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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
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November 8, 2007

Mr. Laurence Lau, Acting Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

RE: Final Environmental Assessment (FEA) and Finding of No Significant Impact (FONSI) for the Kohala Watershed Partnership Rare Species Protection Fencing Project, TMKs (3) 5-9-002-004, (3) 5-8-002-001, Island of Hawai'i

Dear Mr. Lau:

The Draft Environmental Assessment for the Kohala Watershed Partnership Rare Species Protection Fencing project on the island of Hawai'i was published in the OEQC Bulletin of September 8, 2007. During the public comment period, three written comments were received. After review of the public comments and of the Final Environmental Assessment, the Division of Forestry and Wildlife has determined that this project will not have significant negative effect on the environment. Thus, we have issued a Finding of No Significant Impact (FONSI). Please publish this notice in the next OEQC Environmental Notice (November 23, 2007).

Enclosed are two copies of the FEA, a CD containing the FEA in pdf format, and a completed OEQC publication form. Please call me or Christen Mitchell, DOFAW planner, at 587-0051 if you have any questions.

Sincerely,

PAUL J. CONRY
DOFAW Administrator

Enclosures

FINAL ENVIRONMENTAL ASSESSMENT

KOHALA WATERSHED PARTNERSHIP
RARE SPECIES PROTECTION FENCING PROJECT

North Kohala District
Island of Hawai‘i

In accordance with
Chapter 343, Hawai‘i Revised Statutes

Proposed by:

Kohala Watershed Partnership
19 E. Kawili St.
Hilo, Hawai‘i 96720

November 2007

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I. SUMMARY

Project Name	Kohala Watershed Partnership Rare Species Protection Fencing Project
Project Location	Ahupua‘a of Kahuā 1&2, Kehena 2 North Kohala District Island of Hawai‘i TMK (3) 5-9-002-004 Ponoholo Ranch, Kahuā 1&2 (3) 5-8-002-001 Parker Ranch, Kehena 2
Land Use	Agricultural District
Applicant	Kohala Watershed Partnership (Parker Ranch, Ponoholo Ranch, Kahuā Ranch, The Queen Emma Land Company, Kamehameha Schools, Laupāhoehoe Nui, Surety Kohala Corporation, State Department of Land and Natural Resources, State Department of Hawaiian Home Lands, Hawai‘i County Department of Water Supply, The Nature Conservancy)
Landowners	Ponoholo Ranch, Parker Ranch
Approving Agency	State of Hawai‘i Department of Land and Natural Resources
Anticipated Determination	Finding of No Significant Impact (FONSI)
Agencies & Organizations Consulted	
Federal:	USDA Forest Service USDA Natural Resources Conservation Service US Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office US Geological Survey, Biological Resources Discipline, Pacific Island Ecosystems Research Center
State:	Department of Business, Economic Development, and Tourism, Office of Planning Department of Hawaiian Home Lands Department of Health, Environmental Planning Office

	Department of Land and Natural Resources Division of Forestry and Wildlife Division of Historic Preservation Division of Historic Preservation, Hawai‘i Island Office Land Division Office of Conservation and Coastal Lands Hawai‘i Island Burial Council Natural Area Reserves Commission Office of Environmental Quality Control Office of Hawaiian Affairs University of Hawai‘i, Environmental Center
County of Hawai‘i:	Department of Public Works Department of Water Supply Office of the Mayor Planning Department
Other Organizations:	‘Ahahui Mālama I Ka Lōkahi Bishop Museum, Hawai‘i Biological Survey Conservation Council for Hawai‘i Earthjustice Hawai‘i Audubon Society Hawai‘i Hunting Advisory Council KAHEA – The Hawaiian-Environmental Alliance Kahuā Ranch Kamehameha Schools Kohala Watershed Partnership Laupāhoehoe Nui Native Hawaiian Legal Corporation North Kohala Gun Club Parker Ranch Pig Hunters of Hawai‘i Ponoholo Ranch Sierra Club, Hawai‘i Chapter, Moku Loa Group Surety Kohala Corporation The Nature Conservancy of Hawai‘i The Queen Emma Land Company Wildlife Conservation Association of Hawai‘i

Summary of Action

The Kohala Watershed Partnership (KWP) proposes the construction of approximately three miles of ungulate-proof fencing, with improvements to an additional ½ mile of existing fence, protecting 520 acres of land at Kānea‘a in Kehena 2 and along the west branch of Honokāne Valley in Kahuā 1&2 (see

Appendix A for maps of the project area). The proposed fencing will prevent the movement of feral cattle in the area and facilitate feral cattle as well as feral pig removal. In addition, proposed actions are anticipated to also enhance watershed functions by the protection and restoration of native forests which are critical for water capture, soil stability, and native species continuation.

Kohala Mountain forest is recognized as a primary water resource for the Kohala region of Hawai‘i Island, and provides exceptional habitat for a wide diversity of native plant and animal species. Feral ungulates (hoofed animals) pose a significant threat to watershed integrity and native species habitat in the Kohala region. Ungulates consume and trample native plants, create conditions favorable for invasive weed infestation and establishment, prevent the establishment of native plant seedlings, serve as vectors for the dispersal of non-native plants, and disrupt soil nutrient cycling. The cumulative impact of ungulates is the decline of intact native ecosystems, including the destruction of suitable habitat for threatened and endangered forest birds, plants, and invertebrates. In the absence of ungulates, plant communities often experience dramatically enhanced recruitment of juveniles and increased survivorship of both adults and juveniles, which in turn improves habitat for native wildlife.

Of particular concern is the impact of a large population of feral cattle that inhabits the area along the west branch of Honokāne Valley to Pololū Valley, between 2400-3800 feet in elevation on the western flank of Kohala Mountain.

Though this region of forest has not yet been extensively surveyed for biological communities, it is known to contain habitat critical to the survival of seven federally listed endangered species and more then twenty-five candidate or at-risk species (see Appendices B and C). The construction of ungulate-proof fencing, followed by feral animal control, is the critical first step towards the protection and restoration of this area.

The proposed fencing is part of the ongoing conservation efforts of the KWP, members of which include seven private landowners, the State of Hawai‘i, and two associate partners, the Hawai‘i County Department of Water Supply and The Nature Conservancy of Hawai‘i. The Partnership currently includes approximately 68,000 acres. The long-term protection planned for the watersheds of Kohala builds upon the Partnership’s prior actions and will significantly contribute towards the protection and restoration of important native forest for watershed and habitat purposes.

II. PROJECT PURPOSE AND NEED

Introduced ungulates, including feral cattle and pigs, are a significant threat to native plants and animals in Kohala, many of which can be found

nowhere else on Earth. Ungulates consume and trample native plants, create conditions favorable for invasive weed infestation and establishment, prevent the establishment of native plants, serve as vectors for the dispersal of non-native plants, disrupt soil nutrient cycling, and cause soil erosion. The cumulative impact of ungulates is the decline of intact native ecosystems and compromised watershed functionality. In the absence of ungulates, plant communities often experience dramatically enhanced recruitment of juveniles and increased survivorship of both adults and juveniles, which in turn improves habitat for native wildlife.

The proposed action is to fence and remove animals, particularly feral cattle and pigs, from 520 acres in North Kohala. By preventing feral ungulates from expanding further into the intact core of the watershed, the action would protect forested watersheds of particular importance as well as potential habitat for multiple endangered species.

Additional benefits for neighboring landowners, including Kahuā Ranch and Surety Kohala Corporation, are that these feral cattle will be prevented from entering their lands, thereby limiting potential adverse impacts and management needs. Also, domestic cattle that graze further downslope and to the west will no longer be negatively impacted by wild stock through degradation of pasture lands and infiltration of inferior genetic stock.

The State of Hawai‘i Comprehensive Wildlife Conservation Strategy (2005) identifies a number of species of greatest conservation need that occur in this area of Kohala. The area provides habitat for the Hawaiian duck, koloa maoli (*Anas wyvilliana*), a federally listed endangered species, and for various native forest birds such as the ‘apapane (*Himatione sanguinea sanguinea*), ‘amakihi (*Hemignathus virens virens*), ‘elepaio (*Chasiempis sandwichensis sandwichensis*), and occasionally the ‘i‘iwi (*Vestiaria coccinea*), whose numbers are thought to be declining in Kohala. Additionally, the Hawaiian short-eared owl, pueo (*Asio flammeus sandwichensis*), and ‘io, the endangered Hawaiian hawk (*Buteo solitarius*), are known from the area.

Kohala is also home to a number of rare plants. A lobeliad endemic to Kohala, *Clermontia drepanomorpha*, is known from nearby populations in the Pu‘u O ‘Umi Natural Area Reserve (NAR). That species and a native mint, *Phyllostegia warshaueri*, were identified by the U.S. Fish and Wildlife Service (USFWS) in Big Island II: Addendum to the Recovery Plan for the Big Island Plant Cluster (1998). This recovery plan identifies fencing and removal of feral ungulates as a critical need in the recovery of these species. Additionally, nearby public land has been identified as critical habitat for the endangered species hala pepe (*Pleomele hawaiiensis*), ‘aiea (*Nothocestrum breviflorum*), and *Achyranthes mutica*, a native amaranth. Though the focus of this project will include the construction of fences and the removal of feral ungulates, future management may include rodent control and potential plantings of rare plants.

The project area consists largely of degraded native ʻōhiʻa (*Metrosideros polymorpha*) forest. Domestic cattle owned by the landowners have largely been kept out of this area, but feral cattle and pigs have caused damage by grazing and rooting. While the area generally consists of an ʻōhiʻa canopy and degraded, non-native understory, numerous native species exist as epiphytes – which are plants that grow upon or are in some manner attached to another plant or object for physical support – upon ʻōhiʻa trees, above the reach of browsing cattle. It is expected that native species that currently exist as epiphytes or on nearby steep cliffs might re-colonize the project area upon ungulate removal, creating a relatively intact, protected environment that might provide habitat for rare or endangered species. In addition, epiphytes have been identified as important components for forest diversity with regard to watershed function and water capture.

Of great significance is the fact that this area of Kohala is the last known habitat for the native land snail, *Partulina physa*. Though this species is not listed as endangered, it is considered a species of concern. Extensive surveys conducted on the Island of Hawaiʻi between 1995-97 discovered no other populations. Fencing and controlling wild cattle and pigs in the area will provide significant protection to this species by reducing forest degradation and allowing for habitat recovery.

Because of the anticipated benefits to watershed health, native species and habitat, and agriculture, fencing this area is one of the priority projects in the regional cooperative conservation effort managed by the Kohala Watershed Partnership.

The project will be funded in part by State funds. As such, the project requires that an Environmental Assessment be prepared in accordance with Chapter 343 of the Hawaiʻi Revised Statutes.

III. PROJECT DESCRIPTION

The Kohala Watershed Partnership proposes to construct three miles of ungulate-proof fencing, and to improve an additional ½ mile of existing fence, to facilitate protection of forested watershed lands as well as habitat important for the survival of a number of native species over 520 acres in the project area. It is anticipated that neighboring State and privately owned lands will benefit from the exclusion of feral cattle and pigs and protection of native habitat that will be provided by the project. Fence construction and long-term conservation management will be coordinated by the KWP. After the construction of ungulate-proof fencing, additional conservation management activities such as animal removal, invasive weed control, and replanting areas with native trees and plants will take place.

Fence construction

The main objective of this project is to build approximately three miles of fencing, protecting 400 acres of Parker Ranch land at Kānea‘a in Kehena 2 and 120 acres in Kahuā 1&2 on Ponoholo Ranch, and to improve ½ mile of existing fence.

The planned fencing alignments will utilize the local topography, existing four-wheel drive (4WD) roads, and existing fencing to provide maximum protection from feral ungulates at minimum cost. The fencing will not actually enclose any area, but will make use of the steep terrain of the Honokāne and Pololū Valleys to strategically prevent herd movements.

A strategic fence will be built on Parker Ranch land, running west from the rim of Pololū Valley, and will tie into an existing fence on the boundary between Parker Ranch and Surety Kohala Corporation property, beginning at ‘Āwini Stream. This strategic fence will prevent the movement of feral cattle along the rim of Pololū Valley thereby also helping to protect adjacent acreage of State land and Surety Kohala Corporation property. Strategic closures are also planned for Kehena 2 and Kahuā 1&2, in the Kānea‘a area between Pololū Valley and the west branch of Honokāne Valley, and extending south along the west branch. Fencing will extend southwest from the head of Pololū Valley on Parker Ranch land, following Pololū Stream past Pu‘u Kāmau, before turning east at the boundary between Parker Ranch and Ponoholo Ranch lands and connecting to existing fencing that runs along this boundary to the rim of the west branch of Honokāne Valley. Another fenceline will diverge from the existing fence, running south and generally parallel to the west branch of Honokāne Valley on Ponoholo Ranch land, before ending at the valley head. This line will follow the old Kehena Ditch trail. By tying into existing fencing, no new stream crossings will be required. An additional short section of fence is planned along the end of the Kānea‘a area, in order to close off access to less steep slopes that might be traversed by cattle. The alignment is illustrated on map 2 of Appendix A.

Prior to construction, the planned fenceline will be flagged and inspected for any rare or endangered plant species, as well as for any historical or archaeological features. However, the project area is well known, and no such incidences are expected. To construct the fencing, a corridor no wider than six feet will be cleared of vegetation where necessary. The planned alignments follow existing trails and 4WD roads. As such, only minimal hand clearing is expected to be necessary, minimizing the impact of the project.

Hogwire fences will be constructed to prevent passage by feral ungulates. The fencing is anticipated to be approximately five feet tall, made of steel posts and steel wire. Barbed wire will be attached to the fencing to prevent cattle damage. Fence construction will involve driving posts into the ground no more

than ten feet apart along the fence route. Four foot high, high-tensile bezinol-coated steel woven wire mesh (hogwire) will be attached to the outside of the posts. The hogwire will be tight to the ground, supplemented by extra pins between fence posts. One or two strands of bezinol-coated barbed wire will be attached to the top of the fence, and one strand will run along the bottom of the fence. The fencing crew will transport themselves, materials, supplies, and equipment to the project area along existing 4WD roads. Helicopters may be used to transport the fencing materials and supplies to the more remote sections of the project area.

During all construction activities, if any archaeological sites, artifacts, or burials are encountered, fencing construction will halt and the appropriate agencies notified to discuss further action, including re-routing the fence line to avoid these elements.

Animal control

Feral ungulates, particularly cattle, are a significant threat to the biological resources of the project area. These animals consume and trample native plants, create conditions for non-native plant infestation and establishment, serve as vectors for the dispersal of non-native plants, and disrupt soil nutrient cycling. The spread of most other non-native species is enhanced by the disturbance of soil, surface litter, and vegetation cover. The cumulative effect of ungulates is the decline of intact native ecosystems, including the destruction of suitable habitat for rare and endangered forest birds, plants, and invertebrates, and the compromising of watershed functionality.

Initial feral animal control measures, such as driving animals out of the project area and ground-based shooting or trapping, may occur before and during fence construction to reduce animal populations in the project area.

Once fences are built, cattle will be removed using a variety of methods including trapping, ground hunting, aerial shooting and other methods as needed. Animal removal will be mainly accomplished by the private land owners of Ponoholo Ranch and Parker Ranch, as well as neighboring land owners, such as Kahuā Ranch and Surety Kohala Corporation, who have cattle removal expertise and will provide their time for the removal phase. Animal removal assistance will also come from the State Division of Forestry and Wildlife. The goal will be the complete removal of the feral cattle herd, estimated at over 400 animals.

Though the initial two year effort will be spent on fencing and cattle removal, the removal of feral pigs will be a secondary goal. Pig removal will occur first on the 120 acre Ponoholo Ranch section and will later continue on the 400 acre Parker Ranch portion. The area will be periodically monitored

afterwards for ungulate ingress, and the fencing will be inspected and maintained on a regular basis.

Weed Control

Weed control efforts after fence construction will be concentrated to protect the most intact native areas from disruptive plant species and begin control efforts while populations are still localized. Weed species are most prevalent at the interface between pasture and forest, edges of the forest reserve, along trails, and in disturbed areas.

Feral cattle, while causing large-scale disturbance to the landscape, can also help to control some weeds through grazing. The removal of grazing ungulates associated with the project will require sustained effort to prevent the spread of invasive weeds in disturbed areas.

Efforts will include distribution mapping of priority weeds, control using herbicide, manual methods, or biocontrol, follow-up monitoring to evaluate effectiveness of control, and annual weed monitoring. Fencing and ungulate control will help greatly with invasive weeds, as there is a direct relationship between damaged sites and weed infestation.

Some of the worst invasive plant species in the surrounding area include various species of ginger (*Hedychium* sp.), strawberry guava (*Psidium cattleianum*), banana poka (*Passiflora tarminiana*), fireweed (*Senecio madagascariensis*), cane tibouchina (*Tibouchina herbacea*), Koster's curse (*Clidemia hirta*), kikuyu grass (*Pennisetum clandestinum*), and various rushes (*Juncus* sp.). Numerous other invasive weeds are found in the Kohala area.

Certain portions of the project area remain fairly intact, but some degree of degradation is characteristic. Existing infestations will require control to prevent or slow their spread, and regular monitoring will be required to prevent new ones. Non-native pasture grasses will need to be targeted for control in certain areas to enhance natural regeneration of native trees and shrubs. Additional species that are present on the island but have not yet reached Kohala, such as *Miconia calvescens* or Himalayan raspberry (*Rubus ellipticus*), may also need control if they become a problem.

The Kānea‘a area is characterized by a sparser growth of remnant ‘ōhi‘a than is found in the upper portion of the project area, and seems to contain less native plants surviving as epiphytes. As such, this area will require attentive monitoring for intrusion of the sort of ecosystem altering weeds, like strawberry guava, that might flourish in the absence of ungulates.

Reforestation and outplanting

Though the focus of this project will include the construction of fences and the removal of feral ungulates, future management may include outplanting

of rare plants. Selection of the appropriate species and planting sites will be conducted only after consultation with rare plant experts. Some portions of the project area already have relatively intact forest canopy and will not require intensive reforestation efforts. Other areas more heavily impacted by ungulates may require reforestation of the common, native tree and shrub species if natural regeneration is not effective. Potential outplanting of rare plant species would likely be concentrated in the more intact forest areas, expanding to other locations as the forest recovers.

Fire management

Due to the wet nature of windward Kohala, fire is not an issue of any great concern for the project area. However, fire management is incorporated as part of the proposed conservation action. Because Hawai‘i’s flora have evolved with infrequent, naturally-occurring episodes of fire, most native species are not fire-adapted and are unable to recover well after wildfires. Alien plants, particularly grasses, are often more fire-adapted than native species and will quickly exploit suitable habitat after a fire. It is recognized that, though unlikely, fire may be a risk in the project area and that in the short-term after fence construction and animal removal, the volume of pasture grasses is likely to increase. Thus, strategies to prevent and minimize the impacts of fire will be incorporated into the project. Many fires are caused by humans, so fire prevention measures will include increased educational efforts for those accessing the property and possible road or area closures in the event of extreme fire danger.

