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**AUWAHI:**

**ETHNOBOTANY OF A HAWAIIAN  
DRYLAND FOREST.**

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## ABSTRACT

Auwahi district on East Maui extends from sea level to about 6800 feet (1790 meters) elevation at the southwest rift of leeward Haleakalā volcano. In botanical references, Auwahi currently refers to a centrally located, fairly large (5400 acres) stand of diverse dry forest at 3000-5000 feet (915-1525 meters) elevation surrounded by less diverse forest and more open-statured shrubland on lava. Auwahi contains high native tree diversity with 50 dryland species, many with extremely hard, durable, and heavy wood. To early Hawaiians, forests like Auwahi must have seemed an invaluable source of unique natural materials, especially the wide variety of woods for tool making for agriculture and fishing, canoe building, *kapa* making, and weapons.

Of the 50 species of native trees at Auwahi,

- 19 species (38%) are known to have been used for medicine,
- 13 species (26%) for tool-making,
- 13 species (26%) for canoe building
- 13 species (26%) for house building,
- 8 species (16%) for tools for making *kapa*,
- 8 species (16%) for weapons
- 8 species (16%) for fishing,
- 8 species (16%) for dyes, and
- 7 species (14 %) for religious purposes.

Other miscellaneous uses include edible fruits or seeds, bird lime, cordage, a fish narcotizing agent, firewood, a source of "fireworks", recreation, scenting agents, *poi* boards, and *hōlua* sled construction.

Nine species of trees (18%) have no recorded uses. In many of these cases, the wood appears to be a good quality durable hardwood for which there were likely ethnobotanical uses despite the lack of references in the literature.

Auwahi has been greatly transformed by burning, grazing, and invasion by non-native plant species. As a result, Auwahi has had much of its original native shrub and understory replaced largely by a thick mat of introduced kikuyu grass (*Pennisetum clandestinum*). Many native tree species produce viable seed but few seedlings are found and fewer of these survive. Since the late 1960s, Auwahi has been the focus of protection and restoration efforts that continue to this day. Thus far efforts have had only limited success.

"Every plant in the forest has a job, some trees have more than one job.

If you cut down the forest, you get money one time. Then when you get sick you must go to the hospital in Honiara where they give you medicines that don't work. When you cut down the forest, you lose all the jobs in the forest. My brother can tell you the job of a plant even if you only let him smell it."

Charles Orataloa, Malaita, Solomon Islands, 1993

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## I. Acknowledgments

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## II. Introduction

Auwahi district lies between Kanaio district to the west and Luala'ilua district to the east, on the southern, leeward flanks of Haleakalā, East Maui. Geographically speaking, Auwahi district extends from sea level to about 6800 feet (1790 meters) elevation at the southwest rift of leeward Haleakalā volcano. In botanical references, however, Auwahi currently refers to a centrally located, fairly large (5400 acres) stand of diverse dry forest at 3000-5000 feet (915-1525 meters) elevation. Auwahi appears to be an old *kīpuka* of robust diverse dryland forest surrounded by less diverse forest and more open-statured shrubland on lava. The place name Auwahi literally translates to 'smoky glow' (Pukui *et al.* 1974). Emerson (1965:124) states, "Auwahi (a word not found in any dictionary) is said by a scholarly Hawaiian to be an archaic form of the word *uwahi*, or *uahi* (milk of fire), Kahiki-nui is a dry region and the wind (*makani*) often fills the air with dust."

The most unique feature of Auwahi compared to nearly any other forest in Hawai'i is the great variety of types of Hawaiian trees. In this report, 50 species of dryland trees are described. Most Hawaiian rain forest areas have much fewer tree species. Tree species of dryland areas are slow growing and often have wood which is extremely hard, durable, and heavy. To early Hawaiians, forests like Auwahi must have seemed an invaluable source of unique natural materials, especially a wide variety of woods for tool making (i.e. for agriculture, fishing, and *kapa* making), canoe building, and weapons. This paper reports a brief history of the Auwahi district including aspects of its vegetation, former habitation and agriculture, and cultural and ethnobotanical importance. The second part of this paper (species accounts) provides a brief overview of each of the 50 native tree species, reporting distribution, Hawaiian names, ethnobotanical uses, and status at Auwahi.

## III. Vegetation of Auwahi

Probably the greatest vegetation change that has occurred at Auwahi in the past two centuries is the near complete loss of native middle- and understory species. Based on small areas of more intact vegetation, the former vegetation of Auwahi forest at 3000-5000 feet (915-1525 meters) elevation appears to have been a dense full-canopied forest with trees ranging from 20 to 60 feet

(6-18 meters) height and with well developed middle- and understories. The understory probably was dominated by ferns and forbs, such as *pala palai* (Microlepia sp.), *laukahi* (Dryopteris wallichiana), *pōhole* (Diplazium sandwichianum), and *kā'ape'ape* (Cyrtomium caryotideum), sedges (Mariscus hillebrandii, Carex wahuensis, Carex macloviana, Carex meyenii) and grasses (Panicum nephiophilum). The middlestory was probably dominated by tangled shrubs, such as *a'ali'i* (Dodonaea viscosa), *ūlei* (Osteomeles anthyllidifolia), *pilo* (Coprosma foliosa), as well as vines such as *pioi* (Smilax) and *maile* (Alyxia). The small leaved *maile*, *maile lau li'i*, (Alyxia oliviiformis), with all leaves less than 2 cm long, was probably extremely common forming a tangling mat of vines through the understory and up to 25 feet (7.6 meters) high into dryland trees.

Today, however, Auwahi forest probably bears little similarity to that prior to human contact. Currently, in central Auwahi, vegetation consists largely of scattered individuals and small groups of native trees scattered within a pasture like understory of a thick mat of kikuyu grass. The terrain is sloping from approximately 20-30 degrees, comprised predominantly of thin rocky ridges and interconnecting gullies and slopes. Throughout, the substrate is extremely rocky with sparse soil accumulations.

The catastrophic changes that have taken place in the native vegetation of leeward forests have been accompanied by the near wholesale loss of native birds and invertebrates. Only four native bird species occur at the site: the *'apapane* (Himatione sanguinea), *amakihi* (Hemignathus virens), *pueo* (Asio flammeus), and rarely the *'i'iwi* (Vestiaria coccinea). Of these, probably only the *pueo* is a resident species that nests in the area. The other three are nectar-feeding honeycreepers that come *makai* (seaward) into upper Auwahi only when the *mamane* and *'ohi'a* are flowering.

The transition from this intact forest to the current degraded condition of mostly isolated trees or small stands of trees scattered in a pasture-like setting began apparently in the late 18th century. During this period, Rose Ranch (currently 'Ulupalakua Ranch) was cleared with fire of shrubby vegetation to enhance its value as pasture (Lennox 1967). The area was used for grazing cattle but also became progressively invaded by a weedy Mexican shrub (Ageratina adenophora). For 30 years (1915-1945), Auwahi had "a nearly solid understory" of the invasive plant. In 1945, a tephritid fly (Procecidochares utilis) from Mexico was introduced as a biological control agent in efforts to combat the Ageratina weed. In conjunction with a drought, Ageratina populations became drastically reduced.

After the Ageratina decline, kikuyu grass (Pennisetum clandestinum), native to Africa, was planted along the roads in the late 1940s to enhance cattle pasturage. This mat-forming grass does not produce seeds in Hawai'i but instead reproduces asexually with vigorous rhizome and stolon production. Quickly, kikuyu grass spread and began to dominate the understory at Auwahi, by 1967, reaching a virtual monoculture (Lennox 1967). At Auwahi, kikuyu grass repeatedly overtops itself, in places producing more than three feet (1 meter) of thickly matted stems and leaves over blocky *'ā'ā* lava substrates.

The tree density and diversity is greatest in western Auwahi, drops off dramatically in eastern Auwahi, and becomes practically pasture with scattered Nestegis trees by the boundary of the

Auwahi-Luala'ilua districts. Presumably, the younger, less eroded, rockier substrates of western Auwahi have afforded greater protection from fire, ungulates, and some weeds.

#### Chronology of Auwahi district:

late 1800s

Lennox (1967) wrote, "In the last half of the century cattle raising as a ranching enterprise gained headway and undergrowth, particularly *pukeawe* and *'a`ali`i*, was destroyed by fire to make way for imported forage grasses. Natural reproduction came to an end for many species."

1887-1912

Hosmer (1912) writes of vegetation in adjacent Kula districts, "belt of heavy forest with dense undergrowth in the Kula districts between the elevations of 3500 and 5000 feet...Gradually opened up by grazing until now it has practically disappeared save as its former extents can still be traced by dead stubs..."

1910

Joseph Rock first visits Auwahi, makes extensive collections, and remarks about its botanical value in his 1919 book, *Indigenous Trees of the Hawaiian Islands*.

1920-1921

Charles N. Forbes explores Auwahi, makes extensive collections, and provides some of the best early documentation of the area in his unpublished field notes.

1915-1945

The western portion of Auwahi is protected from cattle grazing by "nearly solid understory" of the weedy Mexican subshrub, *Ageratina adenophora*.

1939

After nearly 20 years absence, Joseph Rock returns to Auwahi and is reported to have wept at the deterioration of the Auwahi forest.

mid- to late 1940s

A biological control agent insect is introduced to control *Ageratina*. The program is successful and in conjunction with a drought, the weed is virtually eliminated.

late 1940s

kikuyu grass is introduced into the former Auwahi forest to enhance its use as pasture

1967

Colin Lennox and The Nature Conservancy make the first attempt at conservation of Auwahi forests by constructing an enclosure. Due to lack of successful kikuyu grass control, the project is generally perceived as a failure, and the cattle are released back into the enclosure.

early 1980-present

The Native Hawaiian Plant Society (NHPS) builds eleven small exclosures to protect patches of native dryland trees at Auwahi.

1997-present

A multi-agency cooperative effort is made at an experimental dryland forest restoration project at a 10 acre exclosure in western Auwahi. Partners include 'Ulupalakua Ranch, Biological Resources Division, U.S. Geological Survey (BRD-USGS), U.S. Fish and Wildlife Service (USFWS), Native Hawaiian Plant Society (NHPS), and Living Indigenous Forest Ecosystems (LIFE).

#### IV. Spiritual significance of Auwahi to Hawaiians

To early Hawaiians, diverse dryland forest areas such as Auwahi must have been considered *wahi pana*, places considered sacred and special.

The district Auwahi is honored in song (Manu 1884):

"After a little while they [ Kihapiilani] went on towards Auwahi for which these few lines of song are the beginning:

Hot is Auwahi

Glowing, the lava of Hanaka`ie`ie

It wasn't long before they came among the *wiliwili* trees and *`akoko* shrubs. They reached Ke-ahu-`aiea which is the boundary of Honuaula and Kahikinui. They climbed above the twin hills of Luailua [Lualailua] and the stream of Waiahu`alele and reached Olepelepe, the place where one sees Kaupo stretched out and Ka-lae-o-ka-`ilio jutting out in the ocean. It was noon as they went along. They continued crossing the whole of Kahikinui, reaching Waiopai, the limits of Kahikinui and Kaupo."

The place name Ke-ahu-`aiea is not known on modern maps but is referred to on the map of Maui island produced by W. D. Alexander in 1885. The place name Ke-ahu-`aiea literally translates to "the heap of *`aiea* trees and shrubs" (Pukui *et al.* 1974), referring to *`aiea* (*Nothocestrum latifolium*), a characteristic tree of dryland forest of the region.

Emerson (1965) recounts the following *mele hoipoipo* (love song) personifying a lover as land forms of leeward East Maui and Hawai'i island:

*Kahikinui, auwahi ka makani!*

*Nana aku au ia Kona,*

*Me he kua lei ahi la ka moku;*

*Me he lawa uli e, la, no*

*Ku`u kai pa-u hala-ka*

*I ka lae o Hana-malo*

*Me he olohe ili polohiwa,*

*Ke ku a mauna,*

*Ma ka ewa lewa Hawaii.*



*Me he ihu leiwi la, ka moku,  
Kou mauna, kou palamoa:  
Kau a waha mai Mauna-kea  
A me Mauna-loa,  
Ke ku a Maile-hahei.  
Uluna mai Mauna Kilohana  
I ka poohiwi o Hu'e-hu'e*

Kahikinui, land of wind-driven smoke!  
Mine eyes gaze with longing on Kona;  
A fire-wreath glows aback of the district,  
And a robe of wonderful green  
Like the sea that has aproned my loins  
Off the point of Hana-malo  
A dark burnished form is Hawaii,  
To one who stands on the mount-----  
A hamper swung down from heaven,  
A beautiful carven shape is the island-----  
Thy mountains, thy splendor of herbage:  
Mauna-kea and Loa stand (in glory) apart,  
To him who looks from Maile-hahei;  
And Kilohana pillows for rest  
On the shoulder of Hu'e-hu'e.

