

LINDA LINGLE
GOVERNOR OF HAWAII



LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HI 96813

Katherine Puana Kealoha, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Director,

Please find enclosed the Final Environmental Assessment (FEA) and Finding of No Significant Impact (FONSI) for Waikoloa Dry Forest Recovery Project, TMK (3) 6-8-002:015 (portion) Waikoloa, South Kohala District, Hawaii Island, Hawaii.

The Department of Land and Natural Resources, Division of Forestry and Wildlife has reviewed the final environmental assessment for the subject project, and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish the notice for this project in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form, one copy of the DEA, and a PDF version was emailed to oeqc@doh.hawaii.gov. Please call Irene Sprecher at (808) 587-4167 if you have any questions regarding this material.

Sincerely,

A handwritten signature in blue ink that reads "Paul Conry".

Paul Conry, Administrator
Division of Forestry and Wildlife
Department of Land and Natural Resources
State of Hawai'i

Final Environmental Assessment
For
Construction of a 275 acre Fence Enclosure
South of Waikoloa Village

February 2010

Prepared by:

Dave T. Faucette
Project Manager
Waikoloa Dry Forest Recovery Project

Table of Contents

1.0 Purpose and Need for Proposed Action	3
2.0 Proposed Action and Alternatives Considered	7
3.0 Existing Environment	9
4.0 Environmental Consequences of the Proposed Action and Alternatives	13
4.1 Air Quality	13
4.2 Noise Quality	13
4.3 Water Resources	14
4.4 Geology and Soils	14
4.5 Biological Resources	14
4.6 Historic and Cultural Resources	17
4.7 Existing Recreational and Aesthetic Values	17
4.8 Forest Health	18
4.9 Economic Impacts	18
5.0 Cumulative Impacts	19
5.1 Air Quality	19
5.2 Noise Quality	20
5.3 Water Resources	20
5.4 Geology and Soils	20
5.5 Biological Resources	21
5.6 Historic and Cultural Resources	21
5.7 Existing Recreational and Aesthetic Values	22
5.8 Forest Health	22
5.9 Economic Impacts	22
6.0 Determination of Significance	23
7.0 Conclusions	25
8.0 Preparer	25
9.0 References	26

List of Figures

<u>Figure</u>	<u>Title</u>
Figure 1	Location of Waikoloa Dry Forest Recovery Project
Figure 2	Firebreak Along the Southern Boundary
Figure 3	Fuels Reduction Around Individual Wiliwili Trees

Purpose and Need for Proposed Action

1.1 Introduction

As little as 20 years ago very few people knew what native plant life existed within the fountain grass dominated landscape that surrounded the Waikoloa Village. Today it represents one of the best examples of a Wiliwili dominated lowland dry forest still remaining within the State of Hawaii. Under the auspices of the Waikoloa Chapter of the Outdoor Circle (WVOC) and the Waikoloa Dry Forest Recovery Project (WDFRP), a native dry forest restoration project has begun that will see the restoration of a native lowland wiliwili forest (*Erythrina sandwicense*) that contains 13 endangered uhiuhi (*Caesalpinia kawaiiensis*) trees (10 of which lie within the project boundaries) over 275 acres of open space south of the community of Waikoloa Village. The 10-year project aims to restore native forest around a remnant patch of lowland wiliwili (*Erythrina sandwicense*) forest habitat and establish new populations of 9 endangered plant species. The remnant forest patch lies ½ mile south of Waikoloa Village at approximately 1000 ft. elevation on the northwest flank of the island of Hawaii (Figure 1).

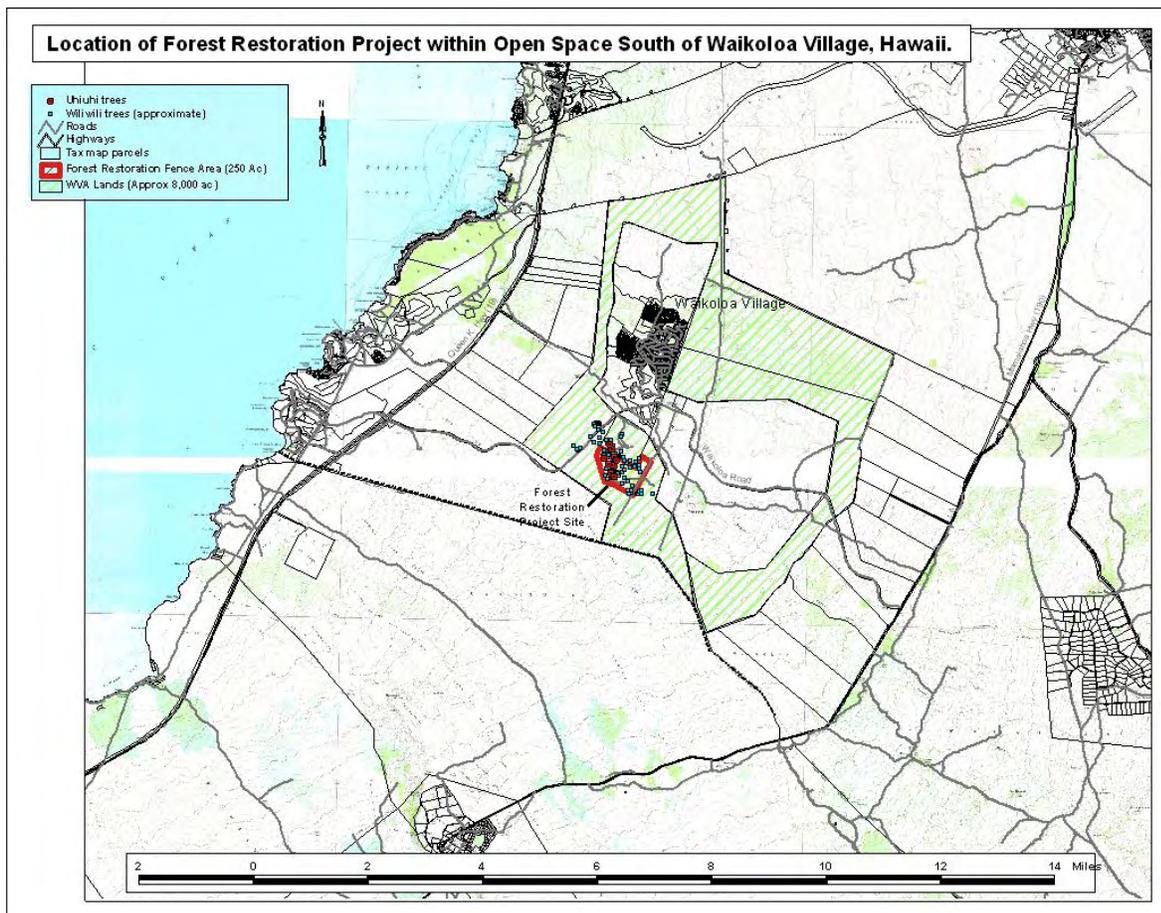


Figure 1: Location of Waikoloa Dry Forest Recovery Project Site

Waikoloa Village is a rapidly growing suburban community (Population approx. 4,000) located in the district of South Kohala on the island of Hawai'i. The Waikoloa Village Association (WVA), which represents the community through an elected Board of Directors, manages the

