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Technical Report 151

VASCULAR PLANT INVENTORY OF KA'ĀPAHU, HALEAKALĀ NATIONAL PARK

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ABSTRACT

Between 2002 and 2004, a vegetation survey was completed to document vascular plant species within the 598-ha (1,478-acre) parcel of Ka'āpahu, Haleakalā National Park. The results of this inventory provide a checklist for the area. Observations in this and previous surveys document two hundred and ninety-two vascular plant species in Ka'āpahu. Of all the taxa that have been documented, 157 (54%) are native, of which 110 are endemic and 47 are indigenous to the Hawaiian Islands. One hundred and thirty-five (46%) are non-native species, of which twelve species are Polynesian introductions. Two botanists surveyed routes within the Ka'āpahu parcel for species not found on the park checklist as well as federally listed and rare native species. Data were collected on the target species and the sites in which they were found. Two hundred and eighty-seven species were seen during this survey, resulting in the addition of eight species to the park checklist. Two of these are endemic and six are non-native species, one of which is a Polynesian introduction. Seven populations of four species listed as endangered by the U.S. Fish and Wildlife Service (USFWS) were found. Six populations of three species listed as candidates for endangered status by the USFWS were found. One population of a species listed by the USFWS as a species of concern (SOC) was recorded. Twenty-eight populations of 10 species rare to the park were documented. Based on site information, surveyors categorized vegetation types into five elevation zones.

INTRODUCTION

Flora and fauna taxa experts at the National Park Service (NPS) Biological Inventories Workshop held in Kailua-Kona, Hawai'i in January 2000 agreed that existing and historic inventories have documented over 90% of the vascular plants and mammals in the Hawai'i parks with the exception of recent land acquisitions. Following the workshop, the steering committee prioritized inventory needs for each park and identified inventories of vegetation, mammals and forest birds at Ka'āpahu, Haleakalā National Park (HALE) as a priority. The 598-ha (1,478-acre) Ka'āpahu parcel was acquired by the National Park Service in 1999. Management goals for Ka'āpahu have not been established and alternatives are currently being reviewed through an Environmental Assessment of an amendment to the HALE General Management Plan. Results of this inventory provide data to guide HALE management decisions for the area.

This report provides documentation and information about the vascular plant species observed during the inventory. A majority of the southwestern portion of Ka'āpahu has a mesic moisture regime at elevations not previously represented in HALE. Mesic is defined as a rainfall gradient intermediate between wet and dry (rainfall between 122-254 cm [48-100 in/year]). Because of this moisture regime and the steep terrain where feral ungulates may not have accessed, additional plant species were expected. The inventory intended to contribute to the goal of the NPS Inventory and Monitoring program to document 90% of vascular plant species in national parks. We targeted native and introduced vascular plant taxa that were not in the HALE species checklist (HALE unpubl. data, Medeiros et al. 1998). Target species also included native vascular plant species that are listed as threatened, endangered, candidate or species of concern (SOC) by the U.S. Fish and

Wildlife Service (USFWS) and those species considered rare in the park. Distributions of these native species and the most abundant non-native plant invaders were recorded. Finally, vegetation associations based on site information data were described.

The Study Area

Ka'āpahu is located on the southeastern slope of Haleakalā on the island of Maui in the Hāna District between two of the major erosional features on the island: Kaupō Gap to the west and Kīpahulu Valley to the east (Figure 1). Ka'āpahu is a rectangular finger of land that ranges in elevation from 1,280 m (4,200 ft) at the northwestern corner to 1,158 m (3,800 ft) at the northeastern corner and continues down to sea level. To the north is the Manawainui area of the park that contains native rainforest (HALE unpubl. data). The Pacific Ocean is on the southern boundary. The upper portion of the northeastern boundary is adjacent to the park's Kīpahulu Scientific Reserve. Kīpahulu was one of Hawai'i's first protected and managed rainforests. It is recovering remarkably from damage by non-native species due to management efforts (Anderson and Stone 1993). The western boundaries and the remainder of the eastern boundaries are surrounded by a combination of privately owned and Hawai'i State lands.

Geology and Soils

Topographically, Ka'āpahu consists of knife-edge ridges and steep-walled, inaccessible deep canyons eroded out of a landscape plunging to the sea. The oldest lava flows known from East Maui have been dated at 1.1 million years (Sherrod et al. 2007). The lava substrate of Ka'āpahu was formed in the post-shield volcanic stage and is of the Kula Volcanics, which span the period from 150,000 to 950,000 years ago (Sherrod et al. 2007). The flows of Ka'āpahu have been dated between 300,000 to 500,000 (Sherrod et al. 2007). Much of the topsoil is in jeopardy of washing away due to the impacts of feral animal activity.

Tributaries of three perennial streams, 'Alelele, Lelekea and Ka'āpahu, dissect the landscape and flow from the uplands to the coast. These streams make it impossible to contour across the ground from east to west as their canyons are inaccessible. Kalepa Stream is the western boundary. The ridge between Ka'āpahu and Kukui'ula streams is the eastern boundary. At 1,280 m (4,200 ft) on the northern boundary, two tributaries of 'Alelele Stream have carved valleys too deep to cross by foot and remain impassable all the way down to the coast.

Climate

The prevailing northeastern tradewinds bring rainfall throughout the year. Rainfall maps in *The Atlas of Hawai'i* indicate that Ka'āpahu receives between 152 to 305 cm (60 to 120 in) a year (Juvik and Juvik 1998). Three moisture regimes for classifying plant communities are distinguished by Gagne and Cuddihy (1990) in the Manual of Flowering Plants. These are: wet (rainfall greater than 254 cm [100 in]), mesic (rainfall between 122-254 cm [48-100 in]) and dry (rainfall less than 122 cm [48 in]). According to this scheme, the plant

community types in Ka'āpahu are within a lowland wet zone, a lowland mesic zone and a coastal mesic zone.

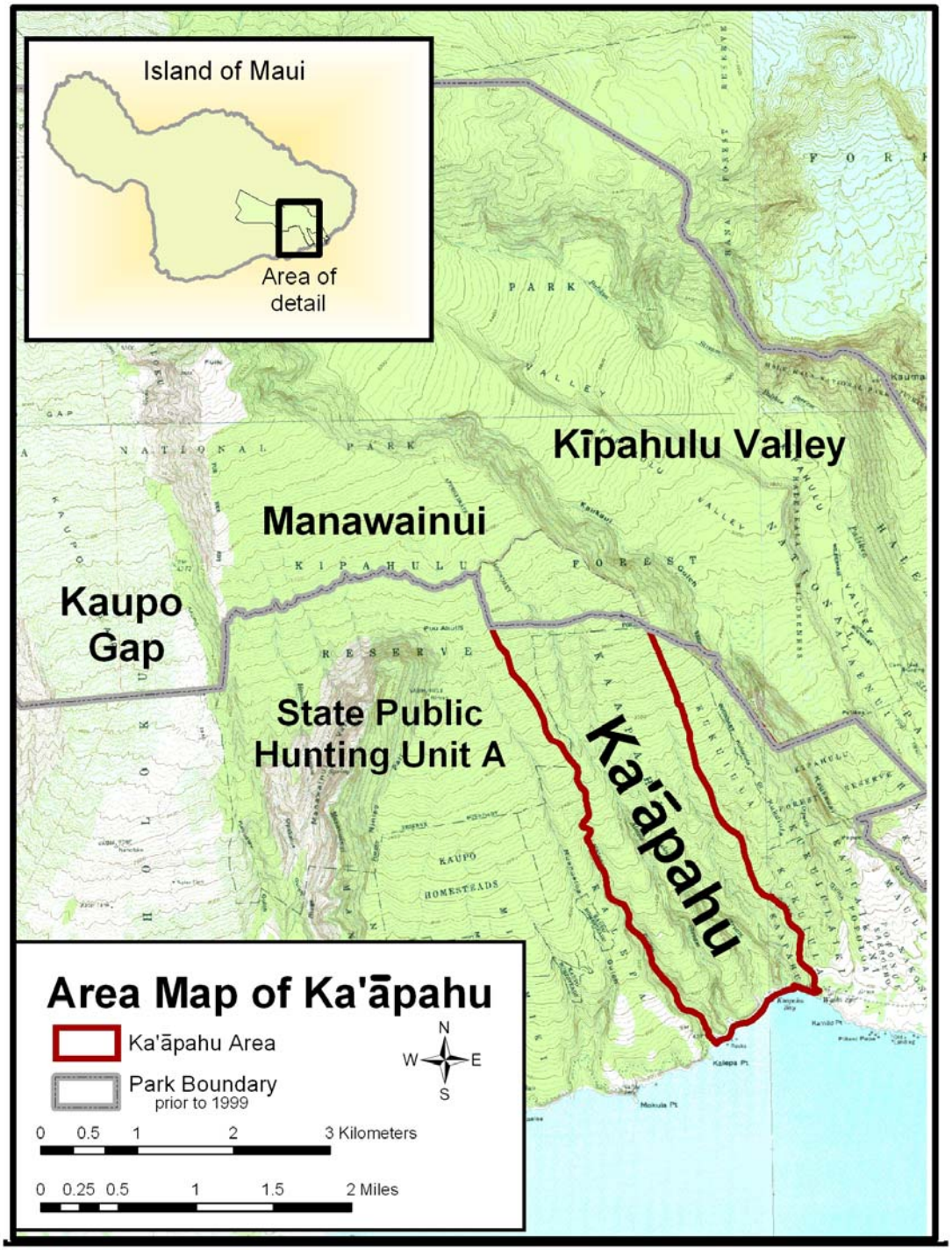

Figure 1. Location of Ka'āpahu, Haleakalā National Park, 2005.

History of Land Use

The original colonizers of the native Hawaiian flora and fauna evolved on the most isolated land mass in the world without the influence of mammalian herbivores and predators. Thus, they lost defensive mechanisms that protected them from threats and predation. Many species co-evolved and adaptively radiated into a multitude of niches and life forms in Hawai'i's diverse ecosystems with extreme elevation and moisture gradients (Carlquist 1965, 1980; Carr 1987). This enrichment by evolution resulted in the most endemic flora and fauna on Earth. Cuddihy and Stone (1990) provide a thorough review of human alteration of Hawaiian ecosystems. Since humans arrived, most of the lowlands have been altered and many plants and animals that came with humans escaped into upland natural areas, degrading and displacing original native ecosystems. Kornbacher (1993) provides historical background, a review of previous archeological investigations of Ka'āpahu, and an explanation of the surface inventory of structures in the lower coastal mesic forest portion. Some sites in the coastal lowlands predate 1776, which is evidence that native Hawaiians used the land prior to European contact and likely altered lowland plant communities in the area.