Fornander (1916-1920) records the legend of "Pele at Hanaka'ie'ie":

"From Molokai they journeyed to Haleakala in Maui. Upon their arrival at this place they began digging a pit which they left open on the top of the mountain. The rocks\* in Hanaka'ie'ie, at Kahikinui, are those that were dug up by Pele and Hiiaka.

\*this had reference to a cluster of rocks in a field or section of aa rubble lava - in the uplands, said rocks being noted for their grouping rather than extraordinary size."

Manu (1899) in A Hawaiian legend of a terrible war between Pele-of-the-eternal-fires and Waka-of-the shadowy-waters. wrote:

"At Kapahuhu, in Kipahulu, the lava went on a slant below Ka-'aha-moa from Hale-a-ka-la to Lua'ila, and made two mounds, called Na-pu'u-mahoe (Twin-hills), that remain to this day. Above these mounds was the first long trail connecting noted places and between these mounds is the new government road being used now.

We, O reader, shall move to Auwahi (going past) Ke-ahu-aiea at the boundary of Kahikinui and here we come to Honua'ula. Between the hill of Nale and Ka-puka-hala-malo at Auwahi, is the source from which Pele descended to a place called Kuanunu."

Regarding Kahikinui, Handy and Handy (1972: 508) stated,

"A writer in the newspaper *Ke Au Hou* (December 14, 1910) says that this region was named by first settlers from Kahiki-of-the-South because of their love of their old homeland. These early migrants must have preceded the volcanic desolation now visible to have chosen it as a place of settlement....It is uninhabited."

Honua`ula is a place name for the `Ulupalakua area widely used in maps (e.g. Alexander map) and literature from the past but rarely used today in maps, literature, or even in conversations with older *kama`āina* of the area. Honua`ula literally translates to 'red land' (Pukui *et al.* 1974).

Erdmann D. Baldwin (1966) wrote:

"On March 15, 1883, we moved camp to Kanaio and pitched our tent near Kumukau's house. Kumukau was the leading character in this region;...

The boundary work in this region was very interesting. One large *ahupuaa* - "Auwahi" was owned by Kamamalu, or rather Ruth Keelikolani at that time and this land was surrounded on all sides by Government lands, so that I had to make a survey of Auwahi, the land was one of those awarded by name with no survey. This land also adjoined Kahikinui and where the boundary crossed the old *alaloa mauka* of Lualailua hills, was the *ahu* of Aiea. The old *alaloa* is quite a bit *mauka* from the present Gov't. Road and overgrown with forest.

This *ahu* was located on the mauka side of the old *alaloa*, was a large and well built pile of stones and was the first real *ahu puua* pile of stones that I have seen."

Places names recorded for the region in the botanists Charles N. Forbes 1919-1921 field notes record the following place names: Kealia, Kieiei ridge, Koholuapapa (heiau at Nakaaha-Auwahi Lualailua), and Pakiloi forest. None of these are used in modern maps and their locations are unknown

## **V. Cultural uses of leeward forests by Hawaiians**

At the time of first contact, diverse dryland forest such as at Auwahi were probably amongst the richest and most diverse of Hawaiian ecosystems. From a utilitarian point of view, nearly everything that could be obtained from the rain forest could be found in the dryland forests, as well as probably a much greater seasonal productivity of birds and spring flushing of vegetation. Dryland forests were also the source of a wide variety of tree species that provided wood to early Hawaiians. To human cultures without metal, sources of abundant and diverse hardwoods are one of the most important of ethnobotanical resources.

Edible ferns *ho'i'o* or *pōhole* (Maui name) (*Diplazium sandwichianum*) and *kikawaio* or *pakikawaio* (Maui name) (*Thelypteris cyatheoides*) are found at the upper edge of the dryland forest at Auwahi and previously may have been common.

Relatively extensive exploration of lava tubes of the leeward slopes of Haleakalā has yielded fossil evidence of an abundant and diverse avifauna which existed before the 1800s. Two major conclusions can be drawn, 1) there were abundant flightless birds ranging from very small (golf-ball size) rails to very large goose-like birds dubbed *moa-nalo*, and 2) honeycreeper and honeyeater birds now restricted to high mountain areas of rain forest on northern Haleakalā were once common in dryland forests down to low elevations, at least 2000 feet (610 meters) elevation (Olson and James 1982a; Olson and James 1991; James and Olson 1991) and probably down to sea level. An obvious conclusion is that these large goose-like birds provided an easy and rich food supply for early Hawaiians. It is also obvious that this stage of easy predation must have been short-lived as the populations of large, predator-naïve geese quickly disappeared (Olson and James 1982b).

Of the 50 species of native trees at Auwahi,

- 19 species (38%) are known to have been used for medicine,
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- 8 species (16%) for tools for making *kapa*,
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Other miscellaneous uses include bird lime, cordage, a fish narcotizing agent, firewood, a source of "fireworks", recreation, scenting agents, *poi* boards, and *hōlua* sled construction.

Nine species of trees (18%) have no recorded uses. In many of these cases, the wood appears to be a good quality durable hardwood for which there were likely ethnobotanical uses despite the lack of references in the literature.

The extensive zone of koa forest above dryland forests gave Hawaiians access to very large *koa* trees suitable for construction of even large canoes. The steep slopes of the Kahikinui area facilitated the difficult transport of the roughed out koa log downslope to the coast where it could be finished. These forests may have also provided access to greater numbers of certain types of forest birds for gathering feathers.

Traveling on leeward Haleakalā, Walker (unpubl. ms., ca. 1930s) wrote:

"Coral was found on this site and also chips and flakes of a dark fine-grained basalt such as is used for adzes. It was suggested by the guide, J. Burns, that trees for canoes were felled and roughly shaped here, as the forest formerly extended down much further than it does now."

Seasonally, *kāwele* (*Eragrostis variabilis*) and *pili* grass (*Heteropogon contortus*), important house thatching grasses, are still relatively common. Before the introduction of grazing animals, these grasses, particularly *kāwele* grass, must have been extremely common, potentially covering large areas.

## VI. Agriculture, fishing, and settlement patterns:

Leeward areas of the Hawaiian Islands, now often sparsely populated, are reported to have once supported large populations of Hawaiians. Partially, these were fishermen working the deep water without reefs that occurred even close to land. Seasonally, they were farmers, specializing in extensive cultivation of sweet potatoes in the lowlands, and dryland taro at the forest edge.

The sweet potato was apparently the primary food crop of early Hawaiians living on the leeward slopes of Haleakalā (Handy 1940). This area has been called the greatest continuous dry planting area in the Hawaiian Islands and once supported a large population (Handy 1940, see full quotations below).

Long-time Maui resident Oskie Rice (in litt.) recalled: "Kinau Pio who was an old man when Oskie Rice was a boy said that his grandfather remembered when the forest came way down around the Ulupalakua elevation (about 1850 or before?). The population was migratory. They would live at the ocean during the winter months when there was rain and the winds calmer. They would move *mauka* during the summer months."

Regarding Kaupō, Handy (1940) stated, "Kaupo has been famous for its sweet potatoes, both in ancient times and in recent years. Sweet potatoes can be cultivated from sea level up to about 2,000 feet (610 meters) in the rich pulverized lava of this district. This old culture is unfortunately vanishing here, due to a combination of economic and climatic circumstances. From here through Kahikinui, Honuaula, and Kula the sweet potato was the staple food for a considerable population, supplemented with dry taro from the low forest zones. This is the greatest continuous dry planting area in the Hawaiian Islands. A few Hawaiians at Ulupalakua have sizable patches of sweet potato at the present time, and a few patches are still planted at Kaupo; but beyond this, the ancient subsistence culture has completely vanished from these vast *kula* slopes which are now given over wholly to ranching. The fishermen along the coasts of Kahikinui and Honuaula used to exchange their fish for sweet potatoes and taro grown by those living up on the *kula*; Hawaiian tradition gives ample evidence that the population of this now almost depopulated country was considerable."

Handy (1940) stated regarding the Kahikinui district, central leeward Haleakalā, "It is now uninhabited. Fishing is comparatively good along its rugged shores, and in former times Hawaiians lived in isolated communities on the broken lava scattered from one end of the district to the other, close to the sea or slightly inland wherever potable water was to be found in some brackish well or submarine spring offshore. I am told by an old informant, born at Kanaio in the next *moku*, that the Hawaiians formerly living along the coast of Kahikinui had their plantations of dry taro and

other edibles inland in the forest zone, where the forests along the southern wall of Haleakala came much lower and where rainfall was more plentiful than it is today."

Regarding Mākena on leeward Haleakala, Handy (1940) stated, "Makena is today a small community of native fishermen who from time to time cultivate small patches of (sweet) potatoes when rain favors them. Formerly, before deforestation of the uplands, it is said that there was ample rain in favorable seasons for planting the sweet potato, which was the staple there. A large population must have lived at Makena in ancient times for it is an excellent fishing locality, flanked by an extensive area along shore and inland that was formerly very good for sweet potato planting and even now is fairly good, despite frequent droughts....Between Makena and the lava-covered terrain of Keoneoio (another famous fishing locality) the coastal region includes the small *ahupua`a* of Onau, Moomuku, Mooloa, Mooiki, Maluaka, and Kaeo. According to an old *kama`aina*, these *ahupua`a* had in former times a continuous population of fisher folk who cultivated potatoes and exchanged their fish for taro, bananas, and sweet potatoes grown by the upland residents of the Ulupalakua section."

Regarding gourds, Handy (1940) stated, "Gourds grew best on the hot shores and lowlands on leeward and southerly coasts where there was moderate rainfall and plenty of sun....The southern coast of eastern Maui was formerly the best gourd country although some were grown on the windward side in sheltered lowlands."

The small shrub *`auhuhu* (*Tephrosia purpurea*) is found *makai* of Auwahi throughout the lower to middle elevation shrublands. These plants, used as fish poison, are the progeny of seeds brought with voyaging Polynesians from the southern Pacific. Another Polynesian introduction and noted fiber plant, *wauke* (*Broussonetia papyrifera*), occurs at two patches growing in arid `a`a lava near Luaia`ilua hills. Apparently, the Polynesian cultivar of this species in Hawai`i is sterile and does not produce fruit. In this case, these patches are very near where they were originally planted.

Table 1. Ethnobotanical uses of forty-nine species of native dryland forest trees found at or near Auwahi, leeward Haleakalā. (Number listed in parentheses after Hawaiian name, e.g. *`A`ali`i* (1), refer to the number of species referred to by that name that are found in the study area).

| Hawaiian tree name  | house-building               | tool making | weapon making | dye source | canoe building | fishing | kapa tools | medicine | religious | other |
|---------------------|------------------------------|-------------|---------------|------------|----------------|---------|------------|----------|-----------|-------|
| <i>`A`ali`i</i> (1) | X                            | A           | X             | R          | -              | X       | -          | X        | X         | -     |
| <i>A`e</i> (2)      | -                            | A           | X             | -          | -              | -       | X          | -        | -         | -     |
| <i>`Ahakea</i> (2)  | X                            | -           | -             | -          | X              | -       | -          | -        | -         | 8     |
| <i>A`i a`i</i> (1)  | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |       |
| <i>`Aiea</i> (1)    | X                            | -           | -             | -          | X              | -       | -          | X        | -         | 12    |
| <i>`Ākia</i> (1)    | -                            | -           | -             | -          | -              | -       | -          | X        | -         | 2,3   |
| <i>`Akoko</i> (1)   | -                            | -           | -             | -          | X              | -       | -          | X        | -         | -     |
| <i>`Āla`a</i> (1)   | X                            | A           | X             | -          | -              | -       | -          | X        | -         | 1     |
| <i>Alahe`e</i> (1)  | -                            | A,C         | X             | B          | -              | X       | -          | X        | -         | -     |
| <i>Alani</i> (1)    | -                            | -           | -             | -          | X              | -       | X          | X        | -         | 7     |
| <i>Halapepe</i> (1) | -                            | -           | -             | -          | -              | -       | -          | -        | X         | -     |
| <i>Hao</i> (1)      | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |       |
| <i>Hō`awa</i> (2)   | -                            | -           | -             | -          | -              | -       | -          | -        | X         | -     |
| <i>Hōlei</i> (1)    | -                            | -           | -             | Y          | X              | -       | -          | -        | -         | 11    |
| <i>`Iliahi</i> (2)  | -                            | -           | -             | R/Br       | X              | -       | -          | X        | -         | 7     |
| <i>Kauila</i> (1)   | -                            | A           | X             | -          | -              | X       | X          | -        | -         | 11    |
| <i>Keahi</i> (1)    | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |       |
| <i>Koai`a</i> (1)   | X                            | A           | X             | -          | X              | X       | X          | -        | -         | 11    |
| <i>Kōlea</i> (2)    | X                            | -           | -             | R/B        | X              | -       | X          | -        | -         | 11    |
| <i>Kōpiko</i>       | -                            | -           | -             | -          | -              | -       | -          | X        | -         | -     |
| <i>Lama</i> (1)     | X                            | X           | -             | -          | X              | X       | -          | X        | X         | 12    |

Tool making code: A = agricultural tool; C = canoe-making tool

Dye code (color): R = red; B = black; Br = brown; Y = yellow; Bl = blue; P = purple.

