U.S. Army Garrison Hawai'i

Integrated Natural Resources Management Plan 2010-2014

Island of O'ahu

Schofield Barracks Military Reservation
Schofield Barracks East Range
Kawailoa Training Area
Kahuku Training Area
Dillingham Military Reservation
Makua Military Reservation
Tripler Army Medical Center

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U.S Army Garrison, Hawaii

INTEGRATED NATURAL RESOURCES

MANAGEMENT PLAN

2010-2014

This Integrated Natural Resources Management Plan meets the requirements of the Sikes Act (16 U.S. C 670a et seq.) as amended.

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Purpose

This Integrated Natural Resources Management Plan (INRMP) guides implementation of U.S. Army Garrison's, Hawai'i (USAG-HI) integrated natural resources management program on USAG-HI properties from 2010 through 2014. This INRMP complies with the Sikes Act Improvement Act as amended through 2003 (Public Law 108-136), which requires the preparation, implementation, update, and review of an INRMP for each military installation in the U.S. with significant natural resources. This plan is prepared in cooperation with the U.S. Fish and Wildlife Service (USWFS) and the state fish and wildlife agency, in this case, the Hawai'i Department of Land and Natural Resources (DLNR).

This INRMP provides for the conservation and rehabilitation of natural resources and the sustainable multipurpose use of USAG-HI resources subject to safety requirements and military security. It provides for "no net loss" in the capability of installation lands to support the military mission and other activities as considered appropriate to the military. At the same time, this document provides for wildlife, land, and forest management; wildlife enhancement and modification; wetland protection, enhancement, and restoration; establishment of natural resource management objectives and time frames; sustained use by the public of natural resources to the extent that such use is not inconsistent with other needs, and public access where appropriate, as well as the enforcement of natural resource laws and regulations.

This INRMP is designed to support the military mission, manage USAG-HI's natural resources, and to ensure compliance with related environmental laws and regulations. The plan ensures the maintenance of quality training land, thereby supporting USAG-HI in accomplishing its critical military missions.

Scope

This plan applies to organizations internal and external to USAG-HI that are involved with, or interested in, the management and/or use of USAG-HI's land and natural resources for military and nonmilitary purposes. This plan applies to active duty units, National Guard and Reserve components, Installation Management Command garrisons, directorates, private groups, and individuals. This Integrated Natural Resources Management Plan applies to major Army installations managed by USAG-HI on the Island of O'ahu: Kawailoa Training Area, Kahuku Training Area, Schofield Barracks Military Reservation (including South Range Acquisition Area), Schofield Barracks East Range, Makua Military Reservation, and Dillingham Military Reservation. Tripler Army Medical Center has one identified candidate species for federal listing. The species, *Megalagrion xanthomelas* (orange black damsel fly), is discussed in Section 4.1.2.11. No detailed discussion is presented for Tripler Army Medical Center due to its size and presence in an urban area and size (375 ac, 152 ha). A separate INRMP exists for Pōhakuloa on the Island of Hawai'i. This plan is an integral part of the U.S. Army Hawaii's Range Development Plan, as well as USAG-HI's Master Plans and Range & Training Land Program Development Plans.

Relationship to the Military

U.S. Army Hawai‘i is an essential power projection platform for the Pacific theater, due to its minimal westerly deployment time. USAG-HI, U.S. Navy-HI, and U.S. Marines-HI installations on the Island of O‘ahu have over 75 different endangered species, which require management of off-site locations to meet legal requirements. In addition, there is a conflict between the public and the military as population levels increase.

U.S. Army Pacific provides combat training for Army Soldiers in Hawai‘i. These Soldiers are among the most specialized military professionals in the world, and they train in some of the world's harshest environments. This INRMP supports the military mission by conserving, managing, and enhancing training lands on which the mission is critically dependent. It also highlights recreational opportunities associated with natural resources, thus supporting USAG-HI's commitment to both the Quality of Life and the Army Communities of Excellence programs. Impacts of military activities on natural resources and means to mitigate these impacts are described in this plan. However, this INRMP does not evaluate U.S. Army Hawaii's military missions, nor does it replace any need or requirement for environmental documentation of those missions.

Environmental Compliance

This INRMP is required by the Sikes Act (16 USC 670a et seq.), Department of Defense Instruction 4715.3 (*Environmental Conservation Program*), and Army Regulation (AR) 200-1 (*Environmental Protection and Enhancement*). This plan describes how USAG-HI will implement provisions of AR 200-1, and local regulations. This INRMP helps USAG-HI comply with federal and state laws, most notably laws associated with environmental documentation, wetlands, endangered species, water quality, and wildlife management.

This INRMP has the signatory approval of the USFWS, acknowledging USAG-HI's compliance with the Endangered Species Act and Migratory Bird Treaty Act. This INRMP has the signatory approval of the Hawai‘i Department of Land and Natural Resources as required by the Sikes Act.

The National Environmental Policy Act (NEPA) requires federal agencies to consider the environmental consequences of proposed major federal actions. Installations are directed by 32 CFR Part 651 (Army Regulation 200-2, *Environmental Analysis of Army Actions*) and the National Environmental Policy Act to integrate environmental analysis as much as practicable with other environmental reviews, laws, directives, and executive orders.

Six installation-specific documents drive many of the natural resource program goals and resulting projects noted in this INRMP. Three are the Biological Opinions issued by USFWS (2003, 2007, and 2008, respectively):

- *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Military Installations, Island of Hawai‘i* (1-2-2003-F-04), 2003.
- *Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation, Island of O‘ahu* (1-2-2005-F-356), 22 June 2007.
- *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation* (1-2-2005-F-356), 18 June 2008.

The other three are the resulting implementation plans:

- *Implementation Plan, Mākua Military Reservation, Island of O'ahu* (USAG-HI 2003a).
- *Addendum to the Implementation Plan, Mākua Military Reservation, Island of O'ahu* (USAG-HI 2005a).
- *Implementation Plan for O'ahu Training Areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, and Kahuku Training Area* (USAG-HI 2008).

Approach

The structure of this INRMP is closely based on the "Integrated Natural Resources Management Plan (INRMP) Template" issued by the Office of the Under Secretary of Defense (14 August 2006) and distributed by the Office of the Assistant Chief of Staff for Installation Management (18 September 2006). The document is composed of six parts:

Chapter 1: Overview details the purpose, scope, approach and management, plan strategy, goals and objective, responsibilities, authority, stewardship, review process, plan integration and unresolved issue(s).

Chapter 2: Current Conditions provides a description of the installation, regional land use, installation history, and operations and activities, as well as a description of the physical environment and ecosystems and the biotic environment.

Chapter 3: Environmental Management Strategy and Mission Sustainability describes supporting mission and the natural environment, natural resources consultation requirements, National Environmental Policy Act (NEPA) compliance, partnerships and collaborative resource planning, public access and outreach, encroachment partnering, and state comprehensive wildlife plans.

Chapter 4: Program Elements describes the program elements and integrated goals and objectives for threatened and endangered species management, natural resources law and regulation enforcement, fish and wildlife management, migratory bird management, invasive species management, pest management, land management, geographical information system (GIS) management, outdoor recreation, bird aircraft strike hazard, wildland fire management, natural resources personnel training, and leases.

Chapter 5: Implementation discusses preparing management plans that drive objectives, projects, achieving no net loss of training lands, use of cooperative agreements, and funding.

Appendices capture all additional information not appropriate for the body of the INRMP. The appendices include a list of acronyms, detailed natural resources plans, list of projects, results of planning level surveys, research requirements, migratory bird management, program benefits to federally listed species, and critical habitat issues.

A number of handbooks and guides were consulted to aid in addressing the various sections, including "A Handbook for the DoD Natural Resources Manager, Resources for INRMP Implementation."

This INRMP includes all the DoD required elements for natural resource management applicable to Schofield Barracks Military Reservation and its sub-installations on the Island of O'ahu. This plan

also includes the U.S. Fish and Wildlife Service's required conservation measures and actions (see Section 1.9, *Integration with Other Plans*).

Ecosystem Status

Schofield Barracks Military Reservation

Schofield Barracks Military Reservation (SBMR) is the primary range complex for individual weapons qualification with limited light maneuver training areas for USAG-HI at 9,520 ac (3,506 ha). Training and live-fire impact areas are situated west of the cantonment area and the South Range maneuver areas and small arms ranges lie south, southwest of the cantonment. The South Range Acquisition Area is included in all SBMR discussions. The wooded eastern slope of the Waiʻanae Mountain Range is used primarily for tactical infantry maneuver training, including land navigation training and bivouac. Army aviation operations and activities are conducted there as well.

There are four native vegetative communities located on SBMR: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural communities. Collectively, there are approximately 3,544 ac (1,433.9 ha) of forest outside of the cantonment area in SBMR. *Metrosideros*/*Acacia*/ *Dicranopteris* and *Schinus* dominated forests account for approximately 93 percent of the land area outside of the cantonment area.

Four endangered animals (one bird, one terrestrial snail, two insects) have been documented at SBMR, along with 23 federally listed and 8 candidate plant species. About 1,900 ac (774 ha) of SBMR have been designated as critical habitat for the Oʻahu ʻelepaio (*Chasiempis sandwichensis ibidis*). Four Oʻahu IP management units are located on SBMR and on five Mākua IP management units. Species of greatest conservation need include 8 bird taxa, 1 mammal species, 3 invertebrate species, and possibly 4 fish taxa, along with 68 plant taxa.

Some 8 non-native mammals; 10 endemic/indigenous and 31 non-native birds; 6 endemic and 14 non-native fish; 12 endemic terrestrial and 10 endemic aquatic invertebrates, along with 4 non-native terrestrial and 6 aquatic invertebrates; and possibly as many as 15 non-native herpetofauna are present on SBMR. Some 259 plant taxa have been documented. Three ant species are considered invasive as are 20 plant species. The Oʻahu Natural Resources (ONR) staff has identified 13 incipient plant species. (See Appendix 3, *Lists of Species*.)

The primary drainages for the military reservation are the Waikōloa Gulch and the Waikele Stream. Also, the North Fork of the Kaukonahua Stream flows along the northeast boundary of SBMR, along with two tributaries. All streams on SBMR flow north into the Pacific Ocean at Waialua, with the exception of the Waikele, which flows into Pearl Harbor from the north. Many streams on SBMR are intermittent. All streams are somewhat degraded; especially drainages affected by the impact area and associated erosion. Stream quality is also affected by non-point pollution from adjacent crop lands.

Soil erosion is locally significant in areas where natural drainage and gulches occur, particularly in the military reservation along Ayres Avenue and McMahon Road in the north, and Duck Field in the south. However, the dry climate and lack of permanent streambeds may reduce the risk of erosion, as well as areas where soils are not developed because of exposed lava.

Outdoor recreation activities include skills training, camping, land navigation exercises, hiking, radio-controlled model plane flights, and trail maintenance.

Schofield Barracks East Range

The Schofield Barracks East Range (SBER) area contains 5,514 ac (2,232 ha) for training purposes, of which 2,223 ac (900 ha) are considered suitable for maneuver training. The western maneuver area on East Range comprises about 2,223 ac (900 ha). This area is valuable for rappelling, jungle survival, and patrolling operations. Several open areas are used for Air Assault and Airborne operations. The eastern portion of SBER has extremely rugged terrain and is densely forested.

There are four native vegetative communities located at SBER: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural communities. Comprising 3,572 ac (1,433 ha) or about 65% of the land area, more than half of the wooded area is composed of *Metrosideros*/*Acacia*/ *Dicranopteris* (56 percent).

One endangered terrestrial mollusk is documented at SBER, along with 14 federally listed plant species (13 endangered, 1 threatened), 1 candidate species, and critical habitat for the O‘ahu ‘Elepaio. Species of greatest conservation need possibly number 15 faunal species (8 bird, 1 mammal, 4 fish, and 2 invertebrates) and 41 plant taxa. There is no designated critical habitat on SBER. There is one O ‘ahu IP management unit on SBER, along with four management units in the central and southern Ko‘ olau Mountains and one Mākua IP management unit southeast of SBER. As many as 13 animal and 41 plants are considered species of greatest conservation need by the Hawai‘i Comprehensive Wildlife Conservation Strategy.

Mammals include 8 non-native mammals; 6 endemic, 3 indigenous, and 25 non-native birds; 4 tree snails, 3 species of land snails; and approximately 15 non-native herpetofauna. Also present are 6 invasive/weedy species and 13 incipient species. (See Appendix 3, *Lists of Species.*)

The primary drainage in SBER is the South Fork Kaukonahua Stream, which originates in the Ko‘olau Mountains, east of Schofield Barracks. This drainage flows northwest toward Waialua and empties into Lake Wilson on SBER. Canon, East Pump, Ko‘olau, and Ku Tree reservoirs are all located on the Kaukonahua in the East Range. The upper portion of the South Fork of Kaukonahua Stream is classified as a Class 1 waterway. All other portions of the South Fork on SBER are classified as Class 2. The South Fork of Kaukonahua Stream is significantly more turbid than the North Fork upon entry into Lake Wilson (Wahiawā Reservoir). Sources of water degradation include denuded training areas (including bivouac sites, LZs and DZs), roads, other concentrated flow sites, gullies at lower elevations where training occurs, disturbance from feral ungulates, and potentially high natural rates of erosion in upper watershed areas.

Soil erosion is significant and is considered severe in many areas in SBER, especially on steep sloping gulches with 30 to 90 percent slopes.

Outreach activities in SBER are limited to freshwater fishing on the South Fork of the Kaukonahua Stream.

Kawailoa Training Area

Kawailoa Training Area (KLOA) is located in north-central O‘ahu on the western slopes of the Ko‘olau Mountain Range and directly south of the Kahuku Training Area. KLOA is subdivided into nine training areas. It is the largest of all of the training areas on O‘ahu at 23,010 ac (9,312 ha). KLOA is characterized by very deep ravines, dense vegetation, and tropical rainforest. This training area contains some of the most rugged terrain in Hawai‘i.

KLOA is used primarily for helicopter aviation training, helicopter unit tactical training, long-range patrol, and command post displacement. Portions of this training area provide an excellent location for mountain and jungle warfare training because of the ravines and dense vegetation present. Slightly less than 25 percent of the area is suitable for maneuver training activities. The remaining area is considered unsuitable due to excessively steep slopes. In areas with slopes greater than 20 percent, troop deployment is typically limited to single file, small unit maneuvers along ridgelines.

KLOA has four native vegetation community types: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural that are characterized within two ecological zones (Wet Summit Crest and Lowland Forest) based on topography, elevation, and prevailing ecological conditions. Nearly all of the training area is wooded (22,556 ac or 98 percent). The major portion of the wooded area is covered with *Metrosideros*/*Acacia*/*Dicranopteris* Forest (85 percent).

There are 6 federally listed endangered terrestrial snails, 1 endangered bird, 1 endangered bat, and 1 candidate insect species, along with 20 federally listed endangered plants and 11 candidate plant species. There is O‘ahu ‘Elepaio Critical Habitat. There are nine O‘ahu Implementation Plan (IP) management units (MU) at KLOA. Twenty-two animal species and 70 plants species have been identified by the Hawaii’s Comprehensive Wildlife Conservation Strategy as species of greatest conservation need.

About 243 plant species have been identified on KLOA, along with 8 endemic and 27 non-native bird species, 6 non-native mammals, 10 non-native reptile species, and potentially 5 non-native amphibians. It is believed that there are 6 endemic and a minimum of 23 non-native fish taxa on the installation. Twelve plant species are considered incipient and are controlled and eradicated when found at KLOA, and 26 invasive/weed species are under evaluation. (See Appendix 3, *Lists of Species.*)

There are nine primary drainages at KLOA, only one is intermittent. Based on monitoring points on five streams and using the Hawai‘i Stream Bio-assessment Protocol, all sites are ranked poor. Contributing factors are the presence of non-native fish/absence of native fish and low embeddedness and substrate characterization scores due to sedimentation. Sedimentation may be attributed to upland disturbance by feral ungulates and low in-stream flows due to agriculture and other diversions. Army training impacts appear to be limited to the effects of foot traffic, rotor wash from helicopters, and a limited amount of vehicle traffic. Three wetland areas are present. No determination has been made and the sites have not been certified. However, all three are likely to be regulated wetlands (USACE 2005). A bog with characteristic bog species, rainforest species, and a number of rare and endangered plant species is present at the summit of the Ko‘olau Mountains.

Army activities affected biological diversity through the increase of non-native plants and potential long-term damage done to woody plants from trampling. However, the Army has taken measures to limit these impacts.

Erosion hazards vary from slight to very severe, dependent on slope. Rock lands and stony regions are common. A thin and fine textured soil mantle of 1 to 10 inches over saprolite is common in the area. There are areas where slopes range from 30 to 100 percent.

Outdoor recreation activities are limited to the hunting of wild pigs and goats and hiking in parts of KLOA.

Kahuku Training Area

Kahuku Training Area (KTA) is the largest contiguous ground-maneuver training area on O‘ahu at 4,596 ac (1,849 ha). KTA is subdivided into seven training areas. The northern portion consists of rolling grasslands and shrublands with moderate relief. KTA can accommodate a number of training scenarios. The southern portion is more elevated with rugged terrain and dense vegetation, making the area poorly suited for large-scale field exercises.

KTA has four native vegetation communities: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural communities natural community types categorize two ecological zones defined by elevation, topography, and the prevailing ecological conditions: Wet Summit Crest Zone and Lowland Forest Zone. Approximately 1,766 ac (714.4 ha) of forest are present on KTA. *Casuarina* and *Schinus* forests are the most common, accounting approximately 60 percent of the forests types in this training area.

The installation has a wide variety of flora and fauna. Four plants are classified as federally endangered and one candidate species is present in KTA. No federally listed animal species have been documented. The Army has no critical habitat obligations. There is one O‘ahu IP management unit with three subunits at KTA.

Seventy-eight vascular plants, and potentially 8 mammal species, 3 fish species, 25 bird species, 5 species of amphibian, and 10 reptile species (Hawaii’s Comprehensive Wildlife Conservation Strategy notes that 19 plant species, 1 raptor taxon, and 4 fish species of greatest conservation need may be present on KTA. (See Appendix 3, *Lists of Species.*) It is difficult to assess the effect of training on biological diversity. However, the non-native vegetation in the Lowland Forest Zone defines the quality of the biological composition at KTA.

All streams and gulches in KTA are intermittent except for Mālaekahana Stream, which flows aboveground to a certain point before going underground and reaching the ocean. At this time, the Army does not conduct stream bio-assessments or water quality sampling at KTA.

Erosion risk at KTA is locally significant in areas where natural drainages and gulches occur. A dry climate and lack of permanent streambeds appear to moderate the risk of erosion.

Hunting at KTA includes wild pigs, goats, and game birds. Up to 12 motocross races are held annually. Various organizations access the installation for hiking, biking, and trail maintenance.

Dillingham Military Reservation (DMR)

Dillingham Military Reservation (DMR) consists of three training areas, a private-use/owned cantonment area, a joint use civilian/military airfield, and three airborne drop zones. DMR covers 664 ac (269 ha). DMR is used for small unit (platoon and squad) maneuvers and combat support operations. DMR supports field training for headquarters and service support units.

Maneuver and field training can occur on over half (354 ac, 143 ha) of DMR. Maneuver training is not permitted on the portion of the airfield that is leased without prior approval. There are no live-fire activities, designated impact areas, or associated surface danger zones on DMR.

The Lowland Dry native vegetative community has been identified at DMR. Within this community type, three forest types are present and comprise 61.5 ac (24.8 ha). *Schinus* Forests make up half of the forest cover.

There are no federally listed animals on DMR and one federally listed plant. Three federally endangered plant species occur adjacent to DMR properties and will be managed by USAG-HI with the land owner's permission. Also, three federally listed bird species have been noted on lands adjacent to the installation. There is no designated critical habitat and DMR is part of one Mākua IP management unit. Six bird species of greatest conservation need may be present on DMR, along with eight plant species.

Potentially four non-native mammals may be present on the installation, along with 6 native bird species, 14 non-native herpetofauna species, and at least 1 endemic and 3 non-native invertebrates. Twenty-nine plant taxa have been identified, as well as, 6 invasive/weed species and 2 incipient plant species. (See Appendix 3, *Lists of Species.*)

There are several unnamed, intermittent streams at DMR. One perched wetland is located on the slopes of the southern property boundary, was determined to be a regulated wetland by the Corps of Engineers. Three other areas were identified, but they do not meet the criteria for a regulated wetland.

Outdoor recreational activities at Dillingham Military Reservation include biking, glider plane, hiking, and parachute drops. The airfield is open to public recreational aircraft use and storage.

Makua Military Reservation (MMR)

Mākua Military Reservation (MMR) is located in an amphitheater-shaped valley, covering 4,190 ac (1,736 ha). MMR is the largest training area on O‘ahu that supports both maneuver and live-fire training. Live ammunition fire requires a surface danger zone and an associated impact area. Wildland fires resulting from live-fire training are the greatest threat to natural resources and endangered species located at and adjacent to MMR.

Two native vegetative communities have been identified at MMR: Lowland Mesic and Lowland Dry Vegetation communities. Four forest communities are present and account for 469 ac (189 ha) of land cover, or about 11 percent.

One federally listed bird, 1 mammal, and 1 snail species are documented on MMR, along with 33 federally listed and 5 candidate plant species have been documented at MMR. Seven additional federally listed plant species occur within the Mākua Action Area. O‘ahu ‘elepaio critical habitat was designated on MMR. Critical habitat for 32 plant species is present within the MMR action area, but there is no critical habitat for plants on the installation. Four bird, 2 marine mammals, and 1 invertebrate species, along with 79 plant species of greatest conservation need may be present. There are four Mākua IP management units located on the installation and 19 management units off the installation.

Potentially, 2 marine mammals and 3 non-native mammal species (e.g., pigs, goats, and rats) have been observed at MMR. Bird observations (mostly informal) include 2 forest species, 1 raptor, 1 sea bird, 1 migratory shorebird, and 11 non-native species. Thirteen herpetofauna may be present at MMR, including one threatened marine turtle. There are no records for fish. Nine endemic/indigenous and 13 non-native invertebrates have been observed. Six non-native ant species have been documented. Some 284 plant species have been identified. Nineteen invasive/weed species have been located at MMR, along with 17 incipient species that the NR staff control and eradicate. (See Appendix 3, *Lists of Species.*)

The primary drainages at MMR are the Punaohaku Stream from the north and the Mākua Stream from west-central MMR; both are intermittent. There are possible palustrine wetlands on MMR, characterized by native trees, shrubs, or persistent emergent species. Possible riverine wetlands and possible palustrine wetlands associated with seep areas in the Mākua Stream drainage are protected using a variety of training restrictions.

Soil erosion can be significant where slopes are steep because of the high shrink-swell potential of soils. Erosion and sediment control practices are used when road and firebreak repair/maintenance is performed to minimize sediment impacts to stream channels.

Partnerships

This INRMP cannot be implemented by USAG-HI alone. In accordance with land withdrawal legislation and the ecosystem management philosophy, USAG-HI has forged partnerships with various agencies to manage its natural resources. Major partners in the implementation of this plan are the U.S. Fish and Wildlife Service and the Hawai‘i Department of Land and Natural Resources. Other partners in this effort include universities, other federal and state agencies, native groups, contractors, and private citizens.

Unresolved Issues

Migratory Bird Treaty Act

The Migratory Bird Treaty Act is a resolved management issue, but an evolving one. In 2001, Executive Order 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*) directed Federal agencies having a measurable negative effect on a migratory bird population to develop and implement a Memorandum of Understanding (MOU) with the USFWS. An MOU was signed July 2006 to promote the conservation of migratory birds (FR 71:51580-51585). The MOU describes specific activities where cooperation between the USFWS and DoD will contribute to the conservation of migratory birds (e.g., promote collaborative projects, minimize loss of migratory bird habitats, and provide training opportunities on migratory bird issues).

A USFWS Final Rule (February 2007, *Migratory Bird Permits, Take of Migratory Birds by the Armed Forces*, 72 FR 89311) allows Armed Forces to “take” migratory birds without a permit in the course of military readiness activities, as directed by the 2003, National Defense Authorization Act (2 December 2002). An Interim Guidance (*Unintentional Take of Migratory Birds for Actions Other than Military Readiness Activities*, 28 July 2008, DA, IMCOM) focuses on non-military readiness activities that provide direct and essential support to military readiness activities. These activities (e.g., range construction and maintenance, prescribed burning, fence construction, etc.) must consider management practices and avoid or minimize adverse impacts to migratory birds to the greatest extent possible. Activities that could have a significant adverse effect are addressed to USFWS and conservation measures established to minimize or mitigate these effects. Many of the measures associated with the implementation plans improve and preserve habitat quality for native and migratory species (e.g., removal of feral cats and rats, reduction of non-native species and ecosystem improvement efforts, etc.).

Grass/Wildland Fire Cycle

The grass/wildland fire cycle is an unresolved issue. Because of the rapid and widespread expansion of non-native invasive species grasses throughout the Island of O‘ahu and the resulting increase in fuel loads, wildland fire now poses a significant threat to native habitats, particularly dry forest systems. Ecological approaches to break the grass/wildland fire cycle are needed. Fire models must

be adapted for the Pacific Islands region to predict fire hazards/severity (behavior). Elements of the models should include, but are not limited to, fuel loading, fuel moisture dynamics, live/dead rations, and microclimate and weather. Of particular importance to DoD are self-sustaining means to prevent and control fire in highly vulnerable areas (e.g., military training areas).

Plan Components

This document guides the natural resources management program at USAG-HI lands on the Island of Hawai‘i. It outlines goals, objectives, and policies in five general areas: stewardship, military readiness, quality of life, compliance, and program integration. It explains USAG-HI's military missions in general terms, including the missions' impacts on natural resources. It describes climate, land base, facilities, and natural resources, including a brief legal and administrative history of natural resources management on USAG-HI lands. The plan also lists agencies, organizations, and individuals involved in the implementation of this INRMP.

Ecosystem management is the underlying philosophy of the plan. This approach is consistent with changes in laws and Department of Army policies. The INRMP serves as a tool to help natural resources personnel implement ecosystem management philosophies on USAG-HI lands. Ecosystem management will continue to allow for the use of natural resources on USAG-HI lands for both military and other human-related values and purposes. Ecosystem management protects properties and functions of natural ecosystems. Since these ecosystems often go beyond installation boundaries, management of USAG-HI's natural resources will include more emphasis on partnerships with its neighbors.

Sikes Act Road Map

The Sikes Act Road Map references the chapters and paragraphs in the Integrated Natural Resources Management Plan, which is cross referenced to the thirteen criteria points required by the Sikes Act. Stakeholder and interested parties can use the road map to quickly check the location and effectiveness of this Integrated Natural Resources Management Plan in meeting Sikes Act requirements. The required Sikes Act criteria can be found in Table ES-1.

Table ES-1 Sikes Act Road Map.

Required Sikes Act Criteria	Location in Integrated Natural Resources Management Plan
1. No net loss in the capability of military installation lands to support the military mission of the installation.	Chapter 1
2. Establishment of specific natural resource management goals and objectives and time frames for proposed action.	Chapters 1 and 4
3. Integration of, and consistency among, the various activities conducted under the plan.	Chapter 4
4. Fish and wildlife management, land management, forest management, and fish and wildlife oriented recreation.	Chapter 4
5. Fish and wildlife habitat enhancement or modification.	Chapter 4
6. Provisions for spending hunting and fishing permit fees exclusively for the protection, conservation, and management of fish and wildlife, including habitat improvement, and related activities in accordance with this INRMP.	Chapter 4

Required Sikes Act Criteria	Location in Integrated Natural Resources Management Plan
7. Wetland protection, enhancement, and restoration, where necessary for support of fish and wildlife.	Chapters 2 and 4
8. Public access to the military installation that is necessary or appropriate for sustainable use of natural resources by the public to the extent that such use is consistent with the military mission and the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security.	Chapter 3 and 4
9. Sustainable use by the public of natural resources to the extent such use is not inconsistent with the needs of fish and wildlife resources management.	Chapter 3 and 4
10. Enforcement of applicable natural resource laws and regulations.	Chapter 3and 4
11. Exemption from procurement of services under Office of Management and Budget Circular A-76 and any of its successor circulars.	Chapter 5
12. Priority for contracts involving implementation of this Integrated Natural Resources Management Plan to state and federal agencies having responsibility for conservation of fish and wildlife.	Chapter 5
13. Review of this Integrated Natural Resources Management Plan and its effects at least every five years.	Chapters 1 and 5

Ongoing Planning Activities

The 2010 - 2014 Integrated Natural Resources Management Plan utilizes existing information as a basis to continue and improve natural resources management while planning continues. Annual internal reviews and meetings with FWS and the State determine if an INRMP needs simple updates or a full revision. Changes to mission or resources on an installation are some of the drivers that may require a full revision. The frequency for a full revision could be as soon as two years or as infrequent as 15 years.

> 25 May 06, DAIM-ED, Subject: Guidance for Implementation of the Sikes Act Improvement Act
>
> 9.a.(3) "If the review process determines that an INRMP needs revising, there is no set time limit to complete the INRMP revision. Until the FWS Regional Director and the appropriate State fish and wildlife agency director mutually agree upon the INRMP revision, the current INRMP remains in effect. However, a timeline should be coordinated by the installation with the FWS and state to ensure that the installation is addressing the revision in a timely matter."

The INRMP is not a static document; rather, it is a dynamic mechanism to guide a program's operations.

Changes Compared to the Previous Plan

Format Change
The format of the USAG-HI INRMP (2010 – 2014) is different from the previous 2002-2006 version. The current INRMP format meets the proposed U.S. Army Environmental Command and Department of Defense outline guidance, which intended a similar format for all services. Most of the content from the previous version remains intact, with the most notable differences occurring in threatened and endangered species management.

Leased Lands
In 2005, DoD policy changed the requirement that leased lands be included in INRMPs.

Benefits and Costs

Military Mission Benefits
Implementation of this plan will improve the quality of USAG-HI's training lands and will improve long-range planning at USAG-HI. The INRMP will improve mission sustainability by enhancing training areas, as well as providing for more intensive planning of missions.

Environmental Benefits
The plan provides the basis for the conservation and protection of natural resources. It will reduce vegetation loss and soil erosion due to military activities, reduce the potential for environmental pollution and provide for biodiversity conservation. Certain sensitive areas and species will be protected from unacceptable damage or degradation. Plan implementation will increase overall knowledge of USAG-HI's ecosystems through surveys and monitoring.

Other Benefits
Soldier sustainable range awareness will be enhanced for military training at USAG-HI posts. Both community relations and USAG-HI's environmental image will be enhanced. Quality of life for the USAG-HI communities and its neighbors will be improved. Plan implementation will decrease long-term environmental costs and reduce potential liabilities from environmental noncompliance.

Costs
It will cost about $7,441,900 annually (2010-2014) to fully implement this INRMP. Funding will be provided primarily either from environmental conservation funds or training funds designated for implementation of the Integrated Training Area Management program. Other dollars will be from special natural resources funds, forestry, and fish and wildlife permit fees. Plan implementation will require staffing at the same level as in recent years, with the exception of additional contract personnel to implement Integrated Training Area Management and other new programs.

Summary

The actions within this INRMP comply with environmental laws, conserve and protect USAG-HI's natural resources, improve its relationship with the public, and enhance the military mission. While this plan will not resolve all existing and/or future environmental issues, it does provide the guiding philosophy, personnel, and means to work toward resolution of such issues.

CHAPTER 1

OVERVIEW

CHAPTER 1 OVERVIEW

1.1 Purpose

The purpose of this document is to review and update the U.S. Army Garrison, Hawai‘i (USAG-HI), O‘ahu, Integrated Natural Resources Management Plan (INRMP). This INRMP was revised due to updated Biological Opinions for USAG-HI's O‘ahu Training Areas and the resulting implementation plans that were developed. The intent is to integrate land use needs, the military mission, and the management and conservation of natural resources at Schofield Barracks Military Reservation and its sub-installations for the next five years (2010 to 2014). This INRMP establishes an approach and actions to accomplish this end, and to satisfy the requirements and meet natural resources planning and management responsibilities of the Sikes Act Improvement Act (SAIA) of 1997 (16 USC §670a et seq.), National Environmental Policy Act (NEPA), Endangered Species Act (ESA), DoD Instruction 4715.3, and Army Regulations (AR) 200-1 and 350-19.

An INRMP is a long-term planning document designed to guide a DoD natural resources manager in the management of natural resources to support an installation's mission while protecting and enhancing installation resources for multiple use, sustainable yield, and biological integrity.

The Sikes Act states that the purpose of an INRMP is to "ensure consistency with the use of military installations to support the preparedness of the Armed Forces, while providing for (1) the conservation and rehabilitation of natural resources on military installations; (2) the sustainable multi-purpose use of the resources including hunting, fishing, trapping, and non-consumptive uses; and (3) public access to military installations within safety and military security requirements." The Sikes Act also states that an INRMP shall provide for "no net loss in the capability of military installation lands to support the military mission of the installation."

1.2 Scope

The initial O‘ahu INRMP (Schofield Barracks Military Reservation and its sub-installations) operated under previous implementation/endangered species management plans and described program activities for 2002 to 2006. Until the final approval of this INRMP, natural resources management program will be continued in accordance with the *O‘ahu Training Areas Integrated Natural Resources Management Plan* (2002 - 2006), USAG-HI's Conservation Annual Status Reports (2007a 2008a, 2009a), and the supporting endangered species management plans noted below.

This updated INRMP (2010 - 2014) reviews, documents, and builds on progress made during the previous plan, outlines natural resource program directions, and implements/integrates the *Final Implementation Plan*, *Mākua Military Reservation*, *Island of O‘ahu*, May 2003 (USAG-HI 2003a); *Addendum to the Implementation Plan*, *Mākua Military Reservation*, *Island of O‘ahu*, January 2005 (USAG-HI 2005a); and the *Final Implementation Plan For O‘ahu Training Areas*: *Schofield Barracks Military Reservation*, *Schofield Barracks East Range*, *Kawailoa Training Area*, and *Kahuku Training Area*, 2008 (USAG-HI 2008b). This document provides the basis and criteria for protecting and enhancing natural resources using an ecosystem perspective, consistent with the military mission. Provisions of the INRMP apply to each directorate, command, tenant units, and others who either directly or indirectly use installation natural resources. Implementation of this INRMP is subject to the availability of annual funding, availability of labor, and to mission requirements.

The INRMP includes input from stakeholders including federal, state, and local agency representatives, conservation organizations, and interested individuals. As required under the Sikes Act, this INRMP reflects contributions from the U.S. Fish and Wildlife Service (USFWS) and the Hawai‘i Department of Land and Natural Resources (DLNR).

This INRMP addresses Schofield Barracks Military Reservation (SBMR) and its sub-installations: Schofield Barracks East Range (SBER), Kawailoa Training Area (KLOA), Kahuku Training Area (KTA), Mākua Military Reservation (MMR), and Dillingham Military Reservation (DMR). The South Range Acquisition Area (SRAA) is included in descriptions and discussions of Schofield Barracks Military Reservation. Tripler Army Medical Center (located in an urban area) has one identified candidate species for federal listing, *Megalagrion xanthomelas* (orange black damsel fly), that is discussed in Section 4.1.2.11, *Stabilization Requirements, Invertebrates.*

1.3 Approach

1.3.1 Document Structure

The structure of this INRMP is closely based on the “Integrated Natural Resources Management Plan (INRMP) Template” issued by the Office of the Under Secretary of Defense (14 August 2006) and distributed by the Office of the Assistant Chief of Staff for Installation Management (18 September 2006). The document is composed of six parts:

Chapter 1: Overview details the purpose, scope, approach and management, plan strategy, goals and objective, responsibilities, authority, stewardship, review process, plan integration and unresolved issue(s).

Chapter 2: Current Conditions provides a description of the installation, regional land use, installation history, and operations and activities, as well as a description of the physical environment and ecosystems and the biotic environment.

Chapter 3: Environmental Management Strategy and Mission Sustainability describes supporting mission and the natural environment, natural resources consultation requirements, National Environmental Policy Act (NEPA) compliance, partnerships and collaborative resource planning, public access and outreach, encroachment partnering, and state comprehensive wildlife plans.

Chapter 4: Program Elements describes the program elements and integrated goals and objectives for threatened and endangered species management, natural resources law and regulation enforcement, fish and wildlife management, migratory bird management, invasive species management, pest management, land management, geographical information system (GIS) management, outdoor recreation, bird aircraft strike hazard, wildland fire management, natural resources personnel training, and leases.

Chapter 5: Implementation discusses preparing management plans that drive objectives, projects, achieving no net loss of training lands, use of cooperative agreements, and funding.

Appendices capture all additional information not appropriate for the body of the INRMP. The appendices include a list of acronyms, natural resources implementation plans, list of projects, species lists, research projects, biological opinions, annual status reports, cooperative documents, and supplemental information.

A number of handbooks and guides were consulted to aid in addressing the various sections, including "A Handbook for the DoD Natural Resources Manager, Resources for INRMP Implementation" (DoD 2002).

The INRMP includes all the DoD required elements for natural resource management applicable to Schofield Barracks Military Reservation and its sub-installations. This plan also includes U.S. Fish and Wildlife Service and the National Marine Fisheries Service required conservation measures and actions presented during Endangered Species Act consultations (see Section 1.9, *Integration with Other Plans).*

1.3.2 Ecosystem Management

The Department of Defense has implemented ecosystem management worldwide. The Department of Defense's goal with regard to ecosystem management is *"To ensure that military lands support present and future training and testing requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, that approach shall maintain and improve the sustainability and biological diversity of terrestrial and aquatic (including marine) ecosystems while supporting sustainable economies, human use, and the environment required for realistic military training operations*" (DoDI 4715.3). Ecosystem management goals and objectives contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance with environmental laws, quality of life, and integration. The Department of Defense ecosystem management principles and guidelines are to:

- Maintain and improve the sustainability and native diversity of ecosystems.
- Administer with consideration for ecological units and evolutionary time frames.
- Support sustainable human activities.
- Develop a vision for continued ecosystem health.
- Develop priorities and reconcile conflicts in land use decisions.
- Develop and implement coordinated approaches to work toward ecosystem health.
    - Use joint planning between natural resources managers and military operations personnel to accomplish and support the mission in a manner consistent with ecosystem management.
    - Involve internal and external stakeholders up front. Meet regularly to discuss issues and to work towards common goals.
    - Incorporate ecosystem management goals into strategic, financial, and program planning and design budgets to meet the goals and objectives of the ecosystem management implementation strategy.
    - Seek to prevent undesirable duplication of effort, minimize inconsistencies, and create efficiencies in programs affecting ecosystems.
    - Site Sustainability Plan for installations.

- Involve scientists and use the best science available.
- Use benchmarks to monitor and evaluate outcomes.
- Implement through installation plans and programs.
- Use adaptive management.
- Integrate conservation of ecosystem integrity into the installation's Integrated Natural Resources Management Plan, Integrated Cultural Resources Management Plan, and other planning and budgeting documents.

The vision of USAG-HI is to maintain itself as a leader in ecosystem management and stewardship. This management strategy enables Schofield Barracks Military Reservation and its sub-installations to conduct military training while conserving natural resources. An ecosystem-based approach promotes and sustains native species and habitats diversity and prevents the breakdown of ecosystem integrity, which in turn, maximizes support to the military's training and infrastructure. Compliance with applicable laws and regulations provides oversight and guidance and ensures stewardship of public lands.

With 81 endangered (68 plants, 13 animals), 1 threatened (1 plant), 20 candidate (18 plants, 2 animals) species, and one designated critical habitat, the USAG-HI's O'ahu Natural Resources (ONR) Program recognizes the benefit of an ecosystem management approach as compared to less efficient species-by-species management. Of the 68 endangered plants, 64 occur within installation boundaries and additional four taxa are present within the Mākua Military Reservation action area, and one of the two candidate animal taxa occurs at Tripler Army Medical Center. An ecosystem approach balances all components (e.g., mission, biological, physical, economic, and human elements), compliance (e.g., Sikes Act , ESA, DoD and Department of Army (DA) regulations and guidance), restoration (e.g., exotic species control, erosion control), and implementation to minimize adverse impacts. USAG-HI's ecosystem management is intended to complement and support local and regional conservation efforts, to manage new activities and infrastructure developments proactively, and to respect cultural values.

1.4 Plan Strategy, Goals and Objectives

The USAG-HI O'ahu INRMP strategy is to support USAG-HI's military and non-military activities while maintaining functional, healthy ecosystems. Over the next five years, the programs outlined in this INRMP will be executed within the principles of ecosystem management and refined as new information and ideas become available. Management will be adaptive. The overall goals of the USAG-HI O'ahu INRMP are to:

- Protect the Army's mission and access to air, land, and water resources by preserving, enhancing and restoring natural resources for present and future generations by:
    - Maintaining or restoring native functional ecosystem types across their natural range when practical and consistent with the military mission.
    - Research ways to break the grass/wildland fire cycle at O'ahu ranges that would result in enhanced training sustainability due to reductions in training restrictions.

- Maintaining or restoring ecological processes when practical and consistent with the military mission.
- Adopting biological opinion recommendations provided by USFWS as feasible.
- Complying with laws and regulations to maintain USAG-HI natural resources.
- Using regional approaches to implement ecosystem management on USAG-HI O‘ahu installations by collaboration with other DoD components as well as other federal, state, and local agencies, and adjoining property owners.
- Providing for outdoor recreation and practical utilization of the land and its resources by the USAG-HI community and the public, while preventing damage to resources or impacting the Army’s mission.

This strategy was developed with USFWS, the Hawai‘i Department of Land and Natural Resources (DLNR), and various divisions within the Hawai‘i DLNR.

The overall objectives of the USAG-HI O‘ahu INRMP are to:

- Implement and complete all Natural Resources Management Program projects validated and funded for the fiscal years of 2010 to 2014 as per the project descriptions. (See Appendix 2, *List of Projects.*)
- Implement and complete all Integrated Training Area Management Program (ITAM) projects that were validated and funded for the fiscal years of 2010 to 2014 as per the project descriptions.

1.5 Responsibilities

The secretary of a military department prepares each INRMP in cooperation with the Secretary of the Interior, acting through the Director of the USFWS, and the head of each appropriate state fish and wildlife agency for the state in which the military installation concerned is located. The resulting plan for the military installation reflects the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources.

Mutual agreement with USFWS and appropriate state fish and wildlife agencies is the goal with respect to the entire plan. Mutual agreement is required only with respect to those elements of the plan that are subject to the otherwise applicable legal authority of the USFWS and a state’s fish and wildlife agency to conserve, protect, and manage fish and wildlife resources. No element of the Sikes Act is intended to either enlarge or diminish the existing responsibilities and authorities of the USFWS or a state’s fish and wildlife agency concerning natural resources management on military lands.

Where USFWS or a state fish and wildlife agency withholds its agreement with an INRMP based on objections to elements of the INRMP clearly not within the scope of the particular agency’s authority, an installation may, notwithstanding the objections, finalize the INRMP and proceed to manage its natural resources in accordance with the terms of the plan.

The INRMP, although written by or under the guidance of the installation natural resources managers, is developed in concert with and with significant input from internal installation

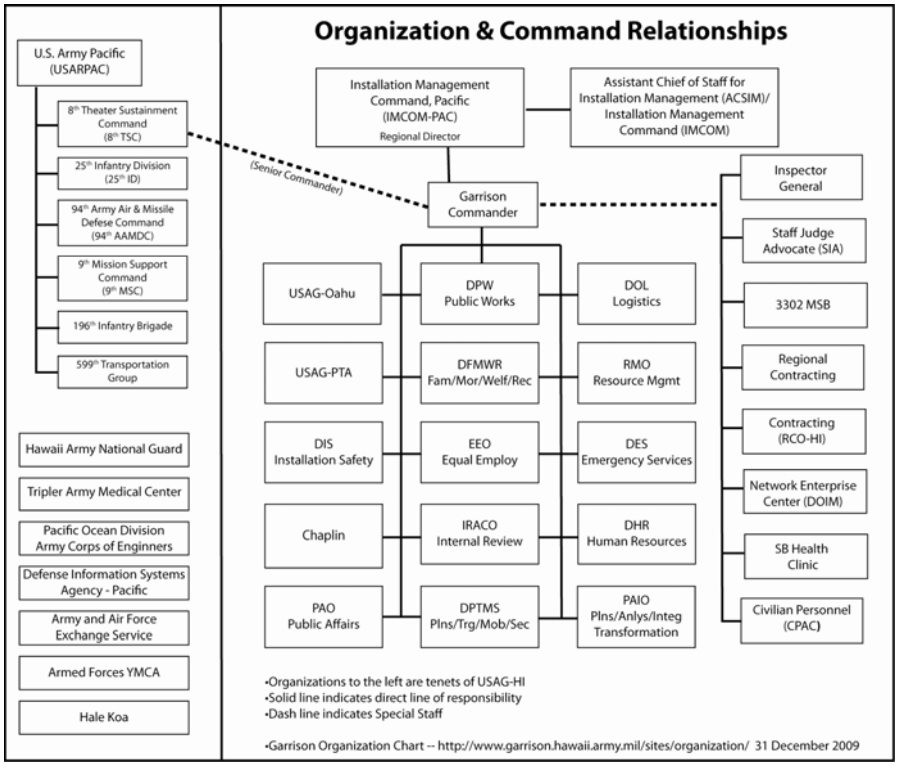


Figure 1.5.a U.S. Army Garrison, Hawai‘i, Organization Chart.

stakeholders (i.e., any branch, section, department, or activity that would carry out work that would execute, impact, or be affected by the INRMP).

1.5.1 Installation Stakeholders

1.5.1.1 U.S. Army Garrison, Hawai‘i (USAG-HI)

The USAG-HI Garrison Commander is directly responsible for the operation and maintenance of Army installations in Hawai‘i and is therefore responsible for the preparation, updating, and implementation of Integrated Natural Resources Management Plans under the Sikes Act (Figure 1.5.a).

Directorate of Public Works (DPW)

The Director of DPW is responsible for the operation and maintenance of Army lands in Hawai‘i and thus is responsible for the preparation, updating, and implementation of the Integrated Natural Resources Management Plan.

- **Environmental Division, Conservation Branch, Natural Resources Program**
  The O‘ahu Natural Resources (ONR) Program Section Chief has oversight of the ONR staff in the Environmental Division for the USAG-HI O‘ahu installations, as well as the ONR staff for USAG-HI Pōhakuloa on the Island of Hawai‘i. The Section Chief coordinates natural resources use, management, and implementation of this plan. The Natural Resources Program Section Chief maintains close coordination and cooperation with other affected organizations and agencies, particularly the USFWS and DLNR. The Natural Resources Program Section

Chief and the Cultural Resources Program Manager work closely together to ensure each program is cognizant of the needs of the other. The Environmental Division at Schofield Barracks oversees funding and program support to the Natural Resources Program.

Directorate of Plans, Training, Mobilization and Security (DPTMS)
The ranges on USAG-HI O'ahu sub-installations are managed by the DPTMS, which is also under the direction of the Garrison Commander. DPTMS is responsible for managing range complexes, coordinating military training, and releasing training areas for land rehabilitation and recreational use.

- **Range Division Hawai'i, DPTMS**
  Range Division Hawai'i, DPTMS is responsible for implementing Integrated Training Area Management (ITAM) programs at USAG-HI lands on O'ahu (Section 4.22, *Sustainable Range Program and Integrated Training Area Management*). The ITAM Coordinator, Land Rehabilitation Coordinator, Range and Training Lands Assessment Coordinator and the Range Officer of the O'ahu Range Division represent the training community and work with the Environmental Division to address natural resources issues in the training areas. Range Division O'ahu, in coordination with the installation's Provost Marshal's Office/Military Police, controls access to USAG-HI installations on O'ahu for hunting and other activities.

Directorate of Public Safety Provost Marshal's Office/Military Police
The Provost Marshal's Office provides general range security and directly controls access for hunting at USAG-HI lands. It also supports, but is not responsible for, the enforcement of laws related to natural resources uses (e.g., the enforcement of the external agency laws and regulations) on O'ahu installations. Law enforcement is managed by the U.S. Army Military Police Brigade, Hawai'i.

Directorate of Emergency Services
The Directorate of Emergency Services (DES) has responsibility for implementing the Wildland Fire Management Plan. The DES Fire and Emergency Services is the primary responder to wildland fires. The DES is responsible for managing wildland fire suppression and prescribed burning on O'ahu Ranges. This requires coordination with Range Division Hawai'i, the O'ahu Natural Resources Office, and the Federal Fire Department, Naval Station Pearl Harbor (NAVSTA-PH). The DES funds and maintains a 10 person wildland fire crew, which responds to wildland fire incidents on army property and off the installation when fires threat O'ahu Natural Resources management units. Through an interservice agreement, fire protection/prevention, aircraft rescue fire fighting, and wildland fire suppression services are provided by the Federal Fire Department at all installations under the jurisdiction of USAG-HI (Section 4.15, *Wildland Fire Management*).

1.5.1.2 25th Infantry Division

The 25th Infantry Division (ID) is the principal land user at O'ahu installations. The 25th ID uses live-fire ranges and training areas located on these installations for tactical training and for military Mission Essential Task List (METL) training. This INRMP supports the training land needs of the 25th Infantry Division and other military units.

1.5.1.3 U.S. Army Pacific Command

U.S. Army Pacific Command (USARPAC) oversees most Army forces in the Asia-Pacific region with the exception of Korea. USARPAC, located at Fort Shafter, Hawai'i, assists USAG-HI with development and implementation of conservation programs (AR 200-1). U.S. Army Pacific Command has review authority for this INRMP.

1.5.1.4 Installation Management Command – Pacific

USAG-HI's higher headquarters is the Installation Management Command-Pacific (IMCOM-PAC) at Fort Shafter, Hawai'i. IMCOM-PAC assists with the development and implementation of conservation programs, and has the final review and approval authority for this INRMP. IMCOM-PAC reports to IMCOM Headquarters. IMCOM Headquarters provides environmental funding for the implementation for this INRMP.

1.5.1.5 U.S. Army Corps of Engineers, Honolulu District

The U.S. Army Corps of Engineers (USACE), Honolulu Engineer District has responsibility for providing engineering support for USAG-HI. This support includes administering major construction, environmental documentation, natural and cultural resources surveys, and research contracts.

1.5.1.6 U.S. Army Environmental Command

U.S. Army Environmental Command (USAEC) provides oversight, centralized management, and execution of the Army's environmental programs and projects. It provides support capabilities for National Environmental Policy Act (NEPA), endangered species, natural and cultural resources, ITAM, environmental compliance, and related areas.

1.5.2 External Stakeholders

1.5.2.1 Federal Agencies

U.S. Department of Defense

- **U.S. Department of the Navy**
  USAG-HI Natural Resources Program conducts endangered species management on Department of the Navy lands (Laulualei Naval Magazine/Reservation) in cooperation with the Navy and the USFWS.

- **U.S. Department of the Air Force**
  USAG-HI Natural Resources Program conducts endangered species management on Department of the Air Force lands (Mt. Ka'ala) in cooperation with the Air Force and the USFWS.

The Department of Defense (DoD) supports a number of venues for conducting natural resource research on military lands with the intent of sustaining resources and the training environment. Sponsored projects typically include other agencies, universities, and other interested parties.

- **Strategic Environmental Research and Development Program**
  The Strategic Environmental Research and Development Program (SERDP) is the DoD environmental science and technology program, planned and executed in full partnership with the Department of Energy and the Environmental Protection Agency, with participation by numerous other federal and non-federal organizations. The intent of SERDP is to address high priority issues that confront the Army, Navy, Air Force, and Marines.

- **Legacy Resource Management Program**
  The Legacy Resource Management Program provides financial assistance for DoD efforts to preserve natural and cultural resources on military lands while supporting military readiness. A number of Legacy projects have been completed by USAG-HI, most of which investigated rare plants and wildland fire.

U.S. Department of Interior

- **U.S. Fish and Wildlife Service Pacific Islands Ecoregion**
  The U.S. Fish and Wildlife Service (USFWS) is a major cooperator in the implementation of this INRMP in accordance with the Sikes Act. Specifics of this cooperation are contained in Mākua and O‘ahu Implementation Plans (Appendix 4, *Implementation Plans*). Cooperative efforts with USFWS primarily involve endangered species and critical habitat management and assistance with research and surveys.

- **National Oceanic and Atmospheric Administration – National Marine Fisheries Service**
  The National Marine Fisheries Service is the analog to USFWS for marine and anadromous species.

- **National Park Service**
  The National Park Service is a source of information and experience on a number of topics (e.g., non-native ungulate control, non-native plant control, bird survey techniques).

- **Geological Survey – Biological Resources Division**
  The Biological Resources Division (BRD) has considerable biological expertise and is charged with gathering nationwide biological data. The BRD collects hydrologic data and conducts investigative studies, including groundwater availability and contamination, rainfall/runoff, and the collection and analysis of climatologic and hydrologic data (http://pubs.usgs.gov/fs/FS-011-96/).

U.S. Department of Agriculture

- **Agricultural Research Service – National Center for Genetic Resources Preservation**
  The National Center for Genetic Resources Preservation (NCGRP) conserves genetic resources, which is important for conservation and biological diversity. USAG-HI Natural Resources Program plans to continue storing federally listed and native plant materials at the NCGRP as part of its conservation effort of this INRMP.

- **Natural Resources Conservation Service**
  The Natural Resources Conservation Service (NRCS) is available to provide technical support and information on plant and animal control and plant identification. The NRCS has expertise in soil conservation and erosion control.

- **U.S. Forest Service**
  The U.S. Forest Service (USFS) helped develop the Wildland Fire Management Plan for USAG-HI. The USFS provides advanced wildland firefighting training that meets National Wildland Coordinating Group Standards for Army personnel. USAG-HI is working with the USFS, Institute of Pacific Islands Forestry Office to develop a better grass fuel model for Hawai‘i to help break the grass fire cycle.

- **Animal and Plant Health Inspection Service, Wildlife Services**
  The Animal and Plant Health Inspection Service, Wildlife Services facilitates the resolution of human-wildlife conflicts and is contracted to implement USAG-HI’s Bird/Animal Strike Hazard Programs at Wheeler and Bradshaw Army Airfields.

1.5.2.2 State of Hawai‘i Agencies

Department of Land and Natural Resources

The Hawai‘i Department of Land and Natural Resources (DLNR) is a major cooperator in the implementation of this INRMP in accordance with the Sikes Act. Specifics of this cooperation are contained in Mākua and O‘ahu Implementation Plans. The Army, in cooperation and under the guidance of DLNR, manages threatened and endangered species located on designated DLNR lands. Cooperative efforts with DLNR typically fall under the responsibilities of the Division of Forestry and Wildlife (hunting management and game populations, wildfire prevention and suppression, and wildlife research), Division of Aquatic Resources (fish management and game populations) and the Division of Conservation Resource Enforcement (natural resources law enforcement). The DLNR works closely with USAG-HI Natural Resources personnel in various working groups.

Department of Agriculture

The Hawai‘i Department of Agriculture is involved in pest management at O‘ahu installations. The agency certifies pesticide applicators, inspects storage facilities for pests, and performs similar functions on the installation.

Office of Hawaiian Affairs

USAG-HI and Office of Hawaiian Affairs (OHA) are committed to the Army Compatible Use Buffer (ACUB) program and achieving their complementary objectives of protecting the environment, the Hawaiian heritage, and the military mission. Lands purchased under the ACUB program are titled to the OHA. In exchange, the Army has the right to manage endangered plant species located on these lands.

1.5.2.3 Other Interested Parties

Hawai‘i Biodiversity and Mapping Program

The Hawai‘i Biodiversity and Mapping Program (HBMP) (formerly known as the Hawai‘i Natural Heritage Program) plays a fundamental support role for DoD lands in Hawai‘i. The HBMP hosts Hawaii’s central database on plant and animal species. It archives data and provides statewide species information to the USAG-HI Natural Resources staff, which aids in the implementation of this INRMP. The HBMP has performed surveys of biological resources at USAG-HI installations and sub-installations via contract and has supported the development of various plans and databases for the natural resources program.

Hawai‘i Conservation Alliance

The Hawai‘i Conservation Alliance (HCA) is a developing cooperative partnership of government, education, and non-profit organizations with a strong commitment to the environmental conservation of the Hawaiian Islands through land management, scholarly research, and financial incentives.

Hawai‘i Fish Habitat Partnership

The Hawai‘i Fish Habitat Partnership seeks to cooperatively develop and implement aquatic conservation projects in Hawaiian streams and estuaries through the support and participation of government agencies, non-governmental organizations, and the private sector. The Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR) and the Pacific Region-USFWS Hawai‘i Office have requested that the Hawai‘i Fish Habitat Partnership be accepted as a candidate partnership in the National Fish Habitat Action Plan.

Board of Water Supply, City and County of Honolulu

USAG-HI's Natural Resources staff works closely with the Board of Water Supply in the Army's efforts to stabilize endangered species populations located on Board of Water Supply Lands that may be impacted by Army actions.

Koʻolau Mountains Watershed Partnership

The Koʻolau Mountains Watershed Partnership (KMWP) is a consortium of landowners and interested parties who have banded together to protect the watershed areas of the Koʻolau Mountains on Oʻahu. USAG-HI is a member of the KMWP.

Other Private Landowners

There are a number of private landowners who cooperate and/or work with the Army in threatened and endangered species management (i.e., Dole Food Co. Ltd, Kamehameha Schools, Bishop Estates, James Campbell Trust Estates).

The Nature Conservancy, Hawaiʻi

The Nature Conservancy (TNC) manages the lands on a number of the U.S. Army's management units. Often, these lands are leased to TNC by private land owners. The U.S. Army and the TNC share species management responsibilities.

Trust for Public Lands

USAG-HI and Trust for Public Lands (TPL) are committed to the Army Compatible Use Buffer (ACUB) program and achieving their complementary objectives of protecting the environment, the Hawaiian heritage, and the military mission. The TPL is working with USAG-HI, the State Division of Forestry and Wildlife, and the USFWS to raise funds for the acquisition and protection of the 3,582 acre (1,450 ha) Honouliuli Preserve on Oʻahu.

University of Hawaiʻi

The University of Hawaiʻi provides support and interacts with USAG-HI Natural Resources Program through the Research Corporation of the University of Hawaiʻi (RCUH). RCUH provides research support in the areas of native species management and non-native species control as well as other areas. These specialists comprise much of the work force for the programs and projects described in this INRMP.

1.6 Authority

This INRMP is required by the Sikes Act (16 U.S.C. 670a et seq.), *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation*, dated 18 June 2008 (1-2-2005-F-356) (USFWS 2008), *Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Training at Mākua Military Reservation, Island of Oʻahu*, dated June 22, 2007 (1-2-2005-F-356) (USFWS 2007a); and *Biological Opinion of the USFWS for Routine Training and Transformation of the 2nd Brigade, 25th Infantry Division, U.S. Army Installations, Island of Oʻahu*, dated October 23, 2003 (1-2-2003-F-04) (USFWS 2003a). This INRMP helps USAG-HI comply with other federal and state laws, most notably laws associated with environmental documentation, wetlands, endangered species, water quality, and wildlife management.

The Sikes Act Improvement Act (SAIA), as amended (16 U.S.C. §§ 670a-670o) requires the secretary of each military department to prepare and implement an INRMP for each military installation in the United States under the jurisdiction of the secretary, unless the secretary determines that the absence

of significant natural resources on a particular installation makes the preparation of such a plan inappropriate.

Additional authority and official DoD policy are provided by the Office of the Under Secretary of Defense memoranda, *Implementation of Sikes Act Improvement Act* of 10 Oct 2002 and 1 Nov 2004, *Implementation of Sikes Act Improvement Act: Supplemental Guidance Concerning Leased Lands* of 17 May 2005 (OUSD 2005), Department of Defense Instruction 4715.3 (*Environmental Conservation Program*), and Army Regulation 200-1 (*Environmental Enhancement and Protection*, 28 August 2007).

1.7 Stewardship and Compliance

The Department of Defense is required to comply with all federal laws and executive orders (EO). For the purposes of an INRMP, this may include, but not be limited to, the Endangered Species Act, Sikes Act, Migratory Bird Treaty Act, Clean Water Act, National Environmental Policy Act, Marine Mammal Protection Act, Invasive Species EO, and the Coastal Zone Management Act. Compliance with these laws and executive orders is a priority to all military installations.

Stewardship, the responsibility to manage and conserve natural resources for the future, is a large component of the military environmental and training ethic. Military lands are actively managed for multiple training and testing missions, and the military implements programs/efforts to reduce impacts on such lands and to ensure environmental and mission sustainability. Good stewardship is the goal of all military installations.

Stewardship efforts include natural resource projects that are proactive, noncompliance conservation efforts, for which funding may or may not be available. When there is a shortage of funding, installations investigate alternative approaches to accomplish projects. This is often accomplished through partnering with local organizations that can supply free volunteer assistance or materials. Installations also have the opportunity to apply for alternative funding from DoD programs such as Legacy, Strategic Environmental Research and Development Program (SERDP) / Environmental Security Technology Certification Program (ESTCP), DoD Forestry Reserve Account, Agricultural Outleasing, etc. (reimbursable programs).

This INRMP contains projects that are compliance and mission driven and others that are driven by ecosystem management and good land stewardship. Projects driven by compliance with federal laws and mission sustainability are first order priority for funding. This INRMP includes valid projects and programs that enhance an installation's natural resources, promote proactive conservation measures, and support investments that demonstrate environmental leadership and proactive environmental stewardship. Stewardship projects that are not compliance/mission driven are accomplished when funding is available or alternative sources for completion are identified. (Additional information on programming and budgeting can be found in DoDI 4715.3, *Environmental Conservation Program*, 03 May 96, Enclosure 4 *Programming and Budgeting Priorities for Conservation Programs*.)

1.8 Review and Revision Process

Section 101(b) (2) of the Sikes Act [16 U.S.C. 670a (b) (2)] states that each INRMP "must be reviewed as to operation and effect by the parties thereto on a regular basis, but not less often that every five years."

1.8.1 Review for Operation and Effect

The Office of the Secretary of Defense policy memoranda: *Implementation of the Sikes Act Improvement Amendments: Additional Guidance concerning INRMP Reviews* states the requirement to review an INRMP, "on a regular basis, but not less often than every five years" does not mean that every INRMP necessarily needs a major revision. The Sikes Act specifically directs that INRMPs be reviewed "as to operation and effect" to determine whether the existing INRMP is being implemented to meet the requirements of the Sikes Act and contributes to the conservation and rehabilitation of natural resources on military installations. The need to revise an INRMP is the decision of the installation based on the outcome of the review for operation and effect. In addition to the formal five-year review documented by the parties, it is DoD policy for an installation to evaluate the effectiveness of its INRMP annually. The appropriate USFWS and state fish and wildlife agency are invited to participate in the annual review.

If the review process determines that an INRMP needs revising, there is no set time limit to complete the INRMP revision by Army Policy (DA 2006c). Until the USFWS regional director and the appropriate state fish and wildlife agency director mutually agree upon the INRMP revision, the current INRMP remains in effect. However, a timeline should be coordinated by the installation with USFWS and the state to ensure that the installation is addressing the revision in a timely matter.

1.8.2 Annual Reviews

Annual reviews verify:

- All "must fund" projects and activities have been budgeted for, and implementation is on schedule.
- All required trained natural resources positions are filled or are in the process of being filled.
- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate INRMP revision.
- All required coordination has occurred.
- All significant changes to the installation's mission requirements or its natural resources have been identified.
- The INRMP goals and objectives are still valid.
- No net loss of training capability has occurred due to implementation of the INRMP in accordance with the Sikes Act.

1.8.3 Public Review

The public is given the opportunity to review the INRMP. This criterion is applicable to first time INRMPs and INRMPs with major revisions.

1.9 Integration with Other Plans

Integrating the components of natural resources management can be a complex challenge. One of the objectives of ecosystem management in USAG-HI is to develop a process that objectively identifies requirements for all species and users of the environment. In addition, natural and cultural resources projects can only be classified as military use (valid expenditures of military funds) if there is a direct

link back to the accomplishment of the overall military mission. An INRMP is prepared in coordination with the installation's Master Plan, Range Complex Master Plan, Range and Training Land Program Development Plan (USACE and Nakata Planning Group, LLC 2002a), Biological Opinion(s) (USFWS 2003a, 2007a, 2008), Implementation Plan(s) (USAG- HI 2003a, 2005a, 2008), Integrated Cultural Resources Management Plan (USAG-HI 200b draft), Integrated Pest Management Plan (USAG-HI 2008c), Installation Restoration Plan that address contaminants covered by Comprehensive Environmental Response, Compensation, and Liability Act and related provisions, and other appropriate plans and offices. The goals and objectives of the various plans complement each other and strive to be compatible. An INRMP is not meant to function as a comprehensive compilation of detailed information on all these related topics. Rather, an INRMP should briefly summarize the key interrelationships with these plans, reference where the plans may be obtained, and describe where detailed information can be found.

1.9.1 Range Related Programs

1.9.1.1 Sustainable Range Program

The Army uses the Sustainable Range Program (SRP) to improve the way it designs, manages, and uses ranges and to ensure that current and future doctrinal requirements are met. The goal of the SRP is to maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements. The sustainability of resources is essential for current and future mission requirements. Natural resource efforts not only sustain resources but maintain and improve how ecosystems function.

It consists of two core programs: the Range and Training Lands Program, which consists of range modernization and range operations; and the Integrated Training Area Management (ITAM) program, which consists of land management and land maintenance (stewardship) activities (USAG-HI IWAM 2006a). These programs are supported by the SRP Geographical Information System (GIS), which creates, manages, and distributes authoritative standardized spatial information, products, and services for executing training strategies and missions on U.S. Army ranges and training lands.

Integrated Training Area Management Five-Year Plan

The Integrated Training Area Management (ITAM) Five-Year Plan outlines program goals and objectives for its four sub-components (Training Requirements Integration, Land Rehabilitation and Maintenance, Sustainable Range Awareness, Range and Training Land Assessment). The plan is designed to support the military mission by protecting and enhancing the training lands upon which the military is critically dependent upon. ITAM projects are not compliance driven, but rather stewardship initiatives and projects. (See Section 4.22, *Sustainable Range Program and Integrated Training Area Management*.)

1.9.1.2 Range and Training Land Program Development Plan

The U.S. Army Hawai‘i Range and Training Land Program Development Plan (RTLPDP) outlines range development requirements for USAG-HI training lands. The RTLPDP creates the framework within which natural resources management occurs (USACE and Nakata Planning Group, LLC. 2002a,b). The INRMP complements the RTLPDP by providing information that minimizes impacts to natural resources when siting new range facilities. This RTLPDP is the responsibility of the USAG-HI's Directorate of Plans, Training, Mobilization and Security, Range Division. (Appendix 9, *Installation Documents*, Range and Training Land Program Land Use Requirement Study May 2002 and Range and Training Land Program Development Plan July 2002.)

1.9.1.3 U.S. Army Hawai‘i Range Complex Master Plan

The USAG-HI Range Complex Master Plan (RCMP) is under development and will be a sub-component of the RTLPDP. It will depict an installation's current range and training land assets, general siting of future range complex project requirements, and an installation's requirements and constraints that may impact ranges or training lands. Like the RTLPDP, the Range Complex Master Plan works to minimize impacts to natural resources. This plan is the responsibility of the USAG-HI's Directorate of Plans, Training, Mobilization and Security, Range Division. USAG-HI has not currently completed this plan.

1.9.2 Environmental Management System

The Secretary of Defense is responsible for ensuring that all necessary actions are taken to integrate natural resources accountability into agency day-to-day decision-making and long-term planning processes across all military missions, activities, and functions. In accordance with EO 13148 of April 21, 2000, *Greening the Government Through Leadership in Environmental Management*, DoD will develop and implement an Environmental Management System (EMS) to ensure that strategies are established to support environmental leadership programs, policies, and procedures, and establish and implement environmental compliance audit programs and policies. An INRMP is a component of EMS.

1.9.3 Environmental Impact Statements

1.9.3.1 Environmental Impact Statement for Military Training Activities at Mākua Military Reservation, Hawai‘i, June 2009

The *Environmental Impact Statement for Military Training Activities at Mākua Military Reservation, Hawai‘i*, Vols. I-III (USAEC and USACE 2009) assessed the live-fire military training exercises to be conducted at Mākua Military Reservation (MMR) for combat units assigned to the 25th ID (L) and for other military units and their potential impacts upon the environment. The EIS's mitigation measures are listed in Table ES-4, Summary of Mitigation Measures (USAEC and USACE 2009).

1.9.3.2 Final Environmental Impact Statement for Permanent Stationing of the 2/25th Stryker Brigade Combat Team

The Final Environmental Impact Statement (FEIS) examines a broader range of reasonable alternatives for the permanent stationing of the 2/25th Stryker Brigade Combat Team (SBCT) than were first assessed in the *Final Environmental Impact Statement for Transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team in Hawai'i, 2004* (AEC 2008). The FEIS for permanent stationing incorporates information from the 2004 FEIS (Tetra Tech, Inc. 2004) and examines whether there have been changes in impacts and the affected environment since the 2004 FEIS was prepared. A more comprehensive document, all activities were analyzed (e.g., equipment fielding, training, facilities construction, and Soldier and family support).

The FEIS assisted the Army in arriving at the decision to proceed with all facets of stationing permanently at Schofield Barracks Military Reservation. Garrison operations will be conducted at SBMR, which includes Schofield Barracks Main Post, South Range Acquisition Area, and Schofield Barracks East Range. Training will be conducted at a number of other training areas in Hawai‘i including Dillingham Military Reservation, Kahuku Training Area, Kawailoa Training Area, and Wheeler Army Airfield on the Island of O‘ahu and at Pōhakuloa, Bradshaw Army Airfield and the Ke‘āmuku Parcel (also referred to as the Western Pōhakuloa Training Area Acquisition Area) on the Island of Hawai‘i. Training resources will include an assortment of live-fire and non-live-fire

maneuver training facilities, fixed-position live-fire training facilities, infantry and engineer demolition training facilities, grenade training facilities, and an urban assault course.

The record of decision (ROD) notes access control and prevention of new weed establishment as two new mitigation measures to be included with those cited in the 2004 FEIS. All implementation and monitoring plans are to be developed and implemented by April 2009. Mitigation and monitoring measures of the ROD combined with existing environmental stewardship measures will aid in avoiding, minimizing, reducing, or rectifying adverse effects.

1.9.3.3 Final Environmental Impact Statement for Transformation of 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team in Hawai‘i

In the *Transformation of 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team in Hawai‘i*, the 2nd Brigade Combat Team military mission impacts are addressed. This environmental impact statement (EIS) addressed the regular ongoing impacts of the current mission as well as the predicted impacts due to the transformation of the 2nd Brigade 25th Infantry Division into a Stryker Brigade Combat Team. The Transformation EIS required full implementation of the mitigation measures listed in Table ES-22, pages ES-56 through ES-63 of the Final EIS (Tetra Tech, Inc. 2004).

1.9.4 U.S. Fish and Wildlife Service and National Marine Fisheries Service Consultations

See Appendix 5, *Biological Opinions and Associated Documents*

1.9.4.1 Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation, 18 June 2008.

This amendment appends the Mākua Military Reservation Biological Opinion (June 2007). In August 2007, the Waialua Fire burned a significant number of the federally endangered *Hibiscus brackenridgei* (ma‘o hau), “substantially reducing the status of the species and increasing the magnitude of the effect military training at Mākua MR could have on the species.” The amendment was necessary pursuant to 50 CFR §402.16 (*Reinitiation of formal consultation*). This amendment also considers critical habitat for *Abutilon sandwicense, Bonamia menziesii, Eugenia koolauensis, Euphorbia haeleeleana, Hibiscus brackenridgei*, and *Nototrichium humile* that is within the proposed fuelbreak area.

The USFWS found it not likely to jeopardize the continued existence of federally listed species of concern or adversely modify or destroy critical habitat for the six plant species noted above, based in large part on the conservation measures built into the Mākua and Puulu to Alaiheihe Management Unit/fuelbreak by the Army.

1.9.4.2 Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation Island of O‘ahu, 22 June 2007

The USFWS 2007 Biological Opinion readdresses the effects of routine military training to 38 threatened and endangered plant species plus the O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*) and its designated critical habitat and on the O‘ahu tree snail (*Achatinella mustelina*) at Mākua Military Reservation. The USFWS 2007 Biological Opinion supersedes all previous biological opinions related to Mākua Military Reservation and incorporates all modifications to training and natural resources activities that will occur within the action area. In its analysis, the USFWS

incorporated the Integrated Wildland Fire Management Plan, the Mākua Implementation Plan (IP) Addendum, plus relevant portions of the Mākua Implementation Plan. The 2007 USFWS Biological Opinion requires one additional endangered plant species to be stabilized within the MMR Action Area. This will impact costs associated with the Mākua IP Addendum 2005.

The service determined that the implementation of the proposed action is not likely to jeopardize the continued existence of any species covered in this opinion, or to adversely modify or destroy designated critical habitat. (See Appendix 8, *Cooperating Agreements*.)

1.9.4.3 Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) October 23, 2003 (1-2-2003-F-04)

USAG-HI requested formal consultation with USFWS, pursuant to Section 7 of the Endangered Species Act of 1973, as amended, in regard to current (Legacy) and potential future (Stryker Brigade Combat Team Transformation) impacts associated with training to threatened and endangered species and their habitats on the installation of Schofield Barracks Military Reservation and the sub-installations of Schofield Barracks East Range, South Range Acquisition Area (acquired during the transformation of 2nd Brigade 25th Infantry Division [L]), Kawailoa Training Area, Kahuku Training Area, and Dillingham Military Reservation on the Island of O‘ahu. Thirty-seven federally listed plants, 11 federally listed snails, 1 federally listed mammal, 2 federally listed birds, and critical habitat designated for one avian species were addressed. The USFWS concluded that the proposed and existing actions were not likely to jeopardize the continued existence of O‘ahu creeper (*Paroreomyza maculata*) and the Hawaiian hoary bat (*Lasiurus cinereus semotus*) (both no longer believed to be present on O‘ahu or to be present in limited numbers). The USFWS also responded with a no jeopardy biological opinion under the condition that the listed species with less than three stable populations and/or more than 50 percent of known individuals occurring within the action area be stabilized. The consultation utilized an action area that encompasses all land potentially affected by military training (i.e., fire, invasive species introductions, management units, etc.) and thus includes land outside the installation boundaries. (See Appendix 8, *Cooperating Agreements*.)

1.9.4.4 Section 7 Consultation Letter with U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, dated October 13, 2006, in Reference to Training at Mākua Military Reservation

The National Marine Fisheries Service (NMFS) in consultation with USAG-HI concurred that combined arms live-fire exercises (CALFEX) are not likely to adversely affect federally listed humpback whales, Hawaiian monk seals, green sea turtles, or hawksbill seat turtles. The Army agreed to incorporate the following monitoring and mitigation measures into Mākua Military Reservation’s Standard Operating Procedures (SOPs):

1) Conduct overflights of the beach prior to commencing training operations to search for Hawaiian monks seals that may be hauled out on the beach.

2) Alter training operations if a seal is hauled out by prohibiting direct beach overflights and limiting munitions use to avoid affecting the animal. These training restrictions would also be implemented immediately if a seal is observed during the training event. The training will be altered to allow the animal to leave the beach voluntarily.

3) Avoid overflights of humpback whales by requiring pilots to use search and avoid techniques. These techniques require pilot maintenance of a 1,000 feet (ft) (304.8 m) distance between

the aircraft and a whale, including horizontal and vertical aircraft movement away from an observed whale to attain and adhere to the 1,000-ft buffer following a whale sighting.

4) Use of OH-58D Kiowa Warrior thermal imaging systems to search for protected species during night operations. Use of thermal scan during nighttime gunnery operations will also be conducted through flights over the ocean ¼ mile offshore prior to a training event. The thermal imaging system uses temperature differentials to create thermal images viewable to the naked eye and is accurate to a two-degree differential. These scans will be completed every two hours until training has ceased.

5) The Army will conduct a hydro-phonic noise study during the next CALFEX event. This study will measure the direct noise levels generated by the exercise and provide additional scientific information to assess more accurately potential noise impacts to listed species. The Army will review noise levels and reinitiate consultation under the ESA should the actual noise levels exceed the harassment levels defined in the Marine Mammal Protection Act of 1972 and used by the NMFS.

In addition, the NMFS asked that the Army document sightings of federally listed marine animals in the action area during training operations and report to its office information on the location of the animal(s) and the mitigation measures taken by the Army in accordance with its commitments made during consultation. (See Appendix 8, *Cooperating Agreements*.)

1.9. 5 Implementation Plans

See Appendix 4, *Implementation Plans*

1.9.5.1 Final Mākua Military Reservation Island of Oʻahu Implementation Plan, May 2003

The Mākua Implementation Plan (MIP) was prepared to guide conservation efforts that would result in the stabilization of 27 endangered plant taxa and an endangered species of Hawaiian tree snail and offset the adverse impacts of military training activities at Mākua Military Reservation (MMR). Stabilization, as defined by USFWS for this implementation plan, was for three naturally reproducing population units (PUs) for the 27 plant species, an ongoing predator control program, establishment of 10 field populations of at least 300 individuals of varying size/age classes of *Achatinella mustelina* (tree snail) in the Waiʻanae Range, and to maintain a captive population for each of the eight recognized evolutionary significant units and the two ecotypes, resulting in a total of 10 captive populations.

Because the implementation of this level of stabilization effort has never before been attempted in Hawaiʻi, the Army created an Implementation Team to assist the Army and its contractors in preparing the MIP. The Implementation Team (IT) was composed of expert biologists, taxon and ecosystem experts representing the Army (H. Kapua Kawelo, Joby Roher, both USAG-HI Natural Resources staff), USFWS (Christina Crooker, Marie M. Bruegmann, James Kwon, Stephen Miller; Pacific Islands Fish and Wildlife Office), State of Hawaiʻi (Brent Liesemeyer, DOFAW; Talbert Takahama, Department of Forestry and Wildlife, DOFAW), Honolulu Board of Water Supply (Amy Tsuneyoshi), The Nature Conservancy of Hawaiʻi (Trae Menard and Campbell Estate liaison, Joan Yoshioka, Pauline Sato), The Berry Botanic Garden (Edward Guerrant, Ph.D.) and University of Hawaiʻi (Michael G. Hadfield, Ph. D., Pacific Biomedical Center; Joel Lau, Center for Conservation Research and Training).

The Mākua IP provided species-specific background summaries that describe the biology and status of the target taxa (see Table 4.1.a, *Species Identified for Stabilization in the USFWS Biological Opinions*); methodologies, conceptual framework, and actions required for species and habitat stabilization; and monitoring protocols to evaluate success of the management actions. Management actions included threat abatement (e.g., control of feral ungulates, selected weeds, and predators that include small mammals, insect pests, and diseases). In addition to taxon-level management of target taxa in situ (in the wild), habitat-level management, requiring a broader geographic scope and control of threats affecting ecosystems processes, is included to support the development of stable populations of target taxa. Because of the widespread distribution of the target taxa and the need for maintaining ecosystem processes, 31 management units (MUs) were proposed in the Waiʻanae and Koʻolau Mountains of Oʻahu and at sites on the Island of Kauaʻi, where the most important wild populations of the target taxa occur (USAG-HI 2003a). These areas encompassed the important habitat for in situ management and reintroduction efforts that would lead to the stabilization of the target taxa. The MUs occurred on Army, Navy, State of Hawaiʻi, Honolulu Board of Water Supply, and private lands, and required cooperation and/or memoranda of agreement with the landowners prior to initiation of management actions at those sites. The Mākua IP included a timetable and budget for implementation.

The anticipated outcome of the plan was the implementation of management actions in populations and MUs to achieve stabilization of populations for each target taxon across its range. To assess the success of the stabilization actions, the monitoring program in the Mākua IP would allow for an assessment of both taxon and habitat status over time, relative to achieving the Mākua IP goals. The Implementation Team would conduct an annual assessment of the results of the management actions through a review of the monitoring data to determine the Army's progress toward achieving stabilization of the target taxa within a reasonable time frame. The assessment would allow for modification of the Mākua IP strategies as needed using an adaptive management approach.

The timeline for the Mākua IP was projected to take over 33 years, during which all of the management actions identified in the Mākua IP would be initiated and in the process of implementation. Three phases are noted, with each taking approximately 10 years. The phases are sequenced based on specific criteria of rarity and risk described in the Mākua IP. All populations and MUs should be at full stabilization by the third phase.

The Mākua IP was subject to the availability of funds, and nothing in the plan should be interpreted to violate the Anti-Deficiency Act. The Army intended to fund the Mākua IP through its annual operating funds. The Mākua IP required the Army to continue to be an active member of regional conservation efforts in support of stabilization of the target taxa and the habitats they depend on. The Implementation Team recognized costs for execution were excessive and that an addendum was necessary. (See Appendix 8, *Cooperating Agreements*.)

1.9.5.2 Addendum to the Final Mākua Military Reservation Island of Oʻahu Implementation Plan May 2003, dated January 2005

The Army decided that the Mākua IP as written was economically unfeasible but it supported the concept. For that reason, the Army worked with the Mākua Implementation Team and USFWS to focus on the MIP actions most essential to reaching stabilization. They also addressed the logistical difficulties of off-site management and how to reduce the cost of the 2003 Mākua Implementation Plan (IP). Logistical difficulties included: (1) some proposed agencies did not wish to participate with the plan, (2) all proposed management units were revisited and some of the units were determined to be so overwhelmed with weeds that there was no chance for success for the stabilization of the proposed species, and (3) sites proposed on other islands were determined to be too costly to

implement stabilization efforts. In the end, to make the plan more realistic and feasible, the Implementation Team scaled back the MUs to those that contained the best habitat.

The 2005 Addendum focuses on the bottom-line as stated in the 1999 USFWS Biological Opinion, and led to a plan with an average cost of $3.3M per year compared to $8M per year as required by the 2003 Mākua IP. The Army's end goal for species stabilization is now three naturally reproducing population units (PU) per taxon instead of the proposed average of six PU per taxon in the original Mākua IP. In the Mākua IP Addendum, the Army will manage for 81 plant and 8 snail populations instead of 188 plant and 10 snail populations as in the original plan. The Addendum prioritizes the management of units, which resulted in the identification of 2,307 acres of priority habitat. In addition, the Army is collecting genetic material for those species most threatened by fire, those for which material is needed to augment PUs, and for species with low numbers of individuals to ensure that, should the bottom-line management technique not work for all species, there is genetic material available for future efforts. In addition, where endangered plant species are located in high fire zone or have a high risk of extinction, the Army will manage four populations.

The Implementation Team will conduct an annual assessment of the results of the management actions through a review of the monitoring data to determine the Army's progress toward achieving stabilization of the target taxa within a reasonable time frame. The assessment will also allow for modification of the Mākua IP strategies as needed, using an adaptive management approach.

The timeline for the Mākua IP Addendum is 20 years compared to 30 years for the original Mākua IP. The Mākua IP Addendum is expected to cost an average of $3,256,800 per year, for an estimated total of $66,836,000 over 20 years. This figure is subject to change due to updated biological opinions, additional consultations and depending on the timing of implementation actions. A biological opinion was published in 2007 and 2008, and their associated costs are not included in the 2005 estimate.

The Mākua IP and Addendum are subject to the availability of funds, and nothing in the plan should be interpreted to violate the Anti-Deficiency Act. Funding will be through annual operating funds. The Mākua IP and Addendum requires the Army to continue to be an active member of regional conservation efforts in support of stabilization of the target taxa and their habitats. By taking an active role to determine the best available practices and the highest priority threat management needs, the Army's conservation efforts will be in the forefront of species conservation in Hawai‘i. Successful implementation of the Mākua IP and Addendum assures Army compliance with the Endangered Species Act, while accomplishing its training mission. (See Appendix 8, *Cooperating Agreements*.)

1.9.5.3 Final Implementation Plan for O‘ahu Training Areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area and Kahuku Training Area, June 2008

The format, content, and stabilization information in the Implementation Plan for O‘ahu Training Areas are based on the Mākua Implementation Plan (USAG-HI 2003a) and Addendum (USAG-HI 2005a). The O‘ahu IP was written by the O‘ahu Implementation Plan Review Committee, which consisted of various biologists and field experts from the Army (H. Kapua Kawelo, M. Mansker, Jane Beachy, Matthew Burt, Matthew Keir, Joby Roher, Vince Costello, Susan Ching, and J. Zimpfu, USAG-HI Natural Resources Program), USFWS (Dawn Greenlee, Eric VanderWerf, Stephen Miller, and Patrice Ashfield, Pacific Islands Fish and Wildlife Office), University of Hawai‘i (Joel Lau, Center for Conservation Research and Training; Michael G. Hadfield, Ph. D., Pacific Biomedical Research Center), The Nature Conservancy Hawai‘i (Dan Sailer representative and Campbell Estate liaison), Board of Water Supply, and the State of Hawai‘i Department of Land and Natural Resources (DLNR). The O‘ahu IP addresses conservation and stabilization efforts for 23 endangered plant taxa,

4 endangered snail species, and 1 avian species potentially affected by military training at any of the Army training installations on O‘ahu (except for Mākua Military Reservation).

The O‘ahu IP contains summaries on species and stabilization plans and habitat level management for 33 management units (MUs). It requires cooperation and/or memoranda of agreements with landowners, taxon management actions and MU actions, as well as a time table and budget for implementation.

The O‘ahu Implementation Team will conduct an annual assessment of the results of the management actions through a review of the monitoring data to determine the Army’s progress toward achieving stabilization of the target taxa within a reasonable time frame. The assessment will also allow for modification of the O‘ahu IP strategies as needed, using an adaptive management approach.

Stabilization, as defined by USFWS, is three naturally reproducing population units (PUs) for the 23 plant species, an ongoing predator control program with documented population increases for 75 pairs of O‘ahu ‘elepaio, and 6 PUs of at least 300 individuals of varying size/age classes of each of 4 *Achatinella* tree snail in the Ko‘olau Action Area (AA). The O‘ahu AA overlaps with the original Mākua AA; therefore, there are several target[1] taxa found in both areas. Without the overlapping species, the O‘ahu IP will stabilize 23 plant, 9 snail and multiple O‘ahu ‘elepaio populations. The O‘ahu IP identifies additional management actions beyond those already utilized by the Army for species stabilization. If at any time there is a change in the training areas or action areas, or if there were a change in the species status, or the discovery of additional taxa, the Army will reinitiate consultation with USFWS to avoid a jeopardy decision under Section 7 of the Endangered Species Act.

The timeline for the O‘ahu IP is 20 years, wherein all the actions outlined in the O‘ahu IP will be initiated. However, the taxa in the Kawailoa Training Area and Schofield Barracks East Range Action Areas are considered at low risk of being affected by military training maneuvers given that no authorized foot maneuvers near target taxa occurred in the last 10 years. For this reason, the Army proposes to monitor the use of these training areas and execute stabilization efforts if changes to training could potentially affect target taxa. These species will indirectly benefit from stabilization management measures for targeted species.

Due to the current and historically low level of impact to federally listed species by military training to the summit areas of Schofield Barracks East Range (SBER) and Kawailoa Training Area (KLOA), the Army is proposing a three tiered approach to species stabilization at O‘ahu Training Areas (except for MMR). Tier I priority stabilization efforts will begin immediately at SBMR and Kahuku Training Area (KTA) for threatened and endangered species that are potentially threatened by the current level of military training. If military training resumes along hiking trails in the upper boundaries of SBER and KLOA, Tier II priority stabilization efforts will be implemented. If military training resumes off trails located in the upper boundaries of SBER and KLOA, Tier III priority stabilization efforts will be implemented. See Chapter 5.1, *Army Stabilization Priority Tiers*, of the *Final O‘ahu Implementation Plan* for a detailed discussion of the stabilization efforts for each tier level.

The implementation of the O‘ahu IP is expected to cost an average of $3.6 million per year for an estimated total of approximately $68 million over 20 years. These figures are subject to change due to update biological opinions, additional consultations, and the timing of implementation actions.

[1] Target taxa are species at risk of becoming extirpated due to training activities.

The O‘ahu IP is subject to the availability of funds, and nothing in this plan should be interpreted to violate the Anti-Deficiency Act. The Army intends to fund the program through its annual operating funds. The Army will continue to be an active member of regional conservation efforts through the O‘ahu IP and Mākua IP. Additionally, successful implementation of the O‘ahu IP ensures Army compliance with the Endangered Species Act while accomplishing its training missions.

1.9.6 Integrated Wildland Fire Management Plan

O‘ahu & Pōhakuloa Training Areas 25th Division (Light) and United States Army, Hawai‘i, October 2003

See Appendix 9, *Installation Documents*

The Integrated Wildland Fire Management Plan (IWFMP) presents a comprehensive approach to reduce the frequency of wildfires, the impacts of training related fires and the associated costs and damages. USAG-HI has implemented this plan to comply with all applicable laws, regulations, USFWS biological opinions, and to fulfill the requirements established by the Army Wildland Fire Policy Guidance dated September 2002. For a further discussion of the IWFMP, see Section 4.15, *Wildland Fire Management*. The IWFMP is projected to be updated by the end of 2010.

1.9.7 USAG-HI Sustainability Plan

The Draft USAG-HI Sustainability Plan (2010 to 2014) lists all goals, objectives, metrics, and measures proposed by all of USAG-HI’s Directorates and Offices to support the Garrison’s assigned missions. Goal 5 of this plan is “Maximize training support while minimizing the impact on the natural environment and the community.” The goals and objectives of the INRMP reflect and support the goals and objectives of the USAG-HI Sustainability Plan.

1.10 Unresolved Issues

Some natural resources issues will be at a point where the path to resolution is unknown or uncertain. Reasons for this status might be bio-political, a lack of scientific information, conflicting agendas, costs, or other roadblocks. Issue resolution difficulties will not prevent USAG-HI and IMCOM-PAC from continuing to work on resolutions. Recognition of and a willingness to deal with such conflicts are part of that process.

1.10.1 Breaking the Grass/Wildland Fire Cycle

The grass/wildland fire cycle is an unresolved issue. Because of the rapid and widespread expansion of non-native invasive species grasses throughout the Island of O‘ahu and the resulting increase in fuel loads, wildland fire now poses a significant threat to native habitats, particularly dry forest systems. Ecological approaches to break the grass/wildland fire cycle are needed. Fire models must be adapted for the Pacific Islands region to predict fire hazards/severity (behavior). Elements of the models should include, but are not limited to, fuel loading, fuel moisture dynamics, live/dead rations, and microclimate and weather. Of particular importance to DoD are self-sustaining means to prevent and control fire in highly vulnerable areas (e.g., military training areas).

Techniques should include creating barriers to prevent the rapid spread of fire (e.g., green stripping), and developing control and restoration techniques to shift from grass dominated to woody-dominated species, thereby reducing fuel loads (HydroGeologic 2007).

In 2008, the Environmental Division funded *The Invasive Species/Wildfire Cycle: Fuel Loads, Microclimate, Fire Potential, and Fire Behavior in the Dominant Grasslands and Adjacent Forests on Military Lands of O'ahu, Hawai'i*. A collaborative project with the USDA Forest Service Pacific Southwest Research Station, Institute of Pacific Islands Forestry, the primary objective is to "provide fire managers and decision makers with information needed to better predict, prevent, and control wildland fires on military lands of Hawai'i (with applicability to other tropical landscapes, such as Guam" (See Appendix 7, *Research Projects*) (Kauffman 2008).

CHAPTER 2

CURRENT CONDITIONS AND USE

CHAPTER 2 CURRENT CONDITIONS AND USE

U.S. Army Garrison, Hawai‘i (USAG-HI) manages seven major training sites on the Islands of O‘ahu and Hawai‘i. Schofield Barracks Military Reservation (including the South Range Acquisition Area), Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area, Dillingham Military Reservation, and Mākua Military Reservation are located on O‘ahu (Figure 2.1.a). Tripler Army Medical Center, located on the Island of O‘ahu, has a candidate species, which is discussed in Section 4.1.2.12, *Stabilization Requirements, Invertebrates.* Pōhakuloa is on the Island of Hawai‘i. A separate INRMP exists for Pōhakuloa.

2.1 U.S. Army Installation Command–Pacific Region

2.1.1 Location

U.S. Army Installation Management Command–Pacific Region (IMCOM-PAC) is headquartered at Fort Shafter, Hawai‘i, Island of O‘ahu. The Pacific Region is one of the most diverse areas geographically, economically, politically, and culturally. The strategic importance of the Pacific is highlighted by the presence of all branches of the U.S. military services on the Island of O‘ahu (IMCOM-PAC 2008).

2.1.2 Infrastructure

IMCOM-PAC has garrisons in Alaska, Japan, and Hawai‘i. The theater of operation for the U.S. Army Pacific Command is a large and complex area, which includes 43 countries, 20 territories and possessions, 10 U.S. territories, and five of the world’s largest foreign armies (IMCOM-PAC 2008).

2.1.3 History

The Installation Management Command (IMCOM), a single organization with six regional offices worldwide, was activated on Oct. 24, 2006, to reduce bureaucracy, apply a uniform business structure to the management of U.S. Army installations, sustain the environment, and enhance the well-being of the military community. It consolidated three organizations under a single command as a direct reporting unit:

1) Installation Management Agency (IMA)
2) Community and Family Support Center, now called Family and Morale, Welfare and Recreation Command (FMWRC), a subordinate command of IMCOM
3) Army Environmental Command (AEC), a subordinate command of IMCOM (IMCOM 2008)

IMCOM-PAC provided funding for and reviewed this Integrated Natural Resources Management Plan.

2.1.4 Military Mission

The IMCOM-PAC’s mission is to provide the Army with installation capabilities and services to support expeditionary operations in a time of persistent conflict, quality of life for Soldiers and families consistent with their service, success in current operations, the opportunity to perform reset operations to ensure future readiness, and a platform for transform to meet the demands of the 21st century. This is accomplished by improving family housing and Soldiers barracks, community

Oahu Installations, U.S. Army Garrison, Hawaii

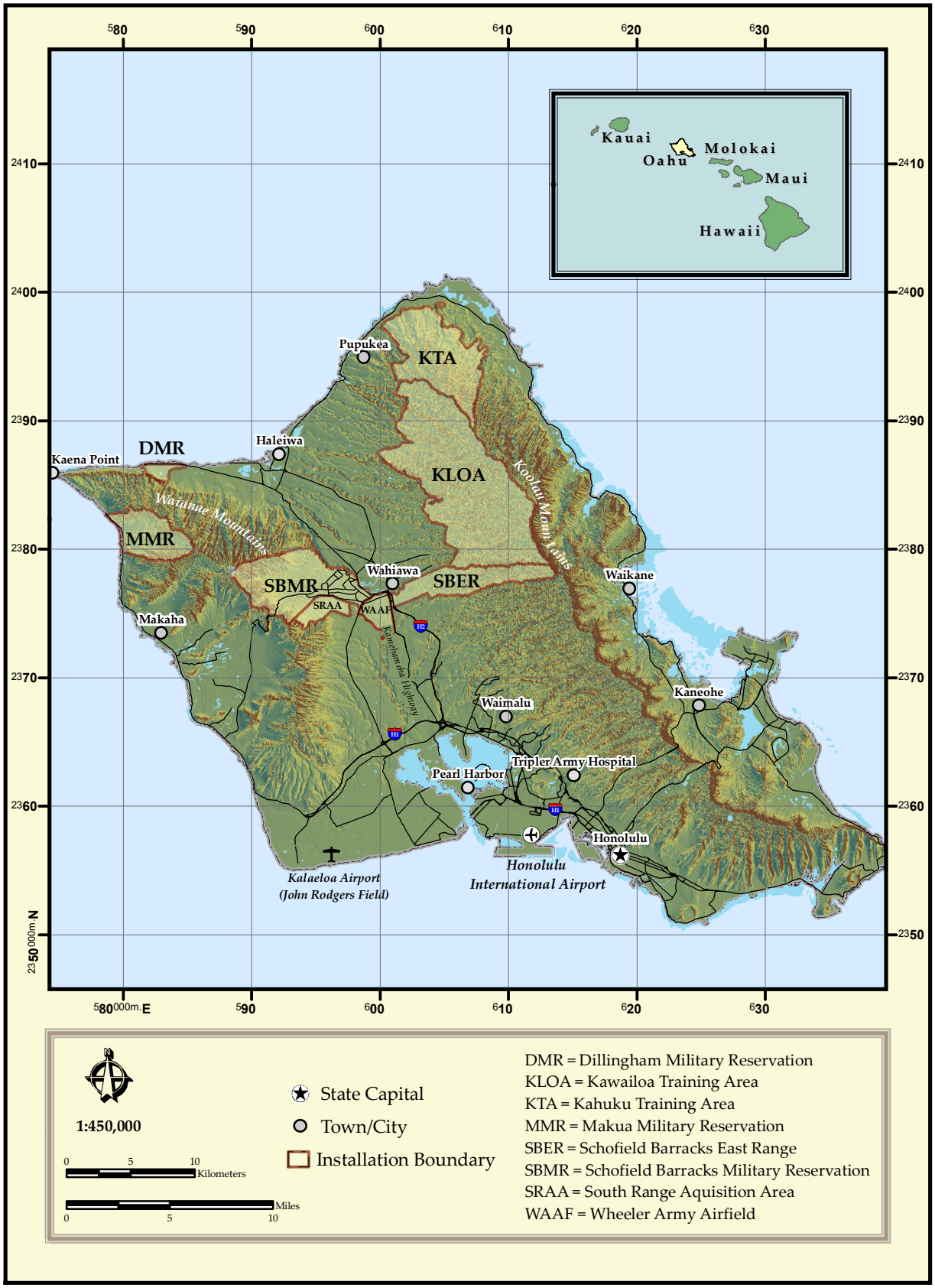


Figure 2.1.a

facilities, and training facilities; continuing responsible stewardship of our environment and resources; revitalizing our Soldiers and families through the implementation of the Soldier Family Action Plan; offering child care, youth services, religious support, community recreation and community services; operating Soldier Family Assistance Centers and Warrior Transition Units; and focusing on the "voice of our customer" to ensure IMCOM is meeting their needs (IMCOM-PAC 2008).

2.2 U.S. Army Garrison, Hawai‘i

2.2.1 Location

The U.S. Army Garrison, Hawai‘i (USAG-HI) is headquartered at Schofield Barracks Military Reservation , 25 miles northwest of Honolulu on the Island of O‘ahu. It also has a support battalion located at Pōhakuloa on the Island of Hawai‘i. USAG-HI higher headquarters is IMCOM–PAC.

2.2.2 Infrastructure

USAG-HI manages 22 installations and approximately 188,466 ac (76,269.48 ha) of land within the State of Hawai‘i. Six of those installations: Schofield Barracks Military Reservation, including the South Range Acquisition Range (SBMR); Schofield Barracks East Range (SBER); Kawailoa Training Area (KLOA); Kahuku Training Area (KTA); Dillingham Military Reservation (DMR); and Mākua Military Reservation (MMR) are addressed in this INRMP. Tripler Army Medical Center has one identified candidate species for federal listing. No detailed discussion is presented for Tripler Army Medical Center due to its presence in an urban area and size (375 acres, 152 ha).

USAG-HI also manages USAG-HI Pōhakuloa on the Island of Hawai‘i. Pōhakuloa activities are addressed in a separate INRMP.

Total maneuver area available to the Army on O‘ahu is approximately 47,278 ac (19,141 ha). Once all training limitations are considered, the acreage available for maneuvers is approximately 14,820 ac (6,000 ha) (USACE and Nakata Planning Group 2002a). The six principal installations on O‘ahu are small, noncontiguous, and have limited ability to support tactical exercises above company level. Mākua Military Reservation can support up to company-sized (150 personnel) and live-fire maneuver training. Schofield Barracks Military Reservation (SBMR), with the completion of its Battle Area Complex in the West Range Area, will also be able to support up to company-sized units (150 personnel and support vehicles) and live-fire maneuver training. Kahuku Training Area (KTA) is the primary maneuver area. With the completion of the Combined Arms Collective Training Facility at KTA, company-sized units (150 personnel with support vehicles) can conduct limited live-fire urban warfare training. Kawailoa Training Area (KLOA) and Dillingham Military Reservation (DMR) are used primarily for helicopter training activities and small unit training. Live-fire training is not allowed on Schofield Barracks East Range (SBER), DMR, KLOA, and leased lands.

Areas considered unsuitable for training on each installation are based largely on topography and maneuverability constraints. Off-limits and restricted areas, impact areas, habitat and species protection areas, identified cultural resource sites, and recreation areas located within each installation reduce and compartmentalize the net available maneuver and training space.

USAG-HI's O‘ahu training complex has 32 firing ranges, 3 laser ranges, a number of miscellaneous non-firing ranges, 49 training areas, 2 airfields, 14 airborne drop zones, 41 landing zones, and 14 surveyed field artillery and mortar firing points (S. Lia, USAG-HI, pers. com., May 2008).

2.2.3 History

2.2.3.1 Installation Management History

U.S. Army Garrison, Hawai‘i traces its history to the District of Hawai‘i, a command formed in 1910 as a sub-element of the Department of California. In 1911, the Hawaiian Department replaced the district reporting directly to the War Department. The department was stationed at Fort Shafter beginning in 1921.

During WWII, the department went through a series of name changes and responsibilities. It was renamed the Hawaiian Department Service Force. It became the Army Port and Service Command in 1943 and was given responsibility as Commander, U.S. Army Forces, Pacific Ocean Area in 1944.

In 1947, the old department was abolished and established as U.S. Army, Pacific Command (USARPAC) with base support operations accomplished by several short-lived organizations. In 1957, U.S. Army Hawai‘i (USARHAW)/25th Infantry Division (ID) was established. In 1960, these two commands were separated and USARHAW assumed an installation support role.

Established in 1973, U.S. Army Support Command, Hawai‘i (USASCH) succeeded USARHAW and was temporarily headquartered at Schofield Barracks Military Reservation. Later in 1973, USARPAC was eliminated as a major command and USASCH returned to Fort Shafter, serving as the command element as well as providing installation support. In 1979, U.S. Army Western Command assumed the command element and USASCH resumed its traditional role as installation support.

In March of 1992, U.S. Army Hawai‘i re-established command over the 25th ID, U.S. Army Support Command, Hawai‘i (USASCH), 45th Corps Support Group (Forward), and the U.S. Army Law Enforcement Command. The 25th ID Commander assumed command as installation commander from the USASCH Commander. U.S. Army Garrison, Hawai‘i was established in 1994 and replaced USASCH. With the establishment of the Installation Management Agency in 2002, USAG-HI was realigned to the Pacific Region Office. In 2006, the Installation Management Command (IMCOM), was formed to reduce bureaucracy, apply a uniform business structure to the management of U.S. Army installations, sustain the environment, and enhance the well-being of the military community. USAG-HI falls under IMPCOM-PAC.

2.2.3.2 Natural Resources Program History

On Army-owned lands and those lands leased from the State and private parties, natural resources management was carried out with limited cohesion by Army land managers and the State of Hawai‘i Department of Lands and Natural Resources (DLNR) until the 1990s. Early funding of staff was nominal. On State lands, management was generally shared between the Army and DLNR, with the Army assuming greater responsibility as management requirements increased with the discovery of threatened and endangered species on several sub-installations.

Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) was initiated in the late 1980s regarding the impacts of training activities on several species of the O‘ahu tree snail found at Mākua Military Reservation. Similar consultations were taking place at Pōhakuloa on the Island of Hawai‘i for the palila (*Loxioides bailleui*) and several plant species.

In 1990, the Sierra Club Legal Defense Fund filed suit against USFWS to accelerate the federal listing process for several plants and to halt construction of the Multi-Purpose Range Complex (MPRC) at Pōhakuloa. This action led the Army to conduct additional surveys and prepare an environmental impact statement. The Army halted construction on the MPRC and decided to suspend construction. This action removed the requirement to complete an EIS for the proposed project. These

legal actions were not directed toward military and resource management activities on Oʻahu; however, they precipitated organizational changes and increased funding for resource management on USAG-HI sub-installations. At the same time, policy directives and regulations were being developed at Major Command and Army Headquarters levels to provide guidance on conservation, stewardship, and integrated land management.

During the early to mid 1990s, the natural resources management program grew considerably with changes to legislative and policy requirements. Increased efforts were made to integrate natural resource considerations into training activities and to minimize adverse impacts. Numerous resource surveys, inventories, and management plans were completed under the DoD Legacy program. Non-profit organizations such as the Nature Conservancy, University of Hawaiʻi, Colorado State University, and other contractors performed resource inventories and documented the status of biological resources (HHP 1994a, 1994b, 1994c; CEMML 1997), primarily on Schofield Barracks Military Reservation, Schofield Barracks East Range, and Mākua Military Reservation. The 1990s saw the gradual implementation of the Integrated Training Area Management (ITAM) program, whose goal is to ensure sustainable training through the integration of training needs with environmental concerns. ITAM was initially organized within the Environmental Division, but was transferred to the Range Division in 1995 (see Section 4.22, *Sustainable Range Program and Integrated Training Area Management*).

By 1995, the natural resources program began to focus on endangered plants and animals and the emerging concept of ecosystem management. By May of 1996, ecosystem management became a DoD policy (DoD 1996).

The Oʻahu Army land management staff works closely with the USFWS, other DoD agencies, U.S. Geological Survey (USGS)-National Biological Survey (NBS), Hawaiʻi Department of Land and Natural Resources (DLNR) (especially the Division of Forestry and Wildlife [DOFAW]), City and County of Honolulu Board of Water Supply, private landowners, conservation organizations, and concerned citizen groups. USAG-HI has collaborated with the National Park Service on fencing and ungulate control projects. Cooperation and partnerships are especially important for managing areas on sub-installation boundaries, and addressing watershed and habitat issues that transcend the scale of sub-installations and individual sub-watersheds. Several Army lands border state-managed lands in the Waiʻanae and Koʻolau mountain ranges on Oʻahu. For example, the Pahole Natural Area Reserve is on one side of a Waiʻanae mountain range ridge, while Mākua Military Reservation occupies the other side. Collaboration among the Army, the State of Hawaiʻi, and USFWS is sometimes regulatory in nature and at other times cooperative and proactive.

Past cooperative projects between the Army, DLNR, and other entities include fencing projects in the Koʻolau and Waiʻanae mountains to protect native plants and communities, surveys for plants and animals and potential habitat, pilot plant propagation and revegetation projects, and the creation of the Koʻolau Mountains Watershed Partnership.

The Army partnered with The Nature Conservancy of Hawaiʻi in the early 1990s, when The Nature Conservancy was contracted through the Army's Legacy Resource Management Program to inventory natural and cultural resources and to develop plans to protect these resources. These plans helped lay the groundwork for the natural resources management programs being developed and implemented. The Nature Conservancy managed the Honouliuli Preserve in the Waiʻanae Mountains adjacent to Schofield Barracks Main Post. The USAG-HI NR staff has helped The Nature Conservancy of Hawaiʻi manage the Honouliuli Preserve for over ten years. A master plan was developed for the preserve, which is home to more than 70 species of rare and endangered native Hawaiian plants and animals (The Nature Conservancy of Hawaiʻi 2000). Because of the proximity of Army and The

Nature Conservancy-HI managed lands and the similarity of threats and management challenges, there was a significant opportunity and interest for collaboration.

Currently, the Trust for Public Land (TPL) is working with USAG-HI, the State Division of Forestry and Wildlife, and USFWS to raise funds for the acquisition and protection of Honouliuli Preserve. Many of the species found on the preserve are on Schofield Barracks Military Reservation and Mākua Military Reservation. The Army manages 16 listed species in the preserve, and half to a third of all mitigation activities required on O‘ahu under USFWS biological opinions occur in the Honouliuli Preserve. Due to the very limited range of many of these species, management of the populations at the preserve is essential to the long-term survival of these species. For a further discussion of the Army Compatible Use Buffer (ACUB) program, see Section 3.6, *Army Compatible Use Buffers* (USAG-HI 2007a; USAEC 2007; M. Mansker, USAG-HI Chief NR Manager, pers. com. 2008).

The dramatic increase in federal and state environmental laws, and the resulting Army regulations and policies, have led to increased efforts and funding for natural resources management on Department of Army lands. For example, in FY 2007, USAG-HI’s Natural Resources Program budget was plus eight million dollars. The initial shift from low-level management to increased awareness and activity came with the discovery of endangered plants and animals on O‘ahu Army lands. During the 1980s and 1990s, natural resources management on O‘ahu Army lands emphasized biological inventories and the documentation and protection of endangered plants and animals. The adoption of ecosystem management principles and attention to biodiversity issues shifted management activities to broader-scale threat management and proactive measures to stabilize and assist in the restoration of threatened and endangered species and important native communities, in addition to species-specific protections. Throughout this period, the Army has worked with USFWS and other agencies to meet the purpose and letter of environmental laws, while managing for sustainable training environments. The understanding of linkages between upland disturbances, biological and training-related threats, and watershed condition has promoted the integration of management efforts and concerns across traditional lines of responsibility. A continued program of threat management, applied research, cooperation, and proactive ecosystem management activities will build on current programs and enhance training realism.

2.2.4 Military Mission

USAG-HI’s mission is to provide installation support and services for Joint Warfighters, their families and the military community. USAG-HI is obligated to provide the best training for our military forces so that they will be ready to defend our nation in times of crisis. USAG-HI goals are to: (1) provide quality facilities, infrastructure and information technology services to support the garrison; (2) recruit, retain and develop a motivated, efficient and customer-focused workforce; (3) become the Army’s benchmark for well-being, quality of life and community relations; (4) enhance readiness and deployment support; (5) provide a safe and secure environment; and (6) maximize stewardship of resources and the environment.

2.2.5 Military Operations and Activities

Military operations and activities are discussed in detail in the *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation*, dated 18 June 2008 (1-2-2005-F-356) (USFWS 2008), *Reintitation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Training at Mākua Military Reservation, Island of O‘ahu*, dated June 22, 2007 (1-2-2005-F-356) (USFWS 2007a), *Biological Opinion of the USFWS for Routine Training and Transformation of the 2nd Brigade, 25th Infantry Division, U.S. Army Installations, Island of O‘ahu*, dated October 23, 2003 (1-2-2003-F-04) (USFWS 2003a),

Environmental Impact Statement for Military Training Activities at Mākua Military Reservation, Hawai'i (June 2009) (USAEC and USACE 2009), *Environmental Impact Statement for the Permanent Stationing of the 2/25th Stryker Brigade Combat Team* (USAEC 2008), and the *Environmental Impact Statement for the Transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team in Hawai'i* (Tetra Tech, Inc. 2004). A condensed version describing military operations and activities follows.

Primary users of USAG-HI's Schofield Barracks Military Reservation and its five sub-installations are the 25th Infantry Division (ID), which is a rapid strike force organized to deploy anywhere in the world to conduct missions across the spectrum of warfare, and United States Marine Corps combat forces. Secondary users include Army National Guard, Army Reserve, and Air National Guard Units. Combat forces are composed of, but not limited to, light infantry, Stryker-supported infantry, attack helicopters, and field artillery. Major training activities associated with these users are weapons live fire, combined arms live-fire exercises, maneuvering, reconnaissance, aviation training, landing zone and drop zone activities. In addition, the Air Force, Navy, Federal, State, and local law enforcement agencies use Schofield Barracks Military Reservation and its sub-installations' firing ranges and training areas on a limited basis.

Mission Training Plans provide commanders and leaders with guidance on how to train key missions of the unit. Specific details of a unit's training program are determined by the following and other factors:

The Mission Essential Task List (METL) for the unit

Chain-of-command training directives and guidance

Training priorities of this unit

Availability of training resources, areas and environmental constraints

Maneuver training in Hawai'i is restricted due to the severity of the terrain and administrative and environmental considerations. Soldiers are typically assigned to the U.S. Army Pacific Command (USARPAC) and 25th ID for a 36-month rotation. Battalion and brigade-level commanders are generally assigned for an 18 to 24-month tour. Additionally, USARPAC supports numerous intra-theater and inter-theatre support missions. Periodic deployment of O'ahu forces can create boom or bust demands on USAG-HI's training and range areas outside of the typical training cycle.

