BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

JANET E. KAWELO
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

'00 JAN 11 A9:3

January 6, 2000

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT
WATER RESOURCE MANAGEMENT

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson: Genevieve

Subject: Negative Declaration Determination and Final Environmental Assessment for Batesole Forest Stewardship Project, Moloaa, Kauai.

We have received your letter of December 22, 1999 regarding Mr. Batesole's proposed Forest Stewardship Project with Department of Land and Natural Resources, Division of Forestry and Wildlife. The following is our response to the questions that were raised for Mr. Batesole's stewardship project with us.

1. Please describe how much irrigation water that project will require. Who owns the agricultural water system and the associated wells that will provide water for this project?

   In the initial 2 years, the project will use 4,000 gallons of water per week. The demand for water will greatly decrease in year 3 and beyond. The source of the irrigation water is from Amfac wells of which Jeff Lindner owns the irrigation system that the project will use.

2. We recommend that the applicant use an Integrated Pest Management approach to control weed. Please consult with the Department of Agriculture's Pesticide Branch for more information on this matter.

   We will advise the landowner to consult with the Department of Agriculture Pesticide Branch to include Integrated Pest Management into his forest management scheme.

3. Please discuss the impacts of harvesting and thinning and the mitigation measures planned to reduce these impacts. These impacts include, but are not limited to, noise impacts from the cutting equipment, fire hazard from

5

post-harvest stumps and other remains, and traffic impacts from post-harvest trucking.

The impact of harvesting trees is no different from harvesting sugar cane during decades of sugar production, as being proposed on this 7-acre project. In addition, the selective harvesting and thinning practices for this 7-acre site will be carried out incrementally while employing the Department's Best Management Practices. These practices will have much less of an impact to the environment than did with past uses for sugar cane harvesting and most recently papaya production. Currently the land is fallowed (colored pictures show the area). Growing trees will only enhance this area which is bare, depleted and is located on former sugarcane land and intensive papaya production land which has been intensively cultivated over the last century. It is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner follow approved and current Best Management Practices and that they be prepared in consultation with DOFAW and the Department of Land and Natural Resources.

4. Please describe the best management practices that the project will employ during soil preparation and other activities to reduce sediment runoff into the nearby ocean.

Tree planting will provide much needed cover and serve to protect the soil which is currently bare and eroding at a rapid rate. When trees reach merchantable size, the project will employ shelterwood cut along the contour which provides harvesting in strips or selective cuts that will always maintain tree growth and vegetation at all times on the property. Again, this is a 7-acre property. Best Management Practice components that the landowner will follow and be incorporated into its timber harvesting plan include: 1) forest roads, standards and use, planning design and location, construction and maintenance, 2) preharvesting planning, 3) timber harvesting, standards and use, felling and bucking, skidding mechanical site preparation, disposal of debris and litter, 3) silvicultural chemical management, description and purpose, planning, pesticide selection, procedures for chemical use, 4) streamside management zone, recommendations, 5) wildfire damage control and reclamation/prescribed burn, and 6) reforestation. These six components are described in detail under "Best Management Practices for Maintaining Water Quality in Hawaii," February 1996.

5. Please provide better quality photographs in the final environmental assessment.

   Photos are attached.

6. Please include a list of all permits and approvals (State, Federal, County) required for the project in the final environmental assessment.

   Following the "finding of no significant impact" of this project a formal contract agreement will be submitted for approval by the Board of Land and Natural Resources as well as Department of Attorney General approval as to contract agreement form, and Department of Accounting and General Services approval to certify the funds annually, and Department of Taxation approval to certify the landowners tax clearance for the previous year. The property is currently zoned Agriculture and is essentially bare ground with no significant resources, no other permits are required at this time.

The following are comments presented by Theresa Menard, University of Hawaii, Department of Zoology of the draft EA for Batesole and our response to her letter dated December 17, 1999.

7. The DEA identifies two proposed actions that will be implemented in the distant future: 1) "Commercial thinning will begin about year 12" (p.3); and 2) "harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter" (p.3). Additional EAs will be required before these two proposed actions are implemented. The cost of hiring consultants to complete the additional EAs are direct costs you might want to include in the "Economic Considerations" section of the DEA.

   The Forest Stewardship Program is a voluntary program that a landowner chooses to enter to receive cost-share assistance for ten years according to an approved management plan and contract agreement with DLNR. Any forest management activities after year ten is beyond the scope of the program. Regarding commercial thinning and harvesting of trees, it is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner will follow approved and current Best Management Practices and that they are prepared in consultation with DOFAW and the Department of Land and Natural Resources. The additional cost of consultants to write EA beyond the scope of the program is at the landowners discretion and not a

requirement of the program. In addition, the scale of each selective harvest being proposed in the future is small (less than 7-acres), and the negative impacts to the environment will be minimal.

8. In particular, the potential impacts of thinning and harvesting on the endangered Hawaiian hoary bat are not addressed. Hawaiian hoary bats roost externally on trees, generally in the foliage. Although no endangered species are believed to be currently present at the action site (p.6), that doesn't mean they won't be present later. In time, bats may move into the tree farm to roost.

   Again, this 7-acre property is former sugar land and most recently under papaya production. The property is currently bare and depleted of which the photos will confirm its present condition. Planting trees will enhance this area on 7 acres and provide a variety of environmental benefits that were eliminated by decades of sugar and papaya production. If nothing is done or agriculture cultivation continues on this property, there will be no benefits to any wildlife and soil erosion will continue. The trees scheduled for planting will probably be seedling size of less than one-and-one-half feet in height off-the-ground. From the ten species recommended for planting; two are koa species which are natives and the remaining eight are non-native species. The majority of the tree species selected for planting is slow growing and are not expected to provide merchantable timber size until twelve to fifteen years or until probably twenty to twenty-five years.

   The property is 7-acres. It seems unlikely that bats will occupy such a small tree cover area when the State Forest Reserve is located just mauka of this project. Figure 3 shows the surrounding area as being in agriculture production or now abandoned with isolated tree cover. When such a time in the future that bats do occur on the project site as a result of the stewardship project, the landowner will mitigate the impacts that harvesting will have on the bats. Impacts are likely to be small because only a few trees will be harvested at any one time. These mitigation measures will be addressed and incorporated into the timber harvesting plan of which the Department will review for approval.

9. The DEA does not identify: 1) the type of survey that will be done to ascertain if bats are utilizing the tree farm at harvest time, and 2) the time of year that trees will be harvested (e.g. Will the tree be cut during the critical bat breeding season (June and July) when bat pups are unable to fly?

If and when bats are located on the Batesole stewardship project as the result of growing the trees, every effort will be used to mitigate impacts made on the bats. Tree harvesting can be scheduled so as not to coincide with the breeding-season of the bats. In twenty to twenty-five years from now, we will have more reliable information about their roosting and breeding behavior that will allow us to make better decisions. The harvesting plan will incorporate and address areas of the 7-acres needing protection for bat habitat. A survey (probably random sampling) will be used to address the need for mitigation of the bats, if found on the property.

10. According to page 5, of the DEA "there is no evidence of threatened flora or fauna on or near this property." This prompts the following questions; 1) Was there any evidence of endangered (as opposed to threatened) flora or fauna?, 2) What types of evidence (e.g. the Nature Conservancy's Natural Diversity Database, published literature, or personal observations) were examined?, and 3) Were any faunal field surveys done? If so, what methods were used?

As Figure 7 and Figure 8 shows this property has been heavily cultivated for agricultural purposes, most recently papaya production. There is no evidence of endangered (as opposed to threatened) flora or fauna. Because this property was previously in papaya production, the database of the Nature Conservancy's Natural Diversity Database, published literature, or personal observations will not show any evidence of listed Threatened and Endangered Species. Lastly, there was no need for a faunal field survey because the property was previously in papaya production and is clearly denuded of any significant wildlife or natural resources.

We have reviewed the comments received during the 30-day public comment period that began on November 23, 1999 for the subject project. We have determined that this project is not likely to have a significant impact on the environment. Please publish a notice of determination for this negative declaration in your January 23, 2000 issue of the Environmental Notice.

We have enclosed a completed OEQC Bulletin Publication Form and four (4) copies of the Final EA for the project. If you have questions, please call Nelson Ayers of the Division of Forestry and Wildlife at 587-4175.

Sincerely yours,

Michael G. Buck
Administrator

Copy: Allan Batesole
John Edson
Nelson Ayers

Enclosures

2000-01-23-KA-FEA-

Final

~~DRAFT~~ ENVIRONMENTAL ASSESSMENT

for

The State of Hawai'i Forest Stewardship Program
~~Batesole~~ Hardwood Tree Farm~~Batesole~~

Moloa'a Hui Lands Agricultural Condominium, Moloa'a , Kaua'i County
Tax Map Key Number 4-9-9-9-CPR-8

APPROVING AGENCY: **Department of Land & Natural Resources**
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

APPLICANT: **Allan Batesole**
2072 Shiloh Ave.
Milpitas, California 95035

PREPARED BY: **John Edson**
Hawai'i Reforestation Nursery Services LLC
5023 D Moa Road
Kapa'a, HI 96746
808 821-8829

OCTOBER 27, 1999

Purpose of this Environmental Assessment

Allan Batesole, together with the Hawai'i State Department of Land and Natural Resources, Division of Forestry and Wildlife proposes to implement a Forest Stewardship Program at Moloa'a, Kaua'i County, Hawai'i. The purpose of this Environmental Assessment is to comply with the requirements of Chapter 343, Hawai'i Revised Statutes (HRS) due to the use of State funds for planting trees for eventual harvest.

Identification of Applicant

Allan Batesole is the owner of the Batesole Hardwood Tree Farm; his mailing address is 2072 Shiloh Avenue, Milpitas, California 95035.

Identification of Approving Agency

The State Department of Land and Natural Resources, Division of Forestry and Wildlife, located at 1151 Punchbowl Street, Room 325, Honolulu, Hawai'i 96813.

Agencies and individuals consulted

Federal:	USDA, Natural Resources Conservation Service, Lihu'e
State:	Hawaii Department of Agriculture Extension Service, Lihu'e
	Tropical Forestry Extension Service, Hilo
County:	Office of Economic Development, Lihu'e
Private:	Paul Huber, Asst. Mgr. Moloa'a Agricultural Condominium
	John McClure, Owner Unit 37, Moloa'a Ag. Condo.
	Marie Mauger, Owner Unit 25, Moloa'a Ag. Condo.
	Mike Bottasso, Hanalei (Sierra Club Member)

Description of Proposed Actions

A. Establish and maintain a long-term forest cover of high-value hardwood species on degraded abandoned former farmland
B. Create an aesthetically pleasing "natural" forest landscape
C. Derive periodic income through selective logging of the plantation
D. Introduce understorey crops to create an agroforestry system over the long term

No facilities are planned. The project will begin by March, 2000 and end in 2020. Cost-share funds of up to $15,018 will be administered by the State of Hawai'i Forest Stewardship Program.

Technical characteristics
Trees will be planted on 7 acres of a 9.162-acre parcel in the northeastern coastal lowland of Kaua'i (Figures 1 & 2). The tract is identified as Unit #27 (tax map key number 4-9-9-9-CPR-8) within the Moloa'a Hui # II of the Moloa'a Hui Lands Agricultural Condominium and is zoned non-residential (Figure 3). The parcel is roughly square-shaped with northeast, southeast, southwest, and northwest facing boundaries approximately 600 feet long (Figure 4).
The following actions will be undertaken to mitigate soil compaction, nutrient deficiencies, and potential weed competition to tree seedlings on the 7 acre tract.
1.Weeds will be treated with Roundup (glyphosate) herbicide.
2. After weed die-off, the field will be cross-ripped, disc-harrowed, and deep-ripped along planting rows.
3. Magnesium sulfate and 15-15-15 N-P-K fertilizer will be spread in 4-foot-wide bands centered along rows.
4. Tree seedlings will be hand planted.
5. Perforated, 3' by 3' polyethylene weed-barrier mats will be stapled to the ground around each seedling.
6. Drip emitters at each seedling will provide water from 3/4" lines laid along rows.
7. A nitrogen-fixing cover crop will be hand-seeded between tree rows.

About 4,000 trees will be planted in all at an initial spacing of 8 by 10 feet. Species selected include *Acacia koa, Acacia koaia, Cassia siamea, Cordia subcordata, Dalbergia sissoo, D. melanoxylon, Eucalyptus deglupta, E. dunnii, Khaya senegalensis, Swietenia mahogani, S. macrophylla, Tectona grandis, Thespesia populnea, Toona ciliata.*
Plantation maintenance will include mowing of inter-rows and minimal herbicide treatment of aggressive weeds only when necessary. Tree growth will be monitored and fertilizer applied as needed. The plantation will be pruned and thinned as each species requires.

Economic characteristics
The tree species are selected primarily for the high value of their heartwood. Commercial thinnings will begin after about year 12, and harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter. By year 20, it is expected that the plantation will produce 40-feet-long millable boles with diameter-breast-heights of about

24". Revenues are expected to exceed costs. Under an analysis using a discount rate of 7%, the project may yield an internal rate of return of up to 15%.

Social characteristics

The hardwood plantation will be within a rural area with a long-standing history of agricultural crop production including sugar, pineapple, and papaya. For the past decade, most of the surrounding lands have been idled, but recent interest in diversified agriculture has increased. Local growers consider a tree farm consistent with other agricultural activities conducted nearby such as papaya and banana farming. To create a planting that will seem pleasing to the eye, species will be arranged in a patch mosaic (Figure 6).

Environmental characteristics

Terrain and climate:

The site lies on a broad undulating bench (Figure 5) and gently slopes uniformly to the south with a gradient of 4% . Maximum elevation of 260 feet above sea-level at the most northerly corner decreases to 225 feet at the south corner (Figure 6). Erosional features are absent on the property itself, but water flows intermittently in a ditch on the other side of the access road bounding the southwest boundary. This northeast region of Kaua'i experiences prevailing salt-bearing northeasterly trade winds with occasional velocities of up to 40 knots or more. Average annual precipitation is 40 to 50 inches with most rain falling in the winter months between October and April. Trade wind showers are generally light, but heavy rains occasionally occur associated with frontal activity. The site may have little or no rain from July through September. Although the area has experienced two major hurricanes within the past twenty years, insufficient historical meteorological data exists to predict future hurricane frequency with any accuracy.

Soils:

Soil at this site is identified as Lihue silty clay, map unit LhB (< 8% slope) within the Lihue Series, and falls within Capability Classification IIe, Woodland Group 5. The topsoil is heavy but tillable and designated suitable for either irrigated or non-irrigated use. Hazard of soil erosion on this mapping unit is considered slight to moderate with soil loss tolerance of 5 tons/acre/year. Windthrow hazard of Woodland Group 5 is judged slight.

The southerly aspect of the site should reduce the effects of prevailing winds on tree growth, and its slight slope lessens the potential for soil erosion. Although average grade is only about 4%, runoff may occur during heavy rain events where topsoil has been compacted by prior cultivation and heavy machinery used in brush-clearing operations. Soil samples reveal nutrient deficiencies of nitrogen, phosphorus, potassium, and particularly magnesium. Water percolates slowly through the compacted soil profile.

Water sources:

There are no known natural water sources such as seeps or springs on this property. An agricultural water system pumps water from nearby wells through a 3-inch diameter PVC

pipe to the property. A 2" waterline that crosses the tract diagonally will irrigate the tree crop (Figure 6); flow is adequate to establish and maintain a plantation.

Flora:
The area once supported a woodland cover, but the project site is now open ground. Existing vegetation is a mosaic of common alien invasive grasses and dicotyledonous herbs. Soil disturbed by recent berm building along property boundaries in March 1999 is being reinvaded by weeds. Young, multiple-row windbreaks of milo, kamani, and neem, together with older ironwood, grow around the perimeter of the tract.

Description of Affected Environment

This project is not within an environmentally sensitive area. Although Moloa'a is close to the coast, the farm lots are set back from sea cliffs elevated 200 feet above the ocean (Figure 4). Because the terrain slopes away from the coast, this project will not impact beaches, estuaries, and other sensitive coastal communities.

There are no permanent surface water features on or near the property, so the project will have no impact on riparian zones or wet-land areas.

The Batesole Hardwood Tree Farm is bounded by dirt access roads on the northwest and southwest sides (Figure 5) with open mown grass fields beyond. A mature papaya plantation is adjacent to the southeast property line and a permaculture is being initiated across the northeast boundary.

We have found no evidence for traditional Hawaiian farming, historical, or archeological activity at this site.

Exotic game birds (pheasant) and other common introductions were observed, but long-term agricultural activity has obliterated any vestige of former native dry forest that is assumed to have grown on this site, and there is no evidence of threatened flora or fauna on or near this property.

Identification of Impacts
1.Herbicide application poses potential risk and odor nuisance to the adjacent papaya and permaculture operations, but there are no residences nearby.
2. Site preparation will produce temporary dust, noise, and exhaust pollution to neighbors.
3. Soil compaction will be reduced by tillage during site preparation.
4. Soil fertility will be increased by fertilization and establishment of a cover crop.
5. Tilth and water-holding capacity will be increased as organic matter accumulates from litter fall during the life of the plantation.
6. A permanent tree canopy will reduce soil movement from water and wind onto nearby properties.

7. The vista will change from an open field to a forest landscape, but there are presently no ocean views and no residences from which mountain view planes could be intercepted by trees.
8. Disturbance of threatened or endangered species will not occur since they have not been found on this and adjacent properties.
9. Wetland degradation will not occur since there are no adjacent streams, ponds, or swamps.
10. The trees selected for this project are not considered highly flammable and do not present a fire hazard to neighboring farms. Furthermore, adjacent grass fields are mown regularly to lower fire danger.
11. The species selected for planting are not known to be reproductively aggressive in Hawai'i and are not likely to regenerate naturally on adjacent land.
12. Wind velocities will be reduced on neighboring properties.

Proposed Mitigation Measures

Herbicide application (Impact 1)
Since the project is down-wind of neighbors when trade winds blow, herbicide will be applied as a coarse spray at a low concentration (1 oz/gal) when air movement (< 2 mph) is away from the adjacent papaya plantation and permaculture field.
Tillage (Impact 2)
Site preparation will be done when trade-winds lessen noise nuisance and blow dust directly away from existing upwind operations (there is presently no activity on downwind properties).

Alternative Actions

No action
If the State of Hawaii Forest Stewardship Program is not implemented on the Batesole Hardwood Tree Farm, then cover on the present site will likely revert to alien woody vegetation of no economic value. Loss of this opportunity to grow high-value timbers will result in a reduced opportunity for Kauai to mill raw wood material and manufacture value-added wood products.

Anticipated Determination

Because the identified negative impacts can be readily mitigated, the Batesole Hardwood Tree Farm, in cooperation with the State of Hawaii Forest Stewardship Program, will not adversely affect the environment of the Moloa'a agricultural area. A Finding of No Significant Impact is therefore appropriate.

Comments

The private citizens listed earlier, including adjacent land owners, have direct knowledge of the project site and have expressed oral support for the Batesole Hardwood Tree Farm proposal and view its implementation as an asset to the Moloa'a environment.

The State Agricultural Extension agent interviewed expressed reservations about the marketing of forest products grown on Kauai since there are presently no large milling facilities in operation. The agent is also concerned about the risk and uncertainty of economic return from long-term investments in forestry projects.

The officer interviewed at the County Office of Economic Development stated that tree farms on more marginal farm lands, such as Moloa'a, did not compete with conventional agricultural activity because there is presently an abundance of unused land on Kauai.

List of Attachments

Figure 1. Map of project location on Kaua'i
Figure 2. Topographic map of the general Moloa'a area
Figure 3. Land tenure map
Figure 4. Air photo of Batesole property (within the square)
Figure 5. Detailed topographic and access map
Figure 6. Site map showing topography and planting design
Forest Stewardship Management Plan
Responses of Comments made to DEA - Batesole stewardship project.

Figure 1. Map of project location on Kaua'i

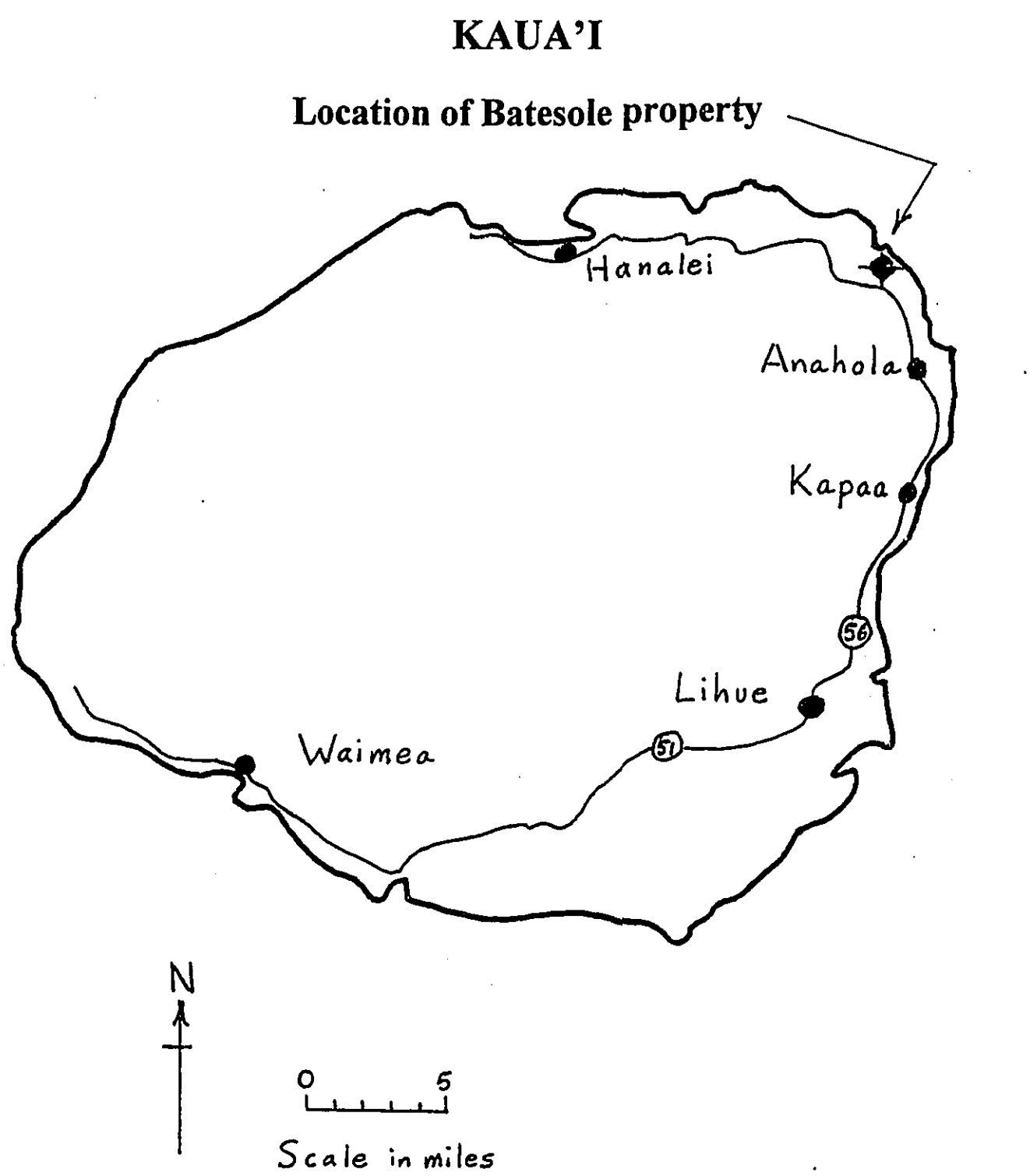


Figure 2. Topographic map of the general Moloa'a area

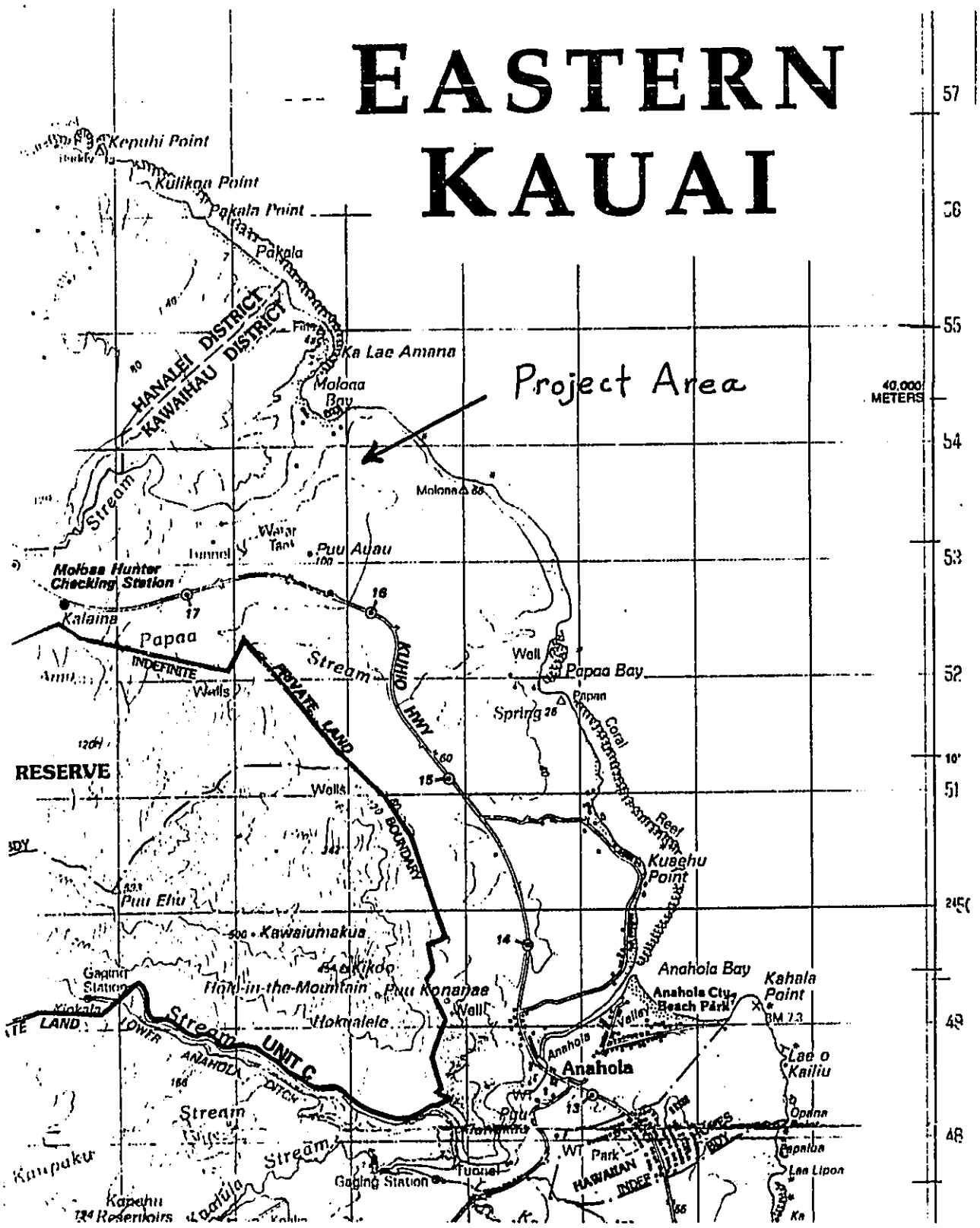
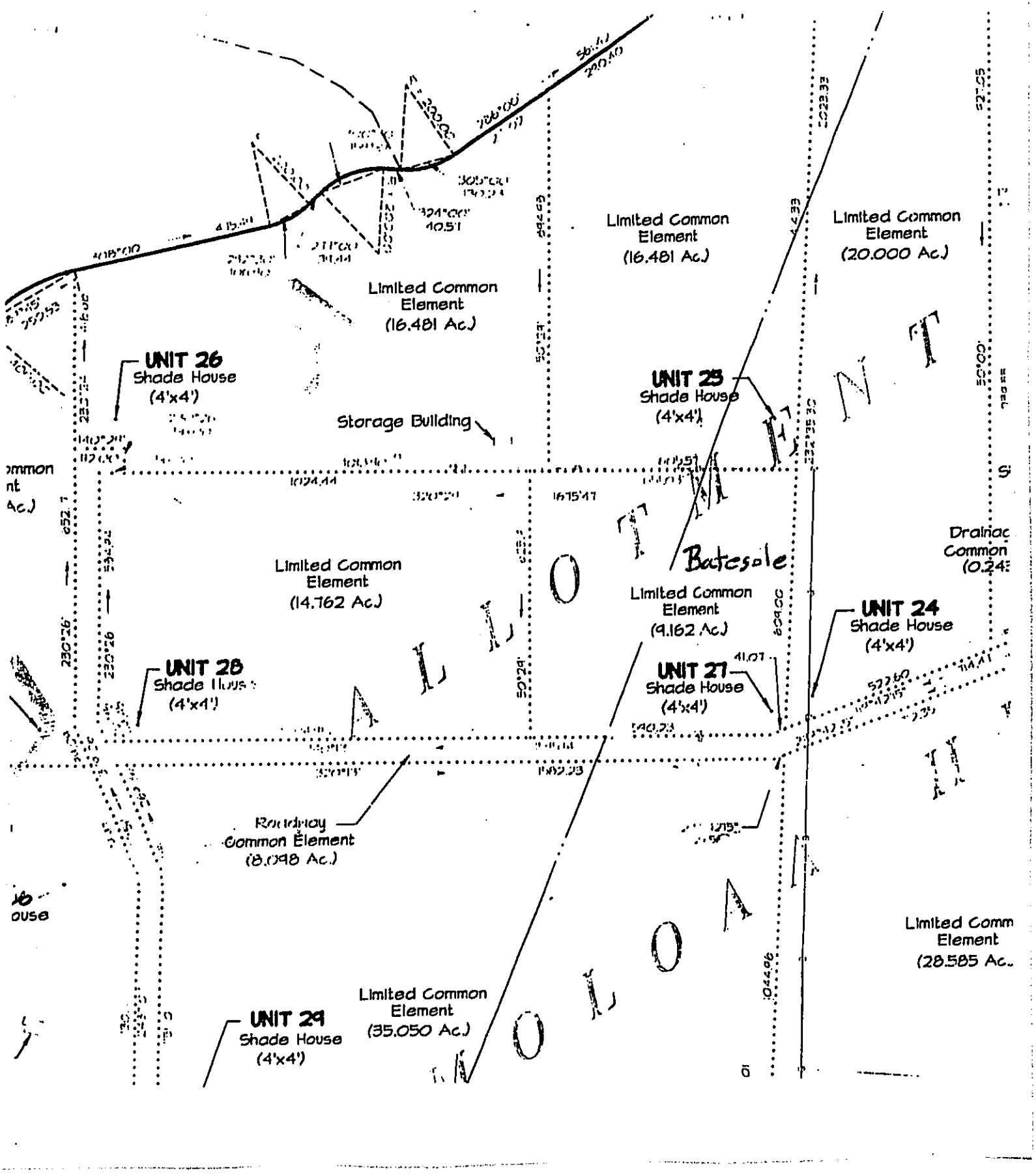
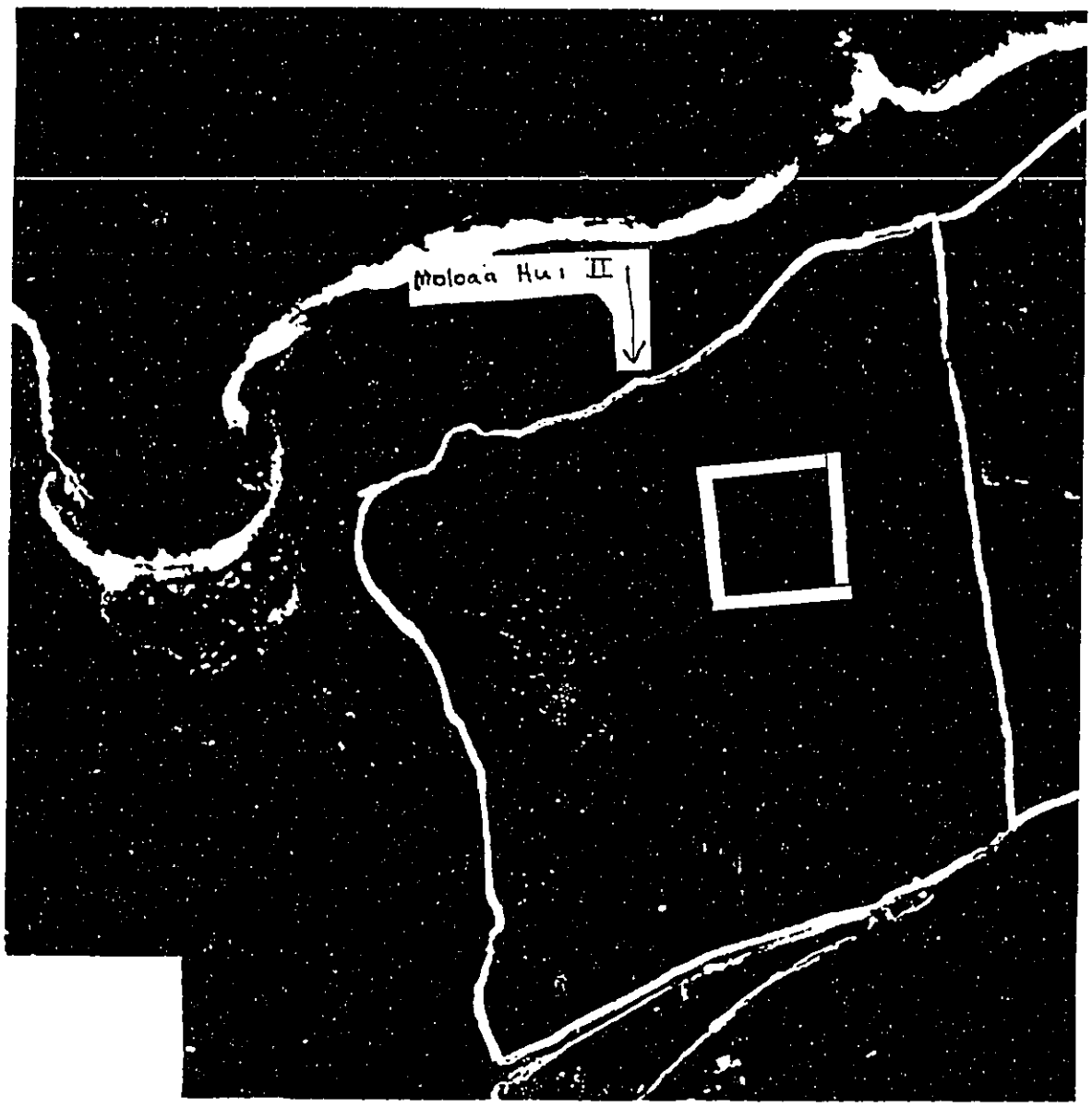


Figure 3. Land tenure map



See page 4 mg't plan for duplicate photo of Figure 4 here.

