree	end
74	*Hibiscus brackenridgei*	MALVACEAE	maʻo hau hele	state flower	end
75	*Hibiscus clayi*	MALVACEAE	kokiʻo ʻula	deep red flower Kauaʻi	end
76	*Hibiscus fucellatus*	MALVACEAE	ʻakiohala, ʻakiahala, hau hele wai	ʻakiohala	ind
77	*Hibiscus kahili*	MALVACEAE	kokiʻo	red hibiscus	end
78	*Hibiscus kokio*	MALVACEAE	kokiʻo ʻula	red hibiscus	end
79	*Hibiscus kokio* subsp. *saintjohnianus*	MALVACEAE	kokiʻo ʻula	orange, orangish red, yellow	end
80	*Hibiscus syriacus*	MALVACEAE	ʻakiahala, rose of sharon	blue hibiscus	intro
81	*Hibiscus tiliaceus*	MALVACEAE	hau	hau	Poly
82	*Hibiscus waimeae*	MALVACEAE	kokiʻo keʻo keʻo	white hibiscus	end

83	*Hippobroma longiflora*	GOODENIACEAE	pua hoku	Star of Bethlehem	intro
84	*Ipomoea batatas*	CONVOLVULACEAE	ʻuala	sweet potato	Poly
85	*Ipomoea pes-caprae* subsp. *brasiliensis*	CONVOLVULACEAE	pōhuehue	beach morning glory	ind
86	*Jacaranda acutifolia*	BIGNONIACEAE	unknown	jacaranda	intro
87	*Jacquemontia ovalifolia*	CONVOLVULACEAE	paʻuohiʻiaka	paʻuohiʻiaka	ind
88	*Jasminum sambac*	OLEACEAE	pīkake pupupu	rose pīkake, double pīkake	intro
89	*Kokia drynarioides*	MALVACEAE	hau heleʻula	tree hibiscus	end
90	*Lampranthus glomeratus*	AIZOACEAE	ʻakulikuli lei	ice plant, white, yellow, pink, lavender, orange	intro
91	*Lipochaeta integrifolia*	ASTERACEAE	nehe	nehe	end
92	*Lysimachia daphnoides*	PRIMULACEAE	lehua, makanoe, kolokolo kuahiwi	makanoe	end
93	*Manihot esculenta*	EUPHORBIACEAE	manioka		intro
94	*Marattia douglasii*	MARATTIACEAE	pala, kapuaʻilio	mule's foot fern	end
95	*Mariscus hypochlorus*	CYPERACEAE	ʻahuʻawa	ʻahuʻawa	end
96	*Metrosideros polymorpha*	MYRTACEAE	ʻōhiʻa lehua	ʻōhia all colors	end
97	*Metrosideros polymorpha* var. *tremuloides*	MYRTACEAE	lehua ʻāhihi	creeping lehua	end
98	*Microlepia strigosa*	DENNSTAEDTIACEAE	palapalai, palai	palapalai	end
99	*Morinda citrifolia*	RUBIACEAE	noni	noni	Poly
100	*Munroidendron racemosum*	ARALIACEAE	unknown	munroidendron	end
101	*Musa acuminata* hybrids	MUSACEAE	maiʻa	banana	Poly
102	*Myoporum sandwicensis*	MYOPORACEAE	naio	false sandalwood	end
103	*Myoporum sandwicensis*	MYOPORACEAE	naio papa	naio papa	end
104	*Neomarica gracilis*	IRIDACEACE	unknown	walking iris, apostle plant	intro
105	*Nephrolepis biserrata* var.	NEPHROLEPIDACEAE	hiʻuiʻa	fishtail fern	intro

	furcans				
106	*Nephrolepis cordifolia*	NEPHROLEPIDACEAE	kupukupu	sword fern	ind
107	*Nerium indicum*	APOCYNACEAE	ʻoliwa, ʻoleana		intro
108	*Nestegis sandwicensis*	OLEACEAE	olopua, pua, ulupua	olopua	end
109	*Notorichium humile*	AMARANTHACEAE	kuluʻi	kuluʻi	end
110	*Notorichium sandwicensis*	AMARANTHACEAE	kuluʻī	kuluʻī	end
111	*Notrocestrum latifolium*	SOLANACEAE	ʻaiea	ʻaiea	end
112	*Osteomeles anthylldifolia*	ROSACEAE	ʻūlei	native rose	ind
113	*Oxalis corniculata*	OXALIDACEAE	ʻihi ʻai, ʻihi ʻawa, ʻihi maka ʻula, ʻihi mākole	yellow wood sorrel	Poly
114	*Pandanus odoratissimus*	PANDANACEAE	hala	hala tree	ind
115	*Pelea anisata*	RUTACEAE	mokihana, mokehana	mokihana	end
116	*Pityrogramma austromericana*	PTERIDACEAE	golddenback fern	golddenback fern	intro
117	*Pityrogramma calomelanos*	PTERIDACEAE	silverback fern	silverback fern	intro
118	*Peperomia* spp.	PIPERACEAE	ʻalaʻala wai nui	peperomia	end
119	*Phyllostegia grandiflora*	LAMIACEAE	kāpana	kāpana	end
120	*Phymatosorus grossus*	POLYOPODIACEAE	lauaʻe	lauaʻe, maile scented fern	intro
121	*Piper methysticum*	PIPERACEAE	ʻawa	kava	Poly
122	*Pipturus albidus*	URTICACEAE	māmaki, māmake	māmaki	end
123	*Pittosporum confertiflorum*	PITTOSPORACEAE	hōʻawa Palikea	hōʻawa	end
124	*Plantago aristata*	PLANTAGINACEAE	laukahi	bracted plantain	intro
125	*Plantago lancelata*	PLANTAGINACEAE	laukahi	narrow-leaved or English plantain	intro
126	*Plantago major*	PLANTAGINACEAE	laukahi	plantain	intro
127	*Plantago pachyphylla*	PLANTAGINACEAE	laukahi kauahiwi, ale	plantago	end
128	*Plantago princeps*	PLANTAGINACEAE	lau-kāhi kuahiwi	plantago	end