village golf course and approximately 10,000 acres of land that surrounds the village which are deed-restricted as open space. The WVA Board of Directors supports this project and has agreed to a long term license agreement with the Waikoloa Village Outdoor Circle. The Waikoloa Village chapter of The Outdoor Circle engages in beautification and maintenance of areas within and around Waikoloa Village for the benefit of residents and visitors.

1.2 Purpose and Need for the Project

Harvesting, burning, grazing by domestic and wild cattle and goats, and the effects of invasive plants and insects have reduced dry forests within the past 100 years to a few small isolated stands. Existing forest patches today mark areas that have been spared by recurring grass-fueled wildfires. There has been no recruitment of dry forest trees within the WDFRP landscape in many decades most likely due to competition with alien grasses and browsing by feral goats. Wildfires now pose the greatest threat to the land and its inhabitants. Driven by persistent trade winds, large-scale grass and brush fires sweep across the landscape on roughly 10-year intervals, threatening properties, degrading rangelands, threatening damage to coral reefs and near shore marine environments through erosion, and destroying endangered lowland and montane dry forests and shrub lands that are intolerant of recurrent fire. In order to mitigate the threat of fire within the WDFRP, fuel break construction is currently ongoing in an attempt to lessen the severity of fire that constantly threaten the remaining plants, while individual actions around trees attempt to protect them further from fire as well as from invasive insects and other ongoing threats (figures 2 and 3).

Need for Action: Ungulates are a major threat to natural and cultural resources in Waikoloa

The first step to controlling the massive herds of ungulates that roam throughout the project site is to erect a fence around the boundaries. Without a properly constructed fence the remaining native vegetation has no future. The use of large scale fencing is now a common method for excluding ungulates and facilitating the recovery of degraded habitat.

Other fence units that have been constructed in order to protect dry forest habitat have facilitated various levels of recovery even over very short periods of time. Probably the most talked about and researched area is the dry forest enclosure that exists at Ka'upulehu. This area was fenced in 1956 in recognition of its rich diversity of native species (Cabin et al. 2000). Other fence units exist at Pu'u Wa'a Wa'a (various enclosures), West Hawaii Veterans Cemetery, Kipuka Owe Owe, Palamanui, the Koaia reserve, and Pohakuloa Training Area (PTA) (Yvonne Yarber Carter, personal communication).

The Waikoloa Dry Forest Recovery project site is home to 10 endangered uhiuhi and approximately 80 living wiliwili trees. The surrounding area harbors at least 3 more uhiuhi trees and approximately another 100-120 wiliwili trees. One thing that is noticeable when walking through the area is the vast number of wiliwili snags. Over half of the trees in the area are dead.



Figure 2: Firebreak along the southern boundary



Figure 3: Fuels reduction around individual wiliwili trees

Wiliwili seedlings can be seen germinating during the rainy season if you look close enough and you are there at the right time. The sheer number of ungulates in the area and the browsing effectiveness they display, leaves one wondering what this forest must have look like 250 years ago. Certainly, it would have been much denser with all age classes represented, along with many more than just the two tree species still present on the site.

Other native vegetation still present within the project vicinity include lama (*Diospyros sandwicensis*), which exists just south of the project boundary, 'ilima (*Sida fallax*), 'aweo'weo (*Chenopodium oahuense*), 'akia (*Wikstroemia pulcherrima*) (reported near Pu'u Hinai), pua kala (*Argemone glauca*), as well as the indigenous uhaloa (*Waltheria indica*) and ilihee (*Plumbago zeylanica*). The area know as Waikoloa Highlands still harbors small populations of kawelu (*Eragrostis variabilis*), a native lovegrassas well as *Dodonea viscosa* (a'ali'i). A cave system located along the southern boundary of the project also supports a scattered population of a yet identified *Asplenium* species.

Recurring fires and the foraging activities of the ungulates within the project boundaries have also lead to the increase and spread of non native weed species. When ungulates browse native vegetation they create opportunities for quickly spreading, highly reproductive weeds to move into those spaces. They may also carry invasive weed seeds in their fur which becomes deposited into terrain not previously occupied by weeds. Increasing the volume and breadth of certain invasive across the landscape also leads to a greater increase in the threat of fire, which further threatens the remaining native vegetation.

Ungulates within the project may also be causing damage to the integrity and context of archaeological features within the cave systems that lie along the southern boundary of the project site. Preliminary surveys show that these caves may have been used as sleeping/rest areas for people likely travelling between Pu'u Wa'aWa'a and Waimea. Glass found on the surface around the project site dates this activity to around the late 1800s. Many of our caves show an incredible amount of ungulate activity based on the amount of feces found on the surface. Ungulates utilizing caves as shelters displace and damage features by moving rocks and trampling. Their feces and urine can also have deleterious impacts on features that might otherwise show no impacts due to natural weathering.

It is imperative that a fence to exclude the ungulates from the area be constructed as quickly as possible. While this approach to preserving the native vegetation is costly, it is the only means available at this time to remove the risk of ungulate browse over the long term. Constructing a fence unit will not only benefit the remaining individuals, but will also promote the recovery and regeneration of the dry land ecosystem that once covered this area as well as areas to the north and south. As we begin to out plant seedlings and continue to control invasive weeds the native seed bank that has been suppressed for many decades may lead to the establishment of species that previously occupied the site.

It has been suggested that we fence off individual trees in order to protect them from browsing (ungulates have been caught in the trees). While this may offer short term protection it does not support the goal of landscape scale restoration. Fencing off the entire 275 acre parcel is the only means available to promote landscape scale restoration and remove the immediate threat that

ungulates pose to the remaining individual trees within the project boundaries.

