

**APPENDIX F: FEDERALLY-LISTED THREATENED AND ENDANGERED SPECIES AT PTA****Vegetation***Asplenium peruvianum* var. *insulare* (diamond spleenwort, fragile fern)

The diamond spleenwort (endangered) is a small to medium-sized fern is found within streamside hollows and grottoes that occur in mesic to dry subalpine shrubland dominated by pukiaawe (*Leptecophylla tameiameia*) and amau (*Sadleria cyatheoides*), with scattered 'Ohi'a lehua. There are between 626 and 1,071 individuals of this fern found on Hawai'i Island; there are 13 known occurrences on PTA with varying number of individuals. Threats to this species include fire, browsing by feral sheep and goats, competition with fountain grass, and habitat degradation or destruction of lava tubes (USAEC, 2009). A recovery plan has been established for diamond spleenwort. The objectives of the recovery plan are to delist to threatened status, secure habitat of current populations and manage threats, establish new populations, and conduct research (USFWS, website accessed on 03/09/11).

*Haplostachys haplostachya* (honohono)

The honohono (endangered) is a short-lived subshrub of the mint family, which grows in dry exposed areas on ash-veneered lava, very stony, shallow soils, and lava outcrops. This species often establishes in large cracks on rocky ridges and on pu'us. Currently, the species is found in six different Intensive Management Units (IMUs) totaling over 20,000 individuals on Hawai'i Island; all occurrences are located in PTA. The primary threats to this species are feral sheep and goats that browse on the flowers; rooting by feral pigs; competition for light, space, and nutrients by fountain grass and other nonnative plants; and invasion by and conversion of habitat to a fire-based vegetation community (USACE, 2009b).

*Kadua coriacea* (kio'ele)

The kio'ele (endangered) is a small shrub in the coffee family, which occurs on pāhoehoe lava flows in sparse *Metrosideros* treelands and open *Metrosideros* treelands with sparse to dense shrub understories. It is found at elevations from 1,500 (4,921 ft) to 1,700 m (5,577 ft) at PTA. One individual plant is currently known on the Island of Maui, and the remaining plants occur on PTA, approximately 175 to 225 individuals. The threats to this species include browsing pressure from feral sheep and goats; habitat degradation; introduction and expansion of invasive plant populations; and military exercises that ignite fires which degrade habitat and subsequent invasion by nonnative plants. Due to the very limited distribution of this species, a single natural or human-caused environmental disturbance could be catastrophic (USAEC, 2009b). A recovery plan has been established for the kio'ele. The objectives of the recovery plan are to delist the species, monitor and manage populations, and expand current populations (USFWS, website accessed on 03/09/11).

*Isodendrion hosakae* (aupaka)

The aupaka (endangered) is in the Violaceae, or violet family, and is a branched, upright, short-lived evergreen shrub. Plants range from 8 cm (3 in) to 82 cm (32 in) tall. Flowers and fruits occur on woody stems. Aupaka are limited in distribution to the South Kohala District on Hawai'i Island. The species is found on three cinder cones in the Waikoloa area to include Pu'u Papapa, Pu'u Nohonaohae, and an

unnamed cone east-northeast of Nohonaohae. The species occurs in dry montane shrublands dominated by Aalii, māmane, *Wikstroemia* sp, and *Santalum* sp. There are 871 individuals of aupaka on PTA and all of these individuals are found in the KMA on Nohonaohae and Papapa cinder cones. These individuals represent 97 percent of the naturally occurring individuals remaining in the wild. Thirty-five plants are being grown in the micropropagation facility at the Harold L. Lyon Arboretum on Oahu, all from PTA plants. Threats to this species include military exercises that increase risk of fire, spread non-native plant species, and cause habitat fragmentation and dust (USFWS, 2003).

