

FINAL ENVIRONMENTAL ASSESSMENT
FOR
HAWAII FOREST STEWARDSHIP GRANT
FOR THE
OLA HONUA
NATIVE FOREST RESTORATION,
TIMBER PRODUCTION,
WATERSHED PROTECTION AND EDUCATION
PROJECT

Kipahulu, Maui
TMK (2) 1-6-008:023

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BY

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On Behalf of
Neaulani, Inc.

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A. SUMMARY

Project Name:	Ola Honua Native Forest Restoration, Timber Production, Watershed Protection and Education Project
Applicant:	Neaulani, Inc.
Approving Agency:	Department of Land and Natural Resources
EA Trigger:	Use of state funds (Forest Stewardship Grant) for planting and management of native trees and exotic hardwoods intended for selective harvesting in 30 to 50 years, or more, from time of planting
Anticipated Determination:	No Significant Impact
Project Location:	Kipahulu, Maui (East Maui). By road, the property is about twelve miles south of the town of Hana and about eight miles east of Kaupo. The property is about one-half mile mauka (inland) of the coastal road, Piilani Highway.
Acreage Involved:	80 acres of a 121-acre project
Tax Map Keys:	(2) 1-6-008: 022 and 023
Land Use:	State Agriculture; County Agriculture
Pre-Consultation:	Robert Hobby (consultant to project) Hank Oppenheimer (consultant to project) DLNR Forestry and Wildlife Division DLNR Historic Preservation Division Maui County Dept. of Public Works Maui County Dept. of Planning Kipahulu Community Association Kipahulu Ohana John and Tweety Lind Meetings with surrounding neighbors

B. DESCRIPTION OF THE PROPOSED ACTION

The proposed action is a long term hardwoods reforestation project funded by a Forest Stewardship Grant ("FS Grant") from the Hawai'i Department of Land and Natural Resources ("DLNR"). The Forest Stewardship Program is described generally in the Forest Stewardship Handbook, a copy of which is attached hereto as Appendix A. The Ola Honua reforestation project, which involves 120 acres in Kipahulu, Maui,

Hawaii, includes the removal of alien plants and trees and the propagation and planting, and long term management of a hardwood forest. All activities will be conducted using certified organic methods. The portion of this project, which is the subject of this EA is section intended for sustainable harvesting 30 to 50 years, or more from now (see explanation in section 2, below. Neaulani intends any harvesting activities to be conducted based on selective timbering techniques using the best practices available at that time.

1. Size of Project Area

Over 40 acres of the project area will be planted in native trees, which will never be commercially harvested. The remaining 80 acres of the project area will be planted in exotic (some non-native) tropical hardwoods that are considered compatible and non-invasive to the environment in Kipahulu. Commercial harvesting of any of the trees within this 80-acre area will not occur until the trees reach maturity, which will take 30 to 50 years.

2. Focus of Environmental Assessment

The trigger for the EA is the use of state funds (the FS Grant). Expending state funds for the purposed of planting trees is expressly exempted from the Chapter 343 environmental assessment. However, state funds expended for prospective tree harvesting activities are not exempted. Thus, the legislature's focus and concern with respect to the environmental impacts of this forestation project is on the potential future harvesting activities.

As mentioned in the earlier section, the trees intended for sustainable and selective harvesting will not reach maturity for harvesting for 30 to 50 years or more. Because harvesting will be selective, some harvesting may not occur for more than 50 years. Due to the decades that will pass before any harvesting would be initiated, Neaulani does not have detailed plans regarding the process to be employed, or the extent of such activities.

Only 80 acres of the forestation project is subject to this EA because over 40 acres of the project area are not intended for harvesting. As mentioned above, tree planting with no plans for commercial harvesting is expressly exempted from the EIS process.

3. Specifics Regarding FS Grant

The FS Grant creates a long term (twenty years or more) relationship with DLNR. State involvement will include oversight by the Forestry Division of Neaulani's forestry management and harvesting practices. Under the grant, the state will matching Neaulani's investment in its forest restoration activities. Matching funds will be provided during the first ten years of the relationship but not thereafter.

4. Forest Planting and Management Plan

As part of the grant, Neaulani, in consultation with a licensed forester, has prepared a detailed forestry management plan ("Forest Stewardship Plan for Ola Honua"). The plan identifies the tree species to be planted, the land preparations prior

to planting and a description of the management of the trees, and a forecast of harvestable timber from the site over the long term. (A copy of this Forest Stewardship Plan for Ola Honua is attached to this EA as Appendix B).

a. THE NATIVE (NO-HARVEST) CORRIDOR

Part of the proposed action includes creating a 40-acre corridor of native plant species running (*mauka – makai*) through the center of the property. This native replanting work is also an extension of the Cable Ridge Restoration Project – a project involving members of the Kipahulu community aimed at protecting native plants and trees, some of them extremely rare, in lands located *mauka* of Ola Honua. One portion of the native corridor will be dedicated to a small forest of Ohia Lehua to attract and sustain the native bird population. The native corridor will be a sanctuary for native habitat and wildlife and will never be commercially harvested. Additional information about the native corridor, including a list of trees and plants which will be planted in the native corridor, may be found in the Forest Stewardship Plan for Ola Honua, attached to this Application as Appendix B. A map showing the location of the native corridor in relation to the rest of the proposed project may be found at Appendix C.

b. THE TIMBER PRODUCTION AREA

Another 80 acres of the project area is planned for exotic hardwoods, which are already found in Hawaii and which are considered to be non-invasive and compatible to native plants and trees. These tropical hardwoods will be planted on each side of the native corridor (see map at Appendix C). A detailed list of the hardwoods proposed for planting may be found in the Forest Stewardship Plan for Ola Honua at Appendix B. Some of the hardwoods being cultivated include teak, mahogany, koa, narra, kamani, pheasant wood and kou. A detailed list of the hardwoods intended for planting is included in the Forest Stewardship Plan of Ola Honua, attached hereto as Appendix B. All trees are propagated on site in Neaulani's existing nursery facility, which includes a mist box, shade house, green house and hardening off zone, all under controlled watering systems.

c. ORGANIC STANDARDS

Neaulani believes that farming may be commercially profitable without sacrificing the environment. To that end, Neaulani is committed to stringent organic standards. Neaulani's farming practices are not only certified to meet the requirements of the National Organic Program ("NOP"), they are also certified under the more stringent "Aurora" certification overseen by Demeter Association, Inc., an international company that has been reviewing farming practices and certifying farms around the world for decades (see information regarding Demeter certification at Appendix D). Neaulani's commitment to organic practices includes not only its planting but also its clearing practices. All weeds and pests, including large stands of guava, Christmas berry and Java plum are cleared without the use of harmful herbicides. Although this is a costly and labor intensive process, these aliens have become a resource for Neaulani; it chips this biomass and uses it as mulch around its young trees.

d. ADDITIONAL OVERSIGHT

In 2004, Ola Honua granted a conservation easement over a portion of the project area to Maui Coastal Land Trust, a non-profit 501(c)(3) organization. The easement, which is perpetual, limits future development and establishes special protocol for future farming activities, including: the current and all future land owners of the protected property must continue to farm organically and be certified by a certifying organization approved by the land trust; farming activities may not harm water quality; and, forestry management oversight by an approved forester, including for harvesting, is required. The press release issued by MCLT regarding this easement is attached to this application as Appendix E.

C. DESCRIPTION OF THE AFFECTED ENVIRONMENT

1. Project Location

Ola Honua (or “the property”) is located in Kipahulu in East Maui. By road, the property is about twelve miles south of the town of Hana and about eight miles east of Kaupo. The property is about one-half mile mauka (inland) of the coastal road, Piilani Highway. Attached as Appendix is C a map of the property showing its location in Kipahulu.

2. General Property Description

The property lies on the southeast flank of Haleakala, a dormant volcano, and slopes in a mauka to makai (oceanward), north to south, direction. The property consists of mostly open grasslands on gently sloping and mildly undulating land, with a dissected gulch area to the southwest, and the steep southwest bank of Koukouai Stream to the northeast. Elevation ranges from near 600 ft. near the southern, makai boundary to approximately 1100 ft. near the Conservation District boundary. The western property boundary slopes towards Opelu gulch and stream, a seasonal stream, which is populated by tall mango trees. Most of the eastern boundary follows the centerline of Koukouai stream, a perennial stream, which has carved a deep and wide canyon.

a. NEARBY PROTECTED AREAS

Kipahulu State Forest Reserve abuts and lies immediately mauka of the property; Kipahulu Biological Reserve lies approximately one and one-half miles to the north of the property; and portions of Haleakala National Park lie less than one mile away from the property.

b. NEARBY DEVELOPMENT

Despite its remoteness and lack of infrastructure, Kipahulu has experienced increased development in recent years, and the dramatic increase in real estate values has spurred some landowners to subdivide or sell. The area is attractive to second home buyers who desire privacy and enjoy the rugged, scenic coastline and lush, tropical upland areas. Recent selling prices of the land make agriculture as a primary use economically impractical for new buyers. Many of the properties immediately makai

of the property are less than 15 acres in size and are used as second homes, with little commercial agricultural activity present.

c. PAST USES

For the past 100 years, the property was used first for sugar cane production, then for cattle grazing. Both activities left the land in a degraded state. Neaulani is in the process of restoring the land using organic methods. Through fencing and eradication, Neaulani has eliminated all of the wild cattle and much of the wild pig populations, which are a major threat to native plants. Neaulani is also removing by hand many alien invasive plant species, such as guava and Christmas berry.

d. ACCESS ROAD

Access to the property is along a private roadway easement, approximately a half-mile long. The road is shared by five parcels, fourteen houses and a private school that accommodates between eight and ten students. The properties along the entry road range in size from 1.25 acres to 13 acres.

e. CURRENT LAND USE DESIGNATIONS

The property is designated for agriculture in the State Land Use District, the Hana Community Plan and is zoned agricultural in Maui's Comprehensive Zoning Ordinance.

3. Soils

Ola Honua has land classified by the State Land Study Bureau Detailed Land ("SLSBDL") Classification as overall (master) productivity rating Class D. All Selected Crop Productivity Ratings for Ola Honua under the SLSBDL standards are "E," with the exception of uses for orchards and grazing, which scored a "C." Under SLSBDL's productivity ratings, "E" has the lowest productivity for the growing of pineapple, vegetables, and sugar cane. The ALISH (Agricultural Lands of Importance to the State of Hawaii) rating for Ola Honua is "Other."

Soils on the property are generally rich, dark, silty clay approximately 30 – 50 cm deep, with a basaltic substrate composed of Hana Series volcanic flows. The USDA classifies this type as "Maka`alae silty clay" (MID), typically on 7-15% slopes. All but a portion of the property can be referred to this soil type. Some of the northeastern portion is classified as "rough, mountainous terrain" (rRT), typical of deeply dissected drainage channels and upper, mauka areas (figure 2).

4. Biological Resources

a. AQUATIC FEATURES

No wetlands occur on the active or fallow agricultural lands occurring on the open ridgetops and gentle upper slopes. The three essential criteria that define a Federally recognized wetland, 1) hydrophytic vegetation, 2) hydric soils and 3) wetland hydrology do not occur within this area. The project abuts Koukouai stream for an approximate length of one half mile. Opelu Stream lies outside the western boundary of the property,

and is a smaller intermittent stream. Its headwaters begin at approximately 3000 feet elevation. Koukouai Stream is a largely unaltered, perennial stream which runs the length of the windward boundary of Lot 2. The stream is a deep drainage that cuts through the Hana Series volcanic flows, and into the older Kula Series. Koukouai Stream has its source high in the Kipahulu Valley section of Haleakala National Park, where the annual average rainfall is considerable. It is prone to powerful flows, and episodic flash flood events. It is characterized by steep sided, largely inaccessible side walls, and a rocky, boulder bottom 5-25m inch width. Some sections of stream bed are gravelly, but most of the stream course on the property consists of large, blocky, basaltic debris, or exposed bedrock. See Baseline Document Report by Hank Oppenheimer, Appendix F for more information.

b. FLORA

This section discusses spontaneous vegetation on the property. The parcel contains four main Natural Vegetation Community types. Natural Communities are assemblages of associated species that occur repeatedly throughout the main Hawaiian archipelago. Two of the community types are dominated by native elements, and two are dominated by non-native, or alien, exotic vegetation. Greater scrutiny was given to survey areas with native dominance.

Of the native communities, *Metrosideros/Dicranopteris* Lowland Forest is the larger in extent, and occurs on the Western and Northwestern portions of the property. However, it presently only covers a small percentage of the property. A smaller remnant is on the slope above Koukouai Stream. *Acacia* Lowland Forest is poorly represented by severely degraded fragments on the upper mauka (Northern) boundary of the site. Past land uses, feral ungulate activity, and subsequent invasion by invasive alien plant species have shaped the terrestrial biota into what it is today.

The two alien dominated communities are Lowland Grassland, and Lowland *Psidium* Forest. The first is dominated by pasture grass, mainly California grass (*Brachiaria mutica*), and pangola grass (*Digitaria eriantha*), with *Spermacoce latifolia* and *Commelina diffusa* abundant herbaceous elements. The latter community is characterized by two species of guava: common (*P. guajava*), and strawberry guava (*P. cattleianum*). There are two forms of *P. cattleianum* present; the red fruited variety, and one with yellow fruit. These forms have been formally named in the past, but the present taxonomy does not recognize any subspecific taxa. Brazilian pepper is also common, and to a lesser extent Java plum.

No plant species listed as Threatened or Endangered under the US Endangered Species Act have been found on the property. No plant species were observed that are considered to be locally rare, or a Species of Concern. No plant species have been observed that are single island endemics; that is, occur only on the island of Maui. All native elements found on the property are considered by knowledgeable botanists to be common and widespread on Maui, as well as throughout the main Hawaiian Islands. Further information regarding the flora found on the property, as well as a species inventory may be found in the baseline report of Hank Oppenheimer, attached hereto as Appendix F.

c. FAUNA

During observations, two rare species of damselfly were observed along Koukouai Stream. *Megalagrion pacificum* (pinao `ula), an endemic Hawaiian damselfly, is listed by the US Fish & Wildlife Service as a Candidate for listing as Endangered under the Endangered Species Act. *Megalagrion nigrohamatum* is listed as a Species of Concern, mainly because a subspecies on O`ahu is rare and a candidate for listing.

Many species of birds were noted using the habitat occurring on the Property. Whether or not these species nest at the site is unknown. The alien cattle egret (*Bubulcus ibis*), and indigenous koa`e kea or white-tailed tropic bird (*Phaethon lepturus dorotheae*), were both observed nearby. It should also be expected that both the introduced, nocturnal barn owl (*Tyto alba*) and diurnal Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) may occasionally forage for prey in the open grassland. See Baseline Document Report by Hank Oppenheimer, Appendix F for more information.

5. Cultural and Social Resources

a. HISTORICAL AND ARCHEOLOGICAL RESOURCES

Pre-contact era. The moku of Kipahulu is the smallest in Maui, and is bordered by the moku of Hana (to the northeast) and Kaupo (to the west). In pre-contact times, this entire three-district area (now legally part of Hana District) was home to a large settled population of farmers and fishers, exploiting the abundant natural resources, including abundant rain just inland and upland from the coasts. Kipahulu was an okana (district) with rich and diverse but scattered agricultural resources. Kipahulu was a fairly populated area in former times and over 700 features have been surveyed on parklands. Stabilized house sites and other ancient ruins such as fishing shrines, heiau, canoe ramps, and old taro patches, can be seen all along the coastal areas. As many as eight heiau have been identified in Kipahulu. Of these, Maulili Heiau is located a half mile west of the Kipahulu mill on the makai side of the road, or about three miles from the Property. Terrace-agriculture systems were common in the area during pre-contact times and some systems survived into the early 20th century. Presumably all of these cultivation areas, and many more that were destroyed by commercial activities in the earlier historic era, had been used for centuries by Native Hawaiians.

Historical era. Commercial sugar cane agriculture came to East Maui during the middle to late 19th century. The Kipahulu Sugar Company began operations in 1879 and shut down operations in 1925. The project area was well within the boundaries of the sugar company's operations. Following the collapse of sugarcane agriculture in East Maui, commercial ranching was established on many of these same lands. The agricultural practices employed by the sugar cane companies destroyed most of the native trees and plants. After sugar cane was no longer productive, the lands at Ola Honua were used for cattle grazing. The land was overgrazed for an extended period, resulting in the introduction of thick stands of guava, bunch grass and lantana. When the current owner purchased Ola Honua, portions of the property were still being used for cattle grazing. Wild cattle were also present. See the attached archaeological report at Appendix G for additional information.

b. SENSITIVE AND SIGNIFICANT AREAS

Sensitive areas include flood plains, tsunami zones, beaches, streams, rivers, oceans, estuaries, anchialine ponds, fresh or coastal waters, erosion prone areas, and geologically hazardous land.

Portions of the property are located within the Koukouai stream drainage system. However, according to Panel Number 150003 0380 B of the Flood Insurance Rate Map, June 1, 1981, prepared by the United States Federal Emergency Management Agency, the project site is situated in Flood Zone C. Flood Zone C represents areas of minimal flooding.

c. CULTURAL FEATURES AND PRACTICES

Cultural features. This part of Maui is classified as a 'closed guava forest with shrubs' Vegetation Zone, and common plants in this zone include: guava, Boston fern, Hilo grass, basket grass, false staghorn fern, kūkui (*Aleurites moluccana*), and hala (*Pandanus tectorius*). Some of these are present on the Property. Three of these Polynesian-introduced and/or endemic plants were used by Native Hawaiians in traditional times for a variety of purposes. Kūkui, also known as the Candlenut tree, was used as food, dye, medicine, lamp oil, and lei; in addition, kūkui is included in a very large number of traditional myths, legends, and stories. The leaves of the Hala (lau hala) were used primarily for plaiting (including mats, canoe sails, baskets, fans, and others), and thatching. Hau was very highly valued and highly regarded and was used for various types of cordage, wood tools, and for medicine. See the attached archaeological report at Appendix G for additional information.

Cultural practices. The presence of the above cultural plants is limited on the property and cultural gathering is not occurring on the property. Neaulani, in conjunction with the owner of Ola Honua, has for some time worked with the Kipahulu Ohana, a local nonprofit, which has a long term plan for the rehabilitation of native plants and trees on state property mauka of Ola Honua. Neaulani has contributed workers to this project and the property owner has granted access to members of the Kipahulu Ohana to gain access to the state parcel through Ola Honua.

Potential future cultural opportunities. Through the Forest Stewardship Grant, Ola Honua is essentially creating a wide corridor of plants and trees running through Ola Honua. It is possible that this native corridor may be made available from time to time to Native Hawaiians for traditional gathering practices.

6. Economic Resources

The Ola Honua property is designated by the State of Hawaii for agriculture and the County of Maui has zoned the property as agricultural. The property was historically used for sugar cane production and in more recent times was used for cattle grazing. Sugar production in Kipahulu has not been viable for probably 100 years. While cattle grazing is considered by some an appropriate use of lands in this part of Kipahulu, the cattle promote alien weeds and have a tendency to destroy native plants and trees. If the cattle congregated in large numbers or permitted to be near streams, they can also seriously harm water quality. Neaulani has removed all cattle from the property.

Most of the lands near the property are also zoned agriculture. However, the most prevalent use of the neighboring lands is second homes. Agricultural activity on adjacent lands appears limited.

7. Access Roads

Ola Honua has a 44-foot wide easement from Piilani Highway which provides roadway and utility access to the subject property. Not including Ola Honua, the road services five parcels, fourteen houses and a private school that accommodates between eight and ten students currently. Ola Honua is the last property served by the road. The road is 2,912 feet long (from Piilani Highway to the Ola Honua boundary). Of that distance, 1,404 ft. is dirt or gravel and 1,508 ft. is concrete road strips. The road is passable year round and, in addition to existing residential and agricultural traffic from the neighbors, supports daily traffic associated with Neaulani's agricultural operation, which includes heavy machinery and trucks.

D. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION; PLANNED MITIGATION MEASURES

1. Impacts on Physical Resources

a. SOIL

The proposed action is expected to have no long term impacts to the soil and water at Ola Honua and no short term negative impacts. Clearing of aliens is conducted without the use of graders, so there is no exposed soil from the clearing process. No chemicals are used to remove aliens, thereby protecting water and soil. Areas that are cleared are replanted in quarter-acre sections; no clear cutting of vegetation occurs. After the trees are planted they are heavily mulched with wood chips derived from the chipping the unwanted alien trees on the property. The mulching offers weed control and conserves moisture.

Soil quality is improved by the addition of amendments. Amendments will be added periodically during the first four years of a tree's life. Nitrogen fixing tree (NFT) species are planted around the hardwoods to offer a balanced source of nitrogen, provide wind protection, and assist in keeping down grass competition. These NFTs are periodically coppiced to prevent them from competing with the hardwoods. See Forest Stewardship Plan for Ola Honua, Appendix B, for greater detail on clearing and planting techniques.

b. WATER QUALITY

Water quality is expected to be positively impacted. The lands degraded by years of sugar production and cattle grazing will be returned to a vibrant forest and undergrowth, which will assist in retention of rain water, thereby reducing runoff and recharging underground aquifers.

No significant negative impacts are expected to water quality, including to Koukouai stream at the time of harvesting. Only about 80 acres of the 120-acre project

are proposed for commercial harvesting and that harvesting will not begin for thirty to fifty years when the trees reach maturity. When harvesting does occur, it is expected to be selective, with perhaps only a few trees cut per year, and replacement trees being introduced thereafter. Trees will be felled using best management practices of the time, as determined in conjunction with working with the DLNR and according to an updated harvest management plan which will be prepared prior to any harvesting. The above facts and procedures indicate there will be little if any change in water quality during the harvest phase of the project.

Mitigation measures. Because planting and harvesting activities will take place well away from Koukouai stream (100 to 200 yards), and in much of the project area the land slopes away from the stream, the stream will not be impacted. Although some water from Koukouai stream is being used in the first four years of the operation for irrigation (pursuant to a state diversion permit), irrigation is limited by Neaulani to about seven gallons per tree at planting time, with further irrigation not required due to the good rainfall Kipahulu experiences and also as a result of Neaulani's planting and mulching techniques, which discourage evaporation and retention of water around tree roots.

2. Impacts on Biological Resources

The proposed action of reforesting the 125 acres should mean positive benefits to biological resources and it will not cause significant impacts to biological resources, including fauna or flora. As mentioned earlier, few native plants or trees were left on the property as the result of sugar cane production followed by cattle grazing. Alien "weeds" are expected to be eliminated or reduced significantly and native plant species and non-weed aliens. Tropical hardwoods selected, after consultation with Neaulani's forester, Bob Hobdy, and with DOFAW, will be introduced in their place. This should provide new habitat for native fauna as the native corridor matures.

When harvesting begins 30 to 50 years from now, it will be selective cutting occurring over many years or decades, and then only to a portion of the property being reforested. All harvesting activities will be conducted in a sustainable fashion using the best management practices of the time. This harvesting program is expected to have no significant impact on biological resources as the ecosystem that will be created is expected to be left substantially intact.

3. Impacts on Cultural and Social Resources

a. HISTORIC AND ARCHAEOLOGICAL RESOURCES

No negative impacts to historic or archaeological resources are anticipated. An archaeological survey and reconnaissance of the property has shown limited archaeological sites or artifacts (see Appendix G). Applicant has consulted with the Maui office of the State Historic Preservation Division (SHPD) to discuss the archaeology on the property. According to SHPD, the sites did not warrant a preservation plan. However, Applicant has nonetheless voluntarily created buffers around identified sites. In addition, Neaulani employees have received training from an archaeologist regarding identifying archaeological sites and artifacts and how to prevent

damage to such sites or artifacts. Neaulani's archaeologist has noted that Neaulani's process of removing alien species by hand (rather than with heavy machinery) is one of the best ways to protect undiscovered archaeological sites from damage.

b. *CULTURAL RESOURCES*

There will be no negative impacts to cultural resources and positive impacts are expected. Prior to Neaulani's involvement, the property had few plants used by Native Hawaiians. Upon completion of the reforestation effort, at least 40 acres will be dedicated to native plants and trees, many of which were used traditionally by Native Hawaiians. This corridor will be managed for long term protection but it is expected that some cultural gathering will be permitted, or that plant products will be made available to the community. It is also expected that the native corridor may be used to provide a route for limited pedestrian access by certain persons within the community to state reserve lands above the property, including the Cable Ridge area, which is being managed by a Native Hawaiian nonprofit group, Kipahulu Ohana.

c. *OTHER SOCIAL ISSUES*

The property and all of the neighboring lands are zoned for agriculture, and the proposed action is consistent with and furthers the purposes of that zoning. Some nearby land owners have developed their properties into what could be classified as "gentlemen estates," with minimal farming taking place on those lands. Some of these neighbors have complained regarding Applicant's farm activities, which at times can create noise. However, both state and county laws protect farmers from these nuisance-type complaints (see section below, quoting from the Maui County Comprehensive Zoning Ordinance).

4. Impacts on Economic Resources

Impacts to economic resources are expected to be positive. The proposed action furthers the state and county's plan for, and intended economic uses of, the property.

State designation. The proposed action furthers the agricultural state designation of the property for agriculture. Among the uses permitted on state agriculture lands is "cultivation of crops, including . . . timber" (See HRS 205-4.5(a)(1)).

County zoning. The proposed action furthers the county agricultural zoning of the property, and furthers the express purposes and intents of that designation, which are as follows:

Promote agricultural development; preserve and protect agricultural resources; support the agricultural character and components of the County's economy and lifestyle; reduce the land use conflicts arising from encroachment of nonagricultural uses into agricultural areas; mitigate rising property values of farm lands to make agricultural use more economically feasible; discourage developing or subdividing lands within the agricultural district for residential uses, thereby preserving agricultural lands and allowing proper planning of land use and infrastructure development; and notify the public that lands within the agricultural district

are used for agricultural purposes, which include normal and accepted agricultural practices and operations, including but not limited to, noise, odors, dust, smoke, the operation of machinery of any kind, including aircraft, and the storage and disposal of manure. Owners, occupants, and users of such property or neighboring properties shall be prepared to accept such inconveniences, discomfort, and possibility of injury from normal agricultural operations. (See Maui County Code § 19.30A.010)

Hana Community Plan. The proposed action furthers the Hana Community Plan's economic goals for the area, which goals include "Promot[ing] and maintain[ing] agriculture as a major economic activity with emphasis on a regional diversified agricultural industry;" [m]aintain[ing] taro farming, ranching and floriculture as major economic activities and promote their economic viability and sustainability;" [p]romot[ing] aquaculture and horticulture as economic activities."

Hardwood production within state. A recent local hardwoods market study conducted by DLNR (see Appendix H) estimates that between seven million and ten million board feet of lumber are imported to Hawaii each year. The study identified the following opportunities: "There is a demand for Hawaiian grown woods in the market place. Significant quantities of hardwood lumber are being imported into the State. The demand for distinctive hardwood lumber is increasing." The study identified the following constraints: "Sufficient sustainable supply of forest resource to ensure economically efficient processing; inconsistent supply; inconsistent manufacturing quality; [and] underdeveloped infrastructure for forest product processing."

The study explained that the demand for hardwood products exceeds the locally produced supply. For this imbalance to change several critical factors must be addressed, according to the study. These factors are: "Sufficient sustainable supply of forest resource to ensure economically efficient processing; properly sized manufacturing facilities to match resource availability; strong commitment to the technical issues of product quality; [and] effective marketing which will place high-value end use products in the market place."

E. ALTERNATIVES TO THE PROPOSED ACTION

1. No Action Alternative

The no action alternative would mean leaving the land fallow, with alien species (primarily weed-type plants and trees) remaining the predominant flora. The no action alternative would be less beneficial to the natural environment compared to the proposed action. If the land remains fallow, the aliens are expected to out-compete any native seeds lying dormant in the soil, or dropped on the property by passing animals. Contrarily, the proposed action would return native plants and trees to over 40 acres of the property and provide another 85 acres of trees that should provide compatible ecosystems for endemic flora and fauna. Therefore the no action alternative would mean less native ecosystem over the long term compared to the proposed action.

No economic benefits would be derived from the no action alternative, which is inconsistent with the state and county zoning and community plan policies for the

property. Alternatively, the proposed action provides the opportunity for long term sustainable income from the property but in a way that will protect the environment despite the economic activity.

Negative impacts to public access, education, archaeological sites and cultural resources will be substantially the same (*i.e.*, no negative impacts) under either the proposed alternative or the no action alternative. However, the proposed action has the advantage of increasing cultural resources, which are lacking under the no action alternative.

2. Alternative Farming Activities

Alternatives to the proposed action include animal husbandry, traditional farming crops, or alternative timbers. These alternatives would likely have greater negative impacts than the proposed action.

Animal husbandry on the 125 acres of land where the proposed action will occur would likely require greater amounts of stream water usage, would not foster the return of native species and ecosystems, and might impact downstream water quality. In addition, it is not clear that animal husbandry could be profitable or as economically beneficial over the long term, compared to the proposed action, despite the greater impacts to the natural environment that would result from the animal husbandry activities.

Likewise, traditional farming crops, including sugar cane, pineapple or vegetable crops, would likely require greater amounts of irrigation and use of Koukouai Stream, would not foster the return of native species and ecosystems, and would result in increased soil exposure, thereby potentially leading to polluted runoff and loss of topsoil. In addition, traditional crops would require greater traffic in the neighborhood from the cultivation and harvesting machines, and from trucks taking product to market throughout the year.

With respect to alternative tree species other than those identified for cultivation in the proposed action, the impacts are generally expected to be the same but the impacts to the natural environment or to economic benefits might be worse than the proposed action. The tree species selected in the proposed action were selected to meet a number of criteria, including: compatibility with the geography, and the local native plants, trees and ecosystems, and the possibility for economic profits from the timbers to be cultivated. Diversity of species was also considered important to reduce risk of disease, improve the introduction of a healthy forest ecosystem, and diversify the timber markets available to the landowner over the long term. Tree species were selected for the proposed action after consultation with numerous forestry experts, including state foresters (see Forest Stewardship Plan for Ola Honua, Appendix B).

3. Alternative Cultivation Methods

Alternative cultivation methods would likely have greater negative impacts to the environment compared to the cultivation methods employed in the proposed action. The proposed action employs the highest organic standards for alien species removal and cultivation of the land. The specifics of the cultivation techniques employed in the

proposed action may be reviewed in Appendix B. The farming activities at Ola Honua are certified organic under both the less stringent National Organic Program standards, as well as under the much more stringent Demeter Aurora standards. The alternative to the cultivation methods in the proposed action would be the traditional use of farming chemicals, including herbicides, pesticides and petrochemical fertilizers. The negative impacts associated with use of those chemicals are discussed in Appendix B.

4. Alternative Harvesting Methods

Commercial harvesting of the trees will not begin until trees have reached maturity, which will not occur for 30 to 50 years. As a result, the harvesting techniques will not be finalized until closer to harvesting time. Currently, the plan for harvesting includes selective harvesting (perhaps as little as two to ten trees per acre per year). When harvesting does begin, Neaulani intends to employ the best sustainable harvesting techniques available at the time.

F. DETERMINATION

1. The proposed project does not involve irrevocable commitment to loss or destruction of any natural or cultural resource.

Instead, the proposed action replaces alien “weed” species with native trees and tropical hardwoods that have been selected by a licensed forester for compatibility with the environment. Cultural plant resources are expected to be enhanced by the proposed action and no archaeological sites will be threatened during the process.

2. The proposed project does not curtail the range of beneficial uses of the environment.

The proposed project is based on sustainable forestry methods, which, by its nature, will preserve or enhance the beneficial uses of the environment.

3. The proposed project does not conflict with the state’s long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed project is consistent with and furthers the policies set forth in Chapter 344, HRS.

4. The proposed project does substantially affect the economic or social welfare of the community or state.

Neaulani believes the proposed project will benefit the Kipahulu economic climate by provide local agricultural jobs. When the trees are harvested it will be done in a long-term, sustainable way, which should continue to enhance the economic and social welfare of the Kipahulu area.

5. The proposed project does not substantially affect public health.

No public health concerns are raised by the proposed project.

6. The proposed project does not involve substantial secondary impacts; such as population changes or effects on public facilities.

Some farm workers are needed with respect to the long term planting and management of 80 acres of harvestable trees covered by this EA. This may mean some extra traffic on the private road. However, the focus of this EA, pursuant to the trigger, is on the impacts from the harvest operations. Those are too far distant at this time to predict secondary impacts, but it is expected that impacts will be minimal or nonexistent.

7. The proposed project does not involve a substantial degradation of environmental quality.

Environmental quality should improve. Neaulani plans to reduce alien species for all areas of Ola Honua, including within the inhabitation area. Alien plants are being removed organically through labor intensive clearing by hand. The owner, in conjunction with the state, is expending substantial funds fencing out alien ungulates who have been responsible for devastating much of Maui's native forests. As discussed earlier in this Application, Neaulani has initiated cultivation of a native plant and tree corridor of about 40 acres in size. This should result in significant environmental benefits, including an increase in habitat for native birds and other native species. Also, as discussed earlier, Neaulani has donated a conservation easement over 72 acres of the property, thereby providing perpetual protection for the native plants and trees being started there.

8. The proposed project does not have considerable cumulative adverse effects.

There are no cumulative adverse effects.

9. The proposed project does not substantially affect a rare, threatened, or endangered species, or its habitat.

Neaulani has confirmed that no rare, threatened or endangered species will be harmed during the forestation efforts. Habitat for such native species is expected to improve from the proposed project.

10. The proposed project does not detrimentally affect air or water quality or ambient noise levels.

. A substantial buffer area of several hundred feet is being maintained between Neaulani's forestry activities and the stream. The banks of the

Koukouai stream are very steep and covered with alien species. Over the long term, Neaulani may develop a restoration plan to substitute native plants and trees for the aliens, but no plans have been made at this point and the stream and its banks are outside the proposed action area. Neaulani uses a chipper to turn the removed alien bushes and trees into mulch, which is then utilized throughout the property for weed and evaporation control. Neaulani runs the chipper only on certain days of the week to limit noise impacts on neighboring land owners. The proposed project does not affect nor is likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

Not applicable.

11. The proposed project does not affect scenic vistas or view-plans identified in county or state plans or studies.

The project area is not identified in county or state plans as an important scenic vista. Nevertheless, the forestry project will not impact scenic views.

12. The proposed project does not require substantial energy consumption.

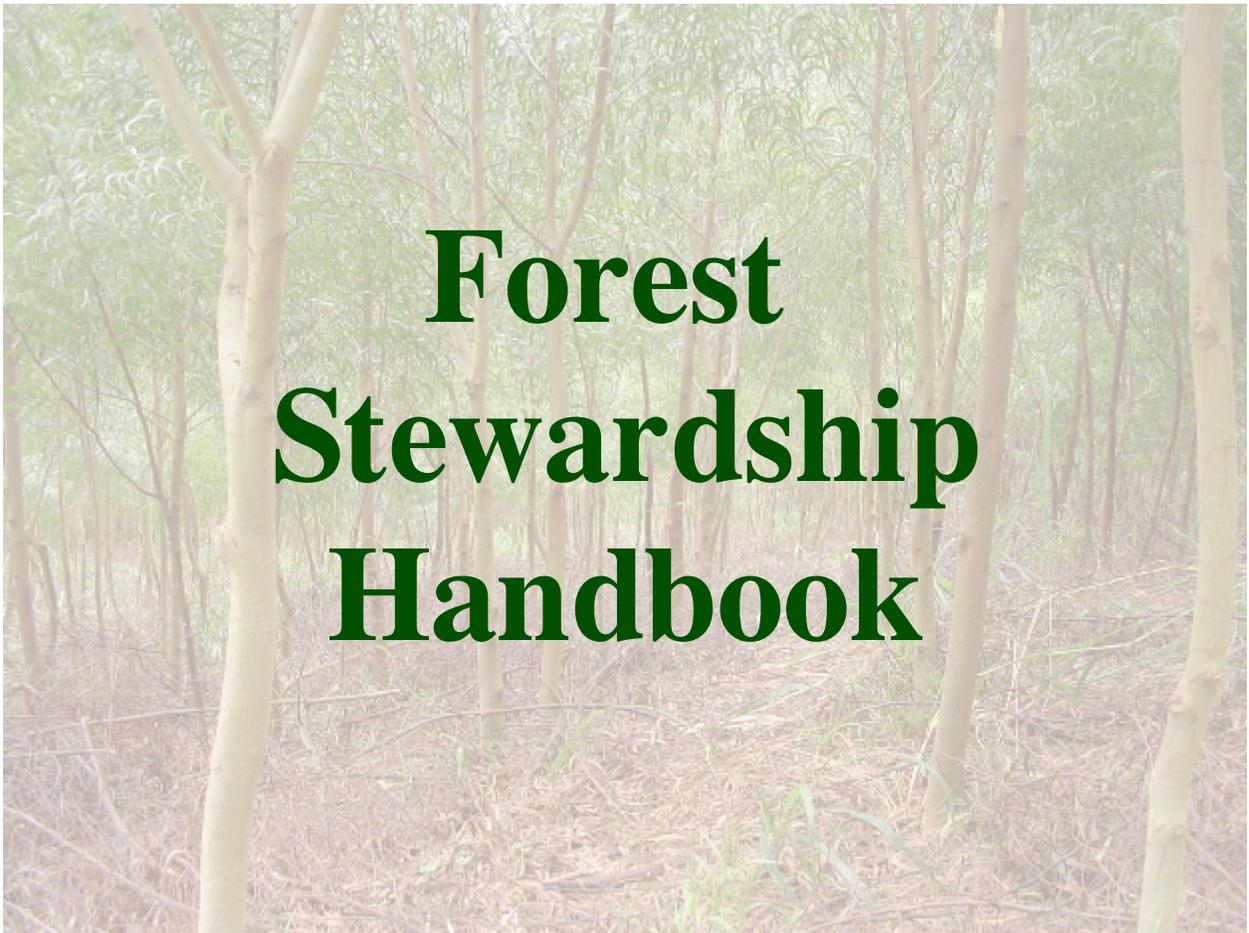
The project is off-grid and the office and the shop associated with the project are run by solar energy. Almost all machinery on the property is run on bio-diesel. The long term management of the forest will have minimal energy needs.

13. The proposed development will not adversely impact the social, cultural, economic, environmental, and ecological character and quality of the area.

Gentrification has occurred in Kipahulu and some land owners are against bonafide agricultural activities. This, however, is not the litmus test for the purposes of this EA. The proposed action is consistent with and furthers the zoning and community plan, which emphasizes legitimate agricultural operations.

A. FOREST STEWARDSHIP HANDBOOK

State of Hawaii



Forest Stewardship Handbook

State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813
(808)587-4174

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I. General Overview

Hawaii's Forest Stewardship Program (FSP), administered by the Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW), provides technical and financial assistance to owners of nonindustrial private forestland who are committed to the stewardship, enhancement and conservation of their forest resources. The assistance provided to landowners through the FSP is intended to help them understand and implement management practices to enhance and protect a variety of forest resource values including timber productivity, wildlife habitat, watershed quality, native ecosystem health/biodiversity, and recreation.

The FSP was adopted through Act 327, as enacted by the 1991 State Legislature to provide State funds on a cost-share basis to financially assist private forest landowners. The DLNR-DOFAW administers the FSP under advisement from the State Forest Stewardship Advisory Committee (The Committee). The Committee reviews Forest Stewardship proposals and management plans and recommends those deserving of funding support to the State Forester and the Board of Land and Natural Resources. Committee members include federal and state agency representatives, professional foresters, professional resource consultants, representatives of resource conservation organizations, representatives of land trust organizations and private landowners.

Applicant Eligibility

To be eligible for the FSP:

- You must own at least five contiguous acres of forested—or formerly forested land—that you intend to actively manage to enhance forest resource values for **both** private and public benefit. You can also meet this minimum acreage requirement if you possess a lease to a property for some minimum term, depending upon your management objectives.
- You are eligible if you are an individual, joint owner, private group, association or corporation.
- If you are an industrial forest producer (you already derive more than 50% of your income from the primary processing of forest products), you are **not** eligible for FSP funding support.

The FSP is available to all applicants who meet the above eligibility requirements without regard to race, creed, sex, national origin or political belief.

Applicant Enrollment and Participation

To enroll in the FSP, you must follow established program procedures with the assistance of available DLNR-DOFAW staff. The primary program enrollment requirement is the development and implementation of a multi-resource management plan covering a period of at least 10 years. We recommend that you develop your management plan with the assistance of a professional resource management consultant, unless you are technically qualified to write the plan yourself. If your plan is approved by the Forest Stewardship Advisory Committee, and the Board of Land and Natural Resources, you will receive cost-share assistance to achieve your forest management objectives. You can also get technical assistance as you need it, from DLNR-DOFAW staff, and from other collaborating agencies and institutions such as the USDA Natural Resources Conservation Service (NRCS) and the University of Hawaii at Manoa Cooperative Extension Service.

Once enrolled, you will be reimbursed as you complete your eligible, approved management practices up to the approved cost-share rate per practice which is typically 50% of the estimated total practice cost. To receive reimbursements for completed management practices, you will be required to submit regular progress reports and cost documentation to the DLNR-DOFAW.

Enrollment, project implementation and reimbursement procedures are described in detail later in this handbook. The following are important introductory points:

1. **Eligible management practices:** The following general forest management practice categories are eligible for cost-share assistance through the FSP.

- **Applicant Forest Stewardship Plan Development**
- **Reforestation and Afforestation**
- **Forest and Agroforest Improvement**
- **Windbreak and Hedgerow Establishment, Maintenance and Renovation**
- **Soil and Water Protection and Improvement**
- **Riparian and Wetland Protection and Improvement**
- **Native Wildlife Habitat Improvement**
- **Forest Recreation Enhancement**

*Guidelines for these management practice categories are provided in **Appendix B**.*

2. **Cost-share reimbursement rate:** You will receive up to a 50% cost-share reimbursement for your management practice expenses, as described in your approved Forest Stewardship Management Plan, provided that these costs are within the limits established and associated with the eligible practice components included in your management plan. When formulating your project budget, you can include “in-kind” services such as family labor and the use of your own equipment as part of your 50% cost-share or match. For current allowable “in kind” cost-share rates for supplies, equipment and labor, see **Appendix G**.

3. **Per-year per project and per acre cost-share caps:** A maximum allowable annual cost-share total per landowner/project is periodically set by the Forest Stewardship Advisory Committee and is dependent upon anticipated availability of, and demand for funding. Allowable reimbursements are, however, subject to a variety of factors including project scale, type, actual project costs and the anticipated availability of program funding.
4. **Progress reporting/reimbursement:** Normally, you will be required to submit project progress reports and cost documentation twice-yearly to the DLNR-DOFAW administration office in Honolulu. A DLNR-DOFAW Branch Forester will then visit you to verify practice completion and discuss your progress with you. After this site visit, the DLNR-DOFAW administration will mail you a reimbursement payment.
5. **Cost-Share assistance pay-back provisions and other funding conditions:** If your primary stewardship objective is commercial timber production you will be required to pay back to the state some of the funding assistance that you receive through the program with each of your successful commercial timber harvests as defined in your Forest Stewardship contract agreement with the state. Your contract agreement language will include a provision whereby you agree to pay back to the state (Forest Stewardship Fund) a certain percentage of the total of cost-share funding that you received through the FSP with each of your commercial timber harvests from the project site. The percentage will be set/adjusted so as not to have a substantially negative impact on the economic viability of your project (normally 5 to 10% of the funding assistance received with each commercial scale harvest). However, if you sell your project property during the term of your approved contract agreement, you may be required to pay back to the state all of the cost share assistance that you received from the FSP following the transfer of your property.

Cost-share reimbursement payments are considered as income and are thus normally subject to state and local taxes. However, depending upon your management activities, payments may be exempt from taxes. A guide to federal income tax regulations affecting landowners of private forests, and other resources are available on line at: www.fs.fed.us/spf/coop. Go to “quick index”, then “forest taxation” for a listing of relevant publication links.

In addition, you may be eligible for real property tax reductions or incentives because of your commitment to long term forest management. For more information, contact your county tax office.

II. The Forest Stewardship Project Pre-Proposal

To enroll in the FSP, you must first prepare and submit a brief project pre-proposal that describes your primary management objectives and the forest resources that you will manage. DOFAW staff and the Hawaii Forest Stewardship Advisory Committee will evaluate your pre-proposal to determine whether it fits with overall Program goals and objectives and current assistance priorities.

Your Forest Stewardship project pre-proposal must include the following:

1. Description(s) of the specific management objective(s) that you want to achieve.

Examples of management objectives include timber production, wildlife habitat enhancement, and native forest restoration.

2. Description of your project property or the land area that you will manage with FSP assistance.

Your site description must include the following information/documentation:

- **Property location and location map**
- **Property or management area size** (acres)
- **Property tax map key number**
- **Property Zoning** (agricultural, conservation, etc.)
- **Topographic Map** (Contact your local USGS office or use on line “mapfinder” at www.usgs.gov)
- **Soils description** (Soil surveys are available at your local NRCS and UH Cooperative Extension Service offices.)
- **Existing vegetation and wildlife** (general description)
- **Land cover use** before and after project implementation. (Pasture, cropland, sugarcane, rangeland, forest-grazed, forest non-grazed, or other.)

3. Brief/summary descriptions of the management activities and practices that you will use to accomplish your objectives.

*The practices that you are proposing for cost-share assistance must be eligible as described in **Appendix B** and **Appendix C** of this Handbook. You should also include relevant planned ineligible practices with the understanding you will implement these practices at your own expense.*

4. Descriptions of natural resources or forest values that you intend to protect, enhance or create with your management plan in order to produce private and public benefits.

It is important that you explain how your project will benefit the public. Examples of forest resource values that benefit an individual landowner applicant as well as the public include: commercial timber production of a significant scale - or as part of a landowner cooperative (economic diversification/employment); native ecosystem and biodiversity restoration; watershed improvement/protection; native wildlife habitat enhancement; and the provision of educational, recreational and/or ecotourism opportunities.

5. Description of any other organizations that will be involved in your project.

Working partnerships with other resource management agencies and organizations are strongly encouraged.

6. An approximate timetable of management practice implementation covering a period of at least 10 years.

*It is recommended that you begin your project **after** your complete management plan and accompanying contract agreement are approved by the Forest Stewardship Advisory Committee and the Board of Land and Natural Resources. If you do begin before you have all approvals and have completed all paperwork you do so at the risk of incurring all costs, while understanding that there is no guarantee of final approvals or cost-share funding.*

7. An estimate of total project costs.

*Base your cost estimates on real data and currently available information. Do not project costs based on the hold-down rates (maximum allowable cost-share rates) established for eligible management practices as listed in **Appendix C**. Hold-down rates are established maximum reimbursement rates for specific management practices and should not be used to estimate costs. Costs will vary widely depending upon island, site, and intensity of management.*

Note concerning Environmental Assessments and Archeological Surveys

All Forest Stewardship plans that include the establishment of timber with the intent of eventual harvesting must be accompanied by an Environmental Assessment that includes a detailed assessment of cultural impacts. An Environmental Assessment can be easily prepared once your Forest Stewardship Management plan is ready for Committee and Board review. DLNR-DOFAW staff are available to assist you with this process which involves a required public review/comment period.

Forest Stewardship plans not subject to the Environmental Assessment requirement must at a

minimum be reviewed by the Division of Historic Preservation to determine whether or not there are any significant cultural or historic resources on the proposed project site. An archeological survey may be required where there is strong evidence to suggest the existence of such resources on the site. Any such resources would then need to be protected throughout the course of a project.

III. The Forest Stewardship Management Plan

In order to qualify for financial assistance under the FSP, you must, after Forest Stewardship Pre-Proposal acceptance, develop a detailed and comprehensive Forest Stewardship Management Plan. You will require the services of a qualified professional forester or resource management consultant unless you are technically qualified to write your own forest management plan. Your management plan must meet the standards set by the Forest Stewardship Advisory Committee and be written according to the established standard plan format.