Figure 4. Air photo of Batesole property (square outline)



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Scale: 1" = 1200'

Figure 5. Detailed topographic and access map

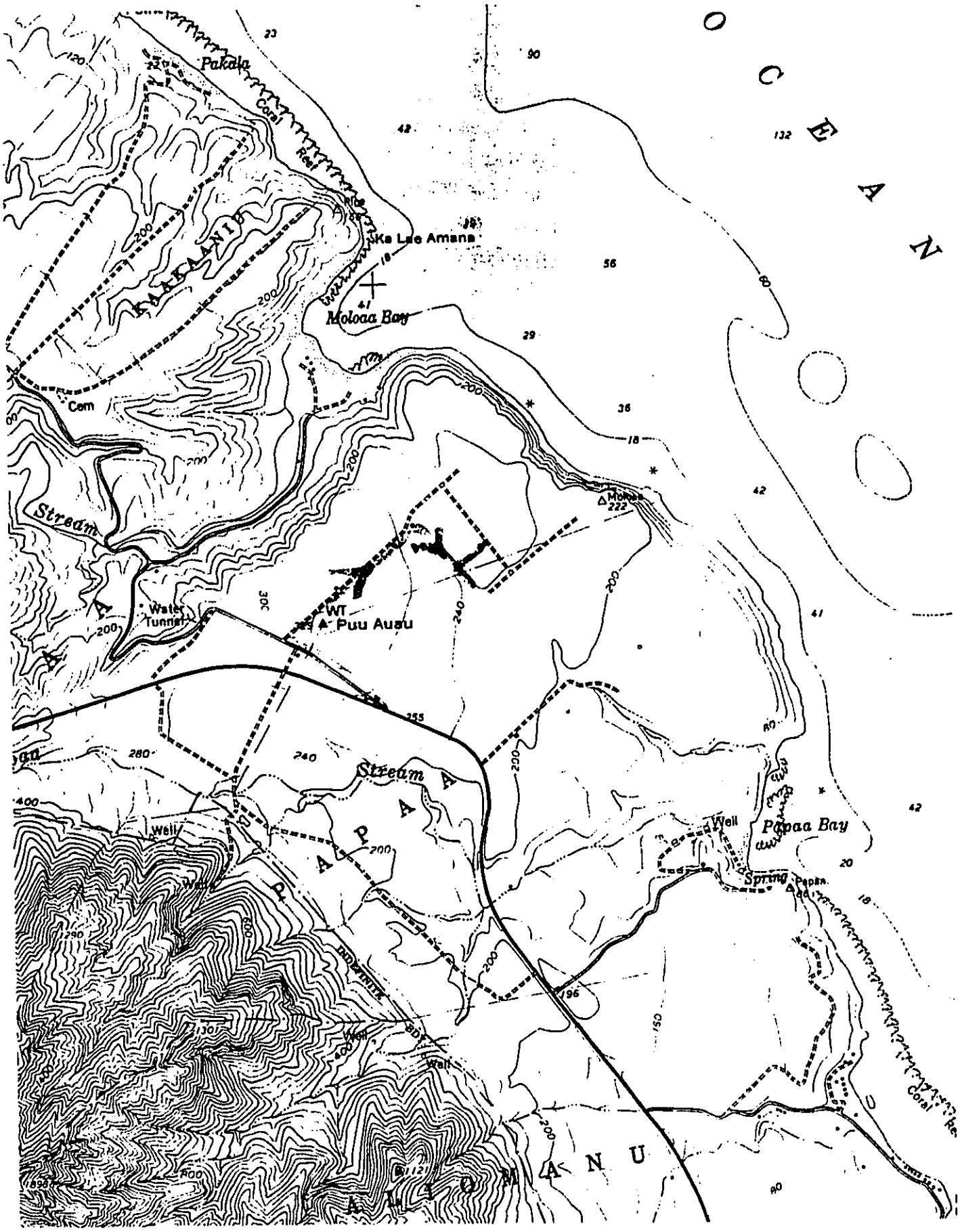
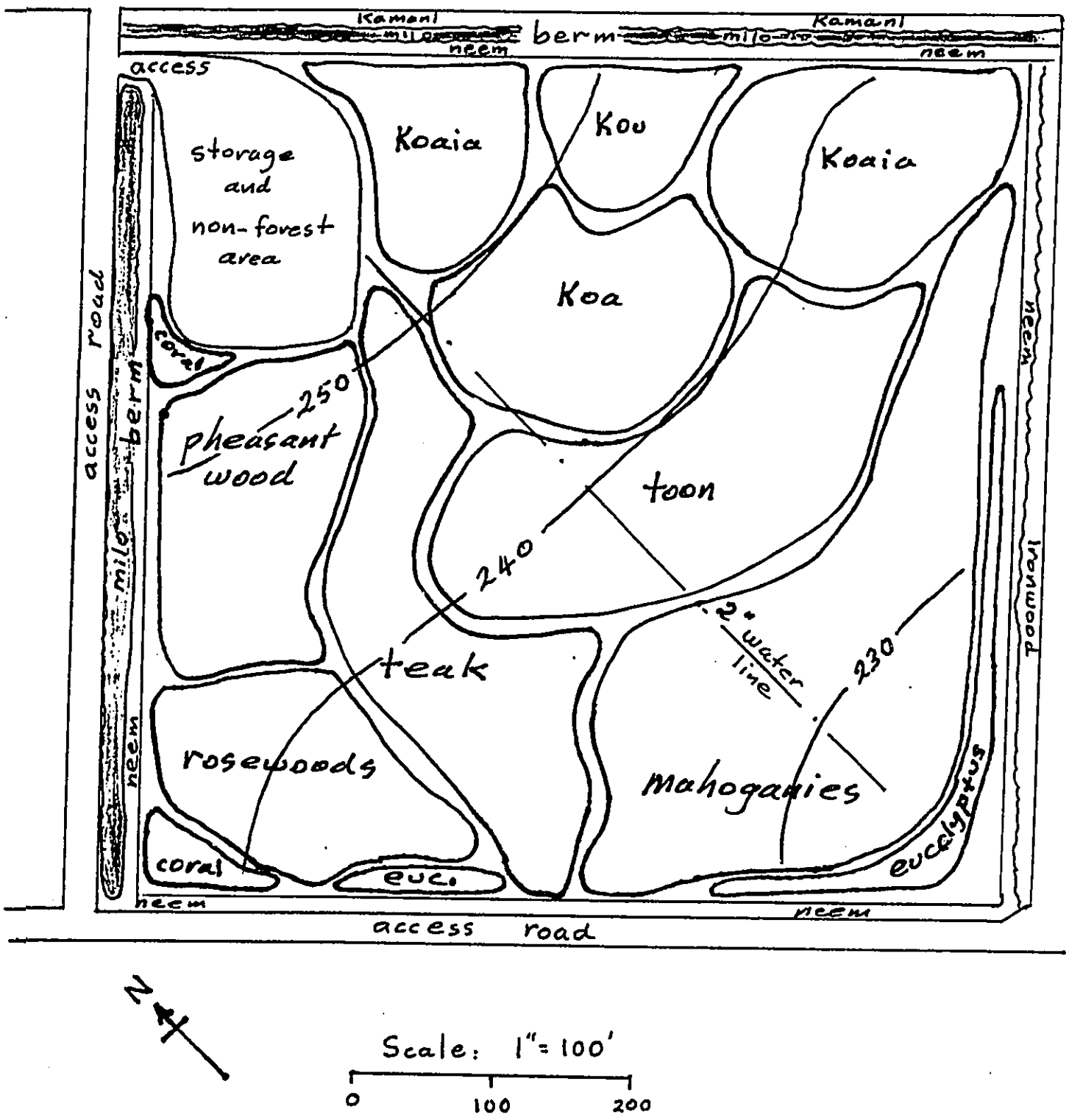


Figure 6. Site map showing topography and planting design



FOREST STEWARDSHIP MANAGEMENT PLAN

for
Allan Batesole
2072 Shiloh Ave.
Milpitas, California 95035

Tax Map Key Number 4-9-9-9-CPR-8
Moloa'a , Kaua'i

Prepared by
John Edson
Forestry Consultant
Hawai'i Reforestation Nursery Services LLC
5023 D Moa Road
Kapa'a, HI 96746
808 821-8829

IV. Introduction

1. General Description of the Batesole Property

Property size and location

This rural property is a parcel of 9.162 acres in the northeastern coastal lowland of Kaua'i (Figures 1 & 2). The tract is identified as Unit #27 within the Moloa'a Hui # II of the Moloa'a Hui Lands Agricultural Condominium at Moloa'a. The parcel is roughly square-shaped with northeast, southeast, southwest, and northwest facing boundaries approximately 600 feet long (Figure 3).

Access

Entry to Moloa'a Condominium frontage is through controlled farm gates from either makai of the Kuhio Highway (56) shortly past milepost 16, approximately 3 miles north of Anahola, or a further 0.5 miles after turning right onto Koolau Road. Access to Unit #27 within the Condominium is by unsurfaced one-way road. The tract itself is bounded by road on the northwest and southwest sides (Figure 4).

Tax map key number

TMK# 4-9-9-9-CPR-8

Zoning

Agricultural, non-residential condominium

Topography, elevation, and climate

The Moloa'a Hui lies on an undulating bench (Figure 4) and this site gently slopes uniformly to the south with a gradient of 4% . Maximum elevation of 260 feet above sea-level at the most northerly corner decreases to 225 feet at the south corner. Erosional features are absent on the property itself, but water flows intermittently in a ditch on the other side of the access road bounding the southwest boundary. This northeast region of Kaua'i experiences the prevailing salt-bearing northeasterly trade winds with occasional velocities of up to 40 knots or more. Average annual precipitation is 40 to 50 inches with most rain falling in the winter months between October and April. Trade wind showers are generally light, but heavy rains occasionally occur associated with frontal activity. The site may have little or no rain from July through September. Although the area has experienced two major hurricanes within the past twenty years, insufficient historical meteorological data exists to predict future hurricane frequency, with any accuracy, for Kaua'i or any other high island of the archipelago (conversation with personnel at the Hurricane Warning Center, Honolulu).

Figure 1

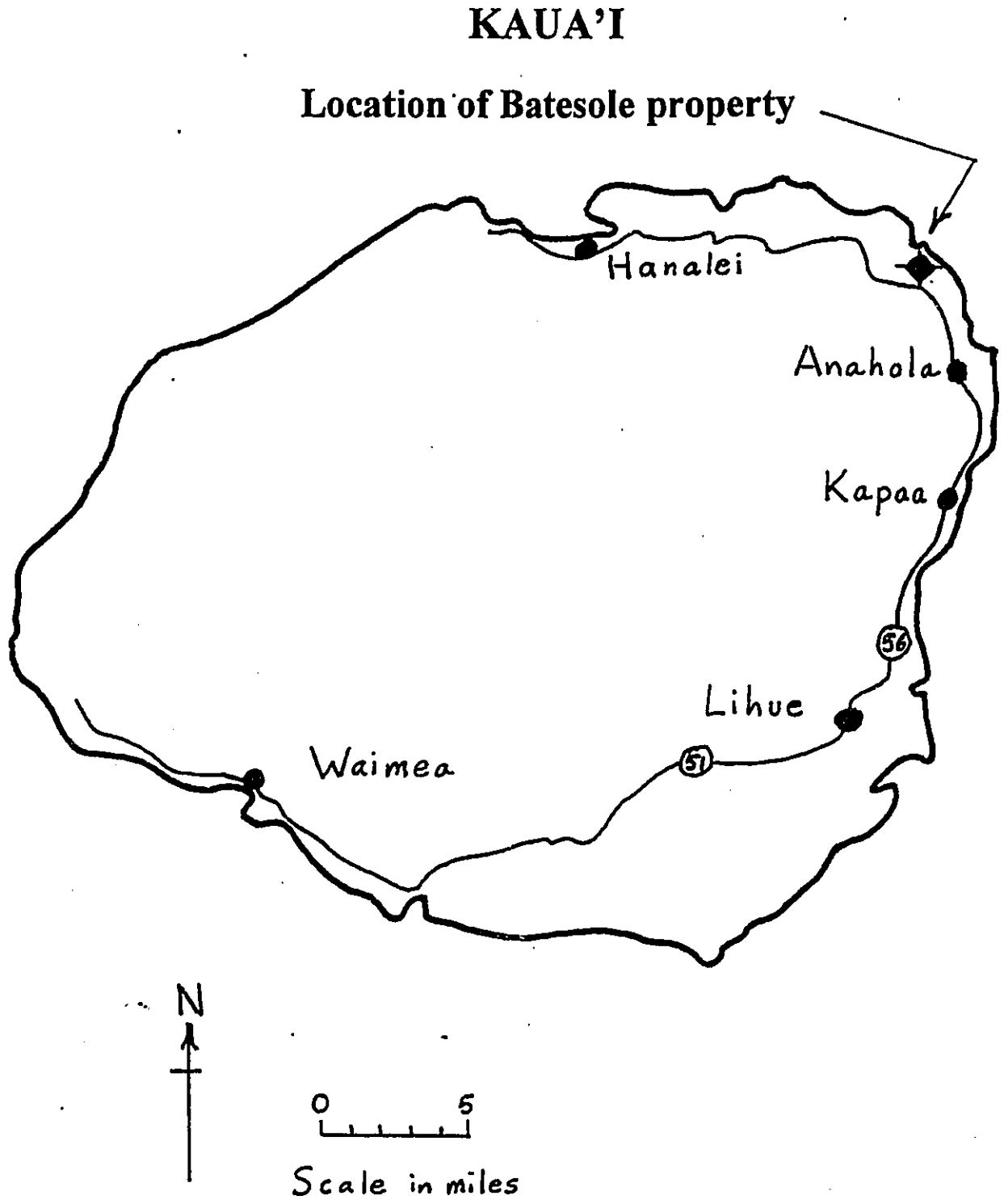

KAUA'I
Location of Batesole property
Hanalei
Anahola
Kapaa
56
Lihue
51
Waimea
N
0
5
Scale in miles

Figure 2. Map shows the northern portion of the windward east coast of Kaua'i. Note locations of the town of Anahola, Moloa'a Bay, and milemarkers on Kuhio Highway (56).

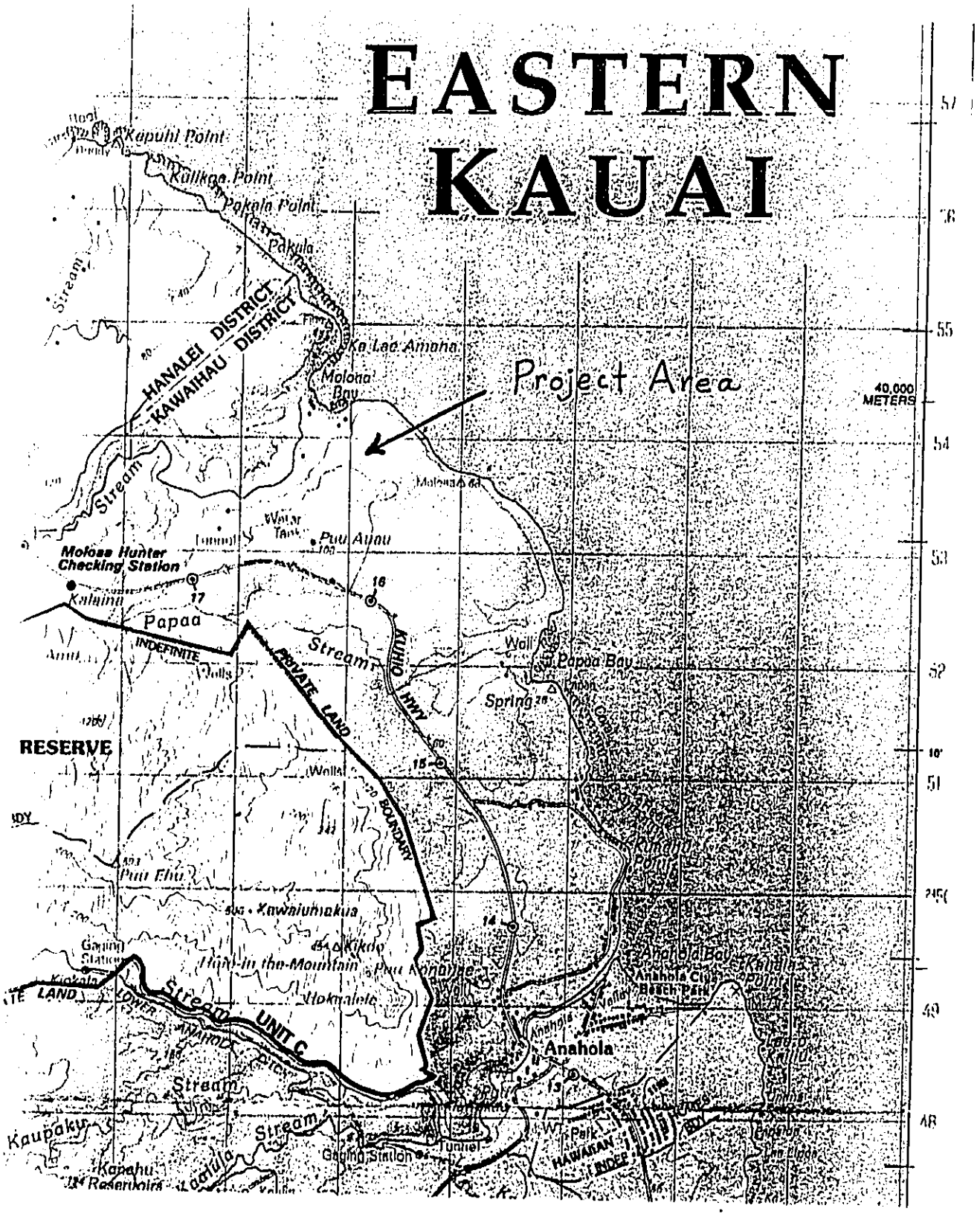
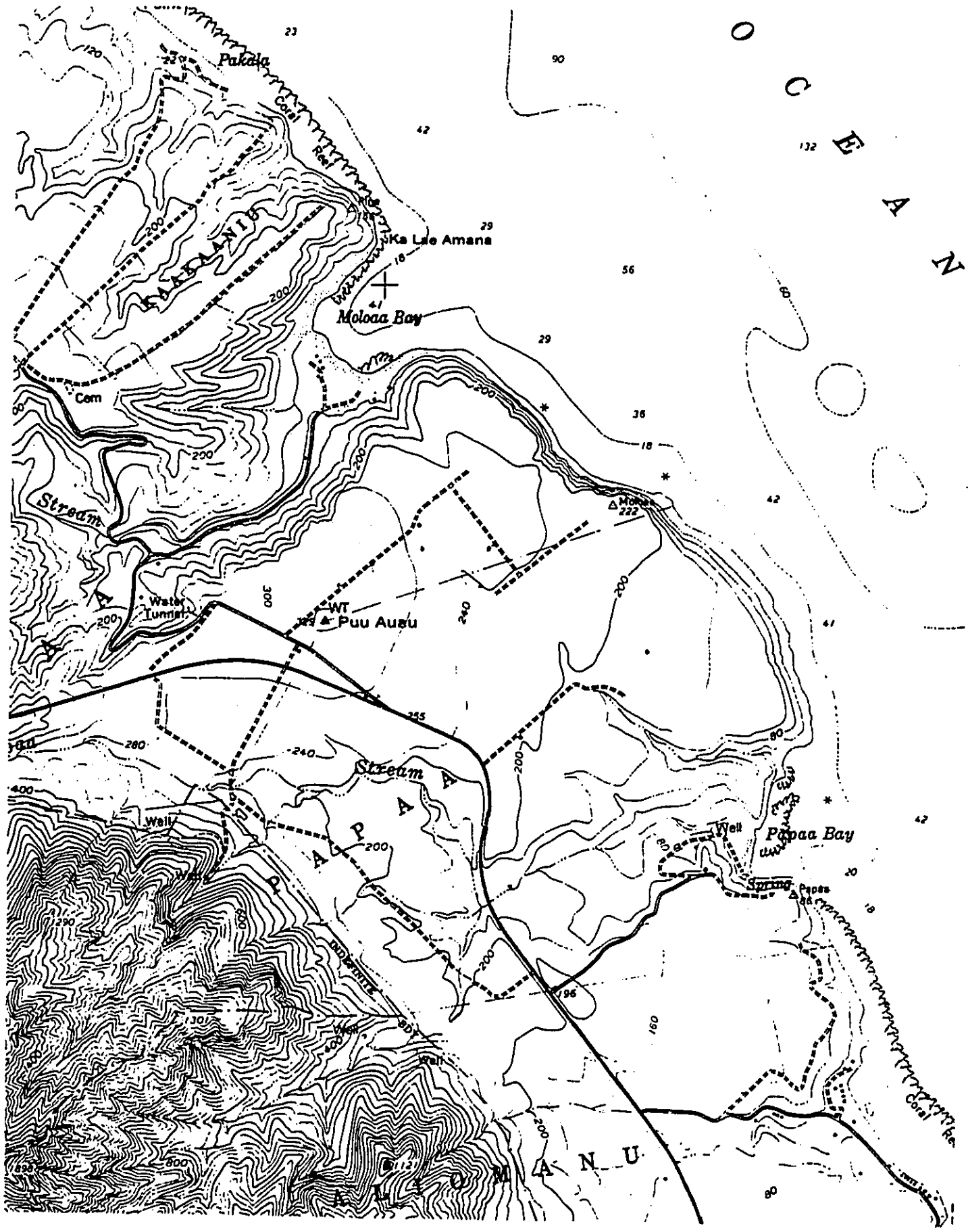


Figure 3. An older air photograph of the Moloa'a area White outlines show the location of the Mola'a Hui # II and the square-shaped Batesole property within it Note the proximity of the Kuhio Highway (lower right), Mola'a Bay (mid-left), the active surf zone toward the north, and the band of woodland behind the sea cliffs

Figure 4. Topographic map showing road access (pink arrows) to the Batesole property (yellow highlight).



Past usage and present condition of the property

The property and surrounding lands have been farmed extensively, but crops have changed over time. Sugar was once widely planted (Figure 5), but farmers switched to intensive papaya production in later years (Figure 6). Reflecting this past activity, debris from drip and T-tape irrigation systems is scattered throughout the soil. Farming was largely abandoned by the early 1990's, and weedy woody plants aggressively invaded the Condominium area. Judging from trees growing along fence lines and scattered groves on nearby properties, non-native brush cover that was removed from the property within the past 18 months likely included haole koa (*Leucaena leucocephala*), Christmas berry (*Schinus terebinthifolia*), African tulip (*Spathodea campanulata*) , Java plum (*Eugenia cuminii*), and guava (*Psidium spp.*)

Access, water, and power have been developed, and the cover of common weedy non-native herbs and grasses is mowed periodically Figure (7). In March 1999, soil berms, about 5 feet tall and 30 feet wide at their bases, were constructed along northeast and northwest perimeters of the property; weeds have now reinvaded these disturbed areas.

Multiple-row windbreaks have been planted on all boundaries:

1. In April 1999, a two-row 630-foot-long windbreak (1-foot tall seedlings) was planted on top of the northeast berm; a windward row of true kamani (*Calophyllum inophyllum)* 6 feet on center and a staggered leeward row of milo (*Thespesia populnea)* 8 feet on center from the first row (Figure 8).
2. A double row of neem (*Azadirachta indica)* seedlings (6" tall) are spaced 15 feet apart on center, along the bases of both berms and the southwestern boundary.
3. A single-row windbreak of mature ironwood (*Casuarina equisetifolia*) (20-25-feet tall) runs the length of the southeast boundary. A single row of newly-planted neem parallels the ironwood at a distance of 30 feet on center (Figure 8).

Windbreaks occupy approximately 1.4 acres. The area to be forested is 7.0 acres, leaving 0.7 acres for access, barn storage, and other uses.

2. Description of the Batesole's Management Objectives

The major objectives of the landowner are to:

A. Establish and maintain a long-term forest cover of high-value hardwood species
B. Create an aesthetically pleasing "natural" forest landscape
C. Derive periodic income through selective logging of the plantation
D. Introduce understorey crops to create an agroforestry system over the long term

Objectives A-C are the primary objectives of this project, although return on investment during the lifetime of the landowner is not a major priority and this planting could be considered a legacy forest. Objective D can be achieved once a forest cover is established. To accomplish these objectives, the landowner will implement management practice SIP 2.

Figure 5. A UDSA land use map showing production of sugar cane on the Moloa'a farm lots before 1971.

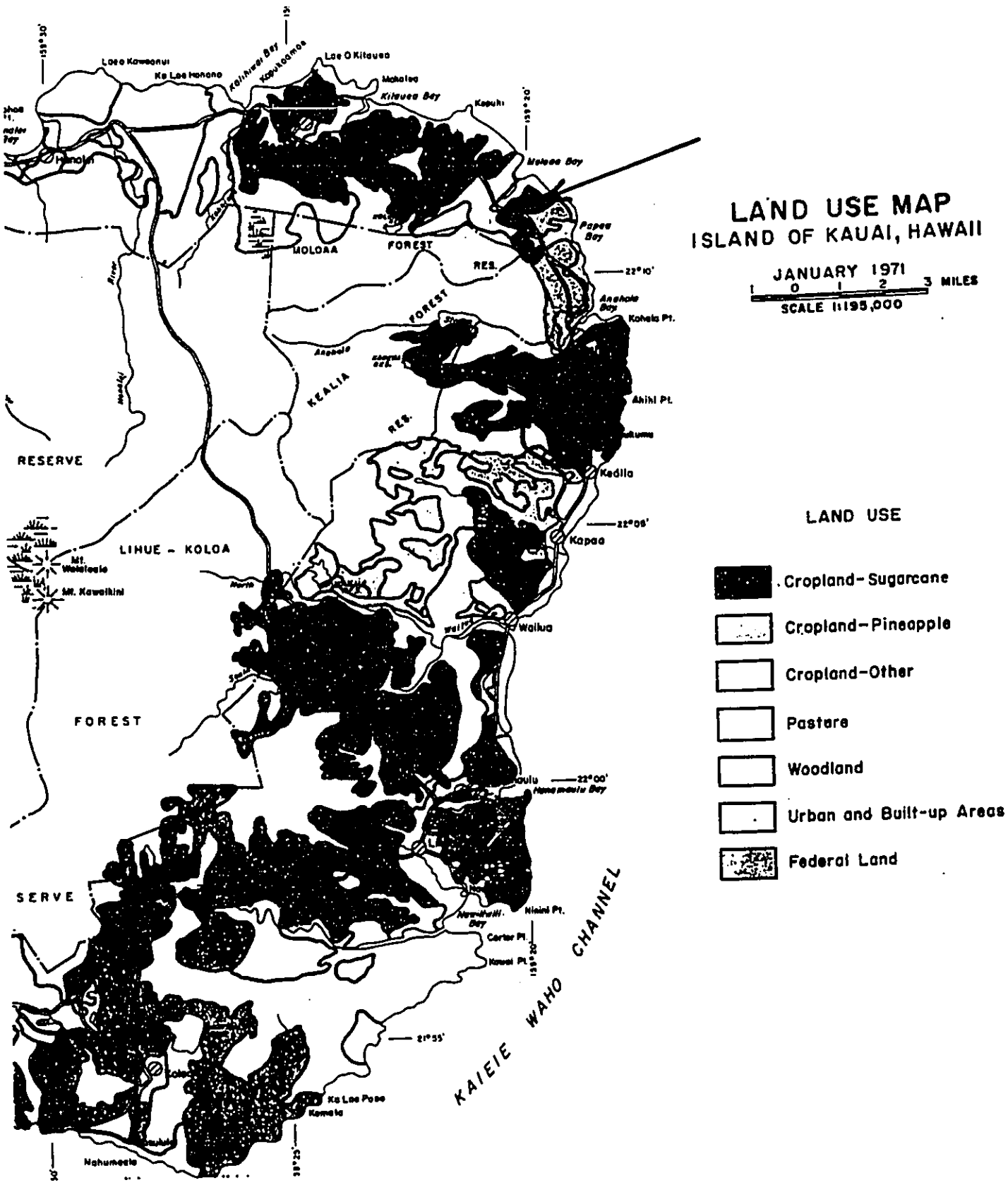


Figure 6. USDA land use map shows orchard production on the Moloa'a farm lots before 1982.