Other code: 1 = bird lime; 2 = cordage; 3 = fish narcotizing agent; 4 = superior firewood; 5 = "fireworks"; 6 = recreation game; 7 = scenting agent; 8 = *poi* boards; 9 = *hōlua* sled construction; 10 = calabash, 11 = *olonā* scraping boards; 12 = edible fruits and/or seeds.

Table 1. Ethnobotanical uses of dryland forest trees at Auwahi (cont.)

| Hawaiian tree name       | house-building               | tool making | weapon making | dye source | canoe building | fishing | kapa tools | medicine | religious | other  |
|--------------------------|------------------------------|-------------|---------------|------------|----------------|---------|------------|----------|-----------|--------|
| <i>Māhoe</i> (1)         | -                            | -           | -             | -          | -              | -       | -          | -        | -         | 12     |
| <i>Māmāne</i> (1)        | X                            | A/C         | -             | -          | -              | -       | -          | -        | X         | 4,9,11 |
| <i>Manena</i> (1)        | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>Māua</i> (1)          | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>Mēhame</i> (1)        | X                            | A           | -             | R          | -              | -       | X          | -        | -         | 11     |
| <i>Mēhamehame</i> (1)    | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>Naio</i> (1)          | X                            | -           | -             | -          | X              | -       | -          | -        | -         | 7?     |
| <i>Neneleau</i> (1)      | -                            | -           | -             | -          | -              | -       | -          | -        | -         | 10     |
| <i>ʻOhe</i> (1)          | -                            | -           | -             | -          | -              | -       | -          | X        | X         | 6      |
| <i>ʻOhe mauka</i> (1)    | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>ʻOhe ʻohe</i> (1)     | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>ʻŌhi ʻa lehua</i> (1) | X                            | X           | -             | -          | X              | -       | X          | X        | X         | 4,8    |
| <i>ʻŌlapa</i> (1)        | -                            | -           | -             | Bl         | -              | -       | -          | X        | -         | -      |
| <i>Olopua</i> (1)        | X                            | A           | X             | -          | X              | X       | -          | -        | -         | 4      |
| <i>Pāpala</i> (1)        | -                            | -           | -             | -          | -              | -       | -          | X        | -         | 5      |
| <i>Pāpala kēpau</i> (1)  | -                            | -           | -             | -          | -              | -       | -          | X        | -         | 1      |
| <i>Pilo</i> (1)          | NO ETHNOBOTANICAL USES KNOWN |             |               |            |                |         |            |          |           |        |
| <i>Po ʻolā</i> (1)       | -                            | -           | -             | -          | -              | -       | -          | X        | -         | -      |
| <i>Uhi uhi</i> (1)       | X                            | A           | X             | -          | -              | X       | X          | X        | -         | 9      |
| <i>ʻŪlei</i> (1)         | -                            | A           | -             | P          | -              | X       | X          | X        | -         | 6,12   |
| <i>Wiliwili</i> (1)      | -                            | -           | -             | -          | X              | -       | -          | X        | -         | 6      |

Tool making code: A = agricultural tool; C = canoe-making tool

Dye code (color): R = red; B = black; Br = brown; Y = yellow; Bl = blue; P = purple.

Other code: 1 = bird lime; 2 = cordage; 3 = fish narcotizing agent; 4 = superior firewood; 5 = "fireworks"; 6 = recreation game; 7 = scenting agent; 8 = *poi* boards; 9 = *hōlua* sled construction; 10 = calabash; 11 = *olona* scraping boards; 12 = edible fruits and/or seeds.

## VII. Species accounts

### *`A`ali`i*

1. *Dodonaea viscosa* Jacq.

SAPINDACEAE, Soapberry family

This species is pantropical and native (indigenous) to the Hawaiian Islands (Wagner et al. 1990:1226).

Other Hawaiian names for this species are *`a`ali`i kū makani* (literally *`a`ali`i* standing [in] wind), *`a`ali`i kū ma kua* (literally *`a`ali`i* standing in back) (Pukui and Elbert 1986) and *kūmakani* (Wagner et al. 1990:1227). Regarding names of this genus in the Pacific, Rock (1913) noted, "It is known to the Samoans as *Togovao*, who employ its leaves for baths as a remedy for rheumatism and other inflammations. In the Viti (Fiji) Islands it is the *Wase*, and in Tahiti, *Apiri*. It is the *Ake* of Rarotonga and New Zealand; in the latter place often called *Akeake*."

Summary statement of uses: The strong dark brown-red wood of *`a`ali`i* was used in house construction and in making weapons, agricultural tools, and fishing tools (squid spears and lures). The leaves were used medicinally. The fruit capsules were used in making a red dye and in making *lei*.

Degener (1945) stated, "The *dodonaea* were sacred to Laka and to Kapo, the goddess of the hula. Various parts of the plant were used by the old Hawaiians. Because of the extreme hardness and durability of the wood, the *dodonaea* when found of sufficient size were sometimes cut into timber for building houses, or fashioned into spears and other weapons. The brilliant red capsules were also gathered, placed in a calabash with water and brought to a boil by dropping hot stones among them. The liquid, becoming as red as ink, was strained and then used for dyeing *kapa* and other articles."

*`A`ali`i* fruit capsules soaked in just boiled water yielded a bright red dye which took easily to cotton fabric and held relatively well (Cathy Davenport & ACM unpublished).

Hillebrand (1888) noted, "It is valued for its hard-grained, dark wood". Kamakau (1976) stated that *`a`ali`i* wood was used for making *ō`ō*, agricultural digging sticks. Kamakau (1976) wrote, "Hardwood trees such as *uhiuhi*, the *naio*, the *`a`ali`i*, the *mamane*, the *pua*, and other trees with hard wood were suitable for house posts. The posts were sometimes three yards long; those used for the houses of the chiefs and the prominent people might be four yards long; five yards was the limit for the length of a post. They had to be dragged." It is worth noting that all the tree species that Kamakau mentions as suitable for posts for house construction are tree species characteristic of leeward areas.

Kamakau (1976) and Buck (1957g) described the use of *`a`ali`i* wood in making bait sticks, *la`au melomelo*, a type of lure used in net fishing. A more detailed description of *melomelo* fishing is given under the *kauila* listing. Rock (1913) stated that the leaves of *`a`ali`i* were used as medicine.



Handy and Handy (1972:240) wrote of *`a`ali`i kū ma kua*, "A tree with very hard heartwood, yielded leaves of medicinal value, used particularly on Kaua`i."

Pukui (1983) related expressions regarding the *`a`ali`i* including:

*"He `a`ali`i ku makani mai au; `a`ohe makani nana e kula`i*

(I am a wind resisting *`a`ali`i*; no gale can push me over)

A boast meaning 'I can hold my own even in the face of difficulties.' The *`a`ali`i* bush can stand the worst of gales, twisting and bending but seldom breaking off or falling over."

Status at Auwahi: Though apparently much depleted, *`a`ali`i* is still very common at Auwahi and in most of the districts of leeward Haleakalā from near sea level to at least 7500 feet elevation.

### *A`e*

2. *Zanthoxylum kauaiense* A. Gray

RUTACEAE, Rue or Citrus family

This species is endemic to the main Hawaiian Islands (Wagner *et al.* 1990).

3. *Zanthoxylum hawaiiense* Hillebr.

This species is endemic to Moloka`i, Lāna`i, Maui, and Hawai`i island (Wagner *et al.* 1990).

Another Hawaiian name for this species is *mānele* (Pukui and Elbert 1986). (Wagner *et al.* 1990). Hillebrand (1888) stated that the name for all Hawaiian species of *Zanthoxylum* is "heae" with the notation trisyllabic (not using glottal marks (*`okina*) in his spelling of Hawaiian names), hence probably "*he`a`e*". Pukui and Elbert (1986) stated that the Proto Polynesian root word for this species is *ake*.

Summary statement of uses: The hard and yellowish wood of *a`e* was used for kapa making tools (anvils or *kua kuku*) (Lennox 1967), agricultural tools (digging sticks), and weapons (spears) (Pukui and Elbert 1986)

In Wagner *et al.* (1990), another species *Z. dipetalum* is given the Hawaiian name *kawa`u* and cited as the species used in making the *kua kuku*, the anvil used for beating *kapa*, who cites the pleasant, resonant tone given by the anvil when made of *kawa`u* wood and struck with a *kapa* mallet of a harder wood (generally *koai`e* or *kauila*). However, based on the comments of Lennox (1967), we believe that other species besides *Z. dipetalum* were used in making *kapa* anvils and that the Hawaiian name *kawa`u* is perhaps most appropriately applied to all native Hawaiian species of *Zanthoxylum*.

Lennox (1967) stated regarding *Z. hawaiiense* at Auwahi, "Trunk as kapa anvil - resonant."

Status at Auwahi: Both *Zanthoxylum* species are now very rare at Auwahi and on Haleakalā in general restricted to less than ten individuals each.

## *`Ahakea*

4. *Bobea sandwicensis* (A. Gray) Hillebr.

RUBIACEAE, Coffee family

This species is endemic to O`ahu, Moloka`i, Lāna`i, and Maui (Wagner *et al.* 1990).

5. *Bobea timonioides* (J.D. Hook.) Hillebr.

This species is endemic to East Maui and Hawai`i island and perhaps also O`ahu and Kaua`i (Wagner *et al.* 1990).

*`Ahakea* is apparently the only Hawaiian name recorded for these two species (Hillebrand 1888; Pukui and Elbert 1986)

Summary statement of uses: The yellowish wood of *`ahakea* was formerly used for *poi* boards, canoe rims (Pukui and Elbert 1986) and framing of doors in houses (Kamakau 1976).

Degener (1970) stated, "To this a gunwale or rim, termed *moo*, six to eight inches high, was accurately fitted and sewed or fastened with wooden pegs. This was made of the more durable *`ōhi`a lehua* or of the yellow *ahakea* (*Bobea* spp), so that the paddles might rub here without much damage to the canoe." The wood of *`ahakea* was also used in making canoe paddles (Andrews 1922).

Kamakau (1976) stated, "*`Ahakea* wood was a suitable wood to use for the side posts, *kunakuna*, of the door; the reddish yellow color of the *`ahakea* matched the chiefly red (*ka `ula`ula o ke ali`i*"). The wood of this species was also used for door sills where the *`aumakua* of the house sat (I. A. Abbott, University of Hawai`i at Mānoa Botany Dept., October 1996, pers. comm.).

*`Ahakea*, as well as other dryland forest trees *alahe`e*, *`iliahi* (as *`aoa*), *kauila*, *naio*, *neneleau*, *`ulei*, and *wiliwili* are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The *`ahakea* tree is matched with the *`Okea* living in the sea", an unidentified marine species (Beckwith 1972).

Status at Auwahi: *`Ahakea* is very rare in western Auwahi and slightly more common on rough lava flows both east and west of the Auwahi district. Total population of dryland *`ahakea* on leeward Maui is less than one hundred trees.

## *A`i a`i*

6. *Streblus pendulinus* (Endl.) F.v. Müll.

MORACEAE, Mulberry family

This species is native from New Guinea, eastern Australia, through parts of Melanesia, Micronesia, and Polynesia eastward to Rapa and the main Hawaiian Islands (Wagner *et al.* 1990).

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

Rock (1919) noted, "The wood of the *Aiai* is light brown, close-grained, hard, and tough. The aboriginals of New South Wales employed the wood for their boomerangs. When properly dressed and polished it has a remarkable resemblance to Oak."

Status at Auwahi: *A`i`a`i`* is one of the most common trees in upper Auwahi (2000-4000 ft) and was once likely a dominant and characteristic tree species of much of leeward Haleakalā.

### *`Aiea*

7. *Nothocestrum latifolium* A. Gray

SOLANACEAE, Tomato family

This species is endemic to Kaua`i, O`ahu, Moloka`i, Lāna`i, and Maui (Wagner *et al.* 1990). The *`aiea* are four species of small trees in the endemic Hawaiian genus *Nothocestrum* (Hillebrand 1888; Wagner *et al.* 1990). Another Hawaiian name for this genus is *hālena* (Pukui and Elbert 1986).

Summary statement of uses: The wood was used in firemaking and in making thatching sticks and canoe trimming. The leaves and bark are used medicinally.

