



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY & WILDLIFE

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December 20, 1995

Mr. Gary Gill, Director
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, HI 96813

RECEIVED
95 DEC 22 P 1:47
OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

Dear Mr. Gill,

Subject: Negative Declaration for Kilauea Forest and Pu'u Maka'ala Natural Area Reserve Fence Construction, TMK 2-4-08-25, Waiakea, South Hilo; 1-9-01-1, 'Ola'a, Puna; and 9-9-10-7, Kilauea, Ka'u, Hawaii

During the 30-day public comment period beginning October 23, 1995, the State Division of Forestry and Wildlife, DLNR, received comments from one party, Mrs. Clara Kakalia, of Ka Lahui Hawai'i. The Division, on behalf of the Group, responded to the questions raised and further explained the regional approach and the practical benefits of designing projects based on biological divisions as opposed to political. Enclosed are copies of both Mrs. Kakalia's letter and our response.

The agency has determined that this project will not have significant environmental effect and has issued a negative declaration. Please publish this notice in the January 23, 1996 OEQC Bulletin. We have also enclosed a completed OEQC Bulletin Publication Form, and four copies of the final EA.

Please contact me at 933-4221 if you have any questions. Thank you.

Sincerely,


WILLIAM T. STORMONT
Natural Area Specialist

Enclosures

185

1998-12-23-171- FEA - Kilauea Forest & Pu'u Maku'ala Natural
Area Reserve Fence Construction

Environmental Assessment



Proposed Kilauea Forest
National Wildlife Refuge

Island of Hawaii

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Region 1, Portland, Oregon

FINDING OF NO SIGNIFICANT IMPACT

PROPOSED ACQUISITION TO ESTABLISH THE KILAUEA FOREST
NATIONAL WILDLIFE REFUGE
Hawaii County, Hawaii

The Fish and Wildlife Service (Service) has prepared an Environmental Assessment to evaluate the effects associated with the acquisition of Kilauea Forest as a habitat for endangered Hawaiian forest birds and plants, and for the protection of its koa-ohia rain forest ecosystem.

Proposed Action:

The Service proposes to acquire approximately 2,956 acres of privately owned lands in Hawaii County, Hawaii, for the purpose of establishing the Kilauea Forest National Wildlife Refuge. This refuge is intended to perpetuate the native plant and animal communities of Kilauea Forest. Authority to undertake the proposed action is provided the Service by the Endangered Species Act of 1973 (16 U.S.C. 1531-1543; 87 Stat. 884) as amended, using funds appropriated by Congress from the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-4-4601-11; 78 Stat. 897).

Alternatives to the proposed action that were considered in the environmental assessment and dismissed are: (1) acquisition and management by others; (2) acquisition of a partial interest; (3) restrictive zoning; and (4) the no action alternative. For an expanded discussion of purpose and need for the project, refer to pages 1 through 6 of the environmental assessment.

The following describes why the proposed action will not have a significant effect on the human environment:

1. A significant segment of koa-ohia rain forest would be protected in perpetuity. Hence, the natural process under which the forest has evolved will, with the exception of efforts to control nonnative species, be permitted to continue.
2. The proposal is consistent with the existing Conservation District zoning of the proposed project area.
3. Mitigation for removing lands from private to public ownership will be accomplished by compensating the current owner the appraised fair market value for the property. Qualifying occupants would be eligible for benefits under the Relocation Assistance and Land Acquisition Policies Act of 1970. The Service would annually reimburse the County of Hawaii, under authority of the Refuge Revenue Sharing Act (P.L. 95-469), to offset property tax revenue lost as a result of the acquisition of private lands.

4. A Section 7 Internal Consultation concerning the endangered forest birds and plants known to occur in the proposed project area indicated that the proposed acquisition will be beneficial to those species. :

5. Consultation with the Hawaii State Historic Preservation Officer indicated that no archaeological surveys have been conducted within the proposed project boundaries, and that the proposed acquisition would have no effect of historic properties. At this time, there are no known properties listed on or eligible for listing on the National Register of Historic Places, or the National Register of Historic Landmarks within the area proposed for acquisition.

Should any future development that might impact the area be proposed, an intensive cultural survey of the development site would be undertaken through consultation with the State Historic Preservation Officer.

6. The Service has evaluated the proposal with respect to various Executive Orders, legislative acts, rules and regulations, and has found it to be consistent and in conformance with: Executive Orders 12372 (Intergovernmental Review of Federal Programs), 11900 (Protection of Wetlands), 11988 (Floodplain Management), 11593 (Protection of Historical, Archaeological and Scientific Properties); the Endangered Species Act of 1973, as amended; the Land and Water Conservation Fund Act of 1965; the National Wildlife Refuge Administration Act of 1966; and other public laws relative to this action.

7. This proposal is comparable to, and has been preceded by, similar actions taken by the Service whereby private lands were acquired for and made part of the National Wildlife Refuge System both in Hawaii and throughout the nation.

Related Documents:

A Hawaii Forest Birds Recovery Plan for the Akiapolaau, Hawaii Akepa, Hawaii creeper, and the Ou was prepared by an inter-agency Recovery Team and approved by the Director of the Service on February 3, 1983. A programmatic Environmental Impact Statement concerning the operation and management of the National Wildlife Refuge System under which the Kilauea Forest National Wildlife Refuge would be managed, was completed in 1976 (FEIS 76-59). The Service's Regional Resource Plan of 1984 outlines Region 1 priorities, including goals relative to the recovery of endangered Hawaii forest birds.

Public Availability:

The environmental assessment was circulated for a 30-day public review period to the landowner and lessees; appropriate Congressional and Federal, State, and local government agencies; interested non-governmental organizations; and to State libraries in Oahu and Hawaii Counties through the Hawaii State Clearinghouse. Copies of this finding will also be distributed to the landowner, other entities, and governmental agencies which received the environmental assessment. In addition, copies are available upon request from the office of the Pacific Islands Land Protection Coordinator, U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Suite 5302, Honolulu, Hawaii, 96813; phone (808) 541-1314.

Determination:

Based upon information in the environmental assessment, the Fish and Wildlife Service has determined that this activity would not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared. This Finding of No Significant Impact will not be final nor will any acquisition be undertaken pending a 30-day period for public review.

Issued in Portland, Oregon, July 2, 1990.


Regional Director MARVIN L. PLENERT

References:

Environmental Assessment: Proposed Kilauea Forest National Wildlife Refuge, Hawaii County, Hawaii
Hawaii Forest Birds Recovery Plan
Region I, FWS, Regional Resource Plan
Environmental Impact Statement: Operation and Management of the National Wildlife Refuge System, FEIS 76-59.

FINAL
ENVIRONMENTAL ASSESSMENT

PROPOSAL TO PROTECT HAWAIIAN FOREST BIRD HABITAT
OF THE
KILAUEA FOREST
ON THE ISLAND OF HAWAII

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
REGION I, PORTLAND, OREGON

June 1990

Prepared by

John Ford, Fish and Wildlife Biologist, Honolulu, Hawaii
Jack Helvie, Wildlife Biologist, Portland, Oregon

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FINAL
ENVIRONMENTAL ASSESSMENT

PROPOSAL TO PROTECT HAWAIIAN FOREST BIRD HABITAT
OF THE
KILAUEA FOREST
ON THE ISLAND OF HAWAII

I. PURPOSE OF AND NEED FOR ACTION

A. BACKGROUND

More native birds have become extinct in the Hawaiian Islands than anywhere else in the world. Twenty of the seventy species of birds endemic to the Hawaiian Islands are found only on the island of Hawaii (Figure 1). Of those 20, 10 are found within Kilauea Forest (Figure 2). Five of these are listed by the U.S. Fish and Wildlife Service (Service) as endangered species.

The Service, in cooperation with the Hawaii Department of Land and Natural Resources and other government and private organizations, has prepared a number of recovery plans designed to identify steps necessary to prevent extinction of these endangered species and to restore their populations. With the completion of several such recovery plans, efforts of the cooperating agencies have shifted to implementing the various actions identified within those plans, a major one of which is to secure productive habitat in perpetuity.

The Kilauea Forest on the island of Hawaii is situated in a particularly important location that links wetter, windward forest habitat with drier forest habitat to the west. This area is identified in two Recovery Plans; i.e., Hawaii Forest Birds and Hawaiian Vetch, as having habitat in need of protection. The forest is one of five known refugia for native forest birds which remain relatively intact on the island. High densities of several endangered species have been documented in this habitat. The Kilauea Forest provides essential habitat for these endangered Hawaiian forest birds: the akiapolaau (Hemignathus munroi [=wilsoni]), the Hawaii akepa (Loxops coccineus), the Hawaii creeper (Oreomystis [=Loxops] mana), and possibly the especially rare ou (Psittirostra psittacea). The endangered Hawaiian Hawk, or Io (Buteo solitarius), has been observed over the forest. The area also contains the larger of two extant populations of the endangered Hawaiian vetch (Vicia menziesii).