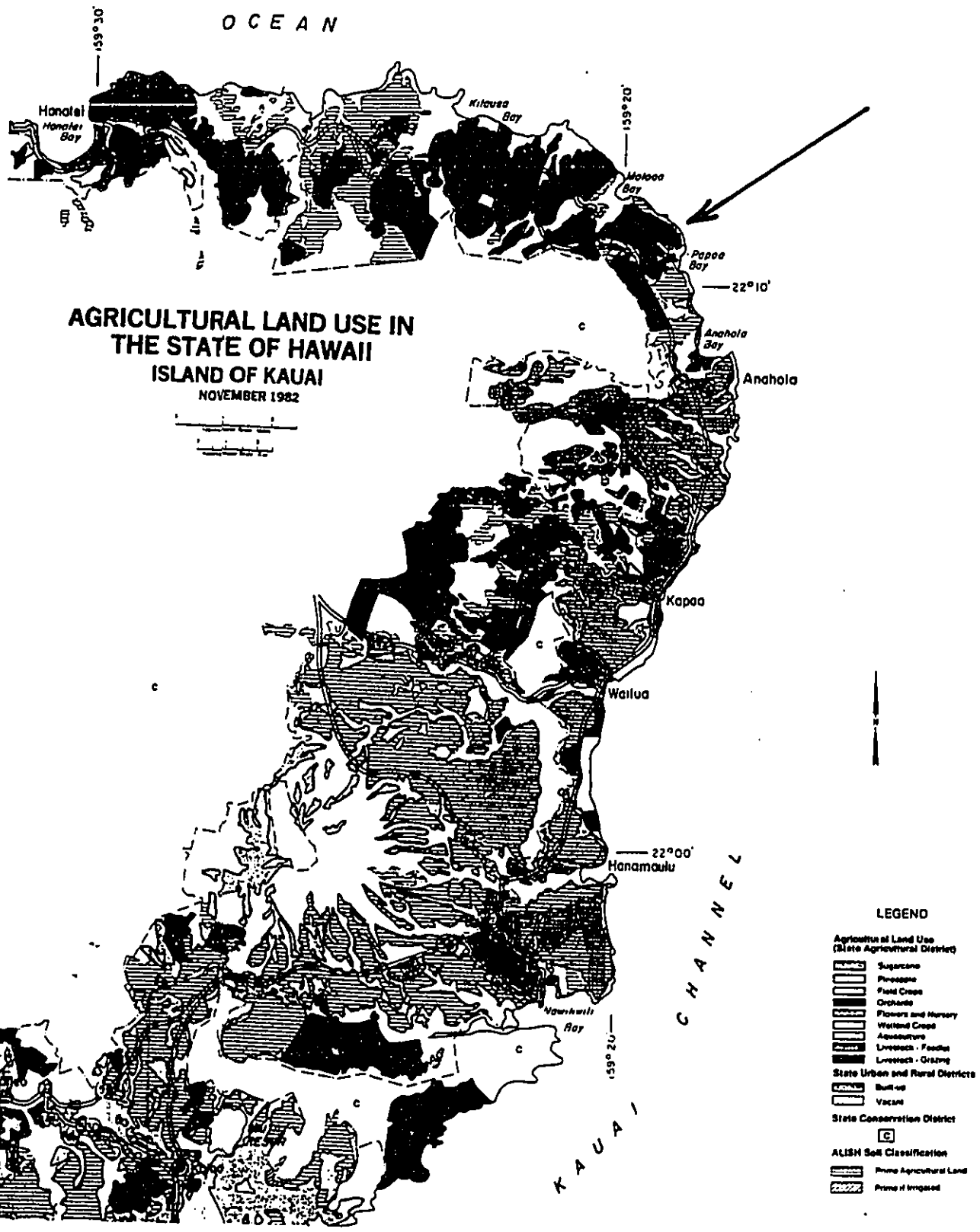


Figure 7. Photographs taken in April ,1999 show vegetative cover, development, and general surroundings of the Batesole property.

Top: diagonal view downslope from north to south corners; site access in the foreground, Anahola Mountains and Moloa'a Forest Reserve in the background.

Below: diagonal view from south corner upslope toward the north corner. The 2" white irrigation pipe, when buried, will feed water to seedlings via lateral 1" drip lines. The Cook pine windbreak is on the adjacent property.

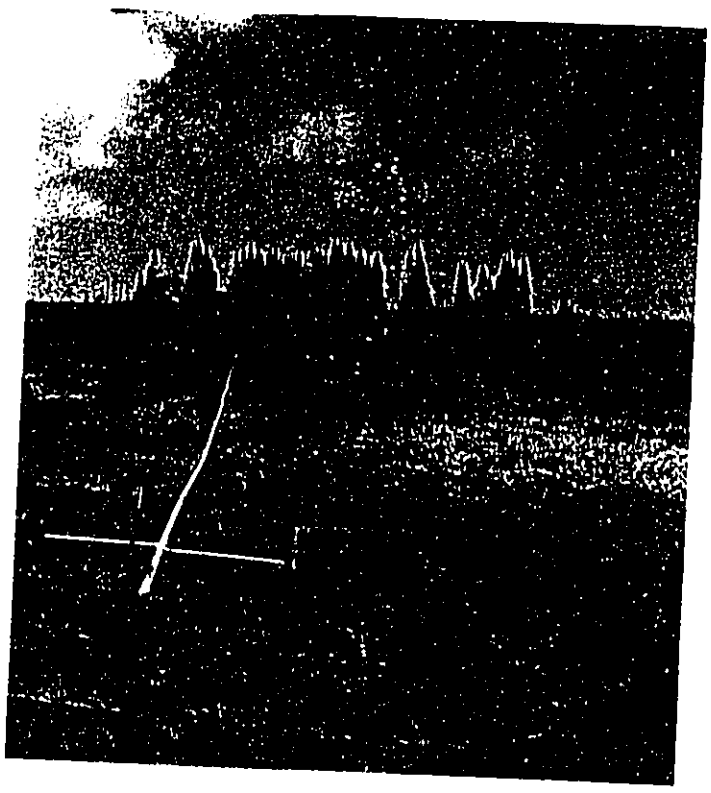
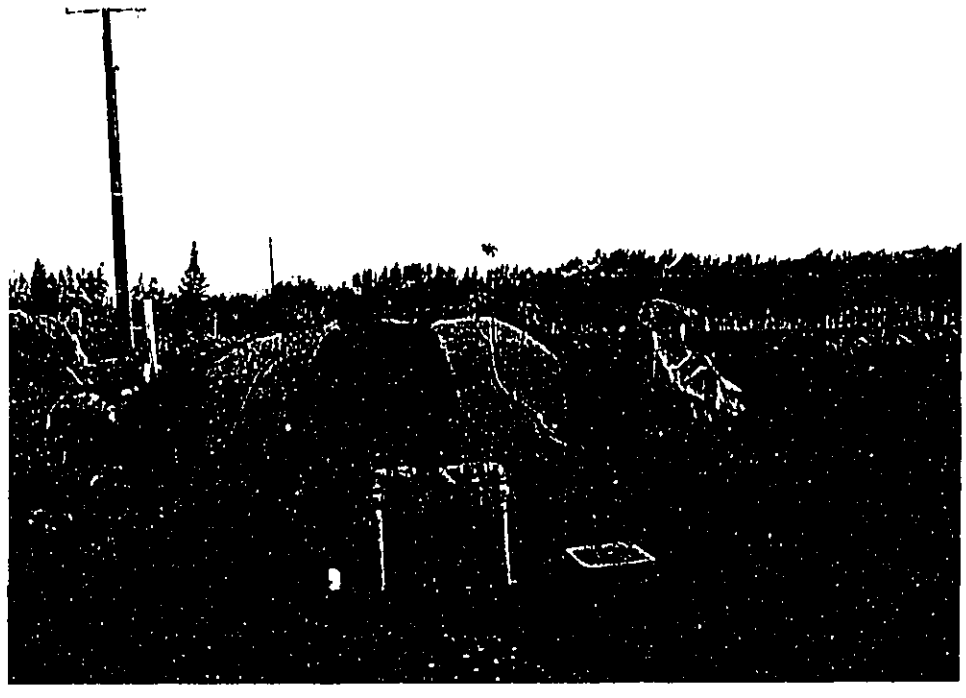


Figure 8. Photographs of windbreaks on the Batesole property



Top: View toward the southeast; kamani (left) and milo (right) windbreaks were planted in April, 1999 on the northeast berm. Foreground shows part of water supply intake.

Below: Ironwood windbreak on right, neem seedlings on left.

V. Land and Resource Description

Existing vegetation and cover types

A mosaic of common invasive grasses and dicotyledonous herbs with occasional rattooons of sugar cane now partially cover the area to be planted in trees. Disturbed soil is being reinvaded by weeds. The following species were found growing on the site in July of 1999.

Grasses and sedges
California grass - *Brachiaria mutica*
Guinea grass - *Panicum maximum*
paspalum - *Paspalum sp.*
purple nutsedge - *Cyperus rotundus*
sawgrass - *Triachne insularis*
sugar cane - *Saccharum sp.*
wire grass - *Eleusine indica*

Dicotyledonous herbs
castor bean - *Ricinus communis*
Flora's paintbrush - *Emilia sp.*
garden spurge - *Euphorbia hirta*
morning glory - *Ipomea obscura*
popolo - *Solanum nigra*
rattlepod - *Crofolaria spectabilis*
sleeping grass - *Mimosa pudica*
sowthistle - *Sonchus oleraceus*
spiny amaranth - *Amaranthus spinosus*

Existing forest health, disease problems, and fire threat

There is no forest (exotic or native) on this or immediately adjacent properties. The ironwood windbreak and new windbreak seedlings appear to be healthy.

With the ocean less than one-half mile distant, windward dieback (most likely due to salt accumulation) alters natural form of woody species on surrounding tracts. However, the strip of coastal woodland behind the sea cliffs north of Moloa'a Hui (Figure 3), together with scattered trees on tracts to the north, provide a first line of protection from salt spray. The salt-tolerant kamani and milo windbreaks should increasingly shield the plantation from salt spray.

Fire hazard to a tree crop on this site is judged to be low because contiguous land to the southeast is under irrigated papaya and non-adjoining grassed fields are mowed regularly. Roads act as fire-break protection from fields along the southwest and northwest boundaries, and berms help protect both northeast and northwest boundaries. Availability of water under pressure provides an effective means to fight outbreak of fire.

Soils and their condition, general slope and aspect

Soil at this site is identified as Lihue silty clay, map unit LhB (< 8% slope) within the Lihue Series, and falls within Capability Classification IIe, Woodland Group 5 (Figure 7, USDA soil conservation map). The topsoil is heavy but tillable and designated suitable for either irrigated or non-irrigated use. Hazard of soil erosion on this mapping unit is considered slight to moderate with soil loss tolerance of 5 tons/acre/year. Windthrow hazard of Woodland Group 5 is judged slight.

The property slopes gently toward the south. The southerly aspect of the terrain should help to reduce the effects of prevailing winds on tree growth, and its slight slope lessens the potential for soil erosion. Although average grade is only about 4%, runoff

may occur during heavy rain events where topsoil has been compacted by prior cultivation and heavy machinery used in brush-clearing operations. To minimize runoff and promote optimal tree growth, the soil should be mechanically treated to create adequate permeability in and below the rooting zone.

Soil was sampled at depths from1 to18 inches from three representative holes, and its analysis is as follows. Nutrient concentrations are in parts per million (ppm).

Factor Analyzed	Result	Interpretation
pH	6.7	high
phosphorus	17 ppm	low
potassium	188 ppm	low
calcium	1116 ppm	low
magnesium	112 ppm	very low

Water resources and their conditions

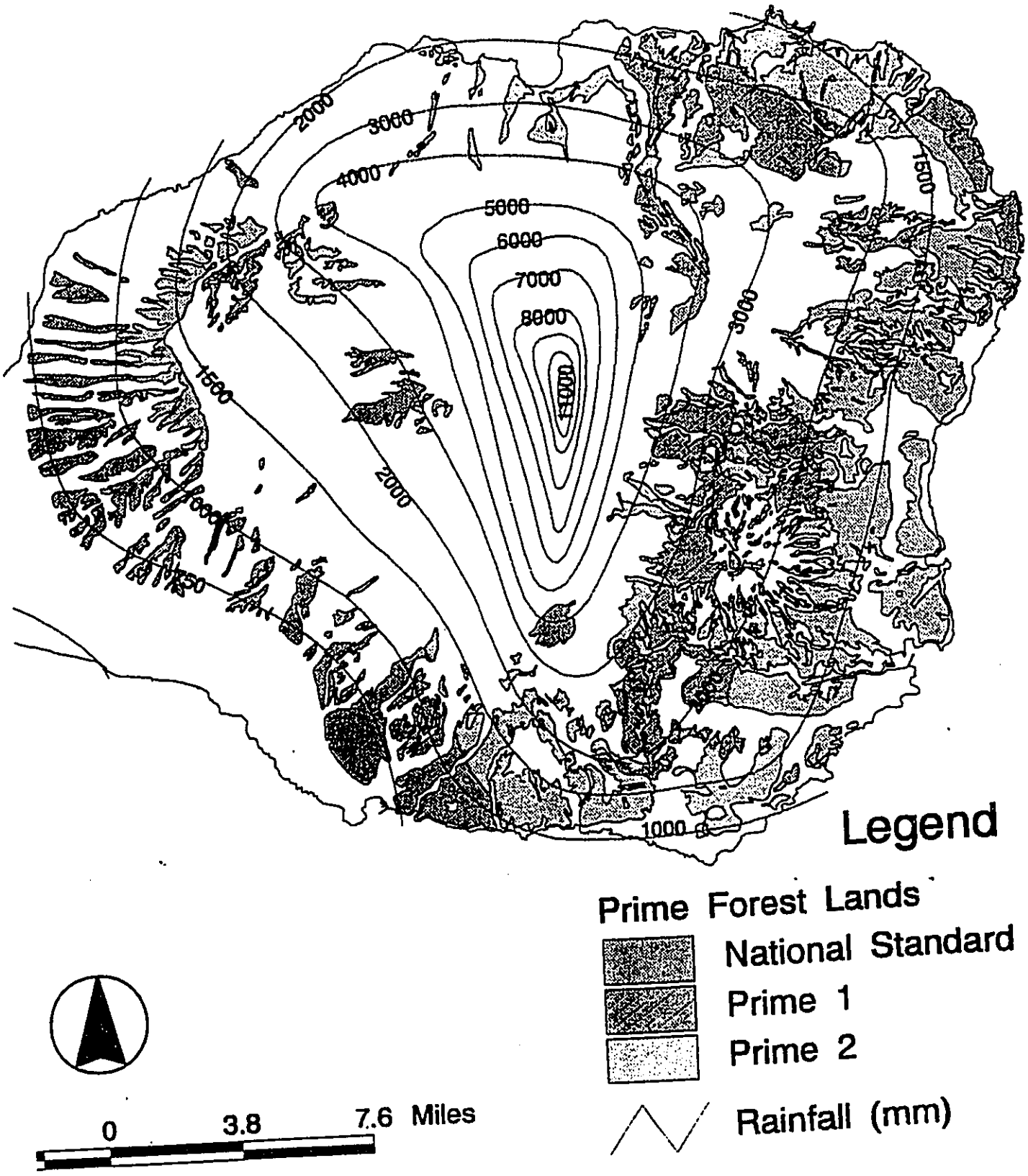
There are no known natural water sources such as seeps or springs on this property. An agricultural water system pumps water from wells in the Forest Reserve south of Kuhio Highway (Figure 4). A 3-inch diameter PVC pipe enters the property at the north corner. The metered water line contains a backflow preventer and a pressure gauge that registers 40 psi when the main valve is fully opened. Water flows into 2" lines that now irrigate all new windbreaks. The waterline that crosses the tract diagonally to the south corner will irrigate the tree crop (Figure 7). A programmable multiple-station electronic timer allows automatic and manual control of water flow. Water supply and control are adequate to establish and maintain a plantation.

Timber resources

There are presently no timber resources on site. The ironwood windbreak is shared with neighboring property, and the neem windbreaks will produce seed crops only. The recently planted milo and kamani seedlings will not be harvested for timber.

Remnant woodland to the north and in the Forest Reserve to the south suggest that natural forest earlier covered this site The State of Hawaii Department of Lands and Natural Resources has rated the Moloa'a area as National Standard prime forest land, a category below Prime 1 & Prime 2 lands (Figure 9). Although potential for growth of hardwood trees on non-irrigated Lihue silty clay soil at this site is rated fair, the landowner's purchase of a drip-irrigation system should enhance site productivity if used to augment soil moisture when necessary.

Figure 9. This Hawaii DLNR map illustrates the distribution of three categories of prime forest lands on Kaua'i and expected annual precipitation in millimeters and shows the Moloa'a area as having National Standard forestry potential.



Wetland resources

There are no wetland resources on this property. We have not observed water ponding at the southern corner, the lowest point of the parcel.

Historical and cultural resources

We have not found any evidence for traditional Hawaiian farming or other cultural activities at this location.

Existing wildlife

Exotic game birds (pheasant) and other common introductions were observed on neighboring properties. Although signs of feral pigs and rats were not seen, their presence is likely in this area from time to time; nearby farmers have controlled pigs in the past.

Threatened and endangered species existing on the property

Long-term agricultural activity has obliterated any vestige of former native dry forest that is assumed to have grown at this site, and there is no evidence of threatened flora or fauna on this property.

Existing recreational and aesthetic values

The Anahola Mountains form a scenic green backdrop to the south and southwest (Figure 7). Vistas of open fields without residences enhance the rural flavor of the area. There are no other present recognizable recreational values on this property.

Grazing & pesticide threats

Grazing animals are not permitted on farm tracts of the Moloa'a Hui. Since farm chemicals may be routinely used on properties upwind of this tract, the landowner should alert neighbors to the dangers of allowing spray of either non-selective weed killers or herbicides selective for dicotyledonous plant to drift over tree seedlings.

VI. Recommended Treatments and Practices

The primary objective of the landowner is to establish a forest cover to produce timber on the present open 7-acre field. The purpose of SIP Practice 2, to establish a stand of forest trees for timber production and conservation purposes, conforms to this objective.

Previous land practices, however, have degraded the fertility and structure of the soil. To achieve a high likelihood of plantation success, the landowner should therefore adequately address the previously identified soil conditions of low acidity, a deficiency of all major nutrients, and compaction; all of which may severely impede tree growth.

Soil acidity and magnesium level should be increased by adding magnesium sulfate. With soil pH lowered to about 6, additional nutrient input of a balanced N-P-K fertilizer, such as 15-15-15, should enhance nutrient availability and seedling uptake.

Because planting in compacted silty clay soils will likely result in stunted trees, it is important that the landowner mitigate soil compaction caused by heavy machinery used in recent brush clearing and berm building by restoring adequate aeration and drainage of the soil profile. The landowner should first cross-rip the entire compacted field at a medium depth and then deep-rip the planting rows along the contour. This additional site preparation expense should benefit seedling establishment, ultimately increase tree growth and timber yield, reduce soil erosion during heavy rains, and lower the need for irrigation.

Site Preparation

Actions necessary to mitigate soil compaction, nutrient deficiencies, and potential competition to seedlings from weeds on the 7 acre tract are as follows:

1. Within several weeks of a close mowing, new growth of weeds should be treated with Roundup (glyphosate) herbicide at a rate of 1/2 gal/acre taking care not to damage existing windbreaks. Estimated costs: Mowing 4 machine-hours @ $50/h; Roundup & sticker-spreader $200; 4 machine-hours spraying @ $150/h; total cost $1,000 or $143/ac.

2. After die-off of weeds, the field should be cross-ripped to lift and aerate the potential rooting zone for shallow lateral tree roots. Using a John Deere D-7 long-track dozer that exerts low compaction pressure on soil, a gang of triple 24" shanks will be set to a depth of 18 to 24". Estimated cost: 15 machine-hours @ $125/h; total cost $1,875 or $268/ac.

3. The field should be disc-harrowed with a D-7 to loosen and smooth the upper 6 to 12 inches of soil. Estimated cost: 8 machine hours @ $125/h; $1,000 or $143/ac

4. The planting grid of rows, 10 feet apart on center, will be laid out along the contour and marked with bright 2-foot-tall flags. Rows, should be deep-ripped by the D-7, 10' apart on center, with a single 36" shank set to a depth of 30 to 36". Estimated costs: Row layout $600, 8 machine hours @ $125; total cost $1,600 or $228/ac.

5. To minimize the cost of amending pH and soil nutrients to acceptable levels, fertilizer will be spread in 4-foot-wide bands centered along rows at rates of 939 lb per acre of

magnesium sulfate and 859 lb per acre of 15-15-15 fertilizer, as a first of two applications. Estimated costs: 4 machine-hours @ $100/h, fertilizer to cover a total "row area" of about 3 acres - magnesium sulfate $260, 15-15-15 $500; total cost $1160 or $165/ac.

6. An artificial ground cover will be used to control weed competition with the trees. A perforated, polyethylene 3' by 3' Arbortech mat will be stapled to the ground around each seedling. Estimated costs: 4,000 mats $3,800, 80 man-hours @ $10/h; total cost $4,600 or $657/ac

7. The landowner will purchase and install irrigation at his expense alone with no cost-share allocation requested. He will dig an 18" trench and bury the drip-irrigation 2" PVC feeder line. The 3/4- inch drip lines, with emitters at appropriate spacing, will be laid along rows and connected to the 2" feeder line.

8. To enhance long-term nitrogen levels, a nitrogen-fixing cover crop will be established between tree rows; 4 acres will be hand-seeded to perennial Dutch clover at a rate of 12 lb/acre. Estimated cost: Seed $220, broadcast labor 4 man-hours @ $10/h; total cost $260 or $37/ac

The total cost of site preparation allocable to cost sharing is estimated to be $10,332 or $1,476/ac

Seedling Acquisition

Trees judged suitable for reforestation of this site were chosen on their ability to grow well under conditions of moderately heavy but well-drained soil, only moderate rainfall, seasonal drought, occasional strong prevailing winds, and wind-borne salt. Marketability and aesthetics determined final species selection.

To ensure a more favorable soil moisture regime for initial tree growth, the landowner has decided to provide irrigation water to supplement natural rainfall as insurance against erratic precipitation and high evapotranspiration. A wider range of species than otherwise can therefore be considered.

Few trees grow well on exposed coastal sites of eastern Kaua'i - windward crowns of most species die back in a classic Krumholz form. From personal observations of coastal hardwood plantings, particularly on windward Kaua'i, it is clear that where landowners plant suitable windbreaks, he/she can largely avoid not only foliar damage due to wind blast and salt, but also root breakage and permanent stem bending from strong prevailing winds.

The following species have been selected for the reasons stated below.
Acacia koa and *Acacia koaia*: Koa and koaia are native to low elevations of windward Kaua'i and grow to significant size (typical of the species) where remnant stands exist in protected locations. Seed will be collected, where possible, from local trees selected for their good form. Both species fix nitrogen. Koaia is rated as having good wind tolerance, koa of medium tolerance. A flourishing koa-koaia market exists in Hawai'i and wood can

have high value; milled products in Hilo are priced from common grade at $4.50 per board foot (bf) to curly koa at $30 /bf.
Cassia siamea: Pheasantwood is wind tolerant. The black wood is highly valued by local crafts workers. Together with African blackwood (*D. melanoxylon*), this species could be niche marketed with other black heartwoods such as true ebonies that currently command high wholesale prices in excess of $30/bf.
Cordia subcordata: Tolerant to wind and salt, kou is also sought after by local woodworkers. Moderately fast-growing, it is a useful wind buffer.
Dalbergia sissoo and *D. melanoxylon:* Both species are well adapted to hot and seasonally dry areas, are wind tolerant, and are nitrogen fixers. These rosewoods have high value with wholesale mainland prices in the $8-$15 /bf range.
Eucalyptus deglupta and *E. dunnii:* Both species are fast growing, suitable as dual purpose windbreak and timber product. Rainbow bark (*E. deglupta*) is already being planted for veneer production on Kaua'i.
Erythrina sandwicensis: This rare endemic coral tree of the drier lowlands will be a valuable cultural and ecological conservation component to the planting. The trees fix nitrogen and produce attractive multi-colored bloom and red seed.
Khaya senegalensis and *K. anthotheca, Swietenia mahogani* and *S. macrophylla:* These true mahoganies are tolerant of heavy soils, wind, and drought. From personal observations on Kaua'i, they also appear relatively tolerant to salt. True mahoganies are successful in plantations and international markets continue to place high value on them as premier products for cabinetry and furniture manufacture. Dryland African true mahoganies have market values similar to the neotropical mahoganies and teak.
Tectona grandis: Several young plantations are now growing successfully in protected locations on coastal Kaua'i in both well-drained and heavy soils. On one unprotected coastal site, teak can be seen growing with bent stems and foliar damage, but with straight trunks and vigorous leaf growth where protected from direct winds. Improved seed is readily available from plantations abroad. Wholesale mainland prices range from $5-8/bf. The international demand for teak continues strong.
Thespesia populnea: Milo is salt tolerant and resists windthrow. The wood is highly prized by local wood workers and present supply is limited. Seed will be selected from large trees with good timber form. Milled product in Hilo fetches $18.50 /bf, comparable to the value of full curl koa.
Toona ciliata: Toon has a history of successful growth in Big Island plantations and exhibits rapid growth in young plantings on Kaua'i. Toon is a member of the family of true mahoganies and its wood value may approach that of mahogany.

Planting stock will be contracted from a forest nursery. The nursery will acquire improved seed, where available, from known provenances. Seedling plugs, with root volume of 12 cu. in., will be container grown for four months and hardened off at the nursery before outplanting. Estimated cost: With a planting of 3,800 seedlings (see plantation design below) and replanting of assumed 5% mortality during the first six months, total seedling cost can be expected to be $7840 or $1.96 per seedling.

Seedling Planting

Plantation design: Species should be arranged and spaced in the plantation according to their wind tolerance, shade tolerance, growth habit, and aesthetics. To achieve the landowner's desire to create a planting that would look more aesthetically pleasing than a monoculture, species will be arranged in a patch mosaic (Figure 10) to simulate the diversity of natural stands; patch boundaries should be non-linear. Most species will be planted at an 8 by 10 foot spacing to give a stand density of about 545 stems per acre. Slower growing rosewoods should be planted at a close spacing of 6 feet on center to promote good form. A total of about 4,000 trees will be planted.

The more wind tolerant and shade intolerant species such as koaia, milo, kou, and eucalyptus will occupy exposed edges of the plantation. Less wind tolerant species such as shade intolerant koa and teak and taxa with some shade tolerance such as mahoganies, toon, pheasantwood, and rosewood fill the leeward side of the planting.

Planting: When soil moisture is optimal, holes will be opened with a planting spade. Four ounces of 5-3-3 N-P-K containing humic acids (to promote root development), will be placed in the holes and covered. Seedlings will be planted with a hand trowel and watered in. Endo-mycorrhizal inoculum *Glomus intraradices* will be mixed in soil of non-nitrogen fixers. Cost: 280 man-hours; total $2,115 or $302/ac.

Post-planting Silvicultural Treatments

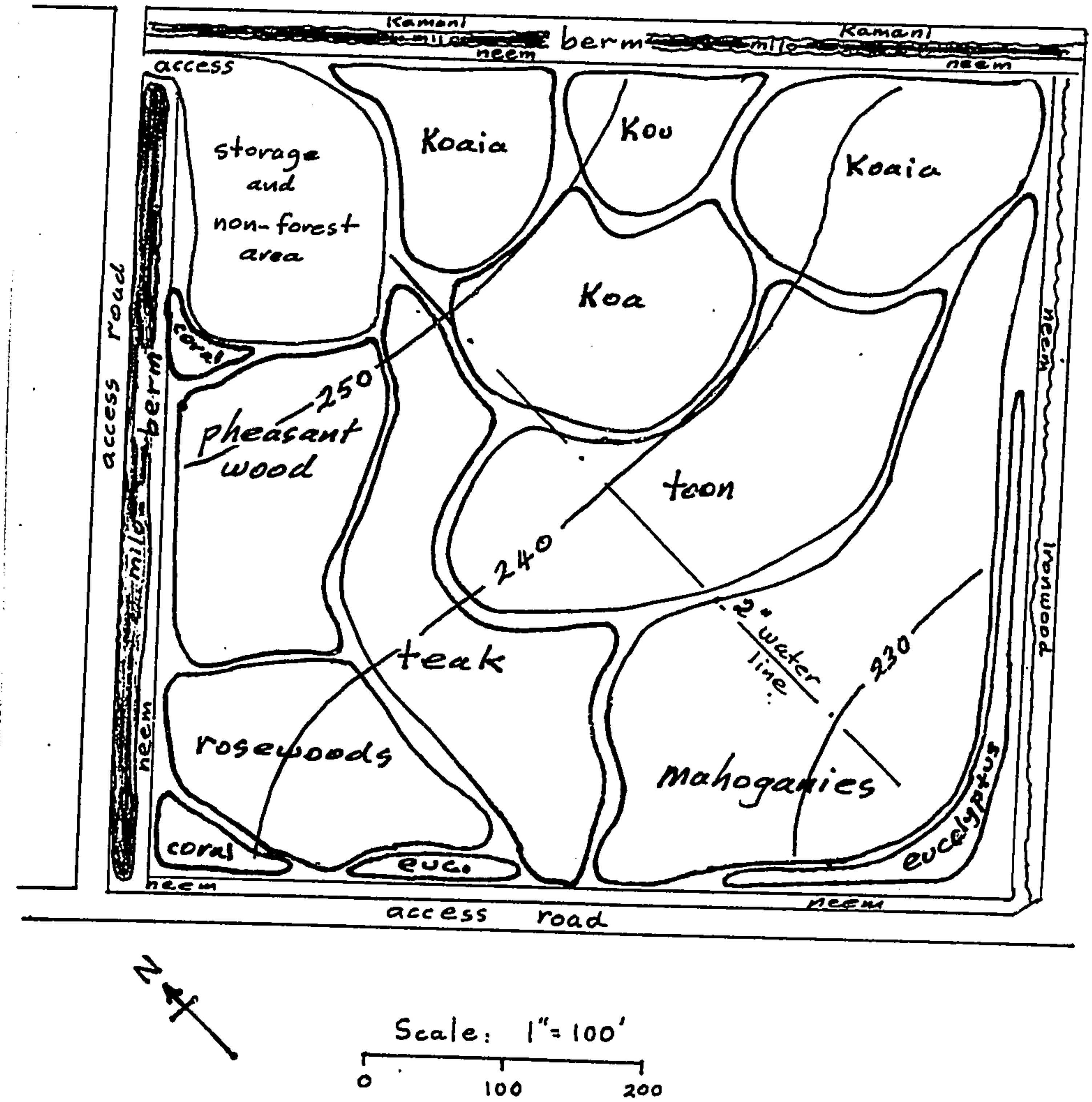
***Weed Control*:** Inter-rows will be mowed 6 times per year for the first two years, 4 times per year in years 3 and 4, and as needed after canopy closure. Aggressive grass weeds such as Guinea grass will be spot treated with Fusilade herbicide.
Estimated costs: Mowing at $400 per mowing or $2,400 per year for Years 1 & 2, $2,000 per year for Years 3 & 4; herbicide treatment $200 per year.