2.0 Proposed Action and Alternatives Considered

2.1 Description of the Proposed Action

2.1.1 Overview

In order to move this project forward and to begin to re-establish a native lowland dry forest within the project boundaries, the construction of a fence needs to be undertaken and completed in the most expedient manner possible. The number of ungulates roaming this area is estimated at between 500 and 600.

The fence will be constructed on land that has been designated by the US Army Corps of Engineers as “High Hazard” due to the probability of unexploded ordnance (UXO). The project area has already undergone a surface sweep in September 2007. The sweep took place immediately after the July 2007 fire. Much of grass covered pahoehoe was quickly surveyed. Before the fence can be constructed a more thorough subsurface sweep of the proposed fence perimeter will need to be undertaken. Specialists from the Corps of Engineers will undertake this survey. This survey will clear a 3-m corridor prior to construction.

After fence construction is complete, all ungulates will be removed within 3 months. An annual survey of the fence unit will be conducted to ensure that ungulates have not returned to the fence unit. Ground surveys will ensure the fence lines are intact. If ungulates are observed, appropriate hunts or trapping will immediately commence to remove these animals. The goal is to have this 275 acre parcel as ungulate free as possible.

Due to fiscal constraints it is unlikely that the fence will be constructed in one year or less. More than likely the fence will take several years to complete.

The general specifications for construction of the fence will be as follows:

- a. Galvanized steel posts would be driven at least 41-cm (16-inches) deep in soil or a substrate and 15 cm (6 inches) into 3.8 cm (1-1/2 inch) drilled holes in pahoehoe substrate. Posts would be spaced no more than 2.4 m (8 feet) apart, within 8 cm (3 inches) of centerline.
- b. This fence will be constructed with 1.8-m (6-foot) high (minimum height) high tensile woven wire fabric (“game fence”). The fence route will avoid rock outcroppings, excessive dips, and the fabric will be securely anchored to the rock/soil to prevent ungulate ingress. No wire would be attached to any trees.
- c. Reinforced corner posts and/or H-braces would be used to add strength at critical points, as necessary.
- d. Two steel gates (galvanized) will be installed to facilitate vehicular traffic on established roads in order to access the fence unit. A similar number of smaller width “people gates”

will be installed to accommodate foot traffic into, and out of, the fence unit by staff, fire fighters, or others requiring access.

2.2 Alternative

2.2.1 Framework for Consideration of Alternatives

Hawai'i Administrative Rules, Title 11 Department of Health Chapter 200 (HAR §11-200), outlines the rules governing the preparation of Environmental Impact Statements (EIS), Environmental Assessments (EA) and other similar documents. This ensures that environmental concerns are noted and given proper consideration during the decision making process along with economic and technical considerations.

HAR §11-200-8 (Exempt classes of action), outlines those types of projects that are exempt from undertaking an EA or EIS. The Waikoloa Dry Forest Recovery Project does not seem to fit into an exempt category. The fact that we are receiving funding assistance from the state to undertake this project also triggers the need to undertake an EA (§11-200-5 Agency actions). HAR§11-200-9 outlines the project proponent to analyze alternatives, in addition to the proposed action outlined in the EA, while HAR 11-200-10 requires that the EA includes the necessary work to determine the validity of the project while subsection 6 asks that the project proponent considers all alternatives.

The Waikoloa Dry Forest Recovery Project (WDFRP) considered several alternatives for the proposed action and determined that the only feasible course of action is to move forward with the project as outlined above. The following subsections describe the alternatives considered in preparing this EA and the criteria used to decide whether to include them in the impact analysis presented in Section 3.

2.2.2 Alternatives Addressed in Detail in the EA

2.2.2.1 Alternative 1

Under this alternative, ground hunting and small fences would be utilized in order to control the feral ungulates and to provide some protection to the remaining tree species and future outplanting sites. No reconnaissance surveys for the fence boundaries would be conducted prior to construction because no groundwork will take place.

The Waikoloa Village Association does not allow hunting on its property and as such controlling the animals will be next to impossible. The population of the animals will continue to grow. The populations are not likely to crash or go away as there is a lot of land still left to be occupied and the ungulates heavily utilize the caves along the southern boundary as well as the golf course for a readily available source of water.

The use of small scale enclosures to protect remaining plants and future out planting will not solve the problem as goats have pushed aside such structures in the past in order to browse the seedlings. Alternative 1 is not a long-term solution for the threat posed by ungualtes to the federally listed threatened and endangered plants within the Waikoloa Dry Forest. Hunting without fences is useful in reducing large ungualte herds to manageable levels, but a few animals

will always remain to replenish the herds. Even one animal can extrapate the poplulation of plants from an area.

2.2.2.2 No-action Alternative

Under this alternative no fences will be constructed and ungualties will be allowed to roam the landscape unimpeded as they currently do. This alternative will perpetuate the current state of actions that has lead to the demise of the plant populations and ecosystems within the dry forest. We can mitigate threats posed by fire and try to prevent the destruction posed by insects and other invasive pests but the regeneration of the forest will be absent. This will ultimately result in the demise of both the uhiuhi and wiliwili trees within the Waikoloa area.

3.0 Existing Environment

3.1 Air Quality

The Federal Clean Air Act of 1970 established National Ambient Air Quality Standards for six criteria pollutants. The Clean Air Act of 1990 follows on the previous acts and relates to the reduction of smog and air pollution. Under this and other similar Clean Air Acts the States do much of the monitoring as pollution control problems require special understanding of local industries and geography.

No monitoring sites for criteria pollutants exist on the Island of Hawai'i. However, some studies measuring both PM 10 AND 2.5 have been undertaken by the United States Army at Pohakuloa Training Area. These data indicate that pollutant levels have very rarely exceeded either federal or state standards; the exception being after brush fires (Dr. J. Morrow, personal communication). The ash material generated after the fire along with exposed soil surfaces have a tendency to blow around when the trade winds pick up. In general, dust and other emissions are brief and quickly dissipate.

3.2 Noise Quality

Ambient noise levels within Waikoloa and around the project site are generally low due to the low population of the area. Noise levels from the road are also relatively low. Any noise generated from the erection of the fence would be quickly absorbed by the surrounding terrain.

3.3 Water Resources

There are no perennial streams located within the project site. There is an unnamed intermittent stream that shows up on maps of the area. This stream has shown no signs of flow during the last couple of years of observation. Along the southern boundary where much of the terrain is pahoehoe, there has been overland flow observed but this is a localized phenomena.