In recent history there have been no human settlements in the study area. A portion of the Kings' Highway dating from 1778 enters the western side at the coast in Kalepa and switchbacks up the ridge to 122 m (400 ft), then contours across 'Alelele Stream before it descends to the coast at Lelekea Bay. The trail was used to travel between Kaupō and Kīpahulu before the county road was constructed at the coast. This trail currently provides access for local pig and goat hunting on the lower ridges. Between 884 m and 1,280 m (2,900 ft and 4,200 ft), koa (*Acacia koa*), the dominant canopy tree, was selectively logged by the previous owners during the early 1990s. Large koa were felled and flown out to the coast by helicopter. Many cut logs remain in the area.

Previous Botanical Excursions

Park staff enthusiastically supported this land acquisition as it encompassed a variety of native plant communities and native birds that were reported from two preliminary botanical excursions in the area. Both of these visits began at the lower helicopter landing zone (LZ) that was used during koa logging at 960 m (3,150 ft). Another LZ that was used during koa logging is at 1,036 m (3,400 ft). During the first reconnaissance on August 18, 1994, staff hiked down a ridge to the coast and found species indicative of a mesic plant community that included lama (*Diospyros sandwicensis*), olopua (*Nestegis sandwicensis*) and alahe'e (*Psydrax odoratum*). On East Maui undisturbed native mesic plant communities are rare and are mostly unprotected. Prior to acquiring Ka'āpahu, this community type was unrepresented in HALE. Park staff on the second expedition on August 23-24, 1995, surveyed above the lower LZ and found an epiphytic fern ally which had not been described. It was later described as *Huperzia stemmermanniae* (Medeiros et al. 1996). This was found on the upper branches of a single 'ōhi'a hā (*Syzgium sandwicensis*) tree. Both of these brief surveys noted that there were relatively intact patches of koa forest remaining with a diverse native tree and shrub understory and a ground cover of native ferns, herbs and non-native grasses. Infestations of weeds were worse where koa had been felled and the canopy had been opened than in areas of intact canopy. The presence of pigs and goats was evident throughout the area.

METHODS

This survey of the vegetation of Ka'āpahu was conducted between 2002 and 2004. To become familiar with rare plants previously located in the area, the natural diversity database of the Hawai'i Natural Heritage Program (1998) was queried. Only two rare plants were recorded in the database, which indicates how few previous botanical surveys had been conducted in the area.

Prior to this survey, vegetation management staff reviewed a set of infrared aerial photographs from 1992 to view the landscape and to distinguish broad patterns of vegetation. The park GIS specialist generated a map using the USGS Digital Elevation Model shown in Figure 2 to facilitate planning the survey. The degree of the slope was categorized. The color scheme begins with green at zero degrees and grades into yellow, orange and red as the steepness increases to a 65-degree slope. The resulting map shows the extreme steepness of the gulches and the dissected terrain. Rare and new species were likely to be found on steep slopes inaccessible to feral ungulates. Primary survey routes were planned along ridges and where terrain was accessible. We incorporated a pre-existing I&M transect in our survey routes.

Helicopters were necessary to access the upper elevations due to the rugged and remote topography of Ka'āpahu. Figure 3 is a map showing all of the LZs, the routes and the I&M transect. In 2002, a LZ at 1,158 m (3,800 ft; Ka'āpahu LZ) near the upper eastern boundary of Ka'āpahu was opened. This LZ was used for access to the site via helicopter and to clear the overgrown vegetation at the 950 m (3,120 ft) lower koa logging LZ. Subsequently, this lower LZ was used as a base camp for tent camping for two trips. In 2004, another LZ ('Alelele LZ) was cleared on a ridge above a tributary to 'Alelele Gulch. The upper western area, Kalepa Ridge, was accessed from a LZ at 1,524 m (5,000 ft) elevation at Ohia Camp. No routes or trails were opened below 1,219 m (4,000 ft) elevation on the two western ridges because of the thick mat-forming fern, uluhe (*Dicranopteris linearis*). Uluhe forms a protective barrier between the forest at higher elevations and the abundant pig activity in forests at lower elevations. If a trail were cut through the uluhe, the path would allow feral animals to move into the upper forests.

Three ridges, Kalepa, 'Alelele and Kukui'ula, were all accessed from sea level. 'Alelele Ridge was too narrow and steep to pass above 427 m (1,400 ft) elevation. On Kalepa and Kukui'ula Ridges, staff walked as far upslope as could be done in a day from sea level and return. When terrain widened on the ridges a different route was taken on the return trip to survey additional areas. The incorporated I&M transect begins at 1,158 m (3,800 ft) and continues along the Lelekea Ridge with stations at 50 m (164 ft) intervals. Lelekea Ridge was surveyed from the upper elevations down because access from the coast was hazardous due to loose boulders. Waterfalls and impenetrable hau (*Hibiscus tiliaceus*) prevented the survey team from walking up the streams. Access into the tributaries of the three main streams from the ridges was impossible due to steep slopes and loose boulders.

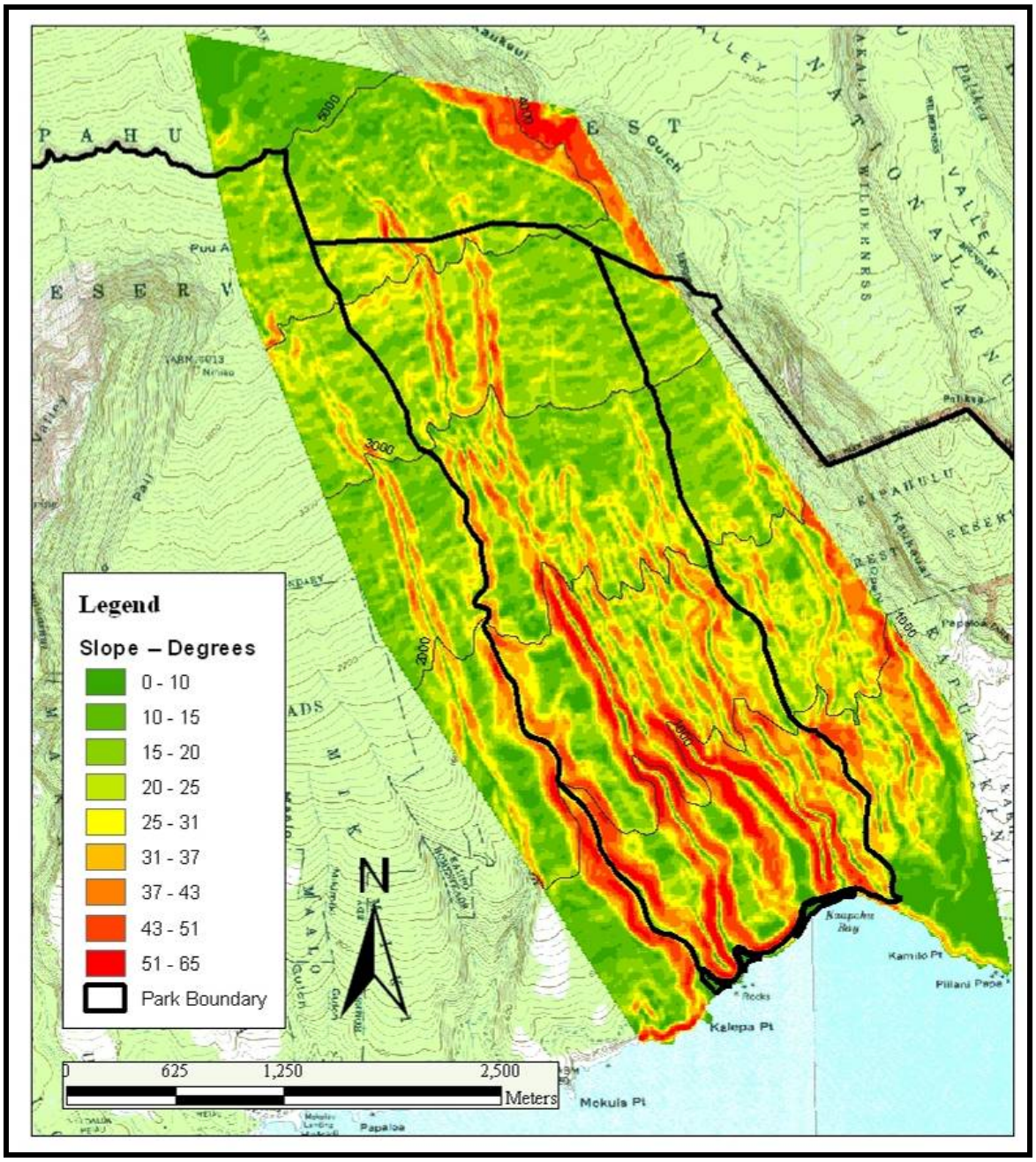

Figure 2. Inventory planning map with slope in degrees, Ka'āpahu, Haleakalā National Park, 2005.