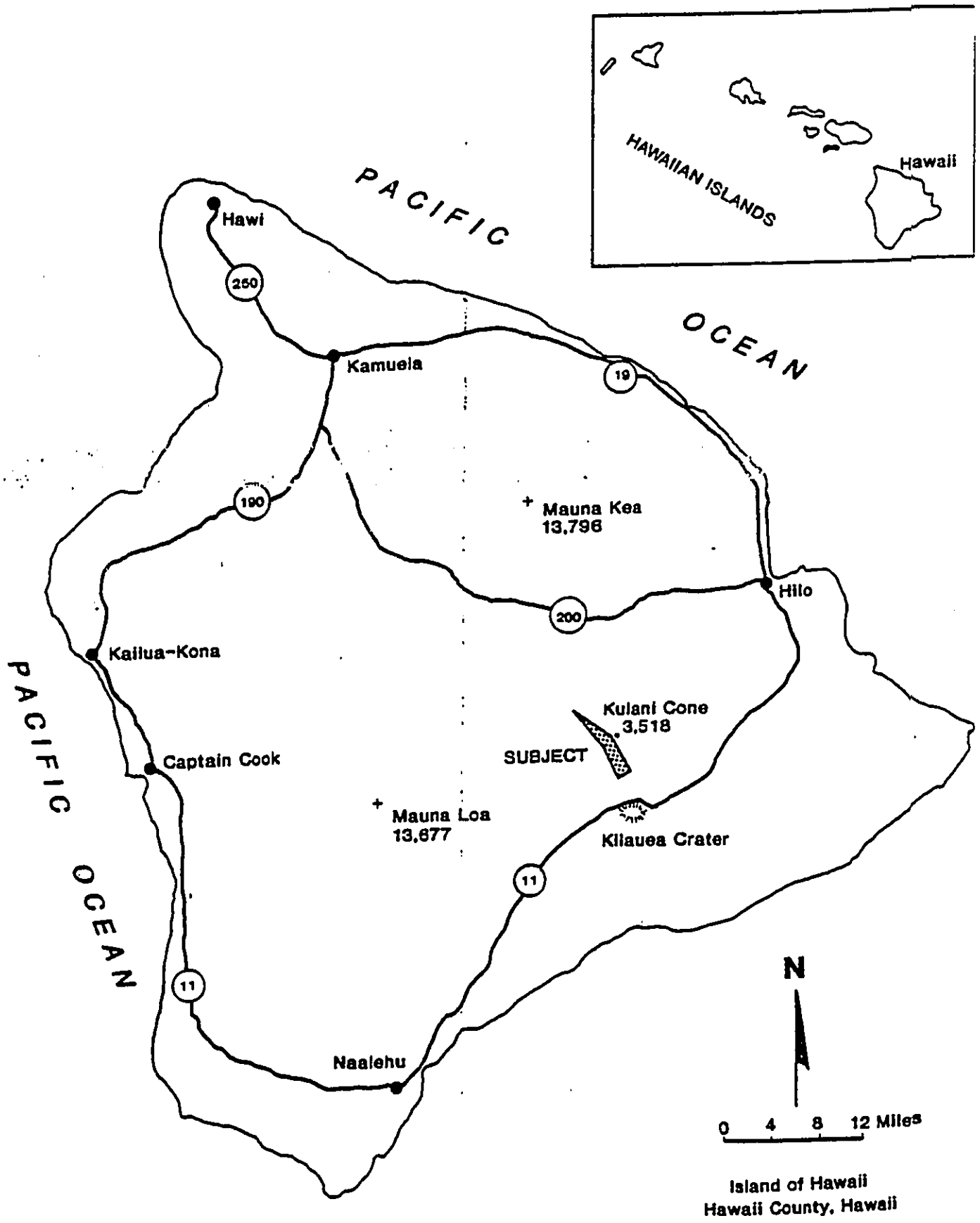


Figure 1. Kilauea Forest Vicinity Map

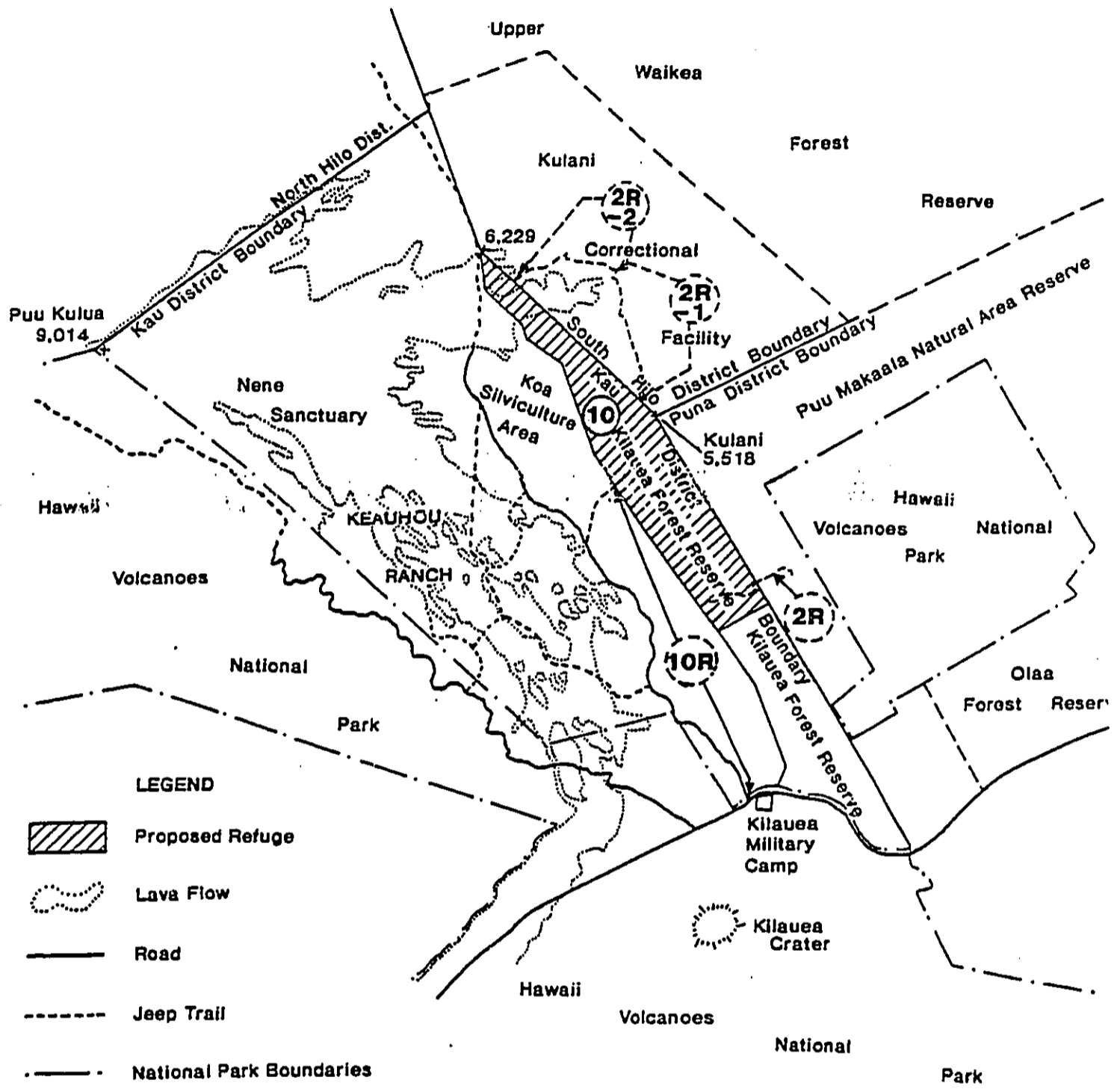


Figure 2. Proposed Kilauea Forest National Wildlife Refuge

Within Kilauea Forest, extensive damage to the forest floor by feral pigs has been documented by Mueller-Dombois, et al. (1981). If the activity of pigs is uncontrolled, they represent a serious threat to the diversity of the forest community. If no action is taken to secure this forest habitat, the land owners or their lessees may seek approval for logging hapuu ferns and downed koa wood within the forest. Removal of dead vegetation is a permitted use within the Conservation P (Preservation) Subzone subject to prior approval by the State Board of Land and Natural Resources. Hence, the P Subzone does not necessarily confer the level of protection needed to preserve this area for endangered forest birds.

Cattle ranching, silviculture, and other intensive land use practices are ongoing and/or potential uses of adjacent lands that result in the reduction of plant and animal species diversity and habitat values that are vital to native species of the area. Concomitant with the changes brought about by these practices is an increase in the number of undesirable plants and animals which may also have a negative impact on the native species.

It has been well documented that use of forest lands for grazing by cattle will eventually eliminate native forest bird habitat (Scott, et al. 1986). Cattle grazing is now occurring on Keauhou Ranch lands (below an elevation of approximately 5,200 feet) adjacent to the western boundary of Kilauea Forest. Although endangered bird species may be found on ranch lands, Scott, et al. (1986) consider these areas as unstable habitat which may not be suitable for endangered species due to lack of regeneration of the native plants comprising the community.

Since 1977, the U.S. Forest Service, in cooperation with The Kamehameha Schools/Bishop Estate and State of Hawaii, has been studying the regrowth of koa trees within a 200-acre fenced reforestation area on Keauhou Ranch. The focus of this research has been to determine growth rates, density of seedlings, growth forms, and crown spread of koa and other woody plants. Plots were not established for the purpose of studying the succession of plants within the reforestation area. Recent discussions with Forest Service biologists revealed that data collected during this study has not yet been evaluated or published. However, this information will be extremely valuable for comparison with the koa reforestation project of the Forest Service and Fish and Wildlife Service at the Hakalau National Wildlife Refuge.

B. PURPOSE OF ACTION

The Service proposes to acquire approximately 2,956 acres of forest lands plus road access for the purpose of contributing to the recovery of endangered birds and plants and for the preservation of their habitat. Protection and maintenance of quality habitat for the four endangered Hawaiian forest birds, the Hawaiian Hawk, and the Hawaiian vetch are crucial elements of their respective recovery programs.

A major purpose of the Endangered Species Act of 1973 is ". . . to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved." As a Federal agency responsible for the conservation of endangered species, the Service, in conjunction with other entities, uses its expertise and resources to achieve such objectives.

C. NEED FOR ACTION

Acquisition of the Kilauea Forest land is needed to prevent loss of habitat which has been cited by Berger (1981), Jacobi and Scott (1985), and Scott et al. (1986) as a major concern in the listing of almost all endangered forest bird species in Hawaii. Loss of habitat continues to threaten the remaining populations. Kilauea Forest is important for the following reasons:

1. It comprises a portion of essential habitat for several endangered Hawaiian forest birds. If the land is dedicated to and enhanced for these species, it would serve to increase and stabilize their populations and would provide a primary basis for the eventual delisting of some of them.
2. Acquisition of Kilauea Forest will link forested areas on adjacent national park lands, the Puu Makaala State Natural Area Reserve, and the Oloa Forest Reserve into a continuous, protected area from Kilauea across to the koa-ohia forests of the Kulani Road area. This will help achieve one of the major objectives of the Hawaii Forest Birds Recovery Plan, which is the maintenance of a continuous band of montane forest habitat from northeast Hamakua to southwest Kau. It will also enhance joint-agency efforts to implement a regional forest habitat management plan for the island of Hawaii.
3. Based on the most recent surveys, the larger of the two remnant populations of the endangered Hawaiian vetch is located in Kilauea Forest. Protection and management of the forest are identified as major tasks in the recovery plan for this species.

4. Protection of the forest as a naturally evolving native rain forest would provide stable habitat for an entire assemblage of native plants and animals and would help prevent a number of declining or rare species from becoming threatened or endangered in the future.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. PROPOSED ACTION (ACQUISITION/MANAGEMENT BY THE SERVICE)

The Service proposes to initiate necessary actions to secure 2,956 acres of privately owned lands that comprise the Kilauea Forest and to provide perpetual protection and management of the natural resources vital to the endangered species of the area.

The project is located on the east slope of Mauna Loa. It is bounded on the west by the Keauhou Ranch lands of Kamehameha Schools/B.P. Bishop Estate (Estate), and on the east by the Upper Oiaa Forest Reserve, the Kulani Prison Project, and the Puu Makaala State Natural Area Reserve. On the north the forest is bounded by the Mauna Loa Forest Reserve. Kilauea Forest is largely encompassed within a single parcel owned by the Estate, and identified as tract 10 (Tax Map Key 9-9-1, Parcel 7).

The forest land acquired by the Service would be made part of the National Wildlife Refuge System and would be managed as a naturally functioning ecosystem primarily for the benefit of endangered Hawaiian species.

Under this preferred alternative, the Service would acquire fee title to tract 10 and access easements or agreements to the project site, as shown on Figure 2, and described below:

1. Tract 10R - road easement would cross Keauhou Ranch land owned by Kamehameha Schools/Bishop Estate in Tax Map Key 9-9-01-4. The route would be through the Kilauea Golf Course, passed the Dillingham Ranch houses, up the Puu Oo trail and crossing northeasterly in the Kilauea Forest Reserve.
2. Tract 2R - road easement would cross land owned by the State of Hawaii in Tax Map Key 1-9-01-1. Access would be via Wright Road from Highway 11 to the top of Volcano Farm Lots.
3. Tract 2R-1 - road easement would cross land owned by the State of Hawaii in Tax Map Key 1-9-01-1. The route would be up the Stainbach Highway to Kulani Prison, then south to Kulani Cone.

4. Tract 2R-2 - road easement would cross land owned by the State of Hawaii in Tax Map Key 1-9-01-1. The route would be up the Stainbach Highway to Kulani Prison, then north to the upper end of Kilauea Forest.

It may not be necessary to acquire all these easements.

The landowner has indicated a willingness to entertain proposals for Service acquisition of the Kilauea Forest, and the ultimate disposition of these lands will be subject to approval by the Estate. It is possible that Service acquisition could be accomplished by any of the following means:

1. Donation

The owners of the property could donate the land to the Service directly or through some other entity such as the National Fish and Wildlife Foundation, The Nature Conservancy, The Trust for Public Land, etc.

