
Forest Management Plan for the Kokee Timber Management Area, Island of Kauai

January 2005

Prepared by:

State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
Division of State Parks

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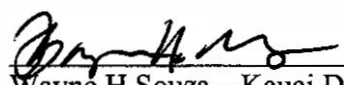
FOREST MANAGEMENT PLAN SIGNATURE PAGE

Kauai District certification: This plan was prepared by a team of Division of Forestry and Wildlife (DOFAW) and State Parks (SP) staff to provide a management framework for the listed Forest Reserves and State Parks.



Alvin M. Kyono – DOFAW Kauai Branch Manager

6/25/07
Date



Wayne H Souza – Kauai District Parks Superintendent

06/25/07
Date

DOFAW and SP Administrator's approval: We have reviewed the enclosed Forest Management Plan and concur with the recommendations herein. We agree that resource management implementation will follow those specified in the Management Plan for the Kokee Timber Management Area.



Paul J. Conry – DOFAW Administrator

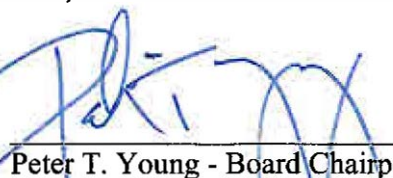
6/27/07
Date



Daniel S. Quinn – SP Administrator

6/27/07
Date

Department of Land and Natural Resources Board approval: This plan meets the criteria established for State Forest Reserve Management Plans as mandated by Chapter 183, Section 16.5, Hawaii Revised Statutes.



Peter T. Young - Board Chairperson

6/27/07
Date

I. INTRODUCTION

The Department of Land and Natural Resources (DLNR) is responsible for a wide range of resource management objectives including but not limited to watershed and endangered species protection, forest product development, nursery seedling production, Natural Area Reserve protection and management, wildland fire suppression, camping, public trails and access, and wildlife and game management programs. Cooperative natural resource programs are also planned and implemented on privately owned forestlands through natural area partnerships, forest stewardship programs, urban forestry projects, service forestry, and other agreements.

In 2001, the forest industry in Hawaii contributed 30.7 million dollars and 926 jobs to Hawaii's economy (Yanagida et al., in press). Sustainable commercial forest management is a viable contributor to economic stability and can enhance the environment while retaining the rural character of the islands. This concept gained credibility when Kamehameha Schools purchased thousands of acres on the island of Hawaii that were subsequently leased to Prudential Timber for the establishment of a multi-million dollar *Eucalyptus* plantation project. The State also played a strategic role in the development of Hawaii's forest product industry when the Board of Land and Natural Resources approved the Waiakea Timber Management Area plan on September 11, 1998 – a process that ultimately lead to the issuance of a large-scale timber land license.

Although the primary focus for industrial forestry has been on the island of Hawaii, similar opportunities exist on a smaller scale for the island of Kauai. Lihue Plantation was growing cane on what is considered prime timber production areas, but recently ceased operations. Gay and Robinson is the sole remaining active sugar plantation on Kauai. The latter operates on the drier side of the island, occupying sites of lesser yet valid forest growth potential. In this climate of changing land use the private company Hawaiian Mahogany has begun planting hundreds of acres of new forest plantations. While these and future plantations are established and grow on Kauai, presently mature State timber resources have the potential to influence how Kauai's forest industry develops and help define the role of public assets in overall commercial forestry development throughout the State.

Considerable land area in the western uplands of Kauai were originally placed into Forest Reserves and State Parks in an attempt to curb erosion and degradation by grazing cattle and goats. Components of Puu Ka Pele Forest Reserve were established by Governors proclamation in 1918 and 1938. The Na Pali Kona Forest Reserve portions were proclaimed in 1907. In 1919, the Governor signed a proclamation withdrawing approximately 415 acres along the edge of Waimea Canyon from the Puu ka Pele Forest Reserve and subsequently issued an executive order turning over the land to the County of Kauai for public recreational use. In 1922, 485 acres from the Puu ka Pele Forest Reserve and 230 acres from the Na Pali-Kona Forest Reserve added a total of 715 acres to what would later become Kokee State Park. Act 185, Session Laws of 1949 created a Division of Territorial Parks and by Executive Order Nos. 1509, 1510, 2197 and 2209, which set aside the lands. Kokee and Waimea Canyon State Parks were officially established in 1952.

Even before all of the lands were removed from grazing, tree planting was started in an attempt to slow down soil erosion. Trees of many species - both exotic and native - were planted during the 1930's and early 1940's until World War II stopped operations by sugar plantation and

government personnel. During the late 1950's and 1960's tree planting was started again on the lower eroded slopes of the area, primarily with *Eucalyptus saligna*, *Pinus taeda* and *P. elliottii*.

As a result, lands managed by DOFAW and SP in western Kauai presently contain considerable mature timber resources that represent a potential wood supply for Kauai's forest products industry. Both the approximately 10 small sawmills on Kauai, as well as numerous craftsmen who make wood items ranging from writing pens, bowls, to custom furniture could benefit from gaining access to timber resources. Since Kauai imports most of its lumber, there is good potential for marketing locally grown and manufactured timber products.

Through this management plan, these Divisions propose the establishment of the Kokee Timber Management Area (KTMA) to add active timber management to present management goals for the subject areas, and to promote Kauai's forest industry development through sustainable management of public lands. This plan proposes three principal methods of forest management for the KTMA:

1. Sustainable commercial management of non-native timber plantation areas, where harvesting would be followed by replanting of either native or non-native species.
2. Selective harvest of non-native or invasive species in native forest areas, where harvesting would be followed by replanting of native species.
3. Harvest of native trees for the purposes of fence and roadway maintenance, hazard reduction or the salvage of dead or dying trees.

Board of Land and Natural Resources approval of the KTMA Plan would trigger the following actions:

1. Preparation of an environmental assessment and pursuit of its approval.
2. Periodic solicitation of requests for proposals for harvest of KTMA timber resources.
3. Development and issuance of permits (Hawaii Administrative Rules §13-104-22) or timber land licenses for approved proposals based on the proposed scope of work.

II. THE KOKEE TIMBER MANAGEMENT AREA

A. Location: On Kauai DOFAW has direct management responsibility for over 100,000 acres (including over 88,000 acres of Forest Reserve), and SP has direct management responsibility of over 13,674 acres. The KTMA is comprised of Puu Ka Pele Forest Reserve, Na Pali Kona Forest Reserve South of and including Milolii ridge, Waimea Canyon State Park, and Kokee State Park – an area totaling approximately 17,092 acres (Table 1). Situated on the western part of the island, the KTMA is located along and adjacent to State Route 550 (Kokee Road), starting approximately 5 miles north of Waimea town (Figure 1).

B. Geographic Site Data: Kauai is one of the oldest Hawaiian Islands, and is a remnant of a huge shield volcano that began its volcanic activity in the early or middle Pliocene epoch of the Tertiary period. The island grew rapidly and volcanic activity ceased around the end of the Pliocene period. Through time and the effects of erosion, faulting, collapse, and weathering, the island's original shape has been greatly altered. Despite the natural weathering process, the

shape of a shield volcano is still the island's dominant feature with Mt. Waialeale and its highest peaks of Kawaikini (5,243 feet) and Waialeale (5,148 feet).

Table 1. Acreage summary for the KTMA.

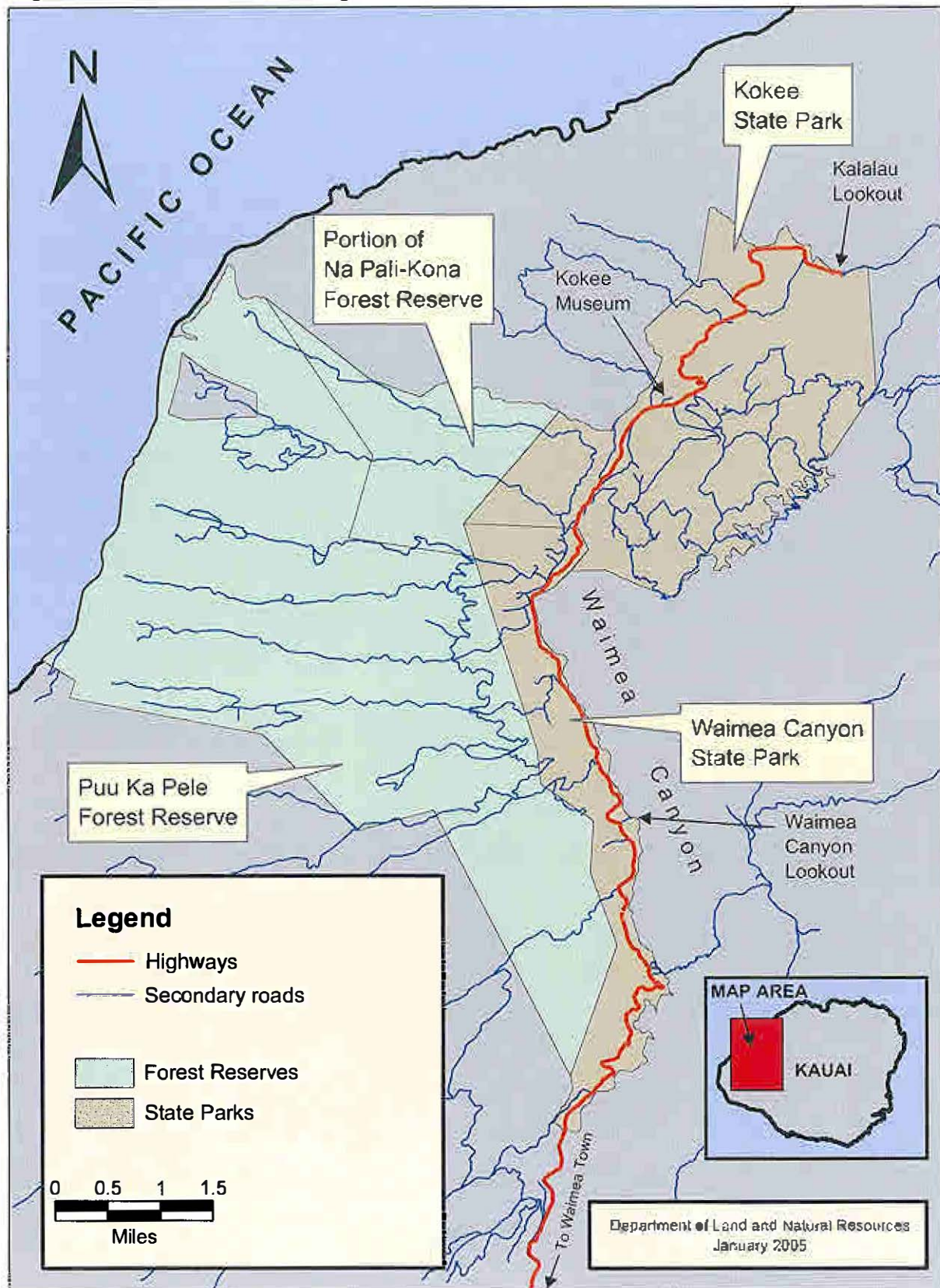
Area	Non-native timber plantation acres	Total acres
Puu Ka Pele Forest Reserve	2,110	9,405
Portion of Na Pali Kona Forest Reserve	95	1,505
Waimea Canyon State Park	160	1,837
Kokee State Park	5	4,345
KTMA totals	2,370	17,092

C. Physical Site Data: The steep windward slopes of Mt. Waialeale and Wainiha Ridge force the moisture-laden winds upward, where changes in temperature and pressure cause rapid condensation, cloud formation and heavy rain. This effect produces an average annual rainfall of 433 inches on Mt. Waialeale (elevation 5,148 feet) and generated a record high of 666 inches in 1982. Median annual rainfall in the KTMA varies with elevation, averaging 30 inches annually at 1,000 feet elevation, and gradually increasing to 120 inches at 4,000 feet elevation. In the approximately 8 miles between Mt. Waialeale and Kanaloahuluhulu Meadow in Kokee State Park, the rainfall contour drops from 433 inches to 60 inches. Within the park boundaries, average rainfall varies from 118 inches at the Puu o Kila lookout (elevation 4,160 feet) to 59 inches at the entrance to Kokee State Park (elevation 3,600 feet) to 39 inches at the entrance to Waimea Canyon State Park (elevation 2,100 feet). Moisture gradients within the two areas are some of the most extreme in the world. Within a single scenic vista can be seen montane and wet forest covered ridges as well as dry, desert-like canyons and cliffs. Mean annual temperature at 1,800 foot elevation is approximately 77°.

