7.10 BIOLOGICAL RESOURCES

7.10.1 Affected Environment

Biological resources include plant and animal species and the habitats or communities in which they occur. This section is divided into discussions of general wildlife, vegetation, and habitat types common to KTA and KLOA (Figure 7-20). A discussion of the sensitive wildlife, vegetation, and sensitive habitats known to occur or with the potential to occur in this area is also included. Federal, state, and locally regulated species are included in this report, along with rare species, identified by rapid population decline or whose habitat has markedly decreased in recent years. Figure 7-20 shows the KTA/KLOA ROI, which was based on the potential for fire damage and loss of land due to construction and trampling during SBCT training and the introduction of exotic species from Soldiers moving throughout the installation. The extent of these impacts was determined by the type of vegetation present, human-made and topographic barriers, and buffers in the areas around the proposed actions. The ROI includes SBCT actions occurring on KTA, KLOA, Drum Road, and a buffer area, the size of which depends on the type of training or proposed activities that would occur and the fire risk imposed by vegetation and topography.

In addition to defining the ROI by the firebreak potential, a smaller portion of the ROI is based on the extent of habitat degradation imposed by trampling and by the effect of introducing exotic species associated with human activities. This is because in some areas vegetation is very moist, making the risk to fire extremely low. The ROI does not include any marine habitat. While waters near KTA are part of the Hawaiian Islands Humpback Whale National Marine Sanctuary, no project actions occur in this area nor in the vicinity of the coastline, in the nearshore, in the offshore marine habitat, or upland from the nearshore marine habitat.

Recovery Plan

There are 36 plant and 1 animal species with recovery plans that are known to occur or have the potential to occur within the ROI. These species are listed in Appendix I-1a.

Vegetation

KTA, a total of 8,528 acres (hectares), is at the end of the Koʻolau Mountains, on the northern tip of Oʻahu. Private, agricultural, and additional Army training lands border it. Botanical surveys to identify rare plants, communities, and potential threats to these resources have been conducted intermittently since 1977. HINHP surveys in 1989, 1993, and 1994 provided the foundation for much of the botanical information used in this EIS.

KLOA is to the north of SBER and to the south of KTA in the Koʻolau Mountains. It consists of 23,348 acres (9,449 hectares). KLOA was surveyed in 1976 and 1977 by the Environmental Impact Study Corporation and later by HINHP (1989 to 1993). Additional botanical and zoological information had been collected on KLOA and adjacent land. Kawailoa is an area of incredible biological richness, with areas of significance for protecting and managing these resources.

Figure 7-20
Kahuku/Kawailoa Training Areas Biological Region of Influence

The vegetation communities identified in the KTA/KLOA ROI are described below and are shown in Figure 7-21.

Portions of the KTA/KLOA ROI contain valuable native vegetation communities, but much of the lower lying vegetation is composed of introduced and invasive plants. Several of these widespread species create dense single-species stands (Christmas berry, ironwood, strawberry guava) that shade out understory species. Two of the plants recently discovered in the ROI that are potentially devastating to the native communities of KTA are manuka *(Leptospermum scoparium)* and moho *(Heliocarpus popayanensis)*. Disturbed moist forests are most at risk from these invasions, and efforts are needed to protect the native communities within these boundaries.

Native natural community types within the KTA/KLOA ROI fall into six general categories: montane wet, lowland wet, lowland forest, lowland moist, lowland dry, and intermittent aquatic natural communities, none of which contain known wetlands (USARHAW and 25th ID [L] 2001a).

Within the montane wet communities there are three community types. The mixed fern/shrub community is a fairly restricted community in the topmost reaches of the Koʻolau Mountains, and rainfall generally exceeds 150 inches (381 centimeters) (USARHAW and 25th ID [L] 2001a). Common fern species in the area include *Sadleria* spp., *Cibotium* spp., and *Dicranopteris* spp. Common shrub species include *Hedyotis* spp., ʻōhiʻa (*Metrosideros polymorpha),* ʻōhelo *(Vaccinium* spp.*)* and kōpiko *(Psychotria* spp.*)*. Rare plants listed within this community are haʻiwale *(Cyrtandra viridiflora),* and kōlea *(Myrsine fosbergii), (M. juddii)*. The ʻōhiʻa mixed bog community is also restricted to the upper elevations (above 2,800 feet [853.4 meters]) of the Koʻolau Mountains. Annual rainfall exceeds 150 inches (381 centimeters), and the soils are poorly drained, acidic, and part clay. ʻŌhiʻa is the dominant species, whether as dwarf form in open shrubland or as dense shrub thicket. The herbaceous understory is composed of sedges, grasses, and mosses, including *Oreobolus,* kuolohia *(Rhynchospora), Dichanthelium,* ʻuki *(Machaerina),* and *Racomitrium*. This community is critically imperiled.

ʻŌhiʻa shrubland falls between 2,400 and 2,800 feet (731.5 and 853.4 meters). The steep windswept ridges have shallow soil, and rainfall is generally between 100 and 200 inches (254 and 508 centimeters) per year. Dwarfed native trees and shrubs thrive here. In addition to ʻōhiʻa, this community frequently consists of manono *(Hedyotis terminalis),* ʻalani *(Melicope* spp.*),* kōlea *(Myrsine* spp.*),* and other plants. Common herbaceous species in this community include *Trematolobelia* spp. and *Clermontia* spp., and ferns are represented by *Cibotium* spp. and ʻamaʻu *(Sadleria* spp.*)*. Documented rare plants in this community include haʻiwale *(Cyrtandra viridifolia),* wāwaeʻiole *(Phlegamriarus nutans),* *Hesperomania arborescens,* kōlea *(Myrsine* spp.*),* heae*(Zanthoxylum oahuense),* and Oʻahu violet *(Viola oahuense).*

The lowland wet community type in KTA is ʻōhiʻa shrubland. It is found between 1,640 and 2,000 feet (500 and 610 meters). The steep windswept ridges have shallow soil, and rainfall is generally between 100 and 200 inches (254 and 508 centimeters) per year. Dwarf native tree

Figure 7-21
Vegetation Communities in the Kahuku/Kawailoa Training Areas Biological Region of Influence

and shrub species thrive here. In addition to ʻōhiʻa, this community frequently consists of manono *(Hedyotis* spp.*),* ʻalani *(Melicope* spp.*),* and kōlea *(Myrsine* spp.*).* Common herbaceous species in this community include *Trematolobelia* spp. and *Clermontia* spp., and ferns are represented by *Cibotium* spp. and ʻamaʻu *(Sadleria* spp.*).* Documented rare plants in this community include hāhā *(Cyanea koolauensis)* and nāʻū *(Gardenia mannii).*

Within the lowland forest zone is the native ʻōhiʻa forest. The general conditions are warm, moist to wet, and wind sheltered in this area below the Koʻolau summit (1,900 to 2,000 feet [579 to 610 meters]). In addition to the dominant ʻōhiʻa, other common tree species include manono *(Hedyotis terminalis),* mehame *(Antidesma platyphyllum),* and kōlea *(Myrsine* spp.*),* as well as the possible codominant species olapa *(Cheirodendron* spp.*).* Amau *(Cibotium* spp.*)* species are the dominant ferns. Herbaceous plants are māmaki *(Pipturus albidius),* naupaka kuahiwi *(Scaevola* spp.*),* and naʻenaʻe *(Dubautia* spp.*).* The only rare plant documented in this area is nāʻū *(Gardenia mannii).*

Also within the lowland forest zone is the uluhe shrubland, which is widespread on many of the Hawaiian Islands, usually in wet lowland areas below 2,200 feet (671 meters). The dominant plants in this community include two ferns, uluhe *(Dicranopteris linearis)* and uluhe lau nui *(Diplopterygium pinnatum).* No rare plants were observed in this community.