Rock (1913) wrote, "The wood of this, as well as of the other species, is soft and of a green color; it was used by the natives in the olden days for finishing off canoes. The reddish yellow berries were sometimes eaten."

Regarding *`aiea*, Pukui and Elbert (1986) noted, "One slender species was used for thatching sticks (*aho*) and fire-making." Lennox (1967) writes of this species, "Soft green wood used for canoe trim".

Chun (1994:197) in his translation of *kahuna lā`au lapa`au* provides a description of using the bark and leaves of *`aiea* as medicine "taken from the side where the sunrises and sets, one *ha`ilima* in length and half a *ha`ilima* in width".

Status at Auwahi: *`Aiea* is one of the most common trees of middle elevation Auwahi (2500-4000 feet elevation) and rarer at higher and lower elevations.

### *`Ākia*

8. *Wikestroemia monticola* Skottsb.

THYMELIACEAE *`Ākia* Family

This species is endemic to East Maui (Wagner *et al.* 1990).

Other Hawaiian names for local species are *`ākia pehu*, *`ākia lau nui*, *`ākia mānalo*, and *kauhi* (Pukui and Elbert 1986). Hillebrand (1888) states the Hawaiian names for the genus are "*akia*" or "*akea*". Hillebrand (1888) also states the root of the word may be in the Fijian name for the genus *mati* and that the native name for the genus in Tahiti is *ovao*.

Summary statement of uses: The primary uses of *`ākia* appear to have been for cordage (Summers 1990) and as an agent of narcotizing fish.

In an excellent discussion of the Hawaiian ethnobotany of *Wikestroemia*, Peterson (1990) wrote, "Species of *Wikestroemia* have furnished one of the strongest Hawaiian fibers, used in making ropes and braids. It is also said to have been used in making *kapa*.... Measurements made from fibers of branches desiccated for 6 months demonstrated that the density of *Wikestroemia* fibers

was about the same as that of New Zealand flax (Phormium tenax) and ramie (Boehmeria nivea).... 'Ākia was used medicinally by Hawaiians in several ways, including as a laxative and as a treatment for asthma. Alkaloids can be extracted from various parts of the plants, and 'ākia has an old reputation for being poisonous; the plants were used for stupefying fish, a method called *hola* by the Hawaiians (Stokes 1912). Degener (1945) mentions that criminals were executed by means of a deadly drink prepared from roots and bark of 'ākia together with parts of other plants. It is possible that not all species of Wikstroemia are poisonous, judging by experiments where 'ākia has been shown to be nontoxic (Arnold 1944; Baldwin 1979). The fruit is slightly bitter but is eaten by birds. Ethanol extracts of Wikstroemia oahuensis and W. uva-ursi have shown antitumor activity (Torrance, Hoffmann & Cole 1979). *Aoaoa* is a vernacular name that may refer to W. oahuensis or W. uva-ursi."

Pukui and Elbert (1986) stated, "The bark yields a fiber; the bark, roots, and leaves (as W. oahuensis) a narcotic used for fish poisoning."

Hillebrand (1888) stated, "Like many other plants of this Order, the Hawaiian *Akeas* contain an acrid-narcotic principle, and are employed by the natives, in common with *Awa* and *Auhuhu* for narcotizing fish. Their strong and flexible bast-fibres serve for many useful purposes and are of the best which the islands produce. A Japanese species furnishes the material for the finest paper made in that country".

Lennox (1967) wrote of this species, "Poisonous - used for stupefying fish. Tough fibers of bark used for cord and rope - almost as strong as olona."

Handy and Handy (1972:239) distinguished two types of 'ākia, a bitter 'ākia ('ākia 'awa) and a 'mild' 'ākia ('ākia manalo). The bitter 'ākia is described as a shrub that bears orange-red fruits, a description that matches that of most Hawaiian Wikstroemia species. Of this type they write that decoctions of the bark and roots are deadly poisonous and were used for killing and suicide. The other mild type of 'ākia, of which no description is given is described as not being poisonous but rather whose bark and leaves were used as a narcotic.

Rock (1913:317) stated, "The trunk and branches are clothed in a black, very tough, fibrous bark, which, owing to its strength, was employed by the natives for ropes and other purposes where strong fiber was needed: it almost equals the *olona* in strength." Chun (1994:172, 233, 265, 156) noted that this species was used as medicine.

The wood of 'akia was also used as a type of ceremonial firewood in 'ana'ana magic (Kamakau 1991). See quote under for *hō'awa* (Pittosporum spp.).

Status at Auwahi: 'Ākia is a very common shrub-tree on much of leeward Haleakalā, even in pasture-like area that are heavily grazed by cattle. The foliage may be poisonous or at least unpalatable to cattle as it is almost never browsed.

### **`Akoko**

9. Chamaecyze celastroides (Boiss.) Croizat & Degener      EUPHORBIACEAE Spurge Family  
var. lorifolia (Gray) Degener & Degener

This species is endemic to main Hawaiian Islands including Nihoa; the variety lorifolia is a tree form of the genus restricted to Maui and rare on Lāna`i (Wagner *et al.* 1990). Other Hawaiian names for this species are *koko*, *`ēkoko*, and *kōkōmālei* (Pukui and Elbert 1986). Hillebrand (1888) states that the name "*koko*" or "*akoko*" means 'blood' and was given to native species of this genus in reference to the milksap, which flows from broken or bruised parts.

Summary statement of uses: The wood of *`akoko* was used as firewood; the leaves medicinally; and the latex used as an ingredient in canoe paint.

Referring to Chamaecyze multiformis, Pukui and Elbert (1986) stated, "Buds and leaves of one species were chewed for debility." Hillebrand (1888) states the wood of the tree form found on the islands of Hawai`i and Maui Nui, and especially common at Auwahi, were "much used" as firewood. Chun (1994:203, 207) noted that this species was used as medicine. Forbes notes (1919) from southern Haleakalā records that Hawaiians of the region used *`akoko* as a laxative.

Buck (1957f:258) wrote that one of the ingredients of canoe paint was "the juice of certain Euphorbia plants", the former name of the native Hawaiian species.

Status at Auwahi: *`Akoko* of Auwahi formed substantial groves along ridgelines in the 1970s. However, the species has declined rapidly in the last two decades and now only scattered tree individuals of this species are to be found.

### **`Āla`a**

10. Pouteria sandwicensis (A. Gray) Baehni & Degener      SAPOTACEAE Sapodilla Family  
This species is endemic to main Hawaiian Islands (Wagner *et al.* 1990:1233). Other Hawaiian names for this species are *āulu* and *`ēla`a* (Pukui and Elbert 1986). Hillebrand (1889) stated the Hawaiian name for this species was *aulu* or *kaulu*. The word *`āla`a* also is used for an *ō`ō* (digging) stick made of *`āla`a* wood (Pukui and Elbert 1986).

Summary statement of uses: The wood of *`āla`a* was used in making weapons and agricultural tools. The leaves were used medicinally. The sap was used as glue for trapping birds.

Wagner *et al.* (1990) wrote, "the hard wood was used for house construction, *ō`ō*, and spears."

Hillebrand (1888) stated that natives used the thick milk-sap (of the bruised or cut fruit) as bird-glue. Pukui and Elbert (1986) noted that the sticky, milky sap was used to trap birds and the wood used for making spears and *ō`ō* handles.

Chun (1994:197) in his translation of *kahuna lā`au lapa`au* from 1867 provides a description of using the leaves of *`āla`a* as part of the cure for the sickness *pehu po`ipū*.

Lennox (1967) wrote of this species, "Milky sap used for bird catching, yellow wood for oo handles, spears."

Status at Auwahi: *Āla`a* is still one of the most common and characteristic of tree species of leeward Haleakalā though based on the number of large, dead trunks, the species has declined in both abundance and size at Auwahi.

### *Alahe`e*

11. *Canthium odoratum* (G. Forster) Seem RUBIACEAE Coffee Family  
This species is native from the New Hebrides, New Caledonia and Micronesia east across the South Pacific to the Tuamotus and the Hawaiian Islands (Wagner *et al.* 1990:1119). This species is also commonly referred to as *walahe`e*. Another Hawaiian name is *ʻōhe`e* (Pukui and Elbert 1986; Hillebrand 1888).

Summary statement of uses: The very hard wood of *alahe`e* was used in making weapons, wooden adzes, fishing tools (spears), and agricultural tools. An unknown part of the plant was also used in medicine.

*Alahe`e* wood was hard and durable and one of the primary woods used in making digging sticks, or *ʻō`ō*, probably the foremost Hawaiian agricultural tool (Buck 1957a; Pukui and Elbert 1986). Handy and Handy (1972) state *alahe`e* wood was used in making short spears (*ʻo*)

According to Malo (1903), the very hard wood of *alahe`e* was used to make a type of adze to carve soft woods, such as *wiliwili*. According to Kamakau (1976), "Other adzes were made of *walahe`e* -- this is a wood. *Ka po`e kahiko* had a saying, 'The seashell is the adz at the shore, and, *walahe`e* the adz of the uplands.' *'O ka pupu ko`i makai, `o ka walahe`e ko`i mauka.*"

Wagner *et al.* (1990) reported that a black dye was produced from the leaves of this species. Pukui and Elbert (1986) note the use of this species in medicine.

*Alahe`e* (spelled as *walahe`e*), as well as other dryland forest trees *ʻahakea*, *ʻiliahi* (as *ʻaoa*), *kaula*, *naio*, *neneleau*, *ʻūlei*, and *wiliwili* are mentioned in the Hawaiian creation chant, *Kumulipo* (Beckwith 1972). The *alahe`e* tree is matched with *he`e*, the squid (Beckwith 1972)

Status at Auwahi: *Alahe`e* is a common small tree species of lower Auwahi (to 2800 feet elevation). Flowering trees attract large numbers of insects, especially introduced honeybees, to their strongly sweet scented flowers.

### *Alani*

Another Hawaiian name for local species is *alani kuahiwi* (Pukui and Elbert 1986).

12. *Melicope adscendens* (St. John & E. Hume) T. Hartley & B. Stone RUTACEAE Rue or Citrus Family

USFWS Endangered species.

This species is endemic to Auwahi, leeward East Maui (Wagner *et al.* 1990:1183).

13. Melicope knudsenii (Hillebr.) T. Hartley & B. Stone

This species is endemic to Kaua'i and leeward East Maui (Wagner et al. 1990:1192).  
USFWS Endangered species.

14 Melicope mucronulata (St. John) T. Hartley & B. Stone

This species is endemic to Moloka'i and leeward East Maui (Wagner et al. 1990:1196).

15. Melicope volcanica (A. Gray) T. Hartley & B. Stone

This species is endemic to Lāna'i, East Maui, and Hawai'i island (Wagner et al. 1990:1205).

Summary statement of uses: The wood of at least one species is used for canoe trim and *kapa* beaters. The fruits and bark are used medicinally; the leaves are used for perfuming *kapa* cloth.

Lennox (1967) wrote of Melicope volcanica, "Tough yellow-white wood for canoe trim, *kapa* beaters."

Handy and Handy (1972:240) wrote of the genus Melicope in Hawai'i, "The nuts, yielding an oil smelling like orange rind, were chewed for therapeutic purposes, and the bark was also used medicinally". Handy and Handy (1972:237) wrote that *alani* leaves were used in perfuming *kapa* cloth, to offset the foul smell produced in the retting stages. The bark of Melicope knudsenii at Auwahi, known from two individuals on Maui, has bark that when rubbed emits a strong fragrance very much like that of *mokihana* (Melicope anisata) of Kaua'i.

Status at Auwahi: Melicope adscendens is an Endangered species (USFWS). It is a scrambling vine-like tree restricted to approximately forty individuals between eastern Kanaio and western Auwahi. Melicope knudsenii is another Endangered species known from about a dozen trees in the late 1970s but is now seemingly restricted to a single living individual in upper western Auwahi. Melicope mucronulata is now thought to be extinct on Haleakalā. Melicope volcanica is uncommon and scattered throughout Auwahi as well as rain forests of windward Haleakalā.

### *Halapepe*

16. Pleomele auwahiensis St. John

AGAVACEAE, Agave family

This species is endemic to Moloka'i and Maui (Wagner et al. 1990:1352). Another Hawaiian name for local species is *le'ie* (Pukui and Elbert 1986). The Hawaiian name, *halapepe*, translates literally to "crushed Pandanus" or "dwarfed Pandanus".

Summary statement of uses: The soft whitish or reddish wood of *halapepe* was used for carving images (*ki'i*) (Hillebrand 1888) and has religious significance.

*Halapepe* was one of the five essential plants represented at the hula altar (*halapepe*, *'ie'ie*, *maile*, *'ōhi'a lehua*, *palapalai*) (Emerson 1965; Handy and Handy 1972:241). Abbott (1992:117) noted that the branches of *halapepe* were used at the altar to represent the goddess Kapo.

