

STATE OF HAWAII
Department of Land and Natural Resources
Planning Branch
Land Division
Honolulu, Hawaii

August 25, 1999

REF:PB:LT

File No.: MA-2928
180-Day Exp. Date: 10/19/99

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OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

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

Dear Ms. Salmonson:

SUBJECT: Conservation District Use Permit Application #MA-2928
for the Installation of Two (2) Miles of Game Fencing
Around a Twenty (20) Acre Kipuka and a Cinder Gulch at
Puu Pohakea, Kanaio Training Area; TMK: 2-1-02: 01 at
Haleakala, Maui

The Department of Land and Natural Resources has reviewed the comments submitted by your office on the draft environmental assessment (EA) and the Applicant's response to those comments which have been included in the final EA.

Comments received by the Applicant from other agencies during the prescoping period, were included in the draft EA.

A determination is made to issue a Finding of No Significant Impact (FONSI) for the proposed project and ask that the notice of our FONSI be published in the September 8, 1999 OEQC bulletin.

Enclosed are four copies of the final EA and a completed OEQC publication form. If you have questions, please call Lauren Tanaka at 587-0385.

Aloha,



Dean Uchida, Administrator

Enclosures

1999-09-08-MA-FEA-

SEP 8 1999

Final Environmental Assessment

FILE COPY

*** Fence Construction
Kanaio Training Area, Maui**

In accordance with:

Chapter 343, Hawaii Revised Statutes

August 1999

Submitted by:

The Hawaii Army National Guard
Engineering: Environmental Section
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Submitted to:

Department of Land and Natural Resources
Division of Land Management

EXECUTIVE SUMMARY

The Hawaii Army National Guard proposes construction and maintenance of several fenced exclosures for the protection and recovery of the listed endangered species at Kanaio Training Area. The proposed fencing will occur in areas that provide suitable out-planting habitat for species re-introduction throughout the training area (e.g., areas containing native species, few weeds, and suitable soil and microclimate conditions). The fences shall protect native vegetation and endangered species from axis deer and feral goat browsing. Approximately 2 miles of Bezinal® rust-resistant game fence averaging 8 feet in height shall be installed to construct no fewer than 3 re-introduction sites. Once protected, these areas shall serve as an out-plant sites to establish additional populations of species such as the endangered *Sesbania tomentosa* var. *arborea* within the training area. In addition, other similarly imperiled, rare and endangered plants of southeast Maui shall be out-planted within the exclosures. All project lands are State owned and within the Conservation District Subzone. As such, this Environmental Assessment (EA) satisfies the requirements under the state environmental assessment and conservation district use application procedures for consideration of this project's environmental impacts.

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CHAPTER 1. PROPOSED PROJECT SCOPE

1.1 Project Summary

Project Name Fence Construction, Kanaio Training Area, Maui

Project Location Kanaio, Makena, Maui Island
TMK no. 2-1-02:1

Applicant State of Hawaii
Department of Defense
Hawaii Army National Guard
Engineering/Environmental Section
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Approving Agency State Department of Land and Natural Resources
Office of Conservation and Environmental Affairs
P.O. Box 621
Honolulu, Hawaii 96809

Agencies/Individuals Consulted Federal: U.S. Department of Interior
Fish and Wildlife Service
National Park Service
USGS, Biological Resources Division

State: Department of Land and Natural Resources,
Division of Forestry and Wildlife and
Division of Land Management
Historic Preservation Division

County: Planning Department

Private: Ulupalakua Ranch, Living Indigenous
Forest Ecosystems (LIFE)

Timeframe September 1999 - June 2000

1.2 Proposing Agency and Action

The Hawaii Army National Guard (HIARNG), in cooperation with the United States Geological Survey (Biological Resources Division), Haleakala National Park (Resource Management), Ulupalakua Ranch and the Hawaii State Department of Land and Natural Resources (DLNR), proposes to construct exclosures for the protection of rare and endangered species.

The project involves installing approximately 2 miles of 6.25-foot Bezinal® tightlock game fence around several project sites at Kanaio Training Area on the southeast flank of Haleakala, Maui to include the following: a 20 acre kipuka (an island of vegetation surrounded by a recent lava flow) at the southeastern section of the property, and a cinder gulch at Pu'u Pohakea (less than 1 acre).

This project contributes to an ongoing HIARNG effort to restore native ecosystems, as stipulated in an informal Section 7 Consultation under the Endangered Species Act with the United States Fish and Wildlife Service. The construction of the fence may likely facilitate the successful re-introduction of rare and endangered species by providing protection from feral ungulate browsing.

1.3 Purpose of Environmental Assessment

Kanaio Training Area occurs within the State Conservation District. Therefore, the project is subject to preparation of environmental documentation per requirements of Chapter 200, Title 11, Hawaii Administrative Rules (HAR), and Chapter 343, Hawaii Revised Statutes as well as application for a Conservation District Use Permit under Chapter 13-5, HAR. As such, this Environmental Assessment (EA) satisfies the requirements under both statutes for consideration of this project's potential environmental impacts.

1.4 Project Purpose and Need

The mission of the Army National Guard is to maintain military readiness while protecting the environment. The U.S. Army Regulation 200-4 states that "it is an Army goal to systematically conserve biological diversity on Army lands within the context of its mission." The Army also recognizes the importance of habitat management as the key to effective conservation of biological diversity. In order to uphold this mandate, the Hawaii Army National Guard is entering into an inter-agency agreement with Resource Management of the Haleakala National Park, Biological Resources Division of the U.S. Geological Survey, the non-profit Living Indigenous Forest Ecosystems (LIFE), and the Division of Forestry and Wildlife of the DLNR. The purpose of the agreement is to fence and restore the native ecosystems of Kanaio Training Area on the island of Maui.

The only Maui population of the endangered *Sesbania tomentosa* var. *arborea* occurs on the cinder slopes of Pu'u Pimoe. Wildfires, weeds and feral ungulate grazing threaten this population warranting the establishment of additional populations in the area. HIARNG proposes to establish several separate and protected populations of this and other rare plants within the fenced enclosures, in order to assure the continued survival of these species.

The proposed exclosures would allow effective control of feral goats and axis deer ingress to the project area. These animals pose a major threat to existing native ecosystems and impede restoration efforts. We will remove goats and deer from the exclosure project areas to allow for a browse-free sanctuary for the restoration of native, rare and endangered

species. The proposed exclosure sites, such as a coastal kipuka, are relatively free of fire threats because barren lava completely surrounds this site and a predominantly native shrub cover of *Dodonaea viscosa* already exists.

In addition to the *Sesbania tomentosa* var. *arborea*, the HIARNG intends to out-plant other, similarly imperiled, rare and endangered plants of southeast Maui. The establishment of these species within fenced exclosures will afford them protection and allow for a multi-species conservation program. Rare and endangered species for out-planting in the exclosure include the following: *Achyranthes splendens* (endangered), *Bonamia menziesii* (endangered), *Vigna o-wahuensis* (endangered), *Cenchrus agrimonioides* var. *agrimonioides* (endangered), *Capparis sandwichiana* (rare), *Canavalia pubescens* (candidate endangered).

1.5 Summary of Alternatives Considered

The environmental assessment considers the following alternatives: 1) fencing the existing population and 2) no action. Alternative one considers fencing the existing endangered plant population at Pu`u Pimoe to provide protection from feral ungulate browsing. However, this population is considered extremely unstable due to low numbers of reproducing individuals and because fire-adapted, alien plants surround this population. As a result, this population would remain vulnerable to extirpation from fire, despite protection from ungulates. In contrast, the proposed project sites are relatively free of fire-promoting weeds, and in the case of the coastal kipuka is isolated by barren lava flows. Fencing such areas would provide an ungulate and fire free sanctuary for listed endangered species. Consequently, the HIARNG will not consider fencing the existing, unstable Pu`u Pimoe population at this time in lieu of better out-planting habitat. The second no action alternative would leave the endangered *Sesbania tomentosa* in an imperiled condition with no protected habitat; therefore, HIARNG will not consider this alternative.

CHAPTER 2. PROJECT DESCRIPTION

2.1 Site Location and Characteristics

Figures 1, 2 and 3 show the proposed project areas located within the 5,948 acre Kanaio parcel, Makena District (TMK no. 2-1-02:1). At this time the HIARNG is considering 2 site locations for the establishment of 3 exclosures; however more sites may be considered in the future depending on availability of funding and suitable plant habitat. The Pu`u Pohakea site is located about half a mile south east of the existing Pu`u Pimoe wild population of *S. tomentosa*. A graded road currently provides limited access to both cinder cones. The second site consists of an isolated patch of native shrubs comprised mostly of *Dodonea viscosa*, on the remote eastern side of the parcel. The kipuka, or patch of vegetation is supported by older, more weathered substrate and surrounded by a barren, more recent lava flow. The Ho`apili (King's) Trail lies about 250 meters south of the proposed fence exclosure. A 4-wheel drive road on Ulupalakua Ranch land exists about 1.5 kilometers east of the project site; however, the site is only accessible by foot or by helicopter. There are no existing structures or utilities in the project area.

2.2 Fence Specifications, Construction and Timeline

Wooden fence posts shall be spaced and installed at 10 foot intervals, and the game fence shall be maneuvered along the fence posts. The last phase involves installing the top wire, support wires and entryways. The entire construction phase is expected to last between 6 to 8 months. As fence construction nears completion, feral ungulates shall be removed from the exclosures. Fence inspections shall be made on a regular basis to ensure that the area remains ungulate free.

Phase I: The delineated fence line and staging area will be marked with plastic flagging and re-surveyed for the presence of rare or endangered plants and historic sites prior to construction. All potentially sensitive natural and cultural sites shall be flagged to prevent damage by fence construction crews. If necessary, fence alignment shall be shifted to avoid these sites. No significant historic sites or endangered species were located by HIARNG natural and cultural resource staff in the staging areas or on the alignment during preliminary surveys in July and December 1998.

Phase II: Non-vegetated, flat staging sites shall be used for materials and equipment storage and allocation. Workers shall transport materials to the site either on foot, using the existing access roads or via helicopter sling loads.

