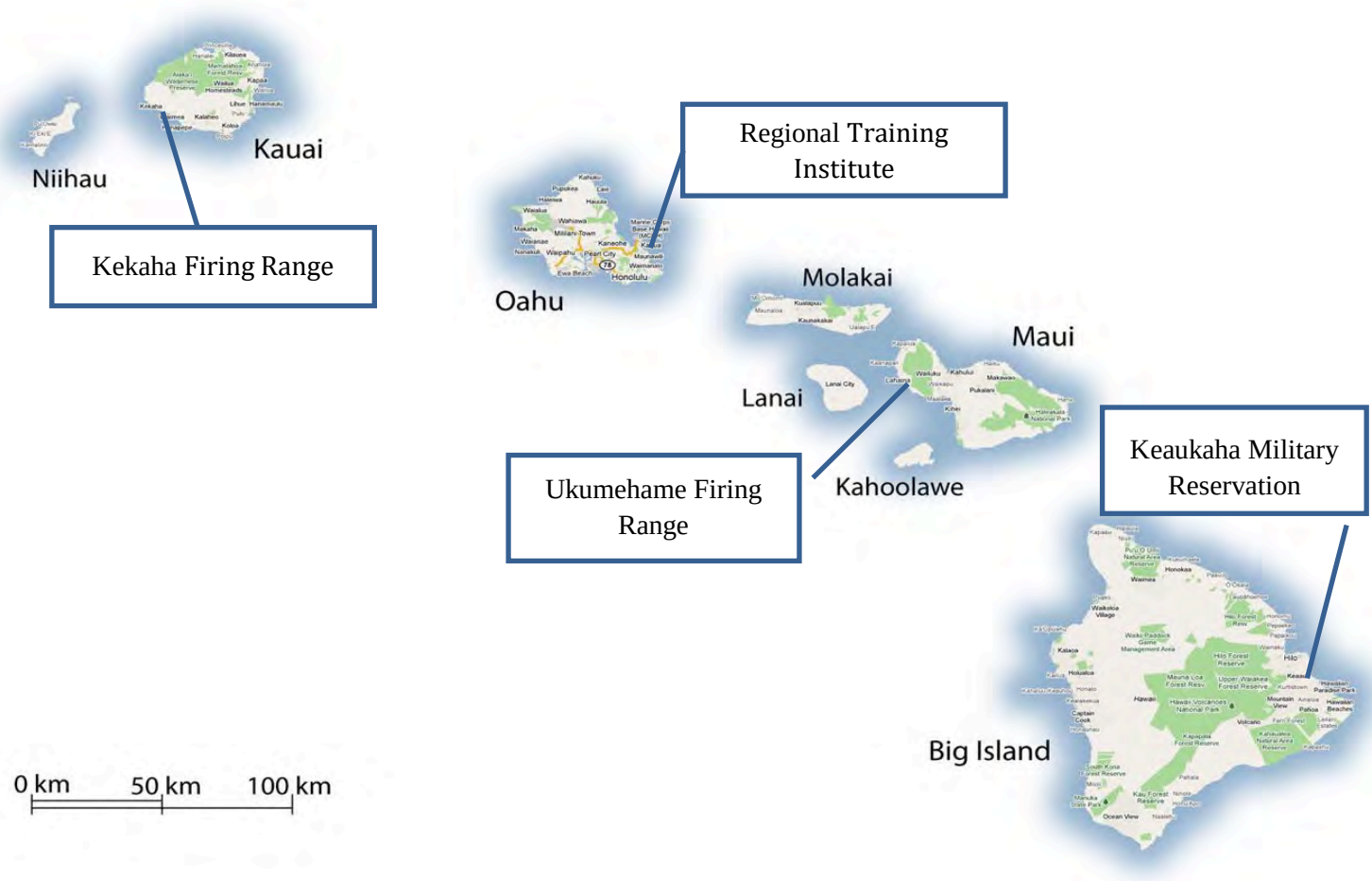
Hawaii Army National Guard
Integrated Natural Resources Management Plan for Four Sites
2019 Update –FINAL



Hawaii Army National Guard

Department of Defense

Office of the Adjutant General

3949 Diamond Head Road

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Integrated Natural Resources Management Plan for Four Sites (2019 Update)

Signature Page – NGB

for 10/28/19

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Integrated Natural Resources Management Plan for Four Sites (2019 Update)

Signature Page – HIARNG

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Integrated Natural Resources Management Plan for Four Sites (2019 Update)

Signature Page – USFWS

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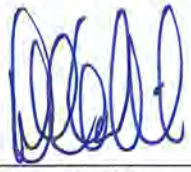
Integrated Natural Resources Management Plan for Four Sites (2019 Update)

Signature Page – DLNR DOFAW



8/19/19

David G. Smith **Date**
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Annual Review and Coordination Page

This page is used to certify the annual review and coordination of this Integrated Natural Resources Management Plan with the United States Fish and Wildlife Service (USFWS), and the Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW) for the Hawaii Army National Guard.

The Conservation Manager's signature below indicates that the USFWS and DLNR-DOFAW were invited to attend the annual INRMP review meeting for the specified year. For INRMP annual review invitations and meeting minutes, please see Appendix B.

Conservation Manager Signature:

2019 	**Date** 10/11/2019
2020	**Date**
2021	**Date**
2022	**Date**
2023	**Date**
2024	**Date**

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LIST OF ACRONYMS AND ABBREVIATIONS

AR	Army Regulation
Army	Department of the Army
ARNG	Army National Guard
°C	Degrees Celsius
CFR	Code of Federal Regulation
cm	Centimeter
CZMA	Coastal Zone Management Act
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
DoD	Department of Defense
EMP	Ecosystem Management Program
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	Degrees Fahrenheit
ft.	Feet (foot)
FY	Fiscal year
GIS	Geographic Information System
HIARNG	Hawaii Army National Guard
HIARNG-ENV	Hawaii Army National Guard Environmental Office
HQ	Headquarters
I&E	Installations and Environmental
in.	Inch(es)
INRMP	Integrated Natural Resources Management Plan
ITAM	Integrated Training Area Management
KD	Known distance
KFR	Kekaha Firing Range
KISC	Kauai Invasive Species Committee
KMR	Keaukaha Military Reservation
m	Meter(s)
NEPA	National Environmental Policy Act
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
ROD	Rapid Ohia Death
RTI	Regional Training Institute
RTLA	Range and Training Land Assessment
SDZ	Surface Danger Zone
SMA	Special Management Area
SOP	Standard Operating Procedure
TAG	The Adjutant General
TES	Threatened and Endangered Species
UFR	Ukumehame Firing Range
UHH	University of Hawaii - Hilo
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
y	Yard

Executive Summary

The Hawaii Army National Guard (HIARNG) is a component of the United States (U.S.) Department of the Army and the U.S. Army National Guard. HIARNG's federal mission is to serve as an integral component of the Army by providing fully-manned, operationally ready, and well equipped units that can respond to any national contingency ranging from war and peacekeeping missions to nation-building operations. The state mission of HIARNG is to provide a highly effective, professional, and organized force capable of supporting and assisting civilian authorities in response to natural disasters, human-caused crises, or the unique needs of the state and its communities.

All Army installations nationwide must develop an Integrated Natural Resource Management Plan (INRMP) in accordance with Army Policy and the Sikes Act (16 USAC 670a *et seq*. I 4715.03). The primary purpose of this INRMP is to support and preserve the training mission of HIARNG by protecting natural resources under Department of Defense control. It will also serve to promote compliance with environmental laws, regulations, and policies by providing baseline environmental documentation that will assist in preparing defensible National Environmental Policy Act documents (e.g., environmental assessments and environmental impact statements). INRMPs must support the training mission through land stewardship and must be revised as necessary. This plan is an update to the 2012 INRMP, signed in 2015. HIARNG operates at 15 sites statewide and conducts training at the following four properties covered in this INRMP:

1. Keaukaha Military Reservation (KMR) on Hawaii Island (504 acres) State Land.
2. Regional Training Institute (RTI) on Oahu (48 acres) Federal Land.
3. Kekaha Firing Range (KFR) on Kauai (68 acres) State Land.
4. Ukumehame Firing Range (UFR) on Maui (39 acres) State Land.

Live fire training is not conducted at any of the four INRMP sites listed above due to Surface Danger Zone (SDZ) and encroachment issues. Maneuver training, administrative training, leadership training, flight operations and land navigation are conducted on HIARNG sites. However, the HIARNG conducts live fire training, maneuver training and field training exercises at the following Army-managed training sites: Pohakuloa Training Area (PTA) on Hawaii Island, Schofield Barracks and Kahuku Training Area (KTA) on Oahu. HIARNG soldiers occasionally utilize Marine Corps-managed training areas, including: Marine Corps Training Area at Bellows (MCTAB), and the Puuloa Training Range Facility at Iroquois Point on Oahu. HIARNG soldiers also deploy to the U.S. mainland, Guam, Indonesian, Singapore, Japan, Philippines, Korea, Nepal, Taiwan and Malaysia for training exercises. ARNG-based trainings include a two-week Annual Training (AT), weekend-based Inactive Duty Training (IDT), and Innovative Readiness Training (IRT), which can include a variety of actions, depending on the unit's function. IRT involves community-based projects for HIARNG soldiers to jointly manage, which provide long-term benefits for Hawaii residents, examples include working with the Boy Scouts of America and constructing a community bike path on Kauai Island. HIARNG soldiers may be activated on State Active Duty (SAD) orders for domestic orders or on Active Duty (T-10) for federal missions and wartime efforts.

Because HIARNG soldiers utilize a variety of land areas within the state, on the U.S. mainland and abroad, biosecurity is an important consideration and management area that the Environmental office focuses on.

The INRMP will discuss biosecurity measures, multi-agency coordination and statewide goals that have been implemented to reduce the risk of invasive species introductions, as well as protect human and environmental health.

The INRMP also summarizes natural resources at these four properties; describes existing natural resource management programs; and establishes goals, objectives, and proposed actions to manage these natural resources. It is an overall ecosystem management master plan for the natural resource components of wildlife and vegetation, threatened and endangered species, water resources, and wetlands, and incorporates the natural resource elements of grounds maintenance, Integrated Training Area Management, land management, pest management and wildland fire management. The four HIARNG sites are home to numerous unique biological resources. Among these are the following.

Keaukaha Military Reservation— The 504-acre parcel on Hawaii Island contains 229 acres of unique lowland wet forest. This ecosystem has been heavily degraded, but it is relatively uncommon today due to coastal development. Three federally endangered species occur on the facility: Hawaiian hawk (*Buteo solitarius*), Hawaiian hoary bat (*Lasiurus cinereus semotus*) and the Cyrtandra groundcover (*Cyrtandra nanawaleensis)*.

Regional Training Institute—The 48-acre facility on the island of Oahu is a multi-functional training unit for the 298th Regiment and provides facilities and classroom space for other federal, state, local, and nonprofit groups, as needed. The facility is located on a flat coastal plain, with nearby wetlands and streams. Roughly half of the facility is maintained turf grass, while the other half is forested area of mainly Koa Haole and other invasive plant species. The Hawaiian stilt (*Himantopus mexicanus knudseni*) and Koloa x mallard duck hybrids have frequently been spotted on the facility along with the migratory kolea/golden plover *(Pluvialis fulva).* Feral pigs are monitored and controlled at RTI to reduce the negative impacts cause by pig presence.

Kekaha Firing Range—The 68-acre parcel is located along the Kekaha shoreline. The shoreline area outside of the parcel boundary has been designated as critical habitat for the endangered Niihau panicgrass *(Panicum niihauense)* by the USFWS. However, individuals have not been observed at or near the facility. A federal species of concern, the Hawaiian short-eared owl or pueo (*Asio flammeus sandwicensis*), has been observed on the installation.

Ukumehame Firing Range— The 39-acre parcel is located across the shoreline, separated by Honoapiilani Highway. The facility contains 8.6 acres of jurisdictional wetlands that are seasonally flooded in wet years. The flooding attracts at least three federally endangered bird species that nest on Ukumehame Firing Range: Hawaiian goose (*Branta sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian coot (*Fulica alai*).

This INRMP describes how the natural ecosystem will be managed to enhance military training and preserve ecosystem function and integrity. HIARNG coordinates annually with the U.S. Fish and Wildlife Service (USFWS) and State of Hawaii Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW), herein DLNR-DOFAW, regarding annual progress updates, potential areas of improvement, and expected projects for the coming year. During this annual review, if it is determined the INRMP goals and objectives are still current the INRMP may remain in place. If goals or conditions require an update, the HIARNG will formally update the INRMP and follow the INRMP Policy from ARNG-I&E dated 20 MAR 2019 (see Appendix B). At least every five years, the HIARNG will meet

with the USFWS and DLNR-DOFAW to review the INRMP for Operation and Effect. HIARNG, USFWS, and DLNR-DOFAW may conclude that the current INRMP is still valid, pending an updated addendum.

Seven overarching goals were identified to protect threatened and endangered species, natural resources, wildlife, and water resources as well as to control invasive species, wildland fire and pest issues at HIARNG INRMP sites. Goals for the HIARNG INRMP include:

1.) Comply with all federal, state, DOD, Army & ARNG laws, regulations, statutes, rules, memos, policies, directives, instructions and manuals.

2.) Protect threatened and endangered species, migratory birds and endemic birds, while reducing their impacts to training.

3.) Manage invasive flora and fauna species to ensure no impact to training lands and operations.

4.) Improve ecosystem health while reducing impacts on NR management on the mission.

5.) Utilize GIS for recording progress of NR projects and integrating conservation management with military training and construction.

6.) Protect water resources, wetlands, and coastal zones

7.) Promote collaboration, develop partnerships and foster awareness for NR Management

To achieve these goals, objectives have been identified and specific projects have been proposed to implement the objectives (see Appendix A). Four themes which integrate the proposed natural resources management program at the four sites are described below:

Support of the Military Mission

- Coordination with training operations to accomplish the military mission
- Enhancement and increased training opportunities at HIARNG training centers
- Implementation of Standard Operating Procedures to protect natural resources and stop the spread of invasive species.
- Promotion of environmental awareness among soldiers to protect natural resources while at the same time completing the military mission

Threatened and Endangered Species Management and Recovery

- Identification of TES on HIARNG lands and analysis of HIARNG actions on TES
- Management of TES to reduce threats and improve habitat
- Consultation and coordination with resource management agencies

Non-native Species Management

- Control and management of feral pigs and other predators
- Control and management of invasive plant species

— Manage ecosystems using Integrated Pest Management principles.

Native Ecosystem Management, Rehabilitation, and Restoration

— Rehabilitation efforts to promote native and non-invasive plant species establishment

— Native species out plantings to reduce fuel load potential

— Restoration through erosion control on training lands

The goal of the INRMP is to improve environmental resources while maintaining and improving training conditions for military readiness activities. Long-range planning within the INRMP will aim to increase training activities on HIARNG sites, while addressing any potential environmental conflicts. The INRMP can address short term projects such as invasive species removal to allow for site access and long-term planning for biosecurity efforts and challenges associated with climate change.

1 General Information

1.1 PURPOSE AND INTRODUCTION

This Integrated Natural Resources Management Plan (INRMP) outlines the Hawaii Army National Guard (HIARNG) Natural Resource Program for land stewardship in support of the military mission. It describes HIARNG's mandate for stewardship in support of the military mission, the important natural resources of these sites, the specific program elements and projects that comprise the stewardship program, and how these elements are integrated with the military mission.

This INRMP is HIARNG's overall 5-year vision, from fiscal year (FY) 2019 to FY 2024, for natural resource management to enhance the training environment. Sound environmental stewardship ensures a realistic, non-degraded setting for military training. This supports HIARNG's overall mission to maintain combat readiness and to organize a response locally, in times of war or disaster. In addition, an important purpose of this plan is to demonstrate how HIARNG complies with applicable federal, state, and local laws governing natural resources.

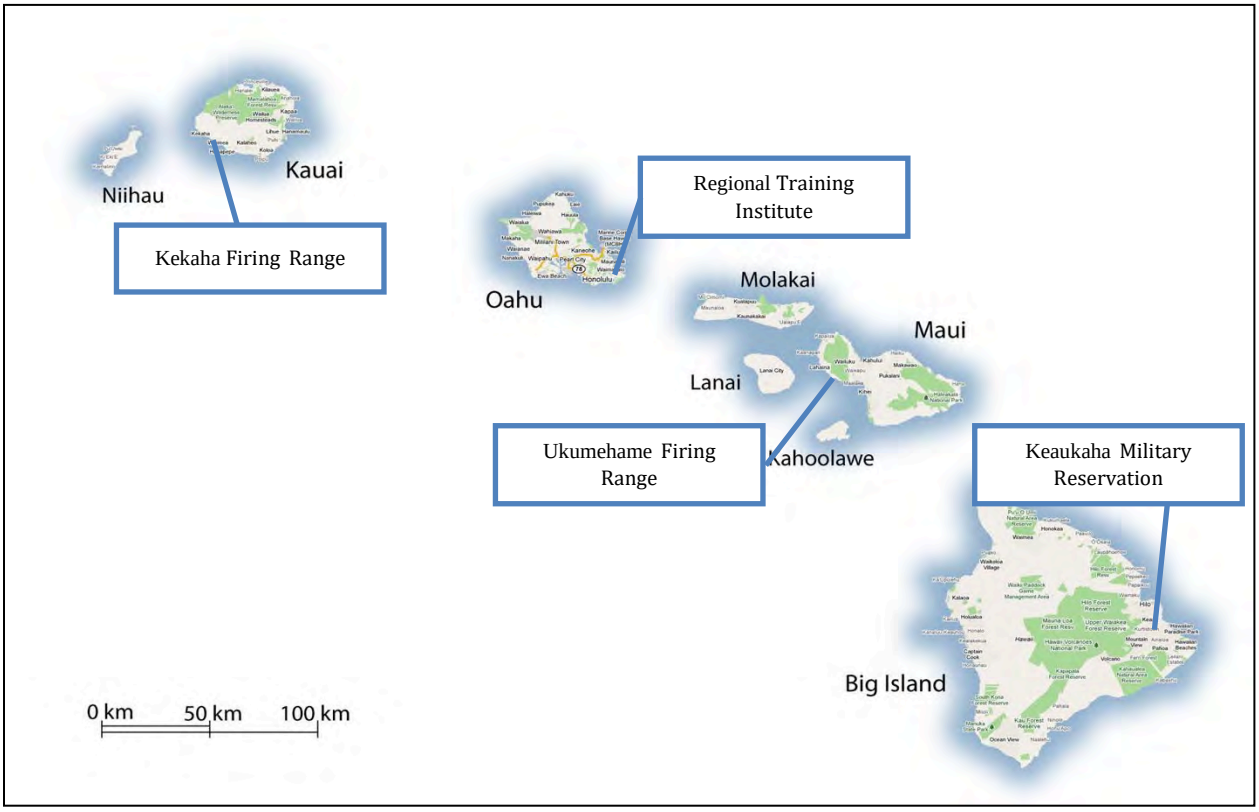
This INRMP is a revision the 2012 INRMP. An EA was completed for the original INRMP in 2001. HIARNG took a "hard look" at the existing EA, per 32 CFR 651.5.g.2, to ascertain the adequacy of the previous environmental assessment and see if it is still relevant. After examining the goals, existing conditions, projects, and environmental consequences of the original EA, HIARNG has determined there is no significant change since the original environmental assessment. Therefore, the updated 2019 INRMP can be treated as a tiering action and documented in a REC (Appendix B).

1.1.1 Facilities Included and the Integrated Natural Resource Management Plan Process

HIARNG conducts its activities on 15 facilities and training areas throughout 1,293 acres. Facilities include local training areas, armories, facility maintenance shops, combined support maintenance shops, and army aviation support facilities located throughout the state of Hawaii. HIARNG controls all properties via State Executive Order (EO), or via lease agreements from other Federal or State agencies. These sites, while not considered in this update plan, do require management and ongoing compliance with laws such as the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA).

The Sikes Act requires that this INRMP cover HIARNG installations with significant natural resources. The sites included in this INRMP are: Keaukaha Military Reservation (KMR), Hawaii; Regional Training Institute (RTI), Oahu; Kekaha Firing Range (KFR), Kauai; and Ukumehame Firing Range (UFR), Maui (Figure 1-1). These sites are under full-time control by the HIARNG and include a headquarters (HQ) military reservation, training areas, and a variety of support facilities. The four sites considered in this INRMP support important resources including native ecosystems, wetlands, and numerous federally endangered animals and plant species.

Figure 1-1 HIARNG Training Areas and Facilities Included in the 2019-2024 INRMP



1.2 MANAGEMENT PHILOSOPHY

This INRMP has been developed to support present and future training and testing requirements while preserving, improving, and enhancing the ecosystem integrity of military lands. It also incorporates the methods developed under Integrated Training Area Management (ITAM) that are used by the Army to monitor how useful land is for training activities, and which can also be used to evaluate the ecological condition of training lands and rehabilitate that land when necessary. Resource protection can often enhance training when, for example, removing stands of invasive weeds from a site both improves native plant recruitment and increases maneuverability for improved training opportunities. Sound management also ensures the compatibility of these two goals. For example, an endangered species monitoring program that identifies spatial and temporal distribution of threatened and endangered species (TES) enables soldiers to accomplish their mission while protecting the environment. Furthermore, an effective management program resolves potential conflicts between resource protection and training early on, thus allowing the mitigation of impacts while ensuring that essential training continues.

The HIARNG-ENV staff prioritize HIARNG lands based on their centrality to mission and ecological importance. The surrounding environment and public concerns are also important considerations. All the biologically sensitive lands within the HIARNG installations are public lands owned by the state of Hawaii, so conservation programs must complement state management policies and the State Wildlife Action Plan (SWAP). Working with partner agencies and groups is also considered key to an effective natural resources management program.

1.2.1 Integrating the SWAP into the INRMP

The State Wildlife Action Plan (SWAP) was updated and approved by the DLNR DOFAW in November 2016. The SWAP outlines the strategy and plans of the DLNR to address conservation needs for the state of Hawaii. The SWAP includes eight elements: Information on the distribution and abundance of wildlife species deemed "Species of Greatest Conservation Need", descriptions of the locations and conditions of key habitats, descriptions of the problems that adversely affect species, descriptions of conservation actions proposed to conserve species, proposed plans for monitoring species and their habitats, procedures to review plans for efficacy, plans for coordinating the update of the SWAP with stakeholders and provisions to ensure public participation in projects and programs.

The plan outlines seven priority conservation objectives:

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 Hawaii;
6. Support policy changes aimed at improving and protecting native species and habitats; and
7. Enhance funding opportunities to implement needed conservation actions.

The SWAP identified terrestrial mammals (1), birds (78), terrestrial invertebrates (~5,000), freshwater fishes (5), freshwater invertebrates (12), anchialine pond-associated fauna (20), marine mammals (26), marine reptiles (6), marine fishes (151), marine invertebrates (197), and flora (over 756) in their assessment of "Hawaii's Species of Greatest Conservation Need" (SGCN). The SGCN species were chosen based on their listing on the State TES list (HAR Ch. 124 Exhibit 1), their listing on the Federal TES list, species protected by the U.S. Marine Mammal Protection Act, the checklist of Birds in Hawaii and species identified by groups with significant experience or expertise (e.g. Audubon Watch List). DLNR Division of Aquatic Resources (DAR) also included native species on the International Union for the Conservation of Nature and Natural Resources (IUCN) Threatened Red List. Species were included in the SGCN list if they met one or more of the following biological criteria:

a. Species with low or declining populations
b. Species indicative of the diversity and health of the state's wildlife
c. Species with small, localized "at risk" populations.
d. Keystone species
e. Indicator species
f. Species with limited dispersal
g. Disjunct species
h. Vulnerable species
i. Species of conservation need
j. "responsibility species (i.e. species that have their center of range within a state)

k. Species with fragmented or isolated populations

Of the 6,252+ species listed as SGCN in Hawaii, HIARNG has approximately 21 Threatened or Endangered species based on species lists provided by the U.S Fish and Wildlife Service every 90 days for all HIARNG installations.

Major threats identified by the SWAP include loss and degradation of habitat, invasive species, ecological consequences of climate change, limited information and insufficient information management, uneven compliance with existing conservation laws, overharvesting, management constraints, and inadequate funding. The HIARNG Environmental staff utilizes the SWAP conservation objectives, threats to species, SGCN list, and program management guidance into our natural resources program.

1.2.2 HIARNG Specific Goals & Objectives

The mission of the HIARNG ENV office to conservation and protect natural resources, while maintaining land areas for mission training. Below are a list of seven goals with associated objectives.

1.) Comply with all federal, state, DOD, Army & ARNG laws, regulations, statutes, rules, memos, policies, directives, instructions and manuals.

- Develop and update an INRMP to effectively manage natural resources consistent with the HIARNG mission.
- Ensure natural resources management activities comply with associated environmental laws, regulations, guidance and management plans.
- Ensure NEPA analysis is conducted on environmental projects prior to execution.

2.) Protect threatened and endangered species, migratory birds and endemic birds, while reducing their impacts to training.

- Collect data on the patterns, distribution and preferences of TES known to occur at HIARNG training sites, to inform Section 7 consultations.
- Protect and enhance known TES and their habitat, while minimizing their impact to the mission.
- Conduct off-site mitigation for TES and other fragile resources when necessary.
- Manage MBTA-protected bird species and endemic bird species on HIARNG properties.

3.) Manage invasive flora and fauna species to ensure no impact to training lands and operations.

- Protect the unique natural resources of Hawaii through biosecurity efforts and education.
- Rate and prioritize invasive species management based on risk analysis and feasibility
- Control and eradicate noxious pest species to ensure no impact to training lands & operations.
- Incorporate an Integrated Pest Management (IPM) approach to controlling pests.
- Manage training areas and vegetation to reduce risks from wildland fires.
- Mitigate impacts of disease and improve conditions for mission training and soldier readiness.

4.) Improve ecosystem health while reducing impacts on NR management on the mission.
- Support pollinator species & native/endemic species.
- Out-plant native species to restore areas previously overgrown by invasive vegetation.
- Manage wildlife and natural vegetation communities for maximum ecosystem health and training land quality.

5.) Utilize GIS for recording progress of NR projects and integrating conservation management with military training and construction.
- Utilize handheld GPS equipment to record on-site NR activities
- Utilize ENV GIS database to collaborate conservation with training and site conditions

6.) Protect water resources, wetlands, and coastal zones
- Reduce impacts of soil erosion and runoff
- conduct dune restoration at near shore sites
- Consider climate change and sea level rise on natural resources managed by HIARNG

7.) Promote collaboration, develop partnerships and foster awareness for NR Management
- Conduct conservation-based trainings on a quarterly basis for unit Environmental Officers (EO).
- Brief command on important NR projects and invasive species concerns
- Partner and collaborate with other federal, state and Non-Governmental Organizations.
- Develop projects that encourage community participation and NR education.
- Ensure natural resource management and land use planning goals are compatible with mission and NR needs.
- .

1.3 LAWS AND REGULATIONS

In addition to its land management and training support responsibilities, HIARNG must manage certain natural resources to comply with specific provisions of numerous environmental laws and regulations. Since HIARNG has dual state and federal agency status, both state and federal laws apply to its operations. At peacetime, HIARNG is officially a state agency (under the State Department of Defense [DoD]) directed by the State Adjutant General and the Governor of Hawaii. During wartime, the President of the United States (U.S.) may direct HIARNG to assist in national defense. HIARNG's dual state-federal role requires compliance with federal, state, and county laws, and also with Army Regulations (ARs) and DoD directives and instructions.

ARs, issued by the Army under DoD, stipulate that the Army shall comply with, at a minimum, all federal, state, and local laws. Furthermore, these regulations provide additional requirements specific to Army actions and call for the Army to take a leading role in environmental conservation consistent with the training mission.

1.3.1 Specific Federal Mandates and Agreements

There are a plethora of federal laws, regulations, Executive Orders, Department of Defense, Army and National Guard Bureau Instructions, memorandums and guidance documents as well as State of Hawaii laws that HIARNG is responsible to comply with. The Sikes Act, as amended in 1997, requires that DOD

agencies develop and implement an Integrated Natural Resources Management Plan (INRMP). The Endangered Species Act (ESA) identifies and protects threatened and endangered species and the habitats that they rely on. It also requires federal agencies to protect those species and their habitats. The State of Hawaii Endangered Species Law, codified in Chapter 195D, Hawaii Revised Statutes (HRS) also identifies and protects endangered species specifically found in Hawaii. To note, HRS 195D lists the Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) and White Tern (*Gygis alba*) as endangered on Oahu, whereas ESA does not list these species. Both ESA and HRS 195D require consultation for any project that may effect a threatened or endangered species. The National Environmental Policy Act (NEPA) and State of Hawaii Environmental Policy Act, codified in Chapter 343 of Hawaii Revised Statutes, requires that federal agencies assess all reasonably foreseeable environmental impacts for a proposed project. The Migratory Bird Treaty Act (MBTA) protects migratory birds by making it unlawful to pursue, hunt, take, kill, possess or export a migratory bird without a permit. The Fish and Wildlife Coordination Act requires federal agencies to consult with the USFWS and State Wildlife agency for any action that alters a body of water. A full list of all law, regulations, etc. can be found in Appendix C of the INRMP.

1.4 RESPONSIBILITIES

Military users are integral to the stewardship of the lands on which they train. This responsibility begins at the federal level and translates down the chain-of-command to the local staff and soldier level. This section outlines general organizational responsibilities.

1.4.1 Army National Guard, Installations & Environment Responsibilities

The Army National Guard, as an agency of the U.S. Army, provides funding and guidance to the HIARNG. HIARNG utilizes the Status Tool for the Environmental Program (STEP) to submit INRMP projects for review, validation, and funding from NGB. HIARNG submits projects in the spring of the prior year to develop their Environmental State Operating Budget (ESOB). ARNG I&E reviews, validates or rejects projects submitted by HIARNG. HIARNG updates any rejected projects and re-request funding as an Un-funded Request (UFR) no later than February of the current fiscal year. ARNG I&E typically sends UFR money between late February and early April (ARNG-I&E Program Guidance 2018). In the past, Continuing Resolutions have delayed the STEP process and subsequent project funding for Environmental Programs.

1.4.2 Hawaii Army National Guard Responsibilities

The responsibilities of key personnel involved in natural resources management are described below.

The Adjutant General—The Adjutant General (TAG) is directly responsible for ensuring a combat-ready military force, as well as the operation and maintenance of the installation, and preservation of the environment, which includes implementation of this INRMP. TAG is responsible for complying with all federal, state, and local environmental laws and regulations as well as Department of the Army environmental policies and programs. Therefore, TAG is ultimately responsible for the success of the HIARNG Natural Resources Program. TAG ensures that all installation land users are aware of, and comply with, procedures, requirements, or applicable laws relating to this plan. TAG approves and supports the INRMP that is consistent with the military mission.

Plans, Operations, and Training Officer; G-3—The Plans, Operations, and Training Officer has the primary responsibility for scheduling military training and ensuring the safety of all HIARNG personnel.

Secondary to scheduling is maintaining a high-quality training site environment. The Plans, Operations, and Training Officer is ultimately responsible for the ITAM program; however at present, the HIARNG does not receive ITAM funding from NGB. The G3 Office does not have a current Range Complex Master Plan (RCMP) because our training sites in Hawaii do not meet the minimum qualifications to be considered a "training site" under NGB policy. The lack of an RCMP and qualified training sites has suspended the ITAM program and associated ITAM funding. The Plans, Operations, and Training Office still has a responsibility to provide military usage and training data to the Environmental Office to assist the Conservation Program in minimizing negative environmental effects or constraints on military training.

Facility Management Officer— The Facility Management Officer oversees the maintenance and improvement of the installation and its infrastructure. The Facility Management Officer manages the installation's construction, engineering, and environmental programs and projects and maintains all real property files, architectural plans, and facility site inventories. The Facility Management Officer is responsible for master planning and ensuring that all construction projects comply with environmental regulations by consulting with the Environmental Protection Specialist prior to any HIARNG construction. Conversely, all environmental projects, contracts, and correspondence must be approved by the Facility Management Officer who oversees physical alterations to the installation. In accordance with this plan, the Facility Management Officer's responsibilities are to: (1) ensure that all engineering projects are reviewed by natural resource staff for compliance with natural resource protection laws; and (2) technically review, approve, and support the INRMP that is consistent with the military mission.

Hawaii Army National Guard Unit Commanders—Military commanders in charge of field training operations are responsible for any damage to natural resources by soldiers under their command. The Facility Management Officer and technical staff can assist unit commanders in becoming environmentally sensitive to natural resource issues (e.g., endangered species, spread of weeds, erosion); however, it is ultimately the commanding officer's responsibility to prevent unnecessary damage to ranges and training areas. In accordance with this plan, unit commanders shall: (1) ensure their units are environmentally aware and trained, and (2) avoid unnecessary impacts to natural resources as outlined in this INRMP.

Environmental Office—The Environmental Office is responsible for the day-to-day management of the natural resources program, pest management program, cultural resources program, NEPA program and compliance programs. The individual responsible for natural resources management is the Conservation Program Manager.

1.5 IMPLEMENTATION, REVISIONS AND UPDATES

1.5.1 Implementation

HIARNG-ENV is responsible for the implementation of this INRMP. Within this office, the Conservation Program Manager is responsible for the day-to-day operations necessary to carry out this INRMP and will conduct the annual reviews of the INRMP. The annual review will be the basis for adaptive management through project prioritization adjustments and reallocating priorities and initiatives to ensure an effective conservation program. An updated Goals, Objectives and Projects database also feeds directly into the planning and budget development process and helps natural resources managers identify successes as well as impediments to success. Changes to projects, priorities, timing, and status can be directly tracked with updates to Appendix A

1.5.2 Revisions and Updates

According to the Sikes Act (Section 101[b] [2]), each INRMP must be reviewed on a regular basis but not less often than every 5 years. DoD policy requires HIARNG to review their INRMP annually in coordination with the FMO, G3, ARNG I&E, USFWS and DLNR-DOFAW. The results of the annual review conducted by HIARNG are sent to all parties in an annual letter.

The annual review of the INRMP will be initiated by the Conservation Program Manager. Appendix A will be used to track objectives and projects. A percentage complete for each project will be specified along with a narrative describing progress and evaluation against performance measures. Using Appendix A as the overall summary for the program, an annual review of the program will be conducted by the Conservation Program Manager, Natural Resources Manager, GIS Specialist and Natural Resources Field Staff. Appendix A will also be used to provide input to the annual Army Environmental Quality Report.

1.5.3 Budgeting & Resources

Funding for all natural resource projects is determined annually by ARNG I&E and the Army. Federal funds are dispersed to all 54 states and territories at the beginning of the federal fiscal year (October 1st through September 30th of the following year). There are two sources of federal funding for which State ARNG's natural resource projects are eligible: (1) Conservation Funding, funded through the Status Tool for the Environmental Program (STEP) database; and (2) ITAM Funding, funded through the annually-submitted ITAM Work Plan. ITAM funding is reliant upon the completion of the Range Complex Master Plan (RCMP). This plan identifies the 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 land. HIARNG does not have a current RCMP due to training site acreage shortfalls and proximity to currently active Army ranges, and therefore is not eligible for ITAM funding.

Conservation funds are used to implement natural resource projects dealing with TES, invasive species, and natural resource planning tasks benefiting ecosystems as well as supporting the military mission. ITAM funding is reserved for a project that specifically benefits the training environment as its primary objective. Because HIARNG does not have a current RCMP or ITAM funding, all projects are requested thru STEP.

1.6 NATURAL RESOURCES MANAGEMENT ACROSS ALL FACILITIES

This section describes the natural resources program elements that apply to all facilities covered under this INRMP. Details regarding specific facilities are provided in subsequent chapters.

1.6.1 HIARNG Conservation Program Organization and Partners

HIARNG Conservation Program Organization

The HIARNG Conservation Program is a team that works with all of HIARNG to promote effective environmental stewardship of natural resources. The conservation program includes identifying and managing natural and cultural resources; ensuring compliance with applicable laws, regulations, and policies; and promoting soldier/personnel awareness of native ecosystems, invasive species and integrated pest management and HIARNG's role in environmental stewardship. The organization of HIARNG-ENV is shown in Figure 1-2 and the responsibilities of key personnel are described below.

Environmental Protection Specialist—The Environmental Protection Specialist manages HIARNG-ENV under the Facility Management Officer. The Environmental Protection Specialist is responsible for managing the following 12 environmental programs: natural and cultural resources, air and water quality, hazardous and solid waste, recycling, pollution prevention, noise management, environmental impact assessment, Geographic Information System (GIS), and environmental awareness. The Environmental Protection Specialist provides oversight to the training site personnel including: Developing and implementing projects, securing permits and Environmental Assessments, conducting field studies, providing environmental awareness materials, and locating and mapping environmentally sensitive sites. In accordance with this plan, the Environmental Protection Specialist's responsibilities are to: (1) maintain an adequate staff to perform the duties and projects outlined in this plan; (2) implement a quality assurance program for all natural resource projects and contracts; and (3) technically review, approve, and support the INRMP so that it is consistent with the military mission.

Conservation Program Manager - The Conservation Program Manager develops and implements all natural and cultural resource programs and contracts. The Conservation Program Manager is responsible for preparing and revising all related plans, creating memoranda of agreements, and initiating consultations with other agencies and individuals to implement these plans. The Conservation Program Manager assists in procuring and obligating federal and state funding to meet TES management, pest management, environmental awareness, and ecosystem rehabilitation requirements and objectives. In accordance with this plan, the Conservation Program Manager's responsibilities are to ensure: (1) the preparation and updating of the INRMP every 5 years, (2) the execution of the INRMP and supporting plans consistent with the military mission, and (3) that personnel receive adequate training.

Natural Resources Supervisor/Integrated Pest Management Coordinator —The Natural Resources Supervisor works with the Conservation Manager on updating the INRMP, tracking contracts and partnerships, collecting data, and managing 4 Natural Resources Staff within the Conservation Program. The Natural Resources Supervisor is located at KMR, but manages two Natural Resources Field Assistants on Oahu. The Natural Resources Supervisor develops in-house monitoring schedules and protocols for ESA and MBTA species. The Natural Resources Supervisor develops rehabilitation activities for ecosystem management and TES monitoring and threats management. The Natural Resources Supervisor oversees all fieldwork, and ensures that projects are implemented in a safe, scientifically sound manner. This position is responsible for managing the HIARNG Integrated Pest Management program, including ensuring all applicable pesticide use information is recorded and reported in accordance with all applicable laws. The Natural Resources Supervisor's responsibilities are to: (1) execute the day-to-day requirements of the INRMP, in particular those involving TES; and (2) ensure adherence to the Pest Management Plan.

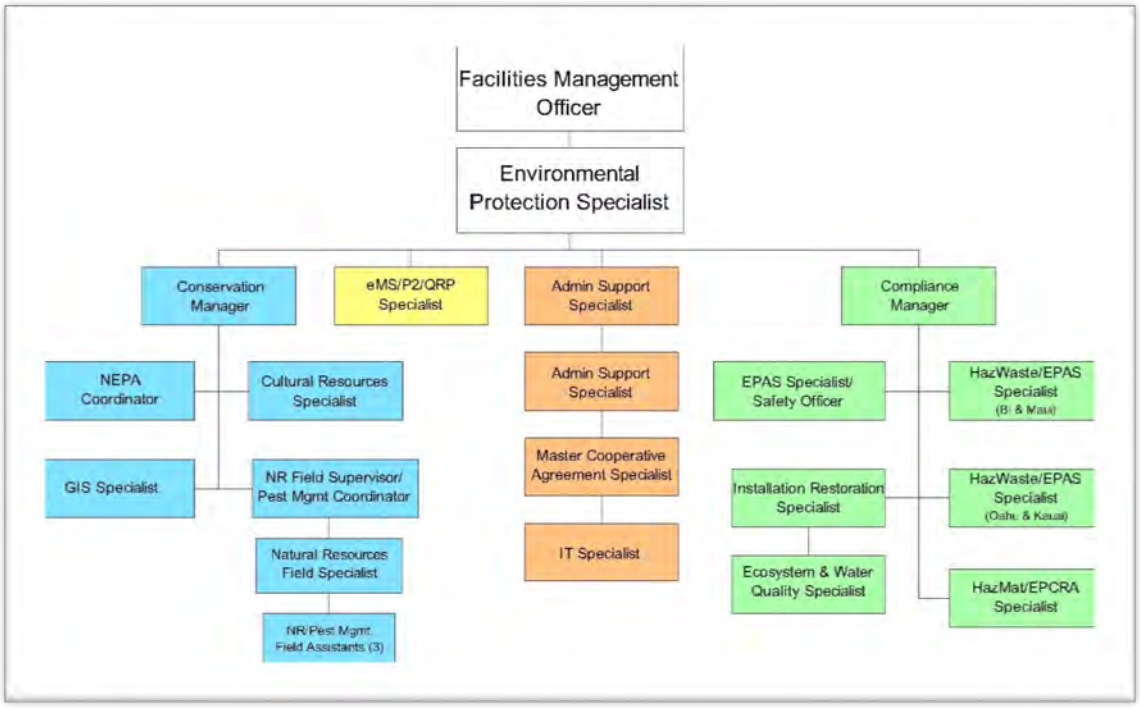
Natural Resources Specialist - The Natural Resources Specialist works with the Natural Resources Supervisor to manage conservation contracts, agreements, partnerships and in-house projects. The NR Specialist is responsible for day-to-day management of conservation projects and associated maintenance, specifically at KMR. The Natural Resources Specialist manages one Natural Resources Field Assistant at the KMR.

Natural Resources Field Assistants/Pest Management Field Assistants – There are 3 Natural Resources Field Assistants in the Conservation Program, two on Oahu and one on Hawaii Island. The NR Field Assistants are responsible for on-the-ground restoration activities, invasive species management, wildland fire management, TES monitoring, and on-going maintenance of projects. The Natural Resources Field

Assistants are responsible for updating the Natural Resources Supervisor and Conservation Manager on land conditions, project updates and issues. The NR Field Assistants also respond to pest management calls.

Geographic Information System (GIS) Specialist—The GIS Specialist oversees the statewide GIS database system that stores spatial and relational data for all HIARNG facilities and training areas. The GIS Specialist oversees all field mapping, aerial photography, data collection, and map production. In accordance with this plan the GIS Specialist's responsibilities are: (1) ensure the integration of all field data, reports, and photographs into the GIS; (2) oversee the maintenance and performance of a comprehensive GIS for all HIARNG users; and (3) support the execution of all GIS projects outlined in the INRMP that is consistent with the military mission.

Figure 1-2 Organizational Chart, HIARNG-ENV



Partners

In accordance with the Sikes Act and because of its dual state-federal status, the HIARNG partners with a variety of federal and state agencies. These partners include the following.

Department of Land and Natural Resources— The HIARNG consults with DLNR-DOFAW on implementation, annual review and update of the INRMP. The HIARNG also coordinate with DLNR, Division of State Parks for actions within Diamond Head Crater. Diamond Head Crater in jointly managed by DLNR Division of State Parks with Hawaii State DOD agencies, specifically HIARNG and Hawaii Emergency Management Agency (HI-EMA). The HIARNG is also required to consult with DLNR for any real estate actions, as it is the agency that manages State of Hawaii land.

U.S. Fish and Wildlife Service— The HIARNG consults with USFWS on implementation, annual review and update of the INRMP. HIARNG also consults with USFWS regarding any projects that may have an effect to TES. The USFWS has conducted detailed surveys and inventories of rare, threatened, and endangered species on HIARNG lands. These surveys include general habitat descriptions and lists of common native and endemic species found at facilities as well as invasive organisms that are degrading habitat and threatening TES. The USFWS used these survey results to develop the Endangered Species Management Plans for each island. The USFWS also prepared an Environmental Awareness Training and Operations Manual for use by HIARNG personnel (USFWS 1998c). This manual helps soldiers avoid impacts to rare, threatened, and endangered species during training and normal operations.

U.S. Department of Agriculture (USDA) —The USDA has been an integral partner for addressing natural resource concerns on HIARNG facilities. Currently, the Natural Resources Field Assistants on Oahu work with USDA to monitor for the introduced Coconut Rhinoceros Beetle. The beetle was accidentally introduced at Joint Base Pearl Harbor Hickam in 2012. The Natural Resources Staff at KMR partnered with USDA to release a biocontrol scale to slow the growth of the invasive Strawberry Guava.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS)— USDA APHIS conducts predator control, specifically feral pigs, at KMR. USDA APHIS has also trapped predators at UFR and conducted TES monitoring during wet seasons. Due to lack of training and funding, predator trapping at UFR has been suspended. USDA APHIS is also monitoring for Coconut Rhinoceros Beetles at KMR to ensure they do not get established on Hawaii Island. USDA plans to test mongoose at KMR for Rat Lungworm disease in 2018.

University of Hawaii, Hilo (UHH) – The Botany department at UHH has been instrumental in assisting the HIARNG-ENV with obtaining the TES permit required for out-planting the endangered *Cyrtandra nanawaleensis* plant. UHH has been working at KMR since 2003 on forest restoration research. Their research focuses on the effectiveness of a "hybrid ecosystem" approach to restoration that considers the different ecosystem services of plant species, the impacts of native species on forest health as well as the cost of maintenance. The research has been conducted in partnership with the U.S. Forest Service, Pacific Southwest Research Station's Institute of Pacific Islands Forestry and Stanford University. This project was initially funded by a $1.6 million grant from the DoD's Strategic Environmental Research and Development Program and is now funded by HIARNG-ENV. The project began in April 2011 and is planned to be expanded to include larger parcels of land. UHH's plant pathology department has assisted HIARNG by testing and monitoring the spread of Rapid Ohia Death (ROD) at KMR.

U.S. Forest Service (USFS) – The USFS has partnered with UHH for years on the research and development of the Hybrid Ecosystem approach to restoration. The USFS assisted HIARNG in 2017 and 2018 in collecting samples of Ohia trees (*Metrosideros polymorpha*) to determine if they were infected with specific strains of the ROD fungus. USFS has also established ROD air particulate monitors at KMR to determine if the fungus is spread through frass carried by the wind.

Hawaii Invasive Species Council (HISC) and Island Invasive Species Committees - HIARNG is an active partner with island invasive species committees, and attends quarterly invasive species council meetings. The Invasive Species Committees' aim to eradicate incipient invasive species on public and private lands using rapid response teams before they become established. BIISC assists in quarterly

management of invasive species at KMR and KISC assists in invasive species control at KFR. HIARNG coordinates with all invasive species committees where appropriate.

U.S. Geological Service (USGS) —The USGS has conducted bat research at various HIARNG facilities to determine the distribution, movement patterns and population dynamics of the endangered Hawaiian Hoary Bat. This research assist the HIARNG in coordinating training as well as construction projects, to avoid certain times of year and removal of trees at certain heights. This partnership has vastly improved the scientific data of bat presence and behavior across the Hawaiian Islands. The USGS has also assisted the HIARNG in air sampling to conduct a ROD air particulate movement study.

Youth Challenge Academy (YCA) —The YCA is a State DOD program that helps at-risk youth graduate from high school, while instilling discipline and holistic development. The HIARNG ENV office partners with the YCA to assist with restoration work, planting natives, removing invasive plant species and assisting with volunteer events like National Public Lands Day and Earth Day.

Army Garrison Environmental & Marine Corps Base Hawaii (MCBH) Environmental – The HIARNG coordinates with other DOD agencies on a variety of invasive species issues. The HIARNG ENV office conducts annual fountain grass surveys with MCBH at the Regional Training Institute as well as their adjacent training area, Marine Corps Training Area Bellows (MCTAB). HIARNG ENV works with Army Garrison Environmental on implementing decontamination protocols to stop the spread of ROD fungus from KMR to Pohakuloa Training Area (PTA) on Hawaii Island. Army, Marine Corps and HIARNG all attend quarterly Oahu Invasive Species Committee meetings to discuss new and emerging threats on training lands.

1.6.2 Ecosystem Management Program

The Ecosystem Management Program (EMP) was established by the DoD in 1994 in response to growing concerns about the military's potential impact on the environment. EMP's mission is to protect natural and cultural resources under Army stewardship. As the nation's third largest federal landowner, the DoD has substantial land management responsibility. However, reductions in force structure have led to a decline in land available for training and put greater pressure on remaining areas. Increased use poses potentially greater environmental degradation, which reduces opportunities for realistic training exercises. For this reason, the goal of the EMP is to support present and future training and testing requirements while preserving, improving, and enhancing the ecosystem integrity of military lands.

AR 200-1, *Environmental Protection and Enhancement* defines the framework for the Army Environmental Management System (EMS) which committed to environmental stewardship in all actions as an integral part of its mission and to ensure sustainability. The goal of the EMS is to "integrates environmental stewardship into the overall management of an Army installation and provides an organized structure for achieving the goals established in an installation's environmental policy"…while actively promoting and enhancing mission readiness.

Nationwide, the Army's EMS manages diverse natural resources for multiple-uses including forestry, fish and wildlife, agriculture out-leasing, and outdoor recreation. The Program balances conservation and use through a set of standard methods that include biological baseline inventories, management planning, and monitoring for human impacts to resources. In essence, the EMS follows well-established stewardship

programs of the National Park Service and USFWS. The inherent difference is that the EMP's underlying objective is to support the military's main mission: to train while protecting the environment.

In order to adequately manage the important resources on HIARNG facilities, the EMS employs both species-specific and ecosystem-wide management strategies. Species-specific efforts focus on individual plant or animal populations and recommend the elimination of threats to and enhancement of these specific resources. The program also employs five broader ecosystem management strategies:

- Develop and implement natural resources goals and strategies to best support the continued training mission of HIARNG
- Monitor environmental variables in order to assess ecosystem health and determine the efficacy of mitigation measures
- Mitigate immediate and long-term impacts from, among others, training activities, invasive species invasion, and soil erosion
- Develop and maintain a GIS that is an effective environmental planning tool
- Conduct education and awareness programs that foster public understanding of and support for HIARNG's stewardship goals and the important natural resources under its care.

1.6.3 Climate Adaptation and Planning

The HIARNG is in a unique situation due the isolated location of Hawaii and the vulnerability to sea level rise as an island state. Hawaii is also unique in that it has the highest level of endemism out of the 50 states, which makes species more vulnerable to climate change impacts, including flooding, more severe storms, hotter climates and mosquitoes at higher elevations. Climate change has the potential to alter habitats, flood zones, and overall site use suitability. Changes to weather patterns will impact species habitat and increase facility vulnerability to drought, flooding, and coastal storms.

The abundance and distribution of species and habitats on HIARNG properties is too small in scale to address comprehensive climate change vulnerabilities. Therefore, the Natural Resources Management Program will collaborate with state agencies on assessing vulnerability risks to natural resources and their habitat. The HIARNG ENV sits on the Hawaii Climate Change Mitigation and Adaptation Commission (HCCMAC) to represent State of Hawaii Department of Defense agencies. The HCCMAC is responsible for developing a statewide sea level rise vulnerability assessment and adaptation report by 2018 to address the effects of climate change through 2050 to protect the State's economy, health, environment, and way of life. The HIARNG Environmental Office's active participation in climate adaptation planning will assist the Conservation staff in planning for adverse effects due to climate adaptation threats. The Conservation Program will look into climate change trainings and inter-agency partnerships to help assess, develop, and implement climate change adaptation strategies. In general, HIARNG will identify and implement sound natural resources strategies that provide benefits to the ecosystem. Future addendums and revisions to the INRMP will support the development of a vulnerability assessment to better understand the potential impacts related to a changing climate. Our current natural resources projects and goals complement climate change adaptation strategies proposed in the "Climate Adaptation for DoD Natural Resource Managers, including development and maintenance of fire breaks, removal of invasive species, increasing restoration areas and recovering endangered species. Because all of HIARNG's sites are low in elevation, mosquitoes

are currently present at all of our sites. HIARNG works with Triple Army MEDCOM to conduct mosquito surveillance and monitoring, specifically for *aedes aegypti*, which is known to spread avian malaria, and other blood borne illnesses.

1.6.4 Biosecurity

Because the HIARNG utilizes training sites all over the state of Hawaii, on the U.S. mainland and abroad, biosecurity is essential to protect Hawaii's unique natural resources and human health. The HIARNG ENV office implemented *Equipment Movement Decontamination Standard Operating Procedures* which were signed by the HIARNG Commander, Brigadier General, Kenneth Hara on April 10th, 2018. The SOPs detail specific actions to inspect for invasive species, including Little Fire Ants and Coqui Frogs, as well as decontaminate from Rapid Ohia Death (ROD) fungus and remove seeds and plant parts of invasive species. The HIARNG ENV office has created decontamination and inspection kits for HIARNG units to properly comply with the new SOPs. Further, the HIARNG ENV is advocating for advanced boot washing stations with rubbing alcohol at KMR, as well as installation of vacuums at all HIARNG wash rack facilities, and having more interaction with units to understand training logistics. The Conservation Manager conducts quarterly Environmental Officer (EO) training for all HIARNG units which covers a variety of natural resource topics, including biosecurity. The HIARNG ENV office regularly coordinates with other DOD agencies, island invasive species committees and other state agencies involved in biosecurity coordination. In February 2018, the Army Garrison Environmental Office at Pohakuloa Training Area (PTA) issued a ROD Checklist for all HIARNG soldiers coming from KMR to reduce the possibility of spreading ROD to PTA. In 2017, the *Hawaii Interagency Biosecurity Plan 2017-2027* was released. The HIARNG follows protocols outlined in the plan and attends regular meetings on the Biosecurity plan implementation and updates.

1.6.5 Integrated Training Area Management/Land Management

The intent of the ITAM program is to reconcile the need to train on land and the need to preserve the land for future training activities and uphold the Army's environmental stewardship responsibility. The overall goal is to provide a uniform strategy for training land management across the entire Army. Four environmental goals specified by the Chief of Staff of the Army serve as the foundation for the program:

- Integrate environmental planning procedures into all operations
- Protect natural and cultural resources
- Ensure that operations comply with environmental standards and receive no notices of violations or fines for non-compliance
- Prevent future pollution and reduce hazardous waste and toxic releases.

Although the HIARNG does not currently receive ITAM funding from NGB because of the size of our training areas, the HIARNG follows the goals and ideas comprising the ITAM program. Because of HIARNG's unique island-installation situation, soldiers train at HIARNG installations as well as at ranges and training areas managed by the Army or Marine Corps. The HIARNG ENV office works closely with the respective ENV offices to ensure soldier compliance and awareness of environmental conditions.

1.6.6 Geographic Information System

HIARNG uses GIS to facilitate resource management, planning, and decision making. An effective GIS allows military planners to map and monitor infrastructure, training environments, and sensitive ecosystems. GIS is an essential tool for HIARNG to identify and track environmental opportunities, constraints, and liabilities for current training operations, and for future planning to identify potential training areas and range configurations. One staff member, a GIS Analyst, is dedicated full-time to the GIS program. HIARNG predominantly uses ArcGIS Desktop software for mai0ntaining data and creating maps. HIARNG has licenses for ESRI ArcGIS Desktop (ArcMap 10.X and ArcGIS Pro 2.X) and ArcGIS for Server 10.X software. For data collection, HIARNG uses Trimble Geo7X with laser range finder and GeoXH 6000 series Global Navigation Satellite System (GNSS) units with TerraSync 5.8.X firmware and Pathfinder Office 5.8.X on a ruggedized Dell Latitude 5414 field laptop. HIARNG's ENV and external situational awareness (ESA) geodatabases contain a couple hundred feature classes (data layers) and maintains data for HIARNG sites on the main Hawaiian Islands. Use of Federal, State, and County GIS servers allows staff to access GIS data and DigtialGlobe satellite imagery within hours of posting. Maps created or updated using this data can be found in a repository organized by county and site, located on the share drive which contains hundreds of geospatial PDF maps. Examples of these maps can be found throughout this INRMP.

The natural resource GIS data layers maintained by HIARNG are listed in the table below. Several of these feature classes, metadata, and metrics about the data are submitted annually in response to NGB data calls as Common Installation Picture data layers.

Table 1-1: Environmental GIS Data Layers

SDSFIE 3.1 Feature Class	Feature Dataset	Common Installation Picture
ERT – Endangered, Rare, Threatened	**A –** Polygon	**P –** Point **L –** Polyline
VegetationClassification_A	EnvNaturalResources	Yes
FloraERT_A/P	EnvNaturalResources	Yes
FloraSpeciesSite_A/P	EnvNaturalResources	Yes
FloraHabitatProtectiveZone	EnvNaturalResources	No
FloraPlanting_A/L/P	EnvNaturalResources	No
FloraStudySite	EnvNaturalResources	No
TreePoint	EnvNaturalResources	No
FaunaERT_A/P	EnvNaturalResources	Yes
FaunaHabitatProtectiveZone	EnvNaturalResources	Yes
FaunaSpeciesSite_A/P	EnvNaturalResources	Yes
PestManagement	CommonCrossFunctional	No
NuisanceSpecies_A/P	EnvNaturalResources	No
TrappingLocation	EnvNaturalResources	No
WildlandFire	EnvNaturalResources	No
RoadCenterline_FireBreaks	CommonCrossFunctional	Yes
LandCover	CommonCrossFunctional	No

SDSFIE 3.1 Feature Class	Feature Dataset	Common Installation Picture
Shoreline	CommonCrossFunctional	No
Wetland	EnvNaturalResources	Yes
SoilMapUnit_A	EnvNaturalResources	Yes
FloodZone_A	EnvNaturalResources	Yes
Innundation_A	EnvNaturalResources	No
NoiseZone	EnvCrossFunctional	Yes
GeologicFeature_A/P	ExternalSA.GDB	No
CriticalHabitat	ExternalSA.GDB	No

Additional data sources used in conjunction with GIS feature classes to analyze and map HIARNG sites.

- Imagery (within 1 mile of site boundaries)
  - — Aerial imagery (updated every 3-5 years)
  - — DigitalGlobe satellite imagery (updated annually, or as needed)
  - — Historic imagery and maps (for INRMP sites, or as needed)
  - — LiDAR datasets for digital elevation models
- Features for External Situational Awareness (within 1 mile of site boundaries)
  - — National Hydrographic Dataset
  - — Land Use/Land Cover
  - — Public Safety – Tsunami Evacuation Zones, Lava Flow Hazards, Fire Risk, Fire Response Zones,
  - — Planning layers – State Land Use Designation, Zoning, Development Plan Areas, Large Landowners Parcels
  - — Roads
  - — Agricultural areas
  - — Recreational layers – Hunting Areas, Reserves, Parks, Trails
  - — Coastal and Aquatic Resources – Special Management Area of the Coastal Zone, Beach Access, Thermal Springs, Na Ala Hele Trails, Water Quality and Monitoring
- Additional Environmental Opportunities and Constraints
  - — Cultural Resources
  - — Environmental Remediation
  - — Environmental Compliance
  - — Sustainable Range Program

1.6.7 Cultural Resources

As much as possible, natural resource projects will aim to integrate and benefit known cultural resources. However, some natural resource management activities have the potential to impacts cultural resources, in which case the HIARNG ENV staff will consult with the State Historic Preservation Division and all interested stakeholders. Potential activities that could adversely affect cultural resources include:

- Earthmoving or filling during construction
- Fence construction
- Investigations of lava tubes
- Out-planting for restoration
- Pest or invasive species treatments around historic sites.

The goals and objectives of the INRMP will consider all identified cultural resources on-site to ensure no negative impacts, and to possibly rehabilitate and enhance known cultural sites.

1.6.8 Public Outreach & Partnerships

HIARNG has partnered with non-profit groups, churches, individuals from the community, local schools, the Youth Challenge Academy, state agencies and federal agencies. The most recent, on-going partnership is with Bellows Air Force Station (BAFS), near the Regional Training Institute. The BAFS has been actively restoring the Pu'ewai Wetlands, a 7.8 acre wetland area that was overtaken by mangroves and other highly invasive species. Throughout the years, BAFS in partnership with HIARNG and other public volunteers has removed almost 4 acres of invasive mangroves, and nearly 3 acres of invasive pickleweed (*Batis maritima*) and Indian fleabane (*Pluchea indica).* Thousands of native plant species that provide habitat and foraging areas for endangered water birds have been planted. This restoration projects improves habitat for the endangered Hawaiian Stilt, Hawaiian coot, Hawaiian Duck and Hawaiian moorhen. This project as also helped to educate the local community, the YCA cadets, university and elementary school students on the important and fragile native ecosystem and its connection to the Hawaiian culture.

The HIARNG also works with UH Hilo (UHH) on their forest restoration plots. UHH collaborates with Ka Umeke Ka'eo, a Hawaiian emersion public charter school, by incorporating sense of place learning. A class of sixth graders partnered with the UHH Liko Na Pilina project, which aims to restore invaded forests using a hybrid ecosystem approach that incorporates native species with non-native but not invasive species, which provide a variety of ecosystem services. The sixth graders collected data on leaf litterfall at the research plots at KMR for a year. The students developed their own scientific method to develop their own question, hypothesis, methods, results and conclusion. The students presented their research findings at an annual student symposium in May 2017. UHH plans to partner with another class from Ka Umeke Ka'eo throughout the upcoming years.

The HIARNG also partners with Sustainable Coastlines Hawaii, Kokua Hawaii Foundation, and Plastic Free Hawaii in hosting an annual Earth Day beach cleanup event along all Waimanalo beaches. This event has gained momentum and continues to recruit more community volunteers each year. In 2017 nearly 620 volunteers showed up to clean almost 5 miles of shorelines, which ended up removing 11,000 lbs. of trash off the beach. In 2018, over 1,500 volunteers showed up to remove plastic debris and trash off of Waimanalo

beaches. This annual event raises awareness of the implications of single use plastics and dangers of global pollution on native and endangered species and their habitat.



The HIARNG also applies for National Public Lands Day (NPLD) grant money to host annual volunteer events that improve DOD-managed lands available to the public. Previous events include a wetland restoration project at Bellows Air Force Station, sand dune restoration project, beautification of an *iwi na kupuna* (bones of our ancestors) burial vault, and installation of a native plant garden within Diamond Head Crater, where millions of visitors hike to the rim of the crater to overlook Waikiki.



Native Garden Installation Sand Dune Out-Planting Wetland Restoration

1.6.9 Environmental Awards

The HIARNG ENV office has received recognition at the NGB level, Army level and Secretary of Defense level for natural resource conservation projects that incorporate innovative and cost-effective invasive species management strategies, while supporting the military mission. The Conservation Program submitted an award application for our innovative approach to invasive vegetation management by partnering with state and federal agencies (i.e. Big Island Invasive Species Committee, Kauai Invasive Species Committee and USDA APHIS), controlling specific species by focusing on a seed source eradication approach, utilizing biocontrol agents to control the invasive Strawberry Guava and utilizing ungulates (i.e. goats and sheep) to control invasive vegetation to make land available for military training. The Conservation Program has effectively eradicated and controlled 3 major invasive pest species on training lands: Miconia, Albizia and Long Thorn Kiawe, while avoiding the use of chemical pesticides and costly contracts to mechanically remove invasive species. This integrated approach to invasive species management has resulted in significant cost savings, reduced herbicide use by 95%, improved ecosystem health for threatened and endangered species habitat, increased available training land and reduced the impact of the invasive species on mission readiness. The project received 3rd place under the 2017 ARNG

Environmental Security Awards for Natural Resources Conservation - Small Installation. The project received the Secretary of the Army Environmental Award and won the National 2017 Secretary of Defense Environmental Award for Natural Resources Conservation - Small Installation. The HIARNG ENV office hopes to develop future projects the incorporate innovative management techniques while supporting the military mission.

Goats and sheep grazing invasive grasses at the Keaukaha Military Reservation

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2 KEAUKAHA MILITARY RESERVATION, Hawaii Island

2.1 INSTALLATION OVERVIEW

2.1.1 Installation History

The 504-acre Keaukaha Military Reservation is located in Hilo, Hawaii Island on TMK [3] 2-1-012:003 & [3] 2-1-013:010. KMR has a variety of habitats within its large boundary, including grasslands, shrubs, and non-native and native lowland wet forest. Prior to development, the site would most likely have been primarily lowland wet forest. The health of this ecosystem has experienced severe declines due to development pressures over the past century and the recent introduction of Rapid Ohia Death (ROD) fungus affecting the native Ohia tree forest.

Figure 2-1 is a current base map of KMR showing generalized land designations at KMR and adjacent landowners. In 1914, the Territory of Hawaii first set aside 216 acres of land for the HIARNG, which was initially used as a 1,000-yard rifle range. The range was the first structure built on the property. The HIARNG later incorporated a small arms range, carbine range, and aviation field. In 1925, land was withdrawn from the HIARNG for construction by the Army Corps of Engineers (USACE) for General Lyman Airfield, also known as Hilo International Airport. In 1943, General Lyman Airfield and parts of KMR became Hilo Naval Air Station (NAS). Hilo NAS required infrastructure improvements, land modification and installation of buildings and structures.

When the base was decommissioned in 1945, almost all facilities were cleared. In 1947, the Army Air Corps began using the site. When reactivated on the island of Hawaii, HIARNG shared facilities with the Army Air Corps. In 1953, the HIARNG built a 5-unit armory to house 11 units, then expanded the armory in 1963. The KMR currently occupies 504 acres, adjacent to the Hilo International Airport.

Due to the 2005 *Defense Final Base Realignment and Closure* Report (Base Closure and Realignment Commission 2005*),* KMR underwent redevelopment and expansion to allow for consolidation of the Kea'au and Honoka'a armories while updating onsite facilities. Six new buildings opened in September 2011, and included 104,000 square feet of training facilities, classrooms, and assembly space (Associate Press 2011). The facility also provides housing and dining facilities for off-island soldiers, and those training at Pohakuloa Training Area (KMR Site Meeting, 9 February 2012).

2.1.2 Surrounding Communities

The facility is located on the northeast side of Hawaii Island, approximately 2 miles south of Hilo, adjacent to the southern boundary of the Hilo International Airport (Figure 2-1). The closest residential areas to KMR are the Waiakea and Keaukaha districts of Hilo, less than a mile to the west and north, respectively. According to the 2010 Census, Hilo's population was 43,263, a 6 percent increase from 2000. The Hilo area is home to approximately 20 percent of Hawaii County's population of 182,079. This percentage of total population has declined as growth in Kona and Puna occurred at a faster rate than Hilo over the past decade (U.S. Census 2010).

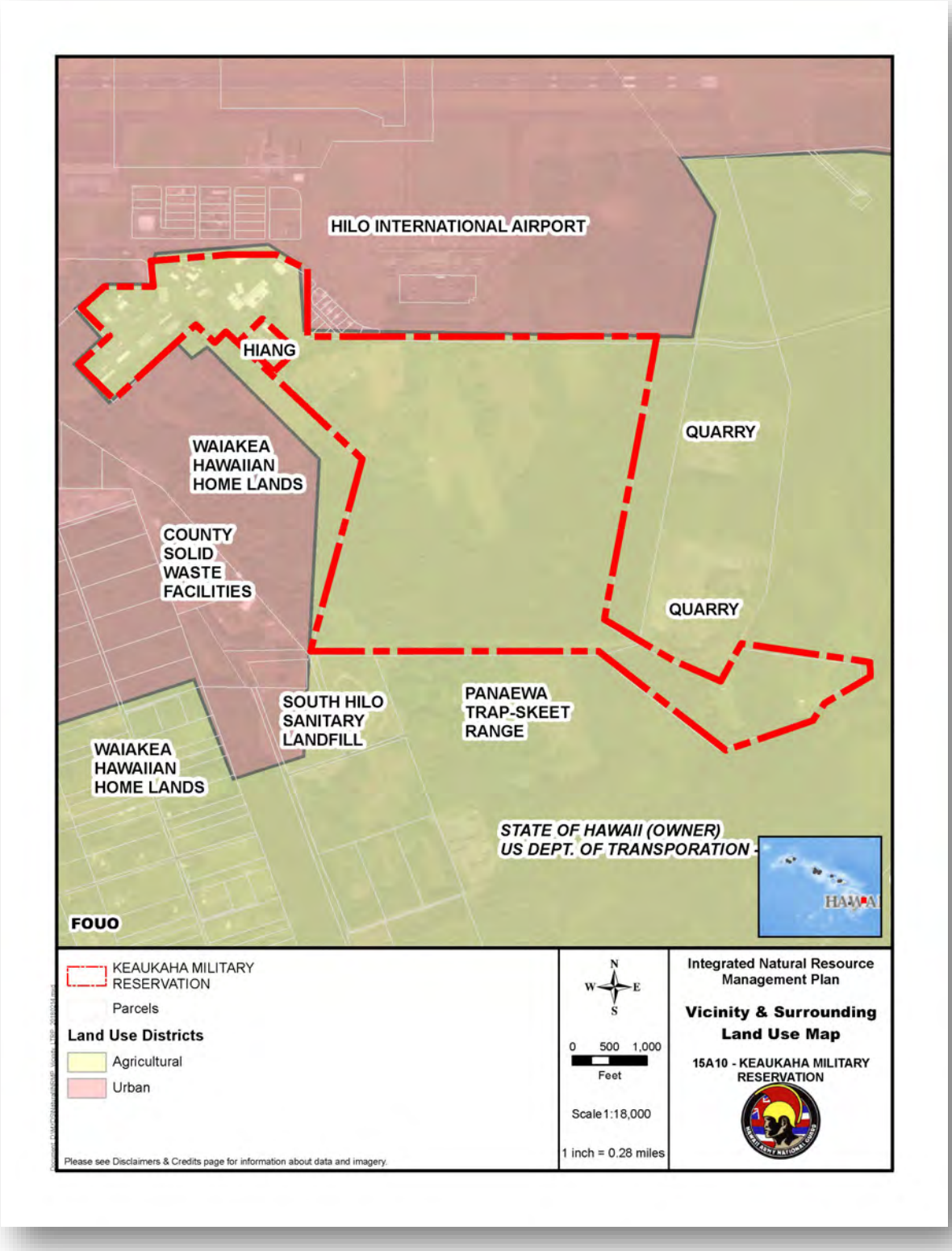


Figure 2-1 Map of Land Use Areas around KMR

2.1.3 Regional Land Use

KMR is located on 504 acres of land currently classified as "agriculture" by the State Land Use Commission, with 29 leased acres used by the Aviation Detachment on "urban" land adjacent to the Hilo Airport (Figure 2-1). South of KMR is the Hilo landfill, and vacant land owned by the State of Hawaii. Located directly east are several stone quarry operations. The Department of Hawaiian Homelands (DHHL) owns property on the west of the site and, while vacant, may be developed into housing. Vacant DHHL land that has been previously disturbed lies just west of the site boundary of KMR; and, prior to 2003, HIARNG conducted infrequent training activities on this parcel. Other land to the east and immediately south of KMR is rugged, mostly forested land. A remnant section of the old Puna Trail runs diagonally through the northwest to southeast corner of the property. This an ancient foot trail that was part of a system that encircled the island. In the 1880s, it became a government road, and is now the main road through the facility, although through modernization and realignment is no longer considered eligible for the National Register of Historic Places (NRHP). Wailoa River and Honolulu Park in Waiakea are approximately 1 mile west of KMR. Approximately 1 mile north, on the other side of the Hilo International Airport, is Hawaii's coastal shoreline, with scattered beaches, beach parks, ponds, and wetlands.

2.1.4 Cultural Resources

KMR cultural resources are managed within the HIARNG ICRMP. Several archaeological surveys have been conducted at KMR. The INRMP is consistent with the goals addressed in the ICRMP. KMR has 13 known archaeological sites associated with both pre-contact and post-contact eras. These sites have been evaluated for eligibility on the NRHP; 12 of the 13 sites are considered eligible for listing on the NRHP. Most archaeological sites are protected and preserved by avoidance or determined no further work in necessary. One site is interpreted as a way-station during the modification of the Puna Trail to a Government road in the 1800s. This site has been fenced and is maintained by the natural resources staff at KMR. This site could be a candidate for planting the endangered *Cyrtandra nanawaleensis* shrub.

2.2 PHYSICAL ENVIRONMENT

2.2.1 Climate

Hawaii's location at 22 degrees north of the equator (22nd parallel north) ensures that temperatures remain stable year round at lower elevations. However, trade winds and topography can produce substantial spatial variation in rainfall and temperature. Trade winds provide orographic uplift, where warm, moist air is forced to higher elevations by mountain ridges, causing persistent inland cloud cover and rainfall. Trade winds blow steadily from the northeast, making the northeast facing or windward sides of islands wetter. This general effect is further complicated by varied topography, especially in the case of large mountain masses on the islands of Hawaii and Maui.

The location of KMR is a prime example of this effect. The shield volcanic series that comprises northeast Hawaii gathers moist, cool air from the trade winds, resulting in consistent precipitation in the Hilo area. While dry and cool alpine conditions persist in the highest summit regions of this volcanic complex, warm, moist air is prevalent at sea level in the KMR region. As a result, KMR receives more rainfall than any other HIARNG facility—an average of 128 inches annually. Precipitation is distributed throughout the year with an average annual high in February/March and an average annual low in May/June (Mauney et al. 1999a).

Temperatures in Hilo are mild, with an average annual low of 66.4 degrees Fahrenheit (°F) and an average annual high of 81.2°F. January and February are the coldest months, averaging a low of 63.5°F, and August and September are the warmest, averaging a high of 83.6°F (Western Regional Climate Center 2006).

2.2.2 Landforms

KMR is situated on a 750- to 1,500-year old gently sloping coastal lava plain below 100-ft elevation. The training area is generally flat and gently sloping, with 3–25 percent slopes. Low lava mounds occur within the generally flat terrain.

2.2.3 Geology and Soils

The soils at KMR were described in the 2007 Planning Level Survey. The description as follows paraphrased from the Planning Level Survey report.

The native soils present at KMR are primarily the Papai series with 3-25 percent slopes (formed from a'a lava) in the main western portion of the site and Opihikao soils with 6-20 percent slopes (formed from pahoehoe lava) to the east of the quarry road. These soils are rocky mucks, with bedrock typically found at depths less than 10 in. (USDA and University of Hawaii [UH] 1972; HIARNG 2008a). Also present are outcrops of lava with little or no soil cover, especially the a'a mounds in the Papai soil areas. Some fill soil has been brought in to the developed areas of the reservation. Groundwater in the entire south Hilo area, including KMR, occurs as basal water in which a fresh water lens floats on top of a deeper salt water wedge (HIARNG 2008a).

2.2.4 Hydrology & Wetlands

There are no water bodies, drainage features (other than some shallow ditches), or wetlands at KMR. Rainfall rapidly infiltrates the porous lava substrate. Some storm water in developed areas of the facility is diverted to underground injection wells. No wetlands have been identified on KMR during previous surveys in 1997, 1999, 2007, and 2012 (USFWS 1997; Mauney et al. 1999a, HIARNG 2008a). There may be locations with moist depressions, but there are no sites with known ponding. See Figure 2-2.

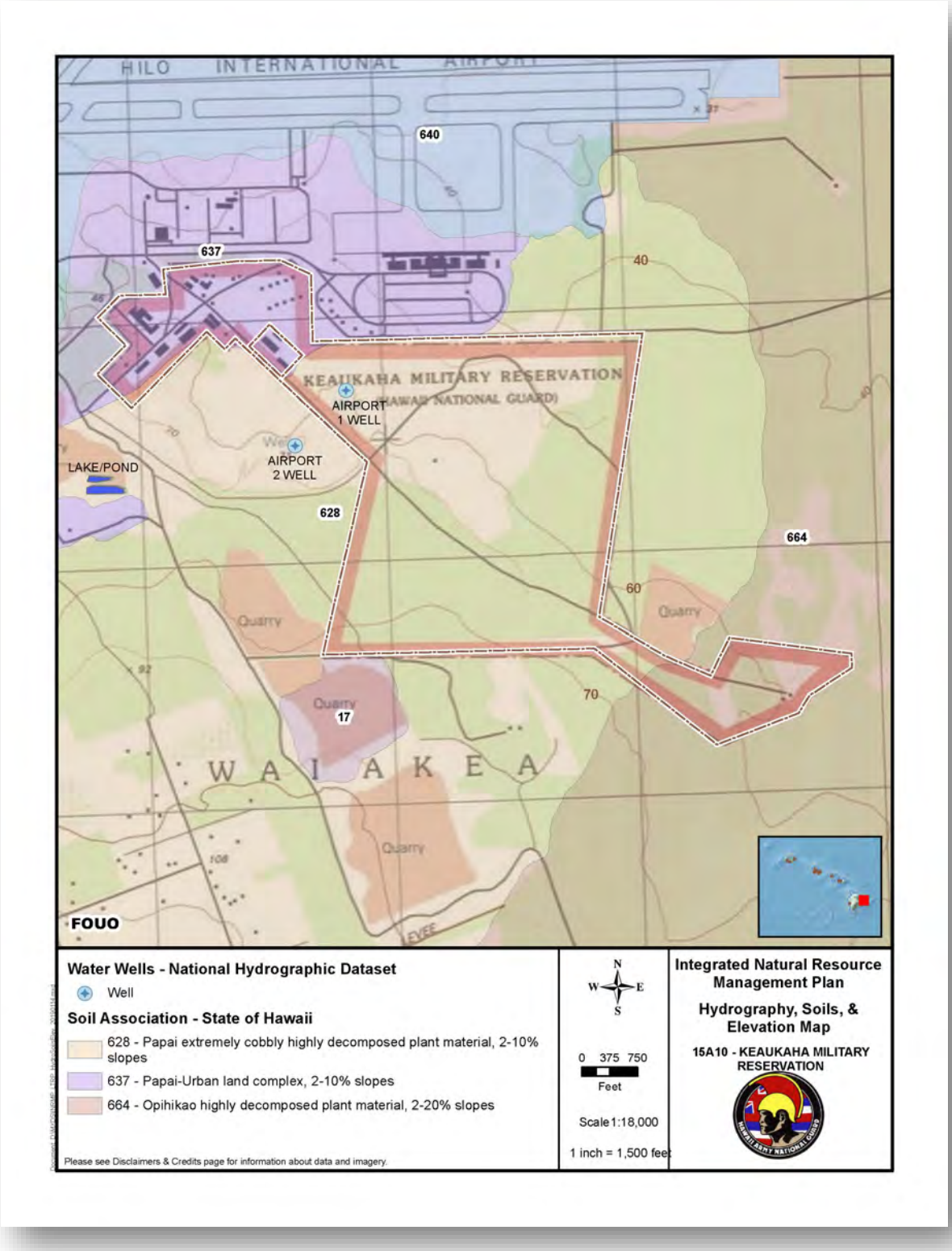


Figure 2-2 Soils, Hydrology, Flood lines of KMR

2.3 NATURAL RESOURCES & CONSERVATION MANAGEMENT

2.3.1 Vegetation - Specific Projects

The HIARNG Natural Resources staff at KMR have a variety of contracts, partnerships, site access for research and in-house work that they manage to ensure range lands are available for military training by reducing invasive vegetation, while restoring areas of KMR with native vegetation. Ongoing projects include: Allowing researchers access to collect data on Rapid Ohia Death (ROD) fungus, contracting the Big Island Invasive Species Committee (BIISC) to control Miconia, Alstonia, Albizia and Fiddlewood at KMR, partnering with USDA to release a scale biocontrol agent to slow the growth of invasive strawberry guava, contracting Aina Pono Livestock to allow goats and sheep to graze invasive plants, partnering with UH Hilo and U.S. Forest Service to conduct research on the effectiveness of a hybrid ecosystem approach to restoration, contracting UHH to assist with in-house recovery efforts for the endangered *Cyrtandra nanawaleensis*, in-house installation of a pollinator garden, surveys for Miconia and Albizia, maintenance of our greenhouse for native plant out plantings, as well as ongoing clearing of trails and lanes with the range at KMR. Future vegetation management plans include clearing selected invasive plant areas and utilizing the UHH approach of hybrid ecosystem restoration.

ROD Research & Awareness - The KMR Natural Resources staff has allowed multiple research groups to collect data on Rapid Ohia Death (ROD) fungus and spread, which has devastated Ohia trees (*Metrosideros polymorpha*) on Hawaii Island. In 2014 ROD was positively confirmed at KMR. In 2015 USDA Forest Service monitored plots within KMR to study the spread of ROD within a forest stand, in 2018 they began studying air samples to monitor the spread of the fungus through wind dispersion. In 2018 the UHH Forest Pathology department obtained samples of ROD infected trees at KMR to study the strains and cellular composition of the fungus. Also in 2018 the USDA Pacific Basin Agricultural Research Center (PBARC) setup particulate sampling collectors to collect data on fungus spread through wind dispersion. In May 2019 the Conservation Manager attended the ROD Science Symposium held in Hilo, the Symposium discussed the latest science, updates and innovations for controlling the spread of ROD. Researchers discussed the strong correlation between ambrosia beetle frass and wind dispersed viable ROD fungus, which may be the primary vector for ROD transmission.

The Conservation Program Manager conducts quarterly awareness training to all HIARNG Environmetnal Officer (EO) soldiers on the importance of disinfecting their boots and equipment before leaving KMR (Appendix F). In April 2018 the HIARNG Commander signed Vehicle Movement Decontamination SOPs (Appendix F), which cover Best Management Practices for disinfecting from ROD as well as other noxious invasive species. The HIARNG ENV office also works closely with the Army Pohakuloa Training Area (PTA) Environmental Staff to ensure ROD does not spread to PTA. The PTA Environmental Office issued a ROD Decontamination and Sanitization Checklist in February 2018 (Appendix F) for all soldiers arriving from KMR. Units are aware of the requirement and importance to comply with this checklist and submit it to the PTA ENV office prior to arriving at PTA. Further, the HIARNG ENV office has developed "decontamination kits" for units utilizing KMR for training. The kits include rubbing alcohol, scrubber brushes and Clorox wipes for ROD decontamination.

The Conservation Program will contract aerial surveys and data analysis of ROD distribution at KMR to gain a better understanding of the devastation caused by ROD at KMR. See Figure 2-3 for ROD distribution on Hawaii Island as of September 2018.