2.2.5.1 Live-Fire Training

Various military weapons and ammunition are used at the O'ahu installations of Schofield Barracks Military Reservation and Mākua Military Reservation. Live-fire training normally entails an individual gunner, crew of a weapon system, or a collective unit firing at predetermined or designed targets from designated firing positions on a designed range facility. The requirement for live-fire training varies depending on individual and unit mission, weapons assigned, and ammunition available. Each weapon system and military manning position has an assigned annual or semi-annual live-fire requirement. Unit commanders must ensure that live-fire training is accomplished to meet readiness standards. Weapons proficiency or qualification is scored and recorded for each individual/crew and reported collectively by unit.

2.2.5.2 Maneuver Training

Maneuver training is a tactical exercise that can include the following activities: attacking an enemy force, defending against an enemy force, searching/screening for an enemy force, delaying or avoiding an enemy force, and withdrawing under enemy pressure (retrograding). Maneuver training may or may not include live-fire activities. Maneuver training exercises are conducted at all levels

from squad to brigade to ensure a combat ready fighting force, and are sometimes supported by firepower. Training programs focus on units attaining and maintaining proficiency in collective maneuver tasks that support mission essential tasks. Maneuver training is the tactical training for armed forces.

Maneuver training is the battle drill for large units. Units must train repetitively on critical maneuver tasks during training periods to maintain a high state of readiness. Maintaining the skills to sustain proficiency in critical tasks requires periodic training throughout the year. The process of sustaining training readiness places demands on all resources, including time, money, land use, and cultural and natural resources. Because units must train as they will fight, training exercises must be able to replicate combat conditions as closely as possible. Combat effects such as smoke and obscurants, noise, and simulated nuclear, biological, and chemical conditions are integrated into training events to condition units for operations in a confused, stressful battlefield environment.

Unit movement during maneuver activities may consist of Soldiers in tactical (when contact with an enemy is likely) and non-tactical (when contact with an enemy is not likely) formations moving in a predetermined direction to accomplish a mission. Individual infantry Soldiers move in non-tactical formations using motorized and mechanized vehicles (mounted maneuvers), by walking in administrative formations on roads or trails, or in a dispersed fashion overland (dismounted maneuvers), or by helicopter. Individual Soldiers move in tactical formations by walking in loose groups overland in designated directions to accomplish a mission. Direction of movement is terrain and tactical scenario dependent. If engaged with an enemy, the objective is to remain concealed or under terrain cover. Due to the risk of ambush, tactical formations do not follow roads or trails. If engagement with an enemy has happened or is likely, then Soldiers will seek cover or concealment. When contact with an enemy is simulated during maneuvers, one section of a unit may provide a base of weapons fire while another section maneuvers toward the enemy.

Airborne units may parachute in under administrative or tactical scenarios. Paratroopers may parachute from transport aircraft belonging to any of the three branches of service (Army, Navy, and Air Force) into a designated drop zone.

Maneuver also entails the set-up of temporary defensive positions to repel an enemy attack. Defensive positions may consist of Soldiers lying in concealed positions and designating fire zones. More complex maneuver defense entails digging individual fighting positions or trenches using hand tools and digging in larger crew-served weapons using excavators. The longer a unit stays in a particular area, the greater the need for digging-in for tactical cover.

During maneuver, Soldiers may sleep in the field. To avoid detection and allow for quick displacement, tents are not set up during light infantry maneuvers. Soldiers normally eat pre-packaged meals in the field. Prepared meals may be brought in from bivouac sites. Training units carry out all trash to avoid detection. Units may use blank ammunition and multiple integrated laser engagement system (MILES) equipment. MILES fires an eye-safe laser beam, and each Soldier wears a harness that senses the laser and indicates hits or misses. Field artillery and mortar units may use live ammunition (see Section 2.2.5.1, *Live-Fire Training*). All ammunition is fired into an impact area.

2.2.5.3 Combined Arms Live-Fire Maneuver Training

Infantry companies are required to conduct at least one Combined Arms Live-Fire Maneuver Exercise (CALFEX) annually. On the Island of O‘ahu, CALFEX training occurs at three locations: (1) Company Combined Arms Assault Course (CCAAC) at Mākua Military Reservation, (2) Battle Area Complex (BAX) at Schofield Barracks Military Reservation, and (3) Kahuku Training Area Combined Arms Collective Training Facility (CACTF) using short range training ammunition.

Typically, CALFEX training integrates the use of combat systems over a five-day period and troop bivouac. Potentially, maneuver lanes will be used to initiate CALFEX training. The first two days, pop-up targets and blast simulators may be placed in the training area to replicate contact with the enemy. On the third and fourth days, unit personnel conduct an actual training exercise. Upon seizing objectives, units prepare for counterattacks. On the final day, units remove exercise-related target equipment, gather spent-round brass casings, remove litter, and restore the range to its condition prior to use. Explosive ordnance disposal specialists destroy all unexploded ordnance. Ordnance normally is destroyed where found, whether from the training being conducted or from earlier exercises. No known dud rounds are left in place at the conclusion of a training exercise.

2.2.5.4 Reconnaissance Training

Typical reconnaissance training operations involve small groups, squad to platoon strength (6 to 50 Soldiers). Reconnaissance training can take place on any type of terrain, but may be constrained by the extremely rugged terrain and thick vegetation at O‘ahu installations. In many respects, reconnaissance training resembles dismounted maneuver training, but does not have the same type of vehicle support. No live fire is involved and vehicles are not used (except in the case of Stryker units). Reconnaissance training may involve a squad being dropped by helicopter into a remote location and navigating to a strategic rendezvous point.

Reconnaissance training operations may include the deployment and operation of unmanned aerial vehicles (UAVs) to search out, detect, and, in some cases, destroy enemy forces. These UAVs need limited take-off and recovery space.

2.2.5.5 Bivouac

Bivouac and forward operating base (FOB) use consists of setting up camp for rest, resupply/refit, and maintenance; or to provide support. Bivouac is normally not done while in direct or indirect contact with an enemy force. Units bivouac under field conditions to stabilize logistics and to provide a common site for support operations. Bivouac/FOB sites vary depending on unit size and mission. Tactical operations may be staged from a bivouac/FOB site.

Depending on unit size, bivouac/FOB sites can contain a vehicle and weapons maintenance area, vehicle parking area, general supply area, munitions supply area, medical area, helicopter landing zones, and vehicle off-loading area. A bivouac/FOB site consists of a series of tents and temporary structures covered with camouflage nets housing the unit. Tents provide for sleeping/living areas, maintenance shops, supply storage, medical facilities, operations/communication areas, and meal preparation areas. Meals may be prepared in mobile field kitchens. Bivouac is normally done in level or gently rolling areas that provide vehicle and aircraft access. Sites are located and chosen to accommodate the unit support element, provide communication links, provide concealment from the enemy, and support maneuver. Open fires are not allowed during bivouac, but cooking in special mobile kitchens (enclosed ovens), and use of tent heaters (enclosed) and generators is permitted.

Bivouac/FOB sites are not designed to repulse an enemy attack. Sites will have security and observation posts and may have individual fighting positions. Vehicle access routes are guarded, and roving patrols are established for security. Likely areas an enemy will approach are monitored and designated for defensive planning and for repulsing an attack. Munitions used in bivouac areas typically consist of grenade and artillery simulators and blank ammunition.

2.2.5.6 Deployment Training

Deployment training involves moving troops and equipment from Schofield Barracks Military Reservation primarily to Pōhakuloa, but may include limited deployment training to Mākua Military Reservation, Dillingham Military Reservation, Kawailoa Training Area, and/or Kahuku Training

Area. Transportation of units consists of a combination of vehicles, sea transport vessels, and aircraft, depending on the type and location of training. Current force personnel deploy to Pōhakuloa from Hickam Air Force Base or Wheeler Army Airfield using C-17 or C-130 aircraft. Deployed equipment to Pōhakuloa uses approximately 30 Logistics Support Vessels round trips from O‘ahu to Kawaihae Harbor per year. On arrival, troops and vehicles use established roadways to access Pōhakuloa. A tank trail will bring troops and vehicles to Pōhakuloa, bypassing public roadways.

2.2.5.7 Aviation Training

Aviation training consists of aircrew training, maneuver, and aerial gunnery. Aircrew training pertains to normal aviation flight skills and includes takeoff and landings; normal, nap-of-the-earth, contour and low level flights; confined and high altitude area landing/takeoff; and navigation for helicopters. Air Force and Naval aviation high performance tactical and transport aircraft practice similar tactics at higher altitudes. Aircrew training tasks accomplished on sub-installations include all tactical maneuvers in accordance with each aircraft’s standard aircrew training manual and unit standard operating procedures.

Maneuver training pertains to the ability of aviation units to transport ground maneuver and combat support/combat service support units to support the tactical battlefield. High mobility and combat flexibility of aircraft are important assets on the battlefield to a maneuver commander. This type of training requires up to 20 helicopters flying in tactical formations carrying ground troops and equipment to battle areas. Aircraft pick up units of Soldiers in pickup zones and carry them to tactical landing zones.

Aerial gunnery pertains to the abilities of aircraft (Army transport, reconnaissance and attack helicopters, Air Force and Naval tactical aircraft) to engage targets with machine guns, cannons, rockets, missiles, or bombs. Aerial gunnery is a live-fire task accomplished on fixed ranges directly from the aircraft in flight to designated ground targets (see Section 2.2.5.1, *Live-Fire Training*).

Helicopters require substantial support for arming and refueling if units are to maintain continuous pressure on the notional enemy to accomplish training mission tasks. Forward Rearm/Refuel Points are employed to position fuel and munitions products forward to support training units. Administrative aircraft support is conducted at Wheeler Army Airfield.

2.2.5.8 Landing and Drop Zone Activities

At O‘ahu installations, landing and pickup zones are used for moving artillery pieces, medevac operations, troop transport, and airborne assault lifts. Troop numbers vary from team (3 personnel) to platoon (40 personnel) to company (150 personnel) size units per event. These events (combined) take place approximately 20 to 30 times a year.

Standard aircraft support packages consist of: (1) 2 UH-60 (Blackhawk) or 1 CH-47 (Chinook) and OH-58D (Kiowa Warrior) for platoon support; (2) 4 UH-60 or two CH-47 and 2 OH-58D for company support; and (3) 12 to 18 UH-60, 4 to 8 OH-58D, and 2 to 4 CH-47 for battalion support. Primary users of landing zones are Army and Marine Corps units. Units are required to use approved landing and take-off zones or other locations with permission from Range Control and the Natural Resources Office. Vehicle support associated with landing zone exercises is confined to existing roads and trails.

Drop zones are used for troop and equipment parachute drops typically with C-130 aircraft. Cargo drops take place approximately two to four times per year and personnel drops once a year (if at all). A drop zone team on the ground typically consists of two to four personnel to retrieve the cargo with

a high mobility multipurpose wheeled vehicle (HMMWV). Personnel and equipment drops take place at approved drop zones.

2.3 SCHOFIELD BARRACKS MILITARY RESERVATION

2.3.1 Location and Neighbors

Schofield Barracks Military Reservation (SBMR), including the South Range Acquisition Area (SRAA), is located in central Oʻahu, west of the town of Wahiawā (pop. 16,151). SBMR extends from the Kamehameha Highway to the Waiʻanae Mountain Range. Kamehameha Highway divides SBMR from East Range (Figure 2.3.a). Primary access is via the H-2 Freeway and Kamehameha Highway. SBMR is bordered to the east by the cantonment area and Kamehameha Highway, to the north by private lands and the Mt. Kaʻala Natural Area Reserve, to the west by the Waiʻanae Kai Forest Reserve on the Waiʻanae Crest, and to the south by Lualualei Naval Reservation, private, and state lands.

2.3.2 Infrastructure

2.3.2.1 Ranges and Training Lands

Lands used for maneuvers at SBMR include the cantonment area, maneuver training areas, ranges, and impact areas (Figure 2.3.b). The SBMR is composed of the Central Range Complex (formerly known as the West Range) (4,536 ac, 1,836 ha) that includes the dudded impact area (2,780 ac), South Range Acquisition Area (1,290 ac, 522.04 ha) that includes maneuver areas and a number of small arms ranges, firing ranges and training/support areas (2,237 ac, 905.28 ha), and the cantonment area (1,952 ac, 790 ha) (USAG-HI unknown date).

The northern maneuver area is relatively flat, but it ascends from 908 ft (275 m) at the cantonment area to 4,026 ft (1,230 m) at the crest of the Waiʻanae Mountains; the southern maneuver area contains the Waikeke River and tributaries. Wooded portions of the plateau east of the Waiʻanae Range are used for tactical maneuver instruction of Soldiers. The impact area, located in steep, more rugged terrain west of the cantonment, is the main site for live-fire training on Oʻahu (USACE and Nakata Planning Group 2000). Small arms, machine gun, mortar, grenade, anti-tank, and limited short-range indirect fire artillery training are conducted at these firing ranges. The live-fire training at SBMR facilities occurs year-round.

SBMR is comprised of approximately 9,520 ac (3,506 ha) of which 3,640 ac (1,473 ha), are ceded and 882 ac (357 ha) are fee simple (G. Sagum, per. comm. March 2008). For the purposes of this document, SBMR consists of West and South Ranges, an impact area, and cantonment area. The State of Hawaiʻi is responsible for management of natural resources and endangered species on state-owned land parcels.

2.3.2.2 Cantonment Area

The cantonment area at SBMR includes about 1,952 ac (790 ha) and contains troop housing, family housing, operational and training facilities, warehouses, and community service facilities (USAG-HI unknown date).

The Schofield High Level Water Body (SHLWB) located west of the Waiʻanae Mountains, is the major source of water for SBMR. There are 120 million gallons of water available per day from the 1952 central aquifer system within the SHLWB, 5.4 million gallons/day of which are allocated to the military, but only 4.7 million gallons/day are used (USACE and Nakata Planning Group 2002a).

Location & Land Ownership
Schofield Barracks Military Reservation

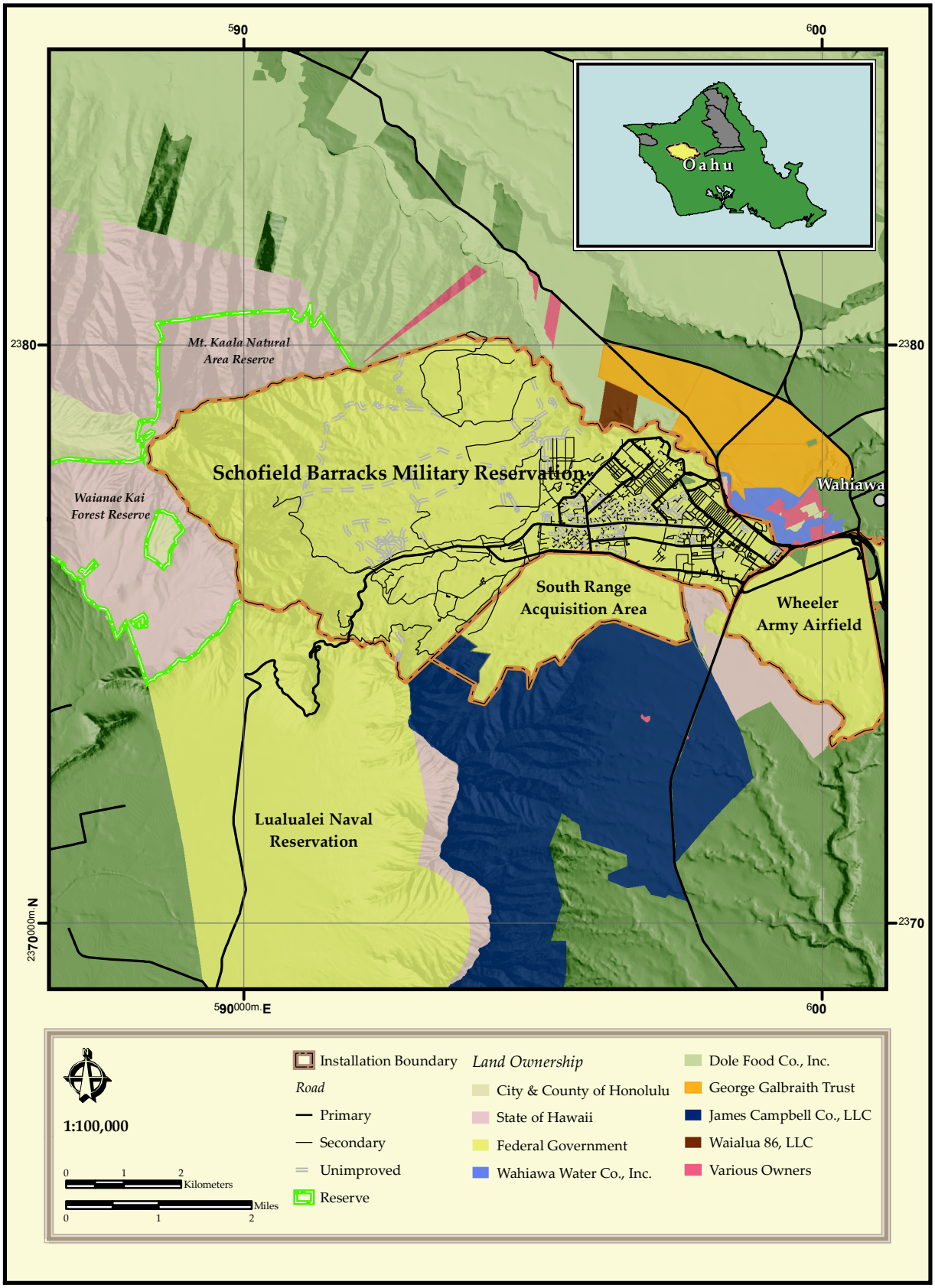


Figure 2.3.a

Cantonment & Training Areas
Schofield Barracks Military Reservation

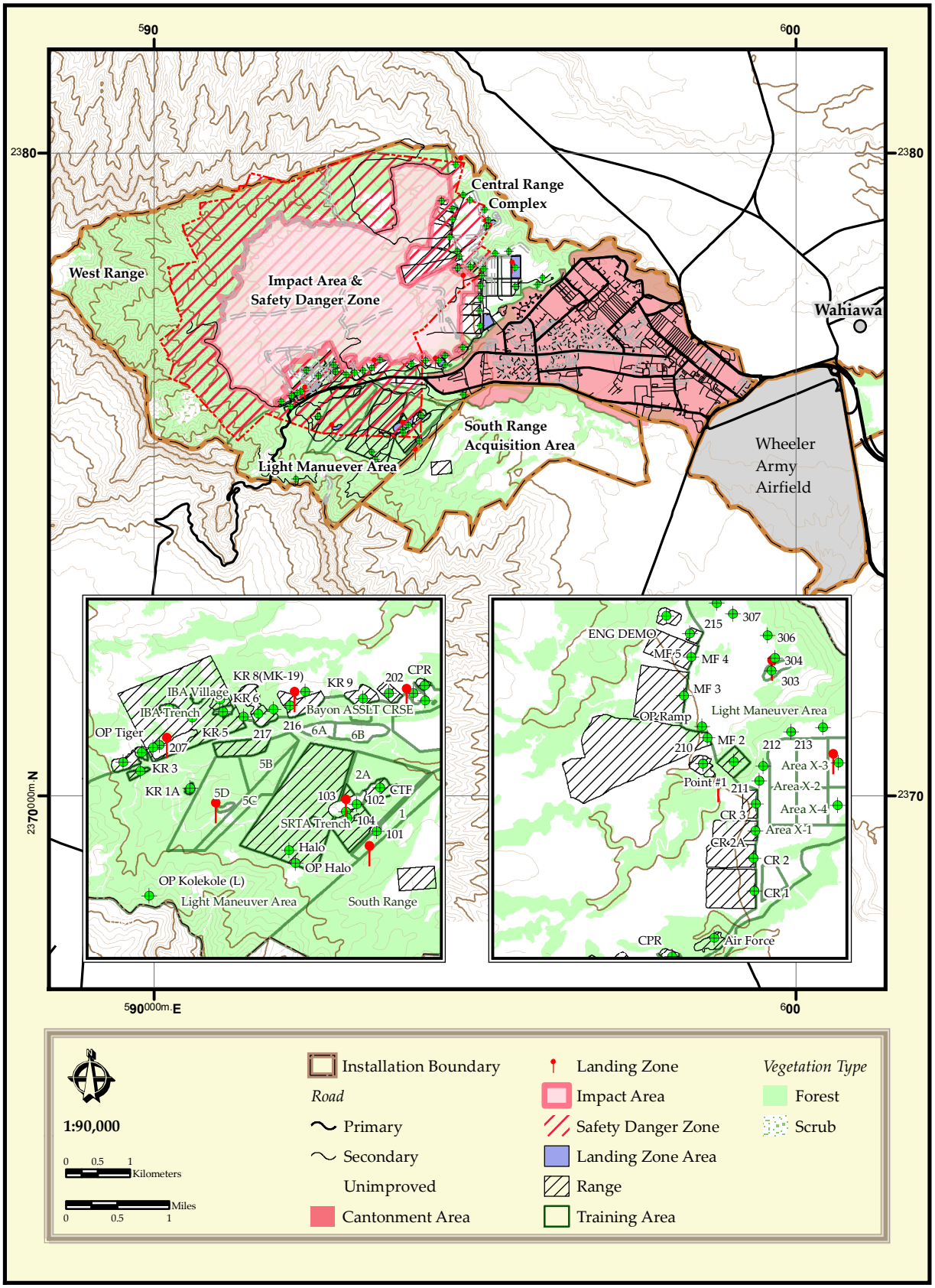


Figure 2.3.b

2.3.2.3 Wheeler Army Airfield
Wheeler Army Airfield (WAAF) is located adjacent to SBMR and SBER and supports military helicopters and small fixed wing aircraft that use SBMR for training purposes. In addition, SBMR has ten helipads and most of the installation is accessible by helicopter (USACE and Nakata Planning Group 2002a). WAAF is being expanded to be able to support the landing and departure of fully loaded USAF tactical airlift aircraft.

2.3.2.4 Commercial/Other Airports
Commercial airports at Kalaeloa Airport (John Rodgers Field) and Honolulu International Airport serve the Island of O‘ahu, handling aircraft up to large commercial jets. Hickam Air Force Base currently supports Army troop and equipment movements.

2.3.2.5 Harbors
SBMR has access to Pearl Harbor for the deployment of equipment to Pōhakuloa and assigned theaters of operation.

2.3.2.6 Roads
There are approximately 34 mi (54 km) of primary and secondary roads, approximately 60 mi (97 km) of tertiary roads, and approximately 26 mi (42 km) of unimproved roads (four-wheel-drive trails) located at SBMR.

2.3.3 Abbreviated History

2.3.3.1 Installation History
Traditional settlement patterns at lower elevations consisted of extensive irrigated agriculture, principally for taro. Irrigated and non-irrigated agriculture would be expected at moderate elevations (1,000 ft-2,000 ft), with scattered and temporary residences along streams. Early post-contract records document the exploitation of sandalwood in the Wahiawā area (Ogden Environmental and Energy Services 1998).

The following history is condensed from Ogden Environmental and Energy Services (1998) and pertains to Schofield Barracks Military Reservation and East Range. After the establishment of Pearl Harbor Naval Base in 1901, a board was convened to investigate other appropriate sites for military defenses. The Leilehua Plateau saw a temporary camp in 1905 for the Organized Militia, which later became known as the National Guard. Since the Army’s role in Hawai‘i was to guard the Navy while in port, Leilehua’s central location was ideal for rapid deployment to all of the island’s coasts. In 1908, the site for Schofield Barracks was selected as the base for Oahu’s mobile defense troops because of its strategic central location between the Wai‘anae and the Ko‘olau mountain ranges. The temporary camp was alternately called Leilehua Barracks and Castner Village, but was later renamed after Lieutenant General John McCallister Schofield (1831-1906). The original area encompasses what is now Schofield Barracks Military Reservation and Schofield Barracks East Range. The area was described in 1901 as being “a third probable arable or grazing land and the remainder irreclaimable hill sides and mountains and inaccessible ravines…It is now used … to a slight extent only for grazing purposes” (U.S. War Department 1901). During this time, extensive sugar and pineapple plantations were developed in surrounding arable areas.

The Secretary of War approved plans for construction and troop build-up at Schofield Barracks in 1911. The first plans for the permanent post were prepared in 1912 by General Macomb. The layout of the cantonment area reflects the linear base design, with the barracks and administration buildings along the central line, housing areas on one side, and technical buildings along the other side.

Construction of the post began in 1913. The post developed rapidly in the following years, although construction was delayed during World War I when Schofield's tenant units were called to war. Following World War I, the Army increased the strength of the Hawaiian Department and formed a combat division at Schofield Barracks. The Hawaiian Division, formed in 1921, was the only complete division in the Army. The establishment of this large division and increased tensions in the Pacific explain the continual construction at Schofield during the 1920s and 1930s and increased defense mobilization throughout the islands.

The Hawaiian Division was reorganized in 1941, forming the 24th and 25th (later renamed the "Tropic Lightning") Divisions. Schofield became the Army's single largest garrison and, in 1939, was the second largest city in the Territory of Hawai'i with a population of 20,000 people. Following the bombing of Pearl Harbor and Wheeler Army Airfield, Schofield Barracks became the major training, staging, and supply center for the war in the Pacific. Over one million troops were temporarily housed at Schofield Barracks in various stages during the war, and many temporary buildings were constructed to accommodate the increase in personnel. Following the war, Schofield Barrack's population shrank to five thousand troops. In 1951, the Hawaiian Infantry Training Center at Schofield Barracks was established to train replacement troops destined for Korea. Schofield Barracks played an important role in the Korean War and the Vietnam War by providing basic training for many raw recruits destined for Asia.

Since September 11, 2001, the Army has rapidly evolved from the Modular Forces to fight the War on Terrorism and future wars. Since 9/11, the 25th ID (L) has reorganized to a more lethal fighting force composed of five maneuver brigades and one support brigade. The Light (L) designation has been dropped due to the conversion of two of its brigades to Stryker Brigade Combat Teams. During the War on Terrorism, the division has deployed to Iraq and Afghanistan. The 25th ID has remained the principal occupant of Schofield Barracks. It continues to share the post with other brigades from the Hawai'i National Guard and the U.S. Army Reserves. This transformation has resulted in renewed and continuing construction at SBMR. Additional administration and operations buildings, maintenance facilities, billets, new and upgraded firing ranges, communications facilities, transportation facilities and road construction have all been proposed or constructed for the new force structure stationed at SBMR.

2.3.3.2 Cultural Resources Management

SBMR has a number of historic districts, approximately 246 known archeological sites, and 2,162 buildings (eligible, unevaluated, and not eligible) (USAG-HI 2007b).

Cultural resources management is handled by the USAG-HI DPW Environmental Resources Division, Conservation and Restoration Branch, Cultural Resources Program. USAG-HI is currently in the process of developing an installation Integrated Cultural Resources Management Plan. USAG-HI's O'ahu Natural Resources (ONR) staff takes into account that their management practices and actions (undertakings) must comply with the National Historic Preservation Act as amended.

2.3.3.3 Natural Resources Program History

Beginning with the passing of a number of major environmental laws in the early to mid-1970s, SBMR's natural resources program began to evolve from low emphasis to being very active today. The Endangered Species Act of 1973 has been and still is to this day the primary driver for SBMR's natural resources program.

Examples of documents produced for and by USAG-HI, illustrate its commitment to endangered species management:

Bird and Mammal Survey of Army Lands in Hawai‘i. Part III. Schofield Barracks Military Reservation, 1977.

Biological Inventory of the Schofield Barracks Military Reservation, O‘ahu, Hawai‘i, June 1994.

Management Assessment for the Schofield Barracks Military Reservation O‘ahu, Hawai‘i, Hawai‘i Heritage Program, June 1994.

Endangered Species Management Plan Report for O‘ahu Training Areas, Honolulu, Hawai‘i, 1997.

Natural Resources Management on O‘ahu Training Areas, Final Report – RCUH, August 1998.

Final Implementation Plan Mākua Military Reservation, Island of O‘ahu, May 2003.

Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Army Installation, Island of O‘ahu, Oct. 2003.

Addendum to the Implementation Plan Mākua Military Reservation Island of O‘ahu, Jan. 2005.

Implementation Plan for O‘ahu Training Areas, *2008.*

2006 Status Reports for the Mākua Implementation Plan and the Draft O‘ahu Implementation Plan, Oct. 2006.

2007 Status Reports for the Mākua Implementation Plan and the Draft O‘ahu Implementation Plan, Nov. 2007.

Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation, Island of O‘ahu, June 22, 2007.

Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation, June 2008.

Shallenberger et al. conducted the first extensive zoological survey using line transects to sample the zoological communities at SBMR in 1976-77. Shallenberger et al. observed several rare species including the ‘i‘iwi (*Vestiaria coccinea*), native tree snails (*Achatinella* spp.), and the Hawaiian hoary bat (*Lasiurus cinereus*). The Hawai‘i Biodiversity and Mapping Program conducted a comprehensive biological survey of SBMR from January 1992 to May 1993. They chose survey areas to represent native-dominated ecological zones at SBMR and surveyed for rare species based on habitat types. Six rare vertebrates, including two endangered species, and 22 rare invertebrates, including seven endangered mollusks, were observed at SBMR and SBER (R.M. Towill Corporation 1997b).

USAG-HI conducted a comprehensive botanical survey at SBMR that was completed in 1996 by the Center for Ecological Management of Military Lands (CEMML 1997). Surveys covered 61 sites at SBMR and SBER combined, collecting 102 families consisting of 286 genera and 384 vascular plant taxa.

The Sikes Act, originally passed in 1960, did not become an effective piece of legislation for DoD until it was amended in 1997, due mainly to the efforts of DoD. Under the Sikes Act Improvement Act (SAIA) of 1997, DoD facilities were required to develop and implement Integrated Natural Resources Management Plans and to update (minor changes) or revise (significant changes to mission or resources) as necessary. USAG-HI began the development and implementation of its first Integrated Natural Resources Management Plan for O‘ahu Training Areas, which included SBMR, in 1997. Since then, the INRMP was updated in 2002, and this current document is the third updated version.

The USAG-HI O‘ahu Natural Resources staff has evolved from two federal natural resources professionals in 1996 to two Army federal employees and 83 contract employees in 2008. The ONR staff is divided into field crews, one fence crew, and various support staff. The O‘ahu Army Natural Resources Program (OANRP) is directed by the Federal Natural Resources Manager. The Federal Biologist oversees and manages the various support staff and contracts. The Senior Natural Resources Management Coordinator oversees and manages the field and fence crews. With the implementation of the Mākua, O‘ahu, and Pōhakuloa Implementation Plans over the next 20 years, the ONR staff for USAG-HI will eventually increase to around 120 employees.

The support staff consists of a federal biologist (1 position), implementation plan project coordinator (1), monitoring program manager (1) and specialist (1), GIS and database manager (2.5), data technicians (2), research specialist (1) and assistants (1.5), office assistant, and environmental outreach/volunteer coordinators (2). Field members consist natural resources management coordinators (2), snail propagation specialists (3), bird specialist (0.5), rat specialist (2), invasive species specialists (1), animal control specialists (2), plant conservationist (1), seed conservationist (1); horticulturalist (1) and assistants (2), fence crew boss (1) and crew (4), and various coordinators (8), technicians (33), and interns (4).

In addition to the regular field crew, OANRP has contracted Pono Pacific for monitoring and predator control for the O‘ahu ‘elepaio in Moanalua, Mākaha, and ‘Ēkahanui. The program has on-call field experts, such as Dr. Eric VanderWerf for monitoring of O‘ahu ‘elepaio and Dr. Steven Montgomery to survey for listed species of *Drosophila* within the Army ranges.

The first Integrated Pest Management Plan (IPMP) for USAG-HI installations was completed in 1997 and updated in 2008. Integrated Pest Management Plans are the responsibility of the Environmental Compliance Branch, but must be closely coordinated with the USAG-HI Natural Resources Office because of potential impacts to endangered species (as well as native flora and fauna).

USAG-HI completed and implemented its first Integrated Natural Resources Management Plan in 1997 for its training areas. In 2002, the INRMP (2002 – 2006) was updated. This is the 3rd edition of the USAG-HI INRMP (2010 – 2014).

2.3.4 Military Mission

Schofield Barracks Military Reservation’s mission is to provide installation support and services for Joint Warfighters, their families, and the military community.

2.3.5 Military Operations and Activities that May Affect Natural Resources

Schofield Barracks is the primary range complex for individual weapons qualification with limited light maneuver training areas. Generally, training and live-fire impact areas are situated west of the cantonment area. The wooded eastern slope of the Wai‘anae Mountain range is used primarily for

tactical infantry maneuver training, including land navigation training and bivouac. Army aviation operations and activities are conducted there as well.

Military operations, training, and testing activities on O‘ahu vary in length. Training exercises may range from month-long exercises by Army or Marine Corps battalions to three-week or weekend exercises by Reserve components and National Guard units. Testing activities may be short-term (days) to long-term (multiple years).

Ranges line the western and southern boundary of the impact area. Approximately 2,700 acres support maneuver training, ranges, and indirect fire activities (USACE and Nakata Planning Group, LLC 2002a). Part of SBMR is in ‘Elepaio Critical Habitat. Direct impacts include live-fire training, fire, introduction of alien plant and animal species, nest disturbance, and access restrictions to Natural Resources staff. ONR staff requires access to accomplish work activities during the breeding season (December through June/July) (USAG-HI 2005a).

Construction and maintenance activities consistently occur at SBMR. Infrastructure support changes at SBMR as mission changes. Ranges are constantly upgraded, converted, and/or constructed. Buildings are in constant need of repair, upgrade, and/or conversion. New buildings are required to support billeting, administration, and maintenance activities due to the transformation of forces located at SBMR.

2.3.6 Natural Resources Constraints on Training Areas and Ranges

The major natural resources constraint in SBMR is slopes over 30 percent and, to a lesser extent, ‘Elepaio Critical Habitat (Figure 2.3.c). A fire-danger rating system (based on multiple environmental factors including wind, moisture content, vegetation type, etc.) determines when munitions firing are permitted. While the forested slopes to the west of the impact area have increasing mesic conditions at higher elevations, there are still open patches of non-native vegetation that can carry fire.

The ‘Elepaio Critical Habitat overlays the forested areas to the west of the impact area and include four management units, which are managed for fire, ungulates, incipient invasive weeds, small mammals, and restricted human impacts (management only, fences proposed) (Figure 2.3.d). The southwestern portion of the South Range Acquisition Area also overlays the ‘Elepaio Critical Habitat. Both plant and ‘Elepaio Critical Habitat are present beyond the West and South Range boundaries. There are a number of management units at or near the SMBR north boundary, which also increase management oversight of training activities.

Training can be suspended or restricted based on the hourly fire danger rating (25th ID (L) and USAG-HI 2003). Troops adhere to fire danger-rating restrictions of incendiary ammunition, pyrotechnics, smoking, and when using other ignition sources. A Red Fire Index restricts the use of blanks and ball ammunition on CR and MF ranges, other live-fire, pyrotechnics, smoking, or warming/cooking fires. Maneuver training is allowed in SBMR.

Minimum staffing and fire response must be arranged and meet training activities (e.g., live-fire training is conducted when fully trained/certified personnel and functioning equipment is available for fire suppression). If fire suppression equipment is not operational, training at SBER is suspended.

Natural Resources Constraints on Training
Schofield Barracks Military Reservation

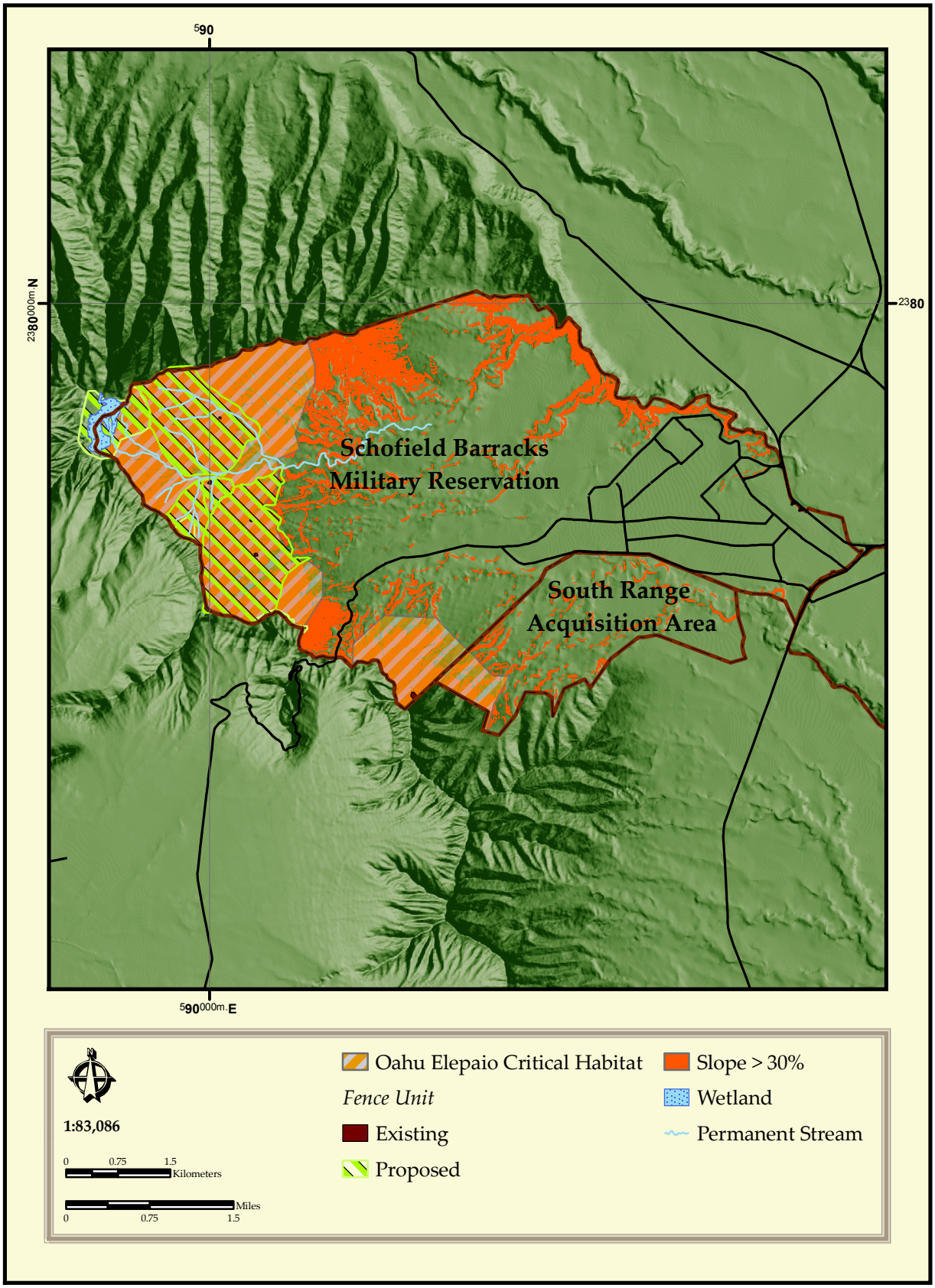


Figure 2.3.c

Training Access at Schofield Barracks Military Reservation

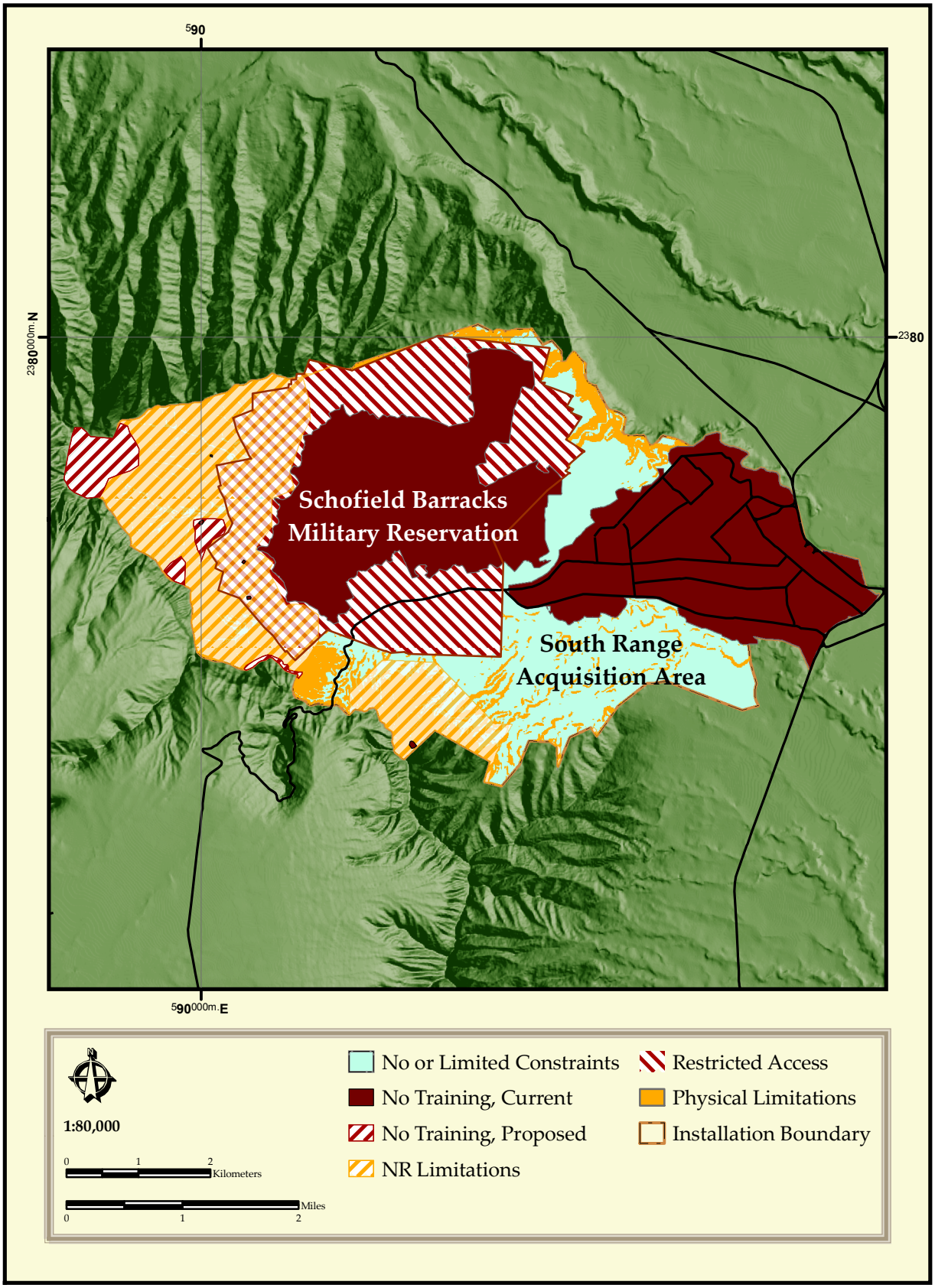


Figure 2.3.d

The ONR manager is notified if fires are a potential threat to federally listed plants or animals (25th ID (L) and USAG-HI 2003).

2.3.7 General Physical Environment and Ecosystems

2.3.7.1 Climate

The annual average temperatures at SBMR range from 69°F (20.6 °C) in January and February to 77°F (25°C) in August (USACE and Nakata Planning Group 2000a,b). Temperatures generally increase 3°F for each 1,000 ft increase in elevation. The average minimum temperature recorded at the upper Wahiawā weather station (1047 ft/319 m elevation) is 61°F (16.1°C) and 78.5 °F (25.8°C) is the maximum (NOAA 1998). The average rainfall varies with elevation and exposure; the averages inland at higher elevations of SBMR are considered representative of the island averages and usually exceed 50 in annually, while the overall average for SBMR is 43.75 in (1,111 mm). The spring/summer (April-October) monthly average is 1.63 to 3.78 in (41 to 96 mm). The range for fall/winter (November-March) months is 4.14 to 6.21 in (105 to 158 mm) (USACE and Nakata Planning Group 2000a,b). Prevailing winds are northeasterly trade winds from 4 to 12 mi per hour (mph) in the warmer summer months, with lighter southeasterly winds in the winter months. Droughts and the risk of fire danger increase in the summer and early fall on O‘ahu.

2.3.7.2 Geology

The Island of O‘ahu developed from the formation of two volcanoes 2 to 3 million years ago. Lava from the Ko‘olau volcano created the Leilehua Plateau between Ko‘olau and the older Wai‘anae volcano (MacDonald et al. 1986). The effects of weathering and erosion on these shield volcanoes have created high sea cliffs, deep valleys, and jagged mountainous regions on O‘ahu (USACE and Nakata Planning Group 2000a,b).

2.3.7.3 Volcanic Hazards

Two kinds of earthquakes affect the Hawaiian Islands. Those responsible for some of the biggest earthquakes are caused from the expansion of active volcanoes across dike intrusions. This type has never occurred in close proximity to O‘ahu. The second earthquake type is caused by the burden of weight of the islands on the lithosphere. These are commonly felt on O‘ahu. The last earthquake to cause damage was the Honomū earthquake in 1973, magnitude 6.2, and the epicenter was the Hāmākua Coast on the Island of Hawai‘i. Due to the depth of this quake, it was felt 200 mi (322 km) away on O‘ahu. Prior to Honomū, an earthquake in 1938 off the north coast of Maui measured 6.5. In 1871, the Lanai earthquake occurred just 65 mi (105 km) southeast of Honolulu at Palaoa Point. This quake measured 6.8 and caused the most extensive earthquake damage recorded in Honolulu (Fryer 2000).

2.3.7.4 Topography

The elevation at SBMR ranges from less than 660 ft above sea level (201 m) in the cantonment area to greater than 3,000 ft (915 m) in the Wai‘anae Range (USACE and Nakata Planning Group 2002a) (Figure 2.3.e).

2.3.7.5 Soils

There are seven soil associations found on O‘ahu and four of these are found at SBMR. The soils reflect the volcanic history of the area. Tropohumults-Dystrandepts soils are common in the mountainous areas and low slopes of the Wai‘anae Range, but these areas also include Mahana, Kolekole, Hālawa, Helemano, Kemoo, Kawaihāpai, and Alaka‘i soil types (Figure 2.3.f). Often, the well-drained soils of these areas are underlain by soft weathered rock, volcanic ash, or colluvium. Common to the main cantonment and the Leilehua golf course is the Helemano-Wahiawā soil association, which in addition to Helemano-Wahiawā soils, includes the Kunia soil type (USACE and

Nakata Planning Group 2002a). The U.S. Soil Conservation Service (currently known as the Natural Resources Conservation Service) describes the soils found on the Island of O‘ahu (1972).

Soil erosion is locally significant in areas where natural drainage and gulches occur, particularly in the military reservation along Ayres Avenue and McMahon Road in the north, and Duck Field in the south. However, the dry climate and lack of permanent streambeds may reduce the risk of erosion, as well as areas where soils are not developed because of exposed lava.

2.3.7.6 Water Resources

Groundwater sources on O‘ahu include basal water bodies, which are fresh water derived from infiltration of rainfall, usually from 0 to 40 ft elevation, and high level water bodies, which are derived by the impounding and accumulation of water in dikes with low permeability. The Schofield High Level Water Body, located west of the Wai‘anae Mountains, is the major source of water for SBMR.

The primary drainages for the military reservation are the Waikōloa Gulch and the Waikele Stream. Also, the North Fork of the Kaukonahua Stream flows along the northeast boundary of SBMR, along with two tributaries: Hale‘au‘au Gulch and Mohiākea Gulch (Figure 2.3.g). All streams on SBMR flow north into the Pacific Ocean at Waialua, with the exception of the Waikele, which flows into Pearl Harbor from the north. Many streams on SBMR are intermittent. The 100-year-flood contours were delineated by the Army Corp of Engineers in 1985 for the Waikōloa and the Waikele drainages.

2.3.8 General Biotic Environment

The Nature Conservancy (TNC) of Hawai‘i and the Hawai‘i Biodiversity and Mapping Program (HBMP) (formerly known as the Hawai‘i Natural Heritage Program [HINHP]) have classified the native natural resources located west of the impact area of Schofield Barracks and high in the Wai‘anae Mountains as having “extraordinary biological significance” (R.M. Towill Corp. 1997b).

2.3.8.1 Threatened and Endangered Species and Species of Concern

Island ecosystems and the species they support are particularly sensitive to environmental change due to their limited geographic distribution and small population sizes (Temple 1978). Species endangerment can be attributed to habitat loss and degradation, disease, competition, predation from introduced species, and the collecting of species.

Fauna

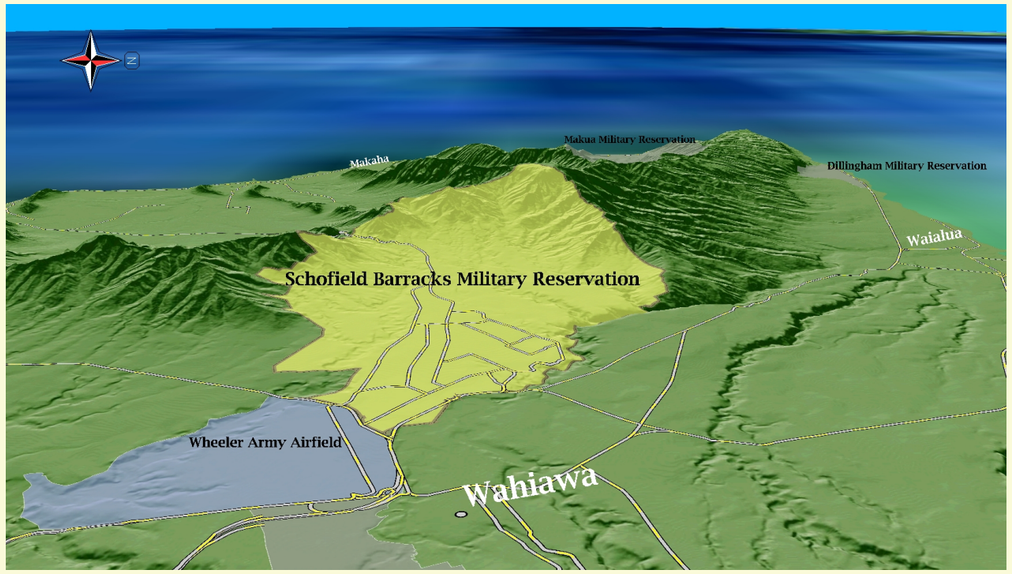
Four endangered animal species have been documented at SBMR (Table 2.3.a). They include one bird, one terrestrial snail, and two insects. Their locations at SBMR are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of O‘ahu* (USFWS 2003a) and the *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b).

Flora

Twenty-three federally listed and eight candidate plant species have been documented at SBMR (Table 2.3.b). Rare plant locations at SBMR are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of O‘ahu* (USFWS 2003a), *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b), and HBMP database for SBMR (HBMP 2007a,b). An additional 11 federally listed and 1 candidate plant species are present in management units near SMBR (Table 2.3.c).

Topography of Schofield Barracks Military Reservation

3-D Perspective View of Schofield Barracks Military Reservation - Looking West



Percent Slope on Schofield Barracks Military Reservation

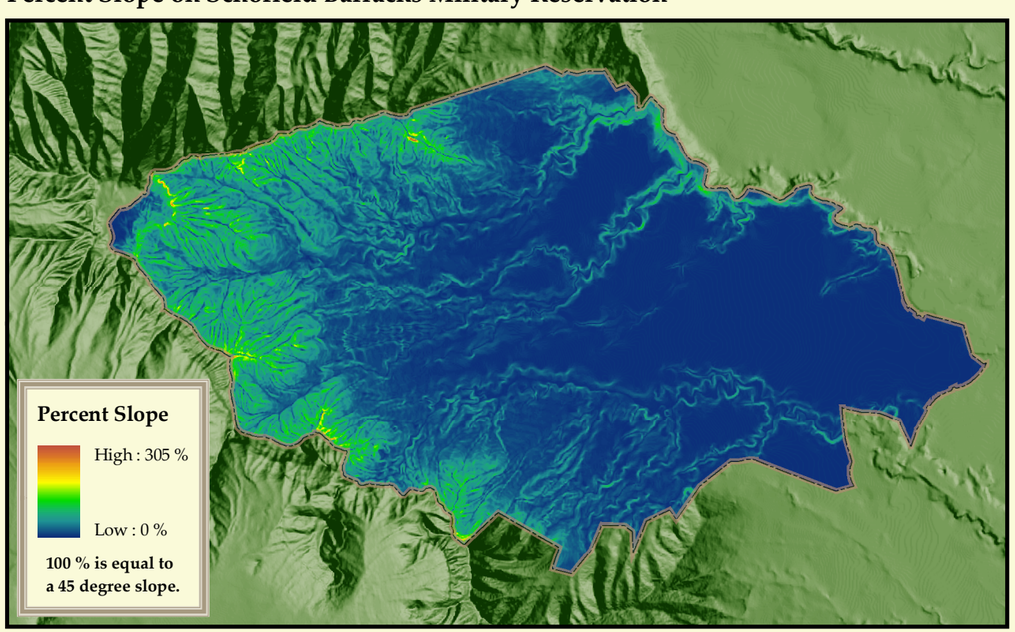
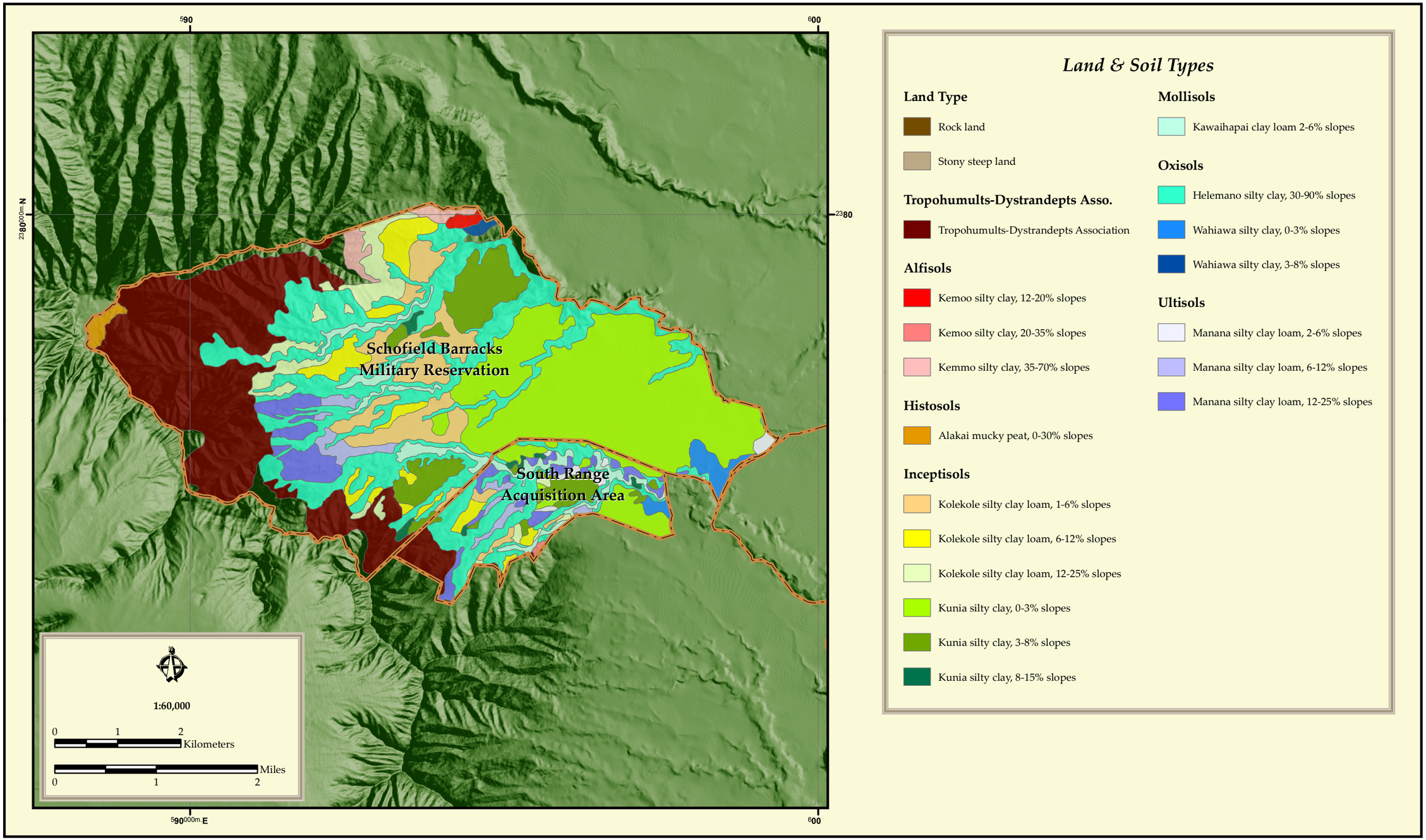


Figure 2.3.e

Land & Soil Types of Schofield Barracks Military Reservation



Land & Soil Types

Land Type

- Rock land
- Stony steep land

Tropohumults-Dystrandepts Asso.

- Tropohumults-Dystrandepts Association

Alfisols

- Kemoo silty clay, 12-20% slopes
- Kemoo silty clay, 20-35% slopes
- Kemmo silty clay, 35-70% slopes

Histosols

- Alakai mucky peat, 0-30% slopes

Inceptisols

- Kolekole silty clay loam, 1-6% slopes
- Kolekole silty clay loam, 6-12% slopes
- Kolekole silty clay loam, 12-25% slopes
- Kunia silty clay, 0-3% slopes
- Kunia silty clay, 3-8% slopes
- Kunia silty clay, 8-15% slopes

Mollisols

- Kawaihapai clay loam 2-6% slopes

Oxisols

- Helemano silty clay, 30-90% slopes
- Wahiawa silty clay, 0-3% slopes
- Wahiawa silty clay, 3-8% slopes

Ultisols

- Manana silty clay loam, 2-6% slopes
- Manana silty clay loam, 6-12% slopes
- Manana silty clay loam, 12-25% slopes

Figure 2.3.f

Water Resources & Wetlands
Schofield Barracks Military Reservation

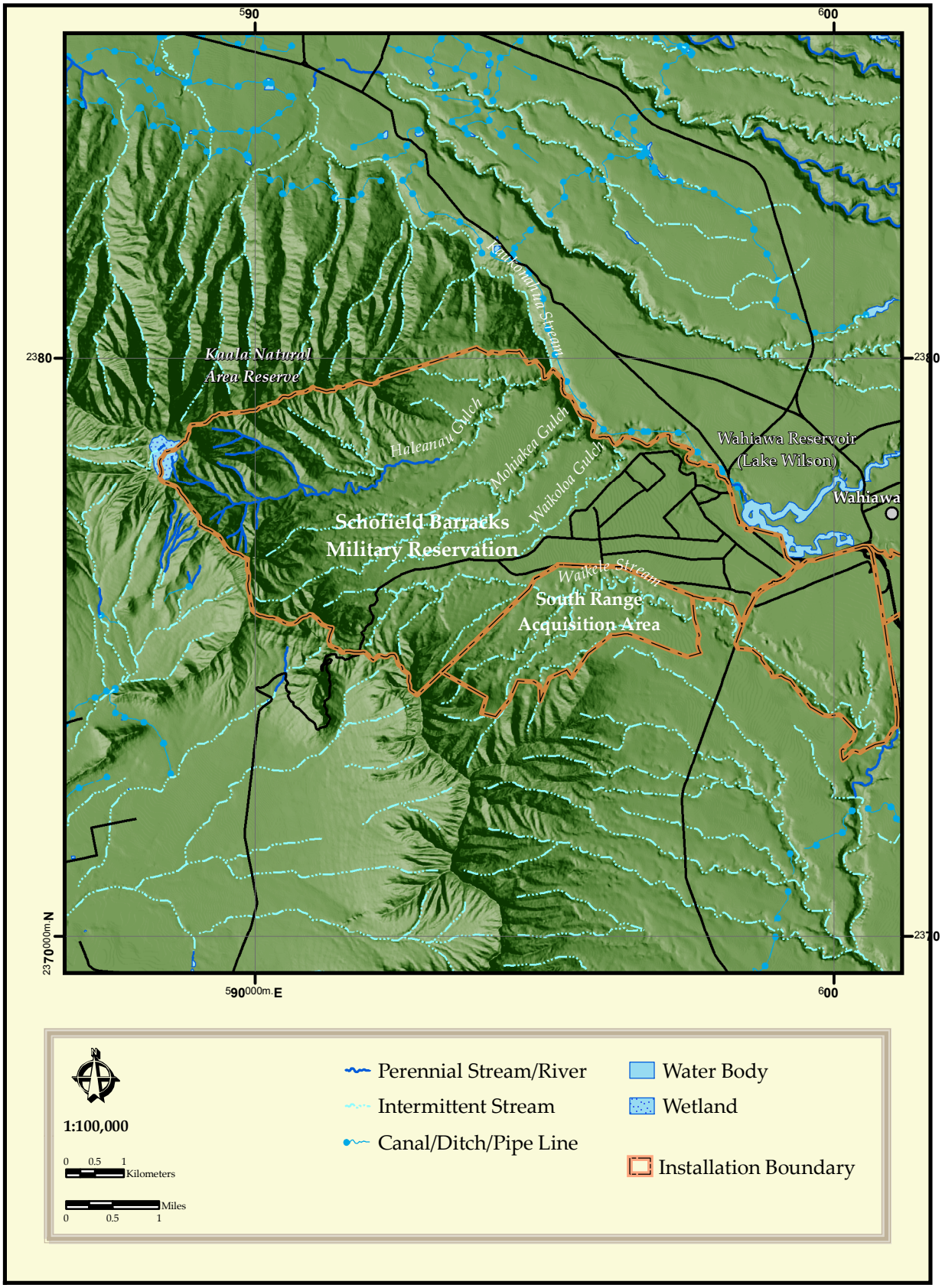


Figure 2.3.g

Table 2.3.a Federally Listed Animals Found or possibly Adjacent to Schofield Barracks Military Reservation.*

Scientific Name	Hawaiian / Common Name	Federal Status[3]	Global Rank[4]
Birds			
Chasiempis sandwichensis ibidis	O‘ahu ‘elepaio	LE	G3T1
Snails			
Achatinella mustelina	Pupu Kuahiwi, Pupu Kanioe, Kahuli, O‘ahu tree snail	LE	G1
Insects			
Drosophila montgomeryi	picture wing fly, pomace fly	LE	G1
Drosophila substenoptera	picture wing fly, pomace fly	LE	G1

* Sources: USFWS 2003a, USAG-HI 2008b, Hawai‘i Biodiversity & Mapping Program Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff, USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008, and USFWS 2006a.

[1] Extirpated. USFWS 2006.

[2] Key to Federal Status: LE = endangered.

[3] Key to Global Ranks as defined by Hawai‘i Biodiversity and Mapping Program, Feb. 12, 2008: G1 = Species critically imperiled globally (typically 1-5 occurrences); G3T1 = species vulnerable, subspecies or variety critically imperiled.

2.3.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: Critical habitat information was compiled from the U.S. Fish and Wildlife Service (USFWS). O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*) is the only federally listed bird species on SBMR with designated critical habitat (Figure 2.3.h). A total of 1,913 ac (774 ha) is located within SBMR West Range. This represents 2.9 percent of the total acreage designated critical habitat for the taxon. USAG-HI predominantly manages ‘elepaio within its designated management units. Critical habitat was designated for the O‘ahu ‘elepaio in 2001 (USFWS 2001b).

The 2003a USFWS Biological Opinion states that the conservation measures executed by the U.S. Army off-sets the adverse effects of training. Some of the measures taken include the control of rodents, actions to minimize the destruction and degradation of forest structure, and the removal of ungulates. In addition, the Army will execute a Wildland Fire Management Plan, conduct demographic monitoring, and increase access to training lands for survey and management to 45 days annually.

Critical habitat was designated for listed plant species on the Island of O‘ahu in 2003 (USFWS 2003b); however, most of the USAG-HI’s lands were eliminated in the final rule due to the Army’s ongoing conservation efforts. Plant critical habitat is present along parts of the northwest boundary and the southwest corner. A ridge separates the installation from the plant critical habitat boundary.

Designated Management Units: Management units (MUs) are located in the Wai‘anae Mountains of O‘ahu where the most important wild populations of the target taxa occur (Figure 2.3.i). These areas encompass the important habitat for *in situ* management and reintroduction efforts that will lead to the stabilization of the target taxa. The MUs occur on Army, Navy, State of Hawai‘i, Honolulu Board of Water Supply, City and County of Honolulu and private lands (USAG-HI 2003a).

There are four O‘ahu Implementation Plan (OIP) management units (MUs) located on SBMR. They are Ka‘ala, North and South Hale‘au‘aum, and Mohiākea.

Ka‘ala MU is located on City and County of Honolulu lands (13 ac/5.3 ha), State of Hawai‘i lands (57 ac/23.1 ha) and Army lands (102 ac/41.3 ha). Ka‘ala MU (172 ac/69.6) has three

Table 2.3.b Federally Listed and Candidate Plants on Schofield Barracks Military Reservation.* "O" references species cited in the O'ahu Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Alectryon macrococcus var. *macrococcus*	'ala 'alahua, mahoe	O,M	LE	G1T1
Cyanea acuminata	'oha, haha, 'ohawai	O	LE	G2
Cyanea calycina (Syn. *Cyanea lanceolata* ssp. *calycina*)	'oha, haha, 'ohawai		C	G1
Cyanea grimesiana ssp. *obatae*	'oha, haha, 'ohawai	O,M	LE	G1T1
Delissea waianaensis	'oha, haha, 'ohawai	O,M	LE	G1
Diellia falcata	Sickle Island spleenwort		LE	G2
Flueggea neowawraea	Mehamehame	O,M	LE	G1
Gardenia mannii	nanu, na'u, Mann's gardenia	O	LE	G1
Hesperomannia arbuscula	Maui island-aster	O,M	LE	G1
Joinvillea ascendens ssp. *ascendens*	'ohe		C	G5T1
Labordia cyrtandrae	Kamakahala	O	LE	G1
Lepidium arbuscula	'anaunau, naunau, kunana		LE	G1
Lipochaeta lobata var. *leptohylla*	Nehe		LE	G2T1
Lobelia oahuensis	'oha, haha, 'ohawai		LE	G1
Melicope christophersenii	alani, Christophersen's pelea, Wai'anae Range melicope		C	G1
Nothocestrum latifolium	'aiea, halena, broadleaf aiea		C	G1
Phyllostegia hirsuta	hairy phyllostegia	O	LE	G1
Phyllostegia mollis	Wai'anae Range phyllostegia	O	LE	G1
Plantago princeps var. *princeps*	Ale	O,M	LE	G2T1
Platydesma cornuta var. *cornuta*			C	
Platydesma cornuta var. *decurrens*	pilo kea		C	G1T1
Pritchardia kaalae	lo'ulu	M	LE	G1
Pteralyxia macrocarpa	kaulu, ridge pteralyxia		C	G2
Schiedea hookeri	Hooker schiedea, sprawling schiedea		LE	G1
Schiedea kaalae	ma'olio'oli, O'ahu schiedea	O,M	LE	G1
Schiedea pentandra	hairy schiedea		C	G2
Schiedea trinervis (Syn. *S. trinerve*, *Alsinidendron trinerve*)	mountain alsinidendron	O	LE	G1
Stenogyne kanehoana	O'ahu stenogyne	O	LE	GH
Tetramolopium filiforme	ridge top tetramolopium	M	LE	G1
Urera kaalae	Ōpuhe		LE	G1
Viola chamissoniana ssp. *chamissoniana*	pamakani, 'olopu, violet	O,M	LE	G2G3T1

* Sources: HBMP 2007a,b, USAG-HI 2008b, HB&M Databook. Nov. 2007, April 2010. USAG-HI ONR staff and the USFWS federally listed and candidate species lists Feb. 12, 2008, 9 Nov. 2009.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai'i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled globally (typically 6-20 occurrences); G1T1 = species and subspecies or variety critically imperiled globally (typically 1-5); G2G3T1 = species imperiled, subspecies critically imperiled; GH = possibly extinct; G2T1 = species imperiled globally and subspecies or variety critically imperiled globally (typically 1-5); G5T1 = species globally secure but subspecies or variety critically imperiled globally).

Table 2.3.c Additional Federally Listed and Candidate Plants in Management Units near Schofield Barracks Military Reservation.* "O" references species cited in the Oʻahu Implementation Plan and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Abutilon sandwicense	green flower Indian mallow	O	LE	G1
Caesalpinia kavaiensis	Uhiuhi		LE	G1
Cenchrus agrimonioides var. *agrimonioides*	kamanomano, agrimony sandbur	M	LE	G1T1
Eragrostis fosbergii	Fosberg's lovegrass	M	LE	G1
Gouania vitifolia		M	LE	G1
Hibiscus brackenridgei ssp. *mokuleianus*	maʻo hau hele, mokulei rose mallow	M	LE	G1T1
Kadua degeneri var. coprosmifolia			LE	G1T1
Kadua degeneri var. *degeneri*		M	LE	G1T1
Lipochaeta tenuifolia	slender-leaved nehe	M	LE	G1
Melicope makahae			C	G1
Nototrichium humile	kuluʻi, kaʻala rock wort	M	LE	G2
Tetramolopium lepidotum ssp. *lepidotum*			LE	G1T1

* Sources: HBMP 2007a,b, USFWS 2003a, USAG-HI 2008b, Hawaiʻi Biodiversity & Mapping Program, Databook. Nov. 2007, April 2010.USAG-HI ONR staff and USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008 and Nov. 9, 2009.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawaiʻi Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled globally (typically 6-20 occurrences); G1T1= species critically imperiled globally and subspecies or variety critically imperiled globally.

endangered plants species (*Cyanea acuminata*, *Labordia cyrtandrae*, and *Schiedea trinervis*) targeted for stabilization. Present in the MU are *Cyanea calycina* (C)[1], *Gunnera petaloidea*, *Melicope christophersenii*, and *Neraudia melastomifolia*. Ninety percent of the MU is protected by fencing.

North Haleʻauʻau MU is located on U.S. Army lands and covers 426 ac (172 ha). This MU has two endangered plants (*Gardenia mannii* and *Labordia cyrtandrae*) and one endangered bird (*Chasiempis sandwichensis ibidis*). Also present is a Mākua IP targeted endangered snail (*Achatinella mustelina*) and two endangered plants (*Alectryon macrococcus* var. *macrococcus* and *Hesperomannia arbuscula*). Other important taxa in this unit include *Cyanea calycina* (C)*, Eurya sandwicensis* (SOC)*, Labordia kaalae* (SOC)*, Nothocestrum longifolium* (G2)*, and Sicyos lanceoloideus* (SOC). Fencing is scheduled for Oʻahu IP year 2[2] and requires an environmental assessment.

[1] Rankings listed by the Hawaiʻi Biodiversity & Mapping Program. Noted in the various management units are additional significant species that are not targeted for management, but will benefit from the management activities.

[2] Oʻahu Implementation Plan year 1 was 2008.

Critical Habitat & Areas of Special Concern
Schofield Barracks Military Reservation

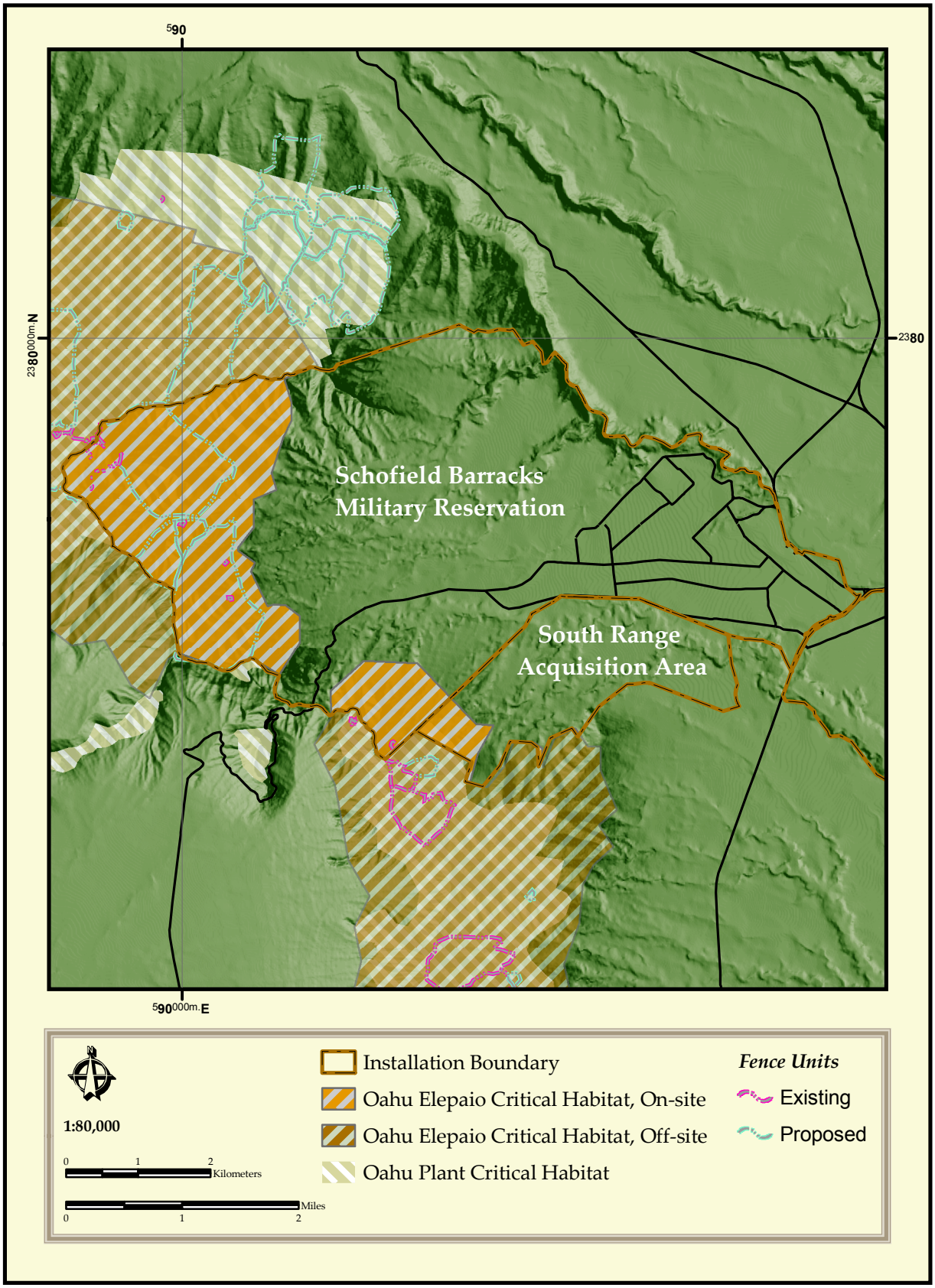


Figure 2.3.h

Management Units
Schofield Barracks Military Reservation

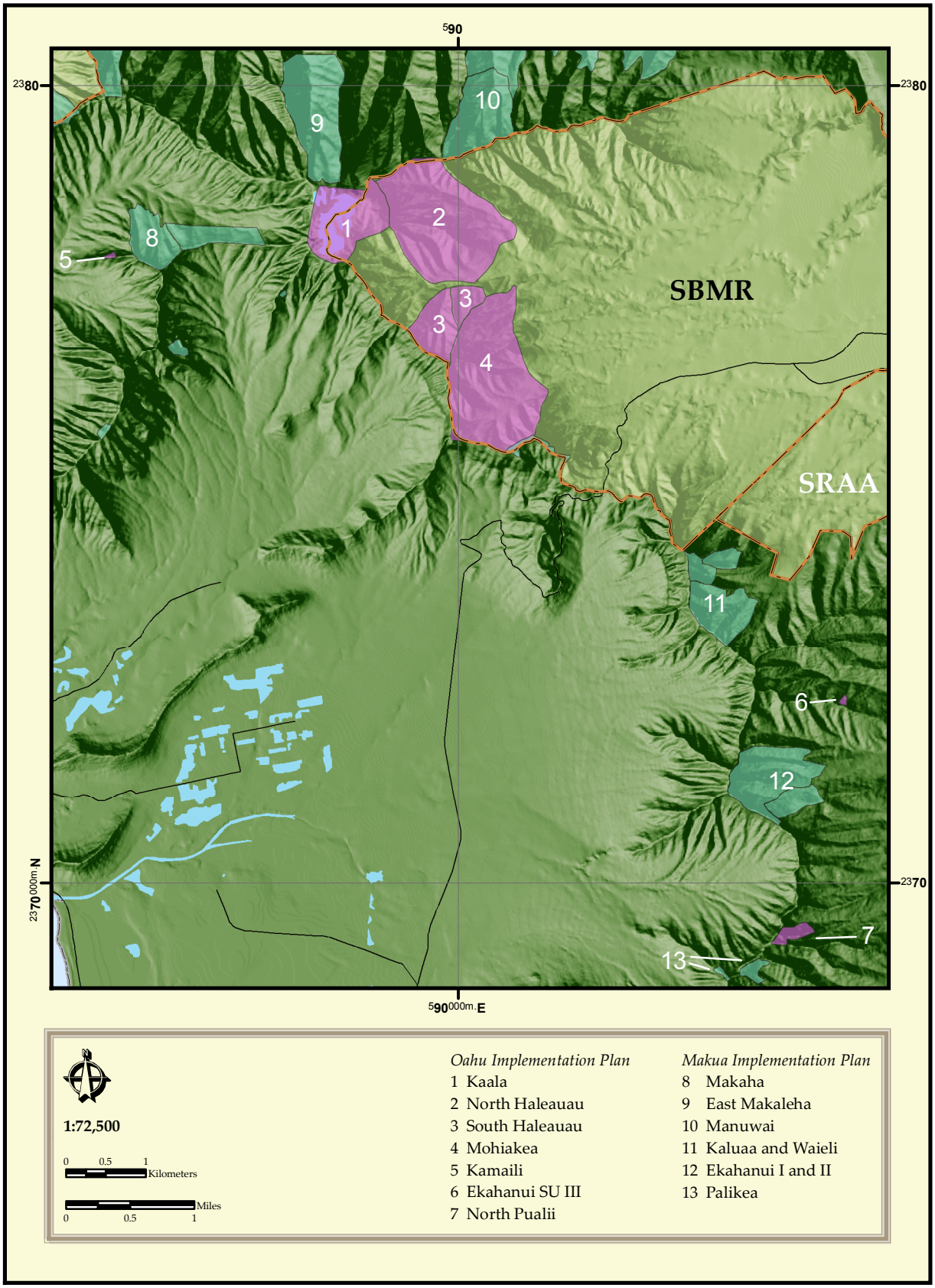


Figure 2.3.i

South Hale‘au‘au MU is located on U.S. Army lands. There are two subunits—I (35 ac/14 ha) and II (88 ac/37 ha). In Subunit I, there is one endangered plant (*Stenogyne kanehoana*) and one endangered bird (*Chasiempis sandwichensis ibidis*) targeted for stabilization. In Subunit II, there are four endangered plants (*Cyanea acuminata, Gardenia mannii, Phyllostegia hirsuta,* and *Schiedea trinervis*), and one insect (*Drosophila substenoptera*). There is also one Mākua IP targeted species, *Achatinella mustelina*. Other important taxa in this unit include *Cyanea calycina* (C)*, Joinvillea ascendens* ssp.*ascendens* (C)*, Lobelia oahuensis* (LE)*, Melicope christophersenii* (C)*, Neraudia melastomifolia* (SOC)*, Platydesma cornuta* var. *decurrens* (C),and *Schiedea hookeri* (LE). Fencing is scheduled for O‘ahu IP year 3 and requires an environmental assessment.

Mohiākea MU is located on SBMR lands owned by the U.S. Army (425.9 ac/172.3 ha). This MU has three O‘ahu IP target plant species (*Phyllostegia hirsuta, P. mollis,* and *Labordia cyrtandrae*) and one bird species (*Chasiempis sandwichensis ibidis*) designated for stabilization. There are also Mākua IP targeted plant species (*Alectryon macrococcus* var. *macrococcus, Delissea waianaensis, Plantago princeps* var. *princeps, Schiedea kaalae,* and *Tetramolopium filiforme*) and a snail (*Achatinella mustelina*). *Plantago princeps* var. *princeps* and *Tetramolopium filiforme* are designated for stabilization. Fencing is scheduled for O‘ahu IP year 3. An environmental assessment is needed prior to fence construction.

There are two additional O‘ahu IP management units to the west or south of the Schofield Barracks. These are Kamaili and North Puali‘i.

Kamaili MU is 2.1 ac (0.8 ha) and is owned by the Board of Water Supply, City and County of Honolulu. There is a single O‘ahu IP targeted species present (*Abutilon sandwicense*) and a single Mākua IP target species (*Flueggea neowawraea*). No other plant or animal taxa are cited as significant within this area. A fence is scheduled for construction in 2013, with a Memorandum of Understanding with the landowner. An environmental assessment is also planned.

North Puali‘i MU is located south of SBMR on The Nature Conservancy (TNC) of Hawaii’s managed lands. Total area for the unit is 10 ac (4 ha). North Puali‘i MU has one endangered bird species (*Chasiempis sandwichensis ibidis*) and one plant species (*Phyllostegia mollis*) that are targeted for stabilization. Other significant species in the MU include *Dissochondrus biflorus* (SOC), *Labordia kaalae* (SOC)*,* and *Urera kaalae* (LE). North Puali‘i MU is protected by a fence constructed by TNC in 2006.

2.3.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii’s Biodiversity and Mapping Program update SBMR’s fauna species lists when new species are identified and have been verified as being present on SBMR.

Keystone Species

A keystone species is a species that has a disproportionate effect on its environment relative to its abundance (Paine 1995). Such an organism plays a role in its ecosystem that is analogous to the role of a keystone in an arch. While the keystone feels the least pressure of any of the stones in an arch, the arch collapses without it. Similarly, an ecosystem may experience a dramatic shift if a keystone species is removed; even though that species was a small part of the ecosystem by measures of biomass or productivity, it is an important species to the sustainment of the ecosystem.

The pueo (Hawaiian short-eared owl) is an example of a keystone species for SBMR. The short-eared owl feeds on rodents and forest birds that impact native snails or bird species that nest on the ground by eating their eggs. The further understanding this keystone species role needs to be developed.

State of Hawaii's Species of Greatest Conservation Need

The development of the State of Hawaii's Species of Greatest Conservation Need (SGCN) list is a requirement of USFWS for all states wishing to participate in the USFWS's State Wildlife Grant program. USFWS required all states and territories to complete a State Comprehensive Wildlife Conservation Strategy (CWCS) by October 2005. The CWCS has eight elements in which the development of species of greatest conservation needs lists is one of the elements. For further discussion of Hawaii's CWCS, see Section 3.7, *Hawaii's Comprehensive Wildlife Conservation Strategy*.

A comparison of SBMR's current fauna lists and Hawaii's CWCS resulted in the identification of eight bird taxa, one mammal species, three invertebrate species, and possibly four fish taxa as species of greatest conservation being present at SBMR (Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered and located on SBMR. (See Appendix 3, *Species Lists*. Annex A, *SBMR Species of Greatest Conservation Need*.)

Mammals

A comprehensive survey of introduced mammals at SBMR has not been conducted. The ʻopeʻapeʻa, or Hawaiian hoary bat (*Lasiurus cinereus semotus*), is the only indigenous terrestrial mammal on the Hawaiian Islands. No sightings have been documented by Oʻahu NR staff.

Eight introduced mammals have been observed at SBMR. (See Appendix 3, *Species Lists*. Annex A, *SBMR Mammals*.)

Birds

A comprehensive survey of bird species at SBMR has not been conducted. Ten endemic/indigenous and 31 introduced bird species have been observed of SBMR in the past (HHP 1994d,e and Bremer 2007). There are large populations of introduced birds at SBMR that include forest birds, field birds, urban birds, game birds, and a bird of prey. (See Appendix 3, *Species Lists*. Annex A, *SBMR Birds*)

Herpetofauna

A comprehensive survey of introduced herpetofauna species at SBMR has not been conducted. There are no native terrestrial herpetofauna species in the Hawaiian Islands. Fifteen introduced herpetofauna species may be present at SBMR.

- ***Introduced Reptiles:*** There may be eight introduced lizards, one terrestrial snake, and one turtle species present at SBMR (McKeown 1996; Hawaiʻi Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex A, *SBMR Herpetofauna*.)

- ***Introduced Amphibians:*** There are six known introduced amphibian species on Oʻahu. Two of these species have been identified in the Waikele Stream on SBMR (McKeown 1996; Hawaiʻi Stream Assessment database 1992). (See Appendix 3. *Species Lists*. Annex A. *SBMR Herpetofauna*.)

Fish

A comprehensive fish survey at SBMR has not been conducted. Six endemic and 14 introduced species were identified in the lower reaches of the Wakikele Stream according to the Hawaiʻi Stream

Assessment database (1992). The USAG-HI ONR staff has not validated the presence of these species at SBMR. (See Appendix 3, *Species Lists*. Annex A, *SBMR Fish*.)

Invertebrates

A comprehensive survey of invertebrate species at SBMR has not been conducted. Twelve endemic terrestrial invertebrates are documented as being present at SBMR. Ten endemic aquatic invertebrates may be present in Waikele Stream (Hawai'i Stream Assessment database 1992). These endemic aquatic invertebrates are believed to be primarily from the lower reaches of the stream and have not been documented by USAG-HI Natural Resources staff as present at SBMR. Four introduced terrestrial and six aquatic species of invertebrates have been documented at SBMR (Hawai'i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex A, *SBMR Invertebrates*.)

- ***Invasive Species:*** Beginning in 2006, USAG-HI began ant surveys to determine range and impact on endangered species (flora and fauna). USAG-HI has identified three ant species at SBMR that it considers invasive. *Plagiolepis alluaudi* has been identified at TNC-Honouliuli Preserve located on the south border of SBMR (S. Ching, USAG-HI ONR staff, per. com. 2008).

2.3.8.4 Flora

USAG-HI has documented 259 identified species and one unidentified taxa at SBMR in the Hawai'i Biodiversity and Mapping Program (HBMP 2007a, b) and its incipient weed database. (See Appendix 3, *Species Lists*. Annex A, *SBMR Plant*, a comprehensive list of native and introduced plant species).

Keystone Species

Conditions and needs of keystone species is an area that requires development for SBMR.

State of Hawaii's Species of Greatest Conservation Need

A comparison of SBMR's current plant species list and Hawaii's Comprehensive Wildlife Conservation Strategy, resulted in the identification of 68 plant species of greatest conservation need present on SBMR (HBMP 2007a,b and Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered on SBMR. (See Appendix 3, *Species Lists*. Annex A, *SBMR Species of Greatest Conservation Needs*.)

Incipient Species

USAG-HI ONR staff has identified 13 incipient species that are controlled or eradicated when found in areas where rare plant species occur at SBMR. (See Appendix 3, *Species Lists*. Annex A, *SBMR Weed.)*

Non-Native/Weedy Species

There are 20 non-native/weedy species that have been identified at SBMR that may have a negative effect on SBMR's training areas, native plant habitats, and ecosystems (NRCS PLANTS Database, June 2008. Weeds of Hawai'i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex A. *SBMR Weed Species*.)

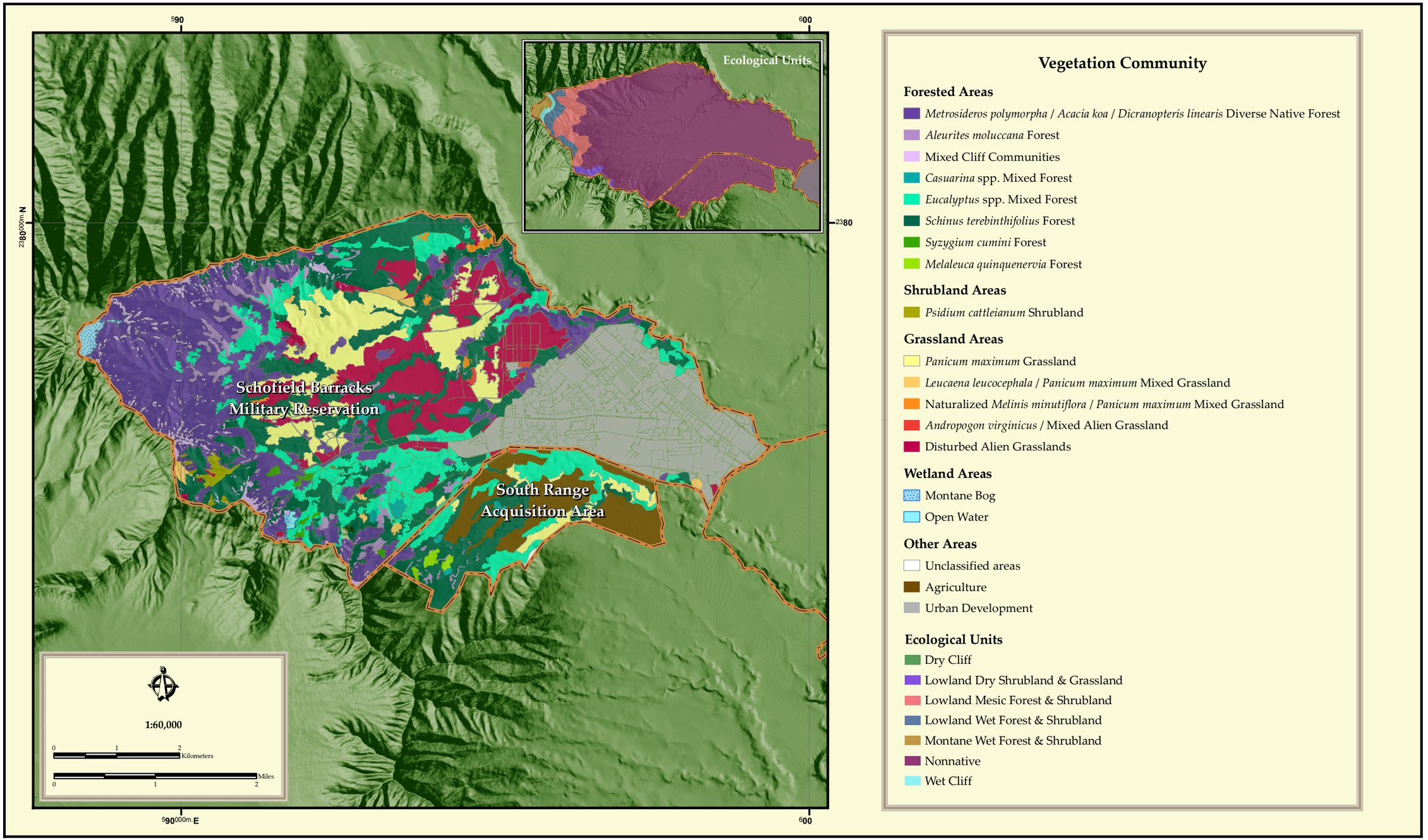
2.3.9.5 Native Vegetation Communities

There are four native vegetative communities located on SBMR: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural communities (Figure 2.3.j). These community types are categorized into ecological zones that are defined by elevation, topography, and prevailing ecological conditions (Wagner et. al. 1999). (See Appendix 3, *Species Lists*. Annex A. *SBMR Native Vegetation Communities and Descriptions*.)

2.3.9.6 Wetlands and Deep Water Habitats

In 2004, the Corps of Engineers (COE) conducted a wetlands delineation inventory of possible wetlands on SBMR. Potential areas located on South Range did not meet the three Corps of Engineers' hydric indicators and were determined not to be wetlands. The possible forested palustrine wetland located on the summit of Mt. Kaʻala at 4,100 ft (1,240 m) within the Mt. Kaʻala Management Unit was not formally delineated (COE 2005). The flat summit portion of the management unit is characterized by drenched, mossy soils and is considered to be a possible immature bog (RCUH 2000). Forested wetlands may also occur in the area (NWI 1977). Approximately 50 percent of the possible wetland is located on SBMR and the remainder is located on the adjacent Mt. Kaʻala Natural Area (see Figure 2.3.g, *Water Resources*). There are no known deep water habitats on SBMR.

Vegetation Communities on Schofield Barracks Military Reservation



Vegetation Community

Forested Areas

- *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest
- *Aleurites moluccana* Forest
- Mixed Cliff Communities
- *Casuarina* spp. Mixed Forest
- *Eucalyptus* spp. Mixed Forest
- *Schinus terebinthifolius* Forest
- *Syzygium cumini* Forest
- *Melaleuca quinquenervia* Forest

Shrubland Areas

- *Psidium cattleianum* Shrubland

Grassland Areas

- *Panicum maximum* Grassland
- *Leucaena leucocephala / Panicum maximum* Mixed Grassland
- Naturalized *Melinis minutiflora / Panicum maximum* Mixed Grassland
- *Andropogon virginicus* / Mixed Alien Grassland
- Disturbed Alien Grasslands

Wetland Areas

- Montane Bog
- Open Water

Other Areas

- Unclassified areas
- Agriculture
- Urban Development

Ecological Units

- Dry Cliff
- Lowland Dry Shrubland & Grassland
- Lowland Mesic Forest & Shrubland
- Lowland Wet Forest & Shrubland
- Montane Wet Forest & Shrubland
- Nonnative
- Wet Cliff

Figure 2.3.j

2.4 SCHOFIELD BARRACKS EAST RANGE

2.4.1 Location and Neighbors

Schofield Barracks East Range (SBER) is a sub-installation of Schofield Barracks Military Training Area. It is located in central O‘ahu, approximately three miles north of Mililani Town (pop. 28,608) and eight miles southeast of Hale‘iwa (pop. 2,225) (Figure 2.4.a). The town of Wahiawā (pop. 16,151) is located along the northwestern boundary of SBER. Primary access to SBER is via H-2 and Kamehameha Highway, which separates East Range from Schofield Barracks’ Main Post. SBER extends east of Kamehameha Highway to the crest of the Ko‘olau Mountain Range, where it borders the Kahana Valley State Park. SBER is bordered on the north by Kawailoa Training Area and on the south by private agricultural and forest lands.

2.4.2 Infrastructure

2.4.2.1 Ranges and Training Lands

The Schofield Barracks East Range area contains 5,514 ac (2,232 ha) for training purposes, of which 2,223 ac (900 ha) are considered suitable for maneuver training. SBER has a cantonment area, 14 maneuver training areas, an air assault course and a confidence course (Figure 2.4.b) (USACE and Nakata Planning Group 2002a).

SBER’s 5,154 ac (2,086 ha) are ceded lands (USACE and Nakata Planning Group 2002a). Because SBER was acquired and managed as a unit with Schofield Barracks Main Post, the history of East Range is similar to that of Schofield Barracks Military Reservations, except that East Range has no firing ranges or impact areas.

2.4.2.2 Cantonment Area

The cantonment area at SBER includes education, pre-Ranger, and Air Assault training facilities, an Army 18-hole golf course, a Noncommissioned Officer Academy, warehouses, and a maintenance facility. There are no ammunition storage or holding areas located on SBER. All blanks and pyrotechnics used at SBER are stored in the ammunition storage point at Wheeler Army Airfield (USACE and Nakata Planning Group 2002a). Wheeler Army Airfield occupies 1,389 ac (562 ha) and is located adjacent to and west of SBER.

2.4.2.3 Wheeler Army Airfield

Wheeler Army Airfield (WAAF), located adjacent to SBER, supports military helicopters and fixed wing aircraft that use SBER for training purposes. In addition, SBER has seven helipads/landing zones (USACE and Nakata Planning Group 2002a). WAAF is being expanded to be able to support the landing and departure of fully loaded U.S. Air Force tactical airlift aircraft.

2.4.2.4 Drop Zones

SBER has nine parachute drop zones. Seven are approved for both equipment and personal. The two remaining drop zones are approved for single type operation use: one for personnel only and one for equipment only.

2.4.2.5 Commercial/Other Airports

Commercial airports at Kalaeloa Airport (John Rodgers Field) and Honolulu International Airport serve the Island of O‘ahu, handling aircraft up to large commercial jets. Hickam Air Force Base currently supports Army troop and equipment movements.

Location & Land Ownership
Schofield Barracks East Range

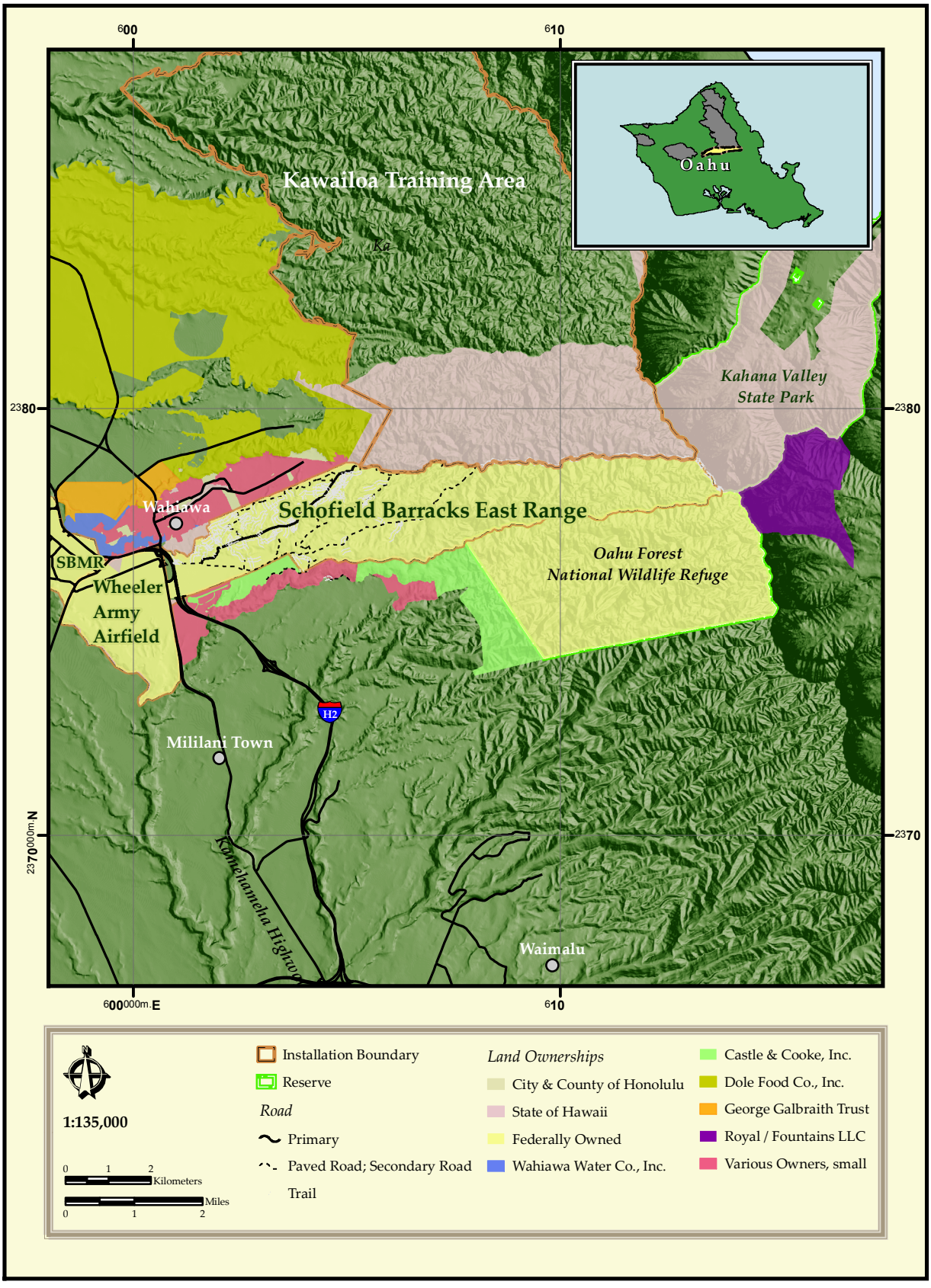


Figure 2.4.a

Cantonment & Training Areas
Schofield Barracks East Range

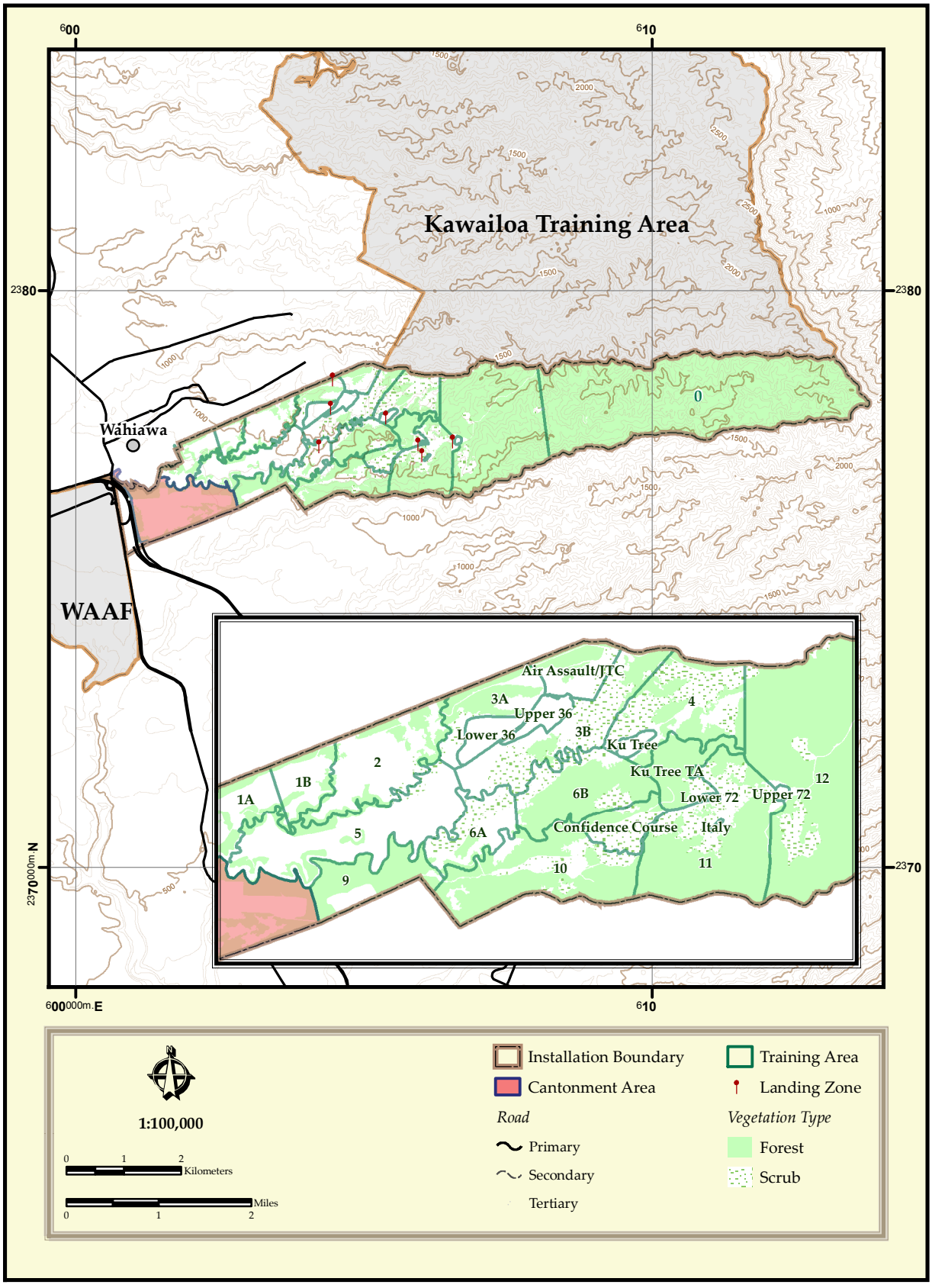


Figure 2.4.b

2.4.2.6 Harbors
See Section 2.3.2.5, *Schofield Barracks Military Reservation, Harbors*.

2.4.2.7 Roads
There are 11 mi (18 km) of secondary roads, 15 mi (24 km) of tertiary roads, and 7 mi (12 km) of unimproved roads at SBER.

2.4.3 Abbreviated History

2.4.3.1 Installation History
See Section 2.3.3, *Schofield Barracks Military Reservation, Abbreviated History*.

2.4.3.2 Cultural Resources
SBER has 12 known archeological sites (USAG-HI 2007b). Historic military facilities at SBER include arrays of communication tunnels (USACE and Nakata Planning Group 2002a).

2.4.3.3 Natural Resources Program History
SBER natural resources program evolved at the same time as the USAG-HI Natural Resources staff and SBMR's program. Like SBMR, the Endangered Species Act of 1973 is the primary driver for SBER's natural resources program.

Shallenberger et al. conducted the first extensive zoological survey using line transects to sample the zoological communities at Schofield Barracks in 1976-77. Shallenberger et al. observed several rare species including the ʻiʻiwi (*Vestiaria coccinea*), native tree snails (*Achatinella* spp.), and the Hawaiian hoary bat (*Lasiurus cinereus semotus*). The Hawaiʻi Biodiversity and Mapping Program (HBMP) conducted a comprehensive biological survey of SBER from January 1992 to May 1993. They chose survey areas that represented the native-dominated ecological zones at SBER and surveyed for rare species in their preferred habitats. Six rare vertebrates, including 2 endangered species, and 22 rare invertebrates, including 7 endangered mollusks, were observed at SBMR and SBER (R.M. Towill Corp. 1997b).

2.4.4 Military Mission

SBER provides training lands for the 25th ID and for tactical field exercises of other Army and U.S. Marine Corps units.

2.4.5 Military Operations and Activities that May Affect Natural Resources

The western maneuver area on SBER is about 2,223 ac (900 ha). This area is valuable for rappelling, jungle survival, and patrolling operations. Several open areas are used for Air Assault and Airborne operations. Unit uses include limited battalion and company-level Army Training and Evaluation Program missions. Climate, terrain, and vegetation provide excellent training for Pacific and Asian Theatre of Operational readiness. The eastern portion of SBER has extremely rugged terrain and is densely forested. Use of steep and/or unstable areas could increase soil erosion potentials as vegetation is trampled or dislodged. Increase soil erosion could, in turn, increase the sediment load in streams.

Construction and maintenance activities consistently occur at SBER. As the mission changes, so infrastructure support changes at SBER. Ranges are constantly upgraded, converted, and/or constructed. Buildings are in constant need of repair, upgrade, or conversion. New buildings are

required to support billeting, administration and maintenance activities due to the transformation of forces located at SBER.

2.4.6 Natural Resources Constraints on Training Areas and Ranges

Natural resource constraints consist of slopes greater than 30 percent and ‘Elepaio Critical Habitat (Figure 2.4.c). These areas overlay the eastern part of the range. Maneuver training occurs on the more level areas to the west, while rappelling, jungle survival, and patrolling operations occur on the steeper slopes to the east. There are two reservoirs and a stream that runs across the area. Training is restricted from the cantonment area (west), constrained by terrain to the east, limited but not restricted by critical habitat to the east, and excluded from the fence units (approximately 30 acres) (Figure 2.4.d).

Training can be suspended or restricted based on the day’s fire danger rating (25th ID (L) and USAG-HI 2003). Troops adhere to fire danger-rating restrictions of incendiary ammunition, pyrotechnics, smoking, and when using other ignition sources. A Red Fire Index restricts the use of all munitions, smoking, and cooking/warming fires.

Minimum staffing and fire response must be arranged and meet training activities (e.g., live-fire training is conducted when fully trained/certified personnel and functioning equipment is available for fire suppression). If fire suppression equipment is not operational, training at SBER is suspended. The ONR manager is notified if fires are a potential threat to federally listed plants or animals (25th ID (L) and USAG-HI 2003).

2.4.7 General Physical Environment and Ecosystems

Unless otherwise stated, the source of information for the affected environment is the Range and Training Land Program Development Plan (USACE and Nakata Planning Group 2002a).

2.4.7.1 Climate

Climate is similar to SBMR. The annual average precipitation, recorded at 1,162 ft (354 m) elevation in the Koʻolau Mountains at the Schofield Barracks East Range (SBER) Koʻolau Dam weather station, was 123.5 in (3,138 mm).

2.4.7.2 Geology

See Section 2.3.7.2, *Schofield Barracks Military Reservation, Geology*.

2.4.7.3 Volcanic Hazards

See Section 2.3.7.3, *Schofield Barracks Military Reservation, Volcanic Hazards*.

2.4.7.4 Topography

SBER is located in the Kawailoa uplands on the leeward side of the 2,400 ft (732 m) Koʻolau Mountains. The western portion of SBER is mostly gentle sloping open areas with mixed cover of grass, shrubs, and native trees, separated by steep drainages. The eastern portion of SBER is extremely rugged and densely forested, with limited road access (USACE and Nakata Planning Group 2002a) (Figure 2.4.e).