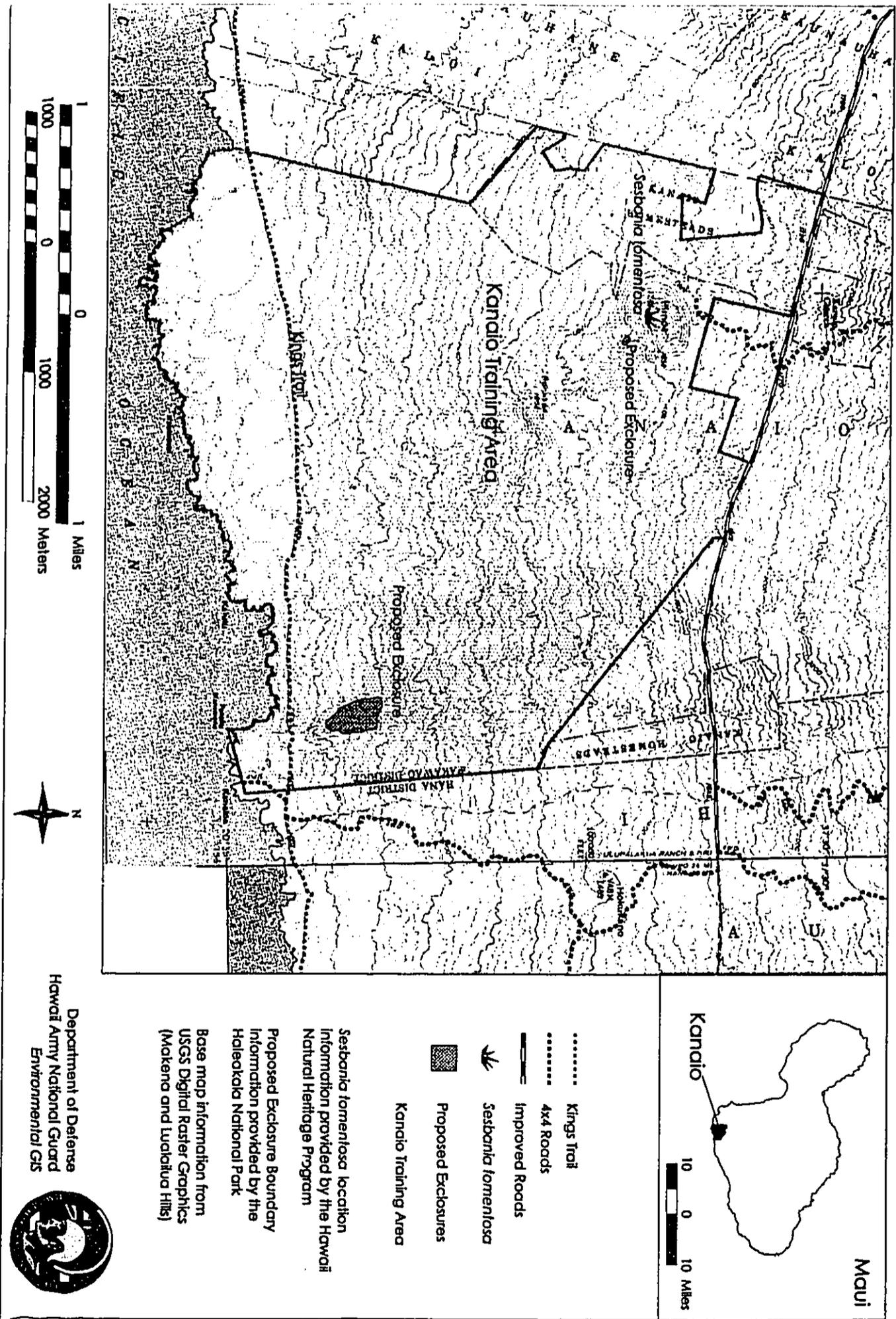


Figure 1. Proposed Site Locations

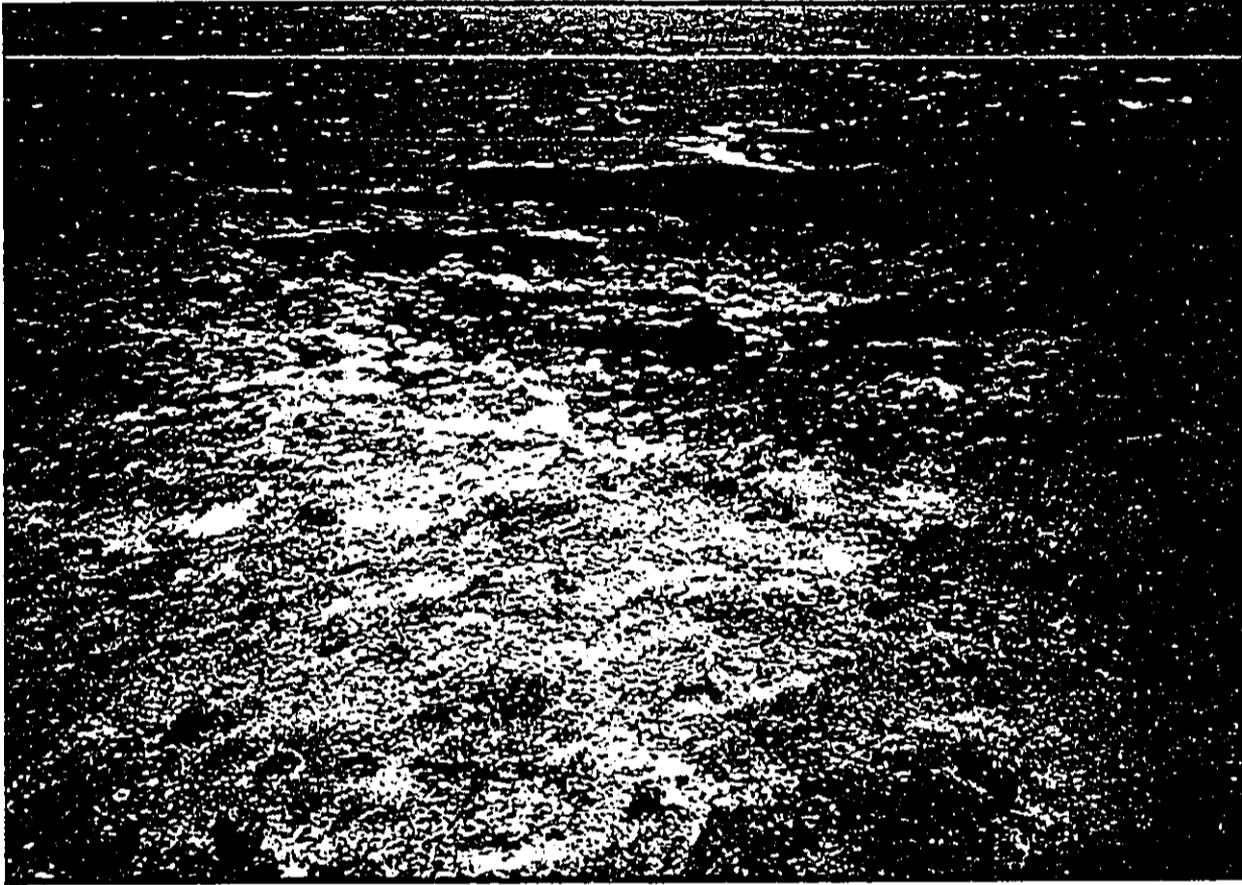


Figure 2. Kipuka site.



Figure 3. Pu`u Pohakea site.

Concurrently, the fence line shall be cleared of woody non-native vegetation no more than 6 feet in width. Minor substrate disturbance (e.g., moving of rocks) shall take place within this corridor.

Phase III: After transporting the fence materials to the staging area, holes will be drilled or dug into the lava or cinder substrate by hand or with small power tools. HIARNG proposes to construct a 6.25 foot tightlock game fence with additional wire aprons in areas (e.g., gulches and pits) to ensure there are no gaps between the bottom of the fence and the ground. HIARNG shall use 10 foot high fence posts, placed at 10 foot intervals to support the fence. Corners of the fence and the fence posts will be braced with tie wire secured to available rocks.

2.3 Native Plant Restoration

The immediate goal of this project is to establish additional populations of *Sesbania tomentosa* var. *arborea* in weed and ungulate-free sanctuaries. The long-term objective of this project is to restore persisting diverse native dryland forest/shrubland through exclusion of ungulates, weed control, seeding and out-planting. In coordination with the Biological Resources Division of Haleakala Field Station, U.S. Geological Survey (USGS-BRD), the HIARNG will out-plant other similarly imperiled, rare and endangered plants of leeward east Maui. As each annual wet season approaches, collected seeds of native plants will be scattered and planted in the completed enclosure. Out-planting of selected rare and endangered species will also be conducted near the beginning of each wet season to maximize chances of successful establishment. Because the sites are still relatively intact and weed free, weed control will be directed towards incipient populations as needed.

Only two extant populations of *S. tomentosa* var. *arborea* occur on Maui and Molokai. The single known population of this species on Maui occurs at Kanaio Training Area. Approximately eight adult plants of *S. tomentosa* var. *arborea* and five sub-adult plants exist naturally on Pu`u Pimoe. HIARNG will emphasize obtaining and out-planting a complete genetic representation of the extant, wild population. Furthermore, HIARNG intends to implement specific management actions to control threats to this and other native species within the enclosure and at the Pu`u Pimoe population. These include conducting population density studies on rodents and insects in order to assess the need for implementing control measures. Should these species pose threats to the population, snap-trapping or bait block stations for rats and general use insecticides for ants (e.g., Amdro ® ant poison) shall be used. Personnel shall apply these pesticides in a manner that is

consistent with the directions and precautions under which the product is registered in Hawaii.

In addition, the most cost-effective methods (out-planting vs. seeding, dry water vs. no dry water) of restoration will be explored. Experimental inoculation of plants with fungal mycorrhizae to enhance survival will be conducted. Monitoring for seedling germination/survival and survival/condition of out-planted individuals will also be conducted at monthly intervals. Individuals will be tagged for ease of relocation. Parameters of size (to determine growth rates) will be measured every six months. The first and subsequent flowering/fruitleting events for each individual will be recorded. Monitoring for establishment of non-native plant species will also be conducted at monthly intervals. Advancements in habitat management derived from this project, can be applied to other dryland habitats throughout the state. Ultimately, the Kanaio restoration project will provide a significant contribution to the on-going conservation efforts in southeast Maui.

CHAPTER 3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Physical Setting

The 5,948 acre Kanaio Training Area lies on the southwest tip of east Maui and extends from the coast to the Pi'ilani Highway at 1800 ft above sea level. The area is largely uninhabited with the exception of a few privately owned homes at the northwestern boundary of the parcel. The mean annual rainfall of the area ranges from about 20 inches at the coast to 25-30 inches near the highway. The topography generally slopes south, with trench-like channels formed by streams of a`a lava which align downslope. The project sites are primarily composed of recent a`a lava flows or cinder substrates supporting some native vegetation cover. Most plant growth occurs during the "wet" season between October and March. According to recent USGS-BRD surveys and the U.S. Fish and Wildlife Service Draft report *Hawaii Army National Guard Rare and Endangered Species Surveys for Maui Nui (1998)*, no listed endangered plants or animals occur in the project areas or along the proposed fence lines. For a complete flora and fauna listing of the training area, see Appendices.

3.2 Flora

The majority of the vegetation cover at the project sites consists of *Dodonea viscosa*. Other native trees in the area include *Rauvolfia sandwicensis* and *Reynoldsia sandwicensis*. This shrubland/forest type was once common in the leeward lowlands of the Hawaiian islands; however, it has been almost completely extirpated by the combined affects of agriculture, fire and invasion of non-native plants. Apart from some individuals of *Prosopis pallida* and *Lantana camara*, there are relatively few non-native plants, except along the outer boundary (e.g., the fence line) and in isolated areas.