2. Exchange for Other Public Lands

Assuming that another Federal agency has jurisdiction over properties surplus to its mission and that the owners of lands within the project area would be willing to exchange their lands for the surplus Federal property, an exchange might be consummated. However, the availability of Federal lands in Hawaii for such an exchange is extremely limited.

3. Fee Purchase

With this means of acquiring fee title (the most probable), the Service would pay the landowners an appraised market value for the properties using monies appropriated specifically for that purpose.

As part of the Hawaiian Islands Complex of the National Wildlife Refuge System, the refuge would be managed primarily for the benefit of threatened and endangered species. It is projected that initial development costs will be \$395,000. Annual operations and maintenance costs are projected at \$150,000, including a staff biologist and maintenance worker.

The preferred alternative of acquisition and management was considered along with other alternatives and selected for the following reasons:

1. It is feasible and would help ensure the long-term protection and perpetuation of the Kilauea Forest for endangered species.

2. It is a more cost-effective means, on a long-term basis, than the other two alternatives except for the "No Action" alternative which does not meet the need for providing protection.
3. It would provide for more effective management of exotic vegetation and predators which would assist in encouraging increased use of the area by endangered species.
4. It is consistent with goals of the Service in meeting objectives of the Endangered Species Act and other legislation under which the Service operates.
5. It is identified in the Recovery Plans as a means of protecting habitat of several endemic Hawaiian endangered species.

B. ALTERNATIVES

With the exception of the "No Action" alternative, the following have been considered as possible means of achieving the objective of maintaining and, where necessary, restoring habitat within the project area. The authority for these alternatives is provided within the Endangered Species Act, and any needed funding would be via the Land and Water Conservation Fund Act.

1. No Action

No Service effort would be expended toward protecting or managing habitat in this area. Any constructive actions towards conserving this habitat would be left to other conservation agencies or organizations, or the landowner. This alternative does not provide for long-term protection of endangered Hawaiian species by the Service and offers little enforcement or protective control of the area. This alternative is inconsistent with Service responsibilities for implementing the Endangered Species Act and other legislative acts.

2. Acquisition/Management by Others

This alternative is dependent on the capabilities and interests of other public or private organizations. Due to the magnitude of effort necessary to provide perpetual protection and management for the endangered species and other fish and wildlife resources within the project area, no other private or government natural resource organization has indicated an interest in accomplishing this project alone.

3. Purchase of an Easement

A conservation easement could be purchased for the property within the proposed area. To be effective in preserving endangered species habitat, it would be necessary to acquire rights such as development, habitat modification, grazing, use of off-road or other vehicles, etc. Feasibility of this alternative is highly questionable since it might impose conditions that could limit management options for the area, and cost of the easement would nearly equal the cost for acquisition in fee.

4. Other Alternatives

a. Leasing

A lease is usually for a relatively short period of time, and there are no assurances that annual funding would be available for renewal or that the lessors would be willing to renew when the lease expired. Long-term protection of the ecosystem could not be assured under a lease. Consequently, this alternative is not practical.

b. Zoning

With this alternative, zoning or other land use limitations would be imposed on the properties identified. To be effective, restrictions invoked would have to be similar to those called for in the "Easement" alternative; i.e., preclude grazing and other human uses detrimental to endangered wildlife. This alternative is currently in effect at Kilauea Forest, which is classified as P Subzone of the State Conservation District. The P Subzone is the most restrictive designation and prohibits modification of habitat to insure conservation of natural resources within the subzone. However, subzone classifications are subject to change under State law by the Board of Land and Natural Resources. Furthermore, the Board may approve certain permitted uses that can be detrimental to the objectives of the refuge (e.g. removal of downed koa trees from the forest). Therefore, no assurance for long-term protection of the Kilauea Forest can be provided under this alternative.

III. AFFECTED ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Climate

The climate of the project area is characterized by warm temperatures, with mean high temperatures from 68 to 80 degrees and mean low temperatures from 55 to 64 degrees Fahrenheit.

Trade winds are from the northeast. The elevational gradient results in a wide range of climatic factors within the project area. Annual rainfall ranges from 100 inches at the 4,000-foot level, to about 20 inches at the 9,000-foot level in the vicinity of Kilauea Forest.

2. Topography, Geology, and Soils

The boundaries of the site range in elevation from 4,200 to 6,230 feet above sea level. There are no precipitous ridges or gullies, and the land slope is generally to the southeast. Only 4 small locations have more than a 20 percent slope. There are no permanent streams or ponds in the area.

The project area lies adjacent to the Northeast Rift Zone of Mauna Loa. The most recent volcanic eruption of significance occurred in 1986 at Puu Oo, which lies to the south of the project area.

Soil types throughout much of the lower and mid-elevations within the forest consist primarily of strongly acid, silty, clay loams which overlay volcanic ash. These soil types can dehydrate irreversibly into fine gravel-sized aggregates (U.S. Department of Agriculture 1973). Above Kulani Cone (Figure 2), soils include rocky silt loams and stony muck. These are generally well-drained, shallow, organic soils which overlay pahoehoe and aa lava flows.

B. BIOLOGICAL ENVIRONMENT

Kilauea Forest is dominated by wet ohia and koa-ohia rain forests. The majority of forest land is zoned P Subzone by the State of Hawaii.

Kilauea Forest supports a wide variety of native plant and animals species and has been well documented as one of the most outstanding remaining examples of a native Hawaiian montane rain forest ecosystem.

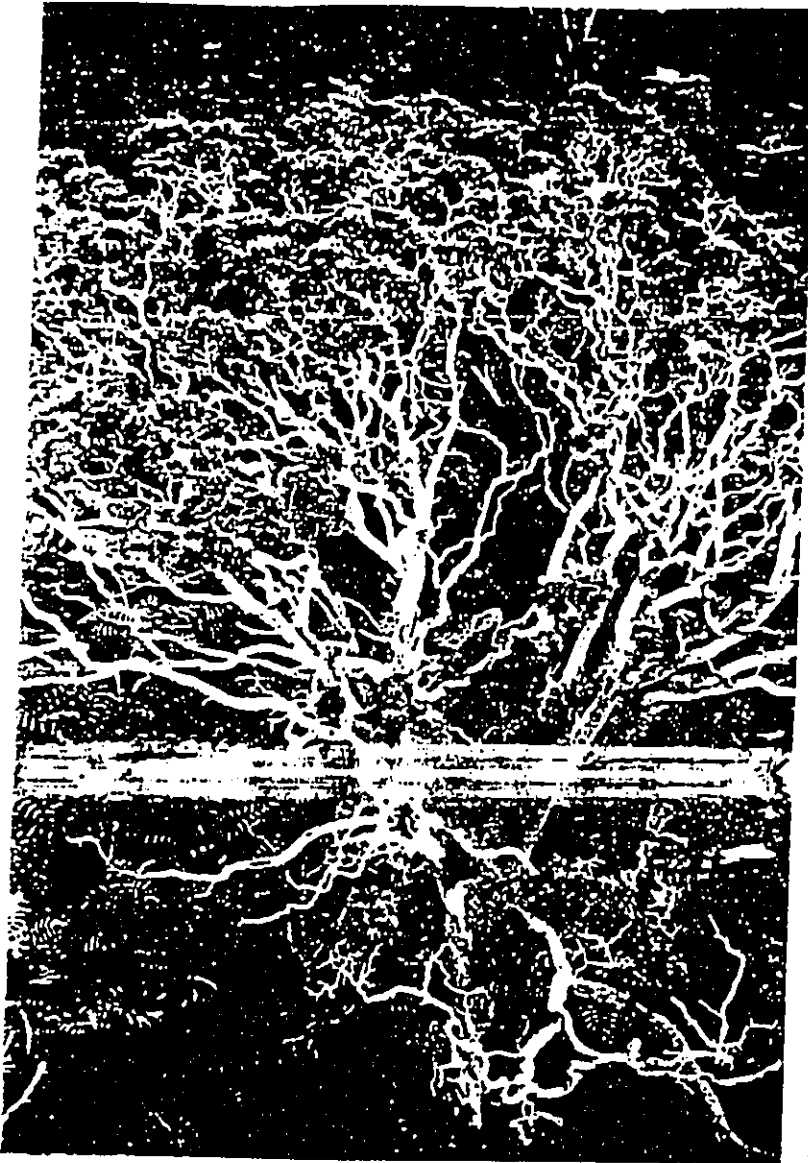


Figure 3.
A solitary giant
acacia koa tree
emerging above a
native ohia and
fern canopy near
Kilauea Forest.



Figure 4.
The effect of
grazing on
forests is
illustrated in this
view of a decadent
koa forest adjacent
to pasture lands at
Keoluon Ranch.

CORRECTION

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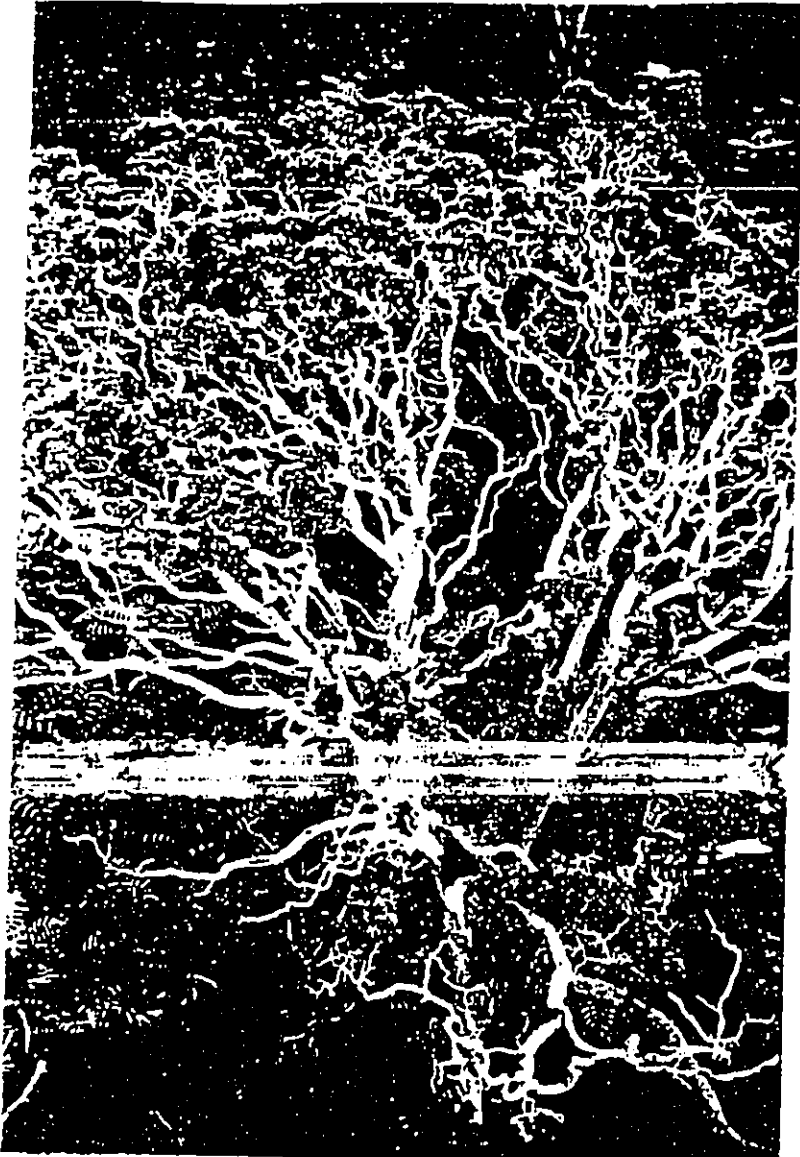


Figure 3.
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Figure 4.
The effect of
grazing on native
forests as
illustrated in this
view of a decadent
koa forest adjacent
to pasture lands at
Keolu Ranch.