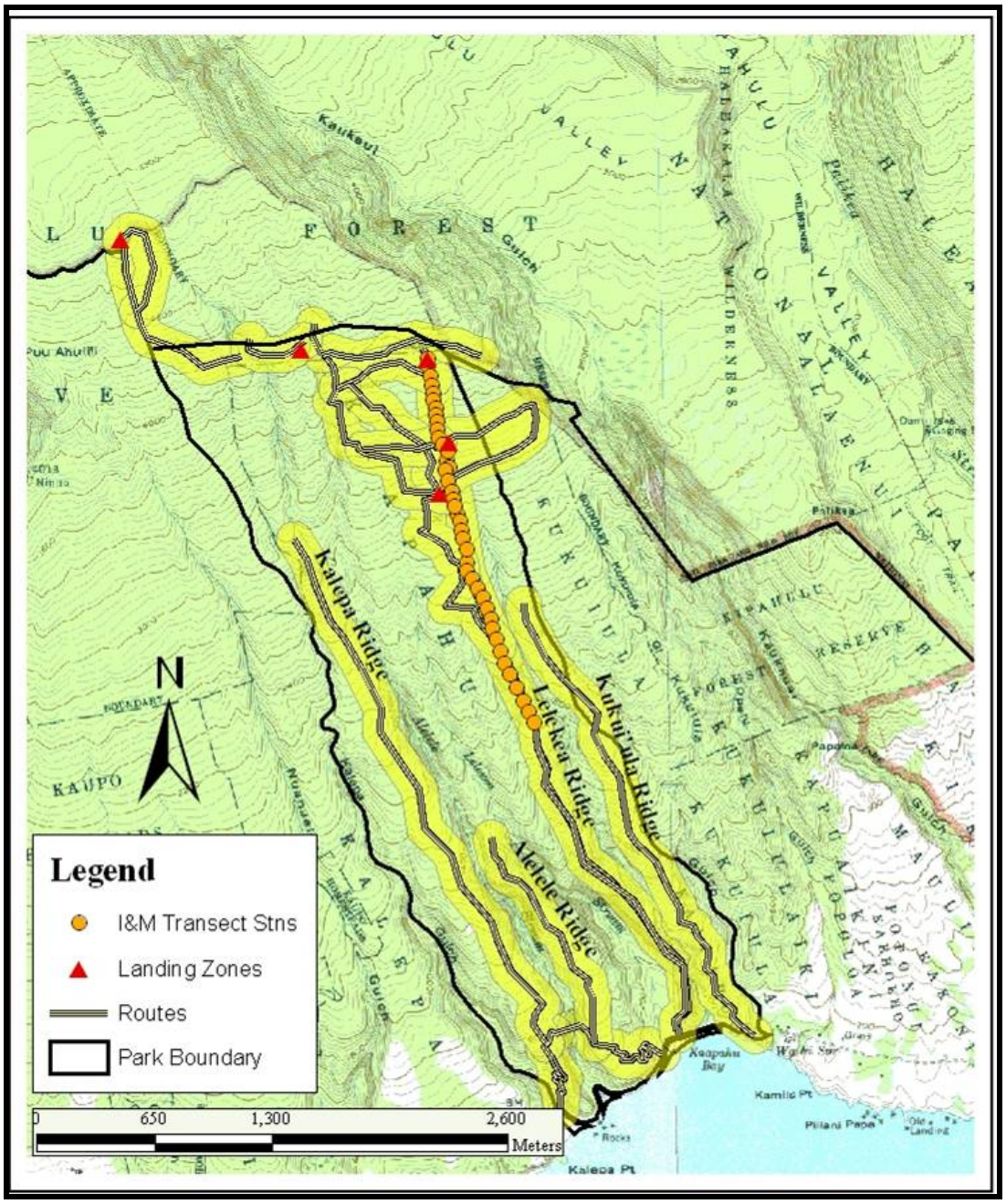

Figure 3. Survey routes, landing zones and transect stations, Ka'āpahu, Haleakalā National Park, 2005.

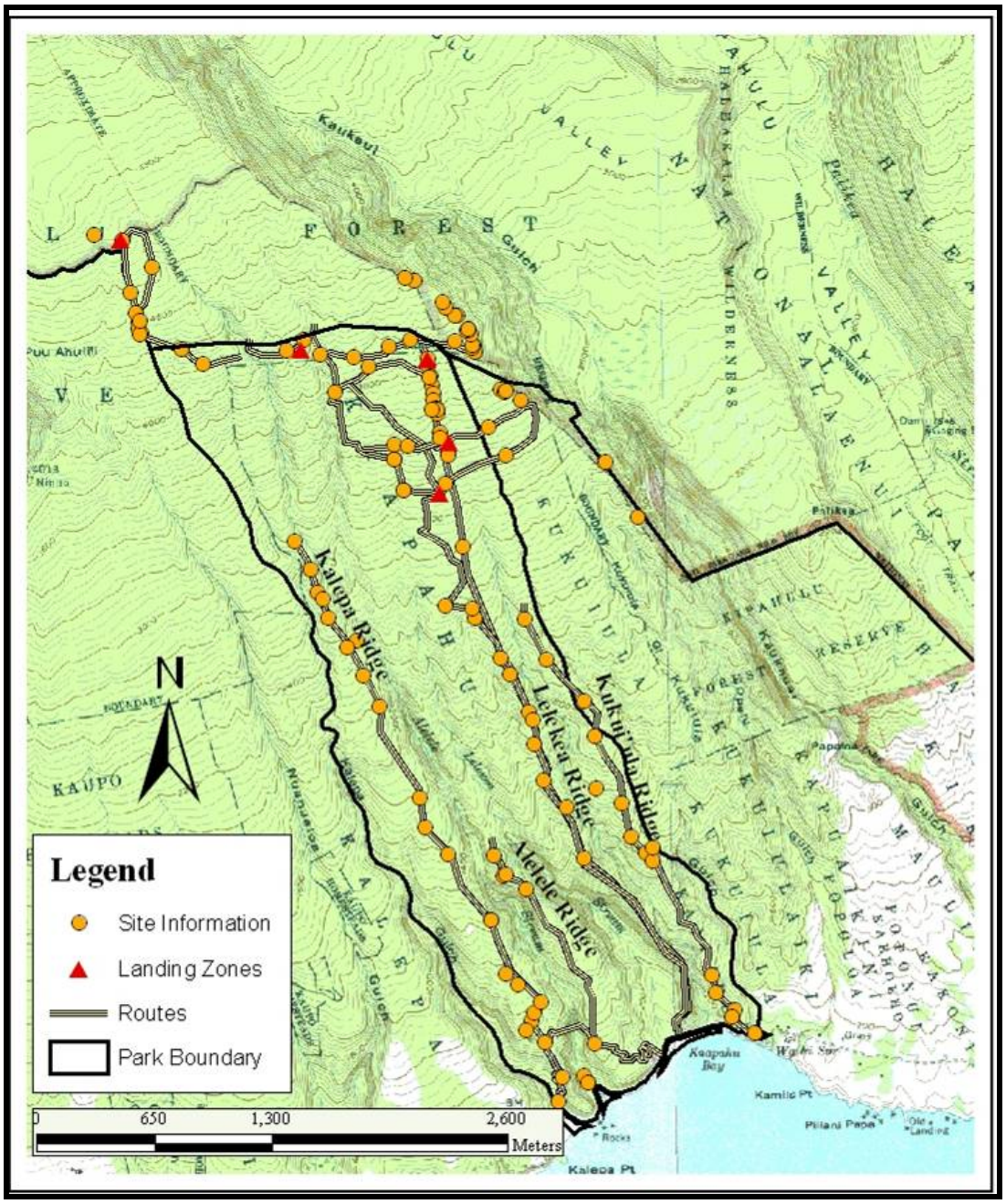

Figure 4. Location of site information records, Ka'āpahu, Haleakalā National Park, 2005.

Two botanists walked the survey routes, primarily on the ridges, 10 to 20 m (33-66 ft) apart from each other where the terrain and time allowed. If there were multiple trips to an area, an effort was made to survey a different route. However, this was not always possible because of the narrow ridges in the lower portions of the study area. Whenever there was a view into the large gulches, binoculars were used to search for target species.

When we encountered targeted native or non-native species, we recorded site information (vegetation association information) to describe vegetation types. Site information recorded was based on an adaptation of Jacobi's (1989) vegetation mapping units. The site described was a circular area with a radius of 10-20 m (33-66 ft), with the observer in the center of the circle. If the vegetation was more open and a greater distance could be seen, the site information record included a minimum and maximum elevation. Three types of vegetation information were recorded: 1) vegetation structure in six layer classes, 2) vegetation cover using five cover classes and 3) species composition by relative dominance as follows below.

The vegetation height (in meters) was divided into the following layers:

>25 m	(>82 ft)
25-10 m	(82-33 ft)
10-5 m	(33-16.5 ft)
5-2 m	(16.5-6.5)
2-1 m	(6.5-3.3 ft)
< 1 m	(<3.3 ft)

One of five vegetation cover classes was determined for each layer. The following codes were used:

V = Very Scattered (<5%)
S = Scattered (5-20%)
O = Open (20-60%)
C = Closed (60-80%)
D = Dense (>80% cover)

Species composition was recorded by relative dominance within each layer for all species. Composition was recorded as a relative ratio:

A = Only A present
A-B = A and B codominant
A,B = A dominant, B subdominant
A,B-C = A dominant, B and C subdominant yet equal
A-B,C = A and B codominant, C subdominant
A-B-C = All codominant
A-B,C,D-E-F,G-H-I etc.

Additional site attributes recorded were location description, date, observers, slope and aspect. Species that were not found in the actual area surveyed, but were located nearby were recorded as associated species. A comment field was used to record weed, animal, and other threats and activity. Figure 4 is a map of the locations of all the site information records.

We recorded detailed information for target species considered rare in the park or federally listed as threatened, endangered, candidate or species of concern (SOC) by the USFWS. Native plant observation (NOBS) information included the species, the number of individuals by size class, life stages and phenology. Potential or observed threats from slugs, insects, pigs, goats, deer, landslides or non-native plants were documented.

Maximum and minimum elevations for invasive species were recorded. Starting at 1,158 m (3,800 ft; Ka'āpahu LZ), we recorded the presence of all non-native species that occurred within a five-meter- (16.5-ft) wide band (2.5 m [8.2 ft] each side) between every 50 m station along the survey transect until the 1200 m (3937 ft) station.

A checklist of all vascular plant species observed on the visits was compiled (Appendix). Nomenclature for flowering plants follows *The Manual of Flowering Plants of Hawai'i* (Wagner et al. 1990) and the most recent version of the online supplement to the Wagner et al. manual (December 2003). Ferns and fern allies follow the taxonomy in *Hawai'i's Ferns and Fern Allies* (Palmer 2003). Voucher specimens were collected when necessary to identify species; vouchers will be incorporated into the HALE herbarium.

Either a Trimble or a Garmin Global Positioning System (GPS) unit was used to map site locations, points on routes and target species. The GPS points are accurate to +/- 12 m (39 ft). If GPS positions were unavailable, points were charted on a standard USGS 1: 24000 quad map and later digitized using ArcView or ArcMap. Routes were digitized in the office using a combination of GPS and charted points from maps. The Datum used was Universal Transverse Mercator, North American Datum 1983 Zone 4.

