Final Environmental Assessment

Kohala Mountain Watershed Management Project

Districts of Hāmākua, North Kohala, and South Kohala
County of Hawai‘i
Island of Hawai‘i

In accordance with Chapter 343, Hawai‘i Revised Statutes

Proposed by:

Kohala Watershed Partnership
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I. SUMMARY

Project Name:

Kohala Mountain Watershed Management Project

Applicant:

Kohala Watershed Partnership:

Kahua Ranch
Kamehameha Schools
Laupahoehoe Nui, LLC
Parker Ranch
Ponoholo Ranch
Queen Emma Land Company
State of Hawai‘i Department of Hawaiian Home Lands
State of Hawai‘i Department of Land and Natural Resources
Kohala Preserve Conservation Trust (Surety Kohala Corporation)
Associate Partners:
Hawai‘i County Department of Water Supply
The Nature Conservancy
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Approving Agency:

State of Hawai‘i Department of Land and Natural Resources

Anticipated Determination:

Finding of No Significant Impact (FONSI)

Project Location:

Land Divisions (ahupua‘a and ‘ili): ‘Āwini, Honokāneiki, Honokānenui, Kahuaiki, Kahuanui, Kawaihae Hikina, Kawaihae Komohana, Laupāhoehoeiki, Laupāhoehoenui, ‘Ōuli, Pu‘ukapu, Wai‘aka 1, Wai‘aka 2, Waimanu, Waimea and Waipi‘o
North Kohala, South Kohala and Hamakua Districts
Island of Hawai‘i
TMK: 347007015, 349001007, 349003006, 349012001, 349012002, 349012003, 349012004, 349012005, 349013001, 349013002, 349014001, 349014003, 349014004, 349014005, 349014008, 349014009, 349014010, 349014011, 349014012, 349014013, 349014014, 349014014, 349014017, 349014020, 3490140,1, 349014022, 349015001,

349015002, 349015003, 349015004, 349015005, 349015009, 349015010, 351001002, 351001003, 351001004, 351001005, 351001006, 351001008, 351001011, 351001016, 351001017, 351001019, 351001021, 351002001, 351002004, 351002012, 351002013, 351002015, 351002017, 351002017, 352001001, 352001002, 352002001, 352002002, 352002003, 352002009, 352003001, 352003002, 352003003, 352004001, 352004002, 352004003, 352004004, 352005008, 352005012, 352005014, 352006003, 353002001, 353003001, 358002001, 358002002, 358002003, 358002005, 35,002007, 358003002, 358003003, 359002001, 359002002, 359002003, 359002004, 359002005, 359002006, 361001001, 361001002, 362001001, 362001002, 362001003, 362001004, 362001005, 362001006, 362001007, 362001008, 362001015, 362001023, 362001025, 362001031, 362001038, 363001001, 363001002, 363001003, 363001004, 363001005, 363001006, 363001007, 364001051, 364001056, 364002061, 364002124, 364002137, 365001003, 365001004, 365001006, 365001008, 365001010, 365001011, 365001013, 365001017, 365001019, 365001020, 365001047

Land Use:

State Agriculture and Conservation Districts (Protective, Limited, Resource, and General subzones)
County zoning (conservation, agriculture)
Special Management Area
Waimea Community Development Plan
State Restricted Watershed
State Natural Area Reserve
State Forest Reserve

Property Owners:

Kahuā Ranch
Kamehameha Schools
Kohala Preserve Conservation Trust (Surety Kohala Corporation)
Laupāhoehoe Nui, LLC
Parker Ranch
Ponoholo Ranch
Queen Emma Land Company
State of Hawai‘i Department of Hawaiian Home Lands
State of Hawai‘i, Division of Forestry and Wildlife, Department of Land and Natural Resources

Agencies, Organizations,Groups, and Individuals Consulted:

Federal:
U.S.D.A. Forest Service
U.S. Department of Agriculture, Natural Resources Conservation Service
U.S. Fish and Wildlife Service, Department of the Interior

State:
Division of Forestry and Wildlife, Department of Land and Natural Resources
Department of Hawaiian Home Lands

County of Hawai‘i:
Department of Water Supply
North Kohala Community Development Plan Steering Committee
South Kohala Community Development Plan Steering Committee

Other Organizations, Groups:
Big Island Invasive Species Committee
Hilo Bay Watershed Advisory Group
Kahuā Ranch
Kamehameha Schools
Kohala Forest Management Group
Kohala Preserve Conservation Trust
Laupāhoehoe Nui LLC
Mauna Kea Soil and Water Conservation District
Parker Ranch
Pelekane Bay Watershed Management Project
Ponoholo Ranch
Queen Emma Land Company
Surety Kohala Corporation
The Kohala Center
The Nature Conservancy
Three Mountain Alliance
Tutu's House (Friends of the Future)
University of Hawai'i at Hilo, TCBES graduate seminar
Waipi‘o Community Circle
Waimea Community Association
Waiulaula Watershed Management Project

Individuals:
Attendants at the April 2006 Open Houses in Hāwī, Waimea and Honoka‘a
Kohala Watershed Partnership volunteers
Local hunters, hikers, and traditional practitioners

II. OVERALL PROJECT DESCRIPTION

Formed in August 2003, The Kohala Watershed Partnership (KWP) is a voluntary alliance of public and private landowners dedicated to protecting watershed values and managing threats that occur across common land ownership boundaries across the Kohala region. The partnership includes: Kahuā Ranch, Kamehameha Schools, Laupāhoehoe Nui, LLC, Parker Ranch, Ponoholo Ranch, Queen Emma Land Company, the State of Hawai‘i Department of Hawaiian Home Lands, and the State of Hawai‘i Department of Land and Natural Resources, and Kohala Preserve Conservation Trust. Associate partners include the Hawai‘i County Department of Water Supply and The Nature Conservancy.

The Partnership has developed a 20-year draft management plan, on which this environmental assessment is based, to guide management actions over the roughly 64,000 acre area of the KWP. The overall goal of the plan is to maintain a healthy watershed and all its related ecosystem values and functions (e.g. ecological, economic, sociocultural). As such, management actions are directed at the major threats facing Kohala's watershed: feral ungulates (hooved animals such as pigs and cattle) and other non-native animals (such as rats and non-native aquatic species), invasive plant species (such as banana poka and kahili ginger), wildfire, and incompatible human activities. Primary management goals are: 1) protection of water resources; 2) prevention of new introductions and control of existing invasive plant species; 3) control of non-native animal populations; 4) native habitat and species protection; 5) wildfire management; and 6) management and promotion of compatible public uses. Major management actions related to these goals are fencing, feral animal removal, invasive species control, outplanting and restoration, monitoring and surveys, research, and infrastructure support and maintenance (including development of new access trails). The entire project area of roughly 64,000 acres is identified as the Kohala Watershed Management Area (WMA) and within this area, high yield watershed units and biodiversity units are identified for management purposes (Appendix A). These high yield watershed units and biodiversity units are where a majority of management actions will be focused; however given the changing nature and location of threats, management actions will be occurring over the entire project area as threats are targeted. For example, these actions might include invasive species control, especially if new weed infestations or new pest species like fire ants or snakes were to be found in the WMA, or the necessary responses to natural disasters like hurricanes or earthquakes. Significant changes in management priorities that involve activities like fencing or animal control would require a new environmental assessment. Management actions will occur over an anticipated 20-year time period and will also depend on funding availability and on-the-ground conditions.

The identified management actions and areas are a result of previous planning initiatives and pre-consultation efforts done in developing the Kohala Watershed Partnership's draft management plan. They include discussions and meetings of the Natural Area Working Group, Kona/Kohala Natural Resource Area Workshop, Kohala Forest Management Group (18 individuals met from 1995-2002), Waimea Water Roundtable, April 2006 open houses held in Waimea, North Kohala,

and Honokaʻa (40 individual attended and provided comments), and input and feedback from individual community members, businesses, government agencies, recreational users, cultural practitioners, private landowners, researchers, and others. Thirty-one individuals were interviewed in 2005 as research for the first draft of the management plan (Appendices B and C). Resulting comments stressed the importance of protecting less-accessible areas that have the most precipitation and that are in the best ecological condition from threats such as feral ungulates and invasive plants so that communities can continue to benefit from the watershed's ecosystem services such as water, clean streams, native habitats and species, culture, recreation, and economics. Final adoption of the revised draft management plan is pending the completion of this environmental review process.

The boundary of the project area follows State Hwy 250 (Kohala Mountain Road) from ʻŌuli Gulch at milepost 1.5 as it climbs northwest to mile 11, where it then goes northward over Kohala Mountain's northwest shoulder toward the Pololū Valley estuary. The Watershed Management Area follows the windward coastline, bends up Waipiʻo Valley, and encompasses the Puʻu Kapu section of the Kohala Watershed. The southern boundary then follows the southern Forest Reserve boundary westward and continues to meet ʻŌuli Gulch at the Highway 250 crossing (see maps in Appendix A).

Kohala mountain provides 154 million gallons of sustainable yield of water per day for the island. In addition to agricultural irrigation, the Kohala Watershed Management Area provides drinking water for North and South Kohala as well as parts of Hāmākua. The Kohala Watershed Management Area is dominated by both wet and mesic lowland and montane forests and shrublands on windward and mauka portions. The leeward slope is characterized by montane wet forest with an abrupt transition to pasture at the mauka fencelines. Within the forest, montane bogs are found on poorly-drained flat areas at high elevation, and the steep cliffs of windward valleys are vegetated with shrubs and trees. There are also streams, cinder cones, lava domes, and native plant and animal species that occur over this 64,000 acre area. The highest point of elevation is 5,480 feet above sea level. There are also man-made dikes, ditches, and other irrigation systems for water harvest.

Historically, the project area was first inhabited and used by Native Hawaiians. In subsequent years, the sandalwood trade flourished with many forests in Kohala harvested for this resource. The trade was then followed by the establishment of ranching in the early 1800s, which was followed by sugar plantations in the mid to late 1800s and other agriculture industries. In addition to these uses, contemporary activities include hunting and hiking. Traditional cultural usages including gathering of plants for rituals, medicines and hula continue. Currently, there are few residents who live full time in the project area.

State land use designations identify lands in the project area as a mix of Agriculture and Conservation (Protective, Limited, Resource, and General subzones) districts. Much of the windward coastal areas are identified as a Special Management Area, and some management actions identified will be done in these areas. County zoning is conservation and agriculture.

Land ownership includes both public (55 %) and private (45%) (Appendix A). Adjacent lands to the Kohala Watershed Management Area include agricultural lands, mostly used for pasture, and the low-density residential areas of Waimea, along Kohala Mountain Road, and in the towns of Hawi, Kapa‘au and Honoka‘a. Current land use for these areas is primarily ranching with some diversified agriculture and eco-tourism.

Purpose and Need

The purpose of the management actions is to insure continued watershed services are provided to the Kohala region and Hawai‘i island by addressing the impacts of current and future threats to the area.

Average annual rainfall on Kohala Mountain ranges from about 30 inches along the leeward section of the Kohala Mountain Road to over 160 inches near the 3,500 foot elevation in the wet forest between Waipi‘o and Honokāne valleys on the windward side. Hawai‘i’s forests play a vital role in watersheds as they provide recharge to underground aquifers and supply surface water. A distinctive feature of Kohala’s hydrology is that a significant portion of its total precipitation comes from water intercepted from the clouds passing through the vegetation high on the mountain (10-20,000 acres of montane cloud forest - see hydrology map in Appendix A). Cloud water interception adds significantly to rainfall, with both combining to provide nearly 200 inches per year across Kohala’s broad windward summit region. The geology of Kohala Mountain favors the storage and transport of subsurface water from these forested regions of the mountain to the coastal areas where water is discharged. This water recharges the aquifers or is stored in the soil (soil moisture holding capacity is higher in forested areas). This water also provides Kohala with its numerous perennial streams and rivers that flow from summit regions to the ocean.

The Hawai‘i County Department of Water Supply relies on the streams of Kohala Mountain to fill three reservoirs which serve as the primary water source for the community of Waimea. Residents of Kohala and surrounding areas also depend on groundwater resources accessed by wells for their water supply. These wells tap into aquifers which are filled from recharge zones in upland forests.

In addition to these water resources, the Kohala watershed is also home to unique plants and animals, some of which can be found nowhere else on earth (Appendix D). Native habitat communities include lowland wet forests, montane wet and mesic forests, coastal strand vegetation, montane wet bogs, lowland and montane shrub and grasslands, as well as wet and dry cliffs. The watershed also provides opportunities for cultural practices including the cultivation of kalo (taro), educational activities, and recreation by hikers, hunters, campers, and others. All of these ecosystem values are components of a healthy, holistic, functioning watershed.

These watershed areas are faced with several threats that may degrade the ability of the forests to provide clean water and other ecosystem services to the Kohala region. Prevalent invasive alien species found in the Watershed Management Area include strawberry guava (*Psidium*

cattleianum), kahili ginger (*Hedychium gardnerianum*), banana poka (*Passiflora tarminianum*), *Tibouchina herbacea*, palm grass (*Setaria palmifolia*) and Koster's curse (*Clidemia hurta*). These plant species can alter both the structure and function of the native forest by out-competing native species and decreasing forest diversity, which can reduce the forest's ability to hold water, and can change the movement of water and nutrients in the ecosystem. Invasive plant species with shallow root structures (like *Tibouchina herbacea*) may cause increased soil erosion by not holding soil effectively. Fast-growing trees that can create single-species closed canopy forests (like strawberry guava) eliminate all ground-cover vegetation, which reduces moisture in the soil, and may increase run-off and reduce aquifer recharge. Changes in forest structure also reduce available habitat for native wildlife species of birds, insects and snails. In addition, run-off may increase turbidity and nutrient loads in streams to the detriment of native stream life and downstream users like kalo farmers. The streams also transport sediments and nutrients that degrade near-shore ocean ecosystems by covering coral reefs and polluting fishing areas. Certain plants like fountain grass found on dry leeward slopes may increase fire hazards by providing abundant fine fuels. Invasive plant species such as strawberry guava form thickets and have strong root systems that can destroy the integrity of archeological sites.

The emergence and establishment of these invasive plant species is also assisted by feral ungulates (wild pigs and cattle), which disturb the soil and destroy low-growing plants like ferns and mosses; understory vegetation is critical for the absorption of rainfall and slowing of water and soil run-off. For example, feral pigs can uproot and damage understory vegetation as well as consume native plants and their seeds, leading to pockets of bare soil areas which provide openings for the establishment of invasive plant species, the seeds of which can be carried by feral pigs. Additionally, bare soil areas are susceptible to soil erosion and affect water quality as sediments are transported via streams or during strong rainfalls and floods into the ocean. This affects fish populations and other marine life and coral areas. Feral cattle also pose a threat by trampling and damaging forested areas and opening up the vegetation for invasive species introductions. For both ungulate species, opening the understory canopy to light and wind affects the ability of these disturbed areas to hold moisture and to grow epiphytes and mosses that are important for fog capture and rainfall storage. Rats, another non-native animal of concern, can consume the seeds, fruits, and flowers of native plant species as well as strip their bark. This can impact the new growth of Kohala's forests and the diversity of native vegetation that makes its forest an effective watershed. Additionally, both feral ungulates as well as rats can affect water quality and human health by serving as sources for water-borne diseases such as Leptospirosis and Cryptosporidiosis. Feral pigs also create wallows where water collects and produce habitats suitable for mosquito populations. Along with carrying bird pox and bird malaria (which threaten native forest birds), mosquitoes also serve as vectors for various human diseases. Feral ungulates disturb archaeological sites by knocking over stone walls, turning over soil and stone paths, and spreading invasive weeds in these areas. Other non-native animals of concern are mongooses, feral cats and dogs, mice, alien birds, alien arthropods, and alien aquatic species.

Another threat posed to Kohala Mountain is the human-related impacts of inadvertent trampling of sensitive vegetation, transportation of invasive weeds, trespassing, and wildfires.

The Kohala watershed is an area that is remote, characterized by difficult terrain, restricted access, and mostly uninhabited by people. However, it is also an area rich in biological and socio-economic resources. Consequently, recreational usage of the area, whether it is for hiking, sight-seeing, hunting/fishing, or other activities, has led to issues of safety management for the watershed. People get lost on Kohala Mountain and deaths have occurred. People have been linked with accidental introduction of alien species along trails, disturbance of rare habitats and species, disturbance of cultural and archaeological sites, and wildfire as well. The intent of the draft management plan is to support and encourage forms of public use in areas where it is compatible with conservation of water and related watershed values and where negative impacts are minimized.

III. DESCRIPTION OF ACTIONS

Many of the identified management actions (e.g. fencing, feral animal removal, invasive species control, outplanting and restoration, monitoring and surveys, research, and infrastructure support and maintenance) serve more than one of the management goals identified: 1) protection of water resources; 2) prevention of new introductions and control of existing invasive plant species; 3) control of non-native animal populations; 4) native habitat and species protection; 5) wildfire management; and 6) management and promotion of compatible public uses. The anticipated time frame for all proposed management actions is 20 years, to begin once all regulatory compliance requirements and necessary permits are approved and in-hand. All management actions will be dictated by terrain, consideration of least minimal impact to resources, management access, discovery of any cultural, archaeological, historical or rare biological resources, funding availability, and other management considerations. Description of management actions also includes their technical characteristics. Should any changes in the management plan be required during the period of implementation that substantially differ in scope from the management actions outlined in this environmental assessment, they will undergo subsequent environmental review and a supplemental environmental assessment will be conducted if required.

Feral Ungulate Management

Feral ungulate management consists of fencing (both those that enclose an area and also strategic fencing which uses natural barriers) and ungulate removal through various methods that are chosen based on project objective, terrain, feasibility, and safety of participants. Methods can include, but are not limited to, public hunting, staff controlled hunting, trapping, snaring, and aerial shooting. Feral ungulate management will help to fulfill the management goals of protection of water resources; prevention of new introductions and control of existing invasive plant species; control of non-native animal populations; native habitat and species protection, and management and promotion of compatible public uses. Primary areas where these activities will occur are in both the high- yield watershed management units and biodiversity units (Appendix A). The high-yield watershed management units are units A (~900 acres), B (~1,600 acres), C (~2,100 acres), and D (~2000 acres). These areas comprise a significant portion of the watershed in which groundwater infiltration is occurring and contain the headwaters for streams such as Ohiahuea and Honokāne. Total acreage of management units A-D are approximately

6,600 acres and comprise State lands (Pu‘u O ‘Umi Natural Area Reserve, Kohala Forest Reserve – 6,200 acres) and private lands (Laupahoehoe Nui, LLC - 400 acres). State land use zoning is Conservation district. For the biodiversity units, proposed fencing will be considered for portions of or entire biodiversity management units E (640 acres), F (430 acres), G (210 acres), H (160 acres), I (20 acres), J (1,530 acres), K (565 acres), L (290 acres), M and N (65 acres) as well as priority stream corridors in leeward Kohala. These areas have been selected because they host unique, rare, or threatened and endangered species and habitats. These management units are comprised of both public (1,245 acres) and private ownership (2,665 acres) and are a mix of both State Conservation and Agriculture districts.

Proposed fencing initiatives in both the high yield watershed units and the biodiversity units will result in approximately 10,500 total fenced acres of both public and private lands within the Watershed Management Areas (approximately 16% of the total 64,000 project acreage, of which 6,995 is public land and 3,145 acres is private land). During development of the draft management plan (which included reviewing meetings of the Natural Area Working Group, Kona/Kohala Natural Resource Area Workshop, Kohala Forest Management Group, Waimea Water Roundtable, and feedback from or interviews with community members, businesses, government agencies, recreational users, cultural practitioners, private landowners, researchers, and others), these areas were identified as highest conservation values for both watershed and native species protection and also because they were rarely used (if at all) by hikers, hunters, campers, and others, thereby minimizing impact on use.

Fencing has proven to be an effective tool for other Watershed Partnerships who have engaged in similar management actions to address similar watershed threats. Examples include East Maui, West Maui, East Moloka‘i, ‘Ōla‘a-Kīlauea, and the Ko‘olaus on O‘ahu. The construction of an ungulate proof fence is the first step in watershed protection and restoration as feral ungulates can degrade native habitat through destruction of forest understory, introduction of invasive weed species, as a vector for human diseases; these animals cause soil erosion, and create wallows where mosquitoes breed and develop. Fencing of such conservation areas followed by animal removal has shown that damage from feral pigs to forest understory and rate of invasive weed disturbance is slowed and even reversed as native vegetation is able to recover.

Fencing alignments will be dictated by terrain and by any sensitive resources that may be discovered. Prior to fence construction, the fence boundary will be surveyed and marked with plastic flagging. During this survey, any sensitive biological resources such as rare plants, bird nesting sites, or archaeological/historical/cultural resources which may be discovered will be identified and alignments shifted to avoid such sensitive features. If any threatened or endangered species are discovered within 10 feet of the proposed fencing corridor, appropriate agencies will be notified. Fencing alignments will also avoid trees, especially those greater than six inches in diameter. Once the fence alignment has been identified, a cleared corridor to allow for fence construction will be created. The corridor to allow for fence construction will be a maximum of four feet wide, and will not need to accommodate vehicles. Some of the corridors may follow existing pasture fence lines (biodiversity units E, H, L, M, N). Clearing will be done

by hand, and materials and crew will be transported to the fencing sites by truck for locations adjacent to pastures, and by helicopter for remote locations.

The fence will be made from steel posts, and will use 47” steel wire mesh (hog wire) fencing, with a bottom strand of bezinol-coated barbed wire, with anchor pins (“dead men”) in-between fence posts to keep the fence tight to the ground. Depending upon terrain, height of the fence can range anywhere from four to six feet. Along any steep slopes or uneven surfaces, hog wire skirting will be extended out from the bottom of the fence to eliminate animals digging under the fence and entering the fenced area.

In potential areas for endangered seabirds, seabird biologists be be contacted to assist in surveys. If birds are found, fencing will not be conducted during nesting seasons. To avoid impacts to endangered Hawaiian batrs, woody plants suitable for bat roosting will not be removed during bat birthing and pup rearing seasons, and barbed wire will not be used on the tops of fences, except where cattle (feral or domestic) are being excluded.

When the fence line crosses a stream, different options (such as breakaway panels or other similar technology to prevent potential flooding build-up) will be considered depending upon the conditions and feasibility, but with foremost consideration focused on limited or no impairment to natural water flow. When the stream has steep, rocky falls or drop-offs, the fence will be tied in to these natural barriers, and will not cross the water flow, but will still restrict animal movements. In the case of more gradual stream beds, culvert pipes, rubber flaps or other animal-restricting devices will be installed along the fence line to allow for variable water flow while reducing damage to the fence from storm events and preventing animal ingress. After any heavy rainstorm, partnership staff will inspect fences along stream crossings to insure that debris has not accumulated.

In addition, where feasible and appropriate, one way gates in the fence will be installed to allow feral pigs to leave fenced areas and move to other areas used for hunting. Similarly, crossovers or self-closing gates will be installed along fencing at trails or other accessible locations to allow for movement of people into and/or between fenced areas. Proposed fencing is designed to limit animal movement, not block access by people.

Fencing will be conducted in phases due to funding limitations or to reflect on-the-ground situations. After the completion of a fence, the fence will be regularly monitored for integrity and efficacy to ensure that there are no broken fence lines or other problems. Fences will also be monitored for impacts to bats and birds.

Once the fence is installed, feral ungulate removal will begin using a variety of methods where appropriate (e.g. public hunting, trapping, aerial shooting, professional hunting, staff control hunting, snaring, etc.). As mentioned previously, the main considerations when determining control methods and options are based on project objective, feasibility, and safety of participants.

Whenever possible and when not jeopardizing the safety of public hunters and their dogs, the first phase of feral ungulate management for any area will include involvement of public hunters.

Due to the remote locations involved with many of these fenced units, crews may be camping on-site for periods of days to weeks. In wet, remote areas, temporary decking may be erected to reduce impact on vegetation by tents and human activities.

Invasive Species Control

Invasive species control involves both weed management (using either mechanical, biological, or chemical controls) as well as non-native animal control. The management approach selected will consider the invasive species' distribution, mode of spread, and other factors. These actions address the management goals of protection of water resources; prevention of new introductions and control of existing invasive plant species; control of non-native animal populations; native habitat and species protection; and wildfire management. These management actions will be done primarily in high yield watershed area units A-D (6,600 acres) as well as biodiversity units E-N (3,910 acres), which total about 10,500 acres. Land ownership for these units is a mix of both public and private with State land use zoning a mix of Conservation and Agriculture districts.

Alien or non-native plant species already exist within the 64,000 acre Kohala Watershed Management Area. Some alien species found elsewhere on the island have not yet invaded Kohala Mountain, yet pose a potentially serious threat. Some invasive species of concern are miconia (*Miconia calvenscens*), Kahili ginger (*Hedychium gardnerianum*), Australian tree fern (*Sphaeropteris cooperi*), albizia (*Falcataria moluccana*), banana poka (*Passiflora tarminiana*), fountain grass (*Pennisetum setaceum*), Himalayan raspberry (*Rubus ellipticus*), palm grass (*Setaria palmifolia*), fireweed (*Senecio madagascarensis*), *Tibouchina herbacea*, Koster's curse (*Clidemia hirta*), and glorybush (*Tibouchina urvelliana*). These and other invasive species are of concern because they have the ability to change the composition and structure of the forest, impact efficacy of water storage and water quality, as well as pose wildfire risks by increasing fuel loads. Certain species such as *miconia* can cause severe landslides because they have shallow roots that do not have the capacity to hold soils. These invasive weed species also impact native habitats and species by degrading or destroying habitats necessary for species survival. Management actions proposed to combat these existing and potential new threats include monitoring (e.g. surveys and assessments including mapping) and control (e.g. mechanical, biological, grazing, prescribed fires, or chemical).

Mechanical control methods include manual pulling, digging, snipping, cutting, girdling, grinding, and others. Methods such as cut-stump, frill, and notch-cut follow treatment immediately with a spot application of herbicide. Cattle and sheep have been used effectively to reduce wildfire grass fuels in pastures and other grasslands on the island. For example, at Pu‘u Wa‘awa‘a Ranch cattle have been used to reduce wildfire fuels through intensive roadside grazing. Cattle are also currently being utilized at Kohala Ranch, on the lower southwest slopes of Kohala Mountain, to keep wildfire fuels reduced around homes in the subdivision. Sheep have

been used to reduce wildfire fuels in a perimeter fuel break for Waikiʻi Ranch. Use of grazing animals may also be an effective method of managing growth of invasive woody plants. Grazing animals would be used only on pastures and other grasslands, not in the forest. Prescribed fire could be used to remove or reduce stands of alien species or to reduce roadside stands of wildfire fuels. It is unlikely that prescribed fire will be used in the watershed for any purpose, but should it need to be used, burn planning will be done cooperatively following established procedures and using best management practices.

Chemical control methods are often an important tool in invasive plant management, especially where mechanical control methods are not feasible, where biological control techniques are not available, and when cost and time constraints dictate. When used responsibly and with caution, herbicides can be an effective tool to quickly kill a plant, keeping it from entering its next reproductive cycle; in many instances, the dead plant tissues form a mulch ground cover. Non-restricted herbicides are carefully used by resource managers throughout the State as part of alien plant management programs with products used in strict adherence to instructions and guidelines. In addition, the herbicides selected will be used in strict accordance with the labeling and selection of herbicides will take into account those approved for use in or near water bodies when applicable.

Biological control is another tool used effectively by managers worldwide in controlling alien species. Biological control uses predators and disease organisms of invasive pests from their native ranges to damage targeted weeds through release of these organisms in infected areas. The process of finding a biological agent can be difficult and expensive, with uncertain results. However, it can provide the only cost-effective method for reducing the negative impacts of priority invasive species that are already well-established in Hawaiʻi. The technique has had several successes throughout the world and in Hawaiʻi, including effective control of the following species that were once more widespread on Kohala Mountain: panini or prickly pear cactus (*Opuntia* sp.), pamakani (*Ageratina riparia)*, and lantana (*Lantana camara*).

The control of non-native animals other than feral ungulates includes small mammals (e.g. rats), alien aquatic species (e.g. exotic fish, mollusks, crustaceans), and incipient species (e.g. coqui frogs and snakes), which are all identified as threats for the Kohala watershed. These non-native species have the ability to change the composition of the watershed by either damaging native habitats, degrading the health and quality of streams, or endangering native species. Management actions proposed to combat these threats include trapping, use of toxicants, baits, netting, and other control methods that may yet be tested for efficacy.

Outplanting and Restoration

The management actions of outplanting of rare, threatened, or endangered native Hawaiian species and restoration of native habitats fulfill the primary management goals of protection of water resources and native habitat, and species protection. Actions will be focused mostly on the biodiversity units, because these areas have active management occurring where threats are

being removed or minimized so as to provide the best habitat and chances of success for species survival, and growth of native forests.

The overall health of the watershed depends on having the full array of biological components of species and habitat that fulfill specific ecological functions. As such, restoration of native species and native habitats of the Kohala watershed will have already begun by the major actions of fencing, feral ungulate removal, control of invasive weeds, and non-native animal control. However, species and habitat restoration will require additional management actions be taken. Example of such management actions include collection of seeds, outplanting of native plants into managed units, and plant surveys to document location and health of rare plant populations. All collection and propagation of rare plant materials will be done under the guidelines established by the Hawai‘i Rare Plant Recovery Group. Additional habitat restoration may be required for translocation of any threatened or endangered species (e.g. more intensive monitoring, increase in predator control, mosquito management, tagging of species, etc.). All necessary State and Federal permits will be acquired and maintained for collection and propagation of these plants as well as any work related to endangered or threatened species (flora and fauna).

Monitoring, Surveys, and Research

All components of management actions and activities will involve monitoring, surveys and research for threat management and to also measure efficacy of actions taken and fulfilling all management objectives and goals for the entire 64,000 acre project area.

Species-specific surverys will be conducted in areas where there is a lack of data on native and alien plants, birds and invertebrates, especially on remote windward slopes and valleys. For feral ungulates, invasive species, native habitat and species, and compatible human use management, maintenance of existing or establishment of new transects for monitoring and assessments may include flagging routes with colored tape around tree parts, use of metal tags attached to trees, insertion of slim metal rod or PVC piping with transect identification information, geospatial mapping, and other monitoring technologies and methods. Surveys for flora and fauna will be conducted. Research may be required to better understand population dynamics and threat relationship to species survival or habitat and watershed health. Monitoring of water resources will include activities such as, but not limited to, installation of satellite-transmittable telemetric meteorological monitoring stations, stream and/or rain gauges and survey transects.

Threatened or endangered species found within management units will be identified, mapped and recorded. Along with ungulate and weed management, these species will be monitored for recovery in the post-fencing period. As part of regular fence maintenance, monitoring for potential species impacts will also occur.

Infrastructure Support and Maintenance

In order to sustain and fulfill the management goals and objectives of the draft management plan, the project will need to develop and maintain infrastructure support. Examples include possible

need of management cabins for staff and volunteers for overnight work trips, creation of helicopter landing zones for transportation of staff and project materials, firebreaks to counter wildfires, establishing new trails and signage, and other infrastructure required to counter threats to the watershed. All potential identified activities will take into consideration as primary factors absolute need of the infrastructure and minimization of any potential negative impact to resources with regard to how infrastructure is developed and its location. In addition, all infrastructure support activities will obtain the necessary government approvals and permits should they be required. For new trails and/or access routes on either state or private land, existing decision-making processes will continue to be followed to determine appropriate locations and alignments, with input from community users. These actions would fulfill all management goals, particularly management and promotion of compatible public uses.

Management actions proposed to minimize human use related impacts to the watershed include development of new access trails for both hunting/hiking/education (which will include flagging a trail, creating a trail corridor by cutting vegetation, and continued maintenance), posting educational/interpretive signage (which can include using ground posts, cutting of vegetation, and soil digging), surveys, documenting and protecting culturally significant areas in the Watershed Management Area. In addition, a half-mile boardwalk and interpretive signage for the bog ecosystem near Alakahi stream will be established for educational and outreach purposes as well as to assist with management of the area. Actions related to the boardwalk will entail clearing of vegetation with construction involving use of building supports, trestles, piers, and metal support posts and deck surface. Boardwalk materials may also need to be flown into the area. Similar boardwalks have been constructed on Oʻahu at Kaʻala Natural Area Reserve as well as other bog ecosystems on Maui, Molokaʻi, and Kauaʻi. The boardwalk will provide an opportunity for students and other members of the community to learn about this unique habitat in Kohala and provide management access to the area with the least impact and disturbance to the bog.

Locations of new trails and signage have yet to be specifically identified in the 64,000 acre project area as they will require more input from the community and further analysis of trail impacts. Trails provide points of ingress to more easily and safely conduct activities such as surveys, ungulate control, search-and-rescue efforts, and fire management, and can represent avenues to experience cultural and historical features, as well as serve as conduits for economic, ecotourism, and recreational opportunities. However, trails can also serve as animal corridors where ungulates will most likely travel and be found, hikers or animals using the trails can contribute to the spread of weeds, and overuse of trails leads to soil compaction and increased water runoff or loss of stabilizing vegetation and soil erosion.

Access to private lands is controlled by the individual landowner (e.g. Parker Ranch offers access to hunters by permit), and access to State lands managed by the Division of Forestry and Wildlife under the rules and regulations of the Division (e.g. permits, access for hunting/hiking/camping, public trail use hours, etc.).

Technical, economic, social, and environmental characteristics, time frame, funding and source

The technical characteristics of the management actions were identified as part of the description of management actions under section III. Given that many of the management actions revolve around protection of water resources, the economic characteristics of the management actions have the potential to affect any commercial activities that rely on the collection and distribution of water to conduct business in the surrounding towns (e.g. Waimea, Kapaʻau, Honokaʻa). Examples include hotels, farms, ranches, restaurants, County Department of Water Supply, and others. As such, the protection of these areas via the proposed management actions will be critical to ensure these economic activities continue. Tourists enjoy these natural areas, and the continued health of the watershed could have an economic impact on the tourism industry as well as related businesses such as hotels and restaurants. In addition, the materials used to construct the fences/boardwalk, helicopter time contracted, and staff used to implement projects also provides economic benefits resulting from the proposed management actions. Subsistence hunting also occurs as an economic activity because hunters are providing food for themselves, their families and neighbors, and would be supported by the management actions addressing compatible public use and identification and development of new access trails for these activities.

Currently, there are very few residents who live in the project area. However, the project area is used for hiking, hunting, and camping. Traditional cultural usages such as gathering of plants for medicines and hula continue. Management actions aim to maintain, and in some cases either improve or increase, the cultural use of the Watershed Management Area. The addition of environmental education and related activities such as hikes and service volunteer trips will also add to the potential social characteristics. The water resources being protected are also utilized by homes for drinking water. Environmental characteristics will be described in section IV.

The anticipated time frame for all proposed management actions is anticipated to be 20 years, to begin once all regulatory compliance requirements and necessary permits are approved and in-hand.

Funding sources for management actions will consist of government (e.g. federal, state, county) and private funds as well as in-kind donations and contributions such as equipment and labor and volunteer work hours. Funding sources currently in-hand to begin smaller projects include the U.S. Fish and Wildlife Service, U.S. Department of Interior ($165,000), and the State of Hawaiʻi Division of Forestry and Wildlife ($205,700). Existing in-kind contributions have also been provided by members of the partnership.

IV. DESCRIPTION OF AFFECTED ENVIRONMENTS

The following descriptions of affected environments and other resources will address the entire 64,000 acre Watershed Management Area with specific references made to high yield watershed and biodiversity units A-N where applicable.

Hydrological Environment and Water Resources. Kohala Mountain (20º7'N, 156º45'W) is the most northern, smallest, and oldest mountain on Hawai‘i island. Kohala is a shield volcano so its slopes are gentle, with intermittent partly-eroded cinder cones across its surface. The windward (east) side is cut with large, deep, well-eroded valleys with near-vertical walls. Kohala Mountain's elongated northwest to southeast shape was formed by thousands of basaltic lava flows that erupted from two main rift zones and possibly a caldera that may have existed but was later buried by younger lava flows. Magma that did not reach the surface may have cooled within the fissures, forming vertical sheets of low-permeability rock. The northeastern slope of the volcano has experienced a major slope failure that resulted in a collapse of the shoreline 12 miles long and extending one mile inland. Pololū and Waipi‘o valleys formed along these faults. The exposed volcanics of the Watershed Management Area fall into two main classes: Hawi volcanics and Pololū volcanics. Pololū volcanics occur within the windward valley areas affected by the slope failure. They are comprised of tholeiitic, transitional, and alkalic basalts. Hawi volcanics consist of postshield-stage Hawaiite, maugerite, benmoreite, and trachyte. Lava flows originated from numerous vents, marked by cinder cones and lava domes, near the rift zones of the volcano. Kohala's summit region is characterized by cinder cones, lava domes, and abrupt slip faults. Topography throughout the rest of the Watershed Management Area is highly varied and ranges from very steep valley walls and sea cliffs, to shallow valleys and narrow drainage gullies and broad rolling pastures. The lower windward slopes are deeply dissected, and major drainage patterns are well established. The mountain is moderately dissected in the upper reaches and along the upper leeward slopes.

Soils of the mountain are primarily inceptisols and are highly-weathered, silty or sandy clay loams. The Amalu soils series dominates and covers nearly all of the slopes along the windward side, except for the Rough Broken Lands, also in the Amalu series, that comprise the valley walls. The upper western windward slopes are Silty Clay Loams in the Kahuā, Palapalai, and Manahaa series, and leeward soils are Silty Loams in the Palapalai and Maile series.

Most notable of the services provided by Kohala Mountain is the abundance of fresh water. Average annual rainfall on Kohala Mountain ranges from about 30 inches along the leeward section of the Kohala Mountain Road to over 160 inches near the 3,500-ft. elevation 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. 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 montane cloud forests high on the mountain. Known as fog drip, water from clouds is intercepted by vegetation. This is a consistent characteristic of the windward Kohala Mountain slopes above 3,000-ft. Fog drip contributes significantly to both

stream flow and rainfall. Cloud forests also reduce rates of water loss via evaporation and transpiration and maintain high water storage capacity. A functional, multi-layered forest keeps sunlight from reaching the ground and heating up the surface. Ground cover such as leaf litter, moss, ferns, and other plants, and foliar cover also help to create pockets of moist air that reduce the pull of water from the soil surface by the hot, dry daytime air. In addition, soil moisture-holding capacity, measured in inches of available water capacity per inch of soil, is higher in forested areas such as ʻōhiʻa forest. Together, rainfall and fog drip provide close to 200 inches per year across Kohala's broad windward summit region. As such, high yield watershed area units A-D comprise a significant portion of the watershed in which groundwater infiltration is occurring and contain the headwaters for streams such as Ohiahuea and Honokāne. This area of the watershed captures 100-150 inches of rain on average every year, significantly assisted by the existing cloud forest. Portions of units A, B, C and D are part of the Puʻu O ʻUmi Natural Area Reserve and contain several rare montane bogs. In biodiversity unit E, the headwaters for five agriculturally important streams, such as Keawewai stream, are found here. This forested area is also the headwaters for Kohakohau stream, which is a main supplier for municipal and agricultural water in the Waimea area. In total, Kohala's cloud forest encompasses approximately 20,000 acres.

The porous and permeable structure of the mountain geology favors the storage and transport of subsurface water from the mountainous interior parts of the Watershed Management Area to the coastal areas where it is discharged. Fresh groundwater that is not withdrawn from wells and tunnels discharges naturally from the aquifer at subaerial and submarine springs and seeps. Fresh groundwater in Kohala Mountain occurs as either a freshwater-lens system in the dike-free lava flows or as a dike-impounded system. Numerous dikes penetrating through Kohala's basaltic sheets flow form dike complexes that store water at high elevations. The boundary between the dike-impounded system and the freshwater-lens system generally corresponds with the seaward extent of mapped volcanic vents represented by cinder cones and lava domes. Water enters the dike-impounded system mainly by infiltration of some part of rainfall and fog drip. Natural discharges from these stores occur via high-level springs and streams and groundwater flow to the down-gradient freshwater-lens system.

The Watershed Management Area has numerous perennial streams or rivers that flow from summit regions to the ocean. Hawaiʻi's streams are generally short (less than 10 miles in length), with numerous waterfalls giving the streams steep profiles. Stream flow typically tracks rainfall patterns. Many of the streams flow from non-agricultural forested lands to the ocean; others flow through agricultural lands intermittently and during flood events. Some are perennial in the upper reaches and intermittent at lower elevations. Intermittent streams on the leeward side of Kohala Mountain appear to flow less now than they did in the past. Based on anecdotal information obtained through interviews with residents from the region, stream flow may be reduced today from even half a century ago. Some believe that the flow regime is now flashier in nature.

Biological Environment and Resources. The physical characteristics of Kohala have created a diverse range of habitats that include coastal strand, lowland tropical rain forest, montane rain

forest, cloud forest, montane bogs, and mesic (moist) forest – all ecological zones determined primarily by macroclimate. Azonal ecosystems (those dictated by adaptive factors) are represented by windward coastline vegetation, bogs, aquatic ecosystems, and cliff environments. The coastal strand vegetation is characterized by salt-tolerant plants, many of which have indigenous distributions beyond Hawai‘i island. Inland from there up to 2,500-feet is the Lowland Wet Forest (biodiversity units I and K). This forest type occurs only on the windward side of the Watershed Management Area. Above 2,500-ft., the Montane Wet Forest (critical in capturing fog drip and converting to water resources) covers the windward slopes and a Diverse Mesic Forest covers the leeward side above pasture lands. Occurring as open patches within the montane cloud forest are wet bogs, a community 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. Hawai‘i island bogs are characterized primarily by sedges, sphagnum moss, and low-stature ‘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, located adjacent to one another at approximately 3,700-feet in the eastern section of the Pu‘u O ‘Umi Natural Area Reserve. Other unique plant communities from windward Kohala include the *Carex alligata* Montane Wet Grasslands and the Mixed Fern/Shrub Montane Wet Cliffs, where the steep slopes and cliffs are covered by fern and shrub communities. Three distinct types of ‘ōhi‘a-dominated forest cover the majority of the Watershed Management Area: ‘Ōhi‘a-‘Olapa Montane Wet Forest comprises the majority of the ‘ōhi‘a-dominated forests; ‘Ōhi‘a Mixed Shrub Montane Wet Forest usually occupies the best drained areas on the ridge tops; and a broad expanse of ‘Ōhi‘a-Uluhe Montane Wet Forest covers the north slopes, ridgetops, and areas recovering from disturbance. A majority of the Watershed Management Area is identified by the State’s Division of Forestry and Wildlife as having the highest quality native vegetation, according to the vegetation classification under its draft management guidelines.

As a result of the range of native habitats found, Kohala Mountain supports over 155 native known species of vertebrates, crustaceans, mollusks, and plants, some of which can be found no-where else on earth (Appendix D). There is a total of 11 threatened and endangered species, 30 species that are either species of concern or species being considered for listing as either threatened or endangered, and two endemic (found nowhere else in the world) species in the Watershed Management Area. Fungi, liverworts, mosses and lichens further contribute to this biological diversity (or biodiversity). The complexity and diversity of Kohala’s ecosystems are significant in comparison to other volcanoes on the island.

The Watershed Management Area provides a diversity of bird habitats that support over a dozen species of sea birds, four forest birds, two waterbirds, and a hawk. The Hawaiian Goose or Nēnē (*Branta sandvicensis*) is considered the eighth most endangered waterfowl species in the world and is listed as an endangered species by the U.S. Fish and Wildlife Service (USFWS). Nēnē occasionally use Kohala Mountain. The Koloa maoli (or Hawaiian Duck, *Anas wyvilliana*), also an endangered species, inhabits wetlands, ponds (natural and man-made), and streams in the Watershed Management Area. Kohala ponds and streams are probably the most important habitat

for these birds on Hawai‘i island and such areas are identified in the USFWS recovery plan for waterbirds as critical core wetlands for species survival. Another endangered species, the Hawaiian Hawk or ‘Io (*Buteo solitarius*), is widespread on the island of Hawai‘i with its distribution following that of native forest (‘Io prefer large ‘ōhi‘a for nesting). Hawaii’s other endemic raptor is the Hawaiian Owl or Pueo (*Asio flammenus sandwichensis*). Pueo inhabit dry forests and rainforests, but are most often seen hunting in leeward pastures and are active during the day and evening hours. Seabirds such as the threatened ‘A‘o or Newell Shearwater (*Puffinus puffinus newelli*), endangered ‘Ua‘u or Hawaiian Petrel (*Pterodroma phaeopygia sandwichensis*), and the migratory Kolea or Pacific Golden Plover (*Pluvialis fulva*) also occur within the Watershed Management Area. Records of sightings and calls suggest that ‘A‘o colonies exist within the Hāmākua and Kohala forests but that these colonies are very dispersed and probably contain very few individuals. ‘A‘o nest in burrows in steep mountainous terrain between 500 and 2,300-feet elevation, usually in association with uluhe. Because the birds are active at night and nest in dense rain forest on steep slopes, nesting sites are difficult to locate. ‘Ua‘u nest in burrows 3-6+ feet deep in steep mountainous terrain between 500 and 2,300 feet elevation from March through November each year. As with the ‘A‘o, their burrows are used repeatedly as they return from year to year. The forest birds ‘elepaio (*Chasiempis sandwichensis)*, ‘amakihi (*Hemignathus virens*), ‘apapane (*Himatione sanguinea*), and ‘i‘iwi (*Vestiaria coccinea*) are most abundant in closed-canopy forests of ‘ōhi‘a and ‘ōlapa. On Kohala Mountain, the majority of these native birds are found above the 4,000-feet elevation, above the range of mosquitoes which can transmit avian diseases. Biodiversity unit L is particularly noted for having all four species of forest birds as well as the ‘Io and waterbirds such as Koloa maoli.

The endangered Hawaiian hoary bat or ‘Ope‘ape‘a (*Lasiurus cinereus semotus*) is the only extant land mammal native to the Hawaiian archipelago. Bats are frequently seen along the windward Kohala coast, especially between Waipi‘o and Waimanu valleys. Data on the food preferences of the species indicate that ‘ope‘ape‘a consume a broad range of insects, including many beetles. One of the most highly diversified groups of animals in Hawai‘i are the native land snails. In 1992, researchers found *Partulina physa*, previously not recorded since 1946, on forested leeward slopes on Kohala Mountain (biodiversity units G and H). Other snails observed within the Watershed Management Area include succinids and minute tornatellinids. Hawaii’s native terrestrial arthropods are most noted for their large number of unknown species and extremely high rate of endemism (99%). Generally, Hawaii’s native arthropod fauna includes insects, arachnids, crustaceans, and myripods. Kohala’s native arthropod fauna is particularly rich and supports many rare species such as the endangered Blackburn’s Sphinx moth (*Manduca Blackburni*) and the endangered *Drosophila ochrobasis*. For the Blackburn’s Sphinx moth, the USFWS has identified areas in Kohala as potential recovery management units for the species.

Kohala streams also support a unique and diverse fauna. Dozens of freshwater streams entering the ocean along the windward coastline support a relatively intact and diverse native stream fauna, including native aquatic insects, fishes, crustaceans, and mollusks. The fishes consist of two closely related families, *Gobiidae* and *Eleotridae*, usually referred to as *o‘opu* or gobies. The native crustaceans include the ‘opae kuahiwi or mountain opae (*Atyoida bisulcata)* and opae

ʻoehaʻa **(***Macrobrachium grandimanus).* There are three endemic species of river *opihi* (limpets), the most common of which is the hihiwai (*Neritina granosa*).

In addition to native wildlife, the Watershed Management Area is also home to several unique native plant species and over three dozen federally-listed plant species. These rare plants vary in habitat from dry to wet, windward coastal sea cliffs to the montane bogs of the summit region, over to the remnant dry forest still extant in the pastures and gulches of leeward Kohala. One of Kohala's most conspicuous rare plants (due to its large flowers) is the *Trematalobelia grandiflora*. It occurs in wet, windswept cliffs and in wet forests and low, boggy wet forests on Kohala Mountain. Other notable rare plants from Kohala include the stately loulu fan palm, *Pritchardia lanigera* (biodiversity unit J), and another endangered Lobeliad ōhāwai, *Clermontia drepanomorpha*, both of which occur only on Kohala Mountain. Biodiversity unit F is also the only place on Hawaiʻi island that *Trematolobelia macrostachys* (koliʻi) is known to inhabit. This unit also houses one of two native orchids found on the island, *Liparis hawaiensis*. Biodiversity units G and K include the rare native gardenia, *Gardenia remyi*. All of the five *Clermontia* species can be found in biodiversity unit L.

The native species and habitats described above identify the current known species and distributions. However, new species and new island records for species are always being discovered in Kohala, particularly along the sea cliffs, and will continue to be catalogued and assessed as management actions move forward.

Historical, Archaeological, and Cultural Environments and Resources. The following steps have been taken to determine the cultural, historical, and archaeological 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, which included a review of cultural, historical and archaeological activities in the project area(see Appendix F); (3) discussions with landowners with longstanding ties to the project area; (4) information gathered during a series of public meetings about the proposed projects of the Kohala Watershed Partnership (Appendix C). A summary of the information found is presented below.

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on, and around them, in the context of genealogical accounts. All forms of the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shore line and ocean depths are believed to be embodiments of Hawaiian gods and deities. The landscape itself is a highly valued cultural property and considered sacred.

In 2004, a cultural study of the Puʻu O ʻUmi Natural Area Reserve and Kohala-Hāmākua Mountains Lands, Districts of Kohala and Hāmākua was completed by Kumu Pono Associates LLC (Appendix F). This study looked at the cultural, historical, and archaeological resources of the area. The historical-archival research conducted for this study was performed in a manner

consistent with Federal and State laws and guidelines for such studies. Among the pertinent laws and guidelines are the National Historic Preservation Act (NHPA) of 1966, as amended in 1992 (36 CFR Part 800); the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai'i State Historic Preservation Statue (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of on-going cultural significance; the criteria, standards, and guidelines of the Department of Land and Natural ResourcesState Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites and practices, Title 13 Sub-Title 13:275-284 (October 21, 2002); and the November 1997 guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (which also facilitate the standardized approach to compliance with Act 50 amending HRS Chapter 343; April 26, 2000).

While conducting the research, primary references included, but were not limited to, land use records, including an extensive review of Hawaiian Land Commission Award (L.C.A.) records from the *Māhele 'Āina* (Land Division) of 1848; Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawai'i; and historical texts authored or compiled by D. Malo (1951); J.P. I'i (1959); S. M. Kamakau (1961, 1964, 1976, and 1991); Wm. Ellis (1963); Chas. Wilkes (1845); A. Fornander (1916-1919 and 1996); G. Bowser (1880); Handy and Handy with Pukui (1972); M. Kelly (1974); and Clark and Kirch (1983). The study also includes several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English by Kumu Pono Associates LLC), and historical records authored by nineteenth century visitors, and residents of the region. The records also include important oral testimonies of elder *kama'āina* of the lands which make up and surround the Pu'u O 'Umi NAR. Historical and archival resources were located in the collections of the Hawai'i State Archives, Land Management Division, Survey Division, Natural Area Reserves office, Bureau of Conveyances; the Bishop Museum Archives; Hawaiian Historical Society; University of Hawai'i-Hilo Mo'okini Library; private family collections; the Parker Ranch and Paniolo Preservation Society (PPS) collections; and in the collection of Kumu Pono Associates LLC.

The study identified the rich native Hawaiian heritage and culture that can be found in the Kohala area, particularly as it relates to the native habitats and species currently found in the Watershed Management Area and their relationship to native Hawaiian deities and world view. Native Hawaiian peoples were the first to be documented as land stewards and resource users of the Kohala-Hāmākua mountain lands for agriculture and subsistence living and inhabited most of the windward valleys of Kohala Mountain. 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, which were primarily used for specialized resource procurement activities as well as certain types of agriculture. As such, the area is the birthplace for many mele and oli. As an example, in association with lands which are now included in the Watershed Management Area, the goddess Hina-ulu-'ōhi'a (Hina, goddess whose form is in the groves of 'ōhi'a) and Pō-kāhi (the darkened place), a god of the mountain mists (the tradition of

Lau-ka-ʻieʻie) are deified parts of the landscape. Both the ʻapapane and ʻiʻiwi, along with the now extinct ʻōʻū and ʻōʻō, have been historically documented and linked in Kohala with native Hawaiian use. The oʻopu or goby fish is featured in a native Hawaiian story of the testing of two brothers where in a contest, one of the required items to gather was an ʻoʻopu ʻai lehua (lehua blossom eating goby fish) known from Hiʻilawe in Waipiʻo.

The traditional system of land and water tenure and management centered on the *ahupuaʻa*, where each chief acted as a steward of the land and granted the *makaainana* (general populace) living in the *ahupuaʻa* use of the land's bounty for their livelihood. Examples of traditional and customary practices include wetland agriculture, particularly kalo(taro), which occurred in the valley streams and terraced agriculture on the lower windward slopes, and leeward Kohala areas which produced dryland foods, such as sweet potatoes and dryland kalo. Food animals, such as pigs, were kept within villages and not allowed to escape into the forest. In the forests, native Hawaiians would gather building materials and fuel, sources of cordage, adornment for display of rank, water, collect birds, herbs and medicines, and craft materials.

As these examples illustrate, in the traditional context, 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, is also mandated by native custom and State and Federal Laws. Today, native Hawaiians continue these traditional and customary practices. Native plant materials are gathered (medicinal plants like mamaki, plants used in tattoo and as dyes, plants for the hula halau, including ʻieʻie, ʻōhia lehua, maile, pili grass and ʻōhelo). Other traditional Hawaiian cultural practices continue today within the watershed, including the cultivation of kalo, noni, ki, ʻawa, and kukui, as well as the harvesting of wood and stone for traditional implements, weapons and games, and the gathering of freshwater fish, ʻopae and edible ferns.

Some local hunters also consider the feral pig or puaʻa, to be a cultural resource. The tradition of hunting wild pigs in the forest has been passed down for many generations in some families. Additionally, these wild animals regularly provide meat to relatives and neighbors, and are sometimes used in Native Hawaiian rituals.

Few archaeological investigations have been conducted in the uplands of Kohala due to its remoteness (and therefore lack of development) and the long-time practice of ranching and grazing, activities that do not usually involve intensive archaeological study. However, there is documented the Kohala Field System, an archaeological site extending approximately 60 sq km along the gently sloping uplands of the Kohala Mountain. This area was converted to fixed field dry land farming by Hawaiians prior to the European discovery of the archipelago and sweet potato was likely the main cultivar. They include extensive stone walls and a few woodland temples. No management actions are planned for these areas. Some traditional trails that traversed the forested mountain were once landmarked by significant natural features like cliffs,

large stones or palms, but most of these trails are not well-documented and now rarely used. No other archaeological resources are known from the project area.

Historical features include the ditches (Kohala, Kehena, Hamakua), tunnels, flumes and irrigation systems, some built in the early 1900s, that delivered water to farmers, ranching operations, and sugar plantations in the Kohala region. Due to the earthquake which occurred in October 2006, some of these features and their related access routes have been damaged and assessments are still underway with regard to structural integrity. Storied ranching operations such as Parker Ranch are also historical features of the Watershed Management Area.

Other Environments and Resources.

Currently, there are few residents who live full-time within the Watershed Management Area. However, there are communities that surround the remote watershed area. The town of Waimea is the largest neighboring community, with a population of over 7,000 residents. Kapa‘au and Hawi in North Kohala have populations of 1,159 and 938 respectively. To the east, in the district of Hāmākua, Honoka‘a is the largest community with a population of over 2,200 residents. Neighboring Kukuihaele has a population of 317 residents. While located at a greater distance from the watershed area, Paauilo, population 571, is included in this description because of its reliance on water from Kohala Mountain.

The history of cattle ranching on the slopes of Kohala Mountain extends back over 150 years. Today, substantial portions of the Watershed Management Area are actively used as rangeland. Ranching operations such as Parker Ranch, Kahuā Ranch, and Ponoholo Ranch continue Kohala’s modern paniolo culture and add to the history, economy, and lifestyle of the region.

Marked and unmarked trails traverse the Watershed Management Area. Not all trails on Kohala Mountain are open to the public; in fact, many occur on private land or require crossing over private property for access and are accessible only by permission of the landowner. There are two public trails under the State’s Na Ala Hele Program, the Muliwai and Pololū trails along the coast. The Muliwai Trail links the remote Waimanu Valley with Waipi‘o Valley. This nine mile trail on the high plateau between the two valleys crosses numerous gulches and descends steeply into Waimanu Valley. Due to the 2006 October earthquake, some trail sections leading to the back of Waimanu Valley currently remain closed due to persistent danger of landslides and falling rocks from above. Camping is allowed in Waimanu Valley with a permit from the State’s Division of Forestry and Wildlife. The 0.25 mile Pololū Trail descends in switchbacks down into Pololū Valley. In the recent past, a frequently used hiking trail was the trail from the end of White Road in Waimea to overlook the back of Waipi‘o Valley. However, the use of this trail meant hunters and hikers had to illegally trespass across leased Department of Hawaiian Home Lands property to access the trail, and the Department is now prosecuting trespassers to assist in the safety and security of its lessee. Hunters also enter the Kohala Forest Reserve above the reservoirs in Waimea, normally traversing Parker Ranch lands, which requires permission.

Many of the trails in the Watershed Management Area were established in order to maintain the ditch systems and other water diversions, and to access stream gauging stations within the watershed. Trails that were originally built to service these irrigation ditches remain to this day the only access routes to many parts of the mountain. These trails are remote, irregularly maintained, and most originate on or traverse private or leased land. These trails include the Kohala Ditch Trail from Pololū Valley along the windward valleys and slopes to Waikaloa Stream, the Hāmākua Ditch Trail from Pu‘u Kapu to the intake at Kawaiki Stream, and the Kehena Ditch Trail mauka of Honokāne Valley. Additionally, a small section of the Ala Kai or King's Trail has been restored along the ocean at Laupāhoehoe Nui. Other trails are used by government personnel and researchers to access survey lines or monitoring sites, conduct biological and hydrological surveys, and perform weed control.

Trails within the Watershed Management Area often intersect or lead to hunting areas (state and private lands). The State Division of Forestry and Wildlife records show that there was an average of 114 hunter trips into the Kohala Forest Reserve between 2000 and 2004 (average 29 trips per year). In that time, the average reported harvest of pigs was 53 animals per year for all areas combined. Seasonal game bird hunting is also a popular recreational activity. Both types of hunting (feral ungulates and game birds) occur within State and private and leased ranchlands included in the Watershed Management Area. It is accepted by both land managers and local hunters that these statistics do not accurately reflect the actual harvest of pigs on Kohala Mountain for a number of reasons. Most hunters agree that pigs are widely distributed in the forest and that hunting success is higher than these data reflect.

There are three public hunting areas on Kohala Mountain managed by DOFAW, Units B (16,460 acres), D (4,770 acres) and K (10,530 acres). All units allow pig hunting with dogs and a variety of weapons, but Unit D is restricted to weekends and holidays only, whereas Units B and K have daily hunting access. The maximum harvest each day is two animals per hunter. Access to these hunting areas is for individuals that hold a current Hawaii Hunting License. According to these and other game management information collected by DOFAW, the proposed fencing areas identified in the Watershed Management Area will reduce available pig hunting areas from 32,000 acres to 26,000 acres. However, these areas proposed for fencing have very low to no use by hunters due to the remoteness of the areas and the extremely rugged terrain.

Unlocked access points for public hunting include the aforementioned Na Ala Hele Trails, as well as a 4WD access point off of Kohala Mountain Road next to Waiakamali Stream at the Koaia Tree Sanctuary. This gated access leads to a 2-mile ranch road which ends at a gate into the Pu‘u O Umi Natural Area Reserve. Other gates and roads on private land that are regularly used by hunters require the permission of the landowner for access.

There are little infrastructure and few facilities within the Kohala Mountain watershed. There are eight camping sites, with composting toilets, in Waimanu Valley. There is vehicular access across some State lands to the edge of the Forest Reserve, from which hunters and hikers must continue on foot. Private ranch roads lead to the Forest Reserve at several locations, and access through

these private lands requires landowner permission. Much of the perimeter of the Forest Reserve on the leeward side of the mountain has been fenced to exclude neighboring cattle. The County Department of Water Supply maintains a road above the Waimea reservoirs to its intake on Kohakohau Stream.

Three and three-quarter miles of fences have been built, encompassing approximately 140 acres, to protect sensitive natural bog habitat within the Pu‘u O ‘Umi NAR; these exclosures comprise less than one percent of the total acreage of the Watershed Management Area. Helicopter landing zones have been constructed throughout the watershed to improve access into remote areas for management, personnel safety, and search-and-rescue missions. A management shelter (Mauga Cabin) has been constructed to facilitate DOFAW’s overnight management work trips. Other public and private cabins and landing zones also exist within the Watershed Management Area.

V. SUMMARY OF MAJOR IMPACTS AND MITIGATION MEASURES

The management actions of fencing, feral animal removal, invasive species control, outplanting and restoration, monitoring and surveys, research, and infrastructure support and maintenance are all aimed at conserving and perpetuating Kohala's watershed and its multiple ecosystem functions of providing surface water and aquifer recharge, native habitats and species, culture, recreation, economics, and climatic benefits. The management actions outlined will have impacts that are both short and long-term for the environment and the surrounding community. Since the goal of management actions is to conserve and enhance the existing watershed and its related services for current and future generations, impacts are beneficial for the long-term.

Environmental Impacts

Native animal species: Noise associated with the construction of fencing may temporarily disrupt the activities of native birds within the project area. However, based on observations during fence construction in other native forests, the impact of construction noise on native birds is expected to be minimal and temporary. The final fence alignment will be selected to avoid large trees; thus, no impact to nesting habitat is anticipated. Long-term benefits of the management actions are anticipated to include the improvement of areas to serve as native forest bird habitat, thereby offsetting any potential temporary disturbance experienced.

The use of barbed wire raises the possibility that the ʻōpeʻapeʻa (Hawaiian hoary bat) or seabirds could fly into the fencing and become entangled, leading to injury or possibly death. However, in order to prevent bats or seabirds getting caught on the fence, barbs will only be used along the top of the fenceline in areas bordering cattle pasture, and flagging or tape at the top may be used as visual aids for avian and bat fauna. The anticipated benefits of the project should outweigh the small chance of any negative interaction with bats or seabirds. Maintenance of the fence line will include monitoring for the presence of potential bat and seabird interactions. If it appears that bats or seabirds are being injured through contact with the fence, mitigation measures will be developed and implemented.

With regard to actions for invasive weed management, for the use of chemical controls, precautions will be taken to avoid impacts to sensitive species/habitats. Generalist herbicides will be used sparingly in areas with a high occurrence of endangered species or sensitive and rare ecotypes. Use of rodenticides and other toxic baits to control rats and mice could potentially poison non-target animals. However, careful testing of toxic baits will be conducted before and after use, and should any native species be significantly adversely affected, use will be reassessed and likely discontinued. Use of toxic baits will be done in accordance with the toxicant registration. Any release of biocontrol agents will be done in accordance with Federal and State requirements to insure no negative impacts to native species will knowingly occur.

Kohala has the potential to serve as relocation and recovery areas for species that were once found there according to fossil records. An example is the endangered Laysan duck (*Anas laysanensis*), which is now only found in the Northwestern Hawaiian Islands but was once

widespread in Kohala. For the Blackburn's Sphinx moth, the USFWS has identified areas in Kohala as potential recovery management units for the species. By addressing many of the threats such as feral ungulates, rats, and invasive aquatic species, that would make such recovery impossible, proposed management actions would create secure native habitats needed for the survival of rare or threatened and endangered species. As such, overall impacts to native animal species are anticipated to be positive.

For any biological resources (e.g. rare, threatened, endangered species/habitats) that may be discovered during any of the proposed management actions, all work will cease and the appropriate agencies and organizations contacted for appropriate consultation and procedures.

Native vegetation and habitats: Construction of fencing, boardwalk, or new trails should result in minimal disturbance to vegetation within a limited construction corridor as a result of the clearing needed to remove potential hazards to crew and to facilitate construction. Common plant species would be pruned or removed along the corridor only when necessary. Removal of native plants greater than six inches in diameter will be avoided. If areas of sensitive botanical resources, large trees, or streams are identified, fence alignments would be adjusted to avoid or mitigate impacts to such areas. Based on fencing as well as boardwalk initiatives in similar native forested areas on Maui, Oʻahu, Molokaʻi, and other parts of Hawaiʻi island, impact to vegetation would be short-term with regrowth of cleared vegetation for fence construction occurring subsequent to the completion of the fence. However, ongoing inspection and maintenance (particularly of fences) would require that immediate corridors be kept cleared of vegetation to maintain integrity of structure(s). Particularly after storms or heavy rains, feral ungulate barriers that may have been used in stream areas (e.g. breakaway panels, metal grates, durable fabric curtains, etc.) will be checked to insure their integrity, and also cleared of accumulated debris to insure stream flow continues and is not blocked. Where possible, the fence, boardwalk, and trails will be aligned so that it passes through open or sparsely vegetated areas with removal of common native species done only when necessary.

Overall, by addressing threats such as feral ungulates and invasive species, the native habitat and survival of rare or threatened and endangered species will be enhanced by proposed management actions. In particular, bird, snail, aquatic, and plant species will benefit greatly by keeping intact or restoring native habitats for species survival. For sensitive habitats such as those of the Puʻu O ʻUmi Natural Area Reserve (NAR), impacts of management actions would serve to conserve and enhance these areas. For example, in biodiversity unit I, this 20 acre area will protect one of the last remaining lowland wet forest stands in the NAR. In biodiversity unit L, proposed management actions will provide continued habitat for all of the five *Clermontia* species known from Kohala Mountain. Biodiversity unit F is also the only place on Hawaiʻi island that *Trematolobelia macrostachys* (koliʻi) is known to inhabit.

Soil and Water: Much of the water of the Kohala watershed is captured and delivered for domestic and agricultural uses in Waimea, Hāmākua, and North Kohala. The forests in the watershed also acts as a filter to clean and to cycle organic matter and nutrients through the

vegetation, soils, and streams, and helps deliver a consistent and dependable source of artesian and surface water, as well as mitigating flood damage downstream. In addition to communities and households, Kahuā, Ponoholo, and Parker ranches, as well as many smaller ranchers and farmers, rely heavily on the water resources provided by Kohala for their operations. The farmers of Waipiʻo valley depend upon reliable, clean, abundant water in streams to cultivate their kalo (taro). In addition, there is a growing demand for domestic water within all of the municipalities surrounding Kohala Mountain. Society's demand for water is expected to grow as the North and South Kohala and Hāmākua districts continue to expand over the coming decades. The impact of proposed management actions would conserve and enhance the water resources available for existing communities and commercial industries as well as help to ensure that future needs could be met as communities grow. Management actions will also allow managers to assess water resources, overall health of the watershed, and effectiveness of management actions.

The conservation and preservation of the forests of Kohala will also help to mitigate soil erosion and sediment run-off into coastal areas. The forest acts as a soil anchor when plants such as ferns and forbs hold surface organic matter that is used as nutrients, and deep-rooted woody plants hold deeper layers of soil and bedrock. The multi-layered canopy of the Kohala forests also shelter the ground surface from the frequent heavy rains that might otherwise wash away its organic matter and mineral soils, thereby protecting nearshore waters from sediments transported by streams. The existence of the forest may also assist with lessening the impact of flooding. While flooding is a natural process that has occurred throughout time, it has been exacerbated in modern history by human habitation and development. Floods can close roads, damage major water supply lines, destroy property, and disrupt businesses. By providing dense ground cover, forests can serve to slow down water as it flows from the mountains thereby helping to decrease the impact of floods.

In many cases, existing trails are not maintained and have resulted in disturbance to the soil and ground cover. The installation of board walks and better footing will decrease the impact of trail use through sensitive habitats. Fence and boardwalk construction as well as new trail development may contribute to erosion or runoff, however, these impacts are anticipated to be short-term and no changes in normal rainwater runoff or percolation expected. To minimize the possibility of this occurrence, the Division of Forestry and Wildlife's Best Management Practices (BMPs) for Maintaining Water Quality in Hawaiʻi (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, herbicides approved for use near water bodies will be used and application methods and equipment that minimize impacts will be selected. Pesticide usage will be in full compliance with State and Federal regulations with staff trained on its safe preparation and application thereby minimizing impact of potential soil contamination. For some mechanical

techniques, ground disturbance may occur. In order to prevent replacement of one alien species by another after an eradication effort, sequenced replacement with species of choice in the removed gap areas will be done or staggered weed removal will be used. This method requires follow-up maintenance.

Alien species: The disturbance to the ground surface and vegetation involved with building a fence may create conditions suitable for the establishment of alien plants and animals. Construction equipment, materials, and personnel may provide opportunities for the accidental introduction of nonnative plants and animals (either new species or existing species in new areas). The following practices will be implemented to minimize the introduction of alien plants and animals and to reduce the possibility of establishment: First, boots, equipment and materials will be inspected for such items such as seeds, eggs, larvae, etc., prior to delivery and/or entry into the project area, and cleaned as necessary; any vehicles used during construction will be inspected and cleaned as needed, following appropriate alien species prevention protocol; and all workers will be instructed on specific procedures to prevent the spread or introduction of alien plants and animals in the project area. In addition, follow-up monitoring for alien species along the fence and boardwalk post-construction and other projects will also occur.

The use of biological controls to control alien invasive species in the Kohala Mountain watershed will only be conducted under strict accordance with state and federal protocols for biological control agents, including extensive research in a laboratory setting to determine effects to non-target native and agricultural species, as well as rigorous feeding trials in quarantine and controlled field settings in both the target pest's home range and in Hawaii. In addition to this research, a separate environmental assessment will precede the release of any biological control agent into natural areas in Hawaii. Sites of release of biological control agents will be rigorously monitored for adverse affects to native forests as well as agricultural crops.

Air pollution: Use of helicopters for transportation of materials and staff may affect air quality. However, given the short duration of and temporary use of such flights, it is anticipated that this will not contribute significantly to air pollution.

Climate: The forests of the Kohala Mountain watershed support an abundance of dense and multi-storied canopy of woody plants that serve to store carbon. Sphagnum and peat environments that are common within forest and bog communities of the watershed represent a relatively high proportion of world carbon stores. Management actions to conserve such areas may provide communities and commercial industries with carbon credits for future consideration, and may mitigate the effects of climate change.

Social Impacts

Periodic noise from helicopter flights, power tools, and other activity associated with fence and boardwalk building as well as flying in staff for maintenance, surveys, and research will be unavoidable during implementation of management actions. However, given the remoteness of this area and the fact that it is not immediately adjacent to any communities, it is anticipated that

such noise levels would be negligible. In addition, all activities will be done during daylight hours and for short durations, thereby further mitigating potential noise disturbance.

By keeping forests and species intact and thriving, existing uses of the watershed for recreation (e.g. hiking, hunting, camping) and education will continue if proposed management actions are implemented. Management actions aim to maintain, and in some cases either improve or increase such social uses of the Watershed Management Area. For example, by maintaining current access trails and creating new access trails for hunting and hiking, improved facilities, and signage, potential negative impacts such as people getting lost, accidental introduction of alien species, soil erosion, loss of subsistence hunting areas, or disturbance to sensitive areas will be minimized and new opportunities created for more appropriate use areas. Some fences may also have one-way doors to allow feral pigs to move out of management units into other areas for hunting purposes. In addition, pooling or congregating of animals along fences will be minimized because staff will be regularly monitoring fences and implement appropriate measures when needed. In addition, cross-overs or pedestrian gates will also be installed at trails and access points along the fence to allow for people to move across the fence line. This will facilitate access for hikers, hunters, gatherers, researchers, and others who are using the area with approved permits and landowner permission. Finally, development of new access trails will mitigate for the decrease in hunting acreage by making other hunting areas more accessible.

The addition of environmental education and related activities such as hikes and service volunteer trips will also add to the positive social impacts by providing opportunities to educate adults and children about the unique ecosystems and biodiversity of Kohala Mountain. The Watershed Management Area also offers numerous potential sites for scientific research and for field trips to reinforce classroom curricula. The boardwalk, improved trail management, and signage will enhance such experiences. As a result, overall social impacts of this project are expected to be positive.

Economic Impacts

Many local families use feral pig meat as an important source of food. The decrease in public hunting acreage from 32,000 acres to 26,000 acres is not expected to impact this food resource, because the population of feral pigs in accessible and well-used hunting areas is not limited by the current rate of hunting. Additionally, the public hunting grounds that are planned for fencing and animal control are some of the most remote and least visited areas on Kohala Mountain.

The proposed action involves the expenditures of funds necessary to construct the fencing and boardwalk, including the purchase of materials, the hiring or contracting of crews, and the purchase or rental of equipment including helicopters, removal of animals, and to restore the project area using weed control, outplanting, and fire management. Research related to management actions will also be conducted. Already, estimated total cost for one proposed conservation project related to fencing and feral ungulate removal is close to $300,000. The Kohala Watershed Partnership is already partnering with other non-profits, including The Kohala Center as a fiscal agent, to carry out this as well as future management projects.

In addition, the economic characteristics of the management actions have the potential to affect any commercial activities that rely on the collection and distribution of water to conduct business in the surrounding towns (e.g. Waimea, Kapa‘au, Honoka‘a). Examples include hotels, farms, ranches, restaurants, County Department of Water Supply, and others. As such, the protection of these areas via the proposed management actions will be critical to ensure these economic activities continue. Tourists also enjoy these natural areas, and the continued health of the watershed could have a positive economic impact on the tourism industry as well as related businesses such as hotels and restaurants.

As such, economic impacts are neutral or positive and 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 and boardwalk building as well as conservation workers and researchers and students from local universities and colleges.

Impacts to Archaeological and Historical Sites or Cultural Resources
In general, the proposed management actions pose no negative impacts to either archaeological or historical resources in the project area as no management actions are being proposed for work at known sites. Eradication or reduction of feral ungulate populations will benefit archaeological sites as these animals have been known to trample or topple artifacts.

Cultural practices in this area (such as gathering), may be impacted by making certain areas inaccessible during periods of fence and boardwalk construction. Efforts will be made to accommodate the continuation of cultural practices during fence construction so as to provide the least disruption.

As stated under Economic Impacts above, the removal of 6,600 acres of remote hunting lands from the public hunting acreage is not expected to affect the availability of pig hunting opportunities, nor the availability of wild meat for local families, nor ceremonial pua‘a for Native Hawaiian ritual purposes. At current hunting rates and barring major ecological changes, the supply of feral pigs from public hunting areas is expected to provide a sustainable, social and economic resource well into the future.

Overall, 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 by insuring that plants used in such collecting retain robust, abundant populations. In addition, overall conservation of native habitats and species will also aid in preserving the rich native Hawaiian history and spiritual connection to the forest, as places linked with oli and stories are preserved. Fencing will incorporate pedestrian gates as well as step-overs at appropriate locations so access by people is not blocked (only animal movement), and maintenance of access trails will be implemented. Therefore, it is anticipated that proposed management actions will have long-term benefits for the perpetuation of native traditions and cultural practices.

While archaeological, historical, or cultural sites are not anticipated to be affected by the proposed actions, should evidence of any such sites be encountered during implementation of management actions (e.g. fence and boardwalk construction, etc.), activities would cease immediately and the appropriate parties would be consulted to determine procedures.

VI. ALTERNATIVES CONSIDERED

Two alternatives have been considered and identified:

Alternative One: Implement identified management actions over the anticipated 20 years for the conservation of the watershed (preferred alternative).
Fencing and animal removal will protect core areas of the forested watershed from feral ungulates; invasive weed control will limit the habitat-modifying affects of these plants to keep forests intact and functioning; establishment of a water resource monitoring system will allow for corrective management to ensure water supply and quality are maintained; trail/recreation use management and signage will mitigate negative impacts to the watershed and sensitive habitats as well as species through education and providing alternative recreation areas; development of a boardwalk will provide scientific and educational opportunities for better natural resource management; and stream management will help to keep these areas healthy and native species thriving. By addressing these identified threats and impacts, the proposed actions aim to ensure that current values and services provided by Kohala's watershed be maintained, enhanced, and conserved for current and future generations without further degradation.

The preferred alternative optimizes protection of the most critically important areas for water recharge and biodiversity through fencing, animal removal, and invasive species management, with the least impact to (and sometimes enhancement of) recreational opportunities such as hiking and hunting as well as cultural practices such as gathering. Under this preferred alternative, all management actions considered have been focused on minimizing potential impact on the environment, cultural practices, biological, historical, and archaeological resources, and recreation while meeting management objectives. Additionally, the management actions were derived from the draft management plan, which was developed using previous planning initiatives and pre-consultation efforts including discussions and meetings of the Natural Area Working Group, Kona/Kohala Natural Resource Area Workshop, Kohala Forest Management Group, Waimea Water Roundtable, and over 90 interviews with community members, businesses, government agencies, recreational users, cultural practitioners, private landowners, researchers, and others.

Alternative Two: No management action taken.
Given the growing domestic demand on water resources with expanding communities, increase in recreational usage of areas in Kohala, and the growing threat of invasive weed species and other non-native animals and plants impacting the forested watershed, not taking any management action to conserve the existing natural resources of the watershed would severely impact future sustainability of the services provided by Kohala's watershed. If no action is taken, degradation of the watershed and its unique habitats and species will continue and steadily worsen to the detriment of native habitat and species as well as communities and commercial operations reliant on the forested watershed.

VII. ANTICIPATED DETERMINATION AND REASONS SUPPORTING THE ANTICIPATED DETERMINATION

The anticipated determination for the Kohala Mountain Watershed Management Project is a Finding of No Significant Impact (FONSI). The intent of proposed management actions is to protect water resources, conserve native habitats and species, and enhance existing cultural, recreational, and economic uses of Kohala's watershed. This determination was based on analysis of the following significance criteria regarding impact on the environment.

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

Proposed management actions will not involve irrevocable commitment to loss or destruction of any natural or cultural resource. Proposed actions will instead conserve and enhance existing natural resources by fencing portions of the core watershed to protect water resources and native habitats from the threat of feral ungulates and other destructive non-native animals. In addition, invasive weed management actions will also address negative impacts to the natural resources by eradicating or controlling these habitat modifying plants from degrading existing native habitats. Proposed management actions will also be restoring certain areas of the watershed by outplanting rare as well as threatened or endangered plant species. By managing negative impacts of incompatible access through improved trails and signage as well as conserving native habitats and species, cultural resources will be protected so they can continue to be sustainably used and enjoyed.

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

By addressing multiple threats to the environment (watershed) in a comprehensive manner, management actions aim to conserve and enhance overall current uses of the environment by protecting water resources, native habitats and species for education, culture, recreation, and economic uses, climate change, and soil erosion and flooding mitigation. For feral ungulate management (specifically animal removal which would reduce hunting acreage by 19%) and appropriate recreation and trail use, these resources will not be curtailed, but rather enhanced by identifying other more beneficial areas for this use that do not negatively impact the watershed or pose safety concerns (these areas are also remote and very little if any permitted hunting or hiking/camping currently takes place).

In this way, proposed actions do not curtail, but rather keep intact and expand the range of beneficial uses of the environment. In addition, beneficial uses of the environment that have not yet even been identified by science or socio-economic fields will be kept intact and could add to the range of future beneficial uses of the environment.

(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. Management actions also support the purpose of the State land use designation of Conservation District under Chapter 13-5 by "conserving, protecting, and preserving the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare." It is also consistent with Section 4 of the County of Hawai‘i General Plan (2005), which sets goals and policies for maintaining environmental quality. The actions are 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. Conservation of the Kohala forested watershed also implements the Hawai‘i Comprehensive Wildlife Conservation Strategy (2005), the Recovery Plan for the Big Island Plant Cluster (1996), Draft revised recovery plan for Hawaiian waterbirds (1999), and the Draft recovery plan for the Blackburn's Sphinx Moth (*Manduca blackburni*) (2003).

In addition, the proposed management actions support the obligation of the State and its agencies to protect the reasonable exercise of customarily and traditionally exercised rights of Native Hawaiians to the extent feasible, in accordance with *Public Access Shoreline Hawaii versus Hawaii County Planning Commission* and subsequent case law.

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

There will be no substantial negative affects on the economic or social welfare of the community or State. Management actions will be keeping intact or enhancing current economic and social welfare by conserving the watershed so that it can continue to provide the existing benefits of water, native habitats and species, culture, recreation, economic livelihoods, and education.

(5) *Substantially affects public health.*

By continuing to provide high quality water and the climate and air filtering benefits of a healthy forest, public health will continue to benefit from Kohala's watershed. Additionally, in managing for feral pigs (which create wallows where water collects and produces habitats for mosquitoes which can carry the West Nile Virus) and small mammalian predators such as rats (which, like pigs, have been identified as carriers of Leptospirosis and other diseases), public health may be improved through decreasing potential vectors and spread of such diseases. As such, no substantial negative affects to public health are anticipated.

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

The proposed management actions are not anticipated to create substantial secondary impacts such as population changes or effects on public facilities given that there are few full-time residents in the proposed Watershed Management Area or existing extensive public facilities.

(7) *Involves a substantial degradation of environmental quality*.

The goal of the management actions is to keep intact and enhance the existing watershed, its native habitats and species and hydrological elements and features. Therefore, proposed actions will not substantially degrade environmental quality, but rather will conserve and enhance the existing high level of environmental quality found in the area for the long-term.

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

Management actions have been described and identified in a comprehensive manner to reflect all actions identified for the entire 64,000 acre Watershed Management Area during a twenty-year time span. As such, cumulative, rather than individual effects, have been considered throughout this environmental assessment. Since proposed management actions are to conserve and enhance existing conditions and prevent further degradation to Kohala's watershed, negative cumulative effects are not anticipated.

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

Proposed management actions will combat existing threats to rare, threatened, or endangered species and habitats. Fencing, animal removal, surveying and monitoring, better signage and trail management, and invasive weed and non-native animal management are aimed at protecting and propagating these species and habitats. Several of the management actions also support existing plans (e.g. State Comprehensive Wildlife Conservation Strategy, U.S. Fish and Wildlife Service Recovery plans) that are geared for the protection and perpetuation of rare, threatened, or endangered species and their habitats. Therefore, anticipated affects are positive and no substantial negative affects are anticipated.

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

The protection of the native forest and watershed for their air and water quality services are one of the main goals of the proposed management actions. Healthy forests absorb carbon dioxide and provide oxygen as well as filter water and mitigate sedimentation in streams. Therefore, impacts to air and water quality will be positive, not detrimental. Temporary disturbance of ambient noise levels may occur during transportation of materials or staff, however, given that proposed areas for such activity are far from communities, will occur during daylight hours, are for short durations, and few full-time residents reside in these areas, impacts are not anticipated to be detrimental.

(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 purpose of several of the proposed management actions is to protect sensitive areas through fencing, invasive weed control, and recreation management as well as mitigate impacts posed by threats on fresh and coastal waters. As such, management actions are geared toward conserving such sensitive areas and actions are not anticipated to create any damaging affects to areas.

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

Management actions are geared toward conserving the socio-economic value of Kohala's watershed by keeping intact scenic vistas and viewplanes. No buildings or large structures are being proposed. The upper most range of proposed fencing height will only be six feet and its location in remote areas means residents should not be able to see it. Similarly, the boardwalk is proposed in an area where scenic vistas or viewplanes is anticipated not to be affected. Fencing, boardwalk, and signs will be well below the forest canopy.

(13) *Requires substantial energy consumption*.

Energy consumption of the management actions will be derived mainly from vehicle use for management and also the use of helicopters for transporting staff and materials and any hand power tools for fence construction and invasive weed management and other management activities. However, such energy consumption is linked with individual projects that are short-term or temporary in nature. No infrastructure or similar elements that require on-going energy consumption is being proposed. As such, management actions are not anticipated to require substantial energy consumption.

VIII. LIST OF PERMITS REQUIRED FOR PROJECT

Given that a majority of the Watershed Management Area is zoned by the State as Conservation District, a Conservation District Use Permit will be required for these areas and approval secured from the Board of Land and Natural Resources. County permits may also be required as work will entail Special Management Areas. Work related to threatened and/or endangered species will require appropriate permits from the State and Federal agencies.

IX. ENVIRONMENTAL ASSESSMENT PREPARATION INFORMATION

This draft environmental assessment was prepared by:

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X. REFERENCES

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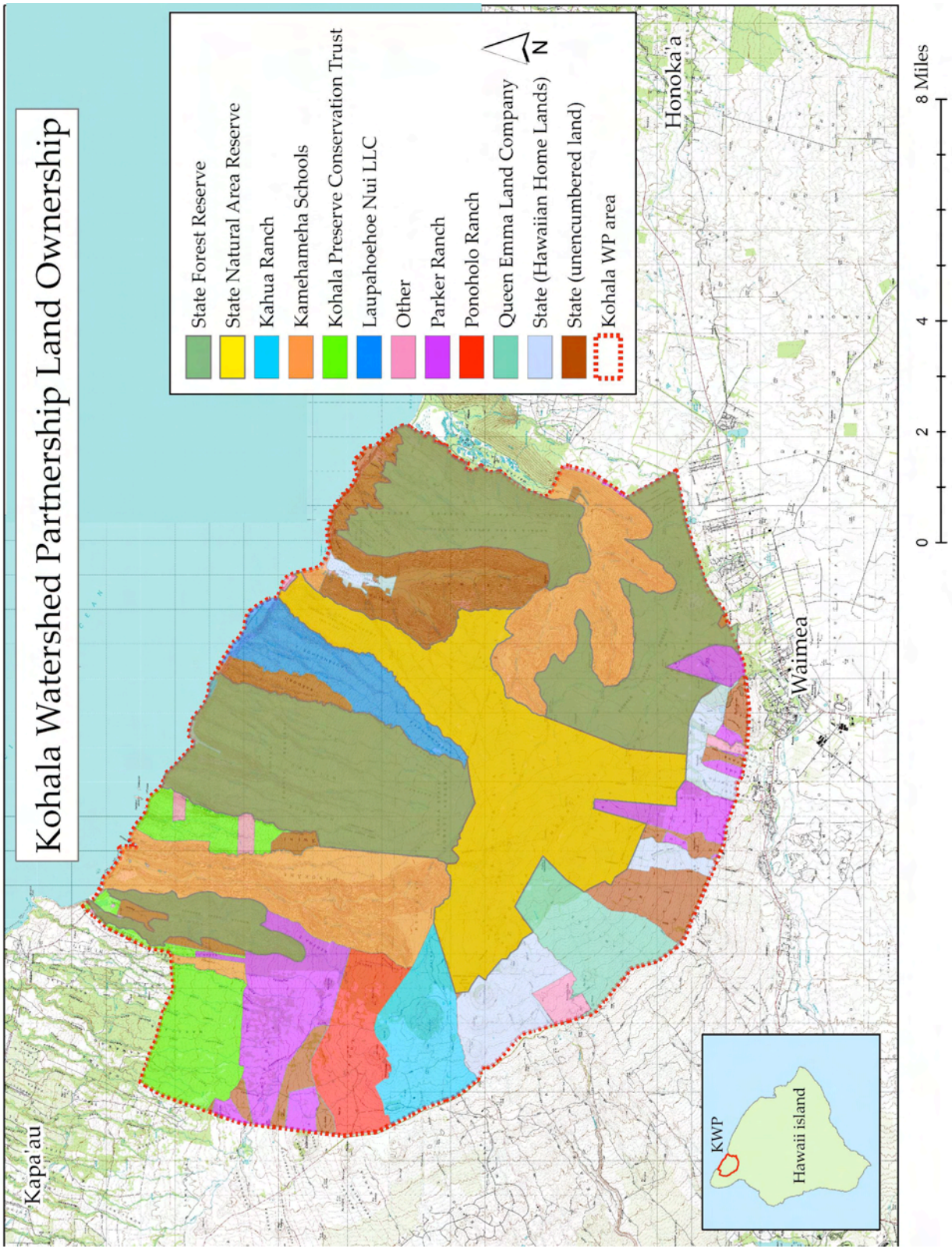
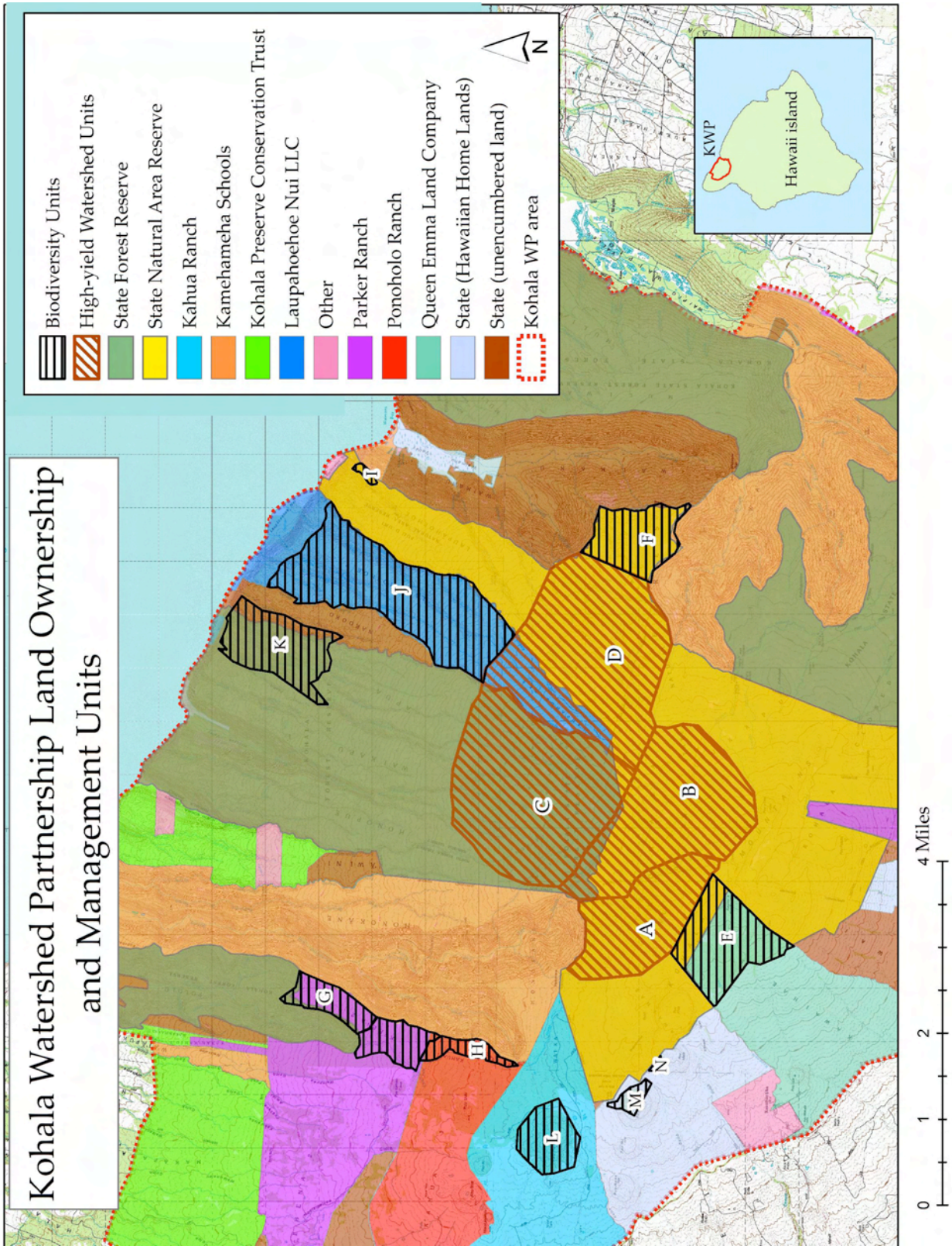
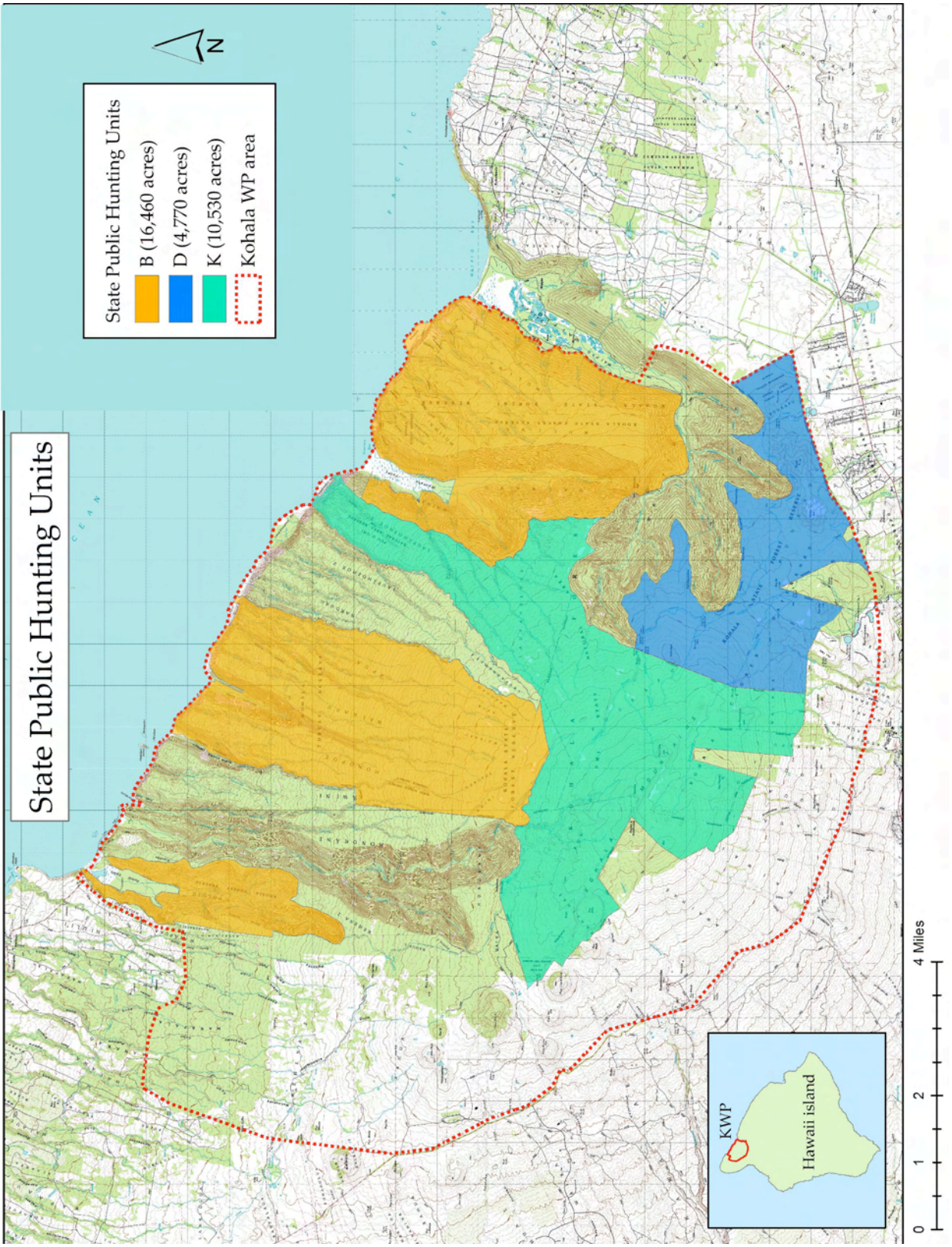
Appendix A: Maps of the project area.
Map 1: Land Ownership and Watershed Management Area.



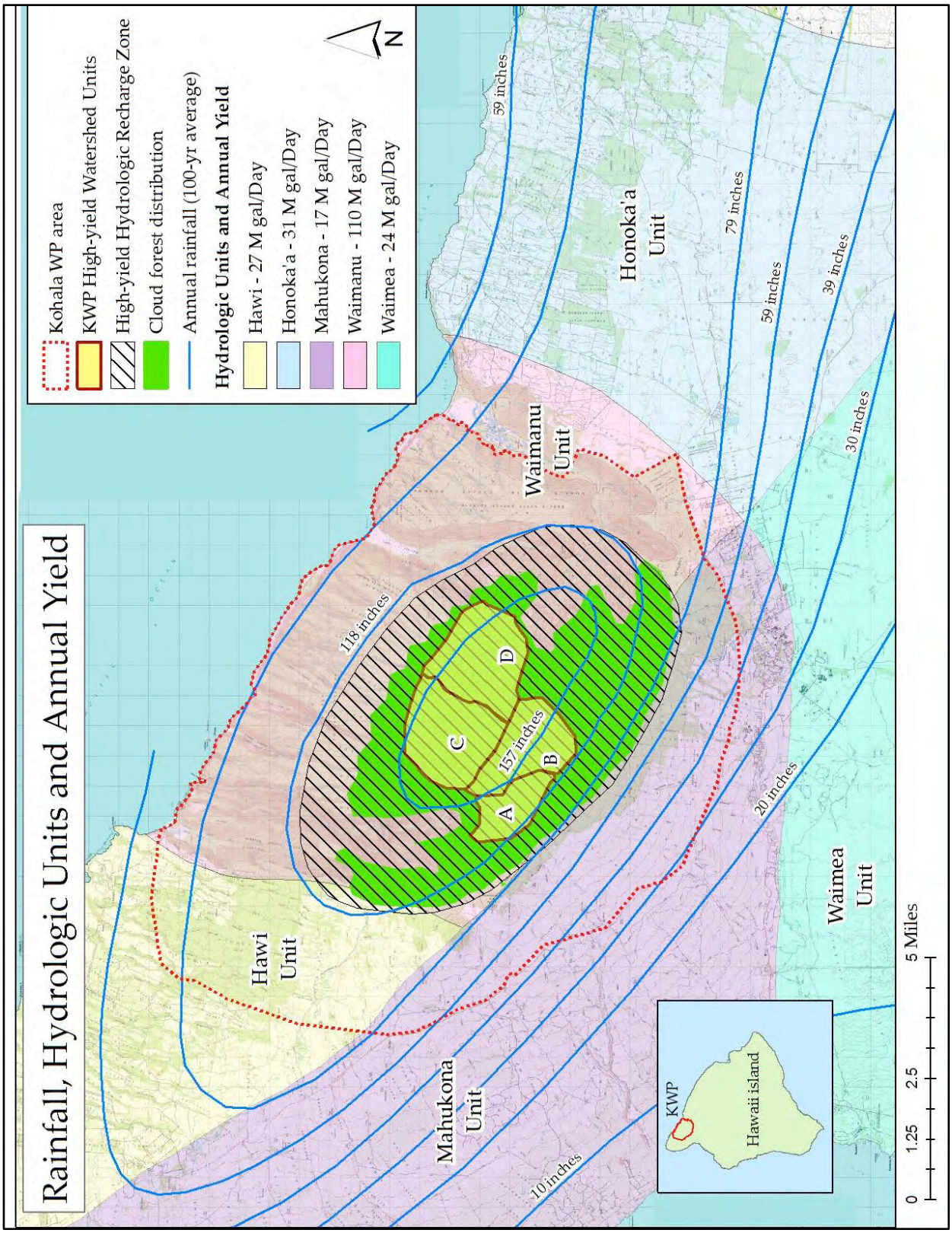
Map 2: KWP Management Units.



Map 3: DOFAW Hunting Units



Map 4: Hydrology of Kohala Mountain



Appendix B: Pre-Consultation/Development of Draft Management Plan and Ongoing/ Future Outreach.

Kohala has had a rich history of discussion and community meetings with respect to the management of the natural resources of the area as well as the watershed. The recommendations that came out of these initiatives were incorporated into the development of the Kohala Watershed Partnership's draft management plan. Additional outreach was also conducted specifically for the purpose of developing the draft management plan. The following is a historical timeline of the pre-consultation initiatives for management in Kohala, the development of KWP's draft management plan, and plans for ongoing/future outreach:

1992-1993 Kona/Kohala Watershed Planning Task Force and Workshop

The task force was convened in 1992 in response to concerns by landowners about the proposed reclassification of agricultural lands in Kona and North Kohala into Conservation District zoning. Its purpose was to plan a series of public informational workshops intended specifically to build the common base of knowledge pertaining to the Kohala and Kona watersheds and natural resources. The task force identified and adopted several statements of agreement.

1995-2002 Kohala Forest Management Group

This community-based planning group of about 15 members was created to address issues specific to Kohala Mountain. The primary goal of the group was to balance the needs of people with the needs of the native ecosystems. Over 40 meetings were held over a seven-year period to identify issues of concern and develop recommendations. Additionally, 30 community members and experts were invited to give testimony at meetings.

1995-2000 Natural Area Working Group

The purpose of this group was to look at how to fairly balance and accommodate a range of interests that were involved with the Natural Area Reserve System and maintaining a healthy forest and social community. The group sought to resolve differences concerning fencing, pig hunting, protection of forests and watersheds, and the management of Hawaii's forest lands and rare, threatened, and endangered species. The group reached consensus on 45 recommendations.

1996 - Waimea Water Roundtable

The purpose of this group is to work toward common solutions of water issues as water flows across many terrains and land ownership boundaries. The group shares knowledge and works cooperatively to achieve mutual goals for Waimea's water resources. The group is advisory and has established a communication link among those in private sector, government, the community, and water users.

2004 Stakeholder and Community Interviews

In addition to researching and incorporating the findings of the various working groups and initiatives from 1993-1996 into the draft management plan, specific interviews were held with stakeholders and community members to develop the draft Kohala Mountain Watershed management plan. Interviews were conducted with landowners, cultural and environmental resource experts, and members of the community. Thirty-one participants were asked seven to nine questions pertaining to the history, natural resource values, threats, and management needs of the Kohala Mountain watershed. Themes that emerged from the interviews included identification of areas of the watershed that needed management, priority threats such as feral cattle and invasive alien plants were identified, the need to balance recreation and protection of the watershed and provide for public safety, and the need to increase general awareness of the watershed's resources within the affected communities to build support and appreciation for the watershed's values and its management. These findings were incorporated into developing the management programs in the draft management plan.

2006 **Draft Management Plan and Environmental Assessment Public Open Houses**

In April of 2006, a series of public open houses were conducted by the Kohala Watershed Partnership to share their draft management plan. The purpose of these open houses was to gain additional input from various communities before moving to finalize the plan and also to gain input for the development of the draft environmental assessment. 40 people attended and provided comments.

2006-7 **Ongoing and Future Outreach Initiatives Planned**

The Kohala Watershed Partnership (KWP) believes that support and involvement by the greater Kohala community is important to insure a healthy watershed. KWP has shown their commitment to this belief by developing a draft management plan that was based on previous initiatives that involved different groups and community members. KWP also proved their commitment by hosting open houses to share their draft management plan and to receive input for developing the environmental assessment. KWP incorporated and addressed many of the comments heard at the open houses into the environmental assessment and is waiting to finalize their management plan until this process was done. The Partnership further showed their commitment to listening to different groups within the community when after the April open houses were conducted, hunters who expressed concerns and comments during the open houses were invited on a field trip to look at the areas being proposed for fencing. Seven hunters expressed interest and two field trips were scheduled. The first trip was canceled due to illness of one of the hunters. The second was canceled because the hunter had already been out with staff previously. Though the trips have not yet occurred due to these scheduling issues, staff are open to conducting the field trip if contacted.

In addition, the Partnership has recently hired a coordinator who has a background in outreach and education, thereby further underscoring the Partnership's commitment to involving the Kohala community as the management plan moves forward. The coordinator has already begun connecting with community groups. She has met with or plans to meet with the Waimea Community Association, Hawaii County Community Planning Steering Committees, Tutu's House (or Friends of the Future), both the Kohala and Waimea Outdoor Circles, the Waipiʻo Community Circle, and public, private and charter schools such as Kanu O Ka ʻĀina and Waimea Middle School. The focus of her meetings are to introduce people to the Kohala Watershed Partnership and to share experiences and information about Kohala Mountain as well as discuss the draft management plan and proposed actions. The coordinator has also started a volunteer program where people have an opportunity to go out into the field on both learning and work trips. She has also implemented nature camps for local children. Outreach materials have been created and distributed to the community, and will continue to be developed. Through these activities, the KWP plans to continue the dialogue started at the April open houses with different groups who use the project area and are interested in its continued management and conservation.

Appendix C:
1. Pre-Consultation for Draft Environmental Assessment and how comments were incorporated.

Specific comments from the April 2006 open houses with regard to what the draft environmental assessment should consider included: fence construction (specifically debris collection after storms, cultural gathering, maintenance, establish need for fences, possible weed vector activity), integration of the plan with other area or island initiatives, clarification on how rare plants will be protected, need for treating the forest with respect, impact of existing trails and continued access (e.g. hunting impacts, cultural gathering), economic impact to community (specifically closing down certain areas to subsistence hunting), preserving the whole system and not keeping out specific components, and valuing multiple ways the watershed is seen by different groups. These comments were addressed in the following manner in the environmental assessment:

Fence construction (specifically debris collection after storms, cultural gathering, maintenance, establish need for fences, possible weed vector activity).

- On pages 12 and 27, debris collection after storms has been addressed. Different technologies for barrier construction where streams are present will be considered, including, but not limited to, breakaway panels. In addition, staff will be checking fences near or across streams after major storms to insure barrier integrity, but also for possible debris accumulation and affects to stream flow. Efforts to avoid the need to cross streams for fencing will be the first consideration when determining the fence line.
- On pages 12-13 and 29, the installment of crossovers along the fence to allow for movement of people into and/or between fenced areas is discussed. This addresses cultural gathering as this movement would include activities for cultural gathering. As stated on page 13, the proposed fencing is designed to limit animal movement, not block access to people. Also continued on page 30, use of proposed fencing areas by cultural practitioners is very minimal and all efforts will be made to accommodate the continuation of cultural practices during fence construction so as to provide the least disruption. Over time, fencing and related management is anticipated to benefit cultural practices by protecting areas with native species, enhancing their populations, and contributing to their long-term existence for use by future generations. On page 33, it also states that the proposed management actions in the environmental assessment as well as the draft management plan support the obligation of the State and its agencies to protect the reasonable exercise of customarily and traditionally exercised rights of Native Hawaiians to the extent feasible, in accordance with *Public Access Shoreline Hawaii versus Hawaii County Planning Commission* and subsequent case law.
- On page 13, fencing maintenance is addressed. It states that fences will be monitored regularly to insure fence integrity so that no broken fence lines, if found, are left unattended and will be fixed.

- On pages 10-12, the need for establishing fences has been clearly outlined. To prevent feral ungulates such as cattle and pigs from impacting core watershed areas, fencing to keep these animals out of high-yield infiltration areas as well as sensitive habitats and high-quality native forests is critical in order to manage such threats. Fencing for these purposes has been used effectively in Hawai‘i in areas such as the State Forest Reserves, State Natural Area Reserves, National Wildlife Refuges, the National Parks, and other Watershed Partnerships. Fencing is the first management action necessary in order to mitigate the primary threats of feral ungulates and also invasive weed species. Current fences which already exist within the project area have proven very effective for threat management (see Appendix E for photo examples of fencing efficacy). Historically in Hawai‘i, fencing as a management action to protect forests and watershed areas was used when the territorial government created the Forest Reserve System as a need in response to the degradation of the forest by feral cattle and other hooved animals (which were causing water consumption issues for ranches and plantations). The first action taken was fencing and then removal of these animals from the Forest Reserve. In fact, 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 its 1904 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 addition, as mentioned in the environmental assessment on page 11, only 10,500 acres out of the entire 64,000 project area (or 16%) has been identified for proposed fencing.
- On page 28, the issue concerning fence construction and prevention of introduction of alien invasive weed species has been addressed. Alien species inspection protocols will be instituted during any fence construction and when personnel and materials are brought into areas to mitigate for this potential impact. Examples of such protocols are inspection of boots, equipment, and materials prior to entry and departure of the project area, appropriate cleaning procedures and proper instruction of crews working on projects regarding the spread of alien species and follow-up monitoring for weeds along the fence post-construction and other projects.

Integration of the plan with other area or island initiatives.

On pages 7 and 32-33, it outlines how the management actions integrate with other area or island initiatives. Specifically, over ten initiatives are identified. In addition, partnership members have been involved with attending county planning initiatives for the region as well as other public-private initiatives to insure continued integration of management actions with other plans and initiatives occurs.

Clarification on how rare plants will be protected.

Pages 10-15 talk about actions to protect rare plants through threat management (e.g. feral ungulates removal, invasive species control, fencing) and active restoration, collection of seeds, outplanting, and monitoring for these species. There already exists small fenced units within the project area dedicated specifically for protection and management of rare plants.

Need for treating the forest with respect.

The goal of the management actions and the draft management plan of the Kohala Watershed Partnership is to maintain a healthy watershed and all its related ecosystem values and functions (e.g. ecological, economic, sociocultural). The fact that the Partnership has formed and has taken an active role through its management plan and actions reflects that the Partnership respects the forest. If the Partnership did not respect the forest, it would not care about impacts and degradation to the watershed and allow for these negative impacts to continue into the future. The need for management has clearly been outlined and continues the tradition from the territorial days when public and private landowners worked together to conserve and protect the forest.

Impact of existing trails and continued access (e.g. hunting impacts, cultural gathering).

Pages 10, 12, 15-17, 24-25, 29-30, and 32-33 all discuss trails and access issues (mainly focused on assessing existing trails and their positive and negative impacts, development of new trails, continued access for different activities, trail and access permits, etc.). Management actions support the continued recreational use of the project area and do not try to limit all uses over the entire 64,000 acre project area. In fact, trails and access are vital for management purposes, cultural gathering, recreation, education, and economic reasons. What the management actions propose is insuring that existing trails are lawful (ie. control of illegal trespassing), safe, and are not primary vectors of invasive weed species, feral ungulates, and other threats. As already stated previously, cultural gathering is supported and access provided. With regard to hunting impacts, most areas of public land proposed for fencing are rarely used by hunters, and 26,000 acres of accessible public hunting areas will still be open for hunting. On page 13, feral ungulate control measures state that where feasible (e.g. terrain and safety conditions), involving public hunters will be the first phase for control work. In addition on page 12 with regard to fence construction, one-way gates will be incorporated to allow for animal movement from fenced areas to outside fenced areas and hunting units. In addition, private landowners like Parker Ranch have hunting programs which they will continue. Finally, development of new trails for recreation are also part of the draft management plan in order to facilitate access to other areas in the watershed where impacts are less detrimental to the watershed and safer for people.

Economic impact to community (specifically closing down certain areas to subsistence hunting).

Pages 15-17 and 29-30 address economic impact. By preserving the watershed which

provides water to the Kohala area and enhancing recreation areas for residents and tourists, the economic impact to the community is positive. In addition, materials bought and personnel hired for projects will also benefit the community as they will be local. With regard to closing down certain areas to subsistence hunting, again looking at the previous paragraph, the management actions are not deterring hunting since most areas are not heavily utilized by hunters and hunters will be invited to be part of the animal control initiatives. As mentioned in the environmental assessment on page 11, only 10,500 acres out of the entire 64,000 project area (or 16%) has been identified for proposed fencing. As such, 85% or 54,500 is open for other compatible use consideration and with landowner permission. Over 25,000 acres will remain in accessible public hunting areas. In addition, new trails and access are being identified in order to enhance hunting as well as other recreational uses of the watershed. These proposed actions will increase both access and experiences for hikers, hunters, and other users of the watershed via identification and development of potential new routes to lands not previously accessible.

Preserving the whole system and not keeping out specific components.

The entire draft management plan and the proposed management actions are addressing the entire 64,000 acre area, in other words, the whole system. All components are being addressed and looked at including water, native habitats and species, recreation, culture, education, and economics. As such, specific components are not being left out.

Value multiple ways the watershed is seen by different groups.

The draft management plan and proposed management actions identify and address the multiple resources offered by the watershed and the many different uses and groups that benefit from a healthy Kohala watershed and mountain. The environmental assessment reflects this by identifying on pages 16-25, the many ways the watershed is seen by different groups and therefore its uses. In addition the draft management plan was developed using prior initiatives as outlined in Appendices B and C, which included a broad range of people with different interests who came together and found common ground and agreement for the management needs for Kohala. Management actions are geared toward enhancing these values and insuring that the resources continue to remain in the future for the continued enjoyment and use by the different groups.

2. Key topics from public response letters to the Draft Environmental Assessment that were addressed in the Final Environmental Assessment (with page numbers).

1. Addressing feral pigs as a social/cultural/economic resource: pages 16,23,30,31
2. Including well-known access trails in description of resources: page 24
3. Clarifying how management decisions are made about access and trails: page 15
4. Clarifying the scope of consultation with individuals (ie. not 90 "interviews"): pages 6-7
5. Adding mitigation measures for biological controls: page 29
6. Clarifying under-reporting of pig hunting harvests: page 25
7. Adding Kepa Maly's entire cultural assessment as Appendix F
8. Adding specific references about current cultural practices: page 23
9. Removing list of individuals that attended public Open Houses in April 2006: page 4
10. Adding description of post-fencing monitoring and species-specific surveys: pages 14-15
11. Adding details to descriptions of fence line boundary surveys: pages 11-12
12. Clarifying the wording about what management actions may be undertaken without an additional environmental assessment: page 6

Appendix D: Partial list of animals and vascular plants of the Kohala Mountain Watershed (both native and non-native).

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*	hō‘i‘o	E	
Gleicheniaceae	*Diplopterygium pinnatum*	uluhe lau nui	E	
Blechnaceae	*Doodia lyonii*		E	SOC
Dryopteridaceae	*Dryopteris fusco-atra*	‘i‘i	E	
Dryopteridaceae	*Dryopteris glabra*	kīlau	E	
Dryopteridaceae	*Dryopteris hawaiiensis*		E	
Dryopteridaceae	*Dryopteris sandwicensis*		E	
Dryopteridaceae	*Dryopteris unidentata*	‘akole	E	
Dryopteridaceae	*Dryopteris wallichiana*	‘i‘o nui	I	
Dryopteridaceae	*Dryopteris* sp.		E	
Lomariopsidaceae	*Elaphoglossum alatum*	hoe a Māui	E	
Lomariopsidaceae	*Elaphoglossum paleaceum*	māku‘e	I	
Lomariopsidaceae	*Elaphoglossum wawrae*	laukahi	E	
Grammitidaceae	*Grammitis hookeri*	māku‘e lau li‘i	I	
Grammitidaceae	*Grammitis tenella*	kolokolo	E	
Lycopodiaceae	*Huperzia phyllantha*	wāwae‘iole	I	
Grammitidaceae	*Lellingeria saffordii*	kihe	E	
Polypodiaceae	*Lepisorus thunbergianus*	pākahakaha	I	
Lycopodiaceae	*Lycopodiella cernua*	wāwae‘iole	I	
Lycopodiaceae	*Lycopodium venustulum*		I	
Thelypteridaceae	*Macrothelypteris torresiana*		N	
Hymenophyllaceae	*Mecodium recurvum*	‘ōhi‘a 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*	‘ae	E	
Psilotaceae	*Psilotum complanatum*	moa	I	
Psilotaceae	*Psilotum nudum*	moa	I	
Dennstaedtiaceae	*Pteridium aquilinum* var. *decompositum*	kīlau	E	
Pteridaceae	*Pteris cretica*	‘ōali	I	
Pteridaceae	*Pteris excelsa*	waimakanui	I	
Blechnaceae	*Sadleria cyatheoides*	‘ama‘u	E	
Blechnaceae	*Sadleria pallida*	‘ama‘u	E	
Blechnaceae	*Sadleria squarrosa*	‘apu‘u	E	
Blechnaceae	*Sadleria souleyetiana*	‘ama‘u	E	
Hymenophyllaceae	*Sphaerocionium lanceolatum*	palai hinahina	E	
Hymenophyllaceae	*Sphaerocionium obtusum*	palai lau li‘i	E	
Lindsaeaceae	*Sphenomeris chinensis*	pala‘ā	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, mau‘u 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*	koai‘a	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*	‘āhinahina	E	
Asteraceae	*Bidens hawaiensis*	ko‘oko‘olau	E	
Asteraceae	*Bidens hillebrandiana* subsp. *hillebrandiana*	ko‘oko‘olau	E	SOC
Rubiaceae	*Bobea elatior*	‘ahakea lau nui	E	
Rubiaceae	*Bobea timonioides*	‘ahakea	E	SOC, EN
Urticaceae	*Boehmeria grandis*	‘ākōlea	E	
Hydrangeaceae	*Broussaisia arguta*	kanawao	E	
Cannabaceae	*Cannabis sativa*	marijuana, paka lōlō	N	
Fabaceae	*Canavalia hawaiiensis*	‘āwikiwiki	E	
Brassicaceae	*Cardamine flexuosa*	bittercress	N	
Casuarinaceae	*Casuarina equisetifolia*	common ironwood	N	
Apiaceae	*Centella asiatica*	Asiatic pennywort	N	
Caryophyllaceae	*Cerastium fontanum*	common mouse-ear chickweed	N	
Euphorbiaceae	*Chamaesyce multiformis*	‘akoko	E	
Amaranthaceae	*Charpentiera obovata*	pāpala	E	
Araliaceae	*Cheirodendron trigynum*	‘ōlapa	E	
Asteraceae	*Cirsium vulgare*	bull thistle	N	
Campanulaceae	*Clermontia calophylla*	‘ōhā wai	E	SOC, EN
Campanulaceae	*Clermontia drepanomorpha*	‘ōhā wai	E	END, EN
Campanulaceae	*Clermontia kohalae*	‘ōhā wai	E	
Campanulaceae	*Clermontia parviflora*	‘ōhā wai	E	
Campanulaceae	*Clermontia waimeae*	‘ōhā wai	E	SOC, EN
Campanulaceae	*Clermontia* sp.	‘ōhā 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*	‘akū	E	C, VU
Gesneriaceae	*Cyrtandra kohalae*	ha‘iwale	E	SOC, X
Gesneriaceae	*Cyrtandra paludosa*	moa	E	
Gesneriaceae	*Cyrtandra platyphylla*	‘ilihia	E	
Gesneriaceae	*Cyrtandra* sp.	ha‘iwale	E	
Campanulaceae	*Delissea parviflora*		E	SOC, X
Ebenaceae	*Diospyros sandwicensis*	lama	E	
Sapindaceae	*Dodonaea viscosa*	‘a‘ali‘i	I	
Caryophyllaceae	*Drymaria cordata*	pipili	N	
Asteraceae	*Dubautia plantaginea*	na‘ena‘e	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, ‘oka kilika	N	
Gunneraceae	*Gunnera petaloïdea*	‘ape‘ape	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*	kuhiʻaikamoʻowahie, ʻōpelu	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*	ʻōhiʻa	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 liʻi	E	
Rubiaceae	*Nertera granadensis*	mākole	I	
Oleaceae	*Nestegis sandwicensis*	olopua	E	
Solanaceae	*Nothocestrum breviflorum*	ʻaiea	E	END, CR
Apocynaceae	*Ochrosia haleakalae*	hōlei	E	C, EN
Rosaceae	*Osteomeles anthyllidifolia*	ʻūlei	I	
Oxalidaceae	*Oxalis corniculata*	ʻihi ʻai, yellow wood sorrel	P ?	
Passifloraceae	*Passiflora tarminiana*	banana poka	N	
Piperaceae	*Peperomia cookiana*	ʻalaʻala wai nui	E	
Piperaceae	*Peperomia hypoleuca*	ʻalaʻala wai nui	E	
Piperaceae	*Peperomia macraeana*	ʻalaʻala 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.	hō‘awa	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*	‘āla‘a	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 ‘ula	E	
Rubiaceae	*Psychotria hawaiiensis* var. *hillebrandii*	kōpiko ‘ula	E	
Rubiaceae	*Psydrax odoratum*	alahe‘e	I	
Ranunculaceae	*Ranunculus repens*	creeping buttercup	N	
Apocynaceae	*Rauvolfia sandwicensis*	hao	E	
Rosaceae	*Rubus argutus*	blackberry	N	
Rosaceae	*Rubus hawaiensis*	‘ākala	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*	‘iliahi, 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*	‘ilima	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*	‘ohe	E	
Araliaceae	*Tetraplasandra oahuensis*	‘ohe 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*	koli‘i	E	
Fabaceae	*Trifolium repens*	white clover	N	
Urticaceae	*Urera glabra*	ōpuhe	E	
Ericaceae	*Vaccinium calycinum*	‘ōhelo, ‘ōhelo kau lā‘au	E	
Ericaceae	*Vaccinium dentatum*	‘ōhelo	E	
Ericaceae	*Vaccinium reticulatum*	‘ōhelo	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*	‘ākia	E	
Thymelaeaceae	*Wikstroemia pulcherrima*	‘ākia	E	
Thymelaeaceae	*Wikstroemia sandwicensis*	‘ākia	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*	‘auku‘u, black-crowned night heron	I	LC
	Columbiformes			
Columbidae	*Streptopelia chinensis*	spotted dove	N	
	Falconiformes			
Accipitridae	*Buteo solitarius*	‘io, 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*	Hawai‘i ‘elepaio	E	
Timaliidae	*Garrulax canorus*	hwamei, melodious laughing-thrush	N	
Drepanididae	*Hemignathus virens virens*	Hawai‘i ‘amakihi	E	LC
Drepanididae	*Himatione sanguinea sanguinea*	‘apapane	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 E: Photos from other similar projects illustrating pre and post habitat change after fencing, fence construction, boardwalk, and the native habitats and species of Kohala.

Photo 1: Fencing project in ʻŌlaʻa-Kīlauea area showing regrowth of native understory and forest once fencing was built and feral ungulates had been removed.

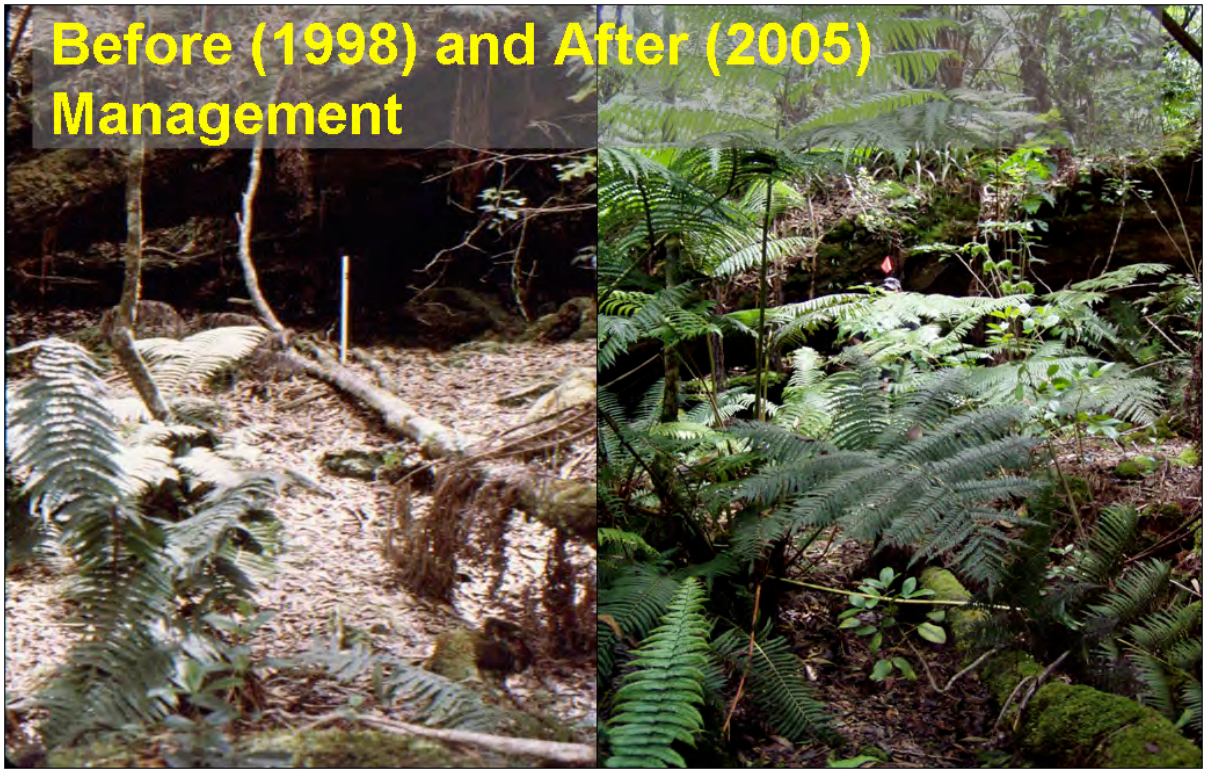


Photo 2: Fence construction projects on Maui and Hawaiʻi.

Photo 3: Boardwalk on Maui.

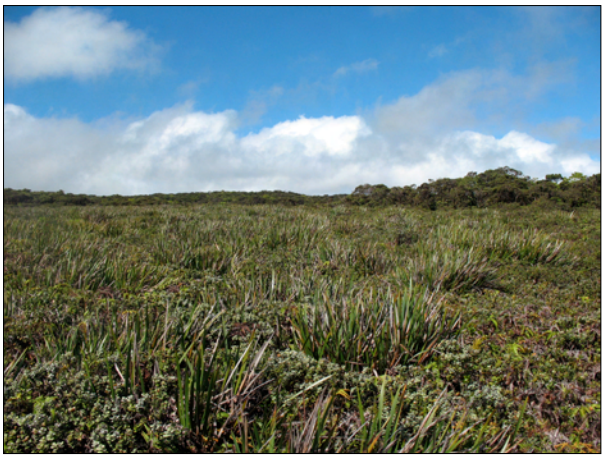
Photo 4: Native habitats and species in Kohala anticipated to benefit from proposed management actions.

‘Ohawai, *Clermontia spp.* sacred to the goddess Uli

Partulina physa, a rare tree snail only found on Kohala Mountain

Koli’i, *Trematolobelia macrostachys*

Montain cloud forests like those on Kohala Mountain are globally endangered and contain a disproportionate number of the world’s rare and endemic species.



Montane bogs of Kohala Mountain are unique ecosystems with incredible water-holding ability.

Appendix F:

Kumu Pono Associates. 2004. *He Moʻolelo ʻĀina: A Cultural Study of the Puʻu O ʻUmi Natural Area Reserve and Kohala-Hāmākua Mountain Lands, Districts of Kohala and Hāmākua, Island of Hawaii*

HE MOʻOLELO ʻĀINA:
A CULTURAL STUDY OF THE PUʻU O ʻUMI NATURAL AREA RESERVE AND KOHALA-HĀMĀKUA MOUNTAIN LANDS, DISTRICTS OF KOHALA AND HĀMĀKUA, ISLAND OF HAWAIʻI

Lanalana (Araneida theridiidae) (William Mull, 1974; Photo Courtesy of DLNR-NARS)

Puʻu o ʻUmi Natural Area Reserve, above the Waimanu Valley Headlands (Photo Courtesy of DLNR-NARS)

Puʻu and Forest Lands of the Puʻu o ʻUmi NAR viewed from Waimea (Photo KPA-N 1237)

ʻŌhāwai (Clermontia drepanomorpha) of Puʻu o ʻUmi (Photo Courtesy of DLNR-NARS)

Nā Lāʻau ʻOhi Wai o Puʻu o ʻUmi (Photo Courtesy of DLNR-NARS)

Kumu Pono Associates LLC

Historical & Archival Documentary Research · Oral History Interview Studies ·
Researching and Preparing Studies from Hawaiian Language Documents ·
Māhele ʻĀina, Boundary Commission, & Land History Records ·
Integrated Cultural Resources Management Planning ·
Preservation & Interpretive Program Development

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EXECUTIVE SUMMARY AND ACKNOWLEDGEMENTS

At the request of Ms. Lisa Hadway, Natural Area Specialist for the State of Hawai'i Department of Land and Natural Resources–Division of Forestry and Wildlife (DLNR-DOFAW), *Kumu Pono Associates LLC*, conducted a series of four detailed studies of historical and archival literature, documenting facets of the cultural landscape of the Natural Area Reserves. This study focuses on the Pu'u o 'Umi Natural Area Reserve, situated within lands of the Kohala and Hāmākua Districts. The documentation also includes detailed oral testimonies—describing the lands, traditional and customary practices, and historical land use—from native residents who relied upon the resources of the Kohala-Hāmākua mountains—that were collected from the 1860s to the early 1900s. The documentation cited herein is the product of years of research, and includes specific research conducted for the study between October 2003 to April 2004. The research was conducted in private and public collections, and that documentation, cited herein, includes written narratives that cover the period from antiquity to the 1980s.

The historical-archival resources were located in the collections of the Hawai'i State Archives, Land Management Division, Survey Division, Bureau of Conveyances and the Natural Areas Reserve offices; the Hawaiian Historical Society; the University of Hawai'i-Hilo Mo'okini Library; private family collections; and in the collection of *Kumu Pono Associates LLC*. The documentation includes rich narratives translated from native Hawaiian accounts; descriptions of lands that make up the Kohala mountains recorded in historic surveys; a history of land tenure from 1848 to the present; records documenting the establishment of the Kohala Forest Reserve, and the subsequent designation of the Pu'u o 'Umi Natural Area Reserve.

The Natural Area Reserve takes it's name from Pu'u o 'Umi, literally, the Hill-of-'Umi, the summit of which is situated 5,260 feet above sea level. It is likely that the naming of Pu'u o 'Umi is associated with the reign of the King, 'Umi-a-Līloa, who ruled the island of Hawai'i in the 1500s, and for whom many sites—from mountain to shore—in the Kohala-Hāmākua region are named.

The native traditions and historical accounts associated with the Kohala-Hāmākua mountain lands span many centuries, from Hawaiian antiquity to the later period following western contact. The narratives 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.

The most detailed descriptions of the Kohala-Hāmākua mountain lands, including documentation of traditional and customary rights, are those found in the Kingdom collections, documenting the history of land tenure, and defining the boundaries of *ahupua'a* in the Kohala-Hāmākua Districts. Detailed oral testimonies from elder native tenants were taken in court proceedings of the mid to late 1800s, and document the occurrence of traditional and customary practices, and 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, and adjoin the Pu'u o 'Umi Natural Area Reserve.

We find in native traditions and beliefs, that 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, rains, 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 Pu'u o 'Umi Natural Area Reserve, we find the goddess *Hina-ulu-'ōhi'a* (Hina, goddess whose form is in the groves of *'ōhi'a*); and *Pō-kāhi* (The darkened place), a god of the mountain mists (see the tradition of *Lau-ka-'ie'ie* in this study), are deified parts of the landscape of the Pu'u o 'Umi Natural Area Reserve.

In the Hawaiian mind, care for each aspect of nature, the *kino lau* (myriad body-forms) of the elder life forms, was a way of life. This concept is still expressed by Hawaiian *kūpuna* (elders) through the present day, and passed on in many native families. Also, in this cultural context, anything which damages the native nature of the land, forests, ocean, and *kino lau* therein, damages the integrity of the whole. Thus caring for, and protecting the land and ocean resources, is a way of life.

In the traditional context above referenced, we find 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. It's protection, and the continued exercise of traditional and customary practices, in a traditional and customary manner, are mandated by native custom, and State and Federal Laws (as those establishing the Kohala-Hāmākua Forest Reserves and Pu‘u o ‘Umi Natural Area Reserve; and the Endangered Species Act).

In this discussion, protection does not mean the exclusion, or extinguishing of traditional and customary practices, it simply means that such practices are done in a manner consistent with cultural subsistence, where each form of native life is treasured and protected. *Kūpuna* express this thought in the words, *“Ho‘ohana aku, a ho‘ōla aku!”* (Use it, and let it live!).

In the early 1900s, the Kohala-Hāmākua forest and watershed lands were determined to be one of the most significant in the Hawaiian Islands, and worthy of protection. In 1913, the mountain lands were dedicated as the Kohala Forest Reserve. In the late 1970s, the Kohala Forest Reserve was again signaled out as being a unique and fragile system, and efforts led to the development of the Pu‘u o ‘Umi Natural Area Reserve in 1987. Since that time, agencies and community members have been working together to try and ensure the health and integrity of the natural and cultural resources of the Pu‘u o ‘Umi Natural Area Reserve.

As a part of on-going ranching operations, and the mission of the newly formed forestry programs, hunting for pigs, and in earlier times, for wild cattle, has been practiced on lands of the Pu‘u o ‘Umi NAR. Such hunting interests remain of importance to community members and long-term management goals of the Natural Area Reserve System program.

māua nō me ka ha‘aha‘a — Kepā a me Onaona Maly

“A‘ohe hana nui, ke alu ‘ia!
(It is no great task when done together by all!)

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INTRODUCTION

Background

As a part of a state-wide program designed to protect, restore, and further the public benefit of significant Hawaiian natural resources making up three existing Natural Area Reserves, and one reserve, all on the island of Hawai'i, Ms. Lisa Hadway, Natural Area Specialist for the State of Hawai'i Department of Land and Natural Resources–Division of Forestry and Wildlife (DLNR-DOFAW), requested that *Kumu Pono Associates LLC* [1], conduct detailed historical-archival research that would describe the traditional-cultural and historical setting of lands within existing, or proposed Natural Area Reserves on the Island of Hawai'i. This component of the study discusses several *ahupua'a* [2] that contribute to the land area of the Pu'u o 'Umi Natural Area Reserve situated on the Kohala-Hāmākua mountains, Island of Hawai'i (*Figure 1*).

The Pu'u o 'Umi Natural Area Reserve (NAR) is generally set within the upper reaches of the *'ili* [3] of Pu'ukapu, which belongs to the larger land of Waimea, though it also includes the upper portions of neighboring watershed forests of other *ahupua'a* in both Kohala and Hāmākua. The NAR was once a part of the Kohala Forest Reserve, which was established by Governor's Proclamation on April 25, 1903, and include nearly 17,000 acres of critical forest and watershed land. On July 9, 1987, Governor's Executive Order No. 3367, established the Pu'u o 'Umi NAR, consisting of some 10,000 acres, comprised of land that was formerly a part of the Kohala Forest Reserve. The NAR takes it's name from Pu'u o 'Umi, literally, the Hill-of-'Umi, the summit of which is situated 5,260 feet above sea level. Though no specific tradition was found to describe the origin of the name, it is likely that the naming of Pu'u o 'Umi is associated with the reign of the King, 'Umi-a-Līloa, who ruled the island of Hawai'i in the 1500s, and for whom many sites—from mountain to shore—in the Kohala-Hāmākua region are named.

The lands and boundaries of the Pu'u o 'Umi NAR are also shared by the upper reaches of several other lands of the Kohala and Hāmākua districts. Because the mountain lands mark the points of boundaries of numerous lands from two districts, traditions and cultural practices from many *'ili* and *ahupua'a* are tied to lands and resources of the Pu'u o 'Umi NAR. The NAR is described as containing:

> …one of the bog ecosystems present on the cloud-shrouded high areas of the Kohala Mountains, where the annual rainfall is 175 inches. Montane bog ecosystems of any significance occur at only two other areas in the state: Mt. Waialeale on Kauai and the West Maui Mountain. The Kohala bog has a ground-cover vegetation of Sphagnum moss, the moss that forms peat bogs on the continents. Many species of ferns, grasses, sedges, and herbs are also present. Tree growth, dominated by *'ōhi'a-lehua* (Metrosideros), *alani* (Pelea), and *'ōlapa* (Cheirodendron), is usually stunted and sparsely distributed. *Makai* of the bog region is an *'ōhi'a* rainforest ecosystem. A mixed *hala* forest is present at the coastal region. [Pu'u o 'Umi NAR Folder, in collection of the DLNR-NAR Office]

A part of the purpose of the Pu'u o 'Umi NAR is described as being to provide:

> …added protection and preservation of the Kohala Watershed and the head waters of Kawainui, Alakahi, Honokane Nui, and Kohakohau Streams, whose water resources

---

1 *Kumu Pono Associates LLC*: Kepā Maly, Cultural Historian-Resource Specialist and Onaona Maly, Researcher.

2 *Ahupua'a* is a traditional term used to describe an ancient Hawaiian land unit (extending from sea to mountain lands), and remains the primary land unit of the modern land classification system.

3 An *'ili* is land division subordinate to the larger *ahupua'a* within which it is found (see discussion on the land divisions of Waimea and South Kohala in this study).

Figure 1. The Pu‘u o ‘Umi Natural Area Reserve – Kohala Mountains, Island of Hawai‘i (H.S.S. Plat No. 513-A; 1986)

> are tapped in the low reaches, but equally protected would be the headwaters of Waihilau and Wailikahi Streams, which are major tributaries of Waimanu Stream… [Pu‘u o ‘Umi NAR Folder, in collection of the DLNR-NAR Office]

This study seeks to provide readers with access to primary documentation on native traditions, customs, and practices associated with the Kohala-Hāmākua mountain lands; and to provide readers with a historical overview of the land and activities of people in the region from the early 1900s through the present-day. Such information will be helpful in planning phases and discussions of the Kohala community and agencies, as efforts to protect the unique natural and cultural landscape of the mountain lands are undertaken. While a great deal of information has been compiled, and is presented in the following sections of this study, we acknowledge that additional information will likely be found through further research. The goal here, is to bring a significant collection of documentation into one study that will help all interested parties plan actions to ensure the well-being of the land for present and future generations.

Historical and Archival Research

The historical-archival research conducted for this study was performed in a manner consistent with Federal and State laws and guidelines for such studies. Among the pertinent laws and guidelines are the National Historic Preservation Act (NHPA) of 1966, as amended in 1992 (36 CFR Part 800); the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai‘i State Historic Preservation Statue (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of on-going cultural significance; the criteria, standards, and guidelines of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites and practices, Title 13 Sub-Title 13:275-284 (October 21, 2002); and the November 1997 guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (which also facilitate the standardized approach to compliance with Act 50 amending HRS Chapter 343; April 26, 2000).

While conducting the research, primary references included, but were not limited to—land use records, including an extensive review of Hawaiian Land Commission Award (L.C.A.) records from the *Māhele ‘Āina* (Land Division) of 1848; Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawai‘i; and historical texts authored or compiled by—D. Malo (1951); J.P. I‘i (1959); S. M. Kamakau (1961, 1964, 1976, and 1991); Wm. Ellis (1963); Chas. Wilkes (1845); A. Fornander (1916-1919 and 1996); G. Bowser (1880); Handy and Handy with Pukui (1972); M. Kelly (1974); and Clark and Kirch (1983). The study also includes several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English, by the author), and historical records authored by nineteenth century visitors, and residents of the region. The records also include important oral testimonies of elder *kama‘āina* of the lands which make up, and surround the Pu‘u o ‘Umi NAR.

Historical and archival resources were located in the collections of the Hawai‘i State Archives, Land Management Division, Survey Division, Natural Area Reserves office, and Bureau of Conveyances; the Bishop Museum Archives; Hawaiian Historical Society; University of Hawai‘i-Hilo Mo‘okini Library; private family collections; the Parker Ranch and Paniolo Preservation Society (PPS) collections; and in the collection of *Kumu Pono Associates LLC*. This information is generally cited in categories by chronological order of the period depicted in the narratives.

THE LANDS OF THE KOHALA-HĀMĀKUA MOUNTAINS: A CULTURAL-HISTORICAL CONTEXT

Hawaiian Settlement

Archaeologists and historians describe the inhabiting of these islands in the context of settlement which resulted from voyages taken across the vast open ocean, with people coming from small island groups. For many years archaeologists have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawai'i were underway by AD 300, with long distance voyages occurring fairly regularly through at least the thirteenth century. It has been generally reported that the sources of the early Hawaiian population—the Hawaiian "Kahiki"—were the Marquesas and Society Islands (Emory in Tatar 1982:16-18).

For generations following initial settlement, communities were clustered along the watered, windward (*ko'olau*) shores of the Hawaiian Islands. Along the *ko'olau* shores, in areas such as Waipi'o, Waimanu and Pololū, streams flowed, rainfall was reliable, and agricultural production became established. The *ko'olau* region also offered sheltered bays from which deep sea fisheries could be easily accessed. Also, near-shore fisheries, enriched by nutrients carried in the fresh water flowing from the mountain streams, could be maintained in fishponds and estuarine systems. It was around these bays that clusters of houses where families lived could be found. In these early times, the residents generally engaged in subsistence practices in the forms of agriculture and fishing (Handy, Handy and Pukui 1972:287).

Over a period of several centuries, areas with the richest natural resources became populated and perhaps crowded, and by ca. 900 to 1100 AD, the population began expanding to the *kona* (leeward side) and more remote regions of the island (Cordy 2000:130). Kirch (1979) reported that by ca. AD 1200, there were small coastal settlements at various areas along the western shore line of Hawai'i—for example, the Waimea lands of 'Anaeho'omalu, Kalāhuipua'a, and Puakō, and Kawaihae (Kirch 1979:198). These leeward coastal lands provided the near-shore and deep sea fishery resources necessary for the families of the larger Waimea region. In this system, the near-shore communities shared extended familial relations with those of the Waimea uplands.