You are eligible to receive up to one of the following reimbursement amounts, once your plan is approved by the Forest Stewardship Advisory Committee and documentation of your consultant's fee is verified. Maximum allowable reimbursements for 75% of cost of producing management plans are adjusted according to plan complexity - which is usually associated with the number of management practice categories involved. These management practice categories are described in **Appendix B**.

1-3 practice categories	\$2,250	(total consultant fee = \$3000)
4-6 practice categories	\$2,625	(total consultant fee = \$3500)
7-9 practice categories	\$3,000	(total consultant fee = \$4000)

Minimum Plan Standards

All Forest Stewardship Management Plans must include the following information in the format outlined below:

I. Cover Sheet

- Your name, address and phone number
- Location of project property
- Consultant name, title, address and phone number
- Date the plan was completed

II. Signature Page (*sample form is provided as Appendix A*)

Applicant, consultant and State Forester signatures

III. Introduction

1. General description of the property including:
 - Property size and location
 - Description of access routes to property
 - Property tax map key number
 - Property zoning
 - Topography, elevation and climate (map)
 - Brief history of uses/description of present condition
2. Descriptions of your specific management objectives

IV. Land and Resource Description

- Existing vegetation/cover types
- Existing forest health and function including disease problems and fire threat
- Soils and their condition, general slope and aspect
- Water resources and their condition
- Timber resources
- Wetland resources
- Significant historic and cultural resources
- Existing wildlife
- Threatened and endangered species existing on property
- Existing recreational and aesthetic values

V. Recommended Treatments and Practices

This section of the plan must describe the specific management practices that you intend to implement in order to achieve your desired forest resource management objectives within a specified time period. All practices for which you are requesting financial assistance should fall under one of the eligible management practice categories listed below and described in detail in *Appendix B*.

- Reforestation and Afforestation
- Forest and Agroforest Improvement
- Windbreak/Hedgerow Establishment, Maintenance and Renovation
- Soil and Water Protection and Improvement
- Riparian and Wetland Protection Improvement
- Wildlife Habitat Improvement
- Forest Recreation Enhancement

It is important that you select the management practices and activities that will make it

possible for you to achieve your stewardship objectives with the resources you have available to you.

The practices and methods you include should suit your goals and your project site. For instance, you must carefully consider your physical site characteristics and objectives when deciding which tree species you will plant.

Tree species considered to be invasive will not be funded and should not be planted within forest stewardship project areas, regardless of funding source. Invasive plant species are non-native plants that harm, or have the potential to harm, the environment (including native forest ecosystems), economy (including agricultural and urban ecosystems), or human health. For further guidance, please contact the Invasive Species Coordinator at the Division of Forestry and Wildlife.

If your management objectives include commercial timber production, your plan should include some basic economic analysis such as a net present value or internal rate of return calculation. You should roughly estimate projected cost and income flows—and consider their sensitivity to changes in economic factors such as price and risks. While it may be impossible to accurately predict financial returns over time or provide precise data on silvicultural systems, it is recommended that you consider possible outcomes in consultation with a qualified resource economist or extension forester.

Cost-share amounts requested for each management practice to be applied should not exceed the cost-share rates listed in *Appendix C*.

VI. Practice Implementation Schedule

- Your practice implementation schedule must clearly list, in a tabular format, all your individual management practice activities, by year, total acreage, projected cost per acre or foot, total cost, state cost-share and your cost-share. Please note that your cost projections should be based on real relevant data and not simply projected using the allowable cost-share rates provided. It may be that your share of project expense projections will exceed the state's share in cases where real cost estimates turn out to be higher than 50% of the allowable cost-share rate for a particular management practice.
- The per year and per acre cost for each management practice must be clear.
- Your schedule must cover a period of at least 10 years.
- The state's share of projected practice expenses should not exceed the cost-share rates provided in *Appendix C*.

VII. Budget Summary

Your budget summary simply lists your projected cost-share, state-share and total

project costs per year for the length of the project.

Examples of an acceptable Practice Implementation Schedule and Budget Summary are provided in Appendix D.

VIII. Required Attachments

Location Map: This map simply illustrates where the project property/site is on island and in relation to towns, major topographic features etc.

Topographic Map

Project/Site Map: This map must locate all activities on the project property to clearly illustrate what is being done where, in relation to the topography, watercourses and other significant natural features of the site. The map must also illustrate the layout and orientation of any proposed tree plantings such as windbreaks, woodlots or plantations. All maps must be of at least a 1:24000 scale and include the following:

- Legend
- North arrow
- Property boundary
- Existing and proposed roads
- Watercourses
- Location, orientation and layout of all management practices the project/site map so that management practices can be viewed as they relate to the site's topography and natural features.

Photograph(s) of Project Site

IX. Recommended Attachments

- Maps: USGS, vegetation, roads/trails/soils, topography
- Existing forest stand inventories
- Plant and animal species lists
- Aerial photographs
- Sources of assistance and information
- Any required permits
- Other sources of financial assistance

All management plans must include page numbers and label all attachments with letters or numbers for referencing purposes. Please do not put your plan into any binding or folder. Loose leaf pages are preferred for photocopying purposes.

Best Management Practices (BMP's)

All Forest Stewardship Program participants must agree to adhere to current Departmental *Best Management Practices* that are pertinent to the management practices being implemented.

Distribution/use of approved Forest Stewardship Management Plans and Use of Information:

One of the primary objectives of the FSP is to generate useful information for landowners throughout Hawaii, who may also be considering active forest management as a land use alternative. During the course of your project, you will be asked to share your experiences and knowledge, to contribute to the development of data and information sources for others.

Once you are enrolled in the FSP to receive funding assistance for your project, your approved management plan will be made available for copy and distribution to the general public upon request. You are thus advised to delete any information that you consider to be proprietary, prior to submitting your management plan to the Forest Stewardship Advisory Committee. You can present relevant proprietary information to the Committee separate from your management plan.

Although approved Forest Stewardship management plans are available for distribution to the general public, they should be used by potential applicants for informational purposes only. Any management plans that appear to plagiarize previously approved plans will not be accepted.

IV. Summation of Program Procedures

The following are the procedural steps, including paperwork, that you must complete in order to start and complete your Forest Stewardship project.

1. Complete and submit your Forest Stewardship Project Pre-Proposal to the DLNR-DOFAW Administration in Honolulu.
2. State Forest Stewardship Advisory Committee reviews your pre-proposal. If the Committee accepts your pre-proposal, you are advised to hire a resource consultant and develop a comprehensive Forest Stewardship Management Plan.
3. Enlist the services of a professional resource consultant unless you are technically qualified to write your own management plan.
4. State Forest Stewardship Advisory Committee reviews your management plan. If the Committee approves your plan, DLNR-DOFAW staff prepare and mail to you your Forest Stewardship contract agreement.
5. You review, sign with notary, and then mail your contract agreement back to the DLNR-DOFAW.
6. The Board of Land and Natural Resources reviews your Forest Stewardship contract agreement.

Note: In some cases, the DLNR Board will request that adjustments be made to management plans and contract agreements to reflect current DLNR priorities or budget concerns.

7. You are informed of Board approval and advised to start your project.
8. You are informed of reporting/reimbursement procedure.
9. You receive a Forest Stewardship recognition sign to post on your project property.
10. You submit 6-month progress reports for periods July to December and January to June each year, including all cost documentation, to DLNR-DOFAW Administration.
*(Required reporting format can be found in **Appendix F**).*
11. A Branch Forester and/or Forest Stewardship Coordinator visits your project site to verify practice completion.
12. DLNR-DOFAW Administration mails you your reimbursement payments.

Forest Stewardship Plan Signature Page

Professional Resource Consultant Certification: I have prepared (revised) this Forest Stewardship Plan. Resource Professionals have been consulted and/or provided input as appropriate during the preparation of this plan.

Prepared by:

Professional Resource Consultant's Signature/ Date

Professional Resource Consultant's Name

Applicant Certification: I have reviewed this Forest Stewardship Plan and hereby certify that I concur with the recommendations contained within. I agree that resource management activities implemented on the lands described shall be done so in a manner consistent with the practices recommended herein.

Prepared for:

Applicant's Signature/ Date

Applicant's Name

State Forester's Approval: This plan meets the criteria established for Forest Stewardship Plans by Hawaii's Forest Stewardship Advisory Committee. The practices recommended in the plan are eligible for funding according to state of Hawaii Forest Stewardship Program guidelines and administrative rules.

Approved by:

State Forester's Signature/ Date

State Forester's Name

Forest Stewardship Management Practice Categories and Guidelines

This appendix describes each of the Forest Stewardship Management Practice Categories that are eligible for cost-share assistance. Descriptions include general practice category definitions, practice implementation requirements, and a list of specific technical components that are eligible for cost-share under each general practice category. Definitions of the individual technical components and corresponding specifications and approved cost-share rates for each are provided in *Appendix C*. A table that summarizes all practice categories and corresponding technical practice components is provided in *Appendix E*.

Forest Stewardship Management Plan Development

Purpose: To provide you with a multidisciplinary, action-oriented forest management plan based on sound biological, environmental and economic management principles. Your plan should consider the long term management of all of the forest resource values that are important to achieving your land use goals and objectives.

All Forest Stewardship Plans must be written by a qualified professional forest resource consultant, or qualified applicant, according to the format detailed in this handbook.

Your plan may be reviewed and revised in the future if necessary, subject to DLNR-DOFAW and Land Board approval. Significant amendments may require that a new contract agreement be drawn up and approved. Minor amendments can typically be made as addenda to original plans.

You are eligible to receive up to one of the following reimbursement amounts, once your plan is approved by the Forest Stewardship Advisory Committee and documentation of your consultant's fee is verified. Maximum allowable reimbursements for 75% of cost of producing management plans are adjusted according to plan complexity - which is usually associated with the number of management practice categories involved.

1-3 Practices	\$2,250	(total consultant fee = \$3000)
4-6 Practices	\$2,625	(total consultant fee = \$3500)
7-9 Practices	\$3,000	(total consultant fee = \$4000)

Reforestation and Afforestation

Purpose: Establish a stand of forest trees for timber production and/or conservation purposes.

Implementation Guidelines and Requirements:

- Apply to open land or partially stocked forest areas.
- Maintain for at least 10 years following establishment
- Protect from destructive fire and destructive grazing.
- Prepare and treat planting areas to eliminate and control plant competition that might cause the practice to fail.
- An area from which timber was recently harvested is not eligible for cost-share under this practice category.
- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock—or where protection as a "stand alone" component will result in the natural regeneration of trees.

- Fruit tree orchard establishment is *not* eligible for cost-share.

- Agroforest establishment is eligible according to the following definition:
 - At least one tree species and at least one crop (food) or livestock species are managed to occur on the same unit of land either in some spatial arrangement or in time sequence.
 - Biological interactions between the woody and non-woody components are significant and managed to improve the total yield, economics or sustainability of the system.
 - Where the primary objective is the production of fruits, nuts coffee beans, etc. harvested from a tree species, one of the following must also be a significant objective (in order to distinguish the system from an orchard):
 - Soil and water conservation by inclusion of a significant shrub or herb strata and minimization of chemical fertilizers and pesticides (multilevel agroforest serving a watershed protection function)
 - Timber and fiber production by inclusion of additional tree species in the system (multi-species agroforest providing multiple products)
 - Biodiversity conservation by management for specific native wildlife or plant species (agroforest serving native habitat function)

Technical Components Eligible for Cost-Share:

Site Preparation
Seedling Acquisition
Planting
Fertilization/Soil Amendments
Weed/Moisture Control
Tree Establishment Protection, including predator control

See *Appendix C* for technical component specifications and approved cost-share rates.

Forest and Agroforest Improvement

Purpose: Achieve stand-specific objectives by increasing the growth rate and quality of crop trees, and improving forest stand vigor. This practice is applied to improve the health or species composition of an *existing forest*.

Implementation Guidelines and Requirements:

- Apply to forest land with existing tree cover.
- Apply to enhance standing timber quality, improve species composition, and/or enhance forest health.
- Apply in a way that preserves or improves the quality of the environment, especially wildlife habitat and the appearance of the area.

- Pre-commercial thinnings will be allowed with the approval of DLNR-DOFAW staff.

- Protect planted areas from destructive fire and destructive grazing.
- Maintain for at least 10 years following establishment.

- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock—or where protection as a "stand alone" component will result in the natural regeneration of trees.

- Only the tree (forest) components of agroforestry systems are eligible for cost-share. (Many of the agricultural or cropping components of agroforestry systems are eligible for cost-share through programs offered by the U.S. Natural Resource Conservation Service (NRCS) and the USDA Farm Service Agency (FSA).)

- Agroforestry is defined as follows for the purposes of the Forest Stewardship Program in Hawaii:
 - At least one tree species and at least one crop (food) or livestock species are managed to occur on the same unit of land either in some spatial arrangement or in time sequence.
 - Biological interactions between the woody and non-woody components are significant and managed to improve the total yield, economics or sustainability of the system.

- Where the primary objective is the production of fruits, nuts coffee beans, etc. harvested from a tree species, one of the following must also be a significant objective (in order to distinguish the system from an orchard):
 - Soil and water conservation by inclusion of a significant shrub and herb strata and minimization of chemical fertilizers and pesticides (multilevel agroforest serving a watershed protection function)
 - Timber and fiber production by inclusion of additional tree species in the system (multi-species agroforest providing multiple products)
 - Biodiversity conservation by management for specific native wildlife or plant species (agroforest serving native habitat function)

Technical Components Eligible for Cost-Share:

Site Preparation

Seedling Acquisition

Planting

Control of Undesirable Plant Species

Fertilization/Soil Amendments

Tree Establishment Protection, including predator control

Non-Commercial Thinning

See Appendix C for technical component specifications and approved cost-share rates.

Windbreak and Hedgerow Establishment, Maintenance and Renovation

Purpose: Establish and maintain windbreaks and hedgerows—and/or renovate existing windbreaks and hedgerows. Windbreaks are lines of trees established to reduce wind erosion and protect newly established tree plantations. Hedgerows are dense lines of trees established along elevation contours to control soil erosion and/or provide green manure or fodder in agroforestry systems.

Implementation Guidelines and Requirements:

- Windbreak and hedgerow system designs must follow technical guidelines established by the USDA Natural Resource Conservation Service (NRCS) and require NRCS and DLNR-DOFAW approval. (*NRCS technical guidelines for field windbreaks and hedgerows are available at DLNR-DOFAW Administration in Honolulu.*)
- Windbreak establishment is not eligible for cost-share, where the sole purpose of the windbreak is to protect non-forest resources such as an unforested pasture managed solely for grazing or a food crop.
- Protect all planted areas from destructive fire and destructive grazing.
- Maintain for at least 10 years following establishment.
- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock.

Technical Components Eligible for Cost-Share:

Weed/Moisture Control
Site Preparation
Seedling Acquisition
Planting
Tree Establishment Protection, including predator control
Fertilization/Soil Amendments
Non-Commercial Thinning
Trickle-Drip Irrigation Systems

See [*Appendix C*](#) for technical component specifications and approved cost-share rates.

Soil and Water Protection and Improvement

Purpose: Improve the water quality and yield from forest soils, maintain or improve the productivity of forest soils, and prevent erosion on forest land.

Implementation Guidelines and Requirements:

- Eligible practices are erosion control measures on forest soils that include the use of soil protecting/conserving plants in order to control sheet or rill erosion, gully formation and/or mass movement of soil.
- Apply practices on abandoned roads, trails, firebreaks, landings and other forest areas requiring critical area treatment.
- Adhere to state-approved ***Best Management Practices*** for activities in stream crossings, cross drainage and streamside management areas. Applicable practices for Streamside Management Zones are described in the Best Management Practices.
- Protect all planted areas from destructive fire and destructive grazing.
- Maintain for at least 10 years following establishment.
- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock—or where protection as a "stand alone" component will result in the natural regeneration of trees.

Technical Components Eligible for Cost-Share:

Tree Establishment Protection, including predator control
Mulching
Water Diversion
Critical Area Revegetation

See *Appendix C* for technical component specifications and approved cost-share rates.

Riparian and Wetland Protection and Improvement

Purpose: Protect, restore, and improve wetlands and riparian areas, reduce stream sedimentation and streambank degradation, and protect water quality.

Implementation Guidelines and Requirements:

- Apply to forest land with existing tree cover or other rural lands capable of supporting forested wetlands or forested riparian areas.
- Apply to establish and maintain permanent tree and shrub cover on plantation forest or agricultural areas that border: permanent streams; lakes or ponds; open water wetlands; important groundwater recharge areas; or important groundwater recharge areas.
- Riparian Buffer Areas
 - Stabilize and protect riparian buffer areas from erosion prior to planting.
 - Protect riparian buffer areas from destructive animal traffic, grazing and browsing.
 - Plant trees on 6x6 foot spacings and shrubs, on 5x5 foot spacings.
 - Buffer areas should be at least 18 feet wide and consist of at least four rows of trees.
- Follow applicable state-approved *Best Management Practices* for Streamside Management Zones when applying any forest or vegetation management activities in riparian or forest buffer zones bordering permanent or major intermittent streams and waterways. The Riparian Buffer Areas described above, are areas within Streamside Management Zones, which most closely border streamsides.
- Protect planted areas from destructive fire and destructive grazing.
- Maintain for at least 10 years following establishment.
- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock—or where protection as a "stand alone" component will result in the natural regeneration of trees.

Technical Components Eligible for Cost-Share:

Site Preparation
Seedling Acquisition
Planting
Fertilization/Soil Amendments
Tree Establishment Protection, including predator control
Establish Permanent Vegetative Cover
Streambank Stabilization

*See **Appendix C** for technical component specifications and approved cost-share rates.*

Wildlife Habitat Improvement

Purpose: Establish, restore, improve, or maintain permanent forest and/or wetland habitat for native and desirable non-native game and non-game wildlife species, including threatened and endangered species.

Implementation Guidelines and Requirements:

- Apply eligible management practices to create and/or alter unique habitat required of specific target wildlife species for nesting, brood cover, escape cover and food.
- Apply practices to forest land with existing tree cover and closely associated lands necessary for species habitat improvement and/or the recovery of threatened and endangered species of plants or animals.
- Develop practices in consultation with wildlife management professionals, and based on past research or scientific observation.
- Protect planted areas from destructive fire and destructive grazing.
- Maintain for at least 10 years following establishment.

- Tree Establishment Protection methods are eligible for cost-share only where it is determined that the primary purpose of this practice will not be achieved if it is not protected from feral animals or domestic livestock—or where protection as a "stand alone" component will result in the natural regeneration of trees.

Technical Components Eligible for Cost-Share:

Control of Undesirable Plant Species
Site Preparation
Tree Establishment Protection, including predator control
Fertilization/Soil Amendments
Seedling Acquisition
Planting
Wildlife Watering Unit

See *Appendix C* for technical component specifications and approved cost-share rates.

Forest Recreation Enhancement

Purpose: Improve forest areas, including historic sites, specifically for recreational and/or educational uses including hiking, natural resource interpretation, wildlife viewing and hunting.

Implementation Guidelines and Requirements:

- Apply to construct trails or walkways in scenic forest areas that are somehow accessible to the public.
- Trails constructed with cost-share assistance must be periodically made accessible to the public.
- Prepare paths, trails and walkways where they are needed for effective and safe use of targeted recreational forest resources.
- Maintain for at least 10 years following establishment.

Technical Components Eligible for Cost-Share:

Trail Construction

See *Appendix C* for technical component specifications and approved cost-share rates.

Forest Stewardship Practice Technical Components, Specifications and Allowable Cost-Share Rates

Site Preparation

Site preparation techniques are applied to create a favorable environment for tree seedling planting, establishment and growth. Applications may involve heavy or light equipment, or simply hand-labor. Vegetative competition is reduced or removed so that seedlings can be expected to survive. Site preparation techniques are also applied to improve the soil condition for seedling growth or natural regeneration. Scarification is commonly used to promote the natural regeneration of *Acacia koa*. Tilling and subsoiling may be required where soil is compacted or where there are hardpans.

Guidelines

- Apply all chemicals in accordance with registered uses, directions on label, and all other applicable federal, state and local policies.
- Be careful not to damage to existing desirable trees.
- Prepare site for planting so as to minimize soil erosion and the movement of sediment.
- Wherever feasible, follow elevation contours when using heavy soil-moving equipment.
- Do not employ mechanical site preparation methods in Streamside Management Zones as defined the DLNR-DOFAW *Best Management Practices*.

Costs and Cost-Share Rates

Costs for site preparation include equipment, labor and materials. Allowable cost-share rates vary depending upon the amount of site preparation required due to density of existing vegetation, soil condition, presence of hardpan, topography, etc. Rates are as follows:

Low	\$200/acre
Medium	\$400/acre
High	\$700/acre

NOTE: The cost-share rates listed in this appendix are the maximum allowable program shares for implementing the listed practices. They are estimated to be 50% of the total cost. Thus, if the \$200/acre Site Preparation rate is applied, an applicant will receive this amount in assistance if he/she spends at least \$400/acre implementing the practice. If the practice actually costs less than \$400/acre, the applicant will receive only 50% of the actual cost. If the practice costs more than \$400/acre, the applicant can still only receive the maximum allowable cost-share rate which is \$200/acre.

Planting

Tree seedlings are hand or machine planted after site preparation is complete.

Guidelines

- Plant seedlings at the beginning of the wettest season.
- **Hole size:** Recommended planting hole size depends upon seedling type and a variety of environmental conditions. Where dibble stock is used, soil is of good structure, and there is adequate rainfall, your planting holes need only to accommodate the small dibble. Where bare-root and larger planting stock are used, holes must be large enough to accommodate freely hanging roots, or root balls. Roots should never be bent or crowded. Where long droughts may threaten seedling survival, larger holes can serve as water storage reservoirs, greatly increasing seedling survival rates. Holes dug through sod or untilled ground should be at least 40cm square.
- You can mix soil amendments or additives such as hydrating polymers with soil before planting holes are filled in to improve growing environment and soil water holding capacity.
- Clear all weeds and competing vegetation from around newly planted seedlings at the time of planting to an area of at least 3 feet in diameter.
- Avoid using heavy machinery on areas bordering streams, major drainages and steep slopes. Hand-planting, direct seeding or natural regeneration are recommended for such areas.
- Avoid glazing sides of planting holes with digging tools, especially augers in wet clay soils.

Costs and Cost-Share Rates

Costs for planting include labor, equipment and materials. Maximum allowable cost-share rates are as follows:

Low	150 trees/acre	\$100/acre
Med.	150-250 trees/acre	\$150/acre
Heavy	250+trees/acre	\$200/acre

Seedling Acquisition

Seedlings should be purchased from local, private growers whenever possible. Local growers are those most likely to carry the species provenances that are best adapted to your site and your intended uses. You may need to order ahead of time to get the quantity and species that you desire. The DLNR-DOFAW also operates a nursery and produces a limited selection of species. Again, you should always order well in advance.

Guidelines

- Use smaller container stock such as dibble tube, airblock, root-trainer or plant band, as opposed to larger potted stock, if available to reduce site preparation and planting costs.
- Seedlings should be of good condition, adequate size and "hardened off" in nursery before planting.
- Make your species choices according to your project site conditions and intended uses/objectives.
- Make your species choices considering the plant communities that currently exist on your project site. **Avoid choosing invasive non-native tree species that may become aggressive weeds or out-compete more desirable forest species.** If you are not sure whether or not a species is invasive, contact the Invasive Species Coordinator at the DLNR-DOFAW.

Costs and Cost-Share Rates

Cost-share is allowable only for the purchase or production of seedlings. Higher rates are allowed for larger potted stock which may be all that is available for some native species. Higher rates may also be applied when you are producing your own seedlings for your project.

Normal Private Rate	\$.50/seedling
High Private Rate	\$1.50/seedling

Fertilization/Soil Amendments

Fertilization is recommended to promote good seedling growth and development where soil nutrients are limiting and where rapid early growth will provide seedlings with a competitive advantage over surrounding vegetation. You can use soil amendments to improve the structure and fertility of the soil immediately surrounding the seedling root zone. Fertilizers and soil amendments may be organic or inorganic.

Guidelines

- Apply chemicals in accordance with registered uses, directions on label, and all other applicable federal, state and local policies. Do not apply inorganic fertilizers near to streams or wetlands where polluted runoff might enter water.
- Chose and apply fertilizers only after considering species demands and soil test data.
- Consider possible induced deficiencies of nutrients due to excessive levels of other nutrients and the effect of soil pH on the availability of both soil and applied sources of plant nutrients and the optimum pH range of the plants to be grown.
- **Fertilizer applications are eligible for cost-share assistance for a period of up to four years subsequent to the seedling planting date.**

Costs and Cost-Share Rates

Costs of fertilization include fertilizer, equipment and labor. The allowable cost-share rates for fertilization/soil amendments are:

Normal Rate	\$100/acre/year
High Rate	\$250/acre/year

The high rate is applicable only where soil depletion is extreme as is the case with former sugar plantation sites.

Weed/Moisture Control

Weed and moisture control applications are recommended for a period following planting to provide seedlings with a favorable growing environment.

Guidelines

- Apply chemicals in accordance with registered uses, directions on label, and all other applicable federal, state and local policies.
- Apply weed control measures specific to competing or undesirable species and design applications to minimize adverse environmental impacts.
- Use mulch where feasible as a form of weed/moisture control.
- **Weed/moisture control practices are eligible for cost-share assistance for a period of up to four years subsequent to the seedling planting date.**

Costs and Cost Share Rates

Costs of Weed/Moisture Control include labor, materials and equipment. Irrigation is not eligible for cost-share under this component. The allowable cost-share rate for Weed/Moisture Control applications is:

\$150/acre/year

Tree Establishment Protection

Tree Establishment Protection strategies serve to protect seedlings and young trees from feral and domestic animals such as pigs, sheep, deer, cattle, horses and humans. You can also apply tree protection methods where animal activity prevents natural forest regeneration. You may also want to explore alternatives to permanent perimeter fencing, such as animal repellents, portable electric fencing, etc., as means of animal control.

Guidelines

Fencing

- Fence must have at least five strands of 12^{1/2} gauge smooth and/or 12^{1/2} gauge barbed galvanized wire.
- Wire should be tightly strung and well secured to post. (If pulled and released, wire should vibrate for 20-30 seconds.)
- Where fence crosses a major drainage, a suitable swinging section should be provided to prevent passage of animals during low water periods, yet allow water flow during flood periods.
- A post and stay should be used to hold fence in an upright position, and to maintain correct wire-wire and ground-wire spacing.
- Posts should be spaced about 10 feet apart.
- Where stays are used, not more than one between each pair of posts is recommended.
- Wooden posts within fence line should be at least 6 inches in diameter and 6 feet in length.
- Line posts should be set deep enough into the ground for adequate stability and support (about 18 inches).
- Line posts in depressions or draws should be anchored to prevent pulling when wire is stretched.
- Corner posts should be set approximately 3 feet into firm soil.
- Only sound, decay resistant material should be used for wooden posts. Kiawe, ohia, eucalyptus and ironwood are considered good post woods.
- Steel posts should be protected with an effective rustproof coating.
- Gates, cattle and/or deer guards should be provided as necessary to allow vehicle and farm traffic.
- Fence maintenance following installation is not eligible for cost-share assistance.

Other Practices

- You are encouraged to experiment with alternative animal control measures as long as there is a reasonable probability that the measure will be successful (proven elsewhere, previous observations, animal behavior studies, etc.).
- Develop alternative methods in consultation with wildlife, game management or livestock management professionals.

Costs and Cost Share Rates

For perimeter fencing, costs are applied on a *per acre protected* basis. Where fencing is needed to add to, or complete an existing fence, costs are applied proportionately to the total acres protected. For Example, if a fence is needed to close off one side of a four-sided square area, costs can be applied to 1/4 or 25% of the total acres protected. Qualifying acres include only those that are actively being managed under the Forest Stewardship Program. House sites, open, and other non managed areas cannot be counted as areas protected. The maximum allowable cost share rate for Tree Establishment Protection is:

\$150/acre protected

Control of Undesirable Plant Species

Apply this practice component wherever the elimination of undesirable plant species is necessary to achieve your forest, agroforest and/or wildlife habitat improvement objectives.

Guidelines

- You can eliminate or control undesirable plant species with herbicides or by physically removing/destroying vegetation.
- Apply chemicals in accordance with registered uses, directions on label, and all other applicable federal, state and local policies.
- Your control measures should be designed specifically for the competing or undesirable species and your applications should be designed to minimize adverse environmental impacts.

Costs and Cost Share Rates

Costs include labor, equipment and materials. Allowable cost share rates for Control of Undesirable Plant Species are as follows:

Low	(less cover)	\$200/acre
High	(more dense cover)	\$400/acre

Non-Commercial Thinning

Apply this practice to stands of trees to increase the production of high-value timber products, or when your multiple objectives include a combination of timber, wildlife and aesthetic benefits.

Guidelines

- Protect treated forest area from destructive grazing livestock and/or browsing wildlife ungulates.
- Apply practice to forested areas where stands of trees are overstocked or where desirable trees are over topped by less desirable trees.
- Your management plan should consider: species that will be favored for better growth; desired tree spacing after thinning; methods of tree removal; best season for thinning; thinning methods (mechanical or chemical); methods for slash disposal; and special treatments, if needed, to forestall the spread of disease fungi or insect pests.
- You can thin crop trees or remove undesirable cull trees to increase the growth rate, health and future value desired timber crop trees.
- Chose cull trees with the assistance of a DLNR-DOFAW Branch Forester or other professional forester.

Costs and Cost-Share Rates

Costs include labor, materials and equipment. The allowable cost-share rate for Non-Commercial Thinning is:

\$100/acre

Trickle Drip Irrigation Systems

You can use drip irrigation systems to establish trees in areas where the natural supply of water is not adequate in the amount or frequency necessary for acceptable seedling survival and growth.

Guidelines

- The installation of irrigation systems is an eligible practice only where they are being used to irrigate windbreak trees within rows—and only if it is determined that trees will not survive without irrigation.
- It is recommended that you use irrigation systems only to enhance seedling survival and growth during early development—before seedling roots have reached upper water table levels. Irrigation should not to be used to maintain trees as they become mature.
- Develop irrigation system designs in consultation with the UH-Cooperative Extension Service or the USDA Natural Resource Conservation Service.
- Cost-share assistance is available for system installation only. System maintenance and repairs are the responsibility of the applicant.

Costs and Cost Share Rates

Eligible costs are for system installation only. They include labor, materials and equipment. The allowable cost-share rate for the installation of Trickle-Drip Irrigation Systems is:

\$0.25/foot

Mulching

Apply mulch to soil surface immediately surrounding young tree seedlings after planting to conserve soil moisture, prevent soil compaction, reduce runoff and erosion, control weeds, improve soil structure and establish plant cover. Mulch consists of plant residues or other suitable materials produced on or off site.

Guidelines

- Apply mulch to erodible soils where trees or cover vegetation are being established.
- Apply mulch around tree seedlings at the time of planting as a means of weed/moisture control.
- Cover the soil surface completely with a mulch layer at least 2 inches thick.
- Where mulch is used to promote **Critical Area Revegetation**, it should serve to control erosion and boost soil fertility.

Costs and Cost-Share Rates

Costs include labor, equipment and materials. The allowable cost-share rate for mulching is:

\$125/acre

Critical Area Revegetation

This practice involves the establishment of permanent vegetation, including trees, shrubs, vines, grasses and legumes on highly erodible sites. The objective is to protect and rebuild soil so that trees can eventually be planted with good potential for survival.

Guidelines

- Apply practices to areas that cannot be stabilized by less intensive methods such as tree planting. Examples are dams, dikes, levees, slope cuts, fills and deep rills and gullies.
- Chose suitable plants according to site conditions and in consultation with the Plant Materials section of the USDA Natural Resource Conservation Service.
- Use erosion control netting and/or mulch on exposed areas with high erosion potential.
- Protect plantings from fire and grazing animals.
- Plant shrub and grass lines along elevation contours.

Costs and Cost-Share Rates

Costs include labor, materials and equipment. Allowable cost-share rates vary depending upon degree of degradation or erosivity. They are:

Less intensive	\$300/acre
More intensive	\$500/acre
Most intensive	\$700/acre

Water Diversions

The purpose of this practice is to divert water from flood or erosion prone forest sites to sites where it can be used or disposed of safely.

Guidelines

- This practice component applies where: 1) Runoff from higher areas is damaging to land being managed under the Forest Stewardship Program; 2) Surface and Shallow subsurface flow caused by seepage is damaging sloping upland; 3) Runoff is in excess and available for use on nearby sites; and 4) A diversion is required as part of a pollution abatement system.
- Do not use water diversions as substitutes for terraces to control erosion.
- Design and construct diversions in consultation with a resource professional from the USDA Natural Resource Conservation Service.
- Diversions must have the capacity to carry peak runoff from a 10-year storm event of 24 hour duration.
- Design diversions to have stable side slopes.
- Construct ridges with a minimum top width of 4 feet.
- The top of the constructed ridge must not be lower at any point than the design elevation plus 10 percent overfill for settlement.
- Locate diversions in consideration of outlet conditions, topography, land use, cultural operations and soil type.
- Do not use diversions below high sediment-producing areas.
- Vegetated filter strips along diversion bottoms are recommended.
- Each diversion must have a safe and stable outlet with adequate capacity.
- Outlets may be grassed waterways, vegetated or paved areas, sediment basins, grade stabilization structures, stable watercourses, underground outlets, or combination.
- Management plans must detail specs. for construction and maintenance including length, width, cross-section, depths, side slopes, slope of channel, and outlet.
- For vegetated diversions, plans should also specify grass species, recommended planting time and methods and fertilizer requirements.

Costs and Cost Share Rates

Costs for Water Diversions include labor, equipment and materials. The allowable cost-share rate is:

\$100/acre protected

Stream Bank Stabilization

This practice involves the establishment of temporary vegetation such as grass, or the use of other materials to stabilize the banks of streams, lakes and estuaries that are subject to erosion and scouring. Stream Bank Stabilization Practices are used to prepare a site for **Establishing Permanent Vegetative Cover**.

Guidelines

- Apply practices to streambanks that are susceptible to erosion and/or damage from livestock or vehicular traffic.
- Streambank stabilization applications include reshaping of banks, stabilization of bank toes with rocks or logs, temporary stabilization with mulch and grass prior to **Establishing Permanent Vegetative Cover** with trees and shrubs.
- Stabilization may be achieved with cuttings or posts of trees or shrubs that root rapidly in wet conditions.
- Follow applicable state-approved ***Best Management Practices*** for Streamside Management Zones when applying any forest or vegetation management activities in riparian or forest buffer zones bordering permanent or major intermittent streams and waterways.

Costs and Cost Share Rates

Costs include labor, materials and equipment. The allowable cost-share rate is:

\$200/acre

Establish Permanent Vegetative Cover

This practice involves the establishment of permanent forested buffer strips within Streamside Management Zones following **Streambank Stabilization** as described above.

Guidelines

- Buffer areas must be stabilized and protected from erosion prior to any tree planting.
- Buffer areas must be protected from destructive animal traffic, grazing and browsing.
- Plant trees on 6x6 foot spacings and shrubs, on 5x5 foot spacings.
- Buffer areas should be at least 18 feet wide and consist of at least four rows of trees.
- Develop planting plans, layout and installation in consultation with a DOFAW Branch Forester.
- Follow applicable state-approved *Best Management Practices* for Streamside Management Zones when applying any forest or vegetation management activities in riparian or forest buffer zones bordering permanent or major intermittent streams and waterways.

Costs and Cost-Share Rates

Costs include labor, materials and equipment. The allowable cost share rate for Establishing Permanent Vegetative Cover is:

\$300/acre

Trail Construction

You can construct trails in forest areas to enhance their recreational value, and to provide for public access and educational opportunities.

Guidelines

- When constructing trails, try not to eliminate key trees and other vegetation that have scenic value, provide shade, reduce erosion and runoff, provide unique habitat for wildlife, or that add to the aesthetic value of the area.
- Develop trail grades suited for your intended purposes, considering the topography, never exceeding 10 percent slope.
- Wherever possible, trail width should remain between two and 4 feet.
- Cut and fill slopes must be stable.
- Plans must include provisions for erosion control.
- Revegetate as soon as is practical following trail construction.
- Design bridges to withstand maximum expected loading with an adequate factor of safety.
- Place directional and warning signs, handrails, bridges and culverts as dictated by the site and intended use.
- Include provisions for maintaining all wearing surfaces, signs and drainage structures.

Costs and Cost Share Rates

Costs of trail construction include labor, equipment and materials. A higher allowable cost-share rate is applied to the construction of educational trails, which must provide for interpretation of forest values, forest species mixes, and/or historic and cultural sites. The allowable cost-share rates for trail construction are:

Recreational	\$1.25/foot
Educational	\$1.75/foot

Wildlife Watering Units

Wildlife Watering Units provide drinking water for wildlife where new, additional or improved watering places are needed to increase the range or to improve the habitat of desirable wildlife species.

Guidelines

- Construct watering units in consultation with a DOFAW wildlife professional.
- Maintain watering units to provide water for wildlife throughout the year.

Costs and Cost Share Rates

Costs include materials. The allowable cost-share rate for a Wildlife Watering Unit is:

\$200/unit

SAMPLE FORMAT: IMPLEMENTATION SCHEDULE

Year 1 - 2002

Practice Component	Units	Cost/Unit	Total Cost	LO Share	State Share
Trail Construction/ Education - Perimeter	6,000 ft.	\$2.58	\$15,480	\$7,740	\$7,740
Site Preparation	4 acres	\$1,769	\$7,076	\$4,276	\$2,800
Tree Establishment Protection	40 acres	\$404	\$16,161	\$10,161	\$6,000
TOTALS			\$38,717	\$22,177	\$16,540

Year 2 - 2003

Practice Component	Units	Cost/Unit	Total Cost	LO Share	State Share
Trail Construction/ Education - Interior	5,280 ft.	\$1.63	\$8,606	\$686	\$7,920
Site Preparation	4 acres	\$2,991	\$11,964	\$9,164	\$2,800
Weed Control	1 acre	\$962	\$962	\$812	\$150
Seedling Acquisition	500	\$2.90	\$1,450	\$700	\$750
Planting	4 acres	\$472	\$1,900	\$1,100	\$800
TOTALS			\$24,882	\$12,462	\$12,420

Year 3 - 2004

Practice Component	Units	Cost/Unit	Total Cost	LO Share	State Share
Trail Construction/ Education - Interior	5,280 ft.	\$1.63	\$8,606	\$686	\$7,920
Site Preparation	4 acres	\$2,991	\$11,964	\$9,164	\$2,800
Weed Control	2 acres	\$962	\$1,924	\$1,624	\$300
Seedling Acquisition	500	\$2.90	\$1,450	\$700	\$750
Planting	4 acres	\$472	\$1,900	\$1,100	\$800
TOTALS			\$25,844	\$13,274	\$12,570

(continue for years LO (landowner) is to receive cost-share assistance and maintain practices)

SAMPLE BUDGET SUMMARY

APPENDIX D

YEAR	Total Budget	Landowner Share	State Share
2002	\$38,717	\$22,177	\$16,540
2003	\$24,882	\$12,462	\$12,420
2004	\$25,844	\$13,274	\$12,570
2005	\$19,660	\$15,260	\$4,400
2006	\$23,060	\$17,910	\$5,150
2007	\$23,060	\$17,910	\$5,150
2008	\$23,060	\$17,910	\$5,150
2009	\$14,750	\$11,275	\$3,475
2010	\$14,750	\$11,275	\$3,475
2011	\$5,250	\$3,740	\$1,510
2012	\$4,550	\$4,550	\$0
2013	\$4,550	\$4,550	\$0
2014	\$4,550	\$4,550	\$0
2015	\$4,550	\$4,550	\$0
2016	\$4,550	\$4,550	\$0
TOTALS	\$235,783	\$165,943	\$69,840

Forest Stewardship Management Plan Development

COMPONENT DESCRIPTION	UNIT	RATE	C/S
1 to 3 SIP Practices included	acre	\$2250.	75%
4 to 6 SIP Practices included	acre	\$2625.	75%
7 to 9 SIP Practices included	acre	\$3000.	75%

Reforestation and Afforestation

Site Preparation - Lower Cost	acre	\$200.	50%
Site Preparation - Medium Cost	acre	\$400.	50%
Site Preparation - Higher Cost	acre	\$700.	50%
Planting - Light (150/acre)	acre	\$100.	50%
Planting - Medium (150-250/acre)	acre	\$150.	50%
Planting - Dense (250+/acre)	acre	\$200.	50%
Weed/Moisture Control	acre	\$150.	50%
Tree Establishment Protection	acre	\$150	50%
Fertilization/Soil Amendments - Normal	acre	\$100.	50%
Fertilization/Soil Amendments - High	acre	\$250.	50%
Seedling Acquisition - Lower Cost	tree	\$0.50	50%
Seedling Acquisition - Higher Cost	tree	\$1.50	50%

Forest and Agroforest Improvement

Site Preparation - Lower Cost	acre	\$200.	50%
Site Preparation - Medium Cost	acre	\$400.	50%
Site Preparation - Higher Cost	acre	\$700.	50%
Planting - Light (150/acre)	acre	\$100.	50%
Planting - Medium (150-250/acre)	acre	\$150	50%

Planting - Dense (250+/acre)	acre	\$200.	50%
Tree Establishment Protection	acre	\$150	50%
Fertilization/Soil Amendments - Normal	acre	\$100.	50%
Fertilization/Soil Amendments - High	acre	\$250.	50%
Non-Commercial Thinning	acre	\$100	50%
Control of Undesirable Species - Light	acre	\$200	50%
Control of Undesirable Species - Heavy	acre	\$400	50%
Seedling Acquisition - Lower Cost	tree	\$0.50	50%
Seedling Acquisition - Higher Cost	tree	\$1.50	50%

Windbreak and Hedgerow Establishment, Maintenance and Renovation

Weed/Moisture Control	acre	\$150.	50%
Site Preparation - Lower Cost	acre	\$200.	50%
Site Preparation - Medium Cost	acre	\$400.	50%
Site Preparation - Higher Cost	acre	\$700.	50%
Planting - Light (150/acre)	acre	\$100.	50%
Planting - Med.(150-250/acre)	acre	\$150.	50%
Planting - Dense (250+/acre)	acre	\$200.	50%
Tree Establishment Protection	acre	\$150.	50%
Fertilization/Soil Amendments - Normal	acre	\$100.	50%
Fertilization/Soil Amendments - High	acre	\$250.	50%
Seedling Acquisition - Lower Cost	tree	\$0.50	50%
Seedling Acquisition - Higher Cost	tree	\$1.50	50%
Non-Commercial Thinning	acre	\$100.	50%
Trickle-Drip Irrigation System	ft.	\$0.25	50%

Soil and Water Protection and Improvement

Tree Establishment Protection	acre	\$150.	50%
Mulching	acre	\$125.	50%
Water Diversion	acre	\$100.	50%
Critical Area Revegetation - Lower Cost	acre	\$300.	50%
Critical Area Revegetation - Medium Cost	acre	\$500.	50%
Critical Area Revegetation - Higher Cost	acre	\$700.	50%

Riparian and Wetland Protection Improvement

Seedling Acquisition - Lower Cost	tree	\$0.50	50%
Seedling Acquisition - Higher Cost	tree	\$1.50	50%
Planting - Light (150/acre)	acre	\$100.	50%
Planting - Medium (150-250/acre)	acre	\$150.	50%
Planting - Dense (250+/acre)	acre	\$200.	50%
Establish Permanent Vegetative Cover	acre	\$300.	50%
Site Preparation - Lower Cost	acre	\$200.	50%
Site Preparation - Medium Cost	acre	\$400.	50%
Site Preparation - Higher Cost	acre	\$700.	50%
Tree Establishment Protection	acre	\$150.	50%
Fertilization/Soil Amendments - Normal	acre	\$100.	50%
Fertilization/Soil Amendments - High	acre	\$250.	50%
Streambank Stabilization	acre	\$200.	50%

Wildlife Habitat Improvement

Control of Undesirable Species - Light	acre	\$200.	50%
Control of Undesirable Species - Heavy	acre	\$400.	50%
Site Preparation - Lower Cost	acre	\$200.	50%

Site Preparation - Medium Cost	acre	\$400.	50%
Site Preparation - Higher Cost	acre	\$700.	50%
Tree Establishment Protection	acre	\$150.	50%
Fertilization/Soil Amendments - Normal	acre	\$100.	50%
Fertilization/ Soil Amendments - High	acre	\$250.	50%
Seedling Acquisition - Lower Cost	tree	\$0.50	50%
Seedling Acquisition - Higher Cost	tree	\$1.50	50%
Planting - Light (150/acre)	acre	\$100.	50%
Planting - Medium (150-250/acre)	acre	\$150.	50%
Planting - Dense (250+/acre)	acre	\$200.	50%
Wildlife Watering Unit	unit	\$200.	50%

Forest Recreation Enhancement

Trail Construction - Educational	ft.	\$1.75	50%
Trail Construction - Recreational	ft.	\$1.25	50%

Forest Stewardship Project Progress Reporting Instructions

Project progress reports are due on June 30th December 31st of each year for which funding has been approved for your project according to your State of Hawaii Forest Stewardship Management Agreement. Please follow the following reporting format.

- 1) **Provide a summary of all of the management practices you accomplished during this period.** Please be quantitative where you can. For example: number of trees planted, number of acres prepared for planting, length of fencing constructed, etc.
- 2) **If you are requesting a reimbursement for this period, itemize all of your expenditures using the example tabular format that follows.** For each requested reimbursement, please provide copies of invoices or receipts. For your in-kind contributions, provide a log of hours of labor and/or equipment rental, signed by workers and/or equipment operator.

Example itemization of management accomplishments and expenses:

activity/practice	units accomplished	hard (cash) costs	in kind labor	in kind equipment use	total cost	reimbursement requested
Site Preparation	15 acres	\$376.00	\$2,246.00	\$4,878.00	\$7,500.00	\$3,750.00
Seedling Acquisition	15 acres: 3750 seedlings	\$2,812.50	\$0.00	\$0.00	\$2,812.50	\$1,406.25
Seedling Planting	15 acres	\$0.00	\$1,750.00	\$500.00	\$2,250.00	\$1,125.00
Fertilizer	15 acres	\$1,250.00	\$0.00	\$2,500.00	\$3,750.00	\$1,500.00
TOTALS		\$4,438.50	\$3,996.00	\$7,878.00	\$16,312.50	\$7,781.25

*In kind equipment use should be charged at allowable hourly rate including equipment operator. Please see Appendix G for allowable rates.

- 3) **Describe any changes you have made—or are planning to make—to your original management plan.**
- 4) **Briefly evaluate each of the technical practices you have applied to date as if you were advising another landowner about to begin a similar project. What has worked? What hasn't? What, if anything would you do differently?**
- 5) **Is there any technical information that would help you as you proceed with your project? If so, please describe.**

**ALLOWABLE HOURLY RATES FOR IN-KIND
LANDOWNER CONTRIBUTIONS**

General Hand Labor (16 years or older)	\$10.00/hour
Specialized Hand Labor	\$12.00/hour

Materials:	Line Posts	\$10.00/each
	Corner Posts	\$15.00/each

Equipment with Operator:

1/2 and 3/4 ton truck	\$15.00/hour
1 ton truck	\$17.00/hour
1-1/2 ton truck	\$20.00/hour
2 ton truck	\$22.00/hour
2-1/2 ton truck	\$25.00/hour
5 ton truck	\$25.00/hour
20 ton tandem dump truck	\$60.00/hour
12 ton tandem dump truck	\$45.00/hour
2 and 4 wheel drive tractor (40 HP)	\$35.00/hour
2 wheel drive tractor (>40 HP)	\$40.00/hour
D-2 or TD6 with attachments	\$40.00/hour
D-4 or TD9 with attachments	\$50.00/hour
D-6 or TD14 with attachments	\$70.00/hour
D-7 or TD18 with attachments	\$90.00/hour
D-8 or TD20 with attachments	\$125.00/hour
D-9 or TD25 with attachments	\$185.00/hour
Back-hoe	\$60.00/hour
Loader	\$60.00/hour
Compressor	\$20.00/hour
Power Saw	\$15.00/hour
Power post hole digger	\$15.00/hour
Power sprayer	\$15.00/hour
Bobcat	\$21.00/hour
Manlift	\$18.50/hour
Mulcher	\$15.00/hour

B. FOREST STEWARDSHIP PLAN FOR OLA HONUA

Forest Stewardship Plan

for the Ola Honua
Native Forest Restoration, Timber
Production, Watershed Protection and
Education Project

Prepared by Neaulani, Inc.