BIISC – The HIARNG has been working with BIISC since 2013 to control noxious weed species at KMR. By the end of 2017, BIISC had helped HIARNG find and treat over 100,000 *Miconia calvenscens*, over 7,000 Albizia (*Falcataria mollucana)*, and nearly 7,600 Alstonia (*Alstonia scholaris).* In 2018 the HIARNG ENV also contracted BIISC to analyze imagery and map stands of Strawberry Guava (*Psidium cattleianum)* in training and conservation areas that would be candidates for release of the biocontrol scale (*Tectococcus ovatus).*

Biocontrol for Strawberry Guava - The HIARNG has partnered with USDA Dept. of Agriculture to obtain the biocontrol scale insect, *Tectococcus ovatus*, which causes galls on the strawberry guava leaves and slows the growth rate of the invasive plant. *T. ovatus* was initially released at KMR in February 2014. The Natural Resources staff at KMR have conducted yearly monitoring of the impacts and results of this biocontrol agent. See Figure 2-4 for biocontrol boundaries, and locations of the endangered *Cyrtandra nanawaleensis.*

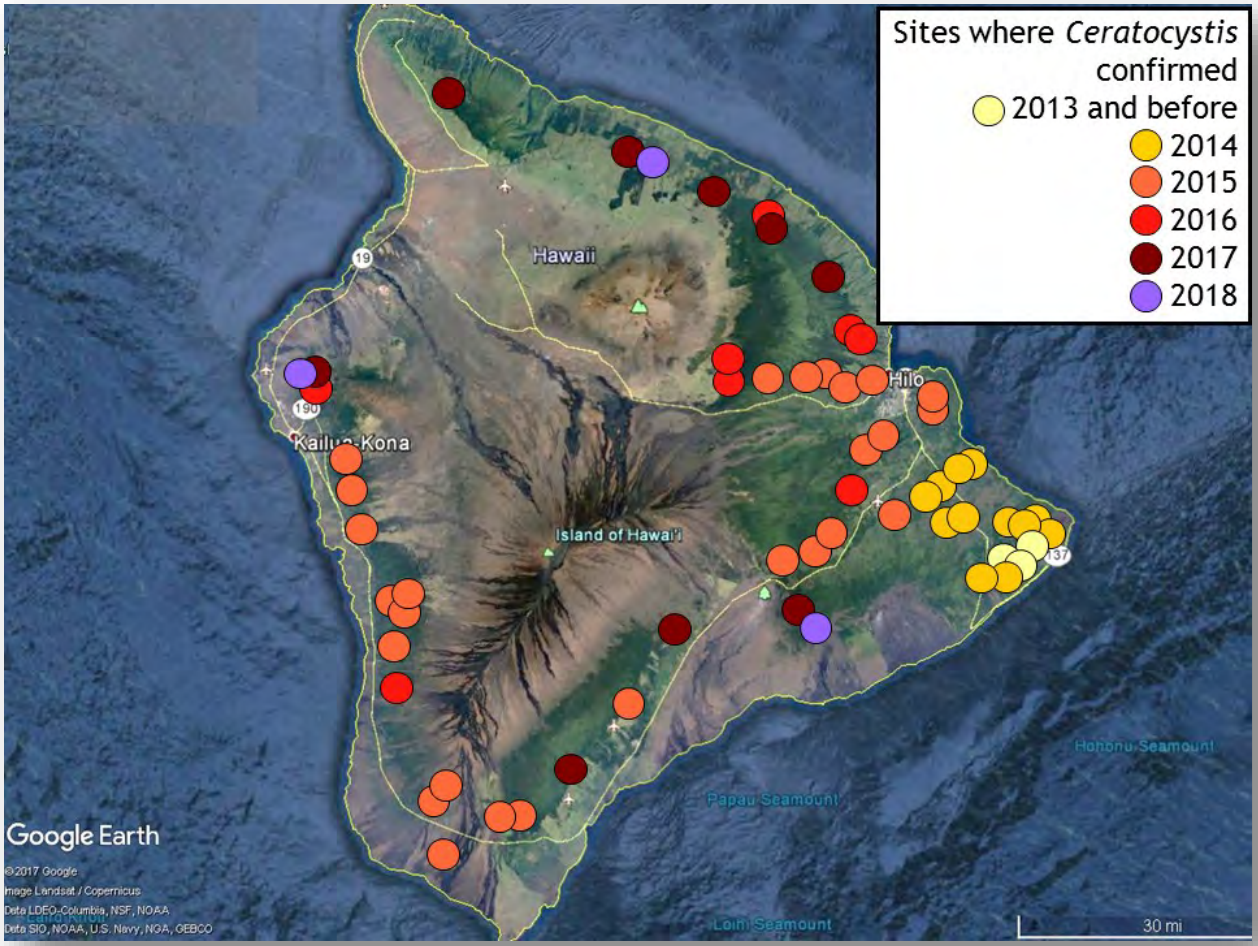


Figure 2-3 ROD Distribution on Hawaii Island as of September 2018 (courtesy of UH)

Aina Pono Livestock – In 2016 the KMR Natural Resources staff contracted Aina Pono Livestock to allow goats and sheep to graze invasive vegetation in selected portions of KMR. The contract was developed after breaking down the costs to control invasive vegetation utilizing a contractor, prison labor or ungulates.

It was determined that ungulates not only were the more cost-effective, but they did not require application of chemical pesticides or use of heavy equipment. This innovative approach has saved the HIARNG money while reducing pesticide application and creating more land available for military training. See Figure 2-4

UH Hilo & U.S. Forest Service Research – UH Hilo has been conducting research at KMR since 2004. The UHH Botany Department was interested in the forest structure and species composition at KMR because it was historically a tropical native lowland wet forest. It was determined that KMR had been heavily invaded by invasive species in the understory but had large intact native canopy trees. Their research aimed to determine the impact of invasive species on light, water and nutrient availability as well as their mechanisms to outcompete native species as well as determine the restoration potential of lowland wet forests. They setup eight 15x15 m plots, four cleared and four control plots. It was determined that weeding efforts are significantly reduced overtime due to a reduced seedbank, however regular weeding is still necessary to avoid re-invasion, specifically for *Clidemia hirta*. Native seed counts confirmed that regeneration is successful when adequate light is available and invasive species are controlled. By 2011, 15% of the total seedling biomass came from native plant species.

The next phase of their research involved developing "new" hybrid ecosystems, which incorporate non-native species that provide ecosystem services with native species to develop a forest structure that maintains itself with little input, and is capable of sequestering carbon, sustaining a range of biological diversity and staying open enough at ground level to allow human movement. The research evaluated functional traits of 18 native and 15 non-native woody species by collecting data such as leaf area, leaf thickness, foliar nutrients, wood gravity, adult stature, flower and fruit type, wood density, photosynthesis rate and seedling survival. These traits were evaluated to develop experimental communities, mixing plant species with symbiotic traits. This second phase involved clearing 20 plots at 20 x 20m with an additional 10 x 10m buffer zone. These plots compared species that had redundant traits (i.e. resistance to invasion, high light environment), with slow carbon turnover to species that had complementary traits with medium carbon turnover, they also included control plots. The success of the plots were determined by evaluating monetary costs, abiotic (soil nutrients, leaf area index), and biotic variables (tree growth, C storage, litter decomposition, soil C turnover, understory abundance and diversity). See Figure 2-4 for locations.

The purpose of this research is to be able to apply the principle of a "hybrid ecosystem" under different management scenarios. The researchers are in the beginning phases of developing a computer model, titled Restoring Ecosystems Services Tool (REST), which would allow users to input species and functional trait objectives to determine species mixes for developing a hybrid ecosystem. REST can be downloaded at https://hilo.hawaii.edu/faculty/ostertag/LikoNaPilina/.

UH Hilo Cyrtandra Recovery Plan – On October 29th, 2013 the *Cyrtandra nanawaleensis* shrub was listed as endangered by the USFWS. It was determined that KMR had 3 populations of *C. nanawaleensis*, amounting to 34 individual plants. The USFWS Pacific Islands Fish and Wildlife Office submitted recovery recommendations to the HIARNG ENV office. The HIARNG Conservation Manager requested approval on May 1st 2014 from NGB to propagate and out-plant the endangered shrub at KMR, following recommendations listed in the USFWS Recovery Plan. HIARNG Command and NGB approved of the recovery efforts in November 2014. Obtaining the federal and state permits was more difficult than originally thought due to the level of expertise required. The HIARNG was able to contract the services of UHH PhD professor, Rebecca Ostertag, to act as the principle in FY2018. It was determined that a federal permit was not required because the recovery actions would not be conducted on federal land, regardless of federal funding. The DLNR DOFAW Permit for Threatened and Endangered Plant Species was finalized

on April 1st, 2018 and is valid for one year, permit number P-278. DLNR DOFAW issued an additional year permit from April 1, 2019 – March 31, 2020, permit number P-500. The HIARNG Natural Resource staff at KMR plan to work closely with UHH PhD Professor Becky Ostertag in 2018 and beyond to execute the recovery plan and monitoring efforts at KMR.

In-House Management Projects – The KMR Natural Resources staff maintain a military training Dismounted Trail (DMT), which is approximately 50 acres. Maintenance includes propagating and out-planting native shrubs and trees along the perimeter of the trail and controlling invasive vegetation around the trail. The NR program also maintains a greenhouse, which propagates plants for restoration efforts, and other NR projects. The NR staff also surveys for Miconia, Albizia and Alstonia in coordination with BIISC (See Figure 2-5) and collects data on the effects of the biocontrol agent on Strawberry Guava. .

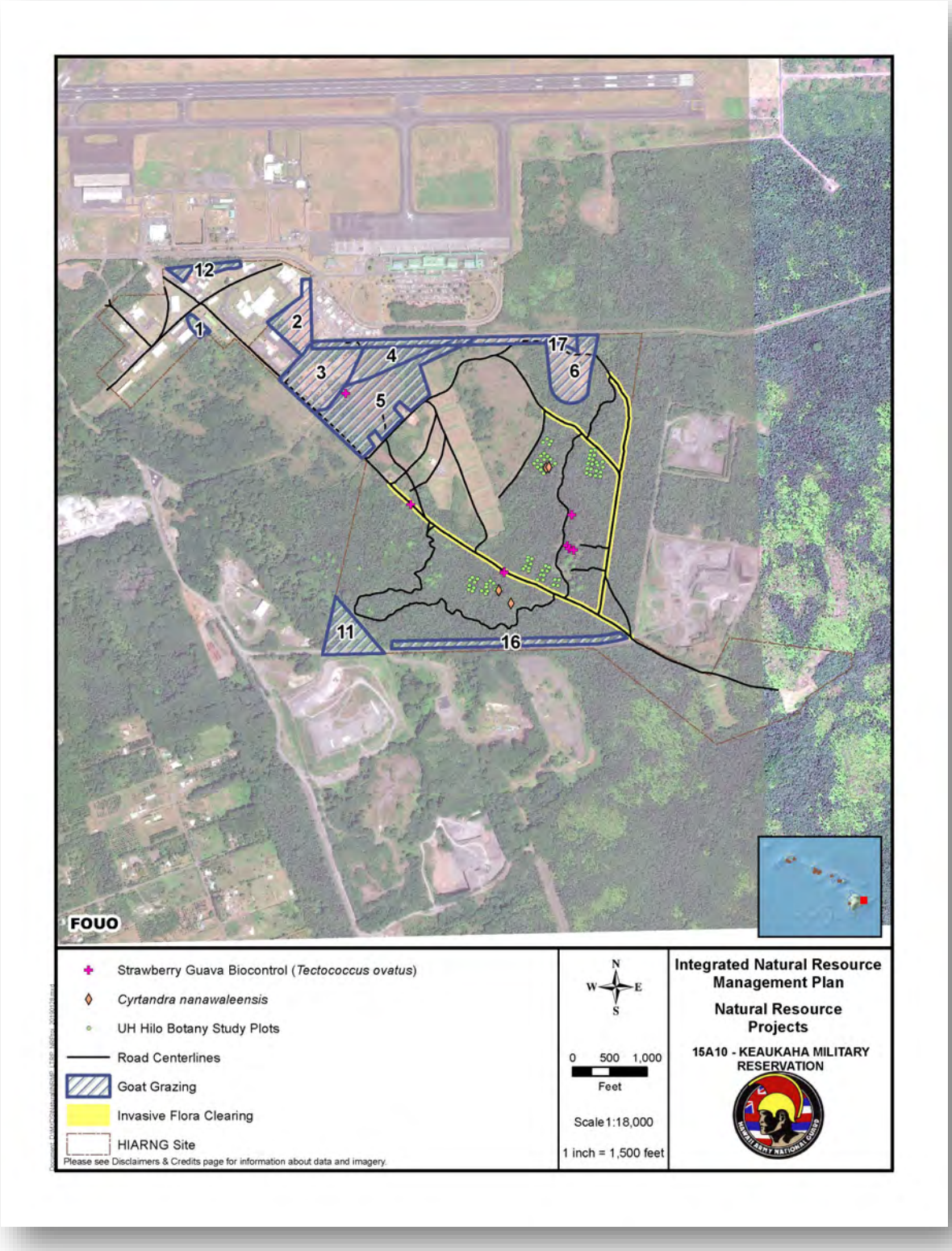


Figure 2-4 Biocontrol, goat grazing areas, UH Hilo plots, Cyrtandra populations at KMR

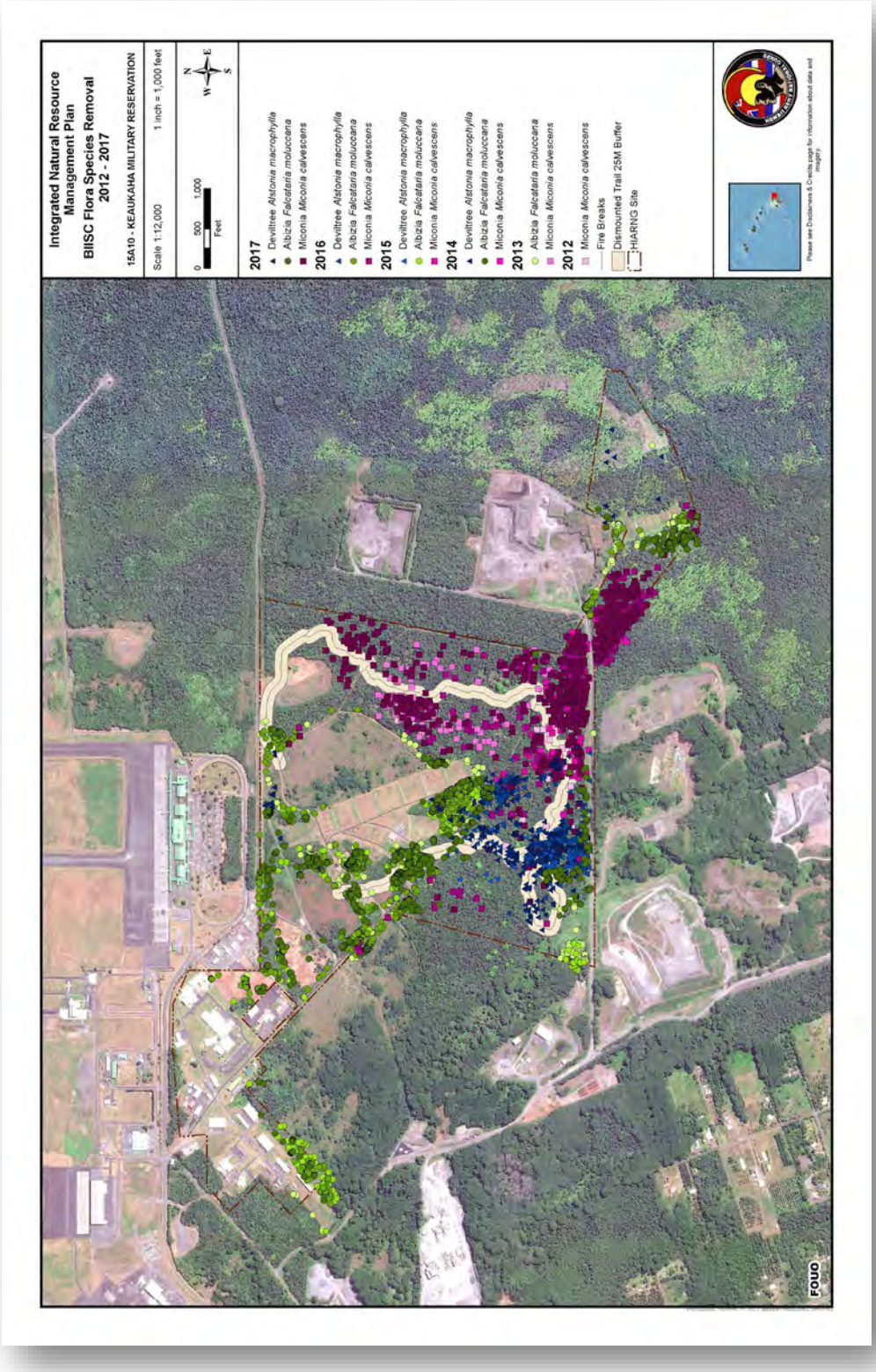


Figure 2-5 Dismounted Trail, Miconia, Albizia & Alstonia treatment areas at KMR

2.3.2 Vegetation – Site Conditions

The ohia tree (*Metrosideros polymorpha*) is Hawaii's most important native tree species, occurring as the dominate tree in at least 80% of Hawaii's native forests and representing 50% of all forests in Hawaii. Occupying nearly one million acres across Hawaiian Islands, ohia forests extend from sea level to 8,000 feet in elevation and from very dry areas to rainforests receiving over 300 inches of rain per year. Ohia is often the first flowering plant to colonize fresh lava flows, and also flourishes on 4 million year old soils of Kauai. Ohia forests protect the upper reaches of the State's critically important watersheds, which supply fresh water to downstream communities. The State's most endangered native birds such as the akepa and Hawaii creeper make their home in high elevation ohia forests, along with hundreds of other native animal and plant species, many of which are rare, threatened or critically endangered. Ohia forests have been treasured by native Hawaiians for centuries, not only for practical uses but also in art such as hula, where ohia is the *kinolau* (bodily manifestation) of important Hawaiian gods Ku, Laka, Kane and Pele. (ROD Strategic Response Plan, November 2016).

In 2010 residents in the southeast Puna district of Hawaii Island reported sudden death of Ohia trees on their properties. In late 2014 the cause of Ohia death was linked to two fungal pathogens within the genus *Ceratocystis.* By April 2018, researchers taxonomically identified the two separate fungal pathogens with distinct pathologies and modes of spread, causing Rapid Ohia Death (ROD). The first pathogen, named *Ceratocystis luku'ohia* or "destroyer of ohia" causes systemic wilt and is the more aggressive of the two species. *Ceratocystis huli'ohia* or "to change the natural state of ohia" is the slower spreading and more localized pathogen, which still results in ROD. To infect a tree, the pathogen must enter through an open wound, after which it spreads into the trunk, stopping water transport. Trees may be infected for many months before showing outward symptoms, once the first visible symptom appear, death follows within a few weeks.

Ohia trees affected by ROD at KMR were first spotted by in-house staff in 2014 and later confirmed by researchers. ROD fungus has been found in over 135,000 acres of native forests on Hawaii Island and has killed millions of Ohia trees as of April, 2018. See Figure 2-3 for ROD distribution on Hawaii Island as of September 2018. A ROD Working Group was developed by Mr. Rob Hauff with DLNR DOFAW to discuss the latest science and determine best ways forward to combat the rapidly spreading disease. A *Rapid Ohia Death Strategic Response Plan 2017-2019* was developed as a multi-agency effort to slow the spread of ROD. In October 2016 the State of Hawaii amended Hawaii Revised Statutes (HRS) 4-72-13 to quarantine all Ohia and soil from ROD infested areas on Hawaii Island. Ms. Lisa Keith with the USDA Agriculture Research Service has tested thousands of Ohia samples for ROD, Dr. Flint Hughes with the USDA Forest Service has conducted data sampling across Hawaii Island and Dr. J.B. Friday with the UH College of Tropical Agriculture and Human Resources (CTAHR) has been instrumental in the research and understanding of ROD spread. ROD will be an ongoing management issue with new developments happening along the way. The Conservation Program is closely tracking the status of ROD research and possible new methods to combat the spread of ROD. In late 2018 the vegetation communities at KMR will be surveyed, which will illustrate the negative impacts of ROD.

Vegetation communities at KMR were evaluated in 1996, 2003, 2006, 2012. Ongoing field work by HIARNG staff, BIISC and UH allows for on the ground updates of new plant introductions. HT Harvey Ecological Consultants will be evaluating the vegetation communities in 2019. The description of vegetation here is derived from these sources. See Figure 2-6 for current vegetation communities.

The vegetation communities identified at KMR include:

- Ohia/Uluhe Fern Forest (7 acres, 1 percent of KMR)
- Ohia/Hala Forest (189 acres, 37 percent of KMR)
- Disturbed Forest (109 acres, 22 percent of KMR)
- Disturbed Area, Shrubland (48 acres, 10 percent of KMR)
- Disturbed Area, Grassland (52 acres, 10 percent of KMR)
- Maintained Grounds (99 acres, 20 percent of KMR).

During the 2012 vegetation survey, approximately 63 percent of the species identified were non-native, and an additional 6 percent were non-native but ornamental (planted around the facility or general roadway areas). Only 6 percent were endemic to Hawaii and 24 percent were indigenous to the Pacific.

The western, developed portion of KMR is managed landscape with grass, introduced ornamentals, shrubs, and trees. Most of the area is maintained with mowed lawns of carpet grass (*Anoxopus fissifolius*), yellow foxtail (*Setaria gracilis*), molasses grass (*Melinis minutiflora*), and guinea grass (*Panicum maximum*). On the periphery of the maintained areas, the landscape transitions to high grasses, ferns, and shrubs. This includes the northeastern corner of KMR and areas near the former ranges. The eastern half of KMR contains large areas of lowland wet forest which contains native and invasive species (Figure 2-1).

Native-dominated lowland forest is rare in the Hawaii due to development pressures. Lowland wet forests offer greater rainfall and increased soil nutrients than typical lava flow areas; thus providing conditions suitable for easier growth of invasive non-natives as well (Zimmerman et al. 2008). The USFWS identified one 11-acre area along the eastern boundary of the site (Figure 2-1) as a relatively intact lowland forest community of ohia/lama (*Metrosideros/Diospyros*) (USFWS 1997, 2001). This relatively intact area was not located during the 2006/2007 and 2012 survey and may no longer be distinguishable from the surrounding forest. Individual ohia and lama trees have been seen by the HIARNG ENV staff (Table 2-1).

Previous and recent studies have established that the canopy of many areas, particularly away from roads and trails, is dominated by ohia (*Metrosideros polymorpha*) and includes sub-canopy endemics such as hapu`u tree fern (*Cibotium chamassoi and C. glauca*), kopiko (*Psychotria hawaiiensis*), kolea (*Myursine lessertiana*), ie'ie (*Freycinetia arborea*) and less commonly, neleau (*Rhus sandwicensis*).

Other frequently seen ferns include uluhe (*Dicranopteris linearis*), and asian sword fern (*Nephrolepis multiflora*). Native herbaceous vegetation includes culturally important species such as maile (*Alyxia oliviformis),* ti (C*ordyline pentaphylla*) and hala (*Pandanus tectorius*).

Forest areas on KMR are being invaded by aggressive invasive species, which dominate forest margins, forming a dense canopy that crowds out native species. One of the most dominant non-native species in the forest margin include the pervasive bingabing (*Macaranga mappa),* which was aerially reseeded during World War II. Understory species found in proximity to bingabing include melochia (*Melochia umbellate),* trumpet tree (*Cecropia obtusifolia),* strawberry guava (*Psidium cattleyanum),* cane tibouchina *(Tibouchina herbacea)* and Coster's curse (*Clidemia hirta).* Other non-native vegetation in disturbed open margins areas includes Philippine ground orchid (*Spathoglottis plicata*), bamboo orchid (*Arundina graminifolia*), albizia *(Falcataria molucca*), *Schizachyrium condensatum*, *Mimosa pudica*, *Crotalaria* sp., and *Dissotis rotundifolia*. Albizia, clidemia, and melastoma are on Hawaii's Noxious Weed List (Ostertag et al. 2009).

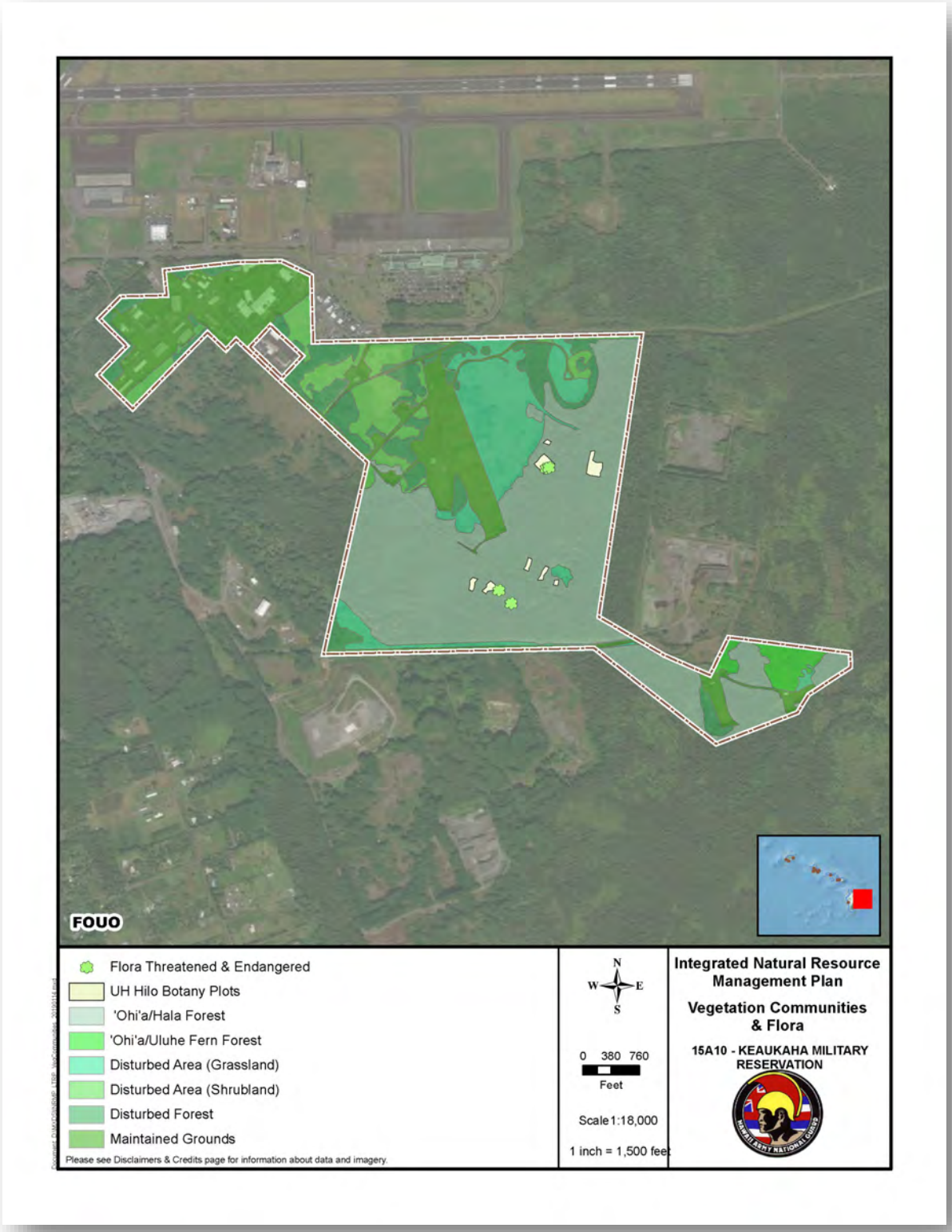


Figure 2-6 Vegetation Community Types at KMR

Miconia *(Miconia calvescens*) is considered to be the most invasive and damaging invader of Pacific island wet forests and has become the focus of state-wide eradication and control campaigns. The Big Island Invasive Species Committee (BIISC) was initially organized as the Big Island Melastome Action Committee in 1996, then renamed BIISC in 2000 to broaden the mission to other species. BIISC began to reduce efforts to control Miconia in 2009 with the development of the Early Detection program, and concluded efforts to contain the species in East Hawaii in 2013. The HIARNG continues to monitor and manage Miconia, in partnership with BIISC, due to the dense near-monotypic stands Miconia creates, which makes land unavailable for military training, shades out all understory vegetation, reproduces rapidly, has a lasting seed bank and prevents natural regeneration. If left un-controlled, Miconia could completely convert the native KMR ecosystems to dense Miconia stands. As such, Miconia presents a grave threat to the remnant native forests at KMR and to available training land at KMR.

Table 2-1 Common Native Plant Species and Status at KMR, Hawaii

Scientific Name	Common Name	Status	Relative Abundance
Fern and allies			
Cibotium chamissoi	hapu`u	Endemic	Occasional
Cibotium menziesii	hapu`u `i`i	Endemic	Occasional
Dicranopterus linearis	`uluhe	Indigenous	Occasional
Ophioderma pendulum	adder's tongue	Indigenous	Occasional
Monocots			
Cordyline fruticosa	Ti, ki	Indigenous	Uncommon
Freycinetia arborea	`ie`ie`	Endemic	Uncommon
Pandanus tectorius	hala	Indigenous	Occasional
Dicots			
Cordia subcordata	Kou	Indigenous	Occasional
Metrosideros polymorpha	`ohi`a lehua	Endemic	Common
Myrsine lessertiana	Kolea	Endemic	Common
Ophioderma pendulum	Puapua moa	Indigenous	Occasional
Pandanus tectoris	hala	Indigenous	Occasional
Psychotria hawaiiensis	kopiko	Endemic	Occasional
NOTE: Indigenous, i.e., native but not restricted to Hawaiian Islands. Common = Abundances are from the most recent survey in 2012.			

Table 2-2 Common Non-Native Plant Species and Status at KMR, Hawaii

Scientific Name	Common Name	Relative Abundance
Ardisia elliptica	shoebutton ardisia	Occasional
Andropogon virginicus	broomsedge	Occasional
Arundina graminifolia	bamboo orchid	Common
Ageratum houstonianum	maile hohono	Occasional
Axonopus compressus	carpetgrass	Common
Blechnum appendiculatum	palm fern	Occasional
Bidens alba	beggartick	Common
Casuarina equisetifolia	ironwood	Occasional
Cecropia obtusifolia	Guarumo, trumpet tree	Abundant
Clidemia hirta	Coster's curse	Common
Cocos nucifera	coconut	Occasional
Crotalaria sp.	rattlebox	Occasional
Cyperus rotundus	nut grass	Occasional
Falcataria molucca	alibizia	Common
Lantana camara	lantana	Occasional
Macaranga mappa	bingabing	Common
Melastoma candidum	melastoma	Abundant
Melochia umbellata	melochia	Abundant
Melinus minutiflora	molasses grass	Abundant
Miconia calvescens	Miconia	Occasional
Mimosa pudica	sensitive plant	Occasional
Paederia foetida	maile pilau	Common
Panicum maximum	Guinea grass	Occasional
Paspalum conjugatum	Hilo grass	Abundant
Phaius tankarvilleae	Chinese ground orchid	Occasional
Polygala paniculata	bubblegum plant	Occasional
Psidium cattleianum	strawberry guava	Abundant
Psidium guajava	common java	Occasional
Rhynchospora caduca	anglestem beakrush	Abundant
Sacciolepis indica	Glenwood grass	Occasional
Schefflera actinophylla	tree	Occasional
Spagneticola trilobata	wedelia	Abundant
Spathoglottis plicata	Philippine ground orchid	Common
Spermacoce assurgens	buttonweed	Occasional
Stachytarpheta australis	Branched porterweed	Common
Trema orientalis	gunpowder tree	Occasional

2.3.3 Wildlife Management

The wildlife management program on KMR is intimately connected with its TES management program (see next section). All management activities that would benefit wildlife also benefit TES and are described under that program, except for pest problems, which are covered under the integrated pest management

program. KMR does not have fish resources and does not have public access for watching wildlife or hunting.

The KMR Natural Resources Staff handle a variety of wildlife issues, ranging from feral pig damage and mongoose predation to mosquito borne illnesses and bird aircraft strike hazards (BASH). The Conservation program utilizes a variety of contracts, partnerships and in-house work to manage all wildlife at KMR. Below are a list of ongoing wildlife management projects at KMR:

USDA APHIS – In March 2008 The USDA Animal and Plant Health Inspection Service (APHIS) conducted an Environmental Assessment for their Feral Swine Damage Management Plan in Hawaii County. The EA determined a Finding of No Significant Impact (FONSI) for their control actions. In 2013, USDA APHIS entered into a Cooperative Service Agreement with HIARNG to conduct wildlife damage management (WDM) activities at KMR. The WDM activities include trapping Indian mongooses, feral cats, and feral dogs to reduce predation and harassment of Pacific Golden Plovers and ruddy turnstones. In addition, USDA APHIS traps and removes feral pigs, which damage natural areas within KMR, spread invasive species, trample native species, create mosquito breading grounds and pose a health risk to troops. The USDA APHIS also provides Bird Air Strike Hazard (BASH) damage management in areas utilized for low level, landing and take-off helicopter operations.

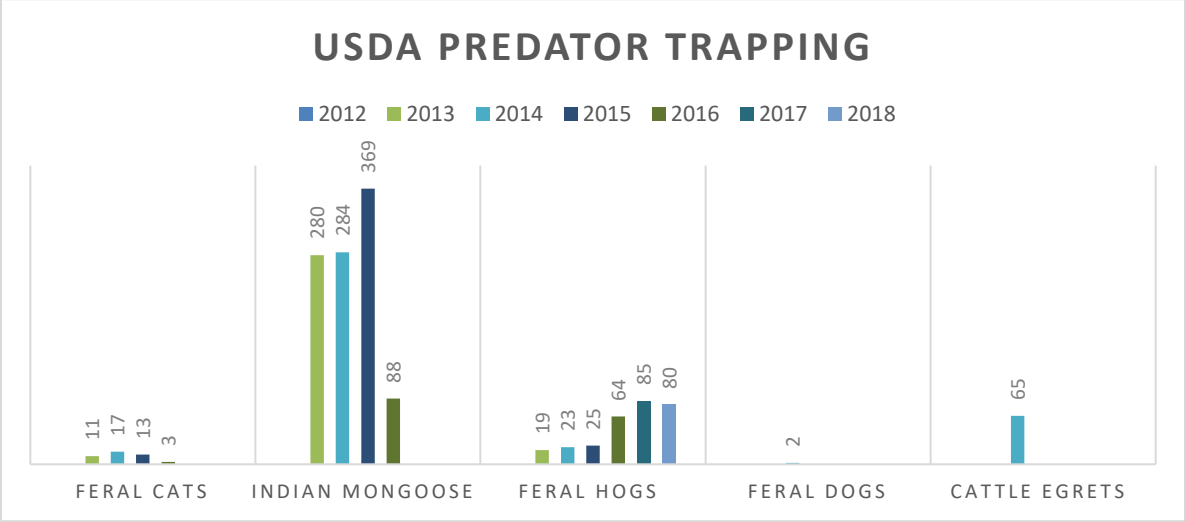


Figure 2-7 Predator Trapping at KMR

USDA NWRC – In 2017, 10 cases of rat lungworm were reported on Hawaii Island, specifically in the Puna District near KMR. 1 case was reported on Oahu, near RTI and 6 cases were reported in Maui. Rat lungworm parasites are carried by rats, transmitted by slugs and snails as intermediate hosts and ingested by humans, which causes a rare form of eosinophilic meningitis. In 2018 the HIARNG ENV granted site access to USDA National Wildlife Research Center (NWRC) staff to trap Mongoose at KMR to test if they are carriers of the rat lungworm parasite.

In House Surveys – KMR Natural Resource staff log migratory bird sightings, specifically for the Pacific Golden Plovers and Ruddy Turnstone.

USGS – The HIARNG ENV contracted the U.S. Geological Service to conduct acoustic survey monitoring and analysis (i.e. seasonal patterns, foraging activity) on the endangered Hawaiian hoary bat in 2012 at 5 HIARNG across the islands: KMR (Hawaii Island), Kalaeloa (Oahu), RTI (Oahu), UFR (Maui) and KFR

(Kauai). In 2014 Kalaeloa was removed from the monitoring sites. In 2016 UFR and KFR were removed from the monitoring sites, due to little bat presences and Wahiawa Armory on Oahu was added. In 2017 Kealakekua Armory on Hawaii Island was added, Waiawa, Wheeler and Ft. Ruger on Oahu were added, Kaunakakai on Molokai was added, Puunene on Maui was added and Hanapepe on Kauai was added. From the 2012 through 2017 surveys, it was determined that Hawaii Island installations had the highest seasonal presence of the endangered Hawaiian hoary bat. In 2018, all acoustic monitors were removed at all sites, except at KMR and Kealakekua on Hawaii Island. In 2018 research at KMR included insect collection to measure prey species for the bats and their plant hosts, thermal imagining for bat roost trees, as well as bat capture to collect tissue and fecal samples for genetic analysis of bat population and radio-tagging to track bat movement patterns. In 2018 USGS will also research bat foraging dynamics with ungulate goat grazing to test if there is a positive relationship between the insect communities attracted by goats and increased bat feeding. In 2019 bat monitoring will be suspended as the HIARNG has a robust collection of bat activity on HIARNG lands. Figure 2-8 shows the presence of bats at KMR based on years of bat surveying by USGS. The microphones used for bat acoustic monitoring are affected by atmospheric attenuation, humidity, forest density, the frequency of sound, the direction the animal was facing, and a large number of other conditions. Most Hoary bat "hits" or fly-bys can be detected at a distance of 30m with a likely maximum of 100m for a very loud, low frequency bat pointing directly at the microphone in perfect conditions.

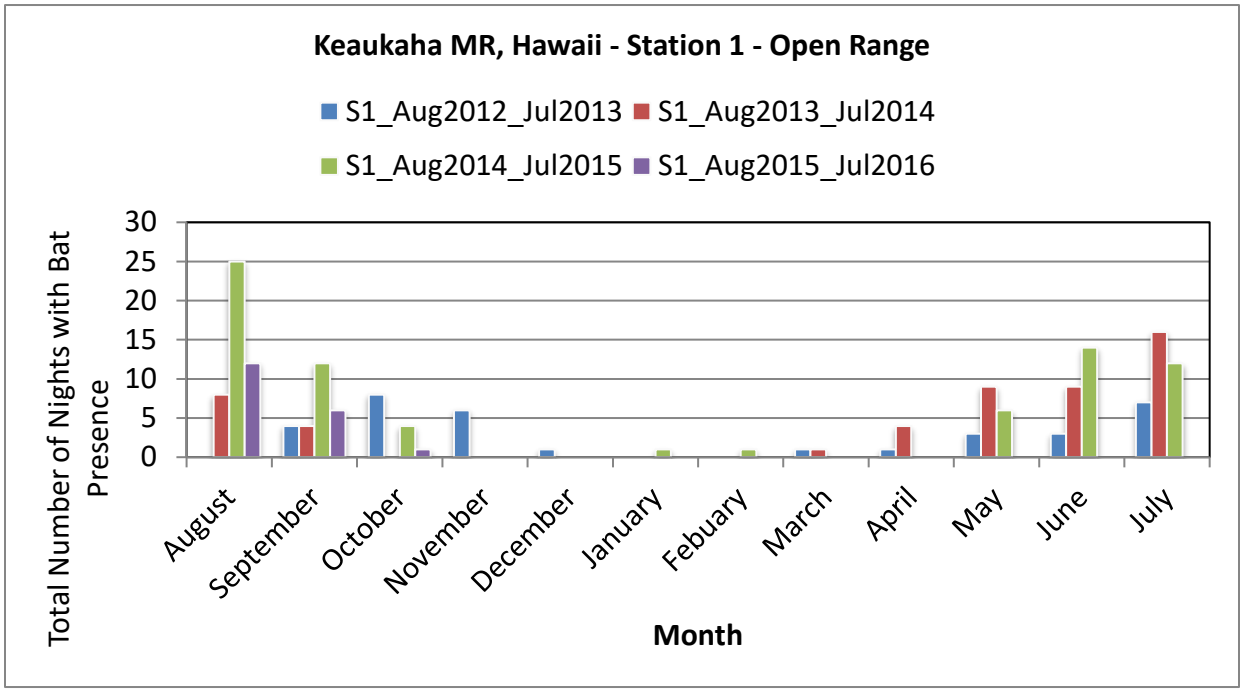


Figure 2-8 Presence of Bats at KMR

Faunal surveys in 2006/2007 recorded a total of 13 species of birds in 12 families. The birds at KMR include the native, migratory kolea or Pacific golden plover (*Pluvialis fulva*), common on the large expanses of lawn, and the native ruddy turnstone (*Arenaria interpres*), a less common migrant at KMR (HIARNG 2008a). In-house HIARNG ENV staff have also documented the Endangered Nene Goose (*Branta sandvicensis*) and possible Koloa duck (*Anas wyvilliana*) or Koloa x mallard hybrid duck present at KMR. See Table 2-3 for migratory birds present at KMR. The 2007 Planning Level Survey recommended that the

use and management of the open areas (lawns) should consider the migrants use of these habitats as feeding areas during the winter. None of the species are identified as being on the "watch list" on the Neotropical Migratory Bird Conservation Act. This definition applies to species which are on the National Audubon Society/American Bird Conservancy's Watch list (2007) or the U.S. Fish and Wildlife Service's (2008) Birds of Conservation Concern. Monitoring has been occurring since 2009.

Other bird species commonly found on KMR include: Cattle egret, common mynah, zebra dove, spotted dove and common barn owl. The cattle egret and barn owl are protected under the Migratory Bird Treaty Act, however they are considered invasive pests in Hawaii. In July 2017 a control order was issued for the cattle egret and barn owls in order to protect native species in Hawaii. The HIARNG ENV contracts USDA APHIS to conduct invasive wildlife management and the Bird Aircraft Strike Hazard (BASH) program by hazing the above-mentioned birds when near the flight line and during landing and take-off of helicopters.

Non-native species commonly found at KMR include pigs *(Sus scrofa)*, mongoose (*Herpestes javanicus*), rats, feral cats and feral dogs. Feral pigs at KMR cause considerable damage to both the forested area as well as the landscaped areas around buildings. Feral pigs attribute to invasive species spread, they also uproot and undermine native and endemic plant species, their rooting causes standing water, which becomes breeding grounds for mosquitoes. They also jeopardize and impede restoration projects and have the potential to alter the forest habitat at KMR, which provides habitat for three endangered species (Hawaiian Hawk, Hawaiian Bat, Cyrtandra plant). A portion of KMR is not fenced, which allows free movement by feral pigs into the KMR installation. The HIARNG Facilities Management Office (FMO) has not deemed the installation of a perimeter fence a high priority for KMR. The HIARNG ENV office is planning to conduct NEPA analysis and USFWS consultation for the installation of hog exclosure fencing at KMR in FY20. Upon completion of NEPA analysis and consultation, the HIARNG ENV office will request funds from NGB to install approximately 14,000 lineal feet of pig exclosure fencing at KMR. The Conservation Program currently contracts USDA APHIS to conduct pig, dog, cat and mongoose trapping at KMR. Ungulate trapping at KMR has been in operation since FY2012 and continues into FY2019. The Conservation Program is considering to allow hunting by soldiers on KMR land, pending command approval, development of detailed SOPs and compliance with all federal, state and local regulations.

Mongoose are a problem statewide, except on the island of Kauai, because of their predation on endangered, native and migratory birds and their eggs. The USDA APHIS contract includes the trapping of mongoose to reduce the impact of mongoose predation on birds at KMR.

During a 1996 survey, the USFWS identified concerns regarding a large number of long-legged ants (*Anoplolepis longipes*), a species known to be especially damaging to Hawaiian arthropod faunas. However, non-native arthropods were found at the time (possibly due to the ant population). None of these long-legged ants have been observed since the initial survey, and are not considered problematic by HIARNG staff.

A far more common invasive species is the Puerto Rican tree frog *(Eleutherodactylus coqui*). These frogs are rapidly expanding from their initial introduction in the late 1980s. Some areas have population densities of 55,000 frogs per hectare (2.2 acres); however, rates can vary dramatically and may be correlated to understory growth (Beard 2008). Hawaii has no native reptiles, amphibians, or ants and these small frogs have the potential to drastically alter the trophic dynamics of Hawaii's native arthropod community.

2.3.4 Threatened and Endangered Species Management

Management of TES at all INRMP sites is grouped into the following three areas:

1. Monitoring existing populations of TES to determine their demographic fluctuations, reproductive viability, tracking and identifying threats
2. Controlling or eliminating threats to stabilize local populations and contribute to species recovery
3. Consultations with USFWS and DLNR DOFAW as well as TES Management Recommendations.

TES Monitoring

Monitoring for the Hawaiian hawk and Hawaiian hoary bat occur annually through official and unofficial surveys. Surveys were conducted in 1996, 2000, 2002, 2003, 2005, 2006/2007, 2011, and 2012-2013. TES monitoring is ongoing and identified 14 Hawaiian hawks, the findings of those monitoring efforts are described in Section 4.1. The available lowland wet forest habitat on KMR that is important habitat, and the most likely nesting areas for these species, is significantly degraded. One 11-acre area of relatively intact lowland wet forest identified in 1996 by USFWS could not be distinguished in the Planning Level Survey conducted in 2006/2007 (HIARNG 2008a).

While not designated as Critical Habitat, the known territory of the Hawaiian hawk extends over large areas to the west of KMR (Appendix D). The KMR habitat is an extension east from this larger zone and may be the primary habitat in the vicinity south of Hilo for this species. The territory of the Hawaiian hoary bat is less known and is not known for the Hilo area (USFWS 1998d), but it is possible that the relatively rare lowland wet forest found at KMR is important habitat. Therefore, habitat preservation and rehabilitation at KMR is an important management action for these species.

Threats Management

With the help of National Park Service, the fencing around the 108-acre Area A was constructed in 2002 as an exclosure to stop feral pig damage to the forest. An ongoing project is to maintain and repair the fence under a routine inspection and maintenance schedule. Routine inspections catch possible hazards from uprooted trees, felled trees, or possible hazards that could affect soldiers and personnel of KMR that utilize the facilities. The maintenance includes clearing a 1.5-m vegetation buffer back from both sides of the fenced exclosure to prevent damage and deterioration, and to allow for the monitoring of possible ingress of feral pigs. An effort is currently underway to place thick-gauged wire along the bottom portion of the fence to prevent "under the fence" ingress of feral pigs. Pig removal has been ongoing at KMR with a general reduction in pigs seen and removed over time.

Consultations with the USFWS and DLNR DOFAW

A DLNR-DOFAW TES Permit was issued in 2018 and renewed in 2019 for recovery efforts of *Cyrtandra nanawalensis*. No Biological Opinions have been issued for TES at KMR. The USFWS and DLNF DOFAW are consulted with for any construction activities, training activities and/or natural resources management activities that are proposed at KMR and have the potential to affect a TES.

TES Considerations at KMR

The 400+ acres of lowland Ohia/Lama wet forest at KMR is home to three federally endangered species. The endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus),* the endangered Hawaiian Hawk or I'o

(*Buteo solitarius*) and the endangered Ha'iwale (*Cyrtandra nanawaleensis*) have been documented in the forested area of KMR. The Hawaiian Hoary bat population has been studied and analyzed by the USGS from 2007 to 2018, the longest consecutive study in Hawaii on the Hawaiian Hoary Bat.

The HIARNG is conducting a Planning Level Survey in 2019 to capture threatened and endangered species at KMR, including an invertebrate study. The survey results will be incorporated into the next annual INRMP update. The HIARNG requests a TES Species List from USFWS every 90 days. The USFWS List dated August 15th, 2018 (01EPIF00-2018-SL-0448) lists the following endangered and threatened species as documented within the general vicinity of KMR:

Hawaiian hoary bat	*Lasiurus cinereus semotus*	Endangered
Hawaiian Hawk	*Buteo solitaries*	Endangered
Hawaiian goose	*Branta sandvicensis*	Endangered
Hawaiian petrel	*Pterodroma sandwichensis*	Endangered
Newell's Shearwater	*Puffinus auricularis newelli*	Threatened
Band-rumped storm petrel	*Oceanodroma castro*	Endangered
Blackburn's sphinx moth	*Manduca blackburni*	Endangered
Ha'iwale	*Cyrtandra nanawaleensis*	Endangered

Avoidance and Minimization Measures for TES, as developed by the Pacific Islands Fish and Wildlife Office, can be found in Appendix D for TES known to occur on or HIARNG properties. (www.fws.gov/pacificislands/). Please see Appendix D for TES information and fact sheets as well. The hoary bat is the only native land mammal in Hawaii, and it was listed as endangered in 1970. KMR provides good potential habitat for the hoary bat. The greatest level activity for the hoary bat occurs at elevations below 1,280 meters (4,200 ft.) elevation in native and non-native forests, near water and along forest/field edges. Hoary bats are known to inhabitant ohia forests (DLNR 2005) on the island of Hawaii, particularly in natural reserve areas and along the Hamakua coast. Habitat loss is the primary threat to the hoary bat population. Predation and pesticide use also negatively impact the species.

The Hawaiian hawk is the only native hawk in Hawaii, and lives and breeds on the island of Hawaii. The hawk has occasionally been seen on other islands. KMR provides good potential habitat as the hawk is often found in lowland non-native forests, and disturbed areas. Hawaiian hawks prefer to nest in native forests, particularly ohia, which is commonly found at KMR (DLNR 2005). The Hawaiian hawk was listed as endangered in 1967; however, due to a stable population, it was recommended for delisting in 2008. Today, there is an estimated population of approximately 3,000. If the species is delisted, the USFWS, State of Hawaii, and other conservation partners would monitor the population, through island-wide surveys every 5 years for a period of 20 years, from 2012 to 2032 (USFWS 2009).

During the 1996 USFWS survey of KMR, one visual and one auditory detection were made of the Hawaiian hoary bat. As a result of these 1996 surveys, additional surveys for the bat were conducted by HIARNG-ENV personnel in order to plan for development of training lanes at KMR. These surveys—in May, August, and September 1999, and February 2000—used visual observation, detection of ultrasonic bat calls with bat detectors, and mist nets. Bats were detected with high frequency (67-100 percent of survey nights) except during the February period, when none were detected.

In 2002, surveys were initially conducted at KMR for the hoary bat (David 2002a). Hoary bats were visually detected within the property line of KMR on three out of five survey dates in the areas between range KD Range #1 and Escape Road, and between Puna Trail Road and Quarry Road (Figure 4-1), confirming their presence in the area. On each date, at least three separate bats were observed. Surveys for the bat also utilized ultrasonic techniques but these were unsuccessful. According to the results of these surveys, David (2002a) concluded that the bats are wide-ranging in their habitat, and that the southern portion of KMR may provide an intermittent but important portion of their foraging and possibly breeding and roosting range. Bat echolocation recording is on-going at two sites at KMR. From August 2012 through May 2013 (most recent data available), bats were heard every month except February 2013. KMR 1 also had no recordings in January 2013. The most active month was May 2013 with over 2500 calls over two nights (USGS HIARNG 2013).

Hawaiian hawks were observed on three out of four survey dates in the southern part of KMR using an audio playback method (David 2002b). Two different individual birds were noted in these surveys. HIARNG-ENV staff also observed the Hawaiian hawk on several occasions during the 1999 bat surveys. On one occasion, a pair was observed in an acrobatic courtship display high above a range area.

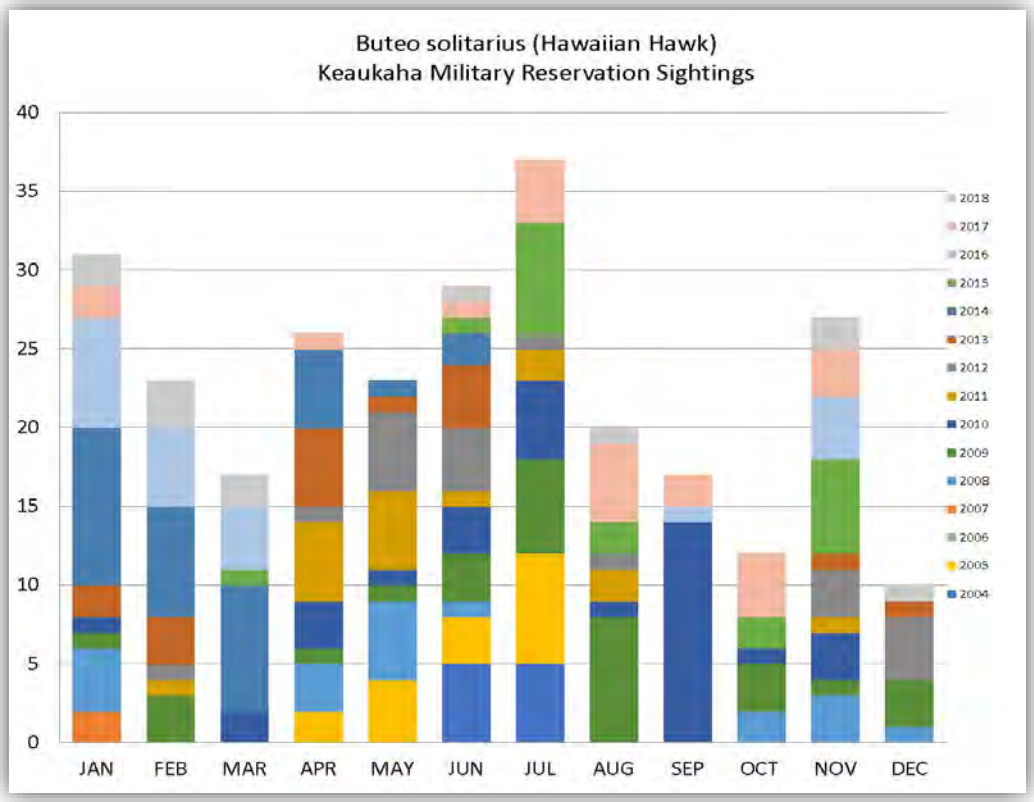


Figure 2-9 Hawaiian Hawk Sightings at KMR

In 2005, two official surveys were conducted for the endangered hawk and bat. During these surveys, a total of six bats and six hawks were observed during 96 survey hours for hawks and 39 survey hours for bat. Numerous sightings of hawks were made on KMR property by HIARNG field personnel and

HIARNG-ENV staff throughout 2005; 37 hawks representing an estimated nine individuals. In addition, six bats were seen during four surveys.

In 2007, a species-specific survey for the Hawaiian hawk confirmed the presence of two adult hawks within the boundaries of KMR but there was no evidence of nesting. Two sub-adults were also observed less than 0.5 miles from the KMR property boundary (HIARNG 2008a).

It is possible that three additional endangered species may land at KMR. The Hawaiian petrel and Newell's shearwater are both endemic to the state of Hawaii, but have limited populations on the island of Hawaii. A small population of approximately 150 petrels breed on Mauna Kea. This ground nesting species is highly vulnerable to predation, particularly as the petrel cannot fly for more than 15 weeks after hatching. The shearwater has limited nesting sites on the island of Hawaii, but it has been noted. Limiting and/or shielding outdoor lighting could benefit the petrel and the shearwater (USFWS 2009).

It is possible that the Blackburn's sphinx moth may be found at KMR. However, this insect prefers *Nothocestrum* habitats, and these trees were not identified at KMR during the 2012 plant survey update.

Due to an increasing population in the area, it is likely that the native amakihi (*Hemignathus virens)* may be found at KMR. These species have been seen in the area, and favors conditions that exist at KMR, including taller ohia forests (Sushita 2008).

The rare Hawaii sedge was been observed in road ditches in 1997 and 2006/2007. These plants were not located during the 2012 survey.

2.3.5 Habitat & Ecosystem Health Management

The HIARNG Environmental office works to incorporate invasive species management, ecosystem restoration, and TES monitoring into a landscape-scale approach. There are a variety of factors and emerging threats that impact our mission, as well as areas of importance regarding restoration activities, fire threats, training areas. Our NR Program utilizes GIS data to incorporate TES considerations, vegetation communities, native species hot spots, invasive species hot spots, threats from climate change as well as training/construction activities.

2.3.6 Integrated Pest Management

The HIARNG ENV office utilizes the IPM method for controlling invasive species across all HIARNG installations. The HIARNG ENV uses biological methods (biocontrol, ungulate grazing), cultural methods (limit water and food availability), mechanical methods (weed whacking, mulching, etc.) as well as chemical methods (ex. Spot treatment with Garlon 4). The HIARNG ENV aims to reduce costs and pesticide applications in combating invasive pest management.

Non-native animals prey upon native birds, migratory birds and TES, ground nesting birds like the native Pueo is especially vulnerable to predation by pest species. Reducing predatory rat, mongoose, and feral cat populations at KMR will increase the chance of survival for the endangered Hawaiian hawk and hoary bat, particularly during nesting season. Further, control of feral pigs increases ecosystem health, reduces the spread of noxious invasive plants and transmission of diseases through mosquitoes.

The HIARNG ENV office is planning to install a pig exclosure fence around the perimeter of KMR in FY20 or FY21, pending funding approvals, NEPA analysis and consultation with the USFWS.

2.3.7 Integrated Wildland Fire Management

Because KMR receives the most rain annually of all HIARNG installation, it has a low fire risk potential. KMR also has the largest intact native forest ecosystem. However, the HIARNG has evaluated the vegetation communities and possible wildland fire threats at KMR in our Integrated Wildland Fire Management Plan (IWFMP). The HIARNG does not utilize controlled burning at any of our installations. To read more about wildland fire risks, please see the HIARNG IWFMP.

Fire Prevention

A fire management plan was completed in 2008 and provides information about land management to reduce fuel loads (HIARNG 2008). KMR is located on the windward side of Hawaii, where high rainfall, low winds, and cooler temperatures reduce fire risks. During droughts, grasslands could provide a large fuel load, as could the understory in native forests as uluhe. The majority of wildfires in the Hilo area is attributed to human impacts, and generally burn less than 2 miles in circumference. As fire risks are somewhat limited due to climatic, recommendations include mowing grasslands and ranges to less than 6 in. (15 cm) and maintaining low vegetation buffers around structures and roadways. This is currently ongoing at KMR, and should be continued throughout the next INRMP schedule of activities. The alteration of grassland to forest is also naturally occurring in the northern section of KMR, which is being colonized by ohia lehua (*Metrosideros polymorpha*). The transition from grassland to native forest is beneficial, as it increases native species, provides habitat for TES and reduces fire risk by shading out fire-prone grasses.

2.4 MILITARY MISSION & TRAINING

2.4.1 Current Use & Training

KMR is the location of the 299th Cavalry (CAV), Headquarters unit, who provides command and control, logistic, and maintenance support for HIARNG operations. KMR also houses the 29 Brigade Support Battalion (BSB) Delta Company, and the 227 Brigade Engineering Battalion (BEB), Bravo Company. KMR was converted to an Armed Forces Reserve Center as part of the 2005 Base Realignment and Closure process. The site also serves as a staging area for Pohakuloa Training Area, reserve and active duty units of the National Guard, Army, and Marines. The Air National Guard and Army Reserves also occupy office space at KMR.

The Armed Forces Reserve Center opened in September 2011, and provides office space, classrooms, and barracks on 60 previously developed acres. An Army Aviation Support Facility is located on 19 acres of leased land off the main installation area on the southwest portion of Hilo International Airport and serves two aviation detachments (40th Aviation and 207 Aviation) operated by the State Army Aviation Office; the other 9.3 acres of leased land are used as warehouse space (HIARNG 1997).

Additional facilities include three currently unused firing ranges: KD Range #1 (600 m), KD Range #2 (200 and 25 m), and a pistol range. These have been closed due to inadequate engineering controls which would allow munitions to exceed the boundaries of KMR. The highest caliber weapon that was generally used at the ranges was 7.62 millimeter. Due to the Surface Danger Zone (SDZ) problem, KD Range #1 would need to be re-oriented or redeveloped with heightened berms and renovated or additional baffling.

KMR is also used for pre-mobilization training. Training includes 15 Army warrior tasks, 4 battle drills, 28 theater-specific individual required trainings, and 21 theater-specific leadership trainings required for pre-mobilization. These trainings include the following:

- Shoot – weapons qualification (50 tasks) Not at KMR
- Maneuver skills and battle drill #1 (21 tasks)
- Base/personal security and battle drill #2 (37 tasks)
- First aid skills and battle drill #4 (19 tasks)
- Land navigation (11 tasks)
- Nuclear, Biological or Chemical (NBC) – defense (8 tasks)
- Convoy operations – mounted operations and battle drill #3 (7 tasks)
- Cultural awareness (12 tasks)
- Soldier welfare – miscellaneous tasks (15 tasks)

Current use at KMR:

- Scouting: per year/up to 1 troop
- Lanes Training: Once or twice per year/200 troops
- Land Navigation: Once or twice per year/70 troops
- Weapons Qualifications: Not used
- Staging for Large Training: Once or twice per year/several hundred troops
- Air Operations: Once or twice per year/no more than a few helicopters
- Pyrotechnics: Not used.

Environmental Compliance

Hazardous Materials Storage and Hazardous Waste. Hazardous waste management is conducted in accordance with an approved management plan (HIARNG 2001d). Storage of hazardous materials on KMR, as identified in the Spill Prevention Control and Countermeasure Plan (HIARNG 2001e), is as follows:

- At the Combined Support Maintenance Shop No. 2 (Combined Support Maintenance Shop #2), storage is approximately 1,560 gallons of petroleum products, anti-freeze, and solvents and the largest container size is 55 gallons.
- The Army Aviation Support Facility No. 2 provides approximately 5,600 gallons of storage with the largest container being 2,500 gallons.
- At Building 622 (storage warehouse for 2-299th Infantry, S4) and Building 626 (grounds keeping services, State Maintenance Facility), storage is approximately 1,500 gallons of diesel fuel with the largest container size of 1,000 gallons.

There are no streams close to any of the storage sites because surface water rapidly infiltrates and the topography is generally flat. There have been no reportable spills at any of these storage sites.

Wastewater—KMR operates four 600-gallon per hour reverse osmosis water purification units. A Standard Operating Procedure (SOP) exists for the operation of these units. Water discharge is in accordance with the Clean Water Act and has been approved by the Hawaii Department of Health.

Installation Restoration Program—The Former State Maintenance area was investigated and oils and pesticides were found to be contaminants of concern. This area was remediated in 2003-2004 and cleanup goals were achieved.

2.4.2 Future Use & Training

The HIARNG currently does not have plans to increase training functionality or modernize current ranges at KMR. Because KMR is located near the Army's Pohakuloa Training Area (PTA) the National Guard Bureau will not release funds to increase training potential at KMR that can be accomplished at PTA. The HIARNG had plans in 2017 to develop a baffled range and other tactical areas (shoot house, half mile trail, physical endurance course, improvised explosive device lane, practice hand grenade qualification course, forward operating base and command outpost), but due to the proximity of PTA, the plans were not approved by NGB.

The HIARNG ENV office developed a 2.4 mile Dismounted Trail, which HIARNG troops utilize during annual training (June to July timeframe). The Dismounted Trail was developed by HIARNG ENV to avoid issues and areas with natural resources, cultural resources and T&E species. The Dismounted Trail also assists HIARNG ENV by giving access to interior areas of the KMR forest and provides a corridor for TES species. The Dismounted Trail is 50 m wide, with an open understory and native canopy. The HIARNG ENV continually out plants native and Polynesian introduced species along the Dismounted Trail and weeds the trail before annual training. Polynesian-introduced species are utilized in conjunction with native species because they are more resistant to invasion by invasive species and they provide proection to native species once their canopy has established.

KMR Ranges are currently inoperable because our Safety Danger Zone (SDZ) extends beyond the HIARNG property. The Facilities Management Office is looking into "tube" ranges to eliminate the SDZ issue for live fire training at KMR.

2.4.3 Natural Resources Support to Training

The requirements for current and potential future training operations include:

- Large acreage with screening vegetation to allow for training operations
- Dismounted lanes with a mixture of open areas and forest with a relatively open understory for maneuvers and concealment
- Edge areas between open and forested areas for lanes training and other maneuvers
- Large open areas for staging of troops and equipment
- Open areas for landing zones for aviation maneuvers. Currently the closed ranges are being used.

2.4.4 Natural Resources Constraints to Training

The biggest constraint to the mission is invasive species reducing training land acreage and quality. Because KMR has selective areas used for training exercises, it is easier to manage invasive species on mission readiness. If KMR is able to increase training exercises at KMR, invasive species will be a consideration in choosing training lands. TES have a minimal impact to training exercises, as annual training lands outside the breeding season of both the bat and hawk. However, HIARNG consults with the USFWS for any training or construction activities within the forested area of KMR. The KMR forest is comprised of many native species. These species rarely impact the mission, and HIARNG ENV proactively manages these natural resources to ensure their protection.

KMR has the most invasive species threat out of all HIARNG installations, including Rapid Ohia Death Fungus, Little Fire Ant, Coqui Frogs, Miconia, Albizia, Alstonia, Tibouchina, and many other noxious invasive plant species. It is of upmost importance that HIARNG units have the resources available to properly implement biosecurity measures to reduce the spread of invasive species.

2.5 MANAGEMENT GOALS, OBJECTIVES & IMPLEMENTATION

See ***Appendix A: Goals, Objectives, and Projects*** to view the all management activities at KMR and across all HIARNG INRMP installations.

3 REGIONAL TRAINING INSTITUTE, Oahu Island

3.1 3.1 INSTALLATION OVERVIEW

3.1.1 Installation History

The 48-acre Regional Training Institute is located in Waimanalo, Oahu on TMK [1] 4-1-015:001. A land use map of the RTI and surrounding area is shown in Figure 3-1. The Waimanalo area was one of the first locations settled by the native Hawaiians. The 48-acre site was once part of the Bellows Air Force Station in Waimanalo. Bellows was originally used solely for on-ground training between 1917 until 1933, when an airstrip was constructed. In the build-up to World War II, Bellows became a separate military post, was and was also attacked during 7 December 1941. The Air Force ceased training on the runways in the late 1940s, but they remained open for non-commercial, personal aviation, until the late 1950s (Hawaii Aviation 2011). During the Cold War, Bellows became a NIKE missile site, and a communications facility. The beachfront property has provided recreational facilities for the military and their family members for the past 60 years.

In 1999, the main facility was transferred from the Air Force to the Marine Corps at nearby Kaneohe Bay for non-live fire training. In 2002, the Navy Marine Corps Base Hawaii licensed the former communications facility area to HIARNG, and the new RTI facility was constructed. The RTI serves the 298th Regiment, Multi-Functional Training Brigade, and also provides facilities and classroom space other federal, state, local, and nonprofit groups, as needed.

3.1.2 Surrounding Communities

The southern boundary and access roads for RTI are adjacent to the town of Waimanalo. This small community has a population of approximately 5,451 in 2012. The community has a higher percentage of native Hawaiian and Pacific Islander residents than the statewide average (40 percent in Waimanalo compared to 10 percent in the rest of the state) (U.S. Census 2010 – Waimanalo Beach Census Designated Place).

3.1.3 Regional Land Use

The access road points for RTI are located off of Route 72, Kalanianaole Highway, at the eastern and western end of a densely developed section of Waimanalo. The boundary to the west follows Waimanalo Stream. Land uses near RTI include residential, schools, commercial, military, golf course, and pasture. Nearby land uses also include croplands, wetland, and parks. Bellows Beach Park, Waimanalo Bay State Recreation Area, Waimanalo District Park, and Olomana Golf course are located less than a mile from RTI. Bellows Beach Park is only open to the public on weekends when training is not being performed.

3.1.4 Cultural Resources

Based on historical documents, the RTI site was for small scale family farms and homes, primarily near the western Kahawai stream area. By the early 1900s until the early 1930s, the site was used for sugarcane production. Prior to and during World War II, the landscape at RTI was heavily altered and graded in order to construct the former airfields and a B-17 dual revetment that remains there today.

Limited archaeological artifacts have been found at RTI during previous archaeological and cultural surveys. A cultural resources survey completed by Tuggle and Dye in 1999 identified subsurface cultural resources, including a possible pre-contact cultural deposit located below the graded runway. The 1999 report recommended, "Monitoring during construction" and data recovery, if disturbed. The World War II B-17 revetment was identified as "probably eligible for the National Register" based on criteria A, C, and D for the National Register of Historic places (Tuggle & Dye 1999).

3.2 PHYSICAL ENVIRONMENT

3.2.1 Climate

RTI is located on the Windward side of Oahu, near sea level. There are two primary seasons: a warmer, drier period from May through September and a wetter, cooler period from October through April. The temperature is generally stable with a maximum monthly high temperature averages of 27.3 degrees Celsius (ºC) (81.2ºF), and a minimum monthly low temperature average of 20.8ºC (69.5ºF) (Western Regional Climate Center 2006). Rainfall averages approximately 101 centimeters (cm) (40 in.) annually.

3.2.2 Landforms

The RTI is located on the coast at the base of the Koolau Mountains. These are visible from the site and rise more than 2,000 ft. from sea level. Due to its coastal location, and the presence of former runways 3L and 6R, the RTI site is largely flat with some gradual sloping. The buildings and maintained areas comprise about two-thirds of the site.

3.2.3 Geology and Soils

RTI is located on a raised Pleistocene limestone reef (HIARNG 1999). The Natural Resources Conservation Service considers 94 percent of the soils onsite to be fill lands. The terrain at RTI is principally flat with some anthropological embankments from World War II.

The majority of the Site is fill lands, with the remaining area consisting of coral outcrop overlain with a mix of coral crop including Ewa silty clay loam, Kaloko clay, and Pohakupa silty clay loam. The Coral Outcrop occurs on the northern portion of the RTI, where the only other soil unit is Fill Land, which is associated with the former runways, roadways, building, and landscaped areas. Coral Outcrop is geographically associated with Jaucas, Keaau, and Mokuleia soils, with 10-20 percent of the coral outcrop composition consisting of a thin layer of friable, red soil material in cracks, crevices, and depressions within the coral outcrop.

3.2.4 Hydrology & Wetlands

The site does not contain surface water, though a lack of drainage causes rain event pooling near the southern fence line near the main gate. Due to the coastal location, the groundwater in the area near RTI can vary from 8 to 12 ft. and up to 20 ft. below ground surface (United States Air Force 2003). The water table is located 20 ft. below the surface. The perennial Waimanalo Stream and its tributary, the Kahawai, lie approximately one-tenth of a mile (160 meters [m]) and 80 ft. (24 m) from the western RTI fence boundary. These streams are part of the Waimanalo watershed, which drains approximately 2.6 square miles to Waimanalo Bay, approximately 4,000-5,000 ft. (1,200 m) east of the site. There are no identified wetlands within the RTI installation boundary, but the USFWS National Wetland Inventory (Cowardin et al. 1979) identified several wetlands adjacent to the southern boundary of the facility.

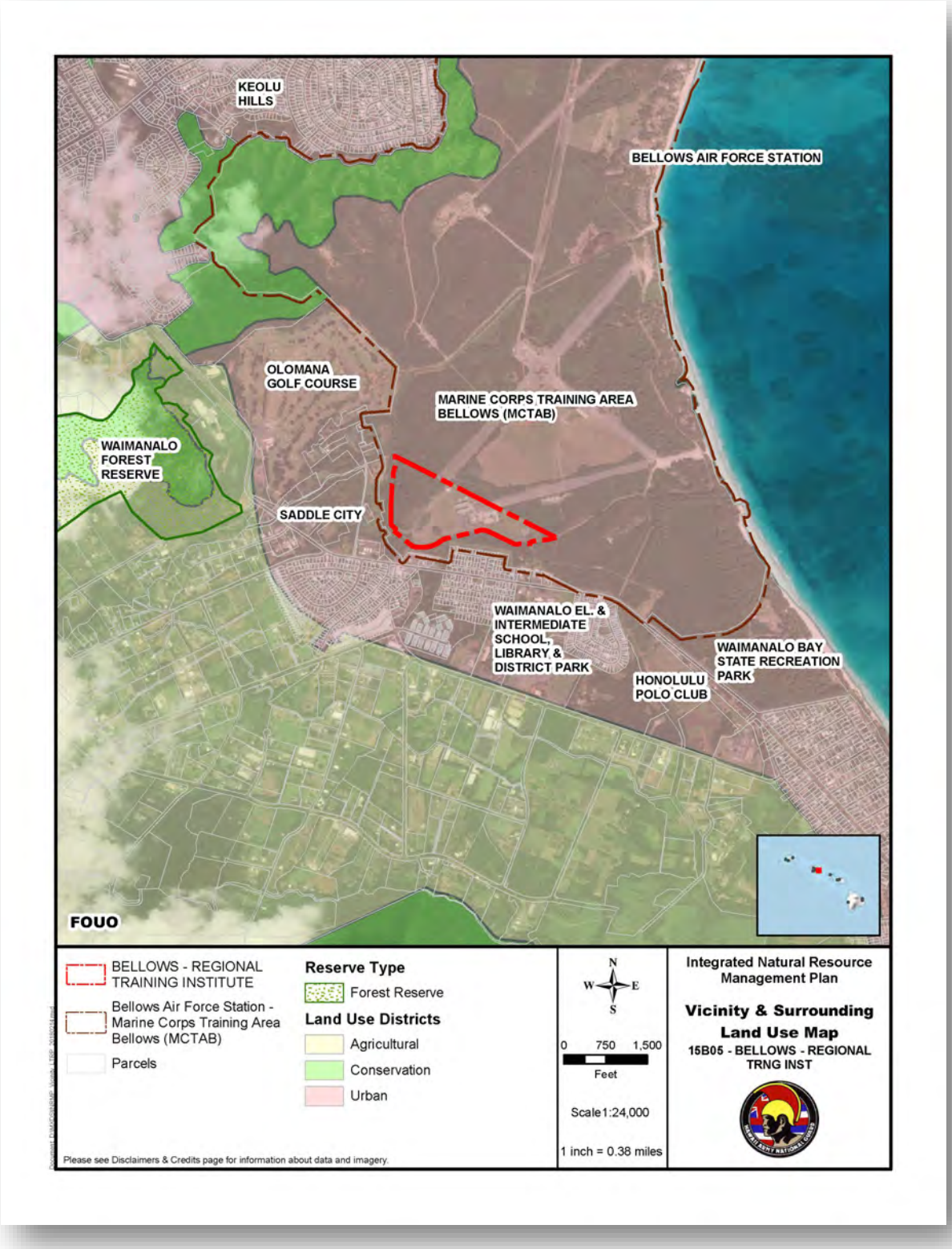


Figure 3-1: Land Use Areas around RTI

Waimanalo stream is located near the western boundary of RTI. This channelized stream has been heavily altered and only 1 percent of it remains in a natural state. Due to flood control measures, limited riparian and habitat zones remaining in the lower watershed. Channelization, fertilizer, animal waste, and general watershed development have all degraded the water quality. In 2004, Waimanalo stream was listed as a Water Quality Limited Segment due to failures in meeting water quality standards (Hawaii Department of Health 2007). Waimanalo Stream drains to Waimanalo Bay, a Class A water, approximately 0.75 miles (1,200 m) away.

3.3 NATURAL RESOURCES & CONSERVATION MANAGEMENT

3.3.1 Vegetation

The RTI is located on the coastal plain. Vegetation is primarily maintained grasslands, and non-native invasives including koa haole (*Leucaena leucocephala*), Guinea grass (*Panicum maximum*), California *(Brachiaria mutica*), and fountain grass (*Pennisetum setaceum*) (Figure 3-3).

RTI consists of two main vegetation areas, approximately two-thirds of the facility is maintained low turf grass, one third is koa haole dominated shrubland, and the remaining few acres consist of drier shrubland, primarily growing over the former runway. The majority of plants are non-native weeds.

Cleared and mown pathways (approximately 20 ft. wide) run along the fence line of RTI, and bisect the largely unmaintained western section. The historic revetment site is also cleared and mulched. A few large Chinese banyan (*Ficus microcarpa)* trees are growing on, over, and near the revetments. Several bingabings (*Macaranga mappa*) were also found along the revetment walls and in the less dry areas of RTI.

The unmaintained western area of RTI has slightly more moist soils, with an overstory of Koa Haole and mock orange (*Murraya paniculata*). Chinese violet (*Asystasia gangetica*) and coral berry (*Rivina humilis)* form the dominate groundcover, with guinea grass growing along the open mown pathways. The lower elevation area south of the historic revetment is being smothered by tinaroo (*Neonotonia wightii).*

3.3.2 Wildlife Management

Commonly seen non-natives fauna included mongoose, rodents, pigs, and feral and domestic cats and dogs (HIARNG 1999). Pigs have been captured onsite at RTI.

During the 1999 survey for the Environmental Assessment for RTI construction, an avian survey identified 21 exotic birds and four common migratory birds. No RTI-specific avian surveys have been performed since 1999. According to the 2003 Final Site Inspection Report at Bellows Air Force Station, birds commonly sighted in the area include the non-native Japanese white-eye (*Zosterops japonicas)*, the migratory northern cardinal (*Cardinalis cardinalis*), white-rumped shama (*Copsychus malabaricus*), Japanese bush warbler (*Cettia diphone*) and the migratory barn owl (*Tyto alba*). The common waxbill (*Estrilda astrild*), chestnut mannikin (*Lonchura malacca*), and zebra dove (*Geopelia striata*) are also seen in areas with tall grasses (USAF 2003).

The HIARNG Environmental Office contracts feral pig removal on an as needed basis throughout the fiscal year. Feral pigs are rampant on adjacent parcels, which requires monitoring the RTI perimeter fence regularly.

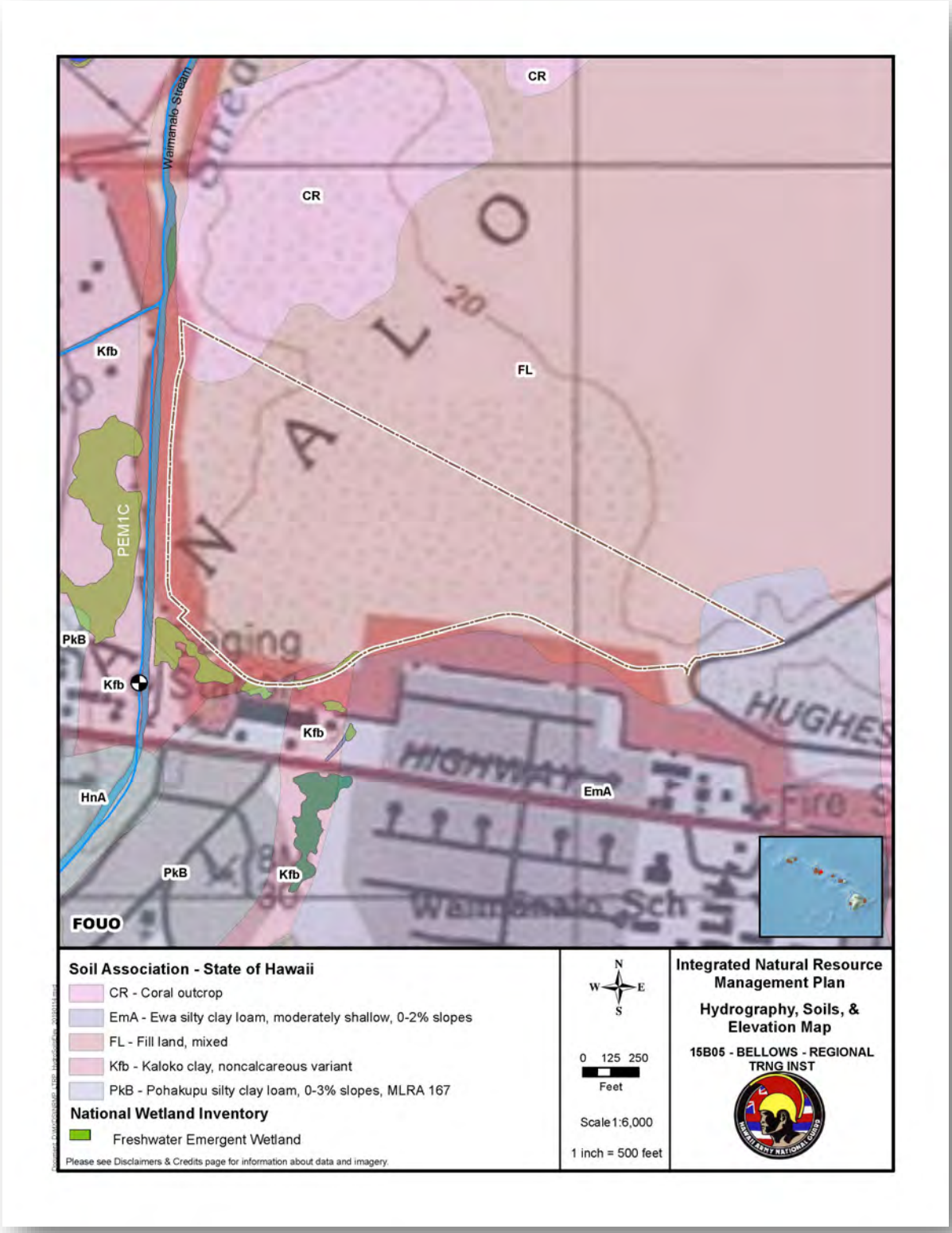


Figure 3-2: Soils, Hydrology, Flood lines at RTI

3.3.3 Threatened and Endangered Species Management

The HIARNG requests a TES Species List from USFWS every 90 days. The USFWS List dated August 15th, 2018 (01EPIF00-2018-SL-0448) lists the following endangered and threatened species as documented within the general vicinity of RTI:

Hawaiian hoary bat	*Lasiurus cinereus semotus*	Endangered
Green Turtle (Central North Pacific)	*Chelonia mydas*	Threatened
Hawksbill Turtle	*Eretmochelys imbricate*	Endangered
Hawaiian stilt	*Himantopus mexicanus knudseni*	Endangered
Hawaiian coot	*Fulica alai*	Endangered
Hawaiian duck	*Anas wyvilliana*	Endangered
Hawaiian gallinule	*Gallinula galeata sandvicensis*	Endangered
Hawaiian goose	*Branta sandvicensis*	Endangered
Hawaiian petrel	*Pterodroma sandwichensis*	Endangered
Newell's Shearwater	*Puffinus auricularis newelli*	Threatened
Band-rumped storm petrel	*Oceanodroma castro*	Endangered

The HIARNG contracted USGS to conduct a Hawaiian hoary bat echolocation monitoring project at the RTI. The study began in August 2012 and ended in July 2016. During the 4 year study, a bat was recorded at RTI only two nights, one in 2014 and again in 2015. The HIARNG still implements BMPs for vegetation cutting and removal to avoid any possible impacts to the Hoary Bat.

The RTI is located .62 miles from the Bellows beach shoreline. Neither the green sea turtle nor the Hawksbill sea turtle have ever been spotted near or on RTI property. Because of the unfeasible nature of these species occurring, HIARNG does not consult with NMFA for consultation purposes.

The endangered Hawaiian stilt (*Himantopus mexicanus knudseni*), is occasionally seen at RTI, near the Hughes Road gate and on the athletic track. In general, more stilts have been seen on Oahu during the past 30 years than on the other neighboring islands, with nearly 35-40 percent of the state's entire stilt population. The population has been increasing slightly over the past 30 years depending on reproductive success (USFWS 2011). Statewide efforts for the stilt population include restoration of wetland habitat and management of existing habitat and development of more effective predator control methods (Mitchell et al). Currently, a stilt has not been observed nesting at RTI and no predator controls for cats or mongoose are in place. The nesting season of the Hawaiian stilt normally extends from mid-February through August, with a peak from April through June, but varies among years depending on water levels (USFWS 1999a and 2005a).

In May 2018, a Hawaiian duck (*Anas wyvilliana*) or possible Koloa x Mallard hybrid duck, was spotted nesting at the RTI, near the Administration building. The HIARNG ENV staff flagged off the area and set up mongoose traps near the nesting site. ENV staff noted eight eggs in the nest, however, it is believed that mongoose carried off the eggs within the span of two weeks, with no successful hatchlings.

No other listed TES have been seen on RTI property, however the Bellows Air Force Station is restoring a nearly 10 acre wetland, which attracts native water fowl, including birds listed on our TES species list.