Status at Auwahi: Despite a near complete lack of reproduction at Auwahi, this species is still one of the most common and characteristic tree species of Auwahi and other high diversity dryland forest on Haleakalā.

### *Hao*

17. Rauvolfia sandwicensis A. DC.

APOCYNACEAE Dogbane Family

This species is endemic to the main Hawaiian Islands (Wagner et al. 1990:220).

Summary statement of uses: Other species in this genus elsewhere in the world have medicinal properties (Neal 1965). No ethnobotanical uses of Hawaiian species have been discovered in the literature.

Lennox (1967) wrote of this species, "Smoke considered poisonous - no recorded uses."

Status at Auwahi: In lower Auwahi, *hao* is still common growing nearly exclusively in the roughest stands of 'a'a lava. This species still survives from 2600 feet elevation nearly to sea level in heavily goat browsed areas. Like 'ākia, *hao* appears at least unpalatable to grazing animals as it is rarely browsed.

### *Hō'awa*

18 Pittosporum argentifolium Sherff.

PITTOSPORACEAE Pittosporum Family

This species is endemic to Moloka'i and leeward East Maui (Wagner et al. 1990:1039).

19 Pittosporum glabrum Hook. & Arnott.

This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui (Wagner et al. 1990:1043).

Another Hawaiian name for native species is *hā'awa* (Pukui and Elbert 1986).

Summary statement of uses: The wood of *hō'awa* has religious significance.

The only specific known ethnobotanical use for this species is as a type of ceremonial firewood in 'ana'ana magic (Kamakau 1991). As part of the description, Kamakau (1991:126) stated, "In preparing for the prayer ritual of a *kuni* ceremony, the *kapuahi kuni*, the ritual fireplace, was set blazing with *ho'awa* and 'ākia with stalks and leaves still green. The firesticks were rubbed (*hi'a ke ahi*), and the fire lighted with green leaves serving as kindling and green wood as fuel, and it sprung into a blaze."

Status at Auwahi: Pittosporum argentifolium is apparently extinct at Auwahi, last collected there in 1921. Pittosporum glabrum is extremely rare at Auwahi, but is more common in moister forests on Maui and elsewhere.

### *Hōlei*

20. Ochrosia haleakalae St. John

APOCYNACEAE Dogbane Family

This species is endemic to East Maui and perhaps Hawai'i island (Wagner et al. 1990:218).

Hillebrand (1888) stated that the Hawaiian name for Ochrosia is *hoolei*.



Summary statement of uses: The bark and roots of *hōlei* are used in making a yellow-orange dye and the wood is used in canoe construction (*mo'o*).

The wood of *hōlei* is used to make gunnels (*mo'o*) for canoes (Holmes 1981). The bark and roots of *hōlei* were used for producing a yellow dye for bark cloth, *kapa* (Buck 1957:186-187; Neal 1965:691; Pukui and Elbert 1986:77). Pukui and Elbert (1986) stated that *kapa* dyed with *hōlei* or the act of dyeing *kapa* with it are also known as *hōlei*. Kamakau (1976) notes two types of *kapa* dyed with *hōlei*: 1) a yellow *kapa* named *hōlei* for the tree, "colored by beating in the juice of the bark of the *hōlei*" and 2) a *kapa* named *waili'ili'i* with a pattern of thick yellow stripes dyed with *hōlei*.

Small bark pieces of *hōlei* soaked in just boiled water yielded a bright yellow dye which took well to cotton cloth (Cathy Davenport and ACM unpublished).

Summers (1990:41) wrote that *kauila*, *koai'e*, *kōlea*, *kāwa'u*, *hōlei*, *māmane*, and *nā'u* were among the woods used in making *lā'au kahi olonā* or *papa olonā*, the long slender thin hardwood boards used for scraping *olonā*.

Status at Auwahi: Perhaps three hundred individuals of this rare species are known from the Auwahi district; approximately 50 individuals from the Makawao Forest Reserve, and very rare at Nahiku in lower elevation windward wet forest (R. Sylva, pers. comm.).

### *'Iliahi*

#### 21. *Santalum ellipticum* Gaud.

SANTALACEAE, Sandalwood family

This species is endemic to the main Hawaiian Islands (Wagner *et al.* 1990).

#### 22. *Santalum freycinetianum* Gaud. var. *lanaiense* Rock

This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui (Wagner *et al.* 1990). The variety *lanaiense*, endemic to Lāna'i and Maui, is considered an Endangered species by the U.S. Fish and Wildlife Service.

Another Hawaiian name for this species is *'aoa* (Pukui and Elbert 1986) *laau aala* (Degener 1945), and *la'au ala* (Hillebrand 1888). Literally, *la'au ala* means "fragrant plant". In Oceania, sandalwood is known as *eai* in Tahiti, *yasi* in Fiji, *mairi* in New Zealand (Hillebrand 1888). Hillebrand (1888) postulates that the Maori name *mairi* is a "transfer" from another fragrant plant, the *maile* (*Alyxia olivifolia*) which does not occur in New Zealand.

Summary statement of uses: The wood of *'iliahi* is favored for making the *pola*, the sometimes covered platform on a double canoe (Holmes 1981). Degener (1945) stated, "They used the powdered heartwood as a perfume and frequently sprinkled it among their *kapa* to offset the objectionable odor that was particularly strong shortly after its manufacture".

Kamakau (1976) notes the making of *maku`e*, a red and brown mottled *kapa* made by "beating in 'iliahi (sandalwood) and *pala`a* (fern)." Chun (1994: 166) noted that this species was used as medicine.

'Iliahi (as 'aoa), as well as other dryland forest trees 'ahakea, alahe'e, kauila, naio, neneleau, 'ulei, and wiliwili are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The 'iliahi tree is matched with the *palaoa* translated with a question mark as 'walrus' (Beckwith 1972). In translating *palaoa*, the Hawaiian dictionary (Pukui and Elbert 1986) does not include 'walrus', but instead considers the primary meaning as a more logical 'sperm whale'.

**Status at Auwahi:** *Santalum ellipticum* is common on leeward Haleakalā from near sea level to nearly 5000 feet elevation. *Santalum freycinetianum* var. *lanaiense* is much rarer, known from two to three hundred individuals in Auwahi. Despite large size (almost 50 feet tall) and bearing prolific amounts of viable seeds, damage by introduced rats and the unsuitability of its current pasture-like habitat has nearly eliminated natural regeneration by seed.

### *Kauila, kauwila*

23. *Alphitonia ponderosa* Hillebr.

RHAMNACEAE, Buckthorn family

This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner *et al.* 1990).

Hillebrand (1888) cited the Hawaiian name *kauwila* for both *Alphitonia ponderosa* and *Colubrina oppositifolia*, a treatment often followed today (e.g. Pukui and Elbert 1986). According to Rock (1913), another Hawaiian name for this species on Maui is *o`a*. However, Neal (1965) and Pukui and Elbert (1986) stated that *o`a* is a Maui name for *Colubrina oppositifolia*.

**Summary statement of uses:** Wood of this species was used in making weapons, *kapa* tools, agricultural tools (especially 'ō'ō), images (*ki'i*), and fishing lures.

Hillebrand (1888) stated of this species, "The wood is remarkable for close grain, hardness and heavy weight, on which account the natives preferred it for making spears, mallets for beating 'kapa' and other tools. It turns black with age." *Kauila* was by far the preferred wood for spears, but *mamane*, *uhiuhi*, and *koa* were also used. Malo (1903) mentions 'olapa and lo'ulu palm wood for spears. *Kauila* was valued for its strength and relative weight as well as its ability for a point to remain sharp and unbroken. *Kauila* and *koai`a* were favored in making the squared edge mallet used for the second beating of Hawaiian kapa, the *i`e kuku*.

Kamakau (1976) also describes the use of *kauila*, *o`a*, *koai`e*, and *hame* (= *mēhame*) woods in making 'ō'ō, or digging sticks. A more detailed description is given under *koai`e*.

Kamakau (1976) writes of an 'ō'ō of *kauila* in a chant for Kū:

*E `ike mai ia`u i kālai 'ō'ō  
He kauila ka 'ō'ō mahi`ai au i ka `āina kula  
He `uala ka `ai*

Look toward me as I carve an 'ō'ō,  
An 'ō'ō of *kauila* to be used on kula lands,  
To plant sweet potatoes for food

Buck (1957j) describes the use of *kauila* wood (often as the preferred choice) in construction of *polulu* (long spears), *ihe* (short spears), *pahoa* (single-, double-pointed, and trucheon daggers), and shark-tooth weapons.

Regarding its preferred use in *ki'i* (images), Abbott (1992:114) wrote, "Art historians Halley Cox and William Davenport who have published the most complete study of this subject (1988), indicate that *kauila* was the most frequently used wood after 'ōhi'a, especially *Colubrina oppositifolia*, which they believe can be distinguished from *Alphitonia ponderosa* on the basis of finer grain and greater natural luster. *Kou* served as a material for small figures, and a few images display the contrasting colors in its grain to great advantage."

Summers (1990:41) wrote that *kauila*, *koai'e*, *kōlea*, *kāwa'u*, *hōlei*, *māmane*, and *nā'u* were among the woods used in making *lā'au kahi olonā* or *papa olonā*, the long slender thin hardwood boards used for scraping *olonā*.

Kamakau (1976) and Buck (1957g) described the use of *o'a* and other hard woods (*koai'e*, *a'ali'i*, *pua*) for the making of *melomelo* sticks used in a type of fishing involving attracting fish with the *melomelo* stick which "had been rubbed with coconut meat, *kukui* nuts, and all sorts of strong-scented things, and roasted over a fire until it was black." Fish swarmed to nibble at the *melomelo* stick and were caught using several canoes and a series of nets.

*Kauila*, as well as other dryland forest trees 'ahakea, *alahe'e*, 'iliahi (as 'aoa), *naio*, *neneleau'u lei*, and *wiliwili* are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The *kauila* tree is matched with the *kauila* eel (Beckwith 1972).

Lennox (1967) wrote of this species, "Used for spears, javelins, *kapa* beaters, bearing sticks, *kahili* handles."

Status at Auwahi: Perhaps one hundred to two hundred and fifty individuals of *Alphitonia* survive at Auwahi and adjacent Kanaio district. Dead trunks of this species with straight trunks up to forty feet tall indicate a taller forest structure than now exists in these areas.

### *Keahi*

24. *Nesoluma polynesianum* (Hillebr.) Baill.

SAPOTACEAE Sapodilla Family

This species is indigenous to the Austral Islands (Raivavae), Rapa, and the main Hawaiian Islands (Wagner et al. 1990).

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

Status at Auwahi: *Keahi* is uncommon but characteristic tree species of lower Auwahi and other leeward districts of Haleakalā where it grows nearly exclusively in very rough 'a' lava at 1400-2400 feet elevation.

### *Koai`a, koai`e*

25. *Acacia koaia* Hillebr.

FABACEAE, Pea family

This species is endemic to Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner et al. 1990).

Summary statement of uses: The hard, durable, dark wood of *koai`a* was used in making spears, canoe paddles, *i'e kuku kapa* beaters, fishing lures, digging sticks (*ō`ō*), *olonā* scraping boards (*papa olonā*). The leaves and branches were used in thatching.

Pukui and Elbert (1986) stated of this species, "the wood is harder (than *koa*), formerly used for spears, fancy paddles, and for the *i'e* tapa beater; later for furniture". Kamakau (1976) stated that the leaves of *koai`e* were used to cover shelters and permanent sheds (*hale lau koai`e*). Kamakau (1976) and Buck (1957g) described the use of *koai`e* wood in making the *melomelo* stick, a type of lure used in net fishing. A more detailed description of *melomelo* fishing is given under the *kauila* listing.

Kamakau (1976) stated regarding the *ō`ō*, or digging stick "This is how *ha`aheo* planting was done. Each man carried an *ō`ō ku*, a digging stick three or four *anana* (meters) long, or longer, and about eight inches in circumference at the middle. It was made of *kauila*, *o`a*, *koai`e*, *hame*, or some other suitable wood, peeled of its bark and rubbed smooth. The top was rounded to a knob (*hamo ka welau a poheheo*) and the bottom (*kumu*) was flattened out like the bill of a duck. One side of the blade was flat, while the back was slightly swelled (*lahilahi`ohu ke kua*: convex). The whole blade was about two and a half feet long, and the point was about six inches long. This was the kind of *ō`ō* used in planting bottom lands."

Summers (1990:41) wrote that *kauila*, *koai`e*, *kōlea*, *kāwa`u*, *hōlei*, *māmane*, and *nā`ū* were among the woods used in making *lā`au kahi olonā* or *papa olonā*, the long slender thin hardwood boards used for scraping *olonā*.