Fertilization: To assure proper growth of the trees as their roots extend beyond the weed mats, a second application of magnesium sulfate and 15-15-15 fertilizer should be broadcast by hand three months after planting, at the same rate as previously, on inter-row areas and at 4 ounces per tree through each slit in the weed mat. Fertilizer will then be applied 3 times per year for 4 years at levels determined by soil and tissue analyses done 6 months after planting. Estimated costs: 8 man-hours per fertilizer application, magnesium sulfate $360, 15-15-15 fertilizer $300 /application; cost of post-plant fertilization in Year 2 $1,750 or $250/ac and $1,260 or $180/ac in later years.

Pruning: Most species should be low pruned at canopy closure; rosewoods, koa, koaia, and milo will likely require earlier pruning to produce good timber form and knot-free wood. Stems between about 4 to 8 inches in diameter that retain their lower branches should be pruned to no more than half tree height or about 15 feet above ground level. Early pruning of small limbs, using a sharp saw, produces best results.

Thinning: The plantation should be thinned periodically to promote optimal growth of the dominant and co-dominant trees with best form. The first two removals of cull trees will be pre-commercial thinnings and should take place at least by Year 8 and Year 12, respectively, depending on species. Commercial thinnings could likely be scheduled for Years 15 and onward for some of the faster growing species such as teak, milo, koa, koaia, and mahoganies. Foresters can advise on final spacing between trees.

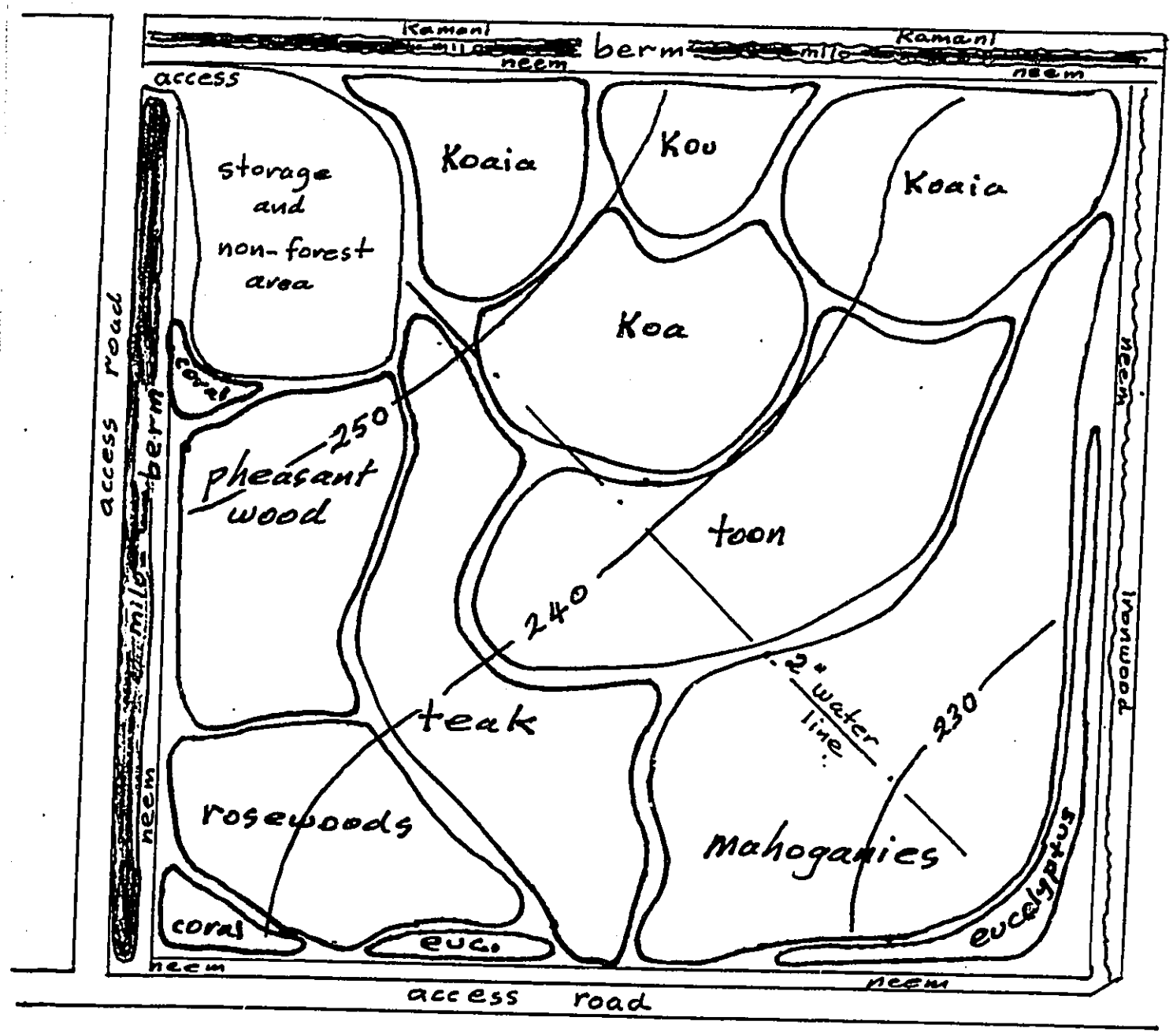
Figure 10. Schematic of planting design showing the mosaic of species to be planted, windbreaks along boundaries, topographic contours (10 foot intervals) in feet above sea-level, and the 2"-irrigation pipe to feed drip-emitter lines.



CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Figure 10. Schematic of planting design showing the mosaic of species to be planted, windbreaks along boundaries, topographic contours (10 foot intervals) in feet above sea-level, and the 2"-irrigation pipe to feed drip-emitter lines.



Final Harvest Plan

The landowner would like to begin to selectively harvest suitable trees after Year 15 of the project. Actual timing of the harvest will depend on the maturity of the various species and market conditions. The landowner will develop and implement a harvesting plan conforming with current State of Hawaii Department of Lands & Natural Resources approved Best Management Plans and in consultation with DLNR-DOFAW Branch staff.

Agroforestry Plantings

As canopy closure occurs, the landowner plans to introduce shade-tolerant understorey species to augment diversity and economic return of the plantation. Maile (*Alyxia oliviformis)* vines could be planted close to koa and koaia trees; indigenous palapalai (*Microlepis strigosa*), the hapu'u endemic tree fern (*Cibotium glaucum*), and rooted cuttings of 'awa (*Piper methysticum*) could be planted between rows of koa and koaia. Grafted stock of cacao (*Theobroma cacao*) and shade coffee (*Coffea arabica*); and seedlings of allspice (*Pimenta dioica*), nutmeg (*Myristica fragrans*), and clove (*Syzygium aromaticum*) are some of the candidates to be planted between rows of mahoganies and toon.

Economic Considerations

Information on economic returns from high-value tropical hardwood plantations is scarce, but some data does exist for Hawai'i koa and teak plantations overseas. Published estimates of returns on teak investment vary widely, are the subject of controversy, and have been unscrupulously used as a tool to fuel highly speculative forestry investments. Projections of plantation growth & yield are either scarce or unavailable (worldwide let alone Hawai'i) for most of the other hardwoods recommended for this site. We do know, however, that koa and big-leaf mahogany (*S. macrophylla*), for instance, can produce similar height growth of up to about 10 feet per year during their first few years in Kaua'i plantations. West Indian mahogany (*S. mahogani*), has a somewhat slower growth rate, but may command a higher price.

Given a 20-25 year rotation period, we will assume an "average" hardwood in the plantation conservatively produces a millable bole of about 40 feet with a diameter-breast-height (dbh) of 24 inches and moderate taper. If a bole yields two 16-foot logs containing about 600 saleable board feet (Scribner decimal C log rule table), and if 80 such mature trees are harvested per acre, an acre could yield about 48,000 board feet. Final harvest of 7 acres could potentially yield 336,000 board feet of merchantable wood.

Because quoted wholesale prices of different species vary, we use a current price for milled koa, mahogany, and teak of around $5/bf as a gauge for an "average" value for milled hardwoods grown in this plantation. Given a stumpage value of $0.50/bf (10% of milled price of $5 per board foot), harvest over several years with low inflation, revenues from final harvest could furnish a **total revenue of $168,000** in 1999 dollars.

Commercial thinnings, particularly of milo, koa, and koaia would likely increase revenue. Higher revenue could also possibly be achieved if the landowner can direct his wood product to a niche market either directly or through cooperative milling entities on Kaua'i that pay higher than stumpage values. Agroforestry plantings could also provide

additional income as the plantation matures. Maile and fern could be sold in the strong local markets for lei and landscape materials. Certain varieties of 'awa are presently a cash crop in high demand for export. The global demand for cocoa is predicted to rise substantially within a decade and processing can be done in Hawai'i. Selection of the right cultivar of shade coffee could result in beans with better flavor than sun-grown coffee presently produced on Kaua'i. Seed from the neem windbreaks will likely produce some income when sold to a local processing plant now in the planning stages.

A high stumpage value of $1/bf would produce revenue of $336,000. On the other hand, less revenue would result from receiving a lower stumpage than expected; $0.25/bf (a low value) would result in a total revenue of only $84,000. Exceptional growth resulting in higher yields could also possibly increase revenue. On the other hand, if inferior wood quality results from fast growth, revenue could be significantly lower..

Landowner costs (excluding irrigation) are estimated to be about $25,000 for the first 10 year-period (Table 2) and about $1,000 per year thereafter for a total of $35,000 over a 20-year cycle. Although irrigation may become unnecessary as root systems encounter groundwater and the drip system is eventually sold, we roughly estimate a total cost of irrigation, hardware, repairs, and water to be $10,000 spread over a 20 year period. Federally backed crop insurance against wind damage is not yet available and not included. Hence at 20 years, **total direct costs of about $45,000** in present dollars could be expected. The landowner plans to defray planting, maintenance, and harvest costs by in-kind labor, so actual out-of-pocket expenditures could be considerably less.

Net profit must take into account the full cost of the investment which could include land payments, improvements, borrowing, taxes, inflation, and opportunity cost of funds actually used to establish, maintain, and harvest the plantation.

To account for the time value of money, net present value (NPV) of the landowner's investment can be computed. NPV is the difference between present values of expected future returns and future costs discounted at an appropriate interest rate. For example, given timber costs only from Table 2 and assuming an annual inflation rate of 3% and an interest rate of 7% then: future timber revenues of $168,000 adjusted for inflation equal $303, 426 and NPV would be $58,000. Under these limited assumptions, the Benefit to Cost ratio would equal 3.5 or a profitability of $3.50 returned on each dollar invested. When accounting for overall costs such as land purchase, improvements, and irrigation etc.., however, NPV is close to zero. This suggests that revenues from commercial thinnings, agroforestry products, and even waste by-products will be important for profitability.

Economic analyses of koa plantation production suggest an internal rate of return (IRR, the calculated rate that a timber investment earns when NPV is zero) could be 15%. Over the past 30 years, various pantropic plantations of exotics such as eucalyptus and tropical pines have reported an IRR ranging from about 8 to 20%. Actual rates of return from this project will depend heavily on how effectively wood products in Hawaii are marketed.

Comments Received From Reviewers of Draft Environmental Assessment Batesole Forest Stewardship Project

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December 17, 1999

Allan Batesole
2072 Shiloh Ave.
Milpitas, California 95035

cc: Hawaii Restoration Nursery Services LLC,
Department of Land & Natural Resources,
Office of Environmental Quality Control

Dear Mr. Batesole,

RE: Draft Environmental Assessment for The State of Hawaii Forest Stewardship Program, Batesole Hardwood Tree Farm

The following comments are in regard to the *Draft Environmental Assessment for The State of Hawaii Forest Stewardship Program, Batesole Hardwood Tree Farm.* I hope they prove useful in the environmental review process.

New EAs required for future phase of project

According to *A Guidebook for the State Environmental Review Process* (p. 17) by the Office of Environmental Quality Control,

> If a project includes a later phase that cannot be fully described or studied today because it is likely to be implemented in the distant future, that future phase should be described in as much detail as possible in the EA. Should the future phase of such a project be proposed, a new environmental review document will be required at that time.

The DEA identifies two proposed actions that will be implemented in the distant future:

1. "commercial thinning will begin about year 12" (p. 3); and
2. "harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter" (p. 3).

Therefore, if environmental regulations are enforced, additional EAs will be required before these two proposed actions are implemented. The cost of hiring consultants to complete the additional EAs are direct costs you might want to include in the "Economic Considerations" section of the DEA.

Description of future phase is incomplete

All possible impacts are not adequately described in the DEA. In particular, the potential impacts of thinning and harvesting on the endangered Hawaiian hoary bat are not addressed. Hawaiian hoary bats roost externally on trees, generally in the foliage. Although no endangered species are believed to be currently present at the action site (p. 6), that doesn't mean they won't be present later. In time, bats may move into the tree farm to roost.

Possible impacts to tree-roosting bats from tree harvesting can be direct or indirect. Direct impacts include direct mortality or injury to individuals when felling trees that harbor roosts. Indirect impacts are those caused by the proposed action and are later in time, but still reasonably certain to occur (50 CFR 402.02). According to the US Fish and Wildlife Service, removal of trees which have the potential to serve as roosts could result in the loss or alteration of roosting habitat (USFWS 1997[1]). In addition, "timber harvest could alter insect species composition and may reduce the availability of insects on which bats feed, thereby causing them to search for alternate foraging habitat" (USFWS 1997).

The DEA does not identify:

1. the type of survey that will be done to ascertain if bats are utilizing the tree farm at harvest time; and
2. the time of year that trees will be harvested (e.g. Will trees be cut during the critical bat breeding season (June and July) when bat pups are unable to fly?).

Mitigation measures to protect bats are not described in the draft EA

The DEA fails to address mitigation measures to protect bats. Some consideration needs to be given to the actions that will be taken if bats are found roosting within the tree farm.

Will a buffer zone be established around roosting bats? For endangered tree-roosting bats on the mainland, a ¼ mile buffer is the mitigation in national forests harboring the Indiana bat.[2] Within this buffer, no logging, road construction, or pesticide use is permitted. For maternity roosts the buffer is 2 miles around each roost.

One might also propose a suspension of all tree-harvesting during the Hawaiian hoary bat's breeding season (i.e. June and July). This strategy protects any undetected roosting bats that may be breeding (i.e. rearing young) in the tree farm. If such conservation-mined mitigation is implemented, it might help the Batesole Tree Farm obtain "green labeling" for its forest products.

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[1] U.S. Fish and Wildlife Service. 1997. Biological Opinion on the Effects of Management Activities Conducted by George Washington and Jefferson National Forests on the Indiana Bat. USFWS, Annapolis, MD, 39 pp.
[2] Ibid.

Other comments

According to page 5 of the DEA, "there is no evidence of threatened flora or fauna on or near this property." This prompts the following questions:

1. Was there any evidence of endangered (as opposed to threatened) flora or fauna?
2. What types of evidence (e.g. the Nature Conservancy's Natural Diversity Database, published literature, or personal observations) were examined?
3. Were any faunal field surveys done? If so, what methods were used?

Summary

- Additional EAs for tree harvesting seem warranted in the future.
- The draft EA is incomplete because it does not describe potential impacts of tree harvesting on endangered bats.
- The draft EA is incomplete because it does not propose mitigation for the potential taking of endangered bats.

Thank you for your time and consideration of these comments. If you have any questions regarding the Hawaiian hoary bat, please call me at (808) 732-4014. I wish you the best on this interesting, new forestry stewardship project.

Sincerely,

Theresa Menard

Theresa Menard
Graduate Student in Ecology,
Evolution, & Conservation Biology

32198

BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

December 22, 1999

Mr. Tim Johns, Chair
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: Draft Environmental Assessment for the Batesole Forest Stewardship Project, Moloaa, Kauai

Thank you for the opportunity to review the subject document. We have the following questions and comments.

1. Please describe how much irrigation water that project will require. Who owns the agricultural water system and the associated wells that will provide water for this project?

2. We recommend that the applicant use an Integrated Pest Management approach to control weed. Please consult with the Department of Agriculture's Pesticide Branch for more information on this matter.

3. Please discuss the impacts of harvesting and thinning and the mitigation measures planned to reduce these impacts. These impacts include, but are not limited to, noise impacts from the cutting equipment, fire hazard from post-harvest stumps and other remains, and traffic impacts from post-harvest trucking.

4. Please describe the best management practices that the project will employ during soil preparation and other activities to reduce sediment runoff into the nearby ocean.

5. Please provide better quality photographs in the final environmental assessment.

6. Please include a list of all permits and approvals (State, Federal, County) required for the project in the final environmental assessment.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

c: Allan Batesole
John Edson

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

JANET E. KAWELO
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

January 6, 2000

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT
WATER RESOURCE MANAGEMENT

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson: Genevieve

Subject: Negative Declaration Determination and Final Environmental Assessment for Batesole Forest Stewardship Project, Moloaa, Kauai.

We have received your letter of December 22, 1999 regarding Mr. Batesole's proposed Forest Stewardship Project with Department of Land and Natural Resources, Division of Forestry and Wildlife. The following is our response to the questions that were raised for Mr. Batesole's stewardship project with us.

1. Please describe how much irrigation water that project will require. Who owns the agricultural water system and the associated wells that will provide water for this project?

   In the initial 2 years, the project will use 4,000 gallons of water per week. The demand for water will greatly decrease in year 3 and beyond. The source of the irrigation water is from Amfac wells of which Jeff Lindner owns the irrigation system that the project will use.

2. We recommend that the applicant use an Integrated Pest Management approach to control weed. Please consult with the Department of Agriculture's Pesticide Branch for more information on this matter.

   We will advise the landowner to consult with the Department of Agriculture Pesticide Branch to include Integrated Pest Management into his forest management scheme.

3. Please discuss the impacts of harvesting and thinning and the mitigation measures planned to reduce these impacts. These impacts include, but are not limited to, noise impacts from the cutting equipment, fire hazard from

post-harvest stumps and other remains, and traffic impacts from post-harvest trucking.

The impact of harvesting trees is no different from harvesting sugar cane during decades of sugar production, as being proposed on this 7-acre project. In addition, the selective harvesting and thinning practices for this 7-acre site will be carried out incrementally while employing the Department's Best Management Practices. These practices will have much less of an impact to the environment than did with past uses for sugar cane harvesting and most recently papaya production. Currently the land is fallowed (colored pictures show the area). Growing trees will only enhance this area which is bare, depleted and is located on former sugarcane land and intensive papaya production land which has been intensively cultivated over the last century. It is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner follow approved and current Best Management Practices and that they be prepared in consultation with DOFAW and the Department of Land and Natural Resources.

4. Please describe the best management practices that the project will employ during soil preparation and other activities to reduce sediment runoff into the nearby ocean.

Tree planting will provide much needed cover and serve to protect the soil which is currently bare and eroding at a rapid rate. When trees reach merchantable size, the project will employ shelterwood cut along the contour which provides harvesting in strips or selective cuts that will always maintain tree growth and vegetation at all times on the property. Again, this is a 7-acre property. Best Management Practice components that the landowner will follow and be incorporated into its timber harvesting plan include: 1) forest roads, standards and use, planning design and location, construction and maintenance, 2) preharvesting planning, 3) timber harvesting, standards and use, felling and bucking, skidding mechanical site preparation, disposal of debris and litter, 3) silvicultural chemical management, description and purpose, planning, pesticide selection, procedures for chemical use, 4) streamside management zone, recommendations, 5) wildfire damage control and reclamation/prescribed burn, and 6) reforestation. These six components are described in detail under "Best Management Practices for Maintaining Water Quality in Hawaii," February 1996.

5. Please provide better quality photographs in the final environmental assessment.

   Photos are attached.

6. Please include a list of all permits and approvals (State, Federal, County) required for the project in the final environmental assessment.

   Following the "finding of no significant impact" of this project a formal contract agreement will be submitted for approval by the Board of Land and Natural Resources as well as Department of Attorney General approval as to contract agreement form, and Department of Accounting and General Services approval to certify the funds annually, and Department of Taxation approval to certify the landowners tax clearance for the previous year. The property is currently zoned Agriculture and is essentially bare ground with no significant resources, no other permits are required at this time.

The following are comments presented by Theresa Menard, University of Hawaii, Department of Zoology of the draft EA for Batesole and our response to her letter dated December 17, 1999.

7. The DEA identifies two proposed actions that will be implemented in the distant future: 1) "Commercial thinning will begin about year 12" (p.3); and 2) "harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter" (p.3). Additional EAs will be required before these two proposed actions are implemented. The cost of hiring consultants to complete the additional EAs are direct costs you might want to include in the "Economic Considerations" section of the DEA.

   The Forest Stewardship Program is a voluntary program that a landowner chooses to enter to receive cost-share assistance for ten years according to an approved management plan and contract agreement with DLNR. Any forest management activities after year ten is beyond the scope of the program. Regarding commercial thinning and harvesting of trees, it is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner will follow approved and current Best Management Practices and that they are prepared in consultation with DOFAW and the Department of Land and Natural Resources. The additional cost of consultants to write EA beyond the scope of the program is at the landowners discretion and not a

requirement of the program. In addition, the scale of each selective harvest being proposed in the future is small (less than 7-acres), and the negative impacts to the environment will be minimal.

8. In particular, the potential impacts of thinning and harvesting on the endangered Hawaiian hoary bat are not addressed. Hawaiian hoary bats roost externally on trees, generally in the foliage. Although no endangered species are believed to be currently present at the action site (p.6), that doesn't mean they won't be present later. In time, bats may move into the tree farm to roost.

   Again, this 7-acre property is former sugar land and most recently under papaya production. The property is currently bare and depleted of which the photos will confirm its present condition. Planting trees will enhance this area on 7 acres and provide a variety of environmental benefits that were eliminated by decades of sugar and papaya production. If nothing is done or agriculture cultivation continues on this property, there will be no benefits to any wildlife and soil erosion will continue. The trees scheduled for planting will probably be seedling size of less than one-and-one-half feet in height off-the-ground. From the ten species recommended for planting; two are koa species which are natives and the remaining eight are non-native species. The majority of the tree species selected for planting is slow growing and are not expected to provide merchantable timber size until twelve to fifteen years or until probably twenty to twenty-five years.

   The property is 7-acres. It seems unlikely that bats will occupy such a small tree cover area when the State Forest Reserve is located just mauka of this project. Figure 3 shows the surrounding area as being in agriculture production or now abandoned with isolated tree cover. When such a time in the future that bats do occur on the project site as a result of the stewardship project, the landowner will mitigate the impacts that harvesting will have on the bats. Impacts are likely to be small because only a few trees will be harvested at any one time. These mitigation measures will be addressed and incorporated into the timber harvesting plan of which the Department will review for approval.

9. The DEA does not identify: 1) the type of survey that will be done to ascertain if bats are utilizing the tree farm at harvest time, and 2) the time of year that trees will be harvested (e.g. Will the tree be cut during the critical bat breeding season (June and July) when bat pups are unable to fly?

If and when bats are located on the Batesole stewardship project as the result of growing the trees, every effort will be used to mitigate impacts made on the bats. Tree harvesting can be scheduled so as not to coincide with the breeding-season of the bats. In twenty to twenty-five years from now, we will have more reliable information about their roosting and breeding behavior that will allow us to make better decisions. The harvesting plan will incorporate and address areas of the 7-acres needing protection for bat habitat. A survey (probably random sampling) will be used to address the need for mitigation of the bats, if found on the property.

10. According to page 5, of the DEA "there is no evidence of threatened flora or fauna on or near this property." This prompts the following questions; 1) Was there any evidence of endangered (as opposed to threatened) flora or fauna?, 2) What types of evidence (e.g. the Nature Conservancy's Natural Diversity Database, published literature, or personal observations) were examined?, and 3) Were any faunal field surveys done? If so, what methods were used?

As Figure 7 and Figure 8 shows this property has been heavily cultivated for agricultural purposes, most recently papaya production. There is no evidence of endangered (as opposed to threatened) flora or fauna. Because this property was previously in papaya production, the database of the Nature Conservancy's Natural Diversity Database, published literature, or personal observations will not show any evidence of listed Threatened and Endangered Species. Lastly, there was no need for a faunal field survey because the property was previously in papaya production and is clearly denuded of any significant wildlife or natural resources.

We have reviewed the comments received during the 30-day public comment period that began on November 23, 1999 for the subject project. We have determined that this project is not likely to have a significant impact on the environment. Please publish a notice of determination for this negative declaration in your January 23, 2000 issue of the Environmental Notice.

We have enclosed a completed OEQC Bulletin Publication Form and four (4) copies of the Final EA for the project. If you have questions, please call Nelson Ayers of the Division of Forestry and Wildlife at 587-4175.

Sincerely yours,

Michael G. Buck
Administrator

Copy: Allan Batesole
John Edson
Nelson Ayers

Enclosures

Figure 2. Map shows the northern portion of the windward east coast of Kaua'i. Note locations of the town of Anahola, Moloa'a Bay, and milemarkers on Kuhio Highway (56).

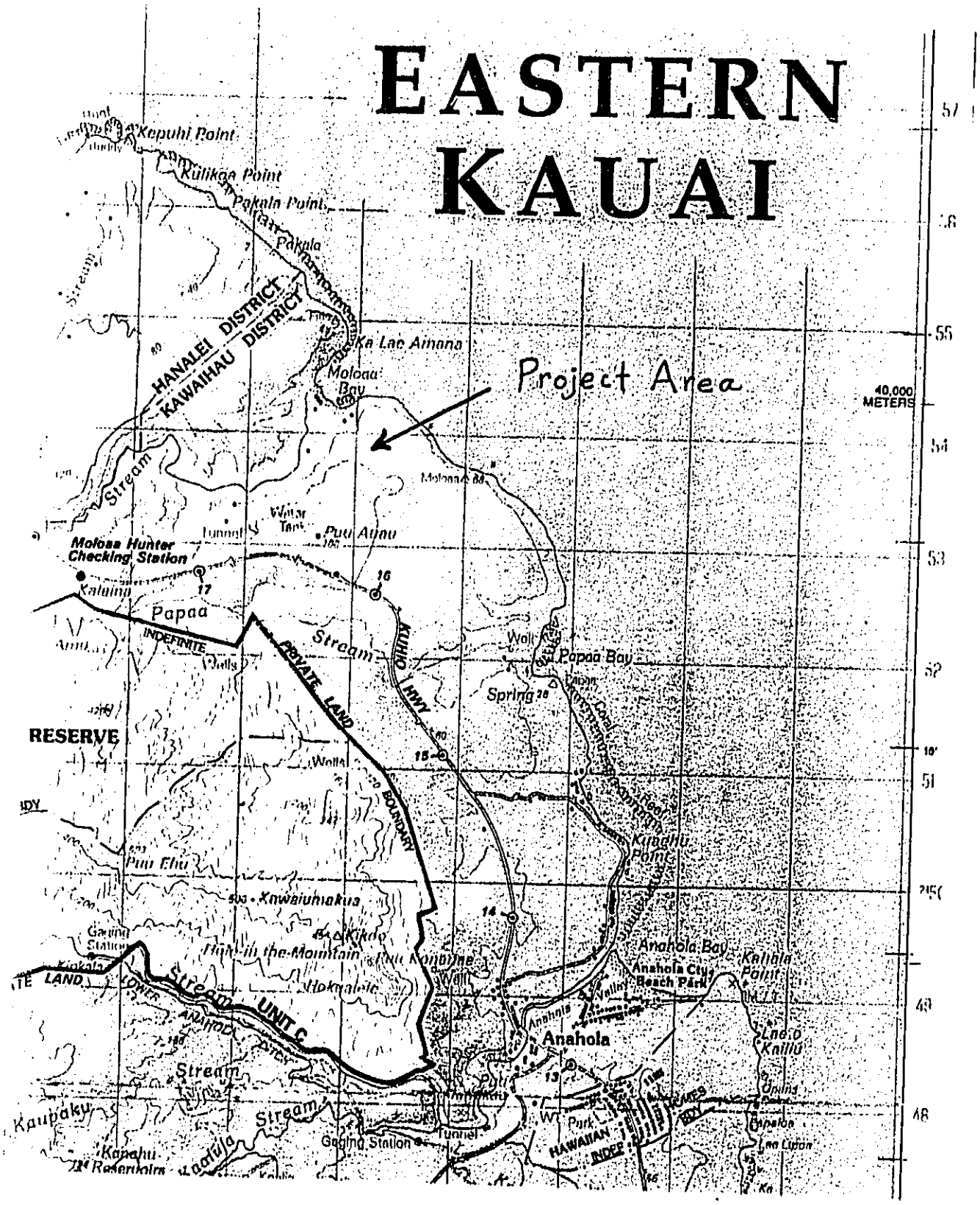
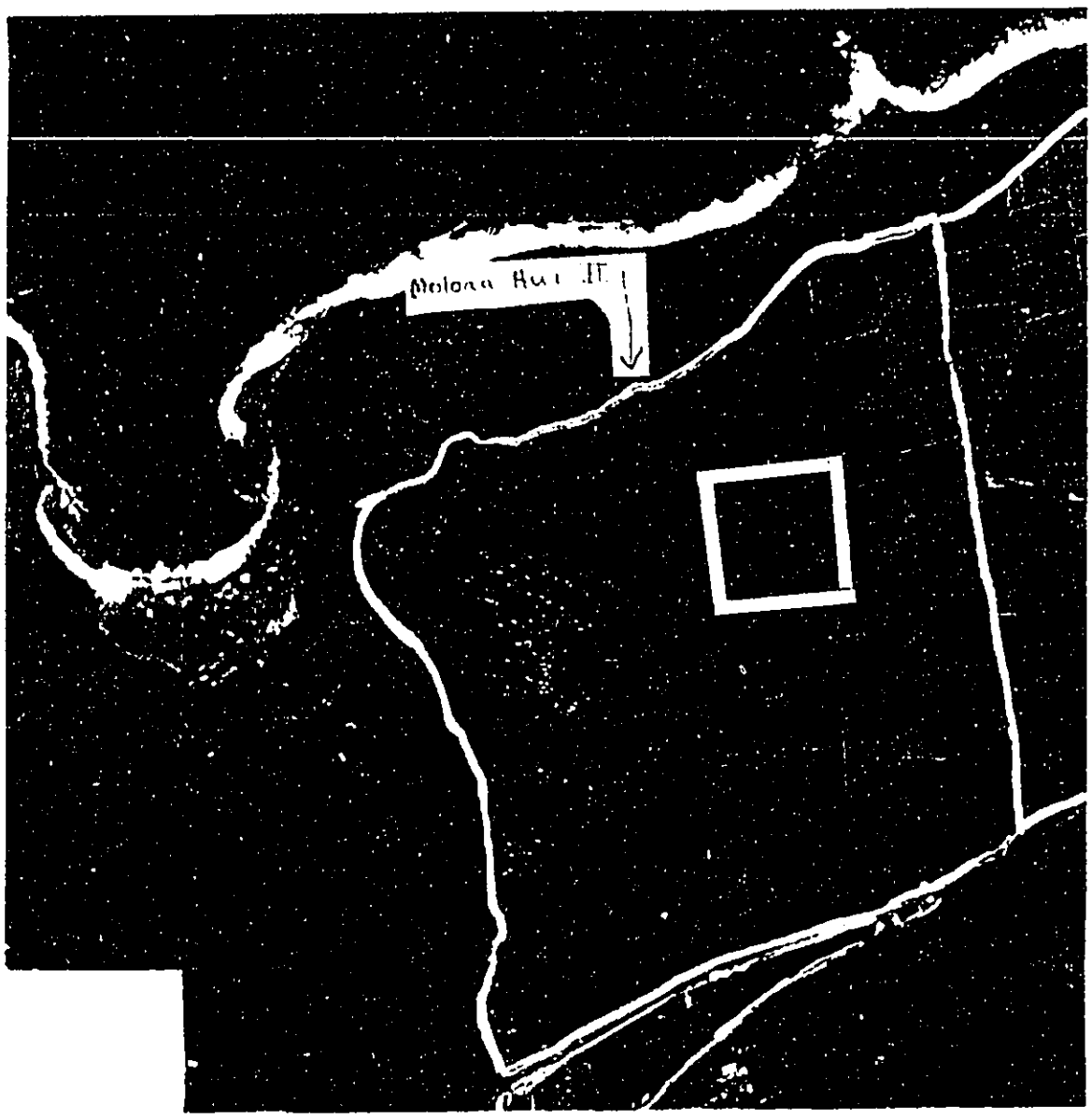
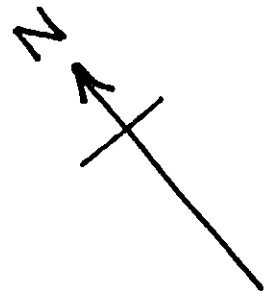


Figure 3. An older air photograph of the Moloa'a area White outlines show the location of the Mola'a Hui # II and the square-shaped Batesole property within it Note the proximity of the Kuhio Highway (lower right), Mola'a Bay (mid-left), the active surf zone toward the north, and the band of woodland behind the sea cliffs





Scale: 1" = 1200'

Figure 7. Photographs taken in April ,1999 show vegetative cover, development, and general surroundings of the Batesole property.