DOCUMENT CAPTURED AS RECEIVED



Figure 5.
Large native tree ferns such as this are typical of high quality remnant moniforest habitats on Hawaii Island.



Figure 6.
A typical tree logging and reforestation project underway at Keauhou Ranch.

1. Flora

The project area is a tropical wet forest. Plant communities within the forest and adjacent lands vary according to soil, moisture conditions, and disturbances by man, feral animals, and aggressive non-native plants.

Kilauea Forest is densely vegetated with an overstory of koa and ohia trees and an understory dominated by native shrubs and tree ferns (hapuu). Within the undisturbed portions of Kilauea Forest, Mueller-Dombois, *et al.* (1981) recorded 79 species of herbaceous plants (60 native species), 47 vascular epiphytes, 28 species of plants within the tree fern layer (26 native species), 11 native species within the layer of low-stature trees, and 4 native species of canopy trees. The forest includes some of the very few known specimens of the Hawaiian vetch (*Vicia menziesii*), the first plant officially listed as endangered in Hawaii. Five candidate endangered plants are believed to inhabit the forest. These include:

<u>Category</u>	<u>Taxon</u>
1	<u>Asplenium fragile</u>
1	<u>Clermontia lindseyana</u>
1	<u>Cyanea stictophylla</u>
2	<u>Phyllostegia velutina</u>
2	<u>Ranunculus hawaiiensis</u>

Category 1 means that substantial biological information is on hand to support a proposal to list a species as endangered or threatened. Category 2 means that conclusive biological data for proposing to list a species are not on hand, although existing information suggests listing is appropriate.

A significant portion of the koa-ohia forest on the adjacent Keauhou Ranch lands has been used historically for cattle grazing. An area of roughly 600 acres (to date) has been developed as a commercial koa plantation. Grasses, principally exotic pasture varieties, are the dominant ground cover, and remnant old koa trees and downed koa logs are interspersed throughout the ranch lands.

2. Fauna

Kilauea Forest provides habitat for six honeycreepers (Subfamily Drepanidinae) endemic to the Hawaiian Islands. These include three endangered species: Hawaii creeper (*Oromystis [=Loxops] mana*), Hawaii akepa (*Loxops coccineus*), and Akiapolaau (*Hemignathus munroi [=wilsoni]*); the other three are: the Apapane (*Himatione*

sanguinea), the Hawaii amakihi (Hemignathus virens), and the Iiwi (Vestiaria coccinea). The endangered Hawaiian hawk or Io (Buteo solitarius) and the native Elepaio (Chasiempis sandwichensis) and Hawaiian thrush (Phaeornis obscurus) (Family Muscicapidae) are also seen above the forest. A complete status list of endemic forest birds on Hawaii Island is provided in Appendix A.

The endangered Hawaiian hoary bat (Lasiurus cinereus semotus) uses the site and has been observed occasionally above Keauhou Ranch lands at an elevation of about 5,400 feet.

The insect fauna of the canopy trees within Kilauea Forest is predominantly native (over 75 percent native species) and relatively diverse (Mueller-Dombois, et al. (1981).

C. CULTURAL AND HUMAN ENVIRONMENT

1. Hawaii Island

The present population of this island is about 125,000 people. This population is expected to increase to an estimated 160,400 people by the year 2000 (Department of Business and Economic Development, 1988). Almost half of the human population on Hawaii lives in the city of Hilo. The resort area of Kailua-Kona and its environs attract increasing numbers of tourists, some of whom remain as part-time or year-round residents. Population growth is currently less marked on Hawaii than on the islands of Kauai, Oahu and Maui. Population density in the Kilauea Forest area is estimated to be less than 10 people per square mile.

Subdivision development and tourism dominate the economy of the island which is currently undergoing a rapid expansion in manufacturing, science and high technology research and development, and resort construction for the "carriage trade." Projections for agriculture on the island of Hawaii are that the sugar industry will continue to decline over the next decade. Although most other crops are predicted to remain at a relatively stable level, some such as macadamia nuts, may be expected to increase in production. Forest products harvested in Hawaii in 1977 were valued at about \$3.5 million, including \$2.3 million from logs for fiber (Department of Planning and Economic Development, 1985). This represents about .03 percent of the total economic production of the State (University of Hawaii 1983). In 1984 commercial forest acreage on the island of Hawaii was estimated to be 569,000 acres (60 percent of the State total); and noncommercial forest acreage on Hawaii was estimated at

583,100 acres (56 percent of the State total). Also, an estimated 18,037 acres (39 percent of the state total) of standing, planted forest exists on Hawaii.

2. Kilauea Forest

Lands within the project area have been owned by the Estate for years. The Estate is dedicated to managing its assets for the betterment of the Kamehameha Schools and for students of Hawaiian and part-Hawaiian ancestry. With that objective in mind, lands within the adjacent Keauhou parcel have been leased for grazing and logging uses during the past 50 years.

Despite the commercial uses of neighboring lands, the Kilauea Forest remains in a relatively undisturbed state. However, permits or variances requesting the extension of hapuu fern logging within the lower elevations of the forest have been approved by the State Board of Land and Natural Resources.

Wildlife/wildland oriented public use will be encouraged on Service lands when funds are available to support such use and where such activities are compatible with refuge purposes. Public use programs can provide a wide array of opportunities for the visitor to enjoy the resource and to gain an understanding and appreciation for fish and wildlife, wildlands ecology, and wildlife management. Through careful planning, the Service can protect fish and wildlife resources and their habitats while providing substantial and varied educational and recreational opportunities to the visiting public. An increased public environmental knowledge and understanding will be beneficial to the resource through greater acceptance of existing and future conservation and management programs.

Public use will be in strict conformance with applicable Federal and State statutes. Special attention will be directed toward assuring that all public uses are compatible with the refuge's primary purposes. New on-site activities will be wildlife/wildlands-related whenever possible.

Few historic or archaeological features are known to exist within the Kilauea Forest. Trails, small forest shrines, burial caves and lava tube shelters are the types of features that might be revealed in the area by intensive surveys.

D. ENVIRONMENTAL CONTAMINANT ISSUES

Service biologists conducted a preliminary survey of environmental contaminants possibly associated with the Kilauea Forest, and found no evidence of pesticide or hazardous waste application or accumulation within the project area. Cattle ranching activities on adjacent lands involve the periodic application of some pesticides and herbicides normally associated with ranching activities. However, there is no evidence or reason to suggest that these chemicals occur in the forest at concentrations greater than in areas adjacent to similar ranch lands elsewhere in the State. The Service has concluded that the hazards to wildlife presented by the normal use of pesticide and herbicide chemicals on lands adjacent to Kilauea Forest are insufficient to warrant a detailed (Level II) contaminant study.

IV. ENVIRONMENTAL CONSEQUENCES

ASSESSMENT OF INDIVIDUAL ALTERNATIVES

A. Acquisition/Management by the Service

Under this alternative, the Service would acquire fee title to all or a portion of the 2,956 acres of private lands comprising the project area within the Kilauea Forest. The anticipated effects of this action include the following:

1. A segment of privately owned koa-ohia rain forest would be protected in perpetuity by the Federal government.
2. This action would help guarantee the ecological integrity of the area for many species of wildlife and plants. Management of the proposed refuge would focus on perpetuating the natural functions of the native forest ecosystem and would serve to minimize adverse impacts from feral animals and alien plants.
3. A critically important, nearly continuous band of protected montane rain forest habitat from windward Mauna Kea (including the newly established Hakalau Forest National Wildlife Refuge) to the eastern border of Keauhou Ranch would be established. Cooperative forest management programs will be established between the Service and the National Park Service, Forest Service, and the State Department of Land and Natural Resources.
4. Once Kilauea Forest is acquired, a historic preservation management plan will be prepared by the Service. The plan will address historic uses, archeological resources, and ways in which the cultural heritage of the forest

(including traditional access and gathering practices) will be managed.

5. Fee acquisition is not expected to have a significant impact on the local economy. The magnitude and intensity of existing logging and cattle ranching operations on the adjacent Keauhou Ranch will not be affected.
6. Under provisions of the Refuge Revenue Sharing Act (Public Law 95-469), the Service would annually reimburse Hawaii County to offset revenue lost as a result of acquisition of private property. This law states that the Secretary of the Interior (Secretary) shall pay to each county in which any area acquired in fee is situated, the greater of the following amounts:
 - a. An amount equal to the product of 75 cents multiplied by the total acreage of that portion of the fee area which is located within such county; or
 - b. An amount equal to three-fourths of one percent of the fair market value, as determined by the Secretary, for that portion of the fee area which is located within such county; or
 - c. An amount equal to 25 percent of the net receipts collected by the Secretary in connection with the operation and management of such fee area during such fiscal year. However, if a fee area is located in two or more counties, the amount for each county shall be apportioned in relationship to the acreage in that county.

There have been occasions in the past when payments to the counties have been less than the legislated amounts because of funding deficits. Congress may appropriate, through the budget process, supplemental funds to compensate local governments for any shortfall in revenue sharing payments. The Refuge Revenue Sharing Act also requires that Service lands be reappraised every five years to ensure that payments to local governments remain equitable. Payments under this Act would be made only on lands which the Service acquires in fee title. On lands where the Service acquires only partial interest through easement, all taxes would remain the responsibility of the individual landowner.

7. Since the forest would be acquired for the express purpose of enhancing the preservation and recovery of endangered Hawaiian forest birds and plants, the area must be managed accordingly. Therefore, public access for recreational

purposes may not be granted immediately; however, the Service will address this issue in the refuge management planning process.

B. No Action

Under this alternative, the Service would limit its efforts regarding the project area to regulatory actions and advisory assistance in an effort to maintain the essential endangered forest bird habitat. The Service would not pursue any land acquisition. Unless other organizations pursue some means of habitat protection independently, the lands would remain in private ownership. Under these circumstances, the following conditions would be expected to occur:

1. Unless the landowners or lessees successfully appeal the State Board of Land and Natural Resources to provide for certain uses or have present zoning altered, Kilauea Forest would remain under the Conservation District Subzone P. Thus, the forest could remain in a more or less natural state without Service acquisition or management. It could also be managed under conditions prescribed by a Conservation District Use permit or a new zoning designation, should such changes occur. It is possible that the area could be managed for commercial silviculture. Without active management to protect the area as a native forest ecosystem, however, the diversity of the native forest vegetation is likely to decline; the forest floor would continue to be disturbed by the foraging activities of feral pigs, goats and stray cattle; and the unique habitat values of the area for native forest birds would be lost.
2. If the forest were to be managed for logging, it might still provide habitat for some native species. However, rare species which require the specialized habitat conditions provided by a diverse, mixed species/mixed age native forest may disappear from this area entirely. Non-native plants and animals would be expected to encroach further into logged areas. Such developments would run counter to the objectives of the proposed action.

C. Acquisition/Management by Others

Under this alternative acquisition and management of the project area would be assumed by another organization. The effects of this alternative on the biological and human environment would depend upon the philosophies of those in control.

D. Purchase of an Easement

This alternative would protect a segment of privately owned koa-ohia, ohia rain forest, and subalpine scrub habitat in perpetuity if the language in the easement document contained adequate restrictions. However, in order to acquire the rights necessary to achieve refuge objectives, the cost may be roughly equivalent to that of fee title; yet the Service would not own the property. With an easement, the Service would not have the management flexibility that would be available in Alternative 1.