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*Silene hawaiiensis* (Hawaiian catchfly)

The Hawaiian catchfly (threatened) is a sprawling, short-lived shrub that typically grows in montane and subalpine dry shrublands on decomposed lava and ash, as well as on all ages of lava and cinder substrates at elevations from 900 m (2,953 ft) to 1,300 m (4,265 ft). The species has also been documented to re-sprout following fire events. There are approximately 1,903 to 2,872 individuals of Hawaiian catchfly distributed throughout the installation, but mainly on the eastern side in Training Area 21. These occurrences represent approximately 71 percent of all naturally occurring individuals State-wide. The major threats to this species include ungulate browse and increased risk of fire from mounted or dismounted off-road maneuvers and bivouac. Military actions can also result in habitat fragmentation,

dispersal of alien plant seeds, and increased potential for trampling of plants (USAEC, 2009). A recovery plan has been established for the Hawaiian catchfly. The objectives of the recovery plan are delisting the species, managing populations, conducting research, and expanding and creating new populations (USFWS, website accessed on 03/09/11).

*Silene lanceolata* (lanceleaf catchfly)

The lanceleaf catchfly (endangered) is a member of the Pink family, and is a perennial shrub recorded on the Islands of Molokai, O‘ahu, and Hawai‘i. On the Hawai‘i Island, this species grows on rocky tumuli or outcrops, on ‘a‘ā lava, in deep ash deposits over pāhoehoe lava, and in Mauna Kea substrate in dry montane shrubland at elevations between 1,253 m (4,111 ft) and 1,320 m (4,331 ft). PTA estimates that there are over 10,000 individuals of the species found onsite. This clearly represents the majority of the species known to exist. Lanceleaf catchfly are extremely susceptible to ungulate browsing and trampling. At PTA, military training activities increase the risk of fires due to live-fire training, bivouac and mounted or dismounted off-road activities. Other threats include trampling, dust, spread of invasive nonnative plants, and fragmentation of remaining habitat (USAEC, 2009).

*Solanum incompletum* (popolu ku mai)

The popolu ku mai (endangered) is a member of the nightshade family that typically occurs as a woody shrub growing to 3 m (10 ft) tall. At PTA, the species is found on lava flows of various ages in Sparse *Metrosideros* Treelands and *Myoporum* Shrublands at an elevation of 1,425 m (4,675 ft). The only natural occurrence of this species is at two disjunction sites at PTA that totals approximately 66 individuals. There have been over 1,100 outplantings of the plant on the installation. Threats to the species include habitat degradation, browsing by feral ungulates, competition with non-native plant species, reduced reproductive vigor (e.g., limited gene pool), and the potential for a single catastrophic environmental event. The primary threat from military activities is the increased risk of fire (USAEC, 2009). A recovery plan has been established for the popolu ku mai. The objectives of the plan are delisting the species, protecting habitat and controlling threats, conducting research, creating monitoring plans, establishing wild populations within historic range, and expanding existing populations (USFWS, website accessed on 03/09/11).

*Spermolepis hawaiiensis* (Hawaiian parsley)

The Hawaiian parsley (endangered), a member of the Apiaceae (parsley family), and is a slender, annual herb which reaches heights between 5 cm (2 in) and 20 cm (8 in). Hawaiian parsley is known from a variety of plant communities throughout its range, including *Metrosideros* Forests, *Dodonea* Lowland Dry Shrubland, cultivated fields, and pastures. It occurs at an elevation range of 300 m (984 ft) to 600 m (1,969 ft). There are 13 occurrences on PTA. These individuals represent between two and five percent of the naturally occurring individuals known State-wide. The species is found within both fenced units in Kipuka Alala and along the westernmost boundary of the installation near the Mauna Loa 1859 Lava Flow. The Hawaiian parsley is threatened by browsing from feral sheep and goats; habitat degradation and competition from various non-native plants such as Molassesgrass (*Melinis minutiflora*) and fountain grass. Threats from military activities include degradation and loss of habitat resulting from mounted and dismounted maneuvers, fire, trampling by Soldiers, maintenance activities, and construction of landing zones in occupied areas (USFWS, 2003). A recovery plan has been established for the Hawaiian parsley.