Top: diagonal view downslope from north to south corners; site access in the foreground, Anahola Mountains and Moloa'a Forest Reserve in the background.

Below: diagonal view from south corner upslope toward the north corner. The 2" white irrigation pipe, when buried, will feed water to seedlings via lateral 1" drip lines. The Cook pine windbreak is on the adjacent property.

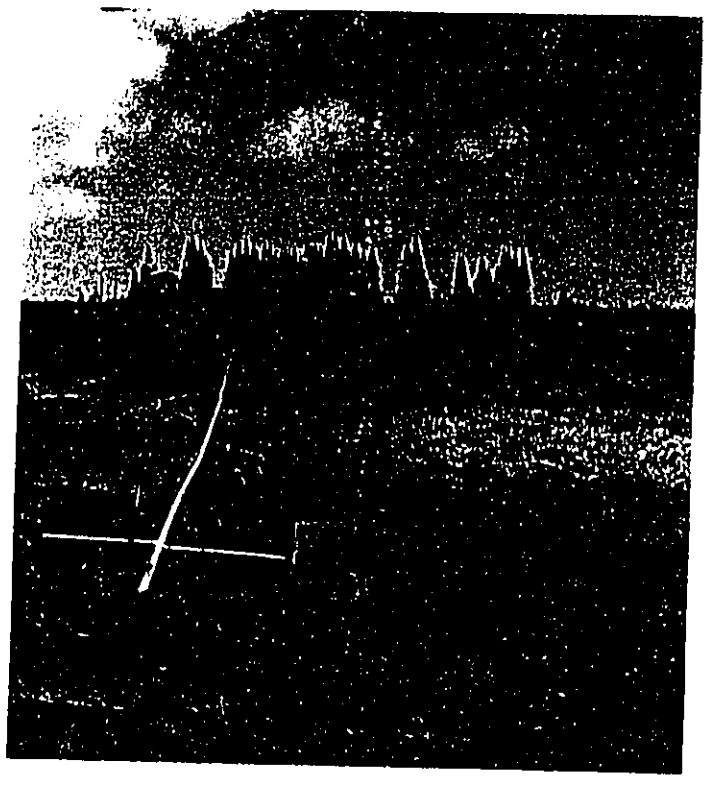


Figure 8. Photographs of windbreaks on the Batesole property

Top: View toward the southeast; kamani (left) and milo (right) windbreaks were planted in April, 1999 on the northeast berm. Foreground shows part of water supply intake.

Below: Ironwood windbreak on right, neem seedlings on left.

2000-01-23-KA-FEA-

Final

~~DRAFT~~ ENVIRONMENTAL ASSESSMENT

for

The State of Hawai'i Forest Stewardship Program
~~Batesole~~ Hardwood Tree Farm~~Batesole~~

Moloa'a Hui Lands Agricultural Condominium, Moloa'a , Kaua'i County
Tax Map Key Number 4-9-9-9-CPR-8

APPROVING AGENCY: **Department of Land & Natural Resources**
Division of Forestry & Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

APPLICANT: **Allan Batesole**
2072 Shiloh Ave.
Milpitas, California 95035

PREPARED BY: **John Edson**
Hawai'i Reforestation Nursery Services LLC
5023 D Moa Road
Kapa'a, HI 96746
808 821-8829

OCTOBER 27, 1999

Purpose of this Environmental Assessment

Allan Batesole, together with the Hawai'i State Department of Land and Natural Resources, Division of Forestry and Wildlife proposes to implement a Forest Stewardship Program at Moloa'a, Kaua'i County, Hawai'i. The purpose of this Environmental Assessment is to comply with the requirements of Chapter 343, Hawai'i Revised Statutes (HRS) due to the use of State funds for planting trees for eventual harvest.

Identification of Applicant

Allan Batesole is the owner of the Batesole Hardwood Tree Farm; his mailing address is 2072 Shiloh Avenue, Milpitas, California 95035.

Identification of Approving Agency

The State Department of Land and Natural Resources, Division of Forestry and Wildlife, located at 1151 Punchbowl Street, Room 325, Honolulu, Hawai'i 96813.

Agencies and individuals consulted

Federal:	USDA, Natural Resources Conservation Service, Lihu'e
State:	Hawaii Department of Agriculture Extension Service, Lihu'e
	Tropical Forestry Extension Service, Hilo
County:	Office of Economic Development, Lihu'e
Private:	Paul Huber, Asst. Mgr. Moloa'a Agricultural Condominium
	John McClure, Owner Unit 37, Moloa'a Ag. Condo.
	Marie Mauger, Owner Unit 25, Moloa'a Ag. Condo.
	Mike Bottasso, Hanalei (Sierra Club Member)

Description of Proposed Actions

A. Establish and maintain a long-term forest cover of high-value hardwood species on degraded abandoned former farmland
B. Create an aesthetically pleasing "natural" forest landscape
C. Derive periodic income through selective logging of the plantation
D. Introduce understorey crops to create an agroforestry system over the long term

No facilities are planned. The project will begin by March, 2000 and end in 2020. Cost-share funds of up to $15,018 will be administered by the State of Hawai'i Forest Stewardship Program.

Technical characteristics
Trees will be planted on 7 acres of a 9.162-acre parcel in the northeastern coastal lowland of Kaua'i (Figures 1 & 2). The tract is identified as Unit #27 (tax map key number 4-9-9-9-CPR-8) within the Moloa'a Hui # II of the Moloa'a Hui Lands Agricultural Condominium and is zoned non-residential (Figure 3). The parcel is roughly square-shaped with northeast, southeast, southwest, and northwest facing boundaries approximately 600 feet long (Figure 4).
The following actions will be undertaken to mitigate soil compaction, nutrient deficiencies, and potential weed competition to tree seedlings on the 7 acre tract.
1.Weeds will be treated with Roundup (glyphosate) herbicide.
2. After weed die-off, the field will be cross-ripped, disc-harrowed, and deep-ripped along planting rows.
3. Magnesium sulfate and 15-15-15 N-P-K fertilizer will be spread in 4-foot-wide bands centered along rows.
4. Tree seedlings will be hand planted.
5. Perforated, 3' by 3' polyethylene weed-barrier mats will be stapled to the ground around each seedling.
6. Drip emitters at each seedling will provide water from 3/4" lines laid along rows.
7. A nitrogen-fixing cover crop will be hand-seeded between tree rows.

About 4,000 trees will be planted in all at an initial spacing of 8 by 10 feet. Species selected include *Acacia koa, Acacia koaia, Cassia siamea, Cordia subcordata, Dalbergia sissoo, D. melanoxylon, Eucalyptus deglupta, E. dunnii, Khaya senegalensis, Swietenia mahogani, S. macrophylla, Tectona grandis, Thespesia populnea, Toona ciliata.*
Plantation maintenance will include mowing of inter-rows and minimal herbicide treatment of aggressive weeds only when necessary. Tree growth will be monitored and fertilizer applied as needed. The plantation will be pruned and thinned as each species requires.

Economic characteristics
The tree species are selected primarily for the high value of their heartwood. Commercial thinnings will begin after about year 12, and harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter. By year 20, it is expected that the plantation will produce 40-feet-long millable boles with diameter-breast-heights of about

24". Revenues are expected to exceed costs. Under an analysis using a discount rate of 7%, the project may yield an internal rate of return of up to 15%.

Social characteristics

The hardwood plantation will be within a rural area with a long-standing history of agricultural crop production including sugar, pineapple, and papaya. For the past decade, most of the surrounding lands have been idled, but recent interest in diversified agriculture has increased. Local growers consider a tree farm consistent with other agricultural activities conducted nearby such as papaya and banana farming. To create a planting that will seem pleasing to the eye, species will be arranged in a patch mosaic (Figure 6).

Environmental characteristics

Terrain and climate:

The site lies on a broad undulating bench (Figure 5) and gently slopes uniformly to the south with a gradient of 4% . Maximum elevation of 260 feet above sea-level at the most northerly corner decreases to 225 feet at the south corner (Figure 6). Erosional features are absent on the property itself, but water flows intermittently in a ditch on the other side of the access road bounding the southwest boundary. This northeast region of Kaua'i experiences prevailing salt-bearing northeasterly trade winds with occasional velocities of up to 40 knots or more. Average annual precipitation is 40 to 50 inches with most rain falling in the winter months between October and April. Trade wind showers are generally light, but heavy rains occasionally occur associated with frontal activity. The site may have little or no rain from July through September. Although the area has experienced two major hurricanes within the past twenty years, insufficient historical meteorological data exists to predict future hurricane frequency with any accuracy.

Soils:

Soil at this site is identified as Lihue silty clay, map unit LhB (< 8% slope) within the Lihue Series, and falls within Capability Classification IIe, Woodland Group 5. The topsoil is heavy but tillable and designated suitable for either irrigated or non-irrigated use. Hazard of soil erosion on this mapping unit is considered slight to moderate with soil loss tolerance of 5 tons/acre/year. Windthrow hazard of Woodland Group 5 is judged slight.

The southerly aspect of the site should reduce the effects of prevailing winds on tree growth, and its slight slope lessens the potential for soil erosion. Although average grade is only about 4%, runoff may occur during heavy rain events where topsoil has been compacted by prior cultivation and heavy machinery used in brush-clearing operations. Soil samples reveal nutrient deficiencies of nitrogen, phosphorus, potassium, and particularly magnesium. Water percolates slowly through the compacted soil profile.

Water sources:

There are no known natural water sources such as seeps or springs on this property. An agricultural water system pumps water from nearby wells through a 3-inch diameter PVC

pipe to the property. A 2" waterline that crosses the tract diagonally will irrigate the tree crop (Figure 6); flow is adequate to establish and maintain a plantation.

Flora:
The area once supported a woodland cover, but the project site is now open ground. Existing vegetation is a mosaic of common alien invasive grasses and dicotyledonous herbs. Soil disturbed by recent berm building along property boundaries in March 1999 is being reinvaded by weeds. Young, multiple-row windbreaks of milo, kamani, and neem, together with older ironwood, grow around the perimeter of the tract.

Description of Affected Environment

This project is not within an environmentally sensitive area. Although Moloa'a is close to the coast, the farm lots are set back from sea cliffs elevated 200 feet above the ocean (Figure 4). Because the terrain slopes away from the coast, this project will not impact beaches, estuaries, and other sensitive coastal communities.

There are no permanent surface water features on or near the property, so the project will have no impact on riparian zones or wet-land areas.

The Batesole Hardwood Tree Farm is bounded by dirt access roads on the northwest and southwest sides (Figure 5) with open mown grass fields beyond. A mature papaya plantation is adjacent to the southeast property line and a permaculture is being initiated across the northeast boundary.

We have found no evidence for traditional Hawaiian farming, historical, or archeological activity at this site.

Exotic game birds (pheasant) and other common introductions were observed, but long-term agricultural activity has obliterated any vestige of former native dry forest that is assumed to have grown on this site, and there is no evidence of threatened flora or fauna on or near this property.

Identification of Impacts
1.Herbicide application poses potential risk and odor nuisance to the adjacent papaya and permaculture operations, but there are no residences nearby.
2. Site preparation will produce temporary dust, noise, and exhaust pollution to neighbors.
3. Soil compaction will be reduced by tillage during site preparation.
4. Soil fertility will be increased by fertilization and establishment of a cover crop.
5. Tilth and water-holding capacity will be increased as organic matter accumulates from litter fall during the life of the plantation.
6. A permanent tree canopy will reduce soil movement from water and wind onto nearby properties.

7. The vista will change from an open field to a forest landscape, but there are presently no ocean views and no residences from which mountain view planes could be intercepted by trees.
8. Disturbance of threatened or endangered species will not occur since they have not been found on this and adjacent properties.
9. Wetland degradation will not occur since there are no adjacent streams, ponds, or swamps.
10. The trees selected for this project are not considered highly flammable and do not present a fire hazard to neighboring farms. Furthermore, adjacent grass fields are mown regularly to lower fire danger.
11. The species selected for planting are not known to be reproductively aggressive in Hawai'i and are not likely to regenerate naturally on adjacent land.
12. Wind velocities will be reduced on neighboring properties.

Proposed Mitigation Measures

Herbicide application (Impact 1)
Since the project is down-wind of neighbors when trade winds blow, herbicide will be applied as a coarse spray at a low concentration (1 oz/gal) when air movement (< 2 mph) is away from the adjacent papaya plantation and permaculture field.
Tillage (Impact 2)
Site preparation will be done when trade-winds lessen noise nuisance and blow dust directly away from existing upwind operations (there is presently no activity on downwind properties).

Alternative Actions

No action
If the State of Hawaii Forest Stewardship Program is not implemented on the Batesole Hardwood Tree Farm, then cover on the present site will likely revert to alien woody vegetation of no economic value. Loss of this opportunity to grow high-value timbers will result in a reduced opportunity for Kauai to mill raw wood material and manufacture value-added wood products.

Anticipated Determination

Because the identified negative impacts can be readily mitigated, the Batesole Hardwood Tree Farm, in cooperation with the State of Hawaii Forest Stewardship Program, will not adversely affect the environment of the Moloa'a agricultural area. A Finding of No Significant Impact is therefore appropriate.

Comments

The private citizens listed earlier, including adjacent land owners, have direct knowledge of the project site and have expressed oral support for the Batesole Hardwood Tree Farm proposal and view its implementation as an asset to the Moloa'a environment.

The State Agricultural Extension agent interviewed expressed reservations about the marketing of forest products grown on Kauai since there are presently no large milling facilities in operation. The agent is also concerned about the risk and uncertainty of economic return from long-term investments in forestry projects.

The officer interviewed at the County Office of Economic Development stated that tree farms on more marginal farm lands, such as Moloa'a, did not compete with conventional agricultural activity because there is presently an abundance of unused land on Kauai.

List of Attachments

Figure 1. Map of project location on Kaua'i
Figure 2. Topographic map of the general Moloa'a area
Figure 3. Land tenure map
Figure 4. Air photo of Batesole property (within the square)
Figure 5. Detailed topographic and access map
Figure 6. Site map showing topography and planting design
Forest Stewardship Management Plan
Responses of Comments made to DEA - Batesole stewardship project.

Figure 1. Map of project location on Kaua'i

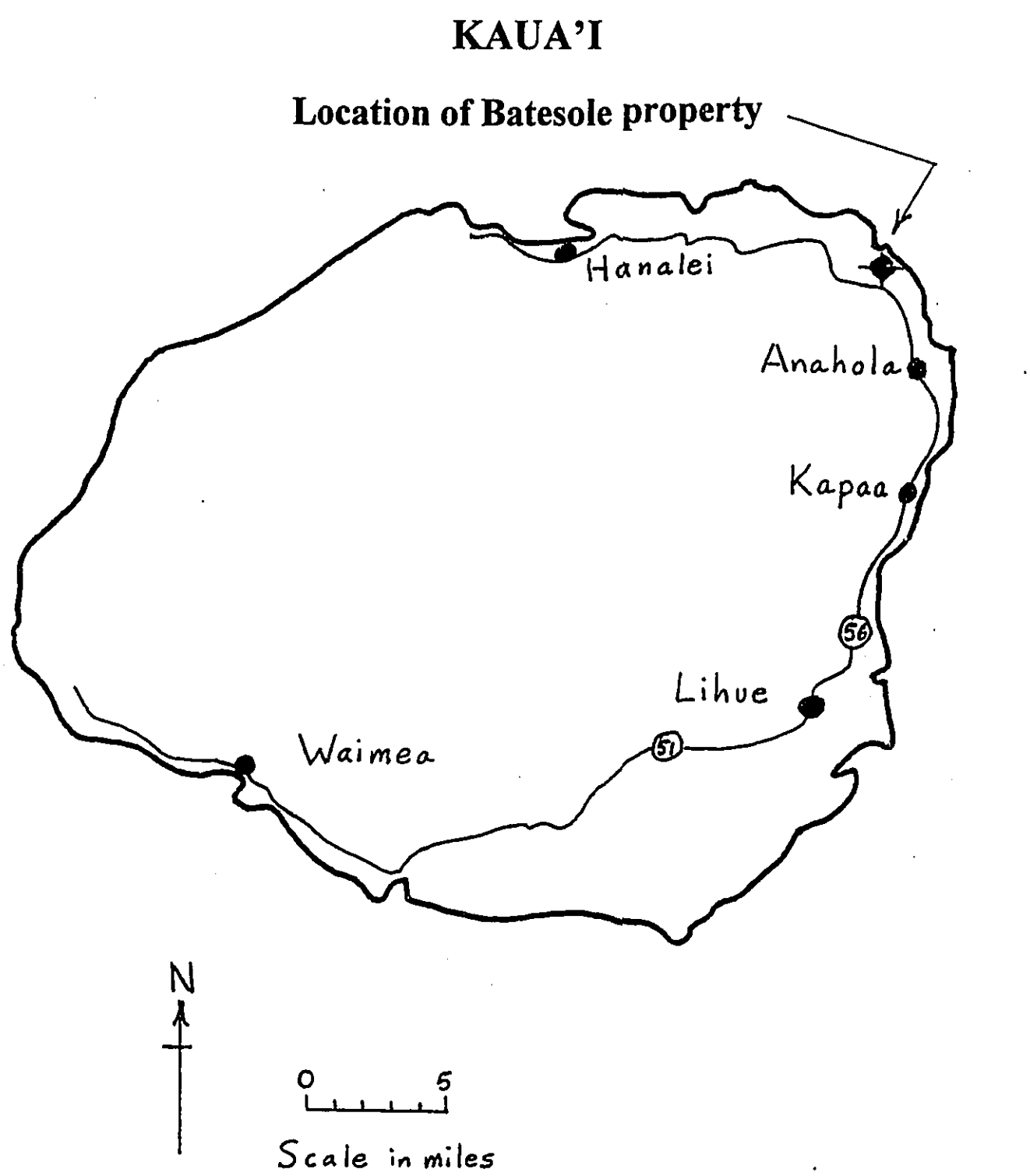


Figure 2. Topographic map of the general Moloa'a area

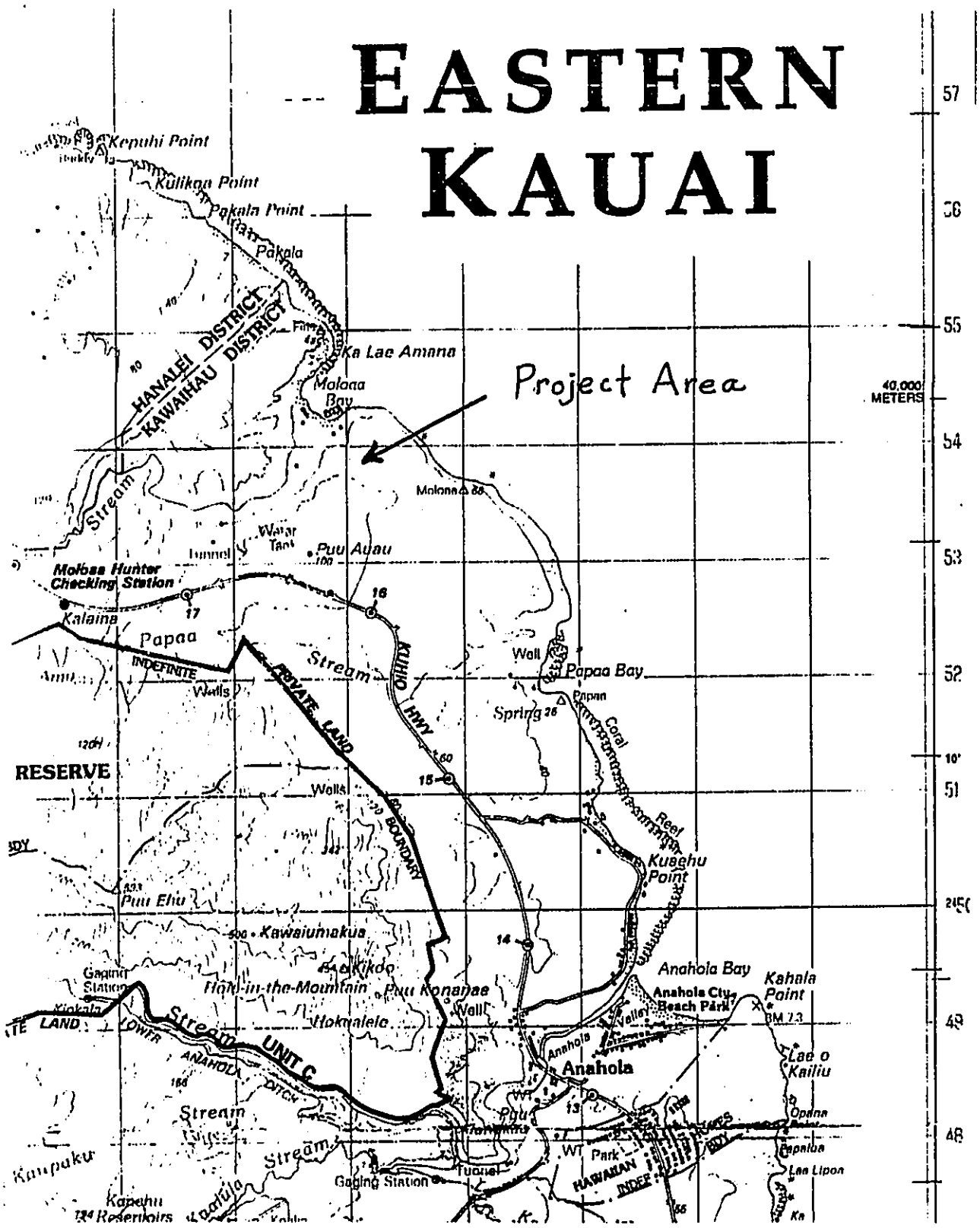
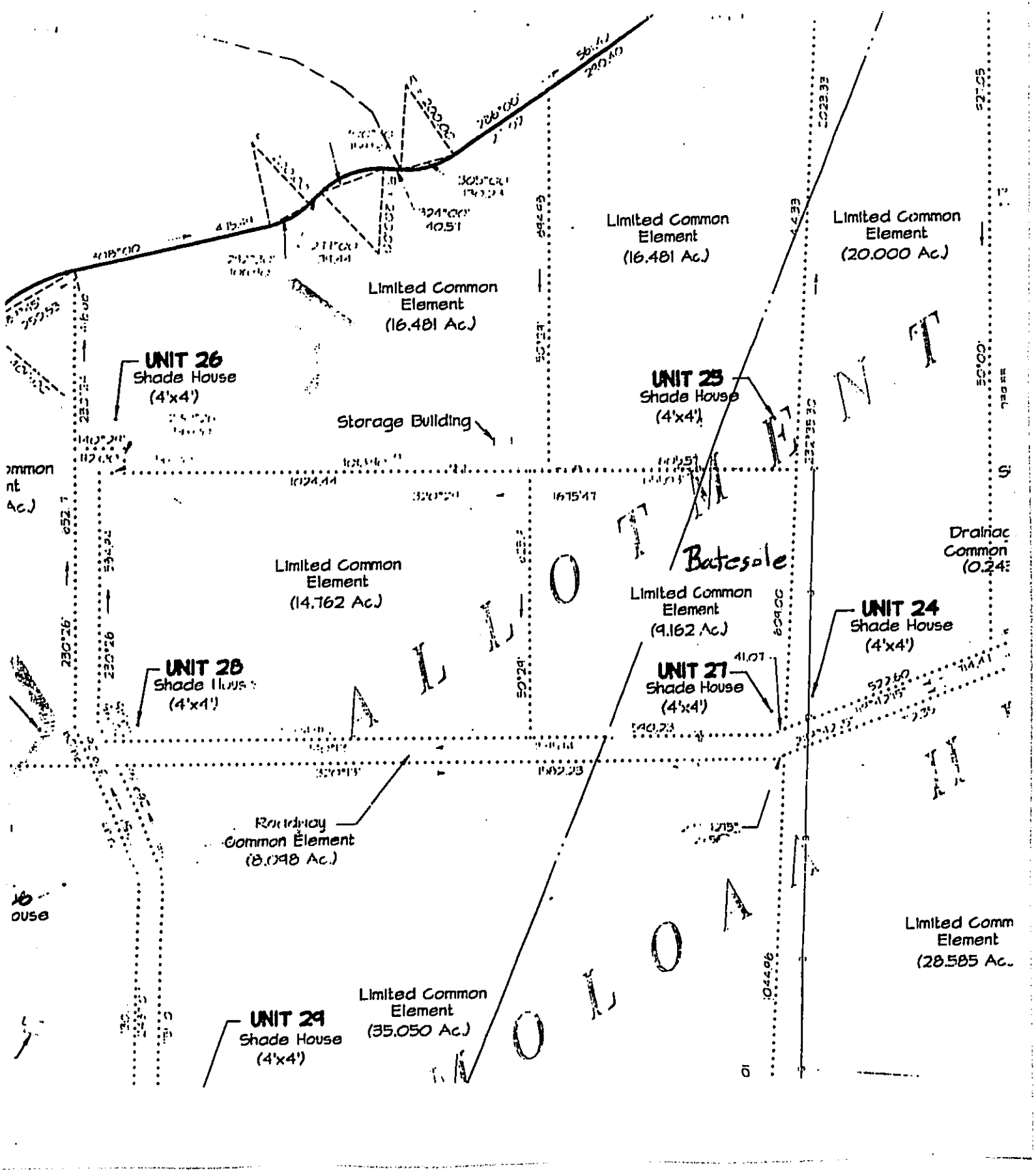
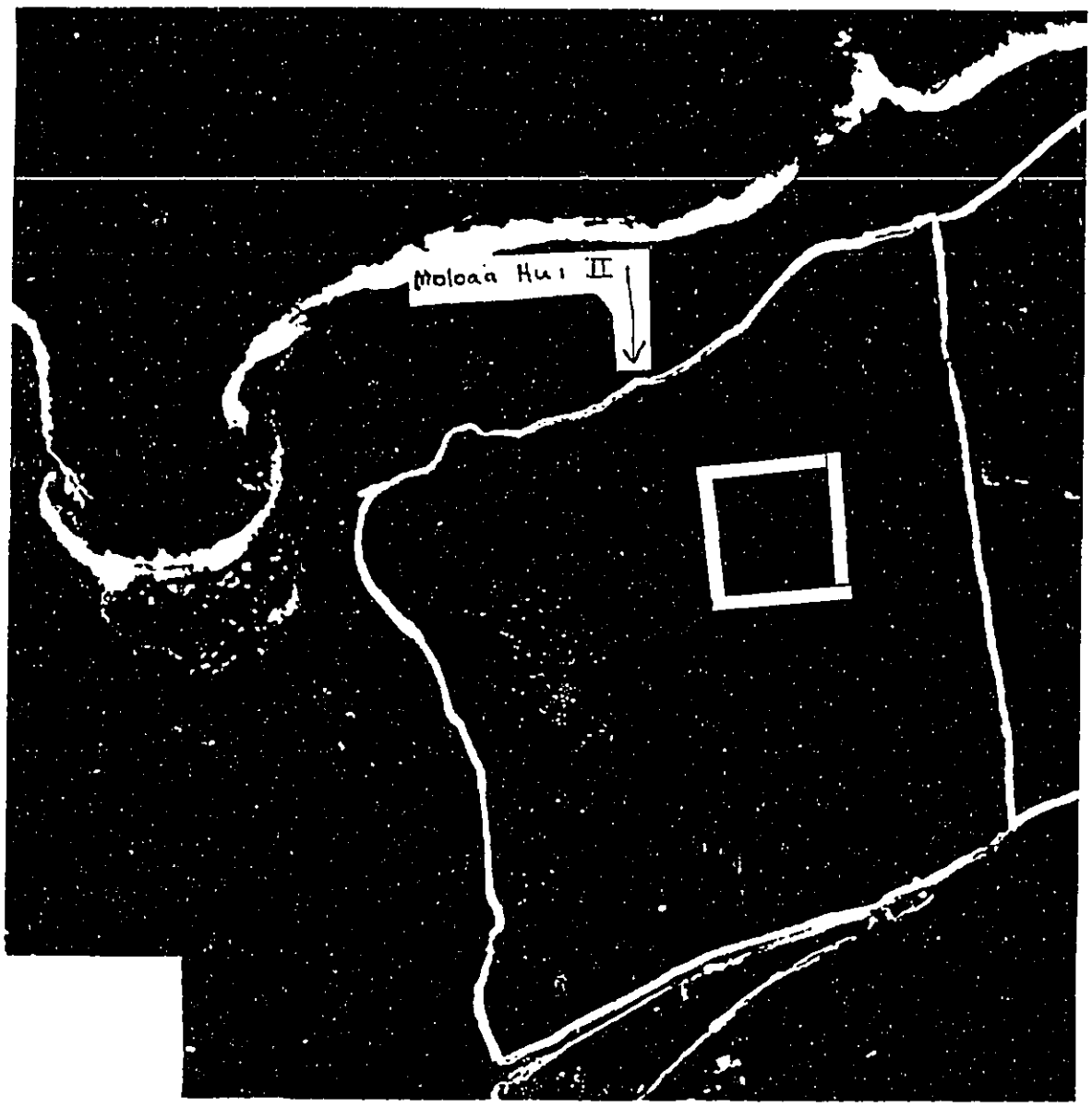


Figure 3. Land tenure map



See page 4 mg't plan for duplicate photo of Figure 4 here.