Over the long-term, it is anticipated that the project will reduce the threat of fire to the area by promoting native tree and shrub cover. Woody vegetation will likely reduce non-native pasture grass cover (the primary source of fine fuels that promote intense fires), increase moisture at ground level (through increased fog interception), and reduce wind velocity near ground level. Although fires will not be prevented by increasing the cover of woody species, fire behavior and the probability of intense and frequent burning will likely decline over the long-term as a result of this project.

Timing & Costs

Fence construction is planned to occur once all permissions and approvals have been received. Fencing may be constructed in phases, and the project is expected to be completed within two years. Related conservation actions, such as animal control, weed control, and outplanting, may occur concurrently with each other after fence construction is completed and are anticipated to continue for the duration of the existence of the fence and management of the area for conservation and watershed purposes.

The known cost estimates for the project are as follows:

Item	Cost
Fence construction and materials (3 mi @ $70,000/mi)	$210,000
Cattle removal	$87,000
Total	$297,000

The rough terrain and remote location in this area greatly increase the costs of this large landscape-scale project. The cost of materials and construction of an ungulate-proof fence is also very high. This is the most critical aspect of the project as well as the highest cost management activity.

Funding for this project includes Federal funds from the USFWS, matching funds and in-kind support from private landowners, and matching funds and in-kind support from the State. Specific costs associated with the planned management of the area after completion of the fencing and feral cattle removal are not yet known. However, it is anticipated that funding will be targeted from Federal, State, County, and private programs, as well as in-kind support from watershed partners.

IV. SUMMARY DESCRIPTION OF AFFECTED ENVIRONMENT

Location and Physical Characteristics of the General Area

The Kohala Watershed Partnership Rare Species Protection Fencing Project area is on land owned by Parker Ranch at Kānea‘a in the ahupua‘a of Kehena 2 (TMK (3) 5-8-002-001), and by Ponoholo Ranch in the ahupua‘a of Kahuā 1&2 (TMK (3) 5-9-002-004), located in the North Kohala District of Hawai‘i Island. The project area is composed of approximately 400 acres of Parker Ranch land and 120 acres of Ponoholo Ranch land. The elevation ranges from approximately 2400-3800 feet. A number of 4WD roads of varying quality currently exist in the TMKs and provide access to and within the project area. Adjacent landowners include Kahuā Ranch, Surety Kohala Corporation, Kamehameha Schools, and the State of Hawai‘i.

The project is located on the upper windward slopes of Kohala Mountain, one of five volcanoes comprising Hawai‘i Island. Located at the northwestern tip of the island, Kohala is the oldest of the five volcanoes, with the last known eruptions occurring some 60,000 years ago. The U.S. Geological Survey has determined that Kohala lies within Hawai‘i Island Volcanic Hazard Zone 9, the area of least hazard.

The project area is largely composed of Pleistocene lava flows of the Hāwī Volcanics, with scattered scoria cones located nearby. Areas downslope in Pololū and Honokāne Valleys are composed largely of older Pleistocene lava flows of the Pololū Volcanics, with some alluvium. Volcanic ash, cinders, and lava flows have contributed to soil development in the area.

As the project area consists largely of well-aged lava flows, of around 150,000 years in age, soils are relatively well-developed. The soils of the windward Kohala area are generally characterized as shallow to deep, poorly drained to somewhat poorly drained soils with moderately fine textured subsoil, on gently sloping to steep uplands. These soils range from near sea level up to the 5500 foot summit area, receive from 80 to more than 200 inches of rainfall annually, have a mean annual soil temperature between 56-75° F, and are generally suitable for use only as pasture, woodland, watershed, and wildlife areas. Forage tends to be of low nutritional value and have very low content of dry matter. More specifically, the project area along the west rim of Pololū Valley is characterized as silty clay loam of the Kahuā Series (KCD), while the Kānea'a area and the western rim of the west branch of Honokāne Valley are characterized as Amalu soils (rAM). rAM are poorly drained, mucky soils with a mat of partly decomposed mosses, leaves, and twigs overlying a layer of smeary, mucky silt loam. KCD consists of a surface layer of very dark brown silt loam, separated from subsoil by six inches of grayish-brown silty clay. Runoff is slow and the erosion hazard slight here. These soils are classed as VI and VII, soils with severe limitations that are unsuited for cultivation. The primary limitation here is the wetness and poor drainage of the soils.

Average annual rainfall on Kohala Mountain is over 160 inches near the 3500 foot elevation level in the wet forest between Waipi'o and Honokāne Valleys on the windward side. As rising moist air cools, it forms clouds that drop moisture in the form of rain, as dictated by topography and wind direction. The cooled clouds continue to drop moisture in the form of rain and intercepted fog and become drier as they flow over the mountains to the leeward side. Fog water that is intercepted by vegetation (fog drip) is a consistent characteristic of the windward Kohala Mountain slopes above 3000 feet. A distinctive feature of Kohala's hydrology is that a significant proportion of its total precipitation comes from water intercepted from the clouds passing through the vegetation high on the mountain.

Streams near the project area include Pololū and Honokāne Nui Streams. Both of these are classified as perennial streams. While not considered impaired, Pololū Stream was identified by the State Department of Health as needing additional monitoring for excess turbidity.

Current Land Use

The project area is located entirely in the State Agricultural District, and is zoned A-20a (Agricultural District, with a minimum building site of twenty acres) by the County. The County General Plan Designation for the area is Extensive Agriculture. The project area is not located in the County of Hawai'i's Special Management Area. Some adjacent lands are similarly zoned, while adjacent lands in Pololū and Honokāne Valleys are in the Conservation District, Resource Subzone. State-owned land in Pololū Valley is a part of the

Kohala Forest Reserve. Nearby land owned by Surety Kohala Corporation is zoned Conservation District, General Subzone.

The project area is located on two parcels of land, one owned by Parker Ranch and the other by Ponoholo Ranch, that have generally been unused, due to the presence of feral cattle. Nearby lands owned by the project landowners are used primarily for grazing domestic cattle. While the majority of project lands have no specific agricultural designation, some project area along the west rim of Pololū Valley, as well as much of the remainder of the TMKs outside of the project area, is designated A-1 (Animal Husbandry; Grazing).

Biological Communities

Though no detailed survey has been conducted specific to the project area, surveys have been conducted in nearby Pu‘u O ‘Umi NAR, and general characterizations of the area’s flora and fauna are produced in the Kohala Watershed Partnership’s Draft Management Plan (2006).

Kohala Mountain forests, bogs, and streams support a large diversity of native species of vertebrates, crustaceans, mollusks, and plants. Fungi, liverworts, mosses and lichens further contribute to its biological diversity. The complexity and diversity of its ecosystems are significant in comparison to other volcanoes on the island. The isolation of Kohala’s natural communities from those of Mauna Kea is a relatively recent occurrence. The two areas were once ecologically connected, allowing for an exchange of genetic materials, but have since been separated by land clearing activities.

Flora

Biomes represented on Kohala include lowland tropical rain forest, montane rain forest, montane bogs, and mesophytic forest. Montane rain forest, sometimes referred to as cloud forest, makes up only 2.5% of the total area of the world’s tropical forests. The frequent presence of clouds and the additional input of water from intercepted fog significantly influence the hydrology of such areas, support unique ecosystems, and help sustain a disproportionately large number of the world’s threatened endemic species. A general description of Kohala Mountain’s windward vegetative communities is below, followed by a specific description of the vegetation found in the project area.

Lowland Wet Forest communities extend up to 2500 feet in elevation in windward areas, where they are succeeded by Montane Wet Forest communities, which cover windward slopes above 2500 feet. Smaller patches of other plant communities found within these major vegetation types include Montane Wet Bogs, Lowland and Montane Shrub and Grasslands, and Wet and Dry Cliffs.

At least eight specific natural community types are known from surrounding areas, including two that are considered rare, meaning that they are known from less than twenty locations worldwide. Vegetation in the area varies across the topographically complex landscape.

Three distinct types of ʻōhiʻa (*Metrosideros polymorpha*)-dominated forest are known to comprise the vast majority of Montane Wet Forests in the area, with ʻŌhiʻa/ʻŌlapa (*Cheirodendron trigynum*) Montane Wet Forest comprising the majority of these. Other types of ʻōhiʻa-dominated forest include ʻŌhiʻa Mixed Shrub Montane Wet Forest and ʻŌhiʻa/Uluhe Montane Wet Forest.

ʻŌhiʻa/ʻōlapa canopy may reach thirty feet in height, but in many instances is shorter (less than fifteen feet). Occasional large tree snags, probably ʻōhiʻa, suggest that some areas of the forest have undergone dieback, and that the low stature canopy represents a regenerative phase. Dieback is a natural successional phenomenon in which older stands die synchronously, leaving gaps in the forest canopy. These gaps provide openings for subsequent ʻōhiʻa regeneration.

Common associated species found in the canopy of the ʻōhiʻa/ʻōlapa forest include kāwaʻu (*Ilex anomala*), kōlea (*Myrsine sandwicensis* and *M. lessertiana*), alani (*Melicope clusiifolia* and other *Melicope* sp.), and hāpuʻu (*Cibotium glaucum* and *C. chamissoi*). Uluhe ferns (*Dicranopteris linearis*, *Sticherus owhyhensis*, and *Diplopterygium pinnatum*) are often codominant in the understory. Shrub species present include alani, pūkiawe (*Leptecophylla tameiameiae*), kanawao (*Broussaisia arguta*), naʻenaʻe (*Dubautia plantaginea*), ʻōhā wai (*Clermontia* sp.), manono (*Hedyotis terminalis* and *H. hillebrandii*), and pilo (*Coprosma pubens* and *C. ochracea*). Native ferns found in this forest include hōʻiʻo (*Diplazium sandwichianum*), ʻākōlea (*Athyrium microphyllum*), *Dryopteris* sp., *Asplenium* sp., ʻae (*Polypodium pellucidum*), ʻamaʻu (*Sadleria pallida* and *S. souleyetiana*), and palaʻā (*Sphenomeris chinensis*). The ground cover is moss-dominated by species of the genus *Sphagnum*, especially in poorly drained areas, but also includes ʻalaʻala wai nui (*Peperomia* sp.) and haʻiwale (*Cyrtandra paludosa*). Maile (*Alyxia oliviformis*) is sometimes abundant. Aside from the unusual abundance of *Sphagnum* mosses, the components of Kohala's ʻōhiʻa/ʻōlapa forest are typical of the community on other islands.

Forming a mosaic with the more prevalent ʻōhiʻa/ʻōlapa forest, the ʻŌhiʻa Mixed Shrub Montane Wet Forest usually occupies the best drained areas on the ridge tops. The ʻōhiʻa canopy of this forest generally exceeds fifteen feet in height. There is often a secondary tree layer containing native species such as kāwaʻu, ʻōlapa, kōlea, alani (usually *M. clusiifolia*), and pilo. Under the tree layer is found a discontinuous hāpuʻu layer and a well-developed native shrub layer containing such species as ʻōhelo kau lāʻau (*Vaccinium calycinum*), kanawao, pūkiawe, ʻōhā wai, kāmakahala (*Labordia hedyosmifolia*), manono, alani, kōlea, koliʻi (*Trematolobelia grandifolia*), pilo (*C. pubens*), and saplings of ʻōhiʻa and ʻōlapa.

A diversity of native ferns is also seen here, including hō‘i‘o, ‘ākōlea, ‘ae, wahine noho mauna (*Adenophorus* sp.), *Asplenium* sp., *Dryopteris* sp., and palai hihi (*Vandenboschia davallioides*). The ground cover contains mosses, liverworts, seedlings of a variety of plants, and ‘ala‘ala wai nui. Native vines include maile, hoi kuahiwi (*Smilax melastomifolia*), and mā‘ohi‘ohi (*Stenogyne calaminthoides*). Epiphytes are well developed in this forest type, and include a variety of mosses, liverworts and ferns.

Patches of ‘Ōhi‘a/Uluhe Montane Wet Forest often occur adjacent to gulches or where ungulate damage is severe, such as the areas immediately adjacent to pasture lands. The composition of this forest is relatively simple; under an open canopy of ‘ōhi‘a, the ground cover is dominated by uluhe. Other elements of surrounding ‘ōhi‘a forests, especially ‘ōlapa and hāpu‘u, emerge above the thick uluhe mats.

Uluhe also forms a shrubland without association of an ‘ōhi‘a canopy, as it can rapidly dominate where there has been disturbance such as landslides, fires, ungulate damage, or road cuts. Steep slopes and some ‘ōhi‘a dieback areas are dominated by these Uluhe Successional Shrublands. On moderate slopes, a variety of scattered low trees and shrubs are also present, including ‘ōhi‘a, ‘ōlapa, and pūkiawe. On steeper slopes, the cover is almost entirely uluhe.

Wet bogs typically occur as open patches within the montane cloud forest. These communities are dominated by grasses or sedges, with few woody plants. Kohala Mountain supports a large bog-cloud forest mosaic across the gently sloping upper windward slopes. It is believed that bogs develop on poorly drained areas where clay soil formation impedes drainage, causing accumulation of perched water on top of the clay, thereby drowning out root systems of woody plants. Hawai‘i Island bogs are characterized primarily by sedges, *Sphagnum* mosses, and stunted ‘ōhi‘a of varying density. Two specific rare bog communities known from Kohala Mountain are the Mixed Grass and Sedge Montane Bog and the ‘Ōhi‘a Mixed Montane Bog. Though bogs are not present in the project area, the project does have the potential to provide benefits for these rare communities.

Mixed Grass and Sedge Montane Bogs are known from fewer than five sites on the Islands of Maui and Hawai‘i, and are considered critically imperiled globally by the Hawai‘i Biodiversity and Mapping Program. These rare bogs are each dominated by a different, but overlapping, set of grasses and sedges. The dominant vegetation seen in the bogs of Pu‘u O ‘Umi NAR is kuolohia (*Rhynchospora chinensis*) and *Sphagnum* mosses. Other grasses include ‘ohe (*Isachne distichophylla*), *Dichanthelium cynodon*, and *D. hillebrandianum*. These bogs typically contain few woody species, such as extremely stunted ‘ōhi‘a, pūkiawe, and ‘ōhelo (*Vaccinium dentatum*).

ʻŌhiʻa Mixed Montane Bogs are considered globally imperiled, and are known from fewer than ten sites on the Islands of Kauaʻi, Molokaʻi, Maui, and Hawaiʻi. Vegetation in these bogs is typically of low stature (< 36 inches), dominated by a bog form of ʻōhiʻa and by the sedge ʻuki (*Machaerina angustifolia*), growing from a mat of *Sphagnum* moss. On better drained portions of the bog, ʻōhiʻa may be of slightly higher stature and form a canopy over a variety of low shrubs, including pūkiawe and ʻōhelo. Other species typical of this bog habitat include a native violet (*Viola maviensis*), ʻohe, kuolohia, *Dicanthelium hillebrandianum*, and *D. cynodon*. Uluhe (*Dicranopteris linearis*) and wāwaeʻiole (*Lycopodiella cernua*) are observed occasionally on bog edges.

Other unique plant communities from windward Kohala include the *Carex alligata* Montane Wet Grasslands and the Mixed Fern/Shrub Montane Wet Cliffs. Both of these are generally found as small, scattered patches.

Carex alligata Montane Wet Grasslands are known from the Islands of Kauaʻi, Maui, and Hawaiʻi, and are often found in low-lying, water-saturated areas. This community often is dominated by the sedge *Carex alligata*, to the near exclusion of other species. Associated species that may occur include scattered ʻōhiʻa, ʻōlapa, ʻōhelo kau lāʻau, and kuolohia.

Vegetation observed on the steepest windward slopes of Kohala is dominated by ferns and shrubs, forming a Mixed Fern/Shrub Montane Wet Cliff community. Dominant species seen in these areas include ʻamaʻu, uluhe, hāpuʻu, and other ferns, with common native shrubs such as ʻōhelo kau lāʻau, pūkiawe, and pilo (*C. pubens*). Occasionally, shrubs such as naʻenaʻe, kanawao, koliʻi, and ʻapeʻape (*Gunnera petaloïdea*) are seen. A variety of mosses, liverworts, smaller ferns, and herbs, such as ʻalaʻala wai nui, occur under the mixed fern and shrub canopy.

The project area itself is dominated by native vegetation, although large portions of the plant communities have been highly altered by logging, cattle grazing, feral ungulates, fire, and alien plant invasion over the past 200 years. Feral cattle are present in the project area because the lack of strategic fencing makes herd reduction and control of their movements difficult.

The vegetation found in the project area is largely ʻōhiʻa-dominated forest. While the ʻōhiʻa canopy remains largely intact, the understory has been degraded by years of abuse from feral cattle and pigs. Understory species remain present in the area, however, as epiphytes on ʻōhiʻa hosts. The largely degraded understory in the project area consists primarily of non-native grass, such as kikuyu grass (*Pennisetum clandestinum*), and sedges of the genus *Juncus*. ʻŌhiʻa in this area is largely second-growth forest, which typically begins growth epiphytically, resulting in a complexity of large trunks reaching the ground. This process provides broad surface areas for the growth of other species, including larger shrubs and small trees. It is likely that these

impressive epiphytic reservoirs will contribute to the natural restoration of native forest upon removal of feral ungulates.

The Ponoholo Ranch section of the project area, also referred to by the KWP as the Pūpū Kani Oe Management Unit, is the more intact of the two areas. The ʻōhiʻa forest here remains relatively dense, and a high diversity of species may be found existing as epiphytes on these ʻōhiʻa. Native shrub and tree species, such as ʻōlapa, ʻōhelo, kōlea, and hāpuʻu, survive as relatively large epiphytes on larger ʻōhiʻa, or in situations where the trunks of larger trees have provided some protection from animals. Understory species, such as ʻalaʻala wai nui, paʻiniu (*Astelia menziesiana*), ʻōhā wai, and a variety of ferns, grow here as well. ʻIeʻie (*Freycinetia arborea*) is also present, and scattered individual shrubs may be found at ground level, including those mentioned above and manono. Another section of Ponoholo Ranch land to the west of this portion of the project area is perhaps in even better condition, and may act as a source of material for natural regeneration.