2.4.7.5 Soils

The Lokekaʻa-Waikāne soil association is common in SBER east of the golf course. These soils developed from old alluvium and weathered igneous rock. In addition to the 20 percent Lokekaʻa and Waikāne soils, this association contains Paumalū, Kemoo, Leilehua, Alaeloa, Kāneʻohe, Paʻaloa,

Natural Resources Constraints to Training
Schofield Barracks East Range

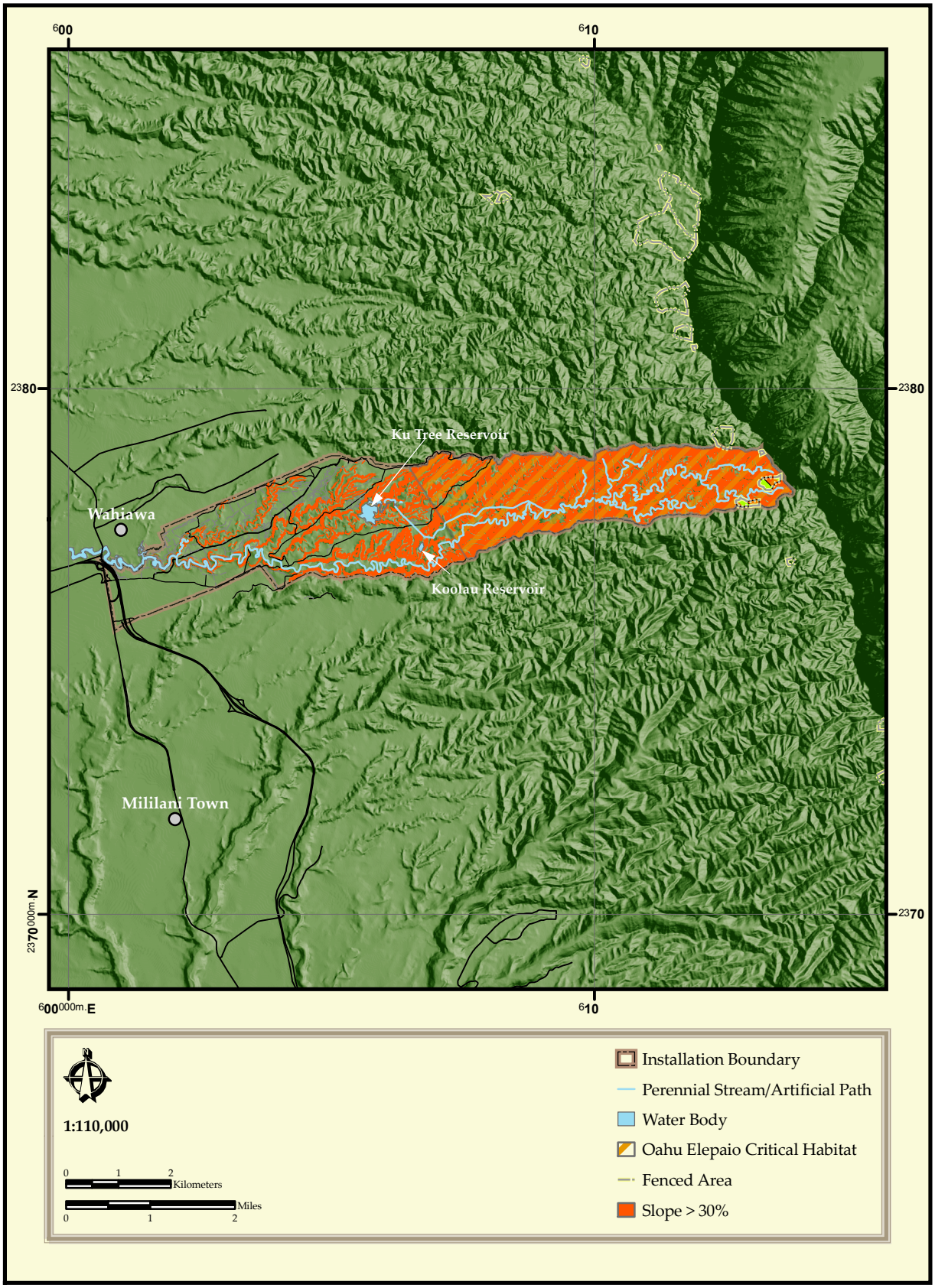


Figure 2.4.c

Training Access at Schofield Barracks East Range

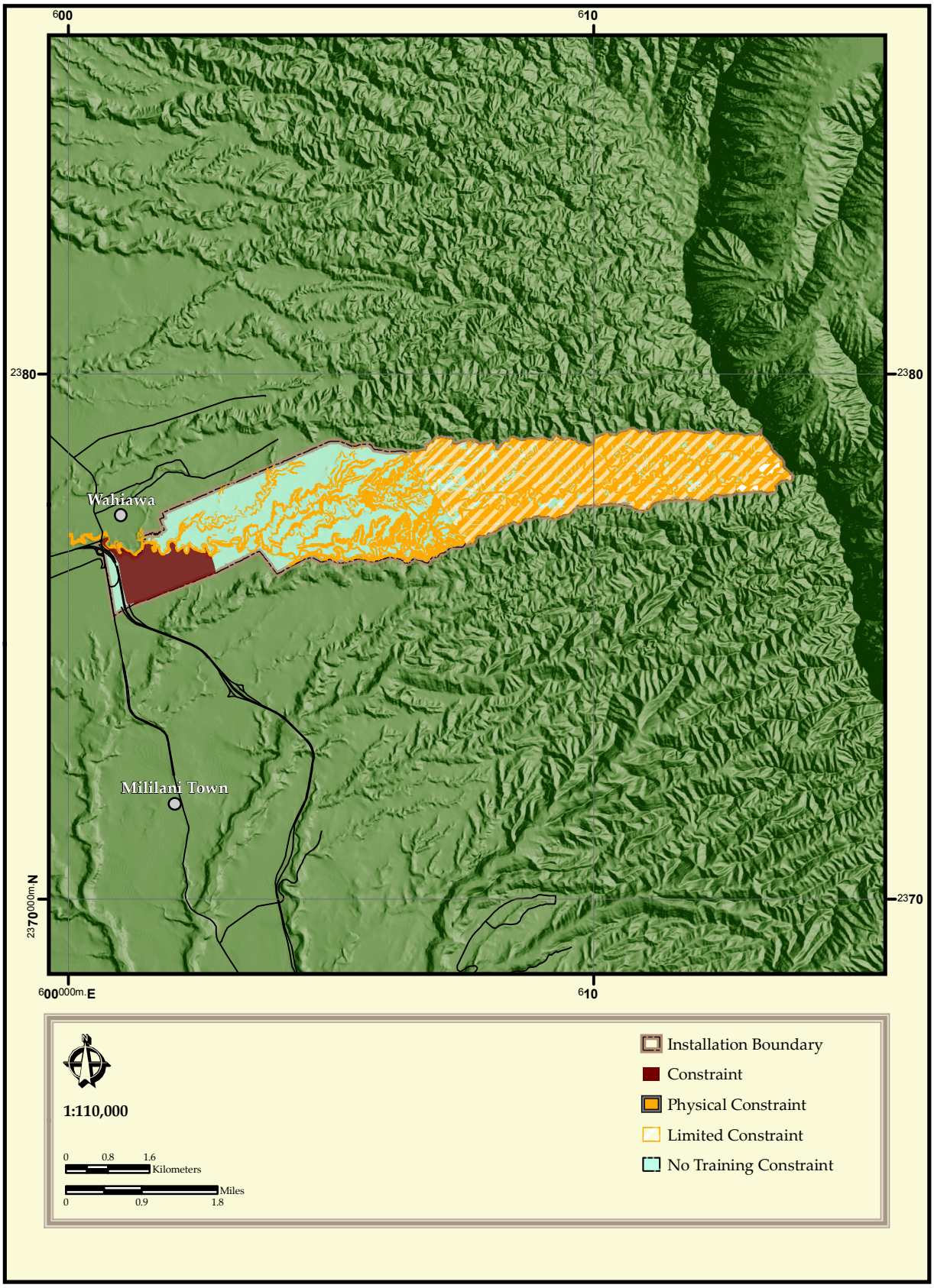


Figure 2.4.d

Table 2.4.a Federally Listed Animals Found and Managed on Schofield Barracks East Range.*

Scientific Name	Hawaiian / Common Name	Federal Status[1]	Global Rank[2]
Snails			
Achatinella byronii/decipiens	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1

* Sources: USFWS 2003a, USAG-HI 2008b, Hawaiʻi Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff, and the USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

1 Key to Federal Status: LE = endangered.

2 Key to Global Ranks as defined by Hawaiʻi Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences).

Pōhākupu, and Mānana soils (Figure 2.4.f). They are well-drained soils with fine to moderately fine textures. The Kapaʻa soil association occurs in the rough mountainous land of the most eastern portions of SBER. Although most of this land (80 percent) is rugged and mountainous, much of the remaining area (75 percent) is Kapaʻa soils, which are deep, well drained, with fine to moderately fine textured subsoils (USACE and Nakata Planning Group 2002a).

The United States Soil Conservation Service (1972) described the soils found on the Island of Oʻahu. Soil erosion is significant and is considered severe in many areas in SBER, especially on steep sloping gulches with 30 to 90 percent slopes.

2.4.7.6 Water Resources

The primary drainage in SBER is the South Fork Kaukonahua Stream, which originates in the Koʻolau Mountains, east of Schofield Barracks. This drainage flows northwest toward Waialua and empties into Lake Wilson on SBER (Figure 2.4.g). Canon, East Pump, Koʻolau, and Ku Tree reservoirs are all located on the Kaukonahua in the East Range, but none of them are currently being used.

2.4.8 General Biotic Environment

2.4.8.1 Threatened and Endangered (T&E) Species and Species of Concern

Island ecosystems and the species they support are particularly sensitive to environmental change due to their limited geographic distribution and small population sizes (Temple 1978). Species endangerment can be attributed to habitat loss and degradation, disease, competition, predation from introduced species, and the collection of species.

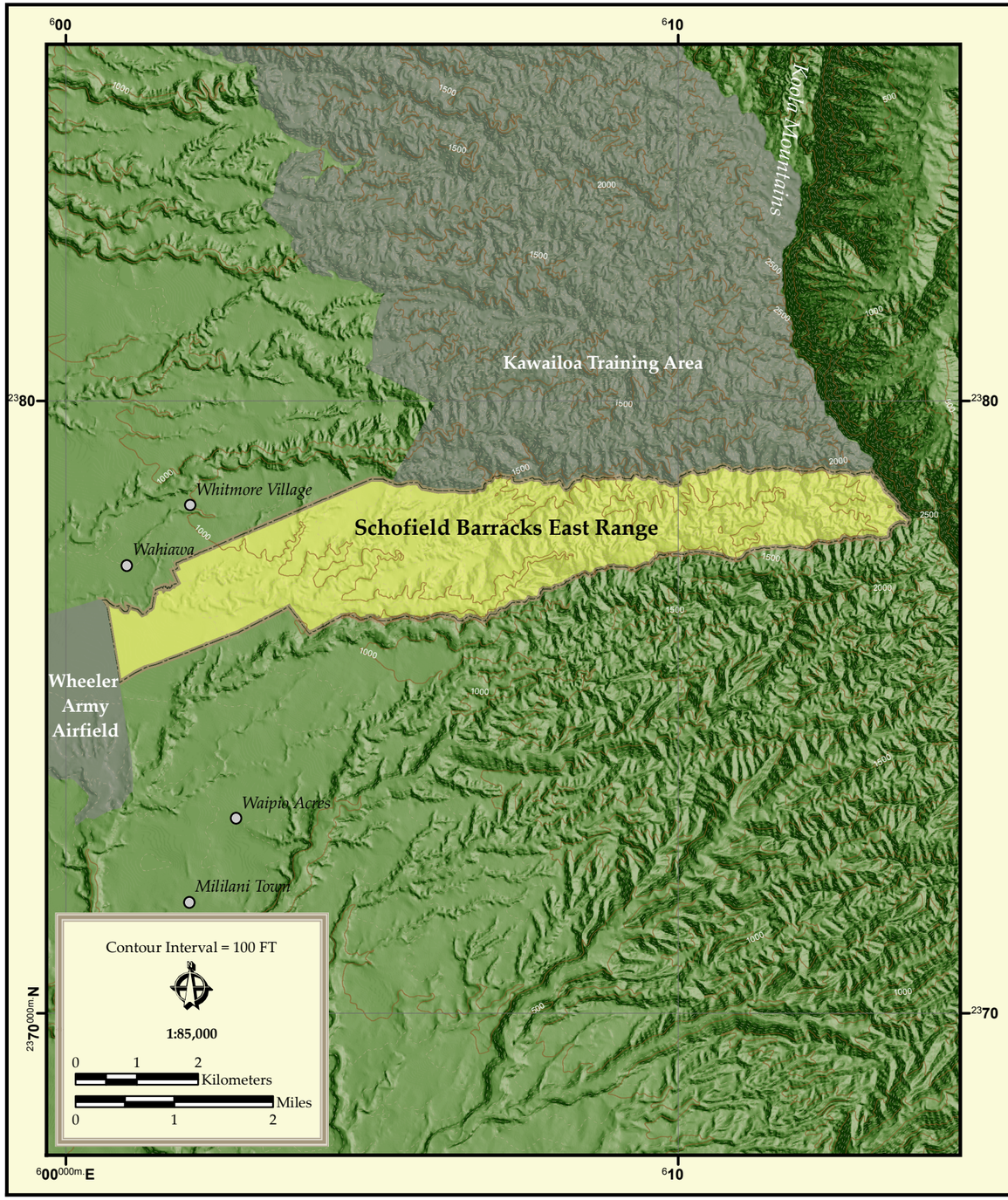
Fauna

One endangered terrestrial mollusk is currently documented as present on SBER (Table 2.4.a). Rare animal locations at SBER are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of Oʻahu* (USFWS 2003a) and the *Implementation Plan for Oʻahu Training Areas* (USAG-HI 2008b).

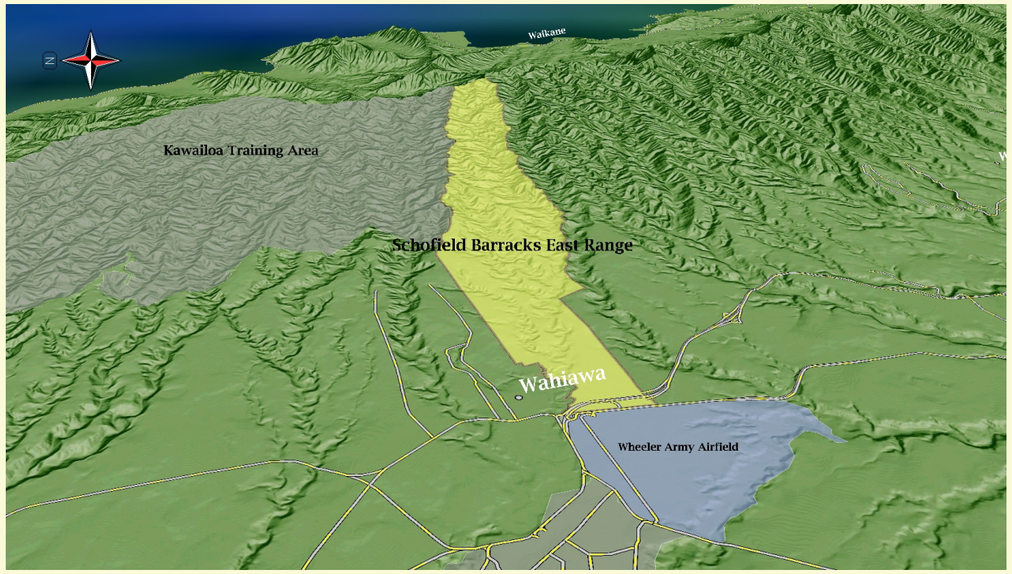
Flora

Thirteen federally listed endangered and one threatened plant species and one candidate species are currently documented on SBER (Table 2.4.b) (HBMP 2007c). Rare plant locations at SBER are described in the Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of Oʻahu (USFWS 2003a), Final Implementation Plan for Oʻahu Training Areas (USAG-HI 2008b), and the HBMP

Topography of Schofield Barracks East Range



3-D Perspective View of Schofield Barracks East Range - Looking East



Percent Slope on Schofield Barracks East Range

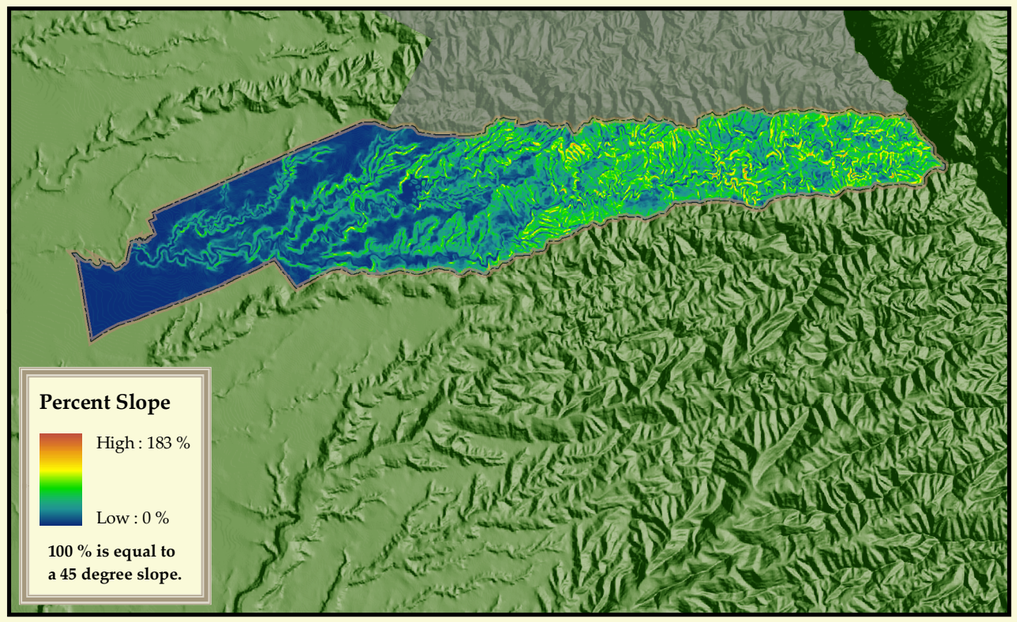


Figure 2.4.e

Land & Soil Types
Schofield Barracks East Range

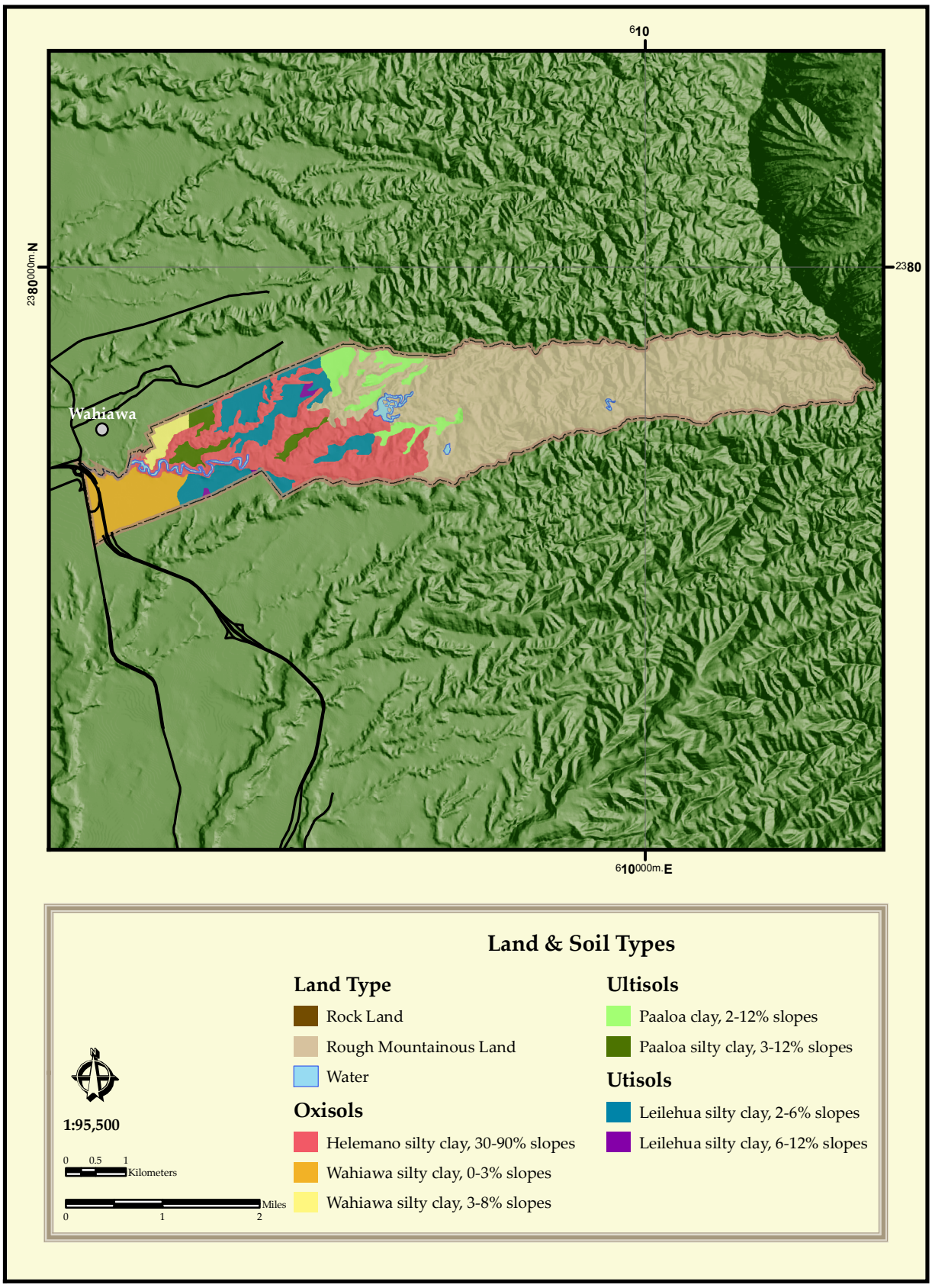


Figure 2.4.f

Water Resources & Wetlands
Schofield Barracks East Range

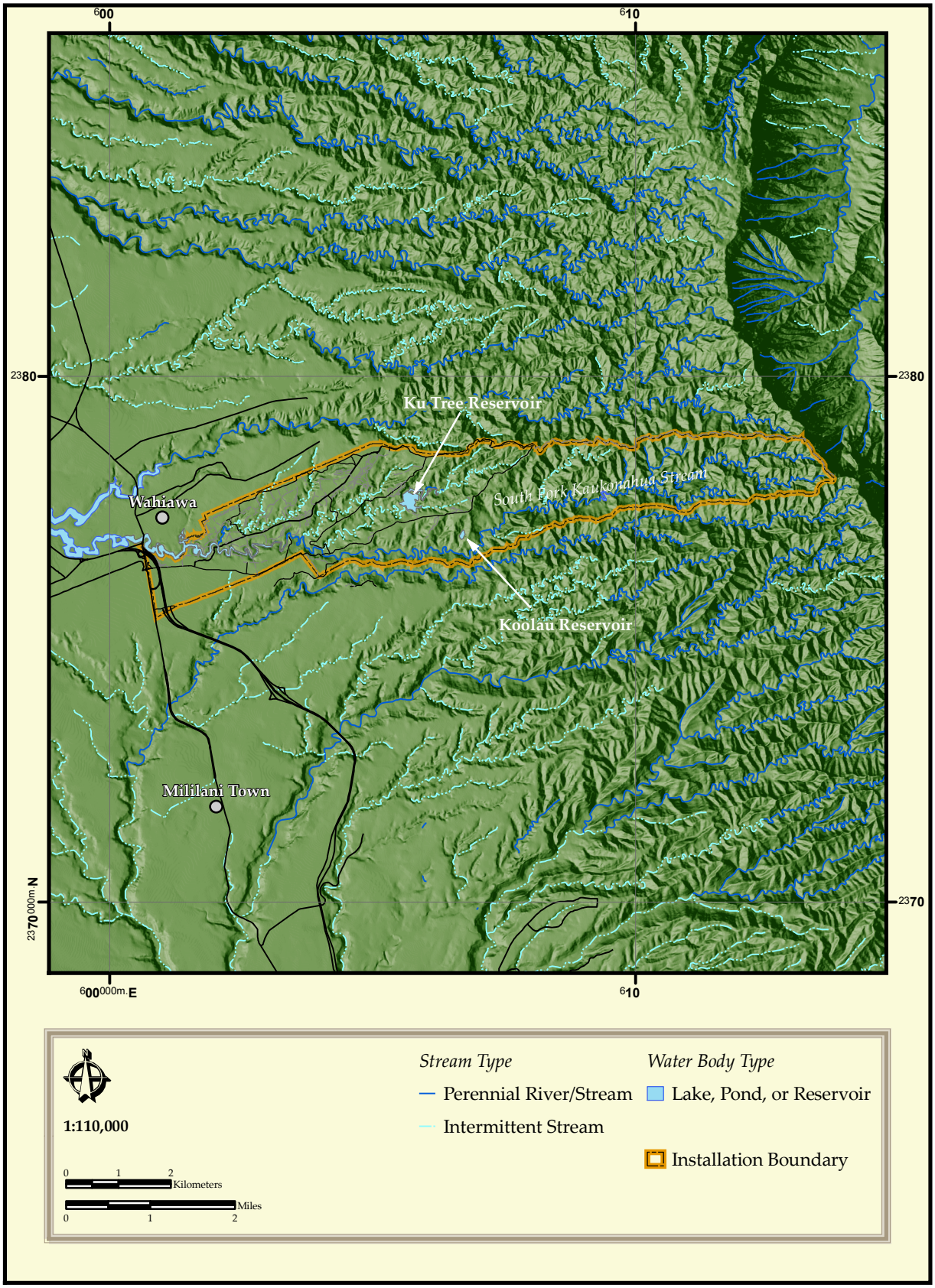


Figure 2.4.g

Table 2.4.b Federally Listed and Candidate Plant Species on Schofield Barracks East Range.*
"O" references species cited in the O'ahu Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Chamaesyce rockii	akoko, koko, kokomalei	O	LE	G1
Cyanea acuminata	ōhā, hāhā, 'ōhā wai, Honolulu cyanea	O	LE	G2
Cyanea koolauensis (Syn. *Rollandia angustifolia*)	hāhā, Palolo Valley Rollandia	O	LE	G1
Cyrtandra subumbellata	ha'iwale, kanawao, ke'oke'o, parasol cyrtandra	O	LE	G1
Cyrtandra viridiflora	ha'iwale, green leaf cyrtandra	O	LE	G1
Gardenia mannii	nanu, na'u, Mann's gardenia	O	LE	G1
Hesperomannia arborescens	lannai Hesperomannia	O	LE	G1
Huperzia nutans (Syn. *Phlegmariurus nutans*)	wawae'iole, nodding club moss	O	LE	G1
Isodendrion longifolium	aupaka, rock cliff isodendrion		LT	G2
Joinvillea ascendens ssp. *ascendens*	'ohe		C	G5T1
Lobelia gaudichaudii ssp. *koolauensis*	'opelu, mo'owahie	O	LE	G1T1
Phyllostegia hirsuta	hairy phyllostegia	O	LE	G1
Pteris lydgatei (Syn. *Pteris lidgatei*)	Lydgate's brake	O	LE	G1
Tetraplasandra gymnocarpa	'ohe 'ohe		LE	G1
Viola oahuensis	Forbe's O'ahu violet	O	LE	G1

* Sources: HBMP 2007c, USFWS 2003a, USAG-HI 2008b, Hawai'i Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff and USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; LT = threatened; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai'i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled globally (typically 6-20 occurrences); G1T1 = species and subspecies or variety critically imperiled globally (typically 1-5); G5T1 = species secure, subspecies critically imperiled (typically 1-5).

database (HBMP 2007c). An additional six federally listed and two candidate species are present on management units near SBER (Table 2.4.c).

2.4.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: Critical habitat information was compiled from USFWS. O'ahu 'elepaio (*Chasiempis sandwichensis ibidis*) is the only federally listed bird species on SBER with designated critical habitat (Figure 2.3.h). An area of 2,226 ac (914 ha) is located on SBER. This represents 2.9 percent of the total acreage designated critical habitat for the taxon. USAG-HI predominantly manages 'elepaio within its designated management units. Critical habitat was designated for the O'ahu 'elepaio in 2001 (USFWS 2001b). The 2003 USFWS Biological Opinion states that the conservation measures executed by the U.S. Army off-sets the adverse effects of training. Some of the measures taken include the control of rodents, actions to minimize the destruction and degradation of forest structure, the removal of ungulates, and the execution of a Wildland Fire Management Plan.

Critical habitat was designated for listed plant species on the Island of O'ahu in 2003 (USFWS 2003b); however, most of the USAG-HI's lands were eliminated in the final rule due to the Army's

Critical Habitat & Areas of Special Concern
Schofield Barracks East Range

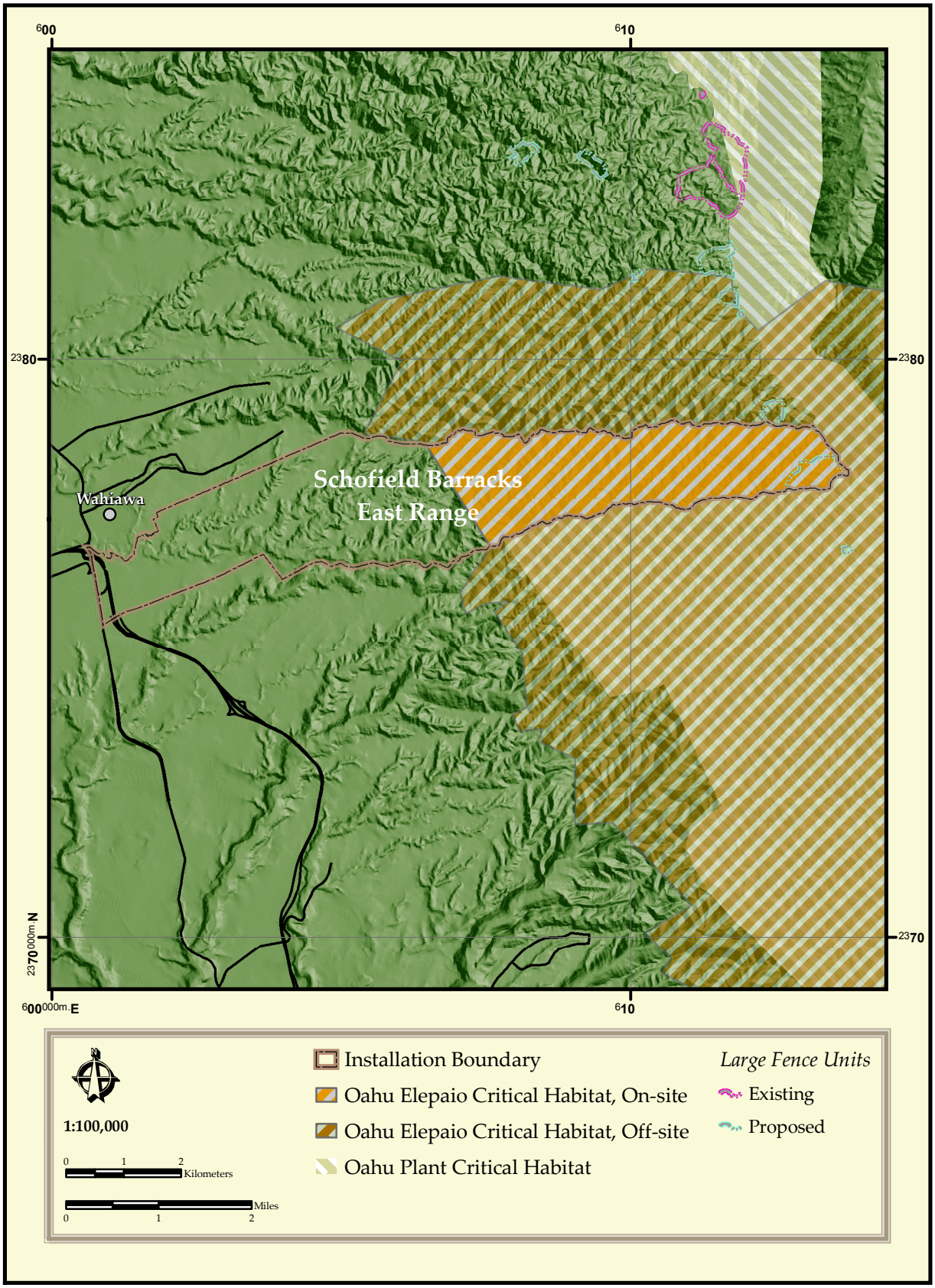


Figure 2.4.h

Table 2.4.c Additional Federally Listed and Candidate Plants in Management Units near Schofield Barracks East Range.* "O" references species cited in the Oʻahu Implementation Plan and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Cyanea calycina	Oʻahu cyanea		C	G1
Cyanea crispa	Koʻolau Range Rollandia	O	LE	G1
Cyanea humboldtiana	Oʻahu Rollandia		LE	G1
Cyanea lanceolata			C	G1
Cyanea st.-johnii	haha, St. John's Rollandia	O	LE	G1
Labordia cyrtandrae	kamakahala, Koʻolau Range labordia	O	LE	G1
Lobelia oahuensis			LE	G1
Trematolobelia singularis	lava slope false lobelia		LE	G1

* Sources: HBMP 2007c, USFWS 2003a, USAG-HI 2008b, Hawaiʻi Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff and USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawaiʻi Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences).

ongoing conservation efforts. Plant critical habitat abuts the southeastern and eastern boundary of SBER. The type of training in the eastern half of SBER that impacts the vegetation and critical habitat is limited.

Designated Management Units: Management units (MUs) are located in the Koʻolau Mountains of Oʻahu, where the most important wild populations of the target taxa occur (Figure 2.4.i). These areas encompass the important habitat for *in situ* management and reintroduction efforts that will lead to the stabilization of the target taxa. The MUs occur on Army, State of Hawaiʻi, City and County of Honolulu and private lands (USAG-HI 2003a).

There is one Oʻahu IP management unit (MU) located on SBER—South Kaukonahua.

South Kaukonahua MU is composed of two subunits: I (93.5 ac/37.8 ha), II (0.95 ac/0.38ha). The land is owned by the United States of America. Subunit I has 10 endangered plant species (*Cyanea acuminata, Cyanea koolauensis*, *Cyrtandra viridiflora, Cyrtandra subumbellata, Gardenia mannii, Hesperomannia arborescens, Huperzia nutans*, *Lobelia gaudichaudii* ssp. *koolauensis*, *Phyllostegia hirsuta,* and *Viola oahuensis*) targeted for stabilization. Subunit II has one plant species (*Sanicula purpurea*) targeted for stabilization. Other noteworthy species in the MU includes *Isodendrion longifolium* (LT), *Joinvillea ascendens* ssp. *ascendens* (C), *Labordia hosakana* (SOC), *Platydesma cornuta* var. *cornuta* (C), and *Zanthoxylum oahuense* (C). Subunit I is projected to be protected by fencing in Oʻahu IP year 6 (2013). Subunit II is projected for fencing in year 8 (2015).

There are four Oʻahu Implementation Plan MUs located to the south of SBER in the central and southern Koʻolau Mountains. They are Kīpapa, Mānana, Waiawa, and Wailupe MUs.

Kīpapa MU is 3.7 ac (1.5 ha) and is a USFWS Refuge. There is a single Oʻahu IP targeted plant species (*Lobelia gaudichaudii* ssp. *koolauensis*) designated for stabilization in this MU. This MU is scheduled for fencing in Oʻahu IP year 12 (2019).

Mānana MU is 18.1 ac (7.3 ha) and is owned by Mānana Valley Farm. There are two Oʻahu IP targeted plant species (*Labordia cyrtandrae* and *Lobelia gaudichaudii* ssp. *koolauensis*)

Management Units
Schofield Barracks East Range

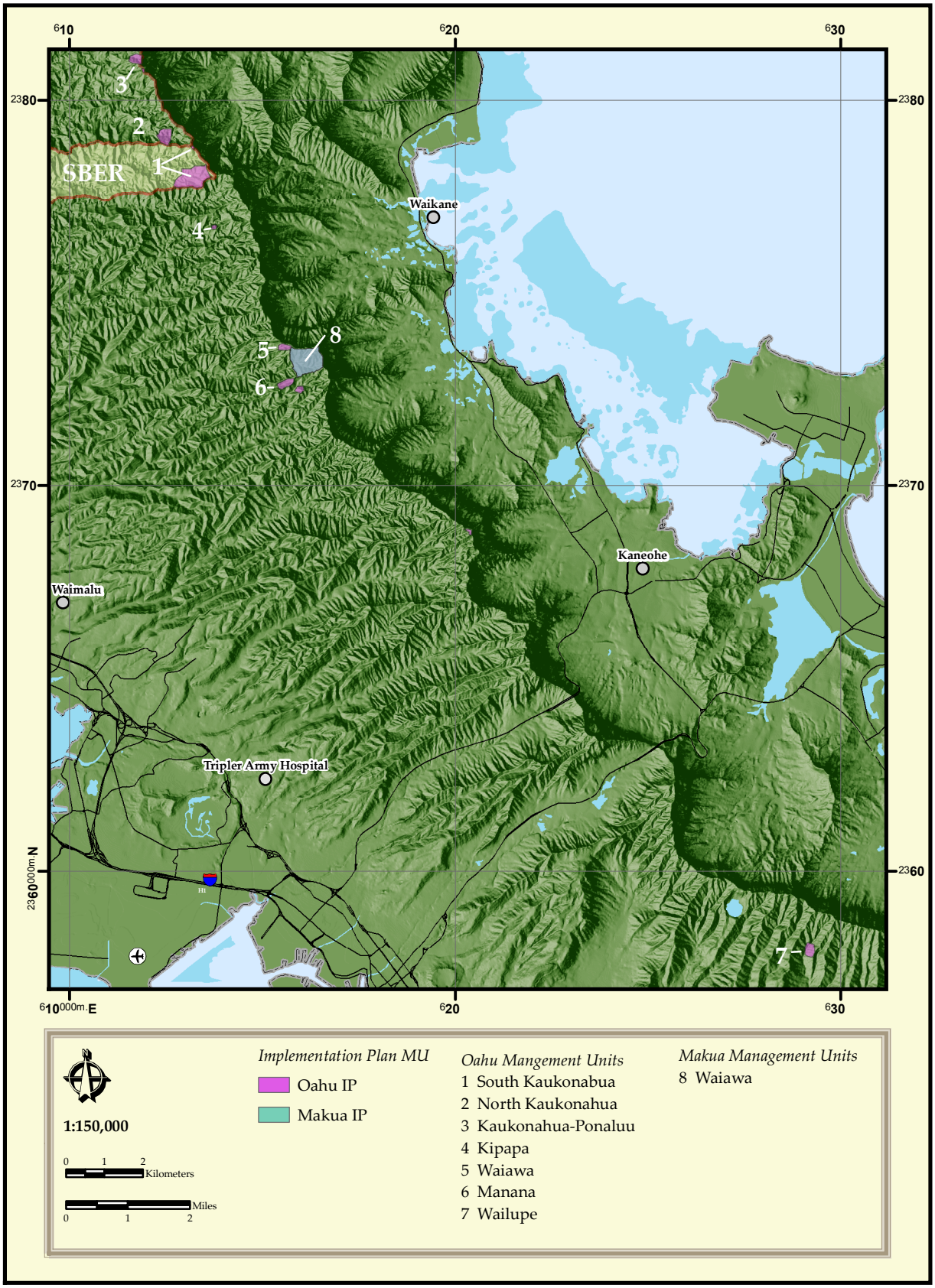


Figure 2.4.i

designated for stabilization. *Tetraplasandra gymnocarpa* is present in this MU. Mānana MU is scheduled for fencing in O‘ahu IP year 5 (2012). A license agreement with the state and an environmental assessment are needed.

Wailupe MU is owned by the State of Hawai‘i and is 21.2 ac (8.6 ha). There is a single O‘ahu IP targeted plant species (*Cyanea crispa*) designated for stabilization. *Cyanea lanceolata* (C) is also present at this MU. Wailupe MU is scheduled for fencing in O‘ahu IP year 16 (2023).

Waiawa MU is owned by B.P. Bishop Estate and totals 136.7 ac (55.3 ha). The O‘ahu MU, Subunit II, is 12.7 ac (5.1 ha). Two O‘ahu IP target plant species are present (*Chamaesyce rockii* and *Cyanea st.-johnii*), but only *Chamaesyce rockii* is designated for stabilization. Other noteworthy species present in the MU include *Cyanea calycina* (C)*, C. humboldtiana* (LE)*, C. koolauensis* (LE)*, Lobelia oahuensis* (LE)*, Tetraplasandra gymnocarpa* (LE)*,* and *Trematolobelia singularis* (LE). A fence is scheduled for O‘ahu IP year 15. Establishment requires a license agreement with the landowner and an environmental assessment. The larger Subunit I is to the east and is a Mākua IP subunit. The above MUs and their locations are discussed in detail in the *Final Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b).

2.4.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii’s Biodiversity and Mapping Program update SBER’s fauna species lists when new species are identified and verified as present on SBER.

Keystone Species

Conditions and needs of keystone species is an area that requires development for SBER.

State of Hawaii’s Species of Greatest Conservation Need

A comparison of SBER’s current fauna lists and Hawaii’s CWCS results in the identification of eight bird, one mammal, possibly four fish, and two invertebrate species of greatest conservation located at SBER (Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered and located on SBER. (See Appendix 3, *Species Lists*. Annex B, *SBER Species of Greatest Conservation Need*.)

Mammals

A comprehensive survey of introduced mammals at SBER has not been conducted by USAG-HI. The ‘ope‘ape‘a, or Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only indigenous terrestrial mammal on the Hawaiian Islands. A hoary bat was observed along the Schofield-Waikāne Trail that runs between SBER and KLOA in 1976 (USAG-HI 2004).

Eight introduced mammals may be present at SBER. (See Appendix 3, *Species Lists*, Annex B. *SBER Mammals*.)

Birds

A comprehensive survey of avian species at SBER has not been conducted. However, from 1977 to 2000, a National Audubon Society Christmas Bird Count was conducted annually along four miles of the northern border of SBER on the Waikāne Trail (Bremer 2006). Six endemic species, 3 indigenous species, and 25 introduced/visitor bird species were identified on SBER. These bird counts were conducted by volunteers of the Hawai‘i Chapter of the National Audubon Society. The count was discontinued in 2000. (See Appendix 3, *Species Lists*. Annex B, *SBER Birds*.)

Herpetofauna
A comprehensive survey of introduced herpetofauna species at SBER has not been conducted. There are no native terrestrial herpetofauna in the Hawaiian Islands. Fifteen introduced herpetofauna species may be present at SBER.

Introduced Reptiles: Ten species may be present at SBER and are the same as those listed for SBMR (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex B, *SBER Introduced Herpetofauna*.)

Introduced Amphibians: Five species may be present at SBER (McKeown 1996; Hawai‘i Stream Assessment database 1992). *Eleutherodactylus coqui* (common coqui) was found on SBER in 2001. After six years of control measures, it is believed, based on monitoring, that the coqui has been successfully eradicated from SBER (USAG-HI 2007a). (See Appendix 3, *Species Lists*. Annex B, *SBER Introduced Herpetofauna*.)

Fish
A comprehensive survey of endemic or introduced fish species at SBER has not been conducted. USAG-HI has no data available for species that may be present in drainages located at SBER.

Invertebrates
A comprehensive survey of invertebrate species at SBER has not been conducted. Seven endemic invertebrates have been documented at SBER. They include 4 O‘ahu tree snails, 2 species of Achatinellid land snails, and 1 species of Amastrid land snail (HHP 1994d). Other native invertebrates include the unique yellow-faced bee (*Hylaeus unica*), and opae oehaa or the Hawaiian prawn (*Macrobrachium grandimanus*) located in Kiikii Stream (Hawai‘i Stream Assessment database 2000, HHP 1994d).

There is little data available for SBER on introduced terrestrial invertebrates. Four invertebrates have been documented as present; along with three others as potentially present (HHP 1994a, HBMP 1994c, and USFWS 2003b). Two species of aquatic invertebrates may be located at SBER. This information is based on data from the Kaukonahua (Kiikii) and Poamoho Streams on Kawailoa Training Area (Hawai‘i Stream Assessment database 1989-2000). In the future, an ant survey will be conducted at SBER determine their range, presence, and impact on endangered species (S. Ching, USAG-HI ONR staff, per. com. 2008). (See Appendix 3*, Species Lists*. Annex B, *SBER Invertebrates*.)

2.4.8.4 Flora
USAG-HI has documented 112 identified and two unidentified taxa at SBER in the Hawai‘i Biodiversity and Mapping Program (HBMP 2007c) and its incipient weed database. See Appendix 3, *Species Lists* Annex B, *SBER Plant Species*, for a comprehensive list of native and introduced plant species found at SBER.

Keystone Species
Conditions and needs of keystone species is an area that needs to be developed for SBER.

State of Hawaii’s Species of Greatest Conservation Need
A comparison of SBER’s plant species list and Hawaii’s Comprehensive Wildlife Conservation Strategy resulted in the identification of 41 plant species of greatest conservation need present at SBER (HBMP 2007c and Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered and located on SBER. (See Appendix 3, *Species Lists*. Annex B, *SBER Species of Greatest Conservation Needs*.)

Incipient Species

USAG-HI ONR staff has identified 13 species that it will control and eradicate when found in areas where rare plant species occur at SBER. (See Appendix 3, *Species Lists*. Annex B, *SBER Weeds*.)

Non-Native/Weedy Species

Six invasive/weed species have been located at SBER. When these species are determined to be having a negative effect on SBER's training areas, native plant habitats and ecosystems, they are controlled (NRCS PLANTS Database, June 2008. Weeds of Hawai'i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex B, *SBER Weeds*.)

2.4.8.5 Native Vegetation Communities

There are four native vegetative communities located at SBER: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural communities (Figure 2.4.j). These community types are categorized into ecological zones defined by elevation, topography, and prevailing ecological conditions (Wagner et al. 1999). (See Appendix 3, *Species Lists*. Annex B, *SBER Native Vegetation Communities and Descriptions*.)

2.4.8.6 Wetlands and Deep Water Habitats

The U.S. Army Corps of Engineers (USACE) conducted a wetlands delineation survey of Schofield Barracks East Range. Of the eight areas identified as potential wetlands, three (Ko'olau Reservoir, Sedge Pond, and Bowl Wetland) were determined to be regulated wetlands (see Figure 2.4.g, *Water Resources*). Three of the potential wetlands (Ku Tree Dam and Reservoir, Canon Dam Reservoir and Frog Pond) met the three Corp of Engineers' hydric indicators for a wetland, but were determined to be streams. The National Wetland Inventory "wetland" site did not meet the criteria for a regulated wetland. The Kim Chi Miau water body site was identified, but not physically surveyed because of inaccessibility, and its status is unknown (USACE 2005). There are no known deep water habitats located on SBER.

Vegetation Communities
Schofield Barracks East Range

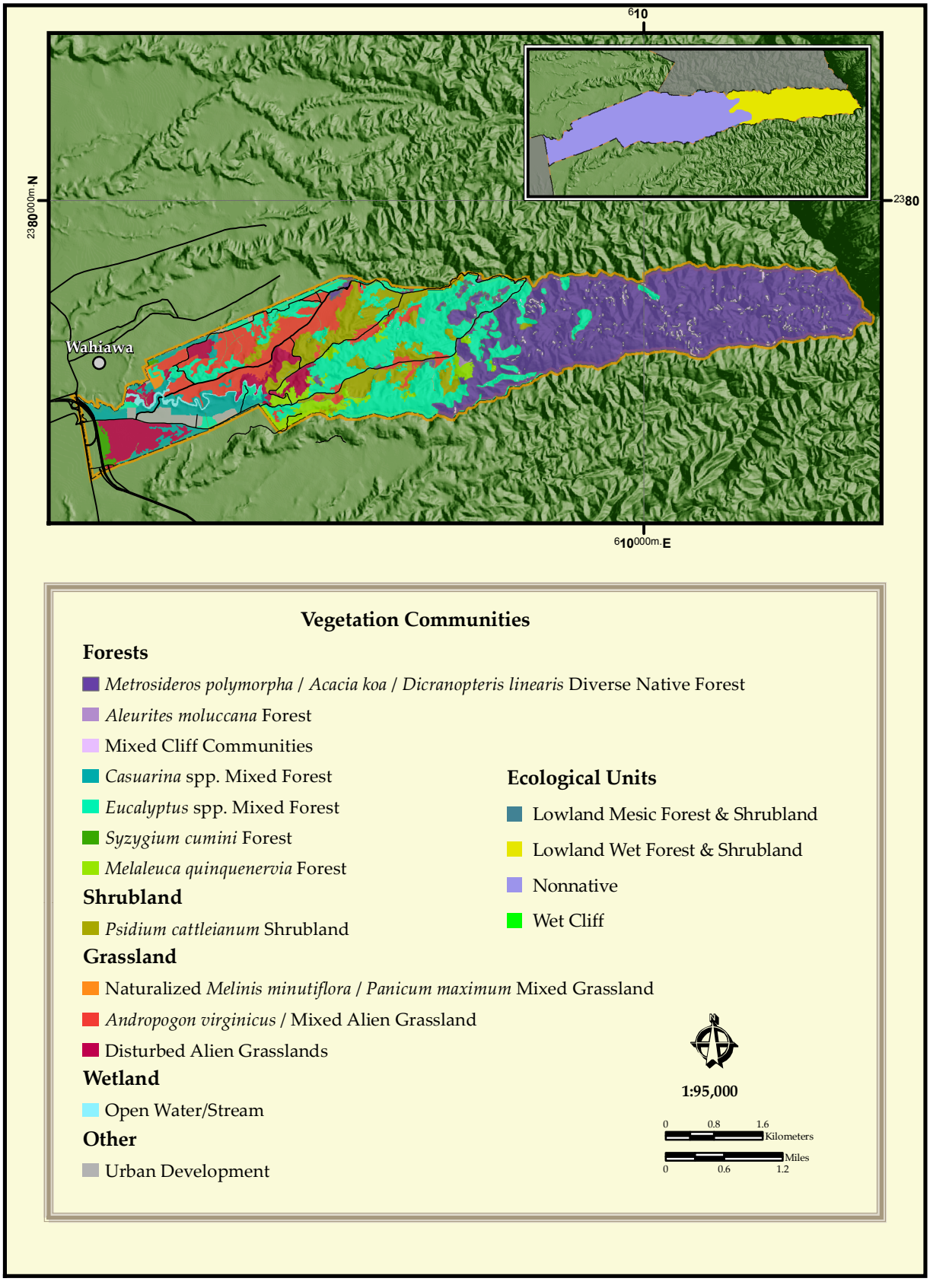


Figure 2.4.j

2.5 Kawailoa Training Area

2.5.1 Location and Neighbors

Kawailoa Training Area (KLOA) is located in north-central O‘ahu on the western slopes of the Ko‘olau Mountain Range (Figure 2.5.a). Access to KLOA is very limited due to the lack of improved roads, steep terrain, and dense vegetation. An improved paved roadway traverses through a small portion of northwestern KLOA; most training and land management activities use helicopters to transport people, equipment, and supplies. The town of Wahiawā (pop. 16,151) is located near the southwestern corner of the installation.

KLOA is bordered on the south by Schofield Barrack East Range; on the Ko‘olau crest to the east by private land, Kaipapa‘u Forest Reserve, Hau‘ula Forest Reserve, and Sacred Falls State Park; on the north by Kahuku Training Area; and on the west by private agricultural lands. The majority of KLOA is located in the Waialua District of O‘ahu. The southern portion of KLOA falls within the Wahiawā District.

2.5.2 Infrastructure

2.5.2.1 Ranges and Training Lands

Kawailoa Training Area (KLOA) is the largest of all the training areas in O‘ahu, consisting of 23,010 ac (9,312 ha) on the slopes of the Ko‘olau Mountain Range and located directly south of Kahuku Training Area (Figure 2.5.b). KLOA is characterized by very deep ravines, dense vegetation, and tropical rainforest, and contains some of the most rugged terrain in Hawai‘i. One unimproved roadway along the western boundary of KLOA provides vehicle access, but all other access is via foot or helicopter. Less than one-quarter of the area (5,310 ac, 2,150 ha,) is suitable for maneuvers (USAEC and Nakata Planning Group 2002a). No facilities exist at KLOA.

KLOA resides on licensed lands. These licensed parcels include 5,009 ac (7,533 ha) from Dole Foods (DACA-84-5-92-99, renewal pending), 13,611 ac (5,508.17 ha) from the Kamehameha Schools (DACA84-5-92-99, holdover tenancy), and 4,390 ac (1,777 ha) from the State of Hawai‘i (DA-94-626-ENG-78, August 17, 1964 to August 16, 2029).

2.5.2.2 Cantonment Area

KLOA does not have a cantonment area.

2.5.2.3 Wheeler Army Airfield

KLOA is the primary training area for aviation units stationed at WAAF (see Section 2.3.2.3, *Wheeler Army Airfield*).

2.5.2.4 Helicopter Landing Pads/Zones

There are 23 landing pads/zones at KLOA (Figure 2.5.b)

2.5.2.5 Drop Zones

KLOA has one parachute equipment landing zone (Figure 2.5.b).

2.5.2.6 Commercial/Other Airports

See Section 2.3.2.4, *Schofield Barracks Military Reservation, Commercial/Other Airports.*

Location & Land Ownership of Kawailoa Training Area

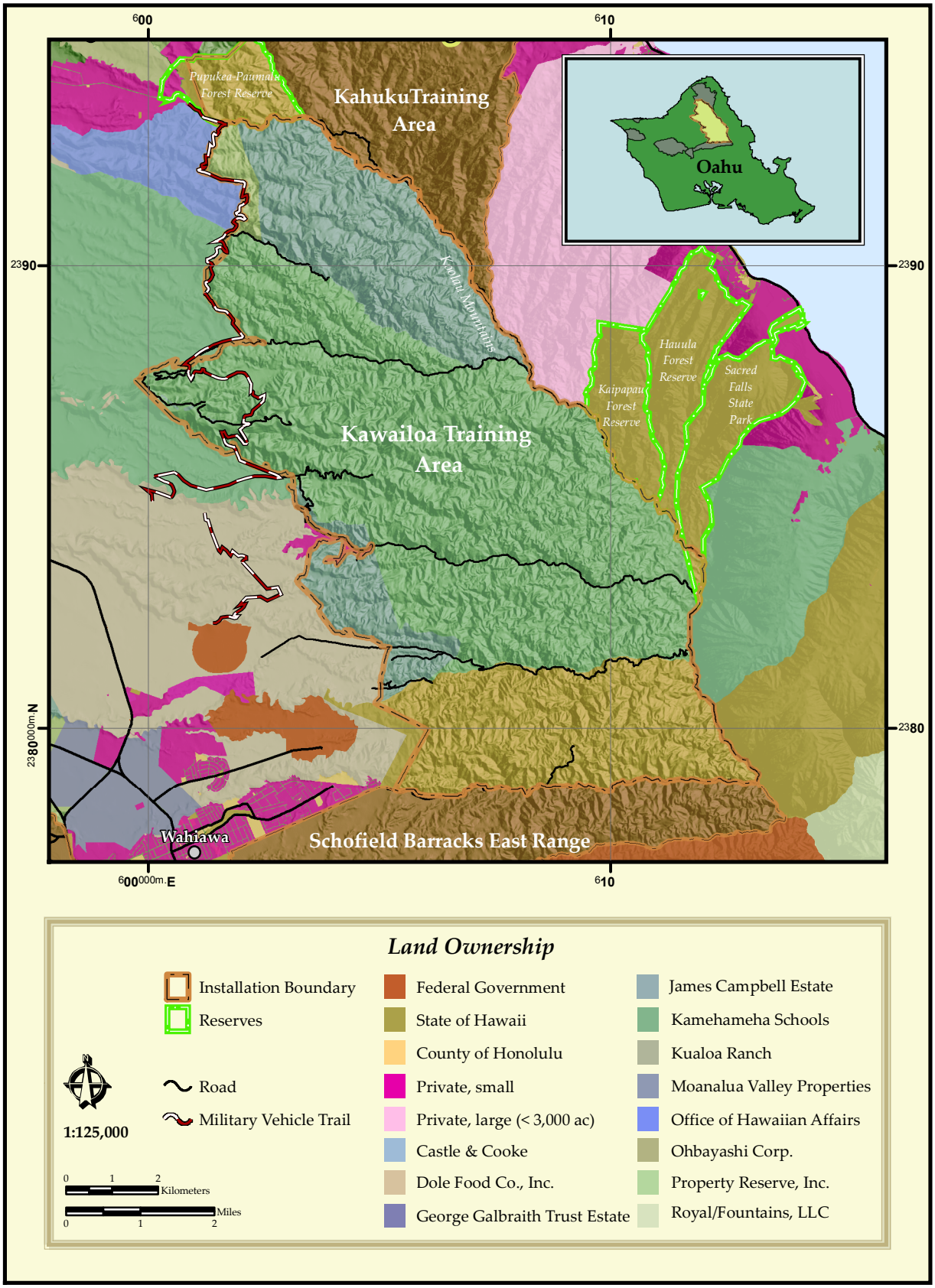


Figure 2.5.a

Training Areas at Kawailoa Training Area

Figure 2.5.b

2.5.2.7 Harbors
See Section 2.3.2.5, *Schofield Barracks Military Reservation, Harbors*.

2.5.2.8 Roads
There are no primary or secondary roads located on KLOA (see Figure 2.5.b). There are approximately 40 mi (64 km) of tertiary roads and approximately 34 mi (55 km) of unimproved roads (four-wheel-drive trails) at KLOA. Dust can be a problem on unimproved roads.

2.5.3 Abbreviated History

2.5.3.1 Installation History
KLOA was established as a troop maneuver and training area under a non-exclusive maneuver permit on January 25, 1955. Because of the extremely rugged nature of the terrain at KLOA, it is doubtful that the area supported much agriculture prior to acquisition, but upland areas would have been exploited for the naturally occurring flora and fauna (Ogden Environmental and Energy Services 1998).

2.5.3.2 Cultural Resources
KLOA has 90 known archeological sites (e.g., agricultural sites, habitation complex, and enclosure (USAG-HI 2007b). In the Anahulu Valley, there are rock shelters dating to 1280 A.D., burial caves, a pond field, irrigation sites, habitation terraces dating to the 1600s, walls, and enclosures.

2.5.3.3 Natural Resources Program History
Some of the first zoological surveys at KLOA were for invertebrates and, in particular, for endangered land snails. Gagne et al. (1975) found 505 individuals of *Achatinella*, representing eight taxa. Gagne et al. suggested that predation by rats and by a carnivorous snail species (*Euglandina rosea*) was impacting native tree snail populations in KLOA. Hart (1979) observed three species of *Achatinella* during surveys from 1972 to 1978. Additional surveys were conducted by Hadfield and Mountain (1980), Hadfield (1988), and Hadfield and Miller (1989); and found snail predation by *Euglandina* a primary source of *Achatinella* spp. degradation.

Shallenberger (1977) detected 14 bird species in addition to multiple introduced species, and Shallenberger and Vaughn (1978) observed 17 bird species at KLOA. Hawai‘i Biodiversity and Mapping Program conducted a comprehensive biological survey of KLOA from 1989 to 1993. They chose survey areas that represent native-dominated ecological zones and surveyed for rare species in these preferred habitats.

Botanical surveys have been outsourced by the Army since 1977 to help fulfill some requirements under the Endangered Species Act. Surveys are conducted on KLOA to identify existing rare plant populations and the potential threats to these populations, including the potential impacts of military training activities (RCUH 2000). Survey reports include maps with specific species population locations. Some of the botanical surveys at KLOA include surveys by K. Nagata (November 1976) and by W. Char, G. Gerrish, R. Stemmermann, and L. Yoshida (9 November to December 1976). No federally protected plant species were discovered during either survey. The only other comprehensive biological surveys of KLOA were conducted by Hawai‘i Biodiversity and Mapping Program from 1989 to 1993. Seven native natural vegetation communities were identified at KLOA, two that are considered rare. In addition, 46 rare and endangered plant species were observed at KLOA (R.M. Towill Corporation 1998). The results from these surveys (HHP 1994b) provided the foundation for the biological inventory information found here and in the Endangered Species Management Plan Report (R.M. Towill Corp. 1997b).

2.5.4 Military Mission

KLOA provides training lands for the 25th ID and for tactical field exercises of other Army and U.S. Marine Corps units.

2.5.5 Military Operations and Activities that May Affect Natural Resources

KLOA is used primarily for helicopter aviation training, helicopter unit tactical training, long-range patrol, and command post displacement. Aviation training is restricted to touch and go landings. Aircraft are allowed to remain a minimal amount of time in the same area. Portions of this training area provide an excellent location for mountain and jungle warfare training because of the ravines and dense vegetation present. Approximately 5,310 ac (2,149 ha) of the installation are suitable for maneuver training activities (e.g., Kawai Iki Trail). However, the remaining area is considered unsuitable for maneuver training activities due to excessively steep slopes. In areas with slopes greater than 20 percent, troop deployment is typically limited to single file, small unit maneuvers along ridgelines.

Helicopters transport troops, ONR staff, equipment, and supplies for military training exercise and land management activities. There is the potential to bring invasive species into the area and for foot traffic to disperse plant parts and propagules along trails and into native stands of vegetation during cross-country exercises. Also, training activities that remove vegetation on slopes could cause to soil erosion and soil sedimentation into streams.

No digging or construction activities are allowed due to the majority of the training area being leased from private parties.

2.5.6 Natural Resources Constraints on Training Areas and Ranges

Terrain is the major constraint to training in Kawailoa Training Area (Figure 2.5.c), with slopes exceeding 30 percent. O‘ahu ‘Elepaio Critical Habitat covers 15-20 percent of the southern portion of the training area. There are natural resources limitations in the area, but training is not prohibited (Figure 2.5.d). A single fence unit on the southeastern boundary excludes training, and five relatively small fences are proposed. Collectively, the fenced units will comprise 1,482 acres, or six percent of the land surface. Only ONR staff is permitted inside of the fenced areas.

Training can be suspended or restricted based on an hourly fire danger rating (25th ID (L) and USAG-HI 2003). Live-fire, tracer ammunition, and pyrotechnics are prohibited. Blank ammunition is permitted. If the fire danger rating is Red, there is no smoking, no firing of blanks, and no cooking/warming fires. Non-live fire training is permissible after troops ascertain if any training restrictions are in effect. All fires must be reported and the officer in charge will initiate a “cease fire” order.

Minimum staffing and fire response must be arranged and meet training activities (e.g., live-fire training is conducted when fully trained/certified personnel and functioning equipment is available for fire suppression). If fire suppression equipment is not operational, training at KLOA is suspended. The ONR manager is notified if fires are a potential threat to federally listed plants or animals (25th ID (L) and USAG-HI 2003).

Natural Resources Constraints on Training
Kawailoa Training Area

Figure 2.5.c

Training Access at Kawailoa Training Area

Figure 2.5.d

2.5.7 General Physical Environment and Ecosystems

2.5.7.1 Climate

The annual temperature at KLOA averages between 70°F and 80°F (21°C and 27°C), with seasonal variation ranging from 60°F to 90°F (16°C to 32°C). The average rainfall at KLOA ranges from 250 in (635 cm) at the higher elevations to 50 in (127 cm) in the central plateau region.

2.5.7.2 Geology

KLOA is located on the Koʻolau Mountains, which were derived from the erosion of a shield volcano in the Pleistocene era. The rough mountainous land of KLOA is deeply transected by streams and waterfalls and, because of erosion, much of the surface is covered by fields of stones and boulders. The effects of erosion are considered average, and much of the original lava surfaces of the shield volcano remain intact (USACE and Nakata Planning Group 2002a).

2.5.7.3 Volcanic Hazards

See Section 2.3.7.3, *Schofield Barracks Military Reservation, Volcanic Hazards*.

2.5.7.4 Topography

The elevation of KLOA ranges from 1,000 ft (305 m) in the west to 2,600 ft (793 m) at the summit of the Koʻolau Mountains (Figure 2.5.e). The general topography can be rugged, with deep valley floors rising abruptly to steep mountainous terrain.

2.5.7.5 Soils

Rock lands and stony regions are common to the mountainous portions of KLOA, particularly in the east. A thin and fine textured soil mantle of 1 to 10 inches over saprolite is common to the area. In areas where alluvial fans and valleys reach 30 to 90 percent slope, particularly in southern KLOA, fine-textured Helamano silty clay is common. In the north where slopes range from 40 to 100 percent, fine-textured Kapaʻa silty clays are present. Isolated pockets of Paaloa silty clays occur throughout KLOA where slopes are more gradual (2 to 12 percent) and runoff is slow (Figure 2.5.f). The erosion hazard ranges from slight to very severe at KLOA, depending on the slope of the area (USACE and Nakata Planning Group 2002a). The United States Soil Conservation Service (1972) describes the soils found on the Island of Oʻahu.

2.5.7.6 Water Resources

The primary drainages at KLOA are ʻElehāhā (intermittent), Helemano, Kaiwikoʻele, Kamananui, Kawai Iki, Kawainui, North Fork Kaukonahua, ʻŌpaeʻula, and Poamoho (Figure 2.5.g).

2.5.8 General Biotic Environment

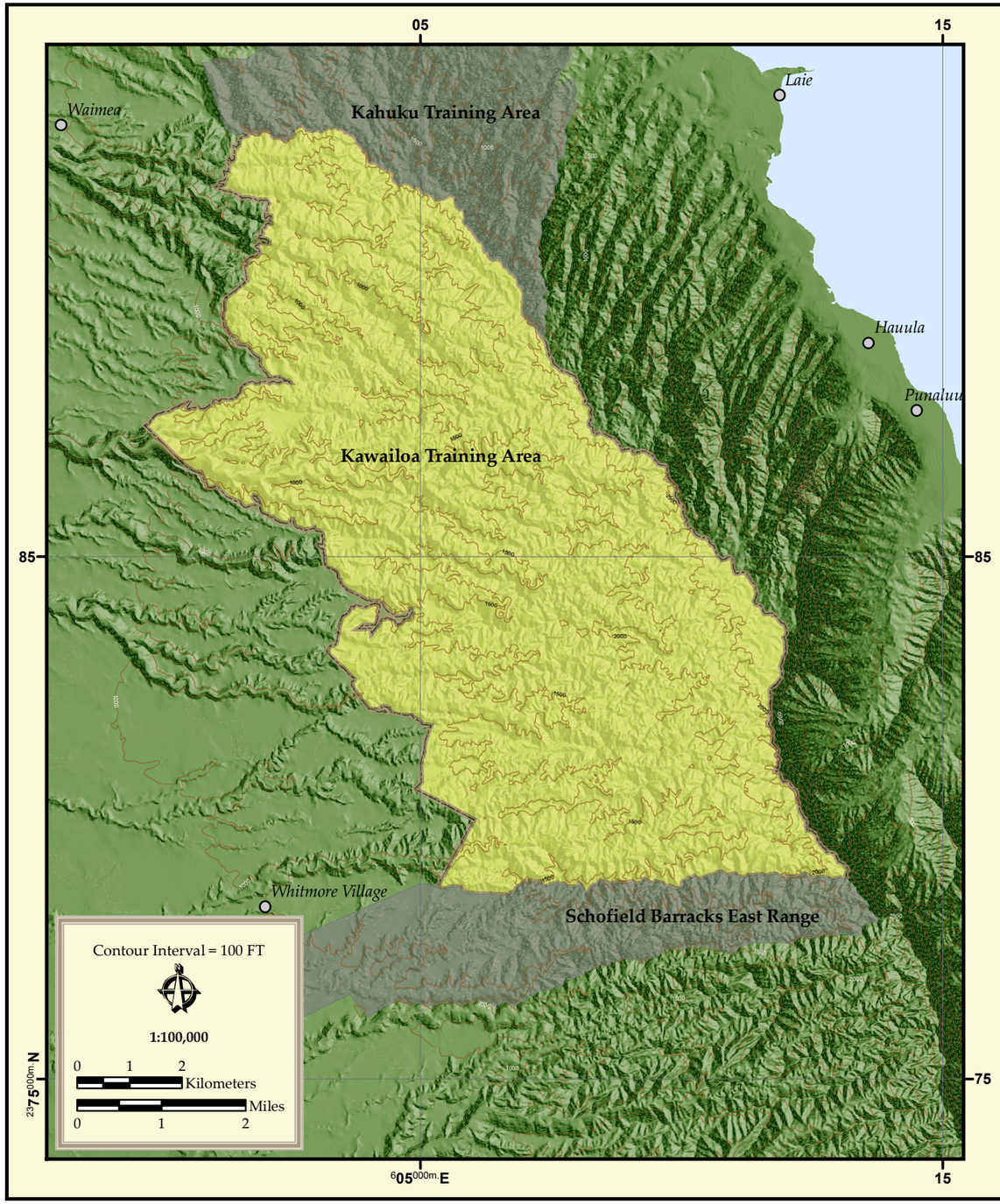
2.5.8.1 Threatened and Endangered Species and Species of Concern

Island ecosystems and the species they support are particularly sensitive to environmental change due to their limited geographic distribution and small population sizes (Temple 1978). Species endangerment can be attributed to habitat loss and degradation, disease, competition, predation from introduced species, and the collection of species.

Fauna

There are eight federally endangered and one candidate animal species documented at KLOA (Table 2.5.a). They include six terrestrial mollusks, one bird, one mammal, and one insect. Rare animal locations at KLOA are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light)* (USFWS 2003a), *Implementation Plan for Oʻahu Training Areas* (USAG-HI 2008b), and HBMP database.

Topography of Kawailoa Training Area



3-D Perspective View of Kawailoa Training Area - Looking Southeast

Percent Slope on Kawailoa Training Area

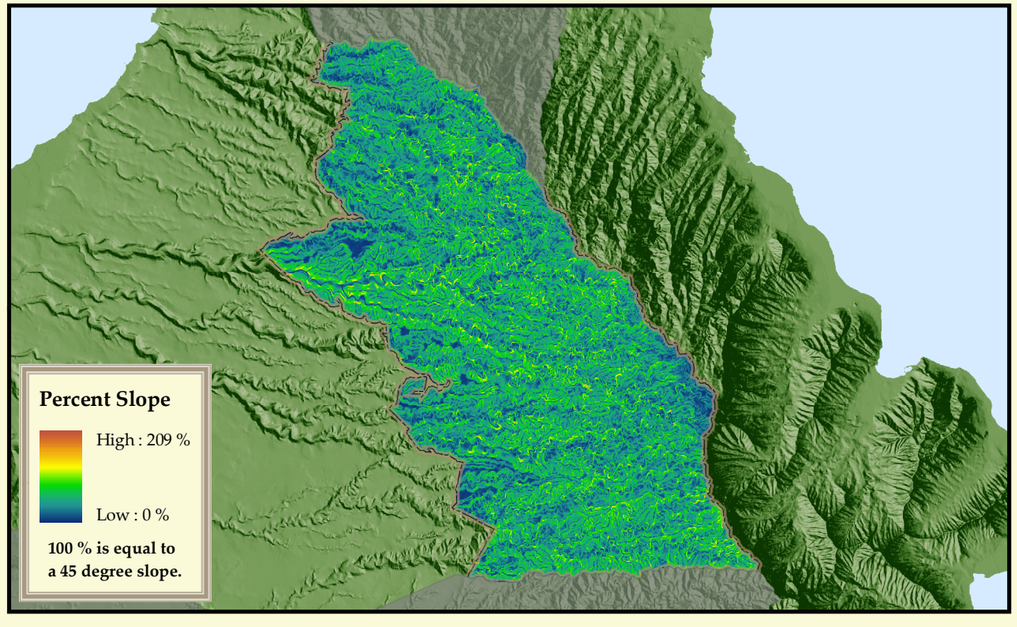


Figure 2.5.e

Land & Soil Types of Kawailoa Training Area

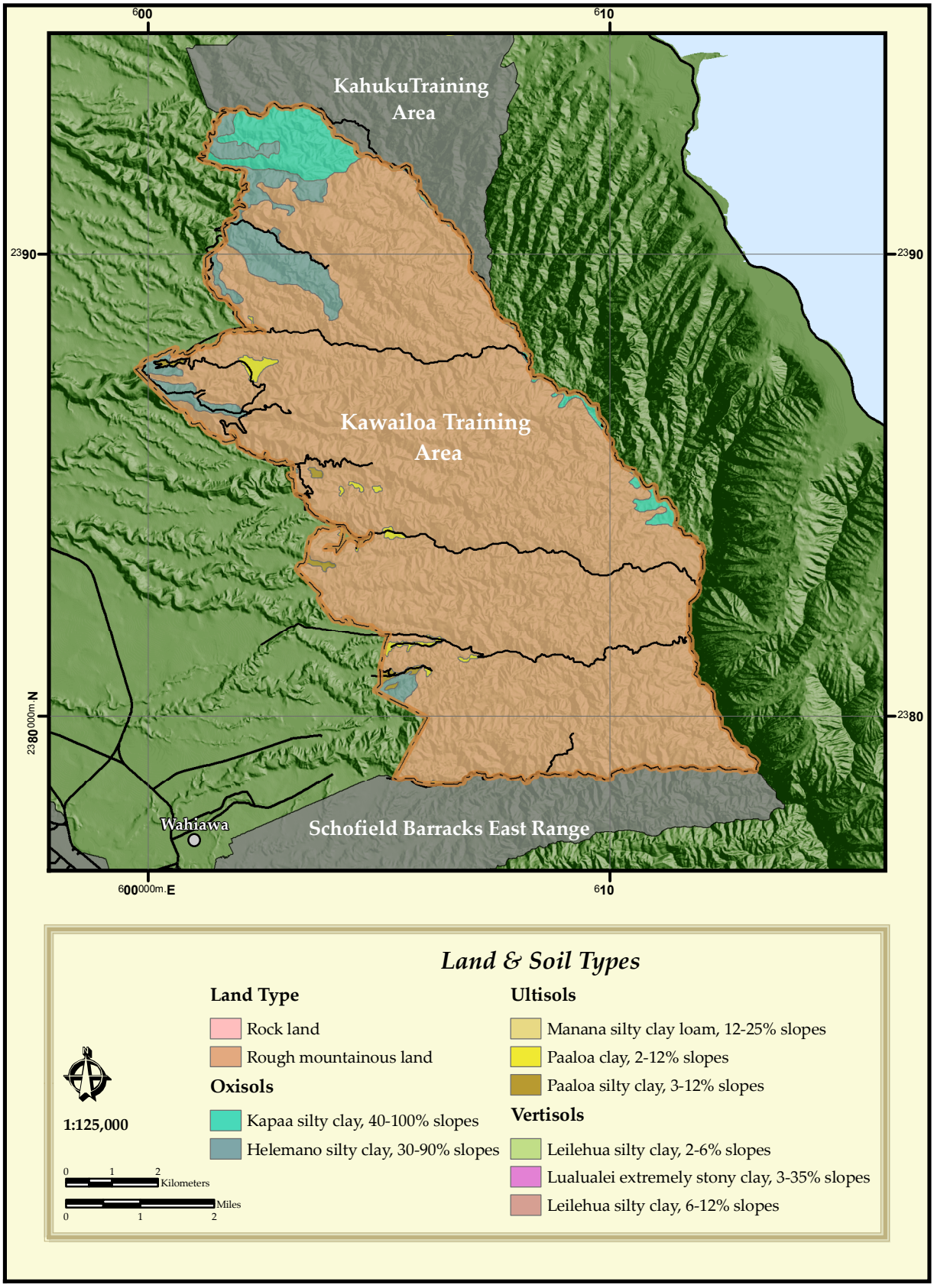


Figure 2.5.f

Water Resources of Kawailoa Training Area

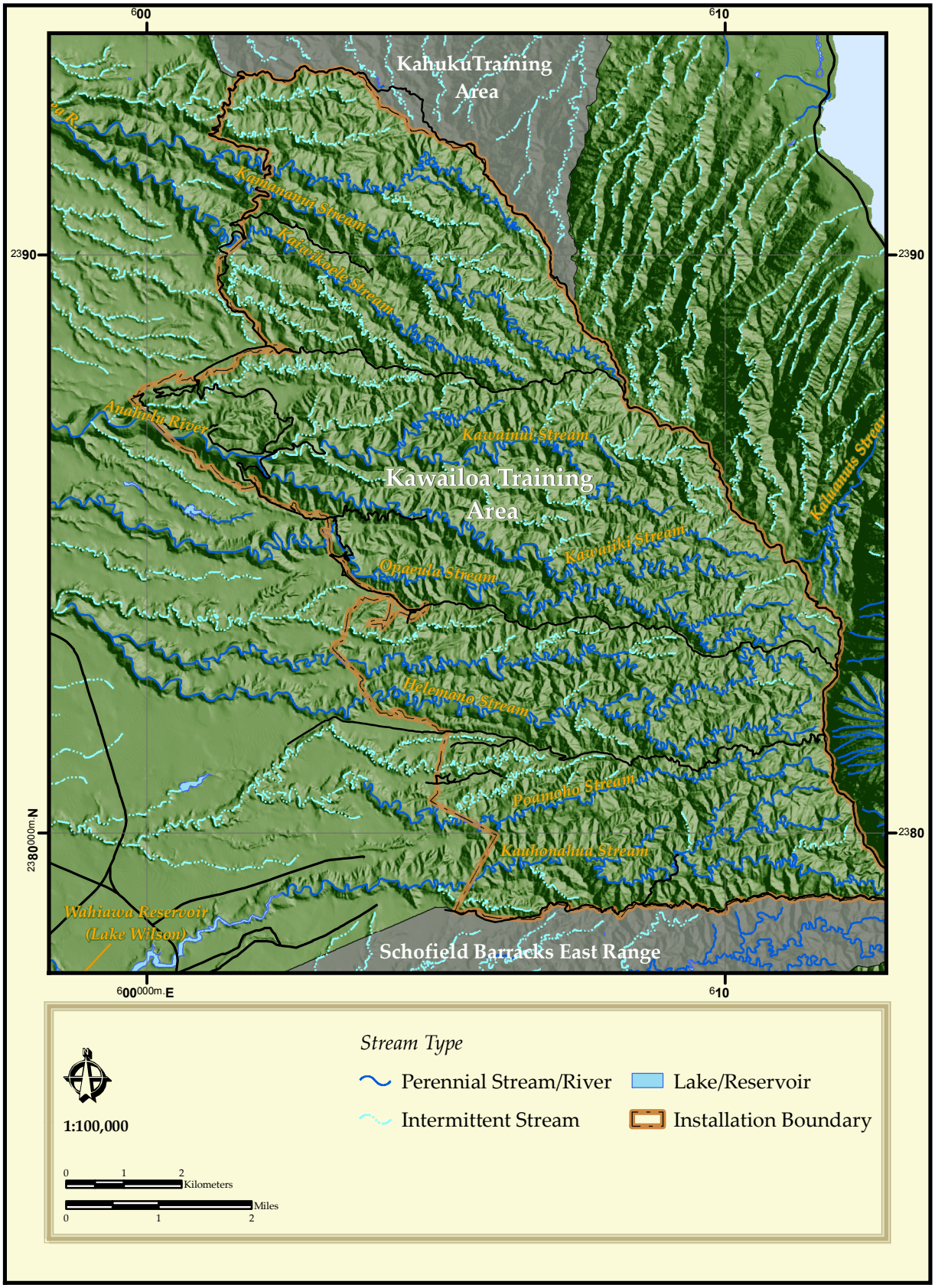


Figure 2.5.g

Table 2.5.a Federally Listed and Candidate Animal Species on Kawailoa Training Area.*

Scientific Name	Hawaiian / Common Name	Federal Status[1]	Global Rank[2]
Mammals			
Lasiurus cinereus semotus	ʻOpeʻapeʻa	LE	G1
Birds			
Chasiempis sandwichensis ibidis	Oʻahu elepaio	LE	G1
Insects			
Megalagrion oceanicum	ocean megalagrion damselfly	C	G2
Snails			
Achatinella apexfulva	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1
Achatinella bulimoides	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1
Achatinella byronii/decipiens	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1
Achatinella lila	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1
Achatinella livida	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1
Achatinella sowerbyana	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1

* Sources: USFWS 2003a, USAG-HI 2008b, HB&MP. Nov. 2007, April 2010. Databook. USAG-HI ONR staff; the USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; GIT1 = critically imperiled, subspecies critically imperiled. G4T2 = apparently secure, subspecies imperiled

Flora

There are 19 federally listed endangered plant taxa and 11 candidate species (Table 2.5.b). Rare plant locations at KLOA are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of Oʻahu* (USFWS 2003a), the *Implementation Plan for Oʻahu Training Areas* (USAG-HI 2008b), and HBMP data base (HBMP 2007d). One federally listed endangered and one candidate plant species are present on management units near KLOA (Table 2.5.c).

Though not located on KLOA, *Schiedea kaalae* (ma olio oli), an endangered plant, receives management assistance from USAG-HI as mitigation to off-set potential impacts that may result from Army training at Oʻahu sub-installations (i.e., wildland fires) (USAG-HI 2008b). The management assistance provided by USAG-HI is beneficial to the adjacent or near land owners in meeting their responsibilities for conserving and protecting species covered under the Endangered Species Act.

2.5.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: Critical habitat information was compiled from USFWS. Oʻahu ʻelepaio (*Chasiempis sandwichensis ibidis*) is the only federally listed bird species on KLOA with designated critical habitat (Figure 2.5.h). A total of 4,349 ac (1760 ha) is located in KLOA. This represents 6.4 percent of the total acreage designated as critical habitat for the taxon. USAG-HI predominantly manages ʻelepaio within its designated management units. Critical habitat was designated for the Oʻahu ʻelepaio in 2001 (USFWS 2001b). The 2003a Biological Opinion states that the conservation measures executed by the U.S. Army off-sets the adverse effects of training. Some

Table 2.5.b Federally Listed and Candidate Plant Species on Kawailoa Training Area.* "O" references species cited in the O'ahu Implementation Plan (IP) and "M" species in the Mākua Implementation Plan.

Scientific Name	Common Name	IP	Federal Status[1]	Global Rank[2]
Chamaesyce rockii	'akoko, koko, kokomalei, Rock's broom spurge	O	LE	G1
Christella boydiae	Boyd's maiden fern		C	G1
Cyanea acuminata	'oha, haha, 'ohawai, acuminate cyanea	O	LE	G2
Cyanea calycina			C	G1
Cyanea crispa (Syn. *Rollandia crispa*)	oha, haha, 'ohawai, crimped Rollandia	O	LE	G1
Cyanea humboldtiana (Syn. *Rollandia humboldtiana*)	haha, 'ohawai		LE	G1
Cyanea koolauensis (Syn. *Rollandia angustifolia*)	haha, 'ohawai	O	LE	G1
Cyanea lanceolata			C	G1
Cyanea st.-johnii (Syn. *Rollandia st.-johnii*)	'oha, haha, 'ohawai	O	LE	G1
Cyrtandra dentata	ha'iwale, kanawao, ke'oke'o, sharp-toothed cyrtandrae	O,M	LE	G1
Cyrtandra viridiflora	ha'iwale, kanawao, ke'oke'o, green-leaved crytandra	O	LE	G1
Eugenia koolauensis	Ko'olau eugenia	O	LE	G1
Gardenia mannii	nanu	O	LE	G1
Hesperomannia arborescens	lanai hesperomannia	O	LE	G1
Huperzia nutans (Syn. *Phlegmariurus nutans, Lycopodium nutans*)	wawae'iole, nodding club moss	O	LE	G1
Joinvillea ascendens ssp. *ascendens*	'ohe		C	G5T1
*Kadua fluviatilis (*Syn. *Hedyotis fluviatilis*)	kamapua'a, water bluet		C	G1
Lobelia gaudichaudii ssp. *koolauensis*	'oha, haha, 'ohawai	O	LE	G1T1
Melicope hiiakae	alani, Ko'olau Range melicope		C	G1
Melicope lydgatei (Syn. *Pelea lydgatei*)	alani, Lydate's pelea	O	LE	G1
Myrsine fosbergii	kolea		C	G1
Myrsine juddii	kolea, cloudswept colicwood	O	LE	G1
Phyllostegia hirsuta	hairy phyllostegia	O	LE	G1
Platydesma cornuta var. *cornuta*	pilo kea		C	G1T1
Psychotria hexandra var. *oahuensis*			C	G2T1
Pteralyxia macrocarpa	kaulu		C	G1
Sanicula purpurea	purple-flowered sanicle	O	LE	G1
Tetraplasandra gymnocarpa	'ohe'ohe		LE	G1
Viola oahuensis	Forbe's O'ahu violet	O	LE	G1
Zanthoxylum oahuense	O'ahu prickly-ash		C	G1

* Sources: HBMP 2007d, USFWS 2003a, USAG-HI 2008b, Hawai'i Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff and the USFWS federally listed and

candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai‘i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled globally (typically 6-20 occurrences); G3 = vulnerable (often 20 - 80 occurrences); G1T1 = critically imperiled, subspecies critically imperiled; G2T1 = imperiled, subspecies critically imperiled; G5T1 = species secure, subspecies critically imperiled.

of the measures taken include the control of rodents, actions to minimize the destruction and degradation of forest structure, the removal of ungulates, and the execution of a Wildland Fire Management Plan.

Critical habitat was designated for listed plant species on the Island of O‘ahu in 2003 (USFWS 2003b); however, most of USAG-HI’s lands were eliminated in the final rule due to the Army’s ongoing conservation efforts. Critical habitat for plants borders the southern half of the eastern border of KLOA. A small area extends across the most northern border of the installation. The land is leased from the Dole Food Company, Kamehameha Schools Bishop Estate, and from Attractions Hawai‘i, which are not excluded from the designation of critical habitat (i.e., areas within the geographical area occupied by the species at the time of listing, if containing physical or biological features essential to conservation or areas determined to be essential for a species’ conservation). The Army was removed from the final critical habitat designation because “the benefits of excluding these lands under 3(5)(A)[3] and 4(b)(2)[4] outweigh the benefits of including these lands in the final designation…the Army has implemented a comprehensive program of endangered species management on its lands under the INRMP process…” As long as the Army includes this area in its endangered species management, the benefits outweigh those gained through the application of the critical habitat designation.

Designated Management Units: Management units (MUs) are located in the Ko‘olau Mountains of O‘ahu, where the most important wild populations of the target taxa occur (Figure 2.5.i). These areas encompass the important habitat for *in situ* management and reintroduction efforts that will lead to the stabilization of the target taxa. The MUs occur on Army, State of Hawai‘i, City and County of Honolulu, and private lands (USAG-HI 2003a).

Table 2.5.c Additional Federally Listed and Candidate Plants on Lands on Management Units near Kawailoa Training Area.*

Scientific Name	Hawaiian / Common Name	Federal Status[1]	Global Rank[2]
Cyanea calycina	O‘ahu cyanea	C	G1
Cyanea truncata		LE	GH

* Sources: HBMP 2007d, USFWS 2003a, USAG-HI 2008b, Hawai‘i Biodiversity & Mapping Program. Nov. 2007. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff and USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai‘i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); GH = possibly extinct.

[3] 3(5)(A) provides the definition of critical habitat in the Endangered Species Act of 1973, as amended.

[4] 4(b)(2) states the basis under which critical habitat can be designated and revisions made to it in the Endangered Species Act of 1973, as amended.

Critical Habitat & Areas of Special Concern
Kawailoa Training Area

Figure 2.5.h

Management Units
Kawailoa Training Area

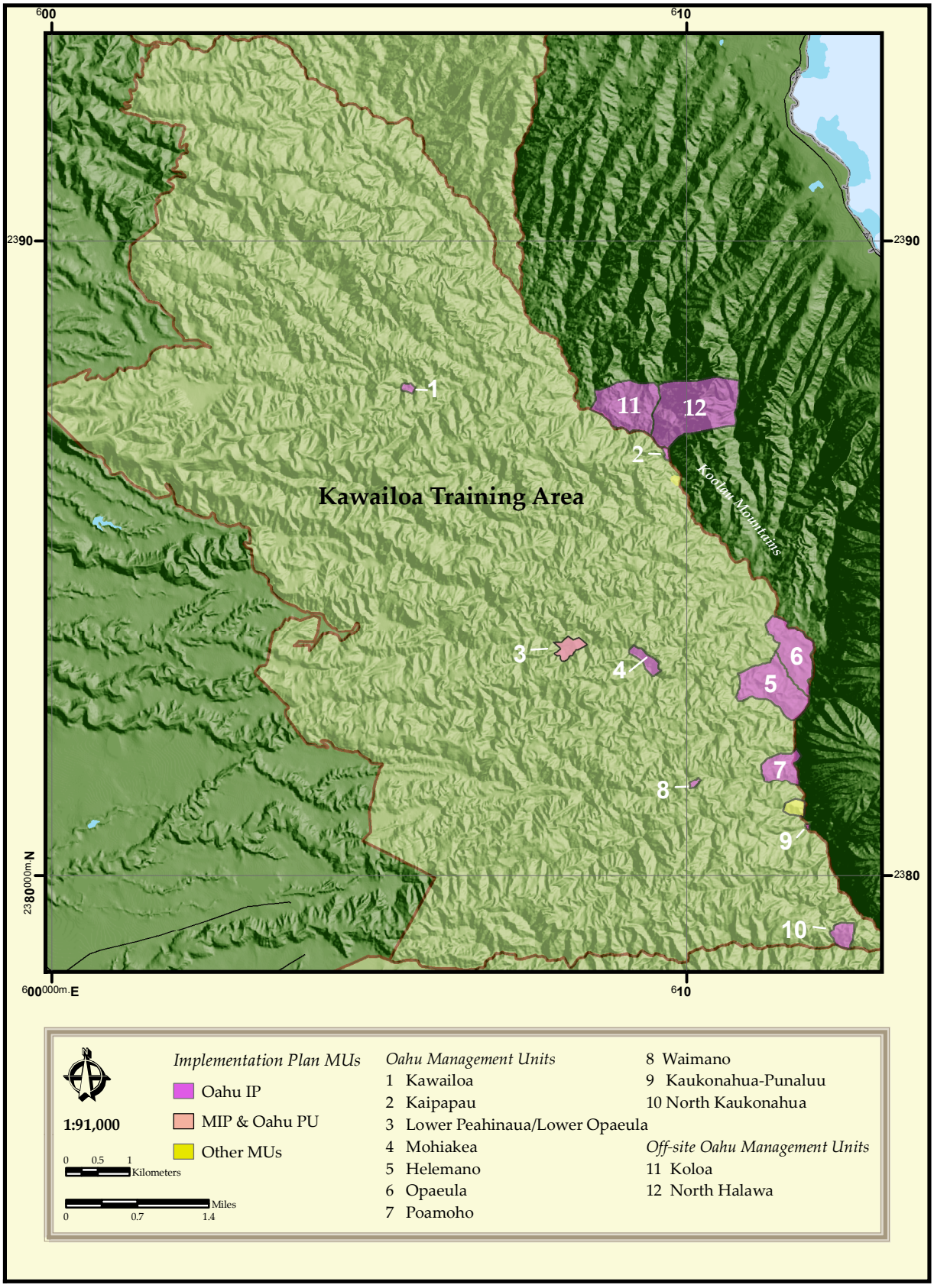


Figure 2.5.i

There are nine Oʻahu IP management units (MUs) and one Mākua IP MU with Oʻahu IP population units in Kawailoa Training Area. These MUs are Kawailoa, Kaipapaʻu, Kawai Iki, Lower ʻŌpaeʻula/Peahinaīʻa, Mohiākea, Helemano and ʻŌpaeʻula, Poamoho, North Kaukonahua, Waimano, Kaukonahua-Punaluʻu, and North Kaukonahua.

Kawailoa MU is 6.5 ac (2.6 ha) and is leased to the U.S. Army by Kamehameha Schools. There is a single Oʻahu IP targeted plant species, *Melicope lydgatei*, designated for stabilization. *Gardenia mannii* (LE) is present at the MU. Kawailoa MU is projected to be protected by a fence and requires a license agreement with the landowner and an environmental assessment.

Kaipapaʻu MU consists of 283 ac (115 ha) and is owned by the State of Hawaiʻi (Kaipapaʻu Forest Reserve, 272 ac/110 ha) and Kamehameha Schools (Army lease, 9.2 ac/3.7 ha). There are three subunits: Subunit I (272 ac/110 ha), Subunit II (4 ac/1.6 ha), and Subunit III (5.2 ac/2.1 ha). Kaipapaʻu Subunit I has seven Oʻahu IP targeted plant species, six that are managed for stability (*Chamaesyce rockii*, *Cyanea acuminata*, *C. koolauensis*, *Hesperomannia arborescens*, *Huperzia nutans*, and *Phyllostegia hirsuta* are managed for stability and *Gardenia mannii*). In Subunits II and III, one plant (*Cyanea crispa*) and one snail (*Achatinella livida*) are managed for stability. *Schiedea kaalae* is an historical species to the site and is a Mākua targeted species. *Kadua fluviatilis* (C) and *Pteralyxia macrocarpa* (C) are present at the site as is the damselfly, *Megalagrion oceanicum*. Fence construction is scheduled for 2012 and requires a license agreement with the owner and environmental assessment.

Lower ʻŌpaeʻula MU (referred to as Lower Peahinaia in the Oʻahu IP) covers 48.9 ac (19.8 ha) and is owned by Kamehameha Schools and leased by the U.S. Army. This MU is located at KLOA. Composed of two management units, Subunit I is 25 ac (10.1 ha) and Subunit II is 23.9 ac (9.7 ha). There is a single Mākua IP target species in Subunit I (*Cyrtandra dentata*). There are three Oʻahu IP targeted plant species (*Gardenia mannii*, *Melicope lydgatei*, and *Phyllostegia hirsuta*) and one snail species (*Achatinella sowerbyana*) present at this MU. Protective fencing is completed in Subunit I and will begin in Subunit II in 2016. Other noteworthy plant species in this MU are *Lindsaea repens* var. *macraeana* (G5T2)*, Joinvillea ascendens* ssp. a*scendens* (C)*,* and *Psychotria hexandra* var. *oahuensis* (C).

Mohiākea MU is 425.9 ac (172.4 ha) owned by the U.S. Army. There are three Oʻahu IP targeted plant species designated for stabilization (*Phyllostegia hirsuta, P. mollis,* and *Labordia cyrtandrae*) and one bird species (*Chasiempis sandwichensis ibidis*). There are two targeted Mākua IP plant species designated for stabilization (*Plantago princeps* var. *princeps* and *Tetramolopium filiforme*) and three target plant species that are not designated for stabilization (*Alectryon macrococcus* var. *macrococcus*, *Delissea waianaensis*, and *Schiedea kaalae*). Additional significant species present in this MU are *Dubautia sherffiana* (SOC)*, Exocarpos gaudichaudii* (SOC)*, Lepidium arbuscula* (LE)*, Lobelia oahuensis* (LE)*, Lobelia hypoleuca, Neraudia melastomifolia* (SOC)*, Schiedea hookeri* (LE)*, S. pentandra, Sicyos lanceoloidea* (SOC)*, Platydesma cornuta* var. *decurrens* (C), and *Pteralyxia macrocarpa* (C). Fencing is scheduled for 2010 and requires an environmental assessment.

Helemano and ʻŌpaeʻula MU totals 234.6 ac (95 ha) and is leased to the U.S. Army by Kamehameha Schools. The ʻŌpaeʻula Subunit covers 121.4 ac (49.1 ha) and the Helemano Subunit covers 113.2 ac (45.8 ha). Collectively, there are five Oʻahu target plant species designated for stabilization (*Chamaesyce rockii, Cyanea koolauensis, Cyanea st.-johnii, Cyrtandra viridiflora,* and *Viola oahuensis*), one targeted species not designated for stabilization (*Phyllostegia hirsuta*), and two snail species designated for stabilization (*Achatinella lila* and *A. sowerbyana*). A trial reintroduction of *Sanicula purpurea* has been

conducted at the ʻŌpaeʻula portion of the Helemano and ʻŌpaeʻula MU. The plant species *Anoectochilus sandvicensis, Cyanea calycina* (C)*, Cyanea humboldtiana* (LE)*, Joinvillea ascendens* ssp. *ascendens* (C), *Lobelia gaudichaudii* var. *gaudichaudii* (SOC)*,* and *Zanthoxylum oahuense* (C), along with the invertebrate species, *Megalagrion nigrum* var. *nigrum*, are present in this MU. Helemano and ʻŌpaeʻula MU is currently protected by a fence.

Poamoho MU is 78.4 ac (31.7 ha) and is owned by Kamehameha Schools or the State of Hawaiʻi. The U.S. Army leases the area. There are three subunits—Subunit I (60.2 ac/24.3 ha), Subunit II (17.8 ac/7.2 ha) and Subunit III (0.5 ac/ ha). Subunit I has three Oʻahu IP targeted plant species, two of which are designated for stability (*Cyanea acuminata* and *Sanicula purpurea* and not designated for stability, *Phyllostegia hirsuta*). There are also three targeted snail species designated for stabilization (*Achatinella bryonii/decipiens, A. lila,* and *A. sowerbyana*). The two snail target species in Subunit II (*A. byronii* and *A. sowerbyana*) are designated for stability, but the one targeted plant species (*Phyllostegia hirsuta*) is not. In Subunit III, one target plant species is designated for stabilization (*Sanicula purpurea*) and one is not (*Cyanea st.-johnii*). The plant species, *Cyanea humboldtiana* (LE)*, Joinvillea ascendens* ssp. *ascendens* (C)*, Platydesma cornuta* var. *cornuta* (C), *Zanthoxylum oahuense* (C), and *Viola kauaiensis*, along with the damselfly, *Megalagrion nigrohamatum nigrolineatum* (C), are also present in the MU. Fencing in Subunit I is scheduled for 2010, and, like Subunits II and III, requires a license agreement with the state and an environmental assessment.

Waimano MU is 3.6 ac (1.5 ha) and is owned by the State of Hawaiʻi. There is a single Oʻahu IP target species designated for stability (*Cyanea st.-johnii*) and one plant that is not (*Lobelia gaudichaudii* ssp. *koolauensis*). There are no other noteworthy species in the MU. Fence construction is scheduled for 2008 and requires an agreement with the state.

Kaukonahua-Punaluʻu Subunit I has two plant species (*Phyllostegia hirsuta* and *Viola oahuensis*) and two snail species (*Achatinella byronii*/*decipiens* and *A. sowerbyana*) targeted for stabilization. Kaukonahua-Punaluʻu Subunit II has one plant species (*Sanicula purpurea*) targeted for stabilization. *Zanthoxylum oahuense* and *Viola kauaensis* are also present at the MU. In year 10 of the OIP, Subunits I and II are projected to be protected by a fence in Oʻahu IP years 10 and 14.

North Kaukonahua MU is 30.4 ac (12.3 ha) and is owned by the State of Hawaiʻi. There are has six endangered plant species (*Chamaesyce rockii*, *Cyanea koolauensis, Hesperomannia arborescens*, *Huperzia nutans*, *Pteris lydgatei*, and *Viola oahuensis*) and one snail species (*Achatinella byronii*/*decipiens*) targeted for stabilization. *Doodia lyonii*, *Joinvillea ascendens* ssp. *ascendens* (C), and *Melicope hiiakae* (C) are also present at the MU. The North Kaukonahua MU is restricted from military training. In OIP year 9 (2016), this MU is projected to be protected by a fence. An agreement with the state and an environmental assessment are required.

There are three MUs to the east of Kawailoa Training Area. They are Kahana, Kōloa, and North Hālawa MUs.

Lower Kahana MU covers 3 ac (0.4 ha) and is owned by the Kualoa Ranch. There is a single Mākua IP target plant species (*Schiedea kaalae*) designated for stabilization. *Cyanea acuminata* (LE), *C. crispa* (LE), *C. truncata* (LE), and *Cyrtandra waiolani* (SOC) are present. This MU is projected to be protected by fencing in Mākua IP year 9.

Kōloa MU (160 ac, 65 ha) is located adjacent to Kawailoa Training Area. This MU has six O‘ahu IP target plant species (*Chamaesyce rockii, Cyanea koolauensis, Cyrtandra viridiflora, Hesperomannia arborescens, Huperzia nutans*, and *Viola oahuensis*) and the snail species, *Achatinella livida*, targeted for stabilization. *Phyllostegia hirsuta* is planned for reintroduction at this MU. *Cyanea calycina* (C)*, Cyanea humboldtiana* (LE)*, Joinvillea ascendens* var. *ascendens* (C), and *Zanthoxylum oahuense* (C) are also present at this MU. Protective fencing is planned for 2009 and requires a license agreement and environmental assessment.

North Hālawa MU is 3.6 ac (1.5 ha) and is owned by Kamehameha Schools. There are two O‘ahu IP targeted plant species, *Cyanea st.-johnii,* which is targeted for stabilization, and *Viola oahuensis*, which is not. This MU is projected to be protected by fencing in 2015. An environmental assessment and an agreement with the landowner are necessary.

The above MUs and their locations are discussed in detail in the *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b).

2.5.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii’s Biodiversity and Mapping Program update KLOA’s fauna species lists when new species are identified and verified as present on KLOA.

Keystone Species

Conditions and needs of keystone species is an area that requires development for KLOA.

State of Hawaii’s Species of Greatest Conservation Need

A comparison of KLOA’s current fauna lists and Hawaii’s CWCS resulted in the identification of five bird, possibly four fish, and 13 invertebrate species of greatest conservation need designated by the State of Hawai‘i as being present at KLOA (Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered and located on KLOA. (See Appendix 3, *Species Lists*. Annex C, *KLOA Species of Greatest Conservation Need*.)

Mammals

A comprehensive survey of introduced mammals has not been conducted for KLOA. The ‘ope‘ape‘a, Hawaiian hoary bat (*Lasiurus cinereus semotus*), is Hawaii’s only indigenous mammal. A hoary bat was observed along the Schofield-Waikāne Trail that runs between SBER and KLOA in 1976 (USAG-HI 2004).

Survey work is planned to document if the species is present on the installation and to determine numbers and habitat use (See Appendix 3, *Species Lists*. Annex C, *KLOA Mammals*.)

Birds

A comprehensive survey of bird species has not been conducted for KLOA. Eight endemic bird species have been documented at KLOA, which includes five forest birds (two believed to be extinct or locally extinct), a raptor, a migratory shore bird, and a sea bird. Twenty-seven introduced species have been observed. (See Appendix 3, *Species Lists*. Annex C, *KLOA Birds*.)

Herpetofauna

There are no native terrestrial herpetofauna in the Hawaiian Islands. A comprehensive survey of introduced herpetofauna species has not been conducted for KLOA. Fourteen introduced herpetofauna species may be present at KLOA.

Introduced Reptiles: There are eight introduced lizards, one terrestrial snake, and one turtle that may be present at KLOA. (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex C, *KLOA Herpetofauna*.)

Introduced Amphibians: There are two species located at KLOA and the possibility of three other species also being present (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex C, *KLOA Herpetofauna*.)

Fish
A comprehensive survey of fish species has not been conducted for KLOA. There are believed to be 6 endemic and a minimum of 23 introduced fish species present in streams located at KLOA. USAG-HI natural resources staff has not verified the presence of these species. (See Appendix 3, *Species Lists*. Annex C, *KLOA Fish*.)

Invertebrates
A comprehensive survey of invertebrate species has not been conducted for KLOA. At a minimum there are 25 endemic and 12 introduced invertebrate species that have be documented as present or potentially present on KLOA. There are 12 terrestrial and 2 aquatic endemic species. There are 8 terrestrial and 4 aquatic introduced species. (See Appendix 3, *Species Lists*. Annex C, *KLOA Invertebrates*.)

2.5.8.4 Flora
USAG-HI has documented 243 identified and 1 unidentified taxa at KLOA (HBMP 2007d, USAG-HI 2008b, USAG-HI ONR staff 2008). (See Appendix 3, *Species Lists*. Annex C, *KLOA Plants*.)

Keystone Species
Conditions and needs of keystone species is an area that requires development for KLOA.

State of Hawaii's Species of Greatest Conservation Need
A comparison of KLOA's plant species list and Hawaii's Comprehensive Wildlife Conservation Strategy resulted in the identification of 70 plant species of greatest conservation need designated by the State of Hawai‘i as present at KLOA (HBMP 2007d and Ogura et al. 2005). USAG-HI manages species of greatest need that are federally listed as endangered and located on KLOA. (See Appendix 3, *Species Lists*. Annex C, *KLOA Species of Greatest Conservation Needs*.)

Incipient Species
USAG-HI ONR staff has identified 12 species that will be controlled and eradicated when found in areas where rare plant species occur at KLOA. (See Appendix 3, *Species Lists*. Annex C, KLOA *Weeds*.)

Non-Native/Weedy Species
There are 26 invasive/weed species that have been identified at KLOA. When these species are determined to have a negative effect on KLOA's training areas, native plant habitats, and ecosystem, they are controlled (NRCS PLANTS Database, June 2008. Weeds of Hawai‘i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex C, *KLOA Weeds*.)

2.5.8.5 Native Vegetation Communities
There are four native vegetative communities located at KLOA: Montane Wet, Lowland Wet, Lowland Mesic, and Aquatic Natural Communities (Figure 2.5.j). These community types are categorized into ecological zones defined by elevation, topography, and prevailing ecological

conditions (Wagner et al. 1999). (See Appendix 3, *Species Lists*. Annex C, *KLOA Native Vegetation Communities and Descriptions*.)

2.5.8.6 Wetlands and Deep Water Habitats

Lehua Makanoe Bog, Pe‘ahina‘a Ponds, Poamoho Pond, and an unnamed area were identified as potential wetlands by the U.S. Army Corps of Engineers (USACE 2005) (see Figure 2.5.g). The Lehua Makanoe Bog is located along the summit of the Ko‘olau Mountains. It contains bog-specific plant species, other rainforest Hawaiian species, and a number of rare and endangered plant species. The Army has fenced the area to protect it. Pe‘ahinai‘a Ponds are located on the south ridge of ‘Ōpae‘ula Gulch, near the center of Kawailoa Training Area. Poamoho Pond is located along the KLOA boundary near the top of the Ko‘olau Mountain Range and south of Lehua Makonoe Bog. The open water potential wetland is located approximately 510 m to the northeast and across a valley from Wailoa Peak. Photos show water lilies on the surface of the ponds and assorted ferns. None of these potential wetlands have been delineated to determine their status as a regulated wetland. There are no known deep water habitats on KLOA.

Vegetation Communities on Kawailoa Training Area

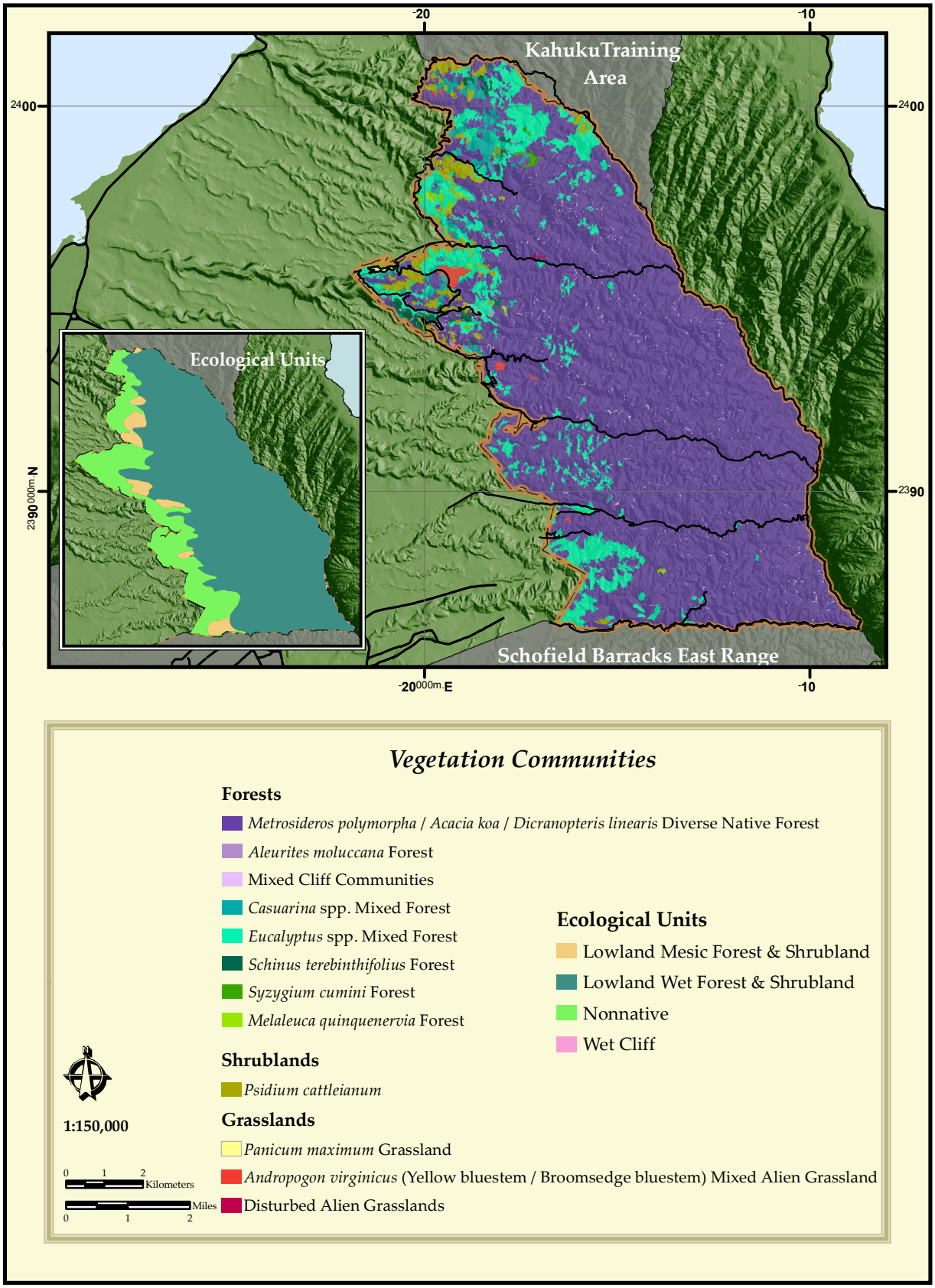


Figure 2.5.j

2.6 Kahuku Training Area

2.6.1 Location and Neighbors

Kahuku Training Area (KTA) is located in northern O‘ahu on the terminus of the Ko‘olau Mountain Range. Main access to KTA is via the Kamehameha Highway. Access gates to KTA are within several miles of the coastal towns of Kahuku (pop. 2,000) and Kawela (pop. 400), and approximately eight miles northwest of Haleiwa (pop. 2,500). KTA is bounded to the north by private agricultural and City and Council of Honolulu lands south of the Kamehameha Highway, by Kawailoa Training Area to the east, and by private lands on the remaining perimeter (Figure 2.6.a). The northern tip of O‘ahu, across the Kamehameha Highway, is a popular resort and recreation area.

KTA is comprised of 9,480 ac (3,836 ha). There are 8,312 ac (3,364 ha) owned in fee, 1,150 ac (465 ha) leased from the State of Hawai‘i (DA-94-626-ENG-77, August 17, 1964 – August 16, 2029), and 18 ac (7 ha) are easements (G. Sagum, per. comm. 2007).

2.6.2 Infrastructure

2.6.2.1 Ranges and Training Lands

Over half of KTA (4,596 ac, 1,860 ha) is available for ground maneuver training, which makes Kahuku Training Area the largest contiguous training area on O‘ahu. The training area is non-live fire with the exception of the use of short-range training ammunition (SRTA) at the KTA Combined Arms Collective Training Facility (CACTF) and two other designated facilities. KTA is composed of nine maneuver training areas (Figure 2.6.b). Blank ammunition is authorized, as are ground pyrotechnics (smoke and incendiary devices), subject to Range Control approval at least ten days in advance of the training date.

2.6.2.2 Kahuku Training Area Combined Arms Collective Training Facility

The CACTF is a proposed state-of-the-art combined arms collective training facility consisting of a site-adapted 24-building facility. This facility will allow the use of SRTA (low velocity plastic bullets), which is considered live fire. Building types include: warehouse buildings (2), municipal building, office building, service station, business buildings (4), hotel building, police station/jail, church and collocated cemetery, bank building, townhouse, residences (9), school building, and a grass airfield.

Range support facilities include an after action review building, ammo breakdown building, operations/storage building, dual sex dry vault latrine and a covered dining area. Additional infrastructure facilities include a new access trail, parking area, primary and secondary power and data distribution systems. Storm drainage, site improvements and berms will be provided as necessary. Approximately 187 ac (75.7 ha) of earth movement would be associated with construction of the 560-ac CACTF, including tactical movement trails, simulated firing points, obstacles, targets, and other infrastructure. The facility is proposed to be completed within the time frame of this INRMP.

2.6.2.3 Cantonment Area

KTA does not have a defined cantonment area, but does have a Range Control compound (Area B-2) and three smaller compounds that are set aside to support Army-related operations. ‘Ōpana Naval Reservation is located in Area B-1. These areas combined take up less than 247 ac (100 ha) of KTA.