The objectives of the plan are delisting the species, protecting habitat and controlling threats, conducting research, creating monitoring plans, establishing wild populations within historic range, and expanding existing populations (USFWS, website accessed on 03/09/11).

*Stenogyne angustifolia* var. *angustifolia* (creeping mint)

Creeping mint (endangered) grows on relatively flat, ash-veneered lava and shallow soils in semi-arid shrublands and *Metrosideros* Woodlands at an elevation of 1,555 m (5,102 ft). The species also occurs at an elevation of 1,035 m (3,396 ft) in the transition zone between pastureland and the Ke‘āmuku lava flow. Between 1,864 and 1,936 individuals of creeping mint have been recorded in PTA at 545 locations; these individuals represent 100 percent of the naturally occurring individuals known State-wide. Threats to the species include habitat competition from nonnative plants, particularly fountain grass; and conversion of habitat to a fire-based vegetation community. Army training such as mounted or dismounted off-road maneuvers, bivouac, and live-fire training increase the risk of fire, habitat fragmentation, and alien plant seed spread (USAEC, 2009). A recovery plan has been established for the creeping mint. The objectives of the plan are to delist to threatened status, secure habitat of current populations and manage threats, establish new populations, and conduct research (USFWS, website accessed on 03/09/11).

*Tetramolopium arenarium* var. *arenarium* (Mauna Kea pamakani)

The Mauna Kea pamakani (endangered) is a shrub species in the sunflower family and grows up to 1.3 m (4.3 ft) tall. At PTA, the species is found in the *Dodonaea* Mixed Shrubland at elevations between 1,300 m (4,265 ft) and 1,700 m (5,577 ft). All of the approximately 577 individuals of this species occur within a 16.2 ha (40 ac) area. The primary threats to this species are feral ungulates that browse on the plant; rooting by feral ungulates; competition from non-native plant species such as fountain grass; and conversion of habitat to a fire-based vegetation community. Army training, such as mounted or dismounted off-road maneuvers, bivouac, and live-fire activities, increase the risk of fire, habitat fragmentation, and alien plant seed spread. Due to the very limited distribution of this species, a single natural or human-caused environmental disturbance (i.e., fire) could be catastrophic (USAEC, 2009). A recovery plan has been established for the Mauna Kea pamakani with objectives to delist the species, manage populations, conduct research, and expand and create new populations (USFWS, website accessed on 03/09/11).

*Vigna o-wahuensis* (no common name)

The *Vigna o-wahuensis* (endangered) is a member of the Fabaceae, or pea family, and is a slender, short-lived, twining perennial herb with fuzzy stems that grow to 0.4 m (1.3 ft). *Vigna o-wahuensis* occur in lowland dry to mesic grassland and shrubland at elevations from 10 m (33 ft) to 1,370 m (4,495 ft). There are 74 individuals located in six occurrences in the KMA. These plants occur on Nohonaohae cinder cone (66 individuals) and Pu‘u Papapa (three individuals), with one occurrence along the southern border (five individuals). These individuals represent 83 percent of all naturally occurring individuals of this species State-wide. Army training such as mounted or dismounted off-road maneuvers, bivouac, and live-fire training increase the risk of fire, habitat fragmentation, and alien plant seed spread. Other threats include continued habitat degradation by feral ungulates, cattle and competition with non-native plant species (USFWS, 2003). A recovery plan has been established for the *Vigna o-wahuensis*. The objectives of the

plan are delisting the species, protecting habitat and controlling threats, conducting research, creating monitoring plans, establishing wild populations within historic range, and expanding existing populations (USFWS, website accessed on 03/09/11).