129	*Pleomele halapepe*	AGAVACEAE	halapepe	halapepe	end
130	*Plumbago zeylanica*	PLUMBAGINACEAE	ʻilieʻe	plumbago	end
131	*Plumeria obtusa*	APOCYNACEAE	pua melia	Singapore plumeria	intro
132	*Portulaca molokiniensis*	PORTULACACEAE	ʻihi	ʻihi	end
133	*Prichardia martii* H.	PALMAE	loulu oʻahu	loulu-hiwa	end
134	*Prichartia hillebrandii*	PALMAE	loulu	fan palm	end
135	*Psilotum nudum*	PSILOTACEAE	moa, moa nahele	moa, upright wisk fern	ind
136	*Psychotria* spp.	RUBIACEAE	kōpiko	kōpiko	end
137	*Reynoldsia sandwicensis*	ARALIACEAE	ʻohe makai	ʻohe	end
138	*Rosa chinesis* var. *viridiflora*	ROSACEAE	lokelau	green rose	intro
139	*Rosa* sp.	ROSACEAE	lokelani	double pink rose, Damask rose, common red rose	intro
140	*Saccharum officinarum*	GRAMINEAE	kō	sugar cane	Poly
141	*Sadleria cyatheoides*	BLECHNACEAE	ʻamaʻu, maʻu	ʻamaʻu	end
142	*Santalum ellipticum*	SANTALACEAE	ʻiliahi, īliahialoʻe	coastal sandalwood	end
143	*Santalum freycinetianum*	SANTALACEAE	ʻiliahi	sandalwood	end
144	*Sapindus oahuensis*	SAPINDACEAE	kaulu (lonomea)	kaulu	end
145	*Sapindus saponaria*	SAPINDACEAE	mānele	mānele	ind
146	*Scaevola gaudichaudiana*	GOODENIACEAE	naupaka kuahiwi	mountain naupaka	end
147	*Scaevola sericea*	GOODENIACEAE	naupaka	naupaka	ind
148	*Schinus molle*	ANACARDIACEAE		California pepper tree	intro
149	*Schizostachyum glauifolium*	POACEAE	ʻohe	bamboo	Poly
150	*Sebania sebans*	FABACEAE	ʻōhai	monkey pod tree	intro
151	*Sesbania tomentosa*	FABACEAE	ʻohai	shrub	end
152	*Sesuvium portulacastrum*	AIZOACEAE	ʻākulikuli	ʻākulikuli	ind
153	*Sida fallax*	MALVACEAE	ʻilima	ʻilima	end

154	*Sida fallax*	MALVACEAE	ʻilima kukaha kai	ʻilima	end
155	*Sida fallax*	MALVACEAE	ilima kukula	ʻilima on the plains	ind
156	*Silene lanceolata*	CARYOPHYLLACEAE	unknown	silene , catchfly	end
157	*Solanum americanum*	SOLANACEAE	pōpolo	glossy nightshade	ind
158	*Solanum capsicoides*	SOLANACEAE	kīkānia lei	cockroach berry	intro
159	*Sophora chrysophylla*	FABACEAE	māmane	māmane	end
160	*Sphenomeris chinensis*	LINDASAEACEAE	palaʻā, palaʻe	lace fern	end
161	*Sporobolus virginicus*	POACEAE	ʻakiʻaki	Seashore rush grass	ind
162	*Strelitzia reginae*	MUSACEAE	unknown	bird of paradise	intro
163	*Stronylodon macrobotrys*	FABACEAE	jade vine	jade vine	intro
164	*Stronylodon ruber*	FABACEAE	nuku ʻiʻiwi	vine	ind
165	*Styphelia tameiameiae*	EPACRIDACEAE	pūkiawe	pūkiawe	end
166	*Syzygium malaccense*	MYRTACEAE	ʻōhiʻa ʻai	mountain apple	Poly
167	*Tabebuia aurea*	BIGNONIACEAE	unknown	yellow tabebuia	intro
168	*Tacca leontopetaloides*	TACCACEAE	pia	pia	Poly
169	*Tagetes* sp.	ASTERACEAE	ʻokole ʻoiʻoi	marigolds	intro
170	*Telosma cordata*	ASCLEPIADACEAE	pakalana	Chinese violet	intro
171	*Tetraplasandra hawaiensis*	ARALIACEAE	ʻohe	ʻohe	end
172	*Thespesia populnea*	MALVACEAE	milo	milo	Poly
173	*Torenia asiatica*	SCROPHULARIACEAE	nanioolaʻa, nanioʻōlaʻa	Olaʻa beauty	intro