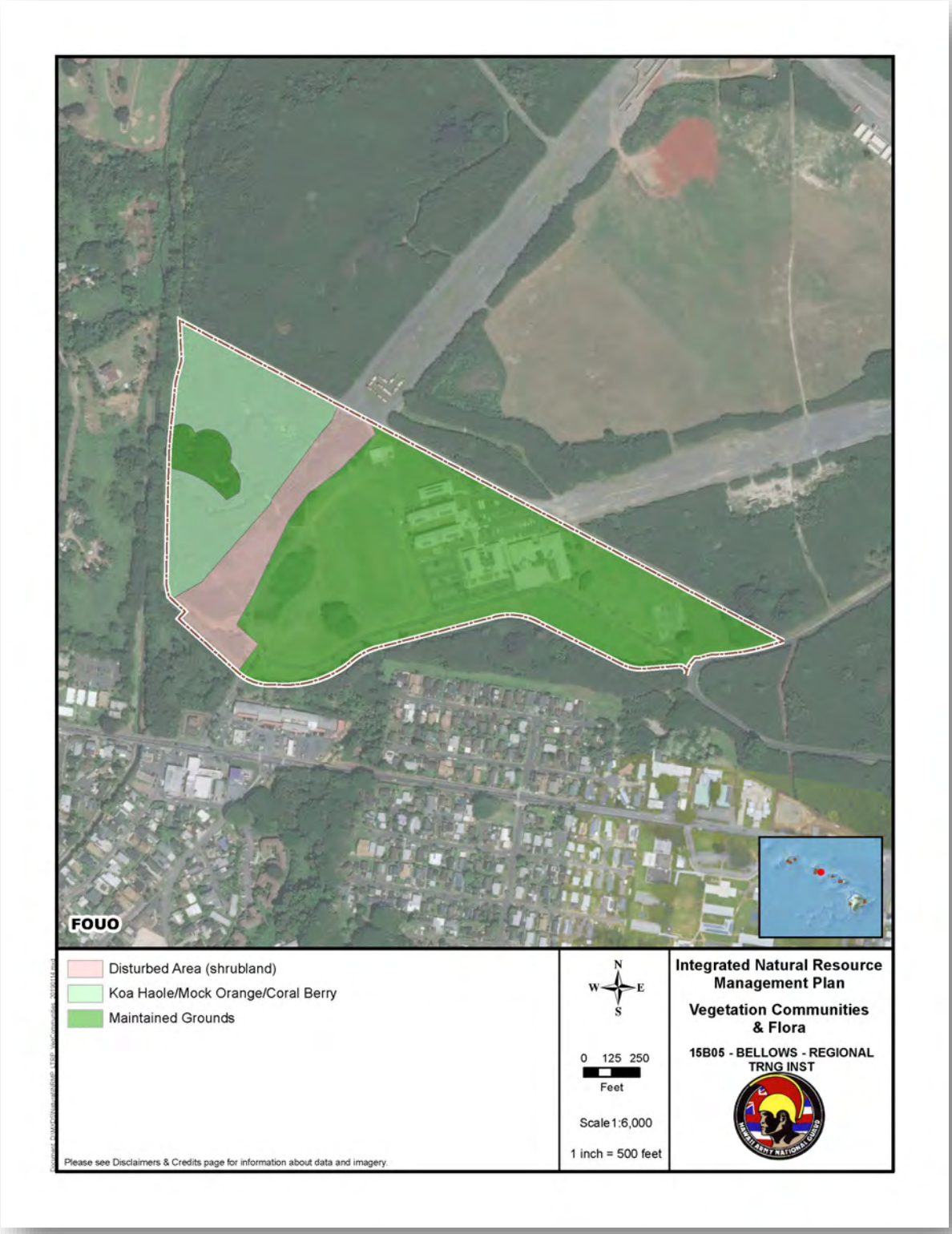


Figure 3-3: Vegetation Communities at RTI, Waimanalo, Hawaii

3.3.4 Habitat & Ecosystem Health Management

The HIARNG ENV natural resources field staff installed a 20m x 20m native and cultural plant species pollinator garden at the RTI. The project involved cutting and treating the invasive Haole Koa trees with point application Garlon 4. The plant material was mulched and the area was weeded before native plant installation. The pollinator garden includes Mamaki, kupukupu fern, taro, pohinahina, akia, aalii, and other native species. The plan is to use this pollinator garden as a propagation source for native plants. The HIARNG would also like to partner with DLNR DOFAW to release the native King Kamehameha Butterfly at this site.

Additionally, the NR field staff maintain the firebreak roads in the forested area of RTI to reduce wildfire spreading and to reduce the invasive species that dominate the RTI forest. They conduct continual monitoring and reporting for invasive species, migratory birds and T&E species at the RTI.

3.3.5 Integrated Pest Management

As a component of grounds maintenance, fountain grass *(Pennisetum setaceum)* removal and surveys have been on-going since 2002. Fountain grass is a highly disruptive and flammable species. To prevent its growth, staff from the Air Force, HIARNG, Marine Corps and the Oahu Invasive Species Council have been working to monitor for and eradicate any plants at Bellows MCTAB and RTI. The fountain grass population has been reduced from 201 clumps in 2003 to one clump in 2011. The surveys and removal activities will continue due to the highly invasive and rapid growth of fountain grass. Removal is both manual and chemical. Grass populations were kept in check when the area was grazed by cattle, and this is being considered as an additional control method (DoD 2012).

3.3.6 Integrated Wildland Fire Management

A fire management plan was completed in 2008. Recommendations included maintaining the existing vegetation buffers around the facility buildings, maintaining the fire break roads in the forested areas and to cut grass below six inches along roadways and the track field. Additional recommendations include limiting smoking to approved smoking facilities.

3.4 MILITARY MISSION & TRAINING

3.4.1 Current Use & Training

RTI is not used as a firing range and outdoor maneuver training is limited primarily to maintained areas. Some concealed maneuvers are performed in the western portion of the site, but the facility is not maintained for these activities.

The RTI is located on the is former Communications Facility site south of Marine Corps Training Area Bellows (MCTAB), and is east of commercial structures in the town of Waimanalo. Approximately half of the 48-acre site consists of maintained grounds with five main buildings used for office space and classrooms, two barracks, an auditorium, and a cafeteria. A 0.25-mile trail lies to the west of the buildings. The maintained grounds are used for training, overflow parking, and can be used for tent staging for large, but infrequent training activities. The primary usage is classroom-based training.

Additional physical/foot maneuver training and land navigation training occurs in the undeveloped western portion of the site. This area of koa haole forest/shrubland is used irregularly.

RTI is primarily used for training the HIARNG. Approximately half of the users are part of the 298th Regiment, with approximately a quarter of users from the U.S. Army and various non-profit organizations. The majority of the training is used for meetings, classroom activities, or limited foot maneuver training. No live fire or mace is allowed onsite. The majority of active training occurs at Marine Corps Training Area Bellows. Once-a-year, multi-agency trainings, including Tiger Balm, have utilized RTI as a staging area, with no active training on the RTI.

Hazardous Materials Storage and Hazardous Waste

There is no onsite fuel storage located at RTI.

Wastewater

RTI was constructed with a septic tank and leach field for wastewater due to a 1991 moratorium on municipal sewer connections to the Waimanalo Wastewater Treatment plan service area. The Environmental Assessment/Environmental Impact Statement called for a sewer connection once the treatment plant was upgraded (HIARNG 1999). The moratorium was lifted on 4 August 2011 (City and County of Honolulu 2011).

3.4.2 Future Use & Training

When the RTI facility was proposed, the original plans included additional recreational facilities in the koa haole shrubland on the western side of the site. This included tennis courts, soccer and baseball fields, and a parking area, which would be open to the public and able to be reserved when not in use by HIARNG (HIARNG 1999). These facilities were never built due to state match funding issues. There are no currently plans to pursue this option. No additional future training activities are planned at RTI.

3.4.3 Natural Resources Support to Training

Because the RTI functions principally as an Officer Candidate School with indoor training, the natural resource needs are minimal. However, staging areas for vehicles are needed. Additionally, infrequent land navigation training has occurred at RTI, which requires trees and obstacles to mimic natural conditions.

It is important that invasive species do not encroach on the fence line of RTI and create a physical security issue. The HIARNG ENV maintains these roads for a multi-purpose result: wildland fire management and physical security management.

3.4.4 Natural Resources Constraints to Training

There are minimal constraints from natural resources to training or activities at the RTI. The endangered Hawaiian stilt is occasionally spotted at RTI, but that does not impede indoor classroom training or infrequent land navigation training. The invasive vegetation does create a wildland fire concern, which is why the HIARNG ENV actively maintains firebreaks at RTI.

In July 2018, a tropical storm dumped over 20” of rain, which produced flash flood warnings across the state. However, the community with the most severe flood damages was Waimanalo. The RTI is mostly outside of the 100- and 500-year flood zone, however a narrow band of three acres along the western boundary is identified as within the 100 year flood zone. During the rain event, water levels rose to 3 feet along the RTI fence line. Luckily no damages were incurred, however this could be a physical security issue if the severity and frequency increase.

3.5 MANAGEMENT GOALS, OBJECTIVES & IMPLEMENTATION

See ***Appendix A: Goals, Objectives, and Projects*** to view the all management activities at RTI and across all HIARNG INRMP installation.

4 KEKAHA FIRING RANGE, Kauai Island

4.1 4.1 INSTALLATION OVERVIEW

4.1.1 Installation History

The 68-acre Kekaha Firing Range is located in Kekaha town, on Kauai island, TMKs [4] 1-2-002:0101 & [4] 1-2-002:021. A land use map of KFR and the surrounding areas, is shown in Figure 4-1. There is currently no live fire training conducted at KFR. In 2009 the eastern range was deactivated and in 2013 the western small arms range was deactivated, both due to Surface Danger Zones (SDZs) that extended off the KFR boundary. KFR consists of two inactive firing ranges, with two auxiliary buildings– a storage shed and latrine. The site is slightly overgrown, with minimal maneuver training currently occurring on the training site. KFR is approximately 1.5 miles west of the nearest town of Kekaha. According to the 2010 Census data, Kekaha had a resident population of approximately 3,600 people (U.S. Census 2010).

4.1.2 Regional Land Use

KFR is located on the coastline on the Mana Plain, a coastal plain at the base of the mountains. Once marshland, much of this plain has been converted to agricultural use (HIARNG 2006a). The firing range is bordered to the northeast by State of Hawaii lands. Adjacent to the northern boundary is a large landfill, bordered by evergreen forests, and to the southeast is the Mana Drag Strip. The Pacific Missile Range at Barking Sands is directly adjacent to the site on the northwest side. The Missile Range encompasses 1,800 acres on the western shore of Kauai, plus an additional 120 square nautical miles for an Underwater Range in the channel between Kauai and Niihau.

Most of KFR is within the coastal SMA, a designation for coastal areas which imposes special restrictions. Development in the SMA requires a permit which allows the state to regulate land uses and activities in coastal areas, thereby ensuring that coastal resources and public beach access are preserved. Kauai County seeks to minimize developments that:

- Alter any bay, estuary, salt marsh, river mouth, slough, or lagoon
- Reduce the size of any beach or other area usable for public recreation
- Reduce or restricts public access to tidal and submerged lands and beaches
- Detract from the line of sight toward the sea from the state highway nearest the coast
- Adversely affect water quality or existing areas of open water free of visible structures; adversely affects existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.

Kawaiele State Waterbird Sanctuary is located on the southern side of Highway 50 between Waimea Town and Barking Sands/Polihale, just past the Kekaha Waste Tip and a collection of fish ponds. It is located several miles to the east of KFR. This sanctuary was created by the state after the removal of sand for construction (Birding Hawaii 2006). Between 2001 and 2003, further sand extraction and conservation work was carried out here, which has altered the surrounding banks and scrub and increased the number of islands, and further extraction may alter the pond layout further.

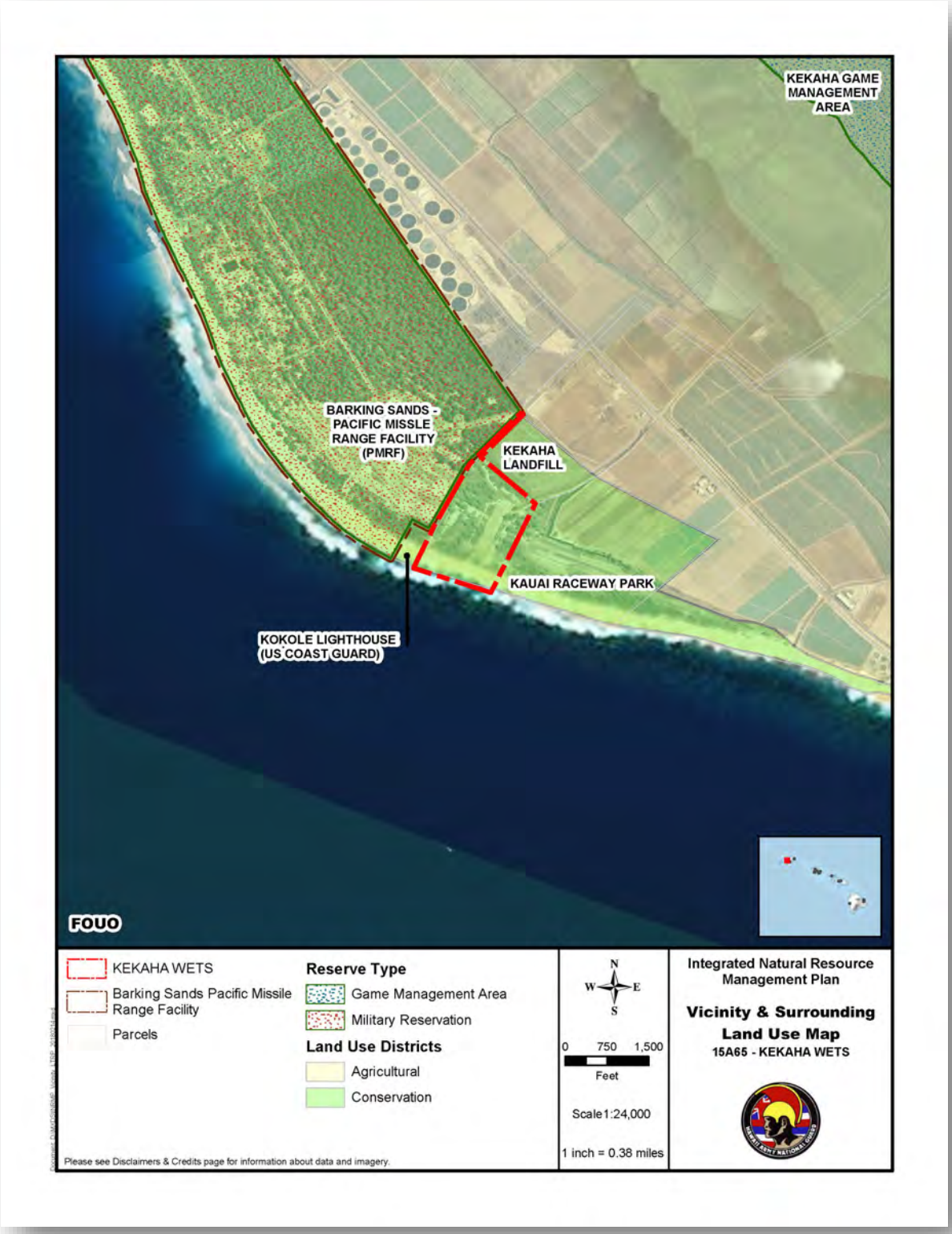


Figure 4-1: Map of Land Use Areas around KFR

There are two wetlands within 1 mile of KFR, one just on the other side of the Kaumualii Highway, and a small one within the Barking Sands Missile Facility. Two beaches are approximately 1 mile from KFR, Barking Sands Beach to the west, and Kekaha Beach Park to the east. There are no forest reserves in the immediate area.

4.1.3 Cultural Resources

There are no known cultural resources at KFR. KFR is being surveyed for cultural resources in a 2018 Archaeological Inventory Survey, under Section 110 of the National Historic Preservation Act. No ground disturbing activities occur at KFR.

4.2 PHYSICAL ENVIRONMENT

4.2.1 Climate

KFR is a coastal**,** arid site that lies in the leeward rain shadow of Kauai's central mountains, receiving an annual average of 21.78 in. of rainfall. Rainfall is distinctly seasonal, with most rainfall occurring during the winter (November–February), and a monthly average of less than 1 in. of rain during the summer (May–September). The dry conditions of El Nino characterize Kekaha that is dependent on low-pressure Kona (leeward) storms for rain. The persistent dry conditions of El Niño sometimes cause die-back of both native and non-native vegetation. The average maximum high and minimum low temperatures are 84.8 and 64.8°F, respectively (Western Regional Climate Center 2006).

4.2.2 Landforms

KFR is located at sea level on a flat, coastal, leeward plain of western Kauai. Low dunes, less than 25 ft. high, are present along the beach at the head of the ranges. Behind the beach is a generally flat area, except for firing range berms. Low sand hills less than 10 ft. high, interspersed with depressions, are present at the back of the range (northeastern end).

4.2.3 Geology and Soils

The soils at KFR were described in the 2007 Planning Level Survey as primarily Jaucus loamy fine sand with 0-8 percent slopes. The soil is a mix of alluvium, lagoon deposits, beach, and sand dunes. The soil is excessively drained and consists of calcareous soils deposited by wind and water, typical of coasts. These soils have severe limitations for use because they are excessively drained and have a risk of wind erosion (HIARNG 2008a). No hydric soils have been classified at KFR (Mauney et al. 1999b).

4.2.4 Hydrology & Wetlands

Rainfall infiltrates rapidly into the porous soil so that there are no defined surface water features. The Pacific Ocean is adjacent to the south boundary of the site. Approximately 25 acres of KFR lie within the 100-year flood plain. No seasonal wet depressions were identified in the 2007 survey at the rear of the range, based on the lack of vegetation that is typically seen in saturated soil or ephemeral wetlands, including native water hyssop (*Bacopa monnieri*), the introduced pluchea or Indian fleabane (*Pluchea indica*), the invasive California grass (*Urochloa mutica*), and sedges. This site does not typically have standing water, and despite heavy rains within a 24-hour period, no standing water or water hyssop was seen at this location. The majority of plants were drought tolerate species, and included an increase of the previously noted California grass (*Brachiaria mutica*), and castor bean (*Ricinus communs).* These plants

are drought tolerant and rely on winter rains for most of their moisture. The species assemblage is suggestive of a wetland habitat, but formal surveys in 1999 and 2007 found that all the criteria required to classify the wetland as jurisdictional are not present (Mauney et al. 1999b).

Mauney et al. (1999b) did not identify any jurisdictional or non-jurisdictional wetlands on KFR; however, the USFWS (1998b, 2001) did identify two seasonally wet areas in the north western corner of the KFR property (not shown in Figure 4-2). They noted the presence of a plant species assemblage suggestive of a wetland habitat, including sedges and water hyssop, in two sandy depressions located at the north end of the range. The sandy soil of these depressions was saturated during their December 1996 field visit but noted that these depressions "do not appear to provide adequate habitat for endangered species such as the endemic Hawaiian water birds" (USFWS 1998b). The 2007 Planning Level Survey investigation confirmed that these seasonal wetlands do not appear to be habitat for any rare species based on plant and soil survey data (HIARNG 2008a). The 2012 site visit occurred after a significant rain event in Kauai but did not result in a saturated presence in the areas noted by the USFWS.

The management of coastal resources centers on the protection and enhancement of the dune system and coastal strand vegetation at KFR. There are no water quality issues at KFR. There have been no management actions taken for the seasonal wet areas identified by the USFWS (1998a, 2001). These wet areas are not impacted by irregular maneuver training events. These areas are not known to be used by wildlife, and are predominately full of invasive species. There is a small area at the low point of the depressions which were dominated by the native water hyssop in the 2007 survey. This was not seen in the 2012 wet season plant survey. A Planning Level Survey, conducted by HT Harvey and Associates is planned for 2019 and will reassess the determination and location of wetlands and surface waters at KFR.

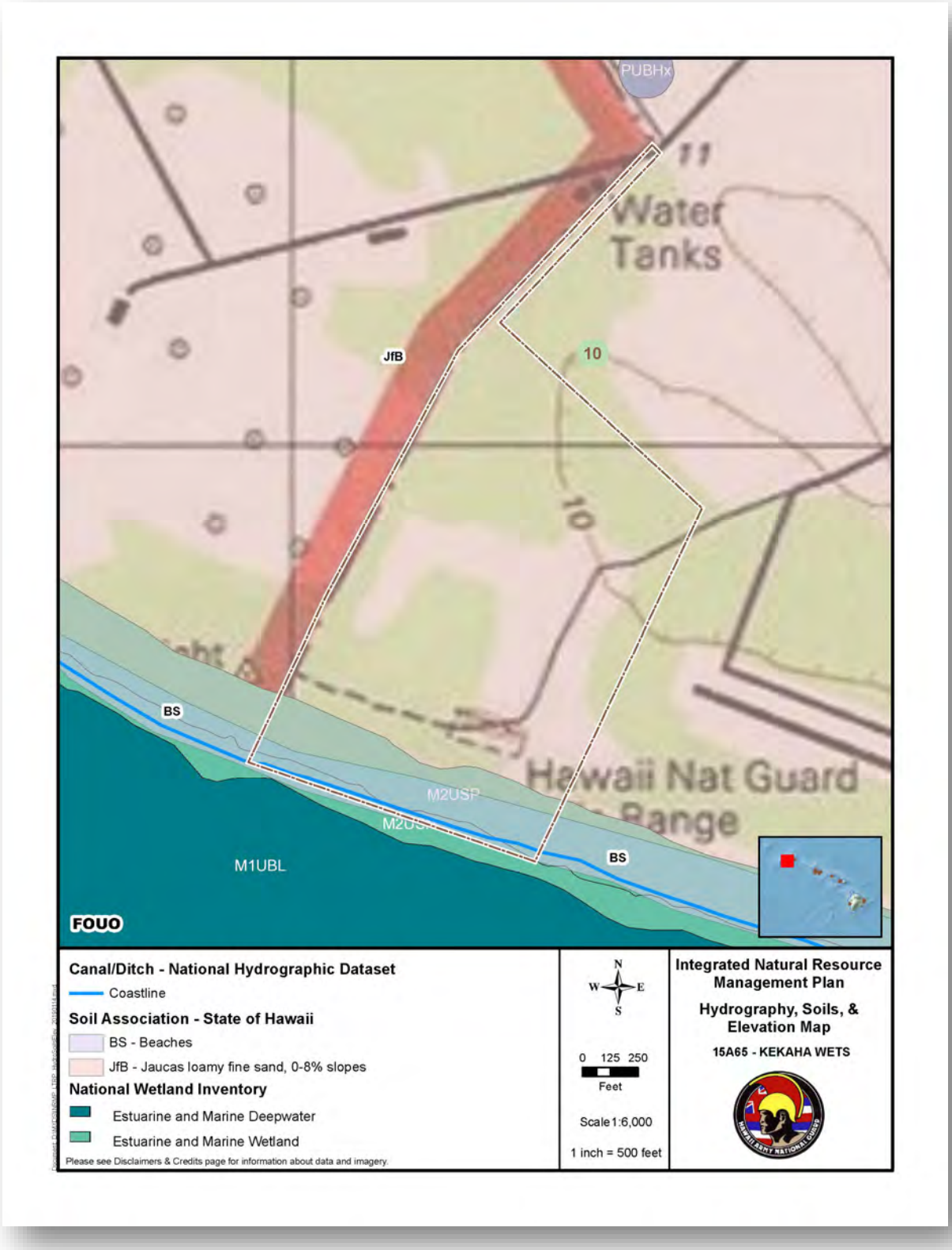


Figure 4-2: Soils, Hydrology, Wetland & Flood lines at KFR

4.3 NATURAL RESOURCES & CONSERVATION MANAGEMENT

4.3.1 Vegetation

KFR is a coastal strand dry ecosystem with sand dunes, containing a mixture of herblands, grasslands, and shrublands dominated by non-native, but with pockets of the native aalii shrub (*Dodonea viscosa*). These areas are most extensive on leeward sides of the islands, and are characterized by prolonged drought conditions from May to September.

Most of KFR is covered by degraded habitat dominated by invasive species. USFWS surveys (1998b) documented two habitats containing limited populations of native plants. A small coastal strand community exists on the seaward sand, and behind the dunes are primarily coastal shrublands and woodlands along with the ruderal community in the inactive firing areas.

The vegetation communities identified at KFR include:

- 'A'ali'i Coastal Dune Shrubland
- Naupaka Kahakai/AkiAki Coastal Strand Shrubland
- Restored Native Coastal Dune Shrubland
- Maintained Ruderal Herbland
- Sourbush/California Grass Seasonal Wetland
- Kiawe/Buffelgrass Coastal Dry Woodland
- Beach

The 'a'ali'i (*Dodonaea viscosa*) Coastal Dune Shrubland is found primarily along the southwestern edge of KFR. 'A'ali'i is often a dominant species in lowland dry communities but not in coastal communities. This community type can also contain small patches of the succulent herb nama (*Nama sandwicensis*). This plant, although not officially designated threatened, endangered, or rare by any system, is noted as being uncommon and vulnerable (Wagner et. al. 1999) and has been referred to as “rare” (USFWS 1998a). The a’al’i shrubland community generally includes other native species such as naupaka, and ‘ilima, and is noticeable for having open stretches of sand/sandy soils with limited overstory. This community is being encroached on by sourbush, (*Pluchea symphytifolia*), indian fleabane (*Pluchea indica*), and koa haole (*Leucaena leucocephala*). Outside of the KFR fence line, but still on KFR property, is a native plant dune restoration area that includes the native Pohuehue vine, Pohinahina and ilima papa. The Kauai Invasive Species Committee (KISC) has nearly eradicated long-thorn kiawe *(Prosopis juliflora*) and is assiting HIARNG in restoring the areas to native plant species.

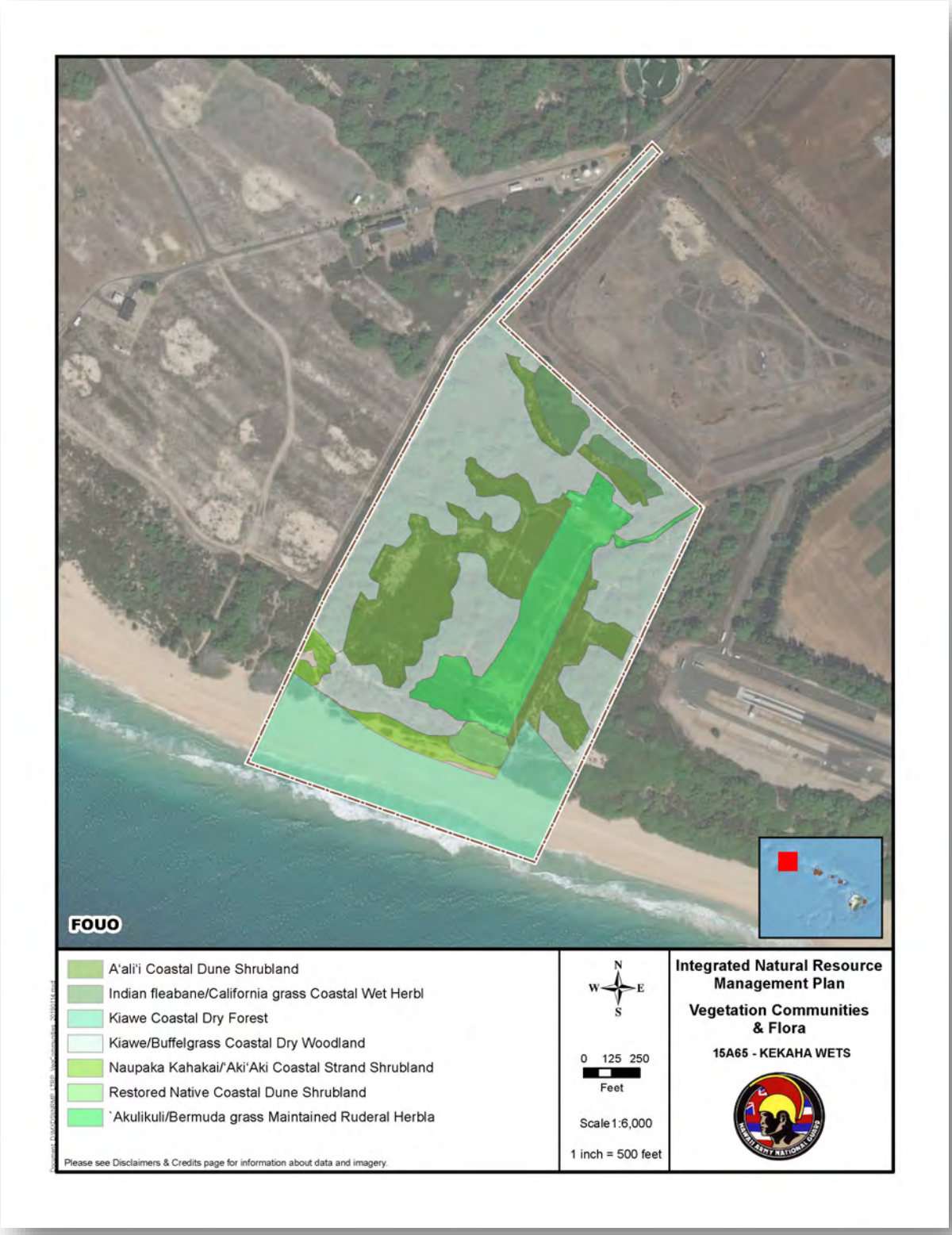


Figure 4-3: Vegetation Communities at KFR

Table 4-1 Common Native Species at KFR

Scientific Name	Common Name	Status	Relative Abundance
Bacopa monnieri	aeae	Indigenous	NR
Boerhavia repens	alena	Indigenous	Rare
Colubrina asiatica	anapanapa	Indigenous	Rare
Cordia subcordata	kou	Indigenous	Rare
Dodonaea viscosa	'a'ali'i	Indigenous	Abundant
Heliotropium curassavicum	kipukai	Indigenous	Common
Ipomoea pes-capre	pohuehue	Indigenous	Uncommon
Ipomoea imperati	hunakai	Indigenous	Uncommon
Jacquemontia ovalifolia	pau-o-Hiiaka	Endangered	Rare
Nama sandwicensis	nama	Endangered	NR
Scaevola taccada	naupaka, beach	Indigenous	Common
Sida fallax	ilima	Indigenous	Common
Solanum americanum	popolo	Indigenous ?	Rare
Vitex rotundifolia	pohinahina	Indigenous	Occasional
Waltheria indica	uhaloa	Indigenous ?	Abundant

NOTE: NR = Not reported in 2012; Indigenous, i.e., native but not restricted to Hawaiian Islands.
? = Unknown or determination tentative.
Sources: USFWS (1998b), HIARNG (2008a).

Table 4-1 Common Non-Native Species at KFR

Species Listed by Family	Common Name	Abundance
Abutilon grandifolium	hairy abutilon	Uncommon
Acacia farnesiana	*klu*	Rare
Boerhavia coccinea	false *alena*	Rare
Cenchrus ciliaris	buffelgrass	Abundant
Chamaecrista nictitans	partridge pea	Uncommon
Chamaesyce hirta	garden spurge	Common
Chamaesyce prostrata	prostrate spurge	Uncommon
Crotalaria incana	fuzzy rattlepod	Uncommon
Cynodon dactylon	Bermuda grass	Abundant
Desmanthus pernambucanus	virgate mimosa	Occasional
Ipomoea obscura	obscure morning-glory	Uncommon
Lantana Camara	lantana	Occasional
Leucaena leucocephala	*koa haole*	Abundant
Malvastrum coromandelianum	false mallow	Uncommon
Panicum maximum	Guinea grass	Occasional
Plantago lanceolata	narrow-leaved plantain	Uncommon
Portulaca pilosa	*Ākulikuli*	Occasional
Prosopis juliflora	Long thorn kiawe	Abundant
Prosopis pallida	*kiawe*	Abundant
Pulchea carolinesis	sourbush	Common
Ricinus communis.	castor bean	Uncommon
Setaria parviflora	yellow foxtail	Uncommon
Sida rhombifolia	Cuban jute	Occasional
Sida spinosa	prickly sida	Rare
Sporobolus virginicus	beach dropseed, *‘aki‘aki*	Occasional
Urochloa mutica	California grass	Occasional

Coastal Dune Habitat at Kekaha

Some of the coastal dunes (approximately 1 acre) backing the inactive rifle range immediately adjacent to the coastal strand has been restored by HIARNG and KISC. This area was heavily degraded by off-road vehicle traffic until the installation of large tires in 2002 and a perimeter fence in 2010, which has eliminated vehicular access. The more commons species are pohinahina (*Vitex rotundifolia*: alena (*Boerhavia repens*), pauohiiaka, (*Jacquemontia ovalifolia*), puhuehue (*Ipomoea pes-capre*), hunakai (*Ipomoea imperati*), naupaka (*Scaevola taccada*), and ilima (*Sida fallax*). Koa haole (*Leucaena leucocephala)* and sour bush (*Pluchea carolinensis)* are increasing along the bottom of the dune. On the mauka side of the coastal dune, introduced grasses, primarily bufflegrass (*Cenchrus ciliaris*), is abundant, and mixed with a few ilima (*Sida fallax*).

The majority of the site is comprised of kiawe/buffelgrass, classified as a coastal dry woodland, which also includes the ubiquitous koa haole (*Leucaena leucocephala*) and sour bush (*Pluchea carolinensis*). Klu (*Acacia farnesiana)* was not as common as previously noted in the 2007 survey. Uhaloa (*Waltheria indica)* is one native species which is also found in the kiawe/buffelgrass coastal dry woodland. The indigenous kipukai or Seaside Heliotrope (*Heliotropium curassavicum),* is also fairly common (Table 4-1).

Long-thorned kiawe is of particular concern as it is a state-listed noxious weed. It is the number two target species of removal concern for the Kauai Invasive Species Committee (KISC). Long-thorned kiawe is currently found at the southeast end of the facility on the ocean (makai) side of the sand dunes and it also occurs in other areas. KISC has been contracted by HIARNG to eradicate long-thorn kiawe at KFR. Throughout the years KISC has effectively controlled and eradicated long-thorn kiawe on KFR. KISC conducted outreach efforts with the Navy, Coast Guard and private entities to ensure long thorn kiawe populations off HIARNG property were also treated, thus reducing the seed bank.

4.3.2 Wildlife Management

Bird surveys throughout the years recorded 16 species in 11 families, all non-native to Hawaii (HIARNG 2008a). The State-listed pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) has been observed on site, as well as the invasive barn owl (*Tyto alba*).

Although not previously observed on KFR, the native Pacific golden plover (*Pluvialis fulva*) could be infrequent foragers or transients to the site. Signs of barn owls have also been observed on KFR. There

have also been tracks, signs, and confirmed sightings of rats, mice, and feral cats on KFR. It is likely that the only resident fauna at KFR include these species.

There is no identified wildlife at KFR, though it is possible that the Hawaiian monk seal, green sea turtle, Pueo, and hoary bat may use the site. There have been no confirmed marine endangered species sightings or bat sightings. Pueo have been seen, but not nesting. KFR does not have fish resources, and does not have public access for watching wildlife or hunting. Due to a lack of protected species onsite, there is no ongoing tracking of predator removal at KFR.

4.3.3 Threatened and Endangered Species Management

The HIARNG requests a TES Species List from USFWS every 90 days. The USFWS List dated August 15th, 2018 (01EPIF00-2018-SL-0448) lists the following endangered and threatened species as documented within the general vicinity of KFR:

Hawaiian hoary bat	*Lasiurus cinereus semotus*	Endangered
Hawaiian coot	*Fulica alai*	Endangered
Hawaiian duck	*Anas wyvilliana*	Endangered
Hawaiian gallinule	*Gallinula galeata sandvicensis*	Endangered
Hawaiian stilt	*Himantopus mexicanus knudseni*	Endangered
Hawaiian goose	*Branta sandvicensis*	Endangered
Hawaiian petrel	*Pterodroma sandwichensis*	Endangered
Newell's Shearwater	*Puffinus auricularis newelli*	Threatened
Band-rumped storm petrel	*Oceanodroma castro*	Endangered
Lau'ehu	*Panicum niihauense*	Endangered
Lau'ehu	*Panicum niihauense*	Critical Habitat

TES Monitoring

A comprehensive Planning Level Survey (PLS) was conducted in 2006/2007 to determine the presence of TES, with no TES observed. A subsequent TES survey, included in a PLS is scheduled for 2019. The beach area and a small portion of the dunes were designated as critical habitat in 2003 for the federally endangered *Panicum niihauense*. Multiple survey efforts over the years have not resulted in the observation of a Niihau panic grass species. There have been no sightings of Hawaiian monk seals, Green Sea Turtles or Hawksbill Sea Turtles on or near the KFR site, however regular monitoring is difficult, as HIARNG Environmental staff are based out of Oahu and Hawaii Island.

Threats Management – Protection and Restoration of the Coastal Strand Habitat

HIARNG has been working to restore the increasingly rare coastal strand ecosystem, which may provide habitat for *Panicum niihauense* and the rare species *Nama sandwicensis.* Prior to 2002, recreational vehicles used trails over and along the dunes at KFR, damaging the coastal strand vegetation. In 2002, HIARNG installed large tires to prevent recreational vehicles from crossing the rear dune. Chain-link fencing was installed in 2010 along the southern, western and eastern boundary to reduce trespassing. The Northern boundary has gates and dense kiawe stands, limiting vehicular access. This fencing will remain in place, per the 2012 recommendations of the USFWS in order to protect the site and limit unpermitted access to KFR.

In 2002 the HIARNG partnered with the University of Hawai'i Sea Grant program, and the Waipa Foundation to remove invasive plants and restore the coastal berm areas at KFR. The restoration work was successful and almost 2,000 native plants established along the berms and coastal areas at KFR. Beginning in 2013, the HIARNG has contracted KISC to control, monitor and eradicate long-thorned kiawe (LTK) on KFR. By 2016, the HIARNG included efforts to restore areas previous invaded by LTK into the KISC scope of work. The KISC has restored nearly an acre of land at KFR by assisting with native plant establishment and monitoring for TES at KFR. HIARNG's contract with KISC continues into 2019, and focus has shifted to more restoration and monitoring of LTK regrowth.

Consultations and USFWS Management Recommendations

The HIARNG does not regularly consult with USFWS because training and management actions are minimal at KFR. The HIARNG is planning to conduct invasive vegetation removal at KFR in 2019 and will consult with the USFWS to make a determination of effect on TES.

In 2001, the USFWS identified fire as one of the biggest management issues with respect to TES management at KFR. This management issue has been reduced due to the inactivity of live fire exercises at KFR. However, the invasive vegetation at KFR poses an increased fire risk and fire break roads should be developed and maintained at KFR to reduce impacts form wildland fire. The HIARNG's Integrated Wildland Fire Management Plan (IWFMP) will be updated in 2019 to address fire risk and fire management at KFR.

Habitat Management

It is likely that the Hawaiian Hoary bat is present on site based on echolocation monitoring. The HIARNG contracted USGS to monitor for the endangered Hawaiian Hoary Bat at KFR from August 2012 to July 2015. Bats were detected most commonly from August thru October in each year, with a drop in hits during those month in 2014. See Figure 4-4. Bat monitoring has concluded at KFR due to inactivity of the range.

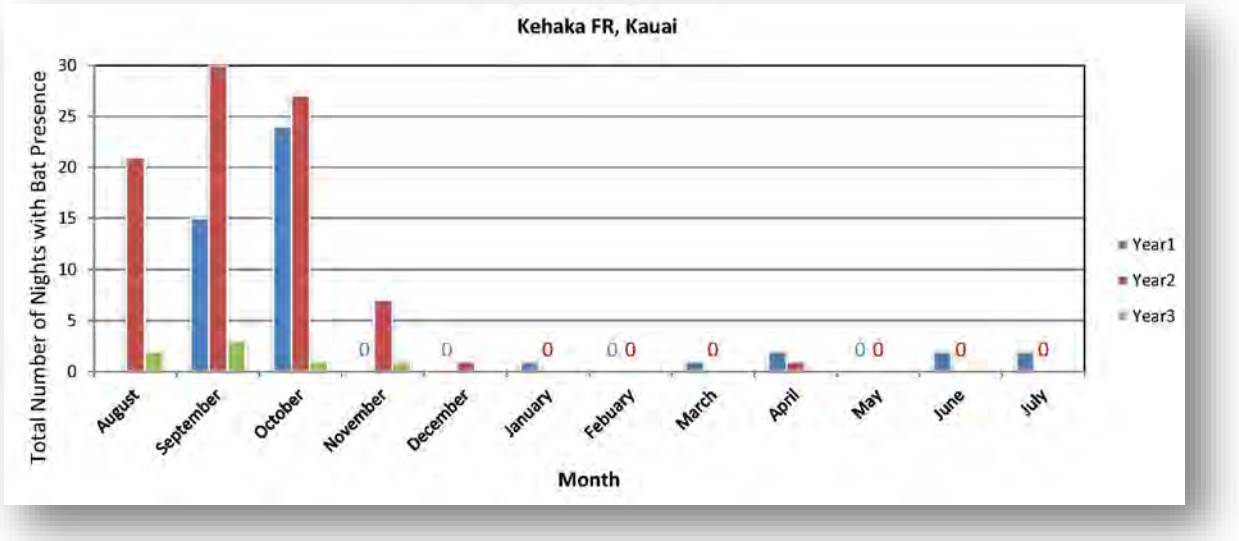


Figure 4-4 Bat Presence at KFR

No TES plants have ever been observed on KFR. However, lauehu or niihau panicgrass (*Panicum niihauense*) was federally-listed as endangered in 1996 (USFWS 1996) and 10.4 acres of KFR was identified as Critical Habitat in 2003 (USFWS 2003). The species is currently known only in one location at Polihale State Park, 6 miles from KFR, although it was historically from Niihau (Mitchell et al. 2005). This particular area is not used for training and is used as a buffer between the facility and the beach.

The coastal dune area of KFR meets the requirements for what is defined as Critical Habitat for the Niihau Panic grass (*Panicum niihauense)*; however, no plants have been seen onsite. The USFWS does not officially designate land owned by the DoD as Critical Habitat when the area is mission critical, or the INRMP provides adequate protection for the species. In 2003, the USFWS designated a portion of KFR as critical habitat for Niihau Panic grass (*Panicum niihauense)*. The adjacent Pacific Missile Defense site was exempted from the critical habitat boundary after negotiations between the USFWS and the Navy.

The endangered Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*) has been observed flying over KFR on occasion. The closest location of known water bird habitat is approximately one mile to the west of KFR, at a pond on Pacific Sands Missile Range.

The USFWS (2001) noted that it is possible that the Hawaiian monk seal (*Monachus schauinslandi*) may occasionally utilize the beach as a haul out site and green sea turtle (*Chelonia midas*) may occasionally utilize the beach as a nesting beach, although there are no records of either species observed on or near KFR.

4.3.4 Habitat & Ecosystem Health Management

From 2013 to 2016, the KISC effectively controlled and eradicated long thorn kiawe (LTK) populations at KFR. This has opened up acres of land which can now be used for maneuver training. Subsequently, restoration efforts have increased native plant seed banks at KFR, and native populations have grown substantially since their initial introduction in 2002. Native plant establishment along sand dunes have captured sand and reduced erosion along the shorelines. The KISC has also been actively maintaining and increasing the restoration efforts at KFR. Most LTK removal and restoration efforts have been occurring along the coastal areas and sand dunes at KFR.

In 2019 and beyond, the HIARNG would like to increase its restoration efforts to include fire breaks of invasive vegetation along the KFR fence lines and to selectively clear invasive vegetation for increase maneuver training activities. The HIARNG in-house staff would like to schedule, at a minimum, annual visits to KFR for weeding efforts, native plant restoration efforts and TES monitoring. Currently, the HIARNG relies on the KISC for invasive species removal, restoration efforts and TES monitoring at KFR.

4.3.5 Integrated Pest Management

Long-thorned kiawe is a State-listed noxious weed and is the number two target species of removal concern for the KISC. It possesses thorns that are several inches long, with the ability to puncture automobile tires and it forms impenetrable stretches of vegetation. Long-thorned kiawe is a proficient seeder and rapid colonizer, often crowding and out-competing native species. In March 2002, HIARNG participated in a multi-agency effort along with KISC, the Pacific Missile Range Facility, the DLNR Division of Forestry and Wildlife, UH College of Tropical Agriculture, and Kokee Resource Conservation Program to determine control methods. Kiawe removals occurred in 2003 with support from KISC and the Hawaii Department of Agriculture and in 2005 with the assistance of a State of Hawai‘i Department of Corrections inmate work

line. Kiawe requires ongoing removal. In 2012, it had returned and spread beyond the initial area, primarily along the southern boundary, and in scattered pockets throughout the facility with an understory of buffelgrass. In 2013 the HIARNG contracted KISC to control the LTK populations at KFR.

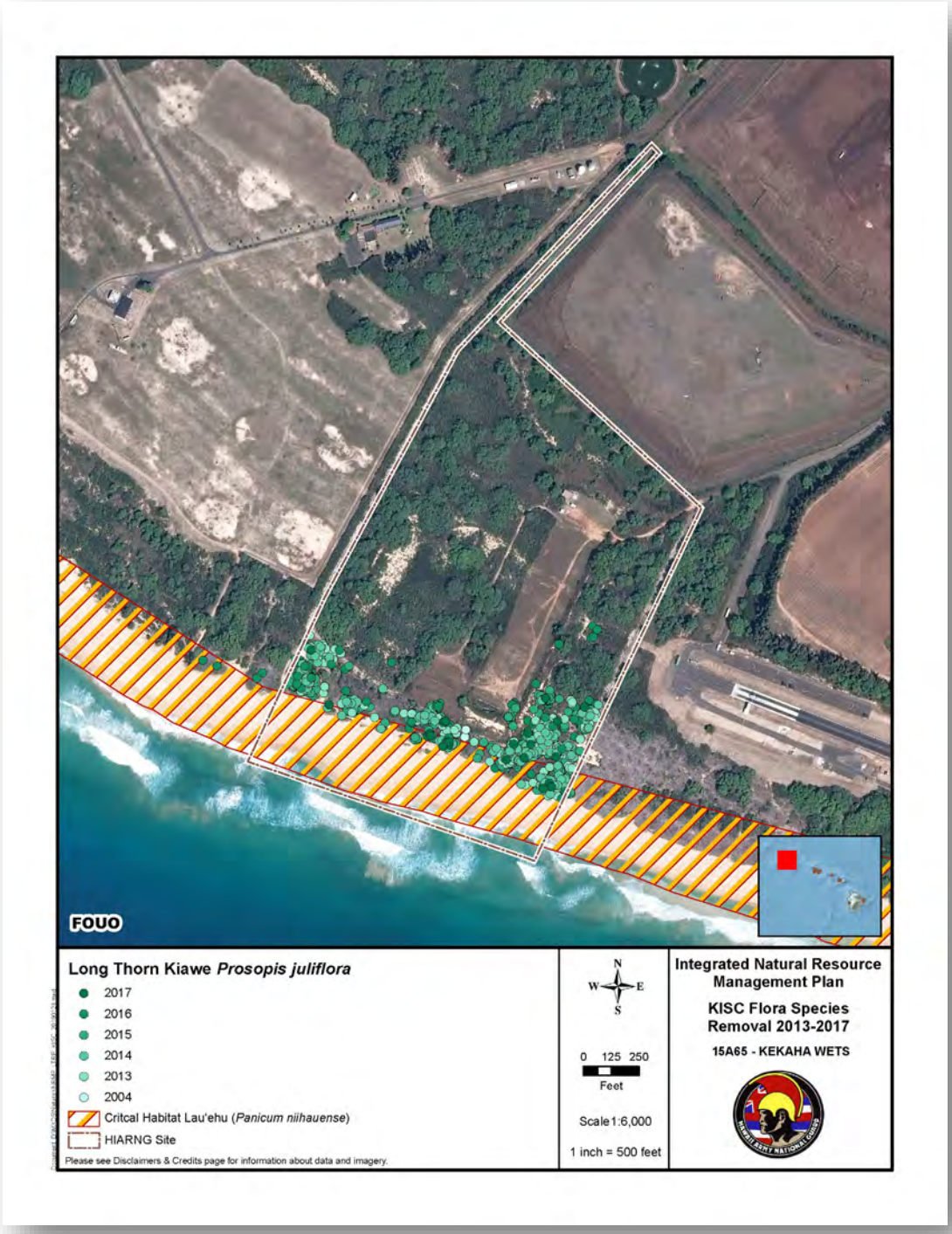


Figure 4-5: Long Thorn Kiawe Removal & Restoration Areas at KFR

There is very limited herbicide and pesticide use. There has been a localized problem with yellow jackets. Vegetation management has been predominantly done through mowing the site, with occasional shrub/tree removal. Based on the current level and types of usage, impacts to natural resources are expected to be minimal. The main training impacts would come from the spread of non-native invasive plants and the level of this impact is not known. There have been no reported wildfires.

4.3.6 Wildland Fire Management

KFR is located in a fire prone area, with high temperatures, low relative humidity, and a potential for high winds (HIARNG 2008). Koa hoale and kiawe are the dominant cover with buffelgrass as the predominate understory throughout much of the site. These grasses can quickly produce a rapidly spreading fire, increasing in intensity once the overstory shrubs catch on fire. However, the surrounding land uses are predominately cleared and maintained, reducing the overall regional fire risk.

An Integrated Wildland Fire Management Plan (IWFMP) was developed in 2008 and will be updated in 2019. Protocols listed in the IWFMP called for troops to visually inspect for and eliminate fuel sources (litter, packing material, and dry vegetation) in training and operations areas in order to detect and eliminate fire hazards. Units were to be trained in fire-fighting methods. This should resume once the facility becomes more active. Currently, no live fire or pyrotechnics are used at KMR. If blanks were to be used, they could still be problematic as muzzle flash could create fires, particularly in tall dead grass. Grasses are currently kept low (less than 6") on the ranges, and this should be continued as a fire management tool.

The high percentage of kiawe/koa haole and buffelgrass cover increases fuel loads and fire risks, while reducing the usable acreage at KFR. These species were removed along the perimeter roadways, and this clearance will continue to allow for better site access and fuel load reductions. KFR is actively removing long-thorn kiawe and monthly removal/maintenance is ongoing at the site. These activities were also recommended by the USFWS (2013) to decrease invasive species.

4.4 MILITARY MISSION & TRAINING

4.4.1 Current Use & Training

KFR is located in an area of primarily industrial and military uses. The Kekaha Landfill forms the northern boundary, the Mana Raceway lies to the east, the Pacific Ocean and beach form the southern boundary, and the Pacific Missile Range Barking Sands lies to the west. Approximately 10 percent of the reservation's 68 acres is managed with low ground cover landscape that supports the small arms firing range, two ancillary buildings and storage containers. The facility is fenced on the east, south, and western boundaries. The waterline is located along the northwestern easement to the Pacific Missile Range.

KFR has been used infrequently since the closing of the firing ranges in 2013 due to SDZ issues. A key challenge for KFR involves reducing the SDZ to stay on KFR property, which would require an Environmental Impact Statement and may not be possible. Alternative training should be considered at KFR.

4.4.2 Future Use & Training

There are no planned future training opportunities beyond mounted and dismounted maneuver training at KFR. The HIARNG ENV will coordinate with the G3 staff and the HIARNG Chief of Staff to discuss innovative training exercises that could utilize KFR.

4.4.3 Natural Resources Support to Training

The removal and eradication of long thorn kiawe populations at KFR has opened up areas of land for training exercises. The native plant restoration areas do not impede training at KFR. The HIARNG ENV staff can selectively clear invasive vegetation for specific training exercises to assist with mission readiness.

4.4.4 Natural Resources Constraints to Training

Natural resource constraints include the possible presence of TES habitat for Niihau panicgrass, and the location within a coastal SMA. However, the critical habitat designation is outside of the KFR fence line, and does not negatively impact training exercises at KFR.

4.5 MANAGEMENT GOALS, OBJECTIVES & IMPLEMENTATION

See ***Appendix A: Goals, Objectives, and Projects*** to view the all management activities at KFR and across all HIARNG INRMP installations.

5 UKUMEHAME FIRING RANGE, Maui Island

5.1 INSTALLATION OVERVIEW

5.1.1 Installation History

The 39-acre Ukumehame Firing Range is located in Lahaina on the island of Maui, TMK [2] 4-8-002:047. A base map of the UFR and surrounding area, as currently configured, is shown in Figure 5-1. The 39.26 acre training area includes a maneuver training area, small arms range and known distance rifle range. The HIARNG stopped using UFR for live fire exercises due to issues with the Surface Danger Zone (SDZ) going off HIARNG property. UFR is still utilized occasionally for maneuver training. The 230th Engineering Company will conduct training at UFR to remove invasive vegetation, in coordination with the HIARNG ENV office.

The property was originally leased to the Olowalu Sugar Company where it cultivated sugar cane from 1870 to1930. Pioneer Mill took over the property in 1930 and cultivated sugar cane until 1988 when the State purchased the property for the firing range. HIARNG subsequently received this parcel via state EO. In 1990, the range was built and included a 600-y KD range and a 45-caliber pistol range. The 600-y range was later reduced to a 400-y range. The rifle range has been inactive since the late 1990s.

Since the early 2000's UFR has been minimally utilized by HIARNG for training. The HIARNG Facilities Management Office (FMO) coded the UFR parcel as "no federal support" in 2017 due to inactivity, which negatively impacted natural resources management actions at UFR. Because of this coding, the HIARNG ENV office could not utilize funding for projects at UFR. During this time the HIARNG Command had multiple meetings and briefings to return UFR to the State Board of Land and Natural Resources (BLNR). However, as of July 2019, the 230th Engineering Company stationed at Puunene Armory on Maui, is being realigned from vertical engineers to horizontal engineers. This realignment could justify keeping UFR as a maneuver training area for the unit. However, future plans for UFR are still uncertain as of this 2019 INRMP update.

5.1.2 Surrounding Communities

UFR is located in the Ukumehame watershed in west Maui, approximately 8 miles southeast of Lahaina on the Honoapiilani Highway. The immediate area is lightly developed. Lahaina has a population of approximately 11,700 permanent residents, with tourism increasing the total to 40,000 people on-island (U.S. Census 2010).

5.1.3 Regional Land Use

Since 1870, sugar cane has been cultivated in the area, first by Olowalu Sugar Company, and then Pioneer Mill, until the land was appropriated for UFR in 1988 (HIARNG 2006a). Modern land uses near the site include a forest reserve area, a water reservoir, a county firing range, and state parks (Figure 5-1). The West Maui Forest Reserve borders the facility on the north. A small portion of UFR is within the coastal SMA. Development in the SMA requires a permit which allows the state to regulate land uses and activities in coastal areas, thereby ensuring that coastal resources and public beach access are preserved.

The County of Maui Firing Range borders the facility to the east and agricultural land owned by Pioneer Mills borders the facility on the west (HIARNG 2001c). The Maui County Firing Range (also called the

Ukumehame Firing Range and Valley Isle Sport Shooters Club) is 45 acres with a parking lot and classroom. It has a clay target range and a police range. It is the only legal public range on Maui (Maui County 2006).

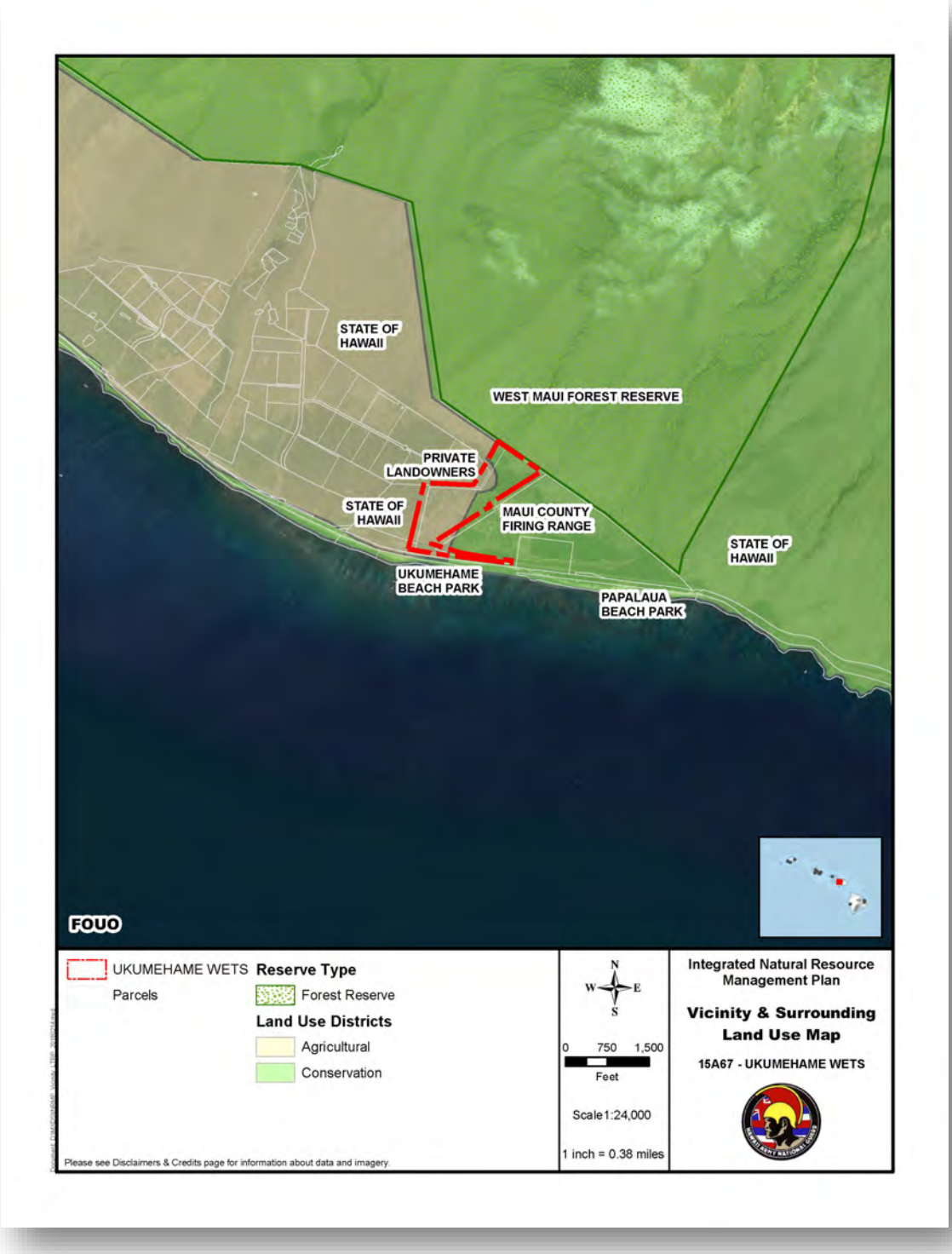


Figure 5-1: Land Use Areas around UFR, Ukumehame, Maui

The Ukumehame subdivision is currently being developed to the west. This project includes 45 agricultural lots and related improvements and 100 acres to be transferred to the County for a future County park and State highway right-of-way (Office of Environmental Quality Control 2005). The Honoapiilani Highway is currently in the process of being widened and this may impact the right-of-way easement used to access the facility.

The facility is directly adjacent to the West Maui Forest Reserve. The coastal area near the site includes Ukumehame Beach State Park and Papalaua State Wayside Park. In addition, a small portion of the site lies within the County of Maui Coastal Zone Management SMA. Additionally, the portion of the Pacific Ocean across the highway is within the Humpback Whale National Marine Sanctuary.

5.1.4 Cultural Resources

UFR is located on a former sugar cane plantation and has been extensively altered and graded since the 19th century. There are no identified cultural resources on-site (HIARNG 2008b).

5.2 PHYSICAL ENVIRONMENT

5.2.1 Climate

Although Hawaii's climate is very constant, with mean monthly temperatures varying by only 9°F statewide throughout the year (Giambelluca and Schroeder 1998), temperature and precipitation at specific sites vary depending on topography and elevation. Climate regimes depend on whether the area is either a lowland, leeward coastal site or a windward, forested area. In contrast to wetter windward areas, the leeward shores lie in the "rain shadow" of interior mountains; rainfall diminishes sharply with downwind distance from the interior. UFR is the driest of the HIARNG installations, with an annual average rainfall of 14.81 in. at this coastal, arid site. As with most areas in Hawaii, UFR has two distinct seasons: a warmer, drier period during the summer months (May–September), and a cooler, rainy season in the winter and spring (October–April). There is virtually no rainfall June-September. January is the wettest month with an average of 3.75 in. of precipitation (Western Regional Climate Center 2006). UFR depends on low-pressure Kona (leeward) storms for rain, these storms arrive from the west, the opposite of the dominate trade winds. Minor kona storms usually occur annually, with major storms occurring every 50-10 years (Giambelluca and Schroeder 1998). Major rainfall above the normalized mean occurred during the wet seasons of 1997-1998 and 2004-2006 (United States Geological Survey 2010).

5.2.2 Landforms

UFR lies close to sea level, north of the Honoapiilani Highway on the south coast of West Maui in the Kahului Isthmus area, a low land link between former islands. The majority of the site is located on a flat to gently sloping alluvial coastal plain and there are no distinguishing landforms other than the berms that have been constructed for the firing ranges. The north end of the facility extends several hundred feet into the foothills of the West Maui Mountains, where some grading has been done in order to install a perimeter fence.

5.2.3 Geology & Soils

UFR is located on an alluvial plain at the base of the West Maui Mountains. Under the site is the Wiluku series basalt that is approximately 1.3 million years old (HIARNG 2001c). The dominant soil type on the facility is Kealia silt loam with 0-1 percent slope, which is classified as a hydric soil type, promoting the accumulation of standing water (USDA and UH 1972). This soil type drains poorly, is susceptible to wind erosion, and has a high salt concentration. To the back of the firing ranges are Pulehu clay loam 0-3 percent slope and other alluvial and rock soils with much greater slopes. These are typical of alluvial fans and in-basins. Unlike the Kealia silt loam, these soils are well-drained and they can be medium-, moderately fine-, and coarse-textured. They develop in alluvium weathered from basic igneous rock and coral (HIARNG 2008a).

At UFR in particular, a variety of factors (human/mechanical disturbance, high wind speeds, soil composition) makes certain sections of UFR prone to erosion, which compromises water quality, and water ponding, both of which limit the re-establishment of vegetation, and also military training opportunities.

5.2.4 Hydrology & Wetlands

The site is located at the foot of a watershed bound by the Hanaula and Papaula streams and runoff from the watershed flows toward UFR. Concrete culverts collect and discharge the water into the Pacific Ocean. Water draining from Papaula Stream does not affect UFR (HIARNG 2001c).

Subsurface hydrology of the Ukumehame System in the Lahaina Sector includes an unconfined basal, confined basal, unconfined high-level diked and an unconfined high-level perched volcanic aquifers. High-level groundwater starts 2 miles inland and is found chiefly in dike aquifers (HIARNG 2001c).

A seasonal wetland on UFR is a result of human modification to the local topography. Firing berms were created by bulldozing the coastal flats, thereby compacting the soil in the early 1990s. The 20-ft high berms remain largely un-vegetated, which results in erosion into the wetlands.

Erosion on the slopes of the berms at UFR has been an ongoing problem. The berms are currently bare earth and covered in non-native species. There is no known storm water discharge offsite to the Pacific Ocean. In an effort to alleviate erosion, HIARNG ENV will work with the Facilities Management Office (FMO) in developing a contract to stabilize the berms by establishing Vetiver grass (*Chrysopogon zizanioides)* or other suitable native plant species. This project will stabilize the berms, reduce invasive species and their seed banks, increase physical security measures and reduce erosion and runoff from UFR. This project is expected to commence in 2019, after an invasive vegetation clearing project scheduled for January 2019.

The wetlands at UFR were artificially created and have never been of high quality; however, they do provide temporary habitat for endangered waterbirds. Invasive plant species are the primary vegetation. Programs to monitor the wetlands are oriented towards TES and do not focus on the wetlands themselves. The wetlands were last delineated in 1999 and approximately 8.6 acres were determined jurisdictional by the USACE (Mauney et al. 1999c). This determination is typically valid for a 5-year period; however, due to changes in site conditions and policy, HIARNG can request an updated determination at any time from USACE (USACE 2012). The manual uses three parameters for defining a wetland: hydric soils, hydrology indicators, and wetland vegetative species.

No wetland permits were issued for UFR to date as no action has occurred onsite that would affect the wetlands.

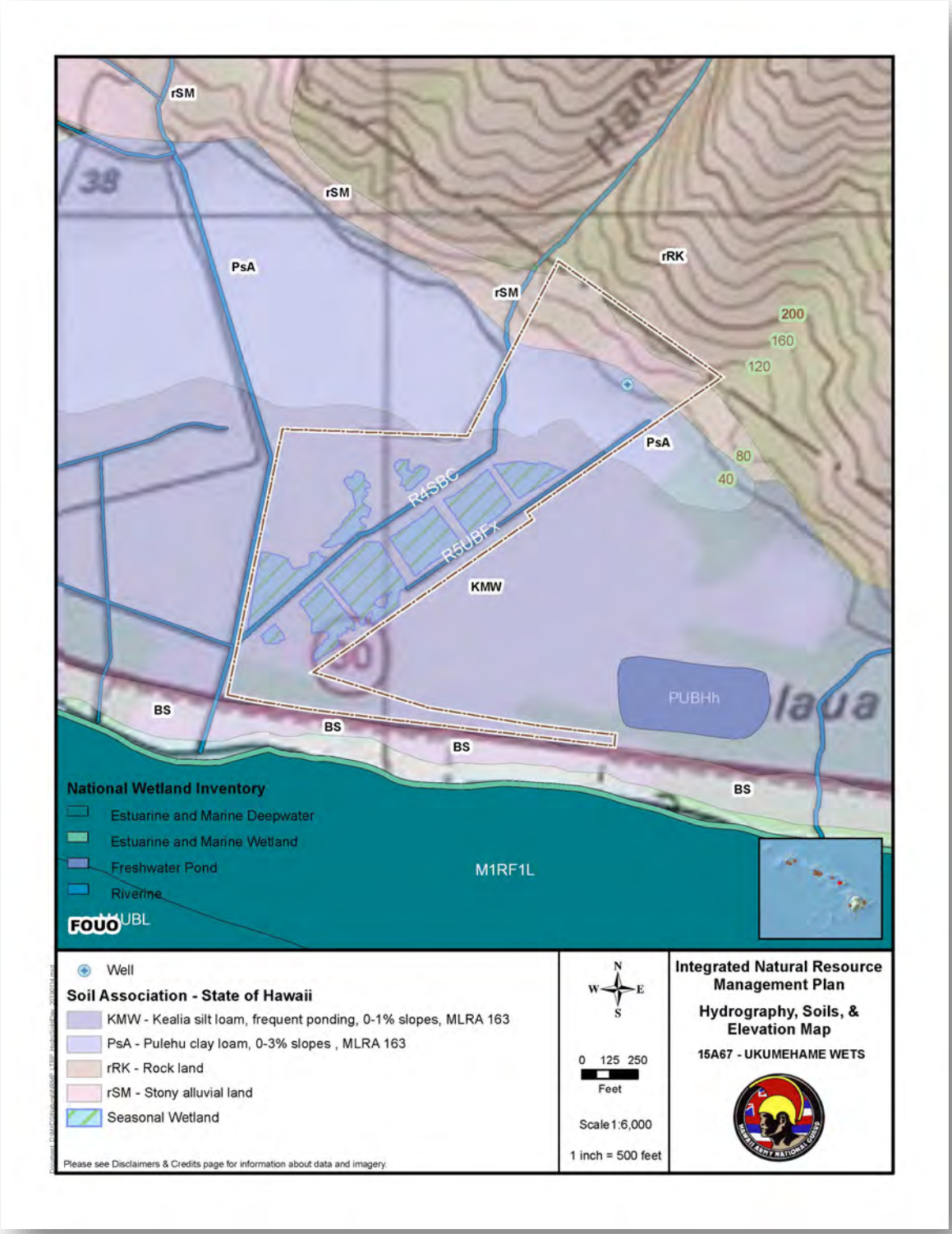


Figure 5-2: Soils, Hydrology, Flood lines at UFR

5.3 NATURAL RESOURCES & CONSERVATION MANAGEMENT

5.3.1 Vegetation

UFR is a coastal dry system containing a mixture of herblands, grasslands, and shrublands dominated by non-native or invasive species. These areas are most extensive on leeward sides of the islands, and are characterized by prolonged drought conditions from May to September.

Annual winter rains are the primary source of freshwater for vegetation growth, although certain plants such as kiawe are able to utilize brackish groundwater. Vegetation at UFR is salt-tolerant and varies according to substrate, which ranges from sandy to rocky basalt upslope.

According to a vegetation survey conducted for the 2006/2007 Planning Level Surveys (HIARNG 2007b), and updated in 2012, six vegetation communities were identified. These communities include:

4. Disturbed Area, Non-wetland
5. Disturbed Area, seasonal wetland
6. Disturbed Area, Grassland
7. Kiawe Coastal Dry Forest
8. Kiawe/Buffelgrass Coastal Dry Woodland
9. Kiawe/Sourbush/Indian Fleabane Coastal Dry Forest

The disturbed area non-wetland was subdivided to include disturbed area, grassland, as the majority of the disturbed area non-wetland was primarily bare earth, but the upslope portion was dried grasses. The plant survey occurred in the middle of the wet season, but the National Weather Service classified the 2011–2012 wet season on leeward Maui as an "extreme drought" (National Weather Service 2012).

UFR vegetation is degraded and dominated by non-native, weedy species with only a few indigenous species present. Botanical surveys have been conducted by HIARNG (1992/2007) and USFWS (1999b). The existing vegetation is dominated by invasive dryland and wetland plants. Dryland plants include invasive kiawe (*Prosopis pallida*), bufflegrass (*Cenchrus ciliaris*), koa haole (*Leucaena leucocephala*), and ʻopiuma (*Pithecellobium dulce*) in the upland. The periphery of the seasonal wetlands are dominated by sourbush (*Pulchea carolinesis)* and buffelgrass. Australian saltbush (*Atriplex semibaccata*), seaside heliotrope or kipukai (*Heleotropum currasavicum*), pickleweed (*Batis maritima*), and akulikuli (*Sesuvium portulacastrum*) are found more commonly in the seasonal wetland area. The woody invasive species onsite grow rapidly and have covered much of the small arms range.

Native species present in significant numbers include ilima (*Sida fallax*) and uhaloa *(Waltheria indica*). Native wetland plants (Table 5-1) include the coastal succulent akulikuli (*Sesuvium portulacastrum*) and kipukai, and kaluha (*Bolboschoenus maritimus*) (HIARNG 1992 and 2007c).

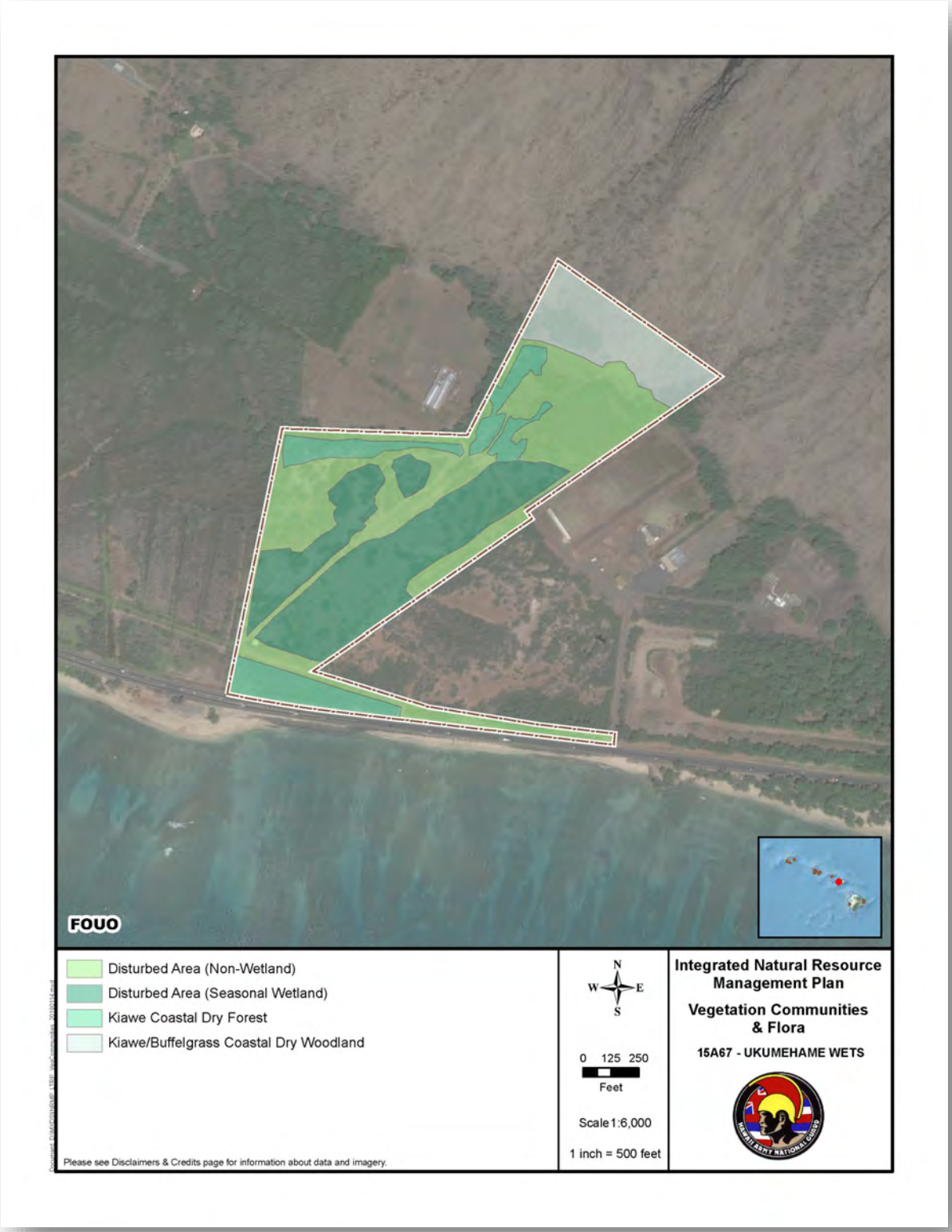


Figure 5-3 Vegetation Communities at UFR, Maui

Table 5-1 Native Plant Species and Their Status at UFR

Scientific Name	Common Name	Status	Relative Abundance
Monocots			
Bolboschoenus maritumus	kaluha sedge	Indigenous	Rare
Dicots			
Gossipium tomentosum	mao	Endemic	Rare
Heliotropim curassavicum	kipukai	Indigenous	Occasional
Sida fallax	ilima	Indigenous	Common
Sesuvium portulacastrum	akulikuli	Indigenous	Rare
Waltheria indica	uhaloa	Indigenous	Common

NOTE: Common = Abundances are from the most recent survey in 2012.
Indigenous, i.e., native but not restricted to Hawaiian Islands/
Pol = Polynesian introduction.
? = Unknown or determination tentative.
Sources: HIARNG (1992, 2007c), USFWS (1999b).

Table 5-2 Non-Native Plants UFR

Species Listed by Family	Common Name	Abundance
Amaranthus spinosus	spiny amaranth	Uncommon
Chloris barbata	swollen finger grass	Occasional
Abutilon grandifolium	hairy abutilon	Occasional
Acacia farnesiana	*klu*	Uncommon
Atriplex semibaccata	Australian saltbush	Occasional
Cenchrus ciliaris	buffelgrass	Common
Chamaecrista nictitans	partridge pea	Uncommon
Chamaesyce hirta	garden spurge	Uncommon
Chamaesyce prostrata	prostrate spurge	Uncommon
Chloris virgata	feather fingergrass	Uncommon
Crotalaria incana	fuzzy rattlepod	Rare
Desmanthus pernambucanus	virgate mimosa	Occasional
Desmodium tortuosum	Florida beggarweed	Occasional
Leucaena leucocephala	*koa haole*	Abundant
Malvastrum coromandelianum	false mallow	Uncommon
Merremia aegyptica	hairy merremia	Uncommon
Panicum maximum	Guinea grass	Occasional
Portulaca oleracea	pigweed	Uncommon
Prosopis pallida	*kiawe*	Common
Pulchea carolinesis	sourbush	Common
Pulchea indica	Indian fleabane	Occasional
Ricinus communis	castor bean	Uncommon
Heliotropium currasavicum	seaside heliotrope	Common
Lantana Camara	lantana	Uncommon
Macroptilium lathyroides	cow pea	Occasional
Pithecellobium dulce	opiuma	Common
Sesuvium portulacastrum	akulikuli	Uncommon
Tridax procumbens	coat buttons	Occasional
Urochloa mutica	California grass	Uncommon
Waltheria indica	uhaloa	Occasional

5.3.2 Wildlife Management

The wildlife management program on UFR is intimately connected with its TES management program and integrated pest management. Various non-native mongoose, rats, mice, cats, and axis deer are seen onsite. HIARNG does not have fish resources and does not have public access for watching wildlife or hunting.

Faunal surveys in 2006/2007 recorded a total of 11 species of birds in eight families. Three common alien species (northern mockingbird, northern cardinal, and house finch) protected under the Migratory Bird Treaty Act were observed during these surveys. In addition to endangered waterbirds, other native birds use UFR. The following species were observed by the USFWS (1998c) during their survey of the area: Pacific golden plover (*Pluvialis fulva*), wandering tattler (*Tringa incanus*), northern pintail (*Anas acuta*), and the resident, indigenous black-crowned night-heron (*Nycticorax nycticorax*). None of these species are listed as threatened or endangered, but all are protected under the Migratory Bird Treaty Act.

During previous surveys, only two arthropods species were observed: the indigenous dragonflies green darner (*Anax junius*) and globe-skimmer (*Pantala favescens*). Both were observed before and after the area had been flooded by winter rains. These species are widespread and receive no formal protection.

Non-native species pose a threat to resident populations of endangered waterbirds that may find suitable habitat for breeding or nesting in the inundated areas. Cats, dogs, rodents, and mongoose frequent the site and may prey directly on nesting stilts or nene including eggs and fledgling young. During the 2012 survey, cats, rodents, mongoose, and axis deer (*Axis axis*) were observed.

5.3.3 Threatened and Endangered Species Management

The HIARNG requests a TES Species List from USFWS every 90 days. The USFWS List dated August 15th, 2018 (01EPIF00-2018-SL-0448) lists the following endangered and threatened species as documented within the general vicinity of UFR:

Hawaiian hoary bat	*Lasiurus cinereus semotus*	Endangered
Green Turtle (Central North Pacific)	*Chelonia mydas*	Threatened
Hawksbill Turtle	*Eretmochelys imbricate*	Endangered
Hawaiian stilt	*Himantopus mexicanus knudseni*	Endangered
Hawaiian coot	*Fulica alai*	Endangered
Hawaiian duck	*Anas wyvilliana*	Endangered
Hawaiian stilt	*Himantopus mexicanus knudseni*	Endangered
Hawaiian goose	*Branta sandvicensis*	Endangered
Blackburn's sphinx moth	*Manduca blackburni*	Endangered
Orangeblack Hawaiian damselfly	*Megalagrion xanthomelas*	Endangered

Impacts to TES from predators are a threat and management efforts have been implemented to reduce the threat. Management of TES at UFR is grouped into the following areas:

TES Monitoring

Nenes have been sighted at UFR due to the captive release program located 2-3 miles upslope from UFR. This program released over 90 nene into the wild since 1994. At least 10 breeding pairs have been observed

at UFR primarily on the berms inside the KD range. Nenes nest on the ground, with an incubation period of 30 days and 2 days in the nest after hatching. During molt, the adults are also flightless for a period of 4-6 weeks. During nesting, hatching, and molting, nene are extremely vulnerable to predators (Kaheawa Wind Power 2006).

Nene monitoring has been on-going since 2005, when the DLNR Division of Forestry and Wildlife surveyed and monitored nene during the breeding season (October-March) and USDA Wildlife Services performed surveys at least 3 days a week during their predator control contract that ran from April-September in 2008 thru 2016.

In 2005, 14 banded nene were observed as well as several un-banded nene; the maximum number of un-banded nene observed per survey was five. The maximum number of total nene observed per survey was 17, with an average number of 7 observed per survey. In addition, three nests were located on UFR by biologists from the Division of Forestry and Wildlife, but only two contained eggs. Of these two nests, one failed due to depredation by mongoose and the remaining nest was successful and resulted in two fledglings.

No nenes were seen during the 2012 survey, likely due to the lack of water onsite. After heavy rains during the first week of March 2012, 11 nene were observed along the interior berms by the USDA Animal and Plant Health Inspection Service (APHIS) staff along with stilts in the wetland areas (USDA 2012).

Between October 2010 and March 2011, there were 116 Nene sightings (HIARNG 2012) compared to over 200 in 2005 (Figure 5-4).

The wetlands at UFR are not considered to be essential for the continued survival of Hawaiian stilts; however, they do contain habitat for birds that are dispersing to the larger, permanent wetlands on Maui. The USFWS estimated that the wetland could support as many as 20-30 nesting pairs of stilts, but they felt that 10 or fewer pairs were more plausible (USFWS 2000). In 2011, there were 61 stilt sightings (HIARNG 2012) (Figure 5-5).

Figure 5-4 Nene Sightings at UFR

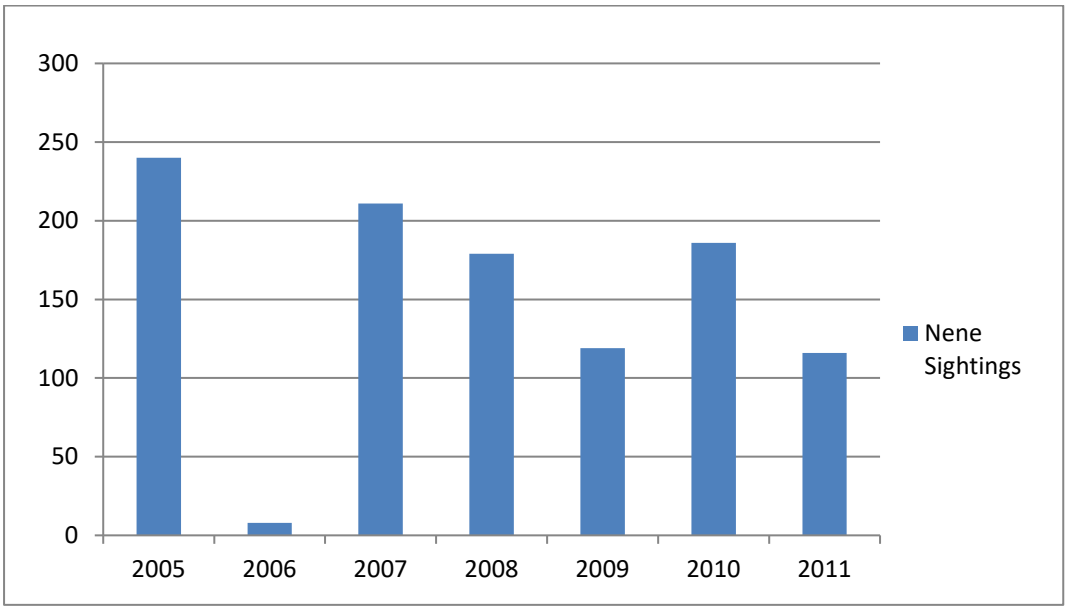
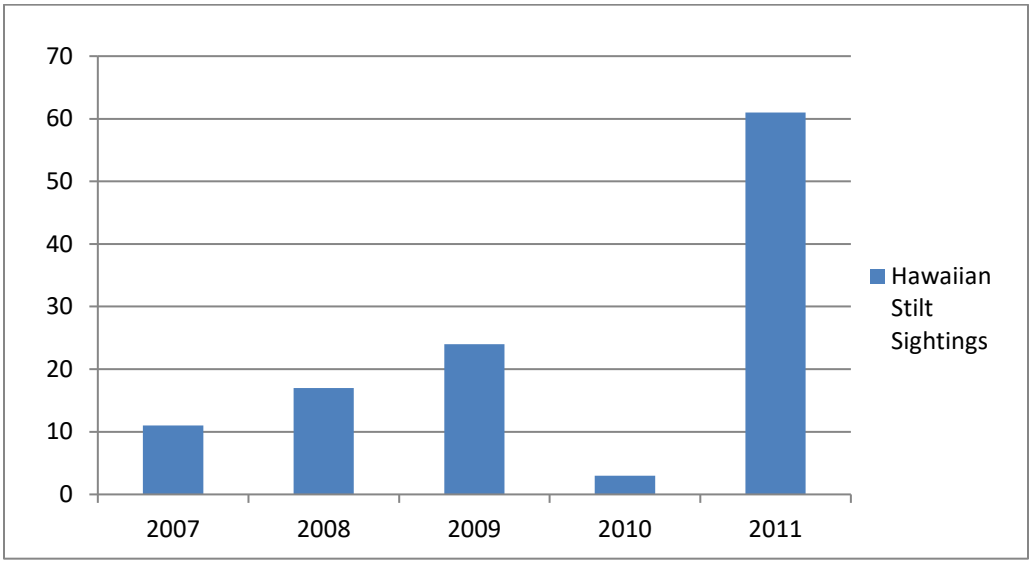


Figure 5-5 Hawaiian Stilt Sightings at UFR



Stilts prefer a specific wetland habitat, with shallow water (less than 9 in. /24 cm) and with limited to no cover surround their nests. This results in larger populations of stilts in human-maintained open canopies or tidal flats (USFWS 2011). Ephemeral wetlands, such as those created by the berms at UFR provide good habitat, particularly as these types of wetlands are no longer common on the leeward sides of the Hawaiian Islands due to agriculture and development (USFWS 2011). There was evidence that the coot and stilt use UFR area for nesting. The nesting season of the Hawaiian stilt normally extends from mid-February through August, with a peak from April through June, but varies among years depending on water levels (USFWS 1999a, 2005a, 2005b).