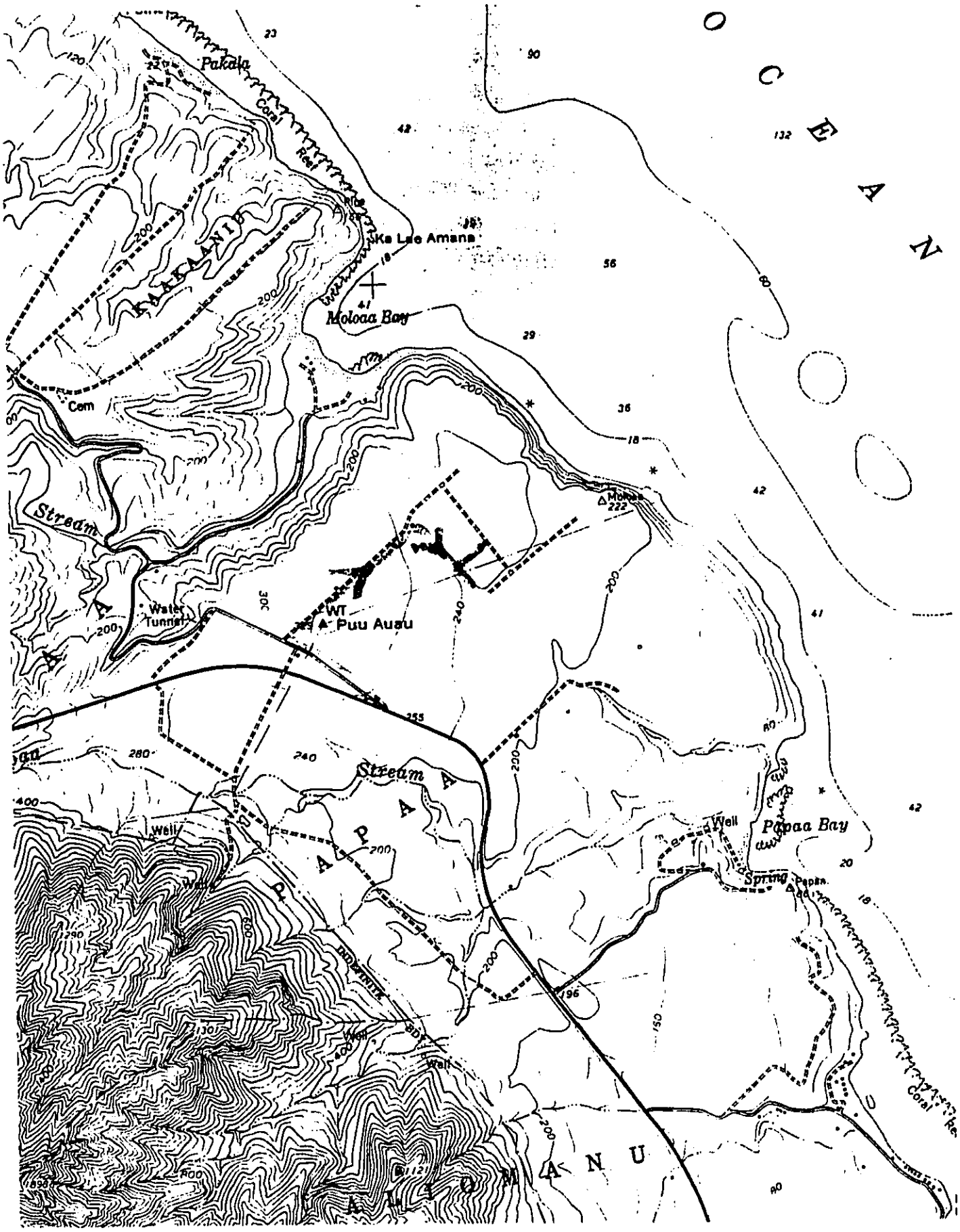
Figure 4. Air photo of Batesole property (square outline)



N

Scale: 1" = 1200'

Figure 5. Detailed topographic and access map



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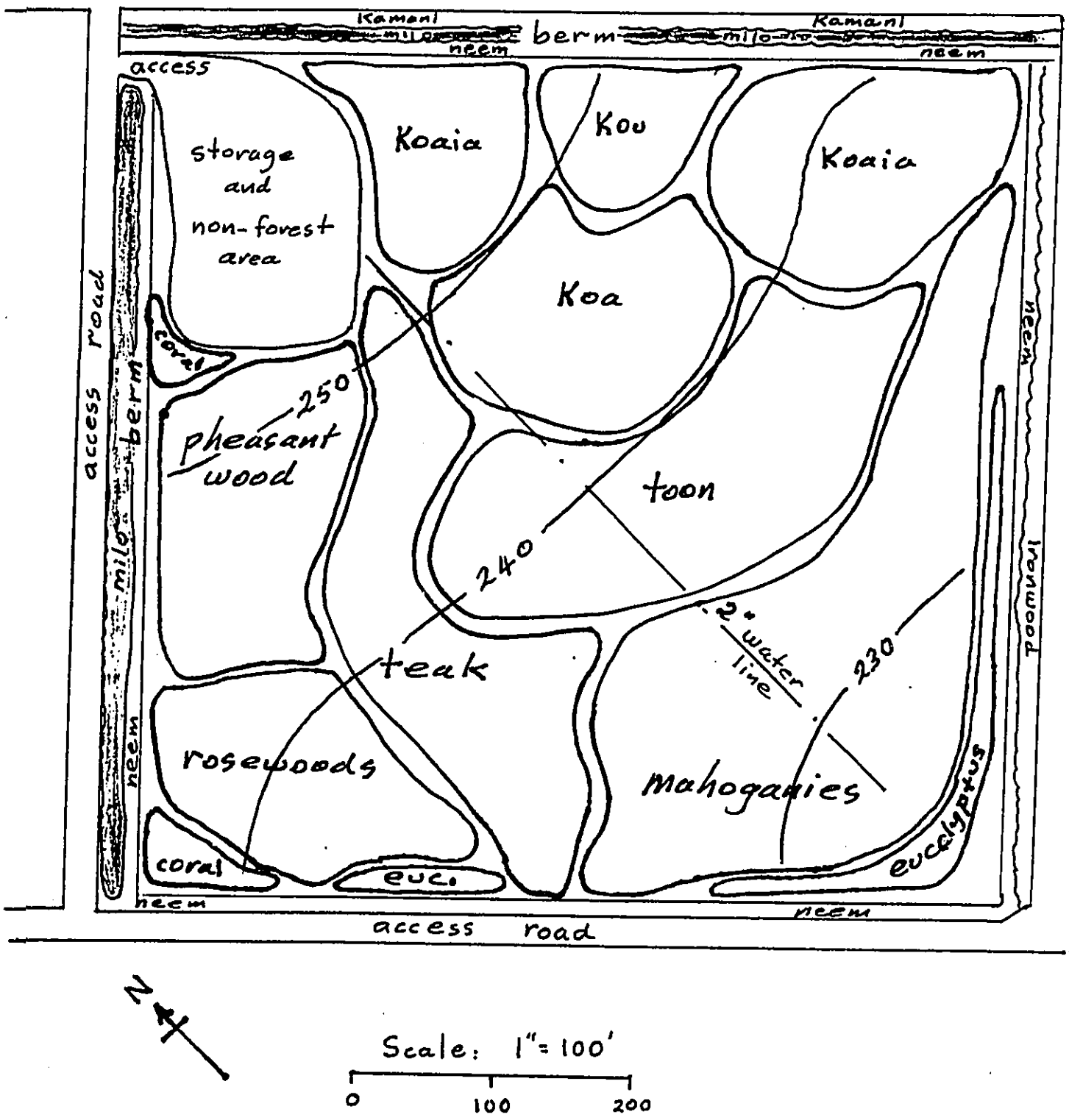

FOREST STEWARDSHIP MANAGEMENT PLAN

for
Allan Batesole
2072 Shiloh Ave.
Milpitas, California 95035

Tax Map Key Number 4-9-9-9-CPR-8
Moloa'a , Kaua'i

Prepared by
John Edson
Forestry Consultant
Hawai'i Reforestation Nursery Services LLC
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IV. Introduction

1. General Description of the Batesole Property

Property size and location

This rural property is a parcel of 9.162 acres in the northeastern coastal lowland of Kaua'i (Figures 1 & 2). The tract is identified as Unit #27 within the Moloa'a Hui # II of the Moloa'a Hui Lands Agricultural Condominium at Moloa'a. The parcel is roughly square-shaped with northeast, southeast, southwest, and northwest facing boundaries approximately 600 feet long (Figure 3).

Access

Entry to Moloa'a Condominium frontage is through controlled farm gates from either makai of the Kuhio Highway (56) shortly past milepost 16, approximately 3 miles north of Anahola, or a further 0.5 miles after turning right onto Koolau Road. Access to Unit #27 within the Condominium is by unsurfaced one-way road. The tract itself is bounded by road on the northwest and southwest sides (Figure 4).

Tax map key number

TMK# 4-9-9-9-CPR-8

Zoning

Agricultural, non-residential condominium

Topography, elevation, and climate

The Moloa'a Hui lies on an undulating bench (Figure 4) and this site gently slopes uniformly to the south with a gradient of 4% . Maximum elevation of 260 feet above sea-level at the most northerly corner decreases to 225 feet at the south corner. Erosional features are absent on the property itself, but water flows intermittently in a ditch on the other side of the access road bounding the southwest boundary. This northeast region of Kaua'i experiences the prevailing salt-bearing northeasterly trade winds with occasional velocities of up to 40 knots or more. Average annual precipitation is 40 to 50 inches with most rain falling in the winter months between October and April. Trade wind showers are generally light, but heavy rains occasionally occur associated with frontal activity. The site may have little or no rain from July through September. Although the area has experienced two major hurricanes within the past twenty years, insufficient historical meteorological data exists to predict future hurricane frequency, with any accuracy, for Kaua'i or any other high island of the archipelago (conversation with personnel at the Hurricane Warning Center, Honolulu).

Figure 1

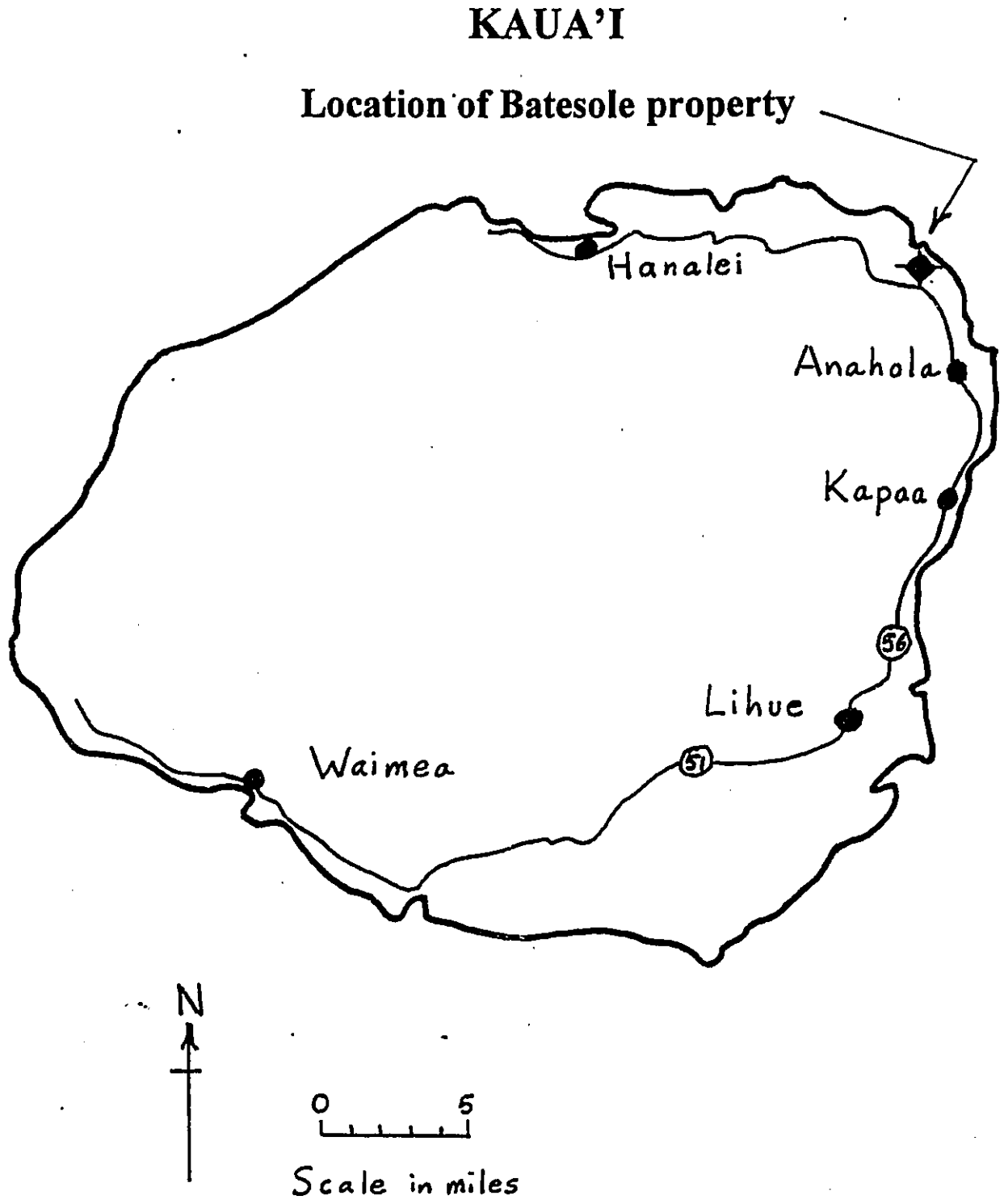

KAUA'I
Location of Batesole property
Hanalei
Anahola
Kapaa
56
Lihue
51
Waimea
N
0
5
Scale in miles

Figure 2. Map shows the northern portion of the windward east coast of Kaua'i. Note locations of the town of Anahola, Moloa'a Bay, and milemarkers on Kuhio Highway (56).

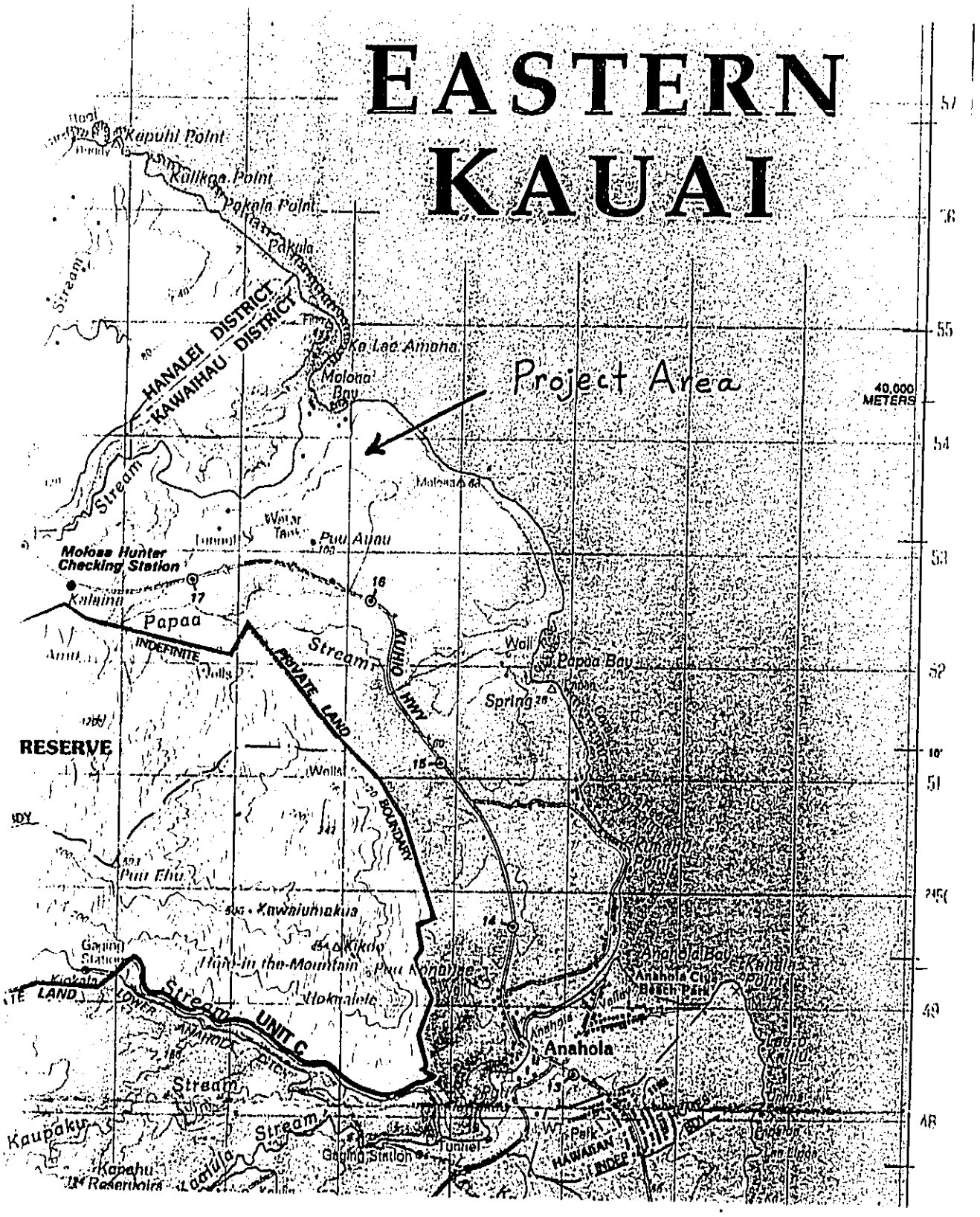
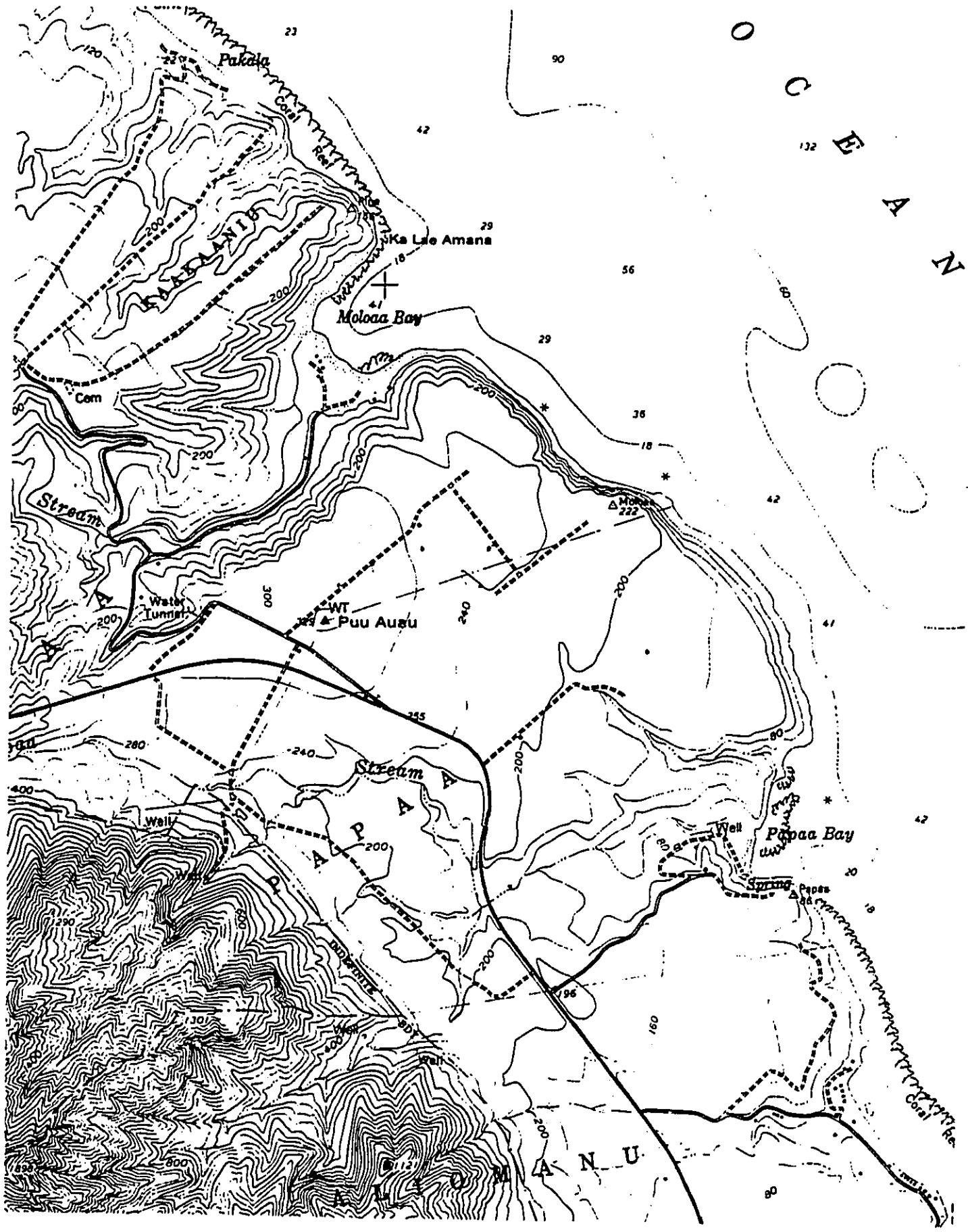


Figure 3. An older air photograph of the Moloa'a area White outlines show the location of the Mola'a Hui # II and the square-shaped Batesole property within it Note the proximity of the Kuhio Highway (lower right), Mola'a Bay (mid-left), the active surf zone toward the north, and the band of woodland behind the sea cliffs

Figure 4. Topographic map showing road access (pink arrows) to the Batesole property (yellow highlight).



Past usage and present condition of the property

The property and surrounding lands have been farmed extensively, but crops have changed over time. Sugar was once widely planted (Figure 5), but farmers switched to intensive papaya production in later years (Figure 6). Reflecting this past activity, debris from drip and T-tape irrigation systems is scattered throughout the soil. Farming was largely abandoned by the early 1990's, and weedy woody plants aggressively invaded the Condominium area. Judging from trees growing along fence lines and scattered groves on nearby properties, non-native brush cover that was removed from the property within the past 18 months likely included haole koa (*Leucaena leucocephala*), Christmas berry (*Schinus terebinthifolia*), African tulip (*Spathodea campanulata*) , Java plum (*Eugenia cuminii*), and guava (*Psidium spp.*)

Access, water, and power have been developed, and the cover of common weedy non-native herbs and grasses is mowed periodically Figure (7). In March 1999, soil berms, about 5 feet tall and 30 feet wide at their bases, were constructed along northeast and northwest perimeters of the property; weeds have now reinvaded these disturbed areas.

Multiple-row windbreaks have been planted on all boundaries:

1. In April 1999, a two-row 630-foot-long windbreak (1-foot tall seedlings) was planted on top of the northeast berm; a windward row of true kamani (*Calophyllum inophyllum)* 6 feet on center and a staggered leeward row of milo (*Thespesia populnea)* 8 feet on center from the first row (Figure 8).
2. A double row of neem (*Azadirachta indica)* seedlings (6" tall) are spaced 15 feet apart on center, along the bases of both berms and the southwestern boundary.
3. A single-row windbreak of mature ironwood (*Casuarina equisetifolia*) (20-25-feet tall) runs the length of the southeast boundary. A single row of newly-planted neem parallels the ironwood at a distance of 30 feet on center (Figure 8).

Windbreaks occupy approximately 1.4 acres. The area to be forested is 7.0 acres, leaving 0.7 acres for access, barn storage, and other uses.

2. Description of the Batesole's Management Objectives

The major objectives of the landowner are to:

A. Establish and maintain a long-term forest cover of high-value hardwood species
B. Create an aesthetically pleasing "natural" forest landscape
C. Derive periodic income through selective logging of the plantation
D. Introduce understorey crops to create an agroforestry system over the long term

Objectives A-C are the primary objectives of this project, although return on investment during the lifetime of the landowner is not a major priority and this planting could be considered a legacy forest. Objective D can be achieved once a forest cover is established. To accomplish these objectives, the landowner will implement management practice SIP 2.

Figure 5. A UDSA land use map showing production of sugar cane on the Moloa'a farm lots before 1971.

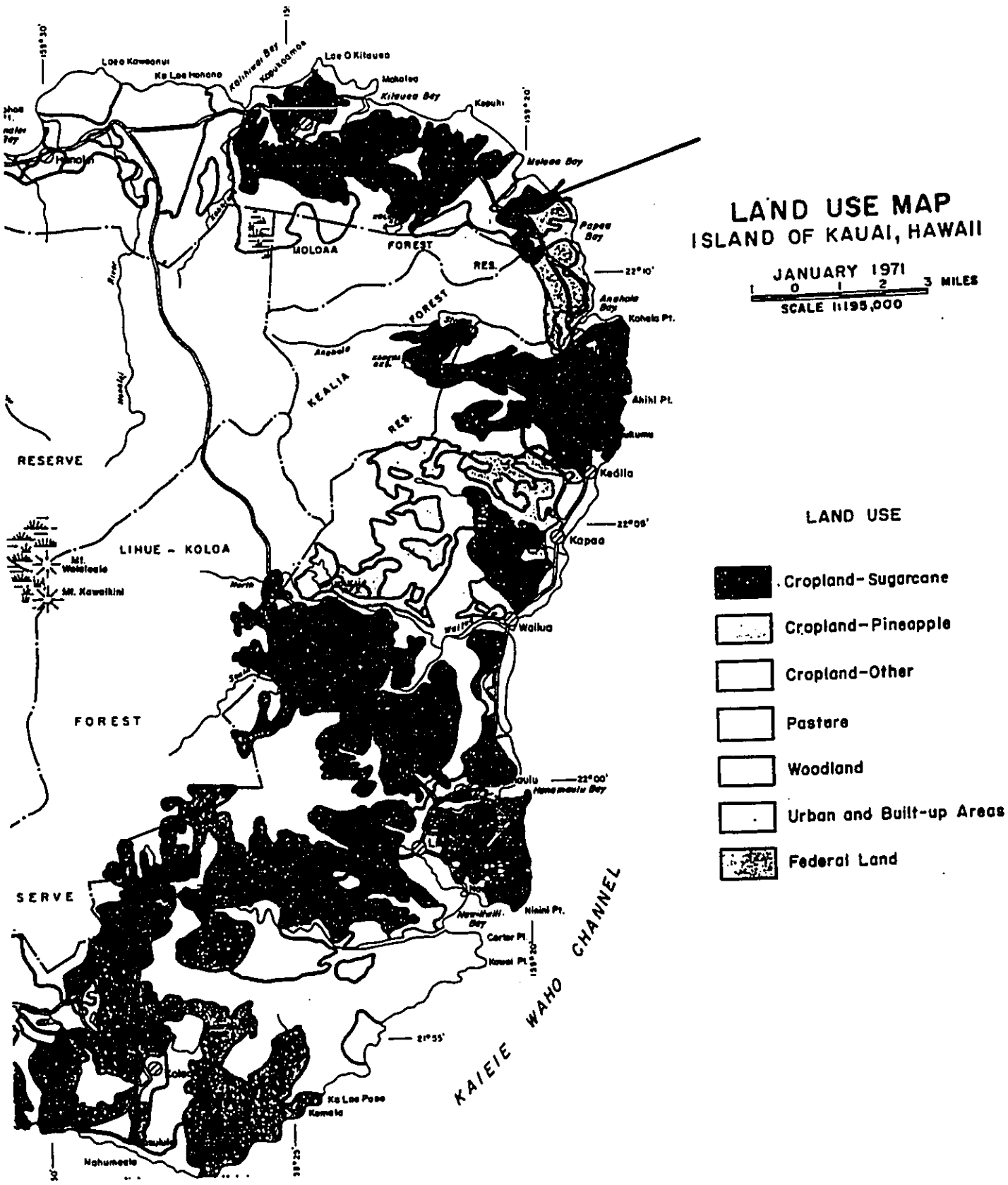


Figure 6. USDA land use map shows orchard production on the Moloa'a farm lots before 1982.

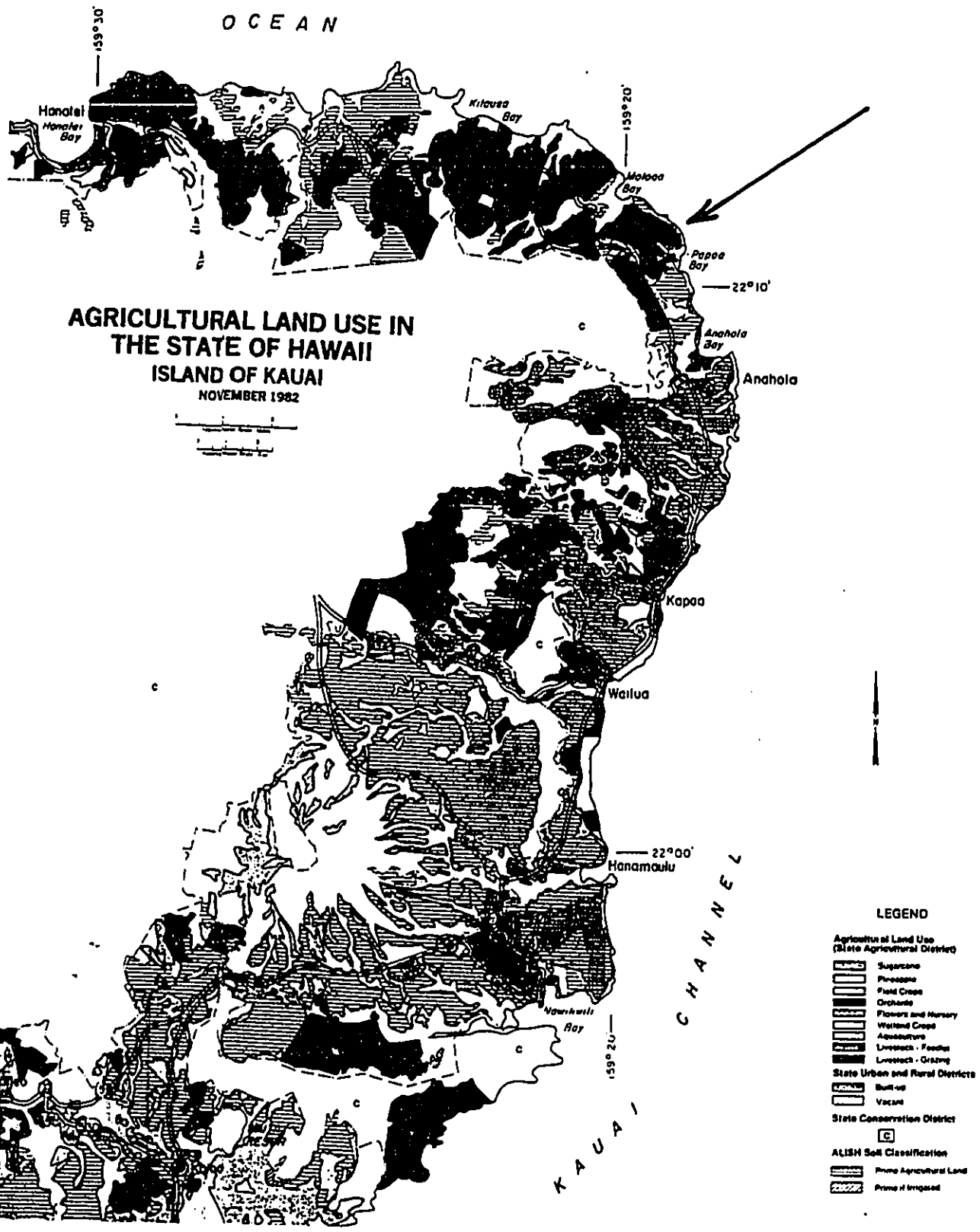


Figure 7. Photographs taken in April ,1999 show vegetative cover, development, and general surroundings of the Batesole property.

Top: diagonal view downslope from north to south corners; site access in the foreground, Anahola Mountains and Moloa'a Forest Reserve in the background.

Below: diagonal view from south corner upslope toward the north corner. The 2" white irrigation pipe, when buried, will feed water to seedlings via lateral 1" drip lines. The Cook pine windbreak is on the adjacent property.