PO Box 449

Kula, HI 96790

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808-248-7561

In Consultation with Robert Hobdy

Submitted: Mar. 4, 2004

Revised: Nov. 18, 2004

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I. Forest Stewardship Plan Preface

This stewardship plan describes the existing vegetation, soils and wildlife/fish on the property and addresses the opportunities for the protection and enhancement of all natural resources while assisting Neaulani, Inc. (“the applicant”) meet its objectives for the management of the property identified below. The plan provides guidelines for a sound strategy that reflects the applicant’s commitment to a land stewardship ethic that focuses on the integration of all resources to manage the property as a valuable legacy for future generations. In addition to the vegetative, soil and wildlife resources, this plan addresses the enhancement of other resources listed below. The plan may need to be revisited as the applicant’s objectives, conditions, and/or opportunities change.

Applicable Resource Areas Covered. Agroforestry is our primary management objective in this stewardship plan.

- Water Quality
- Agroforestry
- Recreation
- Threatened/endangered species
- Forest Health
- Archaeological-Cultural Resources

The applicant is unaware of any threatened or endangered species, cultural or historic resources, floodplains or wetlands on the property.

This plan provides a strategy and action plan for sound integrated resource management of the property, and reflects our desire to protect or enhance all resources in the management of the property for at least the life of the Forest Stewardship Agreement with the State.

II. INTRODUCTION

A. Property Description

Property size and location: The Ola Honua Project is on the southeastern slope of Haleakala in the district of Kipahulu on the island of Maui. The property is about one half hour from Hana and one half hour from Kaupo. The entire property is 175 acres in size. The applicant proposes to reforest and manage an area of approximately 121 acres. The property is surrounded by state land with the exception of a stretch of properties to the east, which is privately owned. Running *mauka* to *makai*, the property has two natural boundaries: Koukouai stream runs down the east side and Opele gulch is on the west side. The property is leased and managed by Neaulani, Inc (Neaulani has a lease with the owner that will run for the length of the Forest Stewardship Agreement with the State).

Description of access routes to the property: Hana and Piilani Highways provide public access to Kipahulu. The property, which is *mauka* of the highway, has easements providing access from the highway to the property. The road to the property is well maintained and consists of gravel and concrete.

Property TMK Nos: 1-6-008-023, 1-6-008-022,

Property zoning: Agriculture 2

Topography, elevation and climate: The land is sloping from 1,000 ft elevation down to 400ft. Rainfall average is 80 in. per year.

Brief history of uses/description of present condition: The land had been used for sugarcane, and then cleared for pastureland. The land was overgrazed for 40 years, resulting in thick guava cover, bunch grass and lantana. The last of the cattle was removed in the summer of 2003.

B. Management Objectives

Native Forest Restoration: We intend to continue to create a corridor of native plant species that will run down the center of the property extending the work of the Cable Ridge Restoration Project. Of the 121 acres under our management, 40 acres will be dedicated to this native corridor. An interpretive trail will wind its way through the native corridor. At the base of the trail will be a wide variety of native plants in a landscaped setting, with educational signs. As the trail progresses up the mountain it will pass through demonstration areas where plants and their traditional uses will be seen. As the trail nears Cable Ridge at the top of the property it will become a pure native zone. One portion of the native corridor will be dedicated to a small forest of Ohi'a Lehua to attract and sustain the native bird population. The native corridor will be a sanctuary for native habitat and wildlife and will never be commercially harvested.

Timber Production: We are dedicated to an environmentally sound, sustainable agroforestry model, which will still ensure a commercially viable timber production plan. Of the lands under our management, 81 acres will be cultivated for commercial harvesting.

Feral Animal Management: We will continue our efforts to eliminate feral animals from the property and above to have any chance of restoring the native habitat or creating a timber operation. Fencing is the key to this strategy.

Watershed Protection: Protecting our surface and subsurface water resources is our main concern as we attend to our other management objectives. This includes assuring that no groundwater contamination results from activities on the project.

Education in Reforestation and Sustainability: Working together with other community groups we are planning extensive educational opportunities to learn about all aspects of our reforestation and farm life. (We generate our own power and use biodiesel fuel for our equipment.) One interactive component will be inviting students to participate in the creation of our Native Corridor. We are already hosting regular monthly volunteer workdays on Cable Ridge.

III. Land and Resource Description

Existing vegetation/cover: When we began to manage the property, it was covered in Guava, Christmas Berry, Java Plum, Lantana and a variety of non-native grasses. Our current reforestation efforts have resulted in the clearing and reforestation of a approximately 3 acres of mixed timber, including teak, mahogany, narra, pheasantwood, kou, kamani.

Existing forest health and function including disease problems and fire threat: Threats to sustained forest health are the feral pigs and goats, which are creating a pressure from the west. We could have a fire threat if we had a sustained drought because of the grasses that have grown since the elimination of the cattle.

Soils and their condition, general slope and aspect: According to the soil description prepared by the NRCS there are two kinds of soils, a Makaalae silty clay and a shallow soil over saprolite.

Water resources and their condition: Koukouai Stream runs year round along the east side of the property.

Timber resources: None

Wetland resources: None

Historic and cultural resources: There are no known historic or cultural resources, however we are the entrance point for the Cable Ridge Restoration Project; which is a joint partnership with community groups, private landowners, state and federal agencies. The plan is to restore the unique mesic forest found in the upper reaches of the Kipahulu Valley. The group has identified two species *Cyanea asplenifolia* (previously thought to be extinct) and the endangered *Melicope ovalis*. Specimens have been enclosed and there are plans in the works for long-term protection and regeneration.

Existing Wildlife: Hawaiian Owl pueo, barn owl, mongoose, feral pigs and goats.

Threatened and Endangered Species: No threatened or endangered species on the property.

Existing recreational and aesthetic values: The property has extensive views of the Kipahulu valley and is exquisitely beautiful.

VI. RECOMMENDED TREATMENTS AND PRACTICES

Site preparation: Scrub trees and brush will be manually removed and chipped to provide mulch for the plantings. Recycling of this biomass back into the system will suppress weeds, add organic matter to the new seedlings and conserve water while providing a fungal food source to the soil environment. The area will be mowed twice with a rotary brush hog and groomed of rock, when possible, the second mowing will occur just prior to out-planting.

Seedling acquisition: All trees will be propagated on site in our nursery facility which includes; mist box, shade house, green house and hardening off zone, all under controlled watering systems. Seedlings will be started in dibble tubes and transplanted to 4" forestry pots (culling inferior plants at this time) and grown out further before being planted out. The last month to six weeks before out-planting they will spend in the hardening off zone to minimize transplant shock. We have found that this extra time and energy spent in the nursery allows us to plant a bigger more vigorous tree and saves us weeding and possible watering if the rains don't come. Species to be propagated and planted for commercial timber include:

Teak- *Tectona grandis*
Mahogany - *Sweitenia macrophylla* and *Sweitenia mahagoni*,
Narra - *Pterocarpus indicus*
Kamani - *Calophyllum inophyllum*
Monkey Pod – *Samanea saman*
Pheasantwood - *Senna siamea*
Kou - *Cordia subcordata*
Rosewood - *Dalbergia retusa*
Rainbow Eucalyptus-*Eucalyptus deglupta*
Coconut-*Cocos nucifera*
Brisbane Box- *Lophostemon conferta*

Species for native regeneration include:

‘Ohi’a-lehu -*Metrosideros polymorpha*

Koaia –*Acacia koaia*

Koa –*Acacia koa*

Hala –*Pandanus tectorius*

Papala-kepau -*Pisonia brunoniana*

Wili wili –*Erythrina sandwichensis*

A’ali’I – *Sida fallax*

Akia -

Kopiko –*Psychotria mauiensis*

‘Iii-ahi –*Santalum ellipticum* (Sandalwood)

Planting of seedlings: Holes for the seedlings will be dug with a backhoe. This serves to remove the heavy sod from around the hole and loosen the compacted soil. Seedlings will be planted with amendments, watered and mulched heavily with wood chips. Plantings will be in quarter acre sections that match a species to the site. We will reserve the richer deeper soil swales for Teak and Kamani knowing that they will thrive in those areas. The other species will be planted on the slopes and ridges. These quarter acre blocks will be single specie stands. This increased diversity will allow for greater sustainability of the overall project by minimizing a solkastic event. A windbreak of fast growing wili-wili is planted around the perimeter of plots along with other nitrogen fixing tree species (NFT).

Fertilization and soil amendments: Soil tests show high organic matter content and deficient calcium, potassium, and phosphorus levels. We use a prilled calcium carbonate and soft rock phosphate at planting and compost, which is our nitrogen, and humic acid source as well as the inoculant for soil microbial populations. The potassium sulphate is added to the compost at the time it is made. Regular foliar feeding of micronutrients will follow planting using a soluble kelp product with a ‘brewed compost tea’ (see www.soilfoodweb.com for more details).

Soil amendments will be added for the first four years as part of our early management strategy. Soil amendments are being applied at a rate recommended by Kinsey Soil Labs that will bring the nutrient levels for optimal plant health. We have included a soil test from Kinsey in the Appendix. Application of these nutrients will be done incrementally over 5 years.

Weed and Moisture control:

Planting NFT's: NFT's such as pidgeon pea (*Cajenis cajens*), glyricidia (*Glyricidia sepems*) and wili-wili (*Erythrina spp*) will be planted within the matrix of the plantings to be used as coppice material. These quick growing plants will provide nitrogen to the system, shade the grass to help with grass competition, provide wind protection, and create on the site mulch for the trees. Coppicing will prevent the NFT's from competing with the timber for light and nutrients.

Mulching: Mulching with wood chips will offer mechanical weed control and conserve moisture, which cycles the biomass back into the system. Heavy carbon mulches will select for a more fungal dominant environment which will help the trees to thrive in the bacteria dominant grass lands we are working with.

Trail Construction-Education: We will be building a trail from our current Native Zone on up through the property to connect with the Cable Ridge Project. It will have signs identifying the different native plants. We will be having a series of volunteer work and educational days whereby we teach how to identify, propagate, and plant native trees and plants. Eventually, we will also have demonstration areas where one can harvest and create Hawaiian crafts. We currently have one regular day a month where we are dedicated to working with volunteers interested in enhancing the current native forest above us. The Forest Stewardship Grant would be involved exclusively with the planting of the native trees and we will be looking for other grant sources to complete the project with other plants and ground covers.

Post planting management strategies: For the first 4 years after out planting we will be fertilizing, weeding, coppicing and insuring that the trees are healthy. Fertilization will include soil amendments of nitrogen, calcium, phosphorus and compost and a foliar of trace minerals and a fungal dominant compost tea will be applied regularly. Weeding will be limited to only assuring that the grass competition not affect the tree growth. Coppicing of the NFT's will be done to add organic matter to the mulch around the trees and remove any branches that are competing with the trees for light and/or nutrients. In the event of severe draught we will water trees that are experiencing draught stress. By year five this management practice will cease as the trees will be tall enough and strong enough to survive on their own.

Management after year five will primarily be monitoring stand density and thinning to improve stand quality and limit stand density. Records of tree measurements will be kept for each tree and the trees measured marked in the field. There may be a market for these small diameter poles of the various timber species or be used on the farm.

After year 15 management will consist of commercial and noncommercial thinning until year 30 when selective and sustainable commercial harvesting will begin.

VII. ECOLOGICAL PRINCIPLES

Our commitment to sound environmental principles requires that we approach all of our efforts here at Ola Honua holistically and sustainably. Our concern for the water resources of this area is paramount and therefore we will do nothing to compromise their purity or integrity. This shows up in a number of different management strategies.

We approach plant nutrition and disease resistance differently choosing a more holistic approach. Dr. Elaine Ingham (www.soilfoodweb.com) has documented the importance of the soil bacterial to fungal ratio. Grassland has a predominately bacterial soil and trees require a fungal dominant soil for optimal growth. Diversity of soil microbes is essential for disease and pest resistance and nutrient cycling. We therefore spend considerable time making compost that is fungal dominant and foliar feeding our trees and spraying the ground to change the soil flora. Dr Ingham states that biocide application decreases soil microbial numbers and diversity and inorganic fertilizers are easily lost from the system by leaching and volatilization.

Therefore we are using site-made composts, foliar feeds, soil tests, quick growing nitrogen fixing trees, lots of organic matter mulches and mechanical weeding as key components of our management practices. We feel the extra time in the beginning will produce faster growth and healthier trees and pay-off in the longer term.

We choose not to use herbicides. Triclopyr is recommended for control of guava according to the CTAHR publication 'Weeds of Hawaii's Pastures and Natural Areas. The EPA "believes this chemical has the potential to leach to ground water" and is "somewhat persistent" and "has been found in

wells” from the publication US EPA Prevention, Pesticides, and Toxic substances 1998 Registration Eligibility Decision. The EPA also states that Triclopyr is “very mobile in soil”. It has been shown that Triclopyr inhibits the growth of mycorrhizal fungi, which is very important in establishing healthy trees in grassland. We inoculate all our nursery stock with mycorrhizal fungi in the nursery.

Attached in the appendices is short review of the literature for Picloram, 2,4-D, Dicamba, Glyphosate, Tebuthiuron, and Triclopyr.

VIII Educational Component

Everyone involved on this project is committed to using the work we are doing to inspire other people. We want to share our passion and love of the land with as many people as we can. We have a larger vision of seeing all of Maui reforested and are dedicated to facilitating that process. Initially, we will sponsor open house workdays to familiarize people with our vision. Eventually, we hope to sponsor internships for longer stays of 3-6 months, where we can fully train students in our whole system. Throughout the process we will identify key group projects and invite students and others interested to join us on special projects.

The content of our educational programs will involve both the cultural and ecological nature of our work. We are fortunate to have John and Tweetie Lind, Kekula Bray Crawford and Uncle Rene Silva, as our advisors for learning about the Hawaiian ways. In cooperation with local groups including the Kipahulu Ohana, we are involved in an effort to restore the native habitat above the project. This area known as Cable Ridge has a wealth of native species due to its mix of wet and dry land forests. We have recently found two species one previously thought to be extinct, the other on the endangered list; *Cyanea asplenifolia* and *Melicope ovalis* respectively. We have applied for a permit to gather seed and propagation materials under the auspices of the Kipahulu Ohana (permit # 3-200-55 which is in process) to assist in regenerating these species. The creation of a native corridor is intended to be a model for using natives in landscaping here on the farm and blend on its way up into a traditional restoration effort as we approach the entrance to cable ridge. A trail will be created through this 100-foot wide corridor for educational purposes with groves of plants used for traditional crafts and cultural practices. For example, a Hala grove would be used to demonstrate Lauhala weaving. Thus as one travels up the path, the

opportunities are to learn about the plants in their environment, as well as their applied uses in Hawaiian culture.

Our advisors and leaders in this will be the Kipahulu Ohana whose mandate is the stewardship of the natural and cultural resources of the Ahupua'a making up the Kipahulu Moku where our project is located.

Practice Implementation Schedule

We are planning to plant 121 acres over the next ten years. 81 acres are to be planted in a commercial timber plantation. The remaining 40 acres will be planted in native trees, which will be managed for stand health and not for commercial profit.

Practice Implementation Schedule

YEAR ONE

Practice Component	#of Acres Planted	Cost per acre	Total Landowner Cost	Share	State Share
Site Preparation					
Clear Land	12	1208	14496		
Mowing 2x	12	285	3420		
Pick Rocks	12	212	2544		
TOTAL		1705	20460	12060	8400
Planting					
375 trees/acre					
dig holes	12	360			
plant trees	12	612			
TOTAL	12	972	11664	9264	2400
Seedling Acquisition					
Growing Our Own					
in 4"pots	12	469	5628	2816	2812
375/acre					
Fertilization/ Soil Amendment					
Lonphoso(phosphorus)	12	72	864		
450lbs/ac					
Calpril(calcium)	12	430	5160		
2000lbs/ac					
Microrisi	12	100	1200		
160oz/ac					
EZ Green(nitrogen)	12	92	1104		

500lbs/ac Compost(homemade)					
2000lbs/ac	12	100	1200		
TOTAL		794	9528	6528	3000
Weed Moisture Control					
Interplanted NFTs	12	660	7920		
Cost of NFTs 1250/ac	12	313	3756		
TOTAL		973	11676	9876	1800
Mulching					
woodchips	12	1078	12936	11436	1500
Trail Construction Thru 460ft Native Corridor			1840	1035	805
SUBTOTAL	12	5991	73729	53012	20717
Fencing	3800ft		37215	27911	9304
<u>TOTAL YEAR ONE</u>			<u>110947</u>	<u>80926</u>	<u>30021</u>

Year Two

Plant Another 12 Acres	12	5991	73732	53015	20717
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Maintenance of
Year One

Strategy	#of Acres Treated	Cost per/ac	Total Landowner Cost	Share	State Share
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**Fertilization/
Amendments**

Calpril(calcium) 1000lbs/ac	12	215	2580		
Lonphosco 450lbs/ac	12	72	864		
Compost 2000/ac	12	100	1200		

Labor to Apply	12	150	1800		
TOTAL		537	6444	3444	3000
Weed/Moisture Control					
coppice NFTs	12	150	1800	900	900
Control of Undesireable Plant Species	12	900	10800	6000	4800
TOTAL Maintenance of Year One	12	1587	19044	10344	8700
Environmental Assess.			10,000	2000	8000
<u>TOTAL YEAR TWO</u>			<u>102776</u>	<u>65359</u>	<u>37417</u>

Year Three

Plant Another 12 Acres	12	5991	73732	53015	20717
Total Maintenance of Yr 1 & Yr 2	24	1587	38088	20688	17400
Enviromental Asse			10,000	2000	8000
<u>TOTAL YEAR THREE</u>			<u>121820</u>	<u>75703</u>	<u>46117</u>

Year Four

Plant Another 12 Acres	12	5991	73729	53015	20717
Maintenance of Yrs 1, 2, & 3	36	1587	57132	31032	26100
<u>TOTAL YEAR FOUR</u>			<u>130,864</u>	<u>84047</u>	<u>46817</u>

Year Five

Plant Another 12 Acres	12	5991	73732	53015	20717
Maintenance of Yrs 1,2,3,& 4	48	1587	76176	41376	34800
<u>TOTAL YEAR FIVE</u>			<u>149908</u>	<u>94388</u>	<u>55517</u>

Year Six

Plant Another 12 acres	12	5991	73732	53012	20717
Maintenance of Yrs 2,3,4,& 5	48	5991	76176	41376	34800
<u>TOTAL YEAR SIX</u>			<u>149908</u>	<u>94391</u>	<u>55517</u>

Plant 12 acres
Maintain 4 acres

TOTAL YEAR SEVEN 149908 94391 55517

Plant 12 acres
Maintain 4 acres

TOTAL YEAR EIGHT 149908 94391 55517

Plant 12 acres
Maintain 4 acres

TOTAL YEAR NINE 149908 94391 55517

Plant 12 acres
Maintain 4 acres

TOTAL YEAR TEN 149908 94391 55517

Plant 12 acres
Maintain 4 acres

TOTAL COSTS **1365855** **870381** **493474**

X. BUDGET SUMMARY

YEAR	TOTAL BUDGET	LANDOWNER SHARE	STATE SHARE
1 2005-06	110,947	80,926	30,021
2 2006-07	102,776	65,359	37,417
3 2007-08	121,820	75,703	46,117
4 2008-09	130,864	84,047	46,817
5 2009-10	149,908	94,391	55,517
6 2010-11	149,908	94,391	55,517
7 2011-12	149,908	94,391	55,517
8 2012-13	149,908	94,391	55,017
9 2013-14	149,908	94,391	55,017
10 2014-15	149,908	94,391	55,517
TOTALS	1,365,855	870,381	493,474

VII. Economic Analysis

Using the model promoted by J.B. Friday and others for analyzing tree farming in Hawaii (see proceedings from the 2001 symposium, Hawaii Forest Industry Ass.) we are applying the following assumptions to our analysis: 18,000 bdft/acre total average yield for a 30 year stand, \$2,000 per 1,000 bdft stumpage value, and no profit from thinning prior to year 30. The first two assumptions are conservative as the price of tropical hardwoods is likely to increase faster than inflation and the yields we believe possible from our holistic management program could be substantially more, and we anticipate that the thinning of timber poles will have some market value. This analysis is for the 81 acres of tropical timbers we are growing and does not apply to the 40 acres of native restoration work we are planning.

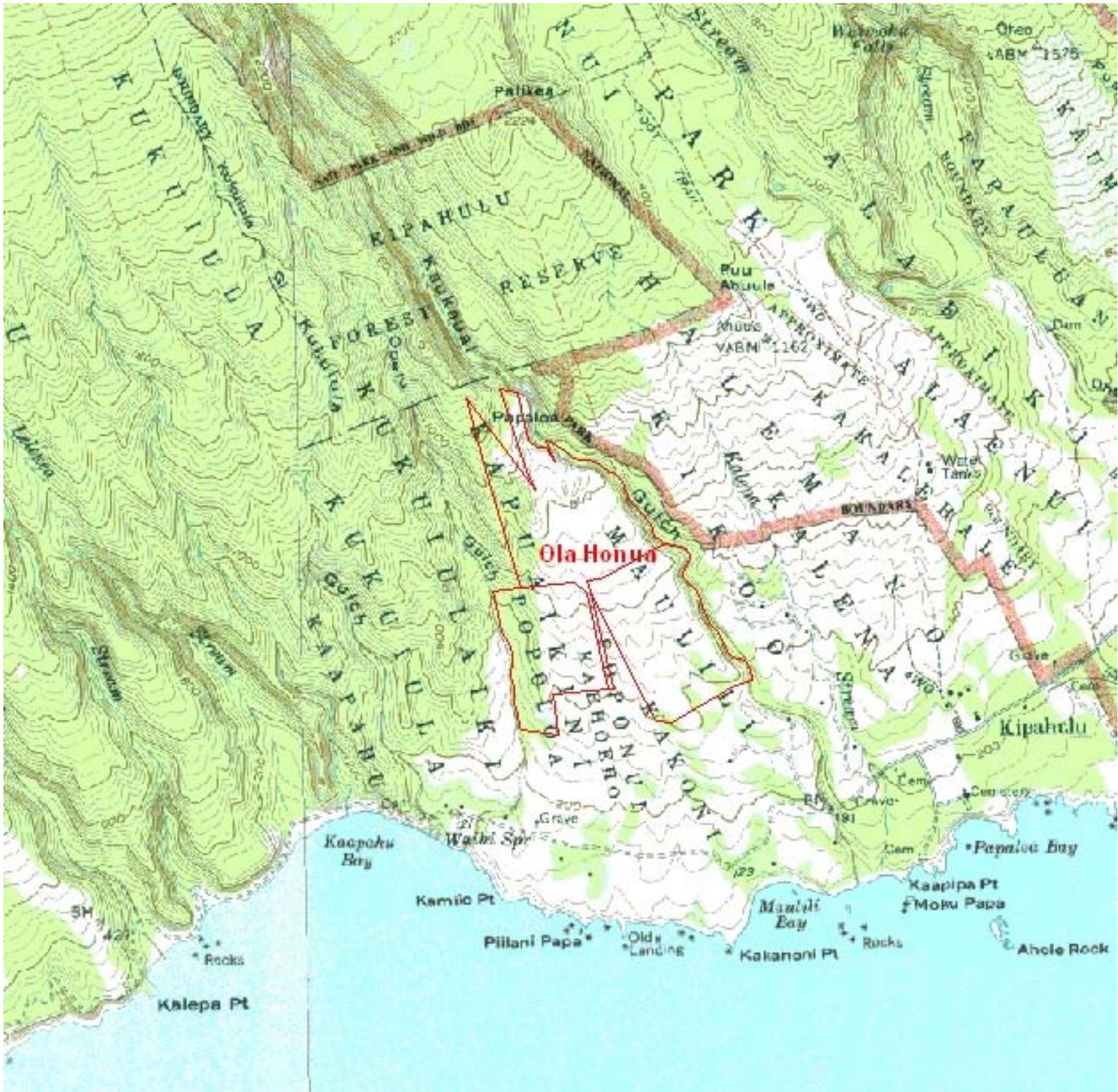
Year	Cost/acre	Revenue/acre	Net profit/acre
1	\$5,991	\$0	\$(5,991)
2	\$1,587	\$0	\$(1,587)
3	\$1,587	\$0	\$(1,587)
4	\$1,587	\$0	\$(1,587)
5	\$1,587	\$0	\$(1,587)
6-29	\$1,000	\$0	\$(1,000)
30		\$36,000	\$36,000
Totals yr1-30	\$13,399	\$36,000	\$22,601

The future value of a \$13,399 investment after 30 years is \$32,523 using a 3% interest rate. This shows that our plan is economically sound given the assumptions we have used.

Invoice for preparing the Forest Stewardship Management Plan

- Preparer time	75hrs x \$25/hr =	\$1875
- Office assistant	50hrs x \$15/hr =	\$ 750
- Office supplies, copying		\$105
- Trip to Kauai to meet with committee and Visit other reforestation sites		\$235
- Consultation fee for Robert Hobdy		\$175
Total cost		\$3140.

C. MAPS OF OLA HONUA

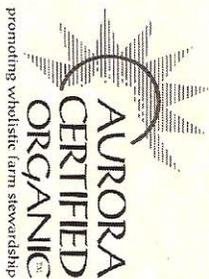




Parcels Displayed: 14, 15.

DEPARTMENT OF TAXATION			
PROPERTY TECHNICAL OFFICE			
STATE OF HAWAII			
TAX MAP			
SECOND TAXATION DISTRICT			
ZONE	SEC.	PLAT	
1	6	08	
SCALE 1 IN. = 300 FT.			

D. DEMETER CERTIFICATION INFORMATION



2006 CERTIFICATION

AURORA CERTIFIED ORGANIC

A division of Demeter Association, Inc. hereby verifies that
OLA HONUAWHISPERING WINDS of Hana, HI
is an **AURORA CERTIFIED ORGANIC™ FARM**

according to the holistic farm stewardship guidelines summarized below. The projects have the legal right to make use of Organic certification on their produce.

SUMMARY OF AURORA ORGANIC STANDARDS

1. No use of chemically synthesized fertilizers, pesticides, herbicides, fungicides, or fumigants; no hormones, growth regulators, GMOs, blood or bone meals.
 2. The basis of fertility maintenance is composting, green manuring, crop rotations, enlivened rock dusts.
 3. The basis of pest control is the balanced farm ecosystem, achieved through crop rotations, companion planting, crop diversification which provides a favorable environment for beneficial insects, animals, birdlife, etc.
 4. Weeds are controlled by cultivation and other mechanical methods.
 5. Composting materials, transplants, and animal feed imported from off the farm are very limited in quantity and must be of good quality.
 6. Farms are visited and re-evaluated annually. Contracts for use of the certification marks are also annual.
 7. Standards must be followed for 36 months before certification can be considered.
 8. Rights to use of certification mark or language are not transferable to processors and packagers.
 9. This certificate does not confer the right to call the product "Demeter Certified" or "Biodynamic". The designation is 'AURORA CERTIFIED ORGANIC.'
- Products certified: Nursery Stock (including Bamboo, Fruit Trees, Native Trees, Miscellaneous other tree species)
Edible Bamboo Shoots, Avocado, Bananas, Bread Fruit, Durian, Lychee, Mangoes, Papaya, Tangelos**

Date: May 17, 2007

For further information, contact Demeter Association, Inc. PO Box 1390 Philomath, OR 97370 phone (541) 929-7148
Effective from November 1, 2006 to December 31, 2007

(seal)

STELLAR CERTIFICATION SERVICES, INC.

hereby verifies that

OLA HONUAWHISPERING WINDS of Hana, HI

Operated by

Rich von Wellsheim

HRC 1 Box 180

Hana, HI 96713

is a CERTIFIED ORGANIC FARM

according to the National Organic Program rule.

The company has the legal right to make use of Organic certification on its products as listed below.

SUMMARY OF NOP STANDARDS

1. No use of chemically synthesized fertilizers, pesticides, herbicides, fungicides, processing aids or non-agricultural ingredients unless on the National list of approved products.
2. Farms, processors and handlers are visited and re-evaluated annually.
3. Grower standards must be followed for 36 months before certification of products.
4. Rights to use of certification language are not transferable to processors and packagers.

Details can be found at www.ams.usda.gov/nop/rule.htm

Products certified 100% Organic: Nursery Stock (including Bamboo, Fruit Trees, Native Trees,
Miscellaneous other tree species;

Edible Bamboo Shoots, Avocado, Bananas, Bread Fruit, Durian, Lychee, Mangos, Papayas, Tangelos

Effective Date: August 26, 2005

Director's Signature

Date April 13, 2007

Stellar Certification Services, Inc., PO Box 1390 Philomath, OR 97370 phone (541) 929-7148
Stellar Certification Services, Inc. is accredited by the National Organic Program.

(seal)

E. CONSERVATION EASEMENT NEWS ARTICLE

Deal ensures farm use of Kipahulu site

By EDWIN TANJI, City Editor

KIPAHULU – A Kipahulu landowner has granted a conservation easement to the Maui Coastal Land Trust to assure that a 75-acre property will remain in agricultural use for perpetuity, trust President Tom Blackburn-Rodriguez has announced.

"This agreement is a big step toward ensuring that this part of Kipahulu will look the same to our children and grandchildren," Blackburn-Rodriguez said.

The property formerly was in sugar cane and used for grazing, but the owner, a family trust, has begun restoring the land as an organic agricultural operation. The farming operation will include orchard trees as well as a construction-grade bamboo and varieties of trees that can be harvested as timber, including koa, kou, kamani, mahogany and teak. The area has been named Ola Honua, for life-giving earth.

Trust Executive Director Dale Bonar said the land preservation agreement provided by the Margaret Winkler Hecht Trust assures that the land will be maintained as an organic agricultural operation even if the family trust changes or the land is sold.

"Our part of the deal is that we ensure that any future landowner will abide by the agreement. Just as the deal will also be there, we will always be around to be sure that any future landowner will adhere to this agreement," he said.

He said the conservation easement for the Kipahulu land is similar to one granted in 2002 by the Hana Ranch for a 41-acre parcel at Makaalae. Maui Coastal Land Trust is working on additional conservation easement agreements as well, he said.

The agreement was applauded by other Kipahulu residents for protecting the open space and rural atmosphere.

"Ola Honua is the result of the family's conviction that a productive, economically viable farm doesn't have to mean a loss of biodiversity or ecological health," said Tom Pierce, an attorney representing the family who also is an MCLT board member.

"The main thing is it means a large section of land will be left alone. They won't be building on it, there will be no development, no subdivisions," said Farley Jacobs, president of the Kipahulu Community Association.

Jacobs, who is a caretaker on an adjoining property, said he also benefits since the assurance that the Hecht property will be maintained as an organic operation means there will be no pesticides or chemical fertilizers running downhill to the properties for which he is responsible.

"The exact wording of the conservation agreement states that they will be using organic processes. I live right down the hill and downstream from the property," he said.

"The organic land-use practices at Ola Honua protect the watershed from erosion and from pollution by agricultural chemicals, while creating a band of native vegetation from the highest to the lowest elevations," Bonar said. "Such continuity is extremely important for a healthy ecosystem of native plants and animals."

Rich von Wellsheim, general manager of the Ola Honua property, said the restoration of the land in agriculture will involve planting native species, followed by commercially sustainable agriculture. The construction-grade bamboo is a noninvasive species that will be available for immediate harvesting, while the other varieties of timber trees are long-term forestry products, suitable for harvesting in 30 to 40 years.

"The owner's desire was to have it permanently protected so it will always be available for organic agriculture," Bonar said. "They want to minimize development out there, and to have a place where organic agriculture will be maintained."

He said the conservation agreement would have the effect of reducing the potential value of the land, that could have been subdivided into as many as 11 smaller agricultural lots. There is a tax benefit to the trust, but it would be relatively small compared to the potential returns from a subdivision and sale of lots.

Accepting the conservation easement means the Maui Coastal Land Trust, based in Wailuku, needs to assure the public that it will always be around to enforce the terms of the agreements, he said.

"We need to build a sustainable organization so that long after the current owners of the land are gone, there will still be a permanent organization as well," he said.

■ Edwin Tanji can be reached at editor@mauinews.com.

F. BASELINE REPORT BY HANK OPPENHEIMER

Ola Honua Lot 2 Final Report

Submitted by Hank Oppenheimer
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808.669.4983
hmo3500@earthlink.net

Purpose:

The following report and associated maps, photographs, and other materials were prepared as part of baseline documentation in accordance with a Conservation Easement between the Property owner, and Maui Coastal Land Trust. These materials record the state of the subject property on or about the time of transfer of said easement.

Summary of Easement Conditions and the Scope of this Report

The express purpose of the Easement is to establish and maintain forever, subject to the express restrictions in this Easement, sustainable forest resources and/or other agricultural activities on the Property, to protect, and to prevent any use of the Property that will significantly impair or interfere with, the Conservation Values of the Property, which are, and are prioritized, as follows:

- (a) First priority is given to the forestry and agriculture resources the Property offers, which are ideally suited for preservation for primarily forestry and agricultural activities, subject to the express restrictions on such forestry and agricultural activities set forth in this Easement;
- (b) Second priority is given to the watershed protection the Property offers to the ecosystem and in-stream flow associated with Koukouai and Opele streams, which run alongside or are in close proximity to the Property

A representative of Maui Coastal Land Trust is obligated to make an annual inspection of the property to ensure the purpose of the Easement is upheld and that the landowner is abiding by the terms of the Easement, which include the following prohibitions or restrictions:

1. Subject to certain stated exceptions, subdivision of the property which would permit increased residential structure density;
2. Any type of mining, excavating, dredging, or removing from the property any mineral resource or natural deposit;
3. Commercial or industrial uses of the property, except for forestry, agricultural, educational, and certain recreational activities;
4. Constructing or placing of any building, mobile home, transmission or receiving tower, energy facility, or other temporary or permanent structure or facility on the property, except as specifically permitted in the Easement, which includes the right to construct certain structures for farm or educational activities, including some dwellings;
5. Cutting, removing, or otherwise destroying trees, grasses, or other vegetation, except performing routine maintenance and upkeep immediately around

- permitted buildings or as otherwise consistent with the Easement, or to control invasive species and for activities related to forestry, educational or agricultural uses permitted by the Easement;
6. The installation of underground storage tanks or dumping garbage on the property;
 7. Any grazing, stabling or boarding of domestic animals except as allowed for under the forestry, agriculture and educational provisions set forth in the Easement;
 8. Commercial feedlots;
 9. Alteration of the natural watercourses of Koukouai stream or Opelu stream;
 10. Use of motorized vehicles for recreational purposes, commercial or non-commercial;
 11. The transfer of development rights;
 12. Any impairment of the conservation values of the property, except under emergency conditions, to which the grantee will be notified.

The scope of this review is to evaluate the condition of the easement as it was taken by the Maui Coastal Land Trust. This report contains the results of the inspection of the following conditions:

1. A general list of naturally growing endemic or indigenous flora and fauna;
2. A general list of alien Species
3. Identification of plants and trees seen to be under cultivation;
4. Streams, bogs or wetlands;
5. Structures, roads or other improvements;
6. General soil quality;
7. Mining, surface mining, excavating, dredging, or removing from Lot 2 of soil, loam, peat, gravel, sand, hydrocarbons, rock, or other mineral resource or natural deposit;
8. Commercial or industrial uses of Lot 2;
9. Recently cleared areas;
10. Evidence of underground storage tanks;
11. Refuse, trash, vehicle bodies or parts, rubbish, debris, junk, waste, or other such substances;
12. Any grazing, stabling or boarding of domestic animals;
13. Commercial feedlots;
14. Alteration of the natural watercourse of Koukouai stream;
15. Evidence of any use or activity on or at Lot 2 which would impair the conservation values.

Current Property Owner and Operations

The current property owner is Margaret Hecht. Ola Honua is an agro-forestry operation covering roughly 175 acres in Kipahulu. The project is run by Neaulani, Inc., which is solely owned by Margaret Hecht. Rich von Wellsheim is the general manager of Neaulani. A description of the operations at Ola Honua is set forth in detail in the Forest Stewardship Plan which is on file with Maui Coastal Land Trust.

Site overview:

Ola Honua Lot 2, (2)1-6-008:022, approximately 74.48 acres in extent (figure 1A), was surveyed by the author on 30 April, 15-16 October, 29-30 October and 19-20 November 2005. The property faces just east of due south, and receives annual average rainfall of approximately 100 to 110 inches (figure 1B). It lies a little more than one-half mile from Haleakala National Park, and approximately six miles from Hana, the nearest town.

The property consists of mostly open grasslands on gently sloping and mildly undulating land, with a dissected gulch area to the southwest, and the steep southwest bank of Kaukauai Stream to the northeast. Elevation ranges from near 600 ft. near the southern, *makai* boundary to approximately 1100 ft. near the Conservation District boundary. Soil was noted to be rich, dark, silty clay approximately 30 – 50 cm deep, with a basaltic substrate composed of Hana Series volcanic flows. The USDA classifies this type as “Maka`alae silty clay” (MID), typically on 7-15% slopes. All but a portion of the Property can be referred to this soil type. Some of the northeastern portion is classified as “rough, mountainous terrain” (rRT), typical of deeply dissected drainage channels and upper, *mauka* areas (figure 2).

Materials & Methods:

A series of fourteen strategically located Photo Monitoring Points were established. These were marked by a 5 foot length of 1” diameter PVC pipe, pounded into the ground, and labeled with an aluminum tag tied to the top of the post with insulated, solid core copper wire (figure 3; table 1). Each post was also photographed. Coordinates of each pipe were acquired using GPS. Rich von Wellsheim of Ola Honua offered to secure the pipes with metal “T” posts or mark the locations of photo points with cement benchmarks for greater durability. Some of the Photo Monitoring Points lie outside of Lot 2, but are valuable in their view of the lay of the land and the state of Lot 2 at the time this baseline documentation was conducted. Multiple images were made in both digital and 35mm color negative photographic formats at each Photo Monitoring Point. The Photo Point ID #, compass bearing in degrees, date of photograph, and the photographers name is marked with permanent ink on the back of each of the film prints (4” x 6” glossy, borderless). The digital images are also named with the Photo Point ID #, compass bearing (in degrees), and date (y/m/d). With this system it should be simple to relocate, and rephotograph every view point during future monitoring efforts. However, there may come a time when, due to the anticipated tall growth of the forestry plantings, some of these view points may become obscured, and less effective. It is essential that the grantor and/or grantee of the Conservation Easement obtain high quality aerial photographs to supplement these ground based monitoring stations.

Survey Results:

Goals

The goal of the Ola Honua project, being a sustainable, organic, forestry endeavor, requires the preparation of planting areas. This can only be accomplished on this scale with the use of mechanical equipment. It is also likely that mechanical equipment will be utilized in the future to harvest hardwood and bamboo. Some degree of soil disturbance is inevitable during the course of these activities, but with care and timing, there should be

minimal negative impact on soil resources. As part of the process of producing forestry and/or other potential useful commercial agricultural products, Ola Honua has been chipping the undesirable overgrowth and applying the resulting material around the plantings, helping to control soil erosion and soil moisture evaporation. This practice also replenishes essential soil nutrients, and suppresses weed growth.

Structures

Three types of hardened man-made structure were observed during the course of this survey (figure 4). The larger and more permanent being a water tank near the lower boundary of Lot 2. It is presently uncovered, and has a capacity of 30,000 gallons. Another feature is a series of fences that exclude feral ungulates from entering the Property, and prevents damage to crops, soils, and stream quality (figure 5). These are typical 'T' post and 48" hog-wire construction. The western and mauka sections have an additional ground apron as well to prevent feral pigs from digging under the bottom of the hog wire. Where these fences dissect the Property roads there are also metal gates. There are remnant metal 'T' posts near the upper, northwestern "rabbit ear" section that are left over from horse pasturage. No evidence of active pasturage was observed, although there are goats in a fenced enclosure in Lot 1, below the water tank. Finally, there is a small wooden shed, approximately 200 square feet in size and 6 feet high, with a corrugated, metal roof near the upper, northwestern "rabbit ear", near Photo Point #3. No sign of permanent or temporary habitation was observed. The Property also seems virtually free of carelessly discarded vehicles, appliances, containers, and other refuse. However, not every thicket of guava or Brazilian pepper, nor the entire length of the gulch bottom on the southwest boundary, was investigated.

Ola Honua has a small, 1.5" inside diameter, black polyethylene waterline that takes in water for agricultural and domestic uses and transmits it to the storage tanks the Property. The point of intake is not on the Property; in fact, most of the transmission line route lies across Koukouai Stream, and it crosses the stream near Photo Point #9, where it finally enters Ola Honua, and generally follows the access trail to the agricultural zone on the ridge top. The line is suspended above the level of presumably highest stream flow, and is supported by small gauge cable and wire. Aside from the small diameter pipe, the stream appears to be unaltered by man-made structures of any kind. However, much of the stream corridor is inaccessible due to the nearly vertical side walls, and a continuous series of waterfalls where the stream has cut into softer substrate. Given the history of the area, with cultivation of sugar, and cattle ranching, there may have been some modifications or small scale support structures in the past. In fact, the Ola Honua site is locally known as Cable Ridge, apparently in reference to a cable crossing of Kaukauai Stream gulch during the era of sugar cultivation. These, or their remnants, were not observed during the course of this survey, if they do exist at all.

Roads and Trails

A series of four-wheel-drive "roads" crisscrosses the Property (figure 6). None of these are paved, nor are any graveled or cindered. The main route accesses the upper portion of the Property while the others consist of merely regularly or occasionally driven 4wd tracks through the grasslands. Over time, Ola Honua may decide to discontinue the use of some of these sections, and plant over them. Others tracks may need to be established in

order to prepare the land for planting, maintenance, and harvest. There are a few foot trails that exist on the property (figure 7). The most significant one is the trail that provides access to Cable Ridge, mauka or north of the Property. Other trails are used to access Kaukauai Stream. At the present time, these trails are primitive footpaths and have not been improved by the placement of steps, borders, paving, etc.

Aquatic Features

No wetlands occur on the active or fallow agricultural lands occurring on the open ridgetops and gentle upper slopes. The three essential criteria that define a Federally recognized wetland, 1) hydrophytic vegetation, 2) hydric soils and 3) wetland hydrology do not occur within this area. Kaukauai Stream is a largely unaltered, perennial stream which runs the length of the windward boundary of Lot 2. The stream is a deep drainage that cuts through the Hana Series volcanic flows, and into the older Kula Series. Kaukauai Stream has its source high in the Kipahulu Valley section of Haleakala National Park, where the annual average rainfall is considerable. It is prone to powerful flows, and episodic flash flood events. It is characterized by steep sided, largely inaccessible side walls, and a rocky, boulder bottom 5-25m in width. Some sections of stream bed are gravelly, but most of the stream course on the Property consists of large, blocky, basaltic debris, or exposed bedrock. The Property abuts Kaukauai stream for an approximate length of one half mile. Opelu Stream lies outside the western boundary of the Property, and is a smaller intermittent stream. Its headwaters begin at approximately 3000 feet elevation. Efforts by Ola Honua to control feral pig activity will do much to decrease the level of soil disturbance as a result of their rooting and slow the process of alien plant succession in the native dominated areas. This should benefit not only watershed cover but water quality in Kaukauai and Opelu Streams. Water quality will also benefit by Ola Honua's policy of avoiding the use of chemical fertilizers, herbicides, and other pesticides, and not contributing to runoff of these products.

Flora

Only spontaneous vegetation was recorded; the forestry and crop plantings by Ola Honua were not inventoried. It is recommended that the grantor and grantee of the Conservation Easement share a summary of these plantings, and periodically discuss changes, if any, to the Forest Stewardship Plan.

The parcel contains four main Natural Vegetation Community types. Natural Communities are assemblages of associated species that occur repeatedly throughout the main Hawaiian archipelago. Two of the community types are dominated by native elements, and two are dominated by non-native, or alien, exotic vegetation. Greater scrutiny was given to survey areas with native dominance.

Of the native communities, *Metrosideros/Dicranopteris* Lowland Forest is the larger in extent, and occurs on the Western and Northwestern portions of the property. However, it presently only covers a small percentage of the Property. A smaller remnant is on the slope above Kaukauai Stream. *Acacia* Lowland Forest is poorly represented by severely degraded fragments on the upper *mauka* (Northern) boundary of the site. Past land uses, feral ungulate activity, and subsequent invasion by invasive alien plant species have shaped the terrestrial biota into what it is today. Ola Honua policy of allowing hunter access, along with a significant project to fence a large portion of the upper, most native

dominated portion, coupled with outplanting of native Hawaiian species, may allow partial recovery of these communities.

The two alien dominated communities are Lowland Grassland, and Lowland *Psidium* Forest. The first is dominated by pasture grass, mainly California grass (*Brachiaria mutica*), and pangola grass (*Digitaria eriantha*), with *Spermacoce latifolia* and *Commelina diffusa* abundant herbaceous elements. The latter community is characterized by two species of guava: common (*P. guajava*), and strawberry guava (*P. cattleianum*). There are two forms of *P. cattleianum* present; the red fruited variety, and one with yellow fruit. These forms have been formally named in the past, but the present taxonomy does not recognize any subspecific taxa. Brazilian pepper is also common, and to a lesser extent Java plum. Ola Honua should remain vigilant lest African tulip tree, shoebutton ardisia, *Clidemia*, *Tibouchina*, Australia tree fern, and moon flower, all present but currently in low numbers, further invade and displace more desirable vegetation. This will entail considerable effort, as these species are abundant in the surrounding country as well.

No plant species were observed that are listed as Threatened or Endangered under the US Endangered Species Act, nor are under consideration as a Candidate for listing as Endangered or Threatened, nor Proposed for listing under the Act. The same holds true for any plant species protected under Hawai'i State law. No plant species were observed that are considered to be locally rare, or a Species of Concern. No plant species were observed that are single island endemics; that is, occur only on the island of Maui. All native elements are considered by knowledgeable botanists to be common and widespread on Maui, as well as throughout the main Hawaiian Islands.

Species Inventory:

Only vascular plants were recorded during the survey. Ninety-one taxa were observed. Species are arranged at higher taxonomic levels first phylogenetically, then alphabetically by Family, Genus, and Species.