Location & Land Ownership of Kahuku Training Area

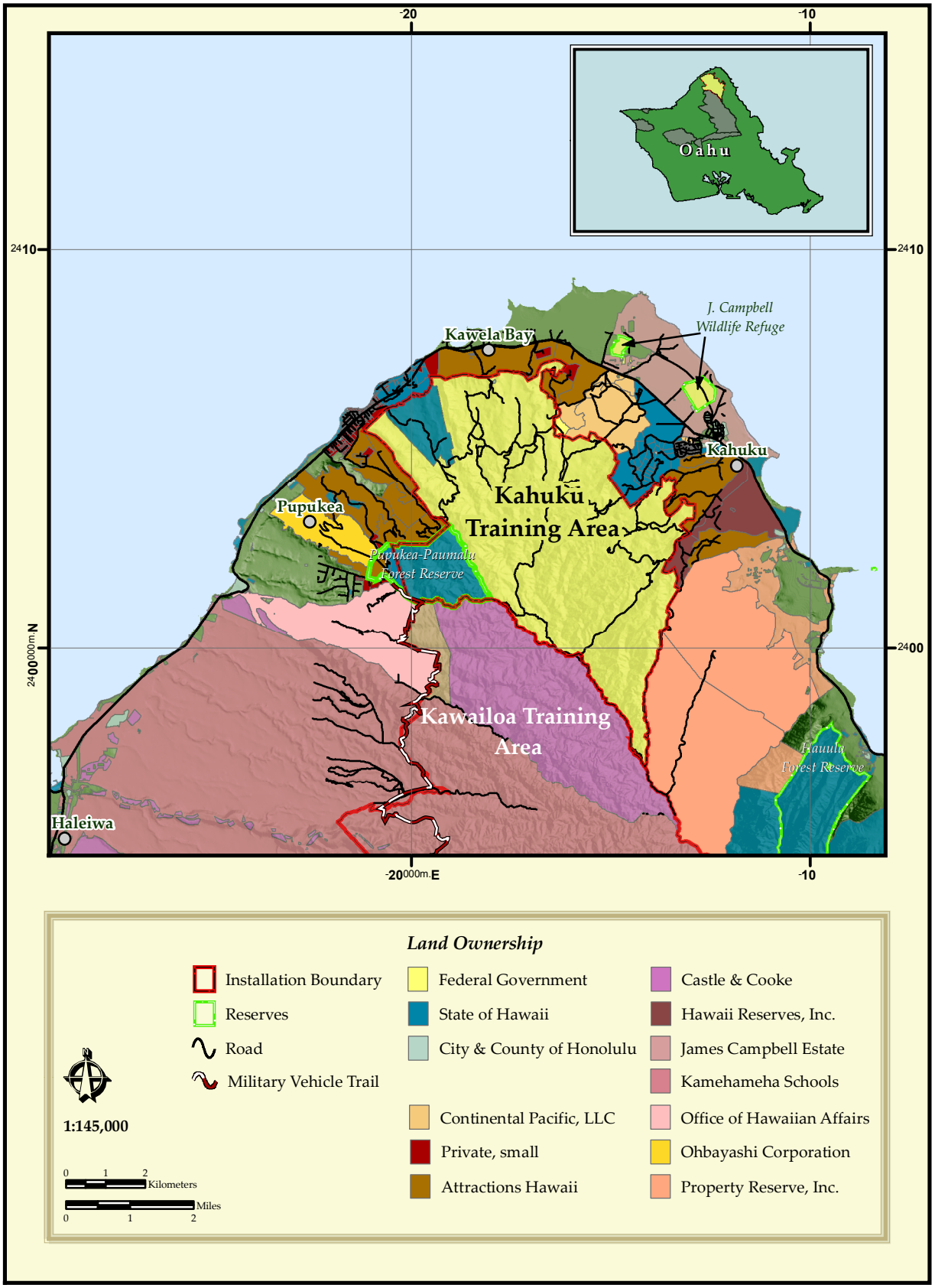


Figure 2.6.a

Training Areas at Kahuku Training Area

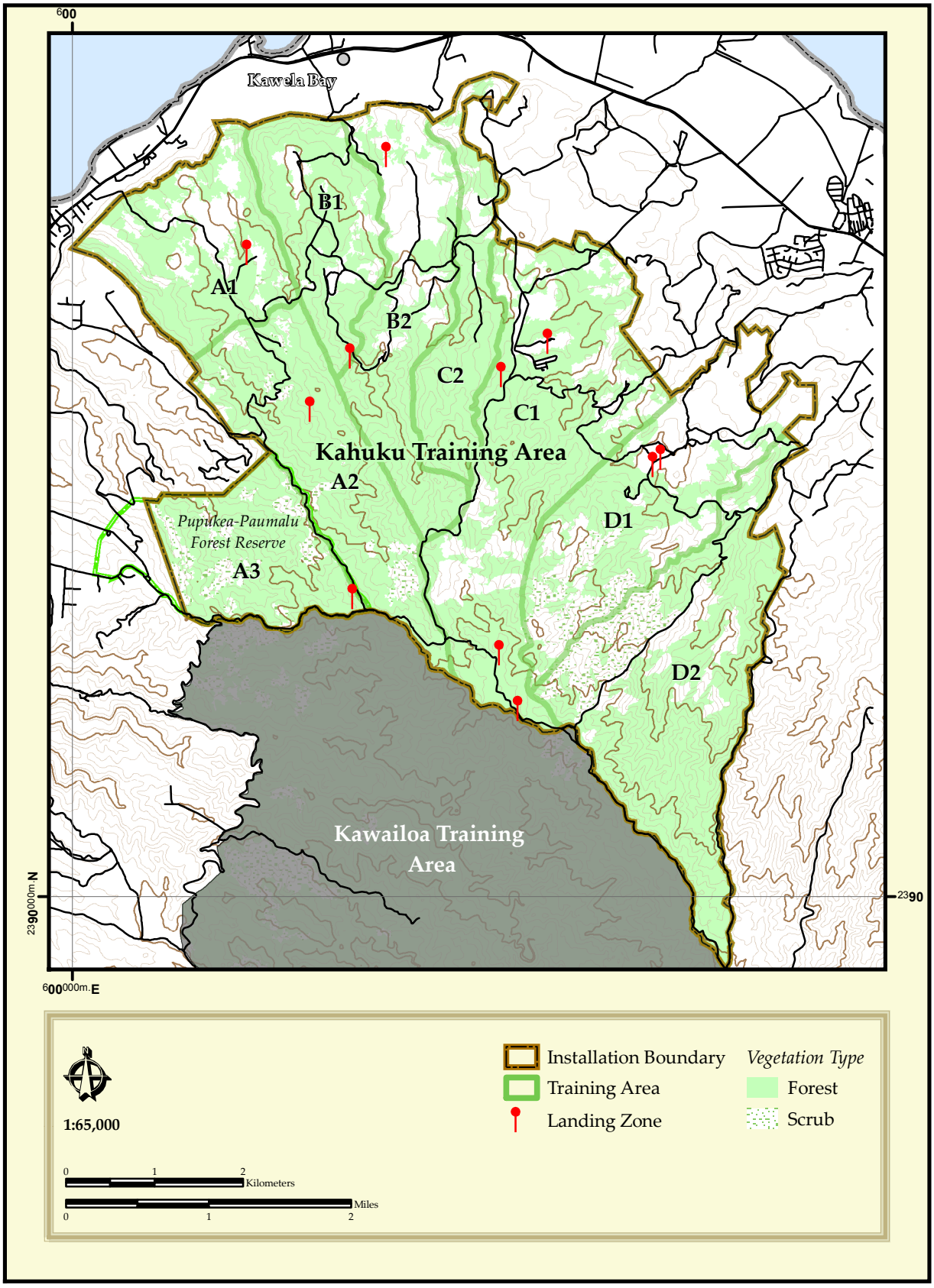


Figure 2.6.b

A tactical vehicle wash rack is proposed for construction on KTA during the time frame of this INRMP.

2.6.2.4 Wheeler Army Airfield
Military aircraft from Wheeler Army Airfield support KTA. (See Section 2.3.2.3, *Wheeler Army Airfield*).

2.6.2.5 Helicopter Landing Pads/Zones
There are 11 designated helipads/landing zones for military helicopters at KTA.

2.6.2.6 Parachute Drop Zones
KTA has three drops zones. Two are approved for both personnel and equipment and one for equipment only.

2.6.2.7 Commercial/Other Airports
See Section 2.3.2.4, *Schofield Barracks Military Reservation, Commercial/Other Airports*.

2.6.2.8 Harbors
See Section 2.3.2.5, *Schofield Barracks Military Reservation, Harbors*.

2.6.2.9 Roads
There are no primary or secondary roads, approximately 40 mi (64 km) are tertiary roads, and approximately 14 mi (23 km) are unimproved roads (four-wheel-drive trails) at KTA (see Figure 2.6.b). Dust can be a problem on unimproved roads.

2.6.3 Abbreviated History

2.6.3.1 Installation History
The training area was established in 1944 under a letter permit from the Territory of Hawai‘i for the use of 1,150 ac (565 ha). Original facilities included temporary huts and mess facilities, which were demolished in 1956, the same year that the U.S. government leased 7,628 ac (3,087 ha) from the James Campbell Estate. Additional leases of 12 ac (5 ha), leased March 14, 1957, and 355 ac (144 ha), leased July 1, 1972, and licenses granted over the years, resulted in the current installation footprint. A NIKE missile site, which was deactivated in 1970, comprised of 25 ac (62 ha), and merged with KTA in 1987 (Schofield Barracks Master Planning 1999). Most of KTA was purchased by the Army in 2000 from a private owner.

2.6.3.2 Cultural History
KTA has 174 known archeological sites (USAG-HI 2007b). Included are those with traditional Hawaiian origins like the Hanakoae Platform, a cooking hearth, a habitation, an agricultural complex, and an upland garden; those with military origins include an observation post, World War II era bunkers, a mobile radar station and one remaining Cold War Nike missile site (USACE and Nakata Planning Group 2002a). The Hanakoae Platform is listed on the National Register of Historic Places (NRHP), and the ‘Ōpana Mobile Radar Station is a National Monument and also listed on the NRHP and the Hawai‘i Register of Historic Places (HRHP).

Settlement in the Kahuku area was initially on the coast. As population and resource requirements increased over time, coastal population centers became more numerous, with an increase in the exploitation of outlying and more marginal areas that may have included KTA lands. Most of KTA’s parcels were granted, leased, or sold to foreigners after 1850 to pasture cattle and sheep, and became part of several large ranches (Ogden Environmental and Energy Services 1998). By the 1940s, the

KTA area was largely denuded outside of the remaining intact native communities within the historic Kahuku Forest Reserve.

2.6.3.3 Natural Resources Management History

With the purchase of KTA, the Army has autonomy in managing all but several state-owned parcels. It is anticipated that infrastructure and training facilities will improve and be better maintained, and a more hands-on approach adopted in managing natural resources, including watershed-scale efforts. Until the Army's acquisition, most of USAG-HI natural resources management efforts focused on rare and endangered species. The State of Hawai'i is responsible for management of natural resources and endangered species on state-owned land parcels.

Some of the first zoological surveys at KTA were for invertebrates and in particular for endangered land snails. No *Achatinella* individuals have been detected in KTA in some of the initial studies by Gagné et al. (1974) and Hadfield (1991 to 1993). Thirteen species of *Achatinella* were observed during surveys in 1980, most were in KLOA (Ecotropics 1981). In 1984 and 1985, Hadfield and Christensen, respectively, conducted O'ahu surveys for *Achatinella* taxa. In addition, the Army's ONR staff has been conducting snail surveys since 1998, focusing on species that have not been documented in the last decade.

Shallenberger detected 16 bird species (three endemics) and six introduced mammal species during vertebrate surveys at KTA in 1977. HBMP conducted a comprehensive biological survey of KTA from 1989 to 1993.

Botanical surveys have been outsourced by the Army since 1977 to fulfill requirements under the Endangered Species Act. Surveys are conducted on KTA to identify existing rare plant populations and the potential threats to these populations, including the potential impacts of military training activities (RCUH 2000). Survey reports include maps of specific species population locations. Five botanical surveys of KTA were conducted prior to the Hawai'i Biodiversity and Mapping Program (HHP 1994a) surveys in 1993 and 1994. Char observed the threats of invasive exotic plants, feral pigs (*Sus scrofa*), and military training activities (particularly the use of flares and smoke grenades) to native plant communities in surveys conducted in 1976 (R.M. Towill Corp. 1997b). Two rare plant species were observed, and threats to native flora are discussed in the 1989 HBMP botanical surveys.

2.6.4 Military Mission

KTA provides training lands for the 25th ID and for tactical field exercises of other Army and U.S. Marine Corps units.

2.6.5 Military Operations and Activities that May Affect Natural Resources

KTA is the largest contiguous ground-maneuver training area on O'ahu, containing 4,596 ac (1,849 ha) categorized as suitable for maneuver. The northern portion of the installation, consisting of rolling grasslands and shrublands with moderate relief, supports all tactical maneuver training scheduled on KTA, including mountain and jungle warfare, pyrotechnics, and air support training. KTA can accommodate a number of training scenarios involving infantry battalion, Army Training Evaluation Program (ARTEP) missions. Aviation assets are incorporated into appropriate training events, but there are no developed airfield facilities for training use. All aviation support assets found on KTA are temporary in nature and associated with specific training events (USACE and Nakata Planning Group 2002a). A number of landing and drop zones are located on KTA. The southern portion of the installation is more elevated with rugged terrain and dense vegetation. The ruggedness of the terrain

makes it poorly suited for large-scale field exercises. Restricted live-fire (SRTA) activities take place on KTA.

KTA Training Area KA1, including A Gate and the landing zone X-Strip, is off-limits to military training during weekends and federal holidays without prior approval from RDH. Under a permit from the state, the public (e.g., Hawai‘i Motor Sports Association) has exclusive rights to this area during weekends and federal holidays. Lease provisions allow the Army to close these areas for brigade or larger field exercises only with prior notification to the public. Units must submit requests during the Range Scheduling Conference for an early notification to the public. KTA Training Area KA3 is a forest reserve area. Military units may conduct training during weekend and federal holidays with prior notification to the public (lease para. 16). Hunters and hikers are allowed access during these periods when the areas are not scheduled for training purposes (lease para. 16). The government is not responsible for the control or safety of the public. Aerial pyrotechnics are not allowed anywhere on KTA. However, pyrotechnics (e.g., smoke, incendiary devices) are permitted, subject to Range Control approval. All pyrotechnics are prohibited in Training Areas A1, A3, and within 1000 m (buffer zone) from the inside of the KTA boundary.

Constructions activities are proposed for KTA. They include the construction of a tactical vehicle wash facility, unimproved road construction to improve vehicle movement from SBMR to KTA through Helemano Military Reservation, and a combined arms collective training facility.

2.6.6 Natural Resources Constraints on Training Areas and Ranges

KTA has elevations that range from near sea level to uplands along the crest of the Ko‘olau Range, with the coastal flats adjacent to upraised limestone cliffs with narrow valleys (25th ID (L) and USAG-HI 2003). Slopes greater than 30 percent are the principal natural resource constraint at KTA (Figure 2.6.c). There are some small fence units for species management that can restrict training and cover about 25 ac (10 ha). Proposed units would cover an additional 10 ac (4 ha). Training access is best on the lower slopes where slopes are moderate (Figure 2.6.d).

Federally listed species are present in Training Area A1-3, D2, and the slopes and upper areas of C1-2, and D1. All training is subject to the fire danger rating system (25th ID (L) and USAG-HI 2003). Range Control notifies troops hourly on training restrictions. Live-fire and tracer ammunition is prohibited at KTA. Blank ammunition and limited pyrotechnics are permitted with Range Control approval. During the Red Fire Index status, all munitions, smoking and cooking/warming fires are prohibited. All fires must be reported and the officer in charge will initiate a “cease fire” order.

Minimum staffing and fire response must be arranged and meet training activities (e.g., live-fire training is conducted when fully trained/certified personnel and functioning equipment is available for fire suppression). If fire suppression equipment is not operational, training at KTA is suspended. The ONR manager is notified if fires are a potential threat to federally listed plants or animals (25th ID (L) and USAG-HI 2003).

2.6.7 General Physical Environment and Ecosystems

2.6.7.1 Climate

The monthly temperatures at KTA range from 48 °F to 91°F (9 -33 °C) in January and 55 °F to 95°F (13 -35°C) in October. Average annual rainfall ranges from 40 in to 50 in (102-127 cm) near the coast to 150 in (381 cm) at the summit of the Ko‘olau Mountains. The monthly recorded low rainfall is 8 in (20 cm) in July and the high is 35 in (89 cm) in February. Prevailing winds are northeasterly trade winds in the warm summer months, and light south to southwesterly winds in the wet winter months

Natural Resources Constraints at Kahuku Training Area

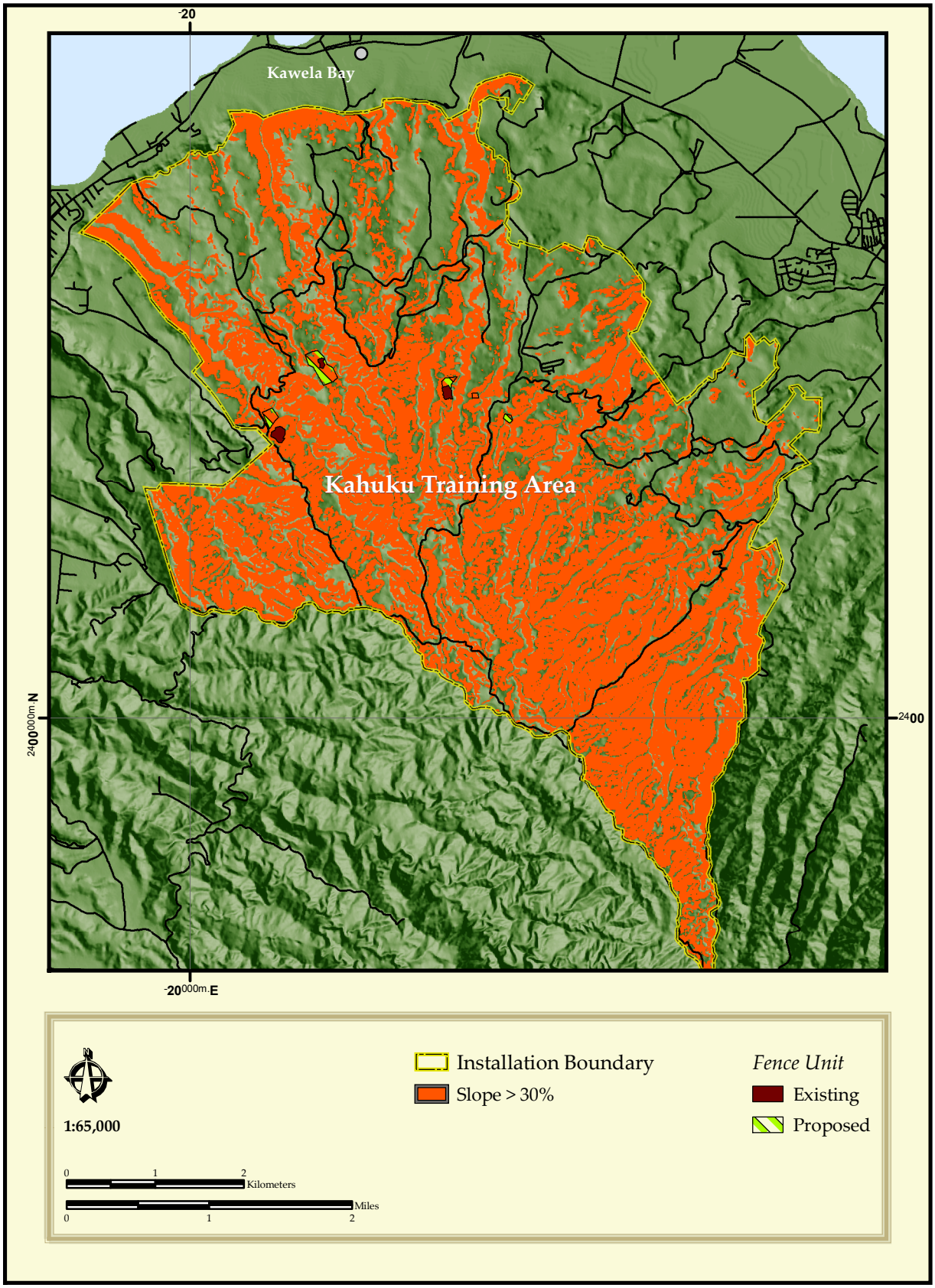


Figure 2.6.c

Training Access at Kahuku Training Area

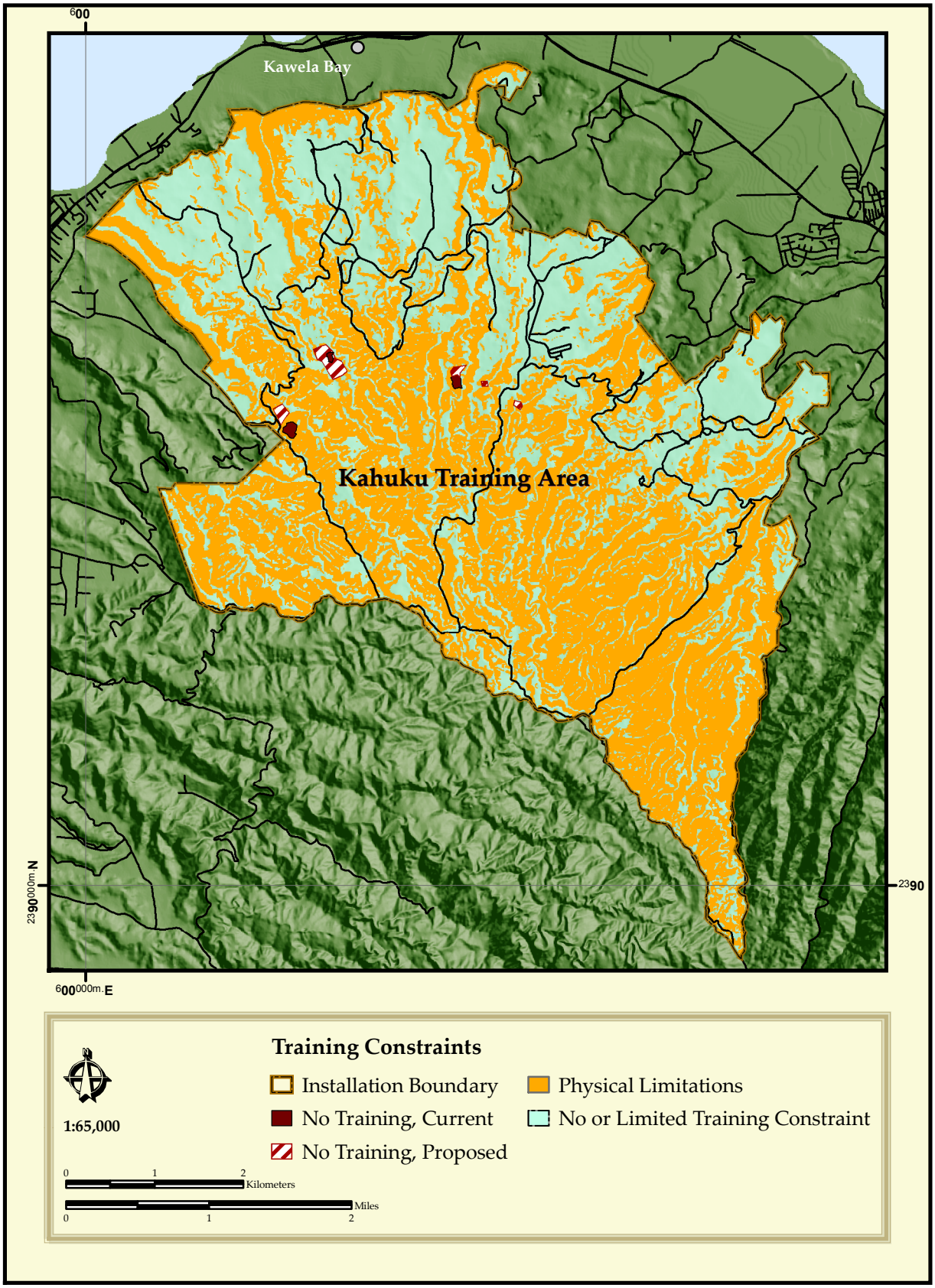


Figure 2.6.d

(USACE and Nakata Planning Group 2002a). There are parts of coastal KTA with unprotected slopes that have some of the highest recorded average wind speeds (18 to 20 knots).

2.6.7.2 Geology

KTA is located on the Koʻolau Mountains, a remnant of an eroded shield volcano from the Pleistocene era, 1.3 to 2.2 million years ago. Much of the original lava surfaces of the shield volcano remain intact along the Kahuku escarpment, along drainages, and in the outcrops of upland areas. The coastal plains at KTA form limestone cliffs uplifted from reefs and are covered by calcareous beach sands and sediments eroded from the volcano (USACE and Nakata Planning Group 2002a).

2.6.7.3 Volcanic Hazards

See Section 2.3.7.3, *Schofield Barracks Military Reservation, Volcanic Hazards*.

2.6.7.4 Topography

KTA is located on the northeastern and windward region of the Koʻolua Mountains (Figure 2.6.e). The elevation of KTA ranges from near sea level along the northern coastal boundary to 1,860 ft (567 m) in the areas along the Koʻolau Mountains. The topography within KTA is highly variable from the relatively flat coastal plains to almost vertical bluffs and stream drainage basins (USACE and Nakata Planning Group 2002a).

2.6.7.5 Soils

The common soil types at KTA are: Kapaʻa Silty Clay, Kemoo-Badland Complex, Kaʻena Very Stony Clay, Kawaihāpai Stony Clay Loam, Keemo Silty Clay, Paumalū Silty Clay, and Paumalū-Badland Complex (Figure 2.6.f). Rock land, rough mountainous land, and stony steep land are also found at KTA. Three of seven soil associations found on Oʻahu are found at KTA. Kaʻena-Waialua soils are commonly found deep in gently sloping areas of coastal plains, talus slopes, and drainages, and characteristically have fine to coarse textured subsoil. Lokekaʻa-Waikāne soils have a fine textured subsoil and are found deep in level to very steep terrain, on alluvial fans, terraces and in uplands. The Kapaʻa soil association occurs along steep drainages, gulches and ridgelines within the rough mountainous regions of KTA. The soils here are deep, well drained, with fine to moderately fine textured subsoil (USACE and Nakata Planning Group 2002a).

Soil erosion is locally significant in areas where natural drainages and gulches occur. However, dry climate and lack of permanent streambeds may moderate the risk of erosion, as well as in areas with exposed lava. The United States Soil Conservation Service (1972) described the soils found on the Island of Oʻahu.

2.6.7.6 Water Resources

All streams and gulches in KTA are intermittent except for Mālaekahana Stream, which flows aboveground to a certain point before going underground. The seasonal streams include Hoolapa Gulch, Kalaeokahipa Gulch, Kaunalā Gulch, Kawela Gulch, Keaaula Gulch, Mālaekahana (Lamaloa and Hina Gulches are tributaries), ʻŌhiʻa Gulch, Oio Stream, Oio Gulch, Pahipahiʻālua Gulch, Paumalū (Kaleleiki Tributary), and Waialeʻe Gulch (Figure 2.6.g) (USAG-HI ONR staff personal communication 2000; USACE and Nakata Planning Group 2002a).

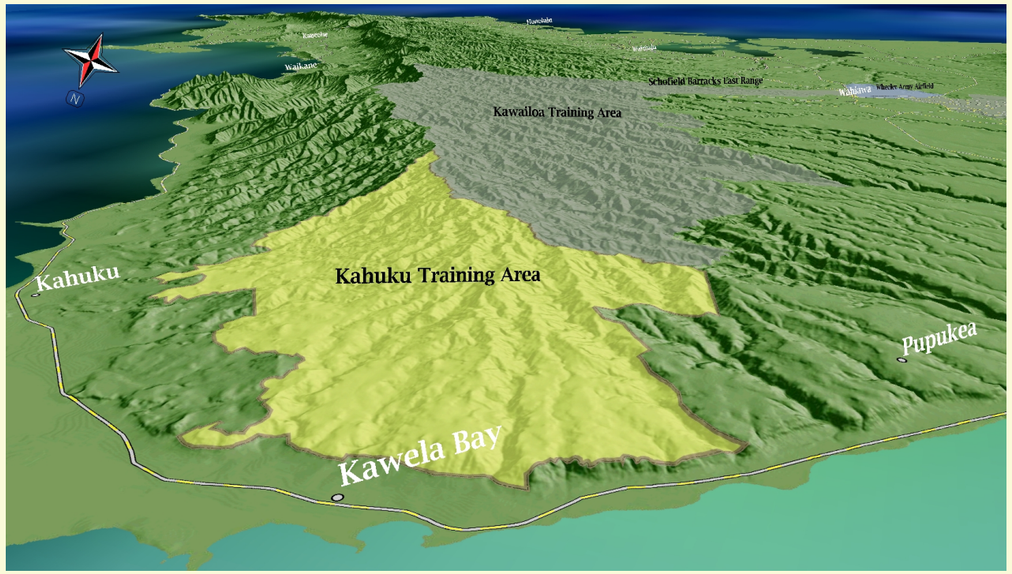
2.6.8 General Biotic Environment

2.6.8.1 Threatened and Endangered Species and Species of Concern

Island ecosystems and the species they support are particularly sensitive to environmental change due to their limited geographic distribution and small population sizes (Temple 1978). Species

Topography of Kahuku Training Area

3-D Perspective View of Kahuku Training Area - Looking South-Southeast



Percent Slope on Kahuku Training Area

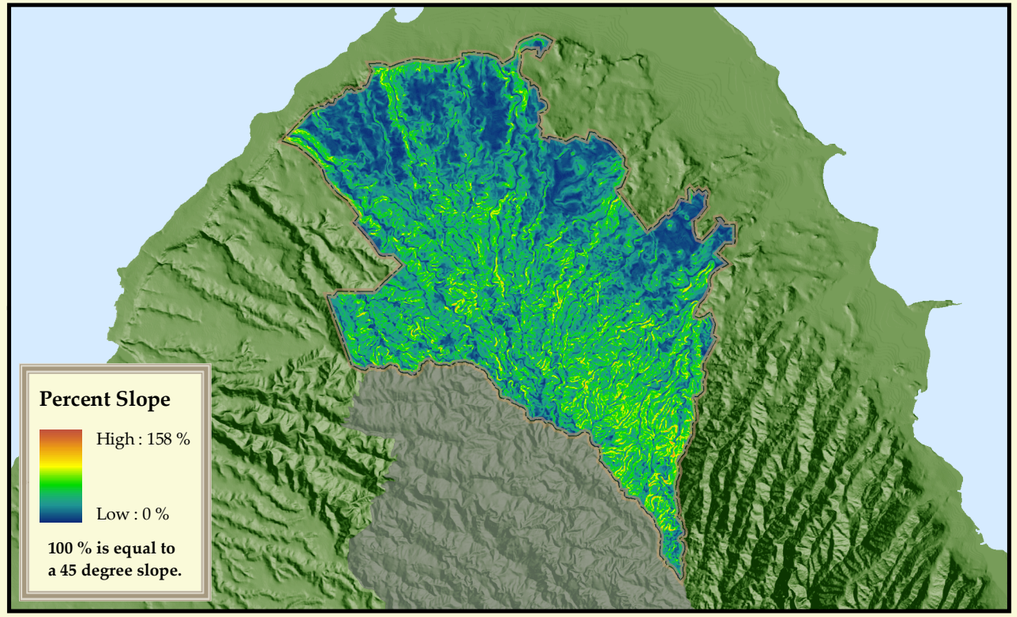
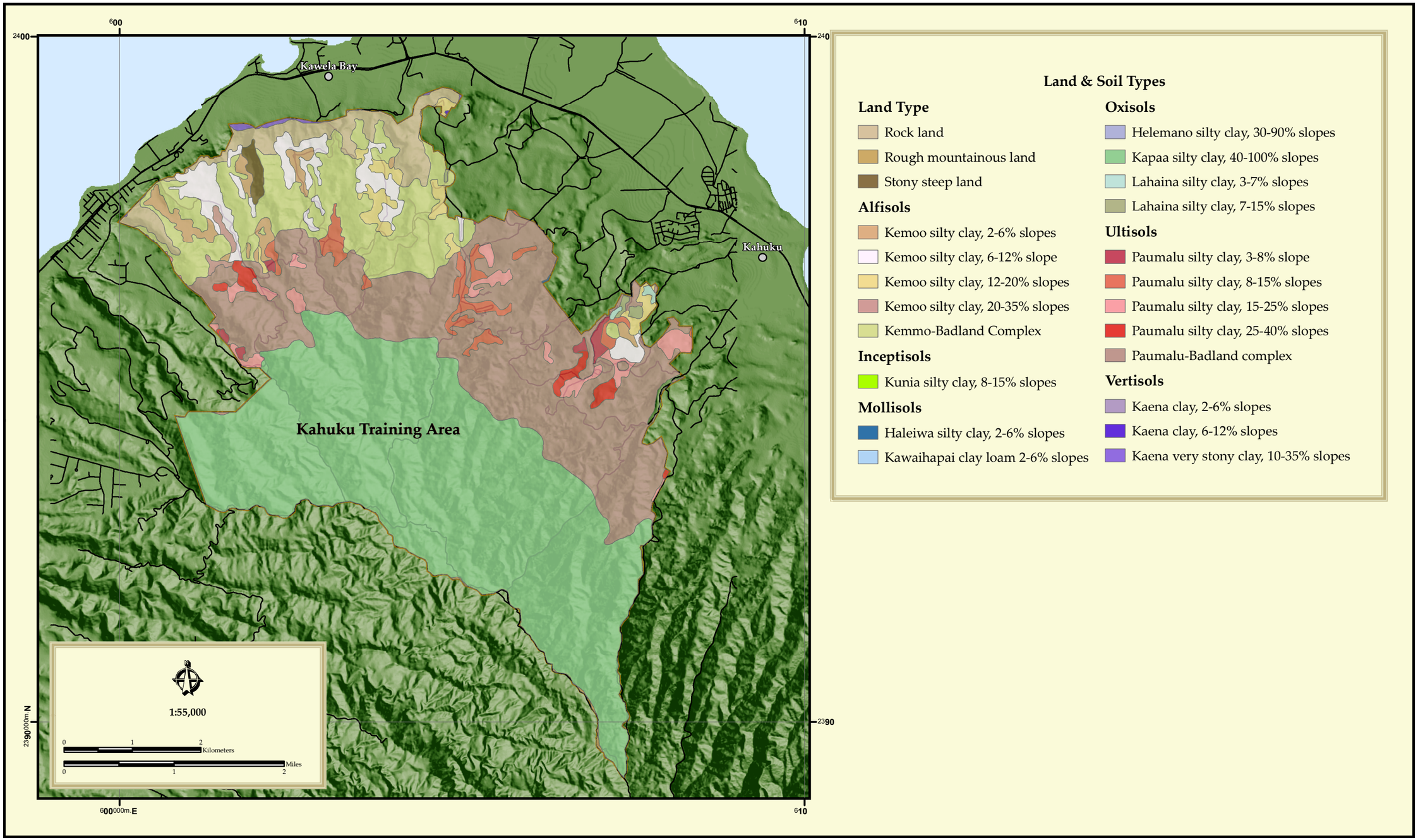


Figure 2.6.e

Land & Soil Types at Kahuku Training Area



Land & Soil Types

Land Type
- Rock land
- Rough mountainous land
- Stony steep land

Alfisols
- Kemoo silty clay, 2-6% slopes
- Kemoo silty clay, 6-12% slope
- Kemoo silty clay, 12-20% slopes
- Kemoo silty clay, 20-35% slopes
- Kemmo-Badland Complex

Inceptisols
- Kunia silty clay, 8-15% slopes

Mollisols
- Haleiwa silty clay, 2-6% slopes
- Kawaihapai clay loam 2-6% slopes

Oxisols
- Helemano silty clay, 30-90% slopes
- Kapaa silty clay, 40-100% slopes
- Lahaina silty clay, 3-7% slopes
- Lahaina silty clay, 7-15% slopes

Ultisols
- Paumalu silty clay, 3-8% slope
- Paumalu silty clay, 8-15% slopes
- Paumalu silty clay, 15-25% slopes
- Paumalu silty clay, 25-40% slopes
- Paumalu-Badland complex

Vertisols
- Kaena clay, 2-6% slopes
- Kaena clay, 6-12% slopes
- Kaena very stony clay, 10-35% slopes

Figure 2.6.f

Water Resources & Wetlands
Kahuku Training Area

Figure 2.6.g

endangerment can be attributed to habitat loss and degradation, disease, competition, predation from introduced species, and the collection of species.

Fauna

In the past 20 years, no federally listed animal species has been documented at KTA. *Asio flammeus sandwichensis*, (pueo, Hawaiian short-eared owl) is believed to be present and is designated as a species of greatest conservation need by the State of Hawai‘i and is species of concern by the Hawai‘i Biodiversity and Mapping Program. (Hawai‘i Biodiversity & Mapping Program. Nov. 2007. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp).

Flora

There are four federally listed and one candidate plant species present on KTA (Table 2.6.a). Rare plant locations at KTA are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of O‘ahu* (USFWS 2003a), *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b), and HBMP 2007 database (HBMP 2007e).

2.6.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: Critical habitat was designated for federally listed plants on KTA (Figure 2.6.h). The Pupukea-Paumalū Forest Reserve sits in the westerly portion of KTA and is designated as plant critical habitat. Owned by the State of Hawai‘i, the site is not excluded from the designation of critical habitat (i.e., areas within the geographical area occupied by the species at the time of listing, if containing physical or biological features essential to conservation or areas determined to be essential for a species’ conservation). Army lands were removed the final critical habitat designation because “the benefits of excluding these lands under 3(5)(A) and 4(b)(2) outweigh the benefits of including these lands in the final designation…[T]he Army has implemented a comprehensive program of endangered species management on its lands under the INRMP process…” As long as the Army includes this area in its endangered species management, the benefits outweigh those gained through the application of the critical habitat designation.

Designated Management Units: Management units (MUs) are located in the Northern Ko‘olau Mountains of O‘ahu, where the most important wild populations of the target taxa occur (Figure 2.6.i). These areas encompass the important habitat for *in situ* management and reintroduction efforts that will lead to the stabilization of the target taxa. The MUs occur on Army and State of Hawai‘i lands (USAG-HI 2003a).

Table 2.6.a Federally Listed Plants Species on Kahuku Training Area.* O” references species cited in the O‘ahu Implementation Plan (IP).

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Cyanea koolauensis	haha, Palolo Valley Rollandia	O	LE	G1
Eugenia koolauensis	nioi, ko‘olau eugenia	O	LE	G1
Gardenia mannii	nanu, na‘u, Mann’s gardenia	O	LE	G1
Pteralyxia macrocarpa	kaulu		C	G1
Tetraplasandra gymnocarpa	‘ohe‘ohe		LE	G1

* Sources: HBMP 2007e, USFWS 2003a, USAG-HI 2008b, Hawai‘i Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff; the USFWS federally listed and candidate
species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai‘i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences).

Areas of Special Concern on Kahuku Training Area

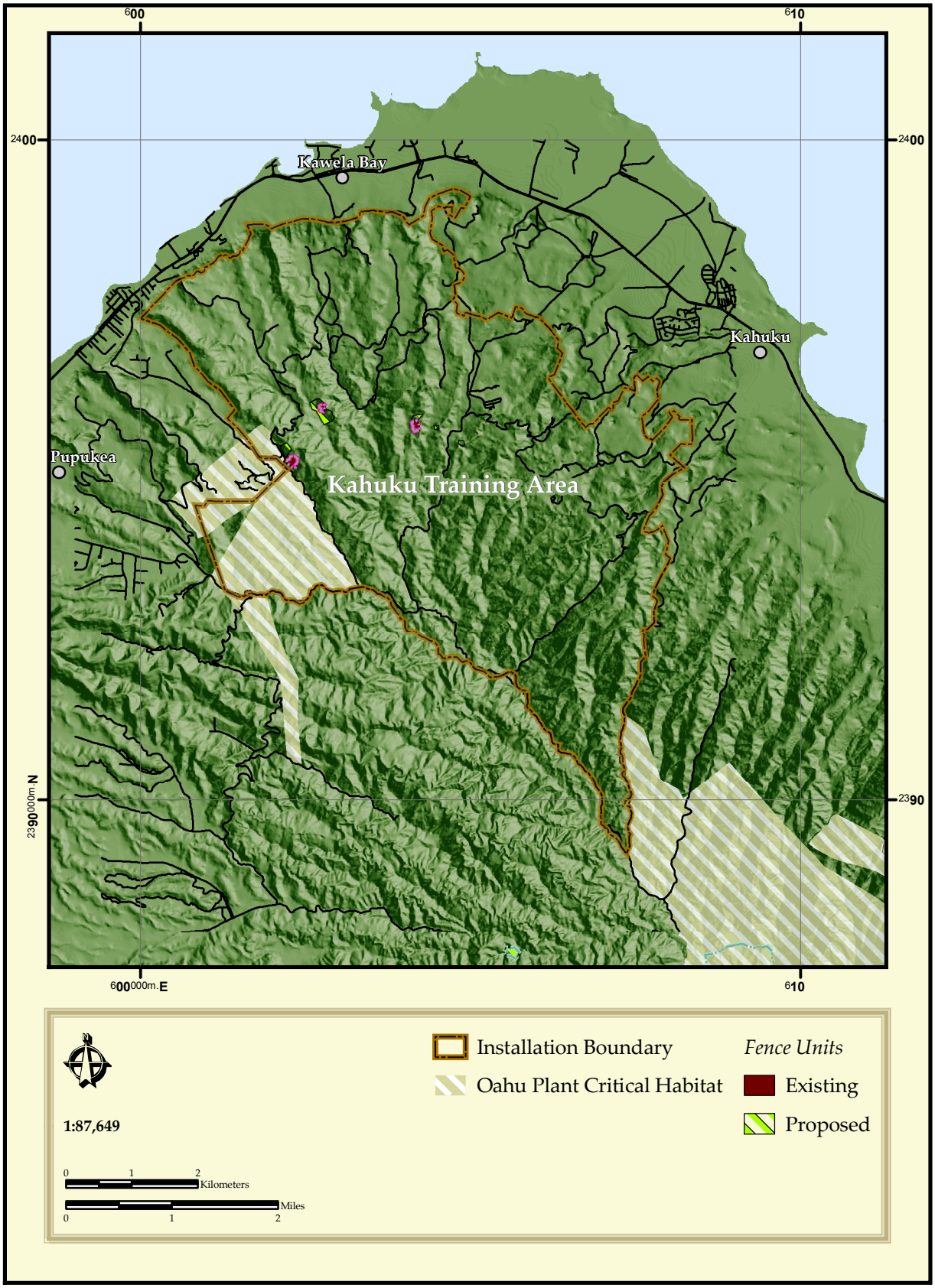
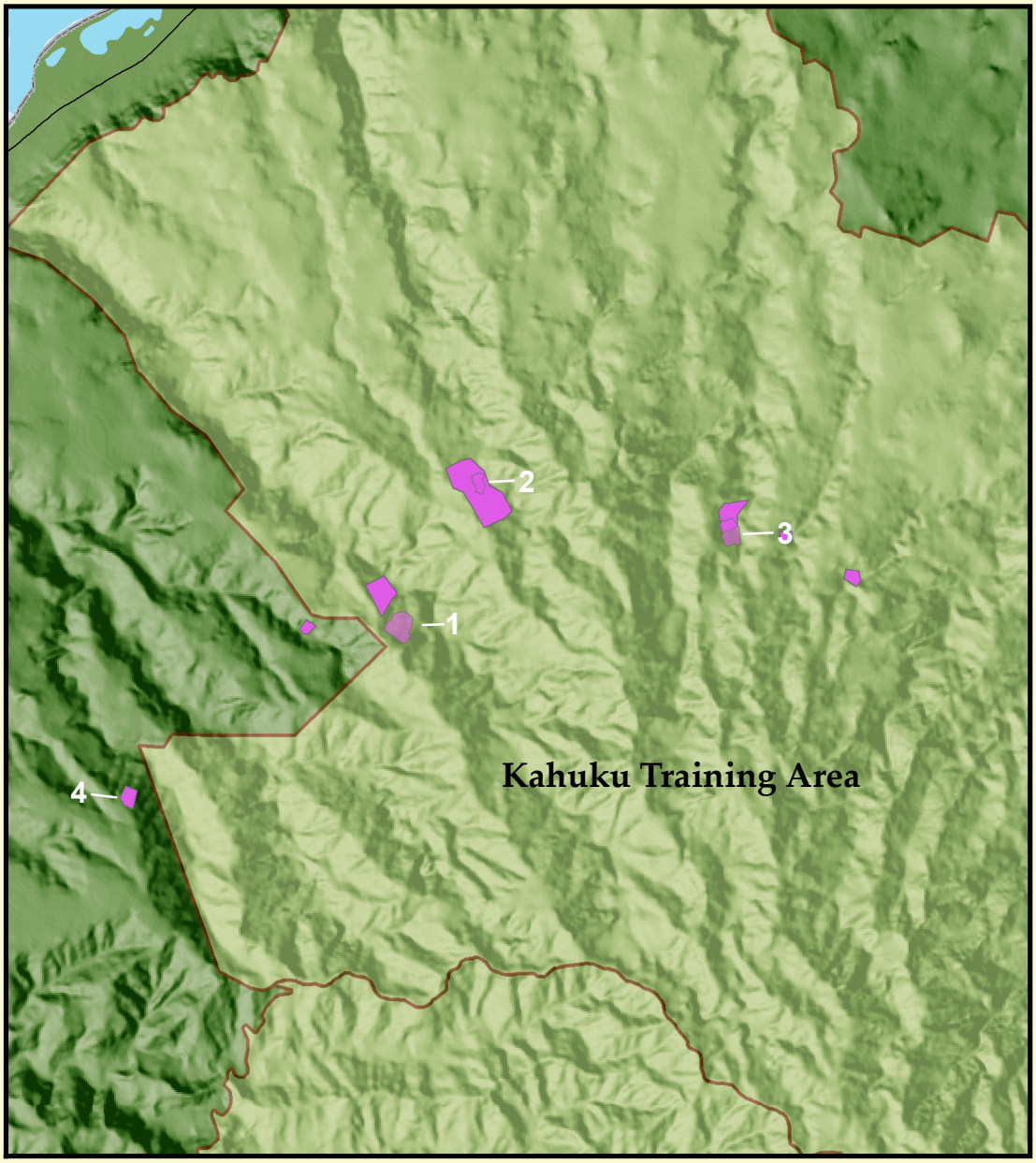


Figure 2.6.h

Management Units
Kahuku Training Area



1:40,000

0 0.5 1 Kilometers

0 0.5 1 Miles

Implementation Plan MU

Oahu IP

Oahu Management Unit

1 Kaunala
2 Pahipahialua
3 Oio
4 Kaleleiki

Figure 2.6.i

There are three management units located at KTA: Kaunala, Pahipahi‘ālua, and ‘Ō‘io. A fourth management unit, K.aleleiki, lies to the west of the installation’s boundary. In the O‘ahu IP, all four units are described collectively.

Kaunalā (5.1 ac/2.1 ha), **Pahipahi‘ālua** (17.1 ac/6.9 ha), ‘Ō‘io (0.9 ac/0.4), and **Kaleleiki** (1.9 ac/0.4 ha) **MUs** cover 25 ac (10.1 ha) and is owned by the State of Hawai‘i (U.S. Army lease, 0.9 ac), State of Hawai‘i (1.9 ac), United States of America (17.1 ac and 5.1 ac). *Eugenia koolauensis* is an O‘ahu IP targets species in each unit and is designated for stabilization in Kaunala, Pahipahi‘ālua, and ‘Ō‘io. *Bobea timonioides* (SOC) is also present. Each unit has protective fencing installed on its boundary. The Kaleleiki fence is managed by the State of Hawai‘i.

The above MUs and their locations are discussed in detail in the *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b).

2.6.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii’s Biodiversity and Mapping Program update KTA’s fauna species lists when new species are identified and verified as being present on KTA.

Keystone Species

Conditions and needs of keystone species is an area that requires development for KTA.

State of Hawaii’s Species of Greatest Conservation Need

A comparison of KTA’s current fauna lists and Hawaii’s CWCS, resulted in the identification of one raptor and possibly four fish species of greatest conservation need designated by the State of Hawai‘i as present at KTA (Ogura et al. 2005). (See Appendix 3, *Species Lists*. Annex D, *KTA Species of Greatest Conservation Need*.)

Mammals

A comprehensive survey of introduced mammal species has not been conducted for KTA. The ‘ope‘ape‘a, Hawaiian hoary (*Lasiurus cinereus* ssp. *semotus*), is the only indigenous terrestrial mammal on the Hawaiian Islands. In 2002, a bat was observed in Pūpūkea-Paumalū, an area bordering the southwest region of KTA. The sighting was later confirmed with a detector (USAG-HI 2002).

Three introduced species have been observed at KTA. (See Appendix 3, *Species Lists*. Annex D, *KTA Mammals*.)

Birds

A comprehensive survey of avian species has not been conducted for KTA. Two native forest birds, one raptor, one migratory shorebirds, and 21introduced bird species have been observed. (See Appendix 3, *Species Lists*. Annex D, *KTA Birds*.)

Herpetofauna

There are no native terrestrial herpetofauna in the Hawaiian Islands. A comprehensive survey of introduced herpetofauna species at KTA has not been conducted. Fifteen introduced herpetofauna species may be present.

Introduced Reptiles: There are eight introduced lizards, one terrestrial snake, and one turtle that may be present at KTA. (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex D, *KTA Herpetofauna*.)

Introduced Amphibians: There is one known frog species and four possible species located at KTA (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex D, *KTA Herpetofauna*.)

Fish
A comprehensive survey of fish species has not been conducted for KTA. The only fish data available for KTA is from Paumalū Stream and includes observations of the endemic *Sicyopterus stimpsoni* (‘o‘opu nopili) and the introduced *Geotomus* (Hawai‘i Stream Assessment database 1991). In addition, a native goby (*Awaous* spp.) was observed in a KTA intermittent stream by HBMP in 1989 (HHP 1994a).

Invertebrates
A comprehensive survey of invertebrate species has not been conducted for KTA. A minimum of twenty-seven endemic terrestrial and two endemic aquatic invertebrates have been observed at KTA. A minimum of twelve introduced terrestrial and four aquatic invertebrates (flatworms, amphipods, isopods, and thiarid snails) were observed in Paumalū Stream on KTA (Hawai‘i Stream Assessment database 1991).

2.6.8.4 Flora
USAG-HI has documented 78 identified and one unidentified taxa at KTA in the Hawai‘i Biodiversity and Mapping Program (HBMP 2007d) and its incipient weed database. (See Appendix 3, *Species Lists*. Annex D, *KTA Plants*, list of native and introduced plant species.)

Keystone Species
Conditions and needs of keystone species is an area that requires development for KTA.

State of Hawaii’s Species of Greatest Conservation Need
A comparison of KTA’s plant species list and Hawaii’s Comprehensive Wildlife Conservation Strategy resulted in the identification of 19 plant species of greatest conservation need designated by the State of Hawai‘i as being present at KTA (HBMP 2007e and Ogura et al. 2005). USAG-HI manages species of greatest conservation need that are federally listed as endangered and located on KTA. (See Appendix 3, *Species Lists*, Annex D, *KTA Species of Greatest Conservation Needs*.)

Incipient Species
USAG-HI ONR staff has identified eight species that it controls and eradicates when found in areas where rare plant species occur at KTA. (See Appendix 3, *Species Lists*. Annex D, *KTA Weeds*.)

Non-Native/Weedy Species
There are 19 invasive/weed species that have been identified at KTA. When these species are determined to be having a negative effect on KTA’s training areas, native plant habitats, and ecosystems, they are controlled. (NRCS PLANTS Database, June 2008. Weeds of Hawai‘i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex D, *KTA Weeds*.)

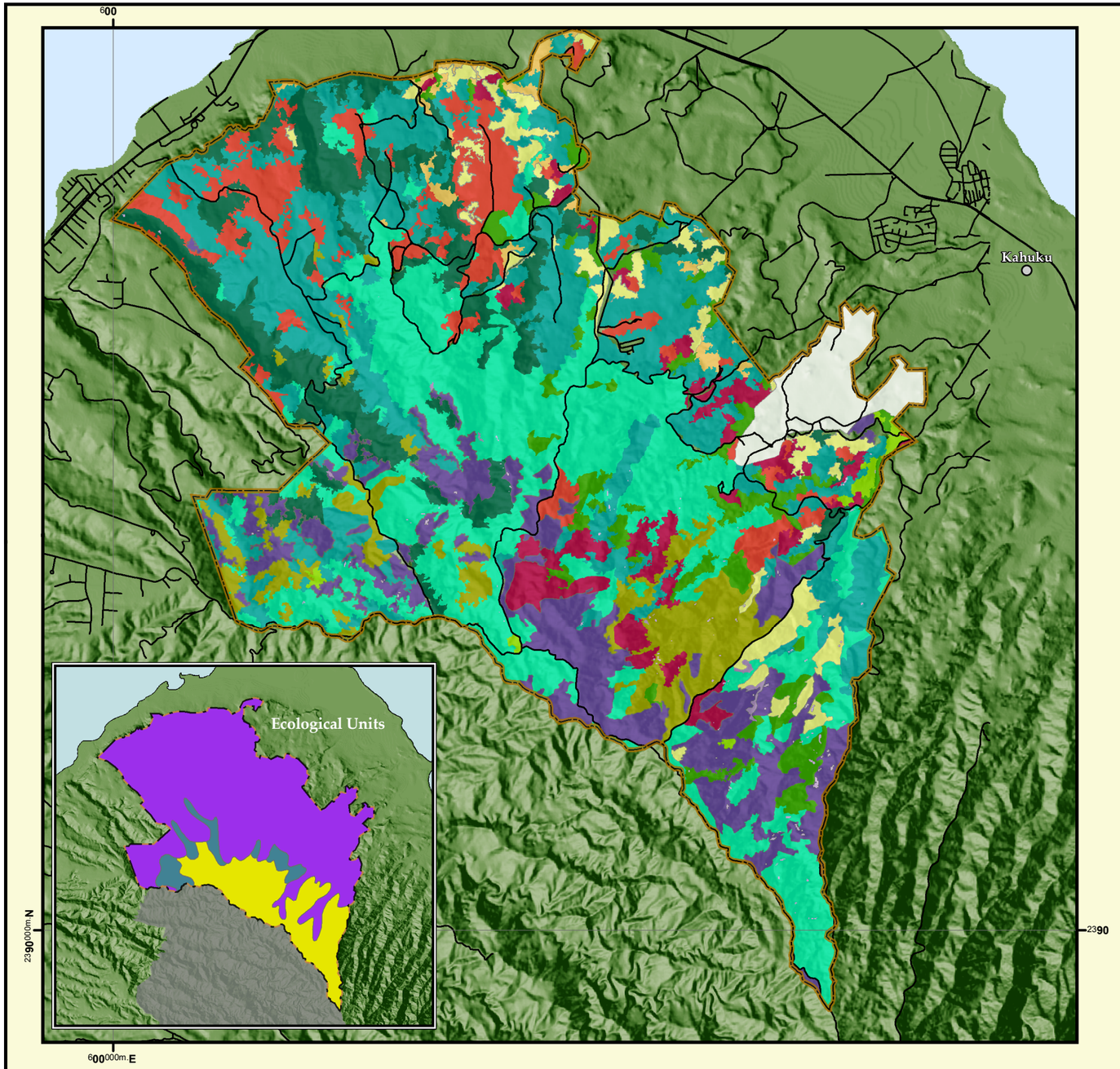
2.6.8.5 Native Vegetation Communities
There are four native vegetative communities located at KTA: Lowland Wet, Lowland Forest Zone, Lowland Mesic, and Aquatic Natural communities (Figure 2.6.j). These community types are

categorized into ecological zones defined by elevation, topography, and prevailing ecological conditions (Wagner et al. 1999). (See Appendix 3, *Species Lists*. Annex D, KTA *Native Vegetation Communities and Descriptions*.)

2.6.8.6 Wetlands and Deep Water Habitats

The U.S. Army Corps of Engineers (USACE) conducted a limited wetlands delineation survey of KTA's known water bodies. The Corps of Engineers identified and described a ponded water area on the ʻŌʻio Stream, Onion Pond, a water body in Kaunalā Gulch, and three potential wetlands (meadows containing California Grass Meadow). Only one area, Onion Pond, located on the south side and near Drum Road, was determined to be a regulated wetland. The wetland met all three USACE hydric indicators. The ponded water area within the ʻŌʻio Stream met all three criteria, but was determined to be a stream and not a regulated wetland by the Corps (USACE 2005). The water body in Kaunalā Gulch and the three meadows did not meet the criteria for a regulated wetland (see Figure 2.6.g). There are no known deep water habitats located on KTA.

Vegetation Communities on Kahuku Training Area



Vegetation Communities

Forest

- *Metrosideros polymorpha / Acacia koa / Dicranopteris linearis* Diverse Native Forest
- *Aleurites moluccana* Forest
- Mixed Cliff Communities
- *Casuarina* spp. Mixed Forest
- *Eucalyptus* spp. Mixed Forest
- *Schinus terebinthifolius* Forest
- *Syzygium cumini* Forest
- *Melaleuca quinquenervia* Forest

Grassland

- *Panicum maximum* Grassland
- *Leucaena leucocephala / Panicum maximum* Mixed Grassland
- Naturalized *Melinis minutiflora / Panicum maximum* Mixed Grassland
- *Andropogon virginicus* / Mixed Alien Grassland
- Disturbed Alien Grasslands

Shrubland

- *Psidium cattleianum* Shrubland

Wetland

- Montane Bog
- Open Water

Other Areas

- Unclassified Areas
- Agriculture
- Urban Development

1:50,000

0 1 2 Kilometers

0 1 2 Miles

Ecological Units

- Lowland Mesic Forest & Shrubland
- Lowland Wet Forest & Shrubland
- Nonnative

Figure 2.6.j

2.7 Dillingham Military Reservation

2.7.1. Location and Neighbors

Dillingham Military Reservation (DMR) is located on the northwestern tip of O‘ahu, on the north shore just east of Ka‘ena Point. DMR is located approximately four miles west of the town of Waialua (pop. 3,761). Sole access is via the Farrington Highway. Neighbors include state and private landholders. The area surrounding DMR is remote and sparsely populated. The installation is bounded on the north by the Pacific Ocean and on the south by the northeastern slopes of the Wai‘anae Mountains (Figure 2.7.a).

2.7.2 Infrastructure

2.7.2.1 Ranges and Training Lands

DMR consists of three training areas, a private-use/owned cantonment area, a joint use civilian/military airfield, and three airborne drop zones (Figure 2.7.b). The reservation is 809 ha (664 ac), of which 182 ha (451 ac) are suitable for unrestricted maneuver training. The remaining area consists of an airfield and slopes bordering the Wai‘anae Mountain Range. Small Army Training and Evaluation Program (ARTEP) missions can be supported. There are no live-firing ranges located on DMR; however, blanks can be fired.

2.7.2.2 Cantonment Area

The Army no longer maintains a cantonment area at DMR. There is a private-use cantonment area consisting of administration buildings and aircraft hangers for small aircraft.

2.7.2.3 Dillingham Airfield

The airfield is a general aviation joint-use facility located on Dillingham Military Reservation and consists of approximately 87 ac (35 ha). It has a 5,000 x 75 ft (152 m x 22m) runway, a state-operated UNICOM (air traffic advisory) facility, several hangars, and a tie-down area for recreation aircraft, but no other facilities. Air traffic is limited to daytime operations by small single-engine and light twin-engine aircraft, sailplanes, ultra-light aircraft, and helicopters. Traditionally, the airfield has been used for recreation, such as glider soaring, hang-gliding, parachuting, and sky jumping. A taxiway extension was supposedly built in 2005. This facility is a visual operating rules (VOR) airfield.

2.7.2.4 Wheeler Army Airfield (WAAF)

Military aircraft from WAAF conduct training and support at DMR. (See Section 2.3.2.3, *Wheeler Army Airfield.*)

2.7.2.5 Commercial/Other Airports

See Section 2.3.2.4, *Schofield Barracks Military Reservation, Commercial/Other Airports*.

2.7.2.6 Drop Zones

There are two civilian parachute drop zones approved for personal, one is located in Runway Protection Zone 8 and the other in Runway Protection Zone 26 of the joint-operated airfield. There is an approved military water drop zone (a circular drop zone with a diameter of 1000 yds.) for personnel and equipment located approximately 50 meters off-shore and on the east end of DMR.

2.7.2.7 Harbors

See Section 2.3.2.5, *Schofield Barracks Military Reservation, Harbors.*

Location & Land Ownership
Dillingham Military Reservation

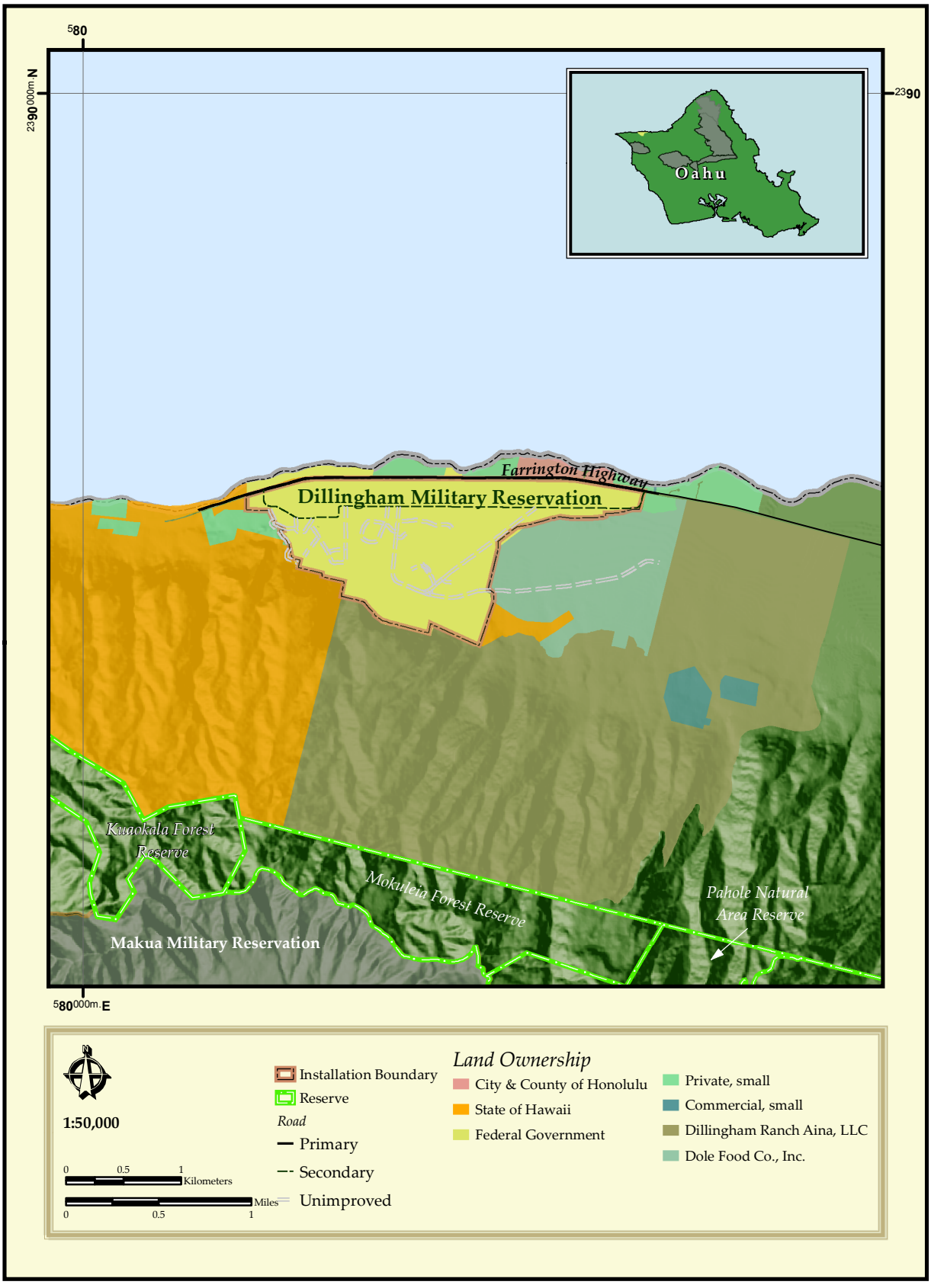


Figure 2.7.a

Cantonment & Training Areas
Dillingham Military Reservation

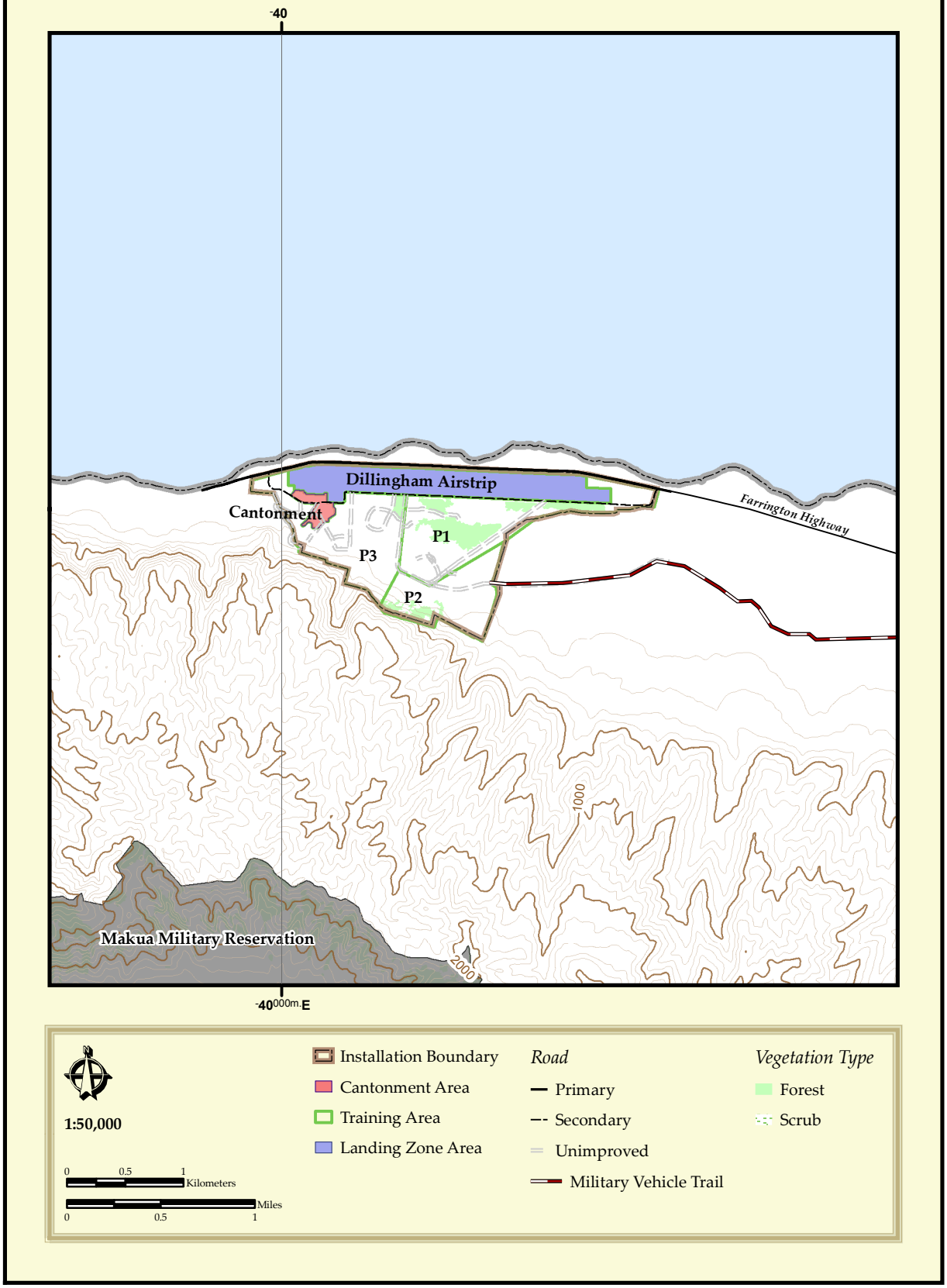


Figure 2.7.b

2.7.2.8 Roads
There are 2 mi (4 km) of primary or secondary roads, virtually no tertiary roads, and approximately 5 mi (8 km) of unimproved roads (four-wheel-drive trails) at DMR (see Figure 2.7 b). Dust can be a problem on unimproved roads.

2.7.3 Installation History

2.7.3.1 Pre-military Use
Traditionally, DMR lands were utilized mainly for their coastal resources. The limited arable land was utilized for cultivation of sweet potato and, to a lesser extent, taro. During the Great Mahele, DMR land was classified as Crown Lands, so no Land Commission Awards were issued. By the early 1900s, most coastal lands in the vicinity of DMR consisted of sugar cane plantations, with the exception of the Dillingham Ranch.

2.7.3.2 Installation History
DMR was acquired January 11, 1925, from W.F. Dillingham in exchange for other lands. The parcel, subsequently known as Kawaihāpai Military Reservation, was used as an Army encampment and for training purposes until reassigned on January 1, 1942, as part of Mokulēʻia Field, Army Air Base.

After the attack on Pearl Harbor, Mokulēʻia Field, with an extensive area of roadways, bunkers, and earthen aircraft revetments hangers, was built along the coastal plain just east of the former Dillingham Ranch. Additional construction extended into the foothills where ammunition storage bunkers and gun emplacements were built (Ogden Environmental and Energy Services 1998).

Sometime between 1945 and 1947, Mokulēʻia Army Airfield was closed. The airfield was transferred to the Air Force, effective July 1, 1948, and was renamed Dillingham Air Force Base (Freeman 2006). In an aerial photograph of the base in July 29, 1949, the airfield appears to be inactive.

During the Korean War, the airfield was reactivated, and at least a squadron of fighter aircraft was stationed there. The airfield was used by four engine aircraft as well (Freeman 2006).

Sometime between 1953 and 1954, the airfield was closed, but the base remained an active Air Force installation. During the 1950s, a Nike-Hercules site was constructed. The Nike-Hercules site was operated by Battery OA-84, Hawaiʻi Army National Guard (Freeman 2006). The site was deactivated in 1970.

DMR was re-transferred to the Army on December 5, 1974, and, between 1975 to 1977, the Army entered into a joint agreement with the State of Hawaiʻi to open a civilian use airport comprising approximately 87 ac (35 ha) (Freeman 2006).

Approximately 354 ac (143 ha) of DMR are currently suitable for maneuver and field training, 107 ac (43 ha) are developed within the cantonment area, and the remaining 203 ac (82 ha) are located on steep slopes of the Waiʻanae Mountains. The former airfield has extensive hardened areas that can support vehicular traffic and headquarters activities and will see an increased use by the 2nd/25th Brigade Stryker Combat Team. Also, four fixed tactical internet antennae sites were recently constructed at DMR.

2.7.3.3 Cultural History
DMR has 23 known archeological sites and 41 buildings whose eligibility has yet to be determined. (USAG-HI 2007b).

2.7.3.4 Natural Resources Program History

The responsibility for managing natural resources on DMR became the responsibility of the Army when the installation was established in 1925. With support from the Army, DLNR provided technical assistance and performed most resources management activities on DMR through the early 1990s. On 23 July 1965, the Agreement for a Cooperative Plan for the Conservation and Development of Fish and Wildlife Resources between the Department of the Army, Department of Interior, and State of Hawai‘i was finalized. It required the preparation and development of a Master Fish and Wildlife Management and Habitat Improvement Plan for each Hawai‘i installation. In 1969, the plan was completed and agreed upon by the three agencies.

Botanical surveys have been outsourced by the Army since 1977 to fulfill requirements under the Endangered Species Act. Surveys were conducted on DMR to identify rare plant populations and the potential threats to these populations, including the potential impacts of military training activities (RCUH 2000). Survey reports include maps of specific species population locations. In 1977, Environmental Impact Study Corporation conducted an extensive biological inventory at DMR and discovered the only known example of extremely dry closed canopy forests of *Sapindus oahuensis*. A second, short survey (due to size of the natural area and the ruggedness of the terrain) was conducted in 1995 by the Hawai‘i Biodiversity and Mapping Program (HBMP).

In addition, surveys for members of the genus *Achatinella* were conducted in 1984 and 1985 by Hadfield and Christensen, respectively, on O‘ahu sub-installations. The information from the 1995 HBMP survey, the HBMP Natural Diversity Database, and information obtained from the environmental impact study provided the foundation for the zoological inventory information found here and in the Endangered Species Management Plan Report (R.M. Towill Corp. 1997b).

In March 1999, USAG-HI ONR staff attempted a trial introduction of *Megalagrion xanthomelas* at a natural water seep/regulated wetland located at DMR, but it was unsuccessful.

2.7.4 Military Mission

The primary mission of DMR is to operate and maintain a safe, modernized, local training area for USAG-HI, U.S. Army Pacific Command, and other U.S. Pacific Command military units.

2.7.5 Military Operations and Activities That May Affect Natural Resources

DMR is used for small unit (platoon and squad) maneuvers and combat support operations. DMR supports field training for headquarters and service support units. Specific training includes Command Post Exercise operations, Emergency Deployment Readiness Exercise support operations, limited maneuver training, airborne operations including equipment and personnel parachute operations, lodgment support operations, and night vision goggle training for helicopter pilots. Platoon-level Army Training Evaluation Program missions are supported at DMR.

Maneuver and field training can occur on over half (354 ac, 143 ha) of DMR. Maneuver training is not permitted on the portion of the airfield that is leased to the State of Hawai‘i unless prior state approval is obtained.

There are no live-fire activities, designated impact areas, or associated surface danger zones on DMR. Ammunition is restricted to the use of blanks and is prohibited on the runway. Non-aerial smoke is allowed in designated areas, but prohibited on the runway. Fire associated with training exercises is possible.

The cantonment area is 107 ac (43 ha) in size and is privately owned and operated. It includes small plane hangars and several small outbuildings. DMR was formerly a military airfield and has extensive hard-packed areas that will support vehicular traffic and headquarter activities.

Construction activities are limited at DMR. There is proposed future construction of an improved gravel road tying DMR with SBMR and two firebreaks.

2.7.6 Natural Resources Constraints on Training Areas and Ranges

Slopes greater than 30 percent are within the southwest boundary of the installation. Proximally central to the site is a wetland (11.8 ac/4.8 ha) (Figure 2.7.c). Training is restricted from the wetland and the physical limitations of the slopes preclude vehicle access (Figure 2.7.d). There is very little native vegetation remaining within the boundaries of the installation, except for the limited area of steep slopes of the Waiʻanae Range located on the southern boundary of DMR. There are no federally protected species at DMR; however, there are species on adjacent properties.

All training is subject to the fire danger rating system (25th ID (L) and USAG-HI 2003). Range Control notifies troops hourly on training restrictions. Live-fire and tracer ammunition is prohibited at KTA. Blank ammunition and limited pyrotechnics are permitted with Range Control approval. During the Red Fire Index status, pyrotechnics, blank fire, smoking and cooking/warming fires are prohibited. All fires must be reported and the officer in charge will initiate a "cease fire" order.

Minimum staffing and fire response must be arranged and meet training activities. If fire suppression equipment is not operational, training at DMR is suspended. The NR manager is notified if fires are a potential threat to federally listed plants or animals (25th ID (L) and USAG-HI 2003).

2.7.7 General Physical Environment and Ecosystems

2.7.7.1 Climate

The average temperature at DMR ranges from 60°F to 86°F (16 to 30°C), and the average annual rainfall ranges from 20 to 30 in (51-76 cm). The monthly average rainfall ranges from less than 1.0 in (2.5 cm) in the summer to 5.0 in (12.7 cm) in the winter. Prevailing winds are east or northeasterly trade winds from 4 to 24 mph in the warm summer months, and light south to southwesterly winds prevail in the wet winter months (USACE and Nakata Planning Group 2002a).

2.7.7.2 Geology

DMR is on the north slope of the Waiʻanae Range and is underlain by chronologically alternating basaltic flows and eroded volcanic rocks of the Waiʻanae and Koʻolau volcanoes. Exposed rocks on the north slope of the Waiʻanae Range, south of DMR, are remnants of the dike complex belonging to the northwest-trending rift zone of the Waiʻanae dome. Along the coast, the volcanic rocks alternately have submerged below and emerged above sea level over recent geologic time. The coastline is underlain by an ancient coral reef, which subsequently has been overlain by dune sand deposits (USAEC 2008).

2.7.7.3 Volcanic Hazards

See Section 2.3.7.3, *Schofield Barracks Military Reservation, Volcanic Hazards*.

2.7.7.4 Topography

DMR is located on the Waialua Plain and abuts the coast to the north and steep sloping cliffs to the south (Figure 2.7.e). The elevation of DMR ranges from sea level along the northern coastal boundary

Natural Resources Constraints
Dillingham Military Reservation

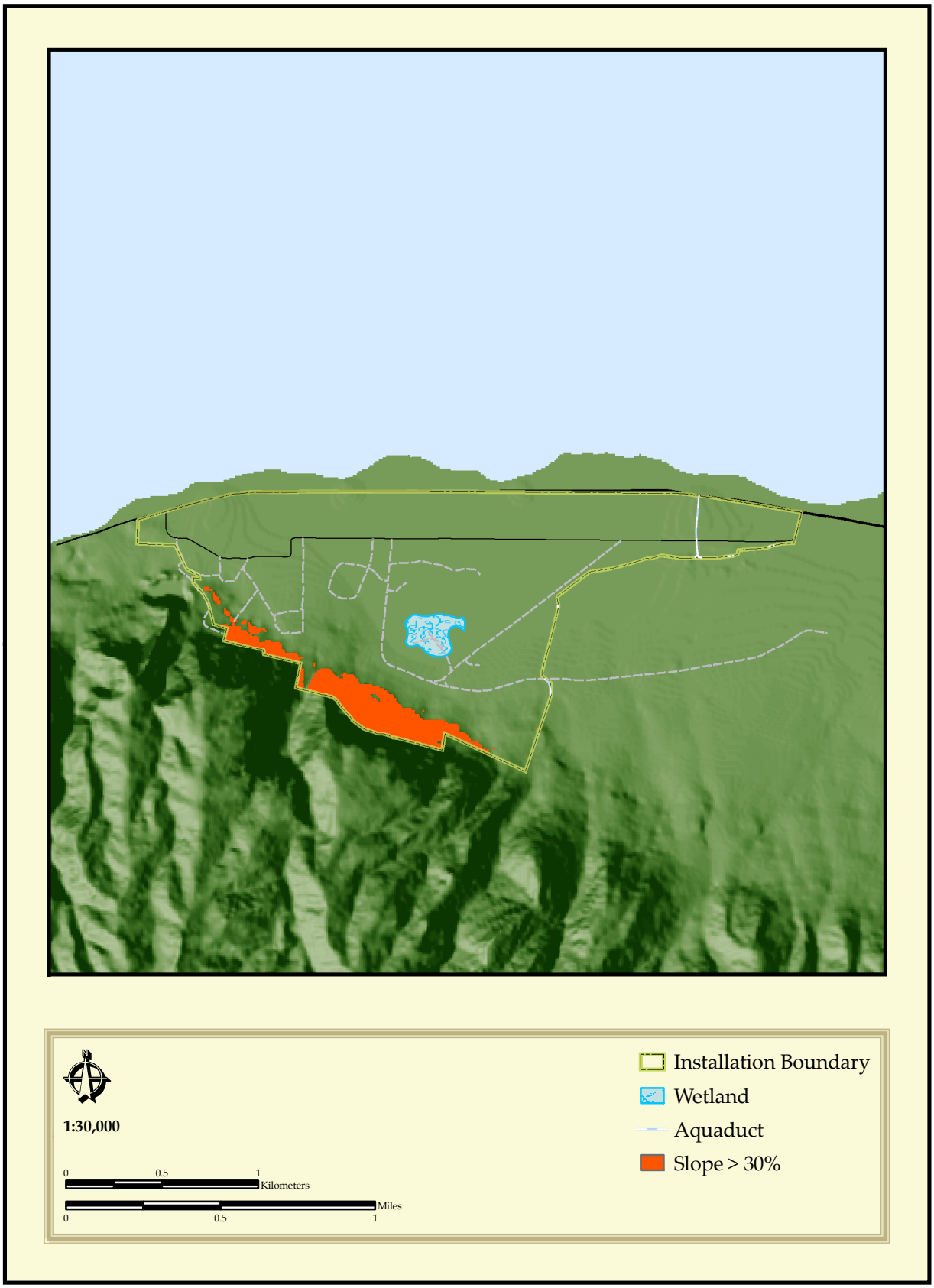


Figure 2.7.c

Training Access at Dillingham Military Reservation

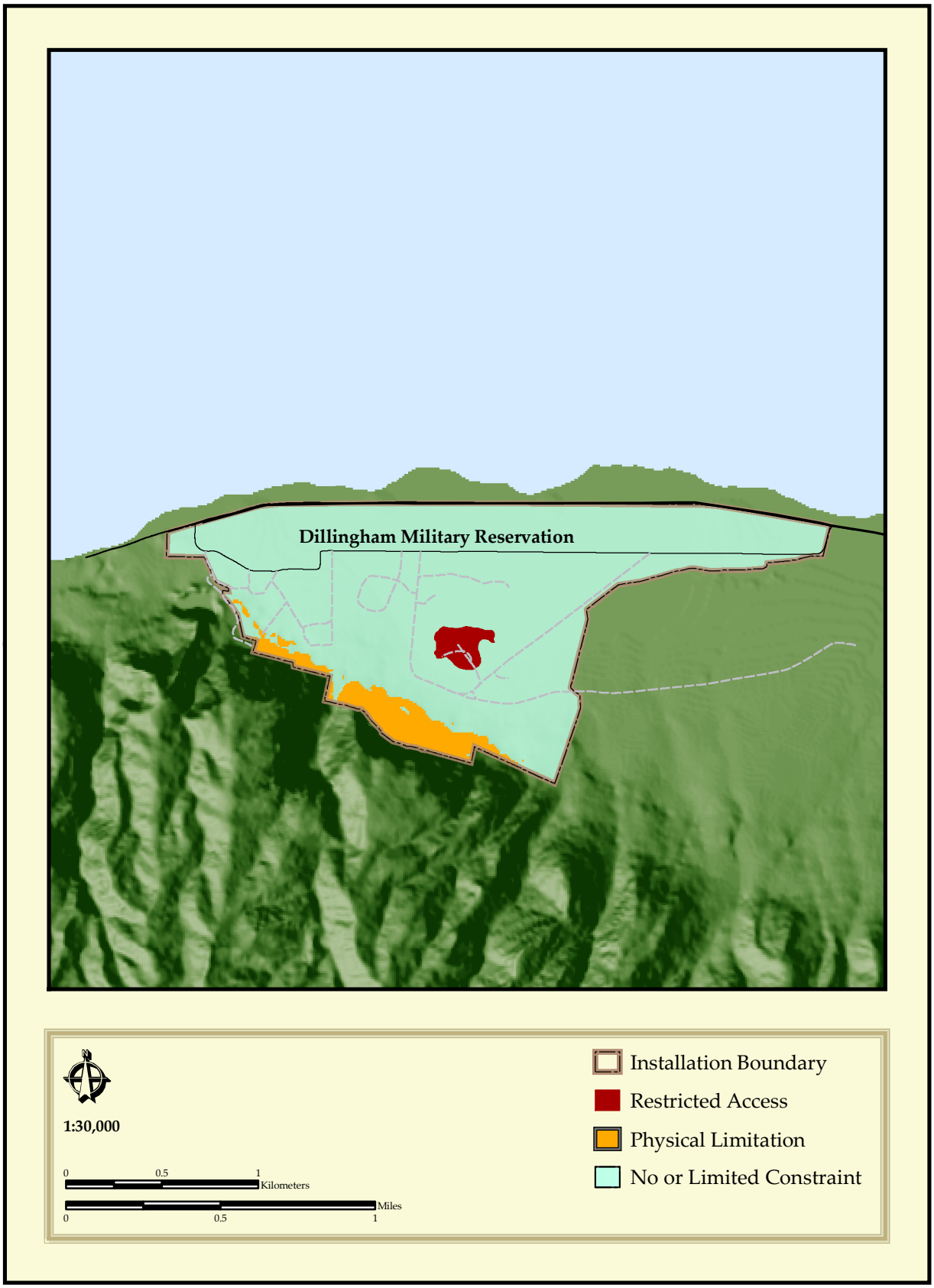
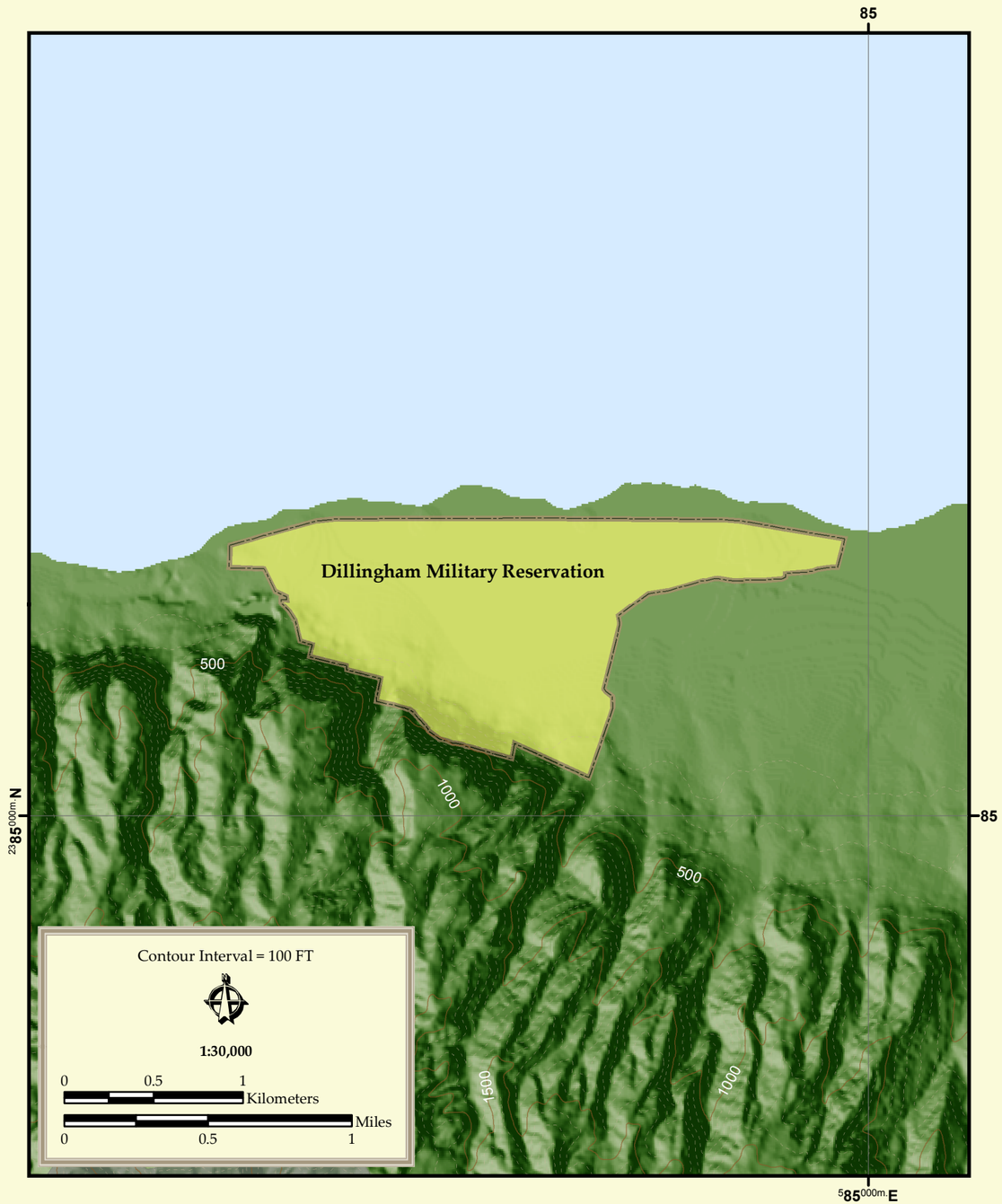
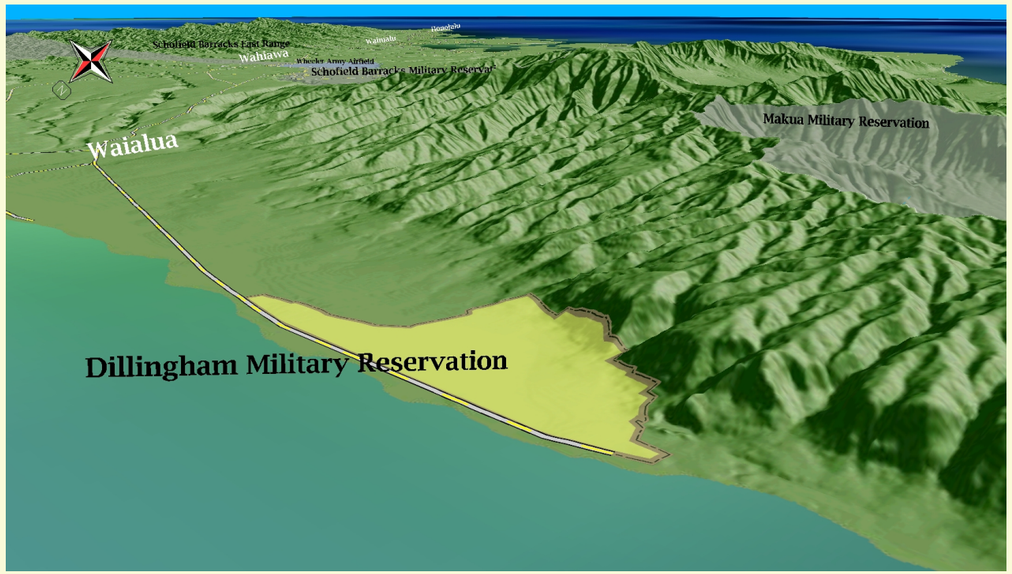


Figure 2.7.d

Topography of Dillingham Military Reservation



3-D Perspective View of Dillingham Military Reservation - Looking Southeast



Percent Slope on Dillingham Military Reservation

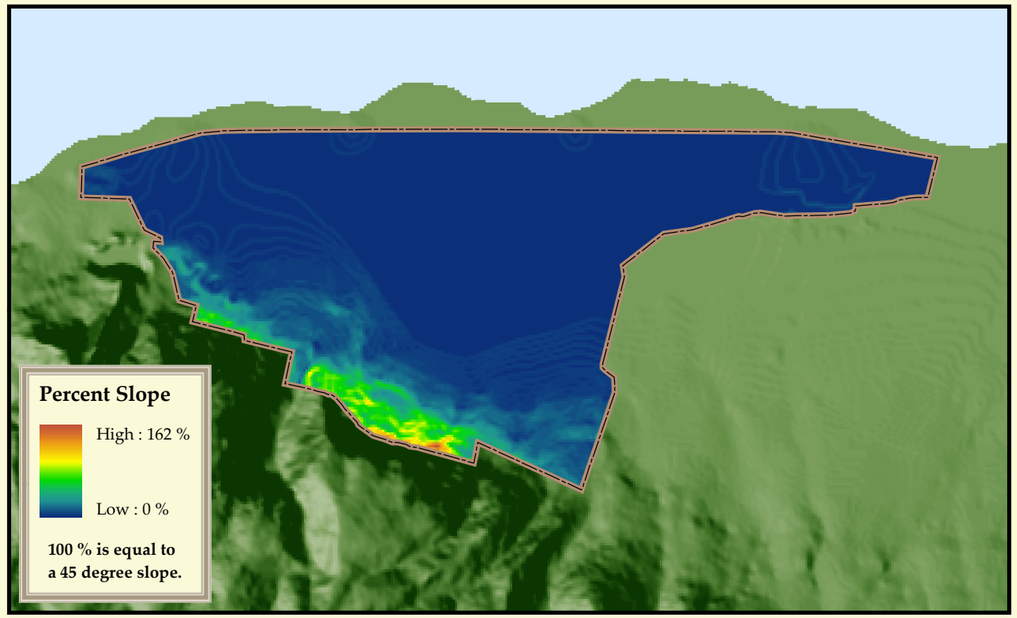


Figure 2.7.e

to 2,000 ft (610 m) in the southern ridgeline areas. The floor of the airfield is 10-120 ft (3 to 37 m) in elevation. The shoreline topography in the north contains reefs with sand pockets and channels (USACE and Nakata Planning Group 2002a).

2.7.7.5 Soils

The common soil types at DMR are beach soils; these include Jaucas Sand, Lualualei Clay, Haleʻiwa Silty Clay, Pūlehu Stony Clay Loam, Kaʻena Very Stony Clay, and Kawaihāpai Stony Clay Loam soils (Figure 2.7.f). The runoff potential is slow and the hazard of erosion is only slight for these soils with the exception of the Kaʻena Very Stony Clay, which has medium to rapid runoff and moderate to severe threat of erosion. The Jaucas sand is very susceptible to wind erosion (USACE and Nakata Planning Group 2002a). The United States Soil Conservation Service (1972) described the soils found on the Island of Oʻahu.

2.7.7.6 Water Resources

There are several unnamed, intermittent drainages and a wetland/bog area at DMR (Figure 2.7.g).

2.7.8 General Biotic Environment

The Hawaiian Islands are the most isolated high-island archipelago on the planet. An ocean barrier of more than 2,500 mi (4,023 km) separates the islands from the nearest continent. This isolation has significant implications for the biological resources of these islands.

2.7.8.1 Threatened and Endangered Species and Species of Concern

Island ecosystems and the species they support are particularly sensitive to environmental change due to their limited geographic distribution and small population sizes (Temple 1978). Species endangerment can be attributed to habitat loss and degradation, disease, competition, predation from introduced species, and the collection of species.

Fauna

No known federally listed animal species have been documented on DMR. Three federally listed bird species present on lands adjacent to DMR (Table 2.7.a). These species may use DMR on occasion.

Table 2.7.a Federally Listed Animals Located on Lands Adjacent to Dillingham Military Reservation.*

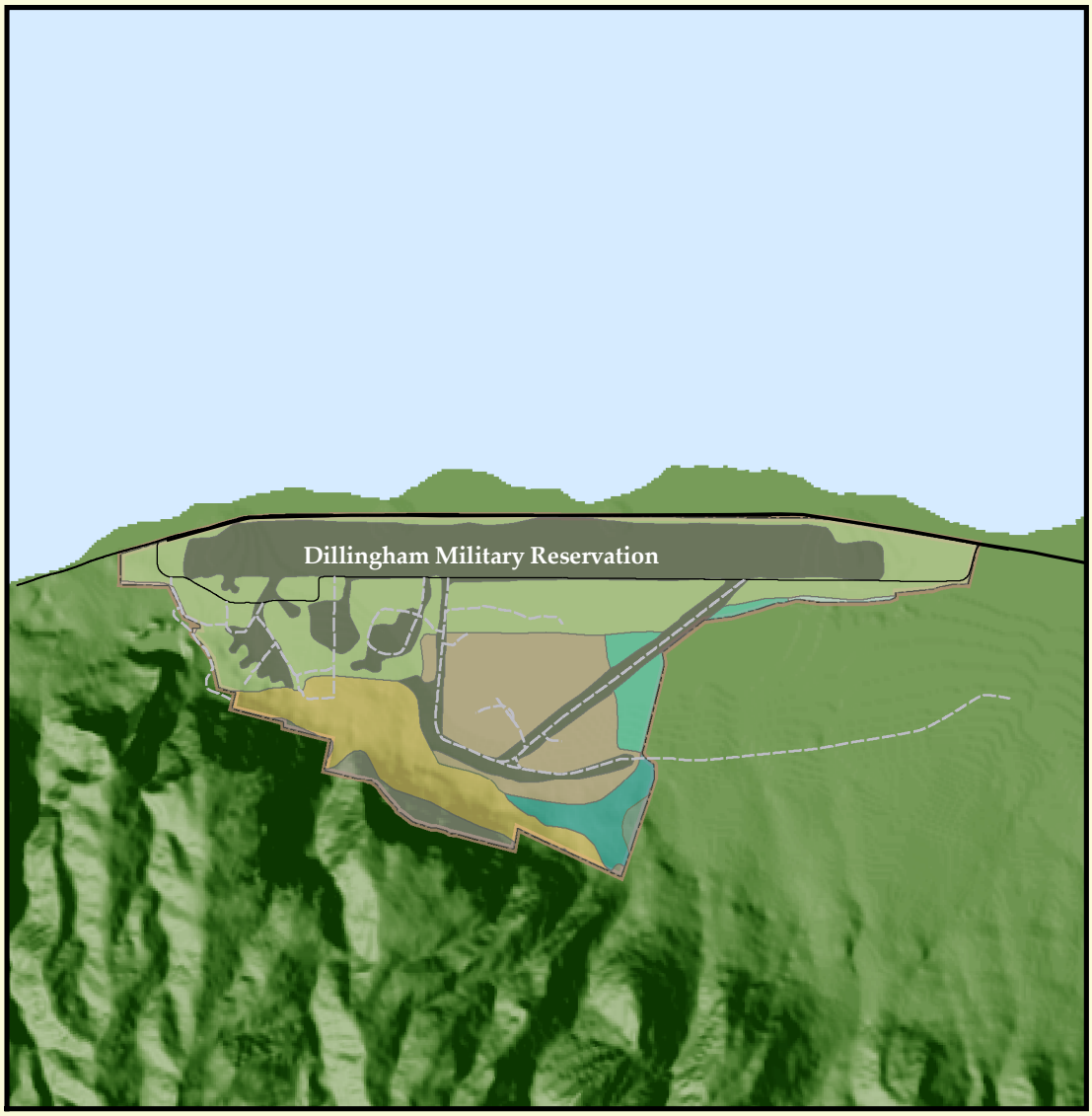
Scientific Name	Hawaiian / Common Name	Federal Status[1]	Global Rank[2]
Birds			
Anas wyvilliana	Hawaiian duck	LE	G1
Fulica alai	Hawaiian coot	LE	G2
Gallinula chloropus sandvicensis	Hawaiian moorhen	LE	G5T2

* Sources: USAG-HI 2007a, HBMP 2007e, USAG-HI 2008b, USAG-HI 2003a, USFWS 2003a, USAG-HI ONR staff, USFWS federally listed and candidate species lists for the Hawaiian Islands, as of Feb. 12, 2008, Hawaiʻi Biodiversity and Mapping April 2010.

1 Key to Federal Status: LE = endangered.

2 Key to Global Ranks as defined by Hawaii Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled, due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G5T2 = globally secure, subspecies or variety imperiled (often 20 or fewer occurrences).

Land & Soil Types at Dillingham Military Reservation



Land & Soil Types

Land Type
- Filled land, mixed
- Rock land
- Other

Entisols
- Jaucas sand, 0-15% slopes

Mollisols
- Haleiwa silty clay, 0-2% slopes
- Kawaihapai stony clay loam, 2-6% slopes
- Mokuleia clay loam
- Pulehu stony clay loam, 2-6% slopes

Vertisols
- Lualualei clay, 0-2% slopes
- Kaena very stony clay, 10-35% slopes

1:30,000

0 0.5 1 Kilometers

0 0.5 1 Miles

Figure 2.7.f

Water Resources & Wetlands
Dillingham Military Reservation

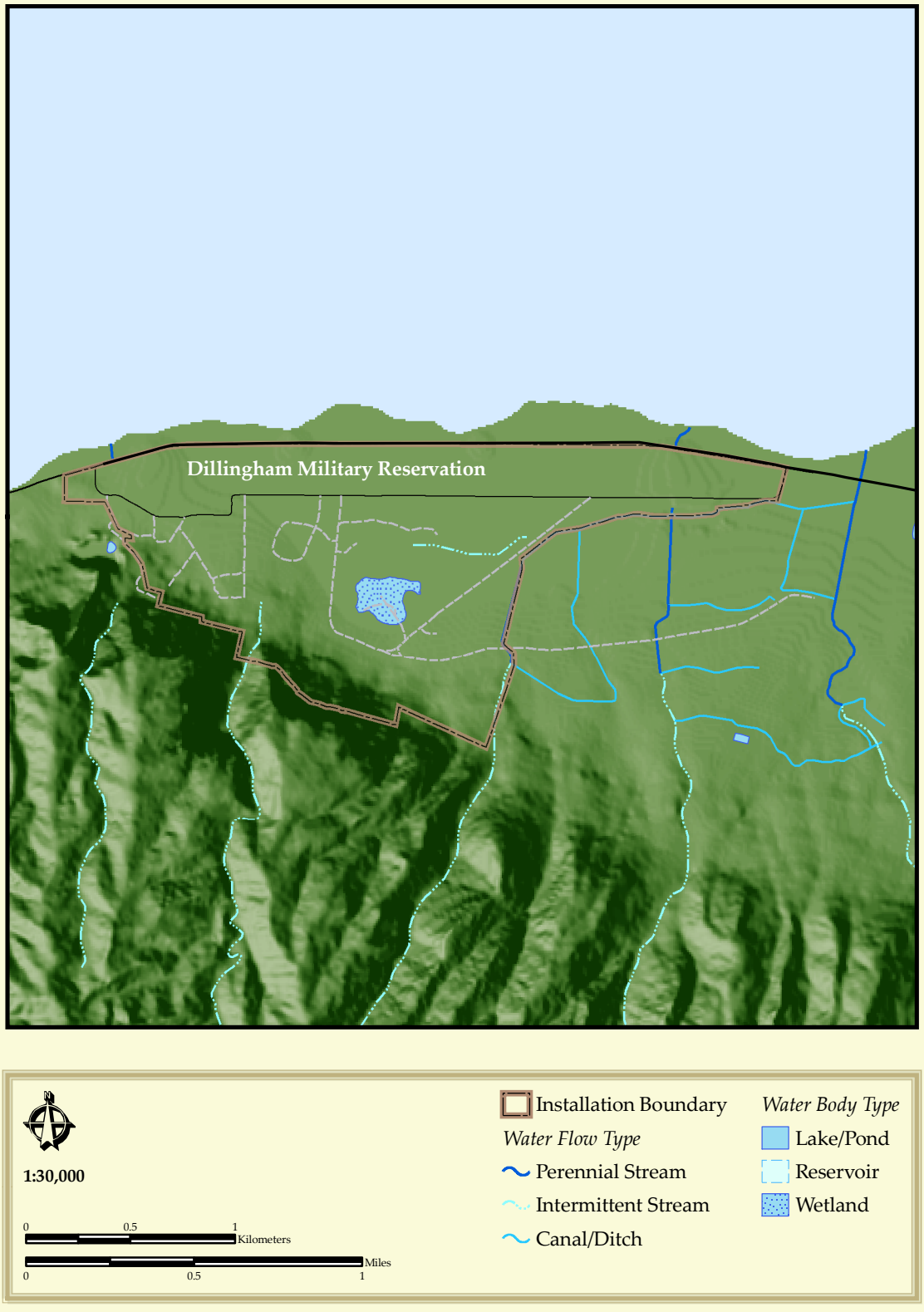


Figure 2.7.g

Table 2.7.b Federally Listed Plant Species on Dillingham Military Reservation.* "O" references species cited in the O'ahu Implementation Plan (IP) and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Schiedea kaalae	ma'oli'oli	O,M	LE	G1

* Sources: HBMP 2007f, USFWS 2003a, USAG-HI 2008b, USAG-HI ONR staff and the USFWS federally listed and candidate species lists for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered.

[2] Key to Global Ranks as defined by Hawai'i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G1T1 = species critically imperiled globally, subspecies or variety critically imperiled globally (typically 1-5 occurrences).

Flora

There is one federally listed plant species, *Schiedea kaalae*, on DMR and three federally listed plant species on lands adjacent to DMR (*Lepidium arbuscula*, *Nototrichium humile*, and *Hibiscus brackenridgei* ssp. *mokuleianus*); all are endangered taxa (Table 2.7.b) (HBMP 2007e). Rare plant locations at DMR are described in the *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light) U.S. Army Installations Island of O'ahu* (USFWS 2003a) and in the *Implementation Plan for O'ahu Training Areas* (USAG-HI 2008b). The endangered plant species will be managed for stabilization if approved by the land owners.

2.7.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: There is no designated critical habitat on DMR. Plant critical habitat lies along the southern boundary, on the upward slope. 'Elepaio Critical Habitat extends from the northern boundary of Mākua Military Reservation toward DMR, a separation of 8 km (5 mi) (Figure 2.7.h).

Designated Management Units: There is one Mākua IP management unit (MU) located on and adjacent to DMR, Haili to Keälia MU (Figure 2.7.i). See Section 2.8.8.2, *Critical Habitat and Designated Management Units* for additional information.

2.7.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii's Biodiversity and Mapping Program update DMR's fauna species lists when new species are identified and verified as being present at DMR.

Keystone Species

Conditions and needs of keystone species is an area that requires development for DMR.

State of Hawaii's Species of Greatest Conservation Need

A comparison of KTA's current fauna lists and Hawaii's CWCS resulted in the identification of four waterbirds, one seabird, and one raptor species of greatest conservation need designated by the State of Hawai'i as possibly present at DMR (Ogura et al. 2005, HHP 1994c,e). Two mammal species of greatest conservation need may be present. (See Appendix 3, *Species Lists*. Annex E, *DMR Species of Greatest Conservation Need*.)

Mammals

A comprehensive survey of introduced mammal species has not been conducted at DMR.

Critical Habitat & Areas of Special Concern
Dillingham Military Reservation

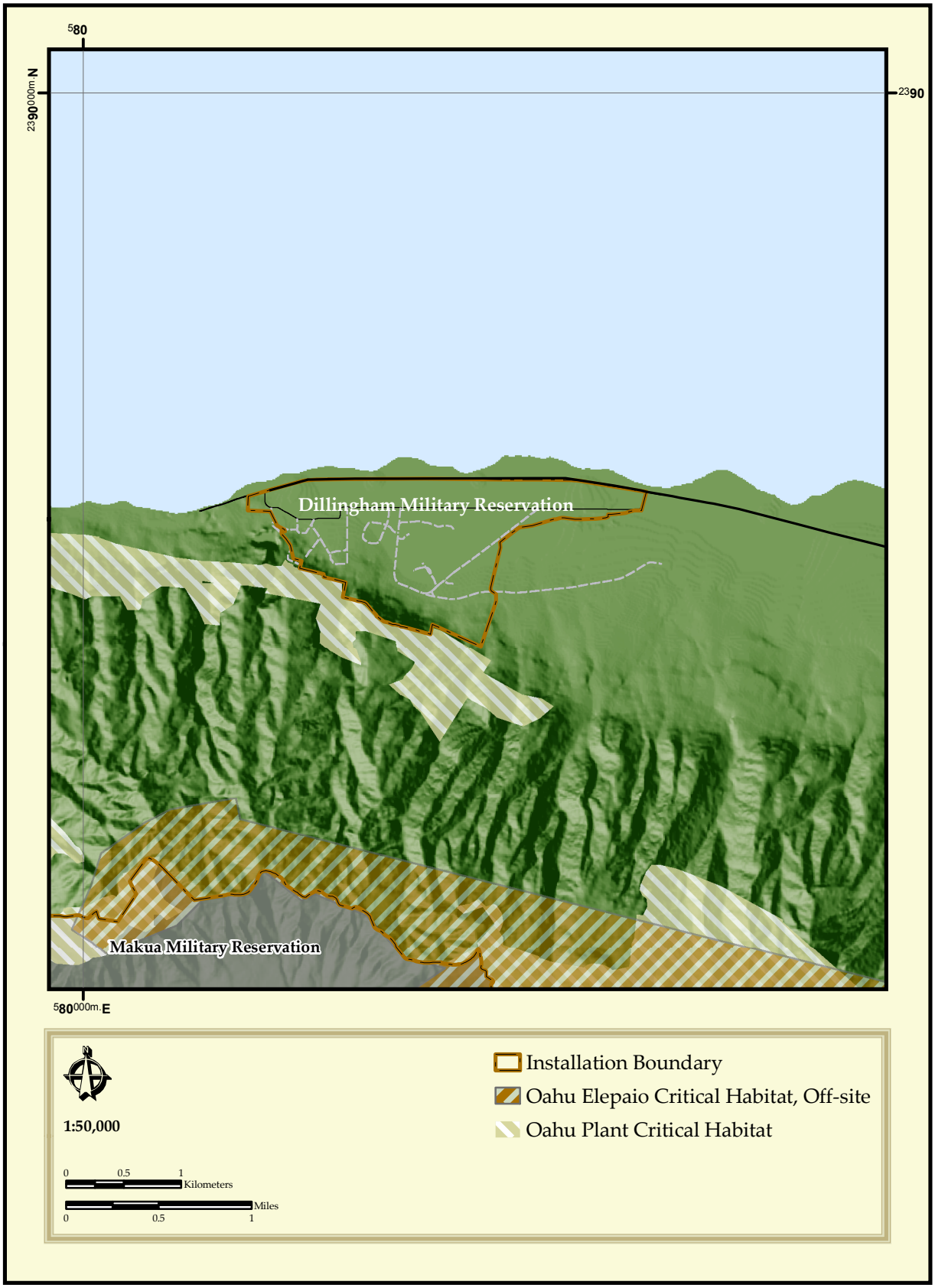


Figure 2.7.h

Management Units
Dillingham Military Reservation

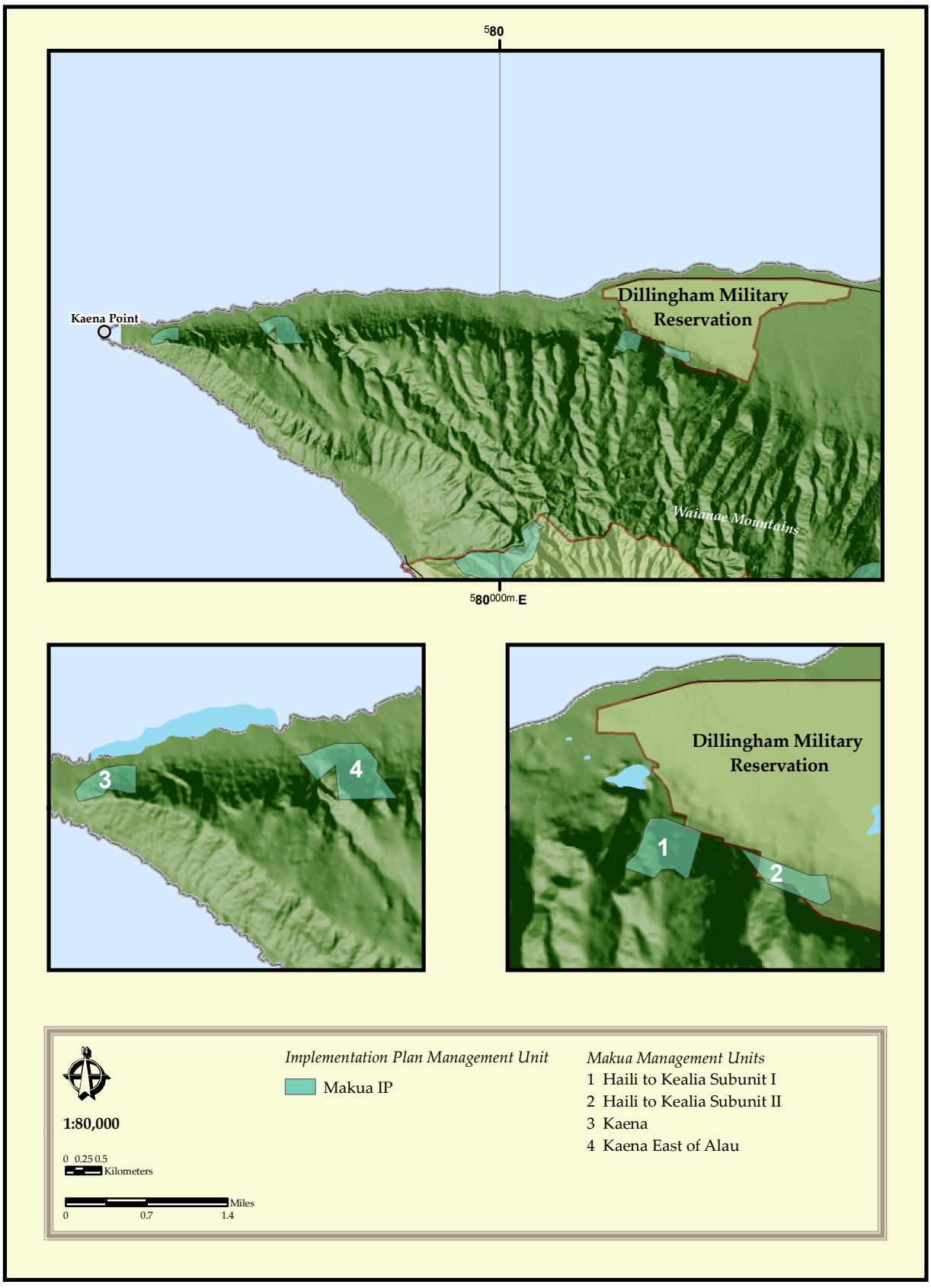


Figure 2.7.i

The ‘ope‘ape‘a (Hawaiian hoary bat/*Lasiurus cinereus semotus*), Hawaii’s only terrestrial mammal, is not known to use DMR. The species has not been observed at DMR. Though very close to the coast, the Hawaiian monk seal (*Monachus schauinslandi*) has not been observed at DMR. Only the feral pig (*Sus scrofa*), an introduced species, has been observed at DMR. Four other introduced species may be present. (See Appendix 3, *Species Lists*. Annex E, *DMR Mammals*.)

Birds

A comprehensive survey of bird species has not been conducted at DMR. Four endemic waterbird species, one seabird, and one raptor species have been observed at DMR. Fifteen introduced bird species may also be present. (See Appendix 3, *Species Lists*. Annex E, *DMR Birds*.)

Herpetofauna

There are no native terrestrial herpetofauna in the Hawaiian Islands. A comprehensive survey of introduced herpetofauna has not been conducted at DMR. Fourteen introduced herpetofauna species may be present at DMR.

Introduced Reptiles: There are eight introduced lizards and one terrestrial snake that may be present at DMR. (McKeown 1996). (See Appendix 3, *Species Lists*, Annex E. *DMR Herpetofauna*.)

Introduced Amphibians: Five species that may be located at DMR (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex E, *DMR Herpetofauna*.)

Fish

A comprehensive survey of fish species has not been conducted at DMR. There are no records of native or introduced fish at DMR.

Invertebrates

A comprehensive survey of invertebrate species has not been conducted at DMR. At least one endemic and three introduced species have been documented at DMR by the USAG-HI ONR staff.

- ***Invasive Species:*** USAG-HI began surveying in 2006 to determine the presence of invasive ants and their impact upon endangered flora. *Ochetellus glaber* and *Paratrechina longicornis* were identified as present in the proposed Kalena Point Management Unit (Mākua Implementation Plan) west of DMR. An ant survey is projected to be conducted at DMR in the future (S. Ching, USAG-ONR staff, per. com. 2008).