3.3 Fauna

Mostly non-native vertebrates inhabit the proposed enclosure area. Feral goats (*Capra hircus hircus*) frequent the area and signs of axis deer (*Axis axis*) exist near the coastal fence site. Other problematic non-native vertebrates, such as the black rat (*Rattus rattus rattus*), the Polynesian rat (*Rattus exulans hawaiiensis*), and the European house mouse (*Mus domesticus*) probably occupy the area on a seasonal basis. Other non-native birds that may frequent Kanaio include the following: grey francolins (*Francolinus podicerianus*), black francolins (*Francolinus francolinus*), Japanese white-eyes (*Zosterops japonicus*), common mynas (*Acridotheres tristis*), rock doves (*Columba livia*), northern cardinals (*Cardinalis cardinalis*), nutmeg mannikins (*Lonchura punctulata*), skylarks (*Alauda arvensis*), house finches (*Carpodacus mexicanus*), northern mockingbirds (*Mimus polyglottos*), barn owls (*Tyto alba*), and house sparrows (*Passer domesticus*). Besides the

native Hawaiian owl (*Asio flammeus sandwichensis*), which may pass through the area occasionally, no native birds are known to exist in the area.

Rare or endangered invertebrate species probably do not regularly inhabit the area. The candidate endangered Hawaiian hawk moth (*Manduca blackburni*) persists in parts of the Kanaio Training Area, but does not inhabit the project areas due to lack of host plants. Native invertebrates that may exist in the project areas include the yellow-faced bee (*Hylaeus* sp.) and native wasps (*Odynerus* sp. and *Ectemnius* sp.).

3.4 Archaeological Sites

HIARNG cultural resources staff conducted a July and December 1998 archaeological reconnaissance of the proposed project sites. The fence line and staging areas for helicopter landings and equipment storage were archaeologically surveyed to assess potential impacts to archaeological resources. Archaeologists noted several cultural sites and features located within the fence line boundaries and in adjacent areas. The Pu`u Pohakea site contains a complex of rock mounds and agricultural terraces. The coastal kipuka sites also contains a platform and 3 mounds. In addition, the Ho`apili Trail, a National Historic Register prehistoric and historic trail which traverses southeastern Maui, lies 250 meters south of the proposed coastal enclosure. Currently, HIARNG archaeologists and Ogden Environmental cultural resource staff are conducting an inventory of sites and features in accordance with the Kanaio Historic Preservation Plan (1997).

CHAPTER 4. ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION

4.1 Short-term Impacts

The primary impacts from this project will be those associated with construction of the exclosures. Minimal substrate disturbance, noise from helicopter flights, and air pollution from small power tools and from an increase in human activity is unavoidable during the 3 to 4 month construction phase.

The proposed fence line and staging areas occur on either: 1) barren a`a lava gulches with very few shrubs or trees, or 2) sparsely vegetated cinder depressions. In rare instances where common native vegetation removal would occur, HIARNG would cut only those native plants with a basal diameter less than 6 inches. HIARNG's efforts at common native, rare and endangered species restoration and out-planting would likely off-set any impacted vegetation during the construction phase.

Potentially significant archaeological sites are located are located either: 1) within the proposed fence boundaries, or 2) in adjacent areas. Mitigation measures include the following: briefing to construction crews regarding archaeological site presence, flagging and avoiding these sites during construction of the fence, and during all other activities conducted within the exclosure (e.g., monitoring and weed control). The Ho`apili trail shall be avoided completely, as access to the site shall be limited to helicopter sling loads and the use of an adjacent 4-wheel drive road to the east. As a result, this project poses no short-term impacts to the trail or any other potentially significant cultural resources.

4.2 Long-term Impacts

A negative impact of the project could include inadvertent dispersal of non-native seeds and pests via worker equipment, clothing and boots. HIARNG intends to institute a rigorous boot, clothing and gear cleaning protocol during the fence installation, as well as during the restoration and research phases following the fence installation. Because the overall plan includes weed control, HIARNG intends to survey for and eradicate all weeds.

Positive long term impacts include regeneration of native dry forest species currently under threat by feral ungulates, fire and weeds. Native tree species such as `iliahi (*Santalum ellipticum*), hao (*Rauvolfia sandwicensis*), and `aiea (*Nothocestrum latifolium*) which were once common on leeward Haleakala have been largely extirpated from the training area. Former native dryland forests and shrublands have been severely degraded so that the current vegetation of the training area is

sparse and almost completely dominated by non-native plant species, many adapted to fire and ungulate browsing. It is hoped that by providing and maintaining an enclosure free of such disturbances, native plants can reestablish and reproduce.

In addition, beneficial impacts include the protection of potentially significant archaeological sites from feral ungulates. Goats and deer are known to erode archaeological sites by the creation of game trails, constant traversal over sites on these trails, and grazing on and around sites. Furthermore, removing the sites from public access will prevent vandalism and looting. A state site number will be assigned to the archaeological sites, such that they will be entered in the State Historic Preservations Division (SHPD) Inventory of Historic Sites for Hawaii. Ultimately, the fences shall provide long-term protection for cultural resources located within the project areas.

4.3 Socio-economic Impacts

This project will restrict public access into endangered species habitat. The proposed sites are sparsely vegetated and extremely arid, windy and remote. Currently there are no direct roads, trails or foot paths that indicate any regular use of the site locations by the public. As such, no major socio-economic impacts are expected as a result of this project.

Positive social impacts include the restoration of a unique and aesthetically pleasing Hawaiian remnant shrubland, available for nature appreciation, education and research. The project is being undertaken with residents of Kanaio, Ulupalakua Ranch and Living Indigenous Forest Ecosystems (LIFE) who are providing access to the area, and are involved in native species out-planting. Ultimately, the public would benefit from the preservation of an endangered natural community which is nearly extirpated from Hawaii's lowlands.

CHAPTER 5. ALTERNATIVES CONSIDERED AND SIGNIFICANCE DETERMINATION

5.1 Alternative 1: Fence the existing population of *Sesbania tomentosa* in Pu`u Pimoe.

While this action would protect the plants from feral ungulates, fire and alien species threats would still imperil the single wild population of this unique species on Maui. The establishment of a separate, geographically removed population would provide a greater chance of survival for the species in the event of fire or disease. Also, the Pu`u Pimoe population lies near roads and dwellings, which allow easy access and vandalism to the fence. In the future, HIARNG may fence the Pu`u Pimoe, but the most effective immediate action would call for fencing and restoring a second population at a different location.

5.2 Alternative 2: No action.

This alternative would likely result in the eventual extirpation of *Sesbania tomentosa* var. *arborea* from Maui. This plant population represents a unique variety of a protected endangered species. The loss of the population could jeopardize the long term survival of the species by reducing the genetic diversity of this species. Therefore, this alternative is not considered.

5.3 Significance Determination and Supporting Reasons

The construction of exclosures in arid, remote a`a lava flows of south Maui will not obstruct views or limit use of the area as a whole, since the site is situated on rough, inaccessible terrain. The project impacts no environmentally sensitive areas (flood plains, beaches, etc.), and poses no threat of future development or substantial energy consumption. Since there appears to be no sustained activity in the project area, the impact on beneficial uses of the area (agriculture, hunting) and subsequent affects on the economic, social, and health welfare of the immediate community shall be negligible. Avoidance of native plants and cultural resources during the construction phase shall significantly minimize affect on these resources. Impacts on ambient noise and air quality will be unavoidable during the 3 to 4 month construction phase, but will ultimately pose no long term impacts. In addition, weed and pest control shall assist in maximizing native species regeneration and survival.

The long-term effects of this project to restore native ecosystems are beneficial. Feral ungulates are a major threat to biodiversity in Hawaii, and their exclusion in the proposed out-planting sites is essential to the recovery of listed rare and endangered species. With the adoption of specific mitigation measures aimed at preventing damage to natural and cultural sites, the HIARNG expects no significant impacts to

the environment. In consideration of the project's potential environmental effects and mitigation measures, no significant impacts are expected to result from the implementation of the proposed activities.

5.4 EA Preparation Information

This Environmental Assessment was prepared on behalf of the Hawaii Army National Guard by:

Melissa Dumarán, Natural Resource Manager
Trae Merard, Field Ecologist
Dan Huber, Geographic Information Systems Manger
and
Wendy Goodman, Cultural Resources Manager

Appendix A1.
Kanaio Training Area Vascular Plant Species List

Kanaio Training Area Vascular Plant Species List

The vascular plants in the five natural community columns are the native and naturalized vascular plants observed on the Hawaii Heritage Program 1992-1993 field survey. The taxonomy and nomenclature of the flowering plants are according to Wagner et al. (1990). The ferns and fern allies follow Wagner and Wagner (1992).

