

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.

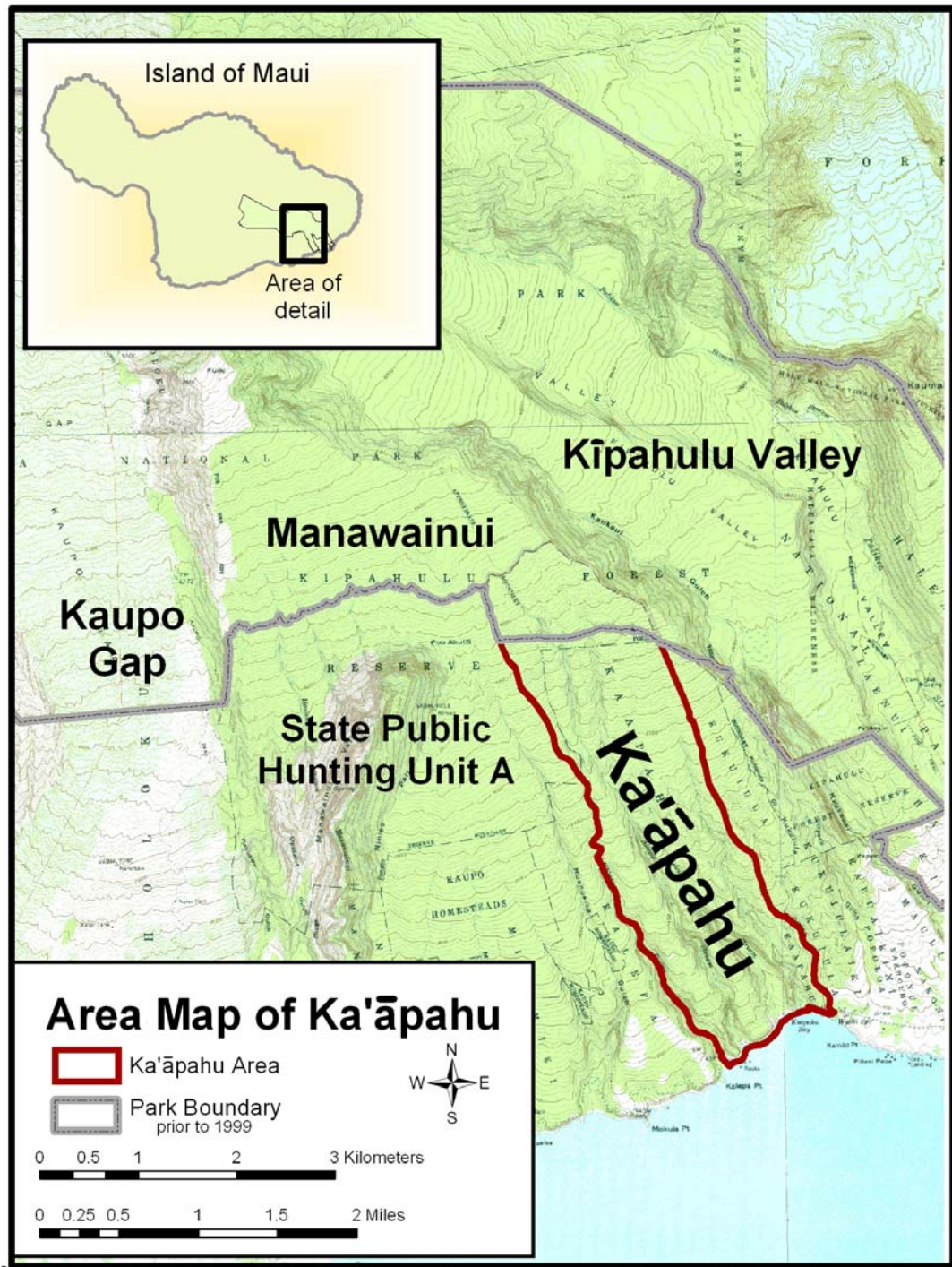


Figure 1. Location of Ka'āpahu, Haleakalā National Park, 2005.

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 (*Syzygium 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.