Table 1. Alternative Matrix Table - Effects of Alternatives

Resource	Alternatives			
	Acquired by Service	No Action	Easement	Acquired by Others
Wildlife	+	-	+	+
Vegetation	+	+/-	+	+
Soils	+	+/-	+	+
Recreation	+/-	+/-	+/-	+/-
Archaeological/ Historical	+	-	+/-	+/-
Retention of Water	+	-	+	+
Socioeconomic	+/-	+/-	+/-	+/-

+ = positive effect
- = negative effect

V. STATEMENT OF COMPLIANCE

The project lies within a forest reserve and therefore, according to State law, requires a coastal zone consistency determination. The project was determined to be consistent with the Hawaii Coastal Zone Management Program by the Office of State Planning on June 30, 1989. Wetlands and floodplains are largely absent from this area and would not be affected by the proposal. There will be no Section 10 (River and Harbor Act of 1899) or Section 404 (Clean Water Act) involvement. There are no Wild and Scenic Rivers, National Trails or National Landmarks within the project area. An internal Section 7 consultation was completed in compliance with the Endangered Species Act. A discussion regarding archaeological records was completed to comply with Executive Order 11593, National Historic Preservation Act. The intergovernmental review process was completed to comply with Executive Order 12372, Intergovernmental Review of Federal Programs.

VI. CONSULTATION AND COORDINATION WITH OTHERS

The Draft Environmental Assessment for the Proposed Keauhou-Kilauea Forest National Wildlife Refuge, Island of Hawaii, was released for public review on May 5, 1989. A total of 20 letters of comment were received (five from Federal agencies, seven from State agencies, two from County agencies, and six from private organizations or individuals). During the review period, the Estate expressed its firm position not to sell any portion of Keauhou Ranch lands to the Service for the establishment of a wildlife refuge. In response, the Service selected acquisition of Kilauea Forest (only) as the preferred alternative. This decision is the focus of the Final Environmental Assessment.

This final assessment is being forwarded to the following agencies, groups, and individuals for review:

National Park Service
Forest Service
Soil Conservation Service
Geological Survey
Hawaii State Clearinghouse (Office of State Planning)
Hawaii Department of Land and Natural Resources
Hawaii Department of Business and Economic Development
Office of Hawaiian Affairs
County of Hawaii
The Nature Conservancy of Hawaii
Hawaii Audubon Society
Conservation Council for Hawaii
Sierra Club, Hawaii Chapter
Sierra Club Legal Defense Club, Honolulu
Natural Resources Defense Council, Honolulu
Craig Harrison

Copies are also being provided to the landowner and lessees of properties within the boundaries of the project area. Also receiving copies are elected officials, public libraries in Hilo, Kona, Kau, and the State Library in Honolulu.

Written comments should be mailed to the U.S. Fish and Wildlife Service, Pacific Islands Land Protection Coordinator, P.O. Box 50167, Honolulu, Hawaii 96850. Additional copies of the final environmental assessment are available for review at the office named above, 300 Ala Moana Blvd., Room 5302.

APPENDIX A. Status of Endemic Forest Birds of the Island of Hawaii

EXTINCT

Hawaiian Rail - Pennula sandwichensis
Hawaii Oo - Moho nobilis
Kioea - Chaetoptila angustipluma
Greater Amakihi - Loxops sagittirostris
Akialoa - Hemignathus obscurus
Ula-ai-hawane - Ciridops anna
Mamo - Drepanis pacifica
Lesser Koa Finch - Psittirostra flaviceps
Greater Koa Finch - Psittirostra palmeri
Grosbeak Finch - Psittirostra kona

ENDANGERED

Hawaiian Hawk - Buteo solitarius
Hawaiian Crow - Corvus hawaiiensis [=tropicus]
Hawaii Creeper - Oreomyzta [=Loxops] mana
Hawaii Akepa - Loxops coccineus coccineus
Akiapolaau - Hemignathus monroi [=wilsoni]
Ou - Psittirostra psittacea
Palilia - Loxioides [=Psittirostra] bailleui
Hawaii Dark-rumped Petrel - Pterodroma phaeopygia sandwichensis

THREATENED

Newell's Shearwater - Puffinus auricularis newelli

NOT LISTED

Hawaiian Thrush - Phaeornis obscurus obscurus
Elepaio - Chasiempis sandwichensis
Hawaii Amakihi - Loxops virens virens
Apapane - Himantione sanguinea sanguinea
Iiwi - Vestiaria coccinea

The designated status and common names used herein are those of the U.S. Fish and Wildlife Service (April 10, 1987; 50 CFR 17.11 and 17.12).

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CHECKLIST OF PROPOSED FENCELINE AREA PLANTS
KEAUHOU RANCH AND KILAUEA FOREST
February 24 & 25, 1993

(Survey by Linda Cuddihy)

Symbols

Status

- E - Endemic, native only to the Hawaiian Islands
- I - Indigenous, native to the Hawaiian Islands and elsewhere
- X - Exotic, introduced, not native to the Hawaiian Islands

* Designates plant taxa under review for endangered or threatened status (candidates) as of February 1, 1993.

STATUS

CLUB MOSSES

Lycopodiaceae

Lycopodium serratum Thunb.
Wawae'iole

E

FERNS

Aspidiaceae

Ctenitis rubiginosa

E

Pauoa

Dryopteris fusco-atra

E

Dryopteris glabra

E

Kilau

Dryopteris glabra X

D. hawaiiensis

E

Dryopteris parallelogramma

I

Lau-kahi

Dryopteris unidentata

'Akole

Dryopteris wallichiana

Aspleniaceae

Asplenium lobulatum

I

Pi'ipi'i-lau-manamana

Asplenium macraei

E

'Iwa'iwa lau-li'i

Asplenium normale

I

Monosoral spleenwort

Asplenium polyodon

E

Athyriaceae

Athyrium microphyllum

E

'Akolea

Athyriopsis japonicum

X

Diplazium sandwichianum

E

Ho'i'o

Blechnaceae

Sadleria cyathioides

E

Sadleria pallida

Ama'u

Sadleria souleytiana

E

Ama'u

Dennstaedtiaceae

Microlepia strigosa

I

Palapalai

Dicksoniaceae	
<u>Cibotium chamissoi</u>	E
Hapu'u 'i'i	
<u>Cibotium glaucum</u>	E
Hapu'u pulu	
Elaphoglossaceae	
<u>Elaphoglossum hirtum</u>	
var. <u>micans</u>	I
<u>Elaphoglossum wawrae</u>	E
'Ekaha, laukahi-nunui	
Gleicheniaceae	
<u>Dicranopteris linearis</u>	I
Uluhe	
<u>Sticherus owhyensis</u>	E
Hawaiian sticherus	
Grammitaceae	
<u>Adenophorus tamariscinus</u>	
var. <u>tamariscinus</u>	E
Wahine-noho-mauna	
<u>Adenophorus tripinnatifidus</u>	
<u>Grammitis hookeri</u>	E
Maku'e-lau-li'i	
<u>Grammitis tenella</u>	
Kolokolo	
<u>Xiphopteris saffordii</u>	E
Kihi	
Hemionitidaceae	
<u>Coniogramme pilosa</u>	E
Lo'ulu	
Hymenophyllaceae	
<u>Mecodium recurvum</u>	E
Ohia ku	
<u>Sphaerocionium lanciolum</u>	E
Palai hinahina	
<u>Vandenboschia davallioides</u>	E
Kilau	
Marattiaceae	
<u>Marattia douglasii</u>	E
Pala, Douglas mulesfoot fern	
Nephrolepidaceae	
<u>Nephrolepis cordifolia</u>	I
Polyodiaceae	
<u>Pleopeltis thunbergiana</u>	I
'Ekaha 'akolea	
<u>Polypodium pellucidum</u>	E
'Ae	

Pteridaceae		
<u>Pteris excelsa</u>		I
Waimaka-nui		
<u>Pteris irregularis</u>		E
Mana, 'ahewa		
Thelypteridaceae		
<u>Pneumatopteris sandwicensis</u>		E
Ho'i'o-kula		
	GYMNOSPERMS	
Taxodiaceae		
<u>Sequoia sempervirens</u>		X
Coast redwood		
	ANGIOSPERMS	
Apocynaceae		
<u>Alyxia oliviformis</u>		E
Maile		
Aquifoliaceae		
<u>Ilex anomala</u>		E
Kawa'u		
Araliaceae		
<u>Cheirodendron trigynum</u>		
var. <u>trigynum</u>		E
'Olapa, olapalapa		
Asteraceae		
<u>Erechtites valerianifolia</u>		X
Campanulaceae		
* <u>Clermontia lindseyana</u>		E
<u>Clermontia montis-loa</u>		E
<u>Cyanea degeneriana</u>		E
<u>Cyanea pilosa</u>		
subsp. <u>longipedunculata</u>		E
Celastraceae		
<u>Perrottetia sandwicensis</u>		E
Olomea		
Ericaceae		
<u>Vaccinium calycinum</u>		E
'Ohelo-kau-la'au		
Fabaceae		
<u>Acacia koa</u>		E
<u>Lotus sp.</u>		X

Gesneriaceae	
<u>Cyrtandra lysiosepala</u>	E
<u>Cyrtandra platyphylla</u>	E
Hydrangeaceae	
<u>Broussaisia arguta</u>	E
Kanawao, pu'aha nui	
Juncaceae	
<u>Juncus effusus</u>	X
Japanese mat rush	
<u>Juncus planifolius</u>	X
Lamiaceae	
* <u>Phyllostegia velutina</u>	E
<u>Stenogyne calaminthoides</u>	E
Hawaiian stenogyne	
<u>Stenogyne macrantha</u>	E
<u>Stenogyne scrophularioides</u>	E
Myoporaceae	
<u>Myoporum sandwicense</u>	E
Naio	
Myrsinaceae	
<u>Myrsine lessertiana</u>	E
Kolea-lau-nui	
Myrtaceae	
<u>Metrosideros polymorpha</u>	
var. <u>glaberrima</u>	E
Lehuahamae, 'ohia-ku-makua	
<u>Metrosideros polymorpha</u>	
var. <u>incana</u>	E
'Ohia lehua	
Phytolaccaceae	
<u>Phytolacca sandwicensis</u>	E
Popolo-ku-mai, Hawaiian pokeweed	
Piperaceae	
<u>Peperomia cookiana</u>	E
'Ala'ala-wai-nui	
<u>Peperomia hypoleuca</u>	E
'Ala'ala-wai-nui	
<u>Peperomia macraeana</u>	E
'Ala'ala-wai-nui	
<u>Peperomia membranacea</u>	E
'Ala'ala-wai-nui	
Polygonaceae	
<u>Polygonum punctatum</u>	X
Water smartweed, knotweed	
<u>Rumex giganteus</u>	E
pawale	

Rosaceae
Rubus hawaiiensis E
 'Akala X
Rubus rosifolius
 Thimbleberry

Rubiaceae
Coprosma ochracea E
 Pilo
Hedyotis terminalis E
 Manono
Nertera granadensis E
 Makole
Psychotria hawaiiensis
 var. hillebrandii E
 Kopiko

Rutaceae
Melicope clusiifolia E
 Alani, clusia-leaved Melicope
Melicope pseudoanisata E
 Alani

Urticaceae
Pipturus albidus E
 Mamaki
Urera glabra E
 Opuhe

MONOCOTS

Cyperaceae
Carex alligata E
 Hawaiian sedge
Uncinia uncinata I

Liliaceae
Astelia menziesiana E
 Pa'iniu

Poaceae
Ehrharta stipoides X
 Meadow rice grass
Paspalum urvillei X
 Vasey grass
Pennisetum clandestinum X
 Kikuyu grass

Smilacaceae
Smilax melastomifolia E
 Hoi-kuahiwi

APPENDIX E

ENVIRONMENTAL ASSESSMENT: PROPOSED KILAUEA FOREST

NATIONAL WILDLIFE REFUGE, Department of the Interior,

U.S. Fish and Wildlife Service, June, 1990.