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis cymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | |
|---------------------------------|---|--------------------------|-------------------|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 |
| FERNS AND FERN ALLIES | | | | | | | |
| | Adiantaceae | | | | | | |
| E | <i>Cheilanthes decipiens</i> (Sm.) W.H. Wagner comb. nov. ined. [<i>Doryopteris decipiens</i> (Hook.) J. Sm.] | Kumuniu | * | | | | * |
| I | <i>Pellaea ternstrofia</i> (Cav.) Link | Kalamoho, cliffbrake | | | | | * |
| N | <i>Pityrogramma calomelanos</i> (L.) Link | Goldfern | | | | | * |
| | Dryopteridaceae | | | | | | * |
| N | <i>Nephrolepis multiflora</i> (Roxb.) Jarrett ex Morton | Kupukupu, ni'ani'au | | | | | * |
| | Ophioglossaceae | | | | | | |
| +E | <i>Ophioglossum concinnum</i> Brack. | Pololei | * | | | | * |
| | Polypodiaceae | | | | | | |
| N | <i>Phymatosorus scolopendria</i> (Burm.) Pic.-Ser. | Laua'e | | | | | * |
| FLOWERING PLANTS: DICOTS | | | | | | | |
| | Aizoaceae (Fig-marigold family) | | | | | | |
| I | <i>Sesuvium portulacastrum</i> (L.) L. | 'Akulikuli, sea purslane | | * | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis cymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | |
|--------|---|-----------------------------|-------------------|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| | Amaranthaceae (Amaranth family) | | | | | | | |
| N | <i>Amaranthus spinosus</i> L. | Spiny amaranth, pakai kuku | | | | | | * |
| | Anacardiaceae (Mango family) | | | | | | | |
| N | <i>Schinus terebinthifolius</i> Raddi | Christmas berry, wilelalki | * | | | | | * |
| | Apocynaceae (Dogbane family) | | | | | | | |
| E | <i>Rauwolfia sandwicensis</i> A. DC | Hao | * | | | | | * |
| | Araliaceae (Ginseng family) | | | | | | | |
| E | <i>Reynoldsia sandwicensis</i> A. Gray | 'Ohe-o-kai, 'ohe kukuluae'o | * | | | | | * |
| | Asclepiadaceae (Milkweed family) | | | | | | | |
| N | <i>Asclepias curassavica</i> L. | Butterfly weed, laulele | | | | | | * |
| N | <i>Asclepias physocarpa</i> (E. Mey.) Schlechter | Balloon plant | * | | | | | * |
| | Asteraceae (Sunflower family) | | | | | | | |
| N | <i>Ageratina adenophora</i> (Spreng.) R. King & H. Robinson | Maui pamakani | * | | | | | * |
| N | <i>Ageratina riparia</i> (Regel) R. King & H. Robinson | Hamakua pamakani | | | | | | * |
| N | <i>Ageratum conyzoides</i> L. | Maile hohono | * | | | | | * |
| N | <i>Baltimora recta</i> L. | | | | | | | * |
| N | <i>Bidens alba</i> (L.) DC var. <i>radiata</i> (Schultz-Bip.) Ballard ex Melchert | | | | | | | * |
| N | <i>Bidens pilosa</i> L. | Spanish needle, beggartick | * | | * | | | * |
| N | <i>Coryza bonariensis</i> (L.) Cronq. | Hairy horseweed, ilioha | * | | | | | * |
| N | <i>Coryza canadensis</i> (L.) Cronq. | Horseweed | | | | | | * |
| E | <i>Dubautia linearis</i> (Gaud.) D. Keck | Na'ena'e | * | | | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis cynosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + - Rare, N - Non-native, I - Indigenous, E - Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | |
|--------|---|-------------------------|-------------------|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| N | <i>Emilia fosbergii</i> Nicolson | Flora's paintbrush | * | | | | | * |
| N | <i>Galinisoga parviflora</i> Cav. | | * | | | | | * |
| E | <i>Gnaphalium sandwicense</i> Gaud. | 'Ena'ena | | | | | | * |
| N | <i>Heterobeca grandiflora</i> Nutt. | Telegraph weed | * | | | | | * |
| N | <i>Hypochoeris glabra</i> L. | Smooth cat's ear | * | | | | | * |
| N | <i>Lactuca serriola</i> L. | Prickly lettuce | * | | | | | * |
| E | <i>Lipochaeta lavatum</i> (Gaud.) DC | Nehe | * | | * | | * | * |
| N | <i>Pluchea symphytisifolia</i> (Mill.) Gillis | Sourbush | | | | | | * |
| N | <i>Sonchus oleraceus</i> L. | Sow thistle, pualele | * | | * | | | * |
| N | <i>Tradax procumbens</i> L. | Coat buttons | * | | | | | * |
| N | <i>Verbesina encelioides</i> (Cav.) Benth. & Hook. | Golden crown-beard | | | * | | | |
| N | <i>Xanthium strumarium</i> L. var. <i>canadense</i> (Mill.) Torr. & A. Gray | Cocklebur, kikania | | | | | | * |
| N | <i>Zinnia peruviana</i> (L.) L. | Puapihi | * | | * | * | * | * |
| | Bignoniaceae | | | | | | | |
| N | <i>Jacaranda mimosifolia</i> D. Don | Jacaranda | * | | | | | |
| | Brassicaceae (Mustard family) | | | | | | | |
| N | <i>Coronopus didymus</i> (L.) Sm. | Swinecress | | | | | | * |
| N | <i>Lepidium virginicum</i> L. | Peppercorn, peppergrass | * | | * | | | * |
| N | <i>Sisymbrium officinale</i> (L.) Scop. var. <i>leiocarpum</i> DC | Hedge mustard | | | | | | * |
| | Cactaceae (Cactus family) | | | | | | | |
| N | <i>Opuntia ficus-indica</i> (L.) Mill. | Prickly pear, panini | * | | | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis gymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + - Rare, N - Non-native, I - Indigenous, E - Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | | |
|--------|--|---------------------------------|-------------------|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | | |
| | Capparaceae (Caper family) | | | | | | | | |
| +E | <i>Capparis sandwichiensis</i> DC | Maipilo, pua pilo | * | | | | | | |
| N | <i>Cleome gynandra</i> L. | Wild spider flower | * | | * | | * | | * |
| | Caryophyllaceae (Pink family) | | | | | | | | |
| N | <i>Silene gallica</i> L. | Small-flowered catchfly | * | | | | | | |
| N | <i>Stellaria media</i> (L.) Vill. | | | | | | | | |
| | Chenopodiaceae (Goosefoot family) | | | | | | | | * |
| N | <i>Chenopodium carinatum</i> R. Br. | Goosefoot, pigweed | * | | | | * | | * |
| N | <i>Chenopodium murale</i> L. | Goosefoot, pigweed | | | | | * | | * |
| E | <i>Chenopodium oahuense</i> (Meyen) Aellen | 'Aheaha, 'aweoweo | * | | * | | * | | * |
| | Convolvulaceae (Morning glory family) | | | | | | | | |
| I | <i>Ipomoea indica</i> (J. Burm.) Merr. | | | | | | | | |
| E | <i>Ipomoea tuboides</i> Degener & Ooststr. | Koali 'awa, koali 'awahia | * | | | | | * | * |
| | | Koali pehu, Hawaiian moonflower | * | | * | | | * | * |
| E | <i>Jacquemontia ovalifolia</i> (Choisy) H. Hallier ssp. <i>sandwicensis</i> (A. Gray) K. Robertson | Pa'u-o-Hi'iaka | | * | | | * | | |
| NP | <i>Merremia aegyptia</i> (L.) Urb. | Hairy merremia | | | | | | | * |
| | Crassulaceae (Orpine family) | | | | | | | | |
| N | <i>Kalanchoe tubiflora</i> (Harv.) Raym.-Hamet | Chandelier plant | | | | | | | * |
| | Cucurbitaceae (Gourd family) | | | | | | | | |
| N | <i>Cucumis dipsacens</i> Ehrenb. ex Spach | Hedgehog gourd, teasel gourd | * | | * | | * | | * |
| N | <i>Momordica charantia</i> L. | Balsam pear | * | | | | * | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis cymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + - Rare, N - Non-native, I - Indigenous, E - Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | |
|--------|---|--|-------------------|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| E | <i>Sigyns pachycarpus</i> Hook. & Arnott | 'Anunu, kupala | * | | | | | * |
| | Ebenaceae (Ebony family) | | | | | | | |
| E | <i>Diospyros sandwicensis</i> (A. DC) Fosb. | Lama, elama | * | | | | | * |
| | Euphorbiaceae (Spurge family) | | | | | | | |
| N | <i>Chamaesyce hirta</i> (L.) Millsp. | Hairy spurge, garden spurge, koko kahiki | * | | | | * | * |
| E | <i>Chamaesyce celastroides</i> (Boiss.) Croizat & Degener var. <i>amplectens</i> (Sherff) Degener & I. Degener | 'Akoko | | | | | * | |
| N | <i>Euphorbia heterophylla</i> L. | Kaliko | | | * | | | * |
| N | <i>Euphorbia pepus</i> L. | Petty spurge | | | | | | * |
| N | <i>Ricinus communis</i> L. | Castor bean, pa'a'ila, koli | | | | | | * |
| | Fabaceae (Pea family) | | | | | | | |
| N | <i>Acacia farnesiana</i> (L.) Willd. | Klu, kolu | | | | | | * |
| N | <i>Chamaecrista nictitans</i> (L.) Moench ssp. <i>patellaria</i> (DC ex Collad.) H. Irwin & Barneby var. <i>glabrata</i> (Vogel) H. Irwin & Barneby | Partridge pea, lauki | * | | * | | | * |
| N | <i>Crotalaria pallida</i> Aiton | Smooth rattlepod | * | | | | | * |
| N | <i>Desmodium sandwicense</i> E. Mey. | Spanish clover, pua pilipili | | | | | | * |
| N | <i>Desmodium tortuosum</i> (Sw.) DC | Florida beggarweed | | | * | | | * |
| E | <i>Erythrina sandwicensis</i> Degener | Williwili | * | | * | | | * |
| N | <i>Glycine wightii</i> (Wight & Arnott) Verde | | * | | | | | * |
| N | <i>Indigofera suffruticosa</i> Mill. | Indigo | * | | | | | * |
| N | <i>Leucaena leucocephala</i> (Lam.) de Wit | Koa haole, haole koa, ekoa | * | | * | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis gymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | |
|--------|---|------------------------------------|-------------------|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| N | <i>Macroptilium lathyroides</i> (L.) Urb. | Wild bean, cow pea | | | * | | | * |
| N | <i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth | Algaroba, mesquite, kiawe | * | | * | | | * |
| N | <i>Senna occidentalis</i> (L.) Link | Coffee senna, mikipalaoa, 'auko'i | | | * | | | * |
| +E | <i>Sesbania tomentosa</i> Hook. & Arnott | 'Ohai | | | | | | * |
| N | <i>Tephrosia purpurea</i> (L.) Pers. var. <i>purpurea</i> | 'Auhuhu, hola | * | | | | | * |
| N | Gentianaceae (Gentian family) | Bitter herb, European centaury | | | | | | * |
| N | <i>Centaurium erythraea</i> Raf. ssp. <i>erythraea</i> | | | | | | | |
| I | Goodeniaceae (Goodenia family) | Naupaka kahakai | * | | | * | | * |
| N | <i>Scaevola sericea</i> Vahl | | | | | | | |
| N | Lamiaceae (Mint family) | Basil | | | | | | |
| I | <i>Ocimum gratissimum</i> L. | | | | * | | | |
| N | <i>Plectranthus parviflorus</i> Willd. | 'Ala'ala wai nui | * | | | | | * |
| N | <i>Salvia coccinea</i> Juss. ex J. A. Murray | Scarlet sage, Texas sage, liilehua | * | | | | | * |
| N | <i>Salvia occidentalis</i> Sw. | West Indian sage | * | | | | | * |
| N | Lauraceae (Laurel family) | Camphor tree | | | | | | * |
| N | <i>Cinnamomum camphora</i> (L.) J. Presl | | | | | | | |
| N | Malvaceae (Mallow family) | Hairy abutilon, ma'o | * | | | | | * |
| N | <i>Abutilon grandifolium</i> (Willd.) Sweet | Cheese weed | | | | | | * |
| N | <i>Malva parviflora</i> L. | False mallow | * | | * | | | * |
| I | <i>Malvastrum coromandelianum</i> (L.) Garcke ssp. <i>coromandelianum</i> | 'Ilima | * | | * | | | * |
| I | <i>Sida fallax</i> Walp. | | * | | * | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
- 2 - *Fimbristylis cymosa* Coastal Dry Grassland
- 3 - 'Ilima Lowland Dry Shrubland

- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | |
|--------|--|---|-------------------|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 |
| NP | <i>Sida rhombifolia</i> L. | | | | | | * |
| | Menispermaceae (Moonseed family) | | | | | | |
| I | <i>Cocculus trilobus</i> (Thunb.) DC | Huehue | * | | | | |
| | Myoporaceae (Myoporum family) | | | | | | |
| I | <i>Myoporum sandwicense</i> A. Gray | Naio, bastard sandalwood | * | | | | * |
| | Nyctaginaceae (Four-o'clock family) | | | | | | |
| N | <i>Boerhavia coccinea</i> Mill. | | * | * | | | * |
| I | <i>Boerhavia glabrata</i> Blume | Alena | * | | | | |
| E | <i>Boerhavia herbstii</i> Fosb. | Alena | | | | * | |
| I | <i>Boerhavia repens</i> L. | Alena | * | | | | * |
| N | <i>Mirabilis jalapa</i> L. | Four-o'clock, marvel of Peru, nani ahiahi | | | | | * |
| | Oxalidaceae (Wood sorrel family) | | | | | | |
| NP | <i>Oxalis corniculata</i> L. | Yellow wood sorrel, 'ihi makole | | | | | * |
| | Papaveraceae (Poppy family) | | | | | | |
| E | <i>Argemone glauca</i> (Nutt. ex Prain) Pope | Pua kala | * | | | | * |
| N | <i>Bocconia frutescens</i> L. | | * | | | | * |
| N | <i>Hunnemannia sumatrana</i> Sweet | Mexican tulip poppy, golden cup | * | | | | * |
| | Passifloraceae (Passion flower family) | | | | | | |
| N | <i>Passiflora foetida</i> L. | Love-in-a-mist, pohapoha | * | | | | * |
| N | <i>Passiflora subpeltata</i> Ort. | White passion flower | * | | | | * |