  Two introduced snail species may be present at DMR. The black twig borer (*Xylosandrus compactus*) has not been documented at DMR, but species from the genus *Bobea*, which are common hosts to the parasite, are present (HHP 1995). The two-spotted leafhopper (*Sophonia rufofascia*) is a species that commonly affects both native and nonnative plants. The saliva of this insect species is suspected to cause yellowing of leaves and reducing the vigor in many native and exotic plant species (HHP 1995). In addition, the carnivorous snail (*Euglandina rosea*) was observed in several areas at DMR. (See Appendix 3, *Species Lists*. Annex E, *DMR Invertebrate Species*.)

2.7.8.4 Flora

A comprehensive survey of vascular plant species has not been conducted at DMR. USAG-HI has identified 29 plant taxa and one unknown species as present at DMR (HBMP 2007f, USAG-HI 2007a). (See Appendix 3, *Species Lists*. Annex E, *DMR Plants*.)

Keystone Species
Conditions and needs of keystone species is an area that requires development for DMR.

State of Hawaii's Species of Greatest Conservation Need
A comparison of DMR's current flora list and Hawaii's CWCS, resulted in the identification of eight plant species of greatest conservation need designated by the State of Hawai'i as being present at DMR (HBMP 2007f and Oqura et al. 2005). (See Appendix 3, *Species Lists*. Annex E, *DMR Species of Greatest Conservation Need*.)

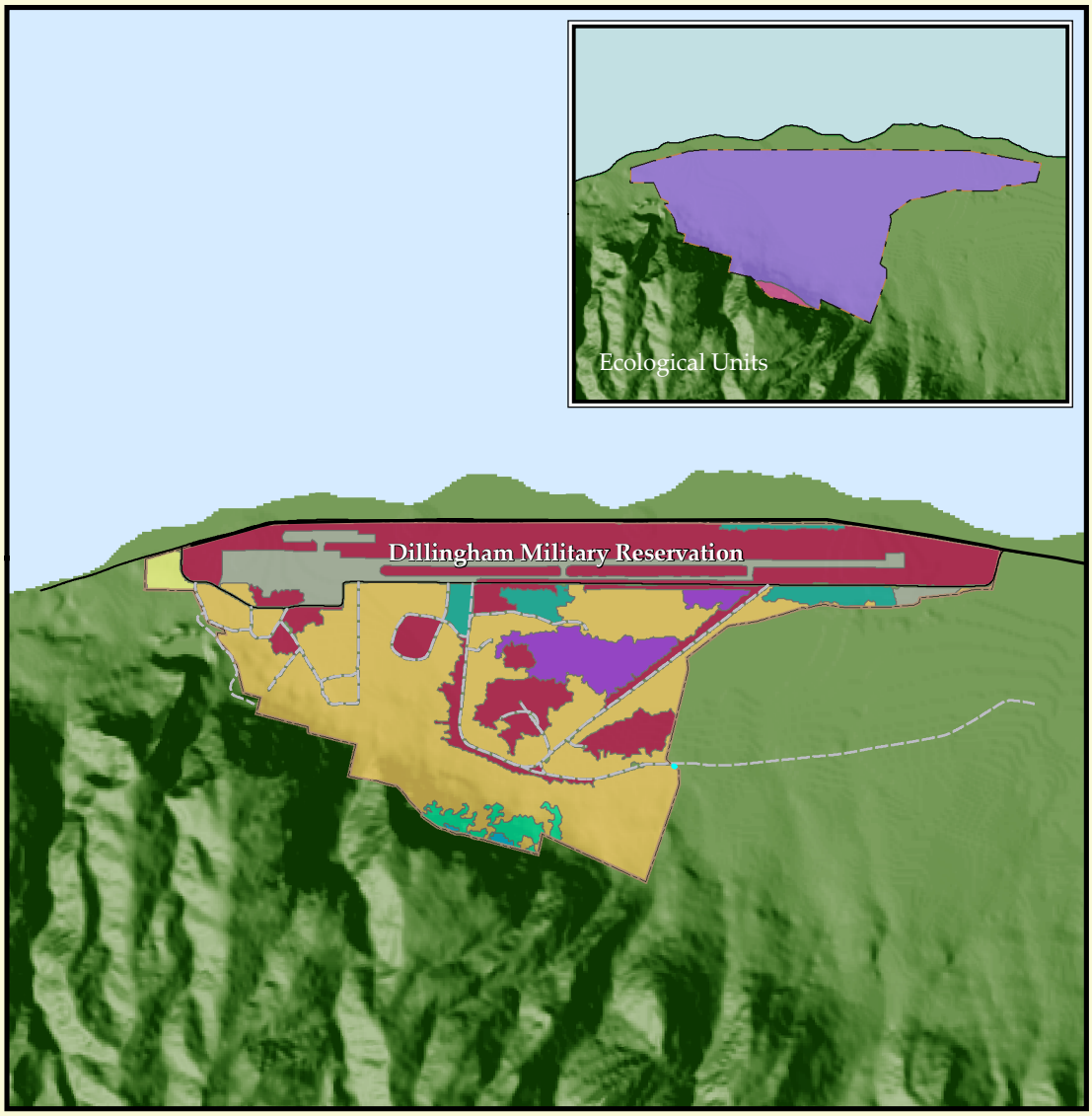
Incipient Species
USAG-HI ONR staff has identified two species that it controls and eradicates when found in areas where rare plant species occur at DMR. (See Appendix 3, *Species Lists*. Annex E, *DMR Weeds*.)

Non-Native/Weedy Species
There are six invasive/weed species that have been identified at DMR. When these species are determined to be having a negative effect on DMR's training areas, native plant habitats, and ecosystems, they are controlled. (NRCS PLANTS Database, June 2008. Weeds of Hawai'i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex E, *DMR Weeds*.)

2.7.8.5 Native Vegetation Communities
Only the Lowland Dry native vegetative community has been identified at DMR (Figure 2.7.j). This community is categorized into ecological zones defined by elevation, topography, and prevailing ecological conditions (Wagner et al. 1999). (See Appendix 3, *Species Lists*. Annex E, *DMR Native Vegetation Communities and Descriptions*.)

2.7.8.6 Wetlands and Deep Water Habitats
The U.S. Army Corps of Engineers (USACE) completed a wetlands delineation survey of DMR. The Corps identified and described all ditches, streams, and potential wetland areas. Only one area, a perched wetland located on the slopes of the southern property boundary, was determined to be a regulated wetland. The perched, spring-fed wetland met all three Corps of Engineers' hydric indicators. The area measures approximately 340 square meters (0.08 ac) and is dominated by primrose willows (*Ludwigia octovalvis*) (USACE 2005). This wetland may be subject to permitting by the Corps of Engineers; however, this unlikely due to its isolated position on the slope of the mountain. Three other potential areas were identified but presently do not meet the criteria for a regulated wetland (see Figure 2.7.g). Though there are no known deep water habitats on DMR, the installation is very near the coast.

Vegetation Types at Dillingham Military Reservation



Vegetation Communities

Forest

- *Casuarina* spp. Mixed Forest
- *Eucalyptus* spp. Mixed Forest
- *Schinus terebinthifolius* Forest
- Mixed Cliff Community

Grassland

- *Panicum maximum* Grassland
- *Leucaena leucocephala* / *P. maximum* Mixed Grassland
- Disturbed Alien Grassland

Other

- Urban Development

Ecological Units

- Lowland Dry Forest & Shrubland
- Nonnative

1:30,000

0 0.5 1 Kilometers

0 0.5 1 Miles

Figure 2.7.j

2.8 Mākua Military Reservation

2.8.1 Location and Neighbors

Mākua Military Reservation (MMR) is located in an amphitheater-shaped valley south of Kaʻena Point in northwestern Oʻahu. Access is via Farrington Highway from the south, approximately six miles north of the town of Mākaha (pop. 7,753) and eight miles north of Waiʻanae (pop. 10,506). The installation extends from the Farrington Highway on the coast to the Waiʻanae Mountain ridgeline to the northwest (Figure 2.8.a). The area surrounding MMR is remote and sparsely populated. Neighboring lands along the ridgeline consist of the Kuakola Forest Reserve, Mokulēʻia Forest Reserve, and Pahole Natural Area Reserve. The southern boundary follows an east-west ridge bordering private lands and the Mākua Keaʻau Forest Reserve.

2.8.2. Infrastructure

2.8.2.1 Ranges and Training Lands

MMR is the largest training area on Oʻahu that supports both maneuver and live-fire training (Figure 2.8.b). Live ammunition fire requires a surface danger zone and an associated impact area. The impact area and the temporary ammunition holding area are restricted access areas due to the danger from unexploded ordnance. The impact area is 457 ac (185 ha) in Mākua Valley and rises from the valley floor to 900 feet in elevation. Helicopters are required to be on station for firefighting purposes at Mākua Valley when live-fire training occurs. Helicopters are used to support ground maneuver training and independent training scenarios (USACE and Nakata Planning Group 2002a). After planned firebreaks and fuelbreaks are constructed, additional weapons can be used (USFWS 2007a).

MMR is comprised of 4,190 ac (1,736 ha), of which 3,236 ac (1,310 ha) are ceded, 782 ac (316 ha) are leased from the State of Hawaiʻi (DA-94-626-ENG-79, expires on Aug. 16, 2029), 1.6 ac (0.64 ha) are license, and 170 ac (69 ha) are fee simple (USACE and Nakata Planning Group 2002a).

2.8.2.2 Company Combined Arms Assault Course

Existing facilities at Mākua include fencing, an administration and classroom building, a battery shop, an observation tower, a 60,000-gallon elevated water tank, and a chlorinator shed. There are two 300,000-gallon "dip tanks" used to hold water for firefighting purposes. Water is supplied via a pipeline that connects to the nearby municipal system. The total area used by the Company Combined Arms Assault Course (CCAAC), including parking, bivouac, ammunition storage, and staging, amounts to approximately 1,034 ac. All live fire is directed into the 457-ac non-dudded impact area within the southern firebreak road. Within the 457-ac area are a variety of surface and subsurface "objectives," on which training units direct live fire as a part of the exercise. These include structures made of sand-filled tires, simulated entrenchments, and several small emplacements designed to represent enemy strong points or defensive positions.

2.8.2.3 Wheeler Army Airfield

Military aircraft from Wheeler Army Airfield support MMR (See Section 2.3.2.3, *Wheeler Army Airfield*).

2.8.2.4 Helicopter Landing Pads/Zones

MMR has six helicopter landing pads.

Location & Land Ownership of Makua Military Reservation

Figure 2.8.a

Training Areas at Makua Military Reservation

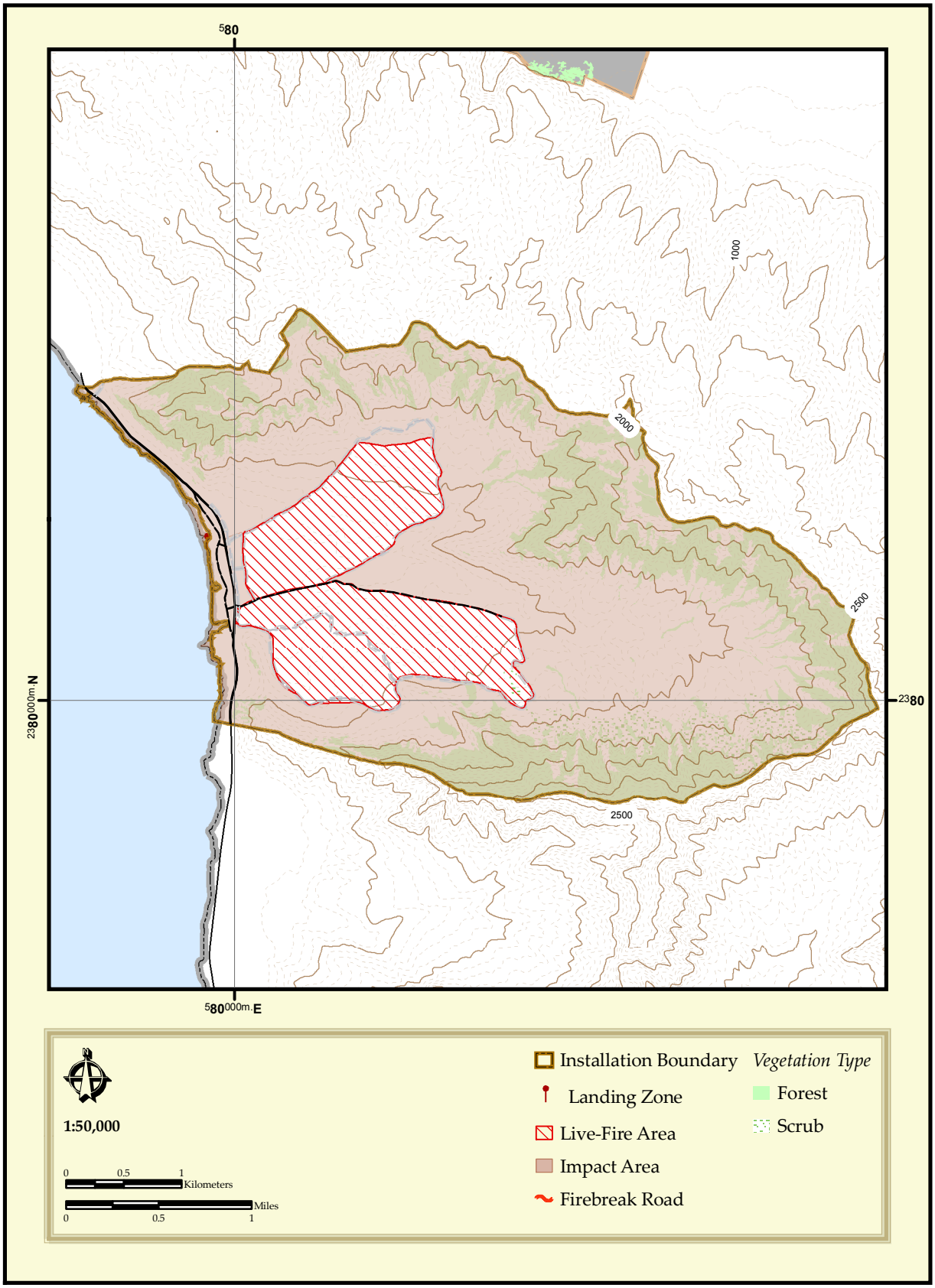


Figure 2.8.b

2.8.2.5 Commercial/Other Airports
See Section 2.3.2.4, *Schofield Barracks Military Reservation, Commercial/Other Airports.*

2.8.2.6 Harbors
See Section 2.3.2.5, *Schofield Barracks Military Reservation, Harbors.*

2.8.2.7 Roads
There are approximately 11 mi (18 km) of primary or secondary roads, approximately 7 mi (11 km) of tertiary roads, and virtually no unimproved roads (four-wheel-drive trails) at MMR (see Figure 2.8.b).

2.8.3 Installation History

2.8.3.1 Pre-military Use
Early historic descriptions of the Mākua area indicate that settlements occurred along the coast. Further inland and within MMR, habitation and agriculture would have been prominent activities. Lowlands would have been used for dryland agriculture, sweet potato a dominant cultivated crop. Land Commission Award testimonies suggest that the inland valley floor was occupied and cultivated for a long period. Eventually, the farmlands awarded during the Great Mahele were taken over by ranchers, who controlled the leases in the Mākua area until the military acquired the lands in 1941 (Ogden Environmental and Energy Services 1998).

2.8.3.2 Installation History
The following history is condensed from the Schofield Barracks Master Plan (1999). United States military use of Mākua Valley dates to the 1920s when three parcels in the upper valley floor were purchased for howitzer emplacements. When martial law was declared in the Territory of Hawai‘i after the bombing of Pearl Harbor in December 1941, the U.S. Army took over the entire Mākua-Ka‘ena Point area for military security and training operations. A portion (2,061 ac or 834 ha) of the area was used by the War Department for combat training. Starting May 17, 1943, under a letter permit from the Territory of Hawai‘i, the Army issued a Real Estate Directive for the 2,061 ac (834 ha). By this directive, the Army obtained territorial lands by governor's consent and private lands by the issuing of condemnation orders to their owners. In May 1943, the Territorial Government of Hawai‘i granted the parcel to the military (Revocable Permit No. 200) "to assist in the present war effort extending for the duration of the present war and six months thereafter." On the basis of this permit, Mākua Training Area was utilized extensively as a bombing/impact site and a training area for combat Soldiers stationed on O‘ahu. During several periods, Mākua was shelled during training exercises from Schofield Barracks Military Reservation and from Navy ships offshore.

Files maintained by the Real Estate Division, Schofield Master Planning, indicate that considerable negotiation between the military and the Territorial Government took place regarding the use of Mākua Training Area on a more permanent basis. Despite a lack of formal authorization by the Territorial Government for continued use of the area, the military continued to exercise control over and utilize Mākua lands with the knowledge and informal approval of territorial authorities.

In 1959, when Hawai‘i was admitted into the Union, the State of Hawai‘i acquired the land held by the United States with the exception that "any lands and other properties that, on the date Hawai‘i is admitted into the Union, are set aside pursuant to law for the use of the United States…remain the property of the United States…" In August 1964, within the five-year period set out in the Hawaiian Statehood Act, President Johnson signed Executive Order No. 11166, setting aside for the United States 3,236 ac (1,310 ha) of the area known as Mākua Training Area. For the portion of Mākua Training Area not set aside, the 1964 Executive Order stipulated the state would enter into a lease

with the Army to begin on August 17, 1964, for 65-years to permit continued military utilization of an additional 1,509 ac (611 ha) in the lower area. This lease expires on August 16, 2029. In January 1990, the lease area was reduced to 782 ac (317 ha). Paragraph 14 of the lease agreement states that "[the] portion of leased land situated between the ocean and Farrington Highway shall be fully available for use by the general public except during periods when the public will interfere with training activities of the Government or training will endanger the public." The government has the right to fire over and maneuver across Farrington Highway (para. 16). The state is responsible for control of the public when public use is permitted. The lease reserves to the Board of Land and Natural Resources the right to develop and use for public purposes Kāneana Cave, commonly called Mākua Cave, with an access foot trail to the cave and parking area adjacent to Farrington Highway. The State of Hawai'i is responsible for management of natural resources and endangered species on state-owned land parcels.

2.8.3.3 Cultural Resources Program

MMR has 118 known archeological sites (USAG-HI 2007b). These sites include heiau, archeological terraces, shrines, house platforms, and historic walls. Ukanipo Heiau is listed on the National Register of Historic Places (NRHP) (USACE and Nakata Planning Group 2002a).

2.8.3.4 Natural Resources Program History

The responsibility for managing natural resources on MMR became the responsibility of the Army when the installation was established in 1942. With support from the Army, DLNR provided technical assistance and performed most resources management activities on MMR through the early 1990s. On 23 July 1965, the Agreement for a Cooperative Plan for the Conservation and Development of Fish and Wildlife Resources between the Department of the Army, Department of Interior, and State of Hawai'i was finalized. It required the preparation and development of a Master Fish and Wildlife Management and Habitat Improvement Plan for each Hawai'i installation. In 1969, the master plan was completed and agreed upon by the three agencies.

In the early to mid-1990s, the USAG-HI Natural Resources staff assumed many natural resources management duties for the installation due to increased management requirements imposed by federal law. See Section 2.2.3.2, *Natural Resources Program History* for the development of the USAG-HI Natural Resources staff that is responsible for managing O'ahu Army installations.

Botanical surveys have been outsourced by the Army since 1977 to fulfill requirements under the Endangered Species Act. Surveys are conducted on MMR to identify existing rare plant populations and the potential threats to these populations, including the potential impacts of military training activities (RCUH 2000). Survey reports include maps of specific species population locations. One of the first botanical surveys on record at MMR was 1976 and conducted by Warschauer and Obata (25th ID (L) et al. 2001). They listed 22 species that are currently considered rare by the Hawai'i Biodiversity and Mapping Program (HBMP) and suggested factors they considered as threats to native species, including evidence of fires in areas currently dominated by exotic species and erosion caused by feral ungulates. A botanical survey was conducted in 1992 by Funk and Funk, but no federally listed plant species were observed (25th ID (L) et al. 2001). In 1993, HBMP conducted an extensive biological survey of MMR to describe the species that occur and their remaining native natural communities. The results from these surveys (HHP 1994c) provided the foundation for the biological inventory information found in the Endangered Species Management Plan Report (R.M. Towill Corp. 1997b) for Mākua Military Reservation.

In 1976, Walker conducted a zoological survey of MMR and observed 19 bird taxa, but no endangered vertebrates were found (25th ID (L) et al. 2001). He did suggest the Hawaiian hoary bat (*Lasiurus cinereus semotus*) and pueo (*Asio flammeus sandwichensis*) were present in the area.

Christenson et al. (1980) found evidence that suggested the tree snail (*Achatinella mustelina)* is present at MMR (25th ID (L) et al. 2001). Two hundred and seventy-one live tree snails (*A. mustelina*) were inventoried in 1982 to confirm this conclusion. Christensen suggested that exotic plant and animal invasions and, more importantly, fire posed the greatest threat to these snail populations. Natural Resources staff marked 412 tree snails (*A. mustelina)* from 20 trees in a mark/recapture study at MMR. They found 75 percent of these trees were *Myrsine lessertiana* and that 10 of these trees have since died. HBMP (1994c) conducted a zoological survey to list birds and mammals and to identify potential habitat areas for *A. mustelina.* Three rare vertebrates, including two endangered species and an endangered mollusk, were observed at MMR (R.M. Towill Corporation 1998).

In September 1998, the Army suspended training at MMR due to several wildfires that burned outside the south and north firebreak roads. Following the suspension of training, in October 1998, Earthjustice filed a lawsuit on behalf of Mālama Mākua, a local group of concerned citizens, seeking to compel preparation of an environmental impact statement addressing all of the Army's training and training-related operations at MMR. The Army began an extensive investigation into the potential effects of wildfires on the environment and reevaluated its fire management plan and training procedures. The Army consulted with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act. The Army and USFWS discussed ways to identify, evaluate, and reduce the impact of Army activities on threatened and endangered species and developed modified live-fire training procedures. Following the consultation in 1999, the USFWS issued an opinion finding that the Army's modified live-fire training at MMR would not likely jeopardize the continued existence of the species covered by that opinion (USFWS 1999).

In 2001, with the discovery of additional endangered species at MMR, the Army again consulted with the USFWS. Additional measures for protection (voluntary removal of tracers) were proposed, and the USFWS again issued a no jeopardy opinion (USFWS 2001a). In May 2001, the 25th ID(L) and U.S. Army Hawai‘i (USARHAW) published a final supplemental environmental assessment, which analyzed training impacts on the natural, social, and cultural environment of MMR and the surrounding area. In July 2001, the U.S. District Court issued a preliminary injunction barring the Army from returning to training until the court could decide the outcome of the National Environmental Policy Act (NEPA) challenge. A Settlement Agreement and Stipulated Order (referred to herein as the Settlement Agreement) between Mālama Mākua and the U.S. Department of Defense was issued on October 4, 2001. The Settlement Agreement allowed the Army to conduct a limited number of CALFEXs until an EIS was completed and the Record of Decision published in the *Federal Register,* no later than October 2004. The Army conducted only 21 CALFEXs total for the years 2002 and 2003. Since October 2004, the Army has continued to prepare the EIS required under the Settlement Agreement.

From 2001 to May 2003, the Army and a team of experts from the conservation community proceeded to create a comprehensive implementation plan to ensure the stabilization of the endangered species recommended by USFWS. The plan was transmitted to USFWS for approval in May of 2003. The *Final Implementation Plan Mākua Military Reservation, Island of O‘ahu*, called for the stabilization of 27 endangered species and one endangered species of O‘ahu tree snail that were identified as being potentially effected by Army training in a 30 year period.

With the designation of 41 critical habitats for plants and the critical habitat for the O‘ahu ‘elepaio, the Army entered into consultation with USFWS, resulting in the *Reinitiation of the 1999 Biological Opinion of the USFWS for Routine Military Training at Mākua Military Reservation, Island of O‘ahu* (1-2-2004-F-006) (USFWS 2007a).

In compliance with the Settlement Agreement between Mālama Mākua and the U.S. Department of Defense, the Army reinitiated consultation with USFWS in August 22, 2005, to address all "current and proposed U.S. Army training to be conducted at MMR." The reinitiation addressed the effects of routine training to 38 threatened and endangered plant species plus 36 plant critical habitats, the Oʻahu ʻelepaio and its designated critical habitat, and one species of the Oʻahu tree snail (USFWS 2007a).

A no jeopardy conclusion was issued based on the Army's conservation and stewardship programs; weapons restrictions, fuel management, fire suppression, and construction of fuelbreaks and fire breaks; and invasive species control, which includes rat baiting, ungulate removal and invasive plant management. Further, the USFWS determined that implementation of the proposed action would not adversely modify or destroy critical habitat due to the number of Army actions to minimize and reduce the risk of fire, introduction and spread of non-native species.

In August 2007, the Waialua Fire burned a significant number of the federally endangered *Hibiscus brackenridgei* (maʻo hau), "substantially reducing the status of the species and increasing the magnitude of the effect military training at Mākua Military Reservation could have on the species" (USFWS 2007a). An amendment was issued to the Biological Opinion. This amendment also considered the critical habitat for *Abutilon sandwicense, Bonamia menziesii, Eugenia koolauensis, Euphorbia haeleeleana, Hibiscus brackenridgei*, and *Nototrichium humile* within the proposed fuelbreak area.

The USFWS found it not likely to jeopardize the continued existence of *Hibiscus brackenridgei* or adversely modify or destroy critical habitat for the six plant species noted above, based in large part on the conservation measures built into the Mākua and Puʻulu to Alaiheihe Management Unit/fuelbreak by the Army.

Threatened and endangered species management for MMR is addressed in the Annual Reports for MMR (USAG-HI 2000-2009). (See Appendix 6, *Annual Reports*.)

2.8.4 Military Mission

Training activities on MMR generally involve a week-long exercise by an Army or Marine Corps rifle company. MMR may be used on weekends by Reserve components and National Guard units.

2.8.5 Military Operations and Activities that May Affect Natural Resources

MMR is the largest training area on Oʻahu that supports both maneuver and live-fire training, primarily at company level. Wildland fires resulting from live-fire training are the greatest threat to natural resources and endangered species located at and adjacent to MMR.

MMR is currently closed to live-fire training pending the completion of an environmental impact statement and the results of a lawsuit filed by the Earthjustice Legal Defense Fund and Mālama Mākua and the issuance of the record of decision (ROD). The Final EIS *Military Training Activities for Mākua Military Reservation*, Vols. I – III, dated June 2009, addresses all training activities to be conducted at MMR due to the permanent stationing of 2nd/25th Stryker Brigade at SBMR and the proposed increase of live-fire training at MMR (USAEC and USACE 2009).

The following description of training activities was current as of 2007. MMR contains approximately 1,034 ac (419 ha) suitable for maneuver and training and 1,944 ac (787 ha) designated as impact area (USACE and Nakata Planning Group 2000). The maneuver space is split into two parcels by the

Kahanahāiki Ridge, and extends from east to west. The southern parcel, Mākua Valley, is the larger of the two areas and allows more flexibility for mission activities. The northern valley, Kahanahāiki Valley, is adaptable for platoon and squad-level activities, and can be used to support objectives when training in the southern valley. Most training takes place in Mākua Valley on the Company Combined Arms Assault Course within the firebreak road. Live ammunition is used on automated pop-up targets. Mock objectives within the firebreak road are used for maneuver exercises. All high explosive and fire-causing ammunition is aimed to land within the confines of firebreak roads. The rest of the installation is surrounded by steep valley walls that act as buffers and safety danger zones for munitions in case of ricochets.

The Company Combined Arms Assault Course supports most small arms weapon systems integral to the 25th ID including limited air-to-ground helicopter aerial gunnery. With the completion of mitigation efforts required in the Biological Opinion (USFWS 2007), limited ground-to-air gunnery will be permitted.

2.8.6 Natural Resources Constraints on Training Areas and Ranges

Slopes greater than 30 percent line the perimeter of Mākua Military Reservation (Figure 2.8.c). In these areas to the east is the ‘Elepaio Critical Habitat. ‘Elepaio Critical Habitat surrounds most of the northern, all of the eastern, and about a third of the southern installation boundary. Much of the critical habitat covers the action area. There is some plant critical habitat within the installation boundary and even more between the eastern boundary of the installation and the action area. Federally listed plants and candidate species surround the upper slopes of the valley. The slopes limit access for training, but fires escaping the valley’s bowl are a threat to listed species and ‘elepaio habitat.

To the north and northeast are two existing fence units with restricted access. An extensive fence unit is proposed, but not yet constructed on the south side of the installation. The center of the valley has no natural resource limitations or restrictions (Figure 2.8.d); however, training restrictions are present in the live-fire area.

The types of weapons scheduled for use at MMR are changing. These changes were addressed in consultation with USFWS (2007a). Weapons use is restricted based on: (1) stabilization status of certain endangered species, (2) seasonal variability in grass greenness, and (3) hourly fire danger rating. Some weapons will not be used until after expedited stabilization of federally listed species near high fire risk zones is competed and new fuelbreaks and firebreaks are established to protect management units (e.g., estimated 5 to 15 years). As such, while the desired weaponry can be used, considerable species management goals must be attained prior to that use, with some types of weaponry requiring the full stabilization of all Mākua Implementation Plan species.

2.8.7 General Physical Environment and Ecosystems

2.8.7.1 Climate

The mean annual temperature at MMR is 73.3°F (22.9°C) and the average annual precipitation for the same twelve-year period is 28.3 in (719 mm) (CEMML 1997). According to Giambelluca et al. (1986), the average rainfall varies dramatically with elevation and exposure at MMR. Average inland precipitation at higher elevations in the upper valley is affected by the rain shadow of the Wai‘anae Mountains, but it still receives 50 in (1,270 mm) compared to 15 in (381 mm) near the coast (USACE and Nakata Planning Group 2002a). Overall, the average annual rainfall for the area is 29 in (737 mm).

Natural Resources Constraints on Training
Makua Military Reservation

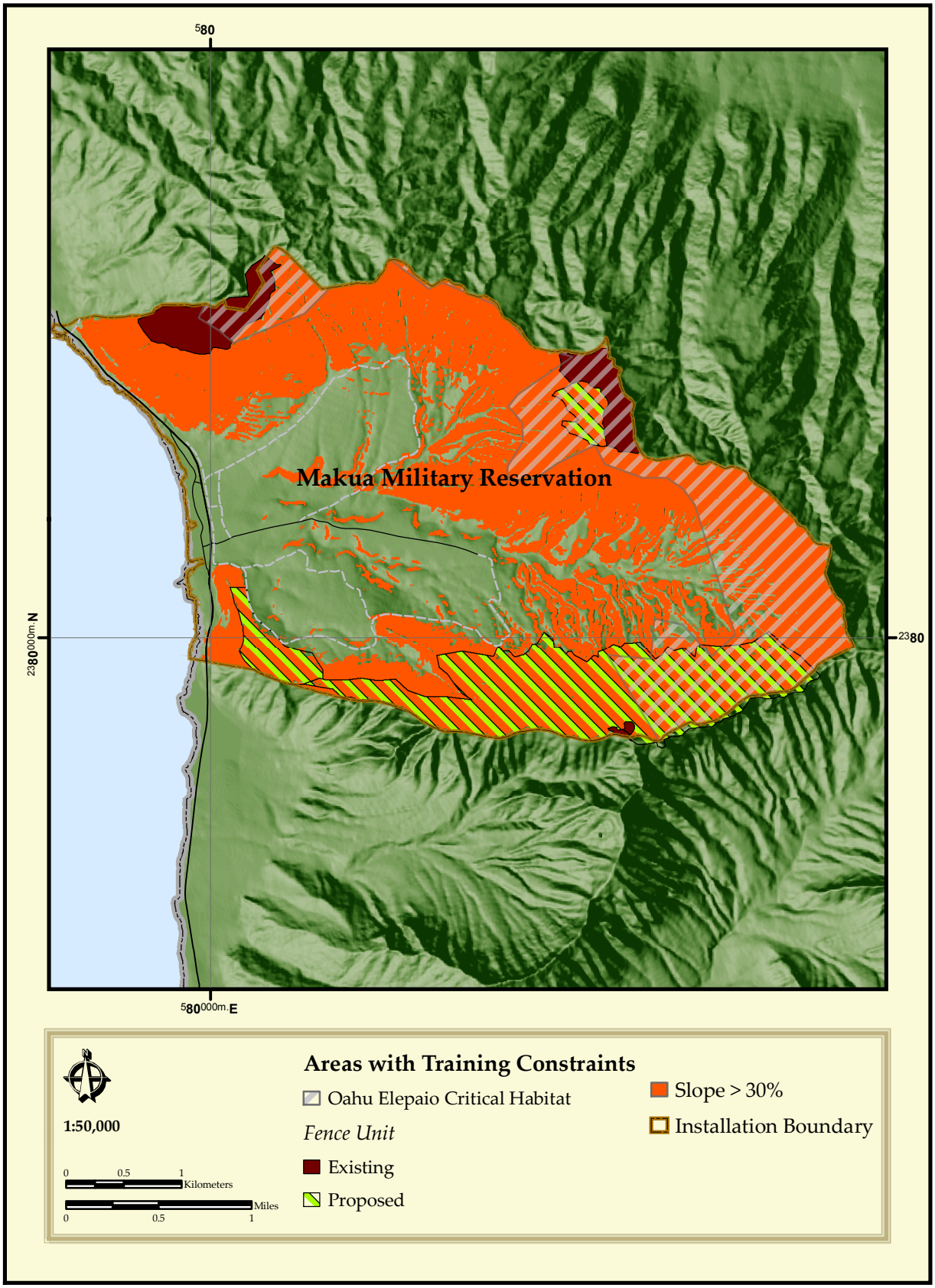


Figure 2.8.c

Training Access at Makua Military Reservation

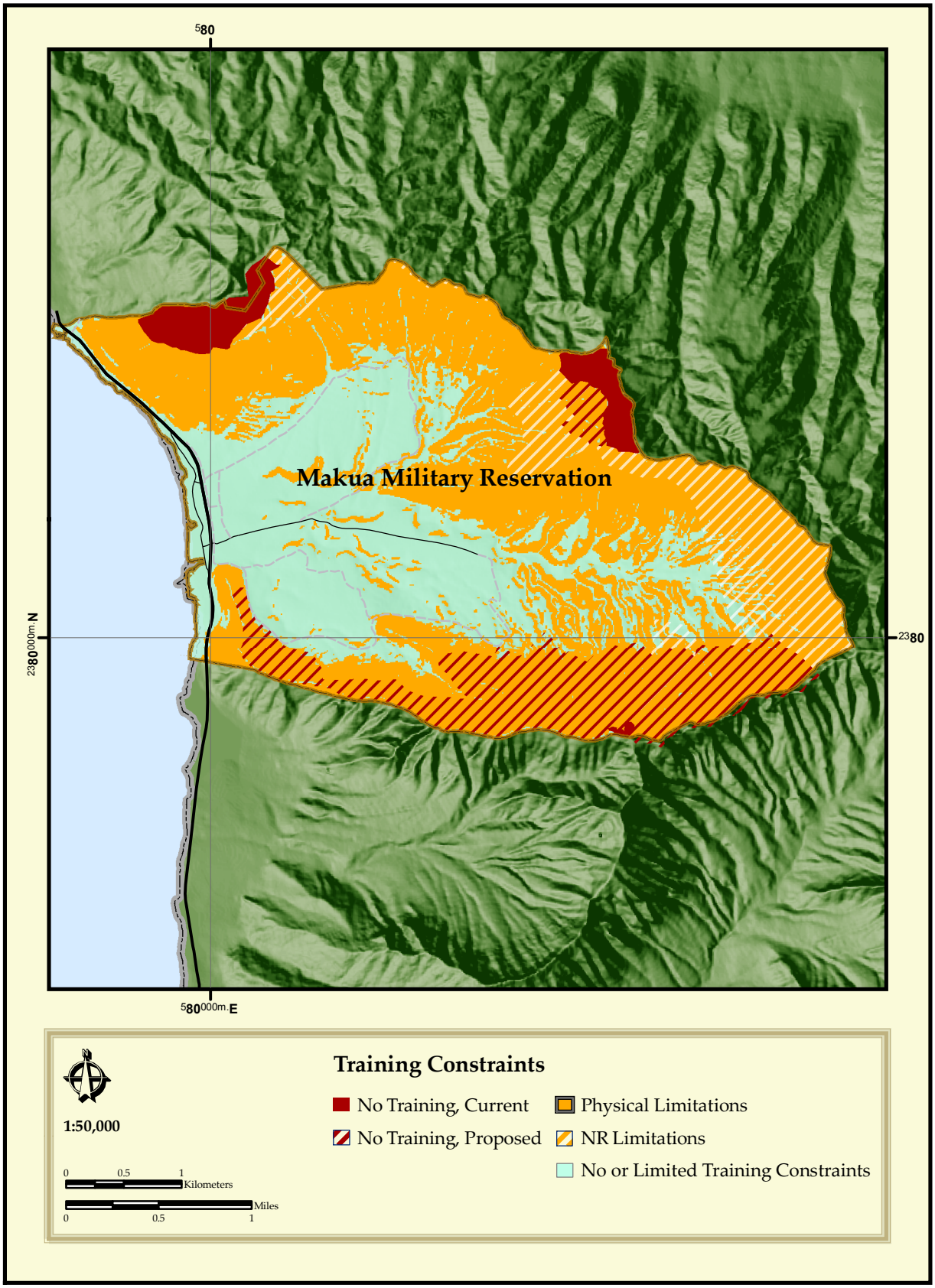


Figure 2.8.d

2.8.7.2 Geology
The Island of Oʻahu developed from the formation of two volcanoes 2 to 3 million years ago. According to MacDonald et al. (1986), lava from the Koʻolau volcano created the Leilehua Plateau between it and the older Waiʻanae volcano. The effects of weathering and erosion on these shield volcanoes have created high sea cliffs, deep valleys, and jagged mountainous regions on Oʻahu (USACE and Nakata Planning Group 2002a).

2.8.7.3 Volcanic Hazards
See Section 2.3.7.3, *Schofield Barracks Military Reservation, Volcanic Hazards*.

2.8.7.4 Topography
The elevation of MMR ranges from 20 to 400 ft (6 to 122 m) on the valley floor to the Waiʻanae Mountain ridgeline bordering the area at 2,100 to 2900 ft (640 to 915 m) (USACE and Nakata Planning Group 2002a). The MMR includes Mākua Valley, Kahanahāiki Valley and Koʻiahi Gulch (Figure 2.8.e).

2.8.7.5 Soils
The soil types found at MMR include Helemano Silty Clay, Rock Land, ʻEwa Silty Clay Loam, Kemoo Silty Clay, Lualualei Extremely Stony Clay, Lolekaa Silty Clay, Māmala Stony Silty Clay Loam, Pūlehu Clay Loam, Pūlehu Stony Clay Loam, Pūlehu Very Stony Clay Loam, Alakaʻi Mucky Peat, Rock Outcrop, Stony Land, Stony Steep Land, and Tropohumults-Dyrstrandepts Association. Erosion can be significant where slopes are steep because of the high shrink-swell potential of soils (Figure 2.8.f). The United States Soil Conservation Service (1972) described the soils found on the Island of Oʻahu.

2.8.7.6 Water Resources
The primary drainages at MMR are the Punaohaku Stream from the north and the Mākua Stream from west-central MMR (Figure 2.8.g). There are possible palustrine wetlands on MMR, characterized by native trees, shrubs, or persistent emergents (USACE and Nakata Planning Group 2002a).

2.8.8 General Biotic Environment

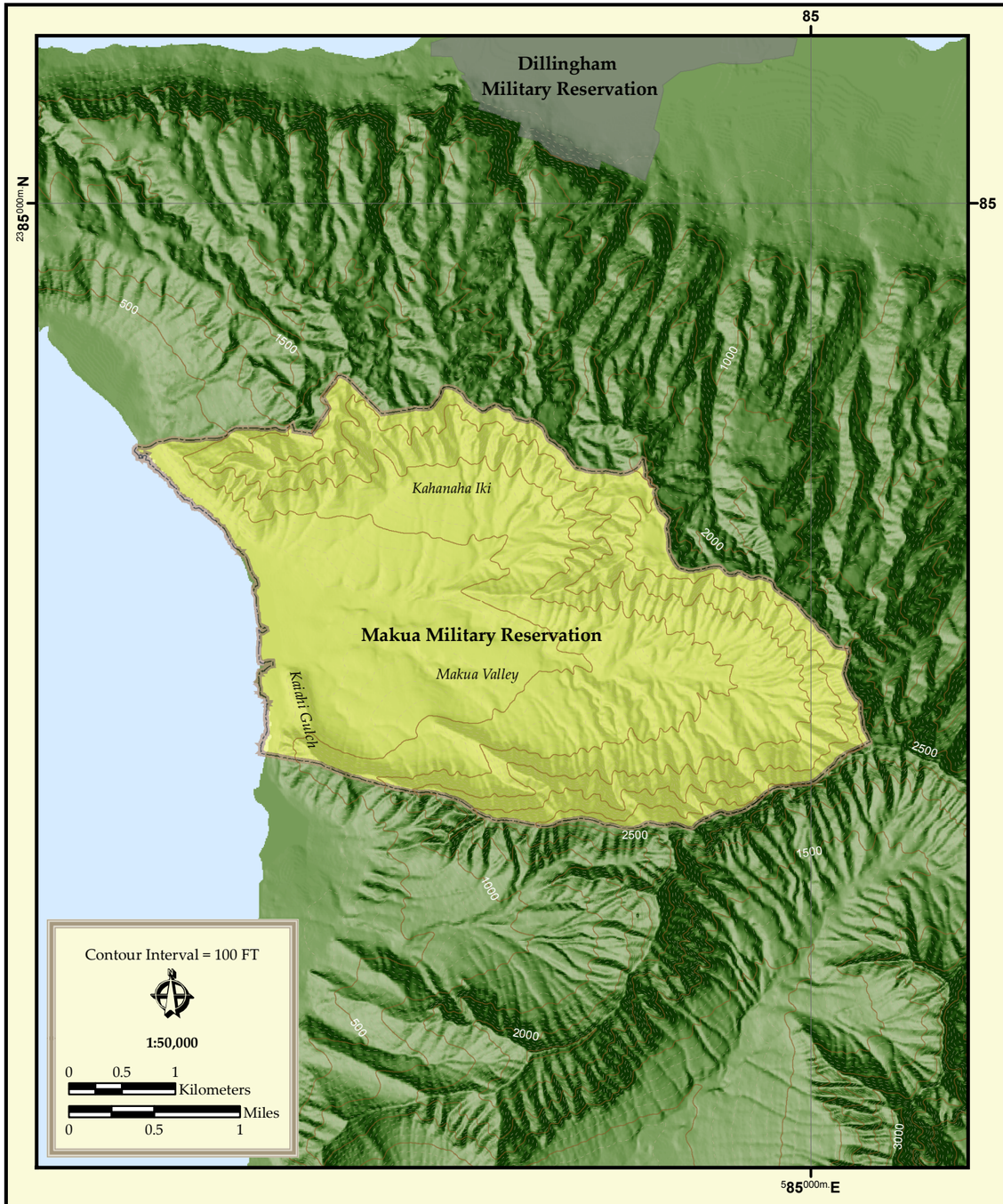
The Hawaiian Islands are the most isolated high-island archipelago on the planet. An ocean barrier of more than 2,500 mi (4,023 km) separates the islands from the nearest continent. This isolation has significant implications for the biological resources of these islands.

2.8.8.1 Threatened and Endangered Species and Species of Concern
Island ecosystems and the species they support are sensitive to environmental change due to their limited geographic distribution and population size (Temple 1978). Species endangerment can be attributed to habitat loss and degradation, disease, competition, interspecific competition, and the collection of species.

Fauna
There is one bird, one snail, and one mammal on MMR (Table 2.8.a) (USFWS 2007a). *Eretmochelys imbricata* (hawksbill turtle) may be present, but are not common for the area.

Flora
There are 33 federally listed endangered and 5 candidate species on MMR (Table 2.8.b) (HBMP 2007g). Seven additional federally listed endangered species occur within the Mākua Action Area.

Topography of Makua Military Reservation



3-D Perspective View of Makua Military Reservation - Looking East

Percent Slope on Makua Military Reservation

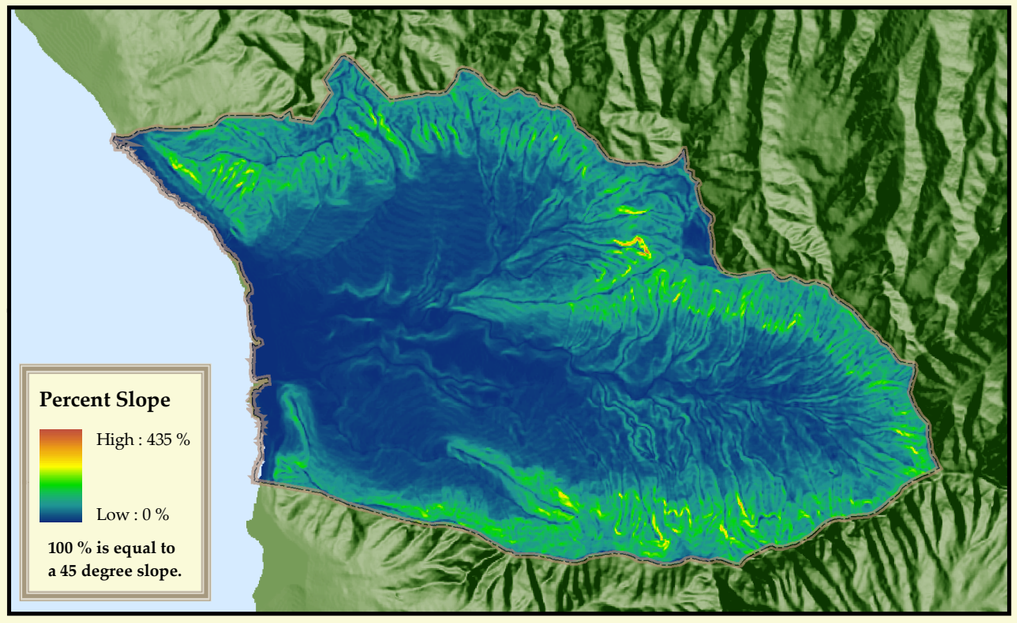


Figure 2.8.e

Land & Soil Types at Makua Military Reservation

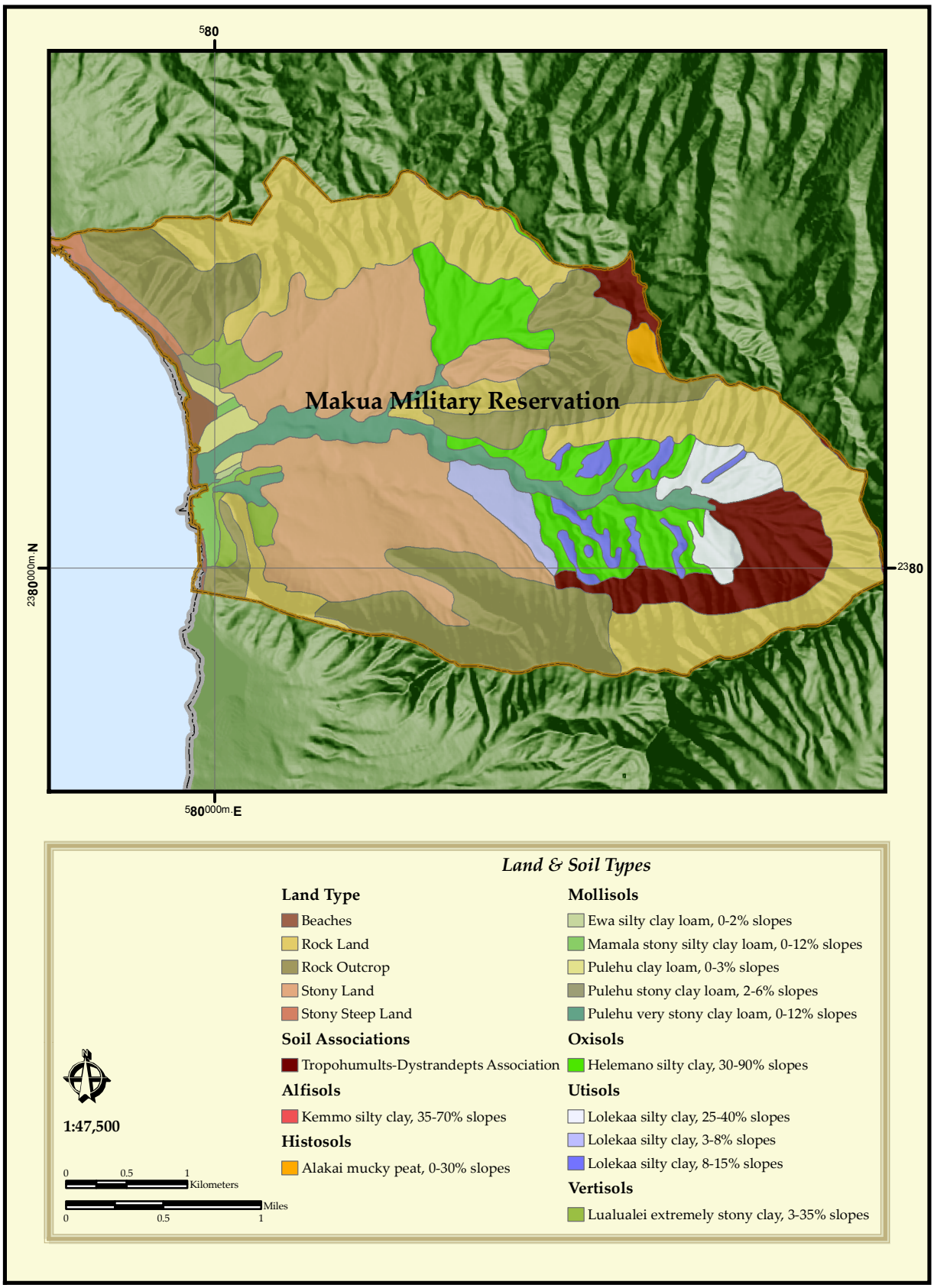


Figure 2.8.f

Water Resources & Wetlands
Makua Military Reservation

Figure 2.8.g

Table 2.8.a Federally Listed Animals Species Present at Mākua Military Reservation Action Area.*

Scientific Name	Hawaiian / Common Name	Federal Status[1]	Heritage Global Rank[2]
Mammals			
Lasiurus cinereus semotus	ʻOpeʻapeʻa	LE	G1
Birds			
Chasiempis sandwichensis ibidis	Oʻahu ʻelepaio	LE	G1
Snails			
Achatinella mustelina	pupu kuahiwi, pupu kanioe, kahuli, Oʻahu tree snail	LE	G1

* Sources: USFWS 2007a, USAG-HI 2008b, Hawaiʻi Biodiversity & Mapping Program. Nov. 2007, April 2010. Databook. (http://hbmp.hawaii.edu/trackedspecies.asp), USAG-HI ONR staff; the USFWS federally listed and candidate species list for the Hawaiian Islands, as of Feb. 12, 2008.

[1] Key to Federal Status: LE = endangered; LE = threatened; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawaiʻi Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences).

Rare plant locations at MMR are described in the *Final Implementation Plan Mākua Military Reservation* (USAG-HI 2003a) and the *Addendum to the Implementation Plan Mākua Military Reservation* (USAG-HI 2005a). An additional 17 federally endangered and three candidate plant species are located in management units outside of MMR (Table 2.8.c)

2.8.8.2 Critical Habitat and Designated Management Units

Designated Critical Habitat: Twenty-one percent of MMR is designated as Oʻahu ʻelepaio (*Chasiempis sandwichensis ibidis*) critical habitat (915 ac, 370.29 ha) (25th ID (L) et al. 2001). ʻElepaio are known from the Kahanahāiki and ʻŌhikilolo MUs, as well as from the East Rim Ungulate Control Area (Figure 2.8.h) (USAG-HI 2008b).

There is critical habitat for the Oʻahu ʻelepaio in the MMR, as well as on state, city/county, and private lands within the MMR action area. Thirty-six critical plant habitats had been identified within Mākua Military Reservation Action Area (see Figure 4.1a) (USFWS 2007a). There is no critical habitat designated for marine wildlife (USFWS 2007a).

Though not located on Army lands, additional threatened or endangered plants are managed by USAG-HI as mitigation to off-set potential impacts that may result from Army training on MMR to these off-site species (i.e., wildland fires) (Table 2.8.c).

Designated Management Units: There are four Mākua IP management units (MUs) located at MMR. They are Lower Ōhikilolo, Ōhikilolo, Kahanahāiki, and Kaluakauila MUs. MMR is a restricted training area due primarily to unexploded ordnance and the presence of a large number of threatened and endangered species (Figure 2.8.i).

Lower Ōhikilolo MU is 70 ac (28.3 ha) owned by the U.S. Army. There are three Mākua IP targeted endangered plant species (*Chamaesyce celastroides* var. *kaenana*, *Hibiscus brackenridgei* ssp. *mokuleianus*, and *Lipochaeta tenuifolia*) designated for stabilization. The MU is protected by fencing.

Table 2.8.b Federally Listed and Candidate Plant Species on Mākua Military Reservation.* "O" references species cited in the O'ahu Implementation Plan (IP) and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Abutilon sandwicense	green flower Indian mallow	O	LE	G1
Alectryon macrococcus var. *micrococcus*	' ala 'alahua, mahoe	O,M	LE	G1T1
Bonamia menziesii			LE	G1
Cenchrus agrimonioides var. *agrimonioides*	kamanomano, agrimony sandbar	M	LE	G1T1
Chamaesyce celastroides var. *kaenana*	'akoko	M	LE	G3T1
Chamaesyce herbstii[3]	'akoko	M	LE	
Ctenitis squamigera	Pauoa		LE	G1
Cyanea grimesiana ssp. *obatae*[3]	haha, splitleaf cyanea	O,M	LE	G1T1
Cyanea longiflora[3]	haha	M	LE	
Cyanea superba ssp. *superba*	'oha, haha, 'ohawai	M	LE	G1T1
Cyrtandra dentata	ha'iwale, mountain cyrtandra	O,M	LE	G1
Delissea waianaensis	'oha, haha, heart-shaped Delissea	O,M	LE	G1
Diellia falcata	sickle island spleen wort		LE	G2
Dubautia herbstobatae	na'ena'e	M	LE	G1
Euphorbia haeleeleana	'akoko		LE	G1
Flueggea neowawraea	mehamehame	O,M	LE	G1
Hesperomannia arbuscula[3]	Maui island-aster	O,M	LE	G1
Hibiscus brackenridgei ssp. *mokuleianus*	ma'o hau hele	M	LE	G1T1
Kadua degeneri var. *degeneri* (Syn. *Hedyotis degeneri* var. *degeneri)*		M	LE	G1T1
Kadua parvula (Syn. *Hedyotis parvula*)	rock face star violet	M	LE	G1
Korthalsella degeneri	hulumoa, kaumahana		C	G1Q
Lepidium arbuscula	'anaunau, naunau, kunana		LE	G1
Lipochaeta tenuifolia (Syn. *Melanthera tenuifolia*)	nehe	M	LE	G1
Lobelia niihauensis	'oha, haha, 'ohawai		LE	G2
Lobelia oahuensis	'oha, haha, 'ohawai		LE	G1
Melicope makahae	Alani		C	G1
Neraudia angulata	ma'oloa, angular fruit	M	LE	G1
Neraudia angulata var. *dentata*			LE	G1T1
Nothocestrum latifolium	'alea		C	G1
Nototrichium humile	kulu'i	M	LE	G2
Phyllostegia kaalaensis[3]	kaala phyllostegia	O,M	LE	G1
Phyllostegia parviflora var. *lydgatei*[3]			LE	G1T1
Plantago princeps var. *princeps*	ale	O,M	LE	G2T1
Pleomele forbesii	Forbes dracaena		C	G1
Pritchardia kaalae	lo'ulu	M	LE	G1
Pteralyxia macrocarpa	kaulu		C	G1
Sanicula mariversa		M	LE	G1
Schiedea hookeri	Hooker schiedea		LE	G1
Schiedea nuttallii	valley schiedea	M	LE	G1

Table 2.8.b Federally Listed and Candidate Plant Species on Mākua Military Reservation.* "O" references species cited in the O'ahu Implementation Plan (IP) and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Schiedea kaalae[3]	O'ahu schiedea	O,M	LE	G1
Schiedea obovata (Syn. *Alsinidendron obovatum*)		M	LE	G1
Silene lanceolata	lanceolate catchfly		LE	G1
Spermolepis hawaiiensis	Hawaiian spermolepis		LE	G2
Tetramolopium filiforme	ridge top Tetramolopium	M	LE	G1
Viola chamissoniana ssp. *chamissoniana*	mamakani, 'olopu	O,M	LE	G2G3T1

* Sources: HBMP 2007g, 2010, USAG-HI 2005a, USFWS 2007a, USAG-HI ONR staff, and USFWS candidate species lists, Feb. 12, 2008 and Nov. 9, 2009.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by HBMP, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G2 = species imperiled globally (typically 6-20 occurrences); G1Q = species critically imperiled, taxonomy questionable; G1T1 = species critically imperiled, subspecies or variety critically impaired; G2T1 = species imperiled globally and subspecies or variety critically imperiled globally (typically 1-5 occurrences); G2G3T1 = species imperiled, vulnerable, subspecies or variety critically imperiled.

[3] Species occurring outside the Mākua Military Reservation boundary, but within the Action Area.

Ōhikilolo MU is 200 ac (80.9ha) owned by the U.S. Army and the Honolulu Board of Water Supply. The Ōhikilolo MU has nine plant species (*Dubautia herbstobatae*, *Kadua parvula*, *Lipochaeta tenuifolia*, *Neraudia angulata*, *Plantago princeps* var. *princeps*, *Pritchardia kaalae*, *Sanicula mariversa*, *Tetramolopium filiforme*, and *Viola chamissoniana* ssp. *chamissoniana*) and one snail species (*Achatinella mustelina*) that are targeted for stabilization. One species will be reintroduced (*Pritchardia kaalae*). *Melicope makahae* (C) is present in this MU. Ōhikilolo Ridge is fenced, as well as six small population units, to protect plant species from ungulates. Additional fencing will be installed in Mākua IP year 7 (2014) to encompass a large portion of the MU.

Kahanahāiki MU covers 94 ac (38 ha) of land owned by the U.S. Army. The MU is composed of two subunits—Subunit I (63 ac/24.5 ha) has six plant species (*Schiedea obovata, Cenchrus agrimonioides* var. *agrimonioides, Cyrtandra dentata, Delissea waianaensis, Flueggea neowawraea,* and *Schiedea nuttallii*) and one snail species (*Achatinella mustelina*) that are targeted for stabilization. Subunit II (31 ac/12.5 ha) has five plant species (*Alectryon macrococcus* var. *macrococcus, Cenchrus agrimonioides* var. *agrimonioides, Cyanea superba* ssp. *superba*—extirpated, *Flueggea neowawraea, Kadua degeneri* var. *degeneri*) and one snail species (*Achatinella mustelina*) that are targeted for stabilization. *Euphorbia haeleeleana* (LE) is present. Both subunits are protected by fencing.

Kaluakauila MU is 104 ac (42.1 ha) owned by the State of Hawai'i and the U.S. Army. There is one Mākua IP targeted species (*Nototrichium humile*) designated for stabilization. *Bonamia menziesii* (LE)*, Bobea sandwicensis* (SOC)*, Euphorbia haeleeleana* (LE)*,* and *Schiedea hookeri* (LE) are also present. The MU is protected by a fence.

The following MIP MUs are located adjacent to MMR. They are West Makaleha, Upper Kapuna, and Pahole.

West Makaleha MU is 93 ac (37.6ha) and is owned by the State of Hawai'i. The MU has five Mākua IP targeted plant species (*Alectryon macrococcus* var. *macrococcus, Schiedea*

Table 2.8.c Additional Federally Listed and Candidate Plants Present on Management Units Outside of Mākua Military Reservation.* "O" references species cited in the O'ahu Implementation Plan (IP) and "M" species in the Mākua Implementation Plan.

Scientific Name	Hawaiian / Common Name	IP	Federal Status[1]	Global Rank[2]
Caesalpinia kavaiensis	uhiuhi		LE	G1
Chamaesyce herbstii	'akoko, Herbst's sandmat	M	LE	G1
Colubrina oppositifolia	kauila		LE	G1
Cyanea calycina			C	G1
Cyanea longiflora (Syn. *Rollandia longiflora*)	haha, ridge rollandia, long-flower rollandia	M	LE	G1
Diellia unisora			LE	G1
Eragrostis fosbergii	Fosberg's lovegrass		LE	G1
Gardenia mannii	nānū, Mann's gardenia	O	LE	G1
Gouania vitifolia	O'ahu chewstick	M	LE	G1
Labordia cyrtandrae	Ko'olau Range labordia	O	LE	G1
Melicope st.-johnii	St. John's pelea		LE	G1
Phyllostegia hirsuta	hairy phyllostegia	O	LE	G1
Phyllostegia mollis	Wai'anae Range phyllostegia	O	LE	G1
Platydesma cornuta var. *decurrens*			C	G1T1
Pleomele forbesii	Forbe's dracaena		C	G1
Schiedea trinervis		O	LE	G1
Stenogyne kanehoana	O'ahu stenogyne	O	LE	GH
Tetramolopium lepidotum ssp. *lepidotum*			LE	G1T1
Urera kaalae	opuhe		LE	G1
Vigna o-wahuensis	vigna		LE	G1

* Sources: USAG-HI 2007a, USAG-HI 2005a, USAG-HI ONR staff, the USFWS lists, Feb. 12, 2008 and Nov. 9, 2010, and Hawai'i Biodiversity and Mapping, April 2010.

[1] Key to Federal Status: LE = endangered; C = candidate for listing.

[2] Key to Global Ranks as defined by Hawai'i Biodiversity and Mapping Program, Feb. 2008: G1 = species critically imperiled globally (typically 1-5 occurrences); G1T1 = species critically imperiled, subspecies or variety critically impaired; GH = possibly extinct.

obovata, Cyanea grimesiana ssp. *obatae*, *C. longiflora*, and *Cyrtandra dentata*) are present. *Chamaesyce herbstii* and *Pritchardia kaalae* are planned for reintroduction. *Delissea sinuata* (SOC), *Gouania vitifolia* (LE), *Phyllostegia mollis* (LE), *Phyllostegia parviflora* var. *lydgatei* (LE), *Tetramolopium lepidotum* ssp. *lepidotum* (LE), and *Vigna o-wahuensis* (LE) are documented as historically present at this MU. A fence is present.

Upper Kapuna MU covers 224 ac (90.6 ha) and is owned by the State of Hawai'i. Ten Mākua IP targeted plant species are present (*Alectryon macrococcus* var. *macrococcus, Schiedea obovata*—extirpated, *Chamaesyce herbstii*, *Cyanea longiflora*, *Cyrtandra dentata*, *Delissea waianaensis*, *Flueggea neowawraea*, *Hesperomannia arbuscula*, *Phyllostegia kaalaensis*, and *Schiedea nuttallii*) and designated for stabilization in Subunit I, and two taxa (*Alectryon macrococcus* var. *macrococcus* and *Delissea waianaensis*) are found in Subunit II. *Cyanea superba* ssp. *superba* is a reintroduction to the area. A DOFAW fence is present and a second fence will be constructed.

Critical Habitat & Areas of Special Concern
Makua Military Reservation

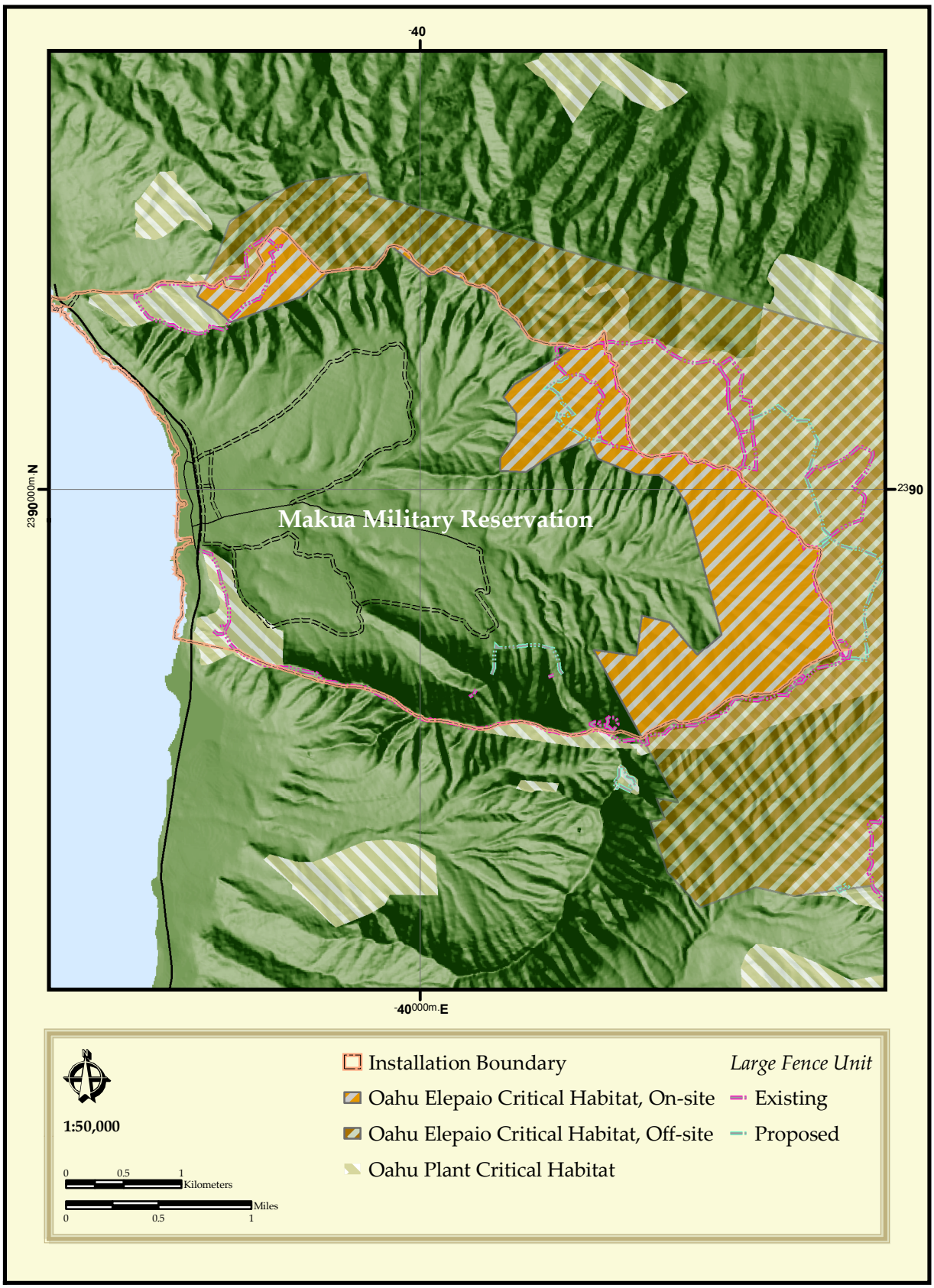


Figure 2.8.h

Management Units on and Adjacent to Makua Military Reservation

Figure 2.8.i-1

Off-site Management Units South and East of Makua Military Reservation

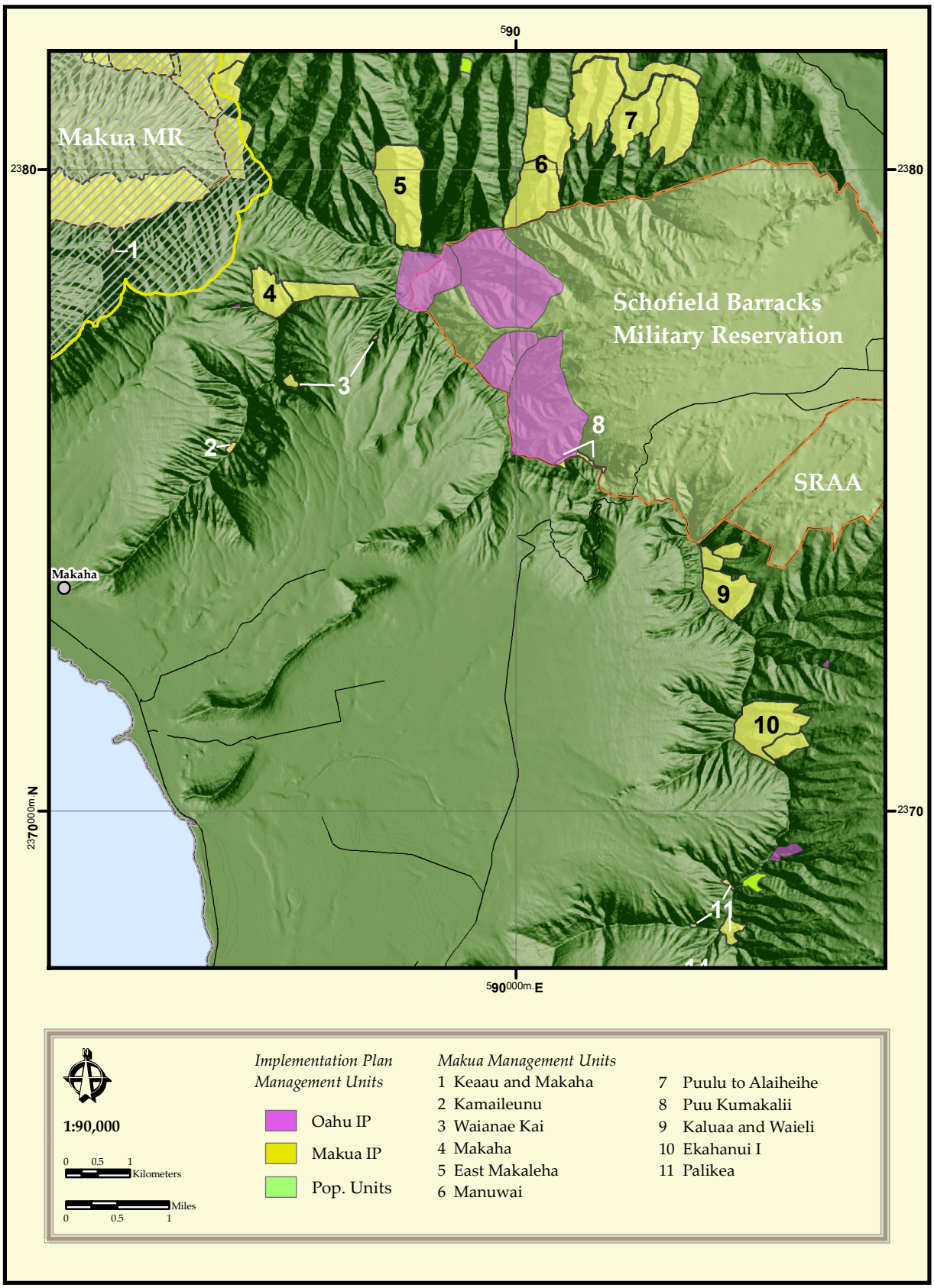


Figure 2.8.i-2

Pahole MU is 215 ac (87 ha) and is owned by the State of Hawai‘i. There are thirteen Mākua IP target species present (*Alectryon macrococcus* var. *macrococcus*, *Schiedea obovata*— extirpated, *Cenchrus agrimonioides* var. *agrimonioides, Chamaesyce herbstii, Cyanea grimesiana* ssp. *obatae, Cyanea longiflora, Cyrtandra dentata, Delissea waianaensis, Flueggea neowawraea, Kadua degeneri* var. *degeneri, Phyllostegia kaalaensis, Schiedea kaalae*, and *Schiedea nuttallii*) and designated for stabilization. *Cyanea superba* ssp. *superba* is a reintroduction to this MU. Pahole MU is protected by fencing.

There are two Mākua IP MU north of MMR, Ka‘ena MU and Haili to Keälia MU (see Figure 2.8.i-1).

Ka‘ena MU covers 52 ac (21 ha) and is owned by the State of Hawai‘i. The MU is composed of two subunits—Subunit I (16 ac/6.5 ha) and Subunit II (36 ac/14.6 ha). There is one Mākua IP target plant species present (*Chamaesyce celastroides* var. *kaenana*) and designated for stabilization in both subunits. *Scaevola coriacea* is documented as historically present at this MU. No fencing is planned for either subunit.

Haili to Keālia MU covers 30 ac (ha) and is owned by the State of Hawai‘i and the federal government. The MU is composed of two subunits. Subunit I (20 ac/ha) has one plant Mākua IP target plant species (*Hibiscus brackenridgei* ssp. *mokuleianus*) designated for stabilization. Subunit II (10 ac/ha) is an augmentation site for *Hibiscus brackenridgei* ssp. *mokuleianus*. This unit is partially located on DMR and State of Hawai‘i land. No fencing is planned for either subunit.

The following Mākua IP MUs are located to the south and east of MMR in the Wai‘anae Mountains (Figure 2.8.i-2). List below are the Kea‘au and Mākaha, Kamaile‘unu, Wai‘anae, Mākaha, East Makaleha, Mawuwai, Puulu to Alaiheihe, Pu‘u Kūmakali‘i, Kalua‘ā and Wai‘eli, ‘Ēkahanui, and Palikea MUs. Descriptions of the Lower ‘Ōpae‘ula, and Lower Kahana can be located in Section 2.5.9.2 and the Waiawa MU in Section 2.4.9.2.

Kea‘au and Mākaha MU is 5 ac (2 ha) and is a State Forest Reserve, Game Management Area (2 ac/ 0.8 ha) and is partially owned by the Board of Water Supply (3ac/ 1.2 ha). There is one Mākua IP target plant species (*Sanicula mariversa*) designated for stabilization. Protective fencing is constructed.

Kamaile‘unu MU is 2 ac (0.8 ha) and is owned by the City and County of Honolulu, Board of Water Supply. There is a single Mākua IP target plant species (*Sanicula mariversa*) present and designated for stabilization. No fencing is planned for this MU.

Wai‘anae Kai MU is 9 ac (3.6 ha) and is owned by the State of Hawai‘i. There are two Mākua IP target plant species present (*Neraudia angulata* and *Nototrichium humile*) and designated for stabilization. Fence will be constructed.

Mākaha MU is 163 ac (66 ha) owned by the Board of Water Supply. Subunit I is 96 ac (38.8 ha), Subunit II is 66 ac (26.7 ha), and Subunit III is 1 ac (0.4 ha). There are five Mākua IP targeted plant species present in Subunit I (*Alectryon macrococcus* var. *macrococcus*, *Flueggea neowawraea*, *Hesperomannia arbuscula*, *Lipochaeta tenuifolia*, and *Viola chamissoniana* ssp. *chamissoniana*) and one snail (*Achatinella mustelina*) designated for stabilization. In Subunit II the plant species are (*Cenchrus agrimonioides* var. *agrimonioides* and *Cyanea longiflora*), along with one snail species (*Achatinella mustelina*). In Subunit III, there are two plant species (*Neraudia angulata* and *Nototrichium humile*). *Schiedea obovata, Cyanea superba* ssp. *superba*, *Dubautia herbstobatae*, and *Phyllostegia kaalaensis* are reintroductions into Subunit I and *Schiedea nuttallii* into Subunit II. *Abutilon sandwicense*

(LE)*, Eragrostis fosbergii* (LE), *Gouania vitifolia* (LE), *Kadua degeneri* var. *coprosmifolia* (LE), *Melicope makahae* (C), and *Sicyos lanceoloideus* (SOC) are also present, along with *Chasiempis sandwichensis ibidis* (LE). Fences have been constructed.

East Makaleha MU covers 231 ac and is owned by the State of Hawai‘i. There are three Mākua IP targeted plants present (*Flueggea neowawraea, Kadua degeneri* var. *degeneri*, and *Pritchardia kaalae*) and one snail species (*Achatinella mustelina*). There are three O‘ahu IP target plant species (*Cyanea acuminata, Labordia cyrtandrae*, and *Schiedea trinervis*). *Chamaesyce herbstii* and *Cyanea superba* ssp. *superba* are reintroductions to the site. *Caesalpinia kavaiensis* (LE), *Colubrina oppositifolia* (LE), *Delissea sinuata* (historical), *Gardenia brighamii* (LE, historical), *Gouania vitifolia* (LE, historical), *Phyllostegia mollis* (LE, historical), *Phyllostegia parviflora* var. *lydgatei* (LE, historical), *Tetramolopium lepidotum* ssp. *lepidotum* (historical), and *Vigna o-wahuensis* (LE) (historical) are important taxa to this unit. Protective fencing is projected for this MU in MIP year 4 (2008).

Manuwai MU is a 166 ac (67 ha) parcel owned by the State of Hawai‘i. There are three Mākua IP targeted plant taxa present (*Kadua degeneri* var. *degeneri, Lipochaeta tenuifolia*, and *Pritchardia kaalae*). One O‘ahu IP target plant species is present (*Abutilon sandwicense*). *Phyllostegia kaalaensis* is a reintroduction to the site. *Caesalpinia kavaiensis* (LE)*, Colubrina oppositifolia* (LE, historical), *Tetramolopium lepidotum* ssp. *lepidotum* (LE, historical) and *Kadua degeneri* var. *coprosmifolia* (LE, historical) are other important taxa.

Puulu to Alaiheihe MU is 86 ac (34 ha) of privately owned land. The Army will work with the landowner to obtain permission to maintain the MU. The Mākua IP target plant species, *Hibiscus brackenridgei* spp. *mokuleianus,* is present and is designated for stabilization.

Puu Kūmakali‘i MU is 28 ac (11.3 ha) and is owned by the U.S. Army and the U.S. Navy. It is located along the boundary of SBMR and Laulualei Navy Magazine. This MU has two Mākua IP target plant species (*Tetramolopium filiforme* and *Viola chamissoniana* ssp. *chamissoniana*) present. No fencing is planned for this MU.

Kalua‘ā and Wai‘eli MU covers 128 ac (51.9 ha) and is leased to The Nature Conservancy by the Estate of James Campbell. It is composed of three subunits–Subunit I (128 ac/51.8 ha), Subunit II (99 ac/40.1 ha), and Subunit III (29 ac/11.7 ha). Subunits I and II have two Mākua IP target plant (*Alectryon macrococcus* var. *macrococcus* and *Schiedea kaalae*) and one snail species (*Achatinella mustelina*) designated for stabilization. There are also three O‘ahu IP targeted plant species (*Phyllostegia hirsuta, P. mollis,* and *Stenogyne kanehoana*). Subunit III has three Mākua IP targeted species (*Alectryon macrococcus* var. *macrococcus*, *Cyanea grimesiana* ssp. *obatae*, and *Delissea waianaensis*) and one snail species (*Achatinella mustelina*) targeted for stabilization. Protective fencing was installed by TNCH for Subunit III. Species identified for reintroduction include *Phyllostegia mollis* and *Stenogyne kanehoana* in the O‘ahu IP for Subunits I and II; and *Schiedea kaalae* (Subunit I) and *Alectryon macrococcus* var. *macrococcus* in Subunit III for the Mākua IP. *Cyanea pinnatifida* (LE, extirpated), *C. calycina* (C)*, Gardenia mannii* (LE)*, Schiedea pentandra* (SOC), *Solanum sandwicense* (LE, historical), and *Tetramolopium lepidotum* ssp. *lepidotum* (LE)*,* and *Urera kaalae* (LE) are documented as present.

‘Ēkahanui MU’s (203 ac/82 ha) is owned by the Campbell Estate and leased to The Nature Conservancy. There are two subunits: Subunit I (44 ac/18 ha) and Subunit II (159 ac/64 ha). Subunit I has a single Mākua IP target plant species (*Schiedea kaalae*) present and Subunit II has four (*Cenchrus agrimonioides* var. *agrimonioides, Delissea waianaensis, Plantago princeps* var. *princeps,* and *Schiedea kaalae*). One snail species is a target taxon (*Achatinella*

mustelina). Subunit I has a single O‘ahu target plant species (*Abutilon sandwicense*) as does Subunit II (*Phyllostegia mollis*). Also present at the ‘Ēkahanui MU are *Diellia unisora* (LE), *Labordia kaalae* (SOC), *Lobelia yuccoides* (SOC), *Melicope st.-johnii* (LE), *Platydesma cornuta* var. *decurrens* (C), *Pleomele forbesii* (C), *Phyllostegia parviflora* var. *lydgatei* (LE), *Pteralyxia macrocarpa* (C), *Tetramolopium lepidotum* ssp. *lepidotum* (LE), and *Urera kaalae* (LE). Fencing is scheduled for 2013 for Subunit I and has been completed for Subunit II.

Palikea MU covers 45 ac (18.2ha) and is leased to The Nature Conservancy by the Estate of James Campbell. The MU has four subunits. Subunit IA (21 ac/8.5 ha) has one plant species (*Cyanea grimesiana* ssp. *obatae*) and one snail species (*Achatinella mustelina*) targeted for stabilization in the Mākua IP. Protective fencing for Subunit IA is projected for Mākua IP year 5. Subunit IB (11 ac/4.5 ha) has one plant species (*Hesperomannia arbuscula*) targeted for stabilization. Protective fencing is projected for construction in Mākua IP year 5. Subunit IV (9 ac/3.6 ha) has one plant species (*Kadua parvula*) targeted for stabilization. No protective fencing is planned. Subunit V (4 ac/ ha) has one plant species (*Kadua parvula*) targeted for stabilization. No protective fencing is planned. Other species present in this MU are *Diellia unisora* (LE), *Phyllostegia mollis* (LE), *Phyllostegia parviflora* var. *lydgatei* (LE), *Pritchardia* sp. *nov*., *Sicyos lanceoloideus* (SOC), and *Urera kaalae* (LE), along with the land snail, *Amastra rubens* (SOC). *Silene perlmanii* and *Solanum sandwicense* are extirpated from this MU.

Three Mākua IP MUs are located in the Ko‘olau Mountains. They are Lower ‘Ōpae‘ula (17 ac; see Section 2.5.8.2), Lower Kahana (3 ac; see Section 2.5.8.2), and Waiawa MU Subunit I (124 ac; see Section 2.4.8.2),

The above MUs and their locations are discussed in detail in the *Implementation Plan for O‘ahu Training Areas* (USAG-HI 2008b), the *Final Implementation Plan Mākua Military Reservation* (USAG-HI 2003a), and the *Addendum to the Implementation Plan Mākua Military Reservation* (MIP) (USAG-HI 2005a). As of 2008, the Mākua IP was in its fourth year of implementation and the O‘ahu IP was in urgent actions year 1 status.

2.8.8.3 Fauna

USAG-HI Natural Resources staff and the University of Hawaii’s Biodiversity and Mapping Program update MMR’s fauna species lists when new species are identified and have been verified as present on MMR.

Keystone Species

Conditions and needs of keystone species is an area that requires development for MMR.

Hawaii’s Species of Greatest Conservation Need

A comparison of MMR’s fauna species lists with the Hawaii’s Comprehensive Wildlife Conservation Strategy, resulted in four birds, two marine mammals, and one invertebrate species of greatest conservation need present at MMR (Ogura et al. 2005). (Appendix 3, *Species Lists*. Annex F, *MMR Species of Greatest Conservation Need.)*

Mammals

A comprehensive survey of introduced mammal species has not been conducted at MMR. The ‘ope‘ape‘a, Hawaiian hoary bat (*Lasiurus cinereus semotus*), is the only indigenous terrestrial mammal on the Hawaiian Island. A single hoary bat was observed flying over Ōhikilolo ridge on MMR in 1998. A bat detector is incorporated into camping trips, and have been noted (USAG-HI 2004).

Two marine mammals and three introduced mammal species have been observed at/near MMR. (See Appendix 3, *Species Lists*. Annex F, *MMR Mammals*.)

Birds

A comprehensive survey of bird species has not been conducted at MMR. Numerous informal and incidental observations have been made at MMR by the ONR staff. Two forest birds, one raptor, one seabird, one migratory shorebird, and 11 introduced bird species have been observed at MMR. (See Appendix 3, *Species Lists*. Annex F, *MMR Birds*.)

Herpetofauna

There are no native terrestrial herpetofauna in the Hawaiian Islands. A comprehensive survey of introduced herpetofauna species has not been conducted at MMR. Thirteen introduced herpetofauna species may be present at MMR. One endangered and one threatened marine turtle may be present at MMR.

Introduced Reptiles: There are eight introduced lizards and one terrestrial snake that may be present at MMR. (McKeown 1996). (See Appendix 3, *Species Lists*. Annex F, *MMR Herpetofauna*.)

Introduced Amphibians: There are four species that may be located at MMR (McKeown 1996; Hawai‘i Stream Assessment database 1992). (See Appendix 3, *Species Lists*. Annex F, *MMR Herpetofauna*.)

Fish

A comprehensive survey of fish species has not been conducted at MMR. There are no records of native or introduced fish at MMR.

Invertebrates

A comprehensive survey of invertebrate species has not been conducted at MMR. Nine endemic/indigenous and 13 introduced invertebrates have been observed at MMR (HINHP 1994c; R.M. Towill Corporation 1997b, USAG-HI 2006). (See Appendix 3, *Species Lists*. Annex F, *MMR Invertebrates*.)

Invasive Species: USAG-HI began surveying in 2006 to determine the presence of invasive ants and their impact on endangered flora. Six species of invasive ants were identified as present at MMR. Three of those species, *Ochetellus glaber*, *Solenopsis papuana*, and *Tetramorium simillimum* were identified at MMR Action Area Management Units, but not at the MMR. *Anoplolepis gracilipes* was identified at an MMR Action Area, but not at the MMR (S. Ching, USAG-HI ONR staff, per. com. 2008). (See Appendix 3, *Species Lists*. Annex F, *MMR Invertebrates*.)

2.8.8.4 Flora

USAG-HI has documented 284 identified and one unidentified taxon at MMR in the Hawai‘i Biodiversity and Mapping Program (HBMP 2007g) and its incipient species database. (See Appendix 3, *Species Lists*. Annex F, *MMR Plants*, list of native and introduced plant species.)

Keystone Species

Conditions and needs of keystone species is an area that requires development for MMR.

State of Hawaii's Species of Greatest Conservation Need

A comparison of MMR's plant species list and Hawaii's Comprehensive Wildlife Conservation Strategy resulted in the identification of 79 plant species of greatest conservation need designated by the State of Hawai'i as being present at MMR (HBMP 2007g and Ogura et al. 2005). (See Appendix 3, *Species Lists*. Annex F, *MMR Species of Greatest Conservation Needs*.)

Incipient Species

USAG-HI ONR staff has identified 17 species that it controls and eradicates when found in areas where rare plant species occur at MMR. (See Appendix 3, *Species Lists*. Annex F, *MMR Weeds*.)

Non-Native/Weedy Species

There are 19 invasive/weed species that have been located at MMR. When these species are determined to be having a negative effect on MMR's training areas, native plant habitats, and ecosystems, they are controlled. (NRCS PLANTS Database, June 2008 Weeds of Hawai'i, http://plants.usda.gov/java/invasiveOne?pubID=HEAR). (See Appendix 3, *Species Lists*. Annex F, *MMR Weeds*.)

2.8.8.5 Native Vegetation Communities

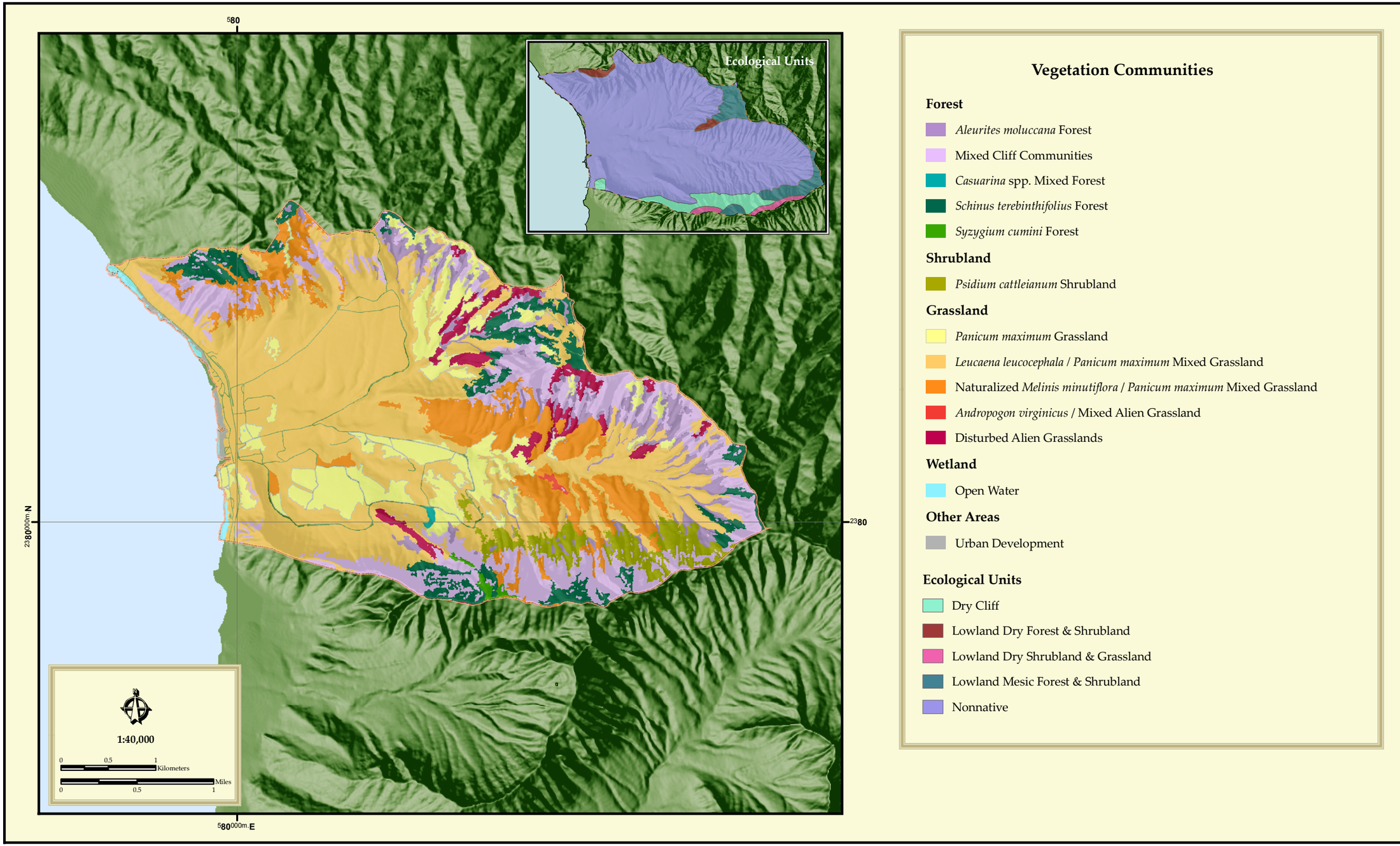
There are two native vegetative communities identified at MMR: Lowland Mesic and Lowland Dry Vegetation communities (Figure 2.8.j). These community types are categorized into ecological zones defined by elevation, topography, and prevailing ecological conditions (Wagner et al. 1999). (See Appendix 3, *Species Lists*. Annex F, *MMR Native Vegetation Communities and Descriptions*.)

2.8.8.6 Wetlands and Deep Water Habitats

A wetlands delineation survey has not been conducted within the installation proper due to safety concerns. There are possible palustrine wetlands on MMR associated with seep areas. These areas are characterized by native trees, shrubs, or persistent emergent species (USACE and Nakata Planning Group 2002a). Between July 2003 and March 2004, the Corps of Engineers conducted wetland delineation surveys of the area between the installation's west fence and the ocean (see Figure 2.8.g) (USACE 2005). Three muliwai ponds and the Hau Thicket were identified as potential wetlands between Farrington Highway and the ocean. Punapohaku Muliwai met all three Corps of Engineers' hydric indicators and was determined to be a regulated wetland. Kalena and Mākua Muliwais met all three indicators as well, but were determined to be streams. The Hau Thicket did not meet the three indicators and was determined not to be a wetland.

Possible riverine wetlands and possible palustrine wetlands associated with seep areas in the Mākua Stream drainage are protected using a variety of training restrictions. Though there are no known deep water habitats within the boundaries of MMR, the installation is located adjacent to the coast.

Vegetation Communities on Makua Military Reservation



Vegetation Communities

Forest

- *Aleurites moluccana* Forest
- Mixed Cliff Communities
- *Casuarina* spp. Mixed Forest
- *Schinus terebinthifolius* Forest
- *Syzygium cumini* Forest

Shrubland

- *Psidium cattleianum* Shrubland

Grassland

- *Panicum maximum* Grassland
- *Leucaena leucocephala* / *Panicum maximum* Mixed Grassland
- Naturalized *Melinis minutiflora* / *Panicum maximum* Mixed Grassland
- *Andropogon virginicus* / Mixed Alien Grassland
- Disturbed Alien Grasslands

Wetland

- Open Water

Other Areas

- Urban Development

Ecological Units

- Dry Cliff
- Lowland Dry Forest & Shrubland
- Lowland Dry Shrubland & Grassland
- Lowland Mesic Forest & Shrubland
- Nonnative

Figure 2.8.j

CHAPTER 3

ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

CHAPTER 3 ENVIRONMENTAL MANAGEMENT STRATEGY AND MISSION SUSTAINABILITY

3.1 Supporting Sustainability of the Military Mission and the Natural Environment

3.1.1 Integrate Military Mission and Sustainable Land Use

The integration of the military mission and effective land use practices is necessary for sustainable land use when resources are limited. Natural recovery is rarely an option, due to time restraints, limited land extent, and non-renewable resources. Section 101(b)(1)(I) of the Sikes Act states that each Integrated Natural Resources Management Plan (INRMP) will provide for "no net loss in capability of military installation lands to support the military mission of the installation" where the situation is appropriate and applicable. "Where appropriate and applicable" recognizes that there are instances where resources will be lost. Effective planning and conservation measures are required for protecting future mission capabilities. Conservation compliance helps direct long-term efforts for resource sustainability. USAG-HI's land use, however, is defined by the installation's mission. The biological setting is only one factor under consideration by the installation's Command when determining land use. It becomes the responsibility of the Environmental Office to understand the mission, to meet compliance requirements, and to effectively address conflicting issues. Involvement by land users and the land managers is a valuable mechanism for achieving a balance that supports the mission and resources.

The USAG-HI training and natural resources management communities share the goal of sustaining the landscape to accommodate continued training with minimal restrictions. This shared value is attainable through cooperation and collaboration. Open communication and information sharing is imperative. Several forums exist to facilitate coordination.

- Weekly staff meetings are held by the Command to present and review existing issues.
- Quarterly/biannual natural resource and training briefs to installation staff.
- Regular interaction between O'ahu Natural Resource (ONR) staff and Integrated Training Area Management (ITAM) personnel.
- Annual reports on natural resource activities that are provided to the Command, Range Control, etc.
- Mākua Process Action Team.

3.1.2 Define Impacts to the Military Mission

The principal natural resource impact to the military mission is the presence of federally listed endangered and threatened species on USAG-HI sub-installations. The number of individuals that are federally listed taxa may be higher per unit area than on any other federally owned or managed land. Training may not be directly affected (e.g., rough terrain precludes mounted maneuvers) by federally listed species, but wildland fire, a potential consequence of live-fire training or any number of military training activities in which blanks and pyrotechnics may be used, can halt training. As such, large portions of all of USAG-HI sub-installations on O'ahu are only partially available to

training due to rough terrain, the amount of vegetative cover, and the presence of federally listed species.

Environmental training restrictions are stated in the 25th ID (L) & USARHAW Regulation 210-16, dated 23 March 1999. (See Appendix 9, *Installation Documents. Standard Operating Procedures.*) Additionally, each range and training area has its own unique standard operating procedures (SOPs), each falling under the umbrella of the 25th ID (L) & USARHAW Regulation 210-16. All training areas have some training restrictions. As an example, vehicle traffic in most training areas is restricted to roads (exceptions include maneuver training areas on sub-installations). Vehicles used at Pōhakuloa must be cleaned at wash facilities prior to returning to the Island of O‘ahu.

As noted above, the potential for wildland fire affects the military mission. Wildland fires resulting from live-fire training and/or the use of blanks and pyrotechnics present the primary threat in adversely impacting threatened and endangered species. Live-fire training presently occurs only at Schofield Barracks Military Reservation (SBMR). Restricted live-fire events occur at Kahuku Training Area (KTA). Use of blanks and pyrotechnics are authorized at all O‘ahu sub-installations. No live fire or use of pyrotechnics was authorized at Mākua Military Reservation (MMR) until the completion of environmental impact statement addressing training at MMR and a record of decision is made. The environmental impact statement was issued in June 2009 and the record of decision was signed in August 2009.

USAG-HI is in the process of updating its Wildland Fire Management Plan (25th ID(L) and USAG-HI 2003). While wildland fire is a very significant issue, non-native species are yet another significant natural resource management issue and part of the problem. Native vegetation is slow to capture open and disturbed areas, whereas some non-native species, such as Guinea grass (*Panicum maximum*), establish in open areas, along, and in roads. Less affected by fire than native plant species, non-native plant species quickly reestablish after fire, extend their presence, and increase by virtue of their successful competitive ability for space and resources. The success of these non-native grasses has created a grass/wildland fire cycle not naturally apart of the Hawaiian environment and, is displacing more and more native forest with every fire (M. Mansker, USAG-HI, personal com.)

Natural resource issues do affect the military mission at USAG-HI sub-installations. Actions have been taken to minimize the effects and maximize training area. Firebreaks, dip tanks, trained fire crews, weather restrictions, and more may not reduce the fire threat, but increase USAG-HI’s ability to minimize the potential for and the overall effect of fires. USAG-HI’s data on endangered species numbers, status, and locations supports greater compatibility between training and species management. Many of the actions the Environmental Office is undertaking are outlined in the *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation*, *Reinitiation of the 1999 Biological Opinion of USFWS for U.S. Army Military Training at Mākua Military Reservation, Island of O‘ahu*, dated June 22, 2007, *Biological Opinion of the USFWS for Routine Training and Transformation of the 2nd Brigade 25th Division (Light) U.S. Army Installations Island of O‘ahu*, dated October 23, 2003, and their associated implementation plans.

The missions of USAG-HI O‘ahu installations will undoubtedly change during this five-year plan; however, impacts on natural resources will probably remain similar to today’s uses. Most impacts are anticipated to occur at the firing ranges, impact areas, and maneuver training areas located on the sub-installations. All mission changes will be analyzed under the National Environmental Policy Act (NEPA) process, when applicable. The U.S. Fish and Wildlife Service (USFWS) will be consulted as appropriate for the situation.

3.1.2.1 Schofield Barracks Military Reservation Military Operations Impacts on Natural Resources

(including the South Range Acquisition Area)

Live-Fire Weapons Training

Live-fire weapons training is typically conducted on established, hardened, and fixed training ranges. In most cases, these ranges require a clear line-of-sight for target acquisition, which influences the type and amount of vegetative cover present. Live-fire activities themselves also affect the type and amount of vegetative cover. The loss of vegetation, disturbance, and erosion tend to be confined to the firing points, target areas, and unhardened travel ways (foot/vehicle). Non-native plant species can be prolific at these disturbed areas. Other effects associated with live-firing weapons use include cratering, target scrape, munitions residues, wildland fires that may significantly threaten or destroy threatened and endangered species and or critical habitat, potential noise issues, and the potential for unexploded ordnance in the impact area.

Maneuver Training

Maneuver training primarily affects soils and vegetation. Military vehicles and dismounted troops can disturb and compact soils, as well as crush and damage vegetation. Training activities can and do cause erosion, road degradation, creation of new trails and long-term habitat change. There is a potential for hazardous materials/waste spills, especially around maintenance areas and fueling operations. The potential for fire starts exists due to the use of pyrotechnics.

Reconnaissance Training

Dismounted reconnaissance training activities typically affect vegetation by damaging or crushing it. Mounted reconnaissance training activities affect soils and vegetation. Mounted reconnaissance activities can and do cause soil compaction, erosion, road degradation, and creation of new trails that may lead to long-term habitat change. There is a potential for hazardous materials/waste spills, especially around maintenance areas and fueling operations. Potential for fire starts exists due to the use of pyrotechnics and explosive simulators. The use of unmanned aerial vehicles has a potential for bird strikes but is expected to be rare.

Bivouac Training

Bivouac activities are intense and localized. There is a higher potential for hazardous materials/waste spills due to maintenance and fueling operations being conducted in bivouac areas. Noise may also be a potential issue due to the use of generators in operation 24 hours a day. Use of pyrotechnics, warming and cooking fires may also potentially cause wildland fires.

Aviation Training

Helicopter take-offs and landings are at defined locations (e.g., landing zones, pads, taxiways and runways) and have limited additional impacts on natural resources (e.g., dust and soil erosion due to rotor wash). Helicopter weapons firing is conducted on approved ranges and their associated impact areas. Bird strikes are possible but are rare based on reports. Other effects associated with aviation training are the potential for hazardous materials/waste spills, especially around maintenance areas and fueling operations; crushing/damaging endangered species; soil compaction/erosion and noise.

Construction Activities

The following construction projects were addressed in the *Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawai'i Final Environmental Impact State,* dated May 2004; the *Biological Opinion of the USFWS for Routine Training and Transformation of the 2nd Brigade 25th Infantry Division (L) U.S. Army Installations Island of O'ahu,*

dated Oct. 23, 2003; and the *Final Environmental Impact Statement Permanent Stationing of the 2/25th Stryker Brigade Combat Team,* dated February 2008 (D. Kanehisa per. com.).

- Urban Assault Course and Training Facilities – Completed.
- Qualification Training Range 2 (QTR2) – Completed.
- Stryker Motor Pool – Completed.
- Prescribed burns to reduce vegetation load at ranges at McCarthy Flats, also this action facilitates unexploded ordnance clearance and surveys for cultural sites – Ongoing.
- Road Construction between SBMR and Helemano Military Reservation (HMR) – Ongoing.
- In cantonment area: Barracks Complex Plus 1 & 2 (Construction of one standard-design barracks facility, one standard-design battalion headquarters, and central plant to meet the new billeting requirements of the 25th ID – In progress.
- In cantonment area: Shopping Center – Completed.
- Range Control Facility – Not started.
- Battle Area Complex (BAX) – In progress.
- Land Easement/Road Construction between SBMR to DMR – Not started.
- In cantonment area: Parking structure Quad F – Not started.
- In cantonment area: Soldier and Readiness Center – Not started.
- In cantonment area: Child Development Center – Completed.
- In cantonment area: Gate alignments – Ongoing.
- Proposed conversion of Military Police Brigade to Combat Support Brigade – Completed.
- In cantonment area: Central Wash Facility – Projected to commence 2011.
- In cantonment area: Whole Barracks Renewal includes battalion headquarters – In progress.
- In cantonment area: Macomb roundabout – To commence sometime in the future.

Other projects include:

- Army Growth and Force Structure Realignment – Ongoing 2013.
- Warrior in Transition Facilities – 2010 to 2012.
- Whole Barracks Renewal Program – Ongoing, 2013.
- Residential Communities Initiative – Ongoing, 2015
- Improvised Explosive device Defeat Training Lane – Ongoing.
- New Barracks – 2010 to 2013, 2011 to 2014, 2013 to 2015.
- 8th Theater Sustainment Command (TSC) Motor Pool – 2010 to 2013.
- Vehicle Maintenance Shop, 307th Integrated Theater Signal Battalion (ITSB) – 2010 to 2012.
- Temporary Organizational Parking, 249th Engineering Battalion – 2010 to 2011.

- Centralized Vehicle Wash Facility – 2010 to 2011.
- Tactical Vehicle Maintenance Facility – 2010 to 2011.
- Training Support Center – 2011 to 2013.
- Unit Facilities, various phases – 2013 to 2018.
- Division Headquarters Facilities, Phase I – Completion date 2017.
- Combat Aviation Brigade Complex Phase II – Beginning in 2015.

3.1.2.2 Schofield Barracks East Range

Live-Fire Weapons Training

No live-fire weapon training is conducted on Schofield Barracks East Range (SBER).

Maneuver and Bivouac Training

Maneuver and bivouac impacts at SBER are the same as for SBMR (see Section 3.1.2.1, *SBMR Military Operations Impacts on Natural Resources*). All exercises are limited to blank ammunition and pyrotechnics. The Army has established a 1,000-foot noise buffer zone between the boundaries of SBER and Wahiawa residential areas. The use of pyrotechnics, simulators and small arms blank ammunition is not authorized in SBER training areas 1A, 1B, 2, 3A, and 3B during the hours of 1800 to 0600 daily.

Mounted and Dismounted Reconnaissance Training

See Section 3.1.2.1, *SBMR Operation Impacts on Natural Resources, Reconnaissance Training.*

Aviation Training

See Section 3.1.2.1, *SBMR on Natural Resources, Aviation Training.* The training is similar at the two areas, except that no live-fire training from helicopters occurs within SBER.

Drop Zone Activities

Personnel and equipment parachute landings are at defined locations that must meet requirements to reduce the risk of harm to personnel and damage to equipment (i.e., slope, roughness of terrain, vegetation type on drop zone, weather conditions). These drop zones are accessible to vehicles for personnel and equipment recovery. Impacts associated with drop zone activities are soil compaction, potential for hazardous materials/waste spills, noise, potential for wildland fires due to use of pyrotechnics, explosive simulators and blanks, and crushing of vegetation from foot and vehicle traffic, not to mention from the landing of personnel and equipment loaded on pallets.

Construction Activities

There are no proposed construction projects currently planned for SBER.

3.1.2.3 Kawailoa Training Area

Live-Fire Weapons Training

There is no live-fire weapons training conducted on Kawailoa Training Area (KLOA). The use of pyrotechnics, explosive simulators, and incendiaries is not allowed; however; the use of blank ammunition is authorized per lease agreement.

Maneuver and Bivouac Training

Maneuver and bivouac impacts at KLOA are the same as for SBMR. Very rugged terrain is off-limits to all training, and military vehicle access is restricted to Pupukea Paalaa Road through Helemano Gate. Blank ammunition is authorized on KLOA training areas. Military units may

conduct training in KLOA Training Area K1B during weekends and federal holidays with prior notification to the public.

Aviation Training
Aviation training impacts are limited to impacts from landing and take-off operations. Aviation maintenance and fueling operations are not conducted at KLOA by aviation units. No Nap of the Earth (NOE) helicopter flights are permitted outside KLOA boundaries due to the presence of cattle ranches on adjacent lands.

Reconnaissance Training Activities
See Section 3.1.2.1, *SBMR Operation Impacts on Natural Resources, Reconnaissance Training*.

Drop Zone Activities
See Section 3.1.2.2, *SBER Operation Impacts on Natural Resources, Drop Zone Activities*.

Construction Activities
There are no construction projects currently proposed for KLOA.

3.1.2.4 Kahuku Training Area
Combined Arms Live-Fire Maneuver Training
Combined Arms Live-fire Maneuver training is conducted on an established, hardened, and fixed training range. At the Kahuku Training Area Combined Arms Collective Training Facility (CACTF), Short Range Training Ammunition (SRTA) is used. This type of training is primarily conducted in an urban environment where vegetation is limited, but typically, units begin their assault from a rural environment/setting into the urban area. In most cases, this range requires a clear line-of-sight for target acquisition thus resulting in the type and amount of vegetative cover present. The live-fire activities themselves also affect the type and amount of vegetative cover. The loss of vegetation, disturbance, and erosion tend to be confined to the firing points, target areas, and unhardened travel ways (due to foot and or vehicle traffic). Non-native plant species can be prolific at these disturbed areas. Other effects associated with live-firing maneuver training includes cratering, target scrape, munitions residues, resulting wildfires from use of tracers, pyrotechnics and explosives may significantly threaten or destroy threatened and endangered species and or critical habitat, noise may be an issue, and the potential for unexploded ordnance in the impact area exists, but is cleared at the end of each training event.

Maneuver Training
See 3.1.2.1, *SBMR Operations Impacts on Natural Resources, Maneuver Training.*

Bivouac Training
See 3.1.2.1, *SBMR Operations Impacts on Natural Resources, Bivouac Training.*

Reconnaissance Training
See 3.1.2.1, *SBMR Operations Impacts on Natural Resources, Reconnaissance Training.*

Aviation Training
See Section 3.1.2.2, *SBER Operation Impacts on Natural Resources, Aviation Training.*

Drop Zone Activities
See Section 3.1.2.2, *SBER Operation Impacts on Natural Resources, Drop Zone Activities.*

Construction Activities

The following construction projects are planned for KTA. These projects were addressed in the *Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawai'i Final Environmental Impact State,* dated May 2004; the *Biological Opinion of the USFWS for Routine Training and Transformation of the 2nd Brigade 25th Infantry Division (L) U.S. Army Installations Island of O'ahu,* dated Oct. 23, 2003; *and Final Environmental Impact Statement Permanent Stationing of the 2/25th Stryker Brigade Combat Team,* dated February 2008.

- Tactical Vehicle Wash Facility – Not started.
- Combined Arms Collective Training Facility (CACTF) – In progress.

3.1.2.5. Dillingham Military Reservation

Because of the extensive hardening of DMR (from WWII up to the early 1960s) with taxi-ways, aircraft parking areas, ammunitions storage areas, and missile launcher sites, there is very little native vegetation remaining within the boundaries of the installations except for the limited area of the steep slopes of the Waianae Range located on the southern boundary of DMR.

Live Fire Weapons Training

No live-fire training is allowed at DMR.

Maneuver and Bivouac Training

Maneuver and bivouac activities are the same as for SBMR but will have fewer impacts to soils because most of DMR has been compacted due to the construction of a military airfield with hardened areas, which have been used by the military for over fifty years. Use of blank ammunition, pyrotechnics (e.g. smoke grenades, and ground flares) and simulators (grenade, artillery and demolition simulators) is authorized at DMR through Range Division Hawai'i. Aerial pyrotechnics (e.g., star and parachute flares) and tear gas grenades are restricted from use at DMR due to safety concerns relating to civilian flight operations and the presence of civilians. Smoke grenades will only be used in areas devoid of vegetation. Range Division Hawai'i will authorize and apply safety buffer zones for smoke grenades in Training Areas P-1, P-2, and P-3 and for ground simulators in Training Area P-3. The use of pyrotechnics, simulators (including demolition effects simulators), and blanks will be restricted by Range Division Hawai'i when under the red Fire Danger Rating System Category. No ignition sources (including cigarettes, cooking/warming fires, and blanks) are allowed outside of the southern firebreak.

Drop Zone

Drop zone (DZ) impacts are considered to be less intense for the civilian drop zone because the number of personnel is not on the scale of military drops and civilians do not carry the equipment associated with military troops. The military "water" drop zone impacts are not considered to be significant because water drops are typically restricted to highly trained, special operations troops, where 15 or less parachutists would be normally involved in a drop.

Aviation Training

See Section 3.1.2.2, *SBER Operation Impacts on Natural Resources, Aviation Training.* The airfield is off-limits to military training unless coordinated through Range Division Hawai'i.

Construction Activities

The following construction projects are planned for KTA. These projects were addressed in the *Transformation of the 2nd Brigade, 25th Infantry Division (L) to a Stryker Brigade Combat Team in Hawai'i Final Environmental Impact State,* dated May 2004; the *Biological Opinion of the USFWS*

for Routine Training and Transformation of the 2nd Brigade 25th Infantry Division (L) U.S. Army Installations Island of O'ahu, dated Oct. 23, 2003; *and Final Environmental Impact Statement Permanent Stationing of the 2/25th Stryker Brigade Combat Team,* dated February 2008.

- Dillingham Military Vehicle Trail – In progress.

Recent construction activities included four tactical internet antennas constructed in areas previously disturbed by construction and where alien species are present. Two firebreaks were completed. The first break was constructed in 2005 to contain fires within Training Area P-1and portions of Training Areas, P-2, and P-3. The second firebreak was constructed in 2006 and was located close to the southern boundary along the base of the slopes of Waianae Range, thus containing nearly all of the training areas. Both firebreaks were constructed in accordance with the Integrated Wildland Fire Management Plan (25th ID (L) and U.S. Army, Hawaii 2003).