The soils in the KTMA are mostly ash-derived silty loams from the Mahana and Oli Series, or basalt derived clay loams from the Niu, Kokee, Kunuweia and Puu Opae Series (Appendix A; Foote et al., 1972). This complex landscape of soil types provides evidence of the island's volcanic origin and the natural forces that shaped the unique terrain. These soils are classified as well drained. Slopes exceeding 25% are common within the KTMA.

D. Existing Vegetation: A majority of the vegetation communities in the KTMA represent native or disturbed native ecosystems. The structure of these communities varies considerably due to the wide range in elevation and rainfall found within the area. The vegetation communities generally belong in the Lowland Mesic and Wet Shrublands, and Lowland Mesic and Wet Forests described by Wagner et al. (1990). A majority of planted non-native timber stands are located on the west-facing ridge tops of Puu Ka Pele Forest Reserve in the 1,000-3,200 foot elevation range. Understory vegetation within these timber stands typically consists of lantana (*Lantana camara*), blackberry (*Rubus argutus*), molasses (*Melinis minutiflora*) and kikuyu grass (*Pennisetum clandestinum*) and native species such as uki, pukiawe (*Styphelia tameiameia*), aalii (*Dodonaea viscosa*), and uki uki (*Dianella sandwicensis*). There are also pockets of native species on these ridge tops and in adjacent valley bottoms consisting primarily

Figure 1. The Kokee Timber Management Area



of koa (*Acacia koa*), ohia (*Metrosideros polymorpha*), kauila (*Alphitonia ponderosa*), iliahi (*Santalum* spp.), etc., with an understory of native and non-native species. Within some of the planted stands and along their fringes are several listed or proposed Threatened and Endangered plant species. Threatened and Endangered species are located on some of the cliff sides and valley bottoms, as well as in the pockets of native vegetation on the ridge tops. Some common plants as well as the eleven (11) threatened and endangered species known to exist in the KTMA are listed in Appendix B.

E. Existing Wildlife: The KTMA has a variety of wildlife resources that provide for both consumptive use such as public hunting, and non-consumptive uses such as wildlife viewing and native species preservation and restoration (Appendix C).

- 1. Public hunting:** DOFAW manages public hunting on all forest reserve lands on Kauai by the regulation of hunting seasons, bag limits and varied hunting methods. Enforcement of hunting regulations (Chapter 122 Rules Regulating Game Bird Hunting, and Chapter 123 Rules Regulating Game Mammal Hunting) is accomplished by the Division of Conservation and Resources Enforcement (DOCARE), of DLNR.

Hunting within the KTMA is divided among designated Hunting Units “A”, “H” and “J”. Each of these units is managed for specific purposes and goals. Game found within these hunting units consists of feral pigs (*Sus scrofa*), feral goats (*Capra hircus*), and black-tailed deer (*Odocoileus hemionus columbianus*). Game birds are: Ring-necked pheasant (*Phasianus colchicus*), Erckel’s francolin (*Francolinus erckelii*), black francolin (*Francolinus francolinus*), chukar partridge (*Alectoris graeca*), lace-necked doves (*Streptopelia chinensis*), and barred doves (*Geopelia striata*).

Hunting in all of these forest areas is restricted to weekends and State holidays only. There is some illegal hunting activity that occurs, but it has been controlled to some degree by a system of locked gates during weekdays.

- 2. Native species:** Only the most common native forest birds remain in those forested areas west of Waimea Canyon rim and Kokee State Park. Remnant populations of the Elepaio (*Chasiempis sandwichensis*), the Apapane (*Himatione sanguinea*), and Amakihi, (*Hemignathus virens, stejnegeri*), are still found in the higher elevation valley bottoms that contain remnant native forest. An occasional Anianiau (*Hemignathus parvus*), or I’iwi (*Vestiaria coccinea*) may be seen in the upper forested areas, but they are very uncommon. The main reason for the paucity of native birds in this forest is believed to be avian malaria, transmitted by mosquitos which generally range up to 3,500 feet elevation. Some of the more common native forest birds have evidently developed some resistance to the disease, while the uncommon birds have not.

The Hawaiian Bat (ope‘ape‘a) is Kauai’s only endemic land mammal and exists island wide. The ope‘ape‘a is a subspecies of the mainland hoary bat and is officially listed as endangered. Hawaiian hoary bats roost solitarily in the foliage of trees. They are most active at dusk when they forage on flying insects. Bats appear to be fairly common in the Puu ka Pele Forest area. Individuals are regularly seen in the evenings, and are often seen feeding near stands of mature eucalypts, but no information on the density and distribution of these animals is available. They are apparently quite versatile and exist

from sea level to over 4,000 feet elevation, and feed heavily on both native and introduced insects.

Native birds and bats are protected under Hawaii's Administrative Rules, and Title 13, Chapter 124 Indigenous Wildlife, Endangered and Threatened Wildlife and Introduced Birds, as well as the Federal Endangered Species Act of 1973.

3. Non-native species: A large variety of introduced song birds inhabit the western Kauai forests, some of which include: The Melodious Laughing Thrush (*Garrulax canorus*), the Shama (*Copsychus malabaricus*), Japanese Bush Warbler (*Cettia diphone*), Japanese White-eye (*Zosterops japonicus*), Common Mynah (*Acridotheres tristis*), Northern Mockingbird (*Mimus polyglottus*), Northern Cardinal (*Cardinalis cardinalis*), Red-crested Cardinal (*Paroaria coronata*), House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), Chestnut Mannikin (*Lonchura malacca*), and Nutmeg Mannikin (*Lonchura punctulata*). Although not of great economic impact, these birds make up of the typical fauna enjoyed by recreationists while using the forest areas for hiking, hunting, camping and fishing.

F. Access: Vehicular access to the subject area is available via paved highways and a series of connected secondary roads. Kokee Road (State Route 550) provides the primary access and is maintained by the State Department of Transportation. There are approximately 75 miles of secondary roads, most having unimproved surfaces within the KTMA. These roads are found on the main ridge tops and include a road that connects the ridges from Papaalai to Kauhao along the 3,000 foot contour. The roads provide public access for hunting, recreation, and non-timber forest product gathering. Secondary roads also provide DLNR and other governmental agencies access for forest protection, timber and resource management, facility maintenance and other management and public service activities.

G. Timber Harvesting: There has been no large-scale commercial timber harvesting sale from within the KTMA. Some salvaging of logs along roadsides was conducted after Hurricanes Iwa and Iniki.

H. Other Public Uses within the KTMA: Although the non-native timber plantations were established primarily for watershed management and commercial timber, the KTMA provides several other important public uses and functions such as watershed protection and important habitat for native resources: the area is also used extensively for wild pig, black-tailed deer, goat, and bird hunting; rainbow trout fishing is permitted in the Puu Lua Reservoir and feeder ditch system; motorcycle riders and 4-wheel drive enthusiasts use the well developed road network within the area for outings; other recreational activities include mountain biking, horseback riding, bird watching, botanical exploration, picnicking, camping and hiking.

I. Archaeological and Historical Sites: Historical sites are categorized based on the period of their construction. The first type – archaeological – belongs to the pre-western contact period. Structures include heiaus, burials, and house sites. The second type – historic – are associated with the period following the arrival of westerners. Structures are usually of a commercial, religious, or residential nature. Archival research indicates that these ridges were once forest exploitation areas (for feathers, canoe logs, etc.), thus temporary campsites and access trails are

expected to be the primary sites found. A survey by Historic Preservation staff in 1993 for the “Roadside Fuel Hazard Reduction” project which included most of the ridge tops of Puu Ka Pele Forest Reserve, found that extensive alteration of the ridge lines had occurred in this century due to grazing, forest planting and other activities, making it highly unlikely that significant historic sites remain within the non-native timber plantation areas. Three locations within the non-native timber plantations that may be possible exceptions include:

1. Haeleele Ridge Road – located at the top of Kepapa Ridge. Possible historic sites may occur at the bottom of the valley, in the vicinity of Kepapa Springs.
2. Kauhao Ridge Road – An area covered with ti plants, which could be a possible site near a fork in the ridge road, approximately 2.5 miles from the Contour Road.
3. Papaalai Road – An area at the road beginning, near the highway, may contain a site.

Kokee and Waimea Canyon State Parks contain a diversity of historical, archaeological and cultural resources from the pre-contact (1778) to the post-contact (1778 to present) periods (Appendix D).

III. MANAGEMENT PLAN PURPOSE AND GOALS

Hawaii Revised Statutes (HRS) Chapter 183 “Forest Reserves, Water Development, Zoning” provides the legal framework for management activities proposed in this plan. HRS Chapter 183 Section 183-1.5 subsection (5) states that the Department shall: “Devise and carry into operation, ways and means by which forests and forest reserves can, with due regard to the main objectives of title 12, be made self-supporting in whole or in part” (Appendix E). Section 183-16.5 requires that all harvesting of trees on public lands be done in accordance with a Board approved management plan (Appendix E). Furthermore, Senate Resolution No. 42 was adopted by the Senate of the 22nd Legislature of the State of Hawaii in 2004, stating in part that “...DLNR and Department of Agriculture are urged to consider and incorporate the importance of economic factors and impacts in the application of laws and adoption of rules and policies concerning the conservation of forestry and agricultural resources...” Enhancing revenue generation through timber harvesting and timber management can support these legislatively mandated goals.

This timber management plan for the KTMA will provide the framework for sustainable, responsible and proactive management of forest resources in support of the following goals:

- Initiate active long-term commercial forestry operations on Kauai.
- Restore native plant communities where partial/remnant native plants exist within areas degraded or dominated by non-native species.
- Promote tree removal or harvest methods in support of hazard reduction.
- Increase existing limits on salvage operations for dead or dying trees.
- Promote use of forests or forest products for cultural or educational purposes.
- Stimulate economic activity and growth in the timber processing sectors of both Kauai and the State.
- Provide DLNR with an opportunity to supplement annual budgets through timber sales revenues, effectively increasing funding available for resource management activities.

As previously noted the KTMA provides a wide variety of important functions and uses from natural resource and public use perspectives. While this plan applies specifically to timber resource management in the KTMA, all objectives and prescriptions were developed with the intention of balancing all resource management goals for the area. Plan revisions will be conducted as necessary to reflect environmental changes, technical advancements and cultural changes.