*Zanthoxylum hawaiiense* (Hawai‘i pricklyash, Hawaiian yellow wood, a‘e)

Hawai‘i pricklyash is a tree species member of the citrus family. At PTA, it’s found on lava and in a variety of plant community types including sparse *Metrosideros* Treelands, Open *Metrosideros* Treelands with dense shrub understory, Intermediate *Metrosideros* Mixed Treelands, *Myoporum* Shrublands, and *Myoporum-Dodonaea* Shrublands. Between 72 and 86 percent of the State-wide population of this tree species occurs on PTA. Threats to the species include habitat degradation and browsing by feral and domestic animals, competition from non-native plant species, seed predation by rodents, fire, trampling, and effects of military activities (i.e., dismounted off-road maneuvers and bivouac increase the risk of fire, promote habitat fragmentation, disperse alien plant seeds, and increase potential trampling of seedlings and young plants) (USAEC, 2009). A recovery plan has been established for the Hawai‘i pricklyash. The objectives of the plan are delisting the species, managing populations, conducting research, and expanding and creating new populations (USFWS, website accessed on 03/09/11).

## Wildlife

*Loxioides bailleui* (palila)

Palila, a federally listed as endangered species, are large, yellow, gray, and white finches found only on the upper slopes of Mauna Kea volcano, on Hawai‘i Island. There, in dry mamane and mamane-naio forest, these birds use their heavy bills to feed on their preferred food, mamane seed pods. Palila are threatened by habitat degradation and mammalian predators. In 1977, USFWS designated critical habitat for the federally listed palila, which included areas at PTA. Critical habitat for the palila is located on two areas of PTA along the northeastern boundary of the installation. A total of 24,356 ha (60,185 ac) of palila critical habitat is designated on Hawai‘i Island; 1,707 ha (4,218 ac) (Audubon, website accessed 5/12/2011).

*Branta sandvicensis* (nēnē, Hawaiian goose)

Nēnē are in the goose family of geese (family: Anatidae). Adult males and females are mostly dark brown or sepia with a black face and crown, cream-colored cheeks, and a buff neck with black streaks. Females are smaller than males. Nēnē graze and browse on the leaves, seeds, flowers, and fruits of at least 50 native and non-native grasses, sedges, composites, and shrubs. Nēnē disperse seeds and play an important ecological role, especially in influencing the species composition of early successional plant communities. Nēnē have an extended breeding season and eggs can be found in all months except May, June, and July, although the majority of birds nest between October and March with most clutches laid between October and December. Females lay between two and five eggs which hatch after 30 days. The current population is estimated at between 1,300 and 1,500 individuals with 480 birds on the Hawai‘i Island (Nēnē Recovery Group). On Hawai‘i Island, nēnē can be found from sea level to 2,400 m (7,900 ft) elevation. Breeding areas encompass a variety of habitats including beach strand, shrubland,

grassland, and lava rock, and occur at a range of elevations (Hawaii Department of Fish and Wildlife, website accessed 1/04/2011).

A group of 18 individuals were observed at PTA in August 2007, including 14 birds that were previously banded and a group of up to 24 individuals were observed in that vicinity in July 2008. These are the largest groups recorded in that location or anywhere else on the installation. The birds are typically observed there in the late summer and fall months, and records of nēnē using the area date back to 2005. Nēnē were first reported using Range 1 at PTA with regularity in 2007, however, PTA Natural Resources Office records and incidental sightings by PTA range workers indicated nēnē have been using Range 1 for over 20 years. Over 30 individuals have been recorded in a single day at Range 1. There have been sparse sightings of nēnē from telemetry studies conducted by the national park near the Western Range Area. Nēnē have not been observed on the ground, but some preliminary data suggests that they may be touching down in the impact area (Peshut, 2011).