Status at Auwahi: Currently, *koai`a* is found in Auwahi only from individuals planted by Colin Lennox in the 1940s. *Koai`a* is uncommon and scattered (several hundred trees) in low to mid elevation areas in districts of leeward Haleakalā both east and west of Auwahi.

### *Kōlea*

26. *Myrsine lanaiensis* Hillebr.

MYRSINACEAE Myrsine Family

27. *Myrsine lessertiana* A. DC.

Both species are endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner et al. 1990). Hillebrand (1888) spells the Hawaiian name as *koolea*. Another Hawaiian name for this species is *kōlea lau nui* (Pukui and Elbert 1986).

Summary statement of uses: The wood of *kōlea* was used in housebuilding, canoe construction, and in making *olonā* scraping boards. The bark was used in making a red dye for *kapa*; charcoal was used in making a black dye.

Degener (1945) stated that *kōlea* logs were used as posts and beams for houses and for the *kua kuku*, the base upon which *kapa* was beaten (Degener 1945). Summers (1990:41) wrote that *kauila*, *koai'e*, *kōlea*, *kāwa'u*, *hōlei*, *māmane*, and *nā'ū* were among the woods used in making *lā'au kahi olonā* or *papa olonā*, the long slender thin hardwood boards used for scraping *olonā*.

Holmes (1981) noted that *kōlea* wood was used for construction of the bow and stern ornamental end pieces (*manu*) and gunnels.

Lennox (1967) wrote of this species, "Used for house timbers, bark for red dye, charcoal for black dye."

A red dye used for dyeing *kapa* was extracted from the bark of *kōlea* trees (Hillebrand 1888; Buck 1957:187). Degener (1945) reported that its red sap and charcoal from the wood was used to dye bark cloth (*kapa*) but stated, "More commonly, however, the bark stripped from the trunk of the tree was pounded and then placed in a calabash with water. After straining through coconut fiber or some similar material, the resulting liquid constituted the dye." Buck (1957:187) stated that dyes made from bark are referred to as *hili* dyes and given the more particular name for the tree they are made from, i.e. *hili kōlea*.

Small pieces of both species of *kōlea* trees from Auwahi placed in just boiled water yielded a red dye which took well to cotton cloth. From similar amounts of bark, *Myrsine lessertiana* produced a richer red color versus *M. lanaiensis* which produced a lighter shade pink-red (Cathy Davenport and ACM unpublished).

Status at Auwahi: Both species are common in forests of Auwahi and in good quality stands of dryland forests elsewhere on leeward Haleakalā. *Myrsine lanaiensis* is restricted to dryland and mesic forests on Maui, while *M. lessertiana* is found both in leeward forests as well as commonly in rain forest on windward Haleakalā.

### *Kōpiko*

#### 28. *Psychotria mauensis*

RUBIACEAE, Coffee family

This species is endemic to Kaua'i, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner et al. 1990). Another Hawaiian name for this species is '*ōpiko* (Pukui and Elbert 1986).

Summary statement of uses: This species has been used medicinally.

Parts of Hawaiian species of this genus are used medicinally (Papa Auwai, pers. comm.).

Handy and Pukui (1972:221) called the *kōpiko* tree, "handsome but useless".

Status at Auwahi: *Psychotria mauensis* is quite uncommon in Auwahi, a few trees scattered in middle to upper elevation western Auwahi. The species is found elsewhere more common on Maui in moister windward forests.

### *Lama*

29. *Diospyros sandwicensis* (A. DC) Fosb.

EBENACEAE, Ebony family

This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner *et al.* 1990). Another Hawaiian name for this species is *ēlama* (Pukui and Elbert 1986).

Summary statement of uses: The wood of *lama* was used in house construction and in making religious structures (offering houses, fences marking spiritual enclosures, heiau structures), hula altar offerings, fish traps (*hina'i*) supports, and tool handles. The fruits were eaten. An unknown part of the plant was used medicinally.

*Lama* wood and branches had religious value to Hawaiians. Perhaps this is, as Pukui and Elbert (1986) noted, due to the double meaning of the word *lama* in Hawaiian, that of the tree, and as light, lamp or more figuratively, enlightenment. Kamakau (1964:97) describes the building of a special house, the *moku hale*, with the posts, rafters, and thatching sticks of *lama* wood, sometimes even thatched with the leaves of *lama*. In this house, called the *hale lau lama*, chiefs made offerings and sacrifices in atonement to a god for some wrongdoing. Wood, branches, and leaves of *lama* were also used religiously in construction of certain parts of *heiau*, such as special houses and enclosure fences (Papa Ii 1959; Kamakau 1976:138; Dye 1991:34). Papa Ii (1959:56) has a drawing of a Hale o Lono *heiau* with an *opu* tower, a seven meter tall pole structure covered with *kapa*, and with *lama* branches stuck in its top, "like unruly hair, going every which way."

Buck (1957k:519) stated, "Malo (1951, p.159) writes that in the *luakini* war temple 'ohi'a wood was used for the houses, oracle tower, and images and that *loulou* palm leaves, or 'uki grass were used for the house thatch. In the 'peaceful' *mapele* temple, *lama* was used for the wooden structures and ti leaves for the thatch."

Pukui and Elbert (1986) stated, "Huts were built of *lama* wood in a single day during daylight (*lama*) hours, and the sick were placed inside them for curing". *Lama* wood was placed at hula altars because its name suggested enlightenment (Pukui and Elbert 1986). *Lama* was used in medicine (Pukui and Elbert 1986) and the wood as rafters in house construction (Kamakau 1976). For the full quote, see account of *mēhame*.

Regarding its use on the *hula* altar, Abbot (1992:117) wrote, "Inside a *hālau hula* was an altar (kuahu) on which lay a block of wood of the endemic *lama* (*Diospyros sandwicensis*), a tree whose name translates as 'light' or 'lamp' and carried the figurative meaning of 'enlightenment.' Swathed in yellow *kapa* and scented with 'ōlena, this piece of wood represented Laka, goddess of hula, sister and wife of Lono."

The berries of *lama* were eaten by Hawaiians as wild foods (Buck 1957a) and were given the name *pi'oi* (Handy and Handy 1972:235), a name used on Hawai'i island (Pukui and Elbert 1986). Hillebrand (1888) stated, "The seeds are eaten by the natives". It is not known if Hillebrand was

mistaken when saying that the seeds (versus the fruits) were eaten. The fruit of many members of this genus are edible, e.g. *Diospyros* spp. are persimmons. The orange *lama* fruit is slightly sweet and when fruiting would be an important source of moisture in a porous lava region lacking potable water for miles.

Status at Auwahi: *Lama* is a common tree species of Auwahi and other leeward districts of Haleakalā, found throughout up to 4500 feet elevation but most common from 2000-3000 feet elevation. Germination of large numbers of *lama* seedlings occurs in the spring but most of these perish by late summer (pers. obs. A.C. Medeiros)

### *Māhoe*

30. *Alectryon macrococcus* Radlk. var. *auwahiensis* Linney      SAPINDACEAE Soapberry Family  
This species is endemic to Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1990:1224). Another Hawaiian name for this species is *'ala'alahua* (Pukui and Elbert 1986). Rock (1913) noted, "The name *Mahoe*, meaning 'twins', undoubtedly refers to the double fruits, which are not uncommon in our *Alectryon*."

Summary statement of uses: The fruits and seeds of this species are eaten.

Rock (1913) wrote of this species, "The wood, which is very hard and tough, has not been made use of by the natives, as far as can be ascertained. The bright scarlet fruit flesh is eaten by the natives, as well as the kernel of the seed, and are not altogether unpleasant."

Status at Auwahi: USFWS Endangered species status report (unpublished Sept. 1995) estimates less than 300 individuals of the species survive. Based on numerous field trips in 1995-1996, just over a dozen of these trees of the variety *auwahiensis* survive currently at Auwahi. Seed gathered from one of these tree produced a young healthy seedling about one year old.

### *Māmāne*

31. *Sophora chrysophylla* (Salisb.) Seem.      FABACEAE, Pea family  
This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner *et al.* 1990). The Hawaiian name for this species is sometimes spelled as *māmāni* (Hillebrand 1888; Degener 1945)

Summary statement of uses: The very hard and durable wood of this species was used in house construction as well as adze handles, agricultural tools, *hōlua* sled runners, *olonā* scraping boards, and superior quality firewood. The wood had religious significance.

*Māmāne* wood was used for tools, spades, and *hōlua* sled runners (Pukui and Elbert 1986, Handy and Handy 1972). Kamakau (1976) stated that straight trunks of *māmāne* and several other dryland trees were preferred for posts of houses. The complete quote from Kamakau (1976) is given under the species account of *'a'ali'i*.

Degener (1945) stated, "The wood of the *māmāni* is very hard and durable. It was used by the Hawaiians as a substitute for the more valuable and rarer *kauila* wood in the making of agricultural

implements and adz handles. It was sometimes used for the posts and beams of their houses. Often the sap wood of such timbers was carefully cut away, as that is not as strong and durable as the older, heartwood. During certain religious ceremonies to ward off evil, the high priest or *kahuna nui*, would hold in his hand a piece of *mamani* or *kauila* wood wrapped in dark *kapa* as a symbol of his authority. *Mamani* wood was preferred for the making of the runners of the Hawaiian sled, or *papa holua*....In more recent times, the ranchers cut the trunks of the *mamani* trees into fence posts because of their great durability in the soil." The *māmane* is referred to in M. Beckwith *Kepelino* (Pukui and Elbert 1986:65).

Summers (1990:41) wrote that *kauila*, *koai'e*, *kōlea*, *kāwa'u*, *hōlei*, *māmane*, and *nā'ū* were among the woods used in making *lā'au kahi olonā* or *papa olonā*, the long slender thin hardwood boards used for scraping *olonā*.

Status at Auwahi: *Māmane* is uncommon at lower elevation but above 3500 feet elevation at Auwahi, large individuals become increasingly common growing with large *naio* trees. Presumably in pre-contact forests this forest type merged in with sub-alpine forest shrublands at ca. 6000 feet on southwest Haleakalā.

### *Manena*

32. *Melicope hawaiiensis* (Wawra) T. Hartley & B. Stone RUTACEAE Rue or Citrus Family  
This species is endemic to Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner *et al.* 1990:1189).

Summary statement of uses: The fruits and bark of unknown species of this genus were used medicinally; the leaves of unknown species of this genus were used for perfuming *kapa* cloth.

Handy and Handy (1972:240) wrote of the genus *Melicope* in Hawai'i, "The nuts, yielding an oil smelling like orange rind, were chewed for therapeutic purposes, and the bark was also used medicinally". Handy and Handy (1972:237) wrote that *alani* leaves were used in perfuming *kapa* cloth, to offset the foul smell produced in the retting stages.

Status at Auwahi: This species is rare and scattered but at least a dozen trees are scattered at the western edge of Auwahi where this district mixes in with rougher, less vegetated lava flows of adjacent Kanaio district.

### *Maua*

33. *Xylosma hawaiiense* Seem. FLACOURTIACEAE, Flacourtia family  
This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner *et al.* 1990). Another Hawaiian name for this species used on Maui is *a'e* (Pukui and Elbert 1986).

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

Status at Auwahi: Just as with *māmane*, this species is present at lower Auwahi but becomes prominent in upper elevation Auwahi (above 3500 feet elevation) where large trees to 40 feet high are a relatively common and characteristic species of this forest.



### *Mēhame*

34. Antidesma pulvinatum Hillebr.

EUPHORBIACEAE, Spurge family

This species is endemic to O`ahu, Moloka`i, Maui, and Hawai`i island (Wagner et al. 1990). Other Hawaiian names for the two local species are *ha`ā*, *ha`āmaile*, *hame*, *hamehame* (Pukui and Elbert 1986).

Summary statement of uses: The wood of *mēhame* was used in housebuilding, making *olonā* scraping boards, and digging sticks ( *ō`ō*). The fruit pulp was used in making a red dye.

Pukui and Elbert (1976) stated, "Formerly the wood was used as anvils for preparing *olonā* fiber, the fruit to color tapa red".

Kamakau (1976) stated regarding house construction, "The rafters were seven yards long for large houses, such as those of chiefs, but most of the houses were smaller. Straight trees were selected for the rafters, such as the *ōhi`a hamau*, *lama*, *ha`a* and other straight firm trees."

Kamakau (1976) also describes the use of *kauila*, *o`a*, *koai`e*, and *hame* (= *mēhame*) woods in making *ō`ō*, or digging sticks. A more detailed description is given under *koai`e*.

Status at Auwahi: This species no longer occurs in Auwahi district but grows (often with *ahakea*) in districts both east and west of Auwahi in middle elevation (1900-2800 feet elevation) dryland forests exclusively on *ā`a* lava.