IV. FOREST MANAGEMENT PRESCRIPTIONS

All field management prescriptions related to commercial timber management will be guided by Best Management Practices (BMP) policies (Appendix F). Timber inventory data from a 1998 survey indicates that non-native timber plantations in the KTMA contains over 3,250,000 net cubic feet of timber (Table 2). Species specific forest management prescriptions and detailed volume analyses by species and diameter class are presented in Appendix G. This represents enough wood to build and panel approximately 1,200 houses. Based on more than 50 years of management experience in the KTMA, DOFAW and SP propose five principal timber resource management methods for the KTMA:

Table 2. 1998 Forest inventory data summary for the KTMA expressed as net wood volume (Net volume is equal to gross volume with the following deductions: volume below a 1' stump; volume above a 4" top; volume losses due to defect or poor form; and gross volume of all trees with DBH < 8").

			Net volume (ft ³) by log minimum diameter class		
Tree Species	Acreage	Net Cubic Feet	4-8"	8-12"	>12"
<i>Eucalyptus robusta</i>	408	715,285	256,278	229,383	229,624
<i>Eucalyptus saligna</i>	431	722,397	263,457	219,732	239,208
Other/Mixed eucalypts	246	449,919	147,389	117,797	184,733
Total eucalyptus (Percent of eucalyptus)	1,085	1,887,601	667,124 (35%)	566,912 (30%)	653,565 (35%)
Slash Pine (<i>Pinus elliottii</i>)	345	731,175	413,944	262,304	54,927
Loblolly Pine (<i>Pinus taeda</i>)	128	417,723	152,174	179,660	85,889
Mixed pines	195	208,650	163,509	45,141	0
Total pines (percent of pine)	668	1,357,548	729,627 (54%)	487,105 (36%)	140,816 (10%)
Brushbox (<i>Lophostemon confertus</i>) (Percent of brushbox)	7	8,827	1,001 (11%)	3,117 (35%)	4,709 (54%)
TOTALS	1,760	3,253,976	1,396,758 (43%)	1,054,025 (32%)	794,381 (25%)

A. Sustainable commercial management of non-native timber plantations: Because existing plantations have already been subject to extensive disturbance and conversion to non-native vegetation, such acreage is viewed as best suited for long-term commercial timber management.

1. **Harvesting practices:** Harvesting can either be selective, in that all trees to be taken will be individually chosen and marked, or, if large-scale species changes are desired, clear cut. Extraction methods will conform to the BMP.
2. **Regeneration:** Timber harvesting in non-native plantation areas will be immediately followed by tree planting of either native or non-native species.
3. **Species selection:** Selecting the appropriate species to plant in a given area is largely dependent on growth potential for a given site. Site productivity for tree growth in the KTMA can be broadly linked to rainfall and elevation. Rainfall averages correlate positively with the rise in elevation. Data collected from the 1998 inventory shows the mean annual increment (MAI) at elevations above 2400 feet were considerably higher than the lower elevations for all of the species. Upon harvest, these areas will likely be converted to higher value native hardwoods such as koa. Below that 2400 foot elevation, species selection will be based on species best suited to the given rainfall and elevation of the respective area.
4. **Site preparation:** Site preparation is achieved by the removal of competing vegetation and exposure of surface soils to aid planting operations. Site preparation is often the most costly silvicultural operation. Site preparation activities will occur only in stands that are harvested. If species changes are desired, the residual stumps will be killed with herbicides. No new plantation areas will be cleared within the KTMA. Desirable stems of both native and non-native tree species not harvested can be left standing, contributing to future stand diversity and value.
5. **Timber stand improvement:** Fertilizer applications are essential for satisfactory seedling survival and growth. During and after planting, commercial fertilizer applications will be manually applied as needed. Weed control may be required in newly planted stands to reduce seedling mortality and competition. Herbicide use should be limited to manual applications in an area about two to three feet in radius around seedlings. Chemical quantities will be carefully prescribed at levels to control the specified target population, and will not be applied in buffer zones for surface waters. Only approved chemicals will be used in the KTMA in strict accordance with the manufacturer's label.

Young tree stands may require side branch pruning to maximize potential value of crop trees. Pruning will be conducted manually, on species that can produce high-value solid wood end products.

B. Selective harvest of non-native or invasive species in areas outside of plantations: Most areas outside of existing non-native timber plantations represent native ecosystems of widely ranging quality - from nearly undisturbed to almost completely dominated by non-native or invasive species. Non-native trees species that have commercial value in such areas will be made available for harvest, followed by replanting of native species. Within the KTMA, native

forest inclusions will be accessible for traditional gathering of forest resources, research, hunting and recreation. In those areas containing 60 percent or more native forest cover, this selective harvest approach will be implemented only through small-scale commercial harvest or special use permits – not large-scale licenses. Management of threatened and endangered plants and forest protection measures in native forest areas will follow the guidelines below.

C. Harvest of non-native and native trees for maintenance or hazard reduction: Individual trees or small pockets of trees may be cut during maintenance operations or to mitigate potential hazards to public safety along trails or roads, to protect buildings, fence lines or other infrastructure and to support fire prevention measures.

D. Salvage harvest of dead or dying native trees : Readily accessible koa and other native trees of significant value that are dead or dying may be harvested for salvage purposes. DOFAW issues commercial harvest permits for such purposes only on an occasional basis because present Administrative Rules for forest reserves strongly limit permit values. As a result, koa sold under this mechanism is typically undervalued, causing the state to lose potential revenue. More frequently such trees are simply left to rot, and all potential commercial value is lost. SP also issues special use permits for the purpose of koa salvage.

E. Special harvesting permits for non-native or native trees: Such permits may be issued on a case-by case basis for cultural or educational non-commercial gathering purposes.

V. GENERAL GUIDELINES

A. Threatened and Endangered Plant Species: The west-facing ridge tops of Waimea Canyon State Park and the Forest Reserves of the KTMA were historically altered by livestock grazing and reforestation with a variety of non-native timber species. These activities have heavily impacted the native plants that once were found on these ridge tops. Endangered plant species known to exist in the valleys and the makai end of some of these ridges include *Lobelia niihauensis* and *Wilkesia hobdyi* at the end of Polihale Ridge; *Wilkesia hobdyi* at end of Kaaweiki and Haeleele Ridges; *Alectryon macrococcus* var. *macrococcus*, *Isodendron laurifolium*, *Pteralyxia kauaiensis*, *Nesoluma polynesianum*, *Euphorbia haeleeleana*, *Lipochaeta fauriei*, and *Lepidium serra* in Haeleele Valley; *Remya kauaiensis* in Kaulaula Valley and Haeleele Ridge (near Puu Lua Reservoir); and *Chamaesyce halemanui* in Kauhao Valley. None of these species are known to occur within any of the planted stands. Several individuals of *Cyanea leptostegia* (listed as Species of Concern) are located along the Contour Road and the upper portions of the ridge top roads including and between Haeleele and Kauhao ridges.

Endangered plant information in this plan is derived from The Nature Conservancy of Hawaii's Rare Plant Database and the National Tropical Botanical Garden and should not be considered comprehensive. In order to insure that no rare plant species are accidentally destroyed, botanical and wildlife surveys will be conducted in areas that will be impacted by commercial timber management activities. If threatened or endangered species are found in those areas, a buffer of 50 feet will be established around the individual or population of interest, and no tree cutting, logging activity or related major disturbances will be allowed in this buffer. Known locations of threatened and endangered plant species will be visited to collect seed or cuttings for propagation

efforts as needed. Such activity will lead to out planting in areas actively managed for rare plant species that are within that species' historical range. Potential out planting sites include the blocks of native forest scattered throughout the KTMA.

B. Wildlife Management: Within Unit A, some harvest of the formerly planted timber species would be beneficial to game resources, because it would release some of the under story plants that provide beneficial forage for game, and create additional "edge" that is favorable for game.

The impact of timber planting and harvesting on native bird and bat populations in this area is likely to be minimal. Timber plantations are well dispersed throughout the forested landscape. There are no large expanses of mono-typical forest to harvest. The resulting mixture of both mature forested areas with more recently harvested or re-planted forest areas would actually provide a more diverse habitat that favors nearly all bird and mammal species found in the area.

C. Watershed Management: The KTMA has extensive tree and ground cover making the area a valuable watershed. The area contains no permanent streams, and the few intermittent streams present eventually lead to ground infiltration. There are no known surface water sources used for domestic or agricultural purposes. Maintaining tree and ground cover will ensure steady infiltration of surface water into ground water systems. All water courses will be protected in order to retard rapid runoff of storm flows, prevent soil erosion, improve water quality, prolong periods of stream flow and aid in recharging underground aquifers. A 50-foot buffer adjacent to all streams and wetlands will be established within the KTMA prior to timber management activities to ensure maintenance of water quality.

D. Weed management: Noxious or invasive weeds are a serious threat within KTMA and can be spread rapidly by birds, wind and mammals, including humans. Invasive weed species that occur in thick and fast-growing patches throughout the KTMA include strawberry guava (*Psidium cattelium*), lantana, blackberry, molasses grass, banana poka (*Passiflora* spp.) guinea grass (*Panicum maximum*) and black wattle (*Acacia mearnsii*). Additional fast-growing species that could become weed problems in this area include palm grass (*Setaria palmifolia*), karaka nut (*Corynocarpus laevigatus*), fire bush (*Myrica faya*), kahili ginger (*Hedygium gardnerianum*), bushy beardgrass (*Schizachyrium condensatum*), and Vasey grass (*Paspalum urvillei*). These latter species are scattered throughout the KTMA, but have the potential to become dominant species under the right circumstances.

Although it has not been a major problem to date, non-native timber species have shown a capability to spread into native forest areas adjacent to the KTMA. This encroachment has been exacerbated in some areas by major disturbances such as fires or hurricanes, which open the native forest canopy, providing opportunities for exotic and pest species to become established. DOFAW has an ongoing program to monitor changes and threats that occur, and initiate control actions where necessary. Prior to entering and leaving the project area all equipment will be power washed with water to help control transmitting seeds of exotic plants.

E. Insects and Disease Monitoring: Within the Kokee region, there are approximately 1,000 species of insects, making it one of the richest insect habitats in the State. Due to the lack of studies on most of the native Hawaiian insects, there is little biological knowledge of these species. Furthermore, there is strong evidence that there are many more endemic insects, which are restricted to pockets of native forest, yet to be discovered. Some of the endemic insects

known to exist in the Kokee forests are the Green Sphinx of Kauai (*Tinostoma smaragditis*), the only known green species of Hawk or Sphinx moths in the world that lives in the tops of ohia trees, the Kauai Antlion, the Flightless Cranefly, and various species of the most ancient Hawaiian fruitfly (*Drosophila* spp.).

The insect species that is likely to represent the greatest threat to flora in the KTMA is the Black Twig Borer (*Xylosandrus compactus*). This species is known to attack the smaller branches and stems (seedlings) of many woody species, particularly those that have been stressed by drought or disease. Eucalypts, particularly *E. robusta*, would also be susceptible, under similar drought conditions, to invasion by the Eucalyptus Longhorned Beetle (*Phoracantha semipunctata*). Grubs of this species tunnel around the bole of trees in the cambial area that effectively girdles the branch or stem.

Due to the dry weather that normally prevails in the KTMA, the incidence of plant disease is expected to be low. However, during drought conditions the death of trees attributed to the lack of water is often erroneously diagnosed as caused by plant pathogens.

Trees within the KTMA will be monitored by DOFAW employees for evidence of pest problems. If problems arise, qualified entomologists or plant pathologists will be consulted to identify the problem and develop a solution to control or minimize the damage.