3.4 Geology and Soil

The Waikoloa Village native wiliwili forest stand occurs on a relatively young Mauna Kea a'a flow that originates from Pu'u Hinai (elev. 1439 ft.) and sweeps down slope toward Puako. Estimated to be between 4.4 and 7.1 thousand years old (Wolfe and Morris 1996), the flow has a very rough and blocky texture that has precluded access to cattle. Like other young and rough

flows that still support remnant patches of dry forest, this flow has remained less colonized by exotic grasses resulting in protection for its inhabitants from wildfire. According to the Soil Survey of the State of Hawaii two soil types are present within **the project area**. These include:

Rock land (rRO), is a miscellaneous land type that consists of pahoehoe lava bedrock covered in places by a thin layer of soil material. The dominant slope is between 10 and 15 percent. Pahoehoe outcrops occupy 50 to 90 percent of the surface. The average depth of the soil material is between 6 and 8 inches, although in some places the material extends into the cracks of the lava. Rock land is at an elevation ranging from near sea level to 13,000 feet and receives from 10 inches to more than 150 inches of rainfall annually. The vegetation is confined mainly to the soil-covered areas and the cracks in the lava. It varies according to rainfall and temperature, and suffers from drought during dry spells. The hazard of water erosion is slight. Rock land is used for pasture, wildlife habitat, and watershed. (Capability subclass VIIIs, non irrigated)

Lava flows, Aa (rLV), has been mapped as a miscellaneous land type. This lava has practically no soil covering and is bare of vegetation, except for mosses, lichens, ferns, and a few small ohia trees. It is at an elevation ranging from near sea level to 13,000 feet and receives from 10 to 250 inches of rainfall annually. It is associated with pahoehoe lava flows and many soils. This lava is rough and broken. It is a mass of clinkery, hard, glassy, sharp pieces piled in tumbled heaps. In areas of high rainfall, it contributes substantially to the underground water supply and is used for watershed. (Capability subclass VIIIs, non irrigated)

A third type of soil called Very Stony Land (rVS) exists just outside the southwest boundary. This soil type is noticeable in that it occupies a more rolling type of landscape, usually at a higher elevation than the other two soil types within the project area.

3.5 Biological Resources

3.5.1 Botanical

Tropical dry forests are among the most threatened ecosystems in the world. In Hawaii, over 90% of the original forest has disappeared (Cabin et al. 2002). The Waikoloa Dry Forest project site certainly reflects and perpetuates this statement. The Waikoloa Dry Forest Recovery project site is home to 10 endangered uhiuhi (*Caesalpinia kavaiensis*) and approximately 80 living wiliwili (*Erythrina sandwicensis*) trees. The surrounding area harbors at least 3 more uhiuhi trees and approximately another 100-120 wiliwili trees. The project site also contains a large number of dead wiliwili snags. The Waikoloa Village Outdoor Circle has counted close to 30 dead uhiuhi snags within and around the project site. Quite clearly the area supported large numbers of mature trees as recently as 50 years ago. The numbers of these species in the various age classes must have been very large in order to stock the number of mature plants currently on site, both alive and dead. All other native vegetation has been virtually extirpated from the project site.

The project site is nearly completely covered with fountain grass (*Pennisetum setaceum*), and buffelgrass (*Cenchrus ciliaris*). Non native shrub species include indigo bush (*Indigofera suffruticosa*) and the rapidly expanding tree tobacco (*Nicotiana glauca*). Kiawe (*Prosopis pallida*) is the most common tree species on the property.

3.5.2 Vertebrates

3.5.2.1 Forest Birds

Native wildlife still exists on the property. The endemic Hawaiian sub species of the Short eared Owl (*Asio flammeus sandwichensis*) or Pueo has been seen in the area on several occasions. During a cave inventory, archeologists inadvertently flushed a Pueo out of a cave situated along the southern boundary of the project site. Two old eggs were also found on a ledge in that cave. It is possible that other endemic birds may use the area during certain times of the year.

3.5.2.2 Seabirds

It is not known whether seabirds use or ever did use the project area. It is unlikely that the current condition of the land would support any activity at this point in time.

3.5.2.3 Bats

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) has not been detected in the area but surveys trying to detect it have not been undertaken. This bat roosts in trees. The planting of native trees more suitable to its habit and the clearing of non-native ground cover may provide more opportunities for the bat to use the area in the future.

3.5.2.4 Non-Native Mammals

Non-native mammals are present within the Waikoloa Dry Forest Recovery Project. Large herds of feral goats (*Capra hircus*) roam the parcel. Rats (*Rattus spp.*), Indian mongoose (*Herpestes auro punctatus auro punctatus*), and cats (*Felis catus*) exist within the project area. The project area would appear to be too rough for feral pigs to occupy. The heat and low elevation also seem to preclude feral sheep from the area. While donkeys have not been detected within the project boundaries they have been heard along the boundary bordering Waikoloa Mauka property.

3.6 Historic and Cultural Resources

Along the project's southern boundary lie a series of caves and lava tubes. They were probably once all connected but over time several tubes have collapsed. The caves have been heavily impacted by ungulates that have been using them as shelter. A dead wiliwili tree has also been observed within one of the tubes along the southeast boundary. A few native ferns still cling to life on inaccessible walls and ceilings where ungulates cannot browse them.

Preliminary surveys of the caves have been undertaken by professional archaeologists (friends of the WDFRP). Further studies are to be conducted in the very near future. These initial surveys have resulted in typical findings for the Waikoloa area. Sleeping/rest quarters have been found in one area of the caves which most likely dates back to the late 1800s. Broken glass scattered across several locations also indicate activity around the end of the 19th century (Escott, personal communication).

Historic accounts of human settlement of the Waikoloa area are sparse due to its harsh terrain. The area likely served as a transportation corridor between mauka lands of Waimea and coastal areas during historic times and for cattle in latter periods; with most habitation being temporary. (Rosendahl 1990).

The proposal to fence the 275 acre parcel will not impact cultural resources. There will be no ground softening. Posts will be pounded directly into the substrate. Along certain boundaries, where pahoehoe lava is encountered, the use of a rock drill will be required. The grasses around the project boundaries are in the process of being cleared in order to facilitate fence installation. These clearing will enable professional archaeologists to locate potential findings that may have been overlooked during previous studies. If historic or cultural features are found during fence construction, the State Historic Preservation Division will be consulted.