The KTA/KLOA ROI contains two lowland moist communities. Koa/ʻŌhiʻa forest is below 2,100 feet (640 meters) and in leeward areas of good drainage; the annual rainfall is between 35 and 75 inches (84 and 191 centimeters). Besides the dominant koa *(Acacia koa)* and ʻōhiʻa, native trees in this community include kōpiko *(Psychotria* spp.*),* mehame *(Antidesma platyphyllum),* ʻōhiʻa hā *(Syzygium sandwicensis),* ʻahakea *(Bobea elatior),* and halapepe *(Pleomele halapepe).* Uluhe (*Dicranopteris linearis)* is the dominant understory species, but naupaka kuahiwi *(Scaevola gaudichaudiana),* alaheʻe *(Canthium odoratum),* and ʻākia are common. Also documented are ferns, such as palaʻā *(Odontosoria chinensis, Elaphoglossum crassifolium,* and *Nephrolepis exalta),* vines, such as maile *(Alyxia oliviformes)* and ʻieʻie *(Freycinetia arborea),* and sedges *(Carex wahuensis, C. meyenii,* and *Gahnia beechyi).* Rare plants in the KTA community are kaulu (*Pteralyxia macrocarpa)* and ʻoheʻohe *(Tetraplasandra gymnocarpa).* Rare plants in the KLOA community are nāʻū *(Gardenia mannii),* heau *(Exocarpus gaudichaudii),* and ʻalani *(Melicope lydgatei).*

ʻŌhiʻa lowland mesic forest is an additional community dominated by ʻōhiʻa. Annual rainfall averages about 75 inches (191 centimeters), and though ʻōhiʻa makes up about 70 percent of the canopy layer, many other native plants are included in the community. ʻAhakea *(Bobea elatior),* halapepe *(Pleomele halapepe),* kōlea *(Myrsine* spp.*),* and lama *(Diaspyros sandwicensis)* are all represented. The rare plant in this community is nīoi (*Eugenia koolauensis).*

Lama forest is the only lowland dry community type in the KTA/KLOA ROI. It is confined to cliffs and harsh ʻaʻā lava flows in the Hawaiian Islands, and threats from pigs and exotic plants are low. KTA has small stands of this community type between 600 and 900 feet (183 and 274 meters). The canopy is dominated by *Diaspyros sandwicensis,* though other native trees are common. The understory is commonly made of alaheʻe *(Canthium odoratum),* ʻākia *(Wikstroemia* spp.*),* pūkiawe (*Styphelia tameiameiae),* and ʻakoko *(Chamaesyce multiformis).* Native

vines are maile and huehue *(Cocculus trilobus)*. Rare plant species in this community in KTA are nīoi (*Eugenia koolauensis)* and keahi (*Nesoluma polynesicum)*.

The intermittent streams and gulches that run through the KTA/KLOA ROI are Pākūlena Stream, Kālunawaikaʻala Stream, Kaleleʻiki Stream, Paumalū Stream, Kaunala Stream, Elehāhā Stream, Kamananui Stream, Kaiwikoʻele Stream, Kawainui Stream, Kawaiʻiki Stream, ʻŌpaeʻula Stream, Helemanō Stream, Poamoho Stream, North Fork Kaukonahua Stream, Waialeʻe Gulch, ʻŌʻio Stream, ʻŌʻio Gulch, Kawela Stream, Pahipahiʻālua Gulch, Hoʻolapa Gulch, Kalaeokahipa Gulch, ʻŌhiʻa Gulch, Keaʻaula Gulch, Lamaloa Gulch, and Hina Gulch.

Drum Road begins at HMR and continues through the Koʻolau Mountains to various sites in the KTA via KLOA. The trail generally follows the western border of KLOA. The vegetation alongside this trail is composed mainly of nonnative species in the lower elevations with the native plants (ʻieʻie, ʻōhiʻa, uluhe, koa) increasing in distribution toward the upper elevations. Rainfall and cloud cover is not uncommon along this trail. There are occasional cleared, flat grassy areas along the trail. These areas have been subjected to grazing pressure from cattle for many years and are either still in use or are maintained as helicopter landing zones.

The Army seeks to preserve and expand the populations of federally listed plants on lands under their management. The pest management and endangered species management programs overlap and reduce the negative impacts of introduced species on the landscape (USARHAW and 25th ID[L] 2001a). Control of noxious weeds is required by the State of Hawaiʻi Noxious Weed Rules (USDA, no date) and is supported by the AR 200-5 *Pest Management* (HQDA 1999).

Invasive and noxious weeds that are proposed for control in the KTA/KLOA ROI include *Acacia confusa,* hāmākua pāmakani *(Ageratina riparia), Aleurites moluccana,* broomsedge *(Andropogon virginicus),* Oriental vessel fern *(Angiopteris evecta),* shoebutton *(Ardisia elliptica),* pink fringe *(Arthrostema ciliatum),* daisy fleabane *(Erigeron karvinskianus),* Kāhili ginger *(Hedychium gardnerianum),* heirba del solado *(Melochia umbellata),* fountain grass *(Pennisetum setaceum),* and Chinese violet (*Asystasia gangetica)*. Widespread weed species would be controlled where they threaten native plants and communities. Current control methods have focused on palm grass *(Setaria palmifolia),* strawberry guava *(Psidium cattleianum),* princess flower *(Tibouchina urvilleana),* manuka, teatree *(Leptospermum flavescens), and* holly *(Ilex cassine)*.

Native plants are directly affected by populations of feral pigs *(Sus scrofa scrofa),* which contribute to numerous ecological problems (Juvik 1998). The effects of these wild pigs include trampled and grazed native plants and advanced erosion and landslides (USARHAW and 25th ID[L] 2001a; PCSU 1999, 2000, 2001). Water collects in the rutted ground, providing a perfect breeding place for mosquitoes, which can carry avian malaria (HINHP 1994). Browsing and otherwise destroying the native vegetation encourages nonnative plants to become established, which can severely alter the habitat for native plants (Atlas 1998).

A possible additional threat to *Melicope lydgatei* is the nonnative black twig borer *(Xylosandrus compactus)*. The pest burrows into branches and introduces a pathogenic fungus that often kills the host.

Introduced snails and slugs pose a threat to rare Hawaiian plants by preying on the seedlings, stems, and fruit, which reduces regeneration of the host. Rats *(Rattus rattus* and *R. exulans hawaiiensis)* also are known to eat the fruit of certain species of native plants, seriously affecting the reproduction of *Pritchardia* spp. and plants in the *Campanulaceae* and *Gesneriaceae* families (Atlas 1998).

Habitat in the KTA/KLOA ROI could be disturbed by military training activities, and trampling associated with training activities could affect populations of rare plants (R. M. Towill Corp. 1997b). Nonmilitary impacts on the area include cultivation of illegal plants along the KTA boundary, pig hunting, mountain biking, horseback riding, and motocross use. Schofield-Waikāne and Pūpūkea hiking trails are within the ROI, and hiking activities are monitored to reduce potential human impacts. Cigarette litter, campfires, arson, and vehicle activity are nonmilitary impacts that could affect the area.

Fire threat is high in KTA. Fire has been known to occur in the neighboring KLOA and is a threat to native plants and ecological communities. Areas along the lower boundary of the native plant zones are mostly highly flammable introduced species. Additionally the rugged terrain of the training area limits access for fire suppression and control. The Army has standard operating procedures meant to reduce the threat of fire in these remote areas.

One important component of Army resource management is ITAM and the individual projects that are assigned under that heading (see Chapter 2, Section 2.1.5 for an overview). The ITAM LCTA program has not been fully implemented at KLOA or KTA. KLOA is most often used for aviation training and is at a low priority for general monitoring. Vegetation surveys and erosion studies have been done on KTA. These data provided the LRAM program with priority areas for rehabilitation. KLOA also includes areas that are targeted by LRAM as needing improvement. TRI seeks to find the best most efficient uses of the training lands on KTA and KLOA, while being sensitive to the natural resources. Wildfire management plans are in production for KTA and KLOA.

Wildlife

Most of the wildlife inhabiting the landscape that makes up the KTA/KLOA ROI are nonnative. The Army has been conducting regular zoological field surveys on KTA and KLOA that have focused on special status invertebrates, mammals, and birds. There have been no specific reptile or amphibian surveys on KTA due to the absence of native terrestrial reptiles and amphibians on the Hawaiian Islands. Surveys conducted by the University of Hawai'i, Bishop Museum Hawaiian Heritage Program, and the HINHP (1994) are cited in the following section. These natural resource surveys have been used for the resource assessments in the *Biological Inventory and Management Assessment at KTA for USARHAW* (HINHP 1994), *Biological Inventory and Management Assessment at KLOA for USARHAW* (HINHP 1994), *Endangered Species Management Plan Report, O'ahu Training Areas* (R. M. Towill Corp. 1997b), as well as the more recent *O'ahu Training Areas INRMP* (USARHAW and 25th

ID[L] 2001a). Zoological information on Drum Road is less extensive because there are few known surveys focused on wildlife in these areas. Information on this section was gathered in association with the environmental assessment for improvements to Drum Road, and a site visit by a Tetra Tech biologist on January 30, 2003. The following sections describe the general presence of species within the invertebrate, mammal, bird, and fish species. Sensitive species are listed in Tables 7-20 and 7-21.