ArcView and ArcMap attribute tables and a Natural Resource Database Template Inventory and Monitoring compatible Microsoft Access database were used to enter, map and analyze data. Data for native species (NOBS), other target species and site attribute information were entered into the relational Access database. A unique LocationID field links the information in the NOBS table to the site information table in the Access database and to the GIS ArcMap spatial and attribute data tables. All data will be housed at Haleakalā National Park and copies archived at the Pacific Island Network office at Hawaii Volcanoes National Park. Species data will be entered into NPSpecies, the NPS Biodiversity Database.

RESULTS

A vegetation survey of the vascular plant species within the 598-ha (1,478-acre) parcel of Ka'āpahu was completed between May 2002 and August 2004. The results of this inventory provide a checklist for the area. Two hundred and ninety-two vascular plant species have been documented in Ka'āpahu (Appendix). Two hundred and eighty-seven

species were seen during this survey. Of all the species that have been documented, 157 (54%) are native to Hawai'i, either endemic or indigenous. Of the native species, 110 species (38%) are endemic, and 47 species (16%) are indigenous. Twelve species (4%) were Polynesian introductions; non-native species introduced by early Polynesian settlers. One hundred and twenty-three (42%) were other non-native species. Eight species were added to the park checklist (HALE unpubl. data). Of those eight species, two were endemic, one was a Polynesian introduction and five were other non-natives. More species likely occur in gulches and in areas where access is prohibitive.

Table 1 and Table 2 emphasize the species diversity and richness of the flora of Ka'āpahu. Eighty-three percent of the fern and fern ally species, 53% of the dicots and 30% of the monocots are native, either endemic or indigenous. Seventeen percent of the fern species, 43% of dicots and 61% of the monocots are non-native species. The majority of the non-native monocots are grasses and sedges that establish quickly after feral animal activity.

Table 1. *Summary of vascular plant taxa in Ka'āpahu, Haleakalā National Park, 2005.*

Plant Group and Status	Number of Species	Percent of Total
Ferns and Fern Allies		
Endemic	30	51%
Indigenous	19	32%
Polynesian Introductions	0	0%
Non-native*	10	17%
Total	59	
Dicotyledons		
Endemic	70	42%
Indigenous	18	11%
Polynesian Introductions	6	3% - 4%
Non-native*	72	43%
Total	166	
Monocotyledons		
Endemic	10	15%
Indigenous	10	15%
Polynesian Introductions	6	9%
Non-native*	41	61%
Total	67	
Total Vascular Plants		
Endemic	110	38%
Indigenous	47	16%
Polynesian Introductions	12	4%
Non-native*	123	42%
Total	292	

* counts for non-native species do not include Polynesian introductions

Table 2. *The number of families, genera, and species of vascular plants represented in each of the nativity categories in Ka'āpahu, Haleakalā National Park, 2005.*

Nativity	Families	Genera	Species
Endemic	50	69	110
Indigenous	17	39	47
Polynesian Introductions	12	12	12
Non-native*	41	48	123

* counts for non-native species do not include Polynesian introductions

Of the eight species that were added to the park checklist (Table 3), the two that are endemic to Hawai'i are lama (*Diospyros sandwicensis*) and wiliwili (*Erythrina sandwicensis*). Lama, generally considered to be a dryland to mesic forest species, is scattered from the coast to 427 m (1,400 ft). Wiliwili typically occurs in lowland dry habitat. Only one wiliwili individual was found below 30 m (100 ft) elevation at the lower southwest corner of Ka'āpahu. One population of the Polynesian introduction pia, or Polynesian arrowroot (*Tacca leontopetaloides*), was found. Only a small number of individuals were found of the five new non-native species. They are elephant's foot (*Elephantopus mollis*), tamarind (*Tamarindus indicus*), allspice (*Pimenta dioica*), mickey-mouse plant (*Ochna thomasiana*) and dogtail or huelo 'ilio (*Buddleia asiatica*).

Table 3. *New species to Haleakalā National Park found in Ka'āpahu, 2005.*

Origin*	Subclass	Family	Genus	Species	Populations
X	Dicot	Asteraceae	*Elephantopus*	*mollis*	1
E	Dicot	Ebenaceae	*Diospyros*	*sandwicensis*	4 ridges
E	Dicot	Fabaceae	*Erythrina*	*sandwicensis*	1 tree
X	Dicot	Fabaceae	*Tamarindus*	*indicus*	1
X	Dicot	Myrtaceae	*Pimenta*	*dioica*	1
X	Dicot	Ochnaceae	*Ochna*	*thomasiana*	1
X	Dicot	Scrophulariaceae	*Buddleia*	*asiatica*	1
P	Monocot	Taccaceae	*Tacca*	*leontopetaloides*	1

*Origin of new species designated as endemic (E), non-native Polynesian introduction (P) or non-native (X).

Species in Ka'āpahu that are listed as endangered, candidate or SOC by the USFWS or considered to be rare in HALE are listed in Table 4. To protect these sensitive species, maps in this report do not include their locations. Seven populations of four endangered species (*Cyanea copelandii* ssp. *haleakalaensis*, *Cyanea glabra*, *Cyanea hamatiflora* ssp. *hamatiflora* and *Huperzia mannii*), six populations of three candidate species (*Cyanea asplenifolia*, *Cyanea kunthiana* and *Joinvillea ascendens* ssp. *ascendens*), and one population of a SOC, *Anoectochilus sandvicensis*, were recorded. Twenty-eight populations of 10 rare species were documented.

Table 4. *Ka'āpahu species designated as endangered (E), candidate (C) or Species of Concern (SOC) by the US Fish and Wildlife Service as well as rare (R) species, 2005.*

Status	Subclass	Genus	Species	Rank	Epithet	Populations
E	Dicot	*Cyanea*	*copelandii*	ssp	*haleakalaensis*	2
E	Dicot	*Cyanea*	*glabra (sp. aff.)*			2
E	Dicot	*Cyanea*	*hamatiflora*	ssp	*hamatiflora*	1
E	Fern Ally	*Huperzia*	*mannii*			2
C	Dicot	*Cyanea*	*asplenifolia*			1
C	Dicot	*Cyanea*	*kunthiana*			2
C	Fern Ally	*Huperzia*	*stemmermanniae*			0
C	Monocot	*Joinvillea*	*ascendens*	ssp	*ascendens*	3
SOC	Monocot	*Anoectochilus*	*sandvicensis*			1
SOC	Dicot	*Lepidium*	*bidentatum*	var	*o-waihiense*	0
SOC	Monocot	*Liparis*	*hawaiensis*			0
R	Dicot	*Cyanea*	*macrostegia*	ssp	*macrostegia*	4
R	Dicot	*Cyrtandra*	*platyphylla*			1
R	Dicot	*Diospyros*	*sandwicensis*			4 ridges
R	Dicot	*Embelia*	*pacifica*			0
R	Dicot	*Erythrina*	*sandwicensis*			1 tree
R	Dicot	*Labordia*	*hirtella*			1
R	Dicot	*Labordia*	*venosa*			2
R	Dicot	*Nestegis*	*sandwicensis*			4 ridges
R	Dicot	*Nothocestrum*	*longifolium*			0
R	Dicot	*Platydesma*	*spathulata*			4
R	Dicot	*Psydrax*	*odorata*			4 ridges
R	Dicot	*Tetraplasandra*	*kavaiensis*			1
R	Dicot	*Trematolobelia*	*macrostachys*			2

Five species previously documented from Ka'āpahu (Medeiros and Chimera 1995) were not seen during this survey. Two are SOC: 'ānaunau (*Lepidium bidentatum*) and 'awapuhi-a-kanaloa (*Liparis hawaiensis*). Kilioe (*Embelia pacifica*), 'aiea (*Nothocestrum longifolium*) and the epiphytic fern ally, *Huperzia stemmermanniae*, were not seen.

Vegetation information was recorded at 83 locations (Figure 4). Five broad zones based on vegetation community and elevation are described below. In the first zone, at the northern boundary, a band of low-stature 'ōhi'a/uluhe (*Metrosideros*/*Dicranopteris*) vegetation dominates between 1,158 and 1,219 m (3,800 and 4,200 ft) elevation. Occasional 'uki (*Machaerina*) bogs are found along the windswept northeastern boundary. Between 914 and 1,158 m (3,000 and 3,800 ft) elevation, the second zone consists of a suite of native species similar to the vegetation in the rainforest to the east. In this zone in Ka'āpahu, there is predominantly a koa/'ōhi'a (*Acacia/Metrosideros*) canopy with a rich diversity of native tree and shrub understory species and a ground cover of native ferns, herbs, and non-native grasses and sedges. The abundance of native rainforest understory species is threatened by feral animals and invasive non-native plant species, particularly strawberry guava (*Psidium cattleianum*), clidemia (*Clidemia hirta*) and Australian tree fern (*Sphaeropteris cooperi*).

In the third zone, on the ridges between 457 and 914 m (1,500 and 3,000 ft) elevation, a koa canopy persists. The understory includes remnants of native lowland species such as kopiko (*Psychotria mariniana*) and hame (*Antidesma platyphylla*). However, non-native species, particularly strawberry guava, are dominant in the understory. The fourth zone, on the ridges between 183 and 457 m (600 and 1,500 ft) elevation, is comprised of scattered koa canopy with a low density of mesic native species such as lama (*Diospyros sandwicensis*), olopua (*Nestegis sandwicensis*) and alahe'e (*Psydrax odoratum*). Again, the understory of this zone is dominated by non-native species, notably java plum (*Syzygium cumini*), Christmasberry (*Schinus terebinthifolius*), common guava (*Psidium guajava*) and strawberry guava. The understory vegetation and canopy floor are often damaged by both pigs and goats below 914 m (3,000 ft) elevation.

A mosaic of vegetation types exist in the fifth zone between sea level and 183 m (600 ft) elevation. Mango (*Mangifera indica*) is the emergent canopy tree. Native hala (*Pandanus tectorius*), lama, neneleau (*Rhus sandwicensis*) and alahe'e are sporadic on the ridges and along the historic trail. The understory consists primarily of non-native species such as inkberry (*Ardisia elliptica*). A small remnant patch of 'a'ali'i (*Dodonaea viscosa*) shrubland persists on an open rocky ridge above the southwestern slope where the only wiliwili (*Erythrina sandwicensis*) tree was seen. Throughout the area, the ground cover is sparse due to feral ungulate damage.