3.7 Existing Recreational and Aesthetic Values

During wildfire operations in the past, fuel breaks have been cut through the project vicinity. State maps show one continuous trail/break that starts along the power line trail and winds its way through the parcel until reaching the new industrial area. This however is not the case, as there is a gap of around 200m across the roughest terrain that was never completed. It appears that they tried to breach this area but were never successful. Completing this trail/fuelbreak is essential as it would provide vehicular access into the area to further protect the area in case of fire as well as to increase recreational opportunities within the project site.

There is currently not much recreational potential on the site as the terrain is extremely dangerous. The views from the site are however, spectacular. When weather conditions are right, there exists a clear view to Pu'u Wa'a Wa'a, all 4 mountains, the coast, and a view to Maui. Several wiliwili trees are also visible from the highway and when flowering provide a beautiful scenic display if only for a brief moment.

3.8 Forest Health

The current health and prognosis of this forest is not good. For the last couple of years the wiliwili has been impacted heavily by the Erythrina gall wasp (*Quadrastichus erythrinae*). Several trees have been lost recently and it is thought that the gall wasp has been the impetus leading to their demise. Many more of the trees are in poor health and it is no guarantee that they will make it without direct intervention.

Uhiuhi trees are impacted by the black twig borer (*Xylosandrus compactus*), which manifests itself through globs of sap hanging down from impacted branches. The trees continue to produce seed, which is fortunate, but one never knows when a threshold is crossed upon which the trees will begin a precipitous decline towards death.

Both tree species are impacted by ungulates browsing on the fresh bark of new branches. All trees display a browse line above which the ungulates are no longer able to browse. Goats have also been observed within the lower branches of wiliwili trees across the project site.

In July 2007, a fire originating from the Pu'u Hinai quarry area resulted in approximately ¼ of the project area burning. We were fortunate in that only one tree was lost. It has been mentioned previously that the nature of the terrain has precluded high densities of non-native grasses from building up in certain areas, but the sheer volume of fuels in the surrounding area and the high winds that frequent the Waikoloa area, provide ample opportunity for embers and ash to move unimpeded across the entire project area. Perhaps many other shrub and tree species have been

lost in the past due to fire which we do not even know about. Fire breaks along the proposed fence line are currently being constructed.

3.9 Economic Impacts

The Proposed Action involves the expenditures of funds earned over a period of years that will complete the project. The majority of the funds will go towards the purchase of fencing materials, a dip tank, irrigation, the contracting of crews, and the purchase or rental of equipment including helicopters. Whenever possible, local vendors will be used. The estimated total cost of the fence construction is approximately \$350,000. Various sources of funding have been ascertained and more are being sought.

4.0 Environmental Consequences of the Proposed Action and Alternatives

4.1 Air Quality

4.1.1 Proposed Action

The activities associated with the construction and ungulate removal would generate some fugitive dust. Most of this dust would emanate from the construction activities associated with the movement of vehicles, drilling and pounding and helicopters. These impacts would be periodic and negligible. The removal of ungulates would generate next to no fugitive dust as hunters would have to walk throughout the project site to spot the remaining ungulates.

4.1.2 Alternative 1

Air quality impacts associated with small scale fence enclosures would be very minimal and for a shorter period of time. No adverse impacts to air quality are anticipated as a result of Alternative 1.

4.1.3 No Action Alternative

None.

4.1.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed.

4.2 Noise Quality

4.2.1 Proposed Action

The activities associated with fence and dip tank construction would generate periodic noise from vehicles traveling to and from the area, drilling and pounding, and the occasional helicopter dropping off supplies to the more remote locations. Weed whacking of fountain grass currently takes place just about every weekend and not a single complaint has been made to date. These noise impacts will be short term and no adverse impacts are anticipated. These noises may impact the owl that occasionally can be seen in the area along the southern boundary.

4.2.2 Alternative 1

Noise quality impacts associated with small scale fence construction would be barely noticeable

given the location of the project.

4.2.3 No Action Alternative

None.

4.2.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed.

4.3 Water Resources

4.3.1 Proposed Action

No water resources would be impacted, as there are no water features present on the site. Water required for construction will be brought in by the fence contractor.

4.3.2 Alternative 1

No impacts would be anticipated as stated in the Proposed Action.

4.3.3 No Action Alternative

None.

4.3.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed.

4.4 Geology and Soil

4.4.1 Proposed Action

Construction activities would involve drilling pounding for the installation of the fence posts into the substrate. These activities will be minor and no impacts are anticipated. The removal of the ungulates will have no impact on the geology or the soil.

4.4.2 Alternative 1

No impact to the geology or soil is anticipated as a result of small scale fence enclosures. There will be less intrusive work as fewer posts will be driven in the ground.

4.4.3 No Action Alternative

None.

4.4.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed.

4.5 Biological Resources

4.5.1 Botanical

4.5.1.1 Proposed Action

The proposed fence line should have any negative impacts on the remaining trees within the project boundaries. There will be no ground softening nor dozer work done along any fence line. As a result there will be minimal ground disturbance other than the rock drilling and pounding. Where branches from a wiliwili tree may come within the fence alignment every means necessary will be used in order to avoid impacting the tree. As a result, no adverse effects are anticipated to occur to either tree species during any type of construction.

Where non-listed smaller shrub type native vegetation comes within the fence line every effort will be made to preserve the vegetation. Fence construction may help to improve shrub vegetation within the project boundaries as the threat of ungulate browse will have been eliminated after the last ungulate is removed. These areas should already have been cleared and any native vegetation identified before fence construction takes place. Mitigation measures may already be in place before construction activities commence.

4.5.1.2 Alternative 1

Animals will continue to have an impact within the project boundaries. As out planted vegetation continues to grow the desire of the ungulates to find a way inside the fence units will be great. As the fence units will be small the impact of browsing can have a long lasting detrimental impact on our out planting efforts.

4.5.1.3 No Action Alternative

Feral ungulates will continue to have a significant impact within the project boundaries on all remnant native vegetation. The end result will be complete extirpation of all native vegetation within the Waikoloa area.

4.5.1.4 Mitigation Measures

As mentioned, prior to fence construction the fence line will already have been cleared of non native vegetation in order to provide a fuels buffer. Any native vegetation along the fence line will be flagged in order to clearly identify it to the construction crew. No native trees will be cut during the fence construction phase of this project. So little native vegetation currently exists out there now it is unlikely this will be an issue.