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I. SUMMARY

Project Name: Fence Construction, Kilauea Forest and Pu'u Maka'ala Natural Area Reserve

Proposing Agencies: State Department of Land and Natural Resources
Division of Forestry and Wildlife

State Department of Public Safety
Kulani Correctional Facility

U.S. Department of Interior
National Park Service
U.S. Fish and Wildlife Service

Kamehameha Schools Bishop Estate
Department of Forestry and Natural Resources

Approving Agency: State Department of Land and Natural Resources

Project Location: Waiakea, South Hilo, Hawai'i, TMK: 2-4-08-25,
'Ola'a, Puna, Hawai'i, TMK: 1-9-01-1, and
Kilauea, Ka'u, Hawai'i, TMK: 9-9-01-7

Agencies Consulted During EA Preparation:

Federal: U.S. Department of Agriculture
Natural Resources Conservation Service

U.S. Department of Interior
Fish and Wildlife Service
National Biological Service
National Park Service

State: Department of Land and Natural Resources
Division of Forestry and Wildlife-Hawaii
Division of Land Management-Hawaii
Historic Preservation Division
Natural Area Reserve System Commission
Office of Conservation and Environmental Affairs

Department of Public Safety
Kulani Correctional Facility

County: Department of Water Supply
Planning Department

Private: Bishop Museum
Conservation Council for Hawaii
Hawaii Audubon Society
Kamehameha Schools Bishop Estate
Native Hawaiian Advisory Commission
Native Hawaiian Legal Corporation
Natural Resources Defense Council
The Peregrine Fund
Pig Hunters of Hawaii
Sierra Club Legal Defense Fund
Sierra Club, Moku Loa Group
The Nature Conservancy of Hawaii
Volcano Community Association
Wildlife Conservation Association of Hawaii, Hilo Chapter

'Ola'a Kilauea Group Members:

State Department of Land and Natural Resources
Division of Forestry and Wildlife
State Department of Public Safety
Kulani Correctional Facility
U.S. Department of Interior
National Park Service
U.S. Fish and Wildlife Service
Kamehameha Schools Bishop Estate
Department of Forestry and Natural Resources

Project Action Summary:

The Division of Forestry and Wildlife (DOFAW), Natural Area Reserves program (as lead), in a cooperative effort with the U.S. Fish and Wildlife Service (USEWS), Hawaii Volcanoes National Park (HVNP), Kulani Correctional Facility (KCF), and Kamehameha Schools Bishop Estate (KSBE), proposes constructing two (2) fence lines across portions of the above parcels as part of ongoing efforts to protect native forest ecosystems, and rare, threatened, and/or endangered flora and fauna found within these ecosystems. The project involves clearing by hand a corridor no more than six feet wide,

and erecting a fence using galvanized steel posts, one strand of barbed wire along the bottom, and thirty-nine inch hog wire. These fences will create two large management units totaling 3,750 acres. The ultimate goal of the project is to control feral pig populations within the two management units to zero density.

Land ownership over the project site is both public and private, including 1,450 acres of Pu'u Maka'ala Natural Area Reserve and 2,300 acres of the Kilauea Tract owned by KSBE. Adjacent lands include 'Ola'a Tract of HVNP, Keauhou Ranch, and the Kulani Correctional Facility. All project lands are within the Conservation District. Maps indicating land ownership and each proposed fence line can be found in Appendix A.

Project Purpose and Need:

Installation of these proposed fence lines will help to more efficiently and effectively control populations of feral pigs (*Sus scrofa*) in the project area. Feral pigs pose the greatest threat to existing intact native wet forest areas. Pigs consume and trample understory plants, create conditions for non-native plant infestation and establishment, prevent the establishment of ground-rooting native plants, serve as vectors for the dispersal of non-native plants, and disrupt soil nutrient cycling. The cumulative effects are the decline of intact native forest ecosystems, including the decline of suitable habitat for threatened and endangered forest birds, plants, and invertebrates. The project area is essential habitat for five (5) endangered forest bird species, and no less than fifteen (15) listed, proposed or candidate endangered plant species. See Appendices B and C for a complete listing of the endangered, threatened and rare flora and fauna found within the project area, respectively.

Projects such as this are aimed at protection of ecosystems, or plant and animal communities, as opposed to particular species. If long-term viability of rare and endangered native organisms is to be achieved, protection of large tracts of land needs to be achieved. This is in keeping with the USFWS policy of an "ecosystem approach" focusing on management of natural communities, and with the Natural Area Reserve Law, which states a system of reserves be established to "...preserve in perpetuity specific land and water areas which support communities, as unmodified as possible, of the natural flora and fauna..." (Chapter 195, Hawaii Revised Statutes).

II. PROJECT DESCRIPTION

General

The proposed fence lines will utilize 39" high galvanized hog wire fence fabric with a basal strand of galvanized barbed wire. The fencing fabric will be supported by galvanized steel fence posts placed no more than 10 feet apart along the entire length of

the fence line. Shorter steel pins will be used as anchors within the 10 foot span. The fence alignment will be cleared by hand to a width of no more than 6 feet.

Location

The project area is located on the eastern flank of Mauna Loa, in the lands of Kilauea, 'Ola'a and Waiakea. It is approximately 22 miles southwest of Hilo, and seven miles northwest of Volcano village, between 4,620 feet and 5,440 feet in elevation. The two proposed fences will tie in to existing fence within the Pu'u Maka'ala Natural Area Reserve (NAR). They will run parallel to each other, approximately 1.5 miles apart across NAR land and Kilauea Forest (KSBE) to the boundary between Kilauea and Keauhou Ranch. The "mauka" line will run from the base of Kulani Cone, on its northwest side, adjacent to the existing access road, to the Kilauea-Keauhou boundary, on a bearing of 265 degrees. This line starts at 5,200 feet elevation and terminates at 5,440 feet. The "makai" line will run from a corner of existing fence within the Pu'u Maka'ala NAR, at 4,620 feet elevation to the Kilauea-Keauhou boundary, on a bearing of 270 degrees. The makai line terminates at an elevation of 5,120 feet.

Project Progression

Progression of the project is as follows: In the first phase the fence corridor is cleared with hand tools and small power tools. As stated above, this clearing is done no more than six feet in width.

The second phase is actual installation of the fence. Materials will be flown in by helicopter. All construction work will be done with hand tools. This construction involves driving galvanized steel fence posts into the ground along the corridor no more than ten feet apart, attaching one strand of galvanized barbed wire along the posts at ground level, and stretching thirty-nine inch high, galvanized hog wire along the posts. Where necessary, anchor posts will be used along the fence, between the posts, to ensure the fencing is tight to the ground. Transport of fence materials into the fenceline corridor by helicopter will be conducted between July and December to minimize any impacts of this activity on nesting forest birds.

III. DESCRIPTION OF AFFECTED ENVIRONMENT

Flora

The project area is dominated by two different natural forest communities, the 'Ohi'a/Hapu'u Montane Wet Forest, and the Koa/'Ohi'a Montane Wet Forest. A majority of the area is in the Koa/'Ohi'a forest type, and the entire area is dominated by hapu'u (tree fern, Cibotium spp.) in the understory. These natural communities within the project area are notable for their high degree of diversity and general lack of

invasive, problematic weed species. They also contain a relatively large number of notable plant species, including 3 listed as endangered, and several more that are considered candidates for listing. Additionally, the area contains the larger of two known natural populations of Vicia menziesii, the endangered Hawaiian vetch. A complete listing of endangered and otherwise rare plants known to exist in the area can again be found in Appendix B.

Botanical surveys of each proposed fence corridor were completed and the plant lists are in Appendix D. Forty-one species of ferns and club mosses were found along the proposed lines, forty of which are native. Fifty seed-bearing plants were identified, forty of which were native. Notable plant species found along or near the proposed fence corridors include Clermontia linseyana, a member of the lobelia family, which is listed as endangered by both the federal and state governments, and Phyllostegia velutina, a native mint which is a candidate for listing.

Fauna

Animal life in the area consists of native and non-native bird species, invertebrates such as snails and insects, and both large and small mammals such as feral pigs, dogs, mongooses, rats, and cats. Cattle from adjoining ranches have, on occasion, gotten into the forest area. The project area is notable for its populations of listed endangered native forest birds, and is considered essential habitat for the 'akepa, Hawaii creeper, 'akia pola'au, and the 'o'u. The endangered Hawaiian Hawk, or 'i'o, can also be found throughout the area. More common native forest birds found in the area include 'elepaio, 'amakihi, 'i'iwi, 'apapane, and 'oma'o. A complete listing of the endangered and more common forest bird species found in the area is in Appendix C. (Information on the fauna in the area is taken from Proposed Kilauea Forest National Wildlife Refuge Environmental Assessment, U. S. Department of Interior, Fish and Wildlife Service, 1990. A copy is attached in Appendix E.)

Sensitive Habitats

Given the information presented above in the Flora and Fauna sections, the entire project area can be considered as sensitive habitat, particularly with regard to listed endangered plants and birds. The overall long-term goal in management of the area, though, is protection of the intact native ecosystems in perpetuity. While construction of the fenceline will entail a certain level of ground and noise disturbance, the long-term benefits of eventual complete removal of all feral pigs, which is impossible without fencing to restrict animal movement, far outweighs the limited effects of fence construction within the six foot corridor.

Socio-Economic Impacts

The project area is utilized by public hunters frequently. Most of the area is

privately-owned KSBE land and not legally available to public hunters. The adjacent state-owned lands of Pu'u Maka'ala NAR are open to public hunting, but there is no barrier to identify the boundary between private- and state-owned lands. The area is used by a number of hunters from the nearby upper Puna and eastern Ka'u communities. A portion of the legal hunting area is currently open seven days a week, with dogs, and the bag limit is set at two pigs per hunter per day. An adjacent area known as the Kulani Buffer Zone is restricted because of its proximity to the Kulani Correctional Facility, and efforts are currently underway to liberalize some of these restrictions.

As efforts to reduce pig populations to maintain certain high-quality native ecosystems continue, the total area available for public hunting will diminish. In early 1994, the DOFAW formed the Natural Areas Working Group to discuss and solve differences among the hunting community, government land managers, and the environmental community. Also involved in the group are community associations, native Hawaiian interests, and a state legislator. The group's goal has been to find solutions whereby each particular interest is met. It has been agreed to that there should be areas where ungulate populations will be kept low, and conversely, other areas managed for high animal/hunting yields. The owners and managers of the proposed project lands, along with the balance of the 'Ola'a Kilauea Group members, feel that the project area is a high priority and needs active, sustained management attention. Consequently, the group feels it appropriate to proceed with the project, being mindful of an ongoing community process designed to address community concerns.

IV. ENVIRONMENTAL IMPACTS

Short-Term Impacts

In the short-term, the actual clearing of the line will cause obvious disturbance to plants along the corridor either by being cut or removed to create the corridor. In the case of hapu'u, all those cut for corridor clearance will be replanted off the line. All rare plants will be clearly marked and pointed out to the crew performing the work to ensure they are not harmed in any way. Soil disturbance is expected to be minimal, and no changes in normal rainwater runoff or percolation are expected. Nor do we anticipate any adverse effects on avifauna and invertebrate fauna. This short-term impact will be far outweighed by the positive long-term benefits to be discussed below.