The maximum and minimum elevations for the most abundant invasive non-native species recorded in site information records are compiled in Table 5. At the upper elevations of the study area, the most abundant weeds were strawberry guava (*Psidium cattleianum*), Hilo grass (*Paspalum conjugatum*), Australian tree fern (*Sphaeropteris cooperi*) and the sedge beakrush (*Rhynchospora caduca*). The most abundant weeds in the lower elevations were strawberry guava, Christmasberry and common guava. In the site information records,

strawberry guava was recorded throughout the study ranging between 30 and 1,305 m (100 and 4,280 ft) in 66% of the sites. We observed Hilo grass in 31% of the sites between 122 and 1,164 m (400 and 3,820 ft). Australian tree fern occurred in 25% of the sites ranging

Table 5. *Maximum and minimum elevations for the most invasive non-native species in Ka'āpahu, Haleakalā National Park, 2005.*

Genus	Species	Max. Elev. (ft)	Min. Elev. (ft)	Common Name	Occurrences in Site Records	Percent Presence (n=83)
Psidium	*cattleianum*	4280	100	Strawberry guava	55	66%
Paspalum	*conjugatum*	3820	400	Hilo grass	26	31%
Sphaeropteris	*cooperi*	3800	1300	Australian tree fern	21	25%
Schinus	*terebinthifolius*	1500	100	Christmasberry	19	23%
Psidium	*guajava*	1700	25	Common guava	15	18%
Clidemia	*hirta*	3440	1700	Clidemia	14	17%
Rhynchospora	*caduca*	3850	1950	Beakrush	12	14%
Spathodea	*campanulata*	3350	1000	African tulip tree	6	7%
Ardesia	*elliptica*	900	80	Inkberry	6	7%
Tibouchina	*herbacea*	3920	1560	Tibouchina	4	5%
Syzygium	*jambos*	400	300	Rose apple	2	2%
Buddleia	*asiatica*	3180	3180	Butterfly bush	1	1%
Ochna	*thomasiana*	300	300	Mickey mouse plant	1	1%
Leucaena	*leucocephala*	100	100	Haole koa	1	1%
Carex	*longii*	3820	3820		1	1%
Juncus	*planifolius*	3800	3800		1	1%

between 396 and 1,158 m (1,300 and 3,800 ft). *Clidemia hirta* occurred in 17% of the sites ranging between 518 and 1,036 m (1,700 and 3,400 ft). Beakrush occurred in 14% of the sites ranging between 594 and 1,173 m (1,950 and 3,850 ft). We found Christmasberry in 23% of the sites ranging between 30 and 457 m (100 and 1,500 ft) and common guava in 18% of the sites ranging from eight to 518 m (25 to 1,700 ft).

There was ample evidence of non-native animal species throughout the survey area. Twenty-seven percent of the site information records had obvious pig damage or pigs present at the location. Seventy-eight percent of the native plant observations for rare species had evident pig or goat damage.

DISCUSSION

The Ka'āpahu parcel hosts diverse native plant communities and animal habitat. The native plant species richness is expected for a rainforest plant community on East Maui, yet few populations of endangered, candidate, SOC or rare species were found during this survey. If unmanaged, the native plant species diversity that persists could diminish in a short time. Many of the populations observed exist because they were next to sheer cliffs, on steep slopes or in protected gullies. For example, only one population of *Cyanea asplenifolia*, a candidate species, was known to occur on East Maui prior to the discovery of a new population during this survey. This new population was found below a ridge with no existent ground cover due to extensive pig damage.

Of the 157 native species previously listed as occurring at Ka'āpahu, only five were not observed during this survey. One record of a small subshrub in the mustard family, 'anaunau (*Lepidium bidentatum* var. *o-waihiense*) is a SOC; it was collected December 9, 1919, by C.N. Forbes on the Ka'āpahu coastal bluffs. In 1995, an epiphytic fern ally, *Huperzia stemmermanniae*, and a small terrestrial orchid SOC, 'awapuhi-a-kanaloa (*Liparis hawaiensis*), were discovered by park staff at 1,158 m (3,800 ft) and between 1,067 and 1,219 m (3,500 and 4,200 ft) elevation, respectively (Medeiros and Chimera 1995). Two more endemic species, kilioe (*Embelia pacifica*) and 'aiea (*Nothocestrum longifolium*), were observed in 1995 as well (Medeiros and Chimera 1995).

The longevity of these rare, endangered, SOC and candidate plant species is in jeopardy due to the presence of feral animals. Ungulate populations are moving into the area from the west and numbers continue to increase (Park Staff pers. comm.). Animal populations are currently not being managed or controlled. Based on observations of similar habitats in this region, regeneration, recruitment and perpetuation of these species will not continue with the constant digging and ground disturbance from feral ungulates (Anderson and Stone 1993). It is probable that invasive non-native plant species, which were observed in all vegetation zones, will continue to establish quickly where ground is disturbed.

With few mesic habitats protected on East Maui, this region is a rare resource of associated native flora and fauna. Since managed and protected by HALE staff, Kīpahulu Valley is now one of the best examples remaining of an intact native Hawaiian rainforest ecosystem in the state. HALE has a tremendous opportunity to provide a safe refuge for its native, rare and endangered species. If Ka'āpahu is fenced and feral animals and invasive non-native plants are managed, the remaining native plant species could reclaim much of the degraded ridges and landscape as has occurred in Kīpahulu Valley (Anderson and Stone 1993). Ka'āpahu's native plant populations could serve as valuable genetic source material for restoration in many other fenced areas throughout the state.

RECOMMENDATIONS

The opportunity for HALE to protect and restore Ka'āpahu's remaining native Hawaiian components into a healthy Hawaiian ecosystem is immense. As an emergency measure, exclosures should be built around endangered, candidate and rare plant populations as quickly as possible to protect and perpetuate habitat until Ka'āpahu is fenced and feral ungulate and non-native plant populations are managed. These exclosures will exclude feral ungulates and protect habitat for native plant species and provide a safe refuge for additional species expected to recover naturally or to be replanted within the exclosure. Invasive non-native plant species would be controlled, and methods and guidelines for further non-native plant species control throughout Ka'āpahu would be developed.

Strategic fencing and feral animal management needs to begin soon before degradation reaches the level where natural recovery will not occur. Ka'āpahu could be fenced with multiple management units. Narrow ridges and large gulches could be used as natural barriers. Non-native plant control and native plant restoration could result in marked recovery of this mesic portion of the park.

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APPENDIX KA'ĀPAHU VASCULAR PLANT SPECIES LIST

Nomenclature for flowering plants follows the Manual of Flowering Plants of Hawai'i (Wagner et al. 1990) and the most recent version of the online supplement to the Wagner et al. manual (December 2003). Ferns and fern allies follow the taxonomy in Hawai'i's Ferns and Fern Allies (Palmer 2003).

Origin: E= Endemic, I=Indigenous, I?=Indigenous?, P=Polynesian Introduction (non-native), P?=Polynesian Introduction?, X=non-native

Status: E = USFWS listed as Endangered, C = USFWS Candidate to be listed as Endangered, SOC = USFWS Species of Concern, R = Rare in the park, New = added to park checklist in this survey, AM = Seen in Art Medeiros survey in 1995, but not seen in this survey

Common Name: NCN=no common name

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
PTERIDOPHYTES								
Ferns								
Aspleniaceae								
	I		NCN	*Asplenium*	*contiguum*	var.	contiguum	Kaulf.
	I		pi`ipi`i lau manamana	*Asplenium*	*lobulatum*			Mett.
	I		NCN	*Asplenium*	*monanthes*			L.
	I		NCN	*Asplenium*	*normale*			D. Don
Athyriaceae								
	E		`ākōlea	*Athyrium*	*microphyllum*			(Sm.) Alston
	X		NCN	*Deparia*	*petersenii*			(Kunze) M. Kato
	E		hō`i`o	*Diplazium*	*sandwichianum*			(C. Presl) Diels
Blechnaceae								
	X		NCN	*Blechnum*	*appendiculatum*			Willd.
	E		`ama`u,	*Sadleria*	*pallida*			Hook. & Arn.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			`āma`uma`u					
	E		`apu`u	*Sadleria*	*squarrosa*			(Gaudich.) T. Moore
Cyatheaceae								
	X		Australian tree fern, scaly tree fern	*Sphaeropteris*	*cooperi*			(Hook. Ex F. Muell.) R. M. Tryon
Dennstaedtiaceae								
	E		olua	*Hypolepis*	*hawaiiensis*	var.	hawaiiensis	Brownsey
	I		palapalai	*Microlepia*	*strigosa*			(Thunb.) C. Presl
Dicksoniaceae								
	E		meu	*Cibotium*	*chamissoi*			Kaulf.
	E		hāpu`u pulu	*Cibotium*	*glaucum*			(Sm.) Hook. & Arn.
	E		hāpu`u `i`i	*Cibotium*	*menziesii*			Hook.
Dryopteridaceae								
	E		`ākōlea	*Ctenitis*	*latifrons*			(Brack.) Copel.
	E		`i`i	*Dryopteris*	*fusco-atra*	var.	fusco-atra	(Hillebr.) W. J. Rob.
	E		kīlau, hohiu	*Dryopteris*	*glabra*	var.	glabra	(Brack.) Kuntze
	I		laukahi	*Dryopteris*	*wallichiana*			(Spreng.) Hyl.
	E		maku`e, pauoa	*Nothoperanema*	*rubiginosa*			(Brack.) A.R. Sm. & D.D. Palmer
Gleicheniaceae								
	I		uluhe	*Dicranopteris*	*linearis*			(Burm. f.) Underw.
	I		uluhe lau nui	*Diplopterygium*	*pinnatum*			(Kunze) Nakai
	E		uluhe	*Sticherus*	*owhyhensis*			(Hook.) Ching
Grammitidaceae								
	E		pai	*Adenophorus*	*hymenophylloides*			(Kaulf.) Hook. & Grev.
	E		kihi, kihe	*Adenophorus*	*pinnatifidus*	var.	pinnatifidus	Gaudich.
	E		wahine noho mauna	*Adenophorus*	*tamariscinus*	var.	montanus	(Hillebr.)L.E.Bishop