The Army has initiated management actions to minimize potential impacts to nēnē at PTA, including installation of remote sensing cameras to detect the presence of nēnē. PTA is believed to be a historical stopover site for birds flying between the two east and west population centers on the island (USAEC, 2008). Historical threats to nēnē included habitat loss and degradation, hunting, and predation by rats, cats, dogs, and small Indian mongoose. Current threats include predation by the above suite of non-native mammals, exposure in high-elevation habitats, nutritional deficiency due to habitat degradation which may result in low productivity, a lack of lowland habitat, and human-caused disturbance and mortality (e.g., road mortality, disturbance by hikers) (Hawaii Department of Fish and Wildlife, website accessed 1/04/2011).

*Buteo solitaries* ('Io, Hawaiian hawk)

The 'Io, or Hawaiian hawk, is the only broad-winged hawk (Family: Accipitridae) known to have colonized Hawai'i. Hawaiian hawks are considered 'aumākua, or family gods by Native Hawaiians. Similar to many birds of prey, females are larger than males, and often weigh approximately 25 percent more than males. Two color morphs, light and dark, occur in 'Io populations. Hawaiian hawks are socially monogamous and limited data indicates individuals form long-term pair-bonds and defend territories year-round. Nest construction is protracted, beginning up to two months before the first egg is laid, and continuing into the nestling period. Both sexes contribute to nest-building. Based on recent studies, clutch size is nearly always one, although historically clutches of two and three were reported. An island-wide survey performed in 1993 estimated the Hawaiian hawk population at 1,600 birds. Based on a survey conducted in 1998, the population was estimated at 1,223 birds. Trends are difficult to determine because of varying census methodology, but the population appears stable (Hawaii Department of Fish and Wildlife, website accessed 1/04/2011).

At PTA, Hawaiian hawk surveys were conducted between 2004 to 2006 and repeated from 2009 to 2010. Only one individual was detected soaring on a thermal over the eastern edge of Training Areas 1-4 before continuing further east beyond PTA. The Hawaiian hawk was lost from sight prior to the end of the 10-minute sample period. Hawaiian hawks appear not to be breeding or using PTA habitats in a predictable manner for any significant amount of time. The survey results suggest that while seemingly suitable Hawaiian hawk habitat exists at PTA, the species is not using this habitat in a consistent and/or biologically significant manner. Although survey results indicate this species is scarce at PTA, there have

been 15 incidental sightings of Hawaiian hawks over the past 12 years. Hawaiian hawks were observed in Training Area 23 in 1998, 2003, 2006, 2008, and 2009. On two occasions in December 2009, a single Hawaiian hawk was seen perched roadside in a tree located within Training Areas 1-4. Hawaiian hawks observed in Training Area 23 have been observed soaring on thermals or perched in trees. All individuals were transient and did not linger in the areas. Based on their behavior and limited interactions with the habitat, it is likely that the birds were passing through PTA (U.S. Army Garrison-Pōhakuloa and CEMML, 2010).

*Lasiurus cinereus semotus* ('ope'ape'a, Hawaiian hoary bat)

The Hawaiian hoary bat is the only native terrestrial mammal in Hawai'i, and it is federally listed as endangered. Current and historical population levels are unknown, but the population is believed to have declined over the past 100 years (USAEC, 2008). The Hawaiian hoary bat is distributed throughout PTA. They have been documented in the northern and western portions of PTA and in Range 1 in the early 1990s (USAEC, 2008). Recently, the Hawaiian hoary bat has been observed near the Cantonment Area flying at night between 4.6 m (15 ft) to 152.4 m (500 ft) feeding on bugs (Peshut, 2011).