F. Fire Prevention and Control: The KTMA is located in a low rainfall zone where wild fire is a constant threat that requires active fire control planning and prevention efforts. Following Hurricane Iniki, a Fuel Hazard Reduction project was accomplished along approximately 21 miles of roads utilizing a USDA grant. A total of 228 acres was cleared of all standing and fallen debris along the roadsides to create firebreaks and to reduce the hazard of falling trees and branches blocking access into the area during emergencies.

Typically, fire risk increases in forested areas with increased human activity. Intensification of timber management activities within the KTMA is expected to increase fire risk. Offsetting that, maintenance of the road network within the KTMA for timber management activities will improve access and monitoring and facilitate rapid containment of fires. All harvesting permits or licenses will include a fire prevention and response plan approved by DOFAW. This plan will detail prevention and suppression responsibilities for fire control in the project area. All roads and trails, designated by DOFAW and needed for fire protection or other purposes, will be kept free of logs or logging debris resulting from operations as much as practical during maintenance operations. DOFAW will post fire prevention signs, distribute brochures, and employ Public Service Announcements to increase public awareness of fire risk. In extreme conditions, public access will be restricted and timber management activities will be minimized or suspended.

G. Timber Harvesting: DOFAW and SP periodically receive inquiries from the private sector for access to timber resources within the KTMA. DOFAW can presently issue commercial harvest permits for koa salvage and other small-scale timber operations. Many inquiries have been for koa salvage opportunities located within Waimea Canyon and Kokee State Parks. SP issues special use permits for timber salvage, primarily for koa, of individual dead or hazardous trees along roadways. Continued implementation of the issuance of permits for small-scale timber harvest or salvage will occur under the premise that no new roads will be created and that

any disturbance of ground area will not exceed 2,000 square feet for a given location. Trees with less than 15% remaining live crown area comprised of healthy leaves will be defined as dying. All proposed salvage harvest trees will be evaluated and marked by a DOFAW forester or staff from SP prior to active salvage operations.

Large-scale and high value timber sales within the KTMA will be administered through a public bidding process, resulting in issuance of timber licenses that require Board of Land and Natural Resources approval. All large-scale timber harvesting activities will be conducted according to a timber harvesting plan approved by DOFAW. The timber harvesting plan shall include all of the forest management practices that are specified as BMP (Appendix F) for timber harvesting.

There are about 40 miles of unimproved roads in the KTMA that can be utilized for hauling the timber products out of the forest. All roads that will be utilized for such purposes as well as the number and location for all main skid trails and landing sites will be approved by DOFAW. The harvester will need to plan and secure access routes that will minimize impact on the Kokee Road for transporting the timber products to the manufacturing sites. All timber licenses will detail general conditions that at a minimum include:

1. **Treatment of logging debris:** Logging debris will be treated by one of the following methods in decreasing order of preference:
 - a. Lop all logging debris such that it lies within 36 inches of the ground surface and away from stumps.
 - b. Scatter logging debris with a bulldozer.
 - c. Pile all logging debris in designated windrows or piles.
2. **Public convenience and safety:** All operators or contractors will required to conduct timber management operations with due regard to the convenience and safety of the public at all times. No materials or equipment shall be stored where it would interfere with the safe passage of public traffic. Operators or contractors will provide, install, and maintain in satisfactory condition, all necessary safety signs and equipment to protect the safety of the public.

H. Road Construction: A need for new road construction is not expected in relation to the objectives of this management plan. Any proposed road construction within the KTMA would be pursued through a separate plan and review process.

I. Non-Timber Forest Products: Non-timber forest products are commonly collected within the KTMA and include:

- | | | |
|--------------|------------------|---------------------|
| • pine cones | • tree seedlings | • guava poles |
| • fruits | • ferns | • banana poka vines |
| • flowers | • maile | • firewood |

Gathering of material from plant species that are not on Federal or State threatened and endangered species lists will be permitted and regulated by DOFAW and SP through standard forest permit procedures. Gathering of plant materials from threatened or endangered species may be allowed if individuals have obtained a special collecting permit from DLNR. Harvesting permits are required for gathering firewood, maile, and greenery for floral arrangements.

Permits for gathering plant material can be obtained from the DLNR Lihue office at 3060 Eiwa Street, Room 306. Hours are Monday through Friday except State holidays from 8:00 AM to 4:00 PM for DOFAW and 8:00 AM to 3:30 PM for SP. These permits are free and are available for non-commercial, home use only. Approximately 300 permits are issued for the Kokee area annually.

J. Education and Research: There is great potential for field studies within the KTMA, especially in regard to native and introduced timber species in Hawaii. Should the Kauai Community College develop a forestry curriculum, the KTMA could be used as an outdoor classroom as well as silvicultural research site.

Permanent growth plots could be established by DOFAW in all principal timber types that will be thinned or harvested. Tree growth data will be obtained and reviewed annually to guide future timber management decisions and practices for the management of commercial species in this forest.

There are opportunities for applied research in tree improvement, silviculture, and studies of wood properties. Tree improvement can enhance forest productivity by increasing both the quality and quantity of wood. Silviculture research will aid in developing sustainable timber management practices. Wood properties studies will help to optimize the value of timber grown for commercial use by targeting the highest end value for each timber species. Public-private partnerships are a cost effective method of enhancing forest research activities. Research organizations such as the Hawaii Agriculture Research Center (HARC) and the U.S. Forest Service's Institute of Pacific Islands Forestry (Honolulu) and the Forest Product Laboratory (FPL) in Madison, Wisconsin, have expressed interest and support for DOFAW research efforts and needs.

Research is needed in the following areas: (1) the effects of nutrient depletion caused by sustained eucalyptus plantation over several rotations; (2) koa silviculture in a mixed species plantation setting; (3) whether a symbiotic relationship exists between koa and eucalypts, and (4) agroforestry opportunities in plantation stands.

K. Management of Historical and Archaeological Sites: The KTMA contains a wealth of historic resources. The five known archaeological sites within the parks do not represent a comprehensive inventory of such historic properties extant in the KTMA. However, minimally, the sites indicate that the area was used by Hawaiians for ceremonial, habitation (whether temporary or permanent), and work activities. Areas within and immediately surrounding known sites will be avoided.

Specific plans for the harvest of KTMA timber resources should be reviewed by SP Archaeologists prior to commencement of active field operations. In the event unanticipated heiau and habitation sites or remains such as shells, bones, rock or wall alignments are encountered during forest management operations, work will stop immediately and the State Historic Preservation Division will be notified.

VIII. OPTIONS FOR DISPOSITION OF FOREST PRODUCTS

The following mechanisms will be employed for maintenance, salvage or commercial disposition of forest products from the KTMA:

- A. **Division operations:** Maintenance operations conducted directly by DOFAW or SP may not involve the commercial disposition of salvaged or felled timber resources. All debris and slash from salvaged felled trees will be treated in the manner described above. Wood resources resulting from such work have in the past been donated to public schools for craftwork curriculums. This practice will continue. Any remaining debris and slash will be left to decompose on-site or salvaged as firewood.
- B. **Small-scale sales or timber salvage operations:** The DOFAW-Kauai Branch office currently issues commercial harvest permits for small-scale sales or timber salvage operations that are valued within the limits defined in Chapter 13-104, Hawaii Administrative Rules, Section 13-104-22 (Appendix H). In the context of the guidelines outlined in this plan, this practice will continue for forest products harvested from forest reserves as needed. Similarly, the SP-Kauai Branch office issues special use permits for timber salvage and hazard tree reduction within the parks lands of the KTMA, and will also continue to issue such permits.
- C. **Commercial timber management contracts:** For commercial-scale operations within the KTMA, timber licenses will be employed to administer the sale of timber resources valued greater than the limit defined for the commercial harvest permits for forest reserves. Such licenses will be offered through a public bidding process with final timber licenses approved by the Board of Land and Natural Resources. For any major commercial harvesting activities to occur within the KTMA, reforestation and other essential forest management activities must be supported to assure the sustainable management of the KTMA. Including clauses in timber harvest licenses that require reforestation, “stewardship contracting,” or reinvesting a portion of the value derived from the license in managing the KTMA would all serve to provide such support.

If employed, stewardship contracting terms would stipulate that a portion of the value owed to the State from the purchase of timber within the KTMA would be used to offset cost of specific stewardship services performed. These could include site preparation, replanting, wildlife habitat enhancement, silviculture programs, and watershed improvements. Reinvested revenues can improve forest health as well as stimulate job creation and value-added processing, without impacting existing general funds. The public is likely to respond more favorably to the use of its forest resources if proceeds derived from harvesting can be reinvested into our forests. At a minimum, the following contract terms and oversight shall be applied for timber licenses:

1. Unique sources of potential forest products that contain economic value, are of interest to forest product processors and whose availability is consistent with overall KTMA management objectives will be identified by the Divisions. Prospective bidders will be shown such sources. The Divisions will conduct value assessments of these segments while affording prospective bidders and opportunity to do so as well.

2. The Divisions will solicit requests for proposals. The Chairperson may stipulate criteria or conditions that all proposals must comply with or incorporate, for example specifications listed above or the responsibility of respective parties during field operations. The Divisions will then conduct a proposal review and selection process, or dismiss the proposals if none are deemed adequate.
3. Licenses will be developed that include or specify: an expiration date; Best Management Practices to be followed; language that gives the Divisions the power to suspend operations or revoke the license for non-compliance; language requiring final site conditions; applicable access issues and permissions; language prohibiting damage to or harvest of any native trees not marked for harvest; treatment of logging debris; treatment of stumps; treatment of slash, erosion control measures; fire prevention and control plan; guidelines for applying or handling chemicals and hazardous waste; a weed control plan.
4. Licenses will be approved only after the successful bidder has deposited a bond equal to double the value of their bid for a given license.
5. When the contractor informs the Divisions that the project is complete, the site will be inspected for contract compliance. The Divisions will release the remaining half or appropriate proportion of the bond if the project was completed satisfactorily.
6. Under conditions of non-compliance, the Divisions will retain the remaining portion of the bond. Administrative proceedings will be pursued to quantify perceived damages and determine the fate of the retained funds.

IX. REVENUE

Revenue obtained from sales of forest products in forest reserves in the KTMA will be deposited in the forest stewardship fund. For commercial harvest permits or timber licenses involving native timber resources, DOFAW can only make deposits into the stewardship fund if the timber originates from degraded forests (HRS 183-16). Degraded forests are defined “areas which have had considerable disturbance, are altered from their natural state, and contain less than twenty percent crown canopy of native tree species” (HRS 186-5.5). Revenue from sales or contracts involving native timber resources not originating from “degraded forests” as provided above shall be deposited in the State General Fund.

Revenue obtained from sales of forest products in State Parks in the KTMA will be deposited in the State Parks Special Fund, pursuant to section 184-3.4, HRS.

XI. TIME LINE AND PROCESSES TO BE FOLLOWED

Through open dialogue and input, a widely accepted plan for the management of the KTMA can support Hawaii’s growing forest industry while fitting within the broader context of resource management and protection. Input and assistance from special interest groups and community groups will be solicited to address issues and concerns relating to KTMA resources and public use. Community field trips will be held so interested parties can see the KTMA first hand. Integration of timber management with hunting, recreational and gathering activities will aid in developing community support for growing and processing timber resources. This management plan will be the basis for an Environmental Assessment developed under HRS Chapter 343. Both documents will be used as the basis for forest management activities within the KTMA.

APPENDIX A. DOMINANT SOILS OF THE KTMA

The following information summarizes soil data compiled by Foote et al. (1972) of the Soil Conservation Service.