Invertebrates

The following are native snails observed in the ROI: O'ahu tree snails (*Achatinella curta, A. dimorpha, A. sowerbyana,* and *A. livida),* achatinellid land snails (*Auriculella perpusilla, A. pulchra,* and *Tornatellides* spp.*),* and the subulinid land snail *(Lamellidea* spp.*)* (R. M. Towill Corp. 1997b). Other native invertebrates known to KTA include springtails *(Entomobyra* spp. and *Seira* spp.*),* flies *(Camsicnemus ornatus, Drosophilia suzukii* group spp., *Forcipomyia hardyi, F. kaneohe, Limonia hawaiiensis, L. jacoba, L. perkinsi, L. stygipennis, Orthocladius* spp., and *Scaptomyza* spp.*)*, and three species of true bugs *(Hyalopeplus pellucidus, Microvelia vagans*, and *Nabis kerasphoros)* (USARHAW and 25th ID[L] 2001a). Also observed on KTA have been four native species of butterflies and moths *(Hyposmocoma* spp. undetermined, *Mestolobes minuscula, Schrankia* spp., and *Scotorythra rara),* native planthoppers *(Trioza* spp.*),* bees, wasps, and ants *(Enicospilus* spp.*),* and an undetermined member of the *Eucoilidae* family. There are three native species of dragonflies and damselflies found on KTA *(Anax strenuus, Megalgrion koelense,* and *Neogonia blackburni).* The common stream shrimp *(Atyoida bisulcata)* and freshwater sponge *(Heteromyenia bailleyi)* are native aquatic invertebrates that occur on KTA (R. M. Towill Corp. 1997b; USARHAW and 25th ID[L] 2001a). Additional native invertebrate species known to KLOA include the O'ahu tree snails *A. livida* and *A. pulcherima.*

Zoological surveys of KTA have detected the following nonnative invertebrates: cannibal snail *(Euglandina rosea),* beetles *(Diomus notescens* and *Orcas australasiae),* springtail *(Salina celebensis),* and flies *(Allograpta exotica, Atrichopogon jacobsoni,* and *Letoera* spp.*)*. There are also nonnative planthoppers *(Heterpsylla mimosae),* bees *(Diadegma* spp.*),* grasshoppers *(Elimaea punctifera),* and the two-spotted leafhopper *(Sophonia rufofascia)* (R. M. Towill Corp. 1997b; USARHAW and 25th ID[L] 2001a). Flatworms, amphipods, isopods, and thairid snails were found in Paumalū Stream (USARHAW and 25th ID[L] 2001a). Humans have purposely or accidentally introduced these species to O'ahu. They now threaten the native invertebrate species through competition for resources, predation, and the spread of disease. The cannibal snail is especially destructive to the native snail population that it preys on.

Amphibians

There are no native terrestrial amphibians on the Hawaiian Islands.

Nonnative amphibians found on O'ahu and potentially on KTA are the bullfrog *(Rana catesbeiana),* wrinkled frog *(R. rugosa),* giant toad *(Bufo marinus),* coqui frog *(Eleutherdactylus coqui),* Cuban tree frog *(Osteopilus septentrionalis),* and green and black dart-poison frogs *(Dendrobates auratus).* These species were introduced into O'ahu from other countries and have inhabited areas where adequate aquatic habitat and surrounding vegetation exists.

Reptiles

There are no native terrestrial reptiles on the Hawaiian Islands.

Nonnative reptiles found on O'ahu include the green anole *(Anolis carolinenesis),* mourning gecko *(Lepidodactylus lugubris),* stump-toed gecko *(Gehyra mutilata),* tree gecko *(Hemiphyllodactylus typus),* Indo-Pacific gecko *(Hemidactylus garnotii),* house gecko *(H. frenatus),* metallic skink *(Lampropholis delicata),* and gold dust day gecko *(Phelsuma laticauda laticauda)*. There is only one known terrestrial snake occurring on the Hawaiian Islands, the island blind snake *(Ramphotyphlops braminus)*.

Terrestrial Mammals

The Hawaiian hoary bat *(Lasiurus cinereus semotus)* has the potential to occur on KTA (USARHAW and 25th ID[L] 2001a). It is the only native terrestrial mammal on the Hawaiian Islands.

The following nonnative species may occur on KTA: feral pig *(Sus scrofa scrofa),* Indian mongoose *(Herpestes auropunctatus),* feral dog *(Canis familiaris*), Norway rat *(Rattus norvegicus),* black rats *(R. rattus),* Polynesian rat *(R. exulans hawaiiensis)*, and house mouse *(Mus musculus)*.

Birds

The following indigenous forest bird species have been recorded on KTA: O'ahu 'elepaio *(Chasiempis sandwichensis ibidis),* O'ahu 'amakihi *(Loxops virens chloris),* great frigatebird *(Fregata minor palmerstoni),* Pacific golden-plover *(Pluvialis fulva),* and the Hawaiian short-eared owl *(Asio flammeus sandwichensis)*.

Nonnative bird species known to occur in KTA include the red-billed leiothrix *(Leiothrix lutea),* white-rumped shama *(Copsychus malabaricus),* Japanese bush warbler *(Cettia diphone),* spotted dove *(Streptopelia chinensis),* zebra dove *(Geopelia striata),* common myna *(Acridotheres tristis),* red-vented bulbul *(Pycnonotus cafer),* and the Japanese white-eye *(Zosterops japonicus)*. Introduced species on KTA are nutmeg manikin *(Lonchura punctulatua),* red-crested cardinal *(Paroaria coronata),* common waxbill *(Estrilda astrild),* house finch *(Carpodactus mexicanus),* white cockatoo *(Cacatua galerita),* barn owl *(Tyto alba),* ring-necked pheasant *(Phasianus colchicus),* and northern cardinal *(Cardinalis cardinalis)*.

Fish

The aquatic natural communities in the KTA/KLOA ROI are mostly intermittent streams. Mālaekahana Stream is not intermittent, but it goes underground before reaching the ocean. HINHP conducted biological assessments of selected streams in 1997, and the USGS collects data from stream gages at 'Ōpae'ula and Kamananui streams. Fish identified as part of the Anahulu River, Waimea River, and Paukauila Stream survey include endemic gobies (*Awaous guamensis, Lentipes concolor,* and *Stenogobius hawaiiensis)*, Sandwich Island sleeper *(Eleotris sandwichensis)*, Hawaiian flagtail *(Kuhlia sandvicensi)* and 'o'opu nōpili *(Sicyopterus stimpsoni)* (AECOS 2002; USARHAW and 25th ID[L] 2001a).

One introduced fish, *Geotomus,* was observed at Paumalū Stream (USARHAW and 25th ID[L] 2001a).

Sensitive Species

Potential sensitive species in the KTA/KLOA ROI were identified by USFWS, the State of Hawai'i DLNR (2002a), USARHAW biologists and surveys, and the HINHP (1994).

A current list of all sensitive vegetation and wildlife and any critical habitat in the region is found in Tables 7-20 and 7-21. An assessment of the likelihood of a species occurring on KTA was made based on the habitat requirements and geographic distribution of the species, existing on-site habitat quality, and the results of biological surveys. Natural history descriptions of sensitive species with the potential to occur in the ROI, and specific locations if known, can be found in Appendix I-1 (Recovery Plans 1-1a; Plants: I-1b; Wildlife I-2c; Critical Habitat I-1d).

Sensitive Plant Species in the KTA/KLOA ROI

KTA and KLOA have twenty species of endangered plants, six species of concern and ten candidate species for federal listing. Sensitive plants listed as occurring within the training area include *Chamaesyce rockii, Cyanea acuminata, C. crispa, C. humboldtiana, C. koolauensis, C. lanceolata, C. st-johnii, Cyrtandra dentate, C. viridiflora, Doodia lyonii, Eugenia koolauensis, Exocarpus gaudichaudii, Hedyotis fluviatilis, Hesperomannia arborescens, Hibiscus koikio* ssp. *kokio, Joinvillea ascendens* ssp. *ascendens, Lobelia gaudichaudii* ssp. *koolauensis, L. hypoleuca, Melicope hiiakae, M. lydgatei, Myrsine fosbergii, Nesoluma polynesicum, Phlegmariarus nutans, Phyllostegia hirsute, Platydesma cornuta* var. *cornuta, Psychotria hexandra* ssp. *oahuensis, Pteris lydgatei, Sanicula purpurea, Stenogyne kaakae* ssp. *sherfii, Tetraplasandra gymnocarpa, Thelypteris boydiae, Pteralyxia macrocarpa, Myrsine juddii, Viola oahuensis, Gardenia mannii,* and *Zanthoxylum oahuense*.