Long-Term Impacts

This fencing project, while having the short-term impacts described above, will reap long-term benefits by allowing for more efficient and effective control of feral ungulates. The long-term impacts of the fence construction itself can include introduction of non-native weed seeds along the fence corridor because personnel will be traversing the site regularly, and pooling or congregating of feral animals as normal

movement patterns may be disturbed.

The animal control effort will include public hunting, staff hunting, and may include live trapping and subsequent release elsewhere. Active removal of animals by paid staff hunters from Hawaii Volcanoes National Park will be used in the Kulani Cone unit, while public hunting alone will be used in the Wright Road unit. The National Park Service has been authorized and contracted by the U.S. Fish and Wildlife Service to perform the staff control task.

Removal of feral ungulates from wet forest ecosystems, both in the 'Ola'a/Kilauea region and elsewhere in the State, has proven to be of great significance in restoring degraded native ecosystems to a healthier state. It has been well documented that the Kilauea Forest is an excellent example of native Hawaiian montane forest ecosystems. A level of active management is necessary to maintain this and neutralize both existing and future ecosystem threats.

V. MITIGATION MEASURES

The short-term effects identified above are unavoidable. Prior to clearing the line, any endangered or rare plant species will be marked and identified to the crew and crew leader to ensure their protection. No trees or plants larger than three inches in DBH (diameter at breast height) will be cut or damaged, and any hapu'u cut down will be replanted off the line. Also, if any signs indicating the existence of archaeological sites or ruins are found, work on the project will halt immediately and the proper authorities notified. Additionally, use of helicopters to place the fencing materials on the line will be done during the period July through December to avoid any possible disturbance to nesting forest birds.

The possible long-term impacts discussed above will be minimized with a diligent program to neutralize each. Routine fence line inspections will take place at no greater than two months intervals, and with each inspection, personnel will be watching for any new introductions along the fence corridor. If weed seedlings are detected, they will either be pulled immediately or a weed control effort will be organized either by DOFAW or cooperatively between DOFAW, KSBE, and KCF. Inspections will be done either by DOFAW personnel or by conservation workline inmates from KCF that have been trained in identifying non-native plant species and particularly those that pose the most serious threats.

Pooling or congregating of animals, pigs in particular, may occur as a result of blockage of traditional movement patterns. This can, in turn, cause higher than usual disturbance of vegetation and soil near and along fence lines. The occurrence of this will also be detected as the fence line inspections take place, as well as by staff from either DOFAW or HVNP while surveying monitoring transects throughout the project area. If

large animal numbers are detected in specific areas, the public hunting community will be notified, through the regional hunting organizations, so that public hunters can be made aware of high pig density locations. If the animal control effort moves into the "last resort" staff control phase, then staff hunting will be concentrated in these areas showing high levels of animal activity.

VI. ALTERNATIVES CONSIDERED

Four alternatives have been identified and are discussed here.

Alternative 1. Build Both Cross Fences

Follow through with project to full scope and construct two (2) fences. Mauka line will run from the base of Kulani Cone, on its northwest side, adjacent to the existing access road, to the Kilauea-Keauhou boundary, on a bearing of 265 degrees. This line starts at elevation 5,200 feet and terminates 5,440 feet. Makai line will run from a corner of existing fence within Pu'u Maka'ala NAR, at 4,620 feet elevation to the Kilauea-Keauhou boundary, on a bearing of 270 degrees. Makai line terminates at 5,120 feet. Constructing both fences, running parallel between existing fence within the Pu'u Maka'ala NAR, 'Ola'a Tract of HVNP and the Kilauea/Keauhou boundary, will create two large, fenced areas totaling 3,750 acres. The mauka area, or Kulani Cone unit, will enclose 1,360 acres, and the makai area, or Wright Road unit, will enclose 2,390 acres.

This is the preferred alternative.

Alternative 2. Build Mauka Cross Fence Only

This alternative calls for constructing the mauka cross fence only, thereby creating one large (3,750 acre) unit encompassing all of the project area. Fence construction will be limited to the mauka corridor only. While this option alleviates the short-term impacts described above on the proposed makai fence corridor, the long-term effect is that the unit will be too large to effectively control animals.

Previous successful animal control efforts have been done with unit sizes no larger than 2,000 acres, and these were done with paid staff hunters and trained hunting dogs. If complete control is to be attained, the units need to be much smaller than 3,750 acres.

Alternative 3. Build Makai Cross Fence Only

Building the makai cross fence only will create a manageable size unit below the fenceline, but leave the area between the two proposed fences uncontained, and

subsequently unprotected. Control of feral animals in this upper unit will be impossible. The bulk of the individual endangered and rare plant species are found within the upper area, including a large colony of Vicia menziesii. This is the Koa/'Ohi'a Montane Wet Forest ecosystem, which is critical habitat for several species of endangered forest birds.

Alternative 4. No Action

This alternative effectively accepts the deterioration of this unique resource by allowing feral animals to remain. While public hunting occurs in the area, without physical barriers to limit the movement of these destructive animals, it is not adequate, and never will be effective in keeping feral animal numbers low enough to allow these native natural communities to remain viable.

VII. EA PREPARATION INFORMATION

This Environmental Assessment was prepared on behalf of the 'Ola'a Kilauea Group by:

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VIII. LIST OF APPENDICES

Appendix A	Maps of Project Area
Appendix B	Endangered and Rare Plant Species Known to Exist in Project Area
Appendix C	Native Bird Species Known to Exist in Project Area
Appendix D	Proposed Fence Corridor Botanical Survey Plant Lists
Appendix E	Environmental Assessment, <u>Proposed Kilauea Forest National Wildlife Refuge</u> , USFWS, 1990