4.5.2 Forest Birds, Seabirds and Bats

4.5.2.1 Proposed Action

The construction of the fence may have short term adverse impacts on the owl that seems to be at least a part time resident of the area. This will likely occur when construction takes place along the southern boundary where the owl has been seen several times. The owl may move away from the area during times when construction takes place, and return once the fence activities are completed.

Strands of barb wire on fence exclosures have been known to result in bird mortalities on occasion. However, no barb wire will be added to the top of the fence; thus reducing this type of impact to any bird species.

As bats may be utilizing trees to roost during the day, every effort will be made to protect those trees, native or otherwise. However, as bats are nocturnal and no activities will take place at night it is assumed the construction will have very little impact on roosting bats, if in fact they do exist within the project boundaries. It is assumed that the bats would fly away if the tree they are roosting in is disturbed. It is hoped that fencing the area will improve the habitat for native birds and bats and they begin to return once the forest is allowed to regenerate.

4.5.2.2 Alternative 1

Small scale exclosures will have less of an impact during construction than would the large scale fence. Less fence means less construction and that will likely translate into fewer stresses on the native birds. However, as there seems to be only one native owl in the vicinity there will be virtually no adverse impacts.

4.5.2.3 No Action Alternative

If we continue under the same state as we currently have, we shall see the continued degradation of the remnant native vegetation until nothing remains. Under this scenario everybody and everything loses.

4.5.2.4 Mitigation Measures

There are no potential for significant adverse impacts from construction and ungulate removal activities, therefore, no mitigation measures are proposed.

4.5.3 Non-Native Mammals

4.5.3.1 Proposed Action

Construction activity would have short term impacts by increasing the level of noise and human activity in the area. However, the area already experiences this on weekends when weed whacking takes place. The non native mammals usually move away from the area temporarily. Once the fence is completed the ungulates would be permanently excluded from the project area. Feral cats and rats would still move freely about the project area. They would be controlled in subsequent years through live trapping in the case of the feral cats and snap traps, bait stations or poison in the case of the rodents.

Both cats and rats impact the fauna and flora of native ecosystems negatively through the killing of native birds and the browsing of green shoots and seed predation respectively.

4.5.3.2 Alternative 1

Small scale fence units will keep non native ungulates out of small areas and nothing more. We can grow plants within these spaces but the threats will be right there waiting for an opportunity to enter the fence unit. It will only take one animal to wipe out the vegetation within the fence unit. Of course the cats and rodents will still be accessing the units until they are trapped or poisoned.

4.5.3.3 No Action Alternative

None.

4.5.3.4 Mitigation Measures

There is no potential for significant adverse impacts from construction and therefore, no mitigation measures are proposed.

4.6 Historic and Cultural Resources

4.6.1 Proposed Action

Removal of the ungulates from the project area would prove beneficial as this will result in the cessation of trampling and degradation of cave environments that are presently being utilized quite heavily by ungulates.

While very little cultural or historical artifacts have been found within the project boundaries that does not mean they do not exist. The pahoehoe sites are for the most part completely covered by fountain grass and make detecting sites very difficult. Removing the ungulates would mean less likelihood of disturbance of those surface features.

Fence lines will be cleared before construction commences so the chance that a cultural or historical artifact will be adversely impacted will be negated.

4.6.2 Alternative 1

As most of the small scale fences will be located around existing native plant life the cave system will continue to be heavily impacted by the ungulates. What significant finding they have within them may eventually be lost forever.

4.6.3 No Action Alternative

The status quo means more ungulates and more desecration of the cave system along the southern boundary.

4.6.4 Mitigation Measures

There is no potential for significant adverse impacts from construction and therefore, no mitigation measures are proposed.

4.7 Existing Recreational and Aesthetic Values

4.7.1 Proposed Action

The proposed fence will only prove beneficial in terms of increasing recreational opportunities in the area. While the area will be fenced off in order to protect the area, guided groups could be admitted, in order to see a rehabilitating dry forest. The recovery may bring with it a return of native fauna which might not otherwise been seen in the current state. If the existing trails can eventually be connected, vehicular traffic may move through the project and allow those who may not otherwise be able to visit the area to do so. Connecting these trails will also help protect the area from fire so that our out planting sites may be better protected which would increase the aesthetic and recreational opportunities within the area.

There is currently no hunting allowed in the area so there will be no adverse impacts due to the

construction of the fence.

4.7.2 Alternative 1

Small fence units may perhaps increase the recreational opportunities available within the project boundaries as native vegetation will be growing but this will not provide the same emotions and feelings that are generated from looking at a landscape level restoration effort.

4.7.3 No Action Alternative

None.

4.7.4 Mitigation Measures

The construction of the connector trail will require a UXO team to be on the ground in order to mitigate the threat of unexploded ordinances. While this threat is low it is still present and as such needs to be considered.

4.8 Forest Health

4.8.1 Proposed Action

The activities associated with constructing the fence and later the dip tank will be short in duration and pose no threat to the health of the forest. No trees seem to be directly in line with the fence alignment so no cutting of native vegetation is anticipated. The trees will benefit in that the activities of browsing will be eliminated. New growth in the form of branched below the browse line will be expected. The big threats to forest health come from the insects that are currently threatening the plants.

4.8.2 Alternative 1

Forest Health under this alternative will not suffer and in may in fact improve as ungulate browse will be curtailed substantially within the small exclosures. We cannot however fence off every mature tree so over the long term certain trees will continue to be browsed which will leave them in a weakened state and more vulnerable to insects and other pests.

4.8.3 No Action Alternative

None.

4.8.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed

4.9 Economic Impacts

4.9.1 Proposed Action

The Proposed Action is not anticipated to have any major negative economic impacts. Positive economic impacts will result from the release of project funds in to the state economy through the purchase of goods and services from local vendors, as well as employment for fence crews. The proposed action may even bring in additional funding for other restoration efforts that might not otherwise be available if left in its current state.

4.9.2 Alternative 1

Like the proposed action there are no negative economic impacts anticipated with the alternative 1 option. There will however be substantially less money flowing into the economy as a result of this alternative, as less material is purchased and fewer fence crew employees are hired.

4.9.3 No Action Alternative

None.

4.9.4 Mitigation Measures

There is no potential for significant adverse impacts, therefore, no mitigation measures are proposed.

5.0 Cumulative Impacts

In considering Cumulative Impacts each resource category was examine and judged through past, present and future actions along with the Proposed Action, Alternative Action and No Action. The following documents and projects were taken into consideration when making determinations:

South Kohala Community Development Plan, Pre-Final July 11, 2008, The South Kohala Community. This development plan outlines the long range comprehensive development of the island of Hawai'i, encompassing County-wide goals.