Although the native vegetation on O'ahu's central plateau has been almost completely replaced by agriculture, the KTA/KLOA ROI hosts a very important cache of endangered species and natural communities. The terrain is characterized by deep gulches and high cliffs covered with dense vegetation. Sensitive plants and their likelihood of occurrence in the KTA/KLOA ROI are shown in Table 7-20; documented occurrences of sensitive plant species in the KTA/KLOA ROI are shown in Figure 7-22.

Sensitive Wildlife Species

The following discussion includes a profile of only those sensitive wildlife species that are considered likely to be found in the project area. This information is based heavily on information from the O'ahu INRMP (USARHAW and 25th ID[L] 2001a), ESMPR (R.M. Towill Corp. 1997b), and the biological inventories of KTA and KLOA (HINHP 1994). HINHP biologists and qualified individuals conducted surveys of KTA in 1993 and 1994. Shallenberger conducted special status species surveys of O'ahu training areas, including KTA, in 1977. The latest USFWS and survey information on species and habitat in the SBCT ROI has been incorporated into this evaluation of biological resources. Sensitive terrestrial wildlife and their likelihood of occurrence at the KTA/KLOA ROI are listed in Table 7-21. Figure 7-23 shows the locations of documented sensitive terrestrial wildlife identified in the KTA/KLOA ROI. Sensitive species outlined in the table below are most likely to occur in the higher elevations in the Ko'olau Mountains and are unlikely to occur in the disturbed lowland areas that make up a large portion of the ROI.

Table 7-20
Sensitive Plant Species Occurring or Potentially Occurring in the KTA and KLOA ROI

Scientific Name	Hawaiian Name/Common Name	Federal Status[1]	State[2]/Global Status[3]	Habitat	Date Last Observed or Confirmed[4]	Likelihood of Occurrence
Chamaesyce rockii	ʻakoko, koko, kōkōmālei/-	E	-/G1	Cloud-swept summit and deep wet gulches	2000	C
Cyanea acuminata	ʻōhā, hāhā, ʻōhāwai/-	E	-/G1	Moist to wet forest	2000	C
C. crispa	ʻōhā, hāhā, ʻōhāwai/-	E	-/G1	Moist to wet forest	2000	C
C. humboldtiana	ʻōhā, hāhā, ʻōhāwai/-	E	-/-	Moist to wet forest	2000	C
C. koolauensis	ʻōhā, hāhā, ʻōhāwai/-	E, CH	-/G1	Moist to wet forest	2000	C
C. lanceolata	ʻōhā, hāhā, ʻōhāwai	C	-/G1	Moist to wet forest	2000	C
C. st.-johnii	ʻōhā, hāhā, ʻōhāwai/-	E, CH	-/G1	Cloud-swept ridges	2000	C
Cyrtandra dentata	haʻiwale/-	E, CH	-/G1	Moist forest slopes	2000	C
C. viridiflora	NCN	E	-/-	Windy wet ridge tops	2000	C
Delissea subcordata	NCN	E, CH	-/G1	Moist to wet forest	2000	C
Doodia lyonii	NCN	SOC	-/G1	Moist to wet forest floors, streambanks	2004	C
Eugenia koolauensis	nīoi/-	E	-/G1	Dry gulches and slopes	2002	C
Exocarpus gaudichaudii	heau/whiskbroom sandalwood	SOC	-/G1	Moist ridges and shrublands, wet forests, usually associated with ʻōhiʻa	2000	C
Gardenia mannii	nānū, nāʻū	E, CH	-/G1	Moist to wet forests	2000	C
Hedyotis fluviatilis	NCN	C	-/G1	Moist to wet forests	2000	C
Hesperomannia arborescens	NCN	E, CH	-/-	Moist to wet forest slopes and ridges	2000	C
Hibiscus kokio ssp. *kokio*	Kokio ula	SOC	-/-	Dry to wet forest	2004	C
Joinvillea ascendens ssp. *ascendens*	ohe	C	-/G5	Wet forest and intermittent streams	2004	C
Lobelia gaudichaudii ssp. *koolauensis*	NCN	E	-/G4	Cloudswept wet forest	2004	C
L. hypoleuca	NCN	SOC	-/G3	Moist to wet forest	2004	C
Melicope hiiakae	NCN	C	-/-	Native-dominated moist forest	2000	C
M. lydgatei	NCN	E	-/-G1	Native-dominated moist forest	2000	C
Myrsine fosbergii	NCN	C	-/-G2	High elevation Koʻolau forests	2000	C
M. juddii	Kolea	E	-/G1	Cloudswept wet forest	2004	C
Nesoluma polynesicum	keahi	SOC	-/G2	Native-dominated moist forest	2000	C

Table 7-20
Sensitive Plant Species Occurring or Potentially Occurring in the KTA and KLOA ROI *(continued)*

Scientific Name	Hawaiian Name/Common Name	Federal Status[1]	State[2]/Global Status[3]	Habitat	Date Last Observed or Confirmed[4]	Likelihood of Occurrence
Phlegmariarus nutans (Lycopodium nutans)	wāwaeʻiole/	E, CH	-/-	Wet forests	2000	C
Phyllostegia hirsuta	NCN	E, CH	-/G1	Steep, shaded, moist to wet slopes	2000	C
Platydesma cornuta var. *cornuta*	pilo kea/-	C	-/G2	Moist forests	2001	C
Psychotria hexandra ssp. *oahuensis*	NCN	C	-/G4	Moist to wet forests	2000	C
Pteris lidgatei	NCN	E, CH	-/-G1	Steep banks in wet forest	2000	C
Pteralyxia macrocarpa	kaulu	C	-/G1	Native-dominated moist forest	2000	C
Sanicula purpurea	NCN	E, CH	-/-G1	Mossy slopes and open bogs	2000	C
Stenogyne kaakae spp. *sherfii*	NCN	SOC	-/-	Mesic forest	2000	U
Tetraplasandra gymnocarpa	ʻohe'ohe/-	E	-/G1	Summit forests	2000	C
Thelypteris boydiae	NCN	C	-/G1	Moist forest slopes	2000	C
V. oahuensis	olopu	E, CH	-/G1	Cloud-swept summits	2000	C
Zanthoxylum oahuense	ae	C	-/G2	Mesic forest	2000	C

Sources: USFWS 2002a; USARHAW and 25th ID(L) 2001a and b

Notes:
NCN = No common name

Status:

[1]Federal:
E = Endangered
SOC = Species of concern
C = Candidate species for listing
CH = Critical habitat designated or proposed for designation

[2]State
/-/= No Status

[3]Heritage Global Rank:
G1 = Species critically imperiled globally (typically 1-5 current occurrences)
G2 = Species imperiled globally (typically 6-10 current occurrences)
/-/ = No Status

[4]Date last observed and recorded in one of the above references, or confirmed by USFWS in comment letter dated Jan 5, 2003 and provided to the preparers in Jan 2004.

Likelihood of occurrence on the project site
C = Confirmed
P = Potentially may occur
U = Unlikely

Table 7-21
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring on KTA/KLOA ROI

Scientific Name	Hawaiian Name/ Common Name	Federal Status[1]	State[2]/Global Status[3]	Habitat	Date last observed	Likelihood of Occurrence
Invertebrates						
Achatinella aperplexa	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
A. byronii/decipiens	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
A. curta	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	1986	C
A. lila	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
A. livida	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/GH	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2001	C
A. pulcherima	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	1974	P
A. sowerbyana	pūpū kuahiwi, pūpū kanioe, kāhuli/Oʻahu tree snail	E	E/G1	Native Hawaiian shrublands, forests, and bogs above 1,000 feet (305 meters)	2000	P
Birds						
Asio flammeus sandwichensis	pueo/Hawaiian short-eared owl	SOC+	E*/G5T3	Pastures, grasslands, dry and wet forests that are dominated by either native or nonnative vegetation. Sea level to 7,900	1985	C
Chasiempis sandwichensis ibidis	Oʻahu ʻelepaio/-	E, CH	E/G4T1	Native Hawaiian forest	1977	P
Himatione sanguinea sanguinea	ʻapapane/-	+	-/G4	Hardwood forest, primarily native ʻo'hia and ʻo'hia-koa and mixed native-exotic forest at high elevations.	1993	C
Paroreomyza maculata	ʻalauahio/Oʻahu creeper	E	E/G1	Native Hawaiian shrublands, forests, and bogs	1985	C
Vestiaria coccinea	ʻiʻiwi/Hawaiian honeycreeper	+	E*/G4	Native forests, especially ʻo'hia forest	2000	C