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	E		wahine noho mauna	*Adenophorus*	*tamariscinus*	var.	tamariscinus	(Kaulf.) Hook. & Grev.
	E		kihe	*Lellingeria*	*saffordii*			(Maxon) A.R. Sm. & R.C. Moran
Hymenophyllaceae								
	E		`ōhi`a kū	*Mecodium*	*recurvum*			(Gaudich.) Copel.
	E		kīlau, kalau, palai hihi	*Vandenboschia*	*davallioides*			(Gaudich.) Copel.
Lindsaeaceae								
	I		pala`ā, palapala`ā	*Sphenomeris*	*chinensis*			(L.) Maxon
Lomariopsidaceae								
	E		hoe a Maui, `ēkaha	*Elaphoglossum*	*crassifolium*			(Gaudich.) W.R. Anderson & Crosby
	I		māku`e	*Elaphoglossum*	*paleaceum*			(Hook. & Grev.) Sledge
	E		laukahi, hoe a Maui, `ēkaha	*Elaphoglossum*	*wawrae*			(Luerss.) C. Chr.
Marattiaceae								
	E		pala, kapua `ilio	*Marattia*	*douglasii*			(C.Presl.) Baker
Nephrolepidaceae								
	I		kupukupu, ni`ani`au	*Nephrolepis*	*cordifolia*			(L.) C. Presl
	I		kupukupu, ni`ani`au	*Nephrolepis*	*exaltata*	var.	hawaiiensis	(L.) Schott subsp. W.H.Wagner
	X		hairy swordfern	*Nephrolepis*	*multiflora*			(Roxb.) F.M. Jarrett ex C.V. Morton
Ophioglossaceae								
	I		puapua moa, adder's tongue	*Ophioderma*	*pendulum*	ssp.	falcatum	(C. Presl) R.T.Clausen
Polypodiaceae								
	I		`ēkaha `ākōlea,	*Lepisorus*	*thunbergianus*			(Kaulf.) Ching

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			pākahakaha					
	X		laua`e haole, rabbit's foot fern, golden polypody	*Phlebodium*	*aureum*			(L.) J. Sm.
	X		laua`e, maile-scented fern	*Phymatosorus*	*grossus*			(Langsd. & Fisch.) Brownlie
	E		`ae	*Polypodium*	*pellucidum*	var.	pellucidum	Kaulf.
Pteridaceae								
	X		`iwa`iwa, rough maidenhair fern	*Adiantum*	*hispidulum*			Sw.
	X		`iwa`iwa, common maidenhair fern	*Adiantum*	*raddianum*			C. Presl
Thelypteridaceae								
	E		palapalai a Kamapua`a	*Amauropelta*	*globulifera*			(Brack.) Holttum
	X		pai`i`ihā, downy woodfern	*Christella*	*dentata*			(Forssk.) Brownsey & Jermy
	X		pai`i`ihā, downy woodfern	*Christella*	*parasitica*			(L.) H. Lev.
	E		hō`i`o kula	*Pneumatopteris*	*sandwicensis*			(Brack.) Holttum
Fern Allies								
Lycopodiaceae								
	E		NCN	*Huperzia*	*erosa*			Beitel & W. H. Wagner
	E	E	NCN	*Huperzia*	*mannii*			(Hillebr.) Kartesz & Gandhi
	I		wāwae `iole, hanging fir moss	*Huperzia*	*phyllantha*			(Hook. & Arn.) Holub
	E	C	NCN	*Huperzia*	*stemmermanniae*			(A.C. Medeiros, W.H.Wagner & Hobdy Kartesz
	I		wāwae `iole	*Lycopodiella*	*cernua*			(L.) Pic. Serm.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	I		NCN	*Lycopodium*	*venustulum*			Gaudich.
Psilotaceae								
	I		moa, pipi	*Psilotum*	*complanatum*			Sw.
	I		moa, pipi	*Psilotum*	*nudum*			(L.) P. Beauv.
Selaginellaceae								
	E		lepelepe a moa	*Selaginella*	*arbuscula*			(Kaulf.) Spring
ANGIOSPERMS								
Dicot								
Aizoaceae								
	I		`ākulikuli, sea purslane	*Sesuvium*	*portulacastrum*			(L.) L.
Amaranthaceae								
	X		pakai kukū, spiny amaranth	*Amaranthus*	*spinosus*			L.
Anacardiaceae								
	X		manakō, manakō meneke, meneke	*Mangifera*	*indica*			L.
	E		neleau, neneleau	*Rhus*	*sandwicensis*			A. Gray
	X		wilelaiki, Christmas berry	*Schinus*	*terebinthifolius*			Raddi
Apiaceae								
	X		pohe kula, Asiatic pennywort	*Centella*	*asiatica*			(L.) Urb.
Apocynaceae								
	E		maile	*Alyxia*	*oliviformis*			Gaudich.
Aquifoliaceae								
	I		kāwa`u	*Ilex*	*anomala*			Hook. & Arnott
Araliaceae								
	E		`ōlapa	*Cheirodendron*	*trigynum*	ssp.	trigynum	(Gaud.) A. Heller

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	E	R	`ohe`ohe	*Tetraplasandra*	*kavaiensis*			(H. Mann) Sherff
	E		`ohe mauka	*Tetraplasandra*	*oahuensis*			(A. Gray) Harms
Asclepiadaceae								
	X		pua hoku hihi, wax plant	*Hoya*	*bicarinata*			A. Gray
Asteraceae								
	X		pāmakani, pāmakani haole	*Ageratina*	*adenophora*			(Spreng.) R. King & H. Robinson
	X		Hāmākua pāmakani	*Ageratina*	*riparia*			(Regel) R. King & H. Robinson
	X		ageratum, maile hohono	*Ageratum*	*conyzoides*			L.
	X		kī, kī nehe, kī pipili, nehe, hairy beggarticks	*Bidens*	*pilosa*			L.
	X		lani wela, hairy horseweed	*Conyza*	*bonariensis*			(L.) Cronq.
	X		redflower ragleaf	*Crassocephalum*	*crepidioides*			(Benth.) S. Moore
	X		little ironweed	*Cyanthillium*	*cinereum*			(L.) H.E. Robins.
	E		plantainleaf dubautia	*Dubautia*	*plantaginea*	ssp.	plantaginea	Gaud.
	X		false daisy	*Eclipta*	*prostrata*			(L.) L.
	X	New	elephant's foot	*Elephantopus*	*mollis*			Kunth.
	X		pualele, Florida tasselflower	*Emilia*	*fosbergii*			Nicolson
	X		fireweed	*Erechtites*	*valerianifolia*			(Wolf) DC
	X		nipplewort	*Lapsana*	*communis*			L.
	X		sourbush	*Pluchea*	*carolinensis*			(Jacq.) G. Don
	X		NCN	*Pseudoelephantopus*	*spicatus*			(Juss. ex Aubl.) C.F. Baker

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	X		small yellow crown-beard	*Sigesbeckia*	*orientalis*			L.
	X		pualele, sow thistle	*Sonchus*	*oleraceus*			L.
	X		Bay Biscayne creeping-oxeye	*Sphagneticola*	*trilobata*			(L.) Pruski
	X		nodeweed	*Synedrella*	*nodiflora*			(L.) Gaertn.
	X		oriental hawksbeard	*Youngia*	*japonica*			(L.) DC
Bignoniaceae								
	X		African tulip tree, fountain tree	*Spathodea*	*campanulata*			P. Beauv.
Brassicaceae								
	E	SOC (Historic)	`ānaunau, `ānounou, kūnānā, naunau pepperwort, peppergrass	*Lepidium*	*bidentatum*	var	o-waihiense	Montin
Campanulaceae								
	E		`ōhā wai nui	*Clermontia*	*arborescens*	ssp.	waihiae	(Wawra) Lammers
	E		forest clermontia	*Clermontia*	*kakeana*			Meyen
	E	C	hāhā	*Cyanea*	*asplenifolia*			(H. Mann) Hillebr.
	E	E	hāhā, Copeland cyanea	*Cyanea*	*copelandii*	ssp.	haleakalaensis	St.John (Lammers)
	E	E	hāhā, smooth cyanea	*Cyanea*	*glabra (sp. aff.)*			(F. Wimmer) St. John
	E	E	wetforest cyanea	*Cyanea*	*hamatiflora*	ssp.	hamatiflora	Rock
	E	C	Kunth's cyanea	*Cyanea*	*kunthiana*			Hillebr.
	E	R	purple cyanea	*Cyanea*	*macrostegia*	ssp.	macrostegia	Hillebr.
	E		Gray's lobelia, Haleakala lobelia	*Lobelia*	*grayana*			F. Wimmer

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	E	R	koli`i	*Trematolobelia*	*macrostachys*			(Hook. & Arnott) A. Zahlbr.
Caricaceae								
	X		mīkana, hē`ī, milikana, papaia, papaya, pawpaw	*Carica*	*papaya*			L.
Caryophyllaceae								
	X		pipili, drymaria	*Drymaria*	*cordata*	var.	pacifica	Mizush.
Celastraceae								
	E		olomea, pua`a olomea, waimea	*Perrottetia*	*sandwicensis*			A. Gray
Combretaceae								
	X		false kamani, kamani haole, kamani `ula, tropical or Indian almond	*Terminalia*	*catappa*			L.
Convolvulaceae								
	X		koali pehu, moon flower	*Ipomoea*	*alba*			L.
	I		koali `awa, koali `awahia, koali pehu	*Ipomoea*	*indica*			(J. Burm.) Merr.
Crassulaceae								
	X		`oliwa kū kahakai, air plant, life plant	*Kalanchoe*	*pinnata*			(Lam.) Pers.
	X		chandelier plant	*Kalanchoe*	*tubiflora*			(Harv.) Raym.- Hamet
Ebenaceae								
	E	New	lama, ēlama, persimmon, ebony	*Diospyros*	*sandwicensis*			(A. DC) Fosb.
Ericaceae								
	I		NCN	*Leptecophylla*	*tameiameiae*			(Cham. & Schltdl.)C. M. Weiller