Although the USFWS also observed several post-fledgling stilts, it is unclear whether they hatched locally or came from other wetlands on Maui. None were seen during the 2012 survey, but conditions were dry at this time. Following heavy rains in March 2012, USDA APHIS staff confirmed that many stilts were seen in the seasonal wetlands. In general, the Hawaiian stilt is more frequently seen at the Kanaha and Kealia wetlands. Annual counts estimate that 250-300 stilts are found island-wide, with birds' also using aquaculture and wastewater treatment ponds as habitat (USFWS 2011).

The USFWS and USDA report that stilts are most common in the large wetland located primarily on the county firing range. This area represents the most well-developed wetland habitat. Later in the season, when rain flooded UFR, many stilts also congregated in the HIARNG 400-y range and adjacent area (USFWS 1999b). The 2005 Comprehensive Wildlife Conservation Plan recommends restoration of wetland habitat and management of existing habitat and development of more effective predator control methods (Mitchell et al 2005).

Consultations and USFWS Management Recommendations

In April 2000, HIARNG-ENV initiated a Section 7 Consultation with the USFWS under the ESA for the implementation of a predator trapping program at UFR. The USFWS issued a Biological Opinion in November 2000, which outlined protocols to protect endangered waterbirds throughout the predator

trapping program, including traps that have anti-gosling guards. The predator control program commenced in 2001 and continued through 2016 (see Figure 5-6). In 2016 the HIARNG FMO changed the federal funding support at UFR to "no federal support". This change in funding constrained the Environmental office from continuing its contract with USDA APHIS for predator control and TES monitoring at UFR.

In 2005, HIARNG conducted an informal consultation with USFWS for a landscape restoration project. USFWS (2005c) agreed that the project could proceed with certain precautions and that the possible effects of disturbance of nene due to ground disturbance would be short-term and minimal and were outweighed by the positive value of the habitat restoration proposed.

Between 2016 and 2018 the HIARNG Command had multiple discussions on how to move forward with UFR. It was agreed upon that the HIARNG would move forward in transferring the land back to the Board of Land and Natural Resources (BLNR). The HIARNG FMO has secured funding to contract an Environmental Condition of Property (ECOP) in 2019 to present to the BLNR for beginning the transfer of the UFR parcel. In 2018 the HIARNG FMO coded the UFR parcel "federal support" to begin efforts to transfer UFR. This change in federal funding codes has allowed the HIARNG ENV office to continue natural resources management at UFR.

The HIARNG ENV office plans to remove invasive species along the fence lines of UFR in 2019. The HIARNG has coordinated with the 230th Engineering Company to remove invasive species along the interior road at UFR as well. In October 2018 the HIARNG consulted under Section 7 with the USFWS for the proposed action to clear invasive vegetation at UFR to reduce wildland fire risks.

Subsequently, the HIARNG ENV plans to conduct site visit at UFR during the rainy season to survey for endangered birds, any nesting sites and the presence of predators.

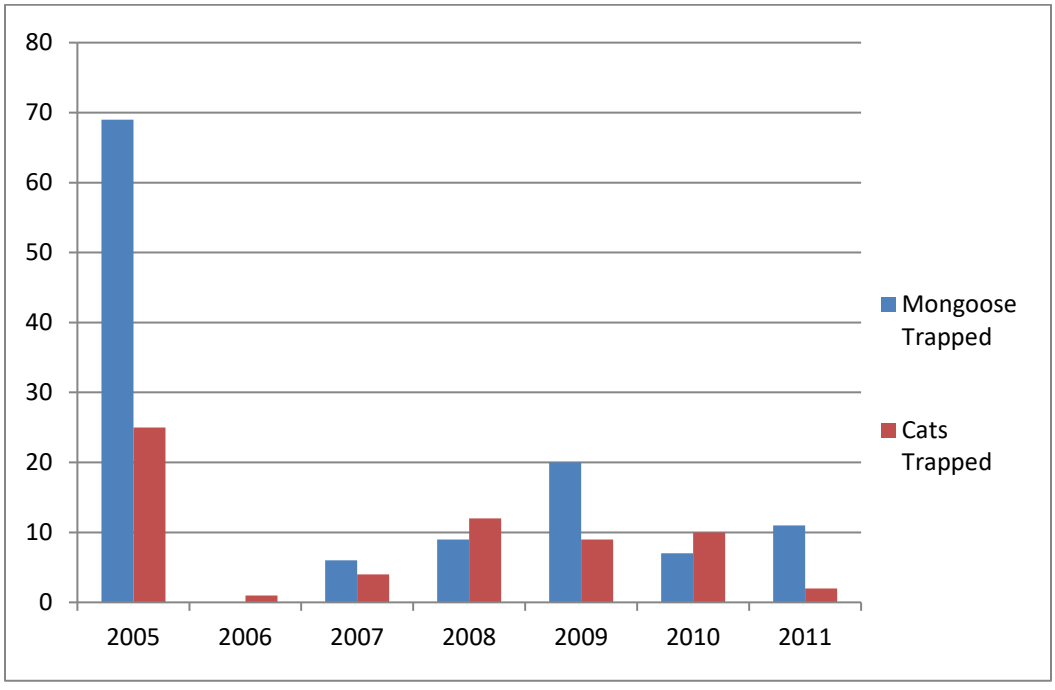


Figure 5-6 Predator Control Trapping at UFR

5.3.4 Habitat & Ecosystem Health Management

The facility has been infrequently used over the past decade due to deployments, SDZ issues that restrict live fire training and alternate training site options. The grounds are unmaintained except for infrequent contracts to remove invasive vegetation along the perimeter fence line and along access roads. UFR is located on an arid site, with limited groundcover within the firing range due to dry and possible saline conditions. UFR contains USACE designated seasonal wetland area, which HIARNG created during the construction of berms for the firing ranges at UFR. The wetlands were surveyed by USACE and were classified as 8.6 acres of palustrine, open water, permanent, diked-impounded wetlands. However, based on the 2007 soils Planning Level Survey, no hydric soils were observed onsite (HIARNG 2008a). Along with the acreage of the adjacent wetlands on the county firing range, the total wetland area containing standing water in wet years is estimated to be 10-15 acres (USFWS 2000).

HIARNG ENV has had a difficult time implementing natural resources management projects at UFR between 2016 and 2018 due to funding constraints. As of October 2018 the UFR parcel is planned for transfer to the BLNR. The HIARNG ENV office has plans to remove invasive vegetation, survey for TES and predators and possibly develop a contract to stabilize the berms using Vetevier grass, pending funds and approvals in FY 2019.

5.3.5 Integrated Pest Management

The HIARNG contracted USDA APHIS to control predators beginning in 2001. Predator control efforts continued until September 30th, 2016 due to funding constraints. Predator control efforts allowed TES populations to remain stable or expand and possibly enhance recovery of the species (See Figure 5-6). All predator control operations followed the guidelines set by the USFWS Biological Opinion that was issued to the HIARNG in November 2000.

Invasive Species Plant Removal

Dry areas of the range are dominated by the noxious weed kiawe as well as haole koa, sourbush, and buffelgrass. Kiawe poses a threat to training because of its thorns, which can puncture tires on vehicles, block access to the road, and injure soldiers training on the site.

Haole koa is a fast growing invasive species that can quickly cover much of the firing range, blocking sight to the targets and out competing native plants. Indian fleabane and sourbush can displace native species and negatively impact habitat for waterbirds. Buffelgrass grows in thick mats, out-competing native plants and many other grass species more appropriate for use on a firing range. Buffelgrass is unsuitable for the firing ranges due to its height and growth structure; the thick mats it forms can make walking difficult and dangerous.

Kiawe and hoale koa were removed from the roads on UFR twice in 2005. Small areas of mangrove (*Rhizophora mangle*) were also removed from along the access road to the range at the same time. HIARNG is planning to contract invasive species removal at UFR in January 2019.

5.3.6 Wildland Fire Management

Non-native species pose competitive and fire threats to the remaining native vegetation. Invasive species should be removed in order to reduce fire hazards and as a basis for native habitat rehabilitation. Such rehabilitation also reduces the erosion potential of un-vegetated berms. Finally, as with all HIARNG

facilities, the potential exists for the introduction of particularly noxious or aggressive weeds. Fountain grass is adapted to the dry environment of UFR and if established would increase the fire hazard.

A fire management plan was completed in 2008 and will be updated in 2019. UFR is located on the leeward side of Maui, with low rainfall, and a high fuel potential if invasive non-native guinea grass and kiawe plants are left unchecked. Recommendations included vegetation maintenance to reduce grasses and shrubs to less than 6 in. (15 cm) in height. This recommendation has not been maintained in the northern section of UFR, where grasses and shrubs are 3-10 ft. high, and the vegetation removal/maintenance should be completed. Recommendations for a 30-ft (10-m) fire break along perimeter fencing will be cleared in January 2019. This break could contain fires that begin at UFR, as well as a way preventing upslope fires crossing onto UFR. Fire suppression protocols will be in place during the vegetation clearing contract.

5.4 MILITARY MISSION & TRAINING

5.4.1 Current Use & Training

The current ranges have SDZ violations which will require NEPA analysis and funding from the National Guard Bureau (NGB). The NGB has determined that due to the proximity of other available firing ranges, they will not authorize funding to HIARNG to make the necessary alterations at UFR for live fire training. However, UFR has the potential for maneuver training exercises or other innovative readiness training. The 230th Engineering Company is located on Puunene, Maui and they will be conducting training to remove invasive species in coordination with the environmental office in January 2019 at UFR.

Vegetation is dominated by non-native species, which is frequently overgrow, rendering the area unusable for training. The issue with vegetation clearing is continued management of the area. Because the HIARNG ENV staff is located on Oahu and Hawaii Island it is difficult to mobilize with the necessary equipment to manage areas and survey the parcel.

5.4.2 Future Use & Training

The current future plan for UFR is to transfer the 39 acre parcel back to the state of Hawaii BLNR. The BLNR may offer the land to the Maui County Parks and Recreation to expand their current firing range facility. Because the county does not need to adhere to federal SDZ requirements, they should not have an issues with SDZ. There could be a possibility for HIARNG soldiers to utilize the range if Maui County manages the UFR.

5.4.3 Natural Resources Support to Training

Because UFR is predominately covered by invasive species, training opportunities are limited. However, HIARNG ENV can selectively clear invasive vegetation to create opportunities for mounted or dismounted training. The HIARNG Command has determined that UFR is not a feasible training site for HIARNG's

5.4.4 Natural Resources Constraints to Training

The natural resource constraints to military missions and planning at UFR include the presence of the manmade wetland as well as endangered water birds that it attracts. This limits the times of year that soldiers can train at UFR. The overgrown invasive vegetation also poses a high wildland fire risk.

5.5 MANAGEMENT GOALS, OBJECTIVES & IMPLEMENTATION

See ***Appendix A: Goals, Objectives, and Projects*** to view the all management activities at UFR and across all HIARNG INRMP installations.

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Appendix A: GOALS, OBJECTIVES AND PROJECT DATABASE

	Goal		Objective	Project No.	Specific Project or Task	Planned FY/Priority Level	Projected Budget	STEP Project Code	KMR	RTI	KFR	UFR	All Sites	POC / Notes
Overarching Goals of the INRMP														
1	**Comply with all federal, state, DoD, Army & ARNG laws, regulations, statutes, rules, memos, policies, directives, instructions and manuals**	1.1	Develop, implement and maintain a current INRMP	1.1.1	Complete a comprehensive review and update of the INRMP every 5 years (MARCH timeframe)	FY2023	Unknown	HI000080006 INRMP Plan Preparation or Revision					✓	Conservation Manager & Natural Resources Supervisor
				1.1.2	Conduct annual reviews of the INRMP with USFWS and DOFAW to determine if update is needed (JAN timeframe)	Annually	$0	N/A					✓	Conservation Manager & Natural Resources Supervisor
				1.1.3	Update the INRMP Goals, Objectives & Project Implementation Table annually to reflect most current information	Annually	$0	N/A					✓	Conservation Manager with all NR staff
				1.1.4	Update the INRMP Appendices to include most current information	Annually	$0	N/A					✓	Conservation Manager
				1.1.5	Update INRMP maps, figures and tables annually to include the most current information	Annually	$0	N/A					✓	Conservation Manager
				1.1.6	Conduct planning level surveys for soil, topography, wetlands, flora, fauna, vegetation communities, and TES every 10 years	FY2018	$54,780	HIA10170009 Veg. Communites PLS					✓	30% of the Veg. Communities PLS Contract. Conservation Manager
		1.2	Ensure natural resources management activities comply with associated environmental laws, regs, guidance and management plans	1.2.1	Conduct NEPA analysis for all NR activities, fill out required documentation (ie. REC) when necessary.	ongoing	Unknown	N/A					✓	NEPA Coordinator
				1.2.2	Consult with the USFWS on any NR project that may affect threatened and/or endangered species under Section 7 of the ESA.	ongoing	unknown	HI000060034 ESA Section 7 Consultation					✓	Natural Resources Program Supervisor
				1.2.3	Consult with USFWS and DOFAW for any NR project that modifies or controls any body of water, as per the Fish and Wildlife Coordination Act	ongoing	unknown	HI000060034 ESA Section 7 Consultation					✓	Natural Resources Program Supervisor
				1.2.4	Consult with the State Historic Preservation Division (SHPD) for any NR project that includes ground disturbance under Section 106 of NHPA and state law.	ongoing	unknown	N/A					✓	Cultural Resources Specialist
				1.2.5	Conduct monthly hazwaste inventory and quarterly hazmat inventory per the HIARNG Hazardous Waste Management Plan	ongoing	$0	N/A					✓	All NR Staff
				1.2.6	Record and submit all MSDS sheet to compliance for record-keeping per the HIARNG Hazardous Waste Management Plan	ongoing	$0	N/A					✓	All NR Staff
				1.2.7	Keep all NR staff current with federal pesticide applicator certification per the IPMP for federal sites	ongoing	?	N/A					✓	All NR Staff

				1.2.8	Maintain Environmental Officer (EO) training and certification	ongoing	$0	N/A					✓	NR staff designated an the Environmental Officer (EO)
				1.2.9	Log and submit all integrated pest management activities to the Pest Management Coordinator using the DD-1532 form	ongoing	$0	N/A					✓	All NR Staff
				1.2.10	Conduct annual property inventory and coordinate with property manager for disposal, as needed	ongoing	$0	N/A					✓	All NR Staff
2	**Protect Threatened and Endangered Species and Migratory Birds, while reducing their impacts to training**	2.1	Collect data on the patterns, distribution and preferences of TES known to occur at HIARNG training sites, to inform Section 7 consultations	2.1.1	Conduct acoustic monitoring, mist nesting and data analysis of the endangered Hawaiian Hoary Bat to understand abundance, population trends, and preferred diet.	FY12-FY18	~$150K annually	Endangered Species Monitoring HI00060032	✓					USGS contract to monitor and collect data on the Hawaiian Hoary Bat roosting trees, diet and population dynamics to ensure NLAA determination in ESA Section 7 consultation and to comply with the USFWS Recovery
				2.1.2	Conduct thermal imaging for bat roosts during their known pregnancy/lactation period (April-August) as mitigation if training is conducted during these times	As needed	in-house	Endangered Species Monitoring HI00060033	✓					As needed for training or construction actions during the breeding season - NR Field Supervisor
				2.1.3	Conduct nest surveys for the endangered Hawaiian Hawk during their breeding season (March - July) as mitigation if training is conducted during these times. Fledgings fledge from July - Sept.	As needed	in-house	Endangered Species Monitoring HI00060034	✓					As needed for training or construction actions during the breeding season - NR Field Supervisor
				2.1.4	Conduct annual surveys for the Hawaiian Hawk after September to ensure no adverse impacts to Hawk behavior. USFWS permit required if using acoustic calls	Annually	in-house	Endangered Species Monitoring HI00060035	✓					NR Field Supervisor, permit mustbe obtained before conducting Hawk sruveys using acoustics.
				2.1.4	Record all TES sightings on HIARNG installations, including native waterfowl.	ongoing	in-house	Endangered Species Monitoring HI00060035					✓	All NR Staff. This should include quarterly site visits to KFR and UFR
				2.1.5	Partner & collaborate with subject matter experts on TES research, analysis and methodologies	ongoing	$0	N/A					✓	All NR Staff.
		2.2	Protect & enhance known TES and their habitat, while minimizing their impact to the mission	2.2.1	Develop a recovery plan for the endangered Cyrtandra nanawaleensis. Ensure out-planting areas do not impede training	FY18	44,250	ESA Implementation, Native Plant Restoration HI00060028	✓					25% of UH Hilo agreement with HIARNG
				2.2.2	Request NGB approval to out plant the endangered Panicum niihauensis grass in its historical range, outside of training areas.	FY20	Unknown	ESA Implementation, Native Plant Restoration HI00060029			✓			Unknown cost
				2.2.3	Protect known TES through physical measures, and habitat enhancement	ongoing	Unknown	HI000060028 ESA Native Plant Restoration & HI000060029 ESA Invasive Species Control					✓	All NR staff, as necessary
				2.2.4	Conduct predator trapping at KMR to reduce predation on endangered species, MBTA-protected Golden Plovers and MBTA-protected species.	ongoing	~$50,000	ESA Implementation, Invasive Species Control - HI00060029	✓					75% of USDA APHIS agreement/WFP with HIARNG.
				2.2.5	Track Army Species-at-risk, state listed TES, and candidate species to ensure not present or no impact to training on HIARNG lands	ongoing	$18,260	HI0NG170009 Vegetation Communities PLS					✓	10% PLS contract total $182,600
				2.2.6	Conduct a TES invertebrate study to determine presence and distribution of possible TES invertebrates	FY18	$18,260	HI0NG170009 Vegetation Communities PLS					✓	10% PLS contract total $182,600

		2.3	Manage MBTA-protected bird species on HIARNG properties	2.3.1	Log all migratory bird sightings on HIARNG properties	ongoing	$0	N/A					✓	
				2.3.2	Work with HIARNG aviation on managing the BASH program. Record all MBTA takes in relation to the BASH program	ongoing	$0	N/A	✓					25% of USDA APHIS agreement/WFP with HIARNG (paid for by aviation)
				2.3.3	Control invasive Cattle Egret (*Bubulcus ibis)* & Barn Owl (*Tybo alba)* under Control Order for Introduced Migratory Bird Species in Hawaii (July 2017)	As needed	$0	N/A					✓	As needed if Cattle Egret or Barn Owl are determined a threat to training operations or ESA listed species
3	**Manage Invasive flora and fauna species to ensure no impact to training lands and operations**	3.1	Control and eradicate noxious pest species to ensure no impact to training lands & operations	3.1.1	Collaborate with other DOD agencies and state agencies on reducing the spread of invasive species from troop movement	ongoing	$0	N/A					✓	Conservation manager
				3.1.2	Contract Big Island Invasive Species Committee to assist with invasive species eradication and management.	ongoing	$92,000	INRMP Implementation: Invasive Species Control HI0NG1300003	✓					Conservation Manager and NR Field Supervisor. 80% of BIISC total contract ($90K)
				3.1.3	Contract with Kauai Invasive Species Committee to eradicate & monitor Long Thorn Kiawe at Kekaha Firing Range	ongoing	$20,000	INRMP Implementation: Invasive Species Control HI0NG1300004			✓			By 2019 the Long Thorn Kiawe population is in control and almost eradicated. Switch to in-house monitoring
				3.1.4	Erect fencing around the boundary of KMR to reduce the impacts from invasive ungulates	FY20-FY21	$250,000	INRMP Implementation: Invasive Species Control HI0NG1300005	✓					Could possibly require an EA, BO, NPDES permit, agreement with adjacent landowners, consultation with SHPD and USFWS
				3.1.5	Clear invasive vegetation at KFR to allow for manuever training and to create firebreaks	FY19	~$50,000	INRMP Implementation: Invasive Species Control HI0NG1300006			✓			Coordinate with units on Kauai to ensure vegetation clearing assists with mission training activities
				3.1.6	Clear invasive vegetation from the historic WWII Revetment at RTI	FY19	~$100,000	INRMP Implementation: Invasive Species Control HI0NG1300007		✓				Utilize in-house and contracted assistance to remove invasive species in the forested areas of RTI.
				3.1.7	Conduct annual surveys and treament for Miconia and Albizia at KMR	ongoing	$0	N/A	✓					Assist BIISC with surveys for Miconia and Albizia at KMR
				3.1.8	Manage the BASH program at KMR to reduce the impacts of Migratory birds on flight operations	ongoing	$0	N/A	✓					Work with aviation on payment for the BASH program
				3.1.9	Monitor and treat for Litte Fire Ant	ongoing	$0	N/A	✓					Work with FMO to procure necessary pesticides for treatment
				3.1.10	Check Albizia treatment areas every 4 years to treat juveniles and record status of treated adult trees	ongoing	$0	N/A	✓					NR Field Supervisor with BIISC
				3.1.11	Purchase and maintain a tractor with boom arm and mower to control invasive trees along range roads at KMR, to reduce mud transport with possible ROD and control grasses for AT vehicle parking and staging.	FY19	$170,000	INRMP Implementation: Invasive Species Control HI0NG1300004	✓					Initial purchase in 2019 with salary funds from vacant positions. Ongoing funds (~$2,000/yr) for general repair and maintenance.
				3.1.12	Clear invasive vegetation at UFR	FY19	$60,000	INRMP Implementation: Invasive Species Control HI0NG1300007				✓		Conservation Manager
		3.2	Incorporate an Integrated Pest Management approach to controlling pests	3.2.1	Utilize goats and sheeps to graze invasive grasses in low-sensitivity areas	ongoing	$96,000	INRMP Implementation: Invasive Species Control HI0NG1300007	✓					NR Field Supervisor
				3.2.2	Release a scale insect bio-control to reduce the growth and spread of invasive Strawberry Guava	ongoing	$0	N/A	✓					Collect GIS data in-house regarding the spred of the scale biocontrols galling effect on Strawberry Guava

				3.2.3	Manage the HIARNG Pest Management Program to reduce chemical applications and cost for HIARNG installations	ongoing	$0	N/A					✓	Pest Management Coordinator
				3.2.4	Attend quarterly DOD joint vector control working group meetings	ongoing	$0	N/A					✓	Conservation Manager
				3.2.5	Develop Vehicle Movement SOPs to reduce the spread of invasive species	FY18	$0	N/A					✓	Applicable to all sites, but KMR has most invasive species of concern
				3.2.6	Create a temporary wash rack during annual training to reduce the spread of Rapid Ohia Death Fungus and other invasive species	FY18-FY20	$0	N/A	✓					This is during the interim while the CSMS is being built at KMR
				3.2.7	Collaborate with units to create a vehicle staging area at KMR during annual training to reduce the spread of Rapid Ohia Death Fungus	FY19	~$30,000	INRMP Implementation: Invasive Species Control HI0NG1300007	✓					NR Field Supervisor
		3.3	Incorporate Wildland Fire Management	3.3.1	Clear invasive vegetation along KMR range roads to create firebreaks	FY18	$49,500	INRMP Implementation: Invasive Species Control HI0NG1300008	✓					
				3.3.2	Develop and maintain firebreaks	ongoing	unkown	N/A					✓	Need to create a STEP project for this if/when funding is required. Annual clearing at KFR
				3.3.3	Conduct annual surveys and removal of fountain grass at RTI with Marine Corps. Environmental (FEB Timeframe)	Annually	$0	N/A		✓				NR Staff on Oahu with Marine Corps Base Hawaii Environmental
				3.3.4	Conduct fuel load analysis at HIARNG sites with known fire risks	FY18 - FY19	$36,520	HI0NG170009 Vegetation Communities PLS					✓	20% of the Veg. Communites PLS. The IWFMP will be updated in FY19, which may require more in-depth analysis
				3.3.5	Target species of highest fire potential at HIARNG sites	FY20 -FY24	Unknown	N/A					✓	Utilize information from the IWFMP update to determine target species
				3.3.6	Clear invasive vegetaion 20' wide along the fenceline at UFR to reduce fire risks	FY19	~$50,000	INRMP Implementation: Invasive Species Control HI0NG1300008				✓		
				3.3.7	Update the Integrated Wildland Fire Mangement Plan	FY19	unknown	N/A					✓	Update in-house as feasible, utilize the Hawaii Wildland Fire Organization as necessary.
4	**Improve Ecosystem Health while reducing impacts of NR management on the mission**	4.1	Support pollinator species & native/endemic species	4.1.1	Install and maintain pollinator gardens, where feasible, to not reduce training areas	FY18-FY24	$0	N/A					✓	Utilize funds from FMO for installation of pollinator gardens outside range areas
				4.1.2	Release the native Kamehameha Butterfly in coordination with DOFAW	FY19	$0	N/A	✓	✓				Coordiante with DLNR DOFAW to ensure Mamaki plants are suitable
				4.1.3	Allow bee apiaries, where feasible, to increase pollination	FY18-FY24	$0	N/A	✓					KMR NR field Staff
				4.1.4	Conduct native outplanting at KFR after long thorn Kiawe has been removed	FY19-FY24	Unknown	N/A			✓			All NR Field Staff
		4.2	Out-plant native species to restore areas previously overgrown by invasive vegetation	4.2.1	Partner with Bellows Air Force Station to utilize their greenhouse	FY18-FY25	$1	N/A		✓				Oahu NR field staff
				4.2.2	On-going propagation of native plants for restoration projects after clearing invasive vegetation	ongoing	unknown	INRMP Implementation: Native Ecosystem Rehabilitation HI000090004	✓					KMR NR field Staff
				4.2.3	Manage the Dismounted Trail at KMR and continue to plant native species along the boarder	ongoing	~$8,000	INRMP Implementation: Native Ecosystem Rehabilitation HI000090005	✓					KMR NR field Staff
				4.2.4	Restore areas along range roads by utilizing the UH Hilo hybrid method to restoration	FY19	~$79,650	INRMP Implementation: Native Ecosystem Rehabilitation HI000090006	✓					All NR Staff

				4.2.5	Allow UH Hilo access to KMR to research using a hybrid approach to successful and feasible restoration	ongoing	$0	N/A	✓					KMR NR field Staff
5	**Utilize GIS for recording progress of NR projects & Contracts. Integrate conservation management with military training & Construction**	5.1	Utilize handheld GPS equipment to record on-site NR activities	5.1.1	GPS locate and record in house NR management projects/activities	ongoing	$0	N/A					✓	GIS Specialist
				5.1.2	GPS locate and record wildland fire management projects/activities	ongoing	$0	N/A					✓	GIS Specialist
				5.1.3	GPS locate and record pest management projects/activities	ongoing	$0	N/A					✓	GIS Specialist
		5.2	Utilize the ENV GIS database to collaborate conservation with training and site conditions	5.2.1	Evaluate NR activities with known cultural sites and future development.	ongoing	$0	N/A	✓	✓				GIS Specialist & Conservation Manager
				5.2.2	Map the distribution of Ohia trees and the impacts of ROD	Annually	$54,780	HI0NG170009 Vegetation Communities PLS	✓					30% of the Veg. Communities PLS Contract. GIS Specialist & Conservation Manager
				5.2.3	Map mango tree distribution at KMR to determine if there is a cultural connection	FY19	$0	N/A	✓					GIS Specialist
				5.2.4	Monitor the effectiveness of biocontrol release on Stawberry Guava populations at KMR	ongoing	$18,000	INRMP Implementation: Invasive Species Control HI0NG1300008	✓					BIISC will conduct flyovers of Strawberry Guava stands at KMR and conduct imagery analysis (20% of contract)
				5.2.5	Record fire load potential for flora species at INRMP sites	FY18 - FY19	$0	N/A					✓	Deliverables from Veg. Communites PLS Contract & IWFMP Update
				5.2.6	Collect and analyze GIS data from all contractors, researchers and HIARNG offices	ongoing	$0	N/A					✓	GIS Specialist
				5.2.7	Collect GIS data from state and federal agencies with pertinent Environmental data	ongoing	$0	N/A					✓	GIS Specialist
				5.2.8	Make GIS available to ENV Mgmt. personnel, G3 training, FMO, etc. for consideration with future plans	ongoing	$0	N/A					✓	GIS Specialist
				5.2.9	Collect INRMP site LiDAR & imagery for current site conditions information	FY18 & FY23	$0	N/A					✓	GIS Specialist
6	**Protect water resources, wetlands, and coastal zones**	6.1	Reduce impacts of erosion and runoff	6.1.1	Stabilize the sand dunes at KFR by out-planting native species	FY19-23	unkown	INRMP Implementation: Native Ecosystem Rehabilitation HI000090006			✓			All NR Staff, contract KISC as necessary
				6.1.2	Stablize the berms at UFR to ensure no negative imacts to the wetland	FY19	unkown	INRMP Implementation: Native Ecosystem Rehabilitation HI000090006				✓		Work with FMO on funding and logistics
				6.1.3	Assist with erosion control measures at non-INRMP sites where runoff is an issue	ongoing	$0	N/A					✓	Conservation Manager
				6.1.4	Utilize LiDAR to determine areas with high potential for erosion and develop mitigation measures	FY19	$0	N/A					✓	GIS Specialist
7	**Utilize innovative research, technology and developed plans to enhance ecosystem health**	7.1	Mitigate impacts of diseases and improve conditions for mission training and soldier readiness	7.1.1	Create vehicle movement SOPs and Best Management Practices for soldiers to reduce the spread of ROD. U.S. Forest Service's create a map of high contamination areas at KMR and create BMPs	FY18-FY19	$100,000	INRMP Implementation: Invasive Species Control HI0NG1300008	✓					HIARNG ENV created soldier SOPs in FY18 to reduce the spread of ROD and other noxious species. FY19 create a ROD contamination map and soldier BMPs.
				7.1.2	Allow USGS access to KMR to conduct ROD air dispersal research	FY18-FY19	$0	N/A	✓					KMR NR field Staff
				7.1.3	Allow UH Hilo Forest Pathology access to KMR to conduct ROD research	FY18-FY19	$0	N/A	✓					KMR NR field Staff

				7.1.4	Allow USDA APHIS access to KMR to research the spread and intermediate hosts of Rat Lungworm Disease	FY18	$0	N/A	✓					KMR NR field Staff
				7.1.5	Allow USDA APHIS access to KMR to install Coconut Rhinocerous Beetle traps	FY18-FY19	$0	N/A	✓					KMR NR field Staff
				7.1.6	Allow Tripler Army access to KMR to conduct mosquito monitoring	FY18-FY24	$0	N/A	✓					KMR NR field Staff
				7.1.7	Review and include information from the Hawaii State Wildlife Action Plan (SWAP) into the INRMP	FY19	$1	N/A					✓	Conservation Manager
				7.1.8	Encourage collaboration between all agencies conducting research at INRMP sites	ongoing	$0	N/A					✓	KMR NR field Staff
8	**Promote collaboration with command & external agencies.**	8.1	Conduct Conservation-based training & encourage community participation in NR projects	8.1.1	Conduct conservation training for HIARNG soldiers to reduce the spread of invasive species	ongoing	$0	N/A					✓	Conservation Manager
				8.1.2	Coordinate pollinator/cultural garden installation, maintenance and harvest with local schools, hawaiian groups, guard soldiers and/or veterans	FY18-FY23	$0	N/A	✓	✓				All NR Staff
				8.1.3	Utilize assistance from the HIARNG Youth Challenge Academy Program	ongoing	$0	N/A	✓	✓				All NR Staff
				8.1.4	Install signage for unique natural resources, or invasive species considerations, when necessary	FY19 or FY20	~$10,000	INRMP Implementation: Invasive Species Control HI0NG1300008	✓					Conservation Manager & NR Field Supervisor
		8.2	Ensure Natural Resource management and land use planning goals are compatible with mission and NR needs.	8.2.1	Attend and present projects at the EQCC I and EQCC II levels to communicate with Command	ongoing	$0	N/A					✓	Conservation Manager
				8.2.2	Attend the Real Property Planning Board Meetings to ensure future development considers NR concerns	ongoing	$0	N/A					✓	Conservation Manager
				8.2.3	Attend the Joint Facilities Board meeting with all State DOD members present to ensure NR management activities cooincide with mission and land use planning	ongoing	$0	N/A					✓	Conservation Manager
				8.2.4	Meet with G3 and FMO at least annually to discuss mission, development and NR management	ongoing	$0	N/A					✓	Conservation Manager
				8.2.5	Encourage Innovative Readiness Training to assist with NR management activities, when feasible	ongoing	$0	N/A					✓	Conservation Manager

Appendix B: INRMP ANNUAL REVIEW & UPDATE DOCUMENTATION

HIARNG Annual INRMP Review 2018

Four Installations Statewide

Keaukaha Military Reservation (Big Island), Regional Training Institute (Oahu), Ukumehame Firing Range (Maui), Kekaha Firing Range (Kauai)

This page certifies that the HIARNG has reviewed the HIARNG INRMP Update 2015 document for timeline, goals and status updates, as well as changing environmental and/or installation information. The HIARNG has invited the U.S. Fish and Wildlife Service (USFWS) and the Hawaii Department of Land and Natural Resources – Division of Forestry and Wildlife (DLNR DOFAW) to comment on the 2018 Annual Review Report for the HIARNG INRMP.

Requirement	Status and Actions Taken
All "must fund" projects and activities have been budgeted for and implementation is on schedule, as funding allows.	*Project list is accurate and on-going projects are being implemented. The fiscal years "2012-2017" should be updated to reflect the 2015 date that the INRMP was signed (i.e. "2015-2020").*
All required natural resources positions are filled or are in the process of being filled.	*The Conservation Manager Position was vacated in June 2015. HIARNG ENV office staff have been Temporarily Assigned to this position. Permanent hiring is dependent on FY18 budget, which is unknown until the CR is passed (projected 22 MAR 2018)*
Projects and activities for the current and upcoming year have been identified and included in the INRMP.	*Project list should include the use of grazing ungulates to control invasive plant species at KMR, the maintenance of pollinator gardens at various HIARNG installations. The inclusion of Natural Resources Planning Level Surveys should also be programmed for FY18 for all INRMP sites.*
All required coordination has occurred.	*All HIARNG undertakings are reviewed for effects to T&E species. If "no effect" is determined, an internal Memorandum For Record (MFR) is signed. If an effect is possible, HIARNG ENV consults with USFWS under Section 7 of the ESA.*
All significant changes to the installation's mission requirements or its natural resources have been identified.	*No changes to mission requirements. However, a newly discovered fungus (Ceratocystis spp.) has been affecting thousands of Ohia trees (Metrosideros*

	polymorpha) on the Big Island, and has been identified at KMR. The ENV office has graveled mud roads at KMR, has developed vehicle movement SOPs, continues to conduct awareness training and allows researchers access to KMR to better understand how to combat the spread of this disease.
The INRMP goals and objectives are still valid.	*The INRMP references annual Work Plans in Section 8 "Implementation" of the INRMP. The purpose of the Work Plan is to evaluate previous projects, upcoming projects, budgeting information, POCs as well as relevant laws and background information associated with the project. Work Plans have not been completed since 2011. The INRMP will be re-worded to utilize a more straight-forward spreadsheet of projects including the above-mentioned information. Goals and Objectives remain relevant, although specific projects have changed, for example our monitoring and treatment of ant species has shifted from long legged ants to little fire ants.*
"No net loss" of training capability has occurred due to implementation of the INRMP.	*No negative impacts to training or the mission have occurred since the 2015 INRMP Update. However, acreage amounts should be updated to reflect most current information from ENV GIS and FMO GIS data.*
All threatened, endangered, and candidate species are adequately managed.	*All TES are properly managed.*
Previous INRMP Annual Reviews	*The Conservation Manager has not conducted annual reviews of the INRMP for 2015 and 2016. No changes were made to the INRMP. Goals, site information, and formatting changes need to be edited to reflect the information provided in this form. Once the INRMP has been updated to incorporate these changes, the revised draft version of the INRMP will be sent to USFWS and DLNR DOFAW for their review, comments and concurrence. It will also be*

	uploaded to the HIARNG ENV website and sent to NGB for review.
Is an INRMP Update warranted	*Due to the inclusion of projects and removal of outdated projects, along with re-formatting the INRMP it is determined that the INRMP requires an Update to incorporate all changes. The HIARNG Conservation Manager will develop a Memorandum to be signed by USFWS, DLNR – DOFAW or will utilize concurrence letters from both agencies, which will be included in the INRMP Update.*

Attendee List

Attendance List	Annual Review Certification
Present: *Environmental Protection Specialist* *Conservation Manager* *Natural Resources Supervisor* **Invited, but not Present:** *US Fish and Wildlife Service* *DLNR – DOFAW*	The Annual INRMP review was completed on *March 15, 2018*. The above minor changes were completed. No Update or Revision is required at this time. Signature:_____ Date: 3/19/2018

HEADQUARTERS
HAWAIʻI ARMY NATIONAL GUARD
91-1227 ENTERPRISE AVENUE
KAPOLEI, HAWAIʻI 96707-2150

March 25, 2019

Ms. Mary Abrams, Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

Dear Ms. Abrams:

Pursuant to the Sikes Act Improvement Act (16 USC 670a *et seq*.), the Hawaii Army National Guard (HIARNG) has completed a Final Draft Integrated Natural Resources Management Plan (INRMP) update for four (4) federally controlled properties, including the 504-acre Keaukaha Military Reservation (KMR) on the island of Hawaii; the 48-acre Regional Training Institute (RTI) on the island of Oahu; the 68-acre Kekaha Firing Range on the island of Kauai; and the 39-acre Ukumehame Firing Range on the island of Maui.

The HIARNG Natural Resources Program has been operating from a 2012 INRMP update that was not signed and operational until February 2015. Because of the gap from drafting the INRMP to signature, the INRMP goals, projects, site conditions and training information are outdated. Because the HIARNG lost its Conservation Manager in June 2015, and did not formally hire a Conservation Manager until July 2018, an annual INRMP update did not occur in 2016 or 2017. The 2018 annual review in March concluded that the INRMP would require a formal update.

The 2019 INRMP update focused on re-formatting the INRMP to organize all pertinent information by INRMP site, rather than by categories (i.e. Ecosystems and the Biotic Environment, Natural Resources Program Management, etc.). The 2019 INRMP update includes new information on current training at the INRMP sites, new information on natural resource issues and successes at the INRMP sites, updates on the status of Rapid Ohia Death Fungus at KMR, updated natural resource projects and more relevant maps and tables to illustrate the natural resource work HIARNG has conducted. The 2019 INRMP update is more concise and the Goals, Objectives and Projects spreadsheet has been moved to Appendix A for future annual update revisions.

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

Additional appendices have been added to include all pertinent information regarding HIARNG's natural resources management program. The requirement for annual Status Reports and Work Plans has been removed, rather the HIARNG will use the annual meeting and coordination with USFWS (U.S. Fish and Wildlife Service) and DLNR DOFAW (Department of Land and Natural Resources Department of Forestry and Wildlife) to summarize the work and results from their natural resource management projects. Overall, the INRMP has been updated to more accurately and concisely reflect all pertinent information regarding the HIARNG's natural resources management program in correlation to INRMP-listed sites.

We humbly request USFWS's review of the Final Draft INRMP update (CD enclosed). We request comments on the Final Draft INRMP in order to ensure that information relating to natural resources on or in the vicinity of HIARNG installations is accurate and acknowledges local and regional management plans and strategies. After agency review and response to comments, the HIARNG will submit copies of the Final INRMP to the USFWS and DLNR DOFAW, which will include an approvals page to be signed by the USFWS Administrator to signify final acceptance of the document. For any questions or concerns, please contact Ms. Kristine Barker at 808-672-1264 or via email at kristine.p.barker.nfg@mail.mil. Feel free to submit formal comments via email to Kristine Barker or by mail at the return address listed on the envelope. Thank you for your time and effort on this request.

Sincerely,

Encl

Karl K. Motoyama
Environmental Protection Specialist
Hawaii Army National Guard

HEADQUARTERS
HAWAIʻI ARMY NATIONAL GUARD
91-1227 ENTERPRISE AVENUE
KAPOLEI, HAWAIʻI 96707-2150

March 25, 2019

David Smith, Administrator
Hawaii Department of Land and Natural Resources
Department of Forestry and Wildlife
Kalanimoku Building
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

Dear Mr. Smith:

Pursuant to the Sikes Act Improvement Act (16 USC 670a *et seq*.), the Hawaii Army National Guard (HIARNG) has completed a Final Draft Integrated Natural Resources Management Plan (INRMP) update for four federally controlled properties, including the 504-acre Keaukaha Military Reservation (KMR) on the island of Hawaii; the 48-acre Regional Training Institute (RTI) on the island of Oahu; the 68-acre Kekaha Firing Range on the island of Kauai; and the 39-acre Ukumehame Firing Range on the island of Maui.

The HIARNG Natural Resources Program has been operating from a 2012 INRMP update that was not signed and operational until February 2015. Because of the gap from drafting the INRMP to signature, the INRMP goals, projects, site conditions and training information are outdated. Because the HIARNG lost its Conservation Manager in June 2015, and did not formally hire a Conservation Manager until July 2018, an annual INRMP update did not occur in 2016 or 2017. The 2018 annual review in March concluded that the INRMP would require a formal update.

The 2019 INRMP update focused on re-formatting the INRMP to organize all pertinent information by INRMP site, rather than by categories (i.e. Ecosystems and the Biotic Environment, Natural Resources Program Management, etc.). The 2019 INRMP update includes new information on current training at the INRMP sites, new information on natural resource issues and successes at the INRMP sites, updates on the status of Rapid Ohia Death Fungus at KMR, updated natural resource projects and more relevant maps and tables to illustrate the natural resource work HIARNG has conducted. The 2019 INRMP update is more concise and the Goals, Objectives and Projects spreadsheet has been moved to Appendix A for future annual update revisions. Additional appendices have been added to include all pertinent information regarding

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

HIARNG's natural resources management program. The requirement for annual Status Reports and Work Plans has been removed, rather the HIARNG will use the annual meeting and coordination with USFWS (U.S. Fish and Wildlife Service) and DLNR DOFAW (Department of Land and Natural Resources Department of Forestry and Wildlife) to summarize the work and results from their natural resource management projects. Overall, the INRMP has been updated to more accurately and concisely reflect all pertinent information regarding the HIARNG's natural resources management program in correlation to INRMP-listed sites.

We humbly request DLNR DOFAW's review of the Final Draft INRMP update (CD enclosed). We request comments on the Final Draft INRMP in order to ensure that information relating to natural resources on or in the vicinity of HIARNG installations is accurate and acknowledges local and regional management plans and strategies. After agency review and response to comments, the HIARNG will submit copies of the Final INRMP to the USFWS and DLNR DOFAW, which will include an approvals page to be signed by the DLNR DOFAW Administrator to signify final acceptance of the document. For any questions or concerns, please contact Ms. Kristine Barker at 808-672-1264 or via email at kristine.p.barker.nfg@mail.mil. Feel free to submit formal comments via email to Kristine Barker or by mail at the return address listed on the envelope. Thank you for your time and effort on this request.

Sincerely,

Encl

Karl K. Motoyama
Environmental Protection Specialist
Hawaii Army National Guard

HEADQUARTERS
HAWAIʻI ARMY NATIONAL GUARD
91-1227 ENTERPRISE AVENUE
KAPOLEI, HAWAIʻI 96707-2150

March 25, 2019

Mr. Jay Rubinoff
Mr. Eric Beckley
ATTN: I&E
111 South George Mason Drive
Arlington, VA 22204-1373

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

Aloha Mr. Rubinoff and Mr. Beckley:

Pursuant to the Sikes Act Improvement Act (16 USC 670a *et seq*.), the Hawaii Army National Guard (HIARNG) has completed a Final Draft Integrated Natural Resources Management Plan (INRMP) update for four federally controlled properties, including the 504-acre Keaukaha Military Reservation (KMR) on the island of Hawaii; the 48-acre Regional Training Institute (RTI) on the island of Oahu; the 68-acre Kekaha Firing Range on the island of Kauai; and the 39-acre Ukumehame Firing Range on the island of Maui.

The HIARNG Natural Resources Program has been operating from a 2012 INRMP update that was not signed and operational until February 2015. Because of the gap from drafting the INRMP to signature, the INRMP goals, projects, site conditions and training information are outdated. Because the HIARNG lost its Conservation Manager in June 2015, and did not formally hire a Conservation Manager until July 2018, an annual INRMP update did not occur in 2016 or 2017. The 2018 annual review in March concluded that the INRMP would require a formal update.

The 2019 INRMP update focused on re-formatting the INRMP to organize all pertinent information by INRMP site, rather than by categories (i.e. Ecosystems and the Biotic Environment, Natural Resources Program Management, etc.). The 2019 INRMP update includes new information on current training at the INRMP sites, new information on natural resource issues and successes at the INRMP sites, updates on the status of Rapid Ohia Death Fungus at KMR, updated natural resource projects and more relevant maps and tables to illustrate the natural resource work HIARNG has conducted. The 2019 INRMP update is more concise and the Goals, Objectives and Projects spreadsheet has been moved to Appendix A for future annual update revisions. Additional appendices have been added to include all pertinent information regarding HIARNG's natural resources management program. The requirement for annual Status

SUBJECT: Hawaii Army National Guard Integrated Natural Resources Management Plan (INRMP) Update for Keaukaha Military Reservation (KMR), Regional Training Institute (RTI), Kekaha Firing Range (KFR) and Ukumehame Firing Range (UFR).

Reports and Work Plans has been removed, rather the HIARNG will use the annual meeting and coordination with USFWS (U.S. Fish and Wildlife Service) and DLNR DOFAW (Department of Land and Natural Resources Department of Forestry and Wildlife) to summarize the work and results from their natural resource management projects. Overall, the INRMP has been updated to more accurately and concisely reflect all pertinent information regarding the HIARNG's natural resources management program in correlation to INRMP-listed sites.

We humbly request NGB's review of the Final Draft INRMP update (CD enclosed). We request comments on the Final Draft INRMP in order to ensure that information relating to natural resources on or in the vicinity of HIARNG installations is accurate and acknowledges Federal, Army and ARNG practices and guidance. After agency review and response to comments, the HIARNG will submit copies of the Final INRMP to the NGB, USFWS and DLNR DOFAW, which will include an approvals page to be signed by the NGB, Chief of Installations & Environmental to signify final acceptance of the document. For any questions or concerns, please contact Ms. Kristine Barker at 808-672-1264 or via email at kristine.p.barker.nfg@mail.mil. Feel free to submit formal comments via email to Kristine Barker or by mail at the return address listed on the envelope. Thank you for your time and effort on this request.

Sincerely,

Encl

Karl K. Motoyama
Environmental Protection Specialist
Hawaii Army National Guard

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DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

MAY 15 2019

Mr. Karl K. Motoyama
Hawai'i Army National Guard
91-1227 Enterprise Avenue
Kapolei, HI 96707

Dear Mr. Motoyama:

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the Hawai'i Army National Guard Final Draft Integrated Natural Resources Management Plan (INRMP) update for four Federally controlled properties: the Keaukaha Military Reservation on the island of Hawai'i, the Kekaha Firing Range on the island of Kaua'i, the Regional Training Institute on the island of O'ahu, and the Ukumehame Firing Range on the island of Maui. DOFAW provides the following comments in respect to our review of the Final Draft INRMP.

We request the inclusion of the State of Hawaii endangered species law, codified in Chapter 195D, Hawaii Revised Statutes (HRS) in Section 1.3 Laws and Regulations, and incorporating its mention throughout the relevant portions of the INRMP. This might include the sections that reference the Federal Endangered Species Act of 1973 (ESA). While all species listed as endangered or threatened under the ESA are listed by the State of Hawaii under HRS 195D, the State and Federal laws are separate and some differences exist between the regulations. For the purposes of the INRMP the most notable distinction is the species listing statuses. For example, the Hawaiian Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) and White Tern (*Gygis alba*) are listed as endangered under HRS 195D on O'ahu only, but these species are not listed under the Federal ESA. DOFAW should be included in any requests for consultations regarding threatened and endangered species, which should be reflected in the INRMP and Appendix A.

In addition to HRS 195D, other State statutes such as the Hawai'i Environmental Policy Act (HEPA) and associated rules should be added as appropriate to the INRMP and Appendix E. We note State laws are listed in the Appendix C table but are not incorporated throughout the document.

DOFAW also recommends adding current best management practices for avoiding or mitigating impacts to listed species in the Threatened and Endangered Species Management section for each property. Depending on the listed species that may be present, this could include such aspects as seabird friendly lighting and downed bird protocols, or avoiding tree trimming during breeding seasons. For endangered and threatened species that are listed under both HRS 195D and the ESA, avoidance and minimization measures can be found at https://www.fws.gov/pacificislands/promo.cfm?id=177175840. For species listed only under

HRS 195D please contact the DOFAW office at (808) 587-0166. We understand the listed species identified as potentially occurring in the vicinity of each site will be updated to reflect the results of the biological surveys scheduled for completion in 2019. If you require additional information on the presence of species at specific sites, please contact the DOFAW office at (808) 587-0166.

We appreciate your efforts to work with our office for the conservation of our native species, and for aligning the INRMP with the State Wildlife Action Plan and Hawai'i Interagency Biosecurity Plan. We look forward to participating in the next annual coordination meeting. If you have any questions in the meantime, please contact Jim Cogswell, Wildlife Program Manager at (808) 587-4187 or James.M.Cogswell@hawaii.gov.

Sincerely,

for DAVID G. SMITH
Administrator

Appendix C: INRMP GUIDANCE, MOUS & ENV LAWS

Federal Laws and Regulations				
Statute	**Laws & Regulations**	**Description**	**Responsible Agency**	**Details**
The Lacey Act of 1900, amended 2008	**16 U.S.C. 3371-3378**	Made it unlawful to import, export, sell, acquire, or purchase fish, wildlife or plants that are taken, possessed, transported or sold in violation of U.S. or Indian Law.	USFWS	The law was amended in 2008 to expand its protection to a broader range of plants and plant products. Makes it unlawful to import certain plants without an import declaration.
Migratory Bird Treaty Act (MBTA) of 1918	**16 U.S.C. 703-712 & 50 C.F.R. 10.13**	Protects migratory birds covered in 4 internaional treaties between U.S., Mexico, Canada, Japan and Russia. Under the act, it is unlawful to (or attempt to) pursue, hunt, take, kill, possess or export any migratory bird, any part, nest or egg, without a valid permit.	USFWS - Regional Migratory Bird Permit Offices	Permits can be issued for scientific collection purposes, depredation (capture or kill birds to reduce damage), rehabilitation (transport and possess birds to rehabilitate them), or for other special purposes
Fish and Wildlife Coordination Act of 1934, as amended 1946	**16 U.S.C. 661-667 & 50 C.F.R. 83**	Requires federal agencies to consult with USFWS and State Fish and Wildlife agencies where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted or otherwise controlled or modified" to prevent loss of and damage to wildlife resources.	USFWS and DOFAW	Federal agencies need to consult with USFWS and DOFAW for any activities that modify or control any body of water to prevent loss or damage to wildlife resources.
Administrative Procedure Act of 1946	**5 U.S.C. 500-596**	Governs the process by which federal agencies develop and issue regulations. It includes requirements for publishing notices of proposed and final rulemaking in the Federal Register, and provides opportunities for the public to comment on notices of proposed rulemaking.		The APA also provides standards for judicial review if a person has been adveresly affected or aggriveved by an agency action.
The Sikes Act of 1960, as amended in 1997 as Sikes Act Improvement Act	**16 U.S.C. 670a-670f**	Ensures that diverse habitats, ecologically important plants and animal species on military lands are protected and enhanced while allowing the military to meet its mission. Requires DoD to develop and implement Integrated Natural Resource Management Plans in cooperation with USFWS and State Fish and Wildlife agencies.	U.S. Fish and Wildelife Service & Deparment of Forestry and Wildlife (DOFAW)	The HIARNG is required to review the INRMP annually in collaboration with USFWS and DOFAW as well as update the INRMP every 5 years. The INRMP should have a tripartide agreement or show concurrence from both USFWS and DOFAW
National Historic Preservation Act of 1966	**54 U.S.C. 300101 & 36 CFR Part 800**	Requires federal agencies to evaluate the impact of all federally funded projects on historic properties (buildings, archaeological sites, etc.) by consulting with the State Historic Preservation Officer (SHPO) and all interested stakeholders, including Native Hawaiian Organizations.	State Historic Preservation Division (SHPD) + Native Hawaiian Organizations (NHOs)	Natural resources projects listed in the INRMP that require ground disturbance and/or may impact archaeological sites, require consultation with SHPD and NHOs to determine if there are "no historic properties present, no adverse affect, or adverse affect" to historic properties
National Environmental Policy Act (NEPA) of 1969	**42 U.S.C. 4321 & 40 C.F.R. 1500-1508 & 32 C.F.R. 989**	Requires federal agencies to make a reasonable and good faith effort to asses all reasonably foreseeable environmental impacts for a proposed project.	Council on Environmental Quality (CEQ)	HIARNG can utilize Army Categorical Exclusions (32 CFR Part 651 - App B) for smaller actions. An EA must be prepared for actions that do not fit into a Cat Ex. A EA will suffice if a FONSI is determined. An EIS is required and determines a ROD.
Coastal Zone Management Act (CZMA) of 1972	**16 U.S.C. 1451-1465 & 15 C.F.R. Part 930**	Created a national management program to comprehensively manage competing uses of and impacts to coastal uses and resources., including pollution discharges, runoff and erosion, wetland mangement, etc.	Office of Conservation and Coastal Lands (OCCL)	CZMA 307 requires that federal agency actions, inside or outside a state coastal zone, that are "reasonably likely to affect" any land or water use or natural resource of the coastal zone must consult with the State CZM agency to ensure compliance with the state CZM program.
Clean Water Act of 1972	**33 U.S.C. 1251 - 1387**	The primary objective of the CWA is to restore and maintain the integrity of the nation's waters, including lakes, rivers, aquifers, and coastal areas. Jurisdictional waters of the U.S. are regulated resources and area subject to federal authority under section 404 of the CWA, which includes tributaries and wetlands.	EPA & HI Dept. of Health (HDOH)	Section 404 of the CWA defines wetland deliniation and characterization. National Polluntant Discharge Elimination System (NPDES) permits are required to regulate point sources that discharge pollutants into the water. THe NPDES permit establishes monitoring, inspection and reporting requirements.
Federal Insecticide, Fungicide, Rodenticide Act of 1910, amended 1972	**7 U.S.C. 136**	FIFRA was enacted to regulate pesticide application to protect applicators, consumers and the environment.	EPA & HI Dept. of Health (HDOH)	EPA ovesees the sale and use of pesticides and regulates the registration process so that all pesticides have an associated EPA number.
Endangered Species Act (ESA) of 1973	**16 U.S.C. 1531-1544 & 50 C.F.R. Part 17**	Identifies & protects threatened and endangered species of fish, wildlife and plants including the habitat in which they rely on. Requires federal agencies to conserve TES and their habitat	USWFS - terrestrial & freshwater organisms NOAA Fisheries - marine species	Updates to the ESA and TES a recorded in the Federal Register
ESA Section 7: Interagency Cooperation	*16 U.S.C. section 1536*	7(a) Federal agencies must consult with USFWS to ensure their action does not jepordize any TES or critical habitat. The USFWS is granted 90 days to responsd to the consultation.	USWFS - terrestrial & freshwater organisms NOAA Fisheries - marine species	Federal agency determination of "no effect" requires internal MFR. "May affect, but not likely to adversely affect" requires informal consultation. USFWS will concur or request formal consultation. "May affect - likely to adversely affect" requires formal consultation with preparation of a BA. The USFWS will issue a BO for the action.
ESA Section 9: Prohibited Acts	*16 USC section 1538*	It is unlawful for any person to take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect) any TES. It is illegal to sell, deliver, carry, transport or receive any TES.	USWFS - terrestrial & freshwater organisms NOAA Fisheries - marine species	Civil pentalties of not more than $25,000 for each violation. Criminal violations of not more than $50,000 or imprisoned for 1 year, or both.
ESA Section 10: Exceptions	*16 U.S.C. section 1539*	Permits may be granted to conduct prohibited acts, as listed in section 9, for scientific purposes or to enhance the propagation or survival of an affected species, as well as for the incidental take of a TES that was not the purpose of a lawful activity.	USWFS - terrestrial & freshwater organisms NOAA Fisheries - marine species	Issuance of an incidental take permit requires a Conservation Plan that specifies details of the proposed project.
Resources Conservation and Recovery Act (RCRA) of 1976	**42 U.S.C. 6901 et. Seq.**	"Cradle-to-grave" management of hazardous waste, including generation, transportation, treatment, storage and disposal. Developed framework for the management of solid waste.	EPA & HI Dept. of Health (HDOH)	EPA delegates authority to the state under HRS 342 and HAR Ch. 58.1, 104 and 260-280. Requirements under this act include inventorying, labeling, record keeping, proper disposal and corrective actions for relsease of hazwaste
Federal Noxious Weed Act of 1974, supersended 1990	**7 U.S.C. 2801 et. Seq.**	Secretary of Agriculture was given authority to designate plants as noxious weeds and prohibit their transport. Requires federal agencies to have adequately trained staff in managing and controlling noxious weed species.	HI Dept. if Agriculture (HDOA)	This act was supersended by the Plant Protection Act of 1990
Plant Protection Act of 1990	**7 U.S.C. 7701**	This act consolidates responsibilities that were previously spread over various legislative statutes, including the Federal Noxious Weed Act, Plant Quarantine Act, and Federal Plant Pest Act.	HI Dept. if Agriculture (HDOA)	A list of federal noxious weeds can be found at: https://plants.usda.gov/java/noxious
National Defense Authorization Act of 1989	**50 CFR Part 21**	Amends two acts and establishes volunteers and partnership programs for natural and cultural resources management on DoD Lands.		In 2003 the NDAA and the DoD Migratory Bird Readiness Rule authorizes, with certain limitations, the incidental take of migratory birds during military readiness activities.
Executive Orders, DoD, Army, NGB Regulations, Instructions, Memos and Guidance Documents				
Statute	**Laws & Regulations**	**Description**	**Responsible Agency**	**Details**
EO 11514: Protection and Enhancement of Environmental Quality	**Mar-70**	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.	Council on Environmental Quality (CEQ)	Monitor and evaluate activities to protect and enhance the environment. Develop procedures to ensure public info and understnading of DoD plans and programs. Research and evaluate activities, exchange data and research results with agencies to ensure collaboration.
EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds	**Jan-01**	Federal agencies taking actions that have or are likely to have a measurable negative effect on MB populations is directed to develop an MOU with USFWS within 2 years that shall promote the conservation of MB populations.	USFWS	The MOU will outline 15 requirements that needs to be addressed. In July 2006 the DoD and USFWS entered into an MOU to Promote the Conservation of Migratory Birds. THe 2014 MOU describes specific actions that DoD should take to advance MB conservation and minimize take.
EO 11987: Exotic Organisms	**May-77**	Requires federal agencies to restrict the introduction of exotic species into the natural ecosystems on lands and water owned or leased by the US.		Furthers the policies set out in the Lacey Act and NEPA. Agencies shall restrict the introduction of exotic species in the the natural ecosystems on lands and waters which they own, lease of hold.

EO 13112: Invasive Species	**Feb-99**	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.		Established a national Invasive Species Council dealing with invasive species issues.
EO 13751: Safeguarding the National from the Impacts of Invasive Species	**Dec-16**	Amends EO 13112 to continue Federal prevention and control efforts related to invasive species. Incoporates considerations of human and environmental health, climate change, tech innovation, and emerging priorities		Furthers policies in NEPA, Plant Protection Act, Lacey Act, ESA, Noxious Weed Control and Eradication Act to prevent the introduction of invasive species and provide for their control and to minimize the economic, plant, animal, ecological, and human health impacts that invasive species can cause.
EO 11990: Protection of Wetlands	**May-77**	Requires federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands has been implemented.		Wetland Definition: Those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Includes swamps, marches, bogs, sloughs, potholes, wet meadows, river overflows, mud flats and natural ponds.
EO 11988: Floodplain Management	**May-77**	Provides direction regarding actions of federal agencies in floodplains, and requires permits from state and federal agencies for construction within a 100-year floodplain.		Floodplain Definition: The lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, including at a minimum, that area subject to a one percent or greater change of flooding in a given year
EO 13148 Greening the Government through Leadership in Environmental Management	**Apr-00**	Requires the restoration of native species and habitat conditions and encourages incorporation of regional native plants in site design and implementation.		Further policies in EPCRA, Pollution Prevention Act, and Clean Air Act to integrate environmental accountability into agency day-to-day decisionmaking and long-term planning.
EO13443 Facilitation of Hunting Heritage and Wildlife Conservation	**Aug-07**	The purpose of this EO is to direct federal agencies that have programs and activities that have a measurable effect on public land management, outdoor recreation, and wildlife management, to facilitate the expansion and enhancement of hunting opportunities and the management of game species and their habitat.		Federal agencies shall evaluate the effet of agency actions on trends in hunting participation, consider economic and recreational values of hunting, manage wildlife and wildlife habitat in a manner that expands hunting opportunities, work collaboratively with State governments to manager and conserve game species.
EO 13352 Facilitation of Cooperative Conservation	**Aug-04**	Requires that the Secretary of Defense carry out programs that implement laws relating to natural resources in a manner that facilitiates collaboration and respects the local community and persons with recognized interests in land and NR, while protecting public health and safety.		Report annually to the Chairman of the CEQ on actions taken to implement this order and provide funding to the Office of the Environmental Quality Management Fund for a Conference.
DoD Directive 4715.1 Environmental Security	**Mar-05**	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This directive also ensures that environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors		Establishes policies on Environment, Safety and Occupational Health (ESOH) to sustain and improve the DoD mission.
DoDI 4150.7 DoD Pest Management Program	**Apr-96**	This instruction requires federal agencies to prevent or control disease vectors as well as pests affecting natural resources, structures, and property and to control exotic species on Federal lands.		Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program. Continues to authorize the publication of DoD Manual 4150-07
DoDI 4715.3 Natural Resources Conservation Program	**May-96**	Implements policy, assigns responsibility, and prescribes procedures under DoD Directive 4715.1 for the integrated management of natural and cultural resources on property under DoD control.		Implements new Natural Resources Conservation Metrics. Provides procedures for the DOD Conservation Committee.
DoDI 6055.05 DoD Fire and Emergency Services Program	**Dec-06**	Establishes a working group, and authorizes guidance specifically for Wildland Fire Management Program. DoD IWFMP shall be in accordance with the 1995 Federal Wildland Fire Management Policy and Program Review and Interagency Fire Management Agreement		Federal lands with burnable vegetaion must have a WFMP.
DoDM 4150.07 DoD Pest Management Training & Certification Program	**May-13**	Implements policy, assigns responsibility, and provides procedures for the training and certification of DoD Pest Management personnel in pesticide application, including applicators that do not meet the requirements of FIFRA.		DOD Pest Management Training and Certification Program: The DoD Plan for Non-federal Insecticide, Fungicide and Rodenticide Act Pesticide Applicators
DoDM 4715.03 Integrated Natural Resources Management Plan (INRMP) Implementation Manual	**Nov-13**	Provides procedures to prepare, review, update, and implement INRMPs in compliance with sections 670-670 of Title 16, United States Code (U.S.C.) (also known and referred to in this manual as "the Sikes Act" (Reference (c))		Details the requirements to follow when updating/revising an INRMP
AR 200-1: Environmental Protection and Enhancement	**Dec-07**	This regulation implements Federal, State, and local environmental laws and DOD policies for preserving, protecting, conserving, and restoring the quality of the environment. This regulation should be used in conjunction federal laws, state laws, DoDI's and supplemental program guidance,		
AR 200-3: Natural Resources - Land, Forest and Wildlife Management	**Feb-95**	Sets forth responsibilities, policies, and procedures to wisely use, manage and restore NR existing on Army lands consistent with the military mission, national security, and Federal laws.		
AR 350-19 The Army Sustainable Range Program	**Aug-05**	Assigns responsibilitiy and provides policy and guidance for managing and operating Army ranges and training lands, including ITAM to support the national defense mission.		
AR 420-90 Fire and Emergency Services	**Sep-97**	Implements DoDI 6055.6 and establishes policies for Fire and Emergency services at installations in Army jurisdiction		
NGB Memo: Management of ARNG Wildland Fire Programs	**Aug-07**	Provides guidance on the roles of ENV, FMO and G3 in implementing and funding the Wildland Fire Management Program.		
NGB Memo: Environmental Document Review	**Mar-11**	Formalizes the review process and establishes a timeframe for NGB-ILE to review and comment on ENV docs, including BAs, BOs, INRMPs, ICRMPs, Eas, ECOPs, etc.	NGB	
NGB Memo: Guidance for the Creation, Implementation, Review and Revisions/Updates of INRMPs	**Apr-12**	Provides specific guidance on how to update, revise, implement and create INRMPs and when/how to consult with USFWS and DOFAW as well as NGB review timeframes.	NGB, USFWS, DOFAW	
NGB Memo: ESA Compliance and NEPA	**Jun-11**	Establishes ARNG documentation requirements under Section 7 of ESA for NEPA including no species present, no affect, not likely to adversely affect and likely to adveresly affect. The last affect determination requires an EA if there is not a previous BO for the action	USFWS	HIARNG must have a current 90 day species list from USFWS either from their website of by formally requesting the 90 day species list.
Army Memo: Guidance for Addressing Migratory Bird Management in INRMPs	**Aug-17**	Provides guidance on migratory bird management as well as outlines Best Management Practices to facilite compliance with legal requirements. Provides clarification on the Readiness Authorization and Migratory Bird Rule		
Army Memo: Army Species at Risk Policy and Implementing Guidance	**Sep-06**	Mandates for proactive Species at Risk management to reduce the impact of SAR on the military mission and keep species off the ESA TES list.		
Army Memo: DoD Policy to Use Pollinator-Friendly Management Perscriptions	**Sep-04**	Expands DoD policy to use current best management practices, as appropriate, to protect pollinators and their habitat and establishes policy to coordinate with partners on pollinator issues.		

Army Memo: MOU for a cooperative INRMP streamlined Procedures	**Sep-13**	Provides guidance for all DoD installations that require an INRMP to expedite the review process with USFWS and state fish and wildlife agencies, as defined in the MOU between DOD, USFWS and the Assoc. of Fish and Wildlife Agencies		
Coordinated Bird Monitoring Plan: Technical Recommendation for Military Lands	**2012**	Presents recommendations developed by USGS and the U.S. North American Bird Conservation Initiative report "Opporunities for improving avian monitoring" to ensure DoD meets regulatory responsibilites for monitoring birds.		
1995 Federal Wildland Fire Management Policy & Program Review	**Dec-95**	Addresses 5 major topic areas, and presents 9 guiding principles that are fundamental to wildland fire management and recommend 13 federal wildland fire policies.		
Guidance for Implementation of Wildland Fire Management	**Feb-09**	Provides specific guidance for implementing the 1995 WFM policy and 2001 Review and Update of that policy.		
Review and Update of the 1995 Federal Wildland Fire Management Policy	**Jan-01**	The 1995 Policy was reviewed by the Interagency Federal Wildland Fire Working Group, which recommened changes and additions to clarify the purpose anf intent. Incoroporated strategic implementation action to ensure success of the program.		

State Laws and Regulations

Statute	Laws & Regulations	Description	Responsible Agency	Details
HRS Title 1 GENERAL PROVISION	**Ch 6E Historic Preservation**	Ch. 6E-8: Review of effect of proposed State projects.	DLNR State Historic Preservation Division	State agencies are required to notify SHPD of an action that may affect historic properties, aviation artifact, or burial site. SHPD has 90 days to review and concur with the project.
		Ch 6E-43.6 Inadvertant Discovery of burial sites	DLNR State Historic Preservation Division	In the event human skeletal remains are inadvertantely discovered, any activity must stop, the discovery shall be reported to SHPD, medical examiner and police dept. within 3 days an archaeologist or coroners office shall examine the remains and the agency will gather any information to contextualize the remains. The Island Burial Councils will assist.
HAR Title 13. DEPARTMENT OF LAND AND NATURAL RESOURCES	**Ch 275**	Rules Governing Procedures for Historic Preservation Review for Governmental Projects.	DLNR State Historic Preservation Division	
	Ch 280	Rules Governing General Procedures for Inadvertant Discoveries	DLNR State Historic Preservation Division	
HRS Title 11. AGRICULTURE AND ANIMALS	**Ch 149A Hawaii Pesticides Law**	HRS 149A Part I - VI Regulates pesticide licensing, sales, use, labeling requirements, record and enforecment.	HI-DOA	
	Ch 152 Noxious Weed Control	Designates noxious weeds, designates areas free of noxious weeds, outlines prohibited acts, and duties of the department	HI-DOA	
HAR Title 4 DEPARTMENT OF AGRICULTURE	**Ch 66 Pesticides**	Outlines rules that implement the requirements of HRS 149A regarding registration, licensing, certification, recordkeeping, usage and other activities.	HI-DOA	
	Ch 68 Noxious Weed Rules	Establishes criteria for designation, control or eradication of noxious weeds.	HI-DOA	
HRS Title 12. CONSERVATION & RESOURCES	**Subtitle 2. Water and Land Development; Flood Control**	HRS 179: Flood Control and Flood Water Conservation HRS 180: Soil and Water Conservation Districts HRS 180C: Soil Erosion & Sediment Control	DLNR DOFAW	
	Subtitle 4. Forest Reserves, Water Development Zoning	Ch. 183 Forest Reserves, Water Development, Zoning 183C: Conservation District, 183D Wildlife. 183-16.5 Harvesting from state-owned lands. 184 State Parks & Recreation Areas 185 Land Fire Protection Law	DLNR DOFAW	
	Subtitle 6 General and Misc. Programs	**195D Conservation of Aquatic Life, Wildlife and Land Plants.** 195D-3 Determination of the Dept. relating to conservation of particular species. 195D-4 Threatened and Endanagered Species. 195D-5 Conservation Programs. 195D-5.1 Protection of Hawaii's unique flora and fauna. 195D-21 Habitat Conservation Plans. 195D-25 Endangered Species recovery committee. 195D-26 Annual report; endangered species. 195D-29 Release or establishment of endangered or threatened species outside its current range. 195D-30 Net gain in recovery of species. 195D-32 Citizen suits.	DLNR DOFAW	
		HRS 194 Invasive Species Council. 197 General Provisions Relating to Aquatic Resources and Wildlife. 195 Natural Area Reserve Systems. 195F Forest Stewardship. 198 Conservation Easements.	DLNR DOFAW	
	Subtitle 7 Enforcement	199 Conservation and Resources Enforcement Program 199D Civil Natural Resource Violation Act	DLNR DOFAW	
HAR Title 13. DEPARTMENT OF LAND AND NATURAL RESOURCES	**Subtitle 5 FORESTRY & WILDLIFE**	Ch. 104 Activities within a forest reserve	DLNR DOFAW	Details the rules to follow when entering a forest reserves. Also includes the requirement to obtain a permit for certain activities within a forest reserve.
		Ch. 107 Threatened and Endangered Plants	DLNR DOFAW	Purpose is to conserve, manage, protect and enhance TES Plants. Relates to HRS 195D, 50 CFR 17.11, 17.12 (TES Wildlife & Plant in ESA)
		Ch. 109 Forest Stewardship	DLNR DOFAW	Includes the Forest Stewardship National Standards and Guidelines
		Ch. 121 Hunting, Ch. 122 Game Bird Hunting Ch. 123 Game mammal hunting	DLNR DOFAW	Details the rules to implement a hunting program on state land
		Ch. 124 Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds & Ch. 124 Exhibits	DLNR DOFAW	Purpose is to conserve, manage, protect and enhance indigenous wildlife, manage introduced wild birds. Relates to HRS 183D-61, 195D-3 thru 6, 191-12, 50 CFR 17.11, 17.12 (TES Wildlife & Plant in ESA)
		Ch. 140 Legacy Land Conservation Program	DLNR DOFAW	
		Ch. 209 Activities within a Natural Area Reserves	DLNR DOFAW	
		Ch. 210 Application, Approval, and Administration of the Natural Area Partnership Program	DLNR DOFAW	
HRS Title 13 PLANNING AND ECONOMIC DEVELOPMENT	**Section 205 Land Use Commission**	205A: Coastal Zone Management. Part I thur Part V covers the CZM Program, compliance, SMA boundaries, guidelines, permit requirements, shoreline setbacks, and artificial light considerations.	Office of Conservation and Coastal Lands (OCCL)	Requires a Site Plan Approval to proceed with activties within a Special Management Area (SMA) ie. Conservation district, as defined by the CZM program.

HAR Title 13. DEPARTMENT OF LAND AND NATURAL RESOURCES	**CH. 5 Conservation Districts**	5-10 thru 5-17 Details the subzones. 5-22 thru 5-25 Identifies land uses and required permits	Office of Conservation and Coastal Lands (OCCL)	Since almost all of HIARNG's facilities are located on state-owned land, proposed activities and projects must be in accordance with state land use zoning laws. For example, in state Conservation District Zones, all proposed natural resource activities must comply with all permitted uses (e.g., protecting natural areas, ensuring that scenic vistas are not affected) for the Conservation District via the state permitting process.
Revised Ordinances of the City & County of Honolulu	**Chapter 25: Special Management Area**	Mimics HRS 205A for City and County Lands that have Special Management Areas. This policy preserves, protects, and where possible, restores the natural resources of the coastal zone of Hawaii.	C&C Dept. of Planning and Permitting (DPP)	HIARNG's proposed activities must also meet local zoning laws protecting specified resources and areas. Some HIARNG facilities are located at or near coastal areas, which are protected under county-designated SMAs. Each county defines boundaries of the SMA along the coastlines. Natural resource projects within the coastal zone require a permit and consultation with respective County Planning Offices for potential coastal impacts to ensure that coastal resources and public beach access are preserved.
HRS Title 19. HEALTH	***Section 343: Environmental Impact Statements***	Ensures environmental consideration prior to undertaking activities, which may have significant impacts, by preparing environmental documentation for public review (e.g., Records of Environmental Consideration, Environmental Assessments, and Environmental Impact Statements).	OEQC	Identifies potential effects of missions and operations, as well as alternative training scenarios and measures to avoid negative impacts.
HAR Title 11. Department of Health. Chapter 200. Environmental Impact Statement Rules	**Subchapter 5 Applicability**	11-200-5 Agency Actions. 11-200-8 Exempt classes of action.	OEQC	For all proposed actions which are not exempt, the agency shall assess at the earliest practicable time the significance of potential impacts of its actions, including the overall, cumulative impact in light of related actions in the region and further actions contemplated.
	Subchapter 6 Determination of Significance	11-200-9 Assessment of agency actions and application actions. 11-200-11.1 Notice of determination for draft EAs. 11-200-12 Significance Criteria	OEQC	Outlines requirements for agencies when determining the significance of their proposed action.
	Subchapter 9 National Environmental Policy Act	11-200-25 National Environmental Policy Act actions; applications to chapter 343, HRS	OEQC	If an agency determines NEPA and HEPA apply to their action, they must comply with both laws. The office and agency shall cooperate to reduce duplication between federal and state requirements. Inlucding joint EAs with concurrent public review and processing at both levels of government.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
600 ARMY PENTAGON
WASHINGTON DC 20310-0600

REPLY TO
ATTENTION OF:

DAIM-ISE

09 SEP 2013

MEMORANDUM FOR

US ARMY MATERIEL COMMAND (AMCOL-IE), 4400 MARTIN ROAD, REDSTONE ARSENAL, AL 35898
NATIONAL GUARD BUREAU, ARMY NATIONAL GUARD READINESS CENTER (ARNG-RMC/ARNG-ILE), 111 SOUTH GEORGE MASON DR., ARLINGTON, VA 22204-1382
US ARMY INSTALLATION COMMAND (IMPW-V), 2405 GUN SHED ROAD, FORT SAM HOUSTON, TX 78234-1223

SUBJECT: Memorandum of Understanding for a Cooperative Integrated Natural Resources Management Program on Military Installations & Associated Streamlined Integrated Natural Resources Management Plan Review Procedures

1. References:
   a. 16 USC 670a et seq, Sikes Act, as amended.

   b. Memorandum, DUSD, 10 Oct 2001, Subject: Updated Guidance for Implementation of the Sikes Act Improvement Act

   c. Memorandum, DAIM-ED, 25 May 2006, Subject: Guidance for Implementation of the Sikes Act Improvement Act

   d. AR 200-1, Environmental Protection and Enhancement, 13 Dec 2007

2. References 1 (a-d) provide guidance for all DoD military installations having significant natural resources to prepare and implement an Integrated Natural Resource Management Plan (INRMP). Enclosure (1) is a recently signed "Memorandum of Understanding (MOU) between the U.S. Department of Defense and the U.S. Fish and Wildlife Service (USFWS) and the Association of Fish and Wildlife Agencies for a Cooperative Integrated Natural Resource Management Program on Military Installations". This MOU furthers the cooperative relationship between the signatories to prepare and implement INRMPs. This MOU also provides an opportunity for Army installations with

DAIM-ISE
SUBJECT: Memorandum of Understanding for a Cooperative Integrated Natural Resources Management Program on Military Installations & Associated Streamlined Integrated Natural Resources Management Plan Review Procedures

"compliant INRMPs" requiring minor updates to utilize new procedures that streamline and expedite the review of updated INRMPs. The MOU defines INRMP status as the following:

Compliant INRMP: An INRMP that has been both approved in writing, and reviewed, within the past 5 years, as to operation and effect, by authorized officials of DoD, DOI, and each appropriate state fish and wildlife agency.

Review for operation and effect: A comprehensive, joint review by the parties to the INRMP, conducted no less often than every 5 years, to determine whether the plan needs an update or revision to continue to address adequately Sikes Act purposes and requirements

INRMP Update: Any change to an INRMP that, if implementend, is not expected to result in consequences materially different from those in the existing INRMP and analyzed in an existing NEPA document. Such changes will not result in a significant environmental impact, and installations are not required to invite the public to review or comment on the decision to continue implementing the updated INRMP.

INRMP Revision: Any change to an INRMP that, if implemented, may result in a significant environmental impact, including those not anticipated by the parties to the INRMP when the plan was last approved and/or reviewed as to operation and effect. All such revisions require approval by all parties to the INRMP, and will require a new or supplemental NEPA analysis.

3. Enclosure (2) further describes procedures for this streamlined review process. It is anticipated that additional comprehensive joint guidance (USFWS and DoD) will be promulgated within 6 months to 1 year. This expedited review and approval (new signatures required) of only updated information/sections of the INRMP, will assist the Army in proactively preparing for upcoming potential species listings in order to seek critical habitat exclusions/exemptions and/or other planning measures necessary to provide greater flexibility to support mission. Utilization of this process provides a cost effective (no new resources needed) and a time-saving alternative to re-reviewing language previously fully reviewed and approved by all signatories, including the USFWS, the State Fish and Wildlife Agency, and DoD.

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4. The Army staff point of contact for Sikes Act/Integrated Natural Resources Management Planning is Ms. Lorri Schwartz, (571) 256-9728, email: lorri.a.schwartz.civ@mail.mil. The Army staff point of contact for Endangered Species Management is Mr. Steven Sekscienski, (571) 256-9725, email: steven.w.sekscienski.civ@mail.mil.

2 Encls
as

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111 SOUTH GEORGE MASON DRIVE
ARLINGTON, VA 22204-1382

ARNG-ILE 9 Apr 12

MEMORANDUM FOR ENVIRONMENTAL PROGRAM MANAGERS for 54 States and Territories

SUBJECT: Army National Guard Directorate, Environmental Programs Division (ARNG-ILE) Guidance for the Creation, Implementation, Review, and Revision and Update of Integrated Natural Resource Management Plans (INRMPs)

1. REFERENCES:

a. The Sikes Act, as amended by The National Defense Authorization Act of 2012, codified at 16 USC 670a et seq.

b. The Endangered Species Act (ESA), as amended by the National Defense Authorization Act of 2004, codified at 16 USC 1533(b)(2) and 1533 (a)(3)(b).

c. AR 200-1, *Environmental Protection and Enhancement*, 13 December 2007.

d. Department of Defense Instruction (DoDI) 4715.03, Natural Resources Conservation Program, 18 Mar 2011.

e. Department of Defense Memorandum, Updated Guidance for Implementation of the Sikes Act Improvement Act, 10 October 2002.

f. Department of Defense Memorandum, Updated Guidance for Implementation of the Sikes Act Improvement Act – Supplemental Guidance Concerning INRMP Reviews, 1 Nov 04.

g. Department of Defense Memorandum, Integrated Natural Resource Management Plan (INRMP) Template, 14 Aug 06.

h. Department of the Army Memorandum, Guidance for Implementation of the Sikes Act Improvement Act, 25 May 2006.

2. PURPOSE: This Army National Guard (ARNG) INRMP guidance is intended as a supplement to the Sikes Act and Army Regulation 200-1 and supersedes all previous ARNG Directorate INRMP guidance.

3. APPLICABILITY: This policy guidance applies to the state ARNG Environmental Programs of all 54 States and Territories.

4. INRMP REQUIREMENT:

a. Reference 1a requires the development and implementation of an INRMP for all military installations with significant natural resources. Per reference 1c "significant natural resources" include:

(1) Federally listed, proposed, or candidate species onsite or critical habitat designated or proposed on the installation.

(2) Reimbursable forestry or agricultural out-leasing of 100 acres or more.

(3) Hunting and fishing for which special State hunting and fishing access permits are issued by the installation.

(4) Unique biological resources, wetlands, species at risk, or ecological issues that can only be addressed by an INRMP.

(5) The installation conducts intensive, on-the-ground military missions that require conservation measures to minimize impacts and sustain natural resources.

b. Reference 1a states that the Sikes Act is applicable to "military installations", which are defined in the law as:

(1) Any land or interest in land owned by the United States and administered by the Secretary of Defense or the head of a military department,

(2) All public lands withdrawn from all forms of appropriation under public land laws and reserved for use by the Secretary of Defense or the head of a military department, and

(3) State-owned Army National Guard installations.

5. COORDINATION REQUIREMENTS FOR NEW AND/OR REVISED INRMPS (Reference 1e):

a. Each ARNG installation shall involve the U.S. Fish and Wildlife Service (USFWS) and State fish and wildlife agency (State Agency) in the scoping, design, preparation and/or review of a new or revised INRMP. At a minimum, this requires that the State ARNG provide these agencies with draft INRMPs for review and comment, and that the State ARNG address these comments appropriately.

b. Each ARNG installation shall advise all appropriate internal and external stakeholders of the intent to prepare or revise an INRMP at least **30 days** prior to starting such an action.

c. Each ARNG installation shall notify the appropriate USFWS office and State Agency of its intent to provide a draft INRMP for review and coordination at least **60 days** prior to delivering such document.

d. For new and revised INRMPs, the following process shall be used to facilitate coordination within and between the various organizations and to ensure adequate documentation of the coordination process. Each ARNG installation shall:

(1) Provide the initial draft INRMP to the USFWS field office and appropriate State Agency office for review and comment. All documents should be sent via certified U.S. mail or certified e-mail to confirm receipt by the USFWS or State Agency.

(2) Request the USFWS to provide written comments to the installation, and furnish copies of these comments to the director's office of the relevant State Agency.

(3) Request the State Agency office to provide written comments to the installation, and furnish copies of these comments to the USFWS office.

(4) Consider all comments received. Any disputed comments should be addressed in consultation with the commenting agency. Once comments are addressed a final draft of the INRMP should be sent to the USFWS office and the director's office of the State Agency with a letter documenting the installation's actions taken in response to the draft comments.

(5) Although it is not expected to occur often, where the USFWS or State fish and wildlife agency withholds its agreement to an INRMP based on objections to elements of the INRMP clearly not within the scope of that 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 (Reference 1e).