- * alien, exotic, naturalized, reproducing without human aid, spontaneous
- + indigenous, native with a wider distribution outside the Hawaiian Islands
- ^ endemic, found only in the Hawaiian Islands
- # Polynesian Introduced
- ? Distribution uncertain
- NCN No Common Name

Pterophyta

Aspleniaceae

^*Asplenium contiguum* NCN

Blechnaceae

**Blechnum appendiculatum* hammock fern

Dennstaedtiaceae

+*Microlepidia strigosa* palapalai

^*Pteridium aquilinum* var. *decompositum* kilau; bracken fern

Dicksoniaceae

**Sphaeropteris cooperi* Australian tree fern

^*Cibotium glaucum* hapu`u

Gleicheniaceae

+*Dicranopteris linearis* uluhe

Hymenophyllaceae

+*Gonocormus minutus* limu ka la`au

Lindsaeaceae

+*Sphenomeris chinensis* pala`a

Lomariopsidaceae

^ *Elaphoglossum crassifolium* hoe a Maui; `ekaha

Lycopodiaceae

+*Lycopodiella cernua* wawai`iole

Marattiaceae

**Angiopteris evecta* mule`s foot fern

Nephrolepidaceae

**Nephrolepis multiflora* scaly sword fern

Polypodiaceae

+*Lepisorus thunbergianus* pakahakaha

**Phlebodium aureum* hare`s foot fern

**Phymatosorus grossus* lau`ae; maile scented fern

Psilotaceae

+*Psilotum nudum* moa

Pteridaceae

**Adiantum raddianum* maiden hair fern

Selaginellaceae

^ *Selaginella arbuscula* lepelepeamo

Thelypteridaceae

**Christella parasitica* NCN

Angiospermatophyta

Magnoliopsida

Anacardiaceae

**Mangifera indica* mango

**Schinus terebinthifolius* Christmasberry; Brazilian pepper

Asteraceae

**Ageratina adenophora* Maui pamakani

**Ageratina riparia* Hamakua pamakani

**Bidens pilosa* Spanish needle; beggars tick

**Conyza bonariensis* hairy horseweed

**Crassocephalum crepidioides* NCN

**Erechtites valerianifolia* fireweed

**Erigeron belliioides* NCN

**Pluchea carolinensis* sourbush

**Sonchus oleracea* sow thistle

Bignoniaceae

**Spathodea campanulata* African tulip tree

Caryophyllaceae

**Drymaria cordata* pipili

Convolvulaceae

**Ipomoea alba* moon flower

Epicridaceae

+*Leptecophylla tameiameia* pukiawe

Euphorbiaceae

#*Aleurites moluccana* kukui; candlenut tree

**Manihot glaziovii* Ceará rubber tree

**Ricinis communis* castor bean

Fabaceae

^*Acacia koa* koa

**Crotolaria cf assamica* rattlepod

**Crotolaria pallida* smooth rattlepod

**Chamaecrista nictitans patellaria glabrata* partridge pea

**Desmodium incanum* Spanish clover

**Desmodium triflorum* tick trefoil

Lythraceae

**Cuphea hyssopifolia* false heather

**Lythrum maritimum* pukamole

Malvaceae

*?*Sida rhombifolia* NCN

Melastomataceae

**Clidemia hirta* Koster's curse
**Tibouchina herbacea* cane tibouchina

Moraceae

**Ficus microcarpa* Chinese banyan

Myrsinaceae

**Ardisia elliptica* shoebutton ardisia; inkberry

Myrtaceae

^*Metrosideros polymorpha* var. *glaberrima* `ohia lehua

**Psidium cattleianum* strawberry guava; waiwi

**Psidium guajava* guava

**Syzygium cumini* Java plum

#*Syzygium jambos* `ohia `ai; mountain apple

Oxalidaceae

*?*Oxalis corniculata* yellow wood sorrel; `ihi `ai

Passifloraceae

**Passiflora subpeltata* white passion flower

Piperaceae

+*Peperomia blanda* var. *floribunda* ala ala wainui

Rosaceae

+*Osteomeles anthyllidifolia* ulei; u`ulei

**Rubus rosifolius* thimbleberry

Rubiaceae

^*Hedyotis terminalis* manono

^*Psychotria mariniana* kopiko

**Spermacoce latifolia* NCN

Tiliaceae

**Triumfetta semitriloba* Sacramento bur

Urticaceae

^*Pipturus albidus* mamake

Verbenaceae

**Lantana camara* lantana

**Stachytarpheta cayennensis* owi; oi

**Verbena littoralis* owi; oi

Liliopsida

Agavaceae

#*Cordyline fruticosa* ti; ki

Arecaceae

**Phoenix* sp. date palm

Commelinaceae

**Commelina diffusa* spreading day flower; honohono

Costaceae

**Costus speciosus* spiral flag

Cyperaceae

^*Carex alligata* kaluhaluha

**Carex longii* NCN

+*Cyperus polystachyos* kaluhaluha

+*Fimbristylis dichotoma* kaluhaluha

**Kyllinga brevifolia* NCN

+*Machaerina mariscoides* subsp. *meyenii* `ahaniu; `uki

**Rhynchospora caduca* NCN

Dioscoreaceae

#*Dioscorea bulbifera* hoi

#*Dioscorea pentaphylla* pi`a

Liliaceae

**Hippeastrum striatum* Barbados lily

Orchidaceae

**Arundina graminifolia* bamboo orchid

**Spathoglottis plicata* Philippine ground orchid

Pandanaceae

+*Freycinetia arborea* `ie`ie

Poaceae

**Andropogon virginicus* broomsedge

**Brachiaria mutica* California grass

**Digitaria eriantha* pangola

**Digitaria insularis* sourgrass

**Oplismenus hirtellus* basket grass

**Panicum maximum* Guinea grass

**Paspalum conjugatum* Hilo grass

**Paspalum paniculatum* NCN

+?*Paspalum scrobiculatum* NCN

**Paspalum urvillei* Vasey grass
**Sacciolepis indica* Glenwood grass
#?*Schizostachyum glaucifolium* `ohe; Polynesian bamboo
**Setaria parviflora* yellow foxtail
**Sporobolus africanus* smutgrass

Zingiberaceae

#*Zingiber zerumbet* `awapuhi; shampoo ginger

Fauna

Faunal surveys were not intended to be exhaustive. Considerable effort, including night time observations, seasonal and radar work for seabirds and bats, and specialized trapping for a wide variety of small mammals and invertebrates would be necessary for a more comprehensive inventory. However, a few taxa are noteworthy. Two rare species of damselfly were observed on 29 October, and again on 19 November 2005 along Kaukauai Stream. *Megalagrion pacificum* (pinao `ula), an endemic Hawaiian damselfly, is listed by the US Fish & Wildlife Service as a Candidate for listing as Endangered under the Endangered Species Act. *Megalagrion nigrohamatum* is listed as a Species of Concern, mainly because a subspecies on O`ahu is rare and a candidate for listing.

No species of fish were observed in Kaukauai Stream. However, on both days that the stream was accessed, it was preceded by high water events; the water was murky as a result. It may also be that Koukouai Stream enters the ocean at a waterfall, precluding all but two of five native stream fishes from recruitment. This was not investigated as the terminus of Kaukauai Stream lies on property not owned by Margaret Hecht. Stream surveys would be interesting to conduct to assess the possible presence and abundance of these and other anadromous taxa.

Many species of birds were noted (by direct visual observation or by audio detection) using the habitat occurring on the Property. Whether or not these species nest at the site is unknown. The alien cattle egret (*Bubulcus ibis*), and indigenous koa`e kea or white-tailed tropic bird (*Phaethon lepturus dorotheae*), were both observed nearby. It should also be expected that both the introduced, nocturnal barn owl (*Tyto alba*) and diurnal Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) may occasionally forage for prey in the open grassland.

Finally, lighting as part of any nocturnal work or structures in the building envelope as allowed in the Easement, should consider its potential impact on seabirds that may use the airspace over the Property while entering and exiting nesting colonies upslope. The adults and fledging chicks all use moon and star light for navigation. Artificial lighting can cause these birds to become confused and disoriented, become grounded and easy prey for predators such as cats, rats, mongoose, or dogs, from which they lack defensive mechanisms. It is recommended that Ola Honua work with Haleakala National Park biologists in order to design lighting that will have no negative impacts on these rare species.

Arthropoda

Crustacea

^*Atyodea bisulcata* opae kala`ole

Insecta

Odonata

+*Anax strenuus* pinao

^*Megalagrion calliphya* pinao `ula

^*Megalagrion nigrohamatum* pinao

^*Megalagrion pacificum* pinao

+*Pantalla flavescens* globeskimmer

Aves

**Acridotheres tristis* common myna

**Cardinalis cardinalis* Northern cardinal

**Carpodacus mexicanus* house finch

**Garrulax canorus* hwamei; melodious laughing thrush

**Geopelia chinensis* spotted dove

^*Hemignathus virens* `amakihi

+*Heteroscelus incanus* `ulili; wandering tattler

**Lonchura punctulata* nutmeg mannikin

+*Pluvialis fulva* kolea; Pacific golden- plover

**Zosterops japonica* mejiro; Japanese white-eye

Mammalia

**Herpestes javanicus* small Indian mongoose

**Rattus* sp. rat

**Sus scrofa* pig; pua`a

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G. SCS ARCHAEOLOGICAL STUDY

**AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT
ON AN APPROXIMATELY 5-ACRE SPECIAL USE PERMIT (SUP) AREA
IN KĪPAHULU, MA`ULILI AND KAKANONI AHUPUA`A,
KĪPAHULU DISTRICT, MAUI ISLAND, HAWAII
[TMK: (2) 1-6-008: 001 (POR.)]**

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ABSTRACT

Archaeological Inventory Survey was conducted on a portion of a single parcel of land measuring approximately 5.0 acres in Kīpahulu, Ma`ulili and Kakanoni Ahupua`a, Kīpahulu District, Maui Island, Hawai`i [TMK (2) 1-6-008: POR. 001]. The Inventory Survey consisted of historical background and archival research; pedestrian survey of the parcel; mapping and description of surface features; subsurface testing (excavation by backhoe and by hand); and, analysis, interpretation, and reporting of all relevant data.

A total of two sites were identified during this project. SIHP No. 50-50-17-5716 consists of four modified bedrock outcrops, interpreted as traditional, temporary habitations, located along the northeast flanks of a small gully that drains through the center of the project area. SIHP No. -5717 consists of seven features, interpreted as traditional, temporary habitations and `auwai, located in the western portion of the gully. One radiocarbon date of 190 ± 60 BP was obtained for SIHP No. -5717. This date, along with other qualitative and contextual observations, suggests both sites date from the terminal Pre-Contact to early historic era.

Subsurface testing consisted of ten 50-cm-by-50-cm Shovel Probes (SP-1 through SP-10), excavated at the modified bedrock overhang features, and fourteen Stratigraphic Trenches (ST-1 through ST-14), positioned throughout the rest of the project area. Subsurface testing was entirely negative, *i.e.*, no cultural deposits were identified in any of these excavation units.

Both sites are significant under Criteria D of the State and National Register of Historic Places. However, no further archaeological work is recommended at these two sites, which have been adequately documented and investigated. The remnant `auwai (features of SIHP -5717), in particular, have previously been severely degraded and disturbed by historic activities. The modified bedrock overhangs of both SIHP No. -5716 and -5717 have been adequately tested (excavated) for cultural deposits. These sites most likely represent a marginal component of a once-thriving, and much larger, traditional habitation/agricultural zone.

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INTRODUCTION

Scientific Consultant Services (SCS), Inc., conducted Archaeological Inventory Survey on a portion of a single parcel of land measuring approximately 5.0 acres in Kīpahulu, Ma`ulili and Kakanoni Ahupua`a, Kīpahulu District, Maui Island, Hawai`i [TMK (2) 1-6-008: POR. 001] (Figures 1 and 2). The Inventory Survey consisted of historical background and archival research; pedestrian survey of the parcel; mapping and description of surface features; subsurface testing (excavation by backhoe and by hand); and, analysis, interpretation, and reporting of all relevant data. Fieldwork was conducted by SCS archaeologists Ian Bassford, B.A., and Jenny Pickett, B.A., from May 18–24, 2005. Chris Monahan, Ph.D., conducted the background and archival research. Dr. Mike Dega is the Principal Investigator.

Archaeological work in the project area was conducted to determine the presence/absence of archaeological deposits in surface and subsurface contexts through complete systematic survey and representative subsurface testing. The ultimate goals of the project were to determine if significant archaeological sites occurred on the parcel and to provide significance assessments and recommendations to the State Historic Preservation Division (SHPD). The landowner is Neaulani, Inc., who manages Ola Honua, a 175-acre working farm, of which the current project area is a part. The client is in the progress of submitting a Special Use Permit (SUP) application, as part of a long-term project to develop and upgrade farm facilities (Figure 3).

A total of two sites were identified during this project (Figure 4). SIHP No. 50-50-17-5716 consists of four modified bedrock outcrops, interpreted as traditional, temporary habitations, located along the northeast flanks of a small gully that drains through the center of the project area. SIHP No. -5717 consists of seven features, interpreted as traditional, temporary habitations and *`auwai*, located in the western portion of the gully. One radiocarbon date of 190±60 BP was obtained for SIHP No. -5717. This date, along with other qualitative and contextual observations, suggests both sites date from the terminal Pre-Contact to early historic era.

According to oral historical sources (local people familiar with the Ola Honua farm), the project area has been used for the past 100 years for sugarcane production and for cattle grazing (Tom Pierce, *pers. comm.*). Inspection of the property clearly shows the significant impacts of these activities. Both of the sites documented in this Inventory Survey were located in a drainage gully cutting through the center of the project area. It is highly likely that additional sites and features representing traditional Native Hawaiian activities were once located here, but have since been destroyed.

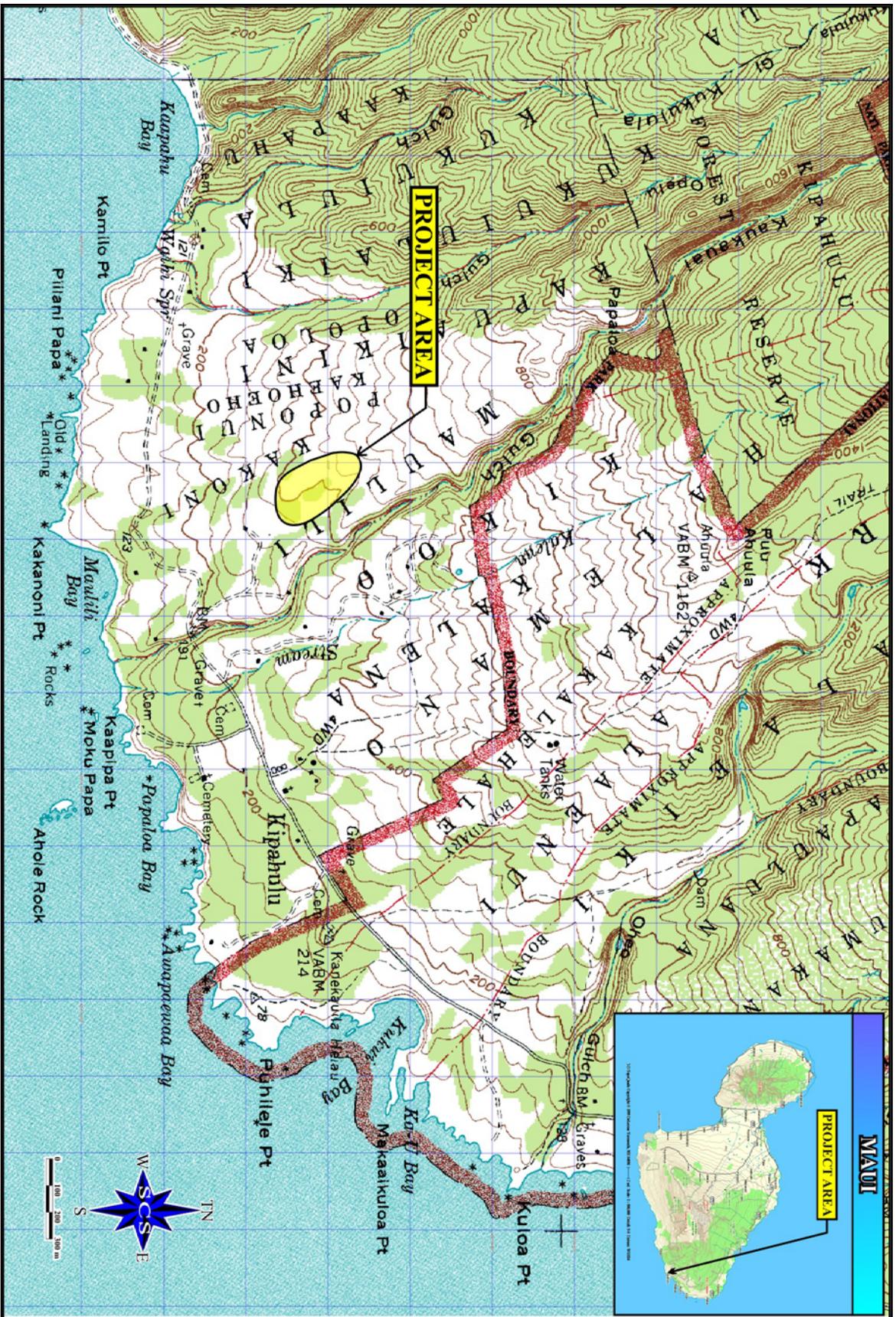


Figure 1: USGS (Kīpahulu Quadrangle) Map of the Project Area.

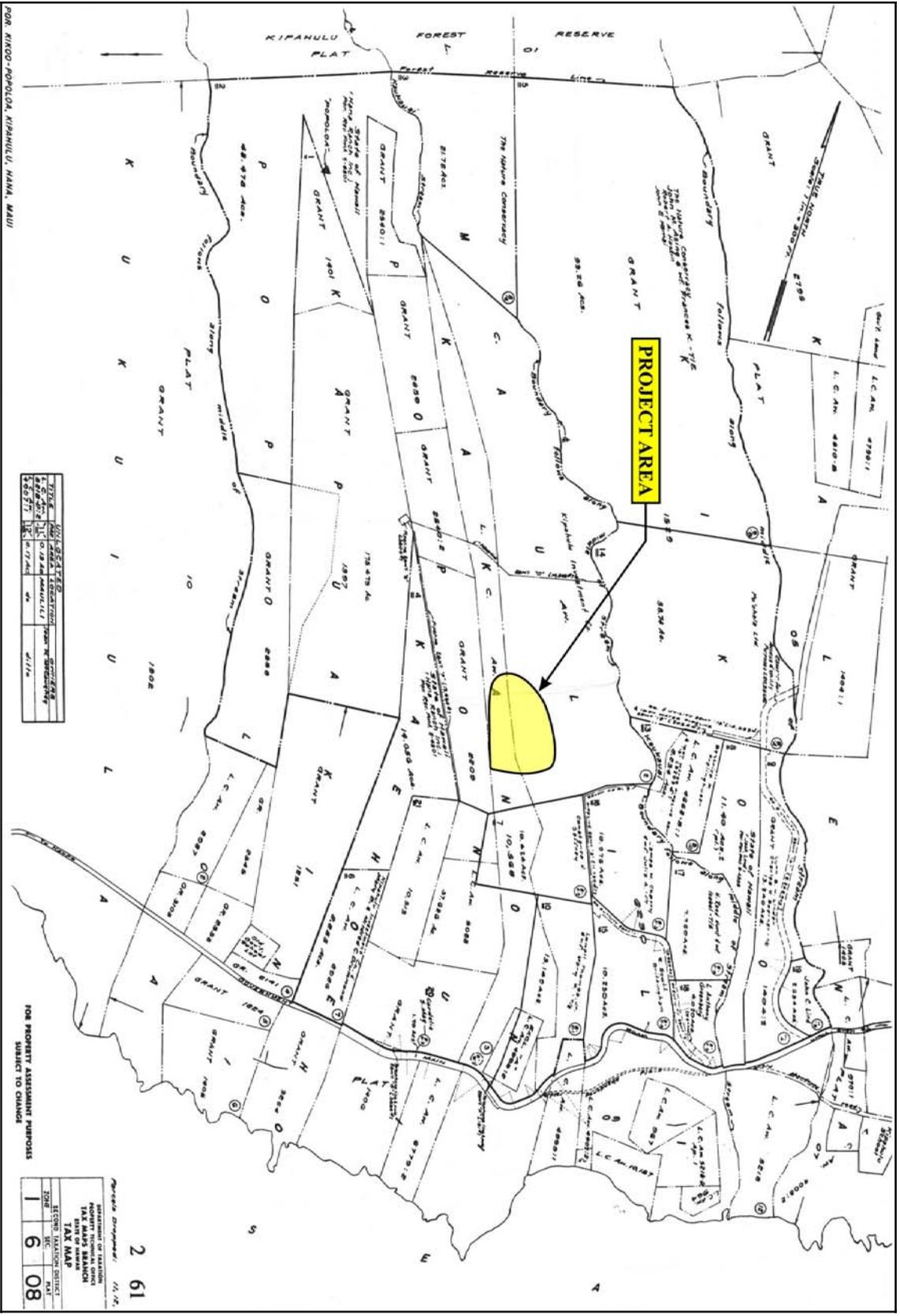


Figure 2: TMK [Tax Map Key] of the Project Area.

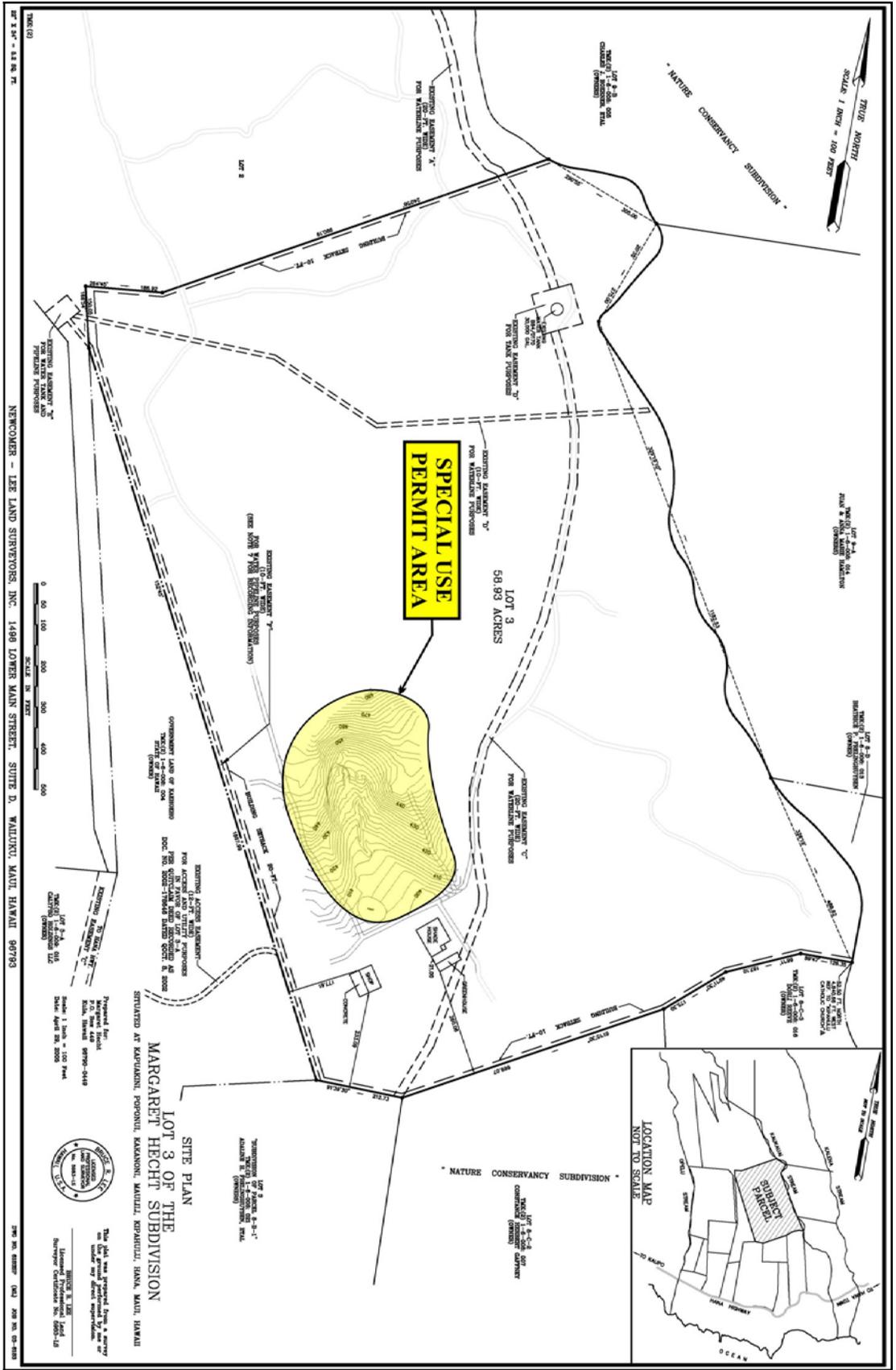


Figure 3: Special Use Permit Area ('Project Area'), Defined by Client on Surveyor's Map.

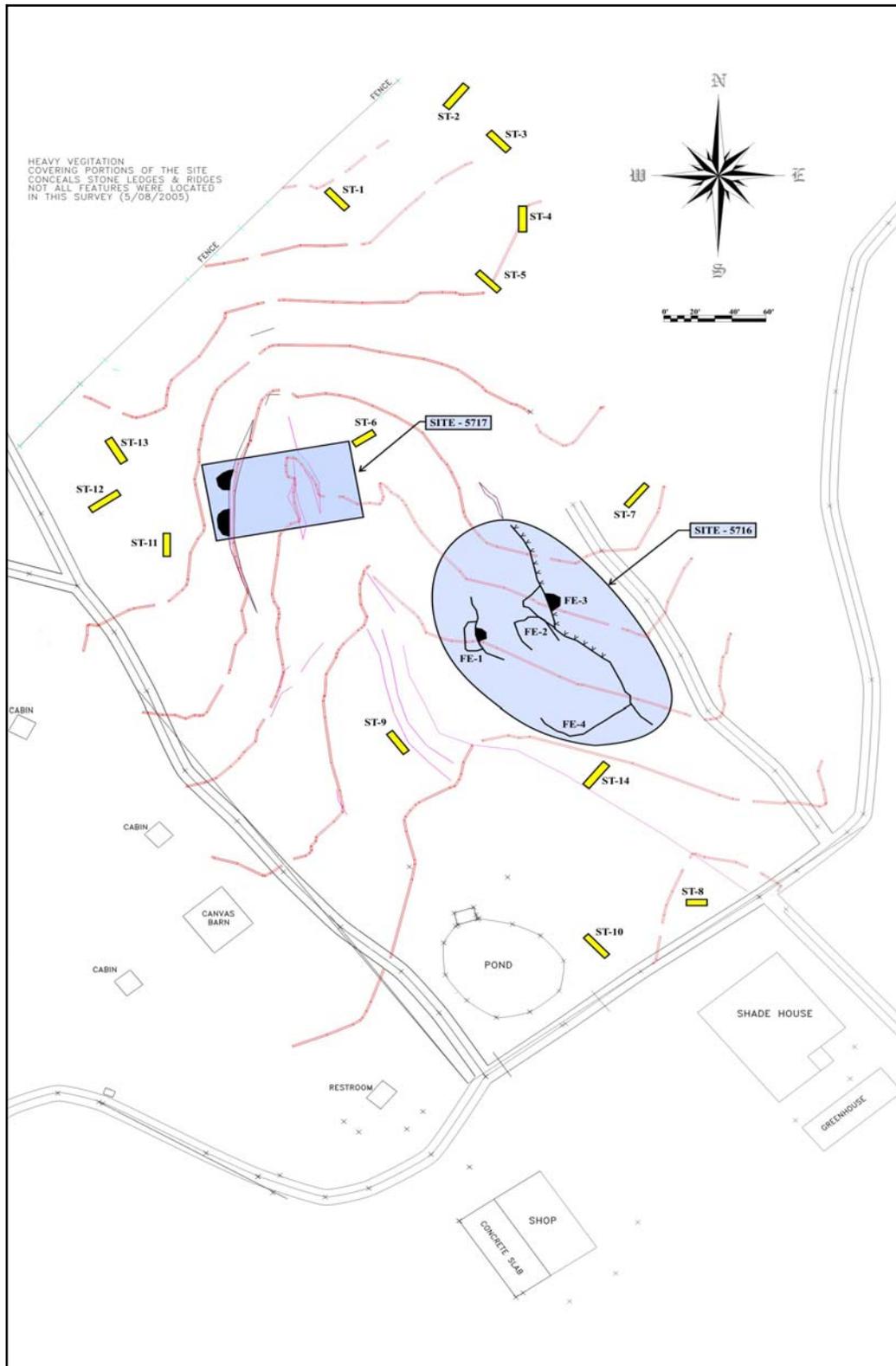


Figure 4: Plan View Map of the Special Use Permit Area, Showing Identified Sites and Features, and Stratigraphic Trenches.

Subsurface testing consisted of ten 50-cm-by-50-cm Shovel Probes (SP-1 through SP-10), excavated at five of the modified bedrock overhang features, and fourteen Stratigraphic Trenches (ST-1 through ST-14), positioned throughout the rest of the project area. All excavation units were taken to bedrock. Subsurface testing was entirely negative, *i.e.*, no cultural deposits were identified in any of these excavation units.

Both sites are significant under Criteria D of the State and National Register of Historic Places. However, no further archaeological work is recommended at these two sites, which have been adequately documented and investigated. The remnant *`auwai* (which are features of SIHP -5717), in particular, have previously been severely degraded and disturbed by historic activities. The modified bedrock overhangs of both SIHP No. -5716 and -5717 have now been adequately tested (excavated) for cultural deposits. Other than the stacked rock features, there is no evidence of human occupation of these modified overhangs (*e.g.*, midden, portable artifacts). These sites probably represent a marginal component of a once-thriving, and much larger, traditional habitation/agricultural zone.

ENVIRONMENTAL SETTING

PROJECT AREA DESCRIPTION AND LOCATION

The project area consists of an approximately 5.0-acre portion of TMK: (2) 1-6-008: 001, defined by the client as the Area of Potential Effect (APE) for a project to construct new worker housing and associated facilities (see Figure 3). The current landowner is Neaulani, Inc., who manages Ola Honua, a 175-acre working farm, of which the current project area is a part. The client is in the progress of submitting a Special Use Permit (SUP) application, as part of a long-term project to develop and upgrade the farm. The project area is located near the *makai* border of the property, between approximately 122–149 m (400–490 ft.) above mean annual sea level (Figure 5).

The project area is located in the *moku* (traditional cultural district) of Kīpahulu, approximately 19.4 km (12.0 mi.) by road south of the town of Hāna, approximately 12.9 km (8.0 mi.) by road east of Kaupo., and approximately one-half mile *mauka* of the coastal road, Pi'ilani Highway.¹ Ma'ulili Bay is located just south of the parcel. The project area is part of the greater Kīpahulu Cliff and Valley physiographic division, a dissected region of numerous drainages terminating at low-cliffed volcanic coastline (Armstrong 1983). Geologically, the project area is part of the lower southeastern slopes of the Haleakalā volcano. Kīpahulu State

¹ The coastal road is called the 'Hana Highway' from this point east, and the 'Piilani Highway' to the west.



Figure 5: Overview of Project Area, Facing Northwest (In the Area of Trench 3).

Forest Reserve abuts and lies *mauka* (upslope) of the project area. Kīpahulu Biological Reserve lies approximately 2.4 km (1.5 mi.) north of the project area. Portions of the Haleakalā National Park are located just *mauka* (north) of the northern boundary of the parcel in which the project area is located.

The terrain in the project area slopes moderately down (to the south-southeast), and a seasonal (ephemeral) drainage gully cuts through the center (Figure 6). This gully—which is flanked by bedrock exposures, ledges, and low overhangs—is the dominant physiographic feature in the project area. Much of the area in and around the project area is a ‘built environment’, *i.e.*, contains various structures and infrastructure, including a man-made pond, roads, pathways, and landscaping. Portions of the project area, not including the gulch area, have been bulldozed and/or graded in historic times. Some of this landscape modification was probably caused by commercial sugarcane activities, and more recent (post-historic-era) alterations of the ground surface have also taken place in the APE.

VEGETATION

This part of Maui is classified as a ‘closed guava forest with shrubs’ Vegetation Zone, and common plants in this zone include: guava, Boston fern, Hilo grass, basket grass, false staghorn fern, *kūkui* (*Aleurites moluccana*), and *hala* (*Pandanus tectorius*) (Armstrong 1983).



Figure 6: Overview of Gully, Located in Center of Project Area, Facing Northwest.

Plant species² identified in the project area, in particular, include: *honohono* (*Commelina diffusa*), *laua`e* (*Phymatosorus scolopendria*), ***kūkui***, Christmas berry (*Schinus terebinthifolius*), century plant (also known as ‘agave’) (*Agave* spp.), and ***hau*** (*Hibiscus tiliaceus*).

According to Krauss (1974) and Wagner *et al.* (1990), three of these Polynesian-introduced and/or endemic plants were used by Native Hawaiians in traditional times for a variety of purposes:

- ***Kūkui***—Also known as the Candlenut tree, was used as food, dye, medicine, lamp oil, and *lei*; in addition, *kūkui* is included in a very large number of traditional myths, legends, and stories; also, according to Wagner *et al.* (*ibid.*:83), “[t]he present distribution of this community [*i.e.*, *kūkui* forest] may reflect past wetland *kalo* (*Colocasia esculenta*) [*i.e.*, taro] cultivation by Native Hawaiians, long since abandoned and overgrown by *kūkui*. (brackets added)
- ***Hala***—Leaves (*lau hala*) were the most important part; used for plaiting (including mats, canoe sails, baskets, fans, and others), and thatching; food (typically as a ‘starvation food’ by Hawaiians), and medicine.

² Polynesian introductions and/or endemic species listed in **bold**.

- *Hau*—According to Krauss (1974:111), “Hau was very highly valued and highly regarded. No commoner could cut any hau branches without gaining permission from chief.” Used for various types of cordage, wood tools, medicine, and others.

CLIMATE

The project area is relatively wet, with mean annual rainfall of approximately 250 cm (100 in.) (Armstrong 1983; Giambelluca *et al.* 1986). Air temperatures in the Kīpahulu area are about average as far as populated regions of the Hawaiian Islands are concerned: maximum annual temperatures (Fahrenheit) at Kīpahulu, just south-southeast of the project area, vary from approximately 82 to 87 degrees; minimum annual temperatures (Fahrenheit) at Kīpahulu vary from approximately 68 to 71 degrees (Armstrong 1983). Particularly in traditional times, *i.e.*, before the advent of commercial farming, ranching, and other ventures in this area, a great amount of fresh water would have been locally available in the numerous streams that drain Haleakalā.

SOILS

Soils in the project area are classified as Makaalae Silty Clay (MID) (Foote *et al.* 1972). This soil forms on “rough, low mountain slopes.” (*ibid.*:87). A typical MID soil profile consists of a ground surface that may contain some scattered stones, underlain by silty clays, which rest upon decomposing `a`ā. These are typically relatively shallow soils (*i.e.*, bedrock is usually reached between 24–48 inches (*ibid.*)). This soil is used for pasture, wildlife habitat, and water supply. As stated above, the project area was apparently used for commercial sugarcane agriculture, starting some 100 year ago.

TRADITIONAL AND HISTORIC SETTING

This section relies heavily on information from several classic references on traditional Native Hawaiian lifeways and archaeological sites (*e.g.*, Thrum 1909, 1917; Walker 1931; Handy and Handy 1972; Sterling 1998). The project area is located in the *moku* (traditional cultural district) of Kīpahulu. Even a cursory look at the Kīpahulu USGS Quadrangle map makes it abundantly clear that the area has been home to a settled population for quite some time. Historic cemeteries and graves—at least eight are located within about one mile of the project area—dot the coastal and near-coastal areas. Also, there are a large number of relatively small *ahupua`a* in the area, which is consistent with relatively dense populations, and/or a particularly abundant environment, in traditional times. Certainly the area is blessed with abundant rainfall

and through-flowing water from its many perennial streams. Several specific references to Ma`ulili Ahupua`a, in which the project area is partially located, are noted below.

PRE-CONTACT ERA

The *moku* of Kīpahulu is the smallest in Maui, and is bordered by the *moku* of Hāna (to the northeast) and Kaupō (to the west). In traditional (Pre-Contact) times, this entire three-district area (now legally part of Hāna District) was home to a large settled population of farmers and fishers, exploiting the abundant natural resources, including abundant rain just inland and upland from the coasts. Sterling (1998) calculated that the entire island of Maui was home to 11 well-documented ‘mega’ *heiau* (*i.e.*, exceeding 200 ft. in length), and six of these occur in the traditional districts of Kaupō-Kīpahulu-Hāna. Heiau in the vicinity of the project area are discussed in more detail below; the point here is: this density of large (possibly sacrificial) *heiau* is a general measure of the regional importance of this portion of East Maui.

Referring specifically to Kīpahulu, Handy and Handy (1972:507) write:

Kipahulu was an `okana (district) with rich and diverse but scattered agricultural resources. Its great valley and lower fringing forests nourished forest taro and other native food plants, as did the lower *kula* lands above the sea...there were still some pockets of taro culture as late as 1934.

According to Kamakau (1991), high chiefs were said to have lived in Kīpahulu District at Kiko`o Ahupua`a, located just east of the project area (east side of Kaukauai Gulch).

Early Settlement of Kīpahulu

Sinoto and Pantaleo (1993) suggest that the earliest settlements on Maui Island occurred between A.D. 300–600 in windward and coastal areas, with populations expanding into dry leeward areas and into the uplands by A.D. 1000 (see also Kirch 1985; Kolb *et al.* 1997). Although there is a shortage of well-documented radiometric data from archaeological contexts in Kīpahulu, there is little doubt that this area, along with Hāna and Kaupō, was part of an important economic and political center, from the early days of human settlement in Maui (Kirch 1985).

Orr (1996) has proposed a general chronology of traditional developments in the *moku* of Hāna that is probably broadly applicable to Kīpahulu. The time of earliest possible settlement (A.D. 300 to 1100) is poorly understood. After this, the so-called Expansion Phase (A.D. 1100 to 1650) witnessed a great increase in the number and variety of archaeological sites and site

types. The ‘Proto-Historic’ Period between A.D. 1650 and 1795 was a time of warfare and intense competition in many parts of the islands and in Maui. Numerous battles and battlegrounds are included in oral historical accounts of this general region [see, *e.g.*, Sterling’s (1998) entries for the *moku* of Kīpahulu, Hāna, and Kaupō].

Heiau

The early surveys of Thrum (1909, 1917) and Walker (1931) identified a large number of religious shrines (*heiau*) in the traditional districts of Kaupō-Kīpahulu-Hāna. Walker, for example, reported several dozen *heiau* (many destroyed, but nonetheless ‘alive’ in the historic-era memory of residents) from Kawaipapa (just north of Hāna) to the western terminus (Waiopai Ahupua`a) of Kaupō District (Walker Heiau Site Nos. 105–169). In Kīpahulu District, alone, Walker reported eight³ *heiau* (Walker Heiau Site Nos. 132-139):

- Poomanihi (also possibly ‘Maopua’) Heiau (Walker Site 132) [Puualu Ahupua`a, in Sterling (1998), also apparently known as ‘Puaaluu,’ on USGS Kipahulu Quadrangle Map], located near-coastal, on a small hill, at the eastern terminus of Kīpahulu District (boundary with Hāna), destroyed.
- Napua (also possibly ‘Namahana’) Heiau (Walker Site 133) (Kaumakani Ahupua`a), located at Manekineki, on the north side of `O`heo Gulch, near the waterfall, remnant (mostly destroyed).
- Wailoa Heiau (Walker Site 134) (‘Alaenui Ahupua`a), located at Kukui “about 50 yards above the road between the Catholic church and Oheo Gulch” (Walker 1931:204).
- Kanekauila (also known as ‘Kanekoela’) Heiau (Walker Site 135) (Kākalahale Ahupua`a), site of the then-present (*i.e.*, 1931) Catholic Church.
- Waihee Heiau (Walker Site 136) (Halemano Ahupua`a), located on a small hill, near-coastal setting, totally destroyed by “the planatation.” (Walker 1931:206).
- Mahinaula Heiau (Walker Site 137) (Halemano Ahupua`a), located “just below the Kipahulu mill makai of the road 150 yards.” Mostly destroyed by Walker’s time; said to have been of the “Hoouluulu ai” (crop fertility) class (Walker 1931:207).
- Maulili Heiau (Walker Site 138) (Ma`ulili Ahupua`a), located “half a mile west of the [Kipahulu] mill on the makai side of the road.” (Walker 1931:208). Note, this is the closest documented *heiau* to the project area.

³ This includes Walker Site No. 132, which is on or near the boundary line with Hāna District.

- Paokahi (also known as ‘Kumuula’) Heiau (Walker Site 139) (Ka`āpahu Ahupua`a), located at “Lelekea Gulch 150 yards above the trail on the left bank of the stream.” (Walker 1931:209). This was described as a fairly impressive, multi-feature site, badly damaged and overrun by domestic animals and large trees.

The closest of these *heiau* to the project area is Maulili Heiau. Walker produced a site map of this impressive, multi-feature *heiau*. It was described as having intact vertical facing of at least 12 feet in one place. Taken together, these observations on the location, number, and character of *heiau* in Kīpahulu District are consistent with a relatively large, settled population in and around the project area for quite some time.

Other Traditional Sites and Cultural Places in Kīpahulu

Several traditional sites and cultural places in Kīpahulu District attest to the area’s settlement history in traditional times.

The ‘Papauluana Burial Cave’, located in Kaumakani Ahupua`a, and purportedly containing canoes and the *iwi* of a chiefly individual (Wahieloa), was described in a 1911 newspaper article (*Ke Au Hou*, referenced in Sterling 1998).

Battles and an ancient fort are known from oral historical accounts at Ka`apahu Ahupua`a.

A traditional trail, paved with *‘ala* stones, existed from `Alaeiki to Kuikui`ula Ahupua`a, meaning that one could traverse the entire *moku* of Kīpahulu, from Hāna to Kaupō, along this trailway. Its precise location (*e.g.*, *mauka-makai*) is unclear, and, even by 1884, according to a Native Hawaiian quoted in Sterling (1998:158), much of it had been disturbed/destroyed beyond recognition.

‘O`heo Gulch (Kaumakani Ahupua`a, approximately 2.9 km (1.8 mi.) east of the project area), also known as the ‘Seven Sacred Pools’, has probably been an important traditional cultural place in East Maui for a very long time. According to Sterling (1998), quoting a *Maui News* story from 1964–5, oral historic references suggest the pools were reserved for royalty, and guarded by warriors. In traditional times, this site was known as *Na Wai Nahiku* (lit. ‘the Seven Waters’), and a large body of legend, myth, and stories abound about it (for a conflicting interpretation, see James 2001).

According to James (2001:98):

Kīpahulu was a fairly populated area in former times and over 700 features have been surveyed on parklands. Stabilized house sites and other ancient ruins such as fishing shrines, *heiau*, canoe ramps, and old taro patches, can be seen all along the coastal areas.

Subsistence Economy

As stated above, Kīpahulu District was known for its rich and diverse agricultural resources. The following extended quotation from Handy and Handy (1972:507) documents numerous locations of terrace-agriculture systems that survived into the early 20th century. Presumably all of these cultivation areas, and many more that were destroyed by commercial activities in the earlier historic era, had been used for centuries by Native Hawaiians. The authors write:

Kukui`ula Stream, where the rugged ridge-and-valley trail to Kaupo begins, watered several small groups of terraces; the small valley of Lolokea once had a few small terraces, no longer cultivated.

In Hanawai there were a few small terraces watered by Alelele Stream as it flows down through Hanawai Valley to the sea, which were being replanted in wet taro in 1934. There are a few dry terraces in Kalepa which presumably were used for wet taro in ancient times. Nuanualoa, the last valley before one sights the plains of Kaupo, traveling westward, had a handful of houses with a few cultivated terraces.

HISTORICAL ERA

Commercial Activities

Commercial sugar cane agriculture came to East Maui during the middle to late 19th century. According to Dorrance and Morgan (2000), the Kipahulu Sugar Company began operations in 1879, and shut down operations in 1925. A map of the geographic extent of acreage in commercial sugar (*ibid.*:60) shows the project area well within its boundaries.

Following the collapse of sugarcane agriculture in East Maui, commercial ranching was established on many of these same lands (Kolb 1993).

According to oral historical sources (local people familiar with the Ola Honua farm), the project area has been used for the past 100 years for sugarcane production and for cattle grazing (Tom Pierce, *pers. comm.*).

Land Commission Awards in the Project Area

There are two Land Commission Awards (LCAs) for the project area (Table 1, Appendix A, and, see Figure 3). LCA documents date from the time of the *Mahele* (1848), and are widely considered to be the first legal land documents in the Hawaiian Islands. Awards gave legal title of land in fee ownership.

Table 1: Land Commission Awards for the Project Area at TMK: (2) 1-6-008: 001 (Por.).⁴

LCA No.	Claimant	District	Ahupua`a	Land Uses, According to LCA Testimony
6230	Kuakini, J.A.	Kīpahulu	Ma`ulili	15 Salt Ponds, 3 Fish Ponds, 1 <i>Mo`o</i> of <i>lauhala</i> trees, 1 coconut grove
10568	Oleloa (‘Wahine’)	Kīpahulu	Kakanoni	6 <i>Lo`i</i> , 1 <i>Mo`o</i> , 2 Breadfruit trees, 1 coconut tree

PREVIOUS ARCHAEOLOGY

The following sampling of studies illustrates the types of sites and features that may be encountered in the project area. Information from older, classic references (*e.g.*, Thrum 1909, 1917; Walker 1931; Handy and Handy 1972; Sterling 1998) can be found above (TRADITIONAL AND HISTORIC SETTING). In general, the Kīpahulu District is rich in archaeological resources, with a wide variety of site types and occurrences recorded. Rockshelters and other exposed bedrock features (*e.g.*, overhangs) with evidence of human occupation are common in Kīpahulu, and most archaeological surveys in the area have identified modified rockshelters and outcrops of one type or another. In some parts of Kīpahulu, these exposed bedrock features extend all the way down to the seashore, making them attractive locations for traditional Native Hawaiians in search of shelter and places to plant. Although Kīpahulu has not been subject to extensive modern development (*e.g.*, resorts), the destructive effects of sugarcane agriculture and ranching have been significant.

KĪPAHULU DISTRICT

According to a search of the SHPD’s library in Kapolei, and the SHPD’s website listing archaeological reports by TMK throughout the Hawaiian Islands⁵, no previous archaeological studies have been conducted in the project area. Several studies have identified a variety of traditional and historic sites in the *ahupua`a* of the project area (Ma`ulili and Kakanoni), and in other, nearby land divisions.

⁴ Source: Waihona Aina website (www.waihona.com), accessed on 6/22/05 (see Appendix A).

⁵ Source: <http://mano.icsd.hawaii.gov/~ckomoek/access/TMKlistMaui.txt>

Ma`ulili Ahupua`a

Surveys by the B.P. Bishop Museum (Soehren 1962) and by the Hawai`i State Historic Register Survey in 1973 documented the following sites in Ma`ulili Ahupua`a: SIHP Nos. -1112, -1113, and -1121 (described in more detail below), SIHP No. -1119—a probable house enclosure constructed with core-filled walls, located just *mauka* of the highway, and SIHP No. -1120—a historic stone-walled animal pen, located just *mauka* of the highway.

Several archaeological studies have been conducted near Ma`ulili Bay, just *makai* of the highway and the project area. Masterson *et al.* (2000) worked in a 20-acre area in Ma`ulili Ahupua`a (TMK: 1-6-009: 003 and 004), identifying seven sites including: two rockshelters (SIHP Nos. -1112 and -4511), an overhang shelter with pictographs (SIHP No. -1121), a cave (SIHP No. -4541), a site complex, possibly Ma`ulili Heiau, including a stone platform and associated walls (SIHP -1113), a modern mound complex and an associated large stone, thought to be the ‘Kanemakua Stone’ (SIHP No.-4481), and two shoreline inlets (SIHP No. -4542). Human occupation of some of these sites may date to as early as the 15th century, with later pre-Contact and early historic use as well. Kolb (2000) tested (excavated) at the possible site of the Ma`ulili Heiau (-1113), with limited results.

Fredericksen (2004) conducted a field inspection of a 7.76-acre portion of land in Ma`ulili Ahupua`a (TMK: 1-6-008: 017), located approximately 750 m east-southeast of the project area. Three rockshelters (SIHP Nos. -5536 through -5538) were identified; at least one these had traditional stone tools on the ground surface. A remnant stone enclosure (SIHP No. -5540) and a sugarcane-era railroad bridge support and associated features (SIHP No. -5539) were also identified.