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	E		`ōhelo, `ōhelo kau lā`au	*Vaccinium*	*calycinum*			Sm.
Euphorbiaceae								
	P		kukui, kuikui, candlenut, tung tree	*Aleurites*	*moluccana*			(L.) Willd.
	E		`akoko, koko, `ekoko, kōkōmālei, spurge	*Chamaesyce*	*celastroides*	var.	laehiensis	(Degener, I. Degener & Scherff) Koutnik
	X		koko kahiki, hairy or garden spurge	*Chamaesyce*	*hirta*			(L.) Millsp.
	X		kaliko, spurge	*Euphorbia*	*heterophylla*			L.
	X		pā`aila, ka`apehā, kamākou, kolī, lā`au `aila, castor bean	*Ricinus*	*communis*			L.
Fabaceae								
	E		koa, koai`a, koai`e, koa`ohā	*Acacia*	*koa*			A. Gray
	X		maunaloa	*Canavalia*	*cathartica*			Thouars
	X		laukī, partridge pea	*Chamaecrista*	*nictitans*	var.	glabrata	(Vogel) H. Irwin & Barneby
	X		pikakani, smooth rattlepod	*Crotalaria*	*pallida*			Aiton
	X		ka`imi, Spanish clover	*Desmodium*	*incanum*			DC
	X		pua pilipili, kīkānia pipili, Spanish or chili clover	*Desmodium*	*sandwicense*			E. Mey.
	X		tick clover	*Desmodium*	*triflorum*			(L.) DC
	E	New	wiliwili	*Erythrina*	*sandwicensis*			Degener
	X		`inikō, `inikoa, kolū, indigo	*Indigofera*	*suffruticosa*			P. Mill.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	X		koa haole, ēkoa, lilikoa	*Leucaena*	*leucocephala*			(Lam.) de Wit
	X		pua hilahila, sensitive plant, sleeping grass	*Mimosa*	*pudica*	var.	unijuga	(Duchass. & Walp.)Griseb.
	I		kā`e`e, kā`e`e`e, sea bean	*Mucuna*	*gigantea*	ssp.	gigantea	(Willd.) DC
	X	New	tamarind	*Tamarindus*	*indicus*			L.
	I		mohihihi, lemuomakili, nanea, nenea, `ōkolemakili, pūhili, pūhilihili, pūlihilihili, wahine `ōma`o, beach pea	*Vigna*	*marina*			(J. Burm.) Merr.
Gesneriaceae								
	E	R	`ilihia	*Cyrtandra*	*platyphylla*			A. Gray
	E		ha`iwale, kanawao ke`oke`o	*Cyrtandra*	*sp.*			
Goodeniaceae								
	E		naupaka kuahiwi	*Scaevola*	*chamissoniana*			Gaud.
	I		naupaka	*Scaevola*	*taccada*			(Gaertn.) Roxb., nom. cons. prop.
Gunneraceae								
	E		`ape`ape, `ape	*Gunnera*	*petaloidea*			Gaud.
Hydrangeaceae								
	E		kanawao, pū`ahanui	*Broussaisia*	*arguta*			Gaud.
Lamiaceae								
	E		NCN	*Stenogyne*	*kamehamehae*			Wawra
Lauraceae								

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	X		avocado, alligator pear	*Persea*	*americana*			Mill.
Loganiaceae								
	E		kāmakahala, bog labordia	*Labordia*	*hedyosmifolia*			Baill.
	E	R	kāmakahala, mountain labordia	*Labordia*	*hirtella*			H.Mann
	E	R	kāmakahala, Maui labordia	*Labordia*	*venosa*			Sherff
Lythraceae								
	X		tarweed, Colombian cuphea, Colombian waxweed	*Cuphea*	*carthagenensis*			(Jacq.) Macbr.
Malvaceae								
	X		ma`o, hairy abutilon	*Abutilon*	*grandifolium*			(Willd.) Sweet
	I?		hau, sea hibiscus	*Hibiscus*	*tiliaceus*			L.
	I		`ilima	*Sida*	*fallax*			Walp.
	X		Indian hemp, arrowleaf sida	*Sida*	*rhombifolia*			L.
	X		Sacramento burrbark	*Triumfetta*	*semitriloba*			Jacq.
Melastomataceae								
	X		Koster’s curse	*Clidemia*	*hirta*			(L.) D. Don
	X		glorybush, tibouchina	*Tibouchina*	*herbacea*			(DC) Cogn.
Menispermaceae								
	I		queen coralbead	*Cocculus*	*orbiculatus*			(L.) DC
Moraceae								

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	P		breadfruit	*Artocarpus*	*altilis*			(Parkinson) Fosb.
	X		Chinese or Malayan banyan	*Ficus*	*microcarpa*			L. fil.
Myrsinaceae								
	X		shoebutton ardisia	*Ardisia*	*elliptica*			Thunb.
	E	AM	kilioe, Pacific embelia	*Embelia*	*pacifica*			Hillebr.
	E		kōlea lau nui	*Myrsine*	*lessertiana*			A. DC
	E		kōlea lau li`i	*Myrsine*	*sandwicensis*			A. DC
Myrtaceae								
	E		`ōhi`a, `ōhi`a lehua, lehua	*Metrosideros*	*polymorpha*	var.	glaberrima	(H. Lev.) St. John
	E		`ōhi`a, `ōhi`a lehua, lehua	*Metrosideros*	*polymorpha*	var.	incana	(H. Lev.) St. John
	E		`ōhi`a, `ōhi`a lehua, lehua	*Metrosideros*	*polymorpha*	var.	polymorpha	Gaud.
	X	New	allspice	*Pimenta*	*dioica*			(L.) Merr.
	X		waiawī `ula`ula, strawberry guava	*Psidium*	*cattleianum*			Sabine
	X		kuawa, kuawa ke`oke`o, kuawa lemi, kuawa momona, puawa, common guava	*Psidium*	*guajava*			L.
	X		Java or jambolan plum	*Syzygium*	*cumini*			(L.) Skeels
	X		`ōhi`a loke, rose apple	*Syzygium*	*jambos*			(L.) Alston
	P		`ōhi`a `ai, `ōhi`a, `ōhi`a `ai ke`oke`o, `ōhi`a hākea, `ōhi`a kea, `ōhi`a leo,	*Syzygium*	*malaccense*			(L.) Merr. & Perry

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			`ōhi`a `ula, mountain or Malay apple					
	E		`ōhi`a hā, hā, kauokahiki, pā`ihi, pā`ihi`ihi	*Syzygium*	*sandwicensis*			(A. Gray) Nied.
Ochnaceae								
	X	New	Mickey Mouse plant	*Ochna*	*thomasiana*			Engl. & Gilg.
Oleaceae								
	E		olopua, pua, ulupua	*Nestegis*	*sandwicensis*			(A. Gray) Degener, I. Degener & L. Johnson
Onagraceae								
	P?		kāmole, alohalua, kāmole lau li`I, kāmole lau nui, primrose willow	*Ludwigia*	*octovalvis*			(Jacq.) Raven
Oxalidaceae								
	P		`ihi `ai, `ihi `awa, `ihi maka `ula, `ihi mākole, yellow wood sorrel	*Oxalis*	*corniculata*			L.
Passifloraceae								
	X		liliko`i, passion fruit	*Passiflora*	*edulis*			Sims
	X		white passion flower	*Passiflora*	*subpeltata*			Ort.
Phyllanthaceae								
	E		hame, ha'a, ha'amaile, hamehame, mehame, mehamehame	*Antidesma*	*platyphyllum*	var.	platyphyllum	H. Mann

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	X		niruri	*Phyllanthus*	*debilis*			Klein ex Willd.
Piperaceae								
	I		'ala'ala wai nui	*Peperomia*	*blanda*	var.	floribunda	(Jacq.) Kunth var. (Miq.) H. Huber
	E		'ala'ala wai nui	*Peperomia*	*hirtipetiola*			C. DC
	E		'ala'ala wai nui	*Peperomia*	*kipahuluensis*			St. John & C. Lamour.
	E		'ala'ala wai nui	*Peperomia*	*macraeana*			C. DC
	E		'ala'ala wai nui	*Peperomia*	*mauiensis*			Wawra
	E		'ala'ala wai nui	*Peperomia*	*membranacea*			Hook. & Arnott
	E		'ala'ala wai nui	*Peperomia*	*obovatilimba*			C. DC
	E		'ala'ala wai nui	*Peperomia*	*remyi*			C. DC
	I		'ala'ala wai nui	*Peperomia*	*tetraphylla*			(G. Forster.) Hook. & Arnott
Pittosporaceae								
	E		hō'awa, hā'awa, papahekili	*Pittosporum*	*glabrum*			Hook. & Arnott
	E		hō'awa, hā'awa	*Pittosporum*	*terminalioides*			Planch. ex A. Gray
Plantaginaceae								
	X		laukahi, kūhēkili, broad-leaved or common plantain	*Plantago*	*major*			L.
Rosaceae								
	I		`ūlei, eluehe, u`ulei	*Osteomeles*	*anthyllidifolia*			(Sm.) Lindl.
	E		`ākala, `ākalakala, kala, Hawai`i blackberry	*Rubus*	*hawaiensis*			A. Gray
	X		`ākala, Hawai`i blackberry	*Rubus*	*hawaiensis x rosifolius*			
	X		ōla`a, `ākala, `ākalakala, thimbleberry,	*Rubus*	*rosifolius*			Sm.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			Mauritius raspberry					
Rubiaceae								
	X		Arabian coffee	*Coffea*	*arabica*			L.
	E		pilo, hupilo	*Coprosma*	*foliosa*			A. Gray
	I		makole	*Coprosma*	*granadensis*			(L. f.) Heads
	E		pilo, pubescent mirrorplant	*Coprosma*	*pubens*			A. Gray
	E		manono	*Hedyotis*	*hillebrandii*			(Fosb.) W.L. Wagner & Herbst
	E		manono	*Hedyotis*	*terminalis*			(Hook. & Arnott) W.L. Wagner & Herbst
	P		noni, Indian mulberry	*Morinda*	*citrifolia*			L.
	E		kōpiko `ula, `ōpiko, red kopiko	*Psychotria*	*hawaiiensis*	var.	hawaiiensis	(A. Gray) Fosb.
	E		kōpiko kea, white kopiko	*Psychotria*	*kaduana*			(Cham. & Schltdl.) Fosb.
	E		forest wild coffee	*Psychotria*	*mariniana*			(Cham. & Schltdl.) Fosb.
	I		alahe'e, ohe'e, walahe'e	*Psydrax*	*odorata*			(G. Forst.) A. C. Sm. & S. P. Darwin
	X		buttonweed	*Spermacoce*	*assurgens*			Ruiz & Pav.
Rutaceae								
	E		kakaemoa	*Melicope*	*clusiifolia*			(A. Gray) T. Hartley & B. Stone
	E		Molokai melicope	*Melicope*	*molokaiensis*			(Hillebr.) T. Hartley & B. Stone
	E		Honokahua melicope, orbicular pelea	*Melicope*	*orbicularis*			(Hillebr.) T. Hartley & B. Stone
	E		alani, alani kuahiwi, boxfuit alani,	*Melicope*	*peduncularis*			H. Lev.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			boxfruit pelea					
	E		alani, alani kuahiwi, volcanic melicope or pelea	*Melicope*	*volcanica*			(A. Gray) T. Hartley & B. Stone
	E		pilo kea	*Platydesma*	*spathulata*			(A. Gray) B. Stone
Sapindaceae								
	I		a`ali`i, a`ali`i kū makani, a`ali`i kū ma kua, kūmakani	*Dodonaea*	*viscosa*			Jacq.
Scrophulariaceae								
	X	New	NCN	*Buddleia*	*asiatica*			Lour.
Solanaceae								
	X		patio pepper	*Capsicum*	*annum*			L.
	E	AM	`aiea, hālena, long-leaved nothocestrum	*Nothocestrum*	*longifolium*			A. Gray
Sterculiaceae								
	I		`uhaloa, `ala`ala pū loa, hala `uhaloa, hi`aloa, kanakaloa, sleepy morning	*Waltheria*	*indica*			L.
Thymelaeaceae								
	E		`ākia, kauhi, O`ahu false ohelo	*Wikstroemia*	*oahuensis*	var.	oahuensis	(A. Gray) Rock
Urticaceae								
	I		Pacific island clearweed	*Pilea*	*peploides*			(Gaudich.) Hook. & Arnott
	E		māmaki, māmake, waimea	*Pipturus*	*albidus*			(Hook. & Arnott) A. Gray
	E		olonā	*Touchardia*	*latifolia*			Gaud.
Verbenaceae								