(6) Request, in writing, that the USFWS and the State Agency provide additional written comments and/or concurrence within 60 days of receipt of the final draft INRMP, unless the participants mutually agree that a longer review period is necessary.

e. Per Department of Defense (DoD) policy (Reference 1e), there are special situations that are exceptions to this timeline. In these cases, the installation, under the direction of the ARNG-ILE, shall request the USFWS notify the installation of the appropriate review timeline within 15 days of receipt of the draft INRMP (for these situations please see references 1d and 1f).

f. Except for the special situations described in the previous paragraph, if, after a period of 120 days, no final comments or letters of concurrence are received from the appropriate USFWS and State Agency offices, an installation may seek assistance from ARNG-ILE to obtain review of its INRMP. The installation should submit a signed written request to the ARNG Directorate seeking assistance. Within 30 days from receipt of the request ARNG-ILE will communicate with the USFWS Region and/or State fish and wildlife agency or arrange for Headquarters Department of the Army (HQDA) to establish a meeting to finalize regulatory review.

g. Per reference 1a, documentation of mutual agreement must be obtained for new or revised plans to be deemed legally sufficient. Letters indicating the agency has reviewed the plan or that the agency has no further comments are not sufficient to comply with the law. There are three ways to reflect mutual agreement of a new INRMP:

(1) A jointly executed signed letter.

(2) Signed letters back from the USFWS and the State agency that they agree with the INRMP.

(3) New signature page to the INRMP.

h. A new or revised INRMP containing an Environmental Assessment (EA) must be reviewed by the National Guard Bureau, Office of the Chief Council (NGB-JA) to determine legal sufficiency.

6. INRMP FORMAT:

a. The DoD has developed a standardized INRMP template (reference 1g) to aid in the preparation and review of INRMPs. While installations are not required to follow the template, and not all topic areas may apply to all installations, an INRMP must, at a minimum, address the following:

(1) Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation;

(2) Fish and wildlife habitat enhancement or modifications;

(3) Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants;

(4) Integration of, and consistency among, the various activities conducted under the plan;

(5) Establishment of specific natural resource management goals and objectives and time frames for proposed action;

(6) Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources;

(7) Public access to the military installation that is necessary or appropriate for the use described in subparagraph (6), subject to requirements necessary to ensure safety and military security;

(8) Enforcement of applicable natural resource laws (including regulations);

(9) No net loss in the capability of military installation lands to support the military mission of the installation[1] (reference 1c); and

(10) Such other activities as the Secretary of the military department determines appropriate.

b. An INRMP revision/update is not necessary solely to meet INRMP template format. INRMP revisions should be initiated based on the need for significant changes to land management goals and objectives as determined by the State ARNG and documented in the formal INRMP 5-year review for operation and effect.

c. All plans must contain goals, measurable objectives to meet goals, and project implementation timelines. It is most effective to set forth the goals, objectives and implementation schedules in a tabular format.

d. The INRMP is not intended to function as a compilation of all natural resource management activities. Rather, the INRMP is intended to integrate natural resource management activities across an installation to meet the plan's specific goals of sustaining and enhancing military training.

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[1] DoD Policy (Reference 1e) states that appropriate management objectives to protect mission capabilities should be clearly articulated in the planning process and should be high in INRMP resourcing priorities. The effectiveness of the INRMP in preventing "net loss" shall be evaluated annually. It is not the intent that natural resources are to be consumed by mission requirements, but sustained for the use of mission requirements. In order to achieve this, environmental programs and policies must have the goal of preserving the environment for the purpose of the mission.
There may be instances in which a "net loss" may be unavoidable in order to fulfill regulatory requirements other than the Sikes Act, such as complying with a biological opinion under the provisions of the Endangered Species Act or the protection of wetlands under the provisions of the Clean Water Act. Any loss of mission capability must be reviewed and approved of by the HQDA. These instances will be identified in the INRMP with a discussion included of measures being undertaken to recapture the net loss.

7. COMPONENT PLANS:

a. A "component plan" is a document that supports subject areas of the INRMP. These plans are generally scientific in nature.

b. If the extent and complexity of management activities related to one of the INRMP's component resource areas warrants, an independent assessment and implementation plan may be developed. Otherwise, resource assessments and management activities should be defined in the context of the INRMP.

c. AR 200-1 identifies specific INRMP component plans, which include, but are not limited to:

(1) Soil Erosion and Sediment Control Component (SESCC).

(2) Endangered Species Management Component (ESMC).

(3) Invasive Species Management Component (ISMC).

(4) Wildland Fire Management Plan (WFMP).

d. Component plans should be integrated into the INRMP by brief discussion and reference of the component plan in the INRMP. The component plans, including operating procedures, activity detail, work plans and related administrative documentation may be included as appendices of the INRMP.

8. INTEGRATION WITH OTHER PROGRAMS:

a. Other ARNG plans and programs that should be referenced or discussed in the INRMP include (Reference 1e):

b. Consultation with Native Americans, Native Alaskans and Native Hawaiians – Per Executive Order 13175 and DOD Instruction 4710.02 – Unless pre-existing consultation practices have been established, consultation with federally recognized tribes who have an interest in specific natural resources within the installation should occur during the review of new or revised INRMPs. Evidence of consultation with federally recognized tribes regarding the potential effect of INRMP plans and projects must be included. Concerns from Tribes should also be addressed within the INRMP.

c. Integrated Training Area Management (ITAM) Program –The INRMP should identify natural resource management requirements necessary to support and maintain training areas and ranges and incorporate the ITAM work plan into the implementation of the INRMP where these activities support INRMP goals and objectives.

d. Range Modernization Program –Resource management programs in the INRMP must consider range operations and modernization to avoid loss of training capability. Environmental staff should be involved in the Range Complex Master Planning (RCMP) process to identify any potential natural resources impacts associated with preliminary siting and maintenance of required ranges.

e. Integrated Pest Management Plan (IPMP) – The IPMP and INRMP should contain cross references to requirements and implementation of invasive and nuisance species control. The INRMP will identify overall landscape goals and objectives. The statewide IPMP would provide details and SOPs for managing individual pest species and pesticide application certification.

f. Installation Master Plan – The INRMP should support development of the Installation and State Master Plans by providing information about resource concerns, management requirements, and general natural resources information.

g. State Wildlife Action Plans (SWAP) - Coordination with the State Agency should identify State priorities for overall game and non-game wildlife management. The SWAP should be used to help guide wildlife management goals and priorities.

9. INRMP PROVISIONS:

a. The 2004 amendments to the ESA include two provisions to exclude designation of Critical Habitat[2] (CH) on lands used by the Army (Reference 1b):

(1) Section 4(a)(3)(B) is not discretionary and mandates that the Secretaries of Interior and/or Commerce exclude designating CH on "...any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which CH is proposed for designation."

(2) Section 4(b)(2), is discretionary. The amendment allows the Secretaries of Interior and/or Commerce to specifically preclude designation of CH on a military facility if they conclude that the benefits of such designation are outweighed by the impact on national security. Such exclusion could not occur if failure to designate an area as CH would result in the extinction of the species.

[2] Installations should request exclusion from Critical Habitat for ARNG installations and armories. Requests should first be submitted to ARNG-ILE for review and concurrence, after which they are submitted to the appropriate USFWS office. ARNG-ILE will also submit a request for exclusion to the USFWS. The Army may also submit a request to the USFWS on behalf of the State ARNG.

b. To ensure exclusion of proposed CH under section 4(a)(3)(B), an installation's INRMP should provide for the benefit of listed species through the management and/or enhancement of habitat utilized by federally-listed species occurring on or contiguous to the installation.

c. Mutual agreement, in writing, is required between the ARNG and the USFWS to render the exemption appropriate.

d. INRMPs will incorporate the results of an installation's previous species-by-species or programmatic ESA consultations, including any reasonable and prudent measures that may have been identified in an incidental take statement. As a consequence, neither informal nor formal ESA §7 Consultation is required under the Sikes Act. However, depending on the management activities of an installation, consultation may be recommended. For example, installations can consult on individual elements of the INRMP or on INRMP wide activities during the planning process to preclude the need for future consultations.

e. Reference 1d indicates that opportunities to conserve federally listed species and the ecosystems on which those species depend should be identified but that the State ARNG shall not accept a disproportionate burden for the conservation of listed species unless it is required by legal authority.

10. INRMP IMPLEMENTATION AND FUNDING:

a. Section 4-3 d(1)(b), of AR 200-1 defines INRMP funding and implementation as :

(1) Actively requesting, receiving and using funds for priority projects and activities.

(2) Ensuring that sufficient numbers of professionally trained natural resources management personnel are available to perform required INRMP tasks.

(3) Coordinating **annually** with all cooperating offices.

(4) Documenting specific INRMP action accomplishments undertaken each year.

(5) Evaluates effectiveness of past and current management activities and adapts appropriately to implement future actions.

b. Because an INRMP is an installation wide plan, it is necessary to coordinate scoping, development and review with all installation stakeholders (such as Environmental Managers, Facilities Managers, trainers, etc.) with <u>shared responsibility to fund</u> various aspects of the plan.

c. Funding for INRMP implementation is not limited to environmental funds. Responsibility for funding natural resource management activities is outlined in the Army Sustainable Range/Installation Environmental Responsibilities Matrix, and is clarified in Memorandum, NGB-ARI, 17 Apr 06: *Clarification of Funding Responsibilities.*

d. For projects that are paid for with environmental funds, State ARNGs shall submit requests via the Status Tool for Environmental Programs (STEP) maintained by ARNG-ILE. For information regarding STEP and general environmental program funding refer to the STEP project catalog or contact the Requirements and Analysis Branch.

e. Projects that are funded through facilities, such as pest management application, and wildfire management, shall submit their request through ARNG-ILI.

f. Projects that are funded through ITAM must be submitted to ARNG-TR for validation using the ITAM Workplan in the Range Complex Master Plan (RCMP). Workplans must be updated by 30 July of each year in accordance with annual guidance issued by ARNG-TR.

g. Projects or management efforts necessary to ensure exemption of critical habitat need to be specifically identified and given high priority for funding.

11. ANNUAL INRMP REVIEWS:

a. Reference 1h states that all INRMPs shall be reviewed annually by installations in cooperation with other parties to the INRMP. Annual reviews should include the USFWS and the State Agency.

b. Annual reviews may be used, as appropriate, to determine if a formal review "for operation and effect" is warranted. Annual reviews are mandatory per DoD guidance and provide the foundation for the review for operation and effect of the plan (Reference 1f).

c. Department of Army policy (Reference 1h) directs that INRMP annual reviews shall verify the following:

(1) All "must fund" projects and activities have been budgeted for and implementation is on schedule.

(2) All required trained natural resources positions are filled or are in the process of being filled.

(3) Projects and activities for the upcoming year have been identified in the INRMP. Any changes made during the previous year shall also be discussed.

(4) All required coordination has occurred.

(5) All significant changes to the installation's mission requirements or its natural resources have been identified.

(6) The INRMP goals and objectives are still valid.

(7) "No net loss" of training capability has occurred due to implementation of the INRMP in accordance with the Sikes Act.

d. If, during the annual review, it is determined that one or more of these seven elements are not adequately addressed in the INRMP, the three parties to the INRMP may either correct the need with an INRMP **update** (discussed in section 14) or initiate a more formal review for operation and effect.

e. The installation commander or designated authority responsible for the INRMP will initiate the annual review via a letter to the appropriate USFWS office and the State Agency office 30 days prior to the anniversary of the INRMP agreement.

f. Installations shall prepare a memorandum for record detailing each annual review. Annual review documents shall be appended to the existing INRMP in an active, growing appendix.

g. The ARNG Installation Natural Resources Managers shall ensure that completed annual reviews are tracked and reported in the annual Army Environmental Database Environmental Quality (AEDB-EQ) data submission. AEDB-EQ submissions are due by the end of the 4th fiscal quarter (September 30) of each year. Per the requirements of the Sikes Act, DoD compiles this information and provides a report to Congress on INRMP status and implementation.

12. REVIEW FOR OPERATION AND EFFECT:

a. Each INRMP must be reviewed for "Operation and Effect" (ROE) at least every 5 years by all three parties to the INRMP, which include the installation commander or the installation designee responsible for the INRMP, the USFWS, and the State agency.

b. The ROE is an assessment of the INRMP by all stake holders to determine whether the INRMP is being implemented to meet the requirements of the Sikes Act and is contributing to the conservation and rehabilitation of natural resources on the

military installation. A ROE can result in either an INRMP **revision** or **update**. Updates and revisions are discussed in more depth in sections 14 and 15 respectively.

13. REPORTING AND TRACKING:

a. Per the Sikes Act (reference 1a), the DOD compiles an annual report to Congress on INRMP status and implementation. The DOD uses natural resources Measures of Merit (MoM) to gauge overall natural resource management effectiveness and compliance with the Sikes Act.

b. State ARNG's shall submit data and information required to prepare the report to ARNG-ILE through the AEDB-EQ data entry. For more information regarding the AEDB-EQ see the Army Environmental Reporting Online (AERO) web portal; http://aec.army.mil/usaec/reporting/index.html.

14. PLAN UPDATES:

a. Definition: An INRMP Update is an amended INRMP that contains limited changes that are <u>not</u> expected to result in biophysical consequences materially different from those anticipated in the existing INRMP (reference 1e).

b. Discussion:

(1) An INRMP update can be initiated during the annual review or the ROE and includes, at a minimum, the results of the current annual review or ROE and project schedules for at least five years.

(2) Mutual agreement between the ARNG, USFWS, and State Agency is documented via a decision memorandum signed by all three parties or by any of the three methods listed in section 5g above.

(3) Staffing for an INRMP update should follow the same process outlined for original INRMPs in section 6.

15. PLAN REVISIONS:

a. Definition: An INRMP Revision is an amended INRMP that contains substantial changes that are expected to result in biophysical consequences materially different from those anticipated in the existing INRMP (reference 1e).

b. Discussion:

(1) The determination to develop a complete revision of an INRMP is the State's discretion that should be based on management and mission needs. A revised plan replaces the existing INRMP, must meet all INRMP requirements, and will require an EA to meet NEPA requirements.

(2) The current INRMP remains in effect until the USFWS and the State agency mutually agree upon the INRMP revision. Mutual agreement between the ARNG, USFWS, and State Agency is documented via any of the three methods listed in section 5g above.

(3) Staffing for an INRMP revision should follow the same process outlined for original INRMPs in section 6.

16. PUBLIC REVIEW AND NEPA:

a. The Sikes Act (Reference 1a) requires that an **initial** INRMP be available for public review and comment. In accordance with 32 CFR 651, *Environmental Analysis of Army Actions*, the NEPA process should be used to accomplish this. An EA should be used to evaluate all new management plans. Documentation must be included to provide record of public notice, any comment received and actions taken to address comments.

b. **Revised** INRMPs will also require an EA public comment and signed Finding of No Significant Impact (FNSI).

c. INRMP **updates** that are not expected to result in biophysical consequences materially different from those anticipated in the existing INRMP must be supported by a REC that tiers off the original INRMP EA (FNSI must be attached to the REC), but do not require public comment (reference 1h).

17. The point of contact for this subject is Mr. Chuck Chamberlain, Natural Resources Program Manager at 703-607-7982, or chuck.chamberlain@us.army.mil.

Michael J. Bennett
COL, LG
Chief, Environmental
Programs Division

Attachment 1. List of required ARNG INRMPs.

State	Installation Name	Owner	Acres
AK	Stewart River Training Site	State	24,160
AL	Fort McClellan	Federal	22,550
AR	Camp Robinson	State	32,867
AR	Fort Chaffee	Federal	64,272
AZ	Camp Navajo	Federal	28,345
AZ	Florence Military Res	Federal	6,495
CA	Camp Roberts	Federal	42,784
CA	Camp San Luis Obispo	State	5,612
CA	Santa Cruz Armory	State	40
CT	Camp Hartell	State	59
CT	Camp Rell	State	82
CT	East Haven Rifle Range	State	121
CT	Stones Ranch Military Res	State	1,862
DE	Bethany Beach TS	State	104
DE	New Castle Rifle Range	Federal	227
FL	Camp Blanding	State	72,000
FL	Snake Creek TS	Federal	322
HI	Keaukaha Military Res	State	509
HI	Kekaha Rifle Range	State	68
HI	Ukumehame Firing Range	State	39
HI	Waiawa Gulch Training Site	Federal	4
IA	Camp Dodge	Federal	31,180
ID	Orchard TS	Federal	138,551
IL	Marseilles TS	State	2,814
IL	Sparta TS	State	2,653
IN	Camp Atterbury	Federal	33,139
IN	Muscatatuck	Federal	63
KS	Kansas Regional TS	Federal	3,536
KY	Disney TS	Federal	558
KY	Eastern Kentucky TS	State	542
KY	Wendell Ford TS	State	11,080
LA	Camp Beauregard TS	State	728
LA	Camp Minden LAAP	State	15,253
LA	Camp Villere TS	State	1,707
MA	Camp Curtis Guild	State	680
MA	Camp Edwards	Federal	14,712

MD	Lil Aaron Straus TS (Baker)	State	6
ME	Casswell-Loring TS	Federal	1,056
ME	Hollis TS	State	425
ME	Auburn TS	Federal	300
ME	Riley/Bog Brook TS	State	10,220
MI	Camp Grayling	State	146,750
MI	Fort Custer	Federal	7,570
MN	Arden Hills TS	Federal	1,496
MN	Camp Ripley	State	52,759
MO	Camp Clark	Federal	1,282
MO	Camp Crowder	Federal	4,362
MO	Macon TS	State	3,083
MO	Truman TS	Federal	691
MO	Wappapello TS	State	2,200
MS	Camp McCain	Federal	12,887
MS	Camp Shelby	Federal	133,882
MT	Fort Harrison	Federal	6,366
MT	Limestone Hills TS	Federal	19,997
NC	Camp Butner	State	4,800
ND	Camp Grafton	State	662
ND	Garrison TS	State	
ND	Williston WETS	State	303
NE	Camp Ashland	Federal	980
NE	Greenlief TS	Federal	3,211
NE	Mead TS	Federal	1,197
NH	New Hampshire NGTS	State	105
NJ	Sea Girt TS	State	167
NM	Black Mountain TS	Federal	2,081
NM	Camel Tracks TS	Federal	9,035
NM	Carlsbad TS	Federal	720
NM	Roswell WETS	Federal	5,212
NV	Floyd Edsall TS	State	3,984
NV	Stead TS	State	370
NY	Camp Smith	State	1,614
NY	Guilderland WETS	State	238
NY	Youngstown TS	Federal	860
OH	Camp Perry	State	640
OH	Ravenna TS	Federal	41,559
OK	Camp Gruber	Federal	33,027

OR	Biak TS	Federal	44,121
OR	Camp Adair	Federal	527
OR	Camp Rilea	State	1,750
PA	Fort Indiantown Gap	State	17,222
PR	Camp Santiago	Federal	11,930
RI	Camp Fogarty TS	Federal	374
SC	Clarks Hill TS	Federal	735
SC	McCrady TS	Federal	15,200
SD	Austin TS	State	384
SD	West Camp Rapid	State	760
TN	Catoosa VTS	Federal	1,627
TN	Milan VTS	Federal	2,466
TN	Smyrna VTS	Federal	868
TN	Tullahoma VTS	Federal	6,311
TX	Camp Bowie	Federal	8,753
TX	Camp Mabry	Federal	376
TX	Camp Maxey	State	6,424
TX	Camp Swift	Federal	11,659
TX	Fort Wolters	Federal	3,990
UT	Camp Williams	Federal	25,000
UT	St George Armory	Federal	70
VA	Camp Pendleton	Federal	348
VA	Fort Pickett	Federal	42,276
VT	Camp Johnson	State	64
VT	Ethan Allen Firing Range	Federal	667
WA	Camp Murray	Federal	231
WI	Camp Wismer TS	State	3,244
WV	Camp Dawson	Federal	4,527
WY	Camp Guernsey	State	40,346
WY	Lander TS	Federal	1,360
WY	Lovell TS	Federal	3,544
WY	Sheridan TS	Federal	3,960
	Total = 107		

NATIONAL GUARD BUREAU
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ARLINGTON VA 22204-1373

ARNG-IEZ

20 MAR 2019

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Army National Guard (ARNG) Installations and Environment (I&E) Directorate Policy for Integrated Natural Resource Management Plans (INRMP)

1. REFERENCES:

a. The Sikes Act, as amended by The National Defense Authorization Act for Fiscal Year 2012, codified at 16 USC §670a et seq.

b. Department of the Army Memorandum, Guidance for Implementation of the Sikes Act Improvement Act, 25 May 2006.

c. Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, 13 December 2007.

d. Department of Defense Manual (DoDM) 4715.03, Integrated Natural Resources Management Plan (INRMP) Implementation Manual, 25 Nov 2013.

e. The Endangered Species Act, as amended by the National Defense Authorization Act of 2004, codified at 16 USC §1533(b)(2) and §1533 (a)(3)(b).

f. Department of Defense Instruction (DoDI) 4715.03, Natural Resources Conservation Program, 18 Mar 2011.

g. U.S. Fish and Wildlife Service Guidelines for Coordination on Integrated Natural Resource Management Plans, Jun 2015

h. Environmental Analysis of Army Actions, 32 CFR Part §651, 29 March 2002.

i. Department of Defense Memorandum, Guidelines for Streamlined INRMP Review, 20 July 2015

2. PURPOSE: Intended as a supplement to references 1b and 1f, this ARNG INRMP Policy supersedes the 9 Apr 12 ARNG Directorate INRMP guidance.

3. APPLICABILITY: This policy applies to all of the 54 States, Territories, and District of Columbia.

4. DEFINITIONS:

a. Compliant INRMP. An INRMP that has been signed in the last 5 years by: the U.S. Fish and Wildlife Service (USFWS) Regional Director (or designated representative); the appropriate State Fish and Wildlife Agency (State Wildlife Agency) Director (or designated representative); the State Guard Adjutant General; and the ARNG Installations and Environment Directorate (ARNG I&E) Chief (References 1a and 1c). An INRMP missing any of the above signatures, or with signatures older than 5 years old, is non-compliant.

b. Operational INRMP. The Army and USFWS consider an INRMP with signatures over 5 years old that is still being used to guide natural resource management to be *Operational* while an Update or Revision is being drafted or reviewed (References 1g and 1i). The State ARNG, USFWS, the State Wildlife Agency, and ARNG I&E must concur in writing on the schedule for the INRMP Update or Revision and have no objections to the natural resource management contained in the existing INRMP for it to be Operational. Concurrence from all parties is required annually for Operational INRMPs.

c. Review for Operation and Effect. The State ARNG will conduct a meeting, to occur no less often than every 5 years, to determine whether the existing INRMP is being implemented to meet Sikes Act requirements (Reference 1a). Required attendees include the State ARNG, USFWS, State Wildlife Agency, and ARNG I&E. The ARNG I&E is required to be notified and will attend in person as funding allows. The result of this meeting will be a joint decision to Update, Revise, or maintain the existing INRMP. Concurrence of all parties that the INRMP is current and effective is equivalent to a newly compliant INRMP and requires updated signatures from all parties. If an Update or Revision is required, attendees will decide if the existing INRMP meets the definition of an Operational INRMP.

5. The INRMP REQUIREMENT:

a. The ARNG military installations may be Federally-owned lands, lands leased, licensed, or permitted by a Federal agency to the State, and State-owned lands upon which the National Guard trains for its Federal mission. All ARNG INRMP preparation, coordination, implementation, and reporting shall be identical regardless of land ownership.

b. Per Reference 1a, military installations with significant natural resources are to prepare an INRMP in cooperation with the USFWS and the appropriate State Wildlife Agency. State ARNGs that believe a new site requires an INRMP will provide ARNG I&E with the location and description of the site, information on the significant natural resource(s) found there, a summary of mission activities, and a narrative supporting the need for an INRMP. ARNG I&E will forward this INRMP request to Headquarters,

Department of the Army (HQDA), unless ARNG I&E determines that the level of management required to manage the significant natural resources does not require an INRMP (Reference 1b).

c. "Significant natural resources" may be defined on a local, regional, national, or international scale (References 1a and 1d). An evaluation for significance should consider the following:

(1) Federally-listed, proposed, or candidate species that are onsite and require management or designated critical habitat occurs or is proposed on ARNG lands.

(2) Level of required management for wetlands, fish and wildlife, forestry, vegetation, erosion control, agricultural outleasing, and grazing.

(3) Degree of active management for special natural features, ecological issues, aesthetics, and outdoor recreational opportunities.

(4) On-the-ground military missions that require conservation measures to minimize impacts (e.g. soil erosion control, invasive species control) and sustain natural resources.

d. State ARNGs that believe a property no longer requires an INRMP will provide ARNG I&E with a request to terminate the INRMP, including the location and description of the site, information on any significant natural resource(s) found there, a summary of mission activities, and a brief narrative describing why the INRMP is no longer necessary. ARNG I&E will forward requests to HQDA unless ARNG I&E determines that the level of management required to manage the significant natural resources does require an INRMP (Reference 1b).

6. GENERAL COORDINATION REQUIREMENTS FOR INRMPs:

a. Each State ARNG shall engage ARNG I&E, USFWS, and the State Wildlife Agency in the scoping, preparation and approval of an INRMP. The State ARNG shall notify these organizations of their intent to prepare an INRMP, invite them to participate in the INRMP preparation process, provide them with the draft INRMP for review and comment, and engage in a dialogue to address their comments and/or concerns to ensure mutual agreement. State ARNGs will keep a log of all communications related to the INRMP review. State ARNGs must engage the National Marine Fisheries Service (NMFS) if the INRMP site has Federally-listed species, Critical Habitat, or Essential Fish Habitat that are under NMFS jurisdiction.

b. Each State ARNG shall use the following process to facilitate coordination within and between the various organizations towards completion of the INRMP unless an

alternative review and approval process has been agreed to by ARNG I&E, USFWS, and the State Wildlife Agency.

(1) Provide the initial draft INRMP to ARNG I&E, the USFWS, and the State Wildlife Agency, concurrently, for review and comment. Send the documents via e-mail with read receipt, or certified mail if applicable, to ensure receipt.

(2) Request ARNG I&E, the USFWS and the State Wildlife Agency provide written comments within 60 days of receipt of the draft INRMP, and request that the wildlife agencies furnish copies of their written comments to the USFWS Regional Sikes Act Coordinator's office and the Director's office of the State Wildlife Agency (Reference 1d). Per DoD and Army policies (References 1b and 1d), there are situations that will extend the review timeline, such as when formal Section 7 Consultation is conducted, when the INRMP is being assessed for an exemption from Critical Habitat, or when consultation is required under the State equivalent endangered species law for State-owned lands. In these cases, the State ARNG shall request the USFWS and/or State Wildlife Agency notify the State ARNG of the appropriate review timeline within 15 days of receipt of the draft INRMP.

(3) Review and address all comments received and send a final draft of the INRMP to ARNG I&E, the USFWS, and the State Wildlife Agency with a letter documenting the actions taken to incorporate the agencies' draft comments. Request all reviewing parties provide comments within 60 days of receipt of the final draft INRMP.

(4) Review and address additional comments received and send the INRMP out to all parties for another 60-day review period if necessary. If mutual agreement is received from ARNG I&E, the USFWS and the State Wildlife Agency, the State ARNG will provide the final INRMP for signature to all parties. INRMPs are not finalized until all parties agree to and sign the INRMP. If a new or revised INRMP, the EA should be sent out for public review when all parties mutually agree on the draft INRMP. If substantive changes are made to the INRMP based on public comments, the State ARNG will provide all parties with the modified INRMP and EA for an additional 15-day review.

(5) If the USFWS or State Wildlife Agency withholds its agreement to an INRMP, the State ARNG will notify ARNG I&E and arrange a meeting with the objecting party to resolve outstanding issues.

c. To expedite the review process, State ARNG should clearly identify changes made to an INRMP Update or Revision (i.e., errata sheet, track changes, summary of changes, etc.) so all stakeholders can focus their review on those elements of the plan they have not reviewed in the past.

d. A new or revised INRMP requires a National Environmental Policy Act (NEPA) Environmental Assessment (EA) and must be reviewed by multiple ARNG Directorate

offices. The EA must meet the requirements of the ARNG NEPA Handbook and, along with the INRMP, be made available for a 30-day public review and comment (Reference 1h).

7. DOCUMENTING CONCURRENCE

a. A compliant plan must include documentation evidencing mutual agreement. Mutual agreement is attained when the INRMP is signed by each of the individuals listed below:

(1) The USFWS regional director or their designee.

(2) Appropriate State Wildlife Agency director or their designee.

(3) State Military Service representative (The Adjutant General).

(4) Army National Guard Directorate (ARNG I&E Chief).

b. An INRMP missing one of the above signatures or with signatures older than 5 years old is non-compliant. Other signatures may be obtained at the discretion of the State ARNG. Letters of concurrence from the above officials are acceptable in lieu of a signature page. Letters that merely indicate that the agency has reviewed the plan or that the agency has no further comments are not sufficient to document a compliant INRMP. See 4 a. above, definition of Compliant INRMP.

8. ANNUAL INRMP REVIEWS AND REPORTING:

a. State ARNGs will review all INRMPs annually, in cooperation with internal (Training, Facilities, etc.) and external (USFWS, State Wildlife Agency) partners. The USFWS and the State Wildlife Agency are required to be invited to the annual review.

b. At a minimum, annual reviews will address the considerations in the Annual Review Template (Enclosure 1), and will include an update to the Project Implementation Table (Enclosure 4). The purpose of the annual review is to document progress, maintain the INRMP, and determine if an INRMP Update or Revision is necessary.

c. State ARNGs shall prepare a memorandum for record detailing the annual review, which shall include the names and offices of all attendees, responses to the Annual Review Template (Enclosure 1), and whether an Update or Revision is necessary. An updated INRMP Implementation Table does not necessitate an official INRMP Update. Annual review documents shall be kept on file to document compliance with the Sikes Act.

d. The State ARNG will forward a copy of the annual review memorandum for record and updated Project Implementation Table to ARNG I&E at the end of each fiscal year. Failure to complete an annual review and associated updates to the Project Implementation Table will affect ARNG I&E validation of Natural Resources funding requests.

9. FIVE-YEAR REVIEW FOR OPERATION AND EFFECT:

a. Per §670a (b)(2) of the SAIA, each INRMP must be reviewed for "Operation and Effect" at least once every 5 years by the State ARNG, USFWS, the State Wildlife Agency, and ARNG I&E. It is recommended that the Review for Operation and Effect be conducted during an annual INRMP review, and well before the INRMP expires.

b. The Review for Operation and Effect is a comprehensive review of the INRMP by the State ARNG, the USFWS, the State Wildlife Agency, and ARNG I&E to assess whether the INRMP is being implemented effectively and contributing to the conservation and rehabilitation of natural resources on State ARNG lands. There is no set outline for a Review for Operation and Effect, but the elements of an annual review are a good framework. The results of a Review for Operation and Effect will be agreement among the reviewing parties that an INRMP is currently adequate and can be re-signed, or if an Update or Revision is necessary.

c. The INRMP Update. If changes to an existing INRMP are required, and these changes are not expected to result in consequences materially different from those in the existing INRMP and analyzed in the existing NEPA document, the State ARNG is not required to conduct an EA under NEPA or provide an additional opportunity for public comment. The INRMP Update will be documented with a Record of Environmental Consideration (REC) that confirms the adequacy of the previous EA in accordance with the Army NEPA regulations (Reference 1h). Practically speaking, INRMP Updates are relatively insignificant changes made to the information in an INRMP in response to annual reviews, but Updates can be made to an INRMP at any time for purposes of addressing Critical Habitat proposals or other emergent needs that do not result in substantive changes to the management of natural resources. Updates can be made to the INRMP in the form of addendums, page replacements, or by other such manner that keeps the INRMP current, organized, and readable.

d. The INRMP Revision. A Revision is required for any change to an INRMP that, if implemented, may result in a significant environmental impact not anticipated by the parties to the existing INRMP or analyzed in the previous EA. Installations that develop INRMP Revisions must conduct a new or supplemental EA of the proposed action under NEPA, and make the INRMP and the environmental document available for a 30 day public review and comment, as appropriate.

e. The State ARNG will send minutes of the Review for Operation and Effect to the USFWS, the State Wildlife Agency, and ARNG I&E for review and concurrence.

f. If an INRMP is determined to be effective with no updates required, this must be documented via a new INRMP signature page signed by the State ARNG, ARNG I&E, the USFWS, and the State Wildlife Agency.

10. OPERATIONAL INRMP:

a. Operational INRMPs are defined as those with signatures over 5 years old that are currently undergoing Updates or Revisions (References 1g and 1i). Operational INRMPs are considered compliant when the USFWS, the State Wildlife Agency, the State ARNG, and ARNG I&E concur in writing on the schedule for the INRMP Update or Revision and have no objections to the natural resource management contained in the existing INRMP (See definition in 4. b. above).

b. Management actions identified in Operational INRMPs shall continue to be programmed and implemented until a Revised or Updated INRMP is finalized. Failure to bring an Operational INRMP into full compliance within the established timeline will result in ARNG I&E's non-validation of that state's Natural Resources funding requests.

11. GOALS AND OBJECTIVES FOR INRMPs:

a. An effective INRMP will provide for the management of the State ARNG's Natural Resources Conservation program, as required by the Sikes Act, by establishing goals for natural resources centered on the military mission and ecosystem health.

b. **Goals** are broad statements of desired future conditions, flexible enough to incorporate a measure of uncertainty, and able to evolve as conditions and knowledge base changes.

c. Goals are supported by **objectives** which are the road map for knowing when and whether a goal is being achieved (i.e., measurable targets for achieving goals). "S.M.A.R.T." objectives are Specific, Measurable, Achievable, Relevant, and Time-bound actions that are implemented to achieve a goal.

d. All natural resources **projects** occurring on ARNG lands, regardless of funding type, shall be described in the INRMP Project Implementation Table and identified as to which goals and objectives they support.

12. The INRMP CONTENT AND FORMAT:

a. During the INRMP planning process, natural resources personnel shall consider appropriate management goals, objectives, and timelines for implementing actions to

protect or enhance State ARNG mission capabilities and ecosystem health when determining INRMP resourcing priorities. At a minimum, each INRMP shall include the information contained in Enclosure 2.

b. All State ARNG INRMPs will contain an Appendix entitled "INRMP Implementation Table" and include all of the information contained in Enclosure 4.

c. State ARNGs with multiple sites requiring an INRMP shall consider combining those sites into a single INRMP. The design of a multi-site INRMP shall contain multiple appendices that can be updated individually without forcing the need for a complete Revision of the document.

d. There is no required format or template for ARNG INRMPs. INRMPs should be clear and concise with a format that focuses on planned actions and that facilitates future updates. An example INRMP outline is included as Enclosure 3. State ARNGs should keep the main text of an INRMP as short and concise as feasible, limiting information on the purpose of the INRMP, relevant laws, and a basic overview of the installation(s) and mission. All other information, including goals, flora summary, fauna summary, maps, and project information should be included in stand-alone appendices that allow for easy updates in the future. The format of an ARNG INRMP should allow for appendices to be updated as necessary without a complete rewrite of the entire INRMP.

13. INTEGRATION WITH OTHER PROGRAMS:

a. INRMPs will address other State ARNG plans and programs and briefly provide a summary of the key inter-relationship with the other plans that are relevant to natural resources conservation and management. Relevant planning documents and programs to address in the INRMP may include, but are not limited to, the Integrated Training Area Management Program, Integrated Pest Management Plan, Army Compatible Use Buffer Program, Integrated Wildland Fire Management Plan, Real Property Master Plan, Integrated Cultural Resources Management Plan, and State Wildlife Action Plans. The INRMP shall provide a reference as to where such documents are available.

b. Consultation with Native Americans, Native Alaskans and Native Hawaiians is required for all new INRMPs and Revisions. The State ARNG will provide Tribes that have a cultural or historical affiliation with the lands encompassed by the INRMP an opportunity to consult. Federally-recognized tribal treaty rights to access natural resources (i.e. hunting, fishing, plant gathering, etc.) on an ARNG installation will be recognized by all State ARNGs as compatible with security requirements.

14. ENDANGERED SPECIES ACT PROVISIONS:

a. The Endangered Species Act (Reference 1e) grants DoD services an exemption from Critical Habitat designation when an INRMP provides a benefit to listed species such as positive management and/or enhancement of suitable habitat for such species.

b. To prevent designation of Critical Habitat onsite and/or land-use restrictions from newly-listed species, State ARNGs need to address the management and conservation of such species in the INRMP; this should be done before the species becomes listed, or while the species is still categorized as Candidate or Proposed. As stated in 10.b. above, management of newly-listed species may be added as an addendum to an existing INRMP with review and signature by the INRMP signatories.

c. For species newly listed under the Federal Endangered Species Act or not otherwise included in the current or Operational INRMP, USFWS recognizes adding an addendum to the INRMP as a method to manage those species and avoid Critical Habitat designation without rewriting the entire INRMP. The addendum must provide a benefit to the applicable species and be signed by the State ARNG, ARNG I&E, State Wildlife Agency, and the USFWS (Reference 1g).

d. The INRMPs will incorporate the results of Endangered Species Act §7 consultations that include conservation measures committed to during informal or formal consultation or reasonable and prudent measures identified in an incidental take statement.

e. Neither informal nor formal Endangered Species Act §7 consultation is required under the Sikes Act for new INRMPs, INRMP Updates, or INRMP Revisions. However, depending on the management activities at ARNG lands, consultation may be advantageous. For example, a State ARNG with proposed natural resources management actions (logging, prescribed fire, etc.), that may affect a listed species can consult on INRMP-wide activities during the INRMP review process to preclude future consultations for site specific impacts.

15. INRMP FUNDING:

a. Implementation and execution of the INRMP are shared responsibilities among those stakeholders that use or have a land management responsibility for ARNG installations. Regardless of funding source, all State ARNG natural resources management projects must be included in the INRMP Implementation Table (Enclosure 4).

b. For projects that require ARNG I&E environmental funds for implementation, State ARNGs shall submit requests via the Status Tool for Environmental Programs (STEP) database. ARNG IEN will not validate Natural Resources projects that are not included

in the INRMP. For information regarding STEP and general environmental program funding refer to the current ARNG I&E Handbook and Program Guidance.

16. The point of contact for this subject is Mr. Eric Beckley, Natural Resources Program Manager at 703-601-7036, or eric.r.beckley.civ@mail.mil.

Encls

William M. Myer
COL, GS
I&E, Army National Guard

DISTRIBUTION:
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Enclosure 1

Annual Review Template

Attendees			
Name	**Agency**	**Phone**	**Email**
Josh Sybrowsky	*State ARNG*	*509-555-3624*	*js@mil.gov*
Brandon Fitzpatrick	*USFWS*	*360-555-6067*	*BF@usfws.gov*
Ned Wilson	*ITAM*	*509-555-8426*	*NW@mil.gov*
Invited – Not in Attendance			
Name	**Agency**	**Phone**	**Email**
Katie Fries	*State Wildlife Agency*	*509-555-1431*	*Kfr@swa.gov*

INRMP Project Implementation
(1) Are INRMP projects, including follow-up inventorying and monitoring work, properly identified, developed, and submitted for funding?
(2) Has project funding been received, obligated, and expended?
(3) What projects have been completed and do they meet expected objectives?
(4) What new projects are proposed?

Federal ESA Listed Species and Critical Habitat
(1) Are conservation efforts effective?
(2) Does the INRMP provide conservation benefits necessary to preclude USFWS Critical Habitat designation?
(3) Are Species at Risk identified and are steps being undertaken to preclude listing?

Partnerships Effectiveness
(1) Has the INRMP review team (State ARNG, USFWS, ARNG I&E, and the State Wildlife Agency) been effective in ensuring the INRMP's implementation?
(2) Are other partnerships needed to meet the INRMP goals?
(3) Have other partnerships been effectively used to meet INRMP goals?
(4) Are internal stakeholders (training, facilities, etc.) effectively coordinating projects?

Fish and Wildlife Management and Public Use
(1) Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to soldiers and employees?
(2) Are public recreational opportunities such as hunting, fishing, and wildlife viewing available to the public?
(3) Does the INRMP and site offer opportunities or facilities for disabled sportsmen?

Team Adequacy
(1) Is the State ARNG's natural resources team adequately resourced to fully implement the INRMP?
(2) Is the State ARNG's natural resources team adequately trained to fully implement the INRMP?

Enclosure 2

Required INRMP Contents

a. No net loss in the capability of military lands to support the military mission of the State ARNG.

b. Identification of legal requirements and conservation law enforcement mechanisms pertinent to natural resources management.

c. Public access to the State ARNG lands, subject to requirements necessary to ensure safety and military security.

d. Consultation with Federally-recognized American Indian and/or Alaska Native governments when tribal treaty rights to natural resources may be impacted.

e. Specific natural resource management goals, objectives and projects with an implementation schedule

f. Summary of general information about the site, its mission and history. To include:

i. Military Mission
ii. Military Land and Natural Resources Management Requirements
iii. Acreage and land ownership status (Federal, State, leased, etc.).
iv. Ecological history of the landscape

g. Summary of the site's natural resources, including but not limited to vegetation communities, topography, soils, climate patterns, water resources, wildlife, Federal and State listed species, other sensitive species, and context within the regional ecosystem. Summaries and descriptions should be grouped into appendices.

h. Management elements

i. Land Management
ii. Fish and Wildlife Management
iii. Habitat Management
iv. Wetlands Management
v. Forest Management

i. Integration of, and consistency among, the various activities conducted under the plan (e.g. forestry, wildland fire, protected species, pest management, etc.)

j. Description of any sensitive areas that Federal regulation or site requirement restricts, such as Critical Habitat, essential fish habitat, invasive species management, wetlands, or other special management areas. Descriptions should be grouped into appendices.

k. Description of forestry, agricultural outleases, and hunting and fishing programs. Descriptions should be grouped into appendices.

l. Description of land management partnerships with other Federal or State agencies, or nongovernmental organizations.

m. Management and procedural recommendations (SOPs, BMPs, etc.) for managing the site's natural resources in ways that are compatible with the State ARNG mission, satisfy legal requirements, and ensure long-term stewardship.

n. Assessment of regional context, challenges and opportunities with respect to managing natural resources on State ARNG lands to include the effects of climate change, landscape scale partnerships, ecosystem services, opportunities for conservation or mitigation banking, compatible use buffer programs, and in lieu of fee banking. Should be grouped into appendices

o. Identification of the critical management requirements necessary for maintaining ecosystem health and integrity to ensure the sustainability of the land for current and future military missions and to ensure effective stewardship of public land.

p. Identification of natural resources related encroachment areas and related impacts to the ARNG mission.

q. Project Table, with all natural resources projects and the goals/objectives they support for the next five fiscal years.

Enclosure 3

Suggested INRMP Outline

Main Document

A. Signature Page
B. Executive Summary
C. Purpose, Scope, and Authorities
D. Overview, General Information, Management Philosophy
E. Implementation, Effectiveness, Roles and Responsibilities, Funding

Appendices

A. Natural Resources Goals and Objectives
B. Project Implementation Table
C. Site Overview (Military Mission, History, Acreage, etc.)
D. Physical Environment (Climate, Geology, Waters, etc.)
E. Flora and Fauna
F. Mission Impacts on Natural Resources
G. Land Management
H. Fish and Wildlife Management
I. Habitat Management
J. Wetlands/Water Management
K. Forest Management
L. Wildland Fire Management
M. Endangered Species Management
N. Resource Protection Guidelines
O. Hunting and Fishing Programs
P. Invasive Species Management
Q. Agricultural Outlease
R. Annual Review Summaries, and 5 year Reviews for Operation and Effect

Enclosure 4

Required INRMP Implementation Table Elements (Sample)

Project Name	Project Description	INRMP Goal	INRMP Objective	STEP Catalog Number	STEP Project Number	Project Class Level (0-3)	Fiscal Year	Status
SA Bat Survey	Project will survey 800 acres for NLEB and Indiana Bat	1 2	1.2 1.3	2505	**TV0NG160911**	1	2016	Complete
Bird Boxes	Install 15 bird boxes around Umtanum Lake	4	4.2	2908	**TV0NG160031**	3	2017-2019	No FY17 funding received. Project pushed to 2019
Wetlands Survey	Project to survey wetlands in recently acquired parcel.	1	1.3	2914	**TV0NG160081**	1	2018	Pending funding
Invasive Species Monitoring	Annual survey of invasive grasses in the Botox maneuver area	2	2.5	2907	**TV0NG160021**	0	2019	Proposed

2019 ARNG INRMP Policy Update

Summary

- **Compliant INRMP -** INRMPs must be signed by the below four parties within the past 5 years to be compliant:
    - TAG
    - Chief, Installations & Environment, Army National Guard
    - U.S. Fish & Wildlife Service
    - State Fish & Game

    - INRMPs missing one of the above signatures, or with signatures over 5 years old are non-compliant.

- '**Operational INRMPs' -** INRMPs with signatures over 5 years old, undergoing an update or revision, with a schedule agreed to in writing by the above four Signatories. Projects in Operational INRMPs are programmed and implemented until an Updated INRMP is completed.

- **STEP Project Validation -** ARNG IEN will not validate natural resources projects that are not included in the INRMP Implementation Table (Enclosure 4) of a compliant INRMP or Operational INRMP.

- **Annual INRMP Review & Update**:
    - All INRMPs must be reviewed and updated annually with internal (Training, Facilities, etc.) and external (USFWS, State Wildlife Agency) partners. External partners may choose not to participate.
    - Annual Updates will include, at a minimum; responses to the Annual Review Template (Enclosure 1), an updated INRMP Implementation Table, and an MFR documenting the Review and Update.
    - The annual update will be forwarded to ARNG I&E at the end of each fiscal year.

- **INRMP Format.** There is no required format for ARNG INRMPs. Overall, INRMPs should be concise documents that focus on land management and not an encyclopedia of natural resources. See Enclosure 3, Suggest INRMP Outline, or ask I&E for an example.

Appendix D: TES INFORMAITON, AVOIDANCE & MINIMIZATION MEASUR

Hawaiian Hoary Bat: The Hoary Bat roosts in both exotic and native woody vegetation across all islands and will leave young unattended in trees and shrubs when they forage. If trees or shrubs 15 feet or taller are cleared during the pupping season, there is a risk that young bats could inadvertently be harmed or killed since they are too young to fly or many not move away. Additionally, Hoary Bats forage for insects from as low as 3 feet to higher than 500 feet above the ground and can become entangled in barbed wire used for fencing.

> **To avoid and minimize impacts to the Hawaiian Hoary Bat,** do not disturb, remove to trim woody plants greater than 15 feet tall during the bat birthing and pup rearing season (June 1 through September 15). Do not use barbed wire for fencing.

Hawaiian Hawk: The Hawaiian Hawk is known to occur across a broad range of forest habitats throughout the island of Hawaii. Loud, irregular and unpredictable activities, such as using heavy equipment or building a structure, near a nest may cause nest abandonment and failure. Harassment of nesting sites can alter feeding and breeding patterns or result in nest or chick abandonment. Nest disturbance can also increase exposure of chicks and juveniles to inclement weather or predators.

> **To avoid and minimize impacts to the Hawaiian Hawk**, try to avoid heavy machinery work during the Hawaiian Hawk breeding season (March 1 through September 30). If work must be conducted, have a biologist familiar with the species conduct a nest search in the project vicinity immediately prior to the start of construction activities. Surveys are only valid for 14 days, ensure surveys are conducted within 14 days before activities will commence. No clearing of vegetation or construction activities should occur within 1,600 feet if any active nest during the breeding season until the young have fledged. Regarless of the time of year, no trimming or cutting of trees containing Hawk nests is allowed, as nests may be re-used during consecutive breeding seasons.

Hawaiian Goose: Nēnē are predominately found on the islands of Hawai‘i , Maui, Molokai, and Kaua‘i, with a small population on O‘ahu. They may be observed in a variety of habitats, but prefer open areas, such as pastures, golf courses, wetlands, natural grasslands and shrublands, and lava flows. Threats to the species include introduced mammalian and avian predators, wind facilities, and vehicle strikes.

> **To avoid and minimize potential project impacts to nēnē**, incorporate the following applicable measures into your project plan: Do not approach, feed, or disturb nēnē. If nēnē are observed loafing or foraging within the project area during the breeding season (September through April), halt work and have a biologist familiar with the nesting behavior of nēnē survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest). Cease all work immediately and contact the Service for further guidance if a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins. In areas where nēnē are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.

Blackburn’s sphinx moth: The Blackburn’s sphinx moth is known from the islands of Hawai‘i , Maui, Lāna‘i, and Kahoolawe, and may be in the vicinity of any proposed project on these islands if host plants are present. Adult moths feed on nectar from native plants, including beach morning glory (*Ipomoea pes-caprae*), ‘ilie‘e (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*); while larvae feed upon non-native tree tobacco (*Nicotiana glauca*) and native aiea (*Nothocestrum* sp.). Moth eggs and larvae are most commonly found feeding on the leaves of native aiea and non-native tree tobacco. To pupate, the larvae burrow into the soil and can remain in a state of torpor for a year or more before emerging from the soil. Soil disturbance can result in death of the pupae.

Avoidance and Minimization Measures: We offer the following survey recommendations to assess whether the Blackburn's sphinx moth is within the project area:*A biologist familiar with the species should survey areas of proposed activities for Blackburn's sphinx moth and its larval host plants prior to work initiation. Surveys should be conducted during the wettest portion of the year (usually November-April or several weeks after a significant rain) and within 4-6 weeks prior to construction. Surveys should include searches for eggs, larvae, and signs of larval feeding (chewed stems, frass, or leaf damage). If moths or the native aiea or tree tobacco over 3 feet tall are found during the survey, please contact the Service for additional guidance to avoid take.* If no Blackburn's sphinx moth, aiea, or tree tobacco are found during pre-construction surveys, it is imperative that measures be taken to avoid attraction of Blackburn's sphinx moth to the project location and prohibit tree tobacco from entering the site. Tree tobacco can grow greater than 3 feet tall in approximately 6 weeks. If it grows over 3 feet, the plants may become a host plant for Blackburn's sphinx moth. Therefore, remove any tree tobacco less than 3 feet tall. *Monitor the site every 4-6 weeks for new tree tobacco growth before, during and after the proposed ground-disturbing activity. Monitoring for tree tobacco can be completed by any staff, such as groundskeeper or regular maintenance crew, provided with picture placards of tree tobacco at different life stages.*

Hawaiian Waterbirds: Threats to Hawaiian waterbirds include non-native predators, habitat loss, and habitat degradation. Hawaiian ducks are also subject to threats from hybridization with introduced mallards. If your project will create, either purposefully or inadvertently, any kind of temporary or permanent standing water, including excavation or grading for construction or roadwork, then it may attract Hawaiian waterbirds to the site. In particular, the **Hawaiian stilt** is known to nest in sub-optimal locations (e.g. any ponding water), if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance.

- **Hawaiian Stilt:** Stilts are commonly found in fresh and brackish-water marshes and natural or man-made ponds, and may also be found wherever ephemeral or persistent standing water may occur. Found on all islands.
- **Hawaiian Coot:** are commonly found in fresh and brackish-water marshes and natural or man-made ponds. Found on all islands.
- **Hawaiian Duck:** are commonly found in fresh and brackish-water marshes and natural or man-made ponds. Found on all islands.
- **Hawaiian Gallinule:** are commonly found in fresh and brackish-water marshes and natural or man-made ponds. Only found on Kauai and Oahu.

Avoidance and Minimization Measures: To avoid and minimize potential project impacts to Hawaiian waterbirds we recommend you incorporate the following applicable measures into your project plan: *In areas where waterbirds are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site or nearby. If water resources are located within or adjacent to the project site, incorporate the applicable best management practices (BMPs) regarding work in aquatic environments into the project design. Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).*

If a nest or active brood is found: *Contact the Service within 24 hours for further guidance. Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer. Have a biological monitor that is*

familiar with the species' biology present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

Hawaiian Seabirds: For all projects, Hawaiian seabirds may traverse the project area at night during the breeding, nesting and fledging seasons (March 1 to December 15). Outdoor lighting could result in seabird disorientation, fallout, and injury or mortality. Seabirds are attracted to lights and after circling the lights they may become exhausted and collide with nearby wires, buildings, or other structures or they may land on the ground. Downed seabirds are subject to increased mortality due to collision with automobiles, starvation, and predation by dogs, cats, and other predators. Young birds (fledglings) traversing the project area between September 15 and December 15, in their first flights from their mountain nests to the sea, are particularly vulnerable

- **Hawaiian Petrel/Band-rumped Storm Petrel:** Hawaiian Petrel populations are greatest on Maui, Lānaʻi, and Kauaʻi with lower densities on Hawaiʻi and Molokai. Band-rumped storm-petrels are found in low densities throughout the islands. All islands may experience overflight at night.
- **Newells Shearwater**: Newell's shearwaters are found in the highest densities on Kauaʻi with lower densities on all of the other islands, except Lānaʻi.

Avoidance and Minimization Measures:

To avoid and minimize potential project impacts to seabirds we recommend you incorporate the following applicable measures into your project plan: *Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary. Install automatic motion sensor switches and timer controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area. Avoid nighttime construction during the seabird fledging period, September 15 through December 15.*

If your project includes a tower or antennae, then the following recommendations should be included in the plan. Listed seabirds have been documented colliding with communication towers, particularly in areas of high seabird passage rate. In general, self-supporting monopoles are the least likely to result in collisions, whereas lattice towers, particularly those that rely on guy-wires, have a much higher collision risk.

To avoid and minimize the likelihood that tower collisions will result in take of listed seabirds we recommend you incorporate the following applicable measures into your project plan: *The profile of the tower should be as small as possible, minimizing the extent of the tower that protrudes above the surrounding vegetation layer, and avoid the use of guywires. If the top of the tower must be lit to comply with Federal Aviation Administration regulations, use a flashing red light versus a steady-beam red or white light. If possible, co-locate with existing towers or facilities.*

If your project occurs near a known seabird colony, please include the following measures: Seabirds have been known to collide with fences, powerlines and other structures near colonies. To avoid and minimize the likelihood of collision we recommend you incorporate the following applicable measures into your project plan: *Where fences extend above vegetation, integrate three strands of polytape into the fence to increase visibility. For powerlines, guywires and other cables, minimize exposure above vegetation height and vertical profile.*

Sea Turtles: Green sea turtles may nest on any sandy beach area in the Pacific Islands. Hawksbill sea turtles exhibit a wide tolerance for nesting substrate (ranging from sandy beach to crushed coral) with nests typically placed under vegetation. Both species exhibit strong nesting site fidelity. Nesting for the Central North Pacific DPS occurs on beaches from May through September, peaking in June and July, with hatchlings emerging through November and December. In the Marianas, nesting may

occur anytime throughout the year, with a peak between April and September. In American Samoa, the nesting and hatching season runs from October to March.

Construction on, or in the vicinity of, beaches can result in sand and sediment compaction, sea turtle nest destruction, beach erosion, contaminant and nutrient runoff, and an increase in direct and ambient light pollution which may disorient hatchlings or deter nesting females. Off-road vehicle traffic may result in direct impacts to sea turtles and nests, and also contributes to habitat degradation through erosion and compaction.

Projects that alter the natural beach profile, such as nourishment and hardening, including the placement of seawalls, jetties, sandbags, and other structures, are known to reduce the suitability of on-shore habitat for sea turtles. These types of projects often result in sand compaction, erosion, and additional sedimentation in nearshore habitats, resulting in adverse effects to the ecological community and future sea turtle nests. The hardening of a shoreline increases the potential for erosion in adjacent areas, resulting in subsequent requests to install stabilization structures or conduct beach nourishment in adjacent areas. Given projected sea level rise estimates, the likelihood of increase in storm surge intensity, and other factors associated with climate change, we anticipate that beach erosion will continue and likely increase.

Where possible, projects should consider alternatives that avoid the modification or hardening of coastlines. Beach nourishment or beach hardening projects should evaluate the long-term effect to sea turtle nesting habitat and consider the cumulative effects.

- Hawksbill sea turtle *(*Endangered*).*
- Green sea turtles *(*threatened in Hawaii*):* and Johnston Atoll, endangered in Mariana Archipelago, American Samoa, and Palmyra, Kingman, Howland, Baker, Wake and Jarvis National Wildlife Refuges.

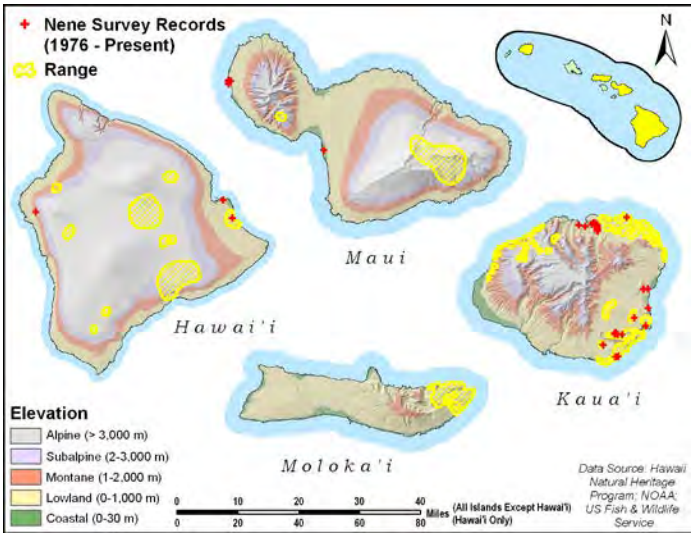
Photo: Jack Jeffery

Nēnē
or Hawaiian goose

Branta sandvicensis

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic
NatureServe Heritage Rank G1 - Critically Imperiled
IUCN Red List Ranking - Vulnerable
Revised Recovery Plan for the Nēnē or Hawaiian Goose (*Branta sandvicensis*) – USFWS 2004

SPECIES INFORMATION: Historically, at least five species of geese (family: Anatidae) occurred in Hawai'i; today, only the nēnē, or Hawaiian goose, survives. Adults are mostly dark brown or sepia with a black face and crown, cream-colored cheeks, and a buff neck with black streaks. Females are smaller than males. Compared to other geese, nēnē are more terrestrial and have longer legs and less webbing between their toes, which likely facilitates walking on lava flows. Nēnē graze and browse on the leaves, seeds, flowers, and fruits of at least 50 native and nonnative grasses, sedges, composites, and shrubs. Diet varies by location and habitat, and they may require a diverse suite of food plants. Currently, several species of nonnative grass are important in mid- and high-elevation habitats. Nēnē facilitate seed dispersal and play an important role in influencing the species composition of early successional plant communities. Historically, flocks moved between high-elevation feeding habitats and lowland nesting areas. Pairs mate for life and engage in relatively simple courtship displays in which the male attacks or threatens potential competitors, runs back to his mate, and calls loudly. Nēnē have an extended breeding season, and nesting may occur in all months except May, June, and July, although the majority of birds nest between October and March, and most clutches are laid between October and December. Nests consist of a shallow scrape lined with plant material and down. Breeding pairs usually return to the previous year's nest site, typically in dense vegetation; when available, kīpuka may be preferred. Females lay two to five eggs, which hatch after 30 days. Young are precocial and not fed by their parents; however, they remain with their parents for up to a year.



DISTRIBUTION: Between sea level and 2,400 meters (7,800 feet) elevation on the island of Hawai'i, Maui, Kaua'i, and Moloka'i, and a single pair was reported on O'ahu in 2014. Historically, the

species was found on all Main Hawaiian Islands and was likely widespread.

ABUNDANCE: In 1951, the wild nēnē population was estimated at 30 individuals and information on historical abundance is limited. The current population is estimated at 2,450–2,550 birds, with 550 on the island of Hawai'i, 400 on Maui, 1,500 on Kaua'i, 80 on Moloka'i, and a single nesting pair reported on O'ahu in 2014. During 2005-2010, about 224 nēnē were removed from near the Kaua'i Airport and released at remote relocation sites on that island to reduce the risk of bird-aircraft strikes. Since 2011, the continued growth of the Kaua'i nēnē population prompted the removal of an additional 600 nēnē from the vicinity of the Kaua'i Airport and which were released into the wild on Hawai'i and Maui.

LOCATION AND CONDITION OF KEY HABITAT: Nēnē historically occurred in lowland dry forest, shrubland, grassland, and montane dry forest, and shrubland. Current habitat preferences are likely biased by the location of release sites of captive-bred birds. They currently use a wide variety of habitats including coastal dune vegetation and nonnative grasslands (e.g., golf courses, pastures, rural areas), sparsely vegetated low- and high-elevation lava flows, mid-elevation native and nonnative shrubland, early successional cinderfall, cinder deserts, native alpine grasslands and shrublands, and open native and nonnative alpine shrubland-woodland community interfaces. Nesting occurs in a variety of habitats, including beach strand, shrubland, grassland, and lava rock, and at a range of elevations. On the islands of Hawai'i and Maui, most nests are built under native vegetation, such as pūkiawe (*Styphelia tameiameiae*), 'a'ali'i (*Dondonaea viscose*), and 'ōhi'a (*Metrosideros polymorpha*). On Kaua'i, however, most nesting areas are dominated by nonnative species, and nēnē often nest under Christmas berry (*Schinus terebinthifolius*), shrub verbena (*Lantana camara*), and ironwood (*Casuarina* spp.). The condition of habitats occupied by nēnē varies considerably. Many of the areas used by the species are managed for conservation by the State of Hawai'i and the U.S. Fish and Wildlife Service (USFWS).

THREATS: Historical threats included habitat loss and degradation, hunting, and predation by rats (*Rattus* spp.), cats (*Felis silvestris*), dogs (*Canis familiaris*), and the small Indian mongoose (*Herpestes auropunctatus*). Current threats include predation by nonnative mammals; exposure to diseases that can be transmitted by introduced nonnative animals such as feral and domestic cats (e.g. toxoplasmosis); nutritional deficiencies due to paucity of quality habitat, exposure stress at high-elevation habitats; a lack of contiguous lowland habitat; human-caused disturbance and mortality (e.g., road mortality, disturbance by hikers, aircraft strikes, collisions with wind turbines); behavioral problems related to captive propagation; and inbreeding depression.

CONSERVATION ACTIONS: Past and current actions include captive propagation and release of captive-bred individuals into the wild, predator control, habitat enhancement, research and monitoring, private conservation efforts, formation of the Nēnē Recovery Action Group, and public education. Other actions specific to conservation of nēnē should include the following:

- Enhance and protect habitats used by nēnē, including foraging habitat, breeding grounds, and summer flocking areas.
- Increase predator control effort and effectiveness, including use of predator-proof fences. Increase efforts to detect and remove mongooses from Kaua'i.

- Significantly increase efforts to minimize negative human-nēnē interactions through public education and outreach focused on communities or areas where the number of nēnē are known to be increasing; continue to promote avoidance and minimization measures that will reduce the risk of collisions with vehicles , aircraft, and wind turbines.
- Develop a statewide long-range management plan for nēnē that includes all of the distinct populations and anticipates changes resulting from management actions and human interaction.
- Continue the nēnē population reintroduction efforts and establish additional populations only where risks can be minimized and habitat quality can support recovery.

MONITORING: Continue surveys to monitor abundance and distribution and annual productivity.

RESEARCH PRIORITIES:

- Standardize survey and monitoring protocols and develop a platform for data sharing.
- Conduct studies on diet and nutrition, particularly as it relates to forage quality of nonnative versus native vegetation, focusing on the needs of goslings and breeding females.
- Refine predator control and exclusion methods.
- Evaluate movement patterns and habitat use by nēnē.
- Evaluate and refine translocation and release methods that incorporates monitoring subsequent dispersal and movement patterns, survival, and reproduction.
- Investigate population genetics as a management tool to monitor the potential for inbreeding.

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From: Kim, Jiny
To: Barker, Kristine P NFG (US)
Subject: [Non-DoD Source] Re: [EXTERNAL] Reclassifying the Nene (UNCLASSIFIED)
Date: Monday, April 23, 2018 9:30:00 AM

Hi Kristine,

Here's what our office said regarding the nēnē:

During the 60-day public comment period, we also reach out for peer review. After the comment period closes, we evaluate comments from the public and peer reviewers, take into account any new data or information on the species status and 4(d) rule provisions, meet with stakeholders, as appropriate. The draft final rule with our recommendations is developed with a target date for publication 1-year from the date the proposal was published (April 2019). Hope that helps.

Let me know if you need more information that the above.

Jiny

On Fri, Apr 20, 2018 at 8:58 PM, Kim, Jiny <jiny_kim@fws.gov < Caution-mailto:jiny_kim@fws.gov > > wrote:

Hi Kristine. So sorry for taking so long to get back to you. I am not sure what the time frame is after we get the comments. We usually have a quick turnaround to address comments and either make revisions or not depending on the best available science. But I will be honest with you that I don't really know. I can find out from our team what typically is timeframe and what happens and get back to you. I just didn't want to take longer than I already had in responding.

I wish I was paddling this year. I cannot because keiki activities come over my own activities :/ Good and sad but really good they get to do the things we do! How are your kids? I love seeing them occasionally on instagram :)

Aloha,
Jiny

On Tue, Apr 3, 2018 at 9:16 AM, Barker, Kristine P NFG (US) <kristine.p.barker.nfg@mail.mil < Caution-mailto:kristine.p.barker.nfg@mail.mil > > wrote:

CLASSIFICATION: UNCLASSIFIED

Hey Jiny,

I saw that USFWS is proposing to reclassify the Nene as threatened rather than endangered. I was wondering if you know how long something like this takes? I see that public comments are due by June 1st, but wasn't sure what next steps USFWS has to take before reclassifying? Hope all is well, you paddling this year?

Aloha,
Kristine Barker
Acting Conservation Manager/
Cultural Resources Specialist
Hawaii Army National Guard
808-672-1264 office
808-445-8301 cell

CLASSIFICATION: UNCLASSIFIED

U.S. FISH AND WILDLIFE SERVICE

Recovery of the Hawaiian hawk or ‘Io

Introduction

The Hawaiian hawk (*Buteo solitarius*) was listed as endangered on March 11, 1967, based on its restricted range (found only on the island of Hawai‘i), its small population size, and the loss of native forest habitat from agriculture, logging and commercial development.
However, at the time of listing there had been no systematic surveys or ecological studies of the species, and the only information available was from anecdotal accounts that gave differing reports on its abundance and population trend in various parts of the island.

Due to implementation of recovery actions and other conservation efforts, the species is now found throughout the island of Hawai‘i and has had a stable population for at least 20 years. It is nesting and foraging successfully in both native and altered habitats and has large areas of protected habitat. The Hawaiian hawk is not currently threatened by overutilization, disease, predation, contaminants, lack of adequate regulatory mechanisms, or other factors, and therefore no longer meets the definition of a threatened or endangered species throughout its range.

On August 6, 2008, the U.S. Fish and Wildlife Service proposed to remove the Hawaiian hawk from its current listing as endangered under the Endangered Species Act because the population is secure and no longer requires federal protection.

Description

The Hawaiian hawk is a small, broad-winged species of hawk endemic to the Hawaiian Islands and is the only member of the hawk family that nests and resides in the islands. This graceful bird of prey measures 16 to 18 inches in length, the female being larger. Two color phases exist: a dark phase (dark brown head, breast, and underwings), and a light color phase (dark head, light breast and light underwings). Feet and legs are yellowish in adults and greenish in immatures.

Hawaiian hawks mate for life and defend their territories year-round. Eggs are laid from March to June and the eggs hatch from May to July. The young birds fledge from July to September. A typical clutch consists of one egg.

Distribution

Currently, the hawk is known to breed only on the island of Hawai‘i, but there have been at least eight observations of the species on the islands of Kaua‘i, O‘ahu, and Maui since 1978, and fossils are known from the islands of Moloka‘i and Kaua‘i. The current range of the hawk is estimated to encompass 2,372 square miles, comprising 58.7 percent of the island of Hawai‘i.

Population Estimates

The first detailed study of the ecology and life history of the hawk provided a population estimate of 1,400-2,500 birds. Subsequent studies have confirmed that the species is broadly distributed throughout the island of Hawai‘i, and has been stable in number for at least 20 years.

The most recent islandwide survey completed in 2007 utlized updated methodologies to calculate the population and density estimates for the 1998-1999 survey data and compared it with the 2007 results. They found that the Hawaiian hawk population numbered 3,239 individuals in 1998 and 3,085 in 2007. Thus, there was no significant difference in population densities found in 1998 and 2007, and there was no evidence that the hawk's islandwide distribution had changed.

What happens if the species is removed from the Federal List of Endangered and Threatened Wildlife?

The proposed rule, if made final, would remove the Hawaiian hawk from the Federal List of Endangered and Threatened Wildlife and remove all protections provided under the Endangered Species Act. The hawk will remain protected under the Migratory Bird Treaty Act, a federal law that prohibits "taking" – killing, selling or otherwise harming migratory birds, their nests or eggs.

Post Delisting Monitoring Plan

As required by the Endangered Species Act, once delisted, the Hawaiian hawk will be monitored for a minimum of five years following delisting. A draft post-delisting monitoring plan was developed by the Service in coordination with the State of Hawai'i, U.S. Geological Survey Biological Resources Discipline, and the National Park Service. The Service proposes to conduct monitoring via islandwide surveys every five years for a period of 20 years, from 2012 to 2032. Post-delisting monitoring ensures that all species delisted due to recovery remain secure from risk of extinction after the protections are removed.

The U.S. Fish and Wildlife Service can initiate procedures to re-list the 'io, including, if appropriate, emergency listing if data from this monitoring effort or from some other sources indicate that the bird is experiencing significant declines in abundance or distribution, that its survival or territory occupancy are declining significantly, or that it requires protective status under the Act for some other reason. Copies of the proposed rule and draft post-delisting monitoring plan may be downloaded from the Service's website at **http://www.fws.gov/pacificislands**, or obtained by calling the Fish and Wildlife Service office in Honolulu at 808 792-9400.

Cultural Significance

In traditional Hawaiian culture, the 'io is believed to be an "'aumakua" – a family or personal god in the shape of an animal. Mortals did not harm or eat 'aumakua, and in return, the 'aumakua would warn and reprimand mortals in their dreams, visions and calls. Also, 'io are considered a symbol of Hawaiian royalty because of their lofty flight.

How do I submit comments?

The Service has already received a number of comments on the proposed rule and is continuing to seek biological data and comments from the public. We are especially interested in comments pertaining to biological, commercial trade, or other relevant data concerning any threats to this species; additional information concerning the range, distribution, and population size of this species, including the locations of any additional populations; current or planned activities in the areas occupied by the species and possible impacts of these activities, as well as data on population trends.

Comments and materials concerning this proposed delisting should be sent to "Federal eRulemaking Portal at **http://www.regulations.gov**." Comments and materials may also be mailed or hand-delivered to: Public Comments Processing, Attn: RIN 1018-AU96; Division of Policy and Directives Management, U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, Suite 222; Arlington, VA 22203.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals and commitment to public service. For more information on our work and the people who make it happen, visit **www.fws.gov**.

Note the following:

- No changes in utilization are assumed in this analysis.
- Medicare Advantage spending would be reduced proportionately to the reduction in FFS spending.
- Included drugs would represent 61 percent of Part B allowed drug spending in years 1 and 2, 81 percent of Part B allowed drug spending in years 3 and 4, and 94 percent of allowed drug spending in year 5.
- The Medicaid impact represents the portion of Medicare cost-sharing that is paid on behalf of dual beneficiaries. It is estimated based on the change in Medicare cost-sharing and current dual beneficiary enrollment. No assumptions are made for State price limitations that would limit the beneficiary cost-sharing paid for by Medicaid.
- Effects on private market cannot be estimated at this time and are not reflected in this analysis.

b. Medicaid Impacts

Based on a review of the Part B drugs that constituted the majority of Part B drug spending in 2017, as well as the top reported Medicaid drugs that were also covered by Part B, the affected drugs reimbursed by Medicaid spending totaled at least $4 billion in 2017, or an estimated 6 percent of gross Medicaid drug spending. The model may impact AMP, ASP, best price, and 340B pricing for these affected drugs, reducing both reimbursements as well as rebates. CMS would seek comment on whether we should exempt prices offered under the model from AMP and Best Price calculations.

2. Potential Impacts on Medicare Providers and Suppliers Participating in the Potential IPI Model

The potential IPI Model would affect a significant number of health care providers that would furnish included drugs to included Medicare beneficiaries. The effect of the model on individual hospitals, physicians, practitioners, and other providers and suppliers would depend on individual practice patterns and the drugs that would be selected for inclusion.

IV. Collection of Information Requirements

This ANPRM is a general solicitation of comments on several options pertaining to the potential IPI Model and thereby not subject to OMB review as stated in the implementing regulations of the Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 *et seq.*) at 5 CFR 1320.3(h)(4). Should the outcome of the ANPRM result in any information collection requirements or burden that are not covered under the provisions in section 1115A(d)(3) of the Act [26] or otherwise covered under a PRA exemption, a detailed discussion of the requirements and burden will be submitted to OMB for approval. In accordance with the implementing regulations of the PRA at 5 CFR 1320.11, interested parties will also be provided an opportunity to comment on such information through subsequent proposed and final rulemaking documents.

V. Response to Comments

Because of the large number of public comments we normally receive on **Federal Register** documents, we are not able to acknowledge or respond to them individually. We will review all comments we receive by the date and time specified in the **DATES** section of this preamble, as we continue to consider the model presented in this ANPRM.

In accordance with the provisions of Executive Order 12866, this ANPRM was reviewed by the Office of Management and Budget.

Dated: October 25, 2018.

Seema Verma,

Administrator, Centers for Medicare & Medicaid Services.

Dated: October 25, 2018.

Alex M. Azar II,

Secretary, Department of Health and Human Services.

[FR Doc. 2018–23688 Filed 10–25–18; 4:15 pm]

BILLING CODE 4120–01–P

[26] As stated in section 1115A(d)(3) of the Act, Chapter 35 of title 44, U.S.C., shall not apply to the testing and evaluation of models under section 1115A of the Act

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R1–ES–2007–0024; FXES11130900000C6–189–FF09E42000]

RIN 1018–AU96

Endangered and Threatened Wildlife and Plants; Removing the Hawaiian Hawk From the Federal List of Endangered and Threatened Wildlife

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule; document availability and reopening of comment period.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce the reopening of the public comment period on the August 6, 2008, proposed rule to remove the Hawaiian hawk or io (*Buteo solitarius*) from the List of Endangered and Threatened Wildlife (List) under the Endangered Species Act of 1973, as amended (Act). Comments submitted during the 2008 comment period, 2009 reopened comment periods, and 2014 reopened comment period do not need to be resubmitted, and will be fully considered in preparation of our final rule. We are reopening the comment period once more to present information we have received since 2014 that is relevant to our consideration of the status of the Hawaiian hawk. We encourage those who may have commented previously to submit additional comments, if appropriate, in light of this new information. In addition, we are also seeking input on considerations for post-delisting monitoring of the Hawaiian hawk. Our goal is to respond to comments and come to a final determination on the status of the Hawaiian hawk in the form of a final rule by the end of 2018.

DATES: The comment period for the proposed rule published August 6, 2008, at 73 FR 45680 is reopened. To ensure that we are able to consider your comments and information, they must be received or postmarked no later than November 29, 2018. Please note that, if you are using the Federal eRulemaking Portal (see **ADDRESSES**, below), the deadline for submitting an electronic comment is 11:59 p.m. Eastern Time on this date. We may not be able to address or incorporate information that we receive after the above requested date.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–R1–ES–2007–0024, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rule box to locate this document. You may submit a comment by clicking on ''Comment Now!'' Please ensure that you have found the correct rulemaking before submitting your comment.

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R1–ES–2007–0024, U.S. Fish and Wildlife Service, MS: BPHC, 5275 Leesburg Pike, Falls Church, VA 22041–3808.

We request that you send comments only by the methods described above. We will post all comments on *http://*

www.regulations.gov. This generally means that we will post any personal information you provide us (see Public Comments, below, for more information).

Document availability: The 2008 proposed delisting of the Hawaiian hawk, comments received during all the open comment periods, and the draft post-delisting monitoring plan (draft PDM plan) are available on *http://www.regulations.gov*. In addition, the supporting file for this proposed rule will be available for public inspection, by appointment, during normal business hours, at the Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850; telephone 808–792–9400.

FOR FURTHER INFORMATION CONTACT: Mary Abrams, Field Supervisor, telephone: 808–792–9400. Direct all questions or requests for additional information to: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Room 3–122, Honolulu, HI 96850. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Species Information and Previous Federal Actions

On August 6, 2008, we published a proposed rule to delist the Hawaiian hawk (io) (73 FR 45680). Please refer to that proposed rule and the recovery plan (which can be found at: *http://ecos.fws.gov/docs/recovery_plan/840509.pdf*) for information about the Hawaiian hawk, its status, its threats, and a summary of factors affecting the species. Please refer to our February 12, 2014, notice to reopen the comment period for a summary of all previous Federal actions (79 FR 8413).

Since the 2008 proposed rule, we opened three additional comment periods. During these comment periods, we received new or updated information on projected urban growth rates and conversion of agriculture lands to unsuitable Hawaiian hawk habitat; and potential effects of climate change (*e.g.,* increased frequency or prolonged drought), rapid ohia death (ROD), and invasive plants (*e.g., Psidium cattleianum* (strawberry guava)) on Hawaiian hawk habitat. The majority of relevant information that has become available since our 2008 proposal to delist the Hawaiian hawk comes from over 173 public comments, 4 independent peer reviews, comments from the State of Hawaii and county agencies and the National Park Service, recent publications, and further evaluation of existing information. Information pertaining to the status of the species that has become available to us since the 2014 notice is provided below.

New Information

Since the 2014 notice to reopen the comment period, we received updated information on trends in human population growth, urbanization, and land subdivision; biocontrol efforts for strawberry guava; impacts from ROD and climate change; and recent volcanic activity. We have also received some preliminary data from an in-house population viability assessment (PVA) (Vorsino and Nelson 2016, unpublished data). In addition, we are not aware of any changes in the status of the biofuel crop production or processing facility on the island since 2014 that would impact the status of the Hawaiian hawk.

Although trends in urban and exurban growth, and land subdivision show upward movement, the rate of growth has slowed. Population growth for Hawaii County between 2010 and 2017 was 1.1 percent annually, 0.5 percent lower than the 1.6 projection in 2012 (Hawaii Department of Business, Economic Development and Tourism (HDBEDT) 2018, in litt.). The number of new homes built per year has also decreased (County of Hawaii 2015, p. 146). Most urban and exurban growth is occurring in or adjacent to already developed areas (County of Hawaii 2015, p. 77, 150). We expect residential and exurban construction for Hawaii County to continue at a similar pace in the foreseeable future as indicated by expected human population growth for Hawaii County and home construction for the island of Hawaii for the last three decades (County of Hawaii 2010, tables 16.1–16.13; County of Hawaii 2015, pp. 144–146, 149–150; HDBEDT 2018, in litt.). Urban and exurban growth and subdivisions in Puna may slow even more due to the recent volcanic activity of Kilauea, which began in May 2018. The north Kona region has one of the highest urban and exurban growth rates on the island (County of Hawaii 2015, p. 11), as well as one of the highest densities of Hawaiian hawk (Gorresen *et al.* 2008, p. 42).

Since the successful deployment in 2012 of a biocontrol agent for strawberry guava (the Brazilian scale insect, *Tectococcus ovatus*) during field trials, the State of Hawaii and other partners have been working to establish *Tectococcus* on strawberry guava invaded forests throughout the islands (Chaney and Johnson in HCC 2013, p. 74; Chaney and Johnson 2018, in litt.; Kerr 2018, pers. comm.). Currently, the insect is established and reproducing on strawberry guava at multiple forest sites on five islands (Hawaii, Kauai, Lanai, Maui, and Oahu) (Chaney and Johnson 2018, in litt.). Under favorable conditions, *Tectococcus* populations have increased rapidly and spread 33 to 262 feet (10 to 80 meters) in a period of several months (Chaney and Johnson 2018, in litt.). The scale typically weakens the trees through its feeding, reducing the ability of the tree to fruit and set seed, thereby limiting its spread (U.S. Forest Service 2016, in litt.). The scale is not expected to kill already established trees (Hawaii Department of Agriculture 2011, in litt.). It is too early to know what effect this may have on guava tree vigor and rate of spread; however, infestations of *Tectococcus* are expected to spread gradually on the target plant, reaching damaging levels within a few years at each release site (Kerr 2018, pers. comm.). The Forest Service will continue to provide technical assistance and monitor the impacts of biocontrol. It is expected that a noticeable decrease in the spread of strawberry guava will be observed over a period of years (Kerr 2018, pers. comm.).

Hawaiian hawks frequently nest in native ohia (*Metrosideros polymorpha*), an evergreen tree in the myrtle family. In 2013, landowners in lower Puna District noticed an increased rate of what was thought to be ohia dieback (Friday and Friday 2013, entire), a phenomenon where trees affected show progressive dieback accompanied by browning of the leaves, reduction in leaf size, and death of all or part of the crown (Hodges *et al.* 1986, p. ii.). Although ohia dieback may have been the culprit of some of the observed dieback leading up to the 2013 report (Friday and Friday 2013, entire), we now believe that at least some of this dieback was actually caused by ROD. In addition to the other information we request in Public Comments, below, we request new information on ROD and its potential or actual impact on Hawaiian hawk.

Although new information shows negative habitat trends due to urbanization, nonnative plant species invasion, and ROD, efforts at habitat restoration that benefit the Hawaiian hawk are being implemented and are achieving success.

Both State and private foresters report an increase in forest areas on the island of Hawaii, particularly in native forest areas (Koch and Walter 2018, in litt.). Starting at the turn of the century, several large landowners (private, Federal, and State) have ended their

pastoral leases and are steadily promoting natural regeneration to take the place of old pastures (Koch and Walter 2018, in litt.). While we know this conversion is occurring, we do not have an exact number of acreage. Additionally, when economically feasible, many nonnative timber plantations in the State have begun planting native timber species, most often koa (*Acacia koa*), post-harvest (Koch and Walter 2018, in litt; Walter 2018, pers. comm.). We do not have an exact number regarding this conversion, but we know it is ongoing. The suitability of koa plantations for Hawaiian hawk foraging and nesting has not been studied, and hawk use of these areas may be variable, because koa plantations likely differ in their suitability as hawk habitat depending upon age of koa stands, stand density, and overstory characteristics related to harvest methods used. A new forest planting project between Waimea and Ahualoa will convert 565 acres (ac) (229 hectares (ha)) of grassland to koa and koa-ohia forests in the next 10 years (Koch and Walter 2018, in litt.).

There has also been a marked increase in protection of native forests-which combined with an increase in forest areas results in increased protection for the Hawaiian hawk by protecting potential nesting, breeding, and hunting habitat. Several large conservation efforts across the island are being implemented by Federal, State, and private landowners, often in collaborative efforts.

Fencing and ungulate removal at Puu Waawaa Forest Bird Sanctuary and parts of the State's Natural Area Reserve System contribute to Hawaiian hawk habitat restoration (Gorresen *et al.* 2008, p. 26) because it helps control the spread of invasive plants such as strawberry guava as well as contributes toward the natural regeneration of native or native exotic mixed habitat which in turn provides potential nesting, breeding, and foraging opportunities for the hawk. The Kohala Watershed Partnership, Mauna Kea Watershed Alliance, and TMA, which collectively encompass approximately 1,688,300 ac (675,137 ha) on Hawaii, have been fencing, outplanting native plants, and removing nonnative species since 2003, 2008, and 2009, respectively (*http://hawp.org/*). Currently, these entities conduct restoration actions on over 80,000 ac (32,374 ha) of forest area on Hawaii (TMA 2007, p. 41; Hawaii Department of Land and Natural Resources (DLNR) 2011, p. 16; State of Hawaii 2012, pp. 43–44; State of Hawaii 2017, pp. 1–6; Cole 2018, in litt.; Dwight 2018, in litt.; Perry 2018, in litt.; *http://hawp.org/*). This value is likely an underestimate as there are so many partners conducting restoration activities that it is difficult to know exactly how many acres are being managed by each entity. Additional activities implemented by the three watershed partnerships on the island of Hawaii include programs that implement fencing inspections and necessary replacements, native species surveys, greenhouse and plant propagation, prevention of the spread of ROD, and outreach (TMA 2007, p. 41; DLNR 2011, p. 16; State of Hawaii 2012, pp. 43–44; State of Hawaii 2017, pp. 1–6; Cole 2018, in litt.; Dwight 2018, in litt.; Perry 2018, in litt.; *http://hawp.org/*).