Key to Natural Communities

1 - 'A'ali'i Lowland Dry Shrubland

2 - *Fimbristylis cymosa* Coastal Dry Grassland

3 - 'Uliua Lowland Dry Shrubland

4 - Niupaka Coastal Dry Shrubland

5 - Alien vegetation

Status Codes: + - Rare, N - Non-native, I - Indigenous, E - Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | | |
|--------|--|------------------------|-------------------|---|---|---|---|--|---|
| | | | 1 | 2 | 3 | 4 | 5 | | |
| | Piperaceae (Pepper family) | | | | | | | | |
| I | <i>Peperomia leptostachya</i> Hook. & Arnott | 'Ala'ala wai nui | * | | | | | | * |
| | Plantaginaceae (Plantain family) | | | | | | | | |
| N | <i>Plantago lanceolata</i> L. | Narrow-leaved plantain | * | | | | | | * |
| | Plumbaginaceae (Plumbago or leadwort family) | | | | | | | | |
| I | <i>Plumbago zeylanica</i> L. | 'Ilie'e | * | | * | | | | * |
| | Portulacaceae (Purslane family) | | | | | | | | |
| N | <i>Portulaca oleracea</i> L. | Pigweed, 'ihi | * | | | | * | | * |
| N | <i>Portulaca pilosa</i> L. | Pigweed, 'ihi | * | | * | | * | | * |
| +E | <i>Portulaca villosa</i> Cham. | 'Ihi | | | * | | | | * |
| | Primulaceae (Primrose family) | | | | | | | | |
| N | <i>Anagallis arvensis</i> L. | Scarlet pimpernel | * | | | | | | * |
| | Rosaceae (Rose family) | | | | | | | | |
| I | <i>Osteomeles anthyllifolia</i> (Sm.) Lindl. | 'Ulei | * | | | | | | * |
| | Santalaceae (Sandalwood family) | | | | | | | | |
| E | <i>Santalum ellipticum</i> Gaud. | 'Iliahi, sandalwood | * | | | | | | |
| | Sapindaceae (Soapberry family) | | | | | | | | |
| I | <i>Dodonaea viscosa</i> Jacq. | 'A'ali'i | * | | | * | | | * |
| | Sapotaceae (Sapodilla family) | | | | | | | | |
| +I | <i>Nesoluma polymetricum</i> (Hillebr.) Baill. | Keahi | * | | | | | | * |
| E | <i>Pouteria sandwicensis</i> (A. Gray) Bohni & Degener | 'Ala'a | * | | | | | | * |

Key to Natural Communities

- 1 - 'A'ali'i Lowland Dry Shrubland
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- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | | |
|-----------------------------------|---|---------------------------|-------------------|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | | |
| | Solanaceae (Nightshade family) | | | | | | | | |
| N | <i>Datura stramonium</i> L. | Jimson weed | * | | | | | | * |
| N | <i>Lycopersicon esculentum</i> Mill. | Tomato | | | | | | | * |
| N | <i>Nicotiana physalodes</i> (L.) Gaertn. | Apple of Peru | * | | | | | | |
| N | <i>Nicotiana glauca</i> R. C. Graham | Tree tobacco | * | | | | | | * |
| +E | <i>Nothoecstrum latifolium</i> A. Gray | 'Aiea | | | | | | | * |
| I | <i>Solanum americanum</i> Mill. | Glossy nightshade, Popolo | | | | | | | * |
| N | <i>Solanum innaeanum</i> Hepper & P. Jaeger | Apple of Sodom | | | * | | | | * |
| | Sterculiaceae (Cacao family) | | | | | | | | |
| I | <i>Waltheria indica</i> L. | 'Uhaloa, hi'aloa | * | | * | | | | * |
| | Thymelaeaceae ('Akia family) | | | | | | | | |
| E | <i>Wikstroemia monticola</i> Skottsb. | 'Akia | * | | | | | | * |
| | Verbenaceae (Verbena family) | | | | | | | | |
| N | <i>Lantana camara</i> L. | Lantana | * | | | | | | * |
| N | <i>Stachytarpheta jamaicensis</i> (L.) Vahl | Jamaica vervain, oi | * | | * | | | | * |
| | Zygophyllaceae (Creosote bush family) | | | | | | | | |
| I | <i>Tribulus cistoides</i> L. | Nohu | | | | | * | * | * |
| FLOWERING PLANTS: MONOCOTS | | | | | | | | | |
| | Agavaceae (Agave family) | | | | | | | | |
| N | <i>Furcraea foetida</i> (L.) Haw. | Mauritius hemp, malina | | | | | | | * |
| | Commelinaceae (Spiderwort family) | | | | | | | | |

Key to Natural Communities

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- 4 - Naupaka Coastal Dry Shrubland
- 5 - Alien vegetation

Status Codes: + = Rare, N = Non-native, I = Indigenous, E = Endemic

| STATUS | TAXON | COMMON NAME | NATURAL COMMUNITY | | | | | | |
|--------|--|-----------------------------|-------------------|---|---|---|---|--|---|
| | | | 1 | 2 | 3 | 4 | 5 | | |
| N | <i>Commelina benghalensis</i> L. | Hary honohono | | | | | | | * |
| | Cyperaceae (Sedge family) | | | | | | | | |
| N | <i>Cyperus gracilis</i> R. Br. | McCoy grass, mau'u hunchune | | | | | | | * |
| I | <i>Cyperus laevigatus</i> L. | Makaloa | | * | | | * | | |
| I | <i>Fimbristylis cymosa</i> R. Br. | | | | | | | | |
| E | <i>Mariscus hillebrandii</i> (Boeck.) T. Koyama | | | * | | | | | * |
| | Poaceae (Grass family) | | | | | | | | |
| N | <i>Bothriochloa pertusa</i> (L.) A. Camus | Pitted beardgrass | | * | | | | | * |
| N | <i>Cenchrus echinatus</i> L. | Common sandbur, 'ume'alu | | | | | | | * |
| N | <i>Cynodon dactylon</i> (L.) Pers. | Bermuda grass, manienic | | * | | | | | * |
| R | <i>Digitaria setigera</i> Roth | Kukaepua'a, itchy crabgrass | | * | | | | | * |
| N | <i>Eleusine indica</i> (L.) Gaertn. | Wiregrass | | | | | | | * |
| E | <i>Eragrostis atropioides</i> Hillebr. | | | * | | | | | |
| N | <i>Eragrostis tenella</i> (L.) P. Beauv ex Roem. & Schult. | Japanese lovegrass | | * | | | | | * |
| R | <i>Heteropogon contortus</i> (L.) P. Beauv. ex Roem. & Schult. | Pili, twisted beardgrass | | * | | * | | | |
| N | <i>Melinis minutiflora</i> P. Beauv. | Molasses grass | | * | | | | | |
| N | <i>Rhynchelytrum repens</i> (Willd.) Hubb. | Natal rairop | | * | | * | | | * |
| N | <i>Setaria verticillata</i> (L.) P. Beauv. | Bristly foxtail | | | * | * | | | * |

Appendix A2.
Kanaio Training Area Animal Species List

Kanaio Training Area Animal Species List Surface Terrestrial and Aquatic Animals

The animals listed below were detected (from visual and/or audio identifications) in the Kanaio Training Area during the Hawaii Heritage Program 1992-1993 aboveground field survey.

Status codes:

- + - Rare
- E - Endemic, native only to the Hawaiian Islands
- I - Indigenous, native to the Hawaiian Islands and elsewhere (includes regular migrants and species which breed in Hawaii)
- A - Alien, not native to the Hawaiian Islands (purposely or accidentally introduced by humans)

| STATUS | SCIENTIFIC NAME (a) | COMMON NAME | STATUS (b) | RANK (c) |
|--------------------|---|-----------------------------------|------------|-----------------|
| MOLLUSKS | | | | |
| I? | Unidentified thiarid sp. | Aquatic snails | | |
| CRUSTACEANS | | | | |
| E | <i>Halocaridina rubra</i> | 'Opae'ua, anchialine pool shrimp | | |
| +E | <i>Metabetaeus lobena</i> | 'Opae'ula, anchialine pool shrimp | C2 | G1 |
| INSECTS | | | | |
| | MOTHS - Lepidoptera: Sphingidae | | | |
| +E | <i>Manduca blackburni</i> | Blackburn Hawk Moth | 3A | not yet tracked |
| | BEES, WASPS, & ANTS - Hymenoptera: Colletidae | | | |
| E | <i>Hylaeus</i> sp. | Yellow-faced Bee | | |
| REPTILES | | | | |
| | GECKOS - Gekkonidae | | | |
| A | <i>Hemidactylus garnoti</i> | Indo-Pacific Gecko, Fox Gecko | | |
| A | <i>Hemidactylus frenatus</i> | House Gecko | | |
| BIRDS | | | | |
| | BOOBIES & GANNETS - Sulidae | | | |
| I | <i>Sula leucogaster plotus</i> | 'A, Brown Booby | | |
| | PHEASANTS, GROUSE & QUAIL - Phasianidae | | | |
| A | <i>Francolinus pondicerianus</i> | Gray Francolin | | |
| A | <i>Phasianus colchicus</i> | Ring-necked Pheasant | | |
| | PLOVERS - Charadriidae | | | |

| STATUS | SCIENTIFIC NAME (a) | COMMON NAME | STATUS (b) | RANK (c) |
|----------------|---|------------------------------|------------|----------|
| I | <i>Pluvialis fulva</i> | Kolea, Pacific Golden-Plover | | |
| | SANDPIPERS & ALLIES - Scolopacidae | | | |
| I | <i>Heteroscelus incanus</i> | 'Uili, Wandering Tattler | | |
| | PIGEONS & DOVES - Columbidae | | | |
| A | <i>Columba livia</i> | Rock Dove | | |
| A | <i>Streptopelia chinensis</i> | Spotted Dove | | |
| A | <i>Geopelia striata</i> | Zebra Dove | | |
| | BARN OWLS - Tytonidae | | | |
| A | <i>Tyto alba</i> | Barn Owl | | |
| | LARKS - Alaudidae | | | |
| A | <i>Alauda arvensis</i> | Eurasian Skylark | | |
| | MOCKINGBIRDS & THRASHERS - Mimidae | | | |
| A | <i>Mimus polyglottos</i> | Northern Mockingbird | | |
| | STARLINGS - Sturnidae | | | |
| A | <i>Acridotheres tristis</i> | Common Myna | | |
| | WHITE-EYES - Zosteropidae | | | |
| A | <i>Zosterops japonicus</i> | Japanese White-eye | | |
| | EMBERIZID FINCHES & ALLIES - Emberizidae | | | |
| A | <i>Cardinalis cardinalis</i> | Northern Cardinal | | |
| A | <i>Paroaria coronata</i> | Red-crested Cardinal | | |
| | OLD WORLD FINCHES & ALLIES - Fringillidae | | | |
| | CARDUELINE FINCHES - (subfamily: Carduelinae) | | | |
| A | <i>Carpodacus mexicanus</i> | House Finch | | |
| | WAXBILLS & ALLIES - Estrildidae | | | |
| A | <i>Lonchura punctulata</i> | Nutmeg Mannikin | | |
| MAMMALS | | | | |
| | WOLVES, JACKALS & ALLIES - Canidae | | | |
| A | <i>Canis familiaris familiaris</i> | Domestic Dog (feral) | | |
| | CIVETS & ALLIES - Viverridae | | | |
| A | <i>Herpestes auropunctatus auropunctatus</i> | Small Indian Mongoose | | |
| | HORSES & ALLIES - Equidae | | | |
| A | <i>Equus asinus asinus</i> | Donkey (domestic) | | |

Kanaio Training Area Animal Species List Animals Detected Within Caves

The animals listed below were detected within caves in the Kanaio Training Area during the Hawaii Heritage Program 1992-1993 survey.