The Kānea'a area, owned by Parker Ranch, has an unusually drier climate than that found on other windward parts of the mountain, due to its location between two valleys, its elevation, aspect, and the effect of local topography on wind. This area also has an ʻōhiʻa-dominated canopy, with native trees such as alani, hala pepe (*Pleomele hawaiiensis*), hame (*Antidesma platyphyllum*), and ʻahakea (*Bobea elatior* and *B. timonioides*) forming the understory. Feral cattle have caused significant damage to the understory here and have inhibited the recruitment of juvenile trees, but older, established trees remain healthy. The ʻōhiʻa forest becomes sparser heading downhill into Kānea'a, and a less diverse epiphytic flora is found on the surviving trees, possibly due to the slightly different climate. Weed monitoring will be a priority here, and ecosystem modifying species, such as strawberry guava, will be dealt with aggressively.

Numerous species may be observed along cliff edges, and it may be possible that the relatively undisturbed steep cliffs may provide a source for forest regeneration material in the project area. Fairly large specimens of pilo kea (*Platydesma spathulata*) may be found along this more open edge, as can the native vine hoi kuahiwi.

It is possible that the forest will aggressively regenerate naturally, using the ʻōhiʻa epiphyte reservoirs and cliff areas for source material. Even highly degraded pasture areas in wet, windward Kohala have been observed to begin regeneration when cattle are kept away for as little as six months. Puʻu Pili, an area of Kohala that was historically degraded by cattle and subsequently fenced, is now a fairly successful native forest, demonstrating that natural regeneration may be successful in Kohala. Revegetation monitoring sites will likely consist of highly degraded clearings surrounded by more dense ʻōhiʻa/epiphyte forest. If native plants are able to reestablish themselves by radiating out from source material, these clearings should show supporting evidence of such a process.

More than 200 native plants are known from windward Kohala Mountain, including seven threatened or endangered species, eight candidate species, and many species of concern (USFWS). These include the native trees, shrubs, grasses, and ferns discussed above, as well as other species endemic to the area. Of special concern in the project area is the endangered – and endemic to Kohala – lobeliad, or ʻōhā wai, *Clermontia drepanomorpha* and other endangered, endemic species such as hala pepe, ʻaiea (*Nothocestrum breviflorum*), a native mint (*Phyllostegia warshaueri*), and the native amaranth *Achyranthes mutica*. Other endemic ʻōhā wai in the area include *C. kohalae* and the species of concern *C. waimeae* and *C. calophylla*. Species of concern known from the area also include the jewel orchid (*Anoectochilus sandvicensis*) and the lobeliad ʻōpelu (*Lobelia hypoleuca*). The endemic lobeliad ʻakū (*Cyanea tritomantha*) is a candidate species. Appendix B contains a list of notable native plants observed in the Kohala area.

Though not all of the native plants and communities described here are found specifically in the project area, the descriptions provide a guide to the nature of windward Kohala's native vegetation. The fencing project will prevent further degradation to native forest in the project area, aid forest regeneration, enhance watershed functions, and help to provide habitat for the rare species listed above. Additionally, the project is likely to benefit areas of greater Kohala, and will contribute to the overall management goals of the KWP.

Fauna

Kohala Mountain provides a diversity of bird habitats that support over a dozen species of seabirds, four forest birds, two waterbirds, and a hawk. The project area provides habitat for native forest birds such as the ʻapapane (*Himatione sanguinea sanguinea*), ʻamakihi (*Hemignathus virens virens*), ʻelepaio (*Chasiempis sandwichensis sandwichensis*), and occasionally the ʻiʻiwi (*Vestiaria coccinea*), whose numbers are thought to be declining in Kohala. Additionally, the Hawaiian short-eared owl, pueo (*Asio flammeus sandwichensis*), and ʻio, the endangered Hawaiian hawk (*Buteo solitarius*) are known from the area.

On Kohala Mountain, native forest birds largely associate with closed canopy forests of ʻōhiʻa and ʻōlapa, but often are absent from degraded forests. Regeneration of native understory could encourage greater use of the project area by native forest birds.

The native waterbirds of Hawaiʻi were once the largest animals in Hawaiian ecosystems. There were more than twelve species in this group, including now extinct giant flightless geese and ducks. Numerous pressures pushed these species to extinction, and today the koloa maoli, or Hawaiian duck (*Anas wyvilliana*), and nēnē, or Hawaiian goose (*Branta sandvicensis*), are the

only members of the family remaining within the main islands of the Hawaiian archipelago.

The koloa maoli, an endangered species, inhabits the wetlands, ponds, and streams of Kohala. This duck was once a widespread species that inhabited coastal marshes of all the main islands except the dry islands, but today it is found only in upland ponds and along mountain streams. Its decline has been due to the loss of wetland habitat, hunting, predation by introduced animals, and other factors. Furthermore, hybridization of koloa maoli with feral populations of the closely related mallard (*A. platyrhynchos*) threatens to genetically alter the species. Kohala ponds and streams are probably the most important habitat for the estimated 200 birds on Hawai‘i Island, and koloa have been observed within the project area.

In addition to being the State bird, the nēnē is considered the eighth most endangered waterfowl species in the world. Nēnē use Kohala Mountain occasionally. The indigenous ‘auku‘u, or black-crowned night heron (*Nycticorax nycticorax hoactli*), also inhabits the wetlands, ponds, and streams of Kohala.

The migratory kōlea, or Pacific golden-plover (*Pluvialis fulva*) occurs in Kohala, as do seabirds such as the threatened Hawaiian shearwater, or ‘a‘o (*Puffinus newelli*), and the endangered ‘ua‘u, or Hawaiian petrel (*Pterodroma sandwichensis*). Records of sightings and calls suggest these birds exist within the Hāmākua and Kohala forests but that these colonies are widely dispersed and probably contain very few individuals. Both birds nest in burrows in steep, mountainous terrain between 500-2300 feet in elevation, usually in association with uluhe ferns.

Recent discoveries of the bones of prehistorically-vanished species now reveal a vast array of former birds that became extinct long before the arrival of Europeans in Hawai‘i. Extinct flightless bird species reported from Pu‘u Wa‘awa‘a, such as a flightless Hawaiian goose (*Branta* sp.), flightless rails (*Porzana* sp.), a slender-billed crow (*Corvus* sp.), the kioea (*Chaetoptila angustipluma*), and the long-billed ‘akialoa (*Hemingnathus* sp.) likely also inhabited Kohala Mountain. Ancient DNA extracted from an array of fossil duck bones has revealed that the Laysan duck (*Anas laysanensis*), now endangered and restricted to Laysan Island, was once very widespread, from near-coastal areas well into the forests up to 5900 feet in elevation.

The critically endangered, and possibly extinct, ‘ō‘ū (*Psittirostra psittacea*) and the extinct Hawai‘i ‘ō‘ō (*Moho nobilis*) have been historically documented in Kohala and linked with native Hawaiian use. George Munro reported in 1944 that now-extinct birds such as the Hawai‘i mamo (*Drepanis pacifica*) and the ‘akialoa (*Hemingnathus obscurus*) were known to frequent the interior of the forest area. He also reported sighting the now-extinct Drepanid

ʻula ʻaihāwane (*Ciridops anna*) along the Kahuā Ditch Trail, and the ʻōmaʻo, or Hawaiian thrush (*Myadestes obscurus*), which has been locally extirpated in Kohala.

The endangered Hawaiian hoary bat, or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*), is the only extant land mammal native to the Hawaiian archipelago. Recent research indicates that the bat may be more widely distributed than previously believed, use both native and non-native habitats, and move seasonally between regions of Hawaiʻi Island. Bats are frequently seen along the windward Kohala coast, especially between Waipiʻo and Waimanu valleys. Little information exists regarding bats in the project area.

One of the most highly diversified groups of animals in Hawaiʻi are the native land snails. The greatest known concentration of tree snails ever recorded in the islands occurred on the Waimea Plains in 1903, where approximately 75,000 *Partulina confusa* were seen in an area of one-half square mile on 150 olopua (*Nestegis sandwicensis*) trees. Land snails have, however, suffered dramatic declines resulting from rat predation, habitat destruction, and overcollection. Particularly rare are members of the arboreal Achatinellidae family. The Island of Hawaiʻi once supported dozens of species in the family, but today only a single population of one species from the family is known. In 1992, researchers found a population of *Partulina physa*, previously not recorded since 1946, on forested windward slopes of Kohala Mountain, within the project area. A 160 acre tract owned by Ponoholo Ranch contains the last known habitat for this native land snail which, though not formally listed as endangered, is considered a species of concern. In fact, the tract is also referred to by the KWP as the Pūpū Kani Oe Management Unit, which may be translated literally as ʻsnails with the long soundʼ, and is a traditional Hawaiian term for snails. Fencing and controlling wild cattle and pigs in the area will provide significant protection by reducing forest degradation and allowing for habitat recovery. Other snails observed in Kohala include Succineids and minute Tornatellids. A comprehensive mollusk inventory for Kohala Mountain has not been made.

Perennial and intermittent streams comprise an important ecosystem on Kohala Mountain. Hawaiʻiʼs streams are generally short – less than ten miles in length – with numerous waterfalls giving the streams steep profiles. Stream flow typically tracks rainfall patterns. The isolation of the Hawaiian archipelago has resulted in high levels of endemism in the aquatic freshwater species: at least five native species of fishes, two species of endemic crustaceans, three species of mollusks and many species of endemic native arthropods.

Kohala, with its dozens of freshwater streams entering the ocean along the windward coastline, supports a unique and diverse native stream fauna. The fishes consist of two closely related goby families, the Gobiidae and Eleotridae,

which are usually referred to as ‘o‘opu. Native crustaceans include the ‘ōpae kala‘ole, or mountain shrimp (*Atyoida bisulcata*) and ‘ōpae ‘oeha‘a, or Hawaiian prawn (*Macrobrachium grandimanus*). There are three endemic species of stream limpet, or ‘opihi, the most common of which is the hīhīwai (*Neritina granosa*). Most native Hawaiian stream animals share the unique life cycle pattern called amphidromy where parts of their life cycle is spent both in freshwater and salt water; which underscores the importance of maintaining natural stream flows. Though Kohala's streams have been studied only incompletely, the general opinion is that they are relatively intact compared with those found in Hāmākua and on other islands.

Hawai‘i's native terrestrial arthropod fauna is noted for the large number of unknown species and extremely high rate of endemism, around 99%. Generally, Hawai‘i's native arthropod fauna includes insects, arachnids, crustaceans, and myripods. It is possible that Kohala supports a fauna particularly rich in rare species.

Megalagrion damselflies, known from Kohala, are among the marvels of Hawaiian insects. The thirty presently known species probably evolved from a single ancestor, which makes their diversity surprising. The immature stages of the different species have adapted to a wide range of moist habitats.

The diversity of native invertebrates observed in nearby Pu‘u o ‘Umi NAR is sometimes very high. Where native communities are intact and most diverse, there is an observable parallel in invertebrate diversity. Several guilds of insects, spiders, snails and other invertebrates have been observed. Considering the lack of invertebrate sampling in Kohala, it is likely that a large number of previously unknown species await discovery and description.

Many species of alien birds are found in the project area. These include the red-billed leiothrix (*Leiothrix lutea*), northern cardinal (*Cardinalis cardinalis*), Japanese white-eye (*Zosterops japonicus*), spotted dove (*Streptopelia chinensis*), house finch (*Carpodacus mexicanus*), northern mockingbird (*Mimus polyglottos*), hwamei (*Garrulax canorus*), nutmeg mannikin (*Lonchura punctulata*), and the ring-necked pheasant (*Phasianus colchicus*).

Non-native mammals known to occur in the project area include feral ungulates such as cattle (*Bos taurus*), pigs, or pua‘a (*Sus scrofa*), and goats (*Capra hircus*), as well as smaller predators. These include the black rat (*Rattus rattus*), Polynesian rat, or ‘iole (*R. exulans*), house mouse (*Mus musculus*), feral cats (*Felis silvestris catus*), feral dogs (‘īlio, *Canis lupus familiaris*), and the Indian mongoose (*Herpestes javanicus*).

Significant and Sensitive Habitats

The region including and surrounding the project area is composed largely of remnant stands of wet, ‘ōhi‘a-dominated native forest. While the ‘ōhi‘a

overstory remains intact, the understory has been impacted by cattle and pigs. However, a common mix of native species, such as kōlea, kāwa‘u, ‘ōlapa, alani, ‘ōhelo, hāpu‘u, and ‘ōhā wai does remain, and will benefit greatly from the fencing project. Various streams run through the area, and steep gulches along stream beds and valley walls provide habitat for a high diversity of native plants.

The State of Hawai‘i Comprehensive Wildlife Conservation Strategy identifies a number of species that are of greatest conservation need that occur in this area of Kohala. The project area provides habitat for the Hawaiian duck, koloa maoli (*Anas wyvilliana*), which is a federally listed endangered species. Upland streams and wetlands in Kohala are identified as important habitat for koloa maoli in the Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision, published by the USFWS (2005). Protecting this region from wild cattle will improve water quality and improve habitat for koloa maoli. The improved native forest expected as a result of the project could help provide habitat for various forest birds such as the ‘apapane (*Himatione sanguinea sanguinea*), ‘amakihi (*Hemignathus virens virens*), ‘elepaio (*Chasiempis sandwichensis sandwichensis*), and ‘i‘iwi (*Vestiaria coccinea*). The project area contains the last known habitat for the native land snail *Partulina physa*. We now know that this population spans from the Kahuā 1&2 region down through Kehena 2 on Parker Ranch. Fencing and controlling wild cattle in the area will provide significant protection to these species by reducing forest degradation and allowing for habitat recovery.

Kohala is also home to a number of rare plants. The region of forest has not been extensively surveyed for plants but is typical habitat for one of the many *Clermontia* species found in Kohala. *Clermontia drepanomorpha*, endemic to Kohala, is known from populations nearby in the Pu‘u O ‘Umi NAR. The Big Island II: Addendum to the Recovery Plan for the Big Island Plant Cluster (USFWS 1998) includes *Clermontia drepanomorpha* and *Phyllostegia warshaueri* from Kohala. This recovery plan identifies fencing and removal of feral ungulates as a critical need in the recovery of these species. Additionally, public land near this area is identified as critical habitat for hala pepe (*Pleomele hawaiiensis*), *Phyllostegia warshaueri*, ‘aiea (*Nothocestrum breviflorum*), and *Achyranthes mutica*. Though the focus of this project will include the construction of fences and the removal of feral ungulates, future management may include outplantings of rare plants.

These forests originally were more spatially variable and diverse in plant species and supported a unique community of animals. The exclusion of ungulates through fencing should help to restore this condition. However, the proposed fencing will not only benefit the fenced area, but also neighboring lands that include other private lands and State Forest Reserve lands. These fences will restrict the movements of feral cattle across these lands, and

eventually lead to protection and restoration of the watershed area and rare species habitat.

Archaeological Sites and Cultural Practices

The following steps have been taken to determine the cultural and historical significance of the project area: (1) general literature review to determine if there were any reports or studies with relevant information regarding the project area; (2) the preparation of a cultural study for the Kohala-Hāmākua area by Kumu Pono Associates (2004), which included a review of cultural and historical activities in the project area; (3) discussions with landowners with longstanding ties to the project area; and (4) information gathered during a series of public meetings about the proposed conservation projects of the Kohala Watershed Partnership. A summary of the information found is presented below.

Kohala Mountain is rich in cultural history. The native traditions and historical accounts associated with the lands of Kohala-Hāmākua span many centuries, from Hawaiian antiquity to the later period following western contact. Many narratives found in the Kumu Pono Associates (2004) study describe customs and practices of the native people who resided on these lands, walked the trails, and who were sustained by the wealth of the mountain lands, the kula (plain and plateau lands), and the adjacent marine fisheries.

In native traditions and beliefs, Hawaiians shared spiritual and familial relationships with the natural resources around them. Each aspect of nature, from the stars in the heavens to the winds, clouds, and rains, the growth of the forests and life therein and everything on the land and in the ocean, was believed to be alive. Indeed, every form of nature was a body-form of some god or lesser deity. As an example, in this context, and in association with lands which are now included in a part of the landscape of the Kohala Watershed Management Area (WMA), we find that the goddess Hina-ulu-ʻōhiʻa (Hina, goddess whose form is in the groves of ʻōhiʻa) and Pō-kāhi (the darkened place), a god of the mountain mists, are deified parts of the landscape. Such body forms and attributes in the Hawaiian mind are ʻkino lauʼ, the myriad body-forms of the gods and creative forces of nature that gave Hawaiians life.

We find, then, that the mountain landscape, its native species, and the intangible components therein, are a part of a sacred Hawaiian landscape. Thus, the landscape itself is a highly valued cultural property. Its protection, and the continued exercise of traditional and customary practices in a traditional and customary manner, are mandated by native custom, and by State and Federal laws, such as those establishing the Kohala-Hāmākua Forest Reserves and Puʻu O ʻUmi Natural Area Reserve, as well as the Endangered Species Act.

The early Hawaiians engaged in subsistence living. During those times, Hawaiians inhabited most of the windward valleys of Kohala Mountain. Though

remote, these ahupua‘a provided the water, ocean, and soil essential to the Hawaiian settlers who relied on farming and fishing. Wetland agriculture, particularly taro, was practiced in the valleys, and the lower windward slopes were terraced for farming. At the height of pre-contact Hawai‘i, the larger valleys of Waipi‘o, Waimanu, and Pololū supported large populations of Hawaiians. On the leeward side of Kohala Mountain, the Hawaiians terraced and farmed the land in dryland agriculture, carrying water to these drier lands in ‘auwai (irrigation ditch or canal), as evidenced by the remnants of extensive rock work still visible today. This area is known as the Kohala Field System.

The most detailed descriptions of the Kohala-Hāmākua mountain lands are those found in the Kingdom collections, which record the history of land tenure and define the boundaries of ahupua‘a. Detailed oral testimonies taken from elder native tenants in court proceedings of the mid to late 1800s document the occurrence of traditional and customary practices, as well as the nature of the resources within given ahupua‘a. In those records, we learn of the traditional knowledge and occurrence of native practices in the lands which today are a part of the Kohala Mountain area.

By 1845, the traditional Hawaiian system of land tenure was being radically altered, and the foundation for implementing the Great Mahele, or Land Division, which brought about the western concept of fee-simple rights of ownership, was set in place by King Kamehameha III. As the Mahele evolved, it defined the land interests of the King and the high-ranking ali‘i and konohiki, as well as the government. All land in the Kingdom of Hawai‘i came to be placed in one of three categories: (1) Crown Lands; (2) Government Lands; and (3) Konohiki Lands. The Kuleana, or Enabling, Act of 1849 further defined the framework by which hoa‘āina (native tenants) could apply for, and be granted, fee-simple interest in so-called ‘kuleana’ lands.