174	*Touchardia latifolia*	URTICACEAE	olonā	olonā	end
175	*Tournefortia argentea*	BORAGINACEAE	tree heliotrope	tree heliotrope	intro
176	*Vaccinium reticulatum*	ERICACEAE	ʻōhelo, ʻōhelo ʻai	ʻōhelo	end
177	*Verbena litoralis*	VERBENACEAE	haʻuōwī, ōwī, oī, haʻuoi	verbena	intro
178	*Vigna marina*	FABACEAE	nanea, mohihi	beach pea	ind
179	*Viola chamissoniana* subsp. *Chamissoniana*	VIOLACEAE	pāmakami; ʻolopū	Hawaiian violet	end
180	*Vitex rotundifolia*	VERBENACEAE	pōhinahina	pōlinalina	ind
181	*Waltheria americana*	STERCULIACEAE	ʻuhaloa		ind
182	*Wikstroemia monticola*	THYMELAEACEAE	ʻakia	ʻakia tree	end
183	*Wikstroemia uva-ursi*	THYMELAEACEAE	ʻākia	ʻākia	end
184	*Zingiber zerumbet*	ZINGIBERACEAE	ʻawapuhi	shampoo ginger	Poly

Appendix C ~ Some Native Plant Articles By Bornhorst and Koob

BY BORNHORST, HONOLULU ADVERTISER	TITLES
Date	
Unknown	Naupaka's romance appealing
Unknown	Gathering mokihana on Kauai to make leis threatens its survival
Unknown	Native wiliwili well-suited for dry, sunny landscape
Unknown	Native vines can find a home in your garden
Unknown	Native ilie'e adds beauty to highway, lanais
Unknown	Hawaiian stingless nettle produces strong, durable fiber
1999/2/14	Poppy used by Hawaiians for medicines
1999/2/21	Native strawberry rewarding for home gardener
1999/6/6	Huehue surprises with its hardiness
1999/7/18	Manele adapts to tough growing conditions
1999/8/8	Native plant bears unusual blue fruit and flowers
1999/8/29	Refined native Hawaiian papala can be used indoors
1999/9/5	Papala kepau is drought-tolerant
1999/11/7	Fragrant 'akia used for ground cover, in flower arranging
1999/11/14	Many plants thrive in coastal conditions
1999/11/21	'Aki'aki may help protect Hawaii beaches
1999/12/1	Holiday plant sale will help Waimea Arboretum
2000/1/8	Variegated hala can be started from seeds
2000/3/12	Attractive, hardy 'anapanapa used in making lei
??/8/21	Lyon Arboretum holding annual plant sale
BY KOOB, HAWAI'I HORTICULTURE	**TITLES**
Date	
1998/9	Pōhinahina A tried-and-true native landscape plant
1998/10	'Ala'ala Wai Nui Wahine One of the Hawaiian Mints
1998/12	Koki'o ke'oke'o Hibiscus arnottianus
1999/1	A Hawaiian Gardenia Gardenia brighamii
1999/3	'Ohai A native Hawaiian endangered plant ideal for dry landscapes
1999/4	Nehe A native Hawaiian ground cover for sunny areas
1999/5	Pā'ūohi'iaka Jacquemontia ovalifolia
1999/8	Hawaiian Plants as Hedges
1999/9	More Native Plants for O'ahu

Appendix D ~ Mission Houses' Rose Cultivars

Name of Mission House rose cultivar and date of hybridization (Watanabe 2002)

Arch Duke Charles 1837
Baronne Prevost 1842
Burgundy Rose (Pompon de Burgogne) 1664
Gieant of Battles (Geant de Batailles) 1846
Great Maidens Blush 1754
La Reine 1842
Lamarque French Cluster 1830
Louis Odier 1851
Louis Philippe 1834
Maidens Blush 1738
Marchesa Bocella 1842
Sombreuil 1850
Souvenir de la Malmaison (Empress Josephine's residence) 1843
Tea Rose no date

Autumn Damask (Chun 2001)
Buicaux
Cloth of Gold (Chromatella)
Cottage Maid (Village Maid)
Green rose
Indigo
Montgomery Je (or JP)
Queen's rose Lariene
Triomphe de Luxembourge

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