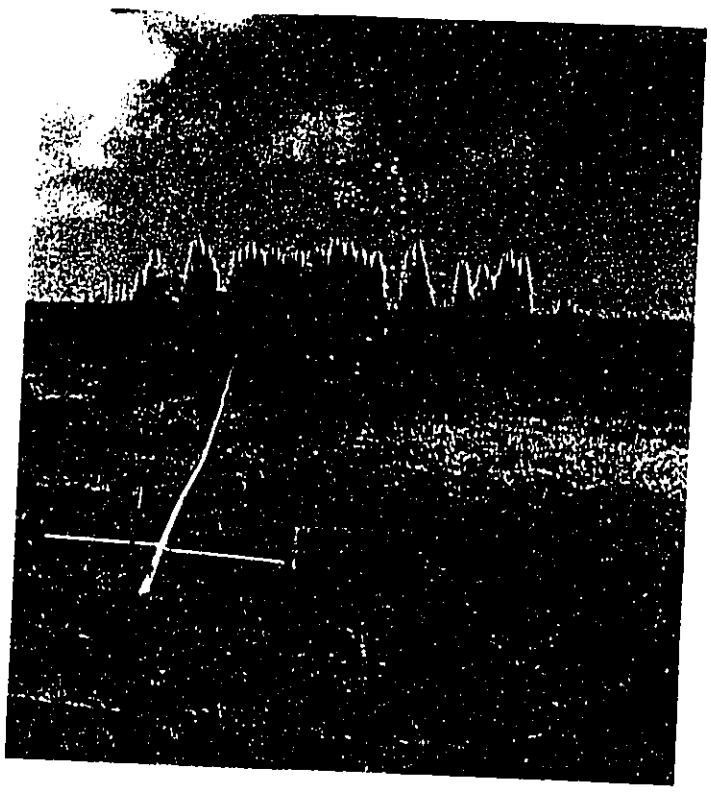
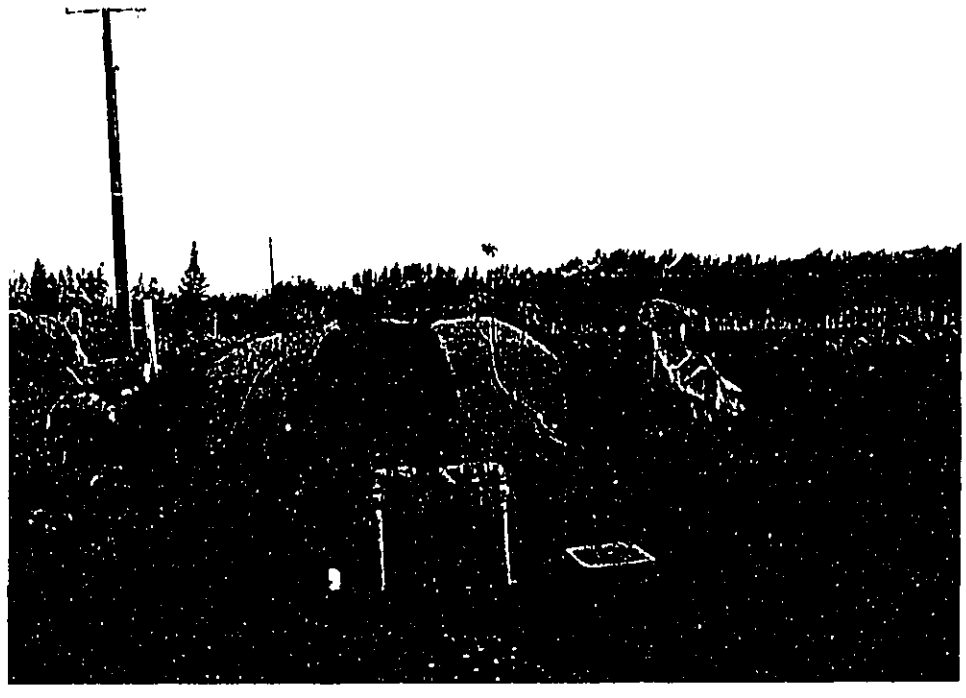


Figure 8. Photographs of windbreaks on the Batesole property



Top: View toward the southeast; kamani (left) and milo (right) windbreaks were planted in April, 1999 on the northeast berm. Foreground shows part of water supply intake.

Below: Ironwood windbreak on right, neem seedlings on left.

V. Land and Resource Description

Existing vegetation and cover types

A mosaic of common invasive grasses and dicotyledonous herbs with occasional rattooons of sugar cane now partially cover the area to be planted in trees. Disturbed soil is being reinvaded by weeds. The following species were found growing on the site in July of 1999.

Grasses and sedges
California grass - *Brachiaria mutica*
Guinea grass - *Panicum maximum*
paspalum - *Paspalum sp.*
purple nutsedge - *Cyperus rotundus*
sawgrass - *Triachne insularis*
sugar cane - *Saccharum sp.*
wire grass - *Eleusine indica*

Dicotyledonous herbs
castor bean - *Ricinus communis*
Flora's paintbrush - *Emilia sp.*
garden spurge - *Euphorbia hirta*
morning glory - *Ipomea obscura*
popolo - *Solanum nigra*
rattlepod - *Crofolaria spectabilis*
sleeping grass - *Mimosa pudica*
sowthistle - *Sonchus oleraceus*
spiny amaranth - *Amaranthus spinosus*

Existing forest health, disease problems, and fire threat

There is no forest (exotic or native) on this or immediately adjacent properties. The ironwood windbreak and new windbreak seedlings appear to be healthy.

With the ocean less than one-half mile distant, windward dieback (most likely due to salt accumulation) alters natural form of woody species on surrounding tracts. However, the strip of coastal woodland behind the sea cliffs north of Moloa'a Hui (Figure 3), together with scattered trees on tracts to the north, provide a first line of protection from salt spray. The salt-tolerant kamani and milo windbreaks should increasingly shield the plantation from salt spray.

Fire hazard to a tree crop on this site is judged to be low because contiguous land to the southeast is under irrigated papaya and non-adjoining grassed fields are mowed regularly. Roads act as fire-break protection from fields along the southwest and northwest boundaries, and berms help protect both northeast and northwest boundaries. Availability of water under pressure provides an effective means to fight outbreak of fire.

Soils and their condition, general slope and aspect

Soil at this site is identified as Lihue silty clay, map unit LhB (< 8% slope) within the Lihue Series, and falls within Capability Classification IIe, Woodland Group 5 (Figure 7, USDA soil conservation map). The topsoil is heavy but tillable and designated suitable for either irrigated or non-irrigated use. Hazard of soil erosion on this mapping unit is considered slight to moderate with soil loss tolerance of 5 tons/acre/year. Windthrow hazard of Woodland Group 5 is judged slight.

The property slopes gently toward the south. The southerly aspect of the terrain should help to reduce the effects of prevailing winds on tree growth, and its slight slope lessens the potential for soil erosion. Although average grade is only about 4%, runoff

may occur during heavy rain events where topsoil has been compacted by prior cultivation and heavy machinery used in brush-clearing operations. To minimize runoff and promote optimal tree growth, the soil should be mechanically treated to create adequate permeability in and below the rooting zone.

Soil was sampled at depths from1 to18 inches from three representative holes, and its analysis is as follows. Nutrient concentrations are in parts per million (ppm).

Factor Analyzed	Result	Interpretation
pH	6.7	high
phosphorus	17 ppm	low
potassium	188 ppm	low
calcium	1116 ppm	low
magnesium	112 ppm	very low

Water resources and their conditions

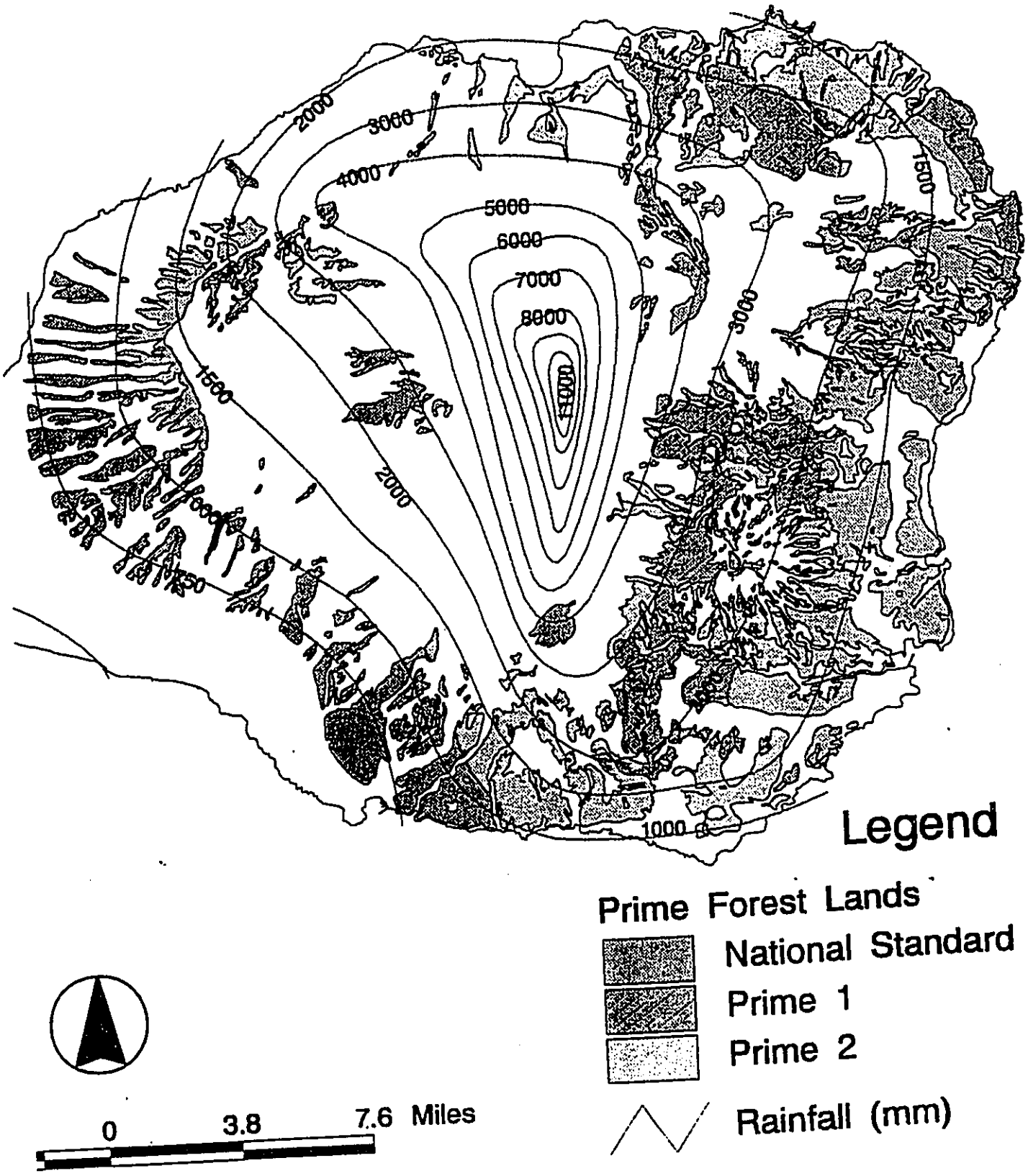
There are no known natural water sources such as seeps or springs on this property. An agricultural water system pumps water from wells in the Forest Reserve south of Kuhio Highway (Figure 4). A 3-inch diameter PVC pipe enters the property at the north corner. The metered water line contains a backflow preventer and a pressure gauge that registers 40 psi when the main valve is fully opened. Water flows into 2" lines that now irrigate all new windbreaks. The waterline that crosses the tract diagonally to the south corner will irrigate the tree crop (Figure 7). A programmable multiple-station electronic timer allows automatic and manual control of water flow. Water supply and control are adequate to establish and maintain a plantation.

Timber resources

There are presently no timber resources on site. The ironwood windbreak is shared with neighboring property, and the neem windbreaks will produce seed crops only. The recently planted milo and kamani seedlings will not be harvested for timber.

Remnant woodland to the north and in the Forest Reserve to the south suggest that natural forest earlier covered this site The State of Hawaii Department of Lands and Natural Resources has rated the Moloa'a area as National Standard prime forest land, a category below Prime 1 & Prime 2 lands (Figure 9). Although potential for growth of hardwood trees on non-irrigated Lihue silty clay soil at this site is rated fair, the landowner's purchase of a drip-irrigation system should enhance site productivity if used to augment soil moisture when necessary.

Figure 9. This Hawaii DLNR map illustrates the distribution of three categories of prime forest lands on Kaua'i and expected annual precipitation in millimeters and shows the Moloa'a area as having National Standard forestry potential.



Wetland resources

There are no wetland resources on this property. We have not observed water ponding at the southern corner, the lowest point of the parcel.

Historical and cultural resources

We have not found any evidence for traditional Hawaiian farming or other cultural activities at this location.

Existing wildlife

Exotic game birds (pheasant) and other common introductions were observed on neighboring properties. Although signs of feral pigs and rats were not seen, their presence is likely in this area from time to time; nearby farmers have controlled pigs in the past.

Threatened and endangered species existing on the property

Long-term agricultural activity has obliterated any vestige of former native dry forest that is assumed to have grown at this site, and there is no evidence of threatened flora or fauna on this property.

Existing recreational and aesthetic values

The Anahola Mountains form a scenic green backdrop to the south and southwest (Figure 7). Vistas of open fields without residences enhance the rural flavor of the area. There are no other present recognizable recreational values on this property.

Grazing & pesticide threats

Grazing animals are not permitted on farm tracts of the Moloa'a Hui. Since farm chemicals may be routinely used on properties upwind of this tract, the landowner should alert neighbors to the dangers of allowing spray of either non-selective weed killers or herbicides selective for dicotyledonous plant to drift over tree seedlings.

VI. Recommended Treatments and Practices

The primary objective of the landowner is to establish a forest cover to produce timber on the present open 7-acre field. The purpose of SIP Practice 2, to establish a stand of forest trees for timber production and conservation purposes, conforms to this objective.

Previous land practices, however, have degraded the fertility and structure of the soil. To achieve a high likelihood of plantation success, the landowner should therefore adequately address the previously identified soil conditions of low acidity, a deficiency of all major nutrients, and compaction; all of which may severely impede tree growth.

Soil acidity and magnesium level should be increased by adding magnesium sulfate. With soil pH lowered to about 6, additional nutrient input of a balanced N-P-K fertilizer, such as 15-15-15, should enhance nutrient availability and seedling uptake.

Because planting in compacted silty clay soils will likely result in stunted trees, it is important that the landowner mitigate soil compaction caused by heavy machinery used in recent brush clearing and berm building by restoring adequate aeration and drainage of the soil profile. The landowner should first cross-rip the entire compacted field at a medium depth and then deep-rip the planting rows along the contour. This additional site preparation expense should benefit seedling establishment, ultimately increase tree growth and timber yield, reduce soil erosion during heavy rains, and lower the need for irrigation.

Site Preparation

Actions necessary to mitigate soil compaction, nutrient deficiencies, and potential competition to seedlings from weeds on the 7 acre tract are as follows:

1. Within several weeks of a close mowing, new growth of weeds should be treated with Roundup (glyphosate) herbicide at a rate of 1/2 gal/acre taking care not to damage existing windbreaks. Estimated costs: Mowing 4 machine-hours @ $50/h; Roundup & sticker-spreader $200; 4 machine-hours spraying @ $150/h; total cost $1,000 or $143/ac.

2. After die-off of weeds, the field should be cross-ripped to lift and aerate the potential rooting zone for shallow lateral tree roots. Using a John Deere D-7 long-track dozer that exerts low compaction pressure on soil, a gang of triple 24" shanks will be set to a depth of 18 to 24". Estimated cost: 15 machine-hours @ $125/h; total cost $1,875 or $268/ac.

3. The field should be disc-harrowed with a D-7 to loosen and smooth the upper 6 to 12 inches of soil. Estimated cost: 8 machine hours @ $125/h; $1,000 or $143/ac

4. The planting grid of rows, 10 feet apart on center, will be laid out along the contour and marked with bright 2-foot-tall flags. Rows, should be deep-ripped by the D-7, 10' apart on center, with a single 36" shank set to a depth of 30 to 36". Estimated costs: Row layout $600, 8 machine hours @ $125; total cost $1,600 or $228/ac.

5. To minimize the cost of amending pH and soil nutrients to acceptable levels, fertilizer will be spread in 4-foot-wide bands centered along rows at rates of 939 lb per acre of

magnesium sulfate and 859 lb per acre of 15-15-15 fertilizer, as a first of two applications. Estimated costs: 4 machine-hours @ $100/h, fertilizer to cover a total "row area" of about 3 acres - magnesium sulfate $260, 15-15-15 $500; total cost $1160 or $165/ac.

6. An artificial ground cover will be used to control weed competition with the trees. A perforated, polyethylene 3' by 3' Arbortech mat will be stapled to the ground around each seedling. Estimated costs: 4,000 mats $3,800, 80 man-hours @ $10/h; total cost $4,600 or $657/ac

7. The landowner will purchase and install irrigation at his expense alone with no cost-share allocation requested. He will dig an 18" trench and bury the drip-irrigation 2" PVC feeder line. The 3/4- inch drip lines, with emitters at appropriate spacing, will be laid along rows and connected to the 2" feeder line.

8. To enhance long-term nitrogen levels, a nitrogen-fixing cover crop will be established between tree rows; 4 acres will be hand-seeded to perennial Dutch clover at a rate of 12 lb/acre. Estimated cost: Seed $220, broadcast labor 4 man-hours @ $10/h; total cost $260 or $37/ac

The total cost of site preparation allocable to cost sharing is estimated to be $10,332 or $1,476/ac

Seedling Acquisition

Trees judged suitable for reforestation of this site were chosen on their ability to grow well under conditions of moderately heavy but well-drained soil, only moderate rainfall, seasonal drought, occasional strong prevailing winds, and wind-borne salt. Marketability and aesthetics determined final species selection.

To ensure a more favorable soil moisture regime for initial tree growth, the landowner has decided to provide irrigation water to supplement natural rainfall as insurance against erratic precipitation and high evapotranspiration. A wider range of species than otherwise can therefore be considered.

Few trees grow well on exposed coastal sites of eastern Kaua'i - windward crowns of most species die back in a classic Krumholz form. From personal observations of coastal hardwood plantings, particularly on windward Kaua'i, it is clear that where landowners plant suitable windbreaks, he/she can largely avoid not only foliar damage due to wind blast and salt, but also root breakage and permanent stem bending from strong prevailing winds.

The following species have been selected for the reasons stated below.
Acacia koa and *Acacia koaia*: Koa and koaia are native to low elevations of windward Kaua'i and grow to significant size (typical of the species) where remnant stands exist in protected locations. Seed will be collected, where possible, from local trees selected for their good form. Both species fix nitrogen. Koaia is rated as having good wind tolerance, koa of medium tolerance. A flourishing koa-koaia market exists in Hawai'i and wood can

have high value; milled products in Hilo are priced from common grade at $4.50 per board foot (bf) to curly koa at $30 /bf.
Cassia siamea: Pheasantwood is wind tolerant. The black wood is highly valued by local crafts workers. Together with African blackwood (*D. melanoxylon*), this species could be niche marketed with other black heartwoods such as true ebonies that currently command high wholesale prices in excess of $30/bf.
Cordia subcordata: Tolerant to wind and salt, kou is also sought after by local woodworkers. Moderately fast-growing, it is a useful wind buffer.
Dalbergia sissoo and *D. melanoxylon:* Both species are well adapted to hot and seasonally dry areas, are wind tolerant, and are nitrogen fixers. These rosewoods have high value with wholesale mainland prices in the $8-$15 /bf range.
Eucalyptus deglupta and *E. dunnii:* Both species are fast growing, suitable as dual purpose windbreak and timber product. Rainbow bark (*E. deglupta*) is already being planted for veneer production on Kaua'i.
Erythrina sandwicensis: This rare endemic coral tree of the drier lowlands will be a valuable cultural and ecological conservation component to the planting. The trees fix nitrogen and produce attractive multi-colored bloom and red seed.
Khaya senegalensis and *K. anthotheca, Swietenia mahogani* and *S. macrophylla:* These true mahoganies are tolerant of heavy soils, wind, and drought. From personal observations on Kaua'i, they also appear relatively tolerant to salt. True mahoganies are successful in plantations and international markets continue to place high value on them as premier products for cabinetry and furniture manufacture. Dryland African true mahoganies have market values similar to the neotropical mahoganies and teak.
Tectona grandis: Several young plantations are now growing successfully in protected locations on coastal Kaua'i in both well-drained and heavy soils. On one unprotected coastal site, teak can be seen growing with bent stems and foliar damage, but with straight trunks and vigorous leaf growth where protected from direct winds. Improved seed is readily available from plantations abroad. Wholesale mainland prices range from $5-8/bf. The international demand for teak continues strong.
Thespesia populnea: Milo is salt tolerant and resists windthrow. The wood is highly prized by local wood workers and present supply is limited. Seed will be selected from large trees with good timber form. Milled product in Hilo fetches $18.50 /bf, comparable to the value of full curl koa.
Toona ciliata: Toon has a history of successful growth in Big Island plantations and exhibits rapid growth in young plantings on Kaua'i. Toon is a member of the family of true mahoganies and its wood value may approach that of mahogany.

Planting stock will be contracted from a forest nursery. The nursery will acquire improved seed, where available, from known provenances. Seedling plugs, with root volume of 12 cu. in., will be container grown for four months and hardened off at the nursery before outplanting. Estimated cost: With a planting of 3,800 seedlings (see plantation design below) and replanting of assumed 5% mortality during the first six months, total seedling cost can be expected to be $7840 or $1.96 per seedling.

Seedling Planting

Plantation design: Species should be arranged and spaced in the plantation according to their wind tolerance, shade tolerance, growth habit, and aesthetics. To achieve the landowner's desire to create a planting that would look more aesthetically pleasing than a monoculture, species will be arranged in a patch mosaic (Figure 10) to simulate the diversity of natural stands; patch boundaries should be non-linear. Most species will be planted at an 8 by 10 foot spacing to give a stand density of about 545 stems per acre. Slower growing rosewoods should be planted at a close spacing of 6 feet on center to promote good form. A total of about 4,000 trees will be planted.

The more wind tolerant and shade intolerant species such as koaia, milo, kou, and eucalyptus will occupy exposed edges of the plantation. Less wind tolerant species such as shade intolerant koa and teak and taxa with some shade tolerance such as mahoganies, toon, pheasantwood, and rosewood fill the leeward side of the planting.

Planting: When soil moisture is optimal, holes will be opened with a planting spade. Four ounces of 5-3-3 N-P-K containing humic acids (to promote root development), will be placed in the holes and covered. Seedlings will be planted with a hand trowel and watered in. Endo-mycorrhizal inoculum *Glomus intraradices* will be mixed in soil of non-nitrogen fixers. Cost: 280 man-hours; total $2,115 or $302/ac.

Post-planting Silvicultural Treatments

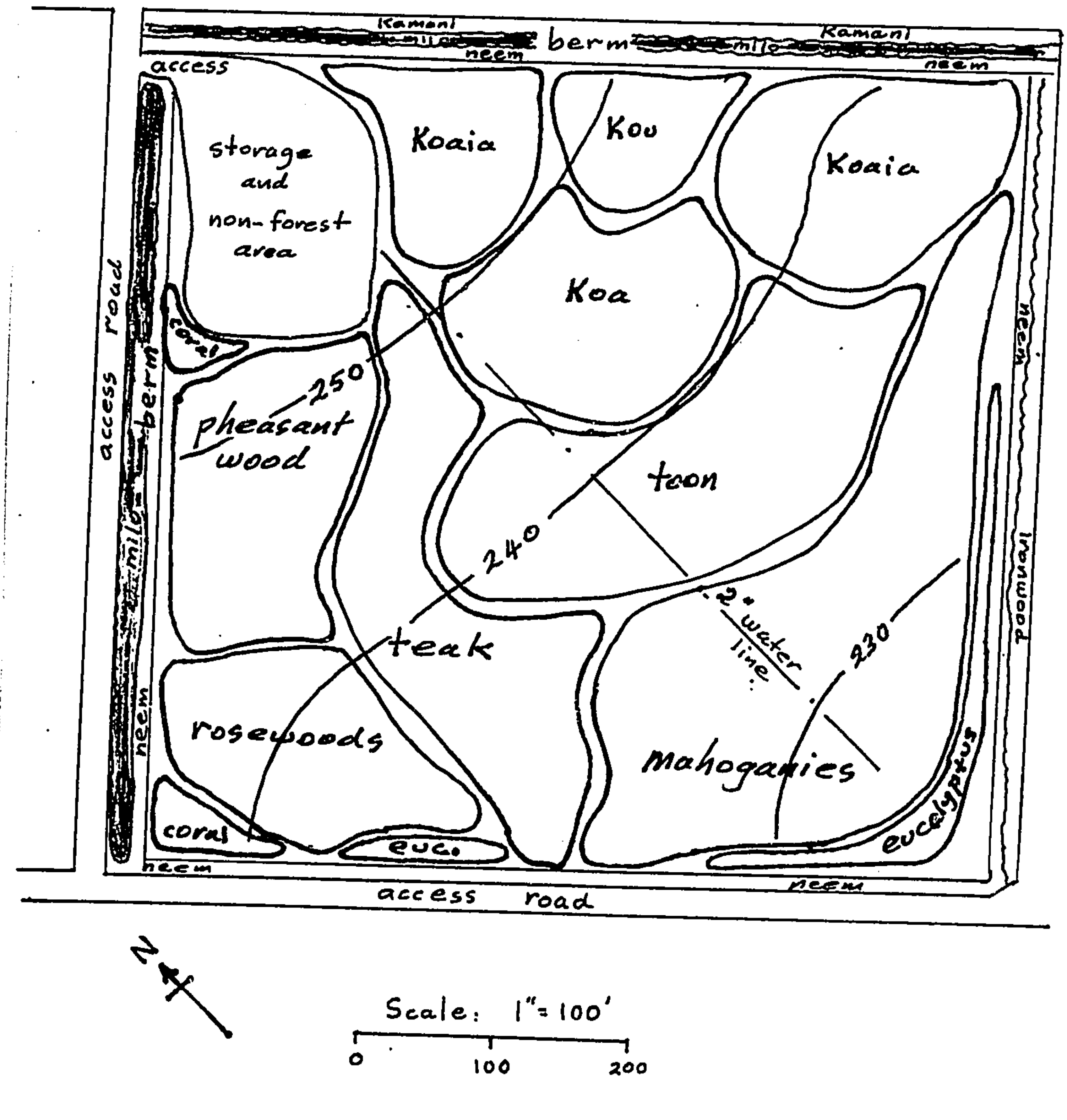
***Weed Control*:** Inter-rows will be mowed 6 times per year for the first two years, 4 times per year in years 3 and 4, and as needed after canopy closure. Aggressive grass weeds such as Guinea grass will be spot treated with Fusilade herbicide.
Estimated costs: Mowing at $400 per mowing or $2,400 per year for Years 1 & 2, $2,000 per year for Years 3 & 4; herbicide treatment $200 per year.

Fertilization: To assure proper growth of the trees as their roots extend beyond the weed mats, a second application of magnesium sulfate and 15-15-15 fertilizer should be broadcast by hand three months after planting, at the same rate as previously, on inter-row areas and at 4 ounces per tree through each slit in the weed mat. Fertilizer will then be applied 3 times per year for 4 years at levels determined by soil and tissue analyses done 6 months after planting. Estimated costs: 8 man-hours per fertilizer application, magnesium sulfate $360, 15-15-15 fertilizer $300 /application; cost of post-plant fertilization in Year 2 $1,750 or $250/ac and $1,260 or $180/ac in later years.

Pruning: Most species should be low pruned at canopy closure; rosewoods, koa, koaia, and milo will likely require earlier pruning to produce good timber form and knot-free wood. Stems between about 4 to 8 inches in diameter that retain their lower branches should be pruned to no more than half tree height or about 15 feet above ground level. Early pruning of small limbs, using a sharp saw, produces best results.

Thinning: The plantation should be thinned periodically to promote optimal growth of the dominant and co-dominant trees with best form. The first two removals of cull trees will be pre-commercial thinnings and should take place at least by Year 8 and Year 12, respectively, depending on species. Commercial thinnings could likely be scheduled for Years 15 and onward for some of the faster growing species such as teak, milo, koa, koaia, and mahoganies. Foresters can advise on final spacing between trees.

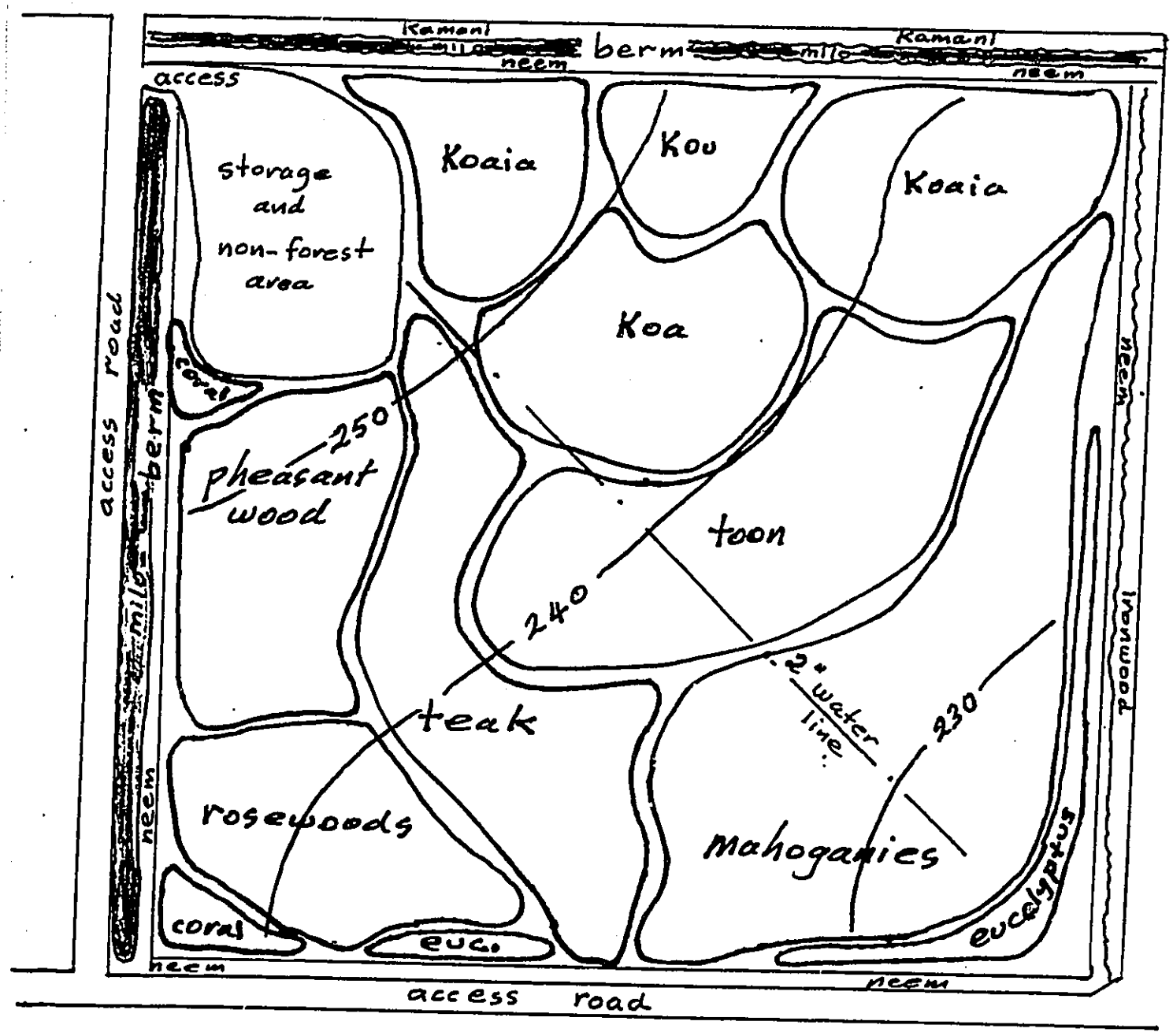
Figure 10. Schematic of planting design showing the mosaic of species to be planted, windbreaks along boundaries, topographic contours (10 foot intervals) in feet above sea-level, and the 2"-irrigation pipe to feed drip-emitter lines.



CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Figure 10. Schematic of planting design showing the mosaic of species to be planted, windbreaks along boundaries, topographic contours (10 foot intervals) in feet above sea-level, and the 2"-irrigation pipe to feed drip-emitter lines.



Final Harvest Plan

The landowner would like to begin to selectively harvest suitable trees after Year 15 of the project. Actual timing of the harvest will depend on the maturity of the various species and market conditions. The landowner will develop and implement a harvesting plan conforming with current State of Hawaii Department of Lands & Natural Resources approved Best Management Plans and in consultation with DLNR-DOFAW Branch staff.

Agroforestry Plantings

As canopy closure occurs, the landowner plans to introduce shade-tolerant understorey species to augment diversity and economic return of the plantation. Maile (*Alyxia oliviformis)* vines could be planted close to koa and koaia trees; indigenous palapalai (*Microlepis strigosa*), the hapu'u endemic tree fern (*Cibotium glaucum*), and rooted cuttings of 'awa (*Piper methysticum*) could be planted between rows of koa and koaia. Grafted stock of cacao (*Theobroma cacao*) and shade coffee (*Coffea arabica*); and seedlings of allspice (*Pimenta dioica*), nutmeg (*Myristica fragrans*), and clove (*Syzygium aromaticum*) are some of the candidates to be planted between rows of mahoganies and toon.

Economic Considerations

Information on economic returns from high-value tropical hardwood plantations is scarce, but some data does exist for Hawai'i koa and teak plantations overseas. Published estimates of returns on teak investment vary widely, are the subject of controversy, and have been unscrupulously used as a tool to fuel highly speculative forestry investments. Projections of plantation growth & yield are either scarce or unavailable (worldwide let alone Hawai'i) for most of the other hardwoods recommended for this site. We do know, however, that koa and big-leaf mahogany (*S. macrophylla*), for instance, can produce similar height growth of up to about 10 feet per year during their first few years in Kaua'i plantations. West Indian mahogany (*S. mahogani*), has a somewhat slower growth rate, but may command a higher price.

Given a 20-25 year rotation period, we will assume an "average" hardwood in the plantation conservatively produces a millable bole of about 40 feet with a diameter-breast-height (dbh) of 24 inches and moderate taper. If a bole yields two 16-foot logs containing about 600 saleable board feet (Scribner decimal C log rule table), and if 80 such mature trees are harvested per acre, an acre could yield about 48,000 board feet. Final harvest of 7 acres could potentially yield 336,000 board feet of merchantable wood.

Because quoted wholesale prices of different species vary, we use a current price for milled koa, mahogany, and teak of around $5/bf as a gauge for an "average" value for milled hardwoods grown in this plantation. Given a stumpage value of $0.50/bf (10% of milled price of $5 per board foot), harvest over several years with low inflation, revenues from final harvest could furnish a **total revenue of $168,000** in 1999 dollars.

Commercial thinnings, particularly of milo, koa, and koaia would likely increase revenue. Higher revenue could also possibly be achieved if the landowner can direct his wood product to a niche market either directly or through cooperative milling entities on Kaua'i that pay higher than stumpage values. Agroforestry plantings could also provide

additional income as the plantation matures. Maile and fern could be sold in the strong local markets for lei and landscape materials. Certain varieties of 'awa are presently a cash crop in high demand for export. The global demand for cocoa is predicted to rise substantially within a decade and processing can be done in Hawai'i. Selection of the right cultivar of shade coffee could result in beans with better flavor than sun-grown coffee presently produced on Kaua'i. Seed from the neem windbreaks will likely produce some income when sold to a local processing plant now in the planning stages.

A high stumpage value of $1/bf would produce revenue of $336,000. On the other hand, less revenue would result from receiving a lower stumpage than expected; $0.25/bf (a low value) would result in a total revenue of only $84,000. Exceptional growth resulting in higher yields could also possibly increase revenue. On the other hand, if inferior wood quality results from fast growth, revenue could be significantly lower..

Landowner costs (excluding irrigation) are estimated to be about $25,000 for the first 10 year-period (Table 2) and about $1,000 per year thereafter for a total of $35,000 over a 20-year cycle. Although irrigation may become unnecessary as root systems encounter groundwater and the drip system is eventually sold, we roughly estimate a total cost of irrigation, hardware, repairs, and water to be $10,000 spread over a 20 year period. Federally backed crop insurance against wind damage is not yet available and not included. Hence at 20 years, **total direct costs of about $45,000** in present dollars could be expected. The landowner plans to defray planting, maintenance, and harvest costs by in-kind labor, so actual out-of-pocket expenditures could be considerably less.

Net profit must take into account the full cost of the investment which could include land payments, improvements, borrowing, taxes, inflation, and opportunity cost of funds actually used to establish, maintain, and harvest the plantation.

To account for the time value of money, net present value (NPV) of the landowner's investment can be computed. NPV is the difference between present values of expected future returns and future costs discounted at an appropriate interest rate. For example, given timber costs only from Table 2 and assuming an annual inflation rate of 3% and an interest rate of 7% then: future timber revenues of $168,000 adjusted for inflation equal $303, 426 and NPV would be $58,000. Under these limited assumptions, the Benefit to Cost ratio would equal 3.5 or a profitability of $3.50 returned on each dollar invested. When accounting for overall costs such as land purchase, improvements, and irrigation etc.., however, NPV is close to zero. This suggests that revenues from commercial thinnings, agroforestry products, and even waste by-products will be important for profitability.

Economic analyses of koa plantation production suggest an internal rate of return (IRR, the calculated rate that a timber investment earns when NPV is zero) could be 15%. Over the past 30 years, various pantropic plantations of exotics such as eucalyptus and tropical pines have reported an IRR ranging from about 8 to 20%. Actual rates of return from this project will depend heavily on how effectively wood products in Hawaii are marketed.

Comments Received From Reviewers of Draft Environmental Assessment Batesole Forest Stewardship Project

Theresa Menard
University of Hawaii
Department of Zoology
2538 The Mall
Honolulu, Hawaii 96822

December 17, 1999

Allan Batesole
2072 Shiloh Ave.
Milpitas, California 95035

cc: Hawaii Restoration Nursery Services LLC,
Department of Land & Natural Resources,
Office of Environmental Quality Control

Dear Mr. Batesole,

RE: Draft Environmental Assessment for The State of Hawaii Forest Stewardship Program, Batesole Hardwood Tree Farm

The following comments are in regard to the *Draft Environmental Assessment for The State of Hawaii Forest Stewardship Program, Batesole Hardwood Tree Farm.* I hope they prove useful in the environmental review process.

New EAs required for future phase of project

According to *A Guidebook for the State Environmental Review Process* (p. 17) by the Office of Environmental Quality Control,

> If a project includes a later phase that cannot be fully described or studied today because it is likely to be implemented in the distant future, that future phase should be described in as much detail as possible in the EA. Should the future phase of such a project be proposed, a new environmental review document will be required at that time.

The DEA identifies two proposed actions that will be implemented in the distant future:

1. "commercial thinning will begin about year 12" (p. 3); and
2. "harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter" (p. 3).

Therefore, if environmental regulations are enforced, additional EAs will be required before these two proposed actions are implemented. The cost of hiring consultants to complete the additional EAs are direct costs you might want to include in the "Economic Considerations" section of the DEA.

Description of future phase is incomplete

All possible impacts are not adequately described in the DEA. In particular, the potential impacts of thinning and harvesting on the endangered Hawaiian hoary bat are not addressed. Hawaiian hoary bats roost externally on trees, generally in the foliage. Although no endangered species are believed to be currently present at the action site (p. 6), that doesn't mean they won't be present later. In time, bats may move into the tree farm to roost.

Possible impacts to tree-roosting bats from tree harvesting can be direct or indirect. Direct impacts include direct mortality or injury to individuals when felling trees that harbor roosts. Indirect impacts are those caused by the proposed action and are later in time, but still reasonably certain to occur (50 CFR 402.02). According to the US Fish and Wildlife Service, removal of trees which have the potential to serve as roosts could result in the loss or alteration of roosting habitat (USFWS 1997[1]). In addition, "timber harvest could alter insect species composition and may reduce the availability of insects on which bats feed, thereby causing them to search for alternate foraging habitat" (USFWS 1997).

The DEA does not identify:

1. the type of survey that will be done to ascertain if bats are utilizing the tree farm at harvest time; and
2. the time of year that trees will be harvested (e.g. Will trees be cut during the critical bat breeding season (June and July) when bat pups are unable to fly?).

Mitigation measures to protect bats are not described in the draft EA

The DEA fails to address mitigation measures to protect bats. Some consideration needs to be given to the actions that will be taken if bats are found roosting within the tree farm.

Will a buffer zone be established around roosting bats? For endangered tree-roosting bats on the mainland, a ¼ mile buffer is the mitigation in national forests harboring the Indiana bat.[2] Within this buffer, no logging, road construction, or pesticide use is permitted. For maternity roosts the buffer is 2 miles around each roost.

One might also propose a suspension of all tree-harvesting during the Hawaiian hoary bat's breeding season (i.e. June and July). This strategy protects any undetected roosting bats that may be breeding (i.e. rearing young) in the tree farm. If such conservation-mined mitigation is implemented, it might help the Batesole Tree Farm obtain "green labeling" for its forest products.

---

[1] U.S. Fish and Wildlife Service. 1997. Biological Opinion on the Effects of Management Activities Conducted by George Washington and Jefferson National Forests on the Indiana Bat. USFWS, Annapolis, MD, 39 pp.
[2] Ibid.

Other comments

According to page 5 of the DEA, "there is no evidence of threatened flora or fauna on or near this property." This prompts the following questions:

1. Was there any evidence of endangered (as opposed to threatened) flora or fauna?
2. What types of evidence (e.g. the Nature Conservancy's Natural Diversity Database, published literature, or personal observations) were examined?
3. Were any faunal field surveys done? If so, what methods were used?

Summary

- Additional EAs for tree harvesting seem warranted in the future.
- The draft EA is incomplete because it does not describe potential impacts of tree harvesting on endangered bats.
- The draft EA is incomplete because it does not propose mitigation for the potential taking of endangered bats.

Thank you for your time and consideration of these comments. If you have any questions regarding the Hawaiian hoary bat, please call me at (808) 732-4014. I wish you the best on this interesting, new forestry stewardship project.

Sincerely,

Theresa Menard

Theresa Menard
Graduate Student in Ecology,
Evolution, & Conservation Biology

32198

BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

December 22, 1999

Mr. Tim Johns, Chair
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Johns:

Subject: Draft Environmental Assessment for the Batesole Forest Stewardship Project, Moloaa, Kauai

Thank you for the opportunity to review the subject document. We have the following questions and comments.

1. Please describe how much irrigation water that project will require. Who owns the agricultural water system and the associated wells that will provide water for this project?

2. We recommend that the applicant use an Integrated Pest Management approach to control weed. Please consult with the Department of Agriculture's Pesticide Branch for more information on this matter.

3. Please discuss the impacts of harvesting and thinning and the mitigation measures planned to reduce these impacts. These impacts include, but are not limited to, noise impacts from the cutting equipment, fire hazard from post-harvest stumps and other remains, and traffic impacts from post-harvest trucking.

4. Please describe the best management practices that the project will employ during soil preparation and other activities to reduce sediment runoff into the nearby ocean.

5. Please provide better quality photographs in the final environmental assessment.

6. Please include a list of all permits and approvals (State, Federal, County) required for the project in the final environmental assessment.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson
Director

c: Allan Batesole
John Edson

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

JANET E. KAWELO
DEPUTY

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

January 6, 2000

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT
WATER RESOURCE MANAGEMENT

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson: Genevieve

Subject: Negative Declaration Determination and Final Environmental Assessment for Batesole Forest Stewardship Project, Moloaa, Kauai.

We have received your letter of December 22, 1999 regarding Mr. Batesole's proposed Forest Stewardship Project with Department of Land and Natural Resources, Division of Forestry and Wildlife. The following is our response to the questions that were raised for Mr. Batesole's stewardship project with us.

1. Please describe how much irrigation water that project will require. Who owns the agricultural water system and the associated wells that will provide water for this project?

   In the initial 2 years, the project will use 4,000 gallons of water per week. The demand for water will greatly decrease in year 3 and beyond. The source of the irrigation water is from Amfac wells of which Jeff Lindner owns the irrigation system that the project will use.

2. We recommend that the applicant use an Integrated Pest Management approach to control weed. Please consult with the Department of Agriculture's Pesticide Branch for more information on this matter.

   We will advise the landowner to consult with the Department of Agriculture Pesticide Branch to include Integrated Pest Management into his forest management scheme.

3. Please discuss the impacts of harvesting and thinning and the mitigation measures planned to reduce these impacts. These impacts include, but are not limited to, noise impacts from the cutting equipment, fire hazard from

post-harvest stumps and other remains, and traffic impacts from post-harvest trucking.

The impact of harvesting trees is no different from harvesting sugar cane during decades of sugar production, as being proposed on this 7-acre project. In addition, the selective harvesting and thinning practices for this 7-acre site will be carried out incrementally while employing the Department's Best Management Practices. These practices will have much less of an impact to the environment than did with past uses for sugar cane harvesting and most recently papaya production. Currently the land is fallowed (colored pictures show the area). Growing trees will only enhance this area which is bare, depleted and is located on former sugarcane land and intensive papaya production land which has been intensively cultivated over the last century. It is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner follow approved and current Best Management Practices and that they be prepared in consultation with DOFAW and the Department of Land and Natural Resources.

4. Please describe the best management practices that the project will employ during soil preparation and other activities to reduce sediment runoff into the nearby ocean.

Tree planting will provide much needed cover and serve to protect the soil which is currently bare and eroding at a rapid rate. When trees reach merchantable size, the project will employ shelterwood cut along the contour which provides harvesting in strips or selective cuts that will always maintain tree growth and vegetation at all times on the property. Again, this is a 7-acre property. Best Management Practice components that the landowner will follow and be incorporated into its timber harvesting plan include: 1) forest roads, standards and use, planning design and location, construction and maintenance, 2) preharvesting planning, 3) timber harvesting, standards and use, felling and bucking, skidding mechanical site preparation, disposal of debris and litter, 3) silvicultural chemical management, description and purpose, planning, pesticide selection, procedures for chemical use, 4) streamside management zone, recommendations, 5) wildfire damage control and reclamation/prescribed burn, and 6) reforestation. These six components are described in detail under "Best Management Practices for Maintaining Water Quality in Hawaii," February 1996.

5. Please provide better quality photographs in the final environmental assessment.

   Photos are attached.

6. Please include a list of all permits and approvals (State, Federal, County) required for the project in the final environmental assessment.

   Following the "finding of no significant impact" of this project a formal contract agreement will be submitted for approval by the Board of Land and Natural Resources as well as Department of Attorney General approval as to contract agreement form, and Department of Accounting and General Services approval to certify the funds annually, and Department of Taxation approval to certify the landowners tax clearance for the previous year. The property is currently zoned Agriculture and is essentially bare ground with no significant resources, no other permits are required at this time.

The following are comments presented by Theresa Menard, University of Hawaii, Department of Zoology of the draft EA for Batesole and our response to her letter dated December 17, 1999.

7. The DEA identifies two proposed actions that will be implemented in the distant future: 1) "Commercial thinning will begin about year 12" (p.3); and 2) "harvest of selected mature trees will likely begin between years 15 and 20 and continue thereafter" (p.3). Additional EAs will be required before these two proposed actions are implemented. The cost of hiring consultants to complete the additional EAs are direct costs you might want to include in the "Economic Considerations" section of the DEA.

   The Forest Stewardship Program is a voluntary program that a landowner chooses to enter to receive cost-share assistance for ten years according to an approved management plan and contract agreement with DLNR. Any forest management activities after year ten is beyond the scope of the program. Regarding commercial thinning and harvesting of trees, it is at the time of harvest that a detailed harvesting plan will be prepared, and reviewed by interested parties to assure that harvesting activities will not adversely impact the environment. We have included language in all Forest Stewardship Contract agreements that involve harvesting that the landowner will follow approved and current Best Management Practices and that they are prepared in consultation with DOFAW and the Department of Land and Natural Resources. The additional cost of consultants to write EA beyond the scope of the program is at the landowners discretion and not a

requirement of the program. In addition, the scale of each selective harvest being proposed in the future is small (less than 7-acres), and the negative impacts to the environment will be minimal.

8. In particular, the potential impacts of thinning and harvesting on the endangered Hawaiian hoary bat are not addressed. Hawaiian hoary bats roost externally on trees, generally in the foliage. Although no endangered species are believed to be currently present at the action site (p.6), that doesn't mean they won't be present later. In time, bats may move into the tree farm to roost.

   Again, this 7-acre property is former sugar land and most recently under papaya production. The property is currently bare and depleted of which the photos will confirm its present condition. Planting trees will enhance this area on 7 acres and provide a variety of environmental benefits that were eliminated by decades of sugar and papaya production. If nothing is done or agriculture cultivation continues on this property, there will be no benefits to any wildlife and soil erosion will continue. The trees scheduled for planting will probably be seedling size of less than one-and-one-half feet in height off-the-ground. From the ten species recommended for planting; two are koa species which are natives and the remaining eight are non-native species. The majority of the tree species selected for planting is slow growing and are not expected to provide merchantable timber size until twelve to fifteen years or until probably twenty to twenty-five years.

   The property is 7-acres. It seems unlikely that bats will occupy such a small tree cover area when the State Forest Reserve is located just mauka of this project. Figure 3 shows the surrounding area as being in agriculture production or now abandoned with isolated tree cover. When such a time in the future that bats do occur on the project site as a result of the stewardship project, the landowner will mitigate the impacts that harvesting will have on the bats. Impacts are likely to be small because only a few trees will be harvested at any one time. These mitigation measures will be addressed and incorporated into the timber harvesting plan of which the Department will review for approval.

9. The DEA does not identify: 1) the type of survey that will be done to ascertain if bats are utilizing the tree farm at harvest time, and 2) the time of year that trees will be harvested (e.g. Will the tree be cut during the critical bat breeding season (June and July) when bat pups are unable to fly?

If and when bats are located on the Batesole stewardship project as the result of growing the trees, every effort will be used to mitigate impacts made on the bats. Tree harvesting can be scheduled so as not to coincide with the breeding-season of the bats. In twenty to twenty-five years from now, we will have more reliable information about their roosting and breeding behavior that will allow us to make better decisions. The harvesting plan will incorporate and address areas of the 7-acres needing protection for bat habitat. A survey (probably random sampling) will be used to address the need for mitigation of the bats, if found on the property.

10. According to page 5, of the DEA "there is no evidence of threatened flora or fauna on or near this property." This prompts the following questions; 1) Was there any evidence of endangered (as opposed to threatened) flora or fauna?, 2) What types of evidence (e.g. the Nature Conservancy's Natural Diversity Database, published literature, or personal observations) were examined?, and 3) Were any faunal field surveys done? If so, what methods were used?

As Figure 7 and Figure 8 shows this property has been heavily cultivated for agricultural purposes, most recently papaya production. There is no evidence of endangered (as opposed to threatened) flora or fauna. Because this property was previously in papaya production, the database of the Nature Conservancy's Natural Diversity Database, published literature, or personal observations will not show any evidence of listed Threatened and Endangered Species. Lastly, there was no need for a faunal field survey because the property was previously in papaya production and is clearly denuded of any significant wildlife or natural resources.

We have reviewed the comments received during the 30-day public comment period that began on November 23, 1999 for the subject project. We have determined that this project is not likely to have a significant impact on the environment. Please publish a notice of determination for this negative declaration in your January 23, 2000 issue of the Environmental Notice.

We have enclosed a completed OEQC Bulletin Publication Form and four (4) copies of the Final EA for the project. If you have questions, please call Nelson Ayers of the Division of Forestry and Wildlife at 587-4175.

Sincerely yours,

Michael G. Buck
Administrator

Copy: Allan Batesole
John Edson
Nelson Ayers

Enclosures

Figure 2. Map shows the northern portion of the windward east coast of Kaua'i. Note locations of the town of Anahola, Moloa'a Bay, and milemarkers on Kuhio Highway (56).

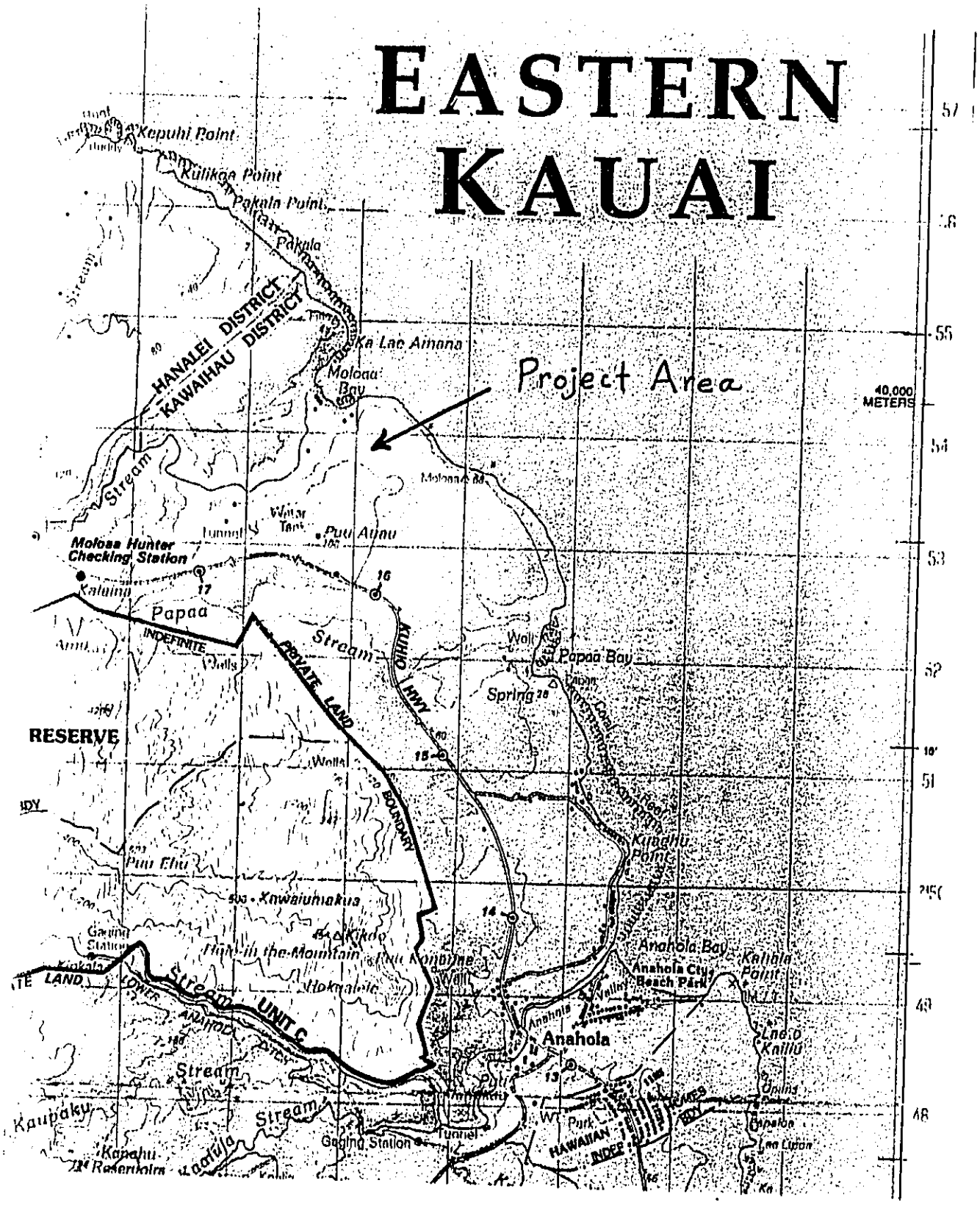
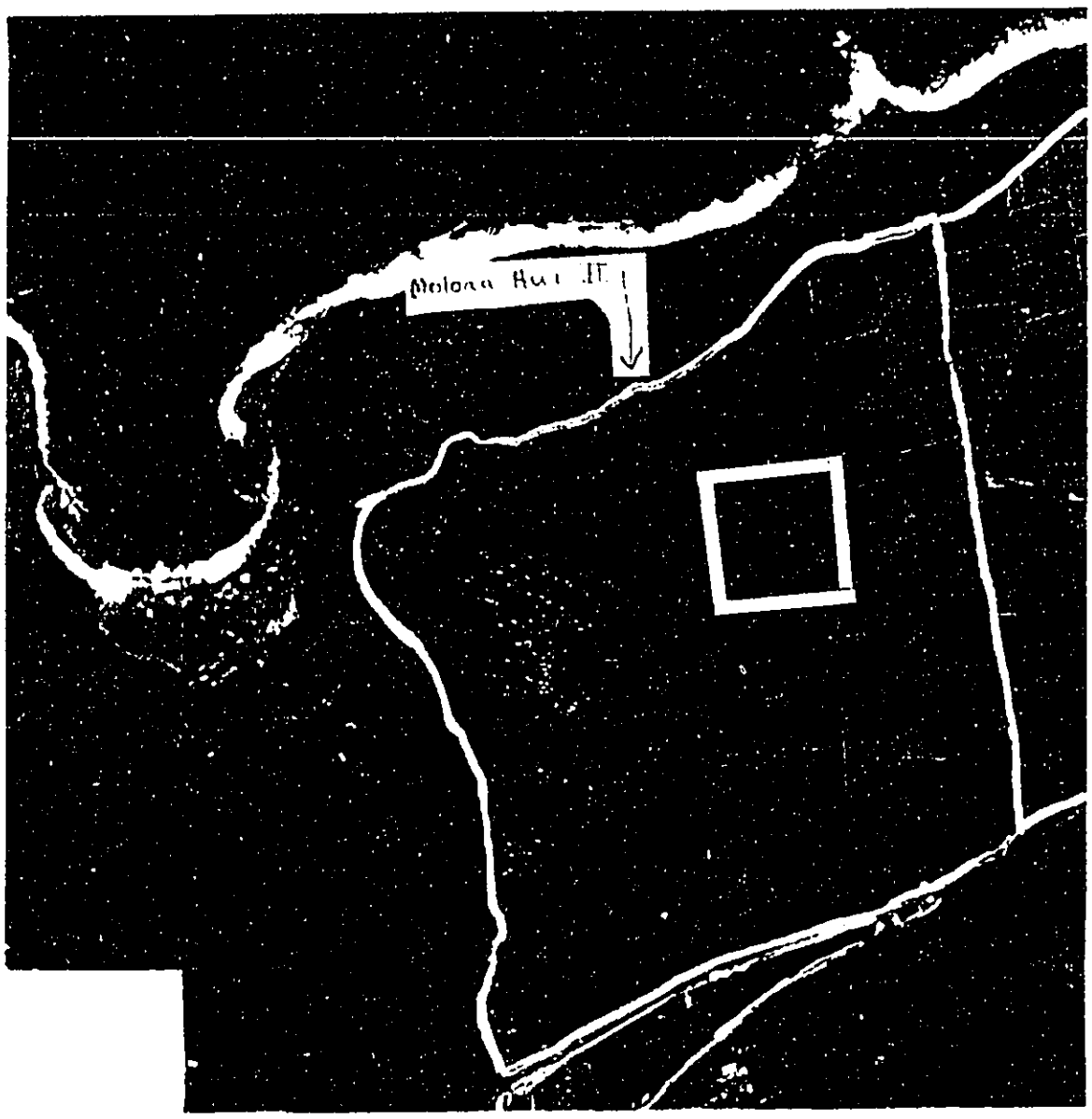
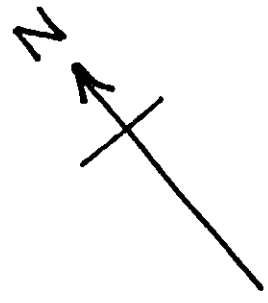


Figure 3. An older air photograph of the Moloa'a area White outlines show the location of the Mola'a Hui # II and the square-shaped Batesole property within it Note the proximity of the Kuhio Highway (lower right), Mola'a Bay (mid-left), the active surf zone toward the north, and the band of woodland behind the sea cliffs





Scale: 1" = 1200'

Figure 7. Photographs taken in April ,1999 show vegetative cover, development, and general surroundings of the Batesole property.

Top: diagonal view downslope from north to south corners; site access in the foreground, Anahola Mountains and Moloa'a Forest Reserve in the background.

Below: diagonal view from south corner upslope toward the north corner. The 2" white irrigation pipe, when buried, will feed water to seedlings via lateral 1" drip lines. The Cook pine windbreak is on the adjacent property.

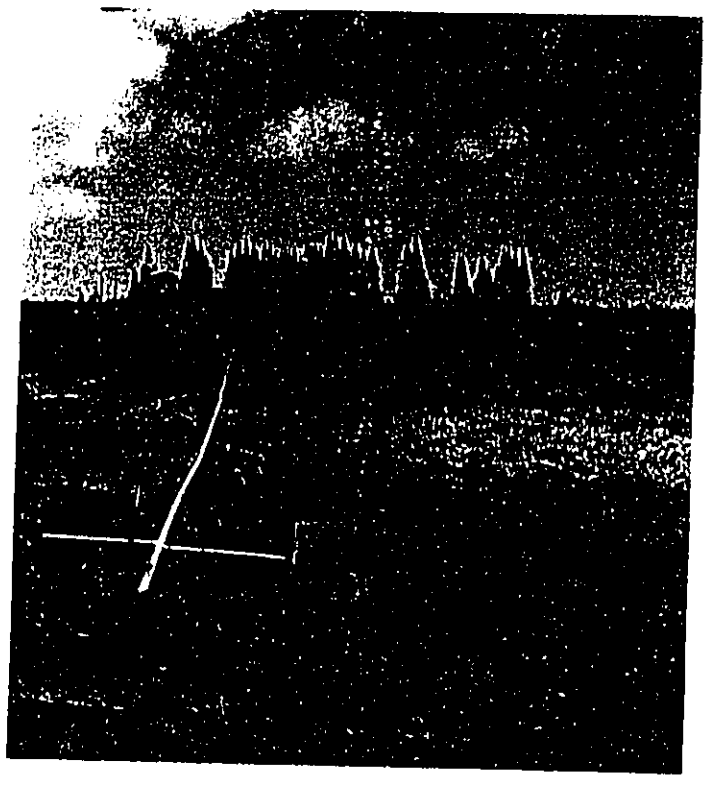


Figure 8. Photographs of windbreaks on the Batesole property

Top: View toward the southeast; kamani (left) and milo (right) windbreaks were planted in April, 1999 on the northeast berm. Foreground shows part of water supply intake.

Below: Ironwood windbreak on right, neem seedlings on left.