Records of the Mahele present first-hand accounts of land use from native tenants, generally spanning the period 1819-55. Of the lands near the project area, the land of ‘Āwini was relinquished by the King to the Government Land Inventory, the lands of Honokāne and Kahuā Iki were retained by Victoria Kamamalu, and Kahuā Nui was retained by Lot Kapuaiwa Kamehameha (King Kamehameha III). Within these lands, a relatively small number of kuleana claims were made, of which four were awarded. However, the Kuleana Act guaranteed the rights of hoa‘āina to access trails, and to access the uplands for subsistence and collection of resources necessary to their life upon the land in their given ahupua‘a.

Testimony before the Boundary Commission (1866-1905), which was tasked with legally setting the boundaries of lands awarded in the Mahele, reveals an intimate knowledge of the region, including place names and their association with oral histories and traditional cultural practices. In general, testimonies include reports of trail usage and historic road development, ritual

and ceremonial sites, resource collection, and knowledge of local features. Many features associated with traditional and customary accesses that were present in the area would leave little evidence in the present day, as they generally had minimal impact on the natural landscape. Those things left behind, that were not cared for or maintained, were simply reabsorbed into the landscape.

Prominent landscape features provided cultural affiliations for native Hawaiians and served as ceremonial cores, as land divisions, and as resource procurement sites. Indeed, many place names from the mountain lands between Kohala and Hāmākua demonstrate knowledge of the landscape, and are tied to traditional travel, access, and practices in the uplands.

The oral traditions and place names of the area focus in some cases upon ʻUmi-a-Līloa (ʻUmi, the son of Līloa), the great chief, or aliʻi nui, of Hawaiʻi Island. The story of ʻUmi has been documented through primary accounts by native Hawaiians, western European historians, explorers, missionaries, and contemporary journalists. During his reign, ʻUmi moved the permanent residences of Hawaiian sovereigns from Waipiʻo Valley to the broad plain between Hualālai and Mauna Loa, but many place names in the Kohala region still bear his name.

The Mahele marked the change of land tenure systems in Hawaiʻi, but large-scale alteration of the landscape had begun much earlier. The 1793 introduction of cattle to the Hawaiian Islands changed the natural landscape forever. Kamehameha I declared a kapu, or taboo, on cattle shortly after their introduction, and they were allowed to roam free and unharmed, damaging the natural environment and becoming a public nuisance. When whaling vessels began to visit the islands regularly, their demand for beef prompted the establishment of ranches. These ranches included large tracts of native forests, which were gradually destroyed by cattle that were eating and trampling the plants, converting forested lands into open rangelands. Free reign of cattle resulted in what Griffiths, a professor from Oʻahu College (1902), called the "total destruction of all the undergrowth and trees on the lower slopes" to a point where the "remaining forests [were] confined to the upper slopes and the more inaccessible canyons."

Sugar plantations were established in North Kohala and Hāmākua during the second half of the 19th century, and recruitment by plantations drew Hawaiians away from their traditional lifestyles. It took a million gallons of water on average to produce one ton of sugar, so each plantation needed a reliable source of water, especially during dry spells. In spite of an ongoing search for new sources of irrigation water, supplies were soon stretched to their limits. These water users recognized that unmanaged ungulates and timber harvests were threatening the health and integrity of the forested watershed on which their water supply depended. Concern for watershed protection arose in

response. In 1876, King Kalākaua signed into law an Act for the Protection and Preservation of Woods and Forests, authorizing the Minister of the Interior to set apart and protect from "damage by trespass of animals or otherwise, such woods and forest lands, the property of government... best suited for the protection of water resources."

In the early 1900s, the Territory of Hawai'i initiated plans to protect Hawai'i's forests by designating select areas as forest reserves. Act 44, the Forest Reserve Act, was passed by the Territorial Legislature in 1903. This legislation created Hawai'i's forest reserve system, the largest public-private partnership in the history of the islands. In the 1904 annual report to the Governor, the Division of Forestry noted that "[n]owhere in the Territory is there more pressing need for forest reservation than in this district [Kohala], for on the forest area of the Kohala Mountain depends the chief water supply of the north end of the island. To insure its permanence this forest ought to be reserved at once." In a 1908 report to the Board of Agriculture and Forestry, the Superintendent of Forestry wrote: "The Kohala Mountain Forest Reserve is created as a protection forest to assist in the conservation of water on the Kohala Mountain.... Within the limits of the proposed forest reserve the Kohala Mountain is clothed with a dense mass of indigenous vegetation – a cover that for its effect on runoff and for holding back moisture after it once reaches the ground cannot be surpassed." In 1913, the Territory designated 29,627 acres of Kohala Mountain as forest reserve.

Meanwhile, demand for water by the plantations and ranches continued to increase, and these businesses sought to develop a means of transporting the water greater distances to increase the productivity of marginal lands. The perennial streams in the eastern valleys of Kohala were sought for their abundance of water, and extensive ditch systems were built to carry water from these sources to areas of Kohala and Hāmākua.

The Honokāne section of the Kohala Ditch was completed in 1906, while the 'Āwini section was finished in 1907. The Kohala Ditch, which delivered to the Kohala plantations an average of 26 million gallons/day (mgd) of water from streams as far east as Waikoloa Stream, was described thusly: "Upon completion, meandering often through solid rock, the Ditch measured 22½ miles, with sixteen miles of...tunnels..., six miles of open ditch, and twenty-nine flumes....Along its way, the ditch tapped into thirty-six intakes and ran close to forty miles of mule trails, three miles of foot trails, dams, contributory tunnels, and twelve bridges." (Schweitzer and Gomes 2003).

The Kehena Ditch, established to distribute water to Kohala's homesteads and ranches, was completed in 1914. It was not, however, a success. Despite a maximum design capacity of 54 mgd, it provided only 1 mgd on an irregular basis, largely because rain and run-off seeped straight into the absorbent ground, captured water was too seasonal, and storage water disappeared from

reservoirs. The lower section of the Kehena Ditch was abandoned in the late 1960s.

Originally developed to support an extensive sugar cane industry, the Upper and Lower Hāmākua Ditches, Kohala Ditch, and Kehena Ditch now supply water for ranching, farming and other uses. The last of the sugar plantations in Kohala closed in the mid-1970s, while Hāmākua Sugar Co., the final consolidation of the Hāmākua sugar plantations, filed for bankruptcy in 1993. The Kohala Ditch is currently owned by Surety Kohala Corporation and produces roughly 12-14 mgd during normal flows. At this time, the ditch water comes primarily from Honokāne Nui Stream. As demand for ditch water increases, Surety Kohala Corporation may restore other sections of the ditch system currently in disrepair. Kahuā and Ponoholo ranches continue to draw approximately 250,000-500,000 gpd from the upper portion of the Kehena Ditch.

Parker Ranch developed its first pipeline from Kohala Mountain above Waimea in 1902 to extend water to the Waimea-Waikoloa Plains as far as Waiki‘i. Parker Ranch currently operates an extensive system of distribution lines to provide livestock water for its widely spread pasture lands in the Waimea area.

The general area has been used for ranching from the mid-1800s to the present. Parker Ranch was founded in 1847, and currently owns approximately 150,000 acres, almost 4500 of which are in the KWP. The modern Kahuā Ranch, a landowner adjacent to the project area, was founded in 1928 by Atherton Richards and Ronald Von Holt. In 1980, Ponoholo Ranch was founded as a subsidiary of Kahuā Ranch, and became an independent operation run by the Von Holt family in the late 1980s.

Few archaeological investigations have been conducted in the uplands of Kohala due to the long-time practice of ranching and grazing, activities that do not usually involve intensive archaeological study, and the remote setting, away from the development that often triggers such investigations. No archaeological resources are known from the project area.

Archival information indicates that the forested uplands of Kohala were likely most commonly used by native Hawaiians for specialized resource procurement activities, as well as certain types of agriculture. As noted above, many of the sites associated with these activities, such as shelters, were likely temporary in nature and reabsorbed into the landscape.

The extensive history of ranching in the uplands of Kohala is evident on the landscape, including walls, roads and trails, paddocks, pastures, water tanks, and irrigation systems. Most of these features have not been formally recorded.

During all construction activities, if any archaeological sites, artifacts, or burials are encountered, fencing construction will halt and the appropriate agencies will be notified to discuss further action, including re-routing the fence line to avoid these elements.

V. ALTERNATIVES CONSIDERED

Two project alternatives are described: the proposed fencing (preferred alternative) and a no-action alternative.

Alternative #1: Construct ungulate-proof fencing, followed by conservation management to restore the forest within the project area (preferred alternative).

The preferred alternative is to construct up to three miles of ungulate-proof fencing, with improvements to an additional ½ mile of existing fence, followed by conservation actions such as animal removal, weed control, and reforestation and outplanting to facilitate protection and restoration of native ʻōhiʻa forest covering approximately 520 acres in the project area. The proposed fencing will protect this area from damage and browsing by introduced animals, with the primary focus on a herd of feral cattle and subsequent feral pig removal. By restricting the movements of these animals, and eventually removing them, a much greater area than just the project area will benefit, including adjacent private lands and State Forest Reserve lands. Without fencing, animal movements cannot be effectively controlled within the project area and protection of remnant forest and rare plants, and the rare fauna they house, from damage by animal browsing and trampling is not possible. The exclusion of ungulates from ʻōhiʻa forest has been demonstrated to significantly contribute to improved health of ʻōhiʻa forest and understory species, and increased recruitment of native seedlings. By protecting tracts of the remnant forest and former forested areas, the preferred alternative will allow for the restoration of ʻōhiʻa forest, potentially providing alternative habitat for native forest birds. In addition, the preferred alternative will protect watershed areas crucial to the local water supply, and will provide an appropriate area for outplanting rare plant species historically known from this area. Ultimately, the preferred alternative is expected to prevent further decline of native forest, protect forested watershed areas, support restoration, increase available habitat for forest birds and other species, and contribute to the recovery of rare plant species. The preferred alternative will further the management goals of the Kohala Watershed Partnership as well as help support and implement the State's Comprehensive Wildlife Conservation Strategy and several U.S. Fish and Wildlife Service recovery plans.

Under the preferred alternative several different strategic fence alignments are planned, as discussed in more detail in the Project Description

and illustrated by the maps in Appendix A. Fence alignments are selected based on available funding, the actual cost of fencing, terrain considerations, the presence of existing roadways, and the biological value and restoration potential of sections within the project area.

Alternative #2: No action.

The no-action alternative fails to take advantage of existing funding opportunities to protect and restore remnant native forest on private lands. The no-action alternative also fails to protect 520 acres from the damaging impact of cattle and pigs. With no action, the remnant ʻōhiʻa forest may eventually disappear, further reducing habitat for endangered plant and animal species, degrading the watershed, and depriving future generations of the opportunity to appreciate these resources. Finally, the no-action alternative reduces the potential for success of affirmative conservation measures, such as outplanting, that are necessary for the long-term recovery of many species.

VI. GENERAL DESCRIPTION OF THE ACTION, INCLUDING ENVIRONMENTAL AND SOCIOECONOMIC CHARACTERISTICS AND MITIGATION MEASURES

Environmental Impacts

Native birds: Noise associated with the construction of fencing may temporarily disrupt the activities of native birds within the project area. Construction activities will likely flush koloa maoli from Pololū Stream, causing temporary disturbance. Based on observations during fence construction in other native forests, the impact of construction noise on native birds is expected to be minimal. The final fence alignment will be selected to avoid large trees; thus, no impact to nesting habitat is anticipated. Currently, native forest birds are not common within the project area and are unlikely to be impacted. Long-term benefits of the project are anticipated to include the improvement of the project area as native forest bird habitat, thereby offsetting any potential temporary disturbance.

Native bats: The use of barbed wire raises the possibility that the ʻōpeʻapeʻa (Hawaiian hoary bat) could fly into the fencing and become entangled, leading to injury or possibly death. The overall impact on native bats is not anticipated to be significant, however since none have been sighted in the project area. The anticipated benefits of the project should outweigh the small chance of any negative interaction with bats.

Maintenance of the fence line will include monitoring for the presence of potential bat interactions. If it appears that bats are being injured

through contact with the fence, mitigation measures will be developed and implemented.

Native vegetation: Construction of fencing should result in minimal disturbance to vegetation within a limited fencing corridor as a result of the clearing needed to remove potential hazards to crew and to facilitate construction. While areas of botanically sensitive resources would be avoided, the removal of some common native plants may be unavoidable. During construction of the fence, common species of native plants will be removed only when necessary, and removal of native plants greater than six inches in diameter will be avoided as much as possible. Although most of the vegetation is expected to grow back over time, ongoing fence inspection and maintenance would require that a portion of the fence corridor be kept cleared of vegetation, resulting in a permanent alteration of some habitat. As the fenceline largely follows existing 4WD roads and trails, very little, if any, native vegetation is anticipated to be impacted by fence construction. Where clearing is necessary, only manual methods will be used. It is anticipated that the natural recovery of plants protected by the fencing will compensate for any damage to common species incurred during construction.

Water impacts: Fence construction, and the creation of limited fencing corridors where the line does not follow existing roads, may contribute to erosion or runoff. To minimize the possibility for this occurrence, the Division of Forestry and Wildlife's Best Management Practices (BMPs) for Maintaining Water Quality in Hawai'i (1996) will be incorporated during the project. Specific BMPs to be incorporated include: locating corridors to fit topography and minimize alterations to the natural features; provision of dips and water bars to minimize erosion; avoidance of the diversion of water from natural drainages; keeping grades at less than 10%, except where unavoidable; and other measures as needed. While these practices should mitigate any potential erosion or runoff caused by construction, the long-term benefits of the project, including decreased ungulate-related erosion, should counteract any potential harm. Regarding weed control and management, any potential future use of herbicides will be done in strict accordance with labeling as well as with all pertinent State and Federal regulations.

Alien species: The disturbance to the ground surface and vegetation involved with building a fence may create conditions suitable for the establishment of weedy plants. Construction equipment, materials, and personnel may provide opportunities for the introduction of destructive non-native plants and insects, such as ants. The following practices will be implemented to minimize the introduction of alien plants and insects and to reduce the possibility of establishment. First, boots, equipment and materials will be inspected for insects, seeds, eggs, larvae, etc., prior to delivery and/or entry into the project area, and cleaned as necessary. Any large truck used during construction will be inspected and cleaned as needed, following

appropriate alien species prevention protocol. All construction workers will be instructed on specific procedures to prevent the spread or introduction of noxious alien plants in the project area. In addition, precautions will be taken to prevent spreading alien plants already found in the project area, and all food, refuse, tools, gear, and construction scrap will be removed upon completion of work.

Air pollution: Limited air pollution from helicopter sling loads and the use of small power tools will be unavoidable during fence construction. Use of this equipment is temporary, of limited duration, and is not anticipated to significantly contribute to the overall air quality in the region.

Environmental benefits: Environmental benefits associated with the project are related to the prevention of landscape damage caused by feral cattle and pigs. These animals degrade native forest and watershed areas by rooting and browsing native vegetation, spreading non-native weed species, and causing erosion. Fencing and removing these feral animals provides long-term protection for the native ecosystem and secures a protected area for watershed management and for rare and endangered species.

Social Impacts

Periodic noise from helicopter flights, power tools, and other activity associated with fence building will be unavoidable during the construction period. However, due to the remote nature of the project area, social impacts resulting from noise are not anticipated to be significant. In addition, the protection of Hawai‘i’s native forest will enhance opportunities for stewardship, education, cultural enrichment, and research. As a result, overall social impacts of this project are expected to be positive.

Economic Impacts

The proposed action involves the expenditures of funds necessary to construct the fencing, including the purchase of fencing materials, the hiring or contracting of crews, and the purchase or rental of equipment including helicopters, and, after fence construction, to remove animals and to restore the project area using weed control, outplanting, and fire management. The estimated total cost of the conservation project related to fencing and feral ungulate removal is close to $300,000. Current funding for the project includes funds provided by the U.S. Fish and Wildlife Service, the State, and private landowners.

The project is not expected to have any major negative economic impacts. Positive economic impacts will result from the release of project funds into the State economy through the purchase of goods and services from local vendors, as well as employment for fence building and conservation workers. The proposed action may attract additional funding for restoration or research activities after the fencing is complete.

Impacts to Archaeological Sites or Cultural Resources

In general, the proposed fencing and conservation management poses a minimal threat to archaeological resources in the project area. The minor ground disturbances that result from fence construction include clearing the corridor of vegetation and embedding metal T-stakes at intervals, activities which have relatively low potential for ground disturbance. No archaeological or cultural sites are known from the project area. If any such site is discovered, appropriate mitigation and site treatments will be developed in consultation with appropriate parties. Because the fencing will be aligned, where possible, adjacent to existing 4WD roads, it is anticipated that construction of fencing will pose little risk to any unidentified sites. As presently designed, the fencing is not anticipated to present any impacts to archaeological sites.

The proposed action is expected to have a positive impact on native Hawaiian traditional and cultural practices as protection of the forest and restoration of its native habitats can benefit practices such as traditional gathering. However, at present, no cultural or archaeological sites are known from the project area or practices documented. Based on the remoteness of the project area, the limited access due to its location on private land, and the conservation purpose of the fencing, it is anticipated that fencing would have little to no impact on native Hawaiian practices. The fencing is not designed to block access by people, but to limit animal movement.

While archaeological or cultural sites are not anticipated to be affected by the proposed action, should evidence of any archaeological or culturally significant sites be encountered during construction, vegetation clearing and fence construction would immediately cease and the appropriate parties would be consulted immediately. If necessary, the fence alignment will be adjusted to reduce or eliminate impact to any features located during construction.

VII. ANTICIPATED DETERMINATION

It is not expected that this project will have a significant negative impact on the environment, and a Finding of No Significant Impact is anticipated.

VIII. FINDINGS AND REASONS SUPPORTING THE ANTICIPATED DETERMINATION

The goal of the proposed action is to provide long-term protection for approximately 520 acres of private land containing remnant native ‘ōhi‘a forest through the construction of ungulate-proof fencing and continuing management of the area. Without fencing, feral cattle and pigs would be expected to

continue to damage this declining native forest, impair important watershed areas, and degrade rare native ecosystems.

Fencing and animal removal from the project area are anticipated to facilitate natural forest recovery, allow for successful reforestation and outplanting efforts, support effective alien species control and removal, and to protect an important watershed.

The anticipated Finding of No Significant Impact is based on the evaluation of the project in relation to the following criteria identified in the Hawai‘i Administrative Rules § 11-200-12:

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

The proposed action does not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. Instead, the goal of the proposed action is to benefit the natural environment by protecting and enhancing existing native forest and watershed areas, and to provide habitat for native plants and animals.

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

The proposed action will not curtail beneficial uses of the environment. Instead, the project will protect an important area that may provide habitat for a range of endangered plant and animal species. The project will also facilitate future conservation activities by providing an ungulate-free area that can be used for forest restoration and outplanting. Fencing and actively managing the project area will increase the beneficial uses of the environment, and will strengthen watershed functionality.