Kokee silty clay loams are composed of material weathered from igneous rock mixed with volcanic ash. They are characterized by well-drained, strongly acidic clay loam and silty loam soils on gently rising (0 to 35 percent) to very steep (35 to 70 percent) slopes. Permeability of these soils is moderately rapid, runoff is medium to rapid, and the erosion hazard is slight to severe, depending on slope. These soils support water supply, woodland growth, and wildlife habitat, with natural vegetation typical of montane wet forest types (ohia, koa, pukiawe).

Kunuweia Very Gravelly Clay Loams are geographically associated with Kokee soils and are also formed of materials weathered from basic igneous rock. Where Kokee soils typically represent valley in-fill material, Kunuweia soil types are identified on ridge tops in nearly level to strongly-sloping conditions. This soil type is found in elevations ranging from 3,500 feet to 4,000 feet in areas with annual rainfall of 70 to 150 inches. Kunuweia soils are characterized as well-drained, strongly acidic soils that consist of very gravelly clay loam that contain fragments of ironstone underlain by soft, weathered rock. Permeability is moderately rapid, runoff is slow, and the erosion hazard is slight. Like Kokee soils, Kunuweia soils are identified with water bearing properties and woodland growth.

Oli silt loams typically occur on the side of gulches and may be found along the upper rim of Waimea Canyon from the area of Mōhihi and Kumuwela Ridge down approximately to mile marker 10. Oli soils are also present along the edges of the ridges that slope westward from the Waimea scarp, and include all of the area around Puu Lua reservoir. Formed from volcanic ash, this soil is typically found at elevations from 1,000 feet to 2,250 feet in areas with annual rainfall of 30 to 40 inches. Oli soils are characterized by well-drained, strongly acidic deep silt loam and loam underlain by slightly weathered hard rock. In the KTMA, Oli soils occur on slopes of 30 to 70 percent punctuated by rock outcrops. Permeability is moderately rapid runoff is very rapid, and the erosion hazard is very severe.

Paaiki soils are primarily found in Waimea Canyon and alternate with Oli soils along the westward sloping crest of the Waimea scarp. Paaiki soils underlie major portions of the mesic forests that skirt the canyon rim down to the Waimea Canyon lookout. Formed from material weathered from igneous rock, volcanic ash, and ejected magma, Paaiki soils are characterized as well-drained loam and silty clay loam over clay subsoil, underlain by hard saprolite (weathered remains of intrusive igneous rock). Permeability is moderately rapid, runoff is slow to rapid and the erosion hazard is slight to severe, depending on the slope that can be as steep as 70 percent.

Areas of predominantly exposed bedrock formed of basalt and andesite are called rock outcrops and can be found in conditions of gently sloping to precipitous and is the predominant soil type in Waimea Canyon. Rough broken land is characterized by very steep land broken by numerous, intermittent gullies located on steeply sloping (40 to 70 percent) mountainsides and gulches. A variable soil type, it is generally not stony although small areas of rock outcrop are common. Runoff is rapid and geologic erosion is active with associated colluvium and alluvium along gulch bottoms.

APPENDIX B. COMMON COMPONENTS OF FORESTS IN THE KTMA

A. T&E species

- *Alectryon macrococcus* var. *macrococcus*
- *Euphorbia haeleeleana*
- *Lepidium serra*
- *Lobelia niihauensis*
- *Nesoluma polynesicum*
- *Remya kauaiensis*
- *Chamaesyce halemanui*
- *Isodendron laurifolium*
- *Lipochaeta fauriei*
- *Lysimachia kalalauensis*
- *Pteralyxia kauaiensis*
- *Wilkesia hobbdi*

B. Native species

- koa (*Acacia koa*)
- maile (*Alyxia oliviformis*)
- ahakea lau li'i (*Bobea brevipes*)
- 'akoko (*Chamaesyce atrococca*)*
- pilo (*Coprosma* sp.)
- 'uki 'uki (*Dianella sandwicensis*)
- lama (*Diospyros hillebrandii*)
- kawelu (*Eragrostis variabilis*)
- manono (*Hedyotis terminalis*)
- 'ohi'a (*Metrosideros polymorpha*)
- naio (*Myoporum sandwicense*)
- olopua (*Nestegis sandwicensis*)
- papala kepau (*Pisonia sandwicensis*)
- moa (*Psilotum nudum*)
- ama'u (*Sadleria* spp.)
- naupaka kuahiwi (*Scaevola gaudichaudii*)
- pukiawe (*Styphelia tameiameia*)
- 'akia (*Wikstoemia oahuensis*)
- dwarf iliau (*Wilkesia hobbdi*)
- kawa'u (*Zanthoxylum dipetalum*)
- kauila (*Alphitonia ponderosa*)
- mule's foot fern (*Marattia douglasii*)
- alahe'e (*Canthium odoratum*)
- hapu'u (*Cibotium* sp.)
- hala lua (*Cyanea leptostegia*)*
- uluhe (*Dicranopteris linearis*)
- 'a 'ali 'i (*Dodonea viscosa*)
- 'i'e'i'e (*Freycinetia arborea*)
- alani (*Melicope* spp.)
- palapalai (*Microlepia strigosa*)
- kolea (*Myrsine lanaiensis*)
- mamaki (*Pipturus albidus*)
- halapepe (*Pleomele aurea*)
- kopiko (*Psychotria* sp.)
- iliahi (*Santalum* spp.)
- 'ilima (*Sida fallax*)
- ohia ha (*Syzigium sandwicensis*)
- iliau (*Wilkesia gymnoxiphium*)
- maua (*Xylosma hawaiiense*)
- hame (*Antidesma platyphyllum* var. *hillebrandii*)

* Federally proposed or Candidate species.

Appendix B. continued

C. Invasive non-native species

- black wattle (*Acacia mearnsii*)
- maidenhair fern (*Adiantum hispidulum*)
- daisy fleabane (*Erigeron karvinskianus*)
- loquat (*Eriobotrya japonica*)
- lantana (*Lantana camara*)
- canyon vervain (*Stachytarpheta urticifolia*)
- molasses grass (*Melinis minutiflora*)
- wild olive (*Olea europaea*)
- Guinea grass (*Panicum maximum*)
- Vasey grass (*Paspalum urvillei*)
- banana poka (*Passiflora mollissima*)
- sourbush (*Pluchea symphitifolia*)
- strawberry guava (*Psidium cattleianum*)
- blackberry (*Rubus argutus*)
- Christmas berry (*Schinus terebinthifolius*)
- palm grass (*Setaria palmifolia*)
- wedelia (*Wedelia trilobata*)
- spiny-bur (*Acanthospermum australe*)
- thistle (*Cirsium vulgare*)
- karakanut (*Corynocarpus laevigatus*)
- kahili ginger (*Hedychium gardnerianum*)
- haole koa (*Leucaena leucocephala*)
- Chinaberry (*Melia azedarach*)
- firetree (*Myrica faya*)
- panini (*Opuntia ficus-indica*)
- dallis grass (*Paspalum dilatatum*)
- passion fruit (*Passiflora edulis*)
- kikuyu grass (*Pennisetum clandestinum*)
- common guava (*Psidium guajava*)
- castor bean (*Ricinus communis*)
- thimbleberry (*Rubus rosifolius*)
- beardgrass (*Schizachyrium condensatum*)
- popolo (*Solanum americanum*)
- downy woodfern (*Thelypteris parasitica*)

**APPENDIX C. SUMMARY OF GAME AND NON-GAME
WILDLIFE SPECIES PRESENT IN THE KTMA**

Game Species	Mammal	Feral Pig (<i>Sus scrofa</i>)
		Feral Goat (<i>Capra hircus</i>)
		Black-tailed Deer (<i>Odocoileus hemionus columbianus</i>)
	Birds	Ring-necked pheasant (<i>Phasianus colchicus</i>)
		Erckel's francolin (<i>Francolinus erckelii</i>)
		Black francolin (<i>Francolinus francolinus</i>)
		Chuckar partridge (<i>Alectoris graeca</i>)
		Lace-necked Dove (<i>Streptopelia chinensis</i>)
		Barred Dove (<i>Geopelia striata</i>)
Non-Game Species	Introduced Mammals	Feral Dog (<i>Canis familiaris</i>)
		Feral Cat (<i>Felis catus</i>)
		Rat (<i>Rattus spp.</i>)
	Native Mammal	Bat (<i>Lasiurus cinereus semotus</i>)
	Native Birds	Amakihi (<i>Hemignathus virens</i>)
		Anianiau (<i>Hemignathus parvus</i>)
		Apapane (<i>Himatione sanguinea</i>)
		Elepaio (<i>Chasiempis sandwichensis</i>)
		Iiwi (<i>Vestiaria coccinea</i>)
		Pueo (<i>Asio flammeus</i>)
	Introduced Birds	Barn Owl (<i>Tyto alba</i>)
		Chestnut Mannikin (<i>Lonchura malacca</i>)
		Common Mynah (<i>Acridotheres tristis</i>)
		House Finch (<i>Carpodacus mexicanus</i>)
		House Sparrow (<i>Passer domesticus</i>)
		Japanese Bush Warbler (<i>Cettia diphone</i>)
		Japanese White Eye (<i>Zosterops japonicus</i>)
		Melodious Laughing Thrush (<i>Garrulax canorus</i>)
		Northern Cardinal (<i>Cardinalis cardinalis</i>)
		Northern Mockingbird (<i>Mimus polyglottus</i>)
		Nutmeg Mannikin (<i>Lonchura punctulata</i>)
		Rd-Billed Leiothrix (<i>Leiothrix lutea</i>)
		Red-crested cardinal (<i>Paroaria coronata</i>)
		Shama thrush (<i>Copsychus malabaricus</i>)

APPENDIX D. HISTORICAL AND ARCHAEOLOGICAL SITES ON PARKS LANDS IN THE KTMA

A. Background: Traditional, legendary sites within the KTMA are “Boiling Pots”, Papu, Puu ka Pele, Kaana, Halemanu, and Pohakuwaawaa.

“Boiling Pots” are holes in the rocks at the top of Waipoo Falls. Legend says that they were used to put babies in while mothers dyed kapa or did other chores at the stream.

Papu is the name given to the pin-hole lookout just upslope from Waimea Canyon lookout near the 10.75 mile marker. The site is associated with the legend of the Menehune Papu, the King’s messenger, who was waylaid by robbers at this spot and thrown to his death with a bundle of fish he was carrying for the King. Legend has it that during certain times of a full moon, the scent of rotting fish fills the area and the site is believed to be visited by Papu who tries to lure visitors over the cliff edge.

Puu ka Pele is the name of a prominent hill located on the rim of Waimea Canyon just past mile marker 11. The area is a legendary site of an ancient Hawaiian village found by Ola, the ruling chief of Waimea in 600 A.D and was used for harvesting forest resources, notably koa trees for use in making canoes, paddles and other implements. A trail is believed to have existed between Puu ka Pele and Waimea village to facilitate the transport of canoe logs to the workshops on the coast (ibid.) Table 4-9 illustrates the location of archaeological sites within the Puu ka Pele area.

The lookout across the road from the Puu ka Pele picnic area sits atop the ridge called Kaana (sadness). According to legend, the spirits of the newly dead would assemble here before beginning their journey down the ridge to the sea (ibid.). Halemanu, or Bird House, is the name given to the valley area at the entrance to Kokee State Park. It refers to an ancient house site used by the Kia Manu, or bird catchers, who trapped forest birds to harvest feathers to be made into cloaks for the heifs. Halemanu is also the site of the first mountain cabin built in the region by the Knudsen family in the late 1800’s. Purportedly built on the site of the old bird catcher’s house, the Knudsen cabin incorporated beams from the original thatched structure in its construction.