Environmental Impact Statement: Waikoloa Highlands, State Land Use Boundary Draft Amendment, South Kohala District, Island of Hawai'i, October 3, 2006. The Waikoloa Highlands development is situated adjacent to a portion of the WDFRP's eastern boundary along the power line road.

Environmental Impact Statement Preparation Notice, Villages of 'Aina Le'a: Waikoloa, South Kohala, Island of Hawai'i, November 2007. This document outlines and describes a proposed development of a 3000 acre golf community just northwest of the WDFRP.

Saddle Road Realignment, Island of Hawai'i. This long term highway project will see the improvement and realignment of the old Saddle Rd between Hilo and Kona. A portion of the road is likely to pass somewhere just south of the WDFRP boundary. This location has not been finalized yet.

The Army's Purchase of the Keamuku Parcel from Parker Ranch. Several years ago the US Army purchased approximately 23,000 acres of ranch land from Parker Ranch for the purpose of training the Stryker Brigade Combat Team (SBCT). This parcel, while a few miles away from the WDFRP may still impact our site through fugitive dust loading and ash as a result of fires.

5.1 Air Quality

5.1.1 Proposed Action

Fence construction and other related activities taking place with the WDFRP would affect air quality minimally. The dust generated will be temporary and fall out quickly. As such, these activities are not expected to contribute to the cumulative impacts on air quality in any significant manner.

5.1.2 Alternative Action

Smaller fence units enclosing individual trees and small outplanting sites will contribute next to nothing in terms of fugitive dust and as such, will not cumulatively impact air quality in any significant manner.

5.1.3 No Action Alternative

None.

5.2 Noise Quality

5.2.1 Proposed Action

Noise generated from the Proposed Action would be temporary and short in duration. The proposed location is also far enough away from the population center of the village such that very little of the activities will be heard. The noise generated is likely to be absorbed into the surrounding terrain and as such, will contribute next to nothing cumulatively.

5.2.2 Alternative Action

Noise generated under this activity will be negligible and be quickly absorbed into the surrounding terrain. There will be no adverse cumulative impacts associated with this activity.

5.2.3 No Action Alternative

None.

5.3 Water Resources

5.3.1 Proposed Action

No water resources will be impacted during the construction activities as no features appear within the project site. Therefore there will be no potential cumulative impacts generated.

5.3.2 Alternative 1

No impacts would be anticipated as stated in the Proposed Action.

5.3.3 No Action Alternative

None.

5.4 Geology and Soil

5.4.1 Proposed Action

Construction activities would involve drilling and pounding for the installation of the fence posts into the substrate. These activities will be minor and take place over the course of several years, and as such, will not contribute to any significant cumulative impacts. If a connector trail is

eventually built, this will generate some dust. As the terrain is predominately a' a this material will fall out quickly. Over land flow during storms will be quickly absorbed into the surrounding terrain. As such, these activities are not going to contribute cumulatively in any noticeable manner.

5.4.2 Alternative 1

There will be even less ground disturbance under this alternative. These activities will not contribute to any significant cumulative impacts.

5.4.3 No Action Alternative

None.

5.5 Biological Resources

5.5.1 Proposed Action

The proposed Action should have no impacts that would generate cumulatively. The fence construction will not impact the trees in any manner. The wildlife, both native and non-native will be impacted only slightly and temporarily. Once the action is complete, native wildlife if present, will most likely return. Once the fence is complete non-native ungulates will be absorbed into the surrounding landscape putting more grazing pressure on the vegetation. However, as the surrounding vegetation is predominately comprised of non native weed species the impacts to native flora is likely to be negligible.

5.5.2 Alternative 1

Non native ungulates will continue to roam throughout the project boundaries. No cumulative impacts are anticipated due to small fence unit construction throughout the project boundaries.

5.5.3 No Action Alternative

None.

5.6 Historic and Cultural Resources

5.6.1 Proposed Action

The activities associated with the Proposed Action will not generate cumulative impacts that would in turn affect the cave system which harbor some features dating back to the late 1800s. The forced movement of ungulates to the surrounding areas may impact features outside the fence unit but this will take place over the course of a couple of years.

5.6.2 Alternative 1

With no fence to protect the cave system we can expect that the features (known or otherwise) will continue to be impacted well into the future. As a result the features and cave's themselves will be impacted in a cumulative manner. The question is whether the features have already been disturbed adversely.

5.6.3 No Action Alternative

The features will continue to be impacted in a cumulative manner.

5.7 Existing Recreational and Aesthetic Values

5.7.1 Proposed Action

Creation of the fence unit will force ungulates to the surrounding area. This will put additional pressure on the surrounding terrain. If the ungulates continue to occupy the area to the south of the project, this will increase the hunting opportunities to these areas that are open to hunting. In that regard it will benefit the recreational opportunities to the area.

5.7.2 Alternative 1

Very little recreational opportunities currently exist on these lands. No cumulative impacts are anticipated.

5.7.3 No Action Alternative

None.

5.8 Forest Health

5.8.1 Proposed Action

Forest health is not expected to be impacted cumulatively as a result of enclosure of the project area. The health of the forest should improve in the near future as regeneration of wiliwili and other native shrub species is likely to occur in the absence of browsing and trampling.

5.8.2 Alternative 1

Forest health under this alternative is likely to suffer cumulatively as pressure on the ungulates from development of Waikoloa area force them to relocate in remote wild spaces. The ungulates will continue to browse and trample but with increasing numbers they are more likely to attack the native vegetation (fence or otherwise). This may leave the trees more vulnerable to attack from insects or other pests.

5.8.3 No Action Alternative

Forest health will suffer cumulatively as other projects in the Waikoloa vicinity are developed. This will displace the ungulates and they may seek refuge within the unfenced boundaries of the project. This will likely hasten the demise of the remaining forest.

5.9 Economic Impacts

5.9.1 Proposed Action

The Waikoloa Village and its vicinity are slated to grow substantially over the next couple of decades. There will be new housing, industrial and recreational development creeping towards the WDFRP boundaries. The fence and associated construction activities will be barely negligible with regard to the overall cumulative impacts likely to impact the area. The impacts from the surrounding activities, on the other hand, may adversely impact the new restoration project. All the new construction will most certainly generate an increase in fugitive dust, runoff and potentially fire.