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 environmental policies established in Chapter 344, Hawai‘i Revised Statutes (HRS) and contributes to the conservation of threatened and endangered species, as covered by Chapter 195D, HRS. It is also consistent with Section 4 of the County of Hawai‘i General Plan (2006), which sets goals and policies for maintaining environmental quality. The action is consistent with goals and objectives of the Kohala Watershed Partnership and with the policies outlined in the Memorandum of Understanding of the Hawai‘i Association of Watershed Partnerships. Finally, protection and restoration of the native ‘ōhi‘a forest of Kohala implements the Hawai‘i Comprehensive Wildlife Conservation Strategy (2005), the Recovery Plan for the Big Island Plant Cluster (1996), the Recovery

Plan for Multi-Island Plants (1999), the Draft Revised Recovery Plan for Hawaiian Forest Birds (2006), and the Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision (2005).

4) Substantially affects the economic or social welfare of the community or state.

The proposed action will not adversely affect the economic or social welfare of the community or state. The ecosystem-related goals of the project will directly benefit the economic, cultural, and social interests of the community and the State by preserving native forests, enhancing watershed function, and providing habitat for rare native plants and animals.

5) Substantially affects public health.

The proposed action is not anticipated to substantially affect public health. The proposed action may have a positive impact on public health by protecting native forest and by helping to keep streams free from sedimentation and potential threats to human health caused by feral ungulates.

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

The proposed action is not anticipated to result in any substantial secondary impacts, such as population changes or effects on public facilities, as there are no public facilities within the project area and the project does not include the building of any structure intended for human habitation.

7) Involves a substantial degradation of environmental quality.

The proposed action does not involve a substantial degradation of environmental quality. Instead, environmental quality is anticipated to improve with the implementation of the proposed action. Fencing, followed by conservation management, will enhance environmental quality of the project area by providing long-term protection for watershed, native forest, and habitat for rare plants and animals from the destructive impact of feral cattle and pigs and other invasive species.

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

The proposed action involves fencing approximately 520 acres in North Kohala and the removal of ungulates from within the fenced area, followed by conservation management activities such as replanting native species, outplanting rare species, and removal of alien plants. While the ungulate-proof fencing is needed for the long-term success of any restoration or outplanting, the cumulative effect on the environment is positive. Moreover, the fencing

does not necessarily require the commitment for ongoing management action as fencing and ungulate removal alone have value by protecting existing native forest and allowing for its natural recovery.

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

There are no known rare, threatened, or endangered plants within the planned fencing corridor; however, several species of rare plants, including some threatened and endangered plants, will benefit from the protection this fencing will provide. Exclusion of feral cattle and pigs by fencing has been shown repeatedly to be one of the most important actions that can be taken to protect rare plant species in Hawai‘i. Construction of fencing would provide protection for habitat that is in decline statewide – relatively intact natural communities in good condition and suitable to support the reintroduction of rare and endangered plants. Failure to implement the proposed action would preclude the opportunity to reintroduce new plant populations into the project area.

There are threatened, endangered, and rare birds found within or near the project area, and restoration of the ‘ōhi‘a forest on Kohala would provide a benefit to these native forest birds by protecting potential habitat. Protection of native forest is a recommended action of the Draft Revised Recovery Plan for Hawaiian Forest Birds (2006). The project will have a beneficial effect on rare snails found in the project area, by preserving habitat. The project is not anticipated to negatively affect a rare, threatened or endangered species.

10) Detrimentally affects air or water quality or ambient noise levels.

The proposed action is not anticipated to have detrimental effects on air quality, water quality, or noise levels. The area is remote, and construction noise will be localized and temporary.

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 project is not located in an environmentally sensitive area.

12) Substantially affects scenic vistas and view planes identified in county or state plans or studies.

The proposed action is not anticipated to affect any vistas or view planes identified in known County or State plans or studies. Given the fence height, the remoteness of the project area, and the fact that adjacent lands do not have

full-time residents, the fence is not anticipated to be visible to people. Based on experience with fences in similar terrain and elevations, the fencing is not expected to be noticeable from a distance.

13) Requires substantial energy consumption.

The proposed action does not require substantial energy consumption, but instead will consume small amounts of energy during fence construction through the use of small power tools and transportation of materials and crews.

IX. LIST OF PERMITS REQUIRED FOR PROJECT

Construction of the project is not anticipated to require any permits.

X. ENVIRONMENTAL ASSESSMENT PREPARATION INFORMATION

This Environmental Assessment was prepared by:

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APPENDIX A: Maps of the Project Area

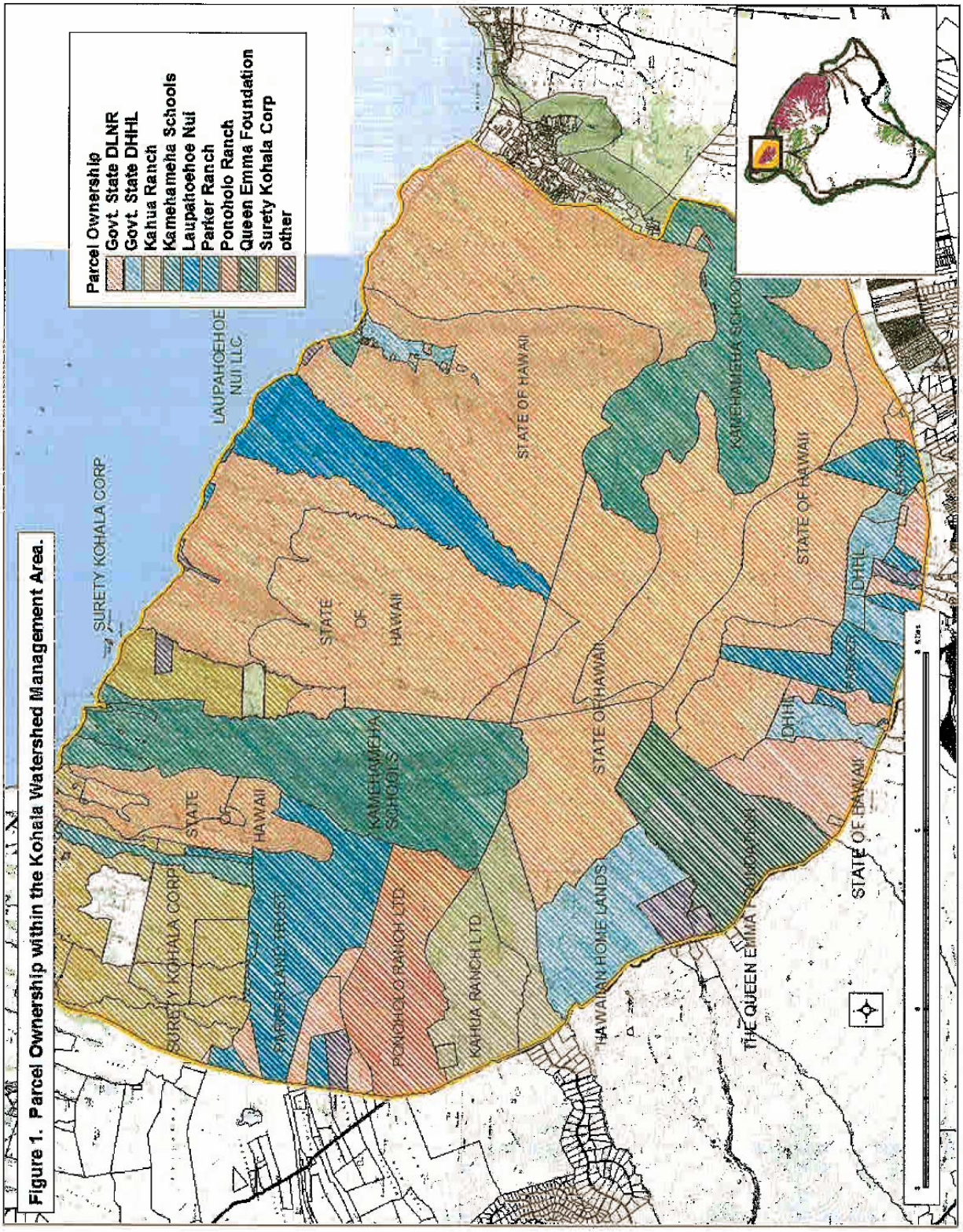
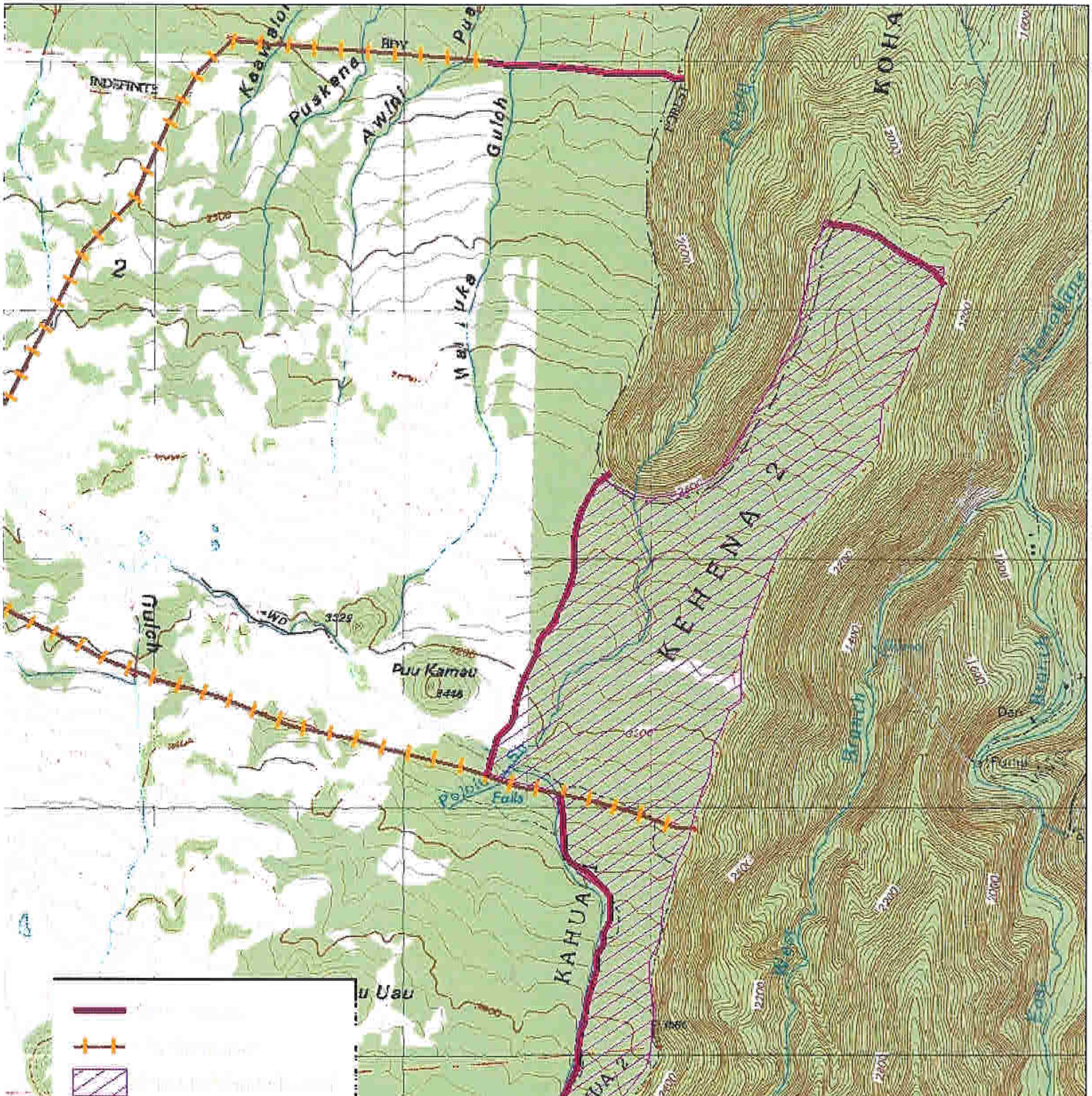


Figure 1. Parcel Ownership within the Kohala Watershed Management Area.



KOHA
BDY
Gulch
2
Puu Kamau
3448
3329
K E H E N A 2
KAHUA
KAHUA 2
Falls
Branch
Dam
Pump
AWD

APPENDIX B

Notable Species of Native Flora and Fauna Thought to Occur In or Near the Project Area

Please see Appendix C for additional species. A few of the more significant species are listed below:

Birds
Koloa maoli(*Anas wyvilliana*)*
Pueo (*Asio flammeus sandwichensis*)
‘Io (*Buteo solitarius*)*
‘Apapane (*Himatione sanguinea sanguinea*)
‘Amakihi (*Hemignathus virens virens*)
‘Elepaio (*Chasiempis sandwichensis sandwichensis*)
‘I‘iwi (*Vestiaria coccinea*)

Plants
*Clermontia drepanomorpha**
Clermontia kohalae
Clermontia waimeae
Clermontia calophylla
Lobelia hypoleuca
Anoectochilus sandvicensis
Cyanea tritomantha
*Pleomele hawaiiensis**
*Phyllostegia warshaueri**
*Nothocestrum breviflorum**
*Achyranthes mutica**

Partulina physa (tree snail – only known habitat)
Megalagrion sp. (damselfly)

* = Federally listed Endangered Species

APPENDIX C

PARTIAL INVENTORY OF FLORA AND FAUNA OF THE KOHALA MOUNTAIN WATERSHED

Status:

USFWS
END Endangered
T Threatened
C Candidate species
SOC Species of Concern (unofficial designation)

WORLD CONSERVATION UNION (IUCN)
CR Critically endangered
EN Endangered
VU Vulnerable
NT Near threatened
LC Least concern

X Presumed extinct

Affinity:

N Non-native
P Polynesian introduction
I Indigenous
E Endemic

Family	Taxon	Common/Hawaiian name	Affinity	Status
I. Flora **Pteridophyta (ferns and fern allies)**				
Grammitidaceae	*Adenophorus hymenophylloides*	pai	E	
Grammitidaceae	*Adenophorus pinnatifidus*		E	
Grammitidaceae	*Adenophorus tamariscinus*	wahine noho mauna	E	
Grammitidaceae	*Adenophorus tripinnatifidus*		E	
Marattiaceae	*Angiopteris evecta*	mule's-foot fern	N	
Aspleniaceae	*Asplenium acuminatum*	lola	E	
Aspleniaceae	*Asplenium adiantum-nigrum*	ʻiwaʻiwa	I	
Aspleniaceae	*Asplenium contiguum*		E	
Aspleniaceae	*Asplenium haleakalense*		E	
Aspleniaceae	*Asplenium horridum*	ʻiwa	I	
Aspleniaceae	*Asplenium kaulfussii*	kūau	E	
Aspleniaceae	*Asplenium lobulatum*	piʻipiʻi lau manamana	I	
Aspleniaceae	*Asplenium polyodon*	pūnana manu	I	
Aspleniaceae	*Asplenium trichomanes* subsp. *densum*	ʻoāliʻi	E	
Aspleniaceae	*Asplenium unilaterale*	pāmoho	I	
Athyriaceae	*Athyrium microphyllum*	ʻākōlea	E	
Blechnaceae	*Blechnum appendiculatum*		N	
Thelypteridaceae	*Christella dentata*	paiʻiʻihā	N	
Dicksoniaceae	*Cibotium chamissoi*	hāpuʻu	E	

Dicksoniaceae	*Cibotium glaucum*	hāpuʻu pulu	E	
Dicksoniaceae	*Cibotium menziesii*	hāpuʻu ʻiʻi	E	
Pteridaceae	*Coniogramme pilosa*	loʻulu	E	
Athyriaceae	*Deparia petersenii*		N	
Gleicheniaceae	*Dicranopteris linearis*	uluhe	I	
Athyriaceae	*Diplazium molokaiense*		E	END
Athyriaceae	*Diplazium sandwichianum*	hōʻiʻo	E	
Gleicheniaceae	*Diplopterygium pinnatum*	uluhe lau nui	E	
Blechnaceae	*Doodia lyonii*		E	SOC
Dryopteridaceae	*Dryopteris fusco-atra*	ʻiʻi	E	
Dryopteridaceae	*Dryopteris glabra*	kīlau	E	
Dryopteridaceae	*Dryopteris hawaiiensis*		E	
Dryopteridaceae	*Dryopteris sandwicensis*		E	
Dryopteridaceae	*Dryopteris unidentata*	ʻakole	E	
Dryopteridaceae	*Dryopteris wallichiana*	ʻiʻo nui	I	
Dryopteridaceae	*Dryopteris* sp.		E	
Lomariopsidaceae	*Elaphoglossum alatum*	hoe a Māui	E	
Lomariopsidaceae	*Elaphoglossum paleaceum*	mākuʻe	I	
Lomariopsidaceae	*Elaphoglossum wawrae*	laukahi	E	
Grammitidaceae	*Grammitis hookeri*	mākuʻe lau liʻi	I	
Grammitidaceae	*Grammitis tenella*	kolokolo	E	
Lycopodiaceae	*Huperzia phyllantha*	wāwaeʻiole	I	
Grammitidaceae	*Lellingeria saffordii*	kihe	E	
Polypodiaceae	*Lepisorus thunbergianus*	pākahakaha	I	
Lycopodiaceae	*Lycopodiella cernua*	wāwaeʻiole	I	
Lycopodiaceae	*Lycopodium venustulum*		I	
Thelypteridaceae	*Macrothelypteris torresiana*		N	
Hymenophyllaceae	*Mecodium recurvum*	ʻōhiʻa kū	E	
Dennstaedtiaceae	*Microlepia strigosa*	palapalai	I	
Nephrolepidaceae	*Nephrolepis cordifolia*		I	
Nephrolepidaceae	*Nephrolepis multiflora*		N	
Dryopteridaceae	*Nothoperanema rubiginosa*		E	
Ophioglossaceae	*Ophioderma pendulum*	puapua moa	I	
Pteridaceae	*Pityrogramma calomelanos*	silver fern	N	
Polypodiaceae	*Polypodium pellucidum*	ʻae	E	
Psilotaceae	*Psilotum complanatum*	moa	I	
Psilotaceae	*Psilotum nudum*	moa	I	
Dennstaedtiaceae	*Pteridium aquilinum* var. *decompositum*	kīlau	E	
Pteridaceae	*Pteris cretica*	ʻōali	I	
Pteridaceae	*Pteris excelsa*	waimakanui	I	
Blechnaceae	*Sadleria cyatheoides*	ʻamaʻu	E	
Blechnaceae	*Sadleria pallida*	ʻamaʻu	E	
Blechnaceae	*Sadleria squarrosa*	ʻapuʻu	E	
Blechnaceae	*Sadleria souleyetiana*	ʻamaʻu	E	
Hymenophyllaceae	*Sphaerocionium lanceolatum*	palai hinahina	E	
Hymenophyllaceae	*Sphaerocionium obtusum*	palai lau liʻi	E	
Lindsaeaceae	*Sphenomeris chinensis*	palaʻā	I	
Gleicheniaceae	*Sticherus owhyhensis*	uluhe	E	