Table 7-21
Sensitive Terrestrial Wildlife Species Occurring or Potentially Occurring on KTA/KLOA ROI *(continued)*

Scientific Name	Hawaiian Name/ Common Name	Federal[1] Status	State[2]/Global[3] Status	Habitat	Date Last Observed	Likelihood of Occurrence
Mammals						
Lasiurus cinereus semotus	-/Hawaiian hoary bat	E	E/G5T2	Bare rock, cliff, hardwood forest, grassland/herbaceous, hardwood woodland, and riparian habitats	1976	P
Fish						
Lentipes concolor	ʻoʻopu ʻalamoʻo /-	-	-/G3	Freshwater, brackish, and marine habitats, depending on life stage	2000?	C

Sources: USARHAW and 25th ID(L) 2001a; HDLNR 2002a; HINHP 1994; R. M. Towill Corp. 1997; NatureServe 2001; Virginia Tech 1998
Notes:
NCN = No common name
*The state endangered listing refers only to the populations on Oʻahu, Lanaʻi, and Molokaʻi

Status:
/-/ = No Status

[1]Federal:
E = Endangered
SOC = Species of concern
CH = Critical habitat designated or proposed for designation
\+ = Birds of Conservation Concern

[3]Heritage Global Rank:
G1 = Species critically imperiled globally (typically 1-5 current occurrences)
G3 = Species rare with restricted range (typically 21-100 current occurrences)
G4 = Species apparently globally secure
G5 = Species demonstrably globally secure
GH = Species known only from historical occurrences
T1 = Subspecies critically imperiled globally (typically 1-5 current occurrences)
T2 = Subspecies imperiled globally (typically 6-10 occurrences)

[2]State
E = Listed as endangered

Likelihood of occurrence on the project site
C = Confirmed
P = Potentially may occur
U = Unlikely to occur

Figure 7-22
Sensitive Plant Species in the Kahuku/Kawailoa Training Areas Biological Region of Influence

Figure 7-23
Sensitive Wildlife Species in the Kahuku/Kawailoa Training Areas Biological Region of Influence

Nine federally listed endangered species and five species globally or locally threatened have been recorded in KTA or its vicinity (R.M. Towill Corp. 1997b). These species are listed on Table 7-21 and are described further below. This includes eight invertebrates, five birds, and an endangered terrestrial mammal (USARHAW and 25th ID[L] 2001a).

Sensitive Habitats

Critical Habitat

There are 681 acres of designated plant critical habitat within the KTA/KLOA ROI but there is no designated critical habitat on the Army installations. The plants for which critical habitat has been designated on KTA are listed in Appendix I-1d and are shown in Figure 7-24. There are 4,812 acres of critical habitat for the ʻelepaio in the KTA/KLOA ROI (see Figure 7-25).

Ecologically Sensitive Areas

There are two areas on KTA that have been determined by elevation, topography, and prevailing ecological conditions to be ecologically sensitive. They contain vegetation communities that are considered rare or threatened.

The wet summit crest zone is considered sensitive and exists in areas above 1,640 feet (500 meters), along the northern Koʻolau summit. The relatively gentle ridges are cut by steep-sided gulches in this cool, wet cloud-swept region. The vegetation community in this part of the ROI is almost exclusively ʻōhiʻa lowland wet shrubland; this community is not considered rare and has a Global Heritage ranking of G3. Loulu hiwa lowland wet forest had been labeled a rare natural community (Global Heritage ranking of G1) and occurs in one steep-sided drainage area within the ROI. An additional rare natural community known in this area is ʻōhiʻa mixed montane bog, which has a Global Heritage ranking of G1.

The second sensitive area is the lowland forest zone. It exists from ridge tops to gulch bottoms at elevations of 590 to 2,200 feet (180 to 671 meters). This area is generally less windy, with conditions being warmer, and moisture ranging from moist to wet as rainfall diminishes increasingly with distance from the summit. ʻŌhiʻa lowland wet forests are present in higher elevations, with gradation to koa/ʻōhiʻa lowland moist forest. Adjacent areas are generally a mosaic of moist forest types, with somewhat diverse canopy constituents, though they are generally dominated by ʻōhiʻa. The drier zones are moist to dry shrublands dominated by *Dodonea viscosa* (ʻaʻaliʻi). The steeper slopes at this elevation are dominated by uluhe *(Dicranopteris)* lowland wet shrubland. These natural communities represent relatively widespread vegetation types that occur on most of the main islands; none are considered rare (Global Heritage rankings of G3 and G4).

There is one aquatic natural community (Mālaekahana Stream) on KTA with a vegetation community rank of G4.

Figure 7-24
Federally Designated Plant Critical Habitat in the Kahuku/Kawailoa Training Areas Biological Region of Influence

Figure 7-25
Federally Designated Critical Habitat for the O'ahu 'Elepaio at the Kahuku/Kawailoa Training Areas Biological Region of Influence

Biologically Significant Areas

The Hawai'i Natural Heritage Program has defined three types of BSAs for managing important natural communities. All are found in the KTA/KLOA ROI and are shown in Figure 7-26.

BSA1: Contains a high density of federally listed endangered, proposed endangered, or candidate species.

Approximately 1,000 acres (405 hectares) of the KTA/KLOA ROI in KLOA are designated as BSA1. This includes much of the wet summit crest ecological zone and the two rare natural communities. Twenty-six of the 28 endangered plant species at KLOA are in this area.

BSA2 contains all or some of the following: lower densities of current occurrences of federally listed endangered or proposed endangered species, current occurrences of candidate species or other species of concern that are expected to be upgraded to federal protected status within the next few years, and areas judged likely to contain high densities of federally listed species based on habitat assessment, despite the lack of any record of such occurrence to date.

There are five BSA2 areas in KTA, three of which are in the northern portion of the training area and contain populations of *Eugenia koolauensis*. At the southern tip of KTA is a BSA2 that includes in its vegetative community populations of the federally listed as endangered *Gardenia mannii, Cyanea koolauensis,* and *Hesperomannia arborescens*. In the northwest of KTA is an additional BSA2 that harbors the endangered tree *Tetraplasandra gymnocarpa,* as well as *Gardenia mannii*. An additional BSA2 zone within the ROI is composed mostly of potential habitat for the endangered land snail, *Achatinella*. This area covers all the remaining wet summit crest zone that was not included in BSA1. These endangered plant species are known to occur in this region: *Eugenia koolauensis, Cyanea longiflora, Delissea subcordata, Gardenia mannii, Phlegmariarus nutans, Melicope lydgatei, Myrsine juddii, Phyllostegia hirsute,* and *Viola oahuensis*.

BSA3 is stands of intact native vegetation with few or no known occurrences of rare elements.

KTA's BSA3 area is large and continuous and adjoins all but one of the BSA2 areas. The dominant vegetation types are 'ōhi'a lowland wet forest and uluhe lowland wet shrubland, which are potential habitats for endangered tree snails and native forest birds. As of 1997, seven plants in the BSA3 region were upgraded to federal status, and it is possible that boundary areas have been revised. Although there are no rare communities in the BSA3, the forests in these locations are native dominated and provide potential habitat for species reintroduction.

Figure 7-26
Biologically Significant Areas in the Kahuku/Kawailoa Training Areas Biological Region of Influence

Also found within the ROI is sensitive snail habitat. Although this habitat has not been federally designated or proposed as critical habitat, it has been identified as containing the habitat requirements necessary for supporting the federally listed and snail species of concern on O'ahu. This area is shown with the BSAs in Figure 7-26.

7.10.2 Environmental Consequences

In response to the agency and public comments received during the Draft EIS comment period we reevaluated our analysis of the biological resources. As a result of considering these comments and a reanalysis of the available information, we recognize that the impact on biological resources from fire could not be mitigated to the less than significant level. However, these impacts will be substantially reduced as a result of mitigation.

Summary of Impacts

Biological resources that have been considered include vegetation communities, wildlife, sensitive species, and sensitive habitats. Significant impacts include impacts from fire on sensitive species and habitat at KTA but these impacts are mitigable at KLOA, Construction of facilities and training activities including the use of the Drum Road and the impacts from nonnative species will have a significant but mitigable to less than significant impact on sensitive species and sensitive in the ROI. Less than significant impacts are expected on general habitat and wildlife from construction and training, on migratory birds from construction of FTI antennas and UAV use, and on wildlife from noise and visual impacts of project activities.