One the other hand, all the new activities may result in a highlighting of the project and its activities such that additional revenues and grants may be generated.

5.9.2 Alternative 1

The cumulative impacts generated from small fence units will be negligible. However, the increased development activities from the surrounding area will put additional pressure on our project as more ungulates may be forced into the project boundaries. This increase in ungulate activity will put additional strain on our small fence units, bring in additional weed species and increase the chance of fire. In this regard the cumulative impacts will adversely impact our project.

5.9.3 No Action Alternative

Like alternative 1 the cumulative impacts of activity in the surrounding terrain will have negative repercussions over the long term.

6.0 Determination of Significance

The goal of the proposed fence construction around the Wiliwili Lowland Dry Forest is to provide permanent, long lasting protection to an extremely rare forest type. Further development throughout the Waikoloa Village and its vicinity will likely result in less dry forest habitat available over the long term. This is one of the best remaining examples of dry forest habitat left in the state.

The anticipated Finding of No Significant Impact is based on criteria outlined in Chapter 200 (Environmental Impact Statement Rules) of Title 11, Administrative Rules of the State Department of Health (§ 110-200-12). The Proposed Action is discussed in relation to these criteria below.

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

The Proposed Action is intended to preserve what little lowland dry forest habitat still remains in the State. The construction of the fence and removal of all ungulates will provide what we hope to be long lasting protection to the forest that still remains and habitat for the future forest we hope to plant over the life of the project.

2. Curtails the range of beneficial uses of the environment.

The Proposed Action will not curtail the beneficial use of the environment. In fact the Proposed Action will enhance the area as weeds will be controlled, fire mitigated and access into the site made easier and safer. Protecting the area is also consistent with the goals of the community development plan.

3. Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, HRS, and any revisions thereof and amendments thereto, court

decisions, or executive orders.

The Proposed Action is consistent with the long-term environmental policies, goals and guidelines of the State of Hawai'i and with the State's mandate to conserve threatened and endangered species, as required by Chapter 195D, HRS.

4. Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.

The Proposed Action will affect the Island of Hawai'i and the State's economic welfare in a positive manner by purchasing fence materials from local vendors, hiring a small crew to construct the fence over the course of several years. At the same we shall be protecting a rare and special ecosystem right in the backyard of the residents of Waikoloa Village.

5. Substantially affects public health.

The health of the public should not be impacted in the least during the construction of the fence unit nor the removal of the ungulates after fence completion. In fact, the public health should improve just knowing that there exists an intact lowland dry forest only ½ mile away.

6. Involves substantial secondary impacts, such as population changes or effects on public facilities.

Substantial secondary impacts are not anticipated during any phase of this project. No public facilities will be impacted, nor are population changes likely to take place as a result of moving forward with this project.

7. Involves a substantial degradation of environmental quality.

The Proposed Action will not involve a substantial degradation of environmental quality. Rather, environmental quality is likely to increase following the implementation of the project. The threat of fire will be mitigated for the southern portion of the Waikoloa Village, one of the State's most threatened native tree species will be protected, and a dry forest landscape will be enhanced for future generations to enjoy.

8. Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.

The Proposed Action is not expected to contribute towards any negative and/or cumulative effects upon the environment. In fact, the action will improve the environment by rehabilitating a fragmented native landscape that is severely impacted by feral ungulates.

9. Substantially affects a rare, threatened, or endangered species, or its habitat.

The Proposed Action will affect rare, threatened, and endangered species and their habitat in a positive way by removing the threats that threaten their existence.

10. Detrimentially affects air or water quality or ambient noise levels.

During the construction phase of the Proposed Action there is most likely going to be some dust and noise generated. However, the amounts are likely to be small. Residents of the Village will not even know work is taking place here due to its remoteness.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The Proposed Action is being undertaken in order to protect a very sensitive and special place from further damage by feral non native ungulates.

12. Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.

The Proposed Action will in no way affect scenic vistas or view planes of the area. The fenced area is far away from the public. They will not even know it is there.

13. Requires substantial energy consumption.

The Proposed Action will not require substantial energy consumption. Very little energy will be needed in those instances when a rock drill is required, or a helicopter is necessary to drop off materials and supplies in a remote location of the project.

7.0 Conclusions

This Environmental Assessment concludes that the Proposed Action to fence off a 275 acre parcel of land for habitat restoration along with the removal of feral ungulates will not have any significant effects on the quality of the human environment and that an Environmental Impact Statement (EIS) is not required. A Finding of No Significant Impact is anticipated.

The project is likely to take several years to complete as funding through government agencies is based on a year to year disbursement. The project will go a long ways to protecting a very special and important section of Lowland Dry Forest habitat on the Island of Hawai'i.

8.0 Prepared by:

Dave T. Faucette,
Project Manager for the Waikoloa Dry Forest Recovery Project
B.A., 1992, University of British Columbia
M.S., 1996, University of British Columbia

9.0 References

- Cabin, R. J., S. G. Weller, D. H. Lorence, T. W. Flynn, A. K. Sakai, D. Sandquist, and L. J. Hadway. 2000. Effects of long-term ungulate exclusion and recent alien species control on the preservation and restoration of a Hawaiian tropical dry forest. *Conservation Biology* 14:439-453.
- Cabin, R. J., S. G. Weller, D. H. Lorence, S. Cordell, and L. J. Hadway. 2002. Effects of microclimate, water, weeding, and direct seeding on the regeneration of native and alien species within a Hawaiian dry forest preserve. *Biological Conservation* 104:181-190.
- Draft Environmental Impact Statement. 2006. Waikoloa Highlands, State Land Use Boundary Amendment South Kohala District, Island of Hawai'i.
- Environmental Impact Statement Preparation Notice. 2007. Villages of 'Aina Le'a, Waikoloa, South Kohala District, Island of Hawai'i.
- Paul H. Rosendahl, Ph.D. Inc. *Archaeological Inventory Survey Waikoloa Mauka Lands, Land of Waikoloa, South Kohala District, Island of Hawai'i*. March 1990.
- South Kohala Community Development Plan. 2008. Pre-Final.
- U.S. Fish and Wildlife Service. 1992. Recovery Plan for the *Caesalpinia kavaiensis* & *Kokia drynariodes*. U.S. Fish and Wildlife Service, Portland, OR. 82 pp. + appendices
- Wolfe, E.W. and J. Morris. 1996. Geologic Map of the Island of Hawai'i. U.S. Geological Survey, Geologic Investigations Series Map I-2524-A. Scale: 1:100,000.