Hymenophyllaceae	*Vandenboschia davallioides*	palai hihi	E	
Magnoliophyta (angiosperms) Liliopsida (monocots)				
Poaceae	*Agrostis avenacea*	he‘upueo	I	
Poaceae	*Andropogon virginicus*	broomsedge	N	
Orchidaceae	*Anoectochilus sandvicensis*	jewel orchid	E	SOC, VU
Poaceae	*Anthoxanthum odoratum*	sweet vernalgrass	N	
Liliaceae	*Astelia menziesiana*	pa‘iniu, kaluaha	E	
Poaceae	*Axonopus fissifolius*	narrow-leaved carpetgrass	N	
Poaceae	*Bambusa* sp.	bamboo	N	
Poaceae	*Briza minor*	little quaking grass	N	
Poaceae	*Calamagrostis expansa*	Maui reedgrass	E	C, VU
Cyperaceae	*Carex alligata*		E	
Arecaceae	*Cocos nucifera*	niu, coconut	P	
Araceae	*Colocasia esculenta*	kalo, taro	P	
Commelinaceae	*Commelina diffusa*	honohono	N	
Agavaceae	*Cordyline fruticosa*	kī, ti	P	
Poaceae	*Cynodon dactylon*	bermuda grass	N	
Cyperaceae	*Cyperus halpan*	umbrella sedge	N	
Cyperaceae	*Cyperus pilosus*	umbrella sedge	N	
Poaceae	*Deschampsia nubigena*	hairgrass	E	
Poaceae	*Dichanthelium cynodon*		E	
Poaceae	*Dichanthelium hillebrandianum*		E	
Poaceae	*Digitaria ciliaris*	Henry’s crabgrass	N	
Poaceae	*Digitaria* sp.	crabgrass	N	
Poaceae	*Ehrharta stipoides*	meadow ricegrass	N	
Cyperaceae	*Eleocharis* sp.	spikerush, kohekohe	N	
Poaceae	*Eragrostis grandis*	lovegrass	E	
Poaceae	*Eragrostis variabilis*	kāwelu	E	
Poaceae	*Festuca* sp.	fescue	N	
Pandanaceae	*Freycinetia arborea*	‘ie‘ie	I	
Zingiberaceae	*Hedychium coronarium*	white ginger	N	
Zingiberaceae	*Hedychium flavescens*	yellow ginger	N	
Zingiberaceae	*Hedychium gardnerianum*	kāhili ginger	N	
Poaceae	*Holcus lanatus*	common velvet grass	N	
Poaceae	*Isachne distichophylla*	‘ohe	E	
Joinvilleaceae	*Joinvillea ascendens* subsp. *ascendens*	‘ohe	E	C
Juncaceae	*Juncus effusus*	Japanese mat rush	N	
Juncaceae	*Juncus ensifolius*	rush	N	
Juncaceae	*Juncus planifolius*	rush	N	
Juncaceae	*Juncus tenuis*	rush	N	
Cyperaceae	*Kyllinga brevifolia*	kili‘o‘opu	N	
Orchidaceae	*Liparis hawaiensis*	‘awapuhiakanaloa	E	SOC
Juncaceae	*Luzula hawaiiensis* var. *hawaiiensis*	wood rush	E	
Cyperaceae	*Machaerina angustifolia*	‘uki	I	
Cyperaceae	*Machaerina mariscoides* subsp. *meyenii*	‘ahaniu	E	

Cyperaceae	*Oreobolus furcatus*		E	
Poaceae	*Panicum repens*	torpedo grass	N	
Poaceae	*Paspalum conjugatum*	Hilo grass	N	
Poaceae	*Paspalum dilatatum*	Dallis grass	N	
Poaceae	*Paspalum fimbriatum*	Panama paspalum	N	
Poaceae	*Paspalum scrobiculatum*	ricegrass, mauʻu laiki	I ?	
Poaceae	*Paspalum urvillei*	Vasey grass	N	
Poaceae	*Pennisetum clandestinum*	kikuyu grass	N	
Agavaceae	*Pleomele hawaiiensis*	hala pepe	E	END, EN
Poaceae	*Poa annua*	annual bluegrass	N	
Arecaceae	*Pritchardia lanigera*	loulu	E	SOC, EN
Cyperaceae	*Pycreus polystachyos*		I	
Cyperaceae	*Rhynchospora chinensis*	kuolohia, beak-rush	I	
Poaceae	*Sacciolepis indica*	Glenwood grass	N	
Poaceae	*Setaria gracilis*	yellow foxtail	N	
Poaceae	*Setaria palmifolia*	palmgrass	N	
Poaceae	*Setaria verticillata*	bristly foxtail	N	
Poaceae	*Sporobolus africanus*	smutgrass	N	
Poaceae	*Sporobolus indicus*	West Indian dropseed	N	
Cyperaceae	*Uncinia uncinata*		I	
Magnoliopsida (dicots)				
Fabaceae	*Acacia koaia*	koaiʻa	E	SOC, VU
Amaranthaceae	*Achyranthes mutica*		E	END, CR
Asteraceae	*Ageratina adenophora*	Maui pāmakani	N	
Asteraceae	*Ageratina riparia*	Hāmākua pāmakani	N	
Asteraceae	*Ageratum conyzoides*	maile hohono	N	
Euphorbiaceae	*Aleurites moluccana*	kukui	P	
Betulaceae	*Alnus nepalensis*	Nepal alder	N	
Apocynaceae	*Alyxia oliviformis*	maile	E	
Primulaceae	*Anagallis arvensis*	scarlet pimpernel	N	
Euphorbiaceae	*Antidesma platyphyllum*	hame	E	
Asteraceae	*Artemisia australis*	ʻāhinahina	E	
Asteraceae	*Bidens hawaiensis*	koʻokoʻolau	E	
Asteraceae	*Bidens hillebrandiana* subsp. *hillebrandiana*	koʻokoʻolau	E	SOC
Rubiaceae	*Bobea elatior*	ʻahakea lau nui	E	
Rubiaceae	*Bobea timonioides*	ʻahakea	E	SOC, EN
Urticaceae	*Boehmeria grandis*	ʻākōlea	E	
Hydrangeaceae	*Broussaisia arguta*	kanawao	E	
Cannabaceae	*Cannabis sativa*	marijuana, paka lōlō	N	
Fabaceae	*Canavalia hawaiiensis*	ʻāwikiwiki	E	
Brassicaceae	*Cardamine flexuosa*	bittercress	N	
Casuarinaceae	*Casuarina equisetifolia*	common ironwood	N	
Apiaceae	*Centella asiatica*	Asiatic pennywort	N	
Caryophyllaceae	*Cerastium fontanum*	common mouse-ear	N	

		chickweed		
Euphorbiaceae	*Chamaesyce multiformis*	ʻakoko	E	
Amaranthaceae	*Charpentiera obovata*	pāpala	E	
Araliaceae	*Cheirodendron trigynum*	ʻōlapa	E	
Asteraceae	*Cirsium vulgare*	bull thistle	N	
Campanulaceae	*Clermontia calophylla*	ʻōhā wai	E	SOC, EN
Campanulaceae	*Clermontia drepanomorpha*	ʻōhā wai	E	END, EN
Campanulaceae	*Clermontia kohalae*	ʻōhā wai	E	
Campanulaceae	*Clermontia parviflora*	ʻōhā wai	E	
Campanulaceae	*Clermontia waimeae*	ʻōhā wai	E	SOC, EN
Campanulaceae	*Clermontia* sp.	ʻōhā wai	E	
Melastomataceae	*Clidemia hirta*	Koster's curse	N	
Menispermaceae	*Cocculus trilobus*	huehue	I	
Asteraceae	*Conyza bonariensis*	hairy horseweed	N	
Rubiaceae	*Coprosma ochracea*	pilo	E	
Rubiaceae	*Coprosma pubens*	pilo	E	
Asteraceae	*Crassocephalum crepidioides*		N	
Cupressaceae	*Cryptomeria japonica*	Tsugi pine	N	
Apiaceae	*Cryptotaenia Canadensis*	honewort	N	
Lythraceae	*Cuphea carthagenensis*	tarweed	N	
Campanulaceae	*Cyanea pilosa*	hāhā	E	
Campanulaceae	*Cyanea pilosa* subsp. *pilosa*	hāhā	E	
Campanulaceae	*Cyanea pycnocarpa*	hāhā	E	SOC, X
Campanulaceae	*Cyanea tritomantha*	ʻakū	E	C, VU
Gesneriaceae	*Cyrtandra kohalae*	haʻiwale	E	SOC, X
Gesneriaceae	*Cyrtandra paludosa*	moa	E	
Gesneriaceae	*Cyrtandra platyphylla*	ʻilihia	E	
Gesneriaceae	*Cyrtandra* sp.	haʻiwale	E	
Campanulaceae	*Delissea parviflora*		E	SOC, X
Ebenaceae	*Diospyros sandwicensis*	lama	E	
Sapindaceae	*Dodonaea viscosa*	ʻaʻaliʻi	I	
Caryophyllaceae	*Drymaria cordata*	pipili	N	
Asteraceae	*Dubautia plantaginea*	naʻenaʻe	E	
Onagraceae	*Epilobium billardierianum*	willow herb	N	
Asteraceae	*Erechtites valerianifolia*	fireweed	N	
Myrtaceae	*Eucalyptus robusta*	swamp mahogany	N	
Theaceae	*Eurya sandwicensis*	ānini	E	SOC, VU
Moraceae	*Ficus macrophylla*	banyan	N	
Moraceae	*Ficus rubiginosa*	banyan	N	
Rosaceae	*Fragaria vesca*	strawberry	N	
Oleaceae	*Fraxinus uhdei*	tropical ash	N	
Rubiaceae	*Gardenia remyi*	nānū	E	C, VU
Geraniaceae	*Geranium homeanum*	cranesbill	N	
Proteaceae	*Grevillea robusta*	silk oak, ʻoka kilika	N	
Gunneraceae	*Gunnera petaloïdea*	ʻapeʻape	E	

Rubiaceae	*Hedyotis acuminata*	au	E	
Rubiaceae	*Hedyotis hillebrandii*	manono	E	
Rubiaceae	*Hedyotis littoralis*		E	SOC
Rubiaceae	*Hedyotis terminalis*	manono	E	
Malvaceae	*Hibiscadelphus hualaiensis*	hau kuahiwai	E	END, CR, X
Malvaceae	*Hibiscus kokio*	koki‘o	E	SOC, VU
Malvaceae	*Hibiscus tiliaceus*	hau	I	
Apiaceae	*Hydrocotyle sibthorpioides*	marsh pennywort	N	
Apiaceae	*Hydrocotyle verticillata*	pohe	N	
Clusiaceae	*Hypericum mutilum*	St. John’s wort	N	
Asteraceae	*Hypochoeris radicata*	hairy cat’s ear	N	
Aquifoliaceae	*Ilex anomala*	kāwa‘u	I	
Convolvulaceae	*Ipomoea indica*	koali ‘awa	I	
Convolvulaceae	*Ipomoea littoralis*	morning glory	I	
Viscaceae	*Korthalsella complanata*	hulumoa	I	
Viscaceae	*Korthalsella cylindrica*	hulumoa	E	
Loganiaceae	*Labordia hedyosmifolia*	kāmakahala	E	
Loganiaceae	*Labordia helleri*	kāmakahala	E	
Loganiaceae	*Labordia hirtella*	kāmakahala	E	
Verbenaceae	*Lantana camara*	lākana	N	
Epacridaceae	*Leptecophylla tameiameiae*	pūkiawe	I	
Campanulaceae	*Lobelia hypoleuca*	kuhi‘aikamo‘owahie, ‘ōpelu	E	SOC
Onagraceae	*Ludwigia palustris*	marsh purslane	N	
Primulaceae	*Lysimachia mauritiana*		I	
Myrtaceae	*Melaleuca quinquenervia*	paperbark	N	
Melastomataceae	*Melastoma candidum*		N	
Rutaceae	*Melicope clusiifolia*	alani, kolokolo mokihana	E	
Rutaceae	*Melicope hawaiensis*	mokihana kūkae moa	E	SOC, VU
Rutaceae	*Melicope pseudoanisata*	alani	E	
Myrtaceae	*Metrosideros polymorpha*	‘ōhi‘a	E	
Malvaceae	*Modiola caroliniana*		N	
Myoporaceae	*Myoporum sandwicense*	naio	I	
Myrsinaceae	*Myrsine lanaiensis*	kōlea	E	
Myrsinaceae	*Myrsine lessertiana*	kōlea lau nui	E	
Myrsinaceae	*Myrsine sandwicensis*	kōlea lau li‘i	E	
Rubiaceae	*Nertera granadensis*	mākole	I	
Oleaceae	*Nestegis sandwicensis*	olopua	E	
Solanaceae	*Nothocestrum breviflorum*	‘aiea	E	END, CR
Apocynaceae	*Ochrosia haleakalae*	hōlei	E	C, EN
Rosaceae	*Osteomeles anthyllidifolia*	‘ūlei	I	
Oxalidaceae	*Oxalis corniculata*	‘ihi ‘ai, yellow wood sorrel	P ?	
Passifloraceae	*Passiflora tarminiana*	banana poka	N	
Piperaceae	*Peperomia cookiana*	‘ala‘ala wai nui	E	
Piperaceae	*Peperomia hypoleuca*	‘ala‘ala wai nui	E	
Piperaceae	*Peperomia macraeana*	‘ala‘ala wai nui	E	

Piperaceae	*Peperomia membranacea*	ʻalaʻala wai nui	E	
Piperaceae	*Peperomia tetraphylla*	ʻalaʻala wai nui	I	
Piperaceae	*Peperomia* sp.	ʻalaʻala wai nui	E	
Celastraceae	*Perrottetia sandwicensis*	olomea	E	
Apiaceae	*Peucedanum sandwicense*	makou	E	T
Lamiaceae	*Phyllostegia ambigua*		E	
Lamiaceae	*Phyllostegia floribunda*		E	C
Lamiaceae	*Phyllostegia vestita*		E	
Lamiaceae	*Phyllostegia warshaueri*		E	END
Phytolaccaceae	*Phytolacca sandwicensis*	pōpolo kū mai	E	
Urticaceae	*Pilea peploides*		I	
Urticaceae	*Pipturus albidus*	māmaki	I	
Nyctaginaceae	*Pisonia brunoniana*	pāpala kēpau	I	
Nyctaginaceae	*Pisonia umbellifera*	pāpala kēpau	I	
Pittosporaceae	*Pittosporum hawaiiense*	hōʻawa	E	SOC
Pittosporaceae	*Pittosporum undulatum*	Victorian box	N	
Pittosporaceae	*Pittosporum viridiflorum*	Cape pittosporum	N	
Pittosporaceae	*Pittosporum* sp.	hōʻawa	E	
Plantaginaceae	*Plantago lanceolata*	narrow-leaved plantain	N	
Plantaginaceae	*Plantago major*	broad-leaved plantain	N	
Rutaceae	*Platydesma remyi*		E	C, EN
Rutaceae	*Platydesma spathulata*	pilo kea	E	
Asteraceae	*Pluchea symphytifolia*	sourbush	N	
Polygonaceae	*Polygonum capitatum*	knotweed	N	
Polygonaceae	*Polygonum punctatum*	water smartweed	N	
Sapotaceae	*Pouteria sandwicensis*	ʻālaʻa	E	
Lamiaceae	*Prunella vulgaris*	selfheal	N	
Rosaceae	*Prunus cerasifera*	Methley plum	N	
Myrtaceae	*Psidium cattleianum*	strawberry guava	N	
Myrtaceae	*Psidium guajava*	common guava	N	
Rubiaceae	*Psychotria hawaiiensis*	kōpiko ʻula	E	
Rubiaceae	*Psychotria hawaiiensis* var. *hillebrandii*	kōpiko ʻula	E	
Rubiaceae	*Psydrax odoratum*	alaheʻe	I	
Ranunculaceae	*Ranunculus repens*	creeping buttercup	N	
Apocynaceae	*Rauvolfia sandwicensis*	hao	E	
Rosaceae	*Rubus argutus*	blackberry	N	
Rosaceae	*Rubus hawaiensis*	ʻākala	E	
Rosaceae	*Rubus rosifolius*	thimbleberry	N	
Polygonaceae	*Rumex acetosella*	sheep sorrel	N	
Polygonaceae	*Rumex crispus*	curly dock	N	
Polygonaceae	*Rumex giganteus*	pāwale	E	
Polygonaceae	*Rumex* sp.	dock	N	
Santalaceae	*Santalum paniculatum*	ʻiliahi, sandalwood	E	
Caprifoliaceae	*Sambucus mexicana*	Mexican elder	N	
Goodeniaceae	*Scaevola chamissoniana*	naupaka kuahiwi	E	
Goodeniaceae	*Scaevola sericea*	naupaka kahakai	I	
Caryophyllaceae	*Schiedea diffusa*		E	SOC
Caryophyllaceae	*Schiedea globosa*		E	SOC