Prescribed burns to reduce fuel load at DMR are ongoing but depend on the season and appropriate conditions as described in the IWFMP.

3.1.2.6 Mākua Military Reservation

Company Combined Arms Assault Course Training

Company Combined Arms Assault Course (CCAAC) training is conducted on an established, hardened, and fixed training range. Small arms ammunition, pyrotechnics, and explosive simulators are used. CCAAC training is primarily conducted in an urban environment where vegetation is limited, but typically, units begin their assault from a rural environment/setting into the urban area. In most cases, this range requires a clear line-of-sight for target acquisition thus resulting in the type and amount of vegetative cover present. The live-fire activities themselves also affect the type and amount of vegetative cover. The loss of vegetation, disturbance, and erosion tend to be confined to the firing points, target areas, and unhardened travel ways (due to foot and or vehicle traffic). Non-native plant species can be prolific at these disturbed areas. Other effects associated with live-firing maneuver training includes cratering, target scrape, munitions residues, resulting wildfires from use of tracers, pyrotechnics and explosives may significantly threaten or destroy threatened and endangered species and or critical habitat, noise may be an issue, and the potential for unexploded ordnance in the impact area exists, but is cleared at the end of each training event.

Maneuver and Bivouac Training

See Section 3.1.2.1, *SBMR Operation Impacts on Natural Resources, Maneuver Training and Bivouac Training.*

Reconnaissance Training Activities

Reconnaissance training is not conducted at MMR due to the presence of unexploded ordnance and risk to endangered species.

Aviation Training

See Section 3.1.2.2, *SBER Operation Impacts on Natural Resources, Aviation Training.* In the future, live-fire training is proposed and impacts would be similar to SMBR (see Section 3.1.2.1, *SBMR Operation Impacts on Natural Resources, Aviation Training*).

Drop Zones Impacts

There are no approved drop zones for MMR.

Construction Activities

The following construction projects are planned for MMR. These projects were addressed in the *Reinitiation of the1999 Biological Opinion of the USFWS for US Army Training at Mākua Military Reservation, Island of O'ahu,* June 22, 2007 (I-2-2005-F-356).

- North Firing Point Improvements – Proposed construction.
- Firebreak road upgrades for the North and South Lobes – Completed.
- Fuelbreaks – Completed.

3.1.2.7 Tripler Army Medical Center

Construction Activities & Site Alteration

The Orange black damselfly (*Megalagrion xanthomelas*) is a federal candidate species for listing. There is one O'ahu population of the taxon, that was threatened by construction impacts on the upper slope of the gully where it is found. The Army built an artificial habitat until construction was over. Attempts have been made to move the species to Makiki and Dillingham Military Reservation without success. Invasive species (e.g., guppies and top minnows) feed on the damselfly naiads.

3.1.3 Relationship to Range Complex Management Plan or Other Operational Area Plans

This Integrated Natural Resources Management Plan is required to be coordinated with USAG-HI Division's Range Complex Management Plan and the Integrated Training Area Management 5 Year Work Plan so as to sustain USAG-HI's training lands into the future. This coordination helps to: (1) ensure that no duplication of effort occurs so as to maximize critical resources, (2) helps in the siting of future ranges so as to avoid environmental or encroachment issues, (3) ensures that program goals and objectives are compatible and supportive, and (4) identifies problem areas and establishes procedures and actions to avoid loss of valuable training lands.

3.2 Natural Resources Consultation Requirements

INRMPs are planning documents that reflect the interests of installation stakeholders to meet natural resources management goals, while allowing for multipurpose uses and enhancement of resources, providing public access, where appropriate, and without net loss in capability to support an installation's military mission. It is a document that first and foremost integrates conservation measures and military operations. It is a document that reflects the cooperation between the U.S. Fish and Wildlife Service (USFWS), state agencies, and the installation relative to the proper management of fish and wildlife resources.

An INRMP reflects and supports the interests of its stake holders who include those involved with military operations and training activities, environmental managers, master planning staff, federal and state agencies, conservation groups, cultural resources managers, pest management professionals, neighboring land owners, and citizens interested in an installation's resources. The result is a document that

- Provides management direction.
- Identifies areas that need protection, enhancement, and restoration necessary to support fish, wildlife, plants, and wetlands.
- Establishes specific natural resources management goals and objects and time frames for execution.

- Provides avenues for sustainable use by the public consistent with natural resources objectives while ensuring the military safety and security.
- Supports the application of natural resources laws and regulations.
- Provides the military with a sustainable training environment without compromising its mission.

3.2.1 Sikes Act Improvement Act

The Sikes Act Improvement Act (SAIA) requires that the INRMP be prepared, reviewed, and updated in coordination with the USFWS and the appropriate state fish and game agency, which is the Hawai‘i Department of Land and Natural Resources (DLNR). The resulting INRMP reflects the mutual agreement of USFWS, Hawai‘i DLNR, and USAG-HI concerning the conservation, protection, and management of plant and wildlife resources as are applicable by their legal authority (i.e., SAIA, ESA). The USFWS and Hawai‘i DLNR were invited to participate in the revision of the INRMP.

3.2.2 Endangered Species Act

Section7(a)(1) of the Endangered Species Act (ESA) states that all federal agencies, in consultation with USFWS and the National Marine Fisheries Services (NMFS), shall use their authorities to further the purpose of the ESA by carrying out programs for the conservation of endangered and threatened species. Section 7(a)(2) requires that federal agencies in consultation and assistance with USFWS or NMFS “insure that any action authorized, funded, or carried out . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species.”

Further, DoD Instruction 4715.3 stipulates that procedures complying with the ESA shall emphasize military mission requirements and interagency cooperation during consultation, species recovery planning, and management activities.

An INRMP is an installation’s mechanism to regularly map, show occurrences, determine habitat distributions, and develop management areas of federally endangered, threatened, proposed, candidate, and species at risk. Army Regulation 200-1 specifies that survey information should be current and reviewed and update prior to an INRMP’s revision. An effective INRMP can assist in efforts to preclude critical habitat designation on an installation and provide data that supports the listing/delisting of species and recovery plan development.

3.2.3 Endangered Species Act, as amended by the National Defense Authorization Act, 2004

The National Defense Authorization Act (NDAA) for Fiscal Year 2004 changed the ESA regarding INRMPs. Under Section 4(a)(3)(B)(i) of the ESA, the Secretary of Interior or the Secretary of Commerce, as appropriate, is precluded from designating critical habitat on any areas owned, controlled, or designated for use by the DoD where an INRMP has been developed that, as determined by the Secretary of Interior or Secretary of Commerce, provides a benefit to the species subject to critical habitat designation. In contrast, Section 4(b)(2) is discretionary. This section allows the Secretaries of Interior and/or Commerce to specifically preclude designation of critical

habitat on military facilities if they determine that the benefits of such designation are outweighed by the impact on national security, as long as such exclusion does not cause the extinction of a species.

As such, this INRMP addresses the benefits of management actions taken for federally listed species and their habitats. The following plan demonstrates management actions that (1) benefit these species, so as to maintain or increase populations, or to enhance or restore habitat; (2) provide certainty that the management plan will be implemented; and (3) measures will be taken to demonstrate that conservation efforts will be effective (e.g., includes biological goals and objectives that are quantifiable through monitoring and that will be reported).

3.2.4 Conservation of Migratory Birds

The DoD and USFWS entered into a Memorandum of Understanding (MOU) in 2006 to promote the conservation of migratory birds in accordance with Executive Order 13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*). (See Appendix 8, *Cooperating Agreements* and Appendix 10, *Additional Information. Executive Orders*.) The MOU's intent is to describe actions to advance migratory bird conservation, avoid or minimize bird take with emphasis on migratory bird species of concern, and ensure DoD operations are consistent with the Migratory Bird Treaty Act. The MOU describes how USFWS and DoD will work together to achieve these ends.

On 28 February 2007, USFWS finalized a rule (*Migratory Bird Permits, Take of Migratory Birds by the Armed Forces*, 72 FR 8931) allowing the Armed Forces to "take" migratory birds in the course of military readiness activities, as directed by the 2003 National Defense Authorization Act (2 December 2002).

The February 2007 rule states that for ongoing or proposed military readiness activities, the Armed Forces may cause a significant adverse effect; however, the Armed Forces must cooperate with USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects.

On 28 July 2008, a second Interim Memorandum addressed *Unintentional Take of Migratory Birds for Actions Other than Military Readiness*. In this case, there is no authorization or permitting process currently in place for the unintentional take of a migratory bird during non-military readiness activities. These activities include routine installation operations, maintenance, and construction.

3.2.5 Memorandum of Understanding (Department of Defense, U.S. Fish and Wildlife Service, and International Association of Fish and Wildlife Agencies)

The DoD, USFWS, and the International Association of Fish and Wildlife Agencies (IAFWA) signed an MOU that helps manage natural resources on military installations under provisions of the Sikes Act. The MOU encourages the signatories to coordinate and discuss cooperative elements of the Sikes Act as well as to establish INRMP implementation teams (see Appendix 10, *Additional Information. INRMPs*).

3.2.6 Executive Order 13352, Facilitation of Cooperative Conservation

Executive Order 13352 (August 2004) ensures Department of Interior, Agriculture, Commerce, and Defense, and the Environmental Protection Agency (EPA) implement laws relating to the environment and natural resources in a manner that promotes cooperative conservation, with an emphasis on appropriate inclusion of local participation in federal decision-making, in accordance with their respective agency missions, policies, and regulations.

3.2.7 Current/Planned Consultations

USAG-HI is currently or planning consultations with USFW in regard to the following:

- Outstanding issues including new endangered plant species finds at SBMR.
- The potential change in status from candidate to federally listed for some species.

3.3 National Environmental Policy Act Compliance

USAG-HI completed an environmental assessment (EA) in the analysis of the potential consequences of implementing the 2002 – 2006 O‘ahu Training Areas INRMP. USAG-HI also completed an EA in the analysis of the potential consequences of implementing the *Final Implementation Plan Mākua Military Reservation Island of O‘ahu*, dated May 2003 (USAG-HI 2006c). USAG-HI considers this INRMP is a minor revision and, therefore, does not require additional National Environmental Policy Act (NEPA) documentation.

3.3.1 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) requires federal agencies to consider the environmental consequences of proposed major federal actions. The premise of NEPA is to provide environmental information to public officials and citizens before decisions are made and actions are taken. The process is intended to help public officials and citizens make decisions that are based on timely and scientifically accurate information. The analysis must fully disclose the environmental effects of the action and demonstrate that the project proponent and the decision-maker have taken an interdisciplinary look at the environmental consequences of implementing a major federal action.

Much of the information in this INRMP in regards to military impacts is not significantly different from those presented in the previous version. What has changed, and what has gone through the NEPA review, is the increased activities associated with federally listed and candidate species with the development and execution of the Mākua and O‘ahu Implementation Plans (USAG-HI 2003a, 2005a, and 2008b).

3.3.2 Army Regulations 200 Series

Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, dated 13 December 2007, implements federal, state, and local environmental laws and DoD policies for preserving, conserving, and restoring the quality of the environment. Section 4.3 d. (1) *Integrated natural resources management* updates requirements policies, responsibilities, and procedures relating to natural resources management that may be addressed in an installation’s INRMP.

Army Regulation 200-2, *Environmental Analysis of Army Actions*, dated March 29, 2002, (32 CFR Part 651) dictates policies, responsibilities, and procedures for integrating environmental considerations into Army planning and decision-making. It implements the Council of Environmental Quality's National Environmental Policy Act regulations and directs installations to integrate environmental analysis as much as practicable with other environmental reviews, laws, directives, and executive orders. This regulation requires that natural resources management plans be evaluated for environmental impacts (Section 651.10 (b) of Army Regulation 200-2).

3.4 Beneficial Partnerships and Collaborative Resource Planning

3.4.1 Beneficial Partnerships

Because many of the endangered plant and fauna taxa that may potentially be impacted by Army actions are located on lands not belonging to USAG-HI, it is critically important to partner with those land owners (both public and private). It is beneficial for all the land owners to work together to meet the requirements under the Endangered Species Act.

See Section 1.5.2.3, *Other Interested Parties* for additional discussion of other partnerships and collaborative natural resource planning. Various land owners are also discussed in detail in USAG-HI 2003a, USAG-HI 2005a, and USAG-HI 2008b.

3.4.2. Collaborative Resource Planning

Because endangered taxa stabilization had never been attempted on such a large scale in Hawaii, the *Final Implementation Plan, Mākua Military Reservation, Island of O'ahu*, (MIP) dated May 2003 (USAG-HI 2003a) and *Addendum to the Implementation Plan, Mākua Military Reservation, Island of O'ahu*, dated January 2005 (USAG-HI 2005a), were developed and completed by a team of biologists representing the Army, USFWS, State of Hawai'i Honolulu Board of Water Supply, the Nature Conservancy of Hawaii, Campbell Estate and endangered taxa or ecosystem experts from the U.S. Geological Survey, University of Hawai'i and The Berry Botanic Garden. The Mākua IP addresses USAG-HI's goals, objectives, and action plans for the stabilization efforts for 27 endangered plant taxa and one endangered snail species potentially affected by military training at Mākua Military Reservation Action Area are detailed.

The *Final Implementation Plan for O'ahu Training Areas: Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, and Kahuku Training Area* (OIP), dated June 2008 (USAG-HI 2008b), was also developed by a team of biologists representing the Army, and USFWS, with advisors from the University of Hawaii and the Nature Conservancy of Hawaii.

The O'ahu IP also addresses USAG-HI's goals, objectives and action plans for the stabilization efforts for 23 endangered plant taxa, several endangered snail species, and one endangered bird species potentially affected by military training at any of the Army's training installations on O'ahu (except Mākua Military Reservation) are detailed.

3.5 Public Access

"The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated."

Department of Defense Directive 4715.3
Environmental Conservation Program
3 May 1996

Public access varies by USAG-HI sub-installation. The USAG-HI relies on a responsible public to adhere to restrictions placed on training area access. Public access is limited and only by permission.

All liability and responsibility conditions are spelled out in the permit letter issued to the public for access. The permit letter states that the exercise of the privileges granted constitutes acceptance of these conditions. In addition, a waiver of liability must be signed for minor children participating in any activity.

The USAG-HI sub-installations may be opened to other outdoor recreation activities, provided such activities are consistent with use of lands and do not conflict with the military mission. Requests for a permit for hiking and most recreational activities go through the DPW Real Estate Office.

Contact information:

Headquarters, United States Army Garrison, Hawaii
Directorate of Public Works, Real Estate Office
947 Wright Avenue, Wheeler Army Airfield
Schofield Barracks, Hawaii 96857-5000
or Fax request to (808) 656-8200

Public access requests are made through the USAG-HI's Provost Marshal's Office, Animal Control, Schofield Barracks.

For special activities (Boy Scout events, archery, etc.) at Training Area X, requesters must coordinate with the Reserve Component Support Office, Schofield Barracks.

Contact information:

USAG-HI, DPTMS
Plans and Operations Division
Chief, Reserve Component Support Branch
Area X, Hut 26
(808) 655-0953, FAX: 655-0949

Appropriate access control procedures are established for each approved outdoor recreation activity. The hunting program and other public uses are presented in detail in Chapter 4.

3.5.1 Schofield Barracks Military Reservation

SBMR public access is limited to hiking on the Pu‘u Kalena Trail and the Pu‘u Hapapa (Kolekole) Trail for recreational purposes only (no camping). Both are owned and managed by the Army. Permits are required from the Directorate of Public Works' Real Property and coordinated through the Environmental Division, DPW. If accessing either trail through non-Army lands, hikers are required to obtain permission from the appropriate landowners. Hiking the Pu‘u Kalena Trail also requires permission from the landowners on the west side of SBMR along the trail. In addition Pu'u Hapapa Trail requires Nature Conservancy's approval with heavy restrictions.

3.5.2 Schofield Barracks East Range

SBER public access is limited to hiking on the Pupukea Summit and Schofield- Waikāne Trails. Pupukea Summit Trail is over 22 km long and passes along the border of Kahuku Training Area, Kawailoa Training Area, and Schofield Barracks East Range. Hiking the Pupukea Summit Trail and

the Schofield-Waikāne Trail requires a DPW permit and permission from the State of Hawai‘i. If accessing either trail through non-Army lands, hikers are required to obtain permission from the State of Hawai‘i and/or private landowners. Due in part to a complicated permit system that requires hikers to get permits from every landowner or manager on a hiking trail, hiking use has been limited.

3.5.3 Kawailoa Training Area

Kawailoa Training Area (KLOA) public access is limited to hiking the Pupukea Summit Trail and hunting on the Ewa Forest Reserve (Wahiawa) State Public Hunting Area (part of Unit C), which are located in and part of KLOA. To use the Pupukea Summit Trail, the public is required to obtain an access permit from DPW. If accessing the trail through non-Army lands, hikers are required to obtain permission from the appropriate landowners. Army policy prohibits overnight stays; thus camping is not promoted on KLOA. Due to the length of the Pupukea Summit Trail, hiking clubs, Boy Scout groups, and scientists have occasionally been granted permission to camp. Campfires are not allowed, and these groups must provide the Army with a map of their hiking route.

3.5.4 Kahuku Training Area

Kahuku Training Area (KTA) public access is opened to a number of recreational events. Hiking is allowed on the Kaunala-West and Pupukea Summit Trails. All trails that access KTA are limited to weekends and federal holidays. If the Army is conducting maneuvers in the area on weekends or federal holidays, it will provide notification that a trail will be closed. The trail is on land leased by the Army from the state; hikers must receive permits from the DOFAW to hike the trail. The trail is part of the Na Ala Hele Trail System. The Pupukea Summit Trail passes along the border of KTA, Kawailoa Training Area, and Schofield Barracks East Range. Hiking the Pupukea Summit Trail is allowed by DPW permit. If accessing the trail through non-Army lands, hikers are required to obtain permission from adjacent landowners (on both sides of the trail). Presently, no permission is required from the State of Hawai‘i to hike trails on state-owned land.

Bicycling (non-motorized) is allowed on maintained roadways in Training Area A-3 and the Kaunala-West Trail.

The Hawai‘i Motorsport Association (HMA) currently leases an area in KTA Training Area A-1, in which they constructed a motocross course. HMA has access to KTA Training Area A-1 on weekends and state and national holidays as long as the Army is not conducting maneuvers in the area. The public may use the course for a fee, and the association sponsors 12 motocross races per year (R.M. Towill Corp. 1997a).

Public hunting is permitted in the Pupukea State Public Hunting Area in KTA Training Area A-3 on Saturdays, Sundays, and federal holidays, unless military training activities have been announced prior to a weekend or holiday. Hunting is allowed from thirty minutes before sunrise to thirty minutes after sunset.

3.5.5 Dillingham Military Reservation

DMR public access is open to a variety of recreational activities. DMR is a joint use airfield for light aircraft and helicopters. Light military, private and commercial aircraft may use the State of Hawai‘i leased/operated airfield. Glider aircraft may also use the airfield. Other public use associated with the airfield includes parachute jumping and hang gliders. These activities are limited to designated areas.

DMR allows access to the Kealia Trail (5.63 km) for hiking by the public on weekends and state holidays. However, this access can be limited if military maneuvers are scheduled and notice is given in advance. Permission for the public to hike the Kealia Trail must be given by DPW and DOFAW.

Bicycling (non-motorized) is allowed only on the Kealia Trail and with the same restrictions that apply to hikers.

3.5.6 Mākua Military Reservation

MMR public access is limited to native Hawaiian access to religious sites and to public access to the beach front west of the Farrington Highway. No other recreational activities are allowed at MMR at this time due to the safety hazard of the impact area, unexploded ordnance, and risks to rare and endangered plant and animal species.

3.6 Army Compatible Use Buffers

3.6.1 Background and Policy

The U.S. Army Environmental Command (USAEC) provides program management and execution for the ACUB program. Through the ACUB program, the Army partners with public and private organizations to identify mutual objectives for land conservation. Under 10 USC 2864a, the Army may contribute funds to its partners to purchase easements or properties from willing landowners through a cooperative agreement. As USAG-HI's ACUB program matures, biennial reviews are necessary for the government to review original assumptions, refine the need for protection, re-prioritize across the program, as necessary (USAEC 2008).

ACUBs support the Army's mission to fight and win the nation's wars. Winning wars requires a trained and ready force. Trained and ready Soldiers require land for maneuvers, live fire, testing and other operations. ACUBs establish buffer areas around Army installations to limit effects of encroachment and maximize land inside the installation that can be used to support the installation's mission.

ACUBs support the Army's responsibility as a federal agency to comply with all environmental regulations, including endangered species habitat protection. By working in partnership with conservation organizations, ACUBs can coordinate habitat conservation planning at the ecosystem level to ensure that greater benefits are realized towards species and habitat recovery.

ACUBs also support local and regional planning and sustainability efforts by emphasizing partnerships with state and local governments and private conservation organizations to work towards common objectives and leveraging public and private funds towards those common goals.

3.6.2 Current Management

USAG-HI has partnered with the Trust for Public Lands (TPL), Office of Hawaiian Affairs (OHA), The Nature Conservancy (TNC), U.S. Fish and Wildlife Service, Windward Ahupua'a Alliance, City and County of Honolulu, U.S. Department of Agriculture Natural Resources Conservation Service, U.S. Navy, U.S. Marine Corps, The North Shore Community Land Trust, Hawaii's Thousand Friends, Hawai‘i Army National Guard, and the State of Hawai‘i Department of Land and Natural

Resources in conserving habitat for endangered species, in addition to important cultural areas to buffer important training areas. To date, 6,700 acres (2,711 ha) on O‘ahu, have been preserved by the Army and its partners by off-post conservation management, thereby avoiding of land development around (1, 875 ac, or 759 ha, located at Waimea Valley in 2006 [buffer for KTA and KLOA]; 3,700 ac, or 1,437 ha, at Moanaloa [buffer habitat for the endangered O‘ahu ‘elepaio for MMR, SBMR, SBER, and KLOA] in 2007; and 1,129 ac, or 457 ha, at Pukea-Paumalu [buffer for KTA] in 2007).

3.6.3 Partnership Status

The Trust for Public Lands (TPL) is the only organization in Hawai‘i with whom the Army has a cooperative agreement under the ACUB program. TPL is a national, nonprofit, land conservation organization with a mission to conserve land for people to enjoy as parks, community gardens, historic sites, rural lands, and other natural places, ensuring livable communities for generations to come. TPL has facilitated the purchase of all ACUB properties and then turned the land over to either the State of Hawai‘i or OHA. As an example, USAG-HI is working with TPL, the State Division of Forestry and Wildlife, and USFWS to raise funds for the acquisition and protection of the Honouliuli Preserve.

The State of Hawai‘i, the City and County of Honolulu, and Office of Hawaiian Affairs are the owners of the properties conserved through the ACUB program. In the future, the Army is looking into establishing additional ACUBs (USAEC 2008).

3.7 Hawaii’s Comprehensive Wildlife Conservation Strategy

Hawai‘i’s *Comprehensive Wildlife Conservation Strategy* (CWCS) outlines a statewide strategy for native wildlife conservation (Ogura et al. 2005). (See Appendix 10, *Additional Information.*) The strategy reviews that status of the state’s native terrestrial and aquatic species and presents methods for long-term conservation. Seven threats were identified and include:

- Loss and degradation of habitat resulting from human development, alteration of hydrology, wildfire, invasive species, recreational overuse, natural disaster, and climate change.
- Introduced invasive species (e.g., habitat-modifiers, including weeds, ungulates, algae and corals, predators, competitors, disease carriers, and disease).
- Limited information and insufficient information management.
- Uneven compliance with existing conservation laws, rules and regulations.
- Overharvest and excessive extractive use.
- Management constraints.
- Inadequate funding to implement needed conservation actions.

The intent of the CWCS is to address these threats by taking the following seven steps:

1. Maintain, protect, manage, and restore native species and habitats in sufficient quantity and quality to allow native species to thrive.
2. Combat invasive species through a three-tiered approach combining prevention and interdiction, early detection and rapid response, and ongoing control or eradication.

3. Develop and implement programs to obtain, manage, and disseminate information needed to guide conservation management and recovery programs.
4. Strengthen existing and create new partnerships and cooperative efforts.
5. Expand and strengthen outreach and education to improve understanding of our native wildlife resources among the people of Hawai‘i.
6. Support policy changes aimed at improving and protecting native species and habitats.
7. Enhance funding opportunities to implement needed conservation actions.

The O‘ahu (Training Areas) INRMP (2002-2006) is referenced (p. C-1) as an existing management plan and tool. The CWCS identifies the assessment of the impacts by the Stryker Brigade on current natural resources management activities as a future need. A second reference documents that U.S. Army is controlling ungulates and protecting rare and endangered species with fencing at Kawailoa Training Area (p. 6-24).

USAG-HI Environmental Division’s Conservation Branch (Natural Resources Office) includes many of the approaches and methods outlined in the CWCS in its operations as outlined in the INRMP, with the intent of engaging different audiences and groups, garnering information, and building support for its programs. USAG-HI has implemented this conservation strategy by (1) public participation and education; (2) participation by resource managers in collaborative efforts; (3) identifying species requiring the greatest conservation needs and their habitats; (4) identifying threats, conservation objectives, research needs, and establishing monitoring programs; (5) utilizing maps and geographic information systems collaborative; and (6) reviewing plans and encouraging public input.

CHAPTER 4

PROGRAM ELEMENTS

CHAPTER 4 PROGRAM ELEMENTS

4.1 Threatened and Endangered Species Management and Species Benefit, Critical Habitat, and Species of Concern Management

4.1.1 Policy and Background

Much of the O‘ahu Army installation’s threatened and endangered species management is guided by the 23 December 2003 *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Military Installations, Island of Hawai‘i* (1-2-2003-F-04) (USFWS 2003a) and the *Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation, Island of O‘ahu* (1-2-2005-F-356) dated 22 June 2007 (USFWS 2007a). As the titles suggest, these Biological Opinions address impacts associated with current and proposed military mission and training activities at all Island of O‘ahu Army installations.

Island of O‘ahu Army lands support 81 endangered (68 plants, 13 animals), 1 threatened (1 plant), 20 candidate (18 plants, 2 animals) species, and one designated critical habitat. Of those species, 51 federally listed threatened or endangered plant species require stabilization (23 plant species occur on Island of O‘ahu installation action area lands other than Mākua Military Reservation[1],18 plant species occur on Mākua Military Reservation action area lands, and 10 taxa occur in lands within both action areas), along with 1 endangered bird species and 11 endangered snails (eight of which are known to occur on one or more installation, three are not known from extant populations) as determined by the USFWS Biological Opinions (Table 4.1.a). The installations are also required to maintain habitat quality in the O‘ahu ‘Elepaio Critical Habitat. An additional six federally listed plant species (*Cyanea humboldtiana, Diellia falcata, Isodendrion longifolium, Lepidium arbuscula, Schiedea hookeri,* and *Tetraplasandra gymnocarpa*) are present in the O‘ahu and Mākua action areas. Although these six additional species do not require stabilization, USAG-HI is still responsible for managing them under Section 7(a)1 of the Endangered Species Act. The USAG-HI O‘ahu Natural Resources (ONR) staff monitors these six species. Required stabilization efforts applied to threatened and endangered species in the area of these other species benefits them as well. Species not requiring stabilization have limited numbers in the action areas relative to their overall number of individuals or populations outside of the action areas.

Based on the number of species and critical habitat requiring stabilization, the Army was tasked to develop and execute two implementation plans, one for species and critical habitat related to the O‘ahu Biological Opinion (USAG-HI 2008b) and one for the species related to the Mākua Biological Opinion (USAG-HI 2003a, 2005a). (See Appendix 4, *Implementation Plans* and Appendix 5, *Biological Opinions*.) The Army developed the plans in consultation with the Implementation Teams (O‘ahu and Mākua, respectively), which consists of Army, USFWS, and state biologists familiar with the species and the conservation areas. The O‘ahu Implementation Teams consists of biologists and field experts from 10 organizations/agencies, and the Mākua Implementation Team consists of members from nine organizations/agencies.

[1] For simplification, O‘ahu Army lands/installations refer to the major Army lands on O‘ahu with the exception of Mākua Military Reservation.

Table 4.1.a Species Identified for Stabilization in the USFWS Biological Opinions (2003, 2007). An "O" indicates O'ahu Army installations (USFWS 2003) and an "M" indicates Mākua Military Reservation (USFWS 2007).

Plants

Abutilon sandwicense (O)
Alectryon macrococcus var. *macrococcus* (O,M)
Cenchrus agrimonioides var. *agrimonioides* (M)
Chamaesyce celastroides var. *kaenana* (M)
Chamaesyce herbstii (M)
Chamaesyce rockii (O)
Cyanea acuminata (O)
Cyanea crispa (O)
Cyanea grimesiana ssp. *obatae* (O,M)
Cyanea koolauensis (O)
Cyanea longiflora (M)
Cyanea st.-johnii (O)
Cyanea superba ssp. *superba* (M)
Cyrtandra dentata (O,M)
Cyrtandra subumbellata (O)
Cyrtandra viridiflora (O)
Delissea waianaensis[2] (O,M)
Dubautia herbstobatae (M)
Eugenia koolauensis (O)
Flueggea neowawraea (O,M)
Gardenia mannii (O)
Gouania vitifolia (M)
Hesperomannia arborescens (O)
Hesperomannia arbuscula (O[1],M)
Hibiscus brackenridgei ssp. *mokuleianus* (M)
Huperzia nutans[2] (O)
Kadua degeneri var. *degeneri*[2] (M)
Kadua parvula[2] (M)
Labordia cyrtandrae (O)
Lipochaeta tenuifolia[2] (M)
Lobelia gaudichaudii ssp. *koolauensis* (O)
Melicope lydgatei (O)
Myrsine juddii (O)
Neraudia angulata (M)
Nototrichium humile (M)
Phyllostegia hirsuta (O)
Phyllostegia kaalaensis (O,M)
Phyllostegia mollis (O)
Plantago princeps var. *princeps* (O,M)
Pritchardia kaalae (M)
Pteris lydgatei (O)
Sanicula mariversa (M)
Sanicula purpurea (O)
Schiedea kaalae (O,M)
Schiedea nuttallii (M)
Schiedea obovata[2] (M)
Schiedea trinervis[2] (O)
Stenogyne kanehoana (O)
Tetramolopium filiforme (M)
Viola chamissoniana ssp. *chamissoniana* (O,M)
Viola oahuensis (O)

Snails

Achatinella apexfulva (O)
Achatinella bulimoides (O)
Achatinella byronii (O)
Achatinella curta[3] (O)
Achatinella decipiens[3] (O)
Achatinella leucorraphe[3] (O)
Achatinella lila (O)
Achatinella livida (O)
Achatinella mustelina (O,M)
Achatinella pulcherrima[3] (O)
Achatinella sowerbyana[3] (O)

Birds

Chasiempis sandwichensis ibidis (O)

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[1]*Hesperomannia arbuscula* is a recent addition to Schofield Barracks Military Reservation's federally listed species and was not noted in the O'ahu Biological Opinion or in the O'ahu Implementation Plan.

[2]Synonomy—*Lipochaeta tenuifolia* (Syn. *Melanthera tenuifolia*); *Schiedea obovata* (Syn. *Alsinidendron obovatum*); *Schiedea trinervis* (Syn. *Schiedea trinerve, Alsinidendron trinerve*); *Kadua degeneri* var. *degeneri* (Syn. *Hedyotis degeneri* var. *degeneri*); *Kadua parvula* (Syn. *Hedyotis parvula*); *Delissea waianaensis* (Syn. *Delissea subcordata*); *Huperzia nutans* (Syn. *Phlegmariurus nutans*).

[3]Species cited in the O'ahu Biological Opinion (USFWS 2003) but not included in the O'ahu Implementation Plan (USAG-HI 2008) for stabilization for various reasons (see Table 4.1.d *Summary of Plant Species Stabilization Requirements*).

The Implementation Plans are designed to meet individual species' stabilization requirements identified during the Section 7 consultations between USFWS and the Army. The species are federally listed taxa with 50 percent or more known individuals occurring in the action area of an installation. An action area is defined as all areas directly and indirectly affected by a federal action. An action area can be greater than the boundaries of an installation, as is the case with the Mākua Military Reservation (Figure 4.1.a), and can include areas of plant critical habitat not present on installations as well as off-site management units established to meet stabilization requirements for species in action areas (see Figures 2.3.i *Management Units, Schofield Barracks Military Reservation* and 2.8.i *Off-site Management Units South and East of Mākua Military Reservation*). O'ahu Natural Resource (ONR) staff activities are considered beneficial to listed species and critical habitat. The ONR staff activities in off-site management units not directly or indirectly affected by military training, are considered beneficial to federally listed species, and, as such, were determined not likely to adversely affect listed species (USFWS 2007a).

Successful execution of the Implementation Plans assures USFWS that the Army will be able to accomplish its training mission in full compliance with the ESA. The requirements of the plans are to:

- Identify areas within the O'ahu and Mākua action areas or off-site areas for priority taxa stabilization.
- Determine an estimate of the minimum viable population for each taxon considered likely to be jeopardized by Army activities.
- Determine intermediate and final definitions of success for the stabilization for each taxon.
- Develop and implement reintroduction and augmentation protocols that include the determination of the number of individuals necessary for successful reintroduction or augmentation, including information on (1) size and life stage distribution of the population, (2) achieving the greatest number of individuals within a population, (3) contamination issues, (4) timing of reintroduction and augmentation, and (5) site selection.
- Determine the greatest possible genetic representation for each target taxon.
- Determine habitat management requirements (quality and quantity) for each taxon.
- Identify priority incipient weeds and areas to be surveyed within the action area and at off-site stabilization areas.
- Develop and implement methods to monitor, integrate and evaluate data, and report results.
- Develop and implement a schedule for completion of implementation actions and cost estimates.
- Develop and implement scopes of work for each of implementation actions.

The Mākua Implementation Plan further identifies the requirement to determine the greatest possible genetic representation for each target taxon (USAG-HI 2005).

Action Area & Critical Habitat on Makua Military Reservation

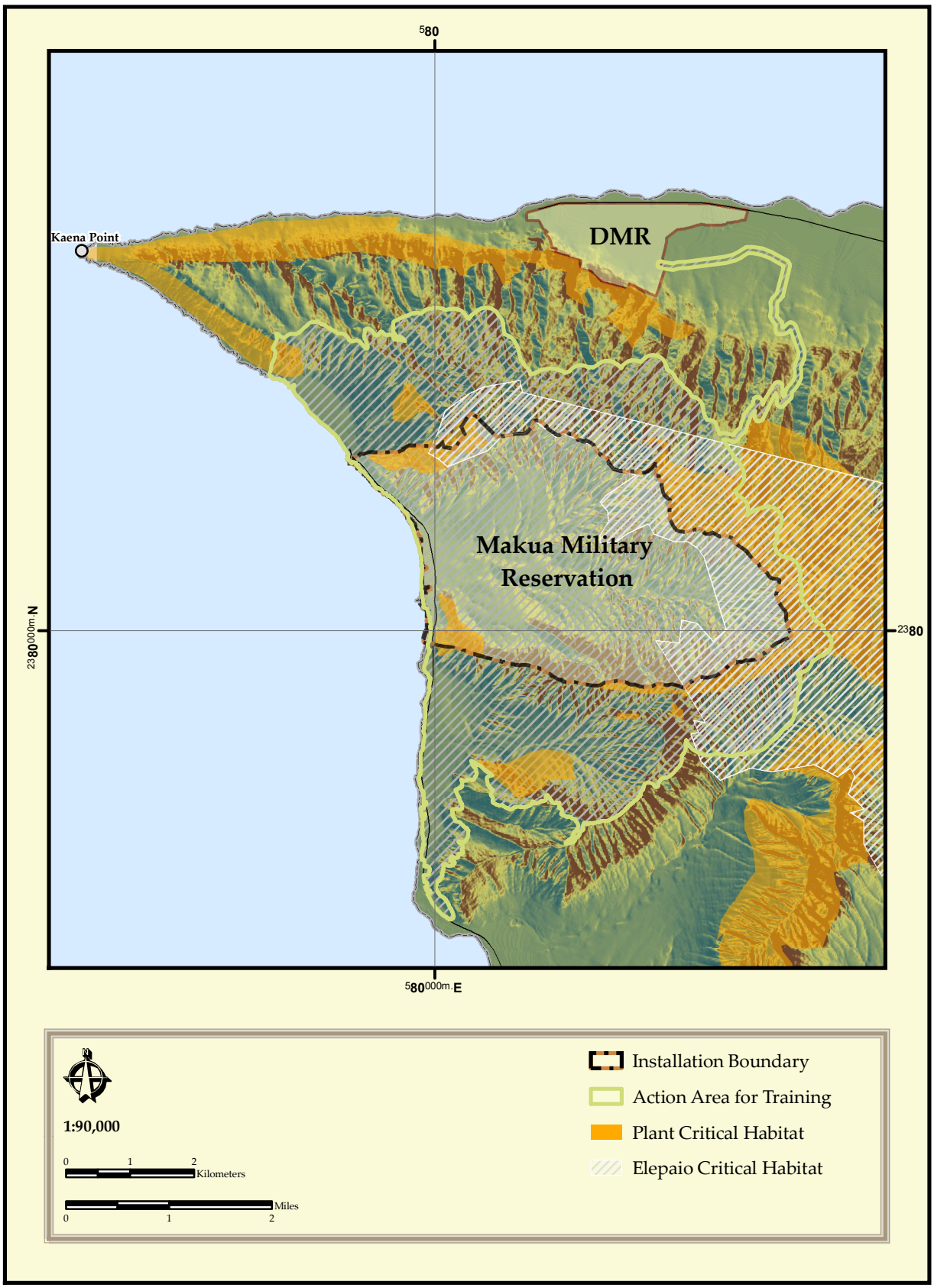


Figure 4.1.a

In 2005, an *Addendum to the Implementation Plan, Mākua Military Reservation, Island of O'ahu* was prepared (USAG-HI 2005a). This document presents a revised approach to the methods used for achieving target species stability, addresses logistical difficulties of off-site management, and identifies a reduction in cost compared to the 2003 Implementation Plan. The Mākua Implementation Plan Addendum identified the following end goals:

- Stabilization of three naturally reproducing population units per taxa instead of an average of six population units. This was a reduction from 188 plant and 10 snail populations to 81 plant and 8 snail populations.
- Management unit prioritization based on selected population units or the identification of 2,307 acres (934 ha) of priority habitat. This is a 64 percent reduction in acreage from the 31 management units originally designated in the Mākua Implementation Plan. The Addendum management units are located in the Wai'anae Mountains and Ko'olau Mountains of O'ahu, locations with the most important wild populations of the target taxa.
- Greater emphasis is placed on genetic material collections from those species most threatened by fire or with very low numbers.
- Reduction in the timeline from 33 years to 20 years. A twenty-year timeline is consistent with the O'ahu Implementation Plan.

The Army uses the Mākua Implementation Plan Addendum (USAG-HI 2005a) and the O'ahu IP (2008b) prepared by and thereby authorized by the Implementation Team to direct stabilization efforts.

Goal 1: Execute O'ahu and Mākua Military Reservation USFWS Biological Opinions (2003a, 2007a, 2008) stabilization requirements.

Goal 2: Execute O'ahu and Mākua Implementation Teams' decisions to meet the stabilization requirements.

Objective 1: Provide the staffing and equipment necessary to meet the stabilization requirements.

Objective 2: Provide data to the O'ahu and Mākua Implementation Teams annually to determine if current plans and protocols for projects related to federally listed species are meeting requirements.

Objective 3: Incorporate changes made by the Implementation Teams into project plans and protocols related to federally listed species.

4.1.2 Current Management

4.1.2.1 Management Approach

A taxon's biological needs determine the specific management actions and locations for these actions. At the same time, negative effects must be minimized (e.g., inadvertent introduction of non-native species, trampling of vegetation, increasing fire risk, etc.). These measures protect target taxa and enhance their habitat while improving the habitat for other sensitive species in management areas.

The Implementation Plans emphasize habitat restoration and ecosystem processes by focusing on:

- Intrinsic value of *in situ* biological systems in designated sensitive/special areas,
- Building on habitat restoration and threat removal/control,

- Stabilizing habitat and allowing for natural recovery, and
- Utilizing augmentation and reintroduction of a taxon as needed.

Species management activities include population augmentation and outplanting, rodent and non-native snail control, and the building of emergency fences. Ecosystem management activities consist of constructing large fences, removing feral animals, and minimizing fire threats. The ONR staff for Oʻahu and Mākua Army installations work from both ends of the spectrum (species management, ecosystems management), in the hope that systems attain greater self-sufficiency and sustainability.

Seedling recruitment, survival, reproduction, increases in abundance, and the expansion of populations are all signs of success. Success is more likely when limiting factors to a species' existence and life history characteristics (e.g., pollination mechanisms, germination requirements, susceptibility to outside threats, etc.) are known. The ONR staff uses the following mechanisms to ensure success:

- Priority ranking of all listed plant species based on their location to current and potential military training.
- Establishment of emergency fences.
- Management Unit (MU) Program, which are areas with a significant number of federally listed plants or intact native habitat.
- Collection of data to quantify and predict population trends (both plants and animals). All data are stored in databases, geo-referenced, analyzed, and reported.
- Habitat enhancement (i.e., invasive species control, feral animal control).
- Propagation and outplanting of plants.
- Building large fence units and partitioning large fence units when necessary for more effective management.
- Research on individual species for effective methods of animal control.
- Implementing individual species management requirements.
- Managing threats.

Wildland fire management is outside the direct preview of the ONR staff; however, their efforts in controlling non-native plant species biomass reduce the fire threat in the immediate area of listed species.

The Army's environmental program is engaged in a variety of active management programs. The Army has developed partnerships with Plant Extinction Prevention Program, Koʻolau Mountain Watershed Partnership, the State of Hawaiʻi, USFWS, the Hawaiian Conservation Alliance, the Oʻahu Invasive Species Committee, the Coordinating Group for Alien Pest Species, Toxicant Working Group, and The Nature Conservancy, along with other organizations.

4.1.2.2 Management Unit Program

There are 57 designated Management Units (MUs) (23 priority management units associated with the Mākua IP Addendum plus the Puulu to Alaiheihe for *Hibiscus brackenridgei* and 33 associated with the Oʻahu Implementation Plan) based on the location of on-site (*in situ*) population units (PUs) of the target taxa on Oʻahu and Mākua Army Installations (Figure 4.1.b,c). The Six Mākua IP management units have Oʻahu IP target species (ʻĒkahanui, Lower ʻŌpaeʻula/Peahinaīʻa, East

Oahu Implementation Plan Management Units

Figure 4.1.b

Makua Implementation Plan Management Units

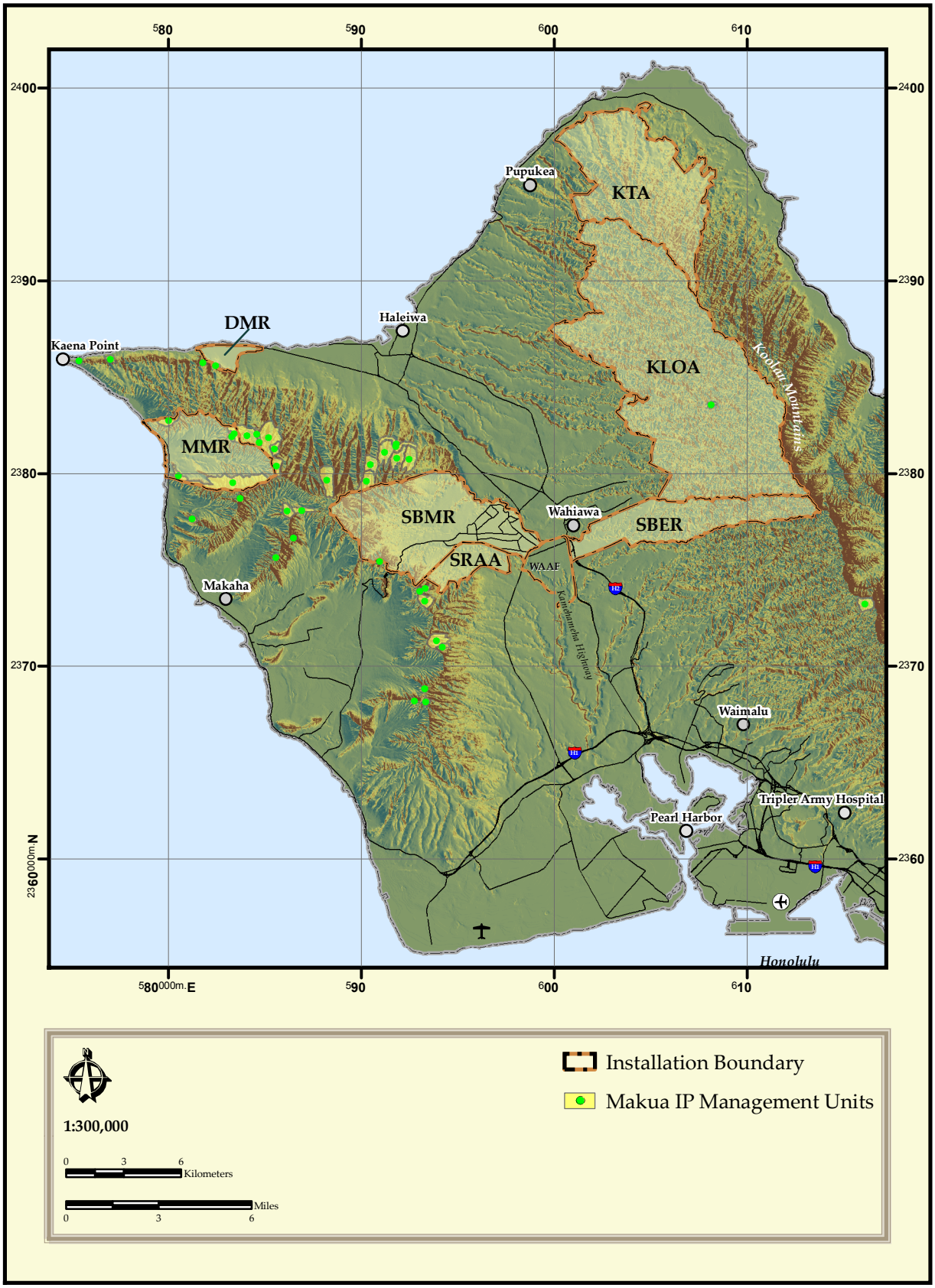


Figure 4.1.c

Makaleha, Manuwai, Kaluaʻā & Waiʻeli, and Waiawa MUs). Management units are a collection of Army, other federal agencies, State of Hawaiʻi, City and County of Honolulu, and privately owned properties. A management unit is an area designated for active protective management with expressed stabilization goals for the population units of target species (USAG-HI 2008b). A management unit is native habitat and is typically a fenced area to actively control or remove ungulates and other threats. Management units are intensively managed areas.

A management unit is designed to provide sufficient area for the stabilization for all *in situ* and reintroduced population units. Large management units tend to contain more than one target species, while smaller units may contain only one or two targeted taxa. Management units may be contiguous with each other, but are managed as unique areas. Larger management units may be divided into subunits, and management is executed at the subunit level. Although each taxon has specific threats, many of the threats apply to all or many of the targeted species in a management unit. There are two major management activities that occur in all management units at some level: (1) ungulate control via fencing and removal and (2) weed control over a portion of the unit or subunit (USAG-HI 2008b).

Threat management and stabilization efforts for federally listed species are already in place at some locations (USAG-HI 2008b). Examples include the State's Natural Area Reserves System (NARS). Areas in Pahole, Mt. Kaʻala, and Kaʻena Point NARS have active ungulate and weed management programs, are active in native vegetation restoration and reintroduction, and partake in other protective management actions (USAG-HI 2008b). State Forest Reserves in the Waiʻanae Mountains provide conservation zoning. The Board of Water Supply lands in the upper Mākaha Valley lie within a protected watershed with limited public access. The Koʻolau Mountains Watershed Partnership facilitates conservation projects. The Oʻahu Plant Extinction Prevention Program works with the Army and other organizations for the conservation of endangered species. Additionally, the Oʻahu Invasive Species Committee actively manages many of Oʻahu's invasive species.

The Army has developed Memoranda of Understanding (MOU) with the Board of Water Supply and the Nature Conservancy of Hawaiʻi (TNCH) for work in the Mākaha and the Honouliuli Preserve, respectively. Other active or in-progress agreements include (1) a long-term license agreement with Kamehameha Schools for natural resource management in Kawailoa, Punaluʻu, Waiʻawa, Waimano, and Waiʻau Valleys; (2) Waikāne Investment Corporation; (3) State Division of Forestry and Wildlife for conducting Implementation Plan actions on state lands; (4) State Department of Land and Natural Resources for the construction and use of a plant holding facility at the State's Nike site; and (5) development of Right of Entries/License Agreements with various landowners (USAG-HI 200a3, 2005a). The Army works with these and other organizations in ungulate control, weed control, snail predator control, rat control, rare plant reintroduction, and limited vegetation restoration. These efforts contribute to the protection of both Mākua and Oʻahu installation target taxa as well as other native taxa.

There are three levels of threat management outlined in the Implementation Plans: (1) immediate vicinity of individual plants of target taxa, (2) entire area for a population unit, and (3) entire management unit or subunits (Table 4.1.b). Management goals may take years to realize and will occur at different scales.

Table 4.1.b Levels of Management at Mākua Implementation Plan Management Units (USAG-HI 2008a).

Threats	Proximity of Individuals (2 m radius)	Proximity of Population Units (50 m buffers)	Management Units (MU) and MU Subunits
Fire	zero incidence	zero incidence	zero incidence
Ungulates	total removal	total removal	total removal
Incipient invasive weeds	total removal	total removal	total removal
Percent cover of other weeds	0%	25%	50%
Small mammals*	total removal	total removal	NA
*Euglandina rosea**	total removal	total removal	NA
Other invertebrates*	total removal	NA	NA
Pathogens	as feasible	as feasible	as feasible
Human impacts (other than management)	no impact	no impact	no impact

*Control only if threatening target taxon.

1. Fencing for Ungulate Control

Fences are a proven effective method of ungulate control. Fences are designed to prevent the movement of feral pigs, goats, and deer into areas with target taxa. The goal is to eradicate ungulates within all management units. Most management units are fenced or are planned for fencing; however, in some cases, areas are self-protected (e.g., by topography) and only strategic fences are needed. Some of the management units will have more than one fenced unit, thereby creating subunits to facilitate management goals. Management units range from 1 ac (0.4 ha) up to 250 ac (101 ha) (see Figure 4.1.b,c) (USAG-HI 2005a, 2008b). Currently, there are more than 30 existing fenced areas in the Waiʻanae Mountains and about 7 in the Koʻolau Mountains. All priority management units cited in the Mākua Implementation Plan Addendum will be fenced. Some fence units will not be built until 2015.

Installation of fences requires on-the-ground evaluation for unexploded ordnance issues, clearing a corridor that avoids listed species, helicopter support, labor, and materials (Figure 4.1.d). Fences have to be monitored and maintained. Small repairs are ongoing; however, fences are estimated to last from 12 to 15 years and will need to be replaced (USAG-HI 2005a).

A combination of galvanized hog wire fencing and panels are used when constructing exclosures. Hog wire fencing is economical, practical, and easy to erect over a broad range of terrain types. Hog panels are more expensive, and are heavy duty and durable and are especially good on steep and uneven terrain. Small fences consist of hog wire, T-posts, barbed wire, and skirts. These fences are for small-sized, *in situ* populations. Small fence units also are used for urgent actions.

2. Weed Management

An important step to weed management is to curtail the spread of species. This includes limiting ungulate and rodent access to sensitive sites. Troop, road crew, and field worker education is as important as the actual work efforts used to control the introduction of weeds. Fences, hunting and trapping, and rodenticides can effectively restrict animal access and the movement of weeds into native areas, while education and adherence to procedures can prevent the long distance transfer of weed species. Gear and vehicle cleaning is emphasized in Section 7 documents. Wash racks have been staged at locations to minimize the transfer of weed and nuisance animal movement between islands. Equipment and persons coming from foreign countries go through U.S. Department of Agriculture and U.S. Customs inspections before coming into the United States. Integrated Training Area Management (ITAM) and the ONR staff produce brochures and posters as reminders to keep gear and vehicles clean.

Implementation Plan Fence Units
U.S. Army Garrison, Hawaii

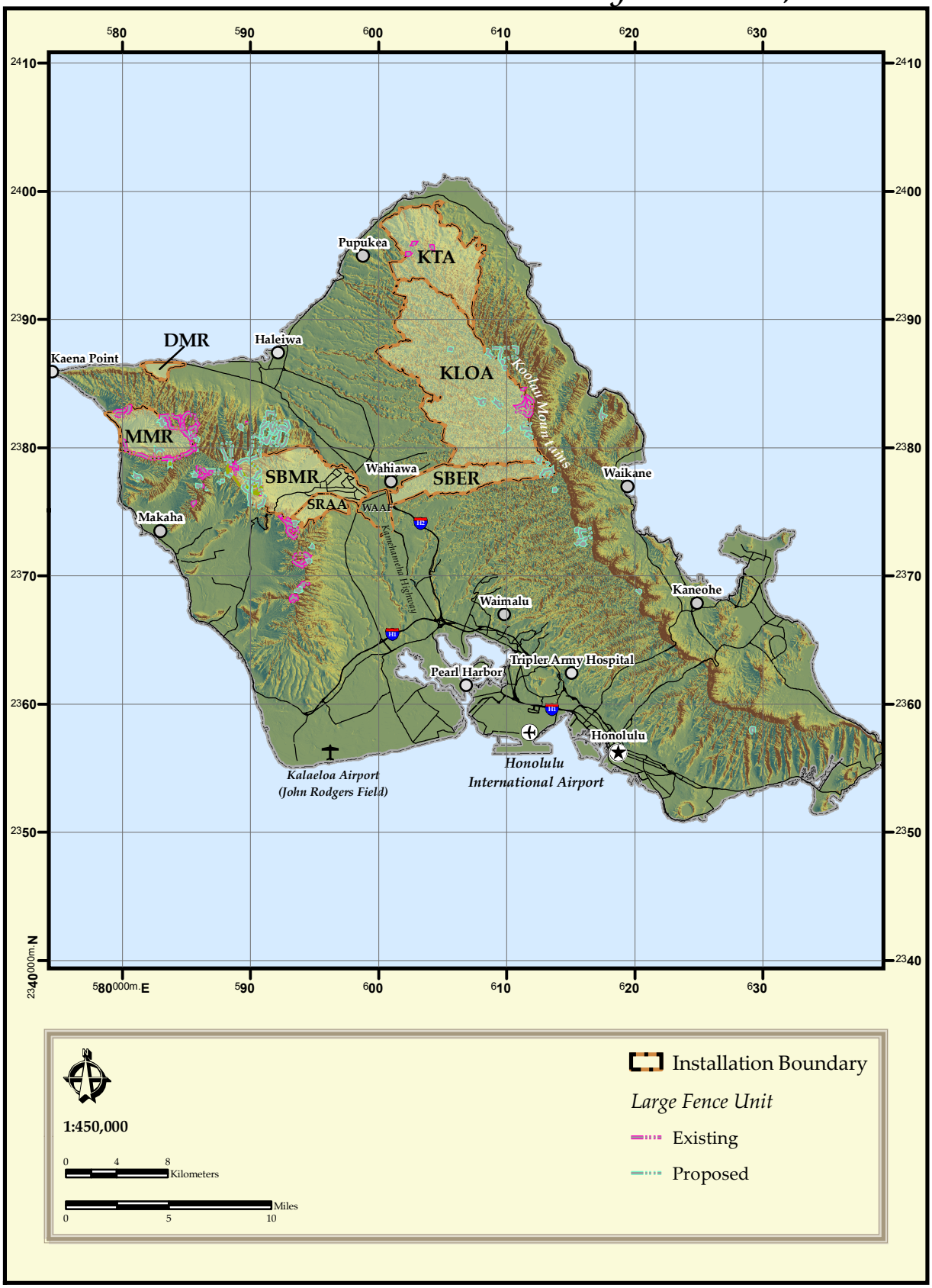


Figure 4.1.d

The ONR staff is aware of the need to reduce weed spread and has instituted a number of policies to limit weed introduction or transfer during growing and planting operations, either by vehicles, footwear or clothes; during storage and movement of materials; during helicopter operations; and even when deciding to use a seed-free rat bait.

Road surveys are conducted regularly for weeds. Training ranges are checked. New weeds are eradicated. Landing zones are also checked because helicopters can be the vector of dispersal. Weed surveys are conducted along ungulate transects.

Two levels of weed management are in place: (1) complete removal of incipient species; that is, the complete removal of those species that significantly modify native habitat in proximity to population units, and (2) monitoring and periodic assessment of non-native species that have little visible affect on the local habitat. If a need becomes apparent, weed control plans will be developed for each management unit.

Weed control includes complete removal within and around a population unit with a lower level of control throughout the management unit. A goal of weed control and management is for the restoration or maintenance of native habitats. Around target taxon plants, understory weeds are removed within a 6.6-ft (2-m) radius and incipient weeds within 164-ft (50-m) radius of target plants (USFWS 2007a). Within management units, long-term weed management calls for the eradication of up to 25 percent of existing weeds in the proximity of population units. Weed control will be incremental as to not cause a rapid change in the microhabitat of sites.

The Mākua Implementation Plan lists priority weeds present in selected Mākua Military Reservation Management Units and the management action (e.g., incipient, eradicate or control locally) is provided by species and location. Some 80 taxa have been identified. The Mākua and the O‘ahu Implementation Plans include a summary of success levels for various methods and herbicides used in weed control (see Appendix 4, *Implementation Plans. Implementation Plans. Mākua Implementation Plan 2003.* Section 3. Appendix 3.1).

3. ‘Ōhi‘a Rust Control

‘Ōhi‘a rust (*Puccinia psidii*) is a recent introduction. The first signs were reported in 2006 on *Eugenia koolauensis* (USAG-HI 2008b). The rust has affected significant stands of *Syzygium jambos* (a closely related genus) as well as *Metrosideros polymorpha, Eucalyptus robusta,* and *Melaleuca quinquenervia*, all species in the Myrtaceae family. The rust typically affects new growth. All size classes of plants are affected. New growth is particularly susceptible. All plants of *Eugenia koolauensis* have been affected and impacted. Eradication is the preferred method for dealing with this rust, but research is under way to find a control when eradication is not effective or feasible.

4. Mammal Control

Hunting, trapping, and toxicants are used to control mammals. Control is focused in the vicinity of population units and areas proposed for reintroductions or augmentation. All mammals will be removed from fenced units. Assessments are conducted regularly within each management unit to determine if mammals are affecting target species and habitat. Control techniques come from ONR staff experiences as well as experiences from other agencies, such as the National Park Service, USFWS Wildlife Refuges, State Natural Area Reserves, and the Nature Conservancy Hawai‘i (USAG-HI 2008). Control methods include public and staff hunting, trapping, snaring, and aerial broadcasting of rodenticide (Cory 2000, USAG-HI 2008).

5. Invertebrate Control

***Euglandina rosea* (rosey wolfsnail) and other snail predator control**

Euglandina rosea is a predatory, non-native snail and is a principal threat to *Achatinella mustelina*. Where populations of *A. mustelina* are present, control techniques are used. Research is being conducted by a University of Hawai‘i graduate student on the ecology of *Euglandina rosea*. Feeding trials indicate that *E. rosea* prefers snails over slugs and small snails to larger snails (USAG-HI 2006d). Recent results show that *E. rosea* prefers leaf litter habitat and can move about seven meters from a starting point.

The ONR staff has used beer traps, copper barriers, electric fences, and salt troughs to protect rare plants and tree snails with mixed success (USAG-HI 2008b). Chemical control is prohibited, as none are registered for forest or conservation use. There is also the concern of affecting native snails. The ONR staff is conducting a field study under an Experimental Use Permit using an organic molluscicide, which appears to reduce slug numbers in treatment plots. *Achatinella* spp. is a tree species, and there are no native terrestrial slugs; however, terrestrial native snails could be affected. The molluscicide under study is safe for birds, mammals, fish, and most other invertebrates. Future work will focus on the use of the molluscicide in seeded areas.

***Platydemus manokwari* (flatworm)**

Platydemus manokwari is a predator of terrestrial and arboreal snails. Electric fences on predator exclosures may deter the flatworm (USAG-HI 2008b). Predator exclosures are used at Mākua Military Reservation. They consist of a rigid wall of corrugated metal roofing laid horizontally with the lower 6 in (15cm) or more buried in the earth. A 10in (25cm) shed-like roof extends outward from the top of the fence to cover the two barriers, a trough of coarse sand and a two-wire electric barrier. A solar panel charges the battery that provides a 12V shock.

***Xylosandrus compactus* (black twig borer)**

Xylosandrus compactus attacks healthy plants, unlike native and naturalized ambrosia beetles in Hawai‘i that nest and rear young in dead wood (USAG-HI 2006d). The species has been found on 108 host plant genera. Removing infected vegetation is an impossible form of control. Not only does the species damage its host plant, but also can inoculate the host plant with the fungus *Fusarium*. The species is a major threat to *Alectryon macrococcus* and *Flueggea neowawraea*.

Trials are ongoing to determine the effectiveness of traps and damage assessment to provide insights on *X. compactus* behavior and potential seasonal triggers (USAG-HI 2007a). Borers are lured to Japanese beetle traps using ethanol. An insecticidal strip is used to kill any insect entering the trap. Monitoring for new damage to study trees is continuing.

Other invertebrates

Other threats include *Adoretus sinicus* (Chinese rose beetle) and *Vespula pensylvanica* (Western yellow-jacket).

6. Human Impacts

Human impacts come from land managers, volunteers, hikers, hunters, and the military (personnel, equipment, and fire). Impacts include crushing vegetation and the introduction of non-native species into native habitat. Signage and restrictions are used to limit human presence. Field surveys, especially along roads, are made to look for species introductions, troops are required to clean vehicles moving between specific sites, and educational material are provided to limit human impacts. To reduce impacts from Army operations, the ONR staff is in the process of developing a USAG-HI regulation that will require training restrictions in sensitive areas due to the presence of threatened or

endangered species. This regulation will require USAG-HI approval/acceptance before it can be implemented.

7. Fire Control & Management

Fires occur related to training, accidents, or arson. Regardless of the ignition source, native habitat is destroyed and listed species may be lost. The Integrated Wildland Fire Management Plan outlines procedures to minimize training fires and to control fires that might start. However, the control and measures to reduce non-native plant species can help reduce the fire threat and minimize threats to target taxa and their habitat. Fire management takes into consideration the fuel types, fire history, access routes (e.g., roads and trails), and topography. Implementation of a fire management plan requires pre-suppression actions, equipment, construction of fuel breaks, maintenance of existing roads, roadside weed clearing, personnel, and crew training. (See Section 4.15, *Wildland Fire Management.*)

8. Erosion Control

At some locations, soil erosion is a threat to *in situ* target taxa (USAG-HI 2003a). Soil and slope stabilization helps minimize the risk of harm. The control of feral ungulates should help reduce erosion. Reducing the number of fires and limiting their extent maintains vegetation and reduces erosion potential.

4.1.2.3 Stabilization Requirements, Plants

The Army's goal is to stabilize federally listed plant taxa that might be jeopardized by direct or indirect effects of military activities on O'ahu and Mākua installations. Stabilization criteria were recommended by the Hawai'i and Pacific Plants Recovery Coordinating Committee (U.S. Army 1999), a group of botanical experts brought together by the USFWS. This group provides guidance on the recovery of listed plant species in the Pacific. The committee considers a taxon to be stable when there are:

- Sufficient numbers of regenerating individuals in a minimum number of populations.
- Threats are controlled within populations.
- Populations are fully represented in *ex situ* collections.

The minimum number of plant populations is three and the number of individuals is:

- 25 mature and reproducing individuals of long-lived perennials (life span greater than 10 years).
- 50 mature and reproducing individuals of short-lived perennials (life span less than 10 years).
- 100 mature and reproducing individuals of annuals per season (life span of 1 year or less).

More plants may be considered necessary for a species' stabilization when physiological or environmental factors affect population size, recruitment, or stability. Issues considered for plants when determining if more individuals than the minimum are necessary includes reproductive problems, history of precipitous decline, low genetic variability, dioecious reproduction, major pest problems, limited seed set, and so on.

By basing the minimum number on mature, reproducing individuals, an adequate number and reservoir of smaller or younger individuals is ensured. These values are considered base population-target goals. Genetic storage must be in effect for the taxon and all threats controlled for a species to be fully stabilized.

The USFWS Biological Opinion (2007a) for Mākua Military Reservation determined the Army must ensure that each endangered plant species within the action area remain at or above three populations to avoid jeopardy and to be considered stable. Eight federally listed plants in the Mākua and O‘ahu action areas exceed the numerical criteria for stability or have less than 50 percent of their individuals in the action area and, therefore, do not require management actions. The taxa that have more than 50 percent of their individuals in the action area or do not meet or exceed the numerical criteria for stability are referred to as target taxa or species, and require additional management by the Army.

4.1.2.4 Priority Ranking of Listed Plant Species

The Army’s stabilization approach for O‘ahu installations, with the exception of Mākua Military Reservation, is based on (1) current training levels, (2) execution of foot maneuvers on trails, and (3) the expansion of foot maneuvers away from trails. Full taxon stabilization is the goal (e.g., ungulate, weed, rodent, etc.). A three tier system has been developed for O‘ahu Army installations for stabilization (USAG-HI 2008b). Tier 1 stabilization efforts began with the funding of the plan; however, Tier 2 and 3 stabilization efforts funding are not scheduled, and will occur if and when military training begins using areas where species occur. Tier 2 and 3 stabilization can and will start in some areas prior to the initiation of military exercises.

- **Tier 1**—Species threatened by the current level of training and fire threat. Eleven species fall within this category on Schofield Barracks Military Reservation (live fire) and Kahuku Training Area (off-road tactical maneuver and possible future live fire) (see Table 4.1.d). There are 15 plant species to be stabilized in 26 MUs. O‘ahu ‘elepaio is included as a Tier 1 species. Fences are planned, partially built, or finished in six of the management units.

  Tier 1 stabilization efforts include monitoring for invasive species along roads, hiking trails, and landing zones utilized during military training.

- **Tier 2**—Species in areas of military training occur along trails, but also where training will be initiated (e.g., upper boundaries of Kawailoa Training Area and Schofield Barracks East Range). Fourteen additional species will be affected by training exercises in seven management units or subunits. Eight snail species are included as Tier 2 species. Fence units are often small and crews may be able to build fences prior to training, thereby activating management.

  Tier 2 efforts will include Soldier education about the spread of invasive species and impacts to federally listed species, pre- and post-monitoring of listed species along and near trails. Landing zones (LZs) are currently monitored to prevent the spread of incipient weeds. Tier 2 stabilization includes hiking trails used for training that are not adjacent to used LZs.

- **Tier 3**—Lowest stabilization priority, which will receive full stabilization when military training occurs. Areas where off-trail training maneuvers may occur are possible in Kawailoa Training Area and Schofield Barracks East Range. Two additional species and two management units will be affected. No additional management units will be necessary.

The Mākua Implementation Plan does not recognize a priority system for species stabilization, but does identify areas as having high priority for weed control and individual priority needs for species. The Addendum to the Mākua Implementation Plan recognizes:

- **Target (at-risk) taxa.** Twelve at-risk species are extirpated and associated with increases in training activities. It will be necessary for the Army to stabilize these taxa prior to the use of certain weapon systems.

- **Stabilization species.** Twenty-eight target endangered plant taxa and the O‘ahu tree snail, *Achatinella mustelina*, are included for stabilization, but are not “at-risk” taxa. These taxa do not require stabilization before certain types of military training can occur.
- **Non-stabilization taxa.** Eleven non-target taxa not directly targeted for Army stabilization. These species will indirectly benefit from stabilization management measures for targeted species. These taxa occur in the management units.
- **Critical habitat** for 36 plant taxa and for the O‘ahu ‘elepaio (see Section 4.1.2.8, *Plant Critical Habitat*).

4.1.2.5 Plant Data Collection and Monitoring

Successful execution of the Implementation Plan requires the development of methods for species monitoring, integration, and data evaluation, and for results to be reported. Data are reviewed annually to assess the results of management actions to determine if the Army is meeting its objectives to achieve stabilization of target taxa. The Implementation Teams can then proceed or adjust their management approach (i.e., adaptive management).

The Army has an ONR staff of over 80 personnel on O‘ahu that includes various biologists, technicians, and field crews addressing monitoring, restoration, rehabilitation, and research needs (see Section 5.7.2, *Staffing*). Staffing changes are ongoing to address changing needs (e.g., 2007–hired two environmental outreach/volunteer coordinators, office associate, horticulturalist and horticultural assistant, and several field crew technicians). The Army contracts additional support and has a number of on-call field experts.

Pono Pacific monitors and conducts predator control for the O‘ahu ‘elepaio in Moanalua, Mākaha, and ‘Ēkahanui. Dr. Eric VanderWerf provides assistance in the monitoring of the O‘ahu ‘elepaio; Dr. Steven Montgomery conducts surveys for potentially listed *Drosophila*, and monitoring and data analysis protocols are being developed for plants under the direction of Dr. James Jacobi, U.S. Geological Survey. The Army also supports research by University of Hawai‘i graduate students on the non-native slug, *Euglandina rosea*, and rat densities on O‘ahu, and genetic variation in O‘ahu tree snail, *Achatinella*.

Types of Data Collection and Monitoring

1. **Target Species—**Demographic information is collected on a number of species to help develop Population Viability Analysis (PVA) models. Data are collected on the number of mature, immature, and seedling (wild) individuals; number of augmented individuals (mature, immature, and seedling); and total number of individuals within each age class annually. The number of dead individuals and their category are also noted. Trend notes are made and include notations on impacts that were observed or reasons for changes in population numbers from a previous survey (e.g., new plants discovered at the same site, a new site found, reintroductions or augmentations that increased numbers, or fluctuations in the number of wild plants). These data are collected by population unit and management designation (as determined for each population unit and are “manage for stability,” “genetic storage,” or “reintroduction for stability.”

2. **Ungulate Surveys—**The success of fencing efforts are typically monitored quarterly for ungulate signs along established transects, through incidental observation, and scouting expeditions. Monitoring does not provide density information about the ungulates, but rather helps detect ungulate activity, which determines if additional efforts are necessary. This information also evaluates hunting and other animal removal measures. Management

techniques, removal methods, and numbers of animals harvested are documented in a database.

3. **Weed Surveys—**Weed surveys are conducted regularly along roads. These surveys detect weed spread by large vehicles and machinery used for training or to support training within and between ranges. Such surveys help detect and eradicate new weed species. Offsite roads near management units are also surveyed.

Weed surveys are conducted at landing zones (LZs). Military and natural resource support helicopters can serve as vectors for weed spread. Heavily used LZs are surveyed annually and smaller LZs are monitored when they are used.

Weed surveys are conducted along ungulate transects. Typically located along fence lines or major ridges, these surveys identify plant spread by pigs and goats as well as humans. Fence lines and ridges are often major travel corridors and therefore can be significant introduction sites.

All survey data are entered in the Weed Database. The database is used to detect and search for new introductions and to create lists detailing first observation information. New methods for weed control and monitoring are ongoing.

Weed, ungulate, and rat control management are summarized by population unit and management designation in the "Population Unit Threat Control Summary" for each taxon both inside and outside the action area.

Genetic Storage—There are three types of genetic storage: (1) Seeds are often the preferred genetic storage technique and requires the least amount of maintenance and cost while providing the largest amount of genetic variability. (2) Micropropagation is used for taxa with limited, sporadic, or no seed production. Maintenance efforts are ongoing, and resources and personnel needs are limited. (3) Living collections is the least preferred. This method requires the most maintenance within a propagation facility and the most resources. Possible avenues of genetic storage and propagation have been determined for all species.

Where seed collections are preferred, up to 50 seeds from up to 50 plants per population are collected. The number of plants contributing 10 or more seeds is noted during collections. Seed viability is constantly tested and the storage potential of a species determines the frequency of seed collection. Vegetative collections require a minimum of three per clones per plant per propagation facility. The number of individuals (seeds, micropropagation, etc.) is measured against a goal set for each species.

It is at this stage of data collection that unique characteristics of a taxon's morphology, phenology, ecology, or pollination biology, as well as outplanting issues, are documented. As with all information, data are organized by population unit and management designation.

1. **Weather Station Monitoring—**Weather stations help measure and track microsite variation and assist in species reintroductions.

2. **Vegetation Mapping—**A trial vegetation mapping project has been instituted in Mākua Valley to map the distribution and abundance of selected native and non-native plant species in the Kahanahāiki and Ōhikilolo management units.

3. **Annual Reporting—**Annual reporting is required by the USFWS Biological Opinions (RCUH 2002, 2003b, 2004; USAG-HI 2005, 2006d, 2007a, 2008a, 2009b). A report for

Mākua Military Reservation was first prepared in 2004. Reporting on measures related to the O‘ahu Implementation Plan were included into a single report with the Mākua Implementation Plan in 2006.

The reports include a summary for each target taxa and typically include the following information:

- Requirements for stability
- Taxon-level discussion (number of population units and individuals, location, management designations, list of threats, fence situation, and genetic storage information)
- Population unit level discussion
- Major highlights/issues (e.g., reintroductions, fire, etc.)
- Plans for next year (e.g., fencing, genetic collections, augmentation, etc.)
- Taxon status summary, propagation and genetic storage chart, and threat control summary tables
- Status of genetic materials
- Survey and outplanting issues
- Research issues

Future data collection and monitoring with be determined by the Implementation Teams. The data collected by the ONR staff are annually evaluated to determine if monitoring goals implied in the Biological Opinions are being met.

4.1.2.6 Propagation

Seed storage is the principal method of genetic storage. It is the most cost effective, requires the least maintenance once instituted, and provides the greatest amount of genetic variability (USAG-HI 2007a). Seed storage guards against the loss of wild populations (USAG-HI 2008b) and is often the principal material source for outplanting and augmentation, as well as research. Seeds are stored at the Center for Conservation, Research, and Training (CCRT) Seed Conservation Laboratory and the Lyon Arboretum Micropropagation Laboratory. Detailed species-specific information is collected for each Priority 1 and target taxa identified in the O‘ahu and Mākua Implementation Plans (USAG-HI 2003a, 2005a, 2008b). Optimal collection conditions, dormancy (physiological, functional), germination requirements and procedures, storage conditions (e.g., moister levels), and seed viability and longevity are documented.

For taxa that do not produce enough viable seed, micropropagation (seed or vegetative) is used. Micropropagation and the maintenance of a living collections is more costly (e.g., ongoing maintenance requirements), vulnerable (e.g., disease, insects, fungus, etc.), and provides less genetic variability (e.g., limited to the number of unique mother plants, no outcrossing).

Specific protocols were developed for propagule collection and storage by the Mākua Implementation Plan and are used for the O‘ahu Implementation Plan. The protocols include a discussion on various topics from collection to seed-storage behavior to multi-year collection strategies (see USAG-HI 2008b, Appendix 1.3, *Plant Propagule Collection Protocols*).

4.1.2.7 Reintroduction and Augmentation

One of the strategies for target taxa stabilization is the reintroduction of plants into suitable habitats within known historical ranges. The purpose is to establish sustainable and growing populations for

Table 4.1.c Plant Critical Habitat Associated with the Mākua Military Reservation Action Area (USFWS 2007a).

*Abutilon sandwicense**	*Hesperomannia arbuscula*
Bonamia menziesii	*Hibiscus brackenridgei* ssp. *mokuleianus*
Cenchrus agrimonioides var. *agrimonioides*	*Isodendrion laurifolium*
Chamaesyce celastroides var. *kaenana*	*Isodendrion longifolium*
Chamaesyce herbstii	*Isodendrion pyrifolium*
Colubrina oppositifolia	*Mariscus pennatiformis*
Cyanea grimesiana ssp. *obatae*	*Melanthera tenuifolia*
Cyanea longiflora	*Melicope pallida*
Cyanea superba ssp. *superb*	*Neraudia angulata*
Cyrtandra dentata	*Nototrichium humile*
Delissea subcordata	*Phyllostegia kaalaensis*
Diellia falcata	*Plantago princeps* var. *princeps*
Dubautia herbstobatae	*Sanicula mariversa*
*Eugenia koolauensis**	*Schiedea hookeri*
Euphorbia haeleeleana	*Schiedea kaalae*
Flueggea neowawraea	*Schiedea nuttallii*
Gouania vitifolia	*Schiedea obovata*
Hedyotis degeneri var. *degeneri*	*Solanum sandwicense*
Hedyotis parvula	*Spermolepis hawaiiensis*

*Critical habitat for these species may come into consideration with the proposed fuelbreak in the Puulu and Alaihehe area.

reintroduction (USAG-HI 2008b). Augmentation is the addition of individuals into areas where the taxon is currently present. Augmentation increases the number of individuals and enhances population number and vitality (e.g., enhanced cross-pollination and seed set). Many of the target taxa have declined to the point where threat management is not enough to achieve stability, and creating and supplementing new plant populations is necessary for the continuance of wild populations.

The Mākua and O‘ahu Implementation Teams consider a multiple of consequences when choosing individuals for use in reintroduction and augmentation (USAG-HI 2003a, 2005b, 2008) from genetic issues (e.g., genetic drift, inbreeding and outbreeding depression, fitness) to contamination of a pre-existing population with new pathogens (e.g., diseases, parasites, invertebrate pests, non-native plants, etc.) to guidelines for the selection of sites (e.g., “no more than two reintroductions per target taxon in a single management unit” and “ no augmentation the first year within a population unit”) to support healthy, viable populations (USAG-HI 2003a, 2005a, 2008b). The Mākua and O‘ahu Implementation Plans reintroduction guidelines were developed from a number of sources including the Hawai‘i Rare Plant Restoration Group.

4.1.2.8 Plant Critical Habitat

No plant critical habitat is addressed in the O‘ahu Biological Opinion (USFWS 2003a) or the O‘ahu Implementation Plan; however, portions of critical habitat are noted for 36 listed plant taxa in the Mākua action area (Table 4.1.c) (USFWS 2007a). No plant critical habitat is present on the Mākua Military Reservation proper. Army-controlled (owned and leased) lands were excluded from plant critical habitat designation due to the Integrated Natural Resources Management Plan providing benefits through the ongoing management and conservation of the designated species (USFWS 2002). As long as the implementation of the INRMP continues to provide a benefit to these species, MMR

will retain its exclusion from critical habitat. Less than 10 percent of the entire designated critical habitat for each of 18 taxa and only one percent or less of nine taxa is present in parts of the action area not owned or leased by the Army. Critical habitat in the action area is present for two taxa, *Schiedea obovata* and *Cyrtandra dentata*, and exceed more than half of these taxa's critical habitat (71 percent and 68 percent, respectively). The USFWS determined that designated critical habitat outside the training action area and within the management units would benefit from the ONR staff actions. The ONR staff activities were judged as having no adverse effect to listed species and critical habitat, but rather were enhancing these areas through fence building, ungulate removal, invasive species control, rat baiting, and so forth.

Plant critical habitat was addressed during the 2008 USFWS Section 7 consultation for the establishment of an additional management unit and fuelbreak for *Hibiscus brackenridgei* (Puulu to Alaiheihe). In this case, the proposed management unit and fuelbreak overlapped the critical habitat of *Abutilon sandwicense* and *Eugenia koolauensis* as well as *Bonamia menziesii, Euphorbia haeleeleana, Hibiscus brackenridgei,* and *Nototrichium humile,* critical habitat addressed in an earlier biological opinion. In all cases, the USFWS determined that there was no adverse modification or destruction of designated critical habitat for the species concerned.

Fire vulnerability is the principal threat to plant critical habitat. Some 20 taxa (8 target species, 7 stabilization species, and 5 non-stabilization species) are in areas identified as high fire risk zones at Mākua Military Reservation. Training-related wildland fires degrade critical habitat by removing native vegetation, facilitating community conversion to non-native grasslands, and precluding natural regeneration and natural habitat restoration by native species.

The potential for training-related wildland fires is reduced by limiting certain weapon use until such time that specific stabilization goals are met for target taxa. The Wildland Fire Management Plan, the O'ahu INRMP, and the Mākua Implementation Plan and Addendum describe measures for conservation and stewardship programs on O'ahu Army installations. Augmentation to at-risk taxa in the wild, improved native habitat that is accomplished through the construction of fences that exclude feral ungulates, the control of non-native plant species, and measures to restore burned areas to pre-burn conditions will improve baseline quality of critical habitats. As such, the USFWS did not require any additional measures or improvements to critical habitat in the Mākua Management Units outside of the training action area.

4.1.2.9 Individual Plant Species Management

USFWS identified information needs and management actions for each species in the Biological Opinions (Table 4.1.d). The specific measures undertaken by the ONR staff for each taxon are detailed in the Mākua Implementation Plan and Addendum and the O'ahu Implementation Plan (see Appendix 4, *Implementation Plans*).

Six federally listed plant species on the O'ahu installations had less than half of their known individuals in the action area and three or more stable populations units outside the action area (*Cyanea humboldtiana, Diellia falcata, Isodendrion longifolium, Lepidium arbuscula, Schiedea hookeri,* and *Tetraplasandra gymnocarpa*). The USFWS deemed that these species did not require stabilization, although the Army was encouraged to consider proactive measures that would benefit the species.

The Implementation Team will evaluate the sufficiency of the required conservation measures and determine if current actions are achieving the desired goals. The ONR staff recognizes that modifications are inevitable and that current activities are providing baseline information.

Table 4.1.d. Summary of Individual Species Information, Population Requirements, and Other Attributes Identified in the USFWS Biological Opinions (USFWS 2003a, 2007a, and 2008).

Species			Population Requirements			Fire Risk Mākua			Mgmt Levels	Fencing	Threat Control											Population Management										Ed	Fire Management					
	Life Form[1]	Biological Opinion (O-O'ahu, M-Mākua)	Individuals/Population Required	Populations to Stabilize Inside the Action Area	Populations to Stabilize Outside the Action Area	Very Low Risk	Low Risk	High Risk	At-risk (R), Stabilize (S) Species (Mākua) and Species' Tiers (O'ahu)	Fencing	Ungulate Control	Goat Control, Specific	Non-native Plant Control/Removal	Specific Plant Species Control (e.g.,*Psidium* sp.)]	Black Twig Borer and/or Chinese Rose Beetle Survey	Black Twig Borer Control	Research on Black Twig Borer	Chinese Rose Beetle Control or Research	Other Insect Research	Slug Research	Slug Control	Collection *ex situ* Representation	Monitoring	Genetic storage	Propagation	Outplanting	Augmentation	Priority to immature/small number	Locate New Occurrences	Priority for Disjunctiveness	Population and Habitat Management	Education	Weapons Restrictions, Fire Detection	Fire Protection/Fuel Management	Fire Detection	Fire Suppression	Fuelbreaks
Abutilon sandwicense	SLP	O	50	3					1	O			O		O													O		O					
Alectryon macrococcus	LLP[2]	O,M	50	4	2	M	M		S	M						O,M						O		M		M				O		M	M	M	M	M
Alsinidendron trinerve	SLP	O	50	3					1		O		O											O	O	O										
Cenchrus agrimonioides var. *agrimonioides*	SLP	M	50	3	2	M	M		S	M	M		M			M	M							M		M					M		M		M	
Chamaesyce celastroides var. *kaenana*	LLP	M	25	4	3			M	S	M	M		M			M	M	M		M	M			M		M						M		M	M	M
Chamaesyce herbstii	LLP	M	25	3	2	M			R	M			M													M						M	M		M	
Chamaesyce rockii	SLP	O	50						2	O			O	O								O														
Cyanea acuminate	SLP	O	50	3					1	O			O	O														O					O			
Cyanea crispa	SLP	O	50	3					2	O			O									O					O									
Cyanea grimesiana ssp. *obatae*	SLP	O,M	100	3	2	M			R	M			M							O		O										M	M		M	
Cyanea koolauensis	SLP	O	50	3					1	O			O	O		O											O						O			
Cyanea longiflora	SLP[2]	M	75	3	1	M	M		R	M	M		M							M	M											M	M		M	
Cyanea st.-johnii	SLP	O	50	3					3	O			O	O								O														
Cyanea superba ssp. *superb*	LLP[2]	M	50	4	3	M	M		R	M			M								M											M	M		M	
Cyrtandra dentate	SLP	O,M	50	3	1	M	M		S	O,M	M		M							M	O			O,M	O,M	M			O		O		M		M	M	M
Cyrtandra subumbellata	SLP	O	50	3					3	O			O	O													O						O			
Cyrtandra viridiflora	SLP	O	50	3					2	O			O	O																			O			
Delissea subcordata	SLP[2]	O,M	100	4	3	M	M		R	M			M							M	O,M			O	O	O						M	O,M		M	
Dubautia herbstobatae	SLP	M	50	3	1	M	M		S	M													M	M	M	M						M		M	M	
Eugenia koolauensis	LLP	O	25	3					1	O			O	O								O		O	O				O	O	O		O			
Flueggea neowawraea	LLP[2]	O,M	50	3	2	M	M		S	M		O	O			O	O							O,M	O					O		M	M	M	M	M
Gardenia mannii	SLP	O	50	3					1	O	O		O	O		O											O		O				O			
Gouania vitifolia	vine	M		3	2	M			R	M			M																			M	M		M	
Hedyotis degeneri var. *degeneri*	SLP	M	50	3	2		M		S	M	M		M											M		M						M	M	M	M	M
Hedyotis parvula	SLP	M	40	3	2	M			S	M	M		M											M									M		M	
Hesperomannia arbuscula	LLP[2]	M	75	3	2	M			S	M																									M	
Hesperomannia arborescens	LLP	O	25	3	3				1	O			O											O	O	O					O		O			
Hibiscus brackenridgei ssp. *mokuleianus*	SLP	M	50	4	3			M	R	M			M						M														M			M	
Huperzia nutans	SLP	O	50	3					1	O	O		O															O					O			
Labordia cyrtandrae	SLP	O	50	3					1	O	O		O	O										O	O	O			O				O			

Table 4.1.d. Summary of Individual Species Information, Population Requirements, and Other Attributes Identified in the USFWS Biological Opinions (USFWS 2003a, 2007a, and 2008).

Species			Population Requirements			Fire Risk Mākua			Mgmt Levels	Fencing	Threat Control										Population Management										Ed	Fire Management				
	Life Form[1]	Biological Opinion (O-O'ahu, M-Mākua)	Individuals/Population Required	Populations to Stabilize Inside the Action Area	Populations to Stabilize Outside the Action Area	Very Low Risk	Low Risk	High Risk	At-risk (R), Stabilize (S) Species (Mākua) and Species' Tiers (O'ahu)	Fencing	Ungulate Control	Goat Control, Specific	Non-native Plant Control/Removal	Specific Plant Species Control (e.g.,*Psidium* sp.)]	Black Twig Borer and/or Chinese Rose Beetle Survey	Black Twig Borer Control	Research on Black Twig Borer	Chinese Rose Beetle Control or Research	Other Insect Research	Slug Research	Slug Control	Collection *ex situ* Representation	Monitoring	Genetic storage	Propagation	Outplanting	Augmentation	Priority to immature/small number	Locate New Occurrences	Priority for Disjunctiveness	Population and Habitat Management	Education	Weapons Restrictions, Fire Detection	Fire Protection/Fuel Management	Fire Detection	Fire Suppression	Fuelbreaks
Lipochaeta (Melanthera) tenuifolia	SLP	M	50	3	2	M	M	M	S	M	M													M								M	M	M	M	M
Lobelia gaudichaudii ssp. *koolauensis*	SLP	O	50	3					3	O			O									O		O		O					O		O			
Melicope lydgatei	SLP	O	50	3					2	O			O		O									O	O	O			O							
Myrsine juddii	SLP	O	50	3	3				2	O			O			O								O	O	O			O		O					
Neraudia angulata	SLP[2]	M	100	4	2		M	M	R	M			M																			M	M		M	
Nototrichium humile	LLP	M	25	4	2	M	M	M	S	M	M		M											M								M	M	M	M	M
Phyllostegia hirsute	SLP	O	50	2					1	O	O	O	O									O				O							O			
Phyllostegia kaalaensis	SLP	O,M	50	3	2				R				M																		O	M	M		M	
Phyllostegia mollis	SLP	O	50	3	2				1	O	O		O											O		O							O			
Plantago princeps var. *princeps*	SLP	O,M	50	4	3	M			S	M	M		M											M							O		M	M	M	M	
Pritchardia kaalae	LLP	M	50	3	1	M	M		S	M																							M		M	M	
Pteris lydgatei	herb	O	100	3					3	O	O		O																					O			
Sanicula mariversa	SLP[2]	M	100	3	1	M	M		R	M	M		M																				M	M		M	
Sanicula purpurea	herb	O	100	3					2	O	O		O															O								
Schiedea kaalae	SLP	O,M	50	4	3	M			S	M	M								M					O,M	O	O,M					O		M	M	M	M	
Schiedea nuttallii	SLP	M	50	3	1	M	M		R	M			M																				M	M		M	
Schiedea obovata	SLP	M	50	3	1	M	M		R	M	M		M						M	M													M	M		M	
Stenogyne kanehoana	SLP	O	100	3					1		O		O																								O	
Tetramolopium filiforme	SLP	M	50	4	2	M	M	M	S	M	M													M		M							M	M	M	M	M
Viola chamissoniana	herb	O,M	50	4	2	M	M		S	M	M		M											O	O	O,M					O		M	O,M	M	M	
Viola oahuensis	SLP	O	50	1		M			2	O,M	O		O																O								

[1]Life Forms are SLP (short-lived perennial), LLP (long-lived perennial).

[2]These are species that have limited numbers because of reproductive issues.

4.1.2.10 Stabilization Requirements, Vertebrates

O‘ahu ‘Elepaio and ‘Elepaio Critical Habitat

The Army manages for 75 pairs of the O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis*) as required by the USFW Biological Opinion (2003a) on *Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Army on the Island of O‘ahu* (1-2-2003-F-04). The species was federally listed as endangered in 2000 (65 FR 20760). Seventeen percent, and the third largest and densest population of the O‘ahu ‘elepaio, occurs at Schofield Barracks Military Reservation (USFWS 2003a).

In 2001, critical habitat was designated in five land units, which primarily include undeveloped high elevation areas (66 FR 63752). Critical habitat consists of areas that provide forage, shelter, and roosting and nesting sites in undeveloped wet, mesic, and dry forest habitats with closed canopies and dense understory. Critical habitat locations were chosen based on the species’ ability to disperse and to have genetic exchange among populations (USFWS 2003b).

Habitat loss through development (e.g., urban, agriculture, and military use) is cited for the historic decline in the O‘ahu ‘elepaio, along with the loss and modification of forest habitat by feral ungulates and fire (USFWS 2003a). However, nest predation (e.g., black rats, *Rattus rattus*; feral cats, *Felis catus*; and mongoose, *Herpestes auropunctatus*) and introduced diseases (e.g., avian pox, *Poxvirus avium*), play a significant role in current declines due to individual loss from reduced nesting success and adult survival.

The primary threats to the species in the Mākua and O‘ahu Action Areas are rodents, range fires ignited by military activities, diseases carried by mosquitoes (particularly avian poxvirus), and degradation of forest structure by ungulates (USFWS 2003a, 2007a). ‘Elepaio nest success and survival is predicated on rat control. The implementation of rodent control measures increased reproduction an average of 112 percent and adult female survival by 66 percent (VanderWerf and Smith 2002). The increase in adult females is important when considering the skewed sex ratio attributed to the loss of females during nighttime incubation to predation (USAG-HI 2008b). Rodent control is considered the most effective method of stabilizing O‘ahu ‘elepaio populations.[2] Range fires destroy habitat (e.g., nesting locations, canopy structure, food sources, facilitates the spread of non-native species and ecosystem change) as well as destroy eggs and kill nestlings. Feral pigs and goats affect ‘elepaio habitat by digging up understory plants, browsing, and preventing canopy recruitment. Rooting by pigs in wet areas may increase mosquito habitat and thereby increase disease transmission to the O‘ahu ‘elepaio (USFWS 2003a).

Habitat Management

Critical habitat for the ‘elepaio overlays Army lands within Mākua Military Reservation as well as the action area. The threats to the ‘Elepaio Critical Habitat are similar to all covered species—feral ungulates, rats, non-native plants, vectors that reduce ecosystem health, fire, erosion, and military training and trampling along trails (USFWS 2007a). The Mākua Military Reservation’s Biological Opinion calls for:

- Restoration of fire-altered native habitats to native vegetation.
- Removal and control of ungulates, rats, and invasive plant species.

[2] O‘ahu ‘Elepaio Population Management. Hawai‘i Division of Forestry and Wildlife. http://www.dofaw.net/fbrp/projects.php?id=00063 (8 January 2007).

- Rat control using toxicant bait stations, aerial broadcasting, and trapping grids.
- Research and implementation of control techniques for non-native invertebrates such as slugs, snails, black twig borer, two-spotted leafhopper, and Chinese rose beetle.

These actions reduce site degradation, support native species, and increase the conservation value of critical habitat areas.

ʻElepaio Critical Habitat in the Oʻahu Action Areas includes lands in Kawailoa Training Area, Schofield Barracks East Range, and Schofield Barracks Military Reservation (USFWS 2003a). The conservation needs on Oʻahu Army installations are similar to those outlined in the Mākua Military Reservation Biological Opinion, along with:

- Adherence to training protocols to prevent ignition and wildland fire spread above the fire break road.
- Reduction in the number of high explosive rounds that land above the fire break road.

Fire in ʻElepaio Critical Habitat is also an issue at Mākua Military Reservation with the Mākua MR Biological Opinion. The biological opinion calls for the Army to encourage shrubs to re-colonize the site following a burn and setting a timetable for recovery, delineating actions, and describing the expected vegetation.

ʻElepaio Critical Habitat and some of the management units overlap. Measures that stabilize plant and snail species also benefit ecosystem function and therefore Oʻahu ʻelepaio habitat.

Stabilization Plan

The ʻElepaio Stabilization Plan is part of the Oʻahu Implementation Plan. The ʻElepaio Stabilization Plan relies on the expertise of Eric VanderWerf and his publications (VanderWerf 1993, 1994, 1998, 1999, 2001, 2004; VanderWerf et al. 1997; VanderWerf 2001; VanderWerf and Smith 2002). The ʻElepaio Stabilization Plan is based on threat control and habitat management. The goal of the plan is to:

- Maintain predator control programs for 75 breeding pairs of the Oʻahu ʻelepaio.
- Monitor predator control effectiveness via banding, re-sight, fledgling success, and adult survivorship of Oʻahu ʻelepaio.
- Control of other threats at each managed field location.

In the 2003 Oʻahu Biological Opinion, approximately 344 ʻelepaio were noted in the Schofield Barracks Military Reservation's Action Area, of which about 155 were breeding pairs (USFWS 2003a). All but two birds were cited to occur at Schofield Barracks with the others located in the Mt. Kaʻala Natural Area Reserve. Birds were noted as no longer present in the East Range, South Range, or the Kawailoa Training Area Action Areas. Within the Mākua Biological Opinion, 16 individual ʻelepaio (Mākua Valley—two pairs, three single males, and one single female; Mākaha Valley—one pair and six single males) were noted as occupying territories in the low and very low fire risk zones, respectively, of the action area (USFWS 2007a).

The Army has chosen to focus its efforts on the windward and central Koʻolau populations where there are currently no management efforts and where there are sufficient numbers of breeding pairs to make predator control worthwhile. Other agencies (e.g., Koʻolaus-State of Hawaiʻi, Honolulu Zoo; Waiʻanaes-The Nature Conservancy) provide management in the Southern Koʻolaus and parts of the Southern Waiʻanaes. The Army has chosen to pursue management of approximately 15 pairs of the

‘elepaio on Schofield Barracks and 60 pairs of birds at five off-site locations. The offsite locations include Honouliuli Preserve, Mākaha Valley, Moanalua Valley, Waikāne Valley, and Pālehua.

Extensive work is required during the breeding season (approximately December through June/July). ‘Elepaio territories are dynamic from breeding season to breeding season and throughout a breeding season (USAG-HI 2007a). Efforts include predator control for each breeding pair, monitoring adult survival, and monitoring nesting success. Fencing is important, but may be difficult in areas where lands are not owned by the Army. The Army is working on agreements with off-site locations owners (USAG-HI 2008b).

4.1.2.11 Stabilization Requirements, Invertebrates

O‘ahu Tree Snail—*Achatinella* spp.

Eleven tree snail species were addressed in the O‘ahu and Mākua Biological Opinions. Stabilization procedures for all snails are based on the *Achatinella mustelina* Stabilization Plan, which is part of the Mākua Implementation Plan. While *A. mustelina* occurs in the Wai‘anae Mountains, the other taxa are principally found in the Ko‘olau Mountains.

Stabilization is ongoing for *Achatinella mustelina* through the Mākua Implementation Plan. Baseline management is occurring for the Ko‘olau Mountain species until the O‘ahu Implementation Plan is finalized. Stabilization of tree snail species includes rodent control, genetic sampling, monitoring, and collection for captive propagation. The proposed long-term goals of the Implementation Plan are to:

- Manage extant population units and additional reintroduction population units up to six population units per species in the action area and encompass the geographical range of the species.
- Achieve at least 300 individuals from all age classes in each population unit per species and to mange each unit for stability.
- Maintain captive propagation populations for each of the three population units per species managed for stability.
- Control all threats in each managed field location.
- The Ko‘olau Mountain Action Area species have a Tier 2 stabilization priority.

Below is a summary on status of the 11 tree snail species:

- ***Achatinella mustelina*** occurs at Mākua and Schofield Barracks Military Reservations Action Areas. *Achatinella mustelina* has been determined to be an evolutionarily significant unit based on assessment of intra-population genetic divergence (USFWS 2003a). As such, there are six evolutionarily significant units at eight field locations based on genetic testing. The goal is to achieve 300 snails in the eight field populations and to maintain six captive populations for each evolutionarily significant unit.
- Populations of three extant species of *Achatinella* tree snails are present in the Ko‘olau Mountains Action Area (***A. byronii /decipiens, A. lila,*** **and** ***A. livida***). All extant populations will be managed for stabilization due to the low number of known populations.
- ***A. byronii*** and ***A. decipiens*** may represent a single taxonomic group. Genetic analysis is being conducted to determine if significant differences exist. Future management will be based on these results.

- Three Ko‘olau snail species have not been seen in over 12 years— ***Achatinella curta*** (last seen in 1990), ***A. leucorraphe*** (last seen in 1989), and ***A. pulcherrima*** (last seen in 1993) (USAG-HI 2008b). Surveys are planned. There are no stabilization efforts for these species unless individuals are located.
- The last encountered individuals of ***Achatinella apexfulva*** was in 2004. Currently, there are eight individuals in the captive population. Two individuals of ***A. bulimoides*** were collected in 2005 for captive propagation. Currently, there are two individuals *in situ* and 34 captive individuals (USAG-HI 2007a).
- ***Achatinella sowerbyana*** is the second most abundant species in the Ko‘olau Mountains after *A. byronii/decipiens*. There are about 31 scattered populations that consist of 276 individuals, with most populations limited to one or two individuals. Currently, there are 47 individuals in captivity. Six population units will be stabilized and all other populations will have up to 10 individuals collected for captive propagation. Genetic analysis could affect changes to stabilization plans. For species without six extant population units, reintroductions are planned into predator proof exclosures. In addition, *A. sowerbyana* may not be distinct taxonomically from *A. livida*. Genetic testing will help direct changes in stabilization needs.

Until taxonomic identification is verified by genetic analysis, there will be no mixing of evolutionarily significant units during augmentation.

Program direction and activities for the tree snails is similar to those in place for plants—management of threats, enhancement of habitat, development of monitoring and field protocols, documentation of wild and captive populations, genetic storage, and propagation. In addition, genetic sampling will be used to discern unique species and evolutionarily significant units.

Snail Population Management

Snail populations are managed for stability and/or for captive propagation. Where sufficient numbers of individuals exist in an intact or restorable habitat and the existing population structure promotes natural recruitment, a population designation is “management for stability.” If there are few individuals, and habitat condition and rehabilitation potential are poor, the population is identified for collection for “captive propagation.”

1. **Manage for Stability—**Management for stability begins with an assessment of snail populations (e.g., size, age classes, etc.), assessment of threat management needs, and choosing site(s) for predator and ungulate exclosures. The key threat to the snails is predation by the carnivorous snail, *Euglandina rosea,* and rats; predation by other invertebrates, such as the terrestrial flatworm, *Platydemis;* and indirect threats to habitat (e.g., ungulates, non-native plants, human disturbances, etc.) that cause snail host-plant decline (i.e., loss of native forests and shrublands). Managing for stability includes monitoring population units and areas adjacent to exclosures and data management. Management includes (see Appendix 4. Implementation Plans. O‘ahu Implementation Plan, Chapter 9, *Strategy for Stabilization of Achatinella Species*):

    - Eradicate ungulates in large ungulate exclosures to improve habitat quality. (Monitoring is the same as for plants).
    - Eliminate rats. Rats are serious predators that decimate snail populations. Predator exclosures and poison baits are used. The Army is working to provide information for the labeling of rat bait for aerial dispersal. (Quarterly monitoring to evaluate application frequency consists of detection of predators, teeth marks, and location of freshly broken shells.)

- Threat management via construction of exclosures. The non-native predatory snail, *Euglandina rosea*, only feeds on other snails and is a major threat to native snail populations.
- Improve native plant communities. Native plant communities with 75 percent native species canopy cover is a 10-year goal of the O‘ahu Implementation Plan. This will require controlling weed species and encouraging native species while ensuring proper environmental conditions. (USAG-HI 2008b, See Section 2, *Action Section* of O‘ahu IP).

2. **Captive Populations—**Population and species numbers can decline to levels where natural regeneration is unlikely. In those situations, propagation of captive individuals can be used to maintain genetic information and to enhance or rebuild populations. Once predator and habitat restoration issues are addressed, reintroduction is possible. Typically, no more than 20 percent of a wild population is collected and at least 7 to 10 individuals. Snails are then maintained and propagated in environmental chambers.

The Army is working with the University of Hawai‘i Snail Laboratory. Samples were collected in 2005 and 2007.

Megalagrion xanthomelas, Orange-black Hawaiian Damselfly

Megalagrion xanthomelas, a federal candidate species, is one of 23 native damselflies in Hawai‘i[3]. A lowland species, it is found near slow-moving and brackish water. Once widespread on O‘ahu, Moloka‘i, Lāna‘i, Maui, and the Island of Hawai‘i, there is one remaining O‘ahu population at Tripler Army Medical Center. Introduced guppies and top minnows feed on the species’ naiads (immature damselflies). The Army temporarily moved the known population to an artificial habitat during one construction project. Currently, the Army provides additional water to the stream and works to maintain the species’ environment. Efforts to establish populations at other locations have failed.

The Army is providing $20,000 for monitoring and translocation through the Bishop Museum. The current location of the orange-black Hawaiian damselfly is a no-go area for future construction activities. The area has been signed and is cleaned annually. Supplemental water is provided year-long as mitigation for previous construction actions.

Surveys will be conducted for *Megalagrion leptodemas*, *M. nigrohamatum nigrolineatum*, and *M. oceanicum* as part of the installation’s stream bio-assessment efforts (See Section 4.21 *Aquatic Health and Water Quality Management.*) *Megalagrion oceanicum* is a candidate species known to occur in the Kawailoa Training Area.

Drosophila spp.—Picture-Wing Flies

In 2006, the USFWS applied endangered status to 11 species of Hawaiian picture-wing flies– *Drosophila aglaia*, *D. differens*, *D. hemipeza*, *D. heteroneura*, *D. montgomeryi*, *D. musaphilia*, *D. neoclavisetae*, *D. obatai*, *D. ochrobasis*, *D. substenoptera*, and *D. tarphytrichia* (71 FR 26835) and developed a recovery outline (USFWS 2006a, 2006b). In 2007, critical habitat was proposed for 12 species (to include *D. mulli*) (USFWS 2007b). *Drosophila montgomeryi* was noted at one location in ‘Ēkahanui MU Subunit II; and *D. aglaia, D. hemipeza, and D. montgomeryi* in the Palikea MU (USAG-HI 2009).

[3] Army Natural Resource Program. *Tripler Army Medical Center’s Hidden Treasure: The Orange Black Damselfly, Megalagrion xanthomelas.* Brochure.

4.1.2.12 Future Projects and Research

The O‘ahu and the Mākua Biological Opinions listed projects and research needs:

- The Army has developed and implemented a preliminary post-fire restoration plan for critical habitat as was required by the USFWS (2007b).
- The Army is funding the U.S. Forest Service to develop methods to restore Guinea grass, molasses grass, and buffel grassed slopes to less flammable cover, and eventually native forest vegetation as required by the USFWS (2007b).
- Research implementation and control methods for the black twig borer (*Xylosandrus compactus*), Chinese rose beetle (*Adoretus sinicus*), and slug control methods (USFWS 2003a).
- Taxonomic research to determine the relationship and genetic distinctiveness of *Diellia falcata* and *D. unisora* (USFWS 2003a).
- Genetic research of *Melicope lydgatei.*
- *Drosophila* surveys—Army training lands contain habitat suitable for these flies. Surveys of prime habitats have occurred and are planned for the future (USAG-HI 2007a, USFWS 2007a). Surveys will focus on *Drosophila montgomeryi* and *D. substenoptera*, and their host plants (*Urera kaalae*; *Cheirodendron* spp. and *Tetraplasandra* spp., respectively) (USFWS 2006a). Surveys will be on a landscape scale and will include all locations where flies have been previously observed and locations near host plants.
- Research on non-native slugs on native plant seedings is ongoing (USAG-HI 2007a).

Some projects have been initiated (e.g., *Drosophila* surveys) and others include University of Hawai‘i graduate student grants and projects:

- *Euglandina rosea* study to determine densities and habitat preferences. The results indicate the species prefers leaf litter for foraging, shelter, and egg laying. Dispersal is limited.
- Study of the movement and the dispersal of *Achatinella* using harmonic radar tracking. *Achatinella* shows site and tree fidelity (USAG-HI 2007a).
- Research to determine the home range and density of rats in a mesic forest habitat. The results from this study will be used by the ONR staff to adapt current management.

Goal 1: Utilize ONR staff to execute programs/projects that work toward the stabilization of listed species that may be adversely affected by military training activities.

Goal 2: ONR staff develops, gets USAG-HI approval/acceptance, and implements USAG-HI regulations that address training restrictions due to presence of threatened and endangered species.

Objective 1: Adjust priority ranking schemes of all listed species requiring stabilization based on current information.

Objective 2: Continue to establish and monitor long-term and emergency fencing for plant and animal populations.

Objective 3: Continue the Management Unit Program in areas with significant numbers of federally listed plants or intact native habitats.

Objective 4: Collect data to quantify and predict population trends (animals, plants). Database these data, along with geo-referenced information. Analyze and report findings to the Implementation Teams annually.

Objective 5: Enhance habitat and manage threats by controlling invasive species, feral animals, and predators.

Objective 6: Store genetic materials for propagation and population augmentation and reintroduction.

Objective 7: Document species-specific information (e.g., life history characteristics, environmental requirements, etc.) to further aid stabilization goals.

Objective 8: Research methods for animal control.

Objective 9: Implement individual species management requirements.

* Section 5.10.1, *Funding* provides a description of the funding classes.

4.2 Section 7 Consultation

4.2.1 Policy and Background

The *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation* (USFWS 2008), *Biological Opinion of the U.S. Fish and Wildlife Service for Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Military Installations, Island of Hawai'i* (USFWS 2003a) and the *Reinitiation of the 1999 Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation, Island of O'ahu* (USFWS 2007a) require implementation plans be developed, updated, and executed. The Mākua Implementation Plan was finalized May 2003 with the recognition that adjustments to the plan were necessary. An addendum was prepared January 2005. The intent of the addendum was to reduce costs. This was accomplished by reducing:

- Number of population units to be stabilized from six to three.
- Number of populations from 188 plant and 10 snail populations to 81 plant and 8 snail populations.
- Area in management units from 6,353 ac (2,571 ha) to 2,307 ac (934 ha) of priority habitat.
- Number of years from 30 to 20.

The USFWS and USAG-HI finalized the O'ahu Implementation Plan in 2008b.

4.2.2 Current Management

The Army utilizes informal and formal consultations with USFWS pursuant to Section 7 of the Endangered Species Act (1973, as amended), following the guidance of the *Endangered Species Consultation Handbook* (USFWS and NMFS 1998).

At this time, no new formal consultations are expected. All of the requirements outlined in the USFWS Biological Opinions (2003a, 2007a, and 2008) are being addressed by the implementation plans.

Goal: To inform and comply with federal, state, DoD, and Army laws, regulations, and policies concerning the Endangered Species Act, Sikes Act, and the Migratory Bird Species Act.

Objective 1: Proactively maintain an up-to-date presence/absence list, distribution information, and habitat data for all Special Status Species on USAG-HI O'ahu sub-installations addressed in this INRMP, in support of project and activity planning, management and implementation.

Objective 2: Monitor projects executed to comply with the 2003, 2007, and 2008 USFWS Biological Opinions.

4.3 Wetlands and Deep Water Habitat Management

4.3.1 Policy and Background

Wetlands are transitional areas between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Wetlands are areas where the land periodically supports predominately hydrophytes, and/or the substrate is predominately-undrained hydric soil, and/or the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. Wetlands types found on O'ahu Army lands include riverine, palustrine, lacustrine, and estuarine wetlands.

Wetlands are of critical importance to the protection and maintenance of living resources, as they provide essential habitats for many species of plants and animals including threatened and endangered species. Wetlands also protect the quality of surface waters by impeding the erosive forces of moving water and trapping waterborne sediment, protect regional water supplies by helping to filter and purify surface and groundwater resources, and maintain base flow to surface waters through the gradual release of stored water. Wetlands also provide a natural means of flood and storm damage protection through the absorption and storage of water during high runoff periods.

Management of wetlands is consistent with ecosystem management principles and is required by Executive Order 12608, *Protection of Wetlands* (Amended Executive Order 11990, *Wetlands Management*), the Sikes Act, and AR 201. Executive Order 12608 requires that federal agencies minimize any action that significantly contributes to the loss or degradation of wetlands. It is Army policy to avoid adverse impacts to existing aquatic resources and offset those adverse impacts that are unavoidable. Additionally, the Army will strive to achieve a goal of no net loss of values and functions of existing wetlands, and permit no overall net loss of wetlands on Army controlled lands. It is the Army's policy to take a progressive approach toward protecting existing wetlands, rehabilitating degraded wetlands, restoring former wetlands, and creating wetlands in an effort to increase the quality and quantity of the nation's wetlands resource base. Wetlands inventories will assist in meeting these policy goals.

All activities affecting wetlands require an environmental analysis in accordance with AR 200-1and applicable federal and state laws and regulations. U.S. Army Corps of Engineers (USACE) permits are required under Section 10 of the Rivers and Harbors Act of 1899 prior to commencing any work or building any structures in a navigable water of the United States. In addition, USACE permits are required under Section 404 of the Clean Water Act for the discharge of dredge or fill material into waters of the United States, including wetlands. The regulations in Title 33 of the *Code of Federal Regulations* Parts 320-330 prescribe the statutory authorities, policies, and procedures applicable to the review of applications for USACE permits.

USAG-HI's sub-installations possess a variety of aquatic habitat including mudflats, depressions, shallow ponds, and riverine wetlands. The wetlands along the coastlines, streams, and ponds provide

an environment for fish, amphibians, and other organisms that encourages a diversified ecosystem. With the exception of Dillingham Military Reservation (DMR) and Mākua Military Reservation (MMR), most of USAG-HI's wetlands are located within the central and northern areas of O'ahu (USACE 2005).

A total of 128.5 ac (50 ha) of reconnaissance level wetlands and water bodies have been identified on USAG-HI properties (USACE 2005). Of this, the USACE only identified 2.4 ac (~1 ha) of regulated wetlands, most occurring in SBER. Other regulated wetlands were delineated on KTA, DMR, and MMR. Other potential wetlands have been identified on SBMR, KLOA, KTA, and MMR, but were not delineated for two primary reasons: (1) the potential wetland area was protected by fencing and/or marked off-limits to training, and (2) the potential impact from Army actions were considered unlikely due to inaccessibility.