***Community codes:**

- 1 Blind Cricket/Blind Planthopper Lowland Cave (Deep Zone inhabitants, Heliconia Cave)
- 2 Cave Sheetweb Spider/Cave Isopod Lowland Cave (Deep Zone inhabitants, Echo Cave #3)
- 3 *Caconemobius* Cricket Lowland Aeolian Lava Flow (Echo Lava Flow)
- 4 Twilight and Transition Zone inhabitants (Non-obligate subterranean species in outer passages of caves)

Status codes:

- E Endemic, native only to the Hawaiian Islands
A Alien, not native to the Hawaiian Islands (purposely or accidentally introduced by humans)

| STATUS | SCIENTIFIC NAME | COMMON NAME | COMMUNITY* |
|--------------------|---|-----------------------------|------------|
| ARACHNIDS | | | |
| | MITES — Acari | | |
| A? E? | Several unidentified spp. | | 1, 2, 4 |
| | SPIDERS — Aranae | | |
| | Dysderidae | | |
| A | <i>Dysdera crocata</i> | none | 1 |
| | SHEETWEB SPIDERS — Linyphiidae | | |
| E† | <i>Meioneta gagnei</i> | Gagné's Cave Spider | 2 |
| | CELLAR SPIDERS — Pholcidae | | |
| A | <i>Smeringopus elongatus</i> | Elongate Cellar Spider | 1, 4 |
| | SPITTING SPIDERS — Scytodidae | | |
| A | <i>Scytodes longipes</i> | Long-Legged Spitting Spider | 4 |
| | Clubionidae | | |
| A | <i>Cheiracanthium diversum</i> | Pale Leaf Spider | 1 |
| | FUNNEL WEB SPIDERS — Agelinidae | | |
| A | <i>Tegenaria domestica</i> | European House Spider | 4 |
| | MICROWHIPSCORPIONS — Palpigrada: Koeneniidae | | |
| A? | <i>Eukoenenia hansenii?</i> | none | 1 |
| CRUSTACEANS | | | |
| | ISOPODS — Isopoda | | |
| A | Unidentified isopod sp. | | 1, 3 |
| E? | Unidentified isopod sp. | | 1 |

| STATUS | SCIENTIFIC NAME (a) | COMMON NAME | STATUS (b) | RANK (c) |
|--------|--------------------------------------|-----------------------|------------|----------|
| | HOLLOW-HORNED RUMINANTS - Bovidae | | | |
| A | <i>Bos taurus</i> | Domestic Cattle | | |
| A | <i>Capra hircus hircus</i> | Domestic Goat (feral) | | |
| | RATS, MICE & VOLES - Muridae | | | |
| A | <i>Rattus rattus rattus</i> | Roof Rat, Black Rat | | |

- (a) The taxonomy used in this list follows the following sources:
Amphibians and reptiles are according to McKeown (undated), birds are according to Pyle (1992) and Pratt et al. (1987), and mammals are according to Tomich (1986) and Banks et al. (1987).
- (b) Key to Federal Status (USFWS 1991):
C2 - Candidate taxa for which there is some evidence of vulnerability, but for which there are not enough data to support listing proposals at this time.
3A - No longer candidates for listing; taxa for which the USFWS has persuasive evidence of extinction. If rediscovered, such taxa might acquire high priority for listing.
- (c) Key to the Hawaii Heritage Program's Global Ranks:
G1 - Species critically imperilled globally (typically 1-5 current occurrences).

| STATUS | SCIENTIFIC NAME | COMMON NAME | COMMUNITY* |
|------------------|--|--------------------------|------------|
| MYRIAPODS | | | |
| | CENTIPEDES — Chilopoda | | |
| A? | Unidentified geophilomorph sp. | | 3 |
| | MILLIPEDES — Diplopoda | | |
| | Polyxenidae | | |
| E? | <i>Polyxenus</i> sp. | none | 1 |
| | Paradoxosomatidae | | |
| A | <i>Oxidus gracilis</i> | Garden Millipede | 1 |
| | SYMPHYLANS — Symphyla | | |
| A | Unidentified sp. | | 1 |
| INSECTS | | | |
| | SPRINGTAILS — Collembola | | |
| E? | Unidentified blind sp. | | 1 |
| A? | Unidentified blind sp. | | 1 |
| A? | Unidentified eyed sp. | | 1, 2, 3 |
| | SILVERFISHES — Thysanura | | |
| A | <i>Nicoletia phytophila</i> | none | 1 |
| A | <i>Ctenolepisma longicaudatum</i> | none | 3 |
| | COCKROACHES — Blattaria: Blattidae | | |
| A | <i>Periplaneta americana</i> | American Cockroach | 1, 2, 3, 4 |
| | CRICKETS — Orthoptera: Gryllidae | | |
| E§ | <i>Caconemobius</i> sp. nr. <i>howarthi</i> | Maui Cave Rock Cricket | 1 |
| E | <i>Caconemobius fori</i> (?) | Aeolian Rock Cricket | 3 |
| A | <i>Cycloptiloides americanus</i> | Scaley Cricket | 1, 2, 3, 4 |
| A | <i>Gryllodes sigillatus</i> | Flightless Field Cricket | 3 |
| A | <i>Myrmecophila quadrispina</i> | none | 1 |
| | PSOCIDS — Psocoptera | | |
| A | <i>Ectopsocus richardsi</i> | none | 3 |
| A? | Unidentified sp. | | 1, 2, 3, 4 |
| | ASSASSIN BUGS — Heteroptera: Reduviidae | | |
| A | <i>Haematoloecha rubescens</i> | Red Assassin Bug | 1 |
| | MEALYBUGS — Homoptera: Pseudococcidae | | |
| A | <i>Geococcus coffeae</i> | Coffee Root Mealybug | 1 |
| | FEATHER WING BEETLES — Coleoptera: Ptiliidae | | |
| A? | Unidentified ptiliid sp. | | 1 |

| STATUS | SCIENTIFIC NAME | COMMON NAME | COMMUNITY* |
|----------------|-------------------------------------|------------------------|------------|
| | MOTHS — Lepidoptera | | |
| | Cosmopterygidae | | |
| E? | <i>Hyposmocoma</i> ? sp. | none | 3 |
| | Tineidae | | |
| A | <i>Pherocoeca allutella</i> | Household Casebearer | 4 |
| | Noctuidae | | |
| A | <i>Anryna natalis</i> | 'Ilima Moth | 4 |
| E | <i>Schrankia</i> sp. | Cave Moth | 1 |
| | FLIES — Diptera | | |
| | MOTH, FLIES — Psychodidae | | |
| A | Unidentified psychodid sp. (Larvae) | | 3 |
| | BLACK FUNGUS GNATS — Sciaridae | | |
| A? | Unidentified sciarid sp. | | 1, 3 |
| | COFFIN FLIES — Phoridae | | |
| A | <i>Megaselia scalaris</i> | none | 1, 2, 3, 4 |
| E? | <i>Megaselia</i> sp. | none | 1, 2, 3, 4 |
| | ANTS — Hymenoptera: Formicidae | | |
| A | <i>Camponotus variegatus</i> | Hawaiian Carpenter Ant | 3 |
| A | <i>Paratrechina longicornis</i> (?) | Crazy Ant | 3 |
| MAMMALS | | | |
| | RATS, MICE & VOLES — Muridae | | |
| A | <i>Rattus rattus rattus</i> | Roof Rat, Black Rat | 2, 4 |

†HHP plans to initiate tracking of this species. It is tentatively ranked G1G2 (global rank tentative, 1 - 20 current occurrences, insufficient data available to assign definite rank). It has no federal status.

§Because the taxonomic status of this animal is uncertain (it is either a new species or a new population of *Caconemobius howarthi*), it has not been assigned a Heritage Global Rank. *Caconemobius howarthi* is ranked G1G2 by the Heritage Program (global rank tentative, 1 - 20 current occurrences, insufficient data available to assign definite rank) and is a C2 candidate for endangered or threatened status (there is some evidence of vulnerability, but not enough data to support listing proposals at this time) (USFWS 1991).

Appendix A3.
Agencies Consulted.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



MICHAEL D. WILSON
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT S. COLOMA-AGARAN

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

December 18, 1998

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

Mr. Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer

Dear Mr. Young:

Subject: Draft Environmental Assessment for Fence Construction, Kanaio
Training Area.

We have reviewed this draft EA with respect to its impacts on DOFAW's management programs and endangered species in particular. We understand that Mr. Bob Hobdy, Forestry Program Manager of our Maui Branch Office has been working with your agency with the planning process of the fence alignment. Consequently, we do not have any additional comments to offer. Thank you for the opportunity to comment.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Michael G. Buck".

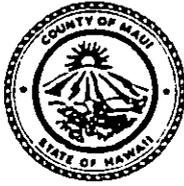
Michael G. Buck
Administrator

Copy: Maui DOFAW Branch

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director



COUNTY OF MAUI
DEPARTMENT OF PLANNING

January 29, 1999

Lieutenant Colonel Richard Young
Hawaii Army National Guard
Facility Management Officer
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Lieutenant Colonel Young:

RE: Special Management Area (SMA) Assessment - For the Installation of Approximately Two (2) Miles of Bezinal® Tightlock Game Fence at the Kanaio Training Area at TMK: 2-1-002:001, Kanaio, Island of Maui, Hawaii (SM5 990006)

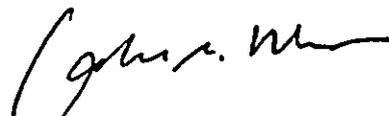
In response to your letter dated December 11, 1998, and in accordance with the Special Management Area (SMA) Rules for the Maui Planning Commission, Section 12-202-12, please be advised that "Development" does not include:

"Use of any land for the purpose of cultivating, planting, growing, and harvesting plants, crops, trees, and other agricultural, horticultural, or forestry products or animal husbandry, or aquaculture or mariculture of plants or animals, or other agricultural purposes."