Anacardiaceae	*Schinus terebinthifolius*	Christmas berry	N	
Asteraceae	*Senecio madagascariensis*	fireweed	N	
Taxodiaceae	*Sequoia sempervirens*	redwood	N	
Cucurbitaceae	*Sicyos cucumerinus*	panunukuahiwi	E	
Malvaceae	*Sida acuta*		N	
Malvaceae	*Sida fallax*	ʻilima	I	
Smilacaceae	*Smilax melastomifolia*	hoi kuahiwi	E	
Asteraceae	*Sonchus oleraceus*	pualele, sow thistle	N	
Fabaceae	*Sophora chrysophylla*	māmane	E	
Lamiaceae	*Stenogyne calaminthoides*		E	
Lamiaceae	*Stenogyne cranwelliae*		E	C
Lamiaceae	*Stenogyne oxygona*		E	SOC, X
Asteraceae	*Taraxacum officinale*	common dandelion	N	
Combretaceae	*Terminalia catappa*	tropical almond	N	
Araliaceae	*Tetraplasandra hawaiensis*	ʻohe	E	
Araliaceae	*Tetraplasandra oahuensis*	ʻohe mauka	E	
Melastomataceae	*Tibouchina herbacea*	glorybush	N	
Melastomataceae	*Tibouchina urvilleana*	lasiandra	N	
Urticaceae	*Touchardia latifolia*	olonā	E	
Campanulaceae	*Trematolobelia grandifolia*		E	SOC
Campanulaceae	*Trematolobelia macrostachys*	koliʻi	E	
Fabaceae	*Trifolium repens*	white clover	N	
Urticaceae	*Urera glabra*	ōpuhe	E	
Ericaceae	*Vaccinium calycinum*	ʻōhelo, ʻōhelo kau lāʻau	E	
Ericaceae	*Vaccinium dentatum*	ʻōhelo	E	
Ericaceae	*Vaccinium reticulatum*	ʻōhelo	E	
Verbenaceae	*Verbena litoralis*	ōwī	N	
Scrophulariaceae	*Veronica plebeia*	trailing speedwell	N	
Scrophulariaceae	*Veronica serpyllifolia*	thyme-leaved speedwell	N	
Fabaceae	*Vigna marina*	mohihihi, nanea	I	
Violaceae	*Viola maviensis*		E	SOC
Thymelaeaceae	*Wikstroemia monticola*	ʻākia	E	
Thymelaeaceae	*Wikstroemia pulcherrima*	ʻākia	E	
Thymelaeaceae	*Wikstroemia sandwicensis*	ʻākia	E	
Flacourtiaceae	*Xylosma hawaiiense*	maua	E	
Asteraceae	*Youngia japonica*	oriental hawksbeard	N	
II. Fauna **Chordata** **Amphibia** **Anura**				
Bufonidae	*Bufo marinus*	cane toad	N	
Leptodactylidae	*Eleutherodactylus coqui*	coquí frog	N	
Ranidae	*Lithobates catesbeianus*	bullfrog	N	
Aves **Anseriformes**				
Anatidae	*Anas wyvilliana*	koloa maoli, Hawaiian duck	E	END, EN
Charadriiformes				
Charadriidae	*Pluvialis fulva*	kōlea, Pacific golden-plover	I	LC

	Ciconiiformes			
Ardeidae	*Nycticorax nycticorax hoactli*	ʻaukuʻu, black-crowned night heron	I	LC
	Columbiformes			
Columbidae	*Streptopelia chinensis*	spotted dove	N	
	Falconiformes			
Accipitridae	*Buteo solitarius*	ʻio, Hawaiian hawk	E	END, NT
	Galliformes			
Phasianidae	*Phasianus colchicus*	ring-necked pheasant	N	
	Passeriformes			
Cardinalidae	*Cardinalis cardinalis*	northern cardinal	N	
Fringillidae	*Carpodacus mexicanus*	house finch	N	
Dicruridae	*Chasiempis sandwichensis sandwichensis*	Hawaiʻi ʻelepaio	E	
Timaliidae	*Garrulax canorus*	hwamei, melodious laughing-thrush	N	
Drepanididae	*Hemignathus virens virens*	Hawaiʻi ʻamakihi	E	LC
Drepanididae	*Himatione sanguinea sanguinea*	ʻapapane	E	LC
Timaliidae	*Leiothrix lutea*	red-billed leiothrix	N	
Estrildidae	*Lonchura punctulata*	nutmeg mannikin	N	
Drepanididae	*Vestiaria coccinea*	ʻiʻiwi	E	NT
Zosteropidae	*Zosterops japonicus*	Japanese white-eye	N	
	Procellariiformes			
Procellariidae	*Pterodroma sandwichensis*	ʻuaʻu, Hawaiian petrel	E	END, VU
Procellariidae	*Puffinus newelli*	ʻaʻo, Hawaiian shearwater	E	T, EN
	Strigiformes			
Strigidae	*Asio flammeus sandwichensis*	pueo, Hawaiian short-eared owl	E	
Actinopterygii (ray-finned fishes) **Cypriniformes**				
Cyprininae	*Carassius auratus*	goldfish	N	
Cyprininae	*Cyprinus carpio*	common carp	N	
	Cyprinodontiformes			
Poeciliidae	*Gambusia affinis*	mosquitofish	N	
Poeciliidae	*Poecilia mexicana*	shortfin molly	N	
Poeciliidae	*Poecilia reticulata*	guppy	N	
Poeciliidae	*Xiphophorous hellerii*	green swordtail	N	
	Perciformes			
Gobiidae	*Awaous guamensis*	ʻoʻopu nākea, giant stream goby	I	
Gobiidae	*Bathygobius cotticeps*	cheek-scaled frill goby	N	
Gobiidae	*Bathygobius fuscus*	common frillfin goby	N	
Eleotridae	*Eleotris sandwicensis*	ʻoʻopu ʻakupa, Hawaiian sleeper goby	E	
Gobiidae	*Eviota epiphanes*	pygmy goby	N	
Gobiidae	*Lentipes concolor*	ʻoʻopu ʻalamoʻo, red-tailed stream goby	E	
Centrarchidae	*Lepomis macrochirus*	bluegill sunfish	N	
Menidae	*Mene maculata*	moonfish	N	

Centrarchidae	*Micropterus dolomieu*	smallmouth bass	N	
Centrarchidae	*Micropterus salmoides*	largemouth bass	N	
Cichlidae	*Oreochromis aureus*	blue tilapia	N	
Cichlidae	*Oreochromis macrochir*	longfin tilapia	N	
Cichlidae	*Oreochromis mossambicus*	Mozambique tilapia	N	
Cichlidae	*Oreochromis niloticus*	tilapia	N	
Gobiidae	*Oxyurichthys lochotus*	point-tailed ʻoʻopu	N	
Gobiidae	*Sicyopteris stimpsoni*	ʻoʻopu nōpili, clinging stream goby	E	
Gobiidae	*Stenogobius hawaiiensis*	ʻoʻopu naniha, black-headed stream goby	E	
	Salmoniformes			
Salmonidae	*Oncorhynchus mykiss*	rainbow trout	N	
	Siluriformes			
Clariidae	*Clarias fuscus*	Chinese catfish	N	
Ictaluridae	*Ictalurus punctatus*	channel catfish	N	
Mammalia				
	Artiodactyla			
Bovidae	*Bos taurus*	cattle	N	
Bovidae	*Capra hircus*	goat	N	
Suidae	*Sus scrofa*	pig, puaʻa	P	
	Carnivora			
Canidae	*Canis lupus familiaris*	domestic dog, ʻīlio	P	
Felidae	*Felis silvestris catus*	domestic cat	N	
Herpestidae	*Herpestes javanicus*	Indian mongoose	N	
	Chiroptera			
Vespertilionidae	*Lasiurus cinereus semotus*	ʻōpeʻapeʻa, Hawaiian hoary bat	E	END
	Rodentia			
Muridae	*Mus musculus*	house mouse	N	
Muridae	*Rattus exulans*	Polynesian rat, ʻiole	P	
Muridae	*Rattus rattus*	black rat	N	
Arthropoda				
Arachnida				
	Araneae (spiders)			
Philodromidae	Unid. genus	crab spiders	E	
Theridiidae	*Argyrodes* sp.	comb-footed spiders	E	
Theridiidae	*Theridion grallator*	happyface spider	E	
Thomisidae	*Misumenops anguliventris* ?	crab spider	E	
Thomisidae	*Misumenops facundus*	crab spider	E	
Thomisidae	*Misumenops* sp.	crab spider	E	
Tetragnathidae	*Tetragnatha* sp.	long-jawed spiders	E	
	Pseudoscorpionida (false scorpions)			
Chernetidae	*Eumecochernes* sp. ?	false scorpion	E	
Entognatha				
	Collembola (springtails)			
Unid. family		springtail	?	
Insecta				
	Odonata (damselflies and dragonflies)			
Aeshnidae	*Anax strenuus*	dragonfly	E	

Coenagrionidae	*Megalagrion blackburni*	large red damselfly	E	
Coenagrionidae	*Megalagrion calliphya*	damselfly	E	
Coenagrionidae	*Megalagrion hawaiiense*	Hawaiian damselfly	E	
Orthoptera (grasshoppers, katydids, and crickets)				
Tettigoniidae	*Banza* sp.	cone-headed katydid	E	
Gryllidae	*Laupala* sp.	sword-tail cricket	E	
Gryllidae	*Leptogryllus* sp.	tree cricket	E	
Gryllidae	*Prognathogryllus* sp.	tree cricket		
Hemiptera (true bugs)				
Delphacidae	Unid. genus	planthopper	E	
Psyllidae	Unid. genus	jumping plant lice	E	
Cixiidae	*Iolania perkinsi*	planthopper	E	
Miridae	*Koanoa* sp.	leaf bug	E	
Anthocoridae	*Lasiochilus* sp.	pirate bug	E	
Veliidae	*Microvelia vagans*	ripple bug	E	
Nabidae	*Nabis blackburni*	damsel bug	E	
Nabidae	*Nabis curtipennis*	damsel bug	E	
Nabidae	*Nabis oscillans*	damsel bug	E	
Nabidae	*Nabis* n. sp.	damsel bug	E	
Lygaeidae	*Neseis whitei brachypterus*	seed bug	E	X
Reduviidae	*Nesidiolestes selium*	thread-legged bug	E	X
Miridae	*Nesidiorchestes* sp.	leaf bug	E	
Miridae	*Nesiomiris* sp.	leaf bug	E	
Cicadellidae	*Nesophrosyne* sp.	leafhopper	E	
Pentatomidae	*Oechalia acuta*	stink bug	E	X
Cixiidae	*Oliarus* sp.	planthopper	E	
Miridae	*Orthotylus hedyoticola*	leaf bug	E	
Miridae	*Orthotylus kassandra*	leaf bug	E	
Miridae	*Orthotylus metrosideri*	leaf bug	E	
Miridae	*Orthotylus* sp.	leaf bug	E	
Miridae	*Pseudoclerada* sp.	leaf bug	E	
Saldidae	*Saldula exulans*	shore bug	E	
Saldidae	*Saldula oahuensis*	shore bug	E	
Miridae	*Sarona adonias*	leaf bug	E	
Miridae	*Sarona hamakua*	leaf bug	E	
Miridae	*Sarona mamaki*	leaf bug	E	
Miridae	*Sarona* sp.	leaf bug	E	
Neuroptera (lacewings and antlions)				
Chrysopidae	*Anomalochrysa fulvescens*	green lacewing	E	
Chrysopidae	*Anomalochrysa fulvescens rhododora*	green lacewing	E	
Chrysopidae	*Anomalochrysa maclachlani*	green lacewing	E	
Hemerobiidae	*Micromus longispinosus*	brown lacewing	E	
Hemerobiidae	*Micromus paradoxus*	brown lacewing	E	
Hemerobiidae	*Micromus rubrinervis*	brown lacewing	E	
Hemerobiidae	*Micromus subochraceus*	brown lacewing	E	
Hemerobiidae	*Micromus vagus*	brown lacewing	E	
Coleoptera (beetles)				
Curculionidae	*Achalles* sp.	true weevil	E	

Scarabaeidae	*Adoretus sinicus*	Chinese rose beetle	N	
Carabidae	*Blackburnia ewingi*	ground beetle	E	
Carabidae	*Blackburnia hawaiiensis*	ground beetle	E	
Carabidae	*Blackburnia kilauea*	ground beetle	E	
Carabidae	*Blackburnia molokaiensis*	ground beetle	E	
Eucnemidae	*Dromaeolus* sp.	false click beetle	E	
Curculionidae	*Dryophthorus squalidus*	true weevil	E	
Nitidulidae	*Eupetinus* sp. (2)	souring beetle	E	
Nitidulidae	*Gonioryctus* sp.	souring beetle	E	
Hydrophilidae	*Limnoxenus semicylindricus*	water scavenger beetle	E	
Carabidae	*Mecyclothorax* sp. (5)	ground beetle	E	
Nitidulidae	*Nesopetinus* sp. (2)	souring beetle	E	
Curculionidae	*Nesotocus munroi*	true weevil	E	X
Curculionidae	*Oodemus* sp.	true weevil	E	X
Cerambycidae	*Parandra puncticeps*	long-horned wood borer	E	
Aglycyderidae	*Proterhinus* sp.	primitive weevil	E	
Dytiscidae	*Rhantus pacificus*	diving beetle	E	
Curculionidae	*Syagrius fulvitarsis*	Australian fern weevil	N	
Scolytidae	*Xyleborus* sp. nr. *hawaiiensis*	bark beetle	E	
Anobiidae	*Xyletobius* sp.	death-watch beetles	E	
Diptera (true flies)				
Dolichopodidae	*Campsicnemus* sp.	long-legged fly	E	
Drosophilidae	*Drosophila murphyi*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila ochrobasis*	Hawaiian picture wing fly	E	END
Drosophilidae	*Drosophila pisonia*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila pullipes*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila setosifrons*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila setosimentum*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila silvestris*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila sobrina*	Hawaiian picture wing fly	E	
Drosophilidae	*Drosophila sproati*	Hawaiian picture wing fly	E	
Dolichopodidae	*Eurynogaster* sp.	long-legged fly	E	
Tipulidae	*Limonia stygipennis*	crane fly	E	
Muscidae	*Lispocephala* sp.	house fly	E	
Ephydridae	*Neoscatella* sp.	shore fly	?	
Tephritidae	*Trupanea apicalis*	fruit fly	E	
Tephritidae	*Trupanea crassipes*	fruit fly	E	
Tephritidae	*Trupanea* nr. *pantosticta*	fruit fly	E	
Tephritidae	*Trupanea* sp.	fruit fly	E	
Hymenoptera (bees, wasps, and ants)				
Sphecidae	*Ectemnius atripennis*	square-headed wasp	E	
Sphecidae	*Ectemnius polynesialis*	square-headed wasp	E	
Sphecidae	*Ectemnius rubrocaudatus*	square-headed wasp	E	
Sphecidae	*Ectemnius tumidoventris*	square-headed wasp	E	
Ichneumonidae	*Enicospilus* sp. ?	wasp	E	
Colletidae	*Hylaeus difficilis*	yellow-faced bee	E	
Colletidae	*Hylaeus dumetorum*	yellow-faced bee	E	
Colletidae	*Hylaeus laeta*	yellow-faced bee	E	

Colletidae	*Hylaeus pubescens*	yellow-faced bee	E	
Vespidae	*Odynerus* sp. (2)	potter wasp	E	
Diapriidae	*Platymischoides* sp.	wasp	E	
Lepidoptera (moths and butterflies)				
Pterophoridae	Unid. genus	plume moth	N	
Sphingidae	*Agrius cingulata*	sweet potato hornworm	N	
Noctuidae	*Agrotis ceramophaea*	moth	E	
Noctuidae	*Agrotis charmocrita*	moth	E	
Noctuidae	*Agrotis dislocata*	moth	E	
Noctuidae	*Agrotis ipsilon*	black cutworm moth	N	
Noctuidae	*Agrotis psammophaea*	moth	E	
Alucitidae	*Alucita objurgatella*		N	
Tortricidae	*Amorbia emigratella*	Mexican leaf-roller moth	N	
Noctuidae	*Ascalapha odorata*	black witch moth	N	
Noctuidae	*Athetis thoracica*	moth	N	
Tortricidae	*Bactra straminea*	leaf roller	N	
Carposinidae	*Carposina dispar*	fruit moth	E	
Carposinidae	*Carposina gracillima*	fruit moth	E	
Carposinidae	*Carposina herbarum* ?	fruit moth	E	
Carposinidae	*Carposina inscripta*	fruit moth	E	
Carposinidae	*Carposina nigronotata*	fruit moth	E	
Carposinidae	*Carposina olivaceonitens*	fruit moth	E	
Noctuidae	*Chrysodeixis eriosoma*	moth	N	
Crambidae	*Eudonia* sp. (10)	moth	E	
Geometridae	*Eupithecia craterias*	inchworm	E	
Geometridae	*Eupithecia monticolens*	inchworm	E	
Geometridae	*Eupithecia orichloris*	inchworm	E	
Geometridae	*Eupithecia staurophragma*	inchworm	E	
Geometridae	*Fletcherana roseata*	inchworm	E	
Noctuidae	*Haliophyle compsias*	moth	E	
Noctuidae	*Haliophyle euclidias*	moth	E	
Noctuidae	*Haliophyle ignita*	moth	E	
Sphingidae	*Hyles wilsoni*	hawk moth	E	
Noctuidae	*Hypocala deflorata*	moth	N	
Cosmopterigidae	*Hyposmocoma* sp.	moth	E	
Geometridae	*Macaria infusata*	inchworm	N	
Noctuidae	*Melipotis indomita*	moth	N	
Sphingidae	*Manduca blackburni*	Blackburn's sphinx moth	E	END
Pyralidae	*Maruca testulalis*	moth	N	
Crambidae	*Mestolobes minuscula*	moth	E	
Crambidae	*Mestolobes* sp.	moth	E	
Crambidae	*Omiodes accepta*	moth	E	
Crambidae	*Omiodes anastreptoides*	moth	E	
Crambidae	*Omiodes continuatalis*	moth	E	
Crambidae	*Omiodes monogona*	moth	E	
Noctuidae	*Ophiusa disjungens*	moth	N	
Crambidae	*Orthomecyna exigua* subsp. *exigua*	moth	E	
Tortricidae	*Panaphelix marmorata*	leaf roller	E	

Tortricidae	*Pararrhaptica sublichenoides*	leaf roller	E	
Tortricidae	*Pararrhaptica subsenescens*	leaf roller	E	
Tortricidae	*Pararrhaptica* sp. (2)	leaf roller	E	
Noctuidae	*Peridroma selenias*	moth	E	
Noctuidae	*Pseudaletia unipuncta*	army worm moth	N	
Noctuidae	*Pseudaletia* n. sp.	moth	E	
Noctuidae	*Schrankia altivolans*	moth	E	
Geometridae	*Scotorythra arboricolans*	inchworm	E	
Geometridae	*Scotorythra artemidora*	inchworm	E	
Geometridae	*Scotorythra gomphias*	inchworm	E	
Geometridae	*Scotorythra hyparcha*	inchworm	E	
Geometridae	*Scotorythra goniastis*	inchworm	E	
Geometridae	*Scotorythra* n. sp. nr. *kuschei*	inchworm	E	
Geometridae	*Scotorythra rara*	inchworm	E	
Geometridae	*Scotorythra* sp.	inchworm	E	
Tortricidae	*Spheterista pleonectes*	leaf roller	E	
Sphingidae	*Theretra nessus*	yam hawkmoth	N	
Oecophoridae	*Thyrocopa fraudulentella*	moth	E	
Oecophoridae	*Thyrocopa* sp.	moth	E	
Crambidae	*Udea endopyra*	moth	E	
Crambidae	*Udea liopis*	moth	E	
Crambidae	*Udea pyranthes*	moth	E	
Crambidae	*Uresiphita polygonalis* subsp. *virescens*	moth	E	
Nymphalidae	*Vanessa tameamea*	Kamehameha butterfly	E	
Malacostraca (crustaceans)				
Decapoda				
Atyidae	*Atyoida bisulcata*	ʻōpae kalaʻole, mountain shrimp	E	
Atyidae	*Halocaridina rubra*	ʻōpae ʻula, red shrimp	E	
Palaemonidae	*Macrobrachium grandimanus*	ʻōpae ʻoehaʻa, Hawaiian prawn	E	
Palaemonidae	*Macrobrachium lar*	Tahitian prawn	N	
Cambaridae	*Procambarus clarkii*	Louisiana crayfish	N	
Mollusca				
Gastropoda (snails, slugs, etc.)				
Pulmonata				
Achatinellidae	*Partulina physa*		E	SOC
Achatinellidae subf. Tornatellidinae	?		E	
Succineidae	?		E	
Neritoida				
Neritidae	*Neritina granosa*	hīhīwai, stream limpet	E	

APPENDIX D

Public Comment Received on the Draft EA and Responses

SEP 18 2007

LINDA LINGLE
GOVERNOR OF HAWAI'I

LAURENCE K. LAU
ACTING DIRECTOR

STATE OF HAWAI'I
DEPARTMENT OF HEALTH
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
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September 14, 2007

RECEIVED
'07 SEP 18 P5:45
FORESTRY & WILDLIFE
STATE OF HAWAII

Paul J. Conry, Director
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Subject: Draft Environmental Assessment (DEA) for the Kohala Watershed Partnership Rare Species Protection Fencing Project, TMKs (3) 5-9-002-004, (3) 5-8-002-001, Island of Hawai'i

Dear Mr. Conry:

Thank you for the opportunity to review and comment on the subject DEA.