By the 1400s, upland elevations to around the 3,000 foot elevation of Waimea—it's smaller attached land divisions, such as Pu'ukapu and 'Ōuli—and neighboring lands like Kawaihae, Waikā, and Kahuā were being developed into areas of residence and a system of mixed dry land and wet land agricultural fields (Clark and Kirch, 1983; and Cordy, 2000). Some of the fields may have been irrigated by such streams as Waikōloa and Keanu'i'omanō, as evidence of *'auwai* (irrigation channels) may still be seen across portions of Kawaihae uka, Waiaka, Pu'ukapu, Noho'āina, Waikōloa, Līhu'e and Lālāmilo. By the 1500s to 1600s, residency in the uplands was becoming permanent, and there was an increasing separation of royal class from commoners. During the latter part of this period, the population stabilized and a system of land management was established as a political and socio-economic factor (see Kamakau 1961; Ellis 1963; Handy, Handy & Pukui 1972; Tomonari-Tuggle 1985; and Cordy 2000).

Natural Resources and Land Management in the Hawaiian Cultural System

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on, and around them, in the context of genealogical accounts. All forms of the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shore line and ocean depths are believed to be embodiments of Hawaiian gods and deities. One Hawaiian genealogical account, records that Wākea (the expanse of the sky–father) and Papa-hānau-moku (Papa, who gave birth to the islands)—also called Haumea-nui-hānau-wāwā (Great Haumea, born time and time again)—and various gods and creative forces of nature, gave birth to the islands. Hawai'i, the largest of the

islands, was the first-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-beings, or creative forces of nature who gave birth to the islands, were also the parents of the first man (Hāloa), and from this ancestor all Hawaiian people are descended (David Malo, 1951; Beckwith, 1970; Pukui and Korn, 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment, and it is the basis of the Hawaiian system of land use.

In the generations that followed initial settlement, the Hawaiians developed a sophisticated system of land use and resource management. By the time ʻUmi-a-Līloa rose to rule the island of Hawaiʻi in ca. 1525, the island (*moku-puni*) was divided into six districts or *moku-o-loko*. Kohala, extending from the slopes of Mauna Kea in the south, across the Kohala Mountains, and to ʻŪpolu Point in the north, is one of those major districts (cf. Fornander 1973–Vol. II:100-102).

The large districts (*moku-o-loko*) like Kohala, and sub-regions (*ʻokana* and *kalana*) were further divided into political regions and manageable units of land. These smaller divisions or units of land were tended to by the *makaʻāinana* (people of the land) (see Malo 1951:63-67). Of all the land divisions, perhaps the most significant management unit throughout the islands was the *ahupuaʻa*.

Ahupuaʻa are subdivisions of land that were usually marked by altars with images or representations of a pig placed upon them, thus the name *ahu-puaʻa* or pig altar. In their configuration, the *ahupuaʻa* may be compared to wedge-shaped pieces of land that generally radiate out from the center of the island, extending to the ocean fisheries fronting the land units. Their boundaries are generally defined by topography and geological features such as *puʻu* (hills), ridges, gullies, valleys, craters, or areas of a particular vegetation growth (see Boundary Commission testimonies in this study; and Lyons, 1875).

The *ahupuaʻa* were also divided into smaller manageable parcels of land—such as the *ʻili*, *kōʻele*, *mahina ʻai*, *māla*, and *kīhāpai*)—that generally run in a *mauka-makai* orientation, and are often marked by stone wall (boundary) alignments. In these smaller land parcels the *makaʻāinana* cultivated crops necessary to sustain their families, and supplied the needs of the chiefly communities they were associated with. As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people who lived in a given *ahupuaʻa* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment and supplying the needs of ones' *aliʻi* (see Malo 1951:63-67 and Kamakau 1961:372-377).

Entire *ahupuaʻa*, or portions of the land were generally under the jurisdiction of appointed *konohiki* or subordinate chief-landlords, who answered to an *aliʻi-ʻai-ahupuaʻa* (chief who controlled the *ahupuaʻa* resources). The *aliʻi-ʻai-ahupuaʻa* in turn answered to an *aliʻi ʻai moku* (chief who claimed the abundance of the entire district). Thus, *ahupuaʻa* resources supported not only the *makaʻāinana* and *ʻohana* (families) who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resource management planning. In this system, the land provided fruits, vegetables and some meat in the diet, and the ocean provided a wealth of protein resources.

The Kalana of Waimea – the ʻIli of Puʻukapu And the Watershed of the Kohala-Hāmākua Ahupuaʻa

While the fundamentals of land management described above conform with the basic system employed across the Hawaiian Islands, we find that there were other political divisions that affected the status of land. For example, native witnesses in early historic testimonies described Waimea as a "*Kalana*" or "*Okana*," a land division which in ancient times was treated as a sub-district, smaller than the *moku o loko*, yet comprised of a number of smaller lands that contributed to its wealth (see Boundary Commission Testimonies in this study). The lands and resources subject to the *Kalana* of

Waimea included, but were not limited to, ʻŌuli, Waiʻaka, Lālāmilo, Puakō, Kalāhuipuaʻa, ʻAnaehoʻomalu, Kanakanaka, Alaʻōhiʻa, Paulama, Puʻukalani (Pukalani), Puʻukapu, and Waikōloa. In the 1840s and 1860s, elder native witnesses described these various lands as "*ili*," or land divisions of lower status than *ahupuaʻa*, which fell under the jurisdiction of the chiefs of Waimea.

Understanding this difference in the status of the land divisions of the Waimea region helps explain why lands such as ʻAnaehoʻomalu and Kalāhuipuaʻa have no independent upland agricultural resources; and why lands such as Puʻukapu and Waikōloa, and all the other lands within Waimea, except for Lālāmilo and ʻŌuli, have no ocean frontage.

Regarding the status of ***Waimea*** and lands that were either subordinate to it, or independent of it, Curtis Lyons, a Kingdom Surveyor, who had surveyed lands in the region in 1852, wrote to Crown Lands Commissioner C.P. Iaukea in 1893. He observed:

> …***Waimea***, Hawaii, was an *Ahupuaa* which partook largely of the qualities of a *Moku* or division that was however assigned as an *Ahupuaa* in the *Mahele*. That is to say to His Majesty K. III., becoming by the Act of 1865, a Crown Land. It would therefore be assumed that all within its boundaries would be Crown Land excepting such Ilis or subordinate ahupuaas as some might call them as were recognized within the *Mahele* or in the Land Commission Records, as separate in title; this distinction in title corresponding to the status known as that of an *ili kupono*. All not so recognized would be technically spoken of as a part of the *Ahupuaa*.
>
> The *Ili Kupono* of ***Puukapu*** was given up in the *Mahele* by Kekauonohi and became Crown Land, thus being practically thereafter one with the *Ahupuaa*.
>
> The other *Ili Kupono* are as follows:
>
> Waikoloa, *Mahele* and Award 8512 B to G.D. Hueu.
> Waiaka 2 *Mahele* and Award 8520 B to Lahilahi.
> Ouli *Mahele* and Award 8518 B to Kanehoa.
> Anaehoomalu *Mahele* and Award 4452 to H. Kalama.
> Kalahuipuaa *Mahele* and Award 4452 to H. Kalama
> Puako *Mahele* and Award 8559 B to Lunalilo
> Kaupo *Mahele* and Award 8515 to Kaoanaeha… [HSA – DAGS 6 Box 22; Nov. 1893]

To this day, remains of extensive dryland planting fields, and residences (both temporary and permanent) on the *kula* (plain lands) may be found in the *Kalana* of Waimea. Such features tell us that in ancient and early historic times, there was intensive use of the upland region. These features generally occur in areas extending from about 1,700 to 3,000 feet above sea level. The *mahina ʻai* (planting fields) were generally marked by a series of *kuaīwi, kuakua*, and *kuāuna* (walls and terraces). Planting techniques employed included *mākālua, ʻumokī* and *puʻepuʻe* (planting in mulched holes, and mulched mounds of stone and earth), and the *pulu lepo*, or depressions and hollows on the landscape where soil and moisture were caught, and where cultivation was supported. The *mahina ʻai* of the Waimea region also extended up the slopes of the Kohala Mountains in the vicinity of Puʻu Hōkūʻula, and extended across the uplands towards the *Kahuā* section of North Kohala. In these upper fields, as well as in areas crossed by streams like Waikōloa, Waiʻaka and Keanuʻiʻomanō, it is likely that irrigated fields were developed as well.

Clark and Kirch (1983) described an extensive agricultural field system in the Waimea region. Crops planted in these fields included *ʻuala* (sweet potatoes) and *kalo* (dryland taro). Along the ridges and boundaries of the *mahina ʻai*, and in terraces, outcrops, fissures and mounds, other crops such as *kō* (sugar cane), *wauke* (paper mulberry), *maiʻa* (banana), *ipu* (gourds) and *uhi* (yams) were cultivated. In the areas where water was available along the streams, *loʻi* (pond fields) could also have been developed for the cultivation of *kalo wai* (wet taro). At the time of the *Māhele ʻĀina* (Land

Division) of 1848, native tenants described agricultural parcels and house lots (often enclosed to keep cattle out) on lands that make up the *Kalana* of Waimea. The claimants generally indicated that their right of residency and land use dated back to the period of Kamehameha I and Kamehameha II (pre 1823), thus indicating that residential and agricultural use had time depth. Ross Cordy reported that features of the "Waimea Field System" were in use up until the mid-nineteenth century (Cordy 1989:4), though Handy, Handy and Pukui (1972), and oral history interviews conducted by Maly, document small gardens kept by Hawaiian residences remained in use along the northern section of this field system through the 1930s.

For many years, the presence of an extensive *ʻauwai* (irrigation channel system), has given rise to the possibility that large portions of the Waimea plains were irrigated and cultivated in ancient times. In fact an important legal case on the water rights of Parker Ranch in the early 1900s led to the production of a detailed map of the *ʻauwai* system on the *kula* of Waikōloa Nui, Waikōloa Iki, Lālāmilo and Puʻukapu (Kanakanui et al., 1914; Reg. Map No. 2576), which depicts flow of water to, and through many of the *kuleana ʻāina* (fee simple land interests) awarded to native tenants in the region.

The land history of Waipiʻo, Waimanu, Laupāhoehoenui, ʻĀwini, Honokāne, Pololū and smaller valleys on the Hāmākua and Kohala mountain side is similar to that of the *ahupuaʻa* described above. Native traditions and historical accounts of land use and access describe a sophisticated system of resource management, knowledge of the mountain lands, and their resources. Indeed, the names of places such as Puʻu o ʻUmi and Nā-poe-a-ʻumi-hulu-maka-o-ka-lani[4], seemingly associated with the life and times of ʻUmi-a-Līloa; and other names such as Pupualenalena, Kulanapahu and Kaʻakōlea on the mountain lands between Kohala and Hāmākua, demonstrate knowledge of the landscape, and are tied to traditional travel, access, and practices in the uplands.

All of the witnesses testifying before the Commissioner of Boundaries between 1864 to 1900 described traditional access and use of resources in the mountain lands, that was controlled and monitored by landlords and chiefs. Knowledge of the boundaries of *ahupuaʻa*, and the extent of rights on the mountain lands was important. If someone from another land was caught taking resources from a land other than their own, the items were taken from them. Indeed, the large collection of testimonies for the island of Hawaiʻi record that infractions of *ahupuaʻa* rights led to fights and death of the intruders. Interestingly, collection of native birds such as the *mamo* and *ʻōʻō*, and the collection of *olonā* on the Puʻukapu mountain lands within the present-day Natural Area Reserve was recorded by elder *kamaʻāina*, though no reference to other forms of hunting or pigs, was made in native testimonies of the 1800s (see Boundary Commission Testimonies in this study).

The historical record of ranch development and ranching operations through the 1940s also documents a tightly controlled system of access and hunting rights. The mountain lands and resources were highly valued in traditional times, and in later years, the water generating properties of the mountains were also highly valued. It was for this reason, following the steady decline of the native forest system, that in the early 1900s, the Kohala Forest Reserve was established. Primary access to the mountain lands was to monitor the growing water interests of the ranches and plantations fed by the watershed of the Kohala mountains.

[4] This *puʻu*, situated a short distance from Puʻu o ʻUmi, is also recorded as having several names, apparently depending on the *kamaʻāina* witnesses' place of residence; the hill was also called "Ka-umu-o-ka-lei-ohia, Ka-umu-o-ka-lei-hoohie" (perhaps a misspelling of the preceding name), or "Kilohana" (see Boundary Commission testimonies in this study).

MOʻOLELO ʻĀINA: NATIVE TRADITIONS AND HISTORIC ACCOUNTS OF THE KOHALA-HĀMĀKUA MOUNTAINS LANDS

This section of the study provides readers with access to a collection of native traditions of the Kohala-Hāmākua mountain lands, some of the accounts translated from the original Hawaiian language narratives for the first time, by the author. The narratives span many centuries, from Hawaiian antiquity to the later period following western contact. Some of the narratives make specific references to places on the mountain lands associated with the Puʻu o ʻUmi NAR, while other accounts are part of larger traditions that are associated with regional and island-wide events. The native traditions 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* (plains and plateau lands), and the adjacent marine fisheries. It is also appropriate to note here, that the occurrence of these traditions—many in association with place names of land divisions, cultural sites, features of the landscape, and events in the history of the lands which make up the Puʻu o ʻUmi NAR—are an indicator of the rich native history of those lands.

The Healing Traditions of Lono-pūhā– A Resident of the Uplands of ʻĀwini

One of the early native traditions which references the Kohala-Hāmākua mountain lands is set in distant antiquity, in a time when gods took human form and walked with mankind. In 1837 S.P. Kalama and G. P. Judd collected native traditions documenting the use of *lapaʻau* (medicinal herbs) for healing, and how the knowledge was first gained by the Hawaiians. An article series published in the Hawaiian newspaper, *Ka Hae Hawaii* in 1858, presented some of that information to readers of the paper. The narrative is of great interest because it describes several island localities and the founding of Hawaiian medicinal practices and rituals.

The account also alludes to the migrations of the god-form of the *kōlea* (golden plover), in connection with events in the account. A place on the boundary of Puʻukapu and Waipiʻo-Lālākea bears the name Kaʻa-kōlea, and was a place of sacrifice in ancient times (see Boundary Commission testimonies in this study; also Register Map No. 872). The *moʻolelo* also tells readers that it was at ʻĀwini (neighboring the Kohala mountain lands), that the arts of *lapaʻau* were taught, and from there, the practices spread throughout the islands.

A translation of selected narratives from the *moʻolelo* are given below:

> Kamāʻoa was the husband and Hinaikamalama was the wife. To them were born the children, Kū, Lono, Kāne, Kanaloa, Kamakaokukoaʻe, Kaʻalaenuiahina, and Kamakanuiʻahaʻilono. Each of the children were gods and possessed various powers. Kamakanuiʻahaʻilono's gift was healing. All of the older children departed from their parents and went to reside at various places around the islands. Each of the children were known for their various attributes, some life giving, and others taking life. Being the youngest, Kamāʻoa and Hinaikamalama assumed that their small son, Kamakanuiʻahaʻilono would remain with them, but when he was old enough, he went to his parents and told them that he wished to travel throughout the islands. He visited Niʻihau, Kauaʻi, Oʻahu, Molokaʻi, Maui, Lānaʻi, Kahoʻolawe, and then returned to Hawaiʻi. Along the way, he healed people who were afflicted with various ailments. These ailments were brought about by Kamakaokukoaʻe, an elder brother of Kamakanuiʻahaʻilono. It was the practice of Kamakaokukoaʻe to make people ill wherever he traveled.
>
> Kamakanuiʻahaʻilono traveled along the *alanui* (trail) through Kona to Kaʻū. While in the uplands of Kaʻū, he came across the chief Lono, who was tending his extensive agricultural fields. Kamakanuiʻahaʻilono distracted Lono, who struck his foot with his

ʻōʻō (digging stick). Immediately, the wound became badly swollen and infected. Kamakanuiʻahaʻilono then healed Lono, and from that time he was also known as Lono-pūhā (Swollen Lono). Kamakanuiʻahaʻilono then set off to continue his journey, heading for Puna and Hilo. Having been healed, Lono-pūhā followed and asked if he could travel with Kamakanuiʻahaʻilono. Kamakanuiʻahaʻilono agreed and the two traveled together through Puna, Hilo, and Hāmākua. Along the way, Lono-pūhā observed as Kamakanuiʻahaʻilono healed people of various ailments by using different herbs.

When they reached the heights of Hāmākua, Kamakanuiʻahaʻilono decided to pass Waipiʻo (where Kamakaokukoaʻe had settled) for he thought that perhaps his new friend might be killed by Kamakakukoaʻe. The two travelers went to the uplands of Waimea, and from there, they descended to the shore of Puakō and went to Kalāhuipuaʻa. Now at Kalāhuipuaʻa, Kamakanuiʻahaʻilono saw a stranger (he did not know it was one of his younger relatives) who had the form of a bird, the *kōlea* (golden plover), and whose path was a rainbow. Now this stranger was also a healer.

Kamakanuiʻahaʻilono called out to him, "Where are you from?" The stranger answered "From Kona." But Kamakanuiʻahaʻilono said, "I have been in Kona and there is no person like you there." Kamakanuiʻahaʻilono asked several times, and each time received a different reply, until finally the stranger said, "I am from the shore, here." Kamaka then said "Yes, you are indeed of this place." The stranger then said his name was Kōlea-nui-a-Hina (also called Lono-i-kōlea-moku), and told him that they were related. The three stayed there for a while and then went further into Kohala to see Kamanuiohua. Kamakanuiʻahaʻilono then asked Lono-pūhā where their herbs were, and Lono-pūhā said that they had fallen at the place of Kōleamoku. Lonopūhā was then told to go to Puakō and fetch the herbs.

When he went to gather the herbs, he found that they were growing there. Seeing this, Lono-pūhā pulled up all of the herbs that could be found, and left none behind. Lono-pūhā then returned to Kamakanuiʻahaʻilono, who asked where the herbs were. Lono-pūhā told him that he had found them growing, and that he had pulled all of them up, leaving none behind. Hearing this, Lono-i-kōlea-moku became angry and he refused to enter the house of Kamakanuiʻahaʻilono. Lonoikōleamoku then carved an image and placed it in front of the door of the house of Kamakanuiʻahaʻilono. He said that he would not again enter the house up to the time that he returned to Kahiki.

When Lonoikōleamoku returned to Kahiki, Kamakanuiʻahaʻilono, then went to ʻĀwini with his friend, Lonopūhā, and taught him about making medicines. Lono-pūhā lived at ʻĀwini, and planted herbs and taught healing throughout his life… [*Ka Hae Hawaiʻi*, November 24, 1858:136; Maly, translator]

Several historians cite various versions of this tradition—with Kamakanuiʻahaʻilono the god-teacher and Lono-pūhā as the student—as the source of how healing arts were originally learned by the Hawaiian people. Lonopūhā himself, resident at ʻĀwini, was deified and called upon by various practitioners while treating patients. The god-form of the *kōlea* also played an important role in these practices (cf. Malo 1951; Kamakau 1961 & 1964; Thrum 1907; Beckwith 1970).

"Moolelo no Pupualenalena" (A Tradition of Pupualenalena)

Pupualenalena was a supernatural dog, who in the time of Hakau (the half brother of ʻUmi-a-Līloa; ca. AD 1525), lived at Puakō. A place named for this creature is situated on the Kohala mountain lands on the boundary between Puʻukapu and Waipio. The tradition of Pupualenalena was collected by Abraham Fornander in the 1880s. A paraphrased summary of the narratives recorded by Fornander is presented here:

Pupualenalena, lived with his master, an old fisherman, at Puakō. When the man went fishing, he always took the dog Pupualenalena with him on his canoe. Now it was the dogs' habit to eat his masters' fish whenever they were tossed into the back of the canoe. The master told Pupualenalena, that it was alright for him to eat the fish, but asked Pupualenalena to go and gather *'awa* (*Piper methysticum*) roots for him to make into a drink. Pupualenalena understood the masters' request, and that evening he went to gather *'awa* for him.

Pupualenalena traveled all the way to Waipi'o, where the king Hakau lived and had his sacred *'awa* garden below Pua'ahuku. Now this *'awa* was restricted for use only by Hakau, and if anyone was caught stealing the *'awa,* the thief would be killed. Eventually, Hakau determined that someone was stealing his *'awa*, and he placed his guards around the *'awa* patch. That night, Pupualenalena traveled from Puakō to Waipi'o, and gathered up the *'awa*. The kings' men saw the dog stealing the *'awa*, but because Pupualenalena was so fast, they could not catch him. One of the kings' runners was able to follow behind Pupualenalena, and they followed him to Puakō, where it was found that the old man exhibited signs of drinking large quantities of *'awa* (his skin was red and scaly).

The old fisherman and the dog were taken to Waipi'o, where Hakau asked if the old man had been drinking *'awa*. The man answered yes, but stated that he had not known that Pupualenalena had been traveling all the way to Waipi'o to get the *'awa*. While Hakau was telling the old man and his dog that they would both be put to death, a great noise arose in Waipi'o. This noise was from a conch shell which was blown throughout the night by the spirits that lived in the uplands of Waipi'o. Because of the constant blowing of the conch shell, the people of Waipi'o were unable to get much sleep. Hakau told the old man, that if Pupualenalena could steal the conch, that they both would be spared. Pupualenalena secured the conch shell, and Hakau cared for the old man and the dog from that day on. (Fornander 1916-1917 Vol. 4-3:558, 560)

Traditions from the Reign of Lono-i-ka-makahiki

One of the traditional narratives which describe events and the occurrence of place names, throughout the region of South Kohala—including references to several of the *pu'u makai* of the Pu'u o 'Umi NAR—date from around the middle 1600s when Lono-i-ka-makahiki, a grandson of 'Umi-a-Līloa, ruled the island of Hawai'i (cf. Kamakau 1961; Fornander 1916-1917 Vol. 4-2:342-344, Vol. 5-2:446-451).

Native historian, Samuel Kamakau (1961) reported that during the reign of Lono-i-ka-makahiki, Kamalālāwalu (the king of Maui), made plans to invade the island of Hawai'i. Kamalālāwalu sent spies to determine how many people lived on the island. The spies "landed at Kawaihae" and traveled around the island, but because they failed to go to the uplands of Kohala, they reported back to their chief, that there were few people in the district. They told Kamalālāwalu:

…"We went all around Hawaii. There were many houses, but few men. We went to Kohala and the men only on the shores…Bare of inhabitants is Kohala, for the men are at the coast." The spies had seen the land of Kohala [but had failed to see the people for] on all of the fields where sports were held from inner Kohala to outer Kohala, from Kohala of the coastal cliffs to Kohala of the inland, a crowd of people gathered every day from morning to night to play. Kohala was known as a thickly-populated land. The spies thought that if Kohala was conquered, Kona, Ka-'u, and Puna would be easily taken, and they felt that Hilo and Hamakua would lend no assistance. This was true, for the chiefs of these districts were cousins of the chiefs of Maui… (Kamakau 1961:56-57)

Kamakau wrote that Kamalālāwalu and his warriors traveled on a great fleet of canoes and landed in the district of Kohala, "The people had gone up to Waimea, for all observed the services held at the

heiau of Mailekini. Only those of lower Kawaihae and Puako remained" (Kamakau 1961:58). Because only few people were along the coast, the victory of battle went to Kamalālāwalu. Kamalālāwalu and his troops then prepared to march to Waimea and enter into battle. Kamalālāwalu's counselors told him:

> Waimea is not a good battle site for strangers because the plain is long, and there is no water. Should defeat be met with by the warring strangers, they will all be slaughtered… (Kamakau 1961:58)

Kama ignored the advice of his counselors, and instead listened to the advice of two old men of Kawaihae, one of whom was named Pūhau-kole (commemorated as the name of a stream that passes the north side of Puʻukoholā and Mailekini). These old men purposefully misled Kamalālāwalu, telling him that the plain below Puʻu ʻOaʻoaka (Waimea) would be a good battle field, and that all his canoes should be taken apart so none of the Maui warriors could run back to the canoes and secretly return to Maui (Kamakau 1961:58). The advice of the old men was taken by Kama, and the following events occurred:

> After Kama-lala-walu's warriors reached the grassy plain, they looked seaward on the left and beheld the men of Kona advancing toward them. The lava bed of Kaniku [behind ʻAnaehoʻomalu] and all the land up to Huʻehuʻe was covered with the men of Kona. Those of Kaʻu and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts. Kamalalawalu with his warriors dared to fight. The battlefield of ***Puʻoaʻoaka*** was outside of the grassy plain of Waimea, but the men of Hawaii were afraid of being taken captive by Kama, so they led [Kamalālāwalu's forces] to the waterless plain lest Maui's warriors find water and hard, water worn pebbles. The men of Hawaii feared that the Maui warriors would find water to drink and become stronger for the slinging of stones that would fall like raindrops from the sky. The stones would fall about with a force like lightning, breaking the bones into pieces and causing sudden death as if by bullets…
>
> …The Maui men who were used to slinging shiny, water-worn stones grabbed up the stones of ***Puʻoaʻoaka***. A cloud of dust rose to the sky and twisted about like smoke, but the lava rocks were light, and few of the Hawaii men were killed by them. This was one of the things that helped to destroy the warriors of Kama-lala-walu: They went away out on the plain where the strong fighters were unable to find water...The warriors of Maui were put to flight, and the retreat to Kawaihae was long. [Yet] there were many who did reach Kawaihae, but because of the lack of canoes, only a few escaped with their lives... Kama-lala-walu, ruler of Maui, was killed on the grassy plain of Puako, and some of his chiefs were also destroyed. (Kamakau 1961:58-60).

Another version of this battle, collected by Abraham Fornander, tells readers that Kamalālāwalu's invading army arrayed itself on top of the hill of Hōkūʻula, where Kamalālāwalu had been falsely told, there were large stones to roll down on the enemy. From the heights of Puʻu Hōkūʻula, the warriors of Maui could see the armies of all Hawaiʻi advancing and taking their positions along the plains of Waimea. Fornander notes that the warriors from North Kohala were stationed between the lands of Momoualoa to Waihaka (Waiʻaka) (Fornander 1917 Vol. IV-11:344):

> The hill [Hōkūʻula] is located in Waimea until this day...It is a very famous eminence because of the battle fought by Kamalalawalu and his distinguished warrior Makakuikalani thereon. On that hill, there are no stones, nor trees, but grass and soils are thereon...
>
> While Kamalalawalu was on the hill of Hokuula, in Waimea, he beheld the dust rising above the stones of Kaniku, the stones being gradually reddened by the dirt. On

account of the many men, the darkness of the stones was covered by the dust. And when Kamalalawalu saw the men of Kaniku advancing, he inquired of Kauhikama: "Where have you traveled on Hawaii that you failed to observe the people?" Kauhikama answered: "From Kawaihae to Kaawaloa, in Kona were the places I visited, but I encountered no person." Kamalalawalu said to Kauhikama: "Did you not see houses standing?" "There were houses indeed, but there were no occupants. There were pigs running about, and there were chickens crowing." Whereupon, Kumaikeau and Kumakaia remarked: "You could not find the occupants at home, for they had gone upland to till the ground because it was morning, and they had gone out fishing. If it were in the afternoon you went there, you would have met the men at home."

Kamalalawalu, on hearing this, said to Kauhikama: "We shall perish; we can not be saved. I thought your report was true, but it is not so. By whom have you been taught that the house is a thing that stands without dwellers. Why! The house is erected, the men live therein. Woe betides us that we perish by your report..." (Fornander 1919{5}:446-448).

Kamehameha I: Rise to Power in Kohala (1790-1793)

In ca. 1790 Kamehameha I and his chiefs were living at Kawaihae. Following the advice of a priest from Kauaʻi, Kamehameha undertook the reconstruction of the *heiau* Puʻu Koholā, to dedicate it as a house for his god, Kūkāʻilimoku (Kamakau 1961:154) During this time, "thousands of people were encamped on the neighboring hillsides" (Fornander 1996:328). We also learn that large and small *ʻōhiʻa* logs were collected from the mountains above, with which to make the images and houses of the *heiau*. In ca. 1791, Kamehameha dedicated this *heiau*, and his cousin, Keōuakūʻahuʻula (Keōua)—a rival for supremacy on Hawaiʻi—was offered as the sacrifice. The narratives below are excerpted from Kamakau's account of the events that led up to the dedication of the *heiau*. In order to construct the *heiau*, Kamehameha—

…summoned his counselors and younger brothers, chiefs of the family and chiefs of the guard, all the chiefs, lesser chiefs, and commoners of the whole district. Not one was allowed to be absent except for the women, because it was *tabu* to offer a woman upon the altar... The building of the *heiau* of Puʻu-koholà was, as in ancient times, directed by an expert—not in oratory, politics, genealogy, or the prophetic art, but by a member of the class called *hulihonua* who knew the configuration of the earth (called *kuhikuhi puʻuone*). Their knowledge was like that of the navigator who knows the latitude and longitude of each land, where the rocks are, the deep places, and the shallow, where it is cold and where warm, and can tell without mistake the degrees, east or west, north or south…

When it came to the building of Puʻu-koholà no one, not even a *tabu* chief was excused from the work of carrying stone. Kamehameha himself labored with the rest. The only exception was the high *tabu* chief Ke-aliʻi-maikaʻi [Kamehameha's younger brother]… Thus Kamehameha and the chiefs labored until the *heiau* was completed, with its fence of images (*paehumu*) and oracle tower (*anuʻunuʻu*), with all its walls outside and the hole for the bones of sacrifice. He brought down the *ʻohiʻa* tree (*ʻohiʻako*) for the *haku ʻohiʻa* and erected the shelter house (*hale malu*) of *ʻohiʻa* wood for Ku-kaʻili-moku according to the rule laid down by the *kahuna* class of Paʻao. Had the class been that of the Naluʻulu the god's house would have been made of *lama* wood… (Kamakau 1961:154).

At various times in between 1792 to 1796, after the dedication of Puʻu Koholā, Kamehameha lived at Kawaihae and worked the lands of South Kohala. While at Kawaihae in 1796, Kamehameha initiated work on the great *peleleu* canoe fleet for the invasion of Kauaʻi, and had his warriors participate in intensive combat training. One famous *mele* (chant) from this period of Kamehameha's rise to power, also mentions ʻŌ-uli. What is unclear in the *mele,* is whether the reference is specifically pertaining to

the land of ʻŌuli, or to the goddess of sorcery, Uli, for which the land may have been named. This mele, "*Hole Waimea i ka ihe a ka makani*…" is said to commemorate the period in which the warriors of Kamehameha trained on the Waimea plains. The warriors are likened to various attributes of the land and weather—such as the tough *koaiʻe* forests that are buffeted by the *kīpuʻupuʻu*, or pelting rains which stab at ones skin like a spear; and call upon the *mana* (supernatural power) of the *ōhāwai* blossoms of Uli, the sorcery goddess for whom the land is named…

Hole Waimea i ka ihe a ka makani,	Waimea is stripped by the winds,
Hao mai na ʻale a ke kīpuʻupuʻu.	The buffeting waves of the *kīpuʻupuʻu*.
He lāʻau kalaʻihi ia na ke anu,	The forest is hardened in the cold,
ʻOʻo i ka nahele o Māhiki.	Matured in the forests of Māhiki.
Ku aku la i ka malanai a ke Kīpuʻupuʻu.	Rising and spreading out before the *kīpuʻupuʻu*.
Holu ka maka o ka ōhāwai o Uli,	The centers of the *ōhāwai* (*lobelia*) blossoms of Uli sway,
Niniau ʻeha i ka pua o ke koaiʻe,	The *koaiʻe* blossoms droop in pain,
ʻEha i ke anu ka nahele o Waikā…	The forest of Waikā is pained by the cold…

(cf. Roberts, 1967; Maly, translator)

"He Moolelo Kaao Hawaii no Laukaieie" (A Traditional of Lau-ka-ʻieʻie)

Another tradition, "*He Moolelo Kaao Hawaii no Laukaieie*…" (A Hawaiian Tradition of Laukaieie) was published in the native language newspaper, *Nupepa Ka Oiaio*, between January 5th 1894 to September 13th 1895. The *moʻolelo* was submitted to the paper by Moses Manu, and is a rich and complex account with island-wide references to—places; descriptions of place name origins; history and *mele*; interspersed with accounts from other traditions and references to nineteenth century events.

The following narratives (translated by Maly), have been excerpted from the *moʻolelo*, and include an overview of the tradition and those narratives which recount the birth of Lau-ka-ʻieʻie (a forest goddess), and the travels of Makanikeʻoe (a wind god). Importantly, the *moʻolelo* opens in the uplands of the Hāmākua-Kohala forest lands, at a place called Ulu, which is situated within the lands now a part of the Puʻu o ʻUmi Natural Area Reserve—marking a portion of the boundary between Puʻukapu and Waipiʻo (see Boundary Commission testimonies in this study). The introductory narratives of the *moʻolelo* offer the following description of the mountain lands, and identify the origins of several place names; and also name some of the rain-mist forms of the mountain lands:

> ***Kaholokuaīwa*** [w.] and Koaʻekea [k.] lived at ***Ulu***, in Waipiʻo Valley on the island of Hawaiʻi. They were descended from the chiefly and godly lines of Kahiki and Hawaiʻi. Their first child was Laukaʻieʻie. But, because she was born in an *ʻeʻepa* (mysterious) form, looking more like a plant than a child, she was wrapped in *līpoa* seaweed and set in the stream. Without her parents knowledge, Laukaʻieʻie was retrieved by Hina-ulu-ʻōhiʻa, a goddess of the forests and mountain lands, and nurtured. Later, two other children, boys, were born to Kaholokuaīwa and Koaʻekea. One was named Hiʻilawe (for whom the falls was named), and the other was Makanikeʻoe (who was also a wind deity).
>
> Koaʻekea's sister was Pōkāhi, and her husband was Kaukini. Though they had been married for a long time, they were childless, and because of their prayers and offerings, Hina-ulu-ʻōhiʻa approached Pōkāhi while she was gathering seaweed, and told her that she would have a girl child to raise as her own. The condition was, that no one, not even her brother and sister-in-law were to know about this child. Because Pōkāhi and Kaukini lived on the mountain ridges above Waipiʻo and Waimanu, it was easy for her to

keep the secret. It was in this way, that Laukaʻieʻie came to be raised by her own aunt and uncle. As a youth, Laukaʻieʻie's companions were the spirits of the plants and animals of the forest. When she matured, she was very beautiful, and thoughts of finding an acceptable mate for her began to grow. One night, when Laukaʻieʻie was sleeping, she dreamed of flying past the valley lands of Hawaiʻi, and across, Maui, Molokaʻi, Oʻahu, Kauaʻi, Niʻihau, Kaʻula, and on to Lehua[5], where she saw a handsome young chief, named Kawelonaakalāilehua. It was this chief that was destined to become her husband… [January 5-19, 1894]

In the edition of the paper for April 20, 1894, Manu presented readers with a beautiful *mele*, used by Makanikeʻoe to call upon his goddess sister, and the forest-body forms of Hina-ulu-ʻōhiʻa and various plant deities of the mountain lands. Several place names of the Hāmākua-Kohala mountain lands are given in the *mele*, cited below:

E-o e ka wahine iloko o ka ohu,	Respond o woman there in the mists,
O ka ohu noho i ke kuahiwi, kualono,	Mist which sits upon the mountain ridges and peaks,
Iloko i Ihikalani hale kumu ohu,	There in *Ihikalani*, mountain-house that is source of the mist,
Paihi kau ao ole ka lewa lani,	The sky clears, there is not a cloud above,
I ka noho a ka wahine kinolau,	At the place where the woman of many body-forms lives,
He kino he lau o Laukaieie,	Body form of the leaves of the *ʻieʻie*
E i aʻe ka wahine nona ka lei,	The woman for whom the *lei* was made, speaks,
I uo ia e Hinauluohia,	It was bound together by *Hinauluohia*,
He liko no ka lama i ka nahele,	from buds of the *lama* in the forest,
O ka hala me ka lehua,	Of the *hala* and *lehua*,
Ke lawe ala ka makani i ke ala,	The wind carries the fragrance,
Puia i ke ala kai o Pakaalana,	It mixes with the fragrance of the sea at *Pakaʻalana*,
Ke awili ia me ka lau lipoa	Interwoven with the *lipoa* seaweed.
He wahine noho lae kahakai,	There the woman resides on the costal promontories,
Alualu huakai o na pali,	Gathering the sea-spray along the cliffs.
Ke lele la ka wai o Kawaikapu,	The water leaps from the falls of Kawaikapu,
Ke iho la i na pali,	Descending along the cliffs,
E iho e Laukaieie, e Laukapalai,	Descend o *Laukaʻieʻie*, *Laukapālai*,
E Lauakolea, pili lau i o uka,	*Lauʻākōlea*, companion of the upland *lau-ī*
E iho mai.	Descend.

This *mele* is an example of the depth of the relationship shared between Hawaiians and their environment. It demonstrates the spiritual attachment of Hawaiians to the mountain lands and forest life—they being more than earth and plant. Each of the plant forms are the embodiments of creative forces of nature, and when respected and called upon, they were believed to help the one calling upon them. These plant and weather forms could ensure safe passage through the mountain lands, or cause one to lose one's way.

[5] The lengthy narratives include site descriptions and traditional accounts for various locations on each of the named islands.

"Kaao Hooniua Puuwai no Ka-Miki"
(The Heart Stirring Story of Ka-Miki)

Perhaps one of the most detailed native traditions which includes rich accounts of place names and traditional practices associated with the Kohala-Hāmākua mountain lands, and adjoining *ahupuaʻa*, is the historical account titled "*Kaao Hooniua Puuwai no Ka-Miki*" (The Heart Stirring Tale of Ka-Miki). The story of Ka-Miki was published in the Hawaiian language newspaper *Ka Hoku o Hawaii* (1914-1917). It is a long and complex account that was recorded for the paper by Hawaiian historians John Wise and J.W.H.I. Kihe (translators of the work of A. Fornander), with contributions from others of their peers. While "Ka-Miki" is not an ancient account, the authors used a mixture of traditions, local stories, tales, and family traditions in association with place names to tie together fragments of site specific history that had been handed down over the generations.

The complete narrative includes historical accounts of more than 800 place names (many personified, commemorating particular individuals) around the island of Hawaiʻi. While the personification of individuals and their associated place names may not be entirely "ancient," such place name-person accounts are common throughout Hawaiian and Polynesian traditions. The selected narratives below, are excerpted from various sections of the tradition, and provide readers with descriptions of the land, resources, areas of residence, and practices of the native residents, as handed down by *kamaʻāina* (those familiar with the land). Of particular interest, specific documentation is given pertaining to the practice of bird catchers, the nature of weather patterns, and the naming of many places on the mountain landscape.

The English translations below (Kepā Maly, translator), are a synopsis of the Hawaiian texts, with emphasis on the main events of the original narratives. Also, when the meaning was clear, diacritical marks have been added to help with pronunciation of the Hawaiian place names and words.

> This *moʻolelo* is set in the 1300s (by association with the chief Pili-a-Kaʻaiea), and is an account of two supernatural brothers, Ka-Miki (The quick, or adept one) and Ma-Kaʻiole (Rat [squinting] eyes). The narratives describe the birth of the brothers, their upbringing, and their journey around the island of Hawaiʻi along the ancient *ala loa* and *ala hele* (trails and paths) that encircled the island. During their journey, the brothers competed alongside the trails they traveled, and in famed *kahua* (contest fields) and royal courts, against *ʻōlohe* (experts skilled in fighting or in other competitions, such as running, fishing, debating, or solving riddles, that were practiced by the ancient Hawaiians). They also challenged priests whose dishonorable conduct offended the gods of ancient Hawaiʻi.
>
> Ka-Miki and Ma-Kaʻiole were empowered by their ancestress *Ka-uluhe-nui-hihi-kolo-i-uka* (The great entangled growth of *uluhe* fern which spreads across the uplands), who was one of the myriad of body forms of the goddess *Haumea*, one of the creative forces of nature—also called *Papa* or *Hina*—who was also a goddess of priests and competitors.

At one point during their adventure, Ka-Miki reportedly called out in praise of the lands of Kohala, describing the boundaries and famed *puʻu* (hill) formations of the district in the following saying:

> *O Kohala nui, o Kohala iki, o Kohala loko, o Kohala waho, o Kohala makani ʻĀpaʻapaʻa, o Pili o Kalāhikiola, o Na-puʻu-haele-lua. ʻOia hoʻi! ʻOia la! O nā ʻokina iho la ʻia o ka ʻāina haʻaheo i ke kāhili a ka makani ʻĀpaʻapaʻa e hoʻolaʻau mai ana me he ipo ala ka nē hone i ka poli o ke aloha —*
>
> Large Kohala, little Kohala, inner Kohala, outer Kohala, Kohala of the *ʻĀpaʻapaʻa* wind, of Pili and Kalāhikiola, the two traveling hills. Indeed! They are the combined sub-districts of this proud land brushed by the *ʻĀpaʻapaʻa* wind, maturing like a love nestled

fondly in the bosom of love (*Ka Hoku o Hawai'i*, March 22, 1917).

For generations, sayings like the one above, have been spoken in praise of Kohala and its various land divisions which extend from Honoke'ā on the Hāmākua boundary to Ke-ahu-a-Lono on the Kona boundary.

Several places of traditional importance around the perimeter of Waipi'o, on the valley floor and cliffs, and in the forests, were described in the *mo'olelo*. In addition to the place name references, we also find descriptions of traditional customs and practices associated with the various localities mentioned. The following excerpts from the *mo'olelo* identify some of the storied places on the landscape (given by date of occurrence in the original texts); first occurrence of the place names is also identified with bold and italics:

> ***Ha'i-wahine*** (Woman [who] speaks) and ***Ha'ina-kolo*** [6](Grumbling answer) are places on the cliffs of ***Waipi'o***. When *Ka-uluhe* prepared Ka-Miki and Maka-'iole for the *'ailolo* (completion of training ceremonies), she sent the brothers to fetch certain items; Ka-Miki was to fetch the sacred water of *Kāne* from Kawaiakāne on Mauna Kea; and Ma-Ka'iole was to get the *'awa* of Waipi'o. The brothers were also instructed to visit their ancestress at ***Lanimaomao***. [*Ka Hoku o Hawaii, February* 5, 1914]
>
> The brothers departed to get the required items, and first went to meet with their goddess-ancestress *Lani-nui-ku'i-a-mamao-loa*, commemorated as the place called Lanimaomao (near the Māhiki section of the Waimea plateau lands). When *Lani-nui-ku'i-a-mamao-loa* inquired of their journey and quest, Ma-Ka'iole chanted, telling her about the *'awa* that he was to acquire—
>
> | | |
> |---|---|
> | *Aia la ilalo o Waipi'o,* | It is there below in Waipi'o |
> | *I ka pali o Kaholokuaīwa* | Along the cliff of ***Kaholokuaīwa*** |
> | *I ka 'awa 'ili lena* | The yellow barked *'awa* |
> | *I ka papa lohi o 'Āpua* | On the long plain of ***'Āpua*** |
> | *A ka mano o ke akua* | *'Awa* of the 4,000 gods |
> | *A kini o ke akua* | *'Awa* of the 40,000 gods |
> | *A ka lehu o ke akua e inu ai* | *'Awa* which the 400,000 gods drink |
>
> Now this was the cherished *'awa* of *Luanu'u-a-nu'u-pō'ele-ka-pō*, king of the ghost hordes… [*Ka Hoku o Hawaii February* 12, 1914]
>
> *Lani-nui-ku'i-a-mamao-loa* tested the brothers to ensure that they possessed the skills necessary to complete their tasks. Upon completion of the test, she felt that Ma-Ka'iole would not be able to safely fetch the *'awa* from Waipi'o, so she told Maka-'iole that he should go fetch the *'awa* strainer, *Ka-lau-o-ke-kāhuli* [made from a native rush that grew on the watered lands of Waikōloa]. She then prepared Ka-Miki to travel to Waipi'o, and warned him not to make any sounds lest he awaken the gods as he drew near the ledge of Ha'iwahine.
>
> She went on to tell him,
>
> > When you reach the hill of ***Pua'ahuku***, gaze below to the *heiau* of ***Pāka'alana***, and look upon Waipi'o, there you will see the cliff of ***Kaluahine***. Then look to the side and go into the *'ōhi'a* forest of ***Ka'auana***. It is there that you will find the *'awa* container called *Ka-pāpāiaoa* [*Ka pāpāia'awa* (The ceremonial *'awa*)], which *Luanu'u-a-nu'u-pō'ele-ka-pō* uses as his pillow so that no one could take it.

[6] Ha'iwahine and Ha'inakolo – names of a goddess who was called upon as a deity of the forest, birds, and *kapa* makers

Luanuʻu will be there in the center of his *hālau hale aliʻi* (royal compound), and the assembly of 4,000, 40,000, 400,000 ghosts will be outside.

When *Lanimaomao* completed her instructions, she allowed Ka-Miki to depart.

In the blink of an eye Ka-Miki disappeared from *Lanimaomao*, and arrived at the forest of ***Māhiki***. Leaping again, he arrived at ***Puaʻahuku***, and he looked upon the beauty of Waipiʻo. Ka-Miki then turned and leapt to the heights of Kaʻauana, and went to the cliff of Kaholokuaīwa where he saw the royal compound of Luanuʻu along the ledge of ***Hea-ke-akua*** (Call of the Warrior), overlooking ***Nā-poʻopoʻo*** (The nooks and crannies), in Waipiʻo, not Kona.

Indeed, there were innumerable ghost beings throughout the region. Ka-Miki called upon his mist-goddess elder, *Ka-ʻohu-kolo-mai-iluna-o-ka-lāʻau*, and a thick mist settled on Waipiʻo, even covering the compound of the god *Luanuʻu*. Ka-Miki then leapt and landed upon the ridge pole of the gods long house. Ka-Miki parted the bird feathers, for this is what the house was thatched with, and looked in. He saw that the god and those with him were sleeping, nestled in the mists of the *ʻawa*. Now, those in the house were of various shapes and sizes, some with hollow eyes, others with long thin necks, or hands that reached to their feet, truly things which living people would fear…

Before taking Luanuʻu's *ʻawa*, Ka-Miki played a trick on *Luanuʻu* and awakened him from his *ʻawa* induced sleep. Ka-Miki then hid unseen amongst the rafters of the *hālau*. *Luanuʻu* called upon his *kūkini*, *Mū-kā* and *Mū-kī*, commanding that they capture the one who would attempt stealing his cherished *ʻawa*.

Luanuʻu sent his messengers to places where *ʻawa* was grown or would be consumed. *Mū-kā* was sent to the cliff of Mōlīlele by Palahemo, Kaʻū. *Mū-kī* was sent to start at the cliff of ***Kaʻenamakaohue*** (Neue, Kohala), where the wind entered along the cliff ***Makanikāhiō***. *Mū-kī* was then to encircle the island searching, Kapākai and Kahuā (Kohala), Kalinaʻōpelu, on the plain of Kanikū; and ascend Puʻu Anahulu to look for a sign from the image of the god *Kapu-ko-malo*.

Mū-kā and *Mū-kī* were then to circle around to the heights of Humuʻula and inquire of ʻŌmaʻokoʻili and ʻŌmaʻokanihae if either of them knew who this rascal thief was; and then go to the chiefesses Poliʻahu, Lilinoe and Kapiko-o-Waiau to see where they dug the water way and guarded the sacred water of *Kāne*; to see if they were responsible. *Luanuʻu* then commanded them to go to ***Puʻu-o-Moeʻawa*** in the forest of Māhiki and stand guard.

Mū-kā and *Mū-kī* departed and the multitudes of other ghosts wandered (*ʻauana*) through the depths of forests of Māhiki and ***Pōkāhi*** in search of this rebel. Ka-Miki heard the indistinct voices of these many ghosts ascend the cliff, and pass through the forests to the heights of Pūʻawaliʻi in the thick mist which ensnares the fished birds. When all the ghosts were gone *Luanuʻu* fell back to sleep with the *ʻawa* container as his pillow. Ka-Miki then leapt from the ridge pole and took *Ka-pāpāiaoa* which was filled with *ʻawa* that had been made ready to use and bundled into balls [wrapped] with *limu pāʻihiʻihi* (a native *limu pōhaku* (rock moss) weed [*Nasturtium sarementosum*]).

Luanuʻu arose greatly angered thinking that he would ensnare this rascal upstart in the net of *Nananana-nui-hoʻomakua* (*Nana-nui* was also one of Luanuʻu's ghost marshals). But unseen, Ka-Miki hid on the ridge pole of the *hālau hale aliʻi* where he held the *ʻawa* container [*Ka Hoku o Hawaii* February 19, 1914].

Luanuʻu, who was also called *Pāhulu nui,* then leapt to the place where the sacred *pahu* (drum) *Lono Hāwea* was kept at the temple of Pākaʻalana. Striking the *pahu*, he

called all the wandering ghosts to return to the lowlands of Waipiʻo. The voice of this drum was a great sign that all of the pathways were to be sealed. The command was heard by all—along the *hulaʻana* cliffs from Waipiʻo to the ledge of Makanikāhiō; heard by those who were at Koholālele and Maulua; heard by those who were by the steep cliffs looking to the uplands of Kalaiʻeha (Humuʻula); and heard by those who were in the forest of Māhiki. And so all of the pathways and swimming trails were blocked, and the net trap was set.

While all of this occurred Ka-Miki remained hidden in the rafters of the *hālau*. One of the ghosts looked inside and saw Ka-Miki upon the ridge pole and prepared to call out on the *hōkio* (gourd nose flute) which would alert the ghosts that the upstart had been found. With great speed, Ka-Miki then leapt from Heakeakua up to the ridge heights, and landed on a *kāwaʻu* (*Ilex anomala*) tree branch. *Ka-ʻohu-kolo-mai-iluna-o-ka-lāʻau* then covered the region in a thick mist, blocking everything from view.

The cry of the ghost hordes could be heard from uplands to shore, as they hungrily looked for Ka-Miki, having been thwarted in their attempts to ensnare him in their supernatural net *Nananana-nui-hoʻomakua*, just as birds were caught. The ghosts wandered along the cliffs and forests of ***Ka-ʻauana*** (on the Kohala side of Waipiʻo) and Māhiki (on the Hāmākua side of the Waipiʻo bluff), and were unable to catch Ka-Miki.

Under the cover of his ancestresses' mist body form, Ka-Miki leapt from the *kawaʻu* tree to ***Puʻu-o-Moeʻawa*** in the forest of Māhiki. Because the ghosts wandered hungrily about, two named places commemorate their wandering and having gone hungry—***Ka-ʻauana*** (The wandering), and in Waikoʻekoʻe, ***Pōloli-ke-akua*** (The hungry ghosts), which is also called *Pōloli-(i)-ka-manu* (Hungry for the bird).

At ***Puʻu-o-moe-ʻawa*** (The hill of prostate *ʻawa* growth), Mū-kī Luanuʻu's ghost messenger intercepted Ka-Miki, but Ka-Miki thwarted his efforts at catching him by throwing foul smelling dirt (dabs of excrement) at him. Though many other ghosts arrived for the fight, they were all driven off, as Ka-Miki began destroying them.

Hio and Nana-nui, Luanuʻu's ghost marshals, told their chief about the events at Puʻuomoeʻawa, and Luanuʻu blew the conch, *Hā-nō*, also called *Kiha-pū*, which was the conch that the supernatural dog *Puapualenalena* stole from the ghosts of Waipiʻo. Hearing the call of the conch, the remaining ghosts fled from Puʻuomoeʻawa, leaving Ka-Miki who returned to Lanimaomao. Ka-Miki presented the sacred *ʻawa* container *Kapāpāiaoa* and *ʻawa* to his ancestress, and she cleansed him in the rains of Waimea.

Ka-Miki and Ma-Kaʻiole were reunited and returned to Kona with their treasured items… [*Ka Hoku o Hawaii*, February 26, 1914]

While in the district of Puna, Ka-Miki entered into a contest that required the collection of certain choice items. Among the required items, was an *ʻoʻopu ʻai lehua* (lehua blossom eating goby fish) from Hiʻilawe. In the account describing the lands in which this type of *ʻoʻopu* was found, we learn further of the nature of the mountain lands and resources of Waipiʻo:

Hiʻi-lawe (Lift and carry, as when the waters rise clearing the river path from mountain to shore). During the contest between Kahaualeʻa (of Puna) and Ka-Miki, Ka-Miki was carried by his ancestress *Ka-ʻohu-kolo-mai-iluna-o-ka-lāʻau* to Waipiʻo where he visited the cliffs and wondrous waterfall of Hiʻilawe which cascades from the cliffs of ***Kapaʻihi***, below the long plain of ***Maukele***. A great rain fell and cleansed the land, the voice of Hiʻilawe was carried to the ocean at Pākaʻalana. The water flowed with such force, that it broke the sand ridges, allowing the *ʻanae* and fish of all kinds to swim into the river ponds at the base of Pākaʻalana.

Now Hiʻilawe was famed for a variety of goby fish called *ʻoʻopu-ʻai-lehua* (*ʻoʻopu* which eats *lehua* flowers that fall into the pool at the base of Hiʻilawe). These *ʻoʻopu* were the second of two items which the *kūkini* contests between Ka-Miki and Kahaualeʻa required be brought back alive to Pūʻula, in Puna. [*Ka Hoku o Hawaii* January 6 and February 3, 1916]

Traveling through the district of Hāmākua, while on their journey around the island, Ka-Miki and his companions arrived in Waipiʻo, and set in motion events that would allow Ka-Miki to set right the practices of the *ʻōlohe* in the region. In the events that transpired, we learn about the naming of localities, and nature of the landscape of the Hāmākua valleys and mountain lands:

While arranging the contests at Pākaʻalana, the chiefs Pili-kaʻakaʻa and Pili-kuamea called on their *ʻōlohe* to unify and support all of Hāmākua in this competition against Ka-Miki. Understanding their intent, Ka-Miki approached the gathering and called out in a *mele* —

He lā manu ka kēia o Waipiʻo,	This is a day that the birds gather at Waipiʻo
Ke wili nei i ka lehua,	Encircling the *lehua*,
Ke piʻi nei ka ʻōpae kalaʻole,	The clawless shrimps (inexpert competitors) rise up,
Ka hinana pākanaka o Wailoa,	As do the tame *hinana* shellfish of Wailoa,
E hoʻokomo ana i ke ao a ka ua,	The rain clouds enter the valley,
He lā ua kēia kūʻululū nei,	It is indeed to be a cold rainy day,
Kūʻululū ka manu ua ʻōpili,	The birds are chilled, numbed by the rain (filled with anxiety),
ʻŌpili i ka ua hoʻokina lēhei pā,	Numbed in the rain which blemishes, and passes over walls,
He pā mauka, he pā makai,	Striking the uplands, striking the lowlands,
Pōʻai a puni a koe koena,	Encircling all who remain,
I hoʻokoe ʻia na Ka-Miki,	All [the competitors] who remain for Ka-Miki
No ka uhu haehae ʻupena o nā pali,	Who is like the *uhu* fish of the cliff which tears at the net
No ka iʻa nahu kananā o ka hulaʻana,	Who is like the fierce biting fish [shark] of the *hulaʻana* (swimming trails).
Ka ʻalaʻihi kala loa e pau ʻai nā lima i ka ʻekeʻeke!	The *ʻalaʻihi kala loa* [*Holocentrus*] fish which consumes [pierces] hands in the fisherman's bag (one who should not be trifled with)!

The *ʻōlohe* Kapuaʻikāhi ridiculed Ka-Miki's implications, and asked,

> O deceitful one - where indeed are the storm clouds? For one can see that the sky is clear.

Ka-Miki responded,

> Because you do not see the sign of the coming rains, you ask your childish questions.

Then, breaking the contest rules, Kapuaʻikāhi leapt to attack Ka-Miki, and was immediately killed. The *ʻōlohe* cried out and would have broken the protocol of the *kahua* and contest by rushing in to attack Ka-Miki, but Kahoʻālalāʻau and the chief Pili-Kaʻakaʻa commanded they stay in place.

Hono-a-kaʻa-ka-lani was called next to compete and lose. In all, twelve master *ʻōlohe* of Hāmākua competed, and were defeated, either bound or killed by Ka-Miki.

Kahoʻālalāʻau then called to Ka-Miki,

> Only ʻ*Kahoʻālalāʻau-a-Kaholokuaīwa*ʻ remains." Kahoʻālalāʻau then told Ka-Miki that his grandmother *Kaholokuaīwa-i-ka-papa-lohi-o-Maukele* named him to fulfill his destiny as a master wielder of war clubs and spears.

Ka-Miki and Kahoʻālalāʻau both related the nature of their training and prepared to compete [*Ka Hoku o Hawaii*, October 19, 1916]. Ka-Miki evoked *Ka-uluhe mā* and *Nihoʻeleki*, and then called to Kahoʻālalāʻau, "Now is the time to test the skills of our teachers."

Kahoʻālalāʻau was famed from Hawaiʻi to Niʻihau for his knowledge and skills in spear and club fighting, and had studied the techniques of each island. As the two exceptional *ʻōlohe* prepared to compete, Ka-Miki called to Ma-Kaʻiole, asking him to fetch his war club *ʻŌlapa-kahuila-o-ka-lani*. Maka-ʻiole departed and immediately disappeared in the "*noe pōhina e kokolo aʻe ana ma nā pali o Kaholokuaīwa*" (mists which crawl over the cliffs of ***Kaholokuaīwa***.)

Standing at the door of Ka-uluhe's house, Ma-Kaʻiole called to his ancestress and she gave him the cherished war club as he requested. Ma-Kaʻiole then returned to those gathered at Pākaʻalana. Kahoʻālalāʻau and the young Pili chiefs all took note of the dark glistening club, oiled with *niu* (coconut) and *kukui*, and so the people of Hāmākua understood that Ka-Miki was a true expert.

Ka-Miki then called to Kahoʻālalāʻau, "What shall the sign of victory be?" Kahoʻālalāʻau answered, "The breaking of the others war club." Thus Kahoʻālalāʻau and Ka-Miki competed in all manner of war club and spear fighting techniques as practiced on Hawaiʻi, Maui, Oʻahu, and Kauaʻi. [*Ka Hoku o Hawaii*, November 9, 1916]

Both competitors were evenly matched, the Pili chiefs, their experts, and all gathered at Pākaʻalana were amazed at the fierce nature of their competition. Two of Kahoʻālalāʻau's clubs were broken, and when his hand was broken as well he called to Ka-Miki,

"The victory is Ka-Miki's, for I have used four techniques, broken two war clubs and now broken my hand."

Ka-Miki responded,

"It is so, you have been defeated by the fisherman who set down the lines, securing — *Ka ʻōpae piʻi i Kōkī o Wailau, i ka paihīhī a ka hinana e piʻi ai* (The shrimp which ascend to the heights of Wailau, the trickling waters ascended by the *hinana*).

Kahoʻālalāʻau then asked, "Let us end our contest and become friends" [*Ka Hoku o Hawaii*, November 26, 1916] .

Ka-Miki accepted the surrender; Kahoʻālalāʻau and the Pili chiefs then hosted Ka-Miki to food and a *pāpāiʻawa* ceremony. And because Kahoʻālalāʻau greatly admired the superior skills of Ka-Miki, he asked to take Ka-Miki *mā* as his foster sons, and that they accept the guardianship of the Pili chiefs. Ka-Miki accepted, and after spending some time in Waipiʻo, Ka-Miki, Ma-Kaʻiole and Keahialaka departed from the land of the

beloved cliff of Haʻinakolo, and began their journey to the steep cliffs of Waimanu [*Ka Hoku o Hawaii*, December 7, 1916].

Wai-manu (Bird water or Water [of the] bird), was described as a rich land, well watered and cultivated —

> *O Waimanu ka ʻāina, ke ulu ala no ke kalo, ka ʻuala, ke kō, ka maiʻa, ka uhi, ka pia, ke ku ala no nā pali, a ke lele ala no ka wai i nā pali, o ka ʻōpae piʻi a me ka hinana ke piʻi ala no i Kapaʻihi...*
>
> Waimanu is the land in which grows the taro, the sweet potato, the sugar cane, the banana, the yams and the arrowroot, and where the cliffs rise above, [land where] water leaps upon the cliffs, and the *ʻōpae* and *hinana* climb up to Kapaʻihi… [*Ka Hoku o Hawaii*, September 21, 1916]

In the following part of the tradition, readers are provided with descriptions of travel through the mountain and valley lands of Hāmākua and Kohala region. Several places within the forest zone of the Puʻu o ʻUmi NAR, and along the neighboring valley lands are named. These include Ulu, Kawaihoʻolana, and Pōkāhi. Readers are also introduced to traditions associated with practice of the *lawaiʻa manu*, or bird catchers in the region:

> The lands of ***ʻĀwini*** (Forward, or Bold) were named for the spear fighting instructor and champion of the sacred *ʻōlohe*-chief ***Kalaʻe*** (The clearing), who controlled the lands from ***Waimanu*** to ***Honopuʻe***.
>
> Ka-Miki and his companions departed from Pākaʻalana in Waipiʻo, and traveled along the path which led past the cliff of ***Hea-a-ke-koa***. At ***Pū-ʻawa-liʻi*** (Clumps of *ʻAwa*) and in various places between Waipiʻo and ʻĀwini, it was the custom of the people to "*lawaiʻa manu*" practice the netting of birds, like the netting of fish. The nets of the *poʻe lawaiʻa manu* were hidden in the forests, darkened by the mists of ***Pōkāhi*** (Darkened Place), which settled thickly over the land. Now the lands and mists of *Pōkāhi* were named for the mysterious formed *kūkini* (messenger-runner and cliff leaper) of the chief Ka-laʻe.
>
> As Ka-Miki *mā* [7] approached Waimanu, they were met by Pōkāhi, who led the visitors to the compound where his chief, Kalaʻe and his daughter ***Ka-wai-kapu*** (The Sacred Water) lived. Leaving Ka-Miki *mā* with Kawaikapu, Pōkāhi went to speak with Kalaʻe, who seeing the strangers called out to Pōkāhi—
>
> > *E kuʻu keiki i ka ʻupena kuʻu i ka noe o Pōkāhi, he uwahi ke kāpeku a hei ai ka iʻa manu o Pūʻawaliʻi!*
> >
> > O my son of the net set down by the mist of Pōkāhi, mist which strikes (confuses) and ensnares the birds of Pūʻawaliʻi, birds that are caught in nets like fish!
>
> Where have these youth come from? How has their journey brought them to you?
>
> Pōkāhi answered, "They have come from the cliff of Heaakekoa and Kawaikapu."
>
> Kalaʻe responded, "Listen my son, you know my custom, it is forbidden that anyone travel these cliffs without my permission."
>
> To which Pōkāhi answered, "Yes, I know your laws and so it shall be that the mists of

[7] *Mā* – and companions.

Pōkāhi ensnare the fished birds of Pūʻawaliʻi. Your wish is my command."

Over hearing this conversation, Ka-Miki called out, "I understand that which you have said. So you say that this place is restricted, and no one may pass by?"

Kalaʻe said, "It is forbidden!"

Ka-Miki then boldly asked, "So you think that you may set boundaries on where travelers may pass by the cliffs, forbidding any to pass this way?"

Kalaʻe answered, "I am entitled to set the boundaries, forbidding any who have no right to be here. I am the *aliʻi kapu* (sacred chief) of these cliffs—

> *O Kalaʻe au o Ulu, o Kalaʻe au o Kawaihoʻolana, o Kalaʻe au i ka ʻupena kuʻu i ka noe o Pōkāhi o kuʻu kūkini aīwaiwa e ku nei!*
>
> I am Kalaʻe of ***Ulu***, Kalaʻe of ***Kawaihoʻolana***, I am Kalaʻe of the net which is set down, of the mist of Pōkāhi who is my mysterious messenger awaiting here.

It is so, boastful youth, and it is a clear day (one for easy victory) along the cliffs of the *hulaʻana* (swimming trail) of ***Kākāʻaukī***."

Ka-Miki told Kalaʻe, "Is that so? You are Kalaʻe? You who speaks like a child, with a barren head like the heights of Hīhīmanu (without wisdom); like a beardless youth (inexperienced), your name should be — *Kalaʻe heuheu ʻole*" (Kalaʻe without fuzz [beardless or without pubic hair, i.e., without experience]).

Hearing Ka-Miki's reply, Kalaʻe was outraged and he called the spear fighting instructor, ʻĀwini to bring *Kuʻi-a-lau* the famous spear of Kalaʻe. ʻĀwini arrived, and Kalaʻe called to Ka-Miki, "Stand to meet ʻĀwini and Kalaʻe." Kalaʻe thrust at Ka-Miki, but Ka-Miki dodged each attack. ʻĀwini then attacked with his club *Kuʻi-ka-honua-opeope*, but both Kalaʻe and ʻĀwini were defeated. Kalaʻe and ʻĀwini surrendered and gave up their waylaying of travelers along the cliff trails.

Ka-Miki then turned to Pōkāhi and called to him—

> *E ke aikāne, ua ʻike maka iho la ʻoe iā Ka-Miki i ke aka o ka hauna lāʻau a Ka-uluhe-nui-hihi-kolo-i-uka... O Ka-Miki kuʻu inoa, no ka miki i nā mea a pau loa a kuʻu kūpuna wahine i aʻo mai iaʻu a ʻoia kēia huakaʻi e hele nei. Huakaʻi hele e hoʻopāpā ma nā mea a pau loa aʻu i aʻo ai me kuʻu kūpuna wahine aīwaiwa hiapaʻiʻole, a o ka puni koe o ka moku kele i ke kai o Hawaiʻi nui kua uli ʻāina a ka lā e kiaʻi mau ana i ka nani o nā kuahiwi kūhaʻo e haʻawe mai la i kuʻu kūpuna wahine iā Ka-ʻohu-kolo-mai-iluna-o-ka-lāʻau...*
>
> Hail o companion, you have personally seen Ka-Miki the image of the war club of *Ka-uluhe-nui-hihi-kolo-i-uka*. My name is Ka-Miki, because I am adept in all things taught to me by my ancestress, and this is the nature of my journey. A journey to compete in all of the things which I have learned from my wondrous and foremost expert ancestress – nearly the entire island of *Hawaiʻi kua-uli* which sails through the sea has been encircled, this land where the sun watches over the extraordinarily beautiful mountains which bear my ancestress *Ka-ʻohu-kolo-mai-iluna-o-ka-lāʻau* (The mist which creeps atop the forest).

Pōkāhi cried out, "*ʻAuwē!* So this is your ancestress. She is a close relative of my own ancestress who taught me all I know." Thus Pōkāhi and Ka-Miki *mā* understood their

relationship and parted as friends. Ka-Miki, Maka-ʻiole and Keahialaka then traveled to Honokeʻā and entered Kohala. [*Ka Hoku o Hawaii*, December 7, 1916]

Departing from ***Ulu*** and ***Kalaʻe***, Ka-Miki *mā* then met the *ʻōlohe* brothers, Māhu-a-lele and Ka-lele-a-māhu, whose practice it was to waylay travelers along the cliffs of ***Nā-hunapalai*** (The *Polypodium hymenophelloides* ferns); also called *Nā pali kapu o ka hulaʻana o Nāhunapalai* (The sacred cliffs of the swimming trail of Nāhunapalai).

The cliffs of Nāhunapalai extend from Waimanu across ʻĀwini and into Kohala. There are many famous places along this expansive cliff line between Hāmākua and Kohala. One place is called Kākā-au-kī (Strip the stalk of the ti plant)), an area famed as a treacherous *hulaʻana* (trail section passed by swimming). Because sections of the *ala loa* (trail) along the coast line here were blocked by steep cliffs, travelers were required to cross the *hulaʻana* in the treacherous shark infested waters (stalks of ti plants were thrown into the crossing before swimming, to test if sharks would attack). [*Ka Hoku o Hawaii*, December 14 & 21, 1916]

Poʻe Lawaiʻa Manu me Poʻe Kia Manu
Bird Catching Techniques of the Ancient Hawaiians

In addition to the references cited in the preceding section, there are a number of traditional accounts describing the *lawaiʻa manu*, those people who "fished for birds," and *poʻe kia manu* (people who caught birds with bird lime). The *lawaiʻa manu* were particularly noted in the Hāmākua-Kohala mountain lands, where they relied upon the cover of thick mist and clouds to conceal their nets in the forests. One chant which employs poetic symbolism, describing the fishing for birds, was published in the Hawaiian newspaper *Ka Hoku o Hawai'i*—Kaukini and Pōkāhi are locations on the mountain bluffs of Waipiʻo; *Pōkāhi* and *Ka-ʻohu-kā-kīkepa*, are famed mists of the region; and Kaʻauana is one of the cliff faces of Waipiʻo Valley:

Ua ike ia Kaukini, he lawaia manu,	Kaukini is seen, a place where birds are caught,
He upena kuu i ka noe Pokahi	A net is set down in the mist of *Pōkāhi*,
Ua hoopuni ae la i ka ohu Kakikepa	Surrounding the birds like the mist, *Kākīkepa* (a mist so thick that it Is worn like a garment)
Ke na'i la i luna o Ka'auana...	Which obtains (reaches) the heights of Ka'auana...

[*Ka Hoku o Hawaii*, May 26, 1908; Maly, translator]

Other methods of bird catching were also widely practiced by native Hawaiians. Early historical accounts recorded in the 1900s, tell us that traditionally, the rarer birds, whose feathers were sought for ornamental purposes were not killed by the bird catchers. One account from the later period in the life of Kamehameha I, reported that as a result of growing commercial activities in the islands, traditional methods of harvesting resources and catching birds, were changing. Kamakau (1961) wrote:

Troubles that arose were not of his making, and those that had to do with disputes about religion came after his time. He ordered the sandalwood cutters to spare the young trees and, not to let the felled trees fall on the saplings. “Who are to have the young trees now that you are getting old?” he was asked and he answered, “When I die my chief and my children will inherit them.” He gave similar orders to bird catchers, canoe makers, weavers of feather capes, wood carvers, and fishermen. These are the acts of a wise and Christian king who has regard for the future of his children, but the old rulers of Hawaii did the same. [Kamakau, 1961:209-210]

While researching various ethnographic records of the Bernice Pauahi Bishop Museum (BPBM), the author reviewed Hawaiian language papers (handwritten and typed) collected by island historian, Theodore Kelsey. Kelsey was born in Hilo in the late 1800s, and spent his entire life speaking with elderly Hawaiian people, collecting their stories, and translating their writings. Among his papers curated at the Bishop Museum (BPBM Archives–SC Kelsey; Box 1.5), are notes on various aspects of Hawaiian culture including bird catching. Kelsey's informant, was the elder Reverend Nālimu, who shared his account of bird catching, both as a means of providing feathers used for making Hawaiian emblems of royalty, and with other birds, as a food source. While the account references localities in the uplands of ʻŌlaʻa and the Hilo District, it is cited here, as a first-hand description of traditional and customary practices which had broad application in the mountain regions, as those in the Kohala-Hāmākua mountain lands.

The following Hawaiian texts are presented verbatim as recorded by Kelsey in c. 1921 (including his use of diacritical marks). The English translation of the Hawaiian narratives was prepared by the author of this study, and reflects the basic tenor of the Hawaiian narratives. It should be noted here, that in the Hawaiian language, occurrences of certain words naturally imply a specific action or statement:

AHELE MANU
by H.B. Nalimu
Poʻe kia manu o Laa, oia ka poʻe ahele manu, kekahi me ka laau a kekahi me ka lehua. O ka mea ahele manu ma ka lehua malaila ka puka e hanai kokoke i ka lehua, he puka paa ke-ia. Kekahi piko o ke kaula ma ka la-la o ka ʻohiʻa e paa ai. Elima, eono paha anana ka lo-ihi o ke aho mai ka puka mai a hiki i ka lima o ke kanaka e paa nei i ka piko o ke aho. A o ka puka aia ma kahi kokoke i ka lehua e kiko aku ai ka manu i ka lehua. I ka wa e lele mai ai ka manu lele no a ku maluna o ke-ia puka e kiko aku i ka lehua. A ia manawa e huki ai ke kanaka i ka piko o ke kaula a paa ka wawae o ka manu. Pii ke kanaka iluna a lawe i ka manu a hana hou aku i kela puka malaila. O ka akakane a me ka ʻiiwi, a me ka ʻo-oʻ iluna o ka pua lehua. Ahele me ke aho olonaʻ makalii. Maluna o ka maiʻa pala e ahele iʻ ai ka manu o-u'.

KĀWILI KĒPAU*. O ke kepau oia ke kohu o ka ʻulu. E ʻoki-oki ai i ka ʻulu a kahe mai ke kohu keʻokeʻo, a i ka wa e maloo ai ua kohu ʻla i ke ahiahi alaila ua paa aʻe ua kohu la. Hele oe e ho-ulu-ulu ke-ia kohu a pau. Ho-ulu-ulu a nui, alaila lilo aʻeʻla uaʻ kohu nei i kepau. Alaila hele oe e ʻohi i hookahi kukui maka a hemo kona iwi ʻa ʻo kona ʻiʻo malama 'oe kelaʻ. Hele hou oe i ka' pa-ihi ku-kepau (kind of clover) he pa-ihi ʻele-ele ia, a hoohui me ke kukui maka, alaila nau a wali ke kukui maka me ka pa-ihi. Hookomo iloko o ke kapa wauke (he mea uaua ia), alaila ʻuwiʻ i ka wai o ke kukui a me ka pa-ihi iloko o ka ʻopihi, oia ka "ipuhao" e kupa ʻai iluna o ke kapuahi. I ka wa e hoomaka ai e paila alaila ʻoki-oki i ke kepau a liilii a hookomo iloko o ke-ia wai kukui me ka pa-ihi i paila ia. Kii elua ni-au ai ʻole ia, mau laau liilii paha e koali ai iloko o ke-ia wai paila. Pela e hanai a pau kelaʻ wai a moʻa kelaʻ kepau. Hookomo iloko o ke poho ʻopihi a i ʻole he la-iʻ a wahi i ka la-iʻ. Kāwili ʻiuka a'e nei o Mokau-lele. Neenee ke pulu ʻohiʻa o ia wahi ilalo o ka pahoehoe.*

Ilalo no oe e ku ai o ka pahoehoe a hana oe i ke kepau iluna o ka pua lehua. Ina ekolu, ehaʻ pua lehua au i kāwili ai i ke kēpau alaila i ka wa e pili ai kekahi pua lehua i ka manu alaila alualu a loaa. Pee hou oe iloko o ka pulu ʻohiʻa (kāhi o ka lau ʻohiʻa e luhe ana ilalo, oia ka pulu ʻohiʻa) a pili hou kekahi manu. Opaʻ ke poo o ka manu a make. Hookomo iloko o kekahi eke. Hola ekolu paha alaila hoʻi, nui ka manu, i hookahi kaau, iwakalua, kanakolu paha. A kela manu makalii; ua momona——kuhikuhi kona iʻo, momona. Oia ke kāwili kēpau.

LAAU KIA MANU*. Ekolu, ehaʻ paha anana ka lo-ihi o ka laau. Kau ia ka pua lehua iluna o ia laau nei mai kekahi ʻao-ao o ka laau a hiki i kekahi poo o ka laau. Hana elua*

kanaka, kekahi ma kekahi laau a kekahi ma kekahi. Kepau maluna o ka laau a he mau pua lehua mawaena o ke-ia mau kēpau—he laau kia manu ia |_____|. Olaa ka aina kia manu a me Piihonua. Nui ka manu o-o‘ ma Puu O-o‘. Malaila ka po‘e kia manu e hele ai a loaa na lei hulu no na lii. O Pana-‘ewa kekahi wahi kia manu.

Huki ka laau kia manu iluna mawaena o na ‘ohi‘a elua. Hana me ka ‘upena kekahi. Huki ia iluna ka ‘upena, hookahi laau maluna, hookahi laau malalo. He ‘upena ‘olona‘ maka hakahaka, a he kaula ‘olona‘ ma na poo. ‘Elima, eha‘, ekolu paha anana kela' ‘upena palupalu. Lele no ka manu, paa ka wawae, paa ka pekekeu. Ina‘ hookahi, elua manu, waiho no pela', oia na manu e kahea ana i na manu e a‘e. Nui ka manu, hookuu ilalo ka ‘upena a huki hou iluna. He ulu ‘ohi‘a ma kekahi ‘ao-ao a me kekahi ‘ao-ao. Oia ka hana ana o ka po‘e lawai‘a manu. Ho‘i i ka hale e wehe ai ka hulu o ka manu ‘o-o‘. Piha ke po‘i i ka hulu a haku lei. Malalo o ka po-ae-ae o ka o-o‘ oia ka hulu a-a‘, a maluna o ka piapia oia me pue.

Bird Snaring (or Trapping)

Bird catchers (*kia manu*) of ‘Ōla‘a were people who snared (*‘āhele*) birds. Some with branches and others with *lehua* blossoms. The individual who snared birds among the *lehua* made a snare (lasso) close to the *lehua* flower, the snare was secured there. One end of the line was securely fastened on the branch of the *‘ōhi‘a*. The cord of perhaps five or six fathoms long, extended from the lasso (on the branch) to the man’s hand where the end of the line was held tightly. The snare was placed close to a *lehua* blossom, where the bird would step (*kīko‘o*) to the *lehua*. At that time, the man would then pull the end of the cordage and secure the feet of the bird. The man then climbed the tree, took the bird, and he would make the snare there again. The *‘akakane* (*‘apapane*), the *‘i‘iwi*, and the *‘ō‘ō* were caught up in the *lehua*, snared with fine *olonā* cordage. The *‘ō‘ū* bird was snared while it was on the ripe banana fruit.

Preparing Bird Lime to Kāwili, or Ensnare Birds.

The bird lime (*kēpau*) is made from the sap of the breadfruit. Cut the breadfruit bark and the white sap flows, and when the sap is dry, say in the evening, the sap is hardened. You go and gather the sap. When enough has been gathered, the sap can be made into bird lime. Then you go and gather some raw *kukui*, removing the shell, you keep its meat. You then go and get the “clover” for making bird lime (*‘ihi-ku-kapu*, the *Nasturtium sarmentosum*), it is a black *pā‘ihi*, and you mix it with the raw *kukui*. Then you chew it, and the *kukui* and *pā‘ihi* become slimy. This is put into a *wauke* bark cloth (it is a tough piece), then the juice of the *kukui* and *pā‘ihi* are squeezed into the *‘ōpihi* (shell), it is the “pot” for cooking the broth over the fire. When it starts to boil, the (*‘ulu*) gum is cut into small pieces and put in the juice of the *kukui* and *pā‘ihi* so it can boil. Then get two coconut mid-ribs or perhaps little sticks to stir this boiling juice. This is how it is done until the juice is cooked and becomes the birdlime. It is then placed into the empty *‘ōpihi* or a *ti* leaf, wrapped up in *ti* leaves. Kāwili is in the uplands adjoining Mokaulele. Then go to where there is low branching *‘ōhi‘a* (*pulu ‘ōhi‘a*), where the *pāhoehoe* is below.

You are below on the *pāhoehoe*, and you apply the bird lime above around the *lehua* flowers. Now you *kāwili* (twist, i.e. apply) this bird lime in among three or four *lehua* flowers, then when a bird is stuck by one of the *lehua* that blossoms, you free it and it is caught. You then hide again among the low *‘ōhi‘a* branches (a place where the *‘ōhi‘a* tops droop down, that is the *pulu ‘ōhi‘a*), and catch another bird. You squeeze the birds head and it is killed. It is placed into a bag. Returning (home) perhaps around three ‘o clock, there are many birds, perhaps forty, twenty, or thirty. Those small birds; when fat—the meat is tasty and sweet. That’s how one prepares *kawili kēpau*, or bird lime to ensnare birds.

Snaring Birds on Branches.
The (decoy) branch is perhaps three or four fathoms long. *Lehua* blossoms are placed on this branch, from one side of the branch up to the tip of the branch. Two men do this job, one at one (end of the) branch and one at the other. Bird lime is placed on top of the branch along with many *lehua* blossoms in between this bird lime—–this is a bird catchers (*kia manu*) branch [drawn] |_____|. ʻŌlaʻa and Piʻihonua are lands of bird catchers. The are many *ʻōʻō* birds at Puʻu ʻŌʻō. It is there that the bird catchers go to get the feathers for adornments (*lei*) of the chiefs. Panaʻewa is also a place of the bird catchers.

The bird catchers (decoy) branch is pulled in between the *ʻōhiʻa lehua* trees. One (person) uses the net. The net is pulled up, one branch is above, one branch is below. It is an open (wide) meshed *olonā* net (*ʻupena olonā maka hakahaka*), and *olonā* cordage at the tip. It is a soft (pliable) net perhaps five, four, or three fathoms long. As the birds fly their feet are caught, or their wings caught. Now if there are one or two birds, they are left, these are the birds that call out to the other birds. When there are many birds the net is let down (the birds taken), then the net is pulled up again. *ʻŌhiʻa* growth is all around. So this is the work of the "bird-fishers," or *lawaiʻa manu*. They return to the house and then remove the feathers of the *manu ʻōʻō*. When the container is filled with feathers, a *lei* is made. Below the wing-pit is where the male *ʻōʻō* bird feathers are, and above on the back by the tail, are the pale yellow feathers. [Nalimu in Kelsey; Bishop Museum , Archives–SC Kelsey; Box 1.5; Maly, translator]

Places on the Mountain Lands Commemorated in a Mele of the Early 1900s

In 1918, members of the Kainapau-Lindsey family—with generational attachments to the lands of the Kohala and Hāmākua Districts—lamented the passing away of George Lindsey, a son of William and Kaluna Lindsey. He had been born January 26, 1880, and passed away on December 19, 1917. He was eulogized in a very traditional Hawaiian style by his mother Kaluna Lindsey, in a "*Kanikau*" (chant of lament), published in *Ka Hoku o Hawaii* (May 9, 1918). In the chant, Mrs. Lindsey recalled many of the special places that had been traveled to, and were important to the family, and in the life of George Lindsey. Many of the places named are situated in on the mountain lands of Puʻukapu and neighboring lands. Excerpts from the *kanikau* (translated by Maly), follow here with reference to many of the *puʻu*, and mists and rains which frequented these lands (see Register Map No.'s 872 & 2785 for locations of the named sites):

He Puolo Waimaka no Kuu Keiki Hele Loa o Geo. Lindsey

...Kuu keiki i ka luna o Haumea	...My son at the heights of ***Haumea***
I ka uka noe anu o Holokaiea...	In the cool misty uplands of *Holokaiea*...
...Hoomaha i ka luna o puu Palailai *(a hill in Momoualoa next to Kino)*	...Resting on the heights of ***Pālailai*** hill
Kau aku ka manao no Kino	With thoughts of ***Kino*** (in the heights of Momoualoa)
I ka nee a ka ohu i ka liko o ka lehua...	Where the mists move across the Budding *lehua*...
...Kuu keiki mai ka ua Eelekoa	My son from the *ʻEʻelekoa* rain showers (*Eʻelekoa* is a name of Waimea storms)
Ka ua halii mai i ka lau o ke Koaie...	The rain which spreads out the leaves of the *Koaiʻe*...
...Kuu keiki mai ka luna o Laelae	My son from the heights of ***Laʻelaʻe*** (the plain across Waiʻaka-Kauniho, and a *puʻu*)
Ka waiho mai a Puu Pueo	***Puʻu Pueo*** is exposed in the distance (Puʻu Pueo is in the uplands of Mānā)

Kahiko i ke alo o pua ka lehua	Adorned in the presence of the *lehua* blossoms
Ka ihona o pau o Kanilio	The descent is completed at Kanilio
Kuu keiki i ka wai lele o Kohakohau	My son at the waterfalls of ***Kohākōhau*** (one of the streams fed by the Kohala watershed)
Ia wai koiawe lelehuna mai i ka pali...	The water that splashes from the cliffs...
...Kuu keiki i ka luna o Hoku'ula	...My son on the heights of ***Hōkū'ula***
I ka ihona la o Palihoni	Descending along ***Palihoni***
Alo aku o la luna o Puoaoaka	In the presence of the heights of ***Pū'oa'oaka***
O ka oni ae a Puuki kau mamua	***Pu'ukī*** is set the in front
Ilaila kuu kamalei e walea ai	It is there that my beloved child relaxed
E kilohi ai i ka nani o Waimea...	gazing upon the beauty of Waimea...
...Kuu keiki o ke kula o Kaopapa	...My son on the plains of Ka'ōpapa
Ka piina o Palinui me ke Ahukauina	Ascending Palinui and the Ahukauina
Auau i ka wai o Puuiki	To swim in the waters of Pu'uiki (Pu'uiki is near the Pauahi-Momoualoa boundary, on the road to Kawaihae)
He aloha Ouli kau mai luna	Greetings to 'Ōuli, placed above
Ia heiau kaulana o ka aina...	That famous temple of the land...
Kuu keiki mai ka piina o Kapahukapu	...My son from the ascent of Kapahukapu
Nana aku o ke kula o Keanuiomano...	Looks to the plains of Keanu'i'omanō...
Kuu keiki i ka wai o Opeawai	...My son in the waters of 'Ōpe'awai (below Wai'aka)
Mai ka piha kanaka o Halekalewa...	From the fullness of people at Halekalewa...

[Kaluna Lindsey, in *Ka Hoku o Hawaii*; May 9, 1918]

HISTORICAL OBSERVATIONS OF THE KOHALA-HĀMĀKUA MOUNTAIN LANDS

Because the upper mountain lands of the Kohala-Hāmākua region were so thickly forested and boggy—and so remote from populated areas—there was little call for early historic visitors to travel into the interior lands. Below, follow several historical accounts, describing the valleys and plateau lands adjoining the Kohala Mountain Range, recorded between the 1820s to the 1930s. While little information directly pertaining to lands within the Pu‘u o ‘Umi NAR was found in these historical accounts, we do find references to historical activities that would have impacted the forest lands—for example, the cutting of *‘ili-ahi* (sandalwood) and collection of *pulu* (*hāpu‘u* silk) for commercial interests.

The Journal of William Ellis: Lands of the Hāmākua-Kohala Region Described in 1823)

The earliest eye-witness accounts written about the portion of Hāmākua in which Laupāhoehoe Nui is situated, were recorded by English Missionary, William Ellis (Ellis 1963). In August 1823, visited the valleys of the Hāmākua and North Kohala Districts. The primary motive of the journey was to seek out the best locations for establishment of missions and schools. These generally came to be situated in the areas with the largest populations in a given region—in northern Hāmākua, churches and schools were established in Waipi‘o and Waimanu valleys.

In his journal, Ellis noted that Waipi‘o was a place “celebrated in Hawaiian history” (Ellis 1963:262), and he provided readers with a description of the natural environment and Hawaiian community at the time:

> …The bottom of the valley was one continued garden, cultivated with taro, bananas, sugar-cane, and other productions of the islands, all growing luxuriantly. Several large ponds were also seen in different directions, well stocked with excellent fish.
>
> A number of small villages, containing from twenty to fifty houses each, stood along the foot of the mountains, at unequal distances on each side, and extended up the valley till projecting cliffs obstructed the view. [Ellis 1963:256]

While in Waipi‘o Valley, Ellis learned of King ‘Umi, traditions associated with him, and described the *heiau* in region:

> I spent the morning in taking a drawing of the valley from the sand-hills on the beach; and in examining some large heiaus in the neighbourhood, in reference to which the natives taxed our credulity by the legendary tales they related respecting the numbers of victims which had on some occasions been offered.
>
> In the days of Umi, they said, that king, after having been victorious in battle over the kings of six of the divisions of Hawaii, was sacrificing captives at Waipio, when the voice of *Kuahiro*, his god, was heard from the clouds, requiring more men; the king kept sacrificing, and the voice continued calling for more, till he had slain all his men except one, whom, as he was a great favourite, he refused at first to give up; but the god being urgent, he sacrificed him also, and the priest and himself were all that remained. Upwards of eighty victims, they added, were offered at that time, in obedience to the audible demands of the insatiate demon. [Ellis 1963:260]

Ellis observed that *‘ili-ahi* (sandalwood) was being taken from the mountains above Waipi‘o, for shipment from the valley, as well:

> During the afternoon great numbers of men belonging to the valley returned with loads of sandal wood, which they had been cutting in the neighbouring mountains. The wood was much superior to that which we had seen at Waiakea, being high coloured, strongly scented, and sometimes in large pieces nearly a foot in diameter… [Ellis 1963:261]

The nature of the community, and prominence of Waipiʻo in Hawaiian history was further described by Ellis in the following narrative:

> …According to the number of houses which we have seen, in all 265, there are at least 1325 inhabitants in this sequestered valley, besides populous villages on each side along the coast, which might be easily visited. This circumstance, together with the fertility of the soil, the abundance of water, the facility with which, at most seasons of the year, supplies can be forwarded by water from Kairua or Towaihae, combine to render this an eligible spot for a missionary station… [Ellis 1963:261]

> ***Waipio Celebrated in Hawaiian History***
> The valley of Waipio is a place frequently celebrated in the songs and traditions of Hawaii, as having been the abode of Akea and Miru, the first kings of the island; of Umi and Riroa, kings who make a prominent figure in their history.
>
> It is also noted as the residence of Hoakau [Hakau], king of this part of the island, who appears to have been one of the Neros of the Sandwich Islands, and whose memory is execrable among the people, on account of his cruelties; and of whom it is reported, that if a man was said to have a fine-looking head, he would send his servants to behead the individual, and bring his head before him, when he would wantonly cut, and otherwise disfigure it. He is said also to have ordered a man's arm to be cut off, and brought to him, only because it was tataued in a manner more handsome than his own. [Ellis 1963:262]

Ellis and party departed from Waipio, and made their way to Waimanu, where again, the party encountered people preparing to ship *ʻili-ahi*, harvested from the mountain lands:

> After proceeding pleasantly along for five or six miles, we arrived at Waimanu a little before eight o'clock.
>
> We found Arapai, the chief, and a number of his men, busy on the beach shipping sandal-wood on board a sloop belonging to the governor, then lying at anchor in a small bay off the mouth of the valley. He received us kindly, and directed two of his men to conduct us to his house, which was on the opposite side.
>
> The valley, though not so spacious or cultivated as Waipio, was equally verdant and picturesque; we could not but notice the unusual beauty of its natural scenery. The glittering cascades and waterfalls, that rolled down the deep sides of the surrounding mountains, seemed more numerous and beautiful than those at Waipio… [Ellis 1963:264]
>
> …When we arrived at the house of Arapai, we were welcomed by his wife and several members of his family.
>
> Mr. Thurston walked up to the head of the valley, to number the houses and speak to the people. At one of the villages through which he passed, about 150 of the inhabitants assembled, to whom he preached… [Ellis 1963:268]

Departing by canoe from Waimanu on the way to Honokāne (in Kohala), Ellis passed near the shore of Laupāhoehoe, where he observed the near shore lands and learned of a great landslide that in late

1822 or early 1823, had destroyed much of the village of Laupāhoehoe.

Trip from Waimanu to Honokane

…We took an affectionate leave, and then stepped into a canoe, which Arapai had provided to convey us as far as Honokane, the first village in the division of Kohala.

As the canoe pushed off from the shore, we again bade them farewell. When we saw the interesting group standing on the beach, we could not but feel the most lively concern for their welfare, and involuntarily besought the great Redeemer, that his holy Spirit might be poured out upon them, that the seed sown among them might take root in their hearts, and produce an abundant harvest to his praise.

Formation of Laupahoehoe

After leaving Waimanu, we passed by Laupahoehoe, a second village of that name on this part of the coast, where, according to the accounts of the natives, about eight or nine months before, an immense mass of rocks had suddenly fallen down. The mountain that remained appeared nearly 600 feet high. The face next the sea was perpendicular, and as smooth as a compact piece of masonry. The rock appeared volcanic, and the different strata of highly vesicular lava were very distinct. In several places we saw the water oozing from the face of the rock 200 or 300 feet from the summit.

The mass that had fallen lay in ruins at the base, where it had formed two considerable hills, filled up a large fish-pond and part of the sea, presenting altogether a scene of wide-spread desolation. [Ellis 1963:271]

The original surface of the ground appeared to have been broken by an earthquake, as some parts were rent by deep chasms, others sunk down six or twelve feet lower than the rest. The shrubs and grass were growing luxuriantly on the upper or original, and lower or fallen surface, while the perpendicular space between them indicated that the latter had recently sunk down from the former.

Wrecks of houses were seen in several places, some partly buried by the ruins, other standing just on the edge of the huge rocks that had fallen from above. Several houses were standing in the neighbourhood, but all seemed deserted.

The natives say that in the evening when the accident took place, a mist or fog was seen to envelop the summits of the precipice, and that after the sun had set, a luminous appearance, like a lambent flame, was observed issuing from and playing about the top, which made them think it was a forerunner of Pele, or volcanic fire. A priest of Pele and his family, residing in one of the villages below, immediately offered his prayer to the goddess, and told the inhabitants that no harm would befall them.

About ten o'clock at night, however, the whole side of the mountain, for nearly half a mile in extent along the shore, fell down with a horrid crash.

Part of two small villages were destroyed, and several of the inhabitants killed, but the natives did not agree as to the numbers; some said twenty were killed, others only eighteen.

The people with whom we talked on the spot, and at other places subsequently, could not recollect having heard the natives who escaped say any thing about an earthquake at the time.

Continuing the journey along the coast, Ellis described the lands passed while paddling to the Kohala valley lands:

> ***Trails Along Kohala Mountain Bluffs***
> We did not land at this place, but passed close to the shore, and continued to sail along at the base of steep mountains, 500 or 600 feet high; and although nearly perpendicular, they were intersected here and there by winding paths, which we at first thought could be travelled only by goats, but up which we afterwards saw one or two groups of travellers pursuing their steep and rugged way.
>
> About noon we passed Honokea, a narrow valley which separates the divisions of Hamakua and Kohala, and shortly after reached Honokane, the second village in the latter.
>
> ***Experiences at Honokane***
> We landed at Honokane, and went through the village to the house of Ihikaina, chief woman of the place, and sister to Arapai, the chief of Waimanu, from which this district is distant about twenty miles. Ihikaina received us kindly, and for our refreshment provided a duck, some vegetables, and a small quantity of excellent goat's milk, large flocks of which are reared by some of the natives for the supply of ships touching at the islands for refreshments.
>
> The valley contained fifty houses. A number of the people collected round the door of the house, and listened to a short address.
>
> ***Great Land Slide Near Pololu***
> About 4 p.m. we left Honokane, and passed on to Pololu. On our way we walked over a long tract of fragments of rocks, occasioned by the falling down of a side of the mountain, which took place at the same time that the mass of rocks fell at Laupahoehoe, which we had passed in the forenoon.
>
> It was impossible, without considerable emotion, to walk over these rocks; some of them were broken in small pieces, others in blocks of several tons weight, each lying exactly as it had fallen, the fractures fresh, and the surface hardly discoloured, while the steep side of the mountain from which they had fallen looked as smooth and even as if the mass below had been separated from it only a few minutes before.
>
> In some places between Honokane and Pololu, we had to walk in the sea, where the water was up to the knees, but by watching the surf we passed by without much inconvenience.
>
> ***Pololu Described***
> Pololu is a pleasant village, situated in a small cultivated valley, having a fine stream of water flowing down its centre, while lofty mountains rise on either side.
>
> The houses stand principally on the beach, but as we did not see many of the inhabitants, we passed on, ascended the steep mountain [Ellis 1963:273] on the north side, and kept on our way. The country was fertile, and seemed populous, though the houses were scattered, and more than three or four seldom appeared together. The streams of water were frequent, and a large quantity of ground was cultivated on their banks, and in the vicinity… [Ellis 1963:274]

Later, while traveling across land to the South Kohala-Waimea region, Ellis and party again encountered people returning from the mountains, with loads of *ʻili-ahi*. He observed:

Thousands of Men Packing Sandal Wood

Before daylight on the 22d we were roused by vast multitudes of people passing through the district from Waimea with sandal wood, which had been cut in the adjacent mountains for Karaimoku, by the people of Waimea, and which the people of Kohala, as far as the north point, had been ordered to bring down to his storehouse on the beach, for the purpose of its being shipped to Oahu.

There were between two and three thousand men, carrying each from one to six pieces of sandal wood, according to their size and weight. It was generally tied on their backs by bands made of ti leaves, passed [Ellis 1963:286] over the shoulders and under the arms, and fastened across their breast. When they had deposited the wood at the storehouse, they departed to their respective homes. [Ellis 1963:287]

While Ellis remained in the lowlands of Kawaihae, Lorrin Thurston traveled to the uplands of Waimea. He learned of several of the lands that make up Waimea, including Puʻukapu, "the last village" in Waimea:

Mr. Thurston Visits Waimea Population

About five p.m. Mr. Thurston set out on a visit to the inland district of Waimea, having been furnished with a guide by Mr. Young. It was dark when he reached Ouli, a place belonging to the latter, where he put up for the night.

After worship with the people, on the morning of the 26th, Mr. Thurston walked on to Kalaloa, the residence of the chief of Waimea, Kumuokapiki (Stump of Cabbage). Leaving Kalaloa, he walked on to Waiakea [Waiaka], from thence to Waikaloa [Waikoloa], Pukalani, and Puukapu, which is sixteen or eighteen miles from the sea-shore, and is the last village in the district of Waimea. At these places he addressed the people.

The soil over which he had travelled was fertile, well watered, and capable of sustaining many thousand inhabitants. In his walks he had numbered 220 houses, and the present population is probably between eleven and twelve hundred. [Ellis 1963:289]

Missionary Observations: Lorenzo Lyons in Waimea (1832-1860)

Following Ellis' circuit around Hawaiʻi, Waimea was selected as the primary station for the district of Kohala, and Northern Hāmākua. On July 16 1832, Lorenzo Lyons (affectionately called "*Makua Laiana*"), one of the most famed and beloved missionaries of all those who came to Hawai'i, replaced Reverend Dwight Baldwin as Minister at Waimea. Lyons' "Church Field" was centered in Waimea, at what is now the historic church 'Imiola, in Waikōloa (Doyle 1953:40 & 57). Lyons remained in Waimea until his death in 1886.

By 1833, Lyons noted that in the Waimea region, "deaths are more numerous than births. Hence the [native] population is decreasing" (Doyle 1953:72). Lyons' journal entry in December of 1834 documents that he, his wife Betsy, and their son Curtis had departed from Waimea and settled in Hāmākua, nearby the 'Ele'io church at Kanahonua. Describing the journey from Waimea, Lyons wrote to his brother:

We have no roads such as you have in America, but we got to Hamakua after a fashion. Mrs. L. was drawn part of the way in a rocking chair attached to the fore wheels of a wagon; a part of the way she was carried in the same chair by natives; and

> a part of the way she walked. The little one [their son Curtis] was carried by a native. You would have smiled to have seen how we lived…[8] [Doyle 1953: 74]

In September 1837, Lyons reported that mumps, and a famine had overtaken the people of Kohala and Hāmākua. As a result of the famine, the people were traveling into the mountains to seek out roots and other foods:

> Something like a famine has been raging for about a year. The common food of the people has failed and they have been compelled to resort to the use of roots such as grow wild in the woods and mountains, and yielding by very little nourishment, just enough to prevent starvations and enable the people to walk about some and attend to some of the ordinary business. The famine does not arise form the indolence of the people, but from the ravages of a worm that abounds in Waimea. As soon as food begins to sprout the worm commences the work of destruction… [Doyle 1953: 99-100]

Between 1839 and 1846, Lyons went out into the field at least three times a year to visit the outlying schools and churches, traveling into Waipiʻo, Waimanu, and other lands of Hāmākua and Kohala. He at times traveled via trails across the mountains between Waipiʻo-Waimanu, and Waimea:

> On the way to Hamakua, there is wet weather, a marsh to pass thro', not much unlike Bunyan's Slough of Despond (Mahiki). It is perhaps four miles long–a most dismal place–yet the woods are sometimes vocal with the music of birds... On one route to Hamakua, part of the road is a mere footpath lying thro' a dense wood of *Koa* and *Ohia*. When we have reached the place of my active labor, my native cooks, usually out doors...Night comes on–a light is needed. *Kukui* nut, about the size of a walnut, are strung on splinters of bamboo, resembling when done, a string of dried apples. Fire is procured perhaps by rubbing two sticks together. Then the string of candle nuts is lighted at one end...
>
> …Arose early (Waipio) and intended to go by canoe to Waimanu. A tremendous wave rolled over the canoe and sank it—swept me into the swelling surf—but I was soon in the hands of natives and delivered safely on shore… All drenched in salt water, I made my way to the house a mile distant, got some dry clothes, and set out again, by way of the mountains. Reached Waimanu, held meetings, etc. ...Left for Waimea via the mountains. About sundown reached my quiet home… [Doyle 1953: 109-111]

Because of diminishing support from the American Board of Commissioners for Foreign Missions (A.B.C.F.M.), Lyons reported that he had selected,

> "Hawaiian elders who superintended the different parishes–They...labored without remuneration... They conduct schools and meetings on the Sabbath. On week days they visit from house to house, conduct funerals, direct all the simple affairs of the church." [Doyle 1953:122]

By 1860, Lyons reported that his parish members were busily procuring materials and building their formal churches. Among the enterprises was the collection of *pulu* which was exported, in order to pay for lumber and other construction materials. Lyons wrote:

> This is very self denying and badly trying labor. It is tedious work to pick it from the ferns, dry it, pack it and take it to the sea side to be shipped. Sometimes they have to descend precipitous rocks and bluffs to get their *pulu*.

[8] Describing the "road" traveled, Betsy reported, "A part of it is laid over with spongy logs." These were probably *hāpuʻu* (tree-fern) logs, as was the custom around the island, in the wet mountain zones.

But when the vessel brings the lumber, then comes the trying time! There are no harbors on the Hamakua shore. Materials must be landed at the best places that can be found, and then only at certain times of the year. In rough weather no landing can be expected... The people have to struggle hard and work long in the water before the last board is safely on the rocks. Then they must have a hard and long pull to get the lumber in from the rocky shore up the steep precipitous paths and thence up to the site of the church... [Doyle 1953:164-165]

Adventures in the Hāmākua-Kohala Mountain Lands and Valleys in 1873

Isabella Bird, was an English woman who was ahead of her time. She traveled solo about Hawai‘i, and in the company of native and local guides, exploring many of the remote regions on the Island. Her narratives (Bird 1964) are colorful and filled with important descriptions of landscape, practices and conditions on the island. Of particular interest to the present study, are Bird's narratives of Waimea and Waipi‘o. While she did not travel into the deep forest region making up a part of the Pu‘u o ‘Umi NAR, she did observe the water production of the watershed, and uses it was put to. Bird also included important descriptions of the cattle and sheep industries in 1873, and observed the changing conditions in the environment and island communities.

First trip to the Valley and Falls of Waipi‘o (from Hilo)

The prospect below us was very charming, a fertile region perfectly level, protected from the sea by sand hills, watered by a winding stream, and bright with fishponds, meadow lands, *kalo* patches, orange and coffee groves, figs, breadfruit, and palms. There were a number of grass-houses, and a native church with a spire, and another up the valley testified to the energy and aggressiveness of Rome. [Bird 1964:91]

…We three, with Halemanu's daughter as guide, left on horseback for the waterfall, though the natives tried to dissuade us by saying that stones came down, and it was dangerous; also that people could not go in their clothes, there was so much wading… We rode through the beautiful valley till we reached a deep gorge turning off from it, which opens out into a nearly circular chasm with walls 2,000 feet in height, where we tethered our horses. A short time after leaving them, D. said, "She says we can't go further in our clothes," but when the natives saw me plunge boldly into the river in my riding dress, which is really not unlike a fashionable Newport bathing suit, they thought better of it. It was a thoroughly rough tramp, wading ten times through the river, which was sometimes up to our knees, and sometimes to our waists, and besides the fighting among slippery rocks in rushing water, we had to crawl and slide up and down wet, mossy masses of dislodged rock, to push with eyes shut through wet jungles of Indian shot, guava, and a thorny vine, and sometimes to climb from tree to tree at a considerable height. When, after an hour's fighting we arrived in sight of the cascade, but not of the basin into which it falls, our pretty guide declined to go further, saying that the wind was rising, and that stones would fall and kill us, but being incredulous on this point, I left them, and with great difficulty and many bruises, got up the river to its exit from the basin, and there, being unable to climb the rocks on either side, stood up to my throat in the still tepid water till the scene became real to me.

I do not care for any waterfall but Niagara, nor do I care in itself for this one, for though its first leap is 200 feet and its second 1,600, it is so frittered away and dissipated in spray, owing to the very magnitude of its descent, that there is no volume of water within sight to create mass or sound. But no words can paint the majesty of the surroundings, the caverned, precipitous walls of rock coming down in one black plunge from the blue sky above to the dark abyss of water below, the sullen shuddering sound with which pieces of rock came hurtling down among the trees, the thin tinkle of the water as it falls, the full rush of the river, the feathery growth of ferns, gigantic below, but so diminished by the height above, as only to show their presence by the green

> tinge upon the rocks, while in addition to the gloom produced [Bird 1964:93] by the stupendous height of the cliffs, there is a cool, green darkness of dense forest, and mighty trees of strange tropical forms glass themselves in the black mirror of the basin… [Bird 1964:93]

Returning towards the seas, from the base of the Waipiʻo cliffs, Bird observed:

> …We rode among most extensive *kalo* plantations, and large artificial fish-ponds, in which hundreds of gold-fish were gleaming, and came back by the sea shore, green with the maritime convolvulus, and the smooth-bottomed river, which the Waipio folk use as a road. Canoes glide along it, brown-skinned men wade down it floating bundles of *kalo* after them, and strings of laden horses and mules follow each other along its still waters. I hear that in another and nearly unapproachable valley [Waimanu], a river serves the same purpose… [Bird 1964:95]

The same evening, Halemanu, host of Bird and her party conveyed the following observations about the diminishing Hawaiian population and past history of Waipiʻo:

> …He's very unhappy; he says, “soon there will be no more Kanakas." He told me that this beautiful valley was once very populous, and even forty years ago, when Mr. Ellis visited it, there were 1,300 people here. Now probably there are not more than 200.
>
> Here was the *Puhonua* [*Puʻuhonua*], or place of refuge for all this part of the island. This, and the very complete one of Honaunau, on the other side of Hawaii, were the Hawaiian "Cities of Refuge…" These two sanctuaries were absolutely inviolable. The gates stood perpetually open, and though the fugitive was liable to be pursued to their very threshold, he had no sooner crossed it than he was safe from king, chief, or avenger. These gates were wide, and some faced the sea, and others the mountains. Hither the murderer, the manslayer, the tabu-breaker fled, repaired to the presence of the idol, and thanked it for aiding him to reach the place of security. After a certain time the fugitives were allowed to return to their families, and none dared to injure those to whom the high gods had granted their protection.
>
> In time of war, tall spears from which white flags were unfurled, were placed at each end of the enclosure, and until the proclamation of peace invited the vanquished to enter. These flags were fixed a short distance outside the walls, and no pursuing warrior, even in the hot flush of victory, could pursue his routed foe one foot beyond. Within was the sacred pale of *pahu tabu*, and anyone attempting to strike his victim there would have been put to death by the priests and their adherents. In war time the children, old people, and many of the women of the neighbouring districts, were received within the enclosure, [Bird 1964:96] where they awaited the issue of the conflict in security, and were safe from violence in the event of defeat. These puhonuas contain pieces of stone weighing from two to three tons, raised six feet from the ground, and the walls, narrowing gradually towards the top, are fifteen feet wide at the base and twelve feet high…
>
> In dreadful contrast to this place of mercy, there were some very large heiaus (or temples) here, on whose hideous altars eighty human sacrifices are said to have been offered at one time. One of the legends told me concerning this lovely valley is, that King Umi, having vanquished the kings of the six divisions of Hawaii, was sacrificing captives in one of these heiaus, when the voice of his god, Kuahilo, was heard from the clouds, demanding more slaughter. Fresh human blood streamed from the altars, but the insatiable demon continued to call for more, till Umi had sacrificed all the captives and all his own men but one, whom he at first refused to give up, as he was a great favourite, but Kuahilo thundered from heaven, till the favourite warrior was slain, and only the king and the sacrificing priest remained.

> This valley of the "vanquished waters" abounds in legends. Some of these are about a cruel monster, King Hooku [Hakau], who lived here, and whose memory, so far as he is remembered, is much execrated. It is told of him that if a man were said to have a handsome head he sent some of his warriors to behave him, and then hacked and otherwise disfigured the face for a diversion. On one occasion he ordered a man's arm to be cut off and brought to him, simply because it was said to be more beautifully tattooed than his own. It is fifty-four years since the last human sacrifice was exposed on the Waipio altars, but there are several old people here who must have been at least thirty when Hawaii threw off idolatry forever… [Bird 1964:97]

Regarding the cultivation of *kalo* and it's importance as a crop in the watered valley of Waipiʻo, Bird described a team of pack mules she encountered on her ascent of the Waipiʻo trail:

> …We started up the tremendous *pali* at the tail of a string of twenty mules and horses laden with *kalo*. This was in the form of *paiai*, or hard food, which is composed, as I think I mentioned before, of the root baked and pounded, but without water. It is put up in bundles wrapped in ti leaves, of from twenty to thirty pounds each, secured with cocoanut fibre, in which state it will keep for months, and much of the large quantity raised in Waipio is exported to the plantations, the Waimea ranches, and the neighbouring districts. A square mile of *kalo*, it is estimated, would feed 15,000 Hawaiians for a year. [Bird 1964:98]

The following excerpts from Birds' letter, describe the ascent to the village of Waimea, from Kawaihae, commenting on the arrid nature of the low lands, and forests upon the mountain lands:

> ***Travel from Kawaihae to the Uplands of Waimea***
> …Every hundred feet of ascent from the rainless, fervid beach of Kawaihae increased the freshness of the temperature, and rendered exercise more delightful. From the fringe of palms along the coast to the damp hills north of Waimea, a distance of ten miles, there is not a tree or stream, though the scorched earth is deeply scored by the rush of fierce temporary torrents… The island is here only twenty-two miles wide, and strong winds sweep across it, whirling up its surface in great brown clouds, so that the uplands in part appear a smoking plain, backed by naked volcanic cones. No water, no grass, no ferns. Some thornless thistles, a little brush of sapless-looking indigo, and some species of compositae struggle for a doleful existence…The red soil becomes suffused with a green tinge ten miles from the beach, and at the summit of the ascent the desert blends with this beautiful Waimea plain, one of the most marked features of Hawaii. The air became damp and cool; miles of fine smooth green grass stretched [1964:131] out before us; high hills, broken, pinnacled, wooded, and cleft with deep ravines, rose on our left; we heard the clash and music of falling water: to the north it was like the Munster Thal, to the south altogether volcanic. The tropics had vanished. There were frame houses sheltered from the winds by artificial screens of mulberry trees, and from the incursions of cattle by rough walls of lava stones five feet high; a mission and court house, a native church, much too large for the shrunken population, and other indications of an inhabited region. Except for the woods which clothe the hills, the characteristic of the scenery is baldness.
>
> On clambering over the wall which surrounds my host's kraal of dwellings, I heard in the dusk strange, sweet voices crying rudely and emphatically, "Who are you? What do you want?" and was relieved to find that the somewhat inhospitable interrogation only proceeded from two Australian magpies. Mr. S. [Spencer] is a Tasmanian, married to a young half-white lady; and her native mother and seven or eight dark girls are here, besides a number of natives and Chinese, and half Chinese, who are employed about the place. Sheep are the source of my host's wealth. He has 25,000 at three stations

on Mauna Kea, and, at an altitude of 6000 feet they flourish, and are free from some of the maladies to which they are liable elsewhere. Though there are only three or four sheep owners on the islands, they exported 288,526 lbs. of [page 147] wool in 1872*. Mr. S— has also 1000 head of cattle and 50 horses.

The industry of Waimea is cattle raising, and some feeble attempts are being made to improve the degenerate island breed by the importation of a few short-horn cows from New Zealand. These plains afford magnificent pasturage as well as galloping ground. They are a very great thoroughfare… ...The altitude of this great table-land is 2500 feet, and the air is never too hot, the temperature averaging 64° Fahrenheit. There is mist or rain on most days of the year for a short time, and the mornings and evenings are clear and cool… [1964:132]

…The moral atmosphere of Waimea has never been a wholesome one. The region was very early settled by a class of what may be truly termed "mean whites," the "beachcombers" and riff-raff of the Pacific. They lived infamous lives, and added their own to the indigenous vices of the islands, turning the district into a perfect sink of iniquity, in which they were known by [1964:133] such befitting *aliases* as "Jake the Devil," &c… [1964:133]

From Waimea, Bird traveled again to Waipiʻo and Waimanu valleys. Her letters provide us with further descriptions of the native communities, industry of the people—such as fishing, making *olonā* cordage, and the cultivation of *kalo*—and descriptions of the natural environment of the valleys and mountain lands behind them. While traveling in the Waimea-Hāmākua tract to the Waipiʻo Valley trail, Bird also observed that herds of wild goats, cattle and pigs" were destroying the forest in the region:

Waimanu Valley. Hawaii.
I am sitting at the door of a grass lodge, at the end of all things, for no one can pass further by land than this huge lonely cleft. About thirty natives are sitting about me, all staring, laughing, and chattering, and I am the only white person in the region. We have all had a meal, sitting round a large calabash of *poi* and a fowl, which was killed in my honour, and roasted in one of their stone ovens. I have forgotten my knife, and have had to help myself after the primitive fashion of aborigines, not without some fear, for some of them I am sure are in an advanced stage of leprosy. The brown tattooed limbs of one man are stretched across the mat, the others are sitting cross-legged, making *lauhala* leis. One man is making fishing-lines of a beautifully white and marvelously tenacious fibre, obtained from an Hawaiian "flax" plant [*olonā*]…

Nearly all the people of the valley are outside, having come to see the *wahine haole*: only one white woman, and she a resident of Hawaii, having been seen in Waimanu before. I am really alone, miles of mountain and gulch lie between me and the nearest whites. This is a wonderful place: a ravine about three miles long and three-quarters of a mile wide, without an obvious means of ingress, being walled in by precipices from 2000 to 4000 feet high. Five cascades dive from the palis at its head, and unite to form a placid river about up to a horse's body here, and deep enough for a horse to swim in a little below. Dense forests of various shades of green fill up the greater part of the valley, concealing the basins into which the cascades leap, and the grey basalt of the palis is mostly hidden by greenery. At the open end, two bald bluffs, one of them 2000 feet in height, confront the Pacific, and its loud booming surf comes up to within one hundred yards of the house where I am writing, but is banked off by a heaped-up barrier of colossal shingle… [Bird 1964:135]

* In 1875 the export of wool had increased to 465,469 lbs.

Waipio, March 5th.

It seems fully a week since I left Waimea yesterday morning, so many new experiences have been crowded into the time. I will try to sketch my expedition while my old friend Halemanu is preparing dinner… My host kindly provided me with a very fine horse and some provisions in a leather wallet, and with another white man and a native accompanied me as far as this valley, where they had some business… [Bird 1964:137] We rode over level grass-covered ground, till we reached the Hamakua bush, fringed with dead trees, and full of ohias and immense fern trees, some of them with a double tier of fronds, far larger and finer than any that I saw in New Zealand. There are herds of wild goats, cattle, and pigs on the island, and they roam throughout this region, trampling, grubbing, and rending, grinding the bark of the old trees and eating up the young ones. This ravaging is threatening at no distant date to destroy the beauty and alter the climate of the mountainous region of Hawaii. The cattle are a hideous breed--all bones, hide, and horns.

We were at the top of the Waipio *pali* at eight, and our barefooted horses, used to the soft pastures of Waimea, refused to carry us down its rocky steep, so we had to walk. I admired this lonely valley far more than before… Against its dewy greenness the beach shone like coarse gold, and its slow silver river lingered lovingly, as though loth to leave it, and be merged in the reckless loud-tongued Pacific…

Halemanu, with hospitable alacrity, soon made breakfast ready, after which Mr. S., having arranged for my further journey, left me here, and for the first time I found myself alone among natives ignorant of English. For the Waimanu trip it is essential to have a horse bred in the Waimanu Valley and used to its dizzy palis, and such a horse was procured, and a handsome native, called Hananui, as guide. We were away by ten, and galloped across the valley till we came to the nearly perpendicular *pali* on the other side… [Bird 1964:138]

Between the summit and Waimanu, a distance of ten miles, there are nine gulches, two of them about 900 feet deep, all very beautiful, owing to the broken ground, the luxuriant vegetation, and the bright streams, but the *kona*, or south wind, was blowing, bringing up the hot breath of the equatorial belt, and the sun was perfectly unclouded, so that the heat of the gorges was intense. They succeed each other occasionally with very great rapidity. Between two of the deepest and steepest there is a ridge not more than fifty yards wide.

Soon after noon we simultaneously stopped our horses. The Waimanu Valley lay 2500 feet (it is said) below us, and the trail struck off into space. It was a scene of loneliness to which Waipio seems the world. In a second the eye took in the twenty grass lodges of its inhabitants, the five cascades which dive into the dense forests of its upper end… The track is as steep and broken as that which goes up from hence, but not nearly so narrow, and without its elements of terror, for kukuis, lauhalas, ohias, and *ti* trees, with a lavish growth of ferns and trailers, grow luxuriantly in every damp rift of rock, and screen from view the precipices of the *pali*…

There were four houses huddled between the *pali* and the river, and six or eight, with a church and schoolhouse on the other side; and between these and the ocean a steep narrow beach, composed of large stones worn as round and smooth as cannon balls, on which [Bird 1964:139] the surf roars the whole year round. The *pali* which walls in the valley on the other side is inaccessible. The school children and a great part of the population had assembled in front of the house… An old man, clothed only with his dark skin, was pounding baked *kalo* for *poi*, in front of the house; a woman with flowers in her hair, but apparently not otherwise clothed, was wading up to her waist in the

river, pushing before her a light trumpet-shaped basket used for catching shrimps, and the other women wore the usual bright-coloured chemises…

Beyond the houses the valley became a jungle of Indian shot (*Canna indica*), eight or nine feet high, guavas and ohias, with an entangled undergrowth of ferns rather difficult to penetrate, and soon Hananui, whose soul was hankering after the delights of society, stopped, saying, "Lios (horses) no go." "We'll try," I replied, and rode on first… [Bird 1964:140] We fought our way a little further, and then he went out of sight altogether in the jungle... H. had never been any further, and as I failed to make him understand that I desired to visit the home of the five cascades, I had to reverse our positions and act as guide. We crept along the side of a torrent among exquisite trees, moss, and ferns, till we came to a place where it divided. There were three horses tethered there, some wearing apparel lying on the rocks, and some human footprints along one of the streams, which decided me in favour of the other. H. remonstrated by signs, as doubtless he espied an opportunity for much gossip in the other direction, but on my appearing persistent, he again laughed and followed me… [Bird 1964:141]

After an hour of wading we emerged into broad sunny daylight at the home of the five cascades, which fall from a semicircular precipice into three basins. It is not, however, possible to pass from one to the other. This great gulf is a grand sight, with its dark deep basin from which it seemed so far to look up to the heavenly blue, and the water falling calmly and unhurriedly, amidst innumerable rainbows, from a height of 3000 feet. The sides were draped with ferns flourishing under the spray, and at the base the rock was very deeply caverned. I enjoyed a delicious bath, relying on sun and wind to dry my clothes, and then reluctantly waded down the river. At its confluence with another stream, still arched by ohias, a man and two women appeared rising out of the water, like a vision of the elder world in the days of Fauns, and Naiads, and Hamadryads. The water was up to their waists, and leis of *ohia* blossoms and ferns, and masses of unbound hair fantastically wreathed with moss, fell over their faultless forms, and their rich brown skin gleamed in the slant sunshine. They were catching shrimps with trumpet-shaped baskets, perhaps rather a prosaic occupation. They joined us, and we waded down together to the place where they had left their horses. The women slipped into their holukus, and the man insisted on my riding his barebacked horse to the place where we had left our own, and then we all galloped over the soft grass… [Bird 1964:142]

In old days it is said that a king of Hawaii assembled most of the adults of the then populous island, and formed a human chain three miles long to pass up stones for the building of the great *Heiau* in Kona. It is said that this valley had 2000 inhabitants forty years ago, but they have dwindled to 117. The former estimate is probably not an excessive one, for nearly the whole valley is suitable for the culture of *kalo*, and a square mile of *kalo* will feed 15,000 natives for a year. [Bird 1964:144]

Two women were shrimping in the river, the children were swimming to school, blue smoke curled up into the still air, *kalo* was baking among the stones, and a group of women sat sewing and making leis on the ground. The Waimanu day had begun; and it was odd to think that through the long summer years days dawned like this, and that the people of the valley grew grey and old in shrimping and sewing and *kalo* baking. All Waimanu shook hands with me, the kindly "*Aloha*" filled the air, and the women threw garlands over us both… [Bird 1964:145}

George Bowser's "Directory and Tourists Guide" (1880)

George Bowser, editor of "*The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide*" (1880) wrote about various statistics and places of interest around the Hawaiian Islands. In the following excerpts from "An Itinerary of the Hawaiian Islands…" (Chapter IV Hawai'i), Bowser

describes the Waimea region, ranching interests, and the journey between Waimea, Kalai'eha, and the summit of Mauna Kea.

> …Waimea has always been a place of some considerable importance, and there are around it several pretty homesteads, notably the residences of Mr. F. Spencer and the Reverend Mr. Lyons. From Mr. Spencer's veranda there is a striking view of Maunakea, the summit of which was at this time of the year still in its winter robe of snow. The snow never leaves this mountain-top entirely, but the position of the snow-line varies considerably with the season of the year, and also from one year to another, according to the weather which characterizes them. The country all round is chiefly suitable for grazing, and, besides innumerable wild cattle, descended, no doubt, from those which Vancouver gave to Kamehameha I, there are some 20,000 head depastured in the neighborhood, the property of Mr. Parker, who has, besides, some large droves of horses, probably numbering a thousand head in all. Mr. Spencer has turned his attention chiefly to sheep farming, and occupies a large tract of country with his flock of 15,000 sheep and 15,000 goats. Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon. Good accommodation can, however, be procured by the traveler.
>
> On March 23d, I set out from Waimea to visit the north Kohala district… The road I had now to follow is only a track running through and skirting a range of mountain. For some eight or ten miles at the outset it is very steep and very stony, but after that, for the remainder of the way, about seventeen miles, it is over well-grassed mountain country, and is pleasant riding, with a grand view of the sea all the way… [Bowser 1880:540]

Bowser returned to Waimea from North Kohala, offering readers a description of the water source of Kohala Mountains, which in the early 1900s came to play an important role in the development and expansion of the ranch to the Waikōloa, Waiki'i, and Ke'āmoku section lands:

> The mountain which divides North from South Kohala is called Kaala. Near its summit is a very pretty lake which is the source of the Waimea River, a never-failing stream. This lake is very difficult of access, and few foreigners have ever visited it. The way there is, however, quite practicable to the man who does not fear fatigue; and the views obtained from the summit will repay those who adventure the ascent. The height of the mountain is nearly 6,000 feet, and the views from it are uninterrupted in almost all directions, including a most magnificent panorama, almost a bird's-eye view of the Waipio Valley, with its winding streams and grand precipices.
>
> I turned my back with a feeling of reluctance on the rich district of North Kohala, and retraced my steps to Waimea… [Bowser 1880:544]
>
> The district surrounding Waimea is capable of producing most of the ordinary crops of a temperate climate, such as wheat, barley, oats maize, beets, turnips, mangel-wurzel, onions, potatoes and all sorts of vegetables. In the neighboring district of Hamakua, coffee, tobacco and cotton may be grown. In no part of the Kingdom does the guava grow to such perfection as in the Hamakua district. Its fruit is there quite as large as an orange. Three varieties of it are grown-the sour, the sweet and the strawberry guava.
>
> No better opportunity can present itself throughout my journey than when speaking of these rich districts of Kohala and Hamakua, to enumerate for the benefit of the tourist the different fruits that grow wild in the Hawaiian Islands, and give some account of them, and of the seasons at which they ripen. I must give the first place to the mountain strawberry, which is very plentiful all round the three lofty mountains of Hawaii and on

Haleakala. It is ripe in June, July and August. The mountain apple grows all over the Islands, at about 800 feet from the sea level… [page 545] To this list I have to add the more familiar forms of the mango…the orange, lime, citron, lemon and bananas, in great variety. Add to these the bread-fruit, tamarind and the rose-apple… [Bowser 1880:546]

The Hamakua Ditches
H.W. Kinney's "Visitor's Guide" (1913)

In 1913, H.W. Kinney published a visitor's guide to the island of Hawai'i. In it, he included descriptions of the land and communities at the time, historical accounts of events, and descriptions of sites and practices that might be observed by the visitor. Of particular interest to the present study, Kinney also reported on the workings of the Hāmākua Ditches and the mountain lands feeding them:

> The great Hamakua ditch system, consisting of a lower and an upper ditch, used to supply water for irrigation and fluming for the Hamakua plantations, affords one of the most splendid scenic attractions of the Islands, as the ditches are accompanied by trails which lead far into the mountain fastnesses, where there is a wealth of wild and impressive scenery. The ditches and trails are also interesting as splendid engineering feats [*Figure 2*].
>
> The Lower Ditch reaches as far as the lands of the Paauilo Plantation. It gathers its water from the four great valley into which Waipio is split. These are, in order from Kukuihaele northwards, Waima, Koiawe, Alakahi and Kawainui. At each of these is an intake where the water is led into the ditch or rather tunnel, for the entire mountain section is, with the exception of the few places where it has been necessary to cross gulches by means of flumes, an enclosed tunnel about nine miles long. The trails runs along the ridges where the tunnel cuts through. It leads to all the intakes, at each of which is a Japanese keepers house, with a telephone. The trail often passes along precipices where the fall to the bottom of the valley is a couple of thousand feet sheer [*Figure 3*], and the rise the same distance straight up. It should not be traversed except on mountain horses or on foot. It begins a bit below the Waipio *pali*, or may be reached by a path through the cane fields starting at the ditch company headquarters. It is a fine stone paved trail, easily wide enough for a horse, and only its position provides the element of danger, which my be eliminated by care. It leads

Figure 2. Flume Piers Crossing Head of Waipio Valley, and Air Compressor Plant for Tunnel (1908). Leighton Photograph No. 124, in collection of U.S. Geological Survey, Denver Library. (Copy Photo No. KPA-N316)

above the Hiilawe fall to the Kawainui intake, and between Waima and Koiawe a trail leads down into the Waipio valley. It is fairly steep at places, but can without difficulty be made on horseback, across several fords, and leads through the Waipio village to Kukuihaele. A conspicuous feature thereon is the grave of Thos. Kelly, a ditch employee who was drowned trying to cross a stream in flood time. From the end of the ditch trail to Kukuihaele either way is about eight miles.

Figure 3. McCrossen and Campbell on the Construction Trail at Waipio (1909). Mendenhall Photograph No. 835, in collection of U.S. Geological Survey, Denver Library. (Copy Photo No. KPA-N209)

The Upper Hamakua Ditch takes its water from the four gulches which feed the lower ditch, but at a much higher elevation. The trail is also a good one and presents some even grander mountain scenery, as well as some rare birds eye views of Waipio and the surrounding country. The trail begins where the ditch crosses Mud Lane, about six miles from Kukuihaele. It is good and absolutely safe as far as Waima. Here it passes along a steep precipice which even ditch employees prefer to pass [Kinney 1913:41] on foot, although the trail is very good. This section may be avoided by taking another trail which leads up to the ditch form Waimea, and which strikes the main trail at Koiawe, whence one may enjoy the rest of the trail to Alakahi and Kawainui, horseback, in perfect safety. From the junction of the trails to Kawainui is about four miles, and to Waima about two miles. [Kinney 1913:42]

The Valley Lands in the 1930s

In the 1930s, E. S. Craighill Handy, conducted an ethnographic study of native Hawaiian customs of agriculture. Handys' work (1940), relied on literature and documentary resources, and information provided by native practitioners. Handy provided readers with the following summary of the agricultural practices in the Hāmākua-Kohala Valley lands:

> ***Waipio.*** The greatest wet-taro valley of Hawaii and one of the largest planting areas in the entire group of islands was Waipio. This vast, flat valley floor was completely

developed in terraces for an area about 3 miles long and 1 to 0.75 mile wide. Some artificial fishponds took the place of terraces behind the sand dunes flanking the beach. The two large present-day fishponds west of the bay are said to have been one great terrace in the time of King Umi. This terrace was called *umiloʻi*, according to Jenny Saffrey, the most eminent living authority on local history. The taro planted in *umiloʻi* by the *alii* was *tapu* and was used by the people of the valley only when there was a dearth of food.

Besides the main body of terraces on the flat floor of the valley there were terraces up Hiilawe Valley; beyond the area of flatland in the main valley for several miles up Waipio Stream; and in the side valleys of Waima, Koiawe, Alakahi, and Kawainui. In 1935 many more terraces were planted in taro than in 1931, when previously visited. During the era of rice growing the lower flatlands of Waipio Valley proper were devoted mainly to rice culture by Chinese. At present, perhaps a quarter of the lower valley produces taro; many old terraces serve for pasturing horses, and the rest are neglected. The interior sections of the main valley and of the inner valleys are now a jungle of guava, *kukui*, and other wild growths…

Waimanu. Waimanu was second only to Waipio as a wet-taro valley. The flatland of the main valley averages about a third of a mile wide and 1.5 miles long and is said to have been completely developed in taro patches. Beyond this, terraces extended 1.5 miles farther up the valley of Waimanu Stream and into the section known as Kealai, where three small streams come down the western slope of the valley and enter Waimanu. I am told that the terraces extended a mile up Waihilau Valley, which opens into Waimanu from the southwest. [Handy, 1940:123]

Coastal strip, between Waimanu and Pololu. A little over a mile north-west of Waimanu is the tongue of land at the base of the cliffs known as Laupahoehoe. Here, I am told, there were a number of terraces which are now unused. Just beyond Laupahoehoe is a narrow strip of land named Nakooka where there were terraces (between Paopao and Kukui Gulches). Less than a mile beyond this there were terraces on a narrow strip of land named Apua between Waimaile and Waikaloa Streams. Continuing westward there was another group of terraces between Ohiahuaea and Oniu Streams on land named Kawaikapu. Just east of Honopue Valley, on flats below the cliffs were terraces on land named Makakiloia. The valley of Honopue which has flatland in its lower part—about a quarter of a mile wide and three quarters of a mile long—was developed in terraces. Beyond this the terraces continued wherever practicable for about half a mile up the narrower portion of the valley.

In the forest zone on the slopes between Pololu and Waipio and in the gulches and upper valleys grows the usual light green *Aweu* wild taro. In addition to this *kamaaina* informants say that the following varieties are found today, having run wild from early planting in the forest area: *Ulaula*, *Kumu*, *Lauloa*, *Poni*, *Mana ulu*, *Mana pikipiki* (having white corm and petiole) *Palai'i*, *Wewehiwa*, and *Ieie*. In the forest zone of the Hamakua coast east of Waipio, taro used to be planted and presumably may be found growing wild today. [Handy 1940:124]

THE KOHALA-HĀMĀKUA MOUNTAINS DESCRIBED IN LAND TENURE DOCUMENTS SURVEY RECORDS, AND GOVERNMENT COMMUNICATIONS

The most detailed descriptions of the Kohala-Hāmākua mountain lands, including documentation of traditional and customary rights, are those found in the Kingdom collections, documenting the history of land tenure, and defining the boundaries of *ahupua'a* in the Kohala-Hāmākua Districts. This section of the study presents readers with the laws of the Hawaiian Kingdom, which established fee-simple land ownership and codified native tenant rights. Subsequent to the definition of land rights, the Kingdom set about the processes to determine the metes and bounds of the lands which had been granted in fee-simple interest to various parties. As a result, detailed oral testimonies from elder native tenants were taken in court proceedings, which further documented the occurrence of traditional and customary practices, and nature of the resources within given *ahupua'a*. In those records, which follow below, we learn of the traditional knowledge and occurrence of native practices in the lands which today are a part of, and adjoin the Pu'u o 'Umi NAR.

The Māhele 'Āina (Land Division)

In Hawai'i prior to western contact, all land, ocean and natural resources were held in trust by the high chiefs (*ali'i 'ai ahupua'a* or *ali'i 'ai moku*). The use of land, fisheries and other resources was given to the *hoa'āina* (native tenants) at the prerogative of the *ali'i* and their representatives or land agents (*konohiki*), who were generally lesser chiefs as well. By 1845, the Hawaiian system of land tenure was being radically altered, and the foundation for implementing the Māhele 'Āina (a fee-simple right of ownership) was set in place by Kauikeaouli (Kamehameha III).

Following implementation of the *Māhele*, the King also initiated a land grant program, issuing fee-simple "Royal Patents" on granted land. In addition to the sale of fee-simple interests in land, the Crown and Government lands were also made available for leases and, in some cases, for sale. Together, these three land programs opened the door for the development of the large ranching interests in Waimea, and the larger Kohala-Hāmākua Districts.

On December 10th, 1845, King Kamehameha III (Kauikeaouli), signed into law "Article IV. –of The Board Of Commissioners to Quiet Land Titles," a joint resolution defining the responsibilities of the Board of Commissioners. Several actions were implemented by this law, among them:

> SECTION I. His Majesty shall appoint through the minister of the interior, and upon consultation with the privy council, five commissioners, one of whom shall be the attorney general of this kingdom, to be a board for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property acquired anterior to the passage of this act; the awards of which board, unless appealed from as hereinafter allowed, shall be binding upon the minister of the interior and upon the applicant…
>
> SECTION VII. *The decisions of said board shall be in accordance with the principles established by the civil code of this kingdom in regard to prescription, occupancy, fixtures, native usages in regard to landed tenures, water privileges and rights of piscary*, the rights of women, the rights of absentees, tenancy and subtenancy, — primogeniture and rights of adoption; which decisions being of a majority in number of said board, shall be only subject to appeal to the supreme court, and when such appeal shall not have been taken, they shall be final…
>
> Section IX. The minister of the interior shall issue patents or leases to the claimants of lands pursuant to the terms in which the said board shall have confirmed their respective claims, upon being paid the fees of patenting or of leasing (as the case may be)… [In the Polynesian; January 3, 1846:140]

As the *Māhele* evolved, it defined the land interests of Kauikeaouli (King Kamehameha III), some 252 high-ranking *Ali'i* and *Konohiki*, and the Government. As a result of the *Māhele*, all land in the Kingdom of Hawai'i came to be placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands. The "Enabling" or "*Kuleana* Act" of the Māhele (December 21, 1849) further defined the frame work by which *hoa'āina* (native tenants) could apply for, and be granted fee-simple interest in "*Kuleana*" lands (cf. Kamakau in *Ke Au Okoa* July 8 & 15, 1869; 1961:403-403). The *Kuleana* Act also reconfirmed the rights of *hoa'āina* to access on trails, subsistence and collection of resources necessary to their life upon the land in their given *ahupua'a*. The *Kuleana* Act, remains the foundation of law pertaining to native tenant rights. The Act was passed on August 6, 1850, and reads:

> An Act confirming certain resolutions of the King and Privy Council passed on the 21st day of December 1849, granting to the common people allodial titles for their own lands and house lots, and certain other privileges… That the following sections which were passed by the King in Privy Council on the 21st day of December A.D. 1849 when the Legislature was not in session, be, and are hereby confirmed, and that certain other provisions be inserted, as follows:
>
> **Section 1**. Resolved. That fee simple titles, free of commutation, be and are hereby granted to all native tenants, who occupy and improve any portion of any Government land, for the land they so occupy and improve, and whose claims to said lands shall be recognized as genuine by the Land Commission; Provided, however, that the Resolution shall not extend to Konohikis or other persons having the care of Government lands or to the house lots and other lands, in which the Government have an interest, in the Districts of Honolulu, Lahaina and Hilo.
>
> **Section 2**. By and with the consent of the King and Chiefs in Privy Council assembled, it is hereby resolved, that fee simple titles free of commutation, be and are hereby granted to all native tenants who occupy and improve any lands other than those mentioned in the preceding Resolution, held by the King or any chief or Konohiki for the land they so occupy and improve. Provided however, this Resolution shall not extend to house lots or other lands situated in the Districts of Honolulu, Lahaina and Hilo.
>
> **Section 3**. Resolved that the Board of Commissioners to quiet Land titles be, and is hereby empowered to award fee simple titles in accordance with the foregoing Resolutions; to define and separate the portions belonging to different individuals; and to provide for an equitable exchange of such different portions where it can be done, so that each man's land may be by itself.
>
> **Section 4**. Resolved that a certain portion of the Government lands in each Island shall be set apart, and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre.
>
> **Section 5**. In granting to the People, their House lots in fee simple, such as are separate and distinct from their cultivated lands, the amount of land in each of said House lots shall not exceed one quarter of an acre.
>
> **Section 6**. In granting to the people their cultivated grounds, or *Kalo* lands, they shall only be entitled to what they have really cultivated, and which lie in the form of cultivated lands; and not such as the people may have cultivated in different spots, with the seeming intention of enlarging their lots; nor shall they be entitled to the waste lands.

> **Section 7**. When the Landlords have taken allodial titles to their lands the people on each of their lands shall not be deprived of the right to take firewood, *aho* cord, thatch, or ti leaf from the land on which they live, for their own private use, should they need them, but they shall not have a right to take such articles to sell for profit. They shall also inform the Landlord or his agent, and proceed with his consent. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, and running water, and roads shall be free to all should they need them, on all lands granted in fee simple. Provided, that this shall not be applicable to wells and water courses which individuals have made for their own use.
> Done and passed at the Council House, Honolulu this 6th day of August 1850. [copied from original hand written "Enabling Act"[9] – HSA, DLNR 2-4]

The most important source of documentation that describes native Hawaiian residency and land use practices — identifying specific residents, types of land use, crops cultivated, and features on the landscape — is found in the records of the *Māhele ʻĀina*. While the "Land Division" gave the *hoaʻāina* an opportunity to acquire fee-simple property interest (*kuleana*) on land which they lived and actively cultivated, the process required them to provide personal testimonies regarding their residency and land use practices. As a result, records of the *Māhele ʻĀina* present readers with first-hand accounts from native tenants generally spanning the period from ca. 1819 to 1855. The lands awarded to the *hoaʻāina* became known as "*Kuleana* Lands" and all the claims and awards (the Land Commission Awards or L.C.A.) were given *Helu* (numbers). The L.C.A. numbers remain in use today, and identify the original owners of lands in Hawaiʻi.

The work of the Land Commission was brought to a close on March 31, 1855. The program met with mixed results, and it has been calculated that the total amount of land awarded to *hoaʻāina* (native tenants – the common people of Hawaiʻi) equaled approximately 28,658 acres, of a total four million available acres (see Governor's report 1902:7).

Disposition of Primary Lands of the Puʻu o ʻUmi Natural Area Reserve in the Māhele

The lands which make up the Puʻu o ʻUmi NAR include *ahupuaʻa* and *ʻili* belonging to the Kohala and Hāmākua Districts. In the *Māhele*, the following division of lands was agreed to by the King and participating *aliʻi* (all page references are to the "*Buke Mahele*" 1848):

Awini	Relinquished by Kalaeokekoi to Kina Kamehameha III [pp. 35-36]
	Granted by King to Government Land Inventory [pp. 198-199]
Honokaneiki & Honokanenui	Retained by V. Kamamalu [pp. 3-4]
Kahuaiki	Retained by V. Kamamalu [pp. 3-4]
Kahuanui	Retained by Lot Kapuaiwa Kamehameha [pp. 7-8]
Kawaihae Hikina	Retained by Keoni Ana [pp. 160-161]
Kawaihae Komohana	Relinquished by M. Kekauonohi to King Kamehameha III [pp. 25-26]
	Retained by King Kamehameha III [p. 194]

[9] See also *"Kanawai Hoopai Karaima no ko Hawaii Pae Aina"* (Penal Code) 1850.