In 2016, the Governor of Hawaii initiated the Sustainable Hawaii Initiative (Initiative) in response to the 2016 World Conservation Congress Legacy Commitment to protect 30 percent (253,000 ac (102,385 ha)) of Hawaii's highest priority watershed forests by 2030 (*http://governor.hawaii.gov/sustainable-hawaii-initiative/*). Through this Initiative, the amount of priority watershed areas under high level of protection has increased from 10 to approximately 15 percent (*http://governor.hawaii.gov/sustainable-hawaii-initiative/;* State of Hawaii 2017, in litt.; *https://dashboard.hawaii.gov/en/stat/goals/5xhf-begg/4s33-f5iv/wtjm-96jt*). The Initiative has outplanted 20,000 native trees, and increased invasive plant control by 130,000 ac (52,609 ha) (State of Hawaii 2017, in litt). In addition, the Hawaii Department of Land and Natural Resources (DLNR), with funding from the Initiative, constructed 22 miles (35 kilometers) of fencing in the Kau watershed, and fenced 24,000 ac (9,712 ha) in the Manuka NAR, to protect these areas from the negative impacts of pigs and other ungulates (Smith 2013, in litt.; State of Hawaii 2014, p. 1). These measures benefit the Hawaiian hawk by securing potential nesting, breeding, and hunting habitat.

Over the past 6 years, the Hawaiian Legacy Reforestation Initiative (HLRI) has converted 1,000 ac (405 ha) of denuded pastureland into an intact ecosystem with over 300,000 endemic trees (*e.g.,* ohia, milo (*Thespesia populnea*), sandalwood (*Santalum* species), and koa), outplanted and a plans to outplant approximately 700,000 more endemic trees over the coming years (HLRI 2018, in litt.; *https://legacytrees.org/*).

Additional ongoing conservation efforts (*e.g.,* nonnative plant and animal removal, fencing, and outplanting native species) are implemented by, but not limited to, the Nahelehele Dryland Forest Restoration program (*http://www.drylandforest.org/*), partnerships working in the Puu Waawaa watershed (*e.g.,* the multi-agency Hawaii Experimental Tropical Forest (*http://www.hetf.us/page/home/*)), The Nature Conservancy's Kona Hema Preserve (*https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/hawaii/placesweprotect/kona-hema.xml*), Hawaii Volcano's National Park, Hakalau National Wildlife Refuge, and the Statewide Sustainable Hawaii Initiative (*https://governor.hawaii.gov/sustainable-hawaii-initiative/*). Additionally, there are many State Natural Area Reserves and Forest Reserves, and several wildlife sanctuaries that provide additional forest areas for Hawaiian hawks and other native species; however because hunting is allowed on many of the Natural Area Reserves and Forest Reserves, they are not maintained solely as protected areas for native species (*https://dlnr.hawaii.gov/recreation/hunting/*). As previously mentioned, forested areas, particularly native forest areas, are increasing on the island of Hawaii (Koch and Walter, 2018, in litt.); however we do not have an exact number to quantify this increase.

At the onset of the most recent Kilauea volcano eruption (May 2018), primarily private lands were impacted; however, more recently the ongoing eruption has impacted native forest areas. In June 2018, the 1,514 ac (613 ha) Malama Ki Forest Reserve (FR) and surrounding areas were either buried by acres of lava or scorched by fumes of sulphur dioxide (Bergfield 2018, in litt.; KHON2 2018, in litt.). This area previously provided habitat for endangered forest birds and plants, and other native species. We do not have an exact number of how much native forest has been, or will be, lost as the eruption is ongoing. The Kilauea eruption is so far concentrated to the East Rift Zone area (USGS 2018, in litt.).

The island of Hawaii, like the island chain, has fortunately evaded most hurricanes due to the surrounding cool water. An exception occurred in 2014 with Hurricane Iselle. Although Hurricane Iselle morphed into a tropical storm before making landfall on the island, it caused extensive canopy loss in some regions of the island (Federal Emergency Management Agency (FEMA) 2014, in litt.). Iselle was the strongest tropical storm to make landfall on the island of Hawaii in recorded history. In 2016, Hurricane Darby made landfall on the island of Hawaii but as a much weaker tropical storm. While

both of these hurricanes caused canopy loss in some regions of the island, no analysis has been done to determine impacts to Hawaiian hawk habitat. Recent data indicate that Hawaii may experience an increase in hurricane frequency and intensity due to increases of both ocean surface temperatures and El Niño events associated with a warming global climate system (Cai *et al.* 2015, pp. 1, 4–5; Herring *et al.* 2015, p. Sii; Knutson *et al.* 2015, p. 7222; Murakami *et al.* 2015, p. S118; Wing *et al.* 2015, pp. 8673–8676; Fletcher 2016, p. 14).

A preliminary female specific stochastic PVA model for the Hawaiian hawk was developed (Vorsino and Nelson 2016, unpublished data) using the mean and variance values of age-specific survival and fecundity (ability and willingness to produce offpring) in native, mixed native-exotic, and exotic habitat (Gorresen *et al.* 2008, p. 15; Klavitter *et al.* 2003, p. 170). Population viability was assessed for optimal and sub-optimal habitats, where population partitioning was based on Hawaiian hawk densities within the habitat types (optimal/sub-optimal) reported in Gorresen *et al.* (2008, p. 15). The effect of catastrophic weather events on the viability of Hawaiian hawk in these various habitat types was also projected and assessed. None of the projected PVAs showed a Hawaiian hawk population that declined to either zero, or below a quasi-extinction threshold of 50 individuals, when projected over 30 years across 500 model iterations.

Current analysis of biodiesel fuel development indicates that construction and testing of facilities on the island of Hawaii has plateaued at 2014 levels, with just one biodiesel facility on the island. In addition to the other information we request in Public Comments below, we request new information on the actual conversion of agricultural land to crops for biodiesel fuel production, including former and current crop type and acreage.

Post-Delisting Monitoring Plan

Section 4(g)(1) of the Act requires us, in cooperation with the States, to implement a monitoring program for not less than 5 years for all species that have been delisted due to recovery. The purpose of this requirement is to develop a program that detects the failure of any delisted species to sustain itself without the protective measures provided by the Act. If, at any time during the monitoring period, data indicate that protective status under the Act should be reinstated, we can initiate listing procedures, including, if appropriate, emergency listing.

The Service has developed a draft post-delisting monitoring (PDM) plan for Hawaiian hawk in cooperation with the State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW); the National Park Service (NPS); and the U.S. Geological Survey, Ecosystem Mission Area (formerly the Biological Resources Division). The draft PDM plan includes monitoring the Hawaiian hawk population every 5 years for 20 years and is designed to verify that the Hawaiian hawk remains secure from risk of extinction after its removal from the Federal List of Endangered and Threatened Wildlife. While not required, with this notice, we are again soliciting public comments and peer review on the draft PDM plan, which can be found on *http://www.regulations.gov* at docket number FWS–R1–ES–2007–0024. We are particularly interested in monitoring information pertaining to Hawaiian hawk habitat in light of ROD and strawberry guava. All comments on the draft PDM plan from the public and peer reviewers will be considered and incorporated into the final PDM plan as appropriate.

Public Comments

We intend that any final action resulting from the proposal will be based on the best scientific and commercial data available and will be as accurate and effective as possible. To ensure our determination is based on the best available scientific and commercial information, we request information on the Hawaiian hawk from governmental agencies, native Hawaiian groups, the scientific community, industry, and any other interested parties. We request comments or suggestions on our August 6, 2008 (73 FR 45680), proposal to delist the Hawaiian hawk; our draft PDM plan; new information presented in this **Federal Register** document; and any other information. Specifically, we seek information on:

(1) The species' biology, range, and population trends, including:

(a) Life history, ecology, and habitat use of the Hawaiian hawk, as well as the species' use of koa plantations and exurban areas;

(b) Range, distribution, population size, and population trends;

(c) Positive and negative effects of current and foreseeable land management practices on the Hawaiian hawk, including conservation efforts associated with watershed partnerships (*e.g.,* The Rain Follows the Forest initiative and the Governor's Sustainable Hawaii Initiative); patterns of land subdivision and development; effects on native forest of introduced plant species; conversion of land to biodiesel production, forestry, and diversified agriculture; and potential effects of biocontrol efforts on strawberry guava;

(d) Potential effects of temperature and rainfall change on fire frequency and intensity and forest type and distribution;

(e) Potential impacts of ROD and climate change (*e.g.,* increased frequency or prolonged drought); and

(f) Potential impacts of the recent Kilauea Volcano eruptions.

(2) The factors, as detailed in the August 6, 2008, proposed rule (73 FR 45680), that are the basis for making a listing/delisting/downlisting determination for a species under section 4(a) of the Act, which are:

(a) The present or threatened destruction, modification, or curtailment of its habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting its continued existence.

(3) Input or considerations for post-delisting monitoring of the Hawaiian hawk.

You may submit your information by one of the methods listed in **ADDRESSES**. If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the website. If you submit a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this personal identifying information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.*

Information and supporting documentation that we receive and use in preparing the proposal will be available for you to review at *http://www.regulations.gov,* or you may make an appointment during normal business hours at the Service's Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

If you submitted comments or information previously on the August 6, 2008, proposed rule (73 FR 45680); the February 11, 2009, document that made available our draft PDM plan (74 FR 6853); the June 5, 2009, publication announcing public hearings and reopening the proposal's and draft PDM

Draft Post-Delisting Monitoring Plan for the Hawaiian Hawk, or Io (*Buteo solitarius*)

December 2008

USFWS Photo

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Table of Contents

1. Background

The U.S. Fish and Wildlife Service (Service) is proposing to remove the Hawaiian hawk, or io, (*Buteo solitarius*) from the List of Endangered and Threatened Wildlife (73 FR 45680). Several studies (Baskett and Griffin 1985; Morrison *et al*. 1994; Hall *et al*. 1997; Griffin *et al*. 1998; Klavitter 2000; Klavitter *et al*. 2003; Gorresen *et al*. 2008) have shown that range-wide population estimates have been stable for at least 20 years and this species is not threatened with becoming endangered throughout all or a significant portion of its range in the foreseeable future. Section 4(g)(1) of the Endangered Species Act of 1973, as amended (Act) requires the Service to implement a system, in cooperation with the States, to monitor for not less than five years the status of all species that have recovered and been removed from the lists of threatened and endangered wildlife and plants (50 CFR 17.11, 17.12). The purpose of this post-delisting monitoring (PDM) is to verify that the Hawaiian hawk remains secure from risk of extinction after it has been removed from the protections of the Act.

1.1. History and Ecology

The Hawaiian hawk is a small, broad-winged hawk endemic to the Hawaiian Islands, and is the only member of the family Accipitridae that is resident and nests in the Hawaiian Islands (Berger 1981, p. 83). Currently, it occurs only on the island of Hawaii, but there have been at least 8 observations of vagrant individuals on the islands of Kauai, Oahu, and Maui since 1778 (Banko 1980, pp. 1-9), and fossil remains have been found on the islands of Molokai (Olson and James 1982, p. 35) and Kauai (Olson and James 1996, pp. 65-69; Burney *et al*. 2001, pp. 628-629).

The Hawaiian hawk occurs over much of the island of Hawaii, from low to high elevations, and occupies a variety of habitat types, including native forest, secondary forest consisting primarily of non-native plant species, agricultural areas, and pastures (Banko 1980, pp. 2-9, 15-16; Scott *et al*. 1986, pp. 78-79; Hall *et al*. 1997, p. 14; Griffin *et al*. 1998, p. 661; Klavitter 2000, pp. 2, 38, 42-45; Klavitter *et al*. 2003, pp. 169-170, 172, 173). Hawaiian hawks are monogamous and defend their territories year-round (Baskett and Griffin 1985, pp. 120-122; Griffin *et al*. 1998, p. 660; Clarkson and Laniawe 2000, pp 6-7; J. Klavitter, Service, pers. comm. 2006), although more aggressively during the breeding season (J. Klavitter, pers. comm. 2006). Egg-laying generally occurs from March to June, hatching from May to July, and fledging from July to September (Baskett and Griffin 1985, p. 110; Griffin *et al*. 1998, p. 656). A typical clutch size is one egg (Baskett and Griffin 1985, p. 76; Griffin *et al*. 1998, p. 657).

1.2. Population Trends

The Hawaiian hawk was listed as endangered on March 11, 1967 (32 FR 4001), based on its restricted range on the island of Hawaii, its small population size, which at the time was thought to be in the low hundreds (Berger 1981, p. 83), and the assumption that it was endangered by loss of native forest habitat from agriculture, logging, and commercial development (Service 1984, pp. 10-11). At the time of listing, however, there had been no

systematic surveys or ecological studies of the species, and the only information available was from anecdotal accounts that gave differing reports on its abundance and population trend in various parts of the island (Perkins 1903, p. 446; Munro 1944, p. 48; Morrison 1969, pp. 75-78). Banko (1980, p. 16) concluded that the species still occupied its entire historical range, but that it had experienced a long-term population decline and cautioned that conclusions concerning population size and trend must be considered tentative due to the scarcity of historical and current information. An intensive large-scale survey of Hawaiian forest birds was conducted from 1976 to1981 during which Hawaiian hawks were found in all study areas on the island of Hawaii, but the population size of the Hawaiian hawk was not estimated because the survey methods used were not suited to raptors (Scott *et al*. 1986, pp. 78-79).

The first detailed study of the ecology and life history of the Hawaiian hawk was conducted from 1980 to 1982 (Griffin *et al*. 1998). During this study, researchers found no significant difference in nest success in habitats dominated by native versus non-native vegetation (Griffin *et al*. 1998, p. 658). No evidence was found that the species was affected by avian diseases, such as avian malaria and avian pox; introduced mammalian predators, such as cats (*Felis catus*), rats (*Rattus* spp.), and mongooses (*Herpestes auropunctatus*); or environmental contaminants, such as DDT (Griffin *et al*. 1998, pp. 658, 661). Baskett and Griffin (1985, p. 26) briefly mentioned a population estimate of 1,400 to 2,500 birds, cited as Griffin *et al.* in prep., but Griffin *et al.* (1998) does not mention the 1,400 to 2,500 bird estimate.

The Service published a proposed rule to reclassify the Hawaiian hawk from endangered to threatened on August 5, 1993 (58 FR 41684), based on Baskett and Griffin's (1985, p. 36) population estimate of 1,400 to 2,500. However, the proposal was not finalized, because, during the public comment period, several commenters expressed concerns that the population data used in the proposal was not sufficiently current and there was not enough known about the hawk's breeding success to warrant a downlisting. Based on these comments, the Service funded an island-wide survey from December 1993 to February 1994 to provide a current assessment of the distribution and population status of the hawk on the island of Hawaii. The researchers found the Hawaiian hawk widely distributed in both native and non-native habitats and provided a population estimate of 1,600 birds (range = 1,200 to 2,400), made up of 1,120 adults, or 560 pairs (Morrison *et al*. 1994, p. 23; Hall *et al*. 1997, pp. 13-14).

In 1997 the Service formed the Io Recovery Working Group (IRWG) to evaluate existing recovery goals for the Hawaiian hawk in light of current knowledge, and formulate new goals if warranted; recommend strategies for minimizing negative interactions between the Hawaiian hawk and the endangered Hawaiian crow or alala (*Corvus hawaiiensis*); identify research and management priorities; and, write and revise a report summarizing their findings and recommendations. The IRWG (1998, p. 3) concluded that "… there was no substantive information to support listing of the io under the provisions of the Endangered Species Act, and there is no quantitative evidence the io was ever threatened or endangered." Further, the IRWG recommended that, rather than focusing on population numbers as a reflection of the Hawaiian hawk's overall status, field studies should focus on trend to be consistent with the

guidelines published by the International Union for Conservation of Nature (IUCN) Species Survival Commission for identification of species at three levels of risk: critically endangered, endangered, and vulnerable (IUCN 1996, p. 21, Annex 8-10; IRWG 1998, p. 4).

In keeping with the IRWG's recommendations, the Service funded a detailed ecological and demographic study of the Hawaiian hawk, conducted in 1998 and 1999, to obtain more comprehensive information about population size, amount of suitable habitat, survival of adult and first-year birds in native and non-native-dominated habitats, fecundity (average number of female offspring produced per individual breeding-aged female per year) in different habitats, and rate of population change in different habitats (Klavitter 2000; Klavitter *et al*. 2003). During this study, researchers found that Hawaiian hawks were broadly distributed throughout the island of Hawaii, and that 58.7 percent of the island (2,372 square miles (sq mi) (6,144 sq kilometers (km)) contained habitat that was useable by the hawk. Of this useable habitat, 31.8 percent (754 sq mi (1,954 sq km)) was located on State and Federal forests, parks, and refuges. The researchers estimated the total population at 1,457 ± 176.3 SE birds, with an average density of 0.24 ± 0.08 SE birds per sq km (Klavitter *et al*. 2003, p. 170). Population density varied somewhat among habitats, from 0.01 to 0.57 birds per sq km. The highest density ranks were within native forest with grass, fallow sugarcane fields, and orchards; the lowest were within native mamane-naio (*Sophora chrysophylla-Myoporum sandwicense*) forest, urban, and lava areas (Klavitter *et al*. 2003, p. 169). One young per nest fledged in all successful nests monitored during the study. Annual survival of juveniles and adults was high (0.50 ± 0.10 SE and 0.94 ± 0.04 SE, respectively), and fecundity was 0.23 ± 0.04 SE female young/breeding female in all habitats combined. There was no difference in fecundity between native and mixed, native and exotic, or mixed and exotic habitats (Klavitter *et al*. 2003, pp. 170-171). The rate of population growth based on data from all habitat areas was 1.03 ± 0.04 SE, which is not significantly different than 1.0, indicating that the population was stationary (neither increasing or decreasing) at the time of the study (Klavitter *et al*. 2003, pp. 170-171).

The researchers also pointed out that the population estimate in 1985 (1,400-2,500 birds) likely was biased high, because it assumed that the Hawaiian hawk was distributed island-wide at the same density as in a small study area representing less than one percent of the species' range (Klavitter *et al*. 2003, p. 172). However, because of the short duration of their study, the relatively low population size, and the possibility of environmental fluctuations, they did not recommend delisting. Instead, the researchers recommended either downlisting the hawk to threatened status or consideration of a "near threatened" status (IUCN 1996, p. 18, Annex 7-8; Klavitter *et al*. 2003, p. 173). Upon review of Klavitter (2000), the IRWG recommended that the Hawaiian hawk be delisted, with the caveat that regular monitoring take place to assess factors that may produce future population declines (IRWG 2001, pp. 3-4).

Most recently, the Service funded an island-wide survey that was completed in the summer of 2007. The researchers used updated vegetation maps and methods to calculate population and density estimates for the 1998-1999 survey data and the 2007 survey data. Using consistent maps and methods they were then able to compare population size and density

over time to see if there had been significant changes. They found that the Hawaiian hawk population numbered 3,239 (95% CI = 2,610 to 3,868) in 1998 (Gorresen *et al*. 2008, p. 11), more than double Klavitter's original estimate of 1,457 (± 176.3 birds) (Klavitter 2000, pp. 38, 96; Klavitter *et al*. 2003, p. 170). Gorresen *et al*. (2008, p. 11) estimated the population in 2007 to number 3,085 hawks (95% CI = 2,496 to 3,680). There was no significant difference in densities found in 1998 and 2007 and no evidence that the hawk's spatial distribution had changed (Gorresen *et al*. 2008, p. 12).

1.3. Habitat Status

The Hawaiian hawk is broadly distributed throughout the island of Hawaii, and 58.7 percent of the island (2,372 sq mi (6,144 sq km)) contains habitat that is useable by the hawk. Fifty-five percent of this useable habitat is zoned for agriculture and 44.7 percent is zoned for conservation. Of these lands, 754 sq mi (1,953 sq km), or 32 percent, is located on protected lands in the form of State and Federal forests, parks, and refuges and only a very small percentage (less than 0.5 percent) is rural and urban-zoned land that is subject to future development (Klavitter *et al*. 2003, p. 170; State of Hawaii Department of Business, Economic Development and Tourism 2007; Chapter 205 Hawaii Revised Statutes).

The IRWG (2001, p. 3) identified (1) urbanization, (2) conversion of cane fields used for foraging to habitats not suitable for foraging such as eucalyptus forest, (3) increase in fire frequency, and (4) invasion of plant species in the understory that degrade foraging habitat by concealing prey as potential threats to the Hawaiian hawk's preferred nesting and foraging habitats. However, we currently have no evidence that the scale of these changes, if they materialize, would adversely impact the Hawaiian hawk throughout all or a significant portion of its range.

1.4. Disease Incidence

Unlike other Hawaiian forest birds, the Hawaiian hawk does not appear to be susceptible to avian pox and malaria (Baskett and Griffin 1985, pp. 105-108; Griffin *et al*. 1998, p. 661). Although the Hawaiian hawk is not currently known to be adversely affected by any diseases, the IRWG (2001, p. 3) identified disease as a potential factor that might lead to a decline in the size of the io population by reducing future reproduction and survival. In their report (IRWG 2001, p. 3) they state: "[d]isease could have a serious negative impact on `io as the population does not appear to be separated into disjunct subpopulations that could more easily evade an outbreak. The panmictic nature of the population [i.e., a population where all individuals are potential partners] may also limit genetic variability that could contribute to pockets of disease resistance, although genetic attributes have not been directly studied."

One disease of concern is West Nile virus. This disease, which is primarily transmitted by infected mosquitoes, has been reported in all of the 48 conterminous United States and is potentially fatal to many species of birds, including members of the genus *Buteo* (Center for Disease Control 2005, 2007). Hawaii and Alaska are the only two states that have reported no occurrences of West Nile virus to date (Hawaii State Department of Health 2006; Center

for Disease Control 2007). The Hawaii State Department of Health has an ongoing, multi-agency West Nile virus surveillance program in place on all of the main Hawaiian Islands, which involves surveillance for infected mosquitoes and dead birds, as well as live bird surveillance at major ports of entry, equine surveillance, and human surveillance (Hawaii State Department of Health 2006). To date, no cases of West Nile virus have been reported in Hawaii; however, there is currently no certainty that we can prevent the disease from arriving and spreading. Should this disease arrive on the island of Hawaii, native birds may be particularly susceptible as they are likely to be immunologically naïve to arboviruses such as West Nile virus, because they evolved in the absence of biting insects (van Riper *et al*. 1986, p. 340). Furthermore, there are a number of introduced birds (e.g., house sparrows and house finches) and mosquitos (e.g., *Culex quinquefasciatus*) that could support West Nile virus amplification in Hawaii and transport it from low to middle to high elevations (Marra *et al*. 2004, p. 398) throughout the range of the Hawaiian hawk. In conjunction with the State's West Nile virus surveillance program, we will continue to monitor for the disease in Hawaii and, in the event of its arrival, evaluate its effects on the Hawaiian hawk and take steps to re-list the species if monitoring reveals declines or potential declines that warrant protection of the Hawaiian hawk under the Act.

2. Justification, Purpose, and Objectives

Section 4(g)(1) of the Act, added in the 1988 reauthorization, requires the Service to implement a system, in cooperation with the States, to monitor for no fewer than 5 years the status of all species that have recovered and been removed from the List of Threatened and Endangered Wildlife and Plants (50 CFR 17.11, 17.12). The purpose of this post-delisting monitoring (PDM) is to verify that a species delisted due to recovery remains secure from risk of extinction after it has been removed from the protections of the Act. Section 4(g)(2) of the Act requires the Service to make prompt use of the emergency listing provisions under section 4(b)(7) to prevent a significant risk to the well being of any recovered species.

Section 4(g) of the Act explicitly requires cooperation with the States in development and implementation of PDM programs, but the Service remains responsible for compliance with section 4(g) and therefore must remain actively engaged in all phases of PDM. The Service also seeks active participation of other entities that are expected to assume responsibilities for conservation of the species or its habitat following delisting.

In keeping with that mandate, the Service developed this draft PDM plan in cooperation with the Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), the National Park Service (NPS), and the U.S. Geological Survey, Biological Resources Discipline (USGS-BRD). All public comments received on this draft PDM plan will be considered and incorporated into the final PDM plan as appropriate. The final PDM plan and any future revisions will be posted on our Endangered Species Program's national web page (http://endangered.fws.gov) and on the Pacific Islands Fish and Wildlife Office web page (http://www.fws.gov/pacificislands).

We intend to monitor the status of the Hawaiian hawk, in cooperation with DOFAW, the NPS, and USGS-BRD, through periodic (every 5 years through 2032) island-wide surveys. If data from these surveys or from some other source indicates significant declines in Hawaiian hawk distribution and abundance or if the species may require protective status under the Act for some other reason, the Service will consider initiating procedures to re-list the Hawaiian hawk, including, if appropriate, emergency listing.

3. Implementation

Post-delisting monitoring is a cooperative effort between the Service, DOFAW, USGS-BRD, and NPS. Funding of post-delisting monitoring presents a challenge for all partners committed to ensuring the continued viability of the Hawaiian hawk following removal of protections under the Act. To the extent feasible, the Service intends to provide funding for post-delisting monitoring efforts through the annual appropriations process. Nonetheless, nothing in this Plan should be construed as a commitment or requirement that any Federal agency obligate or pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. 1341, or any other law or regulation.

The Pacific Region (Region 1) of the Service, through the Pacific Islands Fish and Wildlife Office (PIFWO) in Honolulu has the lead responsibility for this monitoring effort, but assistance from and collaboration with DOFAW, NPS, and USGS-BRD, are crucial for its successful implementation. Continuing advice and assistance from the IRWG will also be essential.

The role of the PIFWO is to:

- Coordinate development and distribution of the PDM plan;
- Determine budget requirements to carry out the monitoring;
- Coordinate and track the island-wide surveys;
- Coordinate and track disease monitoring;
- Compile all monitoring results and coordinate their analysis;
- Ensure that monitoring methods prescribed in the PDM plan are followed;
- Prepare periodic and final reports for distribution to all cooperators and interested parties; and,
- Coordinate meetings or conference calls to discuss monitoring results and their interpretation.

The role of DOFAW is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys as staff and funds allow;
- Assist with coordination and implementation of disease monitoring efforts, as staff and funds allow; and,
- Communicate with the PIFWO about any projects that may reduce the quantity or quality of the hawk's preferred habitat.

The role of NPS is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys, as staff and funds allow;
- Assist with coordination and implementation of disease monitoring efforts on NPS lands, as staff and funds allow; and,
- Communicate with the PIFWO about any projects on NPS lands that may reduce the quantity or quality of the hawk's preferred habitat.

The role of USGS-BRD is to:

- Assist with completion of the PDM plan, through review and input, as staff and funds allow;
- Assist with coordination and implementation of the island-wide surveys, as staff and funds allow;
- Assist with coordination and implementation of disease monitoring efforts, as staff and funds allow; and,
- Assist with analysis of monitoring data, including estimation of population size and trend, as staff and funds allow.

4. Methods

4.1. Population Trend Monitoring

4.1.1. Playback Response Study

Playbacks have been used in previous population studies of the Hawaiian hawk (Baskett and Griffin 1985; Morrison *et al*. 1994; Hall *et al*. 1997; Griffin *et al*. 1998; Klavitter 2000; Klavitter *et al*. 2003; Gorresen *et al*. 2008) because they are effective in increasing hawk detection, but they cause a positive movement bias and inflated density estimates. Therefore, correcting counts for movement bias is critical to achieving accurate density estimates. The regression model applied by Gorresen *et al*. (2008, p. 4) had an R^2 of only 0.15 because of high variability in the distances hawks moved prior to detection and the limited number of hawks (n = 28) used to characterize the relationship of unobserved and observed distances. Additional measures of observer-hawk distances and unobserved movement are needed to better establish the relationship of Hawaiian hawk responses to playback broadcasts which, in turn, will produce more accurate population estimates.

Therefore, prior to the initiation of additional population surveys, we plan to conduct a short study to better define the Hawaiian hawk's response to call playbacks. More refined data will then be used to obtain more accurate hawk density and population estimates (M. Gorresen, USGS-BRD, pers. comm. 2008; Gorresen *et al.* 2008, pp. 8-9). The study will be conducted over a period of 4 to 6 weeks, utilizing between 2 and 4 researchers, sometime prior to 2012 to avoid possible acclimatization issues that may affect the VCP surveys.

Using methods described in Klavitter and Marzluff (2007, p. 84), we intend to search for hawks while driving on unpaved roads. One or more observers will watch the hawk while another observer, the surveyor, moves some distance away to perform a 10-minute point count using playbacks. The observer(s) will use a GPS receiver to measure the distance from the bird to the surveyor at the start and end of the point count. At least 20 birds will need to be included in this study as a suitable sample size.

If after several months these methods prove unsuitable for locating a sufficient number of birds, we may capture up to 20 birds and attach radio-tags to them to enable researchers to more readily locate the birds for the playback study, as was done by Klavitter and Marzluff (2007, p. 84).

4.1.2. Abundance and Distribution

In 2012 and every 5 years thereafter through 2032, we will conduct island-wide variable circular plot (VCP) surveys (Reynolds *et al*. 1980, pp. 309-313) following the methodologies described by Gorresen *et al*. (2008, pp. 3-6). The surveys will be conducted from March through July, following the stations used in the 2007 surveys. A total of 577 stations will be surveyed, spaced at 1 mile (1.6 kilometer) intervals, mostly along roads (Figure 1). Region-habitat strata with high variance relative to mean density may be augmented with additional samples in future surveys to help reduce variance. Each point will be surveyed for 10 minutes using playback recordings of adult and fledgling Hawaiian hawks. The playbacks will be conducted for 1-minute periods during the first, fourth, and eighth minutes. At each point, a record will be made whether hawks were detected, the distance at which the detection was made, type of detection (audio or visual), surveyor's percentage of view obstructed, and the habitat associated with each detection. Counts will be corrected for movement bias using information gathered from the playback response study, as described in Gorresen *et al.* 2008 (pp. 3-4, 6-8). Point count data will be analyzed with the program DISTANCE (Thomas *et al*. 2005). The best model will be selected using minimum Akaike Information Criterion values (AIC), and a global detection function will be calculated to generate densities from count data (Buckland *et al*. 2001, pp. 54-55). Densities will be used to extrapolate population estimates and differences in estimated hawk densities will be compared among years, regions, and habitats with a three-way repeated measures analysis of variance (ANOVA), as described in Gorreson *et al*. (2008, pp. 6-8).

4.2. Disease Monitoring

All dead Hawaiian hawks found by field crews during VCP surveys or reported by the public will be salvaged and necropsied to determine the cause of death. Monitoring cooperators will report all dead, injured, and diseased birds to the PIFWO, who will collate information on disease, cause of injury or death, location, date, and any other relevant data. We will also continue to participate in and coordinate with the ongoing multi-agency West Nile Virus surveillance program administered by the Hawaii State Department of Health (Hawaii State

Department of Health 2006). If West Nile Virus is detected in any birds on the island of Hawaii monitoring efforts for Hawaiian hawk will be reassessed.

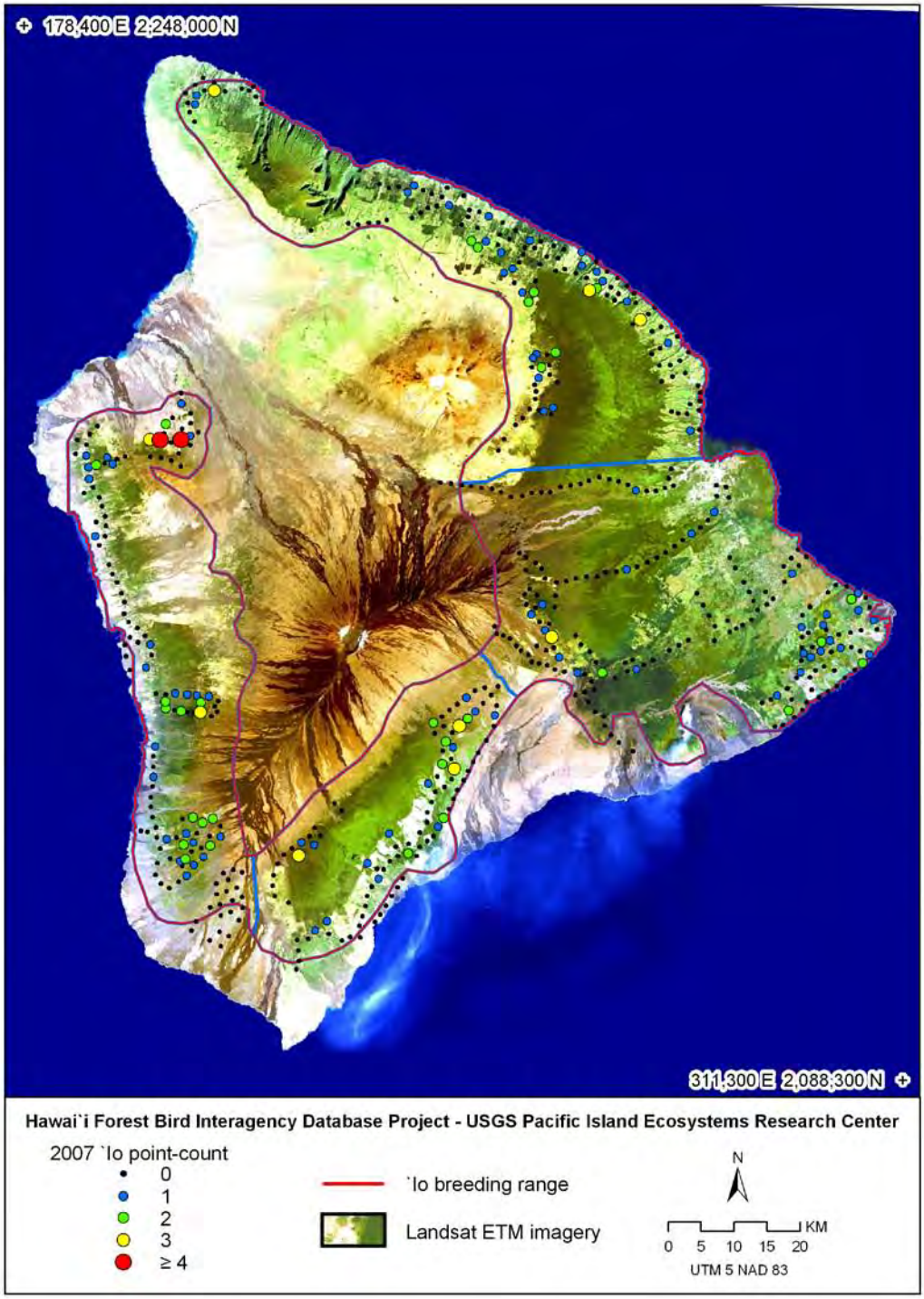

Figure 1. Location of Hawaiian hawk survey stations on the island of Hawaii during the 2007 abundance survey (Gorresen *et al*. 2008).

5. Triggers and Responses

Variable Circular Plot surveys have been used to assess the status of the Hawaiian hawk population on the island of Hawaii, documenting a stable population that currently numbers approximately 3,085 hawks (95% CI = 2,496 to 3,680) (Gorresen *et al*. 2008, p. 6). Barring some catastrophic event, such as the arrival of West Nile virus to Hawaii, we anticipate that the Hawaiian hawk population will remain stable over the monitoring period.

Using the coefficient of variation (CV) from 2007 survey efforts (CV = 0.098) and setting the significance level to 0.20 and the power to 0.80 we used TRENDS software to estimate the minimum detectable population change using a one-tailed significance test for a linear negative change. The population estimate in 1998 will be used as the baseline year from which to assess whether or not the population is declining. Thus, the following values represent the minimum statistically significant population decline we will be able to detect assuming CV = 0.098, alpha = 0.20, and power = 0.80:

Year	Minimum detectable decline (%) from 1998 population estimate
2012	14
2017	12
2022	11
2027	10
2032	9

If we detect statistically significant decline (alpha = 0.20, power = 0.80) in the total population estimate or in the population estimates for any given region or habitat-type, we will promptly evaluate the potential causes, including evaluation of habitat quantity and quality trends, disease, weather, and other possible limiting factors, take remedial steps, examine whether additional monitoring is necessary, and possibly relist the Hawaiian hawk. Any relisting decision by the Service will be made by evaluating the status of Hawaiian hawks relative to the Act's five listing factors (section 4(a)(1)) and will require the solicitation of public comments and peer review.

6. Periodic and Final Reports

A report summarizing the activities, data collected, and results of each component of the PDM plan will be prepared by the PIFWO every 5 years, immediately following monitoring efforts. These reports will be prepared and reviewed in a timely manner to ensure that adequate data are being collected, to allow evaluation of the efficacy of the monitoring programs and their modification if necessary, and to allow periodic assessment of the status of the Hawaiian hawk. The PIFWO will compile all results, synthesize draft reports for review and comments by all cooperators, and distribute final reports to all cooperators. Each report will comment on the status of the Hawaiian hawk relative to the need for relisting.

At the end of the monitoring period (2032), a final report summarizing the results of the monitoring effort will be prepared. The final report will include a discussion of whether monitoring should continue for any reason. If the results are inconclusive, monitoring should continue and the monitoring plan should be modified as appropriate. The final report will be posted on our Endangered Species Program's national web page (http://endangered.fws.gov) and on the Pacific Islands Fish and Wildlife Office web page (http://www.fws.gov/pacificislands).

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Appendix 1. Proposed Timeline and Budget

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	Travel & Materials	Personnel	TOTAL
2010		Preparation		Playback Response Study			Analysis				$ 3,000 to *$7,000	$ 15,000	$ 18,000 to *$22,000
2012		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2017		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2022		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2027		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
2032		Preparation		VCP Abundance Survey			Analysis				$ 10,000	$ 35,000	$ 45,000
										TOTAL			$ 243,000 to *$247,000

* With radio-telemetry, if needed.
Note: some of these tasks are part-time and spread over several months (e.g., preparation for Playback Response Study and VCP fieldwork)
Note: Cost estimates for VCP surveys are based on the costs of the 2007 Surveys conducted by USGS-BRD and funded by the USFWS, utilizing USFWS, DOFAW, and other staff field time not accounted for in the proposed budget.

plan's comment period (74 FR 27004); or the February 12, 2014, publication reopening the proposal's and draft PDM plan's comment period (79 FR 8413), please do not resubmit them. These comments have been incorporated into the public record and will be fully considered in the preparation of our final determination.

References Cited

A complete list of references cited is available on the internet at *http://www.regulations.gov* and upon request from the Service's Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this document are staff of the Service's Pacific Islands Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: August 14, 2018.

James W. Kurth,

Deputy Director, U.S. Fish and Wildlife Service, Exercising the Authority of the Director, U.S. Fish and Wildlife Service.

[FR Doc. 2018–23697 Filed 10–29–18; 8:45 am]

BILLING CODE 4333–15–P

Photo: USFWS

Terrestrial Mammal

ʻŌpeʻapeʻa or Hawaiian hoary bat

Lasiurus cinereus semotus

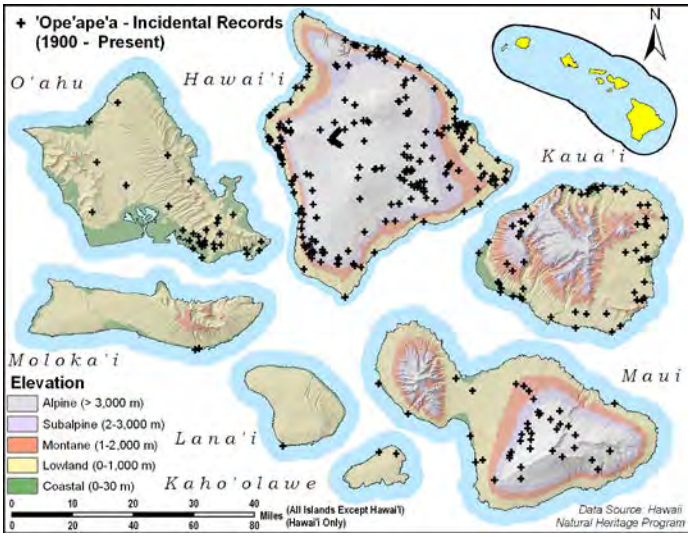
SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Indigenous (at the Species Level and Endemic at the Subspecies Level)
NatureServe Heritage Rank G5/T2 – Species Secure/Subspecies Imperiled
Recovery Plan for the Hawaiian Hoary Bat – USFWS 1998

SPECIES INFORMATION: The ʻōpeʻapeʻa, or Hawaiian hoary bat (Family: Vespertilionidae), is Hawaiʻi's only native terrestrial mammal, although sub-fossil evidence indicates that at least one other bat species was native to the islands. Additionally, the hoary bat has dispersed to the Hawaiian Islands from the mainland at least twice, forming two different populations of Hawaiian hoary bats (Russell et al. 2015). The first emigrant arrived approximately ten thousand years ago, and the more recent emigrant arrived an estimated 600 years ago (Russell et al. 2015). Both sexes have a coat of brown and gray fur. Individual hairs of the coat are tipped or frosted with white; hence the name "hoary" which means frosted. The older population of hoary bats on the Hawaiian Islands is typically chestnut brown in color with less white "frosting" of the fur tips—it has largely lost the "frosted" appearance. The more recent population comprises individuals that are more hoary ("frosted"), similar to mainland hoary bats. Males and females have a wingspan of approximately one-third of a meter (1 foot), and females are typically larger than males. The Hawaiian name refers to a half taro leaf or canoe sail shape; these being somewhat similar to the shape of the bat.

Little research has been done on the ʻōpeʻapeʻa, and little is known about its habitat requirements or population status. Fewer than 30 accounts of roosting are known statewide, but these indicate that ʻōpeʻapeʻa roost in native and non-native vegetation from 1 to 9 meters (3 – 29 feet) above ground level; the species is rarely observed using lava tubes, cracks in rocks, or human-made structures for roosting. While roosting during the day, ʻōpeʻapeʻa are solitary, although mothers and pups roost together. They begin foraging either just before or after sunset depending on the time of year; altitude also may affect activity patterns. ʻŌpeʻapeʻa feed on a variety of native and non-native night-flying insects, including moths, beetles, crickets, mosquitoes, and termites; and similar to other insectivorous bats, prey is located using echolocation. Water courses and edges (e.g., coastlines and forest/pasture boundaries) appear to be important foraging areas; the species also is attracted to insects that congregate near lights. Breeding bats (e.g., lactating females) have been documented only on the islands of Hawaiʻi, Kauaʻi, and Oʻahu (Dave Johnston pers. obs.). Mating most likely occurs between September and December, and females usually give birth to twins during June. Mother bats likely stay

with their pups until they are six to seven weeks old. Little is known regarding dispersal or movements, but inter-island dispersal is possible.

DISTRIBUTION: The hoary bat is the most widely distributed bat in North America. In Hawai'i, ʻōpeʻapeʻa have been reported from all the Main Hawaiian Islands except for Niʻihau, although specimen records exist only for Kauaʻi, Oʻahu, Maui, Molokaʻi, and the island of Hawai'i. ʻŌpeʻapeʻa occur in a wide range of habitats across a wide elevation gradient. On the island of Hawaiʻi, bats are found primarily from sea level to 2,288 meters (7,500 feet) elevation, although they have been observed near the island's summits (above 3,963 meters or 13,000 feet). See "Location and Condition of Key Habitat," below, for distribution by seasons.



ABUNDANCE: Mostly unknown, although Pinzari et al. 2014 suggested that the population on the island of Hawaiʻi has been stable or is slightly increasing based on occupancy models from acoustic monitoring. Survey methods to count or estimate populations of solitary roosting bats have not been established. Although based on incomplete data, Kauaʻi and the island of Hawaiʻi may support the largest populations.

LOCATION AND CONDITION OF KEY HABITAT: ʻŌpeʻapeʻa have been found roosting in ʻōhiʻa (*Metrosideros polymorpha*), pu hala (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), kukui (*Aleurites moluccana*), kiawe (*Proscopis pallida*), avocado (*Persea americana*), shower trees (*Cassie javanica*), pūkiawe (*Styphelia tameiameiae*), fern clumps, eucalyptus (*Eucalyptus* spp.), cook pine (*Araucaria columnaris*), and Norfolk Island pine (*Araucaria heterophylla*) stands. Recent work on the island of Hawaiʻi found that bat activity varied with season and altitude, and the greatest level of activity occurred at low elevations (below 1,280 meters or 4,200 feet) from April to December (Bonaccorso et al. 2015). Because warm temperatures are strongly associated with reproductive success in this and other bat species, it has been suggested that key breeding habitat is likely to occur at sites where the average July minimum temperature is above 11°C (52°F). If true, key breeding habitat on the island of Hawaiʻi would occur below 1,280 meters (4,200 feet) elevation (Bonaccorso et al. 2015). Because bats use both native and non-native habitat for foraging and roosting, the importance of non-native timber stands, particularly those at low elevations, should be determined. Breeding sites are known for Mānuka Natural Area Reserve and scattered areas along the Hāmākua Coast.

THREATS: Bats are affected by habitat loss, pesticides, collisions with structures, and roost disturbance. A reduction in tree cover (e.g., roost sites) might be the primary reason for the species' decline in Hawaiʻi. Pesticides also may have reduced populations. Bats are known to interact and sometimes collide with wind turbines. Lastly, bats of many species are affected by predation, so this may also be a problem for ʻōpeʻapeʻa.

CONSERVATION ACTIONS: The goals of conservation actions are to not only protect current populations and key breeding habitats, but also to establish additional populations thereby reducing the risk of extinction (U.S. Fish and Wildlife Service 1998). In addition to common statewide and island conservation actions, specific management directed toward ʻōpeʻapeʻa should include the following:

- Conserve known occupied habitat.
- Develop and implement conservation plans and strategies that guide the management and use of forests to reduce negative effects on known bat populations.
- Support Hawaiian hoary bat research.

MONITORING: Continue surveys of population and distribution in known and likely habitats and identify key limiting factors affecting the recovery of the species.

RESEARCH PRIORITIES: Given that little is known about ʻōpeʻapeʻa any research would contribute to the understanding of and ability to conserve this species. Research priorities for the ʻōpeʻapeʻa include the following:

- Develop standard survey and monitoring methods and procedures that will allow the accurate estimation of populations and changes in activity and/or occupancy.
- Conduct occupancy surveys of all the Main Hawaiian Islands to examine distribution and population trends.
- Identify key breeding and wintering sites.
- Better describe roost site characteristics and preferences.
- Increase efforts to track and monitor movements and behaviors.
- Determine the extent to which Hawaiian hoary bats use torpor.
- Better describe threats and important factors limiting recovery such as whether depredation by introduced animals or availability of prey represent constraints for populations.
- Continue to support the development of avoidance and minimization measures that can be effectively implemented to reduce collisions with wind turbines.
- Direct research findings toward the development of conservation and management actions that address the needs and deficiencies of the species and refine these approaches using an adaptive management approach.

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Photo: Steve McConnell

ʻAkēʻakē or Band-rumped storm-petrel

Oceanodroma castro

SPECIES STATUS:
Federal Candidate for Listing
State Listed as Endangered
State Recognized as Indigenous
NatureServe Heritage Rank G4 - Apparently Secure
Regional Seabird Conservation Plan - USFWS 2005

SPECIES INFORMATION: The ʻakēʻakē or band-rumped storm-petrel is a medium sized, highly pelagic storm-petrel (Family: Hydrobatidae), and is the smallest and rarest seabird that breeds in Hawaiʻi. Adults are primarily blackish-brown and have a sharply defined narrow white band across rump area. Flight is characterized by shallow wing beats and long glides just over the surface of the ocean. Foraging alone or with conspecifics, ʻakēʻakē feed while sitting on the water or by dipping prey while flapping just above the ocean surface, often pattering water with feet. There is no diet information from Hawaiʻi, but elsewhere diet primarily consists of small fish, squid, and some crustaceans. Breeding biology in Hawaiʻi is poorly known, but these birds are known to nest in burrows or natural cavities in a variety of high-elevation, inland habitats. As with most seabirds, a single egg is laid per season. In Hawaiʻi, eggs are laid between May and June, and nestlings fledge in October. ʻAkēʻakē likely do not breed until they are three to seven years old, and likely live for 15 to 20 years.

DISTRIBUTION: Historically, was abundant and widespread throughout Main Hawaiian Islands (MHI). Nesting colonies occur on Kauaʻi at elevations around 600 meters (1,950 feet), on Maui (in Haleakalā National Park) and the island of Hawaiʻi (in Hawaiʻi Volcanoes National Park) at elevations greater than 1,200 meters (3,900 feet), and on Lehua. Outside of Hawaiʻi, the species nests in Japan and on the Galapagos, and on several islands in the Atlantic. At sea, they occur in the Pacific and Atlantic oceans.

ABUNDANCE: In Hawaiʻi, breeding population size is unknown, but likely very small. The breeding population on Kauaʻi was estimated at between 171 and 221 breeding pairs in 2002. Worldwide population is unknown, but likely less than 25,000 breeding pairs.

LOCATION AND CONDITION OF KEY HABITAT: Breeds in a variety of remote, high-elevation, inland habitats. On Kauaʻi, colonies are in steep valleys vegetated with shrubs and grasses. On Maui and the island of Hawaiʻi, colonies occur on high, barren lava flows. Nesting in burrows or crevices in rock or lava has also been documented using artificial nest boxes.

THREATS: Due to its very small population size in the Hawaiian Islands, the ʻakēʻakē is susceptible to stochastic, genetic, environmental, and demographic events that could lead to extirpation. Important threats to the species include:

- Introduced predators. Adults and chicks are susceptible to predation by pigs (*Sus scrofa*), rats (*Rattus* spp.), feral cats (*Felis silvestris*), and the small Indian mongoose (*Herpestes auropunctatus*).
- Feral ungulates. Pigs, goats (*Capra hircus*), and sheep degrade nesting habitat.
- Artificial lighting. Street and resort lights, especially in coastal areas, likely disorient fledglings, causing them to eventually fall to the ground exhausted or increasing their chance of colliding with artificial structures (i.e., fallout). Once on the ground, fledglings are unable to fly and are killed by cars, cats, and dogs (*Canis familiaris*) or die of starvation or dehydration.
- Collisions. Adults and fledglings are susceptible to mortality from collisions with obstacles such as communication towers and utility lines while commuting between inland nest sites and the ocean at night.
- Colony locations. The remoteness of colonies, as well as the habitat in which they occur (e.g., steep terrain or dense forest), complicates predator and ungulate eradication or control.

CONSERVATION ACTIONS: Past actions directed at ʻaʻo or Newell's shearwater (*Puffinus auricularis*) that have benefited ʻakēʻakē include the rescue and rehabilitation of downed fledglings by the Save Our Shearwaters (SOS) program and efforts to shade resort lighting and streetlights. Current and future conservation efforts on Kauaʻi to benefit the ʻakēʻakē, ʻaʻo, and ʻuaʻu (Hawaiian petrel [*Pterodroma sandwichensis*]) include efforts to reduce and shield lighting, control predators and invasive species, conduct surveys to locate additional colonies, and develop revised population estimates using at-sea survey data. In addition to these efforts, future actions specific to Hawaiian populations of ʻakēʻakē should include the following:

- Locate potential sites for the establishment of new breeding colonies.
- Continue efforts to eradicate and control predators and ungulates, particularly on Lehua where birds have been recently observed.
- Continue to identify fallout areas and minimize effects of powerlines and artificial lights.
- Continue to support the SOS program, particularly the public outreach about light fallout and its rescue and rehabilitation program. Consider establishing similar programs on other islands where appropriate.

MONITORING: Conduct at-sea and terrestrial surveys in known and likely habitats to evaluate the population size and status, and to locate unidentified breeding colonies.

RESEARCH PRIORITIES:

- Investigate new technologies or adapt existing technologies (e.g., radar, at-sea surveys, mark/recapture) to ascertain population status and trends.
- Evaluate life history, habitat requirements, reproductive biology, and population status to assess management needs and conservation status of this poorly known species.
- Identify factors currently limiting populations.
- Evaluate mortality related to powerlines and coastal lighting.

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U.S. Fish and Wildlife Service. 2014. Species Assessment and Listing Priority Assignment Form: *Oceandroma castro,* Band-rumped Storm-petrel. U.S. Fish and Wildlife Service, Region 1, Pacific Region.


Photo: James Bruch, KIRC

Terrestrial Invertebrates

Blackburn's Sphinx Moth

Manduca blackburni

SPECIES STATUS:
Federally listed as Endangered
State listed as Endangered
State recognized as Endemic
NatureServe Heritage Rank G1 - Critically imperiled
Recovery Plan for the Blackburn's Sphinx Moth (*Manduca blackburni*) - USFWS 2005
Designation of Critical Habitat for the Blackburn's Sphinx Moth: Final Rule – USFWS 2003

SPECIES INFORMATION: Blackburn's sphinx moth is one of Hawaii's largest native insects (Family: Sphingidae) with a wing span of up to 12 centimeters (5 inches). Adults are overall gray with black bands across the top of their wings and five orange spots on each side of their abdomen. Caterpillars are large and populations contain two distinct color morphs, bright green or purple/gray. Both morphs have scattered white speckles across their back and a horizontal white stripe on the side of each segment. Caterpillars feed on plants in the nightshade family (Solanaceae), especially native trees in the genus *Nothocestrum,* but also on non-native solanacious plants such as commercial tobacco (*Nicotiana tabacum*), tree tobacco (*N. glauca)*, eggplant (*Pseudomonas solanacearum*), tomato (*Lycopersicon esculentum*), and Jimson weed (*Datura stramonium*). Adults have been observed feeding on the nectar of koaliawa (*Ipomea indica)*. Other likely adult nectar sources include other species of *Ipomea*, maiapilo (*Capparis sandwichiana)*, and ʻilieʻe (*Plumbago zeylancia*); it is believed that the moth pollinates these species, but further study is necessary. Development from egg to adult may be as short at 56 days, but pupae may aestivate (i.e., period of dormancy during hot or dry conditions) in the ground for as long as a year. Moths are found year-round, but may be most active between January and April and again between September and November, especially after rains.

DISTRIBUTION: Originally distributed across all the Main Hawaiian Islands (MHI), the species was believed to be extinct in the late 1970s. In 1984, the species was rediscovered on East Maui. Additional populations recently have been found on Kahoʻolawe and the island of Hawaiʻi. Blackburn's sphinx moth can be found across a broad elevational gradient from sea level to 1,540 meters (5,000 feet), though it does not breed in all locations where the adults might be found.

ABUNDANCE: Unknown. The species' short life span as an adult, rarity, and mobility makes estimating population sizes difficult. Despite this, it is believed that populations have declined over the past 100 years since the moth no longer occurs on several islands on which is had been recorded. Currently, the largest populations reside on Maui and Hawaiʻi. Historical accounts and museum specimens suggest the species was widespread and common on most of the MHI.

LOCATION AND CONDITION OF KEY HABITAT: Historical records indicate that Blackburn's sphinx moth mostly occurred in coastal, lowland, and dry forests in areas receiving

less than 127 centimeters (50 inches) of rain per year. Human modification of Hawaiian landscapes has greatly reduced these communities; for example, more than 90 percent of Hawaii's dry forests have been destroyed. Depending on the location and elevation, the composition of the plant species in moth habitat varies considerably. However, some common native plants found in areas where the species occurs include lama (*Diospyros sandwiceneses*), ʻohe (*Reynoldsia sandwicensis*), hao (*Raovolfia sandwicensis*), ʻālaʻa (*Pouteria sandwicensis*), āulu (*Pisonia sandwicensis* and its varieties), ʻaʻaliʻi (*Dodonaea viscose*), naio (*Myoporum sandwicense*), and wiliwili (*Erythrina sandwicensis*). The populations on Maui and Hawaiʻi are primarily associated with ʻaiea (*Nothocestrum* spp.) trees. Perhaps the largest stand of ʻaiea trees in the State are located on Maui in the Kanaio Natural Area Reserve. Other large stands are found on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, and the island of Hawaiʻi. On Molokaʻi, potential moth habitat consists of mixed-species mesic and dry forests with both native and non-native plants (see below). On Kahoʻolawe, caterpillars currently feed on the non-native tree tobacco, as do populations on Maui and the island of Hawaiʻi. Although the species will feed on non-native plants, primary constituent elements of critical habitat as designated by the USFWS include the endemic larval host plant species *N. latifolium* and *N. breviflorum*, and native nectar sources for adults including koaliawa, other species of *Ipomoea*, maiapilo, and ʻilieʻe. These species are likely superior to non-natives in that they are more persistent, especially during drought conditions. In 2003, 40,420 hectares (99,433 acres) of critical habitat was designated by the USFWS on the islands of Hawaiʻi, Maui, Molokaʻi, and Kahoʻolawe.

THREATS: Historically, habitat loss and degradation due to ranching, introduced plants and animals, human development, and wildfire reduced the quantity and quality of native habitats. Current threats include non-native ants, especially the big-headed ant (*Linepithema humile*) and several species of parasitic flies and wasps. Although little documentation exists of direct predation, native insects have been eliminated in areas where big-headed ants occur, and several alien wasp species have been reported parasitizing species closely related to Blackburn's sphinx moth. All species of *Nothocestrum* are declining. Because of development, competition from non-native species, browsing by cattle and feral goats, and wildfire, the larval host plant, *N. breviflorum* on the island of Hawaiʻi, and the potential host plant, *N. peltatum* on Kauaʻi, are federally listed as endangered. Finally, small populations are plagued by a variety of potentially irreversible problems that fall into three categories: demographic, stochastic, and genetic; the former are usually most problematic. For example, given that the species inhabits dry habitats, natural variation in rainfall can result in reduced food availability and negatively affect moth populations.

CONSERVATION ACTIONS: The Kanahā Pond Sanctuary dune restoration project on Maui is planting native host plants in response to observations of caterpillars on plants in the restoration area. In addition to common statewide and island conservation actions, specific management directed toward Blackburn's sphinx moth should include the following:

- Restoration of habitat (e.g. dry and mesic shrub land and forests) and increased protection of currently occupied habitats, especially those supporting host plants.
- Support cultivation and restoration of *Nothocestrum* species.
- Restore *Nothocestrum* on Kahoʻolawe to support moth populations.
- Re-establish moth populations throughout their historic range.
- Prevent introduction of non-native invertebrates that may pose a risk to existing moth populations.

MONITORING:

- Continue surveys of populations in known and potential habitats.
- Continue monitoring of *Nothocestrum* species.
- Monitor non-native plant and animal populations in known and potential moth habitat.

RESEARCH PRIORITIES:

- Evaluate the species' habitat needs, population status, and life history.
- Evaluate limiting factors on the species, possibly through controlled release trials. This should be geared towards establishing additional populations across the former range of the species.

References:

U.S. Fish and Wildlife Service. 2003. Designation of Critical Habitat for the Blackburn's Sphinx Moth: final rule. Federal Register 68:34710-34766.

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U.S. Fish and Wildlife Service. 2009. Blackburn's Sphinx Moth (*Manduca blackburni*) 5-Year Review: Summary and Evaluation. Pacific Islands Fish and Wildlife Office. Honolulu, Hawai'i.

Megalagrion nigrohamatum nigrolineatum. Photo: Dan Polhemus, USFWS.

Terrestrial Invertebrates

Blackline Hawaiian damselfly

Megalagrion nigrohamatum nigrolineatum

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion nigrohamatum nigrolineatum* (Perkins 1899) is a moderate-sized damselfly, immediately distinguishable from all other Hawaiian species by the greenish to blue color of the lower half of the face and eyes. Males and females are sexually dimorphic in color pattern, with males reddish on the side of the thorax and females yellow to light blue. Adults are found along stream corridors in the vicinity of the pools and slow-moving stream sections that serve as breeding sites.

DISTRIBUTION: Endemic to Oʻahu, it formerly occurred on both sides of the island but is now apparently extirpated from the Waiʻanae range. In the Koʻolau range, it occurs in scattered locations along streams of the central and northern region, on both the windward and leeward sides. Seventeen populations are currently known.

ABUNDANCE: Numbers are drastically reduced due to the highly constrained area of habitat available. The population is estimated to be about 800 to 1,000 individuals total, with approximately 50 individuals at each site.

LOCATION AND CONDITION OF KEY HABITAT: The naiads live in pools and slow sections of perennial montane streams. Like most native damselflies, this species cannot survive where introduced fish and frogs are present. Although it historically occurred close to sea level, it is now restricted to upper elevations where barriers such as waterfalls prevent upstream movement of aquatic predators.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by erosion, the presence of feral ungulates, stream diversion and alteration, and alien aquatic plants.
- Predation. Non-native predators, including invasive fish, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion nigrohamatum nigrolineatum* specifically, management needs include the following:

- Conduct surveys around known populations to determine threat levels and control needs.

- Conduct studies on life history and essential habitats to better direct conservation measures.
- Use these results to create a management plan for species recovery.

MONITORING: Periodically census populations in order to assess their stability and trends.

RESEARCH PRIORITIES:
- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77:57648–57862.

Megalagrion nesiotes. Photo: Dan Polhemus, USFWS.

Terrestrial Invertebrates

Flying earwig Hawaiian damselfly

Megalagrion nesiotes

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion nesiotes* (Perkins, 1899) is a large damselfly, distinguished from other Hawaiian species by the blue and black color pattern and enlarged terminal appendages of the male. Females are brown with black stripes on the thorax. As a dark-colored, weak-flying species that occurs in forest, it is relatively inconspicuous and difficult to observe. Never very common, this species had not been seen since the 1930s before it was rediscovered along a stream on Maui in the early 1990s.

DISTRIBUTION: Historically this species was known from windward East Maui and Hawai'i, mostly below 914 meters (3,000 feet) elevation. The last collections from Hawai'i were made in the 1930s, and intensive surveys at historical sites in Puna and Volcano have not recovered it. However, its coloration and habits may mean it has been overlooked. The only known population site is on the north slope of Haleakalā, where the species was rediscovered in the 1990s after a gap of 75 years.

ABUNDANCE: Unknown. The sole known population is small and vulnerable to stochastic events, and no individuals have been observed during recent visits.

LOCATION AND CONDITION OF KEY HABITAT: The breeding habitat is unknown. Based on its behavior and relationships, it is thought to breed in terrestrial or semiterrestrial habitat, such as uluhe mats, damp leaf litter, or wet banks. Because these are not associated with the introduced aquatic predators that have cause the decline of most *Megalagrion* species, the main driver of this species' decline is unclear.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by erosion, the presence of feral ungulates, and alien aquatic plants.
- Predation. Non-native predators, including invasive invertebrates, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion nesiotes* specifically, management needs include the following:

- Conduct surveys around the known population to determine threat levels and control needs.

- Conduct studies on life history and essential habitats to better direct conservation measures.
- Use these results to create a management plan for species recovery.

MONITORING: Periodically census the population in order to assess stability and trends.

RESEARCH PRIORITIES:
- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith, AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; listing the flying earwig Hawaiian damselfly and Pacific Hawaiian damselfly as endangered throughout their ranges. Federal Register 75:35990–36012.

Megalagrion oceanicum. Photo: Dan Polhemus, USFWS.

Oceanic Hawaiian damselfly

Megalagrion oceanicum

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion oceanicum* (McLachlan, 1883) is a large, relatively robust damselfly. Like its relatives *M. heterogamias* of Kauaʻi and *M. blackburni* of Hawaiʻi, males are predominantly red except near the tip of the abdomen, while females have a dull greenish thorax and a dark abdomen. The size and the predominantly red coloration of the males make them conspicuous when flying about. Adults are found along stream corridors in the vicinity of fast-moving stream sections that serve as breeding sites; they are strong fliers and may also be found in adjacent forest.

DISTRIBUTION: Endemic to Oʻahu, it formerly occurred on both sides of the island but is now apparently extirpated from the Waiʻanae range. In the Koʻolau range, it occurs in scattered locations along streams on the windward side of the central and northern region. Twelve populations are currently known.

ABUNDANCE: Unknown. The population is thought to be relatively small due to the highly constrained habitat available.

LOCATION AND CONDITION OF KEY HABITAT: The naiads live in fast-flowing sections of perennial montane streams, but may come out of the water to forage on mossy banks and rocks. Like most native damselflies, this species cannot survive where introduced fish and frogs are present. Although it historically occurred close to sea level and in all habitable streams, it is now restricted to upper elevations in streams where barriers such as waterfalls prevent upstream movement of aquatic predators.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by erosion, the presence of feral ungulates, stream diversion and alteration, and alien aquatic plants.
- Predation. Non-native predators, including invasive fish, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion oceanicum* specifically, management needs include the following:

- Conduct surveys around known populations to determine threat levels and control needs.

- Conduct studies on life history and essential habitats to better direct conservation measures.
- Use these results to create a management plan for species recovery.

MONITORING: Periodically census populations in order to assess their stability and trends.

RESEARCH PRIORITIES:
- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77:57648–57862.

Megalagrion pacificum. Photo: Hank Oppenheimer.

Pacific Hawaiian damselfly

Megalagrion pacificum

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion pacificum* (McLachlan, 1883) is a moderate-sized damselfly, readily distinguished from all other Hawaiian species by the red and black color pattern of the male. Females are similar, with the abdomen predominantly black and the thorax marked with light green instead of red. Males can also be recognized by having the lower pair of terminal appendages much longer than the upper; in most species the upper pair is longer. Once considered the most common and widespread species of Hawaiian damselfly, it is now extirpated from most of its range and restricted to a handful of sites. Adults are found around the seepage-fed side pools of stream corridors that serve as breeding sites.

DISTRIBUTION: Historically this species was found in the lowlands of all the main islands except Niʻihau and Kahoʻolawe. It apparently disappeared from Oʻahu first, around 1910, and later from Kauaʻi and Lānaʻi. Recent surveys have found it at seven streams on Molokaʻi (with possibly more that are unsurveyed), fourteen on Maui, and only one on Hawaiʻi.

ABUNDANCE: Unknown. Numbers are drastically reduced due to the highly constrained area of habitat available.

LOCATION AND CONDITION OF KEY HABITAT: The naiads live in seepage-fed side pools off of main streams. Like most native damselflies, this species cannot survive where introduced fish and frogs are present. Formerly, *M. pacificum* was found in other lentic habitats such as marshes and taro ponds, but these are now almost all invaded by alien fish. It is now restricted to sites where barriers such as waterfalls prevent upstream movement of aquatic predators.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by erosion, the presence of feral ungulates, stream diversion and alteration, and alien aquatic plants.
- Predation. Non-native predators, including invasive fish, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion pacificum* specifically, management needs include the following:

- Conduct surveys around known populations to determine threat levels and control needs.
- Conduct studies on life history and essential habitats to better direct conservation measures.

- Use these results to create a management plan for species recovery.

MONITORING: Periodically census populations in order to assess their stability and trends.

RESEARCH PRIORITIES:
- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith, AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; listing the flying earwig Hawaiian damselfly and Pacific Hawaiian damselfly as endangered throughout their ranges. Federal Register 75:35990–36012.

Megalagrion leptodemas. Photo: Dan Polhemus, USFWS.

Terrestrial Invertebrates

Crimson Hawaiian damselfly

Megalagrion leptodemas

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion leptodemas* (Perkins, 1899) is a small, relatively slender damselfly. Males are predominantly bright red except on the posterior half of the abdomen, and females are greenish. Despite the coloration of the males, the small size and shy habits make them inconspicuous when flying about. Adults are found along stream corridors in the vicinity of standing pools or slow-moving stream sections that serve as breeding sites, usually not straying far from the stream. It is considered the rarest Oʻahu species known to be extant.

DISTRIBUTION: Endemic to Oʻahu, it formerly occurred on both sides of the island but is now apparently extirpated from the Waiʻanae range. In the Koʻolau range, it occurs in only three isolated locations in the upper reaches of streams: Moanalua, North Halawa, and Maakua.

ABUNDANCE: Unknown. The total population is extremely small due to the highly constrained habitat available and few remaining populations.

LOCATION AND CONDITION OF KEY HABITAT: The naiads inhabit still pools and slow-flowing sections of streams. Like most native damselflies, this species cannot survive where introduced fish and frogs are present. As a result, it is now restricted to upper elevations in streams where barriers such as waterfalls prevent upstream movement of aquatic predators.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by erosion, the presence of feral ungulates, stream diversion and alteration, and alien aquatic plants.
- Predation. Non-native predators, including invasive fish, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion leptodemas* specifically, management needs include the following:

- Conduct surveys around known populations to determine threat levels and control needs.
- Conduct studies on life history and essential habitats to better direct conservation measures.
- Use these results to create a management plan for species recovery.

MONITORING: Periodically census populations in order to assess their stability and trends.

RESEARCH PRIORITIES:

- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77:57648–57862.

Megalagrion xanthomelas. Photo: Karl Magnacca.

Terrestrial Invertebrates

Orangeblack Hawaiian damselfly

Megalagrion xanthomelas

SPECIES STATUS:
Federal Candidate for Listing
State Recognized as Endemic

GENERAL INFORMATION: *Megalagrion xanthomelas* (Selys-Longchamps, 1876) is a small, relatively slender damselfly. Males are red on the head, thorax, and tip of the abdomen, and black across most of the abdomen; females are patterned similarly but with pale brown instead of red. Adults are found in the vicinity of standing pools or slow-moving stream sections that serve as breeding sites, usually not straying far from the breeding habitat. It occurs primarily in lowland areas, and is one of the most adaptable native damselflies, capable of breeding in brackish anchialine ponds, basal spring wetlands, pools in slow-moving streams, and artificial water bodies.

DISTRIBUTION: The most widely distributed species of native damselfly, *M. xanthomelas* has been documented from all the main islands, including Niʻihau, except for Kahoʻolawe. However, it has apparently been extirpated from Kauaʻi and Maui (the Niʻihau population is unknown). On Oʻahu it was formerly widespread, including in basal spring wetlands around Pearl Harbor and in the vicinity of Honolulu, but the alteration of wetlands and near-ubiquitous presence of alien fish and frogs has reduced them to a single small population on the grounds of Tripler Army Medical Center. Lānaʻi has a few locations, but the largest population appears to be in artificial ponds at Koele Lodge. Molokaʻi and Hawaiʻi have several significant populations, dwelling in both streams and anchialine ponds near the coast.

ABUNDANCE: Unknown. The Molokaʻi and Hawaiʻi populations are relatively large, though the anchialine ponds on the Kona coast of Hawaiʻi are under threat from development, pollution, and introduction of fish. The Oʻahu population is extremely small and vulnerable to extirpation.

LOCATION AND CONDITION OF KEY HABITAT: The naiads inhabit still pools and slow-flowing sections of streams. Unlike most other species that occur in similar habitat, *M. xanthomelas* is able to live in many types of this form of water body, provided introduced fish and frogs are absent. As a result, they have persisted in what would be considered degraded sites, including drainage ditches, leaking pipes, and golf course water hazards.

THREATS:

- Habitat loss and degradation. Habitat is lost or degraded by development, stream diversion and alteration, and alien aquatic plants.
- Predation. Non-native predators, including invasive fish, frogs, ants, birds, and reptiles, consume this species.

CONSERVATION ACTIONS: The goals of conservation actions are not only to protect current populations and key breeding habitats, but also to establish additional populations, thereby reducing the risk of extinction. For *Megalagrion xanthomelas* specifically, management needs include the following:

- Conduct surveys around known populations to determine threat levels and control needs.
- Conduct studies on life history and essential habitats to better direct conservation measures.
- Use these results to create a management plan for species recovery.

MONITORING: Periodically census populations in order to assess their stability and trends.

RESEARCH PRIORITIES:

- Survey for additional populations, in both historical and novel sites.
- Conduct studies to determine if reintroduction to additional sites is feasible.

References:

Polhemus DA, and Asquith AA. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu, Hawai'i.

U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Federal Register 77:57648–57862.


Courtesy NMFS

Marine Reptiles

Honu or Green sea turtle

Chelonia mydas

SPECIES STATUS:
Federally Listed as Threatened
State Listed as Threatened
State Recognized as Indigenous
IUCN Red List – Endangered

SPECIES INFORMATION: Mature males are distinguished from females by their longer, thicker tails. Little information exists on the feeding behavior of post-hatchlings and juveniles in pelagic waters, but most likely they are exclusively carnivorous (e.g., soft-bodied invertebrates and fish eggs). Subadult and adult turtles in nearshore benthic environments are almost completely herbivorous; feeding primarily on macroalgae and seagrasses. Research from the Caribbean suggests that green sea turtles are a keystone species that help to maintain healthy seagrass beds. Hawaiian honu exhibit slow growth rates, even compared to other populations, with an average annual growth rate of 1–5 centimeters (0.5 to 2 inches) per year. Turtles reach sexual maturity at about 35 to 40 years of age. Females in the Northwestern Hawaiian Islands (NWHI) breed once every two or more years, while males may breed every year. Honu mate at sea and approximately 25 to 35 days after mating females swim onshore to excavate a nest and lay eggs. Females may lay up to six clutches per season, often returning to the same site for each clutch every 12 to 15 days. Each clutch contains 100 eggs and sex determination is temperature-dependent. Incubation takes about 60 days and hatchlings emerge from their nests at night. Both males and females often haul out between nesting intervals to bask in the sun.

DISTRIBUTION: Occurs around all the Hawaiian Islands. Important foraging areas are along the coasts of Oʻahu, Molokaʻi, Maui, Lānai, Hawaiʻi, Lisianski Island, and Pearl and Hermes Reef. Ninety percent of nesting occurs on French Frigate Shoals of the NWHI, with small numbers of nests on the other islands and atolls of the NWHI and Main Hawaiian Islands (MHI). Hawaiian turtles only migrate throughout the 2,450-kilometer (1,500-mile) expanse of the Hawaiian Archipelago, and so make up a discrete population. Worldwide, green sea turtles occur throughout tropical, subtropical, and to a lesser extent, temperate waters, and they nest in more than 80 countries.

ABUNDANCE: The French Frigate Shoals annual nesting population is estimated at 400 breeding females, with an increasing population trend. Worldwide, approximately 100,000 to 150,000 females nest each year.

LOCATION AND CONDITION OF KEY HABITAT: Honu are most often found in shallow, protected or semi-protected, water around coral reefs and coastal areas. These habitats contain

sea grasses and algae for foraging and shelter from predators such as tiger sharks. Key foraging habitat can be found around most of the Hawaiian Islands, but they often return to the same foraging areas after the breeding season. Foraging habitat is degraded on the south coast of Moloka'i; Kāne'ohe Bay, O'ahu; Hanalei Bay, Hanamaulu Bay, and Nawiliwili Harbor, Kaua'i; Maalaea Bay, Kihei, and Lahaina, Maui; and Hilo Bay, Hawai'i. Cleaning stations and resting habitats are important habitats for turtles as well. Nesting occurs on minimally disturbed sandy beaches, which is critical to the survival of the honu. The condition of nest beaches in the NWHI is relatively good compared to other areas because the NWHI are designated as a refuge with little development, and predation on eggs and hatchlings is low.

THREATS:

- Disease. Fibropapillomatosis (FP), a tumor-forming disease associated with herpesvirus, occurs on honu in Hawai'i. FP tumors are external and can impede critical functions such as swimming, eating, breathing, vision, and reproduction. Prevalence of FP peaked in the mid-1990s and has since declined around most Hawaiian islands, except around watersheds with high nitrogen outputs, where rates are increasing.
- Habitat degradation. Alien seaweeds are displacing important foraging, resting, and cleaning habitats. Other threats include loss or degradation of foraging habitats along coastal areas due to development, sedimentation, soil erosion, or sewage.
- Fisheries bycatch. Mortality of adult and juvenile turtles results from fisheries bycatch. Due to federally mandated take reduction measures implemented by Hawaiian longline fisheries, bycatch rates have been reduced by approximately 90 percent since 2004. However, bycatch remains a threat in other regions.
- Predation. Eggs and hatchlings are preyed on by introduced species (e.g., mongoose, rats, dogs, feral pigs, and cats) on the MHI. Predation on hatchlings by seabirds, fish, and sharks in the open ocean is a threat, although the extent of predation is unknown.
- Human disturbance and activities. Snorkeling and other recreational activities may cause disturbance or stress to honu. Injury or mortality from collisions with boats is also a threat.
- Marine debris. Entanglement by, or ingestion of, marine debris is a source of mortality.
- Climate change. Effects of climate change, such as increased temperatures, sea level rise, ocean acidification, and increased storm frequency leading to erosion, could have a variety of effects on honu, such as decreased reproductive success, loss or degradation of nesting habitat, and changes in juvenile and adult distribution.

CONSERVATION ACTIONS: Actions specific to honu should include the following:

- Protect, restore, and manage nesting, foraging, and resting habitats and cleaning stations.
- Reduce marine debris in in the marine environment and on beaches.
- Continue partnerships with local conservation groups to monitor and conserve turtles, respond to stranding, and conduct research and outreach programs.
- Conduct education and outreach efforts, particularly to address threats such as fishing interactions, marine recreation interactions, and marine debris.

MONITORING:

- Continue to monitor nesting sites.
- Continue to monitor abundance and distribution.
- Continue to monitor the occurrence and effects of FP.
- Continue to monitor turtles harmed or killed by marine debris and from fisheries bycatch.

RESEARCH PRIORITIES:

- Examine the environmental factors associated with FP.
- Evaluate effects of tourist activities on turtles.
- Determine distribution, abundance, and status of post-hatchlings, juveniles, and adults in the marine environment.

References:

Balazs GH. 1980. Synopsis of the biological data on the green turtle in the Hawaiian Archipelago. Prepared for National Marine Fisheries Service, Honolulu, HI. Technical Report NOAA-NMFS- SWFSC-7.

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Meadows DW. 2004. Behavior of green sea turtles in the presence and absence of recreational snorkellers. Marine Turtle Newsletter 103: 1-4.

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Leatherback sea turtle

Dermochelys coriacea

For photo see:

http://www.nmfs.noaa.gov/prot_res/species/turtles/leatherback.html

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
IUCN Red list – Vulnerable

SPECIES INFORMATION: Little information exists on the feeding behavior of post-hatchling and juvenile leatherback sea turtles living in pelagic habitats, but most likely they are exclusively carnivorous. Leatherbacks are the only sea turtle in which adults are also pelagic and carnivorous, feeding on jellyfishes, siphonophores, and salps, although they also feed on plants. They exhibit rapid growth rates from hatchling to juvenile (approximately 32 centimeters in length per year). Reproduction is seasonal, with two to three years between nesting. Females lay about five to seven clutches per year, and incubation lasts about 60 days. They are known to migrate long distances, up to 11,000 kilometers from their breeding areas. Sex determination is temperature-dependent. Genetic analysis of turtles incidentally caught in the Hawai'i-based longline fishery reveals that 12 out of 14 turtles came from the west Pacific and the other two originated from the eastern Pacific.

DISTRIBUTION: Transient visitors around the Hawaiian Islands. The entire Pacific population may be highly interconnected. Worldwide, leatherback sea turtles occur throughout tropical, temperate, and sub-polar regions of the Atlantic, Pacific, and Indian Oceans and the Mediterranean. Nesting occurs on subtropical and tropical beaches of the Atlantic, Pacific, and Indian Oceans.

ABUNDANCE: Rare in Hawai'i. In the Pacific Ocean, the annual number of breeding females is around 3,000 with declining nesting population trends noted at most breeding locations.

LOCATION AND CONDITION OF KEY HABITAT: Usually found in deep, highly productive waters. They occur in water that is far colder than that inhabited by any other sea turtle species. Nesting does not occur in Hawai'i but occurs on sandy beaches in the subtropics and tropics.

THREATS:

- Fisheries bycatch. Mortality of adult and juvenile turtles results from fisheries bycatch. Due to federally mandated sea turtle take reduction measures implemented by Hawaiian longline fisheries, bycatch rates have been reduced by approximately 90 percent since 2004. Bycatch remains a threat in other regions.
- Habitat loss and degradation. Nesting beaches (all of which occur outside Hawai'i) are critical to the species' survival and are subject to natural and human-caused threats such as tsunamis, oil spills, sea level rise from climate change, and coastal development.
- Harvest of eggs and adults. Harvest occurs on beaches in many countries, although conservation efforts have reduced this threat.
- Marine debris. Entanglement by, or ingestion of, marine debris is a source of mortality.

CONSERVATION ACTIONS: Actions specific to leatherback sea turtles should include the following:

- Cooperate with jurisdictions where nesting occurs to restore nesting habitat and reduce take of eggs and females.
- Reduce marine debris in the marine environment and on beaches.
- Continue partnerships with local conservation groups to monitor and conserve turtles, respond to stranding, and conduct research and outreach programs.
- Conduct education and outreach efforts, particularly to address threats such as fishing interactions, marine recreation interactions, and marine debris.

MONITORING: Continue to monitor turtles harmed or killed by marine debris and fisheries bycatch.

RESEARCH PRIORITIES: Determine distribution, abundance, and status of post-hatchlings, juveniles, and adults in the marine environment, especially in their foraging grounds.

References:

Gulko D, Eckert K. 2003. Sea turtles: an ecological guide. Honolulu, HI: Mutual Publishing.

IUCN Red List of Threatened Species. 2015. Version 2014.3. Available at: www.iucnredlist.org. (Accessed May 2015).

Kaneko JJ, and Bartram PK. 2008. What if you don't speak "CPUE-ese"? Pelagic Fisheries Research Program Newsletter, University of Hawai'i. 13(2):1-3.

National Marine Fisheries Service. 2004. Fisheries off West Coast States and in the Western Pacific; Western Pacific Pelagic Fisheries; Pelagic Longline Fishing Restrictions, Seasonal Area Closure, Limit on Swordfish Fishing Effort, Gear Restrictions, and Other Sea Turtle Take Mitigation Measures. FR 69:17329-17354.

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National Marine Fisheries Service and U.S. Fish and Wildlife Service. 2013. Leatherback Sea Turtle (*Dermochelys coriacea*) 5-year Review: Summary and Evaluation. National Marine Fisheries Service, Silver Springs, Maryland, and U.S. Fish and Wildlife Service, Jacksonville, Florida.

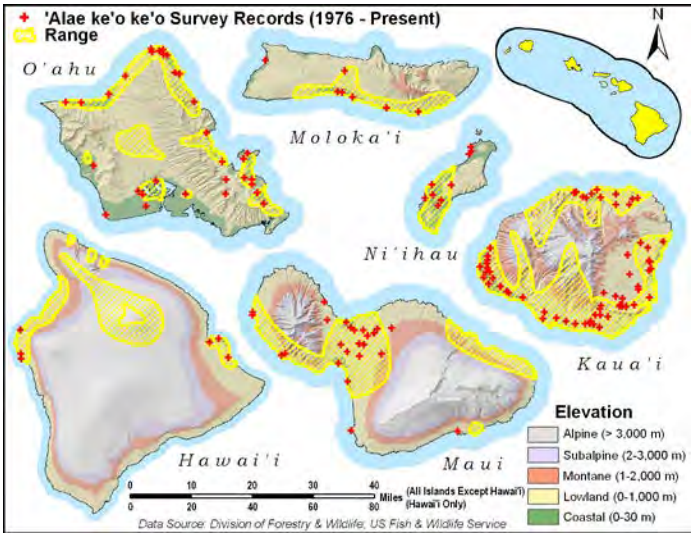
Photo: DOFAW

ʻAlae keʻokeʻo or Hawaiian coot

Fulica alai

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic
NatureServe Heritage Rank G2 - Imperiled
IUCN Red List Ranking - Vulnerable
Recovery Plan for Hawaiian Waterbirds - USFWS 2011

SPECIES INFORMATION: The ʻalae keʻokeʻo or Hawaiian coot is a small waterbird (Family: Rallidae) endemic to Hawaiʻi. Adult males and females have a black head, a slate gray body with white undertail feathers, and a prominent white frontal shield and bill; feet are lobed rather than webbed and are greenish gray. The Native Hawaiian considered ʻalae keʻokeʻo to be a deity but also considered it good to eat. Life history and breeding biology are poorly known. The species is somewhat gregarious and uses freshwater and brackish wetlands, including agricultural (e.g., taro fields) wetlands and aquaculture ponds. ʻAlae keʻokeʻo are generalists and feed on land, from the surface of the water, and underwater; also, they will graze on grass adjacent to wetlands. Food items include seeds and leaves, snails, crustaceans, insects, tadpoles, and small fish. The species will travel long distances, including between islands, when local food sources are depleted. Nesting habitat includes freshwater and brackish ponds, irrigation ditches, and taro fields. Floating nests are constructed of aquatic vegetation and found in open water or anchored to emergent vegetation. Open water nests are usually composed of mats of water hyssop (*Bacopa monniere*) and Hilo grass (*Paspalum conjugatum*). Nests in emergent vegetation are typically platforms constructed from buoyant stems of species such as bulrush. Nesting occurs year-round, but mostly between March and September. Nest initiation is tied to rainfall because appropriate water levels are critical to nest success. Clutch size range from three to ten eggs, and precocial young hatch after a 25-day incubation period.