Kakanoni Ahupua`a

Surveys by the Bishop Museum (Soehren 1962) and by the State (1973) documented the following sites in Kakanoni Ahupua`a: SIHP No. 50-50-17-1122, consisting of a possible burial platform and an associated platform, as well as a possible habitation enclosure, SIHP No. -1123, consisting of remnant traces of a large rectangular enclosure, and SIHP No. -1124, consisting of several features including a large, irregularly-shaped platform, with an associated portion of wall, pavements, two small possible habitation platforms (both badly deteriorated), and a remnant enclosure. All of these sites are located in near-coastal and/or coastal settings, just west of Ma`ulili Bay.

Burgett *et al.* (1995) conducted an Archaeological Inventory Survey on a small parcel in Kakanoni Ahupua`a, immediately *makai* of the project area, identifying three sites: a stone enclosure (SIHP Nos. -4149), interpreted as a traditional habitation, a complex of habitation terraces and a wall (SIHP No.-4150), and a modified outcrop, also interpreted as a traditional habitation site (SIHP No. -4151). One radiocarbon date of 310 ± 60 BP (2 Sigma Calibration—OxCal v2.11, A.D. 1446 to 1668, (0.98 probability) was obtained for SIHP No. -4149. Excavations (one test unit at each site) yielded traditional artifacts at SIHP No. -4149 and -4151, including a basalt adze, adze performs, and adze blanks, as well as volcanic glass debitage and other lithics.

Other Relevant Studies

Surveys by the Bishop Museum (Soehren 1962) and by the State (1973) documented the following sites in Kiko`o Ahupua`a: SIHP No. 50-50-17-1115, a large rockshelter in the shoreline cliff, approximately 20 meters above the beach, overlooking the mouth of the Kalena Stream, and SIHP No. -597, a site complex consisting of a large number of diverse features including: agricultural terraces, a possible burial platform, stone walls, stone house enclosures, several terraced platforms, and several stone pens. Most of these features were constructed with water-worn basalt.

In Ka`apahu Ahupua`a, approximately one mile west of Ma`ulili Bay, Kornbacher (1993) conducted an Archaeological Inventory Survey, which did not include excavation, along a corridor of the Hāna-Pi`ilani Highway, between Kalepa Stream (to the southwest) and Kukui`ulu Stream (to the northeast). Several sites were documented, including three that were previously identified in the State Survey: SIHP Nos. -1129, a series of walls and terraces along the Alelele Stream (see also Kornbacher 1992), SIHP No. -1130, a *ko`a* (fishing shrine), designated the 'Kalepa Shrine,' and SIHP No. -1492, an extensive complex of walls and terraces along the east side of the Lelekea Stream, and including Paokahi Heiau. Kornbacher (1993) also recorded several new sites, including three modified rockshelters, an extensive rock wall, a buried cultural layer containing a probable firepit, and a large complex of stacked-rock structures.

Fredericksen and Fredericksen (2001) conducted an Archaeological Inventory Survey of a 6.5-acre, coastal parcel in Kalepa Ahupua`a, *moku* of Kaupō (TMK: 1-7-001: 049). One site (SIHP -5058) was identified as a traditional Native Hawaiian fishing area, located at Moku`ia Point.

Tulchin and Hammatt (2003) conducted an Archaeological Inventory Survey of a 0.14-acre, near-coastal parcel in Kepio Ahupua`a, *moku* of Kaupō (TMK: 1-7-002: 018). One rock wall and associated corral, both dating from later historic ranching times, were designated as components of the Hāna Belt Road (SIHP No. -1638).

Large-scale projects in the Haleakalā National Park (Rosendahl 1976; Dye *et al.* 2002), located just above (*mauka*) the project area, have identified a vast array of traditional and historic sites from *mauka* to *makai* including: numerous multi-component site complexes, religious shrines, habitations (including rockshelters), agricultural sites, stone structures of every conceivable type (*e.g.*, enclosures, walls, terraces, mounds, pavements, platforms), buried features (*e.g.*, stone-lined pits), and traditional burials.

EXPECTED FINDINGS

Based on all available physiographic, archaeological, and historical evidence, there was a limited, but significant, chance of finding traditional (*i.e.*, Pre-Contact) sites and features in the project area. If not for the documented history of landscape disturbance in this area, due to commercial sugarcane agriculture, in particular, there most certainly would have been traditional rock terraces and other features related to irrigation and/or temporary habitation. Even given this widespread landscape disturbance, however, it was expected that the central portion of the project area—because it consisted of a rocky drainage gully—might contain undisturbed sites or features. It is common, in Maui and the Hawaiian Islands, in general, for rocky gullies to: (1) escape historic disturbance, simply because they are difficult to work; and/or (2) become filled in with bulldozed debris from historic activities. In either case, this expectation was borne out by the fieldwork, which identified two sites within the central gully area.

METHODOLOGY

The work described in this report consisted of historical background and archival research; pedestrian survey of the parcel; mapping and describing of surface features; subsurface testing (excavation by backhoe and by hand); and, analysis, interpretation, and reporting of all relevant data. Chris Monahan, Ph.D., conducted the background and archival research. Dr. Mike Dega is the Principal Investigator.

ARCHIVAL METHODS

Archival research was conducted at the SHPD library facility (Kapolei, HI) and on the SHPD website (SHPD 2005) before, during, and after the fieldwork described in this report. Archival work consisted of general research on the history and archaeology of Kīpahulu and East

Maui, in general, as well as specific searches of previous archaeological studies in and around the subject parcel. Historic land use data from in and around the site were obtained from the Waihona `Aina website (Waihona `Aina 2005).

FIELD METHODS

Fieldwork was conducted by SCS archaeologists Ian Bassford and Jenny Pickett from May 18–24, 2005. All aspects of the work were photographed with negative-based film, and digital copies of these photographs have been archived on the SCS computer network. Fieldwork resulted in a 100% pedestrian survey of the project area; however, vegetation was extensive in some portions of the project area. All surface features were described using standard archaeological recording forms; and, sketched and mapped (to scale) in sufficient detail to show their character, size, location, and inter-relationships.

Subsurface Testing

A total of ten Shovel Probes (SP-1 through SP-10) were excavated to bedrock at five traditional surface features. The features were thought to represent possible Pre-Contact occupation of this area. The Shovel Probes were primarily aimed at recovering buried cultural deposits that might have chronological implications.

A total of fourteen Stratigraphic Trenches (ST-1 through ST-14) were excavated to bedrock. The trenches were positioned randomly throughout the project area, in order to sample the soil-stratigraphic record. Trenching exposed a total of 62.03 linear meters (203.5 ft.) of subsurface deposit. A 65-cm-wide backhoe bucket was used. Depth of excavation ranged from 10–138 cmbs (4.0–54.3 in.). Not counting ST-2, where bedrock was reached (and excavation terminated) at 10 cmbs, average depth of excavation was 94.2 cmbs (37.1 in.). Total excavated area was 40.32 square meters. Approximate total excavated volume was 38.0 cubic meters. Trench locations were recorded using tape and compass, and were documented on a base map provided by the client. Field notes, stratigraphic profiles, and soil descriptions were recorded for each trench, in keeping with standard archaeological procedure. All significant finds (*i.e.*, excepting recent garbage) were bagged, catalogued, and returned to SCS, Honolulu, for laboratory analysis. One charcoal sample was collected for radiocarbon dating.

LABORATORY METHODS

All significant finds (*i.e.*, portable artifacts over 50 years in age) were transported to the SCS laboratory in Honolulu. These artifacts were catalogued, analyzed, and interpreted in the laboratory. Laboratory work also consisted of digital drafting of stratigraphic profiles, maps and feature drawings. The traditional artifacts were analyzed by Dr. Robert L. Spear. All field notes,

maps, photographs, and artifacts pertaining to this project are being curated at the SCS laboratory in Honolulu until further notice.

RESULTS

This section describes the archaeological sites and features located in the project area, the subsurface testing conducted, and the interpretation of these data.

OVERVIEW

Two sites were documented in the project area (Table 2, see Figure 4). Both of the sites, which are approximately 30 m (100 ft.) apart, are located in a small gully that drains through the center of the SUP. The gully is approximately 3.0–4.5 m (10–15 ft.) deep, and oriented roughly north-northwest to south-southeast. As described in detail above (PROJECT AREA DESCRIPTION), the gully is flanked by exposed bedrock ledges and low overhangs. The two sites occupy a total (rectangular) area of approximately 28,800 sq. ft. (0.7 acres).

Table 2: SIHP Sites Documented During Inventory Survey in the SUP.

SIHP No.	No. of Fea.	Formal Description	Site Size (Area)	Functional Interpretation	Temporal Designation
-5716	4	Modified Outcrops; Stacked-Rock Terraces, Walls, and Enclosures	9,600 sq. ft.	Temporary Habitation	Later Pre-Contact/Early Historic
-5717	7	Modified Outcrops; Stacked-Rock Terraces, Walls; and, `Auwai Features	3,200 sq. ft.	Temporary Habitation, and Agriculture	Later Pre-Contact/Early Historic

SIHP No. -5716 consists of four features within a total area of approximately 9,600 sq. ft., located along the northeast flanks of the gully. The features are described in detail below. In brief, they consist of modified bedrock outcrops and low overhangs, consistent with small, temporary habitation areas. Subsurface testing (six 50-cm-by-50-cm Shovel Probes) at SIHP No. -5716 was negative. No significant surface finds (*e.g.*, artifacts or midden) were present at these features. No charcoal (for dating) was present. SIHP No. -5716 is consistent with a later Pre-Contact to early historic era site.

SIHP No. -5717 consists of seven features within a total area of approximately 4,500 sq. ft., located in the western portion of the gully. The features are described in detail below. In brief, they consist of modified bedrock outcrops and low overhangs, consistent with small, temporary habitations areas, and remnant (truncated) `auwai (*i.e.*, irrigation channels). Subsurface testing (four 50-cm-by-50-cm Shovel Probes) at SIHP No. -5717 was negative. No significant surface finds (*e.g.*, artifacts or midden) were present at these features. One charcoal

feature located under the rocks used to construct Feature 7 (a probable remnant *auwai*) was radiocarbon dated to 190±60 BP, with a one sigma (67% probability) calibration (OxCal v3.5) of: A.D. 1720 to 1820 (0.58), A.D. 1650 to 1690 (0.24), and A.D. 1920 to 1950 (0.17). SIHP No. -5717 is consistent with a later Pre-Contact to early historic era site.

SIHP NO. -5716: MODIFIED OUTCROPS/GARDEN PLOTS

SIHP No. -5716 consists of four features (Nos. 1–4), each of which incorporates natural bedrock outcrops and/or overhangs with rock stacking to create partially or wholly enclosed level soil areas, consistent with traditional Native Hawaiian garden plots (Table 3).

Table 3: Features Documented at SIHP No. -5716.

Fea. No.	Formal Description	Functional Interpretation	Shovel Probes	Comments
1	Modified Outcrop-Rock Walls/Enclosure	Temporary Habitation	SP-5 and SP-6	No Cultural Materials Recovered
2	Modified Outcrop-Rock Terrace/Enclosure	Temporary Habitation	SP-3 and SP-4	No Cultural Materials Recovered
3	Modified Outcrop-Rock Walls/Enclosure	Temporary Habitation	SP-1 and SP-2	No Cultural Materials Recovered
4	Modified Outcrop-Rock Wall	Temporary Habitation	None	Terminates Into a Severely Degraded Terrace

Feature 1: Modified Outcrop-Rock Walls/Enclosure

Feature 1 is an enclosed modified overhang, consisting of bedrock outcrop on the east and stacked walls to the north, south, and west (Figures 7 and 8). The feature is located at the base of the outcrop ridge, in the northeast portion of the main gully. Features 2 and 3 are located approximately 10 m (30 ft.) upslope (east-northeast) of Feature 1. The overhang at Feature 1 is approximately 2.00 m in length by 1.00 m in depth, with a maximum interior height of 73 cm (cm above the ground surface). No internal modification of the ground surface of the overhang was observed. The area is heavily-vegetated with *honohono*, *lau`a`e*, and low-lying *kūkui* trees. An enclosed, level soil area of approximately 4.00 m by 2.00 m (interior dimensions) is located just in front (to the west) of the overhang. A free-standing rock wall extends another 5.80 m to the west of the small enclosed area. Facing is present along much of the rock stacking in this feature. Average wall thickness (width) is 80 cm. Maximum wall height of the enclosure varies from 58–73 cm, around the exterior, to 17–76 cm, in the interior. Rocks consist of sub-angular and sub-rounded basalt cobbles and small boulders, stacked up to 3–4 courses high. The feature is generally in poor physical condition, having been altered by grazing animals and historic activities.



Figure 7: Feature 1 (SIHP No. -5716), Facing Northeast.

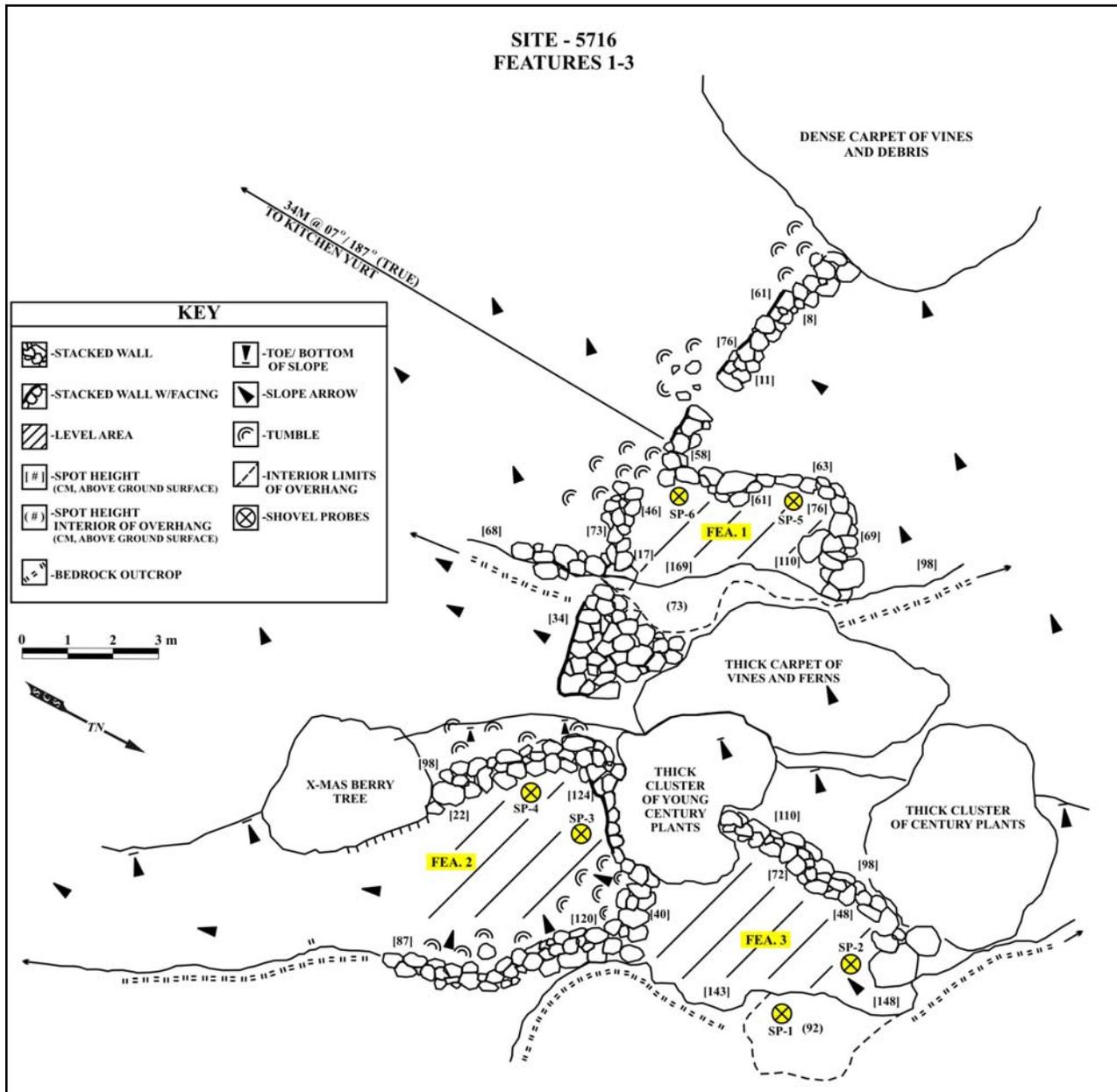


Figure 8: Plan View Sketch Map (to Scale) of Features 1–3 (SIHP No. -5716).

Two 50-cm-by-50-cm Shovel Probes (SP-5 and SP-6) were excavated within the enclosed area just west of the outcrop (see Figure 8). No cultural materials were observed in excavation.

Feature 2: Modified Outcrop-Rock Terrace/Enclosure

Feature 2 is a series of short terraces that form a partially (*i.e.*, three-sided) enclosed level area to the west of the outcrop (Figure 9, and see Figure 8). The feature is located about midway



Figure 9: Feature 2 (SIHP No. -5716), Facing North.

up the slope of the outcrop ridge, in the northeast portion of the main gully, abutting Feature 3. Feature 1 is located approximately 10 m (30 ft.) downslope (west-southwest) of Features 2 and 3. The area is heavily vegetated with Christmas Berry, *lau`a`e*, century plants, *kūkui*, and *honohono*. The enclosed, level soil area measures approximately 3.5 m by 3.5 m; the exterior of the rocks that constitute these terraces measures 5.0 m by 4.0 m. The three-sided terrace/enclosure is oriented roughly northwest-to-southeast, and the northwest section of terrace abuts another level area (designated Feature 3) immediately adjacent (to the northwest) of Feature 2. The longest section of terracing is approximately 5.5 m. Formal facing is only present along a portion of the interior of the northwest terrace. Average thickness (width) of the terraces ranges from 75–100 cm. Maximum terrace heights vary from 87–124 cm. Rocks consist of sub-angular and sub-rounded basalt cobbles and small boulders, stacked up to 3–4 courses high. The feature is in fair to poor physical condition, having been altered by grazing animals and historic activities.

Two 50-cm-by-50-cm Shovel Probes (SP-3 and SP-4) were excavated within the enclosed area just west of the outcrop (see Figure 8). No cultural materials were observed in excavation.

Feature 3: Modified Outcrop-Rock Walls/Enclosure

Directly abutting the northwest terrace rock stacking of Feature 2 (above), Feature 3 is an enclosed overhang, consisting of the bedrock overhang, itself, to the east, and free-standing rock-stacked walls to the west and to the south (Figure 10, and see Figure 8). Feature 3 is located at the upper edge of an outcrop ridge, in the northeast portion of the main gully. These three components—the natural bedrock overhang, plus the two sections of man-made walls—form a roughly triangular enclosed, level area. The overhang, itself, is approximately 3.00 m in length by 2.00 m in depth, with a maximum interior height of 92 cmas. No internal modification of the ground surface of the overhang was observed. The area is heavily-vegetated with *honohono*, *kūkui* trees, and century plants. The enclosed, level soil area measures approximately 5.00 m by 4.00 m (interior dimensions), and is located just in front (to the west-southwest) of the overhang. The exterior of the rocks that define this level area measures 6.0 m by 5.0 m. The long axis of the enclosed area is roughly north-to-south. There is no formal facing present, and average wall thickness (width) is 100 cm. Maximum wall height varies from 98–110 cmas (cm above the ground surface), around the exterior, to 40–148 cmas, in the interior. Rocks consist of sub-angular and sub-rounded basalt cobbles and small boulders, stacked up to 3–4 courses high. The feature is generally in poor physical condition, having been altered by grazing animals and historic activities.



Figure 10: Feature 3 (SIHP No. -5716), Facing North.

One 50-cm-by-50-cm Shovel Probe (SP-2) was excavated within the enclosed area just west-southwest of the outcrop; one 50-cm-by-50-cm Shovel Probe (SP-1) was excavated within the bedrock overhang (see Figure 8). No cultural materials were observed in excavation.

Feature 4: Modified Outcrop-Rock Wall

Feature 4 is a rock wall constructed partially atop, against, and perpendicular to, the upper outcrop ridge that runs up to Feature 3 (Figures 11 and 12). Feature 4 is located approximately 20 m (60 ft.) south-southeast of Features 2 and 3, and approximately 3.0–4.5 (10–15 ft.) below (in elevation) these features. The wall designated Feature 4 is located in a dense *hau* patch, and runs downslope, a distance of at least 14 m, at which point it terminates into a severely degraded remnant terrace. This free-standing wall consists of 2–3 courses of small boulders (sub-angular and sub-rounded basalt), with maximum heights ranging from 12–98 cm. Wall thickness (width) varies from 50–80 cm. Formal facing is entirely absent from this feature. This wall is generally in poor physical condition, having been altered by grazing animals and historic activities.

No subsurface testing was conducted at this feature.

SIHP NO. -5717: MODIFIED OUTCROPS/GARDEN PLOTS AND `AUWAI

SIHP No. -5717 consists of seven features (Nos. 1–7), including natural bedrock outcrops with rock stacking, remnant (truncated) *`auwai*, and mounds (Table 4, Figure 13).

Table 4: Features Documented at SIHP No. -5717.

Fea. No.	Formal Description	Functional Interpretation	Shovel Probes	Comments
1	Modified Outcrop-Rock Terrace	Temporary Habitation	SP-7 and SP-8	No Cultural Materials Recovered
2	Modified Outcrop-Rock Retaining Wall/Terrace	Temporary Habitation	SP-9 and SP-10	No Cultural Materials Recovered
3	Rock Retaining Wall	<i>`Auwai</i> (remnant)	None	Runs Along West Bank of an Intermittent Stream
4	Modified Outcrop-Rock Terrace/Alignment	<i>`Auwai</i> (remnant)	None	--
5	Rock and Soil Mound	Associated with <i>`Auwai</i> (remnant)	None	--
6	Modified Outcrop-Rock and Soil Mound	Associated with <i>`Auwai</i> (remnant)	None	--
7	Modified Channel-Partially Defined by Rock Stacking	<i>`Auwai</i> (remnant)	None	Charcoal Collected At Base of Rock Stacking

As stated above, one charcoal feature located under the rocks used to construct Feature 7 (a probable remnant *`auwai*) was radiocarbon dated to 190±60 BP, with a one sigma (67%



Figure 11: Feature 4 (SIHP No. -5716), Facing Northeast.

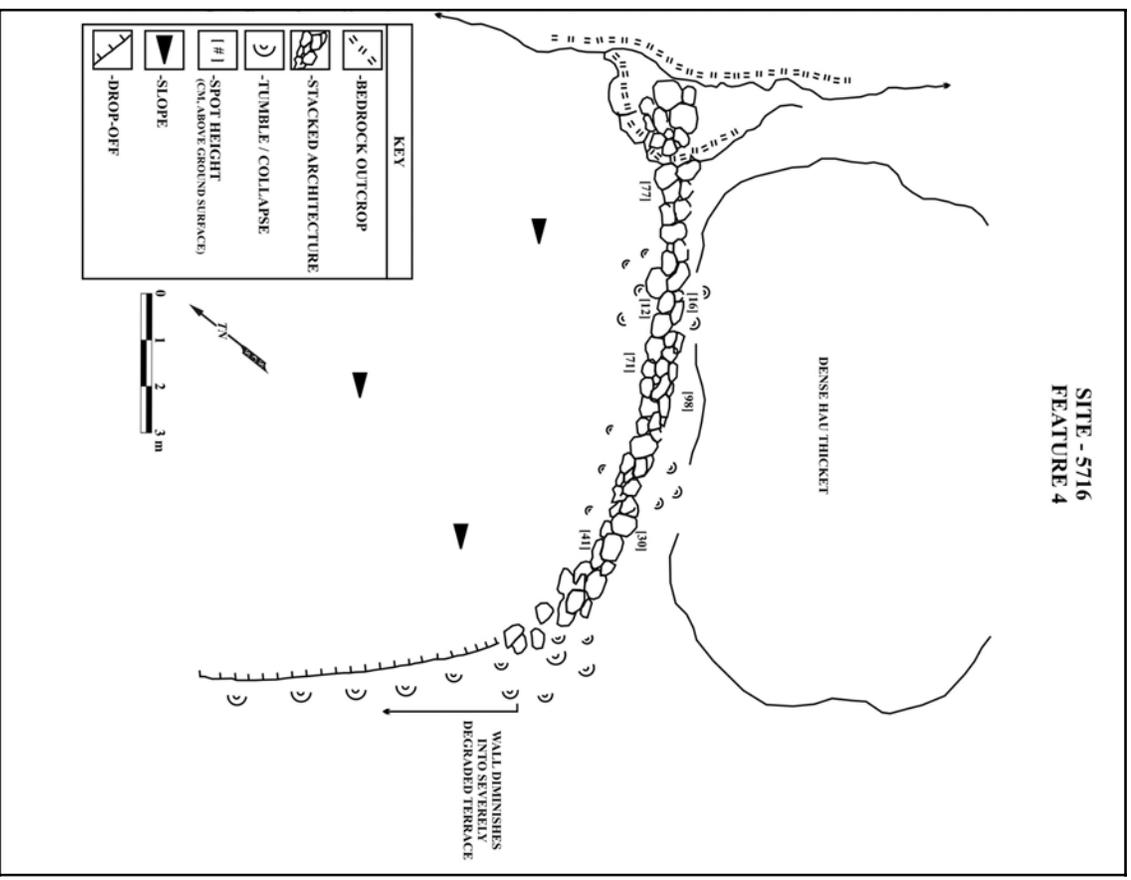


Figure 12: Plan View Sketch Map (to Scale) of Feature 4 (SIHP No. -5716).

probability) calibration (OxCal v3.5) of: A.D. 1720 to 1820 (0.58), A.D. 1650 to 1690 (0.24), and A.D. 1920 to 1950 (0.17). SIHP No. -5717 is consistent with a later Pre-Contact to early historic era site.

Feature 1: Modified Outcrop-Rock Terrace

Feature 1 is a modified overhang, consisting of bedrock outcrop on the west and an associated terrace at its opening (Figure 14). No internal modification of the ground surface within the overhang was observed. The feature is located along the west edge of a small gully, and the area is heavily vegetated. A second modified bedrock overhang (Feature 2) is located immediately adjacent to the northwest. The overhang at Feature 1 is approximately 8.00 m in length by 3.00 m in depth, with a maximum height of 93 cm. This is the largest (areal) overhang in the project area at approximately 24.00 sq. m of internal space. The level, terraced area in front (east) of the opening of the overhang measures approximately 5.0 sq. m. The terrace is constructed of 1–2 courses of sub-angular to sub-rounded basalt cobbles and small boulders. It is approximately 5.50 m long, 0.50 m wide, and 0.32 m high. There is no formal facing. The feature is generally in fair physical condition, having been altered by grazing animals and historic activities.



Figure 14: Feature 1 (SIHP No. -5717), Facing West.

Two 50-cm-by-50-cm Shovel Probes (SP-7 and SP-8) were excavated within the bedrock overhang. No cultural materials were observed in excavation.

Feature 2: Modified Outcrop-Rock Retaining Wall/Terrace

Feature 2 is a modified overhang, consisting of bedrock outcrop on the west and an associated retaining wall forming a terraced area at its opening (Figure 15). No internal modification of the ground surface within the overhang was observed. The feature is located along the west edge of a small gully, and the area is heavily vegetated. A second modified bedrock overhang (Feature 1) is located immediately adjacent to the southeast. The overhang at Feature 2 is approximately 6.00 m in length by 3.50 m in depth, with a maximum height of 77 cms. The level, terraced area in front (east) of the opening of the overhang measures approximately 5.0 sq. m. The rock retaining wall that helps create the terraced area is constructed of 2–3 courses of sub-angular to sub-rounded basalt cobbles and small boulders. The wall is approximately 5.00 m long, 1.50–2.00 m wide, and 0.80–1.50 m high. A short section of formal facing is located along the northeast end of the wall. The feature is generally in fair physical condition, having been altered by grazing animals and historic activities.



Figure 15: Feature 2 (SIHP No. -5717), Facing West.

Two 50-cm-by-50-cm Shovel Probes (SP-9 and SP-10) were excavated within the bedrock overhang. No cultural materials were observed in excavation.

Feature 3: Rock Retaining Wall

Feature 3 is a formally-stacked rock retaining wall, which runs along the west bank of a small, intermittent stream (Figure 16). The wall is constructed of 5–7 courses of small, medium, and large boulders. It continues upstream (north) into a patch of extremely heavy vegetation. The wall is approximately 11.5 m long, 1.00–1.50 m wide, and 0.40–1.20 m high. The ditch continues up hill, well beyond the existing limits of the retaining wall. Some additional rock features, possibly representing badly degraded terraces, are located upslope of the wall. This feature appears to be part of an old *`auwai* system, long since abandoned. The retaining wall appears to be a formalization of the naturally-occurring drainage. The feature is in relatively poor physical condition, having been altered by grazing animals and historic activities.

No subsurface testing was conducted at this feature.



Figure 16: Feature 3 (SIHP No. -5717), Facing Southwest.

Feature 4: Terrace with Associated Rock Alignments/Stackings

Feature 4 is a terrace with two associated rock alignments/stackings (Figure 17). The latter features appear to be badly degraded, remnant *auwai* components; the terrace is interpreted as a small garden plot. Altogether, this feature covers an area of approximately 50 square meters. The alignments/stackings are severely collapsed in most portions. This poor state of preservation makes field interpretations of these individual sub-features difficult; however, in context with the rest of the features at SIHP No. -5717, these two alignments/stackings are probably formalizations of the naturally-occurring drainage, similar to Feature 3 (above).



Figure 17: Feature 4 (SIHP No. -5717), Facing Northwest.

The U-shaped terrace is approximately 3.40 m long ('front face'), and the level soil area behind (to the northeast of) the terrace is at least 3.80 m wide. The terrace is constructed of large, angular basalt cobbles. The 'front face' (south and west sides) has a maximum height of 48 cms. The two severely degraded alignments/stackings—one to the northwest, and one to the southeast of the terrace—have minimum overall lengths of approximately 4.0 m. The northwest sub-feature has a maximum height of 56 cms.

No subsurface testing was conducted at this feature.

Feature 5: Rock and Soil Mound

Feature 5 is an oval-shaped (plan view) mound constructed of medium and large, subangular and sub-rounded, basalt cobbles in a sedimentary matrix of compacted soil (Figure 18). The surface of the mound is uneven. Maximum dimensions of the mound are: 4.40 m (length), 2.80 m (width), and 20–68 cm (height). Feature 5 is probably associated with another mound (Feature 6), located immediately adjacent to the south-southeast. Several large (old) *kūkui* trees are located between Features 5 and 6.

No subsurface testing was conducted at this feature.



Figure 18: Feature 5 (SIHP No. -5717), Facing Southwest.

Feature 6: Modified Outcrop-Rock and Soil Mound

Feature 6 is a partially-modified bedrock outcrop, built into a large mound constructed of medium and large, subangular and sub-rounded, basalt cobbles in a sedimentary matrix of compacted soil (Figure 19). This outcrop-mound construction, in association with Feature 11, creates another ‘formalized’ drainage representing a portion of the ruins of the *auwai* system that was once located in the project area. Maximum dimensions of the mound are: 5.10 m (length), 3.80 m (width), and 20–70 cm (height). Some formalized rock stacking (up to 60 cm) is present in the northern portion of Feature 5, forming a clearly recognizable channel-like depression with Feature 11. This portion of SIHP No. -5717 is probably relatively intact, and



Figure 19: Feature 6 (SIHP No. -5717), Facing Southwest.

reflective of the features' original form and function. Feature 6 is probably associated with another mound (Feature 5), located immediately adjacent to the north-northwest. As stated, several large (old) *kūkui* trees are located between Features 5 and 6.

No subsurface testing was conducted at this feature.

Feature 7: Modified Channel-Partially Defined by Rock Stacking

Feature 7 is a modified channel, partially defined by rock stacking (Figure 20). This feature is likely another portion of the *auwai* system that was once located in the project area. The rocks are formally stacked on the north portion of this feature: sub-angular and sub-rounded basalt pebbles and cobbles are located on a sloped face of the natural alluvial channel. The feature is partially stacked, but mostly collapsed (tumbled), in its east portion. Maximum dimensions of the mound are: 11.10 m (length), 2.85–3.10 m (width), and 60–70 cm (height).

Subsurface charcoal concentrations were observed in a naturally-eroding bank of a portion of the remnant *auwai* designated Feature 7 (Figure 21). The charcoal was located under the boulders and cobbles used to formalize this probable irrigation drainage. The rock ('architectural') layer was exposed between 20–50 cmbs. One well-defined charcoal lens was



Figure 20: Feature 7 (SIHP No. -5717), Facing Northeast, With Naturally-Eroding Face.

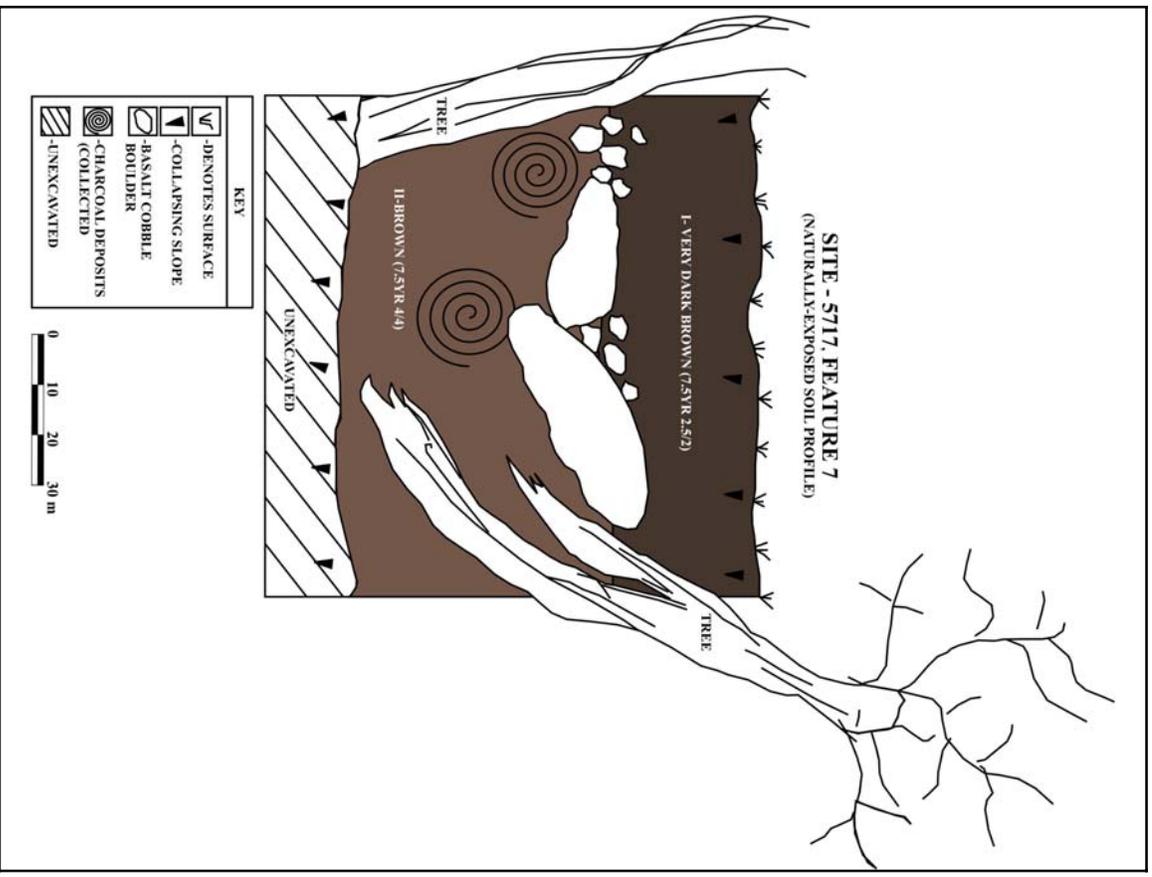


Figure 21: Soil-Stratigraphic Profile of Eroding Face of Feature 7 (*Aiawai*) (SIHP No. -5717).

located between 35–55 cmbs; a second well-defined charcoal lens was located between 45–65 cmbs. A single sample from 30–40 cmbs was submitted for radiocarbon dating, yielding a result of 190±60 BP.

SUBSURFACE TESTING

Stratigraphic Trenching

A total of fourteen Stratigraphic Trenches (ST-1 through ST-14) were excavated to bedrock (Table 5). The trenches were positioned randomly throughout the project area, in order to sample the soil-stratigraphic record (see Figure 4). Trenching exposed a total of 62.03 linear meters (203.5 ft.) of subsurface deposit. A 65-cm-wide backhoe bucket was used. Depth of excavation ranged from 10–138 cmbs (4.0–54.3 in.). Not counting ST-2, where bedrock was reached (and excavation terminated) at 10 cmbs, average depth of excavation was 94.2 cmbs (37.1 in.). Total excavated area was 40.32 square meters. Approximate total excavated volume was 38.0 cubic meters.

Table 5: Summary of Stratigraphic Trenching in the Project Area.

Trench No.	Length (m)	Width (cm)	Depth (cm)	Orientation ¹	Findings and Comments
1	5.90	65	91	140/320	None
2	5.20	65	10	65/245	None
3	4.50	65	58	120/300	None
4	4.20	65	72	4/184	SSF-1 (charcoal lens) between 10-20 cmbs; collected as bulk sample
5	5.23	65	75	144/324	None
6	3.40	65	118	50/230	None
7	4.25	65	112	60/240	Bottle glass (olive-green body sherd) recovered in backfill
8	4.75	65	138	113/293	<i>All surface finds:</i> 1 edge-altered basalt flake tool, 1 basalt debitage, 1 piece of coral, 1 piece of <i>kukui</i> , 1 (light blue) bottle glass (body sherd), 1 porcelain rim sherd (exterior and interior glazed black); all collected
9	3.70	65	135	118/298	None
10	4.40	65	105	164/344	None
11	4.30	65	70	144/324	None
12	4.00	65	50	40/220	None
13	4.00	65	65	148/328	None
14	4.20	65	135	60/240	1 edge-altered basalt flake (recovered in backfill)

¹ Degrees E of N (True).

No significant artifacts, features, and/or sites were documented in the trenches. No human remains and/or possible burial features were documented. One subsurface charcoal lens was located in ST-4. Although it was collected as a bulk sample, and returned to the SCS laboratory, the feature was relatively shallow (between 10–20 cmbs), was not associated with

any artifacts and/or midden, and was therefore not subjected to radiocarbon dating. An isolated historic artifact (bottle glass) was found in the backfill of ST-7. An isolated artifact (edge-altered basalt flake) was found in the backfill of ST-14 (Figure 22). Traditional and historic artifacts were recovered from the ground surface at ST-8 (see Table 5), but no subsurface artifacts or features were documented.

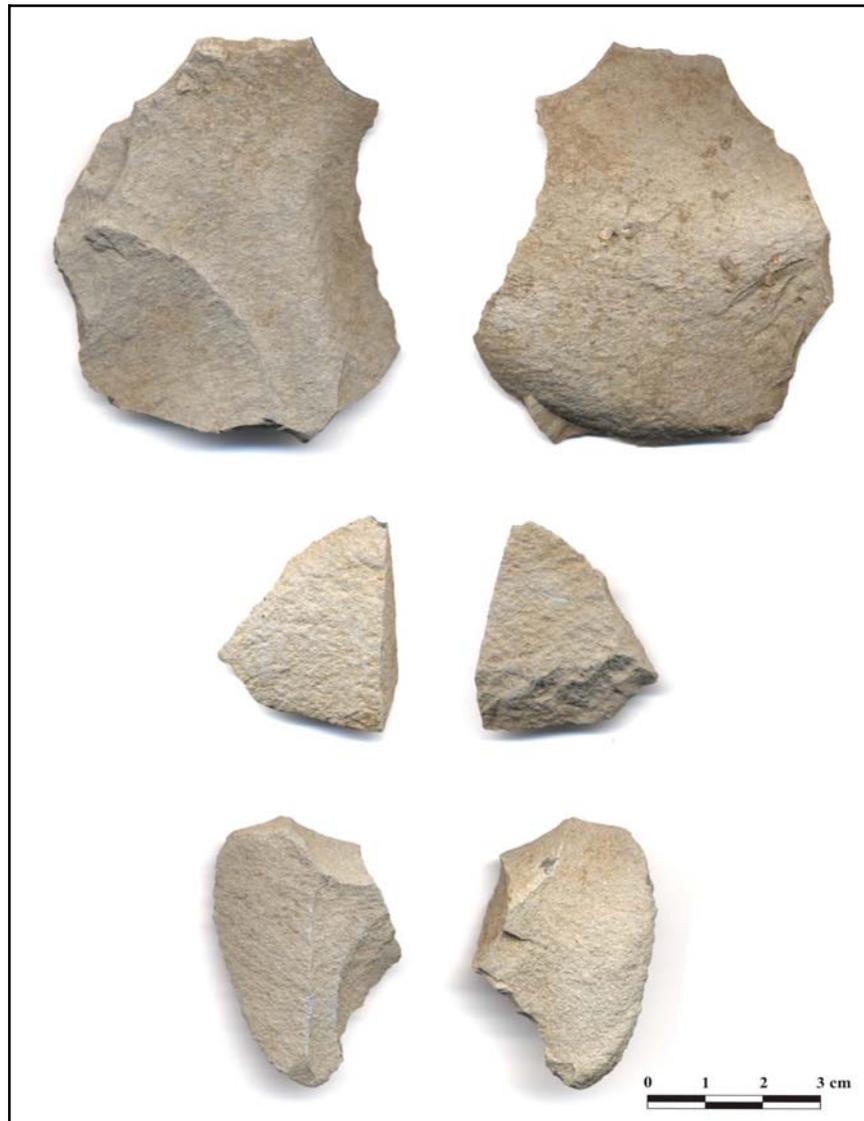


Figure 22: Basalt Flakes Recovered from the Surface of ST-8, and in the Backfill of ST-14.

Some of the trenches can be grouped together, for the purposes of describing their general soil-stratigraphic properties (Figures 23 and 24). Unless stated otherwise, none of these layers contained cultural materials, including midden, and none contained charcoal.

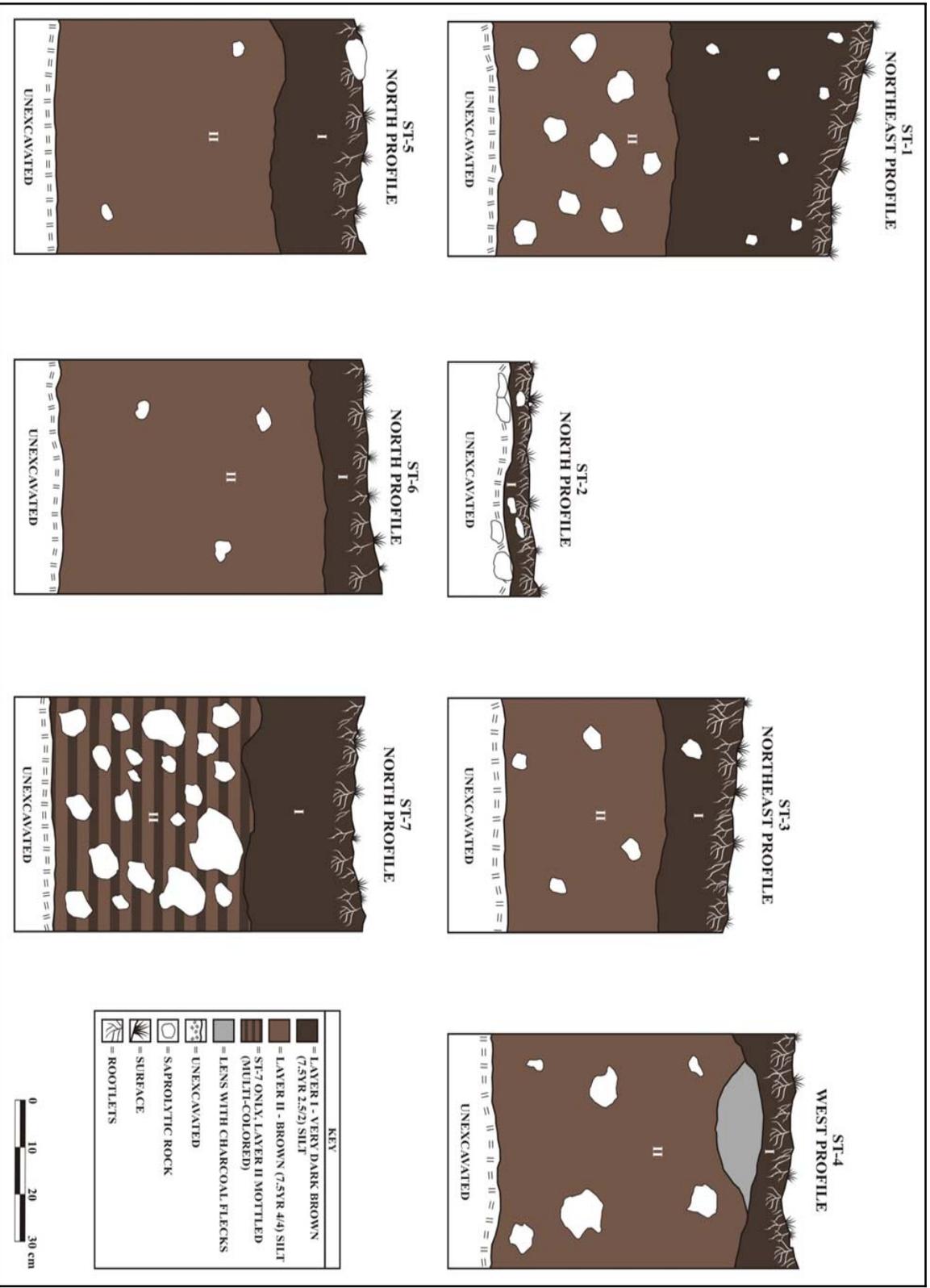


Figure 23: Soil-Stratigraphic Profiles, ST-1 Through ST-7.