Laupahoehoeiki	Relinquished by Kalaeokekoi to King Kamehameha III [pp. 35-36]
	Granted by King to Government Land Inventory [pp. 187]
Laupahoehohenui	Retained by Kalaeokekoi [pp. 35-36]
Ouli	Retained by J.Y. Kanehoa [pp. 160-161]
Puukapu	Relinquished by M. Kekauonohi to King Kamehameha III [pp. 27-28]
	Retained by King Kamehameha III [p. 194]
Waiaka 1	Retained by Kamaikui [pp. 162-163]
Waiaka 2	Retained by Gini Lahilahi [pp. 162-163]
Waimanu	Relinquished by N. Namauu to King Kamehameha III [pp. 174-175]
Waimea	Retained by King Kamehameha III [p. 194]
Waipio	Retained by H. Kalama [pp. 146-147]

Within these lands, *hoa'āina* also made claims for small *kuleana*. Our review of all records of the Māhele revealed that the following number of claims were made in these lands[10]:

Ahupuaa	***Claims***	***Awarded***	***Not Awarded***
Awini	0	0	0
Honokaneiki & Honokanenui	6	4	2
Kahuaiki & Kahuanui	1	0	1
Kawaihae 1 & Kawaihae 2	19	13	6
Laupahoehoe iki & Laupahoehoe nui	3	3	0
Ouli	6	1	5
Puukapu	20	13	7
Waimanu	15	14	1
Waimea (and outlying *'ili* other than Ouli and Pu'ukapu)	66	47	19
Waipio	109	92	17

None of the claims by *hoa'āina* appear to have identified uses or parcels within what is now a part of the Pu'u o 'Umi NAR, though it is understood (based on traditional and customary practices, and the

[10] The on-going research of *Kumu Pono Associates LLC* in the nearly 60,000 records of the *Māhele 'Āina*, may lead to modifications in these numbers at a later date.

laws cited above) that native tenants of the lands would have accessed the mountain lands in order to collect resources or participate in other traditional practices. Significant testimonies documenting travel and traditional activities in the upper forests between the Kohala and Hāmākua mountain lands were recorded in between 1865 to 1905, in the proceedings of the Boundary Commission (see records below).

Proceedings of the Boundary Commission: Documenting Traditional and Customary Practices, and Land Boundaries (1866-1905)

In 1862, a Commission of Boundaries (the Boundary Commission) was established in the Kingdom of Hawai'i to legally set the boundaries of *ahupua'a* that had been awarded to *Ali'i, Konohiki*, and foreigners during the *Māhele*. By the middle 1860s, land owners and their lessees were petitioning to have the boundaries of their respective lands—which were the foundation of ranching interests on Hawai'i—settled. Initially, G.M. Robertson began taking testimonies from native residents of the Waimea region early in the Commission's history. Following Robertson's death, brothers, Rufus and Fredrick Lyman continued the work and collection of detailed testimonies for the Third and Fourth Judicial Circuits (Island of Hawai'i).

In 1874, the Commissioners of Boundaries were authorized to certify the boundaries for lands brought before them (W.D. Alexander in Thrum 1891:117-118). The primary informants for the boundary descriptions were old native residents (generally born between the 1780s to 1820s) of the areas being discussed. The native witnesses usually spoke in Hawaiian, and their testimony was translated into English and transcribed as the proceedings occurred.

Readers will note that there are significant inconsistencies in spelling of various words, including place names, people names, and features on the landscape. This is problematic, but with the help of maps produced as a part of the surveys to establish boundaries, and other period maps, many of the locations described can be identified. We have also observed that in some testimonies, when the original translator-transcriber used two of the same vowels, it indicated that he/she heard a lengthened pronunciation of a particular vowel. This emphasis of pronunciation is now indicated by a macron mark—for example, the word "*neenee*" (for *nēnē*), the native goose formerly hunted on the mountain lands. While in the modern context of the language, two of the same vowels are generally both pronounced, and broken by an *'okina* or glottal mark.

The narratives cited below, are verbatim transcripts from the testimonies given by native residents or land owners, and those given by surveyors who recorded the boundaries based on the testimony of native guides. The testimonies include descriptions of the primary lands which rise up from the ocean from both the Hāmākua and Kohala Districts (in the case of Pu'ukapu, from the Waimea plateau lands), to the Kohala Mountain, and which form the region in which the Pu'u o 'Umi Natural Area Reserve is located. These native land divisions include the *ahupua'a* and *'ili* of Kahuā nui and Kahuā li'ili'i, Kawaihae 1st and Kawaihae 2nd, 'Ōuli, Pu'ukapu and Waimea, and Waikā, in the District of Kohala; and the *ahupua'a* of Honokāne iki & nui, Laupāhoehoe iki & nui, Waipi'o, and Waimanu, in the district of Hāmākua (see *Figure 4.*, depicting locations of primary mountain boundaries described in testimonies).

The native testimonies describe a wide range of traditional practices including—travel; land use; resource collection; the traditional practices associated with the collection of or "hunting" birds; and the subsequent practices associated with hunting introduced ungulates—all under the control of *Konohiki* [11]; and changes in the landscape. It is of importance to note that the boundaries were known

[11] In regards to hunting, it will be noted that descriptions of traditional hunting practices are limited to native species of birds, including the *ua'u, nēnē, mamo* and *'ō'ō*; while descriptions of historical hunting practices are limited to goats, which were hunted under contract of *Konohiki*, the Crown, or the Government.

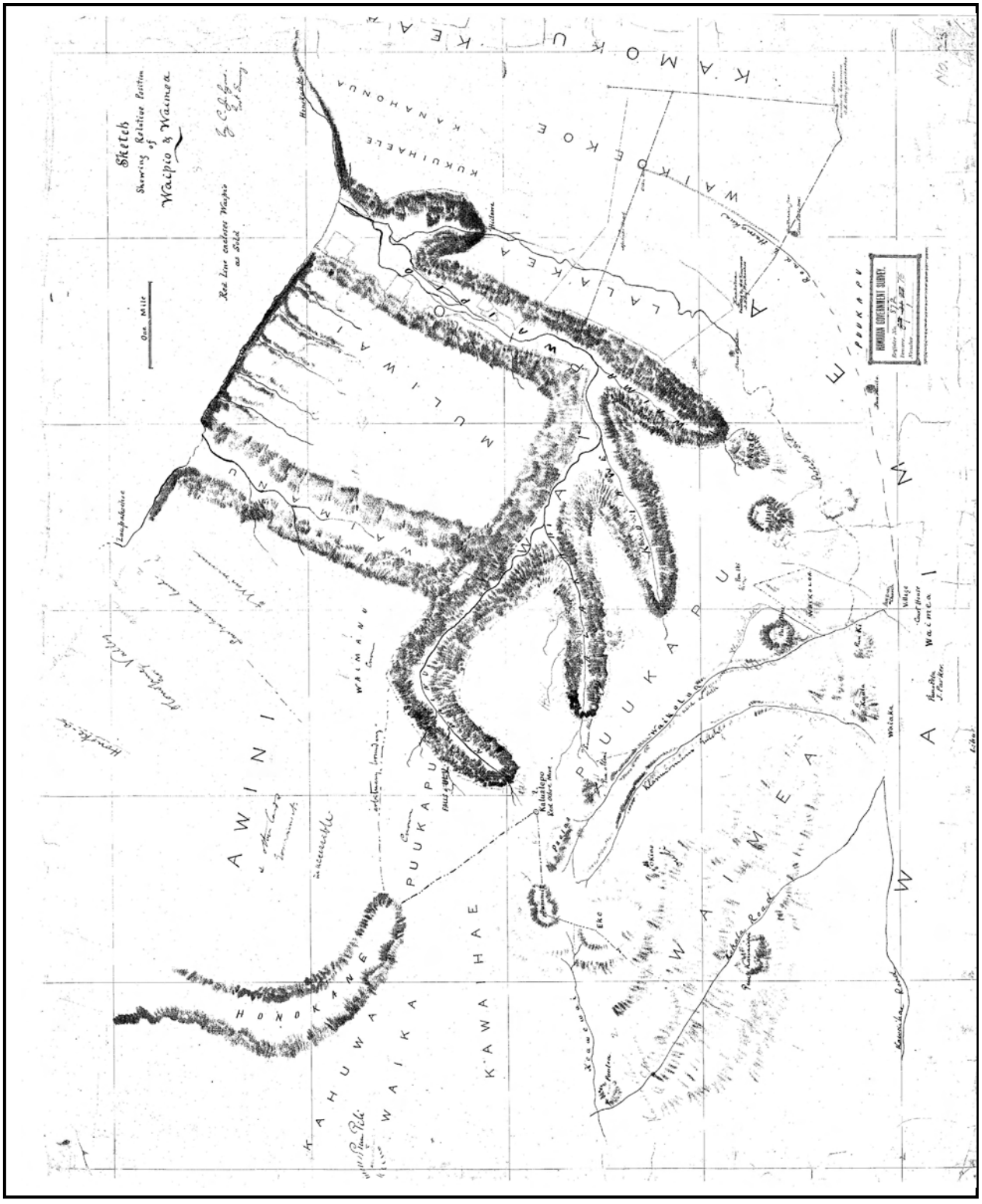

Figure 4. Reduction of Register Map No. 872 (C.J. Lyons, ca. 1875); Depicting Boundaries of Mountain Lands Described in Native Testimonies (State Survey Division)

by the native tenants, and the rights to take or hunt resources in traditional times were fiercely protected—individuals without chiefly, genealogical claims, or residency ties to given lands were not allowed to trespass and take resources from the *ahupua'a*.

Underlining, square bracketing, bold and italic print are used by the compilers here, to highlight place names and particular points of historical interest recorded in the testimonies. The proceedings for the cited lands are given in alphabetical order, and by date of recordation.

Ahupuaa of Honokane

District of North Kohala, Island of Hawaii,
Boundary Commission, Hawaii, Volume A:245-246

Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii

The undersigned would herewith make application for the settlement of the Boundaries of the following named Ahupuaas or lands belonging to the Estate of the Kekuanaoa & V. Kamamalu, viz…; [page 245]

…***Honokane***, District of Kohala, Hawaii adjoining lands unknown…

Your Honor therefore will please appoint a day for the hearing of said application, and grant a certificate in accordance therewith,

(sig) J.O. Dominis, admts.
J.F.H. Harris, Atty at Law
Hilo August 16th A.D. 1873 [page 246]

Ahupuaa of Honokane
Boundary Commission, Hawaii, Volume B:119-121
The *Ahupuaa* of ***Honokane***, District of North Kohala, Island of Hawaii, 3d J.C.

On this, the 22d day of November A.D. 1873 the Commission of Boundaries for the Island of Hawaii, 3d J.C., met at the Court House, North Kohala on the application of J.O. Dominis, for the Estate of M. Kekuanaoa for the settlement of the boundaries of ***Honokane***, situated in the District of North Kohala, Island of Hawaii. Notice of hearing at the ***Waimea*** Court House, South Kohala, for the settlement of the boundaries of lands in Hamakua and Kohala, on the _____
Served by publication in Hawaiian Gazette of _____ and *Kuokoa* of _____ 1873, and continued at the Court House in North Kohala on the 22d instant.

Due notice personally served on owners or agents of adjoining lands, as far as known.

Present: Jas. Woods for applicant and for Commissioner of Crown Lands, Kamakaala for Hawaiian Government.

For Petition see Folio 245, Book A.

Testimony

Mamani K. Sworn.
I was born at ***Honokane*** at the time of building the *heiau* at ***Kawaihae*** [1793], and have always lived there and know all the boundaries of the land. I was told them by my parents. My father, a birdcatcher and cultivator, was a *kamaaina* of the land, and I used to go into the mountain with him.

Honokane is bounded at the sea on the Kohala side by the land of ***Pololu***. Commencing at a place called ***Kaneaa***. Kahena bounds it along the brow of the *pali*; thence along the edge of the *pali* to ***Waihoolana***. It is bounded by ***Kahuaiki*** from ***Kehena*** to ***Waihoolana***. I do not know whether ***Kawaihae*** bounds ***Honokane*** or not, but the boundary of ***Honokane*** runs along the brow of the *pali*. I have not seen ***Waihoolana***, but I have heard that it is a large pool of water. [page 119]

Bounded on the Hilo side by ***Awini***, the boundary being on the Hilo *pali* of gulch called ***Kalele***; thence along the middle of the *pali* to ***Kukuiaweo***. I have not seen this place and do not know what it is. Thence to Mahu, where they used to build fires at night to catch birds. Thence on past some bamboos that are on ***Awini***. This is as far as I know of the *mauka* boundaries.

Bounded *makai* by the sea. The *Uhu* was the *konohiki* fish, and the fishing rights extended out to sea to a place called Hahaku.

C.X.d.

Puulau K. Sworn
I was born here in North Kohala, but do not know when; have always lived here; am a *kamaaina* and know a part of the boundaries. Koko, a brother to the last witness showed them to me (he is now dead). I know a place on the ***Honokane*** *pali* called ***Kilohana*** where you can look down into the valley; have heard that ***Kehena***

joins ***Honokane*** there. The boundary runs along the *pali* to ***Waihoolana***. ***Honokane*** does not extend above the brow of the *pali*. I have not heard what lands bound ***Honokane*** at ***Waihoolana***. The boundary at sea shore is at ***Nalupai***, at the foot of the *pali*, and at ***Kukuilapaweo***, a place on the road. The land above the cocoanut grove, ***Kalele***, is now owned by Wiliama. I do not know any more about *mauka* boundaries. Bounded *makai* by the sea; have heard that the ancient fishing rights extended out to sea. I do not know anything about other boundaries.

C.X.d.

Kaaua [K.] Sworn, I was born at ***Honokane*** and was quite small when Kamehameha I died [in 1819]. My mother was a *kamaaina* of ***Honokane*** and knew a part of the boundaries. My parents used to live at ***Kilohana***. ***Kehena*** is on top of the *pali*, above this place, and the boundary is on the brow of the *pali*; thence to the land of ***Kehena*** along the brow of the *pali* to ***Waihoolana***. I have never been to ***Waihoolana*** [page 120], but the head of the *pali* is the boundary of the land. I do not know of any land except ***Kehena*** that joins ***Honokane***. Bounded *makai* by the sea, from the land of ***Pololu*** to a large rock in the sea called Nulupai; thence along land sold on ***Awini***; thence along the side of the *pali*; thence to a marked rock on top of the *pali*. Makai [K.] now on Kaui [Kauai?] who formerly lived on ***Awini***, told me that ***Kawiwi*** gulch is the boundary between ***Kehena***, ***Awini*** and ***Honokane***. I do not know the boundary between ***Honokane*** and ***Awini*** in this gulch to corner of land sold on ***Awini***.

I do not know any other boundaries of ***Honokane***, and have never heard that ***Waimanu*** joins ***Honokane***.

C.X.d.

Mr. James Woods says he has been unable to find any more witnesses. For Boundaries between ***Pololu*** and ***Honokane*** see Certificate No. ____ Folio ____. For boundaries between ***Kehena*** 2 and ***Honokane*** see Certificate of boundaries No. ____ Folio ____.

Case continued until further notice to interested parties.

R.A. Lyman. Commissioner of Boundaries, 3d J.C… [page 121]

Ahupua of Honokane
Boundary Commission, Hawaii, Volume D No. 5:205-209

Continued from page 121, Book B, (No. 2)

The *Ahupuaa* of ***Honokane***, District of
North Kohala, Island of Hawaii, 3d & 4th J.C.

Copy

Office of the Trustees under the Will of
Bernice P. Bishop

Honolulu Hawaiian islands
August ***1st***, 1898.

Mr. R. A. Lyman
Commissioner of Land Boundaries
Hilo, Hawaii

Dear Sir:
The Trustees of the B.P. Bishop Estate
are desirous of securing the Boundary Commission Award
of the *Ahupuaa* of ***Honokane***, North Kohala, Hawaii,
and I herewith submit you a survey and map of
the land in question as required by section 281, Chapter
19, Civil Code (Ballon edition); Laws Hawaiian Islands.
You will observe that the names of the owners of
the adjoining lands are noted on the map submitted.
We shall be pleased to receive your notice as to when
you are prepared to hear the case and have our rep-
resentative appear before you.

Yours respectfully,
(Signed) A.C. Lovekin
for secretary

Copy

Office of the Trustees under the Will of
Bernice P. Bishop
Honolulu, Hawaiian Islands
August 10th, 1898.

Mr. R. A. Lyman
Commissioner of Land Boundaries
Hilo, Hawaii

Dear Sir:
Your communication of the 6th
Inst. is at hand and contents noted.

I have consulted with our surveyor, Mr. W.A. Wall,
and if convenient to you he will leave here on the
S.S. Kinau, sailing Tuesday 13th of September. He will

arrange to bring a *Kamaaina* with him from [page 205]
Kohala, as you suggest.

Kindly inform us if this plan is satisfactory to you.

Yours respectfully
(Signed) A.C. Lovekin
for Secretary

The above letter was answered August 16th 1898,
and notice of time and place of hearing for final
settlement of the boundaries of ***Honokane*** were
forwarded by mail at same time to the owners
of the adjoining lands, as far as the owners are known.
And the following Notice was published in
the Hawaii Herald published in Hilo, Hawaii,
August 18, 1898, and also Aug. 25th 1898, and
Sept. 1, 1898 in both the English and Hawaiian
languages.

Notice
Commissioner of Boundaries
Notice is hereby given that application having been made
to me by A.C. Lovekin, Secretary for Trustees under
the will of Bernice P. Bishop, for the final settlement
of the boundaries of the *Ahupuaa* of ***Honokane***,
situate in the District of North Kohala, Island of
Hawaii, Third Judicial Circuit, and the certificate
of boundaries of said land be issued.

It is hereby ordered that all parties interested in
the boundaries of said land of ***Honokane*** appear
before me at the Court House, South Hilo, Hawaii
at 10 a.m. September 15th 1898, and show cause if
any, why said petition should not be granted.

(Signed) Rufus A. Lyman
Commissioner of Boundaries, Island of Hawaii
Third and Fourth Judicial Circuit.
Hilo, Hawaii, Aug. 16, 1898. [page 206]

Hilo Hawaii Sept. 15, 1898

The Commission of Boundaries for the 3d and 4th
Judicial Circuits, Island of Hawaii, Republic of Hawaii
met at the South Hilo Court House this 15th day of
September 1898, according to notice published in the
English and Hawaiian Languages in Hawaii Herald
of August 18, 1898, Aug. 25, 1898 and Sept. 1st 1898.

And there appeared the following persons: W.A. Wall,
representing the Trustees under the Will of the Estate of
B.P. Bishop and also representing J.F. Brown, Public Land
Commissioner, Palmer Woods for Estate of James Woods,
the owner or lessees of ***Kehena 2d***, J.F. Woods

for owners of Kahua Ranch Co., the owners and lessees of ***Kahua Nui*** and ***Kahualiilii***.

The Awini Coffee Fruit & Stock Co., Ltd. by W.V. Rodenhurst, Manager and H.L. Holstien, their Atty. The notes of survey of ***Honokane*** filed and marked Exhibit A; The map also filed and marked Exhibit B.

The Commissioner of Boundaries stated that on the 16th day of May 1873, J.O. Dominis, Adm. of the Estate of M. Kekuanaoa, by his atty., F.H. Harris filed a petition with Rufus A. Lyman, the Com. of Boundaries for the Island of Hawaii, 3d J.C. to have the Boundaries of the *Ahupuaa* of ***Honokane*** and other lands settled.

The Petition is recorded on folios 245 & 246 Book A or No. 1.

On the 22d day of Nov. 1873, the Commission of Boundaries for the Island of Hawaii met at the Court House in North Kohala, Hawaii, and took the evidence of Mamani, Puulau and Kaaua in reference to Boundaries of ***Honokane***.

See folio 121, 122 and 123 Book B or No. 2, and also the Commissioner of Boundaries had settled the Boundaries of the land of ***Pololu***, and the land of ***Kehena 2d***, and issued Certificate of Boundaries for both of these lands.

H.L. Holstien that the owners of the lands adjoining ***Honokane*** wish to prepare a stipulation accepting the boundaries of ***Honokane*** as surveyed by W.A. Wall.

Granted. [page 207]

Evidence
W.A. Wall, says:
I have surveyed the land of ***Honokane*** in North Kohala Hawaii. In making the survey I followed the notes of survey of ***Pololu***, as given in Certificate of Boundaries of ***Pololu***, to the junction of ***Honokane***, ***Pololu*** and ***Kehena 2d***, and along land of ***Kehena*** I followed the notes of survey as given in the Certificate of Boundaries of ***Kehena***, to the junction of these lands with land of ***Kahua nui***. Along ***Kahua*** I followed the brow of the *pali*.

On the side adjoining ***Awini***, I followed the boundary as given in the notes of survey on the Grant on ***Awini*** and the boundary of the Homestead lots on ***Awini***.

The boundary of Homestead lots had been
surved [surveyed] along the bottom of the gulch, instead
of along the brow of the *pali*, but we decided
to give up the *pali* to the Homestead lots.

C.X.d.

H.L. Holstien filed the following stip-
ulation signed by all Land Owners present.
Marked Ex. C.

In the Commissioner's Court of Boundaries of the
Third and Fourth Circuit, Hilo, Hawaii

September 15, 1898.

In the settlement of the boundaries
of the *Ahupuaa* of ***Honokane***, District
of North Kohala, Island of Hawaii,
now being held by the Trustees of the Bishop Estate.
Stipulation of parties present in Court.
The respective owners of lands adjacent thereto, as
well as the representative of the Trustees,
now comes the Estate of James Woods, by P.P. Woods;
the Kahua Ranch by J.F. Woods; the Awini Coffee
Fruit & Stock Company by W.V. Rodenhurst, Manager
and H.L. Holstien, their attorney, W.A. Wall, repre-
senting the Trustees of the Bishop Estate, and
J.F. Brown, Commissioner of Public Lands, and
in open session of this Tribunal agree and [page 208]
stipulate that the notes of survey presented and filed in
the above entitled proceeding marked Exhibit A, as well as
the map accompanying said notes, marked Exhibit B, be
and the same are hereby accepted as true field notes
of surveys, bearings, and map, and hereby abide by
the same as exact boundaries of our respective lands.

Done in court this 15th day of September 1898.

(Signed) Est. of James Woods
by P.P. Woods
Kahua Ranch
by J.F. Woods

Awini Coffee Fruit & Stock Co. Ltd.
By W.V. Rodenhurst, Manager

H.L. Holstien
attorney of said Company

W.A. Wall representing B.P. Bishop Estate
& J.F. Brown, Commissioner Public Lands.

Decision
The boundaries of the *Ahupuaa* of ***Honokane***
are decided to be as set forth in the notes
of survey and map made by W.A. Wall and
filed this day as Exhibits A and B, and
the Certificate of Boundaries will be issued
and dated as of today.

Rufus A. Lyman
Commissioner of Boundaries
3d & 4th Jud. Circ'.s
Hawaiian islands.

Ahupuaa of Honokane
Boundary Commission, Hawaii, Volume C No. 4:93-95

No. 172

Certificate of Boundaries of the Land
of ***Honokane***
District of North Kohala
Island of Hawaii,
L. C. Award No. 7713

Commission of Boundaries
3rd & 4th Judicial Circuits
Rufus A. Lyman, Esq., Commissioner

In the matter of the boundaries
of the Land of ***Honokane***
District of North Kohala
Island of Hawaii, 3rd Judicial Circuit

Judgement.
An application to decide and certify the Boundaries of
the Land of ***Honokane***, District of North Kohala
Island of Hawaii, having been filed with me on the 16th
day of May 1873, by J.O. Dominis, Adm. of the
Estate of M. Kekuanaoa, by his Atty., F.H. Harris
in accordance with the provisions of an Act to facili-
tate the settlement of Boundaries; now, therefore
having duly received and heard all the testimony offered
in reference to the said boundaries, and having endea-
vored otherwise to obatin all information possible to
enable me to arrive at a just decision, which will more
fully appear by reference to the records of this matter
by me kept in book No. A, pages 245 & 246 and Book
B, pages 121-123 and Book D, pages 205-209 and it
appearing to my satisfaction that the true, lawful
and equitable boundaries are as follows, viz.:

As surveyed by W.A. Wall.

Beginning at a rock marked "**KP**" on the beach at a
place called "***Kapili***," and where the house used to stand

is called "***Keawehalu***," the boundary between ***Honokane*** and ***Pololu***, from which point the Government Survey Station "***Makanikahio***" bears N. 74° 23' E. 2450 feet; thence the boundary runs *mauka* over a low sand ridge and up a point of the *pali*; following notes of survey of land of ***Pololu***, Certificate of Boundaries, No. 14.
S. 6º 00' E. Mag. 884 feet to *Puhala* tree marked **K**;
thence up along the *pali* near the brow of it [page 93]
South Mag. 1320 feet to place called ***Kupehau***
S. 5º 00' E. Mag. 924 feet
S. 13º 00' W. Mag. 246 feet
S. 16º 00' E. Mag. 891 feet to ***Kahuapau***;
S. 12º 00' W. Mag. 1320 feet to ***Keikipuaa***;
S. 17º 00' W. Mag. 1320 feet to ***Kahinai***;
South Mag. 792 feet to end of *Ili* of ***Pololu*** called ***Hoau***;
thence over hill named "***Puukana***,"
S. 20º 00' E. Mag. 1320 feet to ***Kaohumaunu***;
Soutn 8º 00' W. Mag. 1914 feet to point on high ridge covered with trees; thence along a sharp narrow ridge dividing the two palis;
S. 17º 30' E. Mag. 1278 feet
S. 11º 00' W. Mag. 1518 feet to a large *ohia* tree marked "**H**" at a rock marked "**K**" at a point called "***Kaneaa***" at the corner of ***Pololu*** and ***Kehena 2nd*** on the ***Honokane*** *pali*, right at the brow of the *pali*; thence along land of ***Kehena 2nd***, certificate of Boundaries No. 17;
S. 6º 00' E. Mag. 5280 feet along brow of *pali*;
S. 21º 30' W. Mag. 4,884 feet along brow of *pali* to a small hill known as "***Kilohana***" rock on a ledge marked "**K**," thence along lands of ***Kahualiilii*** and ***Kahua nui***;
S. 20º 04' W. True 5,980 feet to ***Puulaau*** (***Puuwau***) at junction of this land with ***Kawaihae 2d***;
thence along ***Kawaihae***;
S. 65º 40' E. True 13,300 feet to corner of this land, ***Kawaihae*** and Awini, Thence along Awini;
North, True, 14,000 feet to corner of Homestead Lots,
N. 8º 10' W., True 11,800 feet to N.W. corner of Homestead Lots, the stream being the boundary;
S. 77º 30' E. True, 800 feet along Homestead Lot #1;
N. 5º 30' W. Mag. 1,683 feet along Grant 2497;
N. 9º 00' W. Mag. 1,914 feet along Grant 2497;
N. 4º 00' W. Mag. 1,633 feet along Grant 2497;
N. 21º 45' E. Mag. 2,812 feet along Grant 2497 to the sea;
thence along the sea shore to the initial point and containing an area of 5,410 Acres. [page 94]

It is therefore adjudged, and I do hereby decide and certify that the Boundaries of the said land of ***Honokane*** are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii,
the Fifteenth day of September, A.D. One thousand
eight hundred and ninety-eight.

Rufus A. Lyman
Commissioner of Boundaries,
Third and Fourth Juducial Circuits
H.I… [page 95]

Ahupuaa of Laupahoehoe Nui (2nd)

District of Hamakua, Island of Hawaii
Boundary Commission, Hawaii Volume D No. 5:380-395

In re Boundaries of the *Ahupuaa* of ***Laupahoehoe-nui*** or Laupahoehoe 2. District of Hamakua, Island of Hawaii, 3rd & 4th Jud. Circs. Territory of Hawaii.

L.C.A. No. 6245.
Kalaeokekoi

Hilo, Hawaii January 17th 1901.

The Commission of Boundaries for the Island of Hawaii, Third & Fourth Judicial Circuits of the Territory of Hawaii, met at the District Court Room of South Hilo, Hawaii, after due notice published in the English language in the Hawaii Herald at Hilo Hawaii for three weeks, as follows:

Notice of Commissioner of Boundaries.
Notice is hereby given that on the 27th day of June A.D. 1900, Elizabeth K. Booth filed application for the settlement of the boundaries of the *Ahupuaa* of ***Laupahoehoe-nui***, situate in the District of Hamakua, Island and Territory of Hawaii, Fourth Judicial Circuit, and asks that Certificate of Boundaries of said land be issued. It is therefore ordered that all parties interested in the boundaries of said land, ***Laupahoehoe-nui*** appear before me at 10 a.m. January 17, 1901, at the Court House, South Hilo, Hawaii, and show cause if any, why said petition should not be granted.

(Signed) Rufus A. Lyman
Commissioner of Boundaries, Island of Hawaii,
Third and Fourth Judicial Circuits
Hilo, Hawaii, December 28, 1900. 22-3.

And notice published in the Hawaiian language in the *Elele Hawaii*, at Hilo, Hawaii, for three weeks as follows:

Hoolaha A Ke Komisina o Na
Palena Aina.

Ke hoolaha ia aku nei ma keia ua waiho mai o
Elizabeth K. Booth he palapala noi kupono i hana

ia, ma ka la 27 o Iune A.D. 1900, no ka hooponopono ana i na palena aina o ke Ahupuaa o ***Laupahoehoe-Nui***, e waiho la iloko o ka Apana o Hamakua, Mokupuni a Panalaau o Hawaii, Apana Hookolokolo Kaapuni Eha, e noi ana e [page 380] hoopuka ia ka Palapala o na Palena Aina o ua aina la i olelo ia. Nolaila, ke kauoha ia aku nei ma keia, o na poe apau i kuelana i na palena aina o ka aina o ***Laupahoehoe-nui*** i oleloia, e hele mai lakou imua o'u, ma ka hora 10 kakahiaka o ka la 17 o Januari, 1901, ma ka Hale Hookolokolo o Hilo Hema, Hawaii, a e hoike mai ina kumu, ina he kumu kekahi, no keaha la e ae ole ia ai ua palapala noi la.

(Signed) Rufus A. Lyman
Komisina o na Palena Aina, Mokupuni o Hawaii,
Apana Hookolokolo Kaapuni Ekolu me Eha.
Hilo, Hawaii, Dekemapa 28, 1900

Present: T.K. Bipi, the Surveyor, Kahelehookahi Kapololu and Kahalehau Kumukahi.

The Commissioner of Boundaries having received the following letter from the Secretary of Commissioner of Public lands.

Commission of Public Lands
Territory of Hawaii.

Honolulu, Jany. 4th 1901,

R.A. Lyman, Esq.
Commissioner of Boundaries
3rd and 4th Judicial Circuit.

Hilo, Hawaii

Sir:

I beg to acknowledge receipt of yours of the 28th Ulti. informing that you have set Jany. 17th 1901 at 10 A.M. for the hearing of evidence as to the boundaries of ***Laupahoehoe Nui***, and to say in reply that in the absence of the Commissioner, I conferred with the Governor relative to this matter, and he advised me to request you to hold the same on any other day than the 17th inst. it being a statutory holiday, and he further holds that no legal business could be held on any legal holidays.

I would therefore suggest that you set a day other than the 17th, informing this office the date of such hearing.

Mr. E.D. Baldwin will represent the Government in the matter.

Yours respectfully,

(Signed) E.S. Boyd
Secretary [page 381]

The foregoing letter was received by the Commissioner of Boundaries on the 10th day of January A.D. 1901, and answered by the Commissioner on the same day as follows.

Hilo, Hawaii, January 10th 1901.

E.S. Boyd, Esq.
Secretary Commission of Public Lands.

Sir

I am in receipt of your favor of the 4th inst. in re the hearing for the settlement of the Boundaries of the *Ahupuaa* of ***Laupahoehoe Nui***.

It was a mistake setting the hearing for the 17th of Jan. 1901, and as the witnesses are coming up from Honolulu and elsewhere next week, I will hold the hearing at 10 a.m. January 18th 1901.

I enclose copies of two letters from J.F. Brown, Commissioner of Public Lands dated July 26, 1900, and Oct. 13, 1900 in re. boundaries & Notes of survey of ***Laupahoehoe Nui***, received by me Oct. 17, 1900 with the corrected Notes of Survey.

The Notes of survey were sent to me several months ago, and I got Attornies for Applicant to refer notes of Survey to Mr. J.F. Brown, Com. of Public Lands, and Mr. Brown wrote letter of July 26 and handed to Kinney, Ballon & McClanahan, and they kept it and handed corrected Notes of survey to Mr. J.F. Brown, and he examined it, and wrote letter dated Oct. 13th 1900, and Kinney, Ballon & McClanahan forwarded both of Mr. Brown's letters and corrected Notes of survey to me.

And as I had there letters of Mr. Brown's in my hands approving T.K. Bipi's Notes of Survey I set time of hearing for settlement of Boundaries, without waiting for Mr. Brown to return.

So as to have the *kamaaina* give evidence as to boundaries, and as to T.K. Bipi's survey, and if they prove boundaries to be the ones given in T.K. Bipi's Notes of survey approved of by the Commissioner of Public Lands, then Cert. of Bound. will be issued, if boundaries given by *Kamaaina* are different from Notes of Survey, then hearing will

be continued, for the Commissioner of Public [page 382] Lands to appear, and bring in evidence as to the Boundaries of land, if he wishes to, before I give my decision. Hoping everything will be satisfactory, to the Government.

I remain
Yours truly,
(Signed) Rufus A. Lyman
Com. of Boundaries 3rd & 4th J.C.
Territory of Hawaii.

From
(Press Copy Book, Pages 49, 50 & 51)
This 17th day of January A.D. 1901, being a Legal Holiday and the witnesses for Applicant having arrived in Hilo, the hearing is continued until 10 A.M. Jany. 1901.

Rufus A. Lyman
Commissioner of Boundaries 3rd & 4th J.C.
Island of Hawaii, Territory of Hawaii.

Hilo, Hawaii, January 18th 1901.

The Commission of Boundaries for the Island of Hawaii met at 10 A.M. according to adjournment from the 17th inst.

Present: the three witnesses who appeared yesterday.

Affidavits of Publication of Notices for the Hearing for settlement of Boundaries were read… [page 383]

…The Commissioner of Boundaries is summoned to appear as a witness, in the Circ. Court 4th Jud. Circ. today, so the hearing is adjourned until 10 A.M. January 19, A.D. 1901.

Rufus A. Lyman
Com. of Bound. 3rd & 4th Jud. Circ.
Island & Territory of Hawaii

Hilo, Hawaii, January 19, 1901
The Commission of Boundaries for the Island of Hawaii, met at the Dist. Court Room, at the Court House, Hilo, Hawaii at 10 A.M. according to adjournment from Jan. 18, 1901.

Present: A.B. Loebenstien on part of Applicant and E.D. Baldwin for J.F. Brown, Commissioner of Public Lands on the part of the Government of the Territory of Hawaii.
T.K. Bipi, K. Kapololu and others.

Petition of the Applicant read as follows:

In re Boundaries of the
Ahupuaa of ***Laupahoehoe-nui***
or ***Laupahoehoe 2***

To the Honorable R.A. Lyman
Commissioner of Boundaries for the
Fourth Judicial Circuit of the
Hawaiian Islands.

Now comes your Petitioner, Elizabeth K. Booth,
and says: that by L.C.A. 6245, Part 2, dated March 6,
1854, there was awarded and set apart to one Ka-
laeokekoi the *Ahupuaa* of ***Laupahoehoe-nui***
situated at Hamakua, Hawaii, as granted to
said Kalaeokekoi by King Kamehameha III [page 384]
in the land *Mahele* of 1848.

That said land is bounded to the best of the knowledge
and belief of your petitioner as follows:

Northerly by the sea; easterly in part by *Ahupuaa* of ***Lau-***
pahoehoe 1, Grant No. 798, by Kamehameha to Keaupuni;
the boundary between the two Ahupuaas following the line of
Kaimu Gulch up to the *Loulu* tree; southerly by the *Ahu-*
puaa of ***Puukapu***, and westerly by the *Ahupuaa* of
Nakooka; the boundary line between said *Ahupuaa* and
the *Ahupuaa* of ***Laupahoehoe 2*** following for the most part
Kukui gulch, save at a point about thirty-five hundred
feet *mauka* of the sea coast, where it runs to the west-
ward of said Gulch.

That the owners of the above mentioned adjoining
Ahupuaas are to your petitioner unknown; that the boun-
daries of said *Ahupuaa* have never been definitely es-
tablished either by award or otherwise;
that the boundaries of said *Ahupuaa*, as claimed by
your petitioner, are as follows:

E hoomaka ma kekahi pohaku kaha e pili
ana i ka pali ma ke kahawai o ***Nakooka*** a e holo
ana ma ka palena o ***Nakooka***
N. 60º E. 198 ft. a hiki i ka pohaku i kahakai,
alaila ma ke kai
S. 71º 30' E. 1500 ft. a hiki i ka pohaku ma ke awa
o ***Hoopaukuku***;
N. 69º 00' E. 320 ft. i ka pohaku nui ;
S. 84º 00' E. 1100 ft. i ka pohaku nui i ka lae;
S. 46º 00' E. 2240 ft. i ka pohaku nui apo ulaula;
S. 18º 00' E. 900 ft. i ka pohaku nui e ku ana iloko
o ke kai, *makai* pono o ka leina wai o ke
kahawai o ***Kaimu***; alaila e holo ana iluna
o ka pali ma ke kahawai o ***Kaimu*** 1200 ft;
alaila, e holo ana ma ia kahawai no;
S. 21º 00' W. 7920 ft. i ke kumu ohia **X** e pili ana i kae
kahawai;

S. 25º 00' W. 370 ft. alaila;
S. 42º 30' W. 256 ft. alaila;
S. 20º 00' W. 330 ft. alaila;
S. 23º 00' W. 1547 ft. alaila;
S. 25º 00' W. 562 ft. alaila;
S. 61º 00' W. 106 ft. alaila; [page 385]
S. 18º 00' W. 220 ft. alaila;
S. 10º 00' E. 1500 ft. alaila;
S. 20º 00' W. 2850 ft. a hiki i kekahi kumu loulu, e
pili ana i ***Puukapu***, alaila e holo i Kohala;
N. 84º 00' W. 5500 ft. a hiki i ke kahawai o ***Kukui***, alaila,
holo i kai ma ia kahawai a hiki i kahi i
hoomaka ai;

2356 eka a oi emi paha.

Ua koe mai ke kuleana o na kanaka.

Wherefore Your Petitioner Prays that the Honorable
Commissioner of Boundaries for the Fourth Judicial
Circuit will appoint a day and place at which
the boundaries of the aforesaid *Ahupuaa* may be de-
cided and certified by said commissioner in the
manner by the Statute made and provided.

(Signed) Elizabeth K. Booth

Honolulu, Oahu,
Hawaiian Islands. S.S.
Elizabeth K. Booth being duly sworn on oath
deposes and says; that she is the petitioner above
named; that she has read the foregoing petition
and that all and singular the matters and things
therein alleged are true, except those matters that
are alleged upon information and belief, and as
to those matters she believes them to be true.

(Signed) Elizabeth K. Booth
Subscribed and sworn to before me
this 21st day of June A.D. 1900.
(Notorial Seal) (Signed) Eleanor W. Davis
Notary Public

A.B. Loebenstien for the applicant asks
to have the letter of the Commissioner of Bound-
aries dated June 28th 1900, and letters of
J.F. Brown, Commissioner of Public Lands
dated July 26th, 1900 and October 13th 1900,
made a part of the evidence in this case,
and also the corrected notes of Survey
endorsed by J.F. Brown, Oct. 13th 1900,
recorded as part of the evidence in this case. [page 386]

Motion approved by E.D. Baldwin on the part of the
Government.

Motion Granted.

Copy of letter of Commissioner of Boundaries dated June 28th 1900, copied from Letter Press Copy book, pages 23 & 24.

Hilo, Hawaii, June 28th 1900.

Kinney, Ballon & McClanahan

Honolulu, Oahu

Gentlemen:
I am in receipt of your favor of the 22d inst. and the petition of Elizabeth K. Booth in re Boundaries of the *Ahupuaa* of ***Laupahoehoe-nui*** or ***Laupahoehoe 2***.

At the present time I can not say when or where I will have the hearing for the settlement of the boundaries of this land.

In the meantime, I think it would be well for you to show the map and notes of survey of the land to J.F. Brown, Agent of Public lands, and also to the Govt. Survey Officers, so as to see if they are satisfied that the notes of survey are correct, and if they will file a pap. with me, accepting the boundaries as given in your notes of survey.

The land of ***Puukapu*** was formerly a Crown land, and was included in Certificate of Boundaries of the *Ahupuaa* of ***Waimea***, and I think lands of ***Laupahoehoe 1***, and ***Nakooka*** are both owned by the Government.

If you can get the Govt. to accept the notes of survey filed with me as true and correct, it will save a great deal of expense in going onto the land, or bringing witnesses a long distance to give their evidence.

I remain
Yours truly,
(Signed) R.A. Lyman
Commissioner of Boundaries 3rd & 4th J. C.
Hawaiian Islands.

Mr. J.F. Brown's letter of July 26th 1900, and of Oct. 13th 1900, and corrected Notes of survey endorsed by J.F. Brown, were forwarded by Kinney [page 387] Ballon & McClanahan, Oct. 15th 1900, and received by the Commissioner of Boundaries for the Island of Hawaii, and filed Oct. 17th 1900.

And are as follows:

Commission of Public Lands
Territory of Hawaii
Honolulu, July 26th,1900
R.A. Lyman, Esq.
Boundary Commissioner
Fourth Judicial Circuit

Sir:
Referring to an application for settlement of boundaries of ***Laupahoehoe-nui***, Hamakua, Hawaii, L.C.A. 6245 Part II to one Kalaeokekoi, the said application with accompanying survey being subscribed and sworn to by Elizabeth K. Booth, before Eleanor W. Davies, Notary Public, under date of June 21st 1900, I would state:

That this office has at present no means of proving the correctness of the metes and bounds given in the said survey, but as this land is represented by the survey and accompanying plan to be bounded on three sides by Natural boundaries, namely *makai* by the sea, on the east by ***Kaimu*** gulch and on the West by ***Kukui*** gulch, and as the upper line does not apparently encroach on what we hold to be the land of ***Puukapu***, no objection will be made to a certificate by this survey if you, as Commissioner of Boundaries are satisfied that the gulches named are respective boundaries of the land.

I would only state further that the plan by T.K. Bipi, dated October 5th 1899 is not strictly in accord with the metes and bounds of survey.

The last course on East side (S. 20º W. 2850 ft.) reaches only to the point marked **O** on plan and not to the corner marked ↞ Loulu.

I would ask that if this case comes on for hearing this letter be made part of the record.

Yours truly
(Signed) J.F. Brown
Commissioner of Public Lands [page 389]

Commission of Public Lands
Territory of Hawaii
Honolulu, October 13th, 1900

R.A. Lyman, Esq.
Boundary Commissioner
Fourth Judicial Circuit

Sir:
Under date of July 26th last, I wrote you in the matter of the settlement of boundaries of *Ahupuaa* of ***Laupahoehoe-nui***, Hamakua. In that letter I referred to an inconsistency between the notes of survey by T.K. Bipi, and the plan furnished.

A corrected survey is now presented at this office, and in regard to same I would say that such corrected survey is accepted by this office, subject to the condition named in my letter of July 26th.

Yours truly,
(Signed) J.F. Brown
Commissioner of Public Lands

Received October 17, 1900

Description of
The Boundary of the *Ahupuaa* of ***Laupahoehoe-nui*** or ***Laupahoehoe 2***.

Commencing at a certain marked rock close to the *Pali* at the Gulch of ***Nakooka*** and running thence along the boundary of ***Nakooka***:

N. 60º 00' Mag. E. 198 feet to a rock at the beach from thence along the sea; thence
S. 71º 30' E. Mag. 1500 feet to a rock at the gulch of Hoopaukuku; thence
N. 69º 00' E. Mag. 320 feet to a big rock; thence
S. 84º 00' E. Mag. 1100 feet to a big rock at a point; thence
S. 46º 00' E. Mag. 2240 feet to a big rock at a red ring;
S. 18º 00' E. Mag. 900 feet to a big rock standing in the sea straight *makai* of the waterfall of the ***Kaimu*** stream; thence running up the *Pali* along the ***Kaimu*** stream 1200 feet; thence along said stream;
S. 21º 00' W. Mag. 7920 feet to an *Ohia* tree marked with a cross close to the edge of the stream; [page 389]
S. 25º 00' W. Mag. 370 feet thence;
S. 42º 30' W. Mag. 256 feet thence;
S. 20º 00' W. Mag. 330 feet thence;
S. 23º 00' W. Mag. 1547 feet thence;
S. 25º 00' W. Mag. 562 feet thence;
S. 61º 00' W. Mag. 106 feet thence;
S. 18º 00' W. Mag. 220 feet thence;
S. 10º 00' E. Mag. 1500 feet thence
S. 20º 00' W. Mag. 4050 feet to a certain *Loulu* tree at ***Puukapu***; thence toward Kohala;
N. 84º 00' W.5500 feet to the gulch of ***Kukui***; thence running down along this gulch to the sea beach at the point of commencement and containing an area of 2350 acres, a little more or less, excepting the Kuleanas of the Kanakas.

Correct from T.K. Bipi's survey.

Endorsed
(Signed) J.F. Brown
Oct. 13th 1900.

Evidence.

T.K. Bipi (K) sworn, says:
I am a surveyor, and know land of ***Laupahoehoe-nui***,
District of Hamakua, Island of Hawaii.

I surveyed land of ***Laupahoehoe-nui*** during month
of October 1899, and had *Kamaaina* with me.
Kapololu Senior, who had charge of the land went
with me, and pointed out the boundaries, from the
sea shore all around the land.

Kaumelelau a *Kamaaina* who went with Kaelema-
kule when he went to survey land, also went with me,
and their statements agreed as to boundaries of land.
Kapololu's son Kahelehookahi Kapololu, Kumu-
kahi, Kapela, and men from Waipio went with us.
Kaumelelau is dead, he died in December 1899,
two months after survey was made.

Kapololu Senior is now in ***Waimanu***, Hamakua,
Hawaii, and is unable to come to Hilo, as he is
sick. Kahelehookahi Kapololu
and Kumukahi *opio* have come to Hilo to [page 390]
give evidence.

I could not find Kapela before I came to Hilo to attend
this hearing. Kuamoo is an old *kamaaina* of the land,
and is in Honolulu now. He did not go with me when
I went to survey the land, as he was too feeble to go.

Laupahoehoe-nui is bounded on the East side by land
of ***Laupahoehoe iki***, or ***Laupahoehoe 1***., a land own-
ed by the Government, and a gulch is the boundary be-
tween the two lands, from the sea shore to the upper
end of the lands adjoining land of ***Puukapu***.

The Boundary follows the middle of the stream of
water flowing in this gulch.

I surveyed from the Sea shore to upper end of land along
the top of the *Pali* or bank of the gulch, as I could not
run my survey up the bottom of the gulch along the
stream, but made the bottom of the gulch the boundary.
My notes of survey are intended to represent the gen-
eral course of the stream of water in the bottom of gulch.
The land of ***Laupahoehoe-nui*** is bounded on West
side by land of ***Nakooka***, owned by the Government,
and a deep gulch is boundary between these two

lands. The gulch is shallow at *mauka* end, and deep from sea shore for three fourths of the way toward the *mauka* end.

The boundary between land of ***Laupahoehoe-nui*** and land of ***Nakooka*** follows the middle of the stream of water that is flowing in this gulch.

I ran my survey along the brow of the *Pali* or bank of this gulch, and the gulch is named the ***Kukui*** gulch. The gulch between ***Laupahoehoe-nui*** and ***Laupahoehoe iki*** is called the ***Kaimu*** gulch. The land of ***Puukapu*** bounds this land on the *mauka* or South side of land. The sea bounds this land on the sea side or North side.

There is no *Iwi aina* [boundary wall] between this land and land of ***Puukapu*** where they join each other in the forrest. I had to cut roads or trails to make my survey. The *Kamaaina* pointed out the place to me, where they said land of ***Puukapu*** cut it off. Kapololu Senior said he went to that place with an old bird catcher named Laahiwa, and that Laahiwa pointed out the boundaries [page 391] to him. Laahiwa died a good many years ago.

I identify these notes of survey as the description of notes of survey as made by me, with the exception of course S. 20º 00' West has had the distance changed to 4050 feet, from the original notes of survey made by me, that read S. 20º 00' West 2850 feet.

Note: The Notes of survey identified by the witness are the notes of survey corrected from T.K. Bipi's survey. Endorsed by J.F. Brown, Oct. 13th 1900.

I was two days surveying that course, the first day I ran the survey a distance of 2850 feet, and the second day ran the course a further distance of 1200 feet, but in copying my field notes I copied in only the distance 2850 feet that I ran the first day in surveying that course, and when my notes of survey were examined in Honolulu, they found that the distance of 2850 feet did not reach to the *Loulu* tree mentioned by me.

They wrote to me about this error, and I examined my original field notes, and found that I had ommitted [to put in the distance of 1200 feet, that I ran the second day that I was at work running that line, and that distance has been added in the corrected notes of survey. My survey is made by the Magnetic Meridian and not by true bearings.

C.X.d

Kahelehookahi Kapololu (K) Sworn, says:
I live at ***Waimanu***, Hamakua, Hawaii.
I am in my 40th year. I was born in ***Waimanu***,
and have lived there most of my life.

I know the land of ***Laupahoehoe-nui***, and
it is a land close to the land of ***Waimanu***.
My father Kapololu is 66 years old, and
is still quite a strong man.

He is a *Kamaaina* of the land of ***Laupahoehoe-nui***, and has pointed out the boundaries to me.
He used to have charge of land when Kia Nahaolelua owned the land.

I went with T.K. Bipi when he surveyed
the land. I was one of the chain men [page 392]

Kaumelelau and my father, Kapololu, went with us,
and pointed out the boundaries of land.

Laupahoehoe iki or 1 bounds this land on the East
side from the sea shore to the upper end of land, where
it is cut off by land of ***Puukapu***.

The gulch called ***Kaimu*** is the boundary, and the
boundary follows the middle of the stream of water
flowing in the bottom of the gulch to a *Loulu* tree
marked **+**. The mark is an old mark, and Kaumeleleau and Kapololu told us that the tree was marked
to show the boundary of the land of ***Puukapu***.

The land of ***Nakooka*** bounds this land on the West
or Kohala side, and the boundary follows the mid.
of the stream of water that is flowing in the bottom
of the ***Kukui*** gulch, and the sea bounds this
land on the *makai* or North side.

Kaumelelau and my father Kapololu, both pointed
out the same places, as being the boundaries of the
land of ***Laupahoehoe-nui***.

C.X.d. I have lived in Honolulu about a year & came here from there.

Kahalehau Kumukahi (K) sworn, says:
I was born at ***Waimanu***, Hamakua, Hawaii,
in the year 1852, and have lived there most of my life.
I know the land of ***Laupahoehoe-nui***. My Grandfather Keaupuni owned the land of ***Laupahoehoe-iki*** or ***Laupahoehoe 1***, and lived on that land.

He was a *Kamaaina* of ***Laupahoehoe iki*** and ***Laupahoehoe-nui***. He, Keaupuni went with Elemakule

the Surveyor, when he surveyed land of ***Laupahoehoe-nui*** and was one of the *Kamaaina* who pointed out the boundaries of the land to him.

The other two *Kamaaina* who pointed out the boundaries to Elemakule when he made his survey were Kapololu Senior, and Kaumelelau, the same *kamaaina* who went with T.K. Bipi and pointed out the boundaries of land to him, when he surveyed ***Laupahoehoe-nui*** in 1899.

My grandfather Keaupuni told me the boundaries, He was over 70 years old when he died, and has been dead for over 20 years.

I went with T.K. Bipi over a year ago, when he surveyed the land. Kahelehookahi Kapololu [page 393] Kapololu Senior, Kaumelelau and others also went with T.K. Bipi when he made the survey. Kaumeleleu, Kapololu Senior pointed out the same boundaries of land to Bipi, that my Grandfather, Keaupuni, had previously told me were the boundaries of the land.

The sea bounds this land on the *makai* side. Land of ***Laupahoehoe iki*** bounds it on the East side or side toward ***Waimanu*** Valley.

The boundary between the two lands of ***Laupahoehoe iki and nui***, runs up the middle of the stream of water flowing in the bottom of the ***Kaimu*** gulch to a *Loulu* tree with an old mark **+** marked on it, where land of ***Puukapu*** cuts land off.

The *kamaaina* said *Loulu* tree was on boundary of ***Puukapu***. The mark on the *Loulu* tree is an old mark, and I do not know who made it. The ***Kaimu*** gulch is very shallow there, and is almost at the *mauka* end of it, where this *Loulu* tree stands (Palm tree). The land of ***Puukapu*** bounds this land on the South side, cutting ***Laupahoehoe-nui*** off until you reach the bottom of the gulch named ***Kukui*** gulch.

The ***Kukui*** Gulch is boundary between ***Laupahoehoe-nui*** and land of ***Nakooka*** on the West side or side toward the District of North Kohala, and the boundary between these two lands follows the middle of the stream of water in the bottom of the ***Kukui*** gulch from land of ***Puukapu*** to the sea shore.

C.X.d. I have lived in Honolulu about a year,

and came from there here.

Testimony for Applicant closed.
E.D. Baldwin on part of Government
says he is satisfied that boundaries are proved
to be boundaries accepted by J.F. Brown
Commissioner of Public Lands. [page 394]

Decision
The Boundaries of the Land of ***Laupahoehoe-nui***,
District of Hamakua, 4th J.C., Island of Hawaii, Territory
of Hawaii, are decided to be as given in the evidence
of the *kamaaina* who have been examined today, and
as described in the Notes of Survey corrected from
Magnetic Survey of T.K. Bipi, endorsed, J.F. Brown
Oct. 13th 1900, and that the boundary between this
land ***Laupahoehoe-nui*** and ***Laupahoehoe-iki***
follow the middle of the stream of water flowing
in the ***Kaimu*** gulch from sea shore to point near
where (*Loulu*) Palm Tree marked **+** is growing,
where this land is cut off by land of ***Puukapu***, as
set forth in corrected notes of survey until you
reach the bottom of the ***Kukui*** Gulch on the
West side of land, and the boundary between
this land and land of ***Nakooka*** follows the
middle of the stream of water flowing in
the bottom of the ***Kukui*** gulch from the
mauka corner to the sea shore.

The sea bounds land on sea shore.

Certificate of Boundaries for Land of ***Laupahoehoe-nui*** will be issued as of today.

Rufus A. Lyman
Commissioner of Boundaries
3rd & 4th J.C., Island of Hawaii
Territory of Hawaii.

For Certificate of Boundaries see
Certificate of Boundaries No. 182.
Boundary Records book No. 4, Folios 132-134
Inclusive. [page 395]

Ahupuaa of Laupahoehoe nui (Laupahoehoe 2)
Boundary Commission, Hawaii Volume C No. 4:132-134

No. 182
Certificate of Boundaries
of the
Land of ***Laupahoehoe-nui*** or Laupahoehoe 2
District of Hamakua, Island of Hawaii

Kalaeokekoi, L.C. Award No. 6245, Part 2
Commission of Boundaries

3rd & 4th Judicial Circuits, Rufus A. Lyman, Commissioner
In the Matter of the Boundaries
of the land of ***Laupahoehoe-nui***
District of Hamakua
Island of Hawaii

Judgement

An application to decide and certify the boundaries of the Land of ***Laupahoehoe-nui***, District of Hamakua, 4th Judicial Circuit, Island of Hawaii, Having been filed with me on the 27th day of June, 1900 by Elizabeth K. Booth, in accordance with the provisions of an Act to facilitate the settlement of Boundaries; now therefore, having duly received and heard all the testimony offered in reference to the said boundaries, and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 5, page 380 to page 395 inclusive, and it appearing to my satisfaction that the true, lawful and equitable boundaries are as follows, viz.:

Commencing at a certain rock marked close to the *Pali* at the Gulch of ***Kukui***, boundary between this land and land of ***Nakooka***, and running thence along the boundary of the land of ***Nakooka***: (Survey runs Magnetic bearings.)

1. N. 60º 00' E. 198 feet to a rock marked at the sea shore, from thence along the sea shore;
2. S. 71º 30' E. 1500 feet to a rock marked at the landing or streams of Hoopaukuku, thence
3. N. 69º 00' E. 320 feet to a big rock marked thence
4. S. 84º 00' E. 1100 feet to a big rock at a point; thence
5. S. 46º 00' E. 2240 feet to a big rock at a red ring [page 132];
6. S. 18º 00' E. 900 feet to a big rock standing in the sea straight *makai* of the waterfall of the ***Kaimu*** stream; thence running up the *Pali* along the ***Kaimu*** Stream 1200 feet; thence along said stream; the middle of stream of water flowing in the ***Kaimu*** gulch being the boundary between this land and land of ***Laupahoehoe 1***, to a point opposite and to a *loulu* tree marked **+** on the boundary of land of ***Puukapu*** District of Sount Kohala, along brow of *Pali* of the Gulch by the following courses and distances, viz.:
7. S. 21º 00' W. 7920 feet to an *Ohia* tree close to brow of the *Pali* of the Gulch, marked with a cross.
8. S. 25º 00' W. 370 feet thence;

9. S. 42º 30' W. 256 feet thence;
10. S. 20º 00' W. 330 feet thence;
11. S. 23º 00' W. 1547 feet thence;
12. S. 25º 00' W. 562 feet thence;
13. S. 61º 00' W. 106 feet thence;
14. S. 18º 00' W. 220 feet thence;
15. S. 10º 00' E. 1500 feet thence
16. S. 20º 00' W. 4050 feet to a certain *Loulu* tree marked **+** on the boundary of land of Puukapu; thence along the land of Puukapu, toward the District of North Kohala.
17. N. 84º 00' W. 5500 feet to the gulch called ***Kukui***; thence running down along this gulch, the middle of same being the boundary of this land, and land of ***Nokooka***, to the point of commencement, at rock marked near the *Pali* close to sea shore; and containing an area of Two thousand three hundred and fifty acres more or less excepting the *kuleana* awards of the people.

Corrected from Magnetic Survey
made by T.K. Bipi.

It is therefore adjudged, and I do hereby certify
and decide that the boundaries of said land of
Laupahoehoe-nui, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Fourth
Judicial Circuit, Island and Territory
of Hawaii, the Nineteenth day of January
A.D. 1901.

Rufus A. Lyman
Com. of Boundaries
3rd & 4th J.C.
Island & Territory of Hawaii… [page 133]

Ahupuaa of Waimanu

District of Hamakua, Island of Hawaii
Boundary Commission, Hawaii Volume A No. 1:238-240

Honolulu, July 7, 1873

R.A. Lyman, Esq.
Hilo

Dear Sir
Mr. F.H. Harris is authorized by the
Commissioners of Crown lands to make appli-

cation to you as Commissioner of Boundaries to have the boundaries of all Crown lands on the Island of Hawaii defined. He has a list of the lands with him.

I have also authorized Mr. F.H. Harris to make application to you for the settlement of boundaries of all lands belonging to Est.of His late Majesty and Her Excellency, R. Keelikolani.

I expect to be in Kona by the trip of the "*Kilauea*" which leaves here on the 28th inst. Can't you make it convenient to come round as the steamer goes to Hilo on that trip.

I wish also to apply for the settlement of the boundaries of Honohina.

I remain,
Yours Respy.
Jno. O. Dominis

Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii, Haw. Is.

The undersigned would herewith make application for the settlement of the boundaries of the following named Ahupuaas or Lands belonging to the Crown, viz… [page 238]

…***Waipio*** in the District of Hamakua adjoining lands unknown.
Waimanu in the District of Hamakua adjoining lands unknown…
Waimea in the District of Kohala adjoining lands unknown…
Puukapu in the District of Kohala adjoining lands unknown…
Kawaihae in the District of Kohala adjoining lands unknown… [page 239]

…Your Honor will therefore please appoint a day for hearing the evidence in the foregoing named lands and having decided upon the same to grant a certificate to that effect to the undersigned.

(Signed) Jno. O. Dominis
Crown Land Agent,
by F.H. Harris
Atty. at law

Hilo Hawaii

August 16th A.D. 1873. [page 240]

Ahupuaa of Waimanu
Boundary Commission, Hawaii Volume B:86-9

The *Ahupuaa* of ***Waimanu*** District of Hamakua
Island of Hawaii, 3d J.C.

On this, the 17th day of November A.D. 1873 the
Commission of Boundaries for the Island of
Hawaii, 3d J.C. on the application of J.O. Dominis
Commissioner of Crown Lands met at the
Court House in ***Waipio***, District of Ham-
akua, for the settlement of the boundaries
of ***Waimanu***, Hamakua, Island of Hawaii.

Notice served by publication in the Haw-
aiian Gazette of _____ and *Kuokoa*
of _____ 1873, for settlement of the
boundaries of lands in Hamakua and
Kohala, at the Court House in ***Waimea***,
South Kohala on the _____
and adjourned to ***Waipio*** on the 17th.

Due notice personally served on owners
or agents of adjoining lands, as far as known.

Present: G.W.D. Halemanu for applicant
and N. Keau for Hawaiian Government

For Petition see Folio 238, Book A.

Testimony

Piikea W. Sworn.
I was born at ***Waimanu***, District of Hamakua
at the time of the Okuu [1803]. Have always lived there
and am a *kamaaina* of a part of the land.
Naone, my father and Keakaaea, my mother
(both dead) told me the boundaries.

Kekalani, an *ili* of ***Waimanu*** bounds it on
the Kohala side, at shore, at an *ahupuaa* [pig altar]
called ***Lonalona*** there is a *heiau* there called
Halehiwa; thence from this *heiau* which is close
to the sea shore the boundary runs along
the high tide mark to the mouth of the
river. Fishing right at the Kohala side of
the river in ***Waimanu*** belonging to ***Ke-***
kalani, said fishing right changing accord-
ing to the course of the river. From ***Halehiwa***
the boundary runs *mauka* to the *makaha* [sluice gate]
of ***Kekalani*** pond (now grown up with weeds);
thence along the bank of the pond, down to
the side of a *heiau* called Lonalona,

at the foot of the *pali* turn towards Kohala [page 86]; thence up the *pali* in an *awaawa*, ***Keanakohoolua***, to ***Pokoli***, at a place where they shoot wood from the head of the *awaawa*. The boundary runs along the brow of the *pali* to ***Waiilikahi***, a gulch and waterfall. This is all I know of the boundaries of ***Waimanu*** on the Kohala side. The boundary on the ***Waipio*** side is at ***Naluea*** gulch; thence up the gulch to a big waterfall. I have heard that ***Waipio*** cuts ***Waimanu*** off up *mauka*. Bounded *makai* by the sea. Ancient fishing rights extending out to sea.

C.X.d.

Kamehaiku [K.] Sworn
I was born at ***Waimanu***, Hamakua at the time of *Peleleu* ***1st*** [1795]. I now live at the other end of Hamakua; lived in ***Waimanu*** from the time of my birth till a few years since. I went with Nakuna, my father, who showed me the boundaries. I was *konohiki* of the land during the reign of Kamehameha 3d, had charge of lands several years, till the time of his death.

Starting from the mouth of the river the boundary runs *makai* side of a wall toward Kohala taking in a narrow strip of sand beach and breakers. Sea and fishing right belonging to ***Waimanu*** and not to ***Kekalani***. Thence on the *makai* side of ***Halehiwa*** to near the foot of the *pali*; thence *mauka* along the side of an old dried up fish pond; thence to the side of ***Lonolono***; thence to the foot of the *pali*; thence up an *awaawa* called ***Kumukoa*** to ***Keanaholua*** at the top of the *pali*; thence along the brow of the *pali* to a gulch of water called ***Konaiki***. This is the small stream *makai* of ***Waiilikahi***; thence it cuts ***Kekalani*** off and runs to ***Laupahoehoe*** gulch. I have not been there, but Lahiwa, an old bird catcher told me about these boundaries. He said that the boundary between ***Laupahoehoe*** and ***Waimanu*** runs up the stream that runs down into ***Laupahoehoe*** valley, thence to ***Waihoolana***. I do not know what land cuts *Waimanu* off on the ***Kawaihae*** side. It is bounded on the ***Waipio*** side at sea shore by ***Muliwai***. ***Naluea*** gulch is the boundary to ***Kukui*** waterfall *mauka* side of Govt. road; and from there to *Waialoa*, where the gulch ends; thence along the brow of ***Waimanu*** *pali*; [page 87] ***Muliwai*** being on the top of the *pali* to ***Kealai***, a place where the old road comes from ***Waipio*** and goes down into ***Waimanu***, the ridge is very narrow here between the two palis, and bends towards

Kohala. ***Muliwai*** ends here and ***Waipio*** joins ***Waimanu***; thence along the brow of ***Waipio*** valley to above ***Ulu***; thence to, and across the ***Waihoolana*** to a big hill on ***Waimanu***.
I have never seen this place. Have only heard of it.

C.X.d.

I have heard that ***Waipio, Waimanu*** and ***Waimea*** join at ***Waihoolana***. This is what I have heard from olden times and I never head that ***Waimanu*** took all the land. Lahiwa told me that ***Waimanu*** runs from ***Ulu*** to ***Waihoolana***. I have never heard that ***Waimea*** cuts ***Waimanu*** off. This is all I know about the boundaries.

Kamakahiki K. Sworn, (same witness as on ***Muliwai***)
I was born at ***Pololu,*** Kohala at the time of the *Okuu*; came to Kohala when I was young, and have lived here ever since. Know the land of ***Waimanu*** and its boundaries along ***Muliwai***. ***Naluea*** gulch separates the lands; the boundary runs up the stream to ***Kukui*** falls; thence to ***Kalahikiola***, a place at the end of the gulch on ***Waimanu***, where they used to build fires in the night to entrap birds. The ridge is very narrow here; thence along the top of ***Waimanu*** *pali* to a place called ***Kealai***, where ***Waipio*** and ***Waimanu*** are separated by a narrow ridge and ***Muliwai*** ends; thence up a bend in the *pali*; and ***Waipio*** bounds ***Waimanu*** to the top of the *pali*; thence along the edge of the *pali* to ***Ulu***, the *pali* belonging to ***Waipio*** and the high land to ***Waimanu***. I have never been above here, but have heard that ***Waipio*** ends at ***Ulu***. Have heard from Kukahekahe, an old bird catcher now living here in ***Waipio*** that ***Kawaihae*** cuts ***Waimanu*** off on the *mauka* side. I have never heard that ***Waimanu*** extends further *mauka* than ***Waipio*** does.

C.X.d.

Case continued until the 18th instant… [page 88]

Waipio Nov. 18, 1874
Case opened according to adjournment, Present: W.G. Helemanu and others.

Kukahikahi K. Sworn
I was born in Hamakua at the time of Kiholo [1811], know the land of ***Waimanu***; know a place called ***Kealai*** where ***Waipio*** and ***Waimanu*** join and cut ***Muliwai*** off. ***Waipio*** and ***Waimanu*** bound each other to

the first large gulch in ***Waipio***. I do not remember whether the names of the gulch is ***Kapuna*** or ***Kaupe***. The boundary does not reach to ***Ulu***; as that place is in the middle of ***Puukapu***. There are only some small gulches between this gulch and ***Ulu***. Thence the boundary between ***Waimanu*** and ***Puukapu*** runs *mauka* along the gulch; I have not been in the woods and seen where this gulch comes from but a *kamaaina* told me that the land of ***Honokane*** cuts ***Waimanu*** off and joins ***Puukapu***. I do not know where the *mauka* end of ***Kekalani*** is. I have heard that ***Puukapu*** and ***Honokane*** join at ***Waihoolana***; and that ***Waimanu*** joins on ***Waimanu*** side and ***Kawaihae*** on the ***Kawaihae*** side, but neither of these lands reach to the point. My *kupuna* was from ***Waimea***. Kalaau was his brother, and they were *kamaaina* of ***Waimea***. Kalani, a bird catcher from ***Ouli*** was the one who told me about these boundaries when I was bird catching. I have been with others who were strangers there, and afterwards on meeting him I told him where we had been and he told me what lands I had been on.

C.X.d.

Hihipa [K.] Sworn
I have been told by bird catchers, Laahiwa and others, that ***Waimanu*** runs to ***Waihoolana***, but I did not hear what lands cut if off *mauka*.

C.X.d.

Kaanaana [K.] Sworn
I was born at ***Honopue*** at the time of *pa Kapakukahola* (Building of the *heiau* at ***Kawaihae*** [Puukohola, ca. 1793]). Live at ***Waimanu*** when King Kamehameha II came to the throne [1819], and have been there ever since. I know the boundaries of ***Kekalani*** and ***Waimanu***. Laahiwa (now dead) told them to me when I used to go [page 89] into the woods, after *mamo* with him. The boundary between ***Kekalani*** and ***Waimanu*** is at *Ahupuaa*. The boundary is at the mouth of the river; thence towards Kohala passing the Protestant Church at ***Halehiwa***; thence to the wall near the Roman Church; thence *mauka* along the wall to the stream; thence along the stream towards Kohala to a *pali*, to ***Kumukoa***; thence up the road to the top of the *pali* to ***Kaumuki***; thence along the brow of the *pali* to ***Konaiki*** gulch; thence across the land towards Kohala, to the center of ***Pokahi***

gulch; thence the boundary of ***Waimanu*** runs *mauka* to the end of the gulch bounded by ***Laupahoehoe nui***; and up ***kuahiwi*** [mountain] to ***Waihoolana***, where ***Honokane*** and ***Waipio*** unite and cut ***Waimanu*** off. This is as Laahiwa told me. I have never been there; know a place called ***Kealai*** where ***Waipio*** and ***Waimanu*** unite; thence the boundary runs along the brow of the *pali* to ***Honokane***] gulch. ***Kaupe*** and ***Kapuna*** gulches are between ***Honokane*** gulch and ***Ulu***. I have been to ***Ulu***. The boundary runs *mauka* along to the end of ***Honokane*** gulch and to ***Waihoolana***.

C.X.d.

Case continued until further notice to all interested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C. [page 90]

[No further description, notes of survey, or Certificate of Boundaries located in Boundary Commission Volumes.]

Ahupuaa of Waipio

District of Hamakua, Island of Hawaii
Boundary Commission Volume A No. 1 pages 230-231

Waipio	District of Hamakua
Kalahuipuaa	District of Kohala, *Ili* of ***Waimea***
Anaehoomalu	District of Kohala, *Ili* of ***Waimea***
Kaplaalaea	District of North Kona
Kalamakumu	District of South Kona, *Ili* of Napoopoo

Honolulu August ***1st*** 1873

To the Honorable Rufus A. Lyman
Commissioner of boundaries for the Island of Hawaii
H.I.

The Undersigned respectfully represents that he is the owner of the following named lands situated on the Island of Hawaii, Hawaiian islands aforesaid, belonging to the Estate of the late Queen Dowager Kalama, dec'd. and awarded to her by Land Commission Award No. 4452.

From Whom the Undersigned applicant inherited the same, to wit—

the *Ahupuaa* ***Waipio***, in the District of Hamakua (*Apana* 5 of said award). 2. Kalahuipuaa, an

Ili of ***Waimea***, in the District of Kohala (*Apana* 3 of said award). 3. Anaehoomalu, an *Ili* of ***Waimea*** in the District of Kohala (*Apana* 4 of said Award). 4. The *Ahupuaa* of Kapalaalaea, in the District of North Kona (*Apana* 2 of said award); and 5. Kalamakumu, an *Ili* of Napoopoo in the District of South Kona. This land having been patented to the undersigned applicant by Royal Patent 4497 and Land Commission Award 8559. That the same have not been awarded by the Land Commission, patented or conveyed by deed from the King by boundaries described in such awards, patent or deed; and therefore he respectfully requests that the boundaries of said lands may be settled by your Honorable Commission, and to that end, make this application to have the same decided and certified by you as Commissioner of Boundaries as aforesaid.

Pursuant to the requirements of the Statute, the Undersigned applicant represents, that the following are the names of the adjoining lands and the names of the owners of the same as far as known to the Undersigned applicant; to wit.

Of the land of ***Waipio***
The land of Waikoekoe owned by His Majesty
Waimanu, owned by applicant [page 230].

Of the *Ili* of Kalahuipuaa
The land of Puako, owned by His Majesty
The land of Anaehoomulu owned by applicant.

Of the *Ili* of Anaehoomalu
The land of Kalahuipuaa, owned by applicant
The land of Napuu, a Crown land

Of the *Ahupuaa* of Kapalaalaea
The land of Laaloa
The land of Kahaluu, owned by R. Keelikolani.

A full description of the boundaries of some of the above lands as claimed is set forth in the annexed surveys with this application and which the undersigned prays may be made a part of this, his application.

Very Respectfully
Chas. Kanaina
by A.F. Judd, his Attorney in fact.

Notes of the Survey of
Anaehoomalu
An *Ili* in ***Waimea***, Hawaii

Beginning at the seashore point of junction
with Kalaihuipuaa, and running thence along
the line of Kalaihuipuaa S. 72 1/3º E. 34.05 ch;
thence along the *Alanui Aupuni* S. 16º W. 83.52 ch.
S. 24º W. 49.00 ch. S. 25º W. 34.00 ch.; thence along
the line of Kapalaoa; N. 73º W. 30.00 ch. to the sea, and
thence along the shore N. 35º East 13.00 ch.; N. 32º W.
56.00 ch; N. 39 ¼ E. 59.40 ch; N 39 ¼ East 59.50 to the point
of commencement.

Comprising an area of 846 acres more or less.

J. Howard Sleeper
Surveyor

Dec. 3rd 1858.

Note: Notes of survey of Kalaihuipuaa on file. [page 231]

Ahupuaa of Waipio
Boundary Commission, Hawaii Volume A No. 1:238-240

Honolulu, July 7, 1873

R.A. Lyman, Esq.
Hilo

Dear Sir
Mr. F.H. Harris is authorized by the
Commissioners of Crown lands to make appli-
cation to you as Commissioner of Boundaries
to have the boundaries of all Crown lands on
the Island of Hawaii defined. He has a list of
the lands with him.

I have also authorized Mr. F.H. Harris
to make application to you for the settlement
of boundaries of all lands belonging to Est. of
His late Majesty and Her Excellency, R.
Keelikolani.

I expect to be in Kona by the trip
of the "*Kilauea*" which leaves here on the 28th
inst. Can't you make it convenient to come
round as the steamer goes to Hilo on that trip.

I wish also to apply for the settle-
ment of the boundaries of Honohina.

I remain,
Yours Respy.
Jno. O. Dominis

Honorable R.A. Lyman
Boundary Commissioner

for Island of Hawaii, Haw. Is.

The undersigned would herewith make application for the settlement of the boundaries of the following named Ahupuaas or Lands belonging to the Crown, viz… [page 238]

…***Waipio*** in the District of Hamakua adjoining lands unknown.
Waimanu in the District of Hamakua adjoining lands unknown…
Waimea in the District of Kohala adjoining lands unknown…
Puukapu in the District of Kohala adjoining lands unknown…
Kawaihae in the District of Kohala adjoining lands unknown… [page 239]

…Your Honor will therefore please appoint a day for the hearing of the evidence in the foregoing named lands and having decided upon the same to grant a certificate to that effect to the undersigned.

(Signed) Jno. O. Dominis
Crown Land Agent,
by F.H. Harris
Atty. at law

Hilo Hawaii
August 16th A.D. 1873. [page 240]

Ahupuaa of Waipio
Boundary Commission, Hawaii, Volume B:111-116

The *Ahupuaa* of ***Waipio***, District of Hamakua Island of Hawaii, 3d J.C.

On this, the 19th day of November A.D. 1873 the Commission of Boundaries for the Island of Hawaii 3d J.C. met at the Court House in ***Waipio***, Hamakua, on the application of A.F. Judd, Agent for Hon .C. Kanaina, for the settlement of the boundaries of ***Waipio*** situated in the District of Hamakua, Island of Hawaii.

Notice of the hearing for the settlement of boundaries of lands in Hamakua and Kohala at ***Waimea*** Court House, South Kohala on the _____ Served by publication in the Hawaiian Gazette of _____ and *Kuokoa* of _____, 1873 and adjourned to ***Waipio*** on the 17th instant and continued on the 18th and 19th. Due notice personally served on agents of adjoining lands, as far as known.

Present: G.W.D. Halemanu for applicant and adjoining lands, J.R. Mills for lessees of ***Waipio***.

For Petition see Folio 230, Book A

Note
For the boundaries of ***Waipio*** adjoining ***Muliwai*** see boundaries and Decision of ***Muliwai***. Folio 83.

Testimony

N. Keau Sworn. (Same witness as in ***Waikoekoe***)
I have lived here for over fifty years, and the boundaries of ***Waipio*** are well known to me. ***Lalakea***, an *ili* of ***Waipio*** bounds it on the Hilo side. I have had charge of ***Lalakea*** and have leased it for over ten years, and when I leased it I went and saw the boundary between it and ***Waipio***. The mouth of the river is the boundary at shore between ***Waipio*** and ***Lalakea***; thence up the wall between ***Lalakea*** and the stream and thence up the stream to *makai* of G.W.D. Halemanu's house; there turn and run up the *pali*, called Pueohuhunui. [page 111]

Note
The old boundary that runs up the *pali* is *mauka* of Halemanu's house; the boundary surveyed is *makai*.

The place at the foot of the *pali* is called ***Waimihi***.

Note:
Keau points out the ridge as running up above A.S. Cleghorn's store.

Thence along the brow of the *pali* till you come to a place called ***Poolakiki***, there is a rock there on the *pali* called ***Hakalaoa***, an old stone god. The boundary has left the top of the *pali* and come along on the side to this place; thence to the foot of ***Hiilawe*** falls; thence along the foot of the *pali* to an *auwai*; thence up the *auwai* to a stream of water (The patch called ***Haha*** is on ***Lalakea***) thence up the stream to Kukauloa, a patch where I used to plant food; there the boundary of ***Lalakea*** turns into the *pali* again along the *loi*, and along the base of the *pali* to the land of Ohia; thence to the middle of the *pali* to a place called ***Opailolo*** [***ʻŌpaelolo***], a road which used to run out to the head of the valley. This is the *mauka* corner of the land (This is established by Certificate of Boundaries of

Waimea, as the corner called ***Kilohana***, of ***Waipio*** and ***Lalakea***).
Kilohana is a resting place at the *mauka*
end of the *pali*.

C.X.d.

I do not know the *mauka* boundaries of ***Waipio***
or what lands cut if off on the *mauka* end.

Paaoao [K.] Sworn.
I was born in ***Waipio,*** Hamakua at the time of *Peleleu* [1795].
I have always lived here and know the boundaries.

Kamehameha I told me the boundaries.

[made correction] Kamehameha I did not tell me the boundaries.

Keala, my *makuakane*, told them to me. He had
charge of ***Lalakea*** and I sometimes went there
with him. My mother, Pelele, was a *kamaaina*
of ***Waipio*** and she told my father who was
from Molokai the boundaries between ***Waipio***
and ***Waimea***. ***Lalakea*** bounds ***Waipio*** on the Hilo
side. Commencing at the shore close to a *heiau*
called ***Kahalekapapaulua***, on the Hilo side
of the stream; thence the boundary runs to a
wall inclosing a fish pond on ***Lalakea*** [page 112];
thence along the *kuauna* to Halemanu's cook house;
thence to the Court House and up an *awaawa*
to the top of the *pali*; thence to the *awaawa* of
Kaluahine, on ***Lalakea***. The top of the *pali* is
called ***Pueohulunui***; thence *mauka* along
the side of the *pali* to the road called ***Puaahuku***
(Contradictory evidence). Thence along this road
to the brow of the *pali* that bounds ***Kemama***
and ***Lalakea***; thence along the *pali* to ***Hiilawe***
falls, to ***Puaahuku*** road; thence along the
brow of the *pali* to ***Opailolo***, a road that used
to lead to ***Waimea*** that runs down the head
of the valley. I do not know of any place called
Kilohana. The head of this road, at the top of
the *pali* is where ***Waimea*** joins ***Waipio***.
Thence along ***Waimea***, along the head of the *pali*, the
awaawa belonging to ***Waipio*** and the land
above to ***Waimea***. The ridges between the
awaawa, in the valley and ***Waipio***, but the
land above the big *pali* is ***Waimea***; thence
along the brow of the *pali* to ***Ulu***. From here
I have been told that ***Waipio*** runs up to
Waihoolana, and joins ***Honokane***.
Waimanu does not reach above ***Kealai***. I do not
know whether it ends there or not. I do not know
what land bounds ***Waipio*** from ***Kealai*** to ***Wai-***
hoolana; have never been beyond ***Ulu***. From
Kealai to sea shore ***Muliwai*** bounds ***Waipio***.

(Note
See Evidence Certificate of Boundaries of ***Muliwai***) Folio 83 & 84
of this book.

Bounded *makai* by the sea. Ancient fishing
rights extending out to sea and in olden times
they used to extend along to ***Naluea*** gulch.
I saw the line of boundary between ***Waipio*** and
Lalakea surveyed from the shore to the Court
House, but I did not go any further with them.
Pehe [K.] and others now dead were with the
surveyor.

C.X.d.

One of the places called ***Manuhi***, in the valley is on
Lalakea; the *pali* all belongs to ***Waipio*** but the
cultivating ground, ***Manuhi*** *makai* on ***Lalakea***;
this place commences at ***Kaihuakapuaa***, the
loi of that name is on ***Waipio***, and the *loi* of the
same name further *mauka* is on ***Lalakea***;
the boundary being the bank between, which
runs out into the stream; thence *mauka* up the
stream to the bank of the *loi* on ***Manuhi*** *mauka*, here [page 113]
the boundary turns towards the *pali*; taking
in all the *kalo* patches and old potato ground.
I can go and point out the boundaries all
around that place. The *mauka* boundary of
the strip of ***Lalakea*** in the valley is between two lois
called ***Kukaualua***, there is no other portion
of land in the valley belonging to ***Lalakea***.

There were formerly strips of land in ***Lalakea***
belonging to ***Waipio***, but when Kaniu had
the land she gave ***Lalakea*** to Kuakini and
he took possession of those tracts of land as a
part of ***Lalakea***. I think this was during
Kamehameha III time and they have been
held as part of ***Lalakea*** ever since. The strips
were called ***Polakikee*** and ***Kumupapala***,
and ***Mahikiwaena*** was a part of ***Kumupapala***.
Kuakini took possession of the *pali* above
the cultivating ground.

Note:
N. Keau asks to be allowed to make a
Statement. Granted.

During the reign of Liholiho the land of
Lalakea belonged to Kamamalu, and she
gave it to her mother, Kaniu [W.], and Kaniu
gave it to Kuakini, and the boundaries
that I testified to are as Kuakini fixed
them at that time, and I have not heard
of their being changed since. The last witness

has testified to the boundaries as they were formerly. Kuakini changed the boundaries of a great many lands at that time.

Waiokalehua [K.] Sworn. (Same witness as in ***Muliwai***) Nahuina [K.] my *makua* told me the boundaries of ***Waipio***, as I testify to today, and I afterwards went with the surveyor of ***Waipio*** and ***Lalakea***. Makuakua [K.] (now dead) was the *kamaaina* of ***Waipio*** and Puanui (now dead) was the *kamaaina* of ***Lalakea***. Kauhine and others who are now dead, went with us and the land was surveyed as the *kamaaina* pointed out the boundaries.

Commencing at the shore between ***Lalakea*** and ***Waipio*** at a *heiau* called ***Kahalekapapaulua***, about five chains from the Hilo side of the river, thence they surveyed across [page 114] the sand beach, to the bank of the fish pond; thence along the wall of the fish pond and the *kuauna* of the river to Halemanu's cook house; thence towards the *pali* passing on the *mauka* side of where the Court House now stands, to the base of the *pali*; thence up a hollow in the *pali* to ***Kilohana***, an old *kauhale*; here a portion of ***Lalakea*** ends and the strip of land called ***Kemama*** bounds ***Waipio***; thence to the *awaawa* of ***Kaluahine*** which is shallow there. We went to a place called ***Kaluapuhe***, and from there sighted to the different points in the valley, and to the top of ***Puahuku*** [***Puaahuku***] *pali*. The surveyor then took the compass, to ***Kaihupuaa*** at the foot of the *pali*, and surveyed out into the valley to the stream to a place called ***Keawehale***, thence straight *mauka* along the banks of the *kalo* patches (true boundary) taking in the whole of ***Manuhi*** *makai* thence to the Hamakua side of the *pali* and along the base to ***Opailolo***, a road running up the *pali*. This is as far as I went with the surveyor. I have been told by them that went with him that he surveyed all around the valley, sighting to different points on the *pali*. It was very pleasant weather and we could see the points on top of the *pali* very distinctly. From the point at the head of the *pali* called ***Kilohana***; the boundary runs along the brow of the *pali* to ***Hiilawe***. The *pali* being on ***Waipio***, thence along the brow of the *pali* to ***Puahuku*** road. My parents told me that the *pali* above the cultivating ground at ***Lalakea*** in ***Waipio*** valley belongs to ***Waipio***. I do not know where Kuakini claimed.

They told me that the brow of the *pali* was the
boundary line running *mauka* to ***Waiakulina***,
a gulch that in olden times was the *mauka*
corner of ***Lalakea***; there is a strip of ***Waipio***
between there and ***Puukapu***. ***Kilohana***
is a resting place at the top of ***Opailolo***, and not
far from ***Waiakulina***. From ***Kilohana***
Waipio runs to ***Ulu***, bounded by ***Waimea***.
Waipio had land on the top of the *pali* between
Kilohana and ***Ulu***. ***Waipio*** and ***Waimea***
join and bound each other to ***Waihoolana***.
I have never been to ***Waihoolana*** but am
told that ***Waipio***, ***Waimanu*** and ***Honokane*** [page 115]
join there. Thence ***Waipio*** and ***Waimanu*** bound
each other to ***Kealai***. The boundary runs
along the brow of the *pali* from ***Ulu*** to ***Kealai***
which is the *mauka* corner of ***Muliwai***;
thence *makai* to sea shore along ***Muliwai***.
For Boundaries see Evidence of Boundaries of ***Muliwai***.
Folios 83 & 84 of this book.

Bounded *makai* by the sea. Ancient fishing
rights extending out to sea.

The ***Waipio*** people used to go after *olona*
on the ridge that projects into the head of the valley.

C.X.d.

I have heard from my mother that ***Kawaihae***
bounds ***Waipio*** at the ***Waihoolana***.

Case continued until further notice to all
interested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Note the case was continued to see whether owners of ***Waipio***
wished to claim the *Ili* of ***Waipio***, that were included
in the survey of ***Lalakea***, to wit. ***Mahikiwaena***, ***Kumupapala***,
and ***Polakikee***.

A.F. Judd, Atty. in fact for H. H. Chas. Kanaina filed
his acceptance of the boundary between ***Waipio*** and ***Lalakea***
as given in notes of survey of ***Lalakea*** and ***Waipio***, filed
by owners of ***Waipio*** and ***Lalakea***; See Folio 118 of this book.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Decision
The Boundaries of ***Waipio*** are decided to be as given in Certificate of Boundaries for
Lalakea, No. 34 for boundary from shore between this land & ***Lalakea*** to point on
East bank of ***Waipio*** called ***Kilohana*** for description by survey see Folio 15.

Liber I No. 3;

Thence along brow of *pali* to place called ***Ulu*** bounded by ***Waimea*** to junction with ***Waimanu***; Thence *makai* along land of ***Waimanu*** to place called ***Kealai***, place where old road to ***Waimanu*** from ***Waipio*** ran over the ridge; thence boundary runs down *pali* along land of ***Muliwai*** to bottom of Pali; thence *makai* along base of *pali*, as pointed out by Kamakahiki & Waiokalehua, see Folios 83 & 84 of this book to point in valley where boundary turns out to ***Imaikalani***, along Kaluas *kuleana* & ***Waiomao*** pond, leaving ***Muliwai*** pond & two *kio pua* on ***Muliwai***; & thence from old pond ***Mokapu*** on ***Waipio***, boundary runs towards Kohala to ***Kaholokuaiwa*** *mauka* side of Govt. road, up the *pali*. Thence to sea shore, bounded *makai* by sea.

New survey to be filed previous to Certificate of Boundaries being issued.

Hilo, May 11, 1874.
R.A. Lyman
Com. of Bound. 3d J.C.

Copy of Decision sent to all interested parties… [page 116]

Ahupuaa of Waipio
Boundary Commission, Hawaii Volume 1, No. 3:332-341

Certificate of Boundaries of the Land
of ***Waipio***. District of Hamakua, Island
of Hawaii

L.C. Award No. _____ [4452]

Commission of Boundaries
Third Judicial Circuit. F.S. Lyman, Esq., Commissioner

In the Matter of the Boundaries
of the Land of ***Waipio***
District of Hamakua, Island
of Hawaii.

Judgment.

An application to decide and certify the Boundaries of the Land of ***Waipio***, District of Hamakua, Island of Hawaii, having been filed with me on the ____ day of August 1873 by A.F. Judd, Agent for Hon. C. Kanaina, owner of the land of ***Waipio***; in accordance with the provisions of an Act to facilitate the settlement of Boundaries, &c, approved on the 22d day of June, A.D. 1868; now therefore having duly received and heard all the testimony offered in reference to the said boundaries and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 2 B. page 116, and it appearing to my satisfaction that the true, lawful and equitable boundaries

are as follows, viz.;

Beginning at the east corner of a stone enclosure known as Waiokalehua's, 290 feet East of Wailoa river bank and about 830 feet from the sea, the same being the East angle of L.C.A. 7860 (Kawahine-ainiu Lot 1) on the boundary of ***Lalakea***, from [page 332] whence "***Waipio*** trig. Sta." bears 108º 5' az. from true South, and top of the main or lower ***Hiilawe*** falls 13º 8' az. from true South and running:

1. S. 49º 10' W. true 396 feet along *kuauna* of ***Lalakea*** fish pond to the *makaha* at south angle of Kawahineainiu's *kuleana*;
2. S. 48º 30' W. true 292 feet along *kuauna* of ***Lalakea*** fish pond.
3. S. 33º 10' W. true 395 feet along *kuauna* of ***Lalakea*** fish pond;
4. S. 18º 20' W. true 429 feet along *kuauna* of ***Lalakea*** fish pond;
5. N. 75º 50' E. true 175 feet along ***Lalakea*** to a marked stone 9 feet S.E. of the S.E. corner of the Court House; Thence
6. S. 38º 30' E. true 1584 feet along ***Lalakea*** up spur of *pali* by old road, known as ***Pueohulunui***, to a marked stone near head of said road whence the top of the main or lower falls of ***Hiilawe*** bears 20º 47' az. from true South and "***Waipio*** trig. sta." bears 127º 42' az. from true South;
7. S. 19º 35' E. true 1132 feet along ***Lalakea***, the boundary being the edge of the main ***Waipio*** *pali*;
8. S. 6º 45' E. true 1116 feet along ***Lalakea***, the boundary being the edge of the main ***Waipio*** *pali*;
9. S. 5º 15' E. true 1110 feet along ***Lalakea***, the boundary being the edge of the main ***Waipio*** *pali*;
10. S. 15º 10' W. true 708 feet along ***Lalakea***, the boundary being the edge of the main ***Waipio*** *pali*;
11. S. 8º 20' W. true 722 feet along ***Lalakea*** to a point on the East edge of ***Hooleleke*** Gulch;
12. S. 79º 40' W. true 219 feet across the mouth of the same;
13. S. 53º 58' W. true 1248 feet;
14. S. 66º 30' W. true 898 feet to the smaller falls east of ***Hiilawe***;
15. S. 68º 30' W. true 171 feet;
16. N. 56º 45' W. true 267 feet to the ***Hiilawe*** falls;
17. N. 63º 45' W. true 455 feet;
18. N. 33º 40' W. true 1062 feet;
19. N. 62º 30' W. true 112 feet to the "Oioina" at the top of the ridge by the old path which descends the spur of the ***Puaahuku*** *pali* [page 333];
20. N. 9º 45' W. true 3114 feet still along ***Lalakea*** down the ridge to a point at its base which marks the East corner of L.C.A. 11102 (Kahiamoe);

21. N. 62º 35' W. true 301 feet along L.C.A. 11102 (Kahiamoe);
22. S. 73º 40' W. true 169 feet along L.C.A. 11102 (Kahiamoe) to a water course; Thence along water course;
23. S. 33º 40' W. true 315 feet still along L.C.A. 11102;
24. S. 43º 00' W. true 174 feet along ***Lalakea***;
25. S. 50º 30; W. true 259 feet along L.C.A. 8472 Keawe;
26. S. 18º 50' W. true 174 feet along L.C.A. 8472; Thence leaving water course;
27. N. 67º 00' W. true 83 feet along *kuauna* by L.C.A. 10781 (Puaanui) to the E. bank of the ***Kumaka*** river;
28. S. 49º 40' W. true 242 feet along L.C.A. 10781;
29. S. 23º 35' W. true 209 feet along L.C.A. 10781;
30. S. 65º 45' E. true 109 feet along L.C.A. 10781;
31. S. 19º 5' W. true 798 feet along L.C.A. 10781;
32. S. 66º 30' E. true 100 feet along L.C.A. 10781;
33. N. 20º 45' E. true 64 feet along L.C.A. 10781 along water course;
34. S. 71º 00' E. true 128 feet along ***Lalakea***;
35. S. 59º 20' E. true 325 feet along L.C.A. 8487 (Kaunauwahi) to its South corner; Thence along side of *pali* by ***Lalakea***;
36. S. 31º 50' W. true 976 feet;
37. S. 6º 00' W. true 238 feet to south corner of L.C.A 7056 (Kahulanui) Lot 1;
38. S. 30º 10' W. true 1402 feet to the east corner of the *Ili* of Pueo, Grant No. 664 (Kaaukai); Thence leaving the *pali;*
39. N. 55º 45' W. true 74 feet along Pueo;
40. N. 32º 20 W. true 119 feet along Pueo to east corner of L.C.A. 7956 (Kahulanui) Lot 2;
41. N. 48º 30' W. true 278 feet along Pueo;
42. N. 58º 30' W. true 106 feet along Pueo;
43. N. 79º 20' W. true 62 feet along Pueo;
44. N. 50º 30' W. true 159 feet along Pueo;
45. S. 38º 10' W. true 324 feet along Pueo [page 334];
46. N. 55º 30' W. true 33 feet along the *Ili* of ***Kaohia*** (Crown);
47. S. 33º 15' W. true 123 feet along the *Ili* of ***Kaohia***;
48. N. 54º 30' W. true 192 feet along the *Ili* of ***Kaohia***;
49. S. 27º 50' W. true 1054 feet along the *Ili* of ***Kaohia*** to its West corner on the W side of a water course;
50. S. 60º 10' E. true 272 feet along ***Kaohia*** to the East corner of L.C.A. 10962 (Konohiki) at a point on the brow of a small *pali* 9 feet east of a pig pen;
51. N. 61º 10' E. true 302 feet along ***Kaohia*** to a well known marked rock called "***Pohaku Ohia***"
52. S. 23º 25' E. true 244 feet along ***Ohia***; thence along the side of the *pali* by ***Lalakea***;
53. S. 28º 10' W. true 363 feet to the east corner of L.C.A. 10962 (Konohiki);

54. S. 30º 40' W. true 505 feet;

55. S. 68º 30' W. true 227 feet;

56. S. 74º 45' W. true 446 feet to the south corner of L.C.A. 8481 (Kawilikopaa); Thence up the *pali* to the top;

57. S. 42º 45' E. true 2380 feet; Thence along the summit edge of *pali* still along ***Lalakea***;

58. S. 30º 15' W. true 430 feet;

59. S. 14º 00' W. true 1073 feet;

60. S. 20º 20' E. true 235 feet;

61. S. 26º 5' W. true 3140 feet;

62. S. 29º 20' W. true 3091 feet;

63. S. 56º 30' W. true 363 feet to a well known marked point called "***Kilohana***," on the boundary of ***Waimea***, at the head of the old ***Opaelolo*** road not far above the rock of ***Pupualenalena***;

64. Thence along the brow of the *pali* around the entire head of ***Waipio*** valley and its several branches called ***Waima***; ***Koiawe***; ***Alakahi*** and ***Kawainui***; along the ahupuaas of ***Waimea*** and ***Waimanu*** (***Awini***, ***Honopue*** and ***Laupahoehoe*** probably also abutting on this *pali*) to [page 335] a point at ***Kealai*** or the lowest part of the saddle of the ridge between ***Waipio*** and ***Waimanu*** valleys at the head of the latter;

65. Thence down *pali* along land of ***Muliwai*** to bottom of *pali*;

66. Thence along bottom of *pali* by ***Muliwai*** to a point 360 feet true North of the junction of the ***Koiawe*** and ***Kawainui*** rivers and N. 58º 0' W. true 6210 feet from sta. 64 at ***Kilohana***; Thence 67. N. 82º 0' E. true 792 feet along base of *pali* by ***Muliwai***;

68. N. 51º 0' E. true 300 feet along base of *pali* by ***Muliwai***;

69. N. 67º 40' E. true 1130 feet along base of *pali* by ***Muliwai***;

70. S. 13º 55' E. true 86 feet across ***Kawainui*** river by ***Pohakumauluulu***;

71. N. 86º 50' E. true 819 feet along edge of the river by ***Pohakumauluulu***;

72. N. 7º 0' E. true 173 feet across both branches of river by ***Pohakumauluulu***;

73. S. 69º 0' E. true 793 feet along base of *pali* by ***Muliwai***;

74. S. 77º 30' E. true 563 feet along base of *pali* by ***Muliwai*** to angle in the valley 500 feet N.W. of junction of ***Kawainui*** and ***Waima*** rivers and N. 7º 10' W. true 4490 feet from sta. 64 at ***Kilohana***;

75. N. 21º 0' E. true 1223 feet along side of *pali* by ***Muliwai***; Thence along the *Ili* of ***Pohakumauluulu*** (Crown);

76. S. 63º 40' E. true 767 feet to a mark on large rock at end of stone wall by edge of small *pali*;

77. S. 61º 10' E. true 178 feet to edge of ***Kawainui*** river; Thence along the N.W. bank of ***Kawainui*** river to a point which bears

78. S. 41º 15' W. true 1474 feet from last station.

79. S. 4º 25' W. true 74 feet across river to a point 70 feet East of junction of ***Waima*** and ***Kawainui*** rivers; thence along the S.E. bank of the ***Kawainui*** river to a point which bears

80. N. 42º 25' E. true 1550 feet from last station and S. 61º 10' E. true 78 feet from station 77;

81. S. 61º 10' E. true 317 feet;

82. N. 44º 0' E. true 490 feet along base of *pali* on E. side of valley [page 336];

83. N. 4º 40' E. true 457 feet along base of *pali* on east side of valley;

84. N. 68º 45' W. true 382 feet crossing ***Kawainui*** river to an old *kahuahale*;

85. N. 75º 20' W. true 711 feet;

86. N. 67º 50' W. true 358 feet still along ***Pohakumauluulu*** to its North corner which bears N. 16º 45' E. true 675 feet from sta. 76; Thence along the side of the *pali* by ***Muliwai***;

87. N. 11º 25' E. true 1834 feet to S.W. corner of L.C.A. 8539 (Kupele) Lot 1:

88. N. 21º 20' E. true 397 feet to N.W. corner of same;

89. N. 23º 15' E. true 963 feet to S.W. corner of L.C.A. 10781 Puaanui Lot 2, which bears N. 79º 55' W. true 1018 feet from Sta. 57;

90. N. 7º 20' E. true 660 feet;

91. S. 67º 35' E. true 100 feet to west angle of L.C.A. 10286 Manuakui, Lot 1; Thence along the base of the *pali* by ***Muliwai***;
N. 37º 15' E. true 903 feet;

93. N. 30º 10' E. true 1789 feet to a point near base ***Kumupapala*** falls at the West corner of L.C.A. 7860 (Kawahineainiu), Lot 1;

94. N. 39º 30' E. true 507 feet to north corner of L.C.A. 7860;
Thence leaving the base and running along
The side of the *pali* still by ***Muliwai;***

95. N. 7º 15' W. true 898 feet;

96. N. 14º 40' W. true 230 feet to north corner of L.C.A. 8471 (Kaheana) Lot 1; just South of a small waterfall;

97. N. 42º 45' E. true 361 feet;

98. N. 54º 30' E. true 309 feet;

99. N. 41º 55' E. true 258 feet;

100. N. 53º 50' W. true 120 feet;

101. N. 28º 00' W. true 148 feet to the west corner of L.C.A. 10395 (Nakoko) at a point on the South edge of basin at foot of ***Neneuwe*** falls;

102. N. 37º 40' E. true 49 feet to a point on east edge of basin;

103. N. 3º 20' E. true 132 feet crossing Neneuwe stream to a point on steep face of a sharp ridge [page 337];

104. N. 87º 0' W. true 223 feet up the ridge; Thence along the side of the *pali* still by ***Muliwai***;

105. N. 14º 50’ W. true 507 feet to West corner of L.C.A. 9827 (Kipapanui);

106. N. 16º 0’ E. true 79 feet;

107. N. 15º 30’ W. true 311 feet to West corner of L.C.A. 8401 (Keliinohopali);

108. N. 37º 15’ E. true 124 feet;

109. N. 56º 00’ E. true 225 feet;

110. N. 39º 35’ E. true 211 feet to North corner of L.C.A. 10066 (Maka) Lot 1;

111. S. 49º 50’ E. true 377 feet to West corner of L.C.A. 8202 (Hamohamo);

112. N. 50º 10’ E. true 48 feet;

113. S. 51º 15’ E. true 87 feet;

114. N. 63º 15’ E. true 207 feet;

115. N. 8º 35’ E. true 122 feet; Thence leaving the boundary of ***Muliwai*** and running around the *lli* of ***Koloakiu***, L.C.A. 8815 B (Kaonaeha);

116. S. 64º 20’ E. true 160 feet down the *pali* to the West bank of the water course by the road;

117. S. 8º 50’ W. true 33 feet;

118. S. 73º 10’ E. true 89 feet;

119. S. 18º 45’ W. true 57 feet;

120. S. 64º 25’ E. true 779 feet;

121. N. 34º 0’ E. true 982 feet to the south corner of L.C.A. 10960 (Wahakole), Lot 1 on the east bank of the ***Makoko*** river;

122. N. 21º 5’ E. true 105 feet to a point in the middle of the river;

123. N. 54º 50’ W. true 1000 feet to the corner of a stone wall by the road at the base of the *pali* near the north corner of the *Loi koele*;

124. N. 49º 10’ W. true 360 feet up the *pali* to a marked rock by *puhala* tree at north corner of L.C.A. 10960 (Wahakole) Lot 1; thence leaving the boundary of ***Koloakiu*** and running along the side of the *pali* by ***Muliwai***;

125. N. 55º 25’ E. true 178 feet to West corner of L.C.A. 8474 (Kealoha) [page 338];

126. N. 40º 00’ E. true 294 feet to North corner of L.C.A. 8479 (Koi);

127. N. 78º 50’ E. true 451 feet to West corner of L.C.A. 10565B (Ohule), Lot 1;

128. N. 39º 35’ E. true 426 feet;

129. N. 1º 25’ E. true 480 feet;

130. S. 72º 30’ E. true 108 feet;

131. N. 30º 20’ E. true 210 feet;

132. N. 54º 40’ W. true 130 feet;

133. N. 35º 15’ E. true 66 feet;

134. N. 51º 20’ W. true 63 feet to West corner of L.C.A. 7856 (Kamakahiki), Lot 2;

135. N. 46º 0’ E. true 380 feet to North corner of L.C.A. 7856 (Kamakahiki), Lot 1;

136. S. 61º 10’ E. true 248 feet down the *pali*; Thence along base of *pali* still by ***Muliwai***;

137. N. 38º 30’ E. true 180 feet;

138. S. 71º 45’ E. true 73 feet crossing the road to a point 17 feet East of stone wall;

139. N. 25º 45’ E. true 303 feet to the North corner of L.C.A. 7863 (Kalua) Lot 3;

140. N. 13º 00’ E. true 172 feet to a point on E. face of stone wall;

141. N. 14º 40’ E. true 25 feet to South corner of L.C.A. 7863 (Kalua), Lot 2;

142. N. 75º 15’ W. true 28 feet crossing the road to a point on side hill 21 feet *mauka* of “***Leimakani’s cave***;”

143. N. 10º 40’ E. true 99 feet;

144. N. 33º 0’ W. true 25 feet;

145. N. 58º 30’ W. true 258 feet;

146. N. 29º 40’ E. true 290 feet; Thence leaving the base of *pali* but still following the boundary of ***Muliwai***;

147. S. 67º 40’ E. true 98 feet to corner of stone wall on East side of road at North corner of L.C.A. 7863 (Kalua), Lot 2;

148. S. 77º 15’ E. true 129 feet;

149. S. 1º 50’ E. true 208 feet along edge marsh;

150. S. 33º 0’ W. true 174 feet along edge marsh;

151. S. 14º 40’ W. true 100 feet to sta. 142;

152. S. 14º 40’ W. true 25 feet to sta. 141; Thence starting again [page 339] from sta. 141 and running out into the marsh still along ***Muliwai***;

153. S. 69º 20’ E. true 198 feet along *kuauna* to angle in [*kuauna*];

154. N. 45º 45’ E. true 88 feet along *kuauna* to *makaha* of old fish pond;

155. S. 64º 50’ E. true 793 feet through marsh to West corner of L.C.A. 10918 (Uma), Lot 3, on East bank of water course;

156. N. 39º 10’ E. true 987 feet to North corner of L.C.A. 7860 (Wahineainiu) Lot 2 on East bank of water course;

157. N. 28º 50’ E. true 491 feet along edge of the ***Muliwai*** marsh to the angle in the *kuauna* at its East corner;

158. N. 59º 0’ W. true 1344 feet along *kuauna* to a point 30 feet East of the road on the West side of the marsh;

159. S. 6º 0’ W. true 55 feet;

160. S. 47º 35’ W. true 225 feet to the South corner of L.C.A. 7863 (Kalua) Lot 1, which is N. 31º 25’ E. true 841 feet from Sta. 148;

161. N. 49º 20’ W. true 146 feet crossing the road to a point on the side of the ***Muliwai*** *pali*;

162. N. 39º 30’ E. true 736 feet along side of *pali* to the North angle of L.C.A. 7863;

163. S. 37º 45’ E. true 132 feet down the *pali*;

164. N. 6º 35' W. true 114 feet to a marked point on the rock at base of *pali* where it forms a sharp angle near sea shore;

165. Thence the *Ahupuaa* of ***Waipio*** owns the shore fishing on all accessible rocks on the coast as far to the Northwest as the gulch ***Naluea*** about two miles.

Starting again from a point which bears N. 64º 20' E. true, 100 feet from sta. 165 and running along sea shore; 166. S. 29º 0' true 350 feet;

167. S. 66º 55' E. true 2624 feet to a point in the middle of river at its mouth [page 340];

168. S. 78º 40' E. true 330 feet to a point on the sea shore on the division line between this land and ***Lalakea***; Thence

169. S. 26º 10' W. true 866 feet along ***Lalakea*** to initial point.

Containing an area of about 5800 acres.
Surveyed by J.S. Emerson, Gov't. Surveyor

I hereby certify the above description to be in accordance with the past decisions of the boundary Commission of the Island of Hawaii.

(Signed) C.J. Lyons

May 17th 1881
It is therefore adjudged and I do hereby decide and certify that the boundaries of the said land are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii, the 23d day of May A.D. one thousand eight hundred and eighty one.

F.S. Lyman
Commissioner of Boundaries… [page 341]

Ahupuaa of Kahualiilii

District of North Kohala, Island of Hawaii, Boundary Commission, Hawaii, Volume A:245-246

Honorable R.A. Lyman
Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii

The undersigned would herewith make application for the settlement of the Boundaries of the following named Ahupuaas or lands belonging to the Estate of the Kekuanaoa & V. Kamamalu, viz…; [page 245]

…***Kahuaike*** [Kahuaiki – Kahua liilii] , District of Kohala, Hawaii
adjoining lands unknown…
…***Kahua***, District of Kohala, Hawaii
adjoining lands unknown…

Your Honor therefore will please appoint a day for the hearing of said application, and grant a certificate in accordance therewith,

(sig) J.O. Dominis, admts.
J.F.H. Harris, Atty at Law
Hilo August 16th A.D. 1873 [page 246]

Ahupuaa of Kahualiilii

District of North Kohala, Island of Hawaii, Boundary Commission, Hawaii Volume B:138-139

The *Ahupuaa* of ***Kahualiilii***, District of North Kona, Island of Hawaii, 3d J.C.

On this, the 24th day of November A.D. 1873 the Commission of Boundaries for the Island of Hawaii, 3d J.C. met at the house of Jas. Woods, Kohala Ranch, North Kohala, on the application of J.O. Dominis, Administrator of the Estate of M. Kekuanaoa for the settlement of the boundaries of Kahualiilii, situated in the District of North Kohala, Island of Hawaii. Notice of hearing, for the settlement of boundaries of lands in Hamakua and Kohala at the Court House in ***Waimea***, South Kohala on _____.
Served by publication in the Hawaiian Gazette of _____ and *Kuokoa* of _____1873, and continued at Kohala Ranch on the 24th instant. Due notice personally served on owners or Agents of adjoining lands, as far as known. Present: Jas. Woods for applicant and all parties.

For Petition see Folio 245 Book A.

Testimony
Kaili K. Sworn.
I was born in Kohala at the time of the great Famine [ca. 1811], now live in Kokio; know the boundaries of ***Kahualiilii***. Kiha, my Father and Pohina, my Uncle, showed them to me. I do not know all the boundaries between ***Kahuanui*** and ***Kahualiilii***. Bounded on the north side at shore by the land of ***Pahinahina***. Commencing at a cave called ***Lehua***, the boundary runs *makai* to a point at the sea shore called ***Kananakauwa***; thence it runs *mauka* to a pile of rocks at ***Lehua***;

thence *mauka* to an *ahu* named ***Panipani***;
thence *mauka* to another pile of stones;
and thence to a place, called ***Kilohana***
where there is a pile of stones that Kahuhu
and I built when Wiltse was surveying.
Kilohana is an old resting place; thence
mauka to ***Ahuaele***; an *ahua* with a pile
of stones on it; thence *mauka* to ***Pahukinikini*** [page 138]
a small *ahua* with a pile of rocks on it; thence
to ***Puuolani*** hill, this is along the land of
Pahinahina; that was sold to Makuaole and is
now owned by Kanehaloa of ***Puuehuehue***;
thence to ***Lolelole***, the *mauka* corner of land
sold; thence *mauka* to ***Ahaloa***, an old *kauhale*
at the *mauka* corner of ***Pahinahina***; thence along
Makeloa (belonging to Kamehameha V Estate);
thence the boundary runs *mauka* to ***Kalala***,
a water hole in a gulch, thence across the gulch
and *mauka* along the land of ***Kalala***; thence
mauka to ***Puukoa***; a hill of *Koa*, at the *mauka*
corner of Kanehalo's land; thence along ***Kaili-***
kea, a land *mauka* of ***Puukoa*** (Wiltse, in
surveying, cut off a corner of ***Kalala***, and
ran the line to ***Holeipalaoa*** gulch); there
is a rock there on the *mauka* side of the
gulch marked **KK**; thence it is bounded
by ***Kehena*** to ***Kilohana*** on ***Honokane***
pali (Note See Certificate of boundaries
of Kehena). Thence along ***Honokane*** *pali*
towards ***Waimea***, to the ***Waimea*** side of
Puuwau hill, the boundary being some
distance this way of the _____; Bounded
at shore by a small gulch called ***Huolo***, a
rock marked **K** is at this place; thence up
the gulch to an *ahua*; thence up to where
Keawewai gulch crosses ***Huolo*** gulch;
thence the boundary runs up the North side
of the gulch; thence to a place called ***Kapa-***
kamakahonu; thence to ***Pohakuloa***, a large
rock in the gulch; thence to an *ahua*; thence
to ***Kawaihae*** Government road; thence to
Puuala; thence to ***Niupaa***, a bullock pen,
the boundary passing through the center
of the pen. Thence it crosses the Govern-
ment road to the wire fence some distance
to the north of Vida's old house; thence to
Puumanu; thence to the south side of
Ahumoa; thence on the North side of ***Waia-***
kananaula, a water place; thence to
Puuiki and from thence to ***Honokane*** *pali*.

C.X.d.

The above boundaries are between ***Kahuanui*** and ***Kahualiilii***.

Case continued until further notice to all parties concerned.

R.A. Lyman
Commissioner of Boundaries, 3d J.C… [page 139]

Ahupuaa of Kahualiilii
Boundary Commission, Hawaii Volume D, No. 5:582-586

Kahualiilii, North Kohala

The Boundary Commission met in the Court House, at Kapaau, North Kohala, at 9 A.M. December 19, 1903, according to Notices published in the Hilo Tribune, and *Ku Okoa*, for a hearing November 14, and a continuance to November 21, and to December 19, and notices of the hearing and continuances, having been sent by mail by the Commissioner of Boundaries to each owner of the adjoining lands, viz.; Commissioner of Public Lands; Estate of B.P. Bishop; Holmes and Stanley, attorneys Estate of J.W. Austin and J.F. Woods.

There being present, J.F. Woods, applicant; A.B. Loebenstein, atty. for applicant; J.W. Pratt, Commissioner of Public Lands; L.P. Weaver, attorney for the Territory; J.B. Kahoi, and others.

Applicant presents his application, filed August 27, 1903, for settlement of the Boundaries of this land; and notices of hearing published in the Hilo Tribune, and *Ku Okoa*, in due form; also asks that the testimony about the boundaries of this land, taken before the former Commissioner of Boundaries in the year 1873, and on Record in Book B, page _____ be taken as part of the testimony in this case.

Also presents Stipulation signed by S. M. Damon, for the Estate of J.W. Austin, owner of ***Kahuanui***, and J.F. Woods, owner of ***Kahualiilii***, agreeing to the boundary as surveyed by A.B. Loebenstein between those two lands.

Also Stipulation signed by J.W. Pratt, Commissioner of Public Lands, December 8, 1903, consenting to settlement of the boundaries as set forth in the application. [page 582]

The land is bounded on the north by ***Pahinahina***, and Grants; ***Pahinahina*** is Gov't. land, and not surveyed, except the Grants.

Also Kehena, Boundary Certificate No. 17.

Presents also notes of survey and description of the land, by A.B. Loebenstein, September 1903, endorsed as accepted by Arthur C. Alexander, Surveyor for the Estate of J.W. Austin, and also for a decision and certificate of Boundaries on such survey

(Application)
Hilo, Hawaii, Aug. 27, 1903

Hon. F.S. Lyman
Commissioner of B'dries 3d & 4th
Circuit, Terr. Hawaii

Sir:
Representing the owners of the *ahupuaa* of ***Kahualiilii*** in the District of North Kohala, Island of Hawaii, I have the honor to request you to set a day for the taking of testimony in this case, and the issuance of a certificate of boundaries. In compliance with the statute I have hereunto annexed a schedule of adjacent lands with respective owners, as far as I have been able to obtain them.

Very repsectfully yours,
A.B. Loebenstein
Atty for J.F. Woods owner
land of Kahualiilii.

Schedule of contiguous lands.
Pahinahina, Territory of Hawaii
Makiloa, Territory of Hawaii
Honokanenui, Estate B.P. Bishop
Kahuanui, Estate J.W. Austin
Kehena, Estate James F. Woods
Gr. 2330, Makuaole
Gr. 780, Kaneihailua
Gr. 752, Kailikea
Gr. 2642, Kaale [page 583]

(Stipulation)
Before F.S. Lyman
Commissioner of Boundaries for the

Third & Fourth Circuits, Terr. Hawaii.
In the matter of the application by
J.F. Woods (owner of the land) for
settlement of the boundaries of the
land of ***Kahualiilii***, North Kohala,
Hawaii.

We, the undersigned, the Estate of
James W. Austin, the owners of the
adjoining land of ***Kahuanui***, and
the said J.F. Woods, hereby stipulate
and agree, that the survey (as alter-
ed in ink) of the boundary of the
said land of ***Kahualiilii*** made by
A.B. Loebenstein, Surveyor, dated
September 1903 and set out in the
schedule hereunto annexed signed
by Arthur C. Alexander, surveyor and
made part of this stipulation, as
shall be accepted and taken as the
boundary between the said lands of
Kahualiilii and ***Kahuanui*** and enter-
ed of record as such boundary.

Dated, December 15th 1903.
The Estate of
James W. Austin,
by their Atty in fact,
S. M. Damon;
Jas. F. Woods, Owner of
the Land of ***Kahualiilii***.

(Stipulation)
Before the Boundary Commission of
the Third Circuit, Territory of Hawaii
F.S. Lyman, Esq. Commissioner

In the matter of the Boundaries
of the land of
Kahualiilii,
North Kohala, Hawaii [page 584]

Return of Territory of Hawaii

Now comes J.W. Pratt, Land Comm-
issioner of the Territory of Hawaii, and
in answer to the application herein
says:

That the boundaries as set forth
in the application herein are correct
in so far as those adjoining the
lands of Puhinahina [sic] and Makiloa,
and hereby consents to a settlement
of said boundaries as set forth in

the application.

Honolulu, T.H., Dec. 8, 1903.
Jas. W. Pratt
Commissioner of Public Lands.

Testimony
A.B. Loebenstein, Sworn. I executed this survey according to the testimony on record in the Bound. Com. taken before R.A Lyman, Nov. 24, 1873, also following description of bounds of adjacent lands Pat'd. by Gov't. Kehena, B. Certificate, No. 17, and land of ***Honokanenui***, Certificate of B.

Most of the points are well known, and I had kamaainas where they were available, starting at well known point at sea shore, along boundary of ***Pahinahina*** to cor. of Grant, Makuaole, and along Grant changed to true bearings between course 15 and 17, correct 16, towards S. hill, as agreed to with Gov't.

L.P. Weaver files - for Territory plan of change to be made in the boundary as Exhibit A.

Then along Grants 780, 752, 2642, and Government remainder, Kalala 2d, then along Kehena, Certificate No. 17 [page 585] on East, Honokanenui Certificate No. 172, to South East Corner, where ***Kahuanui*** comes in, and survey made according to that to sea coast, and along coast high water mark to commencement.

C.X.d.

No one appearing to contest, and all present consenting, the case is closed, decision to be given later.

Decision.
I hereby decide that the Boundaries of the Land of ***Kahualiilii***, District of Kohala, Island of Hawaii, T.H., are, and hereafter shall be as described in the Survey on file, made by A.B. Loebenstein, September 1903, Certificate of Boundaries to be issued on payment of costs and expenses of the Commission of Boundaries.

December 22d, 1903
Frederick S. Lyman
Commissioner of
Boundaries 3d
Judicial Circuit… [page 586]

Ahupuaa of Kahualiilii
Boundary Commission, Hawaii Volume C No. 4:138-141

No. 184

Certificate of Boundaries of the Land
of ***Kahualiilii***, District of Kohala, Island of Hawaii,
L. Kamehameha, L.C. Award 7715.

Commission of Boundaries.
Third Judicial Circuit Territory of Hawaii, U.S.A.

Frederick S. Lyman, Commissioner

In the Matter of the Boundaries
of the Land of ***Kahualiilii***,
District of Kohala,
Island of Hawaii

Judgment.

An application to decide and certify the Boundaries of the Land of ***Kahualiilii***, District of Kohala, Island of Hawaii, having been filed with me, on the 27th day of August, 1903, by A.B. Loebenstein, as attorney for J.F. Woods, the owner of said land, in accordance with the provisions of an Act to facilitate the settlement of Boundaries, now therefore, having duly received and heard all the testimony offered in reference to the said boundaries and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 5, D, pages 582 and it appearing to my satisfaction that the true, lawful, and equitable boundaries are as follows, viz.:

Beginning at the West angle of this land near the mouth of a dry water course called "***Lehua***" at a **+** marked on top of a low falls, by the opening of a cave called "***Lehua***" the coordinates being S. 17669.0 W. 20457.3 referred to the Puu Aiea Ref. Survey Station, the boundary runs by the true meridian:

1. N. 26º 58' 00" E. 1980.0 ft. along Govt. land of ***Pahinahina*** to marked stone under old mound of stones on West bank of the ravine;
2. N. 36º 24; 30" E. 5769.0 ft. along ***Pahinahina*** to a **VIII** cut in boulder by mound of stones on rise called "***Lanai***" W. of ***Keanapakulua*** falls in ravine; the coordinates being S. 11262.2 W. 16135.5 ft. referred to the ***Puu Aiea*** Ref. Survey

Station; [page 138]

3. N. 37º 54' 10" E. 4977.0 ft. along ***Pahinahina*** to a **+** under old mound of stones on a rise called ***Panipani***, below the ***Kawaihae-Puuhue*** road;
4. N. 35º 10' 40" E. 3998.0 ft. along ***Pahinahina*** to a and old **VI** under large pyramid of stones on rise called ***Kilohana***, the coordinates being S. 4068.0 W. 10775.2 ft. referred to ***Puu Aiea*** Survey and Ref. Station;
5. N. 25º 36' 00" E. 3935.0 ft. along ***Pahinahina*** to middle point under large mound of stones by ancient roadway on top of slope and lower end of flat bench called ***Ahuaele***;
6. N. 56º 15' 00" E. 2069.0 ft. along ***Pahinahina*** to angle by ancient roadway;
7. N. 57º 12' 00" E. 866.0 ft. along ***Pahinahina*** to large pyramid of stones by ancient roadway marking the South West angle of the Royal Patent (Grant) 2330, Makuaole, the coordinates being N. 1100.6 W. 6227.2 ft. referred to Survey and Ref. Station ***Puu Aiea***;
8. N. 61º 54' 30" E. 754.0 ft. along Grant 2330;
9. N. 41º 11' 00" E. 1116.0 ft. along Grant 2330 to an old **+** cut in stone by ancient roadway;
10. N. 52º 53' 00" E. 792.0 ft. along Grant 2330;
11. N. 60º 01' 00" E. 3930.0 ft. along Grant 2330 to middle point under mound of stones on the slope and near the crest of the Puu o Lani hill, the bearing and distance from the Puu o Lani Survey and Ref. Station being N. 20° 18' W. 117.0 ft.;
12. N. 59º 09' 00" E. 443.0 ft. along Grant 2330;
13. N. 67º 25' 00" E. 1123.0 ft. along Grant 2330;
14. N. 83º 31' 00" E. 1189.0 ft. along Grant 2330;
15. N. 78º 17' 40" E. 1066.0 ft. along Grant 2330 to South East angle of same to a **+** on stone at lower edge of old Kohala road, the coordinates being N. 5746.5 E. 2450.6 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
16. N. 82º 00' 00" E. 1220.0 ft. along ***Makiloa*** to angle;
17. N. 54º 50' 00" E. 3009.0 ft. along same to an old **+** on rock ledge on W. bank of ***Pokiiahua*** stream;
18. N. 76º 21' 00' E. 396.0 ft. along Royal Patent (Grant) 780, Kanehailau, to an old mound of stones marking the South West angle of Royal Patent (Grant 752), Kailikea, the coordinates being N. 7742.4 E. 6502.6 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
19. N. 74º 27' 00" E. 1479.0 ft. along Grant 762, to a **+** under mound of stones marking the South West angle of R.P. (Grant) 2642 [page 139] Kaale, the coordinates being N. 8138.8 E. 7927.1 ft. referred to the Survey and Ref. Station ***Puu Aiea***;

20. N. 87º 57' 00" E. 1065.0 ft. along Grant 2642;
21. S. 60º 32' 00" E. 3314.0 ft. along Govt. Land of ***Kalala***, to an old **>I K** of the Wiltse survey of 1857, cut in the rock a short distance above falls and road crossing and on the East bank of the ***Hooleipalaoa*** stream, the coordinates being N. 6542.9 E. 11876.4 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
22. S. 75º 51' 00" E. 8258.0 ft. along the land of Kehena, Bdy. Cert. 17, to the point on the edge of the ***Honokane*** *pali* known as ***Kilohana***, being an old resting place; now covered by sumach trees, by the intersection of the old trail along the brink of the *pali*, with the one leading into the valley a long lava ledge on the brink being marked, ***Kehena*** and ***Kahua*** also on either side of a , also two old ***K's***, the coordinates being N. 4524.2 E. 19885.8 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
23. S. 11º 52' 00" W. 3130.0 ft. along ***Honokanenui***, Cert. 172, the boundary following the windings of the top of the *pali* to a projecting spur, from which point the *pali* makes a sharp turn to the South West, the coordinates being N. 1461.9 E. 19342.2 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
24. S 86º 17' 45" W. 7737.8 ft. along the land of ***Kahuanui*** to South brow of ***Puuiki*** hill;
25. S. 88º 43' 30" W. 2076.0 ft. along ***Kahuanui*** to a on stone at foot of post marked , at S. base of A***humoa*** hill; the coordinates being N. 915.8 E. 9543.7 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
26. N. 62º 24' 00" W. 736.0 ft. along ***Kahuanui*** to a on stone in valley between the ***Ahumoa*** and the ***Waiakanounouula*** hills;
27. N. 46º 45' 00" W. 1449.0 ft. along ***Kahuanui*** to a on boulder in gully at foot of ***Ahuaomanu*** hill;
28. N. 74º 56' 00" W. 941.0 ft. along ***Kahuanui*** to post on top of ***Ahuaomanu*** hill, the coordinates being N. 2506.1 E. 6939.0 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
29. N. 63º 40' 00" W. 2414.0 ft. along ***Kahuanui*** to a **+** on stone;
30. S. 83º 22' 00" W. 2119.0 ft. same; [page 140]
31. S. 79º 31' 00" W. 2201.0 ft. along ***Kahuanui*** to a **+** cut on stone, under mound of stones just above East angle of old stone corral by edge of the ***Honoipu*** road, the coordinates being N. 2931.9 E. 486.7 ft. referred to the Survey and reference Station ***Puu Aiea***;
32. S. 65º 37' 00" W. 3051.0 ft. along ***Kahuanui*** to a **+** under mound of stones in ancient roadway;
33. S. 60º 09' 30" W. 2231.0 ft. along ***Kahuanui*** to an old **+** on boulder by ancient roadway, the coordinates being N. 562.5 W. 4226.0 ft. referred to the Survey and Ref. Station ***Puu Aiea***;

34. S. 32º 15' 00" W. 3817.0 ft. along ***Kahuanui*** to a **+** under mound of stones of top of low hill called ***Puu Nau***;
35. S. 19º 06' 00" W. 2814.0 ft. along ***Kahuanui*** to an old ***IV*** on large vertical boulder called ***Pohakuloa***, by roadway and East edge of the ***Pohakuloa*** gulch, the coordinates being S. 5328.4 W. 7183.5 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
36. S. 46º 16' 30" W. 4743.0 ft. along ***Kahuanui*** to an old ***III*** cut in large flat lying boulder by roadway on ridge called ***Ahua Kii***;
37. S. 30º 08' 00" W. 2722.0 ft. along ***Kahuanui*** to point in ancient roadway between two large mounds of stones;
38. S. 22º 03' 00" W. 977.0 ft. along ***Kahuanui*** to an old **II** cut in boulder on the flat of ***Kapaokamakahonu***, the coordinates being S. 11870.3 W. 12344.6 ft. referred to the Survey and Ref. Station ***Puu Aiea***;
39. S. 43º 02' 00" W. 5362.0 ft. along ***Kahuanui***, to an old **++** on boulder near West bank of the ***Keawewai*** gulch a short distance above the ***Waiokanalopaka*** falls and pool;
40. S. 32º 01' 00" W. 4864.0 ft. along ***Kahuanui*** to an old **K** on boulder at the crossing of the ***Kawaihae-Mahukona*** trail in the ***Huolo*** gully, the coordinates being S. 19915.3 W. 18582.3 ft. referred to the Survey and Ref. Station ***Puu Aiea***; thence down middle of gully to sea shore at high water mark, and following the meanders of same at high water mark to point of beginning, the direct bearing and distance from the said K being;
41. N. 39º 51' 00" W. 2926.0 ft. to said point of beginning.

Containing an area of 4040.0 acres, more or less, surveyed by A.B. Loebenstein, September, 1903.

It is therefore adjudged, and I do hereby certify and decide that the boundaries of said land of ***Kahualiilii***, are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii, the 26th day of December, A.D. 1903.

Frederick S. Lyman
Commissioner of Boundaries, Third and Fourth Jud. Circuits.
Territory of Hawaii, U.S.A. [page 141]

Ahupuaa of Kahuanui

District of North Kohala, Island of Hawaii
Boundary Commission, Hawaii, Volume A, No. 1:453

Honolulu, Sept. 185h 1873.

R.A. Lyman, Esq.
Commissioner of Boundaries on Hawaii,
Hilo

Dear Sir:
Until I recv'd. your letter of the 26th ulti.
I was under the impression that I had applied
to you for settlement of boundaries of J.W. Aus-
tin's lands on Hawaii, ***Kahuanui*** in N.
Kohala and Panau in Puna. As his Attorney
I now request you to define and settle the
boundaries of those lands. The names of the
lands on either side of them, and of the owners
thereof, you know, and I do not. The survey of
Kahuanui was in Mr. Wiltse hands. The land of
Panau in Puna is worth so little. I hope that
expense of survey and settlement will also be
moderate

I remain, Very Respectfully Yours,
Chas. R. Bishop, attorney for J.W. Austin. [page 453]

Ahupuaa of Kahuanui
District of North Kohala, Island of Hawaii
Boundary Commission, Hawaii Volume B:144-146

The *Ahupuaa* of ***Kahuanui***, District of
North Kohala, Island of Hawaii, 3d J.C.

On this, the 25th day of November A.D. 1873, the Commis-
sion of Boundaries for the Island of Hawaii, 3d J.C.
met at the house of Jas. Woods, Kohala Ranch,
North Kohala, on the application of C.R.
Bishop, Agent for J. W. Austin for the settle-
ment of the boundaries of ***Kahuanui***,
situated in the District of North Kohala, Island
of Hawaii. Notice of hearing, at the ***Waimea***
Court House, South Kohala.

Served by publication in the Hawaiian Gazette
of _____ and *Kuokoa* of _____
and continued at Kohala Ranch on the 24th
and 25th instants. Due notice personally
served on owners or agents of adjoining
lands, as far as known.

Present: Jas. Woods for applicant and for
all parties.

For Petition see Folio 453 Book A.

Testimony.
Kekua K. Sworn.
I was born at the time of *Aepala* [eating of the *pala* during famine ca. 1811] of and have always lived at ***Kahua*** until lately.

Kahuanui is bounded on the Kona side by
Waika. Commencing at the mouth of a gulch
the boundary between the *Ahupuaa* and

Kupono [independent land division] begins at a landing place called ***Kaiopae***; thence *mauka* along the Kuponos to ***Ahukuli***, a pile of stones; thence *mauka* to ***Puueoka***, a *heiau*; thence to along stone named ***Pohakuloa***; thence to ***Kamakaiwi***, a resting place; thence to ***Kapio***; thence to ***Ahumoa***, the boundary running through the hills; thence to ***Puuiki***; thence to ***Kanoa***, where fire used to be; thence to ***Kahawaikukae***, to *pali* of ***Kahawaiiki***; thence to ***Kahawaiholopapa***; thence to ***Ainamakanui*** [Hinamakanui] at the head of ***Honokane*** Gulch.

The ***kupono Kahawainui Kukui*** runs up here. ***Waika*** ends at ***Pohoakala***, a place where they used to gather *mamaki*. This is as far as I [page 144] know the boundaries on this side. I have heard that the land runs down to ***Mahiki*** in Hamakua. When Lyons surveyed ***Waika*** he cut across the *kupono* of ***Kahua*** and included them in ***Waika***. Know a place called ***Ahuanaha***. The real boundary is from ***Oneloa*** to ***Kapai***, a pile of stones by the road; thence to ***Kamanukaa***, where the gulch is the boundary between ***Waika*** and ***Kahua***. The boundary crosses the gulch to the Kohala side at ***Ahuanaha***; thence it runs to ***Ahuakapaakea***; thence *mauka* to ***Kalehua***; thence up the gulch to ***Moolau***. (The pile of stones is way on the Kohala side of the gulch, but the boundary is at the gulch). Thence past Macy's (G.W. Macy's) old house and *mauka* to ***Hookeke***; thence to *kahawai* ***Palapalai***; thence *mauka* to the *pali* of ***Kaloloulaula*** on ***Pili***; thence to ***Kapohoakala***; thence along to ***Kahaliaina***, a place below ***Puupala***, where ***Kawaihae*** joins ***Kahua***. From ***Kahaliaina*** the boundary runs along the foot of the *pali* to just above ***Puuwau*** on ***Kahuanui***. ***Puuwau*** is a hill a short distance back from ***Pili***; thence to ***Hinamakanui***, a cabbage garden on the brow of ***Honokane*** *pali*.

The boundary at shore between ***Kahuanui*** and ***Kahualiilii*** is a rock in the sea called ***Kahuapopolo***.

(Note:
Kaauwai [K.] puts the boundary a few rods on the Kohala side of this rock.)

Thence to ***Waiakanalopaka***, a pool of water at the end of the gulch, thence to

Pohakupalahalaha, a wall below the road to ***Kawaihae***, now called ***Kamakahonu***; thence to ***Waikalio*** gulch; thence across said gulch to ***Ahuakia***; thence the boundary runs to a stone called ***Pohaku-loa***; thence *mauka* across ***Pohakuloa*** gulch to ***Puanau***, a resting place; thence to ***Puuala***; thence ***Kipawale***, a resting place at the Government road; thence to a hill called ***Ahuamanu***; thence to ***Waiakapiai***; thence to ***Ahumoa***, part of which is on ***Kahua*** and part on another land. This is all I know of the boundaries.

C.X.d. [page 145]

No more witnesses on hand.
Jas. Woods asked to have case continued.
See evidence of boundaries of ***Waika*** & ***Kahualiilii*** &c.

Case continued until further notice to interested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C. [page 146]

Ahupuaa of Kahuanui
Boundary Commission, Hawaii Volume D:654-655

In the Matter of the Boundaries
of the Land, ***Kahua nui***,
District of North Kohala,
Island of Hawaii.
Third Judicial District, Territory of Hawaii

The application of Herbert Austin and Walter Austin, Trustees under the Will of James W. Austin, deceased, having been filed with the Commissioner of Boundaries for the Third and fourth Judicial Circuits, T.H. on the 4th day of May, 1905. Notices of hearing said application were published in the Hawaiian Gazette, and *Ku Okoa* newspapers, in English and Hawaiian, May 12, 19, 26 and June 2 for a hearing at the Office of the Commissioner of Boundaries in Hilo, Hawaii, on Thursday, the 8th day of June 1905, 9 A.M. Written notices of the time and place of hearing were also sent by mail, May 6th, to Messrs Holmes and Stanley, attorneys for Petitioners; to J.F. Woods, owner of adjoining lands; and to the Trustees of the Estate of Bernice P. Bishop, owner of adjoining land.

On the 8th of June, 1905, the Boundary Commission met in the Office of the Commissioner of Boundaries at Hilo, Hawaii, T.H. at 9 A.M. according to the published notice.

There being Present: W.L. Stanley, Esq., of Holmes & Stanley,

attorneys for the applicants;
and the Trustees of the Estate of B.P. Bishop having filed
acceptance of "the survey as made by the Austin Estate
and filed."

Due proof was made of the publication of Notice
in the Hawaiian Gazette, and *Kuokoa*, May 12, 19 & 26 and
June 2d in the English and Hawaiian languages.

There were also presented in evidence:

Deed of Victoria Kamamalu and M. Kekuanaoa to James
W. Austin, dated January 31, 1862, Recorded in Liber 15,
pages 38, 39, for the land Kahua-nui, North Kohala,
Hawaii, being Apana 4, Royal Patent 4475 by name
to Victoria Kamamalu. [page 654]

Certified copies of Letters of Trusteeship issued out of the Probate Court,
Suffolk County, Massachusetts, to Herbert Austin and Walter Austin,
Trustees under the Will of James W. Austin, deceased.

Also the testimony before the Commissioner of Boundaries November
25, 1873 in Boundary Commission Records, Book B, 2 on pages
144-6, as evidence in the boundaries of ***Kahua-nui***.

Also the Certificates of Boundaries of the adjoining lands; viz.:
Certificate No. 172, ***Honokane***, Book C. No. 4, pages 93, 94 & 95.
Certificate No. 183, ***Waika***, Book C, No. 4, pages 135-7.
Certificate No. 184, ***Kahua-liilii***, Book C, No. 4, pages 138-41.

Also Testimony offered on boundaries of ***Kahua-liilii***, Nov. 24,
1873. Book B, 2, pages 138-9, and Book 5, D, pages 582-6.
Testimony for ***Waika***, Book 5, D, page 578.
Testimony for ***Honokane***, Book A, pages 245 & 6; Book B., pages 121-3;
Book D, pages 205-9.

Copies of letters notifying owners of the adjoining lands; and
letter from Trustees of the Bishop Estate accepting Survey of
Kahua-nui attached to petition

Petitioners ask to continue case for two weeks to file the
acceptance by J.F. Woods, of the survey of ***Kahua-nui***
adjoining his lands, ***Waika*** and ***Kahua-liilii***.

Continued until June 22d.

F.S. Lyman
Com. of Boundaries [page 655]

Boundary Commission, Hawaii, Volume D, No. 5:656-661

Kahua-nui
North Kohala

Application To: F.S. Lyman, Esq.

Commissioner of Boundaries for the
Third Judicial Circuit
Territory of Hawaii.

Application for Certificate of Boundaries.

The undersigned, Herbert Austin and Walter Austin, both of Boston, Massachusetts, United States of America, Trustees under the Will of James W. Austin, late of Boston aforesaid, allege as follows:

1. That, as such Trustees, they are the owners in fee simple of all that certain tract of land containing an area of 5425 acres, or thereabouts, situate in North Kohala, Island and Territory of Hawaii, and in the Third Judicial Circuit of the said Territory, known as the *Ahupuaa* of ***Kahua-nui***, and being the land mentioned in Royal Patent 4475, *Apana* 4, to Victoria Kamamalu.

2. That the said Royal Patent 4475, *Apana* 4, the said *Ahupuaa* of ***Kahua-nui*** was not patented by boundaries in the said Patent decided, but the true boundaries thereof are set forth in the Schedule hereunto annexed and made part hereof.

3. That the names of the adjoining lands and of the owners thereof are:

(a) the *Ahupuaa* of ***Waika*** owned by J.F. Woods of North Kohala aforesaid and the boundaries whereof have heretofore been decided and certified to in Boundary Certificate No. 183.

(b) The *Ahupuaa* of ***Kahua-liilii*** owned by J.F. Woods aforesaid, and the boundaries whereof have heretofore been decided and certified to in boundary Certificate No. 184; and

(c) The *Ahupuaa* of ***Honokane-nui*** owned by the Trustees of the Estate and under the Will of Bernice P. Bishop, deceased, and the boundaries whereof have heretofore been decided and certified to in Boundary Certificate No. 172

Wherefore the undersigned hereby make application that the boundaries of the said *Ahupuaa* of ***Kahua-nui*** [page 656] may forthwith be decided and certified to by the Commissioner of the Third Judicial Circuit, Territory of Hawaii, or his successor in office.

Herbert Austin
Walter Austin,
Trustees under the Will of
James W. Austin, deceased
by their attorney in fact,
S.M. Damon

Dated at Honolulu,
May 2, 1905
Holmes & Stanley, Attorneys for Herbert Austin
and Walter Austin, Trustees

Schedule
Description of the Boundaries of the land of ***Kahua nui***,
Waimea, Kohala, Hawaii
(See certificate of Boundaries
No. ____, Book C, pages ____.

Hilo, Hawaii, May 6, 1905
To the Trustees of the Estate
under the Will of Bernice P. Bishop,
owners of ***Honokane-nui***,
a land adjoining.

Gentlemen:
You are hereby notified
that the application of the Trustees under the Will of James
W. Austin, will be heard at the Office of the Commissioner
of Boundaries, in Hilo, Hawaii, on Thursday, the 8th day
of June, A.D. 1905, at 9 a.m.

Frederick S. Lyman
Commissioner of Boundaries

(a similar notice, sent also to J.F. Woods, ***Kahua***, North Kohala,
owner of ***Waika***, and ***Kahua-liilii***, adjoining lands, and to
Holmes & Stanley, for applicants.) [page 657]

Ahupuaa of Kahuanui
Boundary Commission, Hawaii Volume C, No. 4:160-163

No. 190

Certificate of Boundaries of the Land of ***Kahua-nui***
District of ***Waimea***, Kohala,
Island of Hawaii, Territory of Hawaii, U.S.A.

Kamamalu, V. – L.C.A. 7713, Patent by Name 4475.

Commission of Boundaries,
Third Judicial Circuit, Territory of Hawaii, U.S.A.,
Frederick S. Lyman, Commissioner.