Pohakuwaawaa is a large, furrowed stone located on the east side of Kaunuohua Ridge overlooking Kapukaohelo between Nualolo and Awaawapuhi valleys. On the USGS map, the stone is misplaced; it is further down the ridge’s flank towards Kanaloahuluhulu, not on the ridge’s peak. This rock marks the boundary of the ahupuaa.

It appears likely that the upland area of Kokee and the Alakai Swamp were utilized in the pre-contact period as resource gathering zones, rather than areas of permanent habitation or agriculture. Several legends suggest this use. One attributes the road of sticks through the Alakai Swamp to the *menehune* (Rice, 1923). Another refers to Lahi (or Lauhaka), a young man who would eat only birds, and traveled to the top of Kilohana (a lookout at the edge of the Alakai Swamp) where the *Uwau* bird nested to satisfy his hunger (ibid). Puu Ka Pele is referred to as an area for gathering *koa* canoe logs and other building materials:

At one time the Menehune built two canoes of koa in the mountains near Puu ka Pele. As they were dragging them down to the lowlands, they were caught by a heavy rain storm, and were forced to leave the canoes across the little valley. The storm covered the canoes with debris, and later, a road was built across them, over which all the materials to build the village of Waimea were hauled (ibid).

Further evidence for the gathering of canoe logs from the uplands comes from the narrative of the Dutch merchant Captain Jacobus Boelen, who visited Waimea in 1828. While his ship was being loaded with sandalwood, he spent some time exploring the region and included the following observation:

On that day we visited Quequaheva's [Kaikioewa's] shipyard, which consisted of large sheds where the largest and most beautiful canoes that can be found in the islands were made. We were assured that the island of Atooi [Kauai] had always been the principal workshop of the islands in these matters. Under one very neatly made roof I saw two of the largest double canoes I have ever seen . . . Long, narrow, and lightly built, although of a strong and heavy type of wood [*koa*], they have only a shallow draught. . . some of these vessels - especially those double canoes of the largest sort, which the highest chiefs use - are up to seventy or eighty feet long . . . (Broeze 1988).

It is apparent from this description that *koa* trees of exceptional size were being harvested in the uplands, where they were partially worked to lessen their weight prior to transport to the coast.

Handy does not specifically mention Kokee with respect to Hawaiian agriculture, although he does state that "the upper gulches and forests in and above Waimea Canyon should be favorable localities for yams" (Handy 1940: 171). He also mentions that boggy areas in the uplands were utilized for the cultivation of *olona*.

There are trails recorded which ran from the valleys of Na Pali to Kokee and Waimea Canyon. Bennett (1931) recorded several trails connecting different areas of Na Pali coast with the uplands. A network of upland and coastal trails is recorded in the following:

More anciently the old Hawaiians used a number of overland trails. The Kamaile trail descended into Nuulolo [Nualolo] Valley inland. There was a trail connecting Nualolo with Honopu. A good trail overland connects Kalalau with Haena. There is a trail from Kokee in the mountains above Kekaha down into Kalalau. From Polihale travelers could go on foot, with a little swimming, to Milolii, and a trail connected Milolii with Nualolo flats. Another trail connects Milolii with Kokee. And there was the path (*ala*), said to have been built by King Ola, that led from Waimea Delta up the canyon to Kokee, over the Alakai Swamp, where it was said to have been paved with sticks (*kipapa*), and thence down Maunahina ridge into Wainiha by way of Kokee. (Handy and Handy, 1972)

This trail system suggests a connection between the north and south sides of the island, although whether the trails facilitated trade or simply travel between the two areas is not known. It can be assumed that the upland forests were utilized as resource gathering zones for such items as hardwoods, bird feathers, and medicinal plants. Undoubtedly a substantial trail existed between the upper Waimea Canyon and Waimea Village to facilitate the transport of large canoe logs.

The Reverend Hiram Bingham traveled from Waimea to Hanalei in 1821 along the old established route passing through Kokee. The trail consisted of a “narrow, winding, slippery foot-path, sometimes on sharp ridges, here ascending and there descending rugged steps” (Bingham, 1981). He described the uplands as being uninhabited but mentioned several temporary shelters along the way which he attributed to sandalwood cutters and reported abundant sandalwood forests still in existence at that time.

Queen Emma, in 1871, made a trek from Waimea to the “Kilohana of Hanalei”, at the edge of Wainiha Valley. A party of about 100 people accompanied the queen, along a route which again likely followed the old trail. At that time the trail was very overgrown but still recognizable. Among the more interesting anecdotes of the trip was a stop the party made on the edge of Kauaikinana Valley where Queen Emma, overcome by the beauty of the spot, insisted upon a *hula* performance. The trip then continued through the Alakai Swamp where the party spent the night. The trail through the swamp was described as a “corduroy road”, built of tree-fern logs placed side by side. They reached the Kilohana the next morning and then retraced their steps to Waimea (Knudsen, 1940).

The sandalwood trade dominated the Kauai economy in the early nineteenth century. Beginning in 1810 and reaching a peak in 1821-22, commoners were forced to leave their taro fields and head into the mountains to cut the precious wood. The resource was controlled by King Kaumualii, who exchanged the commodity for ships and other western luxuries. Unfortunately, this took a great toll upon the people as well as the sandalwood forests, which were all but depleted by the mid-1830's. Waimea was the sole port of export on Kauai for the wood, which came almost exclusively from the upland gulches of Waimea Canyon and Kokee (Joesting 1984).

Valdemar Knudsen obtained a lease to much of the present day Kokee State Park in the mid-1800's. He used the land to run cattle, which provided beef to provision the whaling vessels. The cattle industry on Kauai diminished greatly by 1900 due to the decline of the whaling business (Joesting, 1984). Also in the early 1850s, Mr. Archer built the first house in Kokee at Halemanu. Mr. Archer traveled through Kokee in transit between his tobacco farms in Hanalei and Mana (Damon 1931).

The decline of cattle overlapped with the onset of the sugar industry. Beginning in the late 1800's and continuing into early this century, an irrigation system known as the Waimea Canyon-Kekaha ditch tapped the upland streams to irrigate the cane lands on the west side of the island. In 1923, the Kokee Ditch was built by Kekaha Sugar as part of this larger system. The Kokee Ditch captures water from streams in the Kokee area (Wilcox, 1984). In conjunction with this development, plantation camps were constructed in the uplands to house the Chinese and Japanese workers who built and maintained the ditch system.

Land use in Kokee during the 20th Century consists mainly of recreational and military activities (Heathcote 1993). Wealthy sugar plantation owners built vacation cabins in Kokee to escape the summer heat of the lowland plains. Hunters traveled on horseback to the uplands in search of pigs and goats. In 1929, there was an effort to establish forest reserves to encourage the recovery of the native forests after the range fire of 1890 (Wenkam, 1967). This met with objections from the ranchers of Kokee, but was supported by the public seeking recreational opportunities in the

mountains. In 1930, 755 acres were designated the Waimea Canyon Territorial Park, but it was not until 1952 that Kokee Territorial Park was designated when 4,451 acres were removed from the Na Pali-Kona Forest Reserve for park purposes. At this time, these parks were under the jurisdiction of the Board of Agriculture and Forestry.

The Civilian Conservation Corps (CCC) facility at Kokee was constructed in 1935 and a large network of trails was built and existing trails were refurbished by the CCC following the Great Depression. During World War II, the CCC Camp was used by the Army's Signal Corps while laying a telephone line through the Alakai Swamp and down to Hanalei. In 1940, the Army also constructed a support camp for a radar station at Kokee in the vicinity of the Kalalau Lookout. This camp consisted of one concrete administrative building, several wooden buildings, numerous tents, a motor pool, and an extensive garden (Plews, 1995). The radar station was returned to the Territory of Hawaii in 1949.

In the 1940's, the road to Kokee was improved, and the lookouts at Waimea Canyon and Kalalau were constructed. The Army camp was dismantled in the early 1950s and the wooden buildings were relocated or dismantled to create many of the buildings for Kokee State Park. One building is now the Kokee Museum while wood from other buildings was used to construct the Kokee Lodge and four park cabins. Between 1947 and 1953, much of Kokee State Park was built, including the Kalalau Lookout and the Waimea Canyon Lookout (DLNR, 1962).

The last major developments in Kokee were in the 1960's with the establishment of a Hawaii Air National Guard installation and a NASA tracking station was constructed as part of the National Space Program. The Air National Guard (Air Force) has operated its radar tracking facility on the former site of the Army radar station since 1961 (Dept. of the Air Force, 1995). This use of recreational areas for military purposes was controversial when these activities were first proposed at Kokee (Wenkam, 1967).

B. Previous archaeological surveys: Archaeological surveys in the Kokee and Waimea Canyon State Parks have been limited in number and scope. As a result, few archaeological sites are recorded in the Kokee area. Kokee is generally regarded as a resource gathering zone rather than an area of permanent habitation which implies that few archaeological sites will be found.

A 1906 survey of *heiau* sites by Thomas Thrum (1906) identified 2 sites in Kokee:

Ahuloulou Heiau: Located at the base of Puukapele, this site consists of 3 platforms. The central platform is described as an enclosure measuring 12 by 30 feet with walls about 3 feet high but badly dilapidated. Thrum states that "no special significance seems to be attached to this so called heiau".

Ka-unu-aiea Shrine: Small shrine in the dense *koa* forest of Milolii but there is no platform left to indicate its existence. Thrum states that this shrine is located on Kaunuohua Ridge and it may have been located in the area of the NASA tracking station. Thrum classifies the shrine as an *unu* for the shifting population of the forest belt. When Bennett (1931) recorded this site in 1928-29, he called it a *heiau* and described it as a small clearing containing a line of stones forming no outline or platform. He further added that the location is "in the forest above Halemanu".

Bennett recorded 2 additional sites at Puu ka Pele, both being house site complexes. Three site numbers were given to the sites at Puu ka Pele:

50-30-01-19: Ahuloulu Heiau. This *heiau* consists of a walled enclosure, the outside dimensions of which are 37 by 41 feet. The walls are four feet wide and badly broken. In front of this structure is a flat area about 50 by 50 feet without paving or boundaries. Back of the enclosure there is a paved platform 8 by 12 feet. This platform is backed by a large rock, the plugged-up holes in which indicate that it might have been used as a depository for umbilical cords.

50-30-01-20: House sites around the crater of Puu ka Pele. The remains of seven house sites are indicated by stones in line forming a terrace with a flat space behind. Some of these house sites measure 30 by 20 feet.

50-30-01-21: House sites toward the sea from Puu ka Pele on the north side of the road. A series of house sites are located on top of a flat ridge, the edge of which is lined with stones for 50 feet or more.

50-30-01-22: Kaumauaiea Heiau.

Francis Ching (1974) field checked the sites in 1974 in conjunction with the Statewide Inventory of Historic Places. He relocated sites 19 and 20 and although he suggested that site 21 was probably still present, he could not confirm this because of the dense vegetation. Subsequently, sites 19, 20, and 21 were consolidated under site #19, the Puu ka Pele Complex. The condition of the *heiau* site (#19) was evaluated during a field check in April, 1995 by State Parks Archaeologist Martha Yent. The site is covered by a dense growth of *lantana* and *koa haole* with a dense mat of silk oak leaves on the surface.