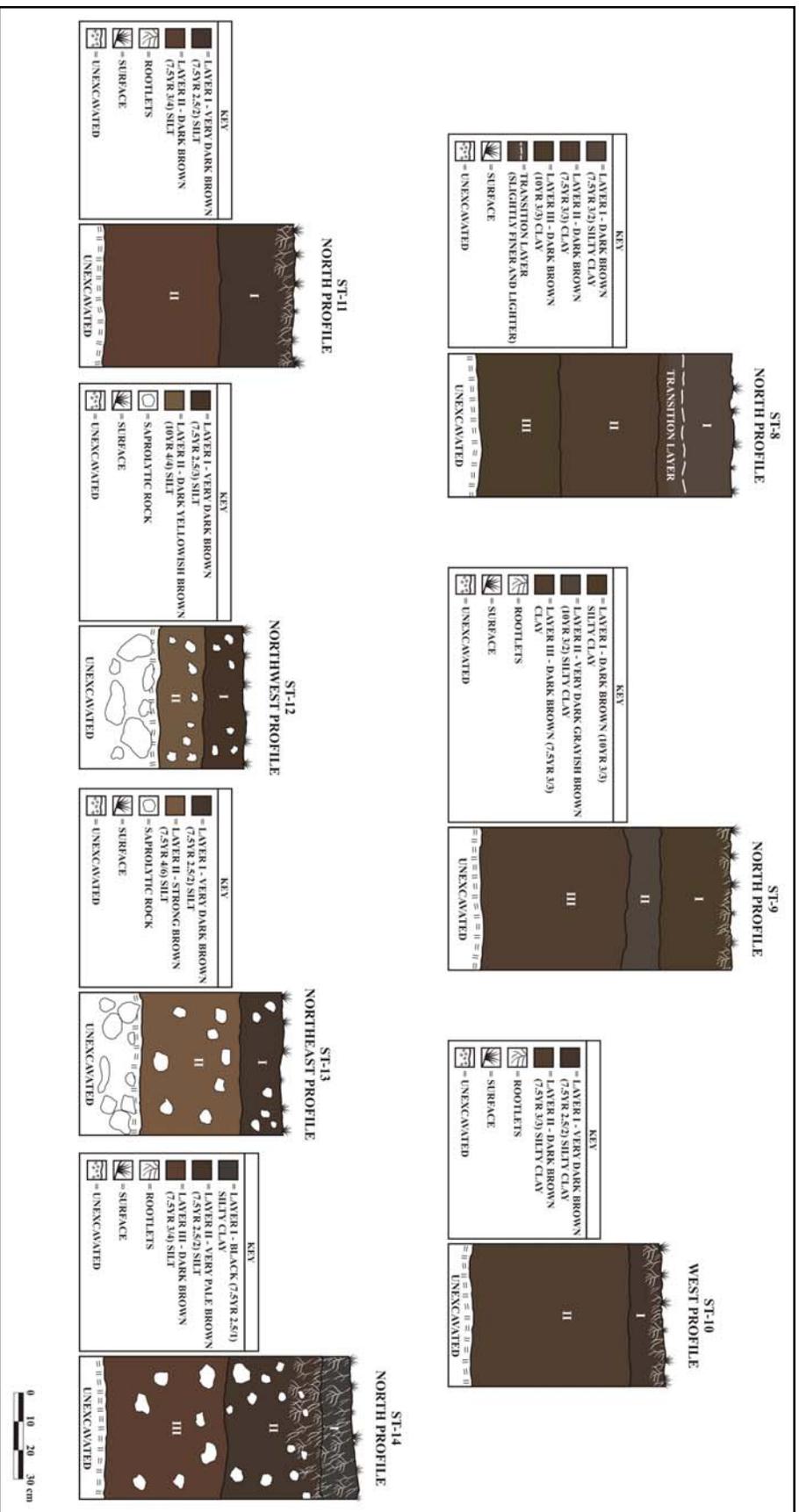


Figure 24: Soil-Stratigraphic Profiles, ST-8 Through ST-14.

ST-1 Through ST-6 and ST-11 Through ST-13

ST-1 through ST-6 and ST-11 through ST-13 consisted of two main sedimentary layers (Figures 25 through 33):

- Layer I: Very dark brown (7.5YR 2.5/2, 2.5/3) silt, varying in thickness from 5–50 cm, including the present ground surface; occasional pebbles and cobbles of saprolytic (decomposing bedrock) rock. Roots and rootlets are common.
- Layer II: Brown (7.5YR 4/4), dark yellowish brown (10YR 4/4), or strong brown (7.5YR 4/6) silt, varying in thickness from 16–50 cm; high proportion of pebbles, cobbles, and small boulders of saprolytic (decomposing bedrock) rock. Roots and rootlets are present, but not common. This layer rests directly on the bedrock.

ST-7

ST-7 (Figure 34) consisted of the same two basic sedimentary layers described above (for ST-1 through ST-6 and ST-11), excepting the mottled (three-color) appearance of Layer II, which was brown (10YR 4/4), yellowish red (5YR 4/6), and yellowish brown (10YR 5/6). This color variation represents natural, saprolytic weathering of the parent material (bedrock). Layer II rests directly on the bedrock.

ST-8

ST-8 (Figure 35) consisted of two main sedimentary layers with a subsurface disconformity (a band of slightly finer and lighter sediment) occurring within the upper, Layer I:

- Layer I: Dark brown (7.5YR 3/2, 3/3) silty clay, 93-cm thick, including the present ground surface; rocks are rare; roots and rootlets are few. A slightly finer and lighter-colored band of sediment occurs between 25–35 cmbs, but no cultural materials, midden, or charcoal was found.
- Layer II: Dark brown (10YR 3/3) clay, 45-cm thick; occasional pebbles, cobbles, and small boulders of saprolytic (decomposing bedrock) rock. Roots and rootlets are present, but not common. This layer rests directly on the bedrock.



Figure 25: Overview, ST-1, Facing Northeast.



Figure 26: Overview, ST-2, Facing Southwest..



Figure 27: Overview, ST-3, Facing West.



Figure 28: Overview, ST-4, Facing West.



Figure 29: Overview, ST-5, Facing North.



Figure 30: Overview, ST-6, Facing Southwest.



Figure 31: Overview, ST-11, Facing Northwest.



Figure 32: Overview, ST-12, Facing Southwest.



Figure 33: Overview, ST-13, Facing Northwest.



Figure 34: Overview, ST-7, Facing Southwest.



Figure 35: Overview, ST-8, Facing West.

ST-9

ST-9 (Figure 36) consisted of three main sedimentary layers:

- Layer I: Dark brown (10YR 3/3) silty clay, 35-cm thick, including the present ground surface; rocks are rare; roots and rootlets are few.
- Layer II: Very dark grayish brown (10YR 3/2) silty clay, 20-cm thick; saprolytic (decomposing bedrock) rocks are rare; roots and rootlets are present, but not common.
- Layer III: Dark brown (7.5YR 3/3) clay, 74-cm thick, saprolytic (decomposing bedrock) rocks are rare; roots and rootlets are present, but not common. This layer rests directly on the bedrock.

ST-10

ST-10 (Figure 37) consisted of two main sedimentary layers:

- Layer I: Very dark brown (10YR 2.5/2) silty clay, 17-cm thick, including the present ground surface; rocks are rare; roots and rootlets are common, but not abundant.



Figure 36: Overview, ST-9, Facing North.



Figure 37: Overview, ST-10, Facing North.

- Layer II: Dark brown (7.5YR 3/3) silty clay, 92-cm thick; saprolytic (decomposing bedrock) rocks are rare; roots and rootlets are present, but not common. This layer rests directly on the bedrock.

ST-14

ST-14 consisted of the same two main sedimentary layers described for ST-1 through ST-6 and ST-11 through ST-13, with an additional upper (ground surface) layer of black (7.5YR 2.5/1) silty clay with abundant roots and rootlets (Figure 38). This is a recent-modern anthropogenic deposit.



Figure 38: Overview, ST-14, Facing Northeast.

Shovel Probes

As summarized in Tables 3 and 4 (above), a total of ten Shovel Probes (SP-1 through SP-10) were excavated to bedrock at five traditional surface features. Features 1–3 at SIHP No. -5716, all of which are modified outcrops with terraced (level) soil areas thought to represent traditional, temporary habitations, were tested. Features 1–2 at SIHP No. -5717, both of which are modified outcrops with terraced (level) soil areas thought to represent traditional, temporary

habitations, were tested. The 50-cm-by-50-cm units were excavated in order to document any cultural deposits that might help date these stacked-rock terraces, enclosures, walls, and alignments. As stated above, none of these shovel probes yielded any significant cultural deposits. The following notes on the Shovel Probes are derived from the field observations of the excavator, Ian Bassford.

SP-1

SP-1 was excavated at SIHP No. -5716, just inside the dripline of Feature 1. SP-1 was excavated to 22 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-2

SP-2 was excavated at SIHP No. -5716, just outside of the dripline of Feature 1. SP-2 was excavated to 13 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-3

SP-3 was excavated at SIHP No. -5716, within the level soil area designated Feature 2. SP-3 was excavated to 18 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-4

SP-4 was excavated at SIHP No. -5716, within the level soil area designated Feature 2. SP-4 was excavated to 20 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-5

SP-5 was excavated at SIHP No. -5716, within the level soil area designated Feature 3. SP-5 was excavated to 22 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-6

SP-6 was excavated at SIHP No. -5716, within the level soil area designated Feature 3. SP-6 was excavated to 11 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-7

SP-7 was excavated at SIHP No. -5717, inside the dripline of Feature 1. SP-7 was excavated to 27 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered .

SP-8

SP-8 as excavated at SIHP No. -5717, inside the dripline of Feature 1. SP-8 was excavated to 29 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-9

SP-9 was excavated at SIHP No. -5717, within the level soil area designated Feature 2. SP-9 was excavated to 27 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SP-10

SP-10 was excavated at SIHP No. -5717, within the level soil area designated Feature 2. SP-10 was excavated to 37 cmbs (bedrock), in a single, natural, stratigraphic layer of very dark brown (7.5YR 2.5/2, 2.5/3) silt. No cultural materials were recovered.

SIGNIFICANCE ASSESSMENTS

Two sites were documented in the project area during Archaeological Inventory Survey at TMK: (2) 1-6-008: 001 (portion) (Table 6).

Table 6: SIHP Sites Documented During Inventory Survey in the SUP.

SIHP No.	No. of Fea.	Formal Description	Site Size (Area)	Functional Interpretation	Temporal Designation
-5716	4	Modified Outcrops; Stacked-Rock Terraces, Walls, and Enclosures	9,600 sq. ft.	Temporary Habitation	Later Pre-Contact/Early Historic
-5717	7	Modified Outcrops; Stacked-Rock Terraces, Walls; and, <i>'Auwai</i> Features	3,200 sq. ft.	Temporary Habitation; and <i>'Auwai</i>	Later Pre-Contact/Early Historic

The sites have been evaluated for significance according to the criteria established for the State and National Register of Historic Places. The five criteria are listed below:

- Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion B: Site is associated with the lives of persons significant to our past;
- Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction;
- Criterion D: Site has yielded or has the potential to yield information important in prehistory or history;
- Criterion E: Site has cultural significance; probable religious structures or burials present (State of Hawai`i criteria only).

State Site 50-50-17-5716

This traditional site consisting of four traditional, temporary habitation features (including modified bedrock overhangs/outcrops) is significant under criterion D.

State Site 50-50-17-5717

This traditional site consisting of seven traditional, temporary habitation and remnant `auwai features is significant under criterion D.

RECOMMENDATIONS

No further archaeological work is recommended at these two sites, which have been adequately documented and investigated. The remnant `auwai (which are features of SIHP - 5717), in particular, have previously been severely degraded and disturbed by historic activities. The modified bedrock overhangs of both SIHP No. -5716 and -5717 have now been adequately tested (excavated) for cultural deposits. Other than the stacked rock features, there is no evidence—including subsurface traces—of human occupation of these modified overhangs (*e.g.*, midden, portable artifacts). These sites probably represent a marginal component of a once-thriving, and much larger, traditional habitation/agricultural zone.

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APPENDIX A LCA DATA



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Number: 06230*M

Claim Number:	06230*M		
Claimant:	Kuakini, J.A.		
Other claimant:			
Other name:			
Island:	Maui		
District:	Kipahulu		
Ahupuaa:	Maulili		
Ili:			
Apana:	1	Awarded:	1
Loi:		FR:	
Plus:		NR:	260v5
Mala Taro:		FT:	
Kula:		NT:	455v10
House lot:		RP:	3597
Kihapai/Pakanu:		Number of Royal Patents:	1
Salt lands:		Koele/Poalima:	No
Wauke:		Loko:	No
Olona:		Lokoia:	No
Noni:		Fishing Rights:	No
Hala:		Sea/Shore/Dunes:	No
Sweet Potatoes:		Auwai/Ditch:	No
Irish Potatoes:		Other Edifice:	No
Bananas:		Spring/Well:	No
Breadfruit:		Pigpen:	No

Coconut:	Road/Path:	No
Coffee:	Burial/Graveyard:	No
Oranges:	Wall/Fence:	No
Bitter Melon/Gourd:	Stream/Muliwai/River:	No
Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals: No	Miscellaneous:	entire ahupua`a

**No. 6230*M, J.A. Kuakini, Honolulu, February 5, 1848
N.R. 260v5**

Greetings to the Land Commissioners: Here is my claim on the Island of Hawaii in the land of Puua Fifteen salt ponds, three fish ponds; one mo`o of lauhala trees and one coconut grove are at Wainana my claim, which was from the Makuas, to myself at this time.
J.A. KUAKINI

John A. Kuakini's share of land at Maulili, Ahupua`a of Kipahulu, Maui. It is possible to quiet the title.
L.P. KALAMA, Secretary
Royal Palace, February 3, 1848

N.T. 455v10
No. 6230, J.A. Kuakini, 17 February 1855

Maulili ahupuaa, Kipahulu, Maui.
I, hereby approve this distribution, it is good, the land noted above is for J.A. Kuakini, Jr. and permission has been granted to present it before the commissioners who settle land claims.
(sign) Kamehameha
True copy from Mahele Book
S. Spencer, Royal Palace, 3 February 1848

[Award 6230; R.P. 3597; Maulili, Kipahulu; 1 ap. ahupua`a]

Number: 10568

Claim Number:	10568
Claimant:	Oleloa, wahine
Other claimant:	
Other name:	
Island:	Maui
District:	Kipahulu, Lahaina
Ahupuaa:	Kakanoni, Puunau

Ili:		
Apana:	Awarded:	1
Loi:	FR:	
Plus:	NR:	524v6
Mala Taro:	FT:	127v7
Kula:	NT:	166v10
House lot:	RP:	1675,1862
Kihapai/Pakanu:	Number of Royal Patents:	2
Salt lands:	Koele/Poalima:	No
Wauke:	Loko:	No
Olona:	Lokoia:	No
Noni:	Fishing Rights:	No
Hala:	Sea/Shore/Dunes:	No
Sweet Potatoes:	Auwai/Ditch:	No
Irish Potatoes:	Other Edifice:	No
Bananas:	Spring/Well:	No
Breadfruit:	Pigpen:	No
Coconut:	Road/Path:	No
Coffee:	Burial/Graveyard:	No
Oranges:	Wall/Fence:	No
Bitter Melon/Gourd:	Stream/Muliwai/River:	No
Sugar Cane:	Pali:	No
Tobacco:	Disease:	No
Koa/Kou Trees:	Claimant Died:	No
Other Plants:	Other Trees:	
Other Mammals:	Miscellaneous:	No

No. 10568, Oleloa
N.R. 524v6>

Here is my claim, from the Mo`i. It is Kakanoni Ahupua`a, adjoining Kipahulu, East Maui. It would award it so it would be mine forever.

Here is this claim of land of mine, - six lo`i and one mo`o, two breadfruit trees, and one coconut tree
OLELOA

F.T. 127-128v7
Cl. 10568, Oleloa Wahine

Napapai, sworn, I know a part of claimant's land. Those which I know are in "Paunau," akalu [ekolu consists of two pieces, one of kula land, and the other a kula and kalo land.

The claimant received this land from the King in 1837 and her rights have never been disputed.

The kula land is bounded:

Mauka by Ohule's land

Olowalu by the poalima of Kapu

Makai by Ohule

Kaanapali by the creek of "Polaiki.

The kalo and kula land is bounded:

Mauka by Ohule's land

Olowalu by the creek of Pahoa

Makai by Paunau elua

Kaanapali by Kuwaa's land.

The claimant produced in evidence a paper showing that at the recent division there was given to her King an Ahupuaa of land in Kipahulu, Maui called "Kakanoni" (See the Book in Mr. Young's Office

See 166 page volume 10.

N.T. 166v10

No. 10568, Oleloa, (from page 127, Vol. 7), 19 October 1852

Oleloa's land as listed in the Mahele Book, Kakanoni, an ahupuaa, Kipahulu, Maui, Minister of Interior
19 October 1852

True Copy

A.G. Thruston, Secretary K.K.

[Award 10568; R.P. 1675; Kakanoni Kipahulu; 1 ap.; 50 Acs; R.P. 1862; Puunau Lahaina; 2 ap.; .8

APPENDIX B RADIOCARBON DATA

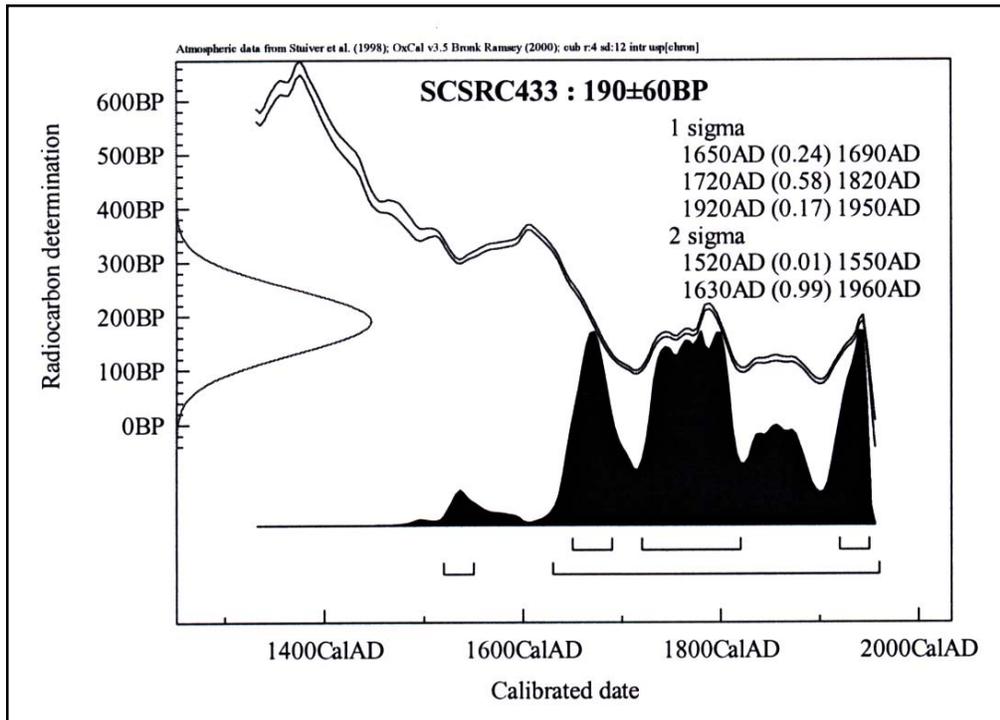
Dr. Robert L. Spear

Report Date: 7/28/2005

Scientific Consultant Services, Inc.

Material Received: 6/24/2005

Sample Data	Measured Radiocarbon Age	$^{13}\text{C}/^{12}\text{C}$ Ratio	Conventional Radiocarbon Age(*)
Beta - 206267 SAMPLE : SCSRC-433 ANALYSIS : Radiometric-Standard delivery MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid 2 SIGMA CALIBRATION : Cal AD 1530 to 1550 (Cal BP 420 to 400) AND Cal AD 1630 to 1950 (Cal BP 320 to 0)	200 +/- 60 BP	-25.9 o/oo	190 +/- 60 BP



APPENDIX C LABORATORY ANALYSIS

PROJECT 575 COLLECTED MATERIAL INVENTORY

FIEL D BAG	SIT E	UNI T	FEATUR E	LAYE R	DEPTH	COLLECTE D MATERIAL	MEASUREMENT S	COUN T
1	TS-1	ST-4	SSFE-1	-	-	Charcoal	0.1 grams	-
1	TS-1	ST-4	SSFE-1	-	-	Soil	≈ 226.8 grams	-
2	TS-1	ST-7	-	Backfill	-	Bottle Glass Body Sherd	-	1
REMARKS: Olive green								
3	TS-1	Near ST-8	-	Surface	-	Coral	40.9 grams	8
REMARKS: Non-worked								
3	TS-1	Near ST-8	-	Surface	-	<i>Kukui</i>	5.9 grams	-
3	TS-1	Near ST-8	-	Surface	-	Bottle Glass Body Sherd	-	1
REMARKS: Light blue								
3	TS-1	Near ST-8	-	Surface	-	Porcelain Rim Sherd	-	
REMARKS: Exterior and interior glazed black								
3	TS-1	Near ST-8	-	Surface	-	Edge Altered Basalt Flake	-	1
3	TS-1	Near ST-8	-	Surface	-	Basalt Debitage	-	1
4	TS-1	ST-14	-	Backfill	-	Charcoal	3.6 grams	-
4	TS-1	ST-14	-	Backfill	-	Edge Altered Basalt Flake	-	1
5	TS-1	*	10	II	30–40 cmbs	Charcoal with Matrix	143.1 grams	-

* Not obtained from archaeological excavation; sample obtained from stream bank erosional face.

PROJECT 575 TRADITIONAL ARTIFACT INVENTORY

FIELD BAG	SITE	UNIT	LAYER	COLLECTED MATERIAL	COUNT
3	TS-1	Near ST-8	Surface	Edge Altered Basalt Flake	1
3	TS-1	Near ST-8	Surface	Basalt Debitage	1
4	TS-1	ST-14	Backfill	Edge Altered Basalt Flake	1

* Not obtained from archaeological excavation; sample obtained from stream bank erosional face.

H. HARDWOOD LUMBER MARKET ANALYSIS

Hardwood Lumber and Wood Product Market Analysis for Hawaii

or

Hawaii Hardwood Market Study

for

The State of Hawaii

Department of Land and Natural Resources

by

Hawaii Agriculture Research Center

Nicklos S. Dudley

&

JQuinn Company

James E. Quinn

December 9, 2004

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Executive Summary:

The market for higher value hardwood products in Hawaii is increasing significantly and consistently as it is in most areas of the country. Most of the high value applications are in hardwood flooring, furniture, cabinetry and other fixtures including doors, windows and moldings. The usage of high value or “appearance” type woods is focused largely in upper end housing and in repairs and remodeling.

Virtually all of the companies and individuals that were interviewed in this study expressed recognition of the demand for Hawaiian grown woods in the market place. Essentially all of the respondents also reported that the principal reasons for the relatively small amount of product in the marketplace are (1) inconsistent supply and (2) inconsistent quality. The inconsistency of supply comes about from the lack of committed resource to the potential producers. The inconsistencies in quality are predominantly the result of lumber drying issues, limited technology, lack of competitive processing facilities and the tendency for producers to force lower grade materials into the sales mixture to achieve the volume and additional revenue that is needed to survive as a business.

It has proved to be very difficult to capture a totally accurate number for hardwood imports. This is due to protection of proprietary and competitive information from retailers and distributors and it is also due to gross generalizations in units of measure from shippers. Nonetheless, we have found evidence of wood importation numbers and this is supplemented by selected information from our interviews. The net result being that we believe that total annual hardwood imports are in the range of 7,000,000 to 10,000,000 Board Feet (BF). Additionally, we have opinion inputs and computed equivalents that cause us to believe that high quality locally grown products could displace as much as 2,000,000 board feet per year of this market segment.

The current principal imports from North American temperate hardwoods include Oak, Cherry, Ash, Maple and Poplar. The principal foreign imports are African Mahogany, Genuine Mahogany, Meranti, Teak and several Eucalypts. Weyerhaeuser is promoting Lyptus which is a Brazilian Eucalyptus hybrid with an appearance similar to *E. grandis* (Grandis) and *E. saligna* (Saligna). Generally speaking, the Hawaiian grown Robusta and Saligna display better color and character than does the Lyptus product. The characteristics of the African Mahogany (*khaya nyasica*) appear to be quite similar to Hawaiian grown *Toona ciliata* (Toon), which is not surprising since they are both relatives of the true Mahogany (*Swietenia macrophylla*). It may also be possible to substitute some Hawaiian Eucalypts for African Mahogany if the processing and quality control are improved. Most of the foreign hardwoods are imported into mainland distributors initially and then they are reshipped to Hawaii.

The potential for the development of a significant forest products industry in Hawaii will be influenced to a great extent by the following:

Opportunities:

- ❑ There is a demand for Hawaiian grown woods in the market place.
- ❑ Significant quantities of hardwood lumber are being imported into the State.
- ❑ The demand for distinctive hardwood lumber is increasing.

Constraints:

- ❑ Sufficient sustainable supply of forest resource to ensure economically efficient processing.
- ❑ Inconsistent supply.
- ❑ Inconsistent manufacturing quality.
- ❑ Underdeveloped infrastructure for forest product processing.

Recommendation:

The limited amount of Hawaiian hardwood products that currently enter the marketplace display the potential to be as good as, or better than, many similar species from other areas. The State forest reserves possess the largest mature inventory of such timber. These stands of non-native species such as Robusta and Saligna also appear to possess the potential for very high quality “appearance grade” lumber.

The process of replacing imported hardwood lumber with locally grown and processed Hawaiian lumber is occurring now, however the scale is very limited. Presently, the demand for hardwood products exceeds the locally produced supply. For this imbalance to change several critical factors must be addressed. These factors are:

- ❑ Sufficient sustainable supply of forest resource to ensure economically efficient processing.
- ❑ Properly sized manufacturing facilities to match resource availability.
- ❑ Strong commitment to the technical issues of product quality.
- ❑ Effective marketing which will place high-value end use products in the market place.

The market for certified forest products is increasing in the US and in most other countries. Certification, particularly under the Principles and Criteria of the Forest Stewardship Council (FSC), carries with it the benefit of priority selection in the market and in some cases a premium over non-certified products. It also provides a generally effective means for social and environmental acceptance of proactive timberland management. FSC certification could enhance the access to forest resources in State forest reserves and ensure sustainable timber supply.

Introduction:

There are well-established markets within and outside of Hawaii for lumber products from native Koa. Currently there are no substantial sales of the products from introduced species that represent the largest mature timber inventory in the state. These introduced species include *Eucalyptus robusta* (Robusta) and *Eucalyptus saligna* (Saligna). Where these species grow in other regions of the world, there is evidence that they can be converted to good quality products. In Hawaii, however, converting these species to useful products has proved to be elusive, at best. There are no current converters of timber to solid wood products who can operate in a manner that would lead to competitively priced products in the open market. Those who are processing Eucalyptus are doing so at extremely low prices for the raw material, which means that they only process lumber when a free or nearly free log is available. Therefore, there is neither any consistency in the supply nor any way to build a business on repetitive orders. A draft report for the Hawaii Forest Industry Association entitled “The Economic Value of Hawaii’s Forest Industry in 2001” estimates the revenue to be approximately \$30,700,000. Meanwhile, products are being imported into Hawaii from nearly identical wood species.

Because of the lack of competitive primary forest products processing, the absence of markets for by-products in the State and the challenges of achieving access to a sustaining supply of timber, nothing has happened to elevate these excellent resources into higher value products and to provide a nucleus for sustainable forest product development. Any potential investor or entrepreneur must have finite information on the scope of the market for the products that can come from the primary mature eucalyptus timber volume. The information that is being requested by the Division of Forestry and Wildlife should prove to be of critical and significant value in the creation of a sustainable forest products industry in Hawaii.

This study was commissioned by the Division of Forestry and Wildlife of The Department of Land and Natural Resources (DLNR) because of their interest in increasing the proportion of locally grown hardwood

lumber used in the hardwood lumber “economy” of Hawaii. To begin addressing this goal, the Department has asked for an evaluation of the consumption, importation, local production, quality assessment and other features that can lead to a better understanding of the scope or scale of opportunity that may exist in the Hawaiian market place for locally produced hardwoods. In pursuit of this goal, the Department has asked specifically that the following areas be addressed:

- A. *Interviews and data collection. Conduct interviews with various organizations and concerns to collect data regarding annual hardwood production and consumption in Hawaii*
- B. *Hardwood lumber volumes and distribution channels. Separately for both Hawaii-produced and imported solid hardwoods.*
 1. *Quantify annual solid hardwood lumber sold into Hawaii*
 2. *Breakdown by industry, lumber type/dimensions, retail versus wholesale, and species.*
- C. *Perceptions of locally grown woods. Interview or consult with sellers, processors, architects and consumers of wood to determine knowledge and perceptions of locally grown solid wood products versus comparable imported materials.*
- D. *Scenarios for Expanded Hawaiian Production. Develop analyses or scenarios evaluating how various fraction of imported hardwood could be replaced by locally produced solid hardwood products.*

Methods:

A. Interviews and data collection.

To meet the objectives of this study, a listing of potential contacts was developed through initial interviews with the Department of Business Economic Development and Tourism and with Dave Rinell of Rinell Wood Systems, and with members of the Hawaii Forest Industry Association (Table 1). Additional interviews were held with University of Hawaii Manoa Business Program, Bank of Hawaii, Building Industry Association of Hawaii, and Foreign Trade Zone 9. Field visits were also made to new construction on three major tract home builders on Oahu including Castle & Cooke, Schuler and Gentry. The Internet and library sources were also used to review information that can be associated with hardwood usage trends.

In addition, research was conducted to better understand utilization of hardwoods in the marketplace. This included end-user perceptions of the use of locally grown woods. Finally, based on these findings, scenarios for the expanded production of locally grown and processed hardwoods forest products were developed.

Results:

B. Hardwood lumber volumes and distribution channels.

The assessment of volumes of lumber and the means of distribution have been researched through direct interviews and by accessing published data on imports. Most of the import data is in broad categories that are associated with tariffs. It became necessary to resort to a variety of means of assessment and upon the use of certain critical assumptions and comparisons of usage and applications from nationally published sources. This section of the report describes those methods and their results. First, it is important to recognize certain trends both in Hawaii and in the US, in general.

Over the last several years remodeling and building permit values in Hawaii have generally increased, while forecasts for housing starts have nearly doubled (Table 2). The value of an average new home in Hawaii is comparable to the average home on the mainland (Table 3). Construction methods and land cost vary between

these locations. Nonetheless, it appears that many of the industry wide averages for materials usage that are published for mainland homes could be used for Hawaiian homes as well.

Statistical information on materials usage in an average home on the mainland includes a notable hardwood category (Table 4). However, visits to new tract homes on Oahu did not reveal evidence of such widespread use of solid hardwood lumber. Therefore, we conclude that the major use of high value and appearance grade hardwoods is going to come about primarily in higher market value homes and in the repair and remodeling sector.

1. Quantification of Solid Hardwood Lumber Sold into Hawaii.

Lumber importation data from Matson, The US Corps of Engineers and from Foreign Trade Zone #9 suggest that a large volume of wood comes to Hawaii by barge from other shippers (Table 5). This wood is primarily construction grade lumber and does not contain high-grade hardwoods. All Hawaii distributors of hardwood lumber reported that their material comes in by container via Matson. Therefore, the disparity between the Matson numbers and the Corps of Engineers total wood volumes may be accounted for by the fact that much of the framing lumber arrives in Hawaii via barge shipments while hardwoods will most likely arrive in containers.

Table 6 summarizes the statistical data on imports of tropical hardwoods into Hawaii. Most tropical woods were Teak, Mahogany, Meranti and similar species. These species retail in the range of \$3.00 to \$8.00 per board foot. If we assume an average of \$4.00 per board foot, then the annualized imported volume for 2004 would be approximately 600,000 board feet.

Several of the distribution companies that were interviewed reported imports of all hardwood species volumes in the range of 500,000 to 1,000,000 board feet per year, each. The importation by large retailers such as The Home Depot and Lowes is not readily traceable via the shipping companies. Their displays of flooring products are much heavier to engineered floors than to solid hardwoods. Their sales of rough or semi-finished hardwoods are more likely to be to the shoulder trade (small scale do-it-yourself) than to the commercial millwork and major remodeling activities. Nonetheless, there are at least six distributors and importers that that bringing in lumber in the range of 500,000 board feet or more per year.

The only full time producer of non-native woods in Hawaii is Hal Brauner of Brauner Molding and Millwork in Hilo. Mr. Brauner focuses primarily on hardwood flooring and at least 60% of his production is in varying species of Eucalyptus. We estimate Mr. Brauner's production to be in the range of 100,000 board feet per year. Mr. Brauner has told us that he believes he is only serving about 5% of the potential market for flooring.

Sales of forest products from State of Hawaii forest reserves averaged less than \$50,000 in the 1990's. (Cannarella, 1998)

A report from the International Tropical Timber Organization (Table 7) shows a volume of 1,500,000 cubic meters of tropical woods were imported into the US in 2001 (Market Access of Tropical Timber, March 2003 (see <http://www.itto.or.jp/live/PageDisplayHandler?pageId=203>). One cubic meter contains 424 board feet of lumber. Therefore, the imported volume to the US in 2001 would be 636,000,000 board feet. By comparison, the US production of hardwood lumber in 2004 has been projected by Hardwood Review to be 11,000,000,000 board feet (see Table 8). The total hardwood market in the US could then be estimated to be 11,636,000,000 board feet.

Conversion and Reconciliation of Volumetric Information:

We conducted multiple analyses to estimate annual hardwood consumption in the Hawaii market. These estimates required the use of some assumptions and extensions of base data. The Corps of Engineers waterborne tonnage report is accessible on the internet. This report covers all wood imports but the categories are limited. Matson represents a large portion of the container imports but they too have limited tariff categories and data collection.

- a. In our first analysis we use Corps of Engineers and Matson data assuming an average wood density of 40 pounds per cubic foot and an average of 12 board feet per cubic foot then 381,000 short tons represent 762,000,000 pounds and 19,050,000 cubic feet for a total of 228,600,000 board feet equivalent of lumber.
 - The consumption of softwood lumber in the US in 2004 is being projected by the Western Wood Products Association to be 59,738,000,000 board feet. This would create a ratio of hardwood to softwood of .194.
 - If this ratio is applied to the conversion from shipping weights then the hardwood volume into Hawaii would be $.194 \times 228,600,000$ or 44,348,000 board feet.
- b. Table 10 provides an analysis by Dr. John Shelley of the Matson and COE data that yields an assessed estimate that places the volume in the range of 7,000,000 board feet of higher grade hardwood imports and utilization.
- c. A third calculation was conducted using a percentage of population basis. The population of Hawaii in 2003 has been estimated to be 1,257,608 - which is 0.43% of the US total of 290,809,777. If this ratio is applied to the total hardwood market for the US it will yield a quantity of $.43\% \times 11,636,000,000$ or 50,000,000 board feet.
- d. A fourth approach uses estimates of imports by distributors and large retailers.
 - Let us assume that there are 6 large distributors and 10 big box home centers (The Home Depot, Lowes, HPM etc) who are direct importers of mixed hardwood products. Additionally there are numerous companies and builders who do direct importing for conversion and construction. Then, it is quite possible that the higher value hardwood importation could be in the range of 12,000,000 to 20,000,000 board feet.
 - It is important to realize that an inconsistency of using total production or consumption on the mainland in the ratio indicators is not typical of Hawaii. This is due to construction differences and due to the fact that Hawaii does not possess any substantial wood conversion and exportation business. Much of the wood on the mainland is being converted to products and shipped to other areas. This is not the case in Hawaii.
 - In follow up discussions with selected distributors, retailers and producers we found that most feel the scope of the market to be on the conservative side. Most would instinctively go with a volume that is between 7,000,000 and 12 million board feet of solid and higher grade hardwoods. In summary we believe that total annual hardwood consumption in Hawaii is approximately 10,000,000 board feet.

The current annual consumption of locally grown non-native hardwoods in Hawaii is presently very low. Discussions with several producers on the Big Island (including Hal Brauner at Brauner Molding and Woodworks, Ted Gomes at Honomolino Mill, and Ed Winkler at Winkler Wood Products) yielded the following estimate of wood production on Hawaii Island:

- Koa – 300,000 + to 400,000 BF/Yr
- Ohia – 100,000 to 200,000 BF/Yr
- Mango – 50,000 to 100,000 BF/Yr
- Robusta – less than 100,000 BF/Yr
- Ash, Toon, Saligna, Grandis, Queensland Maple, Silver Oak, Monkeypod, and Chocolate Heart Albizia all less than 25,000 BF/Yr each.

2. Utilization of Hardwoods in the Marketplace.

North American hardwood utilization trends between 1994 and 2000 increased most notably in the hardwood flooring sector (Table 9). By contrast, the largest decrease was noted in the furniture sector. The decrease in lumber going to furniture from US producers is mainly the result of outsourcing of production to Asian countries.

Most distributors are sourcing for millwork and cabinetry shops. Predominant size is 4/4 (60%) with 5/4 and 8/4 following at about 20% each, and the grade is FAS (1)¹ and Select. There is no apparent market for lower grades at this time. Predominant lengths are 8' through 12', heavy to the 12'. Imports from the mainland include the normal US domestic woods such as Oak, Cherry and Poplar. Foreign imports are heavy to African Mahogany. Teak and Honduran Mahogany are also imported. Honduran or "genuine" mahogany is difficult to source. A summary of wholesale prices is shown in Table 10.

Most retailers buy imported wood from distributors. This is due to the shipping and sourcing issues. It is more likely, however, for them to buy local production directly from the producers. Wholesalers and distributors would prefer to have significant routine supplies of local wood to sell to retailers and wood workers if the supply was to be more consistent. Furniture makers, cabinet makers, flooring contractors and other finishing operations are likely to buy imports through distributors and local woods more directly from the producers. This is particularly the case for Koa and Ohia.

A price list from a retailer who deals in both imported and local woods on Hawaii Island is displayed in Tables 11 and 12.

C. Perceptions of locally grown woods.

There was widespread awareness of most of the major Hawaiian woods. Everyone was aware of Koa and it is a niche market heavy to furniture and fixtures. Some are currently using O'hia in various applications from posts to flooring. Numerous groups and individuals have tried Robusta and other nonnative species. Much of the experience with the product has been inferior. Drying has been inconsistent and the quality of the sawing and presentation has been suspect as well. Continuity of sourcing is another issue. Virtually no one has been able to repeatedly supply a quality product in reliable and significant quantities over a prolonged period of time. Even with the problems of the past, the individuals interviewed all expressed interest in trying Hawaiian grown woods when supply and quality issues could be shown to have been solved.

A Leadership in Energy and Environmental Design (LEED) seminar was conducted in Honolulu in 2003 for architects. This seminar was sponsored by the Department of Business and Economic Development and Tourism and by the Certified Forest Products Council. LEED http://www.usgbc.org/leed/leed_main.asp is a program developed by the US Green Building Council. It gives points and ratings for sustainable activities. The use of certified (Forest Stewardship Council / FSC) wood is one means for earning points in LEED. Kim Hum of the Nature Conservancy, James Quinn, Steve Smith and Peter Simmons each gave presentations about Hawaiian wood to the 25 architects in attendance. Samples of four species *Eucalyptus robusta*, *E. saligna*, *E. globulus* and Tropical Ash (*Fraxinus uhdei*) were circulated amongst the attendees. The architects were asked if they would specify these woods in their designs if they knew that it could be supplied regularly. The response was a unanimous yes. Most people who have seen Toon believe that it has great potential if it

¹ FAS is a lumber grade that comes from the National Hardwood Lumber Association. It refers to Firsts and Seconds. Please see Exhibit A for details or visit <http://www.natlhardwood.org>.

could be sourced consistently. Few are aware of tropical ash. Robusta is well appreciated for its potential. This is due primarily to its darker color and the fact that most Robusta that has been harvested is older and therefore more stable. There has not been any significant commercial harvesting of eucalyptus for solid wood products. That which has been logged has come in many cases from over-mature timber from roadside rights of way and other more urban extraction. Most of this has been Robusta. Saligna/Grandis will require more extensive marketplace development work because the color is a bit lighter and the species have not been as available for processing and are not as well known in the marketplace at this time.

D. Scenarios for Expanded Hawaiian Production.

It will be extremely important to solve the continuity of supply and the lumber drying and other processing issues for any significant expansion of Hawaiian production. It will then be critical that the improved quality is effectively displayed to potential buyers and distributors. There will need to be a multi-phased approach to the development of expanded production. Determination of accessible and sustainable forest resources is a must. A well designed and coordinated study for the assessment of variation of wood quality and yield for a variety of species and tree sizes will be of great assistance in projecting the opportunities for marketing these species.

In the next phase, it will be important to install and effectively operate a lumber drying facility that will ensure that the wood reaches 160 degrees F for 75 minutes during the kiln schedule. This may require the introduction of totally new and different technology to Hawaii. Another key ingredient will be the adaptation to or definition of product grades. There are standard lumber grades for hardwoods under the National Hardwood Lumber Association. These rules have not been used in totality with Hawaiian products. This is because most of the business has been with Koa and there are special features for Koa that transcend standardized grading rules. Flooring will need to be a major product for the utilization of Eucalyptus. This will in turn require a fairly significant investment in finishing equipment such as molders and end matchers. Some semi finished lumber will be marketable into the millwork and furniture markets in Hawaii and abroad. To achieve optimal utilization of mill equipment and maximize economic return, it will be necessary to export some product to the US mainland or to Asia.

Distributors that we interviewed in Hawaii expressed a strong interest in locally grown products. They also expressed a strong desire for some form of preferential alignment or exclusive relationship with forest product producer for unique species or product lines. They have all experienced problems in the past with market place confusion. This occurs when the same products that they are trying to distribute will also appear on the market from a different direction such as a direct sale from the mill to a retailer or converter. This is a perennial issue in the wood business and one that requires careful handling by all producers.

Ramping up a business can be a very costly experience. Pre-marketing will be very helpful in the early phases of expanded production. One suggestion presented by one of the marketing survey respondents during this study was to conduct tours and educational sessions with architects, distributors and retailers to display the resource and the technology for the new forest products production business. This process would enable end-users to become familiar with this Hawaiian produced product line. The anticipated result would be that end-users would start to consider substituting Hawaii grown and produced forest products with products that are now imported.

Summary remarks, conclusions and recommendations:

- ❑ There is an increasing demand for solid hardwood products for appearance applications nationally and survey conclusions indicate the same for Hawaii. The largest opportunity could materialize in hardwood flooring.
- ❑ There is a reasonably good awareness of the beauty and potential for Hawaiian grown woods, but the requests for products cannot be met by current producers.
- ❑ Koa supply is at a level that existing smaller scale operations can satisfy the current demand and maintain good economics even though mill efficiencies are not globally competitive.
- ❑ There have been problems in quality and consistency of supply of non-native but locally grown woods.
- ❑ The largest inventory of timber appears to be in the form of Grandis, Saligna and Robusta.
- ❑ The Hawaiian grown eucalypts appear to have the potential to display superior characteristics and qualities to related species from imported sources.
- ❑ It is extremely important to focus any industry efforts in Hawaii on the upper end products that can be differentiated in the market place by their appearance, value and usefulness. Koa does this now. Several of the non-native species can also be elevated in this market by displacing other imports. It will be important to focus marketing efforts on applications that do not disrupt or denigrate the Koa reputation.
- ❑ Forest Certification for the State forest reserves should be investigated. Certification carries with it the developing benefit of priority selection in the market and in some cases a premium over non-certified products. It also provides a generally effective means for social and environmental acceptance of proactive timberland management. This could enhance the access to forest resources in State forest reserves and ensure sustainable timber supply.
- ❑ The State of Hawaii statewide experimental forest and forest reserves appear to possess the highest concentration of Grandis, Saligna and Robusta when considering all the major land owners.
- ❑ The future for the development of a larger forest products industry lies with the successful processing and marketing of mature and over-mature eucalyptus into the highest value products possible.
- ❑ There does not appear to be enough inventory of timber in Hawaii to allow commodity type products to be competitive with imports from more sizeable resource bases and higher capital and more efficient operations.
- ❑ Creation of a larger scale operation and more employment opportunity in the state will require a continuous supply of timber.
- ❑ There are questions to be resolved on the potential yields from the mature eucalyptus trees. Some reports indicate that the hearts of these trees (the original fast growth or juvenile wood) do not exhibit good stability and usefulness.
- ❑ There appears to be a very good opportunity to develop a processing and marketing program which can match with the resource and the local market. It will be imperative, however, to verify sustainable timber inventories, solve the quality and consistency issues, and find uses for low grade portions of the timber.
- ❑ Finally, it is going to be important to take the resource to its highest potential value. This will require some portions of the wood to be sliced into veneers for paneling and overlaid moldings and trim.

References:

Cannarella, R. 1998. Forest Industry In: Atlas of Hawaii, Ed. S.P. Juvik and J.O. Juvik., Dept. Geography, Univ. Hawaii, University of Hawaii Press., p249.

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International Tropical Timber Organization (ITTO) – Market Access of Tropical Timber 2004, <http://www.itto.or.jp>

National Association of Home Builders - Housing Facts, Figures and Trends 2004 – <http://www.nahb.org>

State of Hawaii – Data Book - http://www2.hawaii.gov/dbedt/index.cfm?section=READ_Databook445

Draft Report for Hawaii Forest Industry Association “The Economic Value of Hawaii’s Forest Industry in 2001” – University of Hawaii – J.F. Yanagida

Personal Communication

Eric Bello, Bello’s Millwork

Hal Brauner, Brauner Molding and Woodworks

Ted Gomes, Honomolino Mill

Karen Nakamura, Building Industry Association of Hawaii

C. Barton Potter, C. Barton Potter Company

Dave Rinell, Rinell Wood Systems

Steve Rubin, Matson Navigation

John R. Shelley, PhD. Forest Products Laboratory, Richmond, CA

Steve Smith, Hawaii Forest Industry Association

Ed Winkler, Winkler Wood Products

Kent Untermann, Pictures Plus

Table 1
Listing of Contacts

Pacific American Lumber
JE Higgins
Architectural Woods
Honsador
Plywood Hawaii
C.S. Wo
Hardwoods Inc
Eric Bello
Martin and MacArthur
King and Zelko
Hardware Hawaii
Woodcraft
Aloha Wood (Kona)
Rinell Wood Systems
Ed Winkler
Brauner Woodworks
Honolulu Hardwoods

Nine of those listed in Table 1 were contacted and interviewed directly. Individual quotes and data are not always displayed in the report because of the sensitivity to proprietary information and competitive data. Other retailers were visited for assessment of product types being stocked and sold including The Home Depot, Lowes and HPM.

Table 2
Building Permits and Housing Starts:

Number and Value of Building Permits, By Counties (source: The State of Hawaii Data Book 2002 – Table 21.01)

<u>Year</u>	<u>Permits</u>	<u>Estimated Value</u>	<u>Housing starts in Hawaii:</u>
1998	16,058	\$1,054,281	
1999	17,381	\$1,320,218	
2000	19,074	\$1,513,073	
2001	19,466	\$1,585,739	2,300
2002	14,172	\$1,772,027	2,700
2003			4,200
2004			4,500 + Est.
2005			6,000 Est.
2006			6,000 Est.

(estimates are per interviews with Karen Nakamura at Building Industry Association of Hawaii.)

Table 3
Economics of Home Construction

Home prices per square foot:

	<u>Median</u>		<u>Average</u>	
	<u>US</u>	<u>West</u>	<u>US</u>	<u>West</u>
2002	\$70.39	\$82.56	\$75.68	\$89.31
Estimated Value of a 2,272 square foot Single Family Residence:				
	\$159,926	\$187,576	\$171,944	\$202,912
	<i>(Extension of NAHB Data)</i>			
Accepted Value per Housing Unit in Hawaii in 2002 (source DEBDT Data Book 2002 – Table 21.03:				
	\$172,027			

Value of Building Permits by county in Hawaii in 2002 (source: DEBDT Data Book 2002 – Table 21.02):

<u>State</u>	<u>Honolulu</u>	<u>Hawaii</u>	<u>Kauai</u>	<u>Maui</u>
	<i>(Thousands of dollars)</i>			
Residential				
\$1,112,912	\$433,841	\$319,788	\$172,660	\$186,622
Additions and Alterations				
\$404,921	\$319,836	\$36,375	NA	\$48,710

Table 4
Materials Used in Single-Family and Multi-Family Homes:

(Source: National Association of Home Builders)

(note: these are national averages and will not apply directly to Hawaii style buildings)

<u>Item</u>	<u>Single Family</u>	<u>Multifamily</u>
Finished Area: (square feet)	2,272	1,268
Total board feet of framing lumber	13,837	
Cabinets: (number)		
Kitchen	15	11
Vanity	3	2
Other	2	0
Floor Coverings: 2,269 square feet		
Carpet (percent)	63%	60%
Hardwood	11	8
All other	26	33
Doors: (percent)		
Patio Door Materials		
Wood	32%	17%
All other	68	83
Exterior Door Materials		
Wood	18	28
All other	82	72
Windows: (average number)	19	8
Wood - No Clad (percent)	5 %	1%
Wood – Aluminum or vinyl clad	23	16
All other	72	83
Decking: (percent)		
Treated Wood	56	66
All other	44	34
Interior Wall Finish (square feet)	6,050	4,047
Lumber/boards (percent)	0.5	0.7
All other	99.5	99.3
Beams (linear feet)		
Solid wood (percent)	9	11
All other	91	89

Table 5
Import Statistics

Matson

<u>Commodity</u>	<u>10/1/2001 - 9/30/2002</u>		<u>10/1/2002 - 9/30/2003</u>		<u>10/01/03 - 9/30/2004</u>	
	<u>Units**</u>	<u>Pounds</u>	<u>Units**</u>	<u>Pounds</u>	<u>Units**</u>	<u>Pounds</u>
Cabinets	74	1,313,204	64	1,140,480	61	1,073,844
Wooden Shingles	217	6,816,404	194	6,350,396	229	7,865,921
Millwork/Molding/Fencing	13	447,681	19	502,474	39	835,128
Lumber/Plywood/Bldng						
Brd	5,019	222,251,358	5,208	230,792,520	4,431	200,648,897
Engineered						
Wood/Flooring	384	15,111,168	199	7,975,522	147	6,139,896
Wooden Doors	57	867,426	27	395,091	77	931,007
Short tons	5,764	246,807,241	5,711	247,156,483	4,984	217,494,693
		123,404		123,578		108,747

Corps of
Engineers

	<u>Short Tons</u>
Wood in the rough (code 4170)	2,000
Lumber (code 4189)	381,000
Primary Wood Products (code 5540)	28,000

** Units are containers

Notes: Steve Rubin of Matson states that he believes that Matson carries about 2/3rds of the container shipments of the target products of the study.