All biological resources have been assessed for potential impacts from project activities. For a full description of the impact methodology used to determine impact to a resource please refer to Section 4.10. Only the resources potentially affected are included in this chapter. If a resource was determined not to be impacted, it has not been included for discussion. A summary of impacts is provided in Table 7-22.

Proposed Action (Preferred Alternative)

Significant Impacts

Impact 1: Impacts from fire on sensitive species and sensitive habitat. SBCT activities within the KTA/KLOA ROI would increase the likelihood of wildland fire. This impact would be significant at KTA and significant and mitigable to less than significant at KLOA. At KTA, training would include use of certain pyrotechnics and SRTA ammunition, which is technically classified as live-fire ammunition and carries an increased threat of fire. There is less of a potential for fire at KLOA as training is limited to nonlive fire and consists mostly of dismounted maneuvers. There are direct and indirect ways in which fires would adversely affect sensitive species and habitat.

Sources of fire include cigarettes, vehicles, pyrotechnics, and nonlive fire training. Cigarettes discarded during mounted and dismounted training would be a risk with the increase in Soldiers and training at KTA and KLOA. Use of the roads by military vehicles would increase with the proposed renovation and construction. An increase in the traffic flow from Drum Road would increase the potential for fire that could affect sensitive species.

Specifically, the proposed Drum Road alignment traverses lowland wet and lowland moist forests and shrublands in KTA. Lastly, the increase in intensity in training, including the proposed SRTA live-fire training at KTA, would increase the probability that fire could originate in the ROI. The increased likelihood of wildfires and the potential SBCT risk factors are discussed in more detail in Section 7.12.2.

Table 7-22
Summary of Potential Biological Impacts at KTA/KLOA

Impact Issues	Proposed Action	Reduced Land Acquisition	No Action
Impacts from fire on sensitive species and sensitive habitat	⊗/⃠	⊗/⃠	⊗/⃠
Impacts from construction and training activities on sensitive species and sensitive habitat.	⃠	⃠	⃠
Impacts from the spread of nonnative species on sensitive species and sensitive habitat.	⃠	⃠	⃠
Impacts from construction and training on general vegetation, wildlife, and habitat.	⊙	⊙	⊙
Threat to migratory birds	⊙	⊙	⊙
Noise and visual impacts.	⊙	⊙	⊙
Runoff impacts on marine wildlife and coral ecosystems.	○	○	N/A

LEGEND:

⊗ = Significant
⃠ = Significant but mitigable to less than significant
⊙ = Less than significant
○ = No impact
\+ = Beneficial impact
N/A = Not applicable

Because natural sources of fire ignition are relatively rare in Hawai'i, many native Hawaiian plants are not adapted to fire and are adversely affected by it. Nonnative species, particularly nonnative grasses and shrubs, typically invade areas after they have burned. This inhibits the regeneration of native plants. The removal of native species and the spread of nonnative species are potential impacts associated with wildland fires and is discussed under Impact 3. In general, most fires in Hawai'i are caused by humans and are fueled primarily by nonindigenous grasses. If native species withstand an initial fire, they are often destroyed by later fires influenced by the invasion of highly flammable grasses. The potential spread of nonnative species resulting from wildfires is considered a significant impact because nonnative species often out-compete native species and destroy native communities. Wildfires that burn into native communities or sensitive habitats could take listed animal species and destroy listed plant species and sensitive habitats. There is no assurance that fires or other threats associated with the Proposed Action would not reach or otherwise threaten populations of listed species on KTA.

Vegetation communities within the ROI include the following:

- Nonnative vegetation communities (approximately 7,534 acres [3,049 hectares]);
- Lowland mesic forest and shrubland (approximately 379 acres [153 hectares]); and
- Lowland wet forest and shrubland (approximately 1,496 acres [605 hectares]).

The rare plants found in these communities are *Chamaesyce rockii, Cyanea acuminate, C. crispa, C. humboldtiana, C. koolauensis, C. lanceolata, C. st.-johnii, Cyrtandra dentata, C. viridiflora, Doodia lyonii, Eugenia koolauensis, Exocarpus gaudichaudii, Gardenia mannii, Hedyotis fluviatilis, Hesperomannia arborescens, Hibiscus kokio* ssp. *kokio, Joinvillea ascendens* ssp. *ascendens, Lobelia gaudichaudii* ssp. *koolauensis, L. hypoleuca, Melicope hiiakae, M. lydgatei, Myrsine fosbergii, M. juddii, Nesoluma polynesicum, Phlegmariarus nutans, Phyllostegia hirsute, Platydesma cornuta* var. *cornuta, Psychotria hexandra* ssp. *oahuensis, Pteralyxia macrocarpa, Pteris lidgatei, Sanicula purpurea, Stenogyne kaakae* ssp. *sherffi, Tertaplasandra gymnocarpa, Thelypteris boydiae, Viola oahuensis, and Zanthoxylum oahuensis.* There are areas of highly flammable nonnative plants (such as *Andropogon virginicus*) along the lower boundaries of areas dominated by native plants (R. M. Towill Corp. 1997b, 6-27; USARHAW and 25th ID[L] 2001a, 290). BSAs that occur within the ROI and that could be affected by a wildfire are BSA2, at 214 acres (87 hectares), and BSA3, at 2,747 acres (1,112 hectares). The rugged terrain can limit the suppression and control of fires, and they can easily spread unchecked into areas that contain sensitive species.

Fires started as a result of any of these SBCT-proposed actions could adversely affect sensitive wildlife by killing them directly or indirectly by destroying their habitat. The sensitive wildlife species listed in Table 7-22 as potential or confirmed in the ROI could be affected by a wildfire, depending on its extent and duration.

In conclusion, sensitive species and habitat occurring within the ROI would be significantly affected by the likely increase in fires that would result from the Proposed Action. Although most sensitive species and sensitive habitats found on KTA and KLOA occur at high elevations, where fire vulnerability is relatively low because of higher levels of rainfall and less fire-prone vegetation, these areas are still considered at risk from fire. The outbreak of fire in portions of the ROI where sensitive species and habitat exist would be a significant impact that would be substantially lessened by regulatory and administrative mitigation, but would still be considered significant.

Regulatory and Administrative Mitigation 1. The effects of the Proposed Action on listed species in the ROI have been evaluated in the ESA Section 7 Consultation with USFWS. The Army will implement all the terms and conditions defined in the Biological Opinions issued by USFWS for current force and SBCT Proposed Actions on O'ahu and Hawai'i. The terms and conditions that implement the reasonable and prudent measures determined during this consultation will be incorporated into the Proposed Action. These measures will help avoid effects and compensate for impacts on listed species that would result directly and indirectly from implementing the Proposed Action. The Biological Opinions are available upon request.

The IWFMP for Pōhakoloa and O'ahu Training Areas was updated in October 2003. The Army will fully implement this plan for all existing and new training areas to reduce the impacts from wildland fires. The plan is available upon request.

Additional Mitigation 1. No additional mitigation has been identified for this impact.

Significant but Mitigable to Less than Significant Impacts

Impact 2: Impacts from construction and training activities on sensitive species and sensitive habitat. Loss and degradation of sensitive species and sensitive habitat would result from project activities and construction in the KTA/KLOA ROI, specifically in the KTA portion. The use of Drum Road as part of SBCT actions would adversely affect the environment by increasing the amount and intensity of traffic in the KTA/KLOA ROI. Though much of the area surrounding Drum Road is already dominated by nonnative plants, the roads bring humans closer to biologically sensitive areas that exist in the ROI (Section 7.10.1, Figure 7-26). Sections of Drum Road cross biologically sensitive areas, with stands of intact native vegetation. Part of the reason that these communities still exist is due to their remoteness. Opening this area up to the more direct effects of humans threatens these communities and their diversity. Hawaiian plant communities evolved without the environmental pressures that are prevalent on major land masses and thus have no defense mechanisms to cope with these stresses. By fragmenting these sensitive communities, corridors for natural species dispersal are interrupted, nonnative plants are encouraged to spread, and the potential for native species to be reintroduced to areas dominated by nonnative species is limited. Troop and other foot traffic in or adjacent to native forest areas could harm rare natural communities, plants, and snails (R. M. Towill Corp. 1997b). Dozens of federally listed and sensitive species are known to occur or have the potential to occur within the KTA/KLOA ROI (Figures 7-22 and 7-23). This includes thirty-six plants, O'ahu creeper, Hawaiian hoary bat, and O'ahu tree snails (Tables 7-20 and 7-21). There is also plant critical habitat and 'elepaio critical habitat within the KTA/KLOA ROI (Figures 7-24 and 7-25), which could be negatively affected by training. *Tetraplasandra gymnocarpa,* a federally listed plant species was identified approximately 492 feet (150 meters) down a slope from Drum Road. This individual is unlikely to be affected directly by use of Drum Road but would be threatened by trampling if people were allowed to move off the proposed road or if a fire started as a result of vehicle use or a discarded cigarette. Because the slope is very steep, the likelihood of dismounted maneuver occurring along this portion of Drum Road is extremely small.