In the Matter of the Boundaries
of the Land of ***Kahua-nui***,
District of ***Waimea***, Kohala,
Island of Hawaii

Judgment

An application to decide and Certify the Boundaries
of the land of ***Kahua-nui***, District of ***Waimea***, Kohala,

having been filed with me on the fourth day of May, A.D. 1905, by S.M. Damon, as attorney in fact for Herbert Austin and Walter Austin, the Trustees under the Will of James W. Austin, deceased, the owner of said land, in accordance with the provisions of an Act to facilitate the settlement of Boundaries, now, therefore, having duly received and heard all the testimony offered in reference to the said boundaries and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 5, D, on page 656, and it appearing to my satisfaction that the true, lawful and equitable boundaries are as follows; namely:

Beginning near the sea shore at an old **K** on a boulder in the ***Huolo*** gully at the crossing of the ***Kawaihae-Mahukona*** trail, the coordinates being S. 19915.3 ft. W. 18582.3 feet referred to the ***Puu Aiea*** Survey and Reference Station, the boundary runs by true azimuths:

1. 212º 01' 4864 ft. along ***Kahua liilii*** to an old **++** on boulder near the west bank of the Keawewai gulch a short distance above the Waikanalopaka falls and pool; [page 160]
2. 223º 12' 5362 ft. along ***Kahua liilii*** to an old **II** cut in boulder on the flat of ***Kapaokamakahonu***, the coordinates being S. 11870.3 ft. W. 12344.6 feet referred to the ***Puu Aiea*** Survey and Reference Station;
3. 202º 03' 977 ft. along ***Kahua liilii*** to point of ancient roadway between two large mounds of stones;
4. 210º 08' 2722 ft. along ***Kahua liilii*** to an old **III** cut in a large flat lying boulder by roadway on ridge called ***Ahua Kii***;
5. 226º 16.5 4743 ft. along ***Kahua liilii*** to an old **IV** cut on large vertical boulder called ***Pohakuloa***, by roadway and East edge of the ***Pohakuloa*** gulch, the coordinates being S. 5328.4 feet W. 7183.5 feet referred to the Puu Aiea Survey and Reference Station;
6. 199º 06' 2814 ft. along ***Kahua liilii*** to a **+** under mound of stones on top of low hill called ***Puu Nau***;
7. 212º 15' 3817 ft. along ***Kahua liilii*** to an old + on boulder by ancient roadway, the coordinates being N. 562.5 ft. W. 4226.0 feet referred to the ***Puu Aiea*** Survey and Reference Station;
8. 240º 9.5' 2231 ft. along ***Kahua liilii*** to a **+** under mound of stones in ancient roadway;
9. 245º 37' 3051 ft. along ***Kahua liilii*** to a **+** cut on stone under mound of stones just above East angle of old stone corral by edge of the Honoipu road, the coordinates being N. 2931.9 ft. E. 486.7 ft. referred to the ***Puu Aiea*** Survey

and Reference Station;

10. 259º 31' 2201 ft. along ***Kahua liilii*** to a ± on stone;
11. 263º 22' 2119 ft. along same.
12. 296º 20' 2414 ft. along ***Kahua liilii*** to post on top of Ahuamanu hill, the coordinates being N. 2506.1 ft. E. 6939.0 ft. referred to the ***Puu Aiea*** Survey and Reference Station;
13. 285º 04' 941 ft. along ***Kahua liilii*** to a on boulder in gully at foot of ***Ahuaomanu*** hill;
14. 313º 15' 1449 ft. along ***Kahua liilii*** to a on stone in valley between the ***Ahumoa*** and the ***Waiakanounouula*** hills;
15. 297º 36' 736 ft. along ***Kahua liilii*** to a on stone at foot of post marked , at South base of Ahumoa hill, the coordinates being N. 915.8 ft. [page 161] E. 9543.7 ft. referred to the ***Puu Aiea*** Survey and Reference Station;
16. 268º 43.5' 2076 ft. along ***Kahua liilii*** to the South brow of ***Puu Iki*** hill;
17. 266º 17.75' 7738 ft. along ***Kahua liilii*** to a projecting spur on the edge of ***Honokane*** *pali*, from which point the *pali* makes a sharp turn to the Southwest, the coordinates being N. 1461.0 ft. E. 19342.2 ft. referred to the ***Puu Aiea*** Survey and Reference Station;
18. 21º 17' 3130 feet along ***Honokane nui***, Certificate 172, the boundary following the windings of the top of the *pali* to a ± on a stone set in the ground on the South peak of the ***Hinamakanui*** crater this point being the common angle of the lands of ***Honokane***, ***Waika***, and ***Kahua nui***, the coordinates being S. 1454.3 ft. E. 18206.4 feet referred to the ***Puu Aiea*** Survey and Reference Station;
19. 72º 10.5' 5514 ft. along the land of ***Waika*** to the ***Puu Pili*** triangulation station;
20. 26º 55' 1600 ft. down the slope of Puu Pili to a ± on a stone at the foot of same in the ***Palapalai*** ravine;
21. 78º 41' 1097 ft. along ***Waika***, the boundary following the middle of said ***Palapalai*** ravine;
22. 94º 34' 3706 feet along ***Waika***, to a ± on stones, the coordinates being S. 4487.4 ft. E. 7471.1 ft. referred to the ***Puu Aiea*** Survey and Reference Station. The boundary following the middle of said ***Palapalai*** ravine;
23. 87º 00' 534 ft. along ***Waika***;

24. 88º 38' 1675 ft. along ***Waika*** to a **K** and ± with "***Waika***" cut in the rock under mound of stones by upper edge of the Waimea-Kohala govt. road, the coordinates being S. 4555.2 ft. E. 5264.1 ft. referred to the ***Puu Aiea*** Survey and Refer. Station;
25. 59º 14' 1298 ft. along ***Waika*** to a ± cut on boulder by south angle old stone enclosure; [page 162]
26. 78º 47' 1311 ft. along ***Waika*** to a **5** cut in a rock at a prominent point called "***Kalehua***," the coordinates being S. 5474.4 ft. E. 2862.6 ft. referred to the ***Puu Aiea*** Survey and Reference Station;
27. 63º 30' 7588 ft. along ***Waika*** to a ± and **>I** under mound of stones on peak called "***Keahuokapaakea luka***";
28. 41º 46' 1467 ft. along ***Waika*** to a ± and **K** under mound of stones on peak called "***Keahuakapaaku Kai***" the coordinates being S. 9953.9 ft. W. 4902.0 feet referred to the ***Puu Aiea*** Survey and Ref. Station;
29. 48º 54.5' 5745 ft. along ***Waika*** to a round hole drilled in a boulder on low knoll called "***Ahuanaha***," the coordinates being S. 13729.2 ft. W. 9232.1 ft. referred to the ***Puu Aiea*** Survey and Ref. Station;
30. 49º 20' 9503 ft. to a ± in ancient roadway midway between two mounds of stones on low hill near north edge of ***Kaiopae*** gulch;
31. 56º 24' 1658 ft. along ***Waika*** to a large boulder at the mouth of the ***Kaiopae*** gulch; thence to sea shore at high water mark and along said sea shore in all its windings at high water mark to the ***Huolo*** gully and up the middle of said gully to the point of beginning, the direct bearing and distance being
32. 140º 31' 1197 ft. to the point of beginning.

Containing an area of 5424 Acres.

The foregoing notes of survey having been compiled from Boundary Certificates 183 and 184 for the lands of ***Waika*** and ***Kahua liilii***.

It is therefore adjudged, and I do hereby Certify and decide that the boundaries of said land of ***Kahua-nui*** are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii, the 24th day of June, 1905 [page 163]

Ahupuaa of Kawaihae 1st

District of South Kohala, Island of Hawaii
Boundary Commission, Hawaii, Volume A, No. 1:238-240

Honolulu, July 7, 1873
R.A. Lyman, Esq.
Hilo

Dear Sir
Mr. F.H. Harris is authorized by the
Commissioners of Crown lands to make appli-
cation to you as Commissioner of Boundaries
to have the boundaries of all Crown lands on
the Island of Hawaii defined. He has a list of
the lands with him.
I have also authorized Mr. F.H. Harris
to make application to you for the settlement
of boundaries of all lands belonging to Est. of
His late Majesty and Her Excellency, R.
Keelikolani.

I expect to be in Kona by the trip of the
"*Kilauea*" which leaves here on the 28th
inst. Can't you make it convenient to come
round as the steamer goes to Hilo on that trip.

I wish also to apply for the settle-
ment of the boundaries of Honohina.

I remain, Yours respectfully
Jno. O. Dominis

Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii, Haw. Is.

The undersigned would herewith make appli-
cation for the settlement of the boundaries of
the following named *Ahupuaa* or Lands
belonging to the Crown, viz.:

Waiakea in the District of Hilo bounded
by Keaau, Olaa, Kapapala, Humuula, Piihonua.
Piihonua in the District of Hilo, bounded
by Punahoa, Waiakea, Humuula and Puueo,
Paukaa & Alae and other lands names not known.
Ponahawai in the District of Hilo bounded
by Punahoa, Kukuau & other small lands.
Hakalauike in the District of Hilo,
adjoining lands unknown [page 238].
Humuula in the District of Hilo bounded by
Kapapala, various lands in Kona and Kohala
and Hamakua, and Hakalau, Makahanaloa,
Papaikou, Paukaa, Piihonua and Waiaka
in the District of Hilo.

Lalakea in the District of Hamakua,
adjoining lands unknown.
Kalopa in the District of Hamakua,
adjoining lands unknown.
Honokaia in the District of Hamakua,
adjoining lands unknown.
Kaohia in the District of Hamakua,
adjoining lands unknown.
Waimanu in the District of Hamakua,
adjoining lands unknown.
Pohakumauluulu, *Ili* of Waipio
in the District of Hamakua,
adjoining lands unknown.
Muliwai, *Ili* of Waipio
in the District of Hamakua.
Pololu in the District of Kohala
adjoining lands unknown.
Aamakao in the District of Kohala
adjoining lands unknown.
Iole in the District of Kohala
adjoining lands unknown.
Kaauhuhu in the District of Kohala
adjoining lands unknown.
Waimea in the District of Kohala
adjoining lands unknown.
Puukapu in the District of Kohala
adjoining lands unknown.
Kawaihae in the District of Kohala
adjoining lands unknown.
Puuwaawaa In the District of Kona
bounded by Puuanahulu, Govt.,
Kaupulehu Est, Kam V
Haleohiu in the District of Kona bounded by
Govt. lands & Kaupulehu, Est. Kam V
Honomalino in the District of Kona bounded
by Omokaa & Okoe, Govt. & by Kahuku,
G.W. C. Jones & Co.
Puaa in the District of Kona
adjoining lands unknown.
Onouli in the District of Kona
adjoining lands unknown [239].
Manoloa, District of Hilo.
Hiaananaloli [Hianaloli] II in the District of Kona
bounded by Hiaananaloli,
Govt. & Hiaananaloli, R. Keliikolani.
Waiohinu in the District of Kau
bounded by Keaa, Govt, Kahilipalinui and
Kahuku, G.W.C. Jones & Co.
Kapapala in the District of Kau bounded by
Kahuku, G.W.C. Jones, Keauhou,
Est. Kam V, Waiakea, Hilo & other
lands unknown.
Olaa in the District of Puna, bounded by
Keaau, Wm. C. Lunalilo, H. M., Waiakea
& Kapapala.

Apua in the District of Puna
bounded by various lands in Puna.
Waiakolea *ili* of Kalapana, Dist. of Puna
adjoining lands unknown.
Kaimu in the District of Puna
adjoining lands unknown.
Gehena [***Kehena***] in the District of Puna
adjoining lands unknown.

Your Honor will therefore please appoint
a day for the hearing of the evidence
in the foregoing named lands and having
decided upon the same to grant a certificate
to that effect to the undersigned.

(Signed) Jno. O. Dominis
Crown Land Agent,

Hilo Hawaii
August 16th A.D. 1873

by F.H. Harris
atty. at law. [page 240]

Ahupuaa of Kawaihae 1st
Boundary Commission, Hawaii, Volume B:147-149

The *Ahupuaa* of ***Kawaihae 1st***, District of North Kohala, Island of Hawaii, 3d J.C.

On this, the 25th day of November A.D. 1873, the Commission of Boundaries for the Island of Hawaii, 3d J.C., met at the house of Jas. Woods, Kohala Ranch, North Kohala, on the application of J.O. Dominis, Agent of Crown Lands for the settlement of the boundaries of ***Kawaihae 1st*** situated in the District of North [South] Kohala, Island of Hawaii. Notice of hearing for the settlement of boundaries of lands in Hamakua and Kohala at the Court House in ***Waimea***, South Kohala on the _____ Served by publication in the Hawaiian Gazette of _____ and *Kuokoa* of _____ 1873, and continued at Kohala Ranch on the 24th and 25th instant.

Due notice personally served on owners or agents of adjoining lands, as far as known. Present: Jas. Woods for applicant and for J.W. Austin, G.W.D. Halemanu for Her Majesty, Queen Emma.

For Petition see Folio ____ Book A.

Testimony.

Kalua [K.] Sworn (same witness as ***Kawaihae 2d***)
I am a *kamaaina* of ***Kawaihae 1st***. My parents pointed out the boundaries to me. It is bounded on the North side by ***Waikaa***, at a place called ***Kamake***, where there is an *ahu* on ***Waikaa***; thence *mauka* along the *pili* to ***Oneloa***, distance of about a mile; there is an *ahu* there; thence to ***Waiapua*** Gulch (the boundary runs from shore in a gulch). Thence to ***Keanahalulu***, in the gulch and by the Government road, on the ***Waimea*** side of the Catholic church. (This is the same gulch that runs from shore.) Thence up the gulch to ***Waipouli***; thence to a place called ***Pohoakala***; thence the boundary leads into a new gulch, and runs off towards ***Kahua***, cutting off ***Waikaa***; thence [page 147] Easterly along the old bird catchers trail to ***Puuwau***, a hill where they used to catch the *uwau*. ***Honokane*** *pali* does not reach to this hill. The land of ***Awini***, which is very narrow here, joins ***Kawaihae*** at this *kauhale*. From thence to ***Moananuikalehua***. This is above where you go down to ***Honokea***, the boundary of Hamakua and Kohala. Thence the boundary keeps East to ***Waiohoolana*** , the *makai* side belonging to ***Waimanu***, and this side to ***Kawaihae***; there it runs to above ***Ulu***; here it turns towards Kohala and runs along ***Kawaihae 2d*** to a place called ***Napoeaumihulumakaokalani***. ***Kawaihae 2d*** runs along the *kualapa* which is very narrow on the East side of ***Waiahoolana***; the slope towards ***Mana*** is ***Waimea***; ***Kalualepo*** is on ***Kawaihae***. ***Kawaihae*** cuts across the heads of ***Waipio*** and ***Waimanu***. The boundary between the Kawaihaes runs over the hill of ***Napaoeaumihulumakaokalani***. ***Kaulanaahu*** is a ridge that runs from this ridge to ***Pali o Waiu***. ***Keawewai*** gulch is on the Kohala side of the ridge; the boundary runs down ***Keawewai*** gulch to ***Keanakawaha***; thence down the gulch to ***Pohakuloa*** and thence follows the gulch to the sea. ***Kawaihae 1st*** is bounded *makai* by the sea. Ancient fishing rights extending out to sea.

C.X.d.

There is a place called ***Piipamauka*** of ***Oneloa***. I know the principal points only, of the boundary from the shore. There is a place called ***Papalepo*** between ***Puuwau*** and ***Puupala***. I was not told what lands run along there, but I know ***Waikaa*** does not reach there. I have never heard of a place called ***Puupili*** on ***Kawaihae***. My parents told me the *makai* boundary but showed me the *mauka* one. I never heard of ***Waikaa*** running up to ***Waihoolana***.

(Note
See evidence of Ohia K. on ***Waikaa***)

I cannot say for certain, that I can [page 148] give *makai* boundaries correctly, as I have never been there with my parents. I used to go bird catching with them in the woods. I do not know but what I would make mistakes if I should try to point out places in the woods. I am certain I remember the names of the places. I can point out the hill. I do not think I have strength enough to get as far as the *mauka* boundary as I am old, and the road is bad.

Kaheana's father came from ***Waimea***. I know a place called ***Hinamakanui***. It is an *ahua* on the ridge, the water that flows to ***Honokane*** gulch flows past this place. ***Kahuanui*** does not reach there. The old bird catchers road to ***Puuwau*** runs way *makai* of this place.

I am not certain as I remember all the points as I am old. I was not full grown when I went with my parents, and I have not been since.

Puhi K. Sworn
I do not know anything about the boundaries of ***Kawaihae***, save those adjoining ***Waikaa***. I do not know anything about the boundaries of ***Kahua***, except what join ***Waikaa***.

C.X.d.

Case continued until further notice to all interested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C..

Case continued on Folio 279. [page 149]

Ahupuaa of Kawaihae 1st
Boundary Commission, Hawaii, Volume B:279-280

The *Ahupuaa* of ***Kawaihae 1st***, District of North Kohala, Island of Hawaii, 3d J.C.

Case continued from November 25th A.D. 1873. See Folio 149 Book B.

On this, the 10th day of June A.D. 1874 the Commission of Boundaries for the Island of Hawaii 3d J.C. met at the house of Jas. Woods, Kohala Ranch, North Kohala, for the examination of witnesses as to the boundaries of ***Kawaihae 1st***. Due notice personally served on all owners or Agents of adjoining lands as far as known. Present: Jas. Woods for Government.

Nahea K. Sworn
I was born at ***Kawaihae*** during the reign of Kamehameha I; was very young when he died. I now live at ***Pololu***; have lived there for over twenty years, before that I lived on ***Kawaihae*** and am a *kamaaina* of the land.

I used to go with Kuhekaa and Kanewa, old bird catchers and they told me the boundaries. I do not know the boundary of ***Kawaihae 1st*** at shore as I used to go on the *mauka* boundary. ***Waika*** bound it on the North side. Commencing at a gulch at the Government road to ***Waimea***, *mauka* and towards ***Waimea*** of the Catholic Church; thence along the gulch to the side of ***Pili***, a hill on ***Waika*** side. ***Waipouli*** and ***Pohoa*** are on the boundary below ***Pili***. It is not very far from ***Pili*** to the end of ***Waika***. Thence to a place called ***Naelemakule***; thence towards a gulch to a large *ohia* tree at ***Papa-lepo***, where they used to hide from the rain; thence to the gulch, ***Puuwau***; thence across the gulch and along a trail towards ***Honokane*** to a place called ***Hinamakanui***, where we used to have our houses, situated at the head of ***Honokane*** *pali*; thence to ***Moano***, where it joins ***Waimanu***; thence across the head of ***Waimanu*** to ***Waipio*** to a place called ***Ulu***. This is as far as I have heard, or know the boundaries. Never heard that ***Puukapu*** reaches to ***Honokane*** *pali*. [page 279]

C.X.d.

I know the place called ***Napoeaumihale-***

akakalani, It is on ***Kawaihae 1st*** but I do not know whether ***Kawaihae Hikina*** reaches there or not. Know a place called ***Kaulanaahu***, I think it is on the boundary between the ***Kawaihae 1st*** and the ***Kawaihae 2d*** but I am not sure.

Waihoolana may belong to both Kawaihaes. I do not know the boundaries between the ***Kawaihae 1st*** and ***Kawaihae 2d***. ***Keawewai*** gulch is the boundary between ***Kawaihae 1st*** and ***Kawaihae 2d***.

Continued

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

See Folio 390 of this Book, evidence given as to boundary between this land and ***Kawaihae 2***. [page 280]

Ahupuaa of Kawaihae Hikina (Kawaihae 2nd)

District of South Kohala, Island of Hawaii
Boundary Commission Hawaii Volume A:453

To Hon. R.A. Lyman
Boundary Comsr.
Island of Hawaii

May it please your Honor to set a day for the hearing and deciding of the Boundaries of the following lands belonging to Her Highness, Emma Leleolani Queen Dowager, viz.

Kawaihae Hikina in South Kohala
Waiaka 1st (*Ili* of ***Waimea***), South Kohala
Waiaha 2, North Kona
Pahoehoe, North Kona
Konawahi, North Kona
Kahului, North Kona
Kalama, South Kona
Kamoamoa, Puna
Kuikuihala, Puna
Waikahekahe ***2d***, Puna
Kaupo, South Kohala

And your petitioner as in duty bound will ever pray, &c.

J.O. Dominis
Agent for said lands
per E.G. Hitchcock
his atty
H.A. Widemann, Agent for Mrs. Naaea
E.G. Hitchcock, his Atty

Hilo, Hawaii. August ***2d***, 1873

Ahupuaa of Kawaihae Hikina (Kawaihae 2nd)
Boundary Commission, Hawaii Volume B:73-77

The *Ahupuaa* of ***Kawaihae 2d***, District of South Kohala, Island of Hawaii, 3d J.C.

On this, the 15th day of November A.D. 1873 the Commission of Boundaries for the Island of Hawaii, 3d J.C., on the application of J.O. Dominis, acting for Her Majesty, Queen Emma, for the settlement of the boundaries of ***Kawaihae 2nd***, situated in the District of South Kohala, Hawaii, met at the Court House in ***Waimea***, South Kohala for the hearing of witnesses.

Notice served by publication in the Hawaiian Gazette of ____ and *Kuokoa* of _____ 1873 of the settlement of the boundaries of lands in Hamakua and Kohala, at the Court House in ***Waimea***, South Kohala on the 14th inst. and continued till the 15th. Due notice personally served on owners or agents of adjoining lands as far as known. Present: G.W.D. Halemanu on the part of applicant and Crown Commissioner.

For Petition see Folio 453, Book A.

Testimony

Kahiahikela K. Sworn.
I was born at ***Kawaihae uka*** two years before the building of ***Kiholo*** [ca. 1809]. I have always lived there, and know all the boundaries.

Kuhelani my Father, and his brother, bird catchers, when they were growing old, showed me the boundaries, as was the custom in olden times. I also went with them when I was young, as they were lunas under the *konohiki* of ***Kawaihae Hikina***.

Kawaihae is bounded *makai* by the sea, and has ancient fishing rights extending out to sea; bounded on the Kona side by the *Ahupuaa* of ***Waimea***. In Kamehameha I time, I heard from my parents that he gave the land adjoining ***Kawaihae*** at the sea shore to ***Ouli***; thereby making that land extend to the sea, before that time, ***Ouli*** stopped at ***Puuike***. Davis and John Young were great favorites of Kamehameha I and he gave them the land, thereby making ***Ouli*** (*Ili* of ***Waimea***)

bound ***Kawaihae*** at the sea shore, instead of [page 73] the *Ahupuaa* [pig altar], a place called ***Kalepemoa***, a pile of stones near ***Waiulaula*** gulch is the boundary. Beginning here the boundary runs up the gulch to ***Paleuli***, an old cultivating ground near the gulch. There the boundary runs to the left of the gulch to ***Lawai*** and from thence to ***Puainako***, where ***Kawaihae*** ceases to join ***Ouli***, and is bounded by ***Napukawaiwai***, an *ili* of ***Waimea***. Thence along this land to ***Kalualepo***, yellow soil on the ***Kawaihae*** side of ***Waihoolana***, this swamp has *piipiiwai* [a native rush] and *kalokaloha* growing in it and is at the South East corner of ***Kawaihae***, and at the place where that land is cut off by ***Waipio***, and ***Waimanu***. The slope towards ***Kawaihae*** belonging to ***Kawaihae*** and the slope towards ***Waipio*** belonging to that land. No swamp belonging to ***Kawaihae***.

(Note: this boundary has already been decided by Judge G.M. Robertson.)

The land of ***Puukapu*** does not cut ***Kawaihae*** off. It is about one and a half miles from ***Kalualepo*** to the boundary of ***Waipio***, at a pool of water called ***Ulu***, at the foot of the water fall; but the boundary runs along on the top of the *pali* above the falls, having the *pali* at the head of ***Waipio*** valley, the boundary runs toward ***Waimanu*** along the lands of ***Waipio*** and ***Waimanu***, on the *makai* side of ***Waihoolana***; ***Kawaihae 2d*** is cut off on the Kohala side by ***Kawaihae 1st***, so that it does not reach ***Waimanu***, but it is a little on the *makai* side of ***Waihoolana***; thence the boundary between ***Kawaihae 1st*** and ***Kawaihae 2*** runs across the swamp to ***Napoeaumihulumakaokalani***, a high hill, a little toward ***Kawaihae*** of the swamp, from which you can see the corners of ***Kawaihae***. I have seen them from there. The boundary between ***Waimea*** and ***Kawaihae*** runs on the ***Mana*** side of this hill, but a long distance from it; from this hill the boundary between ***Kawaihae 1st*** and ***Kawaihae 2d*** runs across the hill and down a ridge to ***Kapaliowaiu***; thence along the top of said *pali* and down the *pali* into ***Keawewai*** gulch. At the foot of the waterfall; thence down the gulch to Kohala road to ***Keanakanaha***, the pool of water below the bridge there the boundary leaves the gulch [page 74] and runs to the *makai* side of Lincolns house to the ***Waimea*** base of ***Olopio***, a hill on ***Kawaihae 1st***; thence the boundary turns a little way

toward Kona and runs to ***Umelaau***, where
a stone crossing is built across the gulch; thence
down the gulch to ***Makahuna***; and from thence
down the center of ***Makahuna*** gulch to the sea.

C.X.d.

My knowledge has always been that ***Puukapu***
does not extend to ***Honokane*** for ***Kawaihae 1***
and ***Kawaihae 2d*** lay between these two lands
on Kohala hills. The water of ***Waihoolana***
does not flow into ***Waimea***, but into ***Waipio***
and ***Waimanu***.

Kiainiu [K.] Sworn
I was born at ***Kawaihae*** at the time of *Oku* [1804]
and have always lived there. Am a *kamaaina*
of the land, know the *makai* boundaries, and
have heard the *mauka* ones from old people.
Piielua, my father, was a bird catcher and told
me the *mauka* boundaries, but I never went
to them with him; He used to bring down yellow
soil to sell, and he said that he got it from
Keaewaiu; This is all that I have heard or know
about the *mauka* part. ***Kauhuhu*** gulch
is the boundary between ***Kawaihae 1st*** and
Kawaihae 2d (***Makahuna*** gulch is in the
center of ***Kawaihae 2nd***); thence up the gulch to
Kenani; thence to ***Keawewai***; the boundary
runs to the head of *awaawa*; thence to ***Keana-***
kawaha at ***Keawewai***.

This is as far as I know the boundaries.

C.X.d.

Kalualukela [K.] Recalled.
Makahuna Gulch is the boundary at sea shore
between ***Kawaihae 1st*** and ***Kawaihae 2nd***; it lays
between John Young's old house and John Parker's
house, and is on the Kona side of the latter.
Kauhuhu gulch is near the trig works.

Kalua [K.] Sworn (same witness as on ***Ouli***)
I know the place called ***Kalualepo***; it is a
hole with yellow soil; it is near the ***Waihoolana***.
Puukapu, an *ili* of ***Waimea*** bounds ***Kawaihae 2d*** [page 75];
Thence to ***Waihoolana***, a gulch of standing water.
This gulch runs to ***Waipio***. I lived there one
month. Thence along the gulch to ***Kaapeape***
a place where there used to be a settlement.
I do not know that the boundary line is on
Kawaihae 2nd, but I do know that the land
comes to ***Kalualepo***, which is the only *mauka*
boundary of ***Kawaihae*** that I know of.

The boundary given is the boundary of
Puukapu. I know the boundary between
Kawaihae and ***Waimea*** going towards shore.

C.X.d.

I know the hill called ***Napoeaumihulumaka-okalani***, but I do knot know what land it is on.
It is a long way off toward Kohala.

Case continued until further notice to all
interested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Continued Folio 390 of this book. [page 76]

Ahupuaa of Kawaihae Hikina (Kawaihae 2nd)
Boundary Commission, Hawaii Volume B:390-394

The *Ahupuaa* of ***Kawaihae 2d*** or ***Kawaihae Hikina***
Continued from Folio 76 of this book,
and folio 280 of this book.

Kawaihae South Kohala, Jan. 20th 1876.
The Commission of Boundaries for the Island of Hawaii, 3d J.C.
met at the house of J.P. Parker at ***Kawaihae***, after notice personally
served on the Agent of Crown Lands, and A.J. Cartwright, Agent
for Her Majesty, Emma ***Kalele***onalani, to take further evidence as to boundaries between ***Kawaihae 1st*** and ***Kawaihae 2d***.

S.P. Wahinenui appeared on part of applicant, and presented a letter
dated Jan. 11th, 1876 from Her Majesty's Land Agent authorizing him to
act for him. Chas. Williams of Hamakua appears for Agent of Crown
Lands.

Testimony
Kaneahiku W. Sworn says (quite an elderly woman)
I was born at ***Pahoa***, Kohala, Hawaii. I helped carry stones at
the building of Kiholo [ca. 1811]. I was married before the battle, near Keauhou in Kona
in which Kekuakalani was killed [Dec. 1819]. I was born the year before
Kanihonui died at Oahu [ca. 1808]. I know the lands
of ***Kawaihae***. I lived here a great many years. My husband
Mahi was buried in the *pali* of ***Honokoa***.

I know the boundaries between ***Kawaihae 1st and 2d***. Olohana
(John Young) put us on ***Kawaihae 2d***, and we lived at place called
Ailipoa below where the church now stands. Mahi was *konohiki*, and I heard him telling people the boundaries.

An old *heiau* called ***Kauhuhu*** is the boundary at the shore
between the two ***Kawaihae***. Thence the boundary between them
runs up the gulch to ***Olopio***. Part of this place lays on ***Kawaihae 1st***

and part on ***Kawaihae 2d***. The boundary runs up the *awawa* from the shore to the Kona side of hill called ***Kanani***; Thence up to ***Keawewai***, the boundary at that place being in the water in the gulch. I do not know very much about the boundary there, as in those days we were "*noho like ma na* ***Kawaihae*** *elua.*" [lived in the same manner between the two ***Kawaihae***.]

From *Keawewai* the boundary runs up the gulch. I do not know the boundaries above there. Kamoehau is the *kamaaina* of the land, and knows the true boundaries.

C.X.d. I know the boundary at shore. I have been away from here 40 or 50 years, and have forgotten the boundaries. John Young was alive when I moved away [prior to 1836]. The beach and sea on the Kona side of ***Kauhuhu*** belonged to ***Kawaihae Hikina***. When we came from the other ***Kawaihae*** on to this place to fish, we had to give part of our fish to Olohana.

I never heard that place called ***Makahuna*** is the boundary between these two lands. I know *ili* called ***Pohakuloa***. It is on this land, and the gulch is on the other side. ***Keawewai*** gulch runs *makai* onto ***Kawaihae 1st*** (note witness seems quite confused, and is very reluctant to give any evidence.) [page 390]

Kamoehau K. Sworn says (he is quite an old man, and is the one who last witness says knows the true boundaries of the land. Was sent for by Commissioner of Boundaries, when Kaneahiku made this statement. He had not previously been summoned as a witness by either party.)

I was born at ***Kawaihae uka***, I saw the *Peleleu* [1795] and was old enough to cook food at that time. I live on ***Kawaihae 1st***, Kohala, Hawaii, and have always lived there. I am a *kamaaina* of these lands, and know the boundaries between them, from the shore to *mauka* end. My parents told me the boundaries. Kauaawa my father, and Nakoana, my mother, were *kamaaina* here. They told me the boundaries because of the killing of Olohana's man by Kawailepolepo. They wanted to kill the man, but Kalaimahu said no, give the land to pay for it, and so the land from ***Pohakuloa*** to ***Waiulaula*** (***Waiulaula*** is boundary between ***Kawaihae 2d*** and ***Ouli***) was given to Olohana, and this place where we now are was left for ***Kawaihae 1st***. Place called ***Pokiiahua*** is the boundary at shore between the two ***Kawaihae***. It is a water hole; thence the boundary runs up the gulch to *makai* of ***Olopio***; there it leaves the gulch and runs up between ***Olopio*** and ***Opulehelehe***, and thence up *auwai* to ***Keawewai***; thence up gulch to ***Waiaeele***, a *powai* [*po'owai* – water head] in gulch; thence up hills to the ***Waikoloa*** gulch where these lands are cut off by ***Waimea***.

C.X.d. (Note. This witness evidence agrees with G.M. Robertson's Certificate of Boundaries of ***Waimea*** as to the two ***Kawaihae*** being cut off by ***Waimea***.)

Know place called ***Kalualepo***, it belongs to both ***Kawaihae***; the ***Waikoloa*** gulch is a long way from there. ***Kalualepo*** is at the head of where the water runs to the ***Honokane*** valley. There is yellowish dirt there. I never heard in olden times that the boundary between these two lands was at ***Kauhuhu***. The sea from ***Pokiiahua*** to ***Kauhuhu*** belonged to ***Kawaihae Akau***, and the sea on the Kona side of ***Pokiiahua*** to ***Kawaihae Hikina***. Mahi lived on the tract of land between ***Pokii-***

ahua and ***Kauhuhu***, but was *konohiki* under Kalaimoku, and not under Olohana. He used to divide the fish and give part to Olohana. Olohana and Kalaimoku were *noho like*, so they used to give him part of the fish.

Place called ***Pohakuloa*** is on ***Kawaihae Hikina*** near boundary. ***Pulama*** is the *ili aina* next to ***Pohakuloa***, and is on ***Kawaihae Akau***. They lay side and side to the sea shore. The place where we now are is on ***Pulama***, and ***Pohakuloa*** is east of us, where Olohana's (John Young) house used to stand. Part of the *Pohopaakai* [salt beds] belong to ***Kawaihae Hikina***, but most of them belong to ***Kawaihae 1st***. The boundary between the two lands is where I stated before. The folks living *mauka* on ***Kawaihae 2d*** used to go after salt at the shore to the salt works near ***Kauhuhu***. The *poho paakai* ***Pohakuloa***, ***Kaholei***, ***Piipapii***, ***Nupaa*** belong to ***Kawaihae Hikina***, the other *poho paakai* to ***Kawaihae 1st***. They are *lele* of ***Kawaihae Hikina***. ***Kaneloa*** is on ***Kawaihae Hikina***, and I know of *poho paakai* called ***Kaneloa***. Know of place of ***Kawaihae Hikina*** called ***Makela***, but do not know of salt place of that name. [page 391]

Malahuehue is an *ili* of ***Kawaihae Hikina***, and I know of salt place at shore by that name, and it belongs to ***Kawaihae Hikina***. ***Kukui*** is an *ili aina* of ***Kawaihae Hikina***; I do not know of any salt place of that name. ***Kapahukapu*** is an *ili* of ***Kawaihae Hikina***, I do not know of any *poho paakai* of that name. The places I have mentioned are *ili aina* of ***Kawaihae Hikina***, and the *poha paakai* of the same names belong to it also.

Kahilione K. Sworn says (quite an old man)
I was born on ***Kawaihae hikina***. Saw Kekuaokalani and Kamehameha ***1st*** and have always lived there. I am a *kamaaina* of the land but do not know the boundaries. My parents never told me the boundaries. I have heard that boundaries are at ***Keawewai*** and ***Kaluahine***, but do not know the boundaries at the shore.

C.X.d.

Court adjourned to meet at ***Puopelu*** [Puuopelu] ***Waimea***, S. Kohala, Hawaii at 12 o'clock noon Monday January 24th 1876.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Puopelu Waimea, S. Kohala, Hawaii
Jan. 24th, 1876.

Commission of Boundaries met according to adjournment.
Present: S.P. Wahinenui on part of applicant, and Chas. Williams for Agent of Crown Lands.

John P. Parker K. sworn (witness for Agt. Crown Lands.)
I was born in N. Kohala, Hawaii in the year 1827, and moved to ***Waimea*** in 1838 and have lived in ***Waimea*** and Hamakua ever since. I know the lands of ***Kawaihae 1st*** and ***Kawaihae 2d***, and have heard where the boundary is between them, from Hueu, Kini

Keoki and Kauwe. They told me that the fishing rights belong to the King's ***Kawaihae*** and that the gulch between my house at the shore and John Young's old house was the boundary. The gulch is on the Kona side of my house. Kauwe is still alive, the other two are dead. I have not heard where the boundary is between the two lands *mauka*, or at the *mauka* road to Kohala.

C.X.d.

Hueu told me the boundary some years ago. Kini Keoke told me when he had charge of the land under Allen & Chillingworth and Kauwe told me last November when I was going to Honolulu and I have alway[s] understood this to be the boundary.

S.P. Wahinenui [K.] Sworn says
I was born in North Kohala in 1827. I now live at ***Kawaihae***, and have lived there for 37 years. The boundaries at the shore between the two ***Kawaihae*** have been pointed out to me. In 1843 there was a dispute about the boundaries. Kaleiepu was the *kamaaina* [page 392] of ***Kawaihae 2d***, also Keliikaheana, Kahooieie Pae, father of Kapa [W.] and Puna. The *kamaaina* of ***Kawaihae 1st*** were Kapuni, Nuholo, Kanakaokai, and they had the dispute near where I live. The *kamaaina* from this land said that the boundary was at ***Kauhuhu***, and Nuholo said to Kaleiepu that he was *aloha ole*. I do not know why he said so. Mahi was dead, and Kekuahine was the *konohiki* of ***Kawaihae 1st*** at this time. Mahi was the *konohiki* of ***Kawaihae 1st*** during his life. I heard the *kamaaina* of both lands tell where the boundaries were. The *kamaaina* from ***Kawaihae 1st*** said that ***Kapili*** *Kahawai* was the boundary. This is the gulch Mr. Parker spoke of. Kaleiepu, said that used to be the boundary but that the land from there to ***Kauhuhu*** was given to ***Kawaihae 2d*** because Kapela was killed by the *keiki* of Kawaileoplepo. He was killed *makai* of where the church now stands. He, Kaleiepu said that Kaleimoku, father of Leleiohoku gave it, and that the boundary between the lands ran from ***Kauhuhu*** to ***Napukoaamauikiikii***; thence to *kauhale paakai*; thence to ***Kekualapo***; thence to ***Kanani ana***, a cave in gulch where they used to *kalai* sandalwood. Thence leaving gulch up across land to ***Powai***; thence to ***Olopio*** running along the *auwai*; thence between *ili aina* ***Pohakuloa*** on ***Kawaihae 2d***, and ***Pulama*** on ***Kawaihae 1st***. The *kamaaina* from ***Kawaihae 1st*** said, and I have since heard the same from Hueu, that the boundary at shore between these lands was at ***Kapalala***, a point of rocks. It is now covered with sand. It is between Mr. Parker's house and where John Young's house used to stand, and thence the boundary runs *mauka* up gulch ***Pokiiahua*** to the bridge; thence up to ***Leinakane***, the junction of two gulches; thence to ***Puainako***; thence up to *makai* of ***Olopio*** and ***Haleuli***. There the disputed boundary ends. When we used to catch fish, Olohana's man used to take part, and the *konohiki* of ***Kawaihae 1st*** a part. I do not know why. I have always heard from Hueu (George Davies) that the fishing rights belonged to ***Kawaihae 1st***. I have heard that the places for making salt belonged to both lands. The *poho paakai* have the same names as the *ili aina* to which they belong on both ***Kawaihae***. The *makaha* of the fish pond is called ***Kukui*** and belonged to ***Kawaihae 2d***. I never heard any dispute about the *poho paakai*, but the dispute was about the land on the Kona side of them to ***Pokiiahua*** gulch.

Wahinenui says Kauwe is at the beach, that he did not see fit to tell him to come as a witness.

C. Williams requests that his evidence be taken if applicants have any more witnesses examined. Granted.

Case continued by request of applicant to have Fanny Young's evidence taken, and also to take Kauwe's testimony.

R.A. Lyman
Com. of Boundaries, 3d J.C… [page 393]

Ahupuaa of Kawaihae Hikina (Kawaihae 2nd)
Boundary Commission, Hawaii, Volume D, No. 5, pps. 597-613

Kawaihae 2d The Boundary Commission South Kohala met in the Court House at Kapaau, North Kohala at 9 A.M. December 19, 1903, according to Notices published in the Hilo Tribune, and *Ku Okoa*, for a hearing November 14, and a continuance to Nov. 21, and to December 19, 1903. — and Notices of the application and hearing, and continuances having been sent by mail, by the Commissioner of Boundaries, to each owner of the adjoining Lands, Namely— The Commissioner of Public Lands, for ***Waimea*** and ***Kawaihae 1st***: and G.W. Macfarlane, for ***Ouli***.

There were present at the hearing, at 1:30 P.M.
A.B. Loebenstein, Attorney for Applicant,
J.W. Pratt, Commissioner of Public Lands,
L.P. Weaver, Attorney for Commissioner of Public Lands,
J.F. Woods, H.H. Holstein, Kanakanui, and others.

The application of Bruce Cartwright, Administrator of the Estate of Queen Emma, amended by permission, to the Trustees of the Queen's Hospital, the present owners of the land; notice to that effect having been received from Bruce Cartwright, and from the Trustees of the Queen's Hospital, and made a part of this record; asking for a settlement of the Boundaries, and a Certificate to Boundaries, for the Land of ***Kawaihae 2d***, District of South Kohala, Island of Hawaii, H.I. presented and read in Court, having been filed August 27, 1903, also Notice of hearing, and continuances, published in due form, also description of the Land ***Kawaihae 2d***, surveyed by A.B. Loebenstein, September -1903.

(Application)

Hilo, Hawaii, August 27, 1903

Hon. F.S. Lyman
Commissioner of Boundaries 3d & 4th Jud.Circuits
Terr. Hawaii:

Sir:
Representing the owners of the *Ahupuaa* of
Kawaihae 2d in the District of South Kohala [page 597],

Isl'd Hawaii, I have the honor to request you to
set a day for the taking of testimony and the issu-
ance of a Certificate of boundaries for said land.
In compliance with the statute I have hereunto
annexed a schedule of adjacent lands with their
respective owners.

Very Respectfully Yours
A.B. Loebenstein
Atty. for Bruce Cartwright
Administrator, Est. of Queen Emma,
Amended to Trustees of the Queen's
Hospital… [page 598]

…Testimony
A.B. Loebenstein, sworn, I am a surveyor
acting under instructions from Bruce Cartwright,
Administrator of the Queen Emma Estate, and
later under the Trustees of the Queen's Hospital,
executed a survey of the land of ***Kawaihae 2d*** –
L.C.A. 8515 – and made a descrip-
tion of its boundaries which I herewith present.
This survey has been made in conformity to
testimony taken before R.A. Lyman, Boundary
Commissioner.

The men, Kalualukela, Kiainui, Kalua, Kaneahiku (w.),
are reported to me as all being dead.

(Copy of the testimony of these witnesses produced,
taken in 1873-6)

Attorney for the Territory objects to this testimony
produced as belonging to an old case that has
expired – the present case having begun with
a new application.

I had correspondence with Curtis J. Lyons of
the Government Survey, and made the survey
according to his direction. I became familiar
with the accepted boundaries of ***Kawaihae***, be-
ing employed by Mr. Parker.

I received this letter from C.J. Lyons in 1902
giving opinion that ***Kawaihae 2d*** cannot go
beyond the Summit, and that was my opinion,
this tracing is of a Map of ***Kawaihae 2d*** made

by me, the lines in blue being the lines of the land all around.

The summit, which I designate is ***Kaumuokaleiohia*** hill, was accepted by me for the reason that Boundary Certificate No.4, on survey of Wiltse, Course 51, & 52 reading as follows: "at end of 51, to the Kohala Road – then 52, thence up and along the general [page 599] course of the Luahine gulch, N. 31º E. 240 chains to a place known as ***Kalualepo*** at *mauka* S.E. corner of ***Kawaihae 2d*** on the boundary of ***Waimea***" - in this I followed instructions of Lyons.

1st course, from known point at sea, along ***Ouli*** to ***Puuainako***, practically as per survey of Wiltse in survey of ***Waimea***.

No. 4 Certificate and ***Ouli*** Certificate – following S. boundary of ***Kawaihae*** to point in ***Waimea*** Certificate, called 46, Boundary Certificate 4. – to ***Luahine*** gulch, where it leaves the hills, we then follow the meanders of ***Luahine*** gulch to its source at confluence of 2 small gullies, maintaining Wiltse survey so far as it follows the gulch; then to a hill named ***Eke***, and thence to the Summit, ***Kaumuokaohia*** – the general direction of the gulch is along by these hills – the fact that the general direction of the line from course 51 at Kohala road, to the end of 240 chains distance practically passes through ***Eke***, magnetic bearing N. 33° E., about 40º true then, variation about 8º now 31º 15' magnetic and true 40º at summit crater given, I fixed *mauka* or East end of ***Kawaihae 2d***.

The ***Waimea*** description calls for a hole called ***Kalualepo*** – and there is no other hole or crater – all is a down slope.

Each land is entitled to its own watershed, the divisions of ***Kawaihae 1st*** & ***2d*** are of recent date – I know by testimony.

Territory asks to strike out what witness said of divisions being of recent date as an opinion.

I refer to testimony of Kamoehau, p. 390, Vol. B. (reads) —
boundary turns towards Kohala from hill ***Kaumukaleiohia***, by ***Waimea*** people so

called; people in near vicinity call it ***Napoeaumihulumakaokalani*** – while [page 600] today it is known by residents in that locality as ***Kilohana*** – from this hill the boundary bent towards Kohala, down the hill to a ridge, down the ridge and *pali* to the ***Keawewai*** gulch – name of ridge being ***Kapaliowai-u*** - going in a N. Westerly direction this is a *pali* plainly seen from below and showing 2 noles or hills on the crest that resemble the bosoms of a woman which gives the name, also called ***na puu o waiu***, these hills were also pointed out to me in 1893, in company with P. Jarret, J. McGuire, former Manager of the Parker interests, lessees of ***Kawaihae 1st***, the latter owner of ***Kahua***, and lessee of ***Kawaihae 2d***; from ***Keawewai*** gulch according to testimony at point ***Leinokane***, at head of gulch, called also ***Haleokane***, by *kamaaina* Kaloa; down the middle of ***Keawewai*** gulch to point on the top of the waterfall, described in award to Lorenzo Lincoln No. 8513, and at old government road crossing – where in accordance to description in award, the boundary leaves the gulch and runs along *makai* side of old government road, at angle of stone walls, - then follows along stone wall enclosing Lincoln award, by various courses and distances to S. angle of the award, then it goes down to a little rise known as ***Makalii***, ditch is a few feet from the top of the nole, at this point found a large mound of stones which I understand was put up by J. Parker; again to another large pile of stones on another nole, called ***Olopio***, a hill with sharp crest, ditch being a little one side - 2 ***Olopio*** hills . I followed general ditch line, not having any *kamaaina* – no other ditches there; only little water runs washed by rains; ditch is 50 to 75 feet S. of ***Makalii***, around hill and comes back again, winds in & out. Further down found gully from [page 601] ***Kauhuhu*** gulch; then to pile ***Kanani***, given in original testimony. Thence as straight line as could get, to old road crossing gully, tributary of ***Makahuna*** gulch, N. branch, thence along N. branch to ***Makahuna*** gulch, thence along ***Makahuna*** gulch to sea-coast. Lyons instructed me if I could not get reliable testimony to make a straight line from Lincoln award to the sea, but I had what I believed to be reliable testimony.

In running the line from course 51, on side by ***Waimea***, I found practical difficulty in following Wiltse evidence, Wiltse survey of ***Waimea***, did not find ***Kaluaiepo***, and ran along ***Kawaihae 1st*** calling it ***Kawaihae 2d*** to ***Honokane*** *pali*, Kalualukela's testimony others refer to Kamohau.

Kalualokela gives the ***Waimea*** base of ***Olopio*** hill as boundary between ***Kawaihae 1st*** and ***Kawaihae 2d***.

Kaneahiku (w.) p. 390, Book B, gives as Follows. "old *Heiau* ***Kauhuhu*** boundary at sea, thence up gulch to ***Olopio***, part of this place lies on ***Kawaihae 1st*** and part on ***Kawaihae*** 2nd."

Kamoehau gives boundary "runs up gulch to *makai* of ***Olopio***, there leaves gulch and runs up between ***Olopio*** and ***Opulehelehe***, thence up *auwai*" &c.

Again Kiainui (Book B) boundary runs &c (see testimony).

Frank Woods, Sworn. I am 28 years old, a rancher in North Kohala. I have a Lease of ***Kawaihae 2d***, upper portion, 3/4 of it; from old Kohala road, above ***Puuloa*** hill, am familiar; starts from Kohala road, used stream as natural fence, ***Keawewai*** gulch. ***Kawaihae 1st*** Government is on N. side of gulch; fence [page 602] extends as far as forest goes (shows on plan) along ***Keawewai*** stream from head down; from head of gulch is a precipice above which is drop of 100 feet and is swampy up to *pali* above; cattle cannot go there. I hold lease of that; have no Lease of ***Kawaihae 1st***; is Leased to Parker Ranch. Lease of ***Kawaihae 2d*** was to McGuire 12 years ago. I run my stock on the land.

C.X.d.

My cattle do get down into swamp land and get fat; when I had the land from McGuire, I asked him the boundaries; he said the boundary was a small gulch North of ***Keawewai*** stream; to ridge and along ridge; which natives told me, and

McGuire also told me that boundary
(shows a tracing - *mauka* boundary ***Kawaihae 2d***).

Akahi (now present) told me this boundary; contestant objects to what Akahi told him; stricken out.

Description of land filed by Loebenstein.
Attorney for Territory objects to being filed so late, should have been done with application, but as Government had been allowed to see it, does not object to being brought in now.

Note: Commissioner asked applicant for it on application being filed, and was assured it would be forthcoming soon, but has not till now.

Contestant.
S.W. Nawahi – Sworn (Holstein, S. Interp.)
Do not know my age; perhaps 65 years; am a *kamaaina* of ***Kawaihae 2d*** since a small child; my father was a bird catcher; I leased ***Kawaihae 1st*** from S. Parker; do not know *mauka*, or *makai* boundaries; only know disputed boundary at ***Pohakuloa***; from boundary Lincoln [page 603] we built wall; from South boundary Lincoln towards sea along fence; from ***Pohakuloa*** to ***Pulama***; then up to corner of Lincoln's land S. boundary of ***Kawaihae 1st***; then up to water head ***Kahinaimaka*** below old Government road; I went there with Kamakanui; do not know above; ***Keawewai*** gulch is there, in Lincoln's land; do not know above there.

From Lincoln's *makai*, I heard, runs down from ***Kahinaimaka*** to ***Pohakuloa***, along ditch down to ***Pulama***, an old village, an *awawa* below, and ***Pulama*** raised land above. ***Pohakuloa*** ditch ends there; then a gulch below to sea; do not know its name; it runs down to ***Mahukona***; I got these locations from my brother Kahue, now dead; ***Olopio*** is on North side , on ***Kawaihae 1st***; a gulch is on North side of ***Olopio***; know hill ***Olopio***; boundary is a little south side of that hill; when boundary leaves ***Pohakuloa*** ditch runs Northerly to S. side of a nole, we put piles of stones with Kahue; do not know name, know ditches; then to ***Olopio***; then along *awawa* to ***Kanani***; to

place near school house; ***Kanani*** near ***Pulama***; ***Makahuna*** stream is on other side near J. Parker's.

Other branches into ***Makahuna***, and a S. branch; do not know its name; the same gulch to J. Parker's; was told boundary in ***Makahuna*** gulch; up to ***Pulama***, up gulch; then on ridge to ***Pulama*** village and to ***Olopio*** which is on ***Kawaihae 1st***; South branch at ***Pulama*** runs into ***Kawaihae 2d***; North of Koo's house, which is on ***Kawaihae 1st*** *mauka* of ***Olopio***, on S. side; ***Olopio*** is North side of ***Pulama***; then to ***Pohakuloa***; from ***Pulama*** to ***Pohaku-loa*** is not a gulch. [page 604]

Olopio is a ditch, not boundary. ***Pohakuloa*** boundary to ***Pulama*** (up ***Makahuna*** gulch from shore). I only heard boundary up gulch to ***Pulama***, S. branch; thence gulch runs into ***Kawaihae 2d***, and boundary runs North of gulch, on the land (*honua*) where we built wire fence with J. McGuire after dispute with him, as settled by *kamaaina* Kahue; then to South corner Lincoln award; do not know Kanaloa; from ***Pulama*** bound-ary follows a ditch to ***Pohakuloa*** gulch turns South.

C.X.d.

Am *kamaaina*, but do not know all the boundaries of ***Kawaihae***; heard from Kahue the son of Pipi; Kahue is dead. Know ***Kanani***, a *pali* and water hole; boundary is South of water hole, not far (say 25 fathoms) to Court house fence. ***Kanani*** is in ***Kawaihae 1st***; we put a pile of stones on small hill at the corner of the wire fence; Kahue built it there; that wire fence is still there; a flag was lately on that pile of stones; flag of Loebenstein. Kahue did not put other piles of stones on the boundary; the boundary runs *makai* from this pile of Kahue, South of the pile 2, or 1 fathom South or 3 fathoms, have not measured. ***Kanani*** is a water hole, on ***Kawaihae 1st***; the boundary is S. of it, as far as to Court house fence.

Redirect. Do not know of *Heiau* near ***Kanani***; do not know any other *Heiau* there. Do not know the distance of ***Kanani*** to ***Makahuna*** gulch; ***Pulama*** branch goes

into it; distances I said, may be to the Court House fence; to gulch towards ***Waimea***; ***Kanani*** gulch where we live; the boundary is at ***Pulama***.

C.X.d.

Kanani, North, and another gulch near ***Pulama***, 3 in all; from ***Kanani*** to 1st about as far as to Court House fence. [page 605]

J.H. Akahi Sworn. This is my 60th year; am *kamaaina makai* to ***Kawaihae***; our parents told us boundaries; my father, and Nawahie's mother told me; my father was a School teacher.

The boundary between ***Kawaihae 1st*** and ***2d***, starts in gulch of ***Makahuna***, up to ***Puuainako***, an old resting place on the side of the gulch; the gulch is the boundary; thence to ***Pulama*** village; along same gulch, which has small branches; at ***Pulama***, the gulch runs into ***Kawaihae 2d***, Queen's land; at ***Pulama*** the boundary follows the ditch to ***Pohakuloa*** where wire fence stands; thence *mauka* along the ditch to the land of Lincoln and on to the Government road; in ditch, and on in ditch to ***Hinaimaka***, water head in ***Keawewai*** gulch.

Contestant objects to evidence about boundary fixed by award to Lincoln. Objection stands.

From the corner of the wire fence at ***Pohakuloa***, the boundary runs through the ditch to ***Pulama***, which is flat on the land of Queen Emma; a ridge leads down to ***Kanani***. ***Olopio*** is *mauka* of that.

The land from the wire fence slopes down from ***Pohakuloa***, uneven, to ***Pulama***, leads into ***Makahuna*** gulch, to ***Puuainako***, to crossing in the gulch; southerly, in the gulch ***Makahuna*** to the sea; ***Kawaihae 1st*** on one side and ***Kawaihae 2d*** on the other of the gulch.

The branch of the gulch is some ways up; no branch on the North side.

The boundary *mauka* follows ***Pohaku-***

Ioa ditch to ***Keawewai***; I was told, but
do not know above that; have chased
cattle there; only heard about bounda- [page 606]
ries there.

C.X.d.

I heard from Nawahie's mother.
Know ***Kanani***; it is a water fall into
the gulch and water hole on *makai*
side of ***Olopio***; ***Kanani*** gulch into
Kauhuhu; there are other small gulches;
other branches in other directions; there
is a mound of stones on the ridge be-
tween ***Pulama*** and ***Kanani*** gulch,
which is still there.

Kanani is on the ***Kawaihae 1st*** side
of the pile of stones. I have been to
Kanani chasing cattle; there are branch-
es of ***Makahuna*** on Queen's land;
there is a bridge there. ***Makahuna***
gulch from the sea to the bridge; do
not know name of the branch; un-
derstood branch to be ***Kaneloa***, the
boundary is on the ***Waimea*** side
of the pile of stones; at ***Kanani*** pile
is on the ridge; the boundary is in the
gulch; quite a distance further than
the Court House fence; down in the
gulch; was told the boundary is in the gulch.

Redirect. Mound is on the ridge, the
boundary in the gulch, ***Makahuna***; in
branch at ***Pulama*** on ***Waimea*** side;
when we made the wire fence, I was
showed the boundary; there at ***Puuloa***
we showed Kanakanui this boundary;
could see it from ***Puuloa***;

C.X.d.

We went together to ***Keawewai***; did
not show Kanakanui boundaries
at ***Kanani***; could see plainly; we
pointed out wire fence; pile of stones;
and ***Puuainako***; from ***Puuloa*** can
see the corner of the wire fence, pile
& ***Kanani***.

S.M. Kanakanui Sworn. Am a govern-
ment surveyor; several years; have [page 607]
surveyed line between ***Kawaihae 1st*** and
Kawaihae 2d; know boundaries from
kamaaina's testimony. Akahi and Nawa-

hie; arrived at ***Kawaihae***, investigated at ***Makahuna*** gulch; coming up on trail we found a prominent gulch on the right going up; one branching N. and 1 South; trail between the two, further up to ***Puuainako*** by South branch of the gulch (shows on map); went on up and crossed S. branch; followed up N. side to opposite ***Olopio***; there is a ditch, which I followed a little way up to pile of stones which Loebenstein designates as ***Makalii***; from there went to fence, wire fence of McGuire.

Next day was at ***Puuloa*** with Akahi and Nawahi. I investigated then about the boundary between ***Kawaihae 1st*** & ***2d*** with reference to Hill ***Makalii***,; they told me the boundary was on the South.

Applicant objects to testimony – overruled, as Akahi and Nawahi have already testified, and he is telling what they showed him on the ground.

Showed me a little South of ***Makalii***, is a ditch, which told me is an old ditch known to be the boundary between ***Kawaihae 1st*** and ***2d***, to ***Pulama*** (shows ***Pulama*** on Map.) gulch bends S. opposite ***Olopio***; with aid of my transit and telescope, as they showed me, should say about 1500 feet between N. and S. gulches, they told me the boundary is the S. branch of ***Makahuna*** gulch; they told me that above ***Makalii*** from the corner of the fence, the ditch is the boundary to S. corner of Lincoln award; from there up to water head ***Hinaimaka*** at ***Keawewai*** stream; the Lincoln award being in ***Kawaihae 1st*** , the ***Keawewai*** stream is the S. boundary of the award; and taking that stream as the boundary of ***Kawaihae 1st*** [page 608] and ***Kawaihae 2d***, to the head of the ***Keawewai*** stream.

Objection by Loebenstein to the testimony of Kanakanui as an expert.

Court. Witness should state his authority to investigate land.

I was sent there to investigate the land and boundaries for the Government, last month; found land from head of ***Keawewai*** stream to ***Paliowaiu***, to ***Kaleihoohie*** and to ***Eke***; from the land included within these points

forming a basin sloping in all
around, forming a big swamp with-
in; from which swamp ***Keawewai***
stream receives its waters. I was sat-
isfied that that swamp draining water
for the ***Keawewai*** stream; and whereas
Kawaihae 1st has an unlimited supply
from ***Keawewai*** stream it would be
only right ***Kawaihae 1st*** should have
control of that water head; water does
not drain from that swamp towards
Waimea; but only down ***Keawewai***
gulch into ***Kawaihae 1st*** and ***Kawai-***
hae 2nd.

Should say boundary S. of ***Kawaihae 2d***
is correct to ***Eke***; the survey of Wiltse
changed to true, would run about from
the Kohala road to 1/2 or 3/4 of a mile
South of ***Eke***; *makai* of old government road,
crossing ***Luahine***, the survey of Loebenstein
is correct.

Certificate # 4, made part of this case by
consent.

Course # 52 would run South of ***Eke*** 1/2 to
3/4 mile; Swamp above ***Eke***, surrounded; *pali*
on Hamakua side, ridge on ***Waimea*** side,
a slope on Kona side, forming a piece
of swampy land enclosed all around. [page 609]

C.X.d.

The line runs over 1/2 mile South of ***Eke***;
does not run to ***Eke*** and Summit, on
Wiltse line.

Official Maps take boundary to ***Eke***; be-
yond that we dispute it for the Govern-
ment.

Government files Map of Hawaii, showing
lines, to be withdrawn after decision of
the Commissioner.

Kanakanui continues. The Government
considers boundary from the Government
road up to ***Eke***; and ***Eke*** to summit
boundary. ***Waimea*** along ***Kawaihae 2d***
to ***Eke***; there ***Kawaihae 2d*** ends and
Kawaihae 1st joins ***Waimea*** to the
Summit; the line on Map of ***Keawewai***
gulch to ***Eke*** is nearly correct; the Gov-
ernment holds by ***Keawewai*** stream;

have not examined evidence of ***Kawaihae 1st*** or ***2d***; learned about the boundaries from Akahi and Nawahie; that is all.

I went a little above the head of ***Keawewai*** stream about 500 feet East and above that much North, and found enough to satisfy myself about the swampy land; the drainage of all that place goes into the ***Keawewai*** stream; and that was substantiated by Akahi. I was satisfied by investigation that it was all swampy land. I am familiar to a certain extent, to plans of sections of the Island of Hawaii.

Loebenstein offers a tracing of Map objected to by the Government; as not made by applicant or authenticated by any one (objection sustained).

Continues - I spent 2 days on the ground; had never been on the ground before. We were at ***Puuloa*** with Akahi and Nawahie; they gave enough evidence to satisfy me they were reliable; a big [page 610] cave on the S. branch of the gulch, estimated distance as expert Surveyor; they showed me a pile of stones on S. edge of gulch at ***Puuainako***, one of the boundaries of Kawaihea [***Kawaihae***] ***1st*** and ***Kawaihae 2d***.

Contest. close.

Rebuttal.

A.B. Loebenstein; relative to testimony of Akahi, he informed me he knew very little about boundary below Lincoln Award, in the presence of others; relative to boundaries of ***Kawaihae 2d*** above the head of ***Keawewai*** gulch (objected to witness giving Akahi's evidence and objection sustained)

Akahi, I gave testimony about boundaries *makai* of Lincoln truly, as I was told. I saw Loebenstein a few days ago about the boundaries of these lands, and told him as I have stated in this case.

I went up with him, F. Woods, and a boy, to where he had marked. I told him Kanakanui had been there with us. I told

Loebenstein about boundaries at ***Keawewai***, of ***Puukapu*** land, cutting them off on the other end by ***Waimea***, to ***Kawaihae 1st*** & ***2d***. ***Puukapu*** is *mauka* side of ***Waimea***, and *kamaaina* came from there.

A.B. Loebenstein: about testimony of Kanakanui, state from my inventory and knowledge of the tract of land from the head of ***Keawewai*** gulch to the North angle of this land at ***Paliwaiu***; thence along N. line of ***Kawaihae*** to summit hill at E. angle of land; thence toward ***Eke*** and back to head of ***Keawewai*** stream, with excepting of land bordering on small feeders forming ***Keawewai*** stream, is not [page 611] swamp but hard land; that the drainage to North of line of tracing is toward ***Honokane***; as also toward ***Waimea*** around the slope of summit hill, known at ***Waimea*** as the ***Keanuiomano*** stream (indicates on tracing map) therefore the 240 chains distance of Wiltse survey was not run out to that described length in order that these several lands would each have their respective share of water heads & further, I have not found it possible in my survey of this land, covering several weeks to observe and pick out any of the points mentioned in testimony of Akahi and Nawahie, as visible from ***Puuloa*** down.

C.X.d.

I was on that hill time and again, could not see the points stated by N. and A. could not see in strong wind; the point ***Puuainako*** is tract of considerable area, beginning of level place above rising ascent by old trail.

Kanakanui: could see corner fence at ***Makalii***, with Transit; could see cave *mauka* of *Heiau* on map.

Testimony closed 9:30 p.m.

Argued

Contested by Applicant. Rational interpretation of the testimony should be taken.

Contestant cites. Riparian Rights of

Kawaihae 2d.

Case rests at 9:50 p.m.

Decision.
The boundaries of the land ***Kawaihae 2d***,
are decided to be as follows. Beginning at the
South angle of the land, in the mouth of
the ***Waiulaula*** gulch, and run up said
gulch, along the land of ***Ouli***, Boundary
Certificate No. 63, and along the land of [page 612]
Waimea, Boundary Certificate No. 4, to, or
as far as, the brow of Summit Hill of the
Kohala range; thence along the land
of ***Kawaihae 1st***, across Summit Hill
and along the ridge to ***Kapaliowaiu***; thence
along the top of said *pali* and down the *pali*
into the ***Keawewai*** stream, and down the
middle of said stream to the East angle
of L.C. Award, No. 8513, to L. Lincoln;
thence along the South East boundary
of said Award to its *makai* corner;
thence following the general course of
the old ***Pohakuloa*** ditch to pile of stones
on ***Makalii*** Hill; thence in a direct line
to the angle in the South branch of
the ***Makahuna*** gulch where it comes
from the land of ***Kawaihae*** 2nd and
turns *makai*, opposite ***Olopio***, near
Pulama; thence follow down the centre
of ***Makahuna***, South branch, to its junc-
tion with the North branch, and down the
centre of ***Makahuna*** gulch to the sea; thence
along the sea shore to the point of commence-
ment."

Frederick S. Lyman
Commissioner of Boundaries,
Third and Fourth Circuit
Territory of Hawaii… [page 613]

Ahupuaa of Kawaihae Hikina (Kawaihae 2nd)
Boundary Commission, Hawaii Volume C, No. 4:148-151

No. 187

Certificate of Boundaries of the Land
of ***Kawaihae 2d***, District of Kohala, Island of Hawaii,
Territory of Hawaii, Unites States of America

Keoni Ana, Land Commission Award No. 8515.

Commission of Boundaries
Third Judicial Circuit, Territory of Hawaii, U.S.A.
Frederick S. Lyman, Commissioner

In the Matter of the Boundaries
of the land of ***Kawaihae 2d***,
District of Kohala,
Island of Hawaii, T.H.

Judgement.

An application to decide and certify the Boundaries of the Land of ***Kawaihae 2d***, District of Kohala, Island of Hawaii, Territory of Hawaii, U.S.A., having been filed with me on the 27th day of June, 1903 by A.B. Loebenstein, Attorney for the Trustees of the Queen's Hospital, in accordance with the provisions of an Act to facilitate the settlement of Boundaries, now therefore, having duly received and heard all the testimony offered in reference to the said boundaries, and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 5, D, page 597, and it appearing to my satisfaction that the true, lawful and equitable boundaries are as follows, viz.:

Beginning at the South angle of this land at a boulder Marked , laying in the mouth of the ***Waiulaula*** gulch, the coordinates of this point being 21941.6 ft. South and 25528.5 ft. West referred to the "Puu Loa" survey station and 6346.4 ft. South, 329.6 ft. West referred to the Survey Reference Station "South Base", the boundary runs by the true meridian —

1. S. 82º 10' 40" E. 9434.0 ft. along the land of ***Ouli***, Bdy. Cert. #63, the boundary following the meanders of the South divide of the ***Waiulaula*** gulch to a on a large flat topped boulder just above beginning of divide; a large pyramid of stones on eminence by North bank of gulch "Paliuli", bearing [page 148] N. 23º 23' E. distant 280 ft.
2. N. 60º 51' 30" E. 4754.0 ft. along land of ***Ouli***, to a large pyramid of stones on hill above two small gullies called Lauwai, the coordinates being 20910.4 ft. S. and 12029.9 ft. west referred to the Puu Loa Survey Station;
3. N. 53º 50' 42" E. 4662.0 ft. along the land of ***Ouli***, Certificate 63 to a **+** under pyramid of stones on hill called "***Puu Aina Ko***" the coordinates being 18159.9 ft. South and 8265.6 ft. West referred to the ***Puu Loa*** Survey Station;
4. N. 65º 23' 30" E. 4747.0 ft. along Govt. Land of ***Waimea***, Bdry. Cert. #4, to a **+** on boulder in ***Luahine*** gulch at foot of ridge;
5. N. 45º 16' 00" E. 10026.0 ft. along ***Puukawaiwai***, an *ili* of ***Waimea*** and covered by boundary Cert. #4, the boundary following the meander of the middle of gulch to a **K** marked on boulder at upper edge of the main road crossing in gulch of the ***Waimea*** Kohala Govt. Road, the coordinates being 9126.0 ft. South and 3172.0 ft. East, referred to the *Puu* ***Loa***

Survey Station;

6. N. 27º 40' 30" E. 10260.0 ft. along land of ***Puukawaiwai*** and ***Waimea*** bdry Cert. 4, the boundary following the meanders of the middle of the ***Luahine*** gulch to a K marked on bed rock between two small gullies that form the ***Luahine*** stream and gulch, the coordinates being 31.0 ft. South and 7941.0 ft. East referred to the ***Puu Loa*** Survey Station.
7. N. 47º 29' 30" E. 2660.0 ft. along land of ***Waimea***, Cert. #4 to middle of a number of marked trees on brow of the hill called "***Eke***."
8. N. 47º 29' 30" E. 2669.0 ft. along ***Waimea*** Cert. #4, to point on East slope of Summit hill, called ***Kaumuokaleihoohie***;
9. N. 51º 10' 00" W. 1062.0 ft. along land of ***Kawaihae 1st*** to middle of a number of marked trees, on brow of Summit hill of the Kohala range, called ***Kaumuokaleihoohie***, also ***Napoeaumimakahuliokalani***, the coordinates being 4236.0 ft. North and 11042.0 ft. East, referred to the ***Puu Loa*** Survey Station;
10. N. 51º 10' 00" W. 5408.0 ft. along Govt. land of ***Kawaihae 1st*** to middle of marked trees on ridge called ***Kapaliowaiu*** also ***Kaulanaahu***;
11. S. 44º 17' 00" W. 3838.0 ft. along Government land of ***Kawaihae 1st*** to **K +** on boulder at head of the ***Keawewai*** stream where it leaves the swamp, and at the foot of bluff called [page 149] ***Leinaokane***, the coordinates being 4881.0 ft. North, and 4150.0 ft. East referred to the ***Puu Loa*** Survey Station;
12. S. 46º 02' 00" 5118.0 ft. along the land of ***Kawaihae 1st***, the boundary following the meanders of the middle of the ***Keawewai*** stream to a **+** marked on brink of the ***Pilihoiki*** falls which form the East angle of Land Commission Award 8513 to L. Lincoln;
13. S. 58º 56' 15" W. 899.0 ft. along L.C.A. 8513, L. Lincoln, the boundary following the middle of the ***Keawewai*** stream to a sharp angle in the same toward the North.
14. N. 72º 48' 36" W. 1747.0 ft. along L.C.A. 8513, L. Lincoln, to a cut in the rock at ledge over water fall under old road crossing, the coordinates being 1380.0 ft. North 1972.0 ft. West referred to the ***Puu Loa*** Survey Station.
15. S. 26º 07' 00" E. 1147.0 ft. along L.C.A. 8513, L. Lincoln to a **+** at angle in stone wall;
16. S. 60º 18' 00" W. 1837.0 ft. along L.C.A., L. Lincoln;
17. N. 38º 05' 00" W. 1470.0 ft. along L.C.A., L. Lincoln; to cut in stone by side of old ditch at upper edge of ***Waimea*** Kohala Government Road, the coordinates being 588.0 ft. North and 3988.0 ft. West referred to the ***Puu Loa*** Survey Station;
18. S. 50º 32' 00" W. 900.0 ft. along L.C.A., L. Lincoln;

19. S. 59º 06' 00" W. 1260.0 ft. along L.C.A., L. Lincoln;
20. S. 71º 30' 00" W. 809.0 ft. along L.C.A., L. Lincoln to a cut in the top of a large boulder by ditch and at angle of stone walls, this point marking the South angle of L.C.A. 8513, L. Lincoln, the coordinates being 888.0 ft. South and 6532.0 ft. West, referred to the ***Puu Loa*** Survey Station;
21. S. 60º 40' 30" W. 4186.0 ft. along land of ***Kawaihae 1st***, to a large pyramid of stones on brow of hill called "***Makalii***," the coordinates being 2938.0 ft. South and 10181.0 ft. West referred to the ***Puu Loa*** Survey Station;
22. S. 33º 47' 00" W. 1810.0 ft. along ***Kawaihae 1st*** down slope of ***Makalii*** hill to bend in ***Palihae*** also called Paulama ravine the same being the South fork forming ***Makahuna*** gulch [page 150]
23. S. 51º 26' 00" W. 16214.0 ft. along ***Kawaihae 1st***, the boundary following the middle of the said South fork to point of junction of the North and South forks of the ***Makahuna*** gulch and down middle of said gulch to large boulder in bed of same under bridge, the coordinates being 14551.0 ft. South and 23865.0 ft. West referred to the ***Puu Loa*** Survey Station and 1044.5 ft. North, 1343.9 ft. East referred to the Survey Ref. Station South Base;
24. S. 50º 01' 00" W. 917.0 ft. along ***Kawaihae 1st*** as before to junction of same with the gully from the South.
25. S. 69º 19' 00" W. 739.0 ft. along ***Kawaihae 1st*** as before to the ***Kawaihae*** road, the coordinates being 194.1 ft. North and 50.5 ft. West referred to the Survey Reference Station, South Base.
26. N. 62º 06' 00" W. 241.0 ft. along ***Kawaihae 1st*** as before to mouth of stream at high water mark;
27. S. 18º 48' 00" W. 1670.0 ft. the boundary following the shore line at high water mark to a **+** cut in the rock by the ***Kawaihae – Puako*** Govt. Road;
28. S. 06º 40' 45" W. 5107.0 ft. the boundary following the shore line at high water mark to point of beginning.

Containing an area of 10615 acres, more or less.

As surveyed by A.B. Loebenstein, September, 1903

It is therefore adjudged, and I do hereby certify and decide that the boundaries of said land of ***Kawaihae 2d***, are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii, the 31st day of December 1903

Frederick S. Lyman

Commissioner of Boundaries
Third and Fourth Judicial Circuits., T.H.

Ahupuaa of Waika

District of North Kohala, Island of Hawaii
Boundary Commission, Hawaii Volume A, No. 1:170-174

The *Ahupuaa* of ***Waika***, District of Kohala
Island of Hawaii, 3d J. C.

On this, the fifteenth day of April A.D. 1873, the Boundary Commission met at ***Puuhue***, North Kohala, Hawaii, 3d J.C. to hear the application of Allen and Chillingworth for the settlement of the boundary of ***Waika*** situated in North Kohala, Hawaii. Present: S.C. Wiltse, on part of Crown Commissioners, S.F. Chillingworth, on part of applicants. Mr. Chillingworth states that within the last two months they have received a copy of notes of survey from Mr. J.W. Austin's agent in Honolulu, and there has not been any notice served on the agent, of time of hearing for Mr. Austin, owner of ***Kahuanui***, but petitioners ask to be allowed to introduce their testimony as to boundaries of ***Waika***, as the witnesses are old men; which is granted, reserving Mr. Austin's agent the right to cross question these witnesses and to introduce their evidence to boundaries of lands adjoining ***Waika***, and documentary evidence as to boundaries.

Petition read as follows:
To the Honorable Rufus A. Lyman, Commissioner of Boundaries for the third Judicial Circuit to wit, the Island of Hawaii.

The Petition of Allen & Chillingworth of ***Kawaihae***, Hawaii, respectfully represents unto your honour, the commissioner, as follows:

That the aforesaid Allen & Chillingworth are possessed of a tract of land situated in North Kohala, in the island of Hawaii called the *Ahupuaa* of "***Waika***."

That the aforesaid land or *Ahupuaa* of ***Waika*** was awarded by the Commissioners to Quiet Land Titles, by name only, and not by survey, and that the boundaries of the same are as yet undefined.

That the following are the names of the lands adjoining the said land of ***Waika***, and the owners of the same as far as the same are known to your petitioner, to wit.

Lands	Owners
Kahua nui	J.W. Austin
Kawaihae Uka	Crown

That the boundaries of said land of ***Waika*** as claimed by your petitioner, are more fully set [page 170] forth in the accompanying survey, marked Exhibit.

That all and singular, the premises are within the jurisdiction of the Honorable Commissioner of Boundaries.

Therefore your petitioner respectfully prays that the boundaries of the said land of "***Waika***" may be decided and certified to by your honor, the Commissioner, and that a certificate defining the said boundaries may be issued to your petitioner, and to this end a day, hour, and place may be appointed, for the hearing of this petition, and the proofs there and then to be adduced, and that due notice according to law may be made to all persons interested on the said matter, to appear and show cause, if any they have, why the said petition should not be granted.

And your Petitioners will ever pray &c.

(Sig) Allen & Chillingworth

April 15th 1873.

Testimony

Puhi K. Sworn.
I live on ***Waika***, Kohala, Hawaii and was born on said land at time of building Kiholo [ca. 1811] and have always lived there, am a kamaaina of the boundaries of the land. My parents, now dead, pointed them out to me. ***Kahuanui*** bounds ***Waika*** on the north side and ***Kawaihae*** on the South side, the sea on the *makai* side.

A rocky point, named ***Oneloa***, is the boundary of ***Waika*** where ***Kawaihae*** joins it. I do not know about fishing rights. Saw Lyons survey above the Government road to ***Waimea***. Leonui, Mooluna, my father and brother, *kamaaina* of ***Waika***, and Kaulalii, the *kamaaina* of ***Kahuanui*** went clear around the land with him, when he surveyed. (They are all dead now). From Oneloa the boundary between these two lands runs *mauka* to a place called ***Piipaa***; thence the line runs up the center of the gulch called ***Kahawaiopili***, to a place called ***Waipouli***, a water hole which is

sometimes dried up. It is above a hill called ***Puupili***, said hill being half on ***Waika*** and half on ***Kahua***. At ***Waipouli*** the boundary leaves the gulch and runs *mauka* to the north side [page 171] of ***Puupala***, have been told that ***Waika*** keeps on to a large *ohia* tree, at a place called ***Papalepo***, and have always been told that ***Kawaihae*** cut ***Waika*** off and joined ***Kahuanui***, but do not know where. I have never been beyond ***Puupala***, a low hill which from some sides looks long and from others sharp. Have heard that ***Kawaihae*** joins ***Awini*** above ***Honokane***. ***Kaiopae*** is the boundary at shore, between ***Kahuanui*** and ***Waika***.

Kaiopae is the place where the ***Kahawai o Pili*** empties into the sea; ***Kahuanui*** being on the North side and ***Waika*** on the south side; from thence the boundary between these two lands runs *mauka* to ***Waikapu***, following close to the sides or bank of gulch. ***Waikapu*** is a water hole in the gulch; Thence to ***Moolau*** a pile of stones, *makai* of a bullock pen at ***Kahuanui***; thence up the *iwi aina* up ***Puupili*** to a depression at the top of the hill. I do not know where the boundary between ***Kahuanui*** and ***Waika*** runs to beyond ***Puupili***.

C.X.d.

I have heard ***Puuomano*** is at ***Awini***.
(Naiapakai [K.] says this hill is on ***Honokane***)

Kaohia [K.] Sworn
I now live and always have lived at ***Waika***, Kohala, Hawaii; was born before the Okuu [prior to 1804]; a foreigner called Kanikili lived on ***Waika*** in the time of Kamehameha I, after he went away Olohana took it. ***Waika*** is an *ili* of Kahua. Keaumoku gave it to Kanikili. ***Kawaihae*** bounds ***Waika*** on the south side from sea to *mauka* corner, and ***Kahuanui*** on the North side from shore, *mauka*. The sea is the *makai* boundary, and the land had an ancient fishing right extending out to sea. ***Oneloa*** is the boundary between ***Kawaihae*** and ***Waika***; thence up a small *awaawa* to a point *makai* of ***Maaukaa***, to a pile of stones where the boundary line between these two lands runs into the gulch. ***Waikaa*** being on the north side of ***Piipaa***, and ***Kawaihae*** on the South side; thence up the gulch passing ***Puupili*** to end of the gulch, thence to ***Waihoolana***, a water hole where ***Kawaihae*** cuts off ***Waika*** and ***Kahuanui***. ***Waipouli*** is above the hill, *mauka* of the Catholic Church and ***Waihoolana*** is

above ***Puupili***, the hill on the boundary [page 172] between ***Kahuanui*** and ***Waika***. ***Kawaihae*** cuts off ***Waika*** and ***Kahuanui*** at the water ponds. ***Waihoolana*** is near ***Puupala***. The level land belongs to ***Waika*** and where the hill begins is ***Kawaihae***. ***Kahoakala***, where the *mamake* patches used to be is where ***Kahuanui*** and ***Waika*** are cut off by ***Kawaihae***.

The line between ***Kahuanui*** and ***Waika*** runs over ***Puupili***; from ***Pohokala***, going towards the sea, to a gulch called ***Kahawaipalapalai***; thence follow the gulch to a place called ***Hookeeke***; there leave the gulch and coming up the north side, the boundary leaves the gulch and running into another small gulch, follows said gulch to Government road called in old times, ***Kukawai***, but now named ***Ke Ahoo Kake***; thence follow down to the bullock pen; thence the boundary leaves the gulch and comes to where Macy's store used to be; thence down to a place called ***Moolau***, a pile of stones; thence to ***Kalehua***, and down the gully; at ***Kalehua***, t here leave gulch and runs to pile of stones, ***Kaapakea***. Thence the boundary runs to another pile of stones; ***Kahimoeanonahaa*** on the South side of said pile; thence to another pile of stones; thence to another pile; thence to another pile; and from thence to a pile of stones on the shore; a large flat rock at Kaiopai. I think is marked **W**.

Kaulalii the *kamaaina* of ***Kahuanui*** and Mooluna and Leonui, the ***Waika*** kamaainas who were with Lyons when he surveyed ***Waika*** went down from ***Puupili*** to shore between ***Waika*** and ***Kahua***, and came up between ***Waika*** and ***Kawaihae***, Mooluna was Puhi's father and Leonui was his brother. These *kamaaina* are all dead. In old times the people used to fight over cultivating grounds, and so we used to keep the run of the boundaries of our lands.

C.X.d.

Note: Plan and notes of survey made by C.J. Lyons filed.

Commission adjourned to Mana, Friday, April 18th, 1873

R.A. Lyman
Boundary Commissioner, 3rd J.C. [page 173]

Mana, April 18th, 1873

Kahaawi K. Sworn.
I was born at ***Waimea*** at time of the death of Kekua-okalani [1819] now live at ***Kawaihae***, South Kohala, Hawaii; Have lived there twenty seven years and am a *kamaaina* of ***Kawaihae***; know a little about the boundaries of ***Waika***; used to be *Konohiki* of ***Kawaihae***, and know a place called ***Waipouli*** in ***kahawai o Pili***; this side of ***Puupili***; It is on the boundary of ***Waika*** and ***Kawaihae***; thence from this point the boundary runs over, and above of ***Puupala***. ***Kawaihae*** cuts off ***Waika*** at a place called ***Kawaihoolana***, a swamp with trees growing in it. I do not know a place called ***Kapoakala***. My brother, Paaluhi, now dead, showed me the boundaries. Ehu, his father, also dead, showed them to him. This is all I know about *mauka* boundaries of ***Waika***.

C.X.d.

My brother showed me the boundaries when we went to catch *mamo* and *oo*.

Case continued till further notice to all parties concerned.

R.A. Lyman
Boundary Commissioner, 3d J.C.

Puuhue, North Kohala, June 15th, 1874.
Present: G.F. Holmes, for applicant and Jas. Woods

Decision
The boundaries of ***Waika*** are decided to be as given in the notes of survey, from shore to the top of ***Puupili***, and then the land extends to near ***Puupala***, as given in the evidence of Kaohia and Kalua Lukela. Notes of survey to be filed previous to Certificate of Boundaries being issued.

R.A. Lyman
Boundary Commissioner, 3d J.C… [page 174]

Ahupuaa of Waika
Boundary Commission, Hawaii Volume D, No. 5:578-581

Waika
North Kohala

The Boundary Commission met in the Court House, at Kapaau, North Kohala, at 9 a.m. December 19, 1903, according to Notices published in the Hilo Tribune

and *Ku Okoa*, for a hearing November 14, and a continuance to November 21, and to December 19, and Notices of the hearing and continuances, having been sent by mail, by the Commissioner of Boundaries, to each owner of the adjoining lands; viz.: The Commissioner of Public Lands, for ***Kawaihae*** 1st; Estate of B.P. Bishop for ***Honokanenui***; and the Estate of J.W. Austin for ***Kahuanui***.

There being present: J.F. Woods, applicant; A.B. Loebenstein, Attorney for applicant, and for the B.P. Bishop Estate.

J.W. Pratt, Commissioner of Public Lands, L.P. Weaver, Attorney for Public Lands, H.L. Holstein, and others.

The application for settlement of the Boundaries of this land filed August 27, 1903, read in Court, and Notice of hearing published in due form, also presents a map, and description of the land of ***Waika***, as surveyed by A.B. Loebenstein, September, 1903, being "Lahilahi," R.P. No. 1668 by name, L. C. Award 8520 B.

Also Stipulation signed by S.M. Damon for Estate of J.W. Austin, and Jas. F. Woods, the owner of ***Waika***.

Also Stipulation of Land Commissioner E.S. Boyd, November 23, 1903, consenting to settlement of the boundaries as set forth in the application.

Also asks to have the testimony taken before R.A. Lyman, former Boundary [page 578] Commissioner, June 15, 1874, on Record in Book A, page 170 be a part of the Record in this case.

Hilo, Hawaii, August 27, 1903

F.S. Lyman
Commissioner of Boundaries 3d & 4th Circuit, Territory of Hawaii

[illegible] …the owners of the *ahupuaa* [illegible — of ***Waika*** in] the District of North Kohala,

[illegible — Island of Hawaii] I have the honor, to request
[illegible] day for the hearing of testi-
mony and the issuance of a Certificate
of boundaries of this land. In compli-
ance with the statute, I have hereunto
annexed a schedule of adjacent lands
with their respective owners.

Very Respectfully yours,
A.B. Loebenstein
Atty for J.F. Woods, owner
land ***Waika***

[illegible — Owners of Adja-] cent lands

[illegible — ***Kawaihae*** 1st], Territory of Hawaii.
Honokanenui, Estate B.P. Bishop.
Kahuanui, Estate J.W. Austin.

(Stipulation)
Before the Boundary Commissioner,
Third Circuit, Territory [illegible — of Hawaii]
F.S. Lyman, Esq.

In the matter of the Boundaries of the Land of
Waika
North Kohala, Hawaii

Return of Territory of Hawaii.

Now comes E.S. Boyd, Land Com-
missioner of the Territory of Hawaii, in
answer to the application herein says;

That the boundaries as set forth
in the application herein are correct as [page 579]
to any land adjoining the *Ahupuaa*
of ***Kawaihae 1st*** and he hereby consents
to a settlement of said boundaries, as
set forth in the application.

Honolulu, T. H. Nov. 23rd, 1903.

E.S. Boyd
Land Commissioner

(Stipulation)
Before F.S. Lyman
Commissioner of Boundaries for the
Third and Fourth Circuits,
Territory of Hawaii

In the matter of the application by
J.F. Woods (owner of the land) for settle-
ment of the boundaries of the land of

Waika, District of North Kohala, Island of Hawaii.

We, the undersigned, the Estate of James W. Austin, the owners of the land of ***Kahuanui***, and the said J.F. Woods hereby stipulate and agree that the survey (as altered in ink) of the boundary of the said land of ***Waika***, made by A.B. Loebenstein, surveyor, dated September 1903, and set out in the schedule hereto annexed signed by Arthur C. Alexander, surveyor, and made part of this stipulation, shall be accepted, and taken as the boundary between the said lands of ***Waika*** and ***Kahuanui*** and entered of record of such boundaries dated, December 15th 1903.

The Estate of James W. Austin,
By their Atty in fact,
S.M. Damon

Jas. F. Woods, Owner
of the Land of
Waika [page 580]

(Evidence)
A.B. Loebenstein, Sworn. I made this survey of ***Waika***, between February and July of this year; had kamaainas point out bounds where available, the points being clear; also a survey by Curtis J. Lyons in 1852, finding most of the artificial monuments erected by him at that time, on N. by ***Kahuanui***.

Award Pat. by name to Kamamalu, East by ***Honokane nui***, Bound. Cert. No. 173, South by ***Kawaihae 1st***, owned by Ter. Hawaii, found no disputed point in bounds.

The tracing Map showed the bounds as surveyed by me, given in this description. C.X 'd.

No one appearing to contest application, and all present consenting thereto, the case is closed, decision to be given later.

Decision
I do hereby decide that the Boundaries of the Land of ***Waika***, District of Kohala, Island of Hawaii, T.H., are, and here-

after shall be as described in the Survey
on file, made by A.B. Loebenstein,
September, 1903.

Certificate of Boundaries to be issued
on payment of costs and expenses of the
Commission of Boundaries

December 22, 1903
Frederick S. Lyman
Com. of Bounda's.
Fourth Judicial Circuit
T.H… [page 581]

Ahupuaa of Waika
Boundary Commission, Hawaii, Volume C, No. 4:135-137

No. 183

Certificate of Boundaries of the Land of
Waika, District of Kohala, Island of Hawaii.

Lahilahi, R.P. 1668 (by name); L.C.Award 8520 B

Commission of Boundaries
Third Judicial Circuit, Territory of Hawaii, U.S.A.
Fredrick S. Lyman, Commissioner.

In the matter of the Boundaries
of the Land of ***Waika***,
District of Kohala,
Island of Hawaii

Judgment.
An application to decide and certify the Boundaries of
the Land of ***Waika***, District of Kohala, Island of Hawaii,
having been filed with me on the 27th day of August 1903,
by A.B. Loebenstein, as Attorney for J.F. Woods, the owner of
said land, in accordance with the provisions of an Act to facil-
itate the settlement of Boundaries, now, therefore, having
duly received and heard all the testimony offered in reference
to the said boundaries and having endeavoured otherwise to
obtain all information possible to enable me to arrive at
a just decision, which will more fully appear by reference
to the records of this matter by me kept in Book No. 5, D,
pages 578 ____ and it appearing to my satisfaction that the
true, lawful and equitable boundaries, are as follows; viz.:

Beginning at the South angle of Ha's land, adjoining the
land of ***Kawaihae 1st***, by the sea shore at high water mark
of the point called "***Oneloa***," the coordinates of same being
South 22803.7 ft. W. 16736.5 ft. referred to the Survey Reference
Station "***Puu Aiea***," the boundary runs by the true meridian:

1. N. 49º 25' E. 2410.0 ft. along ***Kawaihae 1st*** to a **+** under mound of stones by ancient roadway;
2. N. 46º 22' E. 6151.00 ft. same as above, the coordinates being S. 16991.3 W. 10454.1 ft., referred to the Survey Ref. Sta. ***Puu Aiea***;
3. N. 54º 25' E. 2713.0 ft. along ***Kawaihae 1st*** to **+** under mound of stones by small *heiau*;
4. N. 65º 27' E. 2757.0 ft. along ***Kawaihae 1st*** to **+** under mound of stones on ledge overhanging the [page 135] "***Keanahalululu***" gulch immediately over the two great cubical boulders, the coordinates being S. 14266.9 W. 5737.7 ft., referred to the Survey Ref. Sta. ***Puu Aiea***;
5. N. 64º 16' E. 14547.0 ft. along ***Kawaihae 1st***, the boundary following the meanders of the middle of the ***Keanahalululu*** gulch to ledge over falls at lower edge of the Waimea Kohala Gov't. road the coordinates being S. 7951.0 E. 7364.1 ft. referred to the Survey Ref. Sta. ***Puu Aiea***;
6. N. 64º 19' E. 5013.0 ft. along ***Kawaihae 1st***, the boundary following the meanders of the middle of ***Keanahalululu*** stream to an **X** cut in flat boulder on the South bank of the stream by pool and falls called "***Waipouli***," the coordinates being S. 5822.6 E. 11881.1 ft., referred to the Survey Ref. Sta. ***Puu Aiea***;
7. N. 88º 12' E. 3121.0 ft. along ***Kawaihae 1st*** to a cut in post, from which the Gov't. Survey Station ***Puu Pili*** bears N. 51° 42' W., distant 3292.5 ft.'
8. N. 72º 09' 40" E. 7764.0 ft. along ***Kawaihae 1st*** to the common angle of the lands of ***Kawaihae 1st***, ***Waika*** and ***Honokanenui***, Bdy. Cert. # 172, the said point being on the West edge of a deep gulch, emptying into the ***Honokane*** canyon, the general name of the locality being "***Waihoolana***," a large cut into the top of a rock mound or knoll bearing S. 31° 59' E. distant 131.2 ft.; said and top of knoll bearing S. 64° 46' 45" E. from the ***Hinamakanui*** Ref. Sta. and N. 39° 23' 52" E. from the ***Puu Pili*** Survey Sta.
9. N. 65º 40' W. 4592.0 ft. along ***Honokane*** Bdy. Cert. #172, to a **+** on a stone set in the ground on the South peak of the ***Hinamakahina*** [Hinamakanui] crater, this point being the common angle of the lands of ***Honokane***, ***Waika*** and ***Ka-Huanui***, the coordinates being S. 1454.3 - E. 18206.4 ft., referred to the Survey Ref. Sta. ***Puu Aiea***;
10. S. 72º 10' 30" W. 5514.0 ft. along the land of ***Kahuanui*** to the ***Puu Pili*** Station;
11. S. 26º 55' W. 1600.0 ft. down slope of ***Puu Pili*** to a **+** on stone at post of same in the ***Palapalai*** ravine;
12. S. 78º 41' W. 1097.0 ft. along ***Kahuanui***, the bdy. following the middle

of said ravine [page 136]

13. N. 85º 26' W. 3706.0 ft. along ***Kahuanui***, to an **+** on stone, the coordinates being S. 4487.4 - E. 7471.1 ft., referred to the ***Puu Aiea*** Ref. and Survey Station; the boundary following the bottom of said ***Palapalai*** ravine;
14. S. 87º 00' W. 534.0 ft. along ***Kahuanui***;
15. S. 88º 38' W. 1675.0 ft. along ***Kahuanui*** to a **K** and **+** with "***Waika***" cut in the rock, under mound of stones by upper edge of the Waimea Kohala Gov't. road, the coordinates being S. 4555.2 - E. 5264.1 ft., referred to the Survey and Ref. Sta. ***Puu Aiea***;
16. S. 59º 14' 15" W. 1298.0 ft. along ***Kahuanui*** to a **+** on boulder by South angle old stone enclosure;
17. S. 78º 47' W. 1311.0 ft. along ***Kahuanui*** to a **5** cut in rock at a prominent point called "***Kalehua***," the coordinates being S. 5474.4 E. 2862.8 ft., referred to the ***Puu Aiea*** Survey and Ref. Station;
18. S. 63º 30' W. 7588.0 ft. along ***Kahuanui*** to a **+** and **>I** under mound of stones on peak called "***Keahuokapaakea luka***".
19. S. 41º 46' 22" W. 1467.0 ft. along ***Kahuanui*** to a **+** and **K** under mound of stones on peak called "***Keahuakapaakea Kai***," the coordinates being S. 9953.0 - W. 4902.0 ft. referred to the Puu Aiea Survey and Ref. Station;
20. S. 48º 54' 30" west 5745.0 ft. to a round drill hole in boulder on low knoll called "Ahuawaha," the coordinates being south 13729.2 W. 9232.1 ft., referred to the ***Puu Aiea*** Survey and Ref. Station;
21. S. 49º 20' W. 9503.0 ft. along ***Kahuanui*** to a **+** cut in ancient roadway midway between two mounds of stones on low hill near north edge of ***Kaiopae*** Gulch;
22. S. 56º 24' W. 1658.0 ft. along ***Kahuanui***, to a large boulder at mouth of ***Kaiopae*** gulch, thence to sea shore at high water mark and along line of said sea shore in all its windings at high water mark to point of beginning, the direct bearing and distance being
23. S. 28º 56' E. 2244.0 ft. to said point of beginning.

Containing an area of 2790 acres, as surveyed by A.B. Loebenstein, September, 1903

It is therefore adjudged, and I do hereby decide and certify that the Boundaries of the said land of ***Waika*** are, and hereafter shall be as hereinbefore set forth.

Given under my hand at Hilo, Island of Hawaii, the 26th day of December, A.D. 1903.

Fredrick S. Lyman
Commissioner of Boundaries, Third & Fourth Jud. Circ., T. H. [page 137]

The Kalana of Waimea, and Ili Lands Taking in Portions of the Kohala Mountain Watershed

Testimony and surveys for the *ʻili* of Puʻukapu, being a part of the larger land division of ***Waimea***—and also holdings of the Crown—were collected as a part of the proceedings for ***Waimea*** and neigboring lands. Regarding the status of ***Waimea*** and lands that were either subordinate or independent to it, Curtis Lyons, a Kingdom Surveyor, who had surveyed lands in the region in 1852, wrote to Crown Lands Commissioner C.P. Iaukea in 1893. He observed:

> …***Waimea***, Hawaii, was an *Ahupuaa* which partook largely of the qualities of a *Moku* or division that was however assigned as an *Ahupuaa* in the *Mahele*. That is to say to His Majesty K. III., becoming by the Act of 1865, a Crown Land. It would therefore be assumed that all within its boundaries would be Crown Land excepting such Ilis or subordinate ahupuaas as some might call them as were recognized within the *Mahele* or in the Land Commission Records, as separate in title; this distinction in title corresponding to the status known as that of an *ili kupono*. All not so recognized would be technically spoken of as a part of the *Ahupuaa*.
>
> The *Ili Kupono* of ***Puukapu*** was given up in the *Mahele* by Kekauonohi and became Crown Land, thus being practically thereafter one with the *Ahupuaa*.
>
> The other *Ili Kupono* are as follows:
>
> Waikoloa, *Mahele* and Award 8512 B to G.D. Hueu.
> Waiaka 2 *Mahele* and Award 8520 B to lahilahi.
> ***Ouli*** *Mahele* and Award 8518 B to Kanehoa.
> Anaehoomalu *Mahele* and Award 4452 to H. Kalama.
> Kalahuipuaa *Mahele* and Award 4452 to H. Kalama
> Puako *Mahele* and Award 8559 B to Lunalilo
> Kaupo *Mahele* and Award 8515 to Kaoanaeha… [HSA – DAGS 6 Box 22; Nov. 1893]

In the records that follow, are selected native testimonies and notes of survey for the *ahupuaʻa* of ***Waimea*** and *ʻili*, taking in the Kohala Mountain lands, which include portions of the ealrier Kohala Forest Reserve and the newer Puʻu o ʻUmi Natural Area Reserve.

Ouli Ili, Waimea Ahupuaa

District of South Kohala, Island of Hawaii
Boundary Commission, Hawaii, Volume A, No. 1:452

> Petitions
> ***Ouli***, South Kohala
> ***Waimea***, South Kohala,
> Hawaii, August 18th 1873
>
> To the Honorable Rufus A. Lyman
> Commissioner of Boundaries for the
> Island of Hawaii, Hawaiian Islands
>
> The undersigned respectfully
> represents, that he is the owner of that
> Ahp. of the land named ***Ouli***, situated
> in this district, South Kohala, Hawaii,
> Hawaiian Islands aforesaid, formerly
> granted in the fee simple by its ancient
> boundaries to His Late Highness, John
> Young, from the Heirs of whom the

undersigned applicant inherited the
same to wit—

The *Ahupuaa* of ***Ouli*** according
to the annexed Ancient Boundaries
is bounded upon the *mauka* side by
Lanikapu [***Lanikepu***], a Government land, and upon
the *makai* side by a Crown Land named
Momouloa. The *Ahupuaa* of ***Waimea*** cuts
both of the above named lands off, and runs
side by side with ***Ouli*** to the sea. Said *Ahupuaa* of ***Waimea*** is a Crown Land, the great
part of which is leased to Dr. McKibbin of
Honolulu. There are one or more kuleanas
on ***Lanikapu***.

The *Ahupuaa* of ***Ouli***, being
granted by its ancient boundaries only.
Therefore the Petitioner respectfully requests
that the said boundaries may be legally
defined and settled by Your Honorable
Commission and to that end makes this
application, to have the same decided and
certified by you as Commissioner of
Boundaries as aforesaid, Pursuant
to the requirements of the Statute.

Very Respectfully,
(Sig) Francis Spencer. [page 452]

Ouli, an Ili Aina of Waimea Ahupuaa
Boundary Commission, Hawaii Volume B:64-67

Ouli an ***Ili Aina*** of ***Waimea*** in the District
Of South Kohala, Island of Hawaii 3d J.C.

On this, the 14th day of November A.D. 1873 the
Commission of Boundaries for the Island of
Hawaii, 3d J.C. met at the Court House in
Waimea, South Kohala, according to notice
by publication in the Hawaiian Gazette of
_____ and *Kuokoa* of _____ 1873.
On the application of F. Spencer for the
settlement of the boundaries of ***Ouli***, South
Kohala, Island of Hawaii. Due notice
personally served on owners or Agents of
adjoining lands as far as known.

Present: F. Spencer, applicant and
G.W.D. Halemanu on the part of the Crown
and Queen Emma.

For Petition see Folio 452, Book A.

Testimony

Pupuka [K.] Sworn.
I was born on ***Ouli***, and was quite large at the building of Kiholo [1811], but do not know the date of my birth. I have lived on ***Ouli*** and adjoining lands. I know all the boundaries of said land, used to *mahiai* [farm] on the *makai* portion of it. ***Ouli*** is bounded *makai* by the sea, and has ancient fishing rights. Iit is bounded on the Kona side by ***Waimea***.

The boundary at sea shore is ***Kaihumoku***, a point of stones in the sea, or the middle of the sand beach, thence direct to ***Ahuahaloo***, the boundary following an old trail to the place, thence to ***Kulanapahu***, thence to ***Kaaweuweu***, where the boundary runs into a gulch called ***Waiulaula***. (at the shore there is an *ahu* [cairn – altar] in the gulch)

Thence along the gulch to ***Puuike*** [***Pu'uiki***] close to the side of the Government road from ***Waimea*** to ***Kawaihae***, from thence to ***Liloapoho***, a *punawai* [spring] in the gulch, thence to ***Paipai*** the *makai* corner of Ohia, formerly Ku's land, and now owned by John Parker, Patent from No. _____, thence along ***Ohia*** to ***Kawaluna*** at the road to North Kohala. [page 64]

Thence along Makaluhi's Land Patent No. ____ to ***Haumea***, a hill; thence along Kiai's *kula* land, now owned by Lindsay, No. 1070, along this land to ***Ainapu***, a hill by the boundary. Kahekalua's land No. 1070 ends near this place. There is a small remnant of the land of ***Lanikapu*** [***Lanikepu***] near the road to ***Kawaihae***. From the *mauka* corner of Kahekalua's land the boundary runs along ***Lanikapu***; thence to ***Ohia o Keawe***, a resting place on the road, which we used to go up and catch birds; thence up to *Lua Meki* ***Halukuwailani***, a deep hole with some small ones near to it; thence to the gulch ***Keanuiomanu*** [***Keanu'i'omanō***] where ***Ouli*** is cut off by the land of ***Puukapu***. There is a deep water hole and ancient crossing at the corner of ***Momoualoa*** and ***Ouli*** and boundary of ***Puukapu***, this point is marked **X**. Thence the boundary between ***Ouli*** and ***Momoualoa*** runs *makai* to ***Kinoiki***, thence to ***Kekualoa*** a cultivating ground, belonging to ***Ouli***, thence to ***Kekuaninau***; between ***Kekualoa*** and ***Kekuaninau*** the boundary runs in the gulch, thence leaving said gulch the boundary runs to ***Keahupuaa***, a pile of stones, passing around the base of a large hill

called ***Kamoa*** (said hill is on the *mauka* side of the road to Kohala); thence to ***Hookeke***, a *koele* [agricultural field worked for the chief], thence to a gulch on the Kohala side of ***Puuiki***, to a place called ***Keahukauina*** on the road to ***Kawaihae***. *Mauka* of ***Puuiki, Momoualoa*** ceases to join ***Ouli***; and ***Pauahi*** joins to ***Keahukauina***. Thence along the land of ***Kapia***, an *ili* of ***Waimea*** to a hill called ***Kuanuanu*** (***Keahukauina*** is a resting place in the road). Thence along the land of ***Napukawaiwai*** (an *ili* of ***Waimea***) to ***Palinui***, a resting place and hill on the Kona side of ***Kawaihae*** road. Thence along the land of ***Kawaihae*** to ***Owahuahoalii***, an ancient pile of stones; thence to gulch, thence along the gulch to ***Waiulaula*** at the shore. My parents (now dead) showed me the boundaries. I went with the surveyor last month, built piles of stones and marked **X** on them, on the boundaries as I pointed them out. Kalua [K.] a *kamaaina* of said lands, also went with us.

CX.d.

The boundary between ***Ouli*** and ***Puukapu*** [page 65] is the gulch ***Keanui o Manu***. I know the boundaries of ***Puukapu***, where I used to go after birds.

Kalua [K.] Sworn.
I was born in ***Waimea*** South Kohala Hawaii at the time of the plague [1804], and have lived in ***Waimea*** and ***Kapia***, a land near ***Ouli***. I am a *kamaaina* and know the boundaries of ***Ouli***. Kauhine [K] a *konohiki* (now dead) showed them to me. The sea bounds it *makai* and the land has ancient fishing rights. Bounded on the Kona side by ***Waimea***. (The land ***Ouli*** is an *ili* of ***Waimea***).

Commencing at the sea shore at a place called ***Kaihumoku*** thence direct *mauka* to ***Ahuahaloo***, thence to ***Kulanapahu***, thence to ***Kaaweuweu***, a place where the trail from shore crosses a gulch; thence up the gulch to ***Puuike***, a place by the road from ***Waimea*** to ***Kawaihae***, thence along the gulch to ***Waiaohua***, a pool of water in the gulch; thence to ***Liloapoho***, thence across the road in the gulch to ***Paipai***, where ***Lanikapu*** joins ***Ouli***; thence along land sold on ***Lanikapu*** to ***Kumukawau***, the *mauka* corner of my land, thence along the Government land to ***Ohia o Keawe***; Thence to *Luameki* ***Haluku-Wailani***; thence to gulch ***Keanuiomano***

where ***Ouli*** is cut off by ***Puukapu***, there is a *pahoehoe* rock in the gulch marked **X**; thence along the gulch towards Kohala, to an ancient crossing place marked **X** thence to ***Kini*** a hill running along on the land ***Moumoualoa*** thence to ***Kekualoa***, and from thence down the gulch to ***Kekuaninau***; there the boundary leaves the gulch and runs along on the south side of said gulch. Thence around the west base of a hill, called ***Kamoa*** to a rock marked **X** called ***Keahupuaa***. Thence to ***Hokeke*** thence to ***Pauahi*** gulch. Thence along ***Kawaihae*** road and land of ***Pauahi*** to ***Keahu Kauina***; thence along the land of ***Kapia*** and ***Panaulukia***, to ***Palinui***. Thence along the *ili aina* of ***Kapukawaiwai*** to ***Kaopapa***, a resting place *mauka* of ***Puu-ainako***. Thence to ***Puuainako***; thence along the land of ***Kawaihae*** to ***Oahuakahohalii***; thence direct down to the gulch called [page 66] ***Waiulaula***, thence down said gulch to ***Kale-peamoa***, where it is marked by the seashore. I went with the surveyor Mr. Brown, and pointed out the boundaries to him. Pupuka, Samuela, Kalalaluhi and Kanealii and others went with us. The boundaries I testify to today are the ones that were told to me by former *Konohiki* and are the same as I pointed out to the surveyor.

C.X.d.

Kauhine was a *kamaaina*, and I learned from him the boundaries of the *makai* portion of ***Ouli***. The upper portion I heard from bird catchers. I went with Kamau and Kanehailua, and lived with them two months catching birds and they told me the *mauka* boundaries.

Moaluhi, [k.], Sworn.
I was born at ***Puukapu***, at the same time of Kamehameha III [ca. 1813]; and have always lived in ***Waimea***. Am a *kamaaina* of ***Puukapu***. Naihe, a cousin of my mothers, who was a bird catcher told me the boundaries.

Puukapu cuts off all lands to ***Kawaihae***, but I have not heard the points where the different lands are cut off.

The *mamo* and *olona* grounds belonged to ***Puukapu***. ***Ouli*** as surveyed does not come into ***Puukapu***. I have heard where it has been surveyed from the two last witnesses.

C.X.d.

All the witnesses not being on hand, the case
is continued until further notice to all inter-
ested parties.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Decision
After due notice to interested parties, the Certificate of Boundaries
is issued in accordance with corrected notes of survey filed by C.J. Lyons.

See No. 63 Folio 120, Liber I or No. 3… [page 67]

Ouli, an Ili Aina of Waimea Ahupuaa
Boundary Commission, Hawaii Volume 1, No. 3:120-123

For Testimony of Ouli, South Kohala
See Folio 64 Book B.

Land Boundary No. 63
Commission Hawaii 3d J.C.

Certificate of the Boundaries of
Ouli, District of South Kohala
Island of Hawaii, 3rd J.C..

Upon the Application of Francis
Spencer and by virtue of the authority
vested in me by law, as sole
Commissioner of Land Boundaries
for the Island of Hawaii, 3rd J. C.;
I hereby decide and certify the
boundaries of the *Ahupuaa* of
Ouli, situated in the District of
South Kohala, Island of Hawaii, to
be as hereinafter set forth.

Given under my hand at Hilo, Hawaii,
This Twenty-first day of January, A.D. 1875.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Boundaries of Ouli
Beginning at a pile of stones at
the point on the ***Kawaihae*** road
known as ***Puuainako*** and running
as follows, by magnetic meridian, the [page 120]
variation being understood to be 8º East
excepting where otherwise indicated by
natural boundary marks:

1. South 44º 00' West 4650 feet along ***Kawaihae***
   to pile of stones Lawai;

2. South 53º 30' west 5000 feet to ***Paliuli***;
3. Thence down the ***Waiulaula*** gulch along ***Kawaihae*** to mouth of said gulch bearing

   South 70º 00' West from initial point, and distant thence 17,500 feet;
4. Thence along the sea shore at high water mark to ***Kaihumoku*** the direct course and distance being; South 2° 30' East 8500 feet;
5. North 53º 00' East 5800 feet along ***Lalamilo*** or *Ahupuaa* of ***Waimea*** to ***Ahuahalo***;
6. North 63º 30' East 2900 feet along the same;
7. North 63º 45' East 6040 feet along the same
8. North 61º 30' East 6417 feet along the same;
9. South 77º 00' East 1084 feet into bed of gulch;
10. North 65º 00' East 705 feet still along the *Ahupuaa* of Waimea and the middle of gulch;
11. North 33º 45' East 2777 feet along middle of gulch;
12. North 76º 30' East 3750 feet along middle of gulch;
13. North 75º 30' East 3635 feet along middle of gulch;
14. North 48º 30' East 1079 feet along middle of gulch;
15. North 47º 00' East 2584 feet along middle of gulch;
16. North 73º 45' East 5060 feet along the middle of gulch to the South corner of Royal Patent No. 1283 (Grant) at the old road;
17. North 2º 30' East 935 feet along Royal Patent 1283; [page 121]
18. North 9º 30' East 1330 feet along Royal Patent 1283;
19. North 1º 30 East 2800 feet along Royal Patent 1282 (to Makaluhi);
20. North 27º 00' East 300 feet along ***Lanikepu*** to *puu* ***Pali o Haumea;***
21. North 13º 00' west 2460 feet along Kiai's land, Land Commission Award 4207 and Royal Patent (Grant) 1070;
22. North 14º 00' East 750 feet along the same to an *ohia* tree at its West angle;
23. Due North 7500 feet along Government land in ***Lanikepu*** to the Keanuiomano Gulch;
24. About Due West 1200 feet along said gulch and line of ***Puukapu***;
25. South 6º 30' East 9000 feet along Momonaloa [***Momoualoa***] to where the gulch takes a sudden turn above hill at rock marked **X**;

26. South 26º 30' East 975 feet around hill;
27. South 7º 30' East 500 feet around hill;
28. South 25º 00' West 245 feet around hill;
29. South 56º 00' West 500 feet around hill;
30. North 49º 15' West 150 feet around hill;
31. South 6º 00' West 260 feet around hill;
32. South 54º 30' West 214 feet around hill;
33. South 7º 00' West 635 feet to *mauka* side of Kohala road;
34. South 3º 30' West 258 feet along ***Momoualoa***;
35. South 10º 15' West 2070 feet along [page 122] ***Momoualoa*** to large rock;
36. South 3º 15' West 2150 feet to pile rocks;
37. North 85º 45' West 1050 feet along ***Momoualoa***;
38. South 47º 30' West 3850 feet along ***Pauahi***;
39. South 68º 30' West 1400 feet along ***Kapia***;
40. South 86º 45' West 4311119 feet along ***Kapia*** & ***Puu Kawaiwai***;
41. South 81º 15' West 4560 feet along ***Puu Kawaiwai***;
42. South 75º 30' West 2750 feet along ***Puu Kawaiwai***;
43. South 83º 00' West 2548 feet to top of ***Puuainako***, the point of commencement.

Containing an Area of 3632 Acres.

R.A. Lyman
Commissioner of Boundaries, 3d J.C.

Surveyed by J.F. Brown… [page 123]

Puukapu, Ili Aina of Waimea

District of South Kohala, Island of Hawaii
Boundary Commission, Hawaii, Volume A, No. 1:238-240

[See letter of J.O. Dominis to R.A Lyman, dated July 7, 1873]

August 16th A.D. 1873
Honorable R.A. Lyman
Boundary Commissioner
for Island of Hawaii, Haw. Is.

The undersigned would herewith make application for the settlement of the boundaries of the following named *Ahupuaa* or Lands belonging to the Crown, viz…: [page 238]

…***Waimea*** in the District of Kohala
adjoining lands unknown.
Puukapu in the District of Kohala

adjoining lands unknown… [239].

Your Honor will therefore please appoint
a day for the hearing of the evidence
in the foregoing named lands and having
decided upon the same to grant a certificate
to that effect to the undersigned.

(Signed) Jno. O. Dominis, Crown Land Agent,

Hilo Hawaii. August 16th A.D. 1873

by F.H. Harris. Atty. at law. [page 240]

Waikoloa nui, Ili of Waimea

District of South Kohala, Island of Hawaii,
Boundary Commission, Hawaii, Volume A, No. 1:6-12

(No. 2)
Rex vs. George Davis
Boundary Dispute
Waikoloa nui *Ili* of ***Waimea*** – Hawaii.
Testimony taken August 8th and 9th 1865 at ***Waimea***, Hawaii.

Davis' Witnesses:	Rex Witnesses:
1. Mi ***1st***	1. Kaolulu [Kaolulo]
2. Ehu	2. Kuupele [Kupele]
3. Kuehu	3. Kanakaole
4. Kalua	4. Moluhi
5. Moolau	5. Kanehailua
6. Kuahine	6. Kahakauwila
7. Wahahee	7. Kualehelehe

George Davis claims that ***Waikoloa***, as he had heard, begins at Puaapilau, thence down the road from Hamakua to ***Waimea***, to ***Puu Okikona***, thence to ***Paakai nui***, thence to ***Ouli***, the land of Keoniana, and along the boundary of ***Ouli*** to the sea shore at Kaihumoku; thence along the shore to Lalamilo; thence to Keaha [Keahaaha]; thence to Keakolono [***Keahuolono***], on the boundary of Kona; then along the boundary of Kona to ***Kaohe***, then along the boundary of Kaohe to ***Kemoli*** [Kemole], thence to ***Kupaha***.

Ehu – sworn. I am *kamaaina* of ***Puukapu***. I was born in ***Waimea***. I know the boundary from my own and my father's knowledge.

Commence at ***Puaapilau***, thence to ***Napamakani***, thence to ***Paakainui***, thence to ***Kapuulepo***, thence to ***Kapalihalapepe***, thence to ***Puuainako***, thence to ***Kalalakoa***.

I knew Kahanapilo w. wife of George Davis, she was not *konohiki* of the ilis on ***Waikoloa***, nor of ***Waimea.*** I was in Kona when she died.

I am *kamaaina* of ***Puukapu*** only – Kainea was the *Konohiki* when I lived there. There was no *pili* grass on that land; my father was not a bird catcher, he used to *mahiai* [farm]. ***Waikoloa*** was the land that had the birds; the boundary as stated is the boundary from the time of Kamehameha first.

Cross – Kainea was *Konohiki* in the time of Kalaimoku – Kainea is dead. ***Waikoloa*** is an *Ahupuaa* of ***Waimea***, which is a *Kalana*, with eight divisions. I only know about ***Waikoloa***. I have been on to ***Pukalani***, ***Nohoaina*** and ***Paulama***; they join ***Waikoloa***, but do not run far out. ***Pukalani*** joins ***Puukapu***. ***Nohoaina*** joins ***Pukalani***, and Paulama joins ***Waikoloa***. ***Puukapu*** is a division of ***Waimea***. ***Pukalani*** belonged to Kamehameha and he gave it to his man Kekoikumoku. ***Nohoaina*** belonged to the chiefs of ***Waimea***, Kupapaulu. ***Paulama*** belonged to Kupapaulu. ***Puukapu*** belonged to Kalaimoku. (I do not know the present owners). I do not know who was the *Konohiki* before Kainea.

Wahahee – sworn. I am *kamaaina* of the King's land ***Puukapu***. I was born there. Commence at ***Puaapilau***, thence to ***Pooholua***, thence to ***Leohu***, thence to ***Paakainui***, thence to ***Kapuulepo***, that is all I know… [page 6].

Mi 1st – sworn. I live on ***Waikoloa*** – I am a *kamaaina* of the lands in dispute. The name of the large land is ***Waimea*** – I am a witness for George Davis, and also for the Rex. – ***Waimea*** is a *Kalana*; which is the same as an island divided into districts. – there are eight *Okana* in ***Waimea***. In those *Okana* are those lands said to extend out (*hele mawaho*). These lands came in to the possession of Kamehameha I who said to Kupapaulu, go and look out to the large lands running to the sea, for John Young and Isaac Davis.

Kupapaulu went to Keawekuloa, the *haku aina*, who said if we give ***Waikoloa*** to the foreigners they will get ***Kalahuipua*** [***Kalahuipuaa***] and ***Anaiomalu*** ***Anaehoomalu***] (two lands at the beach) then your master will have no fish. So they kept
the sea lands and gave ***Waikoloa*** to Isaac Davis. John Young asked my parents if it was a large land they said, the black *aa* was ***Napuu***, and the good land ***Waimea***.

They kept all the valuable part of the lands, and gave the poor land outside to Isaac Davis. They kept ***Puukapu***, ***Pukalani, Nohoaina, Kukuiula*** (above the church), and ***Paulama***; and gave ***Waikoloa*** to Isaac Davis. The other ***Waikoloa***, this side of the stream dividing them, was the King's. It comes down along the stream by Mr. Lyon's, then along the ditch, then along the wall of ***Puuloa***, to ***Ahuli*** on the King's land, to the round hill, ***Uleiokapihe***, and is cut off here by Davis' ***Waikoloa***. The wall was the boundary below, between ***Waikoloa*** of Isaac Davis and the land of the King, Kamehameha I. The latter built it by Kauliakamoa; to keep the cattle off from the King's land. The boundary runs to ***Liuliu***, and the *pili* was all South, on Davis' land; then I know along an old road, ***Puupa***; ***Waikoloa*** being South and ***Waimea*** North of the road, then to ***Kaniku***. That is all I know.

Cross. My parents heard the command of Kamehameha I to Kupapaulu, and they told me, and also about John Young's asking about the land.

I never heard that ***Puukapu***, ***Nohoaina, Pukalani***, and ***Paulama*** extended out to the *pili*. A road divided the land of the King and that of I. Davis.

Waikoloa. The wall was built to keep off the cattle, and to mark the land.
The church is on the King's land. When Kalama measured ***Waikoloa*** he took in the church, I heard. I went with Kalama some of the time. Kalama said leave the old boundary and make a straight boundary, so I left him lest Davis' land would go to the King. The boundary as I know it is from the English school house along a hollow, to the ditch near to ***Hoomaloo***; thence to ***puu Makeokeo***; thence to hills outside of ***Ahuli***. The church is on ***Paulama*** which joins ***Waikoloa***.

I know the boundary of ***Paulama*** it does not reach ***Napuu***.

I know the *mauka* boundary of ***Waikoloa*** and ***Puukapu***. ***Puukapu*** extends to ***Puulepo***, then goes in (*maloko*)… [page 7]

Moluhi – sworn. I am *kamaaina* of ***Puukapu***. I was born there. I know the boundary of ***Waipio*** and ***Puukapu***. At ***Puaapilau Paauhau*** joins ***Puukapu***; thence to ***Puukaliali***; thence to ***Puupapapa***; thence to ***Keanaauloa***, where ends ***Puukapu*** and commences ***Pukalani***; then to ***Puulepo***, between ***Puukapu*** and Pukalani; then to ***Waialolo***; thence to ***Haloa***, the end of ***Pukalani***; then ***Puukapu*** extends to ***Kawaihae***.

Pukalani, Nohoaina, and ***Paulama*** lie between ***Puukapu*** and ***Waikoloa***, so I do not know the boundaries of ***Waikoloa***. ***Puukapu*** is a *kupono* of ***Waimea*** *Ahupuaa*, my father had charge of it; the present King owns it… [page 10]

Kualehelehe – sworn. I am *kamaaina* of ***Puukapu***. I was born there.
The boundary of Hamakua and ***Puukapu***, commencing at ***Waipio***, at ***Pupulenalena***; thence to ***Kahakolea***; thence to ***Kaimuhonu***; thence to ***Puuae***; thence to Kalapapohaku, along Kanaina's land to the corner. Then to ***Manuhea***; thence to ***Papalaokiekie***; thence to ***Kahaleula***; thence to ***Makahaluhalu***; thence to ***Kapuaapilau***; thence to ***Puukaliali***; then along ***Paauhau*** to ***Puupapapa***; thence to ***Keanaauloa***, the corner of ***Paauhau***; thence to ***Kapuulepo***; thence to ***Waialolo***; thence to ***Haloa***, along ***Pukalani*** to the corner; then along ***Nohoaina*** to ***Paulama*** and on to ***Puuohu***, the corner of ***Waikoloa*** of Hueu; and thence on to ***Kawaihae***. ***Pukalani, Nohoaina*** and ***Paulama*** lie between ***Puukapu*** and ***Waikoloa*** of Davis. I had charge of ***Puukapu*** when the late King was king. I am *kamaaina* of this land only. ***Pukalani*** belongs to the King… [page 11]

The Boundaries of ***Waikoloa*** nui as decided by the Commissioners of Boundaries at ***Waimea*** – Hawaii, August tenth 1865.

Commencing at ***Kokiaina*** run to ***Waiakalehua***, to ***Kapele***, ***Alaanui***, ***Alaohia***, ***Keakualapalapa***, ***Kulanapahu***, ***Kaopapa***, ***Keanakii***, ***Kahoopapale***, ***Kahooalapiko***, then along ***Napuu*** to ***Puupaha***; then along the King's land to ***Puakowai***, ***Kilohana***, ***Puuokaa***, ***Makeokeo***, ***Waikoloa***, to ***Puuohu***, and to commencement, as given by Kaolulu, Kuupele, Kanehailua, and Kahakauwila.

P. Cummings
F.S. Lyman. [Volume A No. 1 page 12]

The following letters are selected communications that were made a part of the Boundary Commission proceedings for ***Waimea*** and associated lands, but not incorparated into the final volumes of the proceedings. The communications include the testimonies taken by G.M. Robertson, used by him to authorize his decisions, and communications from applicants and surveyors, regarding settlement of boundaries.

The communications are given here in chronological order, with those records found in the microfilm collection at appropriate dates. It will be noted that the full testimonies given by witnesses before the Commission were apparently not recorded in the Volumes copied in the microfilms. Thus, greater detail is found in the testimonies of witnesses cited below as dated communications (these additional records were viewed in the collection of the Hawai'i State Archives).

October 4, 1866
To the Hon. George M. Robertson, First Associate Judge of the Supreme Court

& Sole Commissioner of Boundaries:
The undersigned Commissioners of Crown Lands most respectfully beg leave to Represent that they desire Your Honor to take into consideration the settlement of the Boundaries of ***Waimea*** in the District of South Kohala on the Island of Hawaii, and for that purpose submit that the names of the adjoining Lands to ***Waimea*** in the District aforesaid are as follows to wit: ***Lalakea***, ***Waikoekoe, Kamoku, Paauhau, Puuanahulu, Kalahuipuaa, Kawaihae kai, Kawaihae uka, Honokane 1st*** and ***2nd***, ***Waimanu*** and ***Waipio***.

That the names of the owners of said Lands are as follows: ***Lalakea***, Keau; ***Waikoekoe***, H.H. Lunalilo, now leased to ***Waimea*** Grazing & Agricultural Company; ***Kamoku,*** part of it belongs to the ***Waimea*** Grazing Company and part owned by the Government; ***Paauhau***, John P. Parker, Senior; ***Puuanahulu***, Government Land; ***Kalahuipuaa***, H.M. Queen Kalama, in charge of Kanaina; ***Kawaihae kai***, H.M. Queen Emma; ***Kawaihae uka***, Crown Land; ***Honokane 1st*** and ***2nd***, Estate of the late R.H. Princess Victoria, in charge of Kuke; ***Waimanu***, Crown Land; ***Waipio***, H.M. Queen Kalama, Leased to Halemanu.

That a formal description of the Boundaries of ***Waimea***, aforesaid, is as follows, to wit:

Commencing at a point called ***Kilohana*** on the south bank of ***Waipio*** *pali*, the corner of the land of ***Lalakea*** to a large *ohia* tree marked "W" on the *makai* side of the Road leaving from ***Waimea*** to ***Waipio***. Thence along the line of Waikoekoe to a large *mamane* post marked "***Puukapu***," at which point Waikoekoe and the land called Kamoku meet. Thence along the line of Kamoku to a *Naio* tree marked H. Thence along the line of Kamoku to a pile of rocks at the S.E. corner of H. Purdy's land. Thence along Kamoku to a large rock marked "P 19" at Puaapilau, where Kamoku and Paauhau meet. Thence to Puupapapa. Thence to Keanaoloa. Thence to Puuahaka or Paakea. Thence to Puumahoelua. Thence to a large rock marked "H." Thence to Kuikahekili; then to Namahana on the line of Kona. Thence along the gulch called Poopoo, bordering the land called Puuanahulu to an *ohia* tree marked "H." Thence to Puuiwaiwa. Thence to a point of rocks marked "H." Thence along the line of Puuanahulu to Kahooalapiko, then to Puuhinei; thence to Puupaha, then to the gulch called Pakoa, then along the gulch to Kapaakea. Thence along the gulch called Pakoa and the road called Keekee or Kiikii to a pile of rocks on a low rocky ridge. Thence to the most Northerly of three small hills called Lolo. Thence to a large pile of rocks at the South East corner of Kalahuipuaa, on the *mauka* side of the Beach Kona Road. Thence along the *mauka* side of said land to a large pile of Rocks on the *aa*, thence *makai* to the sea over a large pile of rocks on the *mauka* side of the Beach Road leading to Kona. Thence along the sea to the mouth of a gulch called ***Waiulaula***. Thence up and along the centre of said gulch to a Rock marked "H," on the North side of said Gulch at a point called Malohuihui, where said Boundary line leaves the gulch, thence along ***Kawaihae*** uka to ***Puuainako***. Thence to ***Luawahine*** Gulch to the head of said gulch at a place called ***Kalualepo***, which intersects the land called ***Puukapu***. Thence along the *mauka* line of ***Kawaihae uka*** to the head of ***Honokane*** Pali. Thence along the head of the Lands called ***Honokane 1st*** and 2nd, ***Waimanu*** and ***Waipio*** to the place of Beginning. Which together with an accompanying chart of the survey of the *Ahupuaa* of ***Waimea*** District aforesaid, are herewith submitted…

C.C. Harris
F.W. Hutchinson
John O. Dominis
Commissioners of Crown Lands. [HSA – Interior Department Lands]

Waimea Hawaii
October 5th 1866
Land Boundary Commission.
The Commissioners of Crown Lands filed an application for the settlement of the exterior boundaries of the Ahupuaa of Waimea…

Mooluhi sworn. (on behalf of the Crown)
Was born at ***Puukapu***, has lived there nearly all his life. ***Puukapu*** is in the *Ahupuaa* of ***Waimea***. Know the boundaries of ***Waimea*** on the Hamakua and Kohala sides. Beginning at the *pali* of ***Waipio*** and running to Kaakolea, along the boundary of ***Lalakea***; thence at ***Waihonakalua*** along ***Waikoekoe***; thence to Papahookiikii along Waikoekoe; thence on to Puaapilau along the line of Kamoku; thence to Pukaliali, on the boundary of Paauhau; thence along Paauhau to Pupapapa; thence still along Paauhau to Keanaoloa. I don't know the boundary beyond that.

I know some of the boundary on the side next to ***Kawaihae uka***, as informed by my ancestors. A hill on the head of ***Honokane*** gulch is the boundary between ***Puukapu*** and ***Honokane***. The watercourse which starts from the high hill or peak I have mentioned and runs to ***Waipio*** divide. ***Puukapu*** from the lands called ***Honokane*** and ***Waimanu*** in North Kohala.

The line of ***Puukapu*** runs on to the *pali* of ***Waipio***. Kaakolea was a place of sacrifice. At Papalahookiikii is a hill where the people used to get *mamaki*. Puaapilau is an ancient place of worship. Kamoku, Paauhau and ***Puukapu*** meet there. Pukaliali and Puupapapa are hills. There is a water course and cave at Keanaoloa.

The boundaries as stated today are the same as I have always known. I got my information from my parents and uncles who lived on ***Puukapu*** before me. I was *Konohiki* of ***Puukapu*** from the time of my father's death at the arrival of the missionaries [1820], till recently.

At Keanaoloa the lands called Paauhau, ***Puukapu*** and Pukalani meet. Pukalani is an *Ili* in ***Waimea***…

Kaolulo sworn.
Was born at Kaupo in ***Waimea***. Knows the boundaries of ***Waimea*** on the sides of North Kohala and Hamakua. ***Kalualepo*** is on the boundary of ***Waimea*** and ***Kawaihae uka***. There is a hill at that place; from ***Kalualepo*** on to ***Kalahomanei*** on the boundary of ***Honokane***, the place called ***Waimalu*** is the boundary of ***Waimea***. ***Kulanapahu*** is on the boundary of ***Waimea*** and ***Honokane*** 2nd. Thence on to the gulch at ***Oulu*** [***Ulu***]. The stream called Oulu runs clear on to ***Waipio*** and marks the boundary between ***Puukapu*** and the North Kohala lands. A place called ***Kilohana*** at the *pali* of ***Kahonohono*** and runs to the place called ***Kilohana*** by the last witness, and then to Kaakolea. Thence to ***Waihonakalua***. Thence to Papalahookiikii on Waikoekoe. Thence to Puaapilau. Thence to Pukaaliali. Thence on Puupapapa on the boundary of Paauhau. Thence to Keanaoloa where Paauhau, ***Puukapu*** and Pukalani meet. Pukalani is an *ili* of ***Waimea***. Thence on to Puumahoelua on the boundary of Paauhau. Thence on to Kuikahekili, where is a hill. Thence to Namahana on the boundary of Kona, where there is a gulch called Poopoo. Thence on to a hill called Puuaiweoweo. Thence on to Kahooalapiko. Thence to Puupaha. Thence on to Kapaakea where is a gulch, and on to Kepulumao. This is the boundary along Puuanahulu as far as I know it.

I learned the boundaries from my ancestors. ***Waimea*** was a rebellious land.

[answer to question from Mr. Jones for G.H. Davis] I know ***Keahuolono***, it is on the boundary of ***Waimea***. Puupoe is on the lava country outside of ***Waimea***. It is a hill. I don't know of a cave there. I know Palihae, it is in Paauhau not on the boundary of Kona. Kahanamauloa is in Hamakua. Kapukaiki is in Kona out beyond the line of ***Waimea***; and so is Hanaialii, a long way from the boundary of ***Waimea***; and so is Wawaekea. Keamuku is also in Kona, a long distance from the line, a point covered with lava. Heewai is also in Kona. Kaawa is in Kona. Puukeekee is on the boundary of Kaohe. Puukapele is in Kona, on beyond the boundary of ***Waimea***. I had to travel over the land to get sandalwood, and I used to go out to hunt for the birds called *uwau*; my father used to point out the different places to me when we had occasion to travel over the land. I have travelled all along the Kona boundary as far as I have stated it. ***Waimea*** bounds on the Kona line, but that line as now given by some people is new to me. Naohulelua is on the boundary of Kona and Hamakua. I have never heard that Kohala goes out so far as that place…

Kanehailua sworn.
Was born in ***Waimea***. Know some of the boundaries of ***Waimea***. Commencing at Puaapilau, where ***Puukapu*** and Hamakua meet. Paauhau touched that point; from thence the boundary runs to Pukaaliali between ***Puukapu*** and Paauhau; thence on to Puupapapa; thence on to Keanaoloa; thence to Puunahaha between ***Waimea*** and Paauhau; thence on to Kenakuku; thence to Puumahoelua; thence to Kuikahekili; thence on to Namahana at the junction of ***Waimea***, Paauhau, and Puuanahulu, in Kona. Thence on to Puuiwaiwa; thence to Kahooalapiko; thence to Puupaha; thence to Kapaakea; thence to Kalolo and on to Kiikii road, which is on the boundary line of ***Waimea***, on to Puali, above Kalahuipuaa. Keahuolono is at the corner of ***Waimea*** where it touches Kona. Anaehoomalu is the land on the shore and belongs to ***Waimea***. Kapalaoa is the land on the Kona side. Then turning and running along the sea beach to Waiulua; thence Iliilinahiahi; thence to Kamakaiwa; thence to Kapukalua, a cave; thence to Paniau; thence to Milokukahi; thence to ***Waima***; thence to Lalamilo, including Puako hamlet; thence to Wailea; thence to Kaihumoku.

Then leave the sea and run *mauka* to ***Puainako*** on the boundary between ***Kawaihae*** and ***Waimea***; thence to a gulch called ***Kaluahine*** which is between ***Kawaihae*** and ***Puukawaiwai***; thence to ***Waiokamalii*** gulch. Then into the woods and towards the mountains; thence to ***Kalualepo*** where ***Kawaihae***, ***Waimea***, and ***Puukapu*** join. From ***Kalualepo*** to Waipahu; thence to Kaleapi; thence to ***Ulu*** gulch or stream; the head waters of the streams which run to ***Waipio***, ***Waimanu***, ***Pololu***, ***Honokane*** and ***Keanuiomano***. The stream of ***Honokane*** is on the boundary of ***Honokane*** and ***Waimea***. On from ***Ulu*** the boundary runs to ***Kilohana*** at the termination of two roads, at the boundary between ***Puukapu*** and ***Waipio***. The boundary of ***Puukapu*** runs along the mountain range, by the head of the ravines which run into North Kohala, till it reached ***Waipio***. The boundary runs on from ***Kilohana*** to ***Pupualenalena***; thence to ***Kaakolea***; thence to ***Waihonakalua***; thence to ***Papalahookiikii***; thence to ***Puaapilau***.

At ***Namahana*** on the boundary of Hamakua, Kohala and Kona, there is a gulch called Poopoo. Waikii is a spring in Hamakua, the father of the different streams of Poopoo etc. Kalolo is the same water course that is called Poopoo farther up. It is called ***Waiulaula*** where it meets the sea.

[answer to question from Mr. Jones for G.H. Davis] Naohulelua is in Kona a long distance from the boundary. It is at the line of Keauhou and Kaohe… Puukeekee is between Namahana and Puukapele on the boundary between Kona and Hamakua… [HSA – Interior Department Lands; 1866]

Waimea, Dsitrict of Kohala, Island of Hawaii
Boundary Commission, Hawaii Volume A No. 1:16-18

(No. 4)

Ahupuaa (or Kalana) of Waimea Hawaii

On the 4th day of October, 1866 the Commissioners of Crown Lands filed with the Boundary Commissioner an application for the settlement of the boundaries of the *Ahupuaa* (or *Kalana*) of ***Waimea***, in the District of Kohala, Island of Hawaii.

Notice was given to all parties interested as far as pracitcable, and the Commissioner Was occupied at ***Waimea***, Hawaii, on the 5th, 6th, 13th, 15th, 17th, and 22nd of October, and at Honolulu, on the 10th and 15th of November, in hearing evidence on behalf of the applicants, and also on behalf of other parties interested. The case was closed and argued by counsel, at Honolulu on the 16th of November. On the 8th of January, 1867, the Commissioner decided and duly certified the Boundaries of the said Land to be as follows, viz.:

Boundaries of Waimea
Beginning at a place known as ***Kilohana***, on the South bank of the ***Waipio*** *Pali*, corner of the lands of ***Waipio*** and ***Lalakea***, on the Eastern boundary of ***Waimea***; Thence along the land ***Lalakea***, South 35º 50' E. 90 58/100 chains, to a large *ohia* tree marked **W.** at a place known as ***Kaakolea***. Thence along the land ***Waikoekoe***, South 60º E 55 30/100 chains, to ***Kaimuhonu***. Thence South 69 ¾ E 118 49/100 chains, South 49º E 10 chains, to a large rock marked **W.** at ***Kalapapohaku***, *mauka* corner of ***Waikoekoe***. Thence along the tract of land known as ***Kamoku***, South 22 chains, to ***Manuhea*** at which point stands a large *mamane* post marked ***Puukapu***. Thence South 63º W 30 chains, South 13º W 11 50/100 chains, South 12 ½ E 60 50/100 chains to a tree marked **X**, at a place known as Kahaleula, N.E. corner of Harry Purdy's land in ***Waimea***. Thence South 16 ½ E 35 chains, cross the road leading from ***Waimea*** to Parker's, 45 chains to ***Makahaluhalu***, 79 chains to a pile of rocks, S.E. corner of Harry Purdy's land. Thence South 12º E 128 chains to a large rock marked **XIX**, at a place known as ***Kapuaapilau***. Thence along J.P. Parker's land, ***Paauhau***, South 2º E. 63 chains, to a pile of rocks on the top of the hill called ***Puukaliali***. Thence along the [page 16] Western boundary of J.P. Parker's land by the line described in his Royal Patent (No. 2769) to a pile of stones marked "**P**" at the most South Westerly point

of ***Paauhau***.

Thence up the gulch known as the ***Auwaiakeakua***, to a large flat rock marked ***XIV***, on the top of a conical hill known as ***Puulaau***, at the South East corner of J.P. Parker's land, ***Paauhau***. Thence to ***Aiakala*** on the boundary of the *Ahupuaa* of ***Kaohe***. Thence along ***Kaohe***, South 14º E 70 chains to the gulch of ***Waikii*** and ***Keoneheehee***. Thence South 13º E 80 chains to a pile of stones marked **X**, at ***Kilohana***. Thence South 4º W 31 chains to a pile of stones marked **X**. Thence South 6º E 24 50/100 chains to a pile of stones marked **X**. Thence South 12º E 131 chains to a pile of stones marked **X**, at the corner of ***Kaohe***, on the South East side of ***Puukapele***. Thence along the boundary of ***Puuanahulu*** in the district of Kona, North 58º W 194 chains to ***Kaaawa***, a resting place, where is a pile of stones. Thence North 62 ½ W. 160 chains to a pile of stones marked **X**. Thence North 85º W. 72 chains to ***Heewai***, where is a pile of stones marked **X**. Thence North 58º W 162 chains to ***Keamuku*** to a large stone marked **X**. Thence North 65º West 72 chains to a pile of stones marked **X**. Thence North 53º W. 73 chains to a pile of stones marked **X**, at ***Wawaekea***. Thence North 42º W. 87 chains to a cave known by the name ***Hanaialii***. Thence North 53º W. 136 chains to a pile of stones at ***Kikiha***. Thence North 30º W. 65 chains to a pile of stones marked **X**. Thence North 47º W. 84 chains to a cave at ***Kapukaiki***. Thence South 89º W. 522 chains by ***Kapalihookaakaa***, ***Kauakahialaa***, ***Hanamauloa***, ***Palihai***, and ***Puupoe***, to ***Keahuaalono*** on the side of the road leading to Kona. Thence to ***Hiiakaikaalei*** on the sea beach, the extreme boundary of the *Ili* of ***Anaehoomalu*** on the line between Kohala and Kona. Thence along the sea shore *makai* of ***Anaehoomalu*** and ***Kalahuipuaa*** to a large pile of rocks on the ***mauka*** side of the Beach road. Thence along the sea; North 31º E. 19 55/100 chains, North 5º E. 15 91/100 chains, South 34º E. 59 85/100 chains to the houses on ***Waima***. Thence North 80º E. 15 chains, North 42º E. 68 chains to the extreme point of rocks at ***Puako***; Thence South 15º E. 16 chains to the church. North 63º E. 20 chains to the South East point of Bay. Thence North 9º E. 16 67/100 chains to ***Piliamoo***; Thence North 10 ¼ E. 50 31/100 chains, North 3 ¼ E. 44 85/100 chains to ***Kaihumoku***. Thence along the sea to the mouth of ***Waiulaula*** gulch, at the corner of the lands ***Waimea*** and ***Kawaihae Kai***; Thence up along the center of said gulch to a large [page 17] boulder marked **X**, at a point known as ***Paleuli***, at the corner of the lands ***Kawaihae Kai*** and ***Kawaihae uka***, at which point the line leaves the gulch to the right; Thence North 51 ½ E. 75 78/100 chains to a pile of rocks at ***Lawai***; Thence North 44º E. 70 45/100 chains to ***Puuainako***, a small hill on the South side

of the ***Waimea*** and ***Kawaihae*** Road. Thence North 53º E. 72 72/100 chains to the ***Luwahine*** Gulch where it leaves the hills; Thence up along said gulch North 53º E. 70/100 chains, North 10º E. 23 50/100 chains, North 48 ¾ E. 81 chains, North 21º ¾ E. 31 chains, to ***Puka-waiwai*** 61 80/100 chains to angle; Thence North 11º E. 22 70/100 chains to the Kohala Road; Thence up and along the general course to the ***Luwahine*** Gulch, North 31º E. 240 chains to a place known as ***Kalua-lepo***, at the *mauka* South East corner of ***Kawai-hae 2nd*** on the boundary of ***Waimea***; Thence along the *mauka* side of ***Kawaihae 1st*** and ***Kawaihae 2nd*** to the head of the ***Honokane*** *Pali*. Thence along the *mauka* ends of the lands of ***Honokane 1st*** and ***Honokane 2nd***, ***Wai-manu***, and ***Waipio 1st*** and ***2nd***, to the place of commencement.