DISTRIBUTION: The ʻalae keʻokeʻo occurs in coastal plain wetlands usually below 400 meters (1,320 feet) elevation on all the Main Hawaiian Islands except for Kahoʻolawe; however, breeding is restricted to relatively few sites. About 80 percent of the population occurs on Kauaʻi (Hanalei, Hulēʻia, Opaekaʻa), Oʻahu (coastal wetlands and reservoirs, such as Lake Wilson and Nuʻuanu

Reservoir, Kahuku Point, and along the windward shore), and Maui (Kanahā and Keālia Ponds, Nu'u Pond). The remaining 20 percent of the population occurs in coastal ponds and playa wetlands, such as Paialoa Pond on Moloka'i, the Lāna'i City wastewater treatment ponds, 'Aimakapā and 'Ōpae'ula ponds on the Kona Coast, and Waiākea and Loko Waka ponds on the island of Hawai'i.

ABUNDANCE: According to the results of biannual (summer and winter) waterbird counts conducted by DOFAW in the years 1997 to 2006, the population is estimated at 1,500–2,800 individuals, with a slightly increasing population trend.

LOCATION AND CONDITION OF KEY HABITAT: The 'alae ke'oke'o uses lowland wetland habitats with suitable emergent plant growth interspersed with open water, especially freshwater wetlands and taro fields, but also freshwater reservoirs, canefield reservoirs, sewage treatment ponds, brackish wetlands, and, rarely, saltwater habitats. On Kaua'i, some birds occur in plunge pools above 1,495 meters (4,900 feet) elevation, and on the island of Hawai'i, stock ponds up to 2,000 meters (6,600 feet) elevation. They typically forage in water less than 30 centimeters (12 inches) deep but will dive in water up to 120 centimeters (48 inches) deep. Compared to 'alae 'ula (Hawaiian moorhen), 'alae ke'oke'o forages in more open water. Logs, rafts of vegetation, narrow dikes, mud bars, and artificial island are important for resting. Ephemeral wetlands support large numbers during nonbreeding season and may provide a key habitat. Some important habitats are located in National Wildlife Refuges and State sanctuaries and receive management attention, but others remain unprotected, such as wetlands facing development or those used for agriculture or aquaculture. Examples include playa lakes on Ni'ihau; Opaeka'a marsh; Lumaha'i wetlands on Kaua'i; Amorient prawn farms; Lā'ie wetlands; Uko, Punaho'olapa, and Waihe'e marshes; Waialua lotus fields; Waipi'o Peninsula ponds on O'ahu; Paialoa and 'Ō'ō'ia playa fishponds on Moloka'i; and Opae'ula and Waiākea-Loko Waka ponds on the island of Hawai'i.

THREATS: Similar to the rest of Hawaiian native waterbirds, 'alae ke'oke'o are threatened by:

- Habitat loss. In the last 110 years, approximately 31 percent of coastal plain wetlands have been lost. A shift from wetland agriculture to other agriculture crops also has reduced the amount of wetland habitats.
- Introduced and native predators. Dogs (*Canis familiaris*), rats (*Rattus* spp.), feral cats (*Felis silvestris*), the small Indian mongoose (*Herpestes auropunctatus*), cattle egrets (*Bulbulcus ibis*), barn owls (*Tyto alba*), and bullfrogs (*Rana catesbeiana*) all potentially prey on adults or young.
- Altered hydrology. Altering wetland habitats for flood control or to allow them to serve as municipal water sources makes them generally unsuitable for 'alae ke'oke'o.
- Nonnative invasive plants. Several species of invasive plants, including pickleweed (*Batis maritima*), water hyacinth (*Eichornia crassipes*), and mangrove (*Rhizophora mangle*) reduce open water, mudflats, or shallows.
- Avian diseases. Botulism outbreaks result in mortality. West Nile virus and avian flu may pose a risk to Hawaiian waterbirds if these diseases reach Hawai'i.
- Environmental contaminants. Fuel and oil spills in wetlands result in toxicity and habitat degradation.
- Climate change. Sea level rise due to climate change may result in a loss of coastal wetland habitats used by Hawaiian waterbirds.

CONSERVATION ACTIONS: The State of Hawai'i, the U.S. Fish and Wildlife Service (USFWS), and private organizations and landowners have protected 82 percent of the core wetlands for Hawaiian waterbirds and 17 percent of their supporting wetlands. Actions specific to conservation of 'alae ke'oke'o and other Hawaiian waterbirds should include the following:

- Continue to manage, restore, and protect core and supporting wetland habitats.
- Eliminate or reduce populations of introduced predators.

MONITORING: Continue annual waterbird surveys and habitat monitoring on all islands to detect changes in population trends.

RESEARCH PRIORITIES:

- Analyze annual survey data for correlations, including use of specific wetlands, time of year, and state of wetlands, in order to improve management for 'alae ke'oke'o.
- Conduct a population viability analysis to identify population numbers and time spans that can serve as predictors for the long-term recovery of the 'alae ke'oke'o.
- Use climate change models to predict sea-level rise, and assess key wetlands to protect/create in light of the analysis.

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Courtesy

Marine Mammals

Īlio-holo-i-ka-uaua or Hawaiian monk seal

Neomonachus schauinslandi

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Indigenous and Endemic
IUCN Red List – Critically Endangered

SPECIES INFORMATION: Īlio-holo-i-ka-uaua, or Hawaiian monk seals, are benthic feeders and feed on reef fishes, octopus, squid, and lobsters over many substrates up to depths of 305 meters (1,000 feet). Juveniles feed on a higher proportion of nocturnal fish species. Food seems to be a limiting factor for population growth. They are usually solitary, except on preferred beaches when they occur in close proximity and interact. Mating occurs in the spring and early summer. Gestation is approximately one year. Pupping occurs in late winter and spring. Weaning lasts five to six weeks, in late spring, and pups and mothers stay ashore until pups are weaned. Foster parenting occurs. Most females breed every other year, but about one-third breed in consecutive years. Sexual maturity occurs at around five to ten years of age, and earliest is at Laysan. Life span is 20 to 25 years of age. These are the only endangered marine mammal that occurs exclusively within the United States.

DISTRIBUTION: Occurs in all of the Hawaiian Islands, including a small population in the Main Hawaiian Islands (MHI), although the majority of the population and pupping occurs in the Northwestern Hawaiian Islands (NWHI).

ABUNDANCE: The total population is estimated at 1,200 individuals, most of which occur in the NWHI, with a decreasing population trend. About 150 of these seals occur in the MHI, where the population is increasing.

LOCATION AND CONDITION OF KEY HABITAT: Feeding occurs within the atoll lagoon systems and on the reef slope within 200 kilometers (124 miles) of islands or atoll systems. They also forage on the submarine ridges connecting the atoll systems and on the seamounts around the NWHI. Terrestrial habitat is used about one-third of the time and includes haul-out areas for pupping, nursing, and resting, primarily on sandy beaches, but virtually all substrates are used. Beach vegetation is used for protection from wind and rain. Critical habitat has been designated under the Endangered Species Act as all waters out to 20 fathoms of depth and beaches (including sand spits and islets) and beach vegetation to its deepest inland extent around the six known breeding sites plus Maro Reef, Gardner Pinnacle, Necker, and Nihoa Islands. In addition, there is proposed critical habitat that would extend the current designation in the NWHI out to the 500-meter depth contour plus Sand Island at Midway Islands, as well as six new areas in the MHI (Kaula Island, Niʻihau, Kauaʻi, Oʻahu, Maui Nui, and Hawaiʻi) from 5 meters inland to the 500-meter depth contour.

THREATS:

- Human disturbance. Capture by humans and disturbance by military activities in the NWHI were once major threats. Disturbance of mothers with pups on popular beaches in the MHI is an ongoing threat.
- Entanglement and fishery interactions. Hooking and entanglement from recreational fisheries and from marine debris are significant sources of mortality. Regulations limiting longline fishing near the NWHI has decreased entanglement.
- Habitat degradation. Haul-out and pupping beaches in the NWHI are being lost to erosion as a result of sea level rise from climate change and storms.
- Disease. The seals are susceptible or potentially susceptible to disease outbreaks caused by canine distemper, leptospirosis, toxoplasmosis, brucellosis, and West Nile Virus.
- Predation. Shark predation on seal pups at French Frigate Shoals is a chronic and significant source of mortality.
- Prey availability. Low pup survival rates have been associated with reduced prey resources, potentially due to climate cycles or other oceanographic factors.
- Small population size and low genetic diversity exacerbate the other threats.

CONSERVATION ACTIONS: Actions specific to īlio-holo-i-ka-uaua should include the following:

- Continue to reduce fishery interactions and remove marine debris.
- Continue restoration and conservation of habitat and prey base.
- Remove sharks that cause significant predation of pups.
- Continue efforts to reduce potential introduction and exposure to infectious diseases.
- Expand and coordinate education and outreach programs.
- Conduct as-needed c aptive feeding and release of juveniles, and translocation of problem males and pups from low-survival areas to bolster other subpopulations.
- Maintain extensive field presence in NWHI to monitor and manage the seal population.

MONITORING: Conduct population monitoring, pup tagging, and adult identification program.

RESEARCH PRIORITIES:

- Examine causes of low juvenile survival.
- Continue habitat use and diet studies.

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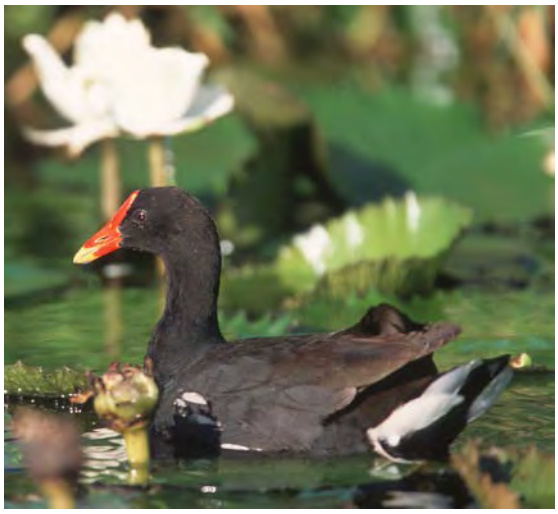

Photo: NRCS

Waterbirds

ʻAlae ʻula or Hawaiian moorhen

Gallinula chloropus sandvicensis

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Indigenous
NatureServe Heritage Rank G5 - Secure
Recovery Plan for Hawaiian Waterbirds – USFWS 2011

SPECIES INFORMATION: The ʻalae ʻula or Hawaiian moorhen is a small, striking waterbird (Family: Rallidae) and is one of 12 recognized subspecies. ʻAlae ʻula is endemic to Hawaiʻi and is very similar to its North American relative in appearance; adults are black above and dark slate blue below, with a white stripe on their flanks and a prominent red shield over their red and yellow bill. Feet are lobed rather than webbed, and males are larger than females. In Hawaiian mythology, a moorhen brought fire to humans, which explains the red on its forehead, a symbol of the scorching from the fire. The species' life history and breeding biology are poorly known. It uses a variety of freshwater habitats and can be somewhat secretive, although it is often seen swimming across open water. ʻAlae ʻula are opportunistic feeders, and their diet likely varies with habitat, but includes algae, grass seeds, plant material, insects, and snails. Nesting habitat is restricted to areas with standing freshwater less than 61 centimeters (24 inches) deep with dense emergent vegetation. Nesting occurs year-round, but mostly occurs between March and August. Nesting phenology is apparently tied to water levels and the presence of appropriately dense vegetation. Platform nests are constructed in dense vegetation over water. The particular species of emergent plant used for nest construction is not as important as stem density and vegetation height. Five to six eggs are laid and hatch after 22 days. Although chicks are precocial and can swim shortly after hatching, they are dependent on their parents for several weeks.

DISTRIBUTION:
ʻAlae ʻula generally occurs in wetland habitats below 125 meters (410 feet) elevation on the islands of Kauaʻi and Oʻahu, although there have been reports from Keʻanae Peninsula on Maui and from the island of Hawaiʻi. On Kauaʻi, the largest populations occur in the Hanalei and Wailua river valleys, but they also occur in irrigation canals on the Mānā Plains of western Kauaʻi and in taro fields. On Oʻahu, the species is widely distributed with most birds found between Haleʻiwa and Waimanalo; small numbers occur at Pearl Harbor and the leeward coast at Lualualei Valley. Historically, ʻalae ʻula occurred on all the Main Hawaiian Islands except for Lānaʻi and Kahoʻolawe.

ABUNDANCE: ʻAlae ʻula are quite secretive, and current survey methods are inadequate to accurately estimate population size. Based on biannual (summer and winter) waterbird counts

conducted by the Division of Forestry and Wildlife in the years 2000 to 2008, counts of ʻalae ʻula varied from 200 to just under 450 individuals, with a slightly increasing trend. The species was common at the turn of the twentieth century, but by the 1940s, its status was considered precarious.

LOCATION AND CONDITION OF KEY HABITAT: ʻAlae ʻula are found in freshwater marshes, wetland agricultural areas (e.g., taro patches), reedy margins of water courses (e.g., streams, irrigation ditches), reservoirs, wet pastures, and, infrequently, brackish water habitats. Important breeding areas are found on the Hanalei National Wildlife Refuge on Kauaʻi and the Kahuku and ʻUkoʻa wetlands and Waialua lotus fields on Oʻahu. Key habitat features include dense stands of robust emergent vegetation near open water, floating or barely emergent mats of vegetation, and water depths less than 1 meter (3.3 feet). Some important habitats are located in National Wildlife Refuges or on State lands and receive management attention, but others remain unprotected, such as wetlands facing development or those used for agriculture or aquaculture. Examples include Opaekaʻa marsh; Lumahaʻi wetlands on Kauaʻi; Amorient prawn farms; Lāʻie wetlands; Uko, Punahoʻolapa, and Waiheʻe marshes; Waialua lotus fields; and Waipiʻo Peninsula ponds on Oʻahu.

THREATS: Like the rest of Hawaiian native waterbirds, ʻalae ʻula are threatened by:

- Habitat loss. In the last 110 years, approximately 31 percent of coastal plain wetlands have been lost. A shift in wetland agriculture to other agriculture crops also has reduced the amount of wetland habitats.
- Introduced and native predators. Dogs (*Canis familiaris*), rats (*Rattus* spp.), feral cats (*Felis silvestris*), the small Indian mongoose (*Herpestes auropunctatus*), cattle egrets (*Bulbulcus ibis*), barn owls (*Tyto alba*), and bullfrogs (*Rana catesbeiana*) all potentially prey on adult or young ʻalae ʻula.
- Altered hydrology. Altering wetland habitats for flood control or to serve as municipal water sources makes them generally unsuitable for ʻalae ʻula.
- Nonnative invasive plants. Several species of invasive plants, including pickleweed (*Batis maritima*), water hyacinth (*Eichornia crassipes*), and mangrove (*Rhizophora mangle*) reduce open water, mudflats, or shallows.
- Avian diseases. Botulism outbreaks result in mortality. West Nile virus and avian flu may pose a risk to Hawaiian waterbirds if these diseases reach Hawaiʻi.
- Environmental contaminants. Fuel and oil spills result in toxicity and habitat degradation.
- Climate change. Sea level rise due to climate change may result in a loss of coastal wetland habitats used by Hawaiian waterbirds.

CONSERVATION ACTIONS: In order to establish a new population, the U.S. Fish and Wildlife Service (USFWS) translocated six ʻalae ʻula to Molokaʻi in 1983; however this reintroduction apparently failed because no birds have been sighted since 1985. The State of Hawaiʻi, USFWS, and private organizations and landowners have protected 82 percent of the core wetlands for Hawaiian waterbirds and 17 percent of their supporting wetlands. Other actions specific to conservation of ʻalae ʻula and other Hawaiian waterbirds should include the following:

- Continue to manage, restore, and protect core and supporting wetland habitats.
- Eliminate or reduce populations of introduced predators.

- Reintroduce ʻalae ʻula to at least two additional islands (Maui, Molokaʻi, Lānaʻi, and/or Hawaiʻi), and monitor survival, dispersal, and reproduction.

MONITORING: Continue annual statewide surveys of populations and habitat monitoring to detect changes in population trends.

RESEARCH PRIORITIES:

- Refine survey techniques, potentially using playback calls of ʻalae ʻula to increase detections.
- Analyze annual survey data for correlations, including use of specific wetlands, time of year, and state of wetlands, in order to improve management for ʻalae ʻula.
- Conduct a population viability analysis to identify population numbers and time spans that can serve as predictors for the long-term recovery of the ʻalae ʻula.
- Use climate change models to predict sea-level rise, and assess key wetlands to protect/create in light of the analysis.

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Photo: C. S. N. Bailey, NPS

ʻUaʻu or Hawaiian petrel

Pterodroma sandwichensis

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Indigenous
NatureServe Heritage Rank G2/T2 –
Species Globally Imperiled/Subspecies Locally Imperiled
IUCN Red List Ranking – Vulnerable
Regional Seabird Conservation Plan – USFWS 2005

SPECIES INFORMATION: The ʻuaʻu or Hawaiian petrel is a medium-sized, nocturnal gadfly petrel (Family: Procellariidae) endemic to Hawaiʻi. The name is derived from a commonly uttered call, heard at colonies. Adults are uniformly dark grayish black above forming a partial collar which contrasts with white throat, forehead, and cheeks; entirely white below except for black tail and leading and trailing edges of underwings. Owing to darkness of back color, the 'W-pattern' across back and upper surface of wings is not visible except in worm plumage. Bill black, and legs and feet mostly pink. Even during the breeding season, ʻuaʻu often feed thousands of kilometers from their breeding colonies, usually foraging within mixed-species feeding flocks over schools of predatory fishes. They feed by seizing prey while sitting on the water or by dipping prey while flapping just above the ocean surface. In Hawaiʻi, they feed primarily on squid, but also on fish, especially goatfish and lantern fish, and crustaceans. ʻUaʻu nest in colonies, form long-term pair bonds, and return to the same nest site year after year. Colonies are now typically in high-elevation, xeric habitats or wet, dense forests, although before the arrival of the Polynesians and their associated animals these birds nested in the lowlands, too. They nest in burrows, crevices, or cracks in lava tubes; nest chambers can be from 1 to 9 meters (3-30 feet) deep. Most eggs are laid in May and June and most birds fledge by December, although there are significant inter-island differences in breeding phenology; for example, the nesters that are earliest by more than a month reside at the summit of Haleakala Volcano. Both parents incubate the single egg, and brood and feed the chick. Birds first breed at five to six years of age.

DISTRIBUTION: Nests among the Main Hawaiian Islands (MHI) including Maui, Hawaiʻi, Kauaʻi, Lānaʻi, and possibly on Molokaʻi. Subfossil evidence indicates that prior to the arrival of Polynesians, ʻuaʻu was common throughout the MHI. At sea, they occur throughout the central tropical and subtropical Pacific Ocean.

ABUNDANCE: In the early 1990s the population was estimated at 19,000 individuals with a breeding population of 4,500 to 5,000 pairs, although inaccessible nesting locations make accurate counts difficult. Analysis of at-sea counts indicate broad consistency with the island-based estimates. More recently (1998-2011) the global population was estimated at 52,000 birds,

although due to differences in sampling methods it is unknown whether these higher numbers reflect a population increase or a difference in the proportion of the total population sampled. More than 1,800 individuals occur at Haleakalā National Park on Maui (a few hundred more nest in West Maui), around 150 pairs occur on Mauna Kea, Hawai'i; around 1,600 pairs occur on Kaua'i; several thousand birds occur on Lāna'i; and potentially around 50 pairs nest on Moloka'i.

LOCATION AND CONDITION OF KEY HABITAT: Nests in a variety of remote, inland habitats. On the islands of Hawai'i and Maui, colonies are located above 2,500 meters (8,200 feet) in xeric habitats with very sparse vegetation, with most nests in existing crevices in the lava. On Kaua'i and Lāna'i, and West Maui colonies occur in lower-elevation forests dominated by 'ōhi'a (*Metrosideros polymorpha*) often with a dense understory of uluhe fern (*Dicranopteris linearis*). At sea, they are pelagic and occur over the open ocean.

THREATS:

- Historical hunting. Nestlings were considered a delicacy by Polynesians, and were harvested from nest burrows, including artificial ones constructed by the Polynesians. Adults were netted as they returned to colonies, and smoky fires were sometimes lit along flight corridors to disorient and ground birds.
- Introduced predators. Adults and chicks are susceptible to depredation by dogs, pigs, rats, barn owls, feral cats, and the small Indian mongoose. The presence of these destructive introduced animals, the main force behind population decline, has relegated the species now to nest only in remote interior areas, at very high altitude, or on islands that are predator-free.
- Feral ungulates. Feral goats (*Capra hircus*), mouflon sheep (*Ovis musimon*), and potentially axis deer (*Axis axis*) trample burrows and degrade nesting habitat.
- Artificial lighting. Street and resort lights, especially in coastal areas, disorient fledglings, causing them to eventually fall to the ground exhausted or increasing their chance of colliding with artificial structures (i.e., fallout) such as powerlines. Once on the ground, fledglings are killed by cars, cats, and dogs, or die of starvation or dehydration.
- Collisions. Adults and fledglings are susceptible to mortality from collisions with obstacles such as communication towers, utility lines, fences, and wind farm structures while commuting between inland nest sites and the ocean at night.
- Colony locations. The remoteness of colonies, as well as the habitat in which they occur (e.g., steep terrain or dense forest), complicates predator and ungulate eradication or control.

CONSERVATION ACTIONS: Past actions directed at 'a'o (Newell's shearwater [*Puffinus auricularis*]) have often benefited 'ua'u populations. These actions include the rescue and rehabilitation of downed fledglings by the Save Our Shearwaters (SOS) program and efforts to shade and curtail resort and event lighting and streetlights. Current and future conservation efforts on Kaua'i to benefit should include efforts to reduce and shield lighting, control predators and invasive species at breeding colonies, conduct surveys to locate and characterize additional colonies, evaluate updated population estimates, and implement management actions appropriately. Actions being carried out in association with several Habitat Conservation Plans, along with State and federal recovery efforts are resulting in conservation benefits to 'ua'u on Maui, Lāna'i and Kaua'i; these include efforts to protect existing breeding populations and establish new colonies using predator-proof fencing, predator control,

ungulate control, social attraction, and translocation work plans. In addition to these efforts, future management actions specific to ʻuaʻu populations should include the following:

- Continue predator and ungulate control at colonies on Hawaiʻi, Maui, Lānaʻi, and Kauaʻi, and potentially at offshore islets that contain suitable nesting habitat.
- Locate additional breeding colonies on Lānaʻi, Hawaiʻi, Maui, and Kauaʻi and perform surveys on Molokaʻi, Lānaʻi, and Kahoʻolawe to assess ʻuaʻu presence on these islands.
- Continue to identify fallout areas and minimize effects of powerlines and artificial lights.
- Continue to support the SOS program, particularly public outreach about light attraction and fallout, the rescue and rehabilitation program, and the establishment of similar programs on other islands where appropriate.
- Re-establish/expand breeding colonies by identifying suitable candidate locations for social attraction and/or translocation, and continue to refine translocation protocols.

MONITORING: Continue at-sea and terrestrial surveys in known and likely habitats to evaluate the population size and status, and to locate unidentified breeding colonies. Monitor breeding incidence, breeding density, reproductive success, causes of mortality, population trends, return rates and effectiveness of management at breeding colonies. Assess the efficacy of predator control efforts.

RESEARCH PRIORITIES:

- Develop and implement standardized survey and monitoring protocols that can be used throughout Hawaiʻi to better estimate population parameters and changes.
- Expand and refine radar studies to monitor population trends, locate colonies, investigate behavior, determine geographic variability in threats, and evaluate the effectiveness of conservation measures.
- Conduct long-term demographic studies to evaluate reproductive success, breeding incidence, breeding density, colony boundaries, population trends, and survival rates.
- Develop, refine, and monitor the outcome of conservation actions and measures that are employed to avoid and minimize impacts from flight collision and other causes, and broaden adaptive management approaches.

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Photo: DOFAW

Migratory Birds

Kōlea or Pacific Golden-Plover

Pluvialis fulva

SPECIES STATUS:
State recognized as Indigenous
U.S. Shorebird Conservation Plan - High concern

SPECIES INFORMATION: The kōlea or Pacific golden-plover is a moderately small yellow-and-buff mottled shorebird (Family: Charadriidae) which winters in the Main Hawaiian Islands (MHI) and breeds in Siberia and westernmost Alaska. Most adults arrive in Hawai'i in August, while juveniles arrive in October; spring departures begin in late April. Kōlea feed primarily on terrestrial insects such as cockroaches, moths, caterpillars, and earwigs, all of which they locate by sight. During the breeding season, they are also known to eat berries, leaves, and seeds. Kōlea show high site fidelity to wintering grounds and will chase intruders from their territories while foraging. Hawai'i is thought to support a large proportion of the world's wintering kōlea population.

DISTRIBUTION: Kōlea winter across the tropical Pacific, in upland and coastal areas from Hawai'i to Japan. In Hawai'i, kōlea are more common in NWHI year-round, but between August and May are also commonly seen on all of the MHI.

ABUNDANCE: Reliable estimates of the global kōlea population have not been made. One estimate of the east Asian population was 90,000, while the population of the MHI has been estimated at 74,000 individuals. In the late 1960s, the O'ahu population was estimated at about 15,000. From 1986 to 2004, the average number of kōlea in Hawai'i State waterbird surveys has been about 950 ± 170 (SE) individuals across MHI. Estimated wintering densities range from 0.22 to 44.7 birds per hectare in wild habitats such as forest trails and coastal mudflats. Densities in developed habitats in Hawai'i have been estimated as 1.4 birds per hectare on golf courses and 5.2 birds per hectare on lawns.

LOCATION AND CONDITION OF KEY HABITAT: The winter range of kōlea is extremely varied, including crop fields, pastures, coastal salt marshes, mudflats, beaches, mangroves, grassy areas at airports, cemeteries, athletic fields, parks, residential lawns, golf courses, roadsides, and clearings in heavily wooded areas. In Hawai'i, birds also use open stands of ironwood (*Casuarina* spp.) and small urban lawns and gardens in areas such as downtown Honolulu. Military bases and airports often provide important wintering grounds. Where suitable habitats (pastures, etc.) occur on mountain slopes, kōlea range to at least 2,500 meters (8,125 feet) elevation. Extensive land-clearing in Hawai'i, dating back to the Polynesian colonization, has probably improved wintering conditions by creating open habitat with plentiful insects.

THREATS: Hunting was a significant threat until 1941 when it was prohibited, and populations are thought to have rebounded since then. Effects of pesticide exposure on wintering grounds and along migratory routes are unknown, but on golf courses in Hawai'i, kōlea come into contact with herbicides and pesticides that may be harmful. Aircraft strikes at Līhu'e (Kaua'i) and Kahului (Maui) airports occur occasionally in the fall, apparently as naive juvenile birds attempt to establish foraging territories on airport grounds.

CONSERVATION ACTIONS: To protect the ability of wintering kōlea to survive while in Hawai'i and to return in good condition to breeding grounds in Alaska, current statewide and island-specific conservation actions should include:

- Protection of current habitat.

MONITORING: Continue surveys of population and distribution in known and likely habitats.

RESEARCH PRIORITIES: Kōlea studies remain fragmentary, probably because the species is neither endemic nor endangered. Research priorities should include the following:

- Increased study of all aspects of ecology and behavior of kōlea in Hawai'i, and comparative research on unstudied populations elsewhere.
- Evaluation of conditions on winter range habitats as related to expanding human activities (e.g., agriculture, reclamation, urbanization, pollution).
- Increased effort to make accurate population estimates, along with systematic monitoring wherever possible to facilitate the recognition of trends and potential problems.

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Photo: Brenda Zaun, USFWS

‘A‘o or Newell’s shearwater

Puffinus auricularis newelli

SPECIES STATUS:
Federally Listed as Threatened
State Listed as Threatened
State Recognized as Indigenous
NaturServe Heritage Rank G2/T2 – Imperiled Species/Imperiled Subspecies
IUCN Red List Ranking – Endangered
Regional Seabird Conservation Plan – USFWS 2005

SPECIES INFORMATION: The ‘a‘o or Newell’s shearwater (Family: Procellaridae) is highly pelagic year-round, and is endemic to the Hawaiian Islands. Adult males and females are dark, sooty brown above, with white throat and underparts, and have a dark bill with a hooked tip. Flight is direct, fast and usually low over water, powered by rapid wing beats interspersed with glides; wing loading is higher than in more aerial shearwaters due to the species’ foraging method (see below). Often forages in large, mixed species flocks associated with schools of large, predatory fishes, which drive prey to the surface. ‘A‘o feed mainly by pursuit-plunging; individuals dive into water and swim using their partly folded wings for propulsion. Diet is not well known, but likely consists of fish and squid. ‘A‘o are colonial and nest on steep mountain slopes, with variable amounts of vegetation, where they lay a single egg in cavities and burrows, often located at the base of a tree. Breeding is highly synchronous, and eggs are laid in early June, and most young fledge by November. Both parents incubate the egg, and brood and feed the nestling. Parents forage hundreds of kilometers offshore and return to colony at night to feed chick. No post-fledging care is provided. Age at first breeding is six to seven years.

DISTRIBUTION: ‘A‘o nest on Kaua‘i, Hawai‘i, Moloka‘i, and Lehua, and may also nest on O‘ahu, Maui, and Lāna‘i, but not confirmed. Nesting colonies do not occur outside of Hawai‘i. At-sea distribution includes the eastern and central subtropical Pacific Ocean.

ABUNDANCE: Apparently abundant prior to the arrival of Polynesians, hunting and predation by introduced species resulted in declines of ‘a‘o, and the species was thought to be extinct by 1908. The species was rediscovered at sea in 1947 and breeding birds were found on Kaua‘i in 1967. Abundance is difficult to estimate because of the remoteness and terrain of colonies. In the early 1990s, the population was estimated at 84,000 birds based on at-sea surveys (included adults and non-breeding birds); the population in the subsequent decade (1998-2011) was estimated at roughly 27,000 birds based on revised population estimates using at-sea survey data and are broadly validated by radar detections. Due to differences in sampling methods it is unknown whether these lower estimates reflect a population decline or a difference in the proportion of the total population sampled. The breeding population was estimated at 14,600 pairs, 75-90 percent of which nest on Kaua‘i, based on demographic data.

The population is in serious decline; radar detections on Kaua‘i declined by approximately 75 percent from 1993 to 2008, and three colonies reported as active between 1980 and 1994 were abandoned.

LOCATION AND CONDITION OF KEY HABITAT: On Kaua‘i, most colonies occur between 160 and 1,200 meters (525 - 3,936 feet) elevation on steep, densely vegetated mountains, however, birds also nest on the dry, sparsely vegetated cliffs of the Nā Pali coast and on Lehua. On the island of Hawai‘i, they nest within forested cinder cones. Colonies are usually located in areas of open native forest dominated by ‘ōhi‘a (*Metrosideros polymorpha*) with a dense understory of ‘uluhe fern (*Dicranopteris linearis*).

THREATS:

- Historical hunting. Subsistence hunting by Polynesians likely reduced populations, and the species was likely captured using methods described for ‘ua‘u or Hawaiian petrel (e.g., artificial nests, nets, and smoke from fires).
- Introduced predators. Adults, eggs, and chicks are taken by introduced predators, including dogs (*Canis familiaris*), pigs (*Sus scrofa*), and rats (*Rattus exulans*). Europeans added barn owls (*Tyto alba*), additional rat species, feral cats (*Felis silvestris*), and the small Indian mongoose (*Herpestes auropunctatus*), which is the main factor behind population decline. The largest colonies are on Kaua‘i, the only Main Hawaiian Island besides Lāna‘i where the small Indian mongoose is not established.
- Habitat loss and degradation. Kaua‘i has lost about 75 percent of its forest in the last 150 years, and much of the remaining forest is being degraded by non-native plant species and feral ungulates
- Artificial lighting. Street and resort lights, especially in coastal areas, disorient fledglings, causing them to eventually fall to the ground exhausted or increasing their chance of colliding with artificial structures (i.e., fallout) such as powerlines. Once on the ground, thousands are killed annually by cars, cats, and dogs or die of starvation or dehydration. On Kaua‘i, approximately 350 fledglings were recovered annually from fallout in 1999 to 2010, far fewer than the thousands found per year in the late 1970s when the Save Our Shearwaters (SOS) program began; an unknown number are never found.
- Collisions. Adults and fledglings are susceptible to mortality from collisions with obstacles such as communication towers, overhead utility lines, and wind farm structures while commuting between inland nest sites and the ocean at night.
- Overfishing. Because ‘a‘o rely on predatory fish to drive prey to the surface, overfishing may be affecting the population.
- Colony locations. Remoteness of colonies, as well as the habitat they occur in (e.g., steep terrain or dense forest) complicates predator and ungulate eradication or control.
- Catastrophes. Given that a large proportion of the population breeds on Kaua‘i, catastrophic events like hurricanes could lead to extirpation.

CONSERVATION ACTIONS: Past and current actions include the SOS program which has recovered and released more than 31,000 downed fledgling shearwaters on Kaua‘i since 1978; presently all streetlights and some other types of lighting have been shielded on Kaua‘i; however, fallout still occurs and it is unknown whether these actions have improved survival. Fallout also occurs on Mau’i. Current and future conservation efforts on Kaua‘i to benefit the ‘a’o, ‘ua‘u (Hawaiian petrel), and ‘akē‘akē (band-rumped storm-petrel) include efforts to reduce

and shield lighting, control predators and invasive species, and conduct surveys to locate additional colonies. In addition to these efforts, future actions specific to ʻaʻo should include the following:

- Continue predator and ungulate control at key colonies on Kauaʻi and the island of Hawaiʻi, and initiate predator control at other known and potential colony sites.
- Continue to support the initiatives of the SOS program, particularly its public outreach about light fallout and rescue and rehabilitation program, and maintain and strengthen similar programs on other islands where needed.
- Continue to identify areas where high fallout occurs, accurately estimate flight collision risk, and develop improved methods to minimize and mitigate the effects of powerlines and artificial lights.
- Eradicate or control invasive plants from current and potential colony sites.
- Prioritize restoration projects at occupied and unoccupied nesting areas based on likelihood of success and existing threats at each site.
- Develop methods, test, and implement social attraction and translocation in order to create safe, managed colonies.
- Develop partnerships with private landowners to assist conservation measures.

MONITORING: Conduct at-sea and terrestrial surveys in known and likely habitats to evaluate the population size and status. Monitor breeding incidence, breeding density, reproductive success, causes of mortality, population trends, return rates and effectiveness of management at breeding colonies. Assess the efficacy of predator control efforts.

RESEARCH PRIORITIES:

- Develop and implement standard survey and monitoring protocols that allow changes in population size and structure to be evident.
- Expand and refine radar studies to monitor population trends, locate colonies, and evaluate the effectiveness of conservation measures.
- Evaluate diet and at-sea distribution to determine the potential effects of fishing and food web changes related to climate and oceanographic factors, and provide input on spatial planning for marine protected areas.
- Expand long-term demographic studies to determine reproductive success, survival rates, and factors affecting the population.

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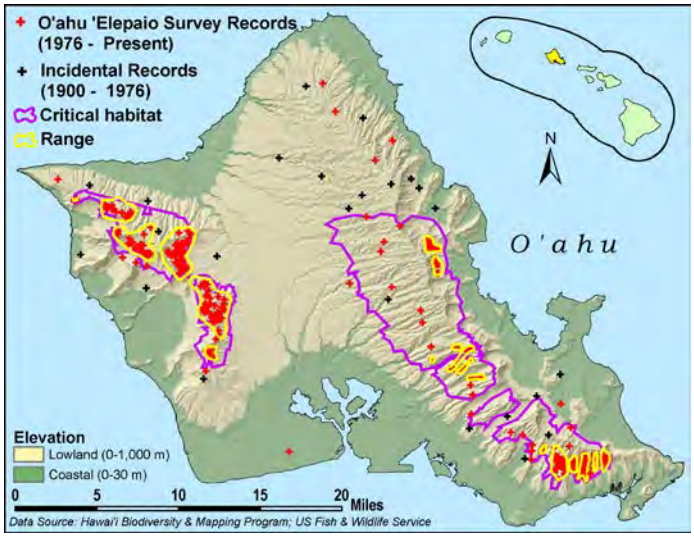
Photo: DOFAW

O‘ahu ‘elepaio

Chasiempis ibidis

SPECIES STATUS:
Federally Listed as Endangered
State Listed as Endangered
State Recognized as Endemic
NatureServe Heritage Rank G1—Critically Imperiled
IUCN Red List Ranking—Endangered
Revised Recovery Plan for Hawaiian Forest Birds —USFWS 2006

SPECIES INFORMATION: The O‘ahu ‘elepaio is a small, adaptable monarch flycatcher (Family: Monarchiade) endemic to the island of O‘ahu. Other species of ‘Elepaio occur on Kaua‘i (*C. sclateri*) and the island of Hawai‘i (*C. sandwichensis*). Males and females are dark brown above and white below with variable light brown streaks on breast and conspicuous white wing bars, tail feather tips, and throat. Both sexes have variable amounts of blacking markings, but males tend to have more. The bird’s name is derived from its primary song which is a shrill whistle given only by males. On the island of Hawai‘i, ‘elepaio use virtually all available substrates for foraging including the ground, logs, rock crevices, snags, and all parts of tress. Equally diverse in the use of foraging maneuvers, ‘elepaio capture a wide range of arthropod prey by flycatching, gleaning while either perched or hovering, and direct pursuit; foraging maneuvers vary depending on plant species from which prey is being captured, and habitat. O‘ahu ‘elepaio use a variety of native and non-native trees for foraging. Pairs remain together throughout the year, and long-term pair bonds are common. Breeding season on O‘ahu is January through July compared to March through August on the island of Hawai‘i. Unlike Hawaiian honeycreepers, both males and females participate almost equally in all aspects of rearing. Finely woven cup nests are built in a variety of native and non-native trees. Clutch size is usually two and second and third nests are attempted after failures, but rarely is a second nest attempted if the first is successful. Fecundity is low even in areas were predators are controlled. Young are fed by parents for at least a month, but remain on their natal territory for up to ten months which may allow young birds to hone their foraging skills.



DISTRIBUTION: Occurs in the Koʻolau Range between 100 to 550 meters (325 – 1,800 feet) elevation, and in the Waiʻanae Range between 500 to 850 meters (1,625 – 2,775 feet) elevation. Dispersal between the ranges is unlikely. Each subpopulation consists of several populations; the amount of dispersal among these is likely low. Original distribution likely included all forested areas of Oʻahu.

ABUNDANCE: In 2013, the population was estimated at 1,261 (95% confidence interval = 1,205-1,317) birds. It had previously been estimated at 1,200 to 1,400 birds. Although Audubon Christmas bird counts from the 1960s through the 1980s provided strong evidence of a dramatic population decline, numbers are now so low that the rate of decline since the 1990s cannot be determined.

LOCATION AND CONDITION OF KEY HABITAT: Occurs in a variety of forest types and across a range of elevations, primarily in valleys and particularly those with tall riparian vegetation, a continuous canopy, and dense understory. Common native plant species where ʻelepaio occur include papala kēpau (*Pisonia umbellifera*), lama (*Diospyros sandwicensis*), māmaki (*Pipturus albidus*), kaulu (*Sapindus oahuensis*) and ʻālaʻa (*Pouteria sandiwicensis*). Common introduced plants in ʻelepaio habitat include strawberry guava (*Psidium cattleianum*), common guava (*P. guajavai*), kukui (*Aleurites moluccana*), mango (*Mangifera indica*), and Christmas berry (*Schinus terebinthifolius*). Oʻahu ʻelepaio are not found in very wet forests, on windswept summits, or in very dry scrubland. Much of their current range is managed by the U.S. military or by the State of Hawaiʻi.

THREATS: Oʻahu ʻelepaio are likely susceptible to the same factors that threaten other native Hawaiian forest birds, including loss and degradation of habitat, predation by introduced mammals, and disease. For Oʻahu ʻelepaio, the following threats are of particular concern:

- Predation. Predation by black rats (*Rattus rattus*) have been implicated in the loss of nests and death of adult females. Rat control in Oʻahu populations resulted in large increases in nest success and in survival of adult females.
- Low reproductive potential. The species' low annual productivity, even in quality habitat, makes it very susceptible to factors that reduce population size.
- Disease. Avian pox (*Poxvirus avium*) reduces both annual survival and reproductive success of birds with active pox lesions compared to healthy birds; no information on the effect of avian malaria (*Plasmodium relictum*).
- Population size. Small populations are plagued by a variety of potentially irreversible problems that fall into three categories: demographic, stochastic, and genetic; the former are usually most problematic. Demographic factors include skewed sex ratios and stochastic factors include natural disasters. Habitat fragmentation exacerbates demographic and genetic problems.
- Fire. Wildfires resulting from military activities threaten two populations.

CONSERVATION ACTIONS: Conservation efforts already undertaken to protect the Oʻahu ʻelepaio include the following: listing as an endangered species by both the U.S. Fish and Wildlife Service (USFWS) and the State of Hawaiʻi, the initiation of long term population and demographic surveys which have identified the most serious threats to its survival, and ongoing rat control at the Honolulu Forest Reserve (DOFAW), at Schofield Barracks West Range and Mākua Military Reservation (U.S. Army Environmental Division), in Honouliuli Preserve (DOFAW) and in Lualualei Valley (U.S. Navy and USDA). In addition, the Oʻahu

ʻelepaio also benefits from management activities designed to conserve other endangered forest birds including the establishment of the Oʻahu Forest National Wildlife Refuge in the Koʻolau Mountains, fencing and ungulate control, forest restoration, habitat monitoring and studies on disease and disease vectors. In addition to these efforts, future management specific to the Oʻahu ʻelepaio should include the following:

- Continue and expand rat control.
- Protect remaining forests on Oʻahu, including through fire prevention.
- Conduct public outreach about the importance and benefits of rodent control.
- Continue demographic studies, especially in the largest populations.
- Continue protection and management of wildlife sanctuaries and refuges.

MONITORING: Continue forest bird surveys and habitat monitoring.

RESEARCH PRIORITIES: Research priorities for most Hawaiian forest birds include developing improved methods for controlling rats and feral cats in native forests, determining the ecological requirements of *Culex* mosquitoes at mid- and high-elevation forests, and developing methods to control mosquito populations. Research priorities specific to the Oʻahu ʻelepaio include the following:

- Identify disease resistance and transmission patterns. If resistant individuals are identified, translocation and/or captive propagation of these individuals may help recover populations.
- Determine genetic population structure.
- Identify areas most suitable for re-introduction of populations or for creation of habitat dispersal links between existing populations.
- Continue efforts to develop techniques for captive propagation using surrogate species (e.g., Hawaiʻi ʻelepaio (*Chasiempis sandwichensis sandwichensis*)).

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Photo: Jim Denny

Migratory Birds

ʻAkekeke or Ruddy Turnstone

Arenaria interpres

SPECIES STATUS:
State recognized as Indigenous
U.S. Shorebird Conservation Plan—High Concern

SPECIES INFORMATION: The ʻakekeke, or ruddy turnstone, is a small, calico-colored shorebird (Family: Scolopacidae) that is one of the most northerly breeding shorebirds. Each year ʻakekeke migrate from tropical coastlines to the Arctic Circle, where they breed in coastal areas and island interiors. ʻAkekeke have short bills, bright reddish-orange legs. They spend their days probing among rocks and pebbles along the shoreline in search of insects, especially flies, spiders, beetles, and grubs. Outside of the breeding season, however, their diet becomes much more diversified, extending to crustaceans, mollusks, worms, small fish, and even carrion, rubbish, and bird eggs.

DISTRIBUTION: During breeding season, ʻakekeke range from the eastern coast of Greenland to the north-eastern coast of Siberia, with most of the North American population concentrated on the northern coast of Alaska and the Arctic islands north of Canada. In winter, ʻakekeke range across a wide swath of tropical coastal regions from southeastern Asia to southwestern Africa and southern Europe. In Hawaiʻi, ʻakekeke are more prevalent on shorelines of the NWHI than in the MHI.

ABUNDANCE: Global population has been estimated at approximately 445,000 individuals, of which about 60percent (267,000) breed in North America. Trend analysis from 1972 to 1983 suggested that the U.S. Atlantic Coast population was in decline, but high variability of counts both within and between years increased uncertainty about the statistical validity of this trend. Average winter population in the MHI from 1986 to 2004, based on State waterbird surveys, was 512 ± 101 (SE), while during breeding season counts averaged 458 ± 62 (SE). Abundance in the NWHI has not been estimated but is probably larger than the MHI population.

LOCATION AND CONDITION OF KEY HABITAT: In winter, ʻakekeke are almost exclusively coastal, foraging mostly along stony or rocky shorelines with abundant seaweed. However, especially in Hawaiʻi and other Pacific Islands, ʻakekeke are also common on sandy shorelines and in mudflats and river deltas. Preferred habitats include ocean beaches along sheltered coastlines or bordering estuaries and other wetlands.

THREATS: Across most of their winter range, primary threats to ʻakekeke are human industrial and recreational activity leading to habitat loss and degradation by means of chemical contamination and disturbance. Avian diseases are also a threat.

CONSERVATION ACTIONS: To protect the ability of wintering ʻakekeke to survive while in Hawaiʻi and to return in good condition to breeding grounds in North America, statewide and island-specific conservation actions should include:

- Protection of coastal habitat.
- Protection and restoration of additional coastal habitat, especially where it can be reclaimed from abandoned urban or agricultural uses.
- Continue protection and management of wildlife sanctuaries and refuges.

MONITORING: Continue surveys of population and distribution in known and likely habitats.

RESEARCH PRIORITIES: Little study of visiting ʻakekeke has been undertaken, probably in part because their annual presence and numbers are uncertain. Research priorities should include the following:

- Identification of stopover sites, their biological attributes, and long-term usage patterns.
- Better understanding of ecological requirements for successful over-wintering, along with growth and development of wintering birds, for all age groups.
- Better understanding of time and energy budgets in relation to molt and preparation for spring migration.
- Measurement of growth and postfledging-survival rates for first arrivals at wintering location.
- More information on known and suspected threats, including degradation of coastal ecosystems, direct interactions with humans, habitat disturbance and destruction, and toxic and chemical contamination.

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Photo available from website:
http://animaldiversity.ummz.umich.edu/site/accounts/pictures/Calidris_alba.html

Hunakai or Sanderling

Calidris alba

SPECIES STATUS:
State recognized as Indigenous

SPECIES INFORMATION: The hunakai, or sanderling, is a sandpiper (Family: Scolopacidae) which is well-known for its habit of foraging at the edge of the surf zone and running up and down the beach to avoid waves while probing the sand for invertebrates. Hunakai are small, plump sandpipers, usually about 19 centimeters (7.5 inches) in length, with bills that are short, straight, and black. Their legs and feet are also black, but the rest of their body is white about the head, pale-gray on the back and ventrally white. Hunakai winter in the Hawaiian Islands, arriving by October and departing for breeding areas in the Arctic Circle by June, with juvenile birds tending to migrate later than adults. Hunakai diet changes markedly with the season, consisting almost exclusively of insects during the breeding season, and consisting of hippid crabs, isopods (*Excirolana* spp.), insects, talitrid amphipods, polychaete worms, and small bivalve mollusks in winter. Hunakai of both sexes are strongly territorial in and above the intertidal zone, but otherwise forage in non-territorial flocks.

DISTRIBUTION: Hunakai may be the most widespread maritime shorebird wintering in North America, with a winter range extending from British Columbia to southern Chile and from Maine to Argentina. Pacific winter range extends from Hawai'i and the Mariana and Marshall Islands through more southerly archipelagos (Phoenix, Union, and Galapagos Islands).

ABUNDANCE: Global population size is unknown, but the North American population is estimated to be 300,000 individuals. Estimated population for Hawai'i, based on State waterbird surveys from 1986 through 2003 yield an average summer count for the MHI of 138 ± 36 (SE), and a winter MHI count of 272 ± 32.6 (SE). NWHI populations may be larger, but data are lacking. In other areas, such as Mexico, shoreline densities of hunakai have been estimated at six birds per kilometer (about nine birds per mile) on sandy beaches, and about one-third of that on rocky coastlines. Trend data are sparse and not conclusive, but suggest a slight decline in numbers through the Americas since the late 1950s.

LOCATION AND CONDITION OF KEY HABITAT: Preferred foraging habitat during winter is sandy beach, mainly intertidal zone at high tide. Tidal sandflats and mudflats are also used, along with shores of lakes and rivers. Hunakai occasionally make use of rocky shores, sloughs, and river mouths, and have been rarely detected at sewage-treatment plants and municipal dumps. Hunakai tend to exhibit strong fidelity to wintering sites.

THREATS: The most severe threats to this species are considered to be environmental (e.g., effects of global warming and oil spills). Global warming is expected to have the greatest impact on breeding populations, although reduced food supplies for wintering birds could also result in adverse impacts. The greatest threats to wintering birds in Hawai'i include loss and degradation of habitat and avian disease.

CONSERVATION ACTIONS: To protect the ability of wintering hunakai to survive while in Hawai'i and to return in good condition to breeding grounds in North America, statewide and island-specific conservation actions should include:

- Protection of current habitat.
- Protection and restoration of additional habitat.

MONITORING: Continue surveys of population and distribution in known and likely habitats.

RESEARCH PRIORITIES: Hunakai have been only minimally studied. Research priorities should include the following:

- Better understanding of habitat requirements and behavioral plasticity, to improve assessments of probable responses to coastal (beach) development, habitat degradation, pollution, and other human disturbances.
- Increased understanding of movements of individuals that overfly the Hawaiian Islands, support needed studies of the extent to which distinct breeding populations exist and whether migration routes and wintering areas are population-specific.

References:

Macwhirter B, Austin-Smith P, Kroodsma D. 2002. Sanderling (*Calidris alba*). *In* The Birds of North America, No. 653 (Poole A, Gill F, editors). Philadelphia, (PA): The Academy of Natural Sciences; and Washington DC: The American Ornithologists' Union.

Photo: Forest and Kim Starr, USFWS

ʻEwaʻewa or Sooty Tern

Sterna fuscata

SPECIES STATUS:
State recognized as Indigenous
NatureServe Heritage Rank G5 - Secure
North American Waterbird Conservation Plan – Moderate concern
Regional Seabird Conservation Plan - USFWS 2005

SPECIES INFORMATION: The ʻewaʻewa or sooty tern is an abundant and gregarious tern (Family: Laridae) with a pantropical distribution, and is able to remain on the wing for years. Eight ʻewaʻewa (sooty tern) subspecies are recognized, and one (*S. f. oahuensis)* breeds in Hawaiʻi. Individuals have long, slender wings and a deeply forked tail. Adult males and females are blackish above, except for white forehead and white on the edges of the outer most tail feathers, and entirely white below. The sharp bill, legs, and feet are black. Flight is characterized by powerful flapping, gliding and soaring, capable of long distance migration and breeding adults remain aloft between breeding seasons. Generally forages in large mixed species feeding flocks, typically feeding over schools of predatory fishes, especially yellowfin tuna (*Neothunnus macropterus*) and skipjack tuna (*Katsuwonus pelamis*). ʻEwaʻewa (sooty tern) feed primarily by seizing prey from the water or air while on the wing, infrequently by shallow dives; species' plumage has poor waterproofing and easily becomes waterlogged. In Hawaiʻi, ʻewaʻewa (sooty tern) diet consists of squid, goatfish, flyingfish, and mackerel scad. Nests in large, dense colonies consisting of thousands to a million pairs of terns. Individuals return to natal colony to breed, some long-term pair bonds have been documented, and breeders prefer to return to previous nest locations. Nests are shallow scrapes often lined with bits of shell or vegetation. Timing of breeding varies among years and locations, even within Hawaiʻi, but generally eggs are laid beginning of February and most birds fledge by July. Both parents incubate single egg and brood and feed chick. Parents continue feeding young for two weeks after fledging and young remain aloft until they return to breed. Birds first breed between four and ten years of age and the oldest known individual was 32 years old.

DISTRIBUTION: ʻEwaʻewa (sooty tern) breed throughout the NWHI and on Moku Manu off of the island of Oʻahu. Outside of Hawaiʻi, ʻewaʻewa (sooty tern) breed on most islands throughout the world's tropical oceans. Outside the breeding season, ʻewaʻewa (sooty tern) are highly pelagic.

ABUNDANCE: In Hawaiʻi, population estimated at greater than one million breeding pairs with the largest populations occurring on Laysan (500,000 pairs) and Lisianski (500,000 pairs). Worldwide population is estimated at between 60 and 80 million breeding pairs.

LOCATION AND CONDITION OF KEY HABITAT: Terrestrial: ʻEwaʻewa (sooty tern) breed on oceanic islands and atolls. Nest is usually on sandy substrates with sparse vegetation. **Marine**: Pelagic.

THREATS:

- Introduced predators. Like all seabirds, adults and nests are susceptible to predation by rats (*Rattus* spp.) and feral cats (*Felis silvestris*). All sites in NWHI are free of rats and cats.
- Native predators. ʻIwa or great frigatebirds (*Fregata minor*), cattle egrets (*Bubulcus ibis*), ʻakekeke or ruddy turnstones, (*Arenaria interpres*) ʻaukuʻu or black-crowned night herons (*Nycticorax nycticorax*), Laysan (*Telespiza cantans*) and Nihoa (*T. ultima*) finches will depredate eggs and chicks.
- Overfishing. Because ʻewaʻewa (sooty terns) rely on predatory fish to drive prey to the surface, overfishing may eventually affect Hawaiian populations.
- Oil pollution. ʻEwaʻewa (sooty terns) populations are vulnerable to oil spills.

CONSERVATION ACTIONS: The following management goals are important to Pacific seabird conservation: maintain, protect, and enhance habitat; eradicate or control non-natives; minimize bycatch and other negative effects of fishing; improve the effectiveness of oil spill response efforts; identify contaminates and hazardous substances; and minimize the effects of powerlines, towers, wind turbines and lights (USFWS 2005). The goal of these management actions is not only to protect seabird populations and their breeding colonies, but also to re-establish former breeding colonies thereby reducing the risk of extinction. In addition to these efforts, future management specific to Hawaiian populations of ʻewa ʻewa (sooty terns) should include the following:

- Eradication and control of introduced predators at current and potential nesting sites.
- Continued protection and management of existing wildlife sanctuaries and refuges.

MONITORING: Continue surveys of population and distribution in known and likely habitats.

RESEARCH PRIORITIES: Most research priorities for seabirds are related to determining the most appropriate methods for achieving the above goals**.** Research priorities specific to ʻewaʻewa (sooty terns) include the following:

- Model interactions and importance of predatory fish, seabirds, and their prey to determine the long-term effects of overfishing on ʻewaʻewa (sooty terns) populations.

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Photo: Forest and Kim Starr, USFWS

ʻUaʻu kani or Wedge-tailed shearwater

Puffinus pacificus

SPECIES STATUS:
State Recognized as Indigenous
NatureServe Heritage Ranking G4/G5 – Apparently Secure/Secure
IUCN Red List Ranking – Least Concern
Regional Seabird Conservation Plan – USFWS 2005

SPECIES INFORMATION: The ʻuaʻu kani or wedge-tailed shearwater is a large, abundant seabird (Family: Procellaridae) that produces a variety of wails and moans that surely inspired the Hawaiian name of this bird which means "calling or moaning petrel." Individuals have long thin wings, a wedge-shaped tail, and a hooked bill. ʻUaʻu kani are polymorphic, having two color phases, dark or light, and sexes are similar in appearance. Light-phase adults are grayish brown above with white underparts except for dark trailing edges of wings and tail. Dark-phase adults are uniformly sooty brown. Flight is similar to that of albatross but flaps wings with greater frequency. Often forages in large, mixed species flocks associated with schools of large predatory fishes which drive prey species to the surface. They use a variety of foraging techniques, most frequently plunges head into water while on the wing, also seizes prey will sitting on the water; often follows fishing vessels. In Hawaiʻi, diet primarily consists of larval goatfish, flyingfish, squirrelfish, and flying squid. Like most seabirds ʻuaʻu kani breed in natal colonies, form long-term pair bonds, have high site fidelity, lay one egg per season, and both parents participate in all aspects of raising young. In Hawaiʻi, nesting is synchronous, and most eggs are laid in June with most young fledging in November. Birds first breed at four years of age, and the oldest known individual was 29 years old.

DISTRIBUTION: Nests throughout the Northwestern Hawaiian Islands (NHWI) and on offshore islets of most of the Main Hawaiian Islands (MHI). Outside of Hawaiʻi, nests on islands throughout the tropical and subtropical Indian and Pacific oceans. After the breeding season, they may migrate to the eastern Pacific Ocean.

ABUNDANCE: In Hawaiʻi, population estimated at 270,000 breeding pairs with the largest colonies on Laysan (125,000-175,000 pairs), Nihoa (30,000-40,000 pairs), and Lisianski (10,000-30,000 pairs). The MHI population is estimated at 40,000-60,000 breeding pairs with the largest colonies on the offshore islands of Mānana (10,000-20,000 pairs), Moku Loa (10,000-20,000 pairs), Lehua (23,000 pairs), and Kaʻula (1,500-2,500 pairs). Smaller populations occur on Moku Manu, Mokuʻauia, Kāpapa, Molokini, Mōkapu Peninsula, Kaʻena Point Natural Area Reserve on Oʻahu, and Kīlauea Point National Wildlife Refuge on Kauaʻi. Worldwide population is estimated at over 5 million birds.

LOCATION AND CONDITION OF KEY HABITAT: Terrestrial: Nests on low, flat islands and sand spits with little or no vegetation, but also excavates burrows on the slopes of extinct volcanoes and in old volcanic craters. Burrows require firm soil or plant roots to stabilize loose soil; generally nesting habitat is devoid of tall woody plants. In locations where nest sites are scarce or the ground is too hard to excavate burrows, birds will nest in rock crevices or above ground. **Marine:** Pelagic.

THREATS:

- Introduced predators. Like many seabirds, adults and nests are susceptible to mammalian predation by pigs (*Sus scrofa*), rats (*Rattus* spp.), feral cats (*Felis silvestris*), and the small Indian mongoose (*Herpestes auropunctatus*).
- Human disturbance. Laysan (*Telespiza cantans*) and Nihoa (*T. ultima*) finches will depredate eggs left unattended because of human disturbance. Trampling by humans can collapse burrows.
- Artificial lighting. Street and resort lights, especially in coastal areas, disorient fledglings, causing them to eventually fall to the ground exhausted or increasing their chance of collision with structures (i.e., fallout). Once on the ground, fledglings are unable to fly and are killed by cars, cats, and dogs or die of starvation or dehydration.
- Overfishing. Because ʻua'u kani rely on predatory fish to drive prey to the surface, overfishing may be affecting Hawaiian populations.
- Contaminants. Mercury, lead, and organochlorines have been detected in Hawaiian birds.
- Disease. Pox-like lesions have been observed on birds breeding on Maui and Moloka'i.

CONSERVATION ACTIONS: Actions specific to ʻua'u kani should include the following:

- Continue eradication and control of introduced predators at current and potential nesting sites on MHI.
- Limit human access to colonies.
- Continue to support the Save Our Shearwater (SOS) program, particularly its public outreach about light fallout and its rescue and rehabilitation program. Consider establishing similar programs on other islands where appropriate.
- Continue to identify fallout areas and work to minimize effects of powerlines and lights.
- Continue protection and management of wildlife sanctuaries and refuges.

MONITORING: Continue surveys of population and distribution in known and likely habitats.

RESEARCH PRIORITIES:

- Monitor contaminant levels and their effects, and investigate potential sources.
- Investigate the cause and effect of pox-like lesions in populations on Maui and Molokini.
- Model interactions and importance of predatory fish, seabirds, and their prey to determine the long-term effects of overfishing on ʻua'u kani populations.

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Birds Found in Hawaii and the Northwestern Hawaiian Islands that are Federally Protected Under the Migratory Bird Treaty Act (Unless Otherwise Noted)

Legend - R-Resident Year-Round; B-Breeds in the islands, leaves during non-breeding season; W-Winter from the bird's perspective, i.e. present in the non-breeding season (winter or summer), breeds elsewhere; V-Visitor, includes passage migrants and vagrant or rare visitors; I-Introduced; (x)-possibly extirpated				
COMMON NAME	**HAWAIIAN ISLANDS**	**Kure-Midway**	**other NWHI**	**NOTES**
Loons. Grebes. Seabirds				
Arctic Loon (*Gavia arctica)*	V	V		
Pacific Loon (*Gavia pacifica*)	V	V		
Pied-billed Grebe (*Podilymbus podiceps*)	V			
Horned Grebe (*Podiceps auritus*)	V			
Red-necked Grebe (*Podiceps grisegena*)	V			
Eared Grebe (*Podiceps nigricollis*)	V		V	
Short-tailed Albatross (*Phoebastria albatrus*)		V	V	Also ESA-listed
Shy Albatross (*Thalassarche cauta*)	V		V	
Black-footed Albatross *aka* Ka'upu (*Phoebastria nigripes*)	V	B	B	
Laysan Albatross *aka* moli (*Phoebastria immutabilis*)	B	B	B	
Wedge-tailed Shearwater *aka* 'Ua'u kani (*Puffinus pacificus*)	B	B	B	
Sooty Shearwater (*Puffinus griseus*)	V	V	V	
Christmas Shearwater (*Puffinus nativitatis*)	B	B	B	
Newell's (Townsend's, Manx) Shearwater *aka* 'A'o (*Puffinus newelli*)	B			Also ESA-listed
Little Shearwater (*Puffinus assimilis*)		V		
Bulwer's Petrel *aka* 'Ou (*Bulweria bulwerii*)	B	B	B	
Jouanin Petrel (*Bulweria fallax*)			V	
Northern Fulmar (*Fulmarus glacialis*)	V	V	V	
Black-winged Petrel (*Pterodroma nigripennis*)	V			

Mottled Petrel (*Pterodroma inexpectata*)	V			
Bonin Petrel (*Pterodroma hypoleuca*)		B	B	
Stejneger's Petrel (*Pterodroma longirostris*)	V			
Herald Petrel (*Pterodroma arminjoniana*)			V	
Hawaiian (Dark-rumped) Petrel *aka* 'Ua'u (*Pterodroma sandwichensis*)	B			Also ESA-listed
Kermadec Petrel (*Pterodroma neglecta*)		V		
Juan Fernandez Petrel (*Pterodroma externa*)	V			
Murphy's Petrel (*Pterodroma ultima*)		V	V	
Fork-tailed Storm-Petrel (*Oceanodroma furcata*)	V			
Leach's Storm-Petrel (*Oceanodroma leucorhoa*)	V	V	V	
Band-rumped Storm-Petrel (*Oceanodroma castro*)	B			proposed for ESA listing
Tristram's (Sooty) Storm-Petrel (*Oceanodroma tristrami*)		B	B	
White-tailed Tropicbird *aka* Koa'e kea (*Phaethon lepturus*)	R	B	V	
Red-billed Tropicbird (*Phaethon aethereus*)	V		V	
Red-tailed Tropicbird (*Phaethon rubricauda*)	B	R	R	
Masked Booby (*Sula dactylatra*)	R	B	B	
Brown Booby *aka* 'A (*Sula leucogaster*)	R	B	B	
Red-footed Booby (*Sula sula*)	R	B	B	
Pelagic Cormorant (*Phalacrocorax pelagicus*)			V	
Great Frigatebird *aka* 'Iwa *(Fregata minor*)	R	R	R	
Lesser Frigatebird (*Fregata ariel*)	V?	V	V	
Jaegers, Gulls and Terns				
South Polar Skua (*Stercorarius maccormicki*)	B		B	
Pomarine Jaeger (*Stercorarius pomarinus*)			W	
Parasitic Jaeger (*Stercorarius parasiticus*)	B		B	
Long-tailed Jaeger (*Stercorarius longicaudus*)	B		B	
Laughing Gull (*Leucophaeus atricilla*)	V			
Franklin's Gull (*Leucophaeus pipixcan*)	V		V	

Black-headed Gull (*Chroicocephalus ridibundus*)	V	V		
Bonaparte Gull (*Chroicocephalus philadelphia*)	V	V	V	
Ring-billed Gull (*Larus delawarensis*)	V		V	
California Gull (*Larus californicus*)	V			
Herring Gull (*Larus argentatus*)	V	V	V	
Slaty-backed Gull (*Larus schistisagus*)		V		
Western Gull (*Larus occidentalis*)	V			
Glaucous-winged Gull (*Larus glaucescens*)	V	V	V	
Glaucous Gull (*Larus hyperboreus*)	V	V	V	
Black-legged Kittiwake (*Rissa tridactyla*)	V	V	V	
Caspian Tern (*Hydroprogne caspia*)	V			
Great Crested Tern (*Thallasseus bergii*)	V		V	
Common Tern (*Sterna hirundo*)	V			
Arctic Tern (*Sterna paradisaea*)	V			
Little Tern (*Sternula albifrons*)	V	V	V	
Least Tern (*Sternula antillarum*)	B	B	B	first successful nesting in Hawaii in 2015
Gray-backed (Spectacled) Tern (*Onychoprion lunatus*)	B	B	B	
Sooty Tern (*Onychoprion fuscatus*)	B	B	B	
Black Tern *aka* 'Ewa'ewa (*Chlidonias niger*)	V	V		
Brown Noddy *aka* Noio koha (*Anous stolidus*)	R	R	R	
Black Noddy *aka* Noio (*Anous minutus*)	R	R	R	
Blue-gray Noddy (*Procelsterna cerulea*)			R	
White Tern (Common Fairy-Tern) (*Gygis alba*)	R	R	R	
Gull-billed Tern (*Gelochelidon nilotica*)	V			
Sandwich Tern (*Thallasseus sandvicensis*)	V			
Auks, Puffins				
Ancient Murrelet (*Synthliboramphus antiquus*)	V			
Parakeet Auklet (*Aethia psittacula*)		V	V	

Tufted Puffin *(Fratercula cirrhata*)			V	
Horned Puffin (*Fratercula corniculata*)		V	V	
Waterfowl				
Tundra Swan (*Cygnus columbianus*)	V	V		
Greater White-fronted Goose (*Anser albifrons*)	V		V	
Snow Goose (*Chen caerulescens*)	V	V		
Emperor Goose (*Chen canagica*)	V	V	V	
Brant (*Branta bernicla*)	V		V	
Canada Goose (*Branta canadensis*)	V	V		
Cackling Goose (*Branta hutchinsii*)	V		V	
Hawaiian Goose *aka* Nene (*Branta sandvicensis*)	R			Also ESA-listed
Green-winged Teal (*Anas crecca*)	V	V	V	
Mallard (*Anas platyrhynchos*)	R, V	V	V	
Hawaiian Duck *aka* Koloa maoli (*Anas wyvilliana*)	R			Also ESA-listed
Laysan Duck (*Anas laysanensis*)			R	Also ESA-listed
Northern Pintail *aka* Koloa mapu (*Anas acuta*)	W	W	W	
Garganey (*Anas querquedula*)	V	V		
Blue-winged Teal (*Anas discors*)	V			
Cinnamon Teal (*Anas cyanoptera*)	V			
Northern Shoveler *aka* Koloa moha (*Anas clypeata*)	W	W	W	
Gadwall (*Anas strepera*)	V	V	V	
Eurasian Wigeon (*Anas penelope*)	V	V		
American Wigeon (*Anas americana*)	W	W	W	
Common Pochard (*Aythya ferina*)		V		
Canvasback (*Aythya valisineria*)	V			
Redhead (*Aythya americana*)	V			
Ring-necked Duck (*Aythya collaris*)	V			
Tufted Duck (*Aythya fuligula*)	V	V		

Greater Scaup (*Aythya marila*)	V		V	
Lesser Scaup (*Aythya affinis*)	W			
Harlequin Duck (*Histrionicus histrionicus*)		V	V	
Long-tailed Duck (Oldsquaw) (*Clangula hyemalis*)		V		
Black Scoter (*Melanitta nigra*)		V		
Surf Scoter (*Melanitta perspicillata*)	V			
Bufflehead (Bucephala albeola)	V	V		
Hooded Merganser (*Lophodytes cucullatus*)	V			
Common Merganser (*Mergus merganser*)	V			
Red-breasted Merganser (*Mergus serrator*)	V		V	
Ruddy Duck (*Oxyura jamaicensis*)	V			
Waterbirds, Wading Birds				
Great Blue Heron (*Ardea herodias*)	V			
Great Egret (*Ardea alba*)	V			
Snowy Egret (*Egretta thula*)	V			
Little Blue Heron (*Egretta caerulea*)	V			
Cattle Egret (*Bubulcus ibis*)	R	V	V	
Green (Little, Green-backed) Heron (*Butorides virescens*)	V			
Black-crowned Night-Heron *aka* 'Auku'u (*Nycticorax nycticorax*)	R			
White-faced Ibis (*Plegadis chihi*)	V			
Rails, Moorhens				
Hawaiian Common Gallinule (Moorhen) *aka* ‘Alae ‘ula (*Gallinula chloropus*)	R			Also ESA-listed
Hawaiian Coot *aka* 'Alae ke'oke'o (*Fulica alai*)	R			Also ESA-listed
Shorebirds				
Black-bellied (Gray) Plover (*Pluvialis squatarola*)	W	V	V	
Pacific Golden-Plover *aka* Kolea (*Pluvialis fulva*)	W	W	W	
Lesser (Mongolian) Sand-Plover (*Charadrius mongolus*)	V		V	
Common Ringed Plover (*Charadrius hiaticula*)	V	V		

Semipalmated Plover (*Charadrius semipalmatus*)	W	V	V	
Killdeer (*Charadrius vociferus*)	V			
Eurasian Dotterel (*Charadrius morinellus*)		V		
Hawaiian (Black-necked) Stilt *aka* Ae'o (*Himantopus mexicanus knudseni*)	R			Also ESA-listed
Greater Yellowlegs (*Tringa melanoleuca*)	V		V	
Lesser Yellowlegs (*Tringa flavipes*)	W	V	V	
Wood Sandpiper (*Tringa glareola*)	V	V		
Solitary Sandpiper (*Tringa solitaria*)	V			
Willet (*Tringa semipalmata*)	V			
Wandering Tattler *aka* Ulili (*Tringa incana*)	W	W	W	
Gray-tailed (Siberian) Tattler (*Tringa brevipes*)		V		
Spotted Sandpiper (*Actitis macularius*)	V			
Whimbrel (*Numenius phaeopus*)	V	V		
Bristle-thighed Curlew *aka* Kioea (*Numenius tahitiensis*)	V	W	W	
Hudsonian Godwit (*Limosa haemastica*)	V			
Bar-tailed Godwit (*Limosa lapponica*)	V	V	V	
Marbled Godwit (*Limosa fedoa*)			V	
Ruddy Turnstone (*Arenaria interpres*)	W	W	W	
Red Knot (*Calidris canutus*)	V	V	V	Also ESA-listed
Sanderling *aka* Hunakai (*Calidris alba*)	W	W	W	
Semipalmated Sandpiper (*Calidris pusilla*)	V			
Western Sandpiper (*Calidris mauri*)	V	V		
Red-necked (Rufous-necked) Stint (*Calidris ruficollis*)		V		
Little Stint (*Calidris minuta*)		V		
Long-toed Stint (*Calidris subminuta*)		V		
Least Sandpiper (*Calidris minutilla*)	W			
Baird Sandpiper (*Calidris bairdii*)	V			
Pectoral Sandpiper (*Calidris melanotos*)	W	W	V	

Sharp-tailed Sandpiper (*Calidris acuminata*)	W	W	W	
Dunlin (*Calidris alpina*)	V	V	V	
Curlew Sandpiper (*Calidris ferruginea*)	V			
Buff-breasted Sandpiper (*Tryngites subruficollis*)	V	V		
Ruff (*Philomachus pugnax*)	W	V	V	
Short-billed Dowitcher (*Limnodromus griseus*)	V	V		
Long-billed Dowitcher (*Limnodromus scolopaceus*)	V	V	V	
Common Snipe (*Gallinago gallinago*)	V	V	V	
Pin-tailed Snipe (*Gallinago stenura*)		V		
Wilson Phalarope (*Phalaropus tricolor*)	V			
Red-necked Phalarope (*Phalaropus lobatus*)	V		V	
Red Phalarope (*Phalaropus fulicarius*)	W		W	
Eagles, Hawks, Falcons				
Osprey (*Pandion haliaetus*)	V	V		
Steller's Sea-Eagle (*Haliaeetus pelagicus*)		V	V	
Northern Harrier (*Circus cyaneus*)	V	V		
Hawaiian Hawk *aka* 'Io (*Buteo solitarius*)	R			Also ESA-listed
Golden Eagle (*Aquila chrysaetos*)	V			
Peregrine Falcon (*Falco peregrinus*)	V	V	V	
Owls				
Barn Owl (*Tyto alba*)	IR	IV	IV	
Hawaiian Short-eared Owl *aka* Pueo (*Asio flammeus sandwichensis*)	R	V	V	
Galliformes				
Black Francolin (*Francolinus francolinus*)	IR			non-native, not MBTA-protected
Gray Francolin (*Francolinus pondicerianus*)	IR			non-native, not MBTA-protected
Erckel's Francolin (*Francolinus erckelii*)	IR			non-native, not MBTA-protected
Chukar (*Alectoris chukar*)	IR			non-native, not MBTA-protected
Japanese Quail (*Coturnix japonica*)	IR			non-native, not MBTA-protected

Kalij Pheasant (*Lophura leucomelanos*)	IR			non-native, not MBTA-protected
Red Junglefowl (*Gallus gallus*)	IR			non-native, not MBTA-protected
Ring-necked Pheasant (*Phasianus colchicus*)	IR			non-native, not MBTA-protected
Common Peafowl (*Pavo cristatus*)	IR			non-native, not MBTA-protected
Wild Turkey (*Meleagris gallopavo*)	IR			non-native, not MBTA-protected
Gambel's Quail (*Callipepla gambelii*)	IR			non-native, not MBTA-protected
California Quail (*Callipepla californica*)	IR			non-native, not MBTA-protected
Sandgrouse, Pigeons, Doves				
Mourning Dove (*Zenaida macroura*)	R			
Chestnut-bellied Sandgrouse (*Pterocles exustus*)	IR			non-native, not MBTA-protected
Rock Dove (*Columba livia*)	IR	IR	IV	non-native, not MBTA-protected, individuals visit other islands
Spotted Dove (*Streptopelia chinensis*)	IR			non-native, not MBTA-protected
Zebra Dove (*Geopelia striata*)	IR			non-native, not MBTA-protected
Parrots, Parakeets, Lories				
Rose-ringed Parakeet (*Psittacula krameri*)	IR			non-native, not MBTA-protected
Red-masked Parakeet (*Psittacara erythrogenys*)	IR			non-native, not MBTA-protected
Nightjar, Swifts				
Island (Micronesian, Caroline Island) Swiftlet (*Aerodramus inquietus*)	R*			*native to CNMI, introduced on Oahu in the 1960s
Kingfishers				
Belted Kingfisher (*Megaceryle alcyon*)	V			
Bee-eaters, Rollers, Larks				
Eurasian Sky Lark (*Alauda arvensis*)	IR	IV		
Swallows, Drongos				
Cliff Swallow (*Petrochelidon pyrrhonota*)	V		V	
Barn Swallow (*Hirundo rustica*)	V	V		
Crows, Jays, Magpies, Cuckoo-Shrikes				

Hawaiian Crow (*Corvus hawaiiensis*)	R			Also ESA-listed; extinct in the wild; reintroductions planned for 2016
Bulbuls, Australo-Papuan & Old World Insect-Eaters				
Oahu Elepaio (*Chasiempis ibidis*)	R			ESA-listed, not MBTA-protected
Hawaii Elepaio (*Chasiempis sandwichensis*)	R			not MBTA-protected
Kauai Elepaio (*Chasiempis sclateri*)	R			not MBTA-protected
Red-vented Bulbul (*Pycnonotus cafer*)	IR			non-native, not MBTA-protected
Red-whiskered Bulbul (*Pycnonotus jocosus*)	IR			non-native, not MBTA-protected
Japanese Bush-Warbler *aka* Uguisu (*Cettia diphone*)	IR			non-native, not MBTA-protected
White-rumped Shama (*Copsychus malabaricus*)	IR			non-native, not MBTA-protected
Hawaiian Native Thrushes				
Oma'o (*Myadestes obscurus*)	R			
Puaiohi (*Myadestes palmeri*)	R			Also ESA-listed
Babblers, Mockingbirds, Wagtails				
Greater Necklaced Laughingthrush (*Garrulax pectoralis*)	IR			non-native, not MBTA-protected
Melodious Laughingthrush *aka* Hwamei (*Garrulax canorus*)	IR			non-native, not MBTA-protected
Red-billed Leiothrix (*Leiothrix lutea*)	IR			non-native, not MBTA-protected
Northern Mockingbird (*Mimus polyglottos*)	IR		IV	
Olive-backed Pipit (*Anthus hodgsoni*)		V		
Red-throated Pipit (*Anthus cervinus*)		V		
American (Water) Pipit (*Anthus rubescens*)		V		
Woodswallows, Shrikes, Starlings				
Common Myna (*Acridotheres tristis*)	IR	IR		non-native, not MBTA-protected
Honeyeaters, White-eyes				
Japanese White-eye (*Zosterops japonicus*)	IR			non-native, not MBTA-protected
Emberizine Finches				
Northern Cardinal (*Cardinalis cardinalis*)	IR		IV	
Yellow-faced Grassquit (*Tiaris olivaceus*)	IR			non-native, not MBTA-protected
Savannah Sparrow (*Passerculus sandwichensis*)		V		

Snow Bunting (*Plectrophenax nivalis*)		V		
Western Meadowlark (*Sturnella neglecta*)	IR			
Red-crested Cardinal (*Paroaria coronata*)	IR			non-native, not MBTA-protected
Yellow-billed Cardinal (*Paroaria capitata*)	IR			non-native, not MBTA-protected
Saffron Finch (*Sicalis flaveola*)	IR			non-native, not MBTA-protected
Black-headed Bunting (*Emberiza melanocephala*)				
Yellow-fronted Canary (*Serinus mozambicus*)	IR			non-native, not MBTA-protected
Yellow Canary aka Common Canary (*Serinus canaria*)		IR		non-native, not MBTA-protected
Cardueline Finches, Honeycreepers				
House Finch (*Carpodacus mexicanus*)	IR	IV	IV	
Common Redpoll (*Acanthis flammea*)		V		
Laysan Finch (*Telespiza cantans*)			R	Also ESA-listed
Nihoa Finch (*Telespiza ultima*)			R	Also ESA-listed
Palila (*Loxioides bailleui*)	R			
Maui Parrotbill (*Pseudonestor xanthophrys*)	R			Also ESA-listed
Hawaii 'Amakihi (*Hemignathus virens*)	R			
Kauai 'Amakihi (*Hemignathus kauaiensis*)	R			
Oahu 'Amakihi (*Hemignathus flavus*)	R			
Anianiau (*Magumma parva*)	R			Also ESA-listed
Lesser 'Akialoa (*Akialoa obscura*)	R (x)			Also ESA-listed, possibly extinct
Greater 'Akialoa (*Akialoa ellisianus*)	R (x)			Also ESA-listed, possibly extinct
Maui nukupuʻu (Hemignathus lucidus affinis)	R (x)			Also ESA-listed, possibly extinct
Kauaʻi nukupuʻu (*Hemignathus lucidus hanapepe*)	R (x)			Also ESA-listed, possibly extinct
Akiapola'au (*Hemignathus munroi*)	R			Also ESA-listed
Akikiki (*Oreomystis bairdi*)	R			Also ESA-listed
Hawaii Creeper (*Manucerthia mana*)	R			Also ESA-listed
Maui 'Alauahio *aka* Maui creeper (*Paroreomyza montana*)	R			Also ESA-listed
Akepa (*Loxops coccineus*)	R			Also ESA-listed
Akeke'e (*Loxops caeruleirostris*)	R			Also ESA-listed

I'iwi (*Vestiaria coccinea*)	R			
Akohekohe (*Palmeria dolei*)	R			Also ESA-listed
Apapane (*Himatione sanguinea*)	R			
Po'o-uli (*Melamprosops phaeosoma*)	R (x)			Also ESA-listed, possibly extinct
Old World Sparrows, Estrildid Finches				
House (English) Sparrow (*Passer domesticus*)	IR	IV	IV	non-native, not MBTA-protected
Red-cheeked Cordonbleu (*Uraeginthus bengalus*)	IR			non-native, not MBTA-protected
Lavender Waxbill (*Estrilda caerulescens*)	IR			non-native, not MBTA-protected
Orange-cheeked Waxbill (*Estrilda melpoda*)	IR			non-native, not MBTA-protected
Black-rumped Waxbill (*Estrilda troglodytes*)	IR			non-native, not MBTA-protected
Common Waxbill (*Estrilda astrild*)	IR			non-native, not MBTA-protected
Red Avadavat aka Red Munia, Strawberry Finch (*Amandava amandava*)	IR			non-native, not MBTA-protected
African Silverbill aka Warbling Silverbill (*Lonchura cantans*)	IR			non-native, not MBTA-protected
Scaly-breasted (Spotted) Munia aka Nutmeg Mannikin, Spice Finch (*Lonchura punctulata*)	IR			non-native, not MBTA-protected
Chestnut (Black-headed) Munia (*Lonchura atricapilla*)	IR			non-native, not MBTA-protected
Tri-colored Munia aka Chestnut Mannikin (*Lonchura malacca*)	IR			non-native, not MBTA-protected
Java (Rice) Sparrow aka Java Finch (*Lonchura oryzivora*)	IR			non-native, not MBTA-protected

Appendix E: CONSERVATION SOPS, TRAINING AND GUIDANCE

ROD Prevention and Sanitization Compliance Certification for the Pohakuloa Training Area

All military training units, specifically those based at or arriving from the Keaukaha Military Reservation (KMR), must comply with the following Rapid Ohia Death (ROD) prevention and sanitization requirements prior to arrival at PTA.

- ☐ Wash clothes with hot water and soap.

- ☐ Clean gear, including boots/shoes, gloves, hats and packs, to remove all soil, plant material, and/or other debris, then spray with 70% or higher isopropyl (rubbing) alcohol or a freshly mixed 10% bleach solution.

- ☐ Clean cutting and ground-disturbing tools (i.e., knives, blades, machetes, shovels, picks, tent/rebar stakes, etc.) to remove all soil, plant material, and/or other debris, then spray with 70% or higher isopropyl (rubbing) alcohol or 10% a freshly mixed bleach solution.

- ☐ Wash the tires and undercarriage of vehicles with soap and water (hot water is recommended) to remove soil, plant material, and/or other debris. Use high pressure hose to clean wheel wells, bumpers, grill, fenders, undercarriage, and side panels behind wheels. Vacuum clean the interiors of vehicles. Visually inspect and remove any remaining mud, plant, or other debris which may contain the fungus.

- ☐ Inspect the interior of vehicles and remove any soil, plant material, and/or debris. Vacuum clean the interiors of vehicles. Spray interior floor and mats with 70% or higher isopropyl alcohol or a freshly mixed 10% bleach solution.