Inasmuch as the proposed project is not deemed to be a development, an SMA permit is not required.

Thank you for your cooperation. If additional clarification is required, please contact Ms. Simone Bosco, Staff Planner, of this office at 243-7735.

Very truly yours,


JOHN E. MIN
Director of Planning

250 SOUTH HIGH STREET, WAILUKU, MAUI, HAWAII 96793
PLANNING DIVISION (808) 243-7735; ZONING DIVISION (808) 243-7253; FACSIMILE (808) 243-7634

A21

Lieutenant Colonel Richard Young
January 29, 1999
Page 2

JEM:SCB:cmb

c: Clayton Yoshida, AICP, Deputy Director of Planning
Aaron Shinmoto, Planning Program Administrator
Simone Bosco, Staff Planner
LUCA (2)
99/CZM File
General File
S:\ALL\SIMONE\SM5\HIARNG.LTR



IN REPLY REFER TO:

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakala National Park
P.O. Box 369
Makawao, Maui, Hawaii 96768



February 6, 1999

Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Lt-Col. Young:

Subject: Comments on Draft Environmental Assessment For
Fence Construction, Kanaio Training Area

I concur with the need for the project to provide feral ungulate enclosures for out-plantings of listed threatened and endangered (TES) plant species that are known to have been in the Kanaio area. I also concur with the strategy to plan for and to construct an eight-foot high fence, to maintain the fences, to remove alien plants inside the enclosure, and to out-plant and monitor the TES plants.

My specific comments on the document are as follows:

Under 1.2 Proposing Agency and Action, paragraph 3.

I feel the fence "may" rather than "will" facilitate the successful re-introduction of rare and endangered species. The enclosure should be considered a deterrent to axis deer, not deer-proof. Also, the out-plantings may (which is the desired outcome) or may not be successful.

Under 1.4 Project Purpose and Need, paragraph 3.

I feel the coastal kipuka enclosure site should not be considered relatively weed free from weed invasions. There are enough weeds at the site to constitute a formidable eradication task. Though the number of species is low, the volume is not low.

The term "weed free" is used several times within the document. I would prefer "predominantly native" to better

describe the selected sites. Under 4.2 *Long-term Impacts*, the phrasing "the current vegetation of the training area is sparse and almost completely dominated by non-native species" contradicts all statements referring to the selected sites as being nearly "weed free" or my preference of "predominantly native".

Under 2.2 Fence Specifications, Construction and Timeline.

Although the fence construction may last up to 3 to 4 months, The entire time frame may be twice that long dependent on the availability of personnel, helicopter support, HIARNG personnel support, and good weather.

Under 2.2 Phase III.

Due to the height of the fence, gates should be used and not ladders.

Under 2.3 Native Plant Restoration, paragraph 1.

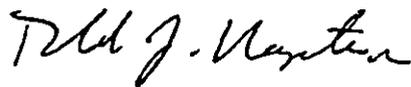
The long term goal lists "limited" weed control as one of the methods of achieving restoration. Yet in 4.2 *Long-term Impacts*, HIARNG "intends to survey for and eradicate all weeds." This is a major undertaking and should not be considered a limited effort. If feral ungulate fencing history repeats itself at Kanaio, there will be an increase in the volume of alien plants due to the removal of browsing animals. There may be new aliens appearing within the exclosures as well as extirpated natives.

Lastly, any reference to Kanaio being in the southeast portion of Maui should be changed to southwest (see 2.3 and 3.1).

Thank you for the opportunity to comment on the EA. It is an ambitious and worthwhile effort that positively justifies the funding being allocated. My apologies for the lateness of my response.

If you or your staff have any questions regarding my comments, please contact me at (808) 572-4490.

Sincerely,



Ronald J. Nagata, Sr.
Chief, Resources Management

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

ORLAN L. PETERSON, JR.
COLONEL
DEPUTY ADJUTANT GENERAL

August 19, 1999

Engineering Office

Mr. Ronald Nagata, Sr.
Chief, Resources Management
National Park Service
Haleakala National Park
Makawao, Hawaii 96768

Dear Mr. Nagata:

Subject: Draft Environmental Assessment (EA), Fence
Construction, Kanaio Training Area, Hawaii Army
National Guard, February 1999

Thank you for your letter of February 6, 1999, regarding the
subject Draft EA.

This is to inform you that your suggested revisions solicited
during the pre-scoping period appear in the published Draft EA of
February 1999, and will be adopted at the project site. We trust
that this letter, in conjunction with the changes made,
adequately addresses your concerns.

If there are any questions, please have your staff contact
Ms. Melissa Dumaran, Natural Resource Manager, at 733-4268 or
733-4267.

Sincerely,


Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer

A25



BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
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August 19, 1999

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Chief, Resources Management
National Park Service
Haleakala National Park
Makawao, Hawaii 96768

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Ms. Melissa Dumarán, Natural Resource Manager, at 733-4268 or
733-4267.

Sincerely,


Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer

A25

United States Geological Survey, Biological Resources Division,
Pacific Islands Ecosystem Research Center, Haleakala Field
Station, P.O. Box 369, Makawao, HI 96768
Phone 808-572-4470 Fax 808-572-1304
E-mail: Lloyd_Looper@usgs.gov

January 11, 1999

Richard Young, Lieutenant Colonel, Engineer
Hawaii Army National Guard
3949 Diamond Head Road
Honolulu, HI 96816-4495

Dear Lieutenant Colonel Young:

Subject: Draft Environmental Assessment for Fence
Construction, Kanaio Training Area

I appreciate the opportunity to review this document. It is quite well done, and my suggestions are only very minor. Since the changes are so minor, I recommend that the document be sent out to the wider audience immediately, and make the changes later if necessary.

In Figure 1, in an otherwise very well done and attractive map, the legend given for the location of the Kanaio Training Area may possibly confuse some readers who are not in the know. I do note that the boundary of the Training Area is well marked, but the area is not shaded as the legend indicates.

The grass Cenchrus agrimonioides, said to be rare (p. 3), is already listed as federally endangered (as var. agrimonioides). The single known site of occurrence on Maui of the variety agrimonioides is very near KNGTA, in the Kanaio Natural Area Reserve. If we can establish this species within exclosures in KNGTA, we have great potential for enhancing the potential for its survival.

In addition to experimentation with enhancing survival of outplanted seedlings/saplings with dry water (bottom of p. 7), we will inoculate plants to be outplanted with fungal mycorrhizae. We will also conduct limited experiments to assure that inoculation makes a difference -- that mycorrhizae actually establish within roots (based on staining) and survival is enhanced. Based on discussions during a recent visit from Drs. J. Gemma and R. Koske of University of Rhode Island, scientists who have extensively explored mycorrhizal relationships in

Hawaiian plants, we are fairly confident that mycorrhizal inoculation will enhance the chances of success in this project substantially.

Sincerely,

A handwritten signature in cursive script, appearing to read "Lloyd L. Loope".

Lloyd L. Loope, Research Scientist

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

ORLAN L. PETERSON, JR.
COLONEL
DEPUTY ADJUTANT GENERAL

August 19, 1999

Engineering Office

Dr. Lloyd Loope
Research Scientist
U.S.G.S. Biological Resources Division
Haleakala Field Station
P.O. Box 369
Makawao, Hawaii 96768

Dear Dr. Loope:

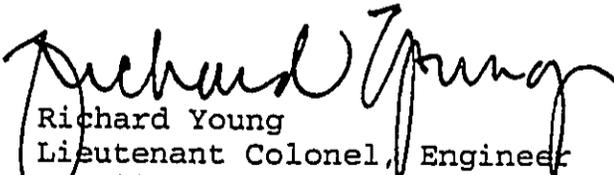
Subject: Draft Environmental Assessment (EA), Fence
Construction, Kanaio Training Area, Hawaii Army
National Guard, February 1999

Thank you for your letter of January 11, 1999, regarding the
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during the pre-scoping period appear in the published Draft EA of
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that this letter, in conjunction with the changes made,
adequately addresses your concerns.

If there are any questions, please have your staff contact
Ms. Melissa Dumarán, Natural Resource Manager, at 733-4268 or
733-4267.

Sincerely,


Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer

A28





United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd., Room 3-122
P.O. Box 50088
Honolulu, Hawaii 96850

In reply refer to: DH

FEB - 1 1999

Lt. Colonel Richard Young
Engineering
Hawaii Army National Guard
State Dept. of Defense
3949 Diamond Head Rd.
Honolulu, HI 96816

Re: Informal Consultation and Review of Draft Environmental Assessment for the Proposed Fence Construction at Kanaio Training Area, Maui, Hawaii.

Dear Colonel Young;

The U.S. Fish and Wildlife Service (Service) has received your request for informal consultation under section 7 of the Endangered Species Act, as amended (Act) and review of the Draft Environmental Assessment for Fence Construction on Kanaio Training Area (KTA), Maui (DEA). The proposed project is being conducted by the Hawaii Army National Guard (HIARNG) in cooperation with the Biological Resources Division (BRD) of the U.S. Geological Survey (USGS), the Hawaii Department of Land and Natural Resources (DLNR), and a private, not-for-profit conservation organization. The Service offers the following comments for your consideration.

The proposed action is to construct two fenced enclosures around predominantly native plant communities in order to protect these habitats from alien ungulates. These fenced enclosures will then be used to out-plant nursery-reared endangered plants such as *Sesbania tomentosa* var. *arborea*, which occurs at another location within the KTA. The proposed fences would surround one kipuka and one cinder gulch.

The Service has reviewed the DEA as well as our own files and information from other sources, including the Hawaii Natural Heritage Program of the Nature Conservancy of Hawaii (HNHP). While we have no records of threatened or endangered species within the proposed project sites, the presence of such species is still possible. The DEA states that the proposed fence lines will be resurveyed for the presence of such species prior to clearing and construction (Section 2.2). If any threatened or endangered species are located during these surveys, then the HIARNG should consult with the Service before proceeding with the project. It is anticipated that the proposed project will have no long-lasting negative impacts on the project areas and will likely result in

Proposed Fence Construction at Kanaio Training Area
Maui, Hawaii

benefits to one or more listed species of plant. In view of this, the Service will concur with a determination that the proposed project is not likely to adversely affect Federally endangered and threatened species. Based on this determination, we believe that the requirements of section 7 of the Act have been satisfied. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts from the project that may affect listed species or (2) the proposed project is modified in a manner that was not considered in this DEA, or a new species is listed or critical habitat is determined that may be affected by the project.

With regard to the DEA, the Service feels that it adequately describes the proposed project and the natural resources present at the proposed project sites. Two alternative actions are presented in the DEA. However, the proposed project best serves the conservation needs of the endangered species the project is designed to protect.