G. M. Robertson
Commissioner of Boundaries
Honolulu
8th January 1867. [page 18]

Travel, Access and Land Use in the Kohala-Hāmākua Mountain Lands

Another source of documentation describing the Kohala-Hāmākua Mountain Lands, is found in the collection of the Hawai'i State Archives (HSA). Communications in the Interior Department collection describe Kingdom efforts at documenting the nature of the landscape and efforts at managing the lands and access. As a result of the development of ranching and plantation interests, increased importance of the health and quality of the watershed lands was emphasized. Also, we find that by the 1880s, the development and sale of Homestead tracts on Government lands was followed by impacts on the forest lands. The following communications include documentation of access to the mountain lands and descriptions of the changing conditions therein.

By the 1840s, social and economic pressures led to the formalization of a road division in the Hawaiian Kingdom. Native foot trails, which had been used for centuries and often provided the "path of least resistance," to travel around and across the island, proved inadequate for the new methods of travel with horse, wagons and team animals. In 1847, Kamehameha III instructed island governors to undertake the survey of routes and construction of new roads, which became known as the *Alanui Aupuni* (Government Roads). Construction was to be paid for through taxation and "labor days" of the residents of the lands through which the roads would pass. Governor Kapeau, on the island of Hawai'i, wrote his *mana'o* on this matter to Premier and Minister of the Interior, Keoni Ana on August 13, 1847:

> *Aloha oe e ka mea Hanohano –*
> I have a few questions which I wish to ask you. Will the police officers be required to pay, when they do not attend the Tuesday (*Poalua*) labor days? How about parents who have several children? What about school teachers and school agents? Are they not required to work like all other people when there is Government work on the roads and highways?
>
> I believe that school agents, school teachers and parents who have several children, should only go and work on the weeks of the public, and not on the *konohiki* days….
>
> …The roads from Kailua and down the *pali* of Kealakekua, and from Kailua to Honokohau, Kaloko, Ooma, the place where our King was cared for, and from thence

to Kaelehuluhulu [at Kaulana], are now being surveyed. When I find a suitable day, I will go to Napoopoo immediately, to confer with the old timers of that place, in order to decide upon the proper place to build the highway from Napoopoo to Honaunau, and Kauhako, and thence continue on to meet the road from Kau. The road is close to the shore of Kapalilua…

The width of the highways around Hawaii, is only one fathom, but, where it is suitable to widen where there is plenty of dirt, two fathoms and over would be all right… If the roads are put into proper condition, there are a lot of places for the strangers to visit when they come here. The Kilauea volcano, and the mountains of Maunaloa, Maunakea, Hualalai.

There is only one trouble to prevent the building of a highway all around, the steep gulches at Waipio and Pololu, but this place can be left to the very last… [HSA – Interior Department, Roads; translation modified by Maly]

July 17th, 1872
Mana
S.C. Wiltse; to Jno. Dominis:
…I am ingaged to make a survey of the principle lands that comprise the Puuhue Ranch in N. Kohala, & purpose commencing next week.

One of these lands ***Kehena*** extends to the ***Honokane Pali*** & bounds the crown land ***Pololu*** on the *mauka* side. Another land to be surveyed is "Nunulu" which bounds the crown land Kaauhuhu on the *mauka* side. So I thought you mite like to have these crown lands surveyed & justified to by the Boundary Com. at the same time with the Puuhue lands, as it would save nearly or quite one half of the expense that would cost to have them settled separately.

Should you propose to do so, I will forward to you the names of the adjoining lands & the names of parties that own them, so that you could make application at once to Gov. Lyman to have the Boundaries of said lands settled at the same time as the Puuhue lands. [HSA - Interior Department, Lands]

November 21, 1887
Kohala, Hawaii
E.C Bond; to L.A. Thurston:
…I should like to say a word to you in your private capacity—not officially—concerning the gov't. lands 5 or 6 miles *mauka* of us, that are now being surveyed by Mr. Jos. Emerson, with the ultimate view, it is understood, of their being sold out by the Gov't. under the homestead act. I have not been up there to see the precise location & nature of those lands, but judge from a general knowledge & much description as has been given are, that they lie largely if not entirely in the woody, wet lands, from whence many if not all of the watercourses in this district draw their supply & think it would be safe to say although of course some of the springs are located well down *makai*.

The woods have for years, been continually receding from the coast, & lands once well wooded are completely bare, but the lands above referred to, have so far, remained comparatively unchanged.

I am not alone in the opinion that the first thing that will be done by settlers on those lands especially if they are Portuguese, as Portuguese always use & want large wood for their fires, & are particularly destructive of trees—will be to clear off the woods for private use & for making a living on the sales of it.

The end of it will be that our watercourses, already reduced in size, will be so far reduced or entirely deprived of their source of supply, that the Gov't will be called upon for some measures for protection, such as we have witnessed in connection with your Honolulu water supply, & presumably be compelled to take back tracks at considerable expense.

If you will interview Noble Wight on the subject, and also Mr. Emerson, when he returns, I think you will find my statements & opinion confirmed. I see that Rep. Kinney is to introduce (or has done so) a bill or resolution to have a commission appointed to examine into that region ("bet. Hamakua & Kohala") to see whether a water supply cannot be found for the benefit of Hamakua. The lands above referred to, would come under that heading, and altho, I do not know whether the lay of the land would permit of water from the above locality being ditched or flumed to Hamakua, I fail to see, in case it can, why Kohala should be robbed for the benefit of Hamakua.

I draw your attention to this matter because I comprehend somewhat, the value of water supply & the importance of preserving the fountain heads thereof, and think that a word in time, may save a vast amount of trouble & expense in the future.

I notice that amendments to the law pertaining to the commissioners of Private Ways & Water rights have been proposed in the House. While they are about it, I think they might so amend as to make it more clearly to be understood whether the law intended, in case of appeal, that the fees of the Commissioners, as well as other costs, should be forwarded to the appellate court, or whether the said fees may be regarded as, "fees strictly retainable by them."

The law is clear, Ch. XVI, Sec. 1001, page 295, but the amendment passed in 1886, Ch. LXIX, Sec. 4, pg. 127, makes it ambiguous. We do not know what fees or "costs" are "strictly retainable by" us, or whether it was intended that the sending of the fees over to the appellate court was intended to be done away with. We fail to see why our fees nor the constable's for serving summons should be sent over, only to be returned, unless, it is for the purpose of giving the appellate court a chance to cut them down.

As Chairman of said Commissioners, I find, especially in case of appeal, that there is a heap of work to be done if there's "nothing in it."

I don't mind getting the experience, but don't see as that acquisition serves as compensation for time or material…

(Note: Refer to survey with request that Emerson be written to have his opinion in the matter ascertained.) [HSA – Interior Department, Water Rights; Box 55]

December 16, 1887
Kokio, Kohala, Hawaii
J.S. Emerson; to L.A. Thurston:
…Before me is the copy of a letter from Mr. E.C. Bond to yourself, dated Nov. 21, '87, also a letter from Mr. C.J. Lyons, of Dec. 13 in which you "request" any "remarks on the forest subject." The more I think upon Mr. Bonds' letter, the better I am satisfied with the correctness of his statements and the soundness of his inferences. He is certainly justified in feeling that there is great cause for alarm with reference to the water supply of Kohala and the protection of the forests in the region included in my survey. If we limit our attention to the upper portion of my survey, say to the North East of a straight line joining ***Lahikiola*** and ***Puu Hue*** hills, we have the forest lands of which he speaks, and as thus limited his remarks are very just. Perhaps I might still further limit it to the district East of the meridian passing through Lahikiola. The protection of these forests

from cattle and the axe of the settler is a matter of serious importance to the agricultural interests of the district. Many of the old springs are now dry, I could mention them by name but time forbids. In the Hooleipalaoa, Wailoa and other gulches the water stands in small pools instead of running in a continuous stream. At nearly every mud hole, where the cattle come, their dead carcasses poison the air and the land is full of their stench. They fall and die on all sides for lack of water. This state of things is mainly due to the destruction of these forests by cattle, but to allow ignorant settlers to hasten the work of destruction with the axe will be still worse. The mail man waits-excuse the haste.

December 27, 1887
Puuokumau
L.B. Low; to H.P. Wood:
…On compliance with your instruction I have been around to the Hamakua side of the Kohala Mountains' to ascertain the practicability of locating a bridle path on the seaward route up the west side of the Waipio and the country westward to the Waimanu, including bothe of its sides with the view of forming part of the road from Kohala to Hamakua.

The west side of the Waipio is practical rocky about three fourths of the way up. Soft rock and earth the balance of the way. From appearance the rock can all or nearly all be removed with pick and gad.

Going west of the Waipio the 1-2-4-5 and 7 canions are shallow and the present grade practical.

3rd canion about 800 feet deep will require nearly all new grade.

6, 9 & 10 canions about 500 feet deep, grade will require to be changed in several places.

8 canion 1000 feet deep, about one third of the present grade is practical the balance will require a new grade.

11 canyon about 600 feet deep will require nearly all new grade.

East side of the Waimanu is practical, showing several stratas of hard rock will require more or less blasting from top to bottom.

West side is much more favorable, very little rock to be seen, the upper part is covered with *ohia* which extend in places nearly to the bottom of the canyon.

The west side of the Waipio and the east side of the Waimanu will cost nearly as much as all of the canyons between with the west side of the Waimanu included… [HSA – Interior Department, Roads]

By late 1888, the Hawaiian Kingdom had begun work on a Government route, across the Kohala Mountain Lands. Several communications regarding development of the road—a formal trail system—are cited below. Interestingly, by September 1889, work on the road was terminated for a lack of funds, and reevaluation of the need of such a road.

April 2nd, 1888
H.P. Wood, Kohala Road Supervisor, to
L.A. Thurston, Minister of the Interior:
…A road should be built between Kohala and Hamakua along the coast (that is a good

horse trail) there is a fair trail I believe from Kukuihaele Hamakua to ***Waimanu*** gulch which could be put into good condition for say 1000.00. Kohala has a good trail to the bottom of ***Pololu*** Gulch and a passable road to ***Awini***. From Awini, Waimanu could be reached by skirting *mauka* of the intervening gulches from Awini to Waimanu in a direct line is only about 5 miles perhaps that distance could have work enabled an expenditure of 2500.00 or 3000.00 would connect Hamakua and Kohala by a direct route thus doing away with the long and tiresome journey via ***Waimea*** besides opening up new land for settlement. Disturbing the operations of *okolehao* distillers perhaps but that could scarcely be mentioned as an objection… [HSA – Interior Department, Roads]

L. Low to
W.P. Wood, Kohala Road Supervisor
December 27, 1888:
…In accordance with your instructions I have been around to the Hamakua side of the Kohala mountains to ascertain the practicability of locating a bridle path on the seaward route up the west side of Waipio and the country westward to the ***Waimanu*** including both sides, with the view of forming part of the route from Kohala to Hamakua… [HSA – Interior Department, Roads]

December 31st, 1888
H.P. Wood, Kohala Road Supervisor, to
L.A. Thurston, Minister of the Interior:
…As per your authorization of 12 Dec. I have drawn on your dept under date of 26 Dec Draft # 1 favor T.H. Davies & Co 265.21 which sum includes all of Mr. Lows expenses to date "for services of self and party in preliminary work of locating and grading trail from ***Honokane*** to ***Waipio***." The Monday following your Excellency's departure from Kohala Mr. Low started for Hamakua to examine the other end of the route he says the battle is to be fought in the west palis of Waipio and the east palis of ***Waimanu***. The intervening 11 or 12 gulches need simply to have the trail cleaned out and drained in some places the grade is fairly good. From personal knowledge of the gulches in the Kohala side and Mr. Lows report of the conditions of the Hamakua end of the trail I am bound to report that while it is practicable to build an easy graded trail along the proposed line, yet owing to the steepness and depth of the gulches the ups and downs and zig zags would increase the distance over double what it is as the crow flies, and such a work properly done would cost from ten to fifteen thousand dollars. Hence I have deferred further work until hearing from your Excellency. There are many reasons why we would like to see the trails commenced and ultimately carried through. For instance it would further the ends of justice in enabling the police to patrol what is now a secure fortress for Illicit Distilleries, Resort of Lepers, Runaway Plantation Hands etc. etc… [HSA – Interior Department, Roads]

H.P. Wood, Kohala Road Supervisor, to
L.A. Thurston, Minister of the Interior
January 18, 1889:
…Though the weather has been some what rainy of late we have been able to make good progress with our road work.

Word received by me from Mr. Low today reports his party at the bottom of ***Honokea*** having cut a trail across the ***Awini*** and down the west side of Honokea that is they have done such work as will enable them to carry supplies along and every spade of earth through out is in the direct line and not a waste of time or money. Before the party reaches ***Honopue***, I will take a trip over the route and personally inspect same… [HSA – Interior Department, Roads]

February 28, 1889
J.F. Brown, Hawaiian Government Survey;
to L.A. Thurston, Minister of the Interior:
…I beg to report: ***Honokane*** is not to my knowledge a Government land either as a whole or in part. There is however a considerable tract of land between Honokane and Waimanu, comprising the following lands. "*Laupahoehoe*" (not the Hilo land), ***Nakooka, Apua, Waikapu, Honopue*** and ***Awini 1 & 2***.

These lands constitute a rugged mountainous tract, largely inaccessible, and unsurveyed.

By means of the names above given Mr. Wood may be able to identify some locality that would suit him, and for the purpose which he desires the lease, I see no objection to granting the same for any reasonable term, and provided any fit description could be given… [HSA – Interior Department, Lands]

March 13, 1889
J.W. Kapololu (Resident at Waimanu); to
L.A. Thurston, Minister of the Interior:
Aloha ia oe.

1. Your Excellency will please be considerate to the pitiful voice of your humble servant.
2. That a portion of the Government land situate at ***Honopue***, which joins ***Honokea***, the end of the boundary of Hamakua.
3. That these portions of land, being ***Honopue nui***, and ***Honopue iki***, have *awa* on these lands, that I have heard that some persons from Kohala have been getting it underhandedly.
4. Therefore, my request to you that you will be kind to me, and that I be the agent to look after these Government lands, as herein below set forth.
5. ***Laupahoehoe iki***, ***Nakooka***, ***Apua***, ***Kawaikapu***, ***Honepue nui***, ***Honopue iki***, ***Honokea***, end of the boundary of Hamakua, it may be that you remember these Government lands, and if these things are not proper.
6. Which is state to you, please make reply, and if it is all right, reply also.
7. Here is this, I received your letter and also Rowela's concerning the matters pertaining to the Road, and I have met with Hon., [Horner, Hāmākua Road Supervisor at the time] and he consented.
8. And I am commencing to fix the Road… [HSA – Interior Department, Lands]

March 8, 1889
H.P. Wood; to L.A. Thurston, Minister of the Interior:
By this weeks "*Kinau*" I am sending you a sample of coffee grown in ***Honokane Gulch***. There are a number of trees distributed throughout the gulch, clean, healthy, thick and bearing freely. Kindly have the sample tested by Honolulu Coffee Experts and let me know how it compares with that grown in Kona.

If there is government land in Honokane that can be obtained by purchase or by a long lease please let me know, and if practicable I will endeavor to start a small coffee plantation there, putting a reliable Portuguese in charge. If no land is at that point for sale or lease can you inform me if there is any between that point and ***Honopue***. I am willing to pay for a tracing of your latest and most reliable surveys of any land or lands you may deem fit for any purpose… [HSA – Interior Department, Lands]

Kohala, Hawaii
March 14, 1889
H.P. Wood; to L.A. Thurston, Minister of the Interior:
…Upon receipt of your letter dated 8th Mch. I immediately recalled Mr. Low who had reached ***Honopue gulch***. In fact he had established a grade half way down the gulch. Thus far Mr. Low has confined his efforts to cutting a mere trail in the best obtainable grade between Honokane & Honopue. The work has occupied more time than I thought as Mr. Low encountered sundry difficulties in the various gulches but he has established a good grade for a horse trail. By next "*Kinau*" I will forward his report in full. If it is your pleasure we will at once commence work on the grade mapped out by Mr. Low starting at Honokane and making a good road as far as the money appropriated will admit.

The dry spell still continues enabling us to accomplish quite an amount of road work. In fact taking advantage of the favorable weather has caused us to draw somewhat more heavily than anticipated… [HSA – Interior Department, Roads]

March 25, 1889
J.W. Kapololu (Resident at Waimanu), to
L.A. Thurston, Minister of the Interior
Aloha ia oe.

1. I heard again from my son that there is *awa* on ***Honopue iki***, on the side adjoining ***Honokea***, and that this *awa* was discovered by the road laborers. The road is now at the *Pali* of Honopue these days.
2. I believe that the *awa* will all be taken by the ones from Kohala when the road is in shape. This is what I suggest, that you publish notice in the newspapers to those of Kohala and here of Hamakua… [HSA – Interior Department, Lands]

April 9, 1889
Waimanu, Hawaii
J.W. Kapololu; to L.A. Kakina (Thurston), Minister of the Interior:
…I have duly received the honor from the Interior Department, that is the Commission which was written on the 22nd day of March, 1889.

And I also received another letter written on the 1st day of April, from the Interior Office. This is what I report to you. I have sent three notices to Kohala, on the doors of the stores. There is another notice at Honokane.

Here is another matter to report to you, if you will be agreeable: That you have my name placed in the list of jurors. For the Nov. term, at Waimea, because, I was a juror in 1875, in the month of October 2nd. And to prove it, I send this document so that you will be satisfied, that I was in this work before. And you try hard so that I will be in the jury of this year, you must not forget.

And will Your Excellency please send a box of giant powder for our road, because, if I go to get it from Hon's. place, he will only give three sticks, and so forth. Therefore, you send a whole box for us, so as to finish the bad places. And you address it in the name of Hon., Kukuihaele, and you let him know, that that box belongs to me. [HSA – Interior Department, Roads]

September 19, 1889
B. Bond, Kohala Road Supervisor; to L.A. Thurston, Minister of the Interior:
…The appropriation for the ***Honokane*** and ***Honokea*** Road having been exhausted, we have ordered all tools brought in and stored.

It is the unanimous opinion of the Board that time and labor and money have been thrown away on that road, and that the best thing that can be done is to stop it henceforth and forever.

When our main line of travel have been properly opened, and our district roads made good from limit to limit, it will then be time enough to hunt up such a scheme to work upon. Few intelligent men in this community could be brought to favor that road, unless from personal motives… [HSA – Interior Department, Roads]

August 16, 1897
J.F. Brown, Commission of Public Lands;
to J.A. King, Minister of the Interior [Figure 5]:
…I beg to call your attention to the sketch map enclosed herewith, which show outlined in red certain lots laid out for cultivation and settlement on the land of Awini, N. Kohala. The majority of these lots have already been applied for and Auction Sale of same will shortly be made.

A rough trail from Niulii Kohala, reaches the lower Awini land, occupied by Awini Ranch Co., but no road or trail exists to these upper Government lots, though such road or trail is a prime necessity in the development of these new Government lots.

Mr. W.V. Rodenhurst of Mahukona, has, through our Sub-Agent Mr. Williams in Hamakua, made an offer to construct a trail over the line of the road surveyed by A.B. Loebenstein (from A to B of sketch) for sum of $350. His offer to this effect is herewith enclosed.

The distance between the points A and B is about 3 ½ miles.

The appropriation under which this office has heretofore performed work of this nature, for the opening up of Government lands, is now exhausted, but I understand that an appropriation exists in the Interior Department, “New Road Honokane Nui Gulch” of which some portion might be applied to construction of this trail. This appropriation as I understand, was made for the special purpose of making accessible the Awini lands about the time that petition was received for dividing up the same, the Honokane-nui Gulch being one of the obstacles in the way, but not as I understand, the only object of the appropriation. I would therefore respectfully refer this matter to your department hoping that it may be possible to meet the wants of intending settlers at an early date. And in same connection, enclose a deed from Awini Ranch Co. conveying a right of way through their fee simple lands. This deed was executed by the Awini Ranch Co. on their own volition and no formal acceptance of same has been made. Such right of way however it is desirable for the Government to have… [HSA – Interior Department, Lands]

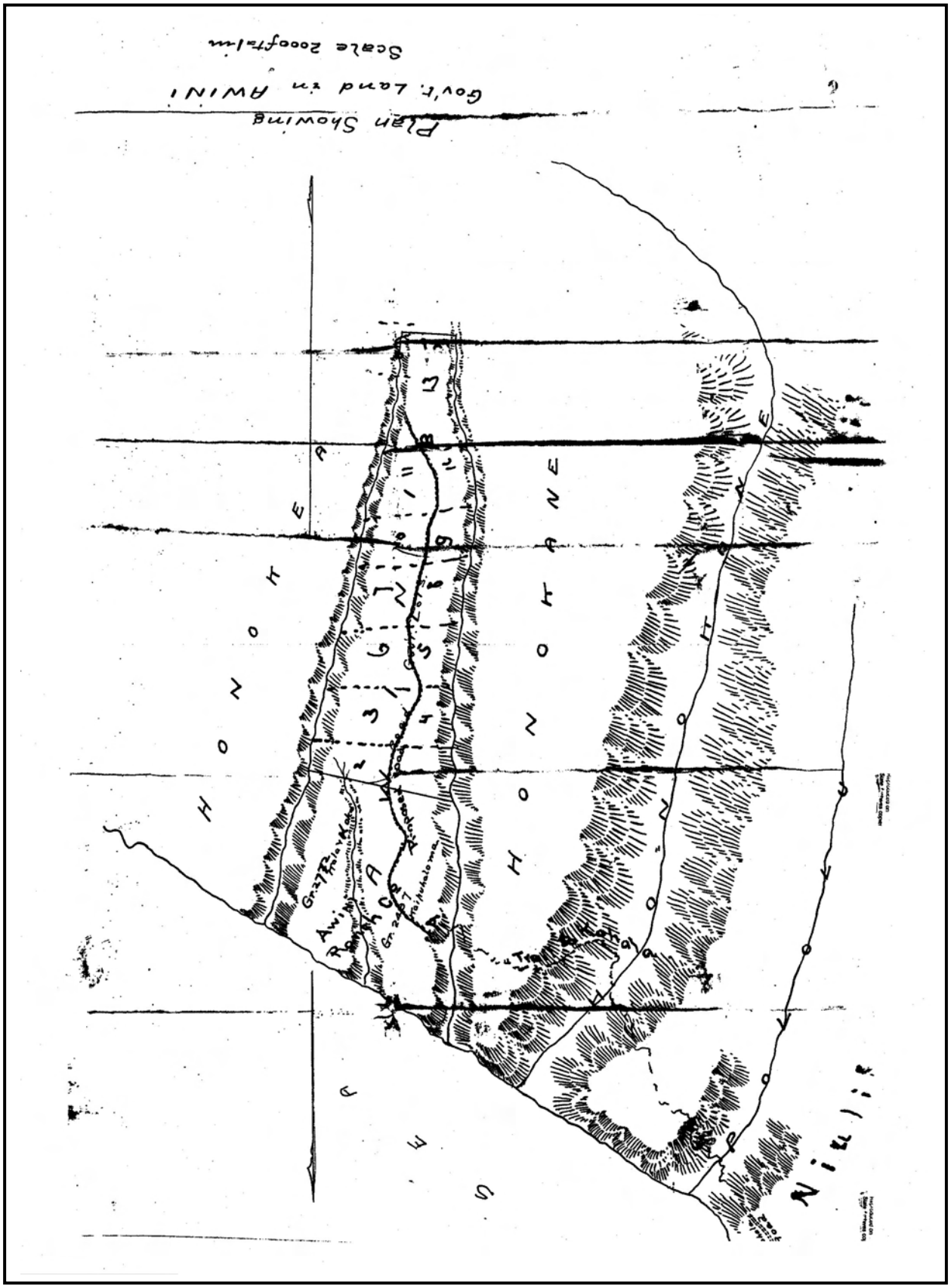

Figure 5. Plan of Awini – Homesteads and Proposed Trail to Uplands (J.F. Brown, 1897)

COMMERCIAL DEVELOPMENT OF WATER RESOURCES FROM THE KOHALA-HĀMĀKUA MOUNTAIN LANDS

This section of the study provides readers with a history of water development on the Kohala-Hāmākua mountain lands. As discussed later in this study, the approach to forestry matters was particularly driven by the desire to ensure that water could be maintained and harvested from the mountains. The efforts of developing water producing systems both pre-dates, and post-dates, establishment of the Kohala and Hāmākua Forest Reserves.

In traditional times, water resources from the mountain lands on both the Kohala and Hāmākua sides, were developed into a system of *ʻauwai* that fed *loʻi* (pond fields) and dry land agricultural activities. In this traditional system, the water drawn off from the streams almost always remained on the land of origin, and unused portions were returned to the stream sources. This ancient system supported both land-based activities and enriched the stream and near shore fisheries.

With the advent of western business interests and development in the region, water usage was increased, and both the ranches and plantations sought to develop a means of transporting the water greater distances to increase the productivity of marginal lands. By the 1880s, interests in Kohala and Hāmākua began investigating the possibilities of developing water resources from the Kohala-Hāmākua mountain lands as a transportable commodity. These efforts led to the development of the Kohala and Hāmākua ditches. In 1889, J.M. Lydgate was under contract to the Kingdom Survey Division, working in the Kohala-Hāmākua districts. His work resulted in the mapping out of the ditch alignment depicted in Register Map No. 1810. Interest by the Kingdom in development of the ditches was described in the letter cited below:

> ***July 11, 1889***
> ***L.A. Thurston, Minister of the Interior; to J.M. Lydgate, Surveyor:***
> …Professor Alexander spoke to me a short time since about your fixing a few stations in the Kohala mountains while there, and said he had written to you on the subject, but that you wanted authority from this office.
>
> As I understand from him, the points desired are in your immediate vicinity will require but little time to fix and could also be used in fixing the location of your ditch.
>
> As the main expense of fixing the points is getting to them, and the work is germane to that you are at present engaged in and can be made useful in connection therewith, I think it is proper that you should do anything of the kind which comes under the above description and which does not to an unreasonable extent interfere with the main object of your expedition.
>
> RE: Kohala Water.
>
> Are you positive that you will be unable to explore the Kohala side? If you can explore sufficiently to ascertain whether there is water enough which can be brought out to make it worth while to do so, I should like it even if you do not have the time to run the line out to Kohala. The Kohala people are getting anxious about the matter. If you cannot, who, if anyone can you recommend?
>
> RE: Waimea Water.
>
> I do not think this water is available for Hamakua except in rainy weather as in dry times there is none to spare from this stream. I suppose you know that Schussler's plan was to run the water from other stream into the Waimea stream making use of it as an aqueduct, and taking it out again lower down… [Parker Ranch – Water File]

A chronological history of the early ditch development in the region was compiled by Parker Ranch's A.W. Carter, and provides the following references to key dates and activities:

> ***Kohala Ditch***
> 1883-1884. Plan to use Hamakua side of watershed for plantations.
>
> 1888-1889. Lydgate suggests ditching on upper portions of lands, under Government, for use by Hamakua plantations. Says 7,000,000 gallons daily could be obtained to be used for fluming and domestic purposes. This from Waipio stream, but not to exceed one-one hundredth of Waipio system.
>
> 1901-1902. Bernice Pauahi Bishop Estate makes exhaustive report on Honokane and Waipio conditions. Especially valuable because made during recent severe drought.
>
> 1901. Sam Parker applies for franchise for ditching for homesteaders and plantations. Immediately many others apply. For three years matter is thrashed out between Honolulu and Washington.
>
> 1905. Sam PArker and associates become purchasers. It is stated that the plan is sometime later to establish high reservoirs to carry off storm waters. Hawi-Honokaa, elevations 950 to 1000 feet would supply 19,000,000 gallons daily.
>
> April 12, 1905. J.S. Low pays $1,000. The area is detailed as North Boundary. The sea, etc. The boundary reaches the 4,200 elevation contour line of Kohala-Hamakua Watershed. Notice of License is given, with particulars as to districts to be supplied by 19 months, 3 years, 4 years. (1) Private Customers; (2) Homesteaders for agriculture; and (3) Plantations.
>
> Later, a license to John W. Jones, Honolulu, appears with full detail, not a franchise. East, the summit separating Waimea Watershed from Kohala Watershed, called Kohala Watershed. Earth, rocks, trees to Jones.
>
> > "License to Jones – The license shall divert no water draining toward Waimea, nor in any way interfere with the sources of water supply of Waimea. The waters on the watershed draining from the Kohala Mountains in a northeasterly direction. The Government of the territory of Hawaii shall fix the dividing line between the Waimea Watershed and the Kohala Watershed, herein before described, it being expressly understood and agreed that should any swamp exist near such dividing line, the waters of which may be deemed by the Government to effect in any degree the water supply of Waimea, such swamp shall be excluded from the Kohala Watershed and its waters shall not be diverted by the Licensee."

Before extensive and sustainable ranching activities could be developed on Parker Ranch, the issue of water resources needed to be addressed and resolved. In the 1890s, the ranch, under John Parker II and manager, Paul Jarrett, began work on a pipe-line system, that transported water from the Kohala Mountains to a few areas on the drier Waimea-Waikōloa plains. But for the most part, livestock on the Mauna Kea mountain lands relied on dew and seasonal rainfall. By 1900, the lack of water in the large, dry region lands of the ranch had almost stopped further growth and development of grazing lands.

A.W. Carter became trustee of the Parker Estate interests of young Annie Thelma Kahiluonapuaapiilani Parker in 1899, while the other half of the estate remained with heir, Samuel Parker. Shortly after his appointment, Carter visited the ranch and conducted an inspection of ranch

assets. Reflecting on the visit, Carter shared his recollections with his assistant, Lucille Brundage, observing that he was—

> …Impressed by the idea that if the ranch was to prosper to its fullest possibility several pressing needs should have immediate attention. More lands must be acquired to provide for increase in the herds. Separation by fencing, and the importation of better breeds would improve the stock. Perhaps most essential of all was the necessity of a piping system to carry water from the mountains for distribution over pasture lands.
>
> The region where cattle had suffered most from this need was that below Waikii. "There were not many head", Mr. Carter said in his reminiscences, "but they had to walk away to Waimea to the stream back of Puuopelu to get a drink of water – a distance of from six to ten miles. This, of course, resulted in plenty of dead cattle in dry weather."
>
> Near the water sources at these times the ground would be so trampled that no vegetation remained upon which the cattle might subsist, and they would make their weary way back to their usual feeding grounds. This perhaps they would have done by instinct anyway. Weakened as they were, the long trips to and fro meant exhaustion and death for many of their number.
>
> Eager to take steps toward improving these conditions, Mr. Carter returned to Honolulu. But as guardian of little Thelma he represented only half of the ranch interest. No important step could be taken without the approval of the other partner, Sam Parker, and when the plan was submitted to him Mr. Parker was strongly opposed to its adoption. The piping system that was needed would mean an expenditure of thousands of dollars, and he objected to the proceeds of the ranch being diverted this way instead of being available as cash. Moreover he consulted certain Honolulu engineers and was assured that the scheme was not feasible. With pipes laid according to the Carter plan, friction would be so great, they said, that not a drop of water would ever emerge at the end of the line.
>
> Far from admitting the authority of these would-be experts, Mr. Carter decided to become an authority himself. He obtained all possible literature on hydraulics, made a careful study of the subject, and became more strongly convinced than ever. Indeed he guaranteed that if when completed the pipe did not furnish 7,000 gallons in twenty-four hours he would pay for it himself. An agreement with Mr. Parker was reached at last and the work promptly begun.
>
> The pipe line was completed April 14, 1902 and proceeded to justify itself by sending forth 15,840 gallons of water in twenty-four hours. [A.W. Carter Water files, in collection of PPS]

Following A.W. Carter's appointment as trustee of the ranch interests on behalf of Annie Thelma Kahiluonapuaapiilani Parker, Samuel Parker, grandson of J.P. Parker I, cousin of A.T.K. Parker, and owner of the other half share of the ranch assets, fell at odds with Carter. By 1900, Parker began to seek out ways by which to remove Carter and gain control over the combined ranch assets. There appear to have been four primary areas of leverage sought by Sam Parker and associates in their bid for the ranch—the first was water; the second, the land of Waikōloa (including the Waikiʻi and Keʻāmoku sections); the third, guardianship over Annie Thelma Kahiluonapuaapiilani Parker; and the fourth, acquisition of the leasehold interest in Humuʻula and the Kalaiʻeha Sheep Station.

On the first two of these items, A.W. Carter observed:

> On my first visit to the Ranch I found the place undeveloped in every way.

But for the short line of pipe from Kohala mountains there was no distribution of water. Some cattle had to travel fourteen miles to get a drink of water and return fourteen miles out of their grazing ground.

Waikii paddocks had no water for the steers held there. The fattening paddocks had no water.

I told Mr. Sam Parker that there were two things that should be done immediately; one was to acquire the land of Waikoloa which had a very short lease; the other was to get water across the plain to below Waikii, as cattle in that neighborhood, although there were not many head, had to walk a ways into Waimea to get water at the stream back of Puuopelu, from six to ten miles distant.

Mr. Parker agreed that both things should be done.

Later.

Regarding the pipe line Mr. Parker repudiated this, and said he wanted all the profits and didn't want anything expended for improvements. I told him I could borrow the money. He absolutely refused to give his consent.

He then talked with some of the surveyors in town who knew nothing of hydraulics and they contended that if I went ahead with this scheme that there would not be a drop of water come out of the other end of the pipe.

I had prepared myself for this connection and I told him, that unless a certain amount of water was obtained at that end of the long pipe in twenty-four hours I would pay for it myself. (My recollection is that I said 7,000 gallons within the twenty-four hours.)

The quantity which flowed at the end of the pipe when completed was 15,840 gallons per twenty-four hours.

Some time afterwards he, Parker, came to my office in Honolulu and wanted $5,000 as he wanted to go to Washington. I thought of the pipe line. I told him there was no profit on hand, I had paid him his share a few days before. He asked if I could not let him have the money myself. I told him I could go out and borrow the sum and loan it to him if he would give his consent to putting in the pipe line which I was anxious to do. His reply was that it was a hold-up proposition, to which I said if he so considered it I would not raise the money for him.

A few days later he came in and said he had been thinking the proposition over and would give his consent, and wanted the check for $5000, which I borrowed and turned over to him.

The pipe line was completed April 14, 1902. [A.W. Carter Water files, in collection of PPS]

In 1902, A.W. Carter wrote to Fred Knight, regarding the matter of land and water, and a proposal by Samuel Parker to develop and maintain a ditch system in the Kohala mountains, to transport water into Hāmākua. Carter expressed concerns about the proposed ditch companies in the following letter:

January 1902.
The land of Puukapu has an unexpired term of 11 ½years. The lands was originally leased to J.P. Parker and was held as a partnership property by the Parker Ranch…

It would be detrimental to the interests of all property owners on this end of the island of Hawaii to allow any person or company to have absolute control of these waters. The power to divert water on the mountain will be extremely dangerous to any present property holders.

Water should be allowed to flow in its natural course where it is being utilized. Of course the waters that run down into the streams of Waipio, Waimanu and Honokane, and other gulches that run into the sea, should be used if possible, and we have no objection as far as Parker Ranch is concerned to utilizing these waters, but the natural flow of water on the top of the mountain should not be interfered with.

I am sending you a map which will give you a rough idea of the situation. You will notice the lands of Puukapu and Crown Kawaihae, also leased to Ranch, include most all of the watersheds of the Kohala mountains, the heads of the ravines and gulches being the boundary of Puukapu and Kawaihae.

It is possible that such a Company as is proposed to be formed will have the power to condemn property such as this for their purposes. If this is possible, it will be, I consider, very detrimental to the interests of Thelma. Should this franchise be granted, even if they should not have such powers, it will only be a question of time when they will control the situation… [Parker Ranch, Water File]

Being that timing for the efforts of establishing the Kohala-Hāmākua ditches and Hawaii Ditch Company came shortly after Hawai‘i was declared a Territory of the United States, action on the matter was forwarded to the 57th Congress, where a bill was introduced as House Resolution 9307:

January 15, 1902.
Mr. Wilcox introduced the following bill; which was referred to the Committee on the Territories and ordered to be printed.

A Bill
Granting to the Kohala Ditch Company, Limited, the right of way over public lands in the Districts of North and South Kohala, in the island of Hawaii, for the purposes of constructing and maintaining ditches or canals and the necessary reservoirs, dams, and the like for irrigation and domestic purposes in said districts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled;

That the Kohala Ditch Company, Limited, a corporation duly organized under the laws of the Territory of Hawaii, its successors and assigns, be, and is hereby, granted the-right of way to construct and maintain two ditches, to be known as the Upper Kohala Ditch and the Lower Kohala Ditch, said Upper Kohala Ditch to begin at or about the elevation of four thousand five hundred feet on the land known as Puukapu, and said Lower Kohala Ditch to begin at or about the elevation of two thousand feet on the land known as Muliwai, each of said ditches running through and over the public lands in said island of Hawaii, Territory of Hawaii, within 'the following described area, to wit: Bounded on the north by the sea, on the east by Waipio Valley and the summit separating the Waimea Watershed from the Kohala Watershed, on the south by the summit of the Kohala Mountains, and on the west by Pololu Gulch, said area being known as the Kohala watershed, and through, over and upon such other public lands in the districts of North and South Kohala and Hamakua as may be necessary to properly supply the consumers of water, and for the conservation and utilization of waters now running waste into the sea; also the right to construct and maintain reservoirs, dams, impounding embankments, tunnels, feeders, waterways, flumes, inverted siphons, pipe

lines or such other works as may be necessary to conserve and convey the waters of the Kohala watershed along or across said public lands. Said right of way shall be to the extent of the ground occupied by such ditches or canals and reservoirs and their laterals and fifty feet on each side of the marginal limits thereof. The said Kohala Ditch Company is also granted the right to take from the public lands adjacent to the ditches or canals and reservoirs such earth and stone or other material as may be necessary for the construction of the same.

Sec.2. That said Kohala Ditch Company may institute in the United States district court for "the Territory of Hawaii proceedings for the condemnation of such private land as may be necessary to cross and use in constructing and maintaining the ditches or canals and reservoirs as herein described whenever said company and the owners of any such lands fail to come to an agreement in respect thereto.

Sec. 3 That the work of constructing said ditches or canals and reservoirs shall be commenced within two years and completed within six years from the date of' the approval of this Act; and in default of either of these conditions Congress may declare the rights herein granted null and void. [Parker Ranch, Water Files]

Samuel Parker succeeded in securing the lease and forming the partnership which developed into the Kohala, Hāmākua and Hawai'i Ditch Companies. In 1906, J.T. McCrosson, manager of the Hamakua Ditch Company described the history of the water and ditch development on the Kohala-Hāmākua mountain lands in the following letter:

July 30, 1906
J.T. Mcrosson, General Manager, Hamakua Ditch Company;
to Geo. R. Carter, Governor of the Territory of Hawaii:
…Answering your inquiry for information regarding water development for irrigation purposes by Kohala and Hamakua Ditch Companies on the Island of Hawaii, I beg to submit the following:

The plantations of the Kohala and Hamakua Districts are among the oldest and have been in years past among the most productive of non-irrigating plantations on these Islands. Owing to the destruction of the forests on the highlands behind the plantations, the rainfall during the last 25 years has been constantly decreasing and, notwithstanding an increase in acreage, the annual output in sugar has greatly diminished.

The Kohala Mountains between 4,000 and 5,000 elevation, and lying directly in the path of the rain clouds forced by the trade winds between the high mountains of Maunakea on the Island of Hawaii and Haleakala on the Island of Maui, furnish one of the best watersheds on these Islands.

It has long been the desire of the various plantations in Kohala and Hamakua to obtain a water supply for domestic and irrigation purposes because during many of the seasons of drought the Hamakua plantations particularly have been compelled to cart water from the mountain streams for the purpose of supplying their laborers and animals with this most needful liquid.

One of the first attempts to investigate the watershed under discussion was made during the summer of 1880 when Geo. C. Williams, then-Manager of the Kohala plantation commissioned the writer to ascertain the feasibility of obtaining water for fluming purposes for the above plantation. A most bountiful supply was found to exist in the numerous permanent streams, but owing to the excessive cost of bringing the same out to the plantation and the lack of cooperation among the various interests in

Kohala, Mr. Williams abandoned the proposition.

In 1883 or 1884 Mr. H.P. Baldwin in company with Mr. Schussler of San Francisco, made a partial investigation of the Kohala Mountains from the Hamakua side for the purpose of furnishing water to the plantations in Hamakua. Owing to more important business requiring Mr. Baldwin's attention on Maui, the investigation was dropped.

In 1888-1889 the Hawaiian Government through Mr. J.M. Lydgate made a thorough examination of the upper portion of the Kohala Mountains in Hamakua for the purpose of furnishing water for fluming and domestic purposes on the Hamakua plantations. Mr. Lydgate found that a daily supply of about 7,000,000 gallons could be obtained from the high elevation where he proposed locating his ditch. This water would have come from the Waipio streams, but he stated that it would not in any way interfere with the valleys below, as at no time would the 7,000,000 gallons proposed to be taken exceed the 1/100 part of the Waipio system.

The next investigation was made in these mounts, conducted by Mr. W.W. Bruner in 1892, for the Hawaiian Government and was made from the Kohala side of the mountains for the purpose of furnishing a domestic supply for the plantations and homesteads in the Kohala District. This survey, like that of Mr. Lydgate was made near the top of the watershed under investigation, and to keep up the parallel, the report and maps were carefully stored away in the archives of the Minister of the Interior.

The impetus given the sugar business by Annexation to the United States caused some of the plantations in Kohala to install expensive pumping machinery to raise water for irrigating their cane lands. This indication that the plantations were in earnest in their desire for water, induced the writer to visit Hawaii in 1900 and to make a more extended investigation into the quantity of water to be obtained and the approximate cost of conducting the same to homesteaders and plantation consumers. After spending several months studying the situation, I became convinced that it would prove a good commercial proposition to conserve the mountain water then running waste to the sea, leading it to consumers in the districts East and West of the watershed.

During 1901 and 1902 the Bernice Pauahi Bishop Museum Trustees and the Trustees of the Bishop Estate made the most thorough and exhaustive examination of the Waipio and Honokane water resources that has ever been made in the Kohala Mountains. Very fortunately this investigation was made during one of the most severe droughts that has been recorded in Hamakua or Kohala and the data can be relied upon as being the minimum flow of the streams gauged.

Early in 1901 an application was made by Col. S. Parker, the lessee of a considerable portion of the Kohala Mountains, to the Territorial Government for a franchise or license to take the water from the Government land in the Kohala Mountains for the purpose of conducting the same to homesteaders and plantation consumers. Almost immediately after it became known that Col. Parker and his associates had applied for a franchise, to develop the water in question, numerous other applicants and claimants appeared, all asking for the franchise and expressing their willingness to spend their time and money for the benefit of the people of Kohala and Hamakua. After three years of investigation in Honolulu and Washington as to the rights of various claimants, the matter was brought to an issue by the Territorial officials submitting the franchise to Public Competition at an upset price. The agent of Col. Parker and associates became the purchaser, and in the latter part of January 1905, work was commenced on the Kohala Ditch.

This ditch consists of two sections. The first section from Hawi Plantation to Honokane, the first large mountain stream, is 13 miles in length and consists of 9 miles of tunnels, 1/2 mile of fluming and 4 miles of open ditching. The tunnels and open ditching are all lined with concrete or stone, set in cement mortar making a permanent job and reducing the seepage to a minimum. This first section was completed June 1 (1906), of this year and is now supplying its consumers with an average of 19,000,000 gallons daily. The ditch has a capacity of 70,000,000 gallons daily and delivers the water on the plantations at an elevation of between 1000 and 950 feet.

The second section of the Kohala ditch runs easterly from Honokane to Laupahoehoe #2, and is 6-1/2 miles long, being nearly all tunnel. This work will be completed early in 1907, and will furnish sufficient water to develop at least 6000 acres of new land between Hawi and Mahukona. There are many thousands of acres of good land belonging to the Government which will be made most valuable by the completion of the Kohala Ditch proper; and by the construction, later of an auxiliary ditch at much higher elevation which will be capable of carrying off the storm waters in the mountains and storing them in suitable reservoirs from which they can be conducted to the homesteaders and planter below. The present ditch (1906) is capable of caring for only a small portion of the water that at times runs waste to the sea.

In March of the present year the Hamakua Ditch Co. began the construction of the Hamakua Upper Ditch which will take water from the Kohala Mountains in Puukapu for the use of the homesteaders and planters in Hamakua, to flume the cane from the highlands to the mills. This ditch will mean success to the many homesteaders now located in Hamakua. The cost of carting their cane to the mills is so great that many of them have been compelled to give up planting; but with the prospect of obtaining water for fluming purposes, many of the people are again going into cane planting. I may here mention that the management of the plantations in Hamakua are doing everything in their power to encourage the homesteaders, offering them free water for fluming, and remunerative prices for all cane grown by them.

The Hamakua Lower Ditch has not gone further than the preliminary surveys. Actual construction work will probably be commenced within the next 2 months. The completion of those 2 ditches in Hamakua will mean much for that district, insuring a good crop annually and taking the plantations out of the speculative category in which they have been for so many years.

The combined cost of the Hamakua Upper and Lower Ditches will exceed $1,000,000.00.

Trusting that this outline of the work done and what is being done in the Kohala Mountains answers your inquiry… [Parker Ranch, Water Files]

While Parker and Carter both vied for control over water, lands, and other trust assets, in 1902, Sam Parker, cousin Eben Low and backers set in motion plans to take over the ranch and remove A.W. Carter. Their first action was to contest Carter's trusteeship of Annie Thelma K. Parker. Parker and party also bid, unsuccessfully, on the Waikōloa lands from heirs of the Davis Estate, and attempted to demonstrate that expenditure of Parker Estate funds on the development of the water lines for the ranch was a waste of assets. Things got so heated between Sam Parker, his partners, and A.W. Carter, that a take over was attempted, and on June 7th, 1904, Eben Low, J.A. Magoon, and J. Lightfoot stormed Carter's office, with Low apparently brandishing his pistols (A.W. Carter & Parker files 1904). Things were heated, but no shots were fired. Subsequently, John "Keoni Poko" Lindsey (father of *Kupuna* Elizabeth Lindsey-Kimura) slept in Carter's office, armed, in case of an attack.

In response to criticism and subsequent litigation over trusteeship and waste of ranch capital in the development of water lines and paddocks, numerous communications between A.W. Carter, Fred

Carter (A.W.'s brother, and assistant in the daily management of ranch operations), and Mrs. Elizabeth "Tootsie" Dowsett Parker-Knight (mother of A. Thelma K. Parker) were recorded. Also, as litigation heated up, numerous testimonies by ranch employees describing conditions on the land and ranch operations prior to the availability of reliable water sources on the ranch were taken.

Several communications from the period between 1900 to 1909 are cited below in chronological order, with particular emphasis on development of water resources. Unless otherwise noted, all records cited were viewed in the collections of the Parker Ranch and Paniolo Preservation Society, under such headings as—Water, Cattle, and Employees:

1900 - A.W. Carter Notes on Inspection of Water Resources, and Proposed Development of Water Lines:
From a pool in this stream [Waikōloa], about 1 ½miles North of Waimea, the stream has a steep descent to the plain. Above this pool it is flat, so by locating the head of the pipe nearly a mile above, but little will be gained in elevation.

This pool, and proposed head of pipe, is lower than the Waikii paddock.

The water can be delivered at a point 8700 feet distant, northerly from Paddock # 2.

This requires a pipe 52,600 feet, or ten miles long. The fall, as indicated by aneroid, is 170 feet. Under these conditions a 2 inch pipe will deliver 20,000 gallons in 24 hours. A 1 ½inch pipe will deliver 10,000 gallons. The pipe will be 1800 feet shorter. The objection to stopping the pipe at this point is its greater distance from the paddocks.

The water should at all times be allowed to flow freely. There should be no stopcock in the pipe (the main pipe).

The utility of this pipe can be much increased by making one or more reservoirs to store the water which otherwise would run to waste. An asphalt lining would be suitable for such reservoirs…

1901, April 23. (A.W. Carter to F. Carter) – Mr. Howell takes the steamer today for Parker Ranch. I have requested him to examine the water supply on the Kohala side and to run levels for a pipe line across the plain to the direction of the Waikii paddocks; also to run levels from the spring on the Paauhau side towards the Dairy [Puʻu Kīkoni]. Mr. Wall will go up next week on the Kinau for the purpose of locating all boundaries and laying out all paddocks on the map [see Parker Ranch Map dated, 1901].

1901 (ca. May). W.A. Wall to A.W. Carter:
Report on Surveys and Investigations for Piping Water from Kohala Mountain to Waikii Paddock, Parker Ranch.

The most practical point for taking water from the mountains is at the head of the rapids on Waikoloa Stream, 1 – ¾miles north of Waimea Village, at or near a point recommended by Mr. Kleugel. See accompanying sketch of water head. The line was staked out from this point to a point within 8,300 feet of Waikii Paddock. Three terminal stations were located and marked by stakes marked T. No. 1, T. No. 2, and T. No. 3 respectively.

Estimates of flow were made at each point as follows:
Estimated flow through a two inch pipe from water head on Waikoloa Stream into a tank at T. No. 1 – 16000 gallons, to T. No. 2, 14000 gallons and to T. No. 3, 10000 gallons per 24 hours. 10000 gallons per 24 hours being sufficient supply for Waikii. T. No. 3 which point is marked by stakes is a preferable location for tanks and watering

troughs as it is the nearest possible point to paddock to which water can be brought from the adopted water head. The following estimates refer to T. No. 3 as terminus:

Distance from water head to terminus	53,800 ft.
Length of pipe required	54,300 ft.
Assumed elevation of water head	1,000 ft.
Elevation top of entrance tank	997 ft.
Elevation of outflow top of tank 12 ft. high	897 ft.
Total head	100 ft.
Estimated flow per 24 hours	10,000 gal.
Greatest pressure per sq. inch	380 lbs.
Average pressure per sq. inch on pipe across plains	360 lbs.
Distance from terminus to Paddock	8,300 ft.
Elevation of Paddock gate	1,530 ft.

or 645 feet higher than proposed terminus:

Waikii Paddock being higher than any practical point for piping water from Waikoloa Stream, levels were run and investigations made up stream just back of Thos. Lindsay's place. On this stream an elevation 300 ft. higher than adopted water head can be had, but this supply at this elevation in extremely dry seasons would be doubtful. It would require about 1 ½miles longer pipe on the mountain end and it would be a difficult and expensive task to get pipe in place on mountain. Taking water from this stream at the above mentioned point it could be raised to a point marked A on the accompanying profile which is about 4,800 feet from Paddock or 3,500 feet nearer than adopted terminus.

Considering the additional cost, additional pressure on pipe and doubtful supply of water, it is not economic to take water from this stream in preference to Waikoloa and all further remarks are directed to the Waikoloa Stream.

If it should be necessary to take water from main pipe at any intermediate point or points as B and C (indicated on profile) the only practical method of doing so would be to establish large tanks or reservoirs at desired points, connect them to main with full two inch connections. Place stop valve near and on Waikii side of tank connections, said valve to be closed immediately when water is turned into tank or reservoir. In filling tank or reservoir, allow water to flow at full capacity of main pipe. The valve referred to will prevent Waikii end from emptying and immediately the water is turned through the main it will begin to flow at Waikii. The supply at Waikii will be diminished in proportions to time required to fill tanks at B and C. Ten Thousand gallons at B and C like amount, can be taken by this method in 12 hours leaving 12 hours uninterrupted flow as Waikii, or 5000 gallons during same day or a total of 25000 gallons per 24 hours.

Theoretically by means of automatic valves, or a steady flow at B and C water could be taken from the main at the rate of only 10,000 gallons per 24 hours leaving no or very little flow at Waikii. It would be necessary to have a careful man to look after filling of tanks. Distributions from tanks could be accomplished automatically.

Provision should be made for repairs in main, such as placing flange joints at intervals of 1000 feet or so apart or else keep in stock a number of such joints together with proper tools for fitting in said flange joints. A good quality of commercial galvanized wrought iron pipe would fulfill requirements. All valves inserted in main should be of full two inch openings.

In taking water from stream (see sketch of water head) it will be necessary to blast out a ditch 44 feet long and 3 ft. deep or sufficient depth to take supply without the use of a dam. A flume or 4 inch pipe should convey water to entrance tank marked on sketch.

Stakes were replaced for location of same.

A tank 7 feet in height to be placed where indicated by stakes. A screen must be placed over the top of tank which must be kept at overflow. The main pipe should enter tank two feet or so above bottom. In laying pipe from tank along gulch, care should be taken not to lay in over stakes at any point before leaving gulch…

1902, January 30. (to Mrs. Knight) – The 2 inch pipe line which is to be laid from back of Waimea to Waikii has arrived, and I have engaged one of the Myers boys from Molokai to attend to putting it up.

I believe this will be a great advance in improvement on the Ranch.

1902, April 18. (F. Carter to A.W. Carter) – Regarding water at Waikii, the pipe is now in the tank 17 ft. from the ground and is discharging at rate of 5 gal. every 24 seconds. (17,000 gal. per 24 hours).

1903, December 21. (F. Carter) – No water running in Waimea streams. Still water in water holes on way to Kawaihae. All feed at Kawaihae burned up. Cattle unable to get water at beach on account of high seas. Should have a windmill at Puako side of Kawaihae and one near our cattle pens.

Cattle at Waikii paddocks showed distress, so took them out and put them in Pa Kila with gates open to Pa Aalii where they can get water. Brush all drying up. Even *mamani* leaves hanging straight down.

No fog, no rain, no dew. In all the years I've been here have never seen it so dry.

1904, June 26.
Statement of John Lindsey, to W.A. Kinney (Translated):
Mr. Carter has done a great deal of piping, and particularly that to Waikii paddock. That is a fine fattening paddock that belongs to the ranch. It is on the slope of the mountain, but when dry weather came on the cattle died for want of water.

As long as the weather is not too windy the dews are sufficient to keep the animals supplied with water, but when it is windy and dry that fails and the animals die very fast.

They are so far away from the water supply at Waimea that it is impracticable to save them by taking them to water there. If they undertake the journey are apt to die right after drinking the water at Waimea.

Thousands of animals have died in that paddock from that cause.

But now that difficulty is overcome as water has been piped across to the paddocks, since which time the death rate has become merely nominal, perhaps two or three in a thousand, whereas previously they have been known to die so fast that the hides could not be saved from the carcasses.

This piping has also helped the land of Waikoloa *makai*. This is a country without any water or spring, but it is good land for the pasturing of animals.

Heretofore, as soon as dry weather would come on the animals had to leave so that the land would not be carrying stock.

Sometimes the animals would leave and go up to Waimea for water, and attempt to come back, but the distance would wear the stock out travelling to get water, so that the land was not available for stock as soon as the dry weather came on.

Now, however, this pipe line that comes to Waikii also supplies water for the stock at four points, and the result is that the stock is now able to remain on this land, which is good pasture land.

One result also is that the land now carries and sustains more livestock even in dry weather than it did formerly before the water was brought over, in wet weather…

1905 – excerpts of Paul Jarrett's Testimony:
When Waikii is dry the feed dries up there. If the cattle had water or moisture they would manage to exist, but at the Waikii paddocks we trusted to the dew entirely, for their water, which was quite sufficient.

The dew comes when there is no wind, but if the wind is blowing, that is when there is no dew, and the time the stock begins to settle.

Say about two weeks steady wind – the cattle will begin to feel the effects of it then. They have had the young weeds – grass – they get moisture from that, but after two weeks of winds blowing that all seems to parch up, and no moisture in it, and then the cattle begin to settle.

Three weeks wind would cripple that portion of the ranch very effectually. Waikii has the best fattening lands on the ranch. I considered it the cream of the ranch…

Litigation over right of trusteeship was decided on November 3, 1905, in favor of A.W. Carter as trustee. And the case regarding partition of assets was decided in September 1906, thus bringing an end to more than five years of disagreements and litigation. The result was that water flowed across the land to outlying regions, and A.W. Carter went on to develop Parker Ranch to its fullest potential.

As a result of the settlement, Carter fully developed the potential for collection and transport of water from the Kohala Mountains to the Waimea-Waikōloa plains. The development and description of resources is described in the following excerpts of communications and notes from A.W. Carter and other participants in the water development history of the Kohala-Hāmākua mountain lands:

December 7, 1906
J. Jorgensen; to A.W. Carter:
…As requested by you, the undersigned made a preliminary survey of a proposed pipeline from Alakahi Branch of the Waipio Stream said pipeline to connect with two existing pipelines across the Waimea plains to Waikii and Wahinekeahou, and begs to submit the following:

Intake:
Alakahi Stream 4007 feet above sea level; ¼million gallons following dry weather…

January 31, 1909
W.E. Rowell; to A.W. Carter:
The day after I wrote you last week bad weather began and we could not do much *mauka* until Friday and Saturday, when I connected to the falls.

The first trail I ran on the course from the base of Punohu [Puunohu], and it took us over a high hill which would be impractical for a pipe line. So I went back to the old trail, and going forth 980 ft., ran a trail that cleared the hill and struck the trail made by the

Japanese to carry the level around from the Alakahi pipe head.

The point where I struck this trail is Sta. (66); from where I ran N.E. 2,800 ft. to the pipe, and S.W. 2,100 ft. to the stream.

Sta. (20) is on the old trail that I told you of before you went away.

The elevations given on the sketch [*Figure 6*] are relative; the distances are all measured.

To see how the pipe could be brought out of the valley from the falls, I ran a 6% grade down, and struck Sta. (88) on the cross line, and it will be some distance further to get out of the valley.

On this 6% line the side of the valley is very steep, and the pipe will have to bend in many places to fit the contour.

In a number of places it will have to be fastened to perpendicular rock.

So, as I wrote you, the conditions will be better to make a reservoir somewhere near Sta. *82 and bring the water from the falls in a large pipe on a low grade (which pipe would be about 800 ft. long), and then by a ditch to reservoir.

The reservoir will be at a little higher elevation than the present pipe head, and the pipe shorter.

A large reservoir can be made near (82) than in the stream, and a break in the pipe from the falls would still have the water in the reservoir to draw on.

The distance from (82) to (20) is 5,300 feet; and from (2) back to the pipe I estimate at 2,000 feet, though the line has not been cut.

There seems to me to be no question but the supply will be sufficient. After two weeks of dry weather when there was only ½inch in the stream, supposing the present water head there was more than this on the cross trails than can be carried to the (82) reservoir by ditch, without going into the valley at all.

If you decide to carry out this plan the first thing to do is to make some explorations and select the best site for the reservoir. Then cut trail to (32) and from (20) to the pipe.

Also a good walking trail should be cut from (20) back to the pipe. The distance is about 3,000 feet and it can be done for $1.00 per 100 feet.

This trail will be used after the pipe is laid by the man who goes up to inspect pipe and water head.

When the weather is bad or if it looks as if it would be bad, it is very hard to get the Japanese to work.

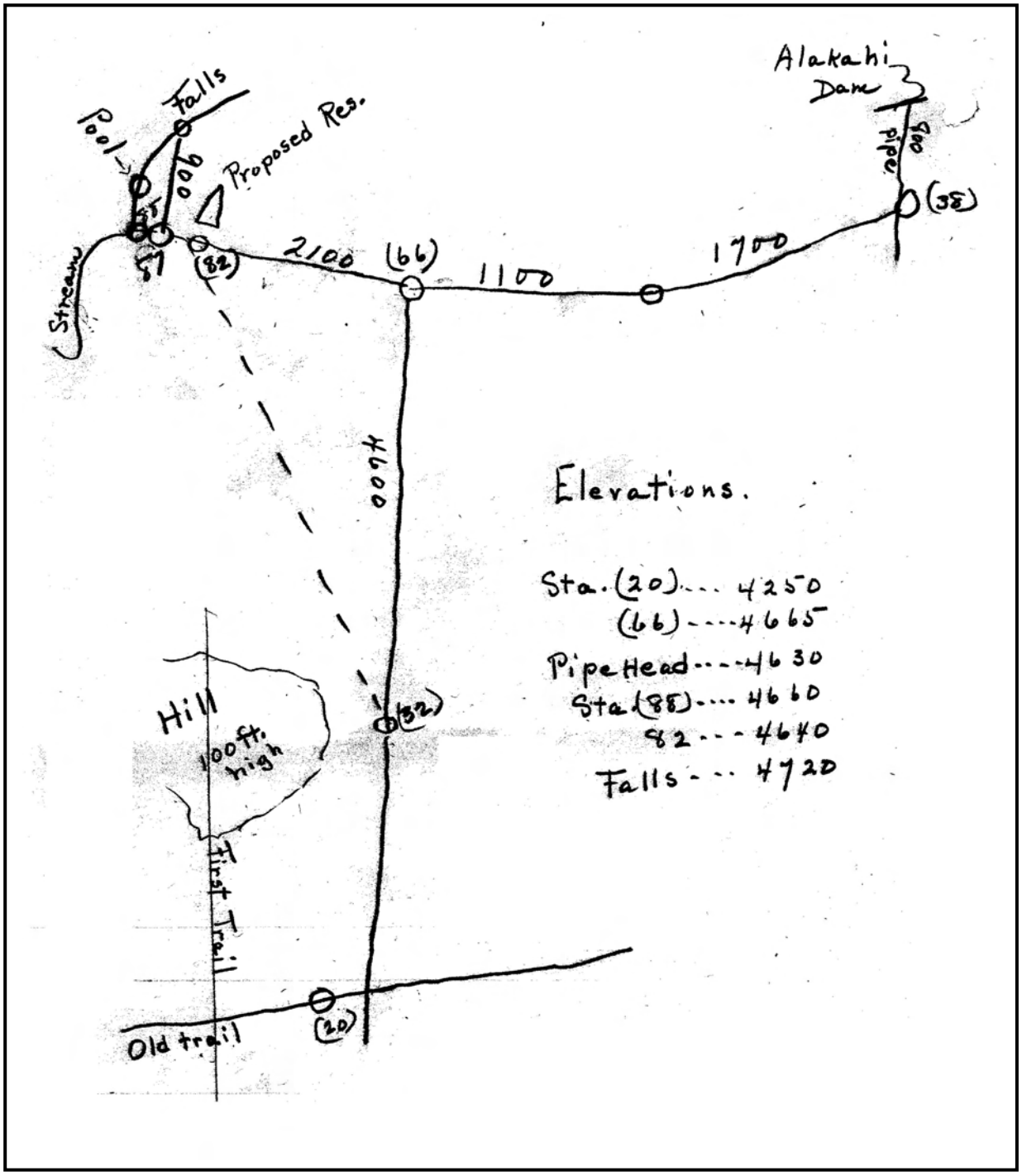

Figure 6. Sketch of Water System Line, Alakahi and Vicinity (1909)

> At present there is a large amount of water coming from the falls, and it will be a bigger job to put in a measuring weir than at Alakahi…

The result of the combined projects of Parker Ranch and the Kohala-Hāmākua Plantations was that water flowed from the mountain lands feeding business interests and supplying water to the ever growing community in North Hawai‘i. The Kohala Ditch was maintained as a part of plantation operations through 1975. The Hamakua Ditch System was maintained as a part of the plantation operations through 1993. Parker Ranch interests in the Pu‘ukapu vicinity intakes, continue to be managed and water used for ranching operations.

One additional historical point regarding the present-day condition of the Kohala-Hāmākua mountain lands, is that things could have been quite different had the United States Military acted on its plan for training in the mountains in 1945. In the letter below, A.W. Carter addressed his concerns to Commander Musser, in response to a U.S. Navy proposal to develop training opportunities on the mountain lands:

> ***August 9, 1945***
> ***A.W. Carter; to Commander Musser:***
>
> In re. South Kohala Forest Reserve.
>
> As I explained to you in our interview, I am very strongly opposed to using the South Kohala Forest Reservation for training purposes which would involve large numbers of men going into the same.
>
> It would result in contamination of the water system which serves the community and all the Parker Ranch employees in that district. There is no other water available.
>
> Secondly, the forest reserve on the mountain has a very good coverage of growth and undergrowth, and also scrub *ohia* trees. The use of this area for training would be detrimental to the forest.
>
> However, the primary objection is the pollution of the water which is used by all the people of Waimea… [Parker Ranch, Water Files]

In 1963, Richard Smart wrote about the role of water development in the history of the ranch, and summarized events in the following narratives:

> The history of water on Parker Ranch is fascinating. In 1900, there was no water distribution system for the Ranch. The break-through to gain water for our lands started under the late Alfred Wellington Carter in the early 1900's. He installed the first two-inch line from Waikoloa intake to Aalii [lower Waiki‘i].
>
> Installation of three-inch lines with more branches followed. Higher pressures were introduced by adding intakes not only in Kohakohau but also in Alakahi. Delivery ends of the lines were extended. The water was lifted still higher up Mauna Kea by diesel engine pumps.
>
> Finally, Parker Ranch could count 160 miles of water carrying pipeline. Until the unprecedented drought, this seemed to fill our needs. But in the drought crisis it was brought home that changes would be necessary to fulfill our place in a growing, demanding market… [R. Smart in Paka Paniolo, October 1963; in the collection of PPS]

NĀ ULU LĀʻAU A ME NĀ KINI KINO LAU O LOKO (THE FORESTS AND MULTITUDES DWELLING THEREIN)

As discussed in earlier sections of this study, Hawaiian traditions and beliefs, 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, rains, 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 Puʻu o ʻUmi NAR, 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 (see the tradition of *Lau-ka-ʻieʻie* in this study), are deified parts of the landscape. Such body forms and attributes in the Hawaiian mind are "*kino lau*," the myriad body-forms of the gods and creative forces of nature that gave Hawaiians life.

In the Hawaiian mind, care for each aspect of nature, the *kino lau* of the elder forms of life, was a way of life. This concept is expressed by Hawaiian *kūpuna* (elders) through the present day, and is passed on in many native families. When discussing the relationship of native families with the lands and resources around them, it is not uncommon to hear *kūpuna* express the thought — *"E mālama i ka ʻāina, a e mālama hoʻi ka ʻāina iā ʻoe! E mālama i ke kai, a e mālama hoʻi ke kai iā ʻoe!"* (Care for the land, and the land will care for you! Care for the sea, and the sea will care for you!). This concept is one that is centuries old and is rooted in the spirituality of the Hawaiian people. Importantly, the converse is that when one fails to care for, or damages nature—the *kino lau*—around them, they are in-turn punished. This is expressed in many traditional sayings, one being, *"Hana ʻino ka lima, ʻai ʻino ka waha!"* (When the hands do dirty-defiling work, the mouth eats dirty-defiled food!). In this cultural context, anything which damages the native nature of the land, forests, ocean, and *kino lau* therein, damages the integrity of the whole.

Of course, since traditional times, many things that were a part of the native Hawaiian natural and cultural landscape have disappeared—being destroyed by changes in land tenure, changes in residency and subsistence practices, and by the introduction of tens-of-thousands of alien species, which have overrun the formerly balanced and fragile bio-systems that made Hawaiʻi unique.

Writing in the late 1860s and early 1870s, native historian, S.M. Kamakau, related to readers some aspects of the Hawaiian association and understanding of the mountain lands and forests. While describing traditional knowledge of the divisions of land, Kamakau wrote:

> Here are some other divisions of the islands, together with their descriptive names.
>
> Heights in the center or toward the side of a land, or island, are called *mauna*, mountains, or *kuahiwi*, "ridge backs." The highest places, which cover over with fog and have great "flanks" behind and in front (*kaha kua*, *kaha alo*)—like Mauna Kea—are called *mauna*; the place below the summit, above where the forests grow is the *kuahiwi*. The peak of the mountain is called *pane poʻo* or *piko*; if there is a sharp point on the peak it is called *puʻu pane poʻo*; if there is no hill, *puʻu*, and the peak of the mountain spreads out like the roof of a house, the mountain is described as a *kauhuhu mauna* (house ridgepole mountain); and if there is a precipitous descent, *kaolo* [from the peak] to the *kauhuhu mauna* below this is called a *kualo* ("block"). If there are deep ravines (*ʻalu haʻahaʻa*) in the sides of the mountain it is called a *kihi poʻohiwi mauna* ("shoulder edge" mountain). A place that slopes down gradually (*hamo iho ana*) is called a *hoʻokuʻu* (a "letting down"); a sheer place is called a *pali lele koaʻe* (cliff where *koaʻe* birds soar), or a *holo* ("slide"), or a *waihi* (a "flowing down"). Rounded ridges that extend from the mountains or "ridge backs" or hills are called *lapa* or *kualapa* or *moʻo*—and, if they are large, *ʻolapalapa* or *ʻomoʻomoʻo*. Depressions between *lapa* or *moʻo* are *awawa*, valleys.

> Here are some names for [the zones of] the mountains—the *mauna* or *kuahiwi*. A mountain is called a *kuahiwi*, but *mauna* is the overall term for the whole mountain, and there are many names applied to one, according to its delineations (*ʻano*). The part directly in back and in front of the summit [Kamakau 1976:8] proper is called the *kuamauna*, mountaintop; below the *kuamauna* is the *kuahea*, and *makai* of the *kuahea* is the *kuahiwi* proper. This is where small trees begin to grow; it is the *wao nahele*.[5] *Makai* of this region the trees are tall, and this is the *wao lipo*. *Makai* of the *wao lipo* is the *wao ʻeiwa*, and *makai* of that the *wao maʻukele*. *Makai* of the *wao maʻukele* is the *wao akua*, and *makai* of there the *wao kanaka*, the area that people cultivate. *Makai* of the *wao kanaka* is the *ʻamaʻu*, fern belt, and *makai* of the *ʻamaʻu* the *ʻapaʻa*, grasslands.
>
> A solitary group of trees is a *moku laʻau* (a "stand" of trees) or an *ulu laʻau*, grove. Thickets that extend to the *kuahiwi* are *ulunahele*, wild growth. An area where *koa* trees suitable for canoes (*koa waʻa*) grow is a *wao koa* and *mauka* of there is a *wao laʻau*, timber land. These are dry forest growths from the *ʻapaʻa* up to the *kuahiwi*. The places that are "spongy" (*naele*) are found in the *wao maʻukele*, the wet forest.
>
> *Makai* of the *ʻapaʻa* are the *paheʻe* [*pili* grass] and *ʻilima* growths and *makai* of them the *kula*, open country, and the *ʻapoho* hollows near to the habitations of men. Then comes the *kahakai*, coast, the *kahaone*, sandy beach, and the *kalawa*, the curve of the seashore—right down to the *ʻae kai*, the water's edge.
>
> That is the way *ka poʻe kahiko* named the land from mountain peak to sea. [Kamakau 1976:9]

Among the native terms listed by Kamakau, above is one which stands out in reference to the Hāmākua-Kohala mountain lands of the Puʻu o ʻUmi NAR; this zone is the *wao akua* (zone or region of the gods and deities). The *wao akua* is so named because of the pattern of cloud cover and precipitation which settles upon the mountain slope—this covering was interpreted as concealing from view the activities of the gods and deities therein (cf. David Malo 1959:16-18; and M.K. Pukui, pers. comm. 1975).

In the traditional context above, we find 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. It's protection, and the continued exercise of traditional and customary practices, in a traditional and customary manner, are mandated by native custom, and State and Federal Laws (as those establishing the Kohala-Hāmākua Forest Reserves and Puʻu o ʻUmi Natural Area Reserve; and the Endangered Species Act).

In this discussion, protection does not mean the exclusion, or extinguishing of traditional and customary practices, it simply means that such practices are done in a manner consistent with cultural subsistence, where each form of native life is treasured and protected. *Kūpuna* express this thought in the words, *"Hoʻohana aku, a hoʻōla aku!"* (Use it, and let it live!).

Transitions in the Health of Hawaiian Forests Following Western Contact

We find that shortly after western contact, the introduction of alien herbivores, and financial value being placed upon resources of the forests and mountain lands, the health and integrity of the resources began to decline. After western contact, the forests were primarily evaluated in the terms of the western economic system. While in the centuries prior to the arrival of westerners in 1778, and subsequently into the reign of Kamehameha I, the system of land tenure and management mirrored the natural landscape of the islands, later management systems focused on what, and how much could be gotten from the land.

Immediately, upon western contact, foreigners looked at the land—first as a source of provisions for ships; and second as a means for earning money, through the trade of natural resources such as

ʻiliahi (sandalwood). In 1778, European boars, goats, rams, and ewes were introduced by Captain Cook. While offered as a "gift," one of the motivating factors was that leaving the animals behind would produce a breeding stock to supply other foreign ships (Beaglehole 1967:276, 578-579). Later, in 1793, cattle were brought to Hawaiʻi by Captain Vancouver. Given as gifts to Kamehameha I, the cattle were first let off at Kawaihae (then at Kealakekua), and were placed under a ten-year *kapu* to protect them and allow them to reproduce (Kamakau 1961:164). Between 1793 and ca. 1811, new stock was added, and the numbers of cattle had increased dramatically. The cattle and other introduced stock rapidly became a problem to the native population and forests.

While the introduced animals were making their way into the higher elevations, other economic pursuits also led to the clearing of large tracts of land. In the early 1800s (ca. 1810-1829), tens-of-thousands of pounds of *ʻiliahi* (sandalwood) were cut from the forests around Waimea and shipped out of Kawaihae (cf. Kamakau 1961, and Ellis 1963). By the 1830s, the forest had been stripped of sandalwood and many other plants of the forest were impacted by the clearings made for collection and transportation of the *ʻiliahi*. Another reason that large sections of forest were cleared, was to develop lands on which western-introduced food crops could be cultivated and harvested for sale to visiting ships.

In this part of the discussion, it is appropriate to note that the European boar was significantly larger, and thus stronger, than the Polynesian introduced *puaʻa*, or pig (Beaglehole 1967:579). Our review of more than 60,000 native Hawaiian land documents dating from 1846 to 1910 revealed many references to *puaʻa* (pigs), but nearly every reference was in the context of them being near-home and as being cared for (raised), not hunted. In the same review of the native Hawaiian land documents, and a large collection of writings from native authors (e.g., D. Malo, 1951; J.P. Ii, 1959, S.M. Kamakau 1961, 1964 & 1976), every reference to traditional collection or "hunting" (a word seldom used in the historical records), was in the context of native birds—those used either for food or from which feathers were collected for royal ornaments and symbolic dress.

After ca. 1815, we find that when native Hawaiians went hunting in the uplands—as described in testimonies and historical texts of the time—they were hunting bullocks, goats and other introduced grazers, and this was generally done on the demand of their landlords, and later for the growing ranches being established in the islands. The first full-scale efforts of western-style hunting in the Kohala-Hāmākua region did not occur until ca. 1815-1820 (cf. Kamakau, 1961; Government Communications in this study; and Barrera and Kelly 1974:44). Those early outings were focused on controlling the wild herds of cattle that were a threat to travelers, agricultural fields, residences, and forest resources.

One of the earliest Government communications regarding the impacts of an introduced herbivore on the native landscape of Kohala, dates from 1856, and reports the following:

> ***Waimea, Hawaii***
> ***November 1, 1856***
> ***Isaac Y. Davis, to Keoni Ana, Minister of the Interior***
> ***(Describes depredation of forest and grazing lands***
> ***as a result of the herds of wild sheep.):***
> …I now have a good time to write to you with *Aloha*, and tell you my thoughts about those things pertaining to the Nation of our King. Love (*Aloha*) is the foremost, and I dwell here with *Aloha* for all of you.
>
> First, let me tell you about the Sheep of the attorney, Mr. Montgomery, dwelling at Puupueo, on the Mountain. Five or perhaps six miles above the place of J.P. Parker, Esq. E. Sparke Esq., is the one who tends to said Sheep, the Land, and the houses, and many acres of land purchased by Mr. Montgomery. I do not know the number of acres of Land, but I have heard that it is Five hundred (500) Acres, that is all. But the

Sheep roam all about, from one area here, to another area over there. The Sheep roam from Puupueo[12] to Puuhuluhulu, and to the Gulch of Kemole. That is half of Mauna Kea, and many thousands of Acres that the Sheep roam across. The land is cut down, there is no place that anything will grow. The grasses are gone, and there is only dirt on the Land, just like Waimea, and because of this, the cattle are also no more on this section of the Mountain, having been routed from one place to another.

As a result, I inquire of you, has this thing been agreed to by you, that the Sheep could simply roam about this place? Because I do not know, and am unaware of it, I inquire of you.

If the Sheep are allowed to stay for long, as they presently do, all the grass and forest of the place shall be consumed. It will be an evil thing, for these Sheep have exceedingly poisonous teeth.

Here is what I know, the sheep were not numerous before, and there were many animals of other varieties in those 20 or more years past. There has been no evil seen upon the land as at the present time.

Give my Aloha to C.T.B. Rooke, Kamaikui, and *Aloha* all of your household as well.

I am with thanks… [HSA – Interior Department, Misc. Box 146; Maly, translator]

Immergence of Hawaiian Forestry Programs

Throughout the middle and late 1800s, efforts at control of the introduced herbivores continued, but with only minimal success. In 1876, King David Kalākaua appointed a commission "to aid in the development of resources in the Kingdom" (Act of September 25, 1876). In 1877, the Commissioners toured the Island of Hawai'i, assessing needs, development potentials, and meeting with residents to discuss the general nature of the resources, and concerns regarding conditions on the island. The Commission's notes describe the Waimea forest and plateau lands, noting particularly the impacts of grazing animals on the forests, areas of residence and agricultural fields. The Commissioners landed at Māhukona, and visited North Kohala, praising it's resources and potential. Departing from Pu'uhu'e, the commission then traveled to Waimea and offered the following report:

The route lies around the slopes of the Kohala mountains through ***Kawaihae-uka***. The forests on the Kohala mountains are dying rapidly. The land is mostly for grazing purposes, though on the mountain, potatoes of fine quality can be raised in large quantities. In sheltered places, coffee would doubtless grow, but owning to the sparseness of the population and the superior attractions to other parts of the district, this part will hardly soon be settled. The once fertile and populous plain of Waimea looked sterile and desolate when visited by the Commission—a painful contrast to Kohala loko on the other side of the mountain.

The complaint of the people is well founded. The water they use is fouled in many places by cattle, horses and other animals, and as the stream is sluggish it has no chance to free itself of impurities, and the water used by the people in their houses must be a cause of disease and death, especially to the children… It is little wonder that with his crops trodden out by the sheep or cattle of his stronger neighbors, his family sickened perhaps to death by the polluted waters, that the small holder should yield to despair, and abandoning his homestead seek employment in some other district, usually without making another home…

[12] Pu'upueo is situated in Pā'auhau, above the Makahālau section of the ranch.

> The plains of ***Pukapu*** [Puukapu] and Waimea are subject to high winds, aggravated by the loss of the sheltering forests of former days. The soil however is very good in many places for sugar cane and other products. To develop its best resources, efforts must be made to restore the forests and husband the supply of water at their sources to furnish a supply for agricultural purposes…
>
> It would seem that a wise appreciation of the best interests of this district, even of the grazing interests themselves, would lead to the decrease of the immense herds which threaten not only Waimea but even Hamakua with almost irreparable disaster. It is to be feared that they will in time render a large part of the land of little value even for grazing purposes. Owning to the increasing frequency and severity of droughts and consequent failure of springs… …the Government, if it would wish to preserve that part of the island of Hawaii from serious injury, must take some steps for reclaiming the forests.
>
> In this connection we would say that it is unfortunate that large tracts of Crown and Government lands have been lately leased on long terms for grazing purposes, without conditions as to their protection from permanent injury, at rates much lower than their value even as preserves for Government purposes or public protection… [Pacific Commercial Advertiser – May 5, 1877]

So significant was the threat of these animals to the Hawaiian landscape, that on September 19, 1876, King David Kalākaua signed into law, an Act for the Protection and Preservation of Woods and Forests. By that Act, the Minister of the Interior was authorized 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…" (Hawaii Laws Chapter XXX:39). The Minister of the Interior was authorized to appoint a superintendent of woods and forests:

> …who shall, under the direction of said Minister, enforce such rules and regulations as may be established to protect and preserve such reserved woods and forest lands from trespass. Said superintendent shall have charge of the construction of fences and barriers required to protect the said woods and forest lands, and shall be responsible for their being kept in good condition… (ibid.).

The above Act was further defined by an Act of the Legislature of the Hawaiian Kingdom, approved by Queen Lili'uokalani on January 4, 1893, which established the Bureau of Agriculture and Forestry. Among the Bureau's goals was the "preservation of forests." On June 14, 1900, the members and functions of the Bureau were absorbed by the Board of Commissioners of Agriculture and Forestry. (Hawaii State Archives – Com 2, Box 11)

On October 29th, 1901, E. Boyd, Commissioner of Public Lands, submitted a report on a visit to the Kohala and Hāmākua Districts to Governor Dole. His communication provides readers with commentary on the condition of portions of what became the Kohala Forest Reserve (later the Pu'u o 'Umi NAR). Excerpts of Boyd's communication follow below.

Departing from Akona's Store in Waimea, Boyd noted that:

> …With the assistance of a guide I was able to reach a point on the bank of the Waimea stream, which point is about a half mile N.W. of Akona's store and about 500 feet west of Lyon's church. Above this point I observed in the stream a copious flow of water, and suddenly disappearing. On investigating I found that it flowed into a pool or water hole, and below this pool, the stream was absolutely dry, on questioning my guide and some of the Kamaainas in that vicinity, they informed me that this pool serves as a source of one of the many subterranean channels of the District, and more particularly known in

Hawaiian as a “Nono”. I was also informed that this stream was never known to have dried up, and the drought through which the District is suffering, has brought its flow to the lowest ebb…

From this point as above referred to, the banks of this stream becomes quite precipitous , averaging all the way up on both sides from 50 to 75 feet deep and even more in some places, extending in length about three miles from this point to its source.

Following the west bank of this stream myself and guide came to what is known as the Waikoloa table land; elevation of 500 to 1000 feet higher than Waimea. Looking back to Waimea from this point of vantage the scenic view that is presented to ones eye is something grand and beyond comparison.

This table land was without any question heavily forested and also of swampy character in years gone by before the advent of the cattle industry – but in its present denuded state it affords excellent grazing land. For a quarter of a mile up, the land becomes quite rugged, and cut up by numerous small ravines or gulches and also full of dangerous ruts, characteristic of dried up swamp land, which made horse back travelling a dangerous venture. However my guide being quite familiar with the country found a fair trail which enabled us to reach the edge of the forest as it now stands, also up to and on the west ridge of ***Puuohu***.

From this point the forest becomes quite dense, making horseback travelling an impossibility. This ridge slopes into the ***Puakalehua*** gulch which is in the Public Land of ***Puukapu***, from this point we travelled on foot for a distance of about 200 to 300 feet down the slope, our descent was considerably retarded by the thick underbrush. On reaching the bottom of this gulch we found that it was impossible to go any further in the direction we had taken – taking another direction towards the west for about a quarter of a mile we came to an opening, which I judged it to be about 500 feet square and thickly covered with a peculiar kind of Hawaiian water grass. I was then informed by my guide that this opening is a very deep marsh or swamp land, which formed a basin, and from the appearance of the slope of the surrounding country, I am perfectly sure that it does, for conserving all the waters from the adjacent water sheds. Viz.: - East Slopes of ***Puupalailai*** and ***Puakalehua*** ridge, north slope of ***Puuohu***, west slope of ***Puuiki***, and south slope of the land of ***Puukapu*** from the ***Koiawe*** ridge.

The ***Waikoloa*** or ***Waimea*** stream takes its source from this swamp, and I must say that the amount of water that finds an outlet in this stream is not 1/3 of the amount of water that flows into this swamp from numerous springs that were observed along our path which was about ¼of its circumference. Consequently I am satisfied that such water that does not find an outlet through visible streams, percolates through the ground and finds other outlets. Possibilities are that the source of some of the numerous springs in ***Waipio*** Valley are dependent on this very same basin. However this is only a matter of conjecture.

Finding it impossible to go any further we retraced our steps back to Waimea. From there we immediately took the road to the Puukapu Homesteads, ascending a rather steep bluff, I managed to reach the top of ***Puu Neenee*** on the land of Puukapu. The land in this locality is very similar in character to that of ***Waikoloa-iki***. Forest trees are dying very rapidly from inroads made by cattle and other stocks, and in all essential points the Puukapu lands affords in its present condition a striking example of how cattle can wrought destruction to forest land… [State Archives Executive Files – Dole 1902:1-4]

On October 10, 1924, C.S. Judd, Superintendent of Forestry, wrote the following account of forests and forestry in the Hawaiian Islands to Governor Farrington. Eighty years later, his words still present readers with an important frame work for the on-going efforts in protection of Hawai'i's native forests:

> Forestry is practiced in the Territory of Hawaii primarily, not for timber production, but for the conservation of water. Probably in no other section of the world is the relation between a satisfactory forest cover on the mountains and the supply of water for domestic and agricultural uses better or more ably demonstrated…
>
> The chief product, and, the most valuable, coming from the main forested and mountainous regions of the Territory, comprising about one-fourth of the total land area of the eight islands (4,099,860 acres) is water. Because of the comparatively limited terrain, short and steep water sheds, heavy rainfall in certain regions and the great need for irrigating the dry but fertile, sun-warmed lowlands, the value of this liquid product of the forest, on which domestic needs and prosperity of the community depend, is most highly appreciated and every effort is being made to conserve and maintain its sources in the forests.
>
> ***Character of the Native Forest.***
> The forest of comparatively small trees found growing naturally on the mountain slopes is admirably suited to prevent erosion and to convert surface runoff into underground drainage, the desirederatum in water conservation. The happy combination of small trees, brushes, ferns, vines and other forms of ground cover keep the soil porous and allow the water to percolate more easily into the underground channels. The foliage of the trees breaks the force of the rain and prevents the impacting of the soil by rain drops. A considerable portion of the precipitation is let down to the ground slowly by this three-storied cover of trees, bushes, and floor plants and in this manner the rain, falling on a well-forested area, is held back and instead of rushing down to the sea rapidly in the form of destructive floods, is fed gradually to the springs and streams and to the underground artesian basins where it is held for use over a much longer interval.
>
> ***Protection of the Forest.***
> Forest practice in the Territory of Hawaii, therefore, resolves itself into what is known as "forest protection" and the main efforts of the foresters are exerted in maintaining and build up the native forests on the mountains so that they will function to the highest degree in conserving the rainfall.
>
> The native forest, however, is peculiarly constituted in that it is readily susceptible to damage. The shallow-rooted trees depend for proper moisture and soil conditions on the undergrowth of bushes and ferns and when the latter, the first to be attacked by stock, are injured or removed, the tree roots dry out, the trees are weakened and begin to decline, and an opening is made in the forest for the invasion of destructive insects and fungi and of the more vigorously-growing foreign grasses and other plants which choke out native growth and prevent tree reproduction. It is always dangerous for this reason to make any opening in the native forest and the only safe way to preserve it and keep it healthy and vigorous is to maintain it inviolable from all attacks and keep the ground well shaded and dark.
>
> ***Damage to the Forest.***
> The chief damage to the native forest is done by cattle and other grazing stock which first attack the toothsome ferns and other plants which give the shallow-rooted trees the protection which is necessary to their existence.

The fencing of exposed forest boundaries to keep out stock and the extermination of wild stock where it exists in the forest constitutes an important item in forest work in the Territory…

Forest Reserves.
Forest lands devoted to the purpose of water conservation have been officially recognized under the law and set apart as forest reserves by proclamation of the Governor. In this manner during the past two decades 50 of such forest reserves have been set aside on the five largest islands of the group. These embrace a total area of 840,984 acres of which 579,905 acres or 68 per cent is land belonging to the Territory… (Hawaii State Archives – Com 2, Box 15)

The Hāmākua and Kohala Forest Reserve Lands

In the early years of the 1900s, the Territory set in motion plans to protect Hawaiian forests by designating select tracts of land as forest reserves. Among these tracts was the Hāmākua-Kohala mountain lands. In the deliberations of the Board of Commissioners of Agriculture & Forestry, descriptions of the lands comprising the Kohala and Hāmākua sections of the proposed forest reserve, were recorded in 1903. The following narratives documenting consideration for establishment of the Kohala Forest Reserve, are taken from the October 5th, 1903 minutes of the Board of Commissioners of Agriculture & Forestry:

Assessment of the Kohala Mountain Forest
Minutes of Special Meeting of the
Board of Commissioners of Agriculture & Forestry,
Held in the Office of the Governor for the
Purpose of Hearing Mr. Wm. L. Hall's
Report on the Forest Question,
on Monday October 5, 1903

Present:–Governor Dole, Mr. Wm. L. Hall, W. R. Castle, A. F. Judd, Prof. Griffiths of Oahu College, F. G. Krauss of Kamehameha School, F. S. Dodge, and the following members : President L. A. Thurston, Secretary H. E. Cooper, A. W. Carter, J. F. Brown, and Jas. D. Dole.

President Thurston stated that as this was a special meeting to meet Mr. Hall and to hear what he had to say regarding his observations on the forest question, the reading of the minutes would be waived.

Mr. Hall stated that it was his intention to have his report in shape to consider with the board, but he thought it more necessary to see as much of the Territory and its conditions as possible, so he was unable to spend much time on the report, and had simply put down a few points for consideration, and continued as follows:

> There are great possibilities in a forest system which you may plan, and I have no criticisms to make. I am satisfied Mr. Pinchot wants to know the conditions so that a man may be obtained to make valuable your forests. I think a matter of greatest importance is to protect as quickly as possible your system of forest reserves, as you cannot expect to see it continue intact. The best results will be secured by adopting a system that will touch the 5 important islands of the group, so I think I shall mention some of the regions that seem to me should go into forest reserves…

Island of Hawaii.

> The region in Kohala beginning at about here (Kehena Woods Estate pointing on map) should be reserved. This portion includes some land which is now held in fee simple by the Woods'. I do not know whether a satisfactory arrangement can be made with them. This is an important tract of land, and it should be set aside as a forest reserve. It is full of cattle. There are streams which run into these gulches. There is a small reservation here. (Land south of Kehena. Points on map). If any way can be arranged for to get hold of this land, the Government will profit by so doing, for it is more important that any other tract in the whole district. I know of no better place in the whole island to plant and establish a forest than here. In answer to President Thurston as to whether it was not the key to the situation in that district, Mr. Hall stated that it was.
>
> The precipitous part of Kohala should be reserved. The reserve can follow the gulches. The line of the reserve should follow quite closely the present forest line.
>
> Asked by President Thurston as to what he thought of the *manienie* grass, he stated that he had not been able to satisfy himself on this point, I think *manienie* has a damaging influence and keeps the forest from coming up. In the Kohala District, the forest is almost entirely killed out by cattle. My feeling in this case is that were the conditions such that the forest could be brought back with reasonable expense, it would be well to keep the forest further down. It should follow practically the line through Kohala up to the boundary of Hamakua… [HSA – COM 2 Box 8]

In the 1904 annual report of the Division of Forestry, Ralph S. Hosmer, Superintendent of Forestry, submitted his recommendations to the Governor, describing the significance of the Kohala-Hāmākua forest lands in the Territory's program:

Kohala.

> Nowhere in the Territory is there more pressing need of forest reservation than in this district, for on the forest area on 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.
>
> The Kohala Reserve should include practically all of the existing forest on the south and west sides of the Kohala mountain, and also a section above the plantations on the windward side of the district, as a water supply is needed both for the agricultural lands near the sea and for the development of the Waimea Plains, which might be made a region of farming lands and of diversified industries. Within the last few years land on and adjacent to the Kohala Mountain has been opened, in which cattle ought never to have been allowed. Unless these areas are reclaimed speedily it will be too late, for the forest is fast disappearing.
>
> Various causes have operated to prevent forest reservation; the latest being the litigation going on over the control of the Parker Ranch [[13]]. But for this a considerable area of the Kohala Mountain would without doubt, by now have been a forest reserve.
>
> Negotiations are now in progress with the owners of lands other than those controlled by the Parker Ranch, which ought to be reserved as forest and the whole matter will be steadily pushed and every effort made to establish the reserve…

[13] The litigation above mentioned was between A.W. Carter, trustee for Thelma Parker, and Samuel Parker; and in part tied to Carter's efforts at development of the water works from the Alakahi vicinity of the Kohala Mountain. Said water system established in 1904, and the source of water which was drawn to supply the Holoholokū Plains, and Waikiʻi and Keʻāmoku out-stations of the ranch (see documentation in this study).

North Hamakua.
The north end of the Hamakua District, between the Kohala District line and the Waipio gulch, and area of seventeen thousand acres, was set apart by Governor Carter as a forest reserve on December 23rd, 1904. The object of this reserve is to protect the watersheds of the streams rising in this section, the water and power from which are soon to be developed. Some additional lands now under private ownership ought also to be included in this reserve, as well as the adjoining section in Kohala… [Forestry, Annual Reports, December 31, 1904]

In 1904, Hosmer provided the Board of Commissioners of Agriculture and Forestry with his report on development of the Hāmākua section of the Forest Reserve adjoining the Kohala mountain lands:

…I have the honor to submit the following report on the proposed forest reserve at the extreme northwestern end of the District of Hamakua, Island of Hawaii, consisting of the section of steep, *pali* country, between the gulches of ***Honokane*** and ***Waipio***.

Under the date of April 2, 1903, Mr. E. E. Olding, the local Consulting Forester, reported to the Board as follows: "As forestry agent for the ***District of Kohala***, I beg to submit the following lands as reserves; all government lands lying between ***Honokane and Waipio Valleys*** (from the headwaters to the sea) as well as government land known as ***Puukapu***, and also all that portion of ***Kawaihae 1***, lying between ***Puupili*** and ***Waimanu***, on expiration of the present leases to Parker Estate."

Upon a request from Mr. Thurston for more definite information, as to metes and bonds, Mr. Olding replied, on May 8th, 1903; "As suggested I enclose herewith a tracing from Government map showing forest lands to windward of Kohala District, which all parties here are willing and desirous to have reserved, proposed reserve is shown and included within" red lines" and is bounded as follows: On the west by the Awini Ranch and Bishop Estate lands, on the south by the Hamakua Boundary line, or lands of Puukapu and Bishop Estate lands, on the east by the Bishop Estate lands of Waipio, on the north by the sea. Land known as Laupahoehoe owned by the Booth Estate is not included."

"As this is in the heart of the forests of Hawaii and joins other government lands it can be added to from time to time as government and private parties desire. It is in a great measure protected from cattle at the present time and should not cost the government much for fencing."

"No settlement has been reached with regard to lands known as ***Puukapu*** and ***Kawaihae 1***, so these lands are not included at this time in proposed reserve."

While I have not personally explored the area in question a task rendered almost impossible from the nature of the country I have carefully considered the question of making this section, with other adjoining lands, a forest reserve. This I believe should be done, for the following reasons:

The chief value which this section now has, or so far as can be foreseen is likely to have, is on account of the streams which head therein, and which can be utilized for irrigating the adjoining agricultural lands, and in the development of power.

To insure the protection of the watersheds of these streams, so that as much as possible of the water falling upon the area be made available for use, it is desirable that the lands be set apart as a forest reserve.

The creation of the forest reserve would in no way hamper the development of water and power. On the contrary it is primarily to maintain and insure this use of the streams that the reserve is proposed to be set apart.

At the present time there is little or no objection to the creation of this reserve; there is , with the exception of certain areas in the ***Waimanu*** Gulch – excluded in these recommendations – no agricultural land; nor from the nature of the country is it a region which could be so developed.

There are several privately owned lands adjoining the proposed reserve which should be included therein; and which the owners thereof are willing to turn over as a part of the forest reserve, if the Government will set apart its land.

I therefore recommend that the Board request the Governor to set apart, after the public hearing provided by law, the government land described below, as a forest reserve; and I further suggest that negotiations be entered into with the owners of the adjoining lands, with the exception of those under cultivation in the Waimanu Gulch, with a view of extending the reserve to include them also.

The following description of the proposed forest reserve, in the District of Hamakua, Island of Hawaii, furnished by the Survey Office, with a map of the same, is now on file in my office.

"Beginning at the mouth of the ***Honokea*** Gulch by the sea, being the boundary of the lands of ***Awini*** and Honokea, in the Districts of Kohala and Hamakua, respectively, running thence up the center of Honokea Gulch, and along Awini homesteads to the land of ***Honokane***; thence along said land of Honokane in a southerly direction to its junction with the lands of ***Kawaihae 1st*** and ***Puukapu***; thence in an easterly direction along the land of Puukapu and the north side of ***Kawainui*** branch of ***Waipio*** Valley, crossing the head of ***Waimanu*** Valley to the west side of Waipio Valley; thence down along said west side of Waipio Valley to the sea; thence along the sea to the point of beginning. Total area, 18,940 acres; (including kuleanas in Waimanu Valley …… 61.05 acres

Homesteads in Waimanu Valley……...195.75 acres

256.80 acres

and that portion of the land of Laupahoehoe owned by C.W. Booth.)"

Total Area …… 18,940 acres [Hawaiian Forester and Agriculturalist 1904:352-355]

Governor Carter issued the following proclamation establishing the Hāmākua section of the forest reserve on December 23rd, 1904:

BY AUTHORITY.
PROCLAMATION OF FOREST RESERVE.

Under and by virtue of the authority vested in me by the provisions of Act 44 of the Session Laws of the Territory of Hawaii, enacted April 25, 1903, and of every other

power me hereunto enabling, I, George R. Carter, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said act provided, do hereby set apart as a forest reserve the Government lands lying between the Waipio Valley and the District of Kohala, in the north end of the District of Hamakua, Island of Hawaii, described as follows, viz.:

Beginning at the mouth of ***Honokea*** Gulch by the sea, being the boundary of the lands of ***Awini*** and Honokea, in the Districts of Kohala and Hamakua respectively, running thence up the center of Honokea Gulch and along Awini Homesteads to the land of ***Honokane***; thence along said land of Honokane in a southerly direction to its junction with the lands of ***Kawaihae First*** and ***Puukapu***; thence in an easterly direction along the land of Puukapu and the north side of ***Kawainui*** branch of ***Waipio*** Valley; crossing the head of ***Waimanu*** Valley to the west side [page 24] of Waipio Valley; thence down along said west side of Waipio Valley to the sea; thence along the sea to the point of beginning.

Total area 18,940 acres, less 256 acres, kuleanas and homesteads in Waimanu Valley, and that part of the *Ahupuaa* of Laupahoehoe owned by the Booth Estate, area unknown.

IN TESTIMONY WHEREOF I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

DONE AT THE CAPITOL, in Honolulu, this twenty-third day of December, A.D. 1904.

G.R. CARTER,
Governor of Hawaii. [Hawaiian Forester and Agriculturalist, 1905:25]

From 1905 to 1913, efforts between government representatives and private land owners continued in pursuit of setting aside the Kohala mountain lands as a part of the Kohala Forest Reserve. Site inspections were made, and testimonies began to be recorded in 1905, on this matter. The following citations are among those reviewed, documenting the thinking behind the reserve, and actions considered in securing both public and private land interests for the reserve:

Territory of Hawaii,
Department of Public Lands.

Hilo, Hawaii, August 14, 1905.

Jas. W. Pratt, Esq.,
Commissioner of Public Lands,
Honolulu.

Sir: In accordance with the instructions contained in your letter of the 1st inst., I met Mr. R. S. Hosmer, Superintendent of Forestry, in Kohala, for the purpose of looking over the lands of the Woods Estate wanted for forestry purposes, placing a value on the same, and also appraising the lower lands near the north point of this island, which lands it was thought at the time, the management of the Woods Estate wanted in exchange for Kehena 2, the land containing the forest.

On Saturday morning, August 5, we accordingly inspected the lands of Hualua, Kealahewa, Opihipau, Hukiaa and Kokoiki, situated near the North Point. Later on, on Tuesday, August 8, I again went over these lands with Mr. Tulloch, the local appraiser.

It was not until Tuesday morning, the 8th, that we learned from the management of the Woods Estate, just what lands were wanted, in return for the land to be given up, and we then found that the following was asked for in exchange:

1. Kawaihae uka, from about 2,100 feet elevation, to approximately 4,000 feet elevation. This would comprise an area of about 4,000 acres. This land is now under lease to the Parker Estate until 1913.
2. All the lands mentioned above, from Hualua to Kokoiki, situated near the North Point of Hawaii. [page 492]
3. About 700 to 800 acres of the "Pili Lands," from Kaipuhaa to Paoo 6.
4. During the existence of the leases on the above named lands, the Woods Estate is to receive rent for Kehena 2, until the expiration of the respective leases; such rents to be paid by the plantations, who it is claimed, are most directly benefited by the conservation of the forest.

The land of Kehena 2, is said to contain 3,344 acres, or about one-third of the lands owned by the Woods Estate; of this area the Estate wants to turn over to the Government the part contained between a gulch named ***Hooleipalaoa***, on the west, to the edge of ***Honokane*** on the east, and containing approximately 2,000 acres. From the Hooleipalaoa gulch to about where ***Niulii*** joins ***Kehena***, there are large open stretches covered with Hilo grass, and swampy in places, thence to Honokane the forest becomes denser, until from a line from near ***Pololu*** to Honokane, it becomes impassable for horse back travel on account of the swampy nature of the ground. There are said to be some wild cattle near Honokane, which it would take some time to get out. The western portion has some tame cattle on it, as that part of the land is divided off into paddocks.

The elevation of the part of Kehena to be released, is from about 2600 feet to 3700 feet; there are no running streams on the land, but a number of the gullies contain standing water, the remains of rains, and which the cattle drink.

It is claimed by Mr. Woods, that Kehena is now the only fattening ground for their cattle, and for that reason the ranch would be of no value without said land. I have no reason to doubt that statement.

As land per se, at that elevation, Kehena would not be of any great value; not even as timber land, as it would be very expensive to get wood to market, on account of the swampy nature of the ground. In appraising the same, however, I have taken in consideration the relative value of land to the ranch.

I have endeavored to have Mr. Woods give me what valuation he places on the land, but up to the present have not received anything from him; it is claimed, however, that the income from the ranch as a property, is practically derived from that piece of fattening land.

For the purpose of arriving at a valuation, I have made inquiries at the Tax Office, and find that in 1903 the Puuhue Ranch lands were returned at $26,678.00, and in 1905 in the neighborhood of $28,500.00. Allowing Kehena to be worth two-thirds of the whole, would bring the value of the whole of Kehena to $19,000.00; deducting there from the value of the one-third to be retained by the ranch, leaves a value for the forest part of $12,667.00.

In placing a valuation of $6.00 per acre on the land, nearly the same result is obtained. Say 2,000 acres $6.00 per acre = $12,000.00, and which is the value I place on the part of Kehena mentioned as a forest reservation.

APPRAISEMENT OF THE LANDS FROM HUALUA TO KOKOIKI.

Of these lands, a small part may be classed as possible cane land, the middle portion being fair pasture, and the lower part dry pasture land. These lands, at the present time, are to a great extent overrun with a heavy growth of lantana, and for that reason I deemed it the most conservative plan, to appraise them at 8 times the rental, especially as the leases were made at a recent date, in 1902.

Hualua, rent $1.35 per acre, value per acre $10.80,	289 acres = $ 3,121.20
Opihipau, rent $.70 per acre, value per acre $5.60	449 acres = $ 2,514.40
Hukiaa, rent $.70 per acre, value per acre $5.60	380 acres = $ 2,128.00
Kokoiki (not leased), rent $.70 per acre, value per acre $5.60	399 acres = $ 2,234.40
Kealahewa (not leased, area unknown) rent $.70 per acre, value per acre, $5.60, say	350 acres = $ 1,960.00
Pili lands (not leased), value per acre $1.00, say	750 acres = $ 750.00
	2617 $12,708.00

Kawaihae uka: To obtain the middle part of Kawaihae uka, seems to be the main object of Mr. Woods. This is one of the best fattening grounds, and acre for acre is worth fully as much, if not more, than Kehena. I must state, however, that by taking out the middle part of Kawaihae, should such a thing be feasible, on account of the lease now on the land, and for other reasons, in my opinion the lower part of Kawaihae, being the dry part, would become practically of no value to the Government.

As to the Pili lands, Mr. Woods does not care much whether he gets them or not, providing he gets the other lands desired.

Regarding the advisability to preserve the forest in that neighborhood, I have only to say, that where 25 years ago I have seen heavy forest, there is now absolutely none. On Kehena, where the cattle have killed the forest, the swampy features also disappear rapidly; the question apparently being how much the people should pay for the conservation of forests on private property.

Respectfully submitted,

(Signed) GEORGE H. WILLIAMS,
Sub Agent 1st and 2nd Land Districts.
[Hawaiian Forester and Agriculturalist, 1905: 493-494]

Mr. Bluett.
Whose report is that?

Mr. Campbell.
George H. Williams to Land Commissioner Pratt.

Mr. Robertson.
And the date?

Mr. Campbell.
August 14, 1905. The Board of Agriculture and Forestry have discussed the proposition, Mr. Swanzy, as to the amount of money which could be devoted for the next two years to reforesting and fencing in the Kohala Forest Reserve, and have concluded that $25,000.00 can be devoted to that purpose. Not for the purpose of purchasing the land, but directly to reforesting, fencing and the necessary expenses. It is a liberal proposition, and I believe the Government's function is in the actual work of reforesting those areas that need reforesting—there are certain areas in this forest reserve, I understand from Mr. Hosmer, that when protected against cattle, and fenced, will reforest themselves very rapidly. The Board's position, I think, is quite clear, gentlemen, but if this thing is to go through on the lines suggested, we must have the assistance of the interests in Kohala. I want to say very frankly that I, as Land Commissioner, do not favor the exchange with the Woods Estate of these remnants along the north point, as I believe eventually they will be of material advantage. They are small remnants. Portions of them are good lands, and with the extension of the Kohala Ditch and improvements contemplated, I think may all come under that ditch. They are too valuable for the Government to give away in this exchange.

Mr. Dowsett.
Mr. Chairman, we have heard from Mr. Robertson, representing the Woods Estate, and Mr. Frank Woods. Is there anybody here to speak for the Austin Estate in regard to the land that Mr. Woods has under lease?

Mr. Bottomley.
I represent the Austin Estate land. The land is under lease and you will have to take it up with Mr. Woods before saying anything, and also take it up with the Austin Estate. We will do that.

Mr. Petrie.
Mr. Chairman, on the basis of your last statement, do I understand that all that will now be required to consummate the scheme outlined will be for the parties in interest to acquire those lands and the balance will be taken care of by the Government, on whatever basis that it can be done? That is the point now in controversy.

Mr. Campbell.
That is the point in controversy.

Mr. Swanzy.
Then Mr. Campbell, there does not seem to be anything else to do but to ask the Government to negotiate with Mr. Frank Woods and the Woods Estate for these lands that it is so important to acquire before this can be consummated?

Mr. Campbell.
Mr. Swanzy, the Government feels that it has gone to the limit of its resources when it is willing to throw into this particular forest reserve $25,000.00. If we should take the $25,000.00 and buy these lands, if they are willing to sell them for $25,000.00, it would leave us as I said before, with a paper forest reserve. The Government must have a fund to devote absolutely to forestry and I think the people of Kohala should get together and see if they cannot secure these particular lands, as they are the people directly benefited. Then the Government will expend $25,000.00; to be devoted to forestry and fencing. The maintenance would necessarily come on the Government, in

the upkeep of fencing and policing, so that what the Government puts in now, that is, in the next two years and a half, is not all—there is a continuous yearly expense on the Government.

Mr. Swanzy.
I think the offer of the Government is exceedingly liberal and it relieves the parties in interest as to any consideration as to care of the reservation to be created, when the fencing is done. But wouldn't the Government undertake to negotiate with the parties in interest to see if they cannot be gotten to name a reasonable price? If they will sell at a reasonable price I take it for granted that the plantations of Kohala will be able to raise the money to buy the land.

Mr. .Campbell.
If the Government had any assurance whatsoever, that the interests at Kohala would do that, we would immediately start negotiations in an endeavor to come to a conclusion as regards price.

We believe, however, that if the interests of Kohala would simply come together and arrive at a determination how far each one is willing to go in this matter, then the entire negotiations might be completed with the Government for these lands, and then we could say yes or no. We have been trying since 1904. The Board wants to pass the responsibility of aid in this matter directly up to Kohala and its interests. It is an important thing, it is a thing that I may go on and talk about for an hour, the benefits of forestry, and we would not be any nearer to a conclusion. We all know the benefits, but the Government is unable, even with the liberality of the Legislature in its act, to give all to Kohala. We have other interests to consider and if $25,000.00 is devoted to this forest reserve it seems to me that the Government has done all that is necessary. Now if Kohala will say that we have only one thing to do, and will go and get the Woods interests and Austin interests to say yes, then the forest reserve is not on paper, but is an actual fact.

Mr. Swanzy.
The Woods Estate owns 2400 and odd acres, which, as I understand it, they are willing to dispose of, if they can get a price which pleases them. Mr. Frank Woods is not disposed to sell and we don't know what the Austin Estate will do. It may be difficult to get lands suitable for Mr. Frank Woods to exchange for this. Under these circumstances, if the Frank Woods and Austin Estate lands cannot be acquired, and if the Woods Estate land of about 2400 acres can be acquired, would the Government be willing to fence that in and reforest it? Would they be willing to do a part of the work if it was not possible for them to be offered the whole of the land for reforestation?

Mr. Campbell.
I may ask Mr. Hosmer, as expert on that matter, what benefit a portion would be without the whole?

Mr. Hosmer.
In reply to that question, I would say that I should much prefer to see the thing go through as a whole, because I believe the value of reserving this whole lot of forest would be much greater than reserving a portion of it. But I do think the Kehena 2nd portion is probably the more important portion of this block, for the reason that several of the small streams that come down into the plantations, some of which go into the ditch, and some others which ought to go into the ditch—surplus water at any rate—rise on this land, or are very largely influenced by Kehena 2nd. And some of those streams don't go up as far as the Kahua lands. For that reason I think the Kehena 2nd portion is somewhat more important than the Kahua lands. Every effort ought, however, to be made to get the whole block.

Mr. Campbell.
In this matter the Government has the right of eminent domain; it could condemn those lands. Of course that proceeding does not want to be invoked except as a very last resort. But, however, if we went into condemnation proceedings for this forest reserve, we would have to be backed up by somebody to guarantee the costs and payment of the judgment rendered by the court, and we could not go into condemnation proceedings until we had such a guarantee. I believe there are other ways to settle without going to that extreme. Of course, in condemnation proceedings there are many nice features that come in. It is a long, slow process, and it might take years to perfect, or get a ruling from the court, or a decision in the matter. In the meantime we are still at a standstill.

Mr. Holstein.
Wouldn't it be a good thing for the Kohala planters, who are present here today, as well as those who act as attorneys and agents, to come together this afternoon and see what they will offer for these lands? I believe this is the sticking point between the ranches and the planters.

Mr. Watt.
I think that the sticking point has always been that the Woods Estate has always refused to state what they would ask for those lands. They would make no statement. Our last meeting, I understood Mr. Holstein was going to write to ask them to state a price. Whether he has done it or not, I don't know.

Mr. Holstein.
They were to hold a meeting. The idea was that the Woods Estate was to come together sometime in September and state to us how much they wanted for these lands. If they are going to ask too large a price for it I don't think that the Kohala planters will deem it advisable to have anything to do with it, but anything within the limit, I think the Kohala planters are willing to consider. I would like to hear from Mr. John Hind on that subject.

Mr. Robertson.
I don't know that there is anything to be gained by that, for the appraiser appointed by the plantation would take the plantation's view of it, and the appraiser appointed by the Woods Estate would take the Woods Estate view of it. Is it not better for the planters to consider the matter themselves? I am inclined to think that possibly that can be done. Let the planters sit down and give careful consideration to the value of that land from the ranch standpoint, if they can put themselves in that position, and having come to the conclusion as to how much they are willing to pay, let them authorize somebody to make an offer. It may be that their offer will be accepted. I don't know. It seems to me that the thing will come to a focus quicker that way than agreeing on the machinery for agreeing on appraisers.

Mr. Campbell.
The Government's position is to get the thing settled as quickly as possible, because by the first of November we ought to have money.

Mr. Swanzy.
I understand the Government is willing to use such portions of the $25,000.00 for the fencing of Kohala as is necessary for the work.

Mr. Campbell.
Yes.

Mr. Hosmer.
I have not been on the land for some months, but my impression is that most of the places that would have to be replanted would be on Kehena 2. Kahua, except right back of Puupili, has not been opened up so much but that if a fence is put there, the forest will come back naturally, but on the land where cattle grazing is going on, and where is [it] has been going on for some time, artificial reforesting would be necessary to help out natural reproduction.

Mr. Campbell.
The $25,000.00 would be in this district. There may be some necessary fencing here and there, but the major portion, twenty-three or twenty-four thousand dollars, will be devoted to this area acquired by the plantation interests. That is a definite statement of fact based upon a resolution of the Board on that point. Mr. Robertson, as attorney for the Frank Woods Estate, are you still holding to the proposition that he wants an exchange?

Mr. Robertson.
Yes.

Mr. Campbell.
To be a little clearer, Mr. Swanzy, if we only secured a portion of these lands, we could only afford to spend a portion. Our offer was to expend $25,000.00, is to take the whole thing, and a proportionate part should be expended if only a portion of these lands should be acquired.

Mr. Petrie.
Mr. Chairman, leaving aside the discussion of Kehena No. 2, I want to ask if the Government has any solution in view of the situation with Mr. Frank Woods, on the basis of an exchange. It seems to me he is not disposed to sell unless he acquires other pasturable lands to continue his ranch business. Has the Government anything in view whereby that part might be solved?

Mr. Campbell.
I cannot give you an answer to that this minute, because I have not in view any lands that might be exchanged. If we have not, we have the other alternative, we can condemn. However, that is a matter that I would be very glad to look into, but I cannot recall now any land that we have.

Mr. Petrie.
So far as Kehena No. 2 is concerned, it does not seem to be of much use to continue this discussion, in view of the attitude that they have taken, and it now remains for the other interests to get together and see if they can make an offer to the Woods Estate to purchase.

Mr. Campbell.
If the interests in Kohala would get busy on that end of it and assure the Government that they would pay the judgment on condemnation proceedings against the Woods Estate, why, we will arrive. That is the only point. I am going to work and try to get a definite answer from Frank Woods, and also an application as to what land he might want. He might want lands that it is impossible for us to give, then we would be up in the air. If we cannot come to a reasonable exchange, then it comes to the question of condemnation, and if it comes to that question, then the interests of Kohala must stand by the Government.

Mr. Petrie.
That might be their conclusion as to how far they are willing to go in the event of the condemnation proceedings.

Mr. Campbell.
Can the Kohala interests get together before the steamer leaves tomorrow and give the Government some idea of what thy [they] think they are willing to do? Before the next Legislature meets we want the Forest Reserve fenced and trees planted on it.

Governor Frear, we would like to hear from you on the Kohala Forest Reserve matter.

Governor Frear.
I did not intend to say anything today as I do not feel that I am very familiar with the details of the proposition. It is a proposition, however, in which I have been very much interested for a long while. It seems to me that if there is any place in the Territory where there is need of the application of a correct forestry policy it is right there in Kohala, and something ought to be done and done soon. Mr. Campbell is quite right in stating that the Government is not in a position financially to purchase these different tracts, although it is in a position financially to do much in the way of fencing and in reforesting and in maintaining the forests in the future. I am going a little further, and say that I do not think it is correct in principle that the Government should purchase these tracts even if it had the money, where the principal beneficiaries would be the private owners there.

Just suppose for illustration, that all of this part of Hawaii belonged to one private individual, he would not expect the Government to buy this portion here and put it into the forest for the benefit of the rest of that man's land. On the other hand, supposing the Government owned the whole of that tract, you expect the Government to lay out all of that and keep it as forest, and then sell just the other portions of it if it sold them at all. Now, in general, on these islands, there are government and private tracts sandwiched in. The typical case is the island of Kauai, which is a round island made up of one big mountain, cut up into lands in apple pie fashion, Government, private, Government, private, right around the island. Now everybody that owns one of those tracts of land extending from the seashore up to the top of the mountain is interested in having the upper portion kept as forest reservation for the benefit of the lower portion, and so placing the Government and private owners all on the same basis, each one having upper land and lower land all around the mountain, you would expect all of them to combine and set aside his upper lands for the benefit of the lower lands. That is what they are doing. That is what we are doing here, although this is not quite as typical a case. The principal lands to be benefited are these private lands around here. The Government has some land here, but the principal tracts here are going to be benefited but very little to speak of by setting aside this forest reserve.

Now suppose this forest reserve is set aside as outlined here by the blue line (indicating area on the map showing government ownership), you will note that the Government is giving anyhow a majority of it, all this in green here and this in green here, it is all set aside, this green, which is directly for the benefit of the lands over here as well as the land over here, so that there is really only this little land over here [Kehena and Kahua] which is to be contributed by private individuals or corporations. I don't know what the best thing to do is to get at this thing to settle it. I should think that the Woods Estate is on a little different basis from a sugar corporation. Perhaps the best way would be to get together and appoint a number of appraisers, three or five, according as it may seem best, and let them appraise the different tracts that are needed for the forest reserve, and then make another appraisement as to the payment

for those tracts, that is, how much is this plantation and this plantation and this one to be benefited by this, that is relatively, and then divide up the cost of all of these factors of forest reserve among these different people in proportion to their benefits, and pay these different owners the amount. It may be that that is not practicable.

Perhaps the best way would be simply for the Kohala people, those most interested in the matter, to get together and see what they can do towards purchasing the different interests and then dividing the cost up amongst them.

Mr. Hind.
One of the most difficult questions to settle, I believe, is how the proportion will be borne by the different plantations.

Governor Frear.
Yes.

Mr. Hind.
Now take the matter of our plantation, there is a very large area there of government land. Now we will be called upon to pay our pro rata, but the pro rata of what, land that we may lease? There are a number of leases already expired, and I have not been able to renew them so far. The question is, must I include those lands or not as a part of our plantation? As the thing stands now, they cannot be.

Mr. Hosmer.
I may say in continuation of the point that Governor Frear made, that the area included in the Kohala Forest Reserve as originally recommended was 53 per cent. Government land. Of the remaining 47 per cent, in private ownership, 33 per cent. is Bishop Estate. Since this red line was drawn across Kehena and Kahua, the proportions are somewhat changed.

Governor Frear.
Does that take that (indicating Hamakua, Pali Forest Reserve) in, too?

Mr. Hosmer.
No, that is already set aside as another reserve. That is all Government land except this little white strip here.

Governor Frear.
Yes, but these lands get all the benefit of the trade winds and get the precipitation.

Mr. Hosmer.
Certainly. That would make the Kohala mountains as a whole 75 per cent. Government ownership.

Mr. Campbell.
I desire to thank you gentlemen. We have come nearer to an understanding than we ever have before.

The meeting then adjourned. [Hawaiian Forester and Agriculturalist, 1905: 495-503]

In the issues of the Hawaiian Forester and Agriculturalist for 1909, we find published detailed descriptions of the lands and resources of the proposed Kohala Forest Reserve. The series also presents readers with a summary of key points in the proceedings and evaluation of the proposed reserve. This historical perspective from those interested in the long-term conservation and protection of the mountain and forest resources is of particular value, as it gives us an opportunity to assess

where we are—successes and short comings—in the management programs over the last ninety-five years. It will be noted that fencing to protect the watershed and unique resources on the mountain lands has been a part of the program since its' inception:

> On the afternoon of October 18, 1909, a public hearing was held in the Throne Room at the Capitol, to consider the addition to the proposed Kohala Mountain Forest Reserve of certain privately owned forest lands in the section above the sugar plantations in the Kohala District. The meeting was called by the Board of Agriculture and Forestry and was attended by a representative gathering of the men who shape the course of affairs in Kohala. The result of the meeting was an understanding which it is expected will lead to definite action in regard to the setting apart in the near future as a permanent forest reserve of one of the most important forest areas on the island of Hawaii.
>
> The creation of a forest reserve on the Kohala Mountain was one of the first projects undertaken by the present Board of Agriculture and Forestry on its organization in 1903. In December, 1904, a portion of the mountain was set apart as the Hamakua Pali Forest Reserve, but owning to a variety of reasons it has been impossible up to this time to secure comprehensive action for the mountain as a whole. The point seems now to have been reached, however, when the entire summit of the Kohala Mountain will shortly be officially set apart. Consequently it is appropriate that there now be made public, in accordance with the usual custom of the Board, the reports of the Superintendent of Forestry and of the Committee on Forestry in regard thereto, together with a full transcript of the discussion at the hearing of October 18.
>
> These reports give the history of the efforts that have been made to establish this reserve. From the present indications it ought not to be long before a portion of an issue of the "Forester" can be devoted to the formal proclamation announcing its actual creation.
>
> REPORT OF THE COMMITTEE ON FORESTRY.
>
> Honolulu, December 3, 1908.
>
> Board of Agriculture and Forestry,
> Honolulu, Oahu.
>
> SIRS:—Your Committee on Forestry have had under consideration the report of R.S. Hosmer, Superintendent of Forestry, under date of October 14, referring to the proposed Kohala Mountain Forest Reserve in the Eastern portion of North Kohala, and in West Hamakua, Island of Hawaii, and hereby recommend:
>
> > That, while approving of the recommendations of Mr. Hosmer, we do not feel that they go far enough in the protection of the water-shed of the Kohala Mountains, and therefore further recommend that not only the area proposed by Mr. Hosmer, but the [page 471] additional area suggested by him on page 8 of his said report, together with the small additional area as shown on the 1901 map of the island of Hawaii—marked in blue—(the said map accompanying the Governor's Report of 1906), be included in the said Forest Reserve.
> >
> > And the Committee further recommends that the Superintendent of Forestry be instructed to at once proceed without further delay to locate said proposed additional area, as above recommended, and report back to the Board at the earliest date possible.

Yours truly — H.M. Von HOLT, Chairman; W.M. GIFFARD, C.S. HOLLOWAY.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, October 14, 1908.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu, Oahu.

GENTLEMEN:—I have the honor to submit herewith a report with recommendations on the proposed Kohala Mountain Forest Reserve in the Districts of Kohala and Hamakua, Island of Hawaii.

LOCATION.

The section included in this proposed forest reserve may roughly be described as embracing the area of existing forest on the Kohala Mountain not already included in the Hamakua Pali Forest Reserve, together with the private forest reserve above Kukuihaele, maintained for many years by the Pacific Sugar Mill Company, and the two forest covered gulches at the west end of the mountain, Honokane and Pololu; owned respectively by the Bishop Estate and by the Government. The total area of the proposed Kohala Mountain Forest Reserve is approximately 27,160 acres.

OBJECT.

The Kohala Mountain Forest Reserve is created as a protection forest to assist in the conservation of water on the Kohala Mountain. The Kohala Mountain lies between two districts that contain considerable areas of land that can only be made productive in a large way through irrigation. As it is the only available source of water supply for these districts, the Kohala Moun- [page 472] tain is justly to be regarded as one of the very important water sheds of the Territory. Through the enterprise of two responsible corporations, the Kohala Ditch Company and the Hamakua Ditch Company, water for irrigating cane land is already led out from the windward slopes of the mountain, both into Kohala and into Hamakua. From the leeward face of the mountain water is also piped out onto the Waimea plain, for domestic use and for watering stock. In the full economic development of these several sections every drop of water that can be got is urgently needed. Especially is this so in view of the probability of the development before many years of the Waimea Plains as a place of residence for many people. It is therefore not only wise but from a far-sighted economic standpoint imperative that all reasonable steps be taken to protect, to safeguard and if possible to increase the sources of supply.

The elevation of the Kohala Mountain, 5,505 feet, is sufficient to make the mountain serve as a point around which the moisture laden trade wind clouds congregate and are held to precipitate their contents. But the mountain is not high enough to serve as a complete barrier to the passage of the trade wind clouds, neither is it large enough in area to make its catchment basins of sufficient size to yield any great quantities of water. For these reasons it is the more important that conditions favorable to a sustained flow, through the retardation of run-off be maintained.

DESCRIPTION.

The setting apart of the Kohala Mountain as a forest reserve has been under consideration ever since the passage of the forest reserve law in 1903. The Kohala Mountain was the first forest area in the Territory visited by me after my arrival in 1904. But because of one reason and another, among which the long continued litigation over the Parker Ranch played no small part, it has not been found feasible to bring the

project to the point of action until now.

TOPOGRAPHY.

The Kohala Mountain is the lowest of the four mountains that make up the island of Hawaii. It forms the northern point of the island and with its abrupt palis cuts off the even slope of the Hamakua District from the similarly situated land in Kohala. As is characteristic of windward slopes in Hawaii, the north-eastern side of the Kohala Mountain rises abruptly from the sea. The high wall, deeply cut by gulches and lesser valleys, each with its stream of water falling over the bluff into the ocean, adds much to the picturesqueness of the coast. On the southern and western sides of the mountain the slope is less steep, but owing to the dense cover of vegetation and the boggy character of the ground the [page 473] mountain is rendered difficult of access and is consequently relatively unexplored.

On the windward slopes the only means of access are the trails in connection with the irrigation projects and those along the bluffs near the sea that connect the limited areas of agricultural land in the bottoms of the larger gulches.

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 run-off and for holding back moisture after it once reaches the ground cannot be surpassed.

OWNERSHIP.

Of the lands in the proposed Kohala Mountain Forest Reserve the larger part belong to the Territory. Out of the total area of 27,160 acres, 14,365 acres, or 53 per cent., are Government lands. Next in order of ownership comes the Bishop Estate with 8,970 acres, or 33 per cent. The more important of the remaining lands are owned by the Kohala Sugar Company, the Parker Ranch, the Queen Emma Estate, the Pacific Sugar Mill, and by one or two individuals. The accompanying list shows the name, ownership, area, (and in the case of the Government lands the lessee, lease number and date of expiration of the existing lease) for all the lands in the reserve. (See Appendix.)

BOUNDARY.

In selecting the boundaries of the proposed Kohala Mountain Forest Reserve natural barriers have so far as possible been followed. Where this was not feasible the boundary has been made to conform to existing fence lines for the maintenance of which provision has in most cases been made. Thus on the face of the mountain above Waimea the reserve boundary follows the upper fences of the Parker Ranch paddocks. So far as possible in the renewal of the leases of Government lands, provision should be made for the maintenance of these fences as one of the terms of the new lease. Across other lands it will often be necessary to keep up the fences by other means. At present the forest reserve line above Waimea is kept intact through the interest of the manager of the Parker Ranch, Mr. A.W. Carter, who, realizing the value of a forest cover on the mountain, has built a number of stretches of fence on the face of the mountain to complete the line.

It is recommendation that tends to become trite through repetition that there should be a fund available in this department from which necessary stretches of forest fence could be built in localities where the interests of the Government would otherwise suffer. It is a recommendation that must and will continue urgently to be made until such a fund is provided.

The portion of the Kohala Mountain Forest Reserve that has been reserved by the Pacific Sugar Mill Company as a private [page 474] reserve is at present fenced and will continue to be maintained by that company as it has been for the past twenty

years. For the present the gulch lands at the northwest end of the mountain are not in need of artificial barriers.

It may perhaps be appropriate to note here that the owners of private land within the proposed Kohala Mountain Forest Reserve are in full sympathy with the aims and object of the Government in creating the reserve and in recommending the preservation of this area. As has already been stated the Bishop Estate is, next to the Government, the largest owner of land in the reserve, controlling as it does 33 per cent.

Because of the present inability of the Government to provide for the definite and systematic administration of its forest reserves through a forest ranger organization, the Trustees of the Bishop Estate are not ready to turn their lands over to this department for management, but they are perfectly willing that their forest be included within the reserve limits, as it is their intention to continue themselves to maintain these lands as a forest reserve.

Much the same is the condition under which the private forest reserve of the Pacific Sugar Mill is included as a part of the Kohala Mountain Forest Reserve, except that in this case the inclusion of these lands gives, as it were, an official recognition of the far sightedness of that company.

For over twenty years the Pacific Sugar Mill has maintained at its own expense some 2,800 acres of land as a private forest reserve. This area protects the source and catchment area of the ***Lalakea stream***, tributary to the ***Waipio Gulch***, which is used on the plantation, and also ***Kukuihaele Spring***, near Kukuihaele, one of the very few sources of water in Hamakua that can be depended on even in long periods of drought. When the reserve was established much of the land was fairly open. Thanks to continued protection by carefully kept up fences there has resulted a marked increase in vegetation through natural reproduction. Especially is this true of the last few years, when original conditions have been more nearly approached by the coming back of ferns, shrubs and small trees.

The planting of introduced forest trees has also helped in this regard.

Because of its running streams and its proximity to the densely forested section to the west of Waipio Gulch the Kukuihaele private forest reserve is in a different case from the remainder of the Hamakua forest belt. This being so different treatment is indicated and the permanent reservation of the area becomes a step of economic wisdom.

The other principal holders of private land in the proposed Kohala Mountain Forest Reserve, the Kohala Sugar Company and the Parker Ranch are also in favor of the creation of the reserve and have manifested their interest in a tangible way by the erection and maintenance of forest fences along certain portions of the reserve boundary and by keeping under forest certain lands which [page 475] by the terms of their leases or by being in fee simple ownership could have been opened for cattle grazing.

To meet the objection that can very pertinently be raised that too much dependence in the management of this and other Hawaiian forest reserves is now placed on the good will of private corporations and individuals it has frankly to be admitted that the present condition is far from satisfactory. The condition is one that can only be remedied by the organization of a salaried forest ranger service, responsible to this department alone. Toward this end the energies of the Division of Forestry will continuously be directed until such a force is secured.

In the meantime the work of formally setting apart forest reserves finds its justification in that it is a necessary and essential step in the right direction—one that must be taken before plans for the forest to do its full part in the development of the Territory can be put into effect.

DESIRABLE EXTENSION OF THE RESERVE.

In addition to the area now recommended to be set apart, it is my belief that the Kohala Mountain Forest Reserve should be extended to include the forested section immediately adjoining and to the west of ***Honokane*** and ***Pololu*** gulches. This section is made up of the privately owned lands of ***Kahua 1 and 2, Kehena 2***, and the area of forest above the ***Niulii***, the ***Halawa*** and the eastern part of the Kohala Sugar Company's plantations that has for some years been held as a private forest reserve. This area is not included in the proposed Kohala Mountain Forest Reserve at this time because of complications arising out of uncertainty as to the use to which certain of the lands may at any moment be put by their owners. Several attempts have been made to bring about action that would result in the permanent setting apart of this area as a forest reserve, but so far nothing tangible has resulted. The matter is, however, still under advisement; in time something may be accomplished.

As a matter of record and as one step toward the desired end I may state here that it is my judgment that there should be added to the Kohala Mountain Forest Reserve the area lying to the west of Honokane and Pololu gulches bounded as follows:

Beginning at the Pololu Gulch at the eastern *makai* corner of the private forest reserve of the Niulii plantation, and following the *makai* boundary of the said reserve and its extension across the lands back of and above the Niulii, Halawa and Kohala Sugar Companies' plantations to its western extremity back of and above the Kohala Sugar Company's mill; thence following the western boundary of the reserve up to the land of Kehena 2; thence easterly along the *makai* boundary of Kehena 2 to the ***Hooleipalaoa Gulch***; thence following up the western (outside) edge of the said gulch to its source in a little pond just north of ***Puu Pili***, to the summit of Puu Pili; thence northerly, along the boundary [page 476] of the Kohala Mountain Forest Reserve to the point of beginning. These should also be included in the reserve the south side of Puu Pili, to protect certain springs on the lower slope of that hill.

In my judgment it is very markedly to the best interests of the Kohala District that all the land within the limits just defined should be held permanently under a forest cover. There is a very considerable area of agricultural land in Kohala that can only be made productive through irrigation. The water bearing area on which the Kohala district has to depend for its supply is at best limited. Large expenditures have been made to bring out water from this area onto the agricultural lands in Kohala. In such a case it is obvious that all possible sources of supply should be turned to account. In the section under discussion there are several springs and brooks that while they are not large are yet of altogether too much importance to be lost sight of. In addition to its value as an actual source of water, this section is also important in that it serves in a measure to protect the forest land lying behind it, on the main slope of the mountain. There is always a tendency in the Hawaiian forest for the edge of the woods to be open and in poor condition. Such an area is now under consideration serves as a buffer and protects the main reserve behind.

With the statement that all the water that can be made available is needed in the development of the Kohala district, it follows as a corollary that all the available sources of water should be carefully protected. The recession of the forest in the Kohala district is one of the most marked examples of the change in natural conditions that is to be found anywhere in the Territory. If the edge of the forest is permitted to be pushed

further back it is my belief that the consequences to the lower lands will be serious. The use for cattle grazing of the forest that now remains decreases in direct proportion the opportunity of making productive the more valuable lower lying lands, from which could be secured larger returns then would ever be possible from raising cattle on the uplands. Individual owners cannot be blamed for making what for their personal interests may appear to be the best use of their own land. But considered from a broad economic stand-point it is very decidedly to be lamented that an area of potentially good agriculture land should be curtailed through the opening up of water-bearing forest areas that should be kept permanently under a dense cover of vegetation.

Owing to the diversity of interest it has been impossible so far to secure the adoption of a comprehensive plan whereby this section could be protected, although such plans have from time to time been proposed and diligently advocated by different persons. At the present time renewed efforts are being made to bring about some sort of a feasible arrangement. But in view of the present uncertainty and the bearing which some of the complications of the past have on the present situation, it has been deemed wise to postpone definite recommendations concerning the reservation of this section until some future time. The present section of this [page 477] report is therefore to be regarded in the nature of a report of progress. It is my hope that it will be followed in due time by a statement of results accomplished.

RECOMMENDATIONS.

For the reasons set forth in the foregoing pages I now recommend that the Board request the Governor of Hawaii to create, in accordance with the law and following the usual method, the Kohala Mountain Forest Reserve, and to set apart as units thereof the Government lands within the boundary officially described by the Government Survey Office.

The Government lands are in two classes, those not under lease, and those on which leases have still some time to run. Those not under lease can be definitely set apart at once; on the others the full reservation takes effect automatically at the expiration of the lease. The lands not under lease are: Pololu 1,000 acres; ***Awini*** 100 acres; ***Pauahi*** 150 acres, and ***Lanikepu*** 435 acres; a total of 1,685 acres. Those on which leases have still some time to run are ***Kawaihae 1*** 3,370 acres; ***Puukawaiwai-Panoluukia-Kapia*** 360 acres; ***Momouloa*** 130 acres; ***Puukapu*** 8,570 acres; ***Kamoku*** 20 acres, and ***Keaa*** 230 acres; a total of 12,680 acres. Altogether there are 14,365 acres of Government land.

OFFICIAL DESCRIPTION OF BOUNDARY.

[In the original there follows the official technical description of the proposed Kohala Mountain Forest Reserve prepared by the Government Survey Office at C.S.F. No. 1960, and shown on Government Survey Registered Map No. 2060. This is omitted here as it will be given in full later, in the formal proclamation. The total area of the Reserve is 27,160 acres.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry. [Hawaiian Forester and Agriculturalist, 1909:478]

Minutes from the October 18th, 1909 public hearing of the Board of Commissioners on the proposed Kohala Forest Reserve provide the following history on issues and objectives surrounding the proposal:

KOHALA MT. FOREST RESERVE HEARING.
Minutes of a hearing re extension of proposed Kohala Mountain Forest Reserve, held by the Board of Commissioners of Agriculture and Forestry, in the Throne Room, October 18, 1909.

Present: Board of Agriculture and Forestry—Messrs. Marston Campbell, President; H.M. Von Holt, D.P.R. Isenberg and J.M. Dowsett, and Superintendent of Forestry R.S. Hosmer.

Governor Frear and Messrs. A.W. Carter, F.S. Dodge, T.H. Petrie, F.M. Swanzy, H. Holmes, A.W.T. Bottomley, A. Lewis, E.A. Knudsen, H.L. Holstein, A.G.M. Robertson, P.W.P. Bluett, J.S. Low, John Hind, A. Mason, G.C. Watt, J.T. Taylor, J.W. Waldron, O. Sorenson, J.T. McCrosson, S.M. Kanakanui, F.J. Testa, J. Jorgensen, H.R. Bryant and L.G. Blackman.

(Various maps showing the proposed reserve were displayed.)

Mr. Campbell.
Gentlemen:—On September 24, at a meeting of the Board of Agriculture and Forestry, I was directed to issue an invitation to all those in the district of Kohala interested directly or indirectly in the Kohala Forest Reserve, to attend a meeting at this place with the Board of Agriculture and Forestry.

The last Legislature of the Territory made it possible for the Board of Agriculture to take some definite action in regard to reforesting portions of the Islands. It has been recognized that the proposed Kohala Forest Reserve is one of the most important, and there has been, I believe since 1904, an effort made toward accomplishing something in this particular reserve. There has, however, never been any united action between those interested and the Government. There has been somewhat of a diversity of opinion as regards the aid which might be given by those directly benefited by the forest reserve. It was thought that this meeting would bring us closer in touch and possibly result in something which would work toward the solving of this problem.

The Board of Agriculture and Forestry, under the provisions of the Immigration-Conservation Act, is now in a position, provided it receives certain aid from those interested, to go ahead with this forest reserve, and we have asked you here to meet us on this proposition.

I think it would be well to get, if possible, a record of those who are here and particularly what interests they may represent, and if there is no objection, I will ask those present to respond to that question. Mr. Bluett?

Mr. Bluett.
I am really representing the Woods Estate in this matter, owners of Kehena 2, but that matter has been referred to Mr. Robertson here as the attorney for the Estate; he was appointed to represent the Estate. [page 480]

Mr. Campbell.
Mr. McCrosson, are you representing any particular interest, either directly or indirectly in this matter?

Mr. McCrosson.
I am particularly interested in the conservation of the forest outline made here, on account of the Kohala and Hamakua ditches.

Mr. Campbell.

Well gentlemen, instead of asking each one of you the question, would you have any objection to letting us know, so that I may know who is represented here? Mr. Dodge, are you representing the Bishop Estate?

Mr. Dodge.
Bishop Estate.

Mr. Swanzy.
I represent the Union Mill Company, and Mr. Hart, Niulii and Makapala.

Mr. Hind.
I represent the Kohala Plantation Company, and also the Ditch.

Mr. Campbell.
Mr. Petrie?

Mr. Petrie.
Kohala Sugar Company.

Mr. Campbell.
Mr. Watt?

Mr. Watt.
Kohala Sugar Company.

Mr. Campbell.
Mr. Carter?

Mr. Carter.
Parker Ranch and Bishop Estate.

Mr. Campbell.
Mr. Sorenson?

Mr. Sorenson.
Bishop Estate.

Mr. Campbell.
Mr. Mason?