In 2007, the installation began a full-scale, year-round installation-wide Hawaiian hoary bat monitoring program. The development of the Hawaiian hoary bat monitoring program was initiated in response to requirements discussed in the 2003 BO. The goal of the Hawaiian hoary bat monitoring was to describe temporal and spatial patterns of Hawaiian hoary bat occupancy at PTA using data collected from automated passive echolocation detectors, where occupancy is defined as the probability that a randomly selected area of interest is occupied by Hawaiian hoary bat. Results from the 2007 study found that the bats make three altitudinal migrations throughout Hawai'i Island each year. The 2009 and 2010 studies detected Hawaiian hoary bats in all habitats sampled. The results of the studies seem to corroborate previously proposed theories regarding intra-annual bat movement, where Hawaiian hoary bat occupancy is thought to increase in the highlands between breeding and post-lactation reproductive periods. In the 2003 BO, Hawaiian hoary bat take was defined in acres of potential roosting treeland habitat at the PTA. The 2003 BO defines shrublands with mamane and naio as dominant or codominant species as potential roosting habitat (USAG-PTA and CEMML, 2010). A recovery plan has been established for the Hawaiian hoary bat. The objectives of the plan are determining actual population numbers and habitat requirements (USFWS, website accessed 03/09/11).

*Pterodroma sandwichensis* ('ua'u, Hawaiian dark-rumped petrel)

The 'ua'u or Hawaiian petrel is a large, nocturnal gadfly petrel (Family: Procellariidae) endemic to Hawai'i. Adult males and females are uniformly dark grayish black above forming a partial collar which contrasts with white throat, forehead, and cheeks; entirely white below except for black tail and leading and trailing edges of underwings. During the breeding season, Hawaiian petrels often feeds thousands of kilometers from colonies, usually foraging with mix-species feeding flocks, typically over schools of predatory fishes (Mitchell et. al, 2005). In Hawai'i, Hawaiian petrels feed primarily on squid, but also on fish and crustaceans. Prey species for the Hawaiian petrel are not found near PTA. Hawaiian petrels nest in colonies, form long-term pair bonds, and return to the same nest site year after year. Colonies are typically located in high elevation, xeric habitats or wet, dense forests. Nests are often found in burrows, crevices, or cracks in lava tubes; nest chamber can be from one to nine meters 0.9 m (3 ft) to 9.1 m (30 ft) deep. Most eggs are laid in May and June and most birds fledge by December. Total number of

individuals is estimated at 20,000 with a breeding population between 4,500 and 5,000 pairs, although inaccessible nesting locations make accurate counts difficult (Mitchell et. al, 2005 and Hawaii Department of Fish and Wildlife, website accessed 1/04/2011).

During an endangered species inventory in 1994, three ‘ua‘u were detected by radar flying over the eastern portion of PTA over the northern flank of Mauna Loa; however, more recent surveys at PTA have not detected the species. In 2002, three human-modified pits were discovered that may have historically been used by the ‘ua‘u as burrows. An additional burrow with two nests from a previous nesting year was also found. The size of potential available nesting habitat at PTA makes the area attractive for ‘ua‘u. Although no birds have been sighted recently at PTA, their burrowing behavior and the discovery of previously used nesting sites suggest small undetected populations are possible. Annual surveys for the species were conducted in two sites where they were previously recorded, but no birds were seen or heard during those surveys in 2007-08 (USAEC, 2008). From 2007 to 2009, six roadside survey locations along Red Leg Trail (Training Area 21) were monitored by PTA Natural Resources Office staff; no ‘ua‘u calls were detected in 2007, 2008, and 2009. Road-side sampling was discontinued in 2010 (U.S. Army Garrison-Pōhakuloa and CEMML, 2010).

*Hemignathus munroi* (‘akiapōlā‘au)

The ‘akiapōlā‘au (endangered) is a finch species in the Hawaiian honeycreeper family (Drepanididae) endemic to Hawai‘i Island. Its’ natural habitats are dry moist forests. This species feeds only on insects hidden within tree branches and on invertebrates found on the forest floor where there is a large amount of natural growth. The bird has an unusually curved beak, as a specialist species (woodpecker niche). ‘Akiapōlā‘au are restricted to forests located at higher elevation forests due to the presence of mosquito-borne diseases at lower elevations and the destruction and degradation of forest habitat (USFWS, 2006). The ‘Akiapōlā‘au have been historically recorded at PTA, but have not been observed or recorded at PTA for 15 or more years (U.S. Army Garrison-Pōhakuloa and CEMML, 2010).