APPENDIX A

PROJECT AREA MAPS

FIGURE 1. Project Area & Land Ownership

FIGURE 2. Existing and Proposed Fences

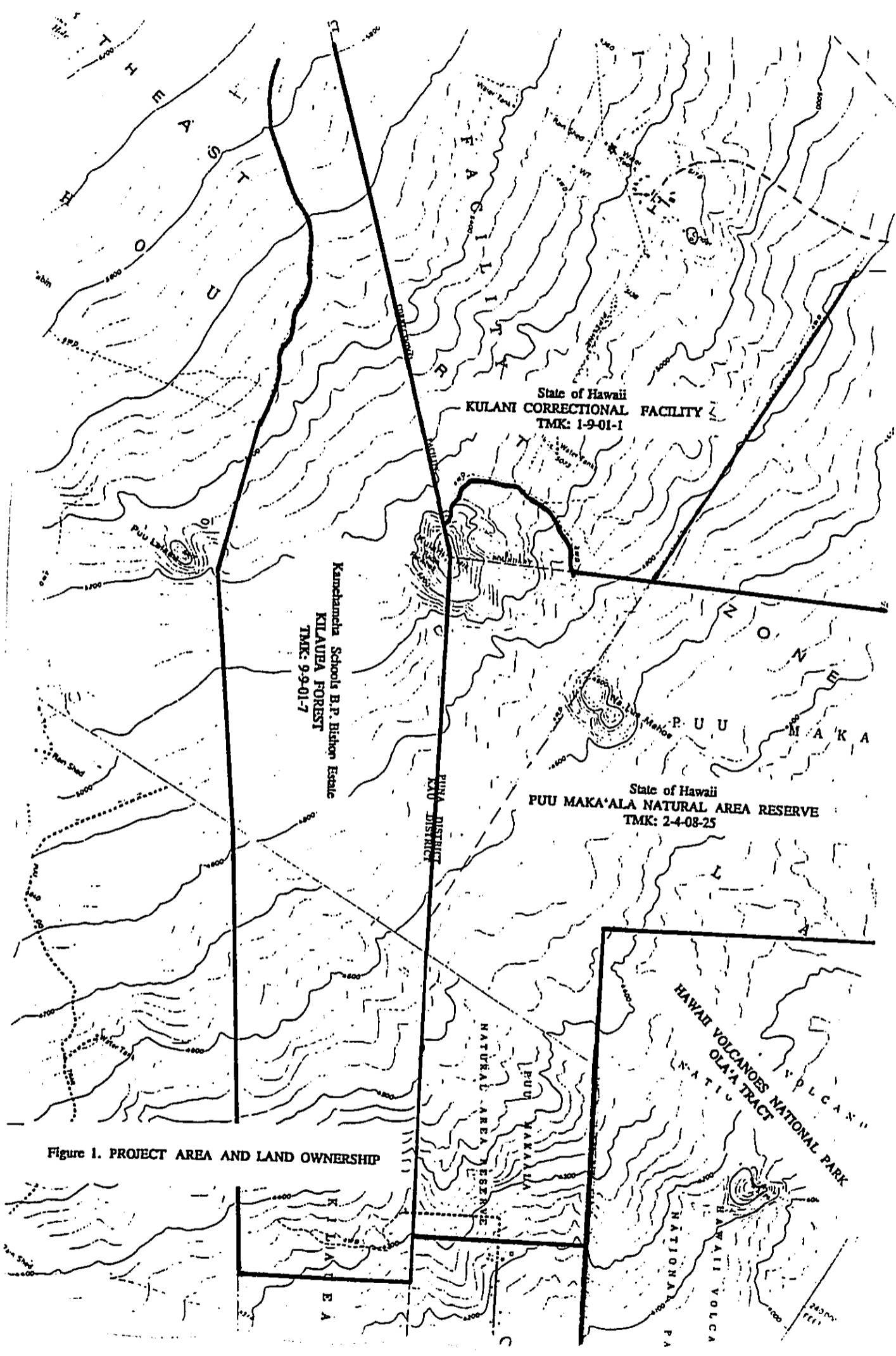


Figure 1. PROJECT AREA AND LAND OWNERSHIP

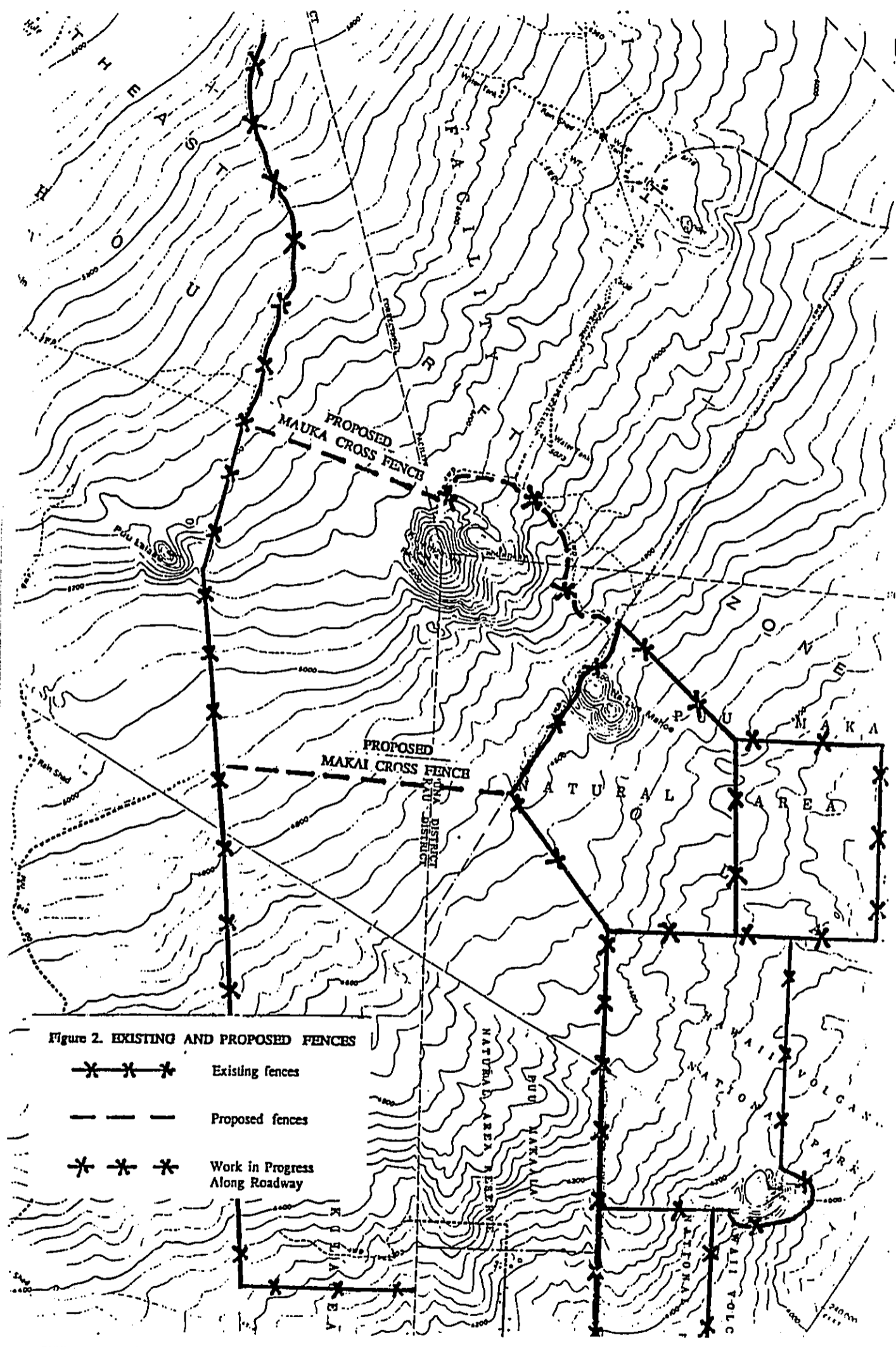


Figure 2. EXISTING AND PROPOSED FENCES

- Existing fences
- Proposed fences
- Work in Progress Along Roadway

APPENDIX B

**ENDANGERED AND RARE PLANT SPECIES KNOWN TO EXIST
IN PROJECT AREA**

<u>NAME</u>		<u>STATUS*</u>
<u>Clermontia lindseyana</u>	'Oha wai	Endangered
<u>Cyanea stictophylla</u>	No common name	Endangered
<u>Vicia menziesii</u>	Hawaiian Vetch	Endangered
<u>Phyllostegia velutina</u>	No common name	Category 1
<u>Asplenium schizophyllum</u>	Spleenwort	Category 2

* Endangered means the species is officially listed as endangered by the Federal and State governments.

Category 1 means there is enough information about the species on hand with the USFWS to substantiate proposing it an endangered species.

Category 2 means there is insufficient information on hand to substantiate listing, though the species is known to be rare.

APPENDIX C

NATIVE BIRD SPECIES KNOWN TO EXIST IN PROJECT AREA

<u>NAME</u>		<u>STATUS*</u>
<u>Loxops</u> <u>coccineus</u>	'Akepa	Endangered
<u>Hemignathus</u> <u>munroi</u>	'Akia pola'au	Endangered
<u>Hemignathus</u> <u>virens</u>	'Amakihi	Common
<u>Himatione</u> <u>sanguinea</u>	'Apapane	Common
<u>Chasiempis</u> <u>sandwichensis</u>	'Elepaio	Common
<u>Oreomystis</u> <u>mana</u>	Hawaii Creeper	Endangered
<u>Vestiaria</u> <u>coccinea</u>	'I'iwi	Common
<u>Buteo</u> <u>solitarius</u>	'Io	Endangered
<u>Myadestes</u> <u>obscurus</u>	'Oma'o	Common in region, rare elsewhere, Big Island only
<u>Psittirostra</u> <u>psittacea</u>	'O'u	Endangered

* Endangered means the species is officially listed as endangered by the Federal and State governments.

APPENDIX D

CHECKLIST OF PROPOSED FENCELINE AREA PLANTS

CHECKLIST OF PROPOSED FENCELINE AREA PLANTS
KEAUHOU RANCH AND KILAUEA FOREST
February 24 & 25, 1993

(Survey by Linda Cuddihy)

Symbols

Status

- E - Endemic, native only to the Hawaiian Islands
- I - Indigenous, native to the Hawaiian Islands and elsewhere
- X - Exotic, introduced, not native to the Hawaiian Islands

* Designates plant taxa under review for endangered or threatened status (candidates) as of February 1, 1993.

STATUS

CLUB MOSSES

Lycopodiaceae

Lycopodium serratum Thunb. E
Wawae'iole

FERNS

Aspidiaceae

Ctenitis rubiginosa E
Pauoa
Dryopteris fusco-atra E
Dryopteris glabra E
Kilau
Dryopteris glabra X
D. hawaiiensis E
Dryopteris parallelogramma I
Lau-kahi
Dryopteris unidentata
'Akole
Dryopteris wallichiana

Aspleniaceae

Asplenium lobulatum I
Pi'ipi'i-lau-manamana
Asplenium macraei E
'Iwa'iwa lau-li'i
Asplenium normale I
Monosoral spleenwort
Asplenium polyodon E

Athyriaceae

Athyrium microphyllum E
'Akolea
Athyriopsis japonicum X
Diplazium sandwichianum E
Ho'i'o

Blechnaceae

Sadleria cyathioides
Sadleria pallida E
Ama'u
Sadleria souleytiana E
Ama'u

Dennstaedtiaceae

Microlepia strigosa I
Palapalai

Dicksoniaceae	
<u>Cibotium chamissoi</u>	E
Hapu'u 'i'i	
<u>Cibotium glaucum</u>	E
Hapu'u pulu	
Elaphoglossaceae	
<u>Elaphoglossum hirtum</u>	
var. <u>micans</u>	I
<u>Elaphoglossum wawrae</u>	E
'Ekaha, laukahi-nunui	
Gleicheniaceae	
<u>Dicranopteris linearis</u>	I
Uluhe	
<u>Sticherus owhyensis</u>	E
Hawaiian sticherus	
Grammitaceae	
<u>Adenophorus tamariscinus</u>	
var. <u>tamariscinus</u>	E
Wahine-noho-mauna	
<u>Adenophorus tripinnatifidus</u>	
<u>Grammitis hookeri</u>	E
Maku'e-lau-li'i	
<u>Grammitis tenella</u>	
Kolokolo	
<u>Xiphopteris saffordii</u>	E
Kihi	
Hemionitidaceae	
<u>Coniogramme pilosa</u>	E
Lo'ulu	
Hymenophyllaceae	
<u>Mecodium recurvum</u>	E
Ohia ku	
<u>Sphaerocionium lanciolum</u>	E
Palai hinahina	
<u>Vandenboschia davallioides</u>	E
Kilau	
Marattiaceae	
<u>Marattia douglasii</u>	E
Pala, Douglas mulesfoot fern	
Nephrolepidaceae	
<u>Nephrolepis cordifolia</u>	I
Polypodiaceae	
<u>Pleopeltis thunbergiana</u>	I
'Ekaha 'akolea	
<u>Polypodium pellucidum</u>	E
'Ae	

Pteridaceae		
<u>Pteris excelsa</u>		I
Waimaka-nui		
<u>Pteris irregularis</u>		E
Mana, 'ahewa		
Thelypteridaceae		
<u>Pneumatopteris sandwicensis</u>		E
Ho'i'o-kula		
	GYMNOSPERMS	
Taxodiaceae		
<u>Sequoia sempervirens</u>		X
Coast redwood		
	ANGIOSPERMS	
Apocynaceae		
<u>Alyxia oliviformis</u>		E
Maile		
Aquifoliaceae		
<u>Ilex anomala</u>		E
Kawa'u		
Araliaceae		
<u>Cheirodendron trigynum</u>		
var. <u>trigynum</u>		E
'Olapa, olapalapa		
Asteraceae		
<u>Erechtites valerianifolia</u>		X
Campanulaceae		
* <u>Clermontia lindseyana</u>		E
<u>Clermontia montis-loa</u>		E
<u>Cyanea degeneriana</u>		E
<u>Cyanea pilosa</u>		
subsp. <u>longipedunculata</u>		E
Celastraceae		
<u>Perrottetia sandwicensis</u>		E
Olomea		
Ericaceae		
<u>Vaccinium calycinum</u>		E
'Ohelo-kau-la'au		
Fabaceae		
<u>Acacia koa</u>		E
<u>Lotus</u> sp.		X

Gesneriaceae	
<u>Cyrtandra lysiosepala</u>	E
<u>Cyrtandra platyphylla</u>	E
Hydrangeaceae	
<u>Broussaisia arguta</u>	E
Kanawao, pu'aha nui	
Juncaceae	
<u>Juncus effusus</u>	X
Japanese mat rush	
<u>Juncus planifolius</u>	X
Lamiaceae	
* <u>Phyllostegia velutina</u>	E
<u>Stenogyne calaminthoides</u>	E
Hawaiian stenogyne	
<u>Stenogyne macrantha</u>	E
<u>Stenogyne scrophularioides</u>	E
Myoporaceae	
<u>Myoporum sandwicense</u>	E
Naio	
Myrsinaceae	
<u>Myrsine lessertiana</u>	E
Kolea-lau-nui	
Myrtaceae	
<u>Metrosideros polymorpha</u>	
var. <u>glaberrima</u>	E
Lehuahamae, 'ohia-ku-makua	
<u>Metrosideros polymorpha</u>	
var. <u>incana</u>	E
'Ohia lehua	
Phytolaccaceae	
<u>Phytolacca sandwicensis</u>	E
Popolo-ku-mai, Hawaiian pokeweed	
Piperaceae	
<u>Peperomia cookiana</u>	E
'Ala'ala-wai-nui	
<u>Peperomia hypoleuca</u>	E
'Ala'ala-wai-nui	
<u>Peperomia macraeana</u>	E
'Ala'ala-wai-nui	
<u>Peperomia membranacea</u>	E
'Ala'ala-wai-nui	
Polygonaceae	
<u>Polygonum punctatum</u>	X
Water smartweed, knotweed	
<u>Rumex giganteus</u>	E
Pawale	

Rosaceae		
<u>Rubus hawaiiensis</u>		E
'Akala		
<u>Rubus rosifolius</u>		X
Thimbleberry		
Rubiaceae		
<u>Coprosma ochracea</u>		E
Pilo		
<u>Hedyotis terminalis</u>		E
Manono		
<u>Nertera granadensis</u>		E
Makole		
<u>Psychotria hawaiiensis</u>		
var. <u>hillebrandii</u>		E
Kopiko		
Rutaceae		
<u>Melicope clusiifolia</u>		E
Alani, clusia-leaved Melicope		
<u>Melicope pseudoanisata</u>		E
Alani		
Urticaceae		
<u>Pipturus albidus</u>		E
Mamaki		
<u>Urera glabra</u>		E
Opuhe		
	MONOCOTS	
Cyperaceae		
<u>Carex alligata</u>		E
Hawaiian sedge		
<u>Uncinia uncinata</u>		I
Liliaceae		
<u>Astelia menziesiana</u>		E
Pa'iniu		
Poaceae		
<u>Ehrharta stipoides</u>		X
Meadow rice grass		
<u>Paspalum urvillei</u>		X
Vasey grass		
<u>Pennisetum clandestinum</u>		X
Kikuyu grass		
Smilacaceae		
<u>Smilax melastomifolia</u>		E
Hoi-kuahiwi		