Mr. Mason.
Puakea Ranch.

Mr. Campbell.
Mr. Low?

Mr. Low.
J.F. Woods, Kahua Ranch.

Mr. Bottomley.
I represent the Austin Estate and Bishop Museum.

Mr. Campbell.
Mr. Waldron?

Mr. Waldron.

Pacific Sugar Mill and Honokaa Sugar Co.

Mr. Bryant.
Puakea Plantation.

Mr. Campbell.
Sometime ago I asked Mr. Hosmer, who has had this matter in hand for a number of years, to write me a little report covering the essential features. I will read that report.

Honolulu, Hawaii, July 24, 1909.

Hon. Marston Campbell,
President and Executive Officer,
Board of Agriculture and Forestry,
Honolulu.

Dear Sir: In reply to your request of July 13, it gives me pleasure to hand you the following statement in regard to the present status of the proposed forest reserve on the Kohala Mountain:

The project to create a forest reserve on the Kohala Mountain was one of the first to receive attention on the definite organization of the Division of Forestry in January, 1904. The obvious [page 481] needs of the situation pointed to the necessity for prompt action but owing to a variety of circumstances the actual setting apart of this reserve has been again and again delayed. Chief among the reasons for the delay were the prolonged litigation over the Parker Ranch and the difficulty of bringing to the point of action the various interests concerned with the reservation of certain private lands in Kohala proper that are needed to complete the forest reservation.

In October, 1908, I submitted a report recommending the reservation of the summit of the Kohala Mountain, embracing "the area of existing forest not already included in the Hamakua Pali Forest Reserve, together with the private forest reserve above Kukuihaele, and the two forest covered gulches at the west end of the mountain. Honokane and Pololu, a total area of approximately 27,160 acres." I recommend further that as soon as practicable [practicable] there be added to this reserve the forested section above the Kohala plantations, now in private ownership, and the lands of Kehena 2, Kahua 1 and 2 and Waika. On the 3rd of December, 1908, the Committee on Forestry recommended that this area be included with that originally recommended, and that steps be taken to secure a complete description so that the whole area might be set apart as a reserve. I immediately requested the Survey Department to complete the survey of this area. The field work has been done and the data is now in such shape that a description can quickly be compiled. The description has not yet been furnished, however, because in the meantime the question of the turning over of the private lands to the Government has reached the point where it seems advisable to have the compilation of the description await the definite settlement of boundaries on the ground.

From a number of visits to Kohala and a careful study of the situation in its various aspects, it is my judgment that for the best interests of all concerned there should be permanently maintained under a forest cover the area that for some years has been treated as a private forest reserve above the plantations, together with that section of the Kehena and Kahua lands lying within, that is to the east of, the Hooleipalaoa Gulch, which starts on the northern slopes of Puu Pili. This is, I believe, the best boundary that could now be selected for this portion of the forest reserve for much of the way its banks are steep enough to form a natural barrier, and it is as good a dividing line as can now be selected between the land that should be held in forest and that which is

proper to be used for grazing.

All the area proposed to be added to the Kohala Mountain Forest Reserve is in private ownership. Because of the beneficial influence which I believe this area of forest exerts on the adjacent lands, I have always held that the plantation interests should bear the major portion of the cost of its reservation. In so doing they would only be acting as have private interests in other districts in the Territory. I believe that it would be fair for the different [page 482] plantation companies and those interested in the lower lands which will be benefited by the water to be obtained from this forest reserve, to pay 75 per cent. of the cost of acquiring the additional private lands that are needed to round out the reserve. This would leave one-fourth to be borne by the government. Working on these lines I tried two years ago to effect an arrangement between the plantation interests and the Woods Estate, but without success. During the recent session of the Legislature I brought the matter up again and arranged a number of conferences among those interested. The outcome of these meetings was a proposition on the part of Mr. John Hind that the plantations might get together on a basis of land ownership. I accordingly had Mr. Kanakanui of the Survey Office draw up a table showing the portion of agricultural land owned by the different plantations. The proposition in this form did not meet with the approval of the representatives of several of the Kohala plantations. Accordingly, a revised plan was suggested which is now being worked up by Hon. H.L. Holstein. Mr. Holstein's proposition is that the corporations desiring to buy the forest land get together on a basis of productive value rather than area. He is now at work on this plan. In the past it has been difficult for the prospective purchasers and the owners of the land to arrive at anything like a common figure.

I am sending you herewith a copy of my report dated October 14, 1908; of the report of the Committee on Forestry dated December 3, 1908, and of a map of the areas proposed to be reserved, that was drawn up by Mr. S.M. Kanakanui of the Survey Office. It should perhaps be noted that when the line comes finally to be fixed the reserve should include a small group of trees on the south and west sides of Puu Pili.

Very respectfully,
RALPH S. HOSMER,
Superintendent of Forestry.

Mr. Campbell.
I will also read a resolution, signed by John Hind and others, adopted at a meeting of the Kohala plantation managers, last January:

Kohala, Hawaii, January 30, 1909.

Whereas, the matter of Forest Reservation is of paramount interest to all concerned in all parts of the country, and

Whereas, same is of vital interest to all inhabitants of the District of North Kohala, Hawaii, and

Whereas, there is available a large tract of land *mauka* of Kohala, which is now unused and of no value for agriculture or pasturable purposes, aggregating approximately twenty thousand acre [acres], and [page 483]

Whereas, if reserved for forest same would be for all time a safeguard to the district against droughts, the agricultural and all other industries located in the North Kohala District would benefit;

Therefore, *be it Resolved by the Planters and Residents of Kohala*, that the Representatives and Senators of this District be requested to take such steps as may be necessary to enact such laws as will enable the government to acquire the lands extending from the timber line on mountains southeast of Kohala to such limits as are recommended by Forester Hosmer.

(Signed) JOHN HIND,
(Signed) ROBT. HALL,
(Signed) H.H. RENTON,
(Signed) J. ATKINS WIGHT,
(Signed) H.R. BRYANT,
(Signed) R.R. ELGIN,
(Signed) GEO. C. WATT.

Mr. Campbell.
I will call on Mr. Hosmer at this point, to describe the proposed forest reserve.

Mr. Hosmer.
The proposed Kohala Mountain Forest is shown on the small blue print map that you hold in your hands. It is made from a tracing of a portion of this big government map of the whole island. It takes in the area shown on this large map by the red lines. The red lines on the blue print take in the whole summit of the Kohala Mountain. In addition to this proposed reserve, a portion of the Kohala Mountain has already been set apart as a forest reserve—the Hamakua Pali Forest Reserve, set apart in 1904.

This new proposed reserve begins with the private forest reserve back of Kukuihaele, maintained for twenty years or more as a private reserve by the Pacific Sugar Mill and on which a good deal of planting has been done. Then it takes in the section back of and above the Waimea plains, a good deal of which is the government land of Puukapu, and all under lease to the Parker Ranch. Mr. Carter, representing the Parker Ranch, has caused fences to be constructed, shutting off this portion of the mountain all the way along from Waimea to the boundary of Waika. I believe that fence is now complete all the way. It consists of paddock fences and other connecting stretches of fence.

The forest reserve as I recommended it on October 14, 1908, did not include the land which we are today considering, because at that time it was not possible to get united action on it and because the Board of Agriculture and Forestry did not feel inclined to make a recommendation of reservation, unless there was prospect of getting something accomplished within a reasonably short time. For that reason the Committee on Forestry, thinking that something could be done and that the whole matter ought to be taken up at once, made the following report on December 3, 1908: [page 484]

Board of Agriculture and Forestry,
Honolulu, Oahu.

Sirs: Your Committee on Forestry have had under consideration the report of R.S. Hosmer, Superintendent of Forestry, under date of October 14, referring to the proposed Kohala Mountain Forest Reserve in the Eastern portion of North Kohala, and in West Hamakua, Island of Hawaii, and hereby recommend:

That, while approving of the recommendations of Mr. Hosmer, we do not feel that they go far enough in the protection of the watershed of the Kohala Mountains, and therefore further recommend that not only the area proposed by Mr. Hosmer, but the additional area suggested by him on page 8 of his said report, together with the small additional area as shown on the 1901 map of the island of Hawaii—marked in blue—

(the said map accompanying the Governor's Report of 1906), be included in the said Forest Reserve.

And the Committee further recommends that the Superintendent of Forestry be instructed to at once proceed without further delay to locate said proposed additional area, as above recommended, and report back to the Board at the earliest date possible.

Yours truly,
H.M. von HOLT,
Chairman;
W.M. GIFFARD,
C.S. HOLLOWAY.

I at once requested Mr. Wall to have the necessary lines run. This blue print map, sent out last spring, is the result. It shows the boundaries that I recommended be adopted. This recommendation is based on personal examination on the ground, the first soon after I came to the Territory in 1904, and I have been on the ground several times since. I decided that this little gulch, Hooleipalaoa, starting behind Puupili and coming down across Kahua 1 and 2 and Kehena 2, is the best boundary that can be adopted as the western limit of the Kohala Mountain Forest Reserve. It would, of course, be possible to carry the boundary further out on Kehena 2, but the cost of making that the forest line would be so much more expensive that I did not feel justified in recommending it. A good portion of the Hooleipalaoa Gulch is sufficiently deep and steep-sided to serve as a natural barrier, thus reducing the cost of fencing.

On this big blue print are shown the areas within the Hooleipalaoa gulch; also the areas of privately owned forest land between the *makai* boundary of Kehena 2 and the plantations. [page 485] This area includes the private forest reserves of the three plantations, which have been maintained by them for some years; by Niulii, Kohala and Halawa plantations. This lower line, which is the *makai* boundary line of the proposed reserve on the north, goes just above the head of the cane. This broken line shows what was in cane last year when Mr. Kanakanui was up there. This straight line is the proposed boundary of the proposed reserve. The area of each of the private lands and the name of the owner is given on this map: Pololu, belongs to the Government; then Waiapuka, 197 acres, Bishop Estate: Niulii, 560 acres and Makapala, 530, to Judge Hart: Aamakao, 710 acres, Kohala Sugar Company; Halawa, 493, Estate of Jas. Wight; then two or three small areas beyond; then the portion of Kehena 2, inside of Hooleipalaoa Gulch, Woods Estate, 2428 acres; Kahua *liilii*, or Kahua 1,782 acres; Kahua nui, (Kahua 2) 482 acres; and Waika, 463 acres. Kahua 1 and Waika belong to Frank Woods in fee. Kahua 2 is Austin Estate, under lease to him. The government map shows Waika as coming up to a point. This is incorrect. This blue print shows the lines as they actually are.

Now the proposition, this afternoon, is to see if we can get to some definite understanding, in regard to a reservation of these areas.

Mr. Campbell.
You have heard Mr. Hosmer in his description of the proposed area to be taken into the forest reserve. Now I would like to hear from any of the gentlemen present, as to whether there is any opposition to this area to be taken, or suggestions as to additional area, or suggestions as to the cane line.

I might in connection with that read this letter to Mr. Hosmer from Mr. Watt:

Kohala, March 15, 1909.

Ralph S. Hosmer,
Superintendent of Forestry,
Honolulu.

Dear Sir: Your letter of February 26 received and contents noted.

Messrs. Bond, Hind, Renton, Wight and myself met and discussed the mater yesterday. The opinion of these gentlemen seemed to be that the reserve should include all the lands inside of about two miles west of the Hooleipalaoa Gulch. As regards the three private forest reserves above the plantations I would say that I agree with your idea and have so expressed myself to the Halawa people here and also to their Trustee (Mr. R.W. Shingle) in Honolulu.

With regard to us here at Kohala, last year the directors decided to set apart nearly all of the Awini property as a government reserve which I consider would be quite an addition to any forest reserve that may be made in future. [page 486]

Up to this time I have not consulted with Mr. Robert Hall of Niulii Plantation and therefore am unable to say what his views on the subject might be.

If Niulii, Halawa and the Kohala Sugar Company were willing to turn over all these forest reserves to the Government, it seems to me that it would only be fair for the other three plantations (Union Mill, Hawi and Puakea) to purchase Kahua and Kehena and turn it over as their contribution and more especially as these last named plantations will derive far more benefit from such a reserve than the others will.

Yours truly,

GEORGE C. WATT,
Manager, Kohala Sugar Co.

Mr. Hosmer.
There is a string of hills out here to the west, beyond the Hooleipalaoa Gulch, which might be made the boundary (indicating on map a row of hills from Puuiki to Puu Oo, to Lahikiola, to Puu Liolio and Puu Manu), but that land has for so long a time been opened up and there is now no forest remaining on it, that it is a question of planting. The cost of fencing too, would be much greater there. I believe that most of the protection that we need would be secured by having the boundary at Hooleipalaoa. Of course if it is simply a question of spending more money, I am not at all opposed to seeing the forest area extended. But it would very materially increase the cost, and it has seemed to me, up to the present, that we had better get Hooleipalaoa and the area inside done before we talk about getting further forest area, or planting further out towards Mahukona.
Mr. Campbell.
The Board has within its power described the forest reserve as it should be, and I should be pleased to hear—

Mr. Hosmer.
I should like to ask if the gentlemen are still of the same mind as they where [were] when this (Mr. Watt's) letter was written?

Mr. Hind.
That is, with the boundary as we have it there [on the map]?

Mr. Hosmer.

As to bringing the boundary further out.

Mr. Hind.
I think the boundary, as far as I am concerned, I think the boundary as laid out by you along the Hooleipalaoa Gulch is about all we can think of just now.

Mr. Watt.
Well, after that map was finished and submitted to us, it was suggested by resident planters that there be more taken in. There was nothing definite said about it. That is why that letter was written.

Mr. Campbell.
You think at all events that he has covered the ground fairly well, Mr. Watt? [page 487]

Mr. Watt.
Well, so far as I know. The other men know more about the country up there than I did, being practically a stranger.

Mr. Campbell.
Mr. McCrosson, you are particularly familiar with that country.

Mr. Watt.
I think Mr. Bluett knows that country well.

Mr. McCrosson.
I think Mr. Bluett could state more intelligently about that now than I can or almost any of the Kohala people.

Mr. Bluett.
I think that boundary is about the best that could be selected under all conditions, with the exception that the line could go to the west of Puu Pili, and take in the entire hill. There is a certain amount of forest on Puu Pili which is still good. Instead of running through the center of Puu Pili the line should circle the hill. I think that is the only change that I should suggest.

Mr. Hosmer.
My recommendation in the report covers that, although the map does not show it.

Mr. Bluett.
As regards [to] those other hills, there are several, and a number of still other hills; those could sometime be fenced in and planted; that may have a very good effect without taking the strip in between.

Mr. Hosmer.
Reading from his report of October 14, 1908: “There should be also included in the reserve the south side of Puu Pili, to protect certain springs on the lower slope of that hill.” Mr. Kanakanui has not worked up his field notes yet, although he is prepared to do so when this matter is settled. The line can go around the hill and take in that side.

Mr. Campbell.
Mr. Holstein, can’t you give us any expression of opinion on that subject?

Mr. Holstein.
I think the Kohala planters have expressed themselves as favoring the Hooleipalaoa Gulch. I have been up there on several occasions and bear out Mr. Hosmer’s statement, the gulch is a natural boundary with a few exceptions, here and there. I

agree also with Mr. Bluett, on the proposition that the boundary on this Puu Pili should be on the west side instead of climbing up the middle and leaving half the hill for a cattle ranch and the other for forest protection.

The great difficulty in the discussion today will be as to what attitude the owners of these private lands will take in the matter. At the meetings we held in Kohala with the Kohala planters—I believe there were three meetings held—while we were unanimously in favor of forest protection in Kohala, the question is how much or what will these private owners of the land sell for? I believe when it comes down to the question of the Kohala planters buying a tract of land, they would be quite willing to do so, for their own protection as well as the protection of other people there. As we have the parties interested in these private lands here it strikes me that the best proposition now is to ask them whether they will sell. And if they are not willing to sell, the question is, will the Government proceed further in the matter? [page 488] I deprecate any proposition of condemnation of land for forest purposes, the more so for private purposes, for the interests of the planters up there. I hope such an idea will not be carried out, because an agreement could be accomplished by the proper meetings of the owners.

Mr. Campbell.
Mr. Holstein, what is your feeling in regard to a possible exchange of land by the Government at Holiu there for forest reserve?

Mr. Holstein.
Private exchange?

Mr. Campbell.
Do you think the Government is justified in making an exchange with other lands for forest reserve?

A. It all depends on what land the Government is going to exchange.

Mr. Campbell.
Well, possibly agricultural land for land of this kind?

Mr. Holstein.
Then I am opposed to such a proposition.

Mr. Campbell.
Lands of a similar character, you might feel differently about?

Mr. Holstein.
I would feel more favorable to such a proposition.

Mr. Campbell.
The point I particularly want to arrive at is this—

Mr. Holstein.
Pardon me, in that vicinity, we have a great problem in the Kohala district, as well as in South Kohala, the reclamation of land, thousands of acres. I think the Government has in the neighborhood of 15,000 acres of *pili* lands, which in days to come will furnish homes for the people which you wish to have in the Islands. The exchange of agricultural land, I am particularly opposed to in that neighborhood. And if we can come to some proposition whereby these lands could be obtained by the Government, all the better.

Mr. Campbell.
I think the situation with regard to any minor changes in line by taking in Puu Pili and any smaller matters can be determined in the final adjustment. I wanted a general expression of opinion of the people of Kohala, whether we have recommended reasonable boundaries and whether the people of Kohala were satisfied.

Mr. Campbell.
Mr. Bryant, do you feel that we are on the right track?

Mr. Bryant.
Yes.

Mr. Campbell.
Practically every interest in Kohala is represented here today, and later on when we come to a conclusion, we don't want to feel that we have made an error, or in our preliminary meetings determine on a thing which is not proper. If there are any objections to the line as established, I would be pleased to hear them.

Mr. Hosmer.
If the line is not perfectly clear to everybody from these maps, there are here some of the detailed maps of that district, if anybody wants them.

Mr. Holstein.
Silence gives consent. [page 489]

Mr. Campbell.
I so take it. Now we come right down, gentlemen, to the proposition, what can the Government do, and what can the interests in Kohala do? We are all here, and I think everybody is agreed on the importance of this thing, and the necessity of some action being taken to reforest Kohala. From the standpoint of the Government within the next two years and a half, if the land is acquired, the Government can expend a stated sum of money in reforesting those areas that may need reforesting, and in fencing. The Government is not in a position, gentlemen, to purchase the lands required in Kehena 2, and the other lands. If those lands are absolutely necessary to the forest reserve in Kohala, it is up to the interests in Kohala to aid the Government; but for the Government to go in and purchase those lands, it simply means another forest reserve on paper, because all the money that could possibly be devoted to that forest reserve would have to go then to the purchase of lands. But if the Kohala interests will aid the Government in securing these lands, why we can immediately start proceedings. I believe any money that the Government puts into this thing should be devoted exclusively to fencing and reforesting.

Mr. Swanzy.
I would like to suggest, Mr. Chairman, that in order to classify things, we learn exactly how the lands in question are held. My understanding is that for these lands, 2428 acres being the larger land, Kehena, is owned by the Woods Estate.

Mr. Campbell.
Yes.

Mr. Swanzy.
That the next land to that, 463 acres, something like that, 463 acres it is on the map, is owned by Mr. Frank Woods; that the next piece to that, Kahua 2, is owned by the Austin Estate, and the *mauka* piece of all, Kahua liilii, is a piece of 782 acres owned by the Government. Now we have here today the representatives, if I understand it rightly, of the Woods Estate, of Mr. Frank Woods, of the Austin Estate, and it seems to me that

it would be a good idea to learn from these gentlemen what their idea of the value of these properties is, what they would be disposed to sell them for. The Kohala people may have a little difficulty in arriving at conclusions regarding the way in which any purchases that may be made shall be divided, but before they can approach that matter at all, they must know how much it is that is to be divided, then there is to consider how much money is to be expended and then if they think that the reforesting of this land is not commensurate with the expense, why then we can drop the thing, but the first thing to find out, in my humble opinion, is what the owners of these lands ask for the land, and in the second place what the Government that owns 782 acres, if that is the area, would do with its land. In what way would the Government propose to participate in this reforestation? Supposing that it was undertaken, the Government has 782 acres. Would the Government give up that land for the purpose of the forest, would they participate in the cost of fencing? What in [page 490] other words would they do, that is what we ought to know, and then we ought to know from the representatives of these other interests here what their idea of their properties is. Then, as I understand it, Mr. Woods or Kahua Ranch have leases on the Government land and on the Austin Estate land and naturally they would have to be separate, so we would have to hear from them as to what they would need in consideration of giving up their leases or whether they would be willing to give up the leases without any consideration. If these points can be settled, then I think we can get along.

Mr. Campbell.
Mr. Robertson, are you prepared at this time to state, as representative of the Woods interests, what sum of money you would be willing to take for the Woods lands?

Mr. Robertson.
I am not, Mr. Campbell. The Woods Estate as I understand it, would be willing to consider an offer that might be made by the parties in interest, who desire to acquire those lands, but I haven't any authority to submit any proposition on behalf of the Woods Estate at this time. We have to dissent from the language of that resolution read by you, passed at some meeting in Kohala, whereas this land of Kehena is dubbed as being of no value either for pasturable purposes or agricultural purposes. We claim that a large proportion of that area is good for either or both agricultural or grazing purposes. Secondly, any offer that might be made would not stand any chance of being accepted if it was made on the basis of that resolution. The parties at the lower elevations there that desire to see this forest reserve put through will have to bring themselves to a frame of mind where they must concede that these lands have some value, a material value, to the present owners. On that foundation the Woods Estate is willing to consider a proposition, providing one be made upon fair and reasonable terms. In other words, in order to help effectuate this forest reservation, the Woods Estate is willing to sell that area that has been designated by the red line here, a portion of Kehena 2, for such price as they deem fair and reasonable. In regard to Frank Woods, whom I also represent, I think Mr. Swanzy is mistaken as to Woods holding a Government lease. He owns two of those lands, Kahua 1 and Waika, in fee simple, and holds a lease from the Austin Estate of Kahua 2, with nearly twenty years unexpired.

Mr. Swanzy.
Then there is no Government land there at all?

Mr. Robertson.
Not that I know of. In regard to Mr. Frank Woods, Mr. Campbell said he does not desire to sell, but he is willing to entertain a proposition for exchange if practicable. In other words he wants to continue in the ranch business, and if those lands are given up for forest reserve purposes, he wants some other lands in lieu of them. Now then, if the Government, or any private parties in interest, are in a position to make any proposition

for an exchange with Frank Woods, he would be glad to entertain it. [Hawaiian Forester and Agriculturalist, 1909:491]

Proclamation of the Kohala Mountain Forest Reserve (1913)

Deliberations regarding compensation for private lands, and modifications to leases on Public Lands as a part of the Kohala Forest Reserve continued until 1913, at which time, the notices were served, and Governor's Proclamation establishing the reserve were published. The records provide us with the following narratives, leading to establishment of the reserve:

1913
Kohala Mountain Forest Reserve.
Honolulu, June 5, 1913.

Gentlemen:—In October, 1908, I submitted to the Board the recommendation that a forest reserve be set apart on Kohala Mountain in the districts of Kohala and Hamakua, Hawaii. [Published in the *Hawaiian Forester and Agriculturist* for December, 1909; Vol. VI, No. 12: pp. 472-478.] The project was referred back to me by the Board to have included in the proposed reserve an additional section of certain privately-owned land at the west end of the mountain, more particularly a portion of the tract known as ***Kehena 2***.

Since then, as the members of the Board know, persistent efforts have been made to acquire the area in question for the government, that the whole section might be set apart and maintained strictly as a forest reserve. To this end a sum of money for the purchase of the forested part of Kehena 2 was raised among the Kohala district sugar plantation companies, and later condemnation proceedings were instituted by the government for acquiring this land.

Up to the present time these efforts have not been successful, nor is the outlook good that this addition will be made in the near future, as the special fund pledged by the Kohala plantations has recently been withdrawn.

On July 1, 1913, the existing leases expire on the large government land of ***Puukapu*** that embraces the greater part of the summit of Kohala Mountain, as well as on one or two other tracts that also run up into the proposed Kohala Mountain forest reserve. These lands are now held by the Parker Ranch. This ranch has for some years now maintained fences on the mountain bordering the forest. At the time the fences were being built the ranch got out the wild cattle then at large on that mountain.

The object of postponing the creation of the Kohala Mountain forest reserve was primarily to bring pressure to bear toward getting the whole forest area on the Kohala Mountain included in the reserve. In practice it has not worked out so, and especially now that action on Kehena 2 appears likely to be slow in coming to a head, it seems advisable not to wait longer before setting apart the remainder of the lands on Kohala Mountain. I therefore recommend that this project be taken up and disposed of. An addition to the area of the reserve can readily be made later, if Kehena should then be available.

The area now recommended to be reserved differs a little from [page 301] that suggested in my original report in that the reserve as now proposed includes the private forest reserves that have for ten years or more been maintained above the Niulii, Halawa and Kohala plantations in Kohala. The forest line back of Waimea has also been slightly modified, recent surveys having made available more accurate data than were to be had in 1908. Above the recently laid out Puukapu homestead lots, second series, the forest line has been somewhat changed in location, as by so doing it

was possible to secure, as one of the terms of the lease of the remnant of government land adjoining, the building and maintenance of a substantial fence on the forest reserve boundary. No part of the lands of Kehena 2, Kahua 1 and 2, or Waika is included in the reserve as now proposed.

The accompanying revised description, prepared by the Government Survey Office, gives the location of the boundary in detail. The total area of the Kohala Mountain forest reserve as now recommended is 29,627 acres. Of this 14,204 acres, 47.9 per cent., is land belonging to the Territory.

For the reasons set forth at length in my original report on this project, under the date of October 14, 1908, I now recommend that the Board approve the creation of the Kohala Mountain forest reserve and that the governor be requested to hold the necessary hearing and thereafter to set this area apart as a forest reserve, in accordance with law and custom.

Very respectfully,

RALPH S. HOSMER
Superintendent of Forestry… [Hawaiian Forester and Agriculturalist, 1913:302]

1913
Proclamation of Forest Reserve
In the Districts of North and South Kohala and of Hamakua,
Island and County of Hawaii, Territory of Hawaii.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, ERNEST A. MOTT-SMITH, Acting Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby RECOMMEND and APPROVE as a forest reserve to be called the Kohala Mt. Forest Reserve, those certain pieces of government and privately owned land in the Districts of North and South Kohala and of Hamakua, Island and County of Hawaii, Territory of Hawaii, which may be described roughly as embracing the summit and upper slopes of the Kohala Mountain, and containing an area of 29,627 acres more or less, more particularly described by and on a map made by the Government Survey Department of the Territory of Hawaii, which said map is now on file in the said Survey Department marked Government Survey Reg. Map No. 2037 and "Kohala Mt. Forest Reserve," and a description accompanying the same numbered C.S.F. No. 2432, which said description now on file in said Survey Department as follows:

KOHALA MOUNTAIN FOREST RESERVE.

Including portions of the lands of ***Awini, Honokane, Pololu, Makanikahio 1 and 2, Waiapuka, Niulii, Makapala, Aamakao, Halawa, Halelua, Nunulu, Lamaloloa, Kaiholena, Kawaihae 1, Kawaihae 2***, the ilis of ***Puukawaiwai-Panoluukia-Kapia, Pauahi, Momoualoa, Ouli, Lanikepu, Waikoloa***, and ***Puukapu***;

In the districts of North and South Kohala, and portions of the *ahupuaa* of ***Waipio***, the *ili* of ***Lalakea***, and the ahupuaas of ***Kukuihaele, Waikoekoe, Kamoku***, and ***Keaa***;

In the District of Hamakua, Island of Hawaii.

Beginning at a point on the West edge of ***Pololu Pali***, the true azimuth and distance of said point from the forest monument post set in on the boundary of the lands of ***Makanikahio*** and ***Waiapuka***, being 280º 58' 672.0 feet, and the coordinates of said point of beginning referred to Government Survey Trig. Station "Kauhola" and 23,222.1 feet South and 8665.5 feet East, and the boundaries run by true azimuths:

1. 100º 58' 9392.6 feet crossing the lands of Makanikahio 1 and 2, Waiapuka, Niulii, Makapala, and Aamakao to a Forest Monument post set in by the gate of the Kohala Sugar Company's fence on the East side of Aamakao Gulch;
2. 77º 58' 8921.4 feet crossing the lands of Aamakao, Halawa, Halelua and Nunulu to the fence on the East side of the present Waimea-Halawa Road; [page 329]
3. Thence along said fence, crossing the lands of Nunulu, Lamaloloa, and into Kaiholena, direct azimuth and distance being 9º 8' 3997.0 feet;
4. Thence along said fence, crossing and along the land of Kaiholena to the land of Halawa, direct azimuth and distance being 271º 25' 4240.0 feet;
5. Thence *mauka* along said fence, bounding Halawa, to the *makai* corner of Kehena (Government Land), direct azimuth and distance being 348º 40' 1488.0 feet;
6. Thence along the fence bounding Kehena (Government Land) and the land of Halawa to Mahinakaka Gulch, the direct azimuth and distance being 296º 30' 1072.0 feet;
7. Thence along said fence, bounding Kehena (Government Land) and the land of Halawa to Hooleipalaoa Gulch, the direct azimuth and distance being 291º 15' 2022.0 feet;
8. Thence the boundaries follow the land of Kehena 2nd by descriptions in Certificate No. 17 along the heads of the lands of Aamakao, Makapala, Niulii, Waiapuka, Makanikahio 1 and 2, to West edge of Pololu Valley, thence *mauka* and around the edge of Pololu Valley to Honokane (as per Boundary Certificate No. 14), at rock + called Kaneaa on West edge of Honokane Gulch;
9. 2º 20' 5280.0 feet along brow of Honokane Gulch;
10. 29º 50' 4884.0 feet along brow of Honokane Gulch to a small hill called Kilohana at rock marked K on ledge;
11. 11º 52' 3130.0 feet along the land of Kahualiilii to a projecting spur in Honokane Gulch;
12. 21º 17' 3130.0 feet along the land of Kahuanui, the boundaries following the winding of the top of Honokane Gulch to a double cross on stone set in the ground on the South peak of the Hinamakanui Crater, this point being the common corner of the lands of Kahuanui, Waika, and Honokane;
13. 294º 20' 4592.0 feet along the land of Waika to "Waihoolana" (a large cross in triangle) cut in the top of a rock mound, from which the true azimuth and distance is 148º 01' 131.2 feet to the common corner of the lands of Waika, Kawaihae 1st, and Honokane Nui;
14. 72º 10' 7640.0 feet along the land of Waika to a point from which the true azimuth and distance to "Puu Pili" Trig. Station is 138º 45' 10" 3496.5 feet;
15. 318º 45' 10" 9499.5 feet, following the *mauka* fence to the gulch on the boundary of Kawaihae 1st and Kawaihae 2nd;
16. 303º 47' 17" 3308.3 feet, following the *mauka* fence to angle in same;

17. 334º 33' 30" 5263.8 feet, following the *mauka* fence to the gulch on the boundary of Kawaihae 2nd and Puukawaiwai;
18. 43º 19' 788.0 feet down gulch;
19. 295º 43' 8892.3 feet following the *mauka* fence;
20. 00º 50' 30" 3195.0 feet following the fence;
21. 273º 12' 8334.2 feet to a point on the ridge;
22. 309º 34' 30" 7590.2 feet along the *mauka* fence to the West side of Puukapu Homesteads, 1st Series;
23. 234º 25' 00" 2600.0 feet following the fence across the *mauka* tier of Puukapu Homesteads, 1st Series, to Hauani Gulch, on the Eastern boundary of said Homesteads;
24. Thence following down Hauani Gulch to the present forest fence; dividing the pasture land between this and the back line of Puukapu Homesteads, 2nd Series, said point being 7192.4 feet North and 8438.0 feet West from the Government Survey Trig. Station "East Base." [page 330]
25. 238º 10' 3100.0 feet along the present forest fence;
26. 249º 30' 5980.0 feet along and through forest to corner of fence, the true azimuth and distance from a pile of stones with stone marked with the sign of an anchor being 159º 25' 970.0 feet;
27. 258º 40' 4800.0 feet along and through forest to corner of fence near the head of the land of Lalakea;
28. 200º 16' 50" 10,373.2 feet following the *mauka* fence line to a stone marked + at corner of fence, said point being the North-west corner of Homesteads (private subdivision);
29. 312º 59' 3107.0 feet to the boundary of Lalakea and Waikoekoe at the old Mahiki Road at Waapa;
30. 281º 30' 8050.0 feet across the land of Waikoekoe, passing road at 400 feet to corner of fence;
31. 184º 20' 1137.0 feet along fence to corner;
32. 259º 30' 2042.0 feet along fence;
33. 177º 20' 1404.0 feet along fence;
34. 197º 40' 4138.0 feet along fence to corner of present forest reserve on boundary of Mooiki and Keaa;
35. 88º 00' 5490.0 feet to point on the road to Waimea, (Mud Lane) which is distant from "Puu Manu" Trig. Stations 4360.0 feet, the true azimuth being 22º 15';
36. 92º 50' 2760.0 feet to a point *mauka* of No. 1 Reservoir of the Pacific Sugar Mill Co.;
37. 123º 05' 4270.0 feet to a point on the boundary of Waipio above Hiilawe Falls; thence along the top edge of the East Pali to Waipio Valley, the general azimuths and distances being:
38. 129º 40' 860.0 feet;
39. 147º 50' 930.0 feet;
40. 117º 12' 110.0 feet to the top of Puaahuku Ridge, where the boundary of Lalakea descends into Waipio Valley;

41. 31º 20' 5750.0 feet to a point where the boundary of Lalakea again meets the top of *pali*;
42. 30º 30' 450.00 feet along top of *pali*;
43. 11º 00' 1050.0 feet along top of *pali*;
44. 103º 40' 5200.0 feet, more or less, across Waipio Valley to the top of the West *pali*;
45. Thence following along the North side of Kawainui branch of Waipio Valley, crossing the head of Waimanu Valley, thence in a Westerly direction along the boundary of Hamakua and Kohala (being also the South boundary of the HAMAKUA PALI FOREST RESERVE) to the junction of the lands of Honokane, Kawaihae 1st, and Puukapu;
46. Thence along down between the boundary of the land of Honokane and the HAMAKUA PALI FOREST RESERVE IN A Northerly direction;
47. Thence along down the middle of Honokea Gulch to its intersection with the boundary between Awini Homestead Lots 2 and 3;
48. Thence along the boundary between said Lots 2 and 3, and 1 and 4 of the Awini Homesteads, the true azimuth and distance being 90º 00' 4104 feet to the Honokane-iki Gulch;
49. Thence down the Honokane Gulch to the sea;
50. Thence along the sea to "Kapili Rock" on the boundary of the lands of Honokane and Pololu;
51. Thence still along the sea to a point on the edge of the *pali* called "Pohaku Kumaka" on the boundary of the lands of Pololu and Makanikanio 1st;
52. Thence following the boundary between Pololu and Makanikahio 1st to the point of beginning. [page 331]

Excepting and Reserving from the *ahupuaa* of Pololu, the kuleanas, the privately owned *ili* of Pa-u, and the Government rice and other bottom lands in Pololu Valley, area 300 acres, more or less.
Total area, 29,627 acres, more or less. (In government ownership, 14,204 acres.)

AND as provided by law, subject to the existing leases, I do hereby SET APART as parts of the Kohala Mountain Forest Reserve those portions of the government lands of Awini (100 acres), Pololu (1000 acres), Lamaloloa (24 acres), Kawaihae 1st (3370 acres), Puukawaiwai-Panoluukia-Kapia (360 acres), Pauahi (150 acres), Momoualoa (130 acres), Lanikepu (435 acres), Puukapu (8385 acres), Kamoku (20 acres), and Keaa (230 acres), altogether an area of 14,204 acres, more or less, that lie within the metes and bounds of the above described Kohala Mountain Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed. Done at the Capitol in Honolulu this 13th day of October, A.D. 1913.

E.A. MOTT-SMITH
Acting Governor of Hawaii. [Hawaiian Forester and Agriculturalist, 1913:332]

Government efforts to secure the mountain lands of Kehena from the Woods Estate continued, and as documented in the following letter from November 1920, remained unsuccessful:

November 29, 1920
Kohala Forest Reserve.
Minutes of a Public Hearing Held at the Executive Building, Honolulu, On Monday November 29, 1920, at 7:30 P.M. to Discuss the Proposition of Securing Certain Private Lands to be Included in the Kohala Forest Reserve, Hawaii.

ATTENDANCE:
Hon. Gerrit P. Wilder, Chairman — Members of Agricultural Committee
" John Fassoth
J. Uluihi
Alex. Lindsay, Jr.
T. H. Petrie
John Hind
G. C. Watt
P. W. P. Bluett
Leslie W. Wishard
Dr. H. L Lyon
Robt. M. Lindsay
C. S. Judd, Executive Officer, Board of Agriculture and Forestry
M. T. Kelly, Stenographer

The Chairman stated that the meeting had been called for the purpose of discussing the question of the advisability of securing certain private lands to be added to the Kohala Forest Reserve, which lands are now being used for grazing purposes. This matter was presented at the special session of the legislature and the Agricultural Committee of the House of Representatives appointed a Committee of three to visit the section referred to and to make a report at the next legislature. It is the intention of the Committee to leave here on Wednesday December 8, 1920, returning on December 11.

In order to facilitate matters, there being a number of representatives of the Kohala district present in Honolulu at this time, the meeting was called to obtain their views on the matter.

The Chairman asked Mr. Hind for his views, but he referred the matter to Mr. Bluett, as he was more familiar with the lay of the land.

The lands in question are ***Kehena 2***, owned by the Jas. Woods Estate, 2,428 acres; ***Kahualliilii***, owned by Frank J. Woods, 782 acres; ***Kahuanui***, owned by the Austin Estate, 482 acres, and ***Waika***, owned by Frank J. Woods, 463 acres, making a total area of 4,155 acres.

Mr. Bluett stated that it was his understanding that the main reason the Woods Estate turned down the proposition of selling this land to the Government in former years was on account of the cutting off of the water supply for their cattle. Mr. Wilder stated that Mr. Palmer Woods had given him the same idea. He also stated that Mr. Woods was very much interested in the Government's securing the land and reforesting the same for the purpose of water conservation, and he hoped that some arrangements could be made whereby the land could either be purchased or exchanged.

Mr. Hind stated that he never remembered the question of water for the cattle being mentioned when the question of securing this land in former years was brought up. Mr. Watt was of the same opinion.

Mr. Bluett stated that in former years the land was covered by a very heavy undergrowth and there were numerous water holes, but since the land was opened to grazing this undergrowth had entirely disappeared and within the last two years there was little or no water there. Mention was also made of wild pigs in the forests which were doing considerable damage. Dr. Lyon remarked that he had had occasion to visit the Kohala district in 1917 there was a very good forest growth in this section but in 1919 clear up to the gulch there was no sign of any undergrowth.

Mr. Wilder then asked if anyone knew the history and the period in which the project was first taken up. Mr. Petrie stated that it was in 1909 or 1910 when the Government proposed to purchase Kehena 2 from the Jas. Woods Estate. The price offered at that time was $24,000., or approximately $10. Per acre. Mr. Petrie asked how many acres were involved in the present transaction, Mr. Judd replied, 4,155 acres.

The question was then asked who was attending to the reforestation of the lands below the area in question, also what trees were being planted. Dr. Lyon replied that the Planters' Association was attending to the planting and that different species of trees, for experimental purposes, were being tried out. Mr. Watt here stated that the land had been turned over for this purpose.

Mr. Robt. M. Lindsay stated that at the present time the drought in the district referred to was very severe, that to his knowledge springs that had plenty of water were now dry, and referred specially to one spring where never before was it known not to have sufficient water for domestic and mill purposes, but at the present time it was absolutely dry. He further stated that in his opinion it was of the utmost importance that the Government by some means obtain the area referred to whereby this land could be reforested and the water conserved.

Mr. Alex. Lindsay then asked, by way of suggestion, if it would not be good policy to ascertain from the persons who own the land what price they placed upon it and then negotiate with them to get their bottom price and then see the private interests concerned and see what they would be willing to contribute toward it. If the price was then not fair, the matter could be referred to the Governor with a recommendation that the land be condemned, but before doing anything he thought it would be advisable to first find out what price was set on the land.

Mr. Robt. M. Lindsay stated that he felt it was a waste of time to discuss the necessity of securing this additional land for the forest reserve, that it was apparent on all sides, and the only question to decide is the question of price. If the price they are asking is prohibitive, and the exchange of land is out of the question, condemnation is the only means left to secure the land. This is the quickest way.

Mr. Wilder stated that as the maximum land exchange under the law is 40 acres, exchange of land is out of the question, unless by Act of Congress, which would take two or three years.

Mr. Fassoth gave assurance, as one of the Committee, that everything possible would be done to secure these lands at the earliest possible moment. That the Committee would go to Hawaii on Wednesday next and look over the grounds and would make a report to the Legislature at the coming session.

There being no further business, the meeting adjourned… [HSA, COM 2]

The Pu‘u o ‘Umi Natural Area Reserve (1987)

Following establishment of the Kohala Forest Reserve, management of the Kohala-Hāmākua mountain lands watershed fell under the jurisdiction of the Territory, and then the State of Hawai‘i. During the years from establishment of the reserve to the 1950s, the primary function of the reserve was to produce water for sugar plantations and ranching interests. Lease-hold interests in water and development of water transporting systems were granted to several parties. As described in Executive Order No. 1660 (1954), this function was further granted to the Hawaii Irrigation Authority, while reserving the right of the County of Hawaii to acquire water:

> ***Executive Order No. 1660***
> ***December 6, 1954***
> ***Setting Aside Land for Public Purposes***
>
> To the Hawaii Irrigation Authority for public purposes, to-wit, the Waimea, Hawaii irrigation and water utilization project,
>
> ALL ditches, tunnels, flumes, and structures comprising that segment of the Upper Hamakua Ditch lying within the Kohala Forest Reserve, Kohala, Island of Hawaii, which segment is delineated in red upon the map hereto attached and made a part hereof, together with the right of access thereto;
>
> AND also all government-owned water rising, flowing or captured in that portion of said Kohala Forest Reserve, containing an area of 4547 acres, more or less, shown and colored in green upon said map, which portion comprises the watershed for said segment of the Upper Hamakua Ditch; subject, however, to the right of the Board of Water Supply of the County of Hawaii to a reasonable amount of water from said Upper Hamakua Ditch for use in the Ahualoa-Honokaa domestic water system, Island of Hawaii… [State Survey Division]

In the 1970s, as a better understanding of the unique nature of Hawaiian forests and ecosystems, and threats to them was developing, the State of Hawai‘i began to investigate areas of particular value in the natural eco-systems of the Hawaiian Islands. From those areas, selected lands and resources came to be designated as Natural Area Reserves. In 1978, the Department of Land and Natural Resources submitted a formal proposal to the Governor, describing the proposed Pu‘u o ‘Umi Natural Area Reserve, and it’s general characteristics. The report offered the following documentation:

> ***PUU O UMI NATURAL AREA RESERVE***
>
> LOCATION:
> Hawaii, in the Kohala Mountains where it is peaked by Puu O Umi at the 5,260 ft. elev. and seaward to the Hamakua Coast.
>
> APPROXIMATE SIZE: 10,182 acres; 1 to 5 X 9 miles.
>
> ADMINISTRATIVE INFORMATION: It is in the Conservation District’s Protective Sub zone in the 32,000-acre Kohala Forest Reserve. It would include most of the western portion of the Kohala Watershed and all the land of Laupahoehoe I *makai*. The land is owned by the state (portion of TMK 4-9-13:1; portion of 6-1-01:1; 6-2-01:1, 2; portions of 6-3-01:2, 4, 5, 7). The TMK 6-3-01 parcels are indicated as being assigned to Hawaiian Home Lands, but their exchange for state land elsewhere was approved by

the Hawaiian Home Lands Commission in 1977.* Adjoining lands are owned by the state (in forest reserve and an estuarine sanctuary), Department of Hawaiian Home Lands, Queen's Medical Center, Richard Smart (Parker Ranch), and William Kamau/Daniel Cardoza. Water Resource facilities and projects, such as the Kohala Ditch and Tunnel, Kehena Ditch, Upper Hamakua Ditch, intakes, diversion dams, and the proposed Kohakohau Dam, have been excluded from the proposed boundaries.

The Kohala-Waimea and Kawaihae-Waimea Roads are about 1 ½miles away in a route roughly parallel to the south boundary. Waiaka, Waimea, and the Waimea Homesteads are situated along the Kawaihae-Waimea Road. Dirt roads and jeep trails along pipelines and the Kehena and Upper Hamakua Ditches would approach and skirt the southeast and southwest sections of the proposed natural area reserve. Within the proposed reserve, topographic charts show a 5-mile foot trail from the Kehena Ditch road at the 4,400 ft. elev. leading to abandoned camps of the U.S. Geological Survey at the 3,000 and 2,400 ft. elev.

NATURAL AREA DESCRIPTION:
It contains one of the bog ecosystems present on the cloud-shrouded high areas of the Kohala Mountains, where the annual rainfall is 175 inches. Montane bog ecosystems of any significance occur at only two other areas in the state: Mt. Waialele on Kauai and the West Maui Mountain. The Kohala bog has a ground-cover vegetation of Sphagnum moss, the moss that forms peat bogs on the continents. Many species of ferns, grasses, sedges, and herbs are also present. Tree growth, dominated by *ʻōhiʻa-lehua* (Metrosideros), *alani* (Pelea), and *ʻōlapa* (Cheirodendron), is usually stunted and sparsely distributed. *Makai* of the bog region is an *ʻōhiʻa* rainforest ecosystem. A mixed *hala* forest is present at the coastal region.

As a natural area reserve, there would not only be added protection and preservation of the Kohala Watershed and the head waters of Kawainui, Alakahi, Honokane Nui, and Kohakohau Streams, whose water resources are tapped in the low reaches, but equally protected would be the headwaters of Waihilau and Wailikahi Streams, which are major tributaries of Waimanu Stream. The adjoining Waimanu Valley and its stream will soon be declared an Estuarine Sanctuary under the National Coastal Zone Management Act.

In 1979, selected lands situated within the Kohala Forest Reserve, were withdrawn from the reserve, in preparation for establishment of the Puʻu o ʻUmi Natural Area Reserve. Those lands were described in C.S.F. (Copy of Survey Furnished) No. 18,629, as follows:

C.S.F. 18,629
The Kohala Forest Reserve
Withdrawal Portion of Kohala Forest Reserve
May 4, 1979

Kawaihae 1, Puukawaiwai, Panoluukia, Kapia, Pauahi, Momoualoa, Lanikepu, Waiaka and Puukapu in South Kohala, and Laupahoehoe 1 in Hamakua, Island of Hawaii, Hawaii

* The approved exchange may, in fact, be inconsequential. In the tax maps, the TMK 6-3-01 parcels are identified as "Hawaiian Home Land (State of Hawaii) Resolution 26". However, Hawaiian Home Land Commission Resolution 26, 1932, deals with TMK 6-4-01 parcels in the Puukapu Homesteads. Also, the TMK 6-3-01 parcels were in the Kohala Forest Reserve by 1913, seven years before the Hawaiian Home Lands Commission Act of 1920, which excluded forest reserve land from "available lands".

Being portions of the Government (Crown) Lands of Kawaihae 1 and Puukapu and portions of the Government Lands of Puukawaiwai, Panoluukia, Kapia, Pauahi, Momoualoa, Lanikepu, Waiaka and Laupahoehoe 1.

Beginning at the west corner of this parcel of land on the boundary between the lands of Waika and Kawaihae 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU PILI" being 2516.38 feet South and 2290.33 feet East, as shown on Government Survey Registered H.S.S. Plat 508-A, thence running by azimuths measured clockwise from True South:—

1. 252º 01' 30" 7250.00 feet along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along Land Court Application 1043 to the south side of Kehena Ditch;

   Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along the south side of Kehena Ditch (40.00 feet wide) for the next (2) courses, the direct azimuths and distances between points on said south side of ditch being:

2. 305º 14' 20" 6742.40 feet;
3. 251º 15' 50" 4055.30 feet to the top of south bank of Honokane Nui Stream;
4. Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along the top of south bank of Honokane Nui Stream, the direct azimuth and distance being: 296º 00' 10" 2598.40 feet;
5. 259º 10' 35" 4414.60 feet along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), to the district boundary of North and South Kohala;
6. Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along R.P. 8182, L.C. Award 6245, Part 2 to Kalaeokekoi, the direct azimuth and distance being: 220º 04' 20" 5222.80 feet to the middle of Kaimu Stream;
7. Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along R.P. 8182, L.C. Award 6245, Part 2 to Kalaeokekoi and along the middle of Kaimu Stream, the direct azimuth and distance being: 218º 32' 55" 18,365.10 feet to high-water mark at seashore;
8. Thence along high-water mark at seashore, the direct azimuth and distance being: 303º 28' 40" 2685.60 feet; Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along R.P. 4475, L.C. Award 7713, Apana 22 to V. Kamamalu and along the Government Lands of Waimanu and Waipio, along the top edge of *pali* for the next five (5) courses, the direct azimuths and distances between points on said top edge of *pali* being:
9. 27º 26' 10" 14,725.70 feet;
10. 307º 01' 45" 4753.50 feet;
11. 359º 00' 30" 5741.20 feet;
12. 112º 19' 40" 6389.90 feet;
13. 41º 20' 40" 6560.90 feet to the middle of Kawainui Stream;
14. 20º 31' 30" 8145.40 feet along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), to the middle of Kohakohau Stream;

15. 6º 08' 40" 5966.80 feet along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), to the middle of Haleaha Gulch;
16. 92º 26' 2300.10 feet along the remainder of the Government Land of Puukapu;
17. 125º 37' 1381.00 feet along Grant 793 to Ohiaku and Kamaikaaloa;
18. 91º 28' 976.80 feet along Grant 793 to Ohiaku and Kamaikaaloa and Grant 792 to Lumaawe;
19. 83º 10' 393.00 feet along Grant 1070 to Kiai;
20. 186º 30' 2419.50 feet along R.P. 2237, L.C. Award 8518-B to Kanehoa;
21. 101º 09' 1997.60 along the remainder of R.P. 2237, L.C. Award 8518-B to Kanehoa;
22. 112º 23' 4720.20 along fence, along the remainder of the Government Land of Momoualoa, along Hawaiian Home Land of Pauahi and along the remainder of the Government Land of Kapia;
23. Thence along fence, along the remainder of the Government Lands of Kapia and Panoluukia, the direct azimuth and distance being: 132º 48' 2368.00 feet;
24. 224º 58' 805.00 feet along the remainder of the Government Lands of Panoluukia and Puukawaiwai to a fence;
25. Thence along fence, along the remainder of the Government Lands of Puukawaiwai and R.P. 1666, L.C. Award 8515 to Keoni Ana, the direct azimuth and distance being; 148º 31' 2975.00 feet;
26. 71º 41' 176.00 feet along the remainder of R.P. 1666, L.C. Award 8515 to Keoni Ana to a fence;
27. Thence along fence, along the remainder of R.P. 1666, L.C. Award 8515 to Keoni Ana, the direct azimuth and distance being: 167º 52' 2439.00 feet;
28. 123º 16' 3446.00 feet along the remainder of R.P. 1666, L.C. Award 8515 to Keoni Ana to a fence;
29. Thence along fence, along Hawaiian Home Land of Kawaihae 1, the direct azimuth and distance being: 138º 52' 9441.00 feet to the point of beginning and containing an

GROSS AREA OF 10,949 ACRES AND A NET AREA OF 10,182 ACRES, MORE OR LESS, after excluding and deducting there from Exclusions (767 Acres) as shown on plan attached hereto and made a part hereof listed as follows:

EXCLUSIONS:

Portion of R.P. 1666, L.C. Award 8515 to Keoni Ana 562 Acres
Portion of R.P. 2237, L.C. Award 8515-B to Kanehoa 187 Acres
Grant 798 to Keaupuni 18 Acres
Total of Exclusions 767 Acres… [State Survey Division]

On July 9, 1987, John Waiheʻe, Governor of Hawaiʻi, issued Executive Order No. 3367 establishing the Puʻu o ʻUmi Natural Area Reserve. The order reads as follows:

Executive Order No. 3367
Setting Aside Land For Public Purposes
By this Executive Order, I, the undersigned, Governor of the State of Hawaii, by virtue of the authority in me vested by Section 171-11, Hawaii Revised Statutes, and every

other authority me hereunto enabling, do hereby order that the public land hereinafter described be, and the same is, hereby set aside for the following public purposes:

FOR NATURAL AREA RESERVE, to be under the control and management of the Department of Land and Natural Resources, State of Hawaii, being the lands situate at Kawaihae 1, Puukawaiwai, Panoluukia, Kapia, Pauahi, Momoualoa, Lanikepu, Waiaka and Puukapu in South Kohala and Laupahoehoe 1 in Hamakua, Island of Hawaii, State of Hawaii, and designated as PUU O UMI NATURAL AREA RESERVE, containing an area of 10,949 Acres and a net area of 10,142 Acres, more or less, all more particularly described in Exhibit "A" and delineated on Exhibit "B", both of which are attached hereto and made a part hereof, said exhibits being, respectively a survey description designated C.S.F. No. 20,405 and survey map designated H.S.S. Plat 513-A, both dated June 4, 1986 prepared by the Survey Division, Department of Accounting and General Services, State of Hawaii.

SUBJECT to disapproval by the Legislature by two-thirds vote of either the Senate or the House of Representatives or by majority vote of both, in any regular or special session next following the date of this Executive Order… [In Collection of DLNR-NARS]

C.S.F. No. 20,405, established the boundaries of the Pu'u o 'Umi NAR, by the following survey (see *Figure 1*);

C.S.F. No. 20,405
June 4, 1986

PUU O UMI NATURAL AREA RESERVE
Kawaihae 1, Puukawaiwai, Panoluukia, Kapia, Pauahi, Momoualoa, Lanikepu, Waiaka and Puukapu in South Kohala and Laupahoehoe 1 in Hamakua, Island of Hawaii, Hawaii.

Being portions of the Government (Crown) Land of Kawaihae 1 and Puukapu and portions of the Government Lands of Puukawaiwai, Panoluukia, Kapia, Pauahi, Momoualoa, Lanikepu, Waiaka and Laupahoehoe 1.

Beginning at the west corner of this parcel of land and on the boundary between the Lands of Waika and Kawaihae 1, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU PILI" being 2516.38 feet South and 2290.33 feet East, as shown on Government Survey Registered H.S.S. Plat 513-A, thence running by azimuths measured clockwise from True South:-

1. 252º 01' 30" 7250.00 feet along the remainder of Kohala Forest Reserve (Governor's proclamation dated December 22, 1928), along Land Court Application 1043 to the south side Kehena Ditch;

   Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928), along the south side of Kehena Ditch (40.00 feet wide) for the next two (2) courses, the direct azimuths and distances between points on said south side of ditch being:

2. 305º 14' 20" 6742.40 feet;
3 251º 15' 50" 4055.30 feet to the top of south bank of Honokane Nui Stream;
4. Thence along the remainder of Kohala Forest Reserve (Governor's Proclamation dated December 22, 1928) along the top of south bank of Honokane Nui Stream, the direct azimuth and distance being:

   296º 00' 10" 2598.40 feet;

5. 259º 10’ 35” 4414.60 feet along the remainder of Kohala Forest Reserve (Governor’s Proclamation dated December 22, 1928), along the remainder of the Government Land of Puukapu to the district boundary of North and South Kohala;
6. Thence along the remainder of Kohala Forest Reserve (Governor’s Proclamation dated December 22, 1928), along R.P. 8182, L.C. Aw. 6245, Part 2 to Kalaeokekoi, the direct azimuth and distance being:

   220º 04’ 20” 5222.80 feet to the middle of Kaimu Stream;
7. Thence along the remainder of Kohala Forest Reserve (Governor’s Proclamation dated December 22, 1928), along R.P. 8182, L.C. Aw. 6245, Part 2 to Kalaeokekoi, along the middle of Kaimu stream, the direct azimuth and distance being:

   218º 32’ 55” 18,365.10 feet to high-water mark at seashore;
8. Thence along high-water mark at seashore, the direct azimuth and distance being:

   303º 28’ 40” 2685.60 feet;

   Thence along the remainder of Kohala Forest Reserve (Governor’s Proclamation dated December 22,1928), along R.P. 4475, L.C.Aw. 7713, Apana 22 to V. Kamamalu and along the Government Lands of Waimanu and Waipio, along the top edge of *pali* for the next five (5) courses, the direct azimuths and distances between points on said top edge of *pali* being:
9. 27º 26’ 10” 14,725.70 feet;
10. 307º 01’ 45” 4753.50 feet;
11. 359º 00’ 30” 5741.20 feet;
12. 112º 19’ 40” 6389.90 feet;
13. 41º 20’ 40” 6560.90 feet to the middle of Kawainui Stream;
14. 20º 31’ 30” 8145.40 feet along the remainder of Kohala Forest Reserve (Governor’s Proclamation dated December 22, 1928), along the remainder of the Government Land of Puukapu to the middle of Kohakohau Stream;
15. 6º 08’ 40” 5966.80 feet along the remainder of Kohala Forest Reserve (Governor’s proclamation dated December 22, 1928), along the remainder of the Government Land of Waiaka to the middle of Haleaha Gulch;
16. 92º 26’ 2300.10 feet along the Hawaiian Home Land of Puukapu;
17. 125º 37’ 1381.00 feet along Grant 793 to Ohiaku and Kamaikaaloa;
18. 91º 28’ 976.80 feet along Grant 793 to Ohiaku and Kamaikaaloa and Grant 792 to Lumaawe;
19. 83º 10’ 393.00 feet along Grant 1070 to Kiai;
20. 186º 30’ 2419.50 feet along R.P. 2237, L.C.Aw. 8518-B to Kanehoa ;
21. 101º 09’ 1997.60 feet along the remainder of R.P. 2237, L.C.Aw. 8518-B to Kanehoa;
22. 112º 23’ 4720.20 feet along fence, along the remainder of the Government Land of Momoualoa, along the remainder of the Land of Pauahi and along the remainder of the Government Land of Kapia;
23. Thence along fence, along the remainder of the Government Lands of Kapia and Panoluukia, the direct azimuth and distance being:

   132º 48’ 2368.00 feet;

24. 224º 58' 805.00 feet along the remainder of the Government Lands of Panoluukia and Puukawaiwai to a fence;
25. Thence along fence, along the remainder of the Government Land of Puukawaiwai and R.P. 1666, L.C.Aw. 8515 to Keoni Ana, the direct azimuth and distance being:

    148º 31' 2975.00 feet;
26. 71º 41' 176.00 feet along the remainder of R.P. 1666, L.C.Aw. 8515 to Keoni Ana to a fence;
27. Thence along fence, along the remainder of R.P. 1666, L.C.Aw. 8515 to Keoni Ana, the direct azimuth and distance being:

    167º 52' 2439.00 feet;
28. 123º 16' 3446.00 feet along the remainder of R.P. 1666, L.C.Aw. 8515 to Keoni Ana to a fence;
29. Thence along fence, along the Hawaiian Home Land of Kawaihae 1, the direct azimuth and distance being:

    138º 52' 9441.00 feet to the point of beginning and containing a GROSS AREA OF 10,949 ACRES, MORE OR LESS, AND A NET AREA OF 10,142 ACRES, MORE OR LESS, after excluding and deducting there from Exclusions 1 to 4, Inclusive, (807 Acres) as shown on plan attached hereto and made a part hereof listed as follows:

EXCLUSIONS:

1. Portion of R.P. 1666, L.C.Aw. 8515 to Keoni Ana	562 Acres, More or Less
2. Portion of R.P. 2237, L.C.Aw. 8518-B to Kanehoa	187 Acres, More or Less
3. Grant 798 to Keaupuni	18 Acres, More or Less
4. Portion of the Land of Pauahi	40 Acres, More or Less

TOTAL OF EXCLUSIONS 807 Acres, More or Less

Subject, however to Waimea, Hawaii Irrigation and Water Utilization Project, Governor's Executive Order 1660… [In Collection of DLNR-NARS]

Overview of Resources and Management Objectives of the Pu'u o 'Umi NAR

In 1989, the Department of Land and Natural Resources, Natural Area Reserves System office prepared a management plan for the Pu'u o 'Umi NAR. The following narratives from the 1989 plan, describe resources of the Pu'u o 'Umi NAR and program objectives:

A. General Setting

Puu o Umi Natural Area Reserve occupies 10,142 acres in the Big Island's Kohala Mountains. The Reserve begins at sea level west of Waimanu Valley, immediately climbing sea cliffs to 1,400 feet. The Reserve continues rising onto the largely uneroded slopes of the Kohala shield volcano. Maximum rainfall may exceed 150 inches annually (Giambelluca, Nullet, and Schroeder 1986). ***Waiilikahi*** and ***Kawainui*** streams begin in the Reserve and drop into Waimanu and Waipio valleys, respectively, on the Reserve's northeast and southeast boundaries. Honokane Valley drops away from the northern boundary of the Reserve's western-most extension. The Reserve's southern leg reaches down to 3,600 feet elevation, above the Hawaii Preparatory Academy in the town of Waimea, and its highest point is 5,260 feet at Puu o Umi.

The region of the Kohala Mountains occupied by the Puu o Umi Reserve is largely inaccessible. The nearest highways are the Kohala-Waimea and Kawaihae-Waimea roads, which are about 1.5 miles away from the Reserve's south boundary. Jeep and foot trails along pipelines and the Kehena and Upper Hamakua Ditches approach and skirt the southeast and southwest sections of the Reserve. A rough trail connects the Kehena Ditch at the 4,400 foot elevation to two abandoned camps of the U.S. Geological Survey at the 3,000 and the 2,400 foot elevation.

The Reserve comprises the majority of the Kohala Watershed. The water is captured and delivered for domestic and agricultural uses in the lands of Waimea, Hamakua, and coastal Kawaihae. Existing water resource facilities and projects were purposely excluded from the Reserve. The facilities include the Kohala Ditch and Tunnel, Kehena Ditch, Upper Hamakua Ditch, intakes, and diversion dams adjacent to the Reserve. The Reserve protects the headwaters of ***Kaiwainui, Alakahi, Honokane Nui,*** and ***Kohakohau*** Streams. These water resources are tapped in their lower reaches. Equally protected in the Reserves are the headwaters of ***Waihilau*** and ***Waiilikahi*** Streams, which are the major tributaries of Waimanu Stream. The adjoining Waimanu Valley is a National Estuarine Research Reserve.

B. Flora

Eight natural communities, two of which are considered rare, were encountered during this survey of Puu o Umi Natural Area Reserve. For the purposes of this management plan, a natural community is considered rare if known from 20 or fewer locations worldwide. The two rare bog communities, Mixed Grass and Sedge Montane Bog and *ʻOhiʻa* Mixed Montane Bog, were located adjacent to each other in the Reserve's eastern extension at approximately 3,700 feet elevation…

Hawaiian bogs dominated by grasses or sedges, with few woody species (Mixed Grass and Sedge Montane Bogs), are known from fewer than five sites on Maui and Hawaii. Each of these rare bogs is dominated by a different but overlapping set of grasses and sedges. The dominant grass in the relatively simple community seen at Puu o Umi was *kuolohia* (*Rhynchospora chinensis*), and the moss, *Sphagnum*. Other grasses included *ʻohe* (*Isachne distichophylla*), *Dichanthelium cynodon* and *D. hillebrandianum*. This bog contained few woody species, such as extremely stunted (often less than eight inches in height) *ʻohiʻa* (*Metrosideros polymorpha*), *pukiawe* (*Styphelia tameiameiae*), and *ʻohelo* (*Vaccinium dentatum*).

Vegetation in the second rare bog observed along Transect 2 was of low stature (less than 36 inches tall), dominated by a bog-form of *ʻohiʻa*, and by *ʻuki* (*Machaerina angustifolia*), growing out of a mat of *Sphagnum* moss. This *ʻOhiʻa* Mixed Montane Bog community is known from fewer than ten sites on the islands of Kauai, Molokai, Maui and Hawaii. On raised, better-drained portions of the bog seen in Puu o Umi Reserve, the *ʻohiʻa* was of higher stature (about 12 inches tall), and formed a canopy over a variety of low shrubs including *pukiawe* and *ʻohelo*. Species typical of bog habitat observed in this Puu o Umi example included a native violet (*Viola maviensis*), *ʻohe*, *kuolohia*, *Dichanthelium hillebrandianum*, and *D. cynodon*. *Uluhe* (*Dicranopteris linearis*) and *wawaeʻiole* (*Lycopodium cernuum*) were observed occasionally on bog edges. This rare community is slow to recover from disturbance.

The other six native-dominated natural communities observed were typical of very wet, montane, windward slopes. Two of these communities, *Carex alligata* Montane Wet Grasslands and Mixed Fern/Shrub Montane Wet Cliffs, formed small scattered patches throughout the Reserve…

Carex alligata Montane Wet Grasslands are known from the islands of Kauai, Maui and Hawaii. Many of the low-lying, water-saturated sections of the Reserve seen during the survey were dominated by *Carex alligata*, often to the near exclusion of other species. Associated species included scattered *ʻohiʻa, ʻolapa* (*Cheirodendron trigynum*), *ʻohelo kau laʻau* (*Vaccinium calycinum*), and *kuolohia*.

Vegetation observed on the steepest slopes throughout the Reserve was dominated by ferns and shrubs, forming a Mixed Fern/Shrub Montane Wet Cliff community. Dominant species seen in Puu o Umi included *ʻamaʻu* (*Sadleria* spp.), *uluhe* (*Dicranopteris linearis*, *Sticherus owhyensis* and *Diplopterygium pinnatum*), *hapuʻu* (*Cibotium* spp.), and other ferns, with common native shrubs such as *ʻohelo kau laʻau*, *pukiawe*, and *pilo* (*Coprosma dubens*). Occasionally, shrubs such as *naʻenaʻe* (*Dubautia plantaginea*), *puʻahanui* (*Broussaisia arguta*), *koliʻi* (*Trematolobelia grandifolia*), and *ʻapeʻape* (*Gunnera petaloidea*) were seen. A variety of mosses, liverworts and smaller ferns, and herbs such as *ʻalaʻalawainui* (*Peperomia* spp.) occurred under the mixed fern and shrub canopy.

Three distinct types of *ʻohiʻa*-dominated forest were observed during this survey forming a mosaic that covered 86 percent of the Reserve, or 8,702 acres. *ʻOhiʻa/ʻOlapa* Montane Wet Forest comprised the majority of the *ʻohiʻa*-dominated forests. The *ʻohiʻa/ʻolapa* canopy reached 30 feet in height, but in many instances was shorter (less than 15 feet). Occasional large tree snags (8-15 inches diameter), probably *ʻohia*, 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 *ʻohiʻa* regeneration.

Common associated species in the canopy of the *ʻohiʻa/ʻolapa* forest included *kawaʻu* (*Ilex anomala*), *kolea* (*Myrsine sandwicensis* and *M. lessertiana*), *alani* (*Pelea clusiifolia* and other species), and *hapuʻu* (*Cibotium glaucum* and *C. chamissoi*). Another tree fern, *meu* (*Cibotium hawaiiense*), was observed infrequently, usually at elevations below those occupied by *C. chamissoi*. *Uluhe* ferns were often codominant. Shrub species included *alani*, *pukiawe*, *puʻahanui*, *naʻenaʻe*, *ʻohawai* (*Clermontia* spp.), *manono* (*Hedyotis terminalis* and *H. hillebrandii*), and *pilo* (*Coprosma pubens* and *C. ochracea*). Native ferns included *hoʻiʻo* (*Athyrium sandwichianum*), *akolea* (*Athyrium microphyllum*), *Dryopteris* spp., *Asplenium* spp., *ʻae* (*Polypodium pellucidum*), *ʻamaʻu* (*Sadleria pallida* and *S. souleyetiana*), and *palaʻa* (*Odontosoria chinensis*). The ground cover was moss-dominated by *Sphagnum* sp., especially in poorly drained areas, but ground cover also included *ʻalaʻalawainui*, and *Cyrtandra paludosa*. *Maile* (*Alyxia oliviformis*) was sometimes abundant. Aside from the unusual abundance of *Sphagnum*, the components of the *ʻohiʻa/ʻolapa* forest were typical of the community on other islands.

Forming a mosaic with the more prevalent *ʻohiʻa/ʻolapa* forest, the *ʻOhiʻa* Mixed Shrub Montane Wet Forest usually occupied the best drained areas on the Reserve's ridge tops. In the Reserve, the *ʻohiʻa* canopy of this forest generally exceeded 15 feet in height. There was often a secondary tree layer containing native species such as *kawaʻu, ʻolapa, kolea, alani* (usually *Pelea clusiifolia*), and *pilo*. Under the tree layer was a discontinuous *hapuʻu* layer and a well-developed native shrub layer containing such species as *ʻohelo kau laʻau*, *puʻahanui*, *pukiawe*, *ʻohawai*, *kamakahala* (*Labordia hedyosmifolia*), *manono*, *alani*, *kolea*, *koliʻi*, *pilo* (*Coprosma pubens*), and saplings of *ʻohiʻa* and *ʻolapa*.

A diversity of native ferns was seen, including *hoʻiʻo, akolea, ʻae, wahine noho mauna* (*Adenophorus* spp.), *Asplenium* spp., *Dryopteris* spp., and *Vandenboschia davallioides*. The herb layer contained mosses, liverworts, seedlings of a variety of plants, and

ʻalaʻalawainui. Native vines included *maile*, *hoi kuahiwi* (*Smilax melastomifolia*), and *maʻohiʻohi* (*Stenogyne calaminthoides*). Epiphytes were well developed, including a variety of mosses, liverworts and ferns.

A broad expanse of *ʻOhiʻa/Uluhe* Montane Wet Forest was observed covering the north slopes leading to the Puu o Umi Reserve's seaward boundary. Patches of similar forest occurred adjacent to gulches or where ungulate damage was severe, such as the areas immediately adjacent to pasture lands. On the whole, the *ʻohiʻa/uluhe* forest occupied about 14 percent (1,420 acres) of the Reserve area. The composition of this forest was relatively simple; under an open canopy of *ʻohiʻa*, the ground cover was dominated by *uluhe*. Other elements of surrounding *ʻohiʻa* forests, especially *ʻolapa* and *hapuʻu*, emerged above the thick *uluhe* mats.

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

Of the five rare plant taxa reported from the Puu o Umi Reserve area, three have been verified within the Reserve's boundary recently (since 1972). For the purposes of this plan, a species is considered rare and imperilled if it is known from 20 or fewer locations worldwide, or less than 3,000 individuals. The other two taxa may occur in the Reserve; both are known from adjacent areas. The fern *Diplazium molokaiense* was seen in 1983 during a survey of the Hamakua ditch area. The rare mint *Phyllostegia floribunda* has not been reported from the Puu o Umi area since 1911. Additional surveys, specifically designed for rare plants, may uncover these taxa, as well as other rare taxa not yet reported from the Reserve.

Thirteen other rare taxa are reported in literature for the area, but lack specific enough location information to include here… [DLNR 1989]

C. Fauna

Four species of native forest birds were observed during the survey. Forest birds were seen throughout all vegetation types in the Reserve, but were most prevalent in closed-canopy forests of *ʻohiʻa* and *ʻolapa*. *ʻElepaio* (*Chasiempis sandwichensis*), *ʻAmakihi* (*Hemignathus virens*), *ʻApapane* (*Himatione sanguinea*), and *ʻIʻiwi* (*Vestiaria coccinea*) all appeared abundant. *ʻIʻiwi, ʻApapane* and *ʻAmakihi* were observed feeding on the flowers of the non-native banana poka vine (*Passiflora mollissima*) near the edge of pastures, in numbers greater than those observed in native forest. This phenomenon has been observed before, and in this case was probably due to the lack of blooming *ʻohiʻa* at the time of the survey (less than ten percent of trees were estimated in flower).

Although not observed during this July survey, two rare bird species are known from the Reserve area. Hawaiian Hawk, or *ʻIo* (*Buteo solitarius*), has been reported along the Reserve's northwestern boundary. Hawaiian Duck, or *Koloa* (*Anas yvilliana*), was sighted in the southeast extension of the Reserve. During the U.S. Fish and Wildlife Service's Hawaii Forest Bird Survey, a mottled brown-light duck, tentatively identified as a *Koloa*, was observed in the western-most section of the Reserve (USFWS n.d.). Additional sightings of both *ʻIo* and *Koloa* have occurred nearby, but outside the Reserve (Banko 1980, 1987).

Newell Shearwater, or *ʻAʻo* (*Puffinus newelli*), is listed as threatened by the U.S. Fish and Wildlife Service (1987). It is thought that this rare seabird has established colonies in the Kohala Mountains, although none have been confirmed. Records of sightings

and calls suggest that *ʻAʻo* colonies exist within the Hamakua and Kohala forests, but that these colonies are very dispersed and probably contain very few individuals (Kepler et al. 1979). Because the birds are active at night and nest in dense rain forest on steep slopes, nesting sites are very difficult to locate. There is a possibility that a breeding colony exists in the Reserve's northern, seaward finger; calls were heard during the night in August 1977 at 2,440 feet, west of where Waiilikahi Stream drops into Waimanu Valley (Hall 1978). During September 13-15, 1977, *ʻAʻo* were heard in Waimanu Valley (Kepler et al. 1979).

Non-native forest birds were also observed throughout the Reserve in all vegetation types. Species noticed included Hwamei (*Garrulax canorus*), Japanese White-eye (*Zosterops japonicus*), and Northern Cardinal (*Cardinalis cardinalis*).

There are many small streams in the Reserve that drain the Kohala summit, but those encountered on this survey did not contain native diadromous species, such as gobies or shrimps. This is probably because the streams observed were either above major waterfalls (blocking upstream migration) or were eventually diverted for agriculture and other uses. However, these streams did contain the typical complement of native aquatic insects, as well as at least one non-native species, an unidentified ranid frog (possibly *Rana rugosa*).

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

Though relatively few native land snails inhabit the geologically young island of Hawaii, the relatively old Kohala Mountains contain the greatest diversity of snail species on the island. A comprehensive mollusc inventory in Puu o Umi Reserve and surrounding areas is not available, as there has been little malacological research on the island of Hawaii for most of this century. During this July 1988 survey, the common native arboreal succinids were found abundantly throughout Puu o Umi, and the minute tornatellinids were found in fair numbers near the Reserve's southern and western boundaries.

There are no recent reports of rare land snails in the Puu o Umi Reserve. Within one-half mile of the Reserve's western edge, however, specimens of the tree snail *Partulina physa* were collected in 1984. The forest in this area west of Puu Pala is similar to that throughout most of the Reserve. It is worth noting that the greatest known concentration of tree snails in the islands was recorded below the Reserve on the Waimea Plains (west/southwest of the Reserve) in 1903, where approximately 75,000 *Partulina confusa* were seen in an area of one-half square miles on 150 *olopua* (*Nestegis sandwicensis*) trees (Pilsbry and Cooke 1912-1914). This species is very similar to *Partulina physa* and may still exist in the Kohala Mountains, even though the colony in the Waimea Plains is now extinct.

Non-native invertebrates were observed in the Reserve, distributed somewhat by elevation and proximity to adjacent, non-native vegetation. Portions of the Reserve closest to the pasture lands of Waimea, the lowest elevation lands along the south Reserve boundary, contained high numbers of non-native millipedes and isopods foraging in leaf litter and in living foliage. Other non-native species were more widespread in the Reserve. Large flies associated with mammals (pigs and cattle) were observed at several localities in the Reserve, especially where pig damage was fresh

and heavy. The predatory flatworm (*Geoplana* sp.) was observed in *Sphagnum* moss and leaf litter and the introduced omnivorous snail (*Oxychilus alliarius*) was found in the southern area of the Reserve near the pastures. Both represent a threat to native snails.

Spoor, scats and feeding damage of feral pig were encountered on every transect, but very little evidence of current cattle damage was seen in the Reserve (only one section of fence line was observed to have been breached by calves). The impact of feral pigs is discussed in the Ungulate Control Program section… [DLNR 1989]

Key Management Considerations

The overall management goal is to protect and maintain the Reserve's native ecosystems. The following key considerations were included in the management programs developed to achieve this goal:

1) The Puu o Umi Reserve encompasses a very large area, much of which is inaccessible. At this time it is not economically realistic to intensively manage the entire Reserve. Priorities have been set for management of specific areas based on the biological resources they contain, the extent of current disturbances, the nature of other biological threats within and near the area, and the feasibility of management (e.g. topography and access).

   Management activity over the next six years will focus on protecting the most intact native bog and forest ecosystems from feral pigs and non-native weeds. Management access into and through the Reserve will be developed by improving roads to the Reserve boundaries and establishing and maintaining a Reserve-wide trail system, with four helipads and three management shelters.

2) Feral pigs (*Sus scrofa*) constitute the most severe threat currently affecting the Reserve. Pig rooting and wallowing destroy native plants and disturb ground cover on the forest floor. Such damage limits effective regeneration of native plants, and creates conditions favorable for certain non-native plants throughout the Reserve, especially banana poka, which is the Reserve's most serious weed problem. Non-native plants degrade the quality and integrity of native plant communities, threatening the existence of species that rely on the forest for survival. This disturbance also threatens the quantity and quality of water originating from the forest watershed. Control of feral pigs is the essential first step in maintenance of the Reserve's native plant communities.

   Aggressive control activities are critical for effective long term reduction of the pig population. (See Management Programs Priority #1 - Ungulate Control Program.)

3) Many non-native plants observed in the Reserve are shade intolerant and pose no major problem as long as the native canopy and ground cover remain intact. Several non-native weed species (e.g. banana poka) in the Reserve, however, form monotypic stands and displace native vegetation over large areas. These are priority weeds for management. Weed control activities will focus on priority weeds within specific management areas, and on localized populations of priority weed species, which could spread if not controlled. (See Management Programs Priority #2 - Non-native Plant Control Program.)

4) The Reserve encompasses the majority of Kohala Watershed and protects the head waters of ***Kaiwainui, Alakahi, Honokane Nui***, and ***Kohakohau*** Streams.

These water resources are tapped in their lower reaches for domestic and agricultural uses. Protection of the Reserve's native ecosystems will also protect this valuable watershed. Agencies involved in the water development activities should be informed and involved in Reserve management activities wherever possible.

5) The rapidly growing Kohala community should be informed about the resources and involved with appropriate management activities in the Reserve. Improved access and a maintained trail system in the Reserve will help. A nature trail is recommended for ***Waipahoehoe Gulch***. A cadre of volunteer Reserve managers from the local community should be developed (See Priority #4 - Volunteer Support Program)… [DLNR 1989]

Management Programs

The following four management programs support the long-term goals for the Reserve. A six-year implementation schedule is proposed. Although the programs are listed by priority, they fit together to form an integrated management package.

Priority #1 - Ungulate Control Program (PUO-RM-01)

GOAL: Eliminate ungulates in select areas of high biologic value. In the rest of the Reserve, reduce the impact of ungulates to a level that prevents further degradation of the Reserve's native ecosystems and allows the greatest possible recovery of the Reserve's native species.

Statement of the Problem: Feral pig control is critical to the survival of native ecosystems and protection of the forest watersheds in the Reserve. There are many techniques for pig control. The NARS manager will need the flexibility to use all the tools available, as the Puu o Umi Reserve presents different vegetation types, topographic features, access problems, and resource protection priorities. These tools include public hunting, fencing, staff hunting, and snaring.

A component of the feral ungulate control program is systematic monitoring. Monitoring will evaluate changes in levels of ungulate damage, the effectiveness of the management program in reducing damage, and the recovery of native vegetation (see Priority #3 - Monitoring Program).

Feral pig activity was observed on all transects in the Reserve. The intensity of damage varied by location and vegetation type. Pig disturbance was limited to the periphery of the pristine bogs. Damage was more prevalent in the better-drained examples of the *Carex* wetlands. The steepest slopes of the mixed fern/shrub cliff community were inaccessible to pigs, but trails and damage on slopes adjacent to less steep terrain were evident. Pig damage was light to moderate in the *ʻOhiʻa* Mixed Shrub Montane Wet Forest community, and regeneration of understory components was observed. Once pigs are controlled, this resilient forest community may resist weed invasion.

Pig damage in the *ʻOhiʻa/ʻOlapa* Montane Wet Forest was generally old and light. A few sections of moderate, fresh damage were noted, however, in which browsed vegetation and rooting was evident. Species such as the Hawaiian orchid *Liparis hawaiensis*, *ʻohawai* (*Clermontia* spp.), and *paʻiniu* (*Astelia menziesiana*) were present only as epiphytes, suggesting that pigs have already removed these species from the ground cover. Pigs move readily through the *ʻOhiʻa/Uluhe* Montane Wet Forest, plowing tunnels under the *uluhe* mats. Damage was difficult to assess, since even severe damage could be hidden by fresh *uluhe* growth.

Improved access, fence construction and maintenance, and aggressive removal of pigs, are all integral components of a successful ungulate control program. Attempts to reduce pig populations to remnant levels in terrain similar to the Reserve's without any fences have not been effective, as animals can move into areas where population densities were reduced. Funds spent on feral pig control will be ineffective unless population size can be reduced to low levels and not allowed to build back up.

Alternative Actions and Probable Impacts:

1) No action. Accept the continuing deterioration of Puu o Umi's forest watershed and native resources. Without control, pigs degrade native communities, lower biological diversity, and increase non-native plant invasion.
2) Attempt control of feral animals without construction or maintenance of any fences. Impacts of feral pigs under this alternative will probably be roughly the same as alternative #1, except for portions of the Reserve where increased hunting activity may keep pig population down and protect small areas of forest. Pig removal will be less effective without fences to keep new populations from moving into the Reserve.
3) Control feral pigs with the aid of fences. This method has proven successful and beneficial for the preservation of native ecosystems. Recovery of native vegetation has occurred in similar areas where management programs have been implemented. The advance of non-native weed species encouraged by pig disturbance can also been slowed. Native plant species surviving only as epiphytes because of pig disturbance can become re-established on the forest floor.

Recommended Action: Alternative #3 is recommended, and involves three projects: access improvement and shelter construction, fence construction and maintenance, and pig removal.

Project 1 - Access Improvement and Shelter Construction

Improved access is needed to undertake management programs in the Reserve. The only official road for vehicular access to the Reserve is on the far western boundary. There are three vehicular access routes proposed, two of which are through state-leased land. No roads are proposed into the Reserve. NARS staff will work with landowners and state lessees to formalize and improve these access routes. Use of these routes by the general public will be determined on a case-by-case basis.

A Reserve-wide trail system is needed to improve access within the Reserve. These maintained management trails will be well marked and designed to minimize disturbance to the existing vegetation. Portions of certain trails traversing boggy areas will need boardwalks. Helipads will be built and maintained to allow efficient and safe transfer of materials and staff into remote areas. Three management shelters will be built to expedite overnight work trips… [DLNR 1989]

Project 2 - Fence Construction and Maintenance

Fencing strategies are dictated by the topographic nature of the Reserve and the priority of resources threatened. Natural barriers should be used whenever possible. Three management units are proposed for fencing.

The first is the 630-acre Bog Management Unit which contains two rare and undisturbed natural communities. A one-mile fence will close off the unit by taking advantage of the natural barriers presented by the steep palis of Waimanu and Waipio valleys on three sides.

The Puu o Umi and Opaeloa Management Units are also proposed for fencing. These units encompass 2,590 acres and are the heart of the Reserve and contain relatively undisturbed native forest ecosystems. A progressive fencing strategy will be used over three years to allow development of shelter and trail infrastructure. This will also allow time for staff hunting to remove as many pigs as possible inside the units before they are closed off. Pig removal in conjunction with fencing is important to take advantage of induced pig movement. It also avoids restriction of animals in one location which can cause heavy localized damage.

Careful clearing of fence lines is needed to minimize disturbance to existing vegetation. All clothing and equipment will be cleaned to avoid spreading or introducing non-native plants and invertebrates. A botanist will walk the flagged fence route to locate and flag rare plants to be avoided by the brushing crew.[14]

Ideally, fences should be inspected and maintained monthly or after major storms. However, the remoteness and inclement weather of the Reserve may make this impractical. Maintenance is planned for six times a year. Inspections will be done in conjunction with other resource management activities such as ungulate removal, monitoring, and non-native plant control. All priority weed species found along fence lines will be removed… [DLNR 1989]

Project 3 - Pig Removal

NARS staff involvement will be required in all Reserve ungulate control programs. Activities will range from organizing "special" public hunts to direct removal of animals in specific management units of the Reserve.

Public hunting can be a viable tool for control, especially in the early stages of a Reserve-wide program. Project 1 outlines a system of management trails and shelters that will help improve access to make public hunting a viable tool for control. The maintained hunting trails will direct and distribute hunting pressure. Volunteer groups can play an important role in establishing and maintaining forest trails in the Reserve (see Priority #4 - Volunteer Support Program).

Special hunts to concentrate on specific portions of a Reserve is another effective tool. These hunts will also allow NARS managers to monitor hunting success and collect biological data on harvested animals. Priority management units proposed for staff control of pigs over the next six years comprise only one-third of the Reserve. This points out the need to incorporate public hunting within the Reserve pig control program in certain areas. These areas include the Puu Ahia, Kohakohau, and the Upper and Lower Waiiliikahi management units, which encompass over 6,900 acres.

Although public hunting may be used as an interim measure, staff will be directly responsible for pig removal in the Puu o Umi, Opaeloa, and the Bog management units. Hunting with dogs is an effective control tool and will be used in unfenced units that are not suitable for snaring and for clearing out pigs from planned fenced areas. Hunting may be alternated with snaring in intensive control units.

[14] While it is recognized that the natural landscape is a Hawaiian cultural resource, it is recommended as a part of this study, that DLNR-NARS staff and contractors meet with State Historic Preservation staff as a part of the program to plan for the fencing of the Pu‘u o ‘Umi NAR. The focus of such a meeting should be to discuss types of traditional cultural sites that may be encountered in the field; and to review the laws and protocols for notification and treatment of inadvertent finds of cultural resources.

Snaring has proven to be an effective pig control tool, especially in remote forested regions like the Puu o Umi Reserve. The Puu o Umi and the Opaeloa management units are ideally suited for this control technique. Snaring is most effective in areas with a combination of well-utilized pig trails, topographic features that will channel movements, and trees to anchor the snares. The most effective approach is to set snares and leave the area unattended to minimize the effect of human presence, returning later to assess the success and condition of the snares. Fences will restrict pig movement in the Reserve and create good snaring opportunities along fence lines. Snares in rain forests last six months to a year.

Public access will be restricted and signs posted in all areas where snares are set. Snare locations will be mapped, adequately marked in the field, and snares set to avoid harm to non-target species. Snares should be checked as frequently as possible. If found alive, pigs caught in snares should be disposed of as humanely as possible. Data on health, sex, and age of captured pigs will be recorded to determine effectiveness of the snaring program.

Shooting pigs from helicopters, which is appropriate only in special cases, is recommended for the Bog Management Unit. This unit is remote, contains valuable biological resources, a low pig population, and low-stature vegetation which allows good visibility and use of infrared spotters. The infrared spotter is heat sensitive and is used in the early morning before the sun has heated up the surrounding lands. The warmth of the pig's body shows up on the screen and the aircraft can move directly to its location and make visual contact. Helicopter use in this Bog Management Unit will minimize damage to the wet, boggy area by avoiding trampling of vegetation and reducing the accidental introduction of weed seeds. Training and safety considerations are essential for this work… [DLNR 1989]

Priority # 2 - Non-Native Plant Control Program (PUO-RM-02)
GOAL: To limit the spread and, where possible, eradicate non-native plant species which are already or may become invasive weeds in the Reserve.

Statement of the Problem: Many non-native plants have become established in Hawaii and their total removal from the Reserve is not feasible. The best control strategy is to maintain intact native forests through limiting disturbance. While feral pig control will help, it is not completely effective in limiting weed spread, as many weeds are spread by birds and people.

Control of priority weed species in key management units will be necessary. Priority weed species found in the Reserve include broomsedge (*Andropogon virginicus*), *kahili* ginger (*Hedychium gardnerianum*), yellow ginger (*Hedychium flavescens*), palm grass (*Setaria palmifolia*), blackberry (*Rubus argutus*), banana poka (*Passiflora mollissima*), and *Tibouchina herbacea*, which was found just outside of the Reserve.

Manual and chemical weed control methods are costly and priorities for their use set by the nature of the weed, the value of the area it is invading, and the effectiveness of the control measure. Biocontrol is an important potential tool in the management of wide spread priority weed species. The NARS should support interagency biocontrol projects, especially for banana poka, by lobbying where appropriate and providing research sites and logistical support.

Non-native plant invasions observed during the survey varied in each community type. Much of the Mixed Grass and Sedge and *ʻOhia* Mixed Montane Bogs were weed-free. However, a pig-disturbed section of the bog contained an incipient population of broomsedge (*Andropogon virginicus*), and also a few individuals of fireweed (*Erechtites*

valerianifolia). Very few non-native plants were observed in the *ʻOhiʻa* Mixed Montane Bog, however, a few non-flowering individuals of *kahili* ginger were found and uprooted. Other incidentals included *Juncus planifolius* and broomsedge but neither were common, and both tended to occur only at the edges of the bog. The central portion of the bog was pristine.

The steep slopes on which the fern/shrub cliff community grows are subject to erosion. These disturbed areas are sites for non-native plant invasions, which included *Ageratina riparia*, palm grass, thimbleberry (*Rubus rosifolius*), and a variety of grasses. In some areas, yellow ginger was abundant. There were few non-native plants in the *ʻOhiʻa* Mixed Shrub Montane Wet Forest community, but ubiquitous species such as *Juncus planifolius* and *Polygonum punctatum* were observed in pig-disturbed areas. The dense canopy and crowded understory in less disturbed portions hinders shade-intolerant weeds from successful invasion.

In the *ʻOhiʻa/ʻOlapa* Montane Wet Forest, non-native plants included several species of grass and sedge, especially *Juncus planifolius* and carpetgrass (*Axonopus fissifolius*), as well as herbs such as fireweed, gosmore (*Hypochoeris radicata*), *Polygonum punctatum*, and St-Johnswort (*Hypericum mutilum*). Several other non-native species were confined to trails and the Reserve boundary along pastures. Thimbleberry was seen in areas of old pig disturbance, and was widespread in parts of the Reserve. Blackberry and banana poka were found above the pastures of Waimea in *ʻohiʻa/ʻolapa* forest, and together represent the greatest weed threat to the Reserve. An incipient population of *Tibouchina herbacea* was found near the beginning of Transect 4, just outside the Reserve boundary.

Non-native plants are infrequent in the *ʻOhiʻa/Uluhe* Montane Wet Forest, which provides a good buffer between disturbed areas, and intact forests deeper in the Reserve. The thick root mat of the *uluhe* seems to inhibit invasion by non-native plants.

Alternative Actions and Probable Impacts:

1) Control pigs, but do not attempt to control any priority non-native plant species. This will reduce the spread of many pig-dispersed plant species, but will allow continued advance of plants spread by birds and people. Decreased rooting and disturbance to the forest floor by feral pigs will slow down establishment of many non-native plants, but already established plants may continue to spread unchecked. A few especially aggressive weeds could overwhelm large areas.
2) Control priority non-native weed species in the key management areas before they become widely established. Set up monitoring transects to locate other incipient populations of priority weed species. Management measures would include selective use of approved herbicides and manual removal with hand tools.
3) Control all non-native plant species in the Reserve. This alternative would require substantial resources and is not practical.

Recommended Action: Alternative #2 is recommended. Non-native plant removal of priority weeds along trails and fences should occur as part of periodic maintenance. The incipient populations of *Tibouchina herbacea*, blackberry, and broomsedge should be removed as soon as possible. All priority weeds should be manually removed from the pristine bogs.

The infestation of banana poka is limited to the lower boundaries of the Reserve. The poka is too widespread for eradication, but attempts need to be made to keep it from

spreading. Infestations should be mapped accurately. Control of mature poka plants should start from the highest elevation of infestation.

The key to checking the spread of poka in the Reserve is pig control. Although both pigs and birds disperse weed seeds, successful seedling establishment seems limited to pig disturbed areas. Pig trails and activity leading from these infestation centers of banana poka should be monitored and poka seedlings found should be removed. Aggressive hunting pressure in infestation centers will help. Volunteer groups can play a key part in the control of banana poka in the Reserve. (See Priority #4 - Volunteer Support.)

Detailed records of the effectiveness of control methods used in the Reserve will be kept. Coordination between NARS and other involved agencies in plant control work will reduce management costs. Strict precautions will be taken to ensure management personnel do not transport weed seeds into the Reserve on their shoes or equipment (including helicopters). Hikers and hunters will be informed of these inadvertent introductions by posted signs along access trails into the Reserve… [DLNR 1989]

Priority # 3 - Monitoring Program (PUO-RM-03)
GOAL: Monitor the effectiveness of management projects and track significant ecological changes through long-term scientific monitoring.

Statement of the Problem: Management activities may not always achieve predicted results and management efficiency needs to be judged. Monitoring changes in non-native and native plant distribution, and animal species abundance entails recording specific data at permanent points and transects in the Reserve. Monitoring also documents progress and facilitates refinement of management techniques employed in the Reserve.

Alternative Actions and Probable Impacts:

1) No monitoring program. This could lead to inefficient management resulting from poor understanding of the area's biological needs.
2) Conduct ad hoc monitoring whenever possible. This is likely to be considerably less effective in the long run than a systematic approach.
3) Establish systematic monitoring programs for ungulate damage, non-native weed invasion, native vegetation recovery, and status of rare species. Increase monitoring intensity for select problems and areas as needed.

Recommended Action: Alternative #3 is recommended. Develop monitoring programs to evaluate effects of management activities and identify future management needs. Many transects will require a two-person crew for safety. Two-person monitoring crews may be dropped off by helicopter in remote areas, take data at established monitoring points, and hike out. Specific goals of the program are to determine:

1) the effectiveness of staff and public hunting in reducing ungulate damage;
2) the success of priority weed species control;
3) the location of incipient populations of other priority weeds; and
4) status of known rare species. Some monitoring activities will be done in conjunction with fence inspection… [DLNR 1989]

Priority # 4 - Public Education and Volunteer Program (PUO-RM-04)
GOAL: To build public understanding and support for the Reserve and the NARS in the local community. Educational opportunities will be provided for interested groups. Volunteer labor to help staff in management activities will be recruited.

Statement of the Problem: The population of the Big Island, and especially the Waimea-Kohala area, has increased rapidly. In light of this development, there is strong public sentiment to conserve what is left of the native Hawaiian heritage. Many new and old residents in the Kohala area are unaware of Hawaii's natural heritage and the Puu o Umi Reserve. Even fewer realize that native resources and the benefits they provide are being threatened. Management of this Reserve will be a long-term effort, and public support and involvement is necessary.

The pristine portions of the Reserve are invaluable for baseline research as examples of undisturbed Hawaiian ecosystems. Public use of these areas should not be encouraged, and in certain areas may need to be controlled (e.g. the Bog Management Unit). The general public needs to know the importance of these areas and the management activities necessary to protect them. Public education through appropriate media coverage is crucial, without encouragement of unrestricted public use of these fragile areas. Special efforts to communicate with public hunters who have traditionally used these areas will be necessary.

Volunteer groups have proven successful in certain natural area management activities, especially in labor intensive efforts such as fence construction, weed control, and trail maintenance. These groups tend to be extremely motivated, representing a valuable resource for the Reserve manager.

Alternative Actions and Probable Impacts:

1) Do not attempt to inform the general public about the resources protected in the Reserve or explain reasons for specific management actions. Do not use volunteer groups in relevant management activities in the Reserve. The results of this alternative could include less public and legislative support for the NARS, misunderstanding among certain groups resulting in vandalism of capital improvements, and increased costs for overall NARS management, especially in plant control work.
2) Maintain community outreach program to give public presentations, provide informational material, and utilize concerned volunteer groups. This could result in cooperation with the general public in feral pig and non-native plant control programs and result in less expensive yet more effective management results. It could also provide a local constituency that would support Reserve management activities.

Recommended Action: Alternative #2 is recommended. Inform the general public about resources within the Reserve and management activities through television, newspaper, and other local media outlets. Present slide shows and talks to community groups. Develop a brochure that describes the resources and ongoing management activities within the Reserve. Establish a self-guided nature trail along the Waipahoehoe Loop Trail.

Utilize volunteer groups for Reserve management whenever feasible. Reserve staff hours will be adjusted so personnel are available to supervise volunteer work groups, especially on weekends. Eventually, leaders from volunteer groups can be trained to supervise their volunteer crews… [DLNR 1989]

This study has been undertaken to provide resource managers and the public with important background information, documenting the wide range of cultural values, practices, and knowledge of resources of the Kohala Mountain lands. An understanding of the cultural environment will help resource managers and the public ensure that the unique qualities of the Pu‘u o ‘Umi NAR, remain a healthy and resilient part of the cultural landscape through future generations.

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Appendix G: Revised Kohala Mountain Watershed Management Plan.

A full copy of the revised management plan on which this environmental assessment was based can be found at: http://www.hawp.org.

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Kohala Mountain Watershed Management Plan

DRAFT

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Kohala Mountain Watershed Management Plan

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Kohala Mountain Watershed Management Plan
EXECUTIVE SUMMARY

On the island of Hawai‘i, Kohala Mountain, crowned in native cloud forest, lies perpendicular to the prevailing trade winds, favoring frequent cloud formation and abundant rainfall vital to North Hawai‘i. These forested areas of Kohala Mountain are vital for recharge of North Hawai‘i’s groundwater aquifers and a supply of dependable surface water for its streams.

As described in Chapter I, the Kohala Watershed Partnership (KWP) brings together major landowners on Kohala Mountain to protect the water resources and watershed functions of the forested watershed. Efforts to protect vital watershed values began to coalesce when a group of government and private landowners signed a Memorandum of Understanding (MOU) in August 2003, officially forming the Kohala Watershed Partnership. By signing this MOU, partners committed to work collaboratively to protect the Kohala Mountain Watershed, despite differences in priorities, mandates and constituencies. These partners include: Parker Ranch; Kahuā Ranch; Ponoholo Ranch; Kamehameha Schools; Queen Emma Foundation; Surety Kohala Corporation; Laupahoehoe Nui, LLC; Hawai‘i Department of Land and Natural Resources; and Department of Hawaiian Home Lands. The Hawai‘i County Department of Water Supply and The Nature Conservancy have joined in this effort as (non-landowner) “associate” partners, because of their experience in and commitment to effective watershed conservation.

The primary goal of the Kohala Watershed Partnership is to show improvements in water and environmental quality by enabling comprehensive and sustainable watershed management projects that address the threats to the watershed, while maintaining its integrity and protecting its economic, socio-cultural, and ecological resources. This management plan describes the watershed resources and associated values, identifies the threats to those resources, and directs the activities of the KWP toward their protection. This plan sets management goals, identifies information needs, and prescribes monitoring activities to measure effectiveness and success. The area addressed by this plan includes approximately 68,000 Acres (Ac) of forest and grass lands on the windward and leeward slopes of the Kohala Volcano.

Chapter II of the management plan describes the resources, uses, and current conditions of the Kohala Watershed, including physical characteristics, hydrology and water use, biological resources, and socio-cultural resources. Kohala Mountain provides approximately 6% (154 million gallons per day) of the sustainable yield of water for Hawai‘i Island, though potential production is far greater. Hawai‘i County Department of Water Supply (DWS) relies on the streams and groundwater of Kohala Mountain for its primary source of domestic drinking water for residents of North Kohala, South Kohala, and parts of Hāmākua. The Hawai‘i Department of Agriculture’s Waimea Irrigation Water System, the Kohala Ditch System, and the Lower Hāmākua Ditch Irrigation System depend on surface water from Kohala Mountain to provide agricultural irrigation water to farms. Private ranches, such as Parker Ranch, Ponoholo Ranch, and Kahuā Ranch also rely on the waters of Kohala. The taro farmers in Waipi‘o Valley also depend on a reliable source of water from the watershed.

The Kohala watershed management area (WMA) is also rich in biological resources, unique ecosystems, and rare and endangered plant and animal species. Upper leeward Kohala slopes support particularly diverse Montane moist forests and bog ecosystems that harbor

many rare flora. The WMA and Kohala vicinity contain over three dozen federally-listed plant species. These rare plants vary in habitat from dry to wet, windward coastal sea cliffs to the montane bogs of the summit region, over to the remnant dry forest still extant in the pastures and gulches of leeward Kohala. There are many small streams that drain from the Kohala summit, most of which harbor native aquatic insects, fishes, crustaceans, and mollusks. Native animal species within the watershed include birds, the hoary bat, snails, and arthropods – many of which are found no where else on earth but in Hawai'i.

The watershed is also rich in cultural history, and the area historically supported a relatively large population of Hawaiians. The early Hawaiians practiced wetland agriculture, particularly taro, in the valleys, and the lower windward slopes were terraced for farming. 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). The 1793 introduction of cattle to the Hawaiian Islands and the sandalwood trade in the early 1800s changed the natural landscape forever, and many of the leeward areas of Kohala Mountain were converted to cattle ranching. Sugar plantations were established in North Kohala and Hāmākua during the second half of the 19th century, relying heavily on the water of Kohala Mountain.

Chapter III of the management plan describes the watershed values of Kohala Mountain. These are characteristics or functions of a watershed that have social, economic and/or ecological benefits. The water resources of Kohala Mountain are valued for their domestic and agricultural uses in the lands of Waimea, Hāmākua, and North Kohala. Kohala Mountain is valued for the watershed functions of its forest, including ensuring sustainable water, reduced rates of water loss via evaporation and transpiration, contributions of organic matter, carbon storage, and soil-holding capacity which prevents erosion. Kohala Mountain contains numerous and diverse ecosystems and many rare and endangered plant and animal species, many of which are found nowhere else in the world. Kohala Mountain's forests help purify the air, regulate climate, regenerate soil fertility, and feed coastal reefs and nearshore fisheries. Species within the forest and streams provide economic, recreational, and socio-cultural benefits as well. The inter-relationship between the land and the people who inhabit it, nourished through daily practice of their culture, has forged a strong bond of Hawaiian culture to the Hawaiian landscape. The watershed is also valued for public access and outdoor recreation, and provides a tremendous opportunity to educate adults and children alike about the unique ecosystems and biodiversity of Hawai'i.

Chapter IV explains the threats to the Kohala watershed. Today, the primary threats to the watershed of Kohala Mountain are from alien plants and animals and their effects, including some feral and domestic cattle, and other factors such as wildfire and climate change. The problem of alien species invasion in native habitats is a well-documented management problem in Hawai'i's natural areas, and this chapter describes the invasive plant species which threaten the resources of Kohala Mountain. Feral ungulates also do considerable damage to the forested watershed, which evolved without the pressures associated with hooved animals. Smaller non-native animals and alien aquatic species also have the potential to become serious pests in the Kohala watershed. Human activities in the watershed, most of which are done with good intentions, can also have a negative impact on the watershed. This chapter also describes the threats arising from aquatic pollutants, wildfire, and climate change.

Chapter V outlines a management program to protect and conserve the resources of the Kohala Mountain watershed. This management program was developed in a series of

planning meetings held by the Kohala Watershed Partnership, drawing from previous information and planning efforts, and with input from landowners, resource managers, and community members. This chapter identifies objectives related to the protection of water resources and watershed functions and the management of threats to these resources. Because the watershed of Kohala Mountain supports unique plant and animal communities that have value to society, this chapter also includes recommendations related to the protection of biodiversity. Recognizing that a management program cannot be effectively implemented without sufficient infrastructure and personnel, recommendations addressing the administration of the program are incorporated. Finally, the chapter addresses compatible public use of the watershed.

Outlined in this chapter are objectives and recommended actions to implement the primary goal and another six major goals over a 20 year period. Under each management goal, there will be one or more objectives, each followed by a brief description of current management activities. Each objective will identify specific management actions to achieve the objective.

This proposed management program reflects the ideas and watershed management goals of the Kohala Watershed Partnership. Recommended actions have not been finalized or prioritized at this time. The Kohala Watershed Partnership believes it is important to get further community input on the plan before the management program is finalized.

Opportunities for additional public input will occur during the environmental review process (Chapter 343, HRS). During this process, the KWP will engage in an outreach effort to gather feedback on the management plan and public input on the action priorities. Various forums will be used to solicit public input, including workshops and community meetings. This input will be incorporated into the draft watershed management plan and Draft Environmental Assessment (EA). These documents will then be available for further review and comment during a 30-day public comment period. Following this public comment period, the management plan and EA will be finalized and submitted to the Board of Land and Natural Resources with the Conservation District Use Application (CDUA) for proposed actions within the Conservation District.

The proposed management goals and objectives are delineated below.

Management Goal 1: Protect Water Resources.

Objective 1a: Maintain a structurally-complex vegetative cover that promotes infiltration and groundwater recharge and minimizes erosion.

Objective 1b: Protect, enhance, and manage high yield watershed areas to maintain water quantity and quality.

Objective 1c: Monitor the quality and integrity of ground water, surface waters, and aquatic environments.

Objective 1d: Develop a thorough understanding of the nature of groundwater resources affected by Kohala Mountain.

Objective 1e: Support appropriate water development to meet the needs of future demand.

Management Goal 2: Prevent New Introductions and Effectively Control Existing Invasive Plant Species.

Objective 2a: Prevent the introduction of new potentially-invasive plant species.

Objective 2b: Manage the spread of incipient and well-established weed pests.
Objective 2c: Conduct monitoring and research to determine efficacy of control measures and to identify occurrences and distribution of other new species.

Management Goal 3: Control Non-Native Animal Populations within Designated Areas.
Objective 3a: Remove feral cattle from the watershed management area.
Objective 3b: Implement pig control to minimize loss of watershed vegetation cover, watershed soil erosion, and human health risks associated with animal-borne diseases.
Objective 3c: Slow the rate of introduction and manage established alien aquatic species.
Objective 3d: Reduce the impacts of rats and other small mammals and promote control of other non-native animals as appropriate.

Management Goal 4: Protect Unique Biological Communities and Rare Species.
Objective 4a: Protect unique plant and animal communities within the WMA.
Objective 4b: Control priority invasive aquatic species in windward streams within the WMA.

Management Goal 5: Prevent and Minimize Wildfire.
Objective 5a: Protect the watershed management area from the threat of wildfire.

Management Goal 6: Manage Access for Compatible Public Use.
Objective 6a: Support continued public hunting on DLNR-managed lands, where compatible with the conservation of water and related watershed values.
Objective 6b: Establish and maintain suitable hiking access trails where the activity is compatible with conservation of water and related watershed values.
Objective 6c: Permit public access to and over private property only with explicit permission of private property owner or representative.
Objective 6d: Ensure that cultural practices, and archaeological and other cultural sites within the WMA are identified, protected, and enhanced.
Objective 6e: Generate community awareness and support of watershed values and management activities on Kohala Mountain.

Management Goal 7: Provide Effective Administrative Coordination and Infrastructure.
Objective 7a: Provide and maintain the appropriate infrastructure and administration to allow for effective watershed management.

The management plan proposes to fence approximately 10,500 acres of the Kohala Mountain watershed management area. The protected areas include both public (7,445 acres) and private lands encompassing approximately 3,065 acres. Management Goal 1 includes measures to protect forest areas comprising the significant portion of the watershed in which groundwater infiltration is occurring. The plan recommends fencing four areas totaling approximately 6,600 acres in order to maintain high yield watersheds. These areas coincide with the areas proposed for fencing in the Kohala Forest Management Group's Action Plan Outline of Projects, for which there was broad agreement amongst participants which included community members, landowners, and resource managers. Management Goal 4 includes management actions to protect a total of approximately 3,910 acres harboring significant native plant and animal communities and ecosystems. These areas would be fenced and managed to protect these important biological communities.

Chapter VI of the management plan provides management program indicators that may be used to gauge the success of the various management actions. Chapter VII is the bibliography. Appendices make up the last part of the management plan. Appendix A is a list of animals and vascular plants of the Kohala Mountain watershed. Appendix B lists selected Hawai‘i statutes and rules that pertain to the management of the Kohala watershed. Appendix C consists of summaries of statements and recommendations made in earlier efforts that related to watershed management on the Island of Hawai‘i. Finally, Appendix D provides detailed descriptions of each biodiversity conservation unit proposed under Management Goal 4.

Kohala Mountain Watershed Management Plan

I. INTRODUCTION

Olelo no`eau in praise of Kohala:

O Kohala nui, o Kohala iki, o Kohala loko, o Kohala waho, o Kohala makani ʻĀpaʻapaʻa, o Pili o Kalāhikiola, o Na-puʻu-haele-lua. ʻOia hoʻi! ʻOia la! O nā ʻokina iho la ʻia o ka ʻāina haʻaheo i ke kāhili a ka makani ʻĀpaʻapaʻa e hoʻolaʻau mai ana me he ipo ala ka nē hone i ka poli o ke aloha –

Large Kohala, little Kohala, inner Kohala, outer Kohala, Kohala of the *ʻĀpaʻapaʻa* wind, of Pili and Kalāhikiola, the two traveling hills. Indeed! They are the combined sub-districts of this proud land brushed by the *ʻĀpaʻapaʻa* wind, maturing like a love nestled fondly in the bosom of love (*Ka Hoku o Hawaiʻi*, March 22, 1917).

On the island of Hawaiʻi, Kohala Mountain, crowned in native cloud forest, lies perpendicular to the prevailing trade winds, favoring frequent cloud formation and abundant rainfall vital to North Hawaiʻi. These forested areas of Kohala Mountain are vital for recharge of North Hawaiʻi's groundwater aquifers and a supply of dependable surface water for its streams.

The critical role played by Hawaiʻi's forests in supporting water has long been recognized. In 1902 U.S. Forester E.M. Griffith wrote, "Forest protection means not only increasing the rainfall, but more important still, conserving the water supply. The future welfare and agricultural prosperity of the Hawaiian Islands depends upon the preservation of the forest." In 1924, C.S. Judd, Superintendent of Forestry in Hawaiʻi, wrote eloquently "Probably in no other section of the world is the relation between a satisfactory forest cover on the mountains and supply of water for domestic and agricultural uses better or more ably demonstrated...." The forested watershed of Kohala Mountain has evolved into an efficient system to capture and store water. Again, C.S. Judd articulated it so well:

> The happy combination of small trees, bushes, ferns, vines and other forms of ground cover keep the soil porous and allow the water to percolate more easily into the underground channels. The foliage of the trees breaks the force of rain and prevents the impacting of the soil by rain drops. A considerable portion of the precipitation is let down to the ground slowly by this three-storied cover of trees, bushes, and floor plants and in this manner the rain, falling on a well-forested area, is held back and instead of rushing down to the sea rapidly in the form of destructive floods, is fed gradually to the springs and streams and to the underground artesian basins where it is held for use over a much longer interval....(1924)

The Kohala Watershed Partnership (KWP) brings together major landowners on Kohala Mountain to protect the water resources, watershed functions, and the natural and cultural resources of the forested watershed. Efforts to protect vital watershed values began to coalesce when a group of government and private landowners signed a Memorandum of Understanding (MOU) in August 2003, officially forming the Kohala Watershed Partnership.

By signing this MOU, partners committed to work collaboratively to protect the Kohala Mountain watershed, despite differences in priorities, mandates, and constituencies. These partners include:

- Parker Ranch
- Kahuā Ranch
- Ponoholo Ranch
- Kamehameha Schools
- Queen Emma Foundation
- Surety Kohala Corporation
- Laupahoehoe Nui, LLC
- Hawai‘i Department of Land and Natural Resources
- Department of Hawaiian Home Lands

The Hawai‘i County Department of Water Supply and The Nature Conservancy have joined in this effort as (non-landowner) “associate” partners, because of their experience in and commitment to effective watershed conservation. The MOU is the basis for the primary goal of the KWP, which is to show improvements in water and environmental quality by enabling comprehensive and sustainable watershed management projects that address the threats to the watershed, while maintaining its integrity and protecting its economic, sociocultural, and ecological resources.

The Kohala Watershed Partnership agreement marks the eighth out of nine watershed partnership that has been formed across the State. Other partnerships include East Maui (1991), ‘Ōla‘a-Kīlauea (1994), West Maui (1998), East Moloka‘i (1999), Ko‘olau Mountains on O‘ahu (1999), Lanai (2001), Kaua‘i (2003), and South Maui (2003). Watershed partnerships are voluntary alliances of public and private landowners committed to the common value of protecting large areas of forested watersheds and associated conservation values. By bringing public and private landowners together around a shared interest, such as watershed protection, these partnerships enable landowners to work together to manage threats that occur across common land ownership boundaries, pool limited resources to achieve conservation goals, and promote collaboration in protecting vital resources across large landscapes.

This management plan describes the watershed resources and associated values, identifies the threats to those resources, and directs the activities of the KWP toward their protection. This plan sets specific management goals, identifies information needs, and prescribes monitoring activities to measure effectiveness and success.

II. DESCRIPTION AND CURRENT CONDITION OF KOHALA WATERSHED

Isabella Bird, explorer in the 1870s, on her first trip to Waipi'o Valley and the Falls of Waipi'o:

With great difficulty and many bruises, [I] got up the river to its exit from the basin, and there, being unable to climb the rocks on either side, stood up to my throat in the still tepid water till the scene became real to me…No words can paint the majesty of the surroundings, the caverned, precipitous walls of rock coming down in one black plunge from the blue sky above to the dark abyss of water below, the sullen shuddering sound with which pieces of rock came hurtling down among the trees, the thin tinkle of the water as it falls, the full rush of the river, the feathery growth of ferns, gigantic below, but so diminished by the height above, as only to show their presence by the green tinge upon the rocks, while in addition to the gloom produced [Bird 1964:93] by the stupendous height of the cliffs, there is a cool, green darkness of dense forest, and mighty trees of strange tropical forms glass themselves in the black mirror of the basin… [Bird 1964:93]

The area addressed by this plan includes approximately 68,000 Acres (Ac) of forest and grass lands on the windward and leeward slopes of the Kohala Volcano. The boundary of the Watershed Management Area (WMA) follows State Hwy 250 (Kohala Mountain Road) from ʻŌuli Gulch at milepost 1.5 as it climbs northwest to mile 11, where it then climbs northward over Kohala Mountain's northwest shoulder to drop northeastward toward the Pololū Valley estuary. The WMA follows the windward coastline, bends up Waipiʻo Valley, and climbs to encompass the Puʻukapu section of the Kohala Watershed. The Southern boundary then follows the southern Forest Reserve boundary westward and continues to meet ʻŌuli Gulch at the Hwy 250 crossing (Figure 1).

The extinct Kohala volcano is approximately 700,000 years old, making it the oldest of Hawaiʻi island's five shield volcanoes (Ziegler 2002). It rises to a height of 5,480 ft. above sea level at the northern tip of the island. The outstanding features of Kohala's tropical climate are its mild year-round temperature, its persistent northeasterly tradewinds, and its regular pattern of orographic cloud formation and precipitation. As rising moist air cools, it drops moisture in the form of rain. The cooled clouds continue to drop moisture as rain and intercepted fog and become drier as they flow over the mountains to the leeward side. Fog water that is intercepted by vegetation and drips to the ground (fog drip) is a consistent characteristic of the windward Kohala Mountain slopes above 2,500 ft.

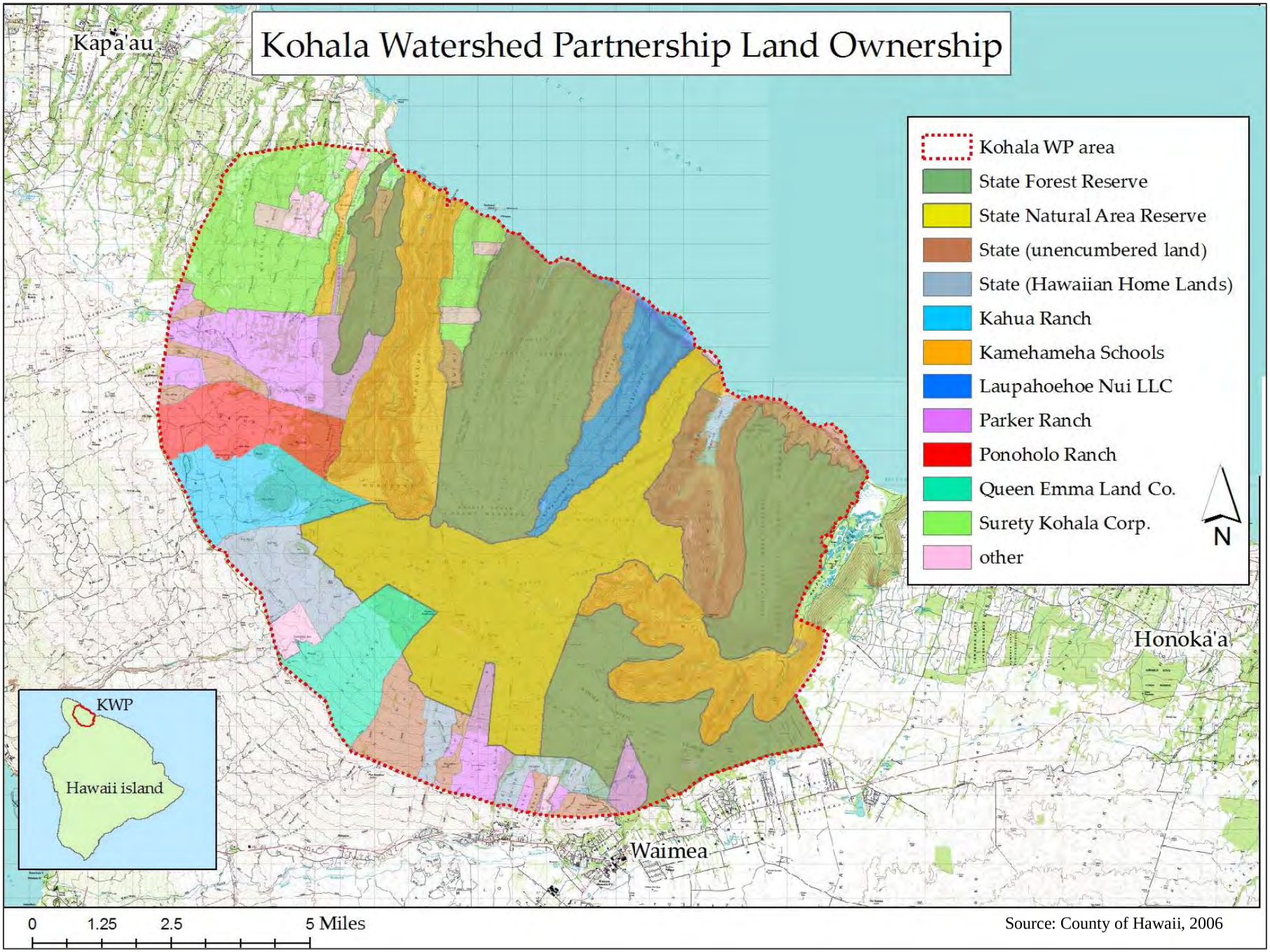

Figure 1. Land Ownership in the Kohala Watershed Management Area

A. Physical Characteristics

Kohala Mountain's elongated northwest to southeast shape was formed by thousands of basaltic lava flows that erupted from two main rift zones and possibly a caldera that may have existed but was later buried by younger lava flows. Eruptions on Kohala volcano were fed by magma rising through fissures toward the rift zones and central caldera. Magma that did not reach the surface may have cooled within the fissures, forming vertical sheets of low-permeability rock (Oki 2002). The northeastern slope of the volcano has experienced a major slope failure that resulted in a reentrant of the shoreline 12 miles long and extending one mile inland. Pololū and Waipi'o valleys formed along these faults (USGS 1995). The exposed volcanics of the WMA fall into two main classes: Hawi volcanics and Pololū volcanics. Pololū volcanics occur within the windward valley areas affected by the slope failure. They are comprised of tholeiitic, transitional, and alkalic basalts dated about 700, 400, and 250 thousand years old, respectively. Hawi volcanics consist of postshield-stage Hawai'ite, maugerite, benmoreite, and trachyte. Lava flows originated from numerous vents, marked by cinder cones and lava domes, near the rift zones of the volcano. Most of these lava flows are *a`a* lava, average 40-ft. in thickness, and few reached the coast. The composite thickness of the layered flows of Hawi volcanics may be as great as 500-ft. near the summit. The slope of the flows range from 3 to 12 degrees except where they flowed into deeply eroded valleys. Soils are generally a few inches to 3 feet thick and commonly rocky in dry areas.

Kohala's summit region is characterized by cinder cones, lava domes, and abrupt slip faults (Wolfe and Morris 1996). Topography throughout the rest of the WMA is highly varied and ranges from very steep valley walls and sea cliffs, to shallow valleys and narrow drainage gullies and broad rolling pastures. The lower windward slopes are deeply dissected, and major drainage patterns are well established. The mountain is moderately dissected in the upper reaches and along the upper leeward slopes.

Soils of the mountain are primarily inceptisols. The Amalu soils series dominates the WMA and covers nearly all of the slopes along the windward side, except for the Rough Broken Lands, also in the Amalu series, that comprise the valley walls. The upper western windward slopes are Silty Clay Loams in the Kahuā, Palapalai, and Manahaa series, and leeward soils are Silty Loams in the Palapalai and Maile series.

B. Hydrology and Water Use

Average annual rainfall on Kohala Mountain ranges from about 40 inches along the leeward section of the Kohala Mountain Road at 3,500-ft. to over 160 inches near the 3,500-ft. elevation in the wet forest between Waipi'o and Honokāne valleys on the windward side (Figure 2). As rising moist air cools, it forms clouds that drop moisture in the form of rain, as dictated by topography and wind direction (Juvik and Juvik 1998). 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 3,000-ft.

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. The distinguishing hydrologic feature of montane cloud forests is their contribution of fog moisture to the hydrology of the forest ecosystem. Recent studies in tropical cloud forests have found that the water intercepted by vegetation typically ranges between 10% and 25% of rainfall, or more, and comprises a larger proportion (up to one-third)

of the total precipitation during dry periods (Juvik and Nullett 1995; Bruijnzeel 2000; Bruijnzeel and Hamilton 2000; Bubb 2004; and Scholl *et al.* 2004). Scholl and colleagues working in East Maui used stable isotopes to trace cloud forests fog water through the hydrologic cycle. They found that water from fog comprised a very small proportion of soil moisture (comprised mostly of rainfall from large storm events), but made up much of ʻŌhiʻa (*Metrosideros polymorpha*) tree sap. Fog drip contributes significantly to stream flow. Overall, they found that cloud water interception adds significantly to rainfall. Cloud water interception at dry and wet cloud forest sites there was equivalent to 10.6 and 42.3 inches per year, respectively (Scholl *et al.* 2004). Together, rainfall and fog drip may total near 200 inches per year across Kohala's broad windward summit region. Cloud forests are mountain forests defined and limited by the persistent presence of clouds and mists and so, in addition to rainfall, capture water droplets that condense on the vegetation.

The precipitation either runs off, evaporates or is transpired by vegetation, recharges the groundwater system, or is stored in the soil. The porous and permeable structure of the mountain geology favors the storage and transport of subsurface water from the mountainous interior parts of the WMA to the coastal areas where it is discharged. Fresh groundwater that is not withdrawn from wells and tunnels discharges naturally from the aquifer at subaerial and submarine springs and seeps. Fresh groundwater in Kohala Mountain occurs as either a freshwater-lens system in the dike-free lava flows or as a dike-impounded system (Oki 2002).

Numerous dikes penetrating through Kohala's sheets of basaltic flows form dike complexes that store water at high elevations. The boundary between the dike-impounded system and the freshwater-lens system generally corresponds with the seaward extent of mapped volcanic vents represented by cinder cones and lava domes. Water enters the dike-impounded system mainly by infiltration of some part of rainfall and fog drip. Natural discharges from these stores occur via high-level springs and streams and groundwater flow to the down-gradient freshwater-lens system (Oki 2002).

Estimated average annual recharge in the Hawi Hydrologic Study Area, an area of 55 square miles bounded on the southwest by the crest of Kohala Mountain and on the east by Pololū Valley and on the north by the coast, is 37.5 million gallons per day (mgd), which represents 18% of the average annual rainfall (Oki 2002). This recharge rate varies across the study area, but is highest in the upland southeastern portion of the study area. Average annual recharge from the direct infiltration of rainfall in the study area was estimated at 55%.

Kohala Mountain provides approximately 6% (154 mgd) of the sustainable yield for Hawaiʻi island (2,431 mgd) (Figure 2). Water budgets for the island of Hawaiʻi indicate that the rainfall is dispersed as 44% evapotranspiration, 25% runoff, and 31% groundwater recharge (Armstrong *et al.* 1983).

Soil moisture-holding capacity[1], measured in inches of available water capacity per inch of soil, is higher in forested areas. In the Hawi Hydrologic Study Area, soil moisture storage capacity was computed from soil type and root depth. Root depths were estimated to be higher in ʻŌhiʻa forest (30 in) than in pasture (22 in) and lowest on steep slopes and in gulches (12 in) (Oki 2002). Using these estimates, the soil moisture-holding capacity of the WMA should be

[1] Soil-moisture storage capacity is estimated by superimposing vegetation information (root depths) on the soils information (available water capacity).

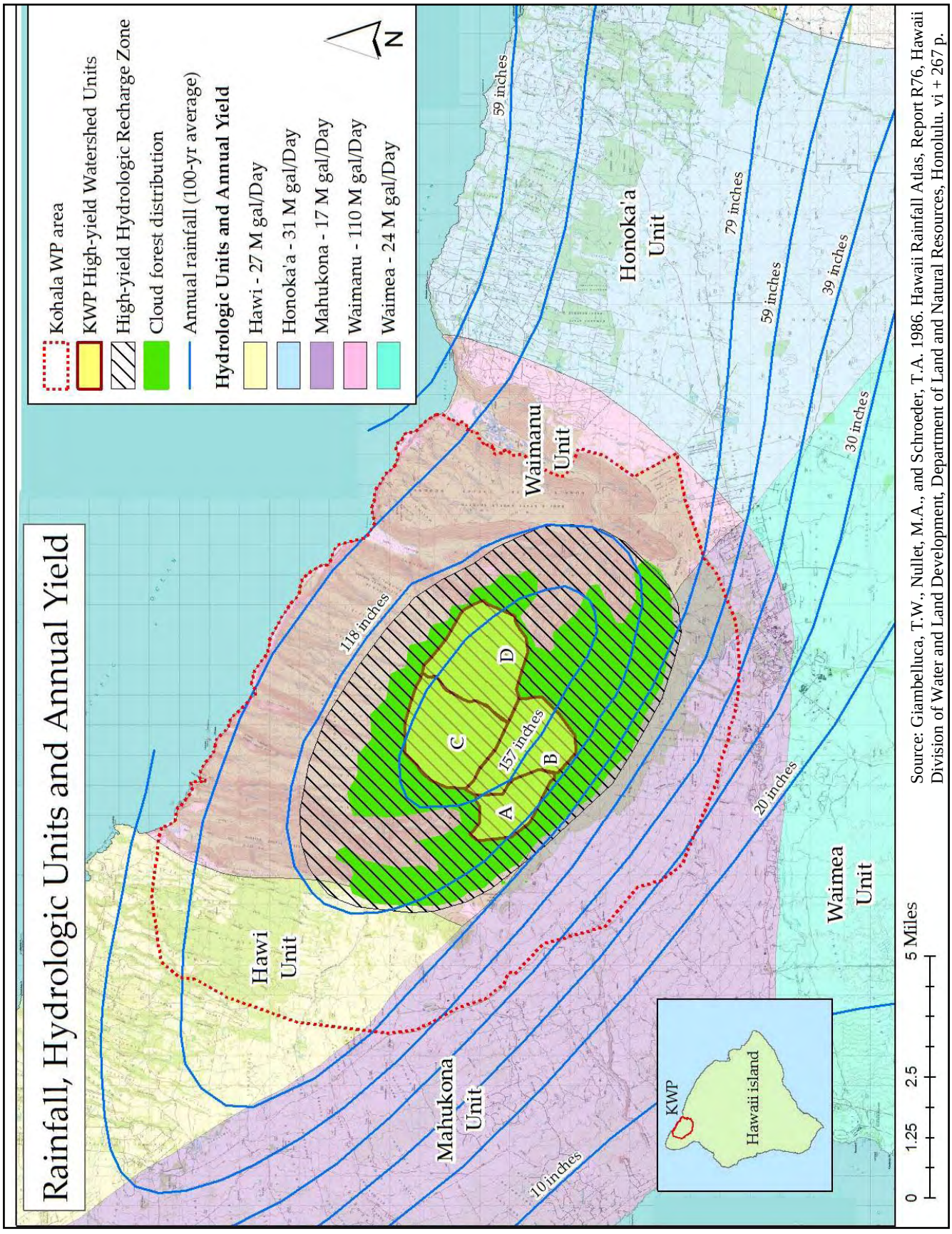

Figure 2. Rainfall, Hydrologic Units and Annual Yield in Kohala Watersheds

high due to the vast, structurally-diverse native forest dominated by ʻŌhiʻa (*Metrosideros polymorpha*), the abundance of organic material produced and cycled within the forest, and the frequently deep soils.

Similar studies have not yet been completed for the other two Kohala Mountain hydrologic units, Waimanu and Māhu-kona. However, an assessment of groundwater conditions was conducted for the districts of North and South Kona and South Kohala from 1991 to 2002 (Bauer 2003). This State Commission on Water Resource Management study provided baseline data to support and inform planning decisions related to development and well-drilling for that region. Implementation of additional studies will be important to the further understanding of Kohala's complex hydrology.

The Kohala Watershed Management Area has numerous perennial streams or rivers that flow from summit regions to the ocean (Table 1 and Figure 3). Table 1 lists the majority of these streams; however, given the many small waterways, the list is likely incomplete. Additionally, local observations indicate there may be a need to reassess the streams in Table 1 for stream class. Many of the streams flow from non-agricultural forested lands to the ocean; others flow through agricultural lands intermittently and during flood events. Some are perennial in the upper reaches and intermittent at lower elevations. Intermittent streams on the leeward side of Kohala Mountain appear to flow less now than they did in the past. Based on anecdotal information obtained through interviews with *kamaʻaina* residents from the region, streamflow may be reduced today from even half a century ago. Some believe that the flow regime is now more flashy in nature. While the causes of a drying local climate are not precisely known, there appears to be a drying trend.

All but four streams in the WMA meet State water quality standards. The federal Clean Water Act requires states to prepare and submit biennial lists of waterbodies not expected to meet state water quality standards. This list is referred to as the Section 303(d) List of Impaired Waters. Hawaiʻi Department of Health's (DOH) 2004 303(d) List includes 70 streams and 174 coastal stations around the State. Of these, the Kohala WMA has four streams: Aamakao, Niulili, Waikama, and Wailoa/Waipiʻo. In its 2004 303(d) List, DOH reported that Wailoa/Waipiʻo Stream, not listed in 2002, exceeded the wet season Nitrite/Nitrate standard by a factor of 2. Waikama Stream, however, previously listed for exceedance of the wet season turbidity standard, showed no exceedance for the wet season in 2004, but exceeded the dry season turbidity standard. Aamakao and Niulili also both exceeded dry season turbidity standards.

DOH identifies these four streams, as well as Pololū, as needing additional monitoring (Koch *et al.* 2004). There are no coastal stations that lie adjacent to the WMA; however, Pelekane Bay, adjacent to Kawaihae Harbor on the leeward side of Kohala, is on the 303(d) List as an impaired coastal water body in exceedance of turbidity standards.

Table 1. Major Streams Emanating from the Kohala Watershed Management Area.

Ref. No.	Stream	CWA 303(d) classification	Pollutant	Stream class†	Land Use Code**	Aspect
1 *	Aamakao	Impaired	Turbidity	Perennial	A, C	Windward
2 *	Niulii	Impaired	Turbidity	Perennial	C	Windward
3 *	Waikama	Impaired	Turbidity	Perennial	C	Windward
4 *	Pololu	--		Perennial	C	Windward
5 *	Honokane Nui East	--		Perennial	C	Windward
6.	Honokane Nui West	--		Perennial	C	Windward
7. *	Honokane Iki East	--		Perennial	C	Windward
8.	Honokane Iki West	--		Perennial	C	Windward
9.	Opaeloa	--		Perennial	C	Windward
10.	Waipahi	--		Intermittent	C	Windward
11. *	Honokea	--		Perennial	C	Windward
12.	Kailikaula	--		Intermittent	C	Windward
13. *	Honopue	--		Perennial	C	Windward
14.	Kolealiilii	--		Perennial	C	Windward
15.	Paohia	--		Perennial	C	Windward
16. *	Ohiahuea	--		Perennial	C	Windward
17. *	Nakooko	--		Perennial	C	Windward
18.	Kamoloumi	--		Perennial	C	Windward
19.	Waiapuka	--		Intermittent	C	Windward
20. *	Waikaloa	--		Perennial	C	Windward
21.	Waimaile	--		Intermittent	C	Windward
22.	Kukui	--		Intermittent	C	Windward
23.	Paopao	--		Intermittent	C	Windward
24.	Waiaalala	--		Perennial	C	Windward
25. *	Punalulu	--		Perennial	C	Windward
26. *	Kaimu	--		Perennial	C	Windward
27.	Pa`e	--		Intermittent	C	Windward
28.	Waimanu	--		Perennial	C	Windward
29.	Wai`ilikahi	--		Perennial	C	Windward
30.	Waihilau	--		Perennial	C	Windward
31.	Kakaauki	--		Perennial	C	Windward
32.	Pukoa	--		Perennial	C	Windward
33.	Manuwaikaalio	--		Perennial	C	Windward
34.	Haweleau	--		Intermittent	C	Windward
35.	Papala	--		Intermittent	C	Windward
36.	Naluea	--		Intermittent	C	Windward
37.	Kahoopu'u	--		Intermittent	C	Windward
38. *	Waipahoehoe	--		Intermittent	C	Windward
39. *	Wailoa/Waipi'o	Impaired	Nitrite/Nitrate	Perennial	C	Windward
40.	Waima	--		Perennial	C	Windward
41.	Koiawe	--		Perennial	C	Windward
42.	Alakahi	--		Perennial	C	Windward
43.	Kawainui	--		Perennial	C	Windward
44. *	Lanimaumau	--		Intermittent	A	Leeward
45. *	Waikoloa	--		Perennial	C	Leeward
46. *	Kohakohau	--		Perennial	no data	Leeward

Ref. No.	Stream	CWA 303(d) classification	Pollutant	Stream class	Land Use Code**	Aspect
47. *	Haleaha Gulch	--		Intermittent	no data	Leeward
48. *	Waiaka Gulch	--		Intermittent	no data	Leeward
49.	Ouli	--		Intermittent	no data	Leeward
50.	Mamaewa	--		Intermittent	no data	Leeward
51.	Pauahi	--		Intermittent	no data	Leeward
52.	Umipoho	--		Intermittent	no data	Leeward
53.	Waiakamali	--		Intermittent	no data	Leeward
54. *	Luahine	--		Intermittent	no data	Leeward
55. *	Keawewai	--		Perennial	no data	Leeward
56. *	Kilohana	--		Intermittent	no data	Leeward
57.	Waipahoehoe	--		Intermittent	no data	Leeward
58. *	Keanahalululu	--		Intermittent	no data	Leeward

* Source: Perennial streams n83 GIS data files from Statewide GIS website (DLNR 2004).
† Stream classes may need revision.
** Land Use Code: A=Agriculture, C=Conservation.

For years, the presence of an extensive *ʻauwai* (irrigation channel system), has given rise to the possibility that large portions of the Waimea plains were irrigated and cultivated in ancient times. In fact an important legal case on the water rights of Parker Ranch in the early 1900s led to the production of a detailed map of the *ʻauwai* system on the *kula* of Waikōloa Nui, Waikōloa Iki, Lālāmilo and Puʻukapu (Kanakanui et al., 1914; Reg. Map No. 2576), which depicts flow of water to, and through many of the *kuleana ʻāina* (fee simple land interests) awarded to native tenants in the region (Maly and Maly 2004).

Extensive agricultural ditch systems built in the early part of the last century capture surface water and distribute it to agricultural lands and storage reservoirs throughout the northern portion of the island (Figure 3). 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. Streams throughout the WMA have been diverted, mostly for agricultural uses. The County Department of Water Supply also diverts surface water in the WMA for domestic consumption.

Hawaiʻi County Department of Water Supply (DWS) relies on the streams of Kohala Mountain for its primary source of water. The DWS system draws its water from diversions on Waikoloa and Kohakohau streams. Raw water from the streams is stored in 4 reservoirs with a total capacity of over 150 million gallons (MG) and is treated in the DWS filtration plant. This system provides about 2.0 mgd to users in Waimea and as far east as Paauilo and west to the Waiemi subdivision on Kawaihae Road. These communities are some of the few in the State still relying on surface water for domestic consumption. During periods of prolonged dry weather or high water usage, the treatment plant cannot process sufficient surface water sources to meet demand; as a result, DWS has developed a deep well in Waimea to supplement surface water sources with groundwater. Residents in North Kohala depend almost entirely on groundwater for their water supply (approximately 700,000 gallons per day).

DWS is currently updating its water use and development plan, scheduled for completion in 2006. With the existing DWS filtration plant at capacity, stricter Environmental Protection Agency (EPA) standards for surface water used for domestic consumption, and rapid growth

within the North and South Kohala regions taxing water supplies, the county will likely develop more groundwater resources in the very near future to meet the growing demand. Groundwater is also more reliable during periods of dry weather. As one component of the hydrology of Kohala Mountain, the groundwater aquifer also relies on captured rainfall and the watershed functions of the forested watershed. There is a need for greater research on the total hydrology and recharge capacity of Kohala Mountain, as well as the connection between Kohala Mountain hydrology and perched groundwater in the Waimea Plains.

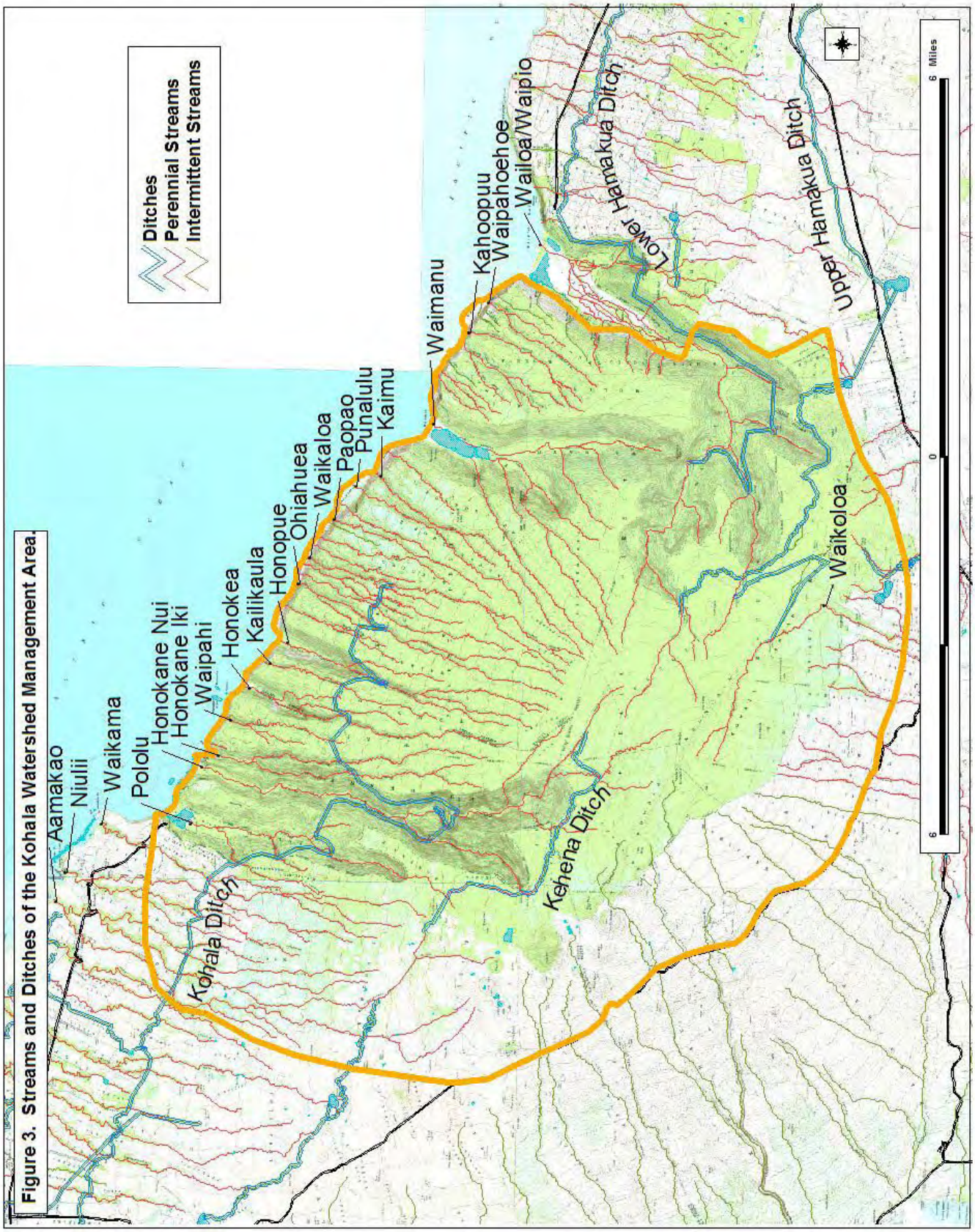

Figure 3. Streams and Ditches of the Kohala Watershed Management Area.