The DEA indicates that endangered and candidate plants such as *Achyranthes splendens*, *Canavalia pubescens*, *Sesbania tomentosa* var. *arborea*, and *Vigna o-wahuensis* will be out-planted into the fenced enclosures (Section 2.2). The Service recommends that the HIARNG should, as much as is practical, ensure that the plants used in these out-plantings come from propagation material (seeds and/or cuttings) derived from local sources in order to ensure the maintenance of local ecotypes and genetic variation. In addition, propagation material collected from local populations, should be collected in such a way as to not harm the donor plants and to collect such material from a number of individuals in an effort to best obtain a broad genetic representation of the donor population. Also, the collection of such plant material for propagation and out-planting will require a permit from the Service if propagation material is to be collected on Federal land. It is the responsibility of the HIARNG to obtain all required Federal and State permits and we recommend that this information be mentioned in the FEA.

The DEA indicates that should rodents or ants pose threats to the endangered species that are out-planted into the enclosures, baits and insecticides will be used to control them (Section 2.3). The DLNR requires that they be informed when the rodenticide diphacinone is used in rural and conservation areas. The Service recommends that any pesticides used (e.g., Amdro, diphacinone) by the HIARNG for the proposed project only be used in a manner that is consistent with the directions and precautions under which the product is registered in Hawaii. It is the responsibility the HIARNG to notify the appropriate State and Federal agencies of the proposed use of certain pesticides. We recommend that these restrictions be identified in the FEA.

A number of sections in the DEA should be clarified in the FEA. Section 1.2, second paragraph, indicates that the kipuka project site is 20 acres in area. Based on the map provided in the DEA, the Pu'u Pohakea project site is smaller, but the area of the second project site is not provided. This information should be included in the FEA. Section 2.1, first paragraph, makes reference to the existing "wild population" at Pu'u Pimoe. We believe this is in reference to *Sesbania*

Proposed Fence Construction at Kanaio Training Area
Maui, Hawaii

tomentosa var. *arborea*, but this is not clear in the text. This should be rewritten in the FEA to make this point clear to other reviewers.

Section 3.1, makes reference to "Endangered Species Surveys for Oahu (1998)." The reference to Oahu appears to be an error. While the final report entitled Hawaii Army National Guard Rare and Endangered Species Surveys for Maui and Molokai has not yet been provided to your office, draft versions were provided to your office previously. The most recent draft, personal communications between HIARNG and Service biologists, as well as previous survey reports provided by the HNHP and BRD also serve as adequate references for the proposed project.

Section 5.1, refers to *Sesbania tomentosa* var. *arborea* on Pu'u Pimoe as "the single wild population of this unique species." This statement suggests that this is the only population of this species (subspecies). However, our records indicate that this subspecies does occur on the island of Molokai. This needs to be clarified in the FEA. Reference to this taxa (as a species or subspecies) should be consistent throughout the text in order to avoid confusion (see also Section 5.2, second sentence). These corrections should be made in order to clarify the proposed action in the FEA.

Finally, as described in the DEA, the HIARNG should make every effort to ensure that their activities do not result in the introduction or spread of alien weeds into the project area. Provided that the recommendations we have provided in this letter are incorporated into the proposed project and reflected in the FEA, the Service would concur with a Finding of No Significant Impact (FONSI) for the proposed project.

The Service commends the HIARNG in their efforts to care for and restore natural habitats in Hawaii and for their on-going efforts to aid in the recovery of threatened and endangered species. We appreciate the opportunity to comment on this DEA. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Dave Hopper at 808/541-3441.

Sincerely,



Robert P. Smith
Pacific Islands Manager

cc: DOFAW, Honolulu, Maui
BRD, Haleakala
CZMP, Hawaii
OEQC, Hawaii

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

ORLAN L. PETERSON, JR.
COLONEL
DEPUTY ADJUTANT GENERAL

August 19, 1999

Engineering Office

Mr. Robert Smith
Pacific Islands Manager
U.S. Fish and Wildlife Service
P.O. Box 50088
Honolulu, Hawaii 96850

Dear Mr. Smith:

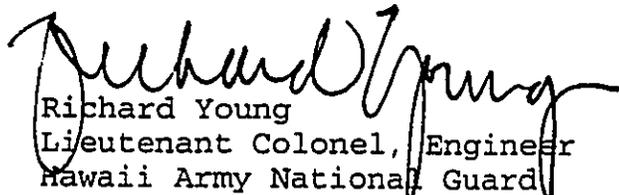
Subject: Draft Environmental Assessment (EA), Fence
Construction, Kanaio Training Area, Hawaii Army
National Guard, February 1999

Thank you for your letter of February 1, 1999, regarding the
subject Draft EA.

This is to inform you that your suggested revisions solicited
during the pre-scoping period appear in the published Draft EA of
February 1999, and will be adopted at the project site. We trust
that this letter, in conjunction with the changes made,
adequately addresses your concerns.

If there are any questions, please have your staff contact
Ms. Melissa Dumaran, Natural Resource Manager, at 733-4268 or
733-4267.

Sincerely,


Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer

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BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamehaha Boulevard
Honolulu, Hawaii 96807

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
GILBERT COLOMA-AGARAN
TIMOTHY E. JOHNS

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES
ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

REF: HP-JEN

JAN - 7 1999

Lt. Colonel Richard Young
Hawaii Army National Guard
Facility Management Officer
Department of Defense
Office of the Adjutant General
State of Hawaii
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

LOG NO: 22727 ✓
DOC NO: 9812RC41

Dear Lt. Colonel Young:

SUBJECT: Chapter 6E-8 (Hawaii Revised Statutes) and National Historic Preservation Act
Section 106 Historic Preservation Review -- Fence Construction for Endangered
Plant Enclosures at Kanaio Training Area
Kanaio, Honua'ula District, Maui

TMK: 2-1-02: 1

This review is also a Section 106 review because federal partners are involved.

Your proposals for the fence line/staging area locations and construction seem acceptable. The fence will be constructed by hand with materials transported by foot, along existing roads or by helicopter. Historic site density is generally low in this area. A professional archaeologist will check these areas and identify and flag around historic properties. These properties will then be avoided. We request that construction crews be briefed on these sites' presence prior to beginning, to help ensure their interim protection. Thus, we find the enclosure construction to have "no effect" on significant historic sites.

In several spots, it is noted that your staff archaeologist conducted preliminary surveys in July and December 1998. In the future, we recommend that reports on these surveys be included in EAs, along with some statement on site types likely to be in the project areas.

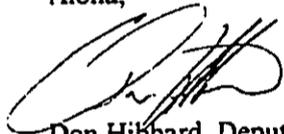
Also, in the cover letter, it notes that our office (Dr. Ross Cordy, our Branch Chief for Archaeology) by phone approved mitigation measures. As a clarification for your information, this is not correct. Dr. Cordy listened to suggested mitigation measures and made informal comments, but he was not approving the measures. Your agency needs to submit such proposals in writing and the State Historic Preservation Officer or his Deputy must approve them in writing. We do not do approvals by phone.

Lt. Colonel Richard Young
Page 2

Last, this project covers only the construction of exclosures, not the planting of species within the exclosures. If active planting is to occur, that is another undertaking. That undertaking would potentially affect many areas. Typically, an archaeological inventory survey of the impact areas and a report on findings is required to determine if significant historic properties are present. Mitigation recommendations are then worked out based on the findings. Thus, if planting will occur, historic preservation compliance is potentially more complicated.

If you have any questions, Ross Cordy (692-8025) is our contact on this project.

Aloha,



Don Hibbard, Deputy
State Historic Preservation Officer

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

ORLAN L. PETERSON, JR.
COLONEL
DEPUTY ADJUTANT GENERAL

August 19, 1999

Engineering Office

Mr. Don Hibbard, Deputy
State Historic Preservation Officer
Department of Land and Natural Resources
Historic Preservation Division
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Mr. Hibbard:

Subject: Draft Environmental Assessment (EA), Fence
Construction, Kanaio Training Area, Hawaii Army
National Guard, February 1999

Thank you for your letter of January 7, 1999, regarding the
subject Draft EA.

This is to inform you that your suggested revisions solicited
during the pre-scoping period appear in the published Draft EA of
February 1999, and will be adopted at the project site. We trust
that this letter, in conjunction with the changes made,
adequately addresses your concerns.

If there are any questions, please have your staff contact
Ms. Melissa Dumarán, Natural Resource Manager, at 733-4268 or
733-4267.

Sincerely,

A handwritten signature in black ink that reads "Richard Young". The signature is written in a cursive style.

Richard Young
Lieutenant Colonel, Engineer
Hawaii Army National Guard
Facility Management Officer



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

July 12, 1999

Dean Uchida, Administrator
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Attention: Lauren Tanaka

Dear Mr. Uchida:

Subject: Draft Environmental Assessment (EA) for Kānaio Training Area Fence Construction, Makena

Please include the following in the final EA:

1. Significance criteria: Include a discussion of findings and reasons, according to the significance criteria listed in HAR 11-200-12, that supports your forthcoming determination, either Finding of No Significant Impact (FONSI) or EIS preparation notice. You may use the enclosed sample as a guideline.
2. Contacts: Consult with the Sierra Club, local hunters associations and any other community groups which may be affected by this project. As a neighboring landowner, Ulupalakua Ranch should be informed of the project and given an opportunity to comment. Document all contacts in the final EA and include copies of any correspondence.
3. Timeframe: What are the anticipated start and end dates of this project?

If you have any questions, call Nancy Heinrich at 586-4185.

Sincerely,


GENEVIEVE SALMONSON
Director

c: Melissa Dumarán, HIARNG

BENJAMIN J. CAYETANO
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

ORLAN L. PETERSON, JR.
COLONEL
DEPUTY ADJUTANT GENERAL

August 11, 1999

Engineering Office

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

Dear Ms. Salmonson:

Subject: Draft Environmental Assessment (EA), Fence
Construction, Kanaio Training Area, Hawaii Army
National Guard, August 1999

Thank you for your letter of July 12, 1999, regarding the subject
Draft EA.

Our responses to your comments are enclosed. We trust that this
letter, in conjunction with the changes made to the Final EA,
adequately addresses your concerns.

If there are any questions, please have your staff contact
Lieutenant Colonel Ron Swafford, Environmental Protection
Specialist, at 733-4214.

Sincerely,

A handwritten signature in black ink, appearing to read "E.V. Richardson".

Edward V. Richardson
Major General
Hawaii Air National Guard
Adjutant General

Enc.

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Draft Environmental Assessment
Fence Construction, Kanaio Training Area,
Hawaii Army National Guard, August 1999

Comment: "Include a discussion of findings and reasons, according to the significance criteria listed in HAE 11-200-12, that supports your forthcoming determination."

Response: We discuss in detail the reasons for our determination of a Finding of No Significant Impact (page 13) as per the significance criteria.

Comment: "Consult with the Sierra Club, local hunters associations and any other community groups which may be affected by this project."

Response: The involvement of members of the Kanaio community, including Ulupalakua Ranch, Living Indigenous Forest Ecosystems, and residents of Kanaio is also documented in the EA (pages 1-2).

Comment: "What are the anticipated start and end dates of this project?"

Response: Included in Project Summary (page 1).