Under *Current Land Use* on page 13, the Office of Environmental Quality Control would like to know if specific cultural use, like the gathering of plant resources, and also recreational use, like hunting, take place in the project area. If such activities do occur, could you please describe any mitigation measures to address possible project impacts on these uses?

Please call Herman Tuiolosega at (808) 586-4185 if you have any questions.

Sincerely,

Laurence K. Lau
Acting Director

KWP
Kohala Watershed
PARTNERSHIP

Parker Ranch

Kahuā Ranch

Ponoholo Ranch

Kamehameha Schools

Queen Emma Land Company

Surety Kohala Corporation

Laupāhoehoe Nui LLC

Hawai'i Department of Land & Natural Resources

Hawai'i Department of Hawaiian Home Lands

Hawai'i County Department of Water Supply

The Nature Conservancy

19 E. Kawili Street
Hilo, HI 96720

phone: 808/333-0976
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October 29, 2007

Mr. Laurence K. Lau
Acting Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment
Kohala Watershed Partnership Rare Species Protection Fencing Project
TMK 5-9-2:004, 5-9-2:001, North Kohala District, Hawaii

Dear Mr. Lau:

Thank you and your staff for your comments, dated September 14, 2007, on the Draft Environmental Assessment on the Kohala Watershed Partnership Rare Species Protection Fencing Project.

You inquired whether specific cultural use, like gathering of plant resources, and also recreational use, like hunting, takes place in the project area, and if such activities do occur, the mitigation measures planned to address possible project impacts on these activities.

The proposed fencing is located on two separately owned parcels of private land. On one parcel, the landowner does allow recreational hunting in certain instances; on the other parcel, the landowner does not allow recreational hunting. Regarding cultural uses, there are no currently known cultural practices occurring on either parcel.

While no animals will remain within the fenced unit of 520 acres, over 25,000 acres of public hunting units in the North Kohala area will remain available for subsistence use and recreational hunting. In addition, gates will be incorporated along defined paths and other appropriate areas as part of the fencing design. For this reason, no significant impacts are anticipated to cultural or recreational uses in the project area.

Thank you again for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact me at (808) 333-0976 or by email at Melora@Purells.net.

Sincerely,

Melora K. Purell

Melora K. Purell
Coordinator

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3220

September 27, 2007

Melora Purell, Coordinator
Kohala Watershed Partnership
19 E. Kawili Street
Hilo Hawai'i 96720

RE: Draft Environmental Assessment, Kohala Watershed Partnership Rare Species Protection Fencing Project, Hawai'i ; TMKs: 3-5-9-002:004, and 3-5-8-002:001.

Dear Ms. Purell,

The Office of Hawaiian Affairs (OHA) is in receipt of the above referenced request for comments concerning the Draft Environmental Assessment (DEA) for the Kohala Watershed Partnership Rare Species Protection Fencing Project on Hawai'i.

OHA understands that this project seeks to put in three miles of ungulate-proof fencing and improve another half-mile of fencing to protect 520 acres of private lands in Kohala. The project area is a primary watershed for the region as well as being habitat for seven endangered species and 25 at-risk species. We further understand that this project will involve weed management, rare plant outplanting as well as feral ungulate removal and has the goals of restoring the native forest and enhancing the watershed. In this regard, OHA appreciates the efforts to both preserve and restore this important area. OHA does seek clarification that the weed management is for invasive species and that the rare plants to be outplanted are native species. We also seek assurances that enough ungulates will be left for our beneficiaries' subsistence use.

While we understand the need for preservation, OHA also expresses concern over the three miles of fencing. OHA requests assurances that access will be granted and available for Native Hawaiians practicing their constitutionally protected traditional and customary activities. We suggest the use of periodic step-overs in the fence line as well as one-way access gates with self-closing hinges to be installed on defined paths. If

placed properly, these installations can allow for adequate access while still achieving the project goal of ungulate-proof areas.

We do note that the *Archeological Sites and Cultural Practices* section of the DEA relies upon a "general literature review" and a 2004 cultural study prepared for another project in the area to conclude that "No archeological resources are known from the project area." A Cultural Impact Assessment (CIA) is required by Act 50, Session Laws of Hawaii, 2000 for a DEA. OHA suggests increasing your consultation process for this project with the local community. We included the contact information of our local office, but also stress that not all of our beneficiaries' concerns can be introduced to you through OHA. Generally, more effort and information gathered in this area will benefit the project and its related goals over the long term.

OHA appreciates that on page 38 of the DEA it states that, "During all construction activities, if any archaeological sites, artifacts, or burials are encountered, fencing construction will halt and the appropriate agencies will be notified to discuss further action, including re-routing the fence line to avoid these elements." We rely on these words to turn these intentions into action should such a situation arise. Further, we ask that the fence line also be re-routed for rare, threatened or endangered species.

Thank you for the opportunity to comment, and OHA looks forward to further commenting on this relevant project. If you have any questions or concerns, please contact Grant Arnold at (808) 594-0263 or granta@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

C: Ruby McDonald, Community Resources Coordinator
Office of Hawaiian Affairs, Kona Office
75-5706 Hanama Place Suite 107
Kailua-Kona, HI 96740

C: Office of Environmental Quality Control
235 S. Beretania St., Suite 702
Honolulu, Hawai'i 96813

KWP
Kohala Watershed
PARTNERSHIP

Parker Ranch

Kahuā Ranch

Ponoholo Ranch

Kamehameha Schools

Queen Emma Land Company

Surety Kohala Corporation

Laupāhoehoe Nui LLC

Hawai'i Department of Land & Natural Resources

Hawai'i Department of Hawaiian Home Lands

Hawai'i County Department of Water Supply

The Nature Conservancy

19 E. Kawili Street
Hilo, HI 96720

phone: 808/333-0976
email: Melora@Purells.net
website: www.hawp.org

October 29, 2007

Mr. Clyde Nāmu'o
Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment
Kohala Watershed Partnership Rare Species Protection Fencing Project
TMK 5-9-2:004, 5-9-2:001, North Kohala District, Hawaii

Dear Mr. Nāmu'o:

Thank you and your staff for your comments, dated September 27, 2007, on the Draft Environmental Assessment on the Kohala Watershed Partnership Rare Species Protection Fencing Project. We have the following responses to your questions and comments (summarized in italics):

1) *OHA does seek clarification that the weed management is for invasive species and that the rare plants to be outplanted are native species.*

The Partnership confirms that planned weed management is for invasive species, particularly ginger, strawberry guava, banana poka, fireweed, cane tibouchina, Koster's curse, kikuyu grass, and various rushes, and that the rare species to be outplanted will be composed solely of native species.

2) *We also seek assurances that enough ungulates will be left for our beneficiaries' subsistence use.*

The purpose of the project is to create an area protected from the destructive impacts of ungulates such as cattle and pigs. Years of research by the National Park Service, USGS, and others has demonstrated that the most effective way to prevent ungulates from damaging and degrading native vegetation is by fencing and removing the animals. While no

animals will remain within the fenced unit of 520 acres, over 25,000 acres of public hunting units in the North Kohala area will remain available for subsistence use and recreational hunting.

3) *OHA request assurances that access will be granted and available for Native Hawaiians practicing their constitutionally protected traditional and customary activities. We suggest the use of periodic step-overs in the fence line as well as one-way access gates with self-closing hinges to be installed on defined paths.*

The Partnership agrees that the purpose of the fencing is to prevent animal movement and not human access and plans to incorporate one-way access gates along defined paths and other appropriate areas as part of the fencing design.

4) *... the DEA relies upon a general literature review and a 2004 cultural study prepared for another project in the area to conclude that 'no archaeological resources are known from the project area.' A Cultural Impact Assessment is required by Act 50, Session Laws of Hawaii, 2000, for a DEA. OHA suggests increasing your consultation process for this project with the local community...*

Over the past three years, the Kohala Watershed Partnership has been developing a Management Plan that identifies important resources, describes the threats to these resources, and outlines future planned management across the region. The 2004 cultural study by Kumu Pono Associates was prepared as part of this process, to ensure that cultural uses and features were considered during the planning process. A series of public meetings in Waimea, Hāwī and Honoka'a were held in 2006 to gather additional public input on the proposed management for the Kohala Watershed Partnership area. The Kohala Watershed Partnership coordinator continues to meet with various members of the community to describe the goals and planned activities of the Partnership. The proposed 520-acre fencing project is one of the management actions identified in the larger Kohala Watershed Partnership Management Plan and is the first major action to be implemented.

Clarification has been made to the Final EA to reflect that the assessment of the impacts on cultural practices was not made solely on a literature review and the cultural assessment, but also involved discussions with families with longstanding ties to the area and ongoing consultation with the larger community about the planned activities of the Kohala Watershed Partnership.

5) *OHA appreciates that on page 38 of the DEA it states that, "During all construction activities, if any archaeological sites, artifacts, or burials are encountered, fencing construction will halt and the appropriate agencies will be notified to discuss further action, including re-routing the fence line to avoid these elements." We rely on these words to turn these intentions into action should such a situation arise.*

We confirm that if any archaeological or cultural sites, artifacts, or burials are encountered during construction, all construction will halt and the appropriate agencies notified to discuss further action.

6) *We ask that the fenceline also be re-routed for rare, threatened, or endangered species.*

We confirm that the fencing will be re-routed if any previously unidentified rare, threatened or endangered species are encountered during construction.

Thank you again for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact me at (808) 333-0976 or by email at Melora@Purells.net.

Sincerely,

Melora K. Purell

Melora K. Purell
Coordinator

Harry Kim
Mayor

County of Hawaii
PLANNING DEPARTMENT
101 Pauahi Street, Suite 3 • Hilo, Hawaii 96720-4224
(808) 961-8288 • FAX (808) 961-8742

Christopher J. Yuen
Director
Brad Kurokawa, ASLA
LEED® AP
Deputy Director

October 8, 2007

Mr. Ben Laws
Division of Forestry and Wildlife
Department of Land and Natural Resources
State of Hawaii
1151 Punchbowl St., Ste. 325
Honolulu, Hawaii 96813

Dear Mr. Laws:

Subject:	**Draft Environmental Assessment (DEA)**
Applicant:	**Kohala Watershed Partnership**
Land Owner:	**Ponoholo Ranch, Parker Ranch**
Project:	**Kohala Watershed Partnership Rare Species Protection Fencing Project**
Location:	**Ahupuaa of Kahua 1&2, Kehena 2, North Kohala District, Hawaii**

We are in receipt of your letter dated September 11, 2007 and the attached Draft Environmental Assessment (DEA) for the subject project on behalf of the Kohala Watershed Partnership.

After reviewing the Draft Environmental Assessment, we have the following comment to offer. The DEA should include a description of the appropriate fencing design to be utilized in crossing Pololu Stream, which will not prohibit water flow while still preventing passage of feral animals. There are two concerns to address. The first being the fence may collect excessive debris during storm events which will back up against the fence causing water to re-route and/or destroy the fence in that section, effectively allowing ungulates to pass through the broken areas of the fence. The other concern is that the fence will be high enough off the ground to allow the water and debris to pass beneath unencumbered, also allowing ungulates, specifically pigs, to pass beneath the fence during times of low flow in the stream.

Thank you for the opportunity to provide comment on the proposed project. Should you have questions, please feel welcome to contact Larry Brown or Dana Okano of my staff at 961-8288.

Sincerely,

CHRISTOPHER J. YUEN
Planning Director

DO:cd
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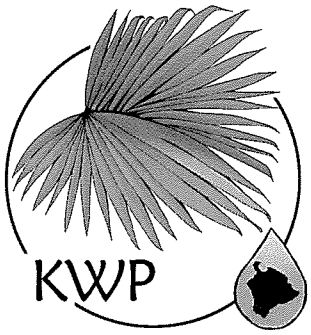
xc: State of Hawaii
Office of Environmental Quality Control
Attn: Ms. Genevieve Salmonson, Director
235 Beretania Street, Suite 702
Honolulu, Hawaii 96813



Kohala Watershed
PARTNERSHIP

October 29, 2007

Mr. Christopher Yuen, Director
County of Hawaii Planning Department
101 Pauahi Street, Suite 3
Hilo, HI 96720

Subject: Comment Letter on Draft Environmental Assessment for Kohala Watershed Partnership Rare Species Protection Fencing Project
TMK 5-9-2:004, 5-9-2:001, North Kohala District, Hawaii

Dear Mr. Yuen:

Thank you and your staff for your comments, dated October 8, 2007, on the Draft Environmental Assessment on the Kohala Watershed Partnership Rare Species Protection Fencing Project.

You provided comments regarding the proposed stream crossing at Pololu Stream, expressing concern regarding the design and the potential for damage during storm events or ineffectiveness during times of low stream flow. We agree that this section is the weakest portion of the fencing, and since the publication of the Draft EA, field staff returned to the project area to evaluate the stream crossing. After further review of the project area, terrain, and vegetation, field staff recommended altering the fence alignment by about 50 feet and tying the fence directly into the existing fencing that already crosses Pololu stream. This will entirely avoid a new stream crossing and improve the design of the proposed fencing. The Final EA has been modified to reflect this minor change in the fencing alignment. We have attached a map of the modified fence alignment.

Thank you again for your participation in the environmental review process. Should you have any future questions or concerns about this project, please feel free to contact me at (808) 333-0976 or by email at Melora@Purells.net.

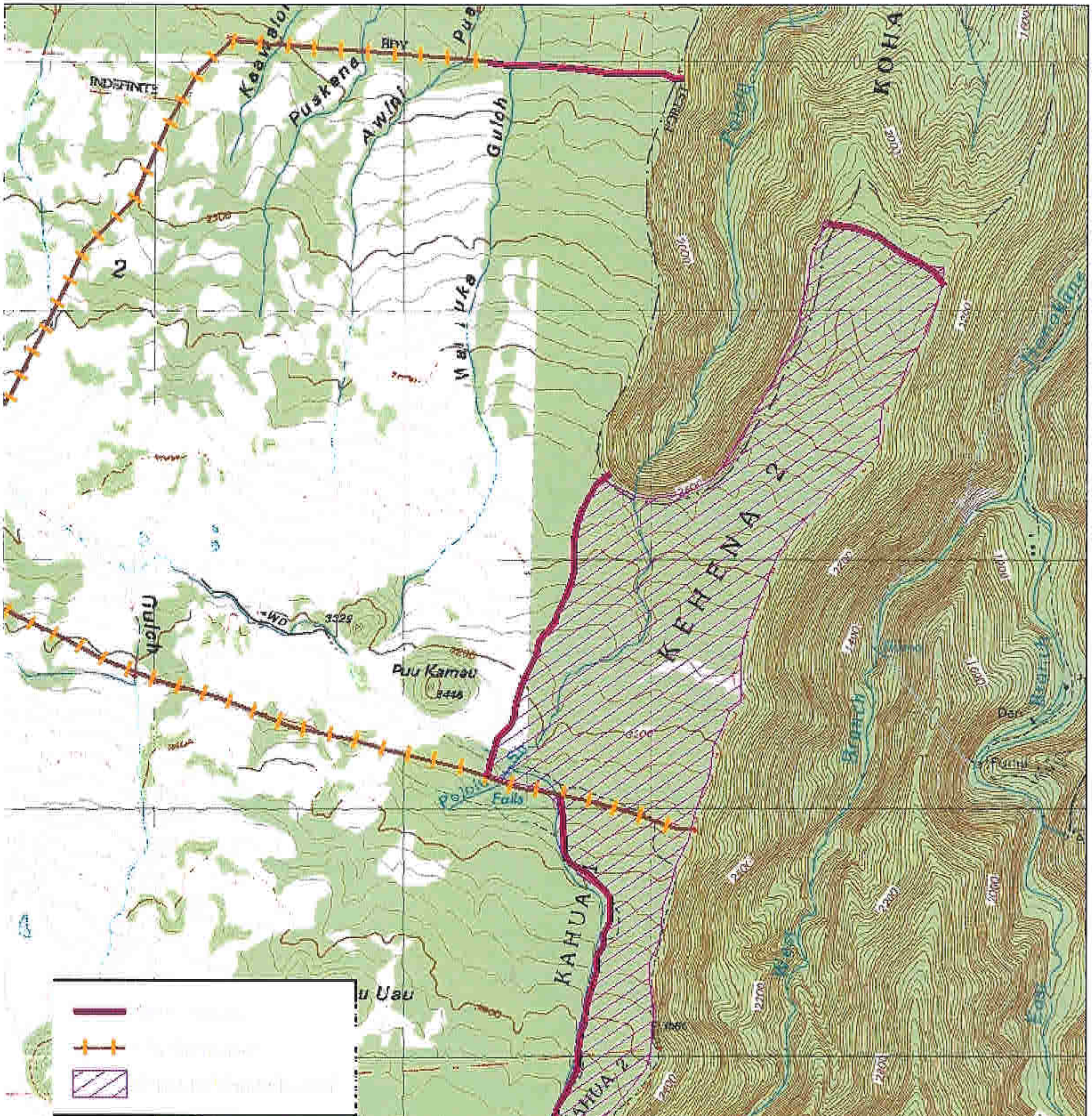
Sincerely,

Melora K. Purell

Melora Purell,
Coordinator

19 E. Kawili Street
Hilo, HI 96720

phone: 808/333-0976
email: Melora@Purells.net
website: www.hawp.org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