The Hawai‘i Department of Agriculture’s (HDOA) Waimea Irrigation Water System provides agricultural irrigation water to farms in Pu‘ukapu and Lalamilo (Figure 4). Surface water diverted from Kohala Mountain streams flows through the Upper Hāmākua Ditch to the system’s 60 MG Waimea Reservoir and 100 MG Pu’u Pulehu Reservoir (HDOA 2003). Pu‘u Pulehu Reservoir water can be transferred to the Waimea Reservoir via a booster pump and connecting pipeline. The water is then distributed by pipelines from Waimea Reservoir to farm lots in Pu‘ukapu and Lalamilo. In 2003, the system had 117 water service accounts drawing over 330 MG annually (0.906 mgd) on 587 acres of farmland (HDOA 2003). Improvements to the system have been planned to better water conveyance efficiency of the existing system; to add storage capacity; and to expand service to provide livestock drinking water (Waimea-Paauilo Watershed Plan).

The Lower Hāmākua Ditch Irrigation System, also operated by HDOA, diverts the headwaters of four streams (Kawainui, Alakahi, Koiawe, and Waima) in Waipi‘o Valley at the 1,000-ft. elevation (Figure 5). The Waima intake is currently inactive (HDOA 2003). The gravity flow system extends approximately 14 miles to Paauilo Reservoir, the last of five reservoirs scattered along the ditch system. According to HDOA (2003), the Department of Agriculture is still in the process of locating all the buried pipelines that distribute the water laterally from the system. For this reason, the system is not fully metered at this time. In September 1999, the USDA Natural Resources Conservation Service (NRCS) prepared a Lower Hāmākua Ditch Watershed Plan under Public Law 83-566 (Watershed and Flood Prevention Act) that assesses needs and recommends improvements to the ditch system including among other things: flume replacement and repair; ditch lining repair and sediment removal; additional reservoir construction; lateral pipelines; screening and filtration; water meters; and improved intakes. State and Federal monies are funding these improvements, and approximately $20 million have been spent since 2001. One recommendation, the construction of a bypass transmission tunnel behind Hakalaoa Falls in order to restore the waterfall into Waipi‘o Valley, has been completed. Historically, the Lower Hāmākua Ditch system maintained a relatively consistent flow of 30-40 mgd; it is difficult to estimate current usage since the HDOA is still working on maintenance and improvements to the system in order to assure reliable water.

A portion of the Kehena Ditch, abandoned by the sugar plantation in the late 1960s because of its unreliable and inconsistent flow, is still used today, drawing water from Opaeloa Stream. Kahuā and Ponoholo ranches continue to draw water via pipeline from the upper portion of the Ditch for domestic and agricultural uses, drawing on average between 250,000-500,000 gallons per day. They supplement this ditch water with water from the forested Pu’u Pili. Water is stored in several existing reservoirs. New and larger reservoirs are needed to ensure adequate and consistent supplies during drought times.

Parker Ranch continues to use a water system developed in 1902 to extend water to the Waimea-Waikoloa Plains. The system’s supply of approximately 300,000 gallons per day comes from high level intakes in Waikoloa, Kohakohau, Alakahi, and Haunani streams on Kohala Mountain. An extensive system of distribution lines deliver livestock water to Parker Ranch’s widely-spread pasture lands in the Waimea area. Parker Ranch also draws water from streams at Keawewai, Kohakohau, and ‘Ōuli, as well as from portions of the former Kehena Ditch, to fill reservoirs from which water is distributed to tanks and cattle troughs throughout leeward Kohala.

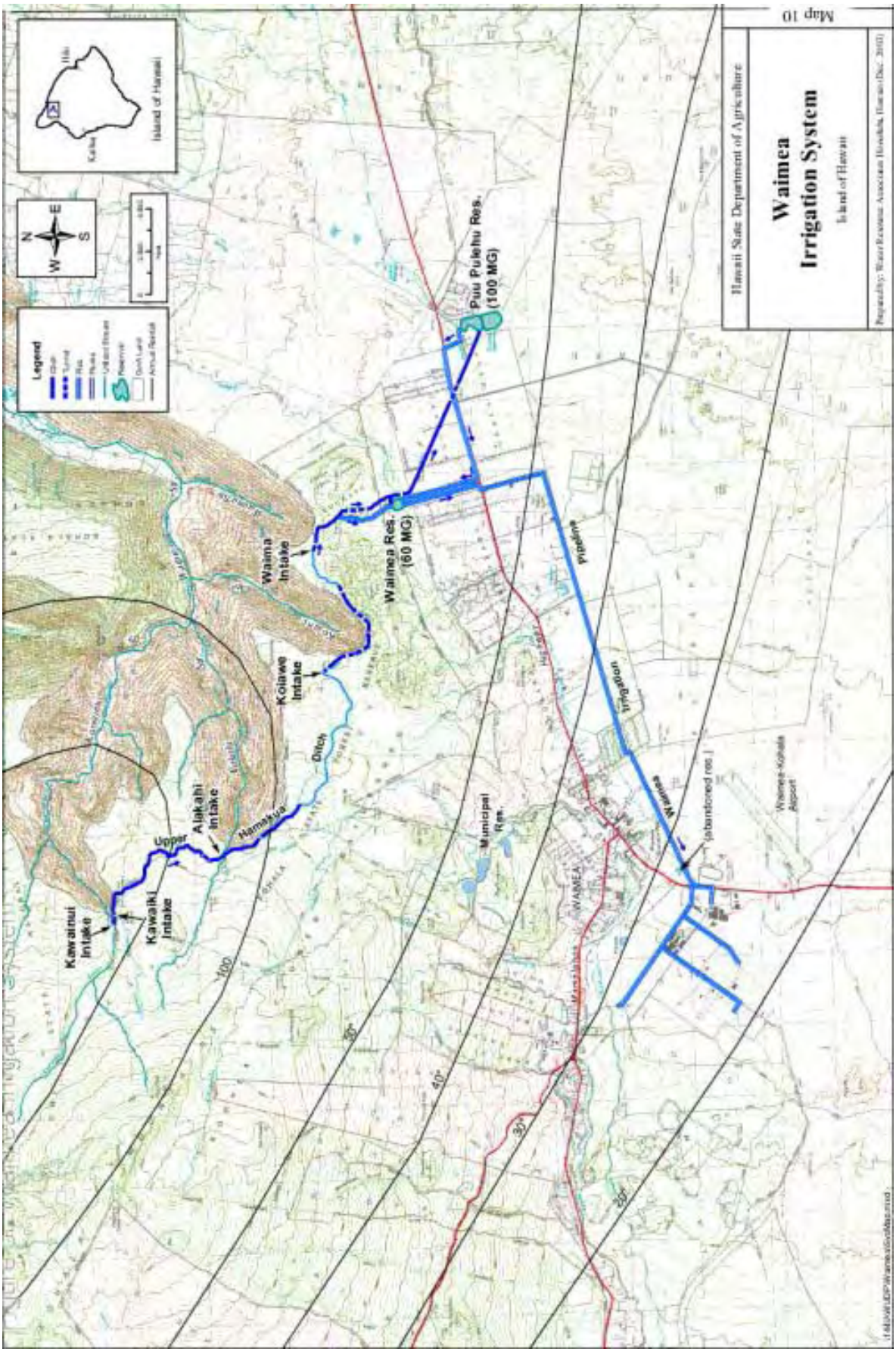

Figure 4: Waimea Irrigation System (taken from HDOA 2003)

Figure 5: Lower Hāmākua Ditch Irrigation System (taken from HDOA 2003)

The Kohala Ditch, initially developed in the early 1900s by the Kohala Ditch Company to provide water to the Kohala sugar plantations, is currently owned by Surety Kohala Corporation and produces roughly 12-14 mgd during normal flows and is used by a myriad of small private entities for irrigation, hydroelectric power, aquaculture, and livestock water. At this time, the ditch water comes primarily from Honokāne Nui. As demand for the ditch water increases, Surety Kohala Corporation may restore other sections of the ditch system currently in disrepair. The table below summarizes current water usage from Kohala Mountain.

Table 2. Current Water Usage.

Water User	Type of Use	Ave. Amount (mgd)
Dept. of Water Supply	domestic	2.7
Waimea Irrigation System	agricultural	0.906
Lower Hāmākua Ditch Irrigation System	agricultural	30-40 historically ??? current
Kehena Ditch (Ponoholo, Kahua, Parker ranches)	agricultural and domestic	0.25 - 0.50
Parker Ranch	agricultural	0.3+
Kohala Ditch	agricultural, industrial	12 - 14
Waipiʻo Valley taro farmers	agricultural	30 - 50

Drought conditions have affected the Hawaiian Islands throughout history. These events often reduce crop yields, diminish livestock herds, desiccate streams, irrigation ditches and reservoirs, deplete groundwater supplies, and lead to forest and brush fires. Periods of drought invariably give rise to water crises, sometimes requiring imposition of emergency conservation measures. The users of the water resources of Kohala Mountain have been particularly susceptible to drought conditions in the past, and the Hawaiʻi Drought Plan identifies this region as an area vulnerable to drought impact. Severe droughts over the past century that have affected North Hawaiʻi or Kohala occurred in 1901, 1908, 1912, 1953, 1962, 1965, 1971, 1977-78, 1980-81, 1983-85, 1996, 1998-1999, and 2000-2002 (DLNR-CWRM website). According to DLNR-CWRM (2004) the "drought of 1998 to 2003 has wreaked havoc on the farmers and ranchers of Hawaiʻi, especially those on the southeastern end of the State." The most severe events of the past 15 years have been associated with the El Nino phenomenon.

The Commission on Water Resource Management (CWRM) recently updated the Hawaiʻi Drought Plan (DLNR-CWRM 2004) to "serve as a 'framework' through which State and local entities can work together to proactively implement mitigation measures and appropriate response actions during periods of drought. Effective coordination of these activities can help reduce and minimize the effects upon the people and natural resources of Hawaiʻi."

Flooding can be equally disastrous to the communities on and surrounding Kohala Mountain. While flooding is a natural process that has occurred throughout time, it has been accentuated in modern history by human habitation and development. Periodically, pressure systems destabilize normal weather patterns around North Hawaiʻi and result in the development of heavy showers and thunderstorms. This, combined with the flashy nature of Kohala streams, can cause flash flooding. A storm on March 14, 2004, washed out a portion of Kohala Mountain Road, cutting off traffic on this road for two months. This same storm caused major flooding in and around Waimea, closing all roads into town and damaging the town's major water supply lines. Several weeks later, another storm caused a portion of the road through

Kapa`au to wash out. Waipi‘o Valley is also particularly susceptible to flooding, and floods over the years have caused significant economic damage.

C. Biological Resources

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on, and around them, in the context of genealogical accounts. All forms of the natural environment, from the skies and mountain peaks, to the watered valleys and lava plains, and to the shore line and ocean depths are believed to be embodiments of Hawaiian gods and deities (Maly and Maly 2004).

1. Ecosystems

Prior to the arrival of humans, Hawaiian life forms evolved in complete isolation for as many as 70 million years. Because the Hawaiian archipelago was never connected to a continent, colonization of the land masses had to occur across 2,000 miles of open ocean by way of wind, storm-driven birds, or floating. Successful colonizations occurred on the average of once every 35,000 years. From approximately 2,000 colonizing ancestors (405 plants, 350 insects, 23 snails, 20 land birds, and numerous fungi, liverworts, mosses and lichens) evolved approximately 8,500 to 12,500 species: plants (1,128), insects (6,000-10,000), land snails (1,200), land birds (115); and numerous fungi, liverworts, mosses and lichens (Loope 1998). As a result, Hawai‘i’s percentage of endemic species[2] is very high.

Kohala Mountain forests, bogs, and streams support over 155 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.

Pacific-wide biomes represented on Kohala include coastal strand, lowland tropical rain forest, montane rain forest, cloud forest, montane bogs, and mesophytic (moist) forest – all ecological zones determined primarily by macroclimate. Azonal ecosystems, those dictated by adaptive factors, are represented by windward coastline vegetation, bogs, aquatic ecosystems, and cliff environments (Mueller-Dombois and Fosberg 1998).

The **coastal strand vegetation** is characterized by salt-tolerant plants, many of which have indigenous distributions beyond Hawai‘i. Inland from there up to 2,500-ft. lies the **Lowland Wet Forest**. This type occurs only on the windward side of the WMA. Above 2,500-ft., the **Montane Wet Forest** covers the windward slopes and a **Diverse Mesic Forest** covers the leeward side above pasture lands. Smaller patches of other plant communities within these major vegetation types include **Montane Wet Bogs**, **Lowland and Montane Shrub and Grasslands**, and **Wet and Dry Cliffs** (DLNR 1989; Gagne and Cuddihy 1990).

Cloud forests in Hawai‘i are represented on most of the major islands. Cloud forests make 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, support

[2] Endemic species are species found only in Hawai‘i and nowhere else in the world.

ecosystems of distinctive floristic and structural form, and contain a disproportionately large number of the world's endemic and threatened species (Stadtmuller 1987; Scholl *et al.* 2004).

Older cloud forests possess an abundance of epiphytic plants, such as mosses and ferns that grow on the trunks and branches of trees. In cloud forests, up to a quarter of all plant species may be epiphytes[3] (Foster 2001). The epiphytes capture water directly from the fogs and clouds and provide a variety of microhabitats for invertebrates, amphibians and their predators (Benzing 1998). Water storage in epiphytes has been calculated as ranging from 3,000 liters per hectare (Richardson *et al.* 2000) up to 50,000 liters/ha (Sugden 1981). Up to half the total input of nitrates and other ions and nutrients to the forest can come from water stripped from clouds by epiphytes (Benzing 1998).

Occurring as open patches within the montane cloud forest are wet bogs, a community dominated by grasses or sedges, with few woody plants. Kohala mountain support 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 moss, and low-stature 'ōhi'a of varying density (Gagne and Cuddihy 1990). Two specific rare bog communities known from Kohala Mountain are the **Mixed Grass and Sedge Montane Bog** and the **'Ōhi'a Mixed Montane Bog**, located adjacent to one another at approximately 3,700-feet in the eastern section of the Pu'u O 'Umi Natural Area Reserve (NAR).

Other unique plant communities from windward Kohala include the *Carex alligata* **Montane Wet Grasslands** and the **Mixed Fern/Shrub Montane Wet Cliffs**, where the steep slopes and cliffs are covered by fern and shrub communities. Three distinct types of 'ōhi'a-dominated forest cover the majority of the WMA: **'Ōhi'a-Olapa Montane Wet Forest** comprises the majority of the 'ōhi'a-dominated forests; **'Ōhi'a Mixed Shrub Montane Wet Forest** usually occupies the best drained areas on the ridge tops; and a broad expanse of **'Ōhi'a-Uluhe Montane Wet Forest** covers the north slopes, ridgetops, and areas recovering from disturbance. Vegetation within the WMA varies across the topographically-complex landscape.

Perennial and intermittent streams comprise another important ecosystem on Kohala Mountain. Hawai'i's streams are generally short (less than 10 miles in length), with numerous waterfalls giving the streams steep profiles. Streamflow typically tracks rainfall patterns. The isolation of the Hawaiian archipelago has resulted in high levels of endemism in the aquatic species: at least 5 native species of fishes (4 endemic, 1 indigenous[4]), 2 species of crustaceans (all endemic), 3 species of mollusks and many species of native arthropods (all endemic).

An important factor that may contribute to the success of long-term conservation of Kohala Mountain's unique ecosystems is the simple fact that they occur on Hawai'i Island. The Island of Hawai'i has an area of more than 4,028 square miles (10,000 sq. km) comprising 63% of the total area of the State, and two high peaks over 13,600 ft (4,146 m). As such, Hawai'i Island possesses by far the most acreage of contiguous native-dominated forest within the State

[3] Epiphytes are plants physically growing on other plants.
[4] Indigenous species are native to Hawai'i but also found elsewhere.

(Juvik and Juvik 1998). Given the rising number and rates of alien species invasions, and other habitat-altering factors such as wildfire and habitat encroachment occurring throughout the State, the large contiguous forests of the island of Hawai‘i may hold the best promise for long-term conservation of Hawaiian ecosystems.

Unfortunately, the isolating factors that have contributed so much to the uniqueness of Hawai‘i’s ecosystems also have made them particularly vulnerable to the effects of many alien species. Many major groups of organisms common on continents, such as land-dwelling mammals, coniferous trees, and ants, never made it to Hawai‘i prior to human arrival. As a result, there was no need for Hawai‘i’s native species to develop traits that favored resistance to pressures such as predation, feeding of rodents, and effects of hoofed animals. In addition, the effects of human activities such as burning, logging, cattle grazing, crop agriculture, development, and wildfire on habitats drove out most lowland species. It is estimated that 170 species of native birds, snails, and insects have disappeared within the last 200 years (Cuddihy and Stone 1990; HBS 2004).

Large-scale extinctions of terrestrial mollusk, arthropod, and bird faunas throughout the Pacific are attributed primarily to the spread of rats that accompanied Polynesian dispersal. In Hawai‘i, rats have had particularly devastating effects on snails, birds, and arthropods (Atkinson 1977).

Extreme reductions in the numbers of sea and forest birds are believed to have affected ecosystems and their inhabitants. Seabirds, waterbirds, and forest birds contributed an enormous amount of organic waste to terrestrial ecosystems (Loope 1998). The contributions were mainly in the form of guano, but also lost eggs, dead birds, spilled food, and molted feathers (Loope 1998). The nitrogen and phosphorus-rich guano deposits would have enriched soils and likely affected vegetation and ecological community structure.

Notable is the relative isolation of Kohala Mountain’s forests from those of adjacent Mauna Kea. The ecologic gap between the two mountains was formerly forested, allowing an exchange of genetic material between the two volcanoes.

The range in habitats and species is also reflected in native Hawaiian mele, which reflect the types of species found and the condition of habitats in these areas (Maly and Maly, 2004):

He lā manu ka kēia o Waipiʻo,	This is a day that the birds gather at Waipiʻo
Ke wili nei i ka lehua,	Encircling the *lehua*,
Ke piʻi nei ka ʻōpae kalaʻole,	The clawless shrimps (inexpert competitors) rise up,
Ka hinana pākanaka o Wailoa,	As do the tame *hinana* shellfish of Wailoa,
E hoʻokomo ana i ke ao a ka ua,	The rain clouds enter the valley,
He lā ua kēia kūʻululū nei,	It is indeed to be a cold rainy day,
Kūʻululū ka manu ua ʻōpili,	The birds are chilled, numbed by the rain (filled with anxiety),
ʻŌpili i ka ua hoʻokina lēhei pā,	Numbed in the rain which blemishes, and passes over walls,
He pā mauka, he pā makai,	Striking the uplands, striking the lowlands,
Pōʻai a puni a koe koena,	Encircling all who remain,
I hoʻokoe ʻia na Ka-Miki,	All [the competitors] who remain for Ka-Miki
No ka uhu haehae ʻupena o nā pali,	Who is like the *uhu* fish of the cliff which tears at the net
No ka iʻa nahu kananā o ka hulaʻana,	Who is like the fierce biting fish [shark] of the *hulaʻana* (swimming trails).
Ka ʻalaʻihi kala loa e pau ʻai	The *ʻalaʻihi kala loa* [*Holocentrus*] fish which
nā lima i ka ʻekeʻeke!	consumes [pierces] hands in the fisherman's bag (one who should not be trifled with)!

2. Species Biodiversity

There are over 15,000 native organisms known from Hawaiʻi, but the number is rising as paleo-ecological research discovers extinct species new to science (Olson and Olson 1991; Steadman 1995; Burney *et al.* 2001). Biological diversity (biodiversity) can be defined on a range of scales from genetic to ecosystem. To use species as the measure of biodiversity, Kohala Mountain's total biodiversity is represented in the total of the sum of the species, their interactions, ecological functions, and ecological processes performed.

Biodiversity is important for ultimately providing ecological services that are of value to society. Based on a broad review of scientific evidence, a panel of well-respected evolutionary ecologists determined with certainty that, "1) Ecosystem services are essential to civilization; 2)They operate on such a grand scale and in such intricate and little-explored ways that most could not be replaced by technology; 3) Human activities are already impairing the flow of ecosystem services on a large scale, a trend that is deleterious to the welfare of all" (Daily *et al.* 1997). They were also confident, again based on scientific information, that: "human activities may cause deterioration of ecological services whose value, in the long term, dwarfs the short-term economic benefits society gains from those activities" (Daily *et al.* 1997). They

further stated that the functioning of many ecosystems relied on very large numbers of species and populations that are required to sustain ecosystem services.

Native Birds

The Kohala WMA provides a diversity of bird habitats that support over a dozen species of sea birds, 4 forest birds, 2 waterbirds, and a hawk. Native waterbirds (Anatidae) of Hawai‘i were the largest animals in the Hawaiian ecosystems. There were more than 12 species in this group, including now extinct giant flightless geese and ducks. Numerous pressures pushed these species to extinction, and, today, the Hawaiian Duck or Koloa maoli (*Anas wyvilliana*) and Hawaiian Goose or Nēnē (*Branta sandvicensis*) are the only members of the family remaining within the main islands of the Hawaiian archipelago. The third extant species from this group is the Laysan Duck (*Anas laysanensis*), which is now known to have once been distributed widely within the islands. Individual ducks from the Laysan population were recently trans-located from Laysan to Midway Atoll in a recovery effort that is off to a successful start.

In addition to being our State bird, the Hawaiian Goose or Nēnē (*Branta sandvicensis*) is considered the eighth most endangered waterfowl species in the world. There are approximately 1,220 individuals in Hawai‘i, of which 620 occur on the Island of Hawai‘i. In addition, there is a captive-bred population of 55 on Moloka‘i. Nēnē were once widespread throughout the islands, but suffered drastic decline due to human hunting, predation by mongoose and feral cats, and other human-induced stresses, until limiting factors started to be addressed and a captive propagation program was initiated by the State of Hawai‘i in 1949 (USFWS 2004). Nēnē use Kohala Mountain occasionally.

The Koloa maoli, an endangered species, inhabits wetlands, ponds, and streams of the WMA. The Koloa maoli 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. It had been reduced to 500 individuals on Kaua‘i and 30 on O‘ahu by the mid-1900s (Schwartz and Schwartz 1949). Its decline has been due to the loss of wetland habitat, hunting, predation by introduced animals (*e.g.*, rats, dogs, cats), and other factors. Furthermore, hybridization of Koloa maoli with feral populations of the closely related mallard (*A. platyrhynchos)* threaten to genetically alter the species (Engilis and Pratt 1993).

A Koloa maoli restoration program was initiated in 1962 by the World Wildlife Fund and the State. By 1979, 350 Hawaiian ducks had been released on O‘ahu and Hawai‘i as part of the program. Recent estimated populations are 2,000 Koloa maoli on Kaua‘i-Ni‘ihau, 300 on O‘ahu, 25 on Maui, and 200 on the Island of Hawai‘i (Engilis 1998). The Hawaiian Duck was listed as an endangered species in 1967 under the Federal Endangered Species Act. The Hawaiian Waterbirds Recovery Plan was completed in 1978, revised in 1985, and is currently being revised and updated again based on a 1999 draft plan. Kohala ponds and streams are probably the most important habitat for these birds on Hawai‘i Island.

The Hawaiian Hawk or ‘Io (*Buteo solitarius*) is widespread on the island of Hawai‘i. Fossil bones recovered on Moloka‘i and Kaua‘i indicate that it may have once been distributed throughout the main islands (Olson and Olson 1982; Burney *et al.* 2001). Its population size is estimated to be between 1,320 and 1,594 hawks, and its distribution essentially follows that of native forests (Klavitter 2000). The ‘Io’s preferred nesting trees are large ‘ōhi‘a. While the ‘Io once fed mainly on forest birds, its diet now consists mainly of introduced rodents (Klavitter

2001). It is not known precisely what proportion of the hawk's population is distributed on Kohala Mountain.

Hawai'i's other endemic raptor is the Hawaiian Owl or Pueo (*Asio flammenus sandwichensis*). Owls inhabit dry forests and rainforests, but are most often seen hunting in leeward pastures. Active during the day and evening hours, the primary diet of the Pueo is rodents. Before rodents arrived, pueo is believed to have fed on the small Hawaiian rail (*Porzana* sp.), a flightless bird that is now extinct.

The 'Auku'u or black-crowned night heron (*Nycticorax nycticorax*), also inhabits wetlands, ponds, and streams within the WMA. Black-crowned night herons are found by marshes at night and by day they roost communally. Night herons are distributed almost worldwide, including North America, South America, South Europe, Africa, South Asia, Falkland Islands, and Hawai'i. In the Hawaiian Islands, the 'Auku'u can be found in all coastal wetlands. The diet of the Black-crowned night heron depends on what is available, and may include algae, fishes, leeches, earthworms, insects, crayfish, squid, amphibians, small rodents, plant materials, and garbage. They have been seen taking baby ducklings and other baby water birds.

Seabirds such as the Newell Shearwater, Hawaiian Petrel, and the migratory Kolea or Pacific Golden Plover (*Pluvialis fulva*) also occur within the WMA. The Newell Shearwater or 'A'o (*Puffinus newelli*) is federally-listed as "Threatened." Records of sightings and calls suggest that 'A'o colonies exist within the Hāmākua and Kohala forests but that these colonies are very dispersed and probably contain very few individuals (Kepler *et al.* 1979). `A`o nest in burrows in steep mountainous terrain between 500 and 2,300-ft. elevation, usually in association with uluhe. Because the birds are active at night and nest in dense rain forest on steep slopes, nesting sites are difficult to locate (USFWS 1983).

The Hawaiian Petrel or 'Ua'u (*Petrodromus sandwichensis*) occurs throughout the North Pacific and migrates between the west coast of California and Hawai'i every year. Once perhaps the most abundant bird in the islands, the petrel has around five populations in Hawai'i totaling between 400-600 individuals (Scott 1986; Harrison 1990; Engilis and Pratt 1993). They nest in burrows 3-6+ ft. deep in steep mountainous terrain between 500 and 2,300 ft. elevation from March through November each year. As with the 'A'o, their burrows are used repeatedly as they return from year to year (USFWS 1983). 'U'au suffered serious declines in both the prehistoric and historic periods. Traditional hunting and predation by the Polynesian rat, dogs, and pigs eliminated 'ua'u populations in the lowlands prior to Western contact. Since then, predation by feral cats, mongooses, dogs, pigs, and all three species of rat now present in Hawai'i, combined with large-scale habitat loss, hunting, and degradation by humans and introduced hoofed mammals, have further reduced the species. Fledglings making their initial flight to the sea can also be disoriented by urban lighting and fly into utility lines and other obstacles. Once grounded, they are vulnerable to predation and being struck by automobiles.

The forest birds 'elepaio (*Chasiempis sandwichensis)*, 'amakihi (*Hemignathus virens*), 'apapane (*Himatione sanguinea*), and 'i'iwi (*Vestiaria coccinea*) are most abundant in closed-canopy forests of 'ōhi'a and 'ōlapa (both the 'apapane and 'i'iwi, along with the now extinct 'ō'ū and 'ō'ō, have been historically documented and linked in Kohala with native Hawaiian use).

On Kohala Mountain, the majority of these native birds are found above the 4,000-ft. elevation, above the range of mosquitoes which can transmit avian diseases. Introduced bird species also pose a threat to native species through competition for food and other resources or as potential vectors for avian diseases and parasites. The Hawai‘i Forest Bird Survey, conducted from 1976-1981, established the status of several of these species (Scott *et al.* 1996).

Extinct Birds

The rate of extinction within Hawai‘i's endemic birds is by far the highest in the United States and is approached worldwide only within a few other isolated island groups. At the time of Captain Cook's visit in 1778 about 93 species and subspecies of native birds were breeding in Hawai‘i. In the ensuing two centuries, at least 23 of these have gone extinct (A.O.U. 1983) and another 13 are imperiled. George Munro (1944) reported observing the Drepanid ula-ai-hawani (*Ciridops anna*) along the "Kahua Ditch Trail" on Kohala Mountain. The species reportedly fed on seeds of the hawane palm (*Pritchardia* sp.). He also reported that the mamo (*Drepanis pacifica*) was known to frequent the interior of the forest area, where ‘akialoa (*Hemingnathus procerus*) and the ‘Oma‘o or Hawaiian thrush (*Myadestes obscura*) were also observed (Munro 1944). Recent discoveries of the bones of prehistorically-vanished species now reveal a vast array of former birds that became extinct long before Captain Cook arrived. Extinct flightless bird species reported from Pu‘u Wa‘awa‘a, such as the flightless Hawaiian goose (*Nesochen sandvicensis*), flightless rails (*Porzana* sp.), a slender-billed crow (*Corvus* sp.), the Kioea (*Chaetoptila angustipluma*), the long-billed akialoa (*Hemingnathus* sp.), and the Hawai‘i ‘o‘o likely also inhabited Kohala Mountain (Giffin 1993). Ancient DNA extracted from an array of fossil duck bones from Hawai‘i revealed that the Laysan duck (*Anas laysanensis*) was once very widespread, from near-coastal areas well into the forests at 5,900-ft. elevation (Cooper *et al.* 1996).

Native Bat

The Hawaiian hoary bat or ‘Ope‘ape‘a (*Lasiurus cinereus semotus*) is the only extant land mammal native to the Hawaiian archipelago. It was listed as endangered in 1970 due to apparent population declines and a lack of knowledge concerning its distribution, abundance, and habitat needs (USFWS 1998). However, 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 the island (Menard 2001). Menard found patterns of annual migration up and down slope and that males persisted in upland areas during most of the year. However, her research did not include the Kohala region. Bats are frequently seen along the windward Kohala coast, especially between Waipi‘o and Waimanu valleys. Data on the food preferences of the species indicate that ‘ope‘ape‘a consume a broad range of insects, including many beetles (Whittaker and Tomich 1983).

Native Snails

One of the most highly diversified groups of animals in Hawai‘i are the native land snails (Cowie *et al.* 1995). 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 (Pilsbry and Cooke 1912-1914). But the land snails suffered dramatic declines resulting from rat predation, habitat destruction, and overcollecting (Hadfield 1986; Hadfield *et al.* 1993; Hadway and Hadfield 1999). Particularly rare are members of the arboreal Achitinellidae family. The Island of Hawai‘i once supported dozens of species in the family (Hadfield and

Miller 1989); however, today only a single population of one species of the family are known from the island (Hadway and Hadfield 1999). In 1992, researchers found *Partulina physa*, previously not recorded since 1946, on forested leeward slopes on Kohala Mountain. Other snails observed within the WMA include succinids and minute tornatellinids (DLNR 1989; Hadway and Hadfield 1998). A comprehensive mollusk inventory for Kohala Mountain has not been made. Appendix A includes a preliminary list of snail species found on Kohala Mountain.

Native Arthropods

Hawai'i's native terrestrial arthropods are most noted for their large number of unknown species and extremely high rate of endemism (99%) (HBS 2004). Generally, Hawai'i's native arthropod fauna includes insects, arachnids, crustaceans, and myripods. Kohala's native arthropod fauna is particularly rich and supports many rare species (Appendix A).

Native Aquatic Species

Kohala streams also support a unique and diverse fauna. Dozens of freshwater streams entering the ocean along the windward coastline support a relatively intact and diverse native stream fauna. The fishes consist of two closely related families, *Gobiidae* and *Eleotridae*, usually referred to as *o'opu* or gobies. In fact, the goby fish is featured in a native Hawaiian story of the testing of two brothers where in a contest, one of the required items was an 'o'opu 'ai lehua (lehua blossom eating goby fish) known from Hi'ilawe in Waipi'o. According to DLNR's Division of Aquatic Resources, the gobies "are particularly adapted to the rocky, steep, flashy-flow nature of Hawaiian streams" (DLNR-DAR website). The native crustaceans include the 'opae kuahiwi or mountain opae (*Atyoida bisulcata) and* opae 'oeha'a **(***Macrobrachium grandimanus).* There are three endemic species of river *opihi* (limpets), the most common of which is the hihiwai (*Neritina granosa*). Most native Hawaiian stream animals share a unique life cycle pattern called amphidromy[5]; this life cycle underscores the importance of maintaining natural stream flows.

There are many small streams that drain from the Kohala summit, most of which harbor native aquatic insects, fishes, crustaceans, and mollusks. Currently, there is inadequate data pertaining to the ecological condition of Kohala's streams, but the general opinion among biologists is that they are relatively intact compared to those of Hāmākua and other islands (Okamura 2003). A baseline condition needs to be established and a monitoring program developed that uses biological and physical criteria to characterize various biotic and environmental features (Englund and Arakaki 2004; Englund *et al.* 2003; Kido and Smith 1997).

Members of Laupahoehoe Nui, LLC partnered with the University of Hawai'i's Hawai'i Stream Research Center to collect baseline biological and physical information for windward streams between Waimanu and Honopue, including every stream from Kaimū to Ohiahuea. They found all of the native stream fishes present.

[5]In an amphidromous life cycle, the species lays its eggs in the stream. The larvae migrate downstream and are swept out to sea. In the post-larval stage, the juveniles return to their freshwater habitat, migrating upstream and often climbing numerous waterfalls.

Invasive aquatic species are those that are non-native and are likely to cause economic or environmental harm, or harm to human health (Shluker 2003). Mexican minnows are among Hawai‘i’s most ecologically-disruptive invasive aquatic species that have become established in north Kohala Mountain streams but have not yet made it into the Kohala Ditch. They compete with native algae eaters and could prey on baby o‘opu; however, they cannot climb waterfalls, limiting their access to low gradient channels. Tahitian prawns (*Lar sp.*) are also disruptive and have the capability to climb waterfalls. Crayfish (*Procambarus clarkii*) are also considered very disruptive, and Talapia (*Oreochromis mozambicas, O. zellei, and other Oreochromis* species), which compete for food, are well-established throughout Kohala streams. In addition, the Chinese catfish (*Clarius fuscus*) is migrating toward interior Kohala from Waipi‘o and the Saltwater tilapia (*Sarotherodon sp.*) from the North Kohala side; however, neither is yet documented within the WMA. A list of native and exotic stream animals is included in Appendix A.

Native Plants

Hawai‘i is recognized for its high levels of endemism. Approximately 12,000 – 13,000 species of native flowering plants are recorded for Hawai‘i, 95% of which are endemic to Hawai‘i. The 12,000 or so endemic species evolved from approximately 270 successful plant colonizing species. Approximately 32 Hawaiian genera (16%) are endemic (Wagner 1985). Hawai‘i’s unique native flora has formed the fabric in which Hawai‘i’s biological and cultural heritage is woven.

Like other groups of terrestrial organisms, Hawai‘i’s native flora has suffered the effects of centuries of change. Approximately 10% of Hawai‘i’s native plants are extinct and roughly 50% are threatened or endangered. Many of these species that meet criteria for formal federal/state listing as Threatened or Endangered have escaped designation due to administrative limitations. But rare species that are not formally recognized remain important components in ecosystems. An evaluation of plant taxa that were candidates for federal listing in 1985, conducted by island, found mesophytic forests and low-elevation rain forests of Hawai‘i Island to be the most degraded ecological zones, harboring 20% and 25% of candidate taxa, respectively. In contrast, they found Montane rain forests to harbor 10% of taxa (Wagner 1985). Upper leeward Kohala slopes support particularly diverse Montane moist forests that may harbor a greater percentage of the island’s rare flora than indicated by the study.

The WMA and Kohala vicinity contain over three dozen federally-listed plant species. These rare plants vary in habitat from dry to wet, windward coastal sea cliffs to the montane bogs of the summit region, over to the remnant dry forest still extant in the pastures and gulches of leeward Kohala.

Although portions of the WMA have been surveyed for rare plants, large expanses have not been thoroughly searched, and specific threats to many of these species are unknown. For this reason, this plan addresses all rare species that may need management attention to control threats to survival and stabilize their populations. Management actions are proposed to protect known rare and endangered plant communities and to address threats to native plants generally; other actions to protect high-yield watershed areas, such as fencing and ungulate control, will also benefit rare plant species. A list of rare plant species is included in Appendix A.

One of Kohala's most conspicuous rare plants is the *Trematalobelia grandiflora*. The name referring to its unusually large flower, *T. grandiflora* is a member of a 4-species endemic genus. It occurs in wet, windswept cliffs and in wet forests and low, boggy wet forests, on Kohala Mountain, in the saddle between Mauna Kea and Mauna Loa, and in and around Hawai'i Volcanoes National Park. The 3-13-ft. tall Lobeliad shrubs bear 5-10 flower branches 1-2 ft. long, each branch forming a raceme of 1-2 in. curved corollas white to pink to rose, or sometimes rose-streaked. Other notable rare plants from Kohala include the stately loulu fan palm, *Pritchardia lanigera*, and another endangered Lobeliad ōhāwai, *Clermontia drepanomorpha*, both of which occur only on Kohala Mountain.

The ohawai is a kinolau of Uli, a goddess of sorcery, for whom an area in Kohala is thought to be named.

Hole Waimea i ka ihe a ka makani,	Waimea is stripped by the winds,
Hao mai na 'ale a ke kīpu'upu'u.	The buffeting waves of the *kīpu'upu'u*.
He lā'au kala'ihi ia na ke anu,	The forest is hardened in the cold,
'O'o i ka nahele o Māhiki.	Matured in the forests of Māhiki.
Ku aku la i ka malanai a ke Kīpu'upu'u.	Rising and spreading out before the *kīpu'upu'u*.
Holu ka maka o ka ōhāwai o Uli,	The centers of the *ōhāwai* (*lobelia*) blossoms of Uli sway,
Niniau 'eha i ka pua o ke koai'e,	The *koai'e* blossoms droop in pain,
'Eha i ke anu ka nahele o Waikā…	The forest of Waikā is pained by the cold…

(cf. Roberts, 1967; Maly, translator)

Extinct Native Species

Recent paleological research documents ecological and climatic change that has occurred over the past 10,000 years. Periods of dry and wet climate caused fluctuations in composition of vegetation and relative proportions of major groups of species, such as ferns and woody plants (Burney *et al.* 1995). But also notable were more recent changes in species coinciding with the arrival of humans. It is well-established from pollen and fossil bird studies that recent extinctions are the result of human activities. Forest clearing on many islands is signaled in changing pollen spectra from sediment cores, with tree taxa rapidly giving way to ferns and grasses; also characteristic are sharp increases in microscopic charcoal influxes, indicating human-induced burning, in most cases probably associated with shifting cultivation. On some islands, forest clearance led to increased erosion rates, along with alluviation of valley bottoms or along coastal plains. The exploitation of natural resources is particularly evident in the zooarchaeological assemblages from early settlement sites, which are characterized by high numbers of land and seabirds, many of them representing now extinct or extirpated species (Steadman 1995, Kirsch 2004). The effects of rats are believed to have played a large role in those extinctions. Extinctions of the past few hundred years include the ula-ai-hawani last seen on Kohala Mountain, the mamo (*Drepanis pacifica*), the akialoa (*Hemingnathus procerus*), and the 'Oma'o (Munro 1944). Also extinct are the flightless Hawaiian goose, flightless rails, a slender-billed crow, the Kioea, the long-billed akialoa, and the Hawai'i 'o'o (Giffin 1993). The Laysan duck and the tree snail *Partulina physa* are examples of two

important Hawaiian species that are close to extinction, but could possible by recovered through intensive habitat management.

D. Socio-cultural Resources

1. Land Ownership, Land Use Zones, and Land Management History

Land Ownership

There are 8 major landowners holding properties of more than 500 acres within the Kohala Mountain Watershed Management Area. These landowners, as well as the acreage of their holdings, are listed in Table 3. These landowners are all members of the KWP. Land ownership is spread across the landscape between public and private landowners, with approximately 56% of the WMA publicly-owned. This distribution of land ownership provides many opportunities for public-private partnerships to implement management projects in the watershed.

Table 3: Total Acreage of Parcels that occur within the WMA.

Major Owner	WMA Acres	Proportion
Govt. State DLNR	34,862	52%
Kamehameha Schools	9,088	14%
Surety Kohala Corporation	5,072	8%
Parker Ranch	4,408	7%
Govt. State DHHL	2,949	4%
Laupahoehoe Nui, LLC	2,261	3%
Kahua Ranch	2,346	4%
Queen Emma Land Company	2,261	3%
Ponoholo Ranch	2,196	3%
Other under 500 Ac	1,325	2%
Grand Total	66,768	100%

Special Management Areas and Land Use Zones

The Hawai‘i Coastal Zone Management (CZM) Act, Chapter 205A, HRS, requires counties to issue use permits for development in coastal areas falling within designated Special Management Areas (SMAs), to ensure that the development is consistent with the objectives and policies of the Hawai‘i CZM Program. While in most places the SMA encompasses coastal lands extending not less than 100 yards inland from the shoreline, along the windward Kohala coast the SMA boundary extends several miles inland to cover areas in which coastal resources are likely to be directly affected by development activities (Figure 6).

State zoning regulations dictate the kinds of uses and projects that are acceptable in any given area. Chapter 205 of the Hawai‘i Revised Statutes (HRS) grants power to the Land Use Commission to zone all lands in the State into four districts: Agriculture, Conservation, Urban, and Rural. The State has jurisdiction for areas designated Conservation District, while the county has jurisdiction over the other three districts. The County of Hawaii revised its zoning in 2007 to match the State zoning, with all State Conservation districts now encompassed by the

county Conservation zone. Figure 6 delineates the State and County land use districts on Kohala Mountain. Approximately 30% of the WMA is designated “Agricultural” while most other lands (71%) are designated as Conservation District (Table 4).

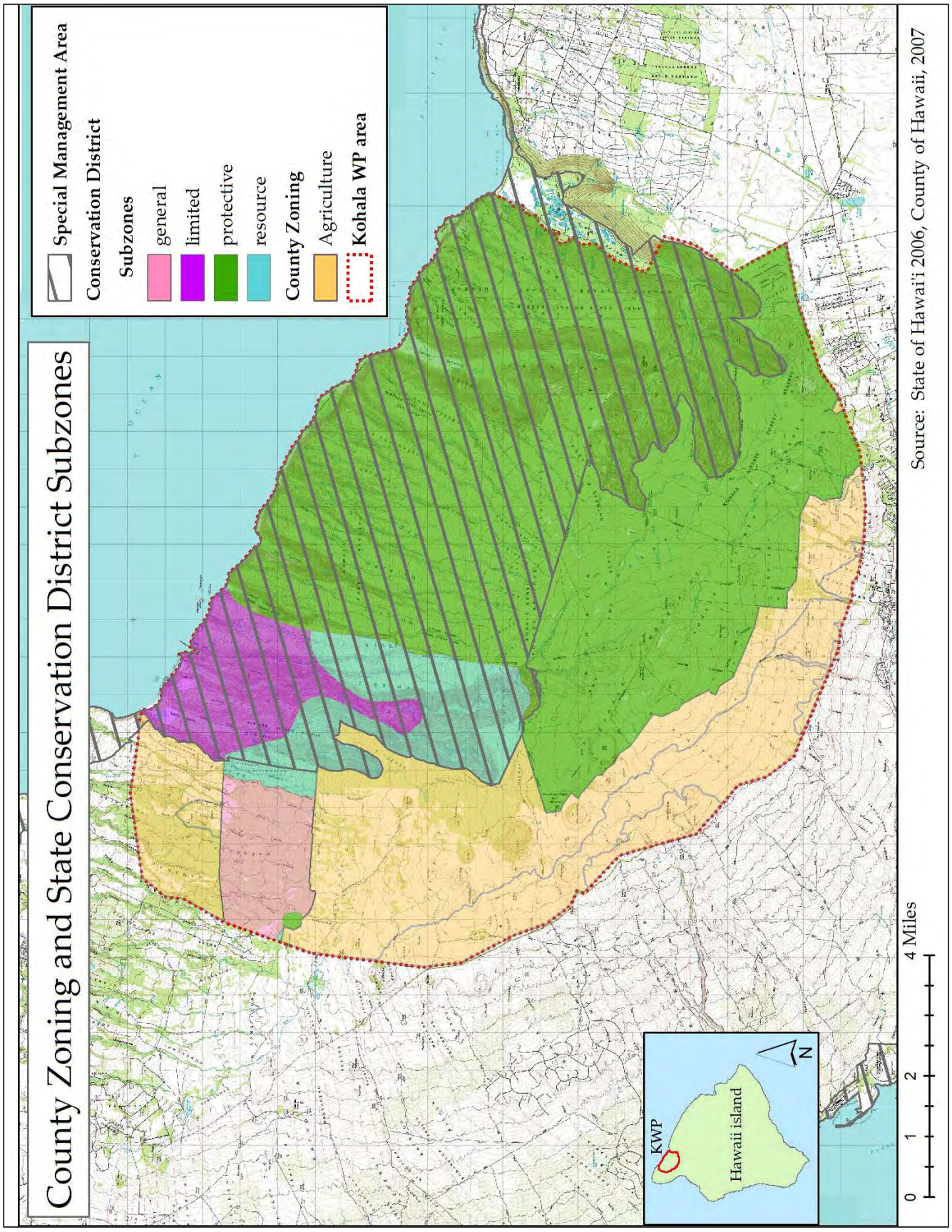

Figure 6. State Conservation District Subzones, Special Management Area and County of Hawaii Zoning

The Conservation District is subdivided into five subzones: Protective, Limited, Resource, General, and Special. Chapter 13-5 of the Hawai'i Administrative Rules (HAR) defines the objectives and types of activities allowed for each subzone. Most of the Conservation District land (79%) within the Kohala Mountain WMA falls within the Protective subzone (38,689 Ac), the most environmentally-sensitive of the Conservation District subzones. The protective subzone encompasses lands and waters necessary to protect watersheds, water sources, and water supplies, as well as natural ecosystems, and significant historic, archeological or geological features. The other subzones included on Kohala Mountain are: Limited (3,473 Ac), where natural conditions suggest constraints on human activities; Resource (4,521 Ac), areas to be managed to ensure sustained use of the natural resources; and General (2,100 Ac), designated open space where specific conservation uses may not be defined but where urban use would be premature. Prior to any use of land in the Conservation District, a Conservation District Use Application (CDUA) must be submitted to and approved by the Board of Land and Natural Resources.

Historic and Current Land Management

In ancient Hawai'i, the traditional system of land and water tenure and management centered on the *ahupua'a*, a wedge of land that extended from the mountains to the ocean and often followed natural watershed divisions. Land and water resources were under the control of the *ali'i* (chief), providing an efficient means of constructing land and water infrastructure. This infrastructure consisted of a highly advanced system of irrigation ditches that would carry water from mountain streams into *lo'i* (irrigated terraces). Native Hawaiians drew their water supplies from fresh water springs, lakes, streams, and shallow wells (Handy and Handy 1972).

The early Hawaiians engaged in subsistence living. During these 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 (Schweitzer and Gomes 2003). 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 (Vitousek *et al.* 2004). This area is known as the Kohala Field System.

The 1793 introduction of cattle to the Hawaiian Islands changed the natural landscape forever. Kamehameha I declared a *kapu* 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, gradually converting forested lands into open rangelands. Free reign of cattle resulted in what Griffiths, a professor from O'ahu 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."

In the early 1800s (circa 1810-1829), tens-of-thousands of pounds of sandalwood (*Santalum paniculatum* or *iliahi*) were harvested from the leeward slopes of Kohala Mountain and shipped

out of Kawaihae (Maly and Maly 2004). Nearly all of the sandalwood was harvested, leaving only a network of well-used trails that undoubtedly helped spread exotic plants throughout former sandalwood areas. Forest trees were also harvested for firewood. It was also during the 1800s, following Western contact, that new diseases decimated native Hawaiian populations.

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 (Wilcox 1996). 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 (Maly and Maly 2004). Concern for watershed protection arose in response. On September 19, 1876, King Kalakaua 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 April 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 "[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" (Maly and Maly 2004). The perennial streams in the eastern valleys of Kohala were sought for their abundance of water, and systems of ditches, tunnels, flumes, and dams were built to carry water from these sources to areas of Kohala and Hāmākua (see Figure 3 for map of ditches.).

The Honokāne section of the Kohala Ditch was completed in 1906, while the Awini section was finished in 1907 (Wilcox 1996). The Kohala ditch delivered to the Kohala plantations an average of 26 mgd of water from streams as far east as Waikaloa Stream, "upon completion, meandering often through solid rock, the Ditch measured 22½ miles, with sixteen miles of ... tunnels..., six miles of open ditch, and 29 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 Hāmākua Ditch Company, which later became the Hawaiian Irrigation Co., was formed in 1904 to provide water to the sugar plantations on the Hāmākua coast. The Upper Hāmākua Ditch was completed in 1907, while the Lower Ditch was finished in 1910. Because of more favorable rainfall, the plantations on the Hāmākua coast did not depend as much on irrigation as others; consequently, water from the Upper and Lower Hāmākua Ditches was used primarily at the mills and for fluming (Wilcox 1996). The water sources for the Upper Hāmākua Ditch were the Kawainui, Alakahi, and Koiawe tributaries of Wailoa stream, which runs through Waipiʻo valley. The Upper Hāmākua Ditch averaged about 8 mgd, but was leaky and required significant maintenance; it was returned to the Territory of Hawaiʻi in 1948 (HDOA 2003). The Lower Hāmākua Ditch tapped into these same water sources, but at lower elevations. The Lower Ditch had an overall length of 24.75 miles (Wilcox 1996). It was extended to Paauhau in 1912 and Paauilo in 1918, and had an average flow of 30 mgd.

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. As noted earlier, the Kohala Ditch is currently owned by Surety Kohala Corporation and produces roughly 12-14 mgd during normal flows. The Hawaiʻi Department of Agriculture (HDOA) took over the Lower Hāmākua Ditch system as a result of the closure of Hāmākua Sugar Company and is in the process of converting the ditch system from large-scale sugar cane irrigation to small scale diversified crop farming operations (HDOA 2003). HDOA also took over the Upper Hāmākua Ditch for use as part of its Waimea Irrigation System.

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. "Rain and run-off seeped straight into the absorbent ground, captured water was too seasonal, and storage water disappeared from reservoirs" (Schweitzer and Gomes 2003). The lower section of the Kehena Ditch was abandoned in the late 1960s. Kahuā and Ponoholo ranches continue to draw water from the upper portion of the 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 Waikiʻi. Parker Ranch currently operates an extensive system of distribution lines to provide livestock water for its widely-spread pasture lands in the Waimea area.

Kalo (taro) farmers in Waipiʻo Valley also rely on the surface waters of Kohala Mountain. Kalo is currently grown on approximately 150 acres on the floor of Waipiʻo Valley. Consistent water is essential to this wetland agriculture. Kalo growers are vulnerable to major changes in water levels, either from drought, diversions, or flooding, as well as water-borne diseases and alien species.

Current Water scarcity and conflicts in water allocation triggered the establishment of watershed protection laws. In 1987, the State Water Code was adopted by the Hawaiʻi Legislature; this statute, Chapter 174C HRS, was amended in 2004. The State, in its stewardship capacity, has management responsibility for all water resources of the State through the Commission on Water Resource Management (CWRM) – also known as the Water Commission. According to HRS §174C-2(c):

> The state water code shall be liberally interpreted to obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.

The Water Commission sets policies and approves water allocations for all water users. Existing uses established prior to 1987 are grandfathered in, provided the existing use is reasonable and beneficial (§174C-50, HRS). The Water Code also requires CWRM to establish and administer a statewide in-stream use protection program, including flow standards on a stream-by-stream basis whenever necessary to protect the public interest (§174C-71, HRS).

In its regulation of water resources, the Commission delegates to the county boards of water supply the authority to allocate the use of water for municipal purposes. The counties are also tasked with adopting water use and development plans, setting forth the allocation of water to land use in that county (§174C-31, HRS).

The State Department of Health (DOH) is assigned primary responsibility for protecting the water quality of Hawai‘i’s water resources under Chapter 342D, HRS. DOH is responsible for developing state water quality standards (including aquatic life use standards), identifying Clean Water Act Section 303(d) impaired waters that do not meet state water quality standards, and preparing Total Maximum Daily Loads (TMDLs) for these impaired waters. Chapter 11-54, HAR, classifies inland and marine waters for purposes of applying the water quality standards. Streams are designated as class 1a (most pristine), 1b or 2, with specific protected uses identified for each class. Likewise, elevated wetlands (bogs) and low wetlands are classified as 1a, 1b or 2.

The 1986 Amendments to the U.S. EPA Safe Drinking Water Act established a nationwide wellhead program to protect groundwater resources used for public water systems from contaminants that may adversely affect the health of humans. This was codified under State statute in Chapter 340E, HRS, Safe Drinking Water, and implemented by the Department of Health.

As noted earlier, the Territory of Hawai‘i established the Kohala Forest Reserve in 1913. DLNR-DOFAW regulates activities in the forest reserves under Chapter 13-104, HAR. These rules prohibit taking of any plant or animal life, except by permit; disturbing of any natural or historic feature; introduction of plants and animals; dumping and littering; and fires. Bird and mammal hunting is permitted by persons with valid Hawai‘i hunting licenses in designated public hunting areas following guidelines set forth in Chapter 122, HAR, Exhibits 1 and 2, and Chapter 123, HAR, Exhibits 11 and 12. Approximately 30,000 acres of public hunting areas are located on Kohala Mountain, within designated Units B (forest reserve), D (restricted watershed) and K (Pu‘u O ‘Umi NAR) (Figure 7). Hunting for pigs in units B and K is permitted year-round on a daily basis, while pig hunting in unit D is limited to weekends and State holidays. Bird hunting is permitted in units B, D, and K during designated hunting seasons.

The Puʻu O ʻUmi Natural Area Reserve (NAR) was established by Executive Order in 1986. This area of 10,142 acres, formerly part of the State forest reserve, is managed by DLNR to protect unique natural resources of Kohala Mountain. The NAR protects the headwaters of Kaiwainui, Alakahi, Honokāne Nui, and Kohakohau streams, all of which are tapped in their lower reaches for domestic and agricultural uses. The Reserve also protects rare native ecosystems and biological resources. According to Chapter 13-209, HAR, allowed activities in the NAR include hiking, nature study, bedroll camping, and hunting pursuant to the hunting rules. Puʻu O ʻUmi NAR is designated public hunting area Unit K, which allows persons with valid Hawaiʻi hunting licenses to hunt daily and year-round for game mammals and on weekends and holidays during the open hunting season for game birds.

The 10,175-acre Kohala Restricted Watershed (Hunting Unit D) was established in 1980 (and contracted in size in 1986 with the establishment of Puʻu O ʻUmi NAR) within the Kohala Forest Reserve to protect a watershed where public supplies are vulnerable to contamination by public access (see Figure 7). Under Chapter 13-105, HAR, all persons are prohibited from entering the 4,834-acre Kohala Restricted Watershed, except by permit from DLNR for official duties, research and scientific pursuits, recreational and educational purposes, and collection of plants for personal use. Public hunting in Unit D is permitted under Chapters 122 and 123, HAR; persons with a valid Hawaiʻi hunting license may hunt on weekends and holidays year-round for game mammals and on weekends and holidays during the open hunting season for game birds.

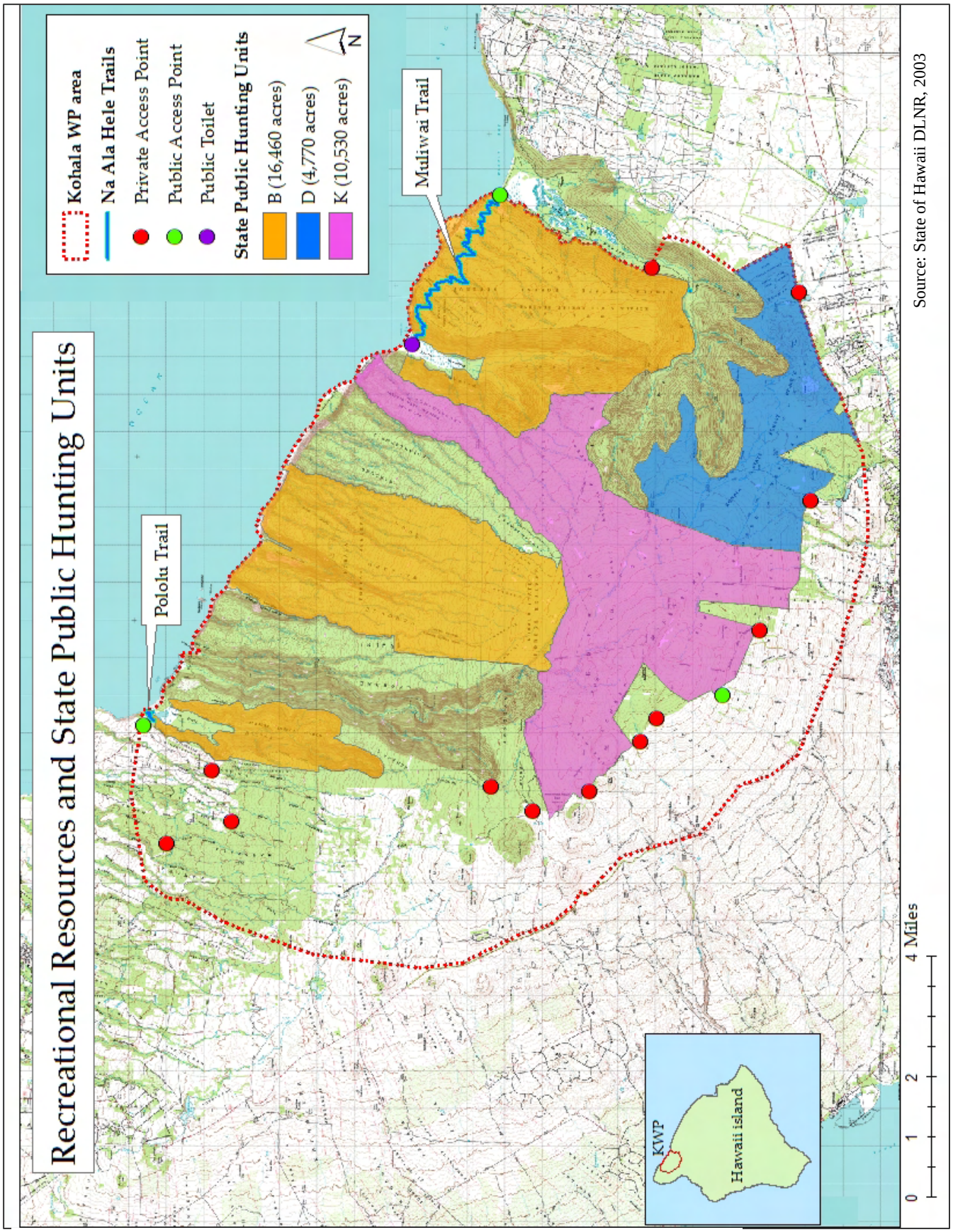

Figure 7. Trails, State Hunting Units, and Access Points

2. Population and Local Communities

Currently, there are few residents who live full-time within the WMA boundaries. However, there are major communities that surround the more remote watershed area. While these communities may not be official members in the Partnership, it is important to gain an understanding of the neighboring communities and involve them in outreach and education efforts.

The town of Waimea is the largest neighboring community, with a population of over 7,000 residents. Kapa‘au and Hawi in North Kohala have populations of 1,159 and 938 respectively (County of Hawai‘i 2000). To the east, in the district of Hāmākua, Honokaa is the largest community, with a population of over 2,200 residents. Neighboring Kukuihaele has a population of 317 residents. While located at a greater distance from the watershed area, Paauilo, population 571, is included in this description because of its reliance on water from Kohala Mountain.

A common factor among all these communities is their reliance on the water resources of Kohala Mountain - whether surface water, groundwater, or spring water - for their domestic and agricultural water supplies. The proximity of these population centers to the Kohala watershed also means that these are the people who are most likely to use the watershed area for hunting, hiking, and gathering of plants for personal and cultural uses.

3. Cultural Resources and Traditional Practices

Kohala Mountain is rich in cultural history. The native traditions and historical accounts associated with the Kohala-Hāmākua mountain lands span many centuries, from Hawaiian antiquity to the later period following western contact. Many narratives found in Maly and Maly (2004) 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.

The most detailed descriptions of the Kohala-Hāmākua mountain lands, including documentation of traditional and customary rights, are those found in the Kingdom collections, documenting the history of land tenure, and defining the boundaries of ahupua‘a in the Kohala-Hāmākua Districts. Detailed oral testimonies from elder native tenants were taken in court proceedings of the mid to late 1800s, and document the occurrence of traditional and customary practices, and 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 Watershed Partnership Area.

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, rains, 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 Watershed Management Area, we find the goddess Hina-ulu-‘ōhi‘a (Hina, goddess whose form is in the groves of ‘ōhi‘a); and Pō-kāhi (the darkened place), a god of the mountain mists (the tradition of Lau-ka-‘ie‘ie), are deified parts

of the landscape. Such body forms and attributes in the Hawaiian mind are "*kino lau*," the myriad body-forms of the gods and creative forces of nature that gave Hawaiians life.

In the Hawaiian mind, care for each aspect of nature, the *kino lau* of the elder forms of life, was a way of life. This concept is expressed by Hawaiian *kūpuna* (elders) through the present day, and is passed on in many native families. When discussing the relationship of native families with the lands and resources around them, it is not uncommon to hear *kūpuna* express the thought — *"E mālama i ka ʻāina, a e mālama hoʻi ka ʻāina iā ʻoe! E mālama i ke kai, a e mālama hoʻi ke kai iā ʻoe!"* (Care for the land, and the land will care for you! Care for the sea, and the sea will care for you!). This concept is one that is centuries old and is rooted in the spirituality of the Hawaiian people. Importantly, the converse is that when one fails to care for, or damages nature—the *kino lau*—around them, they are in-turn punished. This is expressed in many traditional sayings, one being, *"Hana ʻino ka lima, ʻai ʻino ka waha!"* (When the hands do dirty-defiling work, the mouth eats dirty-defiled food!). In this cultural context, anything which damages the native nature of the land, forests, ocean, and *kino lau* therein, damages the integrity of the whole.

In the traditional context, we find 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 State and Federal Laws (as those establishing the Kohala-Hāmākua Forest Reserves and Puʻu O ʻUmi Natural Area Reserve; and the Endangered Species Act).

In this discussion, protection does not mean the exclusion, or extinguishing of traditional and customary practices, it simply means that such practices are done in a manner consistent with cultural subsistence, where each form of native life is treasured and protected. *Kūpuna* express this thought in the words, *"Hoʻohana aku, a hoʻōla aku!"* (Use it, and let it live!).

Existing literature provides detailed information on this history. Maly and Maly (2004) provide readers access to primary documentation on native traditions, customs, and practices associated with the Kohala-Hāmākua mountain lands. The traditional system of land and water tenure and management centered on the *ahupuaʻa*, where each chief acted as a steward of the land and granted the *makaainana* (general populace) living in the *ahupuaʻa* use of the land's bounty for their livelihood. Headmen (*konohiki*) facilitated day to day operations with the assistance of specialists (*luna*). The *ahupuaʻa* formed a self-contained economic and social unit that effectively integrated the uses of its resources from dispersed ecological zones. Everyone living throughout the *ahupuaʻa* had access to all types of products and everyone was entitled to a share of what they produced from the soil or took from the sea. Wetland agriculture, particularly taro, occurred in the valley streams; terraced agriculture on the slopes produced dryland foods, such as sweet potatoes and dryland taro. Food animals were kept within villages and not allowed to escape into the forest. In the forests, Hawaiians would gather building materials and fuel; sources of cordage; adornment for display of rank; water; birds; herbs and medicines; and craft materials. The review in Maly and Maly (2004) of more than 60,000 native Hawaiian land documents dating from 1846 to 1910 revealed many references to *puaʻa* (pigs), but nearly every reference was in the context of them being near-home and as being cared for (raised), not hunted. In the same review of the native Hawaiian land documents, and a large collection of writings from native authors (e.g., D. Malo, 1951; J.P. Ii, 1959, S.M. Kamakau 1961, 1964 & 1976), every reference to traditional collection or

"hunting" (a word seldom used in the historical records), was in the context of native birds—those used either for food or from which feathers were collected for royal ornaments and symbolic dress.

Maly and Maly (2004) also provide a historical overview of the land and activities of people in the region from the early 1900s through the present day. Schweitzer and Gomes (2003) offer a history of North Kohala, beginning in ancient times and describing some more modern cultural resources stemming from the multi-culturalism of the plantation era. Wilcox (1996) includes information on the history of the plantation ditches and irrigation companies on the island of Hawai'i.

The Hawaiian culture nearly lost much of its rich history of cultural traditions and practices over the past 150 years. However, the ancient practice of *hula*, Hawaiian storytelling through dance, has remained strong on the Island of Hawai'i, now globally recognized as home of the world hula championship Merrie Monarch Festival. The forests of Kohala Mountain serve as an important source of materials used in *hula* and other aspects of Hawaiian culture. Today, modern-day practitioners continue to gather plants for medicinal and religious purposes, for lei making and adornment in *hula*, and for other crafts.

In addition, the Kohala region is a stronghold for the modern Hawaiian cultural revival. Modern legends of Hawaiian culture, such as the late slack-key guitar virtuoso Gabby Pahunui and living legend and storyteller Kindy Sproat, hail from the Kohala region.

4. Compatible Public Use

The landscape of the forested watershed of Kohala Mountain is wet, steep, and rugged. The nature of this landscape - muddy bogs, dense vegetation, numerous gulches and steep cliffs - naturally limits access to a certain extent. A more limiting factor, perhaps, is the fact that much of the perimeter of the WMA is encircled by private lands. Historically, these two factors, as well as the control of traditional access and use of resources by landlords and chiefs, have resulted in limited access to the area. Such limited access reflected the high value of the watershed both as mountain and water resources. Nevertheless, the relatively small amount of public access into the watershed area generally occurs along the fringes of the forest reserve; few people venture into the interior of the mountain, which is dangerous terrain for the unprepared visitor.

Trails, with both positive and negative attributes, are important to the management of the watershed. From a management perspective, trails provide points of ingress to more easily and safely conduct activities such as surveys, ungulate control, search-and-rescue efforts, and fire management. Trails also represent avenues to experience cultural and historical features, as well as conduits for economic, ecotourism, and recreational opportunities. Trails also tend to serve as animal corridors, areas where ungulates will most likely travel and be found. Hikers or animals using the trails contribute to the spread of weeds. Overuse of trails can lead to soil compaction and increased water runoff or loss of stabilizing vegetation and soil erosion.

Few trails on Kohala Mountain are maintained, marked, or open to the public; in fact, many occur on private land or require crossing over private property for access. There are two

public trails promoted by the Na Ala Hele Program[6] on Kohala Mountain (Figure 7). The difficult Muliwai Trail links the remote Waimanu Valley with Waipiʻo Valley. This 9-mile trail on the high plateau between the two valleys crosses numerous gulches and descends steeply into Waimanu Valley. Camping is allowed in Waimanu Valley with a permit from DLNR's Division of Forestry and Wildlife. The 0.25 mile Pololū Trail descends in switchbacks down into Pololū Valley and is an attainable hike for residents and tourists. Until recently, a popular hiking trail in the WMA was the trail from the end of White Road in Waimea to overlook the back of Waipiʻo Valley. Though it was promoted by some guidebooks as a public trail, this ditch trail has no legal public access and requires hikers to leave their cars along White Road, where there is insufficient parking, and trespass across leased Department of Hawaiian Homelands property to gain access to the trail. Additionally, the trail has become dangerous due to collapsed sections that were the result of the earthquake of October 2006. Hikers also enter the forest reserve above the reservoirs in Waimea, normally traversing Parker Ranch lands without permission.

Much of the access into the watershed is unmonitored. The only data that exist for public use of the Kohala Mountain region are hunting harvest records submitted by licensed hunters. Trails within the WMA often intersect or lead to hunting areas. Many of the trails in the WMA were established in order to maintain the ditch systems and other water diversions, and access gauging stations on streams within the watershed. Other trails are used by government personnel and researchers to access transect sites, conduct biological and hydrological surveys, and perform weed control.

There is broad and growing interest in environmental research and management in Hawaiʻi. A growing proportion of visitors are interested in seeing wild places and learning about ongoing environmental management projects, such as watershed conservation. The Kokeʻe Resource Conservation Program on Kauaʻi administered by the Kokeʻe Natural History Museum, and the volunteer tree-planting program at Hakalau Forest National Wildlife Refuge are both demonstrating the broad national and international interest visitors have in pitching in with time, money, and effort to help protect and restore Hawaiʻi's unique ecosystems. At this time, there is limited access into the WMA for educational purposes. However, there is interest in facilitating such access, provided it can occur in a controlled and safe manner, as outlined in the management section of this plan.

5. Infrastructure and Facilities

There are few facilities and little infrastructure within the Kohala Mountain watershed. There are eight camping sites, with composting toilets, in Waimanu Valley; camping is allowed with a permit from DLNR. There is vehicular access across some State lands to the edge of the forest reserve, from which hunters and hikers must continue on foot. Private ranch roads lead to the forest reserve at several locations, and access through these private lands requires landowner permission. Much of the perimeter of the forest reserve on the leeward side of the mountain has been fenced to exclude neighboring cattle. The County Department of Water Supply maintains a road above the Waimea reservoirs to its intake on Kohakohau Stream.

[6] Na Ala Hele, administered by DLNR's Division of Forestry and Wildlife, was established in 1988 under Chapter 198D, HRS, in response to public concern about the increasing loss of public access to trails and the threat to historic trails from development pressure.

Three and three-quarter miles of fences have been built, encompassing approximately 140 acres, to protect sensitive natural bog habitat within the Pu‘u O ‘Umi NAR; these exclosures comprise < 1% of the total acreage of the WMA. Helicopter landing zones have been constructed throughout the watershed to improve access into remote areas for management and search-and-rescue missions. A management shelter (Mauga Cabin) has been constructed to facilitate DLNR’s overnight work trips. Some landowners also maintain historic cabins within the watershed.

III. WATERSHED VALUES

Characteristics or functions of a watershed that have social, economic and/or ecological benefits are defined as watershed values. The broad watershed values described in this chapter were compiled through a literature search and interviews with various stakeholders on Kohala Mountain, and built upon past efforts including the Natural Area Working Group, Kona/Kohala Natural Resource Area Workshop, Kohala Forest Management Group, and Waimea Water Roundtable. Summaries of each of these land and water management planning efforts are provided in Appendix C.

A. Water Resources

Historical accounts recount waterfalls, lakes, and streams that were harnessed to provide for native Hawaiian agricultural fields, small towns, and ranches. Today, much of the water of the Kohala watershed is captured and delivered for similar domestic and agricultural uses in the lands of Waimea, Hāmākua, and North Kohala. Existing water resource facilities include the Kohala Ditch; Kehena Ditch; Lower Hāmākua Ditch Irrigation System; Waimea Irrigation System; DWS stream intakes, pipelines and reservoirs; Parker Ranch water capture, storage and transport system; and the water systems of other private landowners. Although the agricultural demand for surface water is not as great as it once was, there is a growing demand for domestic water within all of the municipalities surrounding the mountain. Society's demand for water is expected to grow as the North and South Kohala and Hāmākua districts continue to grow over the coming decades. Hawai'i County DWS is currently investigating the feasibility of shifting supplies for domestic water from surface water to groundwater through the establishment of additional withdrawal stations. These proposed changes will be enumerated in the updated County water use and development plan currently under development.

The water that rains and drips down into streams and the groundwater aquifer flows mostly unnoticed. As a society, we take this most precious resource for granted and fail to recognize its importance in sustaining us. Nonetheless, we use it daily for consumption, agriculture, and development. It is essential for economic, social, and cultural sustenance, and we cannot live without it. Surface water resources also have instream values, sustaining unique aquatic ecosystems and supporting Hawaiian cultural farming practices.

B. Watershed Functions of Forest

Most notable of the services provided by Kohala Mountain is the abundance of fresh clean water. Lush forests provide the ability to ensure sustainable water, even when rainfall patterns are intermittent. Like all mountain forests, Kohala's forests have an important role in stabilizing water quality and maintaining sustainable natural flow patterns of the streams and rivers originating from them. But, tropical montane cloud forests such as that of Kohala Mountain also have the unique additional value of capturing water from the condensation from clouds and fog. This 'stripping' of wind-blown fog by the vegetation becomes especially important during the non-rainy season and in areas with low rainfall but frequent cloud cover. Water originating from cloud forests is also increased because water loss from vegetation wetted by rain or fog is reduced. This results in streamflows from cloud forest areas that are greater and

more dependable in dry periods (Bubb 2004). Kohala's cloud forest encompasses approximately 10,000 to 20,000 acres (Figure 2).

Forests and cloud forests reduce rates of water loss via evaporation and transpiration and maintain high water storage capacity. Water loss from evaporation is moderated by a multi-layered forest canopy structure and persistence of clouds. A functional forest keeps sunlight from reaching the ground and heating up the surface. Ground cover such as leaf litter, moss, ferns, and other plants, and foliar cover also help to create pockets of moist air that reduce the pull of water from the soil surface by the hot, dry daytime air. Rates of transpiration of water vapor into the atmosphere by plants is also moderated by dense vegetation cover and the humid air in the cloud forest. Forests also contribute and recycle organic matter, further increasing the absorptive sponge-like quality of the soil. The forests of the Kohala Mountain watershed support an abundance of dense and multi-storied canopy of woody plants that serve to store carbon. Sphagnum and peat environments that are abundant within forest and bog communities of the watershed are considered to represent a relatively high proportion of world carbon stores.

The watershed is also an open space free from development and use of fossil fuels, a value becoming increasingly scarce in today's world. Furthermore, the rich and diverse beauty of the landforms of Kohala, combined with its unique climate, vegetation, and wildlife, provide aesthetic values that, while may be hard to quantify, are of great value to visitors and local residents alike. Indeed, for native Hawaiians, the landscape itself is a highly valued cultural property and considered sacred (Maly and Maly 2004).

The forest also acts as a soil anchor, a function critical to protect nearshore waters from sedimentation. Shallow-rooted plants such as ferns and forbs help hold surface organic matter that is used as nutrients, and deep-rooted woody plants hold deeper layers of soil and bedrock. The multi-layered canopy of the Kohala forests shelters the ground surface from the frequent heavy rains that might otherwise wash away its organic matter and mineral soils, thereby protecting nearshore waters from sedimentation. The forest also acts as a filter to clean and to cycle organic matter and nutrients through the vegetation, soils, and streams, and helps deliver a consistent and dependable source of artesian and surface water.

C. Native Species and Ecosystems

Kohala Mountain contains numerous and diverse ecosystems and many rare and endangered plant and animal species, many of which are found nowhere else in the world (see Section II.C. Biological Resources for more information). Kohala Mountain's unique climatic and ecological setting supports a wide array of biomes, numerous highly-endemic, and in some cases rare, biological communities that occur as a contiguous forested landscape. Kohala's ecosystems are relatively intact, compared to the rest of the State, and support some of the most intact stream ecosystems in Hawai'i, an array of montane bogs interspersed within tropical montane cloud forest, and diverse montane mesic forest. Conservation of remaining hotspots of biodiversity (locations that harbor clusters of rare species and unique biological communities), such as in the Kohala Mountains, is important to conserve Hawai'i's dwindling biological heritage. Kohala's forested watershed also plays an important role in conservation of biodiversity at the regional and global scales as natural environments decline world-wide.

Kohala Mountain's forests help purify the air, regulate climate, regenerate soil fertility, and feed coastal reefs and nearshore fisheries. Species within the forest and streams provide economic, recreational, and socio-cultural benefits as well. Although the value of these services are not typically quantified, economic research evaluating the value of ecosystem services such as these estimates their value in the hundreds of millions to several billions of dollars (Pearce and Moran 1994).

D. Cultural Resources

Native Hawaiians resided in the valleys and on the slopes of Kohala Mountain at the time of European arrival. Many *ahupua'a* that at one time supported large agricultural and subsistence populations are included within the WMA. The traditional *ahupua'a* system of land and water management in old Hawai'i was centered around the natural watershed divisions. The native Hawaiians lived within the means of what the *ahupua'a* resources could sustain. Wetland agriculture, particularly taro, was practiced in the valleys, and the lower windward slopes and broad areas of leeward Kohala were terraced for farming. The Hawaiians gathered materials from the forest primarily for building, adornment, medicine, crafts, and sustenance.

Some of these cultural practices continue today. *Hula halau* and others may harvest plant materials for the making of lei and adornment for dance and other rituals. Hawaiian healers collect herbs and plants for medicines. The prominent natural features of Kohala Mountain continue to have importance today in Hawaiian myth and culture. Indeed, a mele from 1894 reflects this traditional viewpoint (Maly and Maly 2004):

E-o e ka wahine iloko o ka ohu,	Respond o woman there in the mists,
O ka ohu noho i ke kuahiwi, kualono,	Mist which sits upon the mountain ridges and peaks,
Iloko i Ihikalani hale kumu ohu,	There in *Ihikalani*, mountain-house that is source of the mist,
Paihi kau ao ole ka lewa lani,	The sky clears, there is not a cloud above,
I ka noho a ka wahine kinolau,	At the place where the woman of many body-forms lives,
He kino he lau o Laukaieie,	Body form of the leaves of the *'ie'ie*
E i a'e ka wahine nona ka lei,	The woman for whom the *lei* was made, speaks,
I uo ia e Hinauluohia,	It was bound together by *Hinauluohia*,
He liko no ka lama i ka nahele,	from buds of the *lama* in the forest,
O ka hala me ka lehua,	Of the *hala* and *lehua*,
Ke lawe ala ka makani i ke ala,	The wind carries the fragrance,
Puia i ke ala kai o Pakaalana,	It mixes with the fragrance of the sea at *Paka'alana*,
Ke awili ia me ka lau lipoa	Interwoven with the *lipoa* seaweed.
He wahine noho lae kahakai,	There the woman resides on the costal promontories,
Alualu huakai o na pali,	Gathering the sea-spray along the cliffs.
Ke lele la ka wai o Kawaikapu,	The water leaps from the falls of Kawaikapu,
Ke iho la i na pali,	Descending along the cliffs,
E iho e Laukaieie, e Laukapalai,	Descend o *Lauka'ie'ie*, *Laukapālai*,
E Lauakolea, pili lau i o uka,	*Lau'ākōlea*, companion of the upland *lau-ī*
E iho mai.	Descend.

This *mele* is an example of the depth of the relationship shared between Hawaiians and their environment. It demonstrates the spiritual attachment of Hawaiians to the mountain lands and forest life—they being more than earth and plant. Each of the plant forms are the embodiments of creative forces of nature, and when respected and called upon, they were believed to help the one calling upon them. These plant and weather forms could ensure safe passage through the mountain lands, or cause one to lose one's way.

This inter-relationship between the land and the people who inhabit it, nourished through daily practice of their culture, has forged a strong bond of Hawaiian culture to the Hawaiian landscape (Maly and Maly 2004). To a practitioner of Hawaiian culture, nearly every feature of the *ahupua'a* has value as a cultural resource, from the water to the stones to the vegetation and other organisms.

Today, substantial portions of the WMA are active rangeland. The history of cattle ranching on the slopes of Kohala Mountain extends back over 150 years. Ranching remains an important part of the history, culture, economy, and lifestyle of much of the modern day culture of the region.

E. Public Access and Outdoor Recreation

Pig hunting within Hawai'i's forests has become a popular activity over the past century and is an important part of contemporary local culture. DLNR's Division of Forestry and Wildlife records show that there were an average of 114 hunter trips per year into the Kohala Forest Reserve and Restricted Watershed between 2000 and 2004. In that time, the average reported harvest of pigs was 53 animals per year for all areas combined. These numbers likely under-report harvest, because many hunters do not report their catch. The pig hunting community on the island is comprised mainly of local residents. It is common practice for hunters to frequent the same locations and develop a familiarity with a given area. Pig hunting is a long-standing practice for many of the older *kama'aina* families that come from rural parts of the region. Most pig hunters interviewed during the development of this document valued the hunting lifestyle as much as any other aspect of the activity.

There are three public hunting areas on Kohala Mountain, Units B (16,460 acres), D (4,770 acres) and K (10,530 acres). All units allow pig hunting with dogs, but Unit D is restricted to weekends and holidays only, whereas Units B and K have daily hunting access. The maximum take each day is two animals per hunter. Access to these hunting areas is for individuals that hold a current Hawaii Hunting License.

Seasonal game bird hunting is also a popular recreational activity within the private and leased ranchlands included in the WMA. The suite of upland game species include Erkels and Grey Francolins, California Quail, Kalij and Ringneck Pheasant, Turkey and Peafowl. All of these game bird species were intentionally introduced for sport hunting.

Public access to Kohala Mountain is limited. Users generally gain access from one of five locations: Waipi'o Valley-Muliwai, the Pololū Valley overlook, upslope from the east edge of the Koaia Tree Sanctuary above Kohala Mountain Road, and from the road above the Waimea reservoirs in the Pu'u Ki area. The first two of these trails are State-managed Na Ala Hele trails and provide unrestricted public access. Four-wheel drive access through leased pasture lands leads to an access gate into the natural area reserve above the Koaia Tree Sanctuary.

At Pu‘u Ki, near the Waimea reservoirs, lessee permission and a hunting license or permission from DLNR is required for forest reserve access. Private land owners may permit other forest users to access mauka lands through their property on an individual basis. (See Figure 7).

Many local residents access the watershed in order to collect materials used in practicing *hula*, or used in leis, such as maile (*Alyxia oliviformis*) and ferns. Some likely supplement their diet with fruits and other foods gathered from within the watershed.

Other users of Kohala Mountain include campers, naturalists and birders, adventure hikers, and helicopter-supported sight-seeing groups. Much of the mountainous interior remains inaccessible except to the experienced user who is prepared to stay overnight. Some ecotourism[7] occurs within the WMA. There are commercially-operating tours in select locations, which provide tourists with access to remote sites of natural beauty. Ecotourism can provide an avenue for education, as well as a potential source of income for private and public landowners.

Kohala Mountain provides a tremendous opportunity to educate adults and children alike about the unique ecosystems and biodiversity of Hawai‘i. The WMA offers numerous potential sites for scientific research and for field trips to reinforce classroom curricula. However, access into the WMA for educational purposes must be conducted in a manner to maximize public safety and minimize potential human impacts.

[7] Ecotourism has been defined as nature-based travel to natural areas to experience and study unique flora, fauna, and culture in a manner that is ecologically responsible, and sustains the well-being of the local community.

IV. THREATS TO THE KOHALA WATERSHED

> ***C.S. Judd, Superintendent of Forestry, 1924:***
>
> The native forest, however, is peculiarly constituted in that it is readily susceptible to damage. The shallow-rooted trees depend for proper moisture and soil conditions on the undergrowth of bushes and ferns and when the latter, the first to be attacked by stock, are injured or removed, the tree roots dry out, the trees are weakened and begin to decline, and an opening is made in the forest for the invasion of destructive insects and fungi and of the more vigorously-growing foreign grasses and other plants which choke out native growth and prevent tree reproduction. It is always dangerous for this reason to make any opening in the native forest and the only safe way to preserve it and keep it healthy and vigorous is to maintain it inviolable from all attacks and keep the ground well shaded and dark.

The historical activities of clearing for agriculture and grazing, timber and fuelwood harvesting, road construction, and mining no longer threaten to reduce or fragment Kohala's forested watershed. Today, the primary threats to the watershed of Kohala Mountain are from alien plants and animals and their effects, including some feral and domestic cattle, and other factors such as wildfire and climate change.

Invasive species pose the gravest threats to Hawai'i's environment and the lives of its residents. Alien species cause large scale ecosystem changes, damage crops, and are pests to agriculture and quality of life (Smith 1985; Ramakrishnan and Vitousek 1989; and Vitousek 1990, 1992; ARMCA 1999; Mack *et al.* 2000; ISSG 2001). In fact, the effects of alien species worldwide have become so severe that a number of national councils and international conventions have formed to assess the issues and develop strategies for action (ARMCA 1999; Genovesi 2000; NISC 2000).

A. Invasive Plant Species

Alien plant invasions and their ecological effects are most severe on oceanic islands, as evidenced by the extinction of whole groups of species, such as snails and ground nesting birds, from Hawai'i (Loope 1992; Burney *et al.* 2001). In fact, alien plant invasions into Hawai'i are considered to be worse than in any other place in the world (Taylor 1982).

The problem of alien species invasion in native habitats is a well-documented management problem in Hawai'i's natural areas (Smith 1985; DLNR 1989; HEAR 2004; Cuddihy and Stone 1990). It is estimated that over 900 alien plant species are naturalized in Hawai'i; this number grows annually (Loope 1998; Staples and Cowie 2001). It is estimated that 20 to 50 new non-native species arrive in Hawai'i every year (Loope and Canfield 2000), mostly via aircraft, ship cargo, or mail (CGAPS 2001). Dispersal and spread may be by any number of mechanisms, such as animals (fur, feathers, clothes, or feces), wind, or water (Smith 1985).

Once established, successful invaders may out-compete native plants for nutrients or water, and quickly modify a native ecosystem by changing the vegetation. Often, invaders homogenize plant communities, simplifying their physical structure and species composition.

Invasive plants interfere with ecological processes and functions, such as reducing the ecosystem's ability to capture fog and store rainfall and fog water for steady release into streams. Plant invasions also cause the loss of species that depend on often geographically-restricted habitats (Loope 1998). Many invasive plant root structures do not hold the soil well when the plants form monotypic stands, which can accelerate geologic processes like erosion. Erosion from monotypic stands of waiawi (*Psidium cattelianum*) and *Tibouchina herbacea* in conjunction with pig disturbance increases the frequency of landslides in the valley areas. This in turn accelerates geologic erosion and decreases water quality, resulting in reef sedimentation.

Alien plant species found within the WMA are profiled in Appendix A. Known invasives include broomsedge (*Andropogon virginicus*), kahili ginger (*Hedychium gardnerianum*), yellow ginger (*Hedychium flavescens*), *Melastoma candidum*, banana poka (*Passiflora tarminiana*), fountain grass (*Pennisetum setaceum*), blackberry (*Rubus argutus*), palm grass (*Setaria palmifolia*), fireweed (*Senecio madagascarensis*), *Tibouchina herbacea*, *Clidemia hirta*, and *T. urvelliana*.

Weed species are most prevalent at the interface between pasture and forest, edges of the forest reserve, along trails, and in disturbed areas. Observations of non-native plant invasions during 1989 DLNR surveys of the Pu'u O 'Umi Natural Area Reserve yielded detailed accounts of alien species distributions by community type (DLNR 1989). DLNR mapped incipient[8] populations of alien plants starting to establish within disturbed areas along ridges, trails, and in pig-rooted areas. Non-native plants appeared infrequent in uluhe-dominated areas, which provide an effective buffer between disturbed areas and intact forests deeper in the Reserve. Very few non-native plants were observed in much of the forest, and some bogs were pristine. Fireweed was not present on DLNR transects in 1996, but by 2001 was present in 40% of the transects.

B. Feral Ungulates[9]

The effects of Hawai'i's extreme isolation are illustrated well by its absence of a single native mammalian herbivore. Hoofed grazing animals, a group of mammals present on islands and continents throughout most of the world, are completely absent from Hawai'i's evolutionary history. The lack of the pressures associated with hoofed grazers, such as trampling and heavy browsing and grazing, resulted in the loss of defenses to such pressures as species evolved to adapt to new niches and new evolutionary pressures.

When the Polynesians first came to Hawai'i, they brought along the relatively small (40-50 lbs) Polynesian pig. Recent archaeological studies suggest that the early Hawaiians kept their carefully-tended pigs close to their homes, preventing them from running loose in the forest (Loope 2001). When Europeans arrived over 1,000 years later, they brought with them the domestic hog, a much larger animal than the Polynesian pig. Over the first 100+ years of occupation, the hog became well-established in the wild. A historical account by Isabella Bird also provides insight into the continued threat posed by feral ungulates to the region: "We rode over level grass-covered ground, till we reached the Hāmākua bush, fringed with dead trees, and full of 'ōhi'as and immense fern trees, some of them with a double tier of

[8] Incipient plants are present but not yet a problem.
[9] Feral refers to domesticated animals that have adapted to living in the wild. Ungulates are mammals having hoofs, such as cattle, pigs, and horses.

fronds...There are herds of wild goats, cattle, and pigs on the island, and they roam throughout this region, trampling, grubbing, and rending, grinding the bark of the old trees and eating up the young ones. This ravaging is threatening at no distant date to destroy the beauty and alter the climate of the mountainous region of Hawai'i" (Maly and Maly 2004).

Cattle

In 1793, Captain George Vancouver delivered domestic cattle (*Bos taurus*) as a gift to King Kamehameha I. A 20-year prohibition on their use (*kapu*) was issued, and they were allowed to proliferate across the landscape without harm from the Hawaiian population. During that time, they exacted heavy impacts on the native vegetation as well as cultivated crops (Cuddihy and Stone 1990; Bergin 2004).

Currently, most cattle grazing takes place on private, managed lands. However, wild cattle persist in limited forested areas on private and public property, where inadequate or absent fencing has allowed cattle to wander into the forest in search of highly palatable foods. Unmanaged cattle are recognized as being a major destructive agent in Hawaiian ecosystems and have had a significant effect on montane mesic forests (Stone 1985). On Kohala Mountain, a feral cattle population numbering in the hundreds occurs on Ponoholo Ranch, Parker Ranch and Surety Kohala Corp. lands west of Pololū Valley. For over 10 years, staff hunted and trapped feral cattle on the Parker Ranch lands, bagging over 1,500 head. The Parker Ranch Hunting Club offers tourists the opportunity to hunt "Vancouver bulls" in this area. There are also cattle populations at the back of Waipi'o Valley, and at Awini.

Pigs

The damage caused by feral pigs (*Sus scrofa*) in native rain forests was recognized in the early 1900s when the Hawai'i Territorial Board of Agriculture and Forestry began a feral pig eradication project that lasted until 1958 and removed 170,000 pigs from forests statewide (Diong 1982). In a 1930 Hawai'i Planter's record, G.A. McEldowney reported that pigs were a bigger threat to watersheds than cattle or goats because they eat seeds and seedlings of trees, upturn soil, and cause erosion. Stone (1985) attributes rising pig population densities and expanding distributions to benefits associated with human activities and mutualistic relationships with certain alien plants such as banana poka and strawberry guava and the increasing availability of animal protein from earthworms as contributing factors.

Pigs depredate native plants, facilitate the spread of alien plants through seed dispersal and creation of sites favorable for colonization, vector disease and pathogens, and facilitate erosion (McEldowney 1930; Giffin 1978; Katahira 1980; Cooray and Mueller-Dombois 1981; Diong 1982; Loope and Scowcroft 1985; Stone 1985; and Aplet *et al.* 1991).

Cory (2000) provides a good summary of the scientific literature on the effects of pigs in native Hawaiian ecosystems. Harmful ungulate activity includes:

- Destroying native habitat through trampling, eating, and rooting;
- Creating soil disturbance, accelerating degradation, erosion, landslides and sedimentation;
- Spreading the seeds of invasive species;
- Direct predation on native species such as tree ferns (*Cibotium* spp.), other succulent-stemmed plants, and invertebrate species; and
- Serving as carriers and vectors of parasites and diseases. Parasites (fleas, lice, hookworms, tapeworms, Trichinae [source of Trichinosis in humans], etc.) and diseases

(Typhus, Leptospirosis, Cryptosporidiosis and Brucellosis) transmittable to humans are described in more detail under Section E "Aquatic Pollutants."

The effects of feral ungulates on the Kohala watershed hydrology is similar to the effects of alien plants in that they reduce and change understory vegetation, thereby affecting the vegetation's ability to capture fog, and store and release fog and rain water to streams and groundwater. As a result of opening the understory canopy to light and wind, mid-canopy air becomes drier, making it intolerable for many epiphytes and mosses that are important in fog capture, rainfall storage, and water release into streams and groundwater. The open canopy causes an increased evaporative draw from soil and vegetation. In addition, pigs create exposed soil, thereby causing erosion of nutrient-rich organic matter resulting in decreased surface water quality, and more favorable sites for colonization by invasive plants.

Studies that have removed pigs from similar environments in Hawai'i generally have shown recovery of native species following removal. A number of studies evaluating the response of vegetation following exclusion of pigs found increases in cover and density of native plants. Response of individual sites varied and was related to the degree and duration of disturbance prior to initiating removal or restoration (Katahira 1980; Higashino *et al.* 1982; and Drake and Pratt 2001).

Pigs are, for the most part, considered a pest to ranchers due to the high amount of damage that they inflict including predation on domestic livestock. (Giffin 1977). Similar sentiment comes from residential subdivisions where pigs root up yards and gardens. In the rainforest, rooting results in erosion and loss of topsoil. Native plant seedlings, saplings, and adults are also consumed by feral pigs (Giffin 1977). Generally in the rainforests of Kohala, food, water, and cover are abundant year round. Hunting has been identified as the primary cause of feral pig mortality on the island. In places where hunting pressure is light, such as in large sections of the WMA, the carrying capacity of the habitat may be exceeded, resulting in serious intraspecific[10] competition. When this happens, food availability appears to be the major limiting factor (Giffin 1977).

Feral pig activity has been observed on all transects in the Pu'u O 'Umi Natural Area Reserve, but the intensity of damage varies by location and vegetation type. Pu'u O 'Umi NAR surveys prior to 1989 noted that pig damage in the 'Ōhi'a-Olapa Montane Wet Forest was generally old and light, with a few sections in which moderate, freshly-browsed vegetation and rooting was evident (DLNR 1989). Species such as the Hawaiian orchid (*Liparis hawaiensis)*, 'ōhāwai (*Clermontia* spp.), and pa'iniu (*Astelia menziesiana*) were often present only as epiphytes, suggesting that pigs have already removed these species from the ground cover.

C. Other Non-Native Animals

Fifty-three (or more) birds, 33 reptiles and amphibians, and 19 mammals are naturalized[11] in Hawai'i. Smaller animals also have the potential to become serious pests in the Kohala watershed. Rats, in particular, may have a significant effect on native vegetation and bird species. Black rats (*Rattus rattus*) and Polynesian rats (*Rattus exulans*) are the dominant

[10] Intraspecific competition is competition between animals of the same species.
[11] Naturalized species are non-native species that have sustained reproductive populations in the wild.

species throughout most of Hawai‘i’s forests. They consume the seeds, fruits, and flowers of numerous native plant species, including many rare ones (Atkinson 1977; Stone 1985). Rats are known to eat the fruits of native Pritchardia (loulu palms) and Clermontia, and strip the bark of some native plants (Cuddihy and Stone 1990; USFWS 2000). They are the biggest contributor to the demise of sandalwood today. Rats also prey on native bird eggs and nestlings. Like ungulates, rats can affect water quality by serving as vectors for water-borne diseases such as Leptospirosis and Cryptosporidiosis. There are no estimates of the rat population in Kohala; however, it likely rises and falls in response to forage availability and other factors.

Other non-native animals that may pose problems in the watershed include mongoose, feral cats, dogs, mice, and birds. Non-native forest birds have been observed in all vegetation types. Species present included Hwamei (*Garrulax canorus*), Japanese White-eye (*Zosterops japonicus*), and Northern Cardinal (*Cardinalis cardinalis*). These species compete with native forest birds for food and other resources, provide vectors for avian diseases, and are vectors for the spread of alien plants such as Clidemia, kahili ginger and strawberry guava.

Over 3,300 alien arthropods are estimated to be naturalized in Hawai‘i; this number grows by 20-40 per year. Alien arthropod species have been introduced intentionally and unintentionally over the past few centuries for a variety of reasons. Impacts of alien invertebrates include direct consumption of rare plants, interference with plant reproduction, predation and parasitism of native animals, transmission of disease, alterations to soil formation processes, and hybridization with native forms (Howarth 1985). Many alien invertebrates occur within the WMA, but little is known about their specific populations and distribution. The Pu‘u O ‘Umi NAR Management Plan reports that the portions of the Reserve closest to the pasture lands of Waimea have high numbers of non-native millipedes and isopods foraging in leaf litter and in living foliage (DLNR 1989). Other non-native species include flies, predatory flatworms (*Geoplana* sp.), and the introduced omnivorous snail (*Oxychilus alliarius*). Both the *Geoplana* and the *Oxychilus* represent a threat to native land snails.

Numerous alien aquatic species that exhibit the characteristics of being invasive[12] threaten to cause ecological and economic harm to Kohala’s freshwater streams and their users. Exotic fish, mollusks, and crustaceans likely compete with the native stream fauna of Kohala Mountain. The loss of these native stream fauna would have cascading effects, degrading the entire native stream ecosystem. Invasive aquatic species could also cause economic impacts to agricultural users of water, resulting from crop damage, infrastructure damage, or contamination. But, perhaps more noticeably, such changes could threaten the historical Hawaiian practice of eating ‘*o‘opu* and *‘o‘pae kala‘ole* from mountain streams.

Introductions of aquaculture and aquarium species into streams occur via flooding, effluents discharged back into the streams, intentional introduction, and by overland travel. The Tahitian Prawn is suspected in the decline of native *‘opa‘e kala‘ole* and *‘o‘opu* populations

[12] According to Staples and Cowie (2001),both terrestrial and aquatic invasive species worldwide possess the following general characteristics:

- adaptable to, and able to thrive in, different habitats and a wide range of conditions;
- rapid growth rate of individuals, thereby able to displace other plants or animals;
- easily dispersible to new localities; and
- have reproductive characteristics that allow for rapid population growth.

observed by Hāmākua farmers (Okamura 1995). Invasive fish used in aquaculture, such as the Saltwater Tilapia (*Sarotherodon melanotheron*) and Chinese Catfish (*Carius fuscus*), prey on native fish, crustaceans, and arthropods, thereby altering the structure of the stream ecosystem. In addition, disease and pathogens associated with cage-reared species could potentially spread through streams and ditches. Fish used in the aquarium industry, such as the Mexican Minnow (*Poecilia mexicana*), Convict Cichilid (*Cichlastoma nigrofaciatum*), and the Swordtail (*Xiphophorus helleri*) directly compete with native stream fauna for food and other resources (Nishimoto 2004; USFWS 2003).

Invasive alien fish, mollusks, crustaceans, and arthropods already exist within streams and ditches in the WMA. This plan seeks to comply with the goals of the Hawai'i Aquatic Invasive Species Management Plan to minimize harmful ecologic and economic impacts of invasive aquatic species, through the prevention and management of their introduction, expansion, and dispersal into, within, and from the Kohala WMA.

D. Human Activities

Most human activities in the watershed are done with good intentions. Hikers access the watershed for its natural beauty, unique plant and bird species, and sweeping views; in the process, they gain a greater appreciation for the natural environment of Kohala Mountain. Hunters provide a benefit to the natural environment by helping to manage pig populations. State and private land managers build fences to protect forested areas and unique plant and animal species from disturbance of ungulates and people. However, these seemingly benign practices can also have a negative impact on the watershed if not conducted in a responsible manner. Humans can damage vegetation directly through trampling and over-collection, and indirectly by introducing weed seeds or by providing the ignition source for fire. Fence-lines constructed without care to prevent introductions and spread of alien species, or unmaintained fences, become avenues for the spread of weeds.

Native plant collection occurs within the WMA, mostly seasonally, subsistence or on a small scale. *Maile* is the primary plant collected. The prevalence of plant collection is unknown and data mostly anecdotal.

Illicit cultivation of marijuana (*Cannabis sativa*) also occurs in the Kohala Mountain watershed. Growers provide a mechanism through which soil bacteria, fungi, and other alien plant pathogens can enter new areas and establish within the remote sections of the watershed. *Cannabis* cultivation is likely to also contribute to the introduction and spread of weeds within the watershed. In addition, marijuana growers sometimes confront recreational users of the watershed and are a threat to hiker safety. Interestingly, the Kohala Mountain watershed was used in a similar manner for illicit distilleries brewing okolehao in the late 1800s and posed many of the same concerns for user safety of these areas.

E. Aquatic Pollutants

Very little information exists about specific aquatic pollutants originating in the Kohala Mountain watershed. Anecdotal information and the fact that these water sources have been used for domestic and agricultural water supplies for centuries suggest that the water of Kohala Mountain is generally of the highest quality. That being said, the Department of

Health's most recent list of impaired waters in Hawai'i includes Wailoa/Waipi'o Stream, Niulili Stream, Waikama Stream, and Aamakao Stream, all of which have their headwaters in the Kohala Mountain WMA. These streams exceed State water quality standards for turbidity and/or nutrients during the dry season.

Sediments

Most water quality problems in the upper watershed do not have anthropogenic origins; rather, they are related to soil erosion, which is a natural process in forested areas, that can be amplified by animal, and to a lesser extent human, disturbances that open up greater areas of the forest floor to increased rates of erosion. These pollutants occur as siltation, suspended solids, turbidity, nutrients, and pathogens.

The sediments eroding from forestlands into streams contribute to a high rate of suspended solids, which are comprised of eroded silts and clays, organic detritus and plankton. High levels of suspended sediment produce a "muddy" appearance in stream waters. These muddy waters affect more than just aesthetics. Suspended sediments can:

- stress native fish like *o'opu*, and hinder their ability to find food;
- damage the gills of some fish species, causing them to suffocate;
- increase water turbidity, which limits light penetration and impairs photosynthesis for aquatic plants;
- raise water temperatures; or
- lower dissolved oxygen concentrations, which at decreased levels can kill aquatic vegetation, fish, and bottom dwellers.

Once these sediments finally settle on the bottom of streambeds, irrigation ditches, and reservoirs, they produce other detrimental impacts. High sedimentation levels can:

- affect levels of nutrients, solids and oxygen-demanding materials;
- eliminate essential habitat and bury food sources and spawning sites for stream life;
- smother bottom-dwelling organisms *'opa'e* and periphyton[13]; and
- reduce the capacity of stream channels and ditches to carry water and of reservoirs to hold water.

Toxins and Bacteria

Swimming in the streams could result in Leptospirosis and Cryptosporidiosis, potentially fatal illnesses caused by water-borne micro-organisms spread by pigs, dogs, mongooses, rats, and even frogs. A few people become ill each year from wading in ponds or drinking water from affected springs and streams. The Department of Health does not currently conduct any regular monitoring of stream pathogens in the WMA.

Leptospirosis is a bacterium, transmitted from animals to humans where people contact the bacteria through water or mud that has been contaminated by animal urine or droppings. About 500 cases, including 7 deaths, have been reported in Hawai'i in the past decade. According to DOH statistics, the windward side of the Island of Hawai'i historically reports the largest number of cases. Waipi'o Valley is considered a hot spot, where people most often are exposed.

[13] Periphyton are the algae attached to bottom vegetation and rock surfaces.

Cryptosporidiosis is a diarrheal illness caused by a microscopic intestinal parasite, Cryptosporidium. People are typically exposed by eating food or drinking water contaminated with feces of infected animals, including cattle, rodents, cats, dogs, and humans.

F. Wildfire

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 (Cuddihy and Stone 1990). On the leeward side of Kohala Mountain the forested watershed abuts pasturelands, with kikuyu grass (*Pennisetum clandestinum*) as the dominant grass species. A wildfire started in grasslands bisected by major roadways could quickly spread into the forest reserve.

Fires cause the removal of vegetation cover, loss of the soil-anchor feature of root masses, and exposure of bare mineral soil. This combination makes burned areas susceptible to high levels of erosion. Fire suppression is difficult in the forested watershed of Kohala Mountain because of its relative inaccessibility to vehicular traffic, so helicopters would likely be used in the event of a fire.

Fire risk, or the potential for fire, is contingent on frequency of human activity and climatic conditions. The wildland-urban area interface and camping sites are important factors as ignition sources. Climatic conditions are often related to seasonal rainfall, where dry summer months and brisk winds can lead to high-risk fire conditions (USFWS 1998). Wildfire hazard, describing the fire intensity, depends upon topography and fuel source.

G. Climate Change

Global and local climate change have the potential to affect the Kohala watershed hydrology through altering rainfall patterns and elevating cloud banks. Changing climate would affect the abundance and seasonality of precipitation, thereby affecting agricultural water users over a broad geographic area. Watershed functions would be compromised from the drying of the air, vegetation and soil, resulting from an elevation of the cloud bank.

Rare ecosystems and species may be affected by relatively rapid changes in precipitation, temperature, and humidity that result from a rapid and drastic change in regional or local climate patterns. At the Monteverde cloud forest in Costa Rica, researchers found declines in cloud forest epiphytes and amphibians to be correlated with a rise in the overhead cloud bank. Costa Rica also displays evidence that regional land-use change can have a significant influence on formation of cloud banks. The deforested Caribbean lowlands downslope of Monteverde remained relatively cloud-free in the dry season, while adjacent forested regions had well-developed cumulus cloud fields (Bubb 2004).

Climate change would also impact the local culture and lifestyle. Populations of culturally-used plants, such as maile (*Alyxia oliviformis*), may decline. Even the modern paniolo lifestyle that is characteristic of the region would be affected by a decline in rangeland quality resulting from a drying climate. Recreational opportunities might also be adversely affected.

V. MANAGEMENT PROGRAM

As early as the 1800s, land tenure documents, survey records, and government communications outline efforts made by ranching and plantation interests as well as the Crown and government lands and native Hawaiians to work together to insure the health and quality of the watershed in light of increased development and human population growth. Historical records reveal the changes to the land and its water source as a result: "Many of the old springs are now dry," "the woods have for years been continually receding from the coast and lands once well wooded are completely bare," "water stands in small pools instead of running in continuous streams," "The forests of the Kohala mountains are dying…the complaint of the people is well founded. The water they use is fouled in many places by cattle, horses and other animals, and as the stream is sluggish it has no chance to free itself of impurities," "The recession of the forest in the Kohala district is one of the most marked examples of the change in natural conditions that is to be found anywhere in the Territory. If the edge of the forest is permitted to be pushed further back it is my belief that the consequences to the lower lands will be serious" (Maly and Maly 2004).

Today, the Kohala Watershed Partnership (KWP) carries on the history of landowners and affected communities working together with its primary GOAL to maintain a healthy watershed as a reliable source of high quality water for North Hawai'i. To achieve this primary GOAL, this chapter identifies OBJECTIVES related to the protection of water resources and watershed functions and the management of threats to these resources. Because the watershed of Kohala Mountain supports unique plant and animal communities that have value to society, this chapter also includes GOALS and OBJECTIVES related to the protection of biodiversity. Recognizing that a management program cannot be effectively implemented without sufficient infrastructure and personnel, recommendations addressing the administration of the program are incorporated. Finally, the chapter addresses compatible public use of the watershed.

Outlined in this chapter are OBJECTIVES and recommended ACTIONS to implement the primary GOAL and another six major goals over a 20 year period. Under each management GOAL, there will be one or more OBJECTIVES, each followed by a brief description of current management activities. Each objective will identify specific management ACTIONS to achieve the OBJECTIVE. GOALS and OBJECTIVES are long-range and not subject to significant change. However, specific ACTIONS may need to be further refined through the management process, as new information is obtained and circumstances evolve.

The management program outlined here was developed in a series of planning meetings held by the Kohala Watershed Partnership, drawing from previous information and planning efforts, and with input from landowners, resource managers, and community members. Management OBJECTIVES and specific ACTIONS build upon recommendations developed by the Natural Area Working Group (NAWG), Kona/Kohala Natural Resource Area Workshop (K/K), Kohala Forest Management Group (KFMG), and the Waimea Water Roundtable (WWR). Summaries of statements and recommendations from past efforts are included in Appendix C. Recommended ACTIONS that were incorporated into this Plan from earlier efforts include, in brackets, the acronym of the earlier effort and a number which refers to the item number in Appendix C.

The proposed management program in this Plan also draws upon the information gathered through interviews of knowledgeable individuals. However, the Kohala watershed partners

acknowledge the importance of gathering additional community input before the management program is finalized. To accomplish this, public workshops will be conducted in the communities most closely affecting, and affected by, management actions contemplated in the Kohala watershed. Comments received from the public will be incorporated into a revised watershed management plan and an Environmental Assessment (EA). These documents will then be available for further review and comment during a 30-day public comment period. Following this public comment period, the management plan and EA will be finalized and submitted to the Board of Land and Natural Resources with the Conservation District Use Application (CDUA) for proposed actions within the Conservation District.

Costs for implementing recommended actions can vary considerably depending on when an action is implemented, who does the work (volunteer vs. employee vs. contractor), and other factors. It was the opinion of the KWP that costs need not be identified in this plan, knowing that when specific projects are budgeted for implementation, cost details will be provided.

The primary goal of the Kohala Watershed Partnership is to show improvements in water and environmental quality by enabling comprehensive and sustainable watershed management projects that address the threats to the watershed, while maintaining its integrity and protecting its economic, sociocultural, and ecological resources.

Management Goal 1: Protect Water Resources.

Resource experts over the last century have recognized the importance of the forested watershed in promoting infiltration and groundwater recharge, with the overstory and understory both performing important watershed functions. More recently, scientists have proven that fog drip represents a significant amount of precipitation captured (Juvik and Ekern 1978; Juvik and Nullet 1995), most notably in the fog belt on the windward sides of tropical montane cloud forests, such as that found on Kohala Mountain. The structurally-complex[14] Hawaiian forest plays a vital role in intercepting cloud water. The fog belt on windward Kohala Mountain extends from the 3,000-ft. elevation to enclose the summit area.

***Objective 1a**: Maintain a structurally-complex vegetative cover that promotes infiltration and groundwater recharge and minimizes erosion.*

Recommended Actions
Manage threats as recommended below to minimize disturbances to robust forested watershed.

***Objective 1b**: Protect, enhance, and manage high yield watershed areas to maintain water quantity and quality.*

Several statutes and regulations exists to protect surface water quality and quantity: Chapter 342D, HRS, related to state water quality standards; Chapter 174C, HRS, Hawai'i Water Code; and Chapter 13-105, HAR, related to restricted watersheds. Each is implemented by a different agency of the State government. The Safe Drinking Water Branch of the Department

[14] Structurally-complex vegetation is that which is multi-canopied or has many strata or layers, such as a cloud forest environment that possesses moss, lichen, and epiphyte layers covering rocks, soil, and stems; and additional layers of ferns, sedges, shrubs, low–stature trees, and overstory trees. Strucurally-complex forests usually have a high total leaf surface area.

of Health protects Hawai'i's drinking water sources (surface water and groundwater) from contamination through the administration of the Safe Drinking Water Program, Underground Injection Control Program (UIC), Groundwater Protection Program (GWPP), and the Drinking Water State Revolving Fund (DWSRF).

While a portion of Kohala Mountain was designated under Chapter 13-105, HAR, as the Kohala Restricted Watershed in order to protect public water supplies that are vulnerable to contamination by public access, most people interviewed as part of the management plan development process agreed that access restrictions are rarely enforced and do little to afford real protection to surface water quality.

The windward area between the backs of Honokāne and Kawainui valleys *mauka* to the summit ridge arguably generate the greatest combined water yield of Kohala Mountain. The area captures more than 100-150 inches of rain on average every year, intercepts significant amounts of fog drip, and contains the headwaters of the major streams feeding domestic and agricultural supplies. This is the area of cloud forest formation, a phenomenon known to contribute as much as one third or more the amount of rainfall to total precipitation. Based on the distributions of the cloud forest on Kohala Mountain and the area of maximum rainfall, which occurs slightly *makai* of the area of cloud persistence, we believe these areas comprise the significant portion of the watershed in which groundwater infiltration is occurring. For these reasons, management of approximately 6,600 acres (delineated in Figure 8) is a priority to protect forest areas that are important for maintaining high yield watersheds. This area coincides with the areas proposed for fencing in the KFMG's Action Plan Outline of Projects, for which there was broad agreement (Figure 8; Appendix C - KFMG (13)).

Three upland units spanning the area from the back of Honokāne Nui east to Pu'u O 'Umi and the rim of Kawainui Valley include: Big Valley (A: 900 acres), which contains the headwaters of Honokāne stream; Upper Kawainui (B: 1,600 acres), which protects the headwaters of more streams and, therefore, a greater yield of water. Both of Units A and B are mainly comprised of sections of the Pu'u O 'Umi Natural Area Reserve. The Upper Ohiahuea (Unit C) contains the headwaters of Ohiahuea stream. The majority of this 2,100 acre unit is comprised of the Kohala Forest Reserve with the additional acreage including a tiny portion of the Pu'u O 'Umi NAR . A fourth unit, Upper Laupāhoehoe Nui (Unit D), captures prime watershed between 3,500 and 4,000 feet on the windward slope and is in relatively good condition. This unit includes approximately 2000 acres and is comprised of the upper third of the privately-owned Laupāhoehoe Nui ahupua'a along with a section of the NAR.

Recommended Actions
Fence high yield watershed areas A: Big Valley (approx 900 acres) [KFMG(13); K/K (20)]; B: Upper Kawainui (approx 1,600 acres); C: Upper Ohiahuea (2,100 acres); and D: Upper Laupahoehoe Nui (2000 Ac).
Remove feral pigs within high yield watershed area A, B C, and D, using most appropriate combinations of methods, as dictated by terrain, management access, and other management considerations.
Prevent the introduction of potentially harmful new weeds and manage existing weeds within high yield watershed area A, B, C and D.
Review Kohala Restricted Watershed designation for its effectiveness in protecting water quality and quantity and recommend changes, as appropriate.

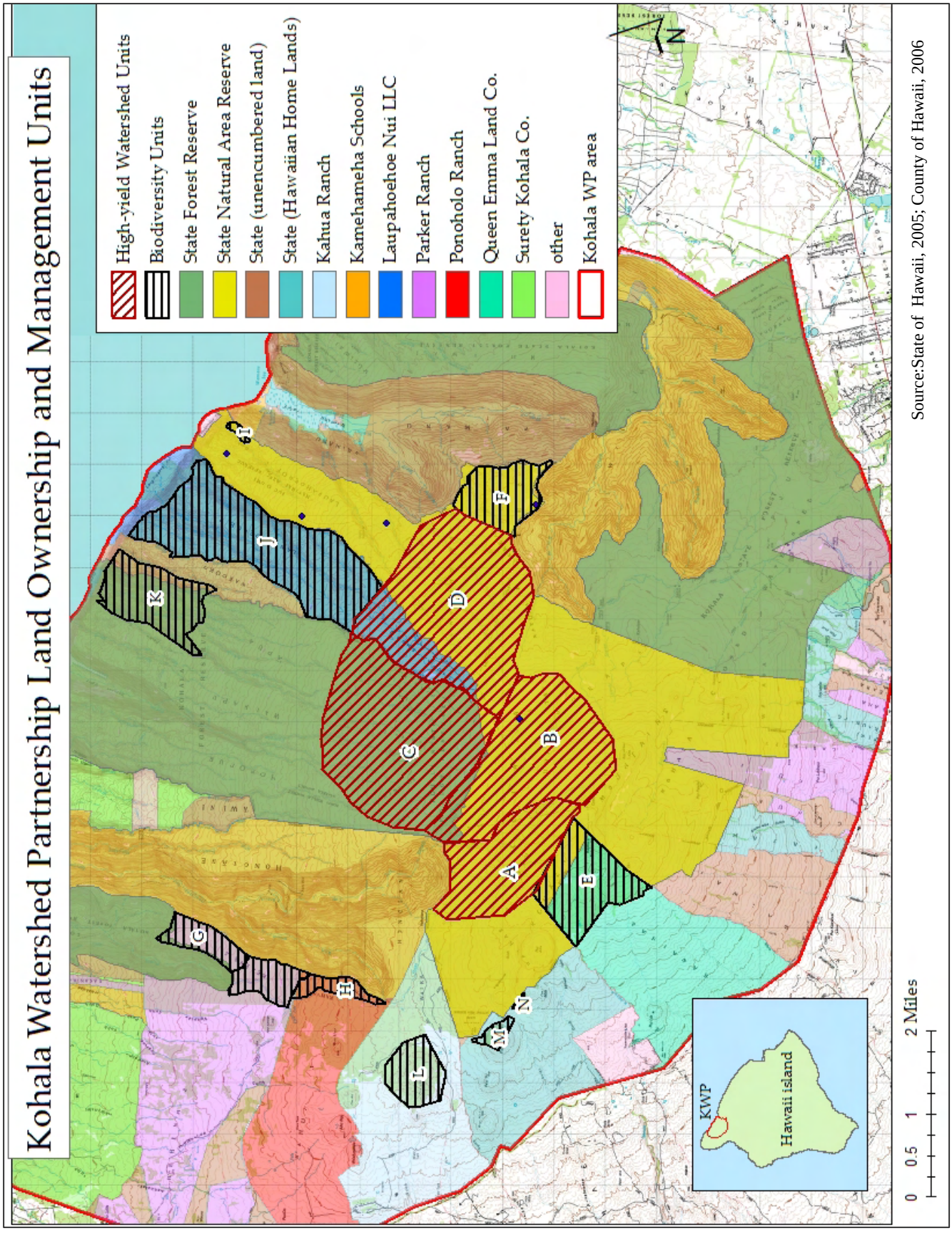

Figure 8. Land Ownership within the Kohala Mountain Watershed Management Area

***Objective 1c**: Monitor the quality and integrity of ground water, surface waters, and aquatic environments.*

Surface and ground water quality on Kohala Mountain are generally regarded as high. The State DOH has monitored stream water quality in the more accessible streams on the western and eastern sides of the WMA. However, little regular groundwater and surface water monitoring has been undertaken within the majority of the WMA; therefore, baseline information is needed for long-term monitoring.

In addition, little information exists pertaining to the current biological condition of Kohala's streams; however, the streams are generally considered to be intact. Stream assessment protocols that utilize biological criteria are needed to obtain information critical to management. Management actions should also be developed and implemented in coordination with DLNR's Division of Aquatic Resources and consistent with the Hawai'i Draft Aquatic Invasive Species Management Plan (2003).

From the mid-1800s, the large agricultural operators around Kohala Mountain kept detailed records of water and weather data (WWR no date). These records included information on rainfall, temperature, evaporation, soil moisture content, stream flow and more. As Hawai'i's economic base has shifted away from agriculture, less of this information has been collected on a regular basis. This deficiency of new data renders it difficult to make informed decisions about watershed health, water allocation, and sustainable yields. Furthermore, additional information is needed about the resources within the watershed and appropriate management techniques in order to make educated management decisions.

Recommended Actions
Develop programs to monitor long-term impacts to water quality and watershed health, in cooperation with other watershed partnerships.
Develop a monitoring program to measure sedimentation, stream flow, turbidity and nutrients on a subwatershed or valley level, in collaboration with Federal and State agencies. [WWR(3)]
Establish network of satellite-transmittable telemetric meteorological monitoring stations in cooperation with the University of Hawai'i at Hilo. [WWR(5)]
Assess the biological integrity of streams in upper Kohala Mountain, as necessary.

***Objective 1d**: Develop a thorough understanding of the nature of groundwater resources affected by Kohala Mountain.*

USGS has estimated the average annual recharge in the Hawi Hydrologic Study Area. Similar studies have not yet been completed for the other two Kohala Mountain hydrologic units, Waimanu and Māhu-kona. However, an assessment of groundwater conditions was conducted for the districts of North and South Kona and South Kohala from 1991 to 2002. This State Commission on Water Resource Management study provided baseline data to support and inform planning decisions related to development and well-drilling for that region.

Developing estimates of groundwater resources, rates of recharge, and sustainable yield can be a daunting task. However, further developing this understanding is necessary in order to

develop and manage groundwater resources responsibly, as demands for these resources continue to increase.

Recommended Actions
Conduct study of groundwater recharge dynamics for Waimanu and Māhu-kona hydrologic units, in coordination with USGS.
Undertake research to improve understanding of both the surface and sub-surface hydrology of Kohala Mountain, especially the connection between Kohala Mountain water and groundwater of the Waimea Plains. [WWR(3)]

***Objective 1e**: Support appropriate water development to meet the needs of future demand.*

Kohala Mountain provides the lifeline for North and South Kohala and parts of Hāmākua with respect to water. Existing domestic water systems throughout the region are approaching capacity, given rapid urban development and increasingly-stringent water treatment requirements. Agricultural water systems are taxed during periods of drought, and by decaying infrastructure, and changing demands. There is an increasingly urgent need to convert domestic consumption to groundwater sources and leave existing surface water sources for agriculture.

Recommended Actions
Participate in the Waimea Water Roundtable to work toward common solutions to water issues affecting Waimea and its environs.
Implement plans to increase use of groundwater for domestic water supplies (DWS).
Support planned improvements to the Waimea Irrigation System to improve water conveyance efficiency, add storage capacity, and expand service to provide livestock drinking water.
Support enhancement and maintenance of stock water storage and dispersal systems.
Support continued use of existing ditches for agricultural and other purposes, as long as they are being used in a reasonable manner with no wastage.
Study the interest in and feasibility of restoring the ditch system with minimal adverse impact to ecological services.

Management Goal 2: Prevent New Introductions and Control Existing Invasive Plant Species.

The Mack *et al.* (2000) literature review panel found that successful invasive species control depends more on commitment and continuing diligence than on the efficacy of specific tools themselves. They also found that control of biotic invasions is most effective when it employs a long-term, ecosystem-wide strategy rather than a tactical approach focused on battling individual invaders (Mack *et al.* 2000).

Once present in the watershed, each species usually has to be managed individually, sometimes using a variety of techniques. The management approach should consider the species' distribution, mode of spread, and other factors. The manager has a wide range of techniques and tools available that could be applied. The how, where, and why of how those

techniques are applied are decisions that depend on the individual circumstance. The Nature Conservancy's Wildland Invasive Species Program "Weed Control Methods Handbook" (2002) provides a thorough overview of weed control techniques and provides other information in support of their application, and Hiebert and Stubbendieck's "Handbook for Ranking Exotic Plants for Management and Control" (1993) helps provide a decision-analysis process for prioritizing alien species for control.

There are some invasive plant species (*e.g.*, fire weed (*Senecio madagascarensis*) and palmgrass (*Setaria* sp.) that are impractical to control at a landscape scale at this time due to their broad dispersal mechanisms (*e.g.*, wind, birds) and limitations in management funding and access. These species may simply have to be tolerated for the time being, or longer, unless an effective biocontrol can be found.

Available methods and techniques include: mechanical, grazing, prescribed fire, chemical, and biological. Mechanical control methods include manual pulling, digging, snipping, cutting, girdling, grinding, and others. Mechanical control can be labor-intensive and expensive. However, volunteers can be effectively utilized for well-defined projects. Methods such as cut-stump, frill, and notch-cut follow treatment immediately with a spot application of herbicide. Some mechanical techniques can cause damage or ground disturbance, stimulating growth of weedy species; eradicating an entire stand of one alien species can open the canopy to allow replacement by another opportunistic alien species. The practical way to avoid such mass disturbance-triggered reinvasion is to remove and replace slowly, in gaps, filling the gaps created by removal with species of choice. This method requires follow-up maintenance.

Cattle and sheep have been used effectively to reduce wildfire grass fuels in pastures and other grasslands on the island. Cattle have been effectively used at Puʻu Waʻawaʻa Ranch to reduce wildfire fine fuels through intensive roadside grazing. Cattle are also currently being utilized in Kohala Ranch, on the lower southwest slopes of Kohala Mountain below the WMA, to keep wildfire fuels reduced around homes in the subdivision. Sheep have been used to reduce wildfire fuels in a perimeter fuelbreak for Waikii Ranch. Use of grazing animals may also be an effective method of managing growth of invasive woody plants now or in the future. Grazing animals would be used only on pastures and other grasslands, not in the forest.

Prescribed fire could be used to remove or reduce stands of alien species or to reduce roadside stands of wildfire fuels. It is unlikely that prescribed fire will be used in the watershed for any purpose, but, should it need to be used, burn planning will be done cooperatively following established procedures and using best management practices.

Chemical control methods are often an important tool in invasive plant management, especially where mechanical control methods are not feasible, where biological control techniques are not available, and when cost and time constraints dictate. When used responsibly and with caution, herbicides can be an effective tool to quickly kill a plant, keeping it from entering its next reproductive cycle; in many instances, the dead plant tissues form a mulch ground cover. Another benefit of herbicide use is the relative ease with which it can be applied compared to more intensive mechanical methods. Non-restricted herbicides are carefully used by resource managers throughout the state as part of alien plant management programs (Tunison 1992; Tu *et al.* 2001).

Precautions should be taken to avoid impact to native species; generalist herbicides should be used sparingly in areas with a high occurrence of endangered species or sensitive and rare ecotypes. The application methods and equipment that minimize the risk to adjacent plants are preferred. Pesticide usage will be in full compliance with state and federal regulations. Additional techniques for alien plant control, such as aerial spraying of herbicides, may be considered for use in the future as these techniques are developed.

Biological control is another tool used effectively by managers worldwide in controlling alien plant and animal species. Biological control uses predators and disease organisms of invasive pests from their native ranges to damage targeted weeds. Australia is currently using biological controls to target over 60 weeds for control (Briese 2004). However, some land managers in Hawai'i are reluctant to use biocontrol agents due to their unpredictability and irreversibility, and a long list of failures in Hawai'i (Howarth and Medeiros 1989). The process of finding a biological agent can be difficult and expensive, with uncertain results as well.

But, according to the Coordinating Group on Alien Pest Species (CGAPS)[15], biological control needs to be a key component of any effective long-term control program, because it provides the only cost-effective method for reducing the negative impacts of priority invasive species that are already well-established in Hawai'i. The technique has had several amazing successes throughout the world and in Hawai'i, including effective control of the following species that once were more widespread in the Kohala Mountains: painiu or prickly pear cactus (*Opuntia* sp.), pamakani (*Ageratina riparia)*, banana poka (*Passiflora tarminiana*), and lantana (*Lantana camara*).

For banana poka, the *Septoria pasiflorae* Leaf Spot fungus has proven successful. A one-time application of the fungal agent sprayed onto leaf and stem tissue spreads without assistance during winter months and periods of high rainfall affecting photosynthesis and other physiological processes. Inoculations of *Septoria* at different forest sites in Hawai'i, Kauai, and Maui resulted in estimated 80 to 95% biomass reductions over more than 2,000 hectares of native forest by 1999 (Trujillo *et al.* 2001). In October 2000, DLNR personnel observed *Septoria* in the Pu'u O 'Umi NAR behind Kahuā Ranch and near Pu'u Mala. It is believed that this occurrence originated from wind-borne spores blown in from Hāmākua or Hualālai where it had been previously introduced. It has not yet been confirmed that the Big Valley introduction of *Septoria* has successfully established. No *Septoria* was found on a June 26, 2001, site visit and no follow-up observations have been made since then (DLNR 2004b).

Pseudomonis bacteria is also present on banana poka in Big Valley and the Pu'u Mala area of Kahuā Ranch. It also causes some defoliation, although not as much as *Septoria*. Banana poka is also easily rooted out by hand.

A biocontrol pathogen has been discovered for *Clidemia hirta* as well. The *Colletotrichum* fungus was identified in Panama in 1984 and brought to Hawai'i and tested in 1985. The pathogen causes severe premature defoliation and tip dieback (Trujillo *et al.* 1986). This fungal biocontrol has been used along the Aiea Loop Trail on O'ahu with success. DLNR's Division of Forestry and Wildlife started introducing the *Colletotrichum* fungus into the WMA in

[15] The Coordinating Group on Alien Pest Species is a multi-agency partnership to coordinate more effective protection for Hawai'i's economy, environment, health, and way of life from harmful alien pests.

the winter of 2004-2005. It was applied monthly during winter months by DOFAW along the Muliwai trail and other locations on the island (DLNR 2004b).

Kahili ginger (*Hedychium gardnerianum*) is an extremely aggressive invader of forest understories and affects large areas in Hawai'i. USGS research has demonstrated that the wilt-causing bacterium *Ralstonia solanacearum* attacks and is highly specific to ginger (USGS-PIERC 2004). This pathogen lives in the soil and gets into the plant either through wounds or root absorption. Once inside the host, the pathogen will cause severe wilting of ginger stems and eventually kill the entire plant. Individual rhizomes will rot and decay within 6–8 weeks of infection, with entire mounds taking anywhere from 1 to 2 years to completely decay away, depending on size. Field trials have been underway on the Island of Hawai'i for 5 years and appear to demonstrate good long-term control (Landcare Research 2004). Biocontrol for fireweed (*Senecio madagascarensis*) and palm grass (*Setaria* sp.) should be initiated immediately.

***Objective 2a**: Prevent the introduction of new potentially-invasive plant species.*

Many potentially-invasive plant species are not yet established in the WMA, but could become so without preventative action. Prevention requires a rigorous education and outreach program to inform land users and the public about weed dispersal and ways to mitigate unintentional introductions.

Recommended Actions
Coordinate with affected industries and interests in the ranching, farming, and horticulture industries to develop mechanisms to create a quarantine barrier to new weed introductions without unduly restricting the long-term productivity of the primary industries operating within or around the WMA. Establish operational protocols to prevent new introductions of invasive plant species.
Identify potential future invaders, likely mechanisms and pathways of introduction, and locations of vulnerability.
Develop an education and outreach program that concentrates prevention awareness campaigns toward the source of likely invasive species, in their place of origin. [NAWG(43)]
Inform watershed users prior to their arrival, upon their arrival, and again upon their departure, about the effects of introduced species and their modes of introduction and spread, and what steps can be taken to prevent introduction and spread of invasive plant species in the watershed.
Support interagency programs to evaluate modes of transmission and develop interdiction programs at ports of entry to the island.

***Objective 2b**: Manage the spread of incipient and well-established weed pests.*

Many invasive plant species are well established within the WMA, and management, other than biocontrol, may not be practical for these. Others have only gained a foothold and may be eradicable with a moderate amount of effort. Interdiction and interception, education and awareness, and conscientious cultural and agricultural practices are required to effectively manage them.

Over the past 10 to 20 years there has been a large body of information printed related to alien species ecology and management. Review of a selection of national and international-level planning documents outlining strategies or directing programs found approaches to be similar in their emphases of the following three steps: 1) prevention; 2) detection, evaluation and response; and 3) building organizational frameworks for long-term management programs (NISC 2000; Genovesi 2000; ARMCANZ 1999; Mack *et al.* 2000).

Many invasive plant species are well-established and cannot effectively be managed or removed given practical constraints of available funding. Many of these species may have to be tolerated for the time being or indefinitely. If there are locations that are not yet occupied by a particular species that may be worthy of keeping free of that one or more invasive species, it may be worthwhile to designate such locations early. Many invasive species distributions are restricted to certain portions of the watershed. For some of these, it may be feasible to first assess and start eliminating satellite populations before working on core populations, a technique used with success locally and abroad (DLNR 2004; Moody and Mack 1998). Control and eradication, however, is achievable for many other species.

Recommended Actions
Regularly assess distribution of problem weed species and maintain current distribution maps.
Prioritize areas for management for each problem species.
Develop and implement an integrated pest management approach that utilizes the appropriate technique or combinations of techniques for each problem weed species.
Manage the spread of problem weeds in watershed management units A-N.
Assess the feasibility of eradicating *Tibouchina urvelliana* population from the Honopue Valley east slope.
Start monitoring program for banana poka and Clidemia.
Develop a biocontrol maintenance program for banana poka and Clidemia.
Conduct a monitoring program in conjunction with management projects to document short- and long-term changes in watershed quality. Revise management strategy, as appropriate, based on monitoring results.
Work with the landscape industry and Hawai‘i Department of Agriculture to address the introduction of new invasive weed species.

***Objective 2c**: Conduct monitoring and research to determine efficacy of control measures and to identify occurrences and distribution of other new species.*

Monitoring is an important component of any management program. Monitoring on Kohala Mountain is challenging due to the inaccessible nature of most of the watershed. A monitoring approach that builds upon the best features of the existing monitoring program will need to be developed. Alternative monitoring programs and methodologies will have to be evaluated and considered. Meanwhile, it will be useful to continue to conduct basic monitoring while developing an improved approach. DLNR collected monitoring data of weed presence along 24 transects within the Pu‘u O ‘Umi Natural Area Reserve in 1996 and 2001.

Recommended Actions
Evaluate current monitoring program to identify strengths and weaknesses, and

assess alternative monitoring methodologies. Streamline overall monitoring program to increase efficiency while obtaining reliable information.
Continue to monitor the patterns of distribution of incipient and well-established weed species and effectiveness of management actions using previously-established transects and other means.
Extend monitoring program to cover the entire watershed management area.
Conduct research on additional control methods for priority species.
Explore alternative techniques for large-scale monitoring, including ground and aerial photography and remote sensing.
Initiate biocontrol research for fireweed and palm grass, and lobby Big Island Invasive Species Council for funding and support.

Management Goal 3: Control Non-Native Animal Populations within Designated Areas. There are a number of techniques available to manage and remove non-native animals, including public hunting, staff hunting, contract hunting, aerial shooting, snaring, trapping, and poisoning. Techniques vary widely in their cost, effectiveness, and length of time taken to complete. A most striking comparison of methods and costs was made between Hawai‘i Volcanoes National Park (HAVO), where hunting, trapping, snaring and fencing was used to control pigs, and Namadgi National Park (NNP) in New Zealand, where pigs were poisoned. Both strategies reduced pigs, but methods at HAVO cost 34 times more ($1,180/km^2) (Hone and Stone 1989). At Hakalau Forest National Wildlife Refuge in Hāmākua, managers found the same array of techniques that HAVO used to be effective, but they were costly and took time. Hakalau's Feral Ungulate Management Plan provides a thorough analysis of methods for reducing feral pig populations (Walker 1996).

In Hawai‘i, use of poisons for eradicating mammalian pests has been restricted to locally depressing rat populations through use of diphacinone rodenticide bait blocks for periods of time. Recent experiments with aerial broadcast rodenticide bait pellets in Kilauea Forest resulted in unexpected indirect effects on non-target animals, an event that will lead to further research on its use prior to approval of aerial broadcast as an allowable method in Hawai‘i. Poisons have not been used for cattle, pigs, or goats.

Reeser and Harry's (2004) review of Hawaiian examples of where ungulate populations are successfully kept at low or zero population levels over large area highlighted four requirements: 1) a strategy of barriers to isolate populations, 2) take of significantly greater percentages from populations than can be replenished by reproduction and ingress from adjoining areas, 3) barrier inspection and maintenance, and 4) vigilance in monitoring and removal of animal population increase and ingress.

Most of the feral pig and cattle management alternatives will entail the use of fencing. Fences are unmatched in utility when it comes to managing wild animals across natural landscapes. Fences are typically used to exclude pigs by completely surrounding the management area, but are sometimes also used strategically in small pieces to block movements across narrow passes and ridges.

A small proportion of the hunters who use the public lands on Kohala Mountain are generally opposed to fencing and removal of pigs for natural resource management purposes. Recent vandalism of a 10-acre rare plant protection fence in the leeward forest illustrates this point.

However, most of the local residents interviewed early in the management plan development process indicated that they would support fencing some areas in order to steward important watershed and unique native forest values.

Animals will be removed from watershed (Management Goal 1) and biodiversity (Management Goal 4) management units as they become fenced, at the discretion of the partnership. Techniques used to remove animals will depend upon accessibility, cost, and other factors. The primary tools available include hunting (public, staff, contract), aerial shooting, snaring, and live trapping.

***Objective 3a**: Remove feral cattle from the watershed management area.*

There has been limited and unsustained control of the feral cattle in the WMA. These feral cattle are found primarily in the forested areas of Ponoholo Ranch, Parker Ranch and Surety Kohala Corp., west of Pololū Valley. These landowners have expressed support for an eradication effort. There are also cattle populations at the back of Waipiʻo Valley, at Awini and in the Puʻukapu section of the WMA. A monitoring program conducted in conjunction with the eradication program will document the recovery of these forested areas.

Recommended Actions
Construct new or replace/repair existing forest reserve boundary fence west of Honokāne Valley and at Puʻukapu.
Improve and regularly maintain boundary fences to prevent future ingress by cattle.
Eliminate feral cattle from the watershed area using available techniques.
Conduct a monitoring program in conjunction with control efforts to document short- and long-term changes in the forest cover and quality resulting from cattle removal.

***Objective 3b**: Implement pig control to minimize loss of watershed vegetation cover, watershed soil erosion, and human health risks associated with animal-borne diseases.*

DLNR monitored pig presence along 24 transects within the Puʻu O ʻUmi Natural Area Reserve in 1996 and 2001. Feral pigs have been removed from two exclosures within the WMA: the 100-Ac bog unit between Waimanu and Kawainui valleys and a 10-Ac unit protecting rare and endangered plants on the leeward side.

Hunting by the public can be well-utilized as a first phase of control in areas that are easily accessible. However, it is generally limited in its effectiveness because it is hard to apply enough hunting pressure to an area to reduce the animals within the timeframe needed to achieve management goals (Molokai Hunting Test Working Group 1998). For these reasons, if public hunting is going to be used to reduce animals in a watershed or biodiversity management unit, it would be best used as the first phase in an approach that follows with more intensive methods. In addition, modeling techniques in animal control efforts will need to be used to ensure that population numbers are being reduced at desired levels.

Staff hunting and contract hunting are time consuming, expensive, and increasingly difficult to complete, as has been demonstrated at Hawaiʻi Volcanoes National Park, in the ʻŌlaʻa-Kīlauea Partnership Forest, and at Hakalau Forest National Wildlife Refuge (Hone and Stone 1989; Katahira *et al.* 1993; Anderson and Stone 1993). Aerial shooting has been used effectively in dryer areas where there is visibility to the forest floor. Snaring is a proven, effective tool for controlling pigs in Hawaiian forests. It is the most effective legal method for rapid and

complete removal of all animals from an area (Anderson *et al.* 1993). Snaring is particularly effective in remote, difficult-to-access, and steep terrain. There is general opposition from hunting and animal rights groups and individuals to the use of snares, based upon the suffering that improperly-set snares can cause.

Live trapping is another technique proven successful on the island. At the Honomalino Preserve in South Kona District of Hawai‘i Island, The Nature Conservancy has removed 99% of the pigs from their primary management unit, and 60% of pigs from the adjacent secondary unit. A benefit of trapping is that animals and meat can be easily salvaged; however, it is labor intensive and its application limited to areas within reasonable vehicular access.

According to Reeser and Harry (2004), current control strategies for pigs include:

- Fence management unit (4’ hogwire with no gaps up to 2,000 acres);
- If not remote, public/volunteer shooters to make initial population reduction;
- Professional shooters with dogs kill most remaining population;
- Baiting with papaya helps concentrate pigs for shooting and/or snaring;
- Professional technicians set snares to eliminate remaining populations;
- Snares are used to take any strays and to monitor for new entries; and
- Keep fences mended.

Fencing at Hakalau Forest National Wildlife Refuge began in 1988. Managers now have enclosed 14,150 acres in 8 units, using almost 44 miles of fencing at an average of more than $28,000 per mile. Since the feral ungulate management program began, more than 1,100 pigs and 260 wild cattle have been removed. Hakalau’s mountainous terrain, with steep gullies and rifts, is similar to that of Kohala Mountain.

Evaluations of the use of public hunting as a means to control feral pig and cattle populations in Hawai‘i show that public hunting is generally ineffective due to the loss of interest associated with increasing hunt difficulty (Hone and Stone 1989; Katahira *et al.* 1993). Staff hunting (with dogs for pig hunting) is more effective due to the diligence of the effort; however, it becomes increasingly difficult and expensive to remove the last few animals and complete the task. Snaring was first used to control feral pigs in Hawai‘i on Maui in 1993. The method has been found to be cost-effective and thorough when used in combination with fencing.