Table 6
Foreign Trade Zone # 9

Tongue/grooved/Molded – nonconiferous		\$849,395	\$846,519	\$883,047	\$492,811
Sawn, sliced - over 6mm – nonconiferous		\$145,306	\$246,280	\$551,638	\$356,612
Other tropical wood		\$61,704	\$246,644	\$563,650	\$321,492
	Total	\$1,056,405	\$1,339,443	\$1,998,335	\$1,170,915
	2004 annualized				\$2,341,830

Table 7

Import Statistics

International Tropical Timber Council

(Market Access of Tropical Timber)
March 24, 2003)

USA

	1997	1998	1999	2000	2001
	(1,000 cubic meters)				
Imports of tropical sawn wood	325	352	284	330	340
Imports of tropical logs	4	1	1	2	2
Imports of tropical veneer	53	43	25	25	26
Imports of tropical plywood	1396	1559	1708	1525	1500

Table 8

Estimating Consumption

By: John R. Shelley PhD

1. Hawaiian housing starts -- 2700 in 2002, 4200 in 2003, est. 6000/year by 2006
2. 2002 - residential value == \$1,112,912,000
 average= \$412,190 per house
3. Hardwood uses in new house construction
 - Flooring -- Nationwide, about 10% of flooring is hardwood
 - Cabinets --
 - molding/millwork --
 - Doors/windows --
 - Siding --
 - roofing --
 - Exterior decking --
4. Furniture construction in Hawaii

Are there any furniture manufactures in Hawaii
 Estimate Hawaii potential for furniture made from non-koa Hawaiian woods.

6 to 10 regular but mostly small

 Mostly Mango

Estimating current shipments of hardwood into Hawaii (2003/2004)

<u>Matson</u>	<u>all wood (tons)</u>	<u>hardwoods (tons)</u>	<u>BF Hardwoods</u>
Cabinets	540	135	81,000
Molding/millwork/fencing	410	164	98,400
Lumber/composite panels	100,000	10,000	6,000,000
Engineered Wood/flooring	3,000	1,500	900,000
Wooden Doors	450	225	135,000
TOTAL	104,400	12,024	7,214,400

Assumptions
 20% of solid hardwood box have solid hardwood doors
 60% is fencing
 10% is hardwood lumber
 50% is flooring
 50% is hardwood

ton to BF conversion =
 12BF/cubic foot,
 40 lbs/cubic foot)

Corps of Engineers

	<u>all wood (tons)</u>	<u>hardwoods (tons)</u>	<u>BF sftwds</u>	<u>BF Hardwd</u>
Lumber	383,000	?	229,800,000	16,837,524
Primary Wood Products	28,000	?		

~40% of national hardwood consumption is in cabinets, furniture, flooring (the possible Hawaiian markets)

Hawaii Hardwood Consumption Based on National Hardwood Consumption Figures

18,920,000 By population (0.43%)

Tropical hardwoods imported into Hawaii (in US \$) -- Foreign Trade Zone #9

	<u>Value</u>	<u>BF</u>
Lumber	\$360,000	90,000
Molding/millwork/flooring	\$500,000	83,333

average value of \$4/BF
 average value of \$6/BF

Table 9

Hardwood Utilization

from

Hardwood Review - Annual Forecast 2004

<http://www.hardwoodreview.com>

page 19

	<u>2004</u>		<u>1994</u>		Trend
	<u>Estimate</u>				
North American Production (BBF)	11.35		13.00		
					%Change
Utilization by Sector (BBF)					
Furniture	1.40	12.74%	3.02	23.14%	- 46.36%
Cabinets	0.74	6.73%	0.52	3.98%	142.31%
Dim/Mill/Mldg	0.70	6.37%	0.75	5.75%	93.33%
Flooring	0.89	8.10%	0.41	3.14%	217.07%
Pallet/Crating	3.08	28.03%	4.70	36.02%	65.53%
Lbr/Dist Yds	1.50	13.65%	1.30	9.96%	115.38%
Railroads	0.89	8.10%	0.70	5.36%	127.14%
Exports	1.20	10.92%	1.00	7.66%	120.00%
Misc.	0.59	5.37%	0.65	4.98%	90.77%
Total	10.99	100.00%	13.05	100.00%	84.21%

Note:

*2003 actual was very close to the total and the distribution of 2004 estimate.
Actual 2003 total was 10.32 and flooring was .85 BBF*

Table 10

Product Prices

<u>Species</u>	<u>Size/Thickness</u>	<u>Price</u> <u>/SF</u>
	(Prices noted in the interview process)	
Acacia koa (see Table 12 for grades)	BF	\$4.50 to \$65.00
African Mahogany	4/4	\$3.5 to \$6
Teak	4/4	\$10 +
Maple/Cherry/Oak	4/4	\$3.5 to \$5
Paint grade Poplar	4/4	\$1.5
Eucalyptus flooring [imported]	3/4 Tongue and grooved	\$3.80 to \$4.90
(Wholesale Prices from Hardwood Review for October 22, 2004)		
Mahogany – Genuine	4/4	\$3.80 KD
Mahogany – Genuine	4/4	\$3.49 Grn
Mahogany – African	4/4	\$2.75
Strip flooring	3/4"	
Red Oak	Select	\$2.4
	#1 Common	\$2.33
	#2 Common	\$1.72
White Oak	Select	\$2.29
	#1 Common	\$2.08
	#2 Common	\$1.56

See Table 11 for Hawaiian grown species prices.

Table 11

ALOHA WOODS, INC.
 (808) 329-5189 Fax (808) 329-5168
 73-4770 Kanalani St.
 Kailua-Kona, HI 96740

SPECIES	CODE	4/4=1" THICK	8/4=2" THICK	LOGS
ALBIZIA LEBBECK (CHOC HEART)	AL	\$6.50	\$6.50	*
AUSTRALIAN RED CEDAR	ARC (TOON)	\$4.25	\$4.60	*
AVOCADO - SPALTED	AUS	\$16.00	\$16.00	*
COFFEE	COFFEE			*
EUCALYPTUS:				
DEGLUPTA	ED	\$4.95	\$5.30	*
GRANDIS	EG	\$4.95	\$5.30	*
ROBUSTA	ER	\$4.95	\$5.30	\$3.00
SALINGA	ES	\$4.95	\$5.30	*
HAU	HAU	*	*	\$8.00
KAMANI	KA	\$8.50	\$8.50	\$3.00
KIAWE	KE	\$12.00	\$12.00	\$6.00
LYCHEE	LY	\$16.00	\$16.00	\$6.00
MACADAMIA NUT	MN	\$12.50	\$12.50	\$3.00
MILO	MI	\$18.25	\$18.75	\$6.00
MANGO	MO	\$8.00	\$8.00	\$3.00
MANGO - Figured	MOC	\$12.00	\$12.00	\$3.00
MANGO, PREMIUM	PMOC	\$16.00	\$16.00	\$3.00
MONKEY POD	MP	\$6.50	\$6.95	\$3.00
NORFOLK PINE	NP	\$2.25	N/A	\$3.00
OHIA	OH	\$8.50	\$8.50	\$2.00
OLIVE		\$8.50	*	\$6.00
PALMWOOD	PALM	*	*	*
PHEASANT WOOD	PW	\$33.00	\$33.00	*
QUEENSLAND MAPLE	QM	\$3.25	\$3.25	*
SILVER OAK	SO	\$8.50	\$8.50	\$3.00
SUGI PINE	SP	\$4.95	\$5.60	*
SANDALWOOD	SW	\$16.00lb	\$16.00lb	\$16.00lb

Logs are priced per inch of diameter x linear foot
 Except Sandalwood which is a per pound price

* Call for availability and pricing

ALL PRICES SUBJECT TO CHANGE

11/30/04

Table 12



KOA PRICES



* PRICED PER BOARD FOOT - 144 CUBIC INCHES*
1" X 12" X 12" = 1 BF

GRADE		4/4 1" THICK	8/4 2" THICK
#2 COMMON	2C	\$4.50	\$4.50
#1 COMMON	1C	\$10.00	\$10.00
SELECT/BETTER	SB	\$18.00	\$18.00
SELECT CURL LIGHTLY FIGURED	SC	\$25.00	\$25.00
FULL CURL MEDIUM FIGURED	FC	\$30.00	\$30.00
PREMIUM CURL HIGHLY FIGURED	PFC	\$45.00	\$45.00
PREMIUM CURL INSTRUMENT QUALITY	PFCI	\$65.00	\$65.00
KOA LOGS		\$6.00	\$6.00

KOA logs are priced per inch of diameter x linear foot

ALOHA WOODS, INC.

(808) 329-5189 Fax (808) 329-5168

73-4770 Kanalani St.

Kailua-Kona, HI 96740

e-mail: alohawoods@msn.com

web: www.alohawoods.com

Toll Free: 1-877-HIWOODS

1-877-449-6637

Table 13
Acknowledgements:

Anderson, Mark - Hawaii Foreign Trade Zone 9
Barber, Andy - Hardwoods Inc.
Bello, Eric – Bello’s Millwork
Borseth, Gary – AWI
Brauner, Hal - Brauner Molding and Woodwork
Brewbaker, Paul - Bank of Hawaii
Cheshire, C.L. - UH Manoa Business Program
Gillespie, David - UH Manoa Business Program
Higginson, Tom - Aloha Woods – Kona
Jensen, Eric - J.E. Higgins Lumber
Jones, Gail Susuki – State of Hawaii, Department of Business and Economic Development
Jones, Lloyd - Martin & MacArthur
Kane, Roberta “Bobbie” – Architectural Wood Incorporated (AWI)
Masai, Dean - State of Hawaii, DBED
Nakamura, Karen - Building Industry Association of Hawaii
Onichi, Janice - Pacific American Lumber Co.
Bart Potter – C. Barton Potter Company
Rinell, Dave – Rinell Wood Systems
Smales, Fred - Plywood Hawaii
Steven Smith - Forestry Management Consultants
Untermann, Kent – Pictures Plus
Whalen, Stephanie - Hawaii Agriculture Research Center
Ed Winkler – Trees Inc.
Yanagida, John - University of Hawaii

Appendices

A. National Hardwood Lumber Association
Lumber Grades

The Illustrated Guide to
**American Hardwood
Lumber Grades**



Introduction

The purpose of this publication is to provide a simplified but thorough explanation of the grading rules for American hardwood lumber. They were established over 100 years ago by the newly formed National Hardwood Lumber Association (NHLA). Today the NHLA has over 2000 members worldwide, and the NHLA rules are still the national standard for the US hardwood industry and form the basis for grading of export lumber.

Wood is a natural material and by its very nature may contain different characteristics and defects that need to be understood and allowed for in any given application. The grading of sawn wood into categories as it is processed helps to determine to a large extent the value and potential use possible for each board of sawn lumber.

The NHLA grading rules provide both the buyer and seller with a consistent language to use in specifying hardwood lumber transactions. Although the NHLA grading rules are targeted for the US marketplace, a reasonable knowledge is essential for buyers worldwide in order to attain their expected degree of quality. The grade of lumber purchased by a manufacturer will determine both the cost and waste factor that is achieved. Because the grades are based on the percentage of clear wood in the board, many of the beautiful, natural characteristics found in hardwoods are not considered in calculating the clear yield. This fact is highlighted by photograph illustrations of the main grades, for 10 important US hardwood species, contained in this publication.

Hardwood lumber is usually graded on the basis of the size and number of cuttings (pieces) that can be obtained from a board when it is cut up and used in the manufacture of a hardwood product. The NHLA rules were designed with the furniture trade in mind to provide a measurable percentage of clear, defect-free wood for each grade. The upper grades provide the user with long clear pieces, while the Common grades are designed to be re-sawn into shorter clear pieces.

The upper grades, which will include FAS, FAS-One-Face (FAS/1F) and Selects, are most suitable for long clear mouldings, joinery products such as door frames, architectural interiors; and furniture applications, which require a heavy percentage of long wide cuttings.

The Common grades, primarily Number 1 Common (No. 1C) and Number 2A Common (No. 2AC), are likely to be most suitable for the kitchen cabinet industry, most furniture parts, and plank and strip flooring. Worth noting is the fact that once re-sawn, the cuttings obtained from the Common grades will be the same clear wood as the upper grades but in smaller (shorter and/or narrower) cuttings. The grade name simply designates the percentage of clear wood in the board, not the overall appearance.

The American hardwood temperate forest resource is the largest of its kind anywhere in the world, with a significant history of sustainability. Exploring the Common grades, where possible, is invaluable in achieving the most value both in lumber cost and yield. These efforts will also help to ensure the sustainability of the resource for generations.



Measurement

The NHLA lumber grading rules adopted by the US hardwood industry are based on an imperial measurement system using inches and feet. In contrast most export markets are more familiar with a metric standard. Additionally, the grade rules were developed with random width and length lumber in mind. Any selection for particular specifications should be discussed prior to ordering.

Board foot

A board foot (BF) is the unit of measurement for hardwood lumber.

A board foot is 1 foot long x 1 foot wide x 1 inch thick. (1 foot = 0.305 metres, 1 inch = 25.4mm)

The formula for determining board feet in a board is:

(Width in inches x length in feet x thickness in inches) divided by 12

The percentages of clear wood required for each grade are based on this 12' unit of measure.

Surface measure

Surface measure (SM) is the surface area of a board in square feet. To determine surface measure, multiply the width of the board in inches by the length of the board in feet and divide the sum by 12 rounding up or down to the nearest whole number. The percentage of clear wood required for each grade is based on the surface measure, not the board feet, and because of this all boards, no matter what the thickness, are graded in the same way.

Some examples for surface measure calculations are as follows:

$$6\frac{1}{2}'' \times 8' \div 12 = 4\frac{1}{2} = 4' \text{ SM}$$

$$8'' \times 12' \div 12 = 8' \text{ SM}$$

$$10'' \times 13' \div 12 = 10\frac{5}{6} = 11' \text{ SM}$$



Example of SM and BF:

The board above is a 2" thick, 6 1/2" wide, and 8' long.

$6\frac{1}{2}'' \times 8' \div 12 = 4\frac{1}{2}$, thus the SM is 4'. Multiply the SM by the thickness 2" and the BF is 8'.

When preparing a bundle tally for export, the boards are recorded by their width and length. Random widths above or below the half inch are rounded to the nearest whole inch. Board widths falling exactly on the half inch are alternatively rounded up or down. Lengths that fall between whole foot increments are always rounded down to the nearest whole foot. For example a board 5 1/2" width and 8 1/2' long is tallied 5" and 8'.

Standard thickness for rough sawn lumber

Standard thickness for rough sawn lumber is expressed in quarters of an inch. For example 1" = 4/4. The majority of US hardwood lumber production is sawn between 1" and 2", although other thicknesses are available in more limited volumes. The standard thicknesses and their exact metric equivalent are shown below.

3/4	(3/4" = 19.0mm)	8/4	(2" = 50.8mm)
4/4	(1" = 25.4mm)	10/4	(2 1/4" = 63.5mm)
5/4	(1 1/4" = 31.8mm)	12/4	(3" = 76.2mm)
6/4	(1 1/2" = 38.1mm)	16/4	(4" = 101.6mm)

Standard thickness for surfaced (planed) lumber

When rough sawn lumber is surfaced (planed) to a finished thickness, defects such as checks, stain, and warp are not considered when establishing the grade of a board, **if they can be removed in the surfacing (planing) process**. The finished thickness for lumber of 1 1/4" and less can be determined by subtracting 3/8" from the nominal thickness. For lumber 1 1/4" and thicker, subtract 1/2".

Measurement of kiln dried lumber

Net tally: The actual board feet of kiln dried lumber measured after kiln drying.

Gross or green tally: The actual board feet measured before kiln drying. When kiln dried lumber is sold on this basis, the buyer can expect to receive approximately 7% less board feet because of shrinkage in the kiln drying process.

Estimating board feet in a bundle of lumber

To determine the board feet of one board, the procedure is to multiply the surface measure by the thickness. A bundle of lumber can be estimated in much the same manner. First, calculate the surface measure of one layer of boards. Do this by multiplying the width of the bundle, minus gaps, by the length of the bundle and divide the sum by 12. If there are several lengths in the bundle, use an average length. Once one layer is estimated, multiply this sum by the total number of layers.

Example:

Average width of unit 40"
(lumber only, after allowing for gaps between boards)

Length of unit 10'

$$40" \times 10' = 400 \div 12 = 33.33$$

$$\text{Thickness of lumber } 8/4 \quad \times 2$$

$$= 66.66$$

$$\text{Number of layers} \quad \times 10$$

$$= 666.67$$

Estimated board feet of the bundle 667 BF



Conversion factors

1": 25.4 millimetres (mm)

1m: 3.281 feet

1,000BF: (1MBF) 2.36 cubic metres (m³)

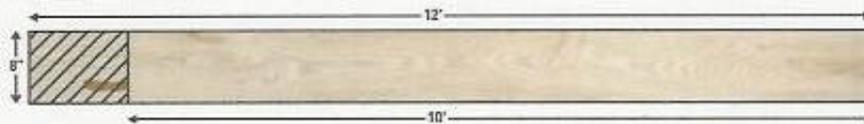
1m²: 424 board feet (BF)

1m³: 35.315 cubic feet (cu.ft)

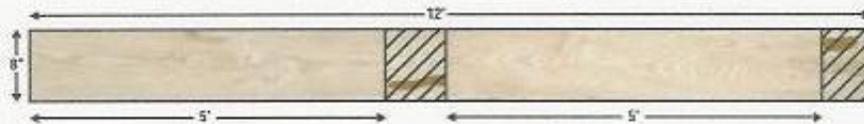
FAS and FAS One Face (Selects)

FAS

The FAS grade, which derives from an original grade "First And Seconds", will provide the user with long, clear cuttings - best suited for high quality furniture, interior joinery and solid wood mouldings. Minimum board size is 6" and wider and 8' and longer. The FAS grade includes a range of boards that yield from 83% (3/4ths) to 100% clear-wood cuttings over the entire surface of the board. The clear cuttings must be a minimum size of 3" wide by 7' long or 4" wide by 5' long. The number of these cuttings permitted depends on the size of the board with most boards permitting one to two. The minimum width and length will vary, depending on species and whether the board is green or kiln dried. **Both faces of the board must meet the minimum requirement for FAS.**



Note: Minimum yield 83% clear wood cuttings on the poor face of the board.



FAS One Face (F1F)

This grade is nearly always shipped with FAS. The better face must meet all FAS requirements while the poor face must meet all the requirements of the Number 1 Common grade, thus ensuring the buyer with at least one FAS face. Often export shipments are assembled with an 80-20 mix, 80% being the percentage of FAS boards and 20% being the percentage of F1F boards. These percentages are strictly left to individual buyer and seller agreement.

Selects

This grade is virtually the same as F1F except for the minimum board size required. Selects allow boards 4" and wider and 6' and longer in length. The Selects grade is generally associated with the northern regions of the USA and is also shipped in combination with the FAS grade.

Often export shipments of upper grades are simply referred to as FAS. The conventional business practice for American hardwoods is to ship these upper grades in some combination. Working closely with the supplier will enable the buyer to be sure that the expected quality will be received. Whether FAS is combined with F1F (Face And Better) or Selects (Sel And Better) every board in the shipment must have a minimum of one FAS face.

Prime grade: This grade has evolved from the NHLA grade of FAS for the export market. It is square edged and virtually wane free. The minimum clear yield will be select and better with appearance being a major factor. Minimum size of the boards varies, depending on the species, region, and supplier.

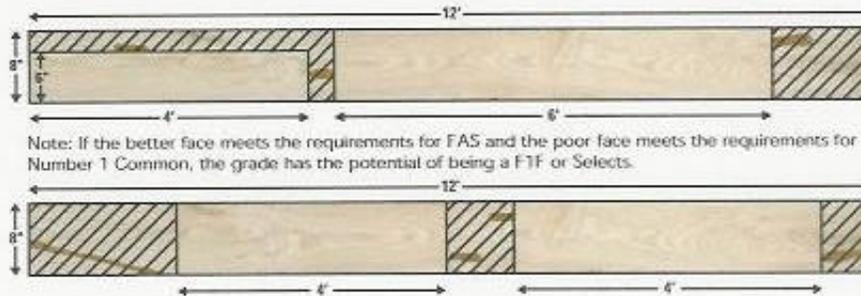
Comsel grade: This grade has evolved from the NHLA grades of Number 1 Common and Selects. For the export market the minimum clear yield should be Number 1 Common or slightly better with appearance a main factor. Minimum size of the boards varies, depending on the species, region and supplier.

Note: The terms Prime and Comsels are not standard NHLA definitions and therefore fall outside the official range of the NHLA grading rules.

No. 1 Common and No. 2A Common

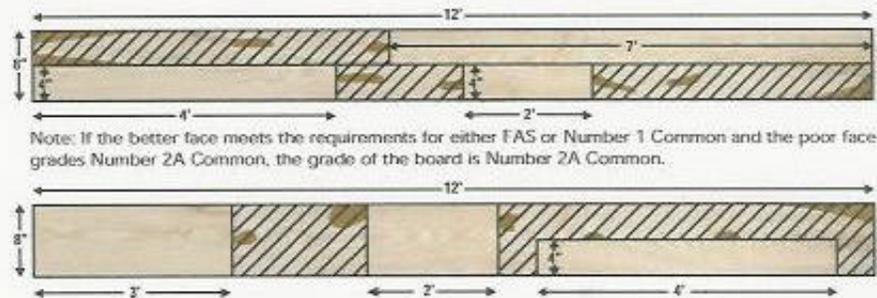
Number 1 Common (No. 1C)

The Number 1 Common grade is often referred to as the Cabinet grade in the USA because of its adaptability to the standard sizes of kitchen cabinet doors used throughout the United States. Number 1 Common is widely used in the manufacture of furniture parts as well for this same reason. The Number 1 Common grades includes boards that are a minimum of 3" wide and 4' long and will yield clear face cuttings from 66% (%ths) up to, but not including, the minimum requirement for FAS (83%). The smallest clear cuttings allowed are 3" by 3' and 4" by 2'. The number of these clear cuttings is determined by the size of the board. **Both faces of the board must meet the minimum requirement for Number 1 Common.**



Number 2A Common (No. 2AC)

The Number 2A Common grade is often referred to as the Economy grade because of its price and suitability for a wide range of furniture parts. It is also the grade of choice for the US hardwood flooring industry. The Number 2A Common grade includes boards that are a minimum of 3" wide and 4' long that yield from 50% (%ths) up to, but not including, the minimum requirement for Number 1 Common (66%). The smallest clear cutting allowed is 3" by 2' and the number of these cuttings depends on the size of the board. If the poorest face meets the minimum requirements for Number 2A Common, it does not matter what the grade of the better face is.



There are lower NHLA grades than Number 2A Common but they are usually converted into dimension parts, flooring parts, or used domestically in the USA.

These Standard Grades form the framework by which all American hardwoods are traded. It is important to note that between buyer and seller any exception to these rules is permissible and even encouraged. For a complete description of the NHLA grades, consult the NHLA's "Rules for the Measurement and Inspection of Hardwoods and Cypress".

B. Excerpts from Hardwood Review



HardwoodReview

Annual Forecast 2004



Photos courtesy of the American Hardwood Export Council

Selected Quotations
From
Hardwood Review – Annual Forecast 2004

The Annual Forecast by Hardwood Review is a document that can be purchased from HR. A copy was purchased by the Hawaii Hardwood Market Study team. The Hardwood Review focuses primarily on U.S. produced temperate hardwoods. Only a few tropical woods and imports are tracked by this subscription periodical. Following are some quotations taken from the 2004 forecast document:

Executive Summary

“The U.S. economy will continue its slow, steady upswing in 2004. The hardwood industry will experience less growth than the U.S. economy in general. Demand for hardwood products will rise and we expect hardwood lumber sales to increase slightly. However, in many hardwood-using sectors, especially furniture and mouldings, the goods necessary to meet the demand will be imported.”

The Economy

Housing Markets

“Three major barometers of housing activity broke new records in 2003: new housing starts, new home sales, and existing home sales.”

Currency Valuation

“The value of the U.S. dollar fell sharply through the first half of 2003 against such major world currencies as the euro and Canadian dollar.”

Hardwood Lumber Markets

The Forecasted Winners and Losers: (Page 13)

Paraphrasing the forecasts:

The Winners:

- Demand for flooring to stay strong
- The lower value of the dollar may boost sales to Europe
- Ash will be a good item.
- Continued strong markets for railroad ties, pallet cants and pallet boards
- “In general, producers that supply lumber that is width, length and color-sorted according to customer requirements will find better business than those that don’t. Getting paid for performing those services? Now that’s a story.”
- “Almost anything with character marks or a rustic appearance will be in good demand in 2004 -----.”
- “Veneer logs and sawlogs will exit the country more rapidly, with a rising percentage of them bound for China.”

The Losers:

- Cherry demand will remain sluggish
- Maples will decline
- Kiln-dried random-width and length lumber sales will decline.

Species Analysis:

Genuine Mahogany

“Genuine Mahogany demand slowed after Brazilian supplies were placed on the Convention on International Trade of Endangered Species (CITES) list. A fair volume of Genuine Mahogany flowed from Peru, but oftentimes it was shorter (*lengths*) than millwork manufacturers and other end-users preferred. Genuine Mahogany has a poor future. Environmental pressures, production problems and declining specifications will compel end-users in other directions. More U.S. manufacturers and importers will exit the Genuine Mahogany business this year.”

African Mahogany

“African Mahogany increased in use last year, including greater acceptance by millwork manufacturers that had previously resisted buying it. The unreliability of Genuine Mahogany supplies was given as the main cause for the increased African Mahogany demand. African Mahogany prices climbed significantly in the U.S. because most of it was traded in euros and because production did not increase in response to higher demand. We believe demand for African Mahogany will exceed supply, as more distribution yards and manufacturers buy it. Due to poor infrastructure, antiquated manufacturing methods and political problems in Africa, supply will be an ongoing concern.”

Export Markets

2004 Forecast

“Global consumer demand no longer favors North American hardwoods. Buyers around the world are looking at color and overall appearance in the wood products they buy rather than for a particular species from a particular region. Improved economic conditions will propel global hardwood usage higher, but U.S. exporters won't benefit as much as producers in other regions because of relatively high prices. Our forecast is that U.S. hardwood lumber exports will total 1.20 BBF (*Billion Board Feet*) in 2004, a 4.0 percent increase over 2003. In the face of increased foreign competition, prices paid for North American hardwoods will likely decline later in the year.”

Hawaii Hardwood Market Study note: It must be understood that Hawaiian subtropical hardwoods would not even be on the radar screen for Hardwood Review and that Hawaii and its resources should be viewed as being more parallel to those that come from developing countries.

Flooring Industry

2004 Forecast

“Last year we predicted 2003 flooring industry consumption of hardwood lumber might surpass 1 billion board feet, and it very well could have if the lumber was available. For 2004, our estimate of lumber utilization is tempered by the fact that it may be mid-year before log and lumber availabilities return to levels that allow flooring manufacturers to produce at desired levels.”

EXECUTIVE SUMMARY

The U.S. economy will continue its slow, steady upswing in 2004. The hardwood industry will experience less growth than the U.S. economy in general. Demand for hardwood products will rise and we expect hardwood lumber sales to increase slightly. However, in many hardwood-using sectors, especially furniture and mouldings, the goods necessary to meet increased demand will be imported.

Profits in the hardwood industry may be marginally better in 2004 than last year. However, increased production could severely impact profitability during the second half of the year. Overproduction will be felt more quickly than in the past because domestic consumption is smaller and a growing abundance of substitutes are available, including imported hardwoods, non-solid wood products and non-wood products. The impact of imports will surprise many people in 2004, as they increasingly show up in every area, from flooring to pallets to millwork.

Economic drivers external to the industry will be mixed. We don't anticipate interest rates to rise more than one percentage point this year, if at all. Two factors will keep the value of the U.S. dollar low against other world currencies. First, the U.S. Treasury is printing new money like it's going out of style. Second, the U.S. budget deficit and the cost of financing it are growing. We expect the value of the U.S. dollar to decline an additional ten percent against the euro and five percent against the Canadian dollar in 2004. Moderate job growth is likely, but job creation will lag previous recoveries because industrial employment will be level at best. The industry will face higher freight rates, both domestic and export, due to rising fuel costs, reduced trucking capacities and tighter regulations. Truck availability in the U.S. and Canada may decline further. Energy prices will also be a major issue in lumber drying. Those who depend on oil and natural gas to fire their boilers will look harder at alternatives, especially wood waste-fired boilers.

We expect that timber and log prices will continue to rise—driven as much by export demand as domestic utilization—and the controversy over log exports will come to a head. One New England sawmill owner, for example, told us that 60 percent of the timber harvested in the Connecticut River Valley is now processed outside of that region, mostly in Canada. Over the long-term, timber prices are likely to decline because of competition from cheaper timber in other parts of the world, but that won't happen for several years.

Sawmill modernization is becoming more expensive, but sawmills will find it increasingly difficult to secure working capital to make needed improvements. Current tax incentives that provide companies the opportunity to modernize facilities and frontload depreciation will soon expire. 2004 will be a decisive year for many business owners trying to decide whether to spend money on their operations or close the doors. The lack of profitable exit strategies will keep many hardwood sawmill and concentration yard owners in the industry long after they would like to sell.

High workers' compensation insurance rates and poor returns on investments have decimated the logging profession, creating a near-crisis situation in several states like West Virginia and Kentucky. These issues must be addressed for the sake of the entire forest products industry, whether through free market solutions or, perhaps, legislation. One idea put forth to reverse declines in the number of loggers is to provide incentives for Hispanics to enter the profession. Until something is done about the larger issue, however, loggers will broaden their businesses to include excavating, landscaping and construction—anything to disguise the logging part of their operations and lower workers' compensation rates.

The hardwood flooring industry will continue to expand in 2004. According to flooring industry contacts, however, they can't raise flooring prices much higher without losing additional

market share to competing products and suppliers. Therefore, they maintain, raw material costs cannot go any higher. If hardwood lumber production increases, as we believe it will, they will probably get their wish. This will be another banner year for domestic hardwood strip and plank flooring sales, but imports dampen longer-term prospects.

Low-grade lumber markets will be even busier in 2004, with demand strong from the flooring industry as well as other users. Pallet demand will increase, but it will lag growth in the general economy because the industrial sector will be stagnant. Robust railroad tie sales will continue.

The cabinet industry is doing quite well and seems to be better positioned than any other sector to fend off imports. Its strategy of delivering custom and semi-custom products to customers quickly and efficiently has been very effective. Cabinet sales should remain quite strong even if housing starts slow, because the majority of cabinet sales are to remodeling markets, which are expected to remain very strong.

There will be a bit less upheaval in the furniture industry this year. Large furniture companies may see improved profits because of increased imports, which tend to have higher margins. Small and medium-sized furniture companies will struggle to find niches; many will open up their own retail stores and offer extremely quick delivery. We will see more furniture plant closings, but not as many as in 2001-2003. The anti-dumping action filed by a group of U.S. furniture manufacturers has a better than 50-50 shot at passing. If tariffs are enacted, they will reduce wood bedroom furniture imports in the short-term, but will be utterly ineffective over the long run.

U.S. hardwood lumber exports in 2004 will be at or near 2003 levels. Economic improvement will stir worldwide hardwood demand, but woods from other parts of the world will meet the extra demand. Overseas customers will more narrowly define width, length, color and a host of other specifications. Many firms will exit the export business due to what they consider to be onerous requirements and insufficient prices for performing those services.

Exports to Southern Europe may grow slightly, but any gains will be offset by continued erosion of northern European markets. European Union (EU) expansion in May will increase the flow of eastern European lumber into Western Europe due to reduced impediments at the borders. China will produce more of almost every manufactured good in 2004, including furniture, flooring, mouldings and cabinet doors. U.S. hardwood exports to China may grow slightly. China's high unemployment, emerging overcapacity in manufacturing and troubled banking system are major concerns. China's economy is more fragile than many people realize and the potential for crisis is growing. If China has no major problems, other Asian markets should be relatively stable through 2004.

Non-tropical hardwood imports to the U.S. will grow and, while still relatively small in volume, will have an increasing impact on markets. Baltic and Russian Birch, for example, are already affecting Yellow Birch sales to the cabinet industry.

As a result of increased worldwide manufacturing and trade, U.S. companies now face intense competitive challenges that require innovative solutions. To effectively compete against lower-cost imports, U.S. companies will give increased attention to lean manufacturing, mass customization and extremely fast delivery. Recent remarks from one very frank lumberman, we believe, accurately sum up our industry's present situation: "At this juncture, the industry does not need 'business as usual,' we need innovative, forward-thinking, brutally honest, bold thinkers."

Lumber Markets by Industry Sector

Table 1 shows our estimates of both hardwood lumber production and usage by industry sector. The sub-sections below analyze hardwood lumber utilization by each sector.

	Estimated Hardwood Production & Use											Est. 2004	Est. Change
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004		
North American Production (BBF)	13.00	13.75	11.90	13.00	14.00	14.25	14.00	11.50	11.20	10.32	11.35	+1.03	
Utilization by Sector (BBF)	13.05	13.26	12.36	13.06	13.54	13.43	14.32	11.73	11.22	10.73	10.99	+0.27	
Furniture	3.02	3.14	3.00	3.10	3.40	3.40	3.45	1.80	1.70	1.56	1.40	-0.16	
Cabinets	0.52	0.50	0.50	0.56	0.56	0.56	0.55	0.58	0.61	0.64	0.74	+0.10	
Dim/Mill/Mldg	0.75	0.78	0.75	0.50	0.60	0.60	0.86	0.85	0.70	0.67	0.70	+0.03	
Flooring	0.41	0.44	0.48	0.55	0.58	0.62	0.49	0.83	0.84	0.85	0.89	+0.04	
Pallet/Crating	4.70	4.70	4.23	4.40	4.40	4.20	4.93	3.75	3.30	2.99	3.08	+0.09	
Lbr/Dist Yds	1.30	1.30	1.10	1.20	1.40	1.40	1.43	1.40	1.40	1.40	1.50	+0.10	
Railroads	0.70	0.70	0.65	0.90	0.90	0.80	0.70	0.78	0.85	0.88	0.89	+0.01	
Exports	1.00	1.05	1.05	1.10	0.95	1.10	1.20	1.10	1.17	1.15	1.20	+0.05	
Misc.	0.65	0.65	0.60	0.75	0.75	0.75	0.72	0.65	0.65	0.60	0.60	+0.00	

Table 1. Estimated hardwood lumber production and utilization by sector, 1994-2004.

Kitchen Cabinet Industry

2003 Year in Review

#1 Common lumber was in heavy demand in 2003, especially towards the latter half of the year, when flooring and export buyers joined the hunt for Oaks and Hard Maple. Red Oak and Cherry lumber prices climbed sharply and steadily throughout the year, while Hard Maple prices, which had fallen throughout the spring and summer, only climbed back to levels seen earlier in the year (Figures 17a-d).

Despite tightening supplies and rising prices, none of the cabinet plants we contacted lost any production time in 2003, namely because these plants can and will pay higher prices for lumber than competing sectors. Several manufacturers took advantage of the growing popularity of rustic looks and increased their utilization of #2 Common lumber.

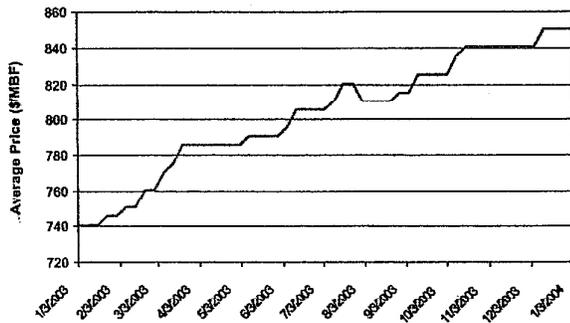
2004 Forecast

We expect hardwood lumber shipments to the cabinet industry to rise 15.6 percent to 740 million board feet. Watch for Red Oak to regain some market share in 2004. Manufacturers are promoting it as a product with lots of versatility—from dark and rustic finishes to neutral tones—and it will remain a mainstay in the stock cabinet sector. As lumber production picks up throughout the year, it may also become a much more economical choice than Hard Maple, Cherry and Yellow Birch.

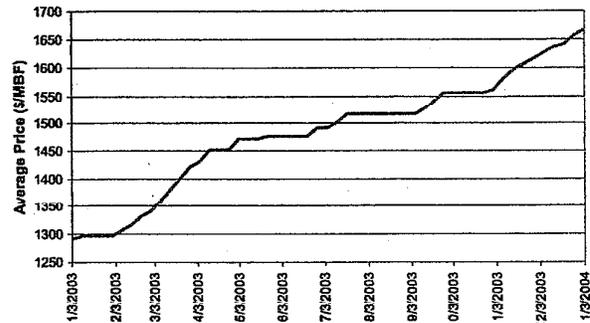
Despite the rapid rise in Cherry lumber prices in 2003, most manufacturers announced plans to increase their Cherry utilization in 2004. One manufacturer shared plans to introduce new lines in Cherry and Hard Maple in April, and indicated they would be stockpiling these species over the next couple of months. Cherry is, quite simply, hot and it remains the species of choice for higher-end consumers. Manufacturers may be able to capitalize on the “rustic” theme by incorporating lower grades of Cherry lumber, thereby offsetting some of the raw material costs. We expect Cherry prices to be firm to slightly higher at least through the first half of 2004.

Hard Maple lumber will continue to be a very good seller for naturally finished cabinet lines. With the growing popularity of dark finishes, paints and glazes, Soft Maple will find increasing

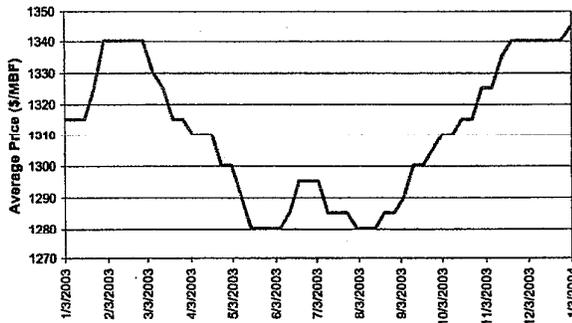
**Green Appalachian Area 1 4/4 #1 Common
RED OAK**



**Green Appalachian Area 2 4/4 #1 Common
CHERRY**



**Green North Central 4/4 #1 Common
HARD MAPLE #1&2 WHITE**



**Green Northeastern 4/4 #1 Common
YELLOW BIRCH SAP/BTR**

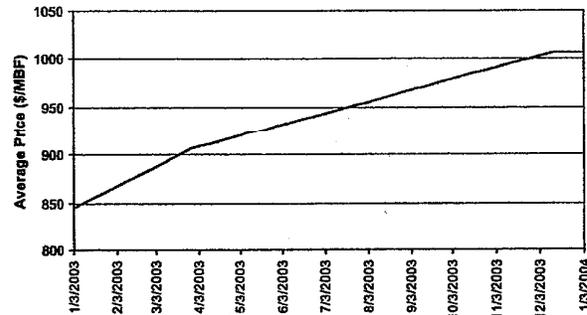


Figure 17a-d. Green 4/4 #1 Common lumber prices, 2003.

acceptance among manufacturers and consumers as a Hard Maple substitute. Continued supply problems and price volatility with Hard Maple also make Soft Maple an attractive alternative. For business planning purposes, many manufacturers have told us that raw material price stability is as important as the price itself. With the ready availability of Soft Maple as a substitute, Hard Maple utilization will likely go down in 2004, which may result in declining prices for #1 Common lumber.

Yellow Birch will hold its own as a preferred cabinet species in 2004. While its usage remained a distant fourth to Oak, Cherry and Hard Maple, there was sufficient demand to pull Yellow Birch prices up sharply through the third quarter of 2003. While prices leveled out in the last quarter, supply and demand seemed to plateau at a new, much higher level than in 2002. Even if demand for Yellow Birch strengthens in 2004, production is not likely to respond much. Yellow Birch timber does not occur in very dense concentrations on the landscape. It would take the promise of sustained high demand and strong prices for producers to reach out and invest in additional Yellow Birch supplies. We suspect cabinet industry consumption of Yellow Birch will remain at current levels throughout 2004 at firm or slightly higher prices.

Flooring Industry

2003 Year in Review

Sales & Market Share

Record home sales and new home starts helped pull hardwood flooring sales up as much as 10 percent in 2003, surpassing the \$2 billion mark (sales value at the first point of distribution). Ed Korczak, executive director of the National Wood Flooring Association (NWFA), estimates that hardwood floors now represent over 10 percent of total U.S. floor covering sales (in dollars). Hardwood flooring comprised 9.2 percent of all floor covering sales in 2002 and 8.9 percent in 2001, according to Catalina Research and *Floor Covering Weekly (FCW)*.

In 2002, hardwood flooring sales increased 8.1 percent to \$1.87 billion (total floor covering sales grew only 4.8 percent) and overtook vinyl as the second leading solid-surface floor covering in sales dollars. 2003's estimated 10 percent sales growth will also far outpace total floor covering industry growth.

On a volume basis, hardwood flooring sales climbed 6.6 percent to 885 million square feet in 2002, although the percentage of the floor coverings market that this represented was unchanged at 3.5 percent. FCW estimates that 58 percent (513 million square feet) of the hardwood flooring sold in 2002 was in engineered products; the balance presumably was solid goods. While the final statistics for 2003 are still 6 months off, based on the disproportionate growth of solid flooring imports, we suspect the percentage of solid wood grew throughout 2003.

Hardwood flooring sales were not consistent throughout the year. "The first 4-5 months were difficult, with extremely tight margins," noted one producer. "During the remaining 7-8 months, prices for finished products escalated at a rapid pace, making the year as a whole reasonably profitable."

"Factory-finished products were still approximately 60 percent of the hardwood flooring sold in the U.S.," according to the NWFAs Korczyk, the same as in 2002, "but it's 60 percent of a bigger pie." Because most engineered flooring is classed as "factory-finished," much of the past several years' rise in factory-finished flooring sales can be attributed to the growing popularity of engineered flooring. Even within the solid wood category, however, the percentage of factory-finished flooring is growing. One California distributor noted a 15-20 percent growth in factory-finished sales and a corresponding decline in unfinished sales in 2003. "The reality," according to one major manufacturer, "is that nobody, absolutely nobody, knows how much factory-finished flooring there is. The best estimates range from 35 to 50 percent of all solid hardwood flooring is now factory-finished."

Armstrong Wood Products, Inc. (Bruce Hardwood Flooring, Hartco Flooring and Robbins Hardwood Flooring) converted most of Bruce's production to factory-finished in 2003 (some estimate Bruce manufactured 45 percent of the unfinished strip-flooring prior to 2003). Although it is still operating one unfinished plant, Armstrong's move further boosted the volume of domestically manufactured factory-finished flooring. It also boosted the outlook of the remaining unfinished flooring producers, who were happy to fill in the production gaps.

Production

While hardwood flooring sales volumes and revenues grew significantly in 2003, domestic shipments did not. According to Stan Elberg, executive director of NOFMA-The Wood Flooring Manufacturers Association, domestic solid unfinished and factory-finished production in 2003 was up less than one percent over 2002 levels to 476 million square feet (633 million board feet) (Figure 28). While NWFAs Korczyk believes production was probably a bit higher than NOFMA's estimate, several factors held production down in 2003.

Lumber availability and profitability were the most oft-cited problems for domestic flooring manufacturers in 2003. It is not clear, however, that the first contributed to the latter. In fact, the weighted average of Red Oak flooring prices published in the

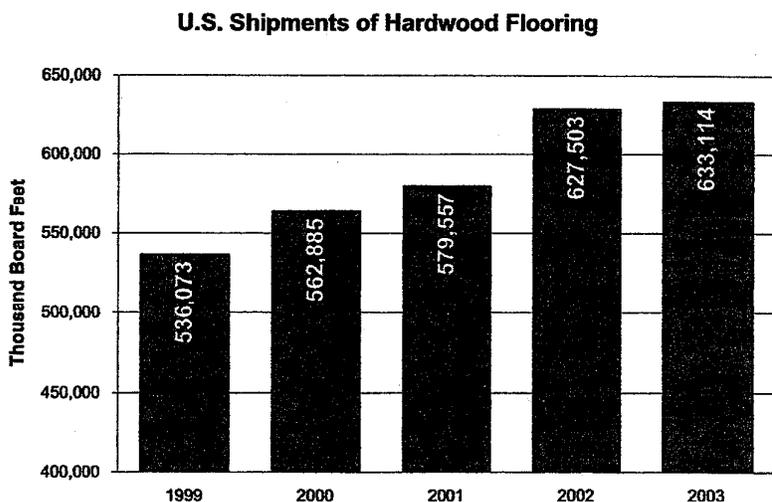


Figure 28. U.S. shipments of solid-strip hardwood flooring, 1999-2003.

Weekly Hardwood Review across all regions rose faster in 2003 than the weighted average of green Red Oak lumber prices. Likewise for White Oak flooring versus White Oak lumber prices (Figures 29 and 30). (NOTE: The weighted average flooring price assumes 55 percent Sel/Btr production; 35 percent #1 Common and 10 percent #2 Common. The weighted average lumber price assumes the plant utilizes 15 percent #1 Common lumber, 55 percent #2A and 30 percent #3A.) On a nationwide basis, all other things

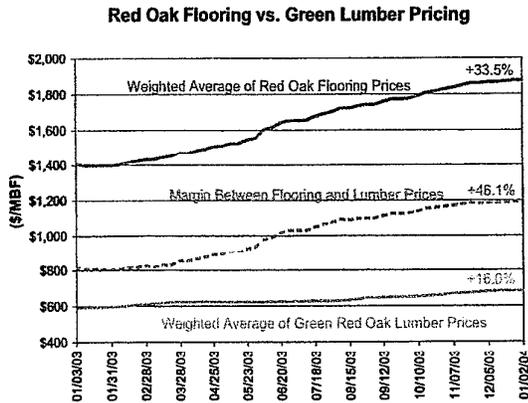


Figure 29. Weighted average Red Oak flooring vs green lumber prices, 2003.

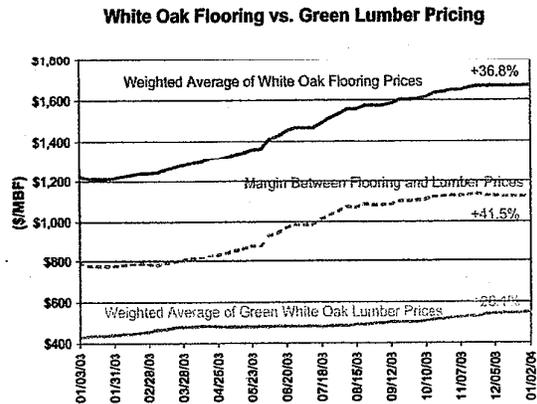


Figure 30. Weighted average White Oak flooring vs green lumber prices, 2003.

equal, flooring manufacturers should have become more—not less—profitable during 2003. Yes, they paid significantly more for lumber, but they also were able to raise their selling prices more than enough to offset increased raw material costs, especially during the latter half of the year.