Increased use of Drum Road would result in direct and indirect impacts to sensitive species and habitat. The present trail is a rutted dirt road that sees little activity. The use of an upgraded Drum Road would fragment habitat for general and sensitive wildlife, ultimately reducing the quantity and quality of habitable lands. The presence of large loud vehicles would limit wildlife migration and would interrupt corridors for natural dispersal of species among these areas. Dust, soil erosion, and runoff would continue to adversely affect the areas that surround the road, including valuable freshwater resources. The loss in habitat value occurs primarily in those areas surrounding the trail, which are exposed to increased noise, car fumes, general activity, and invasive species, and areas downstream that are subject to runoff and erosion problems.

Dismounted and mounted training would occur on approximately 621 acres, (251 hectares) in multiple areas at KTA. Mounted training would occur and would almost double the present vehicular usage (7,211 MIMS currently, 13,772 MIMS predicted). Mounted maneuver proposed in portions of northern KTA (Figure 2-5) would destroy vegetation, possibly federally listed plants and would disturb wildlife, including federally and state listed species. The increased dismounted training proposed for KTA and along Drum Road would result in trampling and habitat degradation in sensitive areas. Dismounted training would involve a greater area at KLOA, expanding the present 0 acres to 5,064 (2,049 hectares) as part of the Proposed Action. Impacts would be significant and mitigable to less than significant by following mitigation procedures:

Regulatory and Administrative Mitigation 2. The Army will implement all the terms and conditions defined in the Biological Opinions issued by USFWS for current force and SBCT Proposed Actions on O'ahu and Hawai'i. The terms and conditions that implement the reasonable and prudent measures determined during this consultation will be incorporated into the Proposed Action and will help avoid effects and compensate for impacts on listed species that would result directly and indirectly from implementing the Proposed Action. The Biological Opinions are available upon request.

The Army will implement land management practices and procedures described in the ITAM annual work plan to reduce erosion impacts (US Army Hawai'i 2001a). Currently these measures include implementing a TRI program; implementing an ITAM program; implementing an SRA program; developing and enforcing range regulations; implementing an Erosion and Sediment Control Management Plan; coordinating with other participants in the KMWP; and continuing to implement land rehabilitation projects, as needed, within the LRAM program. Examples of current LRAM activities at KTA include revegetation projects involving site preparation, liming, fertilization, seeding or hydroseeding, trees planting, irrigation, and mulching; a CTP; coordination through the TCCC on road maintenance projects; and development of mapping and GIS tools for identifying and tracking progress of mitigation measures.

Regulatory and Administrative Mitigation measures identified as part of Chapter 7, Section 7.8, Water Resources, and Section 7.9, Geology, will also lessen this impact on sensitive species and habitat.

Impact 3: Impacts from the spread of nonnative species on sensitive species and sensitive habitat. In general, both plant and animal nonnative species pose a threat to Hawaiian native ecosystems. The proposed actions on KTA could affect the introduction and spread of nonnative species in the following ways:

- Troops and equipment moving into Hawai'i from other countries, states, or islands and between subinstallations within Hawai'i increase the likelihood of nonnative plant/animal introductions.
- Construction could introduce nonnative species and other weeds through the use of sand and gravel that potentially contains nonnative plant seeds.

The use of Drum Road would introduce more invasive species to the area, which would have both a short-term and long-term impact on sensitive plants and wildlife.

A long-term increase in the use of Drum Road is associated with the Proposed Action. This includes increasing Stryker and conventional truck traffic (trucks and HMMWVs) on the proposed road. There would be 275 vehicles, 114 of which would be Strykers, that would travel on either trails or roads, from SBMR to KTA 12 times per year. Most of the travel would be on trails, but Drum Road would carry ten percent of all Stryker travel and 40 percent of all trucks between these two bases. There would be a net increase of 195 vehicles traveling on roads and trails between SBMR and KTA, four times per year, and 235 vehicles eight times per year. Transformation-related increases in the number of vehicles that would traverse Drum Road increase the likelihood that nonnative plants would be introduced or spread. The Proposed Action would increase the likelihood of a fire in the ROI, as discussed in Impact 1. Nonnative species often benefit from fires, due to their ability to colonize areas following a burn. Also the presence of nonnative species often provides fuel for wildfires, makes fires larger, and facilitates its spread. Nonnative plants pose a tremendous threat to sensitive plants and native vegetation communities.

Although most of the plant species in and around the proposed Drum Road are nonnative, the area could be further disturbed than it already is and would adversely affect the recovery of sensitive species. Sensitive plant species and sensitive wildlife species are likely to occur within the KTA/KLOA ROI.

Satinleaf *(Chrysophyllum oliviforme)*, manuka, and melochia *(Melochia umbellata*) are nonnative plants that have not yet established within the KTA/KLOA ROI. The habitat degradation associated with the construction projects could lead to these very aggressive species becoming established throughout the project area. They can spread rapidly in a disturbed habitat, which could alter the original habitat and its associated ecosystem, adversely affecting native wildlife. Altering vegetative type and cover can devastate species that have evolved alongside another specialized species or cover type. Changes in vegetation can also adversely affect wildlife at sensitive times of their lifecycles by altering elements that they depend on, such as shelter.

When it arrives in Hawai'i, all Army cargo is thoroughly checked for nonnative species, such as the brown tree snake. It is unlikely that use of Drum Road and the vehicle tactical wash would introduce nonnative vertebrate animal species into the area. Discrete quantities of sensitive native plant species that are especially threatened by nonnative species' invasion include the following:

- Ninety-five percent of the remaining nīoi *(Eugenia koolauensis)* plants exist within the KTA/KLOA ROI. There is a high threat to these plants from nonnative species invasions associated with the proposed activities.
- Twelve individuals of the native gardenia nānū *(Gardenia mannii)* exist in the KTA/KLOA ROI. There is a moderate threat to these plants from nonnative species invasions associated with the proposed activities.

- Two to five percent of the remaining ʻohe'ohe plants *(Tetrapalasandra gymnopcarpa)* exist in the KTA/KLOA ROI. There is a low to moderate threat to these plants from nonnative species invasions associated with the proposed activities.
- There are several sensitive wildlife species occurring within that ROI that could be affected by the spread of nonnative species: *Achatinella curta, A. livida, A. pulcherrima, A. sowerbyana, Aurculella pulchra,* Oʻahu ʻelepaio, and the ʻiʻiwi (Figure 7-23). These species would be adversely affected by the introduction or increase in the spread of nonnative species within the KTA/KLOA ROI.

Regulatory and Administrative Mitigation 3. As required in the terms and conditions of the Biological Opinions, the Army will implement the following:

- Educate soldiers and others potentially using the facilities and roads in the importance of cleaning vehicles, equipment, and field gear;
- Educate contractors and their employees about the need to wear weed-free clothes and to maintain weed-free vehicles when coming onto the construction site and to avoid introducing nonnative species to the project site;
- Prepare a one-page insert to construction contract bids informing potential bidders of the requirement; and
- Inspect and wash all military vehicles at wash rack facilities prior to leaving SBMR, KTA, or PTA to minimize the spread of weeds, such as fountain grass, and animal (invertebrate) relocations.

USARHAW will follow HQDA guidance developed in consultation with the Invasive Species Council and compliance with Executive Order 13112, which determines federal agency duties to prevent and compensate for invasive species impacts. USARHAW will agree to all feasible and prudent measures recommended by the Invasive Species Council that would be taken in conjunction with SBCT action to minimize the risk of harm. Implementing an Environmental Management System will further improve the identification and reduction of environmental risks inherent in mission activities.

In accordance with its regulations and requirements, the USDA will inspect and certify cargo originating outside of Hawaiʻi to ensure it is not carrying the brown tree snake or other reptiles before the cargo is transported to training ranges.

Additional Mitigation 3: The Army proposes to use native plants in any new landscaping or planting efforts where practicable. When practicable, natural habitats would remain intact or adjacent areas would be restored as habitat.

Less than Significant Impacts

Impacts from construction and training activities on general habitat and wildlife. The Proposed Action is expected to have a less than significant impact on general habitat and wildlife at KTA and

KLOA. The slopes at KTA and KLOA are steep and training activities are generally limited by the topography to dismounted maneuvers and vehicle travel on established roads. Vegetative regrowth in the ROI is fairly rapid. The majority of the training area is nonnative vegetation and common native plants, primarily grasses and shrubs, which typically colonize denuded areas quickly and thoroughly. The proposed CACTF would be constructed at KTA in previously disturbed areas containing primarily nonnative vegetation, and approximately 187 acres (76 hectares) of vegetation would be removed.

Approximately 621 acres (251 hectares) on KTA would be used for off-road maneuvers under the Proposed Action. Off-road vehicle maneuvers would be allowed in areas of less than 30 percent slope and would be expected to result in adverse impacts on biological resources.

Operation of the ranges would likely displace various wildlife species, such as birds and mammals by displaying an increased human presence in the area and by elevating noise levels. Animal species in the project areas would be expected to vacate during construction, off-road maneuver activities, and in areas immediately adjacent to the ranges while the ranges are in use. The most likely species to be affected by these activities are ground-nesting birds or small mammals.

The UAV would be flown over portions of KTA/KLOA already allowing aircraft and would follow AR 95-1, Aviation Flight Regulations, which restrict elevation of UAVs about Noise Sensitive Areas to minimum of 2,000 feet, unless mission essential. This would limit the effect of UAVs on sensitive biological resources during normal operation. Due to the nature of the UAV, accidents would be possible and could cause wildfires. The impact of potential wildfires within the ROI is discussed above as Impact 1.

Regulatory and Administrative Mitigation: Programs to benefit sensitive species and habitats listed under mitigation for Impact 2, including the actions outlined in the BO, would enhance general vegetation and wildlife communities as well. Regulatory and administrative mitigation measures identified in Section 7.8, Water Resources, and Section 7.9, Geology, would lessen this impact on general vegetation, wildlife, and habitat.

Threat to migratory birds. The presence of the FTI antennas could significantly affect migratory bird species known to occur in the KTA/KLOA ROI, especially those that migrate at night (USFWS 2000). Although the exact number of bird fatalities from tower collisions in Hawai'i is not known, birds are killed in large numbers worldwide by antenna support structures each year (USFWS 2000). This is a violation of the MBTA (16 USC 703-712), which prohibits taking or killing migratory birds. Tower size is also considered a factor, with towers taller than 200 feet (61 meters) responsible for the greatest number of bird fatalities (Manville 2000). Less than significant impacts are expected because monopole antennas will be under 100 feet (33 meters) and, where possible, will be sited on buildings or towers, and no guy wires will be used. A full description and a map of proposed locations of the FTI antennas are in Appendix D.

UAVs would fly over the training area, as discussed Section 7.4. The UAV activity is not anticipated to threaten migrating birds.

Noise and visual impacts. No threatened or endangered species are known to occur within the immediate areas of the proposed CACTF. Sensitive species are primarily located at higher elevations, in areas where training generally does not occur. Maneuvers would not take place in areas known to contain sensitive species or sensitive habitats.

Dismounted (on foot) training includes walking in formations on roads or trails or in a dispersed fashion overland. Dismounted training on existing roads and trails would have no impact on biological resources, while those maneuvers that do not follow roads or trails could affect biological resources, particularly in the southern portion of the ROI where native species and natural communities are located. Most training would occur in the disturbed flatlands of KTA, which are dominated by nonnative and invasive species. The impact on general vegetation and wildlife is therefore considered less than significant.

No Impacts

Runoff impacts on marine wildlife and coral ecosystems. SBCT activities at KTA/KLOA are not expected to result in runoff impacts on marine wildlife and coral ecosystems due to limited activities that would occur there.

Reduced Land Acquisition Alternative

The impacts associated with RLA are identical to those described for the Proposed Action.

No Action Alternative

No Action would result in no new impacts on biological resources but would involve a continuation of existing impacts. An in-depth analysis of current force training impacts on KTA and KLOA biological resources can be found in the *O'ahu Training Areas INRMP* (USARHAW and 25th ID[L] 2001a) and the *Endangered Species Management Plan Report (ESMPR) for O'ahu Training Areas* (R. M. Towill Corp. 1997b). All conservation measures detailed in the 2003 BO for Routine Military Training and Transformation of the 2nd Brigade 25th ID(L) at US Army Installations on O'ahu (USFWS 2003d) will be enacted under this alternative as well. A synopsis of No Action Alternative impacts is given below.

Significant Impacts

Impact 1: Impacts from fire on sensitive species and sensitive habitat. Under the status quo of No Action, current training threatens native habitat and sensitive species in the KTA/KLOA ROI. New measures of mitigation for wildland fires will be the same as those listed in the 2003 BO for O'ahu Army Installations and described for this impact under the Proposed Action. In addition, the following current force fire avoidance and mitigation would be continued:

- Reevaluating and revising KTA and KLOA's current fire control plan and program for inclusion in the O'ahu general fire management plan;

- Regularly updating Incident Command System (ICS) contact personnel and reviewing fire control protocols;
- Posting signs about the Army's regulations concerning ignition sources;
- Addressing fire control in an island-wide fire management plan;
- Improving fire education and awareness by preparing educational materials on fire hazards and preventative measures; and
- Maintaining fire access roads and fire breaks.

Significant but Mitigable to Less than Significant Impacts

Impact 2. Impacts from construction and training activities on sensitive species and sensitive habitat. There have been and would continue to be impacts on the listed plants and wildlife. Vehicle and dismounted maneuvers along with live-fire and nonlive fire training at KTA and KLOA occurs primarily on disturbed portions of the ROI that are of low value to Hawai'i's listed species. However, the effects of fire, spread of nonnative species, noise pollution, and visual presence of humans in or nearby designated and sensitive habitats negatively affects listed species that use or would potentially use this area.

The Army has completed ESA Section 7 Consultation for the impacts on federally listed species and their designated critical habitat from current force and proposed SBCT training at KTA/KLOA. The designation of plant critical habitat is part of the consultation. The terms and conditions of the BO will be incorporated into this alternative, as well as the Proposed Action. Ongoing programs that would lessen the impact on listed species and their designated critical habitat include the ecosystem management plan, endangered species management plan, and INRMP (USARHAW and 25th ID[L] 2001a; R. M. Towill Corp. 1997b). These measures would help avoid effects and would compensate for impacts on listed species that would result directly and indirectly from implementing the No Action Alternative.

Impact 3: Impact from the spread of nonnative species on sensitive species and sensitive habitat. Under the status quo of No Action, current force training would continue use of an upgraded Drum Road. Nonnative plants and animals, some of which could be invasive, have likely been and would continue to be introduced and spread into natural areas on KTA and KLOA. There would be no increase in the number of vehicles or Soldiers, but the impact of vehicle traffic on the road would continue to be considered significant. Troop transport and vehicle entry into the KTA/KLOA ROI could spread invasive species via clothing and vehicles. Invasive species can spread rapidly in a habitat disturbed by human activities, such as troop maneuvers or construction. In compliance with EO 13112 on invasive species, the Army would continue to undertake all feasible and prudent measures to minimize risk of harm caused by invasive species. Army environmental management programs (described in Chapter 2, Section 2.2.4 of this document), including research, monitoring, stabilization projects, and measures outlined in the 2003 BO for O'ahu Army Installations, would reduce these impacts to the less than significant level.

Less than Significant Impacts

Impacts from construction and training activities general habitat and wildlife. Under the status quo of No Action current force training would result in the same impacts as those described for the Proposed Action. Construction would be undertaken on a case-by-case basis in support of current training. Non-Stryker tactical vehicle use would continue, though MIMS would not increase. Continued use of Drum Road would have similar impacts as that described in the Proposed Action. Army environmental management programs (Section 2.2.4 of this document), including research, monitoring, stabilization projects, and measures outlined in the 2003 BO for O'ahu Army Installations, would reduce the intensity and extent of these impacts.

Threat to migratory birds. Current force activities would continue to have a less than significant impact on migratory birds. Status quo activities in the ROI may incidentally affect migratory birds but are unlikely to severely disturb birds, considering the disturbed nature of the present training area.

Noise and visual impacts. Noise would continue to be produced as a result of current force activities. Noise would adversely affect animals in the area but would not significantly affect their behavior and would not lead to a population level decline.