Brief reconnaissance surveys in the Kokee area have been conducted by Ching (1978a, 1978b), Kikuchi (1982), Yent (1982), and Walker and Rosendahl (1990). However, these surveys did not locate any archaeological sites.

In 1993, an archaeological reconnaissance survey was conducted along the ridge roads of Kokee prior to widening of these roads as firebreaks after Hurricane Iniki (McMahon 1993). A single archaeological site was recorded at the end of Polihale Ridge (State site #50-30-05-499). This site consists of a 5-meter long stone alignment that may have served as a sweet potato planting area. The general lack of sites recorded during this survey is believed to be the result of the extensive disturbance in the 20th Century from the sugarcane plantations, military activities, and reforestation.

Another 1993 survey involved 3 facilities in the Kokee and Waimea uplands (Dowden and Rosendahl 1994). No sites were located at the Pacific Missile Range - Makaha Ridge Facility, the Halemanu section of the Pacific Missile Range - Kokee Facility, or at the Kokee Air Force Station and Former NASA site.

Two independent archaeological surveys were conducted in conjunction with the proposed concession facility at the Waimea Canyon Lookout. State Parks archaeologists recorded site

#50-30-06-707 during a 1993 survey (Carpenter 1993). This site consists of a single row of stones on 3 sides on a level area about 80 meters southwest of the men's restroom at the lookout. The site is may be a temporary habitation site related to the logging of wood for canoes. The other survey conducted at the lookout involved archaeological testing (Chaffee and Spear 1993). No sites or subsurface cultural deposits were located during this survey.

In December 1993, an archaeological survey was conducted on the *makai* portion of Kahuamaa Flat for a plant sanctuary proposed by DOFAW (Carpenter and Yent 1994). This survey area is on the *makai* side of the Kokee Park Road and approximately 1.25 miles northeast of the Army Camp project area. Much of the Kahuamaa survey area consists of extremely steep cliffs at the back of Kalalau Valley. The dense vegetation hampered a thorough survey of the flat portion on the rim of the valley. No archaeological sites were located during this survey.

A survey of the old Army Camp site at Kokee was conducted in October 1994 (Yent 1995a). This camp was built in the early 1940s on Kaunuohua Ridge and was dismantled in the 1950s. This camp site is approximately 1.5 miles northeast of the CCC camp site. The Army Camp consisted of 5 major buildings along a dirt roadway off the paved Kokee Road with an additional 4 outlying structures. One concrete building remains along with the concrete slabs from 2 other buildings. No subsurface archaeological deposits or features other than those associated with the camp were located during the survey. A similar survey of the CCC Camp was conducted in 1995 (Yent 1995b). This facility consists of 7 wooden buildings around a grassed quadrangle. No subsurface testing has been conducted to determine the presence or absence of cultural deposits at the CCC Camp. The CCC Camp was listed on the Hawaii and National Registers of Historic Places in 1996.

In 2004, in conjunction with the master planning for Kokee and Waimea Canyon State Parks, an archaeological fieldcheck was conducted at 10 sites identified for future park development (Chiogioji et al. 2004). Several of these sites are existing park facilities, such as the lookouts. No significant sites were located at any of the 10 locations.

The archaeological surveys conducted to-date in Kokee tend to support the idea that this upland area was used largely as a resource gathering zone with limited habitation. The stone-lined platforms recorded at Puu ka Pele and near the Waimea Canyon Lookout appear to be temporary habitation sites.

APPENDIX E. SELECTED SECTIONS OF HAWAII REVISED STATUTES, CHAPTER 183

Section 183-1.5 Duties in general. The department shall:

- (1) Gather and compile information and statistics concerning the area, location, character, and increase and decrease of forests in the State;
- (2) Gather and compile information as necessary concerning trees, plants, and shrubs recommended for planting in different localities, including the care and propagation of trees and shrubs for protective, productive, and aesthetic purposes and other useful information, which the department deems proper;
- (3) Have the power to manage and regulate all lands which may be set apart as forest reserves;
- (4) Devise ways and means of protecting, extending, increasing, and utilizing the forests and forest reserves, more particularly for protecting and developing the springs, streams, and sources of water supply to increase and make that water supply available for use;
- (5) Devise and carry into operation, ways and means by which forests and forest reserves can, with due regard to the main objectives of title 12, be made self-supporting in whole or in part;
- (6) Devise and carry into operation, ways and means of reforesting suitable state lands;
- (7) Formulate and from time to time recommend to the governor and legislature such additional legislation as it deems necessary or desirable for better implementing the objectives of title 12;
- (8) Publish, at the end of each year, a report of the expenditures and proceedings of the department and of the results achieved by the department, together with such other matters as are germane to the subject matter under title 12 and which the department deems proper. [L 1903, c 44, pt of §5; am L 1919, c 65, §1; RL 1925, §586; RL 1935, pt of §176; am L 1941, c 228, §1; RL 1945, pt of §1006; RL 1955, pt of §18-7; am L Sp 1959 2d, c 1, §22; am L 1961, c 132, §1; HRS §183-1; am L 1981, c 85, §3; am L 1985, c 174, §2; am L 1988, c 337, §6; am L 1990, c 315, §3]

Section 183-16.5 Harvesting from state-owned lands. All harvesting of trees on public lands shall be done in accordance with a management plan approved by the board, and in accordance with the provisions regarding conservation of aquatic life, wildlife, and land plants, and the provisions regarding environmental impact statements. For any harvesting of native trees from public lands, the department shall use existing fire prevention and management programs and ensure that appropriate silvicultural practices are used to encourage native biodiversity and ecosystem processes. No native forests on public lands shall be converted to introduced forest plantations. [L 1997, c 256, §1]

APPENDIX F. BEST MANAGEMENT PRACTICES

Available upon request from DOFAW offices in Lihue and Honolulu:

Division of Forestry and Wildlife
3060 Eiwa Street #306
Lihue, HI 96766
808-274-3433

Division of Forestry and Wildlife
1151 Punchbowl Street #325
Honolulu, HI 96813
808-587-4186

Or on the web at:

http://www.state.hi.us/dlnr/dofaw/pubs/BMPs_bestmanagement.pdf

APPENDIX G. SPECIES SPECIFIC CONSIDERATIONS

Each of the commercial introduced timber species or species groups grown and managed within the KTMA have unique management requirements. These are due to differences in physiology and growth potential and utilization considerations such as value and products.

A. Eucalyptus species: Eucalyptus stands, which comprise 1,085 acres or 60 percent of the non-native plantations in the KTMA, contain a total net wood volume of 1,887,601 ft³. *E. robusta* and *E. saligna* constitute 76 percent of the total eucalypt volume in the KTMA, with other mixed species making up the remaining volume. *Eucalyptus saligna* and *E. microcorys* appear to be well suited to the growing conditions found in the KTMA. Rapid growth rates, high yields, and the straight form of these trees make them desirable for a wide variety of processing opportunities including dimensional lumber, veneer, plywood, poles, and chips. *E. robusta* has not grown as well, because of the relatively dry climate conditions. *Eucalyptus* stands in the KTMA were heavily damaged by hurricane Iniki, with most species sustaining volume losses of 20% or more and approximately 25% of the trees having broken tops.

Current eucalypt stands within the KTMA range from young seedlings, to stands that contain medium or “pole” sized (4-12" diameter) trees, and mature or “saw timber” sized (> 12" diameter) trees. About one-third of the *Eucalyptus* stands are in the latter two categories, indicating a potential to begin harvesting mature “saw timber” sized stands and stagnant “pole” sized stands immediately while allowing younger seedling and pole stands to continue growing. The following harvesting guidelines are recommended for the Eucalypts:

1. Clear-cutting is the preferred harvesting method for Eucalypts because these species require open, well prepared sites to regenerate and grow vigorously.
2. In order to minimize ecosystem and aesthetic impacts of eucalypt clear cutting, each harvest unit will not exceed 25 acres, and no adjacent timber plantation unit will be harvested for a minimum of five (5) years.
3. All harvested areas will be replanted either with Eucalypts, other high value hardwood timber species, or native tree species, based on the potential of the site.

To manage the 1,085 acres of Eucalypts on a sustained yield bases, up to 50 acres of Eucalypts could to be harvested and replanted annually based on a 20-year rotation cycle. The 20-year cycle is desirable for maximizing wood production over time and maintaining harvest log size near a 12 inch DBH, since larger logs are prone to splitting and checking. This prescription may be changed based on shorter rotations or different end product mixes. Annual wood production from the harvest of Eucalypts in the KTMA may contribute to supporting a local wood manufacturing company that obtains its wood requirements from a variety of sources. Data collected from the 1998 inventory shows the mean annual increment (MAI) at elevations above 2,400 feet were considerably higher than the lower elevations for all of the species. These areas will likely be converted to higher value native hardwoods such as koa.

B. Pine Species: Slash (*Pinus elliottii*), Loblolly (*Pinus taeda*), and mixed pine plantings are found on 668 acres or 37 percent of the KTMA. While initially planted on a smaller scale than the Eucalypts and primarily for erosion control on the lower ridges, Southern pines have not

grown as well as the Eucalypts in their current locations with typically lower mean annual increments. The southern pines proved to be the most resistant to wind damage, suffering minor defects ranging from 2% to 5%. There presently appears to be little demand for pine wood products on Kauai. As such pines in the KTMA will be harvested selectively or in small patches that do not exceed 5 acres. No adjacent timber plantation unit will be harvested for a minimum of five (5) years. Income generation from the sale of branches and pine cones is a more likely scenario for the future than timber related products. Harvested pine units will either be converted to native species or planted with non-native species that are more desirable than pine for commercial forestry purposes.

C. Other non-native species: Other non-native tree species found in minor quantities in the KTMA include brushbox (*Lophostemon confertus*) on seven acres, Monterey pine (*Pinus radiata*) on two acres, paperbark (*Melaleuca quinquenervia*) on less than one acre, Formosan koa (*Acacia confusa*) on eight acres, ironwood (*Casuarina equisetifolia*) on eight acres, and silk oak (*Grevillia robusta*) on 16 acres. With the exception of brushbox, no detailed volume or distribution data are available for these species due to their scattered occurrences. Some refer to brushbox as “chocolate heart,” and it is used primarily for flooring in Australia. DOFAW has received inquiries regarding the availability and volume of this desirable wood. Silk oak is a finely figured wood and used in the wood craft industry mainly on the island of Hawaii. Demand for this wood is periodic but could be constant should a sustained volume be made available. In addition to the 16 acres of silk oak plantations, this species has spread into non-plantation zones of the KTMA. Where feasible, such silk oak will be selectively harvested in an effort to convert such sites back to native species while recovering value from the harvested silk oak trees.

These “other species” presently exist in only very small stands or are considered invasive, and will be harvested selectively or in small patches. Any harvesting of species that are considered invasive would be done with a primary interest in control, removal and conversion to native species. Because of these factors, no harvest unit size limit or time frame limit will be employed for these species. Harvested “other species” units will either be converted to native species (for invasive species) or planted with non-native species that are more desirable for commercial forestry purposes (e.g. brushbox and Monterey pine).

D. Native species: Koa and other native species will be harvested within the KTMA only for the purposes of salvaging dead and dying trees, removing hazardous trees, or during road and fence maintenance operations.

APPENDIX G (continued). E. PRINCIPAL TIMBER TYPE CLASSES IN THE KTMA

Descriptive statistics for timber types in the West Kauai study area. Age data represent original planting date, while stocking and DBH data represent all tree species with a minimum DBH of 2 inches. Maximum DBH data represent planted, non-native trees only.