- ☐ Earth moving equipment/machinery (exteriors): Wash the tires/tracks and undercarriage of equipment and machinery with soap and water. Use high pressure hose to clean wheel/track wells, bumpers, grill, fenders, undercarriage, side panels behind wheels/tracks, and blades, buckets, drills, and any other parts used to dig or move soil, rock, or other substrates. Visually inspect and remove any remaining mud, plant, or other debris which may contain the fungus.

- ☐ Earth moving equipment/machinery (interiors): Inspect the interior of vehicles and remove any soil, plant material, and/or debris. Vacuum clean the interior cabs of machinery. Sanitize floor and mats with 70% isopropyl alcohol or a freshly mixed 10% bleach solution.

I certify that the above listed ROD sanitation requirements were completed by unit personnel under my charge /command prior to arrival at PTA to prevent ROD at PTA.

Military Unit:_____ Dates at PTA:_____

_____ _____

Print Name Print Name

_____ _____

Signature Date Signature Date

Officer in Charge (OIC) Commander

HEADQUARTERS
HAWAIʻI ARMY NATIONAL GUARD
91-1227 ENTERPRISE AVENUE
KAPOLEI, HAWAIʻI 96707-2150

NGHI-ENV 10 April 2018

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: EQUIPMENT MOVEMENT DECONTAMINATION STANDARD OPERATING PROCEDURES

1. PURPOSE. This SOP provides guidance on how to survey and clean vehicles and equipment for invasive species before movement to other installations, ranges, islands, national destinations and international destinations.

2. BACKGROUND. The HIARNG has soldiers, vehicles and equipment stationed across 5 of the 8 Hawaiian Islands. The HIARNG conducts annual training across the Hawaiian Islands, nationally and internationally. HIARNG soldiers deploy across the world and assist in local as well as national emergencies, requiring vehicle, aircraft and equipment movement. The readiness of HIARNG soldiers is of upmost importance, and movement of units and their associated equipment is critical. However, it is important that HIARNG stays vigilant in inspecting its vehicles, aircraft and equipment for unwanted pests before proceeding to move the equipment between installations, islands, to the mainland or to international destinations.

3. REGULATORY AUTHORITY. As an agency with a federal and state mission, the HIARNG is required to follow a variety of laws and regulations that aim to reduce the impacts of invasive species. The following Executive Orders (EO), Army and State Regulations, DoD instructions, TAG's Environmental Policy and the Hawaii Biosecurity plan are all guiding documents in complying with invasive species: Executive Order (EO) 13112 *Invasive Species*, EO 13751 *Safeguarding the Nation from the Impacts of Invasive Species,* Army Regulation (AR) 200-1 *Environmental Protection and Enhancement,* DoDi *DoD Pest Management Program,* TAG's Environmental Policy, Hawaii Interagency Biosecurity Plan, and HAR 4-72-13 *Quarantine restrictions on ohia and soil from rapid ohia death infested areas*.

Invasive species can interfere with the military mission, damage real property, degrade Hawaii's unique ecosystems, negatively impact tourism, diminish our quality of life, cost our state billions of dollars and expose people to diseases unless proactively monitored and controlled. The accidental spread of invasive species can negatively impact the image of the HIARNG here in Hawaii. The HIARNG has a responsibility to protect our land and our people from the negative impacts that invasive species pose.

4. APPLICABILITY. This SOP applies to service members, civilians, tenants, contractors, and external entities that utilize HIARNG installations.

5. RESPONSIBILITY. All personnel conducting training or activities that involve movement between HIARNG installations are required to ensure that vehicles and equipment utilized are not carrying seeds, plant materials, infected soil, amphibians, insects and/or other invasive species to prevent their spread.

6. HIGH PRIORITY INVASIVE SPECIES BY ISLAND, as of JAN 2018:

a. BIG ISLAND: Coqui Frogs (*Eleutherodactylus coqui*), Little Fire Ant (*Wasmannia auropunctata)*, Rapid Ohia Death Fungus (*Ceratocystis fimbriata*), Rat Lungworm parasite (*Angiostrongylus cantonensis*), Miconia (*Miconia calvescens*), Cane Tibouchina (*Tibouchina herbacea*), Fountain Grass (*Cenchrus setaceum*), Pampas Grass (*Cortaderia selloana*), Albizia (*Falcataria moluccana*), Barbados Gooseberry (*Pereskia aculeata*),

b. MAUI: Coqui Frogs (*Eleutherodactylus coqui*), Little Fire Ant (*Wasmannia auropunctata),* Rat Lungworm parasite (*Angiostrongylus cantonensis*), Miconia (*Miconia calvescens*), Fountain Grass (*Cenchrus setaceum*), Pampas Grass (*Cortaderia selloana*), Albizia (*Falcataria moluccana*)

c. MOLOKAI: Albizia (*Falcataria moluccana*), Fireweed (*Senecio madagascariensis),* Barbados Gooseberry (*Pereskia aculeata*)

d. OAHU: Coconut Rhinocerous Beetle (*Oryctes rhinoceros*), Rat Lungworm parasite (*Angiostrongylus cantonensis*), Devil Weed (*Chromolaena odorata*), Fireweed (*Senecio madagascariensis),* Cane Tibouchina (*Tibouchina herbacea*)

e. KAUAI: Long Thorn Kiawe (*Prosopis juliflora),* Fountain Grass (*Cenchrus setaceum*), Barbados Gooseberry (*Pereskia aculeata*)

7. UNIT ENVIRONMENTAL OFFICERS (EOs). Invasive species are insidious, hard to detect, and prolific. Because Hawaii is an isolate island state, it is vital that HIARNG personnel understand the severe impact invasive species have to our islands and be vigilant in not spreading them. All leaders and supervisors (military and civilian) must be made aware of the potential danger of spreading invasive species. HIARNG ENV is directed to include and maintain a briefing for all unit Environmental Officers (EO) to assist in preventing the spread of noxious and invasive species. Unit EOs will be

required to inspect vehicles and equipment before movement and disseminate protocols. Unit EOs will be required to contact the HIARNG ENV office in the event treatment is necessary to remove invasive species.

8. BEST MANAGEMENT PRACTICES & PROTOCOLS. All personnel, units, and organizations moving or shipping vehicles and/or equipment to-or-from HIARNG installations are required to ensure vehicles and equipment are clean prior to movement. If vehicles and/or equipment were deployed to Big Island, Guam, or other out-of-state locations, units are responsible for conducting an inspection and contacting the HIARNG ENV office if any invasive species are suspected or detected. Clean, wash and inspect vehicles and/or equipment prior to movement to-or-from off island locations. Notify the HIARNG ENV office prior to movement to ensure treatment materials are available.

KEAUKAHA MILITARY RESERVATION-SPECIFIC PROTOCOLS

a. COQUI FROGS (*Eleutherodactylus coqui*)

(1) INSPECT. Shortly after sunset, take a walk around vehicles and equipment to listen for the pronounced “CO-KEE” call. Male frogs can usually be located by sound, but they are cryptic and difficult to find. Be patient. As you get closer, males usually stop calling. When the frog calls again, pinpoint its location as best you can. Remember that there often are one or more silent females near a calling male.

(2) TREATMENT. Call the HIARNG ENV office immediately if coqui frogs are present on vehicles or equipment. A certified pesticide applicator will treat for coquis with a citric acid solution (2¾ cup citric acid granular to 1 gal of water) before movement of vehicles.

b. LITTLE FIRE ANT (*Wasmannia auropunctata*)

(1) INSPECT. Put a thin smear of peanut butter on one end of a popsicle stick or chopstick. Place 5-10 sticks around the vehicles/equipment, focusing on moist areas. Avoid putting sticks in direct sunlight. Leave sticks out for 1 hour, then carefully place sticks with any kind of ants into a ziplock bag. Contact the HIARNG ENV office for an LFA inspection kit and to submit ant samples.

(2) TREATMENT. Call the HIARNG ENV office immediately if LFA are suspected or confirmed on vehicles and/or equipment. A certified pesticide applicator will treat the Little Fire Ant before movement of vehicles.

c. RAPID OHIA DEATH (*Ceratocystis fimbriata*)

INSPECT. Ensure plant parts, mud and soil have been washed off vehicles, equipment and boots before movement off KMR to avoid the spread of Rapid Ohia Death (ROD) fungus. Clean boots, equipment and tools with a 70% isopropyl alcohol spray if they were used within the KMR forested areas. Contact the HIARNG ENV office for a ROD sanitation kit and to obtain storage, use and disposal information for 70% isopropyl alcohol.

9. HIARNG ENV CONTACTS.

a. Mr. Craig Blaisdell, Natural Areas Reserve Specialist Supervisor/Pest Management Coordinator, 808-672-1278, 808-206-2043 (cell), craig.p.blaisdell.nfg@mail.mil.

b. Ms. Kristine Barker, Acting Conservation Manager, 808-672-1264, 808-445-8301 (cell), kristine.p.barker.nfg@mail.mil

c. Mr. Karl Motoyama, Environmental Protection Specialist, 808-672-1266, 808-206-2045 (cell), karl.k.motoyama.civ@mail.mil

DISTRIBUTION:
A

KENNETH S. HARA
Brigadier General
Commanding

HAWAII ARMY NATIONAL GUARD

HIARNG Environmental Conservation 2019

HAWAII ARMY NATIONAL GUARD

TAG's Environmental Officer Definition:

Personnel shall become stewards of environmental protection by being responsible for understanding and implementing current procedures, practices and policies and by bringing deficiencies of operations to the attention of top management

Reality:

You were voluntold that you would be the unit EO. You absorbed additional duties without additional pay. You don't want to be the person responsible for environmental compliance.

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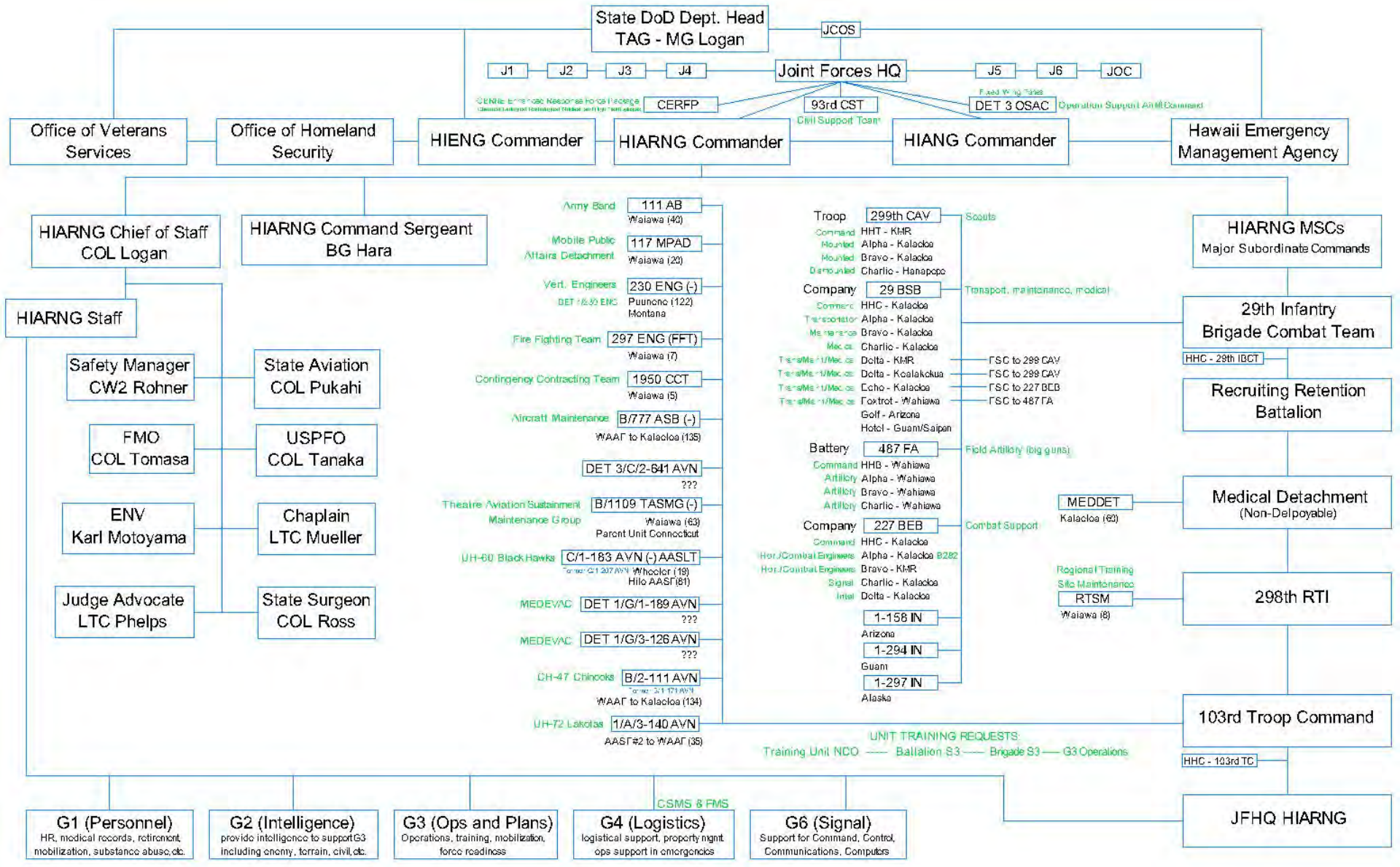

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Conservation Questions:

1. Can you name an invasive species here in Hawaii?
2. Can you name a threatened or endangered species here in Hawaii?
3. Who knows the pesticide ACUs are treated with prior to issuance?
4. Where are some places you've been for training or deployed to?
5. Does your unit ship your vehicles/equipment for training?
6. How can ENV make your non-paid additional duties easier?

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Conservation's Mission

The mission of the Conservation Program is to support and preserve HIARNG's training and readiness by protecting natural and cultural resources, reducing threats of invasive species, and educating soldiers. Our goal is to maintain or increase training lands available for soldiers, while improving the ecosystem. The Conservation Program aims to ensure compliance with the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA) as well as other environmental laws.

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1. Integrated Natural Resources Management Plan (INRMP)

2. Integrated Cultural Resources Management Plan (ICRMP)

3. Integrated Pest Management Plan (IPMP)

4.Integrated Wildland Fire Management Plan (IWFMP)

5. Statewide Noise Management Plan

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Stop the Spread of Invasive Species (Biosecurity)



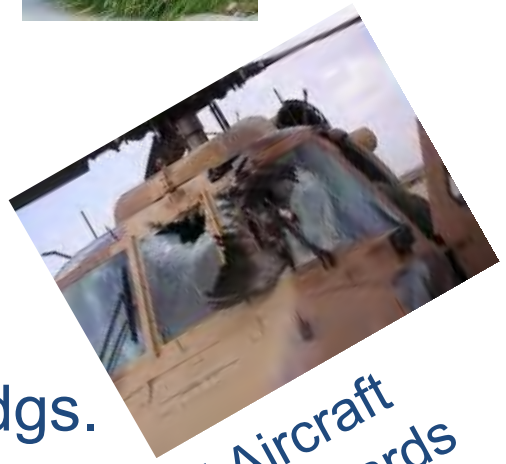


Ecosystem Restoration

Wildland Fires

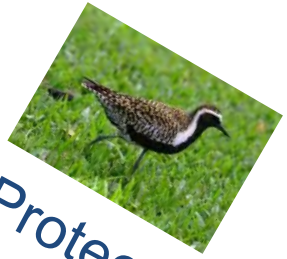
-Protect Endangered Species



Bird Aircraft Strike Hazards (BASH)

-Protect Cultural Sites & Historic Bldgs.

Protect Migratory Birds

-Integrated Pest Management



Regulatory Compliance (NEPA, ESA, NHPA)

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Biosecurity:

Is the set of measures taken to manage the risk from invasive species to the economy, environment, and health/lifestyle of the people.

Invasive Species:

An organism that causes ecological or economic harm in a new environment where it is not native.

Examples of Impacts:

- Spreads diseases (ex. Mosquitoes, rats, ticks)
- Destroys an ecosystem
- Outcompetes native or endangered species = extinction
- Impacts to human health and safety (fires, landslides, property damage)

IUCN Top 100 Invasive Species Worldwide:

Feral Cats

Miconia

Asian Tiger Mosquito

Feral Pigs

LFA

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Why it is so important for HI:

- Hawaii is one of the most isolated places on earth, at 2,400 miles from the U.S. and 3,800 miles from Japan. Yet highly trafficked.
- Hawaii possesses the world's highest degree of endemism (90% for terrestrial species and 20% for marine species).
- Hawaii accounts for less than 0.2% of U.S. land area, but holds 28% (434 species) of the nation's threatened and endangered species.
- Hawaii is extremely vulnerable to biological invasions because it is THE major transportation hub in the Pacific.

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Why Do Invasive Species Matter to You?

Property Damage, power outages, clogged drainage

Diseases

Wildfires

Loss of Hawaii's Beauty & Recreational Access

Reduced Quality of Life

Flooding

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They reduce biodiversity and change native ecosystems at a rapid rate across Hawaii

Invasive grasses establish in wetter months, then dry out in the summer months, which leaves behind oils in their dried plant material, which act as tinder and fuel in a wildfire. They are first to regenerate after a fire.

Native ecosystems can capture water ***much*** more efficiently than an invaded forests, drastically reducing flooding

Vs.

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Why They Matter to Hawaii?

They cost the state billions of dollars each year (wildland fires, flooding, soil erosion & sedimentation, damages to infrastructure, damages to coral reefs, impacts to tourism industry, destroys native ecosystems)

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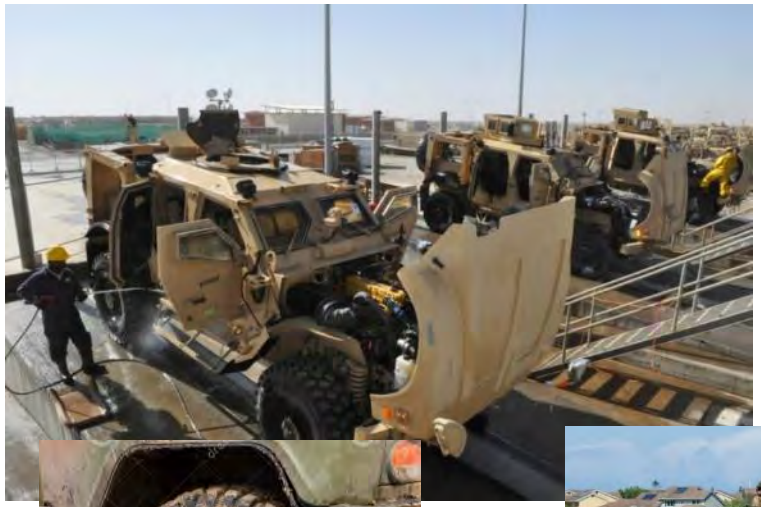
Why They Matter to HIARNG?

Invasive species reduce land available for training, they cost big money to control, they create bad publicity/relations with outside agencies and the public, they negatively impact native and endangered species.



Army Garrison's 25th Infantry Division had training in Louisiana, their vehicles weren't clean and didn't pass inspection by USDA Customs & Border Protection in Texas, training was delayed over a week, Army was assessed fines, time and money wasted. Total losses $1 MIL

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Interesting Invasive Species Stats

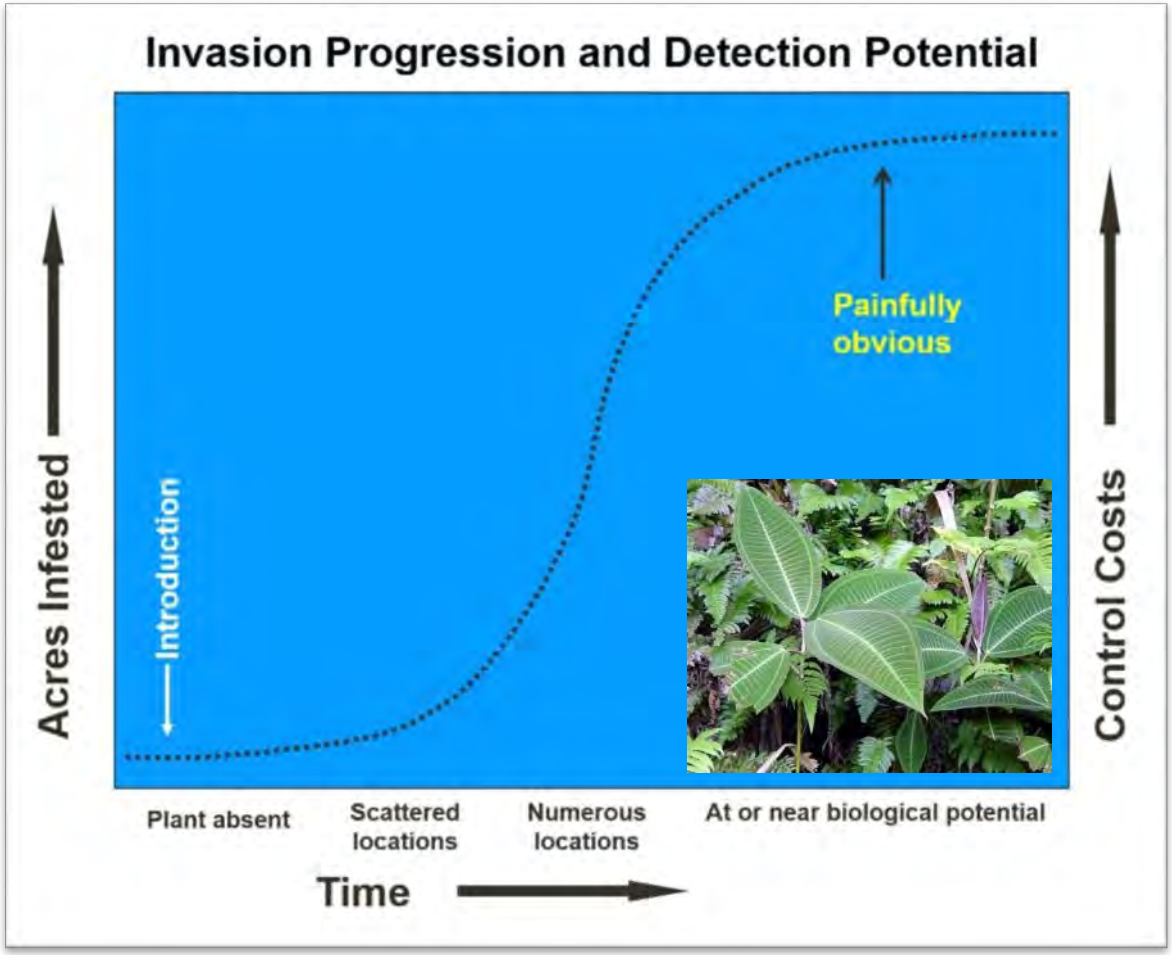
Albizia – Introduced in 1917 as an ornamental/reforestation tree to reduce erosion. Extremely fast growing, up to 15 ft. in its 1st year, that's 1 ft every 2 weeks! Super weak branches because of fast growth. Prolific seeds. Adds too much nitrogen to soil for native species. HELCO spent $13.7 MIL after hurricane Iselle in 2014. HDOT spent $1MIL per mile to remove 1,000 Albizia in Puna.

Miconia – Introduced to Hawaii in 1960s as an ornamental species. It has taken over 60% of Tahiti's forest. Shallow root systems make for easy landslides on slopes. Big paddle leaves shade out all other vegetation. 10-20 MIL seeds per year, spread by wind and birds.

Brown Tree Snake – Accidentally introduced to Guam in early 1950s. It has wrecked havoc on Guam. Populations estimated at 13,000 snakes per square mile. It has driven seven birds on Guam to extinction and caused millions in damage to electrical infrastructure.

Coqui Frog – 55,000 frogs per hectare. Loss of insects as pollinators. Food source for snakes if they arrive to HI. Calls are up to 90 decibels. Hearing protection at 85.

Once they are established, they are too cost prohibitive to control



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Invasive Species at KMR, not established on other islands:

- Little Fire Ants
- Coqui Frogs
- Rapid Ohia Death Fungus
- Miconia
- Tibouchina

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Inspect before leaving KMR

COQUI FROGS:

- Always park vehicles away from brush to reduce the risk of coquis laying eggs on your vehicles or equipment.
- Males make the pronounced “CO-KEE” call when calling for females, usually from dusk to dawn.
- Hot water or citric acid work best to kill them.
- They WILL lay eggs on/inside your vehicles!

LITTLE FIRE ANT:

- Let ENV know ***BEFORE*** training that you would like us to treat for LFA at KMR.
- LFA are protein feeders, so use peanut butter on popsicle sticks to survey for them around vehicles before leaving KMR. They prefer shady areas. Takes 15 min.
- If you find LFA, call ENV to treat your vehicles with pesticides
- LFA live in trees, park vehicles away from brush. Stinging from bites can last days.

PTA does not have these invasive species!

RAPID OHIA DEATH:

- Fungal disease that kills Ohia trees. Spread by infected soil and sawdust by beetles
- Wash mud and dirt off of vehicles and equipment. Use rubbing alcohol spray to clean boots and equipment.
- Fungus enters tree’s through wounds – don't injure Ohia trees at KMR.

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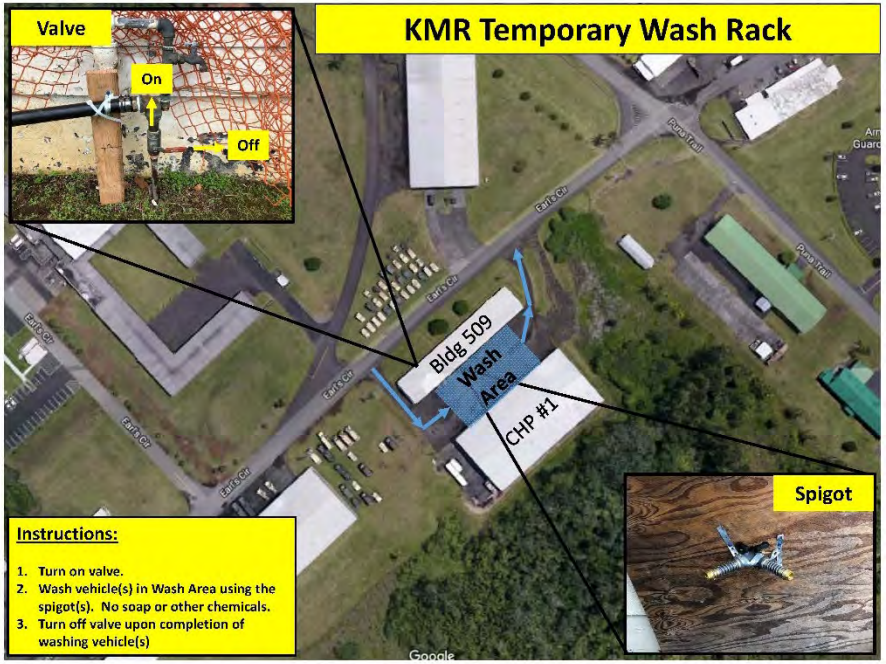
Inspection & Decon Kits/ Temp. Wash Rack

Decontamination and Inspection Kits are available at ENV office at KMR, 299 CAV HHT, 227 BEB Bravo Co. and 29 BSB Delta Co.



ENV created a make-shift wash rack with power washers for AT because no wash rack was available.

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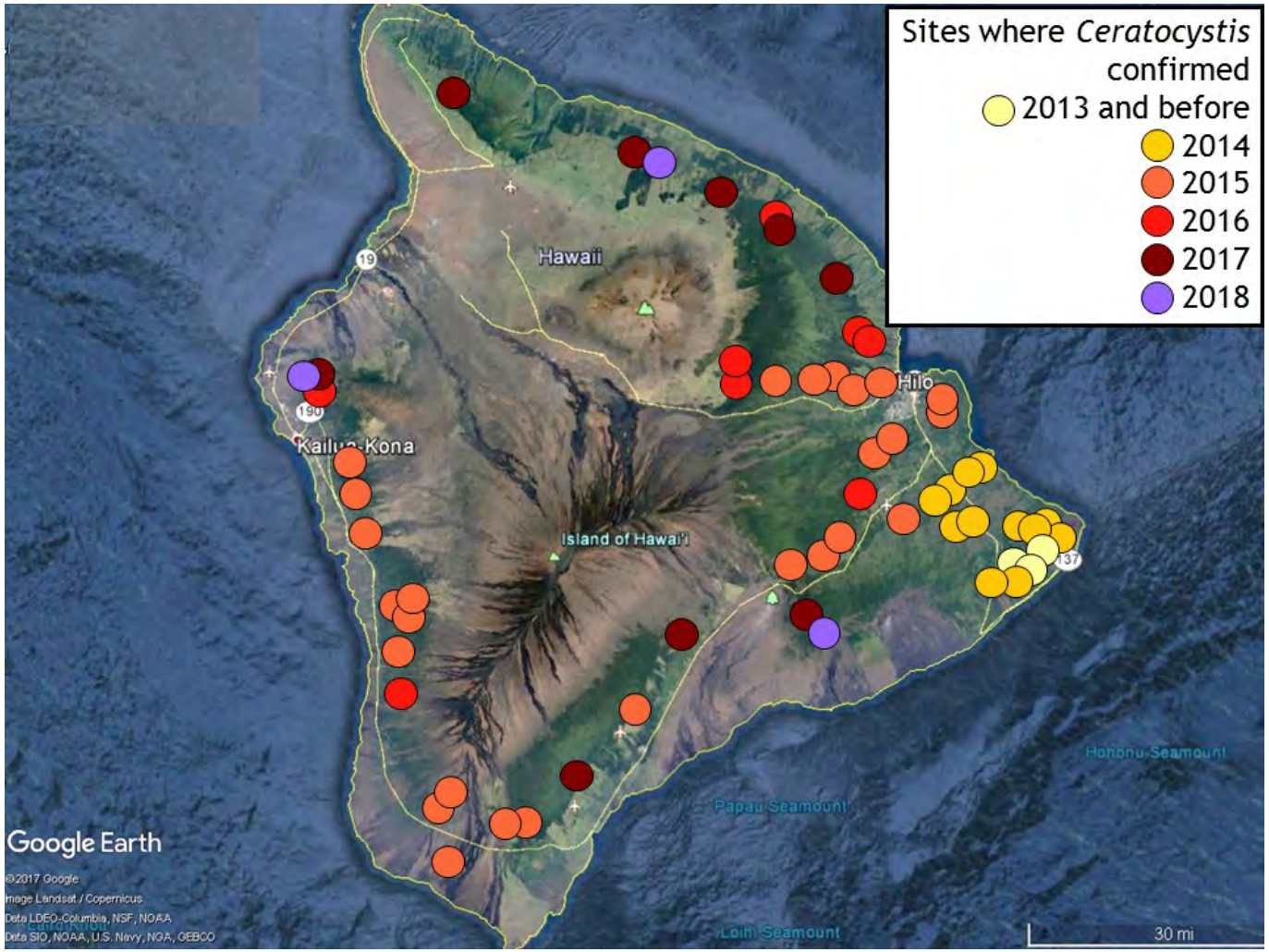

ROD is found on Hawaii Island, but NOT at PTA!
PTA has 28,000 acres of Ohia forests

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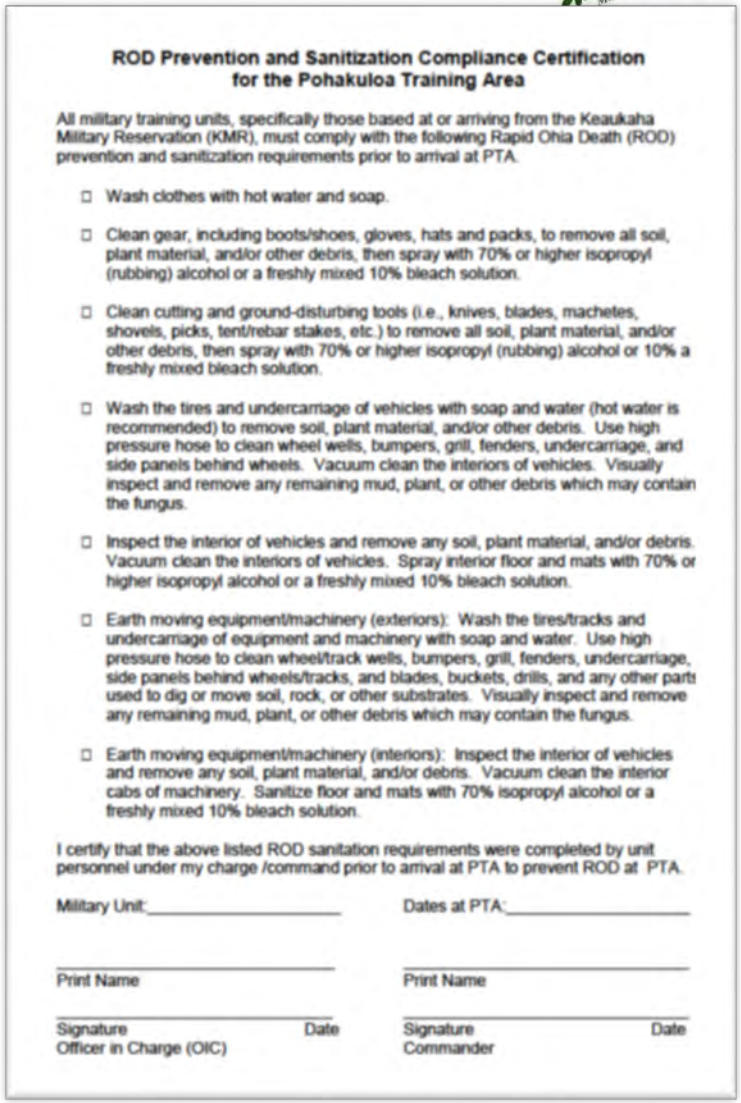
PTA Decontamination Checklist

In February 2018 the Pohakuloa Training Area (PTA) Environmental Office issued a **ROD Prevention and Sanitization Certification Checklist**. The Checklist must be pre-filled out and complied with *prior* to arriving at PTA for all units coming from KMR. The checklist is to ensure that ROD present at KMR does not infect Ohia trees at PTA. There has been no identification of ROD at PTA as of October 2019. PLEASE respect the aina and respect our fellow DoD agencies – clean your vehicles and equipment!



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- ☐ Clean gear, including boots/shoes, gloves, hats and packs, to remove all soil, plant material, and/or other debris, then spray with 70% or higher isopropyl (rubbing) alcohol or a freshly mixed 10% bleach solution.
- ☐ Clean cutting and ground-disturbing tools (i.e., knives, blades, machetes, shovels, picks, tent/rebar stakes, etc.) to remove all soil, plant material, and/or other debris, then spray with 70% or higher isopropyl (rubbing) alcohol or 10% a freshly mixed bleach solution.
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- ☐ Inspect the interior of vehicles and remove any soil, plant material, and/or debris. Vacuum clean the interiors of vehicles. Spray interior floor and mats with 70% or higher isopropyl alcohol or a freshly mixed 10% bleach solution.
- ☐ Earth moving equipment/machinery (exteriors): Wash the tires/tracks and undercarriage of equipment and machinery with soap and water. Use high pressure hose to clean wheel/track wells, bumpers, grill, fenders, undercarriage, side panels behind wheels/tracks, and blades, buckets, drills, and any other parts used to dig or move soil, rock, or other substrates. Visually inspect and remove any remaining mud, plant, or other debris which may contain the fungus.
- ☐ Earth moving equipment/machinery (interiors): Inspect the interior of vehicles and remove any soil, plant material, and/or debris. Vacuum clean the interior cabs of machinery. Sanitize floor and mats with 70% isopropyl alcohol or a freshly mixed 10% bleach solution.

I certify that the above listed ROD sanitation requirements were completed by unit personnel under my charge /command prior to arrival at PTA to prevent ROD at PTA.

Military Unit:_____ Dates at PTA:_____

Print Name Print Name

Signature Date Signature Date

Officer in Charge (OIC) Commander

Both documents are on the GKO ENV website, including “how to” guides with POCs

GKO – Special Staff – Environmental Office

HAWAII ARMY NATIONAL GUARD

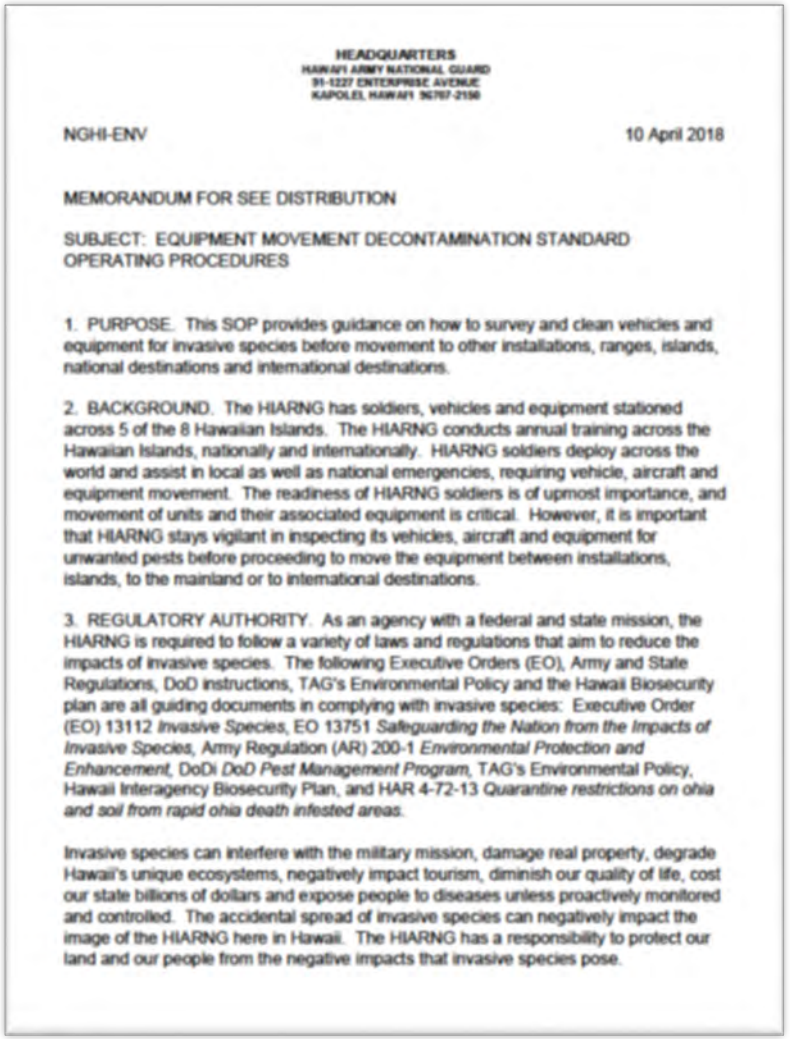
HIARNG Decontamination SOPs

BG Hara signed the **HIARNG Equipment Decontamination SOPs** in April 2018

The HIARNG ENV office is ALWAYS AVAILABLE to help units accurately complete these SOPs.

Being vigilant is so important to keeping invasive species from establishing on other islands.

Please go to the ENV website for a copy of the SOPs, including POCs and logistical information.



HEADQUARTERS
HAWAI'I ARMY NATIONAL GUARD
91-1227 ENTERPRISE AVENUE
KAPOLEI, HAWAI'I 96707-2150

NGHI-ENV 10 April 2018

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: EQUIPMENT MOVEMENT DECONTAMINATION STANDARD OPERATING PROCEDURES

1. PURPOSE. This SOP provides guidance on how to survey and clean vehicles and equipment for invasive species before movement to other installations, ranges, islands, national destinations and international destinations.

2. BACKGROUND. The HIARNG has soldiers, vehicles and equipment stationed across 5 of the 8 Hawaiian Islands. The HIARNG conducts annual training across the Hawaiian Islands, nationally and internationally. HIARNG soldiers deploy across the world and assist in local as well as national emergencies, requiring vehicle, aircraft and equipment movement. The readiness of HIARNG soldiers is of upmost importance, and movement of units and their associated equipment is critical. However, it is important that HIARNG stays vigilant in inspecting its vehicles, aircraft and equipment for unwanted pests before proceeding to move the equipment between installations, islands, to the mainland or to international destinations.

3. REGULATORY AUTHORITY. As an agency with a federal and state mission, the HIARNG is required to follow a variety of laws and regulations that aim to reduce the impacts of invasive species. The following Executive Orders (EO), Army and State Regulations, DoD instructions, TAG's Environmental Policy and the Hawaii Biosecurity plan are all guiding documents in complying with invasive species: Executive Order (EO) 13112 *Invasive Species*, EO 13751 *Safeguarding the Nation from the Impacts of Invasive Species*, Army Regulation (AR) 200-1 *Environmental Protection and Enhancement*, DoDi *DoD Pest Management Program*, TAG's Environmental Policy, Hawaii Interagency Biosecurity Plan, and HAR 4-72-13 *Quarantine restrictions on ohia and soil from rapid ohia death infested areas.*

Invasive species can interfere with the military mission, damage real property, degrade Hawaii's unique ecosystems, negatively impact tourism, diminish our quality of life, cost our state billions of dollars and expose people to diseases unless proactively monitored and controlled. The accidental spread of invasive species can negatively impact the image of the HIARNG here in Hawaii. The HIARNG has a responsibility to protect our land and our people from the negative impacts that invasive species pose.

Available at GKO – Special Staff – Environmental Office

HAWAII ARMY NATIONAL GUARD

Invasive Species at Fort Ruger & MCTAB

- Fountain grass

Localized to Lanikai hillside and Diamond Head Crater. Seeds are tiny. Introduced as an ornamental, but is an invasive, fire-adaptive plant.

As an EO, please remind your unit the importance of cleaning your boots and equipment to avoid invasive species transport

HAWAII ARMY NATIONAL GUARD

Invasive Species at KTA

Devil Weed (*Chromolaena odorata)* is another highly invasive plant species found on Oahu. It was first detected in 2011 at Kahuku Training Area and is now found in Kahana Valley, Pupukea and Aiea. Army is tracking this plant closely as it can produce 800,000 seeds each year, it is toxic to livestock and is easily spread by wind, birds and mud. Again, always clean your vehicles, equipment and boots before leaving any training range.

Devil Weed

Closed down KTA Bravo 1 area (680 acres) for 5 years. No mounted training allowed

Freedom of Action Reduced

$2 Million in control efforts so far

HAWAII ARMY NATIONAL GUARD

Coconut Rhinoceros Beetle (CRB)

Coconut Rhino Beetles were initially found at Joint Base Pearl Harbor-Hickam in December 2013, accidentally brought in from Guam. Introduced to Guam in 2007 and have destroyed Coconut palms. CRBs live and bread in mulch piles and feed on a variety of palms. Current infestations at Iroquois Point and Wahiawa nurseries.

Navy spent $6 Million in control efforts so far, projected $20 mil more

HAWAII ARMY NATIONAL GUARD

Protect Endangered Species

The Endangered Species Act (ESA) makes it unlawful to “take” any TES species.

TAKE = harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect.

Civil Penalties $25,000/violation

Hawaii’s Well-Known Threatened & Endangered Species

Haleakala Silversword
(Threatened)

Hawaii’s State Bird
(Endangered)

Green Sea Turtle
(Threatened)

Hawaii’s State Mammal
Hawaiian Monk Seal
(1,100 individuals)

Humback Whale
(Most populations Delisted)

Pueo
(State listed as End.
- Oahu only)

Hawaii’s State Flower
(Endangered)
Ma’o Hau Hele

Hawaii’s State Fish
(not listed)
Humuhumunukunukuapua’a

HAWAII ARMY NATIONAL GUARD

Protect Endangered Species

Endangered Species are found on both HIARNG land, as well as Army and Marine Corps Training land. Always avoid endangered species and **stop training if they are within 100' of your operations and let them leave on their own accord**.

Oahu Army has 76 listed TES (most are plants)













PTA has 25 listed TES

HIARNG sites have ~22 listed TES

HAWAII ARMY NATIONAL GUARD

Pre-Coordination for ESA Species

HIARNG is required by ESA to consult with USFWS on our actions

Hoary Bat – Breeding season is between May and October. No cutting down trees over 15' tall during their breeding season.

Hawaiian Hawk – Breeding season is between April – September. No cutting down trees over 15' tall during their breeding season. Nest Surveys.

Nene Goose – Breeding season between August to April. Be aware of nesting birds at UFR or KFR.

Other Considerations for ESA: Nighttime lighting confuses endangered seabirds. Barbed wire can kill Hoary Bats. Installing ungulate fencing to restore habitat for Endangered plant species.

HAWAII ARMY NATIONAL GUARD

Pre-Coordination for Digging

Your unit has plans to dig an 8'W x 8'L x 3'D in-ground shelter for an upcoming training.

HIARNG is required by Federal and State law to consult with the DLNR State Historic Preservation Division (SHPD) *BEFORE* digging. Call or email our Cultural Resources Specialist, Kekapala, to coordinate.

HAWAII ARMY NATIONAL GUARD

Protecting Cultural Sites

Many cultural sites are ambiguous and indistinct. Please leave any rock formations or other features alone. Preservation by avoidance.

I get it, PTA can be boring, but please DO NOT stack your own rocks.

HAWAII ARMY NATIONAL GUARD

Reporting Pest Problems

As of March 2018, HIARNG switched from a contracted pest services with Terminix to Environmental managing all HIARNG pest issues.

Call or email for help with any pest issues: rats, mices, roaches, centipedes, wasps, bees, ants, mosquitoes, etc.

HAWAII ARMY NATIONAL GUARD

Vectored-Borne Diseases

(human illnesses cause by parasites, viruses and bacteria that are transmitted by organisms, most commonly mosquitoes)

MOSQUITOES:

- Dengue Fever (309 million cases/year – *India, Asia, Pacific Islands*)
- Malaria (207 million cases/year – *Africa, Asia, S. America*)
- Chikungunya (350,000 cases/year – *S. America, Africa, Asia, Europe*)
- Yellow Fever (200,000 cases/year – *S. America, Africa, Asia, Australia*)
- West Nile Virus (30,000 cases/year – *Africa, Europe, Middle East, N. America*)
- Zika (30,000 cases/year – *S. America, Africa, SE Asia, Western Pacific*)

RATS/SNAILS/SLUGS:

- Rat Lungworm Disease (~2,800 cases worldwide – *China, Asia, Australia, Pacific*)

FLEAS:

- Plague (~6,000 cases/year - *Americas, Africa, Madagascar, China, Russia*)

TICKS:

- Lyme Disease (30,000 cases/year in US alone – *Americas, Europe, Asia*)

HAWAII ARMY NATIONAL GUARD

Dengue Fever & Zika Virus

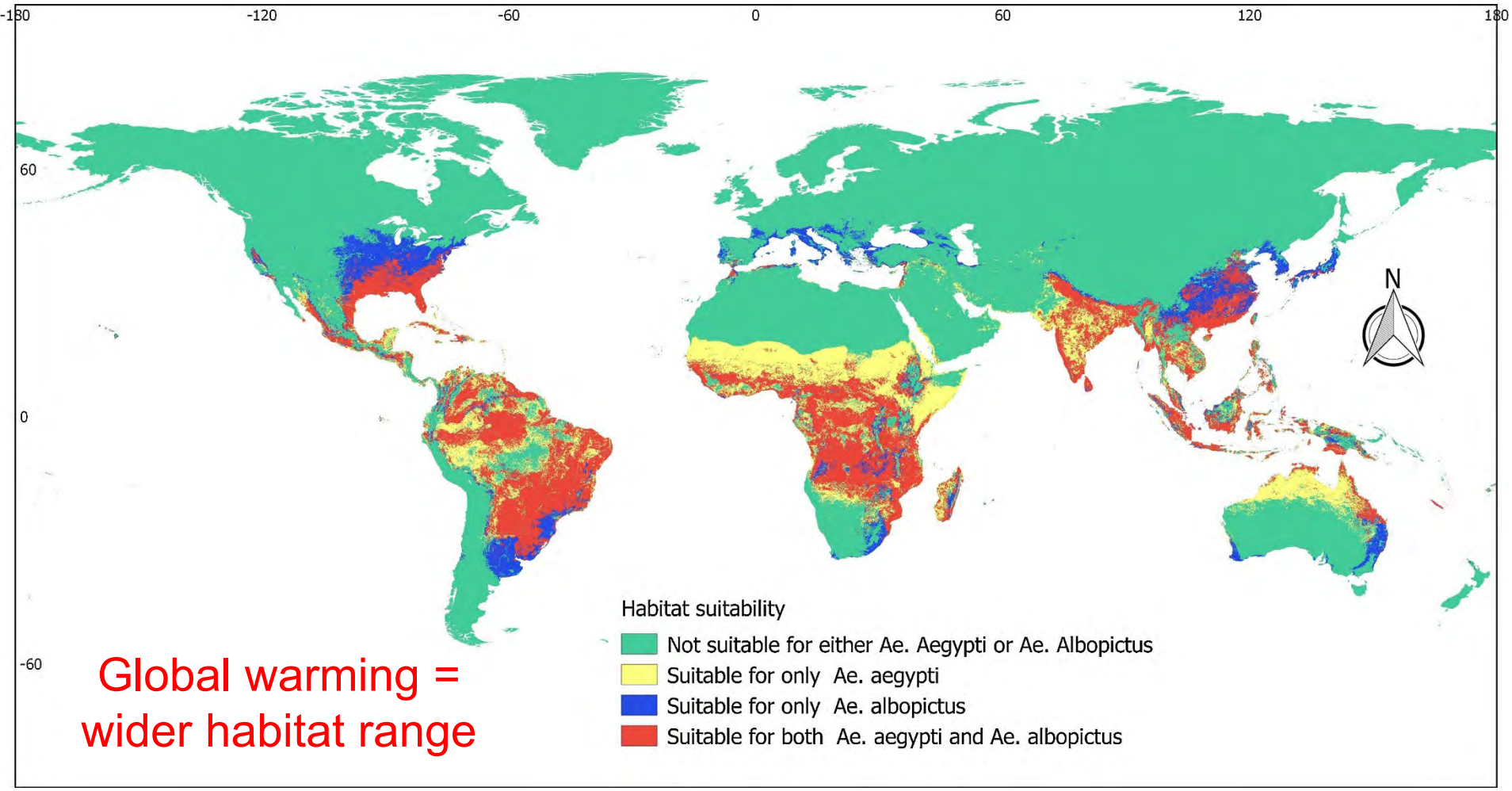
Prevent Mosquito-Borne illnesses from Spreading

- **Remove standing water!** Take a look around regularly
- Apply mosquito repellent with DEET
- Since 2013 DOD Uniforms are pre-treated with Permethrin, which can kill mosquitoes, ticks, chiggers, and flies. Soldiers are not supposed to dry-clean Permethrin-treated ACUs. Proven to last through 50 launderings.

COOL FACTOIDS:

- Females are blood feeders and only feed right before laying eggs, males are not.
- Mosquitoes live ~2 weeks and only fly a few blocks during their life.
- Females generally lay 100 eggs at a time and can lay up to 3 times in their life.
- In 2015-2016 Big Island had a Dengue outbreak with 264 confirmed cases.
- Zika is also a sexually transmitted disease. No local Zika HI outbreaks as of yet.

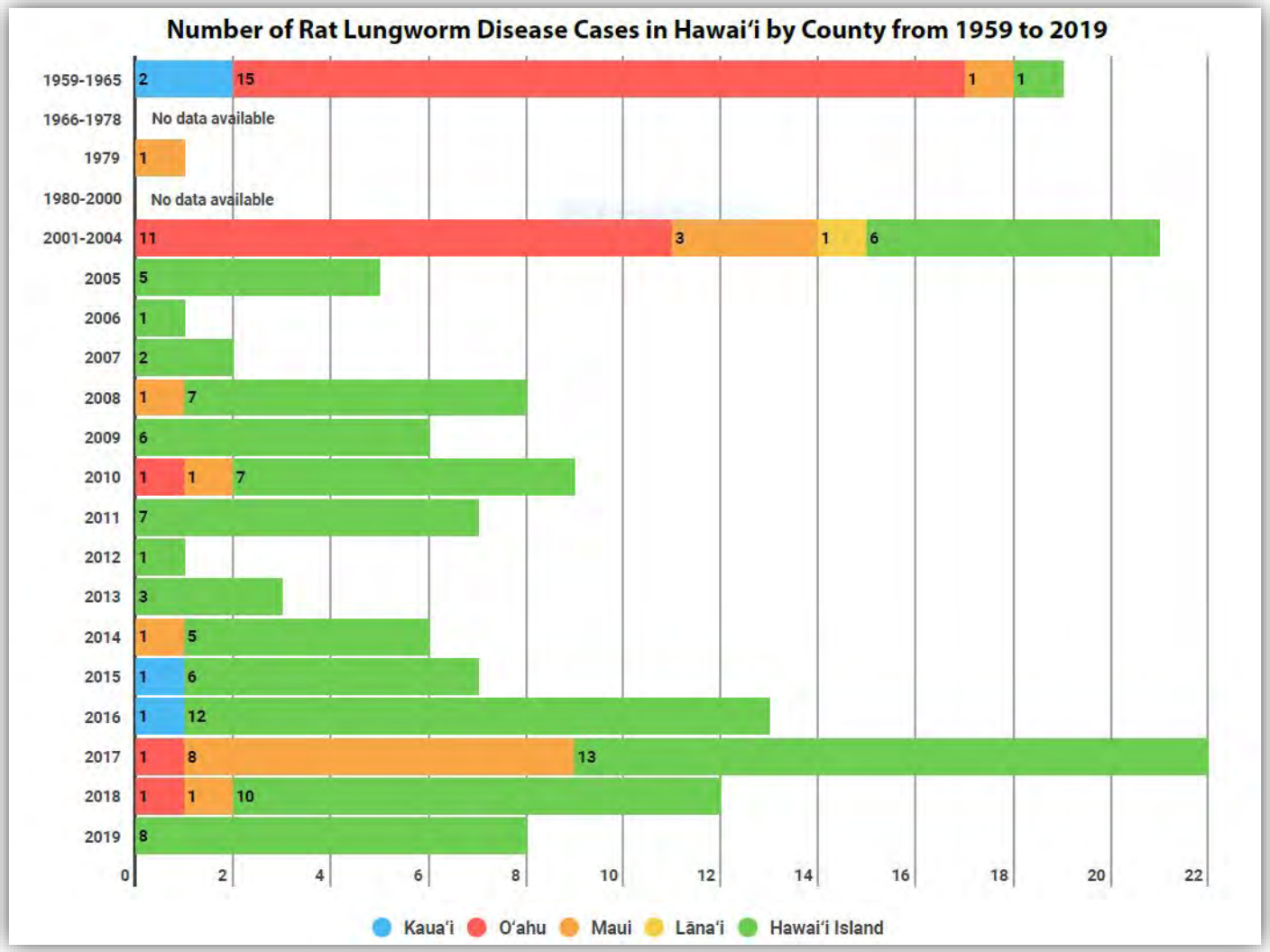
HAWAII ARMY NATIONAL GUARD



Global warming = wider habitat range

HAWAII ARMY NATIONAL GUARD

Rat Lungworm Disease



HAWAII ARMY NATIONAL GUARD

Semi-slug

Giant African Snail

Cuban Slug

How people get sick from rat lungworm

1. Infected rats pass the worm in their droppings.

2. Slugs and snails get the worm by eating rat droppings. Freshwater prawns, frogs, crayfish, snails, and crabs get the worm by eating slugs or snails.

3. People get sick accidentally by eating tiny slugs or snails on unrinsed, raw produce. People can also get sick from eating undercooked slugs, snails, or freshwater prawns, frogs, crayfish, or crabs.

SIGNS & SYMTOMS

Not everyone will have the same symptoms. They usually start 1 to 3 weeks after infection. Illness can last for 2 to 8 weeks or longer.

- Severe ongoing headache
- Nausea and vomiting
- Neck and back stiffness
- Tingling or painful skin
- Low-grade fever
- Although rare, coma and death

Children may have behavioral changes such as unusually bad temper, mood changes, or extreme tiredness.

See your doctor as soon as possible if you think you may have been infected.

Conservation POCs

- **Conservation/NEPA: Kristine Barker (808) 672-1264**, kristine.p.barker.nfg@mail.mil
  - Contact her to initiate the NEPA process
  - Contact her if you have any conservation-related questions or concerns
- **Cultural Resources Specialist : Kekapala Dye (808) 672-1274**, Kekapala.dye@hawaii.gov
  - Contact him if you plan on digging for an upcoming training
  - Contact him if you spot any possible artifacts or cultural features
- **Pest Management/Natural Resources: Craig Blaisdell (808) 672-1278**, craig.p.blaisdell.nfg@mail.mil
  - Contact him with any issues regarding pests and/or invasive species concerns.
  - Contact him regarding surveying for Coqui or LFA
  - Contact him if you see an endangered species.

Want to Learn More… Follow

@bigislandinvasivespecies

@advance_wildlife_education

@wildlifeofhawaii

@hawaiiwildlifecenter

@usfws

@earthalliance

@leonardodicaprio

BREAK!


Any Questions, comments, feedback?
We want to be an asset, not a roadblock!

HAWAI'I WATERBIRD SURVEY INSTRUCTIONS AND IDENTIFICATION GUIDE

General Instructions:

- Use the attached data forms. The forms, these instructions, and a photographic identification guide also can be downloaded from the DOFAW website at http://www.dofaw.net/
- All data and notes should be written on the attached forms and submitted to the compiler on each island as soon as possible following the count. Copies of the field forms should be retained on each island for safe keeping.
- Each group should include one person who is familiar with the survey route and one person who is familiar with all species of birds likely to be encountered.
- Private landowners should be contacted in advance for access as needed.
- Spend at least 10-15 minutes at each site, even if no birds are immediately visible.
- Follow all instructions on the field form. For wetland names use only those indicated on the route maps or the master list of wetland names.
- Count only birds utilizing the wetland, not birds flying overhead or standing in adjacent fields, unless their presence is directly related to the wetland.

Hawaiian Stilt:

- Record the numbers of adults and juveniles separately if possible. Juveniles can be distinguished by their more extensive white on the forehead and sides of the neck, duller pink legs, and higher-pitched calls. Juveniles cannot be distinguished by back color; male stilts have black backs, females and juveniles have brownish-black backs.
- Do not separate male and female stilts; count both as adults.
- Check stilts for bands and record any band combinations. For example, red over aluminum on left leg, green over yellow on right leg, or RA/GY. Right and left are always from the bird's perspective.

Hawaiian Coot:

- Record the numbers of adults and juveniles separately. Juveniles are gray and lack the white frontal shield of adults.
- It is not necessary to separate coots by frontal shield coloration. Hawaiian coots can have red or white frontal shields.

Hawaiian Moorhen:

- Record the numbers of adults and juveniles separately.
- Moorhens can be secretive and may not be visible right away. The chances of observing moorhens and obtaining a more accurate count will be improved if more time (at least 15 minutes) is spent watching quietly at each site.

Koloa or Hawaiian Duck and Koloa-Mallard Hybrids:

Koloa are very similar to female mallards, but many birds can be distinguished by careful observation of the characters described in the table below. Koloa-Mallard hybrids are intermediate and variable, and individuals may exhibit characteristics of both species. Outside Kauai and parts of the Big Island, many ducks that superficially appear to be Koloa may actually be hybrids. Male Mallards in breeding plumage can be recognized by their green head, white collar, chestnut breast, and gray back. Male mallards in non-breeding plumage and young males are duller in color and more similar to female mallards and to Koloa, but show hints of the adult male breeding plumage. However, some male Koloa-Mallard hybrids can exhibit these same characteristics. Hybrid males and hatching-year Koloa males often show some of the characteristics of male mallards, especially a grayish back and flanks and black and white tail. The descriptions in the table below are preliminary.

Character	Koloa	Female Mallard
Size	Small; 70-80% length of Mallards. Males 600 g, females 460 g	Large; males 1240 g, females 1080 g.
Bill size	Smaller, narrower	Larger, wider
Bill color	Mostly dark, often greenish, tip of bill may be orange in female	Mostly orange, with some dark splotches in center
Tail and undertail covert color	Whitish with brown spots or mottling	whitish
Speculum Color	Emerald green to blue	Blue

Migratory Shorebirds. We are attempting to improve the utility of the waterbird count for monitoring populations of migratory shorebirds. Record the number of each species of migratory shorebird. If you are unable to identify a shorebird to species, take notes on its appearance and behavior that can be used later to help identify it, including relative size (e.g. smaller

Revised 2 June 2005. If you have comments or suggestions for improving the field form, the instructions, or the count in general, please contact Eric VanderWerf of the U.S. Fish and Wildlife Service (eric_vanderwerf@fws.gov or ewerf@hawaii.rr.com; 792-9461) or Megan Laut of the Hawaii Natural Heritage Program (mlaut@hawaii.edu).

than a Kolea, but larger than a Sanderling), bill length (e.g. bill 1.5 times length of head), leg length (e.g. legs longer than bill), coloration of different body parts (legs, head, back, eye-stripe, breast, whether breast is streaked), behavior (e.g. walking on exposed mud, wading in shallow water, probing with bill, describe any vocalizations). The most frequently observed species are briefly described below, for other species consult field guides.

- Pacific Golden Plover or Kolea. You should at least know this one!
- Black-bellied Plover. Similar to Kolea but slightly larger and heavier, with larger bill, and more gray plumage. In flight has black axillaries (wing-pits).
- Semipalmated Plover. A small plover with orange legs and a single dark breast band. Killdeer, much rarer in Hawaii, is larger and has 2 black breast bands.
- Ruddy Turnstone. Smaller than Kolea. Back mottled brown, black marks on breast. Bill short and straight. Legs orange. Distinctive black and white back pattern in flight.
- Sanderling. Small. Bright white below, pale gray above, black legs, short straight black bill.
- Wandering Tattler. Plain gray above, white below (may have dark barring in summer), narrow white stripe above eye. Legs medium long and yellow. Bill medium long and straight.
- Long-billed Dowitcher. A little larger than a Kolea, stocky, mostly gray, bill straight and very long. Often forages in slightly deeper water with repeated "sewing machine" probes of the bill.
- Lesser Yellowlegs. More slender than Kolea, speckled gray-brown plumage. Legs long and yellow. Bill medium-long, thin, and straight. Often very active when foraging.
- Pectoral Sandpiper. A little smaller than a turnstone, yellowish legs, bill medium length, sharp border between dense brown streaking on upper breast and white lower breast.
- Sharp-tailed Sandpiper. Like Pectoral Sandpiper, but breast streaking less distinct, lower border more gradual, white stripe above eye (supercilium) more obvious, becomes wider behind eye.
- Bristle-thighed Curlew or Kioea. Large, brown, with long curved bill. Loud "kee-oo-eet" call often given in flight.

Migratory Waterfowl. Record the number of each species of migratory waterfowl. Migratory waterfowl are not usually present during the summer. If you are unable to identify a duck, goose, or some other waterfowl, take notes on its appearance and behavior that can be used later to help identify it, including bill shape, coloration of different body parts (head, breast, sides, speculum), behavior (dabbling on surface, diving under water). The most frequently observed species are briefly described below, for other species consult field guides.

- Canada Goose. Black neck with white cheek patch. Recently split into 2 species, best distinguished by size and bill length. Presence of white neck ring may help identify some forms. Take photographs if possible.
    - Canada Goose. Larger, longer-billed, generally paler, typical "honking" call.
    - Cackling Goose. Smaller, shorter-billed, darker on the breast and back, higher-pitched "cackling" call.
- White-fronted Goose. Grayish-brown with black marks on breast, white on face at base of pink bill, orange legs.
- Northern Pintail. Long and slim with pointed tail. Breeding males have brown head, white breast and neck stripe, nonbreeding males and females are speckled brown all over. Neck and tail longer than other ducks.
- Northern Shoveler. Long, flat, black (male) or orangish (female) bill is distinctive. Breeding males have green head, white breast, chestnut sides, nonbreeding males and females are brownish.
- American Wigeon. Males have green head with whitish forehead. Females brown. Both sexes have short bluish bill, head more rounded than most ducks. White patch on upper wing distinctive in flight.
- Teals. 3 species, all are small.
    - Green-winged Teal. Green speculum, bill small. Breeding males have green and chestnut head, vertical white stripe on side. In female dark line through eye more distinct than Blue-winged and Cinnamon.
    - Cinnamon and Blue-winged Teal. Large blue patch on upper wing. Breeding male Cinnamon Teal mostly cinnamon, breeding male Blue-winged Teal has dark head with white crescent in front of eye. Females and nonbreeding males hard to separate, consult field guides.
- Lesser Scaup. Dives under water. Males have dark head, breast, and tail, light gray back and sides, bluish bill. Females brownish with white patch at base of bill. Both sexes have a slightly pointed crown and a white wing stripe.
- Greater Scaup. Similar to Lesser but slightly larger, with more rounded head, white wing stripe extends to primaries.
- Ring-necked Duck. Dives under water. Male has dark head, back, breast and tail, gray sides. Bill dark with white band near tip. Female dark with white eye ring and less prominent white band at base of bill.

Feral Waterfowl. Several species of ducks and geese have been introduced to Hawaii and have become feral. The most widespread types are briefly described below. Consult field guides for other species. Record apparently wild mallards as

"Mallard (migratory)", feral Mallards as "Mallard (domestic)", and all other Mallard-derived barnyard ducks (e.g., Pekin, Indian Runner) as "other domestic waterfowl."

- Mallard. Males have green head, chestnut breast, and white neck ring; females brownish and streaked. Some wild Mallards may migrate to Hawaii; feral birds are usually less wary than wild birds, and feral Mallards are often larger.
- Muscovy. Large, black and/or white ducks with knobby red bill.
- Domestic ducks. Color variable; some are white with a yellow bill ("Pekin" duck), some look like dark, oversize mallards.
- Domestic geese. Large, long neck, color variable; some are gray with an orange bill like a Greylag Goose, some are all white with an orange bill.

Gulls and Terns. Gulls do not nest in Hawaii, but several species are seen in Hawaii each winter. Most gulls take 3-4 years to acquire adult plumage, most that reach Hawaii are immature. The most commonly seen species are described below, for other species consult field guides.

- Laughing Gull. Mantle (back and wings) dark gray, wing tips black, mottled with brown in immature. Head black in summer, white with dark smudges in winter. Bill black in winter, red in summer. Immature has broad dark tail band.
- Ring-billed Gull. Mantle light gray, wing tips black with white spots, wings mottled with brown in immature. Bill yellow with black band in adult, pinkish with black tip in immature. Immature has black tail band.
- Glaucous-winged Gull. Large, mantle pale gray in adult, immature mottled with pale brown above and below. Thick bill has red spot in adult, black band in immature.
- Caspian Tern. Much larger than terns that breed in Hawaii, white with black cap, heavy red bill.
- Common Tern. Small, white below, with pale gray back, crown smudged black. Immature has dark bar on shoulder.

Other Issues:

- Wetland names. One of the biggest challenges in compiling and analyzing the waterbird count data has been inconsistent use of names. On the field form please use only the wetland names indicated on the route maps or on the master list of wetlands.

- Visit all wetlands on the scheduled itinerary. If you know in advance that a particular wetland no longer exists and there is no point in visiting it, make a note of that when submitting forms so the information can be recorded into a wetland database.

- It is important that you fill out a field form for each wetland you visit, even if no birds are present or the wetland appears dry. If no form is filled out and submitted, it may be assumed that the site was not visited that year.

- For wetlands with subsites (e.g., Kealia Pond, Kanaha Pond, Kaneohe Marine Base), record data separately for each individual subsite, and indicate the names of both the site and the subsite on each form. Data from different subsites can be combined later if necessary, but if data is lumped when collected, we cannot separate it later.

- Copies of the data sheets should be kept by the compiler on each island, even after they have been submitted to the Oahu office. In some cases the data appears to have been lost in the DOFAW office on Oahu (or perhaps never received?), and the original data sheets could not be located. It is very unfortunate to lose this irreplaceable data after people have made the effort to collect it.

Revised 2 June 2005. If you have comments or suggestions for improving the field form, the instructions, or the count in general, please contact Eric VanderWerf of the U.S. Fish and Wildlife Service (eric_vanderwerf@fws.gov or ewerf@hawaii.rr.com; 792-9461) or Megan Laut of the Hawaii Natural Heritage Program (mlaut@hawaii.edu).

Waterbird Survey Field Form

Wetland Condition Codes		Weather Codes	
Water Level (WL): 0 = dry 1 = lower than normal 2 = normal 3 = higher than normal	Human Impact (HI): 0 = indirect (little garbage, few people present) 1 = moderate 2 = heavy (many people present) (e.g. on boat, wading, fishing, etc.)	Rain Fall (RF): 0 = no rain 1 = mist or fog 2 = drizzle 3 = light rain 4 = heavy rain 5 = snow or hail	Wind: 0 = no wind, <1 mph 1 = smoke drifts, 1-3 mph 2 = wind felt on face, 4-7 mph 3 = leaves and twigs rustle, 8-10 mph 4 = dust raises, branches stir, 13-18 mph 5 = small trees sway, >19 mph
Vegetation Cover (VC): 0 = open water (<25%) 1 = 26-50% cover 2 = 51-75% cover 3 = >75% cover	Shoreline Condition of Tidal Wetlands (SC): 0 = water at high tide mark (leave blank if NA) 1 = 25 feet from high tide mark 2 = 50 feet from high tide mark 3 = >50 feet from high tide mark	Cloud Cover (CC): estimate to nearest 10%	

Date: _____ Observers: _____

Island: _____ _____

_____

Wetland Name																				
Condition	WL	VC	HI	SC	WL	VC	HI	SC	WL	VC	HI	SC	WL	VC	HI	SC	WL	VC	HI	SC
Weather	CC	RF	Wind		CC	RF	Wind		CC	RF	Wind		CC	RF	Wind		CC	RF	Wind	
Time	Start	Stop			Start	Stop			Start	Stop			Start	Stop			Start	Stop		
COOT - adult																				
- juvenile																				
MOORHEN - adult																				
- juvenile																				
STILT - adult																				
- juvenile																				
KOLOA - adult																				
- juvenile																				
Koloa/Mallard hybrid																				
Mallard (domestic)																				
Muscovy																				
Other Dom. Waterfowl																				
Black-cr. Night-Heron																				
Cattle Egret																				
Pacific Golden Plover																				
Ruddy Turnstone																				
Sanderling																				
Wandering Tattler																				

COMMENTS: Note all chicks, stilts or other birds with bands, and anything interesting or unusual.

Retain a copy of this form for your records

version January 2008

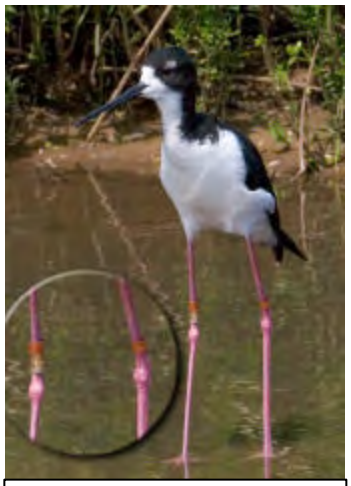
Clear Form Print Submit

HAWAII STATE WATERBIRD COUNT – PHOTGRAPHIC IDENTIFICATION GUIDE

by Eric A. VanderWerf, June 2005

This guide is intended to help identify waterbirds that may be encountered during the Hawaii State waterbird count, including the four species of endangered waterbirds and some of the more common species of migratory shorebirds, waterfowl, gulls, and terns. If you observe a bird that does not match any of the species shown below, make careful notes on its appearance and behavior, take photographs if possible, then consult field guides for further information. All photos copyrighted, used with permission.

Hawaiian Stilt



Hawaiian Stilt male. Note the black back and bright pink legs. Photo Hugo de Vries.

Hawaiian Stilt juvenile. Note the more brownish back, dull pink legs, and more extensive white on the neck and forehead. Photo Eric VanderWerf.

The **bands** on this juvenile stilt are red over aluminum left, blue over white right, or **RA/BW**. Photo Eric VanderWerf.

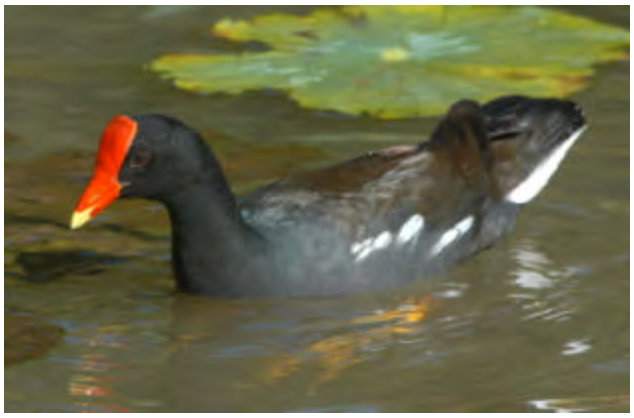
Hawaiian Coot

Hawaiian Coot adult (left) and juvenile. Juveniles are grayish and lack the white bill. Photo Eric VanderWerf.

Adult Hawaiian Coots can have **white or red frontal shields** above the white bill. Photo Eric VanderWerf.

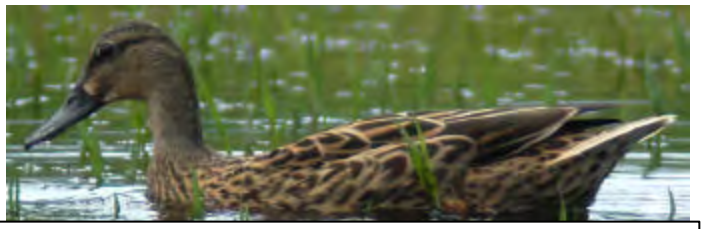
Hawaiian Moorhen

Hawaiian Moorhen. Note the long unlobed toes. Photo Eric VanderWerf.



Hawaiian Moorhen with chicks. Note the long unlobed toes. Photo David Desrochers.

Hawaiian Duck or Koloa



Koloa male (left) and female. Hanalei, Kauai. Note the overall dark color, dark bill, mostly brownish back, brownish undertail coverts with black spots, and whitish tail with brown spots. Photos Eric VanderWerf.

Koloa pair. Hanalei, Kauai. Photo Eric VanderWerf.

Koloa pair. Hanalei, Kauai. Photo Eric VanderWerf.

Koloa in flight. Hanalei, Kauai. The speculum can range from blue to emerald green. Photos Eric VanderWerf.

Koloa wing. Photo Brenda Zaun.

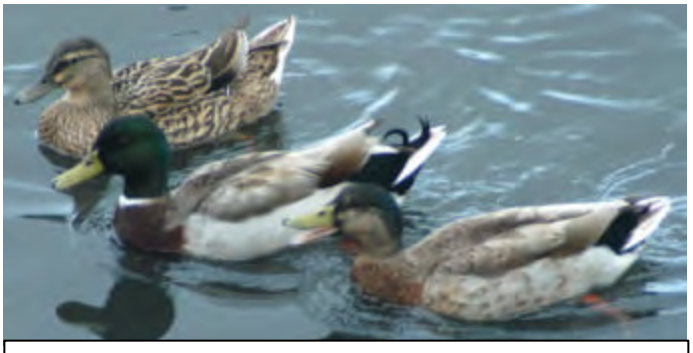
Koloa-Mallard Hybrids

Koloa-Mallard hybrid. Male. Hanalei, Kauai. Photo Eric VanderWerf.

Koloa-Mallard hybrid. Male. Kaelepulu, Oahu. Note the grayish sides and back, black and white tail, and curled black tail coverts. Photo Eric VanderWerf.

Mallard

Mallard. Male (front) and female. Note the "teal" blue speculum, white tail, and curled black tail coverts. This female has a darker, less orange bill than most and may be a domestic hybrid. Photo Eric VanderWerf.



Mallard. Males (front) and female. Note the white tail, curly black tail coverts, and gray back of males. The front male may be molting into breeding plumage or may be a domestic hybrid. Photo Eric VanderWerf.

Migratory Shorebirds

Pacific Golden Plover or Kolea in non-breeding plumage. Photo Eric VanderWerf.

Black-bellied Plover in non-breeding plumage. Note the grayer plumage and larger bill than Kolea. Photo Jaan Lepson.

Semipalmated Plover. Note the single dark breast band. Photo Eric VanderWerf

Ruddy Turnstone. Note the orange legs, black breast band, short bill, and mottled brown back. Photo Eric VanderWerf.

Wandering Tattler. Note the gray plumage, yellow legs, and white supercilium. Photo Eric VanderWerf.

Sanderling. Note the very white breast, black legs, and black bill. Photo Eric VanderWerf.

Pectoral Sandpiper. Note the sharp lower border to streaking on the breast. Photo Eric VanderWerf.

Sharp-tailed Sandpiper juvenile. Note the chestnut cap, white supercilium, and indistinct lower border to breast streaks. Photo Eric VanderWerf.

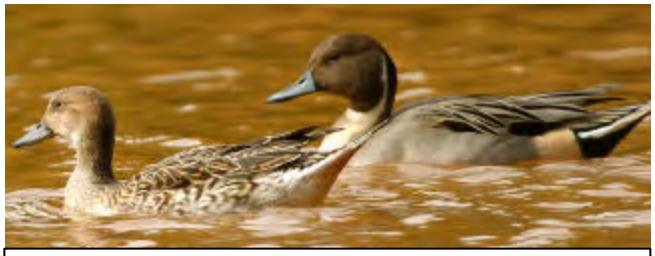
Sharp-tailed Sandpiper adult. Note the indistinct lower border to breast streaks and more streaked crown. Photo Eric VanderWerf.

Long-billed Dowitcher. Note the long bill, chunky body, and yellow legs. Photo Eric VanderWerf.

Lesser Yellowlegs. Note the long yellow legs, thin bill, and slim body. Photo Jim Denny.

Bristle-thighed Curlew. Note the large size, long curved bill, and head stripes. Photo Eric VanderWerf.

Migratory Waterfowl

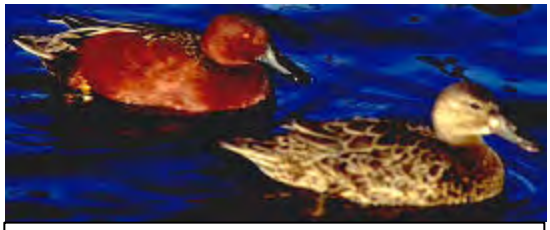


Northern Pintail. Male (right) and female. Note the long neck, and long pointed tail. Photo Jim Denny.

American Wigeon. Male (back) and female. Note the short bluish bill and steep forehead. Photo Jaan Lepson.

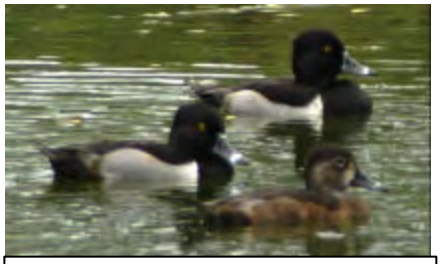
Green-winged Teal. Male (left) and female. In female note shorter bill and more distinct eye-line. Photo Arleone Dibben-Young.

Blue-winged Teal. Male. Photo Susan Hengeveld.

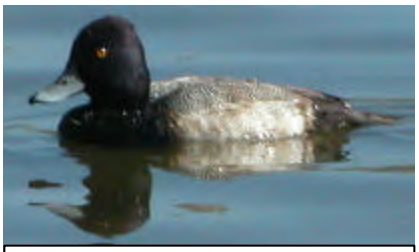


Cinnamon Teal. Male (left) and female. In female note longer bill and plainer face than other teal. Photo Arleone Dibben-Young.

Northern Shoveler. Male (left) and female. Note the long flat bill. Photos Arleone Dibben-Young.



Ring-necked Duck. Female (front) and 2 males. Photo Eric VanderWerf.

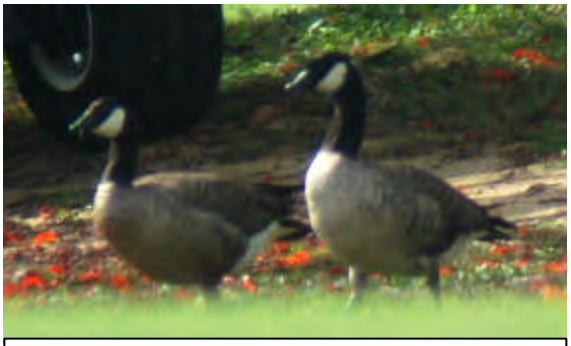


Lesser Scaup. Male. Note peaked head. Photo Jaan Lepson.

Lesser Scaup. Female. Note peaked head. Photo Eric VanderWerf.

Greater Scaup. Male (right) and female. Note rounder head, larger bill. Photo Jim Denny.

Cackling Goose. Note short neck and bill. Photo Eric VanderWerf.



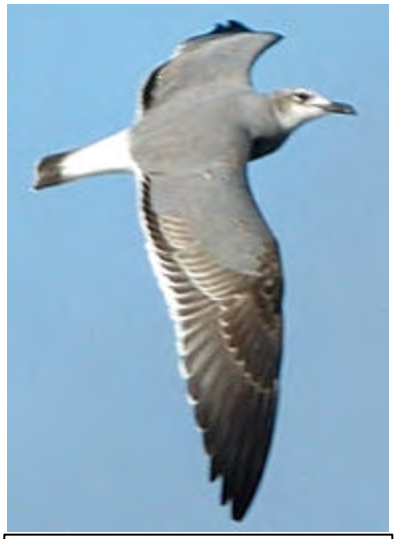
Cackling (left) and Canada Geese. Note differences in size, neck and bill length, and breast color. Photo Eric VanderWerf.

White-froonted Goose. Photo Eric VanderWerf.

Gulls and Terns

Laughing Gull. Adult in breeding plumage. Photo David Price.

Laughing Gull. 1st year. Photo Susan Hengeveld.



Laughing Gull. 1st year. Note black tail band and brownish primaries. Photo Jim Denny.

Ring-billed Gull. 1st year. Photo Eric VanderWerf.

Glaucous-winged Gull. 2nd-year. Photo Eric VanderWerf.

Glaucous-winged Gull. 1st-year. Photo Eric VanderWerf.

Caspian Tern. Note the large red bill. Photo Eric VanderWerf.

Common Tern. Winter plumage. Photo Dayna Harris.

Appendix F: MANAGEMENT PLANS & REPORTS

Management Plans & Reports on HIARNG Share Drive:

Z:\VENN_Conservation\Reports_and_Plans\INRMP\01_A_INRMP_2016_Update_KRISTINE\APPENDIX F - Management Plans & Reports

1. Hawaii State Wildlife Action Plan (SWAP) 2015

2. Endangered and Rare Species on Hawaii Army National Guard Lands of the Island of Hawaii 1997
3. Endangered and Rare Species on Hawaii Army National Guard Lands of the Island of Kauai 1998
4. Endangered and Rare Species on Hawaii Army National Guard Lands of the Island of Oahu 1998
5. Endangered and Rare Species on Hawaii Army National Guard Lands of the Islands of Maui and Molokai 1999

6. Delineation of Wetlands and other Regulated Waters, Kekaha Training Area, 1999
7. Delineation of Wetlands and other Regulated Waters, Keaukaha Military Reservation, 1999
8. Delineation of Wetlands and other Regulated Waters, Ukumehame Training Area, 1999

9. Natural Resources Planning Level Surveys for Kekaha Firing Range, Kauai 2007
10. Natural Resources Planning Level Surveys for Keaukaha Military Reservation, Hawaii 2007
11. Natural Resources Planning Level Surveys for Ukumehame Firing Range, Maui 2007
12. Natural Resources Planning Level Surveys for Regional Training Institute, Oahu 2012

13. Rapid Ohia Death Strategic Response Plan 2017-2019
14. A Spectral Mapping Signature for the Rapid Ohia Death (ROD) Pathogen in Hawaiian Forests March 2018
15. Presence and viability of Ceratocystis luku'ohia in ambrosia beetle frass from Rapid Ohia Death-affected Metrosideros polymorpha trees on Hawaii Island. October 2018

16. A Five-Year Study of Hawaiian Hoary Bat (Lasiurus cinereus semotus) Occupancy on the Island of Hawaii, July 2013.
17. Endangered Species Recovery Committee Hawaiian Hoary Bat Guidance Document, December 2015