### *Mēhamehame*

35. Flueggea neowawraea W. Hayden

EUPHORBIACEAE, Spurge family

This species is endemic to Kaua`i, O`ahu, Moloka`i (?), Maui, and Hawai`i island (Wagner et al. 1990). Formerly called Drypetes phyllanthoides (Rock) Sherff in Hawaiian botanical literature.

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

This species produces fine quality, dense, durable hardwood and was probably used as were other durable woods (e.g. weapons, agricultural tools, canoe parts, adze handles).

Status at Auwahi: This tree is one of the rarest species found at Auwahi and is known from two individuals in middle Auwahi (2800 feet elevation). The only other tree of this species on Haleakalā is found about one mile to the east in the Luala`ilua district. No seed production of this dioecious species has been noted on Maui. The long term survival of this species is jeopardized by the herbivory of the black coffee twig borer (Xylosandrus compactus) which attacks nearly every apical tip of this species in the field.

### *Naio*

36. *Myoporum sandwicense* A. Gray

MYOPORACEAE Myoporum Family

This species is indigenous to Mangaia in the Cook Islands and on all the main Hawaiian Islands (Wagner *et al.* 1990). Hillebrand (1888) gives the Hawaiian names for this species as *naea* and *naieo*. The wood of *naio* is referred to as '*a'aka*' (Pukui and Elbert 1986).

Summary statement of uses: The wood of *naio* was used in housebuilding and in making canoe parts and fishing torches.

Kamakau (1976) stated that straight trunks of *naio* and several other dryland trees were preferred for posts of houses. The complete quote from Kamakau (1976) is given under the species account of '*a'ali'i*'. Holmes (1981) noted that *naio* wood was used for construction of the bow and stern ornamental end pieces (*mamu*) and gunnels.

Hillebrand (1888) states that the wood, particularly that of the roots, becomes fragrant on drying with an odor resembling sandalwood.

Lennox (1967) wrote of this species, "Used for house timbers, fishing torches."

*Naio*, as well as other dryland forest trees '*ahakea*, '*alahe'e*', '*iliahi*' (as '*aoa*'), '*kauila*', '*neneleau*' '*ūlei*', and '*wiliwili*' are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The *naio* tree is matched with the 'sea-worm' (Beckwith 1972).

Status at Auwahi: *Naio* trees are still fairly common throughout Auwahi but based on the numbers of dead trunks of this species in many areas, used to be much more common.

### *Neneleau*

37. *Rhus sandwicensis* A. Gray

ANACARDIACEAE Mango Family

This species is endemic to Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i island (Wagner *et al.* 1990).

Summary statement of uses: Lennox (1967) wrote of this species, "Used for plain calabashes, *lomi lomi* sticks."

The lightweight, coarse-textured, and tough wood was formerly used for saddle trees, yokes, and plows. The bark was once used locally for tanning (Wagner *et al.* 1990).

Speaking generally about the genus *Rhus*, Hillebrand (1888) noted, "Several Sumachs are poisonous, even to the touch, others are used for tanning and dyeing, while some Japanese species furnish the laquer for the much prized laquer ware of that country".

In the Society Islands, the related *Rhus tahitiense* called *apape* produce "odoriferous" good quality wood from which dugout canoes are made (Chabout and Chabout undated)

*Neneleau*, as well as other dryland forest trees '*ahakea*, '*alahe'e*', '*iliahi*' (as '*aoa*'), '*kauila*', '*naio*,

*ʻūlei*, and *wiliwili* are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The *neneleau* tree is matched with the 'Ne seaweed' Beckwith 1972).

Status at Auwahi: *Neneleau* is known from one group of trees in middle elevation central Auwahi, apparently reproducing clonally by root suckering. This same patch of trees is the only one known in Auwahi and was apparently the same group discovered by Colin Lennox in the 1940s.

### *ʻOhe*

38. *Reynoldsia sandwicensis* A. Gray

ARALIACEAE Ginseng Family

This species is endemic to Niʻihau, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi island (Wagner *et al.* 1990). Other Hawaiian names for this species are *ʻohe kukuluʻae ʻo*, *ʻohe-o-kai*, *ʻohe-ma-kai* (Pukui and Elbert 1986).

Hillebrand (1888) noted that in Tahiti, *ofe* is the name of another tree (*Meryta lanceolata* Forst.) in the same family as *ʻohe*, i.e. the Araliaceae.

Summary statement of uses: The soft light wood of *ʻohe* was used for making spiritual images (*ki ʻi*) and stilts for recreation. The bark was used medicinally.

Lennox (1967) wrote of this species, "Soft white wood used for stilts." Buck (1957h) states that the specific construction of the stilts (*kukuluʻae ʻo*) made of *ʻohe* is not recorded.

Chun (1994: 171) noted that the bark of this species was used as medicine. Handy and Handy (1972:241) wrote "The *ʻohe* tree (not a bamboo) growing at Maunaloa, Molokaʻi was the 'tree form of the goddess Kapo, and its wood (regarded as poisonous) was used to make 'poison god' images for black magic."

Status at Auwahi: *Reynoldsia* is a common characteristic species of Auwahi, especially below 2800 feet elevation. As with many dryland tree species, despite abundant seed set and germination success in greenhouse conditions, natural reproduction is very rare.

### *ʻOhe mauka*

39. *Tetraplasandra oahuensis* (Gray) Harms

ARALIACEAE Ginseng Family

This species is endemic to Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi island (Wagner *et al.* 1990).

Summary statement of uses: No ethnobotanical uses found in the literature.

Status at Auwahi: *Tetraplasandra oahuensis* is a large, fairly common tree of upper Auwahi at 2800-4000 feet elevation.

*‘Ohe`ohe*

40. *Tetraplasandra kavaensis* (Mann) Sherff

ARALIACEAE Ginseng Family

This species is endemic to Kaua`i, O`ahu, Lāna`i, Maui, and Hawai`i island (Wagner et al. 1990).

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

Wagner et al. (1990) stated regarding distribution: "*Tetraplasandra kavaensis* is common only on Kaua`i and is apparently rare on the other islands. On O`ahu it is found only in the northern Wai`anae Mountains...A few remaining old plants in certain areas on Maui (e.g. eastern Auwahi) represent populations that are probably doomed to extinction in the near future, as they are not reproducing".

On Niihau island where this species does not occur, *‘ohe`ohe* is used for *Reynoldsia sandwicensis* (see *‘ohe*) (Pukui and Elbert 1986).

This is one of the tallest trees of the Auwahi forest with trees reaching 80 feet (24.3 meters) in height. Scattered large trees of *‘ohe`ohe* are found from upper Kula and `Ulupalakua across the southwest slopes of Haleakalā.

Status at Auwahi: This species is recognized as Endangered by the USFWS. Less than ten individuals of *‘ohe`ohe* survive in the upper elevation eastern edge of Auwahi forest, averaging perhaps 50-60 feet in height

*‘Ōhi`a lehua*

41. *Metrosideros polymorpha* Gaud.

MYRTACEAE Myrtle Family

This species is endemic to Kaua`i, O`ahu, Moloka`i, Lāna`i, Maui, and Hawai`i island (Wagner et al. 1990).

Superficially similar *Metrosideros* species are known as *vuga* in Fiji, *rata* in New Zealand (Maori), and *puarata* in Tahiti (Hillebrand 1888; Chabout and Chabout undated).

Summary statement of uses: The hard, dark reddish wood of *‘Ōhi`a lehua* was used in house and canoe construction and in making images (*ki`i*), *poi* boards, weapons, tool handles, *kapa* beaters (especially the rounded *hohoa* beater), and as superior quality firewood. The foliage served religious purposes and young leaf buds were used medicinally. The flowers and leaf buds (*liko lehua*) were used in making *lei*.

Hillebrand (1888) states, "The wood is very hard, furnishes the best fuel, and is also used for building houses. Many of the old idols were made of it."

*‘Ōhi`a lehua* had religious value to Hawaiians. Wood, branches, and leaves of *‘Ōhi`a lehua* were also used religiously in construction of certain parts of *heiau*, such as special houses and, in some cases, branches with leaves serving as a loose roof (Papa Ii 1959; Kamakau 1976:138; Dye 1991:34).

Regarding images (*ki'i*), Abbott (1992:114) stated, "Most of the large images were carved from wood of the *'ōhi'a lehua*, an endemic species whose usage in building construction has already been described. This tree was regarded as a *kinolau* of the gods Kāne and Kū, and the reddish color of the freshly cut wood may have been considered appropriate for figures associated with sacrifices. The wood tends to crack as it dries, and most of the surviving large images manifest such cracks. Exposure to rain and sunshine also has the effect of bleaching the wood, turning it gray, as may be seen occurring in the figures at Hale o Keawe, the *heiau* enclosure at Pu'uhonua o Honaunau in Kona. Most of the *akua kā'ai* were also made from *'ōhi'a lehua*, but several other woods were also used."

Handy and Handy (1972:241) wrote, "The *'ōhi'a lehua* is a 'body' of Ku. Images of Ku-ka'ili-moku, the war god, were carved out of *'ōhi'a* logs in conventional form depicting ferocity."

*'Ōhi'a lehua* was one of the five primary plants represented at the hula altar (*halapepe*, *'ie'ie*, *maile*, *'ōhi'a lehua*, *palapalai*) (Emerson 1965). Abbott (1992:117) noted that the *'ōhi'a lehua* was used on the altar to represent the god *Kūkā'ōhi'a Laka*, named for a famous *'ōhi'a lehua* tree that had a red flower on an eastern branch and a white one on a western branch.

Lennox (1967) wrote of this species, "Used for house timbers, *poi* boards, idols, *kapa* beaters."

Regarding its use medicinally, Handy and Handy (1972) wrote, "The leaf buds (*liko*) were prescribed as a tonic to stimulate the appetite and digestion of a debilitated child."

Status at Auwahi: *'Ōhi'a lehua* trees are relatively common at Auwahi growing scattered in small stands among other dryland forest trees, increasing in frequency with increasing elevation.

### *'Ōlapa*

42. *Cheirodendron trigynum* (Gaud.) A. Heller ARALIACEAE, Ginseng family  
This species is endemic to Ni'ihau, Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner et al. 1990). Another Hawaiian name for this species is *mahu* used on Moloka'i (Hillebrand 1888).

Summary statement of uses: The bark and/or leaves of *'ōlapa* were used to make a blue dye.

Hillebrand (1888) stated, "Called *olapa* or *mahu* (Molokai) by the natives, who know how to prepare a blue dye from the bark or leaves." In simple concoctions of bark and leaves of *'ōlapa*, no blue dye was produced (A.C. Medeiros and C.F. Davenport, unpublished).

Status at Auwahi: Large, spreading *'ōlapa* trees are a common feature of diverse forests of the Auwahi district above 3500 feet elevation. This species is also very common in rain forests on the windward slopes of Haleakalā and other Hawaiian rain forests.

### *Olopuia*

43. *Nestegis sandwicensis* (A. Gray) Degener, I. Degener, & L. Johnson

OLEACEAE, Olive family

This species is endemic to Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi island (Wagner *et al.* 1990). Hillebrand (1888) gave the Hawaiian names for this species as *pua* and *ulupua*. The Hawaiian word for flowers of this species is *nonohina* (Pukui and Elbert 1986).

Summary statement of uses: The hard, dark brown wood of *olopua* was used in house construction and in making weapons (spears and daggers), agricultural tools (adze handles and digging sticks), firewood, and fishing lures.

Wagner *et al.* (1990) state, "The durable hard wood was formerly used for handles of adzes and other tools and as a rasp in the manufacture of fish hooks. It was a preferred firewood, as it burned with a hot flame even when green."

Kamakau (1976) stated that straight trunks of *olopua* and several other dryland trees were preferred for posts of houses. The complete quote from Kamakau (1976) is given under the species account of *ʻaʻaliʻi*.

Kamakau (1976) and Buck (1957g) described the use of *pua* wood in making bait sticks, *laʻau melomelo*, a type of lure used in net fishing. A more detailed description of *melomelo* fishing is given under the *kauila* listing.

Buck (1957j) describes the use of *olopua* wood for *pahoa* (daggers) and *pikoi*, (tripping weapons).

Status at Auwahi: *Olopuia* is one of the most common and characteristic dryland tree species throughout Auwahi district. Despite this, natural reproduction by seed is very rare.

### *Pāpala*

44. *Charpentiera obovata* Gaud.

AMARANTHACEAE Amaranth Family

This species is endemic to Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi island (Wagner *et al.* 1990).

Summary statement of uses: The primary recorded use of this species was as a type of fireworks for recreation.

Lennox (1967) wrote of this species, "Wood soft - burns like paper - used for torches." Rock (1913:139) reported that the wood of this species, "is soft and very fibrous, and when dry exceedingly light, and will burn like paper".