That said, profitability was still a major concern voiced by those companies we talked with in preparing this report. Obviously the national data may mask certain local or regional profitability concerns. At the same time, lumber is but one cost associated with the manufacture of flooring. Increased labor, energy and transportation costs likely also kept the bottom line profitability of most flooring manufacturers from achieving the 50 percent profit gains suggested by these simple price analyses.

We suspect, however, that the physical availability of lumber, tightened by lower production and heightened demand from other low-grade industries, including the revitalized truck flooring industry, had a larger role in slowing flooring production in 2003 than rising lumber prices.

Imports/Exports

With hardwood flooring sales up as much as 10 percent and domestic production steady, imported hardwood flooring is obviously playing a larger role in domestic flooring markets. Nevertheless, many domestic manufacturers and industry representatives show little or no concern about imported flooring. One suggested imports are chiefly a threat to engineered flooring manufacturers. Another said imports are just filling gaps in demand that domestic producers can't meet. It wasn't too long ago, however, that the U.S. furniture industry said, "the Chincsc are only interested in and capable of taking low-end production." Either way it is clear, as one producer aptly noted, "sales of wood flooring are up in 2003; it just ain't being made around here."

When we visited the National Wood Flooring Association Expo in April 2003, we were, quite honestly, shocked at the prevalence of displays containing or dedicated to imported flooring products. Imported products were clearly the focus of much of the industry's promotional efforts.

A word of caution on import statistics: Imported wood products are tough to track and reporting systems and methodologies change. While some of the numbers may be off, we believe that the trends in these import statistics over time are generally accurate.

In 2002, the United States became a net importer of solid-strip flooring, importing almost a million more square feet than it exported. By the end of 2003, the U.S. imported twice as much solid flooring as it exported, even though exports continued to grow (Table 6). Also in 2003, solid flooring import volumes surpassed imports of laminate/engineered products. Based on the domestic production estimates of NOFMA and those that could be derived from *Floor Covering Weekly* research, imports accounted for between 17 and 22 percent of the solid hardwood flooring purchased in the United States in 2003.

In 2003, China appears to have tripled its shipments of solid hardwood flooring to the U.S., surpassing Canada as the largest source of imported solid wood flooring (Table 7). That's not only surprising, but should effectively quell the notion that Chinese producers are not interested or actively targeting U.S. solid flooring markets. Even if the Chinese figures are overstated by 50 percent, Chinese imports doubled. Further, Canada, Brazil, Italy, Thailand and Taiwan all more than doubled their shipments of hardwood flooring to the U.S. in 2003.

Indonesia remained the largest provider of engineered hardwood flooring products in 2003, shipping almost twice the volume as China, the second leading provider. Indonesia's volume was flat, however, while China's volume doubled.

Hardwood Flooring	2001 m ²	2002 m ²	2003 m ²
<i>Imports</i>			
Solid Strip	2,017,057	3,995,301	7,372,750
Laminate/Engineered	5,933,231	6,630,741	7,142,508
Total	7,950,288	10,626,042	14,515,258
<i>Exports</i>			
Solid Strip	3,040,642	3,060,226	3,681,723
Laminate/Engineered	313,479	274,199	233,397
Total	3,354,121	3,334,425	3,915,120

Table 6. Volume of U.S. flooring imports vs. exports, 2001-2003.

Country	Solid Hardwood Flooring Imports		
	2002	2003	% Change
	-- m ² --		%
China	633,293	1,983,625	+213.2%
Canada	735,394	1,866,340	+153.8%
Brazil	531,900	1,338,035	+151.6%
Indonesia	318,225	354,520	+11.4%
Malaysia	328,595	351,791	+7.1%
Italy	52,460	325,201	+519.9%
Paraguay	112,432	211,550	+88.2%
Germany	144,971	159,267	+9.9%
Thailand	33,103	109,811	+231.7%
Taiwan	15,531	87,033	+460.4%
WORLD TOTAL	3,995,301	7,372,750	+84.5%

Table 7. Volume of solid hardwood flooring imports by country, 2002-2003.

2004 Forecast

Sales & Market Share

The overwhelming sentiment expressed by flooring manufacturers and industry representatives is that flooring demand will hold strong as long as interest rates stay low and housing stays strong. Of course, that kind of goes without saying. The real question is: how long will interest rates stay low and housing stay strong? By and large, most industry representatives expect the boom to continue at least through the first half of 2004. Economists concur that housing markets and interest rates will remain essentially unchanged through at least the second quarter.

It's important to note, however, that new housing starts are not the largest driver of hardwood flooring sales. *Floor Covering Weekly* estimated that 55 percent of the hardwood flooring sold

in 2002 went for residential renovation and repair. Only 31 percent was sold with new home construction, and only 21 percent was for single-family home construction. It will take continued strong new home sales as well as existing home sales to keep flooring markets humming in 2004, since it is likely the existing home buyers that are doing much of the remodeling and hardwood flooring installation.

Based on the last three years' growth trends, solid and engineered hardwood flooring sales should surpass the one billion square foot mark in 2004, and sales should exceed \$2.25 billion (Table 8).

Long-term, put your money on engineered flooring to grow faster than solid wood flooring. The declining quality and the increasing value of the resource suggest we will continue to move towards products that allow manufacturers to meet consumers' appearance expectations with a smaller percentage of high-dollar fiber. But, that's long term. The market share of solid hardwoods held steady in 2003, and solids should hold their own again in 2004, if not improve slightly. Armstrong shut down two engineered flooring plants in 2003, and most of the new production that came online in 2003 was in solid strip flooring.

Several unfinished strip-flooring manufacturers indicated that the outlook for 2004 was good, but that their fortunes are always subject to the possibility that factory-finished lines can be readily converted back to unfinished production.

Consumer Preferences

Watch for the growth trend in 2004 to favor higher-end and specialty flooring products. Consumer advertising and trade show displays indicate increased consumer interest in wider planks, non-traditional species and exotic looks. One industry observer noted increased usage of alternative species (Hard Maple, Hickory and Cherry) as well as strips wider than 2-1/4 inch.

Ed Korczak, executive director of NWEA, also reported increased usage of borders and medallions. Simple borders have become commonplace now, he says. Korczak also notes that "just a few years ago we had 10-12 species; now the consumer can choose from 50-55."

"Factory finished remains the choice for remodeling in 2004," according to Korczak, "while job-site finished is still the floor covering of choice for upscale new homes."

Many manufacturers and distributors noted that high-quality hardwood flooring continues to be a great selling product. With the economy rebounding, "cheaper" isn't turning out to be a better seller.

Production

With logging conditions already improving in the first weeks of 2004, flooring manufacturers were looking forward to ramping up production. One manufacturer told us it was planning for a 40 percent increase beginning in April, with unfinished the biggest focus of its growth. Again,

	2001	2002	2003*	2004*
	--million square feet--			
Hardwood Flooring Sales	830	885	945	1,002
Floor Covering Industry Sales	24,000	25,340	25,500	26,447
% of Square Footage in Hardwood	3.5%	3.5%	3.7%	3.8%
	--million dollars--			
Hardwood Flooring Sales	1,731	1,871	2,100	2,270
Floor Covering Industry Sales	19,373	20,281	20,792	21,568
% of Sales \$ in Hardwood	8.9%	9.2%	10.1%	10.5%

*2003 estimated, 2004 projected based on 3-year trend.

Table 8. Volume and value of solid and engineered hardwood flooring sales vs. total floor covering industry sales, 2001-2004.

2004 will be a good year for unfinished strip-flooring manufacturers. Long-term, however, the unfinished market will grow only slowly, if at all, meaning that this burst of unfinished activity will only last a short time.

Of major concern for many flooring manufacturers, especially coming off the heels of 2003, is whether the lumber supply will be sufficient to allow them to grow production enough to meet demand. While most manufacturers say they are operating profitably at today's lumber and flooring prices, several worried that they would not be able to ramp up their product prices fast enough or high enough to offset significant lumber price increases.

While logging conditions had improved in January 2004, an early arrival of spring breakup could make the 2003-2004 winter logging season one of the shortest on record. That had several manufacturers predicting that the industry would be facing another log crisis come March and April. "Already, many major flooring manufacturers are feeding off the same supply," noted one southern manufacturer, "the sharks are circling."

It appears that there will be few changes in domestic flooring production during the first six months of 2004. While several sawmills have announced intentions to build flooring plants, and at least one dimension manufacturer is making the conversion to flooring, there doesn't seem to be enough lumber in the pipeline to allow significant production increases until mid-year.

Profitability

Poor profit margins will continue to plague flooring manufacturers. Flooring manufacturers have told us that there is going to be real problems if flooring prices keep going up. "Builders and consumers won't stomach another 7-8 percent hike in flooring prices," one noted, "we'll see a shift away from Oak and maybe even hardwoods if this continues." While our earlier price analyses suggests there is some room for lumber prices to rise without shipwrecking the entire flooring industry, real or perceived, margins will continue to be a concern.

On the positive side, increased lumber production in 2004 will reduce the volume of #1 Common lumber that manufacturers need to buy. Additionally, if lumber production increases after mid-year, as we expect it will, prices for #2&3A Common lumber could fall.

At the same time, the ability of producers to raise prices will diminish throughout the year due to the increasing availability of imports and the likelihood of additional domestic manufacturing capacity coming online.

Imports/Exports

For many hardwood flooring manufacturers, a significant part of their growth in 2003 resulted from increased sales of imported lines. Many manufacturers' brochures, in fact, currently showcase imported and domestic flooring side-by-side, and retail outlets are featuring more imported species at price points at or near domestic Oaks. One major flooring manufacturer/distributor acknowledged that the margins on exotic imports are much better than for either manufacturing or reselling domestic species, and they sell for about the same price. Only time will tell whether such co-marketing of domestic and imported production will eventually come to haunt these domestic manufacturers.

There are still those companies that do not believe imports will have much of an effect. Because high-priced flooring products are currently selling so well, one manufacturer forecasted it would be quite a while before Asian flooring (whose most attractive advantage is price) found success in the U.S. The owner of another manufacturing firm who had just returned from China observed that most Chinese flooring manufacturers are "mom and pop" operations in the countryside employing 100 or more laborers. "With that many manual laborers," he noted, "they will always

be better able to patch up knotty lumber and do things like hand scraping, but those are minor items in the marketplace.”

However, if you are one of those alarmed by 2003's near doubling of imported solid hardwood flooring shipments, expect 2004 to induce cardiac arrest. One manufacturer, already in the early stages of panic, noted, “the worst is yet to come in Chinese flooring imports. Right now they are just dabbling—aligning markets and distribution channels. The big push is coming soon.” This same manufacturer, however, also noted that, while it will increase its domestic production capacity in 2004, it will also increase its import of exotic species. Apparently the strategy is to capitalize on the cheaper imports rather than fight them head-on.

Imports of engineered flooring will also increase, although domestic demand for engineered flooring is not expected to grow much in 2004. By 2004 or 2005, China should surpass Indonesia as the leading supplier of engineered hardwood flooring materials.

C. Housing Facts, Figures and Trends 2004
(National Association of Home Builders)



Housing Facts, Figures and Trends 2004

**Housing Facts, Figures
and Trends 2004**

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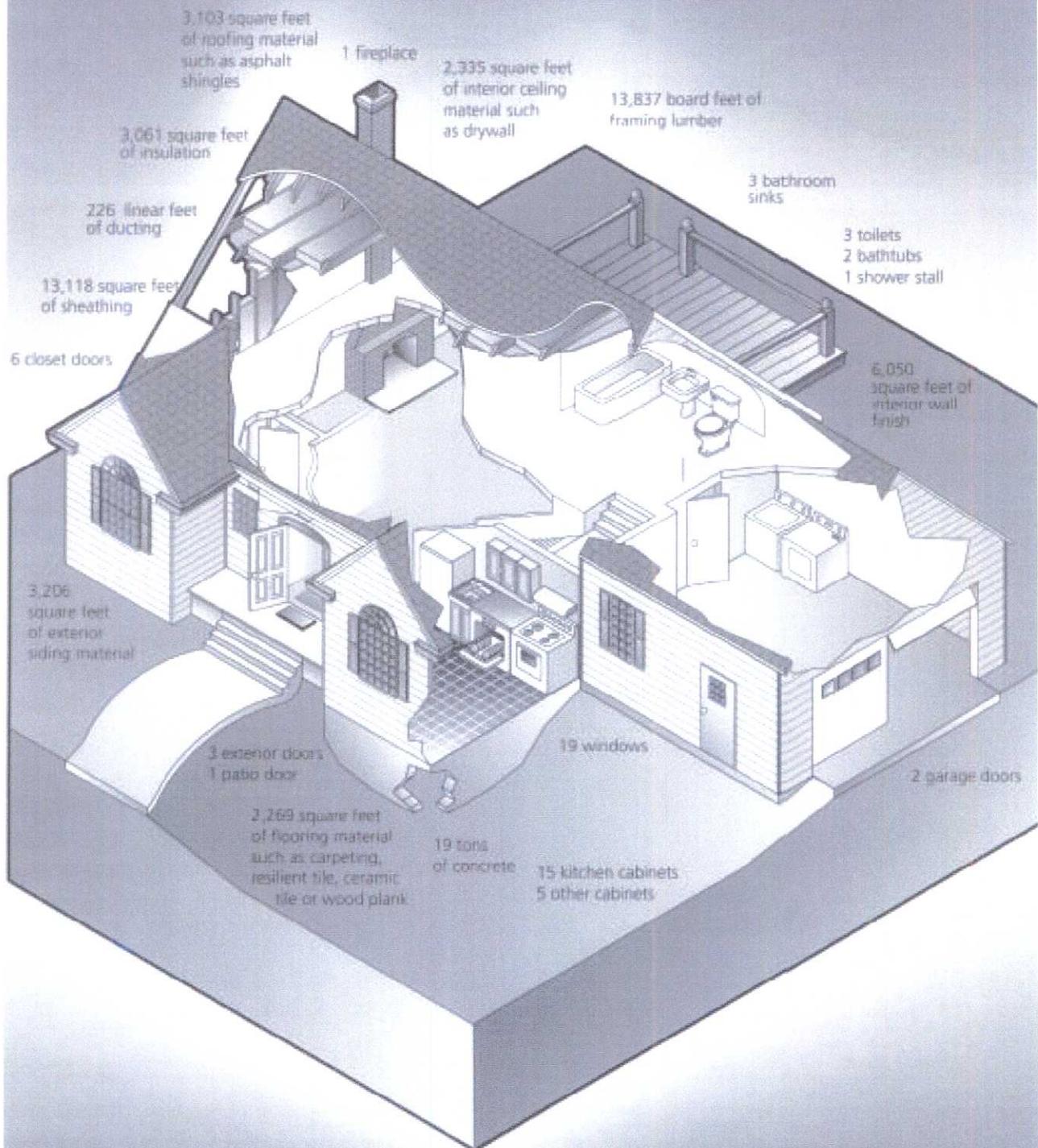
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Materials Used in New Single-Family and Multifamily Homes

ITEM	SINGLE FAMILY	MULTIFAMILY
Finished Area (square feet)	2,272	1,268
Kitchen Appliances		
Ranges, cook tops and ovens	95%	100%
Microwave	72	57
Refrigerator	40	83
Dishwasher	93	91
Clothes dryer and washer	19	60
Garbage disposer	77	74
Trash compactor	5	7
Hot water dispenser	5	7
Central vacuum	10	2
Kitchen Counter Tops		
Average Linear Feet per Home	23	17
Laminate	56%	70%
Solid surface	17	20
Granite	15	8
Ceramic tile	9	2
Other	3	—
Kitchen Sinks		
Stainless steel	57%	72%
Enameled cast iron	24	15
Enameled steel	10	8
Other	9	5
Cabinets (average number)		
Kitchen cabinets	15	11
Vanity cabinets	3	2
Other rooms	2	0
Roofing		
Roofing Material (square feet)	3,103	—
Roofing Material (percent)		
Asphalt shingle	80.0%	—
Cedar shake	1.6	—
Clay roof tiles	2.6	—
Concrete roof tiles	14.0	—
Other ²	1.9	—
Floor Coverings		
Floor Covering Materials		
Carpet	63%	60%
Hardwood	11	8
Vinyl	13	16
Ceramic Tiles	12	16
Other	1	<1

continued on page 8

Materials Used to Build a 2,272-Square-Foot Home



Source: NAHB Research Center, 2001 Builder Practices Survey

Security and Home Automation Systems

Intercom/entrance phone	5.8%	12.6%
Video entrance phone	1.0	3.1
Whole home control or automation system	1.9	1.4
Security system—sounds alarm in house	17.3	14.2
Security system—alerts protection service	23.3	25.5
Lighting control system	2.1	4.5
Programmable thermostat	40.1	33.1
Communicating thermostat	0.6	0.1
Whole-house audio system	7.2	3.1
Whole-house video system	4.6	3.3
Built-in home theater	4.6	1.3
Electrical load-monitoring system	0.6	1.8
Multi-line phone system	38.4	41.8
Structured wiring	31.0	45.0

Doors**Patio Door Materials**

Aluminum	19%	23%
Vinyl	25	30
Steel	19	1
Wood	32	17
Aluminum clad wood	5	27
Other	2	1

Exterior Door Materials

Steel	66%	64%
Fiber glass	16	8
Wood	18	28

Windows

Average number of windows	19	8
---------------------------	----	---

Window Materials

Vinyl	44%	59%
Aluminum	26	23
Wood-aluminum or vinyl clad	23	16
Wood-No clad	5	1
Other	1	1

Exterior Siding

Exterior Siding (square feet)	3,206	977
-------------------------------	-------	-----

Exterior Siding Materials

Vinyl	28%	33%
Brick	19	20
Cement stucco	19	13
Synthetic stucco	2	1
Hardwood	4	5
Fiber cement	13	5
Lumber	4	3
Cedar shingles	2	2
Manufactured stone	2	4
Plywood panels	1	1
Natural stone	2	<1
Oriented strand board	2	<1
Other	2	2

continued on page 9

Sheathing		
Floor, wall and room sheathing (square feet on 3/8 basis)	13.118	4.940
Sheathing Materials		
Plywood	3.276	1.676
Oriented strand board	8.619	2.951
Solid board	132	313
Foam	1.091	—
Heating, Ventilation and Air Conditioning		
Cooling equipment	88%	89%
Heating equipment	98	98
Outdoor Features		
Deck Materials		
Treated wood	56%	66%
Cedar	12	14
Wood/plastic components	10	6
Redwood	9	4
Other	13	10
Driveways (linear feet)	57	—
Poured concrete	60%	—
Asphalt	19	—
Gravel	9	—
Garage Doors		
Garage Door Materials		
Steel	88%	77%
Wood	7	10
Fiberglass/plastic	2	6
No answer	3	7
Cement/Concrete Usage		
Tons of Cement	19.00	8.87
Basement and crawl space: foundation wall	3.04	0.88
Basement floor	1.65	0.59
Foundation footings	1.85	0.61
Above grade walls	1.16	0.50
Slabs and floors	3.48	1.91
Concrete products	2.53	0.86
Fireplaces, hearths and chimneys	0.12	0.04
Landscaping and paving	5.17	3.49

continued on page 10

SECTION 1 What's Being Built and Sold

Walls		
Exterior Wall Framing Material (linear feet)	301	141
Wood	88%	85%
Masonry	11	14
Steel	1	1
Interior Wall Finish (square feet)	6,050	4,047
Gypsum drywall	98.4%	99.2%
Cement bound	0.6	0.4
Lumber/boards	0.5	0.2
Other	0.5	0.3
Interior Ceiling Finish (square feet)	2,335	1,286
Gypsum drywall	98.0%	97.0%
Cement bound	0.5	0.7
Lumber/boards	0.8	0.2
Other	0.8	1.1
Beams		
Beams (linear feet)	113	75
Built-up dimensional lumber	43%	24%
LVL	22	22
Steel	7	7
Solid wood	9	11
Glulam	8	8
Parallam	4	6
Open web joist	2	9
I-joist	2	9
Other	2	4

Source: NAHB Research Center, 2001 Builder Practices Survey—Analyzed by NAHB's Economics Group.

Population by Race and Hispanic or Latino Origin, for the United States, Regions, Divisions, and States, and for Puerto Rico: 2000 (continued)

U.S. REGION/DIVISION/ STATE	TOTAL POPULATION	WHITE	BLACK OR AFRICAN AMERICAN	AMERICAN INDIAN AND ALASKA NATIVE	ASIAN	NATIVE HAWAIIAN AND OTHER PACIFIC IS- LANDER	SOME OTHER RACE	TWO OR MORE RACES	HISPANIC OR LATINO (OF ANY RACE)	WHITE ALONE, NOT HISPANIC OF LATINO
West Virginia	1,808,344	1,718,777	57,232	3,606	9,434	400	3,107	15,788	12,279	1,709,966
North Carolina	8,049,313	5,804,656	1,737,545	99,551	113,689	3,983	186,629	103,260	378,963	5,647,155
South Carolina	4,012,012	2,695,560	1,185,216	13,718	36,014	1,628	39,926	39,950	95,076	2,652,291
Georgia	8,186,453	5,327,281	2,349,542	21,737	173,170	4,246	196,289	114,188	435,227	5,128,661
Florida	15,982,378	12,465,029	2,335,505	53,541	266,256	8,625	477,107	376,315	2,682,715	10,458,509
East South Central	17,022,810	13,113,106	3,418,542	57,850	136,378	5,741	121,441	169,752	299,176	12,967,670
Kentucky	4,041,769	3,640,889	295,994	8,616	29,744	1,460	22,623	42,443	59,939	3,608,013
Tennessee	5,689,283	4,563,310	932,809	15,152	56,662	2,205	56,036	63,109	123,838	4,505,930
Alabama	4,447,100	3,162,808	1,155,930	22,430	31,346	1,409	28,998	44,179	75,830	3,125,819
Mississippi	2,844,658	1,746,099	1,033,809	11,652	18,626	667	13,784	20,021	39,569	1,727,908
West South Central	31,444,850	22,422,698	4,536,428	434,877	684,064	19,714	2,592,442	754,627	7,043,574	18,384,207
Arkansas	2,673,400	2,138,598	418,950	17,808	20,220	1,668	40,412	35,744	86,866	2,100,135
Louisiana	4,468,976	2,856,161	1,451,944	25,477	54,758	1,240	31,131	48,265	107,738	2,794,391
Oklahoma	3,450,654	2,628,434	260,968	273,230	46,767	2,372	82,898	155,985	179,304	2,556,368
Texas	20,851,820	14,799,505	2,404,566	118,362	562,319	14,434	2,438,001	514,633	6,669,666	10,933,313
WEST	63,197,932	43,274,074	3,076,884	1,187,989	5,003,611	304,246	7,622,844	2,728,284	15,340,503	36,911,587
Mountain	18,172,295	14,591,933	523,283	614,553	353,429	38,508	1,541,704	508,885	3,543,573	12,883,812
Montana	902,195	817,229	2,692	56,068	4,691	470	5,315	15,730	18,081	807,823
Idaho	1,293,953	1,177,304	5,456	17,645	11,889	1,308	54,742	25,609	101,690	1,139,291
Wyoming	493,782	454,670	3,722	11,133	2,771	302	12,301	8,883	31,669	438,799
Colorado	4,301,261	3,560,005	165,063	44,241	95,213	4,621	309,931	122,187	735,601	3,202,880
New Mexico	1,819,046	1,214,253	34,343	173,483	19,255	1,503	309,882	66,327	765,386	813,495
Arizona	5,130,632	3,873,611	158,873	255,879	92,236	6,733	596,774	146,526	1,295,617	3,274,258
Utah	2,233,169	1,992,975	17,657	29,684	37,108	15,145	93,405	47,195	201,559	1,904,265
Nevada	1,998,257	1,501,886	135,477	26,420	90,266	8,426	159,354	76,428	393,970	1,303,001
Pacific	45,025,637	28,682,141	2,553,601	573,436	4,650,182	265,738	6,081,140	2,219,399	11,796,930	24,027,775
Washington	5,894,121	4,821,823	190,267	93,301	322,335	23,953	228,923	213,519	441,509	4,652,490
Oregon	3,421,399	2,961,623	55,662	45,211	101,350	7,976	144,832	104,745	275,314	2,857,616
California	33,871,648	20,170,059	2,263,882	333,346	3,697,513	116,961	5,682,241	1,607,646	10,966,556	15,816,790
Alaska	626,932	434,534	21,787	98,043	25,116	3,309	9,997	34,146	25,852	423,788
Hawaii	1,211,537	294,102	22,003	3,535	503,868	113,539	15,147	259,343	87,699	277,091
PUERTO RICO	3,808,610	3,064,862	302,933	13,336	7,960	1,093	260,011	158,415	3,762,746	33,966

Source: U.S. Census Bureau, Census 2000 Redistricting Data (PL 94-171) Summary File for states and Census 2000 Redistricting Summary File for Puerto Rico, Tables PL1 and PL2.

SECTION 7

Remodeling

Expenditures for Maintenance and Repairs and Improvements

Seasonally Adjusted Annual Rate in Millions of Dollars

	TOTAL EXPENDITURES	MAINTENANCE AND REPAIRS	TOTAL IMPROVEMENTS	ADDITIONS AND ALTERATIONS	MAJOR REPLACEMENTS
1975					
First Quarter	\$ 22.600	\$ 9,100	\$13.500	\$ 9.900	\$ 3,600
Second Quarter	24.700	9,100	15.600	10.800	4,800
Third Quarter	25.800	9,600	16.100	11,600	4,500
Fourth Quarter	27.500	11,200	16.200	11,400	4,800
1980					
First Quarter	48.100	15,800	32,300	21,800	10,500
Second Quarter	44.700	15,100	29,600	20,200	9,400
Third Quarter	45.900	15,000	31,000	21,300	9,700
Fourth Quarter	47,100	15,100	32,000	22,100	9,900
1985					
First Quarter	79,200	33,900	45,400	29,700	15,600
Second Quarter	79,500	39,200	40,200	26,000	14,200
Third Quarter	76,300	33,200	43,100	28,400	14,600
Fourth Quarter	94,400	39,200	55,200	33,700	21,500
1990					
First Quarter	120,900	52,900	67,900	44,200	23,800
Second Quarter	113,600	55,700	57,900	40,100	17,900
Third Quarter	112,800	55,400	57,400	38,800	18,700
Fourth Quarter	115,800	58,500	57,300	37,900	19,400
1995					
First Quarter	131,200	49,100	82,100	55,300	26,800
Second Quarter	133,200	48,700	84,500	56,200	28,300
Third Quarter	127,900	48,800	79,100	48,300	30,900
Fourth Quarter	107,200	41,600	65,600	44,300	21,200

Expenditures by Type of Job, Owner-Occupied Properties: 1993 to 2002

(Millions of dollars. Components may not add to totals due to rounding)

	1993	1995	1997	1999	2001	2002
Total expenditures	\$79,800	\$83,911	\$93,962	\$99,281	\$109,642	\$121,507
Additions	14,909	9,784	12,057	10,773	11,638	17,778
Decks and porches	1,890	2,466	2,911	2,407	1,305	3,239
Attached garages	2,332	2,227	472	544	1,189	1,499
Rooms	10,688	5,092	8,674	7,822	9,144	13,040
Alterations	20,209	20,022	26,566	33,678	37,016	39,355
Plumbing	892	919	1,587	1,297	1,140	892
HVAC	972	1,229	1,952	2,127	1,602	1,681
Electrical	537	495	556	628	482	678
Flooring	1,823	1,970	2,573	2,999	5,209	5,052
Kitchen remodeling	2,769	2,781	5,064	4,823	2,714	6,608
Bathroom remodeling	1,593	1,532	3,281	2,498	2,425	4,492
Kitchen and bathroom remodeling	641	600	171	180	2,745	2,124
Finishing space	1,122	1,172	1,216	1,284	1,696	2,956
Interior restructuring	1,456	2,363	3,639	3,151	8,451	3,588
Siding	994	369	1,164	1,328	384	566
Windows and doors	863	320	620	756	100	223
Other alterations	6,547	6,271	4,741	12,606	10,069	10,493
Outside Additions and Alterations	7,402	8,824	9,805	11,351	13,307	15,383
Detached buildings	587	1,492	3,235	1,464	1,912	1,402
Patos and terraces	529	495	1,357	794	1,495	1,090
Driveways and walkways	885	866	1,240	1,292	1,058	2,631
Fences	1,475	1,441	1,564	2,079	1,817	2,186
Other outside additions and alterations	3,925	4,530	2,409	5,723	7,025	8,075
Major Replacements	14,749	18,086	18,206	19,229	23,063	25,339
Plumbing	1,684	2,029	1,555	1,334	1,202	1,557
HVAC	3,684	5,307	4,603	3,120	4,892	4,314
Siding	1,190	1,110	1,105	1,972	1,764	1,684
Roofing	3,060	3,732	5,450	5,375	5,221	5,974
Driveways and walkways	774	435	551	990	1,033	890
Windows	1,871	2,436	2,959	3,291	3,892	3,861
Doors	975	846	1,008	1,188	1,364	1,354
Other major replacements	1,510	2,189	975	1,958	3,695	5,705

**D. Western Wood Products Association
Fall Forecast**



A stronger than expected U.S. economy in 2004 will push lumber consumption to historic highs. While economic activity will slow into 2005, housing and lumber demand will decline only moderately and pick up again in 2006. Offshore lumber imports should continue to climb, but Western mills should be able to hold their own in 2005 and 2006.

U.S. Economic & Housing Outlook

U.S. ECONOMY IN PIVOTAL POSITION

The U.S. represents 30 percent of the world's GDP and is the largest importing country in the world. Thus, if the U.S. economy coughs, the rest of the world catches a cold. To avoid a return to global economic weakness, energy prices must moderate and the U.S. economy has to fire on all cylinders.

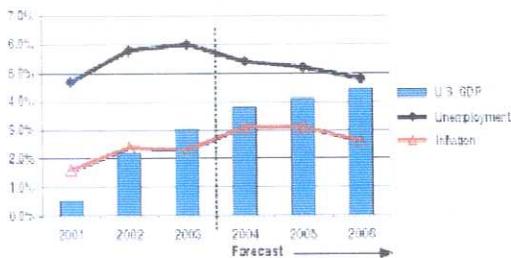
Many forecasts are calling for slower growth in 2005 and 2006. By contrast, WWPA forecast calls for moderate growth in the U.S. this year and next, with further expansion in 2006.

FALSE SPRING

Aided by federal tax cuts and low interest rates, quarterly consumer spending (two-thirds of U.S. GDP) rose 3.3 percent on average from 2001 through 2003, helping the U.S. economy climb out of a mild recession. Aided by consumers' spendthrift ways, gross domestic product rose to 3 percent in 2003.

By the second quarter of 2004, however, consumer spending moderated as people began paying off high consumer debt in anticipation of higher rates. Savings rates are still near all-time lows and should inch higher. Expect uneven consumer spending until mid-year 2005.

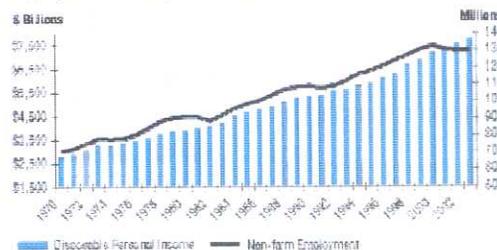
Forecast Fundamentals



IT'S ALL ABOUT JOBS

Consumer spending won't heat up again until real gains are seen in personal income. Since 1970, growth in personal income has averaged 1.7 percent during periods of no job growth. During times of expanding employment, real growth in personal income averaged 3.8 percent.

Employment vs. Disposable Income



New jobs in September 2004 totaled an estimated 96,000, which did not keep pace with the number of new entrants into the civilian workforce due to immigration and demographics. The upbeat forecast for 2006 hinges on an estimated 200,000 jobs created per month during the second half of 2005.

HIGHER PROFITS, INCREASED INVESTMENTS

On average, increased business investment added more than a percentage point to U.S. economic growth from 1993 to 2000.

In the face of the 2001 recession and the weak growth that followed, businesses trimmed spending and jobs.

Although profits have steadily grown since the last quarter of 2002, business investment has lagged. Purchases of equipment and software have trended higher since the beginning of 2003. However, with office and industrial building vacancy rates failing to drop significantly, investment in new nonresidential buildings has remained weak. Expect a modest increase in

spending on structures, gaining momentum as the economy gathers steam in mid-2005.

Business Profits vs. Business Investment

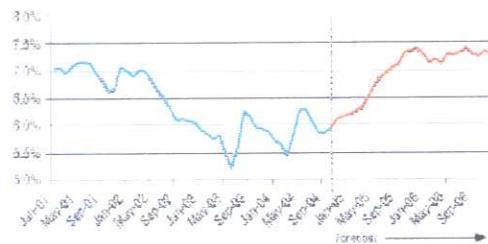


Increased business investment, combined with job growth and steadier consumer spending, should provide a good boost to the U.S. economy, particularly in 2006. Because higher prices seen early in the year were predominantly energy driven, lower energy prices coupled with modest interest rate increases should keep inflation at bay through 2006.

U.S. HOUSING MARKETS

Conventional housing construction and existing home sales boomed through the recession of 2001, gathering strength into 2004. Although low interest rates were key in keeping home buying affordable during this period, personal income growth and general economic health are longer term indicators of the housing sector's health.

30-year Fixed Mortgage Rate



Interest rates are expected to rise slowly in 2005, with 30-year fixed mortgage rates easing past 7 percent by midyear.

2004-2006 U.S. Housing

thousands	2004	2005	2006
Single family	1,574	1,465	1,515
Multi-family	343	338	345
Total	1,917	1,803	1,860
Manufactured housing	135	140	140

Higher rates are expected to dampen home buying and remodeling more than home building, with existing home sales off 8 percent and 2 percent in 2005 and 2006, respectively. Meanwhile, new home construction should fade in the second half of 2005, rekindling by the spring of 2006 due to improved economic conditions.

REPAIR AND REMODELING

Repair and remodeling of existing homes is the second leading lumber market in the U.S. Ninety percent of lumber used in the R&R market is used in improvements. Expenditures for improvements track with existing home sales. Since home sales are expected to decline in 2005 and 2006, record R&R lumber consumption of nearly 19 billion board feet in 2004 should be followed by an 8 percent decline in 2005 and a smaller decline of 4 percent in 2006.

Home Sales vs. Home Improvement Expenditures



INDUSTRIAL, OTHER MARKETS

Industrial/Other lumber use (not related to construction end-use markets) is expected to top 9 billion feet in 2004 and climb modestly over the next two years due to an increase in manufacturing and trade. Lumber use in nonresidential construction is forecast to increase over the forecast period as investment in new commercial buildings gains momentum, particularly in 2006.

U.S. Lumber Demand

Million Board Feet	2003	2004	2005	2006
New Construction	24,366	25,568	23,861	24,624
Repair and Remodeling	17,988	18,930	17,395	16,724
Non-Residential	5,956	6,184	6,544	6,849
Industrial and Other	8,683	9,056	9,437	9,691
Total Demand	56,993	59,738	57,237	57,888

Lumber Supply by Region

B.C. – A TALE OF TWO REGIONS

The lumber industry in British Columbia is increasingly split between the Coast and Inland regions of the province, with each area seeing unique challenges and opportunities.

Increased sawmill productivity combined with an expanding supply of beetle-killed timber has lumber production in Interior B.C. headed for a record 13 billion board feet in 2004. An expected 4 percent decline in U.S. lumber consumption in 2005 should have only a modest impact on Interior B.C. mills. Interior production is forecast to drop 0.8 percent in 2005 and rise slightly more than 1 percent in 2006.

B.C. Production

Million Board Feet	2003	2004	2005	2006
Interior	12,552	13,150	13,050	13,200
Coast	2,458	2,400	2,250	2,285
Total B.C.	15,010	15,550	15,300	15,485

Meanwhile, the Coast B.C. industry is in the midst of rationalization – closing inefficient mills while at the same time reducing production of Hemlock. Coast B.C. production is expected to decline 2 percent to 2.4 billion board feet in 2004 and move lower yet over the next two years.

EASTERN ADVANTAGE FADES

Between 1995 (the last year before the quota) and 2002 (the first full year after its demise), Canadian production east of the Rockies rose 54 percent. U.S. imports from that region peaked at 9.8 billion board feet in 2000, a 31 percent increase compared to 1995.

Production East of the Rockies

Million Board Feet	2003	2004	2005	2006
Quebec	7,487	7,614	7,217	7,290
Ontario	3,563	3,438	3,208	3,224
Prairies	3,872	4,243	4,094	4,151
Maritimes	2,255	2,311	2,207	2,229
Total	17,177	17,607	16,727	16,894

After expanding its capacity during the late 1990s, Quebec saw production reach 8.1 billion board feet in 2002. Maritimes production climbed to 2.4 billion board feet. Despite the then-record U.S. consumption, production in the

Eastern provinces (Ontario, Quebec, New Brunswick, Nova Scotia) faltered in 2003, dropping 7 percent. U.S. duties on Canadian imports had some impact, but growing evidence suggests timber availability is getting stretched in the Eastern provinces.

With U.S. lumber markets red hot through three quarters of 2004, Canadian imports shot up 8 percent but production in the Eastern provinces was muted, up less than 1 percent year-to-date through July. By contrast, production in the Prairie provinces (Alberta, Saskatchewan and Manitoba) posted year-to-date increases of 10 percent. Production in the Eastern provinces has likely topped out and is expected to decline in 2005 and 2006.

CANADIAN IMPORTS, TIMBER SUPPLY

Timber supply constraints in the Eastern provinces will likely restrict market share and force exports to the U.S. down over the forecast period. By contrast, Interior B.C. is expected to gain share in the U.S. market while Coast B.C. will see its share decline. Imports from Prairie provinces are expected to track with U.S. consumption.

Canadian Imports

Million Board Feet	2003	2004	2005	2006
B.C.	10,258	10,733	10,562	10,673
Prairies & East	9,108	9,691	9,206	9,372
Total Canada	19,366	20,424	19,768	20,045

SOUTH PACES U.S. PRODUCTION

The South has been called the new “timber basket of North America” and the region’s response to favorable lumber markets in 2004 support that claim. But record Southern production, combined with healthy lumber price increases, hasn’t translated into record timber prices in the region.

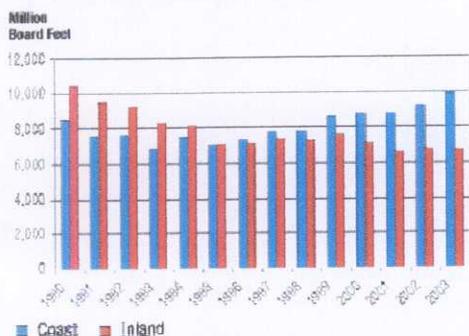
Timber Mart-South reports second quarter 2004 Southern Yellow Pine sawtimber prices (the latest report available) nearly flat since the second quarter of 2002. State forestry departments report modestly higher prices (up approximately \$2 per ton or \$8-10/MBF, Scribner) in July-August 2004 compared to May-June.

Southern production is expected to exceed 17.5 billion board feet for 2004, drop 3 percent next year and then climb back over 17 billion board feet in 2006.

INLAND WEST: WORST IS OVER

Over the past decade, lumber production in the Inland region has been cut nearly in half due to drastic reductions in federal timber sales. By 2003, national forests supplied less than 12 percent of the logs used by Inland sawmills compared to 53 percent in 1990.

Inland Production vs. Coast Production



In the past two years, the dramatic reduction of Inland sawmill capacity has slowed. Although additional Inland mill closures are expected, other mills are retooling and becoming more competitive. Meanwhile, Inland mills report a better log supply. The outlook for Inland sawmills is for modest declines in market share through 2006.

COAST CONTINUES TO RISE

In contrast to the Inland region, Coast mills have enjoyed increased log availability since the mid-1990s. There have been steep declines in log exports and increasing log imports. Private timberlands – long the primary source of logs for Coast sawmills – continue to increase productivity. State timberlands have been more resilient and haven't experienced the same timber sale reductions as federal lands. The state of Washington in particular is working to increase timberland revenues of DNR lands.

U.S. Production

Million Board Feet	2003	2004	2005	2006
Inland	6,717	6,775	6,500	6,523
Coast	9,904	10,500	10,298	10,381
California Redwood	976	995	864	865
South	16,858	17,512	16,985	17,084
Other U.S.	2,153	2,200	1,924	1,950
Total	36,608	37,982	36,571	36,803

Better log supply coupled with capacity increases should allow the Coast region to gain market share over the forecast period.

OFFSHORE IMPORTS CLIMB

Lumber imports from countries other than Canada are expected to top 2 billion board feet in 2004, up 17 percent. Leading the way is European imports, expected to increase shipments to U.S. markets by 28 percent to 1.2 billion board feet this year. Latin American imports will be up by at least 17 percent and top 800 million board feet.

U.S. Lumber Imports

Million Board Feet	2003	2004	2005	2006
Canada	19,366	20,424	19,768	20,045
Europe	904	1,160	968	1,044
Latin America	712	835	754	821
New Zealand/Other	227	170	185	190
Total	21,209	22,589	21,675	22,100

Both Europe and Latin America consider the U.S. an important market today. Look for offshore imports to gain market share in 2005 and 2006 even as U.S. lumber consumption softens cyclically.

EXPORTS IN THE DOLDRUMS

After the brief rebound in 2003, U.S. lumber exports continued their decline in 2004 and are expected finish 13 percent lower for the year. Due to a modestly weaker dollar and lower domestic prices, exports should see mild increases in 2005 and 2006.

U.S. Lumber Exports

Million Board Feet	2003	2004	2005	2006
Japan	113	102	115	112
Canada	217	225	230	225
Mexico	294	189	197	205
Other	323	310	319	330
Total	947	826	861	872

E. Western Wood Products Association
Statistics

ESTIMATED U.S. SOFTWOOD LUMBER CONSUMPTION

By Markets and Principal Sources 1994 — 2002

Million Board Feet

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Markets (Demand):									
Residential Construction	18,997	17,864	19,095	19,158	20,642	22,122	20,596	21,248	22,652
Repair & Remodeling	14,254	14,296	14,890	15,148	14,675	15,113	16,420	16,188	17,937
Non-Residential Construction	6,238	6,696	6,883	7,541	7,790	7,634	7,713	7,608	6,851
Materials Handling	4,110	4,309	4,436	4,695	4,771	4,943	5,085	4,879	4,844
All Other	4,054	4,133	4,174	4,328	4,331	4,451	4,126	4,006	3,780
Total	47,653	47,298	49,478	50,870	52,209	54,263	53,940	53,929	56,064
Sources (Supply):									
Coast Region	6,610	6,399	6,650	7,039	7,527	8,071	8,310	8,503	8,994
Inland Region	7,656	6,314	6,631	6,762	7,027	7,260	6,732	6,380	6,579
California Redwood Region	1,424	1,179	1,281	1,441	1,367	1,323	1,216	1,123	1,052
Southern Pine Region	14,618	14,384	14,991	15,887	15,673	16,427	16,253	15,880	16,411
Other U.S.	965	1,627	1,711	1,737	1,928	2,004	1,980	1,968	2,048
Total	31,273	29,903	31,264	32,866	33,522	35,085	34,491	33,854	35,084
Imports	16,380	17,395	18,214	18,004	18,687	19,178	19,449	20,075	20,980
Total	47,653	47,298	49,478	50,870	52,209	54,263	53,940	53,929	56,064

Residential Construction: Single-family; low rise and high-rise multi-family; and mobile homes.

Non-residential Construction: Commercial, industrial, public and other buildings; public utilities; sewer and water systems; highway construction; conservation and development projects; and non-residential farm construction.

Repair & Remodeling: Residential and non-residential.

Materials Handling: Boxes, crates and packaging; wooden pallets; and dunnage.

All Other: Railroads and mining, products made for sale, including furniture; and miscellaneous uses not included elsewhere.

Imports: Softwood lumber, softwood siding and flooring.

PRIVATE HOUSING STARTS
and
MANUFACTURED HOME SHIPMENTS
By Region and Type of Structure 1994 — 2002
Thousands of Units

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Single-Family Starts									
Northeast	123	102	112	111	122	126	118	111	118
Midwest	268	234	254	238	273	289	260	269	277
South	522	485	524	507	574	579	556	590	628
West	286	256	271	278	303	308	297	303	336
	1,198	1,076	1,161	1,134	1,271	1,302	1,231	1,273	1,359
Multi-Family Starts									
Northeast	15	16	20	26	27	30	37	38	40
Midwest	61	56	68	66	57	58	57	62	73
South	117	130	138	163	169	167	158	142	154
West	65	75	90	85	92	84	86	88	80
	259	278	316	340	346	339	338	330	346
Total Housing Starts									
Northeast	138	118	132	137	149	156	155	149	158
Midwest	329	290	322	304	330	347	317	331	350
South	639	615	662	670	743	746	714	732	782
West	351	331	361	363	395	392	383	391	416
	1,457	1,354	1,477	1,474	1,617	1,641	1,569	1,603	1,705
Manufactured Home Shipments									
	304	340	363	354	373	348	251	193	169
Total New Housing									
	1,761	1,694	1,840	1,828	1,990	1,989	1,820	1,796	1,874

MANUFACTURED HOME PLACEMENTS
By Region 1994 — 2002
Thousands of Units

	1994	1995	1996	1997	1998	1999	2000	2001*	2002
Mobile Home Placements									
Northeast	16	15	16	14	15	14	15	12	12
Midwest	53	57	59	55	58	52	50	38	33
South	178	203	218	220	250	229	178	116	100
West	44	44	45	47	51	43	38	30	27
Total	291	319	338	336	374	338	281	196	172

* Census Bureau Revisions.

Housing data: U.S. Census Bureau

Columns may not add to total due to rounding.

F. U.S. Population Distribution

Population Distribution

State	Jul-03 pop.	Percent	Pop. rank, 2003
Alabama	4,500,752		23
Alaska	648,818		47
Arizona	5,580,811		18
Arkansas	2,725,714		32
California	35,484,453		1
Colorado	4,550,688		22
Connecticut	3,483,372		29
Delaware	817,491		45
DC	563,384		50
Florida	17,019,068		4
Georgia	8,684,715		9
Hawaii	1,257,608	0.43%	42
Idaho	1,366,332		39
Illinois	12,653,544		5
Indiana	6,195,643		14
Iowa	2,944,062		30
Kansas	2,723,507		33
Kentucky	4,117,827		26
Louisiana	4,496,334		24
Maine	1,305,728		40
Maryland	5,508,909		19
Massachusetts	6,433,422		13
Michigan	10,079,985		8
Minnesota	5,059,375		21
Mississippi	2,881,281		31
Missouri	5,704,484		17
Montana	917,621		44
Nebraska	1,739,291		38
Nevada	2,241,154		35
New Hampshire	1,287,687		41
New Jersey	8,638,396		10
New Mexico	1,874,614		36
New York	19,190,115		3
North Carolina	8,407,248		11
North Dakota	633,837		48
Ohio	11,435,798		7
Oklahoma	3,511,532		28
Oregon	3,559,596		27
Pennsylvania	12,365,455		6
Rhode Island	1,076,164		43
South Carolina	4,147,152		25
South Dakota	764,309		46
Tennessee	5,841,748		16
Texas	22,118,509		2
Utah	2,351,467		34
Vermont	619,107		49
Virginia	7,386,330		12
Washington	6,131,445		15
West Virginia	1,810,354		37
Wisconsin	5,472,299		20
Wyoming	501,242		51
Total U.S.	290,809,777		—