Regulated wetlands were delineated based upon the established 1987 USACE Wetlands Delineation Manual. Potential identified wetlands on Army training lands on O'ahu may include open water, riverine, palustrine, lacustrine, and estuarine types. In addition, possible wetland areas were classified and mapped at coarse resolutions from aerial photographs by the USFWS National Wetlands Inventory in 1977.

To protect and manage wetlands on O'ahu, the Army will employ a variety of strategies, including the following:

- Review all projects affecting wetlands using the National Environmental Policy Act (NEPA) process.
- Promote coordination among DPW Environmental Division, Range Division, Hawai'i, and others in the early stages of project planning to determine adverse impacts to wetlands.
- Restrict development and training when necessary to avoid wetlands impacts to the maximum extent possible.
- Mitigate unavoidable impacts on wetland functions.
- Incorporate wetland conservation education into environmental awareness and Sustainable Range Awareness programs to educate Soldiers, leaders, and commanders.
- Document the status and condition of wetland communities over time.
- Utilize GIS to develop management tools and environmental limitations maps for training operations.

USAG-HI's only sub-installation with a deep water environment is MMR. The Army owns approximately 11 ac (4.4 ha) of shoreline along Mākua Beach that it has leased back to the state for management in the beach park. USAG-HI does monitor storm water run-off into the ocean.

4.3.2 Current Management

USAG-HI completed its most recent wetland planning level surveys during the period of 2002 to 2005, with the final report published in September of 2005 by the Army Corps of Engineers (USACE 2005). USAG-HI protects wetlands by a number of different methods that include fencing, signage, training restrictions, sustainable range awareness training, and public environmental awareness training. The ONR staff, ITAM staff, and Range Division Hawai'i personnel conduct monitoring of wetlands for impacts from training.

Goal: Protect and conserve wetlands to ensure no net loss of wetlands and conservation of associated hydrologic regimes, species, and habitats.

Objective 1: Protect identified wetlands that are being impacted by Army training, or non-military use (i.e., unauthorized recreational off-road vehicle use) by installing signage, fencing and signage, and/or sustainable range awareness/public environmental awareness training.

Objective 2: Monitor known wetlands for impacts resulting from Army training and non-military use on a regular basis (e.g., quarterly, semiannually).

Objective 3: Inspect fencing and signage of protected wetlands areas for repairs on a regular basis (e.g., quarterly, semiannually).

Objective 4: Repair fencing and signage for protected wetlands areas.

4.4 Law Enforcement of Natural Resources Laws and Regulations

4.4.1 Policy and Background

Natural resources law enforcement is a combined responsibility of the USAG-HI Provost Marshal's Office and the Hawai'i DLNR, Law Enforcement Division (Cooperative Agreement, DA, Department of Interior, State of Hawai'i, 23 July 1965). The Provost Marshal's Office controls access and physical security on USAG-HI sub-installations. The Hawai'i DLNR is responsible for enforcing state laws involving natural resources such as state hunting regulations. Under the cooperative agreement, military police and DLNR officers patrol state and federal lands on USAG-HI sub-installations and provide assistance to each other within their areas of expertise and authority. In general, the Military Police do not specifically conduct patrols for wildlife-related enforcement, but do report suspected hunting violations to the DLNR. There are two game wardens within the Provost Marshal's Office, who work in fish and wildlife related enforcement for USAG-HI's sub-installations.

USAG-HI sub-installations boundaries are poorly marked outside of the cantonment, which makes enforcement difficult. There are a limited number of gates, signs, and boundary fences. Enforcement is also difficult in many areas due to remoteness and vehicle inaccessibility.

In 2006, the USFWS, The International Association of Fish and Wildlife Agencies (IAFWA), and DoD signed a memorandum of understanding (MOU) (*Cooperative Integrated Natural Resource Management Program on Military Installations*). (See Appendix 10, *Additional Information. INRMP.*) The purpose of the MOU was to establish a cooperative relationship, with the IAFWA representing state fish and wildlife agencies, for the preparation, review, and implementation of INRMPs. The USFWS agreed, via this document, to "provide law enforcement support to protect fish, wildlife, and plant resources on military installations within the jurisdiction" of its organization. Current USFWS enforcement priorities allow for those enforcement duties on USAG-HI sub-installations where there is a special reason for such actions only.

4.4.2 Current Management

Most law enforcement falls under the direction of the USAG-HI Provost Marshal at USAG-HI sub-installations. Recreational users of USAG-HI lands and lands leased by the Army must comply with USAG-HI's Outdoor Recreation Plan Report (USAG-HI 1997) requirements, DLNR recreational guidelines, DAR fishing regulations and guidelines, and DOFAW hunting regulations and guidelines. DLNR officers may staff game check stations during hunting periods located on Kahuku Training

Area and Kawailoa Training Area. (See Appendix 9, *Installation Documents, Outdoor Recreation Plan Report.*)

Goal: Assure legal compliance during military and civilian activities with regard to natural resources on USAG-HI sub-installations.

Objective 1: Cooperate with DNLR and USFWS enforcement personnel in the protection of natural resources.

Objective 2: Review cooperative agreement and determine if it is being used effectively.

4.5 Fish and Wildlife Management

4.5.1 Policy and Background

As stated previously, the O‘ahu INRMP 2010-2014 is an agreement between the Sikes Act’s required partners: USAG-HI, U.S. Fish and Wildlife Service, and Hawai‘i Department of Land and Natural Resources (DNLR). The Fish and Wildlife Management section of the INRMP provides a program of planning for and the development, maintenance, and coordination of fish, wildlife, and game conservation. This section should address fish and wildlife habitat improvements or modifications, fish and wildlife considerations in all range rehabilitation, control of off-road vehicle traffic, use and protection of fish and wildlife resources, to include both consumptive and non-consumptive use, and natural resources law enforcement requirements, and designated responsibilities for the control and disposal of feral animals.

Game management is typically a part of wildlife management and is discussed in a section following the Wildlife Management section. Wildlife management at USAG-HI sub-installations consist of the survey and management of native birds, two marine mammals, two marine turtles (see Section 4.5.3.1, *Current Wildlife Management*), non-native mammals and birds (including for hunting), native and non-native fish (including for fishing), and control of invasive non-native mammals.

Related wildlife management issues are addressed in Sections 4.1.2.11 and 12, *Stabilization Requirements Management*; Section 4.6, *Migratory Bird Management*; Section 4.9.2.3, *Invasive Animal Species Management*; and Section 4.13, *Outdoor Recreation*.

Fish and wildlife inventories include comprehensive installation-wide planning level surveys designed to identify all faunal species on USAG-HI sub-installations. AR 200-1directs installations to conduct faunal surveys, including field data, which describes and maps the distribution and extent of animals. These surveys are to be reviewed and/or updated annually. In addition, this regulation directs installations to conduct surveys that map and show the occurrence, habitat distribution, and habitat management areas of federally endangered, threatened, proposed, candidate, and species at risk occurring on the installation. Survey information is further reviewed and/or updated with the installation’s INRMP review/update.

Faunal surveys at USAG-HI sub-installations work to identify all native, neotropical, upland game (non-native), and raptor bird species and native and non-native mammals. Introduced amphibians are known to be present on all of the sub-installations. Introduced reptiles are believed to be present at all the sub-installations. There are no native amphibians in Hawai‘i. The only known native reptiles in Hawai‘i are five species of sea turtle and one species of sea snake.

4.5.2 Fish Management

USAG-HI is in the process of developing a fish management program for its sub-installations. Fish and aquatic invertebrates are known to be present at Schofield Barracks Military Reservation (SBMR), Schofield Barracks East Range (SBER), possibly at Kawailoa Training Area (KLOA), Kahuku Training Area (KTA), Dillingham Military Reservation (DMR), and Mākua Military Reservation (MMR). MMR has coastal shorefront. This shorefront area has been leased to the state of Hawai‘i as a recreational area.

Essential Fish Habitat (EFH) for bottom fish lies off Ka‘ena Point. EFH are those waters and substrate necessary for fish to spawn, breed, or grow to maturity (Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1966; Public Law 104-267). The Magnuson-Stevens Fishery Conservation and Management Act established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal Fisheries Management Plan (FMP). Section 305(b)(2) of the Act requires federal action agencies to consult with the NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency that may adversely affect EFH. The EFH off Ka‘ena Point is a Bottomfish Restricted Fishing Area (BRFA): D is 1.5 nm northwest of MMR and DMR shorelines.

A study was conducted in 2007 to evaluate whether fish, shellfish, marine algae, or other marine resources near Mākua Beach were contaminated by substances associated with proposed military training at MMR. Data collected near-shore of MMR were compared with data collected at background sites. The study noted, “a comparison of the site data with the available background data shows little if any differences between substances found in the Mākua area and the background sites. Compounds identified for analysis… are not unique to military training and are found at both Mākua and background sites” (USAEC 2009).

Game management is a part of fish management. (See Section 4.5.4, *Game Management*.)

- **Freshwater fish surveys** determine the presence of species and provide better understanding of species’ habitat requirements and populations to assist in developing strategies to guide management decisions.
- **Freshwater game species monitoring** determines species numbers, health of fish species and annual bag limits. Monitoring is conducted by Department of Aquatic Resources (DAR).
- **Watershed management** is conducted by USAG-HI within a number of programs such as pollution prevention, storm water run-off, training restrictions along riparian zones, and ITAM’s land rehabilitation and maintenance program to ensure healthy aquatic environments within the sub-installations. (See Section 4.20, *Watershed Management*.)

Current fish management includes:

- **Initial planning level fish surveys** will be planned and conducted. Surveys should include determining the presence of State of Hawaii designated species of greatest conservation need (SGCN), USAG-HI designated keystone fish species, and ESA listed species.
- **Watershed management** has a direct impact upon fish populations. (See Section 4.20, *Watershed Management*.)

4.5.3 Wildlife Management

Many of the wildlife projects at USAG-HI O‘ahu sub-installations fall under multiple areas of management (see Section 4.1.2.10 and 11, *Stabilization Requirements*; Section 4.9.2.3, *Invasive Animal Species Management*). Game management is part of wildlife management. Project areas within wildlife management include:

Birds

- **Forest, urban, field, water, sea, migratory, game and raptor surveys** determine the presence of species and provide better understanding of a species’ habitat requirements and populations to assist in developing strategies to guide management decisions.
- **Rare bird surveys** determine the presence of these specific species and provide better understanding of a species’ habitat requirements and populations to be able to develop strategies to guide management decisions. (See Section 4.1.2.10 and 11, *Stabilization Requirements.*)
- **Rare bird monitoring** determines if management objectives are being achieved. Keystone species monitoring determines if something is amiss with the ecosystem they inhabit.
- **Habitat improvement** includes improving habitat quality for the O‘ahu ‘elepaio (*Chasiempis sandwichensis ibidis* in the ‘Elepaio Critical Habitat (SBMR, MMR, Honouliuli Forest Reserve, Moanalua and Mākaha Valleys), pueo (*Asio flammeus sandwichensis*), and ‘i‘iwi (*Vestiaria coccinea*) state-listed habitat areas; protecting nesting areas from introduced feral mammals and implementation of USAG-HI’s Wildland Fire Management Plan/Program.

Mammals

- **Marine mammal surveys** determine the presence of these specific species and help better understand a species’ habitat requirements and populations to be able to develop strategies to guide management decisions (see Appendix 5, *Biological Opinions, Mākua Mammals*).
- **Marine mammal monitoring** determines if management objectives are being met.
- **Hawaiian hoary bat** (*Lasiurus cinereus semotus*) has been infrequently observed/detected at a number of locations including the Schofield-Waikane Trail (1976), near KTA at Pūpūkea-Paumalū (2002), and flying over Ōhikilolo ridge on MMR (1998). Efforts have been made to document locations at MMR.
- **Introduced mammals surveys** are conducted to determine presence and provide a better understanding of a species’ habitat requirements and populations to assist in developing strategies to guide management decisions. The presence of certain mammals pose potential threats to rare, threatened and endangered fauna and flora species.
- **Introduced mammals** are monitored to determine if management objectives are being achieved.

Herpetofauna

- **Rare/keystone reptile surveys** are conducted to determine presence and better understand a species’ habitat requirements and populations to assist in developing strategies to guide management decisions.
- **Introduced reptile surveys** are conducted to determine presence and better understand a species’ habitat requirements and populations to assist in developing strategies to guide management decisions.
- **Brown snake awareness training and reporting** is conducted at all sub-installations.

- **Introduced amphibian surveys** are conducted to determine presence and better understand a species' habitat requirements and populations to assist in developing strategies to guide management decisions.

All Wildlife Species

- **Data collection and documentation** is an important part of all wildlife projects from forest bird surveys to number of species harvested through hunting. All collected data meets Natural Resources standards.

4.5.3.1 Current Wildlife Management

Current wildlife management includes: (1) annual surveys and monitoring for the Oʻahu ʻelepaio, (2) Christmas Bird Counts in parts of SBMR, Wheeler Army Airfield, and KLOA, (3) possible planning level faunal surveys (birds, mammals, reptiles, invertebrates, and amphibians), which would determine the presence of State of Hawaiʻi designated species of greatest conservation need, USAG-HI designated keystone species, and additional federally listed species; and (4) acoustic surveying for bats at KLOA, MMR, and at other locations.

Hawaiian Hoary Bat Surveys

Bat surveys have been conducted as part of other efforts; however, the Army will formalize a survey plan designed to determine the presence, and extent on Army lands, beginning at known locations. Habitats used will be noted and numbers of individuals estimated by habitat use and seasonality. Acoustic monitoring will be used. Results will be documented in ONR annual reports.

Monitoring and Surveying at Dillingham Military Reservation

The *Biological Opinion of the USFWS for Routine Military Training and Transformation of the 2nd Brigade, 25th Infantry Division (Light), U.S. Army Installations, Island of Oʻahu*, (1-2-2003-F-04), dated October 23, 2003, (USFWS 2003a) directs the Army to conduct federally listed bird species monitoring at Dillingham Military Reservation (DMR). The Army is to conduct surveys and monitoring at Crowbar Ranch Pond for the presence of federally listed wetlands birds. USAG-HI will conduct monitoring to determine if nesting migratory birds are present and if noise traffic from military convoys is resulting in an adverse impact. The Army will sign the area, restricting access, and work with the Directorate of Plans, Training, Mobilization, and Security (DPTMS) to produce and distribute no-go maps to military units.

Marine Reptile Monitoring at Mākua Military Reservation

The National Marine Fisheries Service requested that USAG-HI document any sightings of federally listed animal in the Mākua Military Reservation (MMR) action area and report those species to them. National Marine Fisheries Service (NMFS) believes that the threatened green sea turtle (*Chelonia mydas*) is present within the MMR action area. The endangered hawksbill turtle (*Eretmochelys imbricata*), according to NMFS, may also be present, but it is very uncommon in the action area. NMFS has requested USAG-HI to document the sightings of any federally listed animal in the MMR action area (NMFS 2006).

Critical Bird Habitat Improvement

Critical bird habitat improvement is conducted annually for Oʻahu ʻelepaio, pueo and ʻiʻiwi bird species.

Humpback Whale Monitoring at Mākua Military Reservation

Monitoring of the humpback whale (*Megaptera novaeangliae*) is to be conducted during CALFEX training at Makua Military Reservation (MMR). Military aircraft are required to avoid getting within 1,000 ft of whales. National Marine and Fisheries Service (NMFS) required that monitoring be

conducted to ¼ of a mile out from the shoreline (NMFS 2006). A noise study was conducted to determine impacts from noise produced by weapons firing at MMR on marine mammals in 2005 by Marine Acoustics, Inc. It was determined that it is highly unlikely that marine mammals potentially present offshore of MMR would be affected by a single or multiple combined arms live-fire exercises (CALFEX) being conducted at the MMR (Messeggee and Labak 2005). NMFS required that a follow hydro-phonic noise study be conducted during the next CALFEX to validate the noise study conducted by Marine Acoustics, Inc. This study has not been conducted due to the cessation of CALFEX training by court order until an environmental impact statement addressing all training at MMR is completed.

Hawaiian Monk Seal Monitoring at Mākua Military Reservation

Monitoring of the Hawaiian monk seal (*Monachus schauinslandi*) is to be conducted during CALFEX training at Mākua Military Reservation (MMR). This monitoring requires overflights of the MMR beach prior to commencing training operations to search for the presence of Hawaiian monk seals that may be hauled out on the beach. If seals are present, Army will alter training operations if a seal is hauled out by avoiding direct overflights and limiting munitions use to avoid affecting the animal. These training restrictions would also be implemented to allow the animal to leave the beach voluntarily (NMFS 2006).

4.5.4 Game Management

Game management is not conducted by USAG-HI's Conservation and Restoration Branch, Department of Public Works. The USAG-HI's Provost Marshal's Office at Schofield Barracks Military Reservation currently implements game management from the point of law enforcement. Hunting and fishing by the public is not allowed on USAG-HI sub-installations due to the War on Terrorism. Hunting and fishing is allowed by DoD employees, retirees and their guests. Hunting is the most commonly used form of population management for wildlife and helps reduce feral ungulate threats to endangered fauna and flora.

State of Hawai'i, Department of Land and Natural Resources' Division of Aquatic Resources (DAR) and Division of Fish and Wildlife (DOFAW), along with the USAG-HI's Provost Marshal's Office, work together to ensure that population numbers can be supported by available habitat as well as being able to sustain recreational demands. The Provost's Marshal's Office manages fishing, hunting and trapping in terms of areas available, dates within DAR and DOFAW seasons, safety requirements, permit and reporting requirements, threatened and endangered species concerns, and other parameters to avoid conflicts with the military mission and to provide safe, quality recreational experiences.

4.5.4.1 Current Game Management

Freshwater Fishing

Freshwater fishing at Schofield Barracks East Range is allowed only to active duty, reserve, retired military personnel and authorized family members, and DoD civilian employees and their civilian guests on the south fork of Kaukonahua Stream in the East Range Freshwater Fishing Area. The fishing area is above and east of the Wahiawa State Freshwater Park and extends about 3.5 miles upstream. Parking is permitted near the East Pump Reservoir Bridge.

Persons wishing to fish on Schofield Barracks East Range must have a valid state fishing license. Fishing is permitted with hook and line only, and each person is limited to two lines. All fishing is from the shore – no boats or personal flotation devices are allowed. Fishing is open throughout the year. "Catch-and release" applies to tucunare fish over 15 inches caught during 1 May to 31 July; the bag limit is four. The bag limit for bass is three (total) large and smallmouth. From 1 February to 31

March, bass over 15 inches must be released. One oscar (*Astronotus ocellatus*) may be caught. Bag limits are set by the DAR.

Hunting

USAG-HI does not manage habitats for the benefit of or to maintain non-native mammal populations. On USAG-HI lands, hunting is limited to active duty, reserve duty, and retired military personnel and authorized family members, and DoD civilian employees and their civilian guests. On leased lands used by USAG-HI, when permitted by lease, the public may use the specified training areas on weekends or holidays for hunting if the Army does not have scheduled training in those training areas. All hunters must have a valid state hunting license, and check in and out with Military Police at Schofield Barracks Military Reservation (SBMR). Only one group (two to six persons) is allowed to hunt at a time, and permits to hunt on USAG-sub-installations are issued on a first-come, first-serve basis by the Provost Marshal.

Hunting is not permitted at Mākua Military Reservation due to the presence of unexploded ordnance and threatened and endangered species and at Kawailoa Training Area.

Schofield Barracks Military Reservation—Hunting at SBMR is limited to game birds. McCarthy Flats Ranges MF 2, 3, and 4 at SBMR allow hunting for game birds in season (November through January) when the area is not in use for military training (weekends, federal holidays). Hunters must check in with Range Control personnel. Game birds may be hunted with a shotgun no larger than 12 gauge and shot size no larger than No. 6. Dogs are permitted, but must be restrained except when actually hunting. Bag limits for specified species are designated annually by DOFAW. Present game bird species include ring-neck pheasants, green pheasants, Erckels francolin, barred dove, and spotted dove. One small group (two to six persons) is allowed in a hunting area at a time, and permits are issued on a first-come, first-serve basis at Range Control. Areas with high grass or near government property (including earth berms, targets) are off-limits. Figure 4.5.a shows Army hunting areas near SBMR. The State of Hawai‘i does not administer any hunting areas on SBMR.

Schofield Barracks East Range—Hunting is limited to wild pigs. Three hunting areas are located on Schofield Barracks East Range (SBER) (Figure 4.5.b). The areas are open for hunting during the week or on weekends and holidays when not in use for military training. Wild pigs may be taken with bow and arrow, spear, and/or knife with dogs in Hunting Area 1. Firearms are not permitted. Hunting Area 2 permits the use of shotgun with slugs, bow and arrow, spear, and/or knife with dogs. Dogs must be restrained except when actually hunting. There are no bag limits.

The state of Hawai‘i does not administer any hunting areas on SBER. The public is not allowed to hunt on SBER.

Kawailoa Training Area—Hunting includes wild pigs and goats. Hunting is allowed in most of Training Area K1B (Figure 4.5.c), which includes the Ewa Forest Reserve (Poamoho Section). State Public Hunting Area (part of Unit C) is located in Kawailoa Training Area (KLOA) between Poamoho Trail and the Schofield-Waikāne Trail. Access to the hunting area is via the Schofield-Waikāne Trail through East Range. Wild pigs and wild goats of either sex may both be taken with shotguns with slugs, bow and arrow, spear, and/or knife with dogs. Rifles and handguns are not permitted. Dogs must be restrained except when actually hunting. Bag limits are set by Division of Fish and Wildlife annually. Normally one pig and one goat of either sex may be taken per day. The area is open for DoD community hunting, with the exclusion of Kamehameha School lands, and when not in use for military training. The DoD community is not permitted to hunt when the public is hunting (weekdays or federal holidays with no scheduled training). Only one group (two to six persons) is allowed to hunt at a time in each hunting area.

Recreation Areas
Schofield Barracks Military Reservation

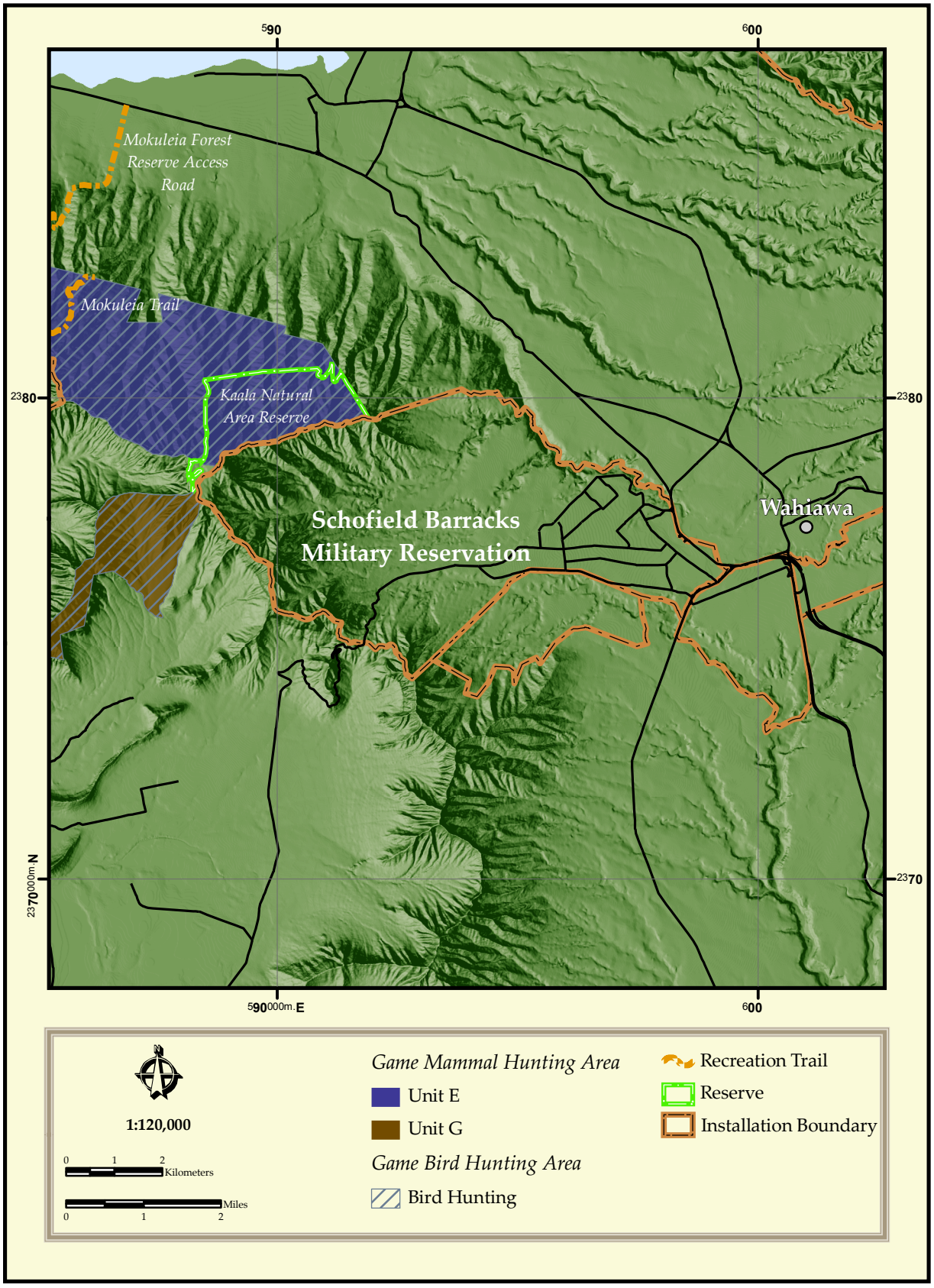


Figure 4.5.a

Recreation Areas near Schofield Barracks East Range

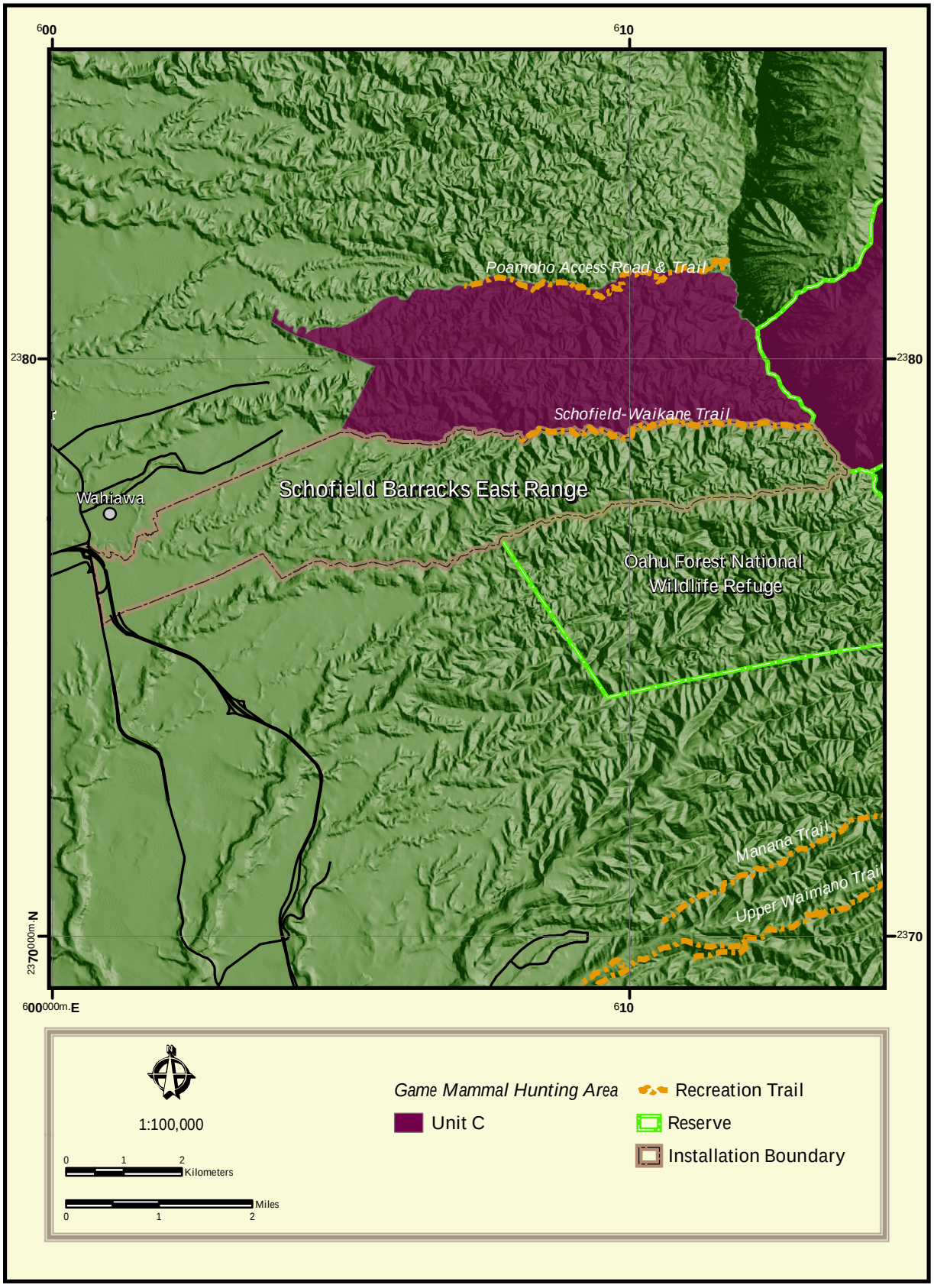


Figure 4.5.b

Recreation Areas on and near Kawailoa Training Area

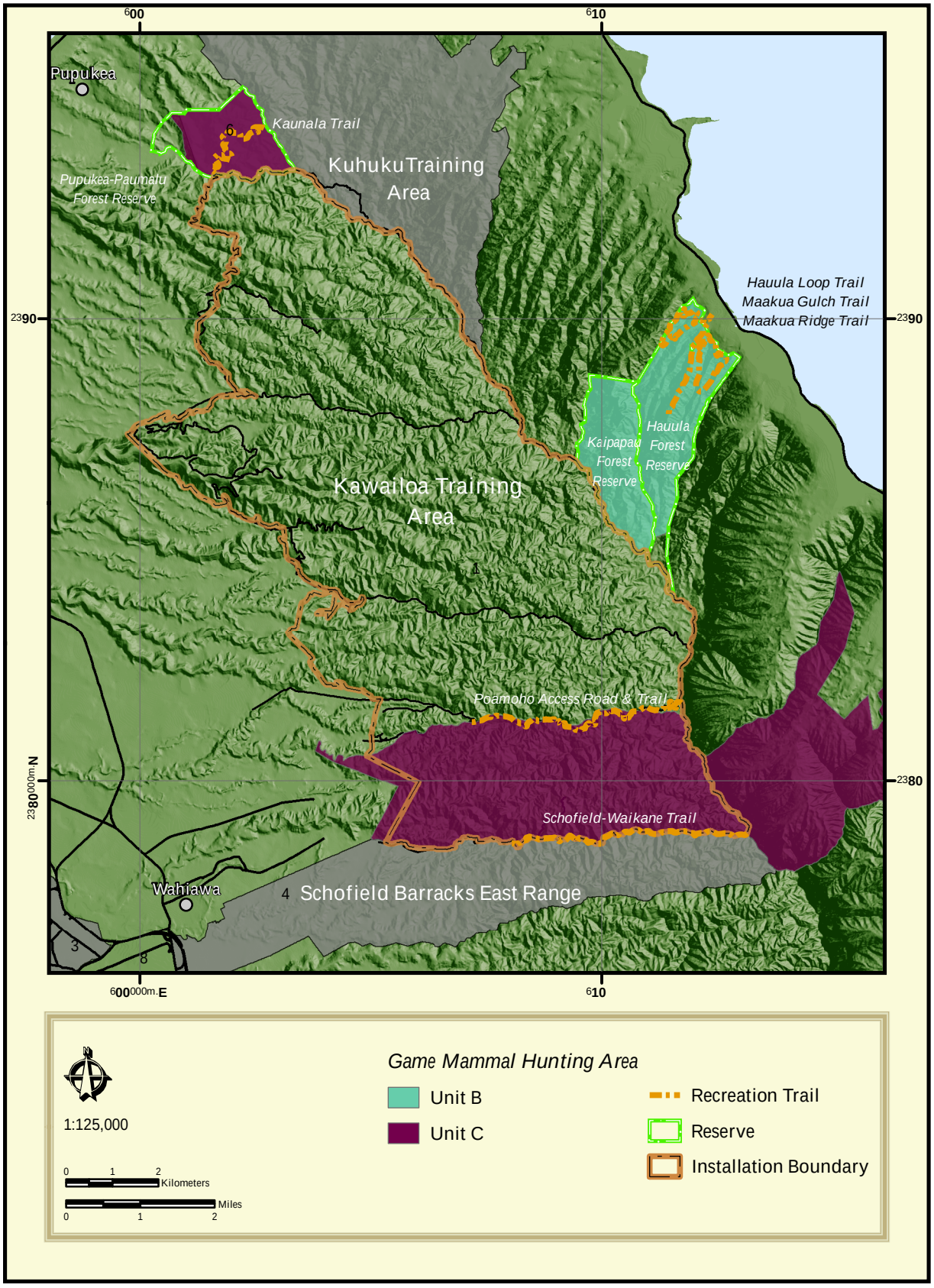


Figure 4.5.c

The general public is allowed to hunt the state-owned portion of KLOA, which is the southern end of the sub-installation (Area C). Public hunting is allowed on Saturday, Sunday, and federal holidays, unless military training activities have been announced prior to a weekend or holiday, and is permitted from 30 minutes before sunrise to 30 minutes after sunrise. Goats and pigs are the only game animals that can be taken. One pig and one goat of either sex may be taken per day. Rifles and handguns are not permitted for hunting, but shotguns with slugs, bow and arrow, spear, and/or knife with dogs are all allowed. Hunting dogs must be kept under restraint except while hunting.

Kahuku Training Area—Hunting includes wild pigs, goats, and game birds. Game bird and wild pig hunting is allowed in Training Area A-1 when not scheduled for training or being used for motocross racing (usually weekends). Training Area A-1 is accessed from Kamehameha Highway on the road leading through Alpha Gate to the motocross track. Game birds may be hunted in season (November – January) with a shotgun no larger than 12 gauge and shot size no larger than No. 6. Bag limits vary depending on the species and are set annually by Division of Fish and Wildlife. Wild pigs may be hunted from February to October. Dogs are permitted, but must be kept under physical restraint except while actually hunting. Knives and spears are the only weapons allowed for pig hunting. Only one hunting group is allowed (two to six hunters per group) for safety reasons.

Pupukea State Public Hunting Area (part of state Hunting Unit C) is located in Training Area A-3 on Kahuku Training Area. The area is open to active duty, reserve, retired military personnel and authorized family members, and DoD civilian employees and their guests on weekdays when Training Area A-3 is not in use for military training. Only one hunting group (two to six persons) is allowed in the training area at a time. Parking is allowed along the paved road near the hunting area.

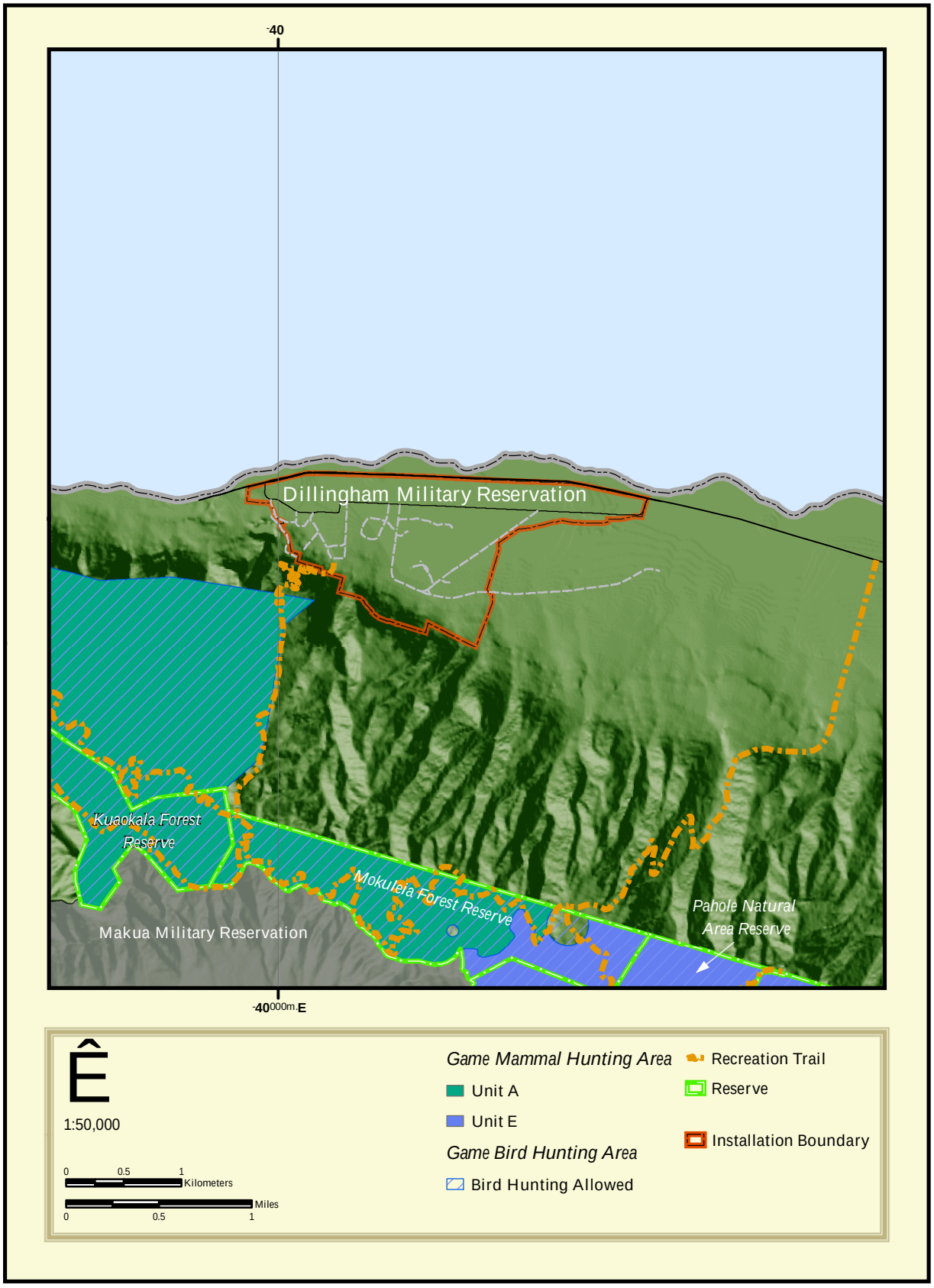
Both goats and pigs may be hunted using shotguns with slugs, bow and arrow, spear, and/or knife with dog. Rifles or handguns are not permitted. Dogs must be kept under restraint except while actually hunting. Bag limits are set annually by Division of Fish and Wildlife. Normally one pig and one goat of either sex may be taken per day. The area is not used for military training when used for public hunting on weekends. The Pupukea Boy Scout Camp, located between Pupukea Road and Kaleleiki Stream, is not part of the hunting area. A safety zone is established from 100 yards west of Kaleleiki Stream.

Public hunting is also permitted in the Pupukea State Public Hunting Area (part of Unit C, Figure 4.5.d) in Kahuku Training Area A-3 on Saturdays, Sundays, and federal holidays, unless military training activities have been announced prior to a weekend or holiday. Hunting is allowed from thirty minutes before sunrise to thirty minutes after sunset. It is accessible from the Pupukea Road off Kamehameha Highway. Goats and pigs are the only game animals that can be taken. One pig and one goat of either sex may be taken per day. Only shotguns, bow and arrow, and spear or knife with dog are allowed. Hunting dogs must be kept under restraint except while hunting. Access to the hunting area is through the Air Force Station (subject to military activities). The state maintains a hunter check station for Kahuku Training Area.

Dillingham Military Reservation—Hunting is limited to wild pig in a designated area south of the airfield (Figure 4.5.e). The area is open to military personnel and family members, DoD civilian employees and their civilian guests on weekends and federal holidays. The area may be accessed from Farrington Highway, and parking is available outside the Dillingham (east) Gate. Hunters may use spears and knives to hunt. Firearms, bows and arrows, and other weapons are not allowed. Hunting dogs may be used, although they must be kept under physical restraint except when actually hunting. There are no bag limits, although only one hunting group (two to six people) is allowed, and permits are issued on a first-come, first-serve basis by the Provost Marshal. The westernmost tip of Dillingham Military Reservation is off-limits to hunting due to the Keālia Trail. All hunters must

Recreation Areas on Kahuku Training Area

Figure 4.5.d


-40
Dillingham Military Reservation
Kuaokala Forest Reserve
Mokuleia Forest Reserve
Pahole Natural Area Reserve
Makua Military Reservation
-40000m E
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1:50,000
0 0.5 1
Kilometers
0 0.5 1
Miles
Game Mammal Hunting Area
Unit A
Unit E
Game Bird Hunting Area
Bird Hunting Allowed
Recreation Trail
Reserve
Installation Boundary

Figure 4.5.f

have a valid state of Hawai‘i hunting license. The state of Hawai‘i does not administer any hunting areas on Dillingham Military Reservation.

State of Hawai‘i Department of Forestry and Wildlife (DOFAW)—DOFAW in cooperation with USAG-HI's Provost Marshal's Office manages the hunting program and its associated game management program on O‘ahu sub-installations (DOFW *Rules Regulating Game Hunting*, January 2003, Title 13, Chapter *Birds*—122, *Mammals*—123). DOFAW has primary responsibility for determining legal weapons, bag limits, and season dates. Hunting regulation booklets are made available to the public annually by DOFAW.

Goal 1: Knowledge of the fish, wildlife and game present and their distribution on USAG-HI sub-installations.

Goal 2: Knowledge of the factors influencing the existence of fish, wildlife and game on USAG-HI sub-installations.

Goal 3: Develop additional hunting opportunities on USAG-HI sub-installations for wild pigs, goats, and game birds.

Objective 1: Install signage at important wildlife habitats on Dillingham Military Reservation by FY 2011.

Objective 2: Develop no-go areas with the Directorate of Plans, Training, Mobilization and Security (DPTMS) when nesting, native birds are present at Dillingham Military Reservation.

4.6 Migratory Bird Management

4.6.1 Policy and Background

A minimum of 80 migratory bird species have been observed on the Island of O‘ahu that are protected by the Migratory Bird Act and Executive Order (EO)13186 (*Responsibilities of Federal Agencies to Protect Migratory Birds*, 10 January 2001) (Walther 2008). The Migratory Bird Treaty Act states that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected. The act is a domestic law that affirms and implements the U.S. commitment to four international conventions for the protection of a shared migratory bird resource. On 28 February 2007, USFWS finalized a rule (*Migratory Bird Permits, Take of Migratory Birds by the Armed Forces*, 72 FR 8931) allowing the Armed Forces to "take" migratory birds in the course of military readiness activities, as directed by the 2003 National Defense Authorization Act (2 December 2002).

In July 2006, the DoD and the USFWS entered into a Memorandum of Understanding (MOU) to Promote the Conservation of Migratory Birds, as required by EO 13186. This MOU requires early planning and coordination between the military and the USFWS for project specifically affecting migratory birds, and emphasizes an interdisciplinary, collaborate approach to migratory bird conservation. The goal is to minimize loss or degradation of habitats on DoD-managed lands and to strive to protect, restore, enhance, and mange habitat for migratory birds. This is to be accomplished by identifying and avoiding management actions that have the potential to adversely affect migratory bird populations. One mechanism noted is the control of introductions, establishment, and spread of non-native plants and animals that may be harmful to migratory bird populations , as required in EO 13112 (*Invasive Species*, 3 February 1999). The DoD agreed to follow all migratory bird permitting requirements for non-military readiness activities, incorporate migratory bird management objectives into DoD planning and documents, provide access to military lands for surveys for USFWS and other partners, fuel management, and more.

A rule in February 2007 addressed situations where, if the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of migratory bird species, then they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

The February 2007 rule also defines:

> *Military Readiness Activity*, as defined in Pub. L. 107-314, Sub-Section 315 (f), 116 stat. 2458 (Dec. 2, 2002) [Pub. L. Sub-section 319 (c) (1),], includes all training and operations of the Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. It does not include (1) routine operation of installation operating support functions such as administrative offices, military exchanges, commissaries, water treatment facilities, storage facilities, schools, housing, motor pools, laundries, moral, welfare and recreation activities, shops, and mess halls; (2) operation of industrial activities; or (3) construction or demolition of facilities listed above.
>
> *Conservation measures*, as used in Sub-Section 21.15, means project design or mitigation activities that are reasonable from a scientific, technological, and economic standpoint and are necessary to avoid, minimize, or mitigate the take of migratory birds or other adverse impacts. Conservation measures should be implemented in a reasonable period of time.
>
> *Significant adverse effect on a population*, as used in Sub-Section 21.15, means an effect that could, within a reasonable period of time, diminish the capacity of a population of migratory bird species to sustain itself at a biologically viable level. A population is "biologically viable" when its ability to maintain its genetic diversity, to reproduce, and to function effectively in its native ecosystem is not significantly harmed. This effect may be characterized by increased risk to the population from actions that cause direct mortality or reduce fecundity. Assessment of impacts should take into account yearly variations and migratory movements of the impacted species. Due to the significant variability in potential military readiness activities and the species that may be impacted, determinations of significant measurable decline will be made on a case-by-case basis.

If conservations measures are required due to significant adverse effect determination under paragraph (a)(1) of Sub-Section 21.14 and require monitoring, the Armed Forces must retain records of any collected data for five years from the date the Armed Forces commence an action. During Integrated Natural Resources Management Plan reviews, the Armed Forces will report migratory bird conservation measures implemented and the effectiveness of the conservation measures in avoiding, minimizing, or mitigating take of migratory bird to USFWS.

On 28 July 2008, a second Interim Memorandum addressed *Unintentional Take of Migratory Birds for Actions Other than Military Readiness*. There is no authorization or permitting process in place for the unintentional take of a migratory bird during non-military readiness activities. These activities include routine installation operations, maintenance, and construction.

USAG-HI has identified potential measures to minimize and mitigate adverse impacts of authorized military readiness activities on migratory birds.

- Identify techniques and protocols to monitor impacts of such activities.
- Identify migratory birds present on O'ahu Army installations.

- Knowledge of their habits and life histories is an essential step to minimizing and mitigating takes.
- Conserve and improve habitat where necessary.
- Maintain forest buffers.
- Control feral animals (in particular feral cats and rats).
- Control invasive species that crowd out other species necessary for migratory bird survival (e.g., brown tree snake, Japanese honeysuckle, kudzu, and brown-headed cowbirds).

The rule relies on the use of the National Environmental Policy Act process to determine whether any ongoing or proposed military readiness activity is "likely to result in a significant adverse effect on the population of a migratory bird species." The rule does not negate the need for the Armed Forces to continue to apply for and receive a Migratory Bird Treaty Act permit for scientific collecting, bird control on military lands, or any other activity that is addressed in current permit regulations.

4.6.2 Current Management

Migratory birds can contribute to the bird/animal strike hazard at Wheeler Army Airfield, Dillingham Military Reservation, and Bradshaw Army Airfield (see Section 4.14, *Bird/Animal Aircraft Strike Hazard*). USAG-HI ONR staff does not consider current Army training, to include life-fire exercises at O'ahu training areas, as significantly impacting migratory birds (M. Mansker, NR Program Manager, pers. com. 2008).

The presence of nesting native birds as well as birds identified in the MBTA, their eggs and young, are considered when associated with non-military readiness activities, such as prescribed burning/mowing of fields, equipment maintenance, and vegetation removal. The potential loss or unintentional "take" of active nests is minimal and does not significantly affect migratory species. Indirect impacts that could cause habitat loss are not at a level that would result in significant impacts. Many of the measures associated with the implementation plans improve and preserve habitat quality for migratory species (e.g., removal of feral cats and rats, reduction of non-native plant species and improvement of overall ecosystem quality, etc.).

Annual forest bird surveys conducted by the ONR staff and the Audubon Society's annual Christmas Bird Count document the migratory birds encountered at USAG-HI O'ahu sub-installations. Nine migratory bird species are known on Schofield Barracks Military Reservation, in which there are three native and six non-native species. Nine migratory bird species are known on Schofield Barracks East Range, in which there are three native and six non-native species. Five migratory bird species are known on Kawailoa Training Area, in which there are three native and two non-native species. Seven migratory bird species are known on Kahuku Training Area, in which there are three native and four non-native species. Four migratory bird species are known on Mākua Military Reservation, in which there are three native and one non-native species. Seven migratory bird species are known on Dillingham Military Reservation, in which there are five native and two non-native species (see Appendix 3, *Species Lists*).

Goal 1: Ensure the Army meets the requirements for migratory birds under the Migratory Bird Treaty Act.

Objective 1: Develop and implement a Migratory Bird Management Plan as part of the INRMP with the USFWS. The plan should include a list of potential migratory bird species, appropriate survey methods for each species, a species profile, potential habitats, and improvements that could be made to existing habitats on O'ahu sub-installations.

Objective 2: Conduct surveys for migratory birds as well as native bird species that describe habitat types and requirements, limits breeding, and identifies habitat types requiring improvements to support these species on O'ahu installations.

Objective 3: Make information from surveys available for inclusion in various environmental documentation (e.g., National Environmental Policy Act).

Objective 4: Document and report birds "taken" as a result of military readiness activities and "takes" to the USFWS. This information will be incorporated into the annual INRMP review.

4.7 Vegetation Management

4.7.1 Policy and Background

Installations are required to have knowledge of the floral resources located on them. Watershed, fuel break/fire management, invasive species control, and soil conservation can all be viewed as components of vegetation management. Meeting the objectives of each of these components requires an integrated approach.

4.7.2 Floristic Surveys

Planning level surveys are an initial step to understanding the floral resources present on an installation. Just as wildlife benefits from planning level surveys (see Section 4.5, *Fish and Wildlife Management*), so do plants. The survey must produce a list of plant species with verified nomenclature, classification, and annotation compatible with the Natural Resources Conservation Service's (NRCS) Plant List of Accepted Nomenclature, Taxonomy, and Symbols (PLANTS). DoDI 4715.3, *Environmental Conservation Program* (3 May 1996) directs that installation-wide surveys be conducted for locally rare and keystone species. DA memorandum, *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys and Integrated Natural Resources Management Plan* (21 March 1997) further stipulates that a floral planning survey must be completed and at a minimum will be "an installation-wide vascular plant survey that produces a list of plant species."

Typically, an initial comprehensive installation-wide floristic survey is conducted over a span of three years and includes a voucher for each species identified. In 1996, USAG-HI completed a one-year survey for Schofield Barracks Military Reservation, Schofield Barracks East Range, and Mākua Military Reservation. Unfortunately, access to certain maneuver areas and training facilities was denied because of changes in training requirements, resulting in an incomplete survey.

Since then, threatened and endangered species management has become a priority, and USAG-HI has limited its efforts to surveying those areas where there is a potential for threatened or endangered species, species of concern, or keystone species. USAG-HI does not inventory areas within a sub-installation where the safety issues or risks to surveyors (i.e., exposure to unexploded ordnance or severe terrain such as cliffs and extremely steep terrain) outweigh the need for data.

Inventories and surveys not only provide a list of species present, but also can provide information on vegetative composition, species diversity/complexity, and condition. These data identify environmental assets, presence and absence of potential training constraints, and land management issues and benefits. Lists of locally rare and keystone species are available from the Hawai‘i Biodiversity & Mapping Program and Hawaii's Department of Land and Natural Resources, Comprehensive Wildlife Conservation Strategy (Ogura et al. 2005). USAG-HI is in the process of developing keystone flora species lists for each of its sub-installations. These data provides support materials for National Environmental Policy Act (NEPA) analysis and other documents.

4.7.3 Vegetation Mapping

A vegetation community's map is a required planning level survey that all Department of the Army installations are required to have and maintain. AR 200-1, *Environmental Protection and Enhancement* (20 August 2007), directs that vegetation communities surveys be conducted that will include field data, which describes and maps the distribution of and extent of dominant and co-dominant plant communities (alliances). This essential baseline and background information is used in supporting National Environmental Policy Act, Endangered Species Act, and other documents. A vegetation map may detail plant species and dominant life forms, but it is also the basis for defining wildlife habitats.

Limited vegetation community maps were initially created for USAG-HI sub-installations by R. M. Towell Corporation (1997a), but only addressed rare community types for each of the sub-installations.

New maps were developed for USAG-HI sub-installation by the Center for Environmental Management of Military Lands (CEMML) in 2003 that covered the entire area of each of the sub-installation (Kennaway 2003). The plant community-mapping schema was derived from a combination of three sources. First, Wagner's *Flowering Plants of Hawai'i*, (1999) was consulted for general plant community descriptions. Second, general descriptions were refined to reflect on site conditions with information from the ONR staff of USAG-HI. Third, the descriptions were further refined with field observations. The resulting schema represented plant communities and other land cover types found within the sub-installations' boundaries.

Dr. Samuel M. ‘Ohukani‘ohi‘a Gon III, Senior Scientist / Cultural Advisor for The Nature Conservancy of Hawai‘i, is concerned that the maps failed to discern smaller, but significant patches of a variety of native forest and shrubland types, but was good at characterizing the alien vegetation types.

4.7.4 Current Management

Plant collections have been made during the course of other studies. As such, many of the plants known to be present on USAG-HI sub-installations may not be scientifically documented by voucher collection. The current Kahuku Training Area (KTA) vegetation map does not cover the entire sub-installation. Additional land was acquired for KTA after the completion of the current vegetation map. USAG-HI has contracted U.S. Geological Survey to determine vegetation trends by conducting monitoring and mapping.

Goal 1: Knowledge of the vegetation present and its distribution on USAG-HI sub-installations.

Goal 2: Knowledge of the factors influencing the distribution of native vegetation types on USAG-HI sub-installations.

Goal 3: Knowledge of the location of the major vegetation types on USAG-HI sub-installations.

Goal 4: Knowledge of the relationship between vegetation and soils on USAG-HI sub-installations.

Goal 5: Provide floristic support to USAG-HI sub-installations and outside agencies.

Objective 1: Conduct initial installation-wide survey for the South Range Acquisition Area to identify and voucher all vascular plant species on training areas.

Objective 2: Update vegetation communities map for Kahuku Training Area to include recent acquisitions that will identify the major and significant plant communities and defines plant communities in the current accepted format for O'ahu sub-installations.

Objective 3: Update vegetation community maps for Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area, Dillingham Military Reservation and Mākua Military Reservation to show the smaller, but significant patches of native forest and shrubland types.

Objective 4: Identify plant community types susceptible to soil erosion rates greater than acceptable limits as defined by the Natural Resources Conservation Service (NRCS) on USAG-HI sub-installations.

Objective 5: Conduct surveys as needed to support federally listed species management.

4.8 Forest Management

4.8.1 Policy and Background

It is Army policy to maintain, restore, and manage its forested lands on an ecosystem basis. The Army forest management program is required to support and enhance the immediate and long-term military mission and to meet natural resources stewardship requirements set forth in federal laws. Forest ecosystems perform important, sometimes unique, natural resource functions, which we inherently value, and are of benefit to all living things.

USAG-HI decided in 2000 that it was not viable to establish commercial timbering on its sub-installations. Forest resources are used to meet mission objectives, preserve forest ecosystems, and support threatened, endangered, and at-risk species. A continuous forest canopy with a dense understory is preferred by the O'ahu 'elepaio. VanderWerf et al. (1997) notes that 'elepaio densities are about twice as high in tall riparian vegetation compared to scrubby. Maintaining the forest structure maybe more important for 'elepaio than species composition; however, non-native composition can affect fire frequency and the loss of habitat.

Forest management focuses on improving and, when necessary, restoring previously degraded forest ecosystems on Army installations. Forest ecosystem management strategies are broad-based to optimize overall natural resources benefits and biodiversity of native vegetation. Forest ecology is more than maintaining trees, and includes supporting a healthy complex system that is not influence by non-native vegetation and fire. O'ahu Army forests are managed for species richness/biodiversity and for the constituent elements that support native animals and plants.

4.8.2 Current Management

The ONR staff has identified the numbers of acres/hectares for each forest community type located on each O‘ahu sub-installation (Table 4.8).

Table 4.8.a Schofield Barracks Military Reservation Forest Communities Outside the Cantonment Area.*

Forest Community Type	Acres	Hectares
Aleurites moluccana (kukui) Forest	57.9	23.4
Casuarina spp. (ironwood) Mixed Forest	25.0	10.1
Eucalyptus spp. Mixed Forest	141.9	57.4
Melaleuca quinquenervia (paper bark eucalyptus) Forest	21.6	8.7
Metrosideros polymorpha (ohi‘a) / *Acacia koa* / *Dicranopteris linearis* (uluhe) Diverse Native Forest	1,748.8	707.7
Schinus terebinthifolius (Christmas berry) Forest	1,530.0	619.2
Syzygium cumini (Java plum) Forest	18.4	7.4
Total Forest Communities Area	**3,543.6**	**1,433.9**

* Source: GIS Data Layers, Plant Community Mapping, Military Training Lands, U.S. Army Hawai‘i O‘ahu, Center for Environmental Management of Military Lands Colorado State University, August 2003. All areas were calculated in WGS1984 UTM Zone 4N.

Table 4.8.b Schofield Barracks East Range Forest Communities Outside the Cantonment Area.

Forest Community Type	Acres	Hectares
Aleurites moluccana (kukui) Forest	6.2	6.2
Casuarina spp. (ironwood) Mixed Forest	157.0	157.0
Eucalyptus spp. Mixed Forest	1244.2	1244.2
Melaleuca quinquenervia (paper bark eucalyptus) Forest	145.8	145.8
Metrosideros polymorpha (ohi‘a) / *Acacia koa* / *Dicranopteris linearis* (uluhe) Diverse Native Forest	2,015.7	2,015.7
Syzygium cumini (Java plum) Forest	2.8	2.8
Total Forest Communities Area	**3,571.7**	**1,433.41**

See Table 4.8.a footnote.

Table 4.8.c Kawailoa Training Area Forest Communities.

Forest Community Type	Acres	Hectares
Aleurites moluccana (kukui) Forest	48.9	19.8
Casuarina spp. (ironwood) Mixed Forest	500.2	202.4
Eucalyptus spp. Mixed Forest	2,601.8	1,052.9
Melaleuca quinquenervia (paper bark eucalyptus) Forest	59.9	24.2
Metrosideros polymorpha (ohi‘a) / *Acacia koa* / *Dicranopteris linearis* (uluhe) Diverse Native Forest	19,156.3	7,752.3
Schinus terebinthifolius (Christmas berry) Forest	158.9	64.3
Syzygium cumini (Java plum) Forest	30.2	12.2
Total Forest Communities Area	**22,556.2**	**9,128.1**

See Table 4.8.a footnote.

Table 4.8.d Kahuku Training Area Forest Communities.

Forest Community Type	Acres	Hectares
Aleurites moluccana (kukui) Forest	9.9	4.0
Casuarina spp. (ironwood) Mixed Forest	696.4	281.8
Eucalyptus spp. Mixed Forest	243.5	98.5
Melaleuca quinquenervia (paper bark eucalyptus) Forest	33.7	13.6
Metrosideros polymorpha (ohi‘a) / *Acacia koa* / *Dicranopteris linearis* (uluhe) Diverse Native Forest	226.7	91.7
Schinus terebinthifolius (Christmas berry) Forest	320.1	129.5
Syzygium cumini (Java plum) Forest	235.6	95.3
Total Forest Communities Area	**1,765.9**	**714.4**

See Table 4.8.a footnote.

Table 4.8.e Dillingham Military Reservation Forest Communities Outside the Cantonment Area.

Forest Community Type	Acres	Hectares
Casuarina spp. (ironwood) Mixed Forest	20.8	8.4
Eucalyptus spp. Mixed Forest	10.2	4.1
Schinus terebinthifolius (Christmas berry) Forest	30.5	12.3
Total Forest Communities Area	**61.5**	**24.8**

See Table 4.8.a footnote.

Table 4.8.f Mākua Military Reservation Forest Communities.

Forest Community Type	Acres	Hectares
Aleurites moluccana (kukui) Forest	213.7	85.5
Casuarina spp. (ironwood) Mixed Forest	4.2	1.7
Schinus terebinthifolius (Christmas berry) Forest	239.6	97.0
Syzygium cumini (Java plum) Forest	11.3	4.6
Total Forest Communities Area	**468.8**	**188.8**

See Table 4.8.a footnote.

Range Division Hawai‘i uses the Land Rehabilitation and Maintenance (LRAM) program to improve timber stands (for maneuverability) and reduce potentially hazardous fuel loads. Under the Tactical Concealment and Training Corridor Enhancement programs, LRAM plans to remove Haole Koa trees and to open up a large off-road maneuver area for training at Kahuku Training Area.

Forest Pest Control: ONR staff coordinates and works with USDA to control insects such as black twig borer that impact endangered plant (tree/shrub) species. Other pests that affect native plant and animal composition are rats, ungulates, and feral cats.

Goal 1: Sustain viable and diversified training lands to meet the military mission.

Goal 2: Improve the biodiversity of species and habitat of USAG-HI sub-installations.

Goal 3: Improve watershed protection and soil conservation of USAG-HI sub-installations.

Goal 4: Improve wildlife habitat, including habitat for threatened and endangered species of plants and animals.

Goal 5: Improve the natural beauty of USAG-HI sub-installations.

4.9 Pest Management

4.9.1 Policy and Background

The Army Pest Management Program is regulated by the following DoD guidelines:

- DoD Directive 4715.1 establishes policies for environmental security within the DoD.
- DoD Instruction 4150.7 implements policies, responsibilities, and procedures for the DoD Pest Management Program.
- DoD Instruction 4150.7-Plan specifies procedures for certifying pesticide applicators at DoD installations under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) (40 CFR 171.8) jurisdiction. The U.S. Environmental Protection Agency (EPA) has approved the DoD Plan.
- DoD 4150.7-Manual specifies standards and procedures for all non-FIFRA training of DoD pest management personnel.
- AR 200-1, *Environmental Protection and Enhancement.* Chapter 5, *Pest Management*, date 13 December 2007.

DoD requirements for integrated pest management plans apply to all Army installations with pest management operations. Integrated pest management plans are reviewed and approved by Army Command (ACOM) pest management consultants. A pest management plan promotes effective integrated pest management, safeguards the environment and human health, supports stewardship of natural and cultural resources, protects property, and complies with applicable laws, regulations, and policies.

The initial pest management plan for USAG-HI was authorized in 1997 and updated in 2008. The execution of the plan is under the Installation Pest Management Coordinator. Annual plan updates are submitted annually to the Command Consultant for review by 30 October. Annual review reports are submitted to the USAG-HI Commander, IMCOM-PAC, U.S. Army Pacific; and the Commander, U.S. Army Environmental Center Pest Management Consultant.

The USAG-HI's pest management plan describes the pest management requirements for each sub-installation; outlines the resources necessary for pest surveillance and control; describes the administrative, safety, and environmental requirements of the program; and how resources and requirements enable USAG-HI to provide effective pest control (USAG-HI 1997). The Installation Pest Management Plan includes implementation and coordination for optimum sanitation, sound structural design and maintenance of facilities, and mechanical, regulatory, cultural, and biological controls.

USAG-HI recognizes nine categories of pests and undesirable vegetation that require management:

1. Real property pests (structural/wood destroying pests (e.g., termites, powder post beetles).
2. Disease vectors and medically important arthropods (e.g., mosquitoes; house, blow, and moth flies; bees, wasps, spiders and other stinging and biting arthropods).
3. Stored products pests (e.g., rodents).
4. Ornamental plant and turf pests (e.g., various noctuid caterpillars, scale insects, beetles, etc.).

5. Undesirable vegetation (e.g., weeds control along fence lines, ditches, roadsides, firebreaks, cantonment area, etc.).
6. Vertebrate pests (e.g., rodents, mongooses, cats, dogs, birds, etc.).
7. Household and nuisance pests (e.g., cockroaches, ants, fleas, etc.).
8. Quarantine pests (i.e., the inspection of cargo for pests such as the brown tree snake).
9. Other pest management (e.g., removal of dead animals).

The installation pest management plan addresses the sale and distribution of pesticides, health and safety (e.g., hazard communications, pest control vehicle standards, use of spill kits and spill response, fire protection), environmental considerations (e.g., protection of the public, sensitive areas, species of concern, and pollution abatement procedures), and administration (e.g., staffing, facilities, reporting, training, and contracts).

Pest management guidance for USAG-HI O‘ahu sub-installations are found throughout the USAG-HI’s Installation Pest Management Plan. Pest control on USAG-HI sub-installations is managed by the Directorate of Public Works pest control shop (personnel), and the Directorate of Community Affairs (golf course personnel) in the cantonment areas. ONR staff and contractors conduct pest management, including weed control and feral animal control activities in the training areas.

ONR staff efforts focus on those pest management issues that are related to endangered species management. There can be overlap and, as such, some activities need to be coordinated. ONR staff works to minimize the effects of undesirable vegetation (Item 5), vertebrate pests (Item 6) and, with the help of ITAM staff, quarantine pests (Item 8).

4.9.2 Invasive Species Management

4.9.2.1 Policy and Background

Executive Order 13112 requires all federal agencies to prevent the introduction of invasive species, provide control, and minimize the economic, ecologic, and human health impacts that invasive species may cause. The effects of invasive species is further addressed in an Army Policy Guidance (*Management and Control of Invasive Species*) distributed June 2001. The requirement to implement invasive species management is identified in the U.S. Army Environmental Cost Standardization Model (formerly the Environmental Program Requirements), the Sikes Act for natural resources stewardship requirements, the Endangered Species Act when protecting or managing listed species and critical habitat, and the Clean Water Act when invasive species are involved in erosion control and wetlands (DA 2001). Installations are required to “monitor invasive species populations, and track the presence and status of invasive species over time to determine when control measures are necessary and to evaluate the effectiveness of prevention, control/eradication, and restoration measures.”

Invasive species are defined as non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species include plants, animals, and other organisms (e.g., microbes). These species are typically introduced by human actions; however, they can be unconsciously carried to new locations by other organisms (e.g., seed in a bird’s gullet), wind, and water. Invasive species can be a threat to natural resources, impact local economies, and adversely affect the military mission. An invasive species is further defined as any species part, including its seeds, eggs, spores, or other biological material, capable of propagating that species.

The purpose of the USAG-HI invasive species program is to detect and manage invasive species and to inhibit negative impacts to federally listed threatened or endangered species, the environment, and military training operations. Objectives of the program are to:

- Conduct ongoing monitoring for invasive species including vegetation, alien reptile species, insects, and mammals.
- Conduct periodic surveys for invasive species including vegetation, birds, insects, and mammals. Include invasive species surveys into planning level surveys and use data collected from Range and Training Land Assessments.
- Determine the location (map) and extent of invasive species and document this information in a Geographic Information System (GIS).
- Determine management priority of an invasive species.
- Develop and implement a management plan to inhibit movement of invasive species within the installation and between installations.

4.9.2.2 Invasive Plant Species Management

Stable ecosystems are thought to be invasion-resistant and a combination of species assemblages that effectively exploit resources in balance with productivity for their maintenance (Smith 1985). However, fire, non-native grazers, and non-native introductions have collectively altered the Hawaiian environment. Disturbance facilitates the success of many non-native species. Successful non-natives capture space and other resources such as light and nutrients faster than native species. Over time, non-native species can affect native species, the persistence of communities (Vitousek 1992), and landscape characteristics.

Control of invasive plant species is extremely important for the management of federally listed and rare species. A considerable amount of the ONR staff's field time is spent annually controlling non-native weed species around rare plants, along fuel breaks, fences and roads, and in military training areas. The goal of the weed control program is to aid the recovery and continuance of federally listed and rare species and to prevent weeds from occupying areas with high natural resource value. Ultimately, an effective weed control program reduces fine fuel load and increases native plant numbers.

Systematic weed control consists of hand pulling plants within one meter of a federally listed or rare plant, herbicide application beyond the one-meter boundary during favorable weather conditions, and maintenance of a weed-free zone with a gas-powered weed trimmer. Quarterly maintenance is necessary and may take two to three years to gain control. Other species may require long-term control measures.

Current Management

The 2007 USFWS Biological Opinion requires the Army to:

- Develop methods for the monitoring of invasive species.
- Develop methods for eradication of invasive species.
- Implement an invasive plant species-monitoring program to control invasive species within and adjacent to landing zones, trails, roadsides and fire damaged areas.
- Eradicate newly found weeds using the most effective means for a particular invasive species.

- Prevent secondary weed spread from fire by monitoring and eradicating newly dispersed weeds.
- Develop and implement an educational program regarding cleaning vehicles and field gear to all troops using O‘ahu installations (education material will be reviewed and approved by USFWS).
- All vehicles will be thoroughly cleaned at a wash rack facility prior to returning to O‘ahu from Pōhakuloa to minimize the risk of spreading non-native plant species. The Army will wash vehicles at SBMR and KTA at their designated wash racks prior to leaving the training areas to remove any seeds and large clumps of soil that may have accumulated on the vehicles to minimize the spread of seeds.
- To address these and other pest management issues outside the cantonment area, the ONR staff will assist the Installation Pest Management Coordinator in the development of the invasive plant and weed species management requirements at firing ranges and training areas for the revised USAG-HI Integrated Pest Management Plan.

Invasive plant species (weeds) control focuses on six principal areas (USAG-HI 2006d):

1. Preventing weed spread is accomplished primarily through education, followed by the implementation of prevention measures learned.

2. Surveying to detect new weeds before they become established. One of the greatest potentials for weed spread by the military is by vehicles along roads and vehicles disturbing soils.

3. Prioritizing weed control areas and projects. ONR staff has prioritized incipient weed control projects and weed control areas in order to ensure that the projects with the most conservation value begin first.

4. Monitoring Mākua and O‘ahu Implementation Plans-related weed control. Monitoring invasive species is required in the Mākua Biological Opinion (USAG-HI 2007a).

5. Research. There are currently few research issues related to weed management.

6. Landscaping Guidelines. The O‘ahu NR staff will be developing landscaping guidelines for USAG-HI installations so as to prevent the accidental introduction of non-native plant species that may in the future become an invasive species problem.

4.9.2.3 Invasive Animal Species Management

Ungulates and predatory mammal control are the main categories of animal control on O‘ahu sub-installations.

Some of the first non-native species to affect the Hawaiian landscape include pigs (*Sus scrofa*), dogs (*Canis lupis familiaris*), and rats (*Rattus* spp.). These species were introduced and spread by Polynesians. Europeans increased the types and diversity of mammal introductions, which included cattle (*Bos taurus*), goats (*Capra hircus*), and sheep (*Ovis aries*). The European mouflon (an undomesticated form of *Ovis aries*) was introduced to the Hawaiian Island in the 1950s (Tomich 1986; Griffin 1982). Feral mammal populations (e.g., cats—*Felis catus* and mongoose—*Herpestes auropunctatus*) have moved from populated areas to more remote sites.

While these species are not displacing native mammal species, they are affecting the landscape. They trample and remove native vegetation, and disturb, carry, and open areas that facilitate the spread of non-native plants, which enhances fire frequency and intensity and alters the composition and form of plant communities.

Current Management

Non-native invasive species control focuses on four principal areas:

1. **Ungulate Monitoring—**Monitoring is required by the Mākua Biological Opinion (USFWS 2007a). Monitoring is done by noting ungulate signs along transects, with incidental observations and scouting expeditions. Results of monitoring are reported in the annual status reports for the Mākua and Oʻahu Implementation Plans.

2. **Ungulate Control—**Animal removal began in earnest in 1995 at Oʻahu installations. In 2002, permission was given to conduct aerial hunts by Animal and Plant Health Inspection Services (APHIS), Wildlife Services (WS), which were successful.

3. **Fencing** is the most effective management method for maintaining ungulate-free areas. Fencing is effective in combination with monitoring and maintenance. Fencing is checked semi-annually, if not more often. ONR staff use a combination of galvanized hog wire fencing and panels when constructing exclosures.

   Fencing projects are slowed because of associated National Environmental Policy Act (NEPA) analysis, permitting and contracting procedures. The ONR staff uses in-house fencing crew to reduce construction costs. This saves time because the crew is already trained in proper procedures, experienced in constructing the various types of fencing and has eliminated time-consuming contracting procedures.

4. **Control—**Rodents eat seeds, arthropods, girdle twigs, and eggs and hatchlings of birds. Rodents are considered a key threat to endemic amastrid, achatinellid, helicinid land snails and Oʻahu tree snails (USAG-HI 2001). House mice, rats (*Rattus rattus*), Norway rats (*R. norvegicus*) and Polynesian rats (*R. exulans*) are the most common rodents on Oʻahu. Rodent damage has been documented on the federally endangered ʻalaʻalahua (*Alectryon macrococcus* var. *macrococcus*), haha (*Cyanea grimesiana* ssp. *obatae*), haha (*Cyanea st.-johnii*) ʻoha (*Delissea subcordata*), ale (*Plantago princeps* var. *princeps*), loʻulu (*Pritchardia kaalae*), and *Schiedea obovata* (Syn. *Alsinidendron obovatum*). Poison-bait grids have been established to control rodents. The Oʻahu Biological Opinion (USFWS 2003) supports the Army's use of aerial broadcasted rodenticides.

Other Animal Control

The USFWS Biological Opinion (2003a) requires:

All sighting of snakes and lizards must be reported to the installation's ONR program immediately.

- Washing vehicle at Pōhakuloa prior to returning to the island of Oʻahu to minimize animals (e.g., invertebrates) from hitch-hiking to Oʻahu from the Island of Hawaiʻi.
- Membership in the Oʻahu Invasive Species Committee.
- Developing a herpetofauna certification program as part of the implementation process for plant material purchased by the Department of Defense to prevent incidental introductions of herpetofauna to the Island of Oʻahu.
- Establishing a phytosanitation certification program similar to that developed in the Mākua IP (USAG-HI 2003a).

Table 4.9.a Species that Adversely Impact Federally Listed Endangered Species.

Species	Species adversely impacted
Euglandina rosea (rosy wolf snail)	ʻalaʻalahua (*Alectryon macrococcus* var. *macrococcus*)
Xylosandrus compactus (black twig borer)	ʻalaʻalahua (*Alectryon macrococcus* var. *macrococcus*), mehamehame (*Flueggea neowawraea*), Kamakahala (*Labordia cyrtandrae*),
Deroceras reticulatum (netted slug), *Veronicella cubensis* (two striped slug)	ʻalaʻalahua (*Alectryon macrococcus* var. *macrococcus*), haha (*Cyanea st.-johnii*), *Cyanea superba* ssp. *superba* (Syn. *Lobelia superba*), heart-shaped delissea/ʻoha (*Delissea subcordata*), ale (*Plantago princeps* var. *princeps*), maʻoliʻoli (*Schiedea kaalae*), Nuttall schiedea (*Schiedea nuttallii*), and *Schiedea obovata* (syn. *Alsinidendron obovatum*).

- Coordinating with the Toxicants Working Group in an effort to determine a safe toxicant for controlling populations of newly established animals and invertebrates.
- Using environmentally safe toxicants for alien species control or eradication associated with military operations or natural resources management. They shall be used pursuant to manufacturers' directions and Army Standard Operating Procedures (SOPs).
- Identifying all new introductions of an alien animals, documenting source and time. Individuals will be eradicated.

Invertebrate Control—ONR staff controls four taxon that are adversely impacting federally listed endangered species (Table 4.9.a)

USAG-HI supports research in finding effective controls of the above listed invertebrates. A list of slugs and semi-slugs as being identified on Oʻahu is located in Appendix 3, *Species Lists.* Annex G, *Oʻahu Slug Species*.

Goal 1: Remove/minimize the impacts of pest animal and plant species from Oʻahu sub-installations.

Objective 1: Control invasive species within and adjacent to landing zones, trails and roadsides.

Objective 2: Control invasive species around federally listed and rare plant species.

Objective 3: Develop a reporting system to document the introduction of new animal and plant species. Develop procedures for the aggressive removal of "new" non-native species.

Objective 4: Work with USFWS on the aerial broadcast of rodenticides.

Objective 5: Implement a pest control/invasive species control program plan.

Objective 6: Work with outside agencies on bio-controls for non-native invasive species control.

Objective 7: Utilize a program like the *Weed Information Management System* to document location and extent of invasive species.

Objective 8: Use contracted hunters, public hunters, snares/traps, rodenticides, and radio-collared animals to control ungulates, other feral animals and rodents.

Objective 9: Protect T&E and rare species by constructing fencing for eight MUs and/or PUs for the Mākua Military Reservation Action Area between 2010 and 2014.

Objective 10: Protect T&E and rare species by constructing fencing for seven MUs and/or PUs for the O‘ahu sub-installations and associated action areas between 2010 and 2014.

Objective 11: Develop a USAG-HI regulation that addresses training restrictions at and near sensitive areas where threatened and/or endangered species are located.

4.10 Land Management

4.10.1 Policy and Background

Overview: AR 200-1 states that land management “planning and execution of programs improve, utilize, and maintain all land and water areas for the greatest long-term net public benefit while supporting the military mission.” Carrying out national land use and conservation policies is required on all federal lands to the extent practicable and in concert with the assigned mission. Commanders are directed to cooperate with local, state and federal organizations in the carrying out of national land use and conservation policies in accordance with accepted scientific and professional standards and practices.

The USAG-HI Environmental Division and Natural Resources managers are required to keep informed appropriate decision-makers and commanders at all levels of USAG-HI of the condition of natural resources, the objective of natural resources plans, and potential or actual conflicts between Army activities and management plans; federal, state, or local laws or regulations; or the policies and procedures within AR 200-1.

Mission requirements for land and water: Both the USAG-HI Garrison Commander and Installation Commander are required to plan land utilization with awareness of the potential environmental effects of proposed actions. Mission requirements for the land will avoid or minimize adverse effects and restore or enhance environmental quality. Actions will be carried out in accordance with Army environmental regulations (e.g., AR 200-1) and applicable federal, state, and local laws and regulations.

The ONR staff manager is required to be an active participant in all planning and decision-making activities regarding uses of the land to ensure that current and planned mission activities (for example, master planning, construction requests, site approval requests, an training exercise plans) are conducted in a manner which is compatible with natural resources and other environmental requirements. The ONR program will be used to identify and evaluate wetlands, marine, and estuarine lands, grasslands, soils, scenic and natural areas, aesthetics, threatened and endangered species habitats, and other sensitive natural resources.

Inventory and classification: For the ONR staff to implement a multiple use natural resources management program based on ecosystem management, it was required to conduct surveys, inventories, and classification of the resources present on all of the O‘ahu sub-installation and their status. ONR staff conducted as a number of preliminary planning level surveys to include:

- Fauna (for federal/state threatened, endangered, and species of concern)
- Flora (for federal/state threatened, endangered, and species of concern)
- Native and Non-Native Vegetation communities
- Wetlands
- Topography
- Soils
- Surface Water

Integrated Training Area Management (ITAM) is a key program for land management on Army lands. (See Section 4.22, *Sustainable Range Program and Integrated Training Area Management*.)

4.10.2 Current Management

Faunal Surveys/Inventories: The last comprehensive rare faunal inventory for each installation was conducted in 1993 by Hawai‘i Biodiversity and Mapping Program (formerly Hawai‘i Heritage Program). Faunal surveys/inventories are addressed in Section 4.5.3, *Wildlife Management*. Additions are made to lists while conducting other surveys. Installation-wide inventories are planned to be updated.

Floral Surveys/Inventories: The last comprehensive rare floral inventory for each installation was conducted from 1992-1994. Floral surveys/inventories for each installation are addressed in Section 4.7.2, *Floristic Surveys*. Species are added often to lists when conducting other surveys.

Native-Non-Native Vegetation Communities Maps: Vegetation community maps (hard copy as well as digital layers for GIS) were last updated in August 2003 for USAG-HI sub-installations by the Center for Environmental Management of Military Lands, Colorado State University (see Section 4.7.3, *Vegetation Mapping*). Currently, there is no plan to update these maps.

Wetlands Identification: Wetland identification/delineation mapping was conducted for USAG-HI sub-installations from 2002-2005 by the Corps of Engineers, Honolulu District (see Section 4.3, *Wetlands and Deep Water Habitat Management*). Currently, there is no plan to update maps.

Topography: Contours for USAG-HI sub-installation maps are presently in NAD83 UTM Zone 4 standards and need to be converted to meet DoD/DA WGS 1984 standards. Currently, there is no plan to update topography information.

Soils:

Soils Mapping: The United States Soil Conservation Service (1972) described the soils found on the Island of O‘ahu. Natural Resources Conservation Service (NRCS) reevaluated the soils in 1993. Current GIS soils data layer used by USAG-HI was created by the NRCS in 2007. These data provide the O‘ahu installations with information on the types of soils present and their location. Each soil map unit has an erosion tolerance value assigned to it. By comparing actual erosion rate to the tolerable rate, the potential soil erosion status can be determined. Slope and vegetative cover are essential components in moderating and accelerating soil erosion. Soil erosion can be modeled and validated with satellite imagery and field data.

Soil Erosion: Soil erosion in training areas is the responsibility of Range Division Hawai‘i (see Section 4.22, *Sustainable Range Program and Integrated Training Area Management*). Soil erosion within cantonment areas of sub-installations is the responsibility of USAG-HI's Directorate of Public Works.

Surface Water Mapping: Current surface water GIS dataset used by USAG-HI is from National Hydrography Dataset, U.S. Geological Survey, which was last updated in July 2004.

Goal: Complete and update all planning level surveys (PLSs) for O‘ahu's six training areas as required by AR 200-1.

Objective 1: Complete all planning level surveys for floral (native/non-native) species for O‘ahu's training areas within the next five years.

Objective 2: Complete all planning level surveys for fauna (native/non-native) species for O‘ahu's training areas within the next five years.

Objective 3: Convert topographic maps for O‘ahu's training areas to DoD world geodetic system (WGS) 84 standards in the next five years.

Objective 4: Updated all planning level surveys for surface waters for O‘ahu's training areas in the next five years as required by AR 200-1.

4.11 Agricultural Outleasing

Agricultural outleasing typically is not viable on O‘ahu sub-installations; however, the Army is pursuing a grazing outlease to control vegetation and fuel load at Mākua Military Reservation. (See Section 5.10.1.2, *Conservation Reimbursable Funding, Agricultural Out-lease Funds*.)

4.12 Geographical Information Systems (GIS) Management, Data Integration, Access, and Reporting

4.12.1 Policy and Background

The use of geographical information systems (GIS) has rapidly evolved within the Army as decision support tools. USAG-HI consolidates GIS data from multiple creators and users of data such as the Environmental Division: compliance, cultural and natural resources; Utilities Division: infrastructure, wastewater plant; Engineering Division: facilities, plans; Planning Division: Integrated Facility System; Range Division: Range Facilities Management Support System, Integrated Training Area Management GIS program support areas; and others. These data are centrally located on the Directorate of Public Works server system. This consolidation of data allows Soldiers, USAG-HI offices/divisions, and other military users to access updated data quickly and efficiently.

GIS data are required to meet Federal Geographic Data Committee standards and Tri-Services Spatial Data Standards, including metadata standards.

4.12.2 Current Management

Currently, there is a GIS Specialist within the ONR staff. Hardware and software requirements are updated as needed.

Goal: Develop, maintain, and share natural resources GIS data, which meets Federal Geographic Data Committee standards and Tri-Services Spatial Data Standards, including metadata standards.

Objective 1: Maintain a fully trained GIS technician on the ONR staff.

Objective 2: Provide accurate and timely GIS support to the ONR staff and other USAG-HI directorates and offices.

4.13 Outdoor Recreation

4.13.1 Policy and Background

Outdoor recreation and public access to military lands is supported by the Sikes Act Improvement Act for the sustainable multi-purpose uses of resources, which shall include hunting and non-consumptive uses [Sec 670a.(a)(3)(B)] and public access [Sec 670a(a)(3)(C)] when consistent with military use. Section 670c (Program for Public Recreation) authorizes the Secretary of Defense to "carry out a program for the development, enhancement, operation, and maintenance of public outdoor recreation." The Army further supports public access in AR 200-1, Section 4-3(9)(d)-(e) which states that installations "[p]rovide for controlled recreational access where feasible at Army installations containing land and water areas suitable for recreational use" and to "[p]rovide access to uniformed personnel, family members, and the public to hunting, fishing, and trapping, consistent with security requirements and safety concerns."

Department of Defense Directive 4715.3 (*Environmental Conservation Program*), May 3, 1996, states, "The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness. Opportunities for such access shall be equitably and impartially allocated."

4.13.2 Current Management

Public access to USAG-HI sub-installations is limited due to security, safety, operational, and environmental concerns. The presence of federally listed and candidate species is a consideration when permitting outdoor recreation activities. Training lands may be opened to other outdoor recreation activities, provided such activities are consistent with land uses and do not conflict with the military mission. Requests for such use are made through USAG-HI's Directorate of Public Works' Real Estate Office at SBMR, which coordinates such requests with Range Division Hawai'i and others whose operations may be affected. Appropriate access control procedures are established for each approved outdoor recreation activity.

The USAG-HI Outdoor Recreation Plan Report (1997b) defines outdoor recreations in one of three classes (See Appendix 9, *Installation Documents*):

- **Class I:** Open to the general public on weekends and national holidays, regardless of association with the military or other DoD agencies. Activity occurs on Army lands administered by the State of Hawai'i per lease agreement or previous Memorandum of Agreement.

- **Class II:** No public recreation. Open to DoD employees and guests on weekend and national holidays. This includes all military and civilian employees of DoD and their dependents, relatives and guests, and retired employees. The Army administers recreational activity.
- **Class III:** Open to the public for special events on a case-by-case basis. Recreational activities are administered by the Army.

At SBMR and SBER, hiking is the only Class I activity and is an Army administered event. Recreational Archery is allowed on Schofield Barracks Military Reservation (SBMR) as a Class II activity but limited only to military personnel, DoD employees, and their dependants, relatives, and quests. There are no III activities. Hiking at Kawailoa Training Area (KLOA) is the only Class I activity. There are no Class II or III activities. At Kahuku Training Area (KTA), hiking and motocross are Class I activities. Biking is a Class III activity allowed on KTA. There are no Class II activities. Dillingham Military Reservation allows a number of activities, but these are limited to military personnel, DoD employees, their dependents, relatives, and guests. These Class I activities are biking, glider plane, hiking and parachute drop. The airfield is also open to recreational aircraft use and storage by the public. There are no class II or III activities (USAG-HI 1997).

Public outdoor recreation activities licensed/approved in 2007 and 2008 (A. Nagata, USAG-HI DPW-Real Estate Office, pers. com. 2008) included activities from volunteer trail maintenance by the Hawaiian Trail and Mountain Club to motocross races that are held annually. Other recreation activities include Junior Reserve Officer Training Corps use, hiking (individuals and groups), leadership course use, land navigation exercises, and camping. Over 40 events took place during this period at various sub-installations.

USAG-HI relies on a responsible public to adhere to restrictions placed on training areas access. Outdoor recreation is limited and only by permission. All liability and responsibility conditions are spelled out in the permit letter issued to the public for access. The permit letter states that the exercise of the privileges granted, constitutes acceptance of these conditions. In addition, a waiver of liability must be signed for minor children participating in any activity.

Hunting—Hunting is a form of outdoor recreation. USAG-HI relies on a responsible public to adhere to restrictions placed on range access. Hunting access is approved by the Provost Marshal's Office (PMO), Animal Control Office. (See Section 4.5.4, *Game Management*.)

Off-road recreational vehicle use—Privately owned vehicles (POVs) in most cases are not allowed within the limits of training areas. All terrain vehicles and motorcycles are limited to the motocross track located at Kahuku Training Area. Where allowed, POVs are required to use established roads and trails. Parking at hiking trail heads is allowed.

Goal: Provide for outdoor recreation activities for Soldiers and the public where and when possible to improve the quality of life.

Objective 1: Provide access to Soldiers, their families, DoD employees and retirees and their families in the use of approved hiking trails at Schofield Barracks Military Reservation (SBMR), Schofield Barracks East Range (SBER), Kawailoa Training Area (KLOA), Kahuku Training Area (KTA), and Dillingham Military Reservation (DMR).

Objective 2: Provide access to public in the use of approved hiking trails at SBMR, SBER, KLOA, KTA and DMR under the supervision of USAG-HI staff.

Objective 3: Provide access to Soldiers, their families, DoD employees and retirees and their families in the use of approved hunting activities in designated areas at SBMR, SBER, KLOA, KTA and DMR.

4.14 Bird/Animal Aircraft Strike Hazard

4.14.1 Policy and Background

Each year, civil and military aircraft strike thousands of birds. The Federal Aviation Administration (FAA) annually reports at least 2,300 wildlife related strikes involving civil aircraft; the Air Force and Navy report at least an additional 3,000. The Army Risk Management Information System, in the past seven years, reports that there has been only an average of approximately 3.6 bird strike incidents per year by Army Aviation assets nationwide (R. Orndorff, pers. com. 2008). The FAA believes that an estimated 20 percent of all actual bird strikes are reported. Because pilots and crews use the same low altitude airspace as large concentrations of birds, the prevention of bird strikes is of serious concern to the military (DoD 2004).

DoD continually implements and improves aviation safety programs in an effort to provide the safest flying conditions possible. One of these programs is the Bird/Animal Air Strike Hazard (BASH, also known as Bird/Wildlife Air Strike Hazard) prevention program.

Integral to a successful BASH program is a good working relationship with airport managers and the consistent reporting and identification of species involved in strike events. By knowing the bird species involved and the location of the strike, researchers and airport managers can better understand why the species is attracted to a particular area of the airport or training route. Once the attractant is identified, its source can be removed or modified and, if that is not possible, airport operations or training route criteria can be altered.

Developing an integrated BASH program at a military airfield requires cooperation and communication. Even with deterrent strategies and environmental modifications, certain species of birds continue to use airfields. Through active communication between all parties involved in day-to-day airfield activities, individuals or concentrations of birds can be detected and avoided. Some birds cannot be deterred from using an airfield, but bird strikes can be avoided through constant observation. Rather than trying to remove all birds, which is virtually impossible, the airport environment should be managed to allow for safe operations in the presence of a small number of individual birds.

4.14.2 Current Management

USAG-HI currently implements the BASH prevention program at Wheeler (WAAF), Dillingham Military Reservation and Bradshaw Army Air Fields (BAAF). Bird control efforts have been in place on USAG-HI airfields since 1988 (M. Leong, pers. com.). The Army's plan is based on guidance from the U.S. Department of Agriculture. Cattle egrets are the most serious threat to aircraft operations in Hawai‘i; however, other birds of varying sizes (native and non-native) are also a threat as are feral animals. The current Work/Financial Plan objective is to control nuisance wildlife in and around buildings and facilities. The principal control methods are trapping and hazing. BASH activities are recorded daily and reported on a quarterly basis. Only a single strike is documented (May 1996) involving a feral dog at Wheeler Army Airfield (M. Leong, pers. com.).

The BASH program is an integral component of the USAG-HI's Pest Management Plan as required by AR 200-1 and DOD Directive 415.0.07. USAG-HI's Directorate of Public Works has contracted the USDA, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS), to conduct bird/animal strike hazard control at WAAF to reduce or eliminate the presence of cattle egrets and other bird strike threats, and to control nuisance birds and feral animals which present health, safety

and maintenance problems at Wheeler Army Airfield and Bradshaw Army Airfield at Pōhakuloa (USAG-HI 2008c).

Goal: Reduce bird/animal air strike hazards to the lowest possible level.

Objective 1: Actively support the BASH program so as to protect aircrew lives and prevent serious damage to or destruction of military aircraft.

Objective 2: Continue efforts to control birds and feral animals.

Objective 3: Continue to work with USDA APHIS, Wildlife Services on bird control.

4.15 Wildland Fire Management

4.15.1 Policy and Background

The development and implementation of an Integrated Wildland Fire Management Plan is necessary for addressing safety, land management, and environmental compliance. "Installations with unimproved grounds that present a wildfire hazard and/or installations that use prescribed burns as a land management tool" are required to have an Integrated Wildland Fire Management Plan (AR 420-1 *Facilities Engineering, Fire and Emergency Services*, 25-40a; 28 March 2009). The plan is to be compliant with and integral to an installation's INRMP and an installation's existing fire and emergency services program (DA Memorandum *Army Wildland Fire Policy Guidance*, 4 September 2002).

An Integrated Wildland Fire Management Plan was completed October 2003 (25th ID (L) and U.S. Army, Hawai'i). This plan is currently being updated. It lays out methods and protocols to control fire frequency, intensity, and size on USARHAW lands to comply with federal and state laws and to meet USARHAW's land stewardship responsibilities (25th ID(L) and USAG-HI 2003). The Integrated Wildland Fire Management Plan intends to use fire prevention, pre-suppression, and suppression in support of land management plans goals and objectives. The plan recognizes the need to avoid damage in areas of high natural resource value during fire suppression activities.

The Hawaiian ecosystem is not fire dependent, and any fire in native vegetation is considered detrimental. Fire is a major disturbance and accelerates the conversion of native-dominated communities to non-native dominated ones (25th ID (L) and USAG-HI 2003).

4.15.2 Current Management

The Army has actively worked to consider all possible fire prevention and management options, knowing that fires on O'ahu sub-installations may affect their native communities and federally listed species. Information should be included in all pamphlets (e.g., hunting, Soldier field cards, etc.) as to the need to prevent fire (e.g., don't toss cigarettes), that valuable resources can be lost, and who to contact in case of a fire.

USAG-HI is currently implementing its *Integrated Wildland Fire Management Plan, O'ahu & Pōhakuloa Training Areas*, dated October 2003. The USAG-HI – O'ahu's Wildland Fire Management Crew now consists of 10 field personnel and a crew boss. USAG-HI also budgets for and provides funds for contracted helicopter fire suppression. In addition, the ONR staff has had 11 of its members trained and certified to the Fire Fighter Type 2 Level.

Within the Integrated Wildland Fire Management Plan are the standard operating procedures for the O‘ahu sub-installations. Many of the procedures focus on the protection of federally listed species and their habitats. Each O‘ahu sub-installation has its specific Fire Danger Rating System (FDRS) restrictions that Soldiers must be aware of and adhere to. Schofield Barracks Military Reservation (SBMR) and Mākua Military Reservation (MMR) allow live-fire activities that include incendiary ammunition, blank ammunition, and pyrotechnics. Kahuku Training Area (KTA) allows short-round ballistic ammunition, blank ammunition, and pyrotechnics. Schofield Barracks East Range (SBER) allows blank ammunition and pyrotechnics. DMR allows blank ammunition and limited pyrotechnics. Kawailoa Training Area (KLOA) allows only blank ammunition. Limited smoking and cooking/warming fires are allowed on all installations except at MMR and KLOA.

The Fire Danger Rating System takes into account each sub-installation’s fire history, fuels, fire behavior models, and weather/climatology; and determines a Fire Danger Class/Categories for the installation. The Integrated Wildland Fire Management Plan details the minimum staffing requirements, training, equipment and supplies, and helicopter fire bucket support as well as fire suppression actions and post-fire analysis surveys.

Firebreaks, along with fuel management, are part of the fire control system at most O‘ahu sub-installations. Firebreaks are the Army’s first defense to fires initiated on SBMR, MMR, and DMR. Fuel management includes prescribed burning and mechanical, hand and chemical treatments. There are number of trails/roads located on all the sub-installations that are utilized as access by fire suppression crews and may be act as firebreaks. These trails/roads do not meet firebreak standards and are not maintained by USAG-HI as firebreaks. The firebreaks and fuel management will help reduce the chance of a catastrophic wildfire event (USFWS 2003a).

USAG-HI has contracted with the USFS to study and report on how to break the Guinea grass fire cycle on O‘ahu. This study (2008 to 2010) will develop a better fuel model for Guinea grass.

Goal 1: Support wildland fire initiatives to minimize future fires.

Objective 1: Reduce fuels where possible to protect federally listed and rare species on O‘ahu sub-installations and other lands being managed by ONR staff.

Objective 2: Develop Environmental Awareness materials to include signage to remind Soldiers about using the Fire Danger Rating System, pamphlets on fire prevention at O‘ahu installations, posters, information kiosks in training areas, etc.

Objective 3: Budget for and fund helicopter fire suppression for the protection of threatened and endangered species.

Objective 4: Budget for and maintain qualification of Fire Fighter Type 2 Level personnel.

4.16 Training of Natural Resources Personnel

4.16.1 Policy and Background

The USAG-HI NR Program Manager requires the O‘ahu NR Program staff to complete the various environmental training as required by DoD policy, DA policy and Army regulations. Normal day-to-day training requirements, such as Equal Employment Opportunity, safety in the work place, etc., are not covered in this INRMP.

4.16.2 Current Policy

All ONR personnel involved in pest management must meet the minimum training requirements as required by Department of Defense Instruction 4715.10, DoD 4150.7 Plan and DoD 4150.7 Manual; and AR 200-1.

ONR personnel in charge of contracted projects are required to attend and complete Contract Officer's Representative or Contract Officer's Technical Representative Course.

Attending Army-related professional development conferences such as the annual Sustainable Range Program Conference or the U.S. Army Environmental Center's Natural Resources Conference by staff members is recommended.

Designated staff personnel to attend any special training required to comply with the Mākua and O'ahu Biological Opinions (USFWS 2007a and 2003a, respectively).

Goal 1: Maintain a professionally trained ONR staff in the latest scientific techniques and theories; knowledge of federal, state and local government laws and policies; DoD policies; and Army policies, directives and regulations.

Objective 1: Federal employees complete all annual and job related DoD and DA training requirements.

Objective 2: Contractor employees to complete all annual and job related training required by USAG-HI NR Program Manager.

4.17 Coastal/Marine Management

4.17.1 Policy and Background

Public Law 92-583, Coastal Zone Management Act, as amended, provides national policy and a program whereby coastal states can develop and establish a Coastal Zone Management Plan. All federal lands are excluded by the federal land exclusion provision in the act and that the exclusion encompasses all lands used by the United States without regard to the ownership or the jurisdictional status of land. However, federal actions in or affecting a coastal zone must, to the maximum extent practicable, be consistent with a coastal state's approved plan. In the same vein, states and governments must attempt to ensure that a state's Coastal Zone Management Plan recognizes the existence of all military installations, facilities, and lands, and excludes provisions for mandatory application over the same. Garrison commanders must cooperate and coordinate with the Coastal Zone Management Plan formulation and implementation.

In addition DoDI 4715.3, paragraph 4.21 states: DoD operations, activities, projects, and programs that affect the land, water, or other natural resources of any coastal zone shall be consistent with Sections 1451 et seq. 3501 et seq., and 1431 et seq. of 16 U.S.C. [Reference (f)].

4.17.2 Current Policy

The current *State of Hawai'i Coastal Zone Management* (CZM) *Plan* (State of Hawaii 1990) does not refer to USAG-HI or any other military organization. In 2008, military training activities at MMR were reviewed for consistency with the Hawai'i CZM Program and were found to be "consistent to the maximum extent practical."

Mākua Military Reservation (MMR) has a coastal shorefront totaling approximately 4,417 yards (4,039 m, 2.51 mi). This area is currently leased to the State of Hawai‘i as a public park and is not currently used by the Army for training. However, when training requires it, the beachfront and Farrington Highway will be closed to public use until completion of the training event.

Dillingham Military Reservation's (DMR) shorefront was ceded back to the State of Hawai‘i. The Farrington Highway is a fabricated barrier that may help reduce storm surge and limit the impacts of local flooding to Army facilities located on MMR and DMR.

USAG-HI currently monitors/samples surface water and bed stream soils from the three streams located at MMR that flow into the ocean (Punapohaku, Mākua, and Kalena). Kaluakauila Stream, located north of MMR, is sampled as a background reference. All four streams flow into the ocean (USAG-HI 2005a).

Goal: Maintain awareness of Hawaii's Coastal Zone Management Plan.

Objective 1: When and where feasible, cooperate and coordinate with the State of Hawai‘i if Army actions may be in contradiction with Coastal and Marine Zone Management Plan in relation to Mākua Military Reservation's shore front.

4.18 Floodplains Management

4.18.1 Policy and Background

Executive Order (EO) 11988, Floodplain Management, signed May 24, 1977, revoked and replaced EO 11296. EO 11988 adds emphasis to the environmental aspects of floodplain management that was not present in EO 11296. This order requires federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. The conceptual framework of floodplain management as set out in *A Unified National Program for Flood Plain Management* (September 1979) and the Water Resources Council is to be incorporated into agency procedures. The unified program has a goal of sound floodplain management that embodies the "wise use, conservation, development, and utilization of interrelated land and water resources to serve objectives of economic efficiency, environmental quality, and social well-being as consonant with responsibilities assigned to respective levels of government by law." *Floodplain Management Guidelines for Implementing Executive Order 11988*, Water Resources Council were published in the Federal Register on 10 February 1978 (43 FR 6030). The guidelines were developed for the purpose of explaining key terms in the executive order, floodplain management concepts, and procedures for complying with the order.

EO 11988 has as an objective, which is the avoidance, to the extent possible, of long and short-term adverse impacts associated with the occupancy and modification of the base floodplain and the avoidance of direct and indirect support of development in the base floodplain wherever there is a practicable alternative. Under the order, USAG-HI is required to provide leadership and take action to:

- Avoid development in the base floodplain unless it is the only practicable alternative.
- Reduce the hazard and risk associated with floods (to include tsunamis).
- Minimize the impact of floods on human safety, health and welfare.
- Restore and preserve the natural and beneficial values of the base floodplain.

4.18.2 Current Policy

USAG-HI Directorate of Public Works is responsible for the implementation of floodplain management. ONR staff manager is responsible for advising the Director of USAG-HI DPW on the restoration and preservation of the natural and beneficial values of the base floodplain.

Goal 1: Support USAG-HI DPW and Range Division Hawai'i with technical advice on restoring and preserving the natural and beneficial values of base floodplains.

Objective 1: Obtain and maintain current Federal Emergency Management Agency (FEMA) issued flood maps for the Island of O'ahu.

Objective 2: Develop Sustainable Range Awareness materials to include signage to remind Soldiers about the dangers of flash flooding and tsunamis and precautionary measures to take.

Objective 3: Develop Sustainable Range Awareness materials to include signage to remind Soldiers to avoid damaging floodplains and their associated riparian areas and stream banks.

Objective 4: Restore damaged riparian areas due to military operations.

4.19 Community Involvement and Education

4.19.1 Policy and Background

Community involvement is an installation's opportunity to demonstrate measures taken to protect, preserve and enhance the public lands that have been entrusted to it. Effective land management includes addressing local community issues and concerns. An installation typically grows with its neighbors and the boundary between the two tends to lessen. Community involvement is an important mechanism for sharing information, resources, and concerns. At O'ahu installations, this includes the establishment of partnerships with federal, state, and local agencies, as well as private parties, for off-site plantings, public involvement in planning documents, recycling, and hosting visits to the propagation facilities and the interpretive garden.

The Sikes Act Improvement Act and the National Environmental Policy Act (NEPA) demonstrate two different types of community involvement needs: (1) Public Outreach/Community Planning — involvement in decision-making issues, and (2) Outdoor Recreation and Community Involvement— providing education on resources and land use.

The Sikes Act Improvement Act (1997) requires sustaining multi-purpose uses of resources (e.g., hunting and non-consumptive uses), public access, and the requirement of public comment on INRMPs and changes to cooperative plans. DoD policy further encourages public involvement in INRMPs by requiring unclassified portions of all final INRMPS be available electronically via the World Wide Web, CD-ROM, or other similar means.

Public notification and involvement is required during environmental reviews under NEPA when proposed actions are studied to determine if the action may have significant impacts (environmental impact statement) or if study is needed to determine if an environmental impact statement is necessary (environmental assessment). An environmental impact statement requires the publication of a Notice of Intent, public scoping meetings, a public draft, and consideration of public comments.

4.19.2 Public Outreach/Community Planning

4.19.2.1 Policy and Background

DoD uses the term "outreach" for defining military issues that involve the public; however, outreach implies a one-way communication rather than open, two-way communication (DoD 2002). The DoD recognizes that the public requires an open, transparent, and inclusive process for understanding the importance of the lands the military uses. Far too often, perception does not equal reality. As such, involving the public early and often in decision-making processes enables public stakeholders to help the Army make cost-effective decisions. Early and often inclusion establishes credibility and trust. DoD Memorandum for Secretaries of Military Departments (*Guidance for Fiscal Years 2006-2011 Sustainable Range Programs*, 26 June 2003) directs installations to "implement sustainment outreach efforts that will improve public understanding of DoD requirements for training and support coalition-building and partnering on range sustainment issues important to DoD readiness." Executive Order 13352 (*Facilitation of Cooperative Conservation*) requires the DoD to implement laws relating to the environment and natural resources "in a manner that promotes cooperative conservation with an emphasis on appropriate inclusion of local participation in Federal decision making." AR 200-1 (*Environmental Protection and Enhancement*) provides summaries for Army actions that necessitate public involvement. This regulation notes that public participation should be included in Installation Restoration (IR), Base Realignment and Closure (BRAC), and Formerly Used Defense Sites (FUDS) cleanup programs' restoration activities.

The Office of Environmental Quality Control, State of Hawai'i, publishes *The Environmental Notice* semi-monthly (http://www.state.hi.us/health/oeqc/notice/index.html). The *Notice* announces the availability of environmental studies and reports under agency or public review. This is a site where the public can find notifications and copies of USAG-HI actions and documents.

4.19.2.2 Natural Resource Outreach Program

Program Summary

In an effort to increase community involvement, secure qualified volunteers, and communicate up-to-date natural resource information to Soldiers, the ONR staff has developed an ONR Outreach Program, built upon a 3-part framework: (1) Volunteer and Community Outreach, (2) Soldier Education, and (3) Public Relations. Each of these parts is defined below as a goal, followed by associated objectives and justification for the work. Professional relationships and landowner partnerships provide the foundation upon which this framework is created, including ongoing cooperation with The Nature Conservancy, Hawai'i Department of Land and Natural Resources, Honolulu Board of Water Supply, Hawai'i Conservation alliance, Ko'olau Mountains Watershed Partnership, Office of Hawaiian Affairs, Kamehameha Schools, and other sections of the Environmental Division such as Cultural Resources and the Environmental Compliance Branch.

Volunteer and Community Outreach

Land managed by the ONR staff and the hiking trails throughout the various installations, provide valuable teaching tools to the public about natural resources, management objectives and actions, and fire suppression activities being conducted. "Learning by doing" is described as one of the best approaches to education and is the philosophy that drives the ONR Outreach Program. This program provides community groups and volunteers with the opportunity to learn about and care for O'ahu's natural resources by participating in service projects that help to support and protect Army and public resources.

During the 2007-2008 reporting period for all locations, 56 in-field volunteer trips and over 4,140 hours of volunteer effort was expended, and 86 in-field trips and over 5,600 volunteer hours during

the 2008-2009 reporting period. The majority of the effort was spent accomplishing invasive weed control, common native plants outplanting, and baseyard projects such as propagule processing, nursery maintenance, greenhouse snail monitoring, herbarium organization, and outreach material preparation.

The ONR staff maintains a volunteer database and regularly communicates with about 400 volunteers monthly (2008), growing to 540 in 2009 (USAG-HI 2008a, 2009b).

Internships

Two internship programs have been developed. The first is with the Hawai‘i Youth Conservation Corp, who volunteered 560 hours over the summer months in 2009. The second were paid internships that were conducted over a three-month period, teaching career skills and experience in the field of natural resources.

Soldier Education

Army training areas provide land for Soldiers to conduct training so they can accomplish their assigned missions. However, Army training lands are home to 80 percent of the endangered plants and animals found on O‘ahu and protected by the Federal Endangered Species Act. The ONR Outreach Program informs Soldiers about natural resource issues specific to their training lands through a 45-minute presentation in the Environmental Compliance Officer training.

Public Relations

Many Army actions on O‘ahu are highly publicized; yet most of this publicity reports negative land-impacts from training activities. It is in the Army’s best interest to inform the community about the lesser-known positive land impacts achieved by the Army’s ONR Program. The ONR Program and its cooperative efforts with other agencies and organizations to protect endangered species and native habitats.

USAG-HI O‘ahu NR Outreach Program objectives attempt to:

- Educate volunteers, the general public and K-12 students about natural resource issues on installations so that the public has the knowledge necessary to make informed decisions regarding these resources.
- Develop partnerships and provides opportunities for collaboration with other agencies and organizations.
- Provide additional support (i.e., increases personnel work hours with volunteers) to meet O‘ahu IP/Mākua IP priorities.
- Provide teaching-tools to supplement coordinated volunteer activities.
- Provide opportunities for students and teachers to experience and appreciate the natural resources and the challenges of managing resources on O‘ahu Army installations.
- Connect volunteers, students and teachers to the natural resources of O‘ahu Army installations through stewardship opportunities.
- Increase the Army’s ONR Program visibility in the community.
- Cultivate potential future ONR Program staff.
- Educate students and community members about education/career paths in the field of natural resource management.

- Support teachers in their efforts to help students meet important national/ state science and math standards through hands-on learning.
- Sustain a qualified volunteer pool from all segments of the populations.
- Facilitate planning for upcoming service projects.
- Provides opportunities for local youth to gain valuable career skills and experience in the field of ONR management.
- Provide Soldiers with current natural resource information that can be used to make sound decisions about their actions and their effect on natural resources while working near and within Mākua IP and O‘ahu IP management areas.
- Fulfill the Public Education and Outreach requirements of the O‘ahu and Mākua Biological Opinions.
- Offer a venue to build a connection between Army Soldiers and the community in which they live.
- Enhance Soldier well-being and mental health.
- Educate media staff and public relations staff about O‘ahu Army installations’ natural resources to support accurate reporting.

The ONR Outreach program achieved many of these objectives with:

- Brochures about natural resources and the Army’s program.
- Displays such as the natural resources kid’s activity board, posters recognizing volunteers or presenting information about the O‘ahu ‘elepaio in Moanalua Valley or weeds at Kahuku Training Area (KTA).
- Field identification cards providing cultural and natural overviews of Ka‘ala, weeds of KTA, or *Megalagrion xanthomelas* (orange-black Hawaiian damselfly).
- Signage for fences.
- Presentations for middle school and college level audiences.

There were 20 outreach events in 2009 that interacted with 3,700 people. ONR staff hopes to continue and expand its outreach program.

GOAL 1: Volunteers and Community Outreach: Cultivate a core group of quality volunteers and develop long-term relationships with a diverse cross-section of the O‘ahu community.

GOAL 2: Soldier Education: Communicate up-to-date natural resources information to Army Soldiers.

GOAL 3: Public Relations: Improve the relationship between the Army and the greater community on O‘ahu.

Objective 1: Continue existing and develop additional volunteer-based projects at appropriate sites within O‘ahu IP and Mākua IP management areas.

Objective 2: Continue to develop and produce educational materials (brochures, field guides, posters, CDs, websites, etc.) focused on natural resources issues specific to O‘ahu Army training areas.

Objective 3: Develop and execute presentations to disseminate information on natural resources specific to Army training lands to local schools and community groups (e.g., Earth Day Fairs, Conservation Conference, Community Festivals, etc.).

Objective 4: Develop hands-on Service Learning Opportunities for students and teachers in a variety of native forest ecosystems on O'ahu Army training lands.

Objective 5: Maintain a volunteer database and regular communication with existing and potential volunteers.

Objective 6: Continue with internships within the Army's ONR Program that are coordinated with cooperating agencies and organizations.

Objective 7: Continue to develop and produce educational materials and presentations for Army Soldiers highlighting the relationship between Soldier training activities and the natural resources on Army training lands.

Objective 8: Coordinate opportunities for Soldiers to engage in community service.

Objective 9: Write articles, press releases, and bulletins.

Objective 10: Provide information on natural resources issues and activities to the media, City and County of Honolulu Fire Department, and state and federal natural resources management agencies.

4.20 Watershed Management

The execution of USAG-HI's natural resources programs (e.g., endangered species management, wildland fire management, pest management, etc.), the implementation of the Army's Integrated Training Area Management (ITAM) program, the adoption and use of best management practices (BMPs) for riparian zones and other areas, and specific watershed management projects provide the mechanism for attaining watershed management goals by:

(1) Maintaining the integrity of stream courses,

(2) Reducing the volume of surface runoff originating from disturbed areas and running directly into surface water,

(3) Minimizing the movement of pollutants (e.g., nutrients) and sediment to surface and groundwater, and

(4) Stabilizing exposed mineral soil areas through natural or artificial revegetation means.