NOTE: DOFAW MANAGED STANDS ONLY

Species & Type Description		Net Acres	Age in Years	Stocking Trees ac ⁻¹	DBH Range	Mean DBH	--Mean ft3 ac ⁻¹ --		Total net volume (ft ³) by log minimum diameter class			Row Sub-Totals
							Gross	Net	4-8"	8-12"	> 12"	
Eucalyptus robusta												
ER00	Recent plantings / sapling stands	47	NA	1,248	2-22	5	1,750	884	31,306	9,538	703	41,548
ER11	Low volume pole and saw timber	169	37-62	504	2-40	8	2,353	1,281	93,854	69,193	53,442	216,489
ER44	Moderate volume pole and saw timber	116	59-65	545	2-22	9	2,860	1,726	93,738	90,590	15,889	200,216
ER55	Moderate volume saw timber	76	59	270	2-38	14	4,734	3,382	37,380	60,062	159,590	257,032
Sub-Total ER:		408							256,278	229,383	229,624	715,285
Eucalyptus saligna												
ES11	Low volume pole and saw timber	338	13-33	420	2-39	8	2,433	1,191	187,839	153,488	61,231	402,558
ES22	Low to moderate volume pole timber	36	18	619	2-18	6	2,956	1,970	37,464	27,076	6,380	70,920
ES55	Moderate volume saw timber	57	18	376	2-32	9	5,547	4,367	38,154	39,168	171,597	248,919
Sub-Total ES:		431							263,457	219,732	239,208	722,397
Eucalyptus sideroxylon												
EE00	Recent plantings / sapling stands	11	NA	587	2-20	6	1,304	579	5,344	288	737	6,369
Sub-Total EE:		11							5,344	288	737	6,369
Eucalyptus microcorys												
EM22	Low to moderate volume pole timber	55	18	903	2-20	7	2,993	1,362	64,470	10,440	0	74,910
Sub-Total EM:		55							64,470	10,440	0	74,910
Mixed eucalyptus												
EX44	Moderate volume pole and saw timber	180	51-55	207	2-34	11	2,739	2,048	77,575	107,069	183,996	368,640
Sub-Total EX:		180							77,575	107,069	183,996	368,640
Lophostemon confertus												
LC11	Low volume pole and saw timber	7	27-59	350	2-23	11	3,289	1,261	1,001	3,117	4,709	8,827
Sub-Total LC:		7							1,001	3,117	4,709	8,827

Species & Type Description		Net Acres	Age in Years	Stocking Trees ac ¹	DBH Range	Mean DBH	--Mean ft3 ac ¹ --		Total net volume (ft ³) by log minimum diameter class			Row Sub-Totals
							Gross	Net	4-8"	8-12"	> 12"	
Pinus elliottii												
PE22	Low to moderate volume pole timber	271	34-37	240	2-23	8	1,876	1,463	256,525	128,090	11,858	396,473
PE33	Moderate to high volume pole and saw timber	74	37-39	404	2-25	10	5,264	4,523	157,420	134,214	43,069	334,702
Sub-Total PE:		345							413,944	262,304	54,927	731,175

Pinus taeda												
PT22	Low to moderate volume pole timber	41	34-38	233	2-15	8	1,634	1,221	25,353	24,708	0	50,061
PT33	Moderate to high volume pole and saw timber	87	37-39	277	2-28	11	4,784	4,226	126,821	154,952	85,889	367,662
Sub-Total PT:		128							152,174	179,660	85,889	417,723

Mixed pines												
PX22	Low to moderate volume pole timber	195	34-38	212	2-15	8	1,396	1,070	163,509	45,141	0	208,650
Sub-Total PX:		195							163,509	45,141	0	208,650

Other non-surveyed types												
AC11	Acacia confusa	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CE22	Casuarina equisetifolia	8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EZ11	Unknown Eucalyptus	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GR11	Grevillia robusta	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
GR33	Grevillia robusta	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PR22	Pinus radiata	2	39	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sub-Total:		34										

Total forested acreage: 1,794

Net volume summary:

Cubic foot totals by log diameter and timber type class.

Type Class	Acres	----Log minimum diameter----			Total
		4-8"	8-12"	> 12"	
00	58	36,650	9,826	1,441	47,917
11	538	282,693	225,798	119,383	627,874
22	608	547,320	235,455	18,238	801,014
33	161	284,240	289,166	128,958	702,364
44	296	171,313	197,659	199,884	568,856
55	133	75,534	99,230	331,187	505,951
Total	1,794	1,397,751	1,057,135	799,090	3,253,976

HOW TO INTERPRET TYPE AND VOLUME DATA

Sapling, pole and saw timber sized trees are defined as 0-6", 6-12", and > 12" in diameter, respectively (DBH is tree diameter measured 4.5 feet above the ground). Each type class has a typical gross volume range within which most stands of that type are included. Gross volume is defined as total cubic volume from tree base to tip. Occasionally a stand within a type class may have more or less gross volume than the specified range, but its structure and composition are similar to the assigned type class.

Because field survey and sampling intensity was not high, the timber type descriptions and associated summary statistics are general. Consider Eucalyptus saligna type class ES55: Moderate volume saw timber. In the KTMA there are several ES55 stands, summing 57 acres. The volume figures in this appendix represent combined analyses of plot data measured in all ES55 stands. Volumes reported within this table follow the theoretical assumption that all trees have been felled and cut into marketable lengths. Within the 57 acres of this type class, logs with minimum small-end diameters ranging from 4-8", 8-12", and > 12" have a total net volume of 37,380 ft³, 60,062 ft³, and 159,590 ft³ respectively. Net volume is equal to gross volume with the following deductions: volume below a 1' stump; volume above a 4" top; volume losses due to defect or poor form; and gross volume of all trees with DBH < 8".

NOTE: These volume and acreage data represent estimates for use in forest management planning only. The data should not be relied upon as a basis for conducting timber sales. Each timber sale will require intensive survey work within harvest units.

APPENDIX H. CHAPTER 104, RULES REGULATING ACTIVITIES WITHIN FOREST RESERVES (as of January, 2005)

Section 13-104-22 Commercial harvest permits.

- (a) The board or its authorized representative may issue permits for the purpose of purchasing, harvesting, and removing forest products (e.g. timber, seedlings, greenery, tree fern, cinder, and lava rock).
- (b) Permits shall be obtained from the district offices of the division during regular working hours of the department..
- (c) Each application for a harvest permit shall be considered on its own merits including its effect on the premises and the public's use and enjoyment of the forest reserve.
- (d) Permits will not be issued for harvesting material for direct resale.
- (e) The value of the raw material to be harvested shall not exceed \$1,000. The quantity to be harvested shall be decided by the board or its authorized representative.
- (f) The time of entry for harvesting shall not exceed 14 days, except that the board or its authorized representative may extend this time for good cause.
- (g) No more than one permit within a thirty day period or three permits within a calendar year may be issued to the same person, group, organization, or association for harvesting the same product.
- (h) Each permit shall specify:
 - (1) The products to harvested;
 - (2) The amount to be harvested;
 - (3) The dollar value of the products;
 - (4) The designated area to be harvested;
 - (5) The date or dates the harvesting may take place; and
 - (6) Any other terms or conditions deemed necessary by the board or its authorized representative.

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Forestry and Wildlife
Honolulu, Hawaii 96813

January 14, 2005

Chairperson and Members
Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Land Board Members:

SUBJECT: Establishment of the Kokee Timber Management Area and Approval
of the Kokee Timber Management Area Plan

Background: The Divisions of Forestry and Wildlife (DOFAW) and State Parks (SP) have jointly developed a management plan for timber resources in the Kokee area of Kauai (Exhibit A). Through this management plan, these Divisions propose the establishment of the Kokee Timber Management Area (KTMA) to add active timber management to present management goals for the subject areas, and to promote Kauai's forest industry development through sustainable management of public lands. This plan proposes three principal methods of forest management for the KTMA:

1. Sustainable commercial management of non-native timber plantation areas, where harvesting would be followed by replanting of either native or non-native species.
2. Selective harvest of non-native or invasive species in native forest areas, where harvesting would be followed by replanting of native species.
3. Harvest of native trees for the purposes of fence and roadway maintenance, hazard reduction or the salvage of dead or dying trees.

HRS Chapter 183 "Forest Reserves, Water Development, Zoning" provides the legal framework for management activities proposed in this plan. HRS Chapter 183 Section 183-1.5 subsection (5) states that the Department shall: "Devise and carry into operation, ways and means by which forests and forest reserves can, with due regard to the main objectives of title 12, be made self-supporting in whole or in part". Section 183-16.5 requires that all harvesting of trees on public lands be done in accordance with a Board approved management plan. Furthermore, Senate Resolution No. 42 was adopted by the Senate of the 22nd Legislature of the State of Hawaii in

2004, stating in part that "...Department of Land and Natural Resources and Department of Agriculture are urged to consider and incorporate the importance of economic factors and impacts in the application of laws and adoption of rules and policies concerning the conservation of forestry and agricultural resources..." Enhancing revenue generation through timber harvesting and timber management can support these legislatively mandated goals.

KTMA Description and Location: The KTMA is comprised of Puu Ka Pele Forest Reserve, Na Pali Kona Forest Reserve south of and including Milolii ridge, Waimea Canyon State Park, and Kokee State Park – an area totaling approximately 17,092 acres (Exhibit A - Table 1). Situated on the western part of the island, the KTMA is located along and adjacent to State Route 550 (Kokee Road), starting approximately 5 miles north of Waimea town (Exhibit A - Figure 1).

Next Steps: Board of Land and Natural Resources approval of the KTMA Plan would trigger the following actions:

1. Preparation of an environmental assessment and pursuit of its approval in compliance with Chapter 343, Hawaii Revised Statutes (HRS).
2. Periodic solicitation of requests for proposals for harvest of KTMA timber resources.
3. Development and issuance of permits (Hawaii Administrative Rules §13-104-22 and §13-146-54) or timber land licenses for approved proposals based on the proposed scope of work.

RECOMMENDATIONS

That the Board:

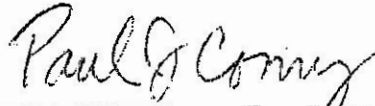
1. Approve the establishment of the Kokee Timber Management Area, comprised of approximately 17,092 acres as detailed in the KTMA Plan.
2. Approve the Kokee Timber Management Area Plan and its corresponding objectives.
3. Authorize the Divisions of Forestry and Wildlife and State Parks to:
 - a. Prepare an Environmental Assessment for the activities proposed in the KTMA Plan in compliance with Chapter 343, Hawaii Revised Statutes.
 - b. Periodically solicit proposals for commercial forestry operations.
 - c. Issue commercial harvest or special use permits for approved small-scale forestry operations.
 - d. Develop timber land licenses for Board approval for large-scale forestry operations.

BLNR – ITEM C-2

-3-

January 14, 2005

Respectfully submitted,



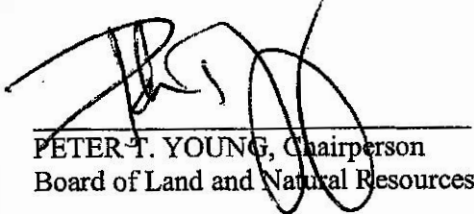
PAUL J. CONRY, Administrator
Division of Forestry and Wildlife



DANIEL S. QUINN, Administrator
Division of State Parks

Attachment: Exhibit A

APPROVED FOR SUBMITTAL:



PETER T. YOUNG, Chairperson
Board of Land and Natural Resources