Recommended Actions
Remove pigs from high yield watershed areas A-D.
Remove pigs from biodiversity conservation units E-N (see Objective 4a).
Conduct a monitoring program in conjunction with ungulate control efforts to document short- and long-term changes in the forest cover and quality resulting from pig removal. Revise management strategy, as appropriate, based on monitoring results.
Seek partnerships with organized hunting groups and community volunteer hunters to utilize their skills for pig control, as needed. [KFMG(5 & 14); NAWG(10)]
Expand pig monitoring transects throughout remaining portion of watershed management area.
Develop and use modeling techniques in animal control efforts to ensure reduction of pig populations at desired rates and levels.

***Objective 3c**: Slow the rate of introduction and manage established alien aquatic species.*

Alien aquatic species impact agriculture, disrupt native stream community structure, and permanently change the make-up of the stream fauna that is so intricately interwoven into Hawaiian legend and practice. The current ecological condition of Kohala's streams needs to be assessed and documented. This baseline condition will serve as a measure for future management and monitoring. An ecological monitoring program that uses biological and physical criteria to characterize various biotic and environmental features will be developed (Englund and Arakaki 2004; Englund *et al.* 2003; Kido and Smith 1997).

In order to prevent the loss of native stream biota, it will be necessary to work cooperatively with aquaculturists, the aquarium industry, and the greater Kohala Mountain community to minimize the potential for introduction of potentially invasive aquatic species. Topics that could be addressed cooperatively include: wild release, live sale, distribution of stocks, species that travel overland, and effects to taro agriculture.

The Aquatic Invasive Species Management Plan for the State of Hawai'i (Shluker 2003) identifies seven objectives related to minimizing the harmful ecological and economic effects of Aquatic Invasive Species (AIS). Actions include: 1) Increase coordination and collaboration; 2) Minimize introductions; 3) Establish systems for rapid response, eradication, control, and restoration; and 4) Increase education and outreach.

Recommended Actions
Conduct a collaborative planning effort with affected stakeholders to identify biological stream and ditch issues and propose solutions.
Implement measures needed to minimize future introductions to and dispersals within or from the WMA.
Evaluate stream bioassessment and monitoring approaches and develop one for long-term use within the WMA to assess conditions of streams and presence of invasive species.
Conduct baseline surveys and inventories of perennial streams within the WMA to assess conditions of streams and presence of invasive species.
Develop distribution map for invasive alien aquatic species.
Conduct outreach with North Kohala, Waimea, and Waipi'o schools and communities.
Revise management goals based upon baseline assessment and monitoring.

***Objective 3d:** Reduce the impacts of rats and other small mammals and promote control of other non-native animals as appropriate.*

Rats are widespread throughout the WMA. In 2003, rodenticide was broadcast over a large area near Volcano to experiment with the use of a large-scale management technique for rat control. However, there were unanticipated effects to non-target species (Tummons 2004); as a result, this method cannot be used at this time.

Coqui frogs are now present in parts of North Hawai'i. Feral rabbits have been spotted periodically in Waipi'o and elsewhere in the WMA. Other non-native species, such as snakes, known to be very invasive and ecologically as well as economically disruptive, threaten to

arrive to Kohala's slopes at any time. Managers need to be prepared to respond with swift action to unpredicted establishment of new alien species.

Recommended Actions
Use appropriate control methods in targeted areas where they threaten native plant and animal species. Ensure that control methods are consistent with goals of water quality protection.
Depress rodent populations near rare tree snail and plant populations, particularly during sensitive life cycle stages for species known or suspected of being adversely affected by rodents.
Conduct a monitoring program in conjunction with rodent control to document mortality and management success.
Develop a prevention and interdiction strategy for incipient species that reduces opportunities for introduction of potentially invasive or disruptive species and prepares managers to swiftly react to new introductions.

Management Goal 4: Protect Unique Biological Communities and Rare Species.
Conservation of remaining hotspots of biodiversity (locations that harbor clusters of rare species and unique biological communities), such as in the Kohala Mountains, is important to conserve Hawai'i's biological heritage. Kohala Mountain's unique biological resources are also important at the regional and global scales as the extent of natural environments and overall number of species decrease. Therefore, an important component of this plan is to conserve and protect rare species and the habitats that support them, and other unique ecological communities (refer to Section II.C Biological Resources for more information about unique and rare species and ecosystems that occur within the WMA). Additionally, it is important to note that natural and cultural resources are considered one and the same. Preserving the biological integrity of the area will also preserve its cultural resources.

Currently, DLNR has 4 fenced ungulate exclosures (Figure 9) within the WMA totaling 140 acres: one protects a rare bog ecosystem (Waimanu Bog Unit: Unit O); the second an intact leeward plant community (Kilohana Stream Unit: Unit Q); and the Waikapu Unit (Unit P) near Kaukini cabin protecting 9 acres of mid elevation uluhe forest. Unit R, the Waiakamali Gulch/Koaia Sanctuary will be expanded to include an additional 300 acres for restoration of riparian habitat. Individuals or small populations of rare plants have also been fenced for protection. Queen Emma Land Company has also hired a contractor to create restoration research exclosures with native species in leeward stream corridors on its land in the WMA. Other fencing projects for protection of unique biological communities and populations of rare species are proposed on both private and public lands. Cattle fences are also maintained by a number of private landowners along the border of the forest.

The following management actions will protect a total of approximately 3,910 acres, within the watershed management area. Biological communities to be protected are mapped in Figure 8. Appendix D provides detailed descriptions of each biodiversity conservation unit and the specific resources to be protected.

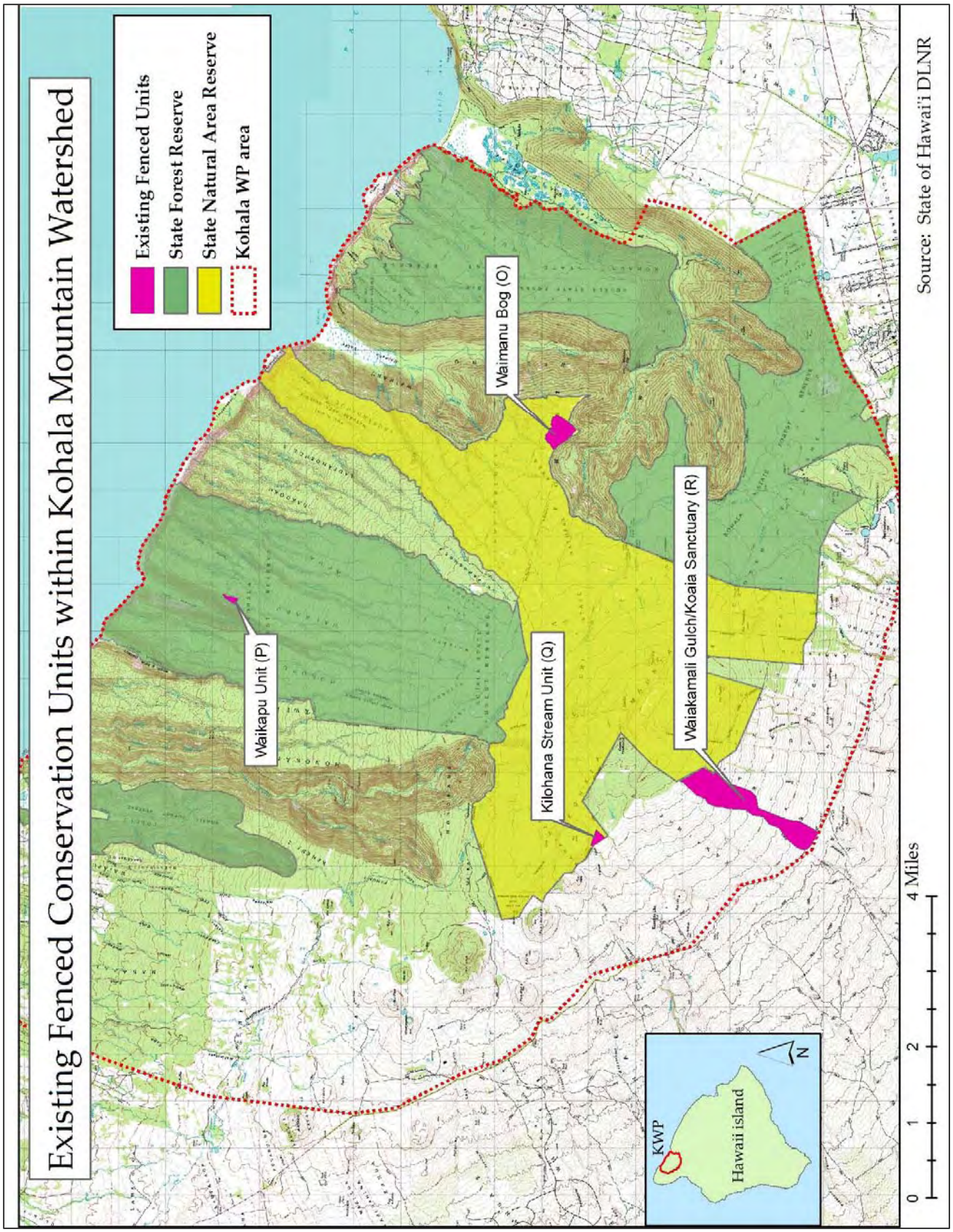

Figure 9. Existing Fenced Conservation Units in the Kohala Mountain Management Area

***Objective 4a**: Protect unique plant and animal communities within the WMA.*

Recommended Actions
In coordination with the State, Queen Emma Land Company (QEL), and its lessees, evaluate the feasibility of fencing approximately 640 acres of biodiversity conservation unit E: Eke to protect unique ecological communities, culturally-significant natural features, and leeward stream headwaters.
Use fencing to create strategic barriers around biodiversity conservation unit F: Waimanu Bog Plateau (430 acres).
In coordination with the State and Parker Ranch, evaluate the feasibility of fencing biodiversity conservation unit G: Kaneaʻa (500 acres).
In cooperation with Ponoholo Ranch, fence biodiversity conservation unit H: Ponoholo Pupukaniʻoe (160 acres to protect unique plant and animal species, including the rare Partulina tree snail). Monitor effects of ungulate removal and habitat management on snail populations and habitat.
Fence biodiversity unit I: Kaimu (20 acres) and other small ecological communities, such as important bird and snail habitats, and single rare, threatened or endangered plant populations using small fence units ("spot fencing") and other management techniques, as appropriate. [K/K (10)]
Fence biodiversity conservation unit J: Lower Laupahoehoe Nui (1,530 acres).
Fence biodiversity conservation unit K: Lower Ohiahuea (565 acres) protecting lowland wet forest in the Kohala Forest Reserve.
In cooperation with Kahuā Ranch, upgrade fence and remove pigs in biodiversity unit L: Puʻu Pili (290 acres).
In cooperation with DHHL and Kahuā Ranch, fence biodiversity unit M and N: Puʻu Lapalapa and Puʻu Mala (65 acres).
Fence and restore priority stream corridors in leeward Kohala as appropriate and as agreed to by landowner and/or leesee.
Control weeds within fenced ungulate exclosures (see Objective 2b).
Collect seeds of native rare species within fenced units and store for future use or propagate following guidelines established by the Hawaiʻi Rare Plant Recovery Group (HRPRG).
Outplant propagules of rare species into fenced units as appropriate.
Support KWP partners conducting conservation activities on their own lands.
Continue to conduct rare plant surveys to document location and health of rare plant populations. [NAWG(2)]
Initiate restoration and outplanting activities in Unit R and other appropriate areas within the WMA.

***Objective 4b**: Control priority invasive aquatic species in windward streams within the WMA.*

Kohala streams also support a unique and diverse fauna. Dozens of freshwater streams entering the ocean along the windward coastline support a relatively intact and diverse native stream fauna for Hawaiʻi. There are many small streams that drain from the Kohala summit, most of which harbor native aquatic insects, fishes, crustaceans, and mollusks. Currently, there is inadequate data pertaining to the ecological condition of Kohala's streams, but the

general opinion among biologists is that they are relatively intact compared to those of Hāmākua and other islands.

However, numerous alien aquatic species that exhibit the characteristics of being invasive threaten to cause ecological and economic harm to Kohala's freshwater streams and their users. Exotic fish, mollusks, and crustaceans threaten the stream fauna of Kohala Mountain. The loss of these native stream fauna would have cascading effects, degrading the entire native stream ecosystem, and causing economic impacts to agricultural users of water.

Recommended Actions
Comply with goals of the Hawai'i Aquatic Invasive Species Management Plan to minimize harmful ecologic and economic impacts of invasive aquatic species through the prevention and management of their introduction, expansion, and dispersal into, within, and from the Kohala WMA.
Establish a baseline condition and a monitoring program that uses biological and physical criteria to characterize various biotic and environmental features.

Management Goal 5: Prevent and Minimize Wildfire.

***Objective 5a**: Protect the watershed management area from the threat of wildfire.*

Because Hawai'i's flora are generally not fire-adapted and the forested watershed of Kohala Mountain is relatively inaccessible, fire prevention is the preferred wildfire management alternative for the WMA. Because the wildland-urban interface is the area most prone to fire starts, particularly along roadways, managing the fine fuels in the grasslands of leeward Kohala will be essential to minimizing the risk of fire spreading into the forested watershed.

Recommended Actions
Assess the fire history and fuel load distribution within the WMA.
Develop fuels mitigation measures along ignition corridors that border the WMA.
Create signage informing users that use of pyrotechnic devices and unattended campfires are prohibited within the WMA.
Develop a coordinated response plan to guide response in the event of a fire.

Management Goal 6: Manage Access for Compatible Public Use.

People have been accessing the forested watershed of Kohala Mountain since the time of the ancient Hawaiians to gather building materials and fuel, sources of cordage, adornment for display of rank, water, birds, herbs and medicines, and craft materials. Some of these uses still exist today. Other uses, such as hunting for ungulates and various forms of recreation, originated relatively more recently. It is the intent of this plan to support and encourage forms of public use in areas where it is compatible with conservation of water and related watershed values.

Forms of public use allowed within DLNR lands vary dependent upon land use designation. To access Forest Reserves, a license or permit is required from DLNR for camping, special use, collecting, commercial harvest, and access (HAR 13-104). Public access into the Restricted Watershed is prohibited except by permit for official duties, research and scientific

pursuits, public hunting and fishing as allowed under Chapters 13-122 and 13-123, HAR, recreational and educational purposes, and collection of plants for personal use (HAR 13-105). Within the NAR, hiking, nature study, and bedroll camping without a tent or other temporary structure are allowed. Hunting is a allowed activity pursuant to hunting rules. Within DLNR's Koaia Plant Sanctuary, hiking and walking, nature appreciation and scientific studies, photography, and hunting as authorized by law are allowed.

***Objective 6a**:* Support continued public hunting on DLNR-managed lands, where compatible with the conservation of water and related watershed values.

There are approximately 32,000 acres of public lands within the WMA in which hunting is currently allowed. Hunting is allowed in the entire NAR, all sections of the Kohala Forest Reserve, and in the Kohala Restricted Watershed. However, the majority of this area is difficult to access due to its remoteness. Hunting is not allowed on lands of the Department of Hawaiian Home Lands (DHHL). Most hunting occurs on the leeward side of Kohala Mountain, but local groups of hunters also access via the Na Ala Hele Muliwai trail from Waipiʻo Valley and via the Pololū Valley trail. Figure 8 shows trails from which hunters access the forest reserve.

Currently, there is no accurate estimate of hunting catch per unit effort (pigs caught per hunting trip) because of inconsistent reporting among hunters. In order to better manage public use and ungulate populations in the WMA, improved documentation of pig harvest will be required. In addition, modeling techniques should be used to better assess the effects of hunting and other management activities on the pig population.

A recommended project that emerged from the meetings of the Kohala Forest Management Group (KFMG) was the establishment of a Game Management Area (GMA) on Kohala Mountain, specifically in the Muliwai area between Waipiʻo and Waimanu valleys. Interviews during the management plan development process also discovered strong interest from a few members of the hunting community in the establishment of perpetual hunting areas within the watershed. Other people interviewed suggested the Puʻukapu area of the forest reserve as a possible GMA site. At this time, no State GMAs on Kohala Mountain have been established by DLNR's Division of Forestry and Wildlife. Establishment of GMAs on Kohala Mountain would provide dedicated areas where community members could access the forest for hunting, and also provide a setting for scientific research related to developing big game management techniques and programs. However, because hunting is currently allowed within all Forest Reserve, NAR and Restricted Watershed lands within the WMA, and DLNR-DOFAW land managers believe that forest and watershed resources within the Forest Reserve and NAR can be best protected under existing rules, there are no plans to dedicate areas as GMAs or designate areas for game production. Furthermore, formal rules establishing GMAs have not been established by DLNR.

Recommended Actions
Maintain existing hunting access points at Muliwai Trail in Waipiʻo Valley, at Pololū Valley, and from near Waiakamali Gulch above Hwy 250.
Develop new access for public hunting on public lands. Consult with hunters who frequently use the watershed to determine suitable and appropriate locations for establishment of additional new public hunting access points.
Develop and implement a program to increase awareness among newer and long-

time Kohala pig hunters regarding the benefits of reporting harvest catch to DLNR. (Reporting hunter effort and harvest helps document the degree of hunting, which helps legitimize the practice as a popular public use.)

***Objective 6b**:* Establish and maintain suitable hiking access trails where the activity is compatible with conservation of water and related watershed values.

At this time, there are only two public trails within the WMA - the Muliwai trail and the trail into Pololū Valley. A third moderately popular public access, although not a maintained trail, is from the top of a 4WD access route east of Waiakamali Gulch. One other trail, accessed from the end of White Road, is also commonly used to access the watershed; however, it is not a legal access trail. A recommendation arising from the Kohala KFMG was the resolution of issues surrounding the White Road access.

Much of Kohala Mountain is not suitable for hiking because of access and safety issues. In addition, hikers can unwittingly cause environmental damage that affects sensitive ecosystems and degrades watershed functional processes. However, carefully sited hiking trails and controlled access can provide visitors and residents with an experience of a lifetime, in which they gain a greater appreciation for the natural environment of Kohala Mountain. In this way, access enhances public awareness and nurtures an environmental ethic.

Recommended Actions
Maintain existing trails at Pololū and Muliwai and enhance signage to indicate that users are entering the Kohala WMA and request that they take precautions to insure that they are not inadvertently introducing potentially-harmful alien species.
Work with appropriate agencies to resolve access and parking issues at the White Road - Upper Hāmākua Ditch trail in order to legitimize use of this popular trailhead. [KFMG (10)]
Establish a boardwalk and interpretive signage in the bog ecosystem near Alakahi stream for controlled use for educational and scientific purposes.
Develop use classifications for the WMA or revise DLNR's proposed areas for differing intensities of recreational use to reflect management goals.
Monitor trail usage and impacts to assess effects over time.

***Objective 6c**:* Permit public access to and over private property only with explicit permission of private property owner or representative.

Public access to and over private lands requires explicit permission from the property owner or lessee. Hunting with permission of landowners also occurs over portions of the nearly 36,000 acres of privately owned or leased property within the WMA. Private land owners also regulate public access across their private lands to public lands beyond. Access over Surety Kohala Corp. land to public lands containing Kapaloa Falls is permitted from the Kohala Ditch trail provided users obtain permission and sign a waiver at the Surety Kohala Corp. office in Hawi prior to setting out. Other landowners regulate public use in a similar manner - with signed permits and waivers.

Chapter 520, HRS, "Landowners' Liability", encourages landowners to make their land and water areas available to the public for recreational purposes by limiting their liability toward

users (Appendix B). However, there remains considerable reservation from private landowners regarding the public use of their lands.

Recommended Actions
Work with appropriate agencies, landowners, and lessees to resolve liability issues for access over private property.

***Objective 6d**:* Ensure that cultural practices, and archaeological and other cultural sites within the WMA are identified, protected, and enhanced.

The State DLNR currently has a contract with a cultural specialist to document native traditions, customs, and practices associated with the Kohala-Hāmākua mountain lands, and a historical overview of the land and activities of people in the region from the early 1900s through the present day. However, not all areas of the WMA have been surveyed for cultural and historic resources.

Recommended Actions
Survey, document, and protect culturally significant areas within the WMA, in collaboration with cultural resource specialists.
Develop a policy statement on how the KWP will respond to requests for access for traditional and cultural practices.
Ensure the long-term availability and sustainability of resources for traditional resource gatherers, working with *kūpuna* and others.
Collect and disseminate information on legends and place names of Kohala Mountain.

***Objective 6e**:* Generate community awareness and support of watershed values and management activities on Kohala Mountain.

Educating the public about the Kohala Mountain watershed, its values, threats to these values, and management activities is vital to the KWP's primary goal of watershed protection. Conservation education and watershed awareness will help reduce unwanted human impacts on the landscape. Greater awareness about the Kohala Mountain watershed should also translate into greater support for management efforts, in the form of a greater community voice for conservation measures, less vandalism of infrastructure, and increased volunteerism.

Enhancing public access into the watershed for hiking, as described under Objective 6b, in conjunction with the development of interpretive materials such as trail guides will serve to both improve the visitor experience and augment environmental and cultural awareness. People who have had a memorable experience in a natural environment often become keen advocates for that environment.

Successful education efforts often target schools and children, with the belief that teaching younger generations not only plants the future seeds of effective conservation but also extends this knowledge to their parents. The Hawai'i Island YMCA received a grant in 2001 for a Kohala Forest Outreach and Education Program. This program conducted community and school surveys about environmental concerns and educational needs related to the Kohala forest, sponsored the first ever "Water Festival" in Kohala, staffed displays and educational

exhibits at community events, and developed environmental educational materials for the local schools. Funding for the Kohala Forest Outreach and Education Program lapsed at the end of 2002.

Public education and outreach are also helpful in recruiting a cadre of volunteers to assist in certain management activities, especially in labor intensive efforts such as fence construction, weed control, and trail maintenance. Volunteers tend to be extremely enthusiastic, but often require an organized volunteer program to help keep motivation levels high.

Recommended Actions
Develop and organize ongoing public outreach programs in coordination with local community and educational organizations. [NAWG (40); KFMG (12)]
Develop public education programs to help manage the negative effects of human activities on the watershed and inspire people about the unique resources of the watershed.
Develop or secure quality teaching materials that could be used in local schools to educate children about the resources and values of Kohala Mountain for use in conjunction with field trips to sites in the watershed. [KFMG(12)]
Develop interpretive signage along trails, identifying natural and cultural features, and providing general information about the unique environments of Kohala Mountain.
Develop pocket trail guides for residents and visitors that provide access and safety information, as well general information about the watershed resources of Kohala Mountain.
Develop a volunteer program for the Kohala Mountain watershed, in coordination with DLNR. [NAWG(37)]
Develop a KWP liability waiver for volunteer and stewardship programs in the WMA.
Educate elected officials and other decision-makers about the resources, values, and management issues of Kohala Mountain in order to ensure broad base of support for proposed activities.

Management Goal 7: Provide Effective Administrative Coordination and Infrastructure.
Implementation of the management plan is a long-term commitment that requires sufficient personnel and financial resources to not only manage the natural resources but develop and maintain the physical infrastructure. The Kohala Watershed partners will join together to seek funds and potential new partners for the projects recommended in this plan. Cooperation and effective communication among partners and other land users and managers will be critical to the success of this management effort.

***Objective 7a**:* Provide and maintain the appropriate infrastructure and administration to allow for effective watershed management.

Recommended Actions
Hire a watershed coordinator to: i) coordinate the implementation of the plan; ii) raise needed funding from a variety of sources; iii) assist partners in implementation projects; and iv) hire staff and obtain equipment, transportation and communication systems as needed.

Complete the process for an Environmental Assessment for the Kohala Watershed Management Plan.
Coordinate use of manpower, equipment, and communication systems throughout the watershed.
Maintain management infrastructure in the WMA.
Maintain communication among partners to facilitate information sharing. Develop clear and effective processes for intra-partnership communication.
Seek participation of other landowners in or adjacent to the WMA and of other entities that are stakeholders in the watershed.
Identify future infrastructure needs to facilitate management activities.
Revise and update watershed management plan as management needs change, management techniques evolve, and new data become available.

VI. MANAGEMENT PROGRAM INDICATORS

The following is a list of indicators that may be used to gauge the success of the various management actions. The best types of indicators are direct measurements that show the impact of the management program on the resources of the watershed.

Management Goal 1: Protect Water Resources.
- Percent forest cover by forest type
- Incidence of disease or pest infestation
- Miles of fencing, or number of fencing projects to protect high-yield watershed
- Basal stream flow of perennial streams
- Level of deep monitor wells, ground-water recharge rates and aquifer sustainable yields
- Levels of nutrients, dissolved oxygen, suspended sediment, turbidity, siltation or temperature change
- Level of rainfall gauging and fog drip
- Area and percent of forest land with significant soil erosion

Management Goal 2: Prevent New Introductions and Effectively Control Existing Invasive Plant Species.
- Percentage cover of invasive weeds vs. native forest cover
- Temporal change of invasive species distribution
- Number of weed control projects completed

Management Goal 3: Control Non-Native Animal Populations within Designated Areas.
- Ungulate sign in plots or along transects (scat, soil disturbance, browse evidence)
- Miles of fencing, or number of fencing projects
- Rate of rodent trapping success
- Level of forest disease incidence
- Level and distribution of invasive aquatic species in WMA streams

Management Goal 4: Protect Biodiversity and Rare Species.
- Viable populations of endangered/threatened species
- Number of restoration projects/outplantings
- Miles of fencing, or number of fencing projects
- Percent of riparian areas along streams
- Presence of biological indicator stream fauna

Management Goal 5: Prevent and Minimize Wildfire.
- Number and extent of fires in the area
- Amount of fine fuels removed

Management Goal 6: Manage Access for Compatible Public Use.
- Hunting catch per effort (pigs caught per hunting trip)
- Percentage of WMA accessible to controlled hunting programs
- Number of hikers or people involved in outdoor recreation
- Condition of selected high traffic trails and access routes (maintenance levels)
- Impact of humans on soil compaction, vegetation disturbance, or new trail cutting
- Number of surveys/consultations conducted for cultural sites
- Protect and enhance traditional and customary practices

- Number of school groups taking field trips into WMA
- Number of trail guides available/distributed
- Number of volunteers or volunteer hours used in management activities
- Hours spent in direct contact with communities

Management Goal 7: Provide Administrative Coordination and Infrastructure.

- Number of cooperative on-the-ground projects, and number of partners involved
- Dollars expended for watershed protection projects
- Funding dollars acquired
- Partner attendance to meetings
- Number of seminars, workshops or other events to facilitate information-sharing
- Partnership membership rate

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APPENDICES

Appendix A
PARTIAL LIST OF ANIMALS AND VASCULAR PLANTS 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*	māku‘e	I	
Lomariopsidaceae	*Elaphoglossum wawrae*	laukahi	E	
Grammitidaceae	*Grammitis hookeri*	māku‘e lau li‘i	I	
Grammitidaceae	*Grammitis tenella*	kolokolo	E	
Lycopodiaceae	*Huperzia phyllantha*	wāwae‘iole	I	
Grammitidaceae	*Lellingeria saffordii*	kihe	E	
Polypodiaceae	*Lepisorus thunbergianus*	pākahakaha	I	
Lycopodiaceae	*Lycopodiella cernua*	wāwae‘iole	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 li‘i	E	
Lindsaeaceae	*Sphenomeris chinensis*	palaʻā	I	
Gleicheniaceae	*Sticherus owhyhensis*	uluhe	E	
Hymenophyllaceae	*Vandenboschia davallioides*	palai hihi	E	
Magnoliophyta (angiosperms) Liliopsida (monocots)				
Poaceae	*Agrostis avenacea*	heʻupueo	I	
Poaceae	*Andropogon virginicus*	broomsedge	N	
Orchidaceae	*Anoectochilus sandvicensis*	jewel orchid	E	SOC, VU
Poaceae	*Anthoxanthum odoratum*	sweet vernalgrass	N	
Liliaceae	*Astelia menziesiana*	paʻiniu, 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*	ʻieʻie	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*	ʻohe	E	
Joinvilleaceae	*Joinvillea ascendens* subsp. *ascendens*	ʻohe	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*	kiliʻoʻopu	N	
Orchidaceae	*Liparis hawaiensis*	ʻawapuhiakanaloa	E	SOC
Juncaceae	*Luzula hawaiiensis* var. *hawaiiensis*	wood rush	E	
Cyperaceae	*Machaerina angustifolia*	ʻuki	I	
Cyperaceae	*Machaerina mariscoides* subsp. *meyenii*	ʻahaniu	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*	koai‘a	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*	‘āhinahina	E	
Asteraceae	*Bidens hawaiensis*	ko‘oko‘olau	E	
Asteraceae	*Bidens hillebrandiana* subsp. *hillebrandiana*	ko‘oko‘olau	E	SOC
Rubiaceae	*Bobea elatior*	‘ahakea lau nui	E	
Rubiaceae	*Bobea timonioides*	‘ahakea	E	SOC, EN
Urticaceae	*Boehmeria grandis*	‘ākōlea	E	
Hydrangeaceae	*Broussaisia arguta*	kanawao	E	
Cannabaceae	*Cannabis sativa*	marijuana, paka lōlō	N	
Fabaceae	*Canavalia hawaiiensis*	‘āwikiwiki	E	
Brassicaceae	*Cardamine flexuosa*	bittercress	N	
Casuarinaceae	*Casuarina equisetifolia*	common ironwood	N	
Apiaceae	*Centella asiatica*	Asiatic pennywort	N	
Caryophyllaceae	*Cerastium fontanum*	common mouse-ear chickweed	N	
Euphorbiaceae	*Chamaesyce multiformis*	‘akoko	E	
Amaranthaceae	*Charpentiera obovata*	pāpala	E	
Araliaceae	*Cheirodendron trigynum*	‘ōlapa	E	
Asteraceae	*Cirsium vulgare*	bull thistle	N	
Campanulaceae	*Clermontia calophylla*	‘ōhā wai	E	SOC, EN
Campanulaceae	*Clermontia drepanomorpha*	‘ōhā wai	E	END, EN
Campanulaceae	*Clermontia kohalae*	‘ōhā wai	E	
Campanulaceae	*Clermontia parviflora*	‘ōhā wai	E	
Campanulaceae	*Clermontia waimeae*	‘ōhā wai	E	SOC, EN
Campanulaceae	*Clermontia* sp.	‘ōhā 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*	kokiʻo	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*	kāwaʻu	I	
Convolvulaceae	*Ipomoea indica*	koali ʻawa	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*	‘ala‘ala wai nui	E	
Piperaceae	*Peperomia tetraphylla*	‘ala‘ala wai nui	I	
Piperaceae	*Peperomia* sp.	‘ala‘ala 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*	hō‘awa	E	SOC
Pittosporaceae	*Pittosporum undulatum*	Victorian box	N	
Pittosporaceae	*Pittosporum viridiflorum*	Cape pittosporum	N	
Pittosporaceae	*Pittosporum* sp.	hō‘awa	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 B

Selected Hawai‘i Revised Statutes (HRS) and Administrative Rules (HAR).

Authority	Law/Rule	Title	Summary
DLNR-DOFAW	Chapter 13-104, HAR	Rules Regulating Activities within the Forest Reserve	-DLNR can issue permits for camping, special use, collecting, commercial harvest, and access.
DLNR-DOFAW	Chapter 13-105, HAR	Rules Regulating Restricted Watersheds	-Entry prohibited except by permit for official duties, research and scientific pursuits, public hunting and fishing as permitted under chapters 13-122 and 13-123, HAR, recreational and educational purposes, and collection of plants for personal use.
DLNR-DOFAW	Chapter 13-106	Plant Sanctuary Rule	-Purpose of rule is to conserve, manage, and protect threatened, endangered, and rare native plants by the establishment of plant sanctuaries; -Plant sanctuaries designated by BLNR; -Permits hiking and walking; nature appreciation and scientific studies; photography; and hunting as authorized by law.
DLNR-DOFAW	Chapter 13-107, HAR	Threatened and Endangered (T&E) Plants	-Purpose of rule is to conserve, manage, protect and enhance native T&E plants. -Prohibits collecting, possessing, transporting, propagating, and outplanting T&E species from wild populations without license for propagation, education, cultural or scientific purposes or to enhance survival of species. -No selling of T&E plants unless species has been approved by department for commercial use; all T&E species from garden-grown stock can be used commercially.
DLNR-DOFAW	Chapter 13-121, HAR	Rules Regulating the Hunting of Wildlife on Public and Other Lands	-Hunting allowed only with license or permit.
DLNR-DOFAW	Chapter 13-122, HAR	Rules Regulating Game Bird Hunting	-Hunting allowed only with valid hunting license from the State in designated hunting areas during open seasons and hunting days for specified game bird species and complying with bag limits. -Public hunting areas include among other things game management areas, forest reserves, natural area reserves, restricted watershed.
DLNR-DOFAW	Chapter 13-123, HAR	Rules Regulating Game Mammal Hunting	-Chapter 123, Exhibit 11. "Game mammals to be taken, daily bag limits, hunting periods, hunting days, and special conditions for the island of Hawai‘i."

Authority	Law/Rule	Title	Summary
DLNR-DOFAW	Chapter 13-124, HAR	Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds	
DLNR	Chapter 13-130, HAR	Rules for Hawai'i Statewide Trail and Access Program (Na Ala Hele)	
DLNR-DAR	Chapter 13-100, HAR	Protected Freshwater Fisheries Resources: Oopu and Hinana	-It is prohibited to fish for, catch, take, injure or kill any oopu or hinana. -Only oopu or hinana raised in private ponds or waters may be harvested and sold.
DLNR-CWRM	Chapter 174C, HRS	State Water Code	-States that the waters of the State are held for the benefit of the citizens of the State and that the people of the State are beneficiaries and have a right to have the waters protected for their use. -Establishes the Commission on Water Resource Management. -CWRM can designate water management area and establish administrative control over withdrawals and diversions of ground and surface water to ensure reasonable beneficial use of the water resources in the public interest. -Permit required for any consumptive use of water in designated water management area, except for domestic consumption of water by individual users. -Authorizes CWRM to establish and administer statewide instream use protection program. -All stream diversions must obtain permit from CWRM.
DLNR-CWRM	Chapter 13-167, HAR	Rules of Practice and Procedure for CWRM	
DLNR-CWRM	Chapter 13-168, HAR	Water Use, Wells, and Stream Diversion Works	
DLNR-CWRM	Chapter 13-169, HAR	Protection of Instream Uses of Water	-Includes interim instream flow standards for Hawai'i Island.
DLNR-CWRM	Chapter 13-170, HAR	Hawai'i Water Plan	
DLNR-CWRM	Chapter 13-171, HAR	Designation and Regulation of Water Management Areas	
DLNR-Land	Chapter 13-190, HAR	Water and Land Development: Dams and Reservoirs	-Rules governing the design, construction, operation, maintenance, enlargement, alteration, repair, and removal of dams, reservoirs, and appurtenant works in the State.

Authority	Law/Rule	Title	Summary
DLNR-Land	Chapter 13-195, HAR	Rules for Natural Area Reserves	-Established to preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites. - Hiking, nature study, and bedroll camping without a tent or other temporary structure are permitted. Hunting is a permitted activity pursuant to hunting Sec. 13-209-3 rules of the department.
DLNR-NAR	Chapter 13-208, HAR	Rules of practice and procedure for the Natural Area Reserves (NAR) System Commission	
DLNR-NAR	Chapter 209, HAR	Rules Regulating Activities with NAR	-Includes permitted activities, prohibited activities, special use permits, and penalties.
DLNR	Chapter 198, HRS	Conservation Easements	-Conservation easement is defined as an interest in real property created by deed, restrictions, covenants, or conditions, the purpose of which is to preserve and protect land predominantly in its natural, scenic, forested, or open-space condition.
Land Use Commission	Chapter 205, HRS	Land Use Commission (LUC)	-Establishes a Land Use Commission. -Establishes four major land use districts in which all lands in the State shall be placed in either urban, rural, agricultural, or conservation districts and specifies permitted uses in each district. -Any district boundary amendments over 15 acres must be processed by the LUC.
	Chapter 205A, HRS	Coastal Zone Management	
	Chapter 343, HRS	State Environmental Review Law	-Establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations.
	Chapter 344, HRS	State Environmental Policy	
	Chapter 520, HRS	Landowners' Liability	-The purpose of this chapter is to encourage owners of land to make land and water areas available to the public for recreational purposes by limiting their liability toward persons entering thereon for such purposes.
DOH	Chapter 340E, HRS	Safe Drinking Water	
DOH	Chapter 342D, HRS	Water Pollution	
DOH	Chapter 342E, HRS	Nonpoint Source Pollution Management and Control	

Authority	Law/Rule	Title	Summary
DOH	Chapter 11-23, HAR	Underground Injection Control	- Establish a state underground injection control (UIC) program in order to protect the quality of the state's underground sources of drinking water (USDW) from pollution by subsurface disposal of fluids.
DOH	Chapter 11-54, HAR	Water Quality Standards	

Appendix C
Summaries of Earlier Planning and Management Efforts

The following are summaries of statements and recommendations made in earlier efforts that related to watershed management. Some of these recommendations have been incorporated into this Kohala Mountain Watershed management plan and are noted within Chapter V of the document.

KOHALA FOREST MANAGEMENT GROUP (KFMG)

This community-based planning group was created in 1995 to address issues specific to Kohala Mountain. The primary goal of the KFMG was to balance the needs of people with the needs of the native ecosystems. Over 40 meetings were held over a 5-year period.

Outline of Issues and Concerns Resulting from Meetings of the KFMG - 2000

Ecosystem Management Needs -- consensus achieved 10 June 1997

1. We should try to preserve plants, birds, and ecosystems in some areas.
2. Creating pig-free areas is a good method of analyzing the effects of pigs on the recovery of native ecosystems.
3. We need to be open to trying strategies that may have been tried before or that haven't been tried before, whatever we think will or might work. This is a unique place from an ecosystem, species, and community perspective.
4. There are incompatible uses of native forest, because some believe that pigs are good for the forest while others feel they cause unacceptable damage.
5. Hunting should be utilized as a management tool in some areas to keep pig populations down.
6. The proposed Awini Watershed Unit has the highest priority (after the bog) for designation as a pig-free zone.
7. There will be pig control and fencing in some areas.

Action Plan Outline of Projects (broad agreement was reached on these items)

8. Add Awini Watershed Unit (1,385 acres) to Pu'u O 'Umi NAR.
9. Establish GMA on Kohala Mountain. The most suitable area is probably the Muliwai area between Waipi'o and Waimanu valleys.
10. Provide public hunting and hiking access to the forest across the DHHL lands at the end of White Road.
11. Establish an ecotourism program, modeled after the one established on West Maui, where the proceeds are applied to the efforts of the land managers to enhance hunter access, remove weeds, grow and out-plant native plants, and maintain fences.
12. Develop an outreach and education program for Kohala Mountain.
13. Construct 18.35 miles of perimeter fence in the following areas and remove pigs from exclosures: (a) Awini Watershed Unit (6.65 miles); (b) Pu'u Ahia (5.3 miles); (c) Big Valley watershed (1.7 miles); and (d) North Slope/Kawainui headwaters (4.7 miles). No other pig-free areas will be proposed.
14. Establish a program for removal of pigs from within fenced exclosures and in unfenced portions of the NAR, including: helicopter transportation of hunters and dogs into specific areas; and sponsoring a hunting tournament.
15. Establish a sustainable agroforestry system where the main animal component would be pigs. These would provide subsistence and recreational hunting opportunities for the

community. Management goals would be for habitat enhancement to provide high sustainable game yields.
16. Establish an ongoing banana *poka* eradication program with the goal of eliminating the non-native *poka* from the upper Kohala Mountain.
17. Establish a program for reforesting and maintaining the State lands between the Koaia Tree Sanctuary and the NAR.
18. Conduct a pig movement study to determine their random and/or seasonal movements. The research would involve capturing 20 pigs and fitting them with radio collars and tracking them from the ground and/or by helicopter.

NATURAL AREA WORKING GROUP (NAWG) - 1995

The goal of the NAWG was to address the question "how do we fairly balance and accommodate the various interests that have a stake in the Natural Area Reserves System (NARS) and maintain a healthy forest and social community?" Two resolutions adopted by the Legislature in 1993 were the impetus for the creation of the NAWG, which was composed of individuals from public, private, and community interest groups, all of whom have a stake in the future of Hawai'i's forests. The group sough to find reasonable resolutions to differences of opinion over fencing, pig hunting, protection of forests and watersheds, and the management of Hawai'i's various forest lands and rare, threatened and endangered species. The NAWG members reached consensus on the following 45 recommendations.

Resource Management

1. Expand hunting areas by looking at encumbered and unencumbered State lands. Areas that are adjacent to or surround existing public hunting areas may provide expanded hunting opportunities.
2. More surveys need to be done to inventory the native species in the NARS.
3. Cooperative programs with public hunters should be developed and shown to be effective.... In Pu'u O 'Umi, the proposed fence should not be built and public hunters assist in keeping pig levels low.
4. Some forest reserves should be designated as GMAs.
5. Identify and manage specific areas for public hunting. These designated areas should not compromise the survival of native species.
6. Look at existing boundaries of the NARs. Boundary modifications either increasing or decreasing reserves in size may be necessary after review.
7. Identify leased lands that could be used for GMAs or that should be preserved as areas best suited for native species. There should be an increase in both GMAs and NARs.
8. Look at improving access to land-locked areas.
9. Service projects should be organized; for example, removing old fence posts or cleaning up forest areas.
10. Utilize assistance from the hunters for managing pigs in the NARs so that meat is not wasted.
11. Create district/regional areas for the purpose of populating game animals.
12. Successful management and enforcement mechanisms should be implemented in GMAs.
13. As a beginning step in developing Resolutions, field trips need to take place so that the members of the NAWG have a clear definition of what are considered damaged or threatened areas, and what are considered excellent as opposed to poor hunting areas to provide a common base of knowledge and understanding.
14. Review and modify State leases to allow/accommodate public access.

15. Create a position for the hunters in the management plan for GMAs, so that they assist in data collection. Hunters play an integral part in acquiring information relevant to the assessment of GMAs.
16. Conduct more research on pig migration, reproduction, damaging effects to the forest, and where these activities occur. Conduct a study on the correlation between pigs in areas where native species are found and the level of direct impact that the pig imposes on the areas.
17. Create a mechanism to alert hunters of "fresh pig signs", especially when such signs are presented in easily accessible areas.
18. Review relative information from the Public Laws and 5F American Indian Tribal Acts.
19. Audit the Pittman-Robertson federal funds over the last 3 to 4 years to see if funds could be spent more effectively, identify gaps in the program, and identify possible disproportionate use of funds. Also audit the revolving State fund generated from hunting licenses.
20. Identify existing traditional routes to the ocean and the forest and develop policies to preserve those accesses.
21. Develop a community program for maintenance and preservation of forest areas. Include broad community interests.
22. Examine federal policies regarding the taking of meat off of federal lands to see if hunters could be allowed to do so.
23. Re-establish the State Ranger System to increase the level of visibility and effectiveness in enforcement.
24. Lobby for more funds and additional staffing for inventorying and monitoring, habitat management, game management, and public education.
25. Expand and develop a more effective mechanism for the enforcement of hunting laws and regulations, especially in the prosecution of illegal hunting/poaching. Look at increasing penalties for poaching.
26. Better manage areas where rare, threatened, and endangered native species have been identified with no overall net loss of GMAs in the region.
27. The outer edges of the NARs should serve as buffer zones. Hunters should be utilized to assist in the management of maintaining low pig numbers in these buffer areas.
28. Begin a dialogue between enforcement agencies and the hunting community to address existing and potential disagreements/misunderstandings.
29. Open up/improve existing roads/easements.
30. Develop RFMACs (Regional Forest Management Advisory Council) that focus on the concerns identified by the community.
31. Continue the NAWG as a means of monitoring the implementation of these recommendations, to oversee the pilot RFMAC, and as a continuing form for discussion of forest management issues.
32. Re-examine State policy on stray game to determine status of the policy and whether additional discussion is needed for species not currently addressed by the NAWG. The NAWG decided to focus on ungulates and not on small mammals, such as stray cats, mongoose, or rats.

<u>Community Participation</u>

33. Monitor the growth of native species, introduce or add more native species in the appropriate areas, and get community groups directly involved in both activities.
34. Develop mechanisms for joint monitoring (community and government agencies) for birds, medicinal plants, water, weeds, native plants, cultural sites, etc.

35. Develop and implement a mechanism that coordinates existing public and private stewardship/partnerships with the goals and interests of the community, such as the NAWG process.
36. Look at increasing community participation in game management by having the various interests represented in the Animal Species Advisory Commission and island councils.
37. Create a position in DOFAW for a Volunteer Coordinator on each island.
38. Work on statutory changes so that the community has more control over board, commission, and committee appointments. A beginning step could be voicing who the community recommends as a representative.

Education

39. Create a forum to carry on the task of working with the public on natural resource issues.
40. Develop a "hands on" educational program that includes all facets of the forests including both pig hunting activities and conservation efforts.
41. Bring information gathered in the NAWG process back to the general public.
42. Lobby for the creation of an Education/Information Specialist within the Island of Hawai'i Branch of DOFAW.
43. Modify and expand existing efforts and develop new ways to heighten public awareness of the dangers of alien pest species introductions.
44. Expand and modify the Hunter Education Program to include conservation needs and increase opportunities for participation.
45. Develop a mechanism to convey information to the public regarding existing NARS activities and cooperative activities that are NARS-related.

WAIMEA WATER ROUNDTABLE (WWR) - 1996-97

The purpose of the WWR was to work toward common solutions of water issues as they flow across many terrains, bringing them into integrated beneficial use in the watershed. The goal of the group was to share knowledge and work cooperatively to achieve mutual goals for Waimea's water resources. The group was advisory and establishes a communication link among those in the private sector, government, the community and water users.

From WWR Synopsis of 1996-97 Meetings

1. Need for better understanding of current policies, management options, agriculture statistics, information on water use, availability of water resources and status of water distribution system.
2. Importance of pursuing groundwater resources as a way to deal with drought conditions and the unreliability of Waimea's surface water system.
3. Data acquisition is critical: Need more data water budgets for the Kohala area, real time rainfall data, streamflow, wind speed, temperature, soil moisture, evaporation, solar radiation, fog drip, runoff, water level (for groundwater), infiltration (for groundwater), etc.
4. Need to protect watershed to maintain water supply.

Climatological Stations Proposal

5. Establish climatological data gathering stations to improve quantity and quality of water and weather data available for the Waimea area (at Waimea airport and in Kohala watershed).

KONA/KOHALA WATERSHED PLANNING TASK FORCE AND WORKSHOP - 1993

The task force was convened in 1992 in response to concerns by landowners about the proposed reclassification of agricultural lands in Kona and North Kohala into Conservation District zoning. Its purpose was to plan a series of public informational workshops intended specifically to build the common base of knowledge pertaining to the Kohala and Kona watersheds and natural resources. Based on the information presented to the workshops, the task force adopted the following "Statements of Agreements."

1. People (landowners/managers/stakeholders) respond better to incentives than to penalties.
2. Persons who are impacted by an action need to be involved in the process of developing and implementing the action.
3. Planning and management techniques need to be site specific and not broad brush. Natural Resource planning especially needs to be site specific.
4. Water resource development in the Kona area is in the early discovery phase.
5. Current weather patterns in the area are effected by vog which reduces rainfall.
6. Tree cover can increase effective water recharge in fog drip area where infiltration is adequate and evapotranspiration is reduced.
7. Regulatory coordination and consistency between different agencies needs to be established.
8. The current biological resources in the area are incompletely known but can be identified through further surveys.
9. Abandoned cane land and pasture will not become fog drip forest without money, effort, and appropriate geography.
10. It is important to protect existing native biological resources where possible.
11. A well-managed pasture can be a good watershed and provides additional cultural and economic benefits.
12. There is a list of permitted uses in the county agricultural district which may not be acceptable for watershed protection.
13. Recent discovery of additional high-level water resources in the Kona area suggests that there may be more groundwater available in this area than previously believed. Sustainable yields in general must be evaluated on an aquifer specific basis.
14. Native forests including both plant and animal life need active management to survive.
15. Adding a mitigation process to the State endangered species law could allow for more creative protection options.
16. The conservation district rules and process need to be revised with relation to scale of activity. They also need to be consistently applied and made more user friendly.
17. Successful agricultural activities require greater flexibility than currently permitted in conservation district.
18. Conservation district lands have less value than agriculture district land in terms of collateral and cash flow loans from a bank.
19. Native ecosystems and some other uses in Kona and Kohala watershed can co-exist if properly managed.
20. Maintaining watershed recharge is important to the future of economic development.
21. We need to map areas of high water recharge and those having valuable native resources separately.

22. The relationship of the high level aquifer and basal aquifer in the Kona area is not well known.
23. Government and non-government natural resource agencies are interested in establishing natural resource management partnerships with landowners.
24. Natural resource management incentives need to be developed, marketed, and user friendly.
25. The Island of Hawai‘i water situation is different from that on O‘ahu.
26. Fog drip can significantly increase effective precipitation but the amount of recharge generated is dependent on other factors.
27. There are a number of new partnerships and cost sharing programs available for natural resource management. Although these need better marketing, increased user friendliness, certainty of sustainability of funding and certainty of commitment from both sides, they are seen as a step in the right direction for cooperative resource management.
28. County and State planning maps and documents are not always in agreement which causes differing expectations and conflicts.
29. Long-term water management, planning, and development requires integrated collaborative planning efforts between the state, county, and private sectors to work.
30. Investment in the development of sustainable forest resources (timber, ecotourism, water recharge, habitat, etc.) requires long horizons and regulatory certainty.
31. Landowners have a right to economic use of their land and this right needs to be fairly balanced with protection of public trust resources.
32. Land use rights may provide incentives to private landowners for appropriate management practices. Removal of these land use rights may be detrimental to encouraging appropriate management practices.
33. Natural resource protection strategies should be tailored to the specific resources and the individual landowner’s needs.
34. Further education is important to bring everyone along.
35. Traditional agricultural practices are changing.
36. Some non-native plants and animals are a resource on the Kona/Kohala lands.
37. Additional dollars are needed to support management efforts in the Kona/Kohala watershed area.
38. The expansion of noxious plants is detrimental to natural resources and requires money and time to rectify.
39. A portion of the value of water harvested should be used to pay for management of the watershed.
40. Fire is a significant threat to natural resources and fire management requires money and coordination.
41. Deadlines are necessary to move any process along but excessively restrictive time deadlines will adversely affect the process.
42. A facilitated process which includes representation of all stakeholders is essential to a successful outcome for Kona/Kohala watershed planning process.
43. A right to harvest or a method for compensation if harvest is denied is needed to encourage commercial forest investment.
44. If there is a need to regulate the area, then the regulating agency should be required to come see what’s there.
45. Changes in county tax laws are necessary to encourage responsible natural resource management.
46. Early surveys, i.e. archeological and biological, are essential to avoid conflicts.

47. Compaction of land effects recharge.
48. Aquifer boundaries in the Kona/Kohala area need to be more accurately defined and understood.
49. Courts are not the most effective place to resolve natural resource disputes.
50. Existing information suggests that current agricultural and residential uses within the Areas of Critical Concern have not contaminated water quality.
51. All water resources need to be protected from degradation and contamination, especially the Kona high-level aquifer because of the lack of information on the current characteristics of the aquifer.
52. Land use controls in and of themselves do not necessarily promote natural resource management. Well thought out land use controls an incentives can serve to enhance natural resource management.
53. Diversification is an essential component of the future of agriculture.
54. Existing grandfathering process within the Conservation District uses do not provide for the flexibility necessary to diversify quickly to take advantage of market and product changes.
55. Native Hawaiian montane forests (between 3,000 and 6,000 feet) make excellent watersheds.
56. Ohia with grass can be a good watershed.
57. Many landowners have been good stewards of the resources they value. As societal values change, former management practices should be recognized in the context of the values of their time.
58. The amount of water that can be safely developed in the Kona/Kohala area is not known at this time.
59. Efforts to address some current regulatory and management needs in the Areas of Critical Concern may be enhanced by the coordinated, collaborative efforts of many agencies and individuals.
60. Population expansion generates conflicts in natural resource management.
61. No single land use designation may be appropriate for the Areas of Critical Concern.

Appendix D

Proposed Biodiversity Conservation Units

Unit E:‘Eke Unit (640 acres)

This unit contains the highest quality forest remaing in the Kohala mountains. It rises from the southwest flanks in the pasture land to the summit of Kohala, Ka‘unu Kaleio‘ohie at 5, 480-ft elevation. Populations of *Schidea diffusa, Anoectochilus sandvicensis*, three species of *Labordia, Tetraplasandra oahuensis, Cyanea tritomantha*, and five species of *Clermontia* including the endangered *Clermontia drepanomorpha* are present.

The headwaters for five agriculturally-important streams, such as Keawewai stream, are derived here. This forested area is also the headwaters for Kohakohau stream, which is a main supplier for municipal and agricultural water in the Waimea area.

Of the 7 native forest birds still extant in the Kohala region, six are found in this unit. Included are the endangered Hawaiian Hawk and the endangered Hawaiian duck, Koloa maoli. This region of forest contains all the necessary remaining environmental criteria necessary for native forest birds to exist. This unit contains 475 acres that is privately owned by the Queen Emma Foundation, with the remaing acreage part of the State of Hawai‘i Pu‘u O ‘Umi NAR.

Unit F : Waimanu Bog Plateau Unit (430 acres)

This 430 acre unit encompasses the existing 110 acre Waimanu Bog exclosure in the Pu‘u O ‘Umi NAR. Through retrofitting an existing fence and some other strategic fencing of not more than 0.8 mi, an ungulate-free unit will exist. Besides containing the headwaters for Waimanu Valley, this is the only place on the island that *Trematolobelia macrostachys* (aka koli`i) is known to inhabit.

The make up of the unit consists of the remaining bog margins not protected in the current exclosure as well as windswept wet shrubland comprised mostly of Kolea lauli‘i, ‘Olapa, ‘Ōhi‘a and ‘Ohelo mixed in with native grasses, shrubs, Uluhe, and three feet of sphagnum moss. Within this wet shrubland is one of two native orchids found on the island, *Liparis hawaiensis*.

Unit G: Kanea‘a Unit (500 acres)

This parcel is owned by Parker Ranch and includes approximately 500 acres along the rims of Honokāne and Pololū Valleys. Due to its location between the two valleys, elevation, aspect, and winds derived from topography, it is unusually drier in this region than in other parts of the mountain. Besides the dominant ‘Ōhi‘a canopy, trees that dominate the understory are comprised of Alani, Ie‘ie, Hame, and ‘Ahakea. While there are other trees present, this unique assemblage provides for some interesting forest structure. The tree snail *Partulina physa* is known from the vicinity, and is dependant on canopy trees for survival.

The major threat to this forest is a large population of wild cattle. They use this area to access the valleys and the uplands. While the cattle have done significant damage to the understory and recruitment of juvenile trees, the older established trees are still present.

Unit H: Ponoholo Pupu kani‘oe Unit (160 acres)

This 160 acre unit will protect the core population of the native tree snail, *Partulina physa*, on the island. This area is part of the Ponoholo Ranch. While the area has been severely degraded, remnant stands of ‘Ohi‘a and other native trees still support these tree snails.

Fencing using existing roads and or trails to completely encircle the area will be used. Rats prey directly upon the snails, making rodent control a priority for management. Fencing to keep out feral and domestic livestock as well as feral pigs will prevent further degradation of the remaining forest.

Unit I: Kaimu Unit (20 acres)

This 20 acre unit will protect one of the last remaining, lowland wet forest stands in Pu‘u O ‘Umi NAR. Located on a bench near the pali and adjacent to the Kaimu Canyon, this unit contains an unusually large diversity of native forest plants and trees for its relative size. Included in this unit are ‘olopua, gardenia, ala‘a, ‘iliahi and a few species of *Melicope*.

The weeds present in the lands of Laupahoehoe within the Pu‘u O ‘Umi NAR are far more prevalent than those of the more northwestern proposed units. Further inland from the coastal cliffs, the native lowland forest is quickly replaced by non-native and invasive Guava/Waiawi forest with clidemia, Malobar melastome, palm grass understory.

Unit J: Lower Laupahoehoe Nui (1530 acres)

This parcel is owned by Laupahoehoe Nui, LLC. Due to the size and elevational gradient of this large unit, a number of species will be protected including the rare loulu palm *Pritchardia lanigera*. New species and new island records for species are always being discovered in Kohala, particularly along the sea cliffs. A discovery of a plant in the genus *Neraudia* was made here recently. Removal of feral pigs from the area will greatly enhance the ability of many rare species to persist, while improving water quality along the numerous streams that occur within the unit. This lower unit also connects to the high yield upper watershed and provides an entire ahupua‘a that will be protected.

Unit K: Ohiahuea Unit (565 acres)

This unit includes a section of the Kohala Forest Reserve which represents some of the steepest and remote land in Kohala. It will stretch from Ohiahuea canyon to Waimaile stream from the abandoned ‘Awini section of the Kohala ditch trail to the Coastal sea cliffs (Pali). It will require approximately 2.3 miles of strategic fencing barbless constriction wire, and natural barriers, of which most would utilize the existing abandoned ditch trail complex.

Contained in this proposed unit are some of the finest remaining examples of lowland wet forest stands in the State. The unit also includes the rare native gardenia, *Gardenia remyi*. This area also contains an entire ridgeline stand of enormous Ginseng trees called ‘Ohe or *Tetraplasandra hawaiensis*. Also present are some fine stands of lowland wet lama forest that continue to sustain themselves despite the weed invasions, rats, and rooting done by feral pigs.

Unit L: Pu‘u Pili (290 acres)

Pu‘u Pili is a self contained watershed unit and is located on Kahuā Ranch. While it is currently functioning, the watershed services provided could be enhanced by the removal of feral pigs and the occasional stray domestic cattle. The forest is very similar to that of the entire west end of Pu‘u O ‘Umi NAR and the ‘Eke unit. All of the five *Clermontia* species, known from Kohala mountain, are present as well as all the forest birds including the ‘Io and and waterbirds such as Koloa maoli.

Unit M: Pu‘u Lapalapa (55 acres) Unit N: Pu‘u Mala (10 acres)

These small units are similar to Pu‘u Pili. Portions of the slopes on these cinder cones are still forested. This forest provides adequate structure that make them more valuable as forest then pasture. The slope is steep enough to provide an intermittent stream when tradewinds prevail.

Appendix H: Public response letters to Draft Environmental Assessment and replies from Kohala Watershed Partnership.

February 21, 2008

RE: Draft EA – Kohala Mountain Watershed Management Project

Reviewed with comments submitted by:

E. Kalani Flores
P.O. Box 6918
Kamuela, HI 96743

Background of reviewer: Currently a Hawaiian Life Styles – Assistant Professor at Hawai'i Community College, UH Center at West Hawai'i. Educational experiences include a BA major in Hawaiian Studies from the University of Hawai'i at Hilo along with a D.O.E teaching certification. Work experiences include over 25 years as a Native Hawaiian educator, specializing in the field of Hawaiian Studies, and teaching in the primary through secondary grades as well as at the collegiate level. Review experiences with EAs, EISs, surveys, and other reports have been in the capacity as a commissioner or board member of the Kaua'i County Historic Preservation Review Commission (1987-1993), Bishop Museum – Native Hawaiian Culture & Arts Program (1993-1999), Office of Hawaiian Affairs – Native Hawaiian Historic Preservation Council (1996-2006), County of Hawai'i Public Access, Open Space, & Natural Resources Preservation Commission (2005-present), as well as numerous other advisory/review committees in the area of Hawaiian cultural resources and historic preservation.

After reviewing this Draft Environmental Assessment (DEA) for the Kohala Mountain Watershed Management Project (KMWMP), comments pertaining to several noted deficiencies and/or inaccuracies are highlighted below. Comments provided by the reviewer address specific content areas of this DEA. As such, if other areas are not discussed in this memo, it does not constitute endorsement or agreement to that content.

Section II. Overall Project Description

It is implied (p. 6, ¶ 3) that "over 90 interviews with community members, businesses, government agencies, recreational users, cultural practitioners, private landowners, researchers, and others" were conducted. However, this DEA provides no documentation, transcripts, and/or biographical information detailing any such interviews. Technically, "interviews" were not conducted with many of these individuals, particularly amongst community members and cultural practitioners who attended an Open House presentation in April 2006. Instead, comments were only solicited and compiled from some of those individuals in attendance.

Section III. Description of Actions

The afore-mentioned statement is also repeated again (p. 10, ¶ 3). Also, it is not explicit and clear as to who actually identified the specific parcels (10,500 acres) for the proposed fencing project area being referred to as the high yield watershed and biodiversity units.

Section IV. Description of Affected Environments

This DEA lacks an adequate cultural impacts assessment. There is no actual analysis of the potential impacts to Native Hawaiian cultural practices, beliefs, and resources, past and current, that are associated with the project area. Out of 64 pages of this DEA, there are less than 2.5 pages (pp. 20-23) that address cultural resources. Out of these particular pages, about one page (p. 21) is padded only with information about the method that historical/archival research was conducted and a listing of references cited in the report, *He Mo'olelo 'Āina: A Cultural Study of the Pu'u O 'Umi Natural Area Reserve and Kohala-Hāmākua Mountain Lands, Districts of Kohala and Hāmākua, Island of Hawai'i, compiled by Kumu Pono Associates LLC.* Yet, out of the 264 pages in this particular report that includes documented historical and archival information, less than one page (p. 22) of cultural information is actually cited in this DEA. Even as such, this information has been diluted and generalized into just three paragraphs without articulating specific connections with the project area. In addition, this study only includes historical/archival research and does not include any oral history interviews with current cultural practitioners as stipulated in a cultural assessment.

As a result of excluding ethnographic and oral history interviews along with any biographic information of cultural practitioners from this DEA, only general comments from individuals and organizations have been cited as a form of consultation. However, this is not adequate and it reflects in the generalization of comments in this section.

Consequently, specific cultural practices, beliefs, and resources associated with the KMWMP are not articulated. There are only two sentences (p. 22, ¶ 3) that mention any traditional and customary practices of Native Hawaiians today. Furthermore, this DEA only vaguely mentions the gathering of materials by *halau hula*, craftspeople, and healers. Also, it fails to cite any specific information that identifies what types of materials are being gathered. If that information is not provided or known, how would one know if there are any potential impacts on these resources? In addition, this DEA excludes cultural practices, beliefs, and resources connected with other cultural practitioners.

There is a failure to adequately address the role of the *pua'a* (pig) in Hawaiian culture and society, especially for cultural practices and ceremonial use. Instead, the pig has been categorized just as a "feral animal" even though part of its DNA is directly linked to the early Polynesian pigs. As such, these *pua'a* and other Polynesian-introduced animals and plants along with Native Hawaiians are descendents of those who arrived together on early voyaging canoes.

There are noted inaccuracies (p. 22, ¶ 2) in the statement, "Food animals, such as pigs, were kept within villages and not allowed to escape into the forest." First of all, *pua'a* (pigs) were primarily considered as ceremonial animals vs. "food animals" in early Hawai'i. Also, our family has accounts and oral traditions of noted ancestors hunting pigs in mountain regions prior to Western contact.

For many Native Hawaiian families, pig hunting is a cultural and subsistence practice. It is similar to the cultural and subsistence practice of catching fish or gathering other sea life along the coast. However, throughout this NEA, pig hunting has been categorized as a recreational activity. It is also unclear as to how subsistence hunting has been classified as an "economic activity" in this report (p. 16, ¶1)

This DEA fails to identify traditional trails that traverse through the project area. Further research and abstracts might be able identify some of these trails. Likewise, some of these trails might also be considered public rights-of-way under the Highways Act of 1892. In addition, locations of all marked and unmarked trails as well as traditional trails within the project area should be identified on a map to determine any impacts to access.

Section VI. Alternatives Considered

There are only two (2) alternatives provided. These alternatives only provide an 'all or nothing' perspective. Other alternatives are not considered such as providing plans for limited fencing initiatives or reducing the fencing acreage. Likewise, other alternatives should also include fencing that is aligned with traditional *ahupua'a* boundaries instead of arbitrary parcels drawn on topo maps.

Section VII. Anticipated Determination and Reasons Supporting the Anticipated Determination

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

This DEA fails to identify the potential impacts to Native Hawaiian cultural practices, beliefs, and resources, past and current, because it has not clearly identified these cultural elements.

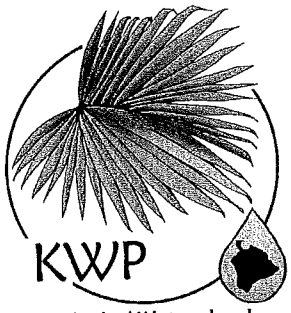
In addition, this DEA has not adequately explained the potential impacts upon Native Hawaiian families who hunt for subsistence, cultural, and/or ceremonial uses if the proposed plans to fence and eradicate the *pua'a* were implemented beyond the 10,500 acres. Likewise, this DEA does not describe the existing life cycles, migration routes, and specific activities of the *pua'a* living within the KMWMP and how this cultural resource would be impacted.

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

Contrary to the statement in this section, this DEA is actually segmented in context because it primarily focuses on the proposed fencing areas that encompass 10,500 acres. However, throughout this document there are references to the KMWMP encompassing over 65,000 acres. Yet, there is very little description of what is being proposed in the other 54,500 acres as part of this overall management plan. Plans for areas outside of the 10,500 acres are left open-ended and vague in this NEA, especially when it pertains to fencing and eradication.

For example, it is stated that, "These high yield watershed units and biodiversity units are where a majority of management actions will be focused; however given the changing nature and location of threats, management actions will be occurring over the entire project area as threats are targeted." (p. 6, ¶ 7, with emphasis underlined).

As such, the cumulative effect of the entire KMWMP area of 65,000 acres is not adequately addressed. State statutes clearly outline that any proposed action must be described in its entirety and cannot be broken up into component parts which, if each is taken separately, may have minimal impact on the environment. Segmenting a project in this incremental way to avoid the preparation of an environmental impact statement is against the law. If a project includes a later phase that cannot be fully described in the current EA because it is only likely to be implemented in the distant future, the EA should disclose as much detail as possible about the future phase.



Kohala Watershed
PARTNERSHIP

October 15, 2008

E. Kalani Flores
P.O. Box 6918
Kamuela, HI 96743

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Flores:

Thank you for your comments of February 21, 2008 on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have the following responses to your comments (summarized in italics):

1.) *It is implied that over 90 interviews . . . were conducted. Technically, "interviews" were not conducted with many of these individuals. . . . comments were solicited and compiled.*

The final EA will clarify the scope of consultation with the following to summarize input received during the (long-term) development of this Management Plan: 18 individuals provided input as members of the Kohala Forest Management Group from 1995-2002 and 30 individuals were invited to give presentations or testimony to that group; 31 individuals were formally interviewed during 2005 as research for the first draft of the management plan; and 40 individuals attended public Open Houses in April 2006. Additionally, feedback from discussions with other community members and groups (*e.g.*, Waipi'o Community Circle, Community Development Planning Committees) will be included in the final EA as well...

2.) *It is not explicit and clear who actually identified the specific parcels (10,500 acres) for the proposed fencing project areas.*

The Kohala Watershed Partnership identified these management areas.

3.) *This DEA lacks an adequate cultural impacts assessment. There is no actual analysis of the potential impacts to Native Hawaiian cultural practices, beliefs, and resources, past and current, that are associated with the project area...fails to identify what types of materials are being gathered [for halau hula, crafts people, and healers]...failure to adequately address the role of the pua'a (pig) in Hawaiian culture and society, especially for cultural practices and ceremonial use [vs. "food animals" and "feral animal"]...it is unclear how subsistence hunting has been categorized as an "economic activity"...fails to address traditional trails that traverse through the project area...locations of all marked and unmarked trails as well as traditional trails with the project area should be*

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

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identified on a map to determine any impacts to access...DEA excludes cultural practices, beliefs, and resources connected with other cultural practitioners.

The Kohala Watershed Partnership adopted five out of the six protocols identified in the Office of Environmental Quality Control (OEQC) guidelines to conduct a cultural impact assessment. Information for cultural impacts can be gained through scoping, community meetings, ethnographic interviews, and oral histories. The Kohala Watershed Partnership gathered information regarding cultural uses in the area and potential impacts by building on previous initiatives and working groups and conducting its own outreach via interviews and conducting scoping as well as community meetings. For those that participated in these processes, individuals identified themselves as Native Hawaiian, kanaka maoli, or Hawaiian cultural practitioners.

According to the OEQC guidelines, impact analysis information can also be obtained through consultation and from documentary research. The Kohala Watershed Partnership relied upon the research compiled and documented in the report He Mo'olelo 'Āina: A Cultural Study of the Pu'u O 'Umi Natural Area Reserve and Kohala-Hāmākua Mountain Lands, Districts of Kohala and Hāmākua , Island of Hawai'i (which also include, per OEQC instructions, historical period studied commencing with the initial presence in the area of the particular group whose cultural practices and features are being assessed as well as primary source materials identified by OEQC). This report is being added as an appendix item in the Final EA.

OEQC guidelines also outline that types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, and recreational customs. All these areas are addressed throughout the DEA, and potential impacts are evaluated, in addition to specific impacts on Native Hawaiian practices, resources, and beliefs.

Types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural. The DEA discusses existing natural areas with cultural significance as well as man-made structures.

The Kohala Watershed Partnership believes that the cultural impact assessment conducted was adequate. The Kohala Watershed Partnership welcomes additional input from the community on additional practices or activities that may be impacted by the proposed conservation management. We understand that not everyone can be reached at one time and anticipate that as people learn more about the Partnership, people will come forward to share their experiences and provide information. As such, the Kohala Watershed Partnership plans to continue this dialogue with people such as yourself and others knowledgeable about cultural resources in the area to minimize negative impacts to traditional practices.

Additional changes will be made in the Final EA as follows: specific references will be included regarding the types of plant materials that are being gathered (medicinal plants like mamaki, plants used in tattoo and as dyes, plants for the hula halau, including 'ie'ie, 'ōhia lehua, maile, pili grass and 'ōhelo), and other traditional Hawaiian cultural practices that continue today within the watershed, including the cultivation of kalo, noni, ki, 'awa, and kukui, the harvesting of wood for traditional implements, weapons and games, and the gathering of freshwater fish, 'opae, and edible ferns. The anticipated impact on these practices will remain unchanged from the Draft EA; we anticipate the impact of conservation management on traditional gathering to be beneficial as "protection

of the forest and restoration of its native habitats can benefit such practices as traditional gathering by insuring that plants used in such collecting retain robust, abundant populations." Additionally, a healthy watershed will provide abundant clean water for downstream users like kalo farmers, as well as habitat for native stream organisms.

With regard to your comments on the role of pua'a in Hawaiian culture and its characterization in the Draft EA as a "feral animal," this categorization is to differentiate the pig from native (endemic and indigenous) animals and to recognize its evolution in Hawaii from a domestic animal that arrived with the Polynesians to a wild animal today. Public comments both during pre-consultation and during the Draft EA public comment period indicate that hunters today have a diversity of views on the feral pig: as sportsmen in search of a trophy, as hunters seeking food for their families, as practitioners who hunt the pig with respect for its role in Hawaiian culture. There is often the reference to "harvesting meat" by local hunters, even those that identify themselves as Native Hawaiian. The final EA will clarify that when hunters provide their own food, hunting becomes an economic, as well as recreational activity. The final EA will also clarify that many community members consider hunting to be a cultural activity.

Finally, we are working with the Access Focus Group of the North Kohala Community Development Planning Committee, who have identified and mapped historic mauka-makai access routes from North Kohala into the watershed management area, to improve the discussion on traditional trails and access routes. Following the suggestions of this Focus Group, some form of this map will be included in the Final EA. Members of the Waimea community have also volunteered to assist with mapping access points and historic trails, which up to this time have not been well documented, especially with GPS or other modern geographic tools. The description of trails in Section IV. Description of Affected Environments, Other Environments and Resources section will be updated to include those trails identified by the Focus group or community members. We also affirm that this must be an ongoing, rather than a one-time process, and we ask your assistance in the identification of individuals or other resources with background information.

4.) *There are only two alternatives provided. These alternatives only provide an "all or nothing" perspective. Other alternatives are not considered such as providing plans for limited fencing initiatives or reducing the fencing acreage. Likewise, other alternatives should also include fencing that is aligned with traditional ahupua'a boundaries instead of arbitrary parcels drawn on topo maps.*

The DEA considers two alternatives, because the plan in its current form is already a compromise between the extremes that had been proposed throughout the planning for watershed management on Kohala. The management units are of a realistic size for management and fence maintenance ($\leq$ 2000 acres each), and the total miles of fence is buildable over 20 years, so that anticipated funding and personnel needs can achieve the stated goals. The locations of the units and fence lines are not arbitrary; they were laid out by people familiar with Kohala Mountain to follow logical topographic boundaries that reduce the impacts to flowing water, to use natural barriers to animal movements (steep stream gulches and pali), to enclose intact native ecosystems and important habitat for rare species, and to minimize impacts on public use such as hunting.

5.) *This DEA fails to identify the potential impacts to Native Hawaiian cultural practices, beliefs, and resources, past and current, because it has not clearly*

identified these cultural elements. In addition, this DEA has not adequately explained the potential impacts upon Native Hawaiian families who hunt for subsistence, cultural, and/or ceremonial uses if the proposed plans to fence and eradicate the pua'a were implemented beyond the 10,500 acres. Likewise, this DEA does not describe the existing life cycles, migration routes, and specific activities of the pua'a living within the KMWMP and how this cultural resource would be impacted.

As discussed previously, we believe the DEA satisfies the requirements for a cultural assessment as outlined in the OEQC guidelines. At the same time, if this DEA omits discussion on any specific activities currently being practiced, we welcome additional information so that the potential impacts on the activity can be evaluated.

The DEA does not evaluate the potential impacts if fencing or removal of pigs is implemented beyond the 10,500 acres because that is not one of the alternatives under discussion. Any implementation of fencing and pig removal beyond the 10,500 acres would be subject to a future environmental assessment (with a supporting cultural assessment).

Finally, the DEA does not discuss life cycles, migration routes, and activities of the pigs living within KMWMP because over 50,000 acres of the project area will remain as feral pig habitat. Given the broad range of habitats remaining within this area and general information on the activities of pigs, it is anticipated that pig populations formerly using the 10,500 acres to be fenced will relocate to other locations.

6.) Contrary to the statement in this section, the DEA is actually segmented in context because it primarily focuses on the proposed fencing areas that encompass 10,500 acres. Yet, there is very little that is being proposed for the other 54,500 acres.

This DEA addresses the impacts of a 20-year management plan which includes the management activities that will take place within both the designated management units (10,500 acres) and the larger partnership area (54,500 acres). Information concerning the 10,500 acres is provided more in detail as these areas are priority areas for management activities based on their high water yield and unique biodiversity and will receive more direct management attention (through fencing, animal removal, weed control, and rare plant outplanting). Funding is also in hand for some of these projects. However, there are activities planned for the unfenced 54,500 acres, including invasive species control, outreach and education initiatives, monitoring and surveying, and research and infrastructure support.

The specific statement that you quote: "given the changing nature and location of threats, management actions will be occurring over the entire project area as threats are targeted" refers to the our inability to specify exactly where in the 54,500 acres activities like invasive weed control and monitoring will occur. Unanticipated weed or invasive species introductions (such as Miconia or coqui frog) or the need to respond to natural disasters like earthquakes, tsunamis or hurricanes may change management priorities.. This clarification will be included in the final EA.

The DEA provides as much detail as possible regarding activities within the entire project area. If any changes in the management plan are proposed that are substantially different in scope from the actions outlined in this DEA, a new DEA will be prepared to evaluate the impacts before making the change.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. Should you have any future questions or concerns about this project, please feel free to contact me by email at Coordinator@kohalawatershed.org or by phone at (808) 333-0976.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

Kanaina Case
65-1206 Hoku'ula Rd.
Kamuela, HI. 96743

February 20, 2008

Kohala Watershed Partnership
19 East Kawili Street
Hilo, Hi. 96720

To Whom It May Concern,

I have read the draft of the Kohala Management Plan and while I believe that there are some good ideas, there are others that I do not agree with. First of all, I do not think that the forest should not be fenced at all. Secondly, the building of a boardwalk will not be very well received by the community. Third, we must take into consideration the overall look of the forest as well as the quality of the water coming out of it. Finally, there is the subject of killing animals that we must address.

In terms of fences, I believe that they should go around the forest rather than through it. Ten or so years ago a group of us removed a fence from the forest. Today, the traces of that fence are still visible. The forest does not recover as fast as people usually think it does. There are trees in that forest that only 6" in diameter but have been there since my childhood. That means that in over twenty years, the size of the tress has not changed much. They still remain three to five feet tall. This is an indication of how precious and delicate the forest is. Therefore, damaging parts of it and cutting down trees to build fences will have devastating impacts. In my opinion, seeing a fence in the forest is like taking a picture of the ocean or the mountains and without being able to rid your view of electrical wires and other visual distractions. They, like the fences, just don't belong there.

In regard to the trails, I believe that well placed trails can be easily maintained. Therefore, cutting forest to build boardwalks is unnecessary. In addition, we must ask ourselves, if we cut areas of our forests to build boardwalks, who are we damaging our forests for? Are we simply cutting it to make it easier for tourists and safe hunting? Speaking from experience, hunters like myself will not use them because the pigs will not either. I know that there are ways to make good trails without building boardwalks. That way, the trails can grow over if and when you want them to.

As far as soil erosion goes, this is a very rainy and swampy area. Just look at the valleys. We are on an island and soils will runaway. However, I've noticed that the water runs currently clear. Therefore, not too much of it is running away even with pigs in it.

In terms of the water in the forest, it currently seems fine to me. I have drunk this water and continue to drink till today and am still in very good health. Therefore, as I care about the cleanliness of the water, I am strongly against the usage of poisons to kill invasive plants in the

forest. I understand that it will be hard to rid the forest of these plants without the use of such poisons. However, should we really risk poisoning our native animals and plants and polluting our fresh water just to make the work easier? I support the removal of invasive plants but feel that we should find alternative methods to accomplish this.

My last concern is about the animals. As a hunter, I am firmly opposed to the killing and meaningless and wasteful discarding of them. I am against them being eradicated and left in the forest. In terms of the cattle, I agree that they are a problem as you cannot see any forest growing outside of the forest fence line where the cattle are. However, pigs on the other hand, do not eat the trees or damage the forest like the cattle do. If pigs were that bad then I believe that we, the people of this land, would have tried to get them out of the forest a long time ago. As I am a supporter of getting species off of the endangered species list, I can see small pieces of land being fenced (like 300 acre pieces) to plant rare plants to see if they will take. Again however, I am firmly against taking the pigs out of the forest.

As a Native Hawaiian of this place, an active member of this community, and a life-long hunter of this forest, I would like to be given the opportunity to sit on the board as I stated at the public meeting. If that is not possible, I would strongly recommend that my father, Lloyd Case be able to sit on the board as a chosen representative of this community who can voice our concerns. Some of us who live here have spent more time in those forest areas than any of you put together. With that in mind, I believe that you should take advantage of the knowledge that we have of this area. There is public land on those mountains, but there is no public or local representative on the board. Therefore, please let us join the board so we can take part in decisions made that will affect not only our forests but our very livelihood.

If you have any questions, please don't hesitate to contact me at the above address or by phone at 896-6742. I look forward to hearing from you soon.

Mahalo,

Kanaina Case

Kanaina Case

cc: Office of Environmental Quality Control
235 South Beretania St., suite 702
Honolulu, Hi. 96813

Attention: Christine Ogura
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St, Room 325
Honolulu, Hi. 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

P.O. Box 437182
Kamuela, HI 96743

phone: 808/333-0976
email: Coordinator@kohalawatershed.org
website: www.hawp.org

October 15, 2008

Kanaina Case
65-1206 Hoku'ula Rd.
Kamuela, Hawai'i 96743

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Case:

Thank you for your comments of February 20, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have responded to your comments (summarized in italics) below:

1). In terms of fences, I believe they should go around the forest rather than through it... traces of fence are still visible [referring to a removed fence]...damaging part of it [trees] and cutting down trees to build fences will have devastating impacts [including visual].

The Kohala Watershed Partnership (KWP) appreciates your sensitivity to the effects of fencing on the forest. We too share this sensitivity as our goal, like yours, is to protect this forest. In recognition of the fact that some plants in this habitat do grow slowly and of our desire to minimize harm to existing native plants, the DEA states that removal of native plants greater than six inches in diameter will be avoided and that if areas of sensitive botanical resources, large trees, or streams are identified, fence alignments would be adjusted to avoid or mitigate impacts to such areas. We agree that fence alignments should be selected to keep habitats/forests intact to the greatest extent possible. However, other considerations used in selecting alignments include terrain, species protection, sensitive habitats, manageability of units, management goals and objectives, and threats. We agree that most plants in this habitat grow very slowly, and the loss of ancient 'ōhia like those your described is not acceptable. With regard to visual concerns, we understand that some people feel the presence of human-built structures in the middle of the forest can be unsettling, but others feel that these are structures of beauty because of their critical role in protecting the forest. Hawaii's sensitive natural resources are disappearing, and rare plant populations continue to decline, as a result of the continued harm caused by feral animals, including cattle and pigs. Years of research and monitoring by the National Park Service have demonstrated that the best way to protect areas of extreme biological importance or high watershed value is through fencing because no other method can eliminate the threat posed by a roving animal. Further, as stated in the DEA, fencing on other islands has proven that impacts to forest are beneficial as the removal of ungulates allows degraded understory and native vegetation to restore itself.

2). *Cutting forest to build boardwalks is unnecessary...are we simply cutting it [forests] to make it easier for tourists and safe hunting...there are ways to make good trails without building boardwalks.*

As stated in the DEA, the purpose of the boardwalk is not for tourists, for hunting purposes, or for the creation of trails in the traditional sense. The purpose of this half-mile boardwalk is for the education of local students and their families about the bog ecosystem near Alakahi stream. This bog ecosystem is comprised of moss, sedges, shrubs and ferns, and is not a forest as people traditionally think of one. So no cutting down of forests will occur to build the boardwalk (though there will be clearing of other types of vegetation such as shrubs). Unlike a forest where the ground has soil and understory vegetation, bog grounds are made up of soft mosses and sponges and are delicate enough that walking through them creates footprints that can remain visible for years, negatively affecting the vegetation. As such, in order to minimize such impacts and footprints, the establishment of a boardwalk is necessary for long-term management and conservation of this area. A boardwalk ensures that impacts to the native ecosystem are minimized to a narrow footprint, rather than a wide trail that expands as people walk along the edges to avoid mud holes.

3). As far as soil erosion goes, this is a very rainy and swampy area...we are on an island and soils will run away.

We agree that some soil runoff is part of the natural system. However, threats such as grubbing/destruction of the understory by feral ungulates and invasive weed species (which may have shallow roots and not hold in the soil as well) add to the sedimentation of soils to the natural system and increase the impacts of such natural processes.

4). As I care about the cleanliness of the water, I am strongly against the use of poisons to kill invasive plants in the forest.

Invasive plants will be managed using multiple methods that include mechanical, chemical, and biological controls. Chemical control is used when mechanical control methods are not feasible or when biological controls are not feasible. As stated in the DEA, herbicide selection will involve only those approved for use in or near water bodies with strict adherence to labeling instructions and product guidelines. In addition, staff are trained in the use of such chemical controls to ensure proper application. Some of the invasive weed species that would be targeted with such chemical control include the Kahili ginger, which is taking over some areas of our Kohala forests.

5) Pigs, on the other hand, do not eat the trees or damage the forest like the cattle do. I am against taking pigs out of the forest.

Kohala Mountain has a lot of forested areas, and management actions are targeting only specific areas designated for the protection of watershed and biodiversity health for feral ungulate control. Pigs will be removed from these areas, but will continue to exist in forests. It is important to remove animals from the areas designated for watershed and biodiversity protection because years of research and observation have demonstrated that pigs do eat native plants, uproot understory plants, roto-till soil, discouraging re-growth by native plants, and spread forest-modifying invasive species like strawberry guava. In addition, pigs have been observed eating the eggs of native birds and damaging the native tree fern *hapu'u* so that the tree fern remnants act as standing pools for breeding mosquitoes. All these actions harm the native forest.

Beyond the EA, the Kohala Watershed Partnership plans to continue its dialogue with the community through outreach events, talks at community associations, activities with schools, and individual meetings about the work it is doing to protect and conserve the Kohala Mountain Watershed. We welcome your continued input. In addition, we plan to involve local hunters for management activities, so that the meat can be used and shared in the community, and hope that you will consider becoming a volunteer in such efforts to protect our watershed.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

M K Purell

Melora K. Purell
Coordinator, Kohala Watershed Partnership

Lloyd E. Case
65-1198 Hoku'ula Rd.
Kamuela, HI. 96743

February 17, 2008

Kohala Watershed Partnership
19 East Kawili Street
Hilo, HI. 96720

RE: Kohala Mountain Watershed Management Plan

Dear Melora Purell:

This letter is in response to the Kohala Mountain Watershed Management Plan. I, as well as many others in my community, would like to offer a proposal that we be able to manage this area at no cost to the state and federal government. We would like to open trails for gathering and for other traditional practices. We would like to teach school groups about the forest, and we would like to assist with weed control. I, Lloyd Case, a native of Waimea, am but the representative of a large community of people who long to manage that which has been and continues to be an essential part of our livelihood.

As a people, we have gathered plants and animals from the Kohala mountain forest area for hundreds of years. Our ancestors gathered food, medicines, and materials for ceremonies and cultural practices from our forests. We continue these traditions today. Therefore, as this place is an integral part of not only our cultural heritage, but our physical and spiritual survival, we the people of Waimea, Kohala, and Hāmākua, would like to manage our forest. This idea is one that is strongly supported by the Native Hawaiian community as well as those of the local community who now gather materials from the forest area.

As a community, we want to open up all of the old trails. There are many trails that are 35 years to 100 years old and beyond, many of which have not been used or seen for a long time. If measured and totaled together they could possibly add up to 150 to 200 miles of trail that cover around 11,000 acres. The majority of these trails are not known to many people. Therefore, we want to protect for those who want to continue to gather freely from the forest. As a result, we strongly oppose the proposed fencing plans. Fences would block both the trails that we currently use as well as the many other trails that we are starting to identify and mark.

As a community, we have been teaching our children how to protect the forest through Hawaiian practices, through taking them to the forest to gather and learn about the natural elements, and through allowing them to interact with the environment in a way that aligns with the traditions of our ancestors. We teach them the values of mālama 'āina, or caring for the land with respect. Our children are learning about the water cycles, about the uses of our native plants, about the weather, and about the intricate connection that each of these elements have with one another. They have essentially been learning about balance, or about how they must continue to live in balance with nature if both the forest and we as a people are to survive. Therefore, we have a plan to take kids from different schools into the forest so that we can continue to teach them and give them access to new trails. Such educational opportunities will

be open to all who are interested and will encourage the community to take a more active role with our forest.

All of these aforementioned plans will be at no cost to the state and federal government. By opening up all the old trails we can better manage and control the wild pig population. Hunters will be able to cover more ground and therefore, harvest more wild meat. If private land owners want to fence their own land then that is their business. However, public land is our birthright as Native Hawaiians and as people of this place. It is ours to share with others.

As a part of this proposal, I would like to be given a set of keys for the gates so that we can go up during the week and begin to open up old trails and make progress on weed control. This is truly our kuleana, or responsibility as not only Native Hawaiian people but as people who live off of this land. This is the task that has been handed down to us from generations of people who used this land. We want to ensure that we, our children, and all of those to come will continue to have access to this special resource.

Please feel free to contact me at my home 808-896-3030 if you have any questions or concerns. This issue and proposal is of the utmost importance to me and to the community that I represent. Therefore, I thank you for reading through our proposal and look forward to hearing from you soon.

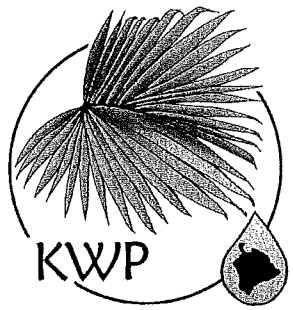
Me ke aloha,

Lloyd E. Case

Lloyd E. Case
Hunter of the Hawaiian Rain Forest

CC: Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI. 96813

Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI. 96813
Attn: Christine Ogura



KWP
Kohala Watershed
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Parker Ranch

Kahuā Ranch

Ponoholo Ranch

Kamehameha Schools

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October 15, 2008

Lloyd Case
65-1198 Hoku'ula Rd.
Kamuela, Hawai'i 96743

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Case:

Thank you for your comments of February 20, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We look forward to learning from you and working together as offered on the shared objectives of ensuring trails are available for gathering, other traditional practices, hunting, teaching school groups/children about the forest and the importance of taking care of them, and weed control. All of these activities are identified as part of the management plan for the Kohala Watershed Partnership. Although KWP has broad conservation goals for all of the forest on the mountain, we are limited by available resources and welcome your efforts and the efforts of others to take care of Kohala Mountain.

We have responded to your comments (summarized in italics) below:

1) We strongly oppose the proposed fencing plans. Fences would block the trails that we currently use as well as the many other trails that we are starting to identify and mark.

We believe the fencing is an important component to protecting the high-yield water areas and important biodiversity units from damage and destruction by feral animals. Most of these areas are in remote locations, not easily accessible by most people for hunting and gathering because of the distance from access points. Even with full implementation of the management plan, more than 26,000 acres of accessible public lands will remain unfenced.

Also, fencing is not meant to block access for people. To ensure that access is not blocked by fencing, crossovers or self-closing gates will be installed wherever fencing crosses a trail and other known access points. We are happy to meet with you to identify if any of the old, undocumented trails in your letter will be affected and to identify locations for crossovers or self-closing gates. In addition, we are also working with the Access Focus Group of the Community Development Plan in North Kohala, as well as community members in Waimea, who will help us identify specific historic access points and trails, to increase our understanding of historic trails and minimize potential impacts to these features.

2) I would like to be given a set of keys for the gates so that we can go up during the week and open up old trails and make progress on weed control.

Your letter does not elaborate on which gates and what lands you are referring to, but the partners in the Kohala Watershed Partnership have their own policies and procedures regarding gate usage. As such request for gate keys must be made directly to the landowners. That said, there may be opportunities for us to work together to open up trails for public use, and I look forward to additional conversations with you on this topic. KWP plans to make access to the mountain less cumbersome for the community, but this will be an ongoing process. We appreciate your patience as we work to balance landowner concerns like liability with the community's desire for access and we hope for your continuing interest and involvement in increasing opportunities for access.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org. I will continue to be in touch!

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

Ocean and Mountain Access Focus Group:

JOE CARVALHO	Joe Carvalho
MIKE ISAACS	Mike Isaacs
Marlene Ching	Marlene Ching
Harry Ching	Harry Ching
Tracy PASCO	Tracy Pasco
NANCINE LLOYD	Nancine Lloyd
Ted Matsuda	Ted Matsuda
Hugh S. Lovell	Hugh S. Lovell
Marcia Carvalho	Marcia Carvalho

Briefly, North Kohala is currently working on their Community Development Plan as required by the County Of Hawaii's General Plan, section 15.1. A Steering Committee was formed to guide the planning process and Focus Groups were established to address four priority issues; one of which is the need for Ocean and Mountain Access (OMA).

The OMA group has serious concerns regarding identified old trails, old government roads and mauka-makai access that are not mentioned in the KWP document.

This group has already identified areas of Kohala Mountain that will be part of their working document. Because of their mission, the OMA group would like to be part of the planning and management of the trails and roads system in the KWP.

These areas listed below are an excerpt from the draft document still being developed.

Mountain trail and drivable mauka-makai access – The North Kohala Access Focus Group recommends a trail that traverses the northern upper slopes of the district just below the forest reserve from Pololu Valley to the Kohala Mountain Road at the old Puu O Kumau Reservoir (Taga Pond) be re-established for public use. This trail was a well-used field road for the sugar plantation, was unrestricted and widely used to access hunting, gathering and recreation areas prior to the 1980s. Portions of it are a government highway. It is reached by vehicular mauka-makai access from Akoni Pule Highway by the following existing public and private roads:

- Makanikahio – vehicular access on an existing jeep road in Makanikahio and Waiapuka ahupua'a.
- Makapala – vehicular access on a paved government road leading to an existing jeep road.
- A'amakao (above Kapanaia Bay) – vehicular access on an existing jeep road between Puwaiola and Waiohia gulches. This existing limited public access was granted in Civil HA-5464 Kohala Corporation v. Ahoi. The key system for card holding members of the Kohala community is administered by Hui Mamalahoa and Surety Kohala Corp.

- Halelua Government Road (betweeen Halawa and Halaula) – vehicular access in Halelua ahupua'a on the main government road from Kohala to Waimea prior to 1892. The road exists through private land, TMK 5-3-04:1. The road extends beyond the proposed mountain trail to meet the Kohala Mountain road south of Lahikiola cinder cones.

- Ainakea ahupua'a -- vehicular access on an existing jeep road on private land.
- Kynnersley Road – vehicular access on the paved county Kynnersley Road extending mauka on an existing unpaved road over private land to Puuokumau Reservoir (Taga Pond) in the Puehuehu ahupua'a.

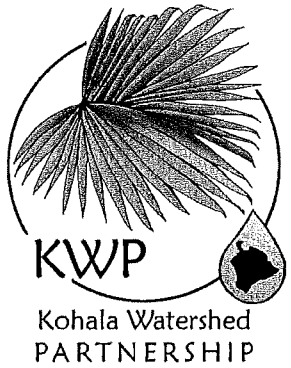
- Puuokumau Reservoir (Taga Pond) – vehicular access on existing unpaved road to a parking area at the mountain trailhead. On private land TMKs 5-7-04:13, 5-4-01:18 and 5-4-01:4.

- **Kohala Windward Valleys** -- Trails were built almost 100 years ago to service the Kohala Ditch Water System and the Kehena Ditch System. Some of them were built over traditional trails. The coastal and valley trails have been maintained by the Kohala Ditch Company as well as other valley land owners, frequent Kohala-based users and the public. The Kehena trail system was maintained by land owners, Kohala-based users and the public. Some sections of the trails were damaged by the earthquake of 2006. Traditional users of the trails should not be hampered in their access to the valleys.

    - Pololu Lookout – vehicular access on a state highway to the paved lookout at the trailhead to Pololu Valley. The valley trail system would start at the bottom of the valley.

    - Makanikahio – vehicular access on an existing unpaved road, also listed as mauka-makai access for the mountain trail to the mauka trailhead of the valley trail system.

    - The Kehena Ditch Trail on private land will be accessed by parking available at the trailhead in Kaupalaoa off of the Kohala Mountain Road.



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October 15, 2008

Ocean and Mountain Access Focus Group
North Kohala Community Development Planning Committee
Kapa'au, Hawaii

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Focus Group members:

Thank you for your oral and written comments of February 20, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008. Part of the EA process is gathering additional information previously unknown to the project and we appreciate the very helpful and specific information provided in your letter to assist in management actions concerning trails.

We have responded to your comments (summarized in italics) below:

The OMA group [Ocean and Mountain Access group, a focus group of the steering committee for the North Kohala Community Development Plan] has serious concerns regarding identified old trails, old government roads and mauka-makai access that are not mentioned in the KWP...the OMA group would like to be part of the planning and management of the trails and roads system in the KWP.

We look forward to continuing a dialogue through the OMA group. After the meeting with the Access Focus Group, and receiving comments from other people about the need for access, the Final EA will include additional details on historic access routes as recommended. The issue of managing access to the forests of Kohala is important to the partners of the Kohala Watershed Partnership, and one of the stated management goals is to Manage Access for Compatible Public Use. Beyond the EA process, we welcome the opportunity to continue to work with OMA concerning trail planning and management so that we may learn from each other's organizations and efforts on this shared topic. However, since the Kohala Watershed Partnership is a voluntary alliance of public and private landowners, it will be up to each landowner to make final decisions about access and trail management on their lands.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

Protecting and sustaining the forest, the water and the people of Kohala.

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

HRD07/3220B

February 11, 2008

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

RE: Draft Environmental Assessment (DEA), Kohala Mountain Watershed Management Project, 'Āwini, Honokāneiki, Honokānenui, Kahuaiki, Kahuanui, Kawaihae Hikina, Kawaihae Komohana, Laupāhoehoeiki, Laupāhoehoenui, 'Ōuli, Pu'ukapu, Wai'aka 1, Wai'aka 2, Waimanu, Waimea, Waipi'o, North Kohala, South Kohala and Hāmākua Districts, Island of Hawai'i.

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 Mountain Watershed Management Project on Hawai'i.

OHA understands that the overall goal of the plan is to maintain a healthy watershed and all its related ecosystem values and functions. The entire project area of roughly 65,000 acres is identified as the Kohala Watershed Management Area (WMA). Generally, OHA is in support of projects like these, and in particular we are supportive of this ambitious plan. As such, we offer the following comments with the goal of improving this proposed project:

OHA notes that county zoning for the entire area is either conservation or agriculture. We stress that the stated management goal for this watershed is to preserve its ecosystem values and functions. OHA supports this proposed project in this capacity and would be critical of any zoning changes to the area that would seek to change the existing uses or character of these lands. OHA would see such changes as contrary to this plan and WMA.

OHA notes that the management plan calls for public hunting, staff controlled hunting, trapping, snaring, and aerial shooting of feral ungulates. Whenever possible and when not jeopardizing the safety of public hunters and their dogs, the feral ungulate management for any area should include the involvement of public hunters. We are concerned that our beneficiary's use of these resources be supported by this proposed project.

OHA does note, however, that access has been considered in this DEA and we only additionally note that any permits or regulations required for access and cultural use take into account constitutionally protected Native Hawaiian uses and, therefore, not be burdensome for our beneficiaries.

OHA notes that the applicant has taken steps to determine historical, cultural and archeological resources in the project area. However, because this area is so vast, it is probable that neither everyone nor every practice has been identified or accounted for. Therefore, we ask that the applicant bear this in mind if this proposed project moves forward, and that they continue to demonstrate the open-mindedness and flexibility towards these sensitive issues as seen in the DEA. Further, we also seek to confirm that during all construction activities, if any archaeological sites, artifacts, or burials are encountered, construction will halt and the appropriate agencies will be notified.

OHA does note that the applicant proposes the use of biological controls in the management plan. However, we do not see the use of biological controls discussed in section V under mitigation controls. We urge that the applicant be very careful in the use of biological controls as they can be unpredictable and have uncertain results, as noted in the DEA. Therefore, we had hoped to see more details regarding the types of biological controls being considered and the mitigation techniques proposed to accompany them. Poisons are also a concern for us; however, the mitigation controls and monitoring proposed alleviate some of our discomfort.

OHA notes that toxic baits, traps, barbed wire fencing, biological controls, and other techniques discussed in this DEA may have an effect on native, endangered, and threatened species. In regards to endangered and threatened species, OHA wonders if an Endangered Species take permit and or a section seven consultation has been initiated in consideration of these unfortunate effects. We did not see this listed in section VIII. OHA also asks if any of the project area has been designated as critical habitat under the Endangered Species Act. We also ask if any non native species are to be re-planted.

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

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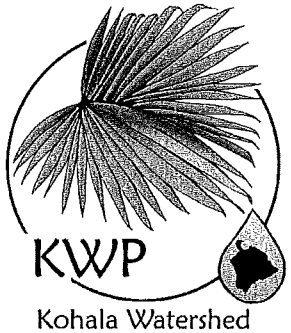

October 15, 2008

Clyde Nāmu'o
State of Hawai'i
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Suite 500
Honolulu, HI 96813

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Nāmu'o:

Thank you for your comments of February 11, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We appreciate the support expressed by OHA for the management plan and the project. The DEA already reflects OHA's desire to involve public hunters for management (when safety of hunters and dogs is not an issue), that access take into account cultural use, and that construction activities will be halted and appropriate agencies notified if any archaeological sites, artifacts, or burials are encountered.

We have responded to additional comments (summarized in italics) below:

1.) *OHA. . . would be critical of any zoning changes to the area [conservation and agriculture] that would seek to change the existing uses or character of these lands.*

The landowning partners of the Kohala Watershed Partnership (KWP) formed this alliance because they were all committed to protecting watershed values and managing threats. Many of the partners have long-standing ties to the lands they manage and a deep desire to continue to see these resources stay intact. Additionally, most of the public lands in the partnership area are specifically for designated for conservation purposes. As such, the KWP would also be critical of any zoning changes that would seek to change the existing uses, character of these lands, or be contrary to the management plan developed.

2) Applicant has taken steps to determine historical, cultural and archeological resources in the project area...area is so vast...probably neither everyone nor every practice has been identified or accounted for...ask that the applicant bear this in mind if this proposed project moves forward, and that they continue to demonstrate the open-mindedness and flexibility towards these sensitive issues.

The Kohala Watershed Partnership recognizes that determining historical, cultural and archeological resources is a fixed timeframe that captures one snapshot at one time period. As such, the KWP understands that information collection of such resources is an ongoing process, of which this EA is one. We understand that not everyone can be reached at one time and as people learn more about the Partnership and its management goals, people will come forward to share their experiences and provide information. As

such, the Kohala Watershed Partnership plans to carry on this dialogue with communities, schools, individuals and others who are knowledgeable about such resources to continue to assess ongoing management actions.

3.) *We do not see the use of biological controls discussed in section V under mitigation controls... we had hoped to see more details regarding the types of biological controls being considered and the mitigation techniques proposed to accompany them.*

The final EA will provide clarification on this point and will include some of the possible biological control target species currently being tested by the U.S. Department of Agriculture (e.g. *Tibouchina herbacea, Miconia calvescens, Clidemia hirta, Psidium cattleinum, Senecio madagascarensis*). Mitigation techniques will follow state and federal protocols and procedures already in place/used to assess introduction of biological controls in Hawai'i. In addition to extensive research in a laboratory setting to determine if any non-target species will be impacted, this process has included a separate environmental assessment evaluating the impacts of a biological control release, such as the one currently underway for strawberry guava, prepared by the appropriate agency (typically, the Department of Agriculture).

4.) *OHA wonders if an Endangered Species take permit or a section seven consultation has been initiated. OHA also asks if any of the project area has been designated as critical habitat under the Endangered Species Act. . . if any non-native species are to be re-planted.*

Critical habitat has been designated within the Kohala Watershed Management Area for 3 Endangered plants of Hawai'i island (*Achyranthes mutica, Phyllostegia warshaueri, Clermontia drepanomorpha*). No section seven consultations have been initiated to date, as there has been no Federal involvement (permits, funding) to date. However, the DEA has been provided to the U.S. Fish and Wildlife Service for review and any determinations made by them for permit or section seven consultation will be followed. In addition, if Federal funds are received in the future, it is anticipated that the FWS will conduct a section seven consultation at that time. During fence line determination, if any threatened or endangered species are found, the US Fish and Wildlife Service will be notified, and fences will be re-routed to enclose populations within the fenced unit. Only native species will be planted.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

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

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2008-FA-0055
2008-TA-0112
2008-B-0015

FEB 2 2 2008

Ms. Melora K. Purell
Kohala Watershed Partnership
19 E. Kawili St.
Hilo, Hawaii 96720

Subject: Comments on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Plan

Dear Ms. Purell:

Thank you for the opportunity to comment on the draft Environmental Assessment (EA) for the Kohala Mountain Watershed Management Plan. The main objective of the 20-year plan is to protect the health of the watershed comprised of 65,000 acres of public and private lands. The plan identifies "high yield watershed units" and "biodiversity units" in which management activities such as fencing, ungulate removal, and weed and pest control will occur. The plan identifies actions such as trail maintenance, native forest restoration, fire management, and surveys which will occur in areas throughout the watershed. Public outreach and education are also key components of the plan.

To assist us in identifying potential impacts to federally listed threatened and endangered species, and designated critical habitat we recommend the following items be incorporated into the final EA.

- Describe biological survey methods for the fence line boundary survey in greater detail.
- Describe methods for the post-fencing species and habitat monitoring in greater detail.
- Identify species-specific surveys that may need to be conducted for each fencing unit.
- Hire a qualified seabird biologist to assist in fence line boundary surveys in areas where endangered seabirds may be present. If burrows are found, every effort should be made to assess the boundaries of the seabird colony and include it in the fenced area. Avoid fencing during the endangered seabird nesting season (May-November).

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- To avoid impacts to the endangered Hawaiian Hoary bat (*Lasiurus cinereus semotus*), no woody plants suitable for bat roosting should be removed or trimmed during the bat birthing and pup rearing season (April to August) and barbed wire should not be used in fence design.

With regard to protection of species listed under the Endangered Species Act (ESA), the EA is programmatic in nature and is a planning document. If, as project planning progresses, you determine the project may adversely impact federally listed species or critical habitats, please contact our office for further assistance. If you have questions regarding these comments, please contact Megan Laut, Fish and Wildlife Biologist, Consultation and Technical Assistance Program (phone: 808-792-9400, fax: 808-792-9581).

Sincerely,

Patrick Leonard
Field Supervisor

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

P.O. Box 437182
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phone: 808/333-0976
email: Coordinator@kohalawatershed.org
website: www.hawp.org

October 15, 2008

Patrick Leonard, Field Supervisor
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, HI 96850

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Leonard:

Thank you for the comments from you and your staff of February 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have responded to your comments (summarized in italics) below:

1) *To assist [USFWS] in identifying potential impacts to federally listed threatened and endangered species, and critical habitat we recommend the following items be incorporated in the final EA:*

a) describe biological survey methods for the fence line boundary survey in greater detail...hire a qualified seabird biologist to assist in fence line boundary surveys in areas where endangered seabirds may be present. If burrows are found, every effort should be made to assess the boundaries of the seabird colony and include it in the fenced areas. Avoid fencing during the endangered seabird nesting season (May-November)..avoid impacts to the endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus), no woody plants suitable for bat roosting should be removed or trimmed during the bat birthing and pup rearing season (April to August) and barbed wire should not be used in fence design..

While we are determining the fence line boundary, we will identify potential threatened and endangered species that may be encountered by developing the proposed alignment in cooperation with biologists familiar with the area and with the rare plants and animals of the Kohala mountains, flagging the proposed fenceline, and conducting a final survey of the area within 10 feet of the fence alignment by qualified biologists to ensure that no rare plants remain within the corridor. If threatened or endangered species are found during the survey, we will re-route the fence line to avoid harm to these species, and we will notify the appropriate agencies.

Additionally, in potential areas for endangered seabirds, seabird biologists will be contacted to assist in surveys, and if birds are found, fencing will not be conducted during nesting seasons. To avoid impacts to endangered Hawaiian bats, woody plants suitable for bat roosting will not be removed during bat birthing and pup rearing season, and barbed wire will not be used on the tops of fences, except in cases where cattle (feral and/or domestic) are being excluded (cattle are one of the major threats to the forested watershed). However, these fences will be also be flagged and/or taped at the top to serve as visual aids for avian and bat fauna and regular post-fencing monitoring will be conducted to assess potential impacts.

b) describe methods for the post-fencing species and habitat monitoring in detail.

Threatened or endangered species that have been found within the management units will be identified, mapped and recorded. Along with ungulate and weed management, we will be monitoring these species to measure recovery in the post-fencing period. As part of regular fence maintenance, monitoring for potential species impact will also occur. The monitoring protocol has not yet been finalized, but will be developed and modified through further communication with other watershed partnerships and land managers to ensure that monitoring is both effective and efficient.

c) Identify species-specific surveys that may need to be conducted for each fencing unit..

Species-specific surveys will be conducted in areas like the windward slopes, where plant and bird survey data are lacking.

All responses above will be, as recommended, included in the final EA.

Thank you again for your participation in the environmental review process. We appreciate your time, thoughtful comments, as well as your offer of further assistance to determine species and critical habitat impacts. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

ISLAND TRANSITIONS LLC

February 21, 2008

Kohala Watershed Partnership
c/o 19 E. Kawili Street
Hilo, HI 96720

SUBJECT: Draft Environmental Assessment for Kohala Mountain Watershed Management Project

Dear Kohala Watershed Partnership:

I agree with your goal of maintaining a healthy watershed. It is vital to the health of our people and environment.

Your DEA refers to "new" accesses and boardwalk(s) that are planned but does not address what your intentions are for the many existing accesses and trails crossing private and publicly owned lands that have been used for generations. How will the Partnership decide which existing trails and accesses will be closed or controlled? Will trail and access users be consulted and what methods will be used to obtain their input? The DEA should clarify how you will develop management decisions that will hopefully improve people's ability to access and responsibly enjoy the Kohala Mountains.

The average reported harvest of pigs in the entire Kohala Mountain public hunting areas of "53 animals/year" seems quite low (p. 23-24). Could this in part be due to insufficient access for hunters? It is striking that Map 3 in the DEA shows only three (3) public access points for the entire 65,000-acre subject area. Does the management project intend to improve hunter access to hunting areas so that more pigs can be removed through public hunting?

There have been problems in the past with ecotourism businesses gaining access without permits into public lands via private lands. Will this management project seek to curtail unpermitted commercial uses of public land? Will DLNR's Policy for Commercial Activities and its "hierarchy of priorities" be observed where public lands are concerned?

What will this project do to prevent the spread of Madagascar fireweed into the forest? It is already widespread on privately owned pasture lands. Will private funds and resources be used in eradication and control efforts? Which invasive species are of highest priority?

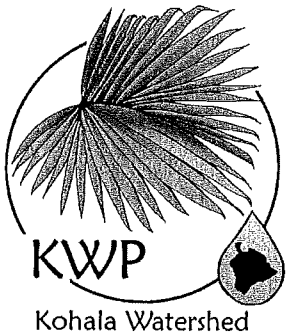
Thank you for the opportunity to review this important project. I look forward to your response to these questions.

Sincerely,

Deborah L. Chang

c: ✓DLNR
OEQC

Deborah L. Chang, LSW · *Principal Planner* · *Specializing In Trails & Access Issues*
P.O. Box 202 · Pa`auilo, Hi 96776-0202 · (808) 776-1516 · hkulaiwi@yahoo.com



October 15, 2008

Deborah Chang
Island Transitions, LLC
P.O. Box 202
Pa'auilo, Hawaii 96776-0202

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Ms. Chang:

Thank you for your comments of February 21, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

The Kohala Watershed Partnership (KWP) appreciates your support for the goal of maintaining a healthy watershed. We have responded to your comments and questions (summarized in italics) below:

1.) *Your DEA . . . does not address what your intentions are for the many existing accesses and trails ... that have been used for generations. How will the Partnership decide which existing trails and access will be closed or controlled? Will trail and access users be consulted and what methods will be used to obtain their input? The DEA should clarify how you will develop management decisions that will hopefully improve people's ability to access and responsibly enjoy the Kohala Mountains.*

The existing trails and access in the area is still being catalogued by the Kohala Watershed Partnership and the information presented in the DEA is the best information we have to date. The KWP recognizes that such information will need to be continually updated as KWP continues its management in the area and continues its dialogue with additional groups and individuals. This new information will be incorporated as part of KWP's adaptive management and continue to build on our knowledge of trails and access.

The Kohala Watershed Partnership, as outlined in our management plan, supports and encourages forms of public use in areas where it is compatible with conservation of water and water-related values. Under Goal #6: Manage Access for Compatible Public Use, several objectives and actions are laid out on how this will be accomplished. The public lands already have a process concerning decision-making regarding trail and access and the private landowners within the partnership do as well. The management plan and landowner processes identified above are how management decisions will be developed concerning trails and access closure/control and this will be made clearer in the final EA as requested.

Regarding user input and methods for input, we have already been in contact with the Access Focus Group of the Community Development Plan in North Kohala, as well as community members in Waimea, who will help us identify specific historic access points and trails. Through this EA process, we welcome continued dialogue with those who

Parker Ranch
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Ponoholo Ranch
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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

P.O. Box 437182
Kamuela, HI 96743

phone: 808/333-0976
email: Coordinator@kohalawatershed.org
website: www.hawp.org

have written to us about this issue. Additional ways KWP intends to continue this dialogue is through making the coordinator available to meet with people, present at groups, and conducting community outreach. Since most of the landowning members in the partnership are part of the Kohala community, the KWP commitment to continuing this dialogue is strong.

2.) *The average reported harvest of pigs in the entire Kohala Mountain public hunting areas of "53 animals per year" seems quite low. Could this in part be due to insufficient access for hunters?. . . only three public access points for the entire. . . area. Does the management project intend to improve hunter access?*

Limited access may be one reason for the low reported pig harvest on Kohala Mountain, but State wildlife managers and local hunters inform us that a more common reason is that hunters under-report their take. There is a general feeling that lower reported harvests will guarantee continued unrestricted hunting access to the area. Because of this, it has been very difficult for state game managers across Hawai'i to accurately record data on pig populations, hunting success and harvests.

As stated in the response to comment #1 above, the Kohala Watershed Partnership, as outlined in our management plan, supports and encourages forms of public use in areas where it is compatible with conservation of water and water related values. Under Goal #6: Manage Access for Compatible Public Use the first objective 6a) states "support continued public hunting on DLNR managed lands, where compatible with the conservation of water and related watershed values with one of the recommended actions being "develop new access for public hunting on public lands." In addition, our private landowners such as Parker Ranch, also have established hunting programs which they will continue to provide access to hunters on private lands. Our DEA also identifies on page 12 that where feasible (e.g. terrain and safety conditions), feral ungulate control measures will involve public hunters as the first phase in any control work.

3.) *There have been problems in the past with ecotourism businesses gaining access without permits into public lands via private lands. Will this management project seek to curtail unpermitted commercial uses of public land? Will DLNR's Policy for Commercial Activities and its "hierarchy of priorities" be observed where public lands are concerned?*

The KWP agrees that unpermitted/unauthorized commercial use on any lands is to be discouraged and could pose threats to the resources, The KWP will work within each landowners' established processes/policies to discourage such use. By conducting management activities and monitoring, KWP staff are another resource and extra pair of ears and eyes for documenting such activities and bringing them to the landowner's attention. The KWP can assist identified personnel from Division of Forestry and Wildlife and DLNR's DOCARE regarding illegal activities on state lands.

4.) *What will this project do to prevent the spread of Madagascar fireweed into the forest? Will private funds and resources be used in eradication and control efforts? Which invasive species are of highest priority?*

Staff and partners of the KWP support preventing the spread of Madagascar fireweed (*Senecio madagascarensis*), as well as other invasive species, into the forest by following basic protocols that include cleaning boots and equipment before entering the forest. Currently, KWP partners use their own resources to control fireweed and other invasive plants on their lands with both herbicides and mechanical controls, and with the use of sheep in their paddock rotations. The KWP supports ongoing research by the USDA into a biological control for fireweed, as this is the most effective way to limit its population in the long-term.

The invasive species of highest priority are those that can reduce native biodiversity or alter the balanced functioning of ecosystems. These species include coqui frogs, snakes, miconia, clidemia, cane tibouchina, strawberry guava, kahili ginger, Australian tree fern, banana poka, albezia, Himalayan raspberry, and faya tree.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

My comments regarding management of the Kohala Mountain Watershed:

I agree with the threats and most mgmt. goals but believe that increasing public access to the watershed would vast our communities with an increased interest in protecting both the watershed and surrounding lands. Post informative signs on new pedestrian trails.

Thank you,

Terry LADWIG

KWP
Kohala Watershed
PARTNERSHIP

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Kamehameha Schools

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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

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email: Coordinator@kohalawatershed.org
website: www.hawp.org

October 15, 2008

Terry Ladwig
P.O. Box 926
Kamuela, Hawaii 96743

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North Kohala District, Hawai'i

Dear Terry Ladwig:

Thank you for your comments of February 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We appreciate your support and agreement with the threats and most management goals outlined in the DEA. You also stated "[I] believe that increasing public access to the watershed would vest our communities with the increased interest in protecting both the watershed and surrounding lands. Post informative signs on new pedestrian trails."

The Kohala Watershed Partnership (KWP) agrees with you about the need for vesting communities with increased interest in protecting both the watershed and surrounding lands. As one way to increase interest in the community in conservation, we have developed a volunteer work force to help with management projects, held workshops and talks at schools, local events, and different community forums, and met individually with interested community members,

The issue of access to Kohala Mountain is addressed in our management plan as Management Goal #6: Manage Access for Compatible Public Use. The objectives and actions outlined include supporting public hunting on DLNR-managed lands where compatible with the conservation of water and related watershed values by establishing and maintaining suitable hunting and hiking access trails and enhancing signage (as you suggested), and permitting public access to and over private property. In addition, we have been in contact with the Access Focus Group of the Community Development Plan in North Kohala, as well as community members in Waimea, who will help us identify specific historic access points and trails. Historical access points and trails will be included in a map in the final environmental assessment, along with an identified process for continued community involvement.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments.We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora Purell
Coordinator, Kohala Watershed Partnership

Protecting and sustaining the forest, the water and the people of Kohala.

February 21, 2008

To Whom It May Concern:

My name is Pua Case. Born and raised in Waimea I am the Hawaiian Studies Teacher at Waimea Middle School, Kumu Hula of a traditional Halau and cultural practitioner in the community.

As I read through the Watershed Management Plan and Proposal, although I found that my name was listed as a concerned participant at a Waimea Community Meeting, my actual concerns as well as the concerns of other affected parties are not accurately reflected throughout the report. In fact, seeing my name may give the false impression that we helped to create this plan or condone by those whom we represent and I wish it to be noted that I in no way support fencing or eradication of our land.

We, cultural practitioners, stewards of the land, native environmentalists and hunters have continually voiced not just our concerns but presented direct and accurate testimony on many aspects of the negative impacts from fencing the land in those areas designated in the report, impact of eradicating not only the pig as a food source but also as eradication of traditional practices associated with the pig and the impact and negative changes to the environment by both fencing and eradication.

May you be reminded of the situation in the Kohala Mountains where the fence was discovered and taken down by myself and others because of the detrimental impact it created in the forested area. So much is made of the preservation of native plants in the forest but believe me I have seen the destruction created by fences to the ecosystem and the lack of maintenance causing potential drought and blockages to the streams.

We have continually attempted to educate those who will be directly involved in eradicating our way of life with factual information of how the pua'a was and still is viewed by native peoples and what could happen if eradication occurs. I speak as the daughter of an expert in water systems and thus know of the intricacies of the water cycle and potential overgrowth of the forest and the consequences of that.

The concerns from cultural practitioners reflected in this report centered on gathering of plant materials and while that is true, it was just one small area in a much wider range of concerns we have presented over this entire process of meeting.

We as educators are schooling our children on sustainability practices, on interdependence between the forest, ocean and ourselves, positive stewardship practices and in way and no time do we teach about eradication in an island environment; killing the animal that feeds us.

I am extremely disappointed that the concerns we have voiced over time are not presented as we have voiced them. I could list them all over again but have already done so in too many meetings to remember. It is said by the kupuna, "Ia 'oe ka hewa," You have been told, yours will be to answer for the impact to the forest and all in it. I stand with the forest. Pua Case

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Hawai'i Department of Land & Natural Resources

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website: www.hawp.org

October 15, 2008

Pua Case
P.O. Box 6918
Kamuela, HI 96743

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Ms. Case:

Thank you for the comments of February 21, 2008 on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have responded to your comments (summarized in italics) below:

1.) *I wish it to be noted that I in no way support fencing or eradication of our land.*

For the final EA, all names of those who attended open houses have been removed, but their input and comments are still contained in Appendix C.

2) *We... have continually voiced not just our concerns but presented direct and accurate testimony on many aspects of the negative impacts from fencing the land in those areas designated in the report, impact of eradicating not only the pig as a food source but also as eradication of traditional practices associated with the pig and the impact and negative changes to the environment by both fencing and eradication.*

We acknowledge your opposition to fencing and animal removal from priority high-yield water areas and important biodiversity units, but respectfully disagree. Years of research by federal and state agencies such as the National Park Service have demonstrated that feral animals damage the native forest by trampling, eating and uprooting vegetation and impair the ability of the forest to absorb water and that fencing, combined with animal removal, effectively enables the forest to heal itself. We would like to point out that only 15% of the total project area of 65,000 acres is proposed for fencing and that these areas are generally located in remote areas not regularly accessed by people. Animals will not be eradicated in the remaining project area, but will remain available for public hunting and/or other traditional practices. We believe the proposed fencing is necessary for the long-term protection of forest function and species biodiversity, and at the same time ensures the continued exercise of traditional and customary practices within the Kohala mountains.

3) May you be reminded of the situation in the Kohala Mountains where the fence was discovered and taken down by myself and others because of the detrimental impact it created in the forested area. So much is made of the preservation of native plants but believe me I have seen the destruction created by fences to the ecosystem and the lack of maintenance causing potential drought and blockage to the streams.

The fence alignments proposed in the current management plan and discussed in the DEA were selected after careful review of the anticipated benefits and expected impacts of the fencing. We are not proposing to re-build previously removed fencing, but have focused on areas in great need of protection from feral animals where impacts on the forest or on streams can be minimized. We acknowledge that your comment was also raised by participants in the April open houses, and the DEA (pages 11-12 and 26) outlines additional steps by which the Kohala Watershed Partnership will address the concerns raised: staff will be checking fences near or across streams after major storms for possible debris accumulation, KWP will avoid streams where possible when finalizing fence lines, and we will consider different technologies for barrier construction where streams are present and select the method most suitable for keeping out feral ungulates, yet allowing the stream to flow and not causing buildup of materials. Additional ways in which the DEA addressees concerns expressed at the April open houses are outlined in appendix C. In addition, the management plan, on which the DEA is based, was developed by building on previous initiatives dating back to 1992 to involve communities and representatives such as native Hawaiians, landowners, hunters, recreational users, researchers, and conservationists concerning watershed and forest management in the region.

As these initiatives show, the Kohala Watershed Partnership has worked hard to gather information from communities and individuals on which to base its management plan and actions as outlined in the DEA. We are committed to carrying on this dialogue by sharing our work with associations, schools, community groups, individuals including yourself, at outreach events and activities, and other ways. Continuing such conversations allow us to learn new/more information to help us to assess and reflect on ongoing management actions.

4) We have continually attempted to educate those who will be directly involved in eradicating our way of life with factual information of how the pua'a was and still is viewed by native peoples and what could happen if eradication occurs.

The input from all the community meetings over the past 16 years has made it clear that hunting for pigs is important to the traditions of many families of Kohala Mountain. Again, the management plan does not propose eradicating the pig from the mountain; instead, a few high-priority areas (high-yield water areas and areas of unique biodiversity) have been identified for fencing and animal removal. This represents less than 15% of the forest and is largely composed of areas that are remote and in most cases, the least hunted areas on the mountain. More than 26,000 acres of accessible public lands will remain unfenced and open to public hunting and the partnership is committed to working with the community to maintain access to make hunting productive for local families and the forest accessible for other cultural uses.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

From: "Brooks K. Rownd" <bkr@speakeasy.net>
Subject: **Re: Kohala Watershed Partnership Draft Environmental Assessment**
Date: February 25, 2008 10:56:53 AM HST
To: "Melora K. Purell" <Melora@Purells.net>
Reply-To: bkr@speakeasy.net

On Jan 30, 2008 at 09:10AM (-1000), Melora K. Purell said:

> Aloha KWP volunteers, friends, neighbors and other interested parties,
> The Draft Environmental Assessment (EA) for the KWP Management Plan
> has been published, and is open for public review and comment.

Comments on the draft Kohala Mountain Watershed Management Plan:

I am delighted to see the new draft Kohala Watershed Partnership management plan. Active protection and management of Hawai'i's remaining native forests is essential to protect our vanishing native flora and fauna from extinction due to habitat loss and the invasion of a growing number of agressive alien species, and to improve our quality of life and our understanding of native ecosystems. It is particularly important to fence, restore and manage a variety of key native habitats, to protect sensitive native plants and soils from destructive grazing and rooting by pigs, sheep and cattle. Rather than protecting a small collection of relic species in small enclosures, fencing whole intact habitats protects native forests as a complete functioning ecosystem, from soil to understory to canopy. This intact community will resist invasive species better, and provide a rich food chain to support our rare native animals.

Protected native ecosystems also enrich our quality of life by preserving Hawai'i's unique natural identity, providing recreational and educational opportunities in a far richer and more beautiful natural environment, and reducing the spread of weed and pest species. I have participated in many volunteer conservation activities on Kohala through the Kohala Watershed Partnership, where we removed smothering invasive weeds from conservation units, and collected native seeds for future planting. We visited several interesting natural areas, where I have been able to see and learn about many of Kohala's unique species and habitats for the first time. I hope that these rewarding conservation and education efforts are expanded, and that volunteer opportunities will help involve the community in appreciating and protecting Kohala's natural areas. I also hope that the small fenced units outlined in this managment plan will continue to grow, into a larger network of fenced units in the future, which will protect as many of Kohala's natural treasures as possible. It is important to remember that we must be proactive in protecting our native flora, fauna and ecology now, because once it is lost it will be gone forever.

KWP
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website: www.hawp.org

October 15, 2008

Brooks Rownd
152 Ainaola Drive
Hilo, HI 96720

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mr. Rownd:

Thank you for your comments of February 23, 2008 on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

The Kohala Watershed Partnership (KWP) appreciates your support of the management plan and management actions as outlined in the DEA. We too agree that we must be proactive in protecting native flora, fauna and ecology because as you stated, once it is lost, it will be gone forever. Other areas of specific actions voiced by your comment letter (italicized) and in which we are in agreement:

- [Need for] *protection and management of native forests...from habitat loss and the invasion of a growing number of aggressive alien species...to improve our quality of life and our understanding of native ecosystems.*
- [Need to] *fence, restore and manage a variety of key native habitats, to protect sensitive native plants and soils from destructive grazing and rooting by pigs, sheep and cattle.*
- [Need to] *fence whole intact habitats protects native forests as complete functioning ecosystem, from soil to understory to canopy.*

We also agree with you about the need for expanding volunteer opportunities to to help involved the community in furthering appreciation and protection for Kohala's natural areas. We plan to include more school groups and community members in our work days as well as for planning future outplanting and restoration projects. We also have a nature day camp that teaches children about native species.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership

Protecting and sustaining the forest, the water and the people of Kohala.

From: "merek" <merek@hialoha.net>
Subject: **Thank you for the Watershed ongoing protection**
Date: January 31, 2008 6:52:42 AM HST
To: <Melora@Purells.net>
Cc: "Angela Rosa" <essentialhealth@webtv.net>, "Bob Martin" <bobmartin@wave.bicv.net>, "Col Jim Channon" <arcturusjim@hotmail.com>

Good morning, I think your plan to preserve Kohala Mountain watersheds is commendable BUT only if you prevent ALL spraying of Pesticides or Herbicides
in North Kohala's public lands,roads and Watersheds,, Cancer clusters are far above normal on Kynnersley Rd. below the old sugar lands .I have witnessed excessive and dangerous spraying continuing along County roads ,many workers have no safety equipment and spray Rodeo and other substances banned in Alaska and Western states.
Should this continue as official policy We will be forced to sue and move for Pecuniary Damages.Excessive and dangerous activities are still continuing ! When mechanical cutting of road sides becomes offical policy we will have protected oldsters and children and ended these policies that were a result of uncaring and dangerous sugar farming practices.....Please keep me posted ,,,,,Capt. Merek "Ed" Mura ,West Hawaii Veterans....PO Box 1156 Kapaau Hawaii....96755

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

P.O. Box 437182
Kamuela, HI 96743

phone: 808/333-0976
email: Coordinator@kohalawatershed.org
website: www.hawp.org

October 15, 2008

Captain Merek "Ed" Mura
P.O. Box 1156
Kapa'au Hawaii 96755

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Capt. Mura:

Thank you for your email comments of January 31, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have responded to your comments (summarized in italics) below:

I think your plan to preserve Kohala Mountain watershed is commendable BUT only if you prevent ALL spraying of Pesticides or Herbicides in North Kohala's public lands, roads and Watersheds.

Invasive plants will be managed using multiple methods that include mechanical, chemical, and biological controls. For chemical control, this method is used when mechanical control methods are not feasible or when biological controls are not feasible. Use of herbicides will be restricted to specific, short-term applications in the forest, when mechanical and biological controls alone are not effective in controlling a noxious invasive species. For example, the control of kahili ginger will entail cutting stems, followed by a one-time application of a squirt of Escort herbicide on the cut stem. Our use of pesticides within the watershed will always follow safety labels, and our workers will wear protective gear. Also, as stated in the DEA, herbicide selection will limit use to those approved for use in or near water bodies with strict adherence to labeling instructions and product guidelines. In addition, staff are trained in the use of such chemical controls.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora Purell
Coordinator, Kohala Watershed Partnership

Protecting and sustaining the forest, the water and the people of Kohala.

Feb. 20, 2008

P.O. Box 261
Hawi 96719

To Whom It May Concern,

I'm a resident of North Kohala. I've been an active participant in The North Kohala Community Development Plan a County project where by we're discussing and planning Kohala's Future.

I'm part of an Access Focus Group re-claiming and re-opening Accesses throughout Kohala. We're talking trails, road ways, mauka and makai, to lateral shore-line accesses.

It was brought to our group's attention (2-13-08) that there was a project to fence thousand's of acres of the Kohala Mountain Watershed Area, the removal of hoofed animals, & protect the Hawaiian snail, the creation of new trails and we had until 02-22-08 to give testimony Excuse Me!! Why weren't we, the North Kohala Community included in this Kohala Watershed Projects Master Plan? How Rude!!. How Criminal!!

How does this non profit Kohala Center get the job of fencing and baseline survey's of animals, vegetation and snail population?. Their also incharge of removing hoofed animals?. The feral horses, mules, and cattle belong to the ranchers, so why don't they remove them?. What? so the non-profit hires and pays the cowboy to remove his own livestock? Sounds like a good deal!!.

In regards to the pig? The Ahupua'a land division was marked by an Ahu or pile of stones on which a ritual offering of a pig or image of a pig was laid as a tribute to the Chief for use of the lands.

The Ahupua'a has an interesting etymology. The history of a linguistic form (as a word) shown by tracing its development since its earliest recorded occurrence in the language where

it is found by tracing its transmission from one language to another by analyzing it into its component parts by identifying the cognates (related by descent from the same ancestral language) to a common ancestral form in an ancestral language. So you see the pig has always played an important role in Our Culture they have always belong!!

So the Hawaiian tree snail justifies the fencing of the entire mountain? You fencing the Snail in or fencing US OUT?.

I try not to make things personal because most don't want to hear the Hawaiian issues of Rights!!. What most don't know is its not just a Hawaiian thing it is personal. That's why the passion.

My family are the Harbottle's and we're heirs to the following lands located in the Kohala Mountains and your project will have an impact on my family lands not to mention the entire Mountain. Working at the Crown of the Mountain fecal matter has never been known to go up hill.

TMK# 5-1-01-1 Ahupua'a of Awini TMK# 5-1-02-6 & 14 The Crown Lands of Pololu. I'm mentioning this ~~is~~ BECAUSE, aside from Kamehameha Schools, another Hawaiian Family and the Harbottle's we all have held Our Intrests and Rights since IMMEMORIAL!!. You folks understand? Before Territory, before State, before County, before Kohala Center and Partners!!.

You folks got your priorities mixed up. As Hawaiian we are an Endangered Species yet a snail takes precedent over us people. That's so wrong!!. And one more thing lets be real its about the WATER its always been about the WATER!!.

Aloha

Nancine E. N. Lloyd

OUR FAMILY ANCESTRAL LANDS

THE LANDS OF MY ANCESTOR'S: OLD AND BAITING,
ENDANGERED BY GREED AND OVERWHELMING TEMPTATION.
WHAT SHALL BE LEFT FOR FUTURE GENERATION'S?
GENETICALLY CONNECTED -- LEFT WITH INCONSIDERATION'S!
RUINATION, DESECRATION -- HOW MUCH MORE CAN SHE TAKE?
WHO'S RESPONSIBLE? FOR HER TERRIBLE FATE?
THE LANDS ARE IN JEOPARDY -- THEIR USED AND ABUSED,
BY SELFISH, UNCARING PEOPLE -- WHO DOES THAT INCLUDE?
CAPITALIST'S?, GOV'T AGENCIES?, PRIVATE SECT'S?,
RUDE, CRUDE AND SHAMEFUL -- NO RESPECT!
STOP, LOOK AND LISTEN -- THEN TAKE HEED,
THE LOST OF THE KOHALA MOUNTAINS, IS A COSTLY DEED.
CAN"T ALLOW HER OVER USE, BY ABUSING HER WATER,
HER MOST FERTILE FRUIT.
HAPPENING UNDER A SHROUD OF PROGRESS?
NOT FOR THE MOUNTAINS, BUT FOR PROFIT!
WHAT OF THE FLORA?, THE FAUNA?, THE FOWL? NO MORE?
AN AWFUL THOUGHT, A DEPLORABLE SORE.
RIVERS, WATERFALLS, AND STREAM BEDS ARE DRY!!
TAP, TAP, TAPPING THE MOUNTAINS GOING TO DIE!!
PROTECT AND PRESERVE? ENDANGERED? ENDEMIC?
THE O'OPU, LIKE US ARE BEING NEGLECTED.
"NO MORE WATER" "NO MORE LIFE",
"NO MORE USE" FOR "OUR GATHERING RIGHT'S".
LANDS ONCE LUSH, NOW RENDERED USELESS?
AN UNCONSCIONABLE ACT -- MERCILESS, CRUEL AND RUTHLESS.
WHO'S RESPONSIBLE FOR THIS INTRUSION?
BREAKING DOWN THE FAMILY UNION.
IT'S OUR LANDS, AND WE'RE NOT GOING AWAY,
NOR, WILL ANYONE! KEEP US AT BAY!
AWINI IS BEAUTIFUL -- SO FAR -- STILL ALIVE,
AS FOR POLOLU VALLEY?, SHE'S DYING A DAY AT A TIME.
ROGUE HORSES AND MULES, AGGRESSIVE AND MEAN,
RUNNING HAVOC, DANGEROUS TO LIFE, PROPERTY AND LIMB.
CONSTANTLY IGNORED -- NOW HUNTING PERMIT'S?
TRESPASSER'S AND ENCROACHER'S, INVADERS OF OUR PIECE/PEACE.
DICTATING, COERCING OUR LANDS, FROM OUR HANDS,
SINCE "IMMEMORIAL", WE'VE HAD TO MAKE A STAND!
SO WHAT'S TO HAPPEN? DOES ANYONE CARE?
I KEEP ASKING FOR HELP AND GET NO WHERE.
NOT JUST OUR LANDS ARE IN JEOPARDY, BUT,
THE MOUNTAINS, VALLEYS, AND STREAMS OF HAWAII!
SHE'S ALL OUR LANDS. WE'LL STAND AND FIGHT!
AS INDIGENOUS HAWAIIAN(S), WE ASSERT "OUR RIGHTS!".

1995

Nancine Lloyd

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

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email: Coordinator@kohalawatershed.org
website: www.hawp.org

October 15, 2008

Nancine E. H. Lloyd
P.O. Box 261
Hawi, Hawaii 96719

Subject: Comment Letter on Draft Environmental Assessment for Kohala Mountain Watershed Management Project, North and South Kohala and Hāmākua Districts, Hawai'i

Dear Mrs. Lloyd:

Thank you for your comments of February 20, 2008, on the Draft Environmental Assessment for the Kohala Mountain Watershed Management Project published in the Environmental Notice on January 23, 2008.

We have responded to your comments and questions (summarized in italics) below:

1) *Why weren't we, the North Kohala Community, included in this Kohala Watershed Projects Master Plan?*

The Kohala Watershed Partnership (KWP) is a voluntary alliance of private and public landowners dedicated to protecting the values and managing threats that occur across common land ownership boundaries across the Kohala region. The KWP developed a draft management plan, built on previous efforts going back to 1992 concerning watershed and forest management for the Kohala region *(see Appendix B in the DEA for a complete summary)*. Many of these were either community-based or involved representatives from the communities serving on task forces. Specific efforts to share the KWP management plan and DEA with communities was also done via informational open houses held in 2006 (for North Kohala, they were held at Kohala high school). In addition, since summer 2007, I have also been visiting schools and community groups and providing information to them about the management plan, including presentations to the Steering Committees for both North and South Kohala Community Development Plans. After the meeting with the Access Focus Group, and receiving comments from other people about the need for improved access, the KWP will include specific details of historic access routes in the management plan and EA (per the advice of the Focus Group).

The primary goal of the management plan is to protect the natural and cultural resources of the Kohala Mountains for future generations. The management plan, of which activities are presented in the DEA, is based on the recommendations of all of these previous efforts and community meetings along with the application of best management practices as learned from conservation activities across the State, including similar watershed management plans.

The DEA carries on this ongoing dialogue with communities to share its management plan and activities and to learn from others. Beyond the EA itself, the KWP plans to maintain this dialogue by meeting with community groups,

schools, individuals, and participating in events and outreach activities to continue garnering information in order to assess ongoing management activities.

2) How does this non-profit Kohala Center get the job of fencing and baseline survey's of animals, vegetation and snail populations...so the non-profit hires and pays the cowboy to remove his own livestock?

The Kohala Center (TKC) is the fiscal and human resources arm of the Kohala Watershed Partnership (KWP); they receive grants on behalf of the Kohala Watershed Partnership and handle accounting and personnel details only. The Kohala Watershed Partnership has its own staff as well as a core dedicated volunteer group to implement activities like fencing, surveys, and weed control. In addition, the Partners put their own time and money into conservation. For example, our partners have built fences, killed and trapped feral cattle, planted trees on pasture lands and in the forest, provided local hunter access, and conducted surveys. The Kohala Watershed Partnership is grant and donation based and is responsible for finding funding to conduct management activities.

3) So the Hawaiian tree snail justifies the fencing of the entire mountain. You fencing the Snail in or fencing US OUT?

Fencing is only one of the proposed management activities to occur on Kohala mountain. Control of invasive plants, removal of feral cattle, and improved public access are other important management activities planned to protect the water resources and the unique biodiversity found in Kohala for future generations. The Kohala Watershed Partnership does not plan to fence the entire mountain, but only 15% of the total project area of 65,000 acres.

Fencing to protect the *Partulina physa*, which can be found nowhere else in the world but in North Kohala, is only one reason for fencing. Other reasons are to protect the forested watershed from being trampled, eaten or uprooted by feral cattle, feral pigs, and other non-native animals. The damage caused by feral animals to the understory of the forest not only destroys the rare plants found there but harms the forest's ability to capture water. As stated in the DEA, units identified for fencing are high-water yield areas where rainfall is abundant, to best ensure a continued water supply, and units that have a high biodiversity, to best ensure that rare native species do not go extinct. Fencing is meant to mitigate the threats posed by feral animals in the most important areas for water and biodiversity, not to keep people out. Most of the forest will remain unfenced. Further, the DEA outlines that walk-overs and or unlocked gates will be installed along fencing at trails or other accessible locations to ensure that access by people is not obstructed.

Beyond the EA process, the Kohala Watershed Partnership will continue its dialogue with communities, schools, individuals and others to learn more so we can assess on-going management action. We hope to continue this conversation with and learn from you as well.

A native Hawaiian land manager in Ka'u once told me, "Hawaiian people are nothing without the land; it is their family and their life. But that land cannot be a palm tree-lined sidewalk in Waikiki; what our people need is the pristine native Hawaiian forest." This manager of privately-owned, ancestral Hawaiian lands is involved in fencing, feral animal eradication and weed control. Along with land managers across the state, the accepted modern protocol for protecting native forest is fencing and feral animal control. These actions are meant to keep the forest in its native state, and in this protected Hawaiian landscape, the people can find their spiritual and physical connections to the land, and from these lands, the

water will flow clean and abundant. This is why we are fencing areas of intact native forest on Kohala Mountain. But what about the pig?

The input from all the community meetings over the past 16 years has made it clear that hunting for pigs is important to the traditions of families of Kohala mountain. They see the pig is an important part of the culture, as well as a source of food for their families and the community. Their input into the plan can be seen in the fact that the public lands that are going to be fenced are the most remote and least hunted areas on the mountain. More than 27,000 acres of the more accessible public lands will continue to be managed for pig hunting. That is the commitment from the partnership for at least the next 20 years.

The Kohala Watershed Partnership formed by a voluntary agreement of the major land owners and land stewards on Kohala Mountain to work together to protect the native forest and the water. Although we have overall management goals for the entire watershed area, there are no specific actions that will be conducted outside of the lands that are owned or managed by KWP partners. Our management efforts will not impact your rights, use of, or access to your family lands in ʻĀwini or Pololū, now or in the future.

Thank you again for your participation in the environmental review process. We appreciate your time as well as thoughtful comments. We will be providing you with both the final environmental assessment as well as management plan. 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 Coordinator@kohalawatershed.org.

Yours sincerely,

Melora K. Purell
Coordinator, Kohala Watershed Partnership