Regarding the use of *papala* for fireworks, Rock (1913) quoted a passage from Mrs. Sinclair's book, Indigenous Flowers of the Hawaiian Islands repeated here:

"On the northwest side of Kauai the coast is extremely precipitous, the cliffs rising abruptly from the sea to a height of from one to two thousand feet, and from these giddy heights the ingenious and beautiful pyrotechnic displays take place.

On dark moonless nights upon certain points of these awful precipices, where a stone would drop sheer into the sea, the operator takes his stand with a supply of *papala* sticks, and, lighting one, launches it into space. The buoyancy of the wood causes it to float in mid-air, rising or falling according to the force of the wind, sometimes darting far seaward, and again drifting towards the land. Firebrand follows firebrand, until, to the spectators (who enjoy the scene in canoes upon the ocean hundreds of feet below), the heavens appear ablaze with great shooting stars, rising and falling, crossing and recrossing each other, in the most weird manner. So the display continues until the firebrands are consumed, or a lull in the wind permits them to descend slowly and gracefully to the sea."

Status at Auwahi: *Pāpala* are fairly common and scattered throughout Auwahi forest.

#### *Pāpala kēpau*

45. *Pisonia brunoniana* Endl. NYCTAGINACEAE, Four 'o clock family  
This species is native to Australia, and on New Zealand, Kermadec, Norfolk, and Lord Howe islands, and the Hawaiian Islands of O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i (Wagner *et al.* 1990). Hillebrand (1888) stated that the name of this species is "*papala*" (just as in *Charpentiera*). He also noted that the Maori name *parapara* (presumably for *Pisonia* species) is related to the Hawaiian name *pāpala*.

Summary statement of uses: The fruits of *pāpala kēpau* are used as a glue in trapping birds.

Hillebrand (1888) stated, "The fruiting perigone of all three species exudes a very viscid glue which the native woodmen make use of for catching birds. It will stick fast to paper in the herbarium for years..."

Status at Auwahi: Though common elsewhere, this species is uncommon at Auwahi, known from only a few individuals.

#### *Pilo*

46. *Coprosma foliosa* A. Gray RUBIACEAE, Coffee family  
This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, and Maui (Wagner *et al.* 1990).

Summary statement of uses: No references of ethnobotanical uses for this species have been found.

Status at Auwahi: This tree is scattered usually in small groves in middle to upper Auwahi and is relatively common, at least in the upper parts.

### *Po'olā*

47. *Claoxylon sandwichense* Müll. Arg.

EUPHORBIACEAE Spurge Family

This species is endemic to Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and Hawai'i island (Wagner et al. 1990). Another Hawaiian name for this species on Kaua'i island is *laukea* (Neal 1965; Pukui and Elbert 1986)

Summary statement of uses: The bark and leaves of *po'olā* were used medicinally.

Chun (1994:197) provides translation of Hawaiian *kahuna la'au lapa'au* in describing the use of the bark and leaves of *po'olā* in treatment of a sickness.

Status at Auwahi: This soft wooded small tree is scattered but still relatively common at Auwahi, one to two hundred individuals are scattered throughout the area.

### *Uhi uhi*

48. *Caesalpinia kawaiiensis* H. Mann

FABACEAE, Pea family

This species is endemic to Kaua'i, O'ahu, Maui, and Hawai'i island (Wagner et al. 1990).

Hillebrand (1888) recorded two other Hawaiian names for this species, *kea* and *kolomona*. Rock (1913) wrote, "The tree is known by the natives as *Uhiuhi* on Kauai and Hawaii, while on Maui, along Kaupo, the southern outlet of Haleakala crater, it is known as *Kea*." Another Hawaiian name for this species is *kāwa'u*, a name also used for several other species of Hawaiian trees (Pukui and Elbert 1986).

The word *kolomona* is the Hawaiian word for Solomon, and apparently derived from the common name for the introduced shrub *Cassia surattensis*, also called *kolomona* or *kalamona* (Renee Sylva, personal communication). Despite obvious differences, the two shrubs are somewhat similar in their bipinnate leaves, flowers, and pod fruits. Hence, the name *kolomona* should probably be regarded as an interesting but derived, post Western contact name for the endemic *Caesalpinia kawaiiensis*.

Summary statement of uses: The very hard, nearly black wood of this species was used in the construction of *hōlua* (sleds), weapons (spears, daggers, clubs), agricultural tools (digging sticks), fishing tools (fishing spears), and houses.

Kamakau (1976) stated that straight trunks of *uhi uhi* and several other dryland trees were preferred for posts of houses. The word *ho'ouhi uhi* means to prepare *uhiuhi* wood for house posts (Pukui and Elbert 1986). The complete quote from Kamakau (1976) is given under the species account of *'a'ali'i*.

Buck (1957j) describes the use of *uhiuhi* wood for *pahoa* (daggers) and *la'au palau*, (wooden clubs).

Kamakau (1976) and Buck (1957g) described the use of *o'a* and other hard woods (*koai'e*, *'a'ali'i*, *pua*) for the making of *melomelo* sticks used in a type of fishing (see longer description



under *kauila*), but did not mention *uhiuhi*. Rock (1913), however, does note that *uhiuhi* was used for this purpose. Rock (1913:185) wrote. "The wood of the *Uhiuhi* is extremely hard, close-grained and very durable; it is of almost black color, with a light colored sapwood. The natives made their spears from it, as well as the *laau melo-melo* or *laau makaalei*, a peculiar implement for fishing

Chun (1994: 166) describes the use of pounded *uhi uhi* leaves and *kukui* flowers (*Aleurites moluccana*) to treat sores and inflammations associated with *me`eau* sickness.

Status at Auwahi: The U.S. Fish and Wildlife Service has recognized *uhi uhi* as an Endangered Species. *Uhi uhi* is no longer found naturally on leeward Haleakalā. However, according to old-timers of this area the species was found formerly on leeward Haleakalā and used in constructing fishing lures (Medeiros et al. 1986).

### *Ulei*

49. *Osteoemeles anthyllidifolia* (Sm.) Lindl.

ROSACEAE, Rose family

This species is native to the Cook Islands, Tonga, and the main Hawaiian Islands (Wagner et al. 1990).

Other Hawaiian names for this species are *eluehe* (Pukui and Elbert 1986) and *u`ulei* (Wagner et al. 1990). Many modern *kama`āina* botanists have been taught the name of this species as *u`ulei* (I. A. Abbott, University of Hawai`i at Mānoa Botany Dept., October 1996, pers. comm., and pers. observ., ACM)

Summary statement of uses: The wood of *ulei* was used in making fishing tools (fishing net frames, fishing spears), agricultural tools (*kapa* beaters), musical instruments, and carrying poles. The berries were used for wild food and in making a blue-purple dye for *kapa*. The leaves and bark were used medicinally.

Pukui and Elbert (1986) wrote of this species, "The wood is tough and formerly used for making digging sticks, fish spears, and the *ukeke* (musical bow)." The tough wood of this species was also used for *auamo* (carrying poles) and hand fishing net frames (I. A. Abbott, University of Hawai`i at Mānoa Botany Dept., October 1996, pers. comm.).

In an eloquent description of the use of *ulei* in making *opelu* or mackerel scad (*Decapterus*) nets, Degener (1945) states, "The *uulei* has very strong but pliable wood. Its long branches were therefore stripped of bark and tied to the rims of fish traps to keep them open. In this way, for example, the Hawaiians constructed their nets for catching the *opelu*, a fish that swims in schools and is a favorite for eating raw either when freshly caught or after it has been dried in the sun. A net about twenty-five feet long was prepared by sewing it in the form of a huge bag. To the upper rim of the wide mouth a series of long, slender branches of the *uulei* were fastened to keep it gaping. This was then lowered on ropes in moderately deep water by the fishermen in their outrigger canoes. In the meantime, grated taro had been cooked and tied in *kapa*. This was then lowered as bait on a string into the sea so as to hang midway between the surface and the bottom. When a school of *opelu* had been attracted by the taro, the net which had been hanging below the

bait, was carefully raised toward the surface. The enclosed fish, made frantic with fright when one of the fishermen would perhaps jump in among them, would dart in all directions and be caught by their gills in the meshes of the net."

Lennox (1967) wrote of this species, "Used for *opelu* nets, bows, *kapa* mallets, *ukeke* boards, short javelin for game *pahee*."

A blue-purple dye from berries was used for dyeing *kapa* (Neal 1965). Chun (1994: 265) describes the use of leaf buds of *ʻūlei* as part of a medicinal cure. Bark of *ʻūlei* mixed and pounded with young *kukui* nut and leaf, then strained, was used as a mild enema (Gutmanis 1977). *ʻUlei* berries were eaten by Hawaiians as wild foods (Handy and Handy 1972: 235)

*ʻUlei*, as well as other dryland forest trees *ʻahakea*, *alahe ʻe*, *ʻiliahi* (as *ʻaoa*), *naio*, *neneleau*, and *wiliwili* are mentioned in the Hawaiian creation chant, Kumulipo (Beckwith 1972). The *ʻūlei* tree is matched with the *umaumalei* eel (Beckwith 1972).

Status at Auwahi: This species is common throughout Auwahi.

### ***Wiliwili***

50. *Erythrina sandwicensis* Degener

FABACEAE, Pea family

This species is endemic to the main Hawaiian Islands (Wagner *et al.* 1990).

Throughout the Hawaiian Islands, most *wiliwili* have flowers with petals and stamens that are dark orange colored. On leeward Haleakala, the flower color, though constant within individuals is highly variable within populations, ranging from entirely orange to a very pale yellow green and all combinations between.

Summary statement of uses: The pale, buoyant wood of this species was used as part of the canoe (hull, *waʻa* and outrigger, *ʻama*), surfboards, fishing net floats, charcoal for dye-making, and medicinally. The seeds were strung in *lei* (Handy and Handy 1972:236).

*Wiliwili* was known for its ability to float no matter how much the wind blew (Kalokuokamaile in Holmes 1981). The wood of *wiliwili* when fresh is heavy and filled with water. However, after drying it is extremely light and buoyant somewhat like balsa. One disadvantage of *wiliwili* wood is that it lacks strength and durability.

*Wiliwili* was the preferred wood for the *ʻama* (float) of the Hawaiian canoe, but *hau* (*Hibiscus tiliaceus*) was used if *wiliwili* was not available (Buck 1957). Shaping the float was done with an *alahe ʻe* or *walahe ʻe* (*Canthium*) adze (Malo 1903; Kamakau 1976). Abbott (1992) also stated that in modern trials, charcoal from *wiliwili* or *hala* (*Pandanus*) mixed with the liquid from the inner bark of *kukui* (*Aleurites*) produced the best paints for canoes. The wood was also used as floats for fish nets (Degener 1945).

*Wiliwili* was sometimes used in making the main hull of canoes apparently intended for near-shore, play, or training purposes (Holmes 1981).

*Wiliwili* wood was used for surfboards (*papa he'e nalu*). Some experts say *wiliwili* was used especially in the longer boards, approximately 15 feet long called *olo* versus the shorter (6 to 9 feet long) *alaia* boards which were often made of *koa* or breadfruit (Buck 1957h:384-386). Buck (1957h) raises the question of the difficulty of procuring *wiliwili* tree of "sufficient size to make the large *olo* boards", but continues, "But doubtless a few were made, and such were the property of chiefs."

Buck cites Ellis's 1839 description of surfboards on Hawai'i island writing, "'generally five or six feet long, and rather more than a foot wide, sometimes flat, but more frequently convex on both sides...usually made of the wood of the erythrina (*wiliwili*), stained quite black, and preserved with great care.' He adds that after use they were left in the sun until perfectly dry, rubbed with coconut oil, and hung up in the dwelling house. Not infrequently they were wrapped in cloth."

Chun (1994:171,173) noted that the bark of the *wiliwili* was used in making medicine. Buck (1957a) notes the use of *wiliwili* or *hau* wood rubbed with *kukui* (*Aleurites*) nut oil to rekindle a fire as they burned without smoldering. Buck (1957a) writes, "Light woods such as *hau* and *wiliwili* were suitable for fishing gear containers, as they floated well if a canoe upset."

*Wiliwili* as well as other dryland forest trees '*ahakea*, *alahe'e*, '*iliahi* (as '*aoa*), *kauila*, *naio*, *neneleau* and '*ūlei*, are mentioned in the Hawaiian creation chant, *Kumulipo* (Beckwith 1972). The *wiliwili* tree is matched with the sea borer (*wili*) (Beckwith 1972)

Status at Auwahi: Though common throughout lower Auwahi, *wiliwili* is most abundant farther east in lower Kahikinui before reaching Kaupo where groves of hundreds of trees still occur.

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