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	X		lākana, lā`au kalakala, mikinolia hihiu, mikinolia hohono, mikinolia kukū	*Lantana*	*camara*			L.
	X		ōwī, oī, Jamaica vervain	*Stachytarpheta*	*jamaicensis*			(L.) Vahl
	X		ōwī, oī, ha`uōwī, seashore vervain	*Verbena*	*litoralis*			Kunth
Viscaceae								
	I		hulumoa, kaumahana, Hawaiian mistletoe	*Korthalsella*	*complanata*			(Tiegh.) Engl.
	E		hulumoa, kaumahana, Hawai`i Korthal mistletoe	*Korthalsella*	*cylindrica*			(Tiegh.) Engl.
Monocots								
Agavaceae								
	P		kī, ti, good luck plant	*Cordyline*	*fruticosa*			(L.) A. Chev.
	X		malina, Mauritius hemp	*Furcraea*	*foetida*			(L.) Haw.
Araceae								
	P		kalo, taro	*Colocasia*	*esculenta*			(L.) Schott
	X		taro vine, pothos, golden pothos	*Epipremnum*	*pinnatum*	cultivar	aurem	(L.) Engl.
	X		philodendron	*Philodendron*	*sp.*			
Arecaceae								
	X		NCN	*Areca*	*sp.*			
	P		niu, ololani, coconut	*Cocos*	*nucifera*			L.

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Asteliaceae								
	E		Pua`akuhinia	*Astelia*	*menziesiana*			Sm.
Cannaceae								
	X		ali`ipoe, li`ipoe, poloka, Indian-shot	*Canna*	*indica*			L.
Commelinaceae								
	X		honohono, honohono wai, mākolokolo	*Commelina*	*diffusa*			N. L. Burm.
Costaceae								
	X		Malay or crepe ginger	*Costus*	*speciosus*			(J. Konig) Sm.
Cyperaceae								
	E		Hawai`i sedge	*Carex*	*alligata*			Boott
	X		Long's sedge	*Carex*	*longii*			Mack.
	E		carex	*Carex*	*wahuensis*	ssp.	wahuensis	C.A. Mey.
	X		sharp edge sedge	*Cyperus*	*haspan*			L.
	I		`ahu`awa, ehuawa	*Cyperus*	*javanicus*			Houtt.
	I		manyspike flatsedge	*Cyperus*	*polystachyos*			Rottb.
	I		mau`u `aki`aki, button sedge	*Fimbristylis*	*cymosa*	ssp.	umbellata-capitata	(Hillebr.) T. Koyama
	X		kili`o`opu, kaluhā, manunēnē, mau`u mokae	*Kyllinga*	*brevifolia*			Rottb.
	X		kili`o`opu, mau`u mokae	*Kyllinga*	*nemoralis*			(J.R. & G. Forst.) Dandy ex Hutchinson & Dalziel
	I		`uki, Polynesian twigrush	*Machaerina*	*angustifolia*			(Gaud.) T. Koyama
	I		`ahaniu, `uki,	*Machaerina*	*mariscoides*	ssp.	meyenii	(Kunth) T. Koyama

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			tropical twigrush					
	X		beakrush	*Rhynchospora*	*caduca*			Elliott
	I		spiked beaksedge	*Rhynchospora*	*chinensis*	ssp.	spiciformis	(Hillebr.) T. Koyama
	I		kamu, matau a Maui, bastard grass, hook sedge	*Uncinia*	*uncinata*			(L. fil.) Kükenth.
Joinvilleaceae								
	E		`ohe	*Joinvillea*	*ascendens*	ssp.	ascendens	Gaud. ex Brongn. & Gris.
Juncaceae								
	X		broadleaf rush	*Juncus*	*planifolius*			R. Br.
Orchidaceae								
	E		jewel orchid	*Anoectochilus*	*sandvicensis*			Lindl.
	X		scarlet, butterfly or baby orchid	*Epidendrum*	*obrienianum*			Rolfe
	X		water-spider orchid, floating orchid, water orchid	*Habenaria*	*repens*			Nutt.
	E	AM	`awapuhiakanaloa	*Liparis*	*hawaiensis*			H. Mann
	X		Philippine ground orchid	*Spathoglottis*	*plicata*			Blume
Pandanaceae								
	I		`ie`ie, `ie	*Freycinetia*	*arborea*			Gaud.
	I		hala, pū hala	*Pandanus*	*tectorius*			S. Parkinson ex Z
Poaceae								
	X		broomsedge, yellow bluestem	*Andropogon*	*virginicus*			L.
	X		wide-leaved carpetgrass	*Axonopus*	*compressus*			(Sw.) P. Beauv.
	X		narrow-leaved	*Axonopus*	*fissifolius*			(Raddi) Kuhlm.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			carpetgrass					
	X		feather fingergrass	*Chloris*	*virgata*			Sw.
	I?		mānienie `ula, pi`ipi`i, pilipili `ula, golden beardgrass	*Chrysopogon*	*aciculatus*			(Retz.) Trin.
	E		hairgrass	*Deschampsia*	*nubigena*			Hillebr.
	X		kūkaepua`a, Henry's crab grass	*Digitaria*	*ciliaris*			(Retz.) Koeler
	X		sourgrass	*Digitaria*	*insularis*			(L.) Mez ex Ekman
	X		mānienie ali`i, wiregrass	*Eleusine*	*indica*			(L.) Gaertn.
	X		sheepgrass	*Eragrostis*	*brownei*			(Kunth) Nees ex Steud.
	E		NCN	*Eragrostis*	*grandis*			Hillebr.
	E		kāwelu, `emoloa, kalamālō	*Eragrostis*	*variabilis*			Hillebr.
	X		common velvet grass, Yorkshire fog	*Holcus*	*lanatus*			L.
	X		molasses grass	*Melinis*	*minutiflora*			P. Beauv.
	X		red Natal grass, Natal red top	*Melinis*	*repens*			(Willd.) Zizka
	X		honohono kukui, honohono, honohono maoli, basketgrass	*Oplismenus*	*hirtellus*			(L.) P. Beauv.
	X		Guinea grass	*Panicum*	*maximum*			Jacq.
	X		mau`u Hilo, Hilo grass, sour paspalum	*Paspalum*	*conjugatum*			Bergius
	X		mau`u laiki, ricegrass	*Paspalum*	*scrobiculatum*			L.

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
	X		Vasey grass	*Paspalum*	*urvillei*			Steud.
	X		Cane grass, elephant grass, napier grass	*Pennisetum*	*purpureum*			Schumach.
	X		black bamboo	*Phyllostachys*	*nigra*			(Lodd.) Munro
	X		glenwood grass	*Sacciolepis*	*indica*			(L.) Chase
	X		mau`u Kaleponi, knotroot bristle grass, perennial foxtail, yellow foxtail	*Setaria*	*parviflora*			(Poir.) Kerguélen
	X		mau`u pilipili, bristly foxtail	*Setaria*	*verticillata*			(L.) P. Beauv.
	X		smutgrass, African dropseed, rattail grass	*Sporobolus*	*africanus*			(Poir.) Robyns & Tournay
Smilacaceae								
	E		hoi kuahiwi, aka`awa, pi`oi, uhi, ulehihi	*Smilax*	*melastomifolia*			Sm.
Taccaceae								
	P	New	pia, Polynesian arrowroot	*Tacca*	*leontopetaloides*			(L.) Kuntze
Zingiberaceae								
	X		`awapuhi `ula`ula, red ginger	*Alpinia*	*purpurata*			(Vieill.) K. Schum.
	P		`ōlena, lena, mālena, turmeric	*Curcuma*	*longa*			L.
	X		`awapuhi ke`oke`o, white ginger, common ginger lily, butterfly lily,	*Hedychium*	*coronarium*			J. Konig

Family	Origin	Status	Common Name	Genus	Species	Rank	Epithet	Author
			garland flower					
	X		kāhili, `awapuhi kāhili, kāhili ginger	*Hedychium*	*gardnerianum*			Sheppard ex Ker-Gawl.
	P		`awapuhi, `awapuhi kuahiwi, `ōpuhi, shampoo ginger, wild ginger	*Zingiber*	*zerumbet*			(L.) Sm.