4.20.1 Policy and Background

Watershed management is a component of the Clean Water Act. Watershed management cannot be effective unless it includes soil erosion controls, pollution prevention, and storm water pollution prevention best management practices, all being implemented by a partnership of government entities, communities, and private landowners located within a defined watershed.

Watershed Management on Army-Controlled Lands

Pollution prevention (P2) and storm water pollution prevention procedures (SWP3) are implemented at USAG-HI's sub-installations as required by AR 200-1, *Environmental Protection and Enhancement*, and associated federal, state, and local laws. P2 and SWP3 for USAG-HI sub-installations are the responsibility of the USAG-HI Garrison Commander and tenant commanders. The Compliance and Pollution Prevention Branch of USAG-HI's Environmental Division, implements and advises the Garrison Commander on P2 and SWP3 actions and issues.

Soil erosion issues within cantonment areas at USAG-HI's sub-installations are the responsibility of the Directorate of Public Works (DPW). Soil erosion issues at firing ranges and training areas are a

shared responsibility between USAG-HI's Directorate of Plans, Training, Mobilization, and Security (DPTMS), Range Division, Range Division's ITAM Office, DPW's Pest Management Shop and USAG-HI O'ahu's NR Program. In addition to DPTMS's Range Division implementing soil erosion actions at its firing ranges and training areas, it also inspects and ensures that units using the firing ranges and training areas are implementing USAG-HI's P2 and SWP3 procedures and policies.

DPW's Pest Management Shop crew and USAG-HI's natural resources staff work together in controlling feral ungulates that cause soil erosion due to their feeding habits. They also work together in controlling incipient invasive species where the impact rare native plants and habitats.

Ko'olau Mountains Watershed Partnership (KMWP)

This partnership was initiated in 1999 and was an initiative sponsored by the Hawai'i Department of Land and Natural Resources. Partners include various public and private owners such as the Kamehameha Schools Bishop Estates, State of Hawai'i, United States Army, Honolulu Board of Water Supply, the Department of Hawaiian Home Lands, The Queen Emma Foundation, the Bishop Museum, and the Wai'hole Water System. Management plans and activities for Schofield Barracks Military Reservation, Kawailoa Training Area, and Kahuku Training Area may be affected by KMWP plans and projects.

The KMWP consists of approximately 97,561 acres (39,481.42 ha). The purpose of the partnership is to have participating partners agree that the Ko'olau Mountains Watershed is an important watershed for O'ahu. The partners also agree that the proactive management of watershed is crucial in eliminating or reducing the threats of damage from weeds, insects, disease, feral ungulates, and human impacts. Partners agree to work together to develop watershed projects and cooperate to obtain funds for these projects. The KMWP partners meet quarterly.

The partnership has cooperatively worked together by implementing feral pig control measures; initiating control programs for rats, weeds, mongooses, and human disturbance; constructed fence protected areas to protect rare plants as well as for outplanting of native plants; and preparation of environmental documentation when federal funds are being used.

4.20.2 Current Management

Watershed management by the USAG-HI's O'ahu NR Program consists of the aggregate of natural resources management programs affecting watershed stability, erosion and sedimentation, and water quality and yield. Program areas include erosion and sediment control through the Land Rehabilitation and Maintenance (LRAM) program, weed control, feral animal control, revegetation and protection of native communities, and wildland fire prevention and suppression. See descriptions of resource activities in this chapter for details of current management. Watershed management is also tightly linked to biodiversity and ecosystem management because diverse native plant communities provide a high degree of watershed protection by promoting infiltration and storage, moderating storm runoff, and filtering sediment and nutrients. Minimization of impacts to watershed from training activities is achieved through a number of institutional procedures including the ITAM Training Requirement Integration (TRI) program, ITAM Sustainable Range Awareness (SRA) program, range regulations, and training and policies provided by DPW Environmental Division.

Goal 1: Protect and enhance watershed stability and native ecosystems by managing for natural rates of runoff, erosion, and sedimentation; maintaining or improving surface water quality and aquatic health; and restoring natural vegetation.

Goal 2: Develop and maintain partnerships with other landowners/agencies in order to facilitate watershed protection and conservation projects, maximize available resources, and optimize information exchange and learning.

Objective 1: Use the Environmental Record of Consideration project review process among USAG-HI DPW, DPTM, Range Control and ITAM to optimize watershed protection and rehabilitation (e.g., road construction and maintenance, storm water management, etc.) for all O'ahu sub-installations.

Objective 2: Establish GIS support, headed by Range Division Hawai'i ITAM, to develop project data layers, analyze data, and display results.

Objective 3: Participate in future watershed partnership initiatives to facilitate watershed protection and conservation projects, maximize available resources, and optimize information exchange and learning.

Objective 4: Complete, in cooperation with NRCS, proposed prevention/erosion control projects planned for KLOA as required by lease agreement with Dole Food Co. and Waialua Sugar Co.

Objective 5: Assist in the development of a LRAM maintenance program that uses native vegetation (where possible) and/or use non-invasive fire resistant non-native vegetation to control erosion in areas that have been heavily disturbed.

Objective 6: Construct fencing at Kahuku Training Area to control illegal trespass by riders of motocross cycles that is resulting in soil erosion issues.

Objective 7: Develop and implement a Soils Erosion Management Plan in cooperation with Kahuku Motocross Track, DOFAW and Range Division Hawai'i ITAM.

4.21 Aquatic Health and Water Quality Management

4.21.1 Background and Policy

Water quality is a subcomponent of the Clean Water Act and the Safe Drinking Water Act. Water quality is the responsibility the USAG-HI Garrison Commander and tenant commanders. The implementation of water quality management is the responsibility of the Compliance and Pollution Prevention Branch of USAG-HI's Directorate of Public Works Environmental Division.

The State of Hawai'i classifies water uses for applying water quality standards, and for the selection or definition of appropriate quality parameters and uses to be protected in these waters. It is the State's goal for Class 1 waters to remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source. To the extent possible, the wilderness character of these areas shall be protected (Hawai'i Department of Health 2009).

The objective of Class 1.b waters is to protect domestic water supplies, food processing, protection of native breeding stock, the support and propagation of aquatic life, baseline references from which human caused changes can be measured, scientific and educational purposes, compatible recreation, and aesthetic enjoyment (Hawai'i Department of Health 2009).

The objective of Class 2 waters is to protect their use for recreational purposes, the support and propagation of aquatic life, agricultural, and industrial water supplies, shipping, and navigation. Class 2 waters shall not act as receiving waters for any discharge that has not received the best degree of

treatment or control compatible with the criteria established for this class. Class 1 and Class 2 waters have the same water quality standards (Hawai‘i Department of Health 2009).

USAG-HI DPTM Range Division has implemented a limited number of training restrictions and management guidelines on O‘ahu Army training lands to protect water bodies, wetlands and riparian areas. Guidelines for travel, disturbance, and excavation are addressed in 25th ID(L) & USARHAW Reg 210-6.

Stream management is a sub-discipline of watershed management that has similar aims. Major influences on stream quality include upland management of vegetation, weeds, ungulates, and land-use disturbances; in-stream disturbances, incision, bank stability, and sediment deposition; and roads, trails, and stream crossings. Streamside areas provide shade, stream bank stability and erosion control, as well as detritus and woody debris that benefit the aquatic ecosystem in general. Streamside areas provide specific wildlife habitat values.

Water quality and stream habitat quality are related but are two distinct aspects of aquatic/stream management. They are acute indicators of stream health and important indicators of watershed condition. A baseline survey of the watershed condition and some clear measure of the water quality and quantity within the watershed are needed. By estimating baseline conditions and monitoring over time, inferences can be made regarding the success of watershed management and other management activities. Some streams draining from O‘ahu Army sub-installations are diverted for agricultural and other demands in Central O‘ahu. These diversions occur both on and off Army-controlled lands. Some streams are naturally intermittent but others are intermittent due to dewatering (i.e., diversions). The intermittent streams are likely devoid of diadromous fauna such as ‘o‘opu (gobioid fishes), hihiwai (*Neritina granosa*), ‘opae kala‘ole (*Atyoida bisulcata*), and ‘opae ‘oeha‘a (*Macrobrachium grandimanus*). However, both perennial and intermittent streams are important to numerous native aquatic insects, snails, and other invertebrates such as the native freshwater sponge (*Heteromeyenia baileyi*) (USAG-HI and USACE 1997).

O‘ahu Army land managers have implemented water quality monitoring and stream bio-assessment protocols to monitor several streams. Seasonal and inter-annual variability in stream flow volume and water quality and diversion of in-stream flows create challenges for monitoring stream condition and water quality (K. Kawelo pers. com.). Range Division through the ITAM program has instituted a number of best management practices (BMP) in training lands to reduce pollutant and sediment loadings into the streams. These include erosion reduction blankets, vegetated strips, sediment settling basins, improved storm drains, and road drainage improvements (S. Turnbull pers. com.). Other concerns include the potential to increase erosion during the construction of fences, and even from the removal of non-native, weedy plant species. In these two cases, the overall, long-term benefits are assumed to outweigh the temporary negative conditions. Environmental assessments of projects, like fence construction, seek best management practices to minimize effects.

Stream Bio-assessments

Stream assessments provide a means to integrate biotic and abiotic characteristics into a rating system. They also may be useful indicators for maintaining and restoring the “biological integrity” of stream ecosystems and identifying adverse upland inputs into aquatic systems. The method used by the state is the *Hawai‘i Stream Bio-assessment Protocol* (HSBP) Version 3.01 (Kido 2002). “Biological or biotic integrity,” as applied to stream ecosystems, is defined as “the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region” (Karr and Dudley 1981). Assessments of biological integrity also support the primary

objective of the Clean Water Act: "to restore and maintain the chemical, physical, and biological integrity of the nation's waters."

The USGS National Water-Quality Assessment (NAWQA) Program has also been investigating biological integrity and water quality of O'ahu streams. Initiated on O'ahu in 1998, the NAWQA program is designed to describe the status and trends in the quality of surface and groundwater resources and to provide a sound understanding of the natural and human factors that affect the quality of these resources. The NAWQA study design for surface water focuses on water quality conditions in streams using three interrelated components: water column studies, bed-sediment and tissue studies, and ecological studies. Ecological studies are designed to assess relationships among physical, chemical, and biological characteristics of streams. Data collected includes habitat assessment and surveys of fish, algal, and benthic invertebrate communities. Several ecological study sites are located on or adjacent to Army lands ('Ōpae'ula Stream, North Fork Kaukonahua Stream, and South Fork Kaukonahua Stream). NAWQA procedures are more ecologically intensive than the Hawai'i Stream Bio-assessment Protocol procedures, especially with regard to assessing algae and invertebrates.

USAG-HI's ONR staff believes that data from both projects can be used to examine relationships between land uses, habitat, and biotic heath and improve existing stream assessment protocols (A. Brasher pers. com.). The most typical application of the HSBP is to examine baseline data for assessing overall quality and/or the degree of degradation due to human activities and other disturbances. Site-specific applications can be used for impact assessment. Long-term monitoring of sites provides a standardized database to monitor condition over time.

There are some concerns about applying these metrics and scoring systems to higher elevation mid- and upper reach stream segments because the protocol was not designed for these areas (K. Kawelo, M. Kido pers. com.). Results may therefore be biased or misleading. Data collection requires approximately three hours per study site using a crew of three trained personnel. Established plots are 100 meters long with five-meter sampling intervals.

Water Quality Monitoring

Federal and state laws drive water quality monitoring of streams and management activities to improve water quality at designated impaired water bodies. Under Section 303(d) of the Clean Water Act, the State of Hawai'i has established a list of waters that are not meeting state water quality standards for the Island of O'ahu. When additional water bodies are identified as being impacted, they are added to the list and submitted to the Environmental Protection Agency (EPA) for review and approval every April of even years. The EPA then establishes Total Maximum Daily Loads (TMDLs) for each parameter of concern (e.g., nutrients, suspended solids, turbidity, metals, pathogens, etc.) for the listed waters. TMDLs are defined as pollutant load limits needed to bring listed waters into compliance with water quality standards. Once identified, impaired waters are studied to determine if TMDLs are needed and, if so, at what level for each pollutant of concern (e.g., sediment, nitrogen, and phosphorus). The most recent list of 303 (d) impaired waters in Hawai'i can be viewed at http://www.epa.gov/owow/tmdl/. The Hawai'i Department of Health (HDOH) Environmental Management Division (EMD) sets TMDL priorities according to which water bodies are logistically convenient (beginning on O'ahu). TMDLs will be developed as funding allows.

There are two listed streams, Kaukonahua Stream Watershed and Waikele Stream Watershed, in the Army's NPDES permit that require the development of an implementation plan (S. Turnbull pers. com.). The plan will include TMDL (total maximum daily waste load) allocation amounts for impacted surface waters (sediment and contaminants) by the Army. Kaukonahua and Waikele Streams drain from the live-fire training ranges at Schofield Barracks into Kaiaka Bay to the north

and Pearl Harbor to the south, which are Environmental Protection Agency (EPA) 303(d) listed waters.

Hawaii's Department of Health is currently assessing if the Kaukonahua Watershed is impaired. The upper North Fork of Kaukonahua Stream is located on Kawailoa Training Area (KLOA), while the South Fork of the Kaukonahua Stream is located on Schofield Barracks East Range (SBER).

There are a number of unimpaired streams, originating on USAG-HI lands, which flow into listed impaired listed water bodies: Pearl Harbor (SBER and Schofield Barracks Military Reservation—SBMR), Waialua-Kaiaka Bays (KLOA), Waikele Stream (SBER and SBMR). Consideration of surface water quality impacts should be considered in USAG-HI management plans, training activities and other activities that may affect water quality.

It is understood that adverse changes in water quality invariably occur during storm events that have the potential to cause runoff from non-point upland sources. The watershed contribution of total suspended solids and nutrients is considered among the major pollutants that impair water quality in receiving coastal waters in Hawai‘i.

Water quality applicability, degradation policies, and standards are presented in *Hawai‘i Administrative Rules, Title 11, Department of Health, Chapter 54: Water Quality Standards* (Hawai‘i Department of Health 2009).

4.21.2 Current Management

Sampling protocols used by USAG-HI land managers need to be comparable to those used by the U.S. Geological Survey and/or the State of Hawai‘i. Currently, stream sampling on Army-controlled lands consists of USGS gauges on three Kawailoa Training Area streams (discharge only) and water quality sampling on ‘Ōpae‘ula stream in conjunction with the ‘Ōpae‘ula Watershed Project (DPW Environmental Division) in Kawailoa Training Area.

Water quality monitoring associated with training impacts may be implemented by the ITAM program (Range Division), while water quality sampling associated with general watershed health and management activities may be implemented through natural resources programs. Because intermittent streams periodically flush out sediments and other pollutants, and because water quality standards for intermittent streams are the same as those for perennial streams, watersheds with intermittent streams should be evaluated for the potential for water quality problems during seasonal or storm runoff events.

Possible munitions' constituents (e.g., metal, explosive compounds, depleted uranium) migration from SBMR and MMR to areas off-site is being addressed (S. Turnbull pers. com.). The Army Environmental Command (AEC) is evaluating off-site migration of constituents and developing data on munitions' constituent levels in groundwater, storm water, and sediment down-gradient of potential areas of munitions' constituent source zones throughout the United States. SBMR and MMR were selected for sampling from 2002 to 2008. Sampling will validate the Operational Range Assessment Program (ORAP) quantitative assessment methodology. If munitions' constituent migration is occurring, the most likely pathway is via runoff or infiltration. Collected data are compared to federal, state and local water quality requirements/standards and, when possible, to background data collected up-gradient of training ranges. The results for SBMR and MMR show trace levels of explosives (RDX) at levels below regulatory limits in a few samples. Metal concentration in surface water were equivalent to background levels in surface water on O‘ahu.

Concentrations of depleted uranium were representative of naturally occurring uranium, not depleted uranium.

An evaluation of Total Maximum Daily Load (TMDL) is underway for portions of Kaukonahua and Wailkele Streams draining from the live-fire training area ranges at SBMR, and non-live fire training areas of Wheeler Army Airfield (WAA) (S. Turnbull pers. com.). The TMDL is being performed concurrently with the evaluation of depleted uranium in stream water as part of the "Schofield Barracks Impact Range Baseline Human Health Risk Assessment for Residual Depleted Uranium Risk Assessment." Stream flow chemistry and flow data are being used to develop best management practices (BMPs) for improving storm water quality flow from the live-fire training ranges. The program objectives include reducing erosion of training lands, as well as reducing nutrient and sediment content in streams leaving installation. This effort support accurate evaluation of the Army's impact to streams off Army property.

Surface water flow information will be used to develop a Storm Water Management plan for SBMR and WAA, as required under the Clean Water Act. Kaukonahua Stream drains into Kaiaka Bay on the North Shore of O'ahu, Hawai'i, the EPA 303(d) listed water under the Clean Water Act. Waikele Stream drains into the EPA 303(d) listed Pearl Harbor estuary (S. Turnbull pers. com.). The State is establishing TMDLs for the estuary. Our NPDES permit requires TMDL be included for impacted waters (Kaukonahua and Waikele Streams) in which the permittee is a source. Sediment and nutrient information will be collected as well as stream flow volume. Best management practices and recommended operational changes for the live-fire training ranges will be developed that meet state and federal in-stream water quality standards. (See Appendix 9*, Installation Documents. Water Quality.*)

Megalagrion leptodemas, M. nigrohamatum nigrolineatum, and M. oceanicum

In light of the proposed listing of *Megalagrion leptodemas, M. nigrohamatum nigrolineatum,* and *M. oceanicum,* the Army will conduct a stream bio-assessment on Army lands to document native species and identify important stream habitats. The Army will note location and abundance of aquatic nuisance species that may impact the native fauna. This information will be collected along with suitable attributes noted in *Hawai'i Stream Bio-assessment Protocol* (HSBP) Version 3.01.

4.21.2.1 Schofield Barracks Military Reservation

Stream resources on Schofield Barracks Military Reservation (SBMR) consist of four intermittent streams: Haleanau Gulch, Mohiākea Gulch, Waikōloa Gulch, upper Waikele Stream. Kaukonahua Stream flows along SBMR's northeastern boundary. Drainages in the northeastern portion of SBMR, within 0.5 km from the Wai'anae ridgeline, are considered state Class 1 waters. All other streams are state Class 2 waters. All streams are somewhat degraded, especially those drainages affected by the impact area and associated erosion. Stream quality is also affected by non-point agricultural pollution from adjacent pineapple and other croplands. To date, no water quality sampling or stream bioassessments have been conducted by the Army on SBMR.

Sources of water quality degradation on SBMR include denuded training and impact areas, and roads and other concentrated flow sites. The Integrated Training Area Management (ITAM), Land and Rehabilitation and Management (LRAM) program is actively working to minimize erosion and control sediment on SBMR using a variety of techniques and structures.

4.21.2.2 Schofield Barracks East Range

The upper portion of the South Fork of Kaukonahua Stream, the only stream system on Schofield Barracks East Range (SBER), is classified as a Class 1 water. The Class 1 area extends approximately

from UTM easting 610000 to the eastern boundary of SBER at the Koʻolau ridgeline. All other portions of the South Fork on SBER are classified as Class 2 (Hawaiʻi Department of Health 2009).

The United States Geological Survey (USGS) collects stream flow data from one stream gauge (USGS gauge # 16208000) on South Fork Kaukonahua Stream just above the junction with the Ku Tree Reservoir drainage outflow. USGS stream flow data are intended for use by state, local, and federal agencies, and the private sector for developing and managing water resources, and are reported online (http://hi.water.usgs.gov/data/adrweb/2005/maps/oahu_sw05.html).

The Hawaiʻi Department of Health is currently in the process of assessing the level of impairment and developing TMDLs for Kaukonahua Stream. The State will sample the South Fork Kaukonahua Stream for various chemical and physical constituents three times each in the wet season and dry season. One sample will be collected near the stream outlet and a second sample will be collected upstream from developed/agricultural areas. Specific sampling locations are not yet determined. Parameters sampled include dissolved oxygen, pH, temperature, nitrate, and ammonium, phosphorus, turbidity, and dissolved solids (T. Teruya pers. com.).

Some stream ecological assessment data has also been collected by the USGS Water Resources Division National Water Quality Assessment Program (NAWQA) on South Fork Kaukonahua Stream. This current effort examines the potential for using algae and invertebrates as indicators of aquatic health, and revising fish metrics in bio-assessment protocols (A. Brasher pers. com.).

The South Fork of Kaukonahua Stream is significantly more turbid than the North Fork upon entry into Lake Wilson, (Wahiawā Reservoir). Sources of water degradation include denuded training areas (including bivouac sites, LZs and DZs), roads, other concentrated flow sites, gullies at lower elevations where training occurs, disturbance from feral ungulates, and potentially high natural rates of erosion in upper watershed areas. The ITAM LRAM program is actively working to minimize erosion and control sediment on SBER using a variety of techniques and structures including revegetation, erosion control structures such as check dams, and road drainage improvements. To date, no stream bio-assessments or water quality sampling have been conducted by the Army on SBER.

The State of Hawaii Clean Water Branch is planning to release its evaluation of TMDLs from the North and South Fork of Kaukonahua Stream in mid-2010 (S. Turnbull pers. com.).

4.21.2.3 Kawailoa Training Area

Streams in upper-elevation watershed areas in the lower half of Kawailoa Training Area (KLOA) are classified as Class 1 waters. The Class 1 area extends from the southern KLOA boundary approximately 3.1 mi (5 km) west of the Koʻolau ridgeline to the north, intersecting the eastern KLOA boundary approximately one kilometer north of Puʻu Kaʻinapuaʻa (southeastern corner of Training Area K3B). All other streams and associated watershed areas on KLOA are classified as Class 2 (Hawaiʻi Department of Health 2009).

One intermittent and eight perennial named streams, all flowing roughly from east to west, are found on KLOA (Table 4.21.a). The United States Geological Survey (USGS) collects stream flow data from stream gauges on Kamananui, ʻŌpaeʻula, and North Fork Kaukonahua streams either on or adjacent to KLOA. USGS stream flow data are intended for use by state, local, and federal agencies, and the private sector for developing and managing water resources, and are reported online (http://hi.water.usgs.gov/data/adrweb/2005/maps/oahu_sw05.html).

Table 4.21.a Summary of Named Streams on Kawailoa Training Area.

Stream	USGS Gauge	Principal Drainage Area*	Notes
ʻElehāhā (intermittent)	No	North K3A	ʻElehāhā and Kamananui combine to form the Waimea River
Kamanaui	16325000	K3A, K3B	No diversions upstream of gauge at Paʻalaʻa Uka Rd.
Kaiwikoʻele	No	K3A, K3B	
Kawainui	No	K2A	Diversion to Kamanui ditch tunnel
Kawai Iki	No	K2A	Joins Kawainui Stream in K2C, diverted to Kawai Iki ditch tunnel to ʻŌpaeʻula Stream and ditch tunnel
ʻŌpaeʻula	16345000	K2B	No diversions upstream of gauge
Helemano	No	K1A, K2B	Diversion to Upper Helemano Reservoir
Poamoho	No	K1B	Diversion to Poamono tunnel to N. F. Kaukonahua Stream and upper Helemano Reservoir
North Fork Kaukonahua	16200000	K1B	Flows into Lake Wilson, diversion to Mauka ditch, no diversions upstream of gauge

* Training Areas draining into stream watershed.

Streams planned for sampling by HDOH include the North Fork of Kaukonahua Stream, Helemano Stream, ʻŌpaeʻula Stream, and Poamoho Stream. Sampling procedures are the same as stated for SBER. Some stream ecological assessment data has also been collected by the USGS Water Resources Division National Water Quality Assessment Program (NAWQA).

Biological assessments of selected streams on Kawailoa Training Area were conducted by the Hawaiʻi Natural Heritage Program (HHP 1997). In 1998, the U.S. Fish and Wildlife Service (USFWS) awarded a grant to Dr. Mike Kido (Hawaiʻi Stream Research Center, Kauaʻi) to establish permanent stream monitoring plots in a number of leeward Koʻolau streams in Kawailoa Training Area. Based on the Natural Heritage report, the Natural Resources Center selected study sites for Hawaiʻi Stream Bio-assessment Protocol (HSBP) assessments. By 1999, permanent Hawaiʻi stream bio-assessment protocol monitoring plots had been established and surveyed on Helemano, Poamoho, Kawai Iki, Kawainui, and ʻŌpaeʻula streams. The Kaukonahua stream system is known to have smallmouth bass and has not been surveyed because scores (especially for biotic integrity) are anticipated to be poor (RCUH 1999, 2000).

All established HSBP monitoring sites surveyed were ranked poor. Major factors contributing to these poor scores include alien fish presence, native fish absence (with the exception of ʻŌpaeʻula Stream), and low embeddedness and substrate characterization scores due to sedimentation (RCUH 1999, 2000; M. Kido pers. com.). The sedimentation may be attributed to a number of factors including: the low grade of leeward Koʻolau streams, upland disturbance from feral ungulates and other sources, and low in-stream flows due to agricultural and other diversions via various ditches and tunnels. This is significant because siltation of streams degrades habitat by altering stream flow and stream morphology characteristics and reduces substrate textural diversity, thereby reducing suitable forage habitat for native fish and the amount of area available for algal growth to support native fish (RCUH 1999). ONR staff continues to work with Dr. Kido to improve protocols for monitoring upper stream reaches where native fish exist. In 2000, the ʻŌpaeʻula Fencing Project provided funding to have USGS gather baseline data on stream sediments and water quality on ʻŌpaeʻula Stream prior to fence construction. No other water quality or discharge information is collected by the Army on KLOA. The State (i.e., HDOH) does not currently sample the water quality in Lake Wilson (T. Teruya pers. com.). The Wahiawa sewage treatment plant may analyze water samples below the

Wahiawā Dam for physical, chemical, and biological properties, but this is below the potential influence of sediment arriving via the North Fork of Kaukoahuna Stream into Lake Wilson.

The ʻElehāhā (intermittent), Kamananui, and Kaiwikoʻele stream drainages join to form the Waimea River near the coast. USAG-HI improvements and maintenance to road drainage structures, culverts, and water turnouts are planned to minimize additional sedimentation and degradation of these streams.

Because of the terrain with in KLOA, there are very limited Army training impacts upon water quality except along Drum Road. Training impacts are due to limited foot traffic, rotor wash from helicopters at designated landing zones and the limited vehicular traffic.

Under the lease agreement with Dole Food Co. and Waialua Sugar Co. (7,533 ha), the leaser retains the right to all surface and underground waters and to develop, take, impound, use, and transport such waters (lease para. 12b).

There are no plans by the State to perform or release TMDLs for this watershed at the present time (S. Turnbull pers. com.).

4.21.2.4 Kahuku Training Area

All streams and gulches on Kahuku Training Area (KTA) are intermittent except for Mālaekahana Stream, which infiltrates completely into the ground before reaching the ocean. The following intermittent streams are found on KTA: Pakulena Stream, Kalunawaikaala Stream, Kaleleiki Stream, Paumalū Stream, Kaunala Gulch, Waialeʻe Gulch, ʻŌʻio Stream, ʻŌʻio Gulch, Kawela Gulch, Pahipahiʻālua Gulch, Hoolapa Gulch, Kalaeokahipa Gulch, ʻŌhiʻa Gulch, Keaaula Gulch, Lamaloa Gulch, and Hina Gulch. Streams on KTA have not been inventoried for aquatic habitat, native invertebrates, and significantly degraded areas. The Army currently does not conduct any stream bio-assessments or water quality sampling at KTA.

There are no plans by the State to perform or release TMDLs for this watershed at the present time (S. Turnbull pers. com.).

4.21.2.5 Mākua Military Reservation

There are no perennial streams on Mākua Military Reservation (MMR). Intermittent streams consist of Punapohaku (north valley) and Mākua streams, and Koʻiahi Gulch. The uppermost portion of the valleys, extending from the Waiʻanae Mountain ridgeline to approximately 0.5 km (0.3 mi.) west, is classified as a Class 1 water zone. All other drainages on MMR are classified as Class 2 by the State (Hawaiʻi Department of Health 2009). The spring area in upper Mākua Valley is within an unexploded ordnance area. There is no disturbance of the spring area and the vegetation associated with the upper drainage of Mākua Stream.

Erosion and sediment control best management practices should be used when road and firebreak repair and maintenance are performed to minimize sediment inputs to all stream channels and prevent sedimentation of receiving marine waters during runoff events. Water quality sampling for contaminates has been conducted at MMR. No TMDL monitoring or stream bio-assessments have been performed at MMR.

The State has expressed no plans to perform or release TMDLs for the Mākua Watershed at the present time (S. Turnbull pers. com.). The Mākua Watershed streams are not on the EPA's 303(d) list. As part of the Mākua EIS and the ORAP program, evaluation of surface water chemistry was performed from 2002 through 2008. The data collected were compared to federal, state and local

water quality requirements /standards and, when possible, to background data collected up-gradient from the training sites. Results showed trace levels of explosives (RDX) at levels below regulatory limits in a few samples. Metal concentration in surface water were equivalent to background levels in surface water on O‘ahu. Concentrations of depleted uranium in samples collected from MMR were representative of naturally occurring uranium, not depleted uranium.

4.21.2.6 Dillingham Military Reservation

There are several unnamed intermittent streams and no perennial streams on Dillingham Military Reservation (DMR). All waters on DMR are classified as Class 2 by the State (Hawai‘i Department of Health 2009). A perched wetlands, measuring approximately 340 square meters (0.8 acres), occurs on DMR. The majority of area on DMR is a grassland dominated by California grass (*Brachiaria mutica*) and contains introduced shrubs and trees (USAG-HI and USACE 1997). No water quality sampling or stream bio-assessments are currently performed on DMR.

Goal: Assess water quality and aquatic health (habitat and biotic components) of streams and other aquatic environments to document status, response to management/disturbance, potential for improvement and compliance with Hawai‘i water quality standards.

Objective 1: Prepare a decision document and briefing to result in the Garrison Commander in adopting a specific stream or riparian zone buffer guidelines to protect aquatic systems from degradation resulting from adjacent land uses and military disturbance.

Objective 2: Perform reconnaissance surveys of streams to document flow status, water quality degradation, habitat potential, and presence of aquatic invertebrates (i.e., as a food base) and other aquatic fauna. Results will be used to help identify needs, prioritize projects, and develop sampling designs (if needed.)

Objective 3: Establish coordinating group amongst USGS Water Resources Division, local universities, and the Hawai‘i Department of Land and Natural Resources, Department of Health, Clean Water Branch, and other agencies/entities to minimize redundant efforts, ensure methods and metrics are comparable, improve bio-assessment protocols for application to upper reach segments, and expand the current water quality sampling program. This includes compiling existing data on bio-assessments and water quality on an annual basis.

Objective 4: Prepare a water quality monitoring and bio-assessment sampling plan for all USAG-HI O‘ahu sub-installations. Streams with known water quality problems will be prioritized, but baseline data is desirable for all perennial/ streams, lakes, ponds and specifically identified bogs and seeps. Priority should be given to sampling sites at or near the sub-installation boundary to best document the quantity and quality of water flowing off Army-controlled areas. The plan should describe watersheds and their associated streams, water bodies, and designated bogs and seeps, and any known or suspected water quality concerns.

Objective 5: Monitor upper reaches of intermediate and perennial streams on Schofield Barracks Military Reservation using the water quality monitoring and bio-assessment sampling plan. Stream bio-assessments should be done at interior and SBMR boundary locations. Surveys should be done in conjunction with improvements in bio-assessment protocols to better assess upper reach segments.

Objective 6: Monitor upper reaches of the North and South Fork Kaukonahua Streams using the water quality monitoring and bio-assessment sampling plan. Stream bio-assessments should be done at interior and Kawailoa Training Area (KLOA) and Schofield Barracks East Range (SBER) boundary locations. Surveys should be done in conjunction with improvements in bio-assessment protocols to better assess upper reach segments.

Objective 7: Monitor upper reaches of all perennial streams on KLOA using the water quality monitoring and bio-assessment sampling plan. ONR staff plant survey teams have documented the presence of ‘o‘opu nakea (*Awaous guamensis*), a native fish in upper stream reaches of ‘Ōpae‘ula and other streams. Surveys should be done in conjunction with improvements in bio-assessment protocols to better assess upper reach segments.

Objective 8: Document water quality impacts associated with military training and other military land use/management activities versus those caused by agriculture or other sources located at KLOA.

Objective 9: Evaluate the results of the two pilot bio-assessment monitoring plots in ʻŌpaeʻula Stream and adjust sampling design and protocols if necessary. Use results to provide feedback to watershed management activities.

Objective 10: Utilize GIS to develop project data layers, analyze data, and display results.

Objective 11: Determine if habitat is suitable for reintroduction of native Hawaiian aquatic species to perennial streams. This may involve collaborative research and management efforts with other agencies and organizations. There is potential work with the USGS to survey the mouths of perennial streams to document the presence or absence of native invertebrates.

Objective 12: Determine if *Megalagrion leptodemas, M. nigrohamatum nigrolineatum,* or *M. oceanicum* are present. If so, determine extent, abundance, and condition of habitat.

4.22 Sustainable Range Program and Integrated Training Area Management

4.22.1 Policy and Background

The Sustainable Range Program (SRP) works to maximize Army capability, availability, and accessibility of ranges and training lands to support doctrinal requirements, mobilization, and deployment under normal and surge conditions (AR 350-19, *The Sustainable Range Program*). The Range and Training Land Program (RTLP) and Integrated Training Area Management (ITAM) are the two core parts of SRP. RTLP provides central management, programming, policy, modernization of the Army's ranges, and day-to-day range operations. ITAM provides Army Range Officers the capability to manage and maintain training lands and support training readiness by integrating mission requirements with environmental requirements and sound land management practices with the intent of establishing policies and procedures that achieve optimum, sustainable use of training and testing lands.

The ITAM program is the Army's formal strategy to address optimum and sustained use of training lands. This uniform training land management program helps to ensure no net loss of training capability, a Sikes Act requirement. ITAM includes inventorying and monitoring land conditions, integrating training requirements with training land carrying capacity, educating land users to minimize adverse impacts, and providing for training land rehabilitation and maintenance. The effective integration of stewardship principles into training land and conservation practices ensures that Army lands support training missions in a sustainable manner. Force readiness depends on the availability of high quality, realistic training lands. Several documents provide policy and procedural guidance for the ITAM program.

The ITAM program was initiated with the realization that Army training lands were being degraded and the cost of purchasing additional lands was not viable solution. If the military community needs to "Train as They Fight," then another solution, which sustains currently held resources[4], is necessary. In 1994, the first ITAM Coordinator was hired to develop an in-house program for all Hawaiʻi Army

[4] See HQDA G3/5/7, Training Simulations Division (DAMO-TRS). August 2006. Integrated Training Area Management Coordinators Program Management Review, Proceedings for a description of program operation and responsibilities.

lands. The program was administered through and responsibility of the Environmental Office until 1995, when the program came under the Directorate of Plans, Training, Mobilization, and Security (DPTMS) at Schofield Barracks Military Reservation, a change consistent with an Army-wide changes. The initial ITAM projects at O‘ahu installations were completed by outside contract. Today, the ITAM program for all Hawai‘i Army installations includes an ITAM, Range and Training Land Assessment (RTLA), and LRAM Coordinator stationed through the DPTMS at Schofield Barracks Military Reservation, along with an LRAM Coordinator and a technician at Pōhakuloa. The RTLA Coordinator at Schofield Barracks oversees Army lands and program management on the islands of O‘ahu and Hawai‘i.

The ITAM program relies on its four components and integrated management from HQDA, Training Doctrine Command (TRADOC) Program Integration Office-Live (TPIO-Live), Army Commands (ACOM), and the installations to accomplish its mission. The four ITAM components are Training Requirements Integration (TRI), Range and Training Land Assessment (RTLA), Land Rehabilitation and Maintenance (LRAM), and Sustainable Range Awareness (SRA).

- **Training Requirements Integration (TRI)** is the decision support component that integrates training requirements for land use with natural resources conditions and capabilities to support doctrinal requirements.
- **Land Rehabilitation and Maintenance (LRAM)** programs, plans, designs, and executes land rehabilitation and maintenance projects to support and sustain the military mission.
- **Range and Training Land Assessment (RTLA)** inventories and monitors short and long-term effects of military activities on the physical and biological resources. RTLA also identifies potential LRAM projects and monitors LRAM project success.
- **Sustainable Range Awareness (SRA)** improves land users’ appreciation and understanding of the environment and the potential effects of unnecessary damage to training lands.

These components work to understand the Army's training requirements impacts on the land and land management practices, how to mitigate and repair training effects, and to communicate the ITAM message to Soldiers and the public. The Geographic Information System (GIS) is a foundational support element of the DPTMS’s Sustainable Range Program.

The GIS component provides centralized access to spatial data, cartographic support, and spatial analysis to support both training land and natural resource manages. An in-house GIS operator was hired and stationed at Schofield Barracks Military Reservation in 1997. Currently, there is a GIS analyst and technician at Schofield Barracks Military Reservation and a technician at Pōhakuloa. GIS is an organized collection of computer hardware, software, spatial data, and personnel designed to capture, store, update, manipulate, analyze, and display all forms of geographically referenced information. The GIS program maintains extensive collections of spatial data for USAG-HI that include soil, surface hydrology, floral, faunal, transportation systems, topography, archaeology, and cultural data, along with special features data.

Goal: Create, analyze, manage, and distribute authoritative standardized spatial information, products, and services for the execution of training strategies and missions on Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area, Dillingham Military Reservation, and Mākua Military Reservation ranges and training areas.

Objective: Coordinate and share GIS data with the Environment Office and USAG-HI Range Division and ensure data quality standards are met by all working groups.

USAG-HI, ITAM prepares a Five-Year Plan (FY 2007-2011) that describes multi-year ITAM programs and resource requirements for eight sub-installations (O‘ahu—Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area, Dillingham Military Reservation, and Mākua Military Reservation; Hawai‘i—Pōhakuloa and Ke‘āmuku parcel). The plan reflects direction and guidance provided by the Chief, Range Division, and the Installation Range Steering Committee. These two sources establish (1) project requirements and prioritization of projects that support current and future training operations, (2) enable coordination and integration of longer-term ITAM plans across the garrison, (3) serve as a driver for other plans (e.g., Range Development Plan), and (4) enable a quality annual work plan. The ITAM staff works closely and coordinates efforts with the DPW Environmental staff to ensure project compliance with state and federal regulations and laws as well as to complement work efforts when possible.

Army mechanisms for program management, review, and information exchange include Program Management Reviews by the ACOM Representative (in this case the U.S. Army Pacific, USARPAC). The Workplan Analysis Module (WAM) is the software application developed by TPIO-Live) to automate the collection of installation-specific ITAM Workplan projects. Projects are initiated by the various coordinators and entered into the system by the ITAM Coordinator. The ACOM representative approves (validates) projects and thereby ensures projects are appropriate. The program allows ITAM users to set and adjust priorities for the current fiscal year (FY), track costs by project, record financial transactions, and track HQDA, ACOM, and installation accounts. As part of the ITAM budgetary and planning process, all O‘ahu installations are designated in Tier 1. All Army installations participating in ITAM fall into one of three categories on which program funding is based. A number of criteria are used to determine the appropriate level (e.g., number and type of units, type of training, other missions, operational terrain setting, training land, ITAM factor, In-processing Training Center (ITC) Value, Joint Training factor, and other Joint Training). Tier 1 installations tend to be larger installations with the most critical training mission and the greatest environmental sensitivity to the training mission. Tier 1 installations can receive funding for a full complement of ITAM staff.

The Army Environmental Command (AEC) produces a quarterly newsletter (“SRP Newsletter”), supports the SRP website, sponsors the annual SRP workshop, and provides program management and coordination for HQDA. The intent of these products and functions is for a greater sharing of information, to meet program goals, and for consistent, but individual, installation execution.

Scope of ITAM

USAG-HI ITAM programs focus on training land management. Training lands include the following facility category groups: impact areas, maneuver areas, ordnance ranges, other mission-related training facilities, and roads, bridges, and tank/maneuver trails. ITAM funding supports the ITAM mission, goals, and objectives. ITAM funding is not intended to address or correct statutory compliance or conservation requirements, perform routine range maintenance or modification, or replace normal base operations activities on training lands normally funded by the Real Property Maintenance Account (DA 1999b).

Program goals and objectives are found in AR 350-19 (*The Sustainable Range Program*). Program goals have been incorporated into the USAG-HI ITAM program

- Achieve optimal sustained use of lands for the execution of realistic training by providing a sustainable core capability that balances usage, condition, and level of maintenance.

- Implement a management and decision-making process that integrates Army training and other mission requirements for land use with sound natural and cultural resources management.
- Advocate proactive conservation and land management practices.
- Align Army training land management priorities with Army training and readiness priorities.

Installation-specific goals are described for each of the components below in Sections 4.13.2, *Training Requirements Integration*; 4.13.3, *Land Rehabilitation and Maintenance*; 4.13.4, *Range and Training Land Assessment*; 4.13.5, *Sustainable Range Awareness*; 4.13, *Sustainable Range Program and Integrated Training Area Management* and 5.8.1, *Geographic Information Systems*.

4.22.2 Training Requirements Integration

4.22.2.1 Policy and Background

Training Requirements Integration (TRI) is the component of the ITAM program that incorporates training requirements with land management, training management, and natural and cultural resources management processes. Integration of requirements occurs through continuous consultation between the Directorate of Plans, Training, Mobilization, and Security (DPTMS), Natural and Cultural Resources Managers, and the Environmental staff. Managed by the ITAM Coordinator, TRI has the direct contact with Range and Training Managers, and the rest of the ITAM staff (e.g., RTLA and LRAM Coordinators).

Land-use planning and management decisions meet training needs and regulatory compliance through interaction and coordination during the TRI process. Commanders rely on TRI to test the feasibility of new training demands and the recommendation for courses of action.

4.22.2.2 Current Management

- Successful implementation requires coordination between Range Division Hawai‘i personnel, ITAM personnel, and the Environmental staff. TRI falls under the responsibilities of the ITAM Coordinator headquartered at Schofield Barracks Military Reservation. The ITAM Coordinator participates in USAG-HI Range staff calls on a biweekly basis.
- Use of in-house support for projects.
    - ♦ Assistance by various engineer battalions on projects such as creating Best Management Practices (BMP) for the East Range Stryker Driver’s Training Course.
    - ♦ Kahuku Range personnel assist with projects, such as the establishment of Seibert stakes along a training course in East Range.
- Outsourcing is used for construction projects as necessary.
- The ITAM Coordinator makes recommendations on land use, facility designs, and addresses trainer and planners concerns. The LRAM Coordinator works with Range Control, the Environmental Office, and the Command on TRI issues.
- Identification and the allocation of funds for LRAM, RTLA, and SRA on O‘ahu and Hawai‘i installations that support TRI is executed through the Workplan Analysis Module (WAM).
- Initiate work orders, construction review, and National Environmental Policy Act process to site military missions and facilities in locations best suited to sustain resources.
- Include mission needs when prioritizing planning level surveys.

4.22.2.3 Future Considerations

- Utilization of Land Condition Models—These models help determine natural resource condition and training carrying capacity of installation lands. Using data collected by Range and Training Land Assessment and other sources, changes can be quantified using Geographical Information System (GIS) technology to determine the viable training load carrying capacities and to site military training. Collect data to support the models accuracy on a regular basis.
- Utilize the Encroachment Condition Model to assist in identifying locations with limited training restrictions or compatible use and for future stationing of exercises.
- Mission Safety—Assessment and identification of sites requiring LRAM efforts for safety and improved training conditions (e.g., revegetation, application of palliatives, etc.).
- Mission Siting—Assessment and identification of new sites to support future training needs. TRI utilizes LRAM and RTLA expertise to identify areas that physically and environmentally meet training needs. Further discussion and validation with the Environmental staff supports subsequent National Environmental Policy Act efforts.
- Review and comment on training restrictions with an understanding of training and environmental needs. The training community is fluid and a resource that understands training impacts at the same time as understanding environmental compliance is beneficial to sustainable training. Restrictions on troops training at O'ahu installations are within 25th ID (L) & USARHAW Regulation No. 210-6, *Ranges and Training Areas* (25th ID (L) and USARHAW 2000) and external standing operating procedures. Some restrictions are directly tied to compliance with various laws and regulations, but many are implemented according to DoD and Department of Army (DA) policy guidance to manage natural resources for long-term sustained use in accordance with good stewardship of public lands.
- Provide trainers with scenarios to complement training restrictions.

Goal 1: Ensure sustained accessibility of lands to meet training standards that are realistic and in natural condition.

Goal 2: Provide military trainers and land managers with the necessary technical and analytical information and support to integrate doctrinally-based training and testing with land constraints to maintain training carrying capacity.

Objective 1: Coordinate and communicate land use needs and land management efforts between the range and natural resources communities.

Objective 2: Request natural resource data and/or assistance in developing training land use models (Land Condition Model, Encroachment Condition Model).

Objective 3: Incorporate natural resources agendas (e.g., sensitive areas, rare species, etc.) into training restrictions and guidance.

4.22.3 Land Rehabilitation and Maintenance

4.22.3.1 Policy and Background

Military activities can severely affect lands. In some instances, site conditions permit natural recovery. In other cases, intervention is required. In those situations, the Land Rehabilitation and

Maintenance (LRAM) program is the Army's first line of defense to repair and rehabilitate training lands. LRAM is a foundational program dedicated to sustaining realistic training conditions, and supporting training and testing personnel, weapons, vehicles, and mission requirements on an installation. LRAM is "land stewardship." The program provides preventative and corrective rehabilitation and maintenance procedures for long-term benefits. LRAM uses shovels and heavy equipment to enhance and maintain training lands and the military mission.

Each installation identifies and executes projects specific to its installation. Projects are programmed, planned, designed, and executed. LRAM projects are designed to maintain quality military training lands, minimize rehabilitation and repair costs, prevent damage to vehicles and other equipment, and to remedy safety issues. LRAM projects can prevent non-compliance status (e.g., excessive soil deposition into waters and potential violation of the Clean Water Act; application of palliatives to reduce airborne particulate matter) and used as an expert resource for mitigation projects.

Not all rehabilitation or maintenance projects are the responsibility of LRAM and ITAM. LRAM and ITAM are funded to manage and maintain training lands with the sole purpose of sustaining and enhancing the capability of the land to meet long-term doctrinal training requirements (SRP Environmental Activities Matrix, 2006, unpublished). Typically, projects and facilities that have a "permanent" nature are the responsibility of the Department of Public Works (DPW). Roads and facilities that are inventoried, such as bunkers, berms, and ranges, are under DPW's oversight. Activities addressing compliance or mitigation requirements are funded through Environment Office resources. Such activities include soils stabilization and erosion control, characterization of military impacts on sensitive species, wetland surveys, preparing and submitting 401 and 404 permits and jurisdictional surveys, and most sensitive species issues. LRAM and ITAM are concerned with less permanent items and conditions that are directly impacted by training and training activities, such as the construction or maintenance of maneuver area trails (for tactical vehicles), hardened water crossing (for tactical vehicles), and erosion control structures to repair damaged caused by maneuver training or to increase training capability. Removing vegetation may be an LRAM task when removing vegetation supports maneuver and training.

LRAM is an important link between the training and natural resources community. All LRAM plans for trail work is in a digital format, which improves and streamlines REC submittals, tracks projects, and assists planning and budgeting, and the creation of Statements of Work. All LRAM projects adhere to the same policies to prevent fires, limit the spread of weed seeds, and to keep clean equipment.

4.22.3.2 Current Management

General Projects/Tasks

- LRAM Coordinator is responsible for identifying and prioritizing LRAM projects, develops scopes of works, submits work requests to appropriate authorities, monitors project execution to ensure compliance with environmental constraints, and verifies that all request work was satisfactorily completed.
- LRAM Coordinator works closely with Range Control; DPW, Real Property; and the Environment Office to address pending concerns and projects.
- LRAM provides site assessments for new ranges, addressing project specifications descriptions.
- LRAM installs Siebert stakes and signage for troop safety and to protect sensitive areas and in construction areas.

Current Projects/Tasks

- Trail reclamation and repair
- Execute the O‘ahu Trail Maintenance Plan for each installation
    - ♦ Ongoing trail assessment and characterization.
    - ♦ Annual prioritization of trail repair.
- Reestablish access to training areas
- Maintain trail rehabilitation procedures for the Stryker Driver’s Training Course
- Address sedimentation to water bodies
- Assist various Army engineers with their tasks

4.22.3.3 Future Tasks/Considerations

General Projects/Tasks

- Provide DPW, Real Property, and the ONR Program with data results from various monitoring projects
- Establish Siebert stakes where needed
- Use troop assistance for various projects
- Develop an Erosion and Sediment Control Management Plan (USFWS 2003a)

Maintenance and Construction

- Trail maintenance—soil stabilization, drainage, and vegetation control
    - ♦ Work on water flow control and surfacing on Kahuku Training Area, Delta Trail.
    - ♦ Repair Kahuku Training Area trails.
    - ♦ Identify trails to accommodate training with Stryker vehicles in East Range and Kahuku Training Area.
    - ♦ Schofield Barracks Military Reservation, South Range, and Kunia Training Area maneuver trails, along with bridge repair.
    - ♦ East Range maneuver trails, delineation, upgrade, and maintenance for Stryker vehicles.
- Maintain LZ/DZs in the Kahuku and Kawailoa Training Areas
- Enhancement of tactical concealment areas and training corridor in the Kahuku Training Area by reducing various non-native species and increasing training capacity
- Optimize watershed protection and rehabilitation (e.g., road construction and maintenance, storm water management, etc.) (USFWS 2003b)
- Participate in watershed partnership initiatives (USFWS 2003b)
- Purchase and use of certified stock plants free of invasive/non-native species (USFWS 2003b)
- Remove all non-target introductions from planted/developed areas
- Upgrade and maintain the East Range Stryker Course

- Assess problems and develop solutions with motorcycle and off-road vehicle use and trespass in Training Area 1 and other affected areas in the Kahuku Training Area (USFWS 2003)
- Vegetation management
    - ♦ Remove vegetation and eliminate hazards on East Range land and drop zones.
    - ♦ Stabilize riparian area soil.
    - ♦ Other maneuver area vegetation management.
- Complete the Schofield Barracks Military Reservation South Range connector trail and the installation stream crossing

Goal 1: Sustain long-term training/testing missions on lands held under the stewardship of USAG-HI and the U.S. Army.

Goal 2: Sustain the overall condition of O'ahu training lands to ensure long-term military viability.

Goal 3: Coordinate long-term land maintenance plans with other real property management programs on USAG-HI.

Goal 4: Apply best management practices for design and execution of LRAM to ensure rehabilitation, repair, and maintenance results are commensurate with the applied resources.

Objective 1: Ensure coordination and communication (maps, results) of projects with DPW, Real Property and the Environment Office.

Objective 2: Work with ONR staff on projects of common interest (e.g., trail maintenance, revegetation, etc.).

Objective 3: Work with ONR staff when siting new training areas.

4.22.4 Range and Training Land Assessment

4.22.4.1 Policy and Background

Range and Training Land Assessment (RTLA) focuses on sustaining doctrinal training. To accomplish this mission, RTLA monitors and assesses natural resource conditions and manages and analyzes natural resource information. These data are essential in evaluating current and potential land condition and the ability of resources to support (sustain) future training needs. RTLA collects biological and physical data and looks toward remote sensing to assist and meet future training community's needs. Assessments can be short or long-term. Recent program changes have called for each installation with RTLA to prepare a program plan that provides goals and objectives for each project, outlines how projects will be accomplished, and the data used and presented.

A secondary role for RTLA is to act as the knowledge center and to support the information needs of Installation Status Reports (ISR), National Environmental Policy Act (NEPA), and Land Condition Model (LCM), installation management plans, assessing internal encroachment issues, and the identification and evaluation of LRAM projects. The role to "identify and evaluate LRAM projects" emphasizes the need to address degrading biological conditions and other project considerations prior to initiating work, and to review and report on the success, and/or effect of a project on completion, if

appropriate. RTLA is one component, along with LRAM, TRI, ONR staff, and the training community, to consider the availability, suitability, accessibility, and capacity of training lands.

RTLA on O‘ahu installations began in 1996 with the establishment 15 Land Condition Trend Analysis (LCTA) plots (Tazik et al. 1992) on Schofield Barracks Military Reservation, 18 plots on East Range, and 15 plots on Mākua Military Reservation. These plots were not resurveyed as part of ITAM, although some of these plots are used by the ONR staff as established baseline data to document change within management units. In the late 1990s, Site Rehabilitation Prioritization (SRP) methods were used to assess condition and to identify areas needing LRAM support. In 2000, a landing zone (LZ) assessment was conducted at 47 landing zones/pick-up zones/drop zones (LZ/PZ/DZ) at Schofield Barracks Military Reservation, East Range, Kahuku Training Area, and Kawailoa Training Area. The survey is used to identify areas needing rehabilitation. A subsequent weed survey was conducted in 2003 at three Kawailoa Training Area landing zones and the foot trails connecting the landing zones. The study was to determine the extent of invasive plant species establishment from the landing zones (Kennaway et al. 2003).

Plant community maps were prepared for all of the O‘ahu installation, with the exception of the South Range and parts of KTA (Kennaway et al. 2003). The *Manual of the Flowering Plants of Hawai‘i* (Wagner et al. 1999) classification system was used. It is a characterization based on elevation, moisture, and physiognomy, along with dominant plants. Satellite imagery (Geo Ortho Kit IKONOS bundle), 0.25-meter aerial photography, and base-level vector data were used, and classifications were field validated. Seventeen community types and two other land cover types were identified.

The O‘ahu RTLA Coordinator is responsible for the program on the Islands of O‘ahu and Hawai‘i. A second coordinator is scheduled to be on the Island of Hawai‘i. The RTLA Plans for each island sets the direction for the program. RTLA and ONR hold shared interests, requiring communication for respective program support.

4.22.4.2 Current Management

Program Responsibilities

- Survey and determine training land condition.
- Monitor changes in training land quality.
- Model training land impacts.
- Measure the effectiveness of land rehabilitation projects.
- Communicate relevant information to DPTMS and the ONR Program.

Monitor and Report

- Establish a protocol to document the impacts incurred by Stryker vehicles on the Stryker Training Driver’s Range.
- Site assessment (e.g., soil stabilization and revegetation at QTR-1).
- Periodic assessment of LZ/PZ/DZ.
- Assess combat roads and maneuver trails.
- Baseline surveys prior to range siting (e.g., Kahuku Training Area smoke training and Stryker maneuvers.
- Develop projects to document effects of high-impact training, determine utilization rates, site stability/resilience, and training capacity (e.g., firing points, MOUT sites).

- Monitor erosion control and participate in the development of a Soil and Erosion Control Management Plan.
- Monitor training areas.
- Determine the impact of foot traffic trampling by infantry Soldiers on endangered species.
- Map and categorize ranges based on plant community characteristics (e.g., European forest, grassland, etc.), condition, availability and utilization, and training requirement deficiencies by training options.
- Evaluate native and established non-native grass to determine suitable species for broadcast seeding of denuded training areas, along with monitoring effectiveness in controlling the extent of Guinea grass.

Program Assistance

- Provide LRAM project assessment.
- Provide DPW, Real Property, and the ONR Program with go-no go maps for validation.
- Execute the RTLA Plan.

Goal 1: Assess impacts of live training and testing activities and recommend options for sustained usage at O'ahu Army installations.

Goal 2: Prioritize and assess land management activities external to training to maximize the capability, accessibility, and availability of O'ahu Army lands to meet the training mission.

Goal 3: Participate in training land use planning (e.g., Range Master Plan, Installation Master Plan, NEPA, etc.) for USAG-HI and O'ahu Army lands.

Objective 1: Involve the Environment Office in RTLA project identification, prioritization, and results.

Objective 2: Coordinate projects identified in the USFWS Biological Opinion with the ONR Program to ensure Implementation Team requirements are properly and completely met.

Objective 3: Provide and support data needs of the Environment Office for the preparations of plans and NEPA documents.

4.22.5 Sustainable Range Awareness

4.22.5.1 Policy and Background

Warfare, by its very nature, is destructive to humans and their natural environment. Environmental damage is a consequence of combat. However, the U.S. military has historically exercised restraint, limiting damage to churches, monuments, archives, and libraries during times of war. Restraint has been incorporated into the decision-making process, and unnecessary environmental damage protects training areas for future use. Soldiers are required to prevent environmental problems by caring for those resources entrusted to them. This responsibility includes financial, material, and environmental stewardship.

The Army will integrate environmental values into its mission to sustain readiness, improve the soldier's quality of life, strengthen community relationships, and provide sound stewardship.

Vision Statement

FM 3-100.4, Environmental Considerations in Military Operations

11 May 2001

Sustainable Range Awareness (SRA) is a component of the ITAM program that develops and distributes educational materials to users of range, training, and testing land assets. The intent is to reduce avoidable impacts to natural and cultural resources by informing land users of restrictions, policies, and proactive actions. SRA is integrated into existing command and installation operational awareness activities and events (AR 350-19, *The Sustainable Range Program*, 30 August 2005), thereby applying appropriate environmental protection procedures during all types of operations (FM 3-100.4, *Environmental Considerations in Military Operations*, 11 May 2001).

Typical SRA materials include Soldier Field Cards, Leader/Soldier Handbooks, posters, news articles, briefings, pamphlets and brochures, website and multi-media presentations, and maps and overlays designed to educate and support Soldiers, leaders, and commanders in understanding their responsibilities to integrate environmental and natural resources conservation procedures, policies, and requirements into mission training events. Some materials are generic and supplied through the Installation Support Training Division (ISTD) (e.g., playing cards).

4.22.5.2 Current Management

- O‘ahu ITAM distributes a Soldier Field Card that provides basic information needs for safe and environmentally responsible training. The Soldier Field Card reviews main points (e.g., “No cross-country driving,” “All fenced areas are off-limits”), vehicle and excavation restrictions, site-specific reminders, and points of contact for emergencies, Range Control and environmental compliance. The card provides basic information needs for safe and environmentally sound training as well as a map that shows protected plant habitats and archaeologically sensitive areas.

- The external standard operating procedures provide current restrictions and environmental considerations to be taken during training.
- SRA helps bridge the communication gap between training and environmental compliance.
- In-processing briefing at O‘ahu. Inclusion of slides within PowerPoint presentation or presentation of a short video reviewing safety procedures and environmental issues.

- Distributes a handout on *Stop the Spread of Invasive Species*, which explains what an invasive species is, why this is an important issue, and what can be done.

4.22.5.3 Future Considerations

- Update/develop the Soldier Field Cards to reflect fenced areas and management units. New cards need to include information about cleaning equipment and gear to prevent the movement of invasive non-native species (plants and animals) between installations. This is required by the USFWS Biological Opinion (2003a).
- Produce a Leader Handbook that provides specific actions that should be taken to minimize training impacts and support environmental quality; background information on laws, regulations and policies; and information specific to training on O‘ahu Army lands.
- New posters illustrating sensitive species, training precautions (e.g., safe handling of POL), and success stories (e.g., Earth Day, Public Lands Day, etc.) should be developed on a regular basis. Posters should be displayed in common areas throughout the base camp.
- Field signage explaining the purpose of a particular fence, noting the sensitive species in the area, excluding foot traffic, or the impact of feral animals.
- Publish ITAM “success” stories in the Sustainable Range Program Newsletter. While articles are written for the training community, they can be distributed for public consumption. The USARPAC issue is published during the winter (February/March timeframe).

Goal: Minimize resource damage by indoctrinating land users on how their activities impact the environment and to instill Soldier pride and stewardship responsibility on O‘ahu Army lands.

Objective 1: Educate Soldiers on how to use and respect the training lands and facilities on O‘ahu Army lands.

Objective 2: Assist ONR staff in the development of environmental awareness materials for the public, neighbors, contractors, etc.

CHAPTER 5

IMPLEMENTATION

CHAPTER 5 IMPLEMENTATION

The Sikes Act Improvement Act requires not just preparation and update of an Integrated Natural Resources Management Plan, but "implementation" of the Integrated Natural Resources Management Plan. The following section discusses the definition and funding implications of implementation.

Implementation anticipates the execution of all "must fund" projects and activities in accordance with specific timeframes identified in the Integrated Natural Resources Management Plan.

An Integrated Natural Resources Management Plan is considered to be implemented if an installation:

- actively requests, receives, and uses funds for "must fund" projects and activities;
- ensures that a sufficient number of professionally trained natural resources management personnel are available to perform the tasks required by the Integrated Natural Resources Management Plan;
- coordinates annually with all internal and external cooperating offices; and
- documents specific Integrated Natural Resources Management Plan action accomplishments undertaken each year.

Natural resource requirements defined by the Office of the Secretary of Defense as environmental "must fund" are those projects and activities required to meet recurring natural resources conservation management requirements or current natural resources compliance needs. The Army equivalent to Office of the Secretary of Defense's "must fund" projects are projects as described by classes 0, 1 and 2 High (2H) in current Army policy and guidance for identifying Environmental Program requirements.

All projects listed in an Integrated Natural Resources Management Plan are not necessarily environmental class 0, 1 or 2H. Implementation of Integrated Natural Resources Management Plans is a shared responsibility among those activities that use the land (e.g., trainers, facility managers, provost marshal) as well as those who ensure compliance and provide overall program oversight. Accordingly, projects necessary to implement Integrated Natural Resources Management Plans are not limited to environmental funds. However, Integrated Natural Resources Management Plans should include all projects.

Projects are contained in Appendix 2, *Lists of Projects* of this Integrated Natural Resources Management Plan and will be reviewed and updated annually upon completion of Army review and validation processes.

5.1 Natural Resources Implementation Goals and Objectives

Natural resources program management includes all the tasks required to plan, organize, implement, and operate the Natural Resources program for USAG-HI. Annual goals for natural resources program management are to:

- Prepare, update, and submit Conservation "must fund" projects.
- Develop, update, and execute Conservation work plan.
- Obtain and execute 100 percent of natural resource funding.

- Contribute to Installation Status Report and Army Environmental Database – Environmental Quality report.

and to:

- Execute conservation implementation plans.
- Meet training needs of designated natural resources professionals.
- Recruit and train adequate staff to conduct natural resources activities.
- Prepare, update, and execute cooperative agreements, Memoranda of Understanding, and Memoranda of Agreement to accomplish natural resources management.

5.2 Achieving No Net Loss of Training Lands to the Military Mission

The Natural Resources program through this Integrated Natural Resources Management Plan (as well as the Integrated Training Area Management program) provides mitigation for the military mission. Therefore, full implementation of this plan is required to achieve no further loss of training lands to the military mission.

5.3 Supporting Sustainability of Military Mission

This Integrated Natural Resources Management Plan is written with the intention of supporting military mission sustainability. Full implementation of this plan is required to achieve mission sustainability.

5.4 Implementation Related Plans and Planning

5.4.1 Integrated Natural Resources Management Plan

Natural resource planning includes preparing, updating, implementing, and reviewing the Integrated Natural Resources Management Plan annually.

5.4.2 Conservation Program Budget Planning

The Natural Resources and Cultural Resources programs make up the Conservation program. The purpose for the U.S. Army Hawai‘i O‘ahu Conservation (Natural Resources) program budget planning is to gain approval and provide programmatic guidance to USAG-HI natural resources (conservation) program managers and coordinators on the future structure of the USAG-HI O‘ahu Natural Resources program. The Sikes Act, as amended in 1998, and Army Regulation (AR) 200-1 stipulate that planning level surveys, integrated natural resources management plans, endangered species management plans (where required), and the implementation of these plans are required for all Department of Defense lands. This plan outlines the steps and identifies the resources necessary to comply with the Sikes Act by supplementing the USAG-HI Conservation program.

5.4.3 Conservation and Integrated Training Area Management Work Plans

The USAG-HI Conservation Annual Work Plan, Army Environmental Cost Standardization Program tracks funding, obligations, and execution of natural resource projects and tasks. Each project contains the following information: project name, priority, project number and name, description,

funding required, funding allocated, funding obligated, year funded, agency (in-house or contractor), National Environmental Policy Act requirements, National Historic Preservation Act Section 106 requirements, other permit requirements, primary USAG-HI point of contact, project status, and comments.

The Integrated Training Area Management Work Plan is created by the Integrated Training Area Management Coordinator, submitted to the Director of Plans, Training, Mobilization, and Security through the U.S. Army Hawaii Garrison, validated by U.S. Army Installation Management Command - Pacific, and turned in to the Department of the Army Mobilization & Operations Army Training Division for Integrated Training Area Management program funding.

5.4.4 USFWS Mandatory Threatened and Endangered Species Management Plans

The *Biological Opinion on Routine Military Training and Transformation of the 2nd Brigade 25th Infantry Division (Light), U.S. Army Installations on the Island of O'ahu, (1-2-2003-F-04)* (USAG-HI 2003a) is used by the USAG-HI Natural Resources staff for planning, budgeting, and implementing endangered species management on Schofield Barracks Military Reservation, Schofield Barracks East Range, Kawailoa Training Area, Kahuku Training Area and Dillingham Military Reservation and their action areas. The *O'ahu Implementation Plan for O'ahu Training Areas* (USAG-HI 2008b) includes the procedures and timelines that USAG-HI is using to implement stabilization activities for designated threatened and endangered species at the sub-installations and their associated action areas.

The *Reinitiation of the Biological Opinion of the U.S. Fish and Wildlife Service for U.S. Army Military Training at Mākua Military Reservation, Island of O'ahu*, (1-2-2005-F-356) (USAG-HI 2007a) and *Amendment of the Biological Opinion of the U.S. Fish and Wildlife Service for Military Training at Mākua Military Reservation* (1-2-2005-F-356) (2008) are used by the USAG-HI Natural Resources *O'ahu* staff for planning, budgeting, and implementing for threatened and endangered species management at Mākua Military Reservation and its associated action areas. The *Final Implementation Plan for Mākua Military Reservation* (2003a) and the *Addendum to the Implementation Plan for Mākua Military Reservation* (2005a) include the procedures and timelines that USAG-HI is using to implement stabilization activities for designated threatened and endangered species at MMR and its associated action areas. It should be noted that this biological opinion replaces all previous opinions for MMR.

5.4.5 NMFS & USAG-HI agreed upon Threatened and Endangered Marine Species Mitigation and Monitoring

In informal consultation with National Marine Fisheries Service, USAG-HI plans, budgets, and implements threatened and endangered marine species management at Mākua Military Reservation and its associated action areas. Included in a *Letter to Colonel Howard J. Killian, Commander, USAG-HI, Schofield Barracks, Hawai'i 96857-550, from William L. Robinson, Regional Administrator (Oct. 13, 2006), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Regional Office*, are the procedures and guidelines USAG-HI uses to implement mitigation and monitoring efforts to avoid adversely impacting four designated threatened and endangered marine species located within the MMR Action Area.

5.5 Reporting

USAG-HI is responsible for submitting reports for funding requirements, funding work plans, and environmental quality status. USAG-HI must annually submit the Army's funding program (Environmental Cost Standardization Program), Army Environmental Database – Environmental Quality, the Installation Status Report; Part II, Environmental and Reimbursable Project Tracking System. The Environmental Program Requirements report, the previous method for reporting environmental funding requirements, was discontinued in 2005.

5.6 Cooperative Agreements

A priority for partnering and accomplishing work to implement this plan is through cooperative agreements. AR 200-1 directs that, where needed, an installation should enter into cooperative agreements.

5.6.1 Fish and Wildlife Cooperative Plan

As per the 1997 amendments to the Sikes Act, INRMPs replaced Fish and Wildlife Cooperative Plans by incorporating the planning, development, maintenance, and coordination of fish, wildlife, and game conservation.

5.6.2 Department of Defense Agreements

Memoranda of Understanding between Department of Defense and other resources agencies provide the authority for installations to develop their own cooperative agreements in attainment of mutual conservation objectives with these agencies.

Memoranda of Understanding have been established between the Department of Defense and the Departments of Agriculture (March 27, 1963) and Interior (April 7, 1978). The memoranda authorize execution of cooperative agreements in attainment of mutual conservation objectives. Installations may develop cooperative agreements with the following:

- Department of Agriculture functioning through the Agriculture Research Service, the Soil Conservation Service, and the Forest Service.
- The Department of the Interior functioning through the U.S. Fish and Wildlife Service for the conservation of fish and wildlife resources and through the National Park Service for the development and management of outdoor recreation activities.

The Department of Agriculture functioning through the Animal and Plant Health Inspection Service and Animal Damage Control for animal damage control on military installations.

A cooperative agreement between the Department of Defense and The Nature Conservancy (December 13, 1988) declared a policy of cooperation and establishes procedures for planning and conducting cooperative efforts between The Nature Conservancy and Department of Defense on Department of Defense lands. Under this agreement, installation commanders can obtain technical assistance from The Nature Conservancy and State Heritage Programs, as well as allowing The Nature Conservancy to study significant ecosystems under the Army's control.

In June 1999, the heads of participating federal agencies signed a Memorandum of Understanding establishing the Cooperative Ecosystem Studies Unit Network. Department of Defense joined the

network in September 2000 and now serves as a council member and technical advisor on one of the Cooperative Ecosystem Studies Units. Cooperative Ecosystem Studies Units (CESU) provide research, technical assistance, and education to federal land management, environmental, and research agencies, and their partners. The CESU Network has several benefits: a broadened scope of scientific services for federal agencies, increased technical assistance to resource managers, additional scientific resources and opportunities for universities, and increased diversity of research scientists and institutions.

5.6.3 Other USAG-HI Agreements

USAG-HI has developed the following cooperative agreements to implement this plan and the conservation program.

- Cooperative Agreement with The Trust for Public Lands in facilitating Army Compatible Use Buffer Program land purchases (see Section 3.6, *Army Compatible Use Buffers*).
- The Koʻolau Mountains Watershed Partnership (KMWP) is a consortium of landowners and interested parties who have banded together to protect the watershed areas of the Ko'olau mountains on Oʻahu (see Section 4.20, *Watershed Management*).
- In the process of developing a cooperative agreement with the Hawaiʻi Fish Habitat Partnership, which seeks to cooperatively develop and implement aquatic conservation projects in Hawaiian streams and estuaries (see Section 1.5.2, *External Stakeholders*).

5.7 Organizational Enhancement, Roles, and Responsibilities

5.7.1 Organization

The Conservation Branch is a sub-component of the USAG-HI's Environmental Resources Department. Other branches within Environmental Resources Department include Planning Branch, Compliance Branch, and Clean-up Branch (Figure 5.1.a). The Natural Resources section is a part of Conservation Branch. The Conservation Enforcement section reports directly to the Provost Marshal's Office, while the Integrated Training Area Management section reports directly to the Director of Plans, Training, Mobilization, and Security –Installation Range Office. Both of these sections are integrated in terms of personnel and implementation of projects with the Conservation Branch.

5.7.2 Staffing

The management and conservation of natural resources under Army stewardship is a government function. Therefore, the provisions of AR 5-20 (*Competitive Sourcing Program*) do not apply to the planning, implementation, enforcement, or management of Army natural resources management programs. This includes all positions (for example, professional, technical, equipment operators, natural resources law enforcement professionals, laborers, and so on) that have been validated as a requirement to perform natural resources management. However, support to the natural resources program, where it is severable from management, planning, implementation, or enforcement actions of natural resources, may be subject to the provisions of this regulation. Personnel positions associated with activities that support (on an as-needed basis), the Natural Resources program (e.g., equipment operators or laborers from a pool or another shop) may be subject to the provisions of AR 5-20.

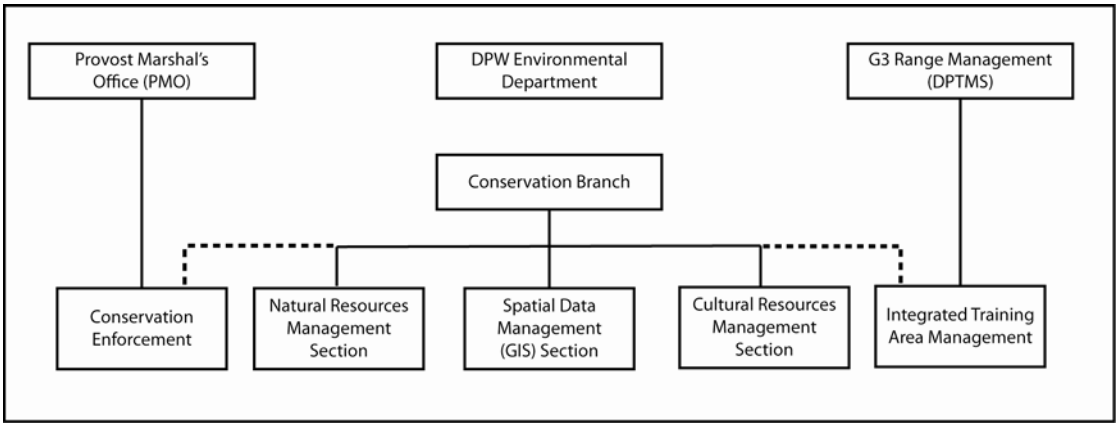

Figure 5.1.a Conservation Branch Organizational Chart.

The ideal situation would be for all positions to be full-time, permanent federal positions. Considering current Army personnel policies, the addition of permanent full-time federal positions is not likely in the foreseeable future, and a blended workforce is necessary. USAG-HI will pursue options to fill staff positions in a manner that will accomplish the most efficient blended workforce as possible.

Because the natural resources disciplines encompassed within this Integrated Natural Resources Management Plan are the natural sciences, AR 200-1 states an efficient and well-trained environmental staff is necessary. USAG-HI will establish positions as needed and fill validated positions in accordance with current Department of Defense/Department of Army policy. Positions required for meeting Sikes Act requirements for implementation of this Integrated Natural Resources Management Plan are shown below in Table 5.1.a.

Staffing Requirements

Implementation of must-fund requirements of this Integrated Natural Resources Management Plan requires two to four full-time federal natural resource managers (chief, O‘ahu installations’ manager, biologists), as well as assistance from USAG-HI’s partners and cooperators, both signatory and otherwise to meet the full implementation of all objectives (Class 1,2, and 3) listed in the INRMP (Table 5.1.a). Specific needs from organizations external to USAG-HI are indicated throughout this document. It is impossible for USAG-HI to hire the specialized expertise needed for some projects within this Integrated Natural Resources Management Plan. USAG-HI will require expertise support from universities, agencies, and contractors to accomplish some tasks. USAG-HI will reimburse parties for their assistance.

Federal In-house Capabilities: USAG-HI has very limited in-house federal positions as a result of manpower restrictions. To meet the intent of the Sikes Act, additional federal positions are required for the planning, management, and enforcement of natural resources.

Federal Agency Support: USAG-HI could utilize personnel support from other federal agencies; however, this option has not been used previously and is not anticipated to be used from 2010 to 2014. These types of personnel meet Sikes Act requirements for “Government in Nature” positions for planning, management, and enforcement of natural resources.

Other Agency Support*:* The Intergovernmental Personnel Act of 1972 (IPA) is a means to obtain personnel support. The IPA is a system where a federal or state agency “borrows” other federal or state agency personnel for a limited time for a specific job. Any state or federal agency is authorized

Table 5.1.a Oʻahu INRMP Staffing Requirements.

Department	Position Title	Current Positions	Category	Additional Positions
Environment	Natural Resources Management Chief	1	DA	None
Environment	Biologist	1	DA	None
Environment	Office Assistant	3	Contract	None
Environment	Implementation Plan Project Manager	1	Contract	None
Environment	Monitoring Program Specialist	2	Contract	None
Environment	GIS and Database Manager	1	Contract	None
Environment	Database Manager	1	Contract	None
Environment	Data Technicians	2	Contract	None
Environment	Research Specialist	1	Contract	None
Environment	Research Assistant	1.5	Contract	None
Environment	Education & Outreach Coordinator	2	Contract	None
Environment	Senior NR Coordinator	2	Contract	None
Environment	Coordinators	8	Contract	None
Environment	NR Field Technicians	33	Contract	None
Environment	NR Summer Interns	4 (S)	Contract	None
Environment	Fence and Animal Control Crew Boss	1	Contract	None
Environment	Fence Technicians	4	Contract	None
Environment	Animal Control Technicians	2	Contract	None
Environment	Horticulturist	2	Contract	None
Environment	Horticultural Assistant	2	Contract	None
Environment	Tissue Culture Specialist	1	Contract	None
Environment	Plant Conservation Specialist	1	Contract	None
Environment	Seed Conservation Specialist	1	Contract	None
Environment	Invasive Species Specialist	1	Contract	None
Environment	Snail Propagation Specialist	1	Contract	None
Environment	Avian Specialist	0.5	Contract	None
Environment	Rat Specialist	2	Contract	None
Environment	Pest Management	0.5	USDA	None
Environment Total		**82.5**		

Table 5.1.a Oʻahu INRMP Staffing Requirements.

Department	Position Title	Current Positions	Category	Additional Positions
Range Division	ITAM/LRAM Coordinator	1	Contract	None
Range Division	LRAM Technician	1	Contract	None
Range Division	RTLA Coordinator	1	Contract	None
Range Division	RTLA Technician	1 S	Contract	None
Range Division	GIS Analyst	1	Contract	None
Range Division	Wildland Fire Program Manager	1	DA	None
Range Division	Wildland Fire Crew Member	1	DA	
Range Division Total		**7**		
Military Police	Military Police Game Warden	2	DA	None
Military Police Total		**2**		

(S) indicates seasonal employees

to participate. The installation pays the borrowed employee's salary and administrative overhead. Major advantages are that personnel are not considered contractors and, therefore, can represent and obligate the federal government. Manpower authorizations are not required. An IPA employee would be considered part of the USAG-HI staff and could be directly supervised by a federal employee. IPA employees are bound by ethics rules of both their home state/federal agency as well as federal ethics regulations of the organization they are temporarily assigned. These personnel meet Sikes Act requirements for "government in nature" positions for planning, management, and enforcement of natural resources.

Oak Ridge Institute for Science and Education Support: Another "borrowed personnel" option for securing manpower assistance is through the Oak Ridge Institute for Science and Education. Oak Ridge Associated Universities manage and operate the Oak Ridge Institute for Science and Education research participation program for the U.S. Department of Energy. Oak Ridge Institute for Science and Education is a consortium of 88 doctoral-granting colleges and universities, providing students and post graduates opportunities to gain experience in their respective fields by working on Army installations. Oak Ridge Institute for Science and Education program coordinators at the Army Environmental Command are points of contact for the program. Oak Ridge Institute for Science and Education personnel are appointed research participants who gain hands-on experience by completing multiple tasks for the duration of their employment. Stipends are equivalent to salaries for employees hired with similar educational backgrounds with a 30 percent overhead. Oak Ridge Institute for Science and Education personnel can be appointed for a maximum three-year term. Installations may assist in the selection of Oak Ridge Institute for Science and Education personnel. These personnel support positions are not considered "government in nature."

University Assistance: Support to the natural resources program, where it is a severable form of management, planning, implementation, or enforcement, may be provided by on-site contract personnel. Due to the Sikes Act preference for other federal and state agencies with natural resource expertise, state universities are a preferred source of contract personnel support. USAG-HI has used several universities in recent years to help with specialized needs. The University of Hawaii has been

the principal source of support to USAG-HI on O‘ahu installations and Colorado State University at Pōhakuloa. These on-site support positions are not considered “government in nature.”

Contractor Support: As a final option for manpower assistance, USAG-HI contracts businesses for tasks that are severable from management, planning, implementation, or enforcement of natural resources. Contractors give USAG-HI access to a wide variety of expertise. Contractors may be used for projects such as plan preparation, National Environmental Policy Act documentation, aerial census and photography, Land Rehabilitation and Maintenance implementation, and similar activities.

5.7.3 Coordination and Training

Staff coordination and communication can be challenging as Conservation staff reside at various locations on O‘ahu and Hawai‘i, hundreds of miles apart. A significant strength of the Conservation program is the integration with other Army directorates, namely the Provost Marshall’s Office and the Directorate of Plans, Training, Mobilization and Security (DPTMS). However, this split chain of command also makes communication and coordination difficult. In some cases, supervisors work in different locations from their staff. A blended workforce consisting of federal employees, Intergovernmental Personnel Agreement (IPA) staff, university personnel, and contract personnel contributes to chain of command challenges. Therefore, USAG-HI has instituted a framework of natural resource teams, in-progress reviews, and periodic training to meet these challenges.

5.7.3.1 In-Progress Review

The USAG-HI Conservation / Integrated Training Area Management In-Progress Review process is the forum by which Conservation personnel report annual accomplishments and brief future plans and requirements to the USAG-HI Environmental Chief, U.S. Army Hawaii Range Manager, and Range Officers for each sub-installation. The In-Progress Review provides an opportunity for discussion between the Conservation personnel from each post and the USAG-HI Range and Environmental staff. Installation Management Command Pacific Area Regional Office Conservation and U.S. Army Pacific Command Integrated Training Area Management personnel are invited to participate.

5.7.3.2 Conservation Team

The USAG-HI Conservation Team exists to promote integration and enhance project execution. All natural and cultural resources employees of USAG-HI are members of the conservation team. The conservation team was created to allow free exchange of ideas and information amongst the members on all three posts. The conservation team exists to tackle technical scientific issues necessary to carry out projects. There are three permanent components of the USAG-HI Conservation Team: the conservation team – USAG-HI Pōhakuloa, the conservation team – O‘ahu Training Areas, and the Conservation Steering Committee. Ad hoc committees are created and convened as necessary. Ad hoc committees include the ecosystem management team and the Range and Training Land Assessment team. Conservation personnel often serve on a number of these permanent and ad hoc teams.

5.7.3.3 Training

Interdisciplinary training is essential for Department of Defense natural resource managers. Training addresses job disciplines, statutory compliance requirements, applicable Department of Defense/Department of Army regulations, pertinent State and local laws, and current scientific and professional standards as related to the conservation of our nation’s natural resources. The natural resource training objective is to identify technical requirements as well as the resources (cooperative agreements, Legacy, Integrated Training Area Management, Memoranda of Understanding, and so forth) available to implement and execute a successful and proactive program. The goal is to maintain

and enhance the military mission, biodiversity, conservation stewardship, and management of the total ecosystem from the practical standpoint of day-to-day operations as well as long-term planning.

5.8 Decision Support

Decision support system goals and objectives all contribute to one or more of the overall natural resources program goals of stewardship, military training support, compliance, quality of life, and integration. Decision support system goals and objectives are:

- Provide a decision support capability to natural resources, range, and engineer planners and managers.
- Develop and maintain USAG-HI Geographic Information System spatial database and data layers.
- Maintain Geographic Information System data in accordance with Federal Geographic Data Committee standards and Tri-Services Spatial Data Standards, including metadata standards.
- Coordinate and synchronize the three decision support systems: Geographic Information System, Range Facility Management Support System, and Integrated Facility System.

5.8.1 Geographic Information Systems

The USAG-HI Geographic Information System is a foundational capability of natural resource management. The Geographic Information System is a computer-based tool capable of assembling, storing, manipulating, and displaying geographically referenced information (i.e., data identified according to their locations). The system can be used to analyze and model (manipulate, overlay, measure, compute, and retrieve) the digital spatial data and display the new map products and tabular resources information showing the results of the spatial analysis. Geographic Information System technology integrates common database operations such as query and statistical analysis with the unique visualization and geographic analysis benefits offered by maps. These abilities distinguish Geographic Information System from other information systems.

5.8.2 Range Facilities Management Support System

The Range Facilities Management Support System is a multi-user, personal computer, web-based software package that automates the real property inventory, scheduling, firing (operations) desk, and management functions at an installation's Range Control Center. The Range Facilities Management Support System was developed to optimize the scheduling, use, and operations and maintenance functions for an installation's live-fire ranges, maneuver training areas, and other related training facilities and assets under AR 210-21. The data from this system allows land managers (i.e., natural resources and ITAM managers) to identify ranges and training areas that may be overly impacted by training use so that some appropriate action can be taken, such as allowing an area to be rested and/or rehabilitated.

5.8.3 Integrated Facility System

The Integrated Facility System is a facility engineer automated information evaluation system that encompasses life cycle management of real property resources. It is the Army Chief of Staff for Installation Management's official source of real property information. The current version is the Integrated Facility System – Micro or Mini. In addition to real property information, the system performs a wide variety of other functions such as work estimating and work-order tracking. The

system has two levels: one for installation level and one for headquarters level (now called Executive Information System). The U.S. Army Corps of Engineers' Center for Public Works manages the Integrated Facility System. The data from this system allows land managers (i.e., natural resources managers, ITAM managers, DPTMS Range Division, and DPW personnel) to identify property owners, Directorate or Office of responsibility, and the appropriate funding mechanisms that are allowed to maintain the identified infrastructure, facility, or land.

5.9 Outreach

Outreach is another extremely foundational component of natural resources implementation. Each natural resource program conducts outreach activities, and the natural resources program management function integrates these efforts through the conservation web page, conservation newsletter, and participates in other outreach events (see Section 4.19, *Community Involvement & Education*).

5.10 Financial Management

Another significant component of USAG-HI natural resource program management is financial management. Financial management consists of funding, budgeting, and contracting. These three components all are important to USAG-HI's ability to implement this plan.

5.10.1 Funding

This document identifies the natural resources management and conservation requirements necessary for sustaining viable ecosystems, the military mission and compliance with relevant environmental laws (i.e., Endangered Species Act). However, full implementation of this INRMP, and all associated natural resources projects, is contingent upon the availability of funds. If funding does not meet the level needed for full implementation, projects and efforts will be prioritized based on importance for mission sustainability and statutory compliance.

Projects are categorized as Class 0, 1, 2, and 3, as defined in DoDI 4715.3 *Environmental Conservation Program*, Enclosure 4 (*Programming and Budgeting Priorities for Conservation Programs*), May 3, 1996.

- Class 0: Recurring Natural and Cultural Resources Conservation Management Requirements. Class 0 shall contain any INRMP action necessary to rehabilitate or prevent resource degradation that may affect military readiness.
- Class 1: Current Compliance Requirements. Class 1 shall contain requirements to manage species and habitats of concern to prevent listing of species that could affect military readiness.
- Class 2: Maintenance Requirements.
- Class 3: Enhancement Actions beyond Compliance.

Class 0 and 1 projects are deemed "must funds" by DoD. "Must Fund" conservation requirements are those projects and activities that are required to meet recurring natural and cultural resources conservation management requirements or current compliance needs. Per DoD policy, accomplishment of all Class 0 and 1 "must fund" projects constitutes the minimal acceptable level of implementation. Not all projects listed in this INRMP are necessarily "must funds."

Funding for INRMP projects are projected 5 years in advance through the Program Objective Memorandum (POM). Proper planning and management are necessary to set goals and objective years in advance.

In general, there are three main focus areas for funding: staffing, compliance activities, and stewardship activities.

1. Staffing of federal employees is considered a "must fund" for budgeting purposes. Staffing is further discussed in Section 5.2 (5.10.2).
2. Activities and projects driven by requirements to comply with federal laws, applicable state laws, and applicable executive orders (EOs) are given the next priority for funding. Compliance is often split into two tiers of "must fund" and "will fund if funds are available." For the purposes of this INRMP, the top tier compliance activities include the Endangered Species Act, Clean Water Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, and National Environmental Policy Act. The second tier compliance activities include, but are not limited to, the Sikes Act, Marine Mammal Protection Act, and Invasive Species EO. Projects that are for compliance purposes can be found in Appendix2.
3. Stewardship, the responsibility to manage and conserve natural resources for the future, is essential to ensure sustainability of military lands for the mission and the environment. Oftentimes, stewardship efforts include natural resource projects that are proactive, noncompliance conservation efforts to maintain or enhance an installation's natural resources that demonstrate environmental leadership and stewardship, conducting baseline surveys and long-term monitoring. Projects that are for stewardship purposes can be found in Appendix 2, *Lists of Projects*. Stewardship projects that are not compliance/mission driven are the lowest priority and accomplished when funding is available or alternate sources for completion are identified.

Natural resources management relies on a variety of funding mechanisms, some of which are self-generating and all of which have different applications rules. In this section are general discussions about different sources of funding to implement an INRMP. (Not all of these are currently used by USAG-HI.) Additional information on programming and budgeting can be found in *Department of Defense Instruction* (DoDI) *4715.3, Environmental Conservation Program* (03 May 96) Enclosure 4, *Programming and Budgeting Priorities for Conservation Programs*.

5.10.1.1 Environmental Program Funding

The request for environmental funds by an installation is budgeted out a minimum of six years. This budget requests is reviewed by U.S. Army Installation Management Command, forwarded to the Department of the Army, and then to U.S. Congress for review and approval. Projects work their way through the six year review process. Only in extenuating cases are new environmental projects funded sooner, which usually results in the delay of other projects.

The Environmental Program Requirements process was formerly used to govern environmental funding. In 2005, the Army decided to adopt the Environmental Cost Standardization (ECS) model to develop an installation's environmental requirements that are predictable. The ECS model uses three processes: identifying requirements, programming for funds, and allocation of dollars actually received. The ECS model is still in development and each U.S. Army Installation Management Command – Region uses its own methods to identify requirements, programming funds, and fund allocation. Environmental funding requirements are divided into two major areas: conservation and compliance.

Non-recurring projects (one-time projects) are addressed with the IMCOM web-based Status Tool for the Environmental Program (STEP). The tool is accessed through the Army Environmental Reporting Online (AERO) portal. The data entered into STEP facilitates project review, approval, and prioritization process and the allocation and timing of funds. The project narrative and project priority are the two most important sections of STEP from the Garrison perspective.

Environmental Conservation Funding

The purpose of environmental conservation funding is to enable the Army mission through the characterization, monitoring, compliance, and oversight of installation natural and cultural resources. Conservation funding allows Army managers to exercise stewardship of natural and cultural resources by the facilitation of the planned management via the Integrated Natural Resources Management Plan and Integrated Cultural Resource Management Plan. Coordination with facility managers, trainers, and other land users and implementing of projects that help preserve, maintain, repair, and improve natural and cultural resources accomplishes sustaining mission requirements (see Appendix 2, *Lists of Projects*.)

Environmental Compliance Funding

The purpose of environmental compliance funding is to enable the Army mission by through the implementation of mandated actions to protect and enhance environmental media from the negative effects of pollution and human alteration and allow sustained access to and use of operational ranges to meet doctrinal training requirements. Most of these funding requirements are not covered in this Integrated Natural Resources Management Plan; however, a few projects that are intertwined with natural resources management (see Appendix 2, *Lists of Projects*.)

5.10.1.2 Conservation Reimbursable Funding

Reimbursable programs support military readiness and land management, and revenues from these programs supplement base operations and other funding. Agriculture/grazing out-leases are authorized by 10 USC 2667(d), commercial forestry is authorized by 10 USC 2665, and the collection of fees to hunt, trap, or fish is authorized by 16 USC 670a. Reimbursable program may be used to enhance and maintain wildlife habitats. Revenues generated through fees to hunt, trap, or fish may be used for the protection, conservation, and management of fish and game. The Army has about 800,000 acres of land leased under agriculture/grazing, and 1.4 million acres under some form of commercial forestry. The Army has executive agent responsibilities over the Department of Defense Forestry Reserve Account.

Forestry Funds

Forestry funds are generated from sale of forest products on military lands. An installation may be reimbursed for all costs associated with the maintenance and disposition of forest products. Forestry funds must be used only for projects directly related to forest ecosystem management. Such projects include timber management, reforestation, timber stand improvement, inventories, fire protection, construction and maintenance of timber area access roads, purchase of forestry equipment, disease and insect control, planning (including compliance with laws), marking, inspections, sales preparations, personnel training, and sales. AR 200-1 notes that revenues from forest product sales can be used for the management of forests and natural resources. USAG-HI currently does not allow commercial timbering on USAG-HI's lands.

Agricultural Outlease Funds

The Army Agriculture/Grazing Out-lease Program is a reimbursable program. This means that proceeds from outleases on an installation are first used to cover authorized expenses. Proceeds are allocated to the installations and U.S. Army Corps of Engineer Districts based on the Agricultural/Grazing Outlease protocol. The use of revenue from agricultural and grazing outleases

are regulated by law. Revenues may be used for reimbursement of the administrative costs of out-leasing and the financing of multiple-land use management activities through established budget procedures. USAG-HI currently does not allow agricultural outleasing.

Fish and Wildlife Funds

Department of Defense Fish and Wildlife Funds are collected through sales of permits for hunting, trapping, or fishing on military controlled lands. They are authorized by the Sikes Act and regulated by AR 200-1 (Section 4-3d[9])—*Hunting, Fishing, Trapping*. These funds may be used only for fish and wildlife management on the installation where they are collected. They cannot be used for recreational activities. They are exempt from equipment purchase amount limitations, and they do not expire (unobligated funds carry over on 1 October). USAG-HI currently does not collect fees for hunting, trapping, or fishing.

5.10.1.3 Facilities Program Funding

Army facilities are funded with two types of funding: Base Operating Support, and Facilities Sustainment, Restoration, and Modernization. It is the Army's plan during 2010-2014 to fund both of these accounts at 90 percent of the validated requirement.

Sustainment, Restoration, and Modernization

The purpose of sustainment funding is to enable the Army mission by funding the sustainment of range and other facilities in good working order to meet long-term doctrinal training requirements. The purpose of restoration funding is to restore failed or failing facilities, systems, and components damaged by a lack of sustainment, excessive age, fire, storm, flood, freeze, or other natural occurrences, improves facilities to current standards. Modernization funding adapts facilities to meet new standards and includes the erection, installation, or assembly of a new real property facility, the addition, expansion, extension, alteration, conversion, or complete replacement of an existing real property facility (DoD *Financial Management Regulation 7000.14-R* Chapter 8 *Facilities Sustainment, Restoration and Modernization*).

Real Property Services

Real Property Services funding provides for those activities of an installation support nature. It includes those support elements and services identified as indirect overhead by Headquarters Department of Army and grounds maintenance activities. This includes abatement and disposal of building hazardous waste resulting from the performance of real property services.

5.10.1.4 Sustainable Range Program Funding

There are three types of range program funding that affect the management of natural resources: range operations, range modernization, and Integrated Training Area Management funding. Range operations funding provides for the operation and management of training ranges, range modernization funding upgrades range facilities, and Integrated Training Area Management funding rehabilitates and maintains training areas.

Integrated Training Area Management

Integrated Training Area Management (ITAM) funding enables the Army mission by funding the management and maintenance of training lands to sustain and enhance the capability to meet long-term doctrinal requirements.

ITAM program funding is not driven by regulatory statute, but is an integral component of the Army's land stewardship effort. ITAM projects are grouped into four categories (A-D) as defined in the ITAM Work Plan Analysis Module Implementation Guidance, July 2007.

Category A: Annual recurring requirements to provide baseline program staffing and operation.

Category B: High priority repair and/or reconfiguration projects required to return degraded training area to useable condition.

Category C: Medium priority repair, reconfiguration, and/or maintenance projects having minimal immediate adverse impact on training, but with potential for near-future significant impact.

Category D: Low priority projects with no immediate adverse impact on training, but with potential for eventual impact. Category D projects may eventually elevate to Category C.

As with other programs in this INRMP, ITAM funding is projected five years in advance through the Program Objective Memorandum (POM). Projects are conceived at the installation and are validated at Installation Management Command (IMCOM) and HQDA levels prior to funds release. The installation submits an obligation report to IMCOM and HQDA at the end of each fiscal year.

Range Operations

Range operations funding enables the Army mission by funding the operation of ranges and training lands to sustain long-term doctrinal training requirement. Range operations funding also provides for record keeping of the number and type of munitions fired, communication and coordination with local public on noise issues, and the design and installation of signage for access controls to ensure safety and security of range facilities.

Range Modernization

Range modernization funding enables the Army mission by funding the design and construction of ranges and the acquisition of training lands that are capable of sustaining long-term doctrinal training requirements.

5.10.1.5 Other DoD Funding Sources

Installations also have the opportunity to apply for alternative funding from DoD programs.

Legacy Program

The DoD Legacy program funds projects with an emphasis on regional and DoD-wide activities, and not installation-specific projects except for national programs (e.g., National Public Lands Day or demonstration projects). Projects may support the military mission or meet legal or statutory requirements; support or leverage DoD conservation initiatives and programs; or attempt new or innovative conservation management on DoD lands. While USAG-HI may seek Legacy funding, it is not expected to be a viable source for implementing this Integrated Natural Resources Management Plan.

Strategic Environmental Research and Development Program

The Strategic Environmental Research and Development Program (SERDP) is DoD's environmental science and technology program, planned and executed in full partnership with the Department of Energy and the Environmental Protection Agency, with participation by numerous other federal and non-federal organizations. To address the highest priority issues confronting the Army, Navy, Air Force, and Marines, SERDP focuses on cross-service requirements and pursues high-risk/high-payoff solutions to the Department's most intractable environmental problems. The development and application of innovative environmental technologies support the long-term sustainability of DoD's training and testing ranges as well as significantly reduce current and future environmental liabilities.

Environmental Security Technology Certification Program

The Environmental Security Technology Certification Program's (ESTCP) goal is to demonstrate and validate promising, innovative technologies that target the most urgent environmental needs of the Department of Defense (DoD). These technologies provide a return on investment through cost savings and improved efficiency. The current cost of environmental remediation and regulatory compliance in the Department is significant. Innovative technology offers the opportunity to reduce costs and environmental risks. ESTCP offers funding in the following four focus areas: Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms.

Readiness and Environmental Protection Initiative

Under authority of 10 USC 2684a, DoD may partner with state and local governments, and non-governmental organizations to acquire from willing sellers conservation easements on private lands, called Army Compatible Use Buffers (ACUBs) by the Army. REPI serves to forestall incompatible land use and protect high-value habitat so that DoD retains the discretion to use military lands free of encroachment-related restrictions and environmental constraints. With REPI, agreements and funding DoD can cost share the acquisition of conservation easements creating "win-win" situations for all partners. Encroachment Management is managed by Directorate of Community Affairs within USAG-HI.

5.10.2 Budgeting

The Environmental program works together with the Directorate of Resource Management to manage the environmental budget. USAG-HI uses work plans to communicate funding requirements to higher headquarters and to help manage the annual budget. USAG-HI uses both an Environmental work plan (natural resources and cultural resources) and an Integrated Training Area Management work plan.

The Conservation Annual Work Plan is used to develop requirements, plan spending, and track funding, obligations, and execution for natural resource projects and tasks. Each project contains the following information: project name, priority, project number and name, description, funding required, funding allocated, funding obligated, year funded, agency (in-house or contractor), National Environmental Policy Act requirements, National Historic Preservation Act Section 106 requirements, other permit requirements, primary USAG-HI point of contact, project status, and comments. The Conservation Annual Work Plan is included as part of the environmental program work plan.

The Integrated Training Area Management Program works with the Deputy Chief of Staff for Resource Management to manage the Integrated Training Area Management budget. The installation work plan is developed in the summer and submitted in August of each year to reflect Integrated Training Area Management program requirements in detail for the following six fiscal years. The work plan reflects all Integrated Training Area Management activities for the installation. Once projects are identified, they are prioritized from most to least important. Approval of these projects and priorities is obtained from the U.S. Army Hawaii Installation Range Office prior to completing the work plan. Once the projects are approved, they are entered into the Installation Work Plan Analysis Module database.

5.10.3 Contracting

The contracting process includes two primary components, purchase/acquisition and contract management. Purchase and acquisition is necessary to get a contract in place then contract

management is necessary to ensure good communication between the government and contractor to enable good contract performance.

5.10.3.1 Purchase and Acquisition

The first step in the contract process is purchase and acquisition. USAG-HI Environmental starts the process by clearly defining desired services in a statement of work, estimating costs, and initiating a purchase request. USAG-HI Environmental works together with a contracting agency to develop an acquisition strategy, using the Sikes Act priority to guide decision-making.

Sikes Act Priority for Contracting

The Sikes Act Committee Report defined natural resources management and conservation as "inherently governmental." Planning, implementation, enforcement, and management of Army natural resources cannot be contracted. The first priority for implementation of this plan will be to use the USAG-HI in-house workforce. USAG-HI in-house capabilities include permanent natural resources employees, other Public Works organizations (such as roads and grounds, carpentry shop, etc.) and troop projects. These methods are usually the least expensive, but tend to be the least flexible. All funds obligated toward in-house work must be expended in the current fiscal year.

Support to the natural resources program, where it can be separated from management, planning, implementation, or enforcement actions of natural resources may be contracted. The Sikes Act outlines priorities for contracting these implementation projects. When entering into contracts for services that implement natural resource management objectives or enforce natural resources laws (i.e., wildlife management and endangered species plans and surveys), priority is given to contracts with federal, state, and local agencies with responsibility for natural resources conservation. In other words, if an installation can not utilize governmental personnel to do natural resources conservation technical support, then other federal and state natural resources agencies have, by this law, a "right of first refusal" to accept this work. In such cases, competitive bids are not required.

When in-house staff or cooperating federal and state agencies cannot perform work, USAG-HI looks to various contract mechanisms. The Government Services Administration environmental services schedule provides companies that have already gone through an open bid process to be on the Government Services Administration contract. Contracting to one of these companies is relatively simple and fast. The Job Order Contract in place in USAG-HI provides quick and efficient service. However, when none of these other options is available, USAG-HI can use the open bid process through a contracting agency.

Documents Required for Acquisition and Purchased

The Economy Act of 1932, as amended, allows federal agencies to obtain services directly from other federal agencies or utilize contracts already in place by other federal agencies. The Military Interdepartmental Purchase Request is used to acquire natural resource conservation services. Natural resources support services may be obtained non-competitively, through contracts with state and local agencies. In this case, a purchase request must be submitted through the directorate of resource management to a contracting agency. Conservation personnel work together with the contracting agency to develop an acquisition strategy, statement of work, and government estimate. The government must prepare a statement of work and government estimate for each purchase request.

5.10.3.2 Contract Management

Once a contract is in place, USAG-HI Environmental must nominate a federal Contract Officer's Representative to help the Contract Officer manage the contract. The Contract Officer authorizes the Contract Officer's Representative to verify that the contractor performs the technical requirements of

the contract, to perform necessary inspections necessary, to maintain liaison and direct communications with the contractor, to monitor the contractor's performance, to submit a monthly report concerning performance of services rendered and to coordinate site entry for contractor personnel.

5.11 Command Support

Command support is essential to implementation of this Integrated Natural Resources Management Plan. Without this support, priority projects for natural resources management will not occur. Failure to execute these projects risks violation of environmental laws, reduced mission readiness, and negative public reaction to a lack of environmental stewardship. The Installation Commander is responsible for compliance with environmental laws and sets the tone for environmental stewardship. Command emphasis on this Integrated Natural Resources Management Plan ensures a healthy environment, sustainable resources, and quality future training lands.

CHAPTER 6. REFERENCES

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CHAPTER 7 PREPARERS

The following is a list of people who were primarily responsible for preparing and/or reviewing the Integrated Natural Resources Management Plan (INRMP), their titles, years of experience, and educational background.

Name	Educational Background	Applicable Experience (Years of Experience)	Project Responsibility
William Saunders	University of Wyoming B.S. (1984) (Physical and Sedimentary Geology)	• 5 years active duty • 20 years with the Wyoming Army National Guard including as the Environmental Program Manager • 5 years NEPA experience	Oversaw the development and executed the revision of the INRMP.
Christine Bern	San Francisco State University B.A. (1974), M.A.(1985) Ecology and Systematic Biology	• 25 years natural resources management, ecology • 2 years NEPA experience	Supported document development and the execution of the revision.
Calvin Bagley	Utah State University B.S. (1984), M.S (1988) Range Science	• 18 years executing ecological monitoring and inventory, natural resources management • 15 years NEPA experience	Supported document development and execution.
Mark Miller	Colorado State University B.A. (1997) Range Ecology University of Auckland, New Zealand Post Graduate Diploma in Science (Geography)	• 5 years NEPA and GIS Analyst, range inventory and monitoring • 2 years environmental planning	Collected and developed GIS data, developed maps.
Glenda Lesondak	Dordt College, B.A.—1988 (Biology) Colorado State University M.S.(in progress) Technical Communication	• 14 years technical editing and formatting experience	Editor

CHAPTER 8 AGENCIES AND PERSONS CONSULTED

U.S. Army Garrison, Hawai‘i

Ching, Susan—Implementation Plan Project Manager, Environmental Division, DPW

Kawelo, Kapua—Biologist, Environmental Division, DPW

Kanehisa, Dale—Environmental Protection Specialist, DPW

Leong, Mark—Entomologist, Engineering Branch, DPW

Lia, Steve—Ranger Planner, G-3/DPTM Range Division, 25th Infantry Division (L)

Lucking, Laurie—Cultural Resources Manager, Environmental Division, DPW

Mansker, Michelle—Chief, Natural Resource Section, Environmental Division, DPW

Nagata, Alan—Real Property Division, Directorate of Civil Works, Schofield Barracks

Nelson, John—Entomologist, Department of Preventive Medicine, Tripler Army Medical Center

Russo, Candace—Environmental Outreach Specialist, Environmental Division, DPW

Sagum, Ginger—Reality Specialist, Real Property Division, Directorate of Civil Works, Schofield Barracks

Suzuki, Rhonda—Chief, Environmental Compliance/Pollution Prevention/Restoration Branch, Environmental Division, DPW

Turnbull, Steve—Environmental Division, Directorate of Public Works

Winger, Christa—GIS and Database Manager, Environmental Division

Yamamoto, Robin—Entomology Program Manager, Environmental Division, DPW, Schofield Barracks

Yamaski, Scott—Army Wildland Fire Management Officer, Installation Safety

Yuh, Peter—Chief, Environmental Division, DPW

Other Army Organizations

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CHAPTER 9 List of Acronyms

ACOM ..... Army Command
ACUB ..... Army Compatible Use Buffer
APHIS ..... Animal and Plant Health Inspection Services
AR ..... Army Regulations
ARTEP ..... Army Training Evaluation Program
BAAF ..... Bradshaw Army Airfield
BASH ..... Bird/Animal Strike Hazard
BMP ..... best management practices
BRAC ..... Base Realignment and Closure
BRD ..... Biological Resources Division, U.S. Geological Survey
CACTF ..... combined arms collective training facility
CALFEX ..... combined arms live-fire exercises
COE ..... Corps of Engineers
CCAAC ..... company combined arms assault course
CWCS ..... Comprehensive Wildlife Conservation Strategy
CZM ..... Coastal Zone Management
DA ..... Department of Army
DAR ..... Division of Aquatic Resources, Department of Land and Natural Resources
DES ..... Director of Emergency Services
DLNR ..... Hawai‘i Department of Land and Natural Resources
DMR ..... Dillingham Military Reservation
DoD ..... Department of Defense
DoDI ..... Department of Defense Instruction
DOFAW ..... Division of Forestry and Wildlife, Department of Land and Natural Resources
DPTMS ..... Directorate of Plans, Training, Mobilization, and Security
DPW ..... Directorate of Public Works
DZ ..... drop zone
ECS ..... Environmental Cost Standardization
EIS ..... environmental impact statement
EMD ..... Environmental Management Division, Hawai‘i Department of Health
EMS ..... Environmental Management System
EO ..... Executive Orders
EPA ..... Environmental Protection Agency
ESA ..... Endangered Species Act, as amended
EFH ..... Essential Fish Habitat
ESTCP ..... Environmental Security Technology Certification Program
FAA ..... Federal Aviation Administration
FDRS ..... Fire Danger Rating System
FEIS ..... final environmental impact statement

FEMA ..... Federal Emergency Management Agency
FMWRC ..... Family and Morale, Welfare and Recreation Command
FOB ..... forward operating base
FUDS ..... Formerly Used Defense Sites
GIS ..... geographical information system
HBMP ..... Hawai‘i Biodiversity and Mapping Program
HCA ..... Hawai‘i Conservation Alliance
HDOH ..... Hawai‘i Department of Health
HINHP ..... Hawai‘i Natural Heritage Program
HMA ..... Hawai‘i Motosport Association
HMMWV ..... high mobility multipurpose wheeled vehicle
HQDA ..... Headquarters, Department of Army
HRHP ..... Hawai‘i Register of Historic Places
HSBP ..... Hawai‘i Stream Bio-assessment Protocol
IAFWA ..... International Association of Fish and Wildlife Agencies
ID ..... Infantry Division
IMA ..... Installation Management Agency
IMCOM ..... Installation Management Command
IMCOM_PAC ..... Installation Management Command-Pacific
INRMP ..... Integrated Natural Resources Management Plan
IP ..... implementation plan
IPA ..... Intergovernmental Personnel Act
IPMP ..... Integrated Pest Management Plan
IT ..... implementation team
ITAM ..... Integrated Training Area Management
ITC ..... In processing Training Center
IWAM ..... ITAM Workplan Analysis Module
IWFMP ..... Integrated Wildland Fire Management Plan
KLOA ..... Kawailoa Training Area
KMWP ..... Ko‘olau Mountains Watershed Partnership
KTA ..... Kahuku Training Area
LCTA ..... Land Condition-Trend Analysis
LRAM ..... Land Rehabilitation and Management
LZ ..... landing zone
METL ..... Mission Essential Task List
MILES ..... multiple integrated laser engagement system
MMR ..... Mākua Military Reservation
MOU ..... Memorandum of Understanding
MPRC ..... Multi-purpose Range Complex
MU ..... management unit
NARS ..... Natural Area Reserves System
NAVSTA-PH ..... Naval Stations Pearl Harbor
NAWQA ..... National Water-Quality Assessment

NBS ..... National Biological Survey
NCGRP ..... National Center for Genetic Resources Preservation
NDAA ..... National Defense Authorization Act
NEPA ..... National Environmental Policy Act
NMFS ..... National marine Fisheries Service
NOE ..... nap of the earth
NR ..... natural resources
NRCS ..... Natural Resources Conservation Service
NRHP ..... National Register of Historic Places
OANRP ..... O‘ahu Army Natural Resources Program
OHA ..... Office of Hawaiian Affairs
ORAP ..... Operational Range Assessment Program
P2 ..... pollution prevention
PARO ..... Pacific Region Office
PMO ..... Provost Marshal’s Office
POM ..... Program Objective Memorandum
POV ..... privately owned vehicle
PU ..... population unit
PVA ..... population viability analysis
PZ ..... pick-up zone
RCMP ..... Range Complex Master Plan
RCUH ..... Research Corporation of the University of Hawai‘i
RDH ..... Range Division Hawai‘i
RDX ..... explosives
REPI ..... Readiness and Environmental Protection Initiative
ROD ..... record of decision
RTLA ..... Range and Training Land Assessment
RTLP ..... Range and Training Land Program
RTLPD ..... Range and Training Land Program Development Plan
SAIA ..... Sikes Act Improvement Act of 1997
SBCT ..... Stryker Brigade Combat Team
SBER ..... Schofield Barracks East Range
SBMP ..... Schofield Barracks Main Post
SBMR ..... Schofield Barracks Military Reservation
SERDP ..... Strategic Environmental Research and Development Program
SGCN ..... Species of Greatest Conservation Need
SHLWB ..... Schofield High Level Water Body
SOP ..... standard operating procedures
SRA ..... Sustainable Range Awareness
SRAA ..... South Range Acquisition Area
SRP ..... Sustainable Range Program
SRTA ..... short range training ammunition
SWP3 ..... storm water pollution prevention procedures

TMDLS ..... total maximum daily load
TNC ..... The Nature Conservancy
TNCH ..... The Nature Conservancy Hawai‘i
TPIO ..... TRADOC Program Integration Office
TPL ..... Trust for Public Lands
TRI ..... Training Requirement Integration
UAV ..... unmanned aerial vehicles
USACE ..... U.S. Army Corps of Engineers
USAEC ..... U.S. Army Environmental Command
USAG-HI ..... U.S. Army Garrison, Hawai‘i
USARHAW ..... U.S. Army Hawai‘i
USARPAC ..... U.S. Army Pacific Command
USASCH ..... U.S. Army Support Command
USDA ..... U.S. Department of Agriculture
USFS ..... U.S. Forest Service
USFWS ..... U.S. Fish & Wildlife Service
USGS ..... U.S. Geological Survey
VOR ..... visual operating rules
WAAF ..... Wheeler Army Airfield
WAM ..... Workplan Analysis Module
WGS ..... world geodetic system
WS